STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

CULBERT L. OLSON, Governor
FRANK W. CLARK, Director of Public Works
EDWARD HYATT, State Engineer

REPORT OF

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

FOR YEAR

1938

APRIL, 1939

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STATE PRINTING OFFICE

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SACRAMENTO - SAN JOAQUIN

WATER SUPERVISION

FOR
1938

Sacramento, 1939

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ACKNOWLEDGMENT

In the conduct of the activities and investigations under the heading of "Sacramento-San Joaquin Water Supervision", valuable assistance has been rendered by many individuals and public and private agencies.

Land owners and water users and the executives, engineers, managers, and water superintendents of the various water organizations throughout the territory covered by this work have cooperated fully in furnishing the many and varied data requested.

For the compilation of pumped diversions the Pacific Gas and Electric Company, San Joaquin Light and Power Corporation and Merced, Modesto and Turlock Irrigation Districts have furnished a large number of power consumption records.

Valuable cooperation has been extended by the Water Resources Branch of the United States Geological Survey, Department of the Interior.

The State Division of Highways has cooperated in the expeditious and efficient testing of salinity samples in its testing laboratory. The Maintenance Department has cooperated in taking water samples.

In the San Joaquin Valley the City of San Francisco Public Utilities Commission, Hetch Hetchy Water Supply, makes available a large amount of stream flow data.

The Merced, Modesto, Turlock and Oakdale Irrigation Districts and Miller and Lux, Incorporated, have assisted in observing and maintaining recording and staff gages in the San Joaquin Valley

ORGANIZATION

Culbert L. Olson - Governor
Frank W. Clark - - - - - - - - - - - - - -Director of Public Works
Edward Hyatt - - - - - - - - - - - - - - - - - - - State Engineer

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Administrative Assistant

ADVISORY COMMITTEE

PERMANENT COMMITTEE OF THE SACRAMENTO-SAN JOAQUIN RIVER PROBLEMS CONFERENCE

This Committee, representing the water users and other interests involved, was appointed by the First Sacramento-San Joaquin River Problems Conference in January 1924. Its continued interest and cooperation and particular activity in the promulgation of effective conservation measures in the seasons of critical water supply have contributed in large measure to the successful prosecution of the Water Supervision Work.

Herbert E. White, Chairman, Sacramento

E. L. Adams, Chico
A. E. Anderson, San Francisco
Alden Anderson, Sacramento
G. A. Atherton, Stockton
P. M. Downing, San Francisco
William Durbrow, Grass Valley
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R. V. Meikle, Turlock
Jesse Poundstone, Grimes
F. T. Robson, Vina
appointed May, 1939

CHAPTER I

INTRODUCTION

The purpose of this report is to make of record the measurements made and data collected in connection with the Water Supervision work in the Sacramento-San Joaquin area during 1938.

Origin and History of Work

The 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. A complete description of the origin, history and conduct 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 in the five year period, 1924 to 1928, inclusive. The Water Supervision reports for subsequent years are mimeographed as is the present report.

Objectives and Scope

The work of supervision is a measure of relief in the difficulties attendant upon water supply conditions and the use of water throughout the Sacramento-San Joaquin territory, particularly on the Sacramento River and in the Delta Region. The situation involves the major problem of satisfying the water requirements for irrigation in both the Up-River areas and the Delta, for the control of salinity in the Delta and Upper Bay areas, and for navigation above Sacramento as demanded by the U. S. War Department, when in nearly every season of

the last fourteen years, each one of these requirements has exceeded the available summer flow in the rivers. Pending ultimate relief through the development of reservoir storage this situation has been met by mutual agreement through a provisional administration of stream flow and diversions. There has been no agreement though under which a water master might definitely and equitably distribute the existing water supply to those entitled to receive it but it seems inevitable that such an agreement or a definite schedule of water priorities must be developed. Its realization will require however, that there shall be available reliable and accurate data over a long period of years covering all of the actual diversions and uses of water, the stream flow, return flow, salinity, and all pertinent hydrographic data. Looking to this requirement, then, the Division of Water Resources is, concurrently with the provisional stream administration, continuing the investigations and all measurements necessary to complete the record of basic data.

Investigational Work

During the past year the investigational work has been carried on along lines similar to the last few years. The work has comprised: measurements and records of the diversions of water from the Sacramento, Feather, Yuba, American, Merced, Tuolumne, Stanislaus, and San Joaquin Rivers on the valley floor and above the Delta; stream flow measurements throughout the territory, partly in cooperation with the Water Resources Branch of the U. S. Geological Survey; measurements and records of waters returned to the Sacramento and San Joaquin rivers; an annual census of irrigated acreages and crops under

all diversions recorded; and observations and investigation of the advance and retreat of salinity in the delta channels and upper bays. In addition, a survey of crops in the Sacramento-San Joaquin delta was made this year. The surveys for the years 1933-1937, inclusive, were omitted.

History of State and Water Users' Cooperative Financing

The complete history of the State and water users' cooperative financing has been published in previous reports.

Conservation Features

A comparison of the run-off and water supply conditions of the 1938 season with those of previous seasons is indicated in Table 1.

TABLE 1

COMPARATIVE SACRAMENTO-SAN JOAQUIN WATER SUPPLY, 1924 TO 1938

Year	Sacramento San Joaquin Run-off in per cent of Normal *	Minimum Flow in Second-feet				Rice Acreage Served by Sacramento River and Tributaries
		Sacramento River at			San Joaquin River near Vernalis	
		Red Bluff	Colusa	Sacramento		
1924	28	2810	1470	705	391	88500
1925	83	3240	1870	2760	660	94700
1926	57	2980	1030	1330	565	128600
1927	114	3580	1960	3420	1290	123300
1928	80	3400	1960	2510	840	101100
1929	42	3060	1550	2300	565	73700
1930	63	2980	1680	2350	645	88000
1931	29	2480	820	Zero	200	126500
1932	78	2620	1530	1900	965	90700
1933	46	2620	1350	1340	569	87400
1934	40	2400	1320	1050	315	91800
1935	86	2860	1780	2700	850	78100
1936	91	2700	1540	2150	980	104400
1937	75	2780	1370	1640	950	109400
1938	160	3880	3000	4950	2030	94800

*Normal taken as 40-year mean (1889-1929) of natural run-off at foothill stations of major tributaries.

CHAPTER II

MEASUREMENTS OF STREAM FLOW

During the irrigation season of 1938, stream flow measurements and records were 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, Wilkins Slough, Knights Landing, and Verona; on the Feather River at Oroville and Nicolaus; on the American River at Fairoaks and H Street Bridge, Sacramento; on the Mokelumne River at Woodbridge; Merced River near Livingston, and on the San Joaquin River near Newman and Vernalis.

The above cooperative stations were supplemented by stations maintained by the Division of Water Resources in connection with the San Joaquin return water measurements (See Chapter IV), by stations as follows: Stanislaus River at Orange Blossom Bridge, Tuolumne River at Roberts Ferry Bridge and Hickman Bridge, Merced River at Yosemite Valley Railroad Crossing and Hills Ferry Road Bridge (near mouth), Dry Creek near Modesto, and San Joaquin River at Delta Bridge and Gustine-Stevinson Highway (Fremont Ford Bridge and Mud Slough). The San Joaquin return water measurement stations were further supplemented by those maintained in cooperation with the Modesto and Turlock Irrigation Districts and the City of San Francisco, Hetch Hetchy Water Supply, as follows: Stanislaus River at Hatmark Ranch, Tuolumne River at La Grange and Tuolumne City and San Joaquin River at Grayson (Laird Slough). The station on the San Joaquin River at Hetch Hetchy Crossing was maintained and records were furnished by the City of San

Francisco Hetch Hetchy Water Supply. In addition, many stations maintained on by-pass and drainage channels for the measurement of return water are listed in Chapter IV.

Sacramento River at Sacramento

The record of the flow of the Sacramento River at Sacramento for the periods of low flow as given in this and previous reports, does not represent actual measurements at a station below the City of Sacramento intake. Because of tidal action during periods of low flow, a gaging station at this point is not maintained. The daily discharge record as given has been computed for the periods of low flow by using the Verona record and making due allowance for the measured inflow and draft between that station and Sacramento. When the flow is above 25,000 cubic feet per second at a gage height of about 10.0, the effect of the tidal influence is lost and a direct ratio between gage height and discharge is used to determine the daily flow. In this computation it is not practicable and no attempt has been made to allow for the time required for the flow to travel from Verona to Sacramento and to make the various deductions and additions enroute at the exact time that the given Verona flow would have passed the respective points of inflow or draft. During the summer period the velocities between Verona and Sacramento are low and a given flow may require a day's time or more to travel this distance. Under these conditions, the computed flow at Sacramento may differ somewhat from that which would have been found if the actual flow could have been measured. Contributing to this difference also there are the accretions or losses which cannot be measured. In the upper sections of the river the invisible ac-

cretions or losses between two points are susceptible of computation as the remaining quantity required to satisfy the equation when the flow at the upper and lower points and all definite intermediate inflows and drafts are known. With no actual measurement of the flow at Sacramento, the invisible accretions or losses between Verona and Sacramento cannot be thus defined and hence they are unaccounted for in the computed flow at Sacramento. From the data presented subsequently in Chapter IV, it would appear that some return flow might be expected in the Verona-Sacramento section but, as indicated in the tabulation of return water (Table 54) no figure for it has been given (except for the measured drains - Table 52) because it could not be derived without a record of the actual flow at Sacramento.

TABLE 2

DISCHARGE OF SACRAMENTO RIVER AT KENNETT-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	7460	30300	23000	17600	20700	11400	5120	4260	3740	3840	6970	8150
2	7250	37600	36800	16700	20700	11100	5590	4130	3740	4040	5200	9870
3	7050	33000	31800	16700	19100	11100	5590	4260	3870	5300	4600	17600
4	7670	25800	26200	20400	18200	10900	5270	4260	3740	4330	4640	10800
5	7460	25400	22000	24700	17600	10400	5430	4130	3740	4140	4600	7870
6	7050	45600	20100	24000	16700	10600	5750	4000	3740	4100	3860	6460
7	6850	57100	19400	22600	16100	10400	5750	4130	3740	4050	4440	5890
8	6850	59600	18200	21000	16100	9680	5270	4000	3870	4050	4980	5620
9	6850	40200	17300	20400	17000	9210	4970	4130	3870	4030	4710	5460
10	5750	46500	16400	21300	16700	8770	4970	4130	3740	3950	4670	5270
11	5920	42000	15900	22300	16700	8330	4970	4130	3740	3940	4400	5000
12	5920	34200	20100	22300	17000	7890	4820	4130	3740	3920	4230	4780
13	5920	38400	35900	21300	17900	8110	4820	4130	3740	3950	3950	4580
14	5750	33800	30600	20400	18500	8110	4820	4130	3740	3970	4100	4610
15	7050	24700	30600	19400	19400	7670	4970	4000	3610	4140	4170	4500
16	8770	20100	57600	19100	19100	7460	4970	4000	3610	4080	4170	4430
17	20100	17000	42400	19700	17600	7250	4820	3870	3740	4130	4050	4430
18	16100	15600	34200	22600	15900	6850	4820	4130	3740	4040	4090	4410
19	15300	13900	45600	24400	14700	6460	4680	4130	3740	4000	4090	4390
20	15300	12100	46500	24700	14200	6460	4680	4000	3610	3960	4090	4320
21	12600	11400	39300	25400	13700	6650	4680	4000	3610	3950	4050	4340
22	11400	11800	34200	24700	13400	6280	4680	3870	3610	3920	3970	4290
23	10900	11600	50200	24000	13900	6280	4540	3870	3740	3950	3970	4230
24	10600	13100	41500	24400	13900	6100	4540	3870	3740	4050	4010	4100
25	9680	13900	33800	23300	13700	5750	4540	3870	3740	4010	3970	4090
26	8990	13700	29900	22000	13700	6100	4540	4000	3610	3990	3870	4100
27	8330	14500	26900	21300	13100	6100	4400	4000	3610	4010	4030	4090
28	8770	15600	25100	21300	12100	5920	4260	3870	4000	4090	4050	4100
29	8990		23000	20700	11800	5750	4260	3870	4130	5490	5270	4180
30	8550		20700	20700	11600	5270	4260	3740	4000	6330	8240	4130
31	16300		19100		12100		4260	3740		7050		4100
Mean	9403	27090.	30140	21650	15900	7945	4872	4025	3753	4284	4515	5622
Ac.Ft. for Month	578100	1504000	1853000	1288000	977700	472800	299600	247500	223300	263400	268600	345700

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey.

TABLE 3

DISCHARGE OF SACRAMENTO RIVER NEAR RED BLUFF-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	10900	39300	45000	26500	26500	14300	6220	4660	4070	4500	9580	11100
2	10900	54600	58000	24800	26500	13700	6340	4560	3980	4420	7940	10400
3	11200	63400	50000	23600	25200	13700	6720	4560	3980	6670	6240	24900
4	11200	50100	44000	26100	23600	13400	6720	4560	4070	5910	5700	20000
5	10900	40300	38000	45800	22400	13400	6340	4560	3980	4950	5730	12400
6	10600	59200	35000	34800	21600	13100	6470	4460	4070	4790	5410	9550
7	10300	78300	32000	32000	20500	13100	6720	4360	4070	4660	4850	8210
8	10000	103000	30000	29600	20100	12400	6340	4360	4070	4540	5750	7560
9	10000	90200	28500	28300	20500	11800	6100	4360	4160	4540	5660	7210
10	9150	94700	27500	28300	20900	11200	5900	4460	4070	4520	5570	6930
11	8590	74900	26500	28300	20900	10600	5800	4460	4070	4460	5410	6640
12	8870	59200	38000	29200	20900	10000	5800	4460	3980	4440	5170	6270
13	8870	61000	56000	28700	22000	9720	5700	4460	3980	4440	4950	6030
14	8590	74900	47000	26900	22800	10000	5700	4460	3980	4480	4850	5910
15	11200	46300	45000	25700	24000	9720	5800	4360	3880	5000	4950	5730
16	11800	35300	71600	24800	24800	9150	5800	4260	3880	4910	4980	5590
17	43100	24800	79000	25700	22800	8870	5700	4260	3880	4790	4910	5500
18	32900	25700	54000	27400	20900	8590	5520	4260	3980	4850	4870	5450
19	27400	24800	64700	31500	19400	8320	5410	4360	4070	4680	4870	5430
20	28300	20900	92500	32000	18000	7510	5300	4360	3980	4580	4890	5450
21	21600	20000	62800	32000	17300	8050	5190	4260	3880	4520	4890	5410
22	18400	19000	53400	32000	17000	8050	5190	4260	3880	4480	4870	5340
23	17300	19000	113000	31000	16700	7780	5190	4160	3980	4460	4740	5280
24	16000	22000	110000	31000	17300	7780	5080	4160	3980	4520	4740	5190
25	15300	24000	62800	31000	17300	7510	5080	4160	4070	4580	4720	5080
26	14000	23000	51200	29200	17000	7240	4980	4160	4070	4520	4680	5080
27	13100	28000	43800	27400	16700	7510	4980	4260	4070	4540	4660	5080
28	13400	35000	39300	27400	16000	7240	4760	4160	4360	4660	4760	5040
29	15600		35800	26500	15300	6980	4760	4070	4870	5190	5480	5060
30	13700		32400	26500	14700	6720	4660	4070	4660	7400	8590	5080
31	19800		29200		14700		4760	4070		8760		5040
Mean	15260	46820	51480	29130	20140	9915	5646	4335	4067	4960	5480	7510
Ac.Ft. for Month	938100	2600000	3166000	1734000	1238000	590000	347200	266600	242000	305000	326100	462000

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located near the Iron Canyon damsite, Mile 196.6 above Sacramento.

TABLE 4

DISCHARGE OF SACRAMENTO RIVER AT BUTTE CITY-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			6750	3700	3020	4620
2			6290	3800	3020	4520
3			6290	3700	3000	4620
4			6290	3700	3000	6250
5			6290	3600	3000	6140
6			6060	3500	3100	5370
7			6060	3400	3100	4940
8			6060	3400	3110	4730
9			5830	3300	3110	4620
10			5500	3300	3200	4620
11			5180	3300	3200	4520
12			5080	3300	3200	4520
13			4860	3300	3200	4420
14			4660	3300	3200	4420
15			4550	3300	3200	4520
16			4550	3300	3200	4940
17			4550	3200	3200	5040
18			4440	3110	3300	4840
19			4340	3200	3300	4840
20		*9050	4340	3300	3400	4730
21		8590	4240	3300	3500	4620
22		8590	4130	3300	3600	4520
23		8360	4130	3200	3600	4520
24		8130	4130	3200	3700	4520
25		7900	4020	3110	3700	4620
26		7440	4020	3110	3800	4620
27		7210	3920	3200	3800	4620
28		7210	3920	3200	4000	4620
29		6980	3820	3200	4310	4840
30		6980	3710	3110	4730	5370
31			3710	3110		7130
Mean			4894	3324	3393	4878
Ac.Ft. for Month			300900	204400	201900	299900

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located near Butte City Bridge, Mile 115.8 above Sacramento.

* Beginning of discharge record for season.

TABLE 5

DISCHARGE OF SACRAMENTO RIVER AT COLUSA-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			6700	3700	3100	4680
2			6340	3700	3100	4680
3			6110	3600	3100	4680
4			6220	3500	3100	4900
5			6220	3500	3100	6000
6			6000	3400	3100	5560
7			5890	3400	3100	5120
8			6000	3300	3200	4900
9			5890	3300	3200	4790
10			5670	3200	3300	4680
11			5340	3200	3300	4680
12			5230	3200	3300	4680
13			5120	3200	3300	4570
14			4900	3200	3300	4570
15			4790	3300	3300	4570
16			4790	3300	3300	4900
17			4900	3200	3300	5120
18			4900	3100	3400	4900
19			4790	3100	3400	5010
20		*9100	4680	3200	3500	4900
21		8620	4570	3300	3600	4790
22		8260	4460	3200	3600	4680
23		8380	4350	3100	3600	4680
24		8140	4240	3100	3600	4680
25		7900	4240	3000	3600	4680
26		7540	4130	3100	3700	4680
27		7180	4020	3100	3800	4680
28		7060	4020	3200	3910	4680
29		7060	3910	3300	4130	4790
30		6940	3800	3200	4460	5120
31			3800	3200		6460
Mean			5033	3271	3427	4897
Ac.Ft. for Month			309500	201100	203900	301100

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at Colusa Bridge, Mile 89.4 above Sacramento.

* Beginning of discharge record for season.

TABLE 6

DISCHARGE OF SACRAMENTO RIVER BELOW WILKINS SLOUGH-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			6230	3180	2760	5240
2			5880	3120	2700	5240
3			5600	3120	2640	5160
4			5600	3060	2700	5310
5			5740	2940	2700	6460
6			5530	2880	2760	6460
7			5400	2880	2760	5910
8			5260	2820	2820	5540
9			5260	2700	2820	5310
10			5140	2700	2880	5240
11			4740	2700	2880	5160
12			4550	2760	2940	5080
13			4420	2700	3000	4940
14			4220	2700	3000	4860
15			4100	2820	3070	4940
16			4030	2820	3200	5010
17			4160	2760	3330	5380
18			4160	2700	3400	5380
19			4160	2700	3460	5310
20			4100	2700	3520	5310
21			3960	2820	3660	5160
22			3840	2760	3790	5080
23			3660	2700	3790	5010
24			3540	2700	3790	5010
25			3600	2640	3930	5010
26		*7140	3540	2580	4070	5080
27		6860	3480	2640	4280	5080
28		6580	3300	2760	4420	5010
29		6580	3240	2820	4640	5080
30		6440	3180	2820	4940	5310
31			3180	2760		5910
Mean			4413	2799	3355	5290
Ac.Ft. for Month			271300	172100	199600	325200

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at Mile 62.9 above Sacramento, a short distance below Wilkins Slough pumping plant of Reclamation District 108.

*Beginning of discharge record for season.

TABLE 7

DISCHARGE OF SACRAMENTO RIVER AT KNIGHTS LANDING-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*6820	3500	3300	5600
2			6580	3500	3250	5600
3			6350	3420	3200	5600
4			6120	3280	3300	5600
5			6280	3130	3400	6420
6			6120	2990	3500	6900
7			5980	2990	3600	6420
8			5820	2990	3700	5980
9			5750	2920	3800	5680
10			5750	2850	3580	5520
11			5300	2920	3500	5380
12			4920	2920	3720	5300
13			4700	2990	3800	5150
14			4700	3130	3650	5000
15			4620	3130	3720	5080
16			4550	3200	3650	5220
17			4620	3130	3950	5450
18			4620	3060	4250	5680
19			4700	3130	4180	5600
20			4550	3280	4250	5520
21			4400	3280	4250	5450
22			4250	3200	4480	5300
23			4100	3200	4400	5300
24			4020	3130	4250	5380
25			3950	3130	4400	5220
26			3880	3060	4550	5080
27			3720	3130	4700	5220
28			3580	3350	4700	5300
29			3500	3350	4920	5300
30			3500	3350	5300	5450
31			3500	3300		5820
Mean			4879	3159	3975	5533
Ac.Ft. for Month			300000	194300	236500	340200

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at the Knights Landing Railroad Bridge, Mile 34.0 above Sacramento, below the point of discharge to the river of Colusa Basin drainage via the Back Borrow Pit of Reclamation Districts 108 and 787.

* Beginning of discharge record for season.

TABLE 8

DISCHARGE OF SACRAMENTO RIVER AT VERONA-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	27200	33900	50700	56900	55300	50900	15300	5620	5140	7780	10300	9550
2	25300	42400	52500	55800	55000	50600	15100	5380	5140	7820	12100	11200
3	24300	51500	54900	55300	55300	50100	14700	5380	5140	7780	13200	13200
4	23800	56300	56300	54500	55000	49800	14000	5380	5140	7840	13200	16200
5	23400	57700	57200	54800	54800	49800	13400	5380	5140	8580	12100	21600
6	22500	58000	57200	55000	54300	49600	12400	5260	4780	9170	11100	23600
7	21800	57700	56900	55300	54000	49300	11400	5140	4670	8760	10500	21200
8	21000	58000	56000	55300	53500	48500	10600	5020	4900	8180	10200	18000
9	20100	59100	55500	55300	53000	47800	10400	4780	5380	7840	9420	16100
10	19200	60200	55500	55000	52700	46500	10200	4780	5260	7570	9100	14700
11	18800	64200	54900	55000	52700	44600	9640	4900	5140	7270	9150	13800
12	18300	67200	54400	55000	53000	41800	9100	4900	5140	7450	9060	13100
13	17700	65300	54600	55000	53000	37600	8920	4900	4900	7400	8870	12400
14	17200	64400	56300	55000	53500	33400	8920	5020	5260	7320	8810	11800
15	17000	63600	58300	55000	54800	31000	8920	5020	5500	7320	8650	11300
16	18800	62200	58000	54800	55300	29300	8560	4900	5750	7450	8500	11000
17	22500	60800	58000	54500	55800	27900	8560	5020	6140	7860	8400	10900
18	30800	59400	58300	54300	55800	27200	8080	5020	6420	8080	8370	10900
19	38500	58600	59100	54300	55300	26000	7450	4900	6010	8100	8370	10700
20	43400	57200	59100	54800	54800	23500	7450	5020	6010	8110	8460	10400
21	46300	56000	59700	55300	54000	21300	7450	5020	6420	7950	8430	10600
22	47600	55200	60200	55800	53200	20400	7300	5020	6700	7700	8240	10500
23	47600	54400	60000	56300	52700	20200	7150	4900	6850	7620	8210	10200
24	46000	53500	60200	56300	52200	20200	6850	4900	6850	7100	8180	9960
25	42900	52500	62200	56300	52200	20000	6420	4900	6850	6940	7920	9820
26	39500	52000	63600	56300	52400	19500	6140	5020	6560	7340	7600	9140
27	36100	51500	62800	56300	52700	18400	6280	5020	6700	7760	7920	8560
28	33400	50900	61100	55800	52700	17300	6140	5140	7450	7680	7710	8330
29	31300		59500	55300	52700	16200	6010	4900	7920	7600	7680	8830
30	30100		58400	55300	52200	15800	5880	4670	7600	8050	8530	8920
31	28900		57400		51700		5750	4900		8870		8880
Mean	29070	56560	57700	55330	53730	33480	9176	5036	5895	7816	9276	12430
Ac.Ft. for Month	1788000	3141000	3548000	3292000	3304000	1992000	564200	309600	350800	480600	552000	764500

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at Mile 19.6 above Sacramento at the mouth of "Cross Canal" main drain of Reclamation District 1001, and below the mouth of the Feather River.

TABLE 9

DISCHARGE OF SACRAMENTO RIVER AT SACRAMENTO-1938

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*53500	62200	64200	59800	19300	6190	5440	8380
2	58200	61000	63700	59800	18800	5880	5450	8410
3	66200	60200	64600	59800	18200	5780	5450	8430
4	63000	60000	62500	59800	17300	5760	5470	8530
5	61700	62200	62200	60200	16100	5710	5470	9270
6	61700	64600	62500	59800	14900	5660	5130	9800
7	62200	62500	62200	58800	13800	5430	5000	9410
8	61500	61700	61700	58500	12900	5270	5210	8810
9	60200	61000	61500	57500	12600	5200	5730	8490
10	59200	61700	63500	56000	12500	5010	5590	8220
11	58800	62200	64600	54200	11500	5120	5470	7860
12	58800	62500	65800	51000	10800	5140	5450	8040
13	69000	62500	67500	46200	10400	5140	5150	7960
14	78500	61700	72000	41200	10300	5240	5510	7940
15	72500	61000	66200	38300	10400	5380	5830	8040
16	69000	61000	65400	36800	9840	5120	5970	8510
17	71500	61500	64600	35400	9840	5240	6440	8720
18	69500	61700	63000	34200	9350	5280	6680	8870
19	67500	65400	61700	31400	8730	5320	6280	8820
20	68000	68500	60600	29000	8620	5370	6410	8860
21	80500	70000	60000	26300	8500	5300	6900	8640
22	75500	70500	60000	25200	8330	5320	7170	8380
23	71500	70500	60200	24900	8120	5180	7330	8320
24	76500	70500	60600	25200	7660	5190	7330	7780
25	81500	68000	66200	25400	7140	5190	7280	7560
26	78200	66200	61000	24900	6940	5360	7110	7990
27	75500	65400	61000	24400	6960	5320	7250	8400
28	72000	65000	61700	22100	7210	5380	8040	8320
29	70000	65000	61000	20700	7000	5210	8510	8250
30	66600	70500	60000	20700	6760	4950	8200	8700
31	64200		59800		6410	5190		9490
Mean	67830	64220	62960	40910	10880	5350	6270	8490
Ac.Ft. for Month	4170200	3821600	3870700	2434700	668850	328920	373390	522050

NOTE: This represents the flow of the Sacramento River past Sacramento (below the City of Sacramento intake) to the delta. Additional water flows to the delta through the East Borrow Pit of Yolo By-Pass. See Table 32. The discharges of this table have been computed as follows: March to June 27, inclusive, gage heights and rating curve at Sacramento; June 28th to October 31st, inclusive, 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 during periods of low flow because of tidal action.

* Beginning of discharge record for season.

TABLE 10

DISCHARGE OF FEATHER RIVER NEAR OROVILLE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	5180	11700	14400	14200	27600	19900	6120	2340	2490	1840	3200	3250
2	5500	18200	22100	13800	27400	19700	5700	2390	2640	1890	2980	3380
3	5640	17400	22400	14100	24800	19600	5380	2340	2140	2220	2700	6080
4	4980	13000	17000	16300	23000	19600	4860	2340	1840	2220	2590	4280
5	4790	12400	14500	19200	22400	18800	4460	2340	1690	1960	2590	3350
6	4600	14100	13600	16900	22000	18400	3800	2240	2190	1740	2460	3000
7	4460	13900	13000	15600	21500	17500	3560	2140	2240	1860	2520	3230
8	4280	24000	12100	16100	21500	16300	3620	2340	2240	1720	2300	3320
9	3860	24800	11600	17800	23000	15600	3320	2490	2140	1540	2360	3200
10	3920	27400	11100	19400	23600	13900	3080	2490	2040	1800	2320	3100
11	3800	26200	11100	20600	24800	12500	2860	2440	1840	1960	2330	2950
12	3680	19400	20300	21300	26500	11100	3560	2490	2340	2080	2360	2880
13	3680	19700	34700	20600	30800	10700	3620	2440	2540	2140	2160	2920
14	3200	18800	25700	19600	35800	10800	3440	2240	2640	2100	2400	2880
15	5050	16000	20300	19600	37100	10600	3320	2440	2700	2260	2240	2980
16	4860	13500	23200	20400	35800	10200	3200	2490	2700	2330	2280	3040
17	10200	11500	22700	22100	33100	9610	2390	2440	2440	2050	2250	3020
18	9340	11500	18800	26900	29300	8480	2490	2340	2190	2140	2250	2960
19	8080	11200	22000	33500	25300	7680	2980	2340	2540	2140	2190	2860
20	7200	10500	39300	36600	23000	7120	3080	2240	2700	2180	2200	3110
21	6190	10200	30800	39900	21700	7360	2920	2140	2640	2350	2260	3110
22	5770	10100	24200	39100	21500	7440	2860	2290	2640	1680	2290	3080
23	5640	10200	37100	37500	22200	7280	2760	2490	2640	1410	2340	3020
24	5310	10200	44500	37500	23000	7520	2540	2640	2040	1990	1700	2530
25	4860	10500	31700	36400	23000	7040	2540	2640	2040	2780	2040	2030
26	4660	10600	25000	30600	23600	6400	2590	2540	2240	2360	1980	1560
27	4530	10500	20400	27600	23000	5980	2590	2140	2490	2230	1890	2280
28	4720	10600	19000	26100	21700	5770	2590	1740	2240	2100	2240	2670
29	4460		17600	26100	21300	6190	2540	2340	1940	2340	2930	2670
30	4100		16300	27900	20400	6260	2390	2590	1940	2860	2930	2520
31	5950		15000		20000		2190	2590		2730		2200
Mean	5242	14930	21660	24440	25150	11510	3334	2371	2304	2097	2376	3015
Ac.Ft. for Month	322300	829300	1332000	1454000	1547000	685000	205000	145800	137100	128900	141400	185400

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey.

TABLE 11

DISCHARGE OF FEATHER RIVER AT NICOLAUS-1938

Day	Daily Discharge in Secondfeet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*8060	1620	1460	2040
2			8060	1460	1420	2040
3			7580	1580	1500	2040
4			6820	1540	1280	2260
5			5980	1500	1060	2440
6			5280	1420	843	2260
7			4500	1380	772	2080
8			4140	1310	1080	2040
9			4020	1240	1160	2080
10			3660	1420	1120	2040
11			3340	1460	1050	2040
12			3140	1420	945	2260
13			3340	1420	896	2310
14			3340	1420	1360	2310
15			3240	1340	1560	2360
16			3140	1280	1680	2540
17			3040	1380	1720	2780
18			2560	1380	1640	2680
19			2160	1340	1480	2780
20			2340	1340	1520	2780
21			2380	1280	1900	2580
22			2340	1170	1900	2680
23			2160	1140	2000	2440
24			2060	1280	2080	2000
25			1900	1380	1820	2080
26			1820	1460	1560	2680
27			1820	1460	1820	2780
28			1820	1310	2360	2680
29			1820	1030	2400	2680
30			1820	928	2040	3080
31			1740	1340		3700
Mean			3530	1356	1514	2437
Ac.Ft.for Month			217000	83360	90100	149800
Diversions below Nicolaus Acre-feet			252	243	206	0
Discharge to Sacramento River Acre-feet			216700	83120	89900	149800

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at Mile 9.3 above the mouth of the river and 0.1 mile below Nicolaus Bridge.
* Beginning of discharge record for season.

TABLE 12

DISCHARGE OF AMERICAN RIVER AT FAIR OAKS-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1870	10900	7520	7960	10900	15100	4500	830	480	582	1250	866
2	1940	10300	16600	7760	12300	16500	4220	772	480	561	1430	954
3	2010	18700	18700	7960	10600	16200	3940	745	495	650	1260	1280
4	2010	12400	12400	8840	9800	17900	3560	745	510	735	1060	1750
5	1800	8740	9520	14200	10300	17500	3110	695	525	638	1010	1690
6	1800	7060	8240	11100	10900	15800	2920	650	480	634	1350	1540
7	1600	6020	7280	9560	10900	15500	2750	610	495	622	1040	1340
8	1570	5820	6840	9080	11700	14500	2750	610	480	650	932	1210
9	1630	7280	6420	9560	13500	13500	2590	630	495	654	899	1220
10	1470	16600	5820	10600	15100	12300	2440	592	495	614	894	1130
11	1470	33400	5620	10600	16800	10900	2230	592	480	614	1020	888
12	1470	19800	9520	10900	17500	9080	2040	558	468	582	976	806
13	1440	12700	27700	10100	21800	7960	1860	558	468	603	882	822
14	1380	20900	19600	9320	26400	8180	1800	540	480	578	833	932
15	2010	12100	14200	9080	27200	8840	1860	540	468	899	888	987
16	2540	9000	13500	9560	25600	9080	1740	558	455	1190	844	970
17	3100	7060	14800	10100	23300	9080	1680	558	468	904	838	932
18	4920	6220	11700	13500	20000	7560	1740	540	455	833	899	926
19	3890	6420	10600	17900	16800	6600	1640	540	455	745	888	916
20	3760	5820	21800	17900	14500	5880	1640	540	455	715	894	954
21	3000	5260	20000	18900	13500	6060	1500	495	468	695	894	987
22	2720	5080	14800	18200	13500	6420	1540	480	468	686	855	778
23	2810	5080	14800	17200	15500	6240	1300	495	455	705	888	822
24	2630	5080	25600	17200	17200	6420	1190	510	468	654	866	750
25	2380	5260	18600	15100	18200	6060	1160	495	468	626	816	710
26	2300	5080	14500	12300	18200	5720	1120	525	480	638	811	695
27	2220	5080	12300	11700	19600	5560	1120	495	510	626	816	682
28	2300	4920	11100	12000	17900	5080	1640	480	558	626	806	811
29	2810		10300	12300	16200	4780	1470	480	558	630	794	735
30	2630		9320	11700	14800	5080	1160	480	558	610	872	745
31	3200		8400		15100		920	495		677		816
Mean	2345	9931	13160	12070	16310	9846	2101	575	486	683	950	989
Ac.Ft. for Month	144200	551600	809500	718400	1003000	585900	129200	35370	28920	42000	56540	60780

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey.

TABLE 13

DISCHARGE OF AMERICAN RIVER AT SACRAMENTO-1938

Day	Daily Discharge in Secondfeet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*4300	840	470	597
2			3900	780	480	614
3			3680	728	480	636
4			3470	739	485	720
5			3020	690	540	684
6			2780	650	470	660
7			2620	610	485	648
8			2620	605	480	660
9			2500	620	485	684
10			2400	600	480	642
11			2150	600	480	630
12			1950	572	457	624
13			1770	564	448	592
14			1680	536	457	602
15			1680	554	457	750
16			1590	564	439	1080
17			1510	554	439	888
18			1550	550	444	816
19			1510	535	448	750
20			1430	540	434	720
21			1390	500	462	720
22			1350	462	466	708
23			1240	495	462	726
24			1130	500	466	708
25			1060	500	462	648
26			1060	550	470	684
27			1020	525	525	672
28			1390	490	570	666
29			1310	490	586	678
30			1100	475	592	672
31			930	480		648
Mean			1971	577	481	694
Ac.Ft.for Month			121200	35500	28600	42700
Diversions below Gaging Station-Ac.Ft.			28	16	5	0
Discharge to Sacramento R. Acre-feet			121200	35500	28600	42700

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U.S.Geological Survey. It is located at H Street Bridge, Sacramento, 6.0 miles above the mouth of the river.
* Beginning of discharge record for season.

TABLE 14

DISCHARGE OF MOKELUMNE RIVER AT WOODBRIDGE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	666	1140	1980	2570	3680	3710	2260	223	281	378	778	717
2	673	793	2130	2510	3300	3890	2260	252	307	412	758	717
3	675	1170	2620	2490	3310	3620	1260	254	344	570	790	717
4	669	1040	2640	2520	3120	3440	378	212	348	451	790	713
5	666	915	2510	2520	2350	3440	769	206	236	396	783	722
6	666	978	2450	2490	2370	3530	936	164	238	476	795	710
7	664	986	2440	2500	2330	3640	947	148	332	520	800	708
8	664	962	2420	2520	2320	3780	864	143	361	524	795	710
9	662	1000	2410	2540	2200	3830	808	216	332	546	795	713
10	660	1050	2420	2530	2540	3820	772	317	318	540	798	713
11	660	1750	2450	2520	3120	3720	547	268	255	526	780	717
12	658	3130	2490	2670	3450	3400	502	246	271	524	792	715
13	658	4240	2710	3010	3490	2730	506	242	276	524	792	705
14	656	4480	2670	3120	3670	1920	487	195	316	542	800	694
15	684	4440	2560	3400	4130	1060	379	181	376	557	798	705
16	690	4000	2530	3800	4270	585	249	220	372	579	805	708
17	679	3750	2550	3810	4360	939	274	241	338	584	802	703
18	681	3710	2520	3760	4270	100	217	200	249	570	802	593
19	675	3480	2590	3790	4340	778	210	240	222	584	802	503
20	671	2980	3230	3880	4420	1030	229	260	283	573	800	593
21	641	2850	3790	3820	4270	942	210	226	298	593	798	586
22	654	2800	3820	3870	4020	692	196	205	310	597	795	584
23	660	2780	3820	3870	3430	1140	391	249	310	602	798	590
24	656	2770	3980	4020	3390	1640	310	262	325	593	732	581
25	656	2420	4320	4120	3750	2400	160	265	332	568	727	568
26	656	2040	4300	4040	4310	2840	174	260	260	570	715	497
27	654	1960	4240	4080	4350	2670	204	270	394	627	710	493
28	660	1940	4180	3990	4450	2270	200	276	400	657	715	562
29	698		4180	3780	4440	1930	214	199	400	673	710	559
30	688		4010	3790	4270	1930	204	262	442	705	715	566
31	732		3030		3860		249	354		1140		559
Mean	669	2341	3032	3278	3599	2381	560	234	318	571	776	643
Ac.Ft. for Month	41120	130000	186400	195000	221300	141700	34440	14390	18890	35110	46160	39510

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located just below dam of Woodbridge Irrigation District.

TABLE 15

DISCHARGE OF SAN JOAQUIN RIVER AT DELTA BRIDGE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	362	374	939	1200	1300	1430	1330	487	4			
2	347	395	922	1160	1290	1460	1350	389	4			-
3	328	433	953	1110	1300	1490	1370	336	4			FLOW
4	310	548	1200	1070	1290	1510	1370	291	3			
5	270	635	1460	1040	1270	1530	1350	286	3			
6	293	721	1540	1000	1260	1540	1310	280	3			
7	310	852	1560	1020	1240	1570	1290	220	2			
8	179	955	1550	1050	1200	1570	1270	122	2			NO
9	348	970	1520	1080	1180	1590	1240	90	2			-
10	343	918	1490	1090	1150	1610	1200	71	1			
11	283	914	1470	1060	1130	1620	1170	75	1			0
12	247	932	1450	1020	1110	1630	1120	114	1	-	-	87
13	238	1050	1420	1000	1110	1640	1080	110	0	FLOW	FLOW	283
14	234	1280	1400	994	1130	1660	1040	69				710
15	247	1350	1460	988	1150	1670	948	43				1210
16	248	1380	1520	988	1190	1670	803	32				1360
17	303	1380	1530	988	1240	1630	630	23				1330
18	462	1380	1520	971	1280	1580	545	18		NO	NO	1210
19	537	1340	1500	948	1320	1530	520	16		-	-	1070
20	491	1310	1470	916	1330	1510	500	14				985
21	485	1280	1440	906	1370	1480	498	13	-			932
22	488	1260	1410	945	1420	1490	538	12				809
23	473	1240	1390	1000	1450	1490	557	11	FLOW			672
24	440	1220	1370	1060	1460	1480	549	11				587
25	404	1170	1330	1130	1450	1440	543	10				516
26	358	1120	1320	1180	1410	1400	541	9				445
27	315	1070	1330	1220	1390	1350	519	8	NO			416
28	301	1000	1300	1260	1360	1310	475	8	-			375
29	293		1260	1290	1360	1300	500	7				354
30	277		1240	1310	1370	1310	541	6				362
31	296		1220		1400		569	5				360
Mean	339	1017	1370	1066	1287	1516	879	103	1			454
Ac.Ft. for Month	20850	56480	84260	63460	79160	90230	54080	6320	60			27900

NOTE: This station is located at the county road bridge 8 miles east and 6 miles north of Los Banos, Mile 158.7 above mouth of San Joaquin River. Prior to the time all river flow is diverted above this station, ordinarily in early July, there is considerable flow which by-passes this station through Pick Anderson and Salt Sloughs.

