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FRANK F. MERRIAM, Governor
EARL LEE KELLY, Director of Public Works
EDWARD HYATT, State Engineer

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REPORT OF

SACRAMENTO-SAN JOAQUIN

WATER SUPERVISION

FOR YEAR

1937

JULY, 1938

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
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WATER SUPERVISION

FOR
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Sacramento, 1938

Page

ACKNOWLEDGMENT vi

ORGANIZATION vii

ADVISORY COMMITTEE viii

CHAPTER I

INTRODUCTION 1
Origin and History of Work 1
Objectives and Scope 1
Investigational Work 2
History of State and Water Users' Cooperative Financing . 3
Conservation Features 3

CHAPTER II

MEASUREMENTS OF STREAM FLOW 5

CHAPTER III

MEASUREMENTS OF DIVERSIONS 38

CHAPTER IV

MEASUREMENTS OF RETURN WATER 78
Sacramento Return Waters 78
Return Flow from other than Sacramento River Sources . . 78
Relation of Sacramento Return Water to Irrigation Draft . 78
Draft-Return Water Relation for Particular Sacramento Valley Areas 80
San Joaquin Return Waters 80
Comparative Sacramento and San Joaquin Return Water, 1924 to 1937 81

CHAPTER V

USE OF WATER IN THE SACRAMENTO-SAN JOAQUIN DELTA 107

CHAPTER VI

SALINITY INVESTIGATION 109
Purpose 109
Scope 109
Station Maintenance and Records 110
Salinity Bulletins 111

Page

CHAPTER VII

SURFACE WATER ANALYSES 122
Purpose 122
Station Maintenance and Record 122

LIST OF TABLES

Table

1 Comparative Sacramento-San Joaquin Water Supply, 1924 to 1937 4
2 Discharge of Sacramento River at Kennett-1937 8
3 Discharge of Sacramento River near Red Bluff-1937 9
4 Discharge of Sacramento River at Butte City-1937. 10
5 Discharge of Sacramento River at Colusa-1937 11
6 Discharge of Sacramento River below Wilkins Slough-1937 . 12
7 Discharge of Sacramento River at Knights Landing-1937 . . 13
8 Discharge of Sacramento River at Verona-1937 14
9 Discharge of Sacramento River at Sacramento-1937 15
10 Discharge of Feather River near Oroville-1937 16
11 Discharge of Feather River at Nicolaus-1937 17
12 Discharge of American River at Fair Oaks-1937 18
13 Discharge of American River at Sacramento-1937 19
14 Discharge of Mokelumne River at Woodbridge-1937 20
15 Discharge of San Joaquin River at Delta Bridge-1937 . . . 21
16 Discharge of San Joaquin River at Fremont Ford Bridge-1937 22
16-A Discharge of Mud Slough (Branches Combined) at Gustine-Stevinson Highway-1937 23
17 Discharge of San Joaquin River near Newman-1937 24
18 Discharge of San Joaquin River at Grayson-1937 25
19 Discharge of San Joaquin River at Hetch Hetchy Acqueduct Crossing-1937 26
20 Discharge of San Joaquin River near Vernalis-1937 27
21 Discharge of Merced River at Yosemite Valley Railroad Crossing-1937 28
22 Discharge of Merced River near Livingston-1937 29
23 Discharge of Merced River near Mouth-1937 30
24 Discharge of Dry Creek near Modesto-1937 31
25 Discharge of Tuolumne River at La Grange Bridge-1937 . . 32
25-A Discharge of Tuolumne River at Roberts Ferry Bridge-1937. 33
26 Discharge of Tuolumne River at Hickman Bridge-1937 . . . 34
27 Discharge of Tuolumne River at Tuolumne City-1937 35
28 Discharge of Stanislaus River at Orange Blossom Bridge 1937 36
29 Discharge of Stanislaus River at Hatmark Ranch-1937 . . . 37
30 Diversions, Acreage Irrigated, and Gross Seasonal Duty of Water in the Sacramento-San Joaquin Area-1937 . . 41
31 Summary of Sacramento River Diversions 42

Table		Page
32	Sacramento River Diversions-1937	43
33	Colusa Trough Diversions-1937	55
34	Back Borrow Pit Diversions-1937	56
35	Lower Butte Creek and Butte Slough Diversions-1937	57
36	By-Pass and Drainage Channel Diversions-1937	59
37	Feather River Diversions-1937	63
38	Yuba River Diversions-1937	65
39	American River Diversions-1937	66
40	Delta Uplands Diversions from Cache Slough-1937	68
41	Delta Uplands Diversions from Old San Joaquin River-1937	69
42	Delta Uplands Diversions from Tom Paine Slough-1937	70
43	Delta Uplands Diversions from San Joaquin River-1937	71
44	San Joaquin River Diversions-1937	73
45	Merced River Diversions-1937	74
46	Tuolumne River Diversions-1937	76
47	Stanislaus River Diversions-1937	77
48	Sacramento and San Joaquin Return Water Percentages, 1924-1937	84
49	Water Discharged to Sacramento River above Sacramento as Measured at Definite Return Channels-1937	85
50	Relation between Return Water and Draft, Sacramento River, Red Bluff to Sacramento, July to September 1937 (Using only Return Water which Entered through Definite Return Channels)	86
51	Relation between Return Water and Draft, Sacramento River, Red Bluff to Sacramento, July to September, 1937 (Including all Accretions)	87
52	Relation between the Return Water in Colusa Trough at Colusa-Williams Highway and the Diversions from which the Return Water was Derived-1937	88
53	Relation between Return Water and Diversions-Reclamation District 108-1937	89
54	Relation between Return Water and Diversions-Reclamation District 1500-1937	89
55	Return Flow in San Joaquin Valley Streams-1937	90
56	Comparison of Diversions and Return Water - San Joaquin Valley-1937	93
57	Discharge of Colusa Trough at Colusa Williams Highway 1937	94
58	Discharge of Butte Slough-1937	95
59	Discharge of Reclamation District 70 Drain-1937	96
60	Discharge of Reclamation District 108 Drain at Rough and Ready Bend-1937	97
60-A	Discharge of Reclamation District 108 Drain on Back Borrow Pit-1937	98
61	Discharge of Colusa Basin Drainage at Knights Landing 1937	99
62	Discharge of Sacramento Slough-1937	100
63	Discharge of Reclamation District 1500 Drain-1937	101

TABLE OF CONTENTS (CONTINUED)

Table		Page
64	Discharge of Sutter By-Pass - East Borrow Pit (Willow Slough at Chandler)-1937	102
65	Discharge of Sutter By-Pass - West Borrow Pit, 1.4 miles above Reclamation District 1500 Drainage Plant-1937	103
66	Discharge of Knights Landing Ridge Cut at West Line of Yolo By-Pass-1937	104
67	Discharge of Yolo By-Pass - East Borrow Pit (Tule Canal) 1937	105
68	Discharge of Reclamation District 1000 Drain (2nd Bannon Slough) - 1937	106
69	Consumptive Use of Water in the Sacramento-San Joaquin Delta 1924-1932	108
70	Maximum Recorded Salinity at Bay and Delta Stations, 1927 to 1937, inclusive	112
71	Salinity Stations at which Observations were Taken	114
72	Salinity Observations, Sacramento-San Joaquin Delta and Upper Bays-1937	116
73	Miscellaneous Salinity Observations-1937	123

Plate		Following-
1	Draft and Return Flow, Sacramento River, Red Bluff to Sacramento, July to September, Inclusive, 1937	86
2	San Joaquin River Return Flow, August to October, inclusive, 1937	93
3	Maximum Seasonal Salinity Encroachment of 100 parts of chlorine per 100,000 parts of water, Sacramento-San Joaquin Delta, 1920-1937	110
4	Comparison of River Discharge and Salinity at Bay and Delta Stations	110

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For the compilation of pumped diversions the Pacific Gas and Electric Company, San Joaquin Light and Power Corporation and 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.

In the San Joaquin Valley the City of San Francisco Public Utilities Commission, Hetch Hetchy Water Supply, has made 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

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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
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F. T. Robson, Vina

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 1937.

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 when, due to financial limitations, it was necessary to considerably reduce the program of work. 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. Since 1932 the annual census of irrigated crops and water consuming areas in the delta has been 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 1937 season with those of previous seasons is indicated in Table 1.

TABLE 1

COMPARATIVE SACRAMENTO-SAN JOAQUIN WATER SUPPLY, 1924 TO 1937

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

*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 1937, 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 accretions 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 51) no figure for it has been given (except for the measured drains - Table 49) because it could not be derived without a record of the actual flow at Sacramento.

TABLE 2

DISCHARGE OF SACRAMENTO RIVER AT KENNET
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	2860	3250	4970	13700	9920	5590	4260	3020	2700	2910	2910	7050
2	2860	3610	5590	15300	10400	5430	4000	3020	2600	3740	3020	6460
3	2910	3870	6280	14500	11400	5430	3740	2910	2600	3370	3020	6280
4	2800	8770	6460	13400	12100	5270	3610	2910	2700	3130	3130	5750
5	2860	5750	7050	12400	11600	4970	3610	3020	2800	2910	3130	5590
6	2860	4130	7670	12100	10900	4970	3610	2910	2800	2860	2650	5270
7	2800	3610	8330	11400	10400	4970	3490	2910	2750	2860	2500	5120
8	2800	3490	9210	11100	9680	4820	3490	2910	2800	2860	2650	5120
9	2700	3250	11100	12100	9680	5120	3490	2910	2650	2860	2860	5430
10	2800	3130	13100	11600	8550	6460	3610	2910	2700	2800	6210	47000
11	2800	3490	14700	10900	8770	5750	3490	2860	2650	2800	13900	97200
12	3370	3870	25100	11100	9210	5430	3490	2800	2600	2800	7050	66400
13	2800	4820	25100	20300	9920	5120	3490	2750	2700	2800	5270	49800
14	2860	7890	19400	31800	10400	4820	3370	2750	2700	3740	9920	35100
15	2800	5430	17000	30600	9920	4970	3250	2800	2600	3610	7890	26500
16	2860	4540	14700	23700	9680	8330	3250	2800	2500	3250	13900	22000
17	2860	4260	15600	18500	9440	8990	3370	2800	2600	3020	17000	18200
18	2910	4680	16100	15900	9920	7050	3370	2750	2700	3020	11100	14700
19	2860	4400	15000	15000	8770	6280	3250	2700	2750	2910	10600	13100
20	2800	4260	16700	14700	7890	5920	3250	2700	2750	2910	51200	12400
21	2800	4130	17900	15300	7890	5590	3130	2700	2700	2860	28200	11100
22	2800	4260	16700	13900	7890	5270	3130	2700	2650	2910	17600	9920
23	2800	4680	16700	12600	7890	4970	3130	2750	2650	3020	31800	9440
24	2860	5430	25400	12100	7890	4680	3250	2750	2650	2910	29900	9210
25	2750	7460	17900	12100	7890	4680	3250	2750	2600	2860	18500	8550
26	2860	5750	13900	12600	7250	4540	3130	2700	2550	2750	14200	8110
27	3020	5120	13100	11800	6850	4260	3130	2650	2600	2860	11600	8330
28	3130	4970	12600	10900	6650	4130	3020	2650	2650	2860	9680	7890
29	3020		12600	9920	6460	4130	3020	2700	2650	2910	8330	7250
30	3020		12100	9680	6280	4400	3020	2750	2650	2910	7460	7250
31	3130		11600		5920		3020	2750		2910		7890
Mean	2883	4725	13860	14700	8949	5411	3378	2806	2667	2997	11910	17720
Ac.Ft. for Month	177200	262400	852200	874700	550200	322000	207700	172500	158700	184300	708500	1090000

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
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	4360	4870	8050	17700	12400	7510	5080	3260	3020	3100	3610	10000
2	3880	8320	8590	21600	12700	6980	4760	3260	2940	7510	3700	9430
3	3790	8870	9720	20100	13400	6720	4460	3180	2860	5750	3700	8870
4	3700	34600	9720	18400	14700	6720	4260	3180	2860	4360	3700	8320
5	3700	38200	9720	16700	14700	6470	4260	3100	3020	3880	3790	7780
6	3700	13100	10600	17300	14000	6220	4160	3180	3100	3610	3700	7510
7	3610	9150	11500	16000	13400	6220	4070	3180	3100	3520	3350	7240
8	3440	6980	12100	15000	12700	5980	3980	3180	3020	3440	3180	6980
9	3520	5980	12700	17300	11800	6100	3980	3180	3020	3440	3520	7240
10	3610	5520	17700	16300	11500	6980	3880	3180	2940	3440	3880	66600
11	3610	6470	17700	15300	10900	7780	3980	3100	2940	3440	14300	225000
12	3980	9720	45900	14700	11200	6980	3880	3020	2940	3350	13400	134000
13	3880	12900	66600	16300	11800	6470	3880	3020	2860	3350	7780	82400
14	3880	36900	35900	35900	12700	6100	3790	2940	2940	3790	10500	56800
15	4260	14700	26100	39000	12400	5980	3700	3020	2940	5300	13400	41300
16	5520	10000	22000	34400	12100	8590	3610	3020	2860	4360	18100	32900
17	4870	8590	21300	25700	11800	12700	3610	3020	2780	3880	42800	27400
18	4560	8590	25200	21300	11800	9720	3700	3020	2860	3790	20100	22800
19	4160	8320	20500	19400	11800	8320	3700	2940	3020	3700	23200	19800
20	3790	7240	24800	18700	10600	7780	3610	2940	3020	3610	91100	17700
21	3610	6720	31500	18700	10000	7240	3440	2860	3020	3520	76200	16700
22	3700	6980	34400	18700	9720	6720	3440	2860	2940	3520	30100	15000
23	3700	7240	24400	17000	10000	6340	3440	2860	2940	3610	37800	14300
24	3790	8590	46500	15600	10000	5980	3440	2940	2940	3610	51200	13700
25	3880	17700	35900	15300	10000	5750	3520	2940	2940	3520	31000	14300
26	3880	12100	24000	15600	9720	5520	3520	2940	2860	3440	22000	12400
27	4260	9430	27400	15300	8870	5190	3440	2940	2860	3440	17700	12100
28	5520	8320	21600	14700	8590	4980	3350	2860	2940	3520	14300	12100
29	5080		19100	13400	8590	4760	3260	2860	2940	3520	12400	11200
30	5860		18000	12400	8050	4980	3260	3020	3020	3520	10900	10600
31	5300		17000		7780		3260	2940		3610		11200
Mean	4142	12000	23100	19130	11280	6793	3797	3033	2948	3853	19810	30440
Ac.Ft. for Month	254700	666600	1421000	1138000	693700	404200	233500	186500	175400	236900	1179000	1872000

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 198.6 above Sacramento.

TABLE 4

DISCHARGE OF SACRAMENTO RIVER AT BUTTE CITY
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			3680	1850	1520	2610
2			3680	1800	1550	3050
3			3520	1750	1630	7090
4			3360	1740	1540	6210
5			3120	1670	1510	4480
6			2980	1640	1610	3940
7			2900	1660	1700	3680
8			2820	1630	1750	3520
9			2750	1610	1740	3440
10			2680	1620	1720	3360
11			2540	1600	1700	3280
12			2540	1570	1730	3280
13			2470	1550	1780	3280
14			2470	1500	1790	3440
15			2400	1460	1860	4110
16			2260	1440	1860	5460
17			2190	1450	1930	4570
18			2150	1480	1930	4110
19			2150	1460	2000	3850
20			2200	1460	2190	3680
21			2100	1460	2330	3600
22			2050	1460	2330	3520
23			2000	1480	2330	3440
24			2000	1450	2330	3600
25			2000	1440	2400	3600
26		*4800	1950	1440	2400	3520
27		4500	1950	1460	2400	3440
28		4300	1950	1480	2470	3360
29		4050	1900	1440	2470	3360
30		3760	1850	1430	2540	3440
31			1850	1490		3440
Mean			2466	1547	1968	3831
Ac.Ft. for Month			151700	95150	117100	235600

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
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			3840	1800	1440	2580
2			3920	1760	1480	2900
3			3760	1720	1510	4430
4			3670	1720	1510	6430
5			3420	1690	1400	4820
6			3240	1650	1510	4140
7			3080	1650	1620	3800
8			2990	1650	1690	3620
9			2900	1620	1720	3540
10			2820	1620	1720	3460
11			2740	1620	1690	3460
12			2660	1620	1720	3380
13			2660	1580	1720	3460
14			2580	1540	1800	3460
15			2500	1480	1840	3620
16			2340	1440	1910	4990
17			2260	1440	1950	4820
18			2260	1480	1950	4300
19			2180	1480	1950	3960
20			2260	1480	2060	3800
21			2180	1480	2180	3710
22			2100	1480	2340	3620
23			2100	1440	2340	3620
24			2020	1440	2340	3620
25			2020	1400	2420	3710
26		*4970	2020	1400	2420	3620
27		4700	2020	1400	2500	3540
28		4440	1950	1440	2500	3540
29		4260	1910	1400	2500	3540
30		4010	1840	1370	2500	3540
31			1800	1370		3540
Mean			2582	1537	1941	3825
Ac.Ft. for Month			158800	94530	115500	235200

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
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			3180	1150	888	2780
2			3080	1150	940	2980
3			3080	1150	1010	3470
4			3020	1120	1120	6060
5			2800	1120	1080	5920
6			2580	1080	1120	4860
7			2430	1040	1190	4380
8			2280	1080	1310	4080
9			2180	1040	1390	3960
10			2080	1010	1430	3860
11			1980	1010	1480	3800
12			1880	1010	1560	3740
13			1880	975	1680	3690
14			1790	975	1760	3690
15			1740	940	1800	3800
16			1700	888	1890	4380
17			1560	870	1980	5180
18			1520	888	2020	4800
19			1520	905	2020	4440
20			1520	905	2160	4200
21			1520	905	2300	4080
22			1430	905	2430	3960
23			1390	888	2530	3910
24			1390	855	2530	3860
25			1390	840	2530	3910
26		*4760	1310	855	2580	3910
27		4310	1310	855	2580	3860
28		4040	1310	888	2680	3800
29		3740	1310	888	2730	3800
30		3460	1230	888	2780	3740
31			1150	855		3800
Mean			1888	965	1850	4087
Ac.Ft. for Month			116100	59360	110100	251300

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
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			3520	1400	1260	3340
2			3340	1460	1330	3400
3			3340	1380	1400	3760
4			3160	1280	1530	5780
5			3040	1300	1630	7020
6			2920	1300	1630	5920
7			2680	1300	1800	5080
8			2510	1300	1850	4720
9			2340	1360	2070	4480
10			2290	1460	2070	4240
11			2240	1280	1960	4120
12			2120	1180	1960	3940
13			2070	1180	2180	3940
14			2020	1160	2290	3940
15			2020	1110	2400	3940
16			1960	1090	2460	4180
17			1800	1070	2510	5260
18			1680	1070	2620	5140
19			1740	1090	2560	4720
20			1740	1110	2800	4360
21			1680	1180	2980	4120
22			1680	1180	3160	4000
23			1630	1200	3220	3880
24			1680	1180	3220	3820
25			1630	1140	3160	3940
26		*5140	1740	1160	3100	3940
27		4780	1740	1160	3160	3820
28		4480	1800	1180	3160	3820
29		4300	1630	1230	3220	3760
30		3880	1460	1260	3280	3700
31			1360	1260		3700
Mean			2147	1226	2399	4315
Ac.Ft. for Month			132000	75390	142800	265300

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 RR. Bridge, Mile 54.0 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
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	7960	10000	23200	47200	32600	21000	6020	2230	2040	5150	6260	40300
2	7960	9860	20800	45700	30500	19200	5600	2130	2080	5150	6260	34400
3	7480	11000	19700	45700	29600	17500	5470	2080	2220	5560	6260	29600
4	7010	13000	19400	46200	30000	16600	5470	2040	2360	7160	6540	26200
5	6860	27300	20100	45500	31200	16100	5080	2000	2660	8980	6400	22700
6	6860	40000	20300	44500	32600	15700	4600	2040	2660	8120	6540	19200
7	7010	46900	20800	44300	33500	14600	4240	2040	2510	7320	6680	17200
8	6710	44100	21000	43100	33900	13200	4240	2080	2560	6840	6540	16100
9	6560	36700	22100	41200	33200	12600	4120	1940	2970	6680	6260	15200
10	6410	31200	23200	40000	31400	11500	3880	1990	2860	6400	6260	16300
11	6560	27500	25000	39000	30000	11100	3770	1940	2760	5980	6540	41600
12	7160	26800	29100	37800	28200	11100	3550	1810	3080	5980	6840	61600
13	7960	28000	37600	36500	28000	10900	3440	1810	2970	5980	10500	66700
14	8120	35800	44500	35500	29300	9880	3440	1860	3190	5980	14400	68100
15	8120	45500	49300	37200	31600	9500	3440	1860	3300	6400	13100	65600
16	9140	50300	51500	41700	33500	9690	3330	1760	3410	7090	13100	62500
17	10200	49300	51500	46900	33900	13000	3440	1760	3410	7960	15500	60200
18	10200	45700	51000	50100	33500	17200	3550	1760	3640	7800	22500	58300
19	9500	41200	50100	50100	32300	16600	3330	1760	4120	7160	29600	56600
20	8800	35500	49800	49300	30700	15300	3110	1860	3880	6840	31000	55200
21	8120	30900	49300	48600	28000	13200	3110	1900	4120	6840	34200	53800
22	7480	27700	52000	47700	26600	12100	3330	2080	4370	9840	40500	52200
23	7320	24700	52700	46700	25900	11300	3220	1860	4630	6680	44400	50700
24	7160	22300	52500	35700	25400	10300	3000	1810	4630	6840	49100	48100
25	7010	21400	52700	44100	25400	9120	3000	1810	4630	6540	54100	44700
26	6710	22700	52900	42600	25900	8380	2780	1760	4890	6400	54400	41300
27	7010	25600	52500	41200	24700	7870	2680	1900	4630	6540	53500	38200
28	7160	25600	51700	40200	23800	7060	2530	2040	4890	6540	52500	35100
29	8290		51000	38500	23600	6450	2430	2040	4890	6400	49900	32700
30	9140		50100	35800	23600	6300	2280	1990	5020	6400	45700	30800
31	10400		48900		23000		2180	2040		6400		29100
Mean	7819	30590	39240	43290	29210	12480	3666	1937	3513	6673	23510	41620
Ac.Ft. for Month	480800	1699000	2412000	2576000	1796000	742500	225400	119100	209000	410300	1399000	2559000

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
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	25400	53500	39500	26300	7360	2240	2110	5520
2	22900	52800	38000	24400	6720	2130	2150	5570
3	20800	54200	38300	23300	6560	2080	2320	6040
4	20000	53200	40000	22500	6380	2050	2480	7630
5	20800	52100	42400	21800	5900	2050	2720	9470
6	21200	51000	44200	20600	5410	2010	2710	8610
7	22300	52500	45400	18900	5060	1990	2540	7820
8	23200	50000	45400	17100	4950	2040	2630	7300
9	24100	48200	43300	16000	4760	1880	3060	7120
10	25700	46800	42400	14700	4510	1920	2930	6750
11	27200	45400	40300	14000	4360	1850	2810	6200
12	30000	44200	38000	13700	4030	1730	3120	6250
13	41200	42700	39200	13300	3950	1720	3040	6380
14	49200	42100	41500	12300	3990	1750	3190	6470
15	53200	44200	43900	11800	3870	1770	3310	7050
16	56500	49800	45100	13000	3630	1650	3470	7860
17	57500	54700	45400	20100	3730	1640	3540	8620
18	57900	57500	44500	20500	3870	1680	3800	8490
19	56700	58800	42700	19200	3640	1700	4310	7770
20	56500	58500	38900	18000	3400	1780	4030	7460
21	57500	58200	36500	16000	3360	1810	4290	7400
22	78500	59200	35100	14800	3550	2180	4600	7400
23	71300	58200	34400	13800	3410	1760	4880	7280
24	65400	55700	34400	12400	3150	1740	4970	7390
25	68000	54200	34200	11100	3170	1730	4980	7060
26	63700	53200	34400	10500	2910	1720	5210	6930
27	60600	52100	32200	9720	2790	1930	4990	7090
28	61000	49500	31700	8630	2560	2060	5220	7120
29	58800	46200	31400	7900	2430	2020	5230	6940
30	57200	43000	31400	7820	2290	1990	5440	6930
31	55200		29600		2210	2070		6950
Mean	46980	49730	38830	15580	4126	1893	3669	7189
Ac.Ft. for Month	2795600	3057800	2387400	954360	253700	116370	218340	442040

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 the Yolo By-Pass. See Table . The discharges of this table have been computed as follows: March to May, inclusive, gage heights and rating curve at Sacramento; June to October, 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.

TABLE 10

DISCHARGE OF FEATHER RIVER NEAR OROVILLE

1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1510	1000	2860	6800	8800	6400	2590	1640	1560	1640	2190	3930
2	965	1890	3030	10200	9970	6260	2540	1640	1840	1640	2490	3690
3	1300	1690	3620	9430	11000	6400	2240	1640	1640	1840	2440	3510
4	1300	6160	4100	8240	12400	6400	2090	1600	1420	1840	2440	3330
5	1560	7220	4220	7440	12300	5980	1990	1560	1420	1740	2440	3150
6	1690	5640	4340	8720	12400	4920	2290	1560	1420	1890	2340	3210
7	1510	3860	4720	7840	12100	4460	2240	1560	1420	1840	2190	3210
8	1340	2590	5050	7520	10300	4530	2190	1560	1560	1840	2290	3150
9	1220	2040	5700	8320	9790	4460	2240	1560	1460	1640	2390	3570
10	1460	2090	6800	8080	9160	4220	1990	1560	1420	1690	2440	77800
11	1740	2340	8080	7600	8980	3980	1940	1510	1420	1990	2860	145000
12	2290	3200	14400	7520	10600	3320	2140	1560	1420	1840	2980	63400
13	1690	5110	14400	10300	12500	3030	2190	1640	1420	2240	2390	35200
14	1840	13100	10900	14700	13600	3320	2140	1560	1420	2340	2700	24400
15	1600	6640	8980	18400	13500	3440	2490	1510	1560	2540	3620	16600
16	1560	4600	7920	17000	12600	7470	2540	1460	1600	2090	3030	14800
17	1220	3560	8090	13400	11700	5570	2440	1890	1600	1740	10300	13300
18	1340	3320	8160	11500	11500	4280	2040	1640	1560	1890	5570	12100
19	1340	3080	7280	11200	9700	3380	2340	1790	1560	2140	4400	11000
20	1070	2920	6960	11600	9160	3140	2440	1560	1560	2240	20600	10200
21	1260	2860	10600	12900	9250	3200	2390	1460	1600	2290	14700	9970
22	1260	3080	9430	13100	9340	3080	2240	1460	1600	2240	7010	9790
23	1300	3260	7920	11400	9430	2980	2040	1460	1600	2090	11100	9160
24	895	3560	10700	11000	9880	2920	1890	1560	1600	1840	11400	8720
25	1100	4160	7680	11100	9520	2540	1790	1940	1600	2240	7290	8400
26	1340	3560	6190	11600	8240	2490	1790	1460	1560	2390	5610	8080
27	1070	3080	6190	11000	8480	2240	1840	1460	1790	2390	5070	7840
28	1510	2860	5570	9610	8890	2590	1840	1420	1740	2340	4050	7680
29	1100		5310	8400	8640	2760	1840	1420	1740	2340	3930	7440
30	1220		5380	8160	7520	2700	1790	1460	1690	2190	4110	7290
31	1070		5570		7040		1740	1740		2190		6320
Mean	1376	3874	7099	10470	10270	4082	2138	1575	1560	2038	5212	17590
Ac.Ft. for Month	84630	215100	436500	623000	631300	242900	131500	96870	92830	125300	310200	1081000

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
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			2020	448	230	1440
2			1890	412	254	1480
3			1850	371	352	1620
4			1690	337	369	1980
5			1450	304	426	1800
6			1250	283	409	1840
7			1190	269	363	1890
8			1250	254	315	1890
9			1190	254	289	1890
10			1160	269	289	1760
11			1130	283	304	1710
12			1010	278	342	1890
13			950	274	380	1940
14			1030	259	403	2070
15			1030	250	397	2450
16			1010	264	386	2750
17			1190	274	488	2450
18			1290	264	693	2200
19			1190	264	828	2070
20			1020	342	812	2250
21			1080	371	850	2400
22			1150	400	914	2450
23			1070	310	954	2450
24			905	259	994	2350
25			769	245	1050	2160
26		*2420	657	239	1170	2200
27		2200	566	278	1220	2350
28		1970	472	363	1280	2300
29		1930	436	254	1350	2350
30		2060	430	230	1440	2350
31			430	239		2300
Mean			1089	295	652	2098
Ac.Ft.for Month			66950	18130	38780	129000
Diversions below Nicolaus Acre-feet			1210	2290	210	40
Discharge to Sacramento River Acre-feet			65740	15840	38570	129000

