STATE OF CALIFORNIA

DEPARTMENT OF PUBLIC WORKS

DIVISION OF WATER RESOURCES

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

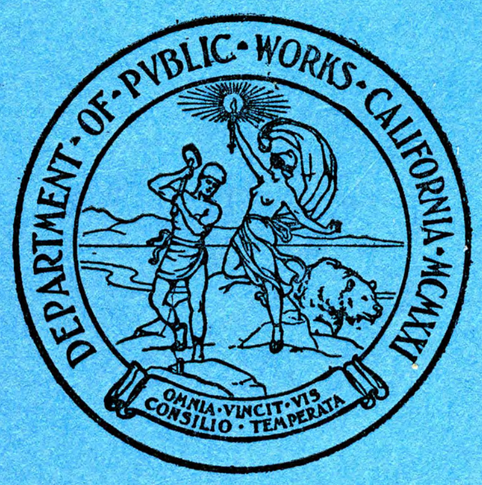
REPORT OF

SACRAMENTO-SAN JOAQUIN

WATER SUPERVISION

FOR YEAR

1939



JUNE, 1940

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

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CULBERT L. OLSON, Governor

FRANK W. CLARK, Director of Public Works

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REPORT OF

SACRAMENTO-SAN JOAQUIN

WATER SUPERVISION

FOR
1939

Sacramento
June, 1940

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ACKNOWLEDGMENT

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

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

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

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

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

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

The Merced, Modesto, Turlock and Oakdale Irrigation Districts and Miller and Lux, Incorporated, have assisted in observing and maintaining recording and staff gages in the San Joaquin Valley as has the United States Bureau of Reclamation.

ORGANIZATION

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

- - 0 - -

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

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Part and full time gage and salinity observers

- - 0 - -

ADVISORY COMMITTEE

PERMANENT COMMITTEE OF THE SACRAMENTO-SAN JOAQUIN RIVER PROBLEMS CONFERENCE

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

Herbert E. White, Chairman, Sacramento

E. L. Adams, Chico
A. E. Anderson, San Francisco
Alden Anderson, Sacramento
G. A. Atherton, Stockton
P. M. Downing, San Francisco
William Durbrow, Grass Valley
Manly S. Harris, San Francisco
Wm. N. L. Hutchinson, Walnut Grove
Warren H. McBryde, San Francisco
R. V. Meikle, Turlock
Jesse Poundstone, Grimes
F. T. Robson, Vina

PERSONNEL OF LOCAL WATER USERS COMMITTEES
SEASON OF 1939

District No.	Name and Address
I	George B. Dozier, Chairman Sacramento, California
II	Rex Lundberg, Chairman Robbins, California
	William J. Duffy, Jr. Robbins, California
	P. J. Hiatt Woodland, California
	P. A. Jacobsen Knights Landing, California
III	Warren Egbert, Chairman Knights Landing, California
	George Poundstone Grimes, California
	Charles Tuttle Colusa, California
IV	Lewis G. Sutton, Chairman Colusa, California
	E. N. Cook Colusa, California
	Einer Sagen Princeton, California
	Charles Tuttle Colusa, California
V	H. R. Allard, Chairman Willows, California
	R. M. Argo Princeton, California
	Tom Balch Willows, California
	Roscoe Caldwell Glenn, California
	Clyde Renwick Willows, California
VI	Fred T. Robson, Chairman Vina, California
	C. Andersen Vina, California
VI (cont'd)	C. D. Conway Los Molinos, California
	Roy Gray Vina, California
	Jesse Smith Anderson, California
VII	J. E. Frazier, Chairman Gridley, California
	James Ownby Gridley, California
	H. E. Savage Biggs, California
	Chas. Bloom Richvale, California
VIII	S. A. McKeehan, Chairman Meridian, California
	Clinton DeWitt Sutter, California
	Carl Watson Meridian, California
IX	Gus Olson, Chairman Clarksburg, California
	Roy Herringer Clarksburg, California
	Wm. N. L. Hutchinson Walnut Grove, California
	R. E. Merwin Clarksburg, California
	A. F. Turner West Sacramento, California
X	John J. McIntosh, Chairman Stockton, California
XI	Jack Knight, Chairman Tracy, California
	Douglas B. Cohen Banta, California
	J. R. Sillerman Patterson, California

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 1939.

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

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. 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 1939 as in the past years the investigational work 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, largely 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; observations and investigations of the advance and retreat of salinity in the delta channels and upper bays, and maintenance and operation of recording tide gages in the area covered by the salinity investigation.

History of State and Water Users' Cooperative Financing

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

Resume of Events and Activities during 1939

Early in 1939 it became apparent to the Division of Water Resources that the coming irrigation season would be deficient in run-off and this fact was brought to the attention of the Chairman of the Permanent Committee of the Sacramento-San Joaquin River Problems Conference together with the information that the money allotted to the Division of Water Resources in the 1939-1940 budget for furtherance of the water supervision work was grossly inadequate to care for an active program of water conservation.

Acting upon a suggestion from the Division of Water Resources the members of the Permanent Committee at the request of their chairman assembled in the State Engineer's office May 3, 1939, and adopted the following resolution:

> "In the opinion of this Committee a grave emergency now exists in the water supply of the Sacramento and San Joaquin valleys; that special supervision of the distribution of the available water is necessary for irrigation, municipal and industrial supplies, and for salinity control, navigation and other purposes; that funds now proposed in the budget of the Division of Water Resources, State Department of Public Works, are inadequate for this special purpose; that an additional $10,000 for the year 1939 to provide proper supervision is necessary; that the chairman of this committee be authorized to appoint a committee of five of which the chairman of this committee is ex-officio chairman, to consult with State officials to endeavor to secure this additional sum."

The Permanent Committee sent the following letter (page 9) to all water users and newspapers in the Sacramento-San Joaquin territory.

The Committee appointed to consult with state officials relative to securing additional funds for the Division of Water Resources started functioning immediately and on May 23, 1939, secured the introduction of Senate Bill No. 1277. This bill, appropriating $10,000, passed the Senate on June 1, 1939, the Assembly on June 19, 1939, and was signed by Governor Olson on June 21, 1939, to become effective on July 1, 1939, as an urgency measure. The text of Senate Bill No. 1277 is as shown on page 10.

Immediately upon the signing of Senate Bill No. 1277 plans were made to start active conservation operations in the field on July 1st.

The Sacramento River continued to drop at an alarming rate and it was decided to call a meeting of all interested parties at Sacramento on July 8, 1939. The following letter (page 11) was accordingly sent out on July 5, 1939.

This meeting was held in the Public Works Building and was well attended. A strong desire was expressed for the utmost conservation of water and a suggestion made that local committees be appointed to work with a Water Supervisor and his assistants. The suggestions were put to a vote and carried, and accordingly the Sacramento-San Joaquin area was divided into eleven geographical districts with a chairman selected for each (page xi). Each chairman chose his own committee from among persons intimately acquainted with irrigation practices in his particular district. These local committees functioned in an excellent manner and a large measure of the success of the conservation efforts was due to their active support of the conservation program.

On July 13, 1939, a meeting of the local committee was held in Colusa and ideas exchanged as to various methods and plans for carrying the work during the approaching critical season. At this meeting it was brought out that large areas customarily devoted to pasture and gun clubs were deferring their flooding operations until the crisis had passed. In order to more intimately acquaint the members of the local water users committees with the Delta area, an all-day trip through that section was made on August 1, 1939. The itinerary was planned so that all types of Delta soils, crops, irrigation practices and drainage works could be seen and observed. A luncheon meeting was held in Stockton at which several of the large operators in the Delta area explained their problems.

There was a splendid spirit of cooperation all along the line and all.

suggestions from the Water Supervisor for the conservation of water were well received. Any water conserved in the upper valley delays encroachment of salinity into the Delta enabling the irrigators in that area to get in the last vital few days of irrigation.

After the low water period passed all efforts were bent toward getting the rice drainage back into the stream channels as soon as possible. This early return flow speeded the fall rise of the river and in many instances enabled the Delta irrigators to get in a late irrigation. It is conservatively estimated that due to up-river conservation efforts about 50,000 acres in the Delta were kept from feeling the effects of salinity greater than 100 parts of chlorine per 100,000 parts of water. Plate 2 shows the limit of the maximum seasonal encroachment of salinity of 100 parts of chlorine per 100,000 parts of water. There are large storage works on the head waters of the Feather River by which the flow of the river may be regulated. In the latter part of July and early part of August the flow of the Feather River was approaching a point where there would not be enough water to satisfy the irrigation demand. An appeal to the Pacific Gas and Electric Company resulted in an increased release from the upstream reservoirs, thereby preventing any water shortage on the Feather River.

On the Yuba River the Hallwood-Cordua Irrigation District released during the period August 1 to August 15, 1939, 650 acre-feet of stored water which reached the Feather River below Marysville.

The water users in the Delta were kept advised of the encroachment of salinity by bulletins, sent out at the height of the season, at four-day intervals to a mailing list containing 206 names. As the salinity encroached, irrigators who wished to keep more closely informed as to the encroachment of salinity personally brought samples to the laboratory where the samples were analyzed immediately, thereby enabling the water users to irrigate up to the

last minute. In some instances irrigators were able to stretch out their operations by pumping on the out-going tide only. Forty-seven observation stations were maintained throughout the Delta and at these local observers took and mailed water samples to the Division at four-day intervals. From these stations a total of 2280 samples were analyzed. The results of the analyses are shown in Table 109.