TABLE 16

DISCHARGE OF SAN JOAQUIN RIVER AT FREMONT FORD BRIDGE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1910	2010	4090	3870	3870	3940	4000	2600	410	280		
2	1910	2340	4090	3870	3760	4120	4100	2500	380	320		
3	1880	3220	4190	3920	3980	4090	4100	2270	380	320		
4	1850	3570	4680	3920	4100	4090	4000	2060	360	320		
5	1800	3600	6500	3980	4100	4190	4050	1910	360	320		
6	1680	4250	5200	3980	4100	4250	4150	1800	380	300		
7	1740	4430	4900	3650	4050	4250	4200	1680	380	280		
8	1680	4400	4900	3870	4050	4570	4000	1540	360	280		
9	1550	4350	4700	3870	3870	4570	3920	1270	340	280		
10	1740	4300	4670	3870	3870	4500	3920	1100	320	260		
11	1800	4140	4620	3930	3760	4500	3840	1000	320	260		
12	1680	3870	4620	3870	4030	4730	3780	900	340	260		
13	1550	3870	4500	3930	3760	4730	3800	1000	340	240	-	-
14	1500	4080	4400	3980	3760	4840	3770	1000	340	280	NO RECORD	NO RECORD
15	1550	4400	4500	3840	3760	4840	3750	860	340	280		
16	1680	4250	4850	3770	3760	4900	3760	750	340	320		
17	1960	4250	5300	3770	3760	4900	3700	620	340	320		
18	2270	4140	4900	3840	3760	4900	3500	580	340	320		
19	2550	4200	4700	4000	3870	4700	3200	550	340	300		
20	2700	4300	5300	3660	3760	4650	2890	490	320	320		
21	2700	4080	4620	3480	3870	4520	2550	460	320	320		
22	2630	3940	4300	3440	3780	4520	2550	460	320	300		
23	2600	4050	4250	3480	4140	4560	2500	490	300	280		
24	2550	4150	4250	3480	4200	4700	2550	490	280	300		
25	2340	4200	4460	3270	4300	4500	2550	520	300	320		
26	2160	4090	4400	3500	4300	4500	2600	490	300	300		
27	2060	4150	4000	3620	4300	4300	2630	490	320	300		
28	1960	4150	3870	3620	4190	4400	2630	440	320	340		
29	1880		4050	3620	4000	4320	2550	440	320	380		
30	1850		4000	3760	4000	4200	2550	440	280	410		
31	1880		3870		3920		2550	410		460		
Mean	1990	3960	4570	3760	3930	4490	3380	1020	336	309		
Ac.Ft. for Month	122200	219700	281000	223500	243400	267500	207600	62700	20000	18980		

NOTE: This is a recording gage station at the county bridge on the road between Gustine and Stevinson, Mile 129.5 above mouth of San Joaquin River and 5.7 miles above the mouth of the Merced River. Additional water during high flow periods passes this station via Mud Slough. See Table 17.

TABLE 17

DISCHARGE OF MUD SLOUGH (BRANCHES COMBINED) AT GUSTINE-STEVINSON HIGHWAY-1938

Day	Daily Discharge in Second-feet*											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	470	565	3900	5750	5750	8100	6700	1060	8			
2	470	860	4350	5300	5750	8550	6250	960	6			
3	425	1260	5750	4800	6250	9000	6700	810	6			
4	380	1580	9900	4350	6250	9500	6700	613	4			
5	333	1860	13950	4350	6250	9900	7150	425	4			
6	245	2190	14400	3900	6250	10350	7150	333	6			
7	290	2750	13950	3500	5750	10350	7150	245	6			
8	245	2750	13950	3500	5750	10800	6700	130	4			
9	130	3125	13500	3500	5300	10800	6250	60	2			
10	290	3900	12600	3125	4800	10800	5750	46	0	-		
11	333	4350	12200	3125	4350	11250	5300	39	0	-	-	-
12	245	5300	12200	3125	4350	11700	4800	32	2			
13	130	8100	11700	3125	3900	11700	4350	39	2			
14	113	9900	11250	2750	3900	11700	3900	39	2			
15	130	10800	11700	2750	3900	11700	3500	30	2			
16	245	10800	12600	2750	3900	11700	3125	20	2			
17	520	10800	13050	2750	3900	11700	2330	15	2			
18	810	10350	13050	2750	4350	11700	1950	12	2			
19	1010	9900	12600	2750	4800	11250	1635	12	2			
20	1160	9500	12600	2510	5300	10800	1360	10	0	-	-	-
21	1160	9000	11700	2510	6250	9900	1160	9				
22	1110	8100	10800	2510	6250	9500	1110	9				
23	1060	7150	10350	2510	7150	9000	1060	10	-			
24	1010	6700	9900	2510	7650	9000	1110	10				
25	860	6250	9900	2750	8550	9000	1110	11				
26	710	5300	9500	3125	9000	9000	1110	10				
27	613	4800	8550	3900	9000	8550	1110	10				
28	470	4350	8100	4350	9000	8550	1110	9		2		
29	425		8100	4800	8550	8100	1010	9	NO	6		
30	380		7650	5300	8550	7150	1010	9	-	8		
31	425		6250		8100		1010	8		9		
Mean	522	5800	10640	3490	6090	10040	3570	162	2	1		
Ac.Ft. for Month	32100	321900	654500	207700	374500	597200	219490	9980	123	50		

FLOW RECORD NO

NOTE: To determine the total flow passing the Gustine-Stevinson highway (Fremont Ford Bridge road) the flow in this table should be combined with that in Table 16.

* Discharges above 7000 cubic feet per second are from a rating curve which has been extended beyond the limits defined by current meter measurements.

TABLE 18

DISCHARGE OF SAN JOAQUIN RIVER NEAR NEWMAN-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	3720	3560	10800	15000	15000	19500	14100	3820	900	748	890	985
2	3640	4840	11300	14100	15400	19500	13700	3820	860	744	895	880
3	3640	4930	13300	13000	15400	20800	13700	3550	842	776	955	845
4	3560	5380	16800	12300	14500	22100	14100	3140	808	758	1030	955
5	3400	6550	22100	11600	14500	22800	14500	2850	842	744	1080	1370
6	3330	7420	31700	11300	14500	23600	14100	2640	825	741	1110	1590
7	3260	8080	33000	11600	14100	23600	13700	2570	808	741	1190	1660
8	3330	8450	31700	11100	14100	22800	13000	2430	790	716	1180	1660
9	3120	9010	30400	11100	14100	22800	12600	2130	772	702	1160	1620
10	3190	9690	28100	10500	13300	23600	11900	1840	755	724	1160	1640
11	3330	11300	27100	10300	13000	24400	11600	1690	755	724	1100	1640
12	3330	14100	27100	10500	12300	24400	11100	1590	772	696	1080	1570
13	3120	20100	26100	10300	12300	24400	10300	1640	772	650	1090	1520
14	3050	23600	25200	10100	12300	23600	9690	1640	755	657	1080	1550
15	3050	23600	25200	10100	12300	23600	9000	1540	738	688	1150	1580
16	3560	24400	27100	9880	12300	22800	8500	1400	755	713	1190	1560
17	3880	24400	29200	9880	12300	22800	8000	1320	738	692	1190	1480
18	4120	24400	28100	9690	12600	22800	7280	1220	755	682	1190	1510
19	4480	22800	28100	9510	13300	22800	6320	1140	772	671	1200	1600
20	4840	21400	27100	10100	14500	22100	5410	1060	738	678	1200	1600
21	5020	20800	25200	10800	15800	20100	4670	1020	720	678	1230	1620
22	4930	19500	24400	11100	16300	18900	4180	1040	720	688	1200	1570
23	4840	17800	23600	10800	16300	17300	4100	1040	702	685	955	1490
24	4660	15400	22100	10800	16800	16800	4090	1040	702	702	732	1510
25	4480	14100	20800	11300	18400	17300	4090	1040	702	692	639	1580
26	4210	13000	20100	11900	19500	17800	4090	1020	720	657	660	1620
27	3960	11900	20100	13000	19500	17800	4090	1000	738	646	900	1580
28	3800	11300	20100	13700	20100	17300	4000	980	755	673	1060	1570
29	3640		19500	14500	20100	16800	3910	1000	755	704	1250	1430
30	3720		17300	14500	20100	15400	3820	960	772	750	1190	1310
31	3640		15800		19500		3730	940		830		945
Mean	3802	14350	23500	11480	15310	21010	8625	1745	768	708	1065	1453
Ac.Ft. for Month	233800	797000	1445000	683000	941200	1250000	530300	107300	45700	43540	63340	89340

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at Hills Ferry Bridge, Mile 123.7 above mouth of San Joaquin River and just below the mouth of the Merced River.

TABLE 19

DISCHARGE OF SAN JOAQUIN RIVER AT GRAYSON-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	4140	4140	12900	16500	15500	20300	16400	4380	1130	1080	1160	1640
2	4040	4500	13000	15700	15600	20000	15300	4360	1100	1120	1170	1550
3	3940	5500	13900	15200	15800	20400	14600	4220	1060	1190	1190	1480
4	3880	6300	15400	14500	15900	21400	14500	3980	1050	1200	1250	1460
5	3790	6200	18000	14100	15500	22700	14700	3600	1070	1160	1300	1570
6	3700	6800	23000	13700	15100	23300	14900	3260	1070	1160	1330	1770
7	3600	7750	29400	13700	15300	23900	14600	3090	1050	1140	1360	1900
8	3580	8800	31000	13700	15000	24100	14200	3040	1020	1120	1410	1920
9	3550	9700	33000	13400	14900	23500	13800	2830	980	1120	1420	1910
10	3420	11000	34000	13200	14700	23100	13400	2480	950	1120	1440	1890
11	3490	12800	31800	12800	14300	23100	13100	2230	980	1100	1420	1880
12	3580	13700	30700	12500	13800	23900	12700	2080	950	1060	1440	1860
13	3530	15700	30500	12400	13300	24100	12400	1970	950	1020	1440	1860
14	3420	18300	28500	12500	12900	24300	11800	1940	930	1010	1440	1870
15	3360	21700	27600	12400	12900	23800	11100	1940	930	1100	1440	1880
16	3410	23400	26800	12200	13100	23300	10400	1860	900	1180	1440	1890
17	3970	24000	29800	12000	13100	23000	9900	1680	900	1140	1450	1900
18	4180	23700	31000	11800	13200	23000	9200	1570	940	1070	1450	1900
19	4390	23300	31500	11500	13600	23000	8400	1470	1040	1020	1450	1920
20	4720	22700	31000	11200	14100	22900	7400	1410	1000	1000	1450	1920
21	5000	22000	30400	11300	15100	21700	6300	1360	930	1000	1460	1920
22	5090	21400	29400	11500	15900	20700	5500	1340	900	1020	1460	1920
23	5090	19900	28400	11600	16400	19100	5100	1340	900	1050	1460	1920
24	5100	17900	27000	11700	16500	17600	4960	1330	910	1060	1460	1920
25	4970	15900	24000	11800	16900	16800	4900	1310	930	1080	1360	1920
26	4880	14700	22200	12200	17600	17100	4840	1300	1030	1080	1250	1940
27	4670	13800	21400	12800	18400	18000	4780	1260	1070	1050	1310	1950
28	4590	13200	20800	13700	19300	18200	4700	1200	1070	1010	1470	1910
29	4320		20400	14500	19900	18100	4660	1240	1030	1020	1570	1830
30	4240		19500	15200	20500	17300	4560	1240	1060	1060	1660	1760
31	4240		18000		20700		4420	1190		1240		1620
Mean	4125	14600	25300	13040	15640	21390	9920	2177	994	1090	1397	1825
Ac.Ft. for Month	253646	810800	1556000	776100	961600	1272800	610000	133900	59170	67000	83130	112200

NOTE: Recording gage station maintained jointly by Division of Water Resources, City of San Francisco, Modesto Irrigation District and Turlock Irrigation District. Station is at Laird Slough Bridge, Mile 96.05 above mouth of San Joaquin River.

TABLE 20

DISCHARGE OF SAN JOAQUIN RIVER AT HETCH HETCHY AQUEDUCT CROSSING-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	6100	6500	18800	20500	19400	28900	23600	5320	2070	2230	2435	3200
2	5750	8500	19000	19200	19300	30000	21400	5245	2060	2260	2555	3095
3	5330	11000	20300	18800	20200	32100	19300	5200	2065	2355	2775	3000
4	5310	13000	25200	18100	20100	34000	18300	5080	2060	2360	3470	2995
5	5060	16000	29700	18000	20200	35400	18800	4790	2065	2340	3670	2960
6	4900	16000	30600	18900	19600	36800	19000	4470	2065	2330	3770	3150
7	4860	15200	33900	19100	19900	37000	18800	4240	2060	2310	3740	3410
8	4830	12700	39000	18300	19700	36600	17900	4210	2040	2305	3755	3530
9	4740	13100	40000	17500	19600	36200	17300	4080	2015	2305	3890	3540
10	4820	15500	41200	17300	19100	35600	17100	3750	2000	2310	3900	3515
11	4790	23000	40000	17400	18900	35400	16800	3460	1995	2290	3855	3490
12	4940	36100	38100	17600	18200	35100	16300	3260	1998	2220	3790	3420
13	4960	37500	39200	18100	18000	33700	15400	3060	1990	2185	3720	3330
14	4890	33600	46900	18200	17700	32200	13800	3070	1980	2180	3685	3350
15	4820	31700	46200	18300	17700	29400	12700	3010	2070	2310	3680	3365
16	4840	34000	42100	18300	18900	28400	12200	2630	1980	2480	3780	3440
17	5100	34800	40200	18100	19400	30000	11900	2330	1975	2440	3800	3420
18	5370	34200	41000	17400	20600	31600	11500	2170	2010	2360	3755	3375
19	5000	31800	40400	17700	22000	32000	11000	2050	2100	2270	3745	3320
20	5570	30300	39200	17600	22500	30700	10300	1970	2160	2250	3805	3440
21	6300	28300	38200	17900	22700	28400	9100	1940	2110	2250	3745	3580
22	6550	26400	37500	18300	22900	24900	7600	1930	2020	2255	3790	3570
23	6500	25300	35400	17800	23600	22400	6450	1855	2000	2250	3880	3520
24	6150	24000	33000	17500	24100	22300	5900	1820	2040	2250	3570	3490
25	6100	22100	31100	17800	24600	22700	5800	1810	2090	2255	3090	3480
26	6450	20500	29800	18400	25400	23600	5700	1800	2150	2265	2855	3420
27	6450	19300	28600	18600	26400	24600	5600	1775	2205	2240	2830	3320
28	6250	18800	27500	19500	27200	25500	5550	1730	2230	2220	2840	3330
29	6200		26500	20000	28200	25900	5500	1750	2200	2220	2910	3390
30	6300		25900	20100	28900	25000	5450	1725	2205	2280	3115	3465
31	6800		22700		28800		5400	1830		2365		3400
Mean	5549	22830	33780	18340	21740	30210	12630	3012	2067	2288	3473	3364
Ac.Ft. for Month	341200	1268000	2077000	1092000	1265000	1798000	776400	185200	123000	140700	206700	206800

NOTE: Recording gage station maintained by City of San Francisco Public Utilities Commission; Hetch Hetchy Water Supply. Station is at Mile 82.65 above mouth of San Joaquin River.

TABLE 21

DISCHARGE OF SAN JOAQUIN RIVER NEAR VERNALIS-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	6460	7560	19800	24200	25500	36700	27600	5700	2240	2450	2960	3600
2	6170	10400	20500	22600	25100	37500	25500	5500	2240	2510	3030	3530
3	5720	12400	21800	21400	24600	39300	23000	5500	2240	2660	3220	3430
4	5540	13800	26500	20800	25100	42200	21400	5400	2240	2680	3740	3410
5	5810	16200	33600	20200	25100	44300	21400	5100	2240	2660	3930	3300
6	5810	17700	35100	20500	24200	46500	21400	4830	2240	2700	4030	3360
7	5630	16300	36700	21800	23800	47600	21100	4560	2240	2730	3920	3650
8	5630	14400	38400	21800	23400	47600	20500	4560	2170	2730	3900	3860
9	5540	13500	38400	21400	23400	46500	19800	4470	2170	2740	4160	3890
10	5270	14100	39300	20500	23400	45400	19500	4200	2170	2730	4180	3890
11	5090	17300	39300	20500	23400	44300	19200	3840	2170	2720	4130	3870
12	5270	28000	36700	20500	23400	43200	18900	3600	2170	2560	4040	3730
13	5270	34000	35900	20800	23800	41200	18100	3440	2170	2510	3930	3580
14	5270	40000	40200	21400	24200	39300	16700	3360	2100	2500	3890	3570
15	5180	39300	50000	21800	25100	35900	15400	3360	2170	2610	3860	3600
16	5360	36700	50000	21800	27600	33600	14400	3040	2170	2870	4080	3730
17	5540	35100	43200	21400	30100	34300	13800	2890	2100	2920	4100	3780
18	5720	33600	41200	21100	30800	35100	13400	2560	2170	2860	4030	3770
19	6080	31500	39300	21100	31500	35900	12800	2400	2240	2720	4040	3630
20	6660	29400	37500	21400	32200	35900	12000	2320	2240	2640	4160	3620
21	7160	28200	35900	22200	31500	34300	10800	2240	2240	2630	4040	3800
22	7460	27100	35900	23400	30800	31500	9000	2320	2170	2640	4060	3860
23	7360	26000	34300	24200	30100	28200	7580	2240	2100	2670	4240	3860
24	7160	25500	32900	24200	29400	26000	6810	2170	2170	2720	4040	3860
25	6960	24200	30800	24600	30100	25500	6500	2170	2240	2710	3660	3860
26	7360	22600	30100	25100	31500	26500	6300	2100	2320	2700	3360	3720
27	7360	20800	28800	25500	33600	28200	6200	2100	2400	2610	3310	3600
28	7260	20200	27600	25500	34300	28800	6100	2100	2400	2560	3230	3580
29	7060		27100	25100	36700	29400	6000	2100	2400	2540	3220	3720
30	6860		26500	25500	37500	28800	5900	2030	2400	2600	3460	4010
31	7160		25500		37500		5800	2030		2750		4040
Mean	6199	23420	34150	22410	28350	36650	14610	3359	2224	2665	3798	3700
Ac.Ft. for Month	381200	1301000	2100000	1333000	1743000	2181000	898300	206600	132400	163900	226000	227500

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. It is located at Durham Ferry Bridge below the mouth of the Stanislaus River and is at Mile 76.7 above mouth of the San Joaquin River.

TABLE 22

DISCHARGE OF MERCED RIVER AT YOSEMITE VALLEY
RAILROAD CROSSING-1938

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	2330	3450	7740	2330	266	82	82
2	2040	3450	8850	2560	259	82	66
3	1950	3450	9250	2560	256	85	59
4	2040	3270	8850	2330	252	89	69
5	2330	3450	9250	1860	248	99	75
6	2040	3450	8400	1620	66	92	79
7	3100	4350	8400	1480	69	105	85
8	2810	4350	7950	1620	66	99	85
9	2040	4350	8660	1550	69	99	99
10	2135	4150	8200	1475	75	105	99
11	2330	3670	8200	1160	79	105	69
12	2225	3450	7500	952	82	107	50
13	2225	3100	5700	760	85	109	48
14	2330	3100	4570	640	92	109	52
15	2330	2950	4800	520	82	107	56
16	2225	2680	5700	520	79	105	58
17	1950	2680	5500	550	75	99	56
18	2225	3270	4800	592	82	99	52
19	3450	3670	4150	514	85	99	50
20	3850	3670	3850	414	109	89	54
21	4150	2950	3450	325	117	89	56
22	4350	2560	2560	289	117	85	50
23	4570	2680	2450	263	134	85	19
24	4800	3100	3450	259	143	89	12
25	5500	3850	5250	245	147	82	15
26	5500	4570	5700	259	143	75	14
27	5500	6600	5500	280	156	82	12
28	4570	8400	5250	272	156	79	14
29	3450	7950	4350	266	160	75	9
30	3450	7500	2560	269	147	72	12
31		7740		269	134		14
Mean	3130	4120	6030	936	130	93	51
Ac.Ft. for Month	186000	253600	358700	57540	7990	5510	3110

NOTE: Recorder maintained throughout year but discharge computed for period April to October, inclusive, only. Station is at Mile 42.1.

TABLE 23

DISCHARGE OF MERCED RIVER NEAR LIVINGSTON-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1260	2020	2040	3160	3940	7850	2780	300	326	319	163	144
2	1260	1720	4500	2780	3940	8460	2830	276	289	328	163	142
3	1260	846	8050	2480	3280	9230	3040	268	268	341	156	141
4	1260	1760	7550	2430	1820	9340	2990	240	270	332	151	137
5	1260	2140	6810	2530	3040	9340	2530	250	280	304	146	132
6	1260	1760	6450	3400	2990	9230	1950	250	287	310	144	132
7	1260	1610	6370	2990	3040	8460	1720	291	272	332	142	130
8	1260	1540	6290	3640	3460	8350	1640	315	244	323	141	129
9	1260	1610	6290	3340	3580	8150	1640	298	252	328	139	125
10	1260	2420	6290	2780	3580	8250	1560	276	254	352	139	125
11	1260	3830	6290	2680	3580	7950	1400	287	262	343	137	124
12	1260	8950	6370	2730	3580	7350	1180	272	268	317	136	122
13	1260	9570	6810	2680	4360	6450	950	289	264	281	132	120
14	1260	7650	7260	2630	4690	5370	730	320	256	269	134	119
15	1440	8150	6720	2730	4690	4820	620	320	252	300	136	120
16	2130	7080	6450	2730	4690	5020	575	309	260	279	139	120
17	1500	6450	6720	2430	4620	5650	575	293	272	265	137	116
18	1470	5890	6030	2330	5090	5730	597	274	262	263	136	116
19	1400	5510	6290	2580	5890	5370	542	268	264	263	136	116
20	1470	5440	6290	3580	6290	4880	470	258	240	257	132	129
21	1500	5370	6290	4500	5810	4240	390	298	244	249	132	125
22	1400	4060	6290	4690	5090	3400	353	322	254	239	132	124
23	1360	2530	6290	4690	4560	2630	335	326	278	271	132	129
24	1330	2130	6290	4690	4880	2380	326	339	280	253	132	129
25	1330	2000	6370	5090	5510	3880	326	350	282	218	130	127
26	1330	1950	6290	5440	6210	4760	335	348	298	184	129	124
27	1330	1900	6210	5440	6810	4820	353	350	300	170	130	119
28	1330	1820	6210	5440	7850	4690	335	353	326	159	132	116
29	1400		4580	4560	8460	4300	326	353	342	154	137	119
30	1540		3220	4000	7850	3280	308	331	335	156	142	132
31	762		3220		7450		300	344		161		125
Mean	1344	3847	6056	3506	4859	6121	1097	302	276	268	139	126
Ac.Ft. for Month	82640	213600	372400	208600	298800	364200	67450	18590	16430	16500	8280	7750

NOTE: This is a permanent station maintained throughout the year under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. The station is at Mile 17.1 above mouth.

TABLE 24

DISCHARGE OF MERCED RIVER NEAR MOUTH-1938

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*3100	2900	3270	2800	870	373	371
2	2720	2930	3400	2630	790	363	358
3	2600	2930	3500	2250	780	364	380
4	2600	2650	3450	2800	750	376	369
5	2540	2860	3500	2760	665	376	356
6	2560	2800	3500	2280	660	366	355
7	2480	2800	3450	2590	650	355	366
8	2580	2800	3500	2520	640	355	366
9	2530	2780	3500	2500	630	356	365
10	2530	2700	3550	2520	570	357	375
11	2400	2700	3600	2440	520	370	364
12	2140	2650	3550	2330	490	370	351
13	1960	2650	3500	2240	455	359	362
14	1930	2700	3450	2140	465	340	350
15	1880	2750	3400	1980	465	340	349
16	1900	2750	3400	1880	440	341	328
17	1850	2750	3400	1900	430	342	308
18	1780	2700	3400	1880	419	342	284
19	1880	2800	3400	1660	397	343	272
20	2580	2960	3360	1280	387	344	282
21	2620	3020	3320	1000	410	354	282
22	2590	3060	3200	1000	411	335	281
23	2620	3060	2950	960	411	344	303
24	2660	3080	2980	960	412	354	292
25	2720	3200	3020	1040	402	363	268
26	2780	3270	3120	1170	391	362	257
27	2840	3320	3050	1040	392	362	256
28	2900	3350	3020	980	404	361	246
29	2920	3400	2990	890	404	372	235
30	2920	3400	2930	860	384	381	235
31		3270		870	395		235
Mean	2470	2935	3320	1810	510	360	320
Ac.Ft. for month	147000	180500	197700	111400	31520	21260	19440

NOTE: This is a staff gage station at bridge 1.1 miles above mouth. Daily gage height readings. During high stages, entire flow is not recorded at this point. See Livingston record, Table 23.

* Beginning of record for season.

TABLE 25

DISCHARGE OF DRY CREEK NEAR MODESTO-1938

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*88	89	71	71	95
2		88	88	71	71	109
3		88	87	71	71	122
4		88	85	65	65	129
5		88	84	65	65	115
6		89	83	65	65	109
7		89	82	71	71	109
8		89	81	77	71	109
9		89	79	77	71	109
10		89	78	71	77	109
11		89	77	65	77	109
12		89	76	65	77	102
13		89	75	60	77	102
14		89	73	65	83	102
15		89	72	71	83	122
16		92	71	71	83	137
17		92	71	71	77	115
18		92	70	71	83	109
19		92	68	71	89	109
20		92	67	77	89	102
21		92	67	77	83	115
22		95	66	71	83	102
23		95	68	71	83	95
24		95	71	71	83	102
25		95	77	71	83	102
26		95	77	71	89	95
27		99	65	71	89	95
28		99	71	77	89	89
29		98	71	83	89	83
30		94	65	77	89	95
31			71	71		122
Mean		92	75	71	79	107
Acre-feet for Month		5449	4612	4368	4713	6583
M.I.D.Spill below Station-Ac.Ft.		885	877	720	280	1295
**Discharge to Tuolumne R.-Acre-ft.		6330	5490	5090	4990	7880
**Discharge to Tuolumne R. Mean c.f.s.		106	89	83	84	128

NOTE: This is a recording gage station about two miles above mouth (near end of Oakdale Road).

* Beginning of record for season.

** Neglecting seepage return below station.

TABLE 26

DISCHARGE OF TUOLUMNE RIVER AT LA GRANGE BRIDGE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	908	6750	4670	2840	4270	13080	3370	437	542	568	1000	1030
2	788	5760	6170	2460	4890	15680	1450	582	545	582	1630	973
3	848	8800	13290	2450	5100	15120	3700	582	547	568	1880	1050
4	848	8180	10230	3260	4980	15750	4950	582	545	568	1880	980
5	848	5860	7230	6390	4980	15550	4700	582	547	568	1870	1080
6	848	4020	6000	5980	4980	13950	3970	586	537	573	1800	1120
7	848	3360	5270	4650	5040	13880	3260	586	542	573	1970	1090
8	848	3930	4980	4070	4810	13550	3540	582	545	573	1890	1130
9	798	5290	4720	4000	4810	13580	4130	582	551	582	1920	1110
10	858	14950	3760	4720	4590	12690	3900	577	560	577	1910	1110
11	848	29750	3370	5370	4320	11310	3520	577	563	608	1880	1040
12	833	15060	6770	5650	4300	9540	2790	573	568	622	1940	1140
13	858	7650	18390	6270	4470	6840	1260	568	568	622	1860	1140
14	853	8210	12170	6490	5330	4930	1040	53	563	622	1930	1160
15	898	8010	8690	6310	4720	6560	1750	13	542	605	1910	1120
16	788	7160	7380	6130	6720	9460	2400	13	563	600	1870	1110
17	369	5460	7590	6020	8940	10000	2100	12	563	556	1850	1050
18	60	4480	6390	6340	9150	8640	2300	11	560	582	1900	975
19	1080	4420	5910	6780	8340	6960	1580	10	560	573	1900	1120
20	1240	4610	6120	7600	7460	5060	1160	9	560	582	1830	1160
21	1100	4550	6770	7190	6990	3410	452	9	563	568	1900	1130
22	968	4600	5770	6120	6610	2960	440	22	563	593	1910	1150
23	693	3740	4950	5920	6890	4650	448	11	563	556	1330	1090
24	1010	3130	5690	6320	7450	6820	427	8	563	605	1120	1070
25	1690	3020	5780	6630	8390	7900	420	8	568	617	1150	955
26	1740	3890	5010	6630	8650	8650	417	8	568	633	1100	995
27	1780	4550	3620	6630	9200	8990	434	14	568	633	956	995
28	1730	4440	4090	6590	9620	8850	447	15	568	641	1090	1120
29	1960		3920	5770	8810	7170	452	42	568	646	1090	1120
30	1780		3440	4050	8260	6210	483	547	568	597	1060	1100
31	2150		3210		10620		448	541		627		1040
Mean	1060	6920	6500	5520	6570	9590	1990	282	558	594	1640	1080
Ac.Ft. for Month	65190	384100	399400	328500	404000	570700	122500	17340	33180	36540	97840	66350

NOTE: Recording gage station maintained by Turlock Irrigation District throughout the year. Occasional discharge measurements made during low water season by Division of Water Resources.

TABLE 27

DISCHARGE OF TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1220	4850					2130	520	588	600	790	985
2	803	6250				16300	1970	600	600	600	1180	955
3	803	7050					3160	600	600	592	1730	985
4	887	8950					4650	600	600	592	1690	985
5	855	6350					4550	600	612	600	1640	920
6	855	3980					3890	600	600	612	1600	985
7	855	2720					3060	600	592	630	1600	985
8	855	2760					3160	600	612	630	1690	985
9	835	4250					3500	600	612	630	1730	920
10	757	10200					3720	600	560	642	1780	955
11	725						3290	600	630	639	1780	1050
12	757						3040	600	630	636	1730	1050
13	725						2360	600	630	660	1640	1050
14	757		NO RECORD*	NO RECORD*	NO RECORD*		1150	304	930	660	1690	1050
15	855						1080	29	630	600	1730	1050
16	790						1870	29	592	612	1730	1050
17	660						1890	29	630	580	1640	1050
18	225						1940	29	630	560	1640	955
19	757		NO	NO	NO		1640	29	630	588	1690	965
20	1120	NO RECORD*					1330	29	630	592	1690	1050
21	931						630	26	630	600	1640	1020
22	868						560	20	630	592	1640	1020
23	712						600	23	630	588	1330	1020
24	660						600	50	630	580	1050	1000
25	1380						576	35	630	612	985	985
26	1440						520	32	630	618	1080	985
27	1470						540	35	630	636	952	985
28	1440					9240	520	29	630	624	985	920
29	1690						552	35	612	630	1020	920
30	1690						560	240	600	630	985	920
31	1600						520	580		630		920
Mean	967						1921	300	616	612	1468	990
Ac.Ft. for Month	59460						118100	18450	36670	37660	87390	60840

NOTE: This is a recording gage station at Mile 39.9

* No record for period February 11th to July 1st - Recorder removed on account of high water.

TABLE 28

DISCHARGE OF TUOLUMNE RIVER AT HICKMAN BRIDGE-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1120	4930					2710	580	758	740	890	1380
2	1120	5900				16700	2620	722	770	746	1230	1300
3	1640						3750	734	770	734	2170	1160
4	1600						4930	734	770	746	2170	1160
5	1450						4930	734	770	758	2170	1160
6	1450						4450	740	782	770	2080	1230
7	1450						3750	740	776	770	2080	1230
8	1450						3750	740	770	770	2080	1230
9	990						4050	740	770	770	2080	1300
10	938						4250	746	746	776	2080	1380
11	978						3850	746	770	776	2080	1380
12	950						3650	746	770	782	2080	1380
13	950						2980	752	770	782	2080	1380
14	950						1530	698	770	800	2000	1380
15	1150						1450	500	770	830	2000	1380
16	985						2440	170	770	830	2000	1380
17	920						2530	170	770	806	2000	1380
18	312						2530	170	770	812	2000	1230
19	704						2170	170	746	812	2000	1300
20	1380						1760	160	746	812	2000	1380
21	1380						830	156	740	812	2000	1380
22	1200						710	156	746	800	2080	1300
23	1030						610	154	752	782	2000	1380
24	950						662	154	758	776	1160	1300
25	1910						686	154	758	788	1090	1300
26	1980						758	154	758	812	1450	1300
27	2020						722	154	752	830	1300	1300
28	2000					9680	722	154	752	854	1300	1230
29	2210						734	154	746	854	1380	1230
30	2240						710	360	746	854	1380	1230
31	2130						600	758		842		1230
Mean	1340						2320	452	761	794	1810	1300
Ac.Ft. for Month	82390						142500	27770	45310	48840	107900	79890

NO RECORD* (Feb. 3d to July 1st)

NO RECORD* (Mar. 3d to July 1st)

NO RECORD* (Apr. 3d to July 1st)

NO RECORD* (May 3d to July 1st)

NOTE: This is a recording gage station at Mile 31.7.

* No record for period February 3d to July 1st - Recorder removed on account of high water. Record for period July 1st - July 23d and December 11th - December 31st by comparison with gage heights at Roberts Ferry Bridge.

TABLE 29

DISCHARGE OF TUOLUMNE RIVER AT TUOLUMNE CITY-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1920	2590	4600	3650	5000	9300	5900	890	900	1020	1140	1500
2	1530	6000	5000	3500	5000	12300	3500	960	910	1010	1340	1470
3	1210	7000	8100	3200	5400	15500	3600	1030	910	1010	1910	1435
4	1190	9800	16400	3050	5700	16500	5350	1030	910	1010	2400	1450
5	1210	9700	14200	3800	5400	16700	5850	1030	910	1010	2425	1405
6	1200	6550	8300	6200	5200	17000	5350	1030	910	1010	2450	1450
7	1180	4530	6100	5950	5200	16000	4600	1035	910	1020	2360	1490
8	1180	3120	5350	4900	5300	15000	4400	1030	910	1030	2400	1470
9	1180	3820	5050	4450	5100	15000	4850	1030	915	1040	2435	1485
10	1160	5600	4850	4400	4900	14700	5000	975	920	1050	2435	1470
11	1160	12800	4300	5050	4600	14200	4700	970	930	1060	2450	1450
12	1160	22400	4350	5500	4400	12700	4150	955	930	1080	2400	1410
13	1160	19300	7400	5850	4500	10800	3070	940	935	1100	2410	1440
14	1180	12400	15700	6400	4600	8300	2250	930	935	1120	2380	1465
15	1210	9600	13600	6700	5400	6100	2490	740	925	1160	2425	1470
16	1280	9700	11100	6500	6300	6900	3175	565	925	1200	2425	1445
17	1270	7700	8600	6400	6700	8900	3350	525	940	1220	2380	1420
18	1100	6000	8600	6200	8400	10100	3330	495	940	1170	2350	1385
19	800	5000	6900	6500	9600	9600	3240	480	940	1130	2370	1340
20	1290	4900	6200	6700	8900	8800	2370	480	955	1080	2370	1440
21	1540	4900	6300	7700	7700	5700	1710	490	955	1070	2295	1480
22	1510	4740	6700	7300	7100	4500	1250	465	965	1070	2370	1440
23	1360	4670	6100	6200	6700	4200	1300	465	970	1060	2390	1445
24	1180	4250	5500	6200	6800	4800	1200	460	975	1060	1900	1435
25	1700	3650	6100	6700	7000	6100	1140	460	980	1090	1635	1425
26	1780	3470	6050	6800	7600	7200	1100	460	990	1110	1600	1335
27	1860	4070	5800	6900	8000	8600	1030	460	995	1120	1555	1315
28	1950	4480	4500	6900	8300	9400	1000	460	1000	1130	1450	1405
29	1940		4250	6800	8600	9500	975	480	1010	1130	1505	1455
30	2440		4100	6200	8500	7600	950	700	1020	1140	1520	1465
31	2590		3800		8200		950	900		1150		1455
Mean	1433	7241	7223	5753	6455	10400	3004	739	944	1086	2116	1437
Ac.Ft. for Month	88106	402129	444100	342347	396893	618843	184721	45461	56172	66764	125901	88354
Diversions Below Station-Ac.Ft.	0	0	0	0	0	0	0	30	0	0	0	0
M.I.D.Spill Below Station-Ac.Ft.	0	0	0	358	1502	1165	1354	390	468	548	0	0
*Discharge to San Joaquin River Acre-feet	88100	402100	444100	342700	398400	620000	186100	45820	56640	67310	125900	88350

NOTE: Recording gage station maintained jointly by Division of Water Resources, City of San Francisco, Modesto Irrigation District and Turlock Irrigation District. Station is 3.35 miles above the mouth.

* Neglecting seepage return below station.

TABLE 30

DISCHARGE OF STANISLAUS RIVER AT
ORANGE BLOSSOM BRIDGE-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*760	22	22	34
2			760	34	22	37
3			760	27	22	90
4			827	22	22	123
5			850	22	22	210
6			760	22	22	175
7			692	27	22	175
8			805	27	22	175
9			760	27	22	175
10			760	22	22	75
11			670	22	0	75
12			490	22	22	90
13			350	22	22	75
14			210	27	22	34
15			90	27	22	90
16			45	27	22	105
17			60	27	22	105
18			210	27	22	210
19			370	27	22	228
20			263	27	22	210
21			140	22	22	210
22			75	22	22	280
23			45	22	22	228
24			45	22	22	296
25			45	22	22	175
26			37	27	22	158
27		2700	45	27	22	217
28			34	27	22	45
29			34	27	34	210
30			26	22	34	470
31	10400		27	22		470
Mean			356	25	21	169
Ac.Ft. for Month			21910	1520	1310	10410

NOTE: This station is located 5.7 miles above Oakdale.
The record is from daily staff gage readings.

* Beginning of continuous record for season.

TABLE 31

DISCHARGE OF STANISLAUS RIVER AT HATMARK RANCH-1938

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	450			2720		8210	*3000	430	340	440		
2					4760		3130	380	330	460		
3			5440		4870		2210	380	320	470	550	
4							2020	410	320	480		
5				3470			2080	450	310	490		410
6							1700	450	300	490		
7		2750					1590	460	300	500	410	
8							1440	420	300	500		
9			3320				1390	430	300	500		
10	710				4830	9620	1360	430	300	500		
11							1330	420	300	490		
12				4150			1290	420	280	480		380
13							1030	420	280	470		
14							890	440	280	480	330	290
15							780	410	280	490		
16							690	430	280	530		
17	740		6270		15470		650	380	280	580		
18		3270					650	380	270	620		
19							600	420	280	560		360
20				5200		3660	590	410	280	540		
21							560	410	290	530	430	
22							550	430	300	510		
23		1840	4390				530	410	310	550		
24	1010				6390		520	390	330	560		
25							520	380	340	550		
26				6410			520	360	360	470		
27						3310	490	350	370	390		330
28						3190	470	350	390	370	400	
29							430	340	410	370		
30			3420		10540		430	340	430	390		
31	940						430	340		550		
Mean							1090	402	315	494		
Ac.Ft. for Month							67180	24730	18760	30370		
Diversions Below Station-Ac.Ft.							211	175	113	15		
Discharge ** to San Joaquin River Acre-feet							66970	24550	18650	30360		

NOTE: Recording gage station maintained jointly by Division of Water Resources, City of San Francisco, Modesto Irrigation District and Turlock Irrigation District. Station is 5.3 miles above mouth of river.