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
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	850	1330	2980	5820	7280	5620	1760	388	276	386	585	1040
2	850	2420	2880	9260	9520	5620	1570	393	317	420	604	970
3	700	2120	2980	8240	11500	6020	1500	402	325	530	560	970
4	700	6240	3190	7060	13600	6220	1320	388	317	550	585	925
5	750	20900	3520	6220	14300	6020	1230	370	269	538	585	902
6	900	19800	3760	8740	14300	5260	1260	355	254	555	595	880
7	850	12500	4020	7520	13600	4600	1230	350	251	570	595	880
8	650	5620	4160	6840	11500	4300	1150	335	300	472	590	880
9	500	3640	4600	6840	10900	3760	1060	330	304	436	600	858
10	400	2880	4920	6840	10300	3520	1040	312	325	290	604	24300
11	514	2320	4760	6420	9520	3200	960	308	265	247	658	81100
12	715	3300	7060	6220	12100	2900	885	308	261	345	835	37000
13	940	4020	9780	6840	14300	2720	910	308	258	454	880	13600
14	790	22500	6840	8480	15900	2720	935	296	258	570	858	8240
15	1070	12700	5820	11800	15900	2630	860	283	234	734	995	5820
16	1360	7280	5620	12100	14000	3620	760	287	237	835	970	4920
17	1100	5260	5820	9520	12700	7420	760	296	312	722	1430	4300
18	690	4440	6420	8480	11500	3640	703	340	272	675	2810	3760
19	740	4160	5620	8740	8740	3000	675	321	279	658	1630	3410
20	715	3640	8240	9260	8240	3000	659	321	269	647	1290	3000
21	470	3190	15600	11500	9000	3100	623	300	261	624	2730	2720
22	494	3080	17800	12400	9520	3000	623	272	258	616	2150	2540
23	548	3190	10600	9780	9780	2810	607	265	296	624	1600	2900
24	618	3410	11800	8740	9780	2540	579	261	335	604	2220	2540
25	574	4920	10100	9780	10100	2380	591	272	325	555	2080	2460
26	510	4300	7060	11200	8240	2220	546	304	325	590	1500	2300
27	790	3520	7060	9780	8000	2010	506	321	335	600	1290	2010
28	1700	3080	6420	8240	8480	1870	478	325	340	590	1200	2010
29	2320		5820	6840	9000	1870	442	269	380	585	1100	1940
30	2410		5440	6220	8240	1870	424	265	386	575	1070	1870
31	1710		5260		6220		424	258		595		1800
Mean	901	6277	6644	8524	10840	3649	873	316	294	555	1173	7189
Ac.Ft. for Month	55390	348600	408500	507200	666600	217100	53690	19440	17500	34110	69820	442000

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
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			1750	380	282	406
2			1550	370	315	400
3			1480	366	360	505
4			1280	366	350	500
5			1180	345	300	522
6			1190	325	290	527
7			1190	306	272	544
8			1140	301	320	505
9			1060	288	340	483
10			1030	292	350	385
11			980	283	305	264
12			876	278	277	315
13			908	288	282	439
14			940	265	268	527
15			845	270	242	638
16			743	265	238	834
17			715	265	315	687
18			696	315	330	680
19			676	320	315	638
20			650	310	310	626
21			630	292	290	596
22			600	242	295	596
23			580	252	315	596
24			560	270	375	584
25			560	270	380	549
26		*2460	530	300	365	560
27		2140	490	320	355	578
28		1880	460	345	370	572
29		1820	420	277	385	572
30		1880	400	277	412	560
31			400	264		572
Mean			855	300	320	541
Ac.Ft.for Month			52580	18460	19050	33240
Diversions below Gaging Station-Ac.Ft.			110	40	20	0
Discharge to Sacramento R. Acre-feet			52470	18420	19030	33240

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
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	600	600	1310	1480	1360	2460	165	119	224	343	401	591
2.	511	680	1030	1480	1360	2470	213	106	256	424	491	590
3	603	653	962	1470	1320	2460	246	137	314	404	485	584
4	513	669	952	1470	1300	2470	256	158	324	304	471	595
5	618	1400	944	1470	1300	2500	171	166	304	484	471	578
6	636	1420	957	1480	1350	2500	107	192	229	433	458	487
7	600	1260	957	1460	1570	2480	170	218	210	380	448	572
8	620	700	960	1440	1670	2450	177	238	269	375	368	586
9	622	689	947	1430	1640	2160	155	124	261	380	428	584
10	574	666	952	1440	1700	1720	170	213	253	401	458	614
11	515	655	957	1440	1570	880	234	229	279	317	493	691
12	662	686	1010	1440	1610	751	137	206	290	382	439	1040
13	640	675	1080	1430	1610	704	124	184	199	389	906	1700
14	611	864	1150	1420	1680	664	165	177	282	384	626	1840
15	618	751	1180	1410	1850	648	172	142	304	397	507	1930
16	603	700	1170	1410	2020	515	180	131	309	403	595	1970
17	362	671	1180	1400	2110	834	190	174	314	408	633	1160
18	315	655	1180	1400	2100	1420	224	196	317	326	628	795
19	562	651	1170	1250	2140	1340	166	211	338	379	622	743
20	647	644	1270	1120	2170	1210	178	222	247	448	608	721
21	649	622	1400	1270	2140	1030	180	261	303	430	593	700
22	649	536	2390	1250	2150	1050	184	266	312	453	480	683
23	651	528	2270	1270	2170	1050	174	128	316	439	601	683
24	653	629	1920	1290	2170	1570	171	149	340	439	612	679
25	649	689	2180	1210	2070	482	192	220	404	343	588	675
26	649	827	1790	1250	2080	543	148	248	382	440	595	671
27	653	1160	1660	1340	2080	486	150	242	292	442	563	664
28	696	1280	1720	1390	2170	288	157	248	421	448	563	669
29	796		1580	1360	2150	237	142	280	426	435	485	671
30	845		1530	1330	2220	164	149	179	430	449	561	664
31	877		1510		2390		137	234		428		660
Mean	619	784	1331	1377	1846	1318	174	193	305	403	539	832
Ac.Ft. for Month	38080	43550	81850	81920	113500	78420	10680	11900	18150	24810	32090	51150

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
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1		185	636	791	385	1070	457					
2		165	619	728	320	1040	438					
3		165	579	659	236	1050	436					
4		156	513	596	225	1040	411					
5		155	453	567	275	1040	382					
6		165	411	567	319	1030	362					
7		209	365	573	369	1030	299					
8		334	324	567	414	1020	239					
9		476	292	553	460	1020	159					
10		636	306	544	507	1010	133					
11	*142	880	281	530	550	1030	91					
12	142	1040	256	524	587	1050	71					
13	136	1100	259	485	613	1070	50					
14	135	1110	277	460	627	1070	32					
15	141	1100	302	431	639	1060	18					
16	141	1070	332	414	656	1020	8					
17	142	1130	354	431	691	948	7					
18	143	1240	313	448	738	835	6					
19	143	1270	297	479	785	731	4					
20	139	1240	328	502	850	688	3					
21	139	1190	373	502	929	694	1					
22	145	1140	411	462	981	715	0					
23	149	1080	392	443	1020	721						
24	148	1010	404	431	1060	741						
25	149	921	445	440	1090	775						
26	149	805	507	453	1100	813						
27	145	685	599	455	1100	854						
28	143	659	761	428	1100	873						
29	146		858	397	1110	835						
30	152		865	397	1080	607						
31	163		846		1100							
Mean		761	450	509	707	916	115					
Ac.Ft. for Month		42280	27690	30260	43470	54510	7090					

NO FLOW - FLOW - NO FLOW - NO FLOW - NO FLOW -

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.

* Beginning of record for season.

TABLE 16

DISCHARGE OF SAN JOAQUIN RIVER AT FREMONT FORD BRIDGE
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1			4040	4220	3050	4110	3510	205	145	162	135	233
2			3890	4180	2950	4110	3050	207	126	160	129	242
3			3820	4110	2850	4100	2550	202	125	161	126	242
4			3750	4000	2650	4110	2280	201	125	161	119	241
5			3610	3890	2500	4260	2170	194	124	176	114	223
6			3470	3750	2380	4300	2080	183	124	183	111	239
7			3220	3680	2380	4300	1980	174	125	185	108	238
8		*3020	3080	3680	2480	4430	1860	165	126	182	111	237
9		3500	2880	3680	2580	4430	1740	160	136	198	119	254
10		4070	2620	3610	2690	4410	1620	159	145	202	134	331
11		4090	2560	3540	2770	4380	1430	146	140	199	132	373
12		4110	2690	3500	2850	4370	1310	141	137	195	132	465
13		4180	2750	3490	2980	4380	1080	141	148	192	128	804
14		4300	2800	3405	3110	4390	988	141	152	187	122	1460
15		4400	2850	3370	3170	4410	860	137	159	185	119	2070
16		4600	2950	3320	3230	4425	695	132	182	185	113	2460
17		4800	2920	3240	3290	4410	564	125	178	185	121	2750
18		4840	2880	3160	3280	4370	496	124	179	181	129	3000
19		4830	2820	3080	3280	4300	466	123	176	181	159	3260
20		4830	2850	3140	3340	4170	446	122	177	180	238	3520
21		4750	2880	3210	3400	3980	422	121	181	194	241	3510
22		4670	2920	3280	3470	3450	391	118	181	196	224	3500
23		4580	3080	3220	3540	3660	352	115	176	199	255	3450
24		4520	3340	3160	3720	3550	340	122	175	221	285	3350
25		4410	3140	3100	3770	3490	308	125	169	214	317	3050
26		4370	3340	3040	3840	3460	277	128	149	211	317	2720
27		4310	3340	3100	3890	3470	231	144	136	175	317	2500
28		4180	3600	3150	4040	3510	222	149	175	164	297	2280
29			3900	3210	4100	3560	213	143	168	155	278	2120
30			4220	3145	4110	3600	205	142	165	150	208	1960
31			4220		4110		205	142		137		1960
Mean			3240	3460	3220	4060	1110	149	153	182	178	1710
Ac.Ft. for Month			199200	205600	198000	241800	68140	9190	9130	11220	10590	105200

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 16A.

* Beginning of record for season.

TABLE 16-A

DISCHARGE OF MUD SLOUGH (BRANCHES COMBINED) AT GUSTINE-STEVINSON HIGHWAY
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1			3230	4280	1440	5780	1850	5	2	2	2	5
2			2600	3930	1370	5780	1410	5	2	2	2	6
3			2420	3580	1310	5780	1060	5	2	2	2	6
4			2240	3200	1220	5380	810	5	2	2	2	6
5			1910	2600	1140	5380	710	5	2	2	2	5
6			1790	2240	1060	5380	610	4	2	0	2	6
7			1520	2060	1160	4980	510	4	2	0	2	6
8		*1410	1460	2060	1290	4980	410	3	2	0	2	6
9		2400	1310	2060	1400	4980	260	3	2	0	2	7
10		3300	1110	1910	1510	4980	140	3	2	0	2	11
11		3500	1060	1850	1610	4980	80	2	2	0	2	16
12		3580	1160	1850	1730	4980	50	2	2	0	2	19
13		3930	1210	1790	1790	4980	36	2	2	0	2	28
14		4280	1260	1730	1850	4400	34	2	2	0	2	95
15		4980	1310	1730	1980	4400	30	2	2	0	2	610
16		5700	1360	1610	2110	4400	26	2	3	0	2	860
17		6580	1340	1550	2240	4400	22	2	3	0	2	1110
18		6980	1310	1480	2420	4400	20	2	3	0	2	1360
19		6980	1260	1460	2600	4280	19	2	3	0	2	1560
20		6980	1280	1510	2870	3930	19	2	3	0	2	1730
21		6580	1300	1560	3230	2880	17	2	3	0	5	1850
22		6180	1310	1610	3580	1790	17	2	3	0	6	2060
23		5780	1460	1560	4280	2060	16	2	3	0	5	1910
24		5780	1670	1510	4280	1850	13	2	3	0	7	1790
25		4980	1790	1460	4630	1790	11	2	2	0	8	1510
26		4980	2060	1410	4980	1790	9	2	2	0	10	1210
27		4630	2420	1460	5380	1790	7	2	2	0	10	1010
28		3900	2900	1510	5780	1850	6	2	3	0	10	810
29			3400	1560	5780	1850	5	2	2	0	9	660
30			4050	1510	5780	1910	5	2	2	2	8	510
31			4050		5780		5	2		2		510
Mean			1890	1990	2830	3940	265	2.7	2.3	0.5	3.9	686
Ac.Ft. for Month			116100	118300	173700	234300	16300	167	140	28	234	42210

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.

* Beginning of record for season.

TABLE 17

DISCHARGE OF SAN JOAQUIN RIVER NEAR NEWMAN

1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	2010	2430	9740	9900	5930	11400	5230	534	410	434	314	466
2	2130	2880	8880	9740	5630	11400	4870	568	404	466	304	466
3	2190	3370	8180	9440	5630	11000	4180	534	404	500	294	483
4	2190	3580	7790	9160	6030	10600	3540	534	417	517	289	483
5	2190	3650	7400	8740	6240	10300	3240	494	439	517	282	434
6	2010	3970	7040	8320	6350	10000	3100	517	462	534	277	434
7	1770	5440	6570	8050	6460	9680	2900	474	452	517	277	450
8	1660	5930	6130	7790	6720	9520	2750	494	430	483	279	466
9	1720	6240	5730	7530	6840	9360	2480	500	410	500	286	483
10	1770	7530	5440	7280	7200	8920	2300	465	420	534	289	606
11	1770	8880	5170	6800	7440	8640	2060	423	420	552	296	780
12	1770	9160	5170	6460	7680	8500	1900	401	417	534	299	960
13	1720	9440	5440	6240	7800	8360	1650	395	436	517	294	1320
14	1660	9900	6460	6130	8080	8080	1500	401	414	534	284	2100
15	1600	11000	6240	5930	8220	8080	1350	407	404	534	279	2700
16	1550	11700	5830	5830	8500	7940	1190	436	417	534	274	3170
17	1550	12500	5630	5630	8920	7940	1060	401	426	552	282	3520
18	1550	12800	5630	5440	9200	7800	990	377	423	517	294	4000
19	1550	12800	5530	5260	9520	7680	950	356	436	483	327	4350
20	1500	12800	5440	5260	9080	7560	890	338	481	434	419	4820
21	1500	12500	5350	6030	10000	7200	830	333	484	419	450	5440
22	1500	12100	5530	6680	10200	6840	770	350	487	434	434	5890
23	1500	11700	6570	7160	10300	6480	731	389	494	419	450	6130
24	1500	11400	7530	6570	10500	6120	712	386	487	434	389	6250
25	1500	10900	8180	5830	10600	5820	676	386	481	419	517	6010
26	1500	11000	9020	5730	10800	5420	640	365	484	404	517	5330
27	1500	11000	9440	5930	11000	5230	604	365	462	368	483	4720
28	1500	10500	9900	6350	11200	5230	551	377	481	348	434	4350
29	1440		10200	6570	11200	5230	517	407	455	343	434	4080
30	1550		10100	6460	11200	5230	517	433	423	330	434	3840
31	1890		10100		11400		517	410		314		3680
Mean	1701	8825	7141	6941	8596	8052	1782	427	442	465	354	2846
Ac.Ft. for Month	104600	490100	439100	413000	528500	479100	109600	26280	26300	28610	21040	175000

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 18

DISCHARGE OF SAN JOAQUIN RIVER AT GRAYSON
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1920	2000	11100	11150	7700	12600	5950	730	580	610	510	
2	1970	2500	10500	11050	7300	12550	5850	760	565	620	500	
3	2010	2900	9800	10950	6900	12400	5500	725	580	660	490	
4	2050	3200	8800	10800	6700	12200	4900	710	585	705	485	
5	2060	3500	8150	10350	6800	11850	4400	710	620	730	480	
6	2060	3750	7650	10100	7050	11450	4000	670	645	750	475	
7	2010	4500	7250	9650	7300	11100	3740	650	650	735	470	
8	1940	5150	6850	9300	7400	10750	3530	660	645	710	470	
9	1880	5300	6400	8950	7750	10400	3310	670	630	675	475	--
10	1890	5450	6000	8550	8000	10200	3120	630	590	700	470	--
11	1910	6000	5700	8200	8200	9950	2920	605	590	895	475	COMPUTED
12	1950	6700	5650	7750	8350	9700	2725	580	555	760	475	
13	1910	7350	5700	7500	8600	9500	2460	560	605	735	470	
14	1870	8250	6150	7200	8850	9350	2095	555	590	760	455	
15	1840	9350	6700	7000	9100	9350	1940	555	515	900	430	
16	1800	10400	6850	6800	9250	9300	1680	590	490	1100	415	
17	1760	11300	6650	6550	9500	9000	1520	615	455	895	420	
18	1740	12150	6450	6450	9600	9100	1395	585	465	775	430	
19	1720	12800	6250	6300	10000	9150	1350	555	535	735	440	NOT
20	1700	12900	6100	6250	10550	9100	1185	530	560	700	490	
21	1680	13000	6050	6200	10800	8750	1070	530	590	950	565	
22	1680	12900	6150	6500	11000	8500	1010	535	590	945	600	
23	1680	12700	6450	7000	11300	8400	920	560	590	940	600	
24	1670	12450	7250	7500	11600	8100	895	560	570	935	640	
25	1670	12000	8050	7500	11800	7450	885	550	575	635	655	-- FLOW
26	1670	11600	9200	7000	12000	6950	860	560	585	620	675	--
27	1660	11500	9900	6800	12200	6500	825	540	600	610	680	
28	1670	11500	10450	7000	12300	6200	790	540	565	580	660	
29	1670		10900	7400	12400	6050	750	560	585	560	635	
30	1670		11250	7700	12400	6000	740	585	570	550	635	
31	1800		11250		12450		730	595		535		
Mean	1820	8320	7790	8050	9520	9400	2360	606	575	701	522	
Ac.Ft. for Month	112100	462300	479200	478900	585400	559100	144900	37270	34220	43080	31080	

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 19

DISCHARGE OF SAN JOAQUIN RIVER AT HETCH HETCHY ACQUEDUCT CROSSING
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	3090	3290	15000	14700	12500	20800	7350	985	830	1515	1595	
2	3090	3430	14400	14500	11800	21600	7100	1050	840	1575	1595	
3	3130	3820	13400	14500	11100	20600	6700	1035	895	1740	1685	
4	3200	4300	12200	14500	10700	19300	6120	955	880	1840	1725	
5	3220	4760	11300	14100	10700	17600	5420	935	885	1780	1695	
6	3250	5860	10600	13600	10800	16300	4750	915	955	1785	1710	
7	3220	8240	10000	13100	11000	15600	4290	890	1000	1925	1715	
8	3060	9150	9400	12700	11200	15000	4000	895	970	1930	1690	
9	2980	7980	8800	12300	11300	14200	3740	920	930	1885	1620	
10	2930	7560	8400	11800	11400	13500	3500	910	1100	1765	1675	—
11	2880	8060	8100	11500	11500	12900	3300	890	1200	1825	1680	
12	2890	8660	8400	11500	11700	12400	3120	870	1260	1850	1680	
13	2870	9350	9000	11400	12200	12100	2890	815	1290	1815	1640	
14	2850	10200	10400	11200	13700	12100	2570	815	1335	1940	1660	
15	2840	11700	11300	11000	15700	12700	2280	850	1280	2030	1615	
16	2820	12900	11400	10700	18200	13000	2050	880	1190	2140	1590	
17	2780	13500	11300	10600	20200	13100	1910	895	1140	2060	1605	
18	2760	14900	10900	10500	19800	13700	1790	890	1130	1940	1610	
19	2730	16600	10300	10300	19100	14100	1710	845	1185	1855	1610	
20	2720	17700	9900	10300	19100	14100	1615	745	1290	1830	1620	
21	2700	17700	9800	10300	18800	13900	1490	725	1350	1765	1700	
22	2710	16900	10000	10300	18500	13700	1410	730	1400	1740	1750	
23	2720	15900	11600	10700	18500	13400	1345	775	1425	1730	1700	
24	2710	15800	12800	11300	18900	12900	1290	775	1420	1700	1785	
25	2700	15900	13200	11500	19200	11600	1265	740	1490	1705	1840	
26	2680	15900	15000	11100	19800	10200	1220	710	1515	1675	1900	
27	2660	15600	16200	11000	20200	8900	1155	690	1535	1650	1785	
28	2660	15600	15600	11500	20200	8200	1105	705	1490	1710	1800	
29	2690		15400	12300	20200	7800	1070	800	1505	1700	1785	
30	2720		15200	12600	20400	7500	1020	840	1505	1680	1745	
31	2830		15100		20800		980	910		1650		
Mean	2870	11120	11760	11910	15780	13760	2890	851	1210	1800	1690	
Ac.Ft. for Month	176700	617400	722800	708900	970300	818800	177600	52330	71840	110500	100800	

— FLOW NOT COMPUTED —

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 20

DISCHARGE OF SAN JOAQUIN RIVER NEAR VERNALIS

1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	3500	4300	16700	16900	14700	26000	7560	1300	1130	1620	1720	2070
2	3580	4140	15600	16700	14200	25400	7360	1350	1100	1720	1720	2140
3	3500	4460	15000	16900	13600	24500	7020	1350	1160	1900	1860	2140
4	3500	5090	13800	16900	13500	23600	6660	1300	1160	1960	1900	2140
5	3500	5450	12800	16500	13600	22400	6080	1280	1160	1900	1900	2210
6	3500	7360	12100	16200	14100	20600	5360	1280	1250	1930	1900	2210
7	3580	9880	11400	15600	14500	18600	4910	1220	1280	1960	1930	2280
8	3420	11000	10590	15300	15000	16900	4460	1200	1220	2000	1930	2140
9	3340	9550	9660	14800	15200	16200	4140	1250	1190	1960	1860	2140
10	3260	9000	9550	14400	15200	15500	3820	1200	1280	1820	1930	2280
11	3260	9330	9330	13900	15200	14700	3580	1150	1400	1860	1930	2420
12	3260	9880	9550	13800	15300	13800	3420	1090	1430	1900	1930	3260
13	3180	10600	10100	13800	15500	13200	3170	1050	1460	1900	1900	5360
14	3260	11300	11600	13800	16900	12900	2940	1050	1490	1960	1930	6360
15	3340	13100	12200	13600	19300	13400	2660	1070	1490	2070	1900	7060
16	3340	14200	12100	13500	22200	13900	3170	1070	1400	2210	1860	6960
17	3260	14500	12100	13600	24500	13900	2310	1090	1370	2140	1930	7160
18	3180	15600	11800	13600	25100	14700	2240	1070	1340	2070	1960	7260
19	3020	17500	11300	13200	25400	15500	2100	1070	1370	2000	1960	7260
20	3020	18800	10800	12900	24900	15500	1970	1010	1460	2000	2000	7260
21	3100	19000	10800	12900	24500	15000	1850	1010	1490	1930	2070	7160
22	3180	18400	11200	12900	23800	14700	1730	1010	1520	1860	2070	7460
23	3180	17300	12900	13500	23600	14500	1670	1070	1550	1900	2070	7660
24	3180	17300	14200	13900	23900	13800	1610	1070	1550	1820	2070	7860
25	3180	17500	15200	13900	24400	12700	1610	1040	1620	1790	2140	7960
26	3100	17700	17300	13600	25000	10800	1550	1010	1620	1760	2210	7860
27	2940	17500	19000	13600	25800	9440	1450	950	1650	1760	2140	7660
28	3020	17300	18400	14100	25800	8670	1400	980	1580	1820	2070	7360
29	3180		17700	14800	25400	8160	1350	1100	1580	1790	2140	7260
30	3420		17500	14800	25600	7760	1300	1160	1580	1790	2070	7060
31	3740		17300		25900		1300	1160		1760		6760
Mean	3291	12390	13210	14460	20050	15560	3284	1129	1396	1899	1967	5296
Ac.Ft. for Month	202400	688300	812200	860600	1233000	925700	201900	69440	83070	116700	117000	325600

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 21

DISCHARGE OF MERCED RIVER AT YOSEMITE VALLEY RAILROAD CROSSING
1937

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		4500	179	62	40	12
2		3560	179	59	28	12
3		3440	176	55	28	16
4		3180	176	59	33	12
5		2700	176	59	35	12
6		2460	99	53	35	14
7		2340	91	50	35	44
8		1900	87	40	27	46
9		*1370	68	38	24	44
10		1370	59	32	16	41
11		1220	57	35	18	36
12		806	59	33	20	35
13		495	57	33	24	27
14		426	53	33	24	27
15		251	46	33	24	28
16		236	40	33	24	30
17		233	38	35	27	5
18		778	55	35	28	1
19		616	69	36	33	1
20		820	66	35	33	2
21		1480	66	38	27	1
22		1440	68	40	20	1
23		1090	71	40	18	1
24		649	71	33	28	1
25		343	64	33	33	1
26		254	61	32	22	1
27		248	62	30	16	1
28		197	64	27	16	1
29		182	59	28	12	1
30		182	59	30	16	1
31			61	33		2
Mean		1292	82	39	25	14.7
Ac.Ft. for Month		76900	5020	2400	1510	905

NOTE: Recorder installed in 1937. Station is at Mile 42.1.

* Beginning of record for season. Period June 1-8 by comparison with flow at Crocker Dam (upstream).

TABLE 22

DISCHARGE OF MERCED RIVER NEAR LIVINGSTON
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	179	662	1860	2340	1740	4520	375	254	218	236	114	164
2	180	950	1700	2380	1900	4160	364	276	222	222	117	137
3	168	1140	1700	2380	2810	3420	354	240	231	251	117	127
4	162	1100	1700	2340	3720	3250	354	236	240	253	112	125
5	158	1270	1660	2340	4220	2990	364	223	254	259	112	124
6	160	2820	1660	2420	4340	2600	334	223	257	234	111	122
7	172	3580	1660	2500	4280	2420	324	236	257	222	111	120
8	195	1820	1660	2340	4280	2320	314	246	240	234	111	119
9	177	1560	1660	2180	4340	1910	294	229	229	239	112	119
10	166	1340	1660	1780	4340	1570	261	189	225	265	112	134
11	166	1420	1660	1480	4340	1500	280	177	198	279	114	153
12	169	1520	1740	1420	4280	1290	280	182	222	249	114	232
13	185	1520	3240	1380	4280	1040	254	174	229	261	112	364
14	171	2420	3170	1380	4280	862	233	171	205	249	112	245
15	160	2860	2290	1380	4400	752	222	214	181	241	116	195
16	151	2020	1820	1340	4960	635	216	223	188	265	116	173
17	144	1860	1780	1310	5410	909	229	213	188	283	119	209
18	139	1780	1740	1310	5480	661	252	188	188	239	124	241
19	137	1740	1740	1280	5410	918	252	177	225	200	122	195
20	144	1700	1700	1900	5280	978	218	172	252	163	122	175
21	160	1700	1700	3210	5150	1160	205	176	238	156	120	161
22	156	1660	2440	3510	4960	1430	209	202	250	151	119	150
23	151	1660	4220	3320	4960	1430	227	213	250	142	120	800
24	148	1660	4220	1420	4960	1160	220	200	248	139	119	1160
25	147	2400	4960	1820	4960	862	252	181	250	130	119	1160
26	146	3160	4700	2100	4700	674	294	166	250	127	122	1190
27	144	3060	4280	2540	4520	596	227	182	254	125	119	1190
28	144	2420	3940	2840	4520	512	214	189	235	122	117	1220
29	153		2930	2750	4520	441	205	213	216	120	119	1220
30	224		2500	2140	4520	408	196	220	222	114	144	1220
31	538		2380		4520		213	220		114		1260
Mean	174	1886	2454	2094	4399	1569	266	207	229	203	117	458
Ac.Ft. for Month	10700	104700	150900	124600	270500	93380	16340	12700	13610	12460	6980	28170

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 23

DISCHARGE OF MERCED RIVER NEAR MOUTH
1937

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			525	268	260	262
2			500	270	262	274
3			475	243	264	286
4			450	245	266	288
5			420	228	288	310
6			400	250	310	302
7			380	253	292	294
8		*2400	360	255	292	296
9		2200	360	258	270	273
10		1700	350	250	280	320
11		1600	330	230	270	310
12		1400	320	226	280	290
13		1200	300	212	280	293
14		1000	280	224	260	298
15		800	275	246	250	296
16		675	270	258	255	293
17		675	270	240	245	311
18		670	270	232	250	289
19		700	250	214	250	266
20		800	245	211	290	264
21		900	250	213	290	262
22		1300	242	230	280	254
23		1500	255	262	290	242
24		1500	258	244	280	225
25		1400	260	246	280	222
26		1200	262	223	280	220
27		1000	255	225	270	218
28		850	238	232	270	215
29		700	230	264	255	207
30		600	223	266	250	205
31			235	258		202
Mean			314	241	272	267
Ac.Ft. for Month			19320	14830	16180	16440

NOTE: This is a staff gage station at bridge 1.1 miles above the mouth. Daily readings.

* Beginning of record for season.

TABLE 24

DISCHARGE OF DRY CREEK NEAR MODESTO
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			77	57	50	54
2			75	55	51	56
3			67	57	50	57
4			70	57	52	57
5			71	57	53	58
6			69	57	53	59
7			73	57	52	59
8			75	57	51	58
9			73	59	51	57
10			75	60	51	58
11			71	58	55	64
12			69	56	57	58
13			70	56	56	53
14		*62	64	57	53	54
15		67	61	57	53	54
16		56	67	55	51	57
17		56	64	54	46	58
18		91	64	56	50	62
19		85	72	57	51	64
20		72	72	57	53	64
21		78	67	53	52	72
22		75	67	57	52	59
23		81	67	54	53	57
24		73	68	55	56	57
25		67	67	53	55	57
26		73	71	53	53	57
27		91	71	53	53	72
28		94	72	53	53	58
29		85	72	52	53	56
30		78	71	53	54	57
31			70	51		55
Mean			70	55	52	59
Acre-feet for Month			4280	3410	3110	3600
M.I.D.Spill below Station-Ac.Ft.			1100	310	280	240
***Discharge to Tuolumne R. Acre-feet			5380	3720	3390	3840
***Discharge to Tuolumne R. Mean c.f.s.			87	60	57	62

NOTE: This is a staff gage station about two miles above mouth. Daily readings.

* Beginning of record for season.

