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SACRAMENTO - SAN JOAQUIN

WATER SUPERVISOR'S

REPORT

FOR YEAR

1930

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Water Supervisor

Sacramento, California
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The cooperation of federal agencies including the Water Resources Branch of the U. S. Geological Survey, through H. D. Mc Glashan, District Engineer and the U. S. Department of Agriculture, Bureau of Agricultural Engineering, through W. W. McLaughlin, Associate Chief;

The untiring and efficient assistance of the engineers as listed under the organization statement who have been employed on this work during the past year.

ADVISORY COMMITTEE

PERMANENT COMMITTEE OF THE SACRAMENTO-SAN JOAQUIN RIVER PROBLEMS CONFERENCE

The successful prosecution of the Water Supervisor's work both in stream administration and collection of records may be attributed in no small measure to the backing, advice, and continued interest and cooperation of the Permanent Committee of the Sacramento-San Joaquin River Problems Conference.

This Committee, representative of the water users and other interests involved, was appointed by the First Sacramento-San Joaquin River Problems Conference in January, 1924. Its present personnel is as follows:

Herbert E. White, Chairman, Sacramento	
E. L. Adams, Chico	Manly S. Harris, San Francisco
A. E. Anderson, San Francisco	W. I. Hechtman, Sherman Island
Alden Anderson, Sacramento	Warren H. McBryde, San Francisco
G. A. Atherton, Stockton	R. V. Meikle, Turlock
P. M. Downing, San Francisco	Jesse Poundstone, Grimes
William Durbrow, Grass Valley	F. T. Robson, Vina

ORGANIZATION

Walter E. Garrison - - - - - Director of Public Works
Edward Hyatt - - - - - State Engineer

- - 0 - -

Harold Conkling - - - - - Deputy in charge of Water Rights

Harlowe M. Stafford
Sacramento-San Joaquin Water Supervisor

Martin H. Blote - - - - - Assistant Water Supervisor
James M. Brockway - - - - - Assistant Engineer
Frederick E. Anderson - - - - - Assistant Engineer
Ralph S. Rose - - - - - Assistant Engineer

DELTA COOPERATIVE INVESTIGATION

W. W. McLaughlin - - - - - Associate Chief,
Bureau of Agricultural Engineering, U.S. Department of Agriculture.
O. V. P. Stout - - - - - Hydraulic Engineer
Lloyd N. Brown - - - - - Assistant Hydraulic Engineer

CHAPTER I

INTRODUCTION

Purpose

The purpose of this report is to make of record the measurements made and data collected through the office of the Sacramento-San Joaquin Water Supervisor during the 1930 irrigation season.

Origin and History of Work

This work was inaugurated in 1924 through the efforts of the first Sacramento-San Joaquin River Problems Conference and its Permanent Committee working with the former Division of Water Rights. The funds for the work in the first year were largely subscribed by the water users but subsequently it has been conducted under legislative appropriations included in the regular biennial budget of the Division. A complete description of the origin and history of this work will be found in the 1924 and 1926 Biennial Reports of the former Division of Water Rights, in Bulletin Number 4 of the same Division, and in Bulletin Number 23 of the Division of Water Resources. The latter bulletin brings together all data and measurements obtained by the Water Supervisor in the five year period, 1924 to 1928, inclusive. The reports for subsequent individual years are mimeographed as the present report, with the plan to again bring all data together in a printed bulletin at the end of the second five year period.

Scope

As outlined in previous reports this work is divided into (1) engineering investigations, measurements and collection of records, and

(2) conservation, waste prevention and such administration of the stream flow as shall fall within the jurisdiction of the Division of Water Resources or be mutually agreed upon by the water users. This report presents chiefly, for permanent record, the results of the engineering investigations. These comprise measurements and records of the diversions of water from the Sacramento, Feather, Yuba, American, Merced, Tuolumne, Stanislaus and San Joaquin rivers within the valley floor and above the Delta; stream flow measurements throughout the territory, largely in cooperation with the Water Resources Branch, U. S. Geological Survey; measurements and records of waters returned to the Sacramento and San Joaquin Rivers; studies of the consumptive use of water in the Sacramento-San Joaquin Delta in cooperation with the U. S. Department of Agriculture Bureau of Agricultural Engineering; an annual census of irrigated areas and crops under all diversions recorded and throughout the Delta; and observations and investigation of the advance and retreat of salinity in the Delta channels and Upper Bays.

Organization

The regular organization has included the Water Supervisor, Assistant Water Supervisor, and three assistant hydraulic engineers. The organization for the cooperative Delta investigations under the direction of W. W. McLaughlin, Associate Chief, Bureau of Agricultural Engineering, U. S. Department of Agriculture, has included an hydraulic engineer and one assistant giving full time to field work.

Under the direction of Martin H. Blote, Assistant Water Supervisor, engineers James M. Brockway and Ralph S. Rose have been responsible for the work above Sacramento, the former working from Meridian to Redding

and the latter from Sacramento to Meridian; Engineer Frederick E. Anderson has been responsible for the census of irrigated acreages and crops in the Delta, the work in the Delta uplands and that on the Feather, American, and Yuba Rivers; and engineers Brockway and Rose have carried out the return water and diversions measurements on the San Joaquin River and its tributaries. Major O. V. P. Stout has been in charge of the Delta Cooperative work with Engineer Lloyd N. Brown in resident charge at King Island.

Conservation Features

A comparison of the run-off and water supply conditions in the 1930 season with those of the previous seasons in which the work of the Water Supervisor has been conducted is indicated in the following tabulation:

Year	*Entire	Minimum Flow in Second-feet		
	Run-off to San Francisco Bay in Per Cent of Normal	At Colusa	At Sacramento	San Joaquin Near Vernalis
1924	28	1470	705	391
1925	83	1870	2760	660
1926	57	1030	1330	565
1927	114	1960	3420	1290
1928	80	1960	2510	840
1929	42	1550	2300	565
1930	63	1680	2350	645

* Normal is 40-year mean (1889-1929) of natural run-off at foothill stations of major tributaries. Previous reports have given run-off in per cent of 50-year mean (1870-1920) as given in Bulletin Number 5, Division of Water Resources.

It will be noted that as far as the seasonal run-off is con-

cerned, 1930 was little better than 1926. However, the 1930 rice acreage was considerably less than that of 1926 and the minimum stream flow which occurred, similar to that of 1928 and 1929, was not critical as in 1924 and 1926. No serious navigation difficulties or shortages of water for irrigation purposes were reported in 1930 and the encroachment in the Delta of salinity to the extent of 100 parts of chlorine per 100,000 corresponded closely with the encroachment of 1928 and 1929. In 1930, therefore, the requirements for strict conservation measures and regulation of diversions through the Water Supervisor's office were somewhat modified, and the work was confined largely to the engineering investigation dealing with the collection of required hydrographic data and records.

CHAPTER II

MEASUREMENTS OF STREAM FLOW

During the irrigation season of 1930, stream flow measurements and records have been obtained through cooperation with the Water Resources Branch of the U. S. Geological Survey for stations on the Sacramento River at Kennett, Red Bluff, Butte City, Colusa, Knights Landing, and Verona; on the Feather River at Nicolaus; on the American River at Fair Oaks and "H" Street Bridge, Sacramento; on the Mokelumne River at Woodbridge and Thornton; and on the San Joaquin River near Vernalis and Newman. Supplementing these, the Water Supervisor has maintained additional stations on upper Butte Creek one mile west of the East Side Highway, on lower Butte Creek and Butte Slough, and in connection with the San Joaquin return water measurements (See Chapter IV) stations as follows: Stanislaus River at Orange Blossom Bridge and at Elliot Ranch, Tuolumne River at Roberts Ferry Bridge and at Tuolumne City, Merced River at Yosemite Valley Railroad Crossing and at the bridge on Hills Ferry Road, Dry Creek at Old Waterford Bridge and at Basso Ranch (near Modesto), and San Joaquin River at San Luis Island and at Grayson (Laird Slough).

TABLE 1
DISCHARGE OF SACRAMENTO RIVER AT KENNETT

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	7160	6370	4130	3210	2940	2820	3100
2	6960	6370	4130	3210	2940	2720	2940
3	6960	6760	4130	3210	2940	2770	2880
4	6760	6180	3990	3210	2940	2770	2940
5	6560	5990	3990	3210	2940	2770	2990
6	6370	5990	3850	3210	2940	2820	2990
7	6370	5800	3850	3210	2880	2880	2940
8	6370	5800	3850	3210	2880	3100	2990
9	6180	5620	3850	3210	2880	3450	2990
10	6180	5620	3710	3210	2880	3100	2990
11	5990	5440	3710	3210	2880	2990	2940
12	5800	5260	3710	3210	2880	3100	2990
13	5990	5090	3710	3100	2880	3100	2990
14	8780	5090	3580	3100	2820	3100	2990
15	8360	4920	3580	2990	2820	2990	2990
16	7960	5260	3580	2990	2820	2940	2990
17	7760	5260	3450	3100	2820	2880	2990
18	7560	5090	3450	3100	2820	2880	2990
19	7360	4920	3330	2990	2820	2940	2990
20	7160	4750	3330	3100	2880	2940	2990
21	7160	4750	3330	2990	2880	2940	2940
22	7560	4750	3330	2940	2880	2990	2990
23	7360	4590	3450	2940	2820	3100	2990
24	7560	4430	3450	2990	2820	3210	2990
25	7160	4280	3330	2990	2820	3100	2990
26	7560	4280	3330	2990	2820	2990	2990
27	7560	4130	3330	2940	2820	2990	2990
28	7360	4280	3330	2940	2820	2990	3100
29	6960	4430	3330	2940	2820	2990	2990
30	6760	4430	3330	2990	2820	2990	2990
31		4280		2990	2820		2990
Mean	7050	5170	3620	3080	2860	2980	2990
Ac. Ft. for Month	420000	318000	215000	189000	176000	177000	184000

NOTE: This is a permanent station of the Water Resources Branch of the U. S. Geological Survey established at Kennett in 1925. This station is maintained throughout the year, but the record is given here for the period of the irrigation season only.

TABLE 2

DISCHARGE OF SACRAMENTO RIVER NEAR RED BLUFF

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	9860	8600	5100	3660	3240	2980	3740
2	9540	8600	5000	3660	3240	2980	3660
3	9220	8900	5000	3580	3150	2980	3490
4	9220	9300	5000	3580	3150	2980	3400
5	8910	9100	4790	3580	3150	2980	3490
6	8600	8900	4690	3580	3060	2980	3490
7	8300	8600	4590	3490	3060	3060	3490
8	8000	8400	4490	3660	3060	3150	3490
9	7710	8200	4390	3490	3060	4010	3580
10	7710	8000	4390	3490	3060	4010	3580
11	7710	7800	4300	3490	3060	3740	3580
12	7160	7600	4200	3490	3060	3400	3580
13	7160	7400	4100	3490	3060	3490	3580
14	10900	7100	4100	3400	3060	3580	3490
15	13300	6800	4100	3320	3060	3490	3490
16	10500	6600	4010	3240	3060	3400	3490
17	9860	6500	4010	3240	3060	3320	3490
18	9540	6400	3920	3320	3060	3320	3490
19	9540	6300	3920	3320	3060	3320	3490
20	9220	6200	3920	3320	3060	3320	3490
21	8910	6100	3920	3320	3060	3400	3580
22	9220	6000	3830	3240	3060	3400	3660
23	9220	5980	3920	3150	2980	3490	3580
24	9540	5900	3920	3240	2980	3660	3580
25	9860	5800	3830	3320	2980	3740	3580
26	9220	5700	3830	3240	2980	3660	3580
27	10200	5600	3830	3240	2980	3490	3580
28	9860	5600	3830	3240	2980	3490	3580
29	9540	5650	3740	3240	2980	3660	3580
30	8910	5430	3740	3150	2980	3660	3580
31		5320		3240	2980		3580
Mean	9210	7040	4210	3390	3060	3400	3550
Ac.Ft. for Month	548000	433000	251000	208000	188000	202000	218000

NOTE: This is a permanent station of the Water Resources Branch of the U. S. Geological Survey located near the site of the proposed Iron Canyon Dam: Mile 198.6 above Sacramento. This station is maintained throughout the year, but the record is given here for the period of the irrigation season only.

TABLE 3

DISCHARGE OF SACRAMENTO RIVER AT BUTTE CITY

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	7650	4360	2550	2050	2020	3480
2	7460	4250	2490	2050	2020	3560
3	7460	4140	2430	2050	2050	3560
4	8420	4040	2430	2020	2020	3480
5	8420	3960	2380	2020	2020	3320
6	7840	3880	2430	1980	2020	3320
7	7460	3720	2380	1980	2100	3320
8	7080	3640	2320	1980	2180	3320
9	6890	3560	2380	1940	2270	3160
10	6700	3400	2320	1940	2740	3160
11	6510	3320	2320	1980	3090	3240
12	6320	3240	2270	1980	3020	3240
13	5950	3090	2270	1940	2740	3240
14	5950	3090	2270	1940	2800	3480
15	5770	3020	2220	1910	2870	3400
16	5590	2940	2180	1880	2870	3400
17	5590	2940	2130	1880	2800	3400
18	5590	2870	2090	1880	2800	3400
19	5590	2740	2090	1840	2740	3400
20	5410	2740	2090	1840	2740	3480
21	5230	2740	2090	1880	2740	3480
22	5060	2670	2090	1880	2870	3560
23	5060	2670	2050	1880	3020	3640
24	4890	2670	2050	1910	3090	3560
25	4720	2670	2090	1940	3240	3480
26	4460	2670	2050	1940	3400	3480
27	4300	2610	2090	1940	3400	3480
28	4210	2610	2050	1940	3320	3480
29	4210	2610	2050	1940	3320	3400
30	4460	2550	2050	1980	3400	3400
31	4460		2050	1980		3400
Mean	5960	3180	2220	1940	2720	3410
Ac.Ft. for Month	366000	189000	136000	119000	162000	210000

NOTE: Gagings taken near Butte City Bridge, Mile 116 above Sacramento. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 4

DISCHARGE OF SACRAMENTO RIVER AT COLUSA

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	7600	4370	2420	1800	1800	3570
2	7600	4280	2420	1740	1800	3570
3	7600	4100	2280	1740	1860	3660
4	8030	3920	2280	1740	1860	3570
5	8910	3920	2280	1740	1860	3480
6	8360	3830	2280	1740	1920	3480
7	7500	3740	2220	1740	1980	3390
8	7200	3650	2160	1680	1980	3390
9	7000	3470	2100	1680	2100	3390
10	6800	3470	2160	1680	2350	3300
11	6600	3290	2100	1680	2950	3390
12	6400	3290	2040	1680	3030	3390
13	6100	3200	2040	1740	2870	3480
14	5810	3110	2040	1740	2870	3570
15	5720	3030	1980	1740	2950	3570
16	5630	2950	1980	1680	2950	3570
17	5540	2870	1860	1680	2950	3570
18	5540	2870	1860	1680	2870	3570
19	5540	2710	1860	1680	2870	3570
20	5360	2630	1860	1680	2870	3570
21	5270	2630	1860	1680	2870	3570
22	5090	2630	1860	1680	2950	3570
23	5090	2630	1860	1680	3110	3660
24	5000	2560	1800	1740	3110	3660
25	4820	2630	1800	1740	3200	3570
26	4640	2560	1800	1740	3380	3570
27	4460	2490	1800	1740	3470	3570
28	4280	2490	1800	1740	3290	3570
29	4190	2490	1740	1740	3290	3480
30	4370	2420	1740	1800	3290	3480
31	4460		1740	1800		3480
Mean	6020	3140	2000	1720	2690	3520
Ac.Ft. for Month	370000	187000	123000	106000	160000	216000

NOTE: Gagings taken near Colusa Bridge, Mile 89.4 above Sacramento. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 5

DISCHARGE OF SACRAMENTO RIVER AT KNIGHTS LANDING

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	8200	4630	2020	1500	1780	3700
2	8200	4630	2020	1500	1780	3920
3	8200	4450	1900	1500	1740	4000
4	8670	4270	1900	1500	1870	4000
5	9620	4150	1900	1500	1920	3920
6	9020	4030	1900	1500	1920	3780
7	8100	3970	1850	1540	1960	3620
8	7770	3850	1820	1540	2050	3620
9	7560	3740	1780	1500	2140	3620
10	7340	3580	1740	1540	2290	3620
11	7120	3410	1780	1540	2540	3480
12	6910	3300	1780	1500	2970	3550
13	6580	3080	1780	1500	3190	3620
14	6270	2860	1820	1500	3240	3550
15	6180	2700	1780	1500	3300	3780
16	6080	2590	1700	1500	3300	3780
17	5980	2390	1660	1500	3300	3780
18	5980	2390	1620	1500	3300	3700
19	5980	2290	1580	1420	3300	3700
20	5790	2240	1540	1420	3300	3700
21	5690	2190	1540	1380	3240	3620
22	5500	2290	1500	1420	3240	3620
23	5500	2340	1500	1420	3140	3700
24	5460	2290	1500	1500	3240	3780
25	5210	2290	1500	1540	3360	3850
26	5010	2190	1500	1540	3410	3850
27	4810	2140	1500	1580	3460	3850
28	4620	2100	1500	1620	3460	3780
29	4520	2100	1450	1660	3460	3780
30	4720	2100	1450	1700	3410	3780
31	4810		1450	1740		3780
Mean	6500	3020	1690	1520	2820	3740
Ac.Ft. for Month	400000	180000	104000	93500	168000	230000

NOTE: Gagings are taken at the Railroad Bridge at Knights Landing at Mile 34.0 above Sacramento and therefore include the water entering the river from the Back Borrow Pit of Reclamation District 737. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 6

DISCHARGE OF SACRAMENTO RIVER AT VERONA

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	31200	20900	12200	3780	2750	3600	6670
2	30300	20000	12000	3640	2640	3360	7120
3	28900	19800	11400	3560	2750	3240	7270
4	27800	20500	10800	3480	2750	3600	7270
5	26600	21600	10200	3400	2530	3730	7120
6	26400	21400	10000	3320	2530	3730	6670
7	26200	20300	9800	3240	2750	3730	6370
8	26000	19600	9600	3160	2640	3990	6520
9	25900	18900	9200	3080	2640	3990	6520
10	26200	18100	8800	3060	2750	4250	6370
11	25200	17400	8400	3040	2750	4520	6370
12	23900	16800	8000	3020	2640	5220	6520
13	22700	16100	7400	3000	2640	5640	6370
14	24100	16100	6800	2990	2640	5780	6070
15	27300	15900	6600	2980	2640	5780	6520
16	28900	15500	6200	2970	2750	5780	6520
17	30300	15300	5800	2800	2640	5780	6520
18	29800	15900	5400	2640	2750	5780	6370
19	28500	16400	5020	2640	2640	5920	6370
20	27600	16400	4890	2640	2540	5920	6370
21	27300	16400	4760	2640	2540	5920	6220
22	26900	15900	4760	2530	2650	5780	6220
23	26900	14900	4760	2530	2760	5360	6370
24	27100	14200	4760	2640	3000	5780	6370
25	26900	13800	4760	2750	3120	6070	6520
26	25900	13400	4500	2640	3120	6220	6520
27	24800	13000	4370	2750	3240	6220	6370
28	23600	12600	4220	2750	3240	6370	6220
29	22300	12400	4070	2530	3360	6370	6370
30	21600	12400	3920	2640	3360	6070	6220
31		12600		2640	3480		6370
Mean	26600	16600	7110	2950	2810	5120	6510
Ac.Ft. for Month	1580000	1020000	423000	181000	173000	305000	400000

NOTE: This station is located at Mile 19.6 above Sacramento below the junction of the Feather with Sacramento River. It is just above the mouth of "Cross Canal", main drain of Reclamation District 1001, and is only a short distance above the upstream limit of the tide effect. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 7

DISCHARGE OF SACRAMENTO RIVER AT SACRAMENTO

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	24800	14800	4240	2560	3550	7080
2	24300	14300	4040	2460	3220	7520
3	24400	13700	3970	2610	3120	7700
4	25100	13200	3930	2590	3470	7760
5	25500	13000	3750	2390	3620	7520
6	25000	13000	3620	2360 ✓	3670	7030
7	23900	13100	3550	2580 ✓	3720	6760
8	23400	12700	3360	2460 ✓	3910	6870
9	22200	11900	3280	2460	3980	6840
10	21100	11400	3190	2580	4240	6650
11	20300	11200	3170	2650	4590	6710
12	19800	10900	3150	2470	5280	6840
13	19700	10100	3090	2490	5790	6550
14	20000	9240	3100	2550	5930	6370
15	19900	8740	3020	2530	5900	6920
16	19000	8110	2990	2620	5900	6840
17	19400	7770	2820	2480	5890	6840
18	20500	7250	2610	2610	5980	6600
19	21400	6690	2670	2450	6070	6580
20	21600	6250	2610	2370	6100	6520
21	21800	5980	2590	2350	6100	6340
22	20700	5870	2390	2480	5980	6320
23	19200	5790	2400	2620	5570	6480
24	18500	5640	2540	2910	5990	6450
25	18000	5650	2610	3020	6350	6670
26	17500	5190	2500	3000	6490	6610
27	17200	5060	2610	3140	6570	6460
28	16900	4840	2610	3150	6680	6310
29	16400	4640	2400	3320	6650	6440
30	15800	4380	2450	3270	6400	6300
31	15600		2480	3410		6460
Mean	20600	9010	3020	2680	5220	6750
Ac. Ft. for Month	1267000	536000	186000	165000	311000	415000

NOTE: This represents the flow past Sacramento (below the City of Sacramento intake) to the Delta. The discharges of this table have been computed by adding to the measured Verona discharges the measured inflow of return water and American River and subtracting therefrom the measured diversions between Verona and Sacramento. A gaging station is not maintained at Sacramento because of tidal action.

TABLE 8

DISCHARGE OF BUTTE CREEK NEAR EAST SIDE HIGHWAY

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		372	117	1		0	26
2		365	103	1		0	28
3		357	90	1		0	30
4	-	350	72	1		0	32
5	-	342	72	1		0	34
6		335	69	1		0	36
7	FLOW	327	66	1		0	38
8		320	63	1	-	0	40
9	FLOW	312	60	1	-	0	42
10		305	58	1	-	0	44
11		297	55	1		0	46
12	OF	290	52	1	FLOW	0	48
13		282	49	1		1	50
14		275	46	1	FLOW	2	51
15	RECORD	282	44	1		3	51
16		289	41	0		4	52
17		297	38	0		5	52
18		305	35	0	NO	6	52
19	OF	293	33	0		7	53
20		280	30	0	-	8	54
21		267	27	0	-	10	55
22		253	24	0	-	12	56
23	NO	239	22	0		14	56
24		225	19	0		16	56
25	-	212	16	0		16	58
26	-	198	13	0		16	60
27		185	11	0		18	62
28		171	8	0		20	64
29		157	5	0		22	66
30		144	2	0		24	68
31		130		0			70
Mean		257	44.7	0.5		6.8	49.3
Ac.Ft. for Month		16800	2660	30		405	3030

NOTE: This record is estimated from current meter measurements and occasional staff gage readings. Station is located at bridge one mile west of the East Side Highway.

TABLE 9

DISCHARGE OF FEATHER RIVER AT NICOLAUS

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	10500	6130	1010	849	1310	2950
2	10100	5690	1080	835	1040	3050
3	10500	5410	1120	842	1010	3050
4	12500	4870	1150	793	1310	2950
5	12300	4610	1230	658	1310	2950
6	10900	4610	989	793	1350	2550
7	10300	4350	919	821	1470	2350
8	10100	4090	828	814	1550	2650
9	9720	3850	856	828	1470	2700
10	9160	3490	884	863	1590	2700
11	8620	3610	891	821	1630	2750
12	8260	3380	870	676	1860	2750
13	7920	3160	863	814	1940	2500
14	8090	2850	807	849	1990	2260
15	8090	2850	664	898	2080	2600
16	7920	2700	718	898	1940	2650
17	7920	2170	712	884	1990	2650
18	8800	2260	670	828	2120	2600
19	8980	2220	664	658	2220	2600
20	8980	2080	694	765	2300	2600
21	9160	2260	676	842	2300	2400
22	8440	2450	586	884	2040	2500
23	7750	2300	744	1010	1720	2600
24	7240	2040	856	1270	2220	2550
25	7240	1940	856	1270	2350	2650
26	6920	1680	856	1080	2500	2700
27	6600	1470	891	1230	2400	2550
28	6600	1390	835	1270	2450	2500
29	6440	1350	652	1270	2450	2600
30	7080	1270	807	1230	2400	2600
31	6760		849	1350		2650
Mean	8710	3080	846	932	1880	2650
Ac.Ft. for	536000	183000	52000	57300	112000	163000
Month						
Monthly Diversions Below Nicolaus	193	1819	1387	2516	519	45
Discharge to Sacto. River	536000	181000	50600	54800	111000	163000
Acre-Ft.						

NOTE: Gagings at Nicolaus Bridge, Mile 9.6 above mouth of River. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 10

DISCHARGE OF AMERICAN RIVER AT SACRAMENTO

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	4020	2820	750	184	205	388
2	4400	2520	721	180	151	436
3	4720	2520	750	184	130	469
4	4720	2680	760	172	142	478
5	4020	3050	640	180	148	436
6	3720	3350	622	168	210	359
7	3800	3650	586	164	184	420
8	3880	3420	541	154	154	380
9	3500	3050	505	164	168	352
10	3200	2980	478	184	151	317
11	3050	3200	487	184	225	331
12	3200	3200	487	172	230	345
13	3800	3050	428	184	268	210
14	4180	2820	373	225	215	331
15	4180	2450	359	205	184	373
16	3800	2220	373	188	225	352
17	4250	2380	331	151	245	352
18	4880	2220	317	142	262	262
19	5200	2000	317	142	230	235
20	5520	1790	298	168	235	172
21	5680	1550	262	164	262	151
22	5040	1480	220	164	220	130
23	4560	1360	192	176	256	136
24	4560	1250	245	192	274	125
25	4560	1190	210	157	292	142
26	4400	1050	205	160	304	139
27	4560	1010	200	176	338	133
28	4560	952	184	215	345	139
29	4250	890	176	225	268	130
30	3720	800	154	200	359	133
31	3200		176	225		130
Mean	4230	2230	398	179	229	274
Ac.Ft. for	260000	133000	24500	11000	13600	16800
Month						
Monthly Diversions Below Gaging Station	28	50	31	18	12	24
Discharge to Sacto. River	260000	133000	24500	11000	13600	16800
Acre-Ft.						

NOTE: Gagings at "H" Street Bridge, 6.0 miles above mouth.
Station maintained by Water Resources Branch of the
U. S. Geological Survey under cooperative agreement.

TABLE 11

DISCHARGE OF MOKELUMNE RIVER AT WOODBRIDGE

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	275	48	1120	3.6	190	184	196
2	340	43	898	2.7	158	94	377
3	188	53	581	2.7	221	328	390
4	38	98	1160	3.6	41	331	382
5	327	391	955	4.2	118	350	364
6	1220	746	1220	5.5	196	357	137
7	1330	723	1610	5.5	221	350	316
8	591	838	2100	67	235	68	398
9	61	769	2310	102	214	213	340
10	17	680	1450	146	232	291	364
11	9	620	1140	180	45	312	374
12	6.5	580	1450	268	120	327	396
13	25	680	1510	233	209	327	388
14	70	1080	1390	24	228	327	388
15	82	1330	1240	102	249	73	381
16	79	1300	1100	253	256	221	381
17	84	1130	1030	260	106	312	374
18	79	1180	930	223	31	305	381
19	114	1480	884	201	103	305	352
20	112	1740	899	208	196	312	108
21	115	2060	795	33	228	298	34
22	110	2480	174	77	256	81	206
23	71	2520	320	138	271	211	396
24	56	2240	102	177	164	359	374
25	61	2140	20	162	36	327	396
26	60	1930	8	155	114	320	388
27	54	2000	5.5	201	303	334	146
28	62	2140	5	26	301	334	284
29	59	2280	5	153	301	89	359
30	79	2200	4.2	174	316	185	531
31		1670		162	286		441
Mean	192	1260	881	121	192	264	334
Ac.Ft. for Month	11400	77500	52400	7440	11800	15700	20500

NOTE: Gaging station located just below Woodbridge Irrigation District's Dam at Woodbridge. Station maintained by Water Resources Branch of the U. S. Geological Survey throughout the year, but the record is given here for the period of the irrigation season only.

TABLE 12

DISCHARGE OF MOKELUMNE RIVER AT THORNTON

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	299	73	1250	27	194	238	192
2	308	49	1040	25	193	158	301
3	288	50	**	24	222	236	380
4	82	58		23	137	378	370
5	91	178	**	23	101	358	360
6	962	652	1120	23	191	378	210
7	1170	666	1450	24	226	378	252
8	833	780	**	26	250	193	360
9	191	780		32	238	171	350
10	89	728		122	234	299	350
11	54	656		172	139	318	380
12	39	632		228	89	338	400
13	37	680	**	290	191	328	400
14	65	988	1340	152	236	328	400
15	92	1230	1140	78	272	188	390
16	94	*	**	217	281	165	390
17	94		**	290	177	290	390
18	98		936	263	80	308	390
19	98		910	223	79	308	380
20	132		884	240	171	318	192
21	132		780	130	217	318	69
22	131		263	82	247	174	120
23	110		308	161	281	169	353
24	85		148	171	236	330	390
25	72		74	212	110	348	430
26	74		58	185	83	318	410
27	63		42	111	235	338	239
28	67		36	78	308	348	240
29	60		32	209	308	191	360
30	70		29	228	318	161	528
31		*		180	308		518
Mean	199			137	205	279	339
Ac.Ft. for Month	11800			8420	12600	16600	20800

* May 16-31, station not rated.

** No record of flow obtained.

NOTE: This station is located near Thornton at the lowest point on the river which is above tidal effect. Station maintained by Water Resources Branch of the U. S. Geological Survey.

TABLE 13

DISCHARGE OF SAN JOAQUIN RIVER NEAR VERNALIS

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	3260	2220	2560	1630	768	1240	1840
2	2940	2080	1900	1570	725	1210	1900
3	2700	2020	1720	1570	725	1210	1900
4	2350	2210	1780	1570	745	1240	1900
5	2350	2280	1780	1600	725	1240	1840
6	2210	2350	2560	1540	705	1240	1840
7	2020	2280	2560	1510	665	1270	1780
8	2280	2080	2700	1450	645	1300	1720
9	3020	1960	3020	1390	835	1300	1720
10	2940	1840	3180	1360	955	1330	1720
11	2630	1840	3020	1390	980	1360	1660
12	2490	1780	2780	1330	980	1420	1660
13	2140	1660	2420	1360	955	1420	1660
14	3020	1540	3430	1390	980	1450	1660
15	2860	1450	4250	1330	955	1540	1630
16	2280	1390	4350	1270	955	1540	1600
17	2140	1360	4850	1210	980	1540	1630
18	2080	1420	4750	1210	1030	1480	1630
19	2140	1420	4150	1180	1060	1420	1600
20	2140	1840	3100	1180	1060	1630	1630
21	2350	3020	2860	1130	930	1630	1570
22	2560	2780	2560	1000	790	1480	1570
23	2860	3020	2350	980	745	1510	1570
24	3020	2940	2420	955	812	1510	1540
25	3180	2700	2280	930	930	1540	1570
26	3180	3180	2080	955	1080	1540	1540
27	2780	2780	1960	955	1100	1540	1570
28	2640	2700	1840	880	1080	1540	1600
29	2500	2780	1720	858	1160	1630	1570
30	2360	2860	1690	858	1240	1690	1570
31		2860		812	1210		1540
Mean	2580	2210	2750	1240	920	1430	1670
Ac.Ft. for Month	154000	136000	164000	76200	56600	85100	103000

NOTE: Gaging station located at Durham Ferry Bridge below the junction of Stanislaus and San Joaquin Rivers. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

CHAPTER III

MEASUREMENT OF DIVERSIONS

Measurements and records of diversions in 1930 have included those from the Sacramento River and its tributaries within the valley floor, those to the Delta Uplands from San Joaquin River, Old San Joaquin River and Tom Paine Slough and those on the Stanislaus, Tuolumne, Merced, and San Joaquin Rivers and Dry Creek as obtained in connection with the return water measurements (See Chapter IV). This report records a total of 493 diversions, segregated to the various sources as follows: Sacramento River 251, Colusa Trough 11, Back Borrow Pit (carrying drainage water from Colusa Basin along the back levees of Reclamation Districts 108 and 787) 5, Lower Butte Creek and Butte Slough 16, By-pass and Drainage Channels 13, Feather River 37, Yuba River 6, American River 29, diversions to Delta Uplands from Old San Joaquin River 11, from Tom Paine Slough 7, from San Joaquin River (below Durham Ferry Bridge) 30, and from Cache Slough 1, San Joaquin River (above Durham Ferry Bridge) 18, Stanislaus River 11, Tuolumne River 9, Dry Creek 7, and Merced River 31.

Under the system for obtaining the diversion records, pump operators have kept daily records on blanks furnished by the Water Supervisor. These records are collected monthly by the field engineers at the same time that the readings of the electric meters are recorded. In order to establish the relation between power input and water pumped, as many as possible current meter measurements of discharge are made throughout the season. With the daily operation records available it has been possible to compile from the monthly diversions as computed

from the power record, a daily diversion record for each plant. In this report and the tables of this chapter it is only possible to publish the record of monthly diversions for each plant. However, the daily diversion records have been compiled as a supplemental report and this is on file and available for reference in the office of the Division of Water Resources.

TABLE 14
SUMMARY OF SACRAMENTO RIVER DIVERSIONS (ACRE-FEET)

River Section	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Totals
Redding to Red Bluff	8519	19098	21652	22354	22222	20018	12525	126388
Red Bluff to Butte City	29917	89321	89058	86893	83148	45439	15547	439323
Butte City to Colusa	4482	16173	15921	17514	13427	4515	97	72129
Colusa to Knights Landing	22548	53859	68734	65353	57160	27210	2145	297009
Knights Landing to Verona	940	4842	5829	4649	3974	1220	11	21465
Verona to Sacramento	7830	15543	20658	20935	19944	9175	2356	96441
Totals	74236	198836	221852	217698	199875	107577	32681	1052755

TABLE 15
SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	: and : : Size : : of : : Pimp :	: Number : : and :	Monthly Diversions in Acre-feet												: Total : : Diversion : : April to : : October : : Acre-feet :	: Acreage : : Irrigated : : Gen- : : eral : : Rice : : Acre-feet :																					
				: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: 2010 :	: 18019 :	: Municipal :																									
City of Sacramento	0.8 L	3-20"	2076	2410	2966	3157	3028	2372	2010	18019	Municipal	98	84	93	130	47	34	39	36	34	23	790	46	74	105	74	20	219	122	31	60	13	12	76	70	6485	2021	
AMERICAN RIVER	MILE 1.1	LEFT	SEE TABLE 10																																			
BACK BORROW PIT R.D. 1000	MILE 1.3	LEFT	SEE TABLE 48																																			
E. Fourness	1.45 R	1-8"		7	59	8	20	3	1																													
C. W. Jones	2.05 L	1-8"			59	21	13																															
RECLAMATION DISTRICT 1000 DRAIN	MILE 2.1	LEFT	SEE TABLE 47																																			
Frank Christophel	2.4 L	1-5"	4	9	17	11	3	3																														
H. M. Swalley	2.45 L	1-5"			22	14	3																															
Albert Elkus	2.9 L	1-5"			12	8	12	2																														
Hayward Reed	3.55 R	1-16"	84	129	282	160		135																														
W. E. M. Beardslee	3.75 R	1-5"		20	35	19																																
W. I. Elliot	4.0 R	1-8"			44	102	70																															
Reese and Greer	4.65 R	1-7"			NO	NO																																
Harbinson Bros.	5.05 R	1-14"			41	33																																
J. W. Roddan and Sons (1)	5.25 R	1-8"		31	54	68	55	11																														
C. H. Merkeley Estate (Merkeley Bros.)	5.3 R	1-8"			23	8																																
A. Casselman	5.5 R	1-5"			13																																	
K. L. Lovdal	5.7 R	1-10"			NO	NO																																
J. E. Bandy	6.0 R	1-6"		24	16	30	6																															
Riverside Mutual Water Co.	6.10 L	2-18"		881	1541	1854	1137	772	300																													
O. A. White	6.4 R	1-6"			NO	NO																																
A. Marty	7.0 R	1-4"			NO	NO																																

* Mileage along river above Southern Pacific Bridge, Sacramento.
(1) Formerly R. S. Seydel.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and size of pump	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Total	Acreege		
			Monthly Diversions in Acre-feet							Diversions	Irrigated		
										April to	Gen-eral		
										October	Rice		
										Acre-	feet		
California Bank and Trust Co.	7.5 L	1-8"			NO	D I V E R S I O N							
F. L. Martin and A. B. Carter (F. J. Stahl)	7.8 L	1-10"			46	17	18			81	94		
A. Marty	7.9 R	1-8"	8	39	106	92	65	23	13	346	(1)370		
M. E. and R. F. Bennett	7.9 L	1-10"		1	123	66	9			199	128		
M. Marty	8.3 R	1-10"			87	200	293	20		600	(2)		
Julius Blauth	8.5 R	1-5"			P L A N T R E M O V E D								
H. Waldeck	8.7 R	1-6"	3	15	25	14	8	11	6	82	39		
T. T. C. Gregory	8.95 R	1-18"			N O D I V E R S I O N								
A. A. Sousa (3)	9.15 R	1-2"			N O D I V E R S I O N								
A. A. Sousa (3)	9.20 R	1-6"			N O D I V E R S I O N								
A. A. Sousa	9.35 R	1-14"			278	188	315	111	12	904	(4)100		
R. G. Pearson and P. S. Driver	9.80 L	1-14"			214	150	61	12		437	(5)340		
Carl Casselman	9.9 R	1-12"			82	148	68	88		386	130		
F. W. Kiesel	10.25 L	1-14"	73		204	229	246	23		775	290		
Reese Estate (Louis Ashwandan)	10.75 R	1-12"			62	134	178	49		423	88		
R. F. Fiddyment & E. J. Cahill	10.75 L	1-12"			49	99	86	3		237	190		
H. L. Hill Jr. (W. R. Taylor)	11.1 R	1-14"			P L A N T R E M O V E D								
A. L. White (6)	11.6 L	1-10"		10		41	11	10		72	40		

* Mileage along river above Southern Pacific Bridge, Sacramento.
 (1) This is the total acreage irrigated by this plant and plant at Mile 8.3 R.
 (2) See plant at Mile 7.9 R.
 (3) Formerly Kate Merkeley.
 (4) Irrigated from plant at Mile 9.35 R.
 (5) Water diverted by this plant serves an additional 100 acres. See plant at Mile 9.20 R.
 (6) New installation.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	: Number: and size of pump	Monthly Diversions in Acre-feet												: Total : Acreage :
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: April to October :	: Gen-eral :	: Rice :			
Conaway Ranch	12.0 R	4-36"	109	3722	3486	3475	4223	2143					17158	145:2040	
Tom O'Connor (1)	12.5 R	1-12"			119								119	90	
Julius Hauser	13.1 R	1-12"	29	55	193	227	102	32					638	54	
H. E. Franks (2)	13.25 R	3 1/2-10"			59	73	21	12			14		179	25	
Elkhorn Mutual Water Co.	14.1 L	1-24"		634	2514	2626	2714	1195					9683	2960: 186	
California Lands, Inc.	15.15 R	(4)-10"			47	125	110	84					366	114	
M. O. Russ	15.7 L	1-6"													
Central Mutual Water Co.	16.0 L	2-38"	2631	3178	3993	3500	3115	1365					(5)17782	1366:2233	
Frank Fisher and Henry Rich (Hershey Plant) (6)	16.27 R	1-20"		298	576	666	536	181					(6)2257	(6):(6)	
Ellis Jones and J. K. Brown	16.3 R	1-10"													
H. T. Silvius	16.4 R	1-6"													
W. B. Beach	16.62 R	4 1/2-6"		11	40	31	18	5					105	70	
Thos. J. Cox Estate	16.7 R	1-16"													

*Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) New installation 1930.
- (2) Formerly listed as California Bank and Trust Company.
- (3) Formerly listed as 12" pump.
- (4) Replaces 8" unit.
- (5) This plant pumps water to the irrigation canal both from a drain canal of District 1000 and from the Sacramento River. The diversions listed are those from the river only. The water obtained from the drain canal was as follows: (Acre-feet) April 480, May 1504, June 901, July 1086, August 1303, September 817, October 43, Total 6134.

(6) The total diversion shown for this plant together with a portion of the diversion by the plant at Mile 22.5 R was by-passed to the east borrow pit of the Yolo By-Pass to be repumped on to By-Pass lands. (See "Yolo By-Pass Diversions" - Fisher and Rich).

(7) 5" gas outfit replaced in June by 6" electric.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and size of Pump	Monthly Diversions in Acre-feet												Total: Acreage			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		April to October	Gen-Rice	
Frank Fisher and Henry Rich (Null Plant)	17.75 R	1-20"		433													433	(1)
A. Linggi	18.45 L	1-12"			NO													
Frank Fisher and Henry Rich (Hoover Plant)	18.95 R	1-18"			NO													
Northern Mutual Water Company	19.6 L	1-36"	2813	3636	3290	3222	3400	510									16871	337:1561:
VERONA GAGING STATION	MILE 19.65			SEE TABLE 6														
FLEATHER RIVER	MILE 20.9 L			SEE TABLE 9														
SACRAMENTO SLOUGH	MILE 21.2 L			SEE TABLE 43														
J. H. Berghausser	21.7 R	1-15"			NO													

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) The diversion by this plant was used in conjunction with a portion of the diversion from the plant at Mile 22.5 R to irrigate the acreage reported for the latter plant.