* Beginning of continuous discharge record for season.

** Neglecting seepage return below station.

CHAPTER III

MEASUREMENTS OF DIVERSIONS

Measurements and records of diversions in 1938 have included those from the Sacramento River and its tributaries on the valley floor, those to the Delta Uplands from Cache Slough, Old San Joaquin River, Tom Paine Slough, and San Joaquin River, and those on the Stanislaus, Tuolumne, Merced, and San Joaquin (above Durham Ferry Bridge) rivers as obtained in connection with the return water measurements (See Chapter IV). For 1938 this report records a total of 601 points of diversion, (12 of which were newly reported this year), segregated to the various sources as follows: Sacramento River 266, Colusa Trough 9, Back Borrow Pit (carrying drainage water from Colusa Basin along the back levees of Reclamation Districts 108 and 787) 13, Lower Butte Creek and Butte Slough 22, By-Pass and Drainage Channels 27, Feather River 40, Yuba River 16, American River 34, diversions to Delta Uplands from Cache Slough 1, from Old San Joaquin River 13, from Tom Paine Slough 8, and from San Joaquin River (below Vernalis gaging station) 48, San Joaquin River (above Vernalis gaging station) 20, Stanislaus River 16, Tuolumne River 11, and Merced River 57. In addition there were 25 plants removed or dismantled during 1938.

All of these diversions except five are accomplished by pumping. The five exceptions are gravity diversions, two on the Yuba River, two on the Feather River and one on the Sacramento River, and the records for these are obtained by means of canal ratings. In the case of the pumping diversions there are a few instances

where the records are obtained by means of canal ratings but in the main the records are obtained from the relation established between electric power consumption and pump discharge. This is possible due to the fact that nearly all of the pumping plants are electrically operated. The relation between power input and water pumped is determined from current meter measurements of the discharge and a measured kilowatt input. At the larger pumping plants several measurements are made during each season. At the smaller plants a number of measurements are made initially to determine the rating and thereafter at intervals to show any changes which may occur in the rating. Prior to 1933 a daily diversion record for each plant was compiled. However, since that year, except for the larger diversions, the monthly diversion records only are available.

For 1938 the amount of water diverted by the larger plants was computed, as above, and several discharge measurements were made at each of the larger plants during the season. Due to the intermittent operation of the smaller plants and the large area to be covered by the field engineers, it was not possible to make many discharge measurements at any one of these smaller plants. However, it is felt that possibly the rating as initially determined, remains more or less constant and that over a period of time, enough measurements will be secured to determine any change in the rating. The diversions for 1938 have been computed on a monthly basis only and the breakdown into daily records was not made.

A summary of the 1938 diversions throughout the Sacramento San Joaquin territory is shown in Table 32. A segregation is made

to show the relative diversions from the various river sources. For each segregation the table shows also the acreage irrigated and the computed seasonal gross duty of water. Table 33 summarizes the diversions and irrigated acreages between different points on the Sacramento River. Table 34 shows a comparison of the Sacramento River stream flow irrigation draft and gross duty of water for the years 1924 to 1938, inclusive.

TABLE 32

DIVERSIONS, ACREAGE IRRIGATED, AND GROSS SEASONAL (MARCH TO OCTOBER, INCLUSIVE) DUTY OF WATER IN THE SACRAMENTO-SAN JOAQUIN AREA-1938

Source	Table Number	Seasonal Diversions Acre-Feet	Acreage Irrigated			Gross Seasonal Duty of Water Acre feet per Acre
			General	Rice	Total	
Sacramento River-Redding to Sacramento	35	932230	85595	62588	148183	6.3
Feather River below Oroville	40	512600	26938	27144	54082	9.5
Yuba River on Valley floor	41	43257	5772	1605	7377	5.9
American River below Fairoaks	42	4287	723	0	(1) 723	1.5
By-Pass and Drainage Channels	39	15943	6688	410	7098	2.3
Lower Butte Creek and Slough	38	(2)8637	2717	0	(2) 2717	3.2
Colusa Trough and Back Borrow Pit	36-37	22852	1505	3040	4545	5.0
Total above Sacramento		1539806	129938	94787	224725	6.9
Delta Uplands from-						
Cache Slough	43	5908	2033	0	2033	2.9
Old San Joaquin River	44	50393	29658	0	29658	1.7
Tom Paine Slough	45	7297	2887	0	2887	2.5
San Joaquin River (below Durham Ferry Bridge)	46	34530	17582	0	17582	2.0
San Joaquin River from Fremont Bridge to Durham Ferry Br	47	89766	42226	200	42426	2.1
Merced River below Snelling	48	8126	3072	0	3072	2.6
Tuolumne River below Roberts Ferry Bridge	49	980	594	0	594	1.6
Stanislaus River below Orange Blossom Bridge	50	7045	3198	0	3198	2.2
Total delta uplands and pumping diversions of San Joaquin River and Tributaries*		*204045	101250	200	101450	2.0
Sacramento-San Joaquin Delta	74	**1226850	448750	0	**448750	**2.7

(1) An additional 2200 acres now classed as suburban lands is not included.

(2) All gun club diversions and acreages have been excluded where possible. The diversions to Sutter By-Pass have also been excluded. (See Table 38.)

*Note that major gravity diversions by canals of Oakdale, South San Joaquin, Modesto, Turlock, Waterford, and Merced Irrigation Districts and Miller and Lux are not included within the scope of these measurements.

**The figures for the delta represent the consumptive use of water (See Chapter V) and are not comparable to the gross diversion figures of the Up-River areas which do not take return water into account. The delta acreage given is the total consumptive area including water surfaces, aquatic growths, weeds, etc. The total irrigated crop acreage was 338,925 on which the seasonal consumptive use was 760,850 acre-feet, a consumptive use of 2.3 acre-feet per acre.

TABLE 33

SUMMARY OF SACRAMENTO RIVER DIVERSIONS AND ACREAGES IRRIGATED-1938

River Section	Acre-feet									Acreage Irrigated	
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Totals	General	Rice
Redding to Red Bluff	3663	9000	12539	21016	20549	20870	20856	11808	120301	9309	0
Red Bluff to Butte City	0	117	32317	78292	91115	87107	48183	14770	351901	27193	29522
Butte City to Colusa	0	0	2692	7610	8445	7005	5447	485	31684	5137	1790
Colusa to Wilkins Slough	0	13272	51670	60580	58961	55473	26878	251	267085	27788	19616
Wilkins Slough to Knights Landing	0	2477	9980	13453	17499	16017	5807	986	66219	6476	4264
Knights Landing to Verona	0	0	1736	2860	3422	3273	1156	0	12447	1757	0
Verona to Sacramento	1622	5076	10913	15934	18581	18669	9850	1948	82593	7935	7396
Totals	5285	29942	121847	199745	218572	208414	118177	30248	932230	85595	62588

TABLE 34

SACRAMENTO RIVER - REDDING TO SACRAMENTO
STREAM FLOW - IRRIGATION DRAFT - GROSS DUTY OF WATER 1924-1938

Year	Seasonal Runoff at Red Bluff in per cent of normal *	Discharge of Sacramento River at Kennett Cubic feet per Sec.		Irrigation Draft		Acreage Irrigated			Gross Duty of Water				
									Acre-feet per Acre			Acres per Second-foot	
		Average Jul.-Sep. Inclusive	Average July	Aver. cfs. Jul.-Sep. Inclusive	Acre-feet Mar.-Oct. Inclusive	General	Rice	Total	Jul.-Sep. Inclusive	July	Mar.-Oct. Inclusive	Mar.-Oct. Inclusive	Jul.-Sep. Inclusive
1924	36	2920**	2890**	2470**	953000	104300	59700	164000	2.75	1.15	5.81	84	66
1925	86	3630**	3640**	2960**	842000	76200	58000	134200	4.03	1.57	6.27	77	45
1926	01	2780	2880	3210	1104000	76600	87500	164100	3.57	1.58	6.73	72	51
1927	117	3550	3950	3510	1159000	77900	79800	157700	4.07	1.60	7.35	66	45
1928	82	3320	3580	2920	1053000	88200	63500	151700	3.52	1.49	6.94	70	52
1929	47	2920	3060	2770	1060000	136900	43900	180800	2.80	1.15	5.86	83	65
1930	65	2970	3070	2880	1053000	96600	56200	152800	3.44	1.42	6.89	70	53
1931	36	2570	2600	3030	1335000	141500	73900	215400	2.57	1.13	6.20	78	71
1932	54	2730	2940	2570	1020000	130700	53800	184500	2.54	1.07	5.53	88	72
1933	49	2770	3010	2680	1042000	101100	53000	154100	3.17	1.28	6.76	72	57
1934	48	2540	2650	2750	1057000	93800	56500	150300	3.34	1.35	7.03	69	54
1935	80	3010	3330	2820	926000	98500	51100	149600	3.44	1.38	6.19	78	53
1936	76	2910	3280	2890	1055000	93100	62700	155800	3.38	1.39	6.77	72	54
1937	64	2950	3380	3210	1070000	101000	66500	167500	3.50	1.41	6.39	76	52
1938	157	4220	4870	2990	932000	85600	62600	148200	3.68	1.47	6.29	77	49
Average 1924-1938		3050	3280	2920	1044100	100100	61900	162000	3.32	1.36	6.47	75	55

* 40 year mean (1889-1929) of natural run-off. Figures given for Red Bluff as Kennett station not established until 1926.

** Flow near Red Bluff. Station at Kennett established in 1926.

TABLE 35

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
— "M" STREET BRIDGE - SACRAMENTO - MILE 0.0 —													
City of Sacramento	C.8 L	3-20"	1622	1795	2524	3133	3502	3368	2752	1866	20562	Municipal	
		1-18"											
— AMERICAN RIVER - MILE 1.1 LEFT —													
— BACK BORROW PIT RECLAMATION DISTRICT 1000 - MILE 1.3 LEFT —													
E. Fourness	1.45 R	1-8"					47	58	40	5	150	79	
M. Zuburi (1)	2.05 L	1-8"				72	72	63	32	11	250	90	
		1-6"(2)											
— RECLAMATION DISTRICT 1000 DRAIN - MILE 2.1 LEFT —													
Frank Christophel	2.4 L	1-5"				14	18	8	2		42	36	
H. M. Swalley	2.45 L	1-5"				14	17		6		37	38	
N. E. Parr	2.9 L	1-6"					2				2	6	
Earl Fruit Company	3.55 R	1-16"				129	183				312	165	
W. E. M. Beardslee	3.75 R	1-5"		3	9	16	19	19	20	8	94	50	
M. C. C. Van Loben Sels (3)	4.0 R	1-10"			NO	DIVERSION							
Reese and Greer	4.65 R	1-7"					21	21			42	(4)44	
Harbinson Brothers	5.05 R	1-14"			NO	DIVERSION (5)						(5)	
R. S. Seydel	5.25 R	1-8"			16	7	12	17	12	9	73	38	
C. H. Merkeley Estate	5.3 R	1-8"					56				56	50	
A. Casselman	5.5 R	1-6"				6	5	5			16	25	
A. A. Casselman	5.55 R	1-6"					13				13	30	
K. L. Leydal	5.7 R	1-10"			NO	DIVERSION							
J. E. Bandy	6.0 R	1-6"			9	36	37	15	5		102	40	
Riverside Mutual Water Company	6.1 L	2-18"			74	1090	1163	1970	910		5207	1506	
O. A. and F. L. White	6.6 R	1-6"			NO	DIVERSION							
E. S. Fisk	7.0 R	1-4"			NO	DIVERSION							
Fred C. Jones (6)	7.5 L	1-8"					17	2	21		40	100	
F. L. Martin,& A. B. Carter (Stahl)	7.8 L	1-10"			NO	DIVERSION							
A. Marty	7.9 R	1-8"						58	16	1	75	49	
M. E. and R. F. Bennett	7.9 L	1-10"				19		20	14		53	91	
M. Marty	8.3 R	2-10"			31	69	131	82	48	38	399	161	
		1-6"(2)											

* Mileage along river above Sacramento.
(1) Formerly Suburban Holdings Company.
(2) Installed temporarily for 1938.
(3) Formerly J. Da Rosa.
(4) Includes 21 acres on adjoining Harbinson property.
(5) See plant at Mile 4.65 Right.
(6) Formerly California Bank and Trust Company.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Blauth Estate	8.5 R	1-7"					26				26	83	
H. Waldeck	8.7 R	1-6"			6	19	20	7	3	1	56	44	
Hazel Goethe	8.95R	1-6"				3	39	23			65	31	
California Lands, Inc.	9.35R	1-14"				146	212	107	11	5	481	(1)265	
R. G. Pearson and P. S. Driver	9.8 L	1-14"			11	236	278	169	152		843	(2)476	
Carl Casselman	9.9 R	1-12"				14	44	36	32		126	119	
Lloyd M. Robbins	10.25L	1-14"				40	193	243	42		518	121	
Reese Estate	10.75R	1-12"			14	85	196	130	9		434	207	
Natomas Company (Joe Rosa)	10.75L	1-12"				15	37	28	13		93	45	
McKeehan and Harris	11.1 R	1-12"			13	63	149	210	11		446	219	
A. L. White	11.6 L	1-10"				19	47	25	26		117	(3)41	
— ELKHORN FERRY - MILE 11.9 —													
Conaway Ranch	12.0 R	4-36"			2258	3849	2953	2854	1079		12993		3100
Thomas O'Connor	12.5 R	1-12"					27	50	1		78	136	
Gertrude Brown	12.7 R	1-6"				3	22	21	8		54	100	
Julius Hauser	13.1 R	1-12"			NO	DIVERSION							
J. Corey	13.2 R	1-8"				12	29	19			60	75	
Henry Schaefer	13.25R	1-8"					95	72	3		170	75	
Elkhorn Mutual Water Company	14.1 L	1-24"											
		1-20"			173	1085	1905	2444	1519		7126	1738	
M. E. Dole	14.25R	1-10"					3				3	10	
M. E. Dole	14.4 R	1-6"			NO	DIVERSION							
California Lands, Inc.	15.15R	1-10"				25	106	143			274	90	
California Trust & Savings Bank	15.7 L	1-6"			NO	DIVERSION (4)						(4)	
Central Mutual Water Company	16.0 L	2-28"		1341	3139	3038	3554	2606	1136		(5)14814	(6)537	2376
Frank Fisher & Henry Rich(Hershey)	16.27R	1-20"				24	48	153			225	228	
H. T. Silvius	16.4 R	1-6"				29	27	30	1		87	(7)70	
George Miyaoka (8)	16.62R	1-10"(9)					71	81			152	(10)105	

* Mileage along river above Sacramento.

(1) Includes 135 acres on adjoining Merkeley property.
(2) Divided as follows: Pearson 137, Driver 339.
(3) Includes 6 acres on adjoining C. G. White place.
(4) 28 acres served through plant at Mile 16.0 Left.
(5) This plant pumps to the irrigation canal both from a drain canal of R.D. 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 58, May 474, June 260, July 137, August 199, September 168, Total 1296.
(6) Includes 28 acres for California Trust and Savings Bank - Mile 15.7 Left.
(7) Includes 20 acres on adjoining Miyakoa property.
(8) Formerly W. B. Beach.
(9) Replaces 6" unit.
(10) Additional acreages served from plants as follows, Mile 16.4 (Silvius) 20 acres, Mile 22.5 (Fisher & Rich) 120 acres.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet:	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
George Miyaoka (1)	16.7 R	1-14"			NO DIVERSION								
Frank Fisher and Henry Rich	17.4 R	1-18"				187	79	114			380	177	
California Western States Life Insurance Company	17.75 R	1-20"				40	426	86			552	200	
M. and J. Scheiber (L.Ashwandan)	18.45 L	1-12"					96	47	55	4	202	95	
G. H. Lyall	18.7 L	1-8"					44	68	20		132	50	
Natomas Company - Reclamation District 1001 (2)	19.6 L (2)		IRRIGATION UNIT REMOVED										
Northern Mutual Water Company (Bennett Plant) (3)	19.6 L (3)		PLANT REMOVED										
Northern Mutual Water Company(4)	19.6L(5)	2-24"		1937	2636	2397	2540	3200	1851		14561		1920
Natomas Ben May Plant (6)	19.6L(6)		PLANT REMOVED										
— VERONA GAGING STATION - MILE 19.6 —													
— FEATHER RIVER - MILE 20.9 L —													
— SACRAMENTO SLOUGH - MILE 21.2 L —													
Frank Fisher and Henry Rich (Keller Plant)	22.5 R	1-22"			143	47	463	427			1080	525	
Hershey Estate (Darneille) (8)	26.95R(8)	1-18"			NO DIVERSION (8)							(7)	
Morse Inglin	28.2 R	1-6"				6	21	14	8		49	25	
Russell Brothers	29.2 R	1-12"					47	22	57		126	85	
M. R. Richardson	29.7 R	1-8"			NO DIVERSION								
P. L. Traganza and K. Russell	29.75 R	1-8"			NO DIVERSION								
Laura Freitas	29.9 L	1-12"				17	25	30			72	90	
Leo Giovanetti	30.2 L	1-5"					12	8			20	(9)19	
M. R. Richardson	30.6 R		PLANT REMOVED										
Floyd Anderson	30.7 R	1-6"			NO DIVERSION								
George Senf	30.9 L	1-8"			NO DIVERSION								
A. C. Huston	31.5 R	1-12"			NO DIVERSION								
M. Alonso	31.8 L	1-6"			NO DIVERSION								
M. R. Richardson	32.0 R	1-10"				6	189	85	15		295	320	
Sutter Mutual Water Company (Portuguese Bend)	32.0 L	2-24"			1454	2240	2141	2160	1030		9025	(10)	(10)

* Mileage along river above Sacramento.

(1) Formerly Thomas J. Cox Estate.

(2) Cross Canal, the main drain between Reclamation District 1000 and 1001, joins the Sacramento River at Mile 19.6 Left. Plant is on north bank and 0.75 mile from junction.

(3) Cross Canal - South Bank - 1.0 mile from junction with Sacramento River.

(4) New installation 1938. One of the units was formerly installed at Bennett plant. (1.0 mile from junction).

(5) Cross Canal - South Bank - 2.0 miles from junction with Sacramento River.

(6) Cross Canal - North Bank - 3.35 miles from junction with Sacramento River.

(7) Includes 120 acres on Miyoaka land, Mile 16.62 Right.

(8) This plant diverts water to Grays Bend (Old River channel) to supplement seepage therein. Hershey Estate maintains a booster plant on this channel. In 1938 there was no irrigation from booster plant.

(9) Includes 9 acres on adjoining Reclamation District 1500 lands.

(10) See plant at Mile 63.75 Left.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Collier Brothers	32.5 R	1-10"					22	26	17		65	57	
R. B. Coulter (Carlson)	33.2 L	2-10"			139	517	421	427			1504	(1) 417	
J. G. Knox	33.35 L	1-8"				16	40	17			73	64	
Snowball Estate	33.5 R	1-12"			NO	DIVERSION							
Leiser Brothers	33.75 L	1-12"				11	41	57	29		138	155	
J. W. Snowball	33.85 R	1-6"			NO	DIVERSION							
— KNIGHTS LANDING GAGING STATION - MILE 34.0 —													
— COLUSA BASIN DRAINAGE - MILE 34.15 R —													
Meek Estate	34.2 R	1-10"											
		2-16"			143	186	311	430	215		1285	(2) 439	
River Farms Company (Townsite Plant)	34.25 R	1-20"											
		1-24"				14	203	161	115	278	771	343	
		1-26"											
Commercial Investment Company (R. B. Bailey)	34.85 L	1-12"				85	13	23	4		125	115	
Walter Raymond	35.2 L	1-12"				22	121				143	140	
Walter Raymond (3)	35.62 L	1-7"					19	26	33		78	39	
J. H. Donnelly Ranch (Bundock Bros.)	35.8 L	1-10"				32	29	16	8	3	88	(4) 50	
F. T. Burrell (J.L.Sills)	36.2 L	1-16"					123				123	100	
R. H. Bailey (5)	36.45 L	1-8"				25	23	24			72	47	
Amedeo Moroni	36.7 L	1-5"			NO	DIVERSION							
W. W. Bottimore	37.2 L	1-14"			NO	DIVERSION							
Bundock Brothers	37.75 L	1-8"					3	124			127	70	
Addie Reel (A. R. Kramer)	38.4 L	1-10"						58			58	90	
California Lands, Inc. (H.A.Kramer)	38.8 L	1-10"					77				77	65	
F. O. Eastman	39.4 L	1-12"			NO	DIVERSION							
Commercial Investment Company (R. B. Bailey)	39.8 L	1-10"					68	16			84	70	
William Duffy, Jr.	39.9 L	1-6"			NO	DIVERSION							
Sutter Mutual Water Company (State Ranch Bend)	40.6 L	2-24"		889	2001	2983	3932	3551	1856		15212	(6)	(6)
Buell Ranch	41.8 L	1-4"			NO	DIVERSION							
Buell Ranch (M. K. Dean)	42.2 L	1-6"			NO	DIVERSION							
Mateolli & Fratchia	42.3 L	1-8"			NO	DIVERSION							
A. Kramer	43.1 L	1-12"			NO	DIVERSION							

* Mileage along river above Sacramento.

(1) Includes 47 acres on adjoining Joe Rossi land.

(2) Includes 27 acres on adjoining Keorefelsis property.

(3) Formerly J. H. Scott.

(4) Includes 10 acres on adjoining Gofitzer land.

(5) New installation 1938.

(6) See plant at Mile 63.75 Left.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
El Dorado Ranch	43.1 R	1-18"			14	197	230	39			480	625	
River Farms Company (Reclamation District 2047 Plant)	43.1 R	2-50"		1388	5111	5990	7353	7203	1734	703	29482	1436	3474 (1)
— RECLAMATION DISTRICT 108 DRAINAGE PLANT - MILE 44.0 R —													
John Clauss (G. Guisti)	47.3 L	1-14"			NO	DIVERSION							
P. J. Hiatt	48.7 L	2-20"			470	1019	1440	998	803		4730	285	150
P. J. Hiatt	49.7 L	1-14"			9	26	34	4			73	50	
Reclamation District 108 (Tyndall Mound Plant)	51.1 R	2-24"			NO	DIVERSION							
		1-36"											
Holmes and Noble (P.J.Hiatt) (2)	51.2 L	2-16"			1232	1275	1235	1080	394		5216	(3)617	160
J. F. White	51.5 L	1-8"			NO	DIVERSION							
T. J. Cummins Ranch Company	52.0 L	1-16"				63	19	32	29		143	81	
George Van Ruiten	52.9 L	1-10"			NO	DIVERSION							
George Van Ruiten	53.9 L	1-12"			NO	DIVERSION							
Broomieside Farm (R. M. Chaplain)	55.1 L	1-20"				74	299	294	26		693	240	
Reclamation District 108 (Boyer Bend Plant)	56.4 R	1-18"			NO	DIVERSION							
		1-30"											
J. M. Miller	56.65 R	1-12"					135	201	56		392	157	
Broomieside Farm (R. M. Chaplain)	56.95 L	1-20"				583	306	129	146		1164	476	
Lamb Brothers	57.5 L	1-16"			NO	DIVERSION							
James A. Neilson (4)	58.2 L	1-15"					116	183			299	(5)267	
Alex Grant	58.9 L	1-16"			NO	DIVERSION (6)					(6)	(6)	
Lamb Brothers	59.8 L	1-14"										280	480
		1-8"		200	1000	779	1100	1247	378		4704	(7)	(7)
Reclamation District 108 (Steiner Bend Plant)	59.85 R	1-16"			NO	DIVERSION							
F. L. Burrell	60.4 L	1-10"			NO	DIVERSION							
Blanche Coulter Brown	60.5 L	1-12"				64	118	66			248	120	
Sutter Basin Corporation (Coles Landing Plant)	61.3 L	1-12"			NO	DIVERSION							
Hines Ranch	62.3 R	1-10"					65	38	2		105	71	
Rowena B. Coulter (E. Seaman)	62.3 L	1-10"				34	99	54			187	140	
William Baker	62.6 R	1-8"			NO	DIVERSION							

* Mileage along river above Sacramento.

(1) Includes 2934 acres of rice on Reclamation District 108 lands.

(2) Formerly California National Bank.

(3) Includes 300 acres on Reclamation District 1500 land and 150 acres on L. C. Middleton land.

(4) Formerly Lester H. Fasig.

(5) Includes 63 acres on adjoining Alex Grant land.

(6) See plant at Mile 58.2 Left.

(7) Includes 480 acres rice and 180 acres general on Reclamation District 1500 land.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
R. L. Young	62.8 L	1-8"				2	28	20	8	2	60	63	
— WILKINS SLOUGH GAGING STATION - MILE 62.9 —													
Reclamation District 108 (Wilkins Slough Plant)	63.2 R	5-42"		1471	14046	13538	13211	12370	2438		57074	449	6228 (1)
Sutter Mutual Water Company (Tisdale Plant) (2)	63.75 L	6-42"		11080	34537	40279	34329	33236	19716	152	173329	16355 (3)	12481 (3)
Ornbaum, Nobles Land and Livestock Company (4)	64.3 R	1-12"						8	4		12	10	
Tisdale Irrigation & Drainage Co.	64.4 L	1-12"				51	455	399	149		1054	(5)1517	
L. F. d'Artenay and Van Horn	64.9 R	1-12"			NO	DIVERSION							
M. Bettencourt	65.1 R	1-10"			NO	DIVERSION							
California Lands, Inc.	65.7 L	1-10"			NO	DIVERSION							
M. P. Schohr (C. A. Hart) (6)	65.8 R	1-16"				4	86	47			137	60	
J. L. Browning	66.4 R	1-18"				74	78	24			176	75	
Tisdale Irrigation & Drainage Co. (Winship Plant)	67.1 L	1-20"										1517	
		1-12"				1003	1587	835	188	14	3627	(7)	
Desmond A. Winship (5)	67.2 L	1-10"			NO	DIVERSION (5)						(5)	
Scott F. Ennis and E. S. Brown	67.5 L	2-24"				2044	1905	1780	934		6663	(8)1805	
— RECLAMATION DISTRICT 70 DRAIN - MILE 68.80 LEFT — (9)													
Meridian Farms Water Co. #5(9)(10)	68.80 L	1-24"			NO	DIVERSION (9)					(9)	(9)	
J. L. Browning	69.0 R	1-24"				152	125	17			294	(11) 207	
Faxon Ranch	69.2 R	1-18"				199	365	490	15		1069	(12)692	
— EDDYS FERRY (GRIMES) - MILE 69.45 —													
Wilbur Jensen, Mary Cecil, et al.	70.35 R	1-24"			NO	DIVERSION							
Houchins, Hoffman, Beckley and Ritchie	70.4 R	1-20"											
		1-6"			NO	DIVERSION							
Meridian Farms Water Company #4 (Grimes)	71.1 L	1-24"		137	1100	1150	1842	2062	975		7266	245	517

* Mileage along river above Sacramento.

(1) An additional 2934 acres in Reclamation District 108 served through Reclamation District 2047 Plant at Mile 43.1 Right.

(2) Improvement Mutual Water Company is now a part of the Sutter Mutual Water Company.

(3) These figures give the total acreage served by this plant and the plants at Miles 32.0 Left and 40.6 Left.

(4) Formerly La Roca Monte Rancho Company.

(5) See plant at Mile 67.1 Left.

(6) New installation 1938.

(7) This is the total acreage served by this plant and the one at Mile 64.4 Left and includes 174 acres on adjoining Winship property. (Mile 67.2 Left.)

(8) Includes acreages on adjoining lands as follows: L. C. Middleton 85 and Meridian Farms Water Company, 68.

(9) Combination irrigation and drainage plant.

(10) No diversion from river. This is a combination drainage and irrigation plant. All water pumped was from Reclamation District 70 drain which enters river through this plant. Water pumped was as follows (Acre-feet) May 256, June 793, July 549, August 377, Total 1975. Acreage irrigated was 1092 general. An additional 68 acres served through plant at Mile 67.5 Left.

(11) Includes 17 acres served through Faxon plant, Mile 69.2 Right.

(12) An additional 17 acres served on Browning land Mile 69.0 Right.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
J. L. Browning	71.9 R	1-12"			NO	DIVERSION (1)						(1)	
Antone Steidlmayer	71.9 R	1-12"					95	80			175	(2) 220	
California Western States Life Ins.Co.(Eugene Montney) (3)	72.3 L	1-7"			NO	DIVERSION							
E. E. Vann (Westfall)	73.6 R	1-12"			NO	DIVERSION							
Meridian Farms Water Company #3 (Headquarters)	74.8 L	1-18"			41	433	359	359			1192	540	
L. B. Westfall	75.3 R	1-10"					42	109			151	(4) 130	
J. H. Yates	76.1 L	1-12"			NO	DIVERSION							
Joe Miller (Sanborn) (5)	76.2 L	1-8"			NO	DIVERSION							
Steidlmayer Brothers	76.5 R	1-16"					75	74		24	173	225	
E. V. Jacobs	77.9 L	1-12"			NO	DIVERSION							
Sebia Davis Estate	78.2 R	1-16"				72	144	60			276	154	
Sebia Davis Estate	78.8 R	1-24"			NO	DIVERSION							
C. E. Reische	79.0 L	1-10"				18	58	40	22		138	(6) 83	
Henry Schmidt	79.3 R	1-10"			NO	DIVERSION							
E. V. Jacobs	79.5 L	1-8"			NO	DIVERSION							
G. W. Wood	79.7 L	1-10"			NO	DIVERSION							
— MERIDIAN BRIDGE - MILE 79.85 —													
Meridian Farms Water Company #1 and #2 (Meridian)	80.0 L	1-24"		584	1914	1380	3029	3074	1844	30	11855	1692	390
		1-18"											
George P. Ahlf	80.3 R	1-8"						40			40	45	
Wonderly and Lilienthal	81.5 L	1-16"				28	80	129	47		284	(7) 129	
Steidlmayer Brothers	81.9 R	1-20"					343	30	298		671	(8) 350	
F. T. Reische and L. T. Wood	82.5 L	1-12"			NO	DIVERSION							
George W. Kirkpatrick	83.3 L	1-14"			NO	DIVERSION							
J. E. Clark (9)	83.5 L	1-8"					11	11	7		29	80	
		1-4"(9)											
— BUTTE SLOUGH - MILE 84.0 LEFT —													
Clifford Reichel	85.8 L	1-8"			NO	DIVERSION							
Ewing and Halsey	86.1 R	1-12"					47				47	70	
J. F. Peck	86.6 L	1-18"			NO	DIVERSION							

* Mileage along river above Sacramento.

(1) See Steidlmayer plant at Mile 71.9 Right.

(2) Includes 110 acres on adjoining Browning land. See 71.9 Right.

(3) Formerly King and Montney.

(4) Includes 120 acres on adjoining lands of Napier and Tuttle.

(5) Formerly Ella Blackmer.

(6) Includes acreages as follows: Staas 24, Lemos 31.

(7) Divided as follows: Wonderly 30, Lilienthal 80 and includes 19 acres on adjoining Thrash property.

(8) Includes 30 acres on adjoining Tubbs property.

(9) 4" unit installed 1938 awaiting permanent installation of 8" unit. 8" not used 1938.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Lloyd Scoggins	86.8 L	1-8"					39				39	45	
M. P. Dwyer (Lower)	86.9 R	1-16"			32	35	182	28			277	194	
M. P. Dwyer (Upper)	87.4 R	1-15"						51			51	66	
Jacobsen and O'Rourke	87.6 L	1-10"			NO	DIVERSION							
Swinford Tract Irrigation Company	87.7 R	1-12"				29	132	5	122	31	319	135	
Edward K. Lange	88.0 R	1-6"			NO	DIVERSION							
W. D. DeJarnett(Nagle & Locovitch)	88.2 L	1-10"					10	9			19	(1)40	
M. D. DeJarnett	88.7 L	1-14"				91	87	90			268	270	
Colusa Irrigation Company	89.2 R	1-20"					229	16	119		364	353	
Phil B. Arnold	89.25L	1-8"					16				16	35	
G. A. Berkey	89.26L	1-12"			NO	DIVERSION							
— COLUSA GAGING STATION - MILE 89.4 —													
T. H. Boggs and Sisters	89.7 L	1-6"				2	9	3			14	44	
Roberts Ditch Company	90.7 R	2-20"			77	392	487	471	218		1645	957	
I. G. Zumwalt	91.6 R	1-12"					91				91	100	
George P. Ahlf	92.5 L	1-8"					3	41			44	(2) 45	
George P. Ahlf	93.0 L	1-6"			NO	DIVERSION							
U. W. Brown	93.0 R	1-12"						23			23	40	
I. G. Zumwalt	93.2 R	1-36"											
		1-18"			NO	DIVERSION							
Paul R. Westfall	93.4 L	1-10"			NO	DIVERSION							
Tuttle Land Company	94.3 R	1-15"											
		1-20"				206	253	213	258		930	(3)283	
M. D. DeJarnett	94.4 R	1-8"			NO	DIVERSION(4)					(4)	(4)	
California Lands, Inc.	94.8 R	1-12"					38	79			117	65	
A. N. Lewis	95.6 L	1-16"											
		1-20"				460	680	312			1452	(5)699	
I. G. Zumwalt	95.7 R				PLANT	REMOVED (6)						(6)	
Bridget Graham Estate	95.8 L	1-16"			NO	DIVERSION (7)					(7)	(7)	
I. G. Zumwalt(8)	96.8 R	1-15"					202			57	259	185	
H. Heitman	97.7 R	1-12"				29	39		34		102	71	
Frank Beckley	98.0 L	1-10"					13	24			37	65	

* Mileage along river above Sacramento.

(1) Nagle 20, Locovitch 20.

(2) All on adjoining lands of Colusa Development Company.

(3) Includes 25 acres on DeJarnett (Mile 94.4 R).

(4) See acreage note for plant at Mile 94.3 Right.

(5) All on Bridget Graham Estate lands. See plant at Mile 95.8 Left.

(6) This area now served by new plant at Mile 96.8 Right.

(7) See plant at Mile 95.6 Left.

(8) New installation 1938. See note for plant at Mile 95.7 Right.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
J. L. Erisey	98.3 R	1-10"			NO	DIVERSION							
R. A. Sperry and Colusa Development Company	98.6 L	1-15"			NO	DIVERSION							
D. Boggs	98.8 L	1-18"			NO	DIVERSION							
Cheney Slough Irrigation Company	99.0 R	1-36"			NO	DIVERSION							
		2-26"											
J. P. Boggs	99.1 L	1-10"				17	25	50	2	4	98	100	
Terrill and Sartain	99.2 L	1-20"			NO	DIVERSION							
Dave George (Cauzza)	99.8 L	1-16"				13	72	73	20	1	179	100	
J. M. Browning	100.8 L	1-20"			NO	DIVERSION							
R. C. Wohlfrom	101.1 R	1-20"					147				147	138	
Clara C. Packer	102.8 R	2-18"											
		2-30"					111				111	600	
		1-30"											
Charles W. Welch	103.7 R	1-16"				294	234	139	34	11	712	569	
Compton-Delevan Irrigation District (1)	103.8 R	2-24"			NO	DIVERSION(1)					(1)	(1)	(1)
		1-36"											
C. M. Tuttle	103.9 R	1-16"			518	807	651	636	445		3057	(2)288	480
		1-20"				67	262	45	42		416	(3)300	
Colusa Development Company and I. G. Zumwalt	104.8 L	1-26"					60	60			120	185	
Thousand Acre Ranch (H. M. Keller)	106.0 R	1-14"					119				119	188	
California Lands, Inc.	110.0 R	1-12"			NO	DIVERSION							
California Lands, Inc.	111.2 R	1-6"											
— PRINCETON FERRY - MILE 112 —													
Reclamation District #1004 (4)	112.1 L	2-30"											
		1-50"			2097	5323	4936	4818	4394	412	(4)21980	60	1310
Princeton-Codora-Glenn Irrigation District (1)	112.4 R	3-24"			NO	DIVERSION(1)					(1)	(1)	(1)
I. G. Zumwalt	112.6 L	1-10"											
Edward L. Steele	115.5 L	1-12"					13				13	25	
— BUTTE CITY GAGING STATION - MILE 115.8 —								18			18	30	
— BUTTE CITY BRIDGE - MILE 115.9 —													
California Lands, Inc.	117.8 R	1-10"			NO	DIVERSION							

* Mileage along river above Sacramento.

(1) See plant at Mile 154.8 Right.

(2) Includes 73 acres on adjoining Helphenstine property.

(3) Acreage divided as follows: Colusa Development Company 150, I. G. Zumwalt 80 and total figure includes adjoining acreages as follows, J. S. Gould 20 and Mrs. Dunham 50.

(4) For additional diversion to Reclamation District 1004 see Butte Creek Diversions, Miles 3.9 Right and 9.3 Right.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938)

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		Gen-eral	Rice
C. T. White	123.7 R	1-6"			NO DIVERSION								
S. Taylor (1)	123.8 R	1-3½"			NO DIVERSION								
Princeton-Codora-Glenn Irrigation District (2)	123.9 R	3-24"			NO DIVERSION (2)						(2)	(2)	(2)
Provident Irrigation District (2)	124.2 R	4-42"			NO DIVERSION (2)						(2)	(2)	(2)
		1-36"											
California Lands, Inc. (2)	124.4 R	1-16"			NO DIVERSION (2)						(2)	(2)	(2)
Mrs. C. L. Leonard (2)	126.3 R	1-12"			NO DIVERSION (2)						(2)	(2)	(2)
E. S. Reager	130.75R	1-6"			NO DIVERSION								
— ORD FERRY - MILE 130.8 —													
M. & T. Inc. and Parrett Investment Company	141.5 L	5-24"			NO DIVERSION (3)								
— OLD CHICO LANDING RAILROAD BRIDGE SITE - MILE 142.1 —													
Edward Fierro (4)	146.5 L	1-6"				3	4	4	5		16	7	
Chico Hop Company	146.9 L				PLANT REMOVED								
M. F. Rose	148.7 R	1-6"			NO DIVERSION								
M. F. Rose	148.9 R	1-6"						2			2	5	
— GIANELLA BRIDGE - MILE 149.5 —													
California Lands, Inc.	150.0 L	1-10"				108	119	84	1		312	140	
Joseph Gianella	150.0L(5)	1-10"			NO DIVERSION								
Holly Sugar Corporation	151.0 R	1-16"			410	618	946	833	261		3068	1322	
		1-12"										(6)	
A. Holecek	152.2 R	1-5"			13	5	9	4	4		35	28	
Maas Brothers	154.6 R	1-5"				2	2	2			6	10	
Glenn-Colusa Irrigation District (7)	154.8 R (7)	1-100"											
		4-72"											
		2-50"											
		2-66"		18	4019	52654	65036	61720	33410	11135	227992 (8)	16933 (9)	20349 (9)
		1-42"											
		2-30"											

* Mileage along river above Sacramento.

(1) Plant reinstalled at an old point of diversion.

(2) See plant at Mile 154.8 Right.

(3) Any irrigation in 1938 was from Butte Creek source.

(4) New installation 1938.

(5) Pump on Nord Slough or Pine Creek Lagoon which which joins Sacramento River at Mile 147.0 Left. Plant is located three miles up slough on right bank or opposite Mile 150.0 Left, Sacramento River.

(6) Includes 100 acres on adjacent Billiou property.

(7) This is a common point of diversion for the Glenn-Colusa, Jacinto, Compton-Delevan, Provident, Princeton-Codora-Glenn, and Maxwell Irrigation Districts.

(8) Additional water from Stony Creek as follows: (Acre-feet) April 8077, May 23100, June 1720. The diversions here shown include water for users outside district as follows: (Acre-feet) L. G. Zumwalt 6935, Golden State Orchards 1100.