** 17 days.

*** Neglecting seepage return below station.

TABLE 25

DISCHARGE OF TUOLUMNE RIVER AT LA GRANGE BRIDGE
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	708	834	2480	2710	3160	5150	80	3	3	629	858	823
2	723	1080	1200	2690	3040	6850	10	3	3	675	863	813
3	644	1210	893	2680	3140	5030	9	3	3	585	868	818
4	753	1270	968	2620	3200	3260	7	3	3	636	854	828
5	769	1770	948	2470	3100	2380	6	3	3	715	868	983
6	773	1730	928	2310	3050	2240	5	3	3	715	883	832
7	794	1070	868	2340	2910	2240	4	3	4	725	784	866
8	794	1060	908	2370	2910	753	4	3	210	605	854	852
9	624	1200	908	2380	2890	903	4	3	320	589	899	838
10	560	1590	1360	2620	3080	898	4	3	317	597	854	802
11	564	1590	1360	3270	3160	923	4	3	326	601	813	967
12	580	1620	2810	3300	5350	983	4	3	314	601	854	1560
13	576	1700	3260	3280	7470	2400	4	3	323	601	868	1510
14	576	1710	3640	3170	8860	3460	4	3	320	593	729	1610
15	576	1380	3790	3080	9560	3390	4	3	320	597	808	1530
16	584	3150	3590	3120	9060	3860	4	3	317	589	844	1570
17	572	4130	3390	3100	9090	5200	4	3	320	572	813	1560
18	568	4130	2720	3530	8390	4820	4	3	320	605	823	1520
19	572	3760	2750	4030	7270	4780	4	3	326	597	828	1510
20	584	3200	2800	3880	6610	4690	4	3	398	589	828	1560
21	614	2300	2790	3720	6880	4730	4	3	410	597	708	1540
22	588	2280	3420	3610	7320	4490	3	3	407	589	823	1590
23	580	2870	3570	3720	8250	3320	3	3	410	585	849	1550
24	576	3250	3640	3430	8750	1700	3	3	407	576	834	1570
25	576	3290	3610	3380	8770	978	3	3	407	581	728	1510
26	576	3260	3510	3630	8520	616	3	3	404	645	779	1490
27	580	3240	3260	4580	8300	572	3	3	404	636	804	1570
28	580	3240	3130	5020	8660	564	3	3	407	641	728	1540
29	572		2840	5000	9070	563	3	3	410	633	813	1520
30	574		2710	4000	8860	564	3	3	407	617	844	1530
31	585		2700		7800		3	3		593		1530
Mean	622	2250	2480	3300	6340	2680	6	3	237	616	823	1300
Ac.Ft. for Month	38200	124600	152000	196100	389000	163000	410	184	16290	37840	48910	79780

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 25-A

DISCHARGE OF TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	870	633	2720	2450	2890	7870	412	42	27	612	663	843
2	685	870	1500	2480	2750	7450	148	39	27	663	815	815
3	734	1060	815	2510	2790	6150	94	36	27	663	826	815
4	685	1100	900	2480	2870	4350	87	39	30	620	826	843
5	760	1140	918	2360	2920	2130	74	39	30	708	843	930
6	771	1820	900	2190	2790	1970	63	42	30	729	843	870
7	760	1290	843	2100	2660	1920	60	45	30	708	815	843
8	760	1020	815	2130	2540	930	57	42	130	699	815	843
9	728	990	843	2190	2620	843	48	39	404	620	870	843
10	633	1330	960	2130	2600	815	45	36	357	633	853	853
11	596	1440	1760	2980	2850	843	42	30	404	633	843	930
12	596	1450	2600	3000	3500	815	39	24	431	624	826	1560
13	604	1530	3220	3040	6850	1360	39	18	431	629	870	1380
14	592	1810	3420	3060	8950	2720	39	18	431	620	760	1480
15	600	1520	3500	2790	9860	3000	36	24	431	620	771	1480
16	596	2240	3500	2710	10020	3040	33	18	434	620	870	1480
17	604	3900	3350	2800	9750	4650	36	18	434	620	853	1480
18	600	3980	2560	3040	9150	4850	30	18	431	608	798	1480
19	600	3880	2480	3780	8350	4810	36	18	431	663	815	1480
20	600	3060	2600	3800	7250	4650	39	18	469	624	815	1480
21	620	2380	2540	3580	7150	4650	39	21	532	629	760	1500
22	624	2050	3160	3420	7350	4750	39	21	524	620	788	1500
23	608	2170	3420	3350	8550	3720	36	24	524	629	590	1500
24	600	3010	3580	3290	9090	2020	39	24	524	629	760	1500
25	596	3080	3580	3160	9450	1220	39	21	524	616	760	1430
26	596	3060	3390	3220	9550	650	36	21	532	624	760	1400
27	600	3060	3140	3800	9150	612	33	21	532	685	760	1400
28	604	2320	3040	5150	9210	580	30	21	532	685	788	1400
29	608		2800	4150	9750	572	33	27	532	663	771	1400
30	612		2420	2910	9690	568	36	24	532	641	826	1420
31	633		2440		8850		45	24		629		1420
Mean	648	1845	2378	2905	6508	2726	60	27	345	644	772	1245
Ac.Ft. for Month	39820	113400	146200	17860	400200	167600	3690	1690	21240	39600	47450	76560

NOTE: This is a recording gage station at Mile 39.9.

TABLE 26

DISCHARGE OF TUOLUMNE RIVER AT HICKMAN BRIDGE
1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1020	806	3220				400	130	122	770	890	1090
2	890	1170	1870				240	132	124	890	1090	1090
3	938	1340	1100				170	132	126	920	1090	1090
4	878	1390	1220				164	134	126	818	1160	1090
5	992	1550	1190				160	134	128	908	1090	1230
6	985	2400	1170				156	134	130	1010	1160	1090
7	999	1680	1150				154	124	130	985	1020	1090
8	1020	1410	1120				152	126	132	992	890	1090
9	950	1410	1140			1140	146	124	460	782	950	1090
10	824	1890	1300	2440		1090	142	122	490	794	950	1160
11	758	1920	2080				140	124	525	806	950	1090
12	782	1940	3110			1120	140	124	505	800	890	1920
13	782	1980	3630				140	124	515	806	950	1760
14	758	2350	3710				138	124	515	800	1090	1840
15	752	2000	3750				138	124	515	800	950	1840
16	740	2710	3660				134	124	515	830	1090	1840
17	764	3450	3490				130	122	515	812	1090	1840
18	752	3750	3070				130	122	510	794	1090	1840
19	758	3750	2980				130	122	510	860	1090	1840
20	764	3590	3121				130	122	555	818	1090	1840
21	782	2980	3400				130	124	600	812	1090	1920
22	806	2640	4200				132	124	620	812	1020	1920
23	746	2890	4250				132	124	620	800	1090	1840
24	734	3470	4350				130	124	620	794	1090	1840
25	734	3530	4100				128	122	625	782	1090	1840
26	734	3490	3970			890	126	122	625	794	1090	1760
27	734	3650	3750e				126	122	625	890	1020	1760
28	758	2980	3640e				126	124	625	866	1020	1760
29	758		3400e				124	124	625	860	1020	1840
30	776		3000e				128	126	625	854	1090	1760
31	800		2900e				130	124		830		1600
Mean	821	2433	2840				150	125	445	842	1039	1568
Ac.Ft. for Month	50430	134900	174300				9200	7690	26450	51660	61760	96230

NOTE: This is a recording gage station at Mile 31.7. Recorder removed March 26th on account of high water and not replaced until July 1st.

e Estimated.

TABLE 27

DISCHARGE OF TUOLUMNE RIVER AT TUOLUMNE CITY-1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	1235	1440	2980	3240	4460	8300	1125	400	365	775	935	
2	1250	1360	2900	2690	3760	7600	1035	395	380	905	980	
3	1120	1470	1490	3240	3650	7220	940	395	370	1005	1230	
4	1055	1590	950	3170	3610	6070	830	375	365	990	1270	
5	1110	1700	1100	3130	3700	4530	730	375	365	950	1235	
6	1180	2350	1040	2990	3560	3400	635	385	350	1040	1235	
7	1160	3890	1040	2710	3490	3290	610	385	375	1110	1265	
8	1165	3260	960	2710	3310	2620	575	380	360	1110	1190	
9	1160	2230	1030	2750	3270	1510	560	385	390	1025	1205	
10	1010	2010	1100	2700	3190	1560	545	390	595	905	1275	
11	945	2200	1760	2930	3290	1510	535	370	635	900	1240	
12	950	2080	2850	3580	3520	1520	525	370	675	920	1220	
13	930	2130	3860	3740	3930	1550	500	395	670	920	1205	
14	925	2480	5590	3730	7240	2740	475	390	640	990	1235	
15	905	3980	4870	3800	8250	3750	460	360	640	1030	1175	
16	900	2780	4580	3830	8850	4080	455	355	635	1040	1100	
17	870	3580	4360	3720	9000	4420	445	355	630	985	1255	
18	870	4480	4220	3740	8950	5500	440	360	625	920	1255	
19	865	4500	3570	4160	8350	5350	430	365	630	920	1190	
20	870	4260	3570	4550	7800	5300	420	370	680	975	1250	
21	865	3720	3610	4510	7250	5260	410	380	690	930	1220	
22	885	2970	3950	4240	7250	5340	410	390	730	930	1135	
23	900	2820	6270	4000	7550	5130	415	400	750	930	1135	
24	855	3320	5430	4030	8150	4220	420	390	760	930	1230	
25	845	3650	6130	3790	8500	2920	420	380	800	930	1230	
26	840	3640	6530	3760	8550	1960	415	375	775	920	1130	
27	835	3750	4850	4310	8550	1290	415	370	780	955	1110	
28	840	3700	4350	5180	8300	1265	410	370	775	1010	1125	
29	860		4200	5440	8500	1185	405	380	780	985	1075	
30	875		3520	5320	8750	1150	400	380	785	980	1115	
31	1085		3370		8800		390	375		955		
Mean	973	2910	3420	3720	6300	3720	541	377	600	964	1180	
Ac.Ft. for Month	59820	161300	210300	221500	387400	221400	33280	23180	35700	59250	70310	
Diversions Below Station-Ac.Ft.	0	0	0	21	0	0	28	17	16	0	0	
M.I.D.Spill Below Station-Ac.Ft.	0	0	0	850	1120	756	708	222	342	224	0	
*Discharge to San Joaquin River Acre-feet	59820	161300	210300	222300	388500	222200	33960	23380	36030	59470	70310	

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.

— NOT COMPUTED — FLOW —

TABLE 28

DISCHARGE OF STANISLAUS RIVER AT ORANGE BLOSSOM BRIDGE
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*3100[e]	27	27	17	17
2		3200[e]	31	27	17	17
3		3400[e]	27	27	17	17
4		3600[e]	27	27	17	17
5		3600[e]	27	27	27	17
6		3500[e]	27	27	27	17
7		3490	27	27	27	17
8		3000[e]	27	27	27	17
9		2500[e]	27	27	27	17
10		2000[e]	27	27	27	17
11		1500[e]	27	27	27	17
12		1100[e]	27	27	17	17
13		580	27	27	17	17
14		1140	27	27	17	17
15		1110	27	27	17	17
16		1080	27	27	17	17
17		2300[e]	27	27	17	17
18		1700[e]	27	27	17	17
19		1195	27	27	17	17
20		580	27	27	17	17
21		1140	27	27	17	17
22		1605	27	27	17	17
23		1330	27	27	17	17
24		1360	27	27	17	17
25		480	27	27	17	17
26		480	27	27	17	17
27		265	27	27	17	17
28		138	27	27	17	17
29		88	46	27	17	17
30		46	27	27	17	17
31			27	17		17
Mean		1687	28	27	19	17
Ac.Ft. for Month		100200	1700	1640	1150	1040

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

* Beginning of record for season.

e Estimate based on flow below Melones after making allowance for intervening diversions and return flow.

TABLE 29

DISCHARGE OF STANISLAUS RIVER AT HATMARK RANCH -1937

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	415	1025	2010	2170	2620	5200	645	292	232	222	210	
2	460	610	920	2440	2740	4580	575	308	228	262	209	
3	442	615	1610	2800	3070	3560	525	290	225	280	209	
4	417	735	1640	2870	3250	3460	545	293	234	288	200	
5	386	1000	1660	2420	3980	3530	505	293	234	276	209	
6	327	2950	1730	2550	4330	3860	495	294	239	239	200	
7	342	3215	1670	2500	4750	3540	420	288	232	227	200	
8	363	2590	1000	2610	5000	3400	370	273	221	239	209	
9	385	1635	710	2350	5140	2920	350	286	222	214	200	
10	386	1690	1110	2210	5140	2500	335	241	216	231	180	
11	386	1690	1130	2300	5120	2090	355	248	227	214	188	
12	383	1690	1030	2300	5180	1870	355	260	228	199	213	
13	352	1785	1230	2600	5510	1670	335	257	228	207	239	
14	480	1945	2080	2720	5660	1420	315	247	221	214	245	
15	546	2875	1410	2880	6000	1490	320	252	230	246	270	
16	586	2490	1070	3180	7150	1580	325	224	240	253	295	
17	588	2080	1070	3480	7420	1430	330	223	237	264	320	
18	455	2065	1070	3570	7400	1810	375	220	238	256	339	
19	320	2155	1050	2910	7290	2340	365	230	239	258	350	
20	300	2170	1000	2890	6480	2650	340	228	244	260	354	
21	430	2085	1190	2840	5590	1430	330	245	240	251	360	
22	559	1500	1820	3070	4930	1460	320	253	238	230	360	
23	605	1025	2890	3460	5100	1650	295	253	237	273	330	
24	605	1730	2440	3480	4990	1570	300	243	243	249	315	
25	605	1860	3340	2960	5130	1580	295	228	229	217	358	
26	518	2045	4310	2760	5640	1130	305	221	235	200	370	
27	382	2070	4290	3260	5620	1000	280	212	233	214	327	
28	455	1970	3500	3660	5150	950	280	240	225	212	304	
29	529		2730	2900	4900	820	280	228	224	206	354	
30	586		2670	3000	5080	700	285	254	228	205	324	
31	1055		2520		5270		305	226		210		
Mean	472	1830	1870	2840	5180	2240	371	253	232	236	275	
Ac. Ft. for Month	29040	101700	114800	168900	318600	133300	22840	15570	13780	14520	16340	
Diversions below Station-Ac.Ft.	0	0	0	136	398	592	649	623	550	0	0	
*Discharge to San Joaquin River-Ac.Ft.	29040	101700	114800	168800	318200	132700	22190	14950	13230	14520	16340	

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.

* Neglecting seepage return below station.

CHAPTER III

MEASUREMENTS OF DIVERSIONS

Measurements and records of diversions in 1937 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 1937 this report records a total of 604 points of diversion, (23 of which were newly reported this year), segregated to the various sources as follows: Sacramento River 263, Colusa Trough 9, Back Borrow Pit (carrying drainage water from Colusa Basin along the back levees of Reclamation Districts 108 and 787) 12, Lower Butte Creek and Butte Slough 21, By-Pass and Drainage Channels 37, Feather River 41, Yuba River 17, 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) 46, San Joaquin River (above Vernalis gaging station) 20, Stanislaus River 17, Tuolumne River 11, and Merced River 56. In addition there were 20 plants removed or dismantled during 1937.

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 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 1937 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 engineer, 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 1937 have been computed on a monthly basis only and the breakdown into daily records was not made.

A summary of the 1937 diversions throughout the Sacramento-San Joaquin territory is shown in Table 30. 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 31 summarizes the diversions between different points on the Sacramento River.

TABLE 30

DIVERSIONS, ACREAGE IRRIGATED, AND GROSS SEASONAL DUTY OF WATER IN THE SACRAMENTO-SAN JOAQUIN AREA
1937

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	32	1070461	100836	66546	167382	6.4
Feather River below Oroville	37	507765	26705	30203	56908	8.9
Yuba River on valley floor	38	59163	6699	2598	9297	6.4
American River below Fairoaks	39	5381	3353	----	3353	1.6
By-Pass and Drainage Channels	36	34839	9643	2340	11983	2.9
Lower Butte Creek and Slough	35	20468	3750	1515	(1)5265	3.9
Colusa Trough and Back Borrow Pit	33-34	46270	100	6173	6273	7.4
Total above Sacramento		1744347	151086	109375	260461	6.7
Delta Uplands from -						
Cache Slough	40	9126	2099	----	2099	4.3
Old San Joaquin River	41	64612	31913	----	31913	2.0
Tom Paine Slough	42	9664	3302	----	3302	2.9
San Joaquin River below Durham Ferry Bridge	43	41228	19648	----	19648	2.0
San Joaquin River from Fremont Bridge to Durham Ferry Bridge	44	99996	41542	230	41772	2.4
Merced River below Snelling	45	12011	4155	----	4155	2.9
Tuolumne River below Roberts Ferry Bridge	46	2212	752	----	752	2.9
Stanislaus River below Orange Blossom Bridge	47	11937	3849	75	3924	3.0
Total delta uplands and pumping diversions of San Joaquin River and Tributaries*		250786	107260	305	107565	2.3
Sacramento-San Joaquin Delta**						

(1) All gun club diversions and acreages have been excluded where possible. The diversions to Sutter By-Pass have also been excluded. (See Table 35).

* 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 those measurements.

** Delta crop census for compilation of Delta consumptive use of water was not taken in 1937. See 1932 and prior reports for acreage irrigated and consumptive use of water in the Delta which vary but little from year to year.

TABLE 31

SUMMARY OF SACRAMENTO RIVER DIVERSIONS-1937
(Acre-feet)

River Section	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Totals
Redding to Red Bluff	0	3402	20114	19428	20992	20813	20821	9039	114609
Red Bluff to Butte City	0	10046	99903	92313	103394	102896	60812	12684	482048
Butte City to Colusa	0	867	8348	9656	10285	7685	5036	693	42570
Colusa to Wilkins Slough	0	11612	51680	51600	55400	48192	28240	406	247130
Wilkins Slough to Knights Landing	0	2788	15509	15541	17314	13799	6221	1354	72526
Knights Landing to Verona	0	170	1391	3049	3680	2857	1601	201	12949
Verona to Sacramento	3459	3842	13394	19340	24239	21682	10540	2133	98629
Totals	3459	32727	210339	210927	235304	217924	133271	26510	1070461

TABLE 32

SACRAMENTO RIVER DIVERSIONS
1937

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
City of Sacramento	0.8 L	3-20" 1-18"	1711	1906	2585	2891	3371	3318	2610	1910	20302	Municipal	
— AMERICAN RIVER - MILE 1.1 LEFT —													
— BACK BORROW PIT RECLAMATION DISTRICT 1000 - MILE 1.3 LEFT —													
E. Fourness	1.45 R	1-8"			16	85	66	54	20		241	141	
Suburban Holdings Company	2.05 L	1-8"			15	29	42	17	15	7	125	90	
— RECLAMATION DISTRICT 1000 DRAIN - MILE 2.1 LEFT —													
Frank Christophel	2.4 L	1-5"			7	21	15	8	11	7	69	38	
H. M. Swalley	2.45 L	1-5"			7	14	25	4	3	12	65	40	
N. E. Parr (1)	2.9 L	1-6"(2)				17					17	23	
Earl Fruit Company	3.55 R	1-16"			88	406		144			638	165	
W. E. M. Beardslee	3.75 R	1-5"				17	6				23	65	
J. Da Rosa	4.0 R	1-10"				106	14	107			227	105	
Reese and Greer	4.65 R	1-7"				37	9				46	113	
Harbinson Brothers	5.05 R	1-14"				82	66				148	83	
R. S. Seydel	5.25 R	1-8"			6	48	46	33	8		141	(3)155	
C. H. Merkeley Estate	5.3 R	1-8"				16	20				36	60	
A. Casselman	5.5 R	1-6"				7	12				19	35	
A. A. Casselman	5.55 R	1-6"		17	15	28					60	70	
K. L. Lovdal	5.7 R	1-10"			NO	DIVERSION							
J. E. Bandy	6.0 R	1-6"			4	46	34	50	35	15	184	83	
Riverside Mutual Water Company	6.10 L	2-18"			4	1313	1644	1750	1140		5851	1594	
O. A. and F. L. White	6.6 R	1-6"						6	10		16	10	
E. S. Fisk	7.0 R	1-4"			NO	DIVERSION							
California Bank and Trust Co.	7.5 L	1-8"					42		42		84	100	
F. L. Martin & A. B. Carter (Stahl)	7.8 L	1-10"				52	28	47	13		140	75	
A. Marty	7.9 R	1-8"			11	36	65	26	23	6	167	(4)	
M. E. and R. F. Bennett	7.9 L	1-10"			28	46	16	51	48		189	95	
M. Marty	8.3 R	2-10"		5	51	146	132	111	85	29	559	(5)372	
Blauth Estate	8.5 R	1-7"			3	96	79				178	83	
H. Waldeck	8.7 R	1-6"			16	11	15				42	42	
Hazel Goethe	8.95 R	1-6"		5	27	22	29	39	28	13	163	37	
California Lands, Inc.	9.35 R	1-14"			33	238	255	100		84	710	(6)375	
R. G. Pearson and P. S. Driver	9.8 L	1-14"				46	400	50	164	40	700	(7)433	
Carl Casselman	9.9 R	1-12"				42	75	55	41		213	130	

* Mileage along river above Sacramento.

(1) Formerly Hayward Reed.

(2) Replaces 5" unit.

(3) Includes 60 acres on adjoining Schmidt property.

(4) See plant at Mile 8.3 Right.

(5) This is the total acreage served by this plant and the one at Mile 7.9 Right.

(6) Includes 165 acres on adjoining K. Merkeley property.

(7) Pearson 128 acres, Driver 305 acres.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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 M. Robbins (1)	10.25 L	1-14"			103	96	101	77	104		481	210	
Reese Estate	10.75 R	1-12"				130	104	11			245	200	
Natomas Company (Joe Rosa) (2)	10.75 L	1-12"			15	57	55	10			137	(3)140	
McKeehan and Harris	11.1 R	1-12"			76	179	296	197	119		867	290	
A. L. White	11.6 L	1-10"				50	31	31	78		190	76	
— ELKHORN FERRY - MILE 11.9 —													
Conaway Ranch	12.0 R	4-36"			3945	5234	7141	5908	1557		23785	680	4000
Thomas O'Connor	12.5 R	1-12"				56	118	41	11		226	166	
Gertrude Brown	12.7 R	1-6"			7	22	12	39	31	10	121	90	
Julius Hauser	13.1 R	1-12"				39	97	86			222	100	
J. Corey	13.2 R	1-8"				37	37	17			91	106	
Henry Schaefer	13.25 R	1-8"(4)				54	124	73			251	120	
Elkhorn Mutual Water Company	14.1 L	1-24"											
		1-20"			777	1975	2258	2226	1049		8285	2467	208
M. E. Dole (5)	14.25 R	1-10"				23	9	2	2		36	100	
M. E. Dole	14.4 R	1-6"			NO	DIVERSION							
California Lands, Inc.	15.15 R	1-10"				60	175	5			240	220	
California Trust and Savings Bank (O. L. Hurt) (6)	15.7 L	1-6"			NO	DIVERSION						(7)	
Central Mutual Water Company	16.0 L	2-28"	1748	1669	3347	3050	3736	3137	1635		(8)18322	(9)894	1798
Frank Fisher and Henry Rich (Hershey Plant)	16.27 R	1-20"				102	19	55			176	408	
H. T. Silvius	16.4 R	1-6"				16	36	13	1		66	40	
W. B. Beach	16.62 R	1-6"				40					40	107	
Thomas J. Cox Estate	16.7 R	1-14"					67	43	20		130	(10) 70	
Frank Fisher and Henry Rich	17.4 R	1-18"			45	142	130	150			487	(11)470	

* Mileage along river above Sacramento.
(1) Formerly E. C. Boom (Trustee for F. W. Kiesel)
(2) Formerly R. F. Fiddyment and Natomas Company.
(3) Includes 35 acres on adjoining property to north.
(4) Replaces 10" unit.
(5) Formerly Joseph Veress.
(6) Formerly Harry Hall.
(7) 54 acres served through Central Mutual Water Company plant at Mile 16.0 Left.
(8) 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) May 122, June 206, July 260, August 488, September 303, Total 1379.
(9) Includes 54 acres for California Trust and Savings Bank, Mile 15.7 Left.
(10) An additional 80 acres irrigated from Plant at Mile 17.4 Right and 145 acres from plant at Mile 22.5 Right.
(11) Includes 80 acres on adjoining T. J. Cox Estate, Mile 16.7 Right.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
California Western States Life Insurance Company	17.75 R	1-20"				9	147	52	4		212	95	
M. and J. Scheiber (L. Ashwandan)	18.45 L	1-12"					62	163	68		293	95	
G. H. Lyall (E. S. Machado)	18.7 L	1-8"				68	49	63	55		235	50	
Natomas Company - Reclamation District 1001 (1)	19.6 L (1)	2-20"			NO	DIVERSION							
Northern Mutual Water Company (Bennett Plant) (2)	19.6 L (2)	1-24"		240	1405	1286	1747	2073	764		7515		732
Natomas Ben May Plant (3)	19.6 L (3)	1-24" 1-10"(4)			758	717	1182	1240	746		4643		580
——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"				88	628	537			1253	1015 (5)	
Hershey Estate (Darneille) (6)	26.95 R	1-18"			NO	DIVERSION (6)						(6)	
Morse Inglin	28.2 R	1-6"			27	25	18	18	11		99	25	
Russell Brothers	29.2 R	1-12"			6	54	56	56	20	9	201	111	
M. R. Richardson	29.7 R	1-8"			NO	DIVERSION							
P. L. Traganza and K. Russell	29.75 R	1-8"				33	5	4	20		62	67	
Laura Freitas	29.9 L	1-12"				40	33				73	75	
Leo Giovanetti	30.2 L	1-5"(7)				2	17	10	8		37	20	
M. R. Richardson	30.6 R	1-12"			NO	DIVERSION							
Floyd Anderson	30.7 R	1-6"						1			1	1	
George Senf	30.9 L	1-8"			NO	DIVERSION							
A. C. Huston (E. Burquist)	31.5 R	1-12"				155	96	50			301	162	
M. Alonso	31.8 L	1-6"					1	4			5	28	
M. R. Richardson	32.0 R	1-10"				11	22	6	64	2	105	220	
Sutter Mutual Water Company (Portuguese Bend)	32.0 L	2-24"		170	1274	2008	2208	1770	1438	190	9058	(8)	(8)
Collier Brothers	32.5 R	1-10"			3	7	21	15	21		67	40	

* Mileage along river above Sacramento.

(1) 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.

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

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

(4) 10" unit added in 1937.

(5) Includes 145 acres on T. J. Cox Estate, Mile 16.7 Right and 35 acres on H. T. Silvius; also 345 acres flooded.

(6) This plant diverts water to Grays Bend (Old River channel) to supplement seepage therein. Hershey Estate maintains a booster plant on this channel. In 1937 there was no irrigation from booster plant.

(7) Replaces 3" unit.

(8) See plant at Mile 63.75 Left.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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. B. Coulter (Carlson)	33.2 L	(1) 2-10"			68	451	457	317			1293	530	
J. G. Knox	33.35 L	1-8"			11	157	55	30	19		272	182	
Snowball Estate	33.5 R	1-12"			NO	DIVERSION							
Leiser Brothers (2)	33.75 L	1-12"					48	37			85	135	
J. W. Snowball	33.85 R	1-6"			2	18	15	2			37	20	
— KNIGHTS LANDING GAGING STATION - MILE 34.0 —													
— COLUSA BASIN DRAINAGE - MILE 34.15 R —													
Meek Estate	34.2 R	2-16"											
		1-10"			215	753	732	133	110	302	2245	(3) 370	
River Farms Company (Townsite Plant)	34.25 R	1-20"											
		1-24"				965	1486	706	228	345	3730	1340	
		1-26"											
Commercial Investment Company (R. B. Bailey)	34.85 L	1-12"			15	43	42	38			138	113	
Walter Raymond	35.2 L	1-12"			NO	DIVERSION							
J. H. Scott	35.6 L	1-7"			NO	DIVERSION							
J. H. Donnelly Ranch (Bundock Brothers)	35.8 L	1-10"			21	27	45	18	6		117	(4) 50	
F. L. Burrell	36.2 L	1-16"			NO	DIVERSION							
Amedeo Moroni	36.7 L	1-5"			NO	DIVERSION							
W. W. Bottimore	37.2 L	(5) 1-14"			NO	DIVERSION							
Bundock Brothers (6)	37.75 L	1-8"				15	11	16			42	40	
Addie Reel (A. R. Kramer)	38.4 L	1-10"					16	46			62	75	
California Lands, Inc. (H.A.Kramer)	38.8 L	1-10"			NO	DIVERSION							
F. O. Eastman	39.4 L	1-12"			NO	DIVERSION							
Commercial Investment Company (R. B. Bailey)	39.8 L	1-10"					89	70			159	70	
William Duffy, Jr.	39.9 L	1-6"			NO	DIVERSION							
Sutter Mutual Water Company (State Ranch Bend)	40.6 L	(7) 2-24"		112	1953	3114	3734	3689	2270	57	14929	(8)	(8)
Buell Ranch (Hitchcock) (9)	41.8 L	1-4"					12	12			24	10	
Buell Ranch	42.2 L	1-6"				4	15	3			22	38	
Matteoli and Fratchia	42.3 L	1-8"					71	20	3		94	46	

* Mileage along river above Sacramento.
(1) Two units to replace one 20" unit.
(2) Formerly Fred Leiser.
(3) Includes 52 acres on adjoining Burtchardt property.
(4) Includes 10 acres on adjoining Gofitzer property.
(5) Erroneously reported as 12" in 1936.
(6) Formerly L. W. Bundock.
(7) One 24" vertical unit added in 1937.
(8) See plant at Mile 63.75 Left.
(9) Plant installed at old point of diversion.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
A. Kramer	43.1 L	1-12"		200	684	712	636	579	266		3080	15	147
El Dorado Ranch	43.1 R	1-18"			44	211	380	253		110	1004	648	
River Farms Company (Reclamation District 2047 Plant)	43.1 R	2-30"		2387	8247	3513	4905	4423	932	159	24626 (2)	843 (1)	2422 (1)
John Clauss (G. Guisti)	47.3 L	1-14"			NO	DIVERSION							
P. J. Hiatt	48.7 L	2-20" (3)			729	983	516				2228	350	
P. J. Hiatt	49.7 L	1-14"			NO	DIVERSION							
Reclamation District 108 (Tyndall Mound Plant)	51.1 R	2-24"											
		1-36"			NO	DIVERSION							
California National Bank (P. J. Hiatt)	51.2 L	2-16"			1767	1936	2015	2006	1191		8915	590	450
J. F. White	51.5 L	1-8"						5	5		10	10	
T. J. Cummins Ranch Company	52.0 L	1-16"			83	130	74	15		23	325	205	
George Van Ruiten	52.9 L	1-10"			NO	DIVERSION							
George Van Ruiten	53.9 L	1-12"			NO	DIVERSION							
Broomieside Farm (4)	55.1 L	1-20"			74	534	271	8		79	966	347	
Reclamation District 108 (Boyer Bend Plant)	56.4 R	1-18"			NO	DIVERSION							
		1-30"											
J. M. Miller	56.65 R	1-12"			10	89	127	91	73	69	459	82	
Broomieside Farm (4)	56.95 L	1-20"			675	815	691	648	517	201	3547	171	420
Lamb Brothers (S. Bristow) (5)	57.5 L	1-16"				153		60			213	130	
Lester H. Fasig (6)	58.2 L	1-15"					143	67	99		309	157	
Alex Grant	58.9 L	1-16"			51	308	282	157	10	7	815	220	
Lamb Brothers	59.8 L	1-14"		89	931	787	646	668	499		3620	330	300
		1-8"											
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"				206	105	30			341	150	
Sutter Basin Corporation (Coles Landing)	61.3 L	1-12"			NO	DIVERSION							
Hines Ranch	62.3 R	1-10"			2	58	10	11			81	74	
Rowena B. Coulter (E. Seaman)	62.3 L	1-10"			5	148	131				284	108	
William Baker	62.6 R	1-8"				14	18				32	23	
R. L. Young	62.8 L	1-8"				23	45	27	12	2	109	105	

* Mileage along river above Sacramento.