The various streams in the Sacramento and San Joaquin valleys were closely observed and measurements of flow made. Table 1 shows the comparative Sacramento Valley water supply 1920-1939, and Table 2 shows the comparative San Joaquin Valley water supply for the same years. It will be noted in Table 1 that while the minimum flow of the Sacramento River at Red Bluff was approximately 200 second-feet greater in 1939 that in 1931, the minimum flow of the Sacramento River at Sacramento in 1939 was 550 second-feet greater than 1931. Table 37 shows the Sacramento River stream flow irrigation draft and gross duty of water 1924 to 1939. It will be noted that the gross duty in the Sacramento River was much lower in 1939 than the average for the years of record, the 1939 gross duty being 5.84 acre-feet per acre while the average for the period is 6.43. 1931, the only year which approaches 1939 in gross diversions and areas irrigated, shows a duty of 6.20 acre-feet per acre. In Table 1 it is shown that the minimum flow at Sacramento for the year 1939 was zero. The Feather River is a large factor in influencing the flow of the Sacramento River at Sacramento. In 1931 the minimum flow of the Feather River at its mouth was zero while in 1939 the flow was 68 cubic feet per second. Summarizing the foregoing it would seem that it would be reasonable to assume that during 1939 the minimum flow from the Sacramento Valley into the Delta was 300 second-feet greater that it would have been had there been no concerted and organized plans for conserving water in the up-river areas. In Plate 3 is shown the relation

between flow to the Delta and area affected by salt water.

All diversions from the streams were measured and where apparently excessive were cut. All well defined return flows were measured and recorded and where the return was apparently excessive, diverters who were contributing to the flow were notified and requested to diminish their diversions. Tables 74 to 81 show the return flow percentages in the Sacramento-San Joaquin territory. Plate 1 shows the relation between the seasonal run-off at Red Bluff in per cent of the 40-year mean and the July to September return in per cent of July to September diversions.

Plots were made showing the location of all crops irrigated by diverters on the Sacramento-San Joaquin valley stream system and by-pass channels.

No crop survey was made in the Delta proper, the last one having been made in 1938. The cropped area in the Delta is not suddenly changed from year to year so it is probable that surveys at intervals are sufficient for all practical purposes. Table 105 shows the estimated unit consumptive use of water by various crops in the Sacramento-San Joaquin delta and Table 106 shows the estimated annual consumptive use.

PERMANENT COMMITTEE
OF THE
SACRAMENTO-SAN JOAQUIN
RIVER PROBLEMS CONFERENCE
401 PUBLIC WORKS BUILDING
SACRAMENTO

May 3, 1939

To Water Users in the Sacramento-San Joaquin Territory:

Your undersigned Committee in cooperation with the State Department of Public Works, Frank Clark, Director, has met today to consider the water situation confronting us in the coming season and to take the action indicated to be necessary.

A forecast of the 1939 water supply and the situation to be expected was presented to the Committee by the State Engineer. The summer stream flow is forecast to approach closely that of 1934. With such low flow the water supply will be hardly sufficient to care for the planted acreage, to prevent salinity encroachment into the Delta approaching in extent that of 1934, and to prevent serious impairment of navigation above Sacramento unless the utmost economy in water use is put into effect.

After careful consideration of data gathered by the Division of Water Resources, State Department of Public Works, this Committee is impelled to warn the water users of the above conditions. The necessity will exist for the greatest possible conservation of water. In other low water years this was effected by water users on the advice of this Committee acting with the Division of Water Resources. The splendid cooperation on the part of all interests resulted in a minimum of loss and an acceptance by the U. S. War Department of local efforts in the interest of navigation, so that no drastic action was taken by the Federal Government. Faced by a recurrence of low water conditions, similar cooperation and effort should, in the opinion of the Committee, be put into effect immediately. Edward Hyatt, State Engineer, advises that his office stands ready to work with the Committee and water users to prevent waste and save water in every possible way.

In considering how best to meet the situation the needs of the Delta must be taken into account along with those of the valleys, as must the authority of the United States in the interest of navigation.

<u>You are urged to consider the situation most carefully,</u> particularly in the case of extensive plantings which will demand large amounts of water in July and August.

Through the efforts of the water users themselves, represented by this Committee, previous dry seasons have been successfully passed with a minimum of friction and a maximum benefit to all interests, and your full cooperation is most earnestly urged to again accomplish this in the season at hand.

Very truly yours,

PERMANENT COMMITTEE OF THE SACRAMENTO-SAN JOAQUIN RIVER PROBLEMS CONFERENCE

HERBERT E. WHITE, Chairman, Sacramento,

E. L. ADAMS, President, Rice Growers Association, Chico,

A. E. ANDERSON, President, River Lines, San Francisco,

ALDEN ANDERSON, President, Capital National Bank, Sacramento,

G. A. ATHERTON, General Manager, California Delta Farms, Inc., Stockton,

P. M. DOWNING, Vice Pres. & Gen. Mgr., Pacific Gas & Electric Co., San Francisco,

WILLIAM DURBROW, President, California Irrigation Districts Association, Grass Valley,

MANLY S. HARRIS, President, United Gun Clubs, San Francisco,

Wm. N. L. HUTCHINSON, Agriculturist, Walnut Grove,

WARREN H. McBryde, Consulting Industrial Engineer, San Francisco,

R. V. MEIKLE, Chief Engineer, Turlock Irrigation District, Turlock

JESSE POUNDSTONE, President, Reclamation District 108, Grimes,

F. T. ROBSON, Secretary, Stanford Vina Ranch Irrigation Company, Vina.

SENATE BILL NO. 1277

CHAPTER 654

"An act making an appropriation to the Department of Public Works, Division of Water Resources, to be used in the supervision and enforcement of water conservation, utilization and regulation, and making an appropriation therefor, declaring the urgency thereof, to take effect immediately."

(Approved by Governor June 21, 1939. Filed with Secretary of State June 21, 1939)

The people of the State of California do enact as follows:

SECTION 1. The sum of ten thousand dollars is hereby appropriated out of any money in the State treasury not otherwise appropriated to be expended during the ninety-first and ninety-second fiscal years, by the Department of Public Works, Division of Water Resources, for the purpose of supervision and enforcement of water conservation, utilization and regulation for the purposes of flood control, river flow control and equation, domestic use, irrigation, reclamation, power development and other beneficial uses.

SEC. 2. This act is hereby declared to be an urgency measure necessary for the preservation of the public peace, health and safety within the meaning of section 1 of Article IV of the Constitution, and therefore shall go into immediate effect. The facts constituting such necessity are as follows: The subnormal rainfall and snowpack of the winter of 1938-1939 in the watersheds of the San Joaquin and Sacramento rivers and tributary streams are causing and will continue to cause unforseeable greatly increased expenditures by the Division of Water Resources in employing additional help for the supervision and enforcement of water conservation, utilization and regulation, particularly in the area served by the San Joaquin and Sacramento rivers and their tributary streams. Such additional help is essential to insure the agricultural industry of said area the maximum beneficial use of the available flow of said rivers and streams."

Permanent Committee
of the
SACRAMENTO-SAN JOAQUIN
RIVER PROBLEMS CONFERENCE
401 Public Works Building
Sacramento, California

I M P O R T A N T

To all Water Users From
Sacramento River:

The discharge of Sacramento River is falling rapidly. Curtailment of use is imperative to save as much crop destruction as possible.

All water users and others interested are invited and urged to attend a meeting called by the Permanent Committee of the Sacramento-San Joaquin River Problems Conference and the Division of Water Resources at Sacramento July 8th at 10:00 A.M. in Assembly Room, Public Works Building, 12th and N Streets, to discuss ways of meeting the situation.

EDWARD HYATT
STATE ENGINEER

July 5, 1939.

TABLE I

COMPARATIVE SACRAMENTO VALLEY WATER SUPPLY 1920 - 1939

Year	Run-off in per cent of normal*		Minimum Flow in Second-Feet (1)								Rice Acreage Served by Sacramento River & Tributaries
	Sacramento-San Joaquin to delta	Sacramento at Red Bluff	Sacramento River at			Feather River at		Yuba River at		American River at	
			Red Bluff	Colusa	Sacramento	Oroville	Nicolaus	Smartsville	Mouth	Fairoaks	Sacramento
1920	-	45	3240	660	540 (2)	905	19 (3)	106		100	114 (2)	
1924	28	35	2810	1470	705	720	Zero	71		5	Zero	88500
1925	83	86	3240	1870	2760	1330	334	150		219	203	94700
1926	57	61	2980	1030	1330	1480	264	114		109	161	128600
1927	114	117	3580	1960	3420	1460	565	240		274	334	123300
1928	80	82	3400	1960	2510	1210	310	180		109	178	101100
1929	42	47	3060	1550	2300	1640	520	119		59	50	73700
1930	63	65	2980	1680	2350	1560	586	220		105	130	88000
1931	29	35	2480	820	-131	950	Zero	130		38	28	126500
1932	78	54	2620	1530	1900	685	284	181		178	159	90700
1933	46	49	2620	1350	1340	1050	200	165		32	30	87400
1934	40	48	2400	1320	1050	1180	208	144		77	75	91800
1935	86	80	2860	1780	2700	1470	690	250		178	185	78100
1936	91	76	2700	1540	2150	1560	603	266		356	415	104400
1937	75	64	2780	1370	1640	1420	230	219		234	238	109400
1938	160	157	3880	3000	4950	1690	772	295		455	439	94800
1939	41	47	2700	1320	556	1360	68	168	38	37	44	103800

(1) Minimum flow that occurred prior to September 30.
(2) No continuous record. Lowest measured discharge.
(3) Lowest measured discharge at mouth of river, August 19.
* Normal taken as 40-year mean (1889-1929) of natural run-off at foothill stations of major tributaries.