(9) Includes 250 acres of duck lakes, also 1000 acres rice for Zumwalt, and 250 acres general for California Lands, Inc., 124.4 R. An additional undetermined acreage for Golden State Orchards is not included.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October : Acre-feet:	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Jacinto Irrigation District	154.8 R	(1)			2830	3594	3630	3445	2854	307	16660	5398	
												(2)	
Compton-Delevan Irrigation Dist.	154.8 R	(1)		2	2382	2698	2251	2124	389		(3) 9846	8	996
Provident Irrigation District	154.8 R	(1)		60	12712	8489	8255	8230	4266		42012	563	5245
											(4)	(5)	(5)
Princeton-Codora-Glenn Irr. Dist.	154.8 R	(1)		32	8069	7992	8674	8432	5096	1543	(6)39838	2190	1812
Maxwell Irrigation District	154.8 R	(1)		5	1785	1785	1845	1845	1785	1785	(7)10835		1120
C. L. Leonard	154.8 R	(1)				198	40				238	100	
California Lands, Inc.	154.8 R	(1)					139	198			337	250	
— CORNING-VINA BRIDGE - MILE 166.5 —													
A. F. Landis	166.7 R	1-3"			4	7	7	6	5		29	5	
Laura B. Caro	166.8 R	1-2"			1	1	1	2	1		6	4	
R. A. Foster	169.1 R				PLANT REMOVED								
— TEHAMA BRIDGE - MILE 177.5 —													
E. B. Noble	184.5 R	1-14"			74	96	113	122	81		486	160	
Coneland Water Company	187.6 L	1-12"			NO	DIVERSION (8)					(8)	(8)	
E. Sluiters	188.6 L	1-8"			NO	DIVERSION							
— RED BLUFF BRIDGE - MILE 193.45 —													
G. E. Sutton	196.2 R	1-6"			NO	DIVERSION							
J. Keithdriber (9)	196.5 L	1-4"					1				1	1	
J. Erickson	196.6 L	1-5"				9	11	23	8		51	29	
C. Droz	197.0 L	1-8"			18	33	32	31	17		131	40	
W. H. Freemeyers	197.65L	1-3"			NO	DIVERSION							
— RED BLUFF GAGING STATION (IRON CANYON) - MILE 198.6 —													
C. W. Griffin	206.75L	1-10"			NO	DIVERSION							
— BEND FERRY BRIDGE - MILE 207 —													
A. A. Keene	209.0 L	1-2½"			NO	DIVERSION							
J. F. Nunes	215.5 R	1-7"			NO	DIVERSION							
— JELLYS FERRY - MILE 215.6 —													
J. F. Nunes	216.0 R	1-3"			NO	DIVERSION							

* Mileage along river above Sacramento.

(1) Same plant as that of Glenn-Colusa Irrigation District.
(2) An additional 32 acres served in Provident Irrigation District.
(3) An additional 34 acre-feet of Stony Creek water received in April.
(4) An additional 1278 acre-feet of Stony Creek water received in April as well as the following additional supplies: Gravity flow 8200 acre-feet, Willow Creek pump 5600 acre-feet and Delevan pump 4600 acre-feet.
(5) Includes 1000 acres of rice and 115 acres of general crops outside of district and 32 acres served through Jacinto District.
(6) An additional 682 acre-feet of Stony Creek water received in April.
(7) An additional 114 acre-feet of Stony Creek water received in April.
(8) Ample water available from foothill runoff.
(9) Formerly Bank of America.

TABLE 35 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October : Acre-feet:	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
M. A. Hunaeus	216.4 L	1-3"						4	6		10	5	
T. A. Haakonson	217.5 L	1-3½"(1)				5	32	18	4		59	54	
J. L. Haskins	218.0 L	1-5"				4	4	3	1		12	12	
Rio Alto Rancho	221.0 R	1-10"			NO	DIVERSION							
— BALLS FERRY BRIDGE - MILE 224.5 —													
— ANDERSON BRIDGE - MILE 232.9 —													
L. C. Smith and C. M. George	233.0 L	1-6"			NO	DIVERSION							
Wm. Menzel Meat Company	240.2 L	1-12"				601	446	133	2		1182	142	
Graf and Graf	241.5 L	1-8"				58	38	32	11		139	38	
— REDDING ALTURAS BRIDGE - MILE 242.0 —													
— NEW REDDING-YREKA BRIDGE - MILE 245.9 —													
Anderson-Cottonwood Irrigation District	246.0 R	Gravity	3663	9000	12513	20316	19963	20615	20792	11808	(2)118670	9036	
— SOUTHERN PACIFIC RAILROAD BRIDGE —													
John Diestelhorst	246.3 R	1-10"			26	32	66	65	40		(3) 229	22	
— OLD REDDING-YREKA BRIDGE - MILE 246.4 —													
Totals			5285	29942	121847	199745	218572	208414	118177	30248	932230	85595	62588

* Mileage along river above Sacramento.

(1) Replaces 5" unit.

(2) Considerable return water from this diversion reaches the Sacramento River as seepage or direct spill in the drains and creek channels between Redding and South of Cottonwood.

(3) It is estimated that at least one-half of this diversion is returned directly to the river.

TABLE 36

*COLUSA TROUGH DIVERSIONS-1938

Water User	**Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated		
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice	Gun Club
Hattie O'Hair	(1)0.35R	1-20"			968	1146	1116	1247	557		5034		850	
— COLUSA TROUGH GAGING STATION - MILE 0 —														
I. G. Zumwalt	2.2 L	1-15"												
		1-20"			NO	DIVERSION								
		1-36"												
A. D. J. Land Company (Kindred)	3.0 L	2-28" Box					11	8			19	40		
Maxwell Irrigation District	7.0 R	1-15"												
Plant #2A		1-26"			NO	DIVERSION								
		1-36"												
Maxwell Irrigation District	7.0 R	1-20"			NO	DIVERSION								
Plant #3A (2)	(2)													
M. E. Rourke (3)	8.0 L	1-20"			NO	DIVERSION								
S. Ashe (4)	8.65R	(5)1-10"						75	125	50	250			(6)100
M. E. Rourke	10.5 L	1-20"			NO	DIVERSION								
— LATERAL HIGHWAY - BUTTE CITY TO WEST SIDE - MILE 20.5 —														
Stevens Brothers	22.0 R	1-18" Box			NO	DIVERSION								
Totals			0	0	968	1146	1127	1330	682	50	5303	40	850	100

* Main Drain of Reclamation District 2047.
** Mileage along Trough above Colusa-Williams Highway.
(1) Below Colusa-Williams Highway. Plant formerly listed as 0.35 Left.
(2) Plant is on Lateral E (Stone Corral Creek) and is 3/4 mile west of Plant #2A (Mile 7.0 R).
(3) Formerly listed as S. Ashe.
(4) Formerly listed as M. E. Rourke.
(5) Replaces 10" unit.
(6) On adjoining lands of El Dorado Sportsmen's Properties, Inc.

TABLE 37

*BACK BORROW PIT DIVERSIONS-1938

Water User	**Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
— SOUTHERN PACIFIC RAILROAD CROSSING - MILE 0.2 —													
— KNIGHTS LANDING RIDGE CUT JUNCTION - MILE 0.4 R —													
River Farms Company	1.45 R	1-20"			NO	DIVERSION							
W. P. Dwyer	4.35 R	1-20"			NO	DIVERSION							
Reclamation District 108 (George Youngmark)	8.8 R	1-14"			605	839	851	784	109		3188		350
Hershey Estate (Johnson and Peterson)	11.15 R	1-14" 1-12"			848	1122	1071	1018	92		4151		750 (1)
Hershey Estate	13.75 R	1-16"			NO	DIVERSION							
B. F. Mumma	14.75 R	1-10"			162	125	135	152	30		604	115	70
— COUNTY LINE BRIDGE - MILE 15.25 —													
M. T. Emmert	15.75 R	1-15"			NO	DIVERSION							
Katherine West	18.1 R	2-15"			NO	DIVERSION							
C. R. Sugget and Gregory Estate	20.0 R	1-15"			NO	DIVERSION							
Gregory Estate (G. W. Knox, Jr.)	21.35 R	1-16"			604	905	888	799	106		3302		400
Bean and Brindenburg	22.15 R	(2)1-14"			NO	DIVERSION							
J. W. Browning Company	22.65 L	1-24"			1054	1002	1054	958			4068		620
— HANNUM BRIDGE - MILE 22.8 —													
— SOUTHERN PACIFIC RAILROAD CROSSING - MILE 23.0 —													
H. Balsdon (3)	24.6 L	1-20"				634	886	573	143		2236	1250 (4)	
— GRIMES-COLLEGE CITY CAUSEWAY - (SOUTH LINE R. D. 2047) - MILE 25.5 —													
— WALLACE CROSSING - MILE 29.2 —													
— COLUSA WILLIAMS HIGHWAY - MILE 37.0 —													
Totals			0	0	3273	4627	4885	4284	480	0	17549	1365	2190

* 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 or partial diversion via Knights Landing Ridge Cut.

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

(1) Acreage divided as follows: Johnson 250, Peterson 400 and includes 100 acres on adjoining Reclamation District 108 lands.

(2) Replaces 16" unit.

(3) New installation 1938.

(4) Includes acreages on adjoining lands as follows; Mumma 70, Spicer 100, Atran 70.

TABLE 38

LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated		
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice	(1) Gun Club
Lower Butte Creek														
Reclamation District 833 (R. C. Ingram)	2.9 L	36" Box					123	763	160		1046	600		
West Butte Country Club	3.85L	1-10"			NO	DIVERSION								
Reclamation District 1004 (2)	3.9 R	(3)1-15"			NO	DIVERSION (2)						(2)		
Butte Lodge Gun Club	4.0 R	1-22"			NO	DIVERSION (4)								(4)900
Reclamation District 1004 (2)	9.3 R	Gravity				1120	2170	1470	2100	2100	(5)8960	960		(5)400
Butte Basin Gun Clubs(6)	(6)10.	Gravity									(6) & (7)			5000 (6)(7)
Murdock Land Company (8)	14.8 R					280	340	380	240		(9)1240	250		
Murdock Land Company — BIGGS-AFTON ROAD - MILE 19.4 —	19.3 R	1-14"				142	172	190	122		626	120		
Glenn Rice Farms	(10)19.8 R	1-24"								112	112			200
O. W. Baker and Sons, Inc.	20.2 R	(11)			NO	DIVERSION								
O. W. Baker and Sons, Inc.	21.2 R	(11)			NO	DIVERSION								

* Approximate mileage from junction with Sacramento River.

(1) Only diversions which occurred prior to November 1st are given for gun club acreage. In most instances the diversions for this purpose extended into November and December.

(2) Reclamation District 1004 diversion points are: Sacramento River 112.1 Left and Butte Creek, Mile 3.9 Right and 9.3 Right.

(3) 24" unit removed 1938.

(4) See diversion at Mile 9.3 Right.

(5) An additional 900 acres served at Mile 4.0 Right. The diversion in September and October were for gun club purposes.

(6) In addition to gun clubs under other diversions listed, this comprises the group of clubs diverting Butte Creek water by gravity from the main or interconnecting channels (Sanborn Slough, etc.) in the vicinity of Mile 10. Through Reclamation District 833 canals, most of the clubs in this group receive also, drainage and Feather River water diverted for the clubs by Western Canal. These diversions are principally in the fall months and those from Butte Creek have not been measured. For diversions via Western Canal see table of Feather River Diversions, Mile 59.7 R. The area flooded by this group is estimated to be approximately 5000 acres. The clubs included are White Mallard, Wild Goose, Last Chance, Berry and Keller, Tule Goose, Bettens, Greenhead, Field and Tule, North Butte, Henshaw, Sacramento Outing, Anderson, West Butte, and Colusa Shooting.

(7) See Feather River diversions, Mile 59.7 Right.

(8) New installation 1938.

(9) Duty of water estimated. No record of use available.

(10) Plant is on Howard Slough but opposite this mileage on Butte Creek.

(11) New units to be installed.

TABLE 38 (CONTINUED)

LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated		
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice	(1) Gun Club
Butte Slough														
Butte Slough Irrigation Co. Ltd. (Diversion to Sutter By-Pass) (2)	0.3 West	Gravity				4209	5954	5248	3023	1172	(3)19606	(4)		
M. Marty	0.3 West	1-12"			NO	DIVERSION								
G. S. and D. C. Smith	1.4 East	1-8"						112	25		137	200		
— MADISON BRIDGE - MILE 2.1 —														
J. E. Smith	3.0 West	1-10"						11	10		21	33		
I. E. Nall	3.5 West	1-10"				10	38	30	12		90	58		
Ullrey Brothers	3.7 West	1-10"					14	8			22	9		
P. A. Reische	4.1 West	1-12"				20	57	66	23		166	(5)144		
E. V. Jacobs	4.8 West	1-10"				19	134	76	13		242	118		
Armstrong, Hensen & Locovitch	5.1 West	1-10"				46	163	70	8		287	(6)225		
M. Nall	6.3 West	1-7"			NO	DIVERSION								
T. J. Hageman	6.8 West	3-8"			NO	DIVERSION								
— LONG BRIDGE - MILE 7.5 —														
Totals (Lower Butte Creek and Butte Slough)			0	0	0	5846	9165	8424	5736	3384	32555	2717 (7)	0	6500 (8)

* Approximate mileage from junction with Sacramento River.

(1) Only diversions which occurred prior to November 1st are given for gun club acreage. In most instances the diversions for this purpose extended into November and December.

(2) Butte Slough Irrigation Company maintains a dam on Butte Slough just above its junction with Sacramento River and thereby diverts water via Butte Slough to East and West Borrow Pits of Sutter By-Pass near "Long Bridge". The total water so diverted is here shown. Rediversions from West Borrow Pit of Sutter By-Pass were made at Miles 28.4, 28.6 and 29.0 R. (See Sutter By-Pass Diversions, Table 39.)

(3) Prior to June 15th water was available for rediversion due to spring runoff.

(4) See acreages under rediversions at Miles 28.4 R, 28.6 R, and 29.0 R., - West Borrow Pit Sutter By-Pass. A considerable additional but indefinite acreage was served by sub-irrigation and direct diversions from flow diverted to East Borrow Pit of Sutter By-Pass which is joined by Feather River return flow entering via Wadsworth Canal. See East Borrow Pit Sutter By-Pass Diversions, Table 39, and footnote, Table 69.

(5) Includes adjoining acreages as follows: S. E. Reische 58, C. P. Reische 64, J. E. Messick 14, L. H. Feith 4, F. R. Granneman 4.

(6) Acreage divided as follows: Armstrong 90, Hensen 60, and Locovitch 75.

(7) Does not include acreage under Butte Slough Irrigation Company, Ltd., 0.3 West. See footnotes (2) and (4).

(8) Note that this figure includes an estimate of 5000 acres for which no diversions are reported.

TABLE 39

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1938

Water User	Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
West Borrow Pit of Sutter By-Pass													
	(1)												
— WEST BORROW PIT GAGING STATION - MILE 0.4 —													
— SOUTHERN PACIFIC RAILROAD CROSSING - MILE 2.5 —													
— KNIGHTS LANDING-MARYSVILLE CAUSEWAY - MILE 12.7 —													
— 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 R	1-16"	NO DIVERSION										
Butte Slough Irrigation Co.Ltd.(2)	28.4 R	Gravity		308	1663	1775	1710	1693	1027		8176	3795	
S. F. Robertson	28.6 R		PLANT DISMANTLED TEMPORARILY										
Frye Brothers	29.0 R		PLANT REMOVED TEMPORARILY										
— NEW COLUSA-MARYSVILLE HIGHWAY - MILE 29.1 —													
— NORTHERN ELECTRIC RAILROAD CROSSING - MILE 29.15 —													
East Borrow Pit of Sutter By-Pass													
	(3)												
Woodland Livestock Co.(Baird)	0.4 S*	1-14"						107	5		112	260	
Woodland Livestock Company	0.1 S*	1-16"	NO DIVERSION										
— GAGING STATION - WILLOW SLOUGH AT CHANDLER - MILE 0 —													
Woodland Livestock Company	0.5 N*	2-14"	NO DIVERSION										
— DRAINAGE PLANT #1 - MILE 1.4 —													
E. H. Christensen	(4)1.4 N	1-12"	NO DIVERSION										
A. W. Kimerer	(4)1.4 N	1-14"	NO DIVERSION										
E. H. Christensen	1.4 N	1-16"			884	850	836	984	536		4090		(5)410
Woodland Livestock Company	1.5 N*	1-14"	NO DIVERSION										
State Reclamation Board	2.19N*		PLANT REMOVED										
Arnold Christensen	2.2 N	1-16"	NO DIVERSION										
State Reclamation Board (6)	2.3 N*	1-10"	NO DIVERSION										
State Reclamation Board	2.65N*		PLANT REMOVED										
Woodland Livestock Company	2.9 N*	1-14"	NO DIVERSION										
Woodland Livestock Company (Alonzo Brothers)	4.00N*	1-14"						96			96	140	

(1) Mileage is given northerly from drainage plant of Reclamation District 1500. Mile 9.15 West Borrow Pit is opposite Chandler.
(2) Diversions at Mile 28.4 R, 28.6 R, and 29.0 R are from water diverted to the West Borrow Pit from Butte Slough. They are included in the total diversion to Sutter By-Pass as listed under Butte Slough Diversions - (See Table 38).
(3) Mileage is given northerly or southerly from Chandler. Chandler is opposite Mile 9.15 West Borrow Pit. Plants are on left bank unless marked with asterisk denoting right bank.
(4) Plant is on drain canal which enters By-Pass at this point.
(5) Includes 170 acres on adjoining Nelson land.
(6) New installation 1938 (Unit brought from Mile 2.19 N*).

TABLE 39 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1938

Water User	Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
East Borrow Pit of Sutter By-Pass (Continued)													
	(1)												
— KNIGHTS LANDING-MARYSVILLE CAUSEWAY - MILE 4.4 N —													
Woodland Livestock Company	4.5 N*	1-14"			NO DIVERSION								
State Reclamation Board	5.9 N*				PLANT REMOVED								
State Reclamation Board	6.35N*				PLANT REMOVED								
State Reclamation Board	6.6 N*				PLANT REMOVED								
— DRAINAGE PLANT #2 - MILE 10 —													
— EAST LEVEE OF WADSWORTH CANAL - MILE 16.0 N —													
— DRAINAGE PLANT #3 - MILE 16.5 —													
R. H. Morehead	18.75 N	1-10"			NO DIVERSION								
Meyer, Platter, Morehead, DeWitt Brothers, Epperson & Middleton	19.1 N	1-14"				629	385	518	8		1540	(2)591	
— NEW COLUSA-MARYSVILLE HIGHWAY - MILE 19.98 N —													
— NORTHERN ELECTRIC RAILROAD CROSSING - MILE 20.0 N —													
Sacramento Slough													
	(3)												
Woodland Livestock Company	1.4 R	1-24"						176			176	350	
Knights Landing Ridge Cut (4)													
	(5)												
— RECLAMATION DISTRICT 730 DRAINAGE PLANT #2 - MILE 3.8 —													
Ralph W. Pollock (6)	4.55 L	1-12"					81	41			122	(7) 50	
Hershey Estate (A.J.Darnielle)	4.7 L	1-15"				112	177	134	21		444	162	
Sieber Brothers	4.7 R	1-6"				11		9	6		26	18	
— WEST LEVEE YOLO BY-PASS - MILE 6.3 —													
Frank Fisher and Henry Rich	6.3 (8)	Gravity			NO DIVERSION								
E. L. Wallace	6.3 (8)	Gravity			NO DIVERSION								

(1) Mileage is given northerly or southerly from Chandler. Chandler is opposite Mile 9.15 West Borrow Pit. Plants are on left bank unless marked with asterisk denoting right bank.
(2) Divided as follows: Meyer 90; Platter on Morehead land 100; Meyer and DeWitt Brothers 146; DeWitt Brothers on Middleton land 110, on Epperson land 145.
(3) Mileage is given easterly from drainage plant of Reclamation District 1500 which is at head of slough.
(4) Flow is principally Colusa Basin drainage diverted to the Ridge Cut by checking at the Knights Landing outfall gates on the Back Borrow Pit of Reclamation District 787. See Table 71.
(5) Mileage is given southerly from head in Back Borrow Pit near Knights Landing.
(6) Formerly listed as George Pollock.
(7) Estimated. Data not available.
(8) Diversions at this point are for irrigating land in Yolo By-Pass (See Yolo By-Pass diversions).

TABLE 39 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1938

Water User	Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Yolo By-Pass (East Borrow Pit or Tule Canal)													
	(1)												
J. S. Bell	0.8 S				P:L A N T: D I S:M A N T:L E D								
Nickerson Lands	0.7 S				P:L A N T: D I S:M A N T:L E D								
George Swanston	0.3 S				P:L A N T: D I S:M A N T:L E D								
George Swanston	0.1 N*				P L A N T R E M O V E D								
George Swanston	1.8 N*	1-15"											
		1-20"			N O	D I V:E R S I:O N							
California Packing Corporation	2.4 N	1-20"				377	196	280	80		933	(2) 1182	
California Packing Corporation	3.4 N	1-8"					16	8			24	(3)	
Smith and Roberts (I.G.McDonnell)	5.9 N	1-10"					63	102	39		204	140	
— SACRAMENTO-WOODLAND HIGHWAY - MILE 6.18 —													
— SACRAMENTO WOODLAND RAILROAD CROSSING - MILE 6.2 —													
— RECLAMATION DISTRICT 1600 DRAINAGE PLANT - MILE 10.0 —													
Frank Fisher and Henry Rich	10.1 R*	Gravity			N O	D I V:E R S I:O N							
— FREMONT WEIR (EAST END) - MILE 12.3 —													
Back Borrow Pit Reclamation District 1000													
	(4)												
— GAGING STATION - MILE 2.1 —					N O	D I V:E R S I:O N S							
Totals - By-pass and Drainage Channel Diversions													
West Borrow Pit of Sutter By-Pass		0	308	1663	1775	1710	1693	1027	0	8176	3795	0	
East Borrow Pit of Sutter By-Pass		0	0	884	1479	1221	1705	549	0	5838	991	410	
Sacramento Slough		0	0	0	0	0	176	0	0	176	350	0	
Knights Landing Ridge Cut		0	0	0	123	258	184	27	0	592	230	0	
Yolo By-Pass (East Borrow Pit or Tule Canal)		0	0	0	377	275	390	119	0	1161	1322	0	
Back Borrow Pit Reclamation District 1000		0	0	0	0	0	0	0	0	0	0	0	
Totals		0	308	2547	3754	3464	4148	1722	0	(5)15943	6688	410	

(1) Mileage is given northerly or southerly from North levee of Sacramento By-Pass. Asterisk indicates land irrigated is in By-Pass area.
(2) This is the total acreage served by this plant and the one at Mile 3.4 N.
(3) See plant at Mile 2.4 N.
(4) Mileage is given easterly from Sacramento River.
(5) Includes 8176 acre-feet included also in Butte Slough Diversions (Table 38). See footnote (2) West Borrow Pit of Sutter By-Pass diversions, this table, and footnote (2) Butte Slough diversions, Table 38.

TABLE 40

FEATHER RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October : Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Sutter Basin Corporation	0.6 R	1-16"			NO	DIVERSION							
Punter and Rutz	1.55L	1-8"					57	68	24		149	45	
Sutter Basin Corporation	2.6 R	1-20"											
		1-26"			NO	DIVERSION							
California Lands, Inc.	6.44L	1-10"(1)				75	116	35			226	(2)148	
M. Scheiber	7.7 L	1-10"				27	79	140	182	69	497	(3)218	
— NICOLAUS GAGING STATION - MILE 9.3 —													
— NICOLAUS BRIDGE - MILE 9.4 —													
Bercut-Richards Company	9.75R	1-20"					540	352	9	45	946	700	
Garden Highway Mutual Water Co.	13.1 R	1-20"											
		1-24"			1331	1931	2391	2080	1151		8884	2151 (4)	880
Feather River Water Company	16.35R	1-14"				87	337	117			541	156	
Plumas Mutual Water Company	17.5 L	1-22"				539	500	645	120	52	1856	1282	
G. C. Shannon	18.75R	1-6"				83	144	15	16		258	69	
Oswald Water District	21.4 R	1-16"				663	894	584	650		2791	773	
G. C. Shannon	22.5 R				PLANT REMOVED								
Alicia Mutual Water Company	24.0 L	1-26"											
		1-30"			228	1552	2204	1293	856		6133	1319	
Cunningham Brothers	25.2 R	1-10"			NO	DIVERSION							
R. Saturi	27.0 L	1-10"			PLANT DISMANTLED								
— MOUTH OF YUBA RIVER - MILE 27.3 R —													
— YUBA CITY - MARYSVILLE BRIDGE - MILE 28.0 —													
Levee District #1	28 R	Gravity			NO	DIVERSION							
J. L. Sullivan	33.9 R	1-10"			33	155	229	93	18		528	155	
Sutter Butte Canal (Sunset Plant)	38.1 R	2-42"											
		1-26"			NO	DIVERSION(5)					(5)	(5)	
Sullivan and Mathew (6)	43.7L (7) H.S1.0.4L	1-18"				358	224	181	141		904	310	

* Mileage along river above mouth.

(1) Replaces former 8" unit.

(2) An undetermined additional amount of water obtained from well.

(3) Includes 40 acres on adjoining Garwood property.

(4) Includes 250 acres on adjoining lands of Brown and Purington.

(5) See Sutter Butte Canal Company's diversion at Mile 58.1 Right.

(6) Formerly Pacific Highway Orchards Tract.

(7) 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.

TABLE 40 (CONTINUED)

FEATHER RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
Thomas Mathew (1)	43.7L (2) H.S1.0.7L	1-5"				12	15	9			36	13	
Moznett-Wetmore Subdivision #1	43.7L (2) H.S1.1.2L	1-10"				121	108	35			264	148	
Manuel Barba	43.7L (2) H.S1.1.25L	1-8"				39	52	52	16		159	65	
A. P. Barba	47.9 L	1-12"				114	163	95	98		470	110	
E. F. Biggs	48.3 L	1-10"					52	108			160	330	
Edward Dunning (3)	49.0 L	1-8"					50	6			56	20	
Clyne Ranch	51.0 R	1-6"					30	22			52	(4)46	
C. E. Porter	51.1 L	1-7"			12	53	40	33	22	6	166	50	
Edward Steadman	51.4 R	1-10"					41	91			132	105	
California Lands, Inc.	51.6 R	1-6"	PLANT TEMPORARILY DISMANTLED										
W. E. Blower	52.1 L	1-10"	NO DIVERSION								13	60	
California Lands, Inc.	52.5 L	1-6"					13						
F. L. Morris	52.7 L	1-8"				17	36	16	2		71	42	
Frank Dutra	52.9 R	1-6"	NO DIVERSION										
Ruby Chambers (5)	53.1 R	1-6"				15	9	7	1		32	40	
Budh Singh	54.7 R	1-8"				50	39	54	40		183	57	
Hearst Estate (Sunical Packing Co.)	55.1 L	1-14"				140	392	193	70		795	383	
L. A. Kister Estate	55.5 L	1-8"					15	10			25	24	
Rio Bonita Ranch	56.6 R	1-14"	NO DIVERSION										
J. H. Abbey	56.8 R		PLANT REMOVED										
Alvin Kister	57.0 L	1-8"					34	14			48	40	
J. E. Carrico	57.0 R		PLANT REMOVED										
Henry Haselbusch	57.9 R	1-10"				3	43	7			53	70	
Sutter Butte Canal Company	(6)58.1 R	Gravity		2381	52990	65512	66818	64848	52099	29650	334298	16695	10367
Richvale Irrigation District	(6)58.1 R	Gravity		623	13858	17132	17474	16958	13625	7754	87424	271	8182
Western Canal Company	59.7 R	Gravity		508	8523	9856	14900	16685	8829	5149	(7)64450	1043	7715
— U.S.G.S. OROVILLE GAGING STATION - MILE 65 —													
Totals			0	3512	76975	98534	108039	104846	77969	42725	512600	26938	27144

* Mileage along river above mouth.

(1) Formerly Ogden Estate.

(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) New installation 1938.

(4) Includes 15 acres on adjoining Steadman property.

(5) Formerly G. H. Bogue.

(6) This is a common point of diversion for Sutter Butte Canal Company and Richvale Irrigation District.

(7) Includes 5149 acre-feet in October for flooding gun clubs in Butte Basin. (See Lower Butte Creek diversions.)

TABLE 41

YUBA RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
— SEVENTH STREET BRIDGE - MILE 0.9 —													
California Lands, Inc.	0.9 L	1-5"			NO DIVERSION								
Davis Brothers	1.6 L	1-12"				70	90	97	113		(1) 370	120	
Charles Shinkle (Harrington)	1.8 R	1-5"				6	14	14			34	12	
G. E. Edwards	1.9 L	1-6"			PLANT REMOVED								
Davis Brothers (2)	3.0 L	1-10"				53	98	97	71		(3) 319	135	
Yuba River Farms (Higgins) (4)	3.0 R	1-6"				7	36	27	6		76	30	
G. F. Sherbourne (5)	4.1 L	1-8"				18	74	63	54		209	(6)46	
James Traynor (Covert)	4.2 R	1-3"				3	6	9			18	5	
S. J. Monaco	4.3 R	1-4"				8					8	5	
C. R. Perkins (Cunningham) (7)	(8)4.70L	1-6"					10	9			19	15	
Earl Fruit Company and Dinsmore	4.75L	1-6"				87	33				120	56	
Dantoni Orchards (Earl Fruit Co.)	5.3 L	1-8"				98					98	75	
Marysville River Farms Company	5.9 L	1-10"			NO DIVERSION								
Marysville River Farms Company (Nagler and Pearson)	6.35L	1-10"			NO DIVERSION								
Marysville River Farms Co.(Plantz)	6.35L				PLANT REMOVED								
Hallwood Irrigation Company (9)	(9)11.0 R	Gravity		360	3284	6378	6419	6207	5844	1020	29512	4581	470
Cordua Irrigation District (9)	11.0 R (9)	Gravity			1523	2643	3202	2910	2196		12474	692	1135
Yuba Consolidated Gold Field Co.	14.5 L	Gravity			NO DIVERSION							(10)	(10)
Totals			0	360	4807	9371	9982	9433	8284	1020	43257	5772	1605

* Approximate mileage along river above highway crossing at Marysville.

(1) The diversion at this point is combined with that at Mile 3.0 Left.

(2) Formerly Davis and Cox.

(3) See plant at Mile 1.6 Left.

(4) Formerly Ward Hughins.

(5) Formerly E. O. Rubke.

(6) Includes 20 acres on Rubke land.

(7) Formerly J. S. Johnson.

(8) Former mileage of 4.8 in error.

(9) Hallwood Irrigation Company and Cordua Irrigation District have a common point of diversion and common canal for about one-half mile.

(10) Includes 285 acres rice and 35 acres general outside of District.

TABLE 42

AMERICAN RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
— GARDEN HIGHWAY BRIDGE - MILE 0.2 —												
— AUBURN BOULEVARD BRIDGE - MILE 1.9 —												
— SACRAMENTO NORTHERN RAILROAD BRIDGE - MILE 2.0 —												
— WESTERN PACIFIC RAILROAD BRIDGE - MILE 2.1 —												
North Sacramento Land Company	2.4 R	1-6"					18				18	(1) 17
North Sacramento Land Company	2.55 R	1-3"			NO DIVERSION							
North Sacramento Land Company	2.80 R	1-5"						2			2	(2)
G. A. Meister (A. Lanci)	3.1 L	1-10"			NO DIVERSION							
— SOUTHERN PACIFIC RAILROAD BRIDGE - MILE 3.5 —												
G. A. Meister	3.7 L	1-4"										
		1-6"			NO DIVERSION							
G. A. Meister (A. Lanci)	4.1 L	1-10"				10	10	14	5		39	29
W. S. Kendall Estate	5.7 L	1-10"			NO DIVERSION							
— GAGING STATION - AMERICAN RIVER AT SACRAMENTO - MILE 6.1 —												
S. H. Cowell	7.1 L	1-7"			NO DIVERSION							
E. Clemens Horst Company	7.5 R	1-8"				29	56				85	104
Hagginbottom Land Company	7.7 R	1-4"			NO DIVERSION							
Hagginbottom Land Company	7.8 R	1-5"				17	20				37	44
Azevedo Dairy	7.95 R	1-10"					114	76	35		225	50
J. H. Kerby	9.0 L	1-6"				34	33	37			104	42
Azevedo Dairy	9.2 R	1-12"					75	169	87		331	76
W. Wright	9.2 L	1-8"			NO DIVERSION							

* Mileage along river above mouth.
** All general crops. No rice.
(1) This is the total acreage served by this plant and the one at Mile 2.80 Right.
(2) See acreage note for plant at Mile 2.4 Right.

TABLE 42 (CONTINUED)

AMERICAN RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
C. E. Wells	9.35 L	1-5"				12	11	1			24	(1) 50
C. E. Wells	9.5 L	1-5"				8	6				14	(2)
C. E. Wells	9.55 L	1-5"			NO	DIVERSION						
Henry Cowell	9.6 L	1-6"			NO	DIVERSION						
Hagginbottom Land Company	10.2 R	1-8"			NO	DIVERSION						
Guy H. Roddan	10.3 L	1-10"		4	12	12	16	17	10	1	72	27
Gold Nugget Orchard Co.(E.A.Boyle)	10.4 R	1-5"				20	7				27	17
Hagginbottom Land Company	10.5 R	1-6"				28	30	12		1	71	35
Mucke Sand and Gravel Company	11.2 L	1-6"		2	7	9	6	9	9	5	47	20
J. T. Gore Estate	11.5 L	1-6"			NO	DIVERSION						
William A. Meyer	11.7 L	1-4"				8	10	7			25	27
Harry Nakatomi	11.7 L	1-5"				17	20	6	3	1	47	35
H. T. Danielson	13.1 R	1-5"			3	4	5	5	4		21	12
P. Osterli	13.2 R	1-6"				84	95	41			220	55
Mary Deterding	13.9 R	1-6"				43	59	47			149	77
Mary Deterding	14.7 R	1-4"			NO	DIVERSION						
Mary Deterding	15.1 R	1-6"			NO	DIVERSION						
Carmichael Irrigation District	16.0 R	1-12"										
		1-8"		94	245	489	662	672	481	80	(3) 2723	Suburban Area
		1-6"										
William H. Devlin	17.1 R	1-6"					3	2	1		6	6
— GAGING STATION - AMERICAN RIVER AT FAIROAKS - MILE 19.2 —												
Totals			0	100	267	824	1256	1117	635	88	4287	723

* Mileage along river above mouth.
** All general crops. No rice.
(1) This is the total acreage served by this plant and the one at Mile 9.5 Left.
(2) See plant at Mile 9.35 Left.
(3) An additional 540 acre-feet of water obtained from Fairoaks Irrigation District.

TABLE 43

DELTA UPLANDS DIVERSIONS FROM CACHE SLOUGH-1938

Water User	Location	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	* Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
Reclamation District No. 2068	SW¼ NE¼ Sec. 34 T6 N, R1E.	1-36" 1-30"	0	279	767	1417	1372	1275	798	0	5908	2033

* All general crops. No rice.

TABLE 44

DELTA UPLANDS DIVERSIONS FROM OLD SAN JOAQUIN RIVER-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
East Contra Costa Irrigation District	(1)36.5 L	2-30"										
		1-24"		417	2117	5684	3497	3599	2128	192	17634 (2)	12763
		1-18"										
Byron-Bethany Irrigation District	40.9 L (3)	1-30"										
		1-26"			1670	2297	2085	1840	1530	907	10329	7600
Joe Santos	(4)44.6 L	1-7"			NO DIVERSION							
E. H. Stevenson Estate	45.3 L	1-12"			NO DIVERSION							
H. Lindeman	47.2 L	1-12"							32	235	267	270
Gus Lindeman	47.2 L	1-10"			NO DIVERSION							
West Side Irrigation District	(5)47.65L	7-15"		896	3172	1758	2742	1961	1262	1915	13706	6214
Noy Melty (Sehrt) (6)	48.7 L	1-8"			15	20	20	1	28		84	40
Naglee Burke Irrigation District	50.4 L	1-16"										
		1-18"			1448	1809	1341	1158	933	308	6997	2074
Freemont Irrigation Association	50.9 L	1-14"			203	263	71	250	283	6	1076	507
Joe Freitas	51.0 L	1-8"			3	4	2	13		3	25	25
Attilio Casserini	51.2 L	1-8"				5	6		7		18	40
Excelsior Ranch	52.4 L	1-10"				149	42	19	47		257	125
— TOM PAINE SLOUGH - MILE 54.3 —												
Totals			0	1313	8628	11989	9806	8841	6250	3566	50393	29658

* Distance along river from its mouth 4½ miles below Antioch. Mileage as established by War Department Survey of 1913-15.
** All general crops. No rice.
(1) To junction of Old River and Indian Slough. Pumping plant is located two and one-half miles west along Indian Slough.
(2) An additional 3665 acre-feet pumped from wells and drains within district.
(3) To junction of Old River and Italian Slough. Pumping plant is located two and three-fourths miles southwest along Italian Slough and extension cut.
(4) Plant is on cut which joins river at Mile 44.6 Left.
(5) To junction of Old River with Intake Cut. Pumping plant is located one mile south along Intake Cut.
(6) Formerly George Froese.

TABLE 45

DELTA UPLANDS DIVERSIONS FROM TOM PAINE SLOUGH-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October :Acre-feet:	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
Stimson Estate Company	0.7 S	2-18"		55	132	98	148	179	88		700	(1)834
Stimson Estate Company	1.2 S	1-18"		29	57	21	24	46	10		187	(2)
Holly Western Sugar Company	2.1 S (3)	1-12" (4)1-10"			3	8	4	6	102	161	(5)284	(2)
Tracy Clover Irrigation District	(3)2.1 S	1-16"			NO	DIVERSION						
Pescadero Reclamation Dist. #2058:												
Plant Number 1	2.9 S	1-12"			104	120	72	96	53	17	462	(6)2053
Plant Number 3	6.3 S	1-24"		284	725	775	789	895	615	218	4301	(7)
Plant Number 5	8.3 S	1-12"		25	146	214	165	152	146	9	857	(7)
Plant Number 5A	9.0 S	1-12"		39	52	128	94	123	48	22	506	(7)
— SOUTHERN PACIFIC RAILROAD CROSSING - MILE 9.1 S —												
— LINCOLN HIGHWAY - MILE 9.9 S —												
Totals			0	432	1219	1364	1296	1497	1062	427	7297	2887

* 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).
** All general crops. No rice.
(1) This is the total acreage served by this plant and the one at Mile 1.2 S and includes 353 acres on adjoining lands as well as 93 acres served from plant at Mile 2.1 S.
(2) See plant at Mile 0.7 S.
(3) To junction of Tom Paine Slough and dredger cut. Pumping plant is located 1½ miles south along dredger cut.
(4) 10" unit added in 1938.
(5) The diversions in September and October were for industrial uses in sugar factory.
(6) This is the total uplands area (South of Tom Paine Slough) irrigated from all Pescadero Reclamation District plants on Tom Paine Slough.
(7) See plant at Mile 2.9 S.