(1) River Farms Company: 799 general; Reclamation District 108: 2422 rice, 44 general.

(2) Water divided approximately twenty per cent to River Farms Company and eighty per cent to Reclamation District 108.

(3) 20" centrifugal unit removed and 2 - 20" vertical units installed in fall of 1936.

(4) Formerly G. W. Stretter.

(5) Formerly J. M. Kirkup.

(6) Formerly H. S. Fasig.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
— WILKINS SLOUGH GAGING STATION - MILE 62.9		—											
Reclamation District 108 (Wilkins Slough Plant)	63.2 R	5-42"		3909	11518	9257	10840	9582	1665		46771	1256 (1)	6052 (1)
Sutter Mutual Water Company (Tisdale) and Improvement Mutual Water Company	63.75 L	6-42"		5339	29769	27946	30260	28135	21547	196	143192 (2)	16854 (3)	10427 (3)
La Roca Monte Rancho Company	64.3 R	1-12"				108	44	5	3		160	24	
Tisdale Irrigation and Drainage Co.	64.4 L	1-12"		69	44	123	550	710	308		1804	(4)	
L. F. d'Artenay and Van Horn (5)	64.9 R		PUMP: REMOVED: TEMPORARILY										
M. Bettencourt	65.1 R	1-10"			NO DIVERSION								
California Lands, Inc.	65.7 L	1-10"			192	301	154				647	110	
J. L. Browning	66.4 R	1-18"				365	325	267			957	650	
Tisdale Irrigation & Drainage Co. (Winship Plant)	67.1 L	1-20"			970	1612	1492	714	343	69	5200	1750 (6)	
Desmond A. Winship, et al.	67.2 L	1-12"			NO DIVERSION (4)							(4)	
Meridian Farms Water Co. #6	67.4 L	1-10"			PLANT REMOVED (7)							(7)	(7)
Scott F. Ennis and E. S. Brown	67.5 L	2-24"		612	2144	1967	2162	1851	607		9343	1789 (8)	270 (8)
— RECLAMATION DISTRICT 70 DRAIN - MILE 68.8 LEFT		—											
Meridian Farms Water Company #5	68.80 L	(9) 1-24"			120	540	120				(10) 780	652	158
J. L. Browning	69.0 R	1-24"			96	165	308	276	171		1016	530	
Faxon Ranch	69.2 R	1-18"			14	390	316	50			770	432	

* Mileage along river above Sacramento.

(1) An additional 2422 acres rice and 44 acres general crops irrigated in Reclamation District 108 from plant at Mile 43.1 Right.

(2) Includes 12,066 acre-feet delivered to Improvement Mutual Water Company (in R.D. 1600). Acre-feet by months - May 2235, June 2233, July 2909, August 2820, September 1869, Total 12,066.

(3) These figures give the total acreage irrigated from the Portuguese Bend, State Ranch Bend, and Tisdale Plants, Miles 32.0 L, 40.6 L, and 63.75 L, respectively. Include Improvement Mutual Water Company as follows: Rice 512 and General Crops 1923.

(4) See acreage note for plant at Mile 67.1 Left.

(5) Formerly Colusa Development Company.

(6) This is the total acreage served by this plant and the one at Mile 64.4 Left and includes 197 acres irrigated on adjoining Winship property (Mile 67.2 Left).

(7) Area formerly irrigated by this plant now irrigated from plant at Mile 68.81 Left.

(8) On adjoining lands as follows: Rice - Meridian Farms Water Company, 172 and L. C. Middleton 98 acres. General - Meridian Farms Water Company, 29 acres.

(9) 12" unit removed and plant consolidated with Reclamation District 70 drainage plant. Now combination irrigation and drainage plant using one 24" unit.

(10) This plant pumps to the irrigation canal both from the main drain of Reclamation District 70 and from the Sacramento River. The diversions here listed are from the river only. The water obtained from the drain canal was as follows (Acre-feet) April 325, May 1230, June 680, July 1180, August 1210, September 515, Total 5140.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
— EDDYS FERRY (GRIMES) - MILE 69.45 —													
Wilbur Jensen, Mary Secil, 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"			1031	1119	1318	1290	692	11	5461	394	537
J. L. Browning	71.9 R	1-12"			NO DIVERSION								
Antone Steidlmayer	71.9 R	1-12"			NO DIVERSION								
King and Monthey (1)	72.3 L	1-7"			40	100	61				201	100	
E. E. Vann (Westfall)	73.6 R	1-12"			NO DIVERSION								
Meridian Farms Water Company #3 (Headquarters)	74.8 L	1-18"			300	496	477	563	362	48	2246	635	
L. B. Westfall	75.3 R	1-10"				32	76	17			125	95	
J. H. Yates	79.1 L	1-12"				21	12	19			52	65	
Ella Blackmer	79.2 L	1-8"					5	7			12	15	
Steidlmayer Brothers	79.5 R	1-16"			NO DIVERSION								
E. V. Jacobs	77.9 L	1-12"				262	103				365	190	
Sebia Davis Estate	78.2 R	(2)1-16"			41	230	230				501	308	
Sebia Davis Estate	78.8 R	(3)1-24"		356	1979	1481	1377	1268	409		6870	400	1200
C. E. Reische	79.0 L	1-10"			67	68	72	56	22		285	(4)162	
Henry Schmidt	79.3 R	1-10"			14	54	58				126	82	
E. V. Jacobs	79.5 L	1-8"			23	29					52	40	
G. W. Wood	79.7 L	1-10"			3	20	14	11	1		49	(5)53	
— MERIDIAN BRIDGE - MILE 79.85 —													
Meridian Farms Water Company #1 and #2 (Meridian)	80.0 L	1-24" 1-18"		1327	2667	3660	3089	2547	1202		14492	1053 (6)	591
George P. Ahlf	80.3 R	1-8"			14	31	23				68	145	
Wonderly and Lilienthal	81.5 L	1-16"			73	29	150	83	122		457	(7)137	
Steidlmayer Brothers	81.9 R	1-20"			97	100	493	251	430	19	1390	356	
F. T. Reische and L. J. Wood	82.5 L	1-12"			17	28	22	27	25		119	(8) 54	
George W. Kirkpatrick	83.3 L	1-14"			NO DIVERSION								

* Mileage along river above Sacramento.

(1) New installation 1937.
(2) Replaces 12" unit.
(3) Has been carried in records since 1930 as 36".
(4) Includes acreages as follows: Staas 25, Lemos 30, Rockholtz 20, Kilgore 28.
(5) Includes 18 acres on adjoining Burtis property.
(6) An additional 287 acres of general crops were irrigated from Plant #7 pumping from an interior lake supplied both by drainage and surplus water from Plants Nos. 1 and 2.
(7) Wonderly 39, Lilienthal 80 and 18 acres on adjoining Thrash lands.
(8) Reische 30, Wood 10 and 14 acres on adjoining Staas lands.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

1937

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
— BUTTE SLOUGH - MILE 84.0 LEFT —													
Clifford Reichel (1)	85.8 L	1-8"					19	43			62	30	
Ewing and Halsey (2)	86.1 R	1-12"			25	83	61	15	95	58	337	100	
J. F. Peck	86.6 L	1-18"			NO	DIVERSION							
Lloyd Scoggins	86.8 L	1-8"				35	36				71	45	
W. P. Dwyer (Lower)	86.9 R	1-16"			67	85	157	44			353	100	
W. P. Dwyer (Upper)	87.4 R	1-15"			47		68				115	68	
Jacobsen and O'Rourke	87.6 L	1-10"			NO	DIVERSION							
Swinford Tract Irrigation Co.	87.7 R	1-12"			80	147	71	20	2	5	325	132	
Edward K. Lange	88.0 R	1-6"				6	6				12	21	
W. D. DeJarnett (Nagle & Locovitch)	88.2 L	1-10"				21	39				60	(3)70	
W. D. DeJarnett	88.7 L	1-14"				194	368	153	82		797	285	
Colusa Irrigation Company	89.2 R	1-20"			228	276	412	188	152		1256	533	
Phil B. Arnold	89.25 L	1-8"				93	12				105	83	
G. A. Berkey	89.26 L	1-12"				126					126	90	
-- COLUSA GAGING STATION - MILE 89.4 —													
T. H. Boggs and Sisters	89.7 L	1-6"				3	3	2			8	10	
T. H. Boggs and Sisters	89.8 L				PLANT	REMOVED							
Roberts Ditch Company	90.7 R	2-20"			539	504	772	544	258	119	2736	1252	
I. G. Zumwalt (1)	91.6 R	1-12"					50	50			(4) 100	100	
George P. Ahlf	92.5 L	1-8"			22	26	114	3			165	(5)75	
George P. Ahlf	93.0 L	1-6"			NO	DIVERSION							
U. W. Brown	93.0 R	1-12"				86	29				115	80	
I. G. Zumwalt	93.2 R	1-36"											
		1-18"			NO	DIVERSION							
Paul R. Westfall (1)	93.4 L	1-10"			NO	DIVERSION							
Tuttle Land Company	94.3 R	1-15"											
		1-20"		97	252	326	366	398	137	54	1630	310	
W. D. DeJarnett	94.4 R	1-8"			NO	DIVERSION							
California Lands, Inc.	94.8 R	1-12"				96	71				167	(6)70	
J. W. Browning	95.2 L				PLANT	DISMANTLED							
A. N. Lewis (Colusa Development Company)	95.6 L	1-16"											
		1-20"				157	800	136			1093	75	

* Mileage along river above Sacramento.
(1) New installation 1937.
(2) Formerly Oakland Prune Company.
(3) De Jarnett 30, Nagle 20, Locovitch 20.
(4) Gas pump. No record of operation kept. Duty of water estimated.
(5) Includes 45 acres on adjoining Colusa Development Company property.
(6) Includes 30 acres on adjoining Marsh property.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
I. G. Zumwalt	95.7 R	1-12"				179	27			230	436	225	
Bridget Graham Estate (Griffen)	95.8 L	1-16"			211	271	312	90			884	505	
H. Heitman	97.7 R	1-12"			19	73	28	33	13		166	63	
Frank Beckley	98.0 L	1-10"		5		53	34	25			117	75	
J. L. Erisey	98.3 R	1-10"				24	40	21			85	112	
R. A. Sperry and Colusa Development Company	98.6 L	1-15"			NO	DIVERSION							
D. Boggs	98.8 L	1-18"			35	38	164	28	27		292	87	
Cheney Slough Irrigation Company	99.0 R	1-36"										279	
		2-26"			66	489	211	135			901	(1)	
J. P. Boggs	99.1 L	1-10"			6	69	79	37	28		219	100	
Terrill and Sartain	99.2 L	1-20"			1263	1286	1070	1101	993	97	5810		600
Dave George	99.8 L	1-16"			7	83	101	71	23	22	307	110	
J. W. Browning	100.8 L	1-20"			NO	DIVERSION							
R. C. Wohlfrom	101.1 R	1-20"			144	35	99				278	138	
Clara C. Packer	102.8 R	2-18"											
		2-30"			8	70	191		184		453	412	
		1-36"											
Glenn Colusa Corporation	103.3 L				PLANT	REMOVED							
Charles W. Welch (2)	103.7 R	1-16"			821	723	737	643	125		3049	321	275
Compton Delevan Irrigation District (3)	103.8 R	2-24"											
		1-36"			NOO	DIVERSION(3)						(3)	(3)
C. W. Tuttle (4)	103.9 R	1-16"				218	183	35	35		471	87	
Colusa Development Company and I. G. Zumwalt (5)	104.8 L	1-26"			310	329	496	79		9	1223	445	
												(6)	
Thousand Acre Ranch (H.W.Keller)	106.0 R	1-14"			80	61	79	49			269	199	
California Lands, Inc.	110.0 R	1-12"				120	111				231	185	
California Lands, Inc.	111.2 R	1-6"			1	8	9				18	27	
— PRINCETON FERRY - MILE 112 —													

* Mileage along river above Sacramento.
(1) Acreage divided as follows: Mitchell 75, Seaver 180, Middlecamp 24.
(2) Formerly American Company.
(3) See plant at Mile 154.8 Right.
(4) Formerly E. M. Gordon.
(5) Formerly B. F. Gould Estate.
(6) B. F. Gould Estate 40, J. C. Dunham and B. F. Gould Estate 90, R. G. Stanton and B. F. Gould Estate 80, J. S. Gould 70, D. P. O'Sullivan 40, and Colusa Development Company 125.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
Reclamation District #1004	112.1 L	(1) 2-30" 1-50"		765	4504	4270	3993	4205	3213	162	(2) 21112	335	1165
Princeton-Codora-Glenn Irrigation District (3)	112.4 R	3-24"			NO DIVERSION (3)							(3)	(3)
I. G. Zumwalt	112.6 L	1-10"			54	17	26				97	90	
Edward L. Steele	115.5 L	1-12"			6	42	90				138	76	
— BUTTE CITY GAGING STATION - MILE 115.8 —													
— BUTTE CITY BRIDGE - MILE 115.9 —													
California Lands, Inc.	117.8 R	1-10"				21	69				90	161	
C. T. White	123.7 R	1-6"			NO DIVERSION								
Princeton-Codora-Glenn Irrigation District (3)	123.9 R	3-24"			NO DIVERSION (3)							(3)	(3)
Provident Irrigation District (3)	124.2 R	4-42" 1-36"			NO DIVERSION (3)							(3)	(3)
California Lands, Inc.	124.4 R	1-16"			NO DIVERSION								
F. S. Reager	130.75R	1-6"			3	4	5	5	4		21	8	
— ORD FERRY - MILE 130.8 —													
M. & T. Inc. and Parrott Investment Company (4)	141.5 L	5-24"			289		366	1895	1380		3930 (5)	300 (5)	500 (5)
— OLD CHICO LANDING RAILROAD BRIDGE SITE - MILE 142.1 —													
Chico Hop Company	146.9 L	1-5"			NO DIVERSION								
M. F. Rose	148.7 R	1-6"				2	5				7	17	
M. F. Rose	148.9 R	1-6"			NO DIVERSION								
— GIANELLA BRIDGE - MILE 149.5 —													
California Lands, Inc.	150.0 L	1-10"			97	125	246	57		2	527	135	
Joseph Gianella	150.0L(6)	1-10"			NO DIVERSION								
Holly Sugar Corporation	151.0 R	1-12" 1-16"			486	607	903	995	574	9	3574	1325	
A. Holecek	152.2 R	1-5"			15	5	12	19	3		54	24	
Maas Brothers	154.6 R	1-5"				5	3	4			12	12	

* Mileage along river above Sacramento.

(1) One 30" unit added in 1937.

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

(3) See plant at Mile 154.8 Right.

(4) Formerly Parrott-Phelan Estate.

(5) All on M. & T. Inc. (Parrott Investment Company received all water from Butte Creek source.) An additional 300 acres rice and 225 acres pasture irrigated from Butte Creek. Butte Creek water was as follows: (Acre-feet) April 900, May 2700, June 2250, July 1800, August 1800, September 1800, Total 11,250.

(6) Pump on Nord Slough or Pine Creek Lagoon 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.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS
1937

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
Glenn-Colusa Irrigation District (1)	154.8 R	1-100" 4-72" 2-50" 2-66" 1-42" 2-30"		5004	68875	67098	73171	72695	44150	10193	341186 (2)	18493 (3)	23069 (4)
Jacinto Irrigation District	154.8 R	(5)		508	2396	2636	3977	3834	2757	111	16219	6651	
Compton-Delevan Irrigation Dist.	154.8 R	(5)		208	3203	2420	2460	2261	593		11145	50	1032
Provident Irrigation District	154.8 R	(5)		1567	11145	9219	10122	9388	5381		46822	(6) 2176	6576
Princeton-Codora-Glenn Irr.Dist.	154.8 R	(5)		2392	12042	8833	10429	10159	5351	1863	51069	2455	2367
Maxwell Irrigation District	154.8 R	(5)		367	1230	1190	1230	1230	516	506	6269		870
— CORNING-VINA BRIDGE - MILE 166.5 —													
A. F. Landis	166.7 R	1-3"			5	9	8	10	6		38	15	
Laura B. Caro	166.8 R	1-2"			1	2	2	1	2		8	4	
R. A. Foster	169.1 R	1-8"			NO DIVERSION								
— TEHAMA BRIDGE - MILE 177.5 —													
E. B. Noble	184.5 R	1-14"			104	90	127	105	58		484	180	
Coneland Water Company	187.6 L	1-12"					174	196			370	476	
E. Sluiters	188.6 L	1-8"			1	15	11	10	4		41	18	
— RED BLUFF BRIDGE - MILE 193.45 —													
G. E. Sutton	196.2 R	1-6"			NO DIVERSION								
J. A. Edwards	196.2 L				PLANT REMOVED								
Bank of America (Petersen)	196.5 L	1-4"			NO DIVERSION								
J. Erickson	196.6 L	1-5"			11	31	22	10	11		85	30	
C. Droz	197.0 L	1-8"					42	22	22		86	25	
W. H. Freemeyers	197.65L	1-3"				1	10				11	38	
C. Droz	197.73L				PLANT REMOVED								
— 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 (7)	209.0 L	1-2½"			NO DIVERSION								

* Mileage along river above Sacramento.

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

(2) An additional 4900 acre-feet received by gravity from Stony Creek in April. The diversion shown includes water for users outside of districts as follows (Acre-feet): C. L. Leonard, May 113, June 206, July 337, August 296; Golden State Orchards, May 250, June 357, July 369, August 179, September 60; I. G. Zumwalt, April 198, May 615, June 595, July 615, August 615, September 298; Total 5103.

(3) Includes 125 acres of duck lakes; also 80 acres for C. L. Leonard outside district.

(4) Includes 300 acres for I. G. Zumwalt outside district.

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

(6) Includes 754 rice and 105 general outside of district.

(7) Formerly Cunningham Ranch.

TABLE 32 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS

1937

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. F. Nunes	215.5 R	1-7"			NO DIVERSION								
— JELLYS FERRY - MILE 215.6 —													
J. F. Nunes	216.0 R	1-3"			NO DIVERSION								
W. A. Hunaeus	216.4 L	1-3"					7	6			13	10	
T. A. Haakonson	217.5 L	1-5"				21	42	38	2		103	(1)63	
J. L. Haskins	218.0 L	1-5"					49	9			58	54	
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. W. George	233.0 L	1-6"(2)			NO DIVERSION								
Wm. Menzel Meat Company	240.2 L	1-12"			53	252	275	160	431		1171	142	
Graf and Graf	241.5 L	1-8"		20	84	23	31	36	26		220	38	
Adams Brothers	242.0 R				PLANT REMOVED								
— REDDING-ALTURAS BRIDGE - MILE 242.0 —													
— NEW REDDING-YREKA BRIDGE - MILE 245.9 —													
Anderson-Cottonwood Irrigation District	246.0 R	Gravity		3382	19946	19103	20546	20499	20309	9034	112819 (3)	13000 (4)	
John Diestelhorst	246.3 R	1-10"			31	29	42	65	53	5	(5) 225	17	
— OLD REDDING - YREKA BRIDGE - MILE 246.4 —													
Totals			3459	32727	210339	210927	235304	217924	133271	26510	1070461	100836	66546

* Mileage along river above Sacramento.

(1) Includes 8 acres on adjoining Lundblad property.

(2) 4" unit has been removed.

(3) 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.

(4) Estimated. District cannot furnish data.

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

TABLE 33

*COLUSA TROUGH DIVERSIONS
1937

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.		
Hattie O'Hair	(1)1.1 L				PLANT REMOVED							
Hattie O'Hair (Kalfsbeck and Tolson) (2)	(1)0.35L	1-20"			706	1335	1378	1378	1244		6041	850
— COLUSA TROUGH GAGING STATION - MILE 6 —												
I. G. Zumwalt	2.2 L	1-15"										
		1-20"			NO	DIVERSION						
		1-36"										
A. D. J. Land Company	3.0 L	2-28" Box				119	1037	478	301		1935	200
Maxwell Irrigation District Plant #2A	7.0 R	1-15"										
		1-20"			NO	DIVERSION						
		1-36"										
Maxwell Irrigation District Plant #3A (3)	7.0 R	1-20"			NO	DIVERSION						
	(3)											
S. Ashe (F. Juney	(4)8.0 L	(4) 1-20"			934	1400	1360	1386	1252		6332	830
M. E. Rourke (F. Juney)	(4)8.65R	(4) 1-14"			NO	DIVERSION						
M. E. Rourke (F. Juney)	(4)10.5L	(4) 1-20"			1410	1460	1600	1610	1210		7290	(5)700
— LATERAL HIGHWAY - BUTTE CITY TO WEST SIDE - MILE 20.5 —												
Razor Ranch	20.7R				PLANT	DISMANTLED						
Razor Ranch	21.1R				PLANT	DISMANTLED						
Stevens Brothers	22.0R	1-18"Box			NO	DIVERSION						
Totals			0	0	3050	4314	5375	4852	4007	0	21598	2580

* Main Drain of Reclamation District 2047.
** Mileage along Trough above Colusa-Williams Highway.
*** All rice. No general crops.
(1) Below Colusa-Williams Highway.
(2) New installation 1937.
(3) Plant is on Lateral E (Stone Corral Creek) and is 3/4 mile west of Plant #2A (Mile 7.0 R).
(4) Mileage formerly given as 11.5 and pump is one of 3 units reported at that mileage.
(5) Includes 400 acres on adjoining lands of Mallon and Blevins.

TABLE 34

*BACK BORROW PIT DIVERSIONS
1937

Water User	**Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet								Total Diversion: March to: October Acre-feet	Acreage Irrigated: General	Acreage Irrigated: Rice
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.			
— KNIGHTS LANDING RIDGE CUT JUNCTION - MILE 0.4 R —													
River Farms Company	1.45R	1-20"			NO DIVERSION								
W. P. Dwyer (Crawford & Wallace)	4.35R	1-20"			1232	1493	1708	1828	823		7084		1105
Reclamation District #108	8.8 R	1-14"			NO DIVERSION								
Hershey Estate (E. A. Johnson)	11.15R	1-12"											
		1-14"			859	670	709	730	61		3029		450
Hershey Estate (H. T. Peterson)	13.75R	1-16"			787	970	971	924	124		3776		580
B. F. Mumma	14.75R	1-10"			173	72	138	139			522	100	80
— COUNTY LINE BRIDGE - MILE 15.25 —													
M. T. Emmert	15.75R	1-15"		64	669	713	577	583			2606		378
Katherine West	18.1 R	2-15"			NO DIVERSION								
C. R. Sugget and Gregory Estate	20.0 R	1-15"			539	931	987	1073			3530		400
Gregory Estate	21.35R	1-16"			NO DIVERSION								
Bean and Brindenburg	22.15R	1-16"			NO DIVERSION								
J. W. Browning Company (Abernethy and Kaelin) (1)	22.65L	1-24"		93	1360	930	1035	707			4125		680
— HANNUM BRIDGE - MILE 22.8 —													
Totals				157	5619	5779	6125	5984	1008	0	24672	100	3593

* 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) Plant reinstalled 1937.

TABLE 35

LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS

1937

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				82	502	626	61		1271	650		
West Butte Country Club	3.85L	(2)1-10"				33	160	20			213	250		
Reclamation District 1004	3.9 R	1-15"										500	1315	
		1-24"			357	2064	2858	3440	651		9370	(3)	(3)	
Butte Lodge Gun Club	4.0 R	1-22"			NO	DIVERSION	(4)							(4)900
Reclamation District 1004	9.3 R	Gravity			292	1368	1345	2071	740		(5) 5816	1375		
Butte Basin Gun Clubs (6)	10	Gravity									(6) & (7)			5000 (6)&(7)
Murdock Land Company (8)	19.3 R	1-14"					42	61	27	9	139	60		
-- BIGGS-AFTON ROAD - MILE 19.4 --														
Glen Rice Farms	(9)19.8R	1-24"		62	390	537	660	541	136		2326		200	
O. W. Baker and Sons, Inc. (10)	20.2 R	(10)			NO	DIVERSION								
O. W. Baker and Sons, Inc. (10)	21.2 R	(10)			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) Replaces former 6" unit.

(3) This is the total acreage served by this plant and a portion of the gravity diversion at Mile 9.3 Right.

(4) Served through diversion at Mile 9.3 Right.

(5) A portion of the diversion at this point was used on acreages reported under Miles 3.9 and 4.0 Right.

(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 at old point of diversion.

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

(10) Formerly John Hannah. New units to be installed.

TABLE 35 (CONTINUED)

LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS
1937

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			891	4369	5090	5035	2437	55	17877 (3)	(4)		
M. Marty	0.3 West	1-12"			3	1	44	4			52	100		
G. S. and D. C. Smith	1.4 East	1-8"					32	148	61		241	200		
J. E. Smith	3.0 West	1-10"			8	4	21				33	38		
I. E. Nall	3.5 West	1-10"			42	38	57	29	8		174	110		
Ullrey Brothers (5)	3.7 West	1-10"			5	5	21				31	45		
P. A. Reische	4.1 West	1-12"			36	45	151	115	45		392	(6)202		
E. V. Jacobs	4.8 West	1-10"			51		77	58	26		212	75		
Armstrong, Hensen & Locovitch	5.1 West	1-10"				28	103	38	17	2	188	(7)125		
W. Nall	6.3 West	1-7"			NO	DIVERSION								
T. J. Hageman	6.8 West	3-8"					10				10	20		
— LONG BRIDGE - MILE 7.5														
Totals (Lower Butte Creek and Butte Slough			0	62	2075	8574	11173	12186	4209	66	38345	3750 (8)	1515	5900 (9)

* 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 36.)

(3) Prior to May 23d, water was available for rediversion due to spring run-off.

(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 36, and footnote, Table 64.

(5) Formerly W. H. Ross.

(6) Includes acreages as follows: S. E. Reische 55, C. P. Reische 80, J. E. Messick 15, J. Hemphill 20, Feith 4, and Granneman 4.

(7) Divided as follows: Armstrong 50, Hensen 50 and Locovitch 25.

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

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

TABLE 36

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS

1937

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 1.4 —													
— SOUTHERN PACIFIC RAILROAD CROSSING - MILE 2.5 —													
— KNIGHTS LANDING-MARYSVILLE CAUSEWAY - MILE 12.7 —													
State Reclamation Board	16.1 L				PLANT DISMANTLED								
Middleton and Dessez	17.5 L				PLANT DISMANTLED								
— 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		347	1981	2029	1938	1864	849		9008	4009	
S. F. Robertson (2)	28.6 R	1-10"			NO DIVERSION								
Frye Brothers (2)	29.0 R	1-7"					26				26	26	
— NEW COLUSA-MARYSVILLE HIGHWAY - MILE 29.1 —													
— NORTHERN ELECTRIC RAILROAD CROSSING - MILE 29.15 —													
East Borrow Pit of Sutter By-Pass													
	(3)												
Woodland Livestock Company (4)	0.4 S*	1-14"						145	13		158	270	
Woodland Livestock Company (4)	0.1 S*	1-16"			NO DIVERSION								
— GAGING STATION-WILLOW SLOUGH AT CHANDLER - MILE 0 —													
Woodland Livestock Company (4)	0.5 N*	1-14"											
		1-14"(5)			205	664	559	591	386		2405		300
E. H. Christensen	(6)1.4 N	1-12"			284	359	465	439	228		1775		200
A. W. Kimerer	(6)1.4 N	1-14"			NO DIVERSION								
E. H. Christensen	(6)1.4 N	1-16"(7)			738	825	732	854	279		3428		320
Woodland Livestock Company (4)	1.5 N*	1-14"(8)				24	18	93			135	(9)900	
State Reclamation Board (C. H. Baird)	2.19N*	1-10"					32				32	150 (10)	
Arnold Christensen	2.2 N	1-16"			NO DIVERSION								

(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 35).
(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) Formerly Holmes and Hughes.
(5) Additional unit added in 1937.
(6) Plant is on drain canal which enters By-Pass at this point.
(7) Replaces 12" unit.
(8) 4" unit has been removed.
(9) This is the total acreage served by this plant and the one at Mile 2.9 N*.
(10) Total acreage served by this plant and one at 2.65 N*.