TABLE 2

COMPARATIVE SAN JOAQUIN VALLEY WATER SUPPLY 1920 - 1939

Year	Run-off in per cent of normal*		Minimum Flow in Second-Feet (1)									
	Sacramento & San Joaquin to Delta	San Joaquin at Vernalis	San Joaquin River near Vernalis	San Joaquin River near Newman	San Joaquin River at (3) Fremont Ford Br.	Merced River at Yos. Val. R.R.	Merced River near mouth	Tuolumne River at La Grange Br. (4)	Tuolumne River at Tuolumne City	Stanislaus River at Orange Blossom Bridge	Stanislaus River at Hatmark Ranch	Calaveras River at Jenny Lind	Mokelumne River at Woodbridge	Cosumnes River at Michigan Bar
1920	-	63	450(2)	62			2(2)	29(2)	245(2)	14(2)	95(2)	0		1
1924	28	24	391	15	0	0						0	1	0
1925	83	86	660	114	0	4(2)	73(2)	35(2)	299(2)	19(2)	161(2)	0	3	6
1926	57	55	565	62	0	5(2)	53(2)	32(2)	286(2)	15(2)	116(2)	0	3	0
1927	114	100	1290	305	0	12(2)	204(2)	45(2)	391(2)	29(2)	275(2)	0	1	6
1928	80	67	840	205	0	6	53	38	292	31	194	0	2	2
1929	42	44	565	105	0	4	65	32	287	30	205	0	3	1
1930	63	50	645	170	0	7	92	60	344	32	216	0	3	1
1931	29	26	200	22	0	1	17	25	243	25	81	0	3	0
1932	78	101	965	251	0	27	165	37	348	35	223	0	150	1
1933	46	51	569	187	0	7	127	36	280	19	185	0	81	0
1934	40	35	315	62	5(2)	7	36	26	270	20	104	0	6	0
1935	86	98	850	306	97(2)	46	206	34	345	28	199	0	84	2
1936	91	100	980	360	150	25	190	33	375	28	194	0	65	4
1937	75	100	950	333	115	12	211	3	355	17	212	0	106	2
1938	160	172	2030	702	280	66	335	8	460	22	270	1	143	14
1939	41	44	545	202	32	2	155	3	310	13	140	0	36	0

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

(1) Minimum flow that occurred prior to September 30.

(2) No continuous record. Lowest discharge measured.

(3) Prior to 1934 station maintained at Delta Bridge.

(4) Prior to 1937 station maintained at Roberts Ferry Bridge. Minimum flow at Roberts Ferry for 1937, 1938 and 1939 was 18, 20 and 34 cubic feet per second, respectively.

CHAPTER II

MEASUREMENTS OF STREAM FLOW

During the season of 1939, 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 Yuba River at Smartville; 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.

It will be noted that for the stations on the Sacramento River at Butte City, Colusa, Wilkins Slough and Knights Landing, on the Feather River at Nicolaus, and on the American River at Sacramento the flow is computed by the Water Resources Branch of the U. S. Geological Survey for the low water period only. The record for the balance of the year at these stations has been completed by this office from the best available data. This was done in order that some approximation of the return flow on an annual basis could be made. It is felt that the flows given for the period not computed by the Geological Survey are reasonably accurate as they are, with the exception of the Wilkins Slough station, based on several current meter measurements made at high stages.

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 staff gage reading of about 10.0 (13.1 U.S.E.D. datum) 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 74) no figure for it has been given (except for the measured drains - Table 73) because it could not be derived without a record of the actual flow at Sacramento.

Table 3 is given to show the water surface elevation which could be expected to occur at any given point on the Sacramento River for stream flows from 1000 to 10,000 cubic feet per second. These elevations are based on data obtained during 1938 and 1939 and are subject to changes from year to year should the channel show any scour or fill at the control points. Table 4 gives for the period March to October 1939 the average water surface elevations at various points on the Sacramento River for 15-day periods. This is the information used to determine the seasonal pumping heads for the various Sacramento River pumping plants. Similar data are available for past years

but have not been published. Tables 5 to 19 list in downstream order discharge records for the Sacramento Valley stream flow stations while similar data for the San Joaquin Valley stations is given in Tables 20 to 36.

TABLE 3

ELEVATION OF WATER SURFACE AT VARIOUS POINTS ALONG SACRAMENTO RIVER FOR DIFFERENT DISCHARGES

Station	Elevation of Zero of Staff Gage U.S.E.D.	July 1939 Av. W.L. U.S.E.D.	July 1939 Av. Disch. c.f.s.	U.S.E.D. Elevation* 1000 c.f.s.	2000 c.f.s.	3000 c.f.s.	4000 c.f.s.	5000 c.f.s.	6000 c.f.s.	7000 c.f.s.	8000 c.f.s.	9000 c.f.s.	10000 c.f.s.
Sacramento	3.10	5.3	982	Flows under 10000 c.f.s. will have no appreciable effect on average gage heights. Tidal effect lost at elevation 13.0. Flow 25000 c.f.s.									
Verona	-0.33	7.6	1281	7.1	8.1	9.1	10.0	10.8	11.6	12.3	13.0	13.6	14.4
Knights Landing	0.0(1)	9.4	997	9.5	11.7	13.5	14.8	16.0	17.0	18.2	19.2	20.2	21.3
Wilkins Slough	0.0	19.0	920	19.1	21.1	22.9	24.6	26.1	27.5	28.7	29.8	31.0	32.0
Colusa	0.0(2)	36.5	1660	35.8	37.1	38.3	39.3	40.2	41.2	42.0	42.8	43.6	44.5
Butte City	0.0	68.9	1620	68.4	69.2	69.9	70.6	71.3	71.6	72.0	72.5	72.8	73.0
Red Bluff (Iron Canyon)	252.0	252.4	3150(3)		251.7	252.3	252.9	253.4	253.8	254.2	254.6	254.9	255.3

*Elevations are subject to variation because of channel changes due to scour or fill. They are based upon data obtained in 1938 and 1939.

(1)New Weather Bureau gage 0 = 7.6 U.S.E.D.

(2)Weather Bureau gage 0 = 40.4 ± U.S.E.D.

(3)Average flows during August 2926 c.f.s.

TABLE 4

1939 (MARCH TO OCTOBER) AVERAGE WATER SURFACE ELEVATIONS AT VARIOUS POINTS ON SACRAMENTO RIVER
FOR BI-MONTHLY PERIOD
ELEVATIONS ARE U.S.E.D. DATUM

Station	Miles above Sacramento	Month and Period																0° of Staff gage U.S.E.D. datum
		March		April		May		June		July		August		September		October		
		1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	1-15	16-31	
Sacramento	0	9.1	14.0	11.8	8.2	7.0	7.2	5.9	5.6	5.2	5.4	5.2	5.3	5.5	5.7	5.5	5.2	3.10
Conaway Ranch	12.0	12.7	18.2	15.1	11.0	8.8	8.9	7.1	6.4	6.0	5.9	5.8	6.2	7.1	7.9	8.2	8.0	0.0
Verona	19.6	15.5	21.0	17.6	13.2	11.0	11.1	8.9	7.8	7.2	6.8	6.7	7.6	9.2	10.2	10.5	10.2	- 0.33
Knights Landing	34.0	19.7	26.0	21.2	16.3	14.2	14.5	11.9	10.4	9.7	9.1	9.0	10.2	12.4	13.6	14.2	14.0	0.0
State Ranch Bend	40.6	21.9	28.5	22.9	17.3	15.1	15.5	12.7	11.0	10.1	9.4	9.3	10.4	12.9	14.9	15.5	15.4	0.0
Rough & Ready	44.0	22.7	29.8	23.9	18.2	15.9	16.3	13.6	11.9	11.0	10.3	10.2	11.0	13.4	15.3	16.1	16.1	0.0
Wilkins Slough	62.9	30.3	37.4	30.1	24.8	22.7	23.2	21.0	19.9	19.2	18.7	18.5	19.0	20.5	22.4	23.2	23.3	0.0
R.D. 70 Drain	68.8	32.2	39.6	32.3	26.7	24.6	25.1	22.8	21.5	20.9	20.4	20.2	20.5	22.0	23.8	24.7	24.6	0.0
Meridian	79.8	38.6	44.1	38.2	34.2	33.0	33.2	31.7	30.6	30.0	30.0	29.8	29.8	30.8	31.7	32.2	32.2	0.0
Colusa	89.4	44.3	48.8	43.3	40.5	39.0	39.3	37.7	37.0	36.6	36.3	36.1	36.3	37.0	37.8	38.4	38.5	0.0
Butte City	115.8	73.4	74.7	72.5	71.2	70.6	70.6	70.0	69.3	69.2	68.7	68.6	68.7	69.2	69.5	70.0	70.0	0.0
M. & T. Inc.	141.5	116.4	117.6	115.7	114.4	113.8	114.0	113.3	113.0	112.7	112.2	112.0	112.5	112.9	112.3	113.7	113.1	4.0
Glenn Colusa ID	154.8			141.1	140.6	140.0	140.5	139.2	138.8	138.6	138.4	138.2	138.7	139.8	140.5	140.7	140.6	3.1
Red Bluff	193.4	245.7	246.5	244.7	243.6	242.8	242.9	242.3	242.1	242.0	241.8	241.7	241.7	241.8	241.9	242.0	242.0	240.6
Iron Canyon	198.6	255.7	256.0	254.5	253.7	253.2	253.4	252.8	252.6	252.5	252.3	252.3	252.2	252.4	252.4	252.5	252.5	252.0