(2) Cross Canal, the main drain between R.D.1000 and 1001 joins the river at Mile 19.6 L. At the mouth of this drain Natomas Northern Mutual Water Co. maintains, during the irrigation season, a booster pump supplying water from the river to the drain. The water is retained in the drain by a movable dam at its mouth. When the river falls lower than the crest of this dam the gates are closed and the booster pump started. There are pumping plants along the south bank of Cross Canal, but only one, at Mile 4.0 from the mouth, was operated in 1930 and the acreage shown was irrigated from this plant. From April 5th until June 11th, inclusive, water was available in Cross Canal without pumping at Booster Plant. The diversions here shown are those for the plant at Mile 4.0 on Cross Canal from April 5th to June 11th and for the booster plant for the remainder of the season. The water pumped through the plant at Mile 4.0 was as follows: (Acre-feet) April 2813, May 3636, June 3123, July 3468, August 3302, September 601, Total 16,943.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		April	to October	Gen-eral
Frank Fisher and Henry Rich (Keller Plant)	22.5 R	1-22"	736	1851	2153	1494	1426	270									(1)7930	630
Hershey Estate	26.95 R	1-18"																
Morse Inglin	28.2 R	1-6"		14	39	24	20	7									106	28
Fred Traganza	29.7 R	1-8"																
P. L. Traganza & K. Russell	29.75 R	1-8"		8	7.8	5.0	2.8										15.6	13
Laura Freitas	29.9 L	1-12"		0.2	1.3	9.1	4.2	1.5									52	65
Leo Giovanetti	30.2 L	1-3"															16.7	22
Charles Ghiselli	30.25 L	1-6"																
Charles Ghiselli	30.45 L	1-2"		4	18	12	13	2									2.0	8
Kendall Ranch (Lower)	30.6 R	1-7"		6	94	41	45	7									49	16
J.G. Goulart	30.75 L	1-3"															193	38
A. C. Huston (A. Simmons)	31.5 R	1-12"																
M. Alonso	31.8 L	1-4"															33	25
Kendall Ranch	32.0 R	1-10"															11.0	15
Sutter Mutual Water Company (Portuguese Bend)	32.0 L	2-24"		1743	1864	1421	844	132									6004	(3): (3)
Collier Bros.	32.5 R	1-10"															65	45

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) A portion of the diversion by this plant was by-passed into the East Borrow Pit of the Yolo By-Pass to supply a portion of the water used for the irrigation of 700 acres of rice on Yolo By-Pass. (See Fisher and Rich plant at Mile 10.1 Yolo By-Pass).

(2) The diversion from the plant on the Sacramento River at Mile 17.75 R was also used to irrigate this acreage.

(3) See Sutter Mutual Water Company plant at Mile 63.75 L.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet												Total : Acreage : : Diversion: Irrigated:	
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to October	Gen-eral	Rice:				
George Stam (1)	33.2 L	1-20"	204	1205	1456	1491	1534	750						6640	50	500
J. G. Knox and Fred Leiser	33.75 L	1-12"		11	146	74	40	32						303	2	126
KNIGHTS LANDING GAGING STATION	MILE 34.0	SEE TABLE 5														
COLUSA BASIN DRAINAGE	MILE 34.15 R	SEE TABLE 42														
Meek Estate	34.2 R	1-10"		317	641	327	107	161				34		1587	(3)	230
River Farms Company (Townsite Plant)	34.25 R	1-24"										734		6074	(4)	1417
Commercial Investment Co. (R. B. Bailey)	34.85 L	1-12"		170	174	146	89	47						626	(5)	205
Fred Van Lew	35.2 L	1-12"			9	11								20	(6)	25
J. H. Scott	35.6 L	1-7"				18								18		17
A. Costa (A. Morconi) (7)	35.8 L	1-10"		25	18	12	14	8						77		93
Amedeo Moroni	36.7 L	1-5"														
River Farms Company (Garden Pump)	36.95 R	1-2"		0.8	0.6	7.4	11.3	1.5				0.1		28.1		4
W. W. Bottimore	37.2 L	1-14"														
L. W. Bundock	37.75 L	1-8"			14	17								31		130

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) New installation 1930.
- (2) Irrigated by Knox 56 acres, by Leiser 70 acres.
- (3) Includes 130 acres irrigated for River Farms Company.
- (4) An additional 130 acres of general crops were irrigated through Meek Estate plant at Mile 34.2 Right.
- (5) Includes 85 acres irrigated on Van Lew land. See Mile 35.2 Left.
- (6) An additional 85 acres was served by Commercial Investment Company pump at Mile 34.85 Left.
- (7) Formerly J. H. Donnelly.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		Diversion: April to October	Irrigated: Gen-eral: Rice	
California Lands, Inc. (H. A. Kramer) (1)	38.8 L	1-10"					24										24	85
Sutter Basin Corporation (A. Colli) (2)	39.4 L	1-12"				47											64	40
Commercial Investment Co. (Ottow Bushaw)	39.8 L	1-10"		41	10	38	42										167	80
Wm. Duffey, Jr. (3)	39.9 L	1-6"	2	9	12	27	25									23	114	23
Sutter Mutual Water Company (State Ranch Bend)	40.6 L	1-24"		21	1492	1740	1184										4897	(4)
Buell Ranch (M. K. Dean): Sutter Basin Corporation (Bozzi and Pressenda) (6)	42.2 L 42.3 L	1-6" 1-8"		42	79	71	6										156 108	40 50
A. Kramer	42.65 L	1-12"		1	7	10	22									13	57	30
El Dorado Ranch	43.1 R	1-18"		318	404	716	268										1722	540
River Farms Company (Recl. Dist. #2047 Plant)	43.1 R	2-50"	3700	3267	4375	5010	4276										20628	2141
RECLAMATION DISTRICT 108 DRAIN	MILE 44.0 R		SEE TABLE 41															
John Clauss	47.3 L	1-14"	14	232	595	324	127									57	1541	300
P. J. Hiatt	48.7 L	1-20"	146	1400	1377	1216	1316									330	(7)7174	172

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) Formerly listed as Bank of Italy.
- (2) Previously listed as Sutter Mutual Water Company (McCutcheon Ranch)
- (3) New installation 1930.
- (4) See Plant at Mile 63.75 Left.
- (5) New location in 1930. Previously at Mile 41.8 Left.
- (6) Previously listed as Sutter Mutual Water Company.
- (7) A large portion of this diversion is discharged to a lake from which surrounding lands are sub-irrigated.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet												Total : Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to October	Gen-eral	Gen-eral	Gen-eral		
Reclamation District 108 (Tyndall Mound Plant)	51.1 R	2-24"			1783	1463	1377	1560	869					7052	120:
G. J. Stam	51.2 L	1-24"		6	13	24								43	25:
J. F. White	51.5 L	1-8"			98		97							196	80:
T. J. Cummins Ranch Co. (2)	52.0 L	1-16"										1		2169	450: 250:
G. W. Stretter (A.R.Waybur) (3)	55.1 L	1-20"			382	610	380	320	327			150			(4): (4):
Reclamation District 108 (Boyer Bend Plant)	56.4 R	1-18"			2398	2750	809	423	386			190		7354	2725:
J. M. Miller	56.65 R	1-12"		6	179	60	188	16						449	40:
G.W.Stretter (A.R.Waybur) (3)	56.95 L	1-20"		658	935	745	702	478				192		3710	(5): (5):
J. M. Kirkup (2)	57.5 L	1-16"		33	45	70	23	11						182	100:
H. S. Fasig (2)	58.2 L	1-15"		289	318	286	118					10		1021	(6)275:
J. R. Young (2)	58.9 L	1-16"		10	76	9	35							130	70:
Lamb Bros. (7)	59.8 L	1-12"			59	1	52							112	110:
Reclamation District 108 (Steiner Bend Plant)	59.85 R	1-16"													
Sutter Basin Corporation (Coles Landings) (2)	60.2 L	1-12"			70	105	117							292	100:

* Mileage along river above Southern Pacific Bridge, Sacramento.
 (1) This rice acreage was on adjoining lands as follows: J. R. Young 230 acres, and Gillette, Shaw and Day 170 acres.
 (2) New installation 1930.
 (3) Formerly J. R. Gailbraith.
 (4) This is the total acreage irrigated by this plant and the plant at Mile 56.95 Left.
 (5) See Plant at Mile 55.1 Left.
 (6) Includes 115 acres on W. H. Saylor land.
 (7) Formerly listed as R. A. Lamb.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	:Number: and : :Size of : : Pump :	Monthly Diversions in Acre-feet												: Total : : Diversion : : April to : : October : : Acre-feet : : Irrigated :
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: Rice :	: Gen-eral :				
Blanche Coulter Brown (1)	60.5 L	1-12"		21	39	16	13							89	50:
A. Kolpien (2)	61.3 R	1-12"			N O	D I V E R S I O N									
Hines Ranch	62.3 R	1-10"		8		16			11					35	10:
Wm. Baker	62.6 R	1-8"				22								22	23:
Reclamation District 108 (Wilkins Slough Plant)	63.2 R	5-42"	4237	6338	7367	7517	6212		790					32461	1189:2741:
Sutter Mutual Water Company (Tisdale) and Improvement Mutual Water Company	63.75 L	6-42"	9643	27461	28081	27244	26909	15822						135160(3)	11024:7126: (4): (4):
Cloman Land and Sheep Co. Tisdale Irrigation and Drainage Company	64.3 R	1-12"			10	21	6					7		44	30:
Colusa Development Company (Spreckles Sugar Co.) (6)	64.4 L	1-12"		283	383	469	465	134						1992	1130: 553: (5): (5):
Otto Wackerman	64.9 R	1-24"		199	755	74								1028	388:
D. L. W. Hoffman	65.1 R	1-10"		10	64	13	12							111	46:
J. L. Browning	65.7 L	1-12"			46	43	63					27		179	70:
	66.4 R	1-20"		210	618	849	378	45						2100	1465: (7):

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) Formerly listed as Thomas J. Coulter.
- (2) New installation 1930.
- (3) Includes water delivered to Improvement Mutual Water Co. as follows: (Acre-feet) Apr. 772, May 1509, June 2197, July 1978, Aug. 2307, Sept. 1932, Total 10695.
- (4) These figures give the total acreage irrigated from the Portuguese Bend, State Ranch Bend and Tisdale Plants at Miles 32.0 L, 40.6 L, and 63.75 L, respectively. They include 541 acres rice and 140 acres general crops irrigated by Improvement Mutual Water Co. (in R.D. 1600) entirely from the Tisdale Plant.
- (5) These figures give the total acreage irrigated from this plant and the other company plant (Winship) at Mile 67.1 L. The general crop figure includes 27 acres of the Desmond A. Winship (formerly listed as Eliza Smith) lands, Mile 67.2 L irrigated from the Winship Plant.
- (6) New installation 1930 but at same location as plant formerly listed under name of Emaline Wilson.
- (7) This is the total acreage irrigated by this plant and the plant at Mile 69.0 R.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	:Number: and	Monthly Diversions in Acre-feet										:Total : Acreage :		
			: and	: Size	: of	: Pump	: Apr.	: May	: Jun.	: Jul.	: Aug.	: Sep.		: Oct.	: Diversion:
Tisdale Irrigation and Drainage Company (Winship Plant)	67.1 L	1-20"	1517	1654	1484	1534	1562	665					8416	(1)	(1)
Desmond A. Winship, et al (2)	67.2 L	1-10"			N O	D I V E R S I O N								(3)	(3)
Meridian Farms Water Company:	67.4 L	1-14"		110	80	120	97	58					465	(5)	(5)
Number 6		(4)													
Etnis-Brown Company (6)	67.5 L	2-24"		2331		2218	2188	1405					8142	(7)	(7)
RECLAMATION DISTRICT 70 DRAIN	MILE 68.8 L	SEE TABLE 40													
Meridian Farms Water Company:	68.81 L	1-12"		196	370	303	357	141					1372	(5)	(5)
Number 5															
J. L. Browning	69.0 R	1-24"		48	436	191	351	79					1105	(8)	(8)
Faxon Ranch	69.2 R	1-18"	114	198	323	517	218	3					1376		870:
DUNNS FERRY (GRIMES)	MILE 69.45														
Wilbur Jensen and Mary Cecil, et al	70.35 R	1-24"				N O	D I V E R S I O N								
Houchins-Hoffman-Beckley and Ritchie (J. M. Ritchie)	70.4 R	1-20"		26	15	112	17						170		89:

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) See plant at Mile 64.4 I.
- (2) Formerly listed as Eliza Smith.
- (3) See note (5) for plant at Mile 64.4 L.
- (4) After June 1st this pump replaced by 12" unit.
- (5) See plant at Mile 80.0 I.
- (6) New installation 1930.
- (7) Includes 160 acres for Geo. Springer and 271 acres for Alameda Farms Company.
- (8) See plant at Mile 66.5 R.
- (9) Acreage distributed as follows: Houchins 0; Hoffman 25; Beckley 34; Ritchie 30.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet												Total : Acreage : :Diversion:Irrigated: :April to: Gen-:Rice: :October : eral : :Acre-feet:				
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.					
Meridian Farms Water Company	71.1 L	1-24"	157	535	778	1723	1685	999	115								5992	(1)	
Number 4 (Grimes)																	(3)	383	400
J. W. Browning	71.9 R	1-12"		88	191	104													
(Spreckles Sugar Co.) (2)																			
Antone Steidelmeyer	71.9 R	1-12"		68	413	225	51												100
E. E. Vann (Coffman Bros.)	73.6 R	1-12"		15	181	90	106			4									110
Meridian Farms Water Company	74.8 L	1-20"	192	313	667	355	427			282	(5)	21							(1)
Number 3 (Headquarters)																			
J. H. Yates	76.1 L	1-12"			93	45	41			5									50
Dr. E. V. Jacobs	77.9 L	1-12"																	
Sebia Davis	78.8 R	1-36"	435	1540	1661	1484	1372												460:1297:
C. E. Reische	79.0 L	1-10"		86	83	77	68			28									342
G. W. Woods	79.7 L	1-10"		8	29	34	32												103
MERIDIAN BRIDGE	MILE 79.85																		
Meridian Farms Water Company	80.0 L	1-24"	460	1780	2880	2726	1944	1974	187										11951
Nos. 1 and 2 (Meridian)		1-18"																	7184:
																			(9)

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) See Plant at Mile 80.0 L.
- (2) New installation 1930.
- (3) Additional water was received from the Steidelmeyer plant at Mile 71.9 R.
- (4) A portion of the diversions by this plant was used on the Browning land to the south (See Mile 71.9 R).
- (5) October diversion was for stock.
- (6) Formerly 24" - New pump installed.
- (7) Includes adjacent lands irrigated from this plant as follows: Kilgore 32; Stacs 30; Rockholt 20; (62 Reische).
- (8) Includes 38 acres on adjacent lands of Burtis.
- (9) This is the total acreage irrigated from this plant and the other company plants at Miles 67.4 L; 68.81 L; 71.1 L; and 74.8 L. An additional 271 acres were irrigated from the plant at Mile 67.5 and were included in the acreage figure given there.

37482

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

REPORTS OF THE
DIVISION OF WATER RESOURCES
EDWARD HYATT, State Engineer

Bulletin # 23

SACRAMENTO - SAN JOAQUIN

WATER SUPERVISOR'S

REPORT

FOR YEAR

1930

HARLOWE M. STAFFORD
Water Supervisor

Sacramento, California
July 1, 1931

Accession # 3562 ✓

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The untiring and efficient assistance of the engineers as listed under the organization statement who have been employed on this work during the past year.

ADVISORY COMMITTEE

PERMANENT COMMITTEE OF THE SACRAMENTO-SAN JOAQUIN RIVER PROBLEMS CONFERENCE

The successful prosecution of the Water Supervisor's work both in stream administration and collection of records may be attributed in no small measure to the backing, advice, and continued interest and cooperation of the Permanent Committee of the Sacramento-San Joaquin River Problems Conference.

This Committee, representative of the water users and other interests involved, was appointed by the First Sacramento-San Joaquin River Problems Conference in January, 1924. Its present personnel is as follows:

Herbert E. White, Chairman, Sacramento	
E. L. Adams, Chico	Manly S. Harris, San Francisco
A. E. Anderson, San Francisco	W. I. Hechtman, Sherman Island
Alden Anderson, Sacramento	Warren H. McBryde, San Francisco
G. A. Atherton, Stockton	R. V. Meikle, Turlock
P. M. Downing, San Francisco	Jesse Poundstone, Grimes
William Durbrow, Grass Valley	F. T. Robson, Vina

ORGANIZATION

Walter E. Garrison - - - - - Director of Public Works
Edward Hyatt - - - - - State Engineer

- - 0 - -

Harold Conkling - - - - - Deputy in charge of Water Rights

Harlowe M. Stafford
Sacramento-San Joaquin Water Supervisor

Martin H. Blote - - - - - Assistant Water Supervisor
James M. Brockway - - - - - Assistant Engineer
Frederick E. Anderson - - - - - Assistant Engineer
Ralph S. Rose - - - - - Assistant Engineer

DELTA COOPERATIVE INVESTIGATION

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O. V. P. Stout - - - - - Hydraulic Engineer
Lloyd N. Brown - - - - - Assistant Hydraulic Engineer

CHAPTER I

INTRODUCTION

Purpose

The purpose of this report is to make of record the measurements made and data collected through the office of the Sacramento-San Joaquin Water Supervisor during the 1930 irrigation season.

Origin and History of Work

This work was inaugurated in 1924 through the efforts of the first Sacramento-San Joaquin River Problems Conference and its Permanent Committee working with the former Division of Water Rights. The funds for the work in the first year were largely subscribed by the water users but subsequently it has been conducted under legislative appropriations included in the regular biennial budget of the Division. A complete description of the origin and history of this work will be found in the 1924 and 1926 Biennial Reports of the former Division of Water Rights, in Bulletin Number 4 of the same Division, and in Bulletin Number 23 of the Division of Water Resources. The latter bulletin brings together all data and measurements obtained by the Water Supervisor in the five year period, 1924 to 1928, inclusive. The reports for subsequent individual years are mimeographed as the present report, with the plan to again bring all data together in a printed bulletin at the end of the second five year period.

Scope

As outlined in previous reports this work is divided into (1) engineering investigations, measurements and collection of records, and

(2) conservation, waste prevention and such administration of the stream flow as shall fall within the jurisdiction of the Division of Water Resources or be mutually agreed upon by the water users. This report presents chiefly, for permanent record, the results of the engineering investigations. These comprise measurements and records of the diversions of water from the Sacramento, Feather, Yuba, American, Merced, Tuolumne, Stanislaus and San Joaquin rivers within the valley floor and above the Delta; stream flow measurements throughout the territory, largely in cooperation with the Water Resources Branch, U. S. Geological Survey; measurements and records of waters returned to the Sacramento and San Joaquin Rivers; studies of the consumptive use of water in the Sacramento-San Joaquin Delta in cooperation with the U. S. Department of Agriculture Bureau of Agricultural Engineering; an annual census of irrigated areas and crops under all diversions recorded and throughout the Delta; and observations and investigation of the advance and retreat of salinity in the Delta channels and Upper Bays.

Organization

The regular organization has included the Water Supervisor, Assistant Water Supervisor, and three assistant hydraulic engineers. The organization for the cooperative Delta investigations under the direction of W. W. McLaughlin, Associate Chief, Bureau of Agricultural Engineering, U. S. Department of Agriculture, has included an hydraulic engineer and one assistant giving full time to field work.

Under the direction of Martin H. Blote, Assistant Water Supervisor, engineers James M. Brockway and Ralph S. Rose have been responsible for the work above Sacramento, the former working from Meridian to Redding

and the latter from Sacramento to Meridian; Engineer Frederick E. Anderson has been responsible for the census of irrigated acreages and crops in the Delta, the work in the Delta uplands and that on the Feather, American, and Yuba Rivers; and engineers Brockway and Rose have carried out the return water and diversions measurements on the San Joaquin River and its tributaries. Major O. V. P. Stout has been in charge of the Delta Cooperative work with Engineer Lloyd N. Brown in resident charge at King Island.

Conservation Features

A comparison of the run-off and water supply conditions in the 1930 season with those of the previous seasons in which the work of the Water Supervisor has been conducted is indicated in the following tabulation:

Year	*Entire Run-off to San Francisco Bay in Per Cent of Normal	Minimum Flow in Second-feet		
		At Colusa	At Sacramento	San Joaquin Near Vernalis
1924	28	1470	705	391
1925	83	1870	2760	660
1926	57	1030	1330	565
1927	114	1960	3420	1290
1928	80	1960	2510	840
1929	42	1550	2300	565
1930	63	1680	2350	645

* Normal is 40-year mean (1889-1929) of natural run-off at foothill stations of major tributaries. Previous reports have given run-off in per cent of 50-year mean (1870-1920) as given in Bulletin Number 5, Division of Water Resources.

It will be noted that as far as the seasonal run-off is con-

cerned, 1930 was little better than 1926. However, the 1930 rice acreage was considerably less than that of 1926 and the minimum stream flow which occurred, similar to that of 1928 and 1929, was not critical as in 1924 and 1926. No serious navigation difficulties or shortages of water for irrigation purposes were reported in 1930 and the encroachment in the Delta of salinity to the extent of 100 parts of chlorine per 100,000 corresponded closely with the encroachment of 1928 and 1929. In 1930, therefore, the requirements for strict conservation measures and regulation of diversions through the Water Supervisor's office were somewhat modified, and the work was confined largely to the engineering investigation dealing with the collection of required hydrographic data and records.

CHAPTER II

MEASUREMENTS OF STREAM FLOW

During the irrigation season of 1930, stream flow measurements and records have been obtained through cooperation with the Water Resources Branch of the U. S. Geological Survey for stations on the Sacramento River at Kennott, Red Bluff, Butte City, Colusa, Knights Landing, and Verona; on the Feather River at Nicolaus; on the American River at Fair Oaks and "H" Street Bridge, Sacramento; on the Mokelumne River at Woodbridge and Thornton; and on the San Joaquin River near Vernalis and Newman. Supplementing these, the Water Supervisor has maintained additional stations on upper Butte Creek one mile west of the East Side Highway, on lower Butte Creek and Butte Slough, and in connection with the San Joaquin return water measurements (See Chapter IV) stations as follows: Stanislaus River at Orange Blossom Bridge and at Elliot Ranch, Tuolumne River at Roberts Ferry Bridge and at Tuolumne City, Merced River at Yosemite Valley Railroad Crossing and at the bridge on Hills Ferry Road, Dry Creek at Old Waterford Bridge and at Basso Ranch (near Modesto), and San Joaquin River at San Luis Island and at Grayson (Laird Slough).

TABLE 1
DISCHARGE OF SACRAMENTO RIVER AT KENNETT

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	7160	6370	4130	3210	2940	2820	3100
2	6960	6370	4130	3210	2940	2720	2940
3	6960	6760	4130	3210	2940	2770	2880
4	6760	6180	3990	3210	2940	2770	2940
5	6560	5990	3990	3210	2940	2770	2990
6	6370	5990	3850	3210	2940	2820	2990
7	6370	5800	3850	3210	2880	2880	2940
8	6370	5800	3850	3210	2880	3100	2990
9	6180	5620	3850	3210	2880	3450	2990
10	6180	5620	3710	3210	2880	3100	2990
11	5990	5440	3710	3210	2880	2990	2940
12	5800	5260	3710	3210	2880	3100	2990
13	5990	5090	3710	3100	2880	3100	2990
14	8780	5090	3580	3100	2820	3100	2990
15	8360	4920	3580	2990	2820	2990	2990
16	7960	5260	3580	2990	2820	2940	2990
17	7760	5260	3450	3100	2820	2880	2990
18	7560	5090	3450	3100	2820	2880	2990
19	7360	4920	3330	2990	2820	2940	2990
20	7160	4750	3330	3100	2880	2940	2990
21	7160	4750	3330	2990	2880	2940	2940
22	7560	4750	3330	2940	2880	2990	2990
23	7360	4590	3450	2940	2820	3100	2990
24	7560	4430	3450	2990	2820	3210	2990
25	7160	4280	3330	2990	2820	3100	2990
26	7560	4280	3330	2990	2820	2990	2990
27	7560	4130	3330	2940	2820	2990	2990
28	7360	4280	3330	2940	2820	2990	3100
29	6960	4430	3330	2940	2820	2990	2990
30	6760	4430	3330	2990	2820	2990	2990
31		4280		2990	2820		2990
Mean	7050	5170	3620	3080	2860	2980	2990
Ac. Ft. for Month	420000	318000	215000	189000	176000	177000	184000

NOTE: This is a permanent station of the Water Resources Branch of the U. S. Geological Survey established at Kennett in 1925. This station is maintained throughout the year, but the record is given here for the period of the irrigation season only.

TABLE 2

DISCHARGE OF SACRAMENTO RIVER NEAR RED BLUFF

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	9860	8600	5100	3660	3240	2980	3740
2	9540	8600	5000	3660	3240	2980	3660
3	9220	8900	5000	3580	3150	2980	3490
4	9220	9300	5000	3580	3150	2980	3400
5	8910	9100	4790	3580	3150	2980	3490
6	8600	8900	4690	3580	3060	2980	3490
7	8300	8600	4590	3490	3060	3060	3490
8	8000	8400	4490	3660	3060	3150	3490
9	7710	8200	4390	3490	3060	4010	3580
10	7710	8000	4390	3490	3060	4010	3580
11	7710	7800	4300	3490	3060	3740	3580
12	7160	7600	4200	3490	3060	3400	3580
13	7160	7400	4100	3490	3060	3490	3580
14	10900	7100	4100	3400	3060	3580	3490
15	13300	6800	4100	3320	3060	3490	3490
16	10500	6600	4010	3240	3060	3400	3490
17	9860	6500	4010	3240	3060	3320	3490
18	9540	6400	3920	3320	3060	3320	3490
19	9540	6300	3920	3320	3060	3320	3490
20	9220	6200	3920	3320	3060	3320	3490
21	8910	6100	3920	3320	3060	3400	3580
22	9220	6000	3830	3240	3060	3400	3660
23	9220	5980	3920	3150	2980	3490	3580
24	9540	5900	3920	3240	2980	3660	3580
25	9860	5800	3830	3320	2980	3740	3580
26	9220	5700	3830	3240	2980	3660	3580
27	10200	5600	3830	3240	2980	3490	3580
28	9860	5600	3830	3240	2980	3490	3580
29	9540	5650	3740	3240	2980	3660	3580
30	8910	5430	3740	3150	2980	3660	3580
31		5320		3240	2980		3580
Mean	9210	7040	4210	3390	3060	3400	3550
Ac. Ft. for Month	548000	433000	251000	208000	188000	202000	218000

NOTE: This is a permanent station of the Water Resources Branch of the U. S. Geological Survey located near the site of the proposed Iron Canyon Dam: Mile 198.6 above Sacramento. This station is maintained throughout the year, but the record is given here for the period of the irrigation season only.

TABLE 3

DISCHARGE OF SACRAMENTO RIVER AT BUTTE CITY

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	7650	4360	2550	2050	2020	3480
2	7460	4250	2490	2050	2020	3560
3	7460	4140	2430	2050	2050	3560
4	8420	4040	2430	2020	2020	3480
5	8420	3960	2380	2020	2020	3320
6	7840	3880	2430	1980	2020	3320
7	7460	3720	2380	1980	2100	3320
8	7080	3640	2320	1980	2180	3320
9	6890	3560	2380	1940	2270	3160
10	6700	3400	2320	1940	2740	3160
11	6510	3320	2320	1980	3090	3240
12	6320	3240	2270	1980	3020	3240
13	5950	3090	2270	1940	2740	3240
14	5950	3090	2270	1940	2800	3480
15	5770	3020	2220	1910	2870	3400
16	5590	2940	2180	1880	2870	3400
17	5590	2940	2130	1880	2800	3400
18	5590	2870	2090	1880	2800	3400
19	5590	2740	2090	1840	2740	3400
20	5410	2740	2090	1840	2740	3480
21	5230	2740	2090	1880	2740	3480
22	5060	2670	2090	1880	2870	3560
23	5060	2670	2050	1880	3020	3640
24	4890	2670	2050	1910	3090	3560
25	4720	2670	2090	1940	3240	3480
26	4460	2670	2050	1940	3400	3480
27	4300	2610	2090	1940	3400	3480
28	4210	2610	2050	1940	3320	3480
29	4210	2610	2050	1940	3320	3400
30	4460	2550	2050	1980	3400	3400
31	4460		2050	1980		3400
Mean	5960	3180	2220	1940	2720	3410
Ac.Ft. for Month	366000	189000	136000	119000	162000	210000

NOTE: Gagings taken near Butte City Bridge, Mile 116 above Sacramento. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 4

DISCHARGE OF SACRAMENTO RIVER AT COLUSA

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	7600	4370	2420	1800	1800	3570
2	7600	4280	2420	1740	1800	3570
3	7600	4100	2280	1740	1860	3660
4	8030	3920	2280	1740	1860	3570
5	8910	3920	2280	1740	1860	3480
6	8360	3830	2280	1740	1920	3480
7	7500	3740	2220	1740	1980	3390
8	7200	3650	2160	1680	1980	3390
9	7000	3470	2100	1680	2100	3390
10	6800	3470	2160	1680	2350	3300
11	6600	3290	2100	1680	2950	3390
12	6400	3290	2040	1680	3030	3390
13	6100	3200	2040	1740	2870	3480
14	5810	3110	2040	1740	2870	3570
15	5720	3030	1980	1740	2950	3570
16	5630	2950	1980	1680	2950	3570
17	5540	2870	1860	1680	2950	3570
18	5540	2870	1860	1680	2870	3570
19	5540	2710	1860	1680	2870	3570
20	5360	2630	1860	1680	2870	3570
21	5270	2630	1860	1680	2870	3570
22	5090	2630	1860	1680	2950	3570
23	5090	2630	1860	1680	3110	3660
24	5000	2560	1800	1740	3110	3660
25	4820	2630	1800	1740	3200	3570
26	4640	2560	1800	1740	3380	3570
27	4460	2490	1800	1740	3470	3570
28	4280	2490	1800	1740	3290	3570
29	4190	2490	1740	1740	3290	3480
30	4370	2420	1740	1800	3290	3480
31	4460		1740	1800		3480
Mean	6020	3140	2000	1720	2690	3520
Ac.Ft. for Month	370000	187000	123000	106000	160000	216000

NOTE: Gagings taken near Colusa Bridge, Mile 89.4 above Sacramento. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 5

DISCHARGE OF SACRAMENTO RIVER AT KNIGHTS LANDING

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	8200	4630	2020	1500	1780	3700
2	8200	4630	2020	1500	1780	3920
3	8200	4450	1900	1500	1740	4000
4	8670	4270	1900	1500	1870	4000
5	9620	4150	1900	1500	1920	3920
6	9020	4030	1900	1500	1920	3780
7	8100	3970	1850	1540	1960	3620
8	7770	3850	1820	1540	2050	3620
9	7560	3740	1780	1500	2140	3620
10	7340	3580	1740	1540	2290	3620
11	7120	3410	1780	1540	2540	3480
12	6910	3300	1780	1500	2970	3550
13	6580	3080	1780	1500	3190	3620
14	6270	2860	1820	1500	3240	3550
15	6180	2700	1780	1500	3300	3780
16	6080	2590	1700	1500	3300	3780
17	5980	2390	1660	1500	3300	3780
18	5980	2390	1620	1500	3300	3700
19	5980	2290	1580	1420	3300	3700
20	5790	2240	1540	1420	3300	3700
21	5690	2190	1540	1380	3240	3620
22	5500	2290	1500	1420	3240	3620
23	5500	2340	1500	1420	3140	3700
24	5460	2290	1500	1500	3240	3780
25	5210	2290	1500	1540	3360	3850
26	5010	2190	1500	1540	3410	3850
27	4810	2140	1500	1580	3460	3850
28	4620	2100	1500	1620	3460	3780
29	4520	2100	1450	1660	3460	3780
30	4720	2100	1450	1700	3410	3780
31	4810		1450	1740		3780
Mean	6500	3020	1690	1520	2820	3740
Ac.Ft. for Month	400000	180000	104000	93500	168000	230000

NOTE: Gagings are taken at the Railroad Bridge at Knights Landing at Mile 34.0 above Sacramento and therefore include the water entering the river from the Back Borrow Pit of Reclamation District 787. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 6

DISCHARGE OF SACRAMENTO RIVER AT VERONA

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	31200	20900	12200	3780	2750	3600	6670
2	30300	20000	12000	3640	2640	3360	7120
3	28900	19800	11400	3560	2750	3240	7270
4	27800	20500	10800	3480	2750	3600	7270
5	26600	21600	10200	3400	2530	3730	7120
6	26400	21400	10000	3320	2530	3730	6670
7	26200	20300	9800	3240	2750	3730	6370
8	26000	19600	9600	3160	2640	3990	6520
9	25900	18900	9200	3080	2640	3990	6520
10	26200	18100	8800	3060	2750	4250	6370
11	25200	17400	8400	3040	2750	4520	6370
12	23900	16800	8000	3020	2640	5220	6520
13	22700	16100	7400	3000	2640	5640	6370
14	24100	16100	6800	2990	2640	5780	6070
15	27300	15900	6600	2980	2640	5780	6520
16	28900	15500	6200	2970	2750	5780	6520
17	30300	15300	5800	2800	2640	5780	6520
18	29800	15900	5400	2640	2750	5780	6370
19	28500	16400	5020	2640	2640	5920	6370
20	27600	16400	4890	2640	2540	5920	6370
21	27300	16400	4760	2640	2540	5920	6220
22	26900	15900	4760	2530	2650	5780	6220
23	26900	14900	4760	2530	2760	5360	6370
24	27100	14200	4760	2640	3000	5780	6370
25	26900	13800	4760	2750	3120	6070	6520
26	25900	13400	4500	2640	3120	6220	6520
27	24800	13000	4370	2750	3240	6220	6370
28	23600	12600	4220	2750	3240	6370	6220
29	22300	12400	4070	2530	3360	6370	6370
30	21600	12400	3920	2640	3360	6070	6220
31		12600		2640	3480		6370
Mean	26600	16600	7110	2950	2810	5120	6510
Ac.Ft. for Month	1580000	1020000	423000	181000	173000	305000	400000

NOTE: This station is located at Mile 19.6 above Sacramento below the junction of the Feather with Sacramento River. It is just above the mouth of "Cross Canal", main drain of Reclamation District 1001, and is only a short distance above the upstream limit of the tide effect. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 7

DISCHARGE OF SACRAMENTO RIVER AT SACRAMENTO

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	24800	14800	4240	2560	3550	7080
2	24300	14300	4040	2460	3220	7520
3	24400	13700	3970	2610	3120	7700
4	25100	13200	3930	2590	3470	7760
5	25500	13000	3750	2390	3620	7520
6	25000	13000	3620	2360 ✓	3670	7030
7	23900	13100	3550	2580 ✓	3720	6760
8	23400	12700	3360	2460 ✓	3910	6870
9	22200	11900	3280	2460	3980	6840
10	21100	11400	3190	2580	4240	6650
11	20300	11200	3170	2650	4590	6710
12	19800	10900	3150	2470	5280	6840
13	19700	10100	3090	2490	5790	6550
14	20000	9240	3100	2550	5930	6370
15	19900	8740	3020	2530	5900	6920
16	19000	8110	2990	2620	5900	6840
17	19400	7770	2820	2480	5890	6840
18	20500	7250	2610	2610	5980	6600
19	21400	6690	2670	2450	6070	6580
20	21600	6250	2610	2370	6100	6520
21	21800	5980	2590	2350	6100	6340
22	20700	5870	2390	2480	5980	6320
23	19200	5790	2400	2620	5570	6480
24	18500	5640	2540	2910	5990	6450
25	18000	5650	2610	3020	6350	6670
26	17500	5190	2500	3000	6490	6610
27	17200	5060	2610	3140	6570	6460
28	16900	4840	2610	3150	6680	6310
29	16400	4640	2400	3320	6650	6440
30	15800	4380	2450	3270	6400	6300
31	15600		2480	3410		6460
Mean	20600	9010	3020	2680	5220	6750
Ac. Ft. for Month	1267000	536000	186000	165000	311000	415000

NOTE: This represents the flow past Sacramento (below the City of Sacramento intake) to the Delta. The discharges of this table have been computed by adding to the measured Verona discharges the measured inflow of return water and American River and subtracting therefrom the measured diversions between Verona and Sacramento. A gaging station is not maintained at Sacramento because of tidal action.

TABLE 8

DISCHARGE OF BUTTE CREEK NEAR EAST SIDE HIGHWAY

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		372	117	1		0	26
2		365	103	1		0	28
3		357	90	1		0	30
4	-	350	72	1		0	32
5	-	342	72	1		0	34
6		335	69	1		0	36
7	F	327	66	1		0	38
8	L	320	63	1	-	0	40
9	O	312	60	1	-	0	42
10	R	305	58	1	-	0	44
11		297	55	1		0	46
12		290	52	1		0	48
13		282	49	1		1	50
14		275	46	1		2	51
15		282	44	1		3	51
16		289	41	0		4	52
17		297	38	0		5	52
18		305	35	0		6	52
19		293	33	0		7	53
20		280	30	0		8	54
21		267	27	0		10	55
22		253	24	0		12	56
23		239	22	0		14	56
24		225	19	0		16	56
25		212	16	0		16	58
26		198	13	0		16	60
27		185	11	0		18	62
28		171	8	0		20	64
29		157	5	0		22	66
30		144	2	0		24	68
31		130		0			70
Mean		257	44.7	0.5		6.8	49.3
Ac.Ft. for Month		16800	2660	30		405	3030

NOTE: This record is estimated from current meter measurements and occasional staff gage readings. Station is located at bridge one mile west of the East Side Highway.

TABLE 9

DISCHARGE OF FEATHER RIVER AT NICOLAUS

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	10500	6130	1010	849	1310	2950
2	10100	5690	1080	835	1040	3050
3	10500	5410	1120	842	1010	3050
4	12500	4870	1150	793	1310	2950
5	12300	4610	1230	658	1310	2950
6	10900	4610	989	793	1350	2550
7	10300	4350	919	821	1470	2350
8	10100	4090	828	814	1550	2650
9	9720	3850	856	828	1470	2700
10	9160	3490	884	863	1590	2700
11	8620	3610	891	821	1630	2750
12	8260	3380	870	676	1860	2750
13	7920	3160	863	814	1940	2500
14	8090	2850	807	849	1990	2260
15	8090	2850	664	898	2080	2600
16	7920	2700	718	898	1940	2650
17	7920	2170	712	884	1990	2650
18	8800	2260	670	828	2120	2600
19	8980	2220	664	658	2220	2600
20	8980	2080	694	765	2300	2600
21	9160	2260	676	842	2300	2400
22	8440	2450	586	884	2040	2500
23	7750	2300	744	1010	1720	2600
24	7240	2040	856	1270	2220	2550
25	7240	1940	856	1270	2350	2650
26	6920	1680	856	1080	2500	2700
27	6600	1470	891	1230	2400	2550
28	6600	1390	835	1270	2450	2500
29	6440	1350	652	1270	2450	2600
30	7080	1270	807	1230	2400	2600
31	6760		849	1350		2650
Mean	8710	3080	846	932	1880	2650
Ac.Ft. for Month	536000	183000	52000	57300	112000	163000
Monthly Diversions Below Nicolaus	193	1819	1387	2516	519	45
Discharge to Sacto. River Acre-Ft.	536000	181000	50600	54800	111000	163000

NOTE: Gagings at Nicolaus Bridge, Mile 9.6 above mouth of River. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

TABLE 10

DISCHARGE OF AMERICAN RIVER AT SACRAMENTO

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	4020	2820	750	184	205	388
2	4400	2520	721	180	151	436
3	4720	2520	750	184	130	469
4	4720	2680	760	172	142	478
5	4020	3050	640	180	148	436
6	3720	3350	622	168	210	359
7	3800	3650	586	164	184	420
8	3880	3420	541	154	154	380
9	3500	3050	505	164	168	352
10	3200	2980	478	184	151	317
11	3050	3200	487	184	225	331
12	3200	3200	487	172	230	345
13	3800	3050	428	184	268	210
14	4180	2820	373	225	215	331
15	4180	2450	359	205	184	373
16	3800	2220	373	188	225	352
17	4250	2380	331	151	245	352
18	4880	2220	317	142	262	262
19	5200	2000	317	142	230	235
20	5520	1790	298	168	235	172
21	5680	1550	262	164	262	151
22	5040	1480	220	164	220	130
23	4560	1360	192	176	256	136
24	4560	1250	245	192	274	125
25	4560	1190	210	157	292	142
26	4400	1050	205	160	304	139
27	4560	1010	200	176	338	133
28	4560	952	184	215	345	139
29	4250	890	176	225	268	130
30	3720	800	154	200	359	133
31	3200		176	225		130
Mean	4230	2230	398	179	229	274
Ac.Ft. for	260000	133000	24500	11000	13600	16800
Month						
Monthly Diversions Below Gaging Station	28	50	31	18	12	24
Discharge to Sacto. River	260000	133000	24500	11000	13600	16800
Acre-Ft.						

NOTE: Gagings at "H" Street Bridge, 6.0 miles above mouth.
Station maintained by Water Resources Branch of the
U. S. Geological Survey under cooperative agreement.

TABLE 11

DISCHARGE OF MOKELUMNE RIVER AT WOODBRIDGE

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	275	48	1120	3.6	190	184	196
2	340	43	898	2.7	158	94	377
3	188	53	581	2.7	221	328	390
4	38	98	1160	3.6	41	331	382
5	327	391	955	4.2	118	350	364
6	1220	746	1220	5.5	196	357	137
7	1330	723	1610	5.5	221	350	316
8	591	838	2100	67	235	68	398
9	61	769	2310	102	214	213	340
10	17	680	1450	146	232	291	364
11	9	620	1140	180	45	312	374
12	6.5	580	1450	268	120	327	396
13	25	680	1510	233	209	327	388
14	70	1080	1390	24	228	327	388
15	82	1330	1240	102	249	73	381
16	79	1300	1100	253	256	221	381
17	84	1130	1030	260	106	312	374
18	79	1180	930	223	31	305	381
19	114	1480	884	201	103	305	352
20	112	1740	899	208	196	312	108
21	115	2060	795	33	228	298	34
22	110	2480	174	77	256	81	206
23	71	2520	320	138	271	211	396
24	56	2240	102	177	164	359	374
25	61	2140	20	162	36	327	396
26	60	1930	8	155	114	320	388
27	54	2000	5.5	201	303	334	146
28	62	2140	5	26	301	334	284
29	59	2280	5	153	301	89	359
30	79	2200	4.2	174	316	185	531
31		1670		162	286		441
Mean	192	1260	881	121	192	264	334
Ac. Ft. for Month	11400	77500	52400	7440	11800	15700	20500

NOTE: Gaging station located just below Woodbridge Irrigation District's Dam at Woodbridge. Station maintained by Water Resources Branch of the U. S. Geological Survey throughout the year, but the record is given here for the period of the irrigation season only.