TABLE 36 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS
1937

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)													
State Reclamation Board (C. H. Baird)	2.65 N* (1)	(2)1-4"					5	5			10	(3)	
Woodland Livestock Company (4)	2.9 N*	1-14"				168	141		193		502	(5)	
Woodland Livestock Company (4)	4.00 N*	(6)1-14"				378	93	230	144		845	100	
— KNIGHTS LANDING-MARYSVILLE CAUSEWAY - MILE 4.4 N —													
Woodland Livestock Company (Alonso Brothers) (4)	4.5 N*	1-14"					78				78	250	
State Reclamation Board (E. H. Christensen and Son)	5.8 N*				PLANT REMOVED								
State Reclamation Board (F. Fisher) (7)	5.9 N*	1-8"					97	63			160	990 (8)	
State Reclamation Board (F. Fisher) (7)	6.35 N*	1-12"					183	61			244	(9)	
State Reclamation Board (F. Fisher) (10)	6.6 N*	1-12" (11)					237				237	(9)	
State Reclamation Board (E. H. Christensen and Son)	6.95 N*				PLANT REMOVED								
— EAST LEVEE OF WADSWORTH CANAL - MILE 16.0 N —													
R. H. Morehead	18.75 N	1-10"			NO	DIVERSION							
Meyer, Platter, Morehead, DeWitt Bros., Epperson & Middleton	19.1 N	1-14"			30	411	357	531	300		1629	652	
— NEW COLUSA-MARYSVILLE HIGHWAY - MILE 19.98 —													
— NORTHERN ELECTRIC RAILROAD CROSSING - MILE 20.0 N —													
Sacramento Slough													
Woodland Livestock Company (4)	1.4 R (12)	1-24"					46	327			373	350	

(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) Replaces former 3" unit.
(3) See plant at Mile 2.19 N*.
(4) Formerly C. F. Holmes and R. E. Hughes.
(5) See plant at Mile 1.5 N*.
(6) 10" unit has been removed.
(7) New installation 1937.
(8) This is the total acreage irrigated by this plant and the ones at Miles 6.35 N* and 6.6 N*.
(9) See plant at Mile 5.9 N*.
(10) Former lessee E. H. Christensen and Son.
(11) New pump to replace Christensen's 12" pump.
(12) Mileage is given easterly from drainage plant of Reclamation District 1500 which is at head of slough.

TABLE 36 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS

1937

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
Knights Landing Ridge Cut (1)													
	(2)												
— RECLAMATION DISTRICT 730 DRAINAGE PLANT #2 - MILE 3.8 —													
George Pollock (3)	4.55 L	1-12"			NO	DIVERSION							
Hershey Estate (A. J. Darnielle)	4.7 L	1-15"				55	45	6	2		108	130	
Sieber Brothers	4.7 R	1-6"			6	9	11	8	11		45	18	
— WEST LEVEE YOLO BY-PASS - MILE 6.3 —													
Frank Fisher and Henry Rich	6.3 (4)	Gravity				1800	1200	2100	2100		(5) 7200	410	1010
E. L. Wallace	6.3 (4)	Gravity			NO	DIVERSION							
Yolo By-Pass (East Borrow Pit or Tule Canal) (6)													
	(7)												
J. S. Bell	0.8 S	1-10"			NO	DIVERSION							
Nickerson Land Co. (F.J.Rogers)(8)	0.7 S	1-10"					21	37			58	119	
George Swanston (William Dee)	0.3 S	1-12"					160	129			289	244	
George Swanston	0.1 N*	1-18"			NO	DIVERSION							
George Swanston (Wallace and Crawford)	1.8 N*	(9) 1-20"			144	1329	1088	972	600		4133		510
California Packing Corporation(10)	2.4 N	(11) 1-20"			150	471	500	280	63	262	1726	(12) 890	
California Packing Corporation(10)	3.4 N	1-8"							16		16	(13)	
Smith and Roberts (I. G. McDonnell (14)	5.9 N	1-10"					129	85	5		219	135	
— 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*										(15)		(15)
— FREMONT WEIR (EAST END) - MILE 12.3 —													

(1) 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 66.
(2) Mileage is given southerly from head in Back Borrow Pit near Knights Landing.
(3) Formerly California National Bank.
(4) Diversions at this point are for irrigating land in Yolo By-Pass (See Yolo By-Pass diversions).
(5) Prior to June 1st ample water was available from spring runoff. After this date surplus flow in Knights Landing Ridge Cut by-passed this diversion and became available for plants on East Borrow Pit of Yolo By-Pass (Tule Canal).
(6) Additional water for the diversions listed under Yolo By-Pass is available because of spill from Knights Landing Ridge Cut.
(7) Mileage is given northerly or southerly from North levee of Sacramento By-Pass. Asterisk indicates land irrigated is in By-Pass area.
(8) Formerly listed as Joe Valine.
(9) 20" unit replaced in 1937 with new 20" unit.
(10) Formerly C. S. Luce.
(11) Replaces 10" unit.
(12) This is the total acreage served by this plant and the one at Mile 3.4 N.
(13) See plant at Mile 2.4 N.
(14) New installation 1937.
(15) See Knights Landing Ridge Cut diversions, Mile 6.3.

TABLE 36 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS
1937

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
Back Borrow Pit Reclamation District 1000													
— GAGING STATION - MILE 2.1 —	(1)		NO DIVERSIONS										
Totals - By-Pass and Drainage Channel Diversions													
West Borrow Pit of Sutter By-Pass			0	347	1981	2029	1964	1864	849	0	9034	4035	0
East Borrow Pit of Sutter By-Pass			0	0	1257	2829	2997	3012	1543	0	11638	3312	820
Sacramento Slough			0	0	0	0	46	327	0	0	373	350	0
Knights Landing Ridge Cut			0	0	6	1864	1256	2114	2113	0	7353	558	1010
Yolo By-Pass (East Borrow Pit or Tule Canal)			0	0	294	1800	1898	1503	684	262	6441	1388	510
Back Borrow Pit Reclamation District 1000			0	0	0	0	0	0	0	0	0	0	0
Totals			0	347	3538	8522	8161	8820	5189	262	(2)34839	9643	2340

(1) Mileage is given easterly from Sacramento River.
(2) Includes 9008 acre-feet included also in diversions listed under Butte Slough. See footnote (2) West Borrow Pit of Sutter By-Pass diversions, this table, and footnote (2) Butte Slough Diversions, Table 35.

TABLE 37

FEATHER RIVER DIVERSIONS
1937

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
Sutter Basin Corporation	0.6 R	1-16"			NO	DIVERSION							
Punter and Rutz (1)	1.55L	1-8"				28	39	32	5		104	(2) 90	
Sutter Basin Corporation	2.6 R	1-20"											
		1-26"					983	2097	70		3150	1675	
California Lands Incorporated	6.44L	1-8"			NO	DIVERSION							
M. Scheiber	7.7 L	(3)1-10"			21	141	191	161	136	38	688	(4)233	
— NICOLAUS GAGING STATION - MILE 9.3 —													
— NICOLAUS BRIDGE - MILE 9.4 —													
Bercut-Richards Company (5)	9.75R	1-20"				499	692	421	140	34	1786	740	
Garden Highway Mutual Water Co.	13.1 R	1-20"											
		1-24"		93	1531	1790	2169	1913	1262	37	8795	(6)1182	800
Feather River Water Company	16.35R	1-14"				299	361	191	189		1040	236	
Plumas Mutual Water Company	17.5 L	1-22"				584	1164	2045	906	830	5529	1482	
G. C. Shannon	18.75R	1-6"				44	49	38	19		150	87	
Oswald Water District	21.4 R	1-16"			127	931	771	608	489	180	3106	729	
G. C. Shannon (7)	22.5 R	1-6"				22	67	33	25		147	46	
Alicia Mutual Water Company	24.0 L	1-26"											
		1-30"			906	1857	2245	1932	1580	426	8946	1158	250
Cunningham Brothers	25.2 R	1-10"				1	39				40	48	
R. Saturi	27.0 L				PLANT	REMOVED							
— MOUTH OF YUBA RIVER - MILE 27.3 —													
— YUBA CITY-MARYSVILLE BRIDGE - MILE 28.0 —													
Levee District No. 1 (8)	28	Gravity	413	400	200					685	1698	(8)	
J. L. Sullivan	33.9 R	1-10"	207	116		138	114	73	59		707	140	
Sutter Butte Canal	38.1 R	2-42"											
(Sunset Plant) (9)		1-26"			NO	DIVERSION (9)						(9)	(9)
Pacific Highway Orchards Tract	43.7L (10) H.S1.0.4L:		PLANT	TEMPORARILY	DISMANTLED								

* Mileage along river above mouth.

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

(2) Includes acreages as follows: Finch 15 and Hennessey 20.

(3) Replaces former 8" unit.

(4) Includes 40 acres on adjoining Garwood property.

(5) Formerly George Pollock Company.

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

(7) New installation 1937.

(8) An indeterminate acreage benefitted. Water used to replenish ground supply along Gilsizier Slough.

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

(10) 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 37 (CONTINUED)

FEATHER RIVER DIVERSIONS

1937

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
Ogden Estate	43.7L (1) H.S1.0.7L	(2)1-5"			2	11	14	9	4		40	13	
Moznett-Wetmore Subdivision No.1	43.7L (1) H.S1.1.2L	1-10"		10	84	110	52	98	31		385	146	
Manuel Barba	43.7L (1) H.S1.1.25L	1-8"			26	29	48	43	25		171	65	
A. P. Barba	47.9 L	1-12"			167	118	199	183	109	110	886	122	
E. F. Biggs	48.3 L	1-10"				117	68	131	14		330	339	
Clyne Ranch	51.0 R	1-6"				8	58	7			73	(3) 46	
C. E. Porter	51.1 L	1-7"			18	35	37	30	24	3	147	50	
Edward Steadman	51.4 R	1-10"				24	112	14		60	210	105	
California Lands Incorporated	51.6 R	1-5"			NO	DIVERSION							
W. E. Blower	52.1 L	(4)1-10"			21	24	54	51	41	6	197	90	
California Lands Incorporated	52.5 L	1-6"					14	4			18	55	
F. L. Morris	52.7 L	1-8"			18	25	41	21	3	2	110	80	
Frank Dutra	52.9 R	1-6"				10	11	5	5		31	30	
G. H. Bogue	53.1 R	1-6"			20	12	14	14	3		63	40	
Budh Singh	54.7 R	1-8"			47	32	41	18	16		154	57	
Hearst Estate (Sunical Packing Co.)	55.1 L	1-14"			31	232	353	296	176	30	1118	383	
L. A. Kister Estate	55.5 L	1-8"				29	48	24	7		108	91	
Rio Bonita Ranch	56.6 R	1-14"			NO	DIVERSION							
J. H. Abbey	58.6 R	1-8"			NO	DIVERSION							
Alvin Kister	57.0 L	1-8"				17	71	60	3		151	50	
J. E. Carrico	57.0 R	1-8"	IRRIGATION			PLANT	ABANDONED (5)						
Henry Haselbusch	57.9 R	1-10"				31	10	10	4	19	74	70	
Sutter Butte Canal Company	(6)58.1 R	Gravity		347	65891	65801	67329	60680	41835	20098	325105	15472	11639
Richvale Irrigation District	(6)58.1 R	Gravity		694	13182	13161	13466	14212	10767	5173	70655	401	8419
Western Canal Company	59.7 R	Gravity		863	10322	13722	18926	17794	7999	2227	(7)71853	1172	9095
U.S.G.S. OROVILLE GAGING STATION - MILE 65	—												
Totals			620	5647	92614	99882	109850	103248	65946	29958	507765	26705	30203

*Mileage along river above mouth.

(1) 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.

(2) Formerly listed as 4" unit.

(3) Includes 15 acres on adjoining Steadman property.

(4) Formerly listed as 9".

(5) Water is used for dredge flotation.

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

(7) The October diversion as well as 6347 acre-feet in November were for flooding gun clubs in Butte Basin (See Lower Butte Creek diversions).

TABLE 38

YUBA RIVER DIVERSIONS
1937

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 Incorporated	0.9 L	1-5"				1	1		1		3	5	
Davis Brothers	1.6 L	1-12"				88	73	141	69		371	(1)120	
Charles Shinkle (Harrington) (2)	1.8 R	1-5"				1	19	9			29	12	
G. E. Edwards	1.9 L	1-6"			NO	DIVERSION							
Davis and Cox (3)	3.0 L	1-10"				8	42	52	87	6	195	82	
Ward Hughins	3.0 R	1-6"				10	18	30	32		90	30	
E. O. Rubke	4.1 L	1-8"				78	116	131	77		402	218	
James Trainor (J. N. Covert) (4)	4.2 R	1-3"				5	7	7	5		24	10	
S. J. Monaco	4.3 R	1-4"				8	28			1	37	5	
Earl Fruit Company & Dinsmore	4.75L	1-6"(5)			5	52	37	27	1		122	56	
J. S. Johnson (4)	4.8 L	1-6"											
		1-4"				11	10	5			26	20	
Dantoni Orchards (Earl Fruit Co.)	5.3 L	1-8"			60	55					115	75	
Marysville River Farms Company (L. A. Plantz)	5.9 L	1-10"				23	26	55	30	2	136	75	
Marysville River Farms Company (J. V. Pearson and J. Nagler)	6.35L	1-10"			NO	DIVERSION							
Marysville River Farms Company (L. A. Plantz)	6.35L	1-5"			NO	DIVERSION							
Hallwood Irrigation Company and Cordua Irrigation District (6)	11.0 R	Gravity		8093	9848	9715	9372	9358	8533	2694	57613	5991	2598
Yuba Consolidated Gold Field Co.	14.5 L	Gravity	NO	DIVERSION	FOR	IRRIGATION						(6)	(6)
Totals			0	8093	9913	10055	9749	9815	8835	2703	59163	6699	2598

* Approximate mileage along river above highway crossing at Marysville.
(1) Includes 20 acres on adjoining Schimp lands.
(2) Corrected spelling. Formerly listed as Shingle.
(3) Formerly Virge Cox.
(4) New installation 1937.
(5) Changed from 10" to 6" in 1936 but not reported.
(6) Hallwood Irrigation Company and Cordua Irrigation District have a common point of diversion and common canal for about one-half mile; Diversion and acreage figures are for combined projects. Irrigated acreage is segregated as follows: Hallwood - Rice 720, General 4110; Cordua - Rice 1878 (includes 610 outside of district), General 1881.

TABLE 39

AMERICAN RIVER DIVERSIONS
1937

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"					9	5			14	35
North Sacramento Land Company	2.55 R	1-3"			NO	DIVERSION						
North Sacramento Land Company	2.80 R	1-5"				5	6	14			25	20
G. A. Meister (Andreozzi & Justi)	3.1 L	1-10"			NO	DIVERSION						
— SOUTHERN PACIFIC RAILROAD BRIDGE - MILE 3.5 —												
G. A. Meister	3.7 L	1-4"										
		1-6"				42	12	1			55	(1)
G. A. Meister (Andreozzi & Justi)	4.1 L	1-10"			6	13	31	16	20		86	(2) 79
W. S. Kendall Estate (3)	5.7 L	1-10"				76	55		4		135	170
— GAGING STATION - AMERICAN RIVER AT SACRAMENTO - MILE 6.1 —												
S. H. Cowell	7.1 L	1-7"					24	11	9		44	15
E. Clemens Horst Company	7.5 R	1-8"				17	55	3			75	104
Hagginbottom Land Company	7.7 R	1-4"			NO	DIVERSION						
Hagginbottom Land Company	7.8 R	(4) 1-5"				32	25	22			79	44
Azevedo Dairy (5)	7.95 R	1-10"						79	30	19	128	48
J. H. Kerby	9.0 L	1-6"			11	42	36	16			105	42
Azevedo Dairy	9.2 R	1-12"				64	290	143	138		635	76
W. Wright (6)	9.2 L	1-8"				20	25	12			(7) 57	(7) 50

* Mileage along river above mouth.
** All general crops. No rice.
(1) See plant at Mile 4.1 Left.
(2) This is the total acreage served by this plant and the one at Mile 3.7 Left.
(3) New installation near an old point of diversion.
(4) Replaced 4" unit in 1936.
(5) New installation 1937.
(6) Formerly M. Oji.
(7) An indeterminate amount of additional water was received from wells and used on the acreage reported.

TABLE 39 (CONTINUED)

AMERICAN RIVER DIVERSIONS
1937

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)1-5"				19	15	9			43	(2)
C. E. Wells	9.5 L	1-5"				21	11	4			36	(3) 50
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"			50	31	24	14	10	20	149	87
Guy H. Roddan	10.3 L	1-10"	3	10	11	16	30	31	14	4	119	27
Gold Nugget Orchard Company (E. A. Boyle)	10.4 R	1-5"				18	36				54	17
Hagginbottom Land Company	10.5 R	1-6"					22	14	11		47	37
Mucke Sand and Gravel Company	11.2 L	1-6"		1	6	7	5	7	6	3	35	20
J. T. Gore Estate	11.5 L	1-6"			NO	DIVERSION						
William A. Meyer	11.7 L	1-4"				12	15	13			40	27
Harry Nakatomi	11.7 L	1-5"				15		13	4		32	35
H. T. Danielson	13.1 R	1-5"			2	2					4	3
P. Osterli	13.2 R	1-6"				61	55	42			158	55
Mary Deterding	13.9 R	1-6"				30	63	39			132	77
Mary Deterding	14.7 R	1-4"			NO	DIVERSION						
Mary Deterding	15.1 R	1-6"				12	31	1			44	20
Carmichael Irrigation District	16.0 R	1-12"										
		1-8"		108	238	525	641	741	551	235	3039	2205
		1-6"										
William H. Devlin	17.1 R	1-6"			5	2	2	2			11	10
-- GAGING STATION - AMERICAN RIVER AT FAIROAKS - MILE 19.2 --												
Totals			3	119	329	1082	1518	1252	797	281	5381	3353

* Mileage along river above mouth.
** All general crops. No rice.
(1) Replaces former 8" unit.
(2) See plant at Mile 9.5 Left.
(3) This is the total acreage served by this plant and the one at Mile 9.35 Left.

TABLE 40

DELTA UPLANDS DIVERSIONS FROM CACHE SLOUGH
1937

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 T6N, R1E.	1-36" 1-30"	0	471	1340	1810	1965	1845	1355	340	9126	2099

* All general crops. No rice.

TABLE 41

DELTA UPLANDS DIVERSIONS FROM OLD SAN JOAQUIN RIVER
1937

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	36.5L(1)	2-30"										
		1-24"		381	5348	4784	5174	5480	2859	1350	25376	13642
		1-18"										
Byron-Bethany Irrigation District	40.9L(2)	1-30"										
		1-26"		515	2865	2955	3175	2815	2225	1415	15965	7600
Joe Santos	44.6L(3)	1-7"			NO	DIVERSION						
E. H. Stevenson Estate	45.3 L	1-12"			NO	DIVERSION						
H. Lindeman	47.2 L	1-12"				107	147				254	220
Gus Lindeman (H. Lindeman) (4)	47.2 L	1-10"			NO	DIVERSION						
West Side Irrigation District	47.65L(5)	7-15"		1684	3849	2035	3436	2265	838	1574	15681	7146
George Froese (6)	48.7 L	1-8"			17	52	21	23	17		130	75
Naglee-Burke Irrigation District	50.4 L	1-16"										
		1-18"			1037	950	1230	1066	880	470	5633	2449
Freemont Irrigation Association	50.9 L	1-14"			228	170	305	201	219	42	1165	586
Joe Freitas	51.0 L	1-8"			7	2	8	11	4	2	34	30
Attilio Casserini	51.2 L	1-8"			6	3	4	6	5		24	40
Excelsior Ranch	52.4 L	1-10"	3	41	61	35	90	67	53		350	(7) 125
-- TOM PAINE SLOUGH - MILE 54.3 --												
Totals			3	2621	13418	11093	13590	11934	7100	4853	64612	31913

* 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) To junction of Old River and Italian Slough. Pumping plant is located two and three-fourths miles southwest along Italian Slough and extension cut.
(3) Plant is on cut which joins river at Mile 44.6 Left.
(4) Formerly A. F. Nunes.
(5) To junction of Old River with Intake Cut. Pumping plant is located one mile south along Intake Cut.
(6) Formerly Langeman and Froese.
(7) Includes 50 acres on Stevinson Estate (See Tom Paine Slough, Mile 0.7 S).

TABLE 42

DELTA UPLANDS DIVERSIONS FROM TOM PAINE SLOUGH
1937

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.		
Stinson Estate Company	0.7 S	2-18"		37	89	167	213	155	69	30	760	(1)681
Stinson Estate Company	1.2 S	1-18"		19	22	40	29	59			169	(2)
Holly Western Sugar Company	(3)2.1 S	1-12"					39	161	156	161	517	Industrial
Tracy Clover Irrigation District	(3)2.1 S	1-16"			167	209	261	196	214		1047	449
Pescadero Reclamation District #2058												
Plant Number 1	2.9 S	1-12"		56	33	79	83	91	80		422	(4)2172
Plant Number 3	6.3 S	1-24"			1010	981	1294	1066	800	236	5387	(5)
Plant Number 5	8.3 S	1-12"			142	208	168	175	79	24	796	(5)
Plant Number 5A	9.0 S	1-12"			82	180	86	138	28	52	566	(5)
Totals			0	112	1545	1864	2173	2041	1426	503	9664	3302

* 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. Figure includes 231 acres on adjoining lands. An additional 50 acres served from Excelsior Water Company (Old San Joaquin River 52.4 Left).
(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) This is the total uplands area (South of Tom Paine Slough) irrigated from all Pescadero Reclamation District plants on Tom Paine Slough.
(5) See plant at Mile 2.9 S.

TABLE 43

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER
1937

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 —												
Annie Jury	45.55 R	1-6"			NO DIVERSION							
Paul Weston	46.3 R	1-6"(1)			1	28	26	1			56	60
R. C. Rose	46.65 R	1-8"				5	23	3			31	70
Wilhoit and Hammill	46.85 R	1-10"					25	17			42	65
W. J. Talbot (2)	47.2 R	1-8"(3)					13	10	2		25	45
Wolfinger Brothers	47.3 R	1-10"				31	37	9			77	45
Alma A. Haack (4)	48.0 R	1-12"				20	5				25	18
H. G. Learned (Lee Young)	48.3 R	1-4"			1	3	7	11	5	3	30	9
H. G. Learned (Yoshido)	48.5 R	1-3½"			4	4	10	12	7	2	39	16
Joe Calcagno	48.5 R	1-6"			2	5	18	14	13	3	55	60
F. Piccardo, J. Vigliani and A. Calcagno	48.6 R	1-6"	1	4	17	33	44	44	22	11	176	60
G. B. Figari (J. Calcagno)	48.7 R	1-5"			NO DIVERSION							
M. O. Couper	49.0 R	1-10"				15	14				29	50
Mettler, Cross and Drury (S. B. Chapman)	49.5 R	1-14"			48	42	33	47		30	200	100
A. A. Rodgers	50.1 R	1-10"		2	20	23	30	21	42	1	139	40
— BRANDT BRIDGE - MILE 50.2 —												
Brandt Brothers	50.4 R	1-6"		2	4	3	4	2	12	2	29	8
Frank Reichmuth	50.4 R	1-8"			16	14	17	17	12		76	(5) 30
Brandt Brothers	50.8 R	1-6"										
		1-7"	2	8	27	22	23	40	11	8	141	50
		1-10"										
California Lands, Incorporated	52.4 R	1-6"				9	9	5	1		24	18
Julia Battilana (6)	52.9 R	1-5"			6	7					13	20
California Lands, Incorporated	53.2 R	1-12"				116	42				158	120
F. De Lima	53.4 R	1-8"			2	6	13	21	4	1	47	30
M. Dos Reis	53.7 R	1-12"			191	148	239	119	157		854	416
R. E. Albertson	54.9 R	1-10"			34	49	52	65	26	28	254	66
— JUNCTION WITH MIDDLE RIVER - MILE 56.2 LEFT —												

* 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) 12" unit has been removed.
(2) Formerly T. J. Wolfe.
(3) Replaces former 5" unit.
(4) Formerly John Haack.
(5) Reichmuth 15, Lagler 15.
(6) Formerly Joe Margre.

TABLE 43 (CONTINUED)

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER
1937

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.		
Oakwood Stock Farm	57.0 R	1-14"			43	90	123	79	57		392	(1) 187
James Tobin	57.15R	1-7"			NO DIVERSION							
T. J. Dutnall	57.3 R	1-3"			NO DIVERSION							
A. J. Thomson	57.3 R	1-5"			NO DIVERSION							
G. Gardella Company	57.5 R	1-4"		4	7	8	9	7	5	2	42	10
V. Sanguenetti	58.4 R	1-2½"			1						1	4
G. B. Figari (G. Alfieri)	58.6 R	1-3"			1	1					2	1
R. Mauro	58.7 R	1-4"			NO DIVERSION							
— MOSSDALE BRIDGE - MILE 58.9 - RECORDING GAGE —												
C. C. Abersold	59.25R	1-6"		11	15	19	20	29	19		113	33
H. A. Neistrath (Madruga)	59.3 R	1-14"			86	96	78	132	192		584	120
H. A. Neistrath (Madruga)	(2)60.1 R	1-6"			13	7	20	20	10	16	86	42
— JUNCTION WITH PARADISE CUT - PARADISE DAM - MILE 62.2 LEFT —												
Banta Carbona Irrigation District	67.5 L	1-36"										
		3-24"		5322	5948	3454	11279	6531	2084	1852	36470 (3)	16328 (4)
		2-20"										
Reclamation District #2075	71.0 R	1-16"		2	16	27	327	351	141	11	875	1315
Mortensen, Borges and Whitman(5)	73.2 R	1-12"			9			119			128	(6) 162
J. Lawrence	75.0 R	1-4"			NO. DIVERSION							
Henry Gard	75.1 R	1-6"						2			2	10
J. W. Cannon	75.2 R	1-4"			NO DIVERSION							
S. G. Paxton	75.25R	1-5"						4	2		6	20
R. R. Swank	75.35R	1-4"			NO DIVERSION							
R. N. Jansen	75.45R	1-6"						3			3	10
Ralph Martin (Simpson)	75.7 R	1-7"			NO DIVERSION							
Ralph Martin (Loe Wan)	76.2 R	1-6"					2	2			4	10
— U.S.G.S. GAGING STATION - SAN JOAQUIN RIVER NEAR VERNALIS - MILE 76.7 —												
Totals			3	5355	6512	4285	12542	7737	2824	1970	41228	19648

* 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) Oliveria 100, Silveria 87.
(2) Up Walthall Slough .2 mile and opposite this mileage on river.
(3) An additional 879 acre-feet diverted in November.
(4) Includes 2000 acres outside of District.
(5) Formerly Mortensen, Anderson and Whitman.
(6) All for Mortensen.

TABLE 44

SAN JOAQUIN RIVER DIVERSIONS--1937

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 —													
River Junction Farms Company #2	79.1 R				PLANT REMOVED								
— STANISLAUS RIVER - MILE 79.7 RIGHT —													
— MAZE ROAD BRIDGE - MILE 81.85 —													
W. C. Blewett	81.95L	3-12"		46	222	206	240	317	334	29	1394	1081	
El Solyo Ranch	82.05L	3-18"											
		1-12"	212	839	2369	1586	2602	2364	1732	1072	12776	3826	70
— 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"		2057	7461	6773	14946	11156	3802	1177	47372	20762	
White Lake Ranch #1	91.8L(1)	1-12"(2)			78	102	131	57			(3) 368	(3) 200	
White Lake Ranch #2	91.8L(1)	2-14"(4)			SEE PLANT NO. 1						(5)	(5)	
White Lake Ranch #3	91.8L(1)	1-12"(4)			NO DIVERSION								
— LAIRD SLOUGH BRIDGE - GAGING STATION - SAN JOAQUIN RIVER NEAR GRAYSON - MILE 96.05 —													
Rancho El Pescadero	98.9 L	1-16"			64	94	152	178			488	550	
Patterson Water Company	104.4 L	4-26"											
		1-18"			6281	6475	6711	6765	5294	431	31957	13125	
		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 Company	109.8 L	2-16"											
		1-8"		115	592	690	944	921	874	462	4598	1521	160
E. Ustick	112.55R	1-12"		43	115	105	113	105	93	90	664	300	
— CROWS LANDING BRIDGE - MILE 113.4 —													
Laura C. Johnson (6)	113.5 R	1-10"				4	4	2			10	15	
A. J. Silveira	113.85R	1-6"					7	7	5	2	21	12	
A. J. Silveira	114.35R	1-8"(7)				6	9	20	9	5	49	23	
King Ranch	114.95R	1-10"			NO DIVERSION								
L. B. Crow (Catrina & Machado)	116.05L	1-14"			16	71	57	48	29	3	224	(8) 77	
Oscar Hogan	116.45R	1-12"									(9)	(9)	
C. F. Olinger	116.95R	1-12"					17	23	11	24	75	50	
— 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			212	3100	17198	16112	25933	21963	12183	3295	99996	41542	230

* 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) Replaces 6" unit.
(3) These are the combined diversion and acreage figures for plants #1 and #2.
(4) Replaces 8" unit.
(5) See Plant No. 1
(6) Formerly James J. Johnson.
(7) Replaces 7" unit.
(8) All for Machado.
(9) Refused to furnish record of pump operation or acreage irrigated.