TABLE 5

DISCHARGE OF SACRAMENTO RIVER AT KENNETT - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	4090	5510	4780	7190	4230	3710	3260	2950	2940	3080	3150	3110
2	4060	5120	4720	7270	4540	3530	3200	2940	2850	3000	3150	3160
3	4370	4940	4680	7190	4400	3510	3200	2930	2840	2990	3140	3200
4	5870	4780	4570	7500	4270	3500	3200	2940	2840	3040	3080	3270
5	10800	4620	4180	7420	4220	3610	3280	2930	2840	3060	3080	3170
6	8530	6890	4720	7050	4100	3590	3380	2930	2920	3160	3100	3140
7	6850	6930	4980	6730	4080	3570	3300	2930	2920	3220	3100	3150
8	6060	6120	5970	6500	4100	3580	3220	2930	2920	3200	3150	3520
9	5590	5610	7420	6030	4040	3550	3210	2930	2930	3120	3190	14100
10	5350	5240	7420	5750	4050	3530	3210	2900	2920	3110	3180	22400
11	5150	4980	7170	5970	4010	3410	3200	2890	2920	3060	3160	16000
12	4940	4970	17100	5920	3880	3380	3110	2840	3000	3010	3150	7710
13	4810	5210	33800	5970	3890	3370	3060	2860	3240	3060	3110	6030
14	4690	5270	18000	5820	3820	3450	3040	2920	3220	3140	3100	5260
15	4650	5320	13100	5330	3830	3460	2980	2970	3160	3140	3110	4580
16	4580	5320	11800	5020	3890	3470	3000	3080	3010	3050	3170	4240
17	4510	5270	11700	4790	4040	3460	3080	3090	2930	3040	3160	4860
18	4510	5430	11100	5210	4100	3480	3080	3080	2940	3050	3150	4580
19	4440	5430	10600	5490	3960	3470	3060	2930	3010	3040	3100	4340
20	4440	5410	10300	5490	3850	3420	3050	2780	3000	2990	3090	4230
21	4400	5370	10900	5300	4350	3540	3040	2680	3070	3000	3110	4090
22	4400	5240	10800	5100	5890	3290	3010	2660	3040	3050	3140	3940
23	4320	5120	10500	4750	5350	3270	3060	2760	3000	3110	3150	3900
24	4230	5030	10100	4620	4580	3240	3050	2840	2950	3370	3120	3810
25	4270	5020	9870	5020	4430	3290	2980	2870	3010	3410	3170	3820
26	4410	5030	10100	4760	4320	3230	3020	2930	3070	3260	3410	3700
27	4680	4960	9370	4790	4260	3210	2980	2920	3060	3230	3310	3580
28	4600	4920	8770	4820	4090	3200	2950	2920	3050	3150	3230	3720
29	5860		8660	4480	4010	3180	2920	2920	3080	3100	3150	3940
30	8070		8420	4260	3950	3190	2890	2930	3100	3080	3110	4720
31	6170		7560		3880		2950	2930		3090		8240
Mean	5281	5324	9780	5718	4207	3420	3096	2907	2993	3110	3151	5533
Ac.Ft. for Month	324700	295700	601300	340200	258700	203500	190400	178700	178100	191200	187500	340200

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 6

DISCHARGE OF SACRAMENTO RIVER NEAR RED BLUFF - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	5000	7620	5980	8700	4870	4180	3280	2970	2970	3330	3380	3650
2	4980	6800	5820	8650	4980	4010	3320	2960	2940	3330	3420	3650
3	5080	7080	5750	8670	5100	3880	3280	2960	2880	3260	3400	3680
4	5570	7290	5680	8790	4870	3860	3300	2910	2880	3230	3370	3770
5	14800	6930	5340	8670	4790	3960	3350	2920	2860	3250	3350	3750
6	13100	8760	5300	8370	4700	3920	3420	2920	2880	3420	3350	3680
7	10100	10700	5910	8080	4580	3880	3450	2920	2920	3540	3370	3660
8	8400	9010	6720	7780	4560	3830	3350	2920	2960	3490	3380	3750
9	7560	7860	9840	7480	4520	3790	3300	2940	2960	3420	3440	11100
10	6930	7320	10200	6930	4460	3770	3260	2960	2970	3350	3470	23500
11	6620	7190	9150	6880	4560	3720	3250	2960	2990	3320	3450	29400
12	6320	6750	11200	6980	4380	3590	3230	2920	3040	3210	3450	13100
13	6080	7080	38200	6980	4240	3560	3150	2880	3260	3200	3490	8790
14	5910	6930	29400	6800	4240	3570	3120	2920	3420	3250	3440	7210
15	5800	6880	18300	6420	4180	3630	3050	2960	3350	3330	3440	6220
16	5700	6980	15000	5930	4200	3700	3020	3050	3250	3320	3560	5570
17	5640	6880	14200	5700	4260	3720	3040	3100	3120	3260	3700	5660
18	5520	6800	13900	5730	4420	3680	3120	3080	3050	3260	3740	6120
19	5520	6880	13100	6080	4500	3680	3100	3020	3100	3280	3660	5660
20	5480	6880	12500	6270	4340	3630	3070	2880	3080	3260	3610	5390
21	5430	6770	12600	6150	4930	3520	3050	2880	3120	3210	3610	5260
22	5390	6600	12700	6300	6770	3440	3050	2700	3150	3250	3630	5080
23	5340	6440	12500	6100	7350	3400	3050	2700	3130	3300	3650	4980
24	5260	6320	12000	5800	5860	3350	3070	2780	3070	3420	3660	4910
25	5170	6220	11600	5840	5320	3350	3040	2840	3070	3940	3660	4830
26	5260	6220	11600	5860	5170	3370	3040	2910	3210	3750	3790	4720
27	5480	6170	12100	5540	5000	3330	3040	2960	3300	3590	3960	4660
28	5890	6120	10800	5590	4830	3300	2990	2940	3260	3500	3830	4580
29	5730		10400	5390	4580	3280	2960	2960	3260	3440	3750	5060
30	12400		10100	5040	4460	3250	2960	2970	3250	3400	3660	6700
31	9370		9370		4360		2960	2990		3370		14700
Mean	6801	7124	11850	6783	4819	3638	3151	2926	3090	3370	3556	7178
Ac.Ft. for Month	418200	395700	728400	403600	296300	216500	193700	179900	183900	207200	211600	441900

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 7

DISCHARGE OF SACRAMENTO RIVER AT BUTTE CITY-1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	5800	9000	6200	8950	4080	3240	1740	1430	1940	3040	3330	3640
2	5800	7800	6000	8200	3980	3110	1720	1430	1950	3140	3180	3640
3	5800	7600	5800	8200	3950	2940	1830	1430	1960	3180	3180	3640
4	6000	7600	5600	7940	3990	2760	1790	1420	1980	3160	3330	3640
5	7000	7600	5800	7940	3850	2690	1830	1390	2010	3150	3330	3640
6	14400	7400	5600	7720	3750	2660	1850	1390	2020	3260	3330	3640
7	14800	8800	6200	7300	3730	2650	1880	1390	2070	3340	3180	3640
8	11000	10000	7800	6920	3600	2590	1920	1370	2130	3630	3180	3640
9	9200	9000	7800	6550	3520	2540	1840	1390	2180	3640	3180	3950
10	8000	8100	10000	6550	3500	2510	1760	1410	2280	3400	3180	9600
11	7700	7600	10200	6000	3430	2450	1740	1410	2320	3280	3330	26600
12	7400	7600	9200	5820	3450	2410	1720	1430	2400	3210	3330	28600
13	7200	7400	12300	5670	3390	2330	1680	1430	2500	3160	3180	13600
14	7000	7400	35000	5670	3240	2240	1630	1380	2720	3060	3180	9000
15	6800	7400	33400	5520	3170	2200	1610	1390	2940	3100	3180	7400
16	6600	7400	22400	5230	3120	2260	1540	1420	2970	3210	3180	6600
17	6400	7400	17400	4940	3110	2280	1540	1470	2920	3240	3330	6000
18	6400	7400	16000	4800	3120	2340	1520	1530	2790	3220	3490	6000
19	6400	7400	15700	4800	3150	2310	1520	1540	2730	3210	3490	6000
20	6200	7400	14800	4940	3260	2280	1520	1540	2740	3200	3330	5800
21	6200	7400	13600	4940	3400	2200	1520	1480	2730	3100	3330	5400
22	6100	7400	13600	4940	3700	2170	1490	1410	2660	3100	3330	5300
23	6100	7200	13600	5080	4760	2040	1490	1360	2680	3160	3490	5100
24	6100	7200	13200	4940	5360	1940	1490	1350	2680	3210	3490	5100
25	6000	7300	12800	4800	4740	1920	1490	1430	2760	3300	3490	5000
26	6000	6800	12000	4650	4370	1930	1480	1540	2860	3500	3640	4900
27	6000	6500	12000	4650	4220	1850	1450	1650	3020	3640	3800	4900
28	6100	6500	12400	4510	4030	1800	1470	1680	3100	3510	3800	4740
29	6400		10550	4510	3880	1780	1450	1760	3000	3460	3640	4900
30	6600		9960	4370	3630	1750	1430	1770	3030	3390	3490	5400
31	10600		9450		3390		1410	1830		3340		9000
Mean	7358	7629	12460	5902	3738	2339	1624	1479	2536	3279	3364	7033
Ac.Ft. for Month	427400	423700	755700	351200	229800	139200	99870	90940	150900	201600	200200	412500

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. Record from May to October inclusive compiled by Geological Survey, balance of year by Water Supervisor. Station is near Butte City Bridge and is at Mile 115.8 above Sacramento.