TABLE 46

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October :Acre-feet:	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
— GARWOOD BRIDGE - MILE 45.3 —												
G. Divini (1)	45.45 R	1-8"			NO	DIVERSION						
A. Jury	45.55 R	1-6"			NO	DIVERSION						
C. R. Van Buskirk (1)	45.6 R	1-5"										
		1-8"		6	6	11	22	17	19	4	85	62
Paul Weston	46.3 R	1-6"			NO	DIVERSION						
Ivy Rainey (2)	46.65 R	1-8"						8			8	12
Wilhoit and Hammill	46.85 R	1-10"			68						68	120
L. F. Grimsley (3)	47.2 R	(4)1-5"				7	20	2	1		30	45
		1-6"										
Wolfinger Brothers	47.3 R	1-10"			NO	DIVERSION						
Alma A. Haack	48.0 R	1-12"				3	6	12		4	25	25
H. G. Learned (Lee Young)	48.3 R	1-4"			1	2	3	6	7	3	22	9
H. G. Learned (I. Yoshido)	48.5 R	1-3½"			3	5	8	10	11	2	39	16
Joe Calcagno	48.5 R	1-6"			11	17	20	15	20	4	87	55
F. Piccardo, J. Vigliani and J. Calcagno	48.5R(5)	1-6"		9	16	19	38	25	22	11	140	40
G. B. Figari (J. Calcagno)	48.6R(5)	1-5"			NO	DIVERSION						
M. O. Couper (Jones)	49.0 R	1-10"			10	12	7				29	22
Mettler, Cross and Drury (S. B. Chapman)	49.5 R	1-14"			22	27	36		39		124	40
A. A. Rodgers	50.1 R	1-10"			16	19	7	26	25	4	97	35
— BRANDT BRIDGE - MILE 50.2 —												
Frank Reichmuth	50.4 R	1-8"			5	5	12	9	10		41	26
Brandt Brothers	50.55R(6)	1-6"		1	4	3	4	2	3	3	20	18
Brandt Brothers	50.8 R	1-6"										
		1-7"		14	19	17	26	22	16	20	134	55
		1-10"										
California Lands, Inc. (Smith)	52.4 R	(7)1-12"				42	62				104	130
Julia Battilana	52.9 R	1-5"			NO	DIVERSION						
California Lands, Inc. (Smith)	53.2 R	1-12"			58	87	38	20			203	210

* 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).

** All general crops. No rice.

(1) New installation 1938.
(2) Formerly R. C. Rose.
(3) Formerly J. J. Talbot.
(4) 6" unit replaces 8"; 5" unit used temporarily in 1938.
(5) Corrected mileage.
(6) Plant moved from 50.4 Right in 1938.
(7) Replaces 6" unit.

TABLE 46 (CONTINUED)

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
F. De Lima	53.4 R	1-8"			10	11	8	13	6		48	30
M. Dos Reis	53.7 R	1-12"			59	40	97	138			334	210
R. E. Albertson	54.9 R	1-10"			31	16	46	52	29	11	185	66
— JUNCTION WITH MIDDLE RIVER - MILE 56.2 LEFT —												
Oakwood Stock Farm	57.0 R	1-14"						70			70	47
James Tobin	57.15 R	1-7"			NO	DIVERSION						
T. J. Dutnall	57.3 R	1-3"			NO	DIVERSION						
A. J. Thompson	57.3 R	1-5"			NO	DIVERSION						
G. Gardella Company	57.5 R	1-4"			3	11	10	12	1		37	5
V. Sanguenetti	58.4 R	1-2½"			NO	DIVERSION						
G. B. Figari (G. Alfieri)	58.6 R	1-3"			NO	DIVERSION						
R. Mauro	58.7 R	1-4"			NO	DIVERSION						
— MOSSDALE BRIDGE - MILE 58.9 - RECORDING GAGE —												
C. C. Abersold	59.25 R	1-6"	1		11	2	6	13	9	2	44	22
H. A. Neistrath (Madruga)	59.3 R	1-14"						150	99		249	85
H. A. Neistrath (Madruga)	60.1R(1)	1-6"							17	14	31	40
— JUNCTION WITH PARADISE CUT - PARADISE DAM - MILE 62.2 LEFT —												
Banta Carbona Irrigation District	67.5 L	1-36"										
		3-24"		3032	6400	3798	9467	5968	2606	909	32180	15977
		2-20"										(2)
Reclamation District #2075	71.0 R	1-16"			NO	DIVERSION						
Mortensen, Borges and Whitman	73.2 R	1-12"						32	64		96	(3) 180
J. Lawrence	75.0 R	1-4"			NO	DIVERSION						
Henry Gard	75.1 R	1-6"			NO	DIVERSION						
J. W. Cannon	75.2 R	1-4"			NO	DIVERSION						
S. G. Paxton	75.25 R	1-5"			NO	DIVERSION						
R. R. Swank	75.35 R	1-4"			NO	DIVERSION						
R. N. Jansen	75.45 R	1-6"			NO	DIVERSION						
Ralph Martin	75.7 R	1-7"			NO	DIVERSION						
Ralph Martin	76.2 R	1-6"			NO	DIVERSION						
— U.S.G.S. GAGING STATION - SAN JOAQUIN RIVER NEAR VERNALIS - MILE 76.7 —												
Totals			1	3062	6753	4154	9943	6622	3004	991	34530	17582

* 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).

** All general crops. No rice.

(1) Up Walthall Slough .2 mile and opposite this mileage on river.

(2) Includes an estimate of 2000 acres outside of district.

(3) All for Mortensen.

TABLE 47

SAN JOAQUIN RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice
— U. S. G. S. GAGING STATION - SAN JOAQUIN RIVER NEAR VERNALIS - MILE 76.7 —													
— STANISLAUS RIVER - MILE 79.7 R —													
— MAZE ROAD BRIDGE - MILE 81.85 —													
W. C. Blewett Estate (Newman)	81.95L	3-12"		258	354	448	463	398	325	158	2404	1190	
El Solyo Ranch	82.05L	3-18"	66	934	2203	1546	2788	2134	1511	1219	12401	4268	200
		1-12"											
— GAGING STATION - SAN JOAQUIN RIVER AT HETCH HETCHY WATER SUPPLY CROSSING - MILE 82.65 —													
— TUOLUMNE RIVER - MILE 91.0 RIGHT —													
West Stanislaus Irrigation Dist.	91.8 L	3-26"	3	2653	8422	6307	12533	8806	3646	821	43191	23323	
White Lake Ranch #1	(1) 91.8 L	1-12"			NO	DIVERSION							
White Lake Ranch #2	(1) 91.8 L	2-14"			NO	DIVERSION							
White Lake Ranch #3	(1) 91.8 L	1-12"			NO	DIVERSION							
— LAIRD SLOUGH BRIDGE - GAGING STATION - SAN JOAQUIN RIVER NEAR GRAYSON - MILE 96.05 —													
Rancho El Pescadero	98.9 L	1-16"			NO	DIVERSION							
— PATTERSON BRIDGE - MILE 104.4 —													
Patterson Water Company	104.4 L	4-26"											
		1-18"		533	5800	6588	5924	5541	4895	419	29700	13045	
		1-14"											
Wisnom and Ross (C. C. Jones)	104.5 R	1-10"			NO	DIVERSION							
Mortgage Guarantee Company	106.5 R	1-10"			NO	DIVERSION							
Patterson Ranch Co.	109.8 L	(2) 2-16"			107	200	253	624	438	146	1768	280	
E. Ustick	112.55R	1-12"			NO	DIVERSION							
— CROWS LANDING BRIDGE - MILE 113.4 —													
Laura C. Johnson	113.5 R	1-10"			NO	DIVERSION							
A. J. Silveria	113.85R	1-6"			NO	DIVERSION							
A. J. Silveria	114.35R	1-8"			NO	DIVERSION							
King Ranch	114.95R	1-10"			NO	DIVERSION							
L. B. Crow (Catrina and Machado)	116.05L	(3) 1-14"			168	30	73	27	4		302	120	
Oscar Hogan	116.45R	1-12"			NO	DIVERSION							
C. F. Olinger	116.95R	1-12"			NO	DIVERSION							
— U.S.G.S. GAGING STATION - SAN JOAQUIN RIVER NEAR NEWMAN - MILE 123.7 —													
— MERCED RIVER - MILE 123.75 R —													
J. J. Stevinson Corporation	129.4 R	1-10"			NO	DIVERSION							
— FREMONT FORD BRIDGE GAGING STATION - MILE 129.5 —													
— DELTA BRIDGE (TURNER ISLAND) GAGING STATION - MILE 158.7 —													
Totals			69	4378	17054	15089	21991	17576	10842	2767	89766	42226	200

* Mileage along San Joaquin River from its mouth four and one-half miles below Antioch. (Mileage as established by War Department Survey of 1913-15). Prior to 1936 mileage was given above Durham Ferry Bridge, Mile 76.7.

(1) Pump is on cut leading to West Stanislaus Irrigation District plant.

(2) 8" unit has been removed.

(3) Listed as 12" prior to 1937.

TABLE 48

MERCED RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October :Acre-feet:	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
— GAGING STATION - MERCED RIVER NEAR MOUTH - MILE 1.1 —							147	223	89	336	795	450
Stevinson Water District	3.8 R	1-15"					20	23	12		55	16
E. C. Brown	4.0 L	1-8"										
E. C. Brown	4.2 L	1-4"			NO	DIVERSION						
H. DeAngeles	5.8 L	1-10"					72	47	37	1	157	56
J. F. Peck	6.1 L	1-18"				80	106	75	47		308	45
Stevinson Water District	6.55 L	1-15"			NO	DIVERSION						
Francis Hartman	8.5 L	1-12"				41					41	15
Mary Collier	8.85 L	1-8"			2	17	3	4	4	1	31	40
Grace McCullagh	9.4 L	1-10"		107	192	80	230	228	92	19	948	330
R. W. Adams and J. B. Silva	10.35 L	1-8"			294	302	333	254	195	32	1410	265
		1-10"										
W. D. Adams	10.85 L	1-12"										
		1-5"		9	69	303	101	129	63	5	679	414
		(1)1-9"										
C. G. McLaughlin (2)	11.4 L	1-8"			NO	DIVERSION						
C. G. McLaughlin	11.55 L	1-4"			NO	DIVERSION						
H. F. Milliken Estate	11.6 L	1-10"			40	119	75	42	6		282	70
J. Regello	11.6 L	1-12"					63				63	80
— NEW MILLIKEN BRIDGE - MILE 11.65 —												
A. J. Azevedo	12.35 L	1-10"			NO	DIVERSION						
Pacific Coast Joint Stock	12.85 L	(3)1-10"			NO	DIVERSION						
Land Bank												
California Lands, Inc.	16.5 L	1-12"		7	36		78	27			148	70
Merced River Farms Company	17.05 L	1-6"						1	1	1	3	15
— U.S.G.S. GAGING STATION - MERCED RIVER NEAR LIVINGSTON - MILE 17.1 —												
R. G. Woodward	17.3 L	1-6"			NO	DIVERSION						
J. Clark	17.7L(4)	1-3"			NO	DIVERSION						
O. B. Daniels	17.7 L	1-5"			NO	DIVERSION						
C. P. Hockett and F. Simpkins	18.7 L	1-6"			NO	DIVERSION						
Geo. Bloss	20.3 R	1-3½"					42	11			53	(5) 100
John Reininghaus	20.4 L	1-6"			NO	DIVERSION						
W. J. Haskins	20.65 R	1-3½"										
— SOUTHERN PACIFIC RAILROAD (MAIN LINE) - MILE 21.05 —								24	7		31	18
Sunbeam Farm Company	21.1 R	1-6"			NO	DIVERSION						
William Collier	21.5 R	1-8"			NO	DIVERSION						
William Collier	21.75 R	1-6"										
William Collier	22.2 R	1-12"			66	101	180	121	56	15	539	150
		1-6"										

* Mileage along river above mouth.
** All general crops. No rice.
(1) Temporary installation 1938.
(2) Plant was reported as dismantled in 1936.
(3) 6" unit removed.
(4) Pump moved from 17.65 Left.
(5) An undetermined amount of additional water received from wells.

TABLE 48 (CONTINUED)

MERCED RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October :Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
William Collier	23.3 R	1-6"				41	55				96	30
M. McConnell	23.4 L	1-5"			NO	DIVERSION						
W. F. McConnell (1)	24.2 L	1-5"			NO	DIVERSION						
California Lands, Inc.	24.3 R	1-4"			NO	DIVERSION						
W. F. McConnell (1)	24.5 L	1-6"			NO	DIVERSION						
California Lands, Inc.	24.6 R	1-6"						11	15		26	(2) 130
California Lands, Inc.	25.0 R	1-5"			2		11	11	9	2	35	(3)
California Lands, Inc.	25.5 R	1-6"			1			25	7	3	36	(3)
Merced River Farms Association(4)	26.3 R	1-8"			55	101	89	71	41	10	367	68
W. C. Magneson	26.55 R	1-5"							8	1	9	25
—SANTA FE RAILROAD CROSSING - MILE 27.05 —												
W. C. Magneson (5)	27.0 R	1-6"					3	10	10	5	28	7
W. C. Magneson	27.6 R	1-10"						40	46	24	110	50
M. Nishihara	27.8 R	1-4"			2		11	7	7	3	30	11
Y. Tanabe	28.1 R	1-6"			8		1	1			10	20
G. H. Lovely	28.4 R	1-4"					5				5	20
J. Campadonica	28.6 R	1-6"			NO	DIVERSION						
D. J. Enright (Alves)	28.6 R	1-8"				20	31	5	16		72	75
		(6)1-5"					3				3	9
C. L. Mehrton (Blair)	29.1 R	1-7"			4		12	15	18		49	39
Tony Demchilli (Bettencourt)	29.75 R	1-6"						32	22		54	40
American National Trust Company (Parreira)	29.9 R	(7)1-6"				10	8	6			24	24
California Lands, Inc. (Maitoza)	30.2 L	1-6"			NO	DIVERSION						
American National Trust Company	30.95 R	1-12"					21	24	5		50	40
California Lands, Inc. (Maitoza)	31.1 L	1-8"										
Mondo Brothers	32.0 R	1-6"			87	305	396	330	180		1298	(8) 250
		1-8"										
—SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) — MILE 32.52 —												
B. H. Arkellian (9)	32.9 R	1-6"			NO	DIVERSION						
B. H. Arkellian (9)	33.55 R	1-7"				3	117	136	25		281	100
C. P. Stout	39.2 L	1-24"			NO	DIVERSION						
—GAGING STATION (MERCED RIVER AT YOSEMITE VALLEY RAILROAD CROSSING) - MILE 42.1 —												
Totals			0	123	858	1523	2213	1933	1018	458	8126	3072

* Mileage along river above mouth.

** All general crops. No rice.

(1) Formerly C. J. McConnell.

(2) This is the total acreage served by this plant and the ones at Miles 25.0 Right and 25.5 Right.

(3) See plant at Mile 24.6 Right.

(4) Formerly listed as River Farms Association.

(5) New installation 1938.

(6) 5" unit added in 1938.

(7) One 6" unit removed 1938.

(8) Estimated. Data not available.

(9) Formerly listed as B. H. Arkella.

TABLE 49

TUOLUMNE RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October Acre-feet:	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
E. T. Mapes	1.8 R	1-10"			NO DIVERSION							
J. M. DeSouza	2.2 R	1-6"			NO DIVERSION							
E. B. Henry	3.1 R	1-16"						30			30	45
— GAGING STATION - TUOLUMNE RIVER AT TUOLUMNE CITY - MILE 3.35 —												
Bancroft Fruit Farm	4.1 R	1-10"			NO DIVERSION							
Bancroft Fruit Farm	5.0 R	1-10"			12		23	53	2	28	118	160
W. F. Nicolson	7.1 R	1-10"				54	76	26	70		226	200
R. S. Brown	7.8 L	1-10"			NO DIVERSION							
J. F. Duffy	7.9 R	1-8"			NO DIVERSION							
		1-4"										
W. F. Duffy	8.4 R	1-10"		12	67	106	83	86	12		366	55
A. Holmes (Kissamos & Pavlakias)	10.2 R	1-11"			38	49	53		31	10	181	82
— SOUTHERN PACIFIC RAILROAD (MAIN LINE) - MILE 15.8 —												
— DRY CREEK INFLOW - MILE 16.5 RIGHT —												
— SANTA FE RAILROAD - MILE 21.6 —												
— SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) - MILE 31.5 —												
— GAGING STATION - TUOLUMNE RIVER AT HICKMAN BRIDGE - MILE 31.7 —												
George H. Sawyer	39.8 L	1-6"			18	13	10	6	12		59	52
— GAGING STATION - TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE - MILE 39.9 —												
Totals			0	12	135	222	245	201	127	38	980	594

* Mileage along river above mouth.
** All general crops. No rice.

TABLE 5*

STANISLAUS RIVER DIVERSIONS-1938

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
Frank Coker	1.1 R	1-6"			NO DIVERSION							
H. Salyer	1.6 R	1-7"			NO DIVERSION							
J. Chisholm	2.9 R	1-8"			NO DIVERSION							
Hatmark Ranch	5.25 L	2-14"			115	114	211	175	113	15	743	148
— GAGING STATION - STANISLAUS RIVER AT HATMARK RANCH - MILE 5.3 —												
Bret Harte Water Users Association	5.9 R	1-16"		196	337	302	355	442	327	121	2080	745
McMullin Reclamation Dist. #2075	5.95 R	2-16"		57	66	222	398	513	231		1487	1255
Henry Pelucca	6.7 L	1-15"			18	24	51	40	17	9	159	38
J. W. Updike	7.4 L	1-8"			NO DIVERSION							
C. C. Updike (1)	8.2 L	1-12"			8	9	6	4	10	44	81	83
Caswell Brothers	9.8 R	1-14"		74	108	200	203	162	107	53	907	273
D. F. Koetitz	10.1 L	1-10"				164	173	188	150	67	742	345
D. F. Koetitz	10.4 L	1-18"			NO DIVERSION							
— SOUTHERN PACIFIC RAILROAD BRIDGE (MAIN LINE) - MILE 15.9 —												
J. E. Alldrin	18.5 R				PLANT REMOVED							
G. R. Stoddard	19.9 L	1-7"			NO DIVERSION							
Palo Alto Company	20.75 R	1-14"			83	150	198	163	40		634	205
Heath Ranch	20.9 L	1-4"					33	18	2		53	16
Earl Fruit Company	21.75 R	1-8"				54	62	43			159	90
— MODESTO-ESCALON BRIDGE - MILE 28.15 —												
— SANTA FE RAILROAD CROSSING - MILE 31.85 —												
— SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) - MILE 39.0 —												
— GAGING STATION - STANISLAUS RIVER AT ORANGE BLOSSOM BRIDGE - MILE 44.7 —												
Totals			0	327	735	1239	1690	1748	997	309	7045	3198

* Mileage along river above mouth.
** All general crops. No rice.
(1) Formerly S. M. Updike.

CHAPTER IV

MEASUREMENTS OF RETURN WATER

Sacramento Return Waters

In the Sacramento Valley the flow of all well defined channels carrying irrigation waters returned to the Sacramento River is measured and recorded. Table 52 lists these channels in downstream order and gives the total flow as computed from the measurements.

Between Colusa and Red Bluff there are no large well defined return channels. Records or estimates of natural inflow from streams in this stretch of the river were, however, obtained. Above Red Bluff, from a point below Cottonwood to Redding, there is some return from the irrigation of the Anderson-Cottonwood Irrigation District but it is not recorded.

Return Flow from other than Sacramento River Sources

In the water returned to the Sacramento River as included in Table 52, 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 of Feather River origin.

Relation of Sacramento Return Water to Irrigation Draft

Tables 53 and 54 record the Sacramento River return water, July to September, inclusive, 1938, and indicate the relation between the return and the diversions from which it was derived. Since, in

Tables 53 and 54, 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, and from the Feather and American Rivers has been excluded. In Table 53 is shown the relation to the diversions of that return water only which was measured at the well defined channels. With the records available of the discharge of the Sacramento River at Red Bluff, Butte City, Colusa, Wilkins Slough, Knights Landing, and Verona and all diversions between these points recorded, as well as the Feather River and other well defined inflows, it is possible to approximate the total water returned to the river between each of these points, including not only the flow in the definite channels which were measured, but all seepage, groundwater return, etc., which could not be directly measured. The figures for the return water computed in this manner and the relation of this return to the draft is shown in Table 54. It should be noted, however, that the return shown for the Verona-Sacramento section is only that contributed by the measured drains since, as explained in Chapter II, the total return in this section including all accretions, is not susceptible of computation in the manner outlined because of the fact that no record of low water flow actually measured at Sacramento is available.

The data in Tables 53 and 54 show that seepage, groundwater return, etc., (for the period July-September, inclusive) which could not be directly measured, amounted to 21 per cent of the irrigation draft, the direct return in definite channels 43 per cent, and the total return 64 per cent.

A comparison of the accumulated return water and the accumulated irrigation draft, in downstream order, Red Bluff to Sacramento, for the period July to September, inclusive, 1938, is shown on Plate 1. This shows also for the same period, the average discharge, inflow and draft at all points in this stretch of the river. The return water line is plotted from the data of Table 54.

Draft-Return Water Relation for Particular Sacramento Valley Areas

In the Sacramento Valley there are certain units or districts which are set apart physically by levees or otherwise, so that the direct return water in each district may be readily segregated when the records of all diversions to and discharges from the unit are available. Included in such units are, the area above the Colusa-Williams Highway Crossing of Colusa Trough, Reclamation District 108, Reclamation District 1500 and Reclamation District 1000. The relation between draft and return water for the Colusa Trough area is shown in Table 55 and for Reclamation Districts 108 and 1500, in Tables 56, 57, and 58.

Tables 61 to 73, inclusive, present in detail the discharge records for the Sacramento Valley return water channels.

San Joaquin Return Waters

In the 1938 San Joaquin Valley return water measurements, the gaging stations were located at the same points as in previous years beginning with 1928, and the same methods were followed. A continuous record of the discharge during the season was obtained at an upper and lower station on each stream; San Joaquin, Merced,

Tuolumne and Stanislaus Rivers. On all but the Stanislaus, continuous records of discharge were also obtained at intermediate stations- four on the San Joaquin River, (1) at Fremont Ford Bridge, (2) just below the junction with the Merced River (maintained by the U. S. Geological Survey and referred to as "San Joaquin River near Newman"), (3) near Grayson (Laird Slough), and (4) at the Hetch Hetchy Water Supply Crossing below the Tuolumne River inflow; one on the Merced River near Livingston; and two on the Tuolumne River, one at Roberts Ferry Bridge and one at Hickman Bridge. Prior to July 1938, high water from the previous winter had the effect of vitiating return water determinations for that period so that the 1938 figures are not given prior to July. Measurements and records of all pumping diversions between stations on each stream were obtained, thereby completing the necessary data for the computations of the return water. The records for the gaging stations are given in Chapter II, Tables 15 to 31, inclusive, and the diversion records for the San Joaquin streams above Durham Ferry Bridge, are given in Chapter III, Tables 47 to 50, inclusive.

Table 59 gives the results of the San Joaquin return water measurements and Table 60 shows a comparison of the return water with the irrigation draft in the San Joaquin Valley. Plate 2 depicts the accumulated return water on the San Joaquin River in downstream order, Delta Bridge to Vernalis gaging station, for the period August to October, inclusive, 1938, and shows also for this period, the average discharge, inflow and draft at all points in this stretch of the river.

Comparative Sacramento and San Joaquin Return Water, 1924 to 1938

Comparative figures, 1924 to 1938, for the Sacramento and San Joaquin seasonal return water in per cent of the irrigation draft are shown in Table 51. Figures for the seasonal stream flow in per cent of the 40-year mean 1889-1929, of the Sacramento River at Red Bluff and the San Joaquin River and its three main tributaries above the Vernalis gaging station are given also in order to show what relation, if any, there may have been between the variation from year to year in the run-off and the variation in the return water percentages. With respect to the Sacramento River data, there appears to be a fairly close relationship between the seasonal run-off at Red Bluff and the return flow percentages. The higher return flow percentages occurred in the years of good run-off and the decrease in percentage in the years when the run-off was greatly below normal is quite marked.

In the case of the San Joaquin return water data there appears to be no such definite relation between the seasonal flow of the San Joaquin River and its tributaries in per cent of normal and the return water percentages. This may be due to the regulation which occurs in Lake McClure on the Merced River, Don Pedro Reservoir on the Tuolumne River and Melones Reservoir on the Stanislaus River. It is to be noted that in some years the period used in the comparison of return flow and diversions makes considerable difference in the percentage figures, and further, that for the period August-September only, the percentage is nearly always greater than when the July-September period is used. As there may be a con-

siderable lag between the diversions and corresponding return flow, the figures in the last column of Table 51 were compiled to show the August-September return flow in per cent of the July-August diversions. These percentages still seem to bear no definite relation to the seasonal run-off percentages but their variation from year to year is somewhat reduced and a more or less constant percentage of return flow is indicated.

The average percentage of diversions occurring as return water in the San Joaquin River is shown to be considerably smaller than that for the Sacramento River. This difference may probably be attributed to the fact that, whereas, due to basin topography, practically all drainage from Sacramento River diversions is quickly returned to the river; in the San Joaquin Valley, much of the drainage from the major foothill diversions may pass to the underground water and from there, in the lower areas of many of the irrigation districts, be recovered by drainage pumps for re-use in the irrigation canals. Considerable of the San Joaquin return, therefore, may never reach the river to be accounted for in the return water measurements.

TABLE 51

SACRAMENTO AND SAN JOAQUIN RETURN WATER PERCENTAGES, 1924-1938

Year	Sacramento River			San Joaquin River and Tributaries						
	Seasonal Run-off at Red Bluff in per cent of Normal *	Return Water in per cent of Diversions		Seasonal Run-off in per cent of Normal S.J.River and Tributaries**	Return Water in per cent of Diversions					Aug.-Sep. Return in per cent of Jul.-Aug. Diversions
		Jun.-Sep. Inc.	Jul.-Sep. Inc.		Jun.-Sep. Inc.	Jul.-Sep. Inc.	Aug.-Sep. Inc.	Jul.-Oct. Inc.	Aug.-Oct. Inc.	
1924	36	33	33	24		35	41			29
1925	86		(1)55	86			38			23
1926	61	49	45	55		28	32			22
1927	117	66	59	100			32			23
1928	82	49	46	67		28	28			23
1929	47	42	39	44		19	21			16
1930	65	55	47	50	20	21	22			17
1931	36	(2)33	32	26	(3)23	27	40			18
1932	54	56	47	101			26		29	21
1933	49	56	48	52		22	20	25	25	17
1934	48	45	41	35	(4)20	21	28	(5)25	33	16
1935	80		62	98		30	24	34	31	19
1936	76	56	47	100		31	25	35	32	20
1937	64		48	100		35	28	38	35	22
1938	157		64	172			41		47	29

* 40-year mean (1889-1929) of natural run-off.
** 40-year mean (1889-1929) of natural run-off at foothill stations of San Joaquin, Merced, Tuolumne and Stanislaus Rivers.
(1) July-October, inclusive, 59.
(2) May-September, inclusive, 34.
(3) May-September, inclusive, 19.
(4) May-September, inclusive, 20.
(5) June-October, inclusive, 23; May-October, inclusive, 21.

TABLE 52

WATER DISCHARGED TO SACRAMENTO RIVER ABOVE SACRAMENTO AS MEASURED AT DEFINITE RETURN CHANNELS-1938

RETURN	Table Number	July Acre-feet	July Aver. c.f.s.	August Acre-feet	August Aver. c.f.s.	September Acre-feet	September Aver. c.f.s.	October Acre-feet	October Aver. c.f.s.	Jul.-Oct. Inclusive Acre-feet	Jul.-Oct. Inclusive Aver. c.f.s.
Butte Slough (1)	62	19060	310	21470	349	24270	408	26070	424	90870	372
Reclamation District 70 Drain	63	1900	31	1930	31	2900	49	389	6	7120	29
Reclamation District 108 Drain	64	6550	106	7375	120	6885	116	464	15	21270	87
Colusa Basin Drainage (2)	66	30490	496	26630	433	28800	484	11210	182	97130	398
Sacramento Slough (3)	67	44930	731	30240	492	40860	687	14960	243	130990	537
Reclamation District 1000 Drain	73	1670	27	2160	35	3720	62	600	10	8150	33
Totals		104600	1701	89800	1460	107440	1806	53690	880	355530	1458

(1) This flow is practically all from lands irrigated by Feather River diversions.
(2) A portion of the water which returns to the Sacramento River at this point is usually diverted to the Knights Landing Ridge Cut. See Table 71.
(3) This is the combined daily flow as given in Tables 68 and 70 and includes some return water from Feather River diversions. See Table 69.

TABLE 53

RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO, JULY TO SEPTEMBER (USING ONLY RETURN WATER WHICH ENTERED THROUGH DEFINITE RETURN CHANNELS*)-1938

	Table Number	July		August		September		July to September Inclusive	
		Acre-feet	Aver. c.f.s.	Acre-feet	Aver. c.f.s.	Acre-feet	Aver. c.f.s.	Acre-feet	Aver. c.f.s.
RETURN									
Reclamation District 70 Drain	63	1900	31	1930	31	2900	49	6730	37
Reclamation District 108 Drain	64	6550	106	7375	120	6885	116	20810	114
Colusa Basin Drainage at Knights Landing	66**	30490	496	26630	433	28800	484	85920	471
Sacramento Slough	67	32450	528	24460	398	29760	500	86670	475
Reclamation District 1000 Drain (2d Bannon Slough)	73	1670	27	2160	35	3720	62	7550	41
Total Return		73060	1188	62560	1017	72060	1211	207680	1138
Total Diversions-Red Bluff to Sacramento	35	198020	3220	187540	3050	97320	1636	482880	2646
Return in per cent of Diversions		37		33		74		43	

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 the portion of the return through Sacramento Slough derived from Feather River diversions (Table 69) and the surplus water diverted to Sutter By-Pass from Butte Slough (Table 38).

* As distinguished from use of all accretions as indicated in Table 54.

** No diversion to Knights Landing Ridge Cut (Table 71).

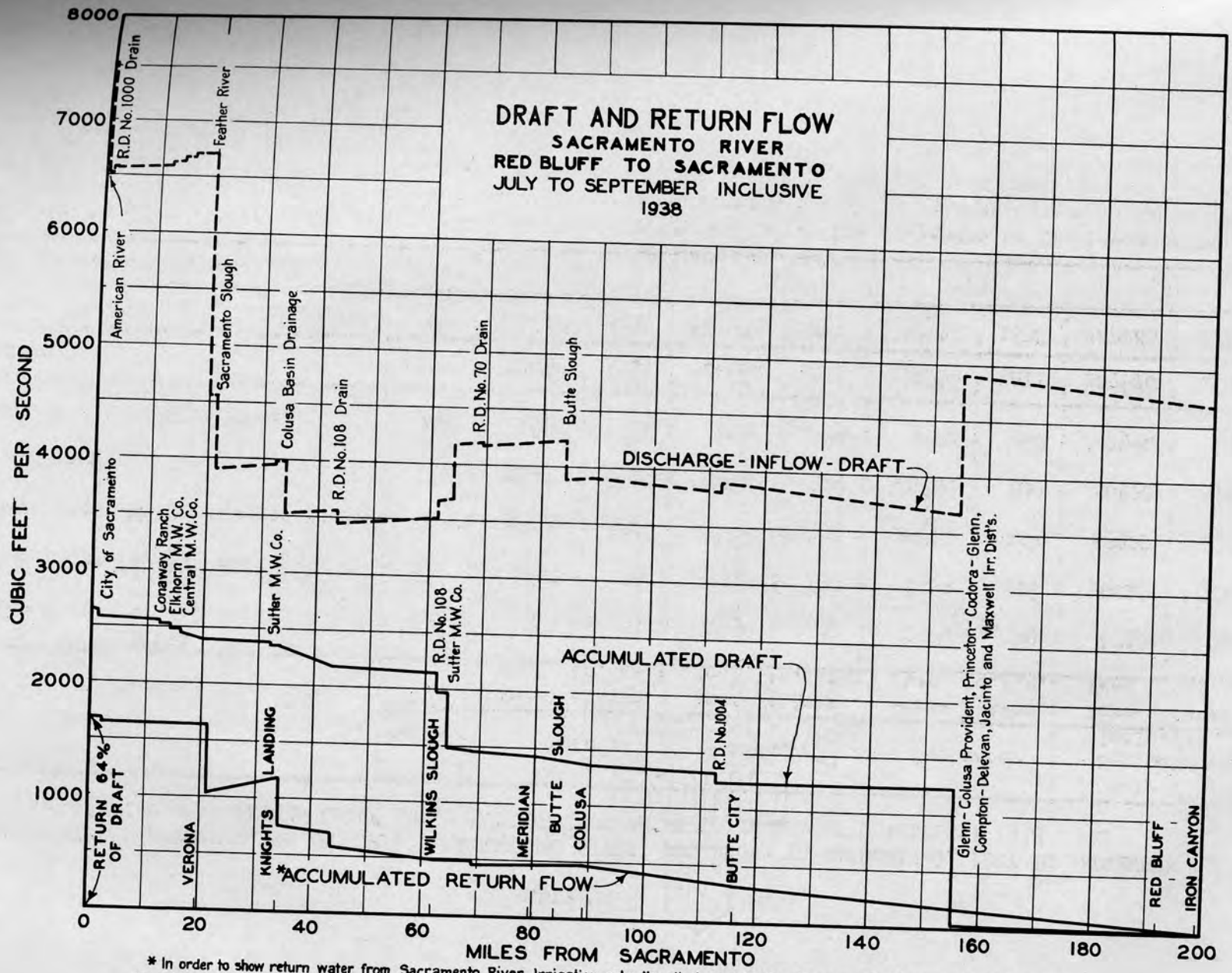


PLATE 1

* In order to show return water from Sacramento River Irrigation only, the discharge to the Sacramento River of the Feather and American Rivers has been excluded as well as that from Butte Slough, the Feather River portion of Sacramento Slough and the inflow of Mill, Antelope, Deer and other creeks between Red Bluff and Butte City.

TABLE 54

RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO, JULY TO SEPTEMBER (INCLUDING ALL ACCRETIONS*)-1938

River Section	July		August		September		Total Return Jul-Sep-Inc		Red Bluff to Lower End of Section: Return		Diversions		Return in per cent of Draft
	Acre-feet	Aver: cfs.	Acre-feet	Aver: cfs.	Acre-feet	Aver: cfs.	Acre-feet	Aver: cfs.	Acre-feet	Aver: cfs.	Acre-feet	Aver: cfs.	
Red Bluff-Butte City	31260	508	21350	347	4980	84	57590	316	57590	316	226405	1240	25
Butte City-Colusa	17040	277	3710	60	7450	125	28200	155	85790	471	247302	1355	35
Colusa-Wilkins Slough	1700	28	5000	81	-1690	-28	5010	27	90800	498	388614	2130	23
Wilkins Slough-Knights Landing	46200	751	38220	621	42710	718	127130	697	217930	1195	427937	2345	51
Knights Landing-Verona	38440	625	29670	483	14460	243	82570	452	300500	1647	435788	2388	69
Verona-Sacramento**	1670	27	2160	35	3720	63	7550	41	308050	1688	482888	2646	64
Total Return	136310	2220	100110	1630	71630	1200	308050	1688					
Total Diversions (Red Bluff to Sacramento	198020	3220	187540	3050	97320	1636	482880	2646					
Return in Per Cent of Draft	69		53		74		64						

NOTE: In the return water here shown, the discharge to the Sacramento River of the Feather and American rivers is excluded as is also the discharge of following return water channels, Butte Slough and that portion of the discharge of Sacramento Slough derived from Feather River waters. Also inflow from Mill, Antelope, and Deer creeks between Red Bluff and Butte City has been excluded.

* 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.

** See discussion in text of Chapters II and IV.

TABLE 55

RELATION BETWEEN THE RETURN WATER IN COLUSA TROUGH AT COLUSA-WILLIAMS HIGHWAY AND THE PRINCIPAL DIVERSIONS FROM WHICH THE RETURN WATER WAS DERIVED-1938

	Mile and Bank	Jul.	Aug.	Sep.	July to Sept. Inclusive		Acreage Irrigated	
		Acre-feet			Ac.Ft.	c.f.s.	General	Rice
DIVERSIONS								
- Sacramento River -(Table 35):								
Glenn-Colusa Irrigation District	154.8 R	65036	61720	33410	160166	878	16933	20349
Jacinto Irrigation District	154.8 R	3630	3445	2854	9929	54	5398	0
Compton-Delevan Irrigation District	154.8 R	2251	2124	389	4764	26	8	996
Provident Irrigation District	154.8 R	8255	8230	4266	20751	114	563	5245
Princeton-Codora-Glenn Irrigation District	154.8 R	8674	8432	5096	22202	122	2190	1812
Maxwell Irrigation District	154.8 R	1845	1845	1785	5475	30	0	1120
- Colusa Trough - None of any consequence								
Total Diversions (Acre-feet		89691	85796	47800	223287		25092	29522
(c.f.s.		1459	1395	803		1224		
RETURN								
Colusa Trough at Colusa-Williams Highway (Table 61)		28020	31260	28120	87400	479		
Colusa Trough Diversions		---	---	---	---	---		
Total Return (Acre-feet		28020	31260	28120	87400			
(c.f.s.		456	508	473		479		
Return in per cent of diversions		31	36	59	39			

TABLE 56

RELATION BETWEEN RETURN WATER AND DIVERSIONS-RECLAMATION DISTRICT 108 FOR 1938

	Jul.	Aug.	Sep.	Jul. to Sep. Inclusive		Acreage Irrigated	
	Acre-feet			Acre-feet	Aver. c.f.s.	Genl.	Rice
Diversions (1)	19780	18850	4000	42700	234	2113	9162
Return Water (2)	6550	7380	7080	21010	115		
Return in per cent of Diversions	33	39	177	49			

(1) The diversions comprise those from Sacramento River, right bank, from Mile 43.1 to 63.2.

(2) The return water is the discharge to Sacramento River of Reclamation District 108 drain at Rough and Ready Bend (Table 64), and on Back Borrow Pit (Table 65).

TABLE 57

RELATION BETWEEN RETURN WATER AND DIVERSIONS-RECLAMATION DISTRICT 1500 FOR 1938

	Jul.	Aug.	Sep.	Jul. to Sep. Inclusive		Acreage Irrigated	
	Acre-feet			Acre-feet	Aver. c.f.s.	Genl.	Rice
Diversions (1)	44130	41780	23630	109540	600	18728	13271
Return Water (2)	23430	21310	23660	68400	375		
Return in per cent of Diversions	53	51	100	62			

(1) The diversions comprise those from Sacramento River, left bank, from Mile 29.9 to Mile 63.75. The principal ones are the 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 the Sutter By-Pass. This water reaches Sacramento River via Sacramento Slough. See Table 68.

TABLE 58

RELATION BETWEEN RETURN WATER AND DIVERSIONS-RECLAMATION DISTRICT 1000 FOR 1938

	Jul.	Aug.	Sep.	Jul. to Sep. Inclusive		Acreage Irrigated	
	Acre-feet			Acre-feet	Aver. c.f.s.	Genl.	Rice
Diversions (1)	7443	7690	3948	19081	105	4970	4296
Return Water (2)	1670	2160	3720	7550	41		
Return in per cent of Diversions	22	28	94	40			

(1) The diversions comprise those from the Sacramento River, left bank, from Mile 2.05 to 19.6.

(2) The return water is the discharge through the drainage plant of Reclamation District 1000 at 2nd Bannon Slough - Sacramento River, Mile 2.1 Left. (Table 73).