TABLE 12

DISCHARGE OF MOKELUMNE RIVER AT THORNTON

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	299	73	1250	27	194	238	192
2	308	49	1040	25	193	158	301
3	288	50	**	24	222	236	380
4	82	58		23	137	378	370
5	91	178	**	23	101	358	360
6	962	652	1120	23	191	378	210
7	1170	666	1450	24	226	378	252
8	833	780	**	26	250	193	360
9	191	780		32	238	171	350
10	89	728		122	234	299	350
11	54	656		172	139	318	380
12	39	632		228	89	338	400
13	37	680	**	290	191	328	400
14	65	988	1340	152	236	328	400
15	92	1230	1140	78	272	188	390
16	94	*	**	217	281	165	390
17	94		**	290	177	290	390
18	98		936	263	80	308	390
19	98		910	223	79	308	380
20	132		884	240	171	318	192
21	132		780	130	217	318	69
22	131		263	82	247	174	120
23	110		308	161	281	169	353
24	85		148	171	236	330	390
25	72		74	212	110	348	430
26	74		58	185	83	318	410
27	63		42	111	235	338	239
28	67		36	78	308	348	240
29	60		32	209	308	191	360
30	70		29	228	318	161	528
31		*		180	308		518
Mean	199			137	205	279	339
Ac.Ft. for Month	11800			8420	12600	16600	20800

* May 16-31, station not rated.

** No record of flow obtained.

NOTE: This station is located near Thornton at the lowest point on the river which is above tidal effect. Station maintained by Water Resources Branch of the U. S. Geological Survey.

TABLE 13

DISCHARGE OF SAN JOAQUIN RIVER NEAR VERNALIS

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	3260	2220	2560	1630	768	1240	1840
2	2940	2080	1900	1570	725	1210	1900
3	2700	2020	1720	1570	725	1210	1900
4	2350	2210	1780	1570	745	1240	1900
5	2350	2280	1780	1600	725	1240	1840
6	2210	2350	2560	1540	705	1240	1840
7	2020	2280	2560	1510	665	1270	1780
8	2280	2080	2700	1450	645	1300	1720
9	3020	1960	3020	1390	835	1300	1720
10	2940	1840	3180	1360	955	1330	1720
11	2630	1840	3020	1390	980	1360	1660
12	2490	1780	2780	1330	980	1420	1660
13	2140	1660	2420	1360	955	1420	1660
14	3020	1540	3430	1390	980	1450	1660
15	2860	1450	4250	1330	955	1540	1630
16	2280	1390	4350	1270	955	1540	1600
17	2140	1360	4850	1210	980	1540	1630
18	2080	1420	4750	1210	1030	1480	1630
19	2140	1420	4150	1180	1060	1420	1600
20	2140	1840	3100	1180	1060	1630	1630
21	2350	3020	2860	1130	930	1630	1570
22	2560	2780	2560	1000	790	1480	1570
23	2860	3020	2350	980	745	1510	1570
24	3020	2940	2420	955	812	1510	1540
25	3180	2700	2280	930	930	1540	1570
26	3180	3180	2080	955	1080	1540	1540
27	2780	2780	1960	955	1100	1540	1570
28	2640	2700	1840	880	1080	1540	1600
29	2500	2780	1720	858	1160	1630	1570
30	2360	2860	1690	858	1240	1690	1570
31		2860		812	1210		1540
Mean	2580	2210	2750	1240	920	1430	1670
Ac.Ft. for Month	154000	136000	164000	76200	56600	85100	103000

NOTE: Gaging station located at Durham Ferry Bridge below the junction of Stanislaus and San Joaquin Rivers. Station maintained by Water Resources Branch of the U. S. Geological Survey under cooperative agreement.

CHAPTER III

MEASUREMENT OF DIVERSIONS

Measurements and records of diversions in 1930 have included those from the Sacramento River and its tributaries within the valley floor, those to the Delta Uplands from San Joaquin River, Old San Joaquin River and Tom Paine Slough and those on the Stanislaus, Tuolumne, Merced, and San Joaquin Rivers and Dry Creek as obtained in connection with the return water measurements (See Chapter IV). This report records a total of 493 diversions, segregated to the various sources as follows: Sacramento River 251, Colusa Trough 11, Back Borrow Pit (carrying drainage water from Colusa Basin along the back levees of Reclamation Districts 108 and 787) 5, Lower Butte Creek and Butte Slough 16, By-pass and Drainage Channels 13, Feather River 37, Yuba River 6, American River 29, diversions to Delta Uplands from Old San Joaquin River 11, from Tom Paine Slough 7, from San Joaquin River (below Durham Ferry Bridge) 30, and from Cache Slough 1, San Joaquin River (above Durham Ferry Bridge) 18, Stanislaus River 11, Tuolumne River 9, Dry Creek 7, and Merced River 31.

Under the system for obtaining the diversion records, pump operators have kept daily records on blanks furnished by the Water Supervisor. These records are collected monthly by the field engineers at the same time that the readings of the electric meters are recorded. In order to establish the relation between power input and water pumped, as many as possible current meter measurements of discharge are made throughout the season. With the daily operation records available it has been possible to compile from the monthly diversions as computed

from the power record, a daily diversion record for each plant. In this report and the tables of this chapter it is only possible to publish the record of monthly diversions for each plant. However, the daily diversion records have been compiled as a supplemental report and this is on file and available for reference in the office of the Division of Water Resources.

TABLE 14
SUMMARY OF SACRAMENTO RIVER DIVERSIONS (ACRE-FEET)

River Section	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Totals
Redding to Red Bluff	8519	19098	21652	22354	22222	20018	12525	126388
Red Bluff to Butte City	29917	89321	89058	86893	83148	45439	15547	439323
Butte City to Colusa	4482	16173	15921	17514	13427	4515	97	72129
Colusa to Knights Landing	22548	53859	68734	65353	57160	27210	2145	297009
Knights Landing to Verona	940	4842	5829	4649	3974	1220	11	21465
Verona to Sacramento	7830	15543	20658	20935	19944	9175	2356	96441
Totals	74236	198836	221852	217698	199875	107577	32681	1052755

TABLE 15
SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	: Number: and : : Size: of : : Pimp:	Monthly Diversions in Acre-feet												: Total : Acreage : : Diversion: Irrigated:	
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: April to Gen- : : October : : Acre-feet:						
: City of Sacramento	: 0.8 L:	: 3-20":	: 2076	: 2410	: 2966	: 3157	: 3028	: 2372	: 2010	: 18019	: Municipal:					
: AMERICAN RIVER	: MILE 1.1 LEFT	: SEE TABLE 10														
: BACK BORROW PIT R.D.1000	: MILE 1.3 LEFT	: SEE TABLE 48														
: E. Fourness	: 1.45 R:	: 1-8"		: 7	: 59	: 8	: 20	: 3	: 1	: 98	: 84:					
: C. W. Jones	: 2.05 L:	: 1-8"			: 59	: 21	: 13			: 93	: 130:					
: RECLAMATION DISTRICT 1000 DRAIN	: MILE 2.1 LEFT	: SEE TABLE 47														
: Frank Christopher	: 2.4 L:	: 1-5"	: 4		: 17	: 11	: 3	: 3		: 47	: 34:					
: H. M. Swalley	: 2.45 L:	: 1-5"			: 22	: 14	: 3			: 39	: 36:					
: Albert Elkus	: 2.9 L:	: 1-5"			: 12	: 8	: 12			: 34	: 23:					
: Hayward Reed	: 3.55 R:	: 1-16"	: 84	: 129	: 282	: 160		: 135		: 790	: 370:					
: W. E. M. Beardslee	: 3.75 R:	: 1-5"		: 20	: 35	: 19				: 74	: 46:					
: W. I. Elliot	: 4.0 R:	: 1-8"			: 44	: 102	: 70			: 216	: 105:					
: Reese and Greer	: 4.65 R:	: 1-7"			: NO	: D I V E R S I O N										
: Harbinson Bros.	: 5.05 R:	: 1-14"			: 41	: 33				: 74	: 20:					
: J. W. Roddan and Sons (1)	: 5.25 R:	: 1-8"		: 31	: 54	: 68	: 55	: 11		: 219	: 122:					
: C. H. Merkeley Estate (Merkeley Bros.)	: 5.3 R:	: 1-8"			: 23	: 8				: 31	: 60:					
: A. Casselman	: 5.5 R:	: 1-5"			: 13					: 13	: 12:					
: K. L. Lovdal	: 5.7 R:	: 1-10"			: NO	: D I V E R S I O N										
: J. E. Bandy	: 6.0 R:	: 1-6"		: 24	: 16	: 30	: 6			: 76	: 70:					
: Riverside Mutual Water Co.	: 6.10 L:	: 2-18"		: 881	: 1541	: 1854	: 1137	: 772	: 300	: 6485	: 2021:					
: O. A. White	: 6.4 R:	: 1-6"			: NO	: D I V E R S I O N										
: A. Marty	: 7.0 R:	: 1-4"			: NO	: D I V E R S I O N										

* Mileage along river above Southern Pacific Bridge, Sacramento.
(1) Formerly R. S. Seydel.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet												Total : Acreage :			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		Diversions : Irrigated : April to October : Gen-eral :		
California Bank and Trust Co.	7.5 L	1-8"			NO	D I V E R S I O N												
F. L. Martin and A. B. Carter (F. J. Stahl)	7.8 L	1-10"			46	17	18										81	94
A. Marty	7.9 R	1-8"		8	39	106	92	65	23								346	(1)370
M. E. and R. F. Bennett	7.9 L	1-10"			1	123	66	9									199	128
M. Marty	8.3 R	1-10"				87	200	293	20								600	(2)
Julius Blauth	8.5 R	1-5"				P L A N T R E M O V E D												
H. Waldeck	8.7 R	1-6"		3	15	25	14	8	11								82	39
T. T. C. Gregory	8.95 R	1-18"				N O D I V E R S I O N												
A. A. Sousa (3)	9.15 R	1-2"				N O D I V E R S I O N												
A. A. Sousa (3)	9.20 R	1-6"				N O D I V E R S I O N												
A. A. Sousa	9.35 R	1-14"				278	188	315	111	12							904	(4)100
R. G. Pearson and P. S. Driver	9.80 L	1-14"				214	150	61	12								437	(5)340
Carl Casselman	9.9 R	1-12"				82	148	68	88								386	130
F. W. Kiesel	10.25 L	1-14"			73	204	229	246	23								775	290
Reese Estate (Louis Ashwandan)	10.75 R	1-12"				62	134	178	49								423	88
R. F. Fiddymont & E. J. Cahill	10.75 L	1-12"				49	99	86	3								237	190
H. L. Hill Jr. (W. R. Taylor)	11.1 R	1-14"				P L A N T R E M O V E D												
A. L. White (6)	11.6 L	1-10"				10	41	11	10								72	40

* Mileage along river above Southern Pacific Bridge, Sacramento.
 (1) This is the total acreage irrigated by this plant and plant at Mile 8.3 R.
 (2) See plant at Mile 7.9 R.
 (3) Formerly Kate Merkeley.
 (4) Irrigated from plant at Mile 9.35 R.
 (5) Water diverted by this plant serves an additional 100 acres. See plant at Mile 9.20 R.
 (6) New installation.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet												Total Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to October	Irrigated Gen-eral				
Conaway Ranch	12.0 R	4-36"	109	3722	3486	3475	4223	2143					17158	145:2040	
Tom O'Connor (1)	12.5 R	1-12"				119							119	90	
Julius Hauser	13.1 R	1-12"	29	55	193	227	102	32					638	54	
H. E. Franks (2)	13.25 R	3 1/2-10"			59	73	21	12			14		179	25	
Elkhorn Mutual Water Co.	14.1 L	1-24"		634	2514	2626	2714	1195					9683	2960: 186	
California Lands, Inc.	15.15 R	(4) 1-10"			47	125	110	84					366	114	
M. O. Russ	15.7 L	1-6"													
Central Mutual Water Co.	16.0 L	2-38"	2631	3178	3993	3500	3115	1365					(5) 17782	1366: 2233	
Frank Fisher and Henry Rich (Hershey Plant) (6)	16.27 R	1-20"		298	576	666	536	181					(6) 2257	(6) : (6)	
Ellis Jones and J. K. Brown	16.3 R	1-10"													
H. T. Silvius	16.4 R	1-6"													
W. B. Beach	16.62 R	(7) 1-6"		11	40	31	18	5					105	70	
Thos. J. Cox Estate	16.7 R	1-16"													

*Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) New installation 1930.
- (2) Formerly listed as California Bank and Trust Company.
- (3) Formerly listed as 12" pump.
- (4) Replaces 8" unit.
- (5) This plant pumps water to the irrigation canal both from a drain canal of District 1000 and from the Sacramento River. The diversions listed are those from the river only. The water obtained from the drain canal was as follows: (Acre-feet) April 480, May 1504, June 901, July 1086, August 1303, September 817, October 43, Total 6134.
- (6) The total diversion shown for this plant together with a portion of the diversion by the plant at Mile 22.5 R was by-passed to the east borrow pit of the Yolo By-Pass to be repumped on to By-Pass lands. (See "Yolo By-Pass Diversions" - Fisher and Rich).
- (7) 5" gas outfit replaced in June by 6" electric.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and size of Pump	Monthly Diversions in Acre-feet												Total Acreage			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		April	to	to
Frank Fisher and Henry Rich (Mull Plant)	17.75 R	1-20"		433													433	(1)
A. Linggi	18.45 L	1-12"																
Frank Fisher and Henry Rich (Hoover Plant)	18.95 R	1-18"																
Northern Mutual Water Company	19.6 L	1-36"	2813	3636	3290	3222	3400	510									16871	337:1561:
VERONA GAGING STATION	MILE 19.65																	
FEATHER RIVER	MILE 20.9 L																	
SACRAMENTO SLOUGH	MILE 21.2 L																	
J. H. Berghauser	21.7 R	1-15"																

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) The diversion by this plant was used in conjunction with a portion of the diversion from the plant at Mile 22.5 R to irrigate the acreage reported for the latter plant.

(2) Cross Canal, the main drain between R.D.1000 and 1001 joins the river at Mile 19.6 L. At the mouth of this drain Natomas Northern Mutual Water Co. maintains, during the irrigation season, a booster pump supplying water from the river to the drain. The water is retained in the drain by a movable dam at its mouth. When the river falls lower than the crest of this dam the gates are closed and the booster pump started. There are pumping plants along the south bank of Cross Canal, but only one, at Mile 4.0 from the mouth, was operated in 1930 and the acreage shown was irrigated from this plant. From April 5th until June 11th, inclusive, water was available in Cross Canal without pumping at Booster Plant. The diversions here shown are those for the plant at Mile 4.0 on Cross Canal from April 5th to June 11th and for the booster plant for the remainder of the season. The water pumped through the plant at Mile 4.0 was as follows: (Acre-feet) April 2813, May 3636, June 3123, July 3468, August 3302, September 601, Total 16,943.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April	October	Gen-eral	Rice		
Frank Fisher and Henry Rich (Keller Plant)	22.5 R	1-22"	736	1851	2153	1494	1426	270						(1)7930	630
Hershey Estate	26.95 R	1-18"													
Morse Inglin	28.2 R	1-6"		14	39	24	20	7	2	106	28				
Fred Traganza	29.7 R	1-8"													
P. L. Traganza & K. Russell	29.75 R	1-8"		8	24	10	10	2.8		15.6	13				
Laura Freitas	29.9 L	1-12"		0.2	1.3	9.1	4.2	1.5	0.4	52	65				
Leo Giovanetti	30.2 L	1-3"								16.7	22				
Charles Ghiselli	30.25 L	1-6"													
Charles Ghiselli	30.45 L	1-2"						0.6		2.0	8				
Kendall Ranch (Lower)	30.6 R	1-7"		4	18	12	13	2		49	16				
J.G. Goulart	30.75 L	1-3"		6	94	41	45	7		193	38				
A. C. Huston (A. Simmons)	31.5 R	1-12"													
M. Alonso	31.8 L	1-4"													
Kendall Ranch	32.0 R	1-10"													
Sutter Mutual Water Company (Portuguese Bend)	32.0 L	2-24"		1743	1864	1421	844	132		6004	(3)	(3)			
Collier Bros.	32.5 R	1-10"													

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) A portion of the diversion by this plant was by-passed into the East Borrow Pit of the Yolo By-Pass to supply a portion of the water used for the irrigation of 700 acres of rice on Yolo By-Pass. (See Fisher and Rich plant at Mile 10.1 Yolo By-Pass).

(2) The diversion from the plant on the Sacramento River at Mile 17.75 R was also used to irrigate this acreage.

(3) See Sutter Mutual Water Company plant at Mile 63.75 L.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total : Acreage : :Diversions:Irrigated:
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to Gen-eral:	October : Rice:	Gen-eral:	Acree-feet:		
California Lands, Inc. (H. A. Kramer) (1)	38.8 L	1-10"					24							24	85
Sutter Basin Corporation (A. Colli) (2)	39.4 L	1-12"				47	17							64	40
Commercial Investment Co. (Ottow Bushaw)	39.8 L	1-10"		41	10	38	42	36						167	80
Wm. Duffey, Jr. (3)	39.9 L	1-6"	2	9	12	27	25	16		23				114	23
Sutter Mutual Water Company (State Ranch Bend)	40.6 L	1-24"		21	1492	1740	1184	460						4897	(4)
Buell Ranch (M. K. Dean): Sutter Basin Corporation (Bozzi and Pressenda) (6)	42.2 L 42.3 L	1-6" 1-8"		42	79	71	6							156 108	40 50
A. Kramer	42.65 L	1-12"		1	7	10	22	4		13				57	30
El Dorado Ranch	43.1 R	1-18"		318	404	716	268	16						1722	540
River Farms Company (Recl. Dist. #2047 Plant)	43.1 R	2-50"	3700	3267	4375	5010	4276							20628	2141
RECLAMATION DISTRICT 108 DRAIN	MILE 44.0 R	SEE TABLE 41													
John Clauss	47.3 L	1-14"	14	232	595	324	127	192		57				1541	300
P. J. Hiatt	48.7 L	1-20"	146	1400	1377	1216	1316	1389		330				(7)7174	172

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) Formerly listed as Bank of Italy.
- (2) Previously listed as Sutter Mutual Water Company (McCutcheon Ranch)
- (3) New installation 1930.
- (4) See Plant at Mile 63.75 Left.
- (5) New location in 1930. Previously at Mile 41.8 Left.
- (6) Previously listed as Sutter Mutual Water Company.
- (7) A large portion of this diversion is discharged to a lake from which surrounding lands are sub-irrigated.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Diversion: April to October	Irrigated: Rice: Acre-feet: Gen-eral:				
Blanche Coulter Brown (1)	60.5 L	1-12"		21	39	16	13							89	50:
A. Kolpien (2)	61.3 R	1-12"			N O	D I V E R S I O N									
Hines Ranch	62.3 R	1-10"		8		16			11					35	10:
Wm. Baker	62.6 R	1-8"				22								22	23:
Reclamation District 108 (Wilkins Slough Plant)	63.2 R	5-42"	4237	6338	7367	7517	6212		790					32461	1189:2741:
Sutter Mutual Water Company (Tisdale) and Improvement Mutual Water Company	63.75 L	6-42"	9643	27461	28081	27244	26909	15822						135160(3)	11024:7126:
Cloman Land and Sheep Co. Tisdale Irrigation and Drainage Company	64.3 R	1-12"			10	21	6							44	30:
Colusa Development Company (Spreckles Sugar Co.) (6)	64.4 L	1-12"	258	283	383	469	465	134						1992	1130: 553:
Otto Wackerman	64.9 R	1-24"		199	755	74								1028	(5): (5):
D. L. W. Hoffman	65.1 R	1-10"		10	64	13	12							111	388:
J. L. Browning	65.7 L	1-12"			46	43	63							179	46:
	66.4 R	1-20"		210	618	849	378	45						2100	70: 1465:

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) Formerly listed as Thomas J. Coulter.
- (2) New installation 1930.
- (3) Includes water delivered to Improvement Mutual Water Co. as follows: (Acre-feet) Apr. 772, May 1509, June 2197, July 1978, Aug. 2307, Sept. 1932, Total 10695.
- (4) These figures give the total acreage irrigated from the Portuguese Bend, State Ranch Bend and Tisdale Plants at Miles 32.0 L, 40.6 L, and 63.75 L, respectively. They include 541 acres rice and 140 acres general crops irrigated by Improvement Mutual Water Co. (in R.D. 1600) entirely from the Tisdale Plant.
- (5) These figures give the total acreage irrigated from this plant and the other company plant (Winship) at Mile 67.1 L. The general crop figure includes 27 acres of the Desmond A. Winship (formerly listed as Eliza Smith) lands, Mile 67.2 L irrigated from the Winship Plant.
- (6) New installation 1930 but at same location as plant formerly listed under name of Emaline Wilson.
- (7) This is the total acreage irrigated by this plant and the plant at Mile 69.0 R.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	:Number: and : Size : of : Pump :	Monthly Diversions in Acre-feet												:Total : Acreage :	
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: Diversion: Irrigated: April to: October : Gen-: Rice: Acre-feet: eral:						
Tisdale Irrigation and Drainage Company (Winship Plant)	67.1 L	1-20"	1517	1654	1484	1534	1562	665						8416	(1)	(1)
Desmond A. Winship, et al (2)	67.2 L	1-10"			NO	D I V E R S I O N										(3)
Meridian Farms Water Company:	67.4 L	1-14"		110	80	120	97	58						465		(5)
Number 6		(4)														
Ennis-Brown Company (6)	67.5 L	2-24"		2331		2218	2188	1405						8142		(7)2824:
RECLAMATION DISTRICT 70 DRAIN	MILE 68.8 L	SEE TABLE 40:														
Meridian Farms Water Company:	68.81 L	1-12"		196	370	303	357	141						1372		(5)
Number 5																
J. L. Browning	69.0 R	1-24"		48	436	191	351	79						1105		(8)
Faxon Ranch	69.2 R	1-18"	114	198	323	517	218	3						1376		870:
DUNNS FERRY (GRIMES)	MILE 69.45															
Wilbur Jensen and Mary Cecil, et al	70.35 R	1-24"			NO	D I V E R S I O N										
Houchins-Hoffman-Beckley and Ritchie (J. M. Ritchie)	70.4 R	1-20"		26	15	112	17							170		89:

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) See plant at Mile 64.4 L.
- (2) Formerly listed as Eliza Smith.
- (3) See note (5) for plant at Mile 64.4 L.
- (4) After June 1st this pump replaced by 12" unit.
- (5) See plant at Mile 80.0 L.
- (6) New installation 1930.
- (7) Includes 160 acres for Geo. Springer and 271 acres for Alameda Farms Company.
- (8) See plant at Mile 66.5 R.
- (9) Acreage distributed as follows: Houchins 0; Hoffman 25; Beckley 34; Ritchie 30.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Diversion: April to October: Acre-feet	Acreage Irrigated: Gen-eral	
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.			
Meridian Farms Water Company Number 4 (Grimes)	71.1 L	1-24"	157	535	778	1723	1685	999	115	5992	(1)						
J. W. Browning	71.9 R	1-12"		88	191	104				(3)	383	400					
(Spreckles Sugar Co.) (2)																	
Antone Steidelmeyer	71.9 R	1-12"		68	413	225	51			(4)	757	100					
E. E. Vann (Coffman Bros.)	73.6 R	1-12"		15	181	90	106	4			396	110					
Meridian Farms Water Company Number 3 (Headquarters)	74.8 L	1-20"	192	313	667	355	427	282	(5)	21	2257	(1)					
J. H. Yates	76.1 L	1-12"			93	45	41	5			184	50					
Dr. E. V. Jacobs	77.9 L	1-12"															
Sebia Davis	78.8 R	1-36"	435	1540	1661	1484	1372				6492	460:1297					
C. E. Reische	79.0 L	1-10"		86	83	77	68	28			342	(7) 144					
G. W. Woods	79.7 L	1-10"		8	29	34	32				103	(8) 68					
MERIDIAN BRIDGE MILE 79.85																	
Meridian Farms Water Company Nos. 1 and 2 (Meridian)	80.0 L	1-24"	460	1780	2880	2726	1944	1974	187	11951	7184	(9)					
		1-18"															

* Mileage along river above Southern Pacific Bridge, Sacramento.

- (1) See Plant at Mile 80.0 L.
- (2) New installation 1930.
- (3) Additional water was received from the Steidelmeyer plant at Mile 71.9 R.
- (4) A portion of the diversions by this plant was used on the Browning land to the south (See Mile 71.9 R).
- (5) October diversion was for stock.
- (6) Formerly 24" - New pump installed.
- (7) Includes adjacent lands irrigated from this plant as follows: Kilgore 32; Stacs 30; Rockholt 20; (62 Reische).
- (8) Includes 38 acres on adjacent lands of Burtis.
- (9) This is the total acreage irrigated from this plant and the other company plants at Miles 67.4 L; 68.81 L; 71.1 L; and 74.8 L. An additional 271 acres were irrigated from the plant at Mile 67.5 and were included in the acreage figure given there.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage Diversion: Irrigated					
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.						
Geo. P. Ahlf	80.3 R	(1) 1-8"		20	51												71	50		
M. S. Davis (2)	80.9 L	1-5"		11	4		18	1			3						37	16		
H. J. Wonderley	81.5 L	1-16"					13	8			3						32	8		
and Geo. F. Springer (2)	81.9 R	1-16"	444	81	74		368	138		197							1302	468		
Steidelmeyer Bros.	82.5 L	1-12"			NO		D I V E R S I O N													
F. T. Reische & L. J. Woods (2)	83.3 L	1-14"		22	16		6	7									51	(3) 55		
Geo. W. Kirkpatrick	83.6 L	1-10"			NO		D I V E R S I O N													
P. E. Garmire	SEE TABLE 39																			
BUTTE SLOUGH	MILE 84.0 L			106			112	26									244	110		
Oakland Prune Company	86.1 R	1-12"			117		141										258	(4) 120		
J. F. Peck	86.6 L	1-18"					7	35									133	50		
Lloyd Scoggins	86.8 L	(5) 1-8"		39	52		107	55		4							494	(6) 266		
Campbell-Dwyer (Lower)	86.9 R	1-16"		185	122		148	16									339	(7)		
Campbell-Dwyer (Upper)	87.4 R	1-15"		79	93		36										36	10		
Jacobsen and O'Rourke	87.6 L	1-10"					51	14									394	140		
Swinford Tract Irrigation Co.	87.7 R	1-12"	52	121	142		45										139	32		
J. B. DeJarnett	88.2 L	1-10"		41	53															
(Nagle and Locovitch)																				

* Mileage along river above Southern Pacific Bridge, Sacramento.
 (1) Portable unit. Moved to Mile 93 L in July.
 (2) New installation 1930.
 (3) Includes 35 acres irrigated for H. B. Turner.
 (4) Includes 30 acres on adjacent lands of Max Reichel.
 (5) This pump replaces 10" formerly used.
 (6) This is the total acreage irrigated from this plant and the one at Mile 87.4 R.
 (7) See plant at Mile 86.9 R.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet						Total Acreage		
			Apr.	May	Jun.	Jul.	Aug.	Sep.		Oct.	Diversions Irrigated: April to October
J. B. DeJarnett	88.7 L	1-14"			57	59				116	265
Colusa Irrigation Company	89.2 R	1-20"	96	371	515	540	261	129		1912	607
Phil B. Arnold	89.25 L	1-8"		73	90					163	85
P. V. Berkeley	89.3 L	1-12"		36	198	30	78			342	(1)80
COLUSA GAGING STATION	89.4	SEE TABLE 4									
T. H. Boggs and Sisters	89.8 L	1-12"									
T. H. Boggs and Sisters (2)	90.4 L	1-6"		2	3	7	7			19	10
Roberts Ditch Company	90.7 R	2-20"	41	453	649	518	370	200	33	2264	951
Geo. P. Ahlf	92.5 L	1-14"		89	221	217		36		563	(3)170
Geo. P. Ahlf (4)	93.0 L	1-8"				30				30	40
U. W. Brown	93.0 R	1-12"		95	91	41				227	(5)91
I. G. Zumwalt	93.2 R	1-36"									
		1-18"									
Tuttle Land Company	94.3 R	1-15"	108	576	754	405	56	48	17	1964	7995
		1-20"									(8)
W. E. Pinney	94.8 R	1-12"	3	106	131	7				247	(7)92
J. W. Browning (C. Meyers)	95.2 L	1-14"			157	670	3	46		876	200
		1-20"									

* Mileage along river above Southern Pacific Bridge.

- (1) An additional 100 acres served for Reclamation District 1004 lands on Butte Creek, Mile 3.9 R.
- (2) Portable plant.
- (3) Includes 40 acres for A. G. Laux and 40 acres for Colusa Development Company on adjoining lands.
- (4) Portable plant temporarily moved to this location from Mile 80.3 R.
- (5) Includes 40 acres on adjacent lands of Ella Arnold.
- (6) Includes 25 acres on adjacent lands of Rhoda N. Meigs.
- (7) Includes 47 acres on adjacent lands of Kate M. Marsh.
- (8) Formerly listed as F. W. Farnsworth.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	: Number : and size of pump	Monthly Diversions in Acre-feet												: Total : Acreage : : Diversions : Irrigated : : April to : : October : Gen- : Rice : : Acre-feet : eral :			
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: Nov. :	: Dec. :	: Jan. :	: Feb. :	: Mar. :				
A. N. Lewis	95.6 L	1-20"			17	166											183	100:
I. G. Zumwalt	95.7 R	1-12"	21	199	264	23											507	(1):
Bridget Graham Estate	95.8 L	1-16"		48	63	247	23										381	250:
I. G. Zumwalt	96.8 R	1-12"																210:
J. P. & J. T. O'Sullivan (2)	97.7 R	(3)1-12"			83	21	24										181	59:
Frank Beckley	98.0 L	1-6"		9	30	35											74	56:
J. L. Erisey	98.3 R	1-10"			33	28											61	23:
R. A. Sperry (Joe Boggs) and: Colusa Development Company:	98.6 L	1-15"	203	713	593	535	548	86									2678	50:
Wm. and D. Boggs	98.8 L	1-18"			53	282	35	43									413	(4):
Cheney Slough Irrigation District	99.0 R	1-36"		710	56	39	48										897	130:
Terrill and Sartain	99.2 L	1-20"			250	567	107	159									1083	230:
Dave George	99.8 L	1-12"																(5)910:
J. W. Browning (C. Meyers) (7)	100.8 L	1-20"															490	(6):
A. F. and R. C. Wohlfrom	101.1 R	1-20"	11	252	145	173	36										617	100:
																		147:

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) On adjacent property of Colusa Development Company.

(2) Formerly listed as Bolla Bros.

(3) This unit replaces former 20" pump.

(4) Acreage distributed as follows: R. A. Sperry 50 general, Colusa Development Company 235 rice, W. H. Ferrett 60 rice and Burton and Harrington 30 rice.

(5) Irrigated acreage distributed as follows: Terrill & Sartain 700; Joe Boggs 90; D.W. George 40; & J.W. Browning 80.

(6) 40 acres irrigated from Terrill and Sartain plant at Mile 99.2 L.

(7) Formerly listed as W. F. Klewe.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	:Number: and : :Size of : : Pump :	Monthly Diversions in Acre-feet							Total : Acreage :								
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: Diversion : : Acre-feet :	: April to : : October : : Acre-feet :	: Gen- : : eral : : Rice : : eral :						
Byron D. Beckwith	: 101.9 L :	: 1-10" :	:	:	: N O :	:	:	:	:	:	:	:	:	:	:	:	:	:
Maxwell Irrigation District	: 102.8 R :	: 2-30" :	:	:	:	:	:	:	:	: D I V E R S I O N :	:	:	:	:	:	:	:	:
	:	: 1-36" :	: 1135 :	: 2319 :	: 1835 :	: 2129 :	: 1888 :	:	:	:	:	:	: 9306 :	:	:	:	:	: 12 : 800 :
	:	: 2-18" :	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	: (1) : (1) :
American Trust Company	: 103.7 R :	: 1-16" :	: 3 :	: 55 :	: 368 :	: 424 :	: 198 :	: 128 :	:	:	:	:	: 1223 :	:	:	:	:	: 510 : (2) :
Compton-Delevan Irrigation District (2)	: 103.8 R :	: 2-24" :	:	:	:	: D I V E R S I O N :	:	:	:	:	:	:	:	:	:	:	:	:
E. M. Gordon	: 103.9 R :	: 1-16" :	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	: 75 : (2) :
	:	: 1-20" :	:	:	: 123 :	:	:	:	:	:	:	:	:	:	:	:	:	:
B. F. Gould	: 104.8 L :	: 1-26" :	:	: 513 :	: 263 :	: 215 :	: 58 :	: 114 :	:	:	:	:	:	:	:	:	:	: 1163 : (3) 630 :
Thousand Acre Ranch (H. W. Keller)	: 106.0 R :	: 1-14" :	: 16 :	: 104 :	: 65 :	: 122 :	:	:	:	:	:	:	:	:	:	:	:	: 307 : 195 :
St. Johns Park Company (W. A. Yerra and Sons)	: 110.0 R :	: 1-12" :	: 71 :	: 97 :	: 44 :	: 190 :	: 36 :	:	:	:	:	:	:	:	:	:	:	: 438 : 166 :
PRINCETON FERRY MILE 112	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Reclamation District 1004	: 112.1 L :	: 1-24" :	:	: 950 :	: 5158 :	: 4899 :	: 4901 :	: 1901 :	:	:	:	:	:	:	:	:	:	: (4) 23504 : (4) 1646 :
	:	: 1-30" :	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	: 1-50" :	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

*Mileage along river above Southern Pacific Bridge, Sacramento.
 (1) Additional Maxwell Irrigation District acreages irrigated from Colusa Trough. See Colusa Trough Diversions.
 (2) See Plant at Mile 154.8 R.
 (3) Divided as follows (Acres) B.F.Gould 80; D. P. O'Sullivan 50; Colusa Development Company 170; I. N. McVay 75; V. N. Donaldson 75; G. and V. McVay 75; J. S. Gould 25; J. C. Dunham and J. F. Gould 80; Total 630.
 (4) A portion of the diversion by this plant was used for gun club purposes on Butte Creek; See Recl. Dist. 1004 Mile 3.9 R and 9.3 R (Butte Creek).

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	:Number: and : :Size: of : :Pump:	Monthly Diversions in Acre-feet												:Total : Acreage : :Diversions:Irrigated:	
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: April to : : October :	: Gen-:Rice : : eral :					
Princeton-Codora-Glenn Irrigation District	112.4 R	3-24"	1920	4091	4752	5024	4971	1657						22015 (1)	2858 (2)	2192 (3)
A. J. Stone (Stone & Falkner)	112.6 L	4 1/2-10"			27	63								90	65	
Edward L. Steele (W.L.King)	115.5 L	1-12"		47	63	2	1							113	37	
Butte City Ranch (June Strawderman)	115.8 R	1-12"			30	62								92	99	
BUTTE CITY GAGING STATION	MILE 116.0	SEE TABLE 3														
Anthony Rademacher	116.1 L	1-2 1/2"			2	2								4	3	
George Hansen	117.8 R	1-10"			54	62								116	150	
Tom Crouch	119.0 L	1-10"			18	19	20							62	60	
Staats, Klewe and Killebrew	123.8 R	1-6"														
Princeton-Codora-Glenn Irrigation District (5)	123.9 R	3-24"	3690	5897	5862	6087	6067	5249	1701					34553 (5)	(6)	(6)
Provident Irrigation District (5)	124.2 R	4-42"														
Provident Irrigation District (5)	124.2 R	1-36"	8137	18960	16096	14535	14647	6900						79275 (5)	280 (7)	5769 (7)
California Joint Stock Land Bank (Shellose)	124.4 R	1-16"	141	155	277	276	182	232						1263	370	

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) Additional water received through plant at Mile 154.8 R.

(2) This is the combined acreage for both District plants Miles 112.4 and 123.9 R and includes 30 acres served through plant at Mile 154.8 R.

(3) Includes 360 acres served by Provident Irrigation District. See Plant at Mile 124.2 R.

(4) Replaces former 8" unit.

(5) See Plant at Mile 154.8 for additional water diverted and acreage served.

(6) See plant at Mile 112.4 R.

(7) An additional 360 acres were irrigated from Princeton-Codora-Glenn Irr. Dist. See Plant at Mile 112.4. This rice figure includes 380 acres served from pump on Hunter Creek.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to October	Gen-eral	Rice			
Glenn-Colusa Irrigation District (1)	154.8 R	1-100" 4-72"	4250	53647	56230	55011	51024	28024	12456	270642	18150	18613	(2)		
Jacinto Irrigation Dist. (3)	154.8 R	(3)	330	2332	2395	2906	2666	1482	1064	13175	3962				
Compton-Delevan Irr. Dist. (3)	154.8 R	(3)	2190	4240	3488	3720	3376	380		17394	5	2294			
Provident Irr. Dist. (3)	154.8 R	(3)	908	2139	1798	1564	1467	552	200	8628		624			
Princeton-Codora-Glenn Irrigation District (3)(5)	154.8 R	(3)		30	84	140	78	96		(6) 428	(5)				
C. L. Leonard (3)	154.8 R	(3)	12	42	80	94	64	96	30	418	156				
CORNING-VINA BRIDGE	MILE 166.5														
A. F. Landis (7)	166.7 R	1-3"			1.8	7.9	3.5	3.5	2.4	19.1	10				
Wm. H. Hall	166.8 R	1-2"		1.8	1.0	1.8	1.2	0.8	0.8	7.4	4				
R. A. Foster	168.7 R	1-5"													

* Mileage along river above Southern Pacific Bridge, Sacramento.

(1) This is a common point of diversion for the Glenn-Colusa, Jacinto, Compton-Delevan, Provident (partial), and Princeton-Codora-Glenn (partial), irrigation districts, and C. L. Leonard. Refer to the above plants at Mile 154.8 for their respective diversions through this plant.

(2) Includes 795 acre-feet obtained by gravity in April. Diversions in November and December were 8040 and 1600 acre-feet, respectively. Additional water was obtained by gravity from Stony Creek as follows: (Acre-feet) April 1795, May 430.

(3) Same plant as that of Glenn-Colusa Irrigation District.

(4) See Plant at Mile 124.2 R.

(5) See Plants at Miles 112.4 R and 123.9 R.

(6) An additional 18 acre-feet diverted in November.

(7) Formerly listed as George Butler.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet							Total : Acreage :										
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		Diversion: Irrigated: April to October : Acre-feet:									
R. A. Foster	169.1 R	1-8"			NO															
Hannon Stock Ranches	169.8 R	1-8"			NO															
Hannon Stock Ranches	170.7 R	1-6"			NO															
Hannon Stock Ranches	171.2 R	1-8"			5	12	15													20:
Hannon Stock Ranches	174.2 R	1-8"			NO															
TEHAMA BRIDGE MILE 177.5																				
E. B. Noble (C.E. Flournoy)	184.5 R	1-14"				51			16											35:
RED BLUFF BRIDGE MILE 193.45																				
R. R. Howell	193.5 L	1-1½"			7	39	23	20	12											20:
		1-4"																		
S. E. Ayer	193.6 R	1-3"				NO														
S. E. Ayer	194.1 R	1-6"				7	20													30:
G. E. Sutton	196.2 R	1-6"			1.9	1.8	4.7	10.0	4.7	1.7										26.0
J. A. Edwards	196.2 L	1-6"			3	15	11			1										30
A. W. Gibson (T. A. Crook)	196.4 L	1-8"			28	21	17	28												(1) 32:
W. E. Johnson	196.5 L	1-4"				5	14													100
J. Erickson	196.6 L	1-3"				1	19	24	2	5										19
		1-5"																		53
H. P. Stice	197.0 L	1-8"				80	65	39	39											223
Freemeyer Bros.	197.65L	1-3"				5.1	5.9													11.0
Pearl Edwards	197.73L	1-6"				4.2	3.0													7.2
RED BLUFF GAGING STATION (IRON CANYON) MILE 198.6																				
BEND FERRY MILE 207																				
T. L. Bonnett (2)	209.0 L	1-2½"				NO														

*Mileage along river above Southern Pacific Bridge, Sacramento.

(1) Includes 2 acres on adjoining Pringle place.

(2) Formerly listed as Geo. J. Ernest.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet							Total : Acreage : :Diversions:Irrigated: :April to : :October:: Gen-:Rice: :Acre-feet: eral:										
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.											
J. F. Nunes	215.5 R	1-7"			NO															
JELLEYS FERRY	MILE 215.6																			
J. F. Nunes	216.0 R	1-3"			NO															
W. A. Hunaeus	216.4 L	1-3"			NO															
Haskins Bros.	218.0 L	1-4"			13	25	3													45:
H. W. Johnson, Jr. (1)	221.0 R	1-10"			171	351	132													200:
BALLS FERRY BRIDGE	MILE 224.5																			
ANDERSON BRIDGE	MILE 232.9																			
L. C. Smith and	233.0 L	1-6"																		
G. W. George (2)		1-4"			6.0:															6.0
Wm. Menzel Meat Company	240.2 L	1-12"			159	115	177	196												
Fitzpatrick and Dempster	240.5 L	1-10"			46	54	133	73												
J. L. Henderson																				
M. Leonardini Estate	241.5 L	1-8"			51	55	81	55	21											
Adams Bros.	242.0 R	1-6"			14	78	79	60	15											
REDDING-ALTURAS BRIDGE	MILE 242.0																			

* Mileage along river above Southern Pacific Bridge, Sacramento.
 (1) Formerly Johnson and Coates.
 (2) Formerly L. C. Smith.
 (3) Includes 25 acres served by plant at Mile 240.5 L.
 (4) An additional 25 acres was irrigated for Menzel Meat Company. See plant at Mile 240.2 L.
 (5) Corrected mileage.