TABLE 45

MERCED RIVER DIVERSIONS
1937

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 —												
Stevinson Water District	3.8 R	1-15"				125	373	400	368	56	1322	460
E. C. Brown (1)	4.0 L	1-8"			33	11	49	54	9	15	171	81
E. C. Brown (2)	4.2 L	1-4"					3	2			5	15
H. DeAngeles	5.8 L	1-10"			70	49	80	70	38	8	315	80
J. F. Peck	6.1 L	1-18"			108	129	93	136	68		534	90
Stevinson Water District (3)	6.25 L	1-6"										
Stevinson Water District	6.55 L	1-15"			NO DIVERSION							
Francis Hartman	8.5 L	1-12"			3	45	33	7			88	100
Mary Collier	8.85 L	1-8"			7	31	4	28	3	1	74	53
Grace McCullagh	9.4 L	1-10"			230	368	183	192	93	42	1108	200
R. W. Adams and J. B. Silva	10.35 L	1-10"		6	236	332	340	284	202	89	1489	410
		1-8"										
W. D. Adams	10.85 L	1-5"		40	143	224	166	185	90	14	862	408
		1-12"										
C. G. McLaughlin	11.55 L	1-4"					5	4	1		10	7
H. F. Milliken Estate	11.6 L	1-10"		8		98	45	4			155	75
J. Regello	11.6 L	1-12"					115	28			143	120
— NEW MILLIKEN BRIDGE - MILE 11.65 —												
A. J. Azevedo (4)	12.35 L	1-10"		20	27	49	113	50	13		272	103
Pacific Coast Joint Stock Land Bank	12.85 L	1-10"			43	108	44	69	8		272	140
		1-6"										
California Lands, Incorporated	16.5 L	1-12"				31	125	32			188	105
Merced River Farms Company	17.05 L	1-6"		2	3	1	1	1	1		9	15
— U.S.G.S. GAGING STATION - MERCED RIVER NEAR LIVINGSTON - MILE 17.1 —												
R. G. Woodward (5)	17.3 L	(6)1-6"			NO DIVERSION							
J. Clark (5)	17.65 L	1-3"			NO DIVERSION							
O. B. Daniels (Jordan)	17.7 L	1-5"					3				3	7
C. P. Hockett and F. Simpkins	18.7 L	1-6"				3	15	13	4	2	37	18
J. A. McDonough	19.3 L				PLANT REMOVED							
George Bloss	20.3 R	1-3½"			NO DIVERSION							
John Reininghaus	20.4 L	1-6"					31	72			103	112
W. J. Haskins (H. A. Carter)	20.65 R	1-3½"				3	1	2	2	2	10	12
— SOUTHERN PACIFIC RAILROAD (MAIN LINE) - MILE 21.05 —												
Sunbeam Farm Company	21.1 R	1-6"			5		7	15	15	15	57	23
William Collier	21.15 R	1-6"			PLANT REMOVED							
William Collier (7)	21.5 R	1-8"			15	3	4				22	15

* Mileage along river above mouth.

** All general crops. No rice.

(1) Formerly Floyd Stevinson.
(2) Formerly J. Grey and W. E. Mitchell.
(3) Listing of plant will be discontinued as pumping is not considered to be directly from river.
(4) Formerly M. Azevedo.
(5) Formerly R. G. and G. L. Woodward.
(6) 4" unit has been removed.
(7) New installation 1937.

TABLE 45 (CONTINUED)

MERCED RIVER DIVERSIONS

1937

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 (1)	21.75 R	1-6"			27	27	27	14			95	20
William Collier (O.W.Harrison)	22.2 R	1-6"										
		1-12"		24	83	95	93	253	174	82	804	201
William Collier	23.3 R	1-6"				32	84	40	37	1	194	67
M. McConnell	23.4 L	1-5"			NO DIVERSION							
C. J. McConnell	24.2 L	1-5"				4	4	2	3		13	8
California Lands, Incorporated	24.3 R	1-4"			NO DIVERSION							
C. J. McConnell	24.5 L	1-6"			7	10	12		12		41	17
California Lands, Incorporated	24.6 R	1-6"				6	16	11			33	(2)100
California Lands, Incorporated(1)	25.0 R	1-5"			23	28		20	40	15	126	(3)
California Lands, Incorporated(1)	25.5 R	1-6"			14		2	28	23	9	76	(3)
River Farms Association	26.3 R	1-8"			72	72	154	69			367	60
W. C. Magneson (4)	26.55 R	1-5"					40		15		55	16
— SANTA FE RAILROAD CROSSING - MILE 27.05 —												
W. C. Magneson	27.6 R	1-10"		8	18	34	69	35	76	31	271	150
M. Nishihara	27.8 R	1-4"			10	1	9	7			27	15
Y. Tanabe	28.1 R	1-6"				15	11	1	6	2	35	20
G. H. Lovely (Pierce)	28.4 R	1-4"			4	2	5	8			19	20
J. Campadoncia	28.6 R	1-6"			NO DIVERSION							
D. J. Enright (Alves)	28.6 R	1-8"			14	24	23	50	34		145	85
C. L. Mehrton (Blair)	29.1 R	1-7"						8			8	20
Tony Demchilli (Bettencourt)	29.75 R	1-6"				23	22	33	15		93	30
American National Trust Co.(Alves)	29.9 R	(5)2-6"				19	43	44			106	(6) 150
California Lands, Inc.(Maitoza)	30.2 L	1-6"				2	6	3	6		17	24
American National Trust Co.(Alves)	30.95 R	1-12"				73	37	33	7		150	(7)
California Lands, Inc. (Maitoza)	31.1 L	1-8"				16	14	12	12		54	40
Mondo Brothers (1)	32.0 R	1-6"										
		1-8"			106	223	380	347	271	3	1330	225
— SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) - MILE 32.52 —												
B. H. Arkella (8)	32.9 R	1-6"				25	33	52			110	60
B. H. Arkella (8)	33.55 R	1-7"				125	167	92			384	140
C. P. Stout (W. Westfall)	39.2 L	1-24"			40	48	30	66	25		209	38
— GAGING STATION (MERCED RIVER AT YOSEMITE VALLEY RAILROAD CROSSING) - MILE 42.1 —												
Totals			0	108	1341	2514	3114	2876	1671	387	12011	4155

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

(1) New installation 1937.
(2) This is the total acreage for this plant and the ones at Miles 25.0 and 25.5 Right.
(3) See plant at Mile 24.6 Right.
(4) Formerly C. A. Laughlin.
(5) 6" unit added in 1937.
(6) This is the total acreage for this plant and the one at Mile 30.95 Right.
(7) See plant at Mile 29.9 Right.
(8) Formerly Pacific Coast Joint Stock Land Bank.

TABLE 46

TUOLUMNE RIVER DIVERSIONS
1937

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)	1.8 R	1-10"			N O	D I:V E R S:I O N						
J. M. DeSouza	2.2 R	1-6"		6							6	4
E. B. Henry	3.1 R	1-16"		15			28	17	16		76	50
GAGING STATION - TUOLUMNE RIVER AT TUOLUMNE CITY - MILE 3.35 —												
Bancroft Fruit Farm	4.1 R	1-10"	41	44	244		102	34	16		481	(2)260
Bancroft Fruit Farm	5.0 R	1-10"		29	46	85	84	80		49	373	(3)
W. F. Nicolson (4)	7.1 R	1-10"			130	85	99	79	106		499	200
R. S. Brown	7.8 L	1-10"			N O	D I:V E R S:I O N						
W. F. Duffy	7.9 R	1-8"			1		1	3			5	19
		1-4"										
W. F. Duffy	8.4 R	1-10"		26	52	91	66	114	74	5	428	80
A. Holmes (Kissamos & Pavlakias)	10.2 R	1-11"			51	53	53	62	35	3	257	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"			16	25	18	20	8		87	57
— GAGING STATION - TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE - MILE 39.9 —												
Totals			41	120	540	339	451	409	255	57	2212	752

* Mileage along river above mouth.
** All general crops. No rice.
(1) Formerly John Caldwell.
(2) This is the combined acreage for this plant and the one at Mile 5.0 Right.
(3) See plant at Mile 4.1 Right.
(4) Formerly Randolph Marketing Company.

TABLE 47

STANISLAUS RIVER DIVERSIONS

1937

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
Frank Coker	1.1 R	1-6"						6	1		7	15	
H. Sayler	1.6 R	1-7"						17			17	35	
J. Chisholm (1)	2.9 R	1-8"							21		21	38	
Hatmark Ranch	5.25L	2-14"	136	398	592	649	604	528	170		3077	227	75
— GAGING STATION - STANISLAUS RIVER AT HATMARK RANCH - MILE 5.3 —													
Bret Harte Water Users Ass'n.	5.9 R	(2)1-16"	267	881	622	670	703	570	304		4017	1024	
McMullin Reclamation Dist. #2075	5.95R	2-15"		105	288	543	475	239	6		1656	1460	
Henry Pelucca	6.7 L	1-15"	10	33	35	47	40	25			190	70	
J. W. Updike	7.4 L	1-8"		NO	DIVERSION								
S. M. Updike	8.2 L	1-12"		9	56		41	47	23		176	90	
Caswell Brothers (3)	9.8 R	1-14"	12	37	85	92	81	49	49		405	92	
D. F. Koetitz	10.1 L	1-10"	64	201	190	274	248	249	95		1312	345	
D. F. Koetitz	10.4 L	1-18"		NO	DIVERSION								
— SOUTHERN PACIFIC RAILROAD BRIDGE (MAIN LINE) - MILE 15.9 —													
J. E. Alldrin (4)	18.5 R	1-12"	19		66	60	38	36			219	150	
G. R. Stoddard	19.9 L	1-7"		NO	DIVERSION								
Palo Alto Company	20.75R	1-14"		152	216	102	129				599	200	
Heath Ranch	20.9 L	1-½"			43	32	20		3		98	15	
Earl Fruit Company	21.75R	1-8"			55	61	27				143	88	
— MODESTO-ESCALON BRIDGE - MILE 28.15 —													
— SANTA FE RAILROAD CROSSING - MILE 31.35 —													
— SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) - MILE 39.0 —													
— GAGING STATION - STANISLAUS RIVER AT GRANGE BLOSSOM BRIDGE - MILE 44.7 —													
Totals			0	503	1816	2248	2530	2429	1756	650	11937	3849	75

* Mileage along river above mouth.

(1) Formerly A. B. Kennedy.

(2) Replaces 20" unit.

(3) Plant installed prior to 1937 but not previously reported.

(4) Formerly American Trust Company.

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 49 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 49, 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 50 and 51 record the Sacramento River return water, July to September, inclusive, 1937, and indicate the relation between the return and the diversions from which it was derived. Since, in

Tables 50 and 51, 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 50 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 51. 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 50 and 51 show that seepage, groundwater return, etc., (for the period July-September, inclusive) which could not be directly measured, amounted to 16 per cent of the irrigation draft, the direct return in definite channels 32 per cent, and the total return 48 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, 1937, 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 51.

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, and Reclamation District 1500. The relation between draft and return water for the Colusa Trough area is shown in Table 52 and for Reclamation Districts 108 and 1500, in Tables 53 and 54.

Tables 57 to 68, inclusive, present in detail the discharge records for the Sacramento Valley return water channels.

San Joaquin Return Waters

In the 1937 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. In June of 1937, high water from natural flow had the effect of vitiating return water determinations from the measurements for that month so that the 1937 figures are only given beginning with 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 29, inclusive, and the diversion records for the San Joaquin streams above Durham Ferry Bridge, are given in Chapter III, Tables 44 to 47, inclusive.

Table 55 gives the results of the San Joaquin return water measurements and Table 56 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, 1937, 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 1937

Comparative figures, 1924 to 1937, for the Sacramento and San Joaquin seasonal return water in per cent of the irrigation draft

are shown in Table 48. 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 considerable lag between the diversions and corresponding return flow, the figures in the last column of Table 48 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 48

SACRAMENTO AND SAN JOAQUIN RETURN WATER PERCENTAGES, 1924-1937

Year	Sacramento			San Joaquin						
	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

* 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 49

WATER DISCHARGED TO SACRAMENTO RIVER ABOVE SACRAMENTO AS MEASURED AT DEFINITE RETURN CHANNELS
1937

RETURN	Table Number	July		August		September		October		Jul.-Oct. Inclusive	
		Acre-feet	cfs.	Acre-feet	cfs.	Acre-feet	cfs.	Acre-feet	cfs.	Acre-feet	cfs.
Butte Slough (1)	58	6630	108	7640	124	23010	387	27450	447	64730	265
Reclamation District 70 Drain	59	194	3	260	4	2400	40	793	13	3650	15
Reclamation District 108 Drain	60	5150	84	6570	107	5850	98	309	5	17880	73
Colusa Basin Drainage (2)	61	15350	250	18930	308	32320	543	11380	185	77980	320
Sacramento Slough (3)	62	26300	428	28000	456	38120	641	15760	257	108200	443
Reclamation District 1000 Drain	68	0	0	0	0	762	13	619	10	1380	6
Totals		53620	873	61400	999	102500	1720	56300	917	273820	1122

(1) This flow is practically all from lands irrigated by Feather River diversions.
(2) A portion of the water which would ordinarily be returned to the Sacramento River at this point is diverted to the Knights Landing Ridge Cut. See Table 66.
(3) This is the combined daily flow as given in Tables 63 and 65 and includes some return water from Feather River diversions. See Table 64.

TABLE 50

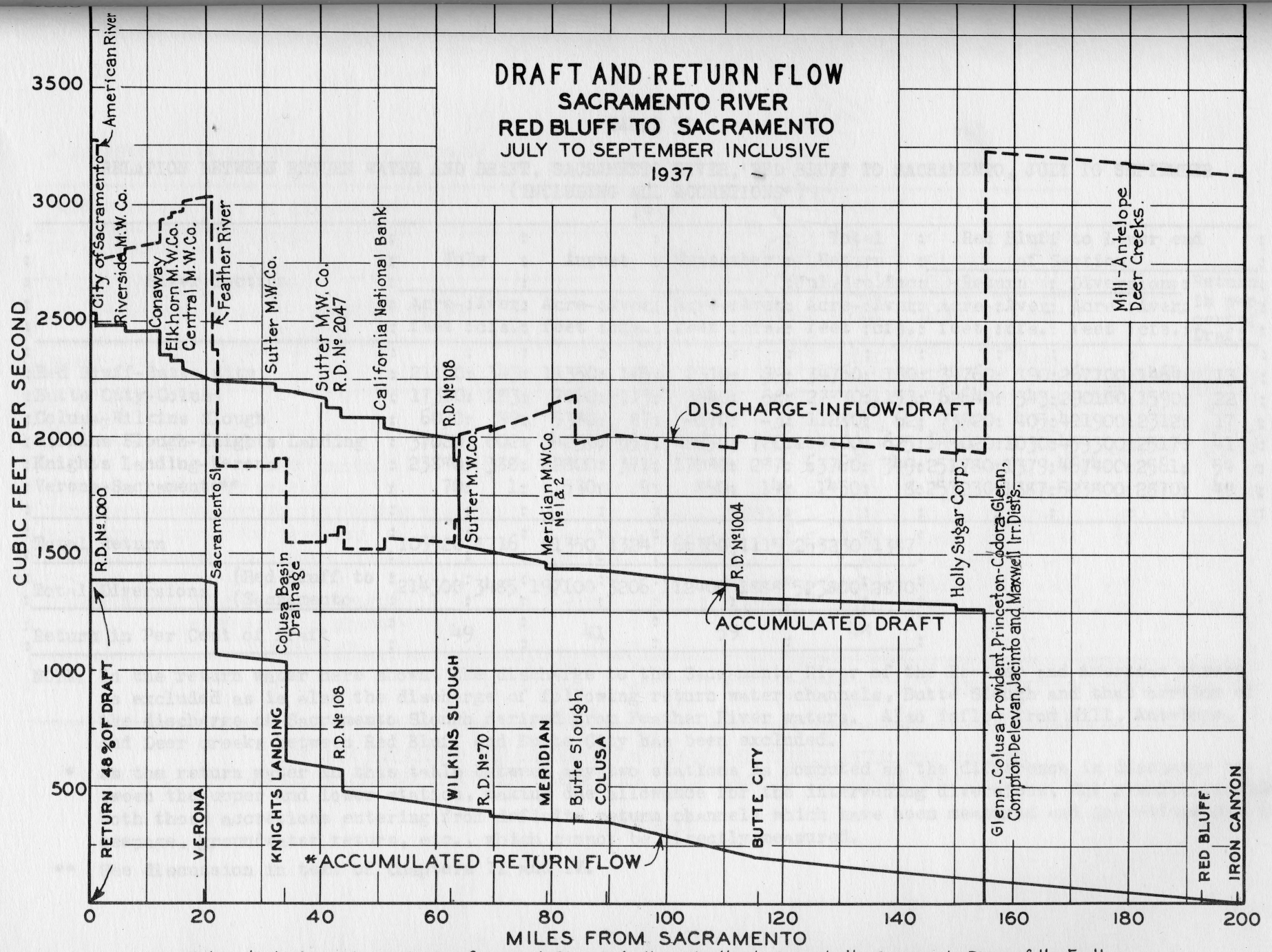
RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO, JULY TO SEPTEMBER
(USING ONLY RETURN WATER WHICH ENTERED THROUGH DEFINITE RETURN CHANNELS*)
1937

	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	59	194	3	260	4	2400	40	2850	16
Reclamation District 108 Drain	60	5150	84	6570	107	5850	98	17570	96
Colusa Basin Drainage at Knights Landing	60 & 66	19160	312	23360	379	36250	609	78770	432
Sacramento Slough (less flow from East Borrow Pit Sutter By-Pass)	62 & 64	18840	306	20070	327	25970	437	64880	355
Reclamation District 1000 Drain (2d Bannon Slough)	49	0	0	0	0	762	13	762	4
Total Return		43340	705	50260	817	71230	1197	164830	903
Total Diversions-Red Bluff to Sacramento		214300	3485	197100	3206	112400	1888	523800	2870
Return in per cent of Diversions		20		25		63		31	

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.

* As distinguished from use of all accretions as indicated in Table 51.

DRAFT AND RETURN FLOW
SACRAMENTO RIVER
RED BLUFF TO SACRAMENTO
JULY TO SEPTEMBER INCLUSIVE
1937



* 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.

PLATE 1

TABLE 51

RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO, JULY TO SEPTEMBER
(INCLUDING ALL ACCRETIONS*)
1937

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	21100	343	11350	185	2310	39	34760	190	34760	190	267100	1464	13
Butte City-Colusa	17380	283	7060	115	3440	58	27880	153	62640	343	290100	1590	22
Colusa-Wilkins Slough	6070	99	5380	87	-170	-3	11280	62	73920	405	421900	2312	17
Wilkins Slough-Knights Landing	37020	602	34230	557	42850	720	114100	625	188020	1030	459300	2517	41
Knights Landing-Verona	23880	388	22800	371	17080	287	63760	349	251780	1379	467400	2561	54
Verona-Sacramento**	70	1	530	9	850	14	1450	8	253230	1387	523800	2870	48
Total Return	105520	1716	81350	1324	66360	1115	253230	1387					
Total Diversions (Red Bluff to Sacramento	214300	3485	197100	3206	112400	1888	523800	2870					
Return in Per Cent of Draft	49		41		59		48						

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 52

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

1937

	Mile and Bank	Jul.	Aug.	Sep.	July to Sept. Inclusive		Acreage Irrigated	
		Acre-feet			Ac.Ft.	c.f.s.	General	Rice
DIVERSIONS								
- Sacramento River -								
Glenn-Colusa Irrigation District	154.8 R	73171	72695	44150	190016	1060	18493	23069
Jacinto Irrigation District	154.8 R	3977	3834	2757	10568	58	6651	0
Compton-Delevan Irrigation District	154.8 R	2460	2261	593	5314	29	50	1032
Provident Irrigation District	154.8 R	10122	9388	5381	24891	136	217	6576
Princeton-Codora-Glenn Irrigation District	154.8 R	10429	10159	5351	25939	142	2455	2367
Maxwell Irrigation District	154.8 R	1230	1230	516	2976	16	0	670
- Colusa Trough -	*							
A. D. J. Land Company	3.0 L	1037	478	301	1816	10	0	200
S. Ashe	8.0 L	1360	1386	1252	3998	22	0	830
M. E. Rouke	10.5 L	1600	1610	1210	4420	24	0	700
Total Diversions (Acre-feet		105386	103041	61511	269938		27866	35444
Total Diversions (c.f.s.		1710	1675	1030		1497		
RETURN								
Colusa Trough at Colusa-Williams Highway		20500	25100	29900	75500	414		
Colusa Trough Diversions		4000	7470	2760	14230	78		
Total Return (Acre-feet		24500	32570	32660	89730			
Total Return (c.f.s.		398	529	549		492		
Return in per cent of diversions		23	31	53	33			

* Mileage above Colusa-Williams Highway.

TABLE 53

RELATION BETWEEN RETURN WATER AND DIVERSIONS
RECLAMATION DISTRICT 108

	Jul.	Aug.	Sep.	Jul. to Sep Inclusive		Acreage Irrigated	
	Acre-feet			Acre-feet	Aver: cfs	Genl	Rice
Diversions (1)	15484	13475	2484	31443	172	2235	8474
Return Water (2)	5230	6860	5950	18040	99		
Return in per cent of Diversions	34	51	239		57		

(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 60). and on Back Borrow Pit (Table 60A)

TABLE 54

RELATION BETWEEN RETURN WATER AND DIVERSIONS
RECLAMATION DISTRICT 1500

	Jul.	Aug.	Sep.	Jul. to Sep Inclusive		Acreage Irrigated	
	Acre-feet			Acre-feet	Aver: cfs	Genl.	Rice
Diversions (1)	39706	35660	26018	101384	555	19231	11232
Return Water (2)	14760	15850	21830	52440	287		
Return in per cent of Diversions	37	44	84		52		

(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 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 63

TABLE 55
RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1937
(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	7090	0	0	0	7090	0	7090	0
Discharge at Fremont Ford Bridge	Table 16 & 16A	84440	9360	9270	11250	93800	18630	114320	29880
Diversions	Table 44	0	0	0	0	0	0	0	0
Net Return Flow (1)		77350	9360	9270	11250	86710	18630	107230	29880
Net Return Flow - Cubic feet per Second (1)		1258	152	156	183	705	154	440	164
FREMONT FORD BRIDGE TO NEWMAN									
Discharge at Fremont Ford Bridge	Table 16 & 16A	84440	9360	9270	11250	93800	18630	114320	29880
Discharge near Newman	Table 17	109600	26280	26300	28610	135880	52580	190790	81190
Inflow of Merced River	Table 23	19320	14830	16180	16440	34150	31010	66770	47450
Diversions	Table 44	0	0	0	0	0	0	0	0
Net Return Flow		5840	2090	850	920	7930	2940	9700	3860
Net Return Flow - Cubic feet per Second		95.0	33.9	14.3	15.0	64.5	24.3	39.8	21.1
NEWMAN TO GRAYSON (LAIRD SLOUGH)									
Discharge near Newman	Table 17	109600	26280	26300	28610	135880	52580	190790	81190
Discharge near Grayson (Laird Slough)	Table 18	144900	37270	34220	43080	182170	71490	259470	114570
Diversions	Table 44	8010	8070	6320	1020	16080	14390	23420	15410
Net Return Flow		43310	19060	14240	15490	62370	33300	92100	48790
Net Return Flow - Cubic feet per Second		704	310	239	252	507	275	378	267
GRAYSON TO HETCH HETCHY CROSSING									
Discharge near Grayson (Laird Slough)	Table 18	144900	37270	34220	43080	182170	71490	259470	114570
Discharge at Hetch Hetchy Crossing	Table 19	177600	52330	71840	110500	229930	124170	412270	234670
Inflow of Tuolumne River	Table 27	33960	23380	36030	59470	57340	59410	152840	118880
Diversions	Table 44	15080	11210	3800	1180	26290	15010	31270	16190
Net Return Flow		13820	2890	5390	9130	16710	8280	31230	17410
Net Return Flow - Cubic feet per Second		225	47.0	90.6	148	136	68.4	128	95.4
HETCH HETCHY CROSSING TO VERNALIS									
Discharge at Hetch Hetchy Crossing	Table 19	177600	52330	71840	110500	229930	124170	412270	234670
Discharge at Vernalis	Table 20	201900	69440	83070	116700	271340	152510	471110	269210
Inflow of Stanislaus River	Table 29	22190	14950	13230	14520	37140	28180	64890	42700
Diversions	Table 44	2840	2680	2070	1100	5520	4750	8690	5850
Net Return Flow		4950	4840	70	-7220	9790	4910	2640	-2310
Net Return Flow - Cubic feet per Second		80.5	78.7	1.2	-117	79.6	40.6	10.8	-12.6
SUMMARY - DELTA BRIDGE TO VERNALIS									
Discharge at Delta Bridge	Table 15	7090	0	0	0	7090	0	7090	0
Discharge at Vernalis	Table 20	201900	69440	83070	116700	271340	152510	471110	269210
Diversions	Table 44	25930	21960	12190	3300	47890	34150	63380	37450
Inflow of tributaries		75470	53160	65440	90430	128630	118690	284500	209030
Total net return flow (1)		145270	38240	29820	29570	183510	68060	242900	97630
Total net return flow - Cubic feet per Second (1)		2360	622	501	481	1490	563	996	535

(1) The return flow figures include any spill from Merced Irrigation District to Bear Creek and any other foreign water.

TABLE 55 (CONTINUED)

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1937
(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 28	1700	1640	1150	1040	3340	2790	5530	3830
Discharge at Hatmark Ranch	Table 29	22840	15570	13780	14520	38410	29350	60710	43870
Diversions	Table 47	1880	1800	1210	480	3680	3010	5370	3490
Net Return Flow		23020	15730	13840	13960	38750	29570	60850	43530
Net Return Flow - Cubic feet per Second		374	256	233	227	315	244	273	239
TUOLUMNE RIVER									
LA GRANGE TO ROBERTS FERRY BRIDGE									
Discharge at La Grange	Table 25	410	180	16290	37840	590	16470	54720	54310
Discharge at Roberts Ferry Bridge	Table 25A	3690	1690	21240	39600	5380	22930	66220	62530
Diversions	Table 46	0	0	0	0	0	0	0	0
Net Return Flow		3280	1510	4950	1760	4790	6460	11500	8220
Net Return Flow - Cubic feet per second		53.3	24.6	83.2	28.6	39.0	53.4	47.1	45.0
ROBERTS FERRY BRIDGE TO HICKMAN BRIDGE									
Discharge at Roberts Ferry Bridge	Table 25A	3690	1690	21240	39600	5380	22930	66220	62530
Discharge at Hickman Bridge	Table 26	9200	7690	26450	51660	16890	34140	95000	85800
Diversions	Table 46	20	20	10	0	40	30	50	30
Net Return Flow		5530	6020	5220	12060	11550	11240	28830	23300
Net Return Flow - Cubic feet per Second		90.0	97.9	87.7	196	93.9	92.9	118	128
HICKMAN BRIDGE TO TUOLUMNE CITY									
Discharge at Hickman Bridge	Table 26	9200	7690	26450	51660	16890	34140	95000	85800
Discharge at Tuolumne City	Table 27	33280	23180	35700	59250	56460	58880	151410	118130
Inflow of Dry Creek	Table 24	5380	3720	3390	3840	9100	7110	16330	10950
Diversions	Table 46	400	370	230	60	770	600	1060	660
Net Return Flow (1)		19100	12140	6090	3810	31240	18230	41140	22040
Net Return Flow - Cubic feet per Second (1)		311	197	102	62.0	254	151	169	121
SUMMARY - LA GRANGE TO TUOLUMNE CITY									
Discharge at La Grange	Table 25	410	180	16290	37840	590	16470	54720	54310
Discharge at Tuolumne City	Table 27	33280	23180	35700	59250	56460	58880	151410	118130
Inflow of Dry Creek	Table 24	5380	3720	3390	3840	9100	7110	16330	10950
Diversions	Table 46	420	390	240	60	810	630	1110	690
Net Return Flow (1)		27910	19670	16260	17630	47580	35930	81470	53560
Net Return Flow - Cubic feet per Second (1)		454	320	273	287	387	297	334	294

(1) The inflow of Dry Creek has been included to obtain these figures.