TABLE 59
RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1938
(Acre-feet except as noted)

		Jul.	Aug.	Sep.	Oct.	Jul-Aug. Incl.	Aug-Sep. Incl.	Jul-Oct. Incl.	Aug-Oct. Incl.
SAN JOAQUIN RIVER									
DELTA BRIDGE TO FREMONT FORD BRIDGE									
Discharge at Delta Bridge	Table 15	54080	6320	60	0	60400	6380	60460	6380
Discharge at Fremont Ford Bridge	Table 16 & 17	427100	72680	20120	19030	499780	92800	538930	111830
Spill Merced District to Bear Creek		8200	7870	7580	6270	16070	15450	29920	21720
Diversions	Table 47	0	0	0	0	0	0	0	0
Net Return Flow (1)		364820	58490	12480	12760	423310	70970	448550	83730
Net Return Flow - Cubic feet per Second (1)		5930	951	210	208	3440	587	1838	459
FREMONT FORD BRIDGE TO NEWMAN									
Discharge at Fremont Ford Bridge	Table 16 & 17	427100	72680	20120	19030	499780	92800	538930	111830
Discharge aear Newman	Table 18	530300	107300	45700	43540	637600	153000	726840	196540
Inflow of Merced River	Table 24	111400	31520	21260	19440	142920	52780	183620	72220
Diversions	Table 47	0	0	0	0	0	0	0	0
Net Return Flow (1)		-8200	3100	4320	5070	-5100	7420	4290	12490
Net Return Flow - Cubic feet per Second (1)		-133	50	73	82	-41	61	18	68
NEWMAN TO GRAYSON (LAIRD SLOUGH)									
Discharge near Newman	Table 18	530300	107300	45700	43540	637600	153000	726840	196540
Discharge near Grayson (Laird Slough)	Table 19	610000	133900	59170	67000	743900	193070	870070	260070
Diversions	Table 47	6210	6240	5360	570	12450	11600	18380	12170
Net Return Flow (1)		85910	32840	18830	24030	118750	51670	161610	75700
Net Return Flow - Cubic feet per Second (1)		1397	534	316	391	966	427	662	415
GRAYSON TO HETCH HETCHY CROSSING									
Discharge near Grayson (Laird Slough)	Table 19	610000	133900	59170	67000	743900	193070	870070	260070
Discharge at Hetch Hetchy Crossing	Table 20	776400	185200	123000	140700	961600	308200	1225300	448900
Inflow of Tuolumne River	Table 29	186100	45820	56640	67310	231920	102460	355870	169770
Diversions	Table 47	12530	8810	3650	820	21340	12460	25810	13280
Net Return Flow (1)		-7170	14290	10840	7210	7120	25130	25170	32340
Net Return Flow - Cubic feet per Second (1)		-117	232	182	117	58	208	103	177
HETCH HETCHY CROSSING TO VERNALIS									
Discharge at Hetch Hetchy Crossing	Table 20	776400	185200	123000	140700	961600	308200	1225300	448900
Discharge at Vernalis	Table 21	898300	206600	132400	163900	1104900	339000	1401200	502900
Inflow of Stanislaus River	Table 31	66970	24550	18650	30360	91520	43200	140530	73560
Diversions	Table 47	3250	2530	1840	1390	5780	4370	9010	5760
Net Return Flow (1)		58180	-620	-7410	-5770	57560	-8030	44380	-13800
Net Return Flow - Cubic feet per Second (1)		946	-10	-125	-94	468	-66	182	-76
SUMMARY - DELTA BRIDGE TO VERNALIS									
Discharge at Delta Bridge	Table 15	54080	6320	60	0	60400	6380	60460	6380
Discharge at Vernalis	Table 21	898300	206600	132400	163900	1104900	339000	1401200	502900
Diversions	Table 47	21990	17580	10850	2770	39570	28420	53190	31190
Inflow of tributaries		372670	109760	104130	123380	482430	213890	709940	337270
Total net return flow (1)		493540	108100	39050	43300	601640	147150	683990	190440
Total net return flow - Cubic feet per Second (1)		8030	1760	656	704	4890	1220	2800	1040

(1) The return flow figures include any return water which may come from the east side tributaries.

TABLE 59 (CONTINUED)

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1938
(Acre-feet except as noted)

		Jul.	Aug.	Sep.	Oct.	Jul-Aug. Incl.	Aug-Sep. Incl.	Jul-Oct. Incl.	Aug-Oct. Incl.
STANISLAUS RIVER									
ORANGE BLOSSOM BRIDGE TO HATMARK RANCH									
Discharge at Orange Blossom Bridge	Table 30	21910	1520	1310	10410	23430	2830	35150	13240
Discharge at Hatmark Ranch	Table 31	66970	24550	18650	30360	91520	43200	140530	73560
Diversions	Table 50	1690	1750	997	309	3440	2747	4746	3056
Net Return Flow		46750	24780	18340	20260	71530	43120	110130	63380
Net Return Flow - Cubic feet per Second		744	403	308	330	582	356	451	347
TUOLUMNE RIVER									
LA GRANGE TO ROBERTS FERRY BRIDGE									
Discharge at La Grange	Table 26	122500	17340	33180	36540	139840	50520	209560	87060
Discharge at Roberts Ferry Bridge	Table 27	118100	18450	36670	37660	136550	55120	210880	92780
Diversions	Table 49	0	0	0	0	0	0	0	0
Net Return Flow		-4400	1110	3490	1120	-3290	4600	1320	5720
Net Return Flow - Cubic feet per Second		-72	18	58	18	-27	38	5	31
ROBERTS FERRY BRIDGE TO HICKMAN BRIDGE									
Discharge at Roberts Ferry Bridge	Table 27	118100	18450	36670	37660	136550	55120	210880	92780
Discharge at Hickman Bridge	Table 28	142500	27770	45310	48840	170270	73080	264420	121920
Diversions	Table 49	10	6	12	0	16	18	28	18
Net Return Flow		24410	9326	8652	11180	33736	17978	53568	29158
Net Return Flow - Cubic feet per Second		397	152	145	182	274	149	220	160
HICKMAN BRIDGE TO TUOLUMNE CITY									
Discharge at Hickman Bridge	Table 28	142500	27770	45310	48840	170270	73080	264420	121920
Discharge at Tuolumne City	Table 29	186100	45820	56640	67310	231920	102460	355870	169770
Inflow of Dry Creek	Table 25	(5490)	(5090)	(4990)	(7880)	(10580)	(10080)	(23450)	(17960)
Diversions	Table 49	235	165	115	38	400	280	553	318
Net Return Flow (1)		43835	18215	11445	18508	62050	29660	92003	48168
Net Return Flow - Cubic feet per Second (1)		713	296	192	301	505	245	377	264
SUMMARY - LA GRANGE TO TUOLUMNE CITY									
Discharge at La Grange	Table 26	122500	17340	33180	36540	139840	50520	209560	87060
Discharge at Tuolumne City	Table 29	186100	45820	56640	67310	231920	102460	355870	169770
Inflow of Dry Creek	Table 25	(5490)	(5090)	(4990)	(7880)	(10580)	(10080)	(23450)	(17960)
Diversions	Table 49	245	171	127	38	416	298	581	336
Net Return Flow (1)		63845	28651	23587	30808	92496	52238	146891	83046
Net Return Flow - Cubic feet per Second (1)		1038	466	396	501	752	432	602	455

(1) The inflow of Dry Creek (Table 25) is presumed to be all Tuolumne River return flow.

TABLE 59 (CONTINUED)

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1938
(Acre-feet except as noted)

		Jul.	Aug.	Sep.	Oct.	Jul-Aug. Incl.	Aug-Sep. Incl.	Jul-Oct. Incl.	Aug-Oct. Incl.
MERCED RIVER									
YOSEMITE VALLEY RAILROAD CROSSING TO LIVINGSTON									
Discharge at Yosemite Valley Railroad Crossing	Table 22	57540	7990	5510	3110	65530	13500	74150	16610
Discharge at Livingston	Table 23	67450	18590	16430	16500	86040	35020	118970	51520
Diversions	Table 48	985	880	472	63	1865	1352	2400	1415
Net Return Flow		10895	11480	11392	13453	22375	22872	47220	36325
Net Return Flow - Cubic feet per Second		177	187	191	219	181	189	194	199
LIVINGSTON TO MOUTH									
Discharge at Livingston	Table 23	67450	18590	16430	16500	86040	35020	118970	51520
Discharge near Mouth	Table 24	111400	31520	21260	19440	142920	52780	183620	72220
Diversions	Table 48	1228	1053	546	395	2281	1599	3222	1994
Net Return Flow		45178	13983	5376	3335	59161	19359	67872	22694
Net Return Flow - Cubic feet per Second		735	227	90	54	481	160	278	124
SUMMARY - YOSEMITE VALLEY RAILROAD TO MOUTH									
Discharge at Yosemite Valley Railroad Crossing	Table 22	57540	7990	5510	3110	65530	13500	74150	16610
Discharge near Mouth	Table 24	111400	31520	21260	19440	142920	52780	183620	72220
Diversions	Table 48	2213	1933	1018	458	4146	2951	5622	3409
Net Return Flow		56073	25463	16768	16788	81536	42231	115092	59019
Net Return Flow - Cubic feet per Second		912	414	281	273	662	349	472	323

PLATE 2

Average discharge in cubic feet per second
0
400
800
1200
1600
2000
2400
2800
3200
Miles from mouth of San Joaquin River
80
90
100
110
120
130
140
150
160
VERNALIS
MAZE ROAD BR.
HETCH HETCHY CROSSING
LAIRD SLOUGH
CROWS LANDING
NEWMAN
TURNER ISLAND BR.
STANISLAUS RIVER
El Solyo Ranch
TUOLUMNE RIVER
West Stanislaus I.D.
Patterson Water Co.
Patterson Ranch
MERCED RIVER
FREMONT FORD BR.
BEAR CREEK
ACCUMULATED RETURN FLOW
ACCUMULATED DRAFT
DISCHARGE-INFLOW-DRAFT
SAN JOAQUIN RIVER RETURN FLOW
AUGUST TO OCTOBER INCLUSIVE
1938

TABLE 60

COMPARISON OF DIVERSIONS AND RETURN WATER - SAN JOAQUIN VALLEY - 1938
(Quantities in Acre-feet except as noted)

	Jul.	Aug.	Sep.	Oct.	Aug. to Oct. Inc.
- DIVERSIONS -					
San Joaquin River near Friant (1) (2) (Miller and Lux Canals, etc.)	212800	130080	80970	78740	289790
Merced River at Exchequer (1) (3) (Merced Irrigation District Canal, etc.)	100000	96160	67200	27370	190730
Turlock Irrigation District Canal (1)	92240	55400	40120	48620	144140
Modesto Irrigation District Canal (1)	64410	36120	31190	29840	97150
South San Joaquin and Oakdale Irrigation District Canals (1)	58070	48180	22690	9010	79880
Oakdale Irrigation District Canal (1)	24160	23970	20410	10720	55100
Pumping Diversions - San Joaquin, Merced, Tuolumne and Stanislaus Rivers (4)	26140	21460	12980	3570	38010
Total Diversions	577820	411370	275560	207870	894800
Total Diversions (Average Second-feet)	9400	6690	4630	3380	4900
- RETURN -					
San Joaquin River near Vernalis (1)	898300	206600	132400	163900	502900
Pumping diversions - San Joaquin, Merced, Tuolumne and Stanislaus Rivers (4)	26140	21460	12980	3570	38010
Total Return	924440	228060	145380	167470	540910
Undiverted flow: power releases and spill	330000	64000	30000	29000	123000
Net Return	594440	164060	115380	138470	417910
Net Return (Average Second-feet)	-----	2670	1940	1880	2290
Return in per cent of Diversions	-----	40	42	56	47

NOTE: Prior to August, return water measurements were vitiated by high river stages.
(1) U. S. G. S. station.
(2) This flow practically all diverted below gaging station after September 1st. - July and August figures corrected for flow past Fremont Ford Bridge and Delta bridge, respectively.
(3) Figure for July corrected for flow past Yosemite Valley Railroad Crossing.
(4) See Tables 47, 48, 49 and 50.

TABLE 61

DISCHARGE OF COLUSA TROUGH AT COLUSA-WILLIAMS HIGHWAY-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			472	418	564	185
2			475	425	585	186
3			490	410	623	186
4			517	402	650	185
5			538	388	617	184
6			532	395	620	182
7			519	410	575	156
8			490	418	549	128
9			475	420	539	118
10			472	461	523	114
11			470	492	542	110
12			470	514	548	107
13			466	517	533	105
14			461	519	540	91
15			464	521	576	105
16			461	529	581	118
17			461	538	588	121
18			445	538	544	113
19			438	532	482	95
20			430	551	496	101
21			428	548	437	95
22			425	559	400	90
23			428	574	371	90
24			423	578	322	98
25		*420	420	588	288	98
26		443	413	616	254	98
27		485	410	614	220	98
28		517	418	593	209	98
29		532	413	574	204	112
30		501	402	562	196	118
31			402	559		121
Mean			456	508	473	123
Ac.Ft. for Month			28020	31260	28120	7550

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.

* Beginning of record for season.

TABLE 62

DISCHARGE OF BUTTE SLOUGH-1938

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*				339	574	560	693
2					355	578	560	693
3					396	348	568	588
4				FLOW-	387	336	355	637
5					354	333	361	693
6					375	335	332	637
7				-NO	352	335	332	588
8					228	249	332	588
9					230	252	332	525
10					380	249	358	525
11	FLOW			266	280	249	349	455
12				371	286	338	349	429
13		FLOW	FLOW	525	289	342	349	409
14	NO			455	264	342	344	353
15				525	256	338	342	333
16				525	252	338	342	285
17		NO	NO	525	332	330	344	279
18				525	335	333	349	284
19				455	330	341	360	284
20				588	339	344	351	304
21				637	342	342	385	309
22				637	259	342	359	292
23				525	264	342	347	289
24				588	267	344	347	300
25				495	269	344	419	325
26				315	267	364	404	326
27	266			392	308	364	544	331
28				449	319	364	637	324
29				471	319	361	637	317
30				471	321	369	588	331
31					317	406		416
Mean	9	0	0	325	310	349	408	424
Ac.Ft. for Month	528	0	0	19320	19060	21470	24270	26070

NOTE: This is the discharge to the Sacramento River at Mile 84 Left and is measured at and regulated by the gravity culverts at the mouth of the Slough. This flow andButte Slough and Butte Creek diversions. (See Table 38) are made up almost entirely of return water from lands irrigated by Feather River diversions.

* Beginning of discharge record for season. Gages read throughout the year.

TABLE 63

DISCHARGE OF RECLAMATION DISTRICT 70 DRAIN-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*52	35	31	29	38	24
2	66	35	32	29	36	17
3	66	34	35	29	36	17
4	66	35	35	29	36	24
5	58	35	34	18	36	8
6	33	34	34	21	108	0
7	34	34	17	26	115	0
8	17	34	28	28	106	15
9	19	34	31	29	98	24
10	19	34	35	10	91	5
11	9	34	36	9	82	0
12	9	34	36	40	82	0
13	28	35	36	23	45	0
14	25	35	38	23	45	0
15	10	54	40	44	32	0
16	24	59	27	41	36	0
17	55	37	21	37	34	3
18	52	38	21	43	34	9
19	44	38	32	31	38	8
20	0	36	31	24	40	8
21	23	36	31	24	38	9
22	37	35	48	39	32	9
23	25	34	28	40	32	8
24	25	35	30	39	21	8
25	23	35	28	39	24	0
26	23	35	28	39	21	0
27	21	0	25	39	38	0
28	20	0	11	39	32	0
29	20	0	26	38	27	0
30	20	0	31	38	27	0
31	18		40	38		0
Mean	30	32	31	31	49	6
Ac.Ft. for Month	1870	1890	1900	1930	2900	389

NOTE: This is the drainage from Reclamation District 70 returned to Sacramento River at Mile 68.8 Left. For period of record discharge to Sacramento River both by pumping and controlled gravity flow.

* Beginning of discharge record for season.

TABLE 64

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN
AT ROUGH AND READY BEND-1938

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		71	75	103	116	122	76
2		71	75	0	105	128	0
3		0	0	172	108	50	0
4		0	0	162	103	315	51
5		0	87	147	100	116	0
6		76	87	110	62	132	50
7		0	87	119	117	132	0
8		76	87	161	116	280	0
9		76	87	0	115	61	36
10		76	98	216	118	14	0
11		84	98	176	115	220	21
12		84	98	140	102	132	0
13		84	98	73	117	166	
14		84	123	65	240	157	
15		84	110	114	103	126	
16		73	86	0	111	177	
17		73	88	211	112	213	
18		73	0	82	115	249	
19		0	131	71	130	75	
20		0	135	68	70	87	
21		0	95	68	159	98	
22		89	97	82	119	76	
23		89	88	0	120	79	
24	*44	0	88	144	126	0	
25	44	0	0	128	126	90	
26	0	81	129	117	140	63	
27	0	81	144	120	68	0	
28	0	81	111	118	188	66	
29	44	81	106	127	135	47	
30	44	0	108	52	136	0	
31		81		155	126		0
Mean		54	87	106	120	116	15
Ac.Ft. for Month		3310	5190	6550	7375	6885	464

FLOW - NO -

NOTE: This is the drainage from Reclamation District 108 returned to the Sacramento River at Mile 44.0 Right. Discharge through siphon and by pumping. Additional drainage from Reclamation District 108 was discharged to Back Borrow Pit at Mile 20.2 Left. See Table 65.

* Beginning of discharge record for season.

TABLE 65

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN
ON BACK BORROW PIT-1938

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1							0	
2							0	
3							0	
4							0	
5							0	
6							5	
7							8	
8							8	
9							8	
10	-	-	-	-	-	-	8	-
11	W	W	W	W	W	W	7	W
12	O	O	O	O	O	O	7	O
13	L	L	L	L	L	L	7	L
14	F	F	F	F	F	F	6	F
15							6	
16							5	
17	O	O	O	O	O	O	5	O
18	N	N	N	N	N	N	4	N
19	-	-	-	-	-	-	3	-
20							3	
21							2	
22							2	
23							1	
24							1	
25							1	
26							1	
27							1	
28							0	
29							0	
30							0	
31								
Mean	0	0	0	0	0	0	3	0
Ac.Ft. for Month	0	0	0	0	0	0	196	0

NOTE: All gravity flow. Additional drainage from Reclamation District 108 is returned to Sacramento River at Mile 44.0 Right. See Table 64.

TABLE 66

DISCHARGE OF COLUSA BASIN DRAINAGE AT KNIGHTS LANDING-1938

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*0	339	456	510	350
2			321	486	513	310
3			314	495	515	328
4			355	495	522	328
5			347	490	536	328
6			422	531	542	294
7			504	235	542	286
8			521	350	538	234
9			531	368	529	202
10			559	392	522	162
11			624	440	520	132
12			595	460	519	120
13			768	484	539	118
14			762	460	445	105
15			607	392	464	148
16			542	359	489	148
17			527	230	502	148
18		0	525	172	515	162
19		45	517	148	513	148
20		110	507	543	512	148
21		190	499	536	493	148
22		270	492	502	475	148
23		320	490	470	460	132
24		353	483	467	460	132
25		369	477	467	443	132
26		415	465	468	405	120
27		431	458	471	388	150
28		398	453	513	372	157
29		329	458	520	372	157
30		394	456	515	365	164
31			453	510		168
Mean		121	496	433	484	182
Ac.Ft. for Month		7190	30490	26630	28800	11210

NO FLOW

NOTE: This is the drainage from Colusa Basin passing down the BackBorrow Pit of Reclamation Districts 108 and 787 and entering the Sacramento River at Mile 34.15 Right, just above the Knights Landing gaging station. It includes the drainage from Reclamation District 787 entering the Back Borrow Pit via Sycamore Slough outlet. Irregularities in the flow are due to checking operations at the Knights Landing outfall gates whereby a portion of the flow of the Back Borrow Pit is diverted to the Knights Landing Ridge Cut. This diversion is shown in Table 71.

* Beginning of record for season.

TABLE 67

DISCHARGE OF SACRAMENTO SLOUGH-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*667	496	582	599
2			660	431	523	516
3			657	412	582	445
4			910	423	953	531
5			624	394	802	357
6			647	521	621	426
7			667	423	598	623
8			680	387	757	308
9			710	434	1020	255
10			730	437	814	172
11			740	419	800	156
12			750	419	558	229
13			760	470	784	190
14			760	492	528	149
15			912	492	815	173
16			757	492	706	219
17			990	470	719	176
18			722	473	786	180
19			904	498	596	181
20			755	552	610	181
21			789	549	433	181
22			752	543	729	162
23			655	549	542	186
24			780	552	586	83
25			747	591	817	118
26			773	498	664	116
27			772	529	608	154
28			765	677	737	144
29			659	489	659	119
30			481	498	673	175
31			477	635		41
Mean			731	492	687	243
Ac.Ft. for Month			44930	30240	40860	14960

NOTE: This is return water discharged to Sacramento River via Sacramento Slough at Mile 21.2 Left. This is the sum of the flow measured at two points: Outlet of Reclamation District 1500 Drain (Table 68) and West Borrow Pit of Sutter By-Pass 1.4 miles above Reclamation District 1500 Drain (Table 70). The flow in Table 70 includes the flow in Table 69.

*Beginning of record for season.

TABLE 68

DISCHARGE OF RECLAMATION DISTRICT 1500 DRAIN-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*545	358	347	362	401	202
2	366	364	350	333	342	187
3	379	364	357	329	348	116
4	384	379	610	325	658	202
5	388	572	324	296	473	95
6	389	312	347	340	326	97
7	399	255	357	289	303	294
8	639	374	360	304	462	101
9	370	374	360	336	691	99
10	374	374	360	339	485	38
11	374	385	360	336	538	0
12	376	631	360	336	324	95
13	397	367	360	336	550	56
14	694	414	360	336	294	34
15	370	312	512	336	581	58
16	262	170	357	336	444	104
17	377	358	590	336	457	42
18	383	424	322	339	524	46
19	474	353	472	342	362	47
20	402	186	323	345	376	47
21	416	270	392	342	226	47
22	418	299	389	336	495	47
23	801	312	326	342	308	88
24	431	317	451	345	291	0
25	444	335	315	410	454	48
26	442	615	341	342	267	46
27	447	292	375	348	211	56
28	448	314	368	521	272	46
29	365	332	364	333	227	46
30	532	342	325	342	241	113
31	448		379	454		0
Mean	437	358	381	347	398	80
Ac.Ft. for Month	26840	21330	23430	21310	23660	4950

NOTE: This is the drainage from Reclamation District 1500 discharged to West Borrow Pit of Sutter By-Pass and thence via Sacramento Slough (in the By-Pass) to Sacramento River. This is one of the sources measured to obtain the total flow in Sacramento Slough. See Table 67.

* Beginning of record for season.

TABLE 69

DISCHARGE OF SUTTER BY-PASS - EAST BORROW PIT
(WILLOW SLOUGH AT CHANDLER)-1938

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*0	97	56	108	132
2		0	97	40	108	132
3		0	97	29	120	132
4		0	97	48	144	132
5		0	108	76	170	120
6		0	108	108	183	120
7		0	132	144	183	120
8		24	156	97	183	120
9		30	183	56	183	120
10		39	197	29	183	120
11		45	197	21	183	120
12		60	197	40	183	120
13		103	197	67	183	120
14		172	197	67	170	120
15		200	197	67	170	108
16		218	197	56	170	108
17		231	197	56	170	108
18		296	183	56	170	108
19		293	170	56	170	108
20		277	170	48	170	108
21		265	156	48	170	97
22		265	144	48	170	97
23		265	156	48	170	88
24		265	156	56	156	88
25		211	156	56	156	76
26		170	144	67	156	76
27		144	170	67	156	76
28		132	183	88	144	76
29		120	144	88	144	76
30		97	108	97	144	76
31			76	97		76
Mean		131	154	64	162	106
Ac.Ft. for Month		7780	9460	3920	9660	6500

NOTE: This is return water originating from Feather River and Butte Slough diversions. It is discharged to Willow Slough through a controlled culvert at Chandler, thence across Sutter By-Pass to the West Borrow Pit and thence via the latter and Sacramento Slough (in the By-Pass) to Sacramento River.

* Beginning of discharge record for season.

TABLE 70

DISCHARGE OF SUTTER BY-PASS - WEST BORROW PIT
0.4 MILE ABOVE R. D. 1500 DRAINAGE PLANT-1938

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			320	134	181	397
2			310	98	181	329
3			300	83	234	329
4			300	98	295	329
5			300	98	329	262
6			300	181	295	329
7			310	134	295	329
8			320	83	295	207
9			350	98	329	156
10			370	98	329	134
11			380	83	262	156
12			390	83	234	134
13			400	134	234	134
14			400	156	234	115
15			400	156	234	115
16			400	156	262	115
17			*400	134	262	134
18			400	134	262	134
19			432	156	234	134
20			432	207	234	134
21			397	207	207	134
22			363	207	234	115
23			329	207	234	98
24			329	207	295	83
25			432	181	363	70
26			432	156	397	70
27			397	181	397	98
28			397	156	465	98
29			295	156	432	73
30			156	156	432	62
31			98	181		41
Mean			350	145	289	163
Ac.Ft. for Month			21500	8920	17200	10000

NOTE: This is the flow in the West Borrow Pit below the confluence of the East Borrow Pit flow entering via Willow Slough. This flow is joined by the discharge through R. D. 1500 drainage plant and the combined flow is thence discharged via Sacramento Slough (in the By-Pass) to Sacramento River. This is one of the sources measured to obtain the total flow in Sacramento Slough. See Table 67.

* Beginning of record for season. Record for period July 1 to July 17 by comparison with East Borrow Pit flow.

TABLE 71

DISCHARGE OF KNIGHTS LANDING RIDGE CUT AT WEST LINE OF YOLO BY-PASS-1938

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*170	2	2	2	1
2		165	2	2	2	1
3		160	2	2	2	1
4		155	2	2	2	1
5		150	2	2	2	1
6		145	2	2	2	1
7		140	2	2	2	1
8		135	2	2	2	1
9		130	2	2	2	1
10		120	2	2	2	0
11		115	2	2	2	
12		115	2	2	2	
13		110	2	2	2	
14		110	2	2	2	
15		110	2	2	2	
16		100	2	2	2	
17		90	2	2	2	
18		80	2	2	2	
19		65	2	2	2	
20		40	2	2	2	
21		30	2	2	2	
22		20	2	2	2	
23		2	2	2	2	
24		2	2	2	2	
25		2	2	2	2	
26		2	2	2	2	
27		2	2	2	2	
28		2	2	2	2	
29		2	2	2	2	
30		2	2	2	2	
31			2	2		0
Mean		77	2	2	2	0.3
Ac.Ft. for Month		4610	123	123	119	18

NO - FLOW

NOTE: During 1938 there was no direct diversion to the Knights Landing Ridge Cut. All water recorded is either spring run-off or seepage.

* Beginning of record for season.

TABLE 72

DISCHARGE OF YOLO BY-PASS - EAST BORROW PIT
(TULE CANAL) - 1938

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*3800	18	4		0
2		3640	18	4		2
3		3150	18	2		2
4		3150	18	2		2
5		3320	18	0		2
6		2800	18	0		0
7		2320	18	2		0
8		1840	16	2		0
9		1240	16	4		2
10		580	16	4		2
11		342	16	2	I	6
12		314	16	0	N	22
13		314	16		O	28
14		314	13		F	30
15		314	13		L	28
16		288	13	I	O	22
17		288	10	N	W	20
18		314	13	O		20
19		288	13	F		18
20		263	10	L		16
21		194	10	O		16
22		136	8	W		13
23		94	6			13
24		59	6			13
25		42	6			10
26		36	6			8
27		30	6			6
28		28	6			4
29		25	6			4
30		22	4			2
31			4			2
Mean		985	12	1	0	10
Ac.Ft. for Month		58600	744	52	0	620

NOTE: This station formerly located just below south levee of Reclamation District 827,(3.0 miles south of Woodland-Elkhorn Highway). Channel changes and pumping installations have made it necessary to move station downstream. It is now located at north line of Sacramento By-Pass (6.2 miles south of Woodland-Elkhorn Highway) and records all flow through Yolo By-Pass into Delta. This flow added to flow shown in Table 9 gives total flow passing Sacramento to Delta.

* Beginning of discharge record for season.

TABLE 73

DISCHARGE OF RECLAMATION DISTRICT 1000 DRAIN
(2nd BANNON SLOUGH)-1938

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*274	96	65	66	0	0	51	34
2	639	130	163	93	76	0	48	0
3	656	61	129	25	0	0	41	47
4	445	134	129	73	46	0	48	0
5	293	114	121	82	0	0	0	41
6	242	124	93	170	0	69	99	0
7	244	116	112	90	120	0	59	35
8	208	98	65	90	0	0	67	0
9	179	103	127	76	0	133	75	0
10	156	61	106	56	167	0	63	41
11	168	127	99	89	0	0	61	0
12	348	96	120	0	0	0	68	0
13	543	86	116	73	0	0	7	0
14	334	94	111	0	42	0	0	47
15	190	76	68	42	94	143	106	0
16	274	87	155	0	0	0	21	0
17	265	55	121	0	0	0	86	0
18	234	121	100	75	0	0	34	0
19	177	104	118	0	88	152	0	0
20	150	79	132	0	0	60	93	58
21	158	74	127	75	0	0	141	0
22	159	98	0	0	0	107	112	0
23	167	80	30	143	26	46	118	0
24	149	58	124	0	0	68	103	0
25	202	136	68	50	0	56	36	0
26	145	63	72	0	90	47	123	0
27	148	136	79	0	0	44	68	0
28	150	85	67	54	0	0	59	0
29	150	111	30	0	0	58	46	0
30	149	107	84	79	95	53	42	0
31	77		104		0	53		0
Mean	248	97	98	50	27	35	62	10
Ac.Ft. for Month	15220	5770	6020	2980	1670	2160	3720	600

NOTE: This is drainage from Reclamation District 1000 returned to the Sacramento River by pumping at Mile 2.1 Left.

* Beginning of record for season.

CHAPTER V

USE OF WATER IN THE SACRAMENTO-SAN JOAQUIN DELTA

As outlined in detail in preceding reports, (1924 to 1933, inclusive) an investigation having as its objective, a complete annual determination of the consumptive use of water in the entire Sacramento-San Joaquin Delta, comprised the experimental work to determine the unit consumptive use of water by the various irrigated crops and vegetation 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 data of the latter to derive the consumptive use of water in the Delta as a whole or on individual tracts or islands.

Annual Census of Irrigated Crop Acreages and Water Consuming Areas

The detail results of the census of the irrigated crop acreages and water consuming areas of the Delta as conducted by the Division of Water Resources in 1938, are shown in Table 74. In the course of the Delta investigations it has been found that in general all lands below a certain elevation, whether idle or cropped, receive and consume water derived by seepage from the adjacent channels. It was necessary, therefore, that all such lands should be accounted for in computations for the total consumptive use of water. It was determined that elevation 5.0 U.S.G.S. datum, would best represent the elevation below which it would be necessary to take the seepage into account and above which unirrigated and idle lands could be

considered as non-water consuming. This required that the census should include a segregation, as above or below elevation 5.0 U.S.G.S. datum, of all unirrigated crops and pasture, idle lands in weeds, and bare lands, and these segregations are indicated in Table 74.

1938 Consumptive Use of Water in the Sacramento-San Joaquin Delta

The figures shown in Table 77 for the total seasonal and annual consumption of water in 1938 by the various Delta crops and water consuming areas were derived by applying the unit figures of Table 75 to the total acreage segregations of Table 74. The unit figures of Table 75 are those which were developed from the experimental data and, with one exception, are those which were used in the computations of Bulletin 27 of the Division of Water Resources. The use of water by weeds as shown opposite the classification "Idle Land with Weeds" has been increased to correspond with a total annual consumption of 2.15 acre-feet per acre. This change was based on the indications of the later results from the weed tank experiments. It is possible that a continuation of the experimental work, terminated in 1932, would indicate certain other changes in these unit figures with respect to aquatic growths, weeds, and open water surfaces, but other than the above mentioned change for the item of idle land with weeds, the results of the work to date would apparently afford no justification for any material revision at this time of the figures as previously used.

Table 76 gives a comparison of the consumptive use of water in the Delta for the period 1924-1938. As shown by Table 77,

the seasonal consumptive use of water in 1938 by the Delta irrigated crop area of 338,925 acres amounted to 760,850 acre-feet or 2.27 acre-feet per acre. The seasonal use on the total consumptive area of 448,750 acres (including aquatic growths, bare lands, idle lands in weeds, open water surfaces, etc.), amounted to 1,226,850 acre-feet per acre.

In Tables 78 and 79 the total consumptive use of water in 1938 has been segregated to show the use in each river Delta, Table 78 showing that in the Sacramento Delta, and Table 79 that in the San Joaquin Delta. Table 80 shows a general classification of the 1938 irrigated crops with respect to the peat and sedimentary soils on which they were produced.

TABLE 74

DETAIL OF IRRIGATED AND NONIRRIGATED CROPS AND ACREAGES IN THE DELTA, 1938

Island or tract	Acreage of irrigated crops and water consuming areas[a]															Acreage of nonirrigated crops and nonwater consuming areas				Total acreage
	Alfalfa	Asparagus	Beans	Beets	Celery	Corn	Fruit	Hemp and hay	Onions	Potatoes	Tomatoes	Seed	Truck vegetables	Total irrigated crop acreage	Idle lands in areas below elev. 5.0 U.S.G.S.	Bare lands below elev. 5.0 U.S.G.S.	Aquatic growths and nonirrigated water surfaces	Total water consuming areas[b]	Grain and hay above elev. 5.0 U.S.G.S.	Pasture, idle and bare lands above elev. 5.0 U.S.G.S.	Levees[c]	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Andrus Island—Reclamation District No. 27, 407, 556	911	1,027	997	1,320		784	427	923	59	6		394	988	6,787	272	290	125	7,812			891	7,903
Bacon Island—Reclamation District No. 2028		240		1,208	320			1,080	257		1,177			4,282	748	117	194	5,341			742	5,823
Bethel Island—Portion of Reclamation District No. 800		685				61		1,060		1,310				3,056		8	3	3,067			51	3,008
Bethel Tract—Reclamation District No. 1618		1,056						445		500				1,701	660	440	159	2,957			84	3,041
Bigger and Jersey Ranch (Dix and Tatos)	116	88						262		400				870		19	82	971			39	1,010
Bishop Tract—Reclamation District No. 2065	443	1,121						241		439				2,244		28	72	2,344			61	2,405
Bishop Highlands										605				605			24	629	360	7		1,005
Black Point Small Area																			211	211		211
Bogue Tract—Reclamation District No. 404	709							683		50				1,442			1,292	2,733	100	101	73	2,914
Bradford Island—Reclamation District No. 799		1,304		1,459	879	197		1,940	50	45				5,867	748	127	64	6,806			1,050	7,856
Brack Tract—Reclamation District No. 3023	381	521		260	80	1,000	15	745		960	20			3,881	63	14	961	4,919			77	4,996
Bradford Island—Reclamation District No. 2059						1,075		1,200		200			20	3,345	604	116	60	4,125			97	4,222
Bouton Island—Reclamation District No. 2067	102	2,117	20	117		878	230	2,137		11		66	58	5,559	40	1,000	227	6,826			257	7,083
Byron Tract—Portion of Reclamation District No. 800		248				420		1,000	68	252	100		72	3,060	740	26	24	3,850			98	3,948
Canal Ranch	314	1,295						824		140	108		71	2,952	373	52	48	3,425			59	3,484
Clifton Court Tract—Reclamation District No. 800	59	1,103				15		944		200				2,321				2,321	330	82		2,733
Collinsville Misc.																					45	45
Coney Island		980						1,264					6	940	54	11	83	1,030			49	1,079
Customs—Private Reclamation Dist.		13	12			329	4							61	159			344	127	50	39	559
Deadhorse Island		180												180				180			73	253
Dodson Island—Reclamation Dist. 2074		150				835	280	1,000		253		35		2,553	93	342	133	3,128			73	3,201
Dowdan Tract		60	552			93	280	1,000					170	1,650	72	20		1,742	100	20	53	1,915
Edinger Johnson Misc. Dist.—Includes Etc. Dist. No. 743	13	180						1,000						1,193			26	1,219			47	1,266
Elkhardt Club		60				259		500					50	869			44	913			37	950
Glanwood Tract				3,440	264			1,300						5,226	206	80	436	6,188			39	6,227
Empire Tract	415	1,191				1,012		2,000	150				43	4,811	171	140	240	5,297	330	189	98	5,746
Fabian Tract																						
Farmers Developed Land Co. (Formerly California Irrigated Farms), (Portion of Reclamation District No. 2028 and 2062	1,030	2,455	2,504			311	4	930		70		71	330	7,730	1,443	230	300	10,694			107	** 10,280
Fay Island						91								91		2	5	98			13	109
Fore Island																					39	39
Fish and Winter Ranch—Portion of Reclamation District No. 2062	80		60			154								294	* 414	12	56	776			58	780
Fox Ranch	359							60						419		178	2	599			3	602
Frank Tract		250						1,000						1,250				1,250	1,040		178	2,468
Grand Island—Reclamation District No. 3	535	2,004	608	1,040	474	2,000	1,252	4,284				230	991	* 13,262	135	338	280	* 15,330	1,318	190	774	17,612
Grand Island—Reclamation District No. 2060		2,300		120		119		3,000				30	30	5,599	122	40	322	6,843		1,000	892	7,735
Hastings Tract—Reclamation District No. 2060																				140	20	160
Headwater Island				100		20	200	800		1,235				1,940	125	61	322	2,398			24	2,759
Henning Tract—Portion of Reclamation District No. 2060																				37	54	91
Hog Island															* 2,600			2,600			46	2,646
Holland Tract—Palm Co. (Formerly Lone Holland Tract)				1,455		58		1,344			441			3,548	41	68	120	3,777			65	3,842
Holland Tract—Reclamation District No. 2025	18	20				45		640		520				1,723	55	10	23	1,811			77	1,888
Hotchkiss Lake Tract	300	45								100				100				1,819	330	107	5	1,461
Horseshoe Island	445	1,197				304	21	500			1,040		43	3,550	1,130		76	4,756			79	4,835
Hotchkiss Tract—Includes Reclamation District No. 798	322	108				2					52			482	30	60		572				572
Ida Island		994				1,000		422			200			2,616	418	273	92	3,399	1,441		117	5,057
Jersey Island—Reclamation District No. 830				120	480	2,277		2,277				160		9,063	55	78	84	9,280			132	9,412
Jones Tract (Upper)—Reclamation District No. 2075				980	280	2,000		2,000		240			67	4,567	1,000	1,000	1,000	7,567		70	108	7,675
Jones Tract (Lower)—Reclamation District No. 2075															85			85				85
Kimball Island				720	160			1,250	102			431		2,751				2,751			74	3,000
King Island—Reclamation District No. 2048	124	1,361	2,104	45	20	1,289	473	2,000					200	* 5,724	511	19	173	* 6,263			450	6,713
Liberty Reclamation District													270	270	* 1,497			1,767	140		156	2,063
Mandeville Island—Reclamation District No. 2027	5					50	36	253			15			459	70	29	4	562			62	676
Marsh Grafton and Brandt Islands		1,220	152					193						1,565	1,241			2,806			80	3,426
McCormack-Williamson Tract						919				1,000		20		1,939	179	661	112	3,231			193	3,424
McDonald Island—Portion of Reclamation District No. 2026					200	440								640				640			47	687
Medford Island—Reclamation District No. 2041																						
Merritt Island—Reclamation District No. 150	346	140	144	1,418		196	400	117		400			481	1,053	* 1,170	23	52	3,294			102	3,396
Mildred Island—Reclamation District No. 2037									400			200			* 1,000	50	52	1,102			52	1,154
Mildred Island—Reclamation District No. 2042				225											474		43	419	1,000			1,473
Monument Island—Portion of Reclamation District No. 2058, 2062															1,135	40	43	1,218				1,135
Orwood Highlands	98																					
Orwood Tract—Reclamation District No. 2024		526		367	90	70		300	40		523		152	1,091	1,000	50	40	2,231			53	2,284
Orwood Tract—Reclamation District No. 2063						1,000		1,054						2,054	1,000	50	50	3,154			50	3,204
Palm Tract—Reclamation District No. 2026						2,000		1,000						3,000	1,000	50	50	4,100			54	4,154
Palm Tract—Reclamation District No. 2030		1,794	442	230	1,987		545	1,214	1,250	10		140	670	8,170	2,153	115	153	8,340	230		810	8,959
Pierson District No. 351		172							100	100				372	140	14	11	537			53	590
Pooker, The Roberts Island																						
Porter Island																						
Prospect Island—Reclamation District No. 2067		2,200													2,200			2,200				2,200
Quimby Island																	19	19			194	213
Ramsdell Island—Reclamation District No. 755							220	30				60	400	710	* 743			1,453			64	1,517
Rhode Island		175						100						275	400			675			3	678
Rio Blanco Tract								100				24	1	125	* 765			890			63	953
Rio Blanco Tract—Reclamation District No. 2032				1,420	760	118		2,000			800			4,983	75	35	26	5,119			107	5,226
Ringler Island—Reclamation District No. 2068	* 613	2,341	247	400	80	1,200		2,500		145	1,700		10	* 8,483	1,000			* 9,649	300	75	300	* 10,324
Roberts Island—Reclamation District No. 348	3,000	1,500	60	500		600	50	3,000		500	200		454	* 10,224	80	60	230	* 10,574	350	136	134	11,194
Roberts Island (Middle Division)—Reclamation District No. 348	1,000	1,000	60	252		600	50	1,000		400			400	3,662	80	60	230	4,032	350	136	134	4,652
Roberts Island (Upper Division)—Reclamation District No. 348	1,251	80				200		442					40	2,013	27	60	230	2,330	55	200	82	2,667
Rough and Ready Island—Reclamation District No. 800	400							1,000						1,400				1,400			47	1,447
Ryer Island—Reclamation District No. 2062	97	2,630	661	735	48	1,000	185	4,407	18			24	108	11,207		179	71	11,457			103	11,295
Ryer Island—Reclamation District No. 2039	57	1,000		270		150	5					189	47	1,718			31	1,749			43	1,179
Sargent-Barnhart Tract	57	1,000		900		350	5	3,500		115				4,979	371	470	117	5,937			366	10,303
Sherman Island—Reclamation District No. 341		50			138	213		1,197						1,598	1,025	22	22	2,713				2,713
Shima Tract		304				426		1,000		137				1,867	100	35	12	1,948	380	120	55	2,503
Smith Tract																					69	69
Spud Island																						
Staten Island		93				300	136	374		21			90	1,000				1,000	20			1,020
Stewart Tract			150		160	1,700	1,000	1,000	40	150			80	4,130				4,130			348	4,478
Stones Island													40	40	454	195	160	849			40	889
Swamp Land—Reclamation District No. 828													40	40	590	5		635			40	675
Tatum Island—Reclamation District No. 2066	6	427		151		160	682	40					100	1,566	90	84	30	1,770			192	1,962
Terminous Tract—Reclamation District No. 348	1,000	1,101	15	140	2,140	750		970	45	1,000	750	11		7,961			39	8,000	* 10,693		142	10,528
Tide Island																				48	34	82
Twitchell Island—Reclamation District No. 2064		972				1,212	12	600		20				2,816	200	61	65	3,142			280	3,421
Tyler Island—Reclamation Districts Nos. 136, 384, 542, 765, 907	55	1,000	142	902		1,743	175	1,000	15				153	5,035	1,000	62	220	6,317			262	6,579
Union Island—Reclamation Districts Nos. 1 and 2	1,672	10,000	58	176		1,200	28	2,214					183	15,531	196	246		15,436	1,330	135	284	18,000
Vado Tract—Reclamation District No. 2066		1,000				60		1,200		420		600		1,000	1,000			2,000			61	2,061
Venice Island—Reclamation District No. 2033															1,000	120		1,120		300	247	1,820
Victoria Island—Reclamation District No. 2043		1,150				2,500		2,000				100		5,750	72	34		5,856			105	7,340
Webb Tract—Reclamation District No. 2058				981		1,200		2,000						5,472	712	90	208	5,422			100	5,522
West Island																						
Widber Island																						
Woodward Island				900		500		525			324			1,749	1,000	50	50	2,849			86	2,935
Wright Tract	33	1,098											324	1,284	3	3		1,290			39	1,329
Reclamation District No. 35																					* 6,200	6,200
Reclamation District No. 307—Lisbon	1,550	810	600	1,100		193	8	949				100	60	* 5,267	106	75	104	* 5,552	430	50	142	6,174
Reclamation District No. 348	2,000	2,500	220	1,000		700	160	1,200		20		60	200	7,860	1,000	75	100	9,035	60	50	126	9,271
Reclamation District No. 349	30	10				40	60							140				140			34	174
Reclamation District No. 353	49	13	326	70		44	6							463	1,000			1,463			34	1,497
Reclamation District No. 369—Tyler	450	1,000		60		1,200		2,447			1,300			6,457	1,000	100		7,557	1,319	1,823	54	9,933
Reclamation District No. 554—Walnut Grove		28		28		20	13	100					10	199	475	60	350	1,084		1,200	142	2,426
Reclamation District No. 765	962	342	150	659	20	140							40	* 2,313	1,000	50	70	* 3,433	952	470	22	4,877
Reclamation District No. 744	78	90	1	257		133	102	40					257	1,013	191	70	51	1,325	46	97	59	1,527
Reclamation District No. 785—Bacon Ranch						1,000	40							1,040				1,040	40		51	1,131
Reclamation District No. 817	317			841			* 20		17	703				1,878	1,953		42	1,995	85	50	122	1,852
Reclamation District No. 827	17	40	80	190		120	112	600					9	1,168	1,000	11	10	1,189	42	75	75	1,381
Reclamation District No. 828—Prospect	75		15	60		60							34	329				2,310	300		53	363
Reclamation District No. 999—West Sacramento	1,722	170		1,000		100	100					200		3,292	1,000			4,292	1,020	715	34	5,269
Reclamation District No. 2060	800	11,000	980	6,300		1,200	130		200			200	2,050	* 22,860	119	70	757	* 24,101	300	200	1,800	26,136
Reclamation District No. 2069	1,000	1,000	90			1,000	107	143	1,018					4,358	1,000	100	100	5,558	1,330	1,360	180	8,461
Reclamation District No. 2074—Staten	42	15				100	47	440		40			126	990	422	33	16	1,461	100	200	45	1,772
Totals	* 31,347	77,311	* 15,087	* 57,141	* 8,934	* 67,457	8,186	90,852	* 3,204	12,596	10,450	3,250	* 11,399	* 396,922	* 29,999	7,949	* 27,347	* 463,777	14,501	10,476	10,185	498,939

[a] All acreages below elevation 5.0 U.S.G.S. datum are considered as irrigated or consuming areas.