TABLE 15 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

Water User	*Mile and Bank of Pump	Number and size of Pump	Monthly Diversions in Acre-feet												Total	Acreage Irrigated
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to October	Gen-eral	Rice				
John Diestelhorst	(1) 246.0 R	1-3"	22	23	19	22	20	22	22	22	22	22	(2)	150	30	
Anderson-Cottonwood Irrigation District	(1) 246.0 R	Gravity	8497	18805	21141	21486	21683	19960	12499	124071	14015	(3)				
TOTALS			74236	198836	221852	217698	199875	107577	32681	1052755	96577	56184				

*Mileage along river above Southern Pacific Bridge, Sacramento.

(1) Corrected mileage.

(2) This pump runs practically continuously throughout the irrigation season but excess water runs right back to river through gardens. Actual seasonal diversion by the pump was 550 acre-feet but the use for the 30 acres is estimated at 5 acre-feet per acre or 150 acre-feet as shown.

(3) Some of this diversion returns to the Sacramento River through the Creek channels between Redding and south of Cottonwood as seepage and direct spill. Observations of this return flow were made at various times and estimated as follows: (Acre-feet) April 2500, May 3600, June 2000, July 4000, August 4000, September 3800, October 3000, Total 22900.

TABLE 17

**BACK BORROW PIT DIVERSIONS

Water User	*Mile and Bank	Number: and size of pump	Monthly Diversions in Acre-feet												Total : Acreage : :Diversion:Irrigated:			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	April to October	Gen-eral	Rice						
River Farms Company	1.45 R	1-14"																
Hershey Estate	11.15 R	1-14"																
Hershey Estate (Youngmark and Kalfsbeek)	13.75 R	1-14"	136	552	551	557	557	178						2531				500
B.F. Mumma	14.75 R	1-10"		219	205	224	202	115						965				135
COUNTY LINE BRIDGE	MILE 15.25																	
County Line Gun Club	15.75 R	1-15"	73	97	65	30	120	53					49	487				100
T. H. Mumma	20.0 R	1-15"	445	894	840	853	832	101						3965				630
HANNUM BRIDGE	MILE 22.8																	
Totals			654	1762	1661	1664	1711	447					49	7948				100

* Mileage along Borrow Pit from outfall gate just above junction of Borrow Pit with Sacramento River at Knights Landing.

** Carries return water from Colusa Basin along west border of Reclamation Districts 108 and 787 and thence to discharge to Sacramento River at Knights Landing.

TABLE 18
LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS

Water User	*Mile and Bank	: and size of pump	: Number: and	Monthly Diversions in Acre-feet							: Total : : Diversion:	: Acreage : Irrigated	
				: Apr.	: May	: Jun.	: Jul.	: Aug.	: Sep.	: Oct.			: April to:
LOWER BUTTE CREEK													
Reclamation District 833 (R. C. Ingram)	2.9 L	1-36"		40	279	377	44				740	518	
El Anzar Gun Club	3.9 L	1-10"		NO DIVERSION									
Reclamation District 1004 (Colusa Delta Farms)	3.9 R	1-15"		328	260	449	280				1317	665	(1): (3): 175:1050:
Butte Lodge Gun Club	4.0 R	1-22"				471	1294	615			2380	700:	
Butte Basin Gun Club (4)	4.2 (5)	Gravity											45200:
South Butte Gun Club	5.5 L	1-10"					98	113			211	60:	
Winchester Gun Club	5.5 L	1-12"			22	71	313	327			733	75:	
Reclamation District 1004 BIGGS-AFTON ROAD	9.3 R	Gravity		712	486	808	1530	1581	(6)	5557	(6)	(6)	(6)
John Hannah	MILE 19.4												
John Hannah	20.2 R	1-20"		NO DIVERSION									
John Hannah	21.2 R	1-36"		NO DIVERSION									

* Approximate mileage along creek from junction with Sacramento River.
 (1) Served also by plant on Sacramento River at Mile 112.1 L and diversion from Butte Creek at Mile 9.3 R.
 (2) Includes 100 acres served by P. V. Berkeley plant on Sacramento River at Mile 89.3 L.
 (3) Prior to September 1st some of the diversion at Mile 9.3 R was used for the 565 acres of general crops and 175 acres rice.
 (4) Prior to 1930 no data was secured relative to gun club acreage other than that served by pumping prior to Sept. 1st. The clubs grouped under this heading obtain their water by gravity. The estimated acreage flooded on each club follows: White Mallard 650 Ac; Wild Goose 400 Ac; C. Berry 250 Ac; Green Head 500 Ac; Field and Tule 400 Ac; North Butte 300 Ac; Sacramento Outing 650 Ac; Henshaw 200 Ac; West Butte 600 Ac; Colusa 600 Ac.
 (5) This is opposite approximate center of these clubs.
 (6) See following plants - Sacramento River Mile 112.1 Left and Lower Butte Creek Mile 3.9 Right.

TABLE 18 (CONTINUED)
LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS

Water User	*Mile and Bank	: Number : and size : of pump :	Monthly Diversions in Acre-feet							: Total : Acreage : Irrigated :
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	
BUTTE SLOUGH										
M. Marty	: 0.3 West	: 1-12"	:	: 52 :	: 48 :	: 42 :	: 4 :	: 146 :	: 60 :	:
I. E. Nell	: 3.5 West	: 1-10"	:	: 20 :	: 56 :	: 38 :	: 71 :	: 185 :	: 118 :	:
W. H. Ross (C. E. Ray)	: 3.7 West	: 1-10"	:	: 28 :	: 35 :	: 33 :	: 4 :	: 100 :	: 45 :	:
P. A. Reische	: 4.1 West	: 1-12"	:	: 19 :	: 122 :	: 102 :	: 100 :	: 359 :	: 246 :	:
E. V. Jacobs (G. M. Gomez)	: 4.8 West	: 1-10"	:	: 132 :	: 157 :	: 98 :	: 20 :	: 407 :	: 113 :	:
A. Armstrong & Colusa County Bank	: 5.1 West	: 1-10"	: 7 :	: 31 :	: 94 :	: 129 :	: 80 :	: 366 :	: 310 :	:
Totals (Lower Butte Creek and Butte Slough)	:	:	: 7 :	: 862 :	: 1341 :	: 1502 :	: 2533 :	: 3614 :	: 2642 :	: 7085 : 175 : 2075 :

* Approximate mileage along Slough from junction with Sacramento River.
(1) Includes lands as follows: (Acres) P. A. Reische 25, S. E. Reische 60, C. P. Reische 80, Feith 3, Granmerman 4, Messick 14, Heaton 20, Fiehart 20, Woods 20.

TABLE 19
BY-PASS AND DRAINAGE CHANNEL DIVERSIONS

Water User	Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet												Total Acreage		
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		Diversion to April	Diversion to October
TISDALE BY-PASS																	
SOUTHERN PACIFIC RR. CROSSING	(1) MILE 2.1																
Sutter Basin Commoany	2.25 S : 1-6"																
Sutter Basin Company	3.35 S : 1-12"																
WEST LEVEE SUTTER BY-PASS	MILE 4.25																
WEST BORROW PIT OF SUTTER BY-PASS																	
KNIGHTS LANDING-MARYSVILLE CAUSEWAY	MILE 12.7																
WEST BORROW PIT GAGING STATION	MILE 15.7																
Middleton and Dessez	17.0 : 1-15"																
SOUTH LEVEE TISDALE BY-PASS	MILE 18.9																
RECLAMATION DISTRICT 1660 GRAVITY RETURN	MILE 19.3																
D. C. Smith, E. I. McGrath and S. A. McKeehan	27.1 : 1-10"																
NORTHERN ELECTRIC RR. CROSSING	MILE 29.15																

(1) Mileage is given easterly from Tisdale Weir.

(2) Mileage is given northerly from Reclamation District 1500 Drain Plant. Mile 9.15 West Borrow Pit is opposite Chandler.

TABLE 19 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS

Water User	Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet							Total	Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Diversion	Irrigated
										April to	Gen-eral
										October	Rice
										acre-feet	
KNIGHTS LANDING RIDGE CUT											
Russell Brothers	(1)	2.3 L 1-12"	39	68	46	16	19	13	201	90	
RECLAMATION DISTRICT 730 DRAIN PLANT #2		MILE 3.8	SEE FOOTNOTE TABLE 42								
WEST LEVEE YOLO BY-PASS		MILE 6.3									

(1) Mileage is given southerly from head in Back Borrow Pit near Knights Landing.

TABLE 20

FEATHER RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet												Total Acreage	
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		Diversion: April to October
Punter and Rutz (1)	1.55 L	1-6"			46	101	10	12	6						175	78
Sutter Basin Company	2.60 R	1-20"		192	1744	1131	2375	494							5936	853
S. A. McKeehan	5.44 L	1-6"		1	3	4	7	4	2					21	20	
Stark Bros. Company (2)	6.44 L	1-8"				108	72		23					203	50	
M. Scheiber	7.7 L	1-8"			26	43	52	9	14					144	60	
NICOLAUS GAGING STATION	MILE 9.4				SEE TABLE	#9										
Geo. Pollock Company	9.75 R	1-12"				559	240	128	122					2021	921	
Garden Highway Mutual Water Company	13.1 R	1-16"												4266	1568	
Feather River Water Company	16.35 R	1-20"	15	328	1306	1269	1184	164						725	246	
Plumas Mutual Water Company	17.5 L	1-14"		8	288	296	126	7						10832	1250	
G. C. Shannon	18.75 R	1-22"	666	2133	2323	2119	2301	939	351					148	61	
Alicia Mutual Water Company	24.0 L	1-6"			53	58	37									
		1-30"(4)		225	954	1005	1130	15						3329	1200	
		1-20"														
		1-16"														

* Mileage along river above mouth.

(1) Formerly Meyer and Rutz.

(2) New installation 1930.

(3) Includes 369 acres of Brown and Purington.

(4) This unit in use temporarily.

TABLE 20 (CONTINUED)

FEATHER RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and size of Pump	Monthly Diversions in Acre-feet												Total Acreage			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April to October	Gen-eral	Rice	
MOUTH OF YUBA RIVER																		
MARYSVILLE																		
J. L. Sullivan				35	223	110										368		155
Sutter Butte Canal Company (Sunset Plant) (1)				N O	D I V E R S I O N													
Pacific Highway Orchards Tract (Charles Cottrell)				N O	D I V E R S I O N													
Moznett-Wetmore Subdivision #1 (Charles St. Claire)			44	111	169	197	110	43								674		200
Manuel A. Barba (J. B. Davis)			6	21	28	29	33	16								133		60
A. P. Barba (John Bettencourt)				17	86	109	50	7								262		75
E. F. Biggs				27	110	50	35	4								229		300
J. F. Harriger					34	20	12	15								70		50
Edward Steadman (3)					46	63	27									151		100
Silva-Bergtholdt				10	5	1										16		25
Blower Brothers					56	38	32									126		120
C. O. Kister					24	38	33	7								102		43

* Mileage along river above mouth.
 (1) See Mile 58.1 Right.
 (2) Plant diverts Feather River water backed into Honcut Slough. Slough is tributary to Feather River at Mile 43.7 Left. Mileage of plant above mouth of Honcut Slough is indicated.
 (3) Previously listed as Donald Steadman.
 (4) Previously listed as 6" pump.

TABLE 20 (CONTINUED)

FEATHER RIVER DIVERSIONS

Water User	*Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet												Total : Acreage			
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		:Diversions : Irrigated		
F. L. Morris	52.7 L	1-8"		15	39	21											75	75
Frank Dutra	52.9 R	1-6"			11	18		8		10							47	30
G. H. Bogue	53.1 R	1-6"		5	43	42		25		12		4					131	40
Budh Singh	54.7 R	1-8"			110	136		63									309	55
Hearst Estate (Sunical Packing Company)	55.1 L	1-14"			277	219		286		82							864	380
L. A. Kister	55.5 L	1-8"		15	109	63		12									199	100
Rio Bonito Ranch	56.6 R	1-14"			199	294		63									556	190
Alvin Kister (1)	57.0 L	1-8"				14		13									27	30
J. E. Carrico	57.0 R	1-8" (2)			28	27		22									77	35
Henry Haselbusch	57.9 R	1-10"			32	37		25									112	72
Emma C. Bakle (E.A. Switzer)	58.1 R	1-8"			12	12		14									38	23
Sutter Butte Canal Company	58.1 R	Gravity	28806	64946	66242	65860	62205	32449	20289								340797	164105
Western Canal Company (3)	59.7 R	Gravity	2182	9821	16046	19159	18698	6495									(3)72401	729
TOTALS				31719	78154	91418	93250	89300	40912	20811							445564	24258

*Mileage along river above mouth.

(1) New installation 1930.

(2) Changed from gasoline to electric operation in 1930.

(3) In addition to diversions here listed there were diversions by Western Canal for flooding ponds of duck clubs in Butte Basin as follows: (Acre-feet), September 219, October 9422, November 7409, December 9173, Total 26442.

TABLE 22 (CONTINUED)
AMERICAN RIVER DIVERSIONS

Water User	*Mile and Bank of pump	Number: and size of pump	Monthly Diversions in Acre-feet												Total Diversion: April to October: Acre-feet:	** Acreage: Irrigated:
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Oct.	Oct.	Oct.	Oct.	Oct.		
A. F. Counsman (Nelson)	9.2 L	1-8"			20	6									26	20
C. E. Wells	9.45 L	1-5"			NO	DIVERSION										
C. E. Wells	9.5 L	1-8"			NO	DIVERSION										
C. E. Wells	9.55 L	1-5"			NO	DIVERSION										
Henry Gowell	9.9 L	1-5"			NO	DIVERSION										
(A. Clemens Horst) (1)																
Gibbens and Richardson	10.2 R	1-8"		14		30	1		18					65	19	
H. W. Bartell	10.3 L	1-20"			NO	DIVERSION										
E. H. Gerber	10.4 R	1-5"	29	41		35								105	40	
(Gold Nugget Orchard Co.)																
Del Paso Hop Company	10.5 R	1-8"(2)														
Annie Hoey	11.2 L	1-6"			16	24	8		13					53	34	
J. T. Gore Estate (C.E. Wells)	11.5 L	1-6"			NO	79	7							102	24	
Wm. A. Meyer	11.7 L	1-4"		6												
Harry Nakatomi	11.7 L	1-5"			1	31	12							36	29	
														44	25	

* Mileage along river above mouth.
 ** All general crops. No rice.
 (1) Quong Ham prior tenant.
 (2) Replaces 10" pump formerly used.

TABLE 22 (CONTINUED)

AMERICAN RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and size of pump	Monthly Diversions in Acre-feet							Total : :Diversions:	** :April to: Acreage : :October: Irrigated:
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
H. T. Danielson (1)	13.1 R	1-5"		2.7	9.2	6.3	8.9	5.0		32.1	12
P. Osterle	13.2 R	2)1-6"			33			1		34	20
Mary Deterding	13.9 R	1-6"			52					52	70
Mary Deterding	14.7 R	1-3"									
Mary Deterding	15.1 R	2)1-6"									
Carmichael Irrigation Dist.	16.0 R	1-6"	271	321	850	827	772	381	106	3528	1961
		1-8"									
		1-12"									
Wm. H. Devlin	17.1 R	1-6"									
		1-1 1/4"									
FAIR OAKS GAGING STATION	MILE	19.2									
TOTALS			317	436	1250	1302	976	504	140	4926	2639

* Mileage along river above mouth.

** All general crops. No rice.

(1) New installation 1930.

(2) Replaces 4" pump formerly used.

(3) Additional water for this acreage obtained from Fairoaks Water Company.

TABLE 23

DELTA UPLANDS DIVERSIONS FROM OLD SAN JOAQUIN RIVER

Water User	*Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet												Total : :Diversion : :April to : :October : :Irrigated : :Acre-feet :				
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.					
East Contra Costa Irrigation District	36.5 L (1)	2-30"	1520	7070	5783	5481	5019	2613	1314								28800	13929	
Byron-Bethany Irrigation District	40.9 L (2)	1-26"	273	3198	3387	3276	3071	2787	569								16561	9200	
Joe F. Costa	45.2 L	1-7"		88	4	1											93	50	
E. H. Stevenson (Ray Bros.)	45.8 L	1-12"				N O D I V E R S I O N													
H. Lindeman	47.2 L	1-12"	5	49	189	156	101	12	1								513	75	
A. F. Noonis (3)	47.2 L	1-10"	3	49	33	176											261	47	
West Side Irrigation District	47.65 L (4)	7-15"	3334	3472	3260	4364	3449	1761	653								20293	10147	
N. E. and John Welty (T.B. Silva)	48.7 L	1-8"	35		21	23	14	28									121	70	
Magle-Burke Irrigation District	50.4 L	1-16"	389	926	1342	1446	1060	1007	446								6616	2157	
Freemont Irrigation Ass'n.	50.9 L	1-14"	65	265	421	353	230	304									1638	634	
Lebrucherie, Platti and Smallpage	52.4 L	1-10"		35	48	13	14	23	36								169	171	
Totals			5624	15152	14488	15289	12958	8535	3019								75065	36480	

* Distance along the river from its mouth four and one-half miles below Antioch. Mileage as established by War Department Survey of 1913-15.

(1) To junction of Old River and Indian Slough. Pumping plant is located 2 1/2 miles west along Indian Slough.

(2) To junction of Old River and Italian Slough. Pumping plant is located 2 3/4 miles southwest along Italian Slough and extension cut.

(3) Formerly Kooyman Brothers.

(4) To junction of Old River with intake cut. Pumping plant is located one mile south along intake cut.

TABLE 24
DELTA UPLANDS DIVERSIONS FROM TOM PAINE SLOUGH

Water User	*Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet												Total
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Oct.	Oct.	Oct.	Oct.		
Stinson Estate Company	0.7 S	(1) 2-18"	125	203	168	226	172	101	275	1270	(2)	1580			
Holly Western Sugar Company	(3) 2.1 S	1-12"					240	270	279	789	(4)	Industrial			
Tracy Clover Irrigation Dist.	(3) 2.1 S	1-16"	185	145	271	422	251	233		1507		582			
California Irrigated Farms Co.															
Plant Number 1	2.9 S	1-12"	77	67	117	106	105	71		543	(5)	2825			
Plant Number 3	6.3 S	1-20"	317	1324	1248	1149	921	873	296	6128		(6)			
Plant Number 5	8.3 S	1-12"	23	263	218	291	272	125	110	1302		(6)			
Plant Number 5A	9.0 S	1-12"	37	79	110	132	163	79		600		(6)			
Totals			764	2081	2132	2326	2124	1752	960	12139		4987			

* Distance along Tom Paine Slough from its mouth which is at Mile 54.3 on Old San Joaquin River (War Department Survey of 1913-15).

- (1) These units replace 20" pump used prior to 1930.
- (2) Includes 880 acres irrigated with waste water from Holly Western Sugar Company Mile 2.1 S.
- (3) To junction of Tom Paine Slough and Dredger Cut. Pumping plant is located 1½ miles south along Dredger Cut.
- (4) This water was reused by Stinson Estate to irrigate 880 acres. See Mile 0.7 S.
- (5) This is the total uplands area (south of Tom Paine Slough) irrigated from all California Irrigated Farms Company plants on Tom Paine Slough.
- (6) See Plant at Mile 2.9 South.

TABLE 25
DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER

Water User	*Mile and Bank	:Number: and size of pump	Monthly Diversions in Acre-feet												:Total: :Diversions: Acreage
			:Apr.:	:May:	:Jun.:	:Jul.:	:Aug.:	:Sep.:	:Oct.:	:April:	:October:	:Acre-feet:	:to: Irrigated:		
Paul Weston	46.3 R	1-6"		51	120	91	97	16		3			378	203	
August Eisele	47.2 R	1-5"			1.4	1.4	0.4						3.2	1	
Wolfinger Bros.	47.3 R	1-10"				17	17						34	40	
John Haack	47.7 R	1-4"		2.5	2.4								4.9	3	
John Haack	48.0 R	1-12"		38		114	292						444	233	
Joe Calcagno	48.5 R	1-6"		44	41	25	13	5		1		134	60		
I. Yoshida	48.5 R	1-3 1/2"		3.8	3.8	5.6	12.3	6.0		2.7		44.0	(1) 15		
Frank Piccardo	48.6 R	1-6"		9	9	2	9	36		10		99	60		
G. Accinielli	48.7 R	1-5" (2)		17	38	13	34	11		4		(3)127	41		
M. O. Couper (M. Matsumoto)	49.0 R	1-5"			NO	D I V E R S I O N									
Mettler, Gross and Drury (S. B. Chapman) (4)	49.5 R	1-14"		53	27	1	36	20		58		195	128		
A. A. Rodgers	50.1 R	1-10" (5)		60	71	36	1	60				228	73		
N. Lagler and Joe Reichmuth	50.4 R	1-8"		3	60	38	69	3				204	78		
John Brandt	50.5 R	1-6"			NO	D I V E R S I O N									
F. Delima	53.4 R	1-8"		21	36	14	8	5				104	33		

* Distance along San Joaquin River from its mouth four and one-half miles below Antioch. (Mileage as established by War Department Survey of 1913-15.)

- (1) Includes 9 acres irrigated from plant at Mile 48.7 R.
- (2) Formerly listed as 6" pump.
- (3) This diversion served an additional acreage for I. Yoshida, Mile 48.5 R.
- (4) Plant installed in Fall of 1929.
- (5) Formerly listed as 8" pump.

TABLE 25 (CONTINUED)
DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER

Water User	*Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet							Total	:Diversion: Acreage
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
Bank of Oakland (1)	53.5 R	1-12"	20	89	35	37	24			185	100
M. Dos Reis	53.7 R	1-12"		194	173	189	170	134		880	400
(Cordoza, Sousa & Avellar)											
W. C. Frank (M. Martin Co.)	54.9 R	1-10"		11	21	33	55			120	45
Oakwood Stock Farm	57.0 R	1-14"	105	136	278	182	208	132	13	1054	400
S. Mauro	57.2 R	1-5"									
A. J. Thompson	57.3 R	1-5"		0.5	1.4	1.9	0.4			4.2	5
P. Colori Company	57.5 R	1-4"	5	10	13	11	8	2		39	32
V. Sanguenetti	58.4 R	1-2 1/2"	1.5	1.6	5.2	2.9	6.8	0.3		18.3	15
G. B. Figari (G. Alfieri)	58.6 R	1-3"	1.2	1.2	2.4	1.8	2.3	0.4	0.2	9.5	4
R. Mauro	58.7 R	1-4"(2)	0.2	0.9	1.5	1.3	2.1	0.2		6.2	4
DIVISION OF WATER RESOURCES RECORDING GAGE											
MOSSDALE BRIDGE MILE 58.9											
H. A. Niestrath (Jos. Egger)	59.3 R	1-14"	79	109	82	162	102	94		628	185
Banta Carbona Irrigation District	67.5 L	1-36"									
			3-24":6509	9908	6029	40901	9841	3488	1121	47797	15156(3)
			2-20"								
McMullin Estate (4)	71.0 R	1-16"	11	752	304	695	550			2312	710

* Distance along San Joaquin River from its mouth four and one-half miles below Antioch. (Mileage as established by War Department Survey of 1913-15.)

- (1) Plant rehabilitated in 1930.
- (2) Formerly listed as 3" pump.
- (3) Includes 1530 acres in the Kasson District formerly served by the old River View Land and Water Company. This area is not in the Banta Carbona District but the latter is under obligation to serve it.
- (4) New installation in 1930.

TABLE 25 (CONTINUED)

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER

Water User	*Mile and Bank	Number and size of pump	Monthly Diversions in Acre-feet							Total	Diversion: April to October	Acreage Irrigated
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.			
Mortensen-Anderson & Whitten (1)	73.2 R	1-12"	39	253	160	270	217	209	44	1192	415	
River Junction Farms Co. (2)	74.7 R	1-14"		31	40	53	25	5		154	47	
VERNALIS GAGING STATION	76.7	U.S.G.S. STATION:										
Totals			6823	11848	7555	12899	11800	4227	1257	56408	18486	

* Distance along San Joaquin River from its mouth four and one-half miles below Antioch. (Mileage as established by War Department Survey of 1913-15).

(1) Formerly River Junction Farms Company.

(2) New installation in 1930.

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TABLE 26

DELTA UPLANDS DIVERSIONS FROM CACHE SLOUGH

Water User	Location	Number and size of pump	Monthly Diversions in Acre-feet							Total	Diversion: April to October	Acreage Irrigated
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.			
Reclamation District #2068 (1)	SW 1/4 NE 1/4 SEC. 34 T6N, R1E	1-36" 1-30"		1504	2353	2717	1914	1206	664	10358	6992	

(1) This plant was first used in 1929. In that year water was diverted as follows: (Acre-feet) Apr. 1560; May 880; June 0; July 880; Aug. 880; Sep. 503; Oct. 348; Total 5051. The area irrigated was 5880 acres of general crops.

TABLE 27

SAN JOAQUIN RIVER DIVERSIONS ABOVE DURHAM FERRY BRIDGE

Water User	*Mile and Bank	: Number: and Size of Pump	Monthly Diversions in Acre-feet												: Total : : Diversion: : April to: : October : : Acre-feet:		
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :								
: U.S.G.S. GAGING STATION "San Joaquin River near Vernalis" MILE 3.0																	
: STANISLAUS RIVER		SEE TABLE 61															
: Vernalis Investment Company	: 5.25 L :	: 3-12" :	: 200 :	: 385 :	: 480 :	: 655 :	: 630 :	: 429 :	: 130 :	: 2909 :							
: El Solyo Ranch	: 5.35 L :	: 3-18" :	: 1070 :	: 2080 :	: 1583 :	: 2193 :	: 2268 :	: 1350 :	: 915 :	: 11459 :							
		: 1-12" :															
: TUOLUMNE RIVER		MILE 14.3															
: West Stanislaus Irrigation Dist.	: 15.1 L :	: 3-26" :	: 3486 :	: 6440 :	: 5252 :	: 4900 :	: 6585 :	: 2538 :	: 377 :	: 29578 :							
: White Lake Ranch #1	: 15.1L(2) :	: 1 :															
: White Lake Ranch #2	: 15.1L(2) :	: 1 :															
: White Lake Ranch #3	: 15.1L(2) :	: 1 :	: 79 :	: 27 :	: 79 :	: 111 :	: 95 :	: 49 :	: 39 :	: 479 :							
: LAIRD SLOUGH BRIDGE		MILE 19.35															
		SEE TABLE 53															
: Charles Moreing	: 22.2 L :	: 1-16" :	: 442 :	: 104 :	: 230 :	: 209 :	: 129 :	: 39 :		: 1153 :							
: Patterson Colony	: 27.7 L :		: 6314 :	: 5358 :	: 6864 :	: 6714 :	: 6070 :	: 5328 :		: 36648 :							
: Sarah J. Ridges	: 27.8 R :	: 1-10" :		: 195 :	: 161 :	: 181 :	: 134 :	: 161 :	: 55 :	: 887 :							

* Mileage along river above Durham Ferry Bridge.
 (1) Formerly Burkhardt.
 (2) Pump on cut leading to West Stanislaus Irrigation District plant.

TABLE 27 (CONTINUED)

SAN JOAQUIN RIVER DIVERSIONS ABOVE DURHAM FERRY BRIDGE

Water User	*Mile and Bank	: Number: and Size of Pump	Monthly Diversions in Acre-feet												: Total : Diversion: : April to : October : Acre-feet:		
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :	: Nov. :	: Dec. :	: Jan. :	: Feb. :	: Mar. :			
Patterson Ranch Company	: 33.1 L	: 2-20"	: 1284	: 879	: 1041	: 1212	: 727	: 755	: 87	: 5985							
E. Ustick	: Opp. 34.2R	: 1			: N O	: D I	: V E	: R S	: I O	: N							
E. Ustick	: 35.85 R	: 1-12"	: 16	: 43	: 115	: 60	: 124	: 45		: 403							
Crows Landing Bridge	: MILE 36.7																
James J. Johnson	: 36.8 R	: 1-10"			: 31	: 39	: 38	: 32		: 140							
A. J. Silveira	: 37.15 R	: 1-6"	: 8	: 6	: 5	: 9	: 6	: 6		: 43							
A. J. Silveira	: 37.65 R	: 1-7"	: 10	: 10	: 18	: 18	: 13	: 9		: 81							
Nelson Bros.	: 38.25 R	: 1-10"			: 8	: 8	: 4			: 20							
L. B. and E. M. Crow	: 39.35 L	: 1-6"	: 22	: 52	: 33	: 83	: 61	: 46		: 322							
(T. F. Laughry)																	
Oscar Hogan	: 39.75 R	: 1-12"	: 39	: 53	: 51	: 80	: 37	: 73		: 353							
U.S.G.S. GAGING STATION	"San Joaquin River near Newman"																
MERCED RIVER	MILE 47.05				: MILE 47.0												
SAN LUIS RANCH	MILE 80.7																
Totals			: 12970	: 15632	: 15951	: 16472	: 16921	: 10860	: 1654	: 90460							

* Mileage along river above Durham Ferry Bridge.

TABLE 28

MERCED RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Merced River near Mouth	Monthly Diversions in Acre-feet												Total Diversion: April to October	
				Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Acre-feet:						
MERCED RIVER GAGING STATION				MILE 1.1													
Stevinson Corporation	2.2 R	1-18"			SEE TABLE 55												
Stevinson Corporation	3.8 R	1-15"		NO	DIVERSION												640
Floyd Stevinson	4.0 L	1-8"		320													
J. F. Peck	6.1 L	1-18"		4		85	86	65	35								308
Stevinson Corporation	6.55 L	1-15"	10	29		48	199	160	13								469
Francis Hartman	8.5 L	1-12"	20	37		52	69	53	55								311
Mary Collier	8.85 L	1-15"				32	32										64
Grace McCullagh	9.4 L	1-10"	230	244		196	246	213	126								1294
J. R. Adams (1)	10.35 L	1-10"	120	242		266	255	255	171								1369
W. D. Adams	10.85 L	1-12"	225	260		254	250	268	210								1577
C. G. McLaughlin	11.4 L	1-6"		12		32	24	21	11								105
H. F. Milliken	11.6 L	1-10"															
		1-12"	100	234		305	323	221	140								1376
NEW MILLIKEN BRIDGE	MILE 11.65																
Bettercourt, Neves & Azevedo (2)	12.85 L	1-10"	60	184		166	177	208	160								996
California Lands, Inc.	16.5 L	1-12"	9	58		91	77	64	53								382
R. G. Woodward	17.05 L	1-6"															
U.S.G.S. GAGING STATION "Merced River near Livingston"																	
Fred Griffith	17.7 L	1-5"		2		2	3	2	3								12
J. A. Shields	18.2 L	1-6"				9	7	5									21
Scott Hughes (M.L.Alves)	20.4 L	1-6"	15	33		38	34	29	26								185
SOUTHERN PACIFIC RR. (Main Line)	MILE 21.05																
Wm. Collier (Cabrall and Company)	22.0 R	1-6"				30	58	58	26								172

* Mileage along river above mouth.
 (1) Formerly listed as Robert Adams.
 (2) Formerly McCormack.

TABLE 28 (CONTINUED)

MERCED RIVER DIVERSIONS

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet												Total Diversion to April to October	
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Oct.	Oct.	Oct.	Oct.			
Wm. Collier (Cabrall & Company)	22.2 R	1-12"	47	184	209	166	162	92								560
McConnell (Veiera and Santos)	24.9 L	1-6"		2	3	3	2	1								11
Linehers Company	25.75 R	1-10"														
State Land Settlement (Delhi)	26.3 R	1-8"	16	43	86	120	62	2								330
C. A. Laughlin	26.55 R	1-6"		13	16	21	20	12								99
SANTA FE RR. MILE 27.05																
N. K. Schmidt (1)	27.6 R	1-10"	60	105	102	105	47									419
Y. Tanabe (2)	27.95 R	1-6"		24	22	9	18	14								100
G. H. Lovely	28.4 R	1-4"	3	5	3	9	8	11								43
J. Campadoncia (3)	28.6 R	1-6"				1	5									6
R. K. Kynaston	28.85 R	1-10"	22	33	23	42	31	12								163
C. L. Mehrton	29.1 R	1-7"	4	9	6	4	12	7								46
J. G. Strong (J. Campadoncia)	29.75 R	1-6"		11	21	21	17	17								87
John Caraglio and Louis Firpo(4)	29.9 R	1-6"	6	10	4	29	32	6								89
John Caraglio and Louis Firpo(4)	30.95 R	1-12"		40	117	87	65	34								343
SOUTHERN PACIFIC RR. (Oakdale Branch) MILE 32.52																
L. Rusconi	33.55 R	1-7"	115	176	212	259	150	5								939
GAGING STATION "Merced River at Yosemite Valley RR. Crossing" MILE 42.1 SEE TABLE 54																
Totals			1062	2319	2750	2716	2253	1242								12816

* Mileage along river above mouth.
 (1) Formerly C. E. Drew.
 (2) Formerly McCormick.
 (3) Formerly Wells.
 (4) Formerly Harter and Perrigo.

TABLE 29
 DRY CREEK DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet												Total Diversion: April to October: Acre-feet:
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.						
MODESTO-EMPIRE BRIDGE	MILE 0.75														
Wm. Basso	2.55 L	1-5"													
GAGING STATION "Dry Creek Near Modesto"	MILE 2.60				SEE TABLE 57										
W. A. Young	2.9 R	1-4"													
C. Ayer	3.25 L	1-4"													
W. H. Howell	5.0 L	1-6"	3	4	3	5								15	
J. R. Mills	5.3 L	1-5"	7	9	4	3								23	
SANTA FE RR.	MILE 6.1														
A. J. Sturtevant, Jr. (1)	6.35 L	1-6"													
NEW HOPE SCHOOL CROSSING	MILE 10.6														
J. S. Tully (Carvalho Bros.)	14.15 R	1-6"				30	26	22						78	
SOUTHERN PACIFIC RR. (Oakdale Branch)	MILE 16.35														
GAGING STATION "Dry Creek Near Old Waterford Bridge"				MILE 16.9	SEE TABLE 56										
Totals			10	13	7	38	26	22	0					116	

* Mileage along creek above junction with Tuolumne River.
 (1) Formerly Sturtevant Bros.

TABLE 30

TUOLUMNE RIVER DIVERSIONS

Water User	*Mile and Bank	Number: and Size of Pump	Monthly Diversions in Acre-feet							Total :Diversions: April to October :Acre-feet:	
			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
John Caldwell	1.8 R	1-10"		81	27	74	74				256
J. M. de Souza	2.2 R	1-6"			27	14	41	16		17	116
GAGING STATION "Tuolumne River at Tuolumne City"				MILE 3.35		SEE TABLE 59					
Bancroft Fruit Farm	4.1 R	1-10"		71	57	140	126	105		9	695
Bancroft Fruit Farm	5.0 R	1-10"		76	105	113	88	9		31	547
Randolph Marketing Company	7.1 R	1-10"				100					100
W. F. Duffy	8.4 R	1-10"		26	127	64	101	75		2	482
James Berryhill	13.0 L	1-6"			NO	DIVERSION					
James Berryhill	13.6 L	1-6"			NO	DIVERSION					
SOUTHERN PACIFIC MAIN LINE	MILE 15.8										
SANTA FE RR.	MILE 21.6										
SOUTHERN PACIFIC RR. (Oakdale Branch)	MILE 31.5										
A. J. Jamieson	39.8 L	1-4"		1	1	3	15	8			28
Geo. H. Sawyer		1-6"		17	25	15	28	11			96
GAGING STATION "Tuolumne River at Roberts Ferry Bridge"					MILE 39.9	SEE TABLE 58					
Totals				173	388	480	523	473	224	59	2320

* Mileage along river above mouth.

TABLE 31

STANISLAUS RIVER DIVERSIONS

Water User	*Mile and Bank	:Number: and : :Size: of : :Pumpo :	Monthly Diversions in Acre-feet												:Total : :Diversio: : :April to: : :October : :Acre-feet:		
			: Apr. :	: May :	: Jun. :	: Jul. :	: Aug. :	: Sep. :	: Oct. :								
GAGING STATION "Stanislaus River at Elliot Ranch"			MILE 5.24				SEE TABLE 61										
River Junction Farms #2 (Sturgeon Bend)	1.1 R	1-20"	14	24	27	38	13	3	8								127
Elliot Ranch	5.25 L	2-14"	116	36	234		73										459
River Junction Farms	5.9 R	1-13"	400	802	780	912	801	648	100								4443
McMullin Estate	5.95 R	1-24"	43		226	148	94	35									546
Henry Pelucca	6.7 L	1-15"		52	11	54	33	18	4								172
S. M. Updike	7.4 L	1-10"			NO	D I V E R S I O N											144
S. M. Updike	8.2 L	1-12"		45	21	36	37	5									303
D. F. Koetitz	10.1 L	1-10"	52	26	85	63	53	21	3								
D. F. Koetitz	10.4 L	1-13"			NO	D I V E R S I O N											
SOUTHERN PACIFIC RR. (Main Line)		MILE 15.9															
G. R. Stoddard	19.9 L	1-7"		7	12	15	9										43
Palo Alto Stock Farm (1)	20.75 R	1-14"		65	99	70	54										283
MODESTO-ESCALON BRIDGE		MILE 28.15															
SANTA FE RR.		MILE 31.85															
SOUTHERN PACIFIC RR. (Oakdale Branch)		MILE 39.0															
GAGING STATION "Stanislaus River at Orange Blossom Bridge"			MILE 44.7				SEE TABLE 60										
Totals			625	1057	1495	1336	1167	730	115								6525

* Mileage along river above mouth.
(1) Formerly Allen Ranch.

CHAPTER IV

MEASUREMENTS OF RETURN WATER

Sacramento Return Waters

In the Sacramento Valley the flow is measured and recorded for all of the well defined channels discharging return water from irrigation back to the Sacramento River. Table 32 lists these channels in downstream order and gives the total flow computed from measurements thereon.

Between Colusa and Red Bluff there are no large well defined return channels. Records or estimates of all natural inflow from streams in this stretch of the river were, however, obtained. Above Red Bluff, on the upper end of the river between Redding and a point below Cottonwood there is a considerable return from the irrigation of the Anderson-Cottonwood Irrigation District. An estimate of this return water is given in the footnote at the end of Table 15, Chapter III.

Return Flow from other than Sacramento River Sources

In the water returned to the Sacramento River as included in Table 32, it should be noted that practically all of that entering the river through Butte Slough is derived from Feather River diversions through the Western and Sutter Butte canals. Of the discharge entering through Sacramento Slough, that portion flowing down the East Borrow Pit of Sutter By-Pass is, also, practically all from Feather River irrigation.

Relation of Sacramento Return Water to Irrigation Draft

Tables 33 and 34 record the Sacramento River return water, June to September, inclusive, 1930, and indicate the relation between the return and the diversions from which it is derived. Since, in these tables,

it is the purpose to show the return water from Sacramento River diversions only, the inflow from Butte Slough, East Borrow Pit of Sutter By-Pass, Back Borrow Pit of Reclamation District 1000 and the Feather and American Rivers has been excluded. In Table 33 is shown the relation to the diversions of that return water only which was actually measured at the well defined channels. With the records available for the discharge of the Sacramento River at Red Bluff, Butte City, Colusa, Knights Landing, Verona and Sacramento, and all diversions between those points recorded, as well as the inflow from the Feather and American Rivers, it is possible to compute what should represent the total water returned to the river between each of those points, including not only the flow in the definite channels which were measured, but all seepage, groundwater return, etc., which cannot be directly measured. The figures for the return water as computed in this manner and the relation of this return to the draft are shown in Table 34. A comparison of Tables 33 and 34 shows that seepage, groundwater return, etc., which cannot be directly measured, amounted to 25 per cent of the irrigation draft in the period June to September, inclusive, while the direct return measured in definite channels totaled 30 per cent of the draft. The total return amounted to 55 per cent of the draft. Plate 1 is a diagram showing the accumulated irrigation draft and return water in downstream order, Red Bluff to Sacramento, for the four months' period, June to September, 1930.

Draft-Return Water Relation for Particular Sacramento Valley Areas

In the Sacramento Valley there are certain units or districts which are so set apart physically by levees or otherwise that the return water in each district may be readily segregated. In each case the

records of all diversions to and discharges from the unit are available. Such units are, the area above the Colusa-Williams Highway Crossing of Colusa Trough, Reclamation District 108, and Reclamation District 1500. The relation between the 1930 draft and return water for the Colusa Trough area is shown in Table 35 and for Reclamation Districts 108 and 1500, in Tables 36 and 37, respectively.