TABLE 8

DISCHARGE OF SACRAMENTO RIVER AT COLUSA - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	6370	11080	6720	11330	4380	3210	1810	1430	1840	3070	3360	3730
2	6250	9520	6250	10600	4160	3080	1810	1440	1920	3120	3360	3640
3	6250	8530	6020	10240	4060	2920	1810	1430	1950	3190	3270	3640
4	6370	8410	5790	10000	4110	2740	1850	1390	1970	3200	3270	3640
5	6840	8650	5790	9880	3970	2620	1850	1370	2000	3200	3360	3640
6	11590	8280	5680	9750	3790	2590	1850	1380	2010	3250	3360	3730
7	14330	8770	5460	9390	3760	2570	1890	1390	2030	3300	3270	3730
8	12600	11460	6020	9030	3660	2540	1910	1340	2100	3450	3180	3730
9	10730	10730	7800	8530	3490	2460	1940	1320	2150	3650	3270	3730
10	9640	9640	10600	8160	3420	2450	1850	1350	2220	3600	3270	3920
11	8900	8900	11200	7550	3350	2450	1780	1390	2280	3400	3270	15400
12	8410	8650	11080	7070	3370	2380	1750	1330	2310	3290	3360	24300
13	8160	8160	11330	6950	3330	2310	1740	1460	2390	3260	3360	24180
14	7920	8280	21600	6720	3220	2210	1670	1430	2560	3230	3270	15150
15	7680	8160	30200	6490	3110	2120	1620	1370	2750	3150	3270	10240
16	7430	8160	25500	6250	3020	2160	1590	1370	2880	3200	3270	8410
17	7190	8160	20400	5790	2950	2210	1590	1400	2900	3260	3270	7430
18	7190	8160	17400	5460	2920	2300	1550	1470	2840	3290	3360	6720
19	7070	8050	16520	5240	2960	2350	1520	1530	2720	3280	3550	6950
20	6950	8160	15750	5350	3050	2310	1510	1530	2680	3270	3550	6720
21	6840	8160	15250	5570	3210	2260	1520	1510	2720	3250	3450	6250
22	6720	8050	14850	5460	3350	2240	1520	1430	2700	3190	3450	6020
23	6600	7920	14850	5570	4120	2130	1510	1350	2680	3200	3550	5790
24	6600	7800	14600	5570	5310	2010	1480	1330	2700	3240	3550	5570
25	6490	7550	14200	5240	5130	1890	1530	1360	2700	3270	3550	5460
26	6370	7310	13900	5130	4760	1890	1530	1480	2850	3410	3550	5350
27	6250	6950	13200	5130	4320	1850	1510	1570	2950	3640	3640	5460
28	6370	6840	13900	4920	4150	1810	1510	1670	3080	3610	3820	5130
29	6720		13200	4720	3950	1770	1510	1730	3040	3530	3820	5130
30	6840		12350	4820	3700	1770	1490	1760	3030	3460	3730	5350
31	9880		11980		3430		1450	1780		3400		6020
Mean	7856	8518	12884	7064	3720	2320	1660	1455	2498	3318	3420	7231
Ac.Ft. for Month	483100	473000	792200	420300	228700	138000	102000	89430	148700	204000	203500	444600

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. Record from May to October inclusive compiled by Geological Survey, balance of year by Water Supervisor. Station is at Colusa Bridge - mile 89.4 above Sacramento.

TABLE 9

DISCHARGE OF SACRAMENTO RIVER BELOW WILKIN'S SLOUGH - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	6490	10600	6640	11500	3640	2860	915	726	1300	3090	3400	3850
2	6580	10200	6290	10900	3430	2660	985	708	1390	3160	3400	3850
3	6390	9180	5900	10450	3220	2450	990	690	1440	3180	3240	3780
4	6390	8620	5670	10300	3220	2220	1110	672	1460	3220	3240	3850
5	6700	8800	5400	10000	3240	2030	1100	654	1430	3210	3330	3850
6	8700	8700	5400	9800	3120	1920	1110	681	1440	3220	3400	3920
7	13000	8550	5150	9400	3040	1860	1160	704	1490	3300	3300	4100
8	13300	10200	5590	8900	2960	1860	1160	663	1590	3420	3240	4050
9	11700	11000	6880	8450	2840	1800	1200	645	1660	3630	3170	4050
10	9900	10300	9180	7930	2750	1760	1110	690	1800	3640	3170	4550
11	9400	9500	11200	7460	2700	1750	1020	726	1840	3470	3240	11300
12	8800	9100	11400	6700	2650	1740	975	717	2020	3340	3400	18800
13	8440	8700	11000	6390	2660	1720	1000	780	2170	3270	3400	21200
14	8100	8300	15300	6100	2630	1610	985	816	2310	3210	3300	16400
15	7850	8390	23300	5900	2550	1460	920	780	2540	3130	3300	11700
16	7700	8300	23000	5500	2470	1400	906	784	2790	3160	3300	9400
17	7450	8200	20300	5060	2380	1520	892	789	2860	3240	3300	8100
18	7380	8200	17700	4760	2320	1620	838	825	2920	3270	3300	7380
19	7300	8100	16400	4400	2360	1670	776	910	2790	3260	3550	7100
20	7200	8100	15800	4250	2490	1640	802	951	2600	3250	3630	7100
21	7100	8100	15100	4320	2670	1590	758	942	2620	3230	3550	6700
22	6950	8100	14500	4400	2850	1500	771	874	2600	3160	3550	6390
23	6880	8010	14300	4480	3330	1470	789	789	2550	3180	3630	6100
24	6790	7850	14200	4550	4500	1380	794	740	2610	3220	3630	5900
25	6700	7510	14100	4400	4980	1300	771	753	2680	3270	3700	5820
26	6640	7530	13700	4100	4480	1260	794	852	2830	3360	3700	5670
27	6580	7200	13400	4050	4090	1220	766	970	2920	3600	3780	5500
28	6640	6700	13500	4000	3910	1160	762	1060	3010	3630	3920	5500
29	6700		13400	3920	3690	1020	802	1120	3070	3550	4000	5400
30	7100		12500	3850	3430	924	807	1160	3030	3510	3920	5500
31	8100		11900		3120		753	1200		3420		6000
Mean	7902	8648	12200	6540	3152	1679	920	818	2259	3316	3467	7187
Ac.Ft. for Month	485800	480300	749900	389200	193800	99920	56570	50320	134400	203900	206300	441900

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U.S. Geological Survey. Record from May to October inclusive compiled by Geological Survey, balance of year by Water Supervisor. Station is located at Mile 62.9 above Sacramento, a short distance below Wilkins Slough pumping plant of Reclamation District 108.

TABLE 10

DISCHARGE OF SACRAMENTO RIVER AT KNIGHTS LANDING - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	6800	10400	6800	11600	3670	3290	860	844	2050	3370	3420	3900
2	6600	10600	6800	11000	3350	2970	956	752	2150	3400	3380	3820
3	6400	10000	6600	10400	3160	2660	1030	794	2130	3460	3380	3820
4	6400	9200	5800	10000	3420	2410	1070	812	2220	3510	3300	3820
5	6800	9200	5400	10000	3360	2270	1210	805	2240	3540	3300	3760
6	6200	9400	5400	9600	3320	2130	1220	791	2310	3550	3300	3980
7	11200	8600	5400	9200	3400	2010	1290	868	2380	3580	3300	4200
8	12800	8000	5400	9000	3210	1980	1400	868	2350	3670	3220	4280
9	11400	10800	5000	7600	3180	1880	1400	791	2280	3780	3220	4280
10	10600	10200	7400	7400	3020	1750	1350	749	2400	3740	3220	4440
11	10000	9600	10800	7400	3000	1640	1260	802	2650	3680	3300	8200
12	9400	9400	12000	6800	2890	1720	1150	896	2900	3550	3380	16200
13	8800	9400	11400	6200	2870	1720	1080	892	2950	3430	3380	19400
14	8400	8800	10600	5800	2840	1650	1080	1020	3000	3360	3300	16200
15	8200	9000	18600	5800	2830	1470	1050	1020	3150	3360	3300	13000
16	8000	9000	20800	5600	2690	1420	996	940	3350	3310	3380	10200
17	7800	8500	19900	5200	2570	1410	1010	948	3500	3300	3520	9000
18	7500	8600	17200	5200	2460	1530	928	976	3360	3310	3600	8000
19	7400	8600	16000	5200	2530	1640	844	1020	3280	3330	3680	8000
20	7400	8600	15000	5000	2660	1700	876	1090	3160	3330	3760	8000
21	7400	8600	14600	4800	2840	1740	872	1180	3080	3350	3680	7600
22	7300	8600	14000	5200	3000	1630	844	1130	3030	3310	3600	7500
23	7100	8500	13400	5200	3360	1520	826	1060	2960	3250	3680	7500
24	7000	8400	13200	5200	4310	1450	848	1000	2950	3220	3760	7000
25	6900	8000	13600	4800	5490	1280	812	1080	2970	3270	3760	7000
26	6800	7900	1300	4600	5460	1260	752	1180	3060	3420	3680	6800
27	6800	7600	12800	4400	4900	1140	756	1340	3240	3590	3760	6500
28	6900	7400	12700	4300	4550	1120	735	1530	3310	3730	3820	6500
29	6900		13000	4200	4350	964	756	1580	3320	3610	3900	6500
30	7400		12800	4000	3950	876	794	1580	3370	3540	3980	6400
31	7200		1200		3590		852	1800		3480		6600
Mean	7929	8982	11500	6690	3427	1741	997	1037	2837	3462	3509	7497
Ac.Ft. for Month	487500	498800	706900	398100	210700	103600	61300	63740	168800	212900	208800	461000