[b] Includes roads, railroads, and farmsteads.

[c] The total levee area includes water consuming acreages estimated at 4,000 willows and 1,000 weeds which should be included in column 18. No survey was made to measure the acreage of levees in the Suisun Marsh.

[d] These figures represent gross areas, i.e., entire area inside surrounding water channels.

[e] Includes 80 acres levees, second crop after grain.

[f] Includes 40 acres idlers, second crop after cotton and 20 acres cotton interplanted to asparagus.

[g] Includes 20 acres levees, second crop after grain.

[h] Includes 20 acres levees.

[i] Includes 40 acres levees and 10 acres levees. Second crop after grain.

[j] Includes 20 acres levees interplanted to asparagus.

[k] Includes 80 acres levees, 10 acres cotton grain and 20 acres corn, second crop after grain and 150 acres beans interplanted to asparagus.

[l] This is not the total inside of the Farmers Developed Land Co. Approximately 2,400 acres lie south of Five Point Slough and are reported in Table 45.

[m] Not cropped due to high water.

[n] Area has been flooded and is subject to total loss due to broken levees.

[o] Includes 40 acres levees, 10 acres grain and 40 acres truck interplanted to asparagus.

[p] This area was flooded through June, 1938.

[q] Includes 80 acres beans interplanted to asparagus.

[r] Includes 100 acres corn, 10 acres beans, and 4 acres rutted grain as second crop and 10 acres levees and 10 acres beans interplanted to asparagus.

[s] Includes 150 acres levees.

[t] Includes 150 acres corn and 50 acres beans as second crop after grain.

[u] Includes 60 acres beans, 200 acres tomatoes and 10 acres corn as second crop after grain.

[v] Includes 141 acres beans as second crop after grain.

[w] Includes interplantings of 27 acres corn and 30 acres tomatoes.

[x] Includes 200 acres celery, 20 acres corn and 15 acres beans as second crop.

[y] Includes 20 acres tomatoes interplanted to asparagus and 10 acres beans and 10 acres tomatoes as second crop after cotton.

[z] Includes 8 acres cotton and 61 acres beans as second crop after grain.

[aa] Includes 20 acres tomatoes interplanted to asparagus and 30 acres beans (1) acres corn and 10 acres cotton grown as second crop.

[bb] Includes 20 acres levees.

[cc] Includes 110 acres beans as second crop and 200 acres beans interplanted to asparagus.

[dd] Includes second crop, 31 acres.

[ee] Includes interplantings and second crop, 1,127 acres.

[ff] Includes second crop, 1,000 acres.

[gg] Includes second crop, 200 acres.

[hh] Includes second crop, 624 acres.

[ii] Includes interplantings and second crop, 30 acres.

[jj] Includes interplantings and second crop, 437 acres.

[kk] Includes interplantings and second crop, 1,200 acres.

[ll] Includes 200 acres temporarily flooded December through June; 10,200 acres flooded continuously, 8,000 acres.

[mm] Includes 75 acres corn and 50 acres beans as second crop after grain.

[nn] Includes 50 acres beans, 200 acres tomatoes and 10 acres corn as second crop after grain.

[oo] Includes 40 acres beans as second crop after grain.

[pp] Includes 100 acres beans as second crop after grain.

[qq] Includes 100 acres beans as second crop after grain.

[rr] Includes 110 acres beans as second crop and 200 acres beans interplanted to asparagus.

[ss] Includes second crop, 31 acres.

[tt] Includes interplantings and second crop, 1,127 acres.

[uu] Includes second crop, 1,000 acres.

[vv] Includes second crop, 200 acres.

[ww] Includes second crop, 624 acres.

[xx] Includes interplantings and second crop, 30 acres.

[yy] Includes interplantings and second crop, 437 acres.

[zz] Includes interplantings and second crop, 1,200 acres.

[aaa] Includes 200 acres temporarily flooded December through June; 10,200 acres flooded continuously, 8,000 acres.

TABLE 75

UNIT CONSUMPTIVE USE OF WATER IN SACRAMENTO-SAN JOAQUIN DELTA**
Acre-feet per Acre

Crop or Classification	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total Seasonal Use	Total Annual Use
Alfalfa	(.06)	(.08)	.10	.30	.40	.50	.65	.55	.50	.20	(.10)	(.07)	3.20	3.51
Asparagus	.05	.05	.05	.05	.08	.14	.40	.68	.55	.42	.12	.10	2.69	2.69
Beans	(.06)	(.08)	(.08)	(.16)	(.20)	.14	.24	.58	.37	(.09)	(.07)	(.05)	1.33	2.12
Beets	(.06)	(.08)	(.08)	.13	.32	.51	.61*	.53*	.20*	(.13)	(.10)	(.07)	2.30	2.82
Celery	(.04)	(.04)	(.04)	(.08)	(.10)	.10	.10	.20	.25	.30	.20	.05	1.20	1.50
Corn	(.04)	(.04)	(.04)	(.08)	(.10)	.24	.85	.84*	.40*	.10	(.10)	(.07)	2.43	2.90
Fruit	(.04)	(.04)	(.04)	.18	.32	.50	.57	.40	.23	.07	(.07)	(.05)	2.27	2.51
Grain and Hay	(.04)	(.04)	.07	.60	.83	.20	(.14)	(.23)	(.21)	(.14)	(.07)	(.05)	1.70	2.62
Onions	(.04)	(.04)	.08	.13	.27	.49	.43	.20	(.16)	(.13)	(.10)	(.07)	1.60	2.14
Pasture	.08	.10	.20	.25	.25	.25	.25	.25	.20	.15	.10	.08	2.16	2.16
Potatoes	(.06)	(.08)	(.08)	(.16)	.15	.38	.52	.30	.15	(.09)	(.07)	(.05)	1.50	2.09
Seed	(.06)	(.08)	(.08)	.10	.25	.50	.50	.50	.35	.10	(.10)	(.07)	2.30	2.69
Truck	(.06)	(.08)	.10	.10	.25	.50	.45	.45	.30	.15	.10	(.07)	2.40	2.61
Tules	.16	.09	.30	.74	1.10	1.28	1.53	1.32	1.18	.98	.59	.36	9.63	9.63
Willows	.05	.03	.09	.22	.33	.38	.46	.40	.35	.29	.18	.10	2.88	2.88
Bare Land	.04	.04	.04	.08	.10	.13	.14	.13	.11	.09	.07	.05	1.02	1.02
Idle Land with Weeds***	.07	.09	.10	.19	.24	.31	.33	.28	.19	.15	.12	.08	2.15	2.15
Open Water Surfaces	.08	.13	.23	.34	.60	.76	.84	.78	.60	.33	.14	.08	4.91	4.91

NOTE: Figures shown in brackets () represent estimated consumptive use on cropped areas before planting and after harvest. (Evaporation from bare land, use by weeds, etc.).

* Includes estimated additional use by weeds during these months.

** These are the data as determined for and published in Bulletin No. 27 - "Variation and Control of Salinity in Sacramento-San Joaquin Delta and Upper San Francisco Bay" - Table 1, except that the figures for "Idle Land with Weeds" have been increased somewhat based upon later experimental work on the use of water by weeds.

*** Average for land below elevation 5.0 U.S.G.S. datum. Use on unirrigated lands above elevation 5.0 is considered zero.

TABLE 76

CONSUMPTIVE USE OF WATER IN THE SACRAMENTO-SAN JOAQUIN DELTA
1924 TO 1932 AND 1938

Year *	Water Consuming Area in Acres		Seasonal (2) Use of Water in Acre-feet		Seasonal Unit Consumption in Ac.-feet per Ac.		Annual (3) Use of Water in Acre-feet		Annual Unit Consumption in Acre-feet per Ac.	
	Total (1)	Irr. Crops	Total	Irr. Crops	Total	Irr. Crops	Total	Irr. Crops	Total	Irr. Crops
1924		319800		674840		2.11				
1925		315600		660900		2.10				
1926		316200		649560		2.06				
1927		315600		649090		2.06				
1928		321500		674920		2.10				
1929	420900	321800	1100140	689550	2.62	2.14	1250180	839590	2.97	2.61
1930	446800	338000	1161000	744000	2.60	2.20	1322000	895000	2.96	2.65
1931	446310	339300	1167390	756010	2.61	2.23	1319250	907870	2.96	2.68
1932	447430	336440	1181030	746800	2.64	2.22	1334060	899830	2.98	2.67
1938	448750	335670	1226850	760850	2.73	2.27	1380120	914120	3.08	2.72

* Annual census omitted for years 1933 to 1937, inclusive.

(1) Total includes interior and exterior water surface, bare and weed lands which consume seepage water, willow and tule areas, etc.

(2) Includes water used by crops and vegetation during the composite growing season and by evaporation for the entire year.

(3) Includes in addition to seasonal use, the use of water on the cropped area during the non-growing or dormant season.

NOTE: Prior to 1929 the annual census was not complete with respect to water consuming areas other than irrigated crop lands.

TABLE 77

CONSUMPTIVE USE OF WATER IN THE SACRAMENTO-SAN JOAQUIN DELTA-1938
Acre-feet

Crop or Classification	(1) Acreage	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total Seasonal Use	Total Annual Use
Alfalfa	31342	(1880)	(2510)	3130	9400	12540	15670	20370	17240	15670	6270	(3130)	(2190)	100290	110000
Asparagus	77311	3870	3870	3870	3870	6180	10820	30920	52570	42520	32470	9280	7730	207970	207970
Beans (2)	10997	(660)	(880)	(880)	(1760)	(2200)	1540	2640	6380	4070	(990)	(770)	(550)	14630	23320
Beets (2)	36311	(2180)	(2900)	(2900)	4720	11620	18520	22150*	19240*	7260*	(4720)	(3630)	(2540)	83510	102380
Celery (2)	6914	(280)	(280)	(280)	(550)	(690)	690	690	1380	1730	2070	1380	350	8290	10370
Corn (2)	40457	(1620)	(1620)	(1620)	(3240)	(4050)	9710	34390	33980*	16180*	4050	(4050)	(2830)	98310	117340
Fruit	6196	(250)	(250)	(250)	1120	1980	3100	3530	2480	1430	430	(430)	(310)	14070	15560
Grain and Hay	89823	(3590)	(3590)	6290	53890	74550	17960	(12580)	(20660)	(18860)	(12580)	(6290)	(4490)	152690	235330
Onions (2)	1304	(50)	(50)	100	170	350	640	560	260	(210)	(170)	(130)	(90)	2080	2780
Pasture	12386	990	1240	2480	3100	3100	3100	3100	3100	2480	1860	1240	990	26780	26780
Potatoes	10650	(640)	(850)	(850)	(1700)	1600	4050	5540	3200	1600	(960)	(750)	(530)	15990	22270
Seed	3235	(190)	(260)	(260)	320	810	1620	1620	1620	1130	320	(320)	(230)	7440	8700
Truck (2)	11999	(720)	(960)	1200	1200	3000	6000	5400	5400	3600	1800	1200	(840)	28800	31320
Total Irrigated Crops (3)	338925	16920	19260	24110	85040	122670	93420	143490	167510	116740	68690	32600	23670	760850	914120
Tules (4)	8300	1330	750	2490	6140	9130	10620	12700	10960	9790	8130	4900	2990	79930	79930
Willows (5)	5600	280	170	500	1230	1850	2130	2580	2240	1960	1620	1010	560	16130	16130
Bare Lands (6) (7)	7850	310	310	310	630	790	1020	1100	1020	860	710	550	390	8000	8000
Idle Lands with Weeds (7)(8)	35780	1750	2250	2500	4750	6000	7760	11810	10020	6800	5370	4290	2860	66160	66160
Open water Surfaces (9)	55550	5300	8620	15250	22550	39790	50400	46660	43330	33330	18330	7780	4440	295780	295780
Total Consumptive Area (10)	448750	25890	31360	45160	120340	180230	165350	218340	235080	169480	102850	51130	34910	1226850	1380120
Unit Consumption-Ac.Ft./Acre:															
Total Consumptive Area	448750	.06	.07	.10	.27	.40	.37	.49	.52	.38	.23	.11	.08	2.73	3.08
Irrigated Crop Area (10)	335670	.05	.06	.07	.25	.36	.28	.43	.50	.34	.20	.10	.07	2.27	2.72

NOTE: Figures in brackets () represent consumptive use on cropped areas before planting and after harvest. (Evaporation from bare land, use by weeds, etc.)

* Includes estimated additional use by weeds during these months.

(1) Data from Table 74.

(2) Figures include use by areas double cropped and intercropped.

(3) Includes 3250 acres of second crop and interplanting.

(4) Interior 3000 acres and exterior channels, 5300 acres.

(5) Interior, as a portion of levee acreage 4400 acres; exterior channels 1200.

(6) Includes roads, camp areas, etc.

(7) Below elevation 5.0 U.S.G.S. datum. Non irrigated and idle lands above this elevation are not considered as consuming water.

(8) Figures include 29,060 interior, 4600 as a portion of levee area, 1800 oaks and brush an exterior channels, and 320 for a group of small islands not included in table. Consumptive use takes account of 10,760 acres temporarily flooded until July.

(9) Includes interior water surfaces 9650 acres; flooded reclamations 8020 acres; rice on Boggs Tract 280 acres; open exterior channels within the delta 36,500 acres and open channels between delta boundary and stream gaging stations (recording flow to delta), 1100 acres. Consumptive use takes account of 10,760 acres temporarily flooded until July.

(10) In total area figure, the acreage of irrigated crops has been corrected for second crop and interplantings. (See (3)).

TABLE 78

CONSUMPTIVE USE OF WATER IN THE SACRAMENTO DELTA-1938
Acre-feet

Crop or Classification	Acreage	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total Seasonal Use	Total Annual Use
Alfalfa	11021	(660)	(880)	1100	3310	4410	5510	7160	6060	5510	2200	(1100)	(770)	35260	38670
Asparagus	37247	1860	1860	1860	1860	2980	5590	14900	25330	20490	15640	4470	3720	100560	100560
Beans (1)	6011	(360)	(480)	(480)	(960)	(1200)	840	1440	3490	2220	(540)	(420)	(300)	7990	12730
Beets (1)	20575	(1230)	(1650)	(1650)	2670	6580	10490	12550*	10900*	4120*	(2670)	(2060)	(1440)	47310	58010
Celery (1)	528	(20)	(20)	(20)	(40)	(50)	50	50	110	130	160	110	30	640	790
Corn (1)	16401	(660)	(660)	(660)	(1310)	(1640)	3940	13940	13780*	6560*	1640	(1640)	(1150)	39860	47580
Fruit	5390	(220)	(220)	(220)	970	1720	2700	3070	2160	1240	380	(380)	(270)	12240	13550
Grain and Hay	28341	(1130)	(1130)	1980	17000	23520	5670	(3970)	(6520)	(5950)	(3970)	(1980)	(1420)	48170	74240
Onions (1)	338	(10)	(10)	30	40	90	170	150	70	(50)	(40)	(30)	(20)	550	710
Pasture	2263	180	230	450	570	570	570	570	570	450	340	230	180	4910	4910
Potatoes	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Seed	2555	(150)	(200)	(200)	260	640	1280	1280	1280	890	260	(260)	(180)	5890	6880
Truck (1)	9425	(570)	(750)	940	940	2360	4710	4240	4240	2830	1410	940	(660)	22610	24590
Total Irrigated Crops (2)	140095	7050	8090	9590	29930	45760	41520	63320	74510	50440	29250	13620	10140	325990	383220
Tules (3)	1910	310	170	570	1410	2100	2440	2920	2520	2250	1870	1130	690	18380	18380
Willows (4)	2000	100	60	180	440	660	760	920	800	700	580	360	200	5760	5760
Bare Lands (5) (6)	2380	100	100	100	190	240	310	330	310	260	210	170	120	2440	2440
Idle Lands with Weeds (6)(7)	8110	370	480	530	1010	1270	1640	2670	2270	1540	1220	970	650	14620	14620
Open Water Surfaces (8)	18720	1720	2800	4950	7320	12910	16360	15730	14600	11230	6180	2620	1500	97920	97920
Total Consumptive Area (9)	171820	9650	11700	15920	40300	62940	63030	85890	95010	66420	39310	18870	13300	465110	522340
Unit Consumption-Ac.Ft./Acre															
Total Consumptive Area	171820	.06	.07	.09	.23	.37	.37	.50	.55	.39	.23	.11	.08	2.71	3.05
Irrigated Crop Area (9)	138700	.05	.06	.07	.21	.33	.30	.46	.54	.36	.21	.10	.07	2.34	2.76

NOTE: Figures in brackets () represent consumptive use on cropped areas before planting and after harvest. (Evaporation from bare land, use by weeds, etc.

* Includes estimated additional use by weeds during these months.

(1) Figures include use by areas double cropped and intercropped.

(2) Includes 1390 acres of second crop and interplantings.

(3) Interior 1310 acres and exterior channels, 600.

(4) Interior, as a portion of levee acreage, 1900 acres; exterior channels 100.

(5) Includes roads, camp areas, etc.

(6) Below elevation 5.0 U.S.G.S. datum. Non-irrigated and idle lands above this elevation are not considered as consuming water.

(7) Acreage includes 5580 interior, 2340 as a portion of levee area, 100 oaks and brush in exterior channels, and 90 for a small area not included in table. Consumptive use takes account of 2800 acres temporarily flooded through June.

(8) Includes interior water surfaces 3930, flooded reclamations 2590; open exterior channels within the delta 11,200; and open channels between delta boundary and stream gaging stations 1000 acres.

(9) In total area figure, the acreage of irrigated crops has been corrected for second crop and interplanting. (See (2)).

TABLE 79

CONSUMPTIVE USE OF WATER IN THE SAN JOAQUIN DELTA-1938
Acre-feet

Crop or Classification	Acreage	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total Seasonal Use	Total Annual Use
Alfalfa	20321	(1220)	(1630)	2030	6090	8130	10160	13210	11180	10160	4070	(2030)	(1420)	65030	71330
Asparagus	40064	2010	2010	2010	2010	3200	5230	16020	27240	22030	16830	4810	4010	107410	107410
Beans (1)	4986	(300)	(400)	(400)	(800)	(1000)	700	1200	2890	1850	(450)	(350)	(250)	6640	10590
Beets (1)	15736	(950)	(1250)	(1250)	2050	5040	8030	9600*	8340*	3140*	(2050)	(1570)	(1100)	36200	44370
Celery (1)	6386	(260)	(260)	(260)	(510)	(640)	640	640	1270	1600	1910	1270	320	7650	9580
Corn (1)	24056	(960)	(960)	(960)	(1930)	(2410)	5770	20450	20200*	9620*	2410	(2410)	(1680)	58450	69760
Fruit	806	(30)	(30)	(30)	150	260	400	460	320	190	50	(50)	(40)	1830	2010
Grain and Hay	61482	2460	(2460)	(4310)	36890	51030	12290	(8610)	(14140)	(12910)	(8610)	(4310)	(3070)	104520	161690
Onions (1)	966	(40)	(40)	70	130	260	470	410	190	(160)	(130)	(100)	(70)	1530	2070
Pasture	10123	810	1010	2030	2530	2530	2530	2530	2530	2030	1520	1010	810	21870	21870
Potatoes	10650	(640)	(850)	(850)	(1700)	1600	4050	5540	3200	1600	(960)	(750)	(530)	15990	22270
Seed	680	(40)	(60)	(60)	60	170	340	340	340	240	60	(60)	(50)	1550	1820
Truck (1)	2574	(150)	(210)	260	260	640	1290	1160	1160	770	390	260	(180)	6190	6730
Total Irrigated Crops (2)	198830	9870	11170	14520	55110	76910	51900	80170	93000	66300	39440	18980	13530	434860	530900
Tules (3)	6390	1020	580	1920	4730	7030	8180	9780	8440	7540	6260	3770	2300	61550	61550
Willows (4)	3600	180	110	320	790	1190	1370	1660	1440	1260	1040	650	360	10370	10370
Bare Lands (5) (6)	5470	210	210	210	440	550	710	770	710	600	500	380	270	5560	5560
Idle Lands with Weeds (6)(7)	27670	1380	1770	1970	3740	4730	6120	9140	7750	5260	4150	3320	2210	51540	51540
Open Water Surfaces (8)	36830	3580	5820	10300	15230	26880	34040	30930	28730	22100	12150	5160	2940	197860	197860
Total Consumptive Area (9)	276930	16240	19660	29240	80040	117290	102320	132450	140070	103060	63540	32260	21610	761740	857780
Unit Consumption Ac.Ft/Ac.															
Total Consumptive Area	276930	.06	.07	.11	.29	.42	.37	.48	.51	.37	.23	.12	.08	2.75	3.11
Irrigated Crop Area (9)	196970	.05	.06	.07	.28	.39	.26	.41	.47	.34	.20	.10	.07	2.21	2.70

NOTE: Figures in brackets () represent consumptive use on cropped areas before planting and after harvest. (Evaporation from bare land, use by weeds, etc.)

* Includes estimated additional use by weeds during these months.

(1) Figures include use by areas double cropped and intercropped.

(2) Includes 1860 acres of second crop and interplantings.

(3) Interior 1690 acres and exterior channels 4700.

(4) Interior, as a portion of the levee acreage, 2500 acres; exterior channels, 1100.

(5) Includes roads, camp areas, etc.

(6) Below elevation 5.0 U.S.G.S. datum. Non-irrigated and idle lands above this elevation are not considered as consuming water.

(7) Acreage includes 23,480 interior, 2260 as a portion of the levee area, 1700 oaks and brush in exterior channels, and 230 for a group of small islands not included in table. Consumptive use takes account of 7960 acres temporarily flooded through June.

(8) Includes interior water surfaces 5720 acres; flooded reclamations 5430 acres; rice on Boggs Tract 280 acres; open exterior channels within the delta 25,300; and open channels between delta boundary and stream gaging station 100 acres.

(9) In total area figure the acreage of irrigated crops has been corrected for second crop and interplanting. (See (2)).

TABLE 80

SEGREGATION OF THE CROPS OF THE SACRAMENTO-SAN JOAQUIN DELTA TO THE GENERAL SOIL CLASSIFICATION ON WHICH THEY WERE PRODUCED - 1938

Crop	Peat Soil Acreage Irrigated	Sedimentary Soil Acreage Irrigated	Total
Alfalfa	8707	22635	31342
Asparagus	28136	49175	77311
Beans	858	10139	10997
Beets	16829	19482	36311
Celery	6311	603	6914
Corn	21764	18693	40457
Fruit	319	5877	6196
Grain and Hay	52557	37266	89823
Onions	900	404	1304
Pasture	4741	7645	12386
Potatoes	9774	876	10650
Seed	464	2771	3235
Truck	1581	10418	11999
Totals	152941	185984	338925

CHAPTER VI

SALINITY INVESTIGATION

Purpose

The purpose of the salinity investigation, as outlined in previous reports, has been to record the occurrence and extent of the encroachment into upper bay and delta channels of salinity from San Francisco Bay, and to establish the relation between movement of salinity, stream flow to the Delta, and tidal action. As reported in Bulletin 27 of the Division of Water Resources, this relation was established for the conditions which obtained during the period of the special investigation for that Bulletin and upon the basis of all data available to that time. Subsequent investigations, therefore, have been directed to the maintenance of un unbroken record of the salinity, tidal and stream flow variations, essential not only in corroboration of the relation as at present established but as the basis for a check of possible modifications in the relation due to changes in channel and tidal conditions which may have taken place or will occur in the future. Also, during periods of low stream flow, the continuation of salinity sampling has been essential in keeping Delta irrigators advised of conditions so that damage from the use of water of too high salt content might be averted.

Scope

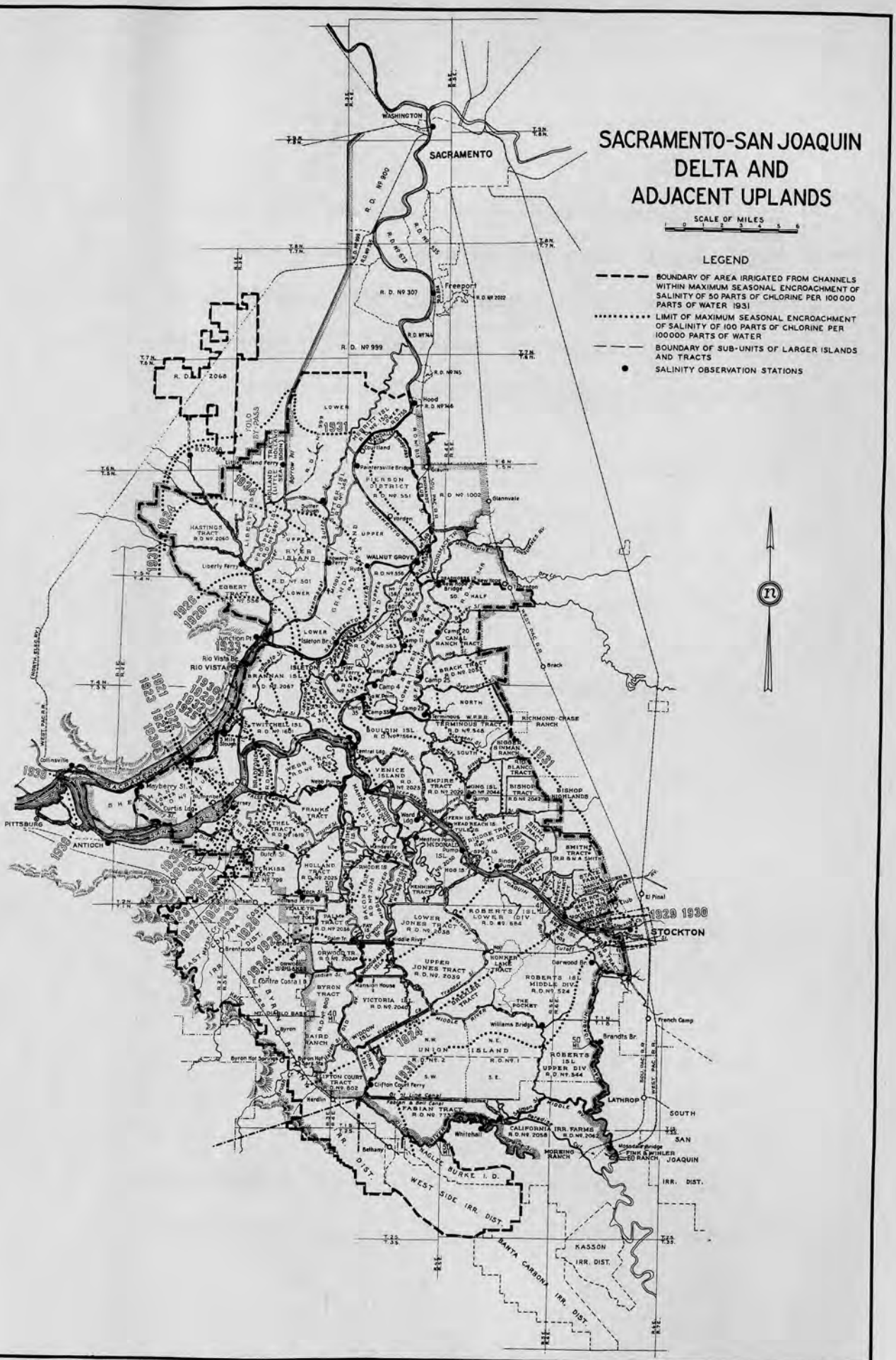
The scope of this investigation each season has been such as to insure that samples of water to be tested for salinity

would be taken at regular intervals at a sufficient number of stations throughout the Delta and upper bay region so that the advance and retreat of the salinity from early summer to late fall would be completely recorded. Plate 3 shows the limit of encroachment into the Delta of 100 part salinity in the years 1920 to 1938, inclusive, Twenty bay and Delta sampling stations are maintained permanently throughout the year.

Station Maintenance and Records

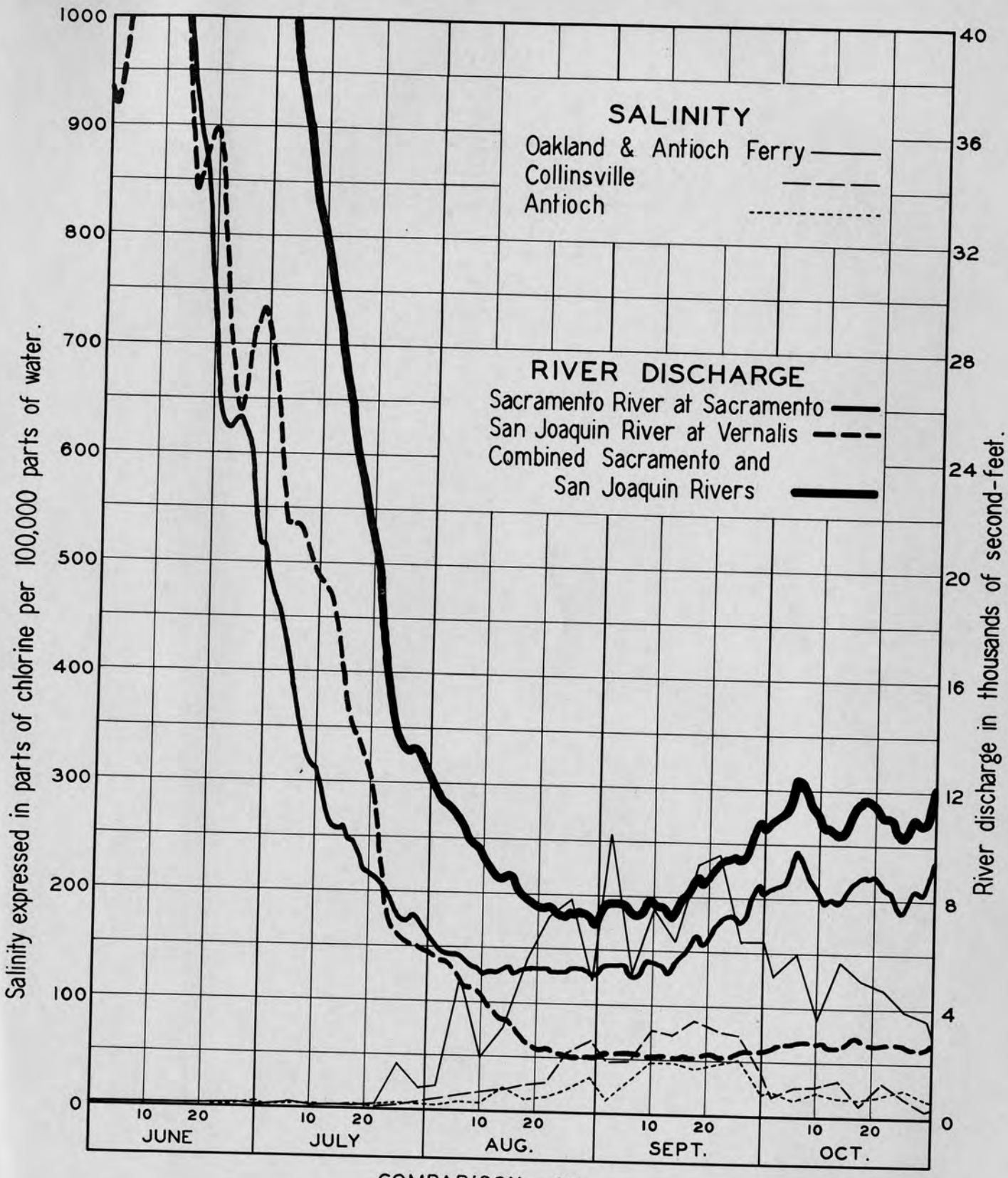
As in the past, the salinity sampling at all stations was done by local observers. Each observer was provided with a schedule showing the exact time for taking the samples so that, throughout the Delta at four-day intervals, all samples would be taken at approximately one and one-half hours after the same high tide. The observers were furnished with stamped containers for the sample bottles so that the latter could be mailed as filled to the laboratory at Sacramento. All testing was done at the chemical laboratory of the Division of Highways. The records of the tests of all samples taken in 1938 are given in Table 83 and Table 82 gives the location and description of each station.

The maximum salinity as recorded at the stations operated in 1938 is shown in Table 81. For comparative purposes, this table shows also the maximum salinity recorded at these stations in previous years beginning with 1928. A comparison of the summer stream flow to the Delta in 1938 and the corresponding salinity at certain of the lower Delta stations is shown on Plate 4.



MAXIMUM SEASONAL SALINITY ENCROACHMENT OF 100 PARTS OF CHLORINE PER 100,000 PARTS OF WATER, SACRAMENTO-SAN JOAQUIN DELTA 1920-1938

PLATE 3.