TABLE 55 (CONTINUED)

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1937
(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 21	5020	2400	1510	905	7420	3910	9830	4810
Discharge at Livingston	Table 22	16340	12700	13610	12460	29040	26310	55110	38770
Diversions	Table 45	1340	1330	780	160	2670	2110	3610	2270
Net Return Flow		12660	11630	12880	11720	24290	24510	48890	36230
Net Return Flow - Cubic feet per Second		206	189	216	191	198	203	200	199
LIVINGSTON TO MOUTH									
Discharge at Livingston	Table 22	16340	12700	13610	12460	29040	26310	55110	38770
Discharge near Mouth	Table 23	19320	14830	16180	16440	34150	31010	66770	47450
Diversions	Table 45	1770	1550	890	220	3320	2440	4430	2660
Net Return Flow		4750	3680	3460	4200	8430	7140	16090	11340
Net Return Flow - Cubic feet per Second		77.3	59.8	58.1	68.3	68.6	59.0	66.0	62.1
SUMMARY - YOSEMITE VALLEY RAILROAD TO MOUTH									
Discharge at Yosemite Valley Railroad Crossing	Table 21	5020	2400	1510	905	7420	3910	9835	4815
Discharge near Mouth	Table 23	19320	14830	16180	16440	34150	31010	66770	47450
Diversions	Table 45	3110	2880	1670	380	5990	4550	8040	4930
Net Return Flow		17410	15310	16340	15920	32720	31650	64980	47570
Net Return Flow - Cubic feet per Second		283	249	275	259	266	262	266	261

TABLE 56

COMPARISON OF DIVERSIONS AND RETURN WATER - SAN JOAQUIN VALLEY - 1937
(Quantities in Acre-feet except as noted)

	Jul.	Aug.	Sep.	Oct.	Jul. to Oct. Inc.
- DIVERSIONS -					
San Joaquin River near Friant (1) (2) (Miller and Lux Canals, etc.)	164000	89220	72390	65230	390840
Merced River at Exchequer (1) (2) (Merced Irrigation District Canal, etc.)	108800	95150	60280	19550	283780
Turlock Irrigation District Canal (1)	72290	67940	69900	214	210340
Modesto Irrigation District Canal (1)	34970	45270	29340	32240	141820
South San Joaquin and Oakdale Irrigation District Canals (1)	49070	43300	15990	6610	114970
Oakdale Irrigation District Canal (1)	23220	20430	9520	7240	60410
Pumping Diversions - San Joaquin, Merced, Tuolumne and Stanislaus Rivers (3)	32030	27680	15860	4390	79960
Total Diversions	484380	388990	273280	135470	1282120
Total Diversions (Average Second-feet)	7880	6230	4590	2200	5260
- RETURN -					
San Joaquin River near Vernalis (1)	201900	69440	83070	116700	471110
Pumping diversions - San Joaquin, Merced, Tuolumne and Stanislaus Rivers (3)	32030	27680	15860	4390	79960
Total Return	233930	97120	98930	121090	551070
Undiverted power releases and spill	23020	0	10040	32810	65870
Net Return	210910	97120	88890	88280	485200
Net Return (Average Second-feet)	3430	1580	1490	1440	1990
Return in per cent of Diversions	43	25	32	65	38

NOTE: Prior to July, return water measurements were vitiated by high river stages.
(1) U. S. G. S. station.
(2) This flow practically all diverted below gaging stations after July 1st.
(3) See Tables 44, 45, 46 and 47.

TABLE 57

DISCHARGE OF COLUSA TROUGH AT COLUSA WILLIAMS HIGHWAY
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		419	308	369	465	311
2		411	297	372	485	311
3		400	286	392	499	364
4		400	287	388	523	348
5		400	289	397	533	289
6		397	305	383	536	225
7		380	302	400	528	193
8		397	295	387	536	185
9		409	289	392	536	156
10		400	294	309	533	142
11		409	297	411	530	133
12		411	305	388	547	128
13		407	313	380	553	114
14		414	305	382	581	105
15		431	311	383	565	120
16		499	322	390	557	137
17		585	329	392	557	123
18		603	338	419	553	105
19	*422	609	343	428	581	99
20	426	589	374	436	577	99
21	436	536	374	438	571	101
22	443	477	382	431	516	99
23	453	405	380	439	477	99
24	479	377	377	443	456	99
25	490	340	382	428	436	101
26	496	316	392	431	397	99
27	516	300	385	443	375	98
28	528	300	380	443	369	96
29	513	300	370	453	362	95
30	477	294	370	456	350	95
31	428		367	460		90
Mean	200	420	334	408	503	153
Ac.Ft. for Month	12090	24980	20490	25120	29870	9420

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.

PLATE 2

Average discharge in cubic feet per second
0
200
400
600
800
1000
1200
1400
Miles from mouth of San Joaquin River
80
90
100
110
120
130
140
150
160
VERNALIS
STANISLAUS RIVER
MAZE ROAD BR.
HETCH HETCHY CROSSING
TUOLUMNE RIVER
LAIRD SLOUGH
CROWS LANDING
NEWMAN
FREMONT FORD BR.
TURNER ISLAND BR.
STANISLAUS RIVER
El Solyo Ranch
TUOLUMNE RIVER
West Stanislaus I.D.
Patterson Water Co.
Patterson Ranch
MERCED RIVER
ACCUMULATED DRAFT
DISCHARGE-INFLOW-DRAFT
ACCUMULATED RETURN FLOW
SAN JOAQUIN RIVER RETURN FLOW
AUGUST TO OCTOBER INCLUSIVE
1937

TABLE 58

DISCHARGE OF BUTTE SLOUGH
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*784	0	0	110	126	108	174	372
2	525		371	234	198	130	204	362
3	735		266	440	198	128	260	324
4	693		0	410	174	128	260	423
5	525		0	400	178	130	326	1169
6	266		0	302	134	130	288	987
7	0		0	352	136	130	288	637
8			0	324	118	130	342	483
9			0	302	120	130	340	483
10		-	266	312	120	130	342	483
11			0	308	86	130	400	539
12			455	284	86	128	513	483
13			455	290	88	108	488	483
14			371	312	86	108	476	420
15	-		266	324	86	94	466	539
16			0	442	48	94	466	455
17			0	442	48	94	463	371
18			0	372	104	110	460	266
19			371	463	104	132	455	266
20			371	522	104	130	444	420
21			455	647	104	130	438	420
22			0	545	106	132	432	420
23			455	522	106	130	429	343
24			266	434	106	130	376	343
25			455	352	90	130	382	343
26			371	456	50	130	386	343
27			455	466	104	108	446	420
28			588	392	106	110	470	343
29			525	198	92	154	432	343
30		0	0	260	72	152	374	238
31	0		588		72	152		343
Mean	114	0	238	374	108	124	387	447
Ac.Ft. for Month	6980	0	14550	22210	6630	7640	23010	27450

NO FLOW - NO FLOW

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 and Butte Slough and Butte Creek diversions (See Table 35) are made up almost entirely of return water from lands irrigated by Feather River diversions.

* Beginning of discharge record for season.

TABLE 58

DISCHARGE OF BUTTE SLOUGH
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*784	0	0	110	126	108	174	372
2	525		371	234	198	130	204	362
3	735		266	440	198	128	260	324
4	693		0	410	174	128	260	423
5	525		0	400	178	130	326	1169
6	266		0	302	134	130	288	987
7	0		0	352	136	130	288	637
8			0	324	118	130	342	483
9			0	302	120	130	340	483
10		-	266	312	120	130	342	483
11			0	308	86	130	400	539
12			455	284	86	128	513	483
13			455	290	88	108	488	483
14			371	312	86	108	476	420
15	-		266	324	86	94	466	539
16			0	442	48	94	466	455
17			0	442	48	94	463	371
18			0	372	104	110	460	266
19		-	371	463	104	132	455	266
20			371	522	104	130	444	420
21			455	647	104	130	438	420
22			0	545	106	132	432	420
23			455	522	106	130	429	343
24			266	434	106	130	376	343
25			455	352	90	130	382	343
26			371	456	50	130	386	343
27			455	466	104	108	446	420
28			588	392	106	110	470	343
29			525	198	92	154	432	343
30		0	0	260	72	152	374	238
31	0		588		72	152		343
Mean	114	0	238	374	108	124	387	447
Ac.Ft. for Month	6980	0	14550	22210	6630	7640	23010	27450

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 and Butte Slough and Butte Creek diversions (See Table 35) are made up almost entirely of return water from lands irrigated by Feather River diversions.

* Beginning of discharge record for season.

TABLE 59

DISCHARGE OF RECLAMATION DISTRICT 70 DRAIN
1937

Day	Daily Discharge in Second-feet						
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		13	41	0	8	1	8
2		13	36	0	6	1	13
3		14	29	0	5	68	10
4		13	23	4	3	66	6
5		13	20	6	5	64	13
6		14	15	5	6	69	12
7		15	15	4	6	61	13
8		14	11	2	6	60	13
9		14	11	0	5	63	8
10		14	14	0	4	64	8
11		14	16	0	4	64	8
12		14	16	0	4	52	8
13		15	37	0	3	46	8
14		20	30	1	6	64	8
15		20	24	1	6	64	8
16		14	20	0	5	58	8
17		15	22	0	2	45	8
18		14	12	0	2	39	8
19		15	34	1	3	38	27
20		15	40	5	3	35	32
21		15	32	2	3	32	34
22		15	36	5	3	28	36
23	*13	15	34	6	3	25	37
24	13	31	34	6	4	24	10
25	13	28	32	6	4	23	8
26	13	25	23	6	6	15	8
27	13	26	30	6	4	13	8
28	13	27	28	8	4	10	8
29	13	29	25	8	3	8	8
30	14	34	28	8	3	10	8
31		35		8	2		8
Mean		18.5	25.6	3.2	4.2	40.3	12.9
Ac.Ft. for Month		1140	1520	194	260	2400	793

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 60

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN
AT ROUGH AND READY BEND
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1				98	0	104	124	30
2			69	56	42	104	125	16
3			66	59	68	104	124	0
4		138	38	58	69	104	123	0
5	158		47		71	103	121	0
6			54	94	76	101	122	0
7		113	66	61	82	102	127	0
8				79	84	101	188	0
9			105	81	85	100	292	0
10	139		125	99	87	101	93	0
11		129	94	95	87	100	95	0
12			124		87	102	96	0
13			130	154	88	105	95	19
14	123		107	170	87	103	104	12
15				124	85	104	91	1
16	85	111	172	130	85	103	90	0
17			131	117	85	104	92	0
18		83	110	128	87	104	89	0
19	86	42	124		89	105	89	0
20		30	109	176	87	105	89	0
21	70	30	113	193	86	104	86	0
22	143	27		109	87	105	82	0
23	129		144	110	90	105	84	0
24	150		133	88	95	108	80	0
25	180		82	95	98	113	80	30
26	283	68	110		100	117	68	12
27	174		51	140	100	117	59	12
28	119		110	113	102	120	44	6
29	72			119	103	123	42	6
30		38	69		103	124	40	12
31	83		78		104	124		0
Mean	64	27	83	92	84	107	98	5.0
Ac.Ft. for Month	3950	1600	5070	5440	5150	6570	5850	309

NOTE: This is the drainage from Reclamation District 108 returned to the Sacramento River at Mile 44.0 Right. Discharge prior to July 1st by pumping, balance of season through siphon and by intermittent pumping. Additional drainage from Reclamation District 108 was discharged to Back Borrow Pit at Mile 20.2 Left. See Table 60A.

TABLE 60-A

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN
ON BACK BORROW PIT
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1					0	8	8	
2						8	8	
3						8	5	
4						5	5	
5						5	5	
6						5	5	
7						5	5	
8						5	5	
9						5	5	
10	-				-	5	0	
11	-	-	-	-	O	5		-
12	W	W	W	W	F	5		W
13	O	O	O	O	F	5		O
14	F	F	F	F		5		F
15	F	F	F	F	O	5	-	F
16					N	5		
17					-	5	W	
18	O	O	O	O		5	O	O
19	N	N	N	N		5	F	N
20	-	-	-	-		4		-
21						4		
22						5	O	
23						5	N	
24						4	-	
25						4		
26						3		
27					0	3		
28					25	3		
29					8	3		
30					8	3	0	
31					0	3		
Mean	0	0	0	0	1.4	4.8	1.7	0
Ac.Ft. for Month	0	0	0	0	81	294	101	0

NOTE: All gravity flow. Additional drainage from Reclamation District 108 is returned to Sacramento River at Mile 44.0 Right. See Table 60.

TABLE 61

DISCHARGE OF COLUSA BASIN DRAINAGE AT KNIGHTS LANDING
1937

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		400	274	204	417	334
2		300	270	224	423	260
3		0	271	236	435	244
4		0	157	262	467	284
5		0	175	289	636	157
6		100	207	236	637	320
7		100	230	243	567	433
8		300	219	247	567	449
9		360	212	247	552	304
10		464	206	254	511	220
11		348	203	203	498	194
12		340	210	255	498	194
13		340	214	284	488	169
14		340	227	293	488	146
15		335	187	283	489	146
16		384	322	292	541	169
17		559	315	302	544	194
18		467	322	335	552	194
19		807	319	370	734	146
20		832	308	373	749	125
21		750	317	256	754	125
22		661	309	416	747	125
23		599	312	392	753	125
24	*515	535	326	392	515	125
25	515	515	325	361	508	125
26	700	330	297	365	493	125
27	800	292	236	360	491	125
28	800	275	185	372	484	106
29	700	265	192	385	425	90
30	700	265	209	396	341	90
31	700		185	399		90
Mean		375	250	308	543	185
Ac.Ft. for Month		22340	15350	18930	32320	11380

NOTE: This is the drainage from Colusa Basin passing down the Back Borrow Pit of Reclamation Districts 108 and 787 and entering the Sacramento River at Mile 34.15 Right, 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 66.

* Beginning of record for season.

TABLE 62

DISCHARGE OF SACRAMENTO SLOUGH
1937

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*464	470	486	474
2			464	449	495	260
3			322	459	399	746
4			419	491	655	385
5			266	494	750	429
6			269	494	600	367
7			404	468	406	319
8			421	512	567	353
9			426	475	1006	187
10			418	478	584	381
11			515	475	708	170
12			447	468	1023	336
13			444	465	727	153
14			441	439	730	247
15			440	455	712	153
16			436	452	712	187
17			431	449	691	463
18			516	446	776	170
19			400	429	764	122
20			410	433	683	137
21			474	414	633	153
22			448	373	629	153
23			456	439	625	153
24			445	448	640	399
25			485	453	641	122
26			429	463	529	122
27			441	472	575	206
28			441	449	521	122
29			441	391	494	108
30			433	464	489	95
31			437	477		289
Mean			428	456	641	257
Ac.Ft. for Month			26300	28000	38120	15760

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 63) and West Borrow Pit of Sutter By-Pass 1.4 miles above Reclamation District 1500 Drain (Table 65). The flow in Table 65 includes the flow in Table 64.

* Beginning of discharge record for season.

TABLE 63

DISCHARGE OF RECLAMATION DISTRICT 1500 DRAIN
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*113	131	0	306	259	290	271	233
2	87	125	311	297	259	259	275	0
3	141	107	341	249	113	259	169	486
4	84	145	239	290	206	271	415	125
5	0	91	190	112	49	271	500	87
6	182	184	244	431	50	271	340	107
7	181	181	244	249	183	248	165	96
8	81	185	195	293	198	295	307	148
9	85	191	362	188	210	261	686	0
10	87	110	290	289	212	267	284	194
11	87	270	307	287	319	267	388	0
12	132	79	308	354	254	263	703	166
13	114	102	311	332	254	263	385	0
14	299	208	312	253	254	240	410	94
15	120	177	330	311	254	269	392	0
16	134	145	372	391	254	259	392	0
17	153	77	305	317	253	259	391	276
18	85	110	309	371	342	259	476	0
19	182	19	311	312	230	259	464	0
20	119	59	313	387	240	263	403	0
21	415	114	316	188	304	244	353	0
22	460	125	0	257	278	198	369	0
23	517	130	746	329	286	259	365	0
24	517	0	314	329	275	263	380	262
25	560	313	316	328	315	263	400	0
26	608	161	356	338	259	263	288	0
27	635	169	404	382	271	267	275	98
28	386	236	318	192	271	244	280	0
29	232	229	342	261	271	186	253	0
30	197	169	402	261	263	259	248	0
31	175		324		267	267		205
Mean	250	145	304	325	240	258	367	83
Ac.Ft. for Month	15330	8590	18680	19340	14760	15850	21830	5100

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 62.

* Beginning of record for season.

TABLE 64

DISCHARGE OF SUTTER BY-PASS - EAST BORROW PIT
(WILLOW SLOUGH AT CHANDLER)
1937

Day	Daily Discharge in Second-feet				
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		*199	94	116	133	182
2		51	107	120	141	182
3		9	135	121	162	182
4		76	154	136	176	182
5		79	153	142	176	182
6		104	152	142	175	182
7		131	151	142	186	182
8		149	145	141	207	182
9		173	139	141	205	182
10		175	124	140	204	182
11		207	116	140	236	182
12		197	116	140	252	182
13		173	117	140	247	182
14		173	117	139	255	182
15		173	118	139	252	175
16		174	118	121	248	175
17		222	118	116	245	175
18		286	118	117	225	175
19		269	119	117	221	175
20		256	125	118	216	175
21		275	129	118	212	175
22		282	121	118	210	175
23		278	116	118	210	175
24		274	116	119	205	175
25		212	116	126	201	175
26		164	110	129	196	175
27		164	104	129	190	175
28		120	104	129	185	175
29		49	105	129	182	175
30		74	106	130	182	175
31			107	130		175
Mean		172	122	129	204	178
Ac.Ft. for Month		10230	7460	7930	12150	10940

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 record for season.

TABLE 65

DISCHARGE OF SUTTER BY-PASS - WEST BORROW PIT
1.4 MILES ABOVE R. D. 1500 DRAINAGE PLANT
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1			*205	180	215	241
2			205	190	220	260
3			209	200	230	260
4			213	210	240	260
5			217	223	250	342
6			219	223	260	260
7			221	220	241	223
8			223	217	260	205
9			216	214	320	187
10			206	211	300	187
11			196	208	320	170
12			193	205	320	170
13			190	202	342	153
14			187	199	320	153
15			186	196	320	153
16			182	193	320	187
17			178	190	300	187
18			174	187	300	170
19			170	170	300	122
20			170	170	280	137
21			170	170	280	153
22			170	175	260	153
23			170	180	260	153
24			170	185	260	137
25			170	190	241	122
26			170	200	241	122
27			170	205	300	108
28			170	205	241	122
29			170	205	241	108
30			170	205	241	95
31			170	210		84
Mean			188	198	274	174
Ac.Ft. for Month			11560	12170	16310	10680

NOTE: This is the flow in the West Borrow Pit below the confluence of East Borrow Pit flow entering via Willow Slough. 1.4 miles downstream 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 62.

* Beginning of discharge record for season.

TABLE 66

DISCHARGE OF KNIGHTS LANDING RIDGE CUT AT WEST LINE OF YOLO BY-PASS
1937

Day	May	Jun.	Jul.	Aug.	Sep.	Oct.
	Daily Discharge in Second-feet					
1		* 0	39	41	79	
2		0	38	48	82	
3		0	37	56	86	
4		32	48	70	93	
5		70	68	77	97	
6		100	86	80	95	
7		110	96	82	84	
8		125e	92	84	84	
9		150e	88	84	82	
10		200e	85	66	72	
11		150e	84	44	68	FLOW
12		150e	88	65	68	
13		150e	91	74	69	
14		150e	97	77	69	
15		150e	79	74	70	
16		170e	62	79	70	
17		150e	58	82	70	ON-
18		110	62	84	72	
19		110	61	93	76	
20		120e	66	92	79	
21		99	70	88	81	
22		75	68	75	79	
23		62	70	68	77	
24		48	74	68	32	
25		53	72	63	32	
26		45	64	64	30	
27		44	28	63	31	
28		40	0	66	31	
29		36	5	70	24	
30		36	19	72	5	
31			28	74		
Mean		91	62	71	66	0
Ac.Ft. for Month		5420	3810	4400	3930	0

NOTE: This is Colusa Basin drainage diverted to Knights Landing Ridge Cut by checking at the Knights Landing outfall gates on the Back Borrow Pit of Reclamation District 787. Water not diverted by Knights Landing Ridge Cut users at Mile 6.3 is spilled into East Borrow Pit of Yolo By-Pass and becomes available for use then.

* Beginning of record and controlled flow for season.

e Estimated.

TABLE 67

DISCHARGE OF YOLO BY PASS-EAST BORROW PIT (TULE CANAL)
1937

Day	Daily Discharge in Second-feet					
	May	Jun.	Jul.	Aug.	Sep.	Oct.
1		55	27	10	26	27
2		39	25	11	26	29
3		29	0	9	27	30
4		26	0	9	26	31
5		21	0	10	28	30
6		20	6	10	28	26
7		17	9	11	28	23
8		15	11	11	30	21
9		15	11	13	30	18
10		17	13	13	31	13
11	*194	17	13	13	31	13
12	196	20	13	13	33	12
13	198	23	14	13	34	10
14	200	25	16	13	35	8
15	204	23	16	13	34	8
16	208	23	18	13	34	7
17	210	27	15	13	31	7
18	230	30	15	13	34	7
19	255	36	17	13	34	6
20	270	40	17	13	32	6
21	282	46	16	13	36	6
22	285	39	16	13	41	6
23	240	35	16	13	41	5
24	170	34	18	13	37	5
25	152	30	18	13	36	4
26	135	32	19	13	34	4
27	122	36	19	13	30	3
28	108	33	17	48	28	3
29	88	33	13	43	25	3
30	66	30	12	37	26	2
31	60		11	30		2
Mean		29	14	15	32	12
Ac.Ft. for Month		1715	853	942	1873	742

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 record for season.

TABLE 68

DISCHARGE OF RECLAMATION DISTRICT 1000 DRAIN
(2nd BANNON SLOUGH)
1937

Day	Daily Discharge in Second-feet							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
1	*117	144	67					
2	69	142						59
3	49	69	61	81				
4		138					38	
5		76		29				
6	120	72						
7		92	63					
8		107	70					
9	102	96					24	
10		68			NO RETURN	NO RETURN		
11	131						20	3
12	242	142						
13	297						35	
14	160	102						
15	84		71					51
16	93	123					51	62
17		123		29				
18	182							41
19	85	127					26	
20	247		54					28
21	620							
22	641	89	41					
23	654							33
24	664	62					46	
25	660						32	
26	664	67		26				
27	664	88					61	
28	571							35
29	291							
30	176	80	30				51	
31	142							
Mean	249	66.9	14.7	5.5	0	0	12.8	10.1
Ac.Ft. for Month	15320	3980	906	327	0	0	762	619

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 preceding reports, this investigation had as its objective, a complete annual determination of the consumptive use of water in the entire Sacramento-San Joaquin Delta, and comprised 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 a complete census available, the former can 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.

Table 69 summarizes the crop and water consuming areas and figures for the consumptive use of water as previously reported for the years 1924 to 1932 inclusive.

TABLE 69

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

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

(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.

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 an 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

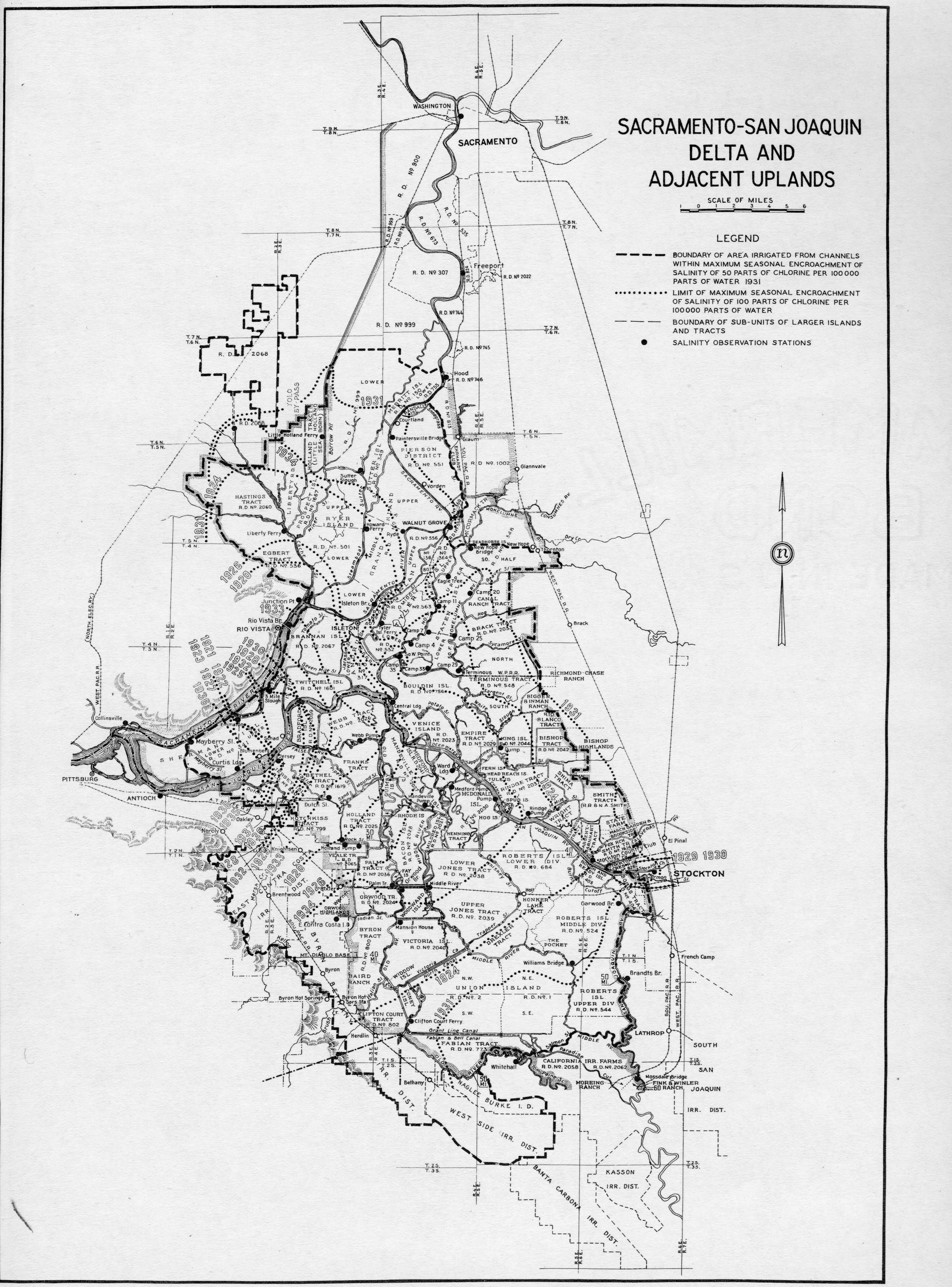
The scope of this investigation each season has been such as to insure that samples of water to be tested for salinity would be taken at regular intervals at a sufficient number of stations through-

out 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 1937, inclusive. Nineteen bay and delta sampling stations are maintained permanently throughout the year, and three additional stations in 1937 were established and maintained for the duration of the season in order to completely record the encroachment and recession of salinity.

Station Maintenance and Records

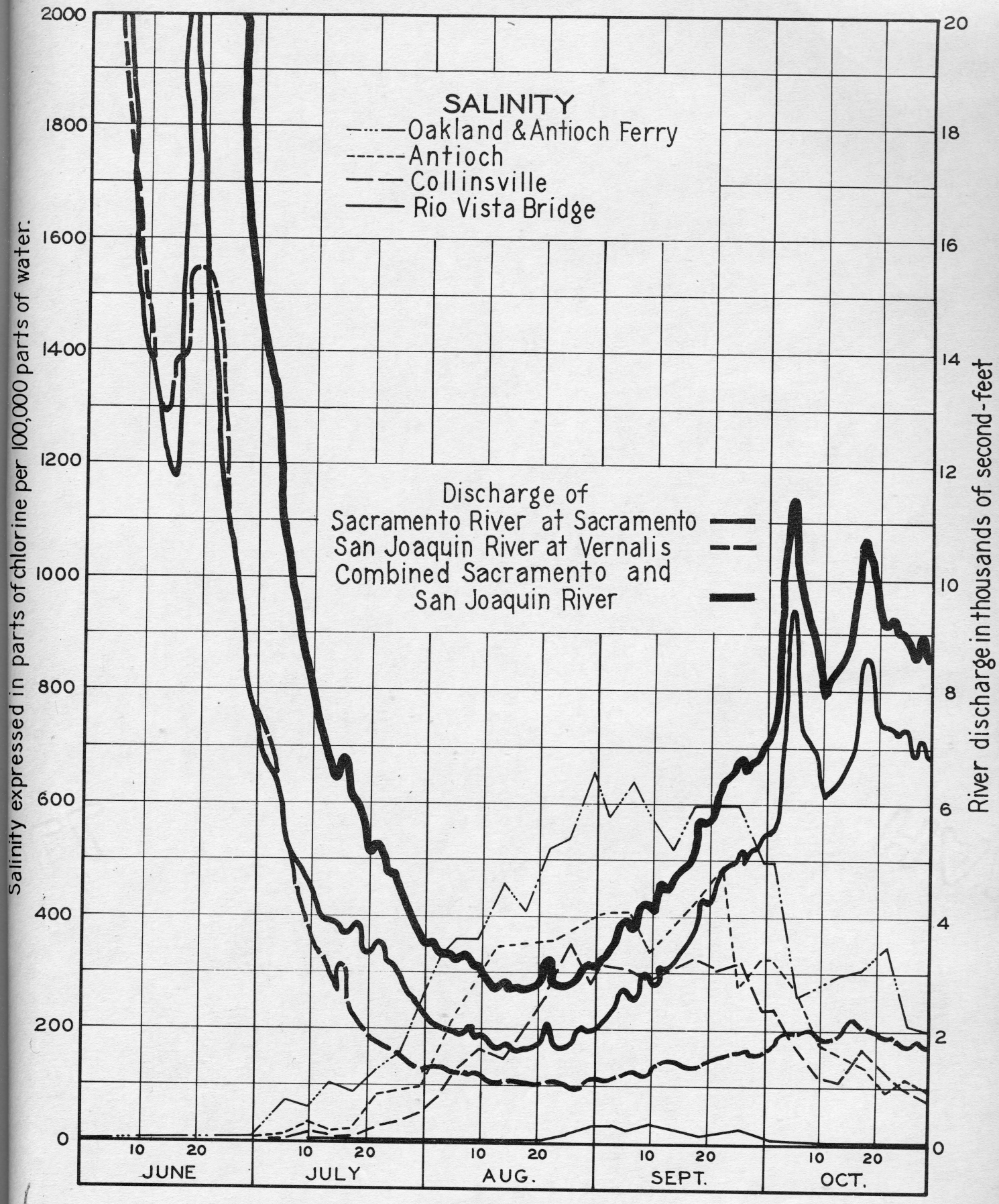
As in the past, the salinity sampling at all stations was done by local observers. Each observer was provided with a schedule showing the exact time for taking the samples so that, throughout the delta at four-day intervals, all samples would be taken at approximately one and one-half hours after the 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 1937 are given in Table 72 and Table 71 gives the location and description of each station.