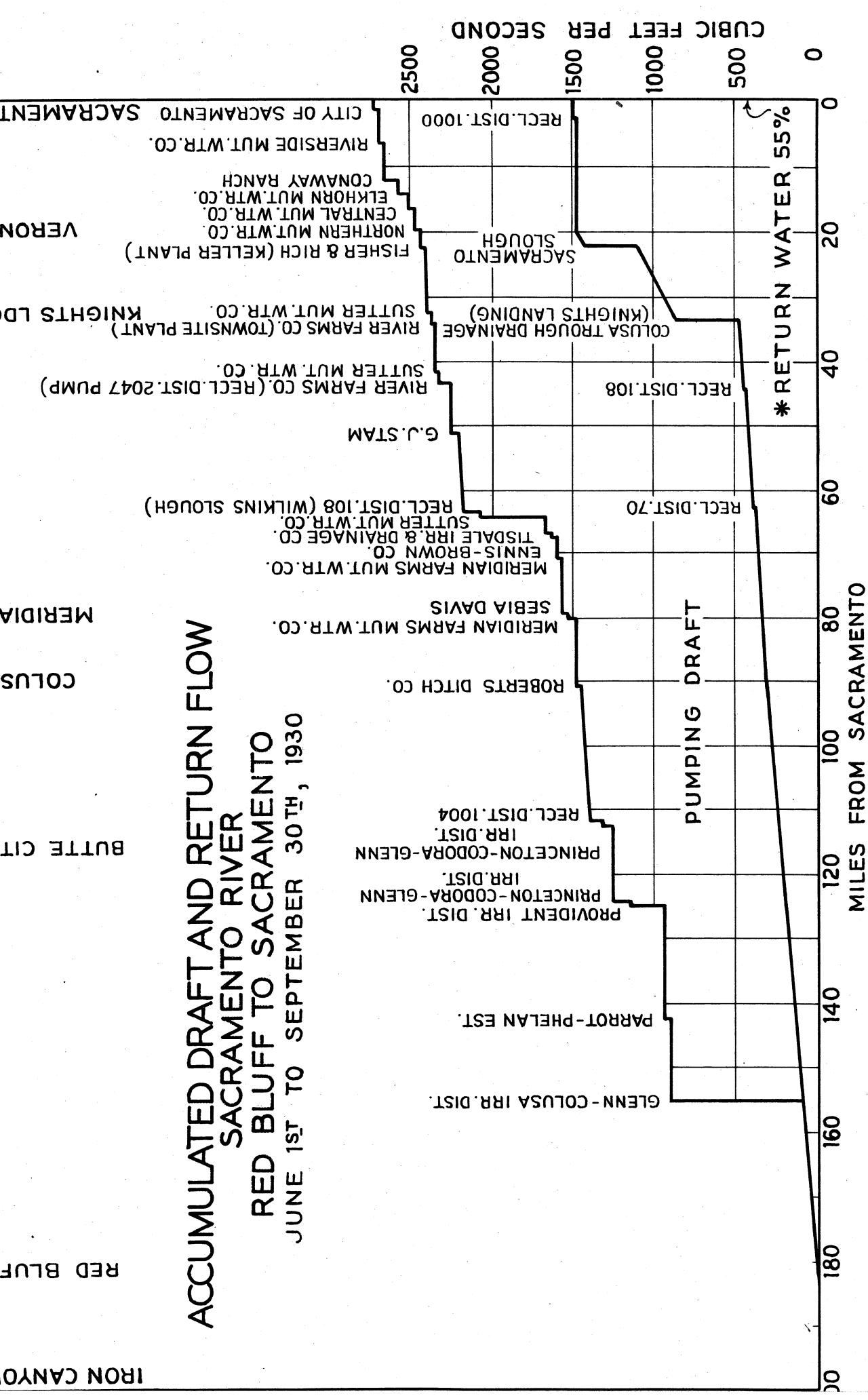
Tables 38 to 49, inclusive, present in detail the discharge measurements for the Sacramento Valley return water channels.

San Joaquin Return Waters

In the San Joaquin Valley return water measurements of 1930, the gaging stations were located at the same points as in 1929 and the same methods were followed. That is, a continuous record of the discharge from June to September, inclusive, was secured at an upper and lower station on each stream: San Joaquin, Stanislaus, Tuolumne, and Merced Rivers, and Dry Creek. On the San Joaquin River, continuous records of discharge were also obtained for intermediate stations, one near Grayson (Laird Slough) and the other just below the junction with Merced River. The latter is a station maintained by the U. S. Geological Survey and referred to as "San Joaquin River near Newman". Measurements and records of all pumping diversions between the upper and lower stations on each stream were also obtained, thereby completing the necessary data for the computation of the return water. Table 50 gives the results of the San Joaquin return water measurements and Table 51 presents a comparison of the return water and irrigation draft for the 1930 season. Tables 52 to 61, inclusive, give the discharge records for the upper and lower stations on each stream. The records of the diversions used in

the computation of the return water will be found in Chapter III, Tables 27 to 31, inclusive.

ACCUMULATED DRAFT AND RETURN FLOW SACRAMENTO RIVER RED BLUFF TO SACRAMENTO JUNE 1ST TO SEPTEMBER 30TH, 1930



* THIS RETURN WATER DIAGRAM SHOWS ALL ACCRETIONS AS TAKEN FROM TABLE 34
 NOTE: IN ORDER TO SHOW RETURN WATER FROM SACRAMENTO RIVER IRRIGATION ONLY, THE DISCHARGE TO THE SACRAMENTO RIVER OF THE FEATHER AND AMERICAN RIVERS IS EXCLUDED AS IS ALSO RETURN THROUGH BUTTE SLOUGH, A PORTION OF THE RETURN THROUGH SACRAMENTO SLOUGH DERIVED FROM FEATHER RIVER DIVERSIONS AND THE RETURN THROUGH THE BACK BORROW PIT OF RECL. DIST. 1000.

TABLE 32

WATER DISCHARGED TO THE SACRAMENTO RIVER ABOVE
SACRAMENTO AS MEASURED AT DEFINITE RETURN CHANNELS

*From records for Butte Slough, District 70 Drain,
District 108 Drain, Colusa Basin Drainage at
Knights Landing, Sacramento Slough, District
1000 Drain (2d Bannon Slough) and Back Bor-
row Pit of District 1000.

Month	Acre-feet	Average Second-feet
June	71000	1200
July	57000	927
August	61300	997
September	62800	1060
October	26800	436
Totals	278900	922

* See Tables 39 to 43, Inclusive, 47 and 48.

TABLE 33

RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO, JUNE TO SEPTEMBER,
(USING ONLY RETURN WATER WHICH ENTERED THROUGH DEFINITE MEASURED CHANNELS*)

	June	July	August	September	June to September Inclusive
	Ac.Ft.:c.f.s.:	Ac.Ft.:c.f.s.:	Ac.Ft.:c.f.s.:	Ac.Ft.:c.f.s.:	Ac.Ft.:c.f.s.:
RETURN					
Reclamation District 70 Drain	807	1090	437	504	2938
Reclamation District 108 Drain	4080	3520	4000	3620	15220
Colusa Basin Drainage at Knights Landing	28600	20200	23300	24600	96700
Sacramento Slough (Less flow down East Borrow Pit of Sutter By-Pass)	18929	19482	19568	18150	76129
Reclamation District 1000 Drain (2nd Bannon Slough)	1109	932	353	1759	4153
Total Return	53525	45224	47758	48633	195140
Total Diversions-Red Bluff to Sacramento	200200	195344	177653	87559	660756
Return in per cent of Diversions	27%	23%	27%	56%	30%

NOTE: In order to show return water from Sacramento River irrigation only, the discharge to the river of Butte Slough is excluded, as is also a portion of the return through Sacramento Slough derived from Feather River diversions and the return through the Back Borrow Pit of Reclamation District 1000.

* As distinguished from use of all accretions as indicated in Table 34.

TABLE 34

*RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO, JUNE TO SEPTEMBER
(INCLUDING ALL ACCRETIONS)

River Section	June		July		August		September		Total Return:		Return in:		Per Cent:			
	Acre-: Aver.: feet : c.f.s:	Aver.: feet : c.f.s:	Acre-: Aver.: feet : c.f.s:	Aver.: feet : c.f.s:	Acre-: Aver.: feet : c.f.s:	Aver.: feet : c.f.s:	Acre-: Aver.: feet : c.f.s:	Aver.: feet : c.f.s:	Jun-Sep. Inc.: Return : Acre-: Aver.: feet : c.f.s:	Draft : Acre-: Aver.: feet : c.f.s:	Return in: Acre-: Aver.: feet : c.f.s:	Per Cent:				
Red Bluff-Butte Cy.	20500:	345 :	14300:	233 :	14100:	229 :	4130:	70 :	53030:	219 :	53030:	219 :	304538:	1259:	17%	
Butte City-Colusa	13900:	234 :	4510:	73 :	427:	2520:	42 :	21357:	88 :	74387:	307 :	74387:	307 :	355915:	1471:	21%
Colusa-Knights Ldg.	47000:	791 :	35100:	571 :	32600:	530 :	23400:	394 :	138100:	571 :	212487:	878 :	574372:	2374:	37%	
Knights Ldg.-Verona	65300:	1099 :	30700:	499 :	27300:	444 :	25100:	422 :	148400:	613 :	360887:	1491 :	590044:	2438:	61%	
Verona-Sacramento	559:	9 :	470:	8 :	178:	3 :	887:	15 :	2094:	9 :	362981:	1500 :	660756:	2731:	55%	
Total Return	147259:	2478 :	85080:	1384 :	74605:	1213 :	56037:	943 :	362981:	1500 :						
Total Draft	200200:	3369 :	195344:	3177 :	177653:	2889 :	87559:	1473 :	660756:	2731 :						
Return in per	74%		44%		42%		64%		55%							
cent of Draft																

* As the return water in this table between any two stations is computed as the difference in discharge between the upper and lower station, making due allowance for the intervening diversions, the results include both those accretions entering from definite return channels which have been measured and accretions due to seepage, groundwater return, etc., which cannot be directly measured.

NOTE: Computed from record of river discharge at Red Bluff, Butte City, Colusa, Knights Landing, Verona and Sacramento and measured diversions between these points. In the return water here shown the discharge to the Sacramento River of the Feather and American Rivers is excluded as is also return through Butte Slough, a portion of the return through Sacramento Slough derived from Feather River diversions and the return through the Back Borrow Pit of Reclamation District 1000. Also, inflow from Mill, Antelope, Deer and other Creeks between Red Bluff and Butte City has been excluded.

TABLE 36
RELATION BETWEEN RETURN WATER AND DIVERSIONS - RECLAMATION DISTRICT NUMBER 108 - 1930

	June	July	August	September	June - Sept. Inclusive	Acreage Irrigated						
: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Rice : Genl.:						
: feet :c.f.s:feet	:c.f.s:feet	:c.f.s:feet	:c.f.s:feet	:c.f.s:feet	:c.f.s:feet	: Rice : Genl.:						
: Diversions (1)	: 14671	: 247	: 13434	: 218	: 11099	: 181	: 1203	: 20	: 40407	: 167	: 4882	: 3987
: Return Water (2)	: 4080	: 68	: 3520	: 57	: 4000	: 65	: 3620	: 61	: 15220	: 63	:	:
: Return in Per Cent of Diversions :	: 28%	:	: 26%	:	: 36%	:	: 301%	:	: 38%	:	:	:

(1) The diversions comprise all those from the Sacramento River, right bank, from Mile 43.1 to Mile 63.2. The principal ones are the plants of Reclamation District 108 at Wilkins Slough, Eldorado (Recl. Dist. 2047 Plant), and Boyer Bend.
 (2) The return water is the discharge to the Sacramento River of Reclamation District 108 Drain at Rough and Ready Bend. See Table 41.

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TABLE 37
RELATION BETWEEN RETURN WATER AND DIVERSIONS - RECLAMATION DISTRICT 1500 - 1930

	June	July	August	September	June - Sept. Inclusive	Acreage Irrigated						
: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Acre-Aver.:	: Rice : Genl.:						
: feet :c.f.s:feet	:c.f.s:feet	:c.f.s:feet	:c.f.s:feet	:c.f.s:feet	:c.f.s:feet	: Rice : Genl.:						
: Diversions (1)	: 37083	: 624	: 35021	: 570	: 32871	: 535	: 18650	: 314	: 123625	: 511	: 8099	: 13770
: Return Water (2)	: 15100	: 253	: 14600	: 238	: 15800	: 257	: 13500	: 227	: 59000	: 244	:	:
: Return in Per Cent of Diversions :	: 41%	:	: 42%	:	: 48%	:	: 72%	:	: 48%	:	:	:

(1) The diversions comprise all those from the Sacramento River, left bank, from Mile 29.9 to Mile 63.75. The principal ones are Sutter Mutual Water Company's plants at Tisdale, State Ranch Bend, and Portuguese Bend.
 (2) The return water is the discharge through the drainage plant of Reclamation District 1500 on the west borrow pit of Sutter By-Pass. This water reaches the Sacramento River via Sacramento Slough. See Table 44.

TABLE 38

DISCHARGE OF COLUSA TROUGH AT COLUSA-WILLIAMS HIGHWAY

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		345	709	411	404	475	203
2		347	724	409	396	477	201
3		372	755	401	401	511	193
4		442	724	413	413	492	190
5		515	706	404	409	488	187
6		533	646	398	415	479	175
7		528	607	369	420	474	159
8		524	547	358	415	479	150
9		532	547	364	415	484	150
10		517	547	358	426	526	113
11		496	543	396	447	526	135
12		454	506	384	435	566	161
13		438	432	377	435	562	176
14		472	364	377	435	498	161
15		494	327	401	426	477	151
16		519	340	384	398	457	146
17		586	350	372	394	465	142
18		605	367	370	396	443	132
19		621	372	372	398	445	140
20		621	394	391	404	445	134
21		599	443	374	406	393	130
22		574	465	382	408	370	121
23		537	494	392	408	341	123
24		519	513	394	447	302	159
25		524	484	391	406	245	132
26		541	452	375	426	195	102
27	341	562	440	367	456	195	116
28	343	562	449	375	484	193	121
29	345	574	432	384	418	213	111
30	333	653	409	403	461	192	93
31		687		409	459		93
Mean		525	503	385	422	415	145
Ac.Ft. for Month		32300	29900	23700	25900	24700	8930

NOTE: This is return water flowing in the main drain of Reclamation District 2047; it is drainage chiefly from lands irrigated by Glenn-Colusa, Provident, Princeton-Codora-Glenn, Compton-Delevan, and Maxwell Irrigation Districts.

TABLE 39
DISCHARGE OF BUTTE SLOUGH

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	526	354	210	183	238	105
2	522	353	209	175	235	98
3	518	350	208	169	240	89
4	514	346	206	171	235	83
5	548	342	201	170	230	94
6	588	337	198	175	231	99
7	592	334	194	186	248	82
8	595	318	176	187	241	72
9	600	306	181	199	238	75
10	604	296	171	204	230	77
11	605	288	181	206	222	59
12	605	277	189	206	221	47
13	598	269	192	210	231	72
14	582	241	193	211	239	145
15	561	223	200	212	241	148
16	543	209	195	210	222	164
17	529	205	184	210	198	146
18	522	200	180	211	187	136
19	507	198	185	212	192	142
20	499	206	194	213	185	161
21	483	195	193	213	188	145
22	470	192	192	214	189	147
23	459	197	192	215	171	153
24	440	193	196	212	153	185
25	423	196	197	213	146	181
26	408	202	195	207	153	189
27	402	202	200	213	130	189
28	388	205	196	211	119	187
29	366	208	179	218	115	187
30	356	208	175	226	108	164
31	354		178	235		160
Mean	507	255	179	203	199	128
Acre-feet for Month	31200	15200	11800	12500	11900	7900
Monthly Di- versions below Gaging Stations	150	487	501	357	55	6
Discharge to Sacramento R.	31000	14700	11300	12100	11800	7890
Natural flow in Butte Cr. (See Table 8)	16800	2660	30	0	405	3030
Net Return Water Sacramento River Acre-feet	14200	12000	11300	12100	11400	4860

NOTE: To determine the amount of this discharge that is strictly return water the discharge for the station measuring natural flow in Butte Cr. one mile west of the East Side Highway (See Table 8) is subtracted as shown above.

This return water is practically all from lands irrigated by Feather River diversions, and is measured in a dredger cut which carries the water from Butte Creek to Butte Slough and joins the latter at Mile 0.7 West. Butte Slough joins the Sacramento River at Mile 84 Left.

TABLE 40

DISCHARGE OF RECLAMATION DISTRICT 70 DRAIN

Day	Daily Discharge in Second-feet						
	:Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*9	25	12	17	17	6	16
2	0	19	12	17	15	0	16
3	11	19	9	17	13	0	16
4	10	25	6	17	13	0	15
5	8	17	6	18	10	10	15
6	0	17	6	18	10	13	14
7	9	16	6	17	0	13	12
8	0	13	6	18	0	15	4
9	11	16	6	18	0	0	7
10	0	18	10	18	0	6	4
11	10	15	14	20	0	10	4
12	0	10	16	19	0	10	4
13	0	12	16	21	0	6	4
14	6	13	16	21	0	6	2
15	13	13	22	21	0	6	4
16	0	15	19	18	0	4	4
17	9	17	20	18	13	8	7
18	0	15	13	18	13	8	4
19	10	15	15	18	13	8	4
20	0	8	17	18	13	9	4
21	0	8	17	17	13	9	4
22	11	7	18	17	13	10	2
23	0	*5	17	13	13	10	2
24	17	0	14	13	15	14	2
25	14	13	15	15	15	14	2
26	16	13	13	17	13	12	2
27	24	15	15	18	10	7	2
28	13	15	17	18	13	10	1
29	17	14	17	19	13	12	0
30	22	14	17	19	13	18	0
31		12		18	10		0
Mean	8.0	14.0	13.6	17.8	8.7	8.5	5.7
Ac. Ft. for Month	476	861	807	1090	537	504	351

* Pumping April 1st to May 23d, inclusive, Gravity flow for remainder of season.

NOTE: This is the drainage returned to the Sacramento River at Mile 68.8 left from District 70.

TABLE 41

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN AT ROUGH AND READY BEND

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*48	100	56	61	64	89	
2	0	100	42	60	62	74	
3	43	107	52	60	62	89	
4	0	83	69	58	62	85	
5	0	51	73	58	62	80	
6	70	89	73	56	62	76	
7	0	99	76	55	62	73	
8	0	111	73	55	61	71	
9	49	57	73	55	61	70	
10	48	58	73	54	60	68	
11	0	126	76	55	60	68	
12	0	115	73	55	60	68	
13	85	59	76	55	60	71	
14	50	53	73	55	60	71	
15	51	61	76	54	79	71	
16	0	122	77	54	76	71	
17	46	65	73	55	73	71	
18	39	145	71	56	70	73	
19	0	118	68	58	68	68	
20	93	100	67	58	67	65	
21	47	60	67	58	67	71	
22	48	64	67	58	65	71	
23	50	62	67	58	68	71	
24	48	121	67	58	68	71	
25	51	*110	68	58	68	71	
26	52	0	68	58	70	0	
27	213	0	68	58	70	0	
28	49	0	67	58	0	0	
29	53	0	65	52	83	0	
30	106	0	62	65	82	0	
31		0		65	86		
Mean	45	72	68	57	65	61	
Ac.Ft. for Month	2660	4440	4080	3520	4000	3620	

* Discharge by pumping during months of April and May. Balance of season gravity flow.

NOTE: This represents drainage from District 108 discharged to the Sacramento River at Rough and Ready Bend, Mile 44.0 Right.

TABLE 42

DISCHARGE OF COLUSA BASIN DRAINAGE AT KNIGHTS LANDING

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	397	683	380	334	431	210
2	412	683	376	337	443	189
3	420	645	366	337	456	212
4	450	645	343	340	470	204
5	520	683	356	350	470	192
6	582	723	363	356	462	165
7	584	723	356	356	445	144
8	584	609	340	359	449	128
9	526	538	308	370	470	124
10	486	521	308	370	493	122
11	460	514	308	383	570	124
12	443	504	337	411	580	126
13	526	461	343	415	632	124
14	486	380	340	408	576	122
15	310	333	334	405	522	120
16	340	302	337	398	484	113
17	374	299	308	373	466	105
18	410	305	308	371	449	97
19	374	324	318	373	412	89
20	410	343	311	385	407	81
21	410	343	311	385	407	73
22	443	408	305	385	357	65
23	486	421	308	378	335	68
24	410	451	321	385	311	74
25	374	461	324	387	294	104
26	410	451	318	389	247	93
27	443	428	308	391	213	73
28	443	421	299	393	184	55
29	443	425	308	395	191	55
30	443	405	321	407	199	50
31	567		331	419		47
Mean	451	482	329	379	414	114
Ac. Ft. for Month	27700	28600	20200	23300	24600	7040

NOTE: This represents the drainage from Colusa Basin passing down the Back Borrow Pit of Reclamation Districts 108 and 787 and entering the Sacramento River at Mile 34.15 Right. This is just above the Knights Landing gaging station. It includes also any water coming from the Knights Landing Ridge Cut.

TABLE 43

DISCHARGE OF SACRAMENTO SLOUGH*

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	523	377	333	372	373	523
2	509	429	390	351	348	511
3	508	390	302	362	291	468
4	509	357	362	368	347	445
5	504	383	306	315	347	398
6	286	332	308	308	340	376
7	294	365	358	355	298	242
8	306	338	314	294	352	155
9	271	401	362	309	347	145
10	275	374	316	360	349	142
11	285	342	375	296	355	114
12	281	358	329	309	390	134
13	292	308	360	360	445	109
14	292	313	310	296	447	109
15	294	366	353	307	432	105
16	295	333	304	355	389	100
17	293	313	346	350	352	95
18	360	350	296	421	404	103
19	359	330	292	350	357	98
20	379	361	292	382	389	93
21	341	342	327	296	330	90
22	413	380	281	309	347	132
23	413	368	282	360	292	67
24	386	368	283	294	278	67
25	344	392	286	333	261	84
26	379	338	308	391	282	84
27	372	394	337	424	306	84
28	362	377	302	305	263	85
29	326	381	340	342	227	85
30	389	374	337	363	303	72
31	388		321	318		76
Mean	362	361	323	340	341	174
Ac.Ft. for Month	20300	21500	19900	20900	20300	10700

* Water discharged through Sacramento Slough to the Sacramento River at Mile 21.2 Left. This is return water from irrigation and represents the sum of measurements at three points as follows: Reclamation District 1500 Drain, See Table 44; Sutter By-Pass East Borrow Pit, See Table 45; and Sutter By-Pass West Borrow Pit, See Table 46.

TABLE 44

DISCHARGE OF RECLAMATION DISTRICT 1500 DRAIN*

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	89	202	231	223	294	274	145
2	89	189	292	278	273	263	141
3	106	189	264	220	286	218	132
4	97	202	231	278	294	274	132
5	97	197	268	220	243	274	110
6	159	206	232	220	243	263	120
7	89	214	260	267	294	218	110
8	106	227	231	220	230	274	92
9	114	202	292	267	243	274	85
10	65	214	264	220	294	274	85
11	89	227	231	278	230	274	60
12	89	227	256	231	243	274	85
13	89	238	211	266	294	274	64
14	89	238	219	220	230	274	64
15	122	239	272	266	243	274	60
16	97	240	239	220	294	263	56
17	97	238	219	266	243	218	51
18	97	305	256	220	294	263	60
19	110	305	231	220	243	218	55
20	114	305	256	220	294	252	50
21	125	226	231	255	230	195	46
22	132	302	268	209	243	195	88
23	132	302	256	209	294	173	25
24	144	276	256	208	230	173	25
25	152	239	280	209	230	159	42
26	164	286	231	220	243	159	42
27	164	279	292	267	294	143	42
28	181	267	278	220	204	145	42
29	189	230	278	256	215	143	42
30	202	291	267	256	260	131	29
31		268		243	215		34
Mean	120	244	253	238	257	227	71.4
Ac.Ft. for Month	7120	15000	15100	14600	15800	13500	4390

* This discharge through Reclamation District 1500 drainage plant combines with the discharge given in Tables 45 and 46 to form the entire flow of Sacramento Slough, See Table 43.

TABLE 45

DISCHARGE OF SUTTER BY-PASS - EAST BORROW PIT
(WILLOW SLOUGH AT CHANDLER)*

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	236	89	36	4	37	294
2	235	80	36	4	23	290
3	234	69	4	4	11	258
4	227	69	4	4	11	237
5	227	55	4	4	11	214
6	0	36	4	4	15	188
7	0	37	4	4	18	69
8	9	37	4	4	16	6
9	9	37	4	4	11	6
10	9	37	4	4	13	6
11	10	37	4	4	17	6
12	10	37	4	4	50	6
13	10	37	4	4	103	7
14	10	37	4	4	101	7
15	11	37	4	4	82	7
16	11	37	4	4	46	7
17	11	37	4	48	47	7
18	11	37	4	66	47	7
19	11	37	4	45	47	7
20	32	37	4	26	47	7
21	74	37	4	4	48	8
22	70	38	4	4	52	8
23	70	38	4	4	4	8
24	69	38	4	4	4	8
25	63	38	4	46	4	8
26	50	38	4	94	27	8
27	49	37	4	78	69	8
28	50	37	4	47	34	9
29	50	37	4	71	10	9
30	50	37	4	46	85	9
31	68		4	44		9
Mean	63.7	43.0	6.1	22.3	36.3	55.7
Ac. Ft. for Month	3920	2560	373	1370	2160	3430

* This flow is practically all return water from lands irrigated by Feather River diversions. This flow combines with the discharge given in Tables 44 and 46 to form the entire flow in Sacramento Slough. See Table 43.

TABLE 46

DISCHARGE OF SUTTER BY-PASS - WEST BORROW PIT
(OPPOSITE GELSHAUSER SLOUGH)*

Day	Daily Discharge in Second-Feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	85	57	74	74	62	84
2	85	57	76	74	62	80
3	85	57	78	72	62	78
4	80	57	80	70	62	76
5	80	60	82	68	62	74
6	80	64	84	61	62	68
7	80	68	87	57	62	63
8	70	70	90	60	62	57
9	60	72	91	62	62	54
10	52	73	92	62	62	51
11	48	74	93	62	64	48
12	44	65	94	62	66	43
13	44	60	90	62	68	38
14	44	57	86	62	72	38
15	44	57	83	60	76	38
16	44	57	80	57	80	37
17	44	57	76	59	87	37
18	44	57	72	61	94	36
19	43	62	68	62	92	36
20	42	68	68	62	90	36
21	41	74	68	62	87	36
22	41	74	68	62	100	36
23	41	74	69	62	115	34
24	41	74	71	60	101	34
25	42	74	73	57	98	34
26	43	69	74	54	96	34
27	44	65	76	52	94	34
28	45	62	78	54	84	34
29	46	66	80	56	74	34
30	48	70	77	57	87	34
31	52		74	59		33
Mean	54.3	65.0	79.1	61.4	78.2	46.7
Ac.Ft. for Month	3340	3870	4860	3780	4650	2870

*This flow is measured at a point 15.7 miles above the main drainage plant of Reclamation District 1500. It includes all return water from Reclamation District 1660. This flow combines with the discharge given in Tables 44 and 45 to form the entire flow in Sacramento Slough. See Table 43.

TABLE 47

DISCHARGE OF RECLAMATION DISTRICT 1000 DRAIN (2d BANNON SLOUGH)

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	26	36		51		43	51
2	39	24	53				
3	33	30	41			44	
4	39	42	59				51
5	32	36	47	52			
6	33	36					39
7	32			51			
8	33	54					
9		36		32		62	
10	65	36				62	
11	32	42			72	56	39
12	33		53			43	
13	39	42				44	
14	26			77		43	
15	46	54		39		37	52
16	39		53			50	
17	39	60		45		37	
18	32					56	
19	45	54	47	52		44	
20	46					37	
21	52		47	39			
22	39					50	
23	39		53	32		37	
24	39	54					
25	45		53			50	52
26	65	48					
27	39		53			49	
28	36						
29	36	54			62	43	
30	54				44		
31		53					
Mean for							
Days	40	44	51	47	59	47	47
Pumped							
Ac. Ft.							
for	2237	1569	1109	932	353	1759	563
Month							

NOTE: This is the drainage pumped back to the Sacramento River at Mile 2.1 Left from District 1000.

TABLE 48

DISCHARGE OF BACK BORROW PIT RECLAMATION DISTRICT 1000

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	9	6	1	1	2	4
2	9	6	1	2	2	4
3	9	6	1	2	2	4
4	9	5	1	2	2	4
5	9	5	1	2	2	4
6	9	4	0	2	2	4
7	9	4		2	2	4
8	9	3		2	2	4
9	9	3		2	2	4
10	9	3		2	2	4
11	10	2		2	2	4
12	10	2	-	2	3	4
13	10	2		2	3	4
14	10	2	-	2	3	4
15	10	2	F	2	3	4
16	9	2	L	2	3	4
17	9	2	O	2	4	4
18	9	2	F	2	4	4
19	9	2	L	2	4	4
20	9	2		2	4	4
21	8	2		2	4	4
22	8	2	N	2	4	4
23	8	2	O	2	4	4
24	8	2	-	2	4	4
25	8	2		2	3	4
26	7	2		2	3	4
27	7	2		2	3	4
28	7	2	0	2	3	4
29	7	2	1	2	3	4
30	7	1	1	2	3	4
31	7		1	2		4
Mean	8.4	2.8	0.3	2.0	2.9	4.0
Ac.Ft. for Month	516	167	16	121	172	246

NOTE: This is water flowing down the borrow pit outside the east levee of Reclamation District 1000 and entering the Sacramento River at Mile 1.3 L. It is measured at the Old Garden Highway crossing (Natomas Trestle). This drainage is probably not derived from Sacramento River sources.

TABLE 49

DISCHARGE OF YOLO BY-PASS-EAST BORROW PIT (TULE CANAL)*

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1				0	5
2					5
3				1	5
4				1	6
5				0	6
6				1	6
7				1	7
8	1	1	1		7
9				0	7
10	1	1	1	1	6
11				1	6
12	1	1	1		6
13	1	1	1	0	6
14	1	1	1	1	5
15	1	1	1	1	5
16				1	5
17				1	5
18	1	1	1	2	5
19	1	1	1	2	5
20	1	1	1	2	5
21				2	5
22	1	1	1	3	5
23				3	5
24				3	4
25				3	4
26				4	4
27				4	4
28				4	3
29				4	3
30				5	3
31					3
Mean				1.5	5.0
Ac. Ft. for Month				89	310

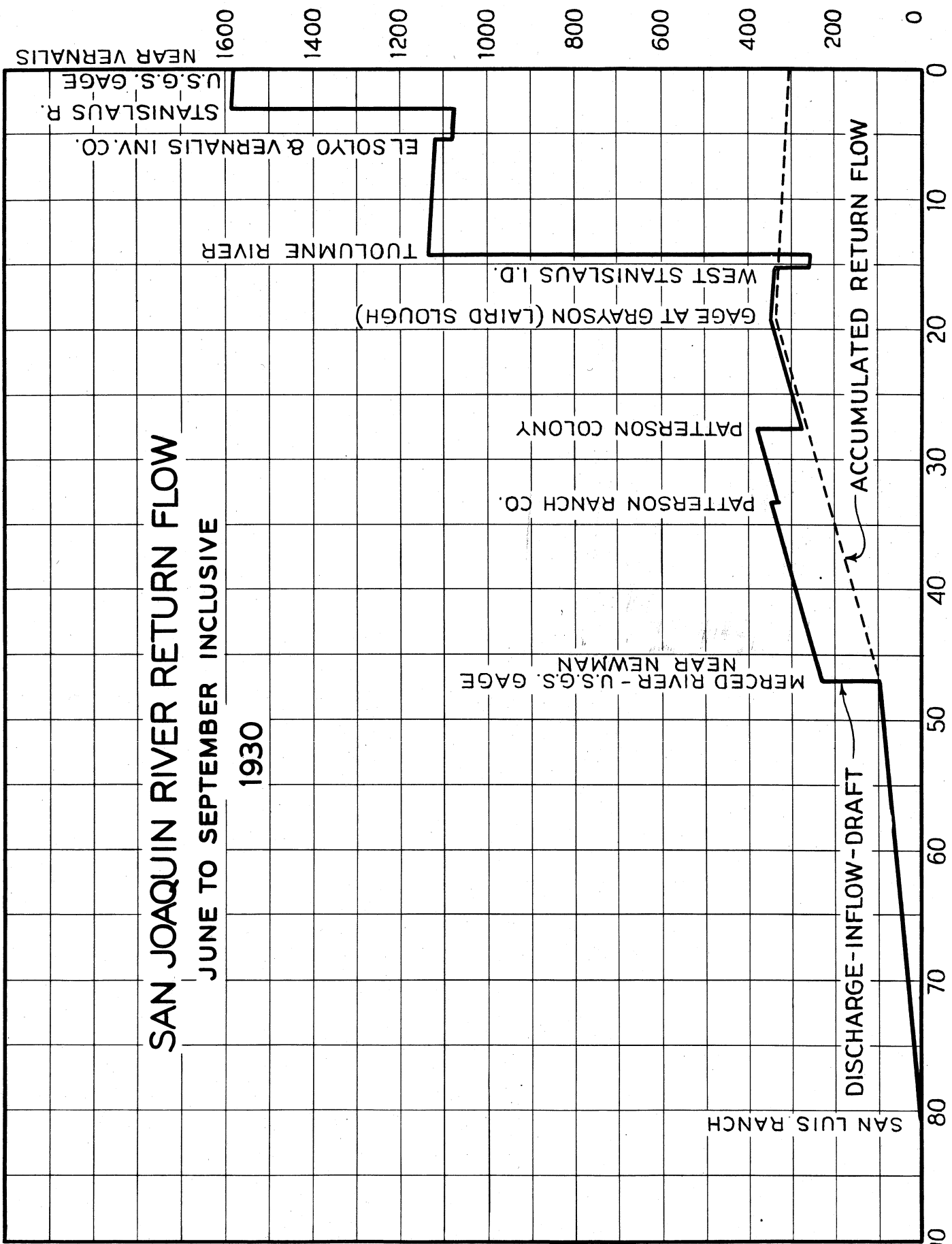
* Measured at north levee of Sacramento By-Pass. This station records any undiverted drainage from Reclamation District 1600. See Yolo By-Pass Diversions, Table 19.

SAN JOAQUIN RIVER RETURN FLOW

JUNE TO SEPTEMBER INCLUSIVE

1930

AVERAGE DISCHARGE - CUBIC FEET PER SECOND



DISCHARGE-INFLOW-DRAFT

ACCUMULATED RETURN FLOW

SAN LUIS RANCH

MERCED RIVER - U.S.G.S. GAGE
NEAR NEWMAN

PATTERSON RANCH CO.

PATTERSON COLONY

GAGE AT GRAYSON (LAIRD SLOUGH)

WEST STANISLAUS I.D.

TUOLUMNE RIVER

EL SOLYO & VERNALIS INV. CO.

STANISLAUS R.

U.S.G.S. GAGE
NEAR VERNALIS

TABLE 50

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS DURING THE IRRIGATION SEASON - 1930

	June	July	August	September	June-Sep. Incl.
	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.
SAN JOAQUIN RIVER					
Discharge at San Luis Ranch	0	0	0	0	0
Discharge near Vernalis Table 13	164000	2760	76200	1239	85100
Inflow of Merced, Tuolumne and Stanislaus Rivers Tables 55, 59, 61	148110	2492	72020	1171	60970
Accretion) San Luis Ranch	15890	268	4180	68	-4370
Diversions) to	15951	268	16472	268	16921
Net Return Flow) Durham Ferry Bridge	31841	536	20652	336	12551
				203	9500
				160	74544
				308	308
STANISLAUS RIVER					
Discharge at Orange Blossom Bridge Table 60	56800	956	2130	35	2180
Discharge at Elliot Ranch Table 61	71500	1203	16700	272	15700
Accretion) Orange Blossom Bridge	14700	247	14570	237	13520
Diversions) to	1495	25	1336	22	1167
Net Return Flow) Elliot Ranch	16195	272	15906	259	14687
				239	16590
				279	63378
				262	262
TUOLUMNE RIVER					
Discharge at Roberts Ferry Bridge Table 58	51900	873	30800	501	22400
Discharge at Tuolumne City Table 59	69200	1164	47000	764	37000
Inflow of Dry Creek Table 57	4140	70	3300	54	3410
Net Accretion) Roberts Ferry Bridge	13160	221	12900	209	11190
Diversions) to	425	7	435	7	358
Net Return Flow) Tuolumne City	13585	228	13335	216	11548
				188	16988
				285	55456
				230	230

TABLE 50 (CONTINUED)

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS DURING THE IRRIGATION SEASON - 1930

	June	July	August	September	June-Sep.
	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.	Ac.Ft.:c.f.s.
DRY CREEK					
Discharge near Old Waterford Bridge	744	452	516	865	2577
Discharge at Mouth	4140	3300	3410	4420	15270
Accretion	3396	2848	2894	3555	12693
Diversions	7	38	26	22	93
Net Return Flow	3403	2886	2920	3577	12786
MERCED RIVER					
Discharge at Yosemite Valley RR. Crossing	736	726	504	420	2386
Discharge near Mouth	7410	6320	8270	9960	33960
Accretion	6674	7594	7766	9540	31574
Diversions	2750	2716	2253	1242	8961
Net Return Flow	9424	10310	10019	10782	40535

TABLE 51

COMPARISON OF DIVERSIONS AND RETURN WATER, SAN JOAQUIN VALLEY, 1930
(Quantities in Acre-feet Except as Noted)

	Jun.	Jul.	Aug.	Sep.	Jun.-Sep. Incl.
DIVERSIONS					
San Joaquin River near Friant (Miller & Lux Canals)	(1) 154000	95300	78700	50500	378500
Merced River at Exchequer	(1) 102000	100000	84800	38200	325000
Merced Irrigation District Canal	(1) 88700	52100	64600	48300	253700
Turlock Irrigation District Canal	(1) 67800	37600	46500	29700	181200
Modesto Irrigation District Canal	(1) 54300	41000	35800	32700	163400
South San Joaquin Irrigation District Canal	(1) 15400	15700	14800	11700	57600
Oakdale Irrigation District Canal					
Pumping Diversions-San Joaquin, Stanislaus, Tuolumne,					
Merced Rivers and Dry Creek	(2) 20600	21000	20700	13100	75400
Total Diversions	502800	362700	345900	223400	1434800
Total Diversions (Average Second-feet)	8460	5900	5630	3760	5930
RETURN					
San Joaquin River near Vernalis	(1) 164000	76200	56600	85100	381900
Pumping Diversions, San Joaquin, Stanislaus, Tuolumne,					
Merced Rivers and Dry Creek	(2) 20600	21000	20700	13100	75400
Total Return	184600	97200	77300	98200	457300
Power Releases, Spill, Undiverted flow	98500	24200	19100	33200	175000
*Net Return	86100	73000	58200	65000	282300
*Net Return (Average Second-feet)	1450	1190	947	1090	1170
*Return in Per Cent of Diversions	17	20	17	29	*20

* Undetermined return water from South San Joaquin Irrigation District entering San Joaquin River below Vernalis gaging station is not included in these figures. Also, no account is taken of return to ground-water re-diverted to irrigation canals via drainage pumps at the lower end of the various irrigation districts.

(1) U. S. G. S. Station.

(2) See Tables 27-31, incl. This is return water diverted by pumping.

(3) Stanislaus River in June, 50300 acre-feet; Tuolumne River June 48200, July 24200, August 19100, Sept. 33200.

TABLE 52

DISCHARGE OF SAN JOAQUIN RIVER NEAR NEWMAN

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	295	345	245	270	210	210	200
2	295	332	370	258	220	200	200
3	282	345	482	245	190	180	210
4	282	385	430	232	190	180	210
5	270	415	448	220	180	180	210
6	258	415	415	210	170	180	210
7	270	385	345	210	180	190	190
8	270	370	270	200	190	220	200
9	282	358	270	220	180	200	180
10	308	370	270	200	180	200	180
11	308	400	232	190	210	200	180
12	295	400	220	200	200	210	180
13	295	385	210	210	200	220	190
14	345	370	210	210	180	220	180
15	345	332	210	200	180	220	180
16	345	320	295	180	190	220	200
17	385	308	332	180	200	210	200
18	385	295	430	180	210	210	190
19	370	308	430	180	210	210	170
20	370	308	400	170	200	210	160
21	358	295	385	190	190	210	160
22	358	308	358	190	200	220	160
23	332	295	332	180	210	232	160
24	308	295	320	190	232	232	160
25	320	270	282	200	245	210	154
26	320	282	270	210	258	200	158
27	320	295	282	210	220	200	160
28	345	258	270	220	210	200	160
29	320	232	258	220	200	200	160
30	332	232	282	210	210	200	170
31		232		200	190		170
Mean	319	327	318	206	201	206	180
Ac. Ft. for Month	19000	20100	18900	12700	12400	12300	11100

NOTE: This is a permanent station of the Water Resources Branch of the U. S. Geological Survey. This station is maintained throughout the year, but the record is given here for the irrigation season only.

TABLE 53

DISCHARGE OF SAN JOAQUIN RIVER NEAR GRAYSON*

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	353	427	270	344	325
2	378	400	265	312	413
3	450	384	268	325	454
4	548	372	237	306	541
5	551	359	235	300	523
6	527	357	220	295	544
7	471	356	220	302	509
8	426	356	205	309	485
9	382	337	210	321	481
10	338	321	240	318	478
11	294	306	235	331	468
12	273	300	235	300	485
13	286	292	258	312	481
14	705	283	281	321	506
15	793	275	304	350	457
16	653	267	328	356	451
17	807	250	306	334	492
18	810	255	278	321	444
19	709	235	281	306	403
20	622	260	281	312	369
21	579	268	273	303	350
22	541	258	247	312	341
23	551	263	242	315	331
24	573	232	265	295	324
25	488	263	298	286	318
26	485	280	337	283	322
27	485	260	378	265	331
28	458	292	347	260	347
29	424	324	321	265	344
30	434	296	265	286	337
31		286	315		334
Mean	513	304	272	308	419
Ac. Ft. for Month	30500	18700	16800	18300	25800

NOTE: Discharge obtained from current meter measurements and recording gage record. For return water figures see Table 50.

* Station is at Laird Slough Bridge.

TABLE 54

DISCHARGE OF MERCED RIVER AT YOSEMITE VALLEY
RAILROAD CROSSING

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	6	13	9	12	3
2	7	13	10	12	3
3	12	15	11	11	3
4	12	12	7	12	3
5	12	12	7	9	3
6	13	12	7	7	3
7	13	12	7	6	3
8	12	11	7	12	4
9	15	12	7	12	4
10	12	12	7	12	3
11	9	12	7	12	3
12	10	12	7	12	4
13	10	12	7	9	4
14	11	12	7	7	3
15	11	12	7	8	3
16	11	12	7	4	3
17	12	12	8	8	3
18	12	12	8	6	2
19	13	12	8	5	2
20	13	11	8	4	2
21	13	12	8	5	2
22	13	12	8	4	3
23	13	12	8	4	3
24	13	12	8	3	3
25	12	12	10	3	5
26	19	12	10	2	4
27	18	12	11	2	4
28	15	10	7	3	3
29	15	9	7	3	3
30	14	11	12	3	4
31		9	12		3
Mean	12	12	8.2	7.1	3.2
Ac. Ft. for Month	736	726	504	420	194

NOTE: Discharge obtained from current meter measurements and intermittent gage readings. For return flow figures see Table 50.