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

TABLE 11

DISCHARGE OF SACRAMENTO RIVER AT VERONA - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep	Oct.	Nov.	Dec.
1	9180	14000	9720	20600	6860	4730	1350	1050	2870	5040	4870	5480
2	8990	14800	9710	19900	6500	4250	1400	1020	2940	4940	4810	5460
3	8860	13800	9270	19500	6300	3740	1410	1020	3290	5020	4790	5520
4	8990	13400	8840	19500	6030	3510	1500	993	3150	5170	4620	5330
5	9540	13600	8500	19300	5920	3260	1530	965	2930	5220	4540	5310
6	13500	12900	8000	18500	5680	3000	1450	1010	2990	5250	4460	5870
7	17100	14400	7700	17800	5550	2890	1440	1020	3300	5330	4360	6100
8	17500	15200	8290	17100	5340	2810	1410	1040	3470	5480	4300	6360
9	15900	16000	12400	17000	5070	2680	1570	1090	3820	5540	4490	6360
10	14100	15400	21600	16300	4980	2520	1630	1140	3790	5180	4560	6640
11	13200	14500	20800	15100	4920	2690	1510	1150	3820	5240	4720	9570
12	12600	13800	18100	13900	5010	2430	1380	1150	4100	5080	4730	19700
13	11800	13000	16500	13300	5000	2370	1370	1220	4090	4940	4610	24600
14	11300	12100	17700	12700	4960	2380	1320	1250	4310	4850	4420	21500
15	10900	12100	26200	11900	4700	2330	1220	1260	4370	4940	4390	16300
16	10500	11900	30200	11000	4350	2110	1180	1220	4640	4720	4760	13200
17	10100	11500	29500	10100	4260	2080	1120	1220	5080	4490	5040	11500
18	9990	11700	26700	9470	4170	2130	1120	1430	4830	4490	5180	9800
19	10000	11600	25100	9170	4000	2270	1120	1680	4700	4660	5370	8890
20	10000	11600	24200	9020	3940	2380	1090	2140	4740	4620	5290	9080
21	9910	11300	23600	9040	4300	2230	1060	1960	4550	4720	5040	9970
22	9890	11500	23500	9420	4580	2110	1100	1780	4440	4680	5020	8870
23	9620	11200	24000	9440	5660	1980	1100	1780	4380	4520	5110	8420
24	9270	10700	24400	8990	7740	1870	1170	1910	4390	4340	5290	8250
25	9310	10800	24300	8300	8840	1810	1180	1960	4360	4300	5240	7800
26	9220	10600	24100	7940	8190	1730	1230	2050	4420	4850	5080	7500
27	9330	10200	24100	7420	7380	1690	1180	2420	4680	5040	5120	7230
28	9450	9690	25000	7090	6950	1650	1140	2250	4780	5120	5210	7340
29	10000		24300	6920	6040	1570	1130	2150	4810	5020	5440	7490
30	10500		22800	6950	5640	1410	1180	2230	5000	4790	5520	7600
31	12400		21300		5210		1130	2580		4740		7980
Mean	11060	12620	19370	12760	5615	2487	1281	1521	4101	4916	4879	9359
Ac.Ft. for Month	680200	700700	1191000	759000	345300	148000	78780	93500	244000	302300	290300	575400

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 12

DISCHARGE OF SACRAMENTO RIVER AT SACRAMENTO - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	9980	15500	11100	24600	9820	6400	1160	654	2660	5200	5410	5970
2	9730	16200	11000	25200	9260	5610	1270	598	2780	5110	5290	6000
3	9600	15200	10600	26800	8960	4820	1260	602	3080	5320	5320	6070
4	9790	15100	10100	26700	8580	4490	1360	567	3000	5680	5130	5860
5	10600	15200	9740	25800	8280	4150	1350	556	2650	5760	5050	5790
6	14300	14500	9190	24900	7930	3620	1240	619	2740	5640	4960	6390
7	18800	17200	9040	24400	7570	3380	1210	603	3130	5730	4880	6630
8	18800	18000	9930	24000	7200	3210	1170	625	3380	6360	4780	6900
9	17000	18000	21000	23700	7070	3060	1370	700	3660	6170	4990	6890
10	15200	17100	27000	22600	7060	2910	1360	775	3610	5710	5040	7180
11	14200	16000	23900	21200	7680	3060	1220	798	3770	5690	5200	10200
12	13600	15200	20600	20000	7790	2730	1080	788	4030	5460	5280	20600
13	12800	14500	18900	18800	7220	2650	1040	886	3900	5340	4990	25400
14	12300	13600	20500	17200	6770	2610	981	898	4160	5220	4830	22200
15	11800	13600	28700	15600	6330	2480	909	931	4300	5320	4810	16900
16	11300	13400	32800	14700	5880	2380	879	1000	4650	5070	5190	13800
17	11000	13000	32600	14300	5830	2380	777	921	5110	4840	5460	12100
18	10900	13200	30600	13900	5580	2370	752	1200	4860	4840	5620	10300
19	10900	13200	29600	14100	5250	2350	771	1440	4740	5030	5790	9480
20	11100	13200	29300	14100	5140	2440	722	1940	4750	4990	5740	9670
21	11100	13000	29200	14100	5460	2270	704	1740	4530	5080	5490	9660
22	11200	13100	29700	14400	6130	1980	746	1590	4510	5100	5480	9460
23	10600	12800	31000	13500	8230	1880	760	1570	4490	4880	5590	9020
24	10400	12300	31300	12300	10000	1700	787	1700	4390	4710	5770	8820
25	10300	12500	31100	11200	12000	1730	786	1790	4450	4860	5710	8350
26	10200	12200	30900	10700	11500	1610	867	1770	4520	5480	5580	8060
27	10200	11700	30400	10100	10500	1540	825	2100	4750	5570	5710	7750
28	10700	11200	29400	10100	9530	1500	742	1930	5030	5610	5890	7900
29	11300		27800	10200	8340	1390	756	1830	5000	5390	5970	8050
30	12000		26200	10200	7560	1210	820	1920	5130	5170	6000	8160
31	14400		25000		7100		770	2370		5170		8700
Mean	12132	14275	23200	17700	7790	2800	982	1210	4060	5340	5365	9942
Ac.Ft. for Month	746000	792800	1424500	1050000	479100	166400	60400	74200	241500	328300	319200	611300

NOTE: This represents the flow of the Sacramento River past Sacramento (below the City of Sacramento intake) to the delta. Additional water flows to the delta through the East Borrow Pit of Yolo By-Pass. See Table 95. The discharges of this table have been computed by adding to the measured Verona discharges the measured inflow of return water and American River and subtracting therefrom the measured diversions between Verona and Sacramento. A gaging station is not maintained at Sacramento during periods of low flow because of tidal action.

TABLE 13

DISCHARGE OF FEATHER RIVER NEAR OROVILLE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	2120	2660	2460	5620	2890	1510	1460	1390	1740	1440	1420	1340
2	1960	2630	2160	5820	2770	1500	1470	1400	1490	1670	1220	1020
3	2320	2840	2320	6100	2520	1500	1470	1390	1420	1640	1340	966
4	2210	2730	2040	6360	2390	1420	1460	1400	1360	1580	981	1630
5	5180	2410	1610	6010	2280	1400	1490	1350	1460	1530	699	1570
6	3380	3780	1910	5870	2040	1420	1550	1360	1560	1740	628	1580
7	2520	3220	2180	5730	1950	1400	1500	1360	1530	1500	1400	1740
8	2270	3180	3500	5880	2030	1370	1490	1360	1530	790	1440	1660
9	2160	2810	4020	5670	2000	1360	1470	1360	1530	1240	1400	1870
10	2370	2880	2960	5260	2040	1410	1470	1430	1400	1520	1480	3530
11	2280	2770	2320	5130	2120	1460	1460	1370	1460	1640	1130	5930
12	2120	2460	2380	5130	2080	1410	1460	1390	1560	1620	651	2410
13	2030	2460	4000	4950	1800	1410	1460	1360	1400	1670	635	2290
14	2100	2660	5100	4590	1640	1380	1460	1530	1510	1460	1570	1900
15	2080	2230	4040	4000	1660	1390	1450	1650	1560	1090	1600	1730
16	2080	2380	3920	3820	1750	1560	1430	1890	1460	1200	1640	1320
17	2020	2440	4230	4000	1610	1640	1470	1860	1360	1460	1670	966
18	2160	2300	4580	4110	1480	1580	1490	1940	1500	1580	1560	1280
19	2160	2380	4830	4240	1570	1530	1490	1590	1500	1560	892	1560
20	2140	2180	5100	4200	1720	1530	1500	1430	1440	1560	1030	1930
21	2200	2420	5680	4540	1900	1520	1520	1620	1560	1470	1280	1580
22	2190	1620	6360	4060	2930	1520	1460	1920	1490	998	1350	1500
23	1950	2020	6640	3570	3080	1480	1440	1880	1510	1130	1070	1330
24	2120	2270	6580	3500	2590	1460	1430	1960	1400	1620	708	966
25	2180	1980	6440	3360	2490	1460	1430	1890	1440	1600	884	772
26	2380	1930	7010	3050	2420	1470	1430	1850	1440	1320	912	1150
27	2570	2280	7200	2980	2040	1470	1430	1460	1340	1350	1170	1250
28	2860	2480	6160	2920	1800	1470	1430	1610	1600	1120	1230	1360
29	2760		5700	2940	1700	1470	1410	1940	1580	1130	1310	1460
30	3350		5470	2860	1640	1460	1390	1940	1400	1390	1340	1780
31	2660		5610		1570		1400	1750		1310		2010
Mean	2415	2514	4339	4542	2081	1465	1460	1602	1484	1417	1188	1722
Ac.Ft. for Month	148500	139600	266800	270300	127900	87190	89790	98480	88320	87130	70690	105900