The maximum salinity as recorded at the stations operated in 1937 is shown in Table 70. For comparative purposes, this table shows also the maximum salinity recorded at those stations in previous years beginning with 1927. A comparison of the summer stream flow to the delta in 1937 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 1920-1937

PLATE 3.



COMPARISON OF
RIVER DISCHARGE AND SALINITY
AT BAY AND DELTA STATIONS
1937

PLATE 4

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 1937, however, the encroachment of salinity as shown on Plate 3 was not of sufficient magnitude to justify the issuing of these bulletins.

TABLE 70

MAXIMUM RECORDED SALINITY AT BAY AND DELTA STATIONS
1927 TO 1937, INCLUSIVE*

Year	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Sacramento-San Joaquin Runoff in per cent of Normal **	114	80	42	63	29	78	46	40	86	91	75
Station (1)	Maximum Recorded Salinity in parts of chlorine per 100,000										
San Francisco, San Pablo and Suisun Bays											
Point Orient	1880	1870	1830	1780	1870	1720	1800	1840	1720	1740	1790
Point Davis	1510	1610	1660	1620	1810	1529	1680	1800	1500	1440	1460
Bulls Head Point	1330	1410	1370	1380	1690	1320	1380	1640	1260	1340	1270
Bay Point	950	1170	1050	1060	1540	1010	1160	1460	720	960	920
O and A Ferry	510	750	830	800	1390	620	900	1200	540	580	660
Innisfail Ferry			870	810	1400	680	900	1260	720	580	700
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	370	590	680	570	1260	500	620	1080	390	300	490
Emmaton	65	156	310	250	1000	166	380	760	88	54	102
Three Mile Slough Bridge	25	109	205	150	860	90	320	660	77	57	120
Rio Vista Bridge	12	44	67	52	740	28	130	520	12	8	33
Junction Point			17	26	620	(2) 7	74	410			
Liberty Ferry		7	14	6	560			230			
Grand Island (Steamboat Sl.)			5					350			
Isleton Bridge		13	6	10	635	(2) 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

* For maximum salinities recorded 1924-1926, 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 71.
(2) Maximum salinity obtained from first sample taken in season.

TABLE 70 (CONTINUED)

MAXIMUM RECORDED SALINITY AT BAY AND DELTA STATIONS
1927 TO 1937, INCLUSIVE*

Year	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Sacramento-San Joaquin Runoff in per cent of Normal**	114	80	42	63	29	78	46	40	86	91	75
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	179	450	600	470	1240	400	580	960	290	270	350
Curtis Landing			450		1060	280	470	810	180		
Jersey	53	192	365	220	910	150	280	(2) 620	86	78	102
Opposite Jersey											136
Webb Pump	16	46	80	61	680	35	122	(3) 340	16	16	25
Central Landing		19	20	15	425	8	25	(4) 90	8	7	
Opposite Central Landing											11
Dutch Slough					510	37	80	280	21	21	28
Rock Slough West of Dam									8	11	13
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
Rindge Pump		28	28	16	198	16	22	94	18	20	20
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
Mansion House		16	16	11	240			90			
Stockton Country Club			36	18	122			44			
Clifton Court Ferry			23		130			40			
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

* For maximum salinities recorded 1924-1926, 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 71.
(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 71

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 71 (CONTINUED)

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	Mokelumne River on Andrus Island directly opposite Central Landing on Bouldin Island.
Dutch Slough*	73.0	7	05	At Bethel Island Bridge.
Rock Slough West of Dam*	77.9	7	20	In Rock Slough, West of Dam at Junction of Sand Mound Slough and Rock Slough.
Ward Landing	79.6	7	35	San Joaquin River near junction with Little Connection Slough on the Southwest Side of Empire Tract.
Holland Pump	80.6	7	40	Rock Slough, North Bank, 1½ miles west of Old River Junction.
Bacon Pump	82.9	7	50	Old River at Bacon Island Drainage Pumping Plant, near Junction with Rock Slough.
Mandeville Pump	83.0	7	50	Connection Slough, North Bank, one mile west of Middle River, on South end of Mandeville Island.
King Island Pump	84.2	8	00	Honker Cut at Empire Tract - King Island Ferry.
Rock Slough East of Dam*	85.4	8	05	In Rock Slough, three-fourths of a mile East of Junction with Sand Mound Slough.
Rindge Pump*	86.1	8	10	San Joaquin River, North Bank, one mile below Fourteen Mile Slough Junction.
Orwood Bridge	86.3	8	10	Old River, at Santa Fe Railroad Crossing, Orwood.
East Contra Costa I.D.	86.7	8	20	Indian Slough, at East Contra Costa Irrigation District Pumping Plant.
Middle River P.O.*	87.7	8	20	Middle River, East Bank, at Santa Fe Railroad Crossing.
Mansion House	88.4	8	30	Victoria Island, Old River, East Bank, at Junction with North Victoria Canal.
Stockton Country Club	90.8	8	45	On Lindley Cutoff (San Joaquin River), North Bank, about three-fourths of a mile above Burns Cutoff Junction.
Clifton Court Ferry	94.2	9	10	Old River just below Junction with Grant Line Canal.
Stockton	94.8	9	15	Near Head of Stockton Channel at Wharf of California Transportation Company.
Garwood Bridge	95.3	9	15	San Joaquin River. At Drawbridge one mile above Santa Fe Railroad Crossing.
Brandt Bridge	100.6	9	50	San Joaquin River. At Drawbridge six miles above Santa Fe Railroad Crossing.
Williams Bridge	101.6	9	55	Middle River, about four miles below Salmon Slough Junction.
Whitehall	104.8	10	20	Old River, West of Junction of Salmon Slough and Paradise Cut. Due north of Tracy.
Mossdale Bridge*	108.5	10	50	San Joaquin River at Lincoln Highway Crossing, about three miles southwest of Lathrop

* Permanent station maintained throughout the year.

TABLE 72

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
1937

Station	JANUARY													
	2		6		10		14		18		22		26		30
San Francisco, San Pablo and Suisun Bays														
Point Orient	1460				1540		1480		1480		1460		1540		1440
Point Davis			1060		1120		1120		920				1000		1020
Bullshead Point	560	ab	460	ab	620		800		720	ab	580	ab	620	a	500
Bay Point			280												
O and A Ferry	a 60		150		190		160		72		94		88	a	100
Innisfail Ferry	b 360		320		260				290		140		160		224
Sacramento River Delta														
Collinsville			62		83		34		15		13		36		10
Emmaton			4			a	5		3	ab	1				4
Sacramento	1		1	ab	1	a	1		1	b	1	b	1		1
San Joaquin River Delta														
Antioch	22		21		22		11	a	11		10		18		9
Jersey									5						
Webb Pump	6			d	4		4		4		5		3		6
Dutch Slough	8		8		7		7		6		6		7		8
Rindge Pump	8		7		6	a	6		6		6	ab	5		7
Rock Slough West of Dam	6		5		6	a	5		6		7	ab	5		6
Rock Slough East of Dam	6		4		7	a	5		4		6	ab	7		5
Middle River P.O.				ab	5				4		5	ab	4		5
Mossdale Bridge	4		5		3		4		4		3		3		4

Station	FEBRUARY													
	2		6		10		14		18		22		26	
San Francisco, San Pablo and Suisun Bays														
Point Orient	1400		1200		960		1080		540		980		720	
Point Davis	820		660		480		520						260	
Bullshead Point	a 300	ab	150				204	a	4	ab	71		18	
Bay Point					4			b	1			a	2	
O and A Ferry	15		18	ab	2	a	3	a	5		1	a	4	
Innisfail Ferry	194		98		102	a	98		68		38	a	23	
Sacramento River Delta														
Collinsville	4		2		1	ad	1		1		1			
Emmaton	2		2	ab	1				1	ab	2			
Sacramento	1	ab	1	ab	1		1		1	ab	1		1	
San Joaquin River Delta														
Antioch	a 4		5		3		4		4		3	a	2	
Webb Pump	ab 6		5	ab	5	a	5		4				2	
Dutch Slough	6		7		5		5		3		3		4	
Rindge Pump	13		2		2		2		9		1		1	
Rock Slough West of Dam	6		6		9		8		10		6		5	
Rock Slough East of Dam	7		7		6		5		5		5		3	
Middle River P.O.	7		7						3					
Mossdale Bridge	3		4	d	28		6		1		1		5	

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

TABLE 72 (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
1937

Station	MARCH															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	940		780		1200		1160		760		720				520	
Point Davis	320	a	560		620		580		180	ab	90	b	60		90	
Bullshead Point	79	ab	238	a	330		250		4	ab	3	b	4		3	
Bay Point			20				7					a	3	a	2	
O and A Ferry	3	a	4	ab	3	a	1		1	ab	6	b	1		1	
Innisfail Ferry	55		35		47	a	43				44	a	26	a	23	
Sacramento River Delta																
Collinsville	1		3		2	a	1		1		1	a	1		1	
Emmaton	3		2	ab	1				1			a	1		1	
Sacramento	1		1	ab	1		2		1	ab	1	b	1		1	
San Joaquin River Delta																
Antioch	5		4	a	3		2		2		1	a	2	a	3	
Jersey			5		4						3	a	3		2	
Webb Pump	2	ab	2		2				1			a	3			
Dutch Slough	3		3		4		3		3		3	b	3		3	
Rindge Pump	2		4		4		5		6		4	b	3		2	
Rock Slough West of Dam	4		5		5		4		5		3	b	6		10	
Rock Slough East of Dam	4		4		4		4		5		4	b	5		7	
Middle River P.O.												a	6		2	
Mossdale Bridge	2		2		2		1		1		1	a	1		1	

Station	APRIL															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	980		780	b	1100		920		860	b	960	b	1020		940	
Point Davis	120	a	330				360		300	b	200				200	
Bullshead Point	4	b	100	b	56		24		87	b	50	b	76		26	
Bay Point		a	3	a	1					a	1	a	1			
O and A Ferry	2	b	3	b	3		2		1	a	2	a	2		1	
Innisfail Ferry			24	a	27	a	29	a	29	a	24	a	20	a	20	
Sacramento River Delta																
Collinsville	4	a	4	a	1		6			a	1	d	3		1	
Emmaton		a	1	b	1	a	1			a	2				1	
Sacramento	1	a	1	b	1		1	a	1	b	1	b	1		1	
San Joaquin River Delta																
Antioch	2	a	3	a	3	a	2	a	3	a	2	a	2		2	
Jersey		a	3				4									
Webb Pump		b	3				3	ad	1	abd	3	b	2		1	
Dutch Slough	4	b	3	b	4		3	b	2	b	2	b	2		2	
Rindge Pump	2	b	3				3	a	3	a	2	b	2		1	
Rock Slough West of Dam	6	a	6	b	7		5	a	4	a	4	b	3		2	
Rock Slough East of Dam	8	a	5	b	6		2	a	3	a	3	b	2		4	
Middle River P.O.	3	a	2	b	2		3	a	1	b	3					
Mossdale Bridge	1	b	2	b	3	ab	1	b	1	b	2	b	1		1	

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

TABLE 72 (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
1937

Station	MAY 2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	840	1200 :b	1160	1060	900	1020 :b	860	1000
Point Davis		540 :a	330	420	260 :b	560 :b	200	
Bullshead Point	50 :b	330 :b	120	170	50 :b	254 :b	14	4
Bay Point	2 :b	2		1	2 :a	1 :a	3 :a	1
O and A Ferry	:a 4 :b	2 :a	1 :a	4	1 :b	1 :b	1 :a	1
Innisfail Ferry	19 :a	16 :a	15	11 :a	14 :a	13 :a	12	11
Sacramento River Delta								
Collinsville	1 :a	1 :a	2	1 :a	3 :a	1 :b	1	1
Emmaton	2 :a	1 :b	1 :a	1	:a	1		1
Sacramento	1 :b	1 :b	1	1 :a	1 :b	1 :b	1	1
San Joaquin River Delta								
Antioch	2 :a	1 :a	4	1 :a	1 :a	1 :a	2	1
Jersey	:a	1						
Webb Pump	:a	5 :b	3		:b	3 :b	1	
Dutch Slough	2	1 :b	1	1 :b	1 :b	1 :b	1	
Rindge Pump	2 :a	3 :b	3	1 :a	2 :a	2 :b	1	1
Rock Slough West of Dam	1 :a	3 :b	2	2 :a	2 :a	1 :b	1	1
Rock Slough East of Dam	3 :a	5 :b	1	1 :a	1 :a	1 :b	1	1
Middle River P.O.	2 :a	1 :b	1	1 :a	3 :b	1 :b	1	
Mossdale Bridge	1 :b	1 :b	1	1 :b	1 :b	1 :b	1	1

Station	JUNE 2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	860	1280		980	1080 :b	1000 :b	860	1200
Point Davis	540				500 :b	580		
Bullshead Point	:ab	280 :b	260	290	220 :b	350 :b	280	720
Bay Point	:a	3		:a	3 :a	4	:a	46
O and A Ferry	1 :a	1 :b	1 :a	1 :b	2 :a	2 :b	1 :a	4
Innisfail Ferry	:ab 13	8	:a	8 :a	14	:a	17	
Sacramento River Delta								
Collinsville	1 :a	1 :a	1 :a	1 :a	1 :a	1 :a	1	1
Emmaton	:a	1 :b	1	:a	1 :b	2	:a	1
Sacramento	:a 1 :b	1	:a	1 :a	1 :b	1 :b	1 :a	1
San Joaquin River Delta								
Antioch	1 :a	1 :a	2 :b	1 :a	1 :a	1 :a	1	2
Jersey		:b	1					
Webb Pump	:a	1 :b	3	:a	1		:a	2
Dutch Slough	:b 1 :b	1 :b	2	2 :b	1 :b	2 :b	1	
Rindge Pump	:a 4 :a	1 :b	3 :a	1 :a	3 :b	1 :b	1 :a	4
Rock Slough West of Dam	:a 1 :a	1 :a	1 :a	1 :a	1 :b	2 :b	1 :a	5
Rock Slough East of Dam	:a 1 :a	1 :a	1 :a	1 :a	2 :b	1 :b	1 :a	1
Middle River P.O.	:a 1 :b	1 :b	1 :a	2 :a	3 :b	1	:a	3
Mossdale Bridge	:b 1 :b	1 :b	1 :b	2 :b	1 :b	1 :b	2	

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

TABLE 72 (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
1937

Station	JULY													
	2		6		10		14		18		22		26		30
San Francisco, San Pablo and Suisun Bays														
Point Orient	1180		1400		1240		1500		1380	b	1520		1420		1600
Point Davis		b	920				960		1100	b	1220		1080		1160
Bullshead Point	660	b	760		700		620		720	b	920				1000
Bay Point	40	a	242	a	200	a	230					a	480	a	540
O and A Ferry		b	72	a	64	a	72	a	82	a	138	a	370	a	192
Innisfail Ferry	12	a	18	a	65		106	a	90	a	130	a	160	d	260
Sacramento River Delta														
Collinsville	3	a	12		34	a	20	a	26	a	86		92	a	96
Emmaton		a	1		3			a	2				4	a	9
Three Mile Slough Bridge					1		2	b	2	b	3		3		6
Rio Vista Bridge					2		1		2	b	2		1		2
Sacramento	1	a	1		8	a	2	a	1	b	1		1	a	2
San Joaquin River Delta														
Antioch	1	a	4		13	a	8	a	12	a	29	a	36	a	52
Jersey		a	1											a	6
Webb Pump						a	2			ab	2		3	a	4
Opposite Central Landing					3	ad	2	abd	3	b	2		2	ad	3
Dutch Slough	1	b	3		5		3	b	2	b	4		4		3
Rindge Pump	4	a	4		5	a	6	a	6	b	7		8	a	11
Rock Slough West of Dam	2	a	2		2	a	3	a	2	b	3		3	a	4
Rock Slough East of Dam	1	a	6		4	a	4	a	3		4		3	a	4
Middle River P.O.	4	a	3			a	4	c	5	b	4		5		
Mossdale Bridge	5	b	4		5	b	8	b	9	b	10		10	b	12

Station	AUGUST													
	2		6		10		14		18		22		26		30
San Francisco, San Pablo and Suisun Bays														
Point Orient	1540	b	1640		1540		1700		1600	b	1620		1580		1640
Point Davis					1260			e	1340				1360		
Bullshead Point	1020	b	1140		960		1080	b	1000	b	1060		1020		1220
Bay Point	460			a	560	a	740	b	700				800		780
O and A Ferry	320	b	360	a	310		500	a	400	a	460		560		660
Innisfail Ferry	230	a	310		360		460	a	410	a	520	a	540		
Sacramento River Delta														
Collinsville	148	a	235		235	a	260	a	350	b	360	a	350	a	400
Emmaton		a	13		40			a	46	b	98			a	98
Three Mile Slough Bridge		b	20		24		43	b	53	b	79		88		
Rio Vista Bridge	2	b	3		4		5	b	8	b	6		15	b	30
Sacramento	3	b	13	a	6	a	3	b	3	b	4	a	1	a	4
San Joaquin River Delta														
Antioch	73	a	130		168	a	150	a	200	a	270		350	a	280
Jersey								a	32						
Webb Pump	4	b	9	a	7			a	8	b	21			a	20
Opposite Central Landing	4	a	3			a	5	ab	7	b	6	a	7		
Dutch Slough	5	b	1		8	b	14	b	14				26	ab	26
Rindge Pump	11	b	13	a	13	a	14	a	14	b	14	a	15		15
Rock Slough West of Dam	5	b	5	a	6	a	5			b	7	a	8	a	7
Rock Slough East of Dam	4	b	4	a	5	a	6	a	7	b	7	a	8	a	8
Middle River P.O.	6	b	5	a	9	a	7			b	7	a	8		
Mossdale Bridge	11	b	10	b	11	b	12	b	11	b	11	b	12	b	9

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

TABLE 72 (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
1937

Station	SEPTEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1680		1640		1600		1600	b	1620		1640		1620		1680	
Point Davis			ab1360		1360		1360	b	1460		1440		1310		1360	
Bullshead Point	b 1180		1100		1060		1060	b	1100		1180		1270			
Bay Point	a 860		800								920					
O and A Ferry	b 580	ab	640		580	a	520	b	600		600	d	600	a	500	
Innisfail Ferry	ab 580				640		620	a	660				580	a	700	
Sacramento River Delta																
Collinsville	410	ab	410	a	340		380				490	a	280	a	330	
Emmaton	a 102			a	84			a	62		100		96			
Three Mile Slough Bridge	b 120		114		104	b	100	b	90		100		58	a	56	
Rio Vista Bridge	b 30		22		33	b	24	b	13		17		23			
Sacramento	c 5	ab	4	a	4	a	3	ab	4	a	4	a	1			
San Joaquin River Delta																
Antioch	ae 320		310		290	a	310	a	330		310		320	a	240	
Jersey	a 92	abd	94	a	68	a	74			ad	102					
Opposite Jersey	a 92		90		116	a	88	a	88		136					
Webb Pump	12			a	18			a	22	a	25			a	15	
Opposite Central Landing	b 10	bd	10	a	9	a	8	b	12		11	a	8	a	10	
Dutch Slough	a 27		26		24	b	25	b	28		23					
Rindge Pump	a 15	b	16	a	16	a	15	b	20	a	15	a	17			
Rock Slough West of Dam	b 7	ab	8	a	8	a	10	b	9		10	ad	13	a	12	
Rock Slough East of Dam	b 8	ab	8	a	9	a	10	b	8		10	a	12	a	11	
Middle River P.O.	b 16	ab	8		9	a	9	a	10	a	10	a	10			
Mossdale Bridge	b 10		9	b	9	b	7	b	7		6	b	7	a	7	

Station	OCTOBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1680		1620		1560		1560		1480		1420		1520		1480	
Point Davis	1340		1300			e	1240		1240		1320		1200		1280	
Bullshead Point	ab1100		1080		800	a	980	ab	860		1000		820	ab	760	
Bay Point			660				640			b	500					
O and A Ferry	500	a	260	a	280	a	300		310	a	350	a	210		200	
Innisfail Ferry	700				560		560		500		440	a	460		410	
Sacramento River Delta																
Collinsville	330		280	a	180		180		140	a	94	a	114		96	
Emmaton			10	a	11				8			a	4			
Three Mile Slough Bridge	abd 40	a	7		6		8		6		6		5		5	
Rio Vista Bridge	5		5		2		2		2		2		3		1	
Sacramento	2	a	2	a	1		1	ab	1	a	1	a	1	ac	1	
San Joaquin River Delta																
Antioch	240		170	a	120		108		166	b	118		36		73	
Jersey		a	42				19			d	15					
Webb Pump		a	13	a	12		12				9	a	8			
Opposite Central Landing	8	a	6	a	3		6		3		6	a	5		5	
Dutch Slough	ae 25	a	25		16		14		13		13		11		10	
Rindge Pump	13	a	13	a	11		12		11	a	11	a	13		10	
Rock Slough West of Dam	13	a	11	a	11		10		9		10	a	9		8	
Rock Slough East of Dam	13	a	10	a	9		9		8		9	a	7		7	
Middle River P.O.	11	a	12	a	9		7		7	a	7	d	8		6	
Mossdale Bridge	d 6		6	b	6		7		5		7	b	5		7	

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

TABLE 72 (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

1937

Station	NOVEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient			1440		1600				1500		1380	b	1080		1360	
Point Davis			1160				1260		1100		940					
Bullshead Point	ab	700	880	a	880		960	ab	600		760	a	200			
Bay Point			400						60						16	
O and A Ferry			320		150		160		90		12				1	
Innisfail Ferry		400	a	420	360				280		150		120		102	
Sacramento River Delta																
Collinsville		92			36		49		41	a	2		2			
Emmaton	ab	3			4			ab	2						0	
Three Mile Slough Bridge		5		4	3		2		2		2		1		2	
Rio Vista Bridge		2		1	1		2		0		1		0		1	
Sacramento	ab	1	a	1	2	ab	1	ab	1	a	1		1		0	
San Joaquin River Delta																
Antioch		56		42	34		28		31		7	d	5		4	
Jersey			a	7	8			ab	5					d	3	
Webb Pump	ab	8	a	7	d 6								7			
Opposite Central Landing	ab	3	a	3	5	ab	4		4	a	4		1		0	
Dutch Slough		10		9	10		9		8		9		9		7	
Rindge Pump		10	a	11	10		10		12	a	13		12		11	
Rock Slough West of Dam		8	a	9	10		8		8	a	9		9		8	
Rock Slough East of Dam		7	a	8	9		7		8	a	9	d	8		7	
Middle River P.O.	ab	7			7	ab	7	ab	6				9			
Mossdale Bridge		9		7	8		9		6	b	8		8		6	

Station	DECEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1210		1260		1220		860		760		1000		780		1100	
Point Davis	600		620		760		160		100		180		320		540	
Bullshead Point	ab	70	320	a	580	ab	6	a	3		4		280	ab	120	
Bay Point		11														
O and A Ferry	ab	1	a	2	19		4	a	1	a	2		1		2	
Innisfail Ferry		78		64	58		112		28		36		38		30	
Sacramento River Delta																
Collinsville		1	a	3	2		0		1		2		6	d	1	
Emmaton				0				a	1		1				2	
Three Mile Slough Bridge		1		1												
Rio Vista Bridge		1		0												
Sacramento	ab	1	a	1	0		0	a	1		1		1	ab	1	
San Joaquin River Delta																
Antioch		2		2	1		2		1		3		2			
Jersey				d	2											
Webb Pump	ab	4					4	ad	3							
Opposite Central Landing		2	a	2	2		0	a	1		1	b	1		2	
Dutch Slough		7		8	8		7		9		8		7		4	
Rindge Pump		9	a	7	7		4	a	4		2		4		4	
Rock Slough West of Dam	ab	8		9	7		10		7		9		8		7	
Rock Slough East of Dam	ab	9		9	19		8		7		5		3		4	
Middle River P.O.		7	a	9			6	a	5					ab	3	
Mossdale Bridge		5		6	5		2		2		1		4		2	

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 1937 the samples were taken by field engineers of this office incident to their other duties and Table 73 gives the results of the samples taken and analyzed.

TABLE 73

MISCELLANEOUS SALINITY OBSERVATIONS-1937
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 Colusa													10	1	1720						
at Colusa	18	1		24	1		7	1	3080	24	1	1440	24	2	2340						
at Meridian	18	1					7	1													
at Knights Landing	18	3					7	1	2680							22	2	4000			
at Verona	18	2	33500	24	1	10300	7	1	4240	24	4	1810	10	1	2860						
at Sacramento	18	1	44500	24	1	12400	7	1	5060	24	3	1740	10	4	2930						
Feather River at Nicolaus				24	1		7	1	1190				13	1	380						
Return Flow Channels																					
Colusa Trough at Colusa-Williams Highway													1	4	465						
Colusa Trough at Colusa-Williams Highway							1	3	303				10	3	533						
Colusa Trough at Colusa-Williams Highway	18	2	422	25	2	340	16	1	322	3	1	392	24	5	456				2	8	93
Butte Slough at Mouth													10	1	342						
Butte Slough at Mouth	18	1	370	25	1	352	16	1	48	19	1	132	24	2	376						
Recl. District 70 Drain at plant	18	12	14	25	9	32							24	18	24						
Recl. District 108 Drain at plant	18	9	110	24	13	88	29	12	103	19	12	105	9	8	292						
Knights Landing Ridge Cut at end										27	3	63									
Colusa Basin Drainage at Knights Landing													9	3	552						
Colusa Basin Drainage at Knights Landing	25	5	515	24	3	535	29	3	192	27	3	360	24	5	515						
Sacramento Slough at Sacramento River				24	4		30	9	433	27	11	472	10	2	584						
Reclamation Dist. 1500 Drain at plant										19	15	259									
Reclamation Dist. 1500 Drain at plant	18	22	309	24	17	329	30	17	263	27	13	267	23	21	365				5	48	
Sutter By-Pass -																					
East Borrow Pit at Chandler				24	1	278	18	1	118	4	1	136	23	1	210						
West Borrow Pit above R.D.1500 Drain										19	5	170									
West Borrow Pit above R.D.1500 Drain	18	1		24	2		30	5	170	27	5	205	23	11	260						
Yolo By-Pass -																					
East Borrow Pit at Elkhorn				24	12	30	29	9	10	27	7	13	22	8	41						
East Borrow Pit at S.P.RR.	19	7	255	24	12	34	28	11	13	27	12	13	22	8	20	21	11	6			
Reclamation Dist. 1000 Drain at plant	19	4	50	24	4	25	1	4	0	24	4	0	22	8	0						

TABLE 73 (CONTINUED)
MISCELLANEOUS SALINITY OBSERVATIONS-1937
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													1	1	1440						
at Friant													16	1	1310				15	0	877
at Mendota																			4	0	
at Mendota													17	1					13	0	
at Mendota							23	1		31	1		30	1		7	1		18	2	
at Fremont Bridge													8	15	126				5	21	114
at Fremont Bridge													10	15	145	8	8	182	12	17	132
at Fremont Bridge	20	1	3340	14	1	4390	23	10	352	12	24	141	16	10	182	13	8	192	19	16	159
above Merced inflow																14	15	195			
near Newman													8	13	410						
near Newman													14	6	414						
near Newman	20	1	9680	14	1	8080	21	17	830	17	14	401	28	9	481	14	6	534	10	16	289
at Crows Landing Bridge	20	1					21	12		12	21		8	10		14	8		10	17	
near Grayson (Laird Slough)																12	8	760	9	20	475
near Grayson (Laird Slough)	20	1	10550	14	1	9350	20	12	1185	11	16	605	7	11	650	14	9	760	22	16	600
Maze Road Bridge				14	1	12100	23	13	1345	13	14	815	8	10	970	14	6	1940	10	9	1680
at Durham Ferry Bridge	20	1	24900	14	2	12900	23	10	1670	13	11	1050	8	8	1220	14	4	1960	10	7	1930
near Lathrop (Mossdale Bridge)	20	1		14	2		23	10		13	12		10	9							
Mud Slough at Gustine-Stevinson Highway																					
Mud Slough							22	65	15				16	350	3	13	350	0	10	210	2
North Fork Mud Slough													16	350	0	13	340	0	10	370	0
Merced River																					
at Yosemite Valley Railroad Crossing				14	1	426	21	1	66	12	1	33	8	1	27	13	1	27	9	1	7
near Mouth																			10	2	150
near Mouth				14	1	1000	21	1	250	12	1	226	8	2	292	13	1	293	22	3	160
Dry Creek																					
near Modesto				14	1	62	19	1	72	10	1	60	8	1	51	11	1	64	8	1	53
Tuolumne River																					
at La Grange							20	1	4	11	1	3	7	1	4	13	1	601	9	1	899
at Roberts Ferry Bridge				8	1	930	20	6	39	11	6	30	7	6	30	11	1	633	9	1	870
at Hickman Bridge				8	1	1140	20	3	130	11	4	124				13	1	806	9	4	950
at Tuolumne City																			9	3	1205
at Tuolumne City				14	1	2740	20	10	420	11	11	370	7	8	375	12	2	920	24	2	1230
Stanislaus River																					
at Orange Blossom Bridge				7	1	3490	19	1	27	10	1	27	7	1	27	13	1	17	8	1	17
at Hatmark Ranch																			8	1	209
at Hatmark Ranch				7	1	3540	19	1	365	10	1	241	8	1	221	12	1	199	22	0	360