TABLE 55

DISCHARGE OF MERCED RIVER NEAR MOUTH*

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	117	169	147	154	154
2	132	162	132	147	177
3	110	117	124	139	169
4	110	117	132	139	177
5	97	132	103	139	177
6	97	117	103	139	184
7	97	162	110	162	147
8	103	147	117	192	162
9	103	139	117	162	154
10	97	132	117	169	147
11	97	124	147	177	147
12	97	117	139	169	154
13	92	117	117	192	162
14	92	147	103	192	147
15	97	117	92	192	162
16	110	124	92	177	177
17	117	124	147	177	177
18	117	117	162	169	154
19	110	117	139	184	147
20	110	132	117	177	132
21	103	132	147	162	132
22	162	132	139	184	132
23	177	132	132	184	132
24	162	132	177	177	132
25	208	139	192	177	132
26	162	139	184	162	132
27	162	162	162	162	132
28	162	169	147	154	139
29	169	147	147	147	139
30	169	147	147	162	139
31		132	139		139
Mean	125	135	135	167	151
Ac.Ft. for Month	7410	8320	8270	9960	9300

NOTE: Discharge obtained from current meter measurements and daily gage readings. For return flow figures See Tbl.50.

* Station is 1.1 mile above mouth at bridge on Hills Ferry Road.

TABLE 56

DISCHARGE OF DRY CREEK NEAR OLD WATERFORD BRIDGE

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	10	8	9	8	18
2	12	8	9	10	20
3	13	7	9	10	22
4	13	7	9	10	20
5	14	7	8	10	17
6	15	6	8	10	15
7	16	7	8	10	16
8	17	7	7	11	17
9	17	8	7	13	18
10	18	7	7	14	20
11	17	6	7	16	20
12	16	6	8	18	21
13	15	5	8	19	22
14	14	6	9	20	23
15	13	6	9	22	19
16	12	7	9	23	15
17	11	7	10	23	11
18	10	8	9	24	8
19	9	8	9	22	8
20	8	9	8	19	8
21	7	9	8	16	8
22	6	8	7	13	8
23	11	8	7	10	8
24	15	8	7	12	8
25	14	7	9	13	8
26	12	7	10	11	8
27	11	8	10	11	8
28	10	8	10	12	9
29	9	8	10	12	9
30	10	8	8	14	9
31		9	7		10
Mean	12	7	8	15	14
Ac. Ft. for Month	744	452	516	865	855

NOTE: Discharge record obtained from occasional current meter measurements and gage readings made at several day intervals.

TABLE 57

DISCHARGE OF DRY CREEK NEAR MODESTO

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		58	53	44	50	88
2		65	47	42	50	88
3		65	44	46	53	74
4		56	42	43	54	78
5		52	43	43	56	81
6		47	42	47	53	78
7		44	42	46	46	74
8		50	40	45	50	71
9		55	39	45	56	65
10		50	39	44	62	59
11		53	38	44	62	53
12		43	38	43	68	53
13		42	100	42	65	53
14		42	56	42	65	53
15		39	39	43	68	50
16		38	40	44	65	74
17		38	40	45	65	84
18		38	39	45	65	56
19		38	39	44	68	47
20		38	39	44	71	45
21		38	46	44	68	45
22		43	47	44	68	45
23	53	55	44	46	71	47
24	56	42	44	46	61	47
25	59	71	44	50	68	50
26	58	74	44	47	68	56
27	59	65	44	47	72	56
28	53	62	41	50	71	57
29	53	56	42	47	92	56
30	53	50	41	47	84	56
31	53		42	47		72
Mean		50	44	45	64	62
Ac. Ft. for Month		2990	2730	2770	3800	3790
Spill from Modesto I.D.		970	390	460	440	620
Seepage Below Gage		180	180	180	180	180
Discharge to Tuolumne R.		70	54	56	74	75
Mean c.f.s.						
Discharge to Tuolumne R. Acre-feet		4140	3300	3410	4420	4590

NOTE: Record obtained from current meter measurements and daily gage readings. Measurements made at a point about two miles above mouth.

TABLE 58

DISCHARGE OF TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	25	635	80	541	640
2	28	651	89	573	613
3	31	662	77	588	640
4	34	662	74	596	646
5	37	662	74	603	651
6	40	657	74	608	581
7	185	657	304	608	662
8	390	657	528	618	662
9	466	657	487	634	657
10	586	657	454	645	635
11	1060	657	464	657	630
12	1770	651	492	677	624
13	2180	651	505	670	635
14	2360	646	504	645	608
15	2470	646	513	642	608
16	2450	646	517	645	646
17	2230	646	524	642	646
18	1860	674	552	645	740
19	1480	639	380	655	635
20	900	486	197	649	651
21	740	393	187	640	680
22	550	389	208	619	660
23	562	389	291	635	640
24	551	397	359	635	640
25	544	395	347	635	651
26	551	246	340	640	697
27	527	112	411	646	662
28	528	95	557	646	646
29	533	86	632	646	646
30	523	60	563	640	640
31		69	511		635
Mean	873	501	364	631	645
Ac. Ft. for Month	51900	30800	22400	37500	39700

NOTE: Discharge obtained from current meter measurements and recording gage record. For return water figures see Table 50.

TABLE 59

DISCHARGE OF TUOLUMNE RIVER AT TUOLUMNE CITY

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	358	802	361	806	1100
2	389	850	358	794	1100
3	403	866	361	834	1040
4	347	878	367	838	1050
5	330	882	356	878	1030
6	324	886	344	878	1010
7	316	894	347	878	963
8	324	882	399	886	959
9	628	874	710	890	959
10	680	878	691	930	950
11	687	870	679	938	930
12	810	878	679	967	930
13	1880	906	679	1000	930
14	2390	942	714	1030	934
15	2680	898	738	1050	922
16	2780	886	750	1070	963
17	2810	882	782	1070	967
18	2560	878	802	963	950
19	2150	882	806	1070	948
20	1540	870	718	1250	945
21	1380	695	537	1100	942
22	1140	653	436	991	939
23	1010	645	457	995	936
24	1230	649	555	1020	933
25	1170	639	635	1040	930
26	1100	635	660	1030	930
27	930	580	624	1050	950
28	870	440	628	1100	959
29	850	406	810	1130	938
30	834	389	862	1120	930
31		373	806		934
Mean	1160	764	602	987	965
Ac.Ft. for Month	69200	47000	37000	58700	59300

NOTE: Discharge obtained from current meter measurements and recording gage record. For return water figures see Table 50.

TABLE 60

DISCHARGE OF STANISLAUS RIVER AT ORANGE BLOSSOM BRIDGE

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	972	46	32	39	44
2	504	44	32	36	44
3	652	39	32	36	44
4	986	34	32	32	44
5	2180	32	32	32	44
6	2010	34	32	32	44
7	2360	39	32	32	44
8	2530	36	32	32	44
9	2210	34	32	32	44
10	2190	34	32	32	44
11	1850	34	32	32	44
12	617	32	34	32	44
13	584	32	34	32	58
14	578	32	34	32	30
15	1750	32	36	32	28
16	1230	32	36	32	34
17	1150	32	36	32	94
18	1150	32	36	32	224
19	591	32	39	32	200
20	597	44	39	32	252
21	578	46	41	32	143
22	571	34	41	32	122
23	168	32	44	32	114
24	143	32	44	32	114
25	114	34	41	32	134
26	94	32	39	32	126
27	94	32	36	32	134
28	82	32	34	32	140
29	61	32	34	32	146
30	64	32	34	34	152
31		32	36		158
Mean	955	35	35	33	95
Ac.Ft. for Month	56800	2130	2180	1940	5810

NOTE: Discharge obtained from current meter measurements and recording gage record. For return flow figures see Table 50.

TABLE 61

DISCHARGE OF STANISLAUS RIVER AT ELLIOTT RANCH*

Day	Daily Discharge in Second-feet				
	Jun.	Jul.	Aug.	Sep.	Oct.
1	1920	384	237	296	352
2	1100	358	229	294	344
3	969	348	252	293	334
4	990	329	245	292	323
5	1120	344	261	291	321
6	1980	338	256	290	336
7	2000	289	229	289	336
8	2220	264	219	291	334
9	2510	264	231	282	310
10	2360	264	242	271	298
11	2160	262	254	287	282
12	1880	262	245	316	274
13	1030	280	254	282	300
14	884	271	245	264	307
15	925	262	241	287	307
16	1480	245	254	289	292
17	1380	245	249	291	289
18	1220	242	271	302	289
19	1150	237	264	300	336
20	870	237	237	289	350
21	829	242	242	289	358
22	800	237	262	309	368
23	770	227	257	325	366
24	700	224	271	316	368
25	549	216	259	310	354
26	498	242	287	316	354
27	459	251	284	325	352
28	452	271	264	316	352
29	437	271	262	334	354
30	411	266	298	350	344
31		264	297		334
Mean	1200	272	255	300	330
Ac.Ft. for Month	71500	16700	15700	17800	20300

NOTE: Discharge obtained from current meter measurements and recording gage record. For return flow figures see Table 50.

* Station is about 5.34 miles above mouth.

CHAPTER V

USE OF WATER IN THE SACRAMENTO-SAN JOAQUIN DELTA

As outlined in detail in preceding reports this investigation having as its objective a complete annual determination of the consumptive use of water by the entire Sacramento-San Joaquin Delta, has comprised the experimental work to determine the unit consumptive use of water by all water consuming crops and growths in the Delta and the general field work to obtain annually a complete census of the irrigated crops and water consuming areas. With the unit consumptive use of water determined by the experimental work and the complete census available, the former may be applied to the latter to derive the complete consumptive use of water for the Delta as a whole or for individual tracts or islands.

Through the regular Federal-State cooperation for Irrigation Investigations the experimental work has been conducted by the Division of Irrigation, Bureau of Agricultural Engineering, U. S. Department of Agriculture and has included probably as its most successful feature and that furnishing most definite and conclusive results, the consumptive use determinations for various Delta crops and vegetation grown in tanks. In 1930 the cooperative work included investigations of the use of water by barley, onions, celery and weeds grown in tanks on King Island, a continuation of the asparagus tank work on the Richmond-Chase tract, tule and cat-tail tanks on King Island and in Reclamation District 999 near Clarksburg, tule tanks on Simmons Island, Suisun Bay, an experiment on a King Island beet field to determine the effect of various irrigation treatments on the tonnage and sugar content of the beets, and investi-

gation of flooding methods in the removal of alkali and in the elimination of nematodes. This work is presented in detail in the report by Major O. V. P. Stout and Lloyd N. Brown which follows in this chapter.

The annual census of the acreage of irrigated crops and water consuming areas has been made through the regular organization of the Water Supervisor and the data for 1930 are given in Tables 62, 63 and 64.

As an important feature of the Special Studies of Salinity Control and the Salt Water Barrier, conducted as a part of the Water Resources Investigation in the development of the "State Water Plan", it has been necessary to derive the best possible estimate of the consumptive use of water in the Sacramento-San Joaquin Delta. In this derivation all of the data on the Delta experimental work and crop census as given in the Water Supervisor Reports beginning with 1924 and including 1930 have been available and the manner of their use and the complete estimate of the Delta's consumptive use are presented in detail in the Water Resources Investigation Bulletin Number 27 - "Variation and Control of Salinity in Sacramento-San Joaquin Delta and Upper San Francisco Bay". In order to make the complete estimate it was found necessary to obtain certain additional data on the extent of idle and bare lands, the acreage of aquatic growths such as tules, cat-tails, willows, the area of interior water surfaces, etc., and it will be noted that the form of Table 62 in this report has been changed somewhat from that of previous years in order to report these additional data. In accounting for the complete acreage of each tract or island under the various segregations a further and more exact check upon the total acreage figures has been obtained and explains the changes in

these figures from those given in previous reports.

The experimental work is to continue on a small scale in order to bring the investigation of the consumptive use of water by aquatic plants to a satisfactory conclusion, to extend the asparagus tank work to cover the economic life of the plants and to perhaps gain more conclusive data on the use of water by weeds and other such non-economic growths. Under present plans, an office report covering the entire Delta cooperative investigation in detail and presenting the complete estimates for the Delta consumptive use of water is to be completed and submitted by Major Stout in 1931. Subsequently it is planned that the usual census and securing of the other data necessary to continue the annual estimates of the Delta's consumptive use will be continued through the Water Supervisor's office. After publication of Bulletin Number 27 and the submission of the report by Major Stout, it is planned that the annual data and computations and complete estimates of the consumptive use of water will be incorporated as a part of the Water Supervisor Reports, beginning with the 1931 Report.

TABLE 63

SUMMARY OF ACREAGES AND CROPS IRRIGATED IN THE
SACRAMENTO AND SAN JOAQUIN-MOKELUMNE DELTAS-1930

Crop	Sacramento Delta	San Joaquin- Mokelumne Deltas	Total
Alfalfa	10295	16635	26930
Asparagus	36799	33470	70269
Beans	15696	13470	29166
Beets	10432	13626	24058
Celery	2110	3859	5969
Corn	6121	48412	54533
Fruit	12403	2101	14504
Grain & Hay	4350	31102	35452
Onions	2391	1950	4341
Pasture	554	7132	7686
Potatoes	325	18514	18839
Seed	4512	840	5352
Truck and Miscellaneous) Vegetables)	13328	2006	15334
Totals	119316	193117	312433

NOTE: In the data for similar tabulations in previous years, the boundary between the deltas has been taken as San Joaquin River, North Fork of Mokelumne River and Snodgrass Slough. In this tabulation a more strict division in accordance with drainage lines has been made. With this division the boundary divides Sherman and Andrus Islands and Reclamation District 551.

TABLE 64

GENERAL SOIL CLASSIFICATION OF THE
DELTA LANDS IRRIGATED IN 1930

Crop	Peat Soil Acreage Irrigated	Sedimentary Soil. Acreage Irrigated
Alfalfa	5489	21441
Asparagus	32484	37785
Beans	4910	24256
Beets	12599	11459
Celery	5045	924
Corn	35323	19210
Fruit	975	13529
Grain and Hay	13218	22234
Onions	1950	2391
Pasture	5026	2660
Potatoes	18054	785
Seed	653	4699
Truck and Miscellaneous Vegetables	1229	14105
Totals	136955	175478

COOPERATIVE IRRIGATION INVESTIGATIONS
IN THE SACRAMENTO-SAN JOAQUIN DELTA IN 1930

By

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and
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INTRODUCTION

The Cooperative Irrigation Investigations in the Sacramento-San Joaquin Delta in 1930 were confined mostly to the peat lands, where experiments on the use of water by crop and other plants was continued in the same manner as in previous years. Some incidental experiments relating to the irrigation of beets and to flooding to remove alkali also received attention. The nematode plots, where it was undertaken to determine the effectiveness of flooding to eradicate this pest, were also continued.

The record of use of water by tules and cattails in tanks at Clarksburg was carried through the year, and experiments with the same plants, but under more nearly normal conditions of exposure, were inaugurated on King Island and on Simmons Island. The new experiments were undertaken at the instance of the Water Resources Investigation.

At the present time there is an awakening of those concerned with the conservation and utilization of the water resources to the importance of the question of the waste involved in the consumptive use of water by growths which serve no useful purpose. Several agencies have concerned themselves in the matter to the extent of launching investigations.

It may not be too much to say that this is in considerable degree due to results reported from these investigations, and that there rests the obligation that the questions which have been raised should be settled.

PEAT LAND INVESTIGATIONS

SUMMARY

The determinations of consumptive use of water in 1930 were confined to crop and other plants growing in tanks. The reason for this, as noted in the report for 1929, is that the control which is possible in the tank work makes it more definite and therefore more valuable than when results depend upon the measurement of water visibly admitted to and drained from fields of growing crops, without adequate or satisfactory account being reasonably obtainable of the water which moves in and out of the fields by way of underground paths, nor, so far as peat lands are concerned, of the differences in the amounts of water stored in the soil of the fields at the beginning and the end of periods of time considered.

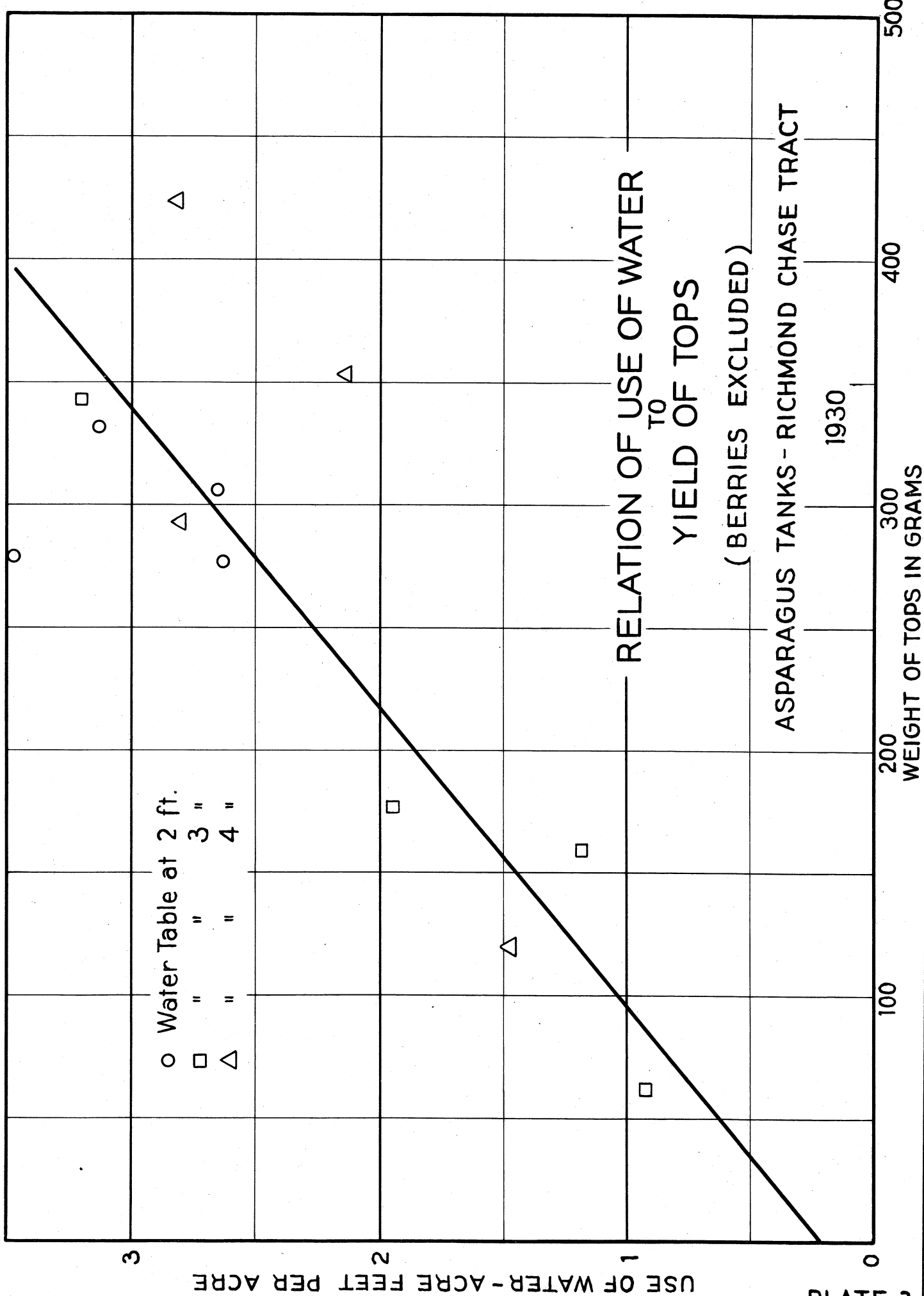
The tanks at Camp 3 $\frac{1}{2}$ on King Island contained barley and onions until those crops were harvested in midsummer. The barley yields covered an extensive range, from a minimum corresponding to crop failure up to a maximum greatly in excess of that obtainable in the field. The onion yields were rather less than good average field yield. The relation of consumptive use to yields is discussed in the detailed account to follow.

After the barley and onions had been removed from the tanks eight of them were taken up to be reset and used for tules and cattails, four of them in a tule swamp on King Island and the other four on the shore of Simmons Island, about seven miles northeast of Bay Point.

The outer cylinders of these eight tanks were found to be so badly corroded that they would not stand resetting and had to be replaced by new ones. They had been in service since 1925, with the peat soil of the field against their outer surfaces and water from the channels against their inner surfaces up to the elevation of the water table in the inner or soil cylinder. The corrosion was on the outer surface, the affected belt being bounded by lines corresponding closely to the highest and lowest elevations of the water table in the field.

The asparagus tanks set in 1927 on the Richmond-Chase ranch were continued in service throughout the year in 1930. The lack of anything like a precise correlation between the consumptive use by asparagus and any other of the determined elements still persists, but it has been found possible, in spite of this, to make fairly confident use of the results of the investigation in estimating the consumptive use of water by asparagus in the Delta. The nearest approach to correlation of use and yield appears in the case of yield of tops in 1930. (See Plate 3). If the experiments are continued for an additional period of a few years, sufficient to bring the plants in the tanks to maturity, a better basis of estimate than the present one will be available.

The experiments on King Island, designed to determine the effectiveness of flooding in destroying nematodes, were continued in 1930, and point quite definitely to the conclusion that, so far as continuous and uninterrupted flooding is concerned, an impracticably long period of time is required to eradicate the pest. Some experiments in intermittent flooding should be made, however, in order to determine if more rapid procedure is possible by that method.



Advantage was taken of an opportunity to observe experiments made by the Richmond-Chase Company in flooding asparagus land to leach out whatever injurious salts may be present. The final analysis of these experiments must be made in the light of crop records yet to accrue, but a brief description of the work and a general statement of some of the results to date are included in this report.

The experiments on sugar beet plots on King Island, commenced in 1929 at the instance of Dr. W. W. Robbins, of the California Agricultural Experiment Station, were continued through the season of 1930. An account of the season's work and results is given.

TANK WORK

Asparagus

Tank work on asparagus began early in 1927 when twelve tanks were installed on the Richmond-Chase ranch near Terminous. The tanks were located in a row running north and south and are numbered from south to north. They are of the same type as used in other work of this nature with Delta crops, but are of a greater diameter. The soil surface in the inner cylinder has an area of 9.28 square feet corresponding to 4694 crowns per acre, a typical asparagus planting. Crowns of the Mary Washington variety were obtained from the University Farm at Davis and female or pistillate plants were set in the odd numbered tanks, and male or staminate plants in the even numbered tanks. It was subsequently found that one of the plants set for staminate was pistillate.

The tanks were divided into three groups for different irrigation

treatments. The water was held at *two feet below the ground surface in tanks 1 to 4, inclusive; three feet in tanks 5 to 8, inclusive; and four feet in tanks 9 to 12, inclusive. No asparagus was cut during the first two years - 1927 and 1928 - but was cut regularly in the third and fourth years, 1929 and 1930. The cutting seasons lasted from the first appearance of spears until July 1st - the commercial cutting season. Following the cutting seasons the spears were allowed to develop into tops.

In Table 65 are shown the general results of the tanks by groups since the inception of the work. The table is arranged so that the yield of spears is placed with the use of water and weight of tops for the previous season because the plant food stored by the tops in the roots produces the spears the following season. During 1929 and 1930 the falling off of production with the two-foot water table and the increase in production with the four-foot water table are very noticeable. Judging by the weight of tops of 1930, group III will produce the most tonnage again in 1931. In Table 66 are shown the number of spears and their total and average weights. It will be noted that in general the plants grown with the four-foot water table showed increased production in 1930 whereas the tanks with three and two-foot water tables held about even and showed a decreased production, respectively. While all of these figures tend to argue in favor of the four-foot water table, too hasty an acceptance of them as final should not be made because the life of an asparagus plant is from 12 to 15 years and maximum production is not reached until about the eighth or ninth year.

* The depths listed are the nominal depths -- those contemplated in the plan of the work. The depths actually maintained varied somewhat from the nominal, the variation during the season up to about the middle of July being in general small and in both directions, while from that time on to the end of the year the depths were greater than the nominal, the average excess amounting in some instances to as much as half a foot.

TABLE 65
GROUP AVERAGE OF USE OF WATER, WEIGHT OF TOPS AND
YIELD OF SPEARS: ASPAPAGUS TANKS, RICHMOND-CHASE TRACT

Group:	1927		1928		1929		1930	
	Distance: :from soil:	Use : Weight : of : of	Use : Weight : of : of	Use : Weight : of : of	Use : Weight : of : of	Use : Weight : of : of	Use : Weight : of : of	Use : Weight : of : of
	Water : Tops	Water : Tops	Water : Tops	Water : Tops	Water : Tops	Water : Tops	Water : Tops	Water : Tops
	:Acre-Ft.: :per Acre:	Grams	:Acre-Ft.: :per Acre:	Grams	:Acre-Ft.: :per Acre:	Grams	:Acre-Ft.: :per Acre:	Grams
I	2	2.28 : 111.2	4.59 : 389.7	7.10 : 478.4	3.19 : 276.4	5.88 : 501.1	2.97 : 298.3	5.01 : 428.5
II	3	1.39 : 84.7	3.22 : 270.2	5.55 : 478.4	2.02 : 185.3	7.09 : 616.7	1.82 : 185.3	2.31 : 297.8
III	4	1.35 : 133.3	2.17 : 225.0	5.70 : 495.0	1.58 : 158.0	7.09 : 616.7	2.31 : 297.8	2.31 : 297.8

* See footnote, page 117.

** During the 1930 growing season, groups II and III each had a comparatively poor top growth. The numbers in brackets are the averages for the groups omitting the weak individuals.

TABLE 66

YIELDS OF SPEARS FROM ASPARAGUS TANKS IN 1929 AND 1930
RICHMOND-CHASE TRACT

Tank	* Depth to Water Feet	Sex S-Staminate P-Pistillate	Number of Spears		Total Weight of Spears		Average Weight of Spears	
			1929	1930	1929 Grams	1930 Grams	1929 Grams	1930 Grams
1	2	P	17	16	830.1	678.9	48.8	42.3
2	2	S	34	34	2141.2	1477.4	63.0	43.5
3	2	P	22	35	1366.6	1225.4	62.1	35.0
4	2	P	25	35	1148.6	1164.1	45.9	33.3
5	3	P	41	27	1751.0	830.0	42.7	30.7
6	3	S	27	34	1062.5	1214.5	39.4	35.7
7	3	P	22	25	920.9	761.2	41.9	30.4
8	3	S	28	52	558.3	1066.4	20.0	20.5
9	4	P	43	63	2024.1	2439.5	47.1	38.7
10	4	S	20	32	802.4	929.4	40.1	29.0
11	4	P	15	22	832.7	1143.6	55.5	52.0
12	4	S	21	26	747.2	970.2	35.6	37.3

* See footnote, Page 117.

TABLE 67

USE OF WATER AND YIELD OF TOPS**, ASPARAGUS TANKS,
1927 TO 1930, INCLUSIVE, RICHMOND-CHASE TRACT

Tank	*Distance from Soil to Water Feet	1927		1928		1929		1930	
		Use of Water Ac. Ft. per Ac.	Wt. of Tops Grams	Use of Water Ac. Ft. per Ac.	Wt. of Tops Grams	Use of Water Ac. Ft. per Ac.	Wt. of Tops Grams	Use of Water Ac. Ft. per Ac.	Wt. of Tops Grams
1	2	1.72	69.5	3.30	291.1	2.44	396.9	2.65	305.7
2	2	2.62	107.1	6.29	466.4	3.93	609.5	3.48	278.8
3	2	2.17	127.6	4.98	401.7	3.08	396.9	3.13	332.0
4	2	2.62	140.5	3.78	399.7	3.31	510.3	2.63	276.7
5	3	1.13	59.9	2.57	309.0	1.00	113.4	.93	61.2
6	3	1.41	112.8	3.20	194.5	2.21	255.2	1.19	159.5
7	3	1.35	56.5	3.36	309.3	2.04	311.9	1.95	176.9
8	3	1.67	109.5	3.75	268.0	2.82	425.3	3.20	343.0
9	4	1.85	91.0	3.87	374.0	1.79	419.6	2.80	293.1
10	4	.83	45.4	1.30	128.0	1.04	198.5	1.48	120.2
11	4	1.40	43.8	1.95	205.3	1.88	482.0	2.82	424.0
12	4	1.32	152.9	1.55	192.5	1.61	439.4	2.14	352.9

* See footnote, page 117.

** Exclusive of berries.

Table 67 shows the yearly uses of water and weights of tops exclusive of berries.

The item of chief concern in connection with all crops is the relation of use of water to commercial yield of crop, and the amount of water required to produce a crop corresponding to the average yield in a good year. In the case of asparagus it is considered that the relation to be studied is that of the yield of spears in any season to the use of water in the previous year. The reason for this is that the use of water in any calendar year up to the end of the cutting season amounts to very little, and that the spears are derived from plant food stored up when the plant was growing in the fern in the previous year. Plate 4 is a diagram on which the abscissa of any point represents the yield, in tons per acre, of spears from a certain tank in a certain season, and the ordinate to the point represents the corresponding consumptive use of water, in acre-feet per acre, in the previous year from about April to December. The yield of spears in 1929 is plotted against the use of water in 1928 and the yield of spears in 1930 against use of water in 1929, - 1929 and 1930 being the first and second seasons of cutting and the third and fourth seasons of growth in the the tanks.

The rates of yield of spears, in tons per acre, from the tanks are greatly in excess of those which are obtained from the fields. Beyond the fact that tank conditions correspond to a complete stand of plants, whereas field stands fall materially short of being complete, no explanation of the heavy yields from tanks has been found.

Although there appears a general tendency for the points on the diagram to arrange themselves with reference to a line running upward

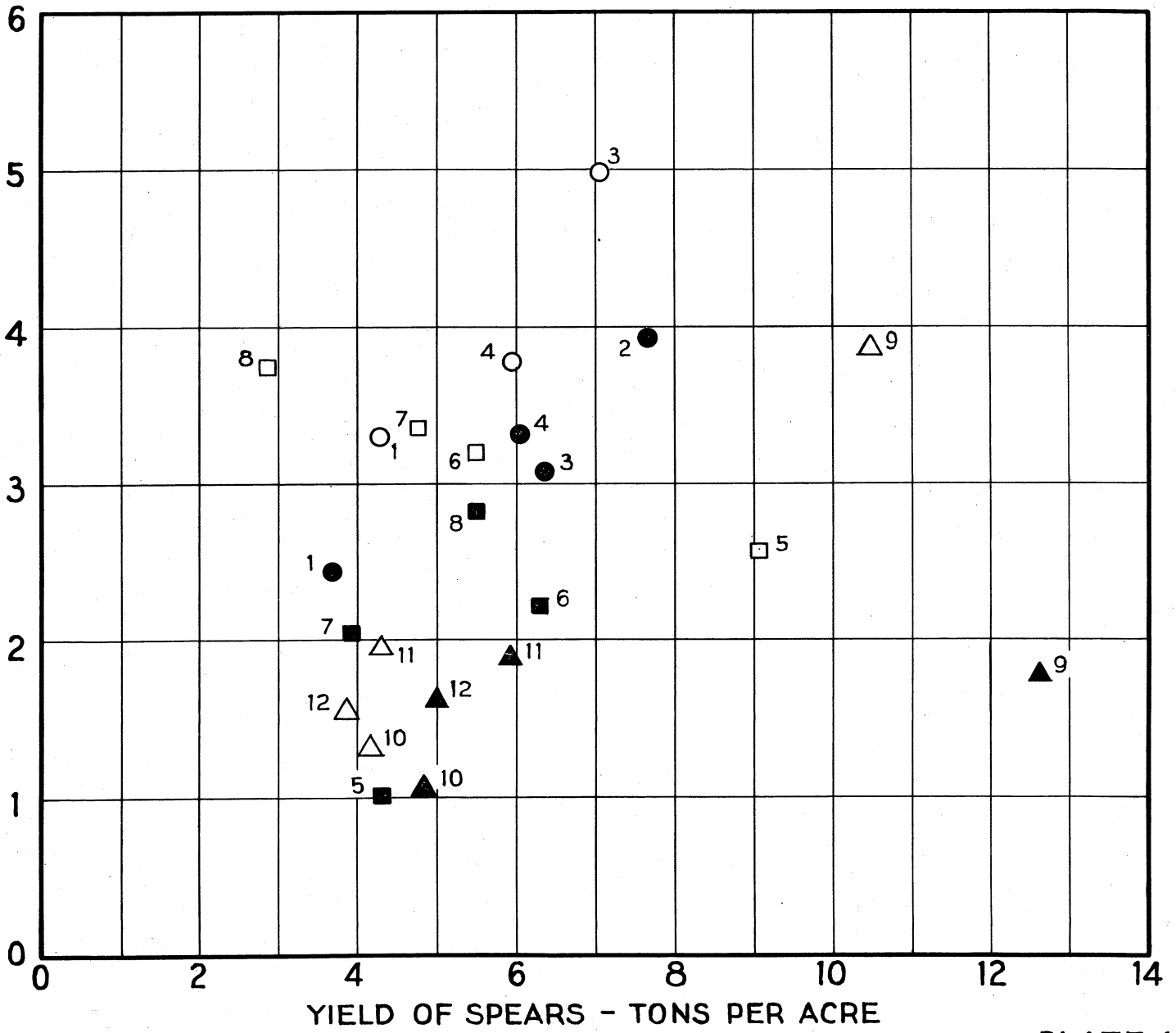
RELATION OF USE OF WATER TO YIELD OF SPEARS

1928 USE TO 1929 SPEARS
1929 " " 1930 "

ASPARAGUS TANKS - RICHMOND CHASE TRACT

1928-29	{	○	Water at 2 ft. down from G.S.	●	} 1929-30
		□	" " 3 " " " " "	■	
		△	" " 4 " " " " "	▲	

Figure at point indicates No. of Tank ○²



and to the right, there is no close or even serviceable correlation to be deduced from the data shown.

A study of Plate 4 brings out that tanks numbers 1, 2 and 3 in 1930 produced less tonnage of spears than in 1929, and also that the use of water in the year 1929 was less than in 1928. That is to say, the production and the use of water were both less for the later period than for the earlier one. Tank number 4 gave a slightly increased yield with less use of water. The water table in these tanks was two feet down from the soil surface.

Each of the tanks, numbers 5, 6, 7 and 8, in which the water table was at three feet, used less water in 1929 than in 1928. The yield of spears in tanks Nos. 5 and 7, which contained pistillate plants, was less in 1930 than in 1929, and the yield in tanks numbers 6 and 8, which contained staminate plants, was greater in 1930 than in 1929.

Each of the tanks numbers 9, 10 and 11, with water table at four feet, used less water in 1929 than in 1928, but in spite of this fact the yield of spears was greater in 1930 than in 1929. Tank number 12, of the same group, also yielded a greater amount of spears but used slightly more water.

Each tank except number 12 used more water in 1928 than in 1929. It is to be remembered in this connection that there was no cutting in 1928 and the plants were permitted to grow and to use water throughout the year from early spring to late fall, while in 1929 there was but little use of water until the plants made some growth following the close of the cutting season on June 30th.

Table 55, on page 105 of the Sacramento-San Joaquin Water Super-

It has been noted that there is very little use of water during the cutting season.

In 1929, from March 14 to July 1, it averaged .26 acre-feet per acre from tanks with the two-foot water table, .10 acre-feet per acre with the thirteen-foot water table, and practically nothing with a four-foot water table. It may be assumed that these amounts may be charged almost entirely to evaporation from the soil surface.

Onions

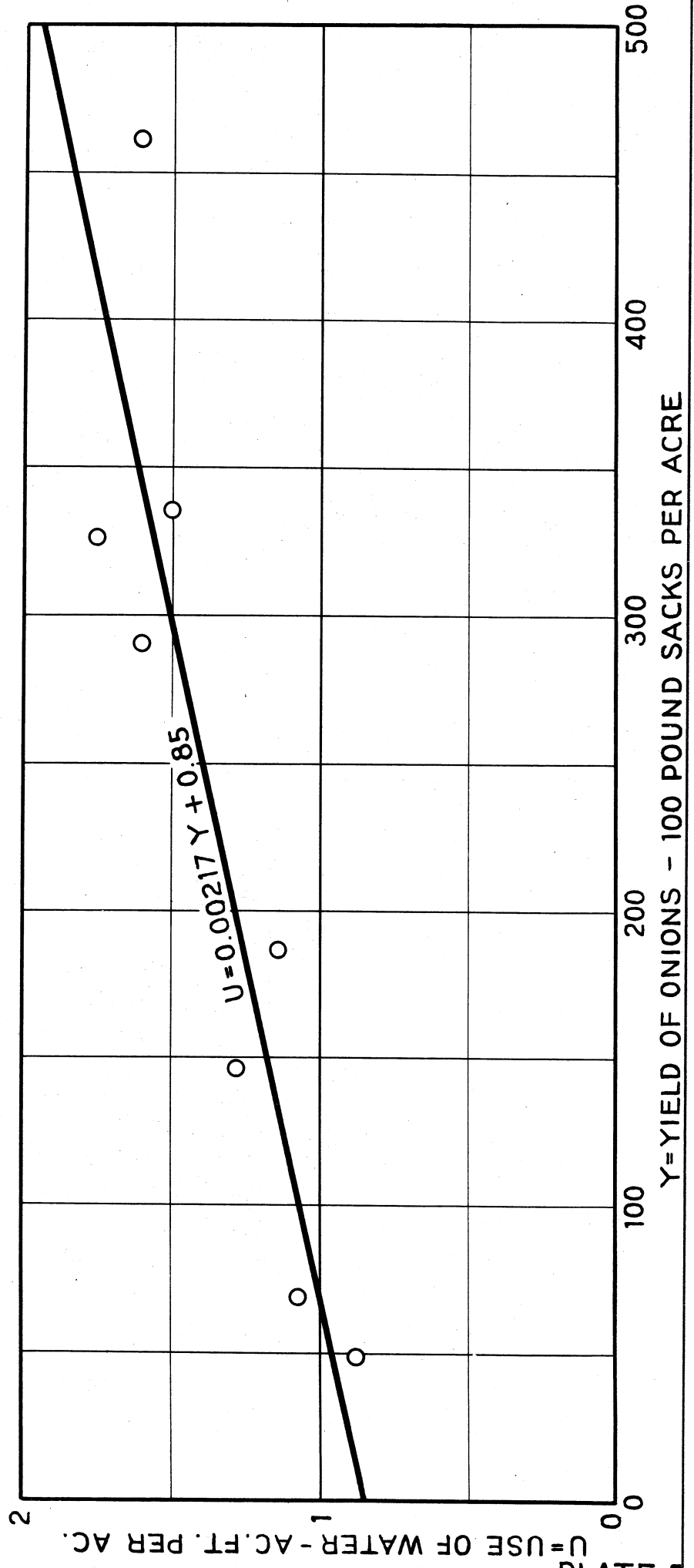
Eight tanks were planted to onions on February 20, 1930. They were harvested on July 31, 1930. The record of use of water was begun on April 4. Tanks numbers 1 to 4, inclusive, were planted with White Globe, and 5 to 8, inclusive, with the Australian Brown variety, known locally as "white" and "buckskin", respectively. These two varieties are among those most widely raised in the Delta. The yields from the tanks were only fair, so the use of water is probably low compared to actual field use. Field yields of 400 sacks or more per acre are common. The onion maggot reduced the crop materially in tanks numbers 6, 7, and 8. This pest is quite common in commercial growing, but since the damage is usually small it is tolerated. A sheep herder removed two or three onions from each of four tanks. However, since there were fifteen or twenty onions in each tank it is believed that the loss was estimated quite accurately and taken into account in the figures submitted in Table 69.

The data of Table 69 are plotted in Plate 5 taking as abscissas Y = yield of onions, in 100-pound sacks per acre, and as ordinates U = use of water, in acre-feet per acre. A line has been drawn to show

RELATION OF USE OF WATER TO YIELD OF ONIONS

ONION TANKS - KING ISLAND

1930



the use-yield relation indicated, the equation of the line being $U = 0.00217 Y + 0.85$. Various growers estimate the average yield of the usual varieties in a good year to be from 150 to 275 sacks per acre. There is one variety, not generally grown, on account of not being a good "shipper and keeper" that yields from 600 to 800 sacks per acre in a good year. According to the results from tanks in 1930, an average yield of 250 sacks per acre would use an average of 1.39 acre-foot of water per acre. The use reported in 1930 to the Water Resources Investigations exceeds this by 0.21 acre-foot per acre, and covers the probability that use in relation to yield may be greater in some years than it was found to be in 1930, the single season in which experiments were made; and also the fact that the average yield estimated above at 250 sacks per acre does not cover the less usual and higher yielding variety or varieties.

TABLE 69

USE OF WATER AND YIELDS, ONION TANKS, KING ISLAND, 1930

Tank Number	Use of Water :Acre-feet per Acre	Yield of Onions :100 Lb.Sacks per Ac
1	1.61	461
2	1.75	327
3	1.50	336
4	1.60	291
5	1.14	187
6	1.07	69
7	.88	49
8	1.28	147

Barley

Twenty tanks at Camp Number 3¹/₂ on King Island were planted to

barley on February 20, 1930. The grain was harvested on June 24th. The record of use of water dates from April 5th. A notable feature of this experiment is the unusually high yield, eight of the tanks producing at the rate of over 100 sacks per acre, each sack weighing 100 pounds. A yield of 40 sacks per acre in the Delta is considered high. However, in commercial production a great deal of grain is lost by lodging and separator waste. If these losses could be prevented, considerably larger crops would be obtained but even then the yield would not approach the heaviest from tanks. The yield of grain, in sacks to the acre, and the use of water, in acre-feet per acre, are shown in Table 70.