COMPARISON OF
RIVER DISCHARGE AND SALINITY
AT BAY AND DELTA STATIONS
1938

PLATE 4

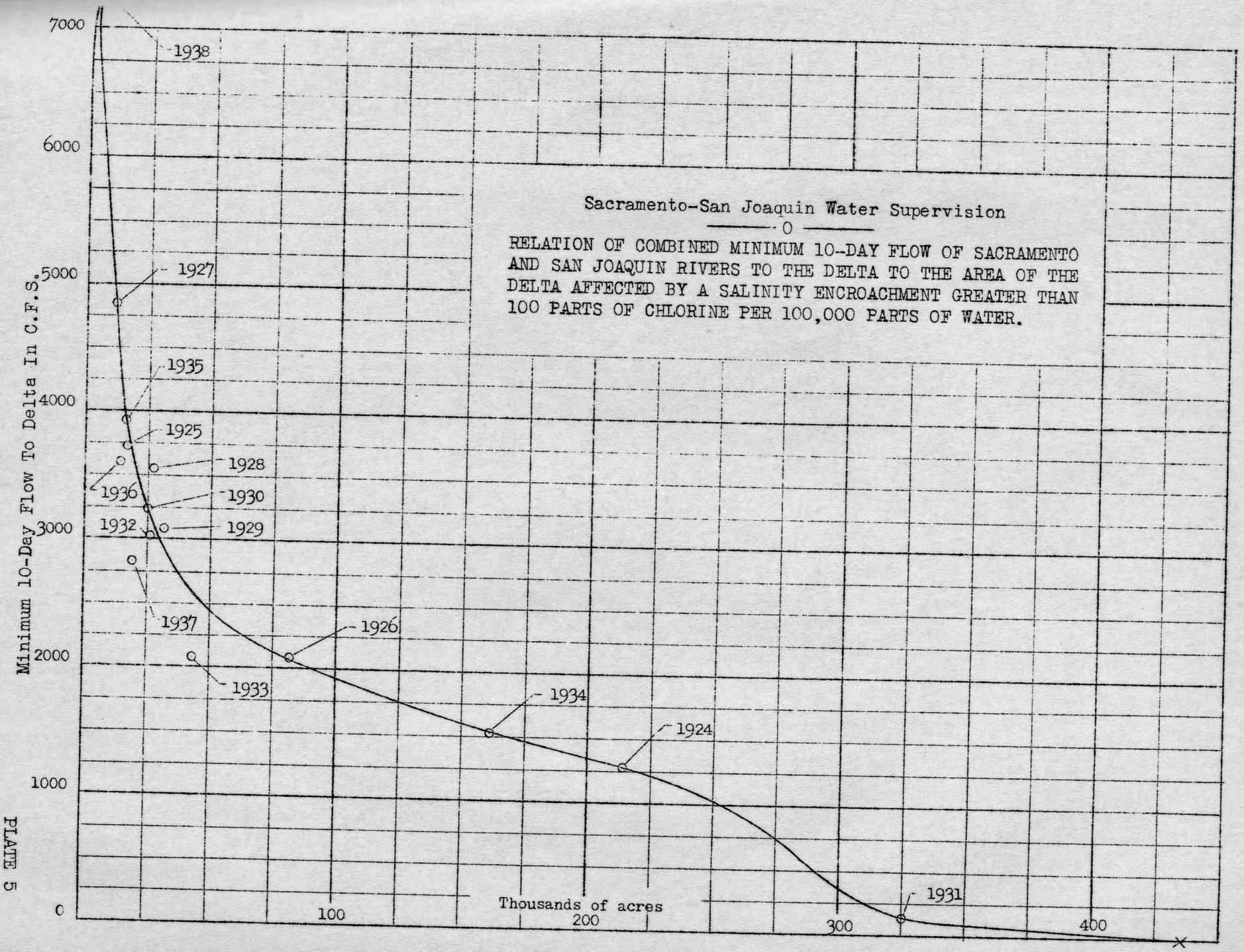

Sacramento-San Joaquin Water Supervision
RELATION OF COMBINED MINIMUM 10-DAY FLOW OF SACRAMENTO AND SAN JOAQUIN RIVERS TO THE DELTA TO THE AREA OF THE DELTA AFFECTED BY A SALINITY ENCROACHMENT GREATER THAN 100 PARTS OF CHLORINE PER 100,000 PARTS OF WATER.
Minimum 10-Day Flow To Delta In C.F.S.
7000
6000
5000
4000
3000
2000
1000
0
Thousands of acres
100
200
300
400
1938
1927
1935
1925
1928
1936
1930
1932
1929
1937
1926
1933
1934
1924
1931

PLATE 5

Salinity Bulletins

In preceding years during periods of low river flow and consequent rapid encroachment of salinity, water users throughout the Delta were anxious to obtain the results of the tests in order that their irrigation operations might be governed to prevent the use of water of injurious salt content. Therefore bulletins were mailed at weekly or ten-day intervals to the water users throughout the Delta, reporting the salinity at the various stations. During 1938, however, the encroachment of salinity as shown on Plate 3 was not of sufficient magnitude to justify the issuing of these bulletins.

Area of Salinity Encroachment

There is a definite relation between the minimum ten-day stream flow into the Delta and the area of the Delta which will be affected by salinity of a greater degree than 100 parts of chlorine per 100,000 parts of water. This relation is shown on Plate 5. A very definite break in the curve is indicated when the flow drops below 3000 cubic feet per second. The area shown to be affected is the gross area within the Delta boundaries and indicates all water channels, levees, etc.

TABLE 81

MAXIMUM RECORDED SALINITY AT BAY AND DELTA STATIONS
1928 to 1938, INCLUSIVE*

Year	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938
Sacramento-San Joaquin Runoff in per cent of Normal**	80	42	63	29	78	46	40	86	91	75	160
Station (1)	Maximum Recorded Salinity in parts of Chlorine per 100,000										
San Francisco, San Pablo and Suisun Bays											
Point Orient	1870	1830	1780	1870	1720	1800	1840	1720	1740	1700	1700
Point Davis	1610	1660	1620	1810	1520	1680	1800	1500	1440	1460	1460(2)
Bulls Head Point	1410	1370	1380	1690	1320	1380	1640	1260	1340	1270	1160
Bay Point	1170	1050	1060	1540	1010	1160	1460	720	960	920	589
O and A Ferry	750	830	800	1390	620	900	1200	540	580	660	256
Innisfail Ferry		870	810	1400	680	900	1260	720	580	700	330
North San Pablo Bay											
Sonoma Creek Bridge		1600	1670	1660	1420	1620					
Grandview			1610	1870	1460	1660					
Vallejo			1340	1700	1300	1420					
Cuttings Wharf			1320	1800	1200	1320					
Sacramento River Delta											
Collinsville	590	680	570	1260	500	620	1080	390	300	490	86
Emmaton	156	310	250	1000	166	380	760	88	54	102	7
Three Mile Slough Bridge	109	205	150	860	90	320	660	77	57	120	
Rio Vista Bridge	44	67	52	740	28	130	520	12	8	33	
Junction Point		17	26	620	(3) 7	74	410				
Liberty Ferry	7	14	6	560			230				
Grand Island (Steamboat Sl.)		5					350				
Isleton Bridge	13	6	10	635	(3) 6	46	310				
Howard Ferry		7		500			232				
Sutter Slough		11		320			50				
Little Holland Ferry		11		300			14				
Ryde		9		280			11				
Reclamation District 2068				280			176				
Walnut Grove		8		220			10				
Paintersville Bridge		9		144			8				
Sacramento		8	5	10	6	7	7	4	4	13	6

* For maximum salinities recorded 1924-1927, see previous reports.
** Normal taken as 40-year mean (1889-1929) of natural runoff at foothill stations of major tributaries.
(1) For location and description see Table 82.
(2) Estimated. Samples not taken during period of maximum salinity.
(3) Maximum salinity obtained from first sample taken in season.

TABLE 81 (CONTINUED)

MAXIMUM RECORDED SALINITY AT BAY AND DELTA STATIONS
1928 TO 1938, INCLUSIVE*

Year	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938
Sacramento-San Joaquin Runoff in per cent of Normal**	80	42	63	29	78	46	40	86	91	75	160
Station (1)	Maximum Recorded Salinity in parts of Chlorine per 100,000										
Mokelumne River Delta											
Southwest Point	23	9	9	390		17	107				
Camp 33, Staten Island	25	8	7	245		13					
Tyler Island Ferry		9	9	200			10				
Camp 11, Staten Island		7		134		5	25				
Camp 29, Staten Island	16	11		182			52				
Camp 25, Staten Island		7		164		7					
Camp 20, Staten Island		8		124			18				
San Joaquin River Delta											
Antioch	450	600	470	1240	400	580	960	290	270	350	51
Curtis Landing		450		1060	280	470	810	180			
Jersey	192	365	220	910	150	280	(2) 620	86	78	102	9
Opposite Jersey										136	
Webb Pump	46	80	61	680	35	122	(3) 340	16	16	25	8
Central Landing	19	20	15	425	8	25	(4) 90	8	7		
Opposite Central Landing										11	10
Dutch Slough				510	37	80	280	21	21	28	11
Rock Slough West of Dam								8	11	13	9
Ward Landing		23	16	350			190				
Holland Pump	334	42	23	325	11						
Bacon Pump						25	160	11			
Mandeville Pump	25	25	17	350	18	29	166				
King Island Pump	19	16		261			104				
Rock Slough East of Dam								8	11	12	11
Rindge Pump	28	28	16	198	16	22	94	18	20	20	15
Orwood Bridge	21	18	12	277			107				
East Contra Costa Irr. Dist.		16	17	200			73				
Middle River	21	17	13	270	12	18	108	11	12	16	13
Mansion House	16	16	11	240			90				
Stockton Country Club		36	18	122			44				
Clifton Court Ferry		23		130			49				
Stockton		200	120	132	72	66	76				
Garwood Bridge				92			38				
Brandts Bridge				43			21				
Williams Bridge		12		118			43				
Whitehall		15		31			12				
Mossdale Bridge		16	10	12	14	13	25	12	14	12	12

* For maximum salinities recorded 1924-1927, see previous reports.
** Normal taken as 40-year mean (1889-1929) of natural runoff at foothill stations or major tributaries.
(1) For location and description, see Table 82.
(2) Estimated maximum of 670 in period not covered by sampling.
(3) Estimated maximum of 350 in period not covered by sampling.
(4) Estimated maximum of 125 in period not covered by sampling.

TABLE 82

DESCRIPTION OF SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN

STATION	Miles from Golden Gate	Time Interval between high Tide at Golden Gate and Time for taking Samples at Station		LOCATION
		Hours	Mins.	
				SAN FRANCISCO, SAN PABLO AND SUISUN BAYS
Point Orient*	12.3	2	20	North End San Francisco Bay, East Shore, one-half mile south of Point San Pablo. Wharf of Standard Oil Company.
Point Davis*	25.2	3	15	East End San Pablo Bay, South Shore, Oleum Wharf of Union Oil Company.
Bulls Head Point*	34.0	3	50	West End Suisun Bay, South Shore, Wharf of Mountain Copper Company.
Bay Point*	39.9	4	15	Suisun Bay, South Shore. Bay Point Wharf of Coos Bay Lumber Company.
O and A Ferry*	46.5	4	40	Upper End Suisun Bay between Mallard Station and Chipps Island at Sacramento Northern Railroad Ferry Crossing.
Innisfail Ferry*	47.3	4	50	Montezuma Slough, about one mile east of Junction with Cutoff Slough, near North End of Grizzly Island.
				NORTH SAN PABLO BAY
Sonoma Creek Bridge	26.4	3	10	Sonoma Creek Entrance at Drawbridge.
Grand View	27.0	3	10	Petaluma Creek, State Highway Drawbridge, near town of Grand View.
Vallejo	29.1	3	35	Napa River at Sears Point Toll Road Bridge, about one mile from Mare Island Navy Yard Causeway.
Cuttings Wharf	36.7	4	00	Napa River, Right Bank, opposite North End of Bull Island, near Carneros Station on Southern Pacific Railroad.
				SACRAMENTO RIVER DELTA
Collinsville*	50.8	5	25	Sacramento River, North Bank, at Junction with San Joaquin River.
Emmaton*	57.7	5	45	Sacramento River, South Bank, Lower end of Horseshoe Bend.
Three Mile Slough Bridge	60.0	5	55	At Junction of Slough and Sacramento River.
Rio Vista Bridge	63.5	6	05	At Highway Bridge near Northerly limits of Rio Vista.
Junction Point	65.2	6	10	Sacramento River, Right Bank, just below the Junction with Steamboat Slough.
Liberty Ferry	67.6	6	25	Cache Slough at Junction with Prospect Slough.
Grand Island (Steamboat Slough)	68.2	6	30	Steamboat Slough at Grand Island Drainage Pumping Plant, three miles from Junction Point.
Isleton Bridge	68.7	6	30	Sacramento River, one mile upstream from Isleton.
Howard Ferry	71.4	6	55	Steamboat Slough, 1½ miles below junction with Sutter Slough.
Sutter Slough	72.8	7	00	At Junction with Miner Slough.
Little Holland Ferry	73.2	7	05	Back Borrow Pit of Reclamation District 999, two miles above junction with Miner Sl.
Ryde	74.4	7	15	Sacramento River, Right Bank, at town of Ryde.
Reclamation District 2068	74.6	7	15	Haas Slough, at Reclamation District 2068 pumping plant.
Walnut Grove	77.4	7	25	Sacramento River, Highway Bridge, at Walnut Grove.
Paintersville Bridge	77.6	7	25	Sacramento River one mile below Courtland.
Sacramento*	103.5	9	30	Sacramento River at Southern Pacific Railroad Bridge.

* Permanent station maintained throughout the year.

TABLE 82 (CONTINUED)

DESCRIPTION OF SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN

STATION	Miles from Golden Gate	Time Interval between high tide at Golden Gate and time for taking Samples at Station		LOCATION
		Hours	Mins.	
				MOKELUMNE RIVER DELTA
Southwest Point	78.8	7	25	Staten Island, North Fork Mokelumne River, South Bank, just above junction with South Fork.
Camp 33, Staten Island	80.2	7	30	South Fork, Mokelumne River. North Bank, Two miles above North Fork Junction.
Tyler Island Ferry	81.9	7	40	On Georgiana Slough, about due east of Isleton.
Camp 11, Staten Island	83.1	7	45	North Fork, Mokelumne River, East Bank, four miles above South Fork Junction.
Camp 29, Staten Island	83.4	7	50	South Fork, Mokelumne River, North Bank, opposite Terminous.
Camp 25, Staten Island	86.4	8	05	South Fork, Mokelumne River, West Bank, one mile above Sycamore Slough Junction.
Camp 20, Staten Island	88.9	8	30	South Fork, Mokelumne River, West Bank, one-half mile below Beaver Slough Junction.
				SAN JOAQUIN RIVER DELTA
Antioch*	54.9	5	55	San Joaquin River, at City Water Works pumping plant.
Curtis Landing	58.9	6	10	San Joaquin River, Right Bank, about three-fourths mile above Antioch Toll Bridge.
Jersey	61.4	6	20	San Joaquin River, Left Bank, one mile below mouth of False River.
Opposite Jersey	61.4	6	20	San Joaquin River, Right Bank, opposite Jersey.
Webb Pump*	72.0	7	00	False River, two miles below Old River Junction.
Central Landing*	72.0	7	00	Mokelumne River at Central Landing, Bouldin Island. (Prior to 1937).
Opposite Central Landing*	72.0	7	00	At Bethel Island Bridge.
Dutch Slough*	73.0	7	05	In Rock Slough, West of Dam at Junction of Sand Mound Slough and Rock Slough.
Rock Slough West of Dam*	77.0	7	20	San Joaquin River near junction with Little Connection Slough on the Southwest Side of Empire Tract.
Ward Landing	79.6	7	35	Rock Slough, North Bank, 1½ miles west of Old River Junction.
Holland Pump	80.6	7	40	Old River at Bacon Island Drainage Pumping Plant, near Junction with Rock Slough.
Bacon Pump	82.9	7	50	Connection Slough, North Bank, one mile west of Middle River, on South end of Mandeville Island.
Mandeville Pump	83.0	7	50	Honker Cut at Empire Tract - King Island Ferry.
King Island Pump	84.2	8	00	In Rock Slough, three-fourths of a mile East of Junction with Sand Mound Slough.
Rock Slough East of Dam*	85.4	8	05	San Joaquin River, North Bank, one mile below Fourteen Mile Slough Junction.
Rindge Pump*	86.1	8	10	Old River, at Santa Fe Railroad Crossing, Orwood.
Orwood Bridge	86.3	8	10	Indian Slough, at East Contra Costa Irrigation District Pumping Plant.
East Contra Costa I. D.	86.7	8	20	Middle River, East Bank, at Santa Fe Railroad Crossing.
Middle River P.O.*	87.7	8	20	Victoria Island, Old River, East Bank, at Junction with North Victoria Canal.
Mansion House	88.4	8	30	On Lindley Cutoff (San Joaquin River), North Bank, about three-fourths of a mile above Burns Cutoff Junction.
Stockton Country Club	90.8	8	45	Old River just below Junction with Grant Line Canal.
Clifton Court Ferry	94.2	9	10	Near Head of Stockton Channel at Wharf of California Transportation Company.
Stockton	94.8	9	15	At Lower End of Port Stockton Wharves.
Port Stockton*	94.0	9	15	San Joaquin River. At Drawbridge one mile above Santa Fe Railroad Crossing.
Garwood Bridge	95.3	9	15	San Joaquin River. At Drawbridge six miles above Santa Fe Railroad Crossing.
Brandt Bridge	100.6	9	50	Middle River, about four miles below Salmon Slough Junction.
Williams Bridge	101.6	9	55	Old River, West of Junction of Salmon Slough and Paradise Cut. Due north of Tracy.
Whitehall	104.8	10	20	San Joaquin River at Lincoln Highway Crossing, about three miles southwest of Lathrop.
Mossdale Bridge*	108.5	10	50	

* Permanent station maintained throughout the year.

TABLE 83

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS

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
1938

Station	JANUARY 2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1140	940	1200	1380	1260	1180	1280	1140
Point Davis				1020	880 :a	360		610
Bullshead Point	:a 90	:a	160 :ab	430 :a	148 :a	21 :ab	340	190
Bay Point							16	17
O and A Ferry	2 :a	2	9	8	7	2		3
Innisfail Ferry	30	52	42	66	62	78	72	46
Sacramento River Delta								
Collinsville	2	3	2	4 :a	2		3 :d	4
Emmaton	:a	2		2 :a	2	2		1
Sacramento	:a 1	2	1 :ab	1 :a	1	1 :ab	1 :ab	1
San Joaquin River Delta								
Antioch	3	2	2	5	4	3	2	3
Webb Pump	3	5		3 :a	3 :abd	4	:ab	4
Opposite Central Landing	2 :a	1	2	2 :a	1	1	3	1
Dutch Slough	6	4	5	4	7	4	5	5
Rindge Pump	:ad 3	:d	4 :ab	5 :a	5 :a	4	3	3
Rock Slough West of Dam	:a 5	6	6	6 :a	6	6	7	7
Rock Slough East of Dam	:a 3	3	5	4 :a	5	4	5	3
Middle River P.O.			2	:a	4			
Mossdale Bridge	2	3	4	2	3	4	4	5

Station	FEBRUARY 2	6	10	14	18	22	26
San Francisco, San Pablo and Suisun Bays							
Point Orient	1020	520	780	340	340	410	640
Point Davis		120	136	4	5	31	350
Bullshead Point	:a	7	:ab	2	5 :a	8 :abd	4
Bay Point				5	:ad	5 :abd	4
O and A Ferry	:a	4	3	3 :a	4		2
Innisfail Ferry		57	25		14	17	25
Sacramento River Delta							
Collinsville	:a 2	3	2		2	2	4
Emmaton	:a 1		2 :ab	1			2
Sacramento	:ade 2	2	1 :ab	2	4	1 :ab	2
San Joaquin River Delta							
Antioch	3	4	4	2	3	2	3
Webb Pump	:ae 3	6 :d	4		4	2	
Opposite Central Landing	:a 2	2	2 :ab	2	3	3	2
Dutch Slough	4	4	5	6	4 :d	4	3
Rindge Pump	:a 2	3	4 :ab	2	4		
Rock Slough West of Dam	:a 7	13	6	7	10	10	8
Rock Slough East of Dam	:a 5	4	6	7	5	5	6
Middle River P. O.			:ab	7			
Mossdale Bridge	3	1	1	1	2	2	2

a, b, c, d, e, f, See footnotes last page of this table.

TABLE 83 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS
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
1938

Station	MARCH															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient		840								400		410		430	b	570
Point Davis		240		160		70		230		4		11				
Bullshead Point	ab	4	a	4			ab	3		3		4	ab	3	c	3
Bay Point		4	a	5				4								1
O and A Ferry		2	a	2	ab	3		3	a	2		3		1	a	2
Innisfail Ferry				34								11			a	9
Sacramento River Delta																
Collinsville		4		3		2		1		2		2		2	a	3
Emmaton	ab	1						1	a	2				1		
Sacramento	ab	2		1		1	ab	1		1		1	ab	1	b	1
San Joaquin River Delta																
Antioch		3		3		4	d	3	a	3		1		3	a	3
Webb Pump						3		2	d	4			abd	4		
Opposite Central Landing	ab	2		1		2		3		1		1	ab	2	a	2
Dutch Slough		10		5		3		3	df	5		4		3	ab	5
Rindge Pump														2	a	3
Rock Slough West of Dam		6		14		13		12		12		15		7	b	10
Rock Slough East of Dam		5		9		5		7		6		5		4	b	5
Mossdale Bridge		3		3		3		2		4		2		2	b	3

Station	APRIL															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	b	860		800		340	b	690		660		520	a	620		
Point Davis	e	101		91		246	b	150		130		170	b	120		
Bullshead Point	b	5		4	a	8	b	5				12				
Bay Point	a	5		3	a	2			a	4			a	3		
O and A Ferry	b	3	a	4	b	2	a	2	a	2		2			a	1
Innisfail Ferry	a	13		14	a	17	a	20		18	a	12	a	9	a	7
Sacramento River Delta																
Collinsville	a	1		3	a	3	ad	2		3	a	2	a	1	a	2
Emmaton					a	3				3	a	2			a	1
Sacramento	b	2		1	b	2	b	3		3	a	1	b	1		
San Joaquin River Delta																
Antioch	a	3		3	a	3	ab	3		5	a	2	a	1	a	1
Webb Pump	b	2		4	a	2							a	2	a	2
Opposite Central Landing	b	3		2	a	3	a	3			a	2	a	1	a	2
Dutch Slough	b	2		4	b	3	b	6		3	b	2	b	3	b	3
Rindge Pump	b	3		3	a	4	b	4		3	a	2	a	2	a	2
Rock Slough West of Dam	b	7		6	a	7	b	5		5	a	5		4		2
Rock Slough East of Dam	b	5		5	a	5	b	6		3	a	3	a	3		3
Mossdale Bridge	e	3		3	b	2	b	5		4	b	2	b	4		

a, b, c, d, e, f, See footnotes last page of this table.

TABLE 83 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS
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
1938

Station	MAY															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1010		680		820	:b	820		500		720		900	:b	900	
Point Davis			190	:b	380	:b	210		120			:b	260	:b	400	
Bullshead Point	2		3			:b	27		2	:a	2	:b	84	:a	4	
Bay Point				:ab	3	:a	2			:a	4	:a	3	:a	1	
O and A Ferry	:a 2		2	:a	1	:b	1	:a	2		1	:a	1	:a	1	
Innisfail Ferry	:a 8	:a	10	:a	9	:a	8				4	:a	5			
Sacramento River Delta																
Collinsville	3	:a	1	:bd	3	:a	2		1	:a	1	:a	3			
Emmaton		:a	4			:a	4		1	:a	2					
Sacramento	1	:a	2	:b	2	:b	3		2	:a	2	:b	1		1	
San Joaquin River Delta																
Antioch		:a	2	:a	1	:a	3		3	:a	3	:ac	2	:a	1	
Webb Pump	3	:ab	2			:b	2		2			:a	3	:b	1	
Opposite Central Landing	1	:a	3	:a	2	:b	4		2	:a	2	:a	1	:b	1	
Dutch Slough	2	:abd	1	:b	2	:b	3		1	:b	1	:ab	2		1	
Rindge Pump	2	:a	3	:a	2	:b	3		2	:a	2	:a	2		1	
Rock Slough West of Dam	3	:a	3	:a	2	:b	3		3	:a	3	:a	2	:b	4	
Rock Slough East of Dam	3	:a	4	:a	2	:b	1		1	:a	2	:a	3	:b	2	
Mossdale Bridge	3	:b	2	:b	2	:b	2		3	:b	1	:b	2	:ab	1	

Station	JUNE															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1060		700	:b	660	:b	720		500		800	:b	1180		1140	
Point Davis	150		220	:b	130	:b	130	:de	280		310	:b	440		410	
Bullshead Point	3		95	:b	2	:b	2	:ad	70		237	:b	310		240	
Bay Point	:a 2			:a	2							:a	7	:a	4	
O and A Ferry	1	:a	1		1		1		1		2	:a	4		3	
Innisfail Ferry	6					:a	7		6		6	:a	7			
Sacramento River Delta																
Collinsville	:d 2	:a	2	:a	2	:b	4	:a	3	:a	3	:a	3		5	
Emmaton	2			:a	1	:b	2				5	:a	5			
Sacramento	2	:a	2	:b	2	:b	2	:a	2		2	:b	4		5	
San Joaquin River Delta																
Antioch	2	:a	1			:a	3		3	:b	4	:a	4	:a	7	
Webb Pump	4					:b	2		2		2			:a	5	
Opposite Central Landing	1	:a	2	:a	2	:b	3	:a	2		1	:a	3		3	
Dutch Slough	:b 3	:ab	1	:a	2	:a	2	:a	3		1	:a	2		2	
Rindge Pump	3	:a	2													
Rock Slough West of Dam	3	:a	1	:b	2	:b	1	:a	2	:a	2	:b	2		3	
Rock Slough East of Dam	2	:a	4	:b	1	:b	3	:a	2	:a	2	:b	3		3	
Mossdale Bridge	1	:b	3	:b	2	:b	2	:b	1	:b	3	:b	3		2	

a, b, c, d, e, f, See footnotes last page of this table.

TABLE 83 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS
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
1938

Station	JULY															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1120		980	b	1220	b	1100		960		1240	b	1440		1360	
Point Davis	580		520	a	560	a	690				940	a	880			
Bullshead Point	190		380			b	230		150		480	b	720		380	
Bay Point				a	5	a	4		7						210	
O and A Ferry	3	a	5	a	2	a	3		3		5	b	42		20	
Innisfail Ferry	7	a	9	a	9				8	a	6				39	
Sacramento River Delta																
Collinsville	4	a	5	a	4	a	2	ab	5	a	2	a	4			
Emmaton	2			a	4	b	2					a	4			
Sacramento	2	a	3	b	3	b	3	a	4	a	3	b	1	a	3	
San Joaquin River Delta																
Antioch	3	a	4	a	5			d	2	a	4	a	6		6	
Webb Pump	3			a	4	b	2		4	b	3	abd	3			
Opposite Central Landing	4	a	2	a	1	b	2	a	3	a	4	a	3	a	5	
Dutch Slough	5	a	3	b	7	b	5	a	2	a	2	ab	5	a	4	
Rock Slough West of Dam	3	a	4	b	5	b	2	a	1	a	4	b	4	a	3	
Rock Slough East of Dam	5	a	3	b	5	b	2	a	3	a	4	b	2	a	4	
Mossdale Bridge	2	b	2	b	2	b	2	b	1	b	1	b	3	b	2	

Station	AUGUST															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1400		1400	b	1460		1460		1620		1580	b	1620		1640	
Point Davis				b	1180		1220		1080	b	1020	b	1280			
Bullshead Point	760	b	710	b	740		740		800			b	900		960	
Bay Point	290	a	100				56		420	ab	400				420	
O and A Ferry	43	b	121	a	50	a	77		140	a	180	b	196	a	122	
Innisfail Ferry	48						120			a	161	a	196		200	
Sacramento River Delta																
Collinsville				a	17	a	20	a	25	a	27	a	56		66	
Emmaton		a	3				6			a	6	b	7			
Sacramento	5	b	3	b	3	a	2	a	4	b	5	b	4	a	4	
San Joaquin River Delta																
Antioch	5	a	8	a	7		21	a	12	a	14	a	21	a	32	
Jersey								a	6	a	8	b	9	a	9	
Webb Pump		b	5			a	5			a	5	b	6			
Opposite Central Landing	3	a	4	a	3	a	5		9	a	3	b	10	a	6	
Dutch Slough	4	b	4	b	4	a	6	a	4	a	5	b	3	a	4	
Rindge Pump	4	a	5	b	2	a	6	a	7	a	11		11	a	8	
Rock Slough West of Dam	4	a	5	b	4		4	a	6			b	5	a	5	
Rock Slough East of Dam	4	a	4	b	6		3	a	5	a	5	b	6	a	8	
Mossdale Bridge	2	b	3	b	2	b	1	b	3	b	2	b	11	b	12	

a, b, c, d, e, f, See footnotes last page of this table.

TABLE 83 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS
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
1938

Station	SEPTEMBER													
	2		6		10		14		18		22		26		30
San Francisco, San Pablo and Suisun Bays														
Point Orient	1620		1500		1560		1640		1580		1580		1700		1480
Point Davis									1260		1300		1320		1180
Bullshead Point	1160				840		860		940	ab	820		760		720
Bay Point	ab 400		340		580		500				580		560		
O and A Ferry	256	a	130		190	a	160		230	ab	240	a	160		160
Innisfail Ferry	a 200	a	202		260		300				330				310
Sacramento River Delta														
Collinsville	a 48	ab	49		77	a	73		86		78		74	a	38
Emmaton		a	5	ab	5								7		
Sacramento	a 3	b	6	ab	4	a	3	a	3	ab	3	a	5	a	3
San Joaquin River Delta														
Antioch	a 12	a	30		48		48	a	42		47		51	a	20
Jersey		a	5			a	6								
Webb Pump		a	6	ab	7	a	7	a	6	ab	6				
Opposite Central Landing	a 5	b	5		4	a	5	a	3		5	a	6	a	5
Dutch Slough	a 7	a	11		5		6	a	6		8		9	a	6
Rindge Pump	a 15	a	14	b	11	a	11	a	11		12	a	10	a	10
Middle River P.O.											10	a	11	a	13
Rock Slough West of Dam	a 5	a	7	ab	7		6	a	7		9	a	7	a	8
Rock Slough East of Dam	a 7	a	7	ab	9		6	a	10		8	a	11	a	11
Mossdale Bridge	b 11		11		10	b	9		11		10		11	a	12

Station	OCTOBER													
	2		6		10		14		18		22		26		30
San Francisco, San Pablo and Suisun Bays														
Point Orient			1440		1590		1460		1540		1480		1500		1360
Point Davis	1080	ab	1160				1200		1200		1140	a	1120		
Bullshead Point	a 860	ab	820	a	620		880	a	760	ab	780		820		680
Bay Point					440		400		300	a	420				
O and A Ferry	a 130	ab	150	a	90		144		126		118	a	98		90
Innisfail Ferry	a 300		310		290	a	280		260		270		240		250
Sacramento River Delta														
Collinsville	a 17		27		28	a	34		10		32	a	19		7
Emmaton					4	a	3				5				3
Sacramento	a 2		2	a	2	a	6		1	a	3	a	2		1
San Joaquin River Delta														
Antioch	a 23	a	15		22	a	18		16		20		26		16
Jersey			7		6										
Webb Pump		ab	6	a	6	a	6				8		6		
Opposite Central Landing	a 4		3		5	a	3		3		5	a	6		2
Dutch Slough	a 7		7		7	a	7		10		7	a	8		6
Rindge Pump	a 8		8	a	11	a	7		11		9	ad	10		11
Middle River P.O.		ae	8		6		7		5		9		7		8
Rock Slough West of Dam	a 7		7		8	a	8		8		9	a	9		8
Rock Slough East of Dam	a 8		8		8	a	8		7		11	a	8		9
Port Stockton										b	21	ad	12		
Mossdale Bridge	b 10		10			b	5		7		6		5		7

a, b, c, d, e, f, See footnotes last page of this table.

TABLE 83 (CONTINUED)

SALINITY OBSERVATIONS, SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS
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
1938

Station	NOVEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1480		1560		1560		1520		1560		1500		1480		1300	
Point Davis	1040		1060		1120		1040		b 1060				980		1160	
Bullshead Point			740	a	560	a	760		ab 620	a	650		690	a	500	
Bay Point	332				440				330		308					
O and A Ferry	ab 46		66		70	a	34		ab 44	a	42	a	38		82	
Innisfail Ferry	238		224		168		162		152		164		180		182	
Sacramento River Delta																
Collinsville	12		6	a	3		7		6		19	a	6		7	
Emmaton				a	3				5	a	4	a	5			
Sacramento	1	ab	1	a	4		2		3	a	3	a	2		3	
San Joaquin River Delta																
Antioch	12								10		14		10		8	
Webb Pump							6		8			a	6			
Opposite Central Landing	4		4		6		4		3		6	a	3		4	
Dutch Slough	9	ab	8	a	7		6		7		8	a	7		11	
Rindge Pump	7		7	a	5		8		8	a	9	a	5		9	
Middle River P.O.	6		7		7		7		5		6	a	5		7	
Rock Slough West of Dam	8		8	a	9		9	d	10		7	a	10		6	
Rock Slough East of Dam	9		9	a	8		8	d	7		8	a	7		7	
Port Stockton	d 20	ab	24	a	24		25			ad	13			d	15	
Mossdale Bridge	6		7	bd	7		7		7		8	b	6		7	

Station	DECEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1420		1440		1580		1480		1540		1300		1300		1240	
Point Davis		a	1180		1160						900		960			
Bullshead Point	ab 680	ab	420		340				820	a	340			a	540	
Bay Point			132		188				224						240	
O and A Ferry	86	ab	9	a	12		25		106		48	a	26		14	
Innisfail Ferry	d 194				112		138								124	
Sacramento River Delta																
Collinsville	16		7	a	1		4		13	b	9		3		3	
Emmaton	2			a	1				3				2			
Sacramento	3	ab	1	a	2		5		ab 3	a	1		2		2	
San Joaquin River Delta																
Antioch	1		8		5		8		8		6		6			
Webb Pump			5			ad	5		4			c	7			
Opposite Central Landing	4		3	a	4		3		3	a	1		2		3	
Dutch Slough	7		5		5				7		5		5		8	
Middle River	5		6	a	5		5		5		5		5		6	
Rock Slough West of Dam	7		6	a	6		10		6	a	6		6		7	
Rock Slough East of Dam	5		6	a	8		8		6	a	6		6		7	
Port Stockton	d 11	ab	8			d	15	ab	10	d	9					
Mossdale Bridge	7		5		4		6		4		5		5		8	

a Low high tide.
b Taken on following day.
c Taken two days later.
d Over one hour off scheduled time.
e Taken on preceding day.
f Taken two days earlier.

CHAPTER VII

SURFACE WATER ANALYSES

Purpose

The purpose of these analyses is to make of record the quality of water in the stream and return flow channels in the Sacramento-San Joaquin Valley area.

Station Maintenance and Record

A complete resume of the sampling program and salinity records taken on the stream and return flow channels in the Sacramento-San Joaquin Valley area is given in the 1936 Sacramento-San Joaquin Water Supervision Report.

During the irrigation season of 1938 the samples were taken by field engineers of this office incident to their other duties and Table 84 gives the results of the samples taken and analyzed.

TABLE 84

MISCELLANEOUS SALINITY OBSERVATIONS-1938
Sacramento-San Joaquin Area

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

Location	May			June			July			August			September			October			November		
	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.
- SACRAMENTO VALLEY -																					
Stream Channels																					
Sacramento River																					
at Kennett	10	0	16700	13	0	8110	15	0	4970	16	0	4000	13	1	3740	16	1	4080			
at Colusa	19	0		19	0		15	1	4790	12	3	3200	8	4	3200						
at Meridian										11	6		8	2							
at Knights Landing	19	0		9	0		15	2	4620	15	2	3130	8	1	3700						
at Verona	19	1	55300	9	1	47800	29	4	6010	15	1	5020	8	4	4900	3	1	7780	10	1	9100
at Sacramento	2	1	63700	2	2	69800	2	2	18800	2	5	5880	2	3	5450	2	2	8410	2	1	
at Sacramento	18	2	63000	18	2	34200	18	4	9350	18	4	6280	18	3	6680	18	1	8870	18	3	
Feather River at Nicolaus	19	0		9	0		2	1	8060	2	0	1460	2	0	1420						
Return Flow Channels																					
Colusa Trough at Colusa-Williams Highway																					
Colusa Trough at Colusa-Williams Highway										12	8	514	7	5	575	6	7	182			
Butte Slough at Mouth													22	5	400	27	5	98			
Butte Slough at Mouth										11	5	249	8	3	332	19	4	284			
Reclamation District 70 Drain at Plant													22	2	359	27	3	331			
Reclamation District 70 Drain at Plant										12	19	40	8	9	106	19	25	8			
Reclamation District 108 Drain at Plant													18	9	34	27	23	0			
Colusa Basin Drainage at Knights Landing										12	12	102	8	6	280						
Colusa Basin Drainage at Knights Landing										25	7	467	8	7	538	10	11	162			
Sacramento Slough at Sacramento River													16	6	489	28	9	157			
Sacramento Slough at Sacramento River													16	7	719	17	16	176			
Reclamation District 1500 Drain at Plant													29	9	659						
Reclamation District 1500 Drain at Plant													16	20	444	17	46	42			
Sutter By-Pass -													29	23	227	28	50	46			
East Borrow Pit at Chandler																					
East Borrow Pit at Chandler													8	3	183	10	4	120			
West Borrow Pit above R.D.1500 Drain													22	1	170	27	2	76			
West Borrow Pit above R.D.1500 Drain													6	5	295	11	7	156			
Yolo By-Pass -													16	6	262	28	6	98			
East Borrow Pit at Elkhorn																					
East Borrow Pit at S.P.RR.													8	14	0						
Reclamation District 1000 Dr. at Plant										12	14	0	28	14	0	13	15	28			
													21	9	141						

TABLE 84 (CONTINUED)

MISCELLANEOUS SALINITY OBSERVATIONS-1938
Sacramento-San Joaquin Area

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

Location	May			June			July			August			September			October			November		
	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.	Day	Cl.	cfs.
- SAN JOAQUIN VALLEY -																					
Stream Channels																					
San Joaquin River																					
at Friant	10	0	10400	7	0	16500	6	0	8400	18	0	1730	6	0	700	6	0	1070			
at Mendota	10	0		9	0		2	0		6	0		13	0		6	0				
Above Bear Creek							12	0	235	12	1	300	8	5	24	7	8	5			
Fremont Ford Bridge	5	1	4100	6	2	4250	1	6	4000	16	6	758	10	9	336	10	9	260			
Fremont Ford Bridge										17	11	622	22	10	344	26	8	275			
Above Merced River inflow							8	1		17	12	790	7	14	390	17	11	374			
Near Newman (below Merced)	6	1	14500	3	1	20800	1	3	14100	17	12	1320	7	7	808	15	6	688			
Near Newman (below Merced)				6	3	23600							22	9	720	26	11	657			
at Crows Landing Bridge				6	2		1	3		18	13		22	9		26	9				
Near Grayson	4	1	15900	7	1	23900	1	3	16400	15	12	1940	20	10	1000	24	8	1060			
at Patterson Bridge				6	1		1	3		17	11		22	9		26	10				
at Maze Road Bridge				6	1	36800	1	3	23600	14	14	3070	22	7	2020	14	6	2180	10	9	3900
at Maze Road Bridge				17	1	30000	23	13	6450	18	10	2170				24	8	2250			
at Durham Ferry Bridge	4	1	25100	2	1	37500	11	1	19200	12	5	3600	1	8	2240	4	5	2680			
at Durham Ferry Bridge										18	12	2560	23	6	2100	24	7	2720			
near Lathrop	2	3		2	1		2	2		2	2		2	11		2	10		2	6	
near Lathrop	18	3		18	1		18	1		18	3		18	11		18	7		18	7	
Mud Slough at Gustine-Stevinson Highway																					
Mud Slough	5	3		2	1		1	1		15	50	24	10	170	0	10	320	0			
Mud Slough													22	350	0						
North Fork Mud Slough										17	99	2									
Merced River																					
at Yosemite Valley Railroad Crossing				6	2	8660	1	1	2330	16	4	62	21	1	89	26	2	15			
near Mouth				10	1	3550	1	1	2800	17	4	428	22	2	335	26	4	266			
Dry Creek																					
near Modesto				1	1	88				5	5	65	21	1	83	26	3	95			
Tuolumne River																					
at La Grange Bridge				2	2	15680	28	4	447	16	2	13	21	2	563	25	3	617			
at La Grange Bridge				28	3	8850															
at Roberts Ferry Bridge				2	2	16300	28	4	520	16	8	29	21	2	630	25	2	612			
at Roberts Ferry Bridge				28	2	9240															
at Hickman Bridge				2	2	16700	28	9	722	16	11	170	21	4	740	25	4	788			
at Hickman Bridge				28	4	9680															
at Tuolumne City Bridge	2	1	5000	1	1	9300	13	1	3070	9	4	1030	2	4	910	5	3	1010			
at Tuolumne City Bridge				30	3	7600				15	9	740	28	4	1000	24	5	1060			
Stanislaus River																					
at Orange Blossom Bridge				1	3		29	3	34				20	1	22	25	4	175			
at Orange Blossom Bridge				27	3	2700															
at Hatmark Ranch	2	0	4760	1	1	8210	13	1	1030	10	1	430	1	1	340	4	1	480			
at Hatmark Ranch				27	2	3310										24	4	560			