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 14

DISCHARGE OF FEATHER RIVER AT NICOLAUS - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	3300	4650	3700	8480	3040	926	216	105	805	1370	1030	1230
2	3200	4350	3700	8640	2970	800	261	91	770	1340	1030	1230
3	3000	4350	3500	9160	2730	722	225	82	721	1480	968	1395
4	3300	4650	3500	9340	2380	752	257	82	616	1580	907	1030
5	4210	4450	3300	8480	2100	686	198	98	564	1570	730	1395
6	6920	4280	3000	8480	1930	668	229	130	576	1620	577	1690
7	5460	6020	3000	8000	1810	598	216	85	714	1740	575	1690
8	4350	5460	3500	8000	1640	526	216	72	777	1810	677	1890
9	4000	5050	7840	8160	1520	450	234	68	833	1490	847	1790
10	3700	4550	12550	8000	1550	455	189	72	889	1020	907	1990
11	3800	4450	7680	7060	1520	435	175	86	854	1280	907	3500
12	3800	4350	5350	6640	1710	390	168	124	756	1240	847	4950
13	3500	4070	4850	6640	1640	365	116	172	932	1300	625	3600
14	3500	3900	5900	6140	1470	390	116	140	978	1370	475	3000
15	3400	4140	6920	5570	1260	298	105	112	955	1360	730	2420
16	3300	3900	6260	5050	1130	303	85	120	1060	1140	1095	2200
17	3300	3800	6140	4850	1150	390	88	302	1100	847	1310	1990
18	3300	3900	6380	4850	1160	375	82	528	1070	1010	1395	1590
19	3400	3800	7200	4850	1030	500	88	583	1040	1160	1395	1395
20	3400	3800	7680	4850	914	495	123	602	1170	1210	1230	1790
21	3300	3700	8160	4850	1050	405	130	408	1080	1220	907	2095
22	3400	3800	8980	5050	1360	380	142	296	1080	1200	1095	2095
23	3300	3900	10300	4650	2590	346	198	357	1130	980	1160	1890
24	3100	3800	10500	4280	3310	312	198	602	1110	733	1230	1790
25	3300	3700	10500	4070	2560	341	155	642	1190	1060	968	1395
26	3200	3500	10300	3900	1880	312	130	700	1120	1390	847	1310
27	3400	3400	11400	3600	1740	303	123	728	1280	1340	968	1160
28	3700	3500	12100	3300	1570	257	109	616	1200	1140	907	1490
29	4000		10300	3200	1320	238	138	438	1310	1000	1160	1690
30	4280		8980	3200	1200	229	147	615	1410	889	1160	1790
31	5250		8480		1110		120	854		1040		1790
Mean	3754	4186	7160	6045	1753	455	161	320	970	1256	9586	1934
Ac.Ft. for Month	230800	232500	440200	359700	107800	27070	9870	19660	57700	77210	57040	118930
Diversions Below Nicolaus,A.F.	0	0	0	700	3300	2310	2310	2700	600	0	0	0
Discharge to Sacramento River,Ac.Ft.	230800	232500	440200	359000	104500	24760	7560	16960	57100	77210	57040	118930

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U. S. Geological Survey. Record from May to October inclusive compiled by Geological Survey, balance of year by Water Supervisor. It is located at Mile 9.3 above the mouth of the river and 0.1 mile below Nicolaus Bridge.

TABLE 15

DISCHARGE OF YUBA RIVER AT SMARTVILLE - 1939

	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	418	770	790	3310	1620	695	242	205	200	192	249	232
2	418	714	760	3580	1510	650	236	205	200	300	216	227
3	434	894	714	3840	1450	704	242	205	205	313	216	227
4	458	820	714	3920	1360	668	247	205	210	300	216	222
5	2390	570	705	3660	1300	668	242	200	216	266	211	227
6	1310	1740	714	3640	1240	596	242	200	221	350	211	243
7	938	1330	770	3660	1180	518	236	200	205	459	190	243
8	790	1120	2250	3770	1140	552	236	200	205	342	175	243
9	714	927	4130	3740	1120	509	247	200	210	236	157	243
10	687	872	2000	3360	1140	500	252	196	210	94	139	288
11	669	830	1530	3180	1250	475	266	196	216	77	190	548
12	660	642	1360	3190	1140	451	286	196	216	271	222	463
13	651	660	1670	3020	1020	451	309	196	216	277	211	324
14	642	750	2030	2560	950	372	306	196	221	277	201	277
15	426	760	1700	2270	920	459	252	200	210	271	196	271
16	426	687	1750	2180	910	419	226	205	242	243	201	330
17	642	750	1930	2230	860	380	226	205	236	232	190	342
18	642	770	2830	2240	840	509	226	205	236	232	180	342
19	624	830	3360	2340	840	388	226	210	231	227	180	330
20	606	850	3440	2410	840	395	226	216	188	216	185	300
21	579	861	3760	2450	960	365	226	205	172	185	190	324
22	426	820	4250	2370	1580	350	226	192	172	196	196	306
23	442	861	4460	2110	1810	313	226	184	168	201	206	312
24	562	883	4250	2000	1330	293	221	184	172	254	201	324
25	426	872	4100	1860	492	279	226	184	188	342	211	312
26	410	850	4290	1760	492	279	216	184	184	300	271	312
27	474	850	5040	1670	560	279	210	188	196	288	277	306
28	615	820	4060	1670	790	279	210	184	196	282	254	312
29	522		3390	1710	850	259	221	188	188	277	243	336
30	1200		3070	1640	900	242	221	192	184	277	232	348
31	960		3160		760		210	196		271		381
Mean	682	861	2548	2711	1069	442	238	197	204	260	207	306
Ac.Ft. for Month	41950	47810	156600	161300	65760	26310	14630	12140	12130	15960	12330	18830

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 16

DISCHARGE OF YUBA RIVER AT MARYSVILLE (SIMPSON'S LANE BRIDGE) - 1939

Day	Daily Discharge in Second-feet					
	May	June	July	Aug.	Sept.	Oct.
1			*69	50	47	183
2			69	47	53	210
3			69	49	72	257
4			69	47	67	267
5			69	49	70	267
6			69	53	65	289
7			69	47	73	412
8			69	47	72	412
9			69	42	73	362
10			69	42	90	233
11			69	43	91	133
12			72	42	91	121
13			75	43	102	225
14			65	44	121	250
15			60	38	139	250
16			67	40	139	240
17			62	42	133	207
18			57	43	144	192
19			57	42	157	183
20			57	43	147	171
21			57	42	142	150
22			57	42	91	137
23			64	42	82	144
24			63	44	85	171
25			55	49	96	278
26			49	50	93	311
27			52	49	97	285
28			51	53	115	267
29			52	47	135	267
30			55	49	157	267
31			57	45		298
Mean			63	45	101	240
Ac.Ft. for Month			3850	2790	5990	14760

*Beginning of record for season.

TABLE 17

DISCHARGE OF AMERICAN RIVER AT FAIR OAKS - 1939

	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	720	1400	1420	4080	3490	1970	291	84	158	172	544	572
2	730	1180	1360	5370	3250	1650	298	79	129	214	554	588
3	659	1280	1360	7380	3090	1300	273	81	61	394	531	570
4	816	1740	1330	7380	2970	1260	276	86	37	628	554	510
5	1520	1440	1280	6800	2860	1150	244	62	41	515	536	519
6	2710	1860	1230	6650	2690	1070	255	66	52	414	559	568
7	1480	2580	1370	6830	2500	948	255	62	41	532	498	565
8	1270	2690	1580	7140	2440	854	248	62	43	876	514	566
9	1200	1780	8500	6920	2510	849	212	66	54	637	516	569
10	1100	1530	5370	6560	2520	849	166	55	43	556	504	562
11	950	1340	3070	6420	3370	827	146	62	56	488	540	887
12	998	1220	2500	6530	3000	827	143	70	50	424	510	1550
13	1040	1410	2440	5830	2560	805	143	70	59	427	372	1130
14	998	1390	2800	4770	2240	745	146	57	116	402	424	884
15	872	1340	2540	4040	2150	700	153	189	98	412	465	671
16	757	1360	2590	4010	2070	805	150	159	132	370	408	700
17	938	1330	3160	4500	2020	775	145	121	182	372	530	577
18	888	1330	3940	4740	1720	687	127	159	155	356	446	594
19	943	1450	4560	5180	1620	624	118	166	126	394	470	682
20	932	1510	5160	5340	1520	574	115	173	107	398	468	704
21	976	1540	5660	5340	1560	518	118	159	104	403	494	690
22	894	1500	6260	5260	2100	486	121	173	86	501	517	707
23	932	1460	7080	4300	2990	470	118	170	113	359	528	662
24	932	1590	7000	3790	2740	450	118	170	78	415	501	664
25	866	1610	6890	3420	3520	427	121	156	107	568	492	566
26	800	1560	6890	3240	3640	412	118	72	148	661	605	489
27	838	1480	6380	3220	3380	393	101	66	225	516	736	568
28	1240	1400	4490	3510	2750	355	112	98	265	459	616	642
29	1120		3570	3820	2410	355	101	92	189	378	520	654
30	1610		3440	3720	2270	330	93	83	193	446	518	668
31	1800		3830		2120		90	116		516		1130
Mean	1082	1546	3840	5203	2583	784	165	106	108	458	516	691
Ac.Ft. for Month	66520	85880	236100	309600	158800	46670	10150	6510	6440	28180	30690	42460

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 18

DISCHARGE OF AMERICAN RIVER AT SACRAMENTO - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	790	1535	1441	4015	3500	2100	276	74	126	194	535	486
2	720	1353	1441	5110	3300	1800	283	66	157	204	480	541
3	720	1353	1441	7110	3100	1500	276	68	87	333	535	553
4	790	1732	1441	7110	3000	1400	266	68	56	550	507	535
5	1095	1632	1353	6940	2880	1250	262	68	44	582	507	475
6	790	1632	1265		2750	1060	244	64	48	424	502	518
7	1732	2817	1353	*	2500	953	244	58	48	439	518	530
8	1265	2817	1535		2370	864	234	56	44	837	480	535
9	1095	2039	6600		2440	830	227	58	50	670	496	535
10	1095	1732	5920		2560	830	177	49	50	576	480	535
11	1012	1535	3443		3250	814	156	58	44	493	485	595
12	1012	1353	2698		3190	814	131	60	54	458	547	913
13	1012	1441	2465		2640	805	136	67	52	444	380	790
14	1012	1535	2817		2300	754	128	64	75	415	413	694
15	936	1441	2698		2140	690	134	64	85	424	416	643
16	790	1441	2580		2030	780	148	204	103	401	425	613
17	936	1441	3059		2050	814	136	126	154	396	421	565
18	936	1441	3865		1800	712	123	160	154	392	445	518
19	936	1535	4475		1720	627	112	167	138	410	421	595
20	1095	1632	4950		1650	585	105	164	129	415	445	595
21	1180	1732	5430		1560	520	107	167	105	401	455	589
22	1180	1632	6090		1820	480	110	197	95	463	455	595
23	1012	1535	6770		2920	456	107	187	90	401	480	589
24	1095	1632	6940		2620	424	105	187	120	405	480	571
25	1012	1732	6770		3410	420	100	180	78	498	470	547
26	936	1632	6770		3670	392	105	120	148	631	502	496
27	860	1535	6600		3520	360	92	71	177	565	589	518
28	1265	1535	4630		2930	346	90	69	292	458	681	565
29	1265		3865		2580	304	90	80	229	401	535	595
30	1535		3443		2350	300	83	69	204	420	480	565
31	2039		3715	*	2300		83	80		463		720
Mean	1069	1657	3802		2608	799	157	102	108	457	486	583
Ac.Ft. for Month	65750	92040	233800		160400	47570	9660	6290	6420	28090	28890	35870
Diversion below Station, Ac.Ft.	0	0	0	32	18	61	74	11	20	0	0	0
Discharge to Sacramento River, Ac.Ft.	65750	92040	238800	-	160400	47510	9590	6280	6400	28090	28890	35870