TABLE 70

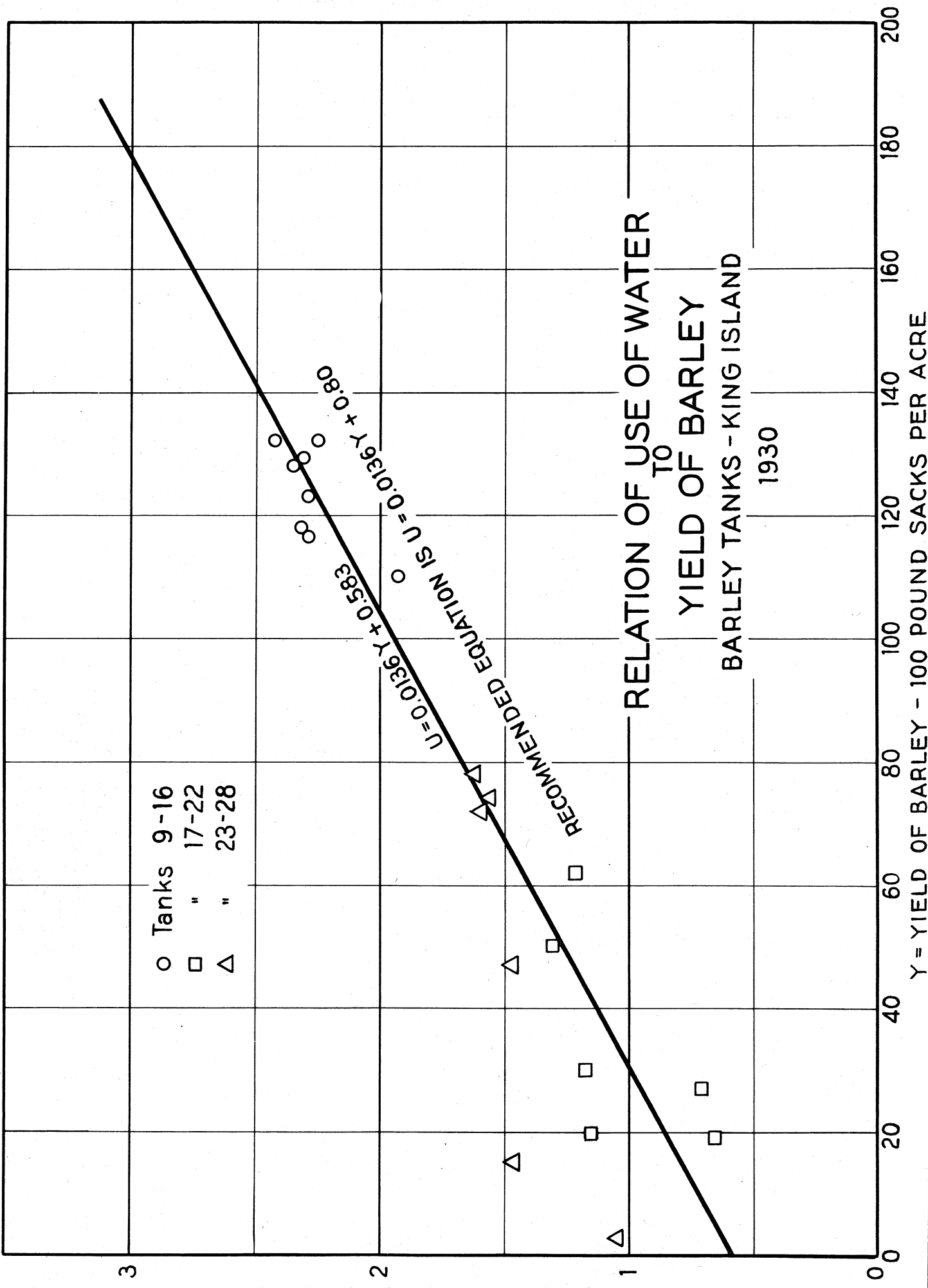
USE OF WATER AND YIELD, BARLEY TANKS, KING ISLAND, 1930

Tank Number	Yield of Grain 100 LbSks. per Acre.	Use of Water Acre-foot per Acre.
9	118	2.31
10	117	2.29
11	128	2.33
12	132	2.42
13	123	2.28
14	129	2.31
15	132	2.24
16	110	1.92
17	62	1.21
18	27	0.71
19	50	1.31
20	19	0.65
21	20	1.15
22	30	1.17
23	3	1.04
24	47	1.47
25	15	1.46
26	74	1.56
27	72	1.59
28	78	1.62

The data of Table 70 are plotted on Plate 6 and then, excluding all points representing yields of 20 sacks per acre or less, which dispose themselves irregularly, the remaining points are marked off in groups of four, according to the yield represented. The centroid of each group is obtained and a line adjusted to them, having the equation $U = 0.0136 Y + 0.583$. For use in estimating the water required to produce a certain yield it may be prudent to increase the constant term in the equation, making it $U = 0.0136 Y + 0.80$. According to this equation, the estimated water requirement for a yield of 25 sacks per acre would be 1.14 acre-feet per acre, and for a yield of 40 sacks per acre it would be 1.34 acre-feet per acre.

It is to be borne in mind that the figures just given are based on the results of one season of observation, the only one available covering approximately the entire growing season of grain in the Delta. Experiments elsewhere by others indicate that the figures given should be increased somewhat in estimating consumptive use of water by grain in the Delta.

It is believed, in fact, that the increase should be in material amount, so that the figures for grain and grain hay in general in the Delta will at least closely approximate 1.70 acre-feet per acre, as reported to the Water Resources Investigations. This opinion is based largely on the figures presented in the following tabular statement of the consumptive use of water which various sets of experiments indicate as necessary to produce 2500 pounds per acre of wheat and barley. Consideration is given also to the fact that reported experimental yields are total yields, whereas waste must be added to commercial



field yield in order to obtain total yield. That waste in the field is material in amount appears on viewing the luxuriant volunteer crops of grain which grow up the next year on stubble fields if permitted to do so. In fact, the waste of one season is frequently depended upon in the Delta to seed the ground for the crop of the next season.

Lodging, shelling and separator inefficiency all contribute to the volume of waste of grain. The sack of grain may weigh from 96 to 110 pounds. It has here been taken as 100 pounds.

In general the figures given in the following tabular statement are the results of correlation and computation applied to data presented in the references noted. The yield of 2500 pounds per acre with corresponding use of water does not precisely appear in most of the references. In a number of instances transpiration only is given and evaporation estimated at 0.50 acre-foot per acre must be added to give consumptive use.

Evaporation from bare ground in the Delta during the growing season of grain has been estimated in the report to Water Resources Investigations as amounting to 0.35 acre-foot per acre. The estimate of 0.50 acre-foot per acre for evaporation from grain fields in the same period is not necessarily inconsistent with the estimate for bare ground, for as against the shade and diminished air circulation induced by the crop is the fact that in an irrigated grain field the ground surface will usually be moister than in the bare areas, the ground surface will usually have less the nature of a mulch, and the water table will be higher. Moreover, the intercept of use-yield lines on the use axis is such as to indicate that the allowance of 0.50 for evaporation in grain fields is not too great.

TABLE 71

RESEARCH DATA ON CONSUMPTIVE USE OF WATER BY GRAIN

Consumptive Use (Evaporation and Transpiration)
in the Production of 2500 Pounds of Grain to the Acre

Reference	Consumptive Use:	
	Ac.Ft. per Acre:	
	Wheat	Barley
U. S. Dept. Agriculture. Department Bulletin No. 1004. Use of Water by Spring Wheat on the Great Plains. John S. Cole and O. R. Mathews. (1923). Rough correlation obtained by plotting the 56 observations tabulated on page 21 gives: - - - - -	1.52	
The 56 observations are from 11 different locations and for various years from 1907 to 1918. Fig. 9 on page 27 is use-yield diagram for Edgely, North Dakota and covers record for 10 years. It gives:-	1.36	
Fig. 10 on page 29 is use-yield diagram for North Platte, Nebraska and covers record for 10 years. It gives: - - - - -	1.88	
Department of the Interior, Canada. Reclamation Service. Irrigation Series. Bulletin No. 6. Irrigation Practice and Water Requirements for Crops in Alberta. W. H. Snelson. (1922). Wheat, mean of 12 tests in 4 years, as shown in diagram on page 31: - -	1.65	
Barley, mean of 13 tests in 3 years, as shown in diagram on page 36: - - - - -		1.70
The Canadian experiments were conducted in plots on soils of different degrees of fertility, induced by differences in previous croppings of the ground.		
U. S. Dept. Agriculture. Bureau of Plant Industry. Bulletin No. 284. The Water Requirement of Plants. I. - Investigations in the Great Plains in 1910 and 1911. Lyman J. Briggs and H. L. Shantz. (1913). Table on page 23 gives water requirement of different varieties of barley at Akron, Colorado, in 1911. Based on work with tanks. Three of the four varieties fairly conformable to a single correlation which gives: - -		1.57
The non-conforming variety used a larger amount of water. On page 47 is a table headed "Summary of water-requirement measurements of varieties and crops at Akron, Colo., in 1911." From this is deduced: - - - - -	1.75	1.64

TABLE 71 (CONTINUED)

RESEARCH DATA ON CONSUMPTIVE USE OF WATER BY GRAIN

Consumptive Use (Evaporation and Transpiration)
in the Production of 2500 Pounds of Grain to the Acre

Reference	Consumptive Use:	
	Ac.Ft. per Acre:	
	Wheat	Barley
Utah Agricultural College Experiment Station. Bulletin No. 117. The Yields of Crops with Different Quantities of Irrigation Water. John A. Widtsoe and L. A. Merrill. (1912) Experiments with plots. Work done in period 1902-11.		
Use-yield observations when plotted do not show the linear correlation ordinarily found in tank experiments: For wheat, assume evaporation = 0.50 acre-feet per acre: and draw line from point corresponding to that value on the use axis to the lowest placed plotted observation, as obtained from table on page 77, thus assuming linear correlation up to that point. This line gives: - - -	1.80	
The data on barley, as given in the table on page 84, are so irregular as to be useless in this connection.		
Tank experiments with wheat and barley at Davis, Calif. in 1913.		
Notes of unpublished work, obtained from Professor S.H. Beckett. Only four experiments with each crop being of nature to be available for correlation. Deduced: - -	1.75	1.09

Celery

After the onions were harvested, celery plants were set in the same tanks. It was realized that such a late planting might not attain maturity. The celery would have matured sometime in January but it was destroyed by sheep in December. The estimated growth at the time of destruction was about 60 per cent. In Table 72 are shown the results for 1930, and also for 1927, the other year when celery was grown in tanks. It is apparent that if the plants had matured in 1930, they would have used about the same amount of water as was used in 1927.

TABLE 72

USE OF WATER, CELERY TANKS,
KING ISLAND, 1930 AND 1927

Tank Number	Use of Water	
	1930*	1927
Acre-feet per Acre		
1	0.70	0.71
2	.76	.83
3	.65	1.10
4	.72	.91
5	.61	1.10
6	.76	1.39
7	.74	.74
8	.80	1.45
Av.	.72	1.03

* It is estimated that the use of water given in the table for 1930 is from 60 to 70 per cent of what would have been required for full growth and maturity of the crop.

Weeds

After the barley was harvested, young weeds were dug up and transplanted to the twelve Davis tanks. Since the season of record did not begin until early August the results are to be appraised and used with that fact in mind. The weeds averaged about 6 inches high when they were transplanted from the surrounding barley stubble. At the end of the growing season the growth of the plants in the tanks was estimated as a certain percentage of normal plants i.e., as they grow in the fields. Such estimates ran from 20 to 100 per cent as shown in Table 73.

This table shows the actual use of water by the plants set in the tanks, and also presents rough estimates of the amount of water used by average or normal plants of the same kind growing in the adjacent stubble field at the same time. In making the rough estimate by method

TABLE 73

USE OF WATER BY WEEDS GROWN IN TANKS,
KING ISLAND, LATE IN SEASON OF 1930

Tank No.	Name of Plant	Aerial Part of Plant	Weight of Aerial Part	Ratio of Size of Tank	Estimated Use of Water by Tank	Rough Estimate of Use of Water by Field	Method No. 1	Method No. 2
		Grams	Normal Field Plant		Acre per Acre	Acre-feet per Acre		
17	Chenopodium anthelminticum.	141.5	0.40	0.90	2.25	2.00		
18	Solanum nigrum. Black nightshade.	81.8	0.40	0.69	1.73	1.48		
19	Chenopodium album. Lamb's quarter.	30.0	0.25	0.49	1.96	1.26		
20	Amaranthus graecizans. Tumble weed.	105.4	0.30	0.56	1.87	1.37		
21	Sanchus oleraceus. Sow thistle.	308.1	1.00	1.09	1.09	1.29		
22	Echinochloa crusgali. Water grass.	66.9	0.30	0.40	1.33	0.83		
23	Xanthium canadense. Cockle burr.	143.2	0.25	0.84	3.36	2.66		
24	Polygonum acre. Smart Weed.	150.0	0.25	1.03	4.12	3.42		
25	Chenopodium anthelminticum.	250.5	1.00	1.48	1.48	1.68		
26	Amaranthus graecizans. Tumble Weed.	68.9	0.20	0.55	2.75	1.75		
27	Echinochloa crusgali. Water grass.	53.1	0.40	0.59	1.48	1.22		
28	Sanchus oleraceus. Sow thistle.	331.7	1.00	1.42	1.42	1.62		

No. 1 the use by the tank plant was divided by the estimated ratio of the size of tank plant to size of normal field plant. In method No. 2 the use by the tank plant was decreased by 0.30 acre-foot per acre, the remainder divided by the estimated ratio of the size of tank plant to size of normal field plant, and 0.50 acre-foot per acre added to the quotient. Method No. 2 presumably gives the better estimate. It will be noted that where plants of the same kind were grown in two tanks, the two corresponding estimates do not agree, whichever method is used. This is not surprising, in view of the fact that some principal elements of the computation are mere estimates. It is believed, however, that the figures presented can be used as an aid to the judgment in any given case. The principal value of the table lies in the indication which it furnishes as to which weeds are the heavy users of water.

Tule and Cat-tail

It was decided during the early part of July, 1930, to install some tanks to determine the use of water by tules (*scirpus lacustris*) and cat-tails (*typha latifolia*). Two groups of tanks of four each were put in operation - one set on King Island and the other on Simmons Island. The tanks at both locations were set in patches of the same kinds of plants as were transplanted to the tanks, the idea being to expose the tank plants to as nearly as possible the normal amount of air and sunshine.

The tanks at King Island were located at Camp 3. Tules were placed in two tanks and cat-tails in the other two. The high level of ground water made it impracticable to install the tanks in the usual manner. The method used was to dig around and lift out a core of earth and roots about 15 inches deep. The hole was then dug deep enough to admit the

tank, which was then put down and partially filled with earth. Then the core of earth was lowered into it. The tanks were filled so that when the core was in place the ground surface was about 15 inches below the rim of the tank. Care was taken to disturb the surrounding tule and cat-tail growth as little as possible.

The tanks at Simmons Island were installed in practically the same manner, except that tops of tanks are about two and one-half feet above the ground surface, which is at about the same elevation inside as outside of the tank. The tule growth here was considerably lighter than at King Island, probably due principally to the greater salt content of the water. All four tanks at Simmons Island contain tules - no cat-tails.

The tanks on King Island used a great deal more water than those on Simmons Island, as shown in Tables 74 and 75.

The data at Simmons Island are not as complete as at King Island, and use of water by months has not been computed.

Allowance for Rainfall

In the computation of the use of water by crops, a rainfall of 0.25 inch or less, falling on a dry soil surface, has not been counted, and about 0.25 inch has been deducted from heavier rainfalls, falling on dry soil, before taking them into account. This is in accordance with a common practice, designed to allow for the temporarily accelerated rate of evaporation from the soil surface under such conditions. In the case of aquatic plants in tanks, where the top soil was always either covered with water or in a practically saturated condition, the full measure of the rainfall was taken into account in reckoning consumptive use.

TABLE 74

USE OF WATER BY TULES AND CAT-TAILS GROWN IN TANKS
AT CAMP 3, KING ISLAND, 1930

Tank No.	Plant	Water Held at	Use of Water - Acre-feet per Acre							Total
			Jul. 23-31	Aug.	Sep.	Oct.	Nov.	Dec. 1-16	Jul. 23-Dec. 16	
1	Cat-tail	Ground Surface	0.40	1.18	0.65	0.43	0.17	0.03	2.86	
2	Cat-tail	One foot above Ground Surface	0.27	1.39	0.84	0.66	0.32	0.04	3.52	
3	Tule	Ground Surface	0.24	1.26	0.97	0.74	0.36	0.17	3.74	
4	Tule	One foot above Ground Surface	0.49	1.50	0.93	0.46	0.18	0.04	3.60	

TABLE 75

USE OF WATER BY TULES GROWN IN TANKS AT SIMMONS ISLAND,
JULY 31 TO NOVEMBER 6, 1930

Tank Number	Water Held at	Use of Water
		Acre-feet Per Acre
1	One foot above ground surface	1.35
2	Ground surface	1.15
3	One foot above ground surface	0.88
4	Ground surface	0.99

FIELD EXPERIMENTS

Sugar Beet Plots*

This experiment was designed to determine the effect of various irrigation treatments on the tonnage and sugar percentage of beets. It has run through the crop seasons of 1929 and 1930. The set-up provides for maintaining of the water table at different depths on the different plots. In 1929 there was but one set of plots, but in 1930 a duplicate set was installed. Table 76, setting forth the results of the 2 years' experiments, shows the percentage of sugar and the yields in tons per acre.

TABLE 76

IRRIGATION EXPERIMENTS ON SUGAR BEETS IN PEAT PLOTS,
KING ISLAND, 1929 AND 1930

Plot	1930				1929		
	Water Table Below Surface Feet	Average Weight per Beet Pounds	Sugar Per Cent	Beets per Acre Tons	Sugar Per Cent	Beets per Acre Tons	
1	1.5	1.83	8.5	31.0	10.1	40.1	
2	2.0	2.18	12.5	35.4	11.0	36.7	
3	2.4	2.02	13.7	31.4	11.1	36.3	
4	2.9	1.93	12.7	29.8	10.0	36.8	
5	1.5	1.81	12.1	28.8			
6	2.0	1.93	13.8	29.4			
7	2.4	1.91	14.7	33.6			
8	2.9	1.93	13.8	32.6			
Average of Replications							
1 & 5	1.5	1.82	10.3	29.9			
2 & 6	2.0	2.05	13.2	32.4			
3 & 7	2.4	1.96	14.2	32.5			
4 & 8	2.9	1.93	13.3	31.2			

* This experiment was headed by Dr. W. W. Robbins of the University of California Agricultural Experiment Station at Davis, who supervised sampling and weighing the beets and testing them for sugar. The junior writer designed and operated the irrigation system and supervised its installation. All cost and expense was met from funds at the disposal of Dr. Robbins.

The plots were irrigated twice during the growing season of 1930, i.e., the water table was brought up to within about 1.3 feet from the ground surface and held there until the water in the soil above this level was materially increased. At no time did the beets in any of the plots show any signs of suffering for water. The results obtained in 1930 indicate certain trends under the conditions of the experiment. It appears that a water table at about two to two and one-half feet from the ground surface produced the most satisfactory crop since both the sugar percentage and tonnage were higher in this region. The reduced tonnage in 1930 as compared with 1929 is due, inferentially, to the continued production of beets on the same soil.

Flooding Peat Land to Remove Alkali

Some areas on the Richmond-Chase ranch have not been yielding as much asparagus as they should. It was presumed that the presence of alkali was responsible for the difficulty. Consequently it was decided to flood two fields of approximately 60 and 70 acres, respectively, to see if the alkali could be removed in this manner.

Eighteen sampling points were located in the 60-acre field and twenty points in the 70-acre field. Thus each sampling point represented about three and one-half acres of land. A set of samples was taken at each point both before and after flooding; and consisted of three sixteen-ounce cans of soil, one can filled at the surface, the second down 22 inches and the third down 44 inches. Vented cans were used so that they could be forced into the soil, thus obtaining an undisturbed sample.

The samples were taken to the laboratory and tested for alkali. The results of the tests have not been completely worked up or analyzed

as yet. However, a preliminary examination discloses that a very large percentage of the alkali was removed. The crop records, while not yet complete, tend to show that the flooding will increase the yield.

Nematodes

It appears in the reports of the earlier years of this investigation that the activities of the garden nematode (*caconema radicum*) constituted a menace to results. In seeking for means of control or protection, it was found that in the literature of the subject the expedient of flooding the infested fields with water was frequently mentioned as a promising one. Accordingly an area 120 feet by 24 feet, on King Island, was prepared for flooding, and subdivided into 20 plots, each 12 feet square. They were first flooded on July 18, 1928, the water supply being so arranged that there was constant submergence from that time on except as some of the plots were drained for examination and test for the presence of nematodes. It was found that about four months of flooding killed the mature individuals, but that the eggs, or at least a part of them, which were present in the soil, remained fertile for nearly two years, and hatched when the plots were drained at a time of year when temperature conditions were favorable. Thus it appears that continuous flooding is not a suitable method for extermination of this pest. Intermittent flooding, designed to destroy the living organisms, then to hatch the eggs and destroy the resulting individuals before they have time to reproduce, has been suggested, but has not been tried.

SEDIMENTARY LAND INVESTIGATIONS

TANK WORK

Tules and Cat-tails

In June, 1929, tules and cat-tails were transplanted to tanks in Reclamation District No. 999, near Clarksburg, and the use of water from each tank up to the end of November was determined. The amount of water used was astonishingly large in amount.* It was therefore decided to leave the plants in the tanks and to continue observations through the year of 1930. The results are set forth in Tables 77 and 78.

These tanks are set in an open field, the only limitation to complete exposure being some small nearby roadside trees which may break slightly the force of a northeast wind. It is believed that the difference in exposure between these tanks and those containing aquatic plants on King and Simmons Islands is the chief factor in accounting for the great difference in consumptive use of water.

RAINFALL RECORDS

Table 79 presents the records of rainfall which have been used in computation of the consumptive use of water. In the records King-Bishop Bridge, Terminous and Clarksburg, the rainfall is recorded for the day on which it fell. The same is true of the Simmons Island record to October 10th, inclusive. At Camp 3, King Island, and for the period after October 16th at Simmons Island, there were no resident observers, and the rainfall noted in each instance is that found in the gage on the date noted, and

* Sacramento-San Joaquin Water Supervisor's Report for Year 1929. (Mimeographed) Page 128,

TABLE 77

USE OF WATER BY CAT-TAILS GROWN IN TANKS, NEAR CLARKSBURG,
RECLAMATION DISTRICT 999, 1930

Tank No.	Use of Water - Acre-feet per Acre												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
2	0.43	0.19	0.52	1.32	2.04	2.09	2.48	2.64	1.87	1.54	0.69	0.39	16.20
3	0.40	0.17	0.44	1.08	1.95	2.29	2.32	2.21	1.55	1.36	0.66	0.35	14.78
4	0.42	0.17	0.52	1.41	2.43	2.74	2.86	2.70	1.65	1.52	0.67	0.36	17.45
5	0.42	0.16	0.52	1.34	2.25	2.37	2.34	1.93	1.17	0.91	0.44	0.31	14.16
6	0.40	0.17	0.60	1.64	2.46	2.94	3.53	3.31	2.16	1.74	0.73	0.40	20.08
Means	0.41	0.17	0.52	1.36	2.23	2.49	2.71	2.56	1.68	1.41	0.64	0.36	16.53

TABLE 78

USE OF WATER BY TULES GROWN IN TANKS, NEAR CLARKSBURG,
RECLAMATION DISTRICT 999, 1930

Tank No.	Use of Water - Acre-feet per Acre												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
7	0.42	0.18	1.01	2.16	3.10	3.82	5.08	4.33	2.65	2.14	0.87	0.41	26.17
8	0.42	0.17	0.63	1.61	2.25	2.56	3.33	2.88	1.88	1.62	0.72	0.33	18.40
9	0.43	0.19	0.73	1.53	1.93	2.24	3.22	2.71	1.74	1.49	0.65	0.34	17.20
10	0.40	0.17	0.77	1.53	2.01	2.65	3.27	2.72	1.90	1.56	0.70	0.35	18.03
11	0.43	0.17	0.56	1.46	1.86	2.02	2.55	2.46	1.55	1.58	0.71	0.40	15.75
12	0.42	0.17	0.54	1.22	1.90	2.37	2.52	2.36	1.50	1.35	0.62	0.34	15.31
Means	0.42	0.18	0.71	1.58	2.18	2.61	3.33	2.91	1.87	1.62	0.71	0.36	18.48

TABLE 79

RAINFALL AT STATIONS IN THE SACRAMENTO-SAN JOAQUIN DELTA IN 1930

King-Bishop Bridge		Terminous		Clarksburg		Simmons Island		Camp 3 King Island	
Date	Rain Inches	Date	Rain Inches	Date	Rain Inches	Date	Rain Inches	Date	Rain Inches
							<u>Small Gage</u>		
Jan. 4	0.10	Jan. 5	1.33	Jan. 6	1.03	Aug. 25	T	Nov. 24	0.87
5	1.03	6	.96	7	.62	29	T		
7	.65	9	.29	9	.22			Dec. 16	.13
9	.30	Record missing		13	.40	Sep. 10	T	31	.07
14	.65	Est. : 2.60		14	.59	20	0.02		
16	1.64	18	.20	16	.83	24	.14		
17	.32	26	.21	17	.04	28	T		
26	.12	31	.08	18	.22	29	.01		
31	.08			26	.09	30	.07		
		Feb. 20	.54	31	.13				
Feb. 20	.50	21	.06			Oct. 1	.01		
22	.40	22	.48	Feb. 20	.34	10	T		
23	.48	23	.44	22	.76	Record missing			
24	.23	25	.33	24	.20				
25	.25	26	.14	25	.22	Nov. 20	.63		
		27	.03						
Mar. 4	.57			Mar. 3	.10	Dec. 29	.16		
5	.87	Mar. 3	.13	4	.41				
6	.08	4	.36	5	1.62	<u>Large Gage</u>			
14	.05	5	.70	6	.23	Nov. 20	.67		
15	.17	6	.42	14	.32				
16	.06	15	.30	15	.44	Dec. 29	.20		
30	.40	16	.14	16	.09				
		31	.25						
Apr. 13	.55			Apr. 14	.84				
14	.48	Apr. 13	.70	28	.03				
15	.14	14	.58						
25	.11	15	.11	May 2	.02				
				4	.31				
May 3	.20	May 4	.93	17	.03				
20	.03								
		Sep. 24	.20	Sep. 10	T				
Aug. 25	.27			21	T				
		Oct. 1	.20	24	.09				
Sep. 23	.15	12	.89	28	.01				
30	.51			30	T				
		Nov. 13	.23	Oct. 1	.06				
Oct. 12	1.10	16	.34	12	.98				
		17	.47						
Nov. 13	.21			Nov. 9	.10				
16	.27	Dec. 1	.08	13	.22				
				16	.82				
Dec. 13	.07								
				Dec. 11	.11				
				13	.05				
				30	.07				

represents the accumulation since the date of the visit next preceding.

The top diameter of the larger rain gage at Simmons Island is 8 inches, and of the inner cylinder two and one-half inches. The top is 25 inches above the ground surface on the crown of the low levee. The top diameter of the smaller gage is 3 inches, the inner cylinder being inaccessible for measurement. The gage is mounted on a post, the top of gage being four and one-half feet above ground surface on the crown of the levee.

EVAPORATION RECORDS

The evaporation pan at Camp 3 $\frac{1}{2}$, King Island, is a duplicate of the one at Clarksburg, hereinafter described. Except as annual crops and field weeds grow up around it and perhaps shelter it slightly, it is subject to complete exposure. Observations in 1930 were begun on May 13. Table 80 sets forth the evaporation by months, as determined by plotting the data and interpolating. Rainfall was taken into account on the basis of the record of precipitation at the King-Bishop bridge, about two miles distant, until October 12th. After that date a record kept at Camp 3, somewhat less than a mile distant, was used.

TABLE 80

EVAPORATION FROM FREE WATER SURFACE IN A TANK,
KING ISLAND, MAY 13TH TO DECEMBER 12, 1930

Month	May 13-31	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec. 1-12	Total
Evaporation: (Feet)	0.23	0.62	0.73	0.62	0.38	0.30	0.21	0.04	3.13

The evaporation pan and rain gages which had been maintained by the U. S. Army Engineers on Simmons Island were reset on October 16th, and observations made and recorded for the remainder of the year. The nominal diameter of the Simmons Island evaporation pan, which is approximated closely by the actual diameter, is 3.5 feet, and the depth is 18 inches. It is mounted on a grillage slightly above the ground surface on the crown of a low levee. A needle point is set in the center of the pan, at elevation about 0.30 foot below the rim of the pan. Observations are made weekly, note being made of the amount of water required to be added in the pan to bring the water surface up to the elevation of the needle point. There is complete exposure to sunlight, and to wind from all directions. The pan is made of galvanized iron, and the exterior surface has rusted up to within about 4 inches of the rim of the pan. The record of evaporation was begun on October 16th. The accumulated evaporation from that date to each of the dates named below was as follows: October 23, .095 foot; October 30, .182 foot; November 6, .255 foot; November 20, .373 foot; December 29, .586 foot; February 19, 1931, .771 foot. By plotting these data and interpolating on the curve through the plotted points, the evaporation by months is obtained, as set forth in Table 81.

TABLE 81

EVAPORATION FROM FREE WATER SURFACE IN A TANK,
SIMMONS ISLAND, OCTOBER 16TH TO DECEMBER 31, 1930

Month	Oct. 16-31	November	December
Evaporation (Feet)	0.19	0.25	0.15

A record of evaporation from the free water surface in a galvanized iron pan a few feet from the tule and cat-tail tanks near Clarksburg, Reclamation District 999, was obtained for the period June 3d to December 20, inclusive, in 1930. The evaporation by months and for the entire period, as computed from this record, is presented in Table 82. This evaporation pan has a diameter of 2.86 feet, depth 2.45 feet. It is set in the ground, with the rim of the pan slightly less than 6 inches above the ground surface. The exposure is not quite complete, as there is a little early morning shade from a small roadside tree, a road embankment about 50 feet east is a little higher than the pan, and across the road to the east is a young bearing orchard.

TABLE 82

EVAPORATION FROM FREE WATER SURFACE IN A TANK, NEAR CLARKSBURG,
RECLAMATION DISTRICT 999, JUNE TO DECEMBER, INCLUSIVE, 1930

Month	*Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	*Dec.	Total
**Evaporation (Feet)	0.687	0.704	0.637	0.412	0.276	0.193	0.082	2.991

* Evaporation for the first three days in June and the last eleven days in December was estimated.

** In allowing for rainfall, the record of precipitation at the headquarters of the Holland Land Company, about one mile distant, was used.

CHAPTER VI

SALINITY

As noted in the 1929 report, the Division of Water Resources began a special salinity investigation in June, 1929, as the basis for an exhaustive and conclusive report of the salinity situation, this report to be submitted as one of the series of bulletins on the State Water Plan. This bulletin is to present in detail both the field and office studies conducted since June, 1929, together with analyses and conclusions on the whole salinity situation. This chapter of the present report, therefore, is confined to a presentation only of the field data obtained in 1930 corresponding to a continuation of the established investigations of previous years.

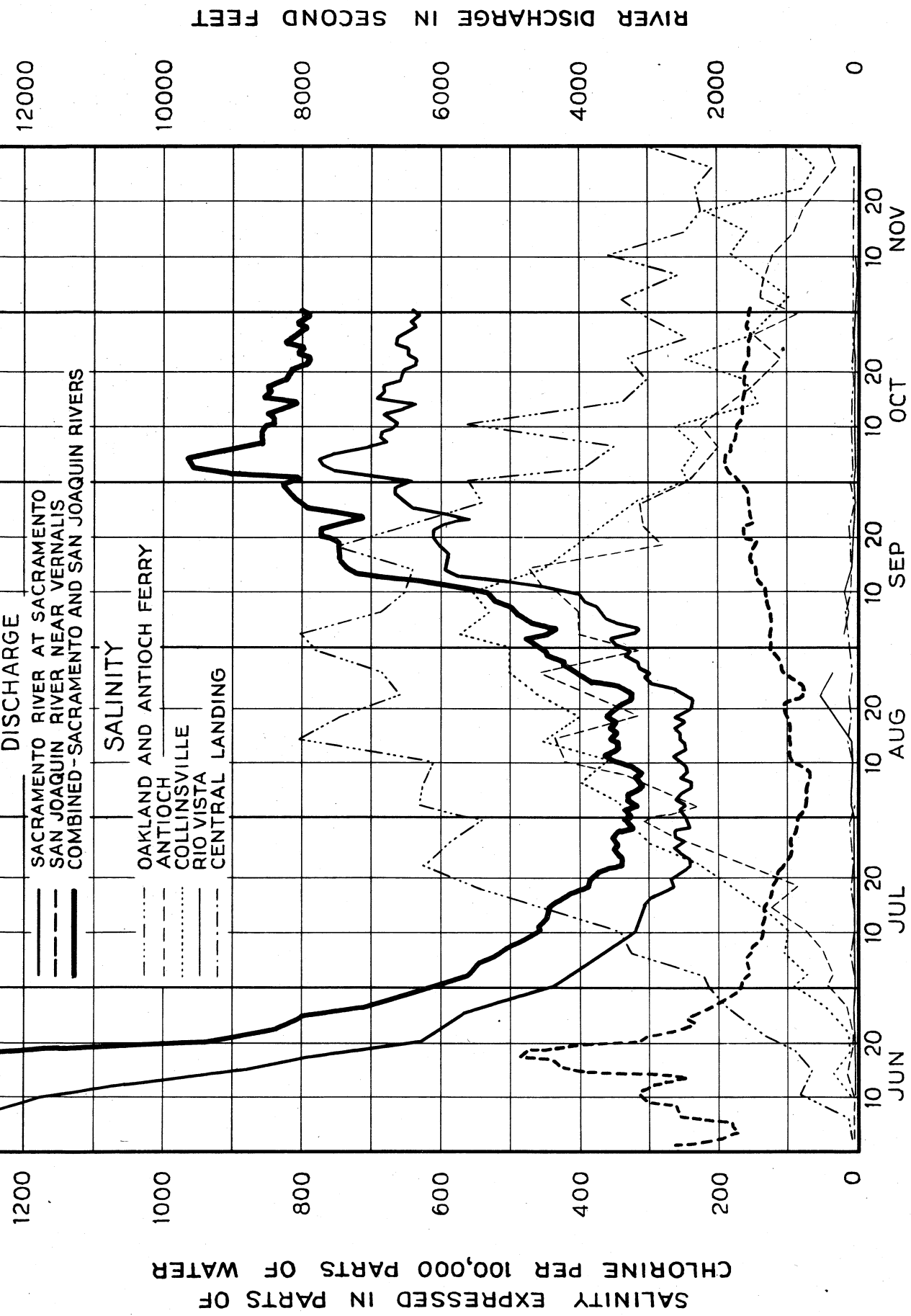
As outlined in previous reports the purpose of these investigations has been to establish as clearly as possible the relation which exists between the discharge of fresh water to the Delta through the rivers, the advance and retreat of the salinity and tidal action. In years of low stream flow it has also had the additional purpose of supplying information to Delta water users in order that their irrigation operations might be so regulated as to avoid the use of excessively saline water.

The scope of the investigation each season has been such as to insure that samples of water to be tested for salinity would be taken at regular intervals at a sufficient number of stations throughout the Delta and in the upper bay region, that the advance and retreat of the salinity from early Summer to late Fall would be completely recorded. In 1930, from June to November, samples were received from forty-six

stations and this number includes twenty-seven stations at which sampling was conducted continuously throughout the year. Tables 84 and 85 give a description and present the results of all sampling for the 1930 stations.

In 1930 the limit in the Delta area above which salinity in the channels did not reach 100 parts of chlorine per 100,000, passed through the lower portion of Brannan and Twitchell Islands, Webb and Franks Tracts and through the central portions of Bethel and Hotchkiss Tracts. This encroachment followed very closely that of 1929 and 1928, also.

Table 83 shows the maximum recorded salinity at bay and Delta stations for the years 1924 to 1930, inclusive, and Plate 7 gives a comparison for the 1930 season, of the river discharge to the Delta and salinity at certain stations.



**COMPARISON OF RIVER DISCHARGE AND SALINITY
AT BAY AND DELTA STATIONS
1930**

TABLE 83
 MAXIMUM SALINITY AT BAY AND DELTA STATIONS
 1924 TO 1930, INCLUSIVE

Year	1924	1925	1926	1927	1928	1929	1930
Seasonal Run-off to San Francisco Bay in per cent of Normal*	28	83	57	114	80	42	63
Station (1)	Maximum Salinity in Parts of Chlorine per 100,000 and Date of Occurrence						
	SAN FRANCISCO, SAN PABLO AND SUISUN BAYS						
Point Orient	9/30 2020	9/10 1880	7/31 1870	9/26 1830	9/10 1780		
Point Davis	8/26 1850	8/26 1510	8/2 1610	5/30 1660	9/22 1620		
Bullhead Point	8/30 1690	9/2 1330	8/10 1410	9/6 1370	9/6 1380		
Bay Point	8/23 1400	9/2 950	8/10 1170	9/6 1050	9/6 1060		
O and A Ferry	8/28 1345	9/26 762	8/30 510	8/22 750	8/30 800	8/14 800	
Innisfail Ferry					9/18 870	8/30 810	
	NORTH SAN PABLO BAY						
Sonoma Creek Bridge						9/26 1600	9/26 1670
Grand View							9/10 1610
Vallejo							9/10 1340
McGill							9/18 1490
Merazo							9/18 1410
Lakeville							9/22 1690
Cuttings Wharf							9/18 1320
Napa							9/30 900
Petaluma							10/30 1580

* Normal is 40-year mean (1889-1929) of natural run-off at foothill stations. Previous reports have given run-off in per cent of 50-year mean (1870-1920) as given in Bulletin No. 5, Division of Water Resources.
 (1) For location and description see table 84.

TABLE 83 (CONTINUED)

MAXIMUM SALINITY AT BAY AND DELTA STATIONS
1924 TO 1930, INCLUSIVE

Year	1924	1925	1926	1927	1928	1929	1930
Seasonal Run-off to San Francisco Bay	28	83	57	114	80	42	63
in per cent of Normal*							
Station (1)	Maximum Salinity in Parts of Chlorine per 100,000 and Date of Occurrence						
	SACRAMENTO RIVER DELTA						
Collinsville	8/16 : 1150 : 9/6 : 448 : 9/6 : 1020 : 9/10 : 370 : 9/2 : 590 : 9/2 : 680 : 9/2 : 570						
Emmaton	8/6 : 802 : 9/4 : 136 : 8/22 : 540 : 8/30 : 65 : 8/22 : 156 : 9/6 : 310 : 9/10 : 250						
Three Mile Slough Bridge	8/30 : 692 : 9/6 : 81 : 8/26 : 430 : 9/10 : 25 : 9/2 : 109 : 9/6 : 205 : 9/10 : 150						
Rio Vista Bridge	8/12 : 608 : 9/2 : 21 : 8/30 : 256 : 9/26 : 12 : 8/30 : 44 : 9/3 : 67 : 8/22 : 52						
Junction Point	8/16 : 192 : 9/16 : 11 : 8/26 : 32 : 9/26 : 7 : 7/22 : 14 : 8/10 : 26						
Liberty Ferry	8/14 : 310 : 9/16 : 12 : 8/19 : 68 : 8/18 : 13 : 9/10 : 6 : 8/22 : 10						
Isleton Bridge							
Sacramento							
	MOKELUMNE RIVER DELTA						
Southwest Point	8/30 : 113 : 8/26 : 65 : 8/10 : 23 : 9/2 : 9 : 7/30 : 9						
Camp 33	8/8 : 44 : 9/6 : 32 : 7/30 : 25 : 7/18 : 8 : 7/30 : 7						
Tyler Island Ferry							
New Hope Bridge							

* Normal is 40-year mean (1889-1929) of natural run-off at foothill stations. Previous reports have given run-off in per cent of 50-year mean (1870-1920) as given in Bulletin No. 5, Division of Water Resources.
(1) For location and description, See Table 84.

TABLE 83 (CONTINUED)
 MAXIMUM SALINITY AT BAY AND DELTA STATIONS
 1924 TO 1930, INCLUSIVE

Year	1924	1925	1926	1927	1928	1929	1930
Seasonal Run-off to San Francisco Bay in per cent of Normal*	28	83	57	114	80	42	63
Station (1)	Maximum Salinity in Parts of Chlorine per 100,000 and Date of Occurrence						
	SAN JOAQUIN RIVER DELTA						
Antioch	8/20 1080	9/4 356	8/26 81	9/18 179	9/2 450	8/30 600	9/14 470
Jersey	8/30 708	9/6 81	8/26 81	9/14 53	9/6 192	9/3 365	8/26 220
Twitchell Island Pump	9/6 414	9/4 24	8/14 24	9/10 16	8/30 46	8/31 80	8/30 61
Webb Pump	9/24 288	9/2 10	9/2 10	9/2 98	8/2 19	8/31 20	9/6 15
Central Landing	10/4 308	9/22 18	9/2 18	9/2 148	10/10 34	9/26 23	9/14 16
Ward Landing	9/16 126	9/2 35	9/14 50	9/18 86	8/2 25	9/22 42	8/26 23
Holland Pump	9/30 186	9/13 13	10/8 13	9/2 69	9/30 28	8/26 28	9/14 17
Mandeville Pump	10/12 148	9/16 11	9/26 11	9/2 69	9/22 21	9/18 18	8/2 16
Ridge Pump	9/16 108		8/30 48		8/2 21	9/18 17	11/26 17
Orwood Bridge					9/2 16	9/14 16	9/14 11
East Contra Costa I.D.						8/14 36	8/6 18
Middle River P. O.						7/18 15	9/14 10
Mansion House						8/18 200	5/2 120
Stockton Country Club							
Drexler Bridge							
Stockton							
Mossdale Bridge	9/8 14					7/22 16	7/30 10

* Normal is 40-year mean (1889-1929) of natural run-off at foothill stations. Previous reports have given run-off in per cent of 50-year mean (1870-1920) as given in Bulletin No. 5, Division of Water Resources.
 (1) For location and description, see Table 84.

TABLE 84

SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN DURING 1930

Station	Miles: : from : : Golden: : Gate :	Location
		<u>SAN FRANCISCO, SAN PABLO AND SUISUN BAYS</u>
Point Orient	: 12.3 :	Upper end S.F. Bay, east shore, $\frac{1}{2}$ mile south of Pt. San Pablo, Wharf of Standard Oil Company.
Point Davis	: 25.2 :	Upper end San Pablo Bay, south shore, Oleum Wharf of Union Oil Company.
Bullhead Point	: 34.0 :	Lower end Suisun Bay, south shore, Wharf of Mountain Copper Company.
Bay Point	: 39.9 :	Center Suisun Bay, south shore, Bay Point Wharf of Coos Bay Lumber Company.
O and A Ferry	: 46.5 :	Upper end Suisun Bay between Mallard Station & Chipps Is. on San Francisco-Sacramento RR.
Innisfail Ferry	: 47.3 :	Montezuma Sl., about 1 mile east of junction with Cutoff Slough. Near most northerly point of Grizzly Island.
		<u>NORTH SAN PABLO BAY</u>
Sonoma Creek Bridge	: 26.4 :	Drawbridge, Sonoma Creek Entrance.
Grand View	: 27.0 :	Petaluma Creek, State Highway Drawbridge, near town of Grand View.
Vallejo	: 29.1 :	Sears Point Toll Bridge, on Napa River, about one mile from Mare Island Navy Yard Causeway
McGill	: 30.6 :	Sonoma Creek at McGill on Northwestern Pacific Railroad, about 1 mile south of Wingo.
Merazo	: 32.7 :	Hudeman Slough Bridge, due south of Merazo station on Santa Rosa branch of Southern Pacific RR.
Lakeville	: 33.8 :	Petaluma Creek, at town of Lakeville, about $7\frac{1}{2}$ miles from mouth of Creek.
Cuttings Wharf	: 36.7 :	Right bank of Napa River, opposite North end of Bull Island, near Carneros Station on Southern Pacific RR.
Napa	: 43.7 :	Bridge on Napa River near center of town of Napa.
Petaluma	: 45.7 :	Petaluma Creek, at Washington Street Bridge in Petaluma.

TABLE 84 (CONTINUED)

SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN DURING 1930

Station	Miles from Golden Gate	Location
<u>SACRAMENTO RIVER DELTA</u>		
Collinsville	50.8	North Bank Sacramento River at junction with San Joaquin River.
Emmaton	57.7	South Bank Sacramento River just above Baker Point Cut, on Horseshoe Bend.
Three Mile Slough Br.	60.0	At junction of Slough and Sacramento River.
Rio Vista Bridge	63.5	Right bank Sacramento River two miles below junction of Cache and Steamboat Sloughs.
Junction Point	65.2	Sacramento River, right bank, just below Steamboat Slough junction.
Liberty Ferry	67.6	On Cache Slough at junction with Lindsay Slough.
Isleton Bridge	68.7	Left Bank Sacramento River three miles above junction with Steamboat Slough.
Walnut Grove	77.4	Left Bank Sacramento River at Upper end of Georgiana Slough.
Sacramento	103.5	Sacramento River, east bank, at Southern Pacific Railroad Bridge.
<u>MOKELUMNE RIVER DELTA</u>		
Southwest Point	78.8	Staten Island, north fork Mokelumne River, south bank, just above junction with South Fork.
Camp 33	80.2	Staten Island, south fork Mokelumne River, north bank, two miles above north fork junction.
Tyler Island Ferry	81.9	On Georgiana Slough, one and one-half miles east of Isleton.
New Hope Bridge	87.0	North end Staten Island at division point for north and south forks Mokelumne River.
<u>SAN JOAQUIN RIVER DELTA</u>		
Antioch	54.9	San Joaquin River, left bank, three and one-half miles above Sacramento River junction.
Jersey	61.4	San Joaquin River, left bank, one mile below mouth of False River.
Twitchell Island Pump	65.4	San Joaquin River, Twitchell Island, south side, about midway between Seven Mile and Three Mile Sloughs.
Webb Pump	72.0	Washington Slough, two miles below Old River junction.
Central Landing	72.0	Bouldin Island, Mokelumne River, left bank, one-half mile above San Joaquin R. junction.

TABLE 84 (CONTINUED)

SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN DURING 1930

Stations	Miles: : from : : Golden: : Gate :	Location
Ward Landing	: 79.6 :	<u>SAN JOAQUIN RIVER DELTA (CONTINUED)</u> Near Southwest corner of Empire Tract. Near junction of river and Little Connection Slough.
Holland Pump	: 80.6 :	Rock Slough, north bank, one and one-half miles west of Old River junction.
McDonald Pump	: 82.7 :	San Joaquin River, Northeast corner of McDonald Island about 1½ miles below Hog Island.
Mandeville Pump	: 83.0 :	South end Mandeville Island, Connection Slough, north bank, one mile west of Middle River.
Rindge Pump	: 86.1 :	San Joaquin River, north bank, one mile below Fourteen Mile Slough junction.
Orwood Bridge	: 86.3 :	Old River at Santa Fe Railroad crossing.
East Contra Costa I.D.	: 86.7 :	At East Contra Costa Irrigation District pumping plant at head of Indian Slough.
Middle River P.O.	: 87.7 :	Middle River, east bank, at Santa Fe Railroad crossing.
Mansion House	: 88.4 :	Victoria Island, Old River, east bank, at junction with North Victoria Canal.
Stockton Country Club	: 90.8 :	On Lindsay Cut-off (San Joaquin River) north bank, about three quarters mile above Burns Cut-off junction.
Drexler Bridge	: 92.3 :	Middle River, southwest corner of Drexler Tract about one-half mile north of Victoria Canal.
Stockton	: 94.8 :	Near head of Stockton Channel at wharf of California Transportation Company.
Mossdale Bridge	: 108.5 :	San Joaquin River at Lincoln Highway Crossing, about three miles southwest of Lathrop.
		<u>DRAINAGE WATER STATIONS</u>
Jersey Drain	: 61.4 :	Jersey Island, Drainage Pump on San Joaquin River, about 1 mile below False River.
Grand Island Drain	: 68.2 :	Grand Island, Drainage Pump on Steamboat Slough, about 3 miles from Junction Point.
Camp 35 Drain	: 78.7 :	Staten Island, Drainage Pump on South Fork Mokelumne River, 1 mile from junction with North Fork Mokelumne River.
McDonald Drain	: 82.7 :	McDonald Island, Drainage Pump on San Joaquin River, about 1½ miles below Hog Island.
Bacon Island Drain	: 82.9 :	Bacon Island, Drainage Pump on Old River, near junction with Rock Slough.
Mandeville Drain	: 83.0 :	Mandeville Island, Drainage Pump on Connection Slough, about 1 mile from Middle River.
Camp 11 Drain	: 83.1 :	Staten Island, Drainage Pump on North Fork Mokelumne River, 4 miles from junction with South Fork Mokelumne River.

TABLE 85

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	JANUARY							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo & Suisun Bays								
Point Orient	1310	1400	1220	1500	1250	1190	1210	1310
Point Davis	800	910	850	810	660	390	750	610
Bullhead Point	400	590	740	670	370	330	345	380
Bay Point	175	270	268	270	75	20	31	37
O and A Ferry	15	11	18	33	5	5	5	5
Innisfail Ferry	62	*77	72	40	73	112	45	
Sacramento River Delta								
Collinsville	4	8	4	4	5	3	3	4
Emmaton	2	2	2	2	3	2	*3	*3
Three Mile Slough Br.	3	2	2	2	3	2	2	*2
Rio Vista Bridge	2	2	1	2		1	2	3
Liberty Ferry				2	2	2	3	3
Walnut Grove	2	2	1	2	1	1		1
Sacramento	2	1	1	2	1	1	1	1
Mokelumne River Delta								
New Hope Bridge	*2	2	1	1	*1	1	*1	*2
San Joaquin River Delta								
Antioch	5	6	4	7		5	6	5
Jersey	6	6	5	6	8	7	7	6
Twitchell Island Pump	4	5	5	4	6	5	6	6
Webb Pump	6	8		7	12		8	8
Central Landing	*3	4	2	3	*2		3	2
Ward Landing	13	13	12	13	14	11	12	12
Holland Pump	13	12	11	12	12	14	13	13
Rindge Pump	19	20	18	15	9	11	11	10
East Contra Costa I.D.			11	11		16	*15	*15
Stockton Country Club	*18	22	15		13	5	*11	*8
Drexler Bridge	9	11	10	9	8	9	9	7
Stockton	95	*101	101	49	49	104	55	
Mossdale Bridge	*8	7	7	5	*6	6	5	4
Drainage Water Stations								
Jersey Drain	31							41
Grand Island Drain							7	8
McDonald Drain	22	22	22	24	22			
Bacon Island Drain	12	12	10	12	17	15		15
Mandeville Drain							19	20

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	FEBRUARY						
	2	6	10	14	18	22	26
San Francisco, San Pablo & Suisun Bays							
Point Orient	1340	1200	1370	1310	1370		1200
Point Davis		780	860	720	730	640	640
Bullhead Point	310	625	560	445	310	780	265
Bay Point	45		200	81	*34	243	10
O and A Ferry	6	6	5	9	4	3	2
Innisfail Ferry	104	52	33	31	31	19	65
North San Pablo Bay							
Sonoma Creek Bridge							480
Grand View							705
Vallejo							320
Lakeville							225
Cuttings Wharf							13
Napa							1
Petaluma							6
Sacramento River Delta							
Collinsville	5	4	3	*2	3	3	3
Emmaton	*3	3	3	3	3	3	*1
Three Mile Slough Br.	3	2	2	3	2	2	
Rio Vista Bridge		2	1	2	1	1	
Liberty Ferry	*2	2	2	2	1	2	
Walnut Grove	1	1	1	2	1	1	
Sacramento	1	1	1	1	1	1	*1
Mokelumne River Delta							
New Hope Bridge	2	2	1	*1	2	1	*1

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	FEBRUARY (CONTINUED)						
	2	6	10	14	18	22	26
San Joaquin River Delta							
Antioch	*7	5	7	5	5	5	5
Jersey	6	8	6	8	6	6	6
Twitchell Island Pump	5	7	5	5	4	5	4
Webb Pump	9	7	7	6	6	6	5
Central Landing	2	2	3	1	1	2	
Ward Landing	11	12	10	10	10	9	11
Holland Pump	12	13	13	10	11	10	10
Rindge Pump	17	10	15	13	13	14	
East Contra Costa I. D.	17	15	15	*15	12	14	*14
Stockton Country Club	9		13	12	15		*5
Drexler Bridge	8	6	7	6	7	8	9
Stockton	102		76	81	100		91
Mossdale Bridge	4	6	9	8	8	8	7
Drainage Water Stations							
Jersey Drain	44	41	41			48	52
Grand Island Drain	7	7	9	7	8		10
Camp 35 Drain			25	17	19	16	23
McDonald Drain			22	16	21	17	23
Bacon Island Drain	16	14	13	11	11	11	13
Mandeville Drain	22	21	20	20	21	23	21
Camp 11 Drain			34	70	71	58	55

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930

Samples taken by local observers approximately one and one-half hours
after high high tide.

Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	MARCH							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo & Suisun Bays								
Point Orient	1080	860	1160	1210		980	1360	1260
Point Davis	370	400	460	505		310	670	860
Bullhead Point	140	115	105	195	7	65	330	285
Bay Point	*6	*6	6	8	6		92	35
O and A Ferry	2	6	4	5			3	3
Innisfail Ferry	99	86	66	31	37		42	34
North San Pablo Bay								
Sonoma Creek Bridge	*240	*150	220	135	130	215	185	*270
Grand View	630	380	395	425	360	350	515	580
Vallejo	260	152	220	120	32	191		
McGill		4	27	71	*73	70	93	*154
Merazo		77	52	81	*100	66	104	
Lakeville	*260	*29	85	172	*135		190	
Cuttings Wharf	33	*7	16	62	*34	14	55	260
Napa		*2	2	*4		3	4	
Petaluma	*10	4	13	14	11	22	35	*50
Sacramento River Delta								
Collinsville	3	3	2	2	2	3	2	*1
Emmaton	*3	3	3	4	1	*2	2	*1
Three Mile Slough Br.	1	2	2	1	2	2		1
Rio Vista Bridge	1	1	2	2	2	2	1	*1
Liberty Ferry		2	3		3	4	2	*1
Walnut Grove	1	1	2		2	1	2	1
Sacramento	1	1	1	*1	2	1	*1	1
Mokelumne River Delta								
New Hope Bridge	1	1	1	*1	1	1	1	1

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	MARCH (CONTINUED)							
	2	6	10	14	18	22	26	30
San Joaquin River Delta								
Antioch	4	*7	4	5	4	5	5	*4
Jersey	5	5	5	5	5	6	5	4
Twitchell Island Pump	4	9	4	5	4	5	3	2
Webb Pump	7	8	7	5	6	7	6	5
Central Landing	4	2	1	2	3	2	2	2
Ward Landing	*10	9	7	7	8		9	*9
Holland Pump	10	13	13	13	11	12	11	10
Rindge Pump	7	6	8	9	9	11	12	*11
East Contra Costa I.D.	16		19	*18	15	16	11	10
Stockton Country Club			8	*7		12		8
Drexler Bridge	10	10	8	9	7	6	7	9
Stockton	86	*63	74	*104		81	75	84
Mossdale Bridge	8	6	4		7	8	8	6
Drainage Water Stations								
Jersey Drain	49	57	49	51	50	45	21	40
Grand Island Drain	8	8	9	9	8	9	9	6
Camp 35 Drain	21	24	26	21				
McDonald Drain	20	21	19	19	28	22	23	28
Bacon Island Drain	14	15	13	14		13	13	12
Mandeville Drain	20	20	21	22	21	22	22	19
Camp 11 Drain	46	51	76		82	82	84	84

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	APRIL							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1220	1220	1320	1240	1230	970	1220	1390
Point Davis	640	565	630	650	520	720	680	720
Bullhead Point	410	380	260	235	240	475	420	500
Bay Point	11	43	*14		10	*41	25	
O and A Ferry	3	3	5	4	3	6	3	3
Innisfail Ferry	*38	34	*40	27	33	*44	44	37
North San Pablo Bay								
Sonoma Creek Bridge		435	570	*700	590		*640	*480
Grand View	400	615	*765	*660	*800	790	*725	*810
Vallejo	470	345	*360		290	480	370	
McGill	*117	293	*350	*335			*280	*400
Merazo			*340					
Lakeville	*250		*300	*350	*380	*415	*420	*470
Cuttings Wharf	*201	172	*280	*310	*220	*170	*240	*270
Napa	*3		*6	*5	*6	*6		*8
Petaluma	*63	74	*130	*111	160	*180	*185	*225
Sacramento River Delta								
Collinsville	3	3	*1	*4	3	*3	2	3
Emmaton	2	2	2	Empty		*2	2	*2
Three Mile Slough Br.	2	2	*1	*1	1	2	1	*2
Rio Vista Bridge	2	2	2	1	1	2	2	1
Liberty Ferry	2	3	2	*2	2	*2	*1	*2
Walnut Grove	1	3	1	1	1		1	
Sacramento	1		1	1	1	1	1	1
Mokelumne River Delta								
New Hope Bridge	1	1						

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	APRIL (CONTINUED)							
	2	6	10	14	18	22	26	30
San Joaquin River Delta								
Antioch	3	4	*5	*5	5	*4	*3	*4
Jersey	4	6	*4	5	5	6	*5	4
Twitchell Island Pump	2	4	*3	3	5	4	4	*3
Webb Pump	6	7	5	6	6	7	5	*5
Central Landing	2	4	2	3	4	*4	*2	*1
Ward Landing	8	8	8	*8	*8		*9	6
Holland Pump	9	11	9	9	10	9	8	8
Rindge Pump		10	*14	9	9	13	9	*6
East Contra Costa I.D.	9	11	*9	10	10	*9	*8	
Stockton Country Club	10	15	*13	7	9			11
Drexler Bridge	8	8	7	8	7	7	5	*4
Stockton	88	108	*103	100	104	89	102	*11
Mossdale Bridge	5	7	3	4	6	*5	*3	
Drainage Water Stations								
Jersey Drain	40	40	27	46	40	34	31	31
Grand Island Drain	9	8	7	9	9	7	7	7
Camp 35 Drain	22	19		17	17	16	17	
McDonald Drain	17	15	18	15	16	11	12	
Bacon Island Drain	15	11	11	9	9	9	7	7
Mandeville Drain	19	21	20	21	22	22	21	19
Camp 11 Drain	81	94	91	62	56	53	31	16

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	MAY							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient		1290	1360	1350	1440	1330	1270	1540
Point Davis	550	750	820	700	530	590	910	960
Bullhead Point	525	360	480	400	430	545	730	750
Bay Point		28	*55	*49	81		*177	*125
O and A Ferry	3	3	3	5	6	4	15	13
Innisfail Ferry	*34	*32	*30	32	29	24		*42
North San Pablo Bay								
Sonoma Creek Bridge	*690	*530	*700	*720	*700	880		*820
Grand View	*730	840	*900		*990	*880	*960	*930
Vallejo	415	400	410					
McGill	*420	*380					*470	
Lakeville	*550		*570	*560	*620	*630		
Cuttings Wharf	*315	740	*360	*350	*380	*310	*330	
Napa	*7	7	*7	*9		11		
Petaluma	265	*300	*300	*360	420	*430	*450	*510
Sacramento River Delta								
Collinsville	3	*3	*3	*2	2	*4	3	*5
Emmaton	2	3	2	3	*3	*3	*2	2
Three Mile Slough Br.	*2	*3	2	2	*2	*2	*2	2
Rio Vista Bridge		1	2		2	2	4	2
Liberty Ferry	2	*1	2	*1	2	*2	2	2
Walnut Grove	2	1	1	2	2	1	3	2
Sacramento	1	*1	*1	1	1	*2	1	1
Mokelumne River Delta								
New Hope Bridge		*1	*1	1	1	1	2	*2

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	MAY (CONTINUED)								
	2	6	10	14	18	22	26	30	
San Joaquin River Delta									
Antioch	3	*4	*4	4	4	*5	*4	7	
Jersey	4	*4	*6	*4	5	5	*5	4	
Twitchell Island Pump	3	*3	*3	3	3	4	Empty	4	
Webb Pump	5	*4	5	5	4	5	4	4	
Central Landing	3	*2	*2	*3	3	*2	*2	3	
Ward Landing		*6		5	5	7	*9	*9	
Holland Pump	8	*6	6	7	7	7	6	7	
Rindge Pump	8	*12	12	13	12	*13	9	7	
East Contra Costa I.D.	4	*5	*6	5	6	*8	*7		
Stockton Country Club	8	*15	13			*11	9	7	
Drexler Bridge	6	5	5	6	5	6	6	6	
Stockton	120	91		80	68	74			
Mossdale Bridge	3	*5	*5	5	7	*4	*4	4	
Drainage Water Stations									
Jersey Drain	32	24	19	32	40	26	23	24	
Grand Island Drain	6	6	7		4	6	6	6	
Camp 35 Drain	13	12	15	8	5	7	6	6	
McDonald Drain	8	14	9	12	13	14	13	9	
Bacon Island Drain	8	8	6	7	7	8	9	8	
Mandeville Drain	20	19	19	19	17	18	18	16	
Camp 11 Drain		44	17	12	49	25	36	27	

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	JUNE							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo & Suisun Bays								
Point Orient	1380	1440	1520	1470	1390	1480	1550	1510
Point Davis	690	940		1080		1180	1150	1120
Bullhead Point	510	800	690	680	820	900	960	860
Bay Point	200	*155	*250	*350	*260	*335		*460
O and A Ferry	9	13	82	65	89	137	185	215
Innisfail Ferry	42	40	47	*77	65	*70	*119	172
North San Pablo Bay								
Sonoma Creek Bridge	980	920	*900	*860	*940	970		
Grand View	*960	1000	*1000	*890	1010	1020	*1100	*1140
Vallejo	530			640	700	820		880
McGill				*540		*700		*740
Lakeville		*810	*810		940	*960		1060
Cuttings Wharf	*530	*540	*550	*500	*550	640	*590	*620
Napa	*23	49	56		*83	117	195	*180
Petaluma		*570	*620	670	*700	*730	*760	860
Sacramento River Delta								
Collinsville	4	*4	*9	36	*9	*12	*41	94
Emmaton	3	*3	4	4	4		*5	5
Three Mile Slough Br.	2	3	*4	3	5	4	4	5
Rio Vista Bridge	2	4	3	2	4	3	6	3
Liberty Ferry	2	*3		2	*2			3
Walnut Grove	2		2	1	3	3		3
Sacramento	1	1	1		1	2	1	2
Mokelumne River Delta								
New Hope Bridge	1	*1	*1	1	*1	*1	1	1

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930

Samples taken by local observers approximately one and one-half hours after high high tide.

Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	JUNE (CONTINUED)							
	2	6	10	14	18	22	26	30
San Joaquin River Delta								
Antioch	5	*5	*6	13	9	*7	*15	43
Jersey	5		4	*4	*6	*6	*5	10
Twitchell Island Pump	4	5	4	4	*6	*5	6	5
Webb Pump	5	6	5	4	5	6	5	6
Central Landing	3	*4	*2	2	*3	*3	*4	4
Ward Landing	7	*7	*7	6	*8	*7	*7	*8
Holland Pump	8	7	7	7		5	6	7
Rindge Pump	10	13	9	6	*5	*6	9	10
East Contra Costa I.D.		*7	*6	*6	*6	*6	4	
Stockton Country Club	11	*15	7	6		*9		12
Drexler Bridge	6	6	6	6	*4	7	5	4
Stockton	111	79	82	93	117	108	97	
Mossdale Bridge	6	*3		2	3	3	4	7
Drainage Water Stations								
Jersey Drain	18		17	17	17	26	19	17
Grand Island Drain	5	6	6	5	7	7	5	7
Camp 35 Drain	4	6						
McDonald Drain	11	11	13	12	9	9	10	
Bacon Island Drain	7	8	8	8	7	8	6	7
Mandeville Drain	16	14	11	10	9	9	8	9
Camp 11 Drain	48	52	30	15	19	43	30	

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930

Samples taken by local observers approximately one and one-half hours
after high high tide.

Salinity expressed in parts of chlorine per 100,000 parts of water

Station	JULY							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo & Suisun Bays								
Point Orient	1620		1550	1640	1640	1600	1650	1740
Point Davis	1220	1330	1270	1160	1190	1390	1410	1450
Bullhead Point	940	1000	870	880	940	1190	1260	1100
Bay Point	640	*560	*560	*620	*640	*790		*780
O and A Ferry	220	325	340	320	540	620	590	540
Innisfail Ferry		*190	*300	300	390	*465		560
North San Pablo Bay								
Sonoma Creek Bridge	1050	1045	*1090	1130	1200	1210	*1180	1340
Grand View	1170	1120	*1200	*1220	1200	*1170	*1240	1320
Vallejo	840	950	930		1060	1090	1150	1130
McGill	1010	*1030		*1020	*1200			
Merazo			*920					
Lakeville	1050	1060	*1100		1160	*1180	*1240	*1300
Cuttings Wharf	700	*740	*800	*790	860	940	*1020	1120
Napa	240		225	*285	320	375		*370
Petaluma	860	*890	*890	950	*990	*1030	*1100	*1000
Sacramento River Delta								
Collinsville	*74	*101	99	*136	*180	*230	*300	*330
Emmaton			*12	20		*36	*80	74
Three Mile Slough Br.	6	*8	11	9	*10	*35	*42	*36
Rio Vista Bridge	3	4	4	4	5	6	5	7
Junction Point					*6	*6	*5	6
Liberty Ferry	*3	*4		5	*5	*5	*6	*6
Isleton Bridge					5	5	4	5
Walnut Grove	4	4	4	4		6	6	6
Sacramento	*3	4	4	4	*4	4	4	*4
Mokelumne River Delta								
Southwest Point					*7	*7	*5	*9
Camp 33					*5	*6	*5	*7
Tyler Island Ferry					6	*6	5	9
New Hope Bridge	*1	*1	2	2	*1	*1	1	*1

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	JULY (CONTINUED)								
	2	6	10	14	18	22	26	30	
San Joaquin River Delta									
Antioch	*34	*48	*77	126	*85	*168	*240	305	
Jersey	*8	*8	*15	*25	*13	*29	33	62	
Twitchell Is. Pump	*6	*6	8	7	*8	24	24	*12	
Webb Pump	6	7	5	6	8	15	15	13	
Central Landing	*5	*6	*4	5	*8	*5	*6	*9	
Ward Landing	*7	*8	*8	7	*8	*8		8	
Holland Pump	*6	*7	6	6	*7	*7	9	*9	
Mandeville Pump					*8	*7	6	*9	
Rindge Pump	*13	*14	11	11	*13	*11	13	*12	
Orwood Bridge					7	6	6	7	
East Contra Costa I.D.	*6	*5	4	5		*7	7	*7	
Middle River P. O.						*8	*7	*8	
Mansion House							*6		
Stockton Country Club			13		*13		14		
Drexler Bridge	*5	*5	5	4	*6	7	6	*6	
Stockton	87	62	*84	*79	85	*82	94	99	
Mossdale Bridge	*5	*7	*6	*7	*8	8	6	10	
Drainage Water Stations									
Jersey Drain	17	20	18	26	22	23	29	38	
Grand Island Drain	8	10	6	7	8	7	11		
Camp 35 Drain						8		10	
McDonald Drain	10	9	11	11	12	11	10	11	
Bacon Island Drain	7	7	6	6	7	7	6	8	
Mandeville Drain			8	6	8	7	6	8	
Camp 11 Drain	18	9	9	8	7	7	9	11	

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	AUGUST							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo & Suisun Bays								
Point Orient	1660	1680	1640	1630	1680	1710	1710	1750
Point Davis		1340	1420	1390	1510	1540	*1560	1580
Bullhead Point	1260	1290	1160	1160	1280	1360	1140	1340
Bay Point	*870	*820	*840	950	*850	*950	*1000	*980
O and A Ferry	630	625	610	800	750	660	680	780
Innisfail Ferry	*530	*560	*580	650	700	*720	660	810
North San Pablo Bay								
Sonoma Creek Bridge	1320	1320	1370	1420	1480	*1470	*1500	
Grand View	*1200	*1320	*1400	1420	1480	1500	*1430	1540
Vallejo	1150	1230	1170		1250	1240	1270	1320
McGill	1260							
Lakeville	*1240	*1320	1320	1330		1340		1520
Cuttings Wharf	1040	*1010	*940	1060	1050	*1050	*1210	1160
Napa	485	510	525			620		690
Petaluma	*1180	*1120	*1120	*1150	*1200	*1240	*1270	
Sacramento River Delta								
Collinsville	340	*400	*360	*450	*400	*460	500	*500
Emmaton		*120	*151	*225	*175	*168	*214	
Three Mile Slough Br.	44	62	*52	78	148	139	92	150
Rio Vista Bridge	10	10	7	9	32	52	36	
Junction Point		*5	6	6	*8	*10	*10	*10
Liberty Ferry		*4	6	*6	*5	*6	5	*6
Isleton Bridge	6	6	6	6	7	10	4	8
Walnut Grove		5	5	5	5	6	*5	4
Sacramento	*5	.5	3		4	4	4	*2
Mokelumne River Delta								
Southwest Point	*6	*5	5	*6	*9	*6	7	5
Camp 33	*5	*5	4	*5	*5	*4	4	*5
Tyler Island Ferry	7	*6	4	6	*4		4	*6
New Hope Bridge	*1	*1	1	*1	*1	*1	1	

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	AUGUST (CONTINUED)							
	2	6	10	14	18	22	26	30
San Joaquin River Delta								
Antioch	*230	*315	420	435	*315	*380	460	315
Jersey	*45	*75	94	120	*97	*135	220	*120
Twitchell Island Pump	*18	*24	46	*23	*23	*56	50	
Webb Pump	18	26	30	34	41	58	47	61
Central Landing	*6		*7	*11	*10	*12	*9	*11
Ward Landing	*8	*9	*7	*9	*10	*11	12	13
Holland Pump	*12	14	13	*12	*12	22	23	*16
Mandeville Pump	*8	*8		*7	*9	10	13	*11
Rindge Pump	*16	12	10	*14	*14	15	13	*15
Orwood Bridge	7	7	6	8	8	8	7	10
East Contra Costa I.D.	*9	*9	7		*8	*5	6	*9
Middle River P.O.	*11	*7	6	9	*8	*7	*8	10
Mansion House		7	7	*8	*8	*8	*7	*9
Stockton Country Club	*17	18	16	*17	*17	*15		*15
Drexler Bridge	*5	7	6	*7	*7	6	7	7
Stockton	100	81	83		88	85	95	94
Mossdale Bridge	*10	9	5	*6	*5	6		
Drainage Water Stations								
Jersey Drain	31	40	36	33	49	78	52	66
Grand Island Drain	6	6		8	7		5	6
Camp 35 Drain	7		6		6	7	8	
McDonald Drain	10	10						
Bacon Island Drain	7	8	7	9	9	9	8	11
Mandeville Drain	7	8	7	8	10	10	13	15
Camp 11 Drain	8	19	9	7	20	10	7	10

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	SEPTEMBER							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1750	1750	1780	1690	1770	1730	1680	1750
Point Davis	1510	1460	1560	1500	1550	1620	1480	
Bullhead Point	1360	1380	1320	1170	1300	1290	1240	1140
Bay Point		*1060	*1030	*940	*940	990	980	770
O and A Ferry	800	690	650	640	750		540	*560
Innisfail Ferry	*790	*780	790	800	*770	810	660	700
North San Pablo Bay								
Sonoma Creek Bridge	1540	*1580	1630	1600	*1560	*1540	1670	
Grand View	1570	*1550	1610	1580	*1590		1600	1560
Vallejo		*1320	1340	1330	1300	1230	1260	
McGill					*1490			
Merazo					*1410			
Lakeville	*1530	*1500	*1510		1610	*1690	1670	*1680
Cuttings Wharf	*1190	*1240	1270	1240	*1320	1290	1240	1320
Napa	*620				800	840		900
Petaluma	*1360	*1360	1350	*1380	*1450		*1480	*1470
Sacramento River Delta								
Collinsville	*570	*530	550	*450		365	320	*245
Emmaton	*146		*250	200		80		*17
Three Mile Slough Br.	*105	115	*150	*70	51	31	24	18
Rio Vista Bridge	20	12	19	10	9	4	6	5
Junction Point	*10	*8	*7	*5	*6	*3	4	*4
Liberty Ferry	*6	*5	5	*4	*5	3		
Isleton Bridge	7	5	5	4	3	3	3	2
Walnut Grove		3	6	4	5			3
Sacramento	4	3	*3	*3			*3	*2
Mokelumne River Delta								
Southwest Point	*6	*5	*6	*7	*7	*4	*4	*3
Camp 33	6	*5	*5	*7	*5	4	*4	*4
Tyler Island Ferry	6	*4	4	7	*4	3	4	*3
New Hope Bridge	*1	1	1	1		1	*1	1

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	SEPTEMBER (CONTINUED)								
	2	6	10	14	18	22	26	30	
San Joaquin River Delta									
Antioch	*400	*400	435	470	*280	310	315	240	
Jersey	160	*150	160		*130	100	105	*57	
Twitchell Island Pump	*42	72	37	43	*30	*28	27	*14	
Webb Pump	60	47	44	41	34	27	26	*18	
Central Landing	*14	*15	11	*10	*8	10	*6	*7	
Ward Landing	15	*13	*13	16	*16	14	16	*13	
Holland Pump	*22	*22	18	*19	*20	20	23		
McDonald Pump							*15	*14	
Mandeville Pump	*14	14	*15	*17	*16	*15	*17	*17	
Rindge Pump	*14	13	*14	*16	*14	*14	*11	*11	
Orwood Bridge	11	11	11		12	11	11		
East Contra Costa I.D.	*9	*8	*10	*11	10	9	9	*9	
Middle River P.O.	*10		*10	*13	*11	10	12	*12	
Mansion House	*9	*8	*9	*11	*8	*8	*8	*8	
Stockton Country Club	15		*10	*14		*9	*13	*10	
Drexler Bridge	*8	7	*9	10	*8	6	8	7	
Stockton	83		99	80	82		71	75	
Mossdale Bridge	5	4	7	*7	5	6	7	*5	
Drainage Water Stations									
Jersey Drain		40	37		35		33	33	
Grand Island Drain	6	6	7	9	9	6	7	6	
Camp 35 Drain						7	8	8	
McDonald Drain						16	17		
Bacon Island Drain	12	11	14	15	12		13	12	
Mandeville Drain	16	16	19	21	19	17	18	18	
Camp 11 Drain	14	19	24	39	27		31	31	

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930

Samples taken by local observers approximately one and one-half hours
after high high tide.

Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	OCTOBER							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1700	1730	1890	1660	1520	1660	1580	1260
Point Davis	1310	*1430	1500		1380	1320	1250	
Bullhead Point	1090	1100	1180	1120	980	960	1050	980
Bay Point	790	770	860	*550	740	700	650	
O and A Ferry	400	350	560	340	305	330	240	310
Innisfail Ferry	690	630	600	520	520		480	480
North San Pablo Bay								
Sonoma Creek Bridge	*1520	1500	*1510	1390	*1380	*1360	1380	1260
Grand View	*1600	1560	1490	1490	1520	1500	1520	1450
Vallejo	*1160	1140	1200	1120	1080	1060	1060	1000
McGill	*1420	1390	1450	1320		1300		*1200
Merazo		1270	1320				1210	
Lakeville		1660	1520	*1640		1670	*1690	1680
Cuttings Wharf	*1280	1290	1200	1180	1180	1160	1140	1170
Napa		875			900	860		850
Petaluma	*1500	1480	1520	*1330	1400	1480	*1530	1580
Sacramento River Delta								
Collinsville	*250	230	265	140	160	250	155	120
Emmaton	*14	*20	10	*5	*11	11	8	*4
Three Mile Slough Br.	11	10	11	7	7	6	*6	*3
Rio Vista Bridge	2	3	3	2	2	2	3	1
Junction Point	*2	1	3	2	1	1	2	3
Liberty Ferry	2	5	3	*2	1		2	2
Isleton Bridge	2	2	2	2	1	1	2	1
Walnut Grove	3	2	2		*3	2		2
Sacramento	1			*1	1	3	*2	1
Mokelumne River Delta								
Southwest Point	*3	*3	*2	*1	1	2	*2	2
Camp 33	*3	*2	*3	*2	2	2	*2	2
Tyler Island Ferry	*2	1	3	2	2	2	4	1
New Hope Bridge	1	1	*1	*1	1	1	*1	1

*Samples taken at low high tide

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	OCTOBER (CONTINUED)								
	2	6	10	14	18	22	26	30	
San Joaquin River Delta									
Antioch	*225	200	225	180	140	110	150	85	
Jersey	48	43	50	44	20		27	10	
Twitchell Island Pump	*14	15	12	11	7	8	8	8	
Webb Pump	14	14	14	11	8	12	9	8	
Central Landing	*6	6	5	*5	2	6	*3	3	
Ward Landing	*13	13	*12	12	11	12	12	9	
Holland Pump	*8	16	17	*15	15	15	13	10	
McDonald Pump	*13	13	13			12	12	11	
Mandeville Pump	*14	13	*11	*12	12	12	*12	10	
Rindge Pump	*10	12	14	*13	11	10	*14	13	
Orwood Bridge	10	8	8	9	7	8	8	7	
East Contra Costa I.D.		7	*8	*9	7	11	*12	11	
Middle River P.O.	11	10	*9	*9	13	9	*9	7	
Mansion House	*8	*7	*8		8		*9		
Stockton Country Club				*14			*10		
Drexler Bridge	6	6	6	*6	4	7	9	6	
Stockton		62	*67	81	72	84	68	88	
Mossdale Bridge	6	*6	*7	*8	5	6	*8	6	
Drainage Water Stations									
Jersey Drain	28	27	26	30	29		42	37	
Grand Island Drain	6	5	5	9	5	7	7		
Camp 35 Drain	9	8	7	6	6	5	6	8	
McDonald Drain	17	14	18	17	17	16	17		
Bacon Island Drain	12	11	14	13	8	12	12	10	
Mandeville Drain	17	18	16	19	18	18	17	18	
Camp 11 Drain	23	15	27	24	16		8	11	

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	NOVEMBER							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1660	1640	1710	1630	1730	1660	1570	1460
Point Davis	1320	1280	1240	1300	*1220	1210	1220	1220
Bullhead Point	1080	1070	*920	860	940	970	860	1080
Bay Point			750	*690	*540	550	530	640
O and A Ferry	340	260	360	250	225	230	205	300
Innisfail Ferry	470	480	475	490	460	415	405	420
North San Pablo Bay								
Sonoma Creek Bridge	1300	1300	*1280	*1260	*1120	*1170	*1160	
Grand View	1500	1470	1480	1420	1360	1420	1440	1370
Vallejo	1080	1130					880	1020
McGill			1180		1100	1060		
Merazo	1140	1150				1030		
Lakeville	1660		*1700	1700	1620		1670	
Cuttings Wharf	1090	1100	1160	1090	1020	1050	*1020	960
Napa			830	760		760	710	
Petaluma	1500	1540	*1550	1540	1500	1500	1470	1440
Sacramento River Delta								
Collinsville	100		*180	160	220	*80	60	86
Emmaton			*3		4	2	2	*3
Three Mile Slough Br.	3	11	*6	3	*2	4	3	1
Rio Vista Bridge	2	1	3					
Junction Point	1	2	2					
Liberty Ferry	1	2	2	2				
Isleton Bridge	1	2						
Walnut Grove	1		2	1				
Sacramento	1	1	*1	1	1	*3	1	1
Mokelumne River Delta								
Southwest Point	2	2	*2	1				
Camp 33	1	2	*2	2				
Tyler Island Ferry	1	2						
New Hope Bridge	1	1	*1					

* Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930
 Samples taken by local observers approximately one and one-half hours
 after high high tide.
 Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	NOVEMBER (CONTINUED)							
	2	6	10	14	18	22	26	30
San Joaquin River Delta								
Antioch	140	133	120	89	78	52	30	36
Jersey		20	*10	13	14		9	7
Twitchell Island Pump	7	8	*7	7	8	7	5	
Webb Pump	7	8	9	7	8	7	6	5
Central Landing	4	5	4	4	5	*4	4	
Ward Landing	12	11	*11	10	9	10	11	10
Holland Pump	10	11	11	8	9	12	9	9
McDonald Pump	10	11	*12	13	13	13	11	11
Mandeville Pump	11		*10	13	10	*10	9	9
Rindge Pump	13	11	*13	11	12	11	11	10
Orwood Bridge	7	8	8	7	8	9	8	7
East Contra Costa I.D.		13	*12	13		*13	17	
Middle River P. O.	7	10	10	11	10	11	9	9
Mansion House	8	7	*8	8	*8	*9		
Stockton Country Club						*10	10	
Drexler Bridge	8	8	9	7	6	8	6	11
Stockton	90	77	68		82	82		
Mossdale Bridge	7	8	*8	8	7	*7	7	6
Drainage Water Stations								
Jersey Drain		29	26	45	43		26	41
Grand Island Drain	8	7	6	5	5	6	6	6
Camp 35 Drain	8	8	7	5				
McDonald Drain	16	18	15	22	16	18	18	16
Bacon Island Drain	9	12	11	10	11	11	9	9
Mandeville Drain	15		16	17	16	17	16	15
Camp 11 Drain	10	6	8		7	13	15	

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930

Samples taken by local observers approximately one and one-half hours after high high tide.

Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	DECEMBER							
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1540	1710	1600	1600	1670	1690	1600	1560
Point Davis	1280	1230	1240	1260	1120	1240	1140	1270
Bullhead Point	1020	1060	990	980	1040	920	900	980
Bay Point	750		*560	600	*600	560	640	720
O and A Ferry		280	160	320	230	250	190	440
Innisfail Ferry	380	410	390	420	400	350	350	
North San Pablo Bay								
Sonoma Creek Bridge	*1140	1180	*1110	*1040	*1070	*1090	1090	1100
Grand View	1410	1400	1340	1280	1360	1410	1300	1280
Vallejo	1060	1030	1000		970	920	980	
McGill	1070				1020			
Lakeville	1530		1570	1620	1500		1600	
Cuttings Wharf	980	1040	1020	1000	1030	*1000	1000	970
Napa	720	740	740	700		670		
Petaluma	1500	1450	*1510	1500	1540	*1560	1510	1480
Sacramento River Delta								
Collinsville	78	148	*105	104	102	90	69	125
Emmaton	2	3		2	3	*3		
Three Mile Slough Br.	2	*1	2	1	3	2	3	
Sacramento	*1	*1	*1	1	*1	*1		1

*Samples taken at low high tide.

TABLE 85 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS, 1930

Samples taken by local observers approximately one and one-half hours
after high high tide.

Salinity expressed in parts of chlorine per 100,000 parts of water.

Station	DECEMBER (CONTINUED)							
	2	6	10	14	18	22	26	30
San Joaquin River Delta								
Antioch	36	92	54	50	69	52	37	45
Jersey	7	16	11	7	14	11		7
Webb Pump	5	7	8	7	7	7	7	6
Central Landing	5	*3	*4	2	3	*3	*6	*5
Ward Landing	9	*9	*11	10	12	12	11	9
Holland Pump	9	12	11	8	9	10	11	9
McDonald Pump	11							
Mandeville Pump	9	10	*10	8	11	*10		*8
Rindge Pump	10	12	*11	8	10	10	9	9
Orwood Bridge	7	8	9		8	8	7	7
East Contra Costa I.D.	13	*14		12	14	*14	11	
Middle River P.O.	8	10	*8	9	10	8	8	8
Mansion House	*9	*8	*8	8	7	*9	6	
Stockton Country Club	11		9			10		
Drexler Bridge	8	8	9	7	6	7	7	9
Stockton	66	60	68			57		
Mossdale Bridge	3	7	*6	4	6	*7	7	9
Drainage Water Stations								
Jersey Drain	31	32	26	27	28	29		33
Grand Island Drain	5	6	5	7	6	5		5
Camp 35 Drain					8	8	11	5
Bacon Island Drain	10	11	10	10	16	10	11	9
Mandeville Drain	16	17	17	15	17	16		14
Camp 11 Drain	9	10	7	8				

*Samples taken at low high tide.