NOTE: This station is maintained seasonally under Federal-State cooperation by the Water Resources Branch of the U.S. Geological Survey. Record from May to October inclusive compiled by Geological Survey, balance of year by Water Supervisor. It is located at H Street Bridge, Sacramento, 6.0 miles above mouth of river. *No record April 6 to 31

TABLE 19

DISCHARGE OF MOKELUMNE RIVER AT WOODBRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	503	551	617	506	37	76	106	91	231	301	167	371
2	482	613	615	516	139	147	149	261	273	97	267	261
3	480	638	615	497	230	186	231	266	143	171	346	236
4	579	650	599	389	216	198	255	158	57	256	464	135
5	627	650	570	421	214	111	196	114	70	346	486	169
6	606	657	441	428	190	182	226	130	214	283	297	213
7	602	668	422	430	132	160	238	60	304	282	357	220
8	595	743	520	426	47	87	328	108	306	278	401	220
9	493	666	652	438	89	134	341	86	319	114	432	217
10	581	650	740	309	184	160	320	74	303	202	482	138
11	584	648	610	267	213	129	299	86	192	291	460	58
12	584	625	546	304	233	41	273	183	180	375	464	30
13	595	600	493	313	278	37	170	90	263	286	460	113
14	586	629	557	319	217	119	249	49	354	248	205	228
15	518	646	581	316	44	198	323	62	352	218	509	234
16	482	641	594	358	157	188	287	212	357	69	934	386
17	575	646	581	302	212	247	66	256	378	141	628	252
18	581	613	568	329	188	247	55	252	403	195	164	195
19	579	542	557	163	225	46	203	296	360	203	177	181
20	577	501	529	70	164	48	255	233	341	221	115	216
21	584	620	566	43	158	157	240	57	330	228	246	222
22	495	634	303	24	36	223	237	49	355	232	297	308
23	480	639	430	25	71	235	151	91	346	109	296	229
24	586	636	520	25	285	200	50	76	365	202	158	226
25	627	629	518	24	268	48	44	140	390	251	126	123
26	625	629	524	24	254	36	128	194	378	277	118	74
27	611	622	454	60	245	37	211	154	341	286	84	229
28	579	618	482	73	237	45	207	45	371	304	408	216
29	480		506	78	80	54	274	44	368	304	516	219
30	480		520	67	181	76	208	57	362	136	410	149
31	557		510		59		59	111		192		101
Mean	558	629	540	253	170	128	206	131	300	229	359	199
Ac.Ft. for Month	34340	34920	33190	15080	10480	7640	12650	8040	17860	14080	21370	12240

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 20

DISCHARGE OF SAN JOAQUIN RIVER AT DELTA BRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1			N.R.	0		0	0	0	0	0	0	
2			0	0								
3				0								
4				0								
5				0								
6												
7												
8												
9												
10												
11												
12												
13												
14	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
15												
16												
17	RECORD	RECORD	FLOW!	RECORD	RECORD	FLOW!	FLOW!	FLOW!	FLOW!	FLOW!	FLOW!	RECORD
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30						0			0		0	
31			0				0	0		0		
Mean	-	-	0	-		0	0	0	0	0	0	-
Ac.Ft. for Month	-	-	0	-		0	0	0	0	0	0	-

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.

TABLE 21

DISCHARGE OF SAN JOAQUIN RIVER AT FREMONT FORD BRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	746	1089	481	309	347	174	67	39	37	60	32	60
2	1150	1004	418	274	354	170	65	39	38	54	33	60
3	1344	970	370	267	357	169	63	39	50	48	35	62
4	1382	1141	333	267	420	164	62	40	66	44	37	62
5	1382	1250	288	278	470	156	61	39	58	45	34	63
6	1300	1341	263	298	484	153	60	36	56	45	34	83
7	1115	1425	240	317	484	148	59	35	60	47	33	154
8	1153	1510	231	392	513	145	58	35	58	46	30	201
9	1294	1594	225	567	543	142	57	35	54	45	30	172
10	1389	1669	240	737	549	139	56	36	60	44	30	150
11	1389	1716	347	823	455	136	54	37	50	40	30	150
12	1375	1757	510	858	322	133	53	37	46	39	31	170
13	1354	1766	490	920	312	130	53	37	49	38	32	202
14	1307	1703	455	995	322	127	52	37	56	37	39	225
15	1277	1651	398	1176	322	125	52	37	54	37	47	269
16	1274	1601	352	1234	304	122	50	38	51	36	40	279
17	1270	1570	320	1234	283	119	58	42	53	34	39	254
18	1253	1544	290	1179	265	116	49	43	58	33	38	246
19	1237	1525	265	1049	281	113	47	43	66	32	37	252
20	1217	1492	245	836	259	111	47	40	83	32	37	253
21	1208	1481	344	640	252	108	45	38	86	32	37	272
22	1195	1365	261	528	263	106	42	39	73	30	39	276
23	1179	1243	250	507	320	100	43	42	67	30	39	274
24	1169	1144	252	513	395	96	44	45	65	32	40	301
25	1128	1083	244	616	352	91	39	42	77	34	42	317
26	1087	889	250	676	281	87	37	39	92	31	48	309
27	1033	685	269	673	248	82	35	38	111	30	58	312
28	1020	570	314	490	235	78	33	40	92	29	56	331
29	1026		320	398	221	73	32	42	98	29	56	332
30	1057		317	354	210	69	33	40	71	30	60	304
31	1083		332		186		39	38		33		263
Mean	1206	1349	320	647	342	123	50	39	64	38	39	215
Ac.Ft. for Month	74130	74930	19680	38490	21040	7300	3060	2400	3840	2330	2330	13250

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. Gage operated by United States Bureau of Reclamation. Measurements of flow made by Division of Water Resources. Additional water during high flow periods passes this station via Mud Slough. See Table 22.

TABLE 22

DISCHARGE OF MUD SLOUGH (BRANCHES COMBINED) AT GUSTINE-STEVINSON HIGHWAY - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0	12	0	0	3	3	0	0	0	0	0	0
2	18	8	0	0	3	3						0
3	39	6	0	0	3	3						0
4	41	15	0	0	3	3						0
5	41	30	0	0	3	3						0
6	33	36	0	0	3	3						0
7	12	42	0	3	3	3						0
8	18	52	0	4	3	2						0
9	33	64	0	5	3	2						0
10	41	88	0	6	3	2						0
11	41	100	0	8	2	2						0
12	40	112	0	10	2	2						0
13	40	112	0	12	2	2						0
14	33	100	0	14	2	2	FLOW	FLOW	FLOW	FLOW	FLOW	0
15	32	88	3	18	2	2						20
16	30	75	3	14	2	2						40
17	30	64	3	16	2	2	NO	NO	NO	NO	NO	40
18	30	58	2	14	2	2						40
19	25	58	2	10	2	2						40
20	25	52	2	12	2	2						40
21	21	48	2	10	2	2						40
22	21	39	1	8	2	2						40
23	18	24	1	6	2	1						40
24	18	15	1	5	2	1						40
25	15	10	1	4	2	1						40
26	10	3	1	3	2	1						40
27	9	0	1	2	2	1					0	40
28	9	0	1	2	2	1					1	40
29	9		1	2	2	1					1	40
30	10		1	2	2	1			0		1	40
31	12		1		2		0	0		0		40
Mean	24	47	0.9	6.3	2.3	2.0	0	0	0	0	-	21
Ac.Ft. for Month	1495	2600	54	377	143	117	0	0	0	0	6	1310

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 21. During 1939 there was no direct contribution of water from the San Joaquin River. No continuous gage height record. Flow interpolated between periodic observations.

TABLE 23

DISCHARGE OF SAN JOAQUIN RIVER NEAR NEWMAN - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	790	1190	1440	727	622	402	250	278	218	304	225	218
2	1180	1110	1100	724	616	410	250	248	228	302	235	218
3	1480	1040	819	712	616	432	255	226	256	297	216	218
4	1570	1220	710	700	646	382	250	222	302	284	201	220
5	1600	1560	632	727	694	392	245	228	285	276	189	228
6	2020	2300	584	745	718	398	245	218	256	268	180	250
7	2170	2610	541	764	724	380	240	220	258	265	175	333
8	2270	2920	526	792	730	355	232	208	238	271	172	398
9	2460	3150	568	912	760	370	228	208	240	263	170	364
10	2640	3200	622	1060	764	372	258	202	246	235	170	330
11	2690	3160	899	1160	712	365	254	210	244	220	170	330
12	2670	3210	895	1150	610	352	236	226	232	223	170	362
13	2640	3240	787	1200	580	318	239	224	246	211	170	406
14	2600	3200	710	1260	577	298	226	234	250	199	172	442
15	2550	3060	646	1360	622	302	214	224	262	199	194	492
16	2540	2950	632	1520	589	315	232	206	265	189	184	512
17	2530	2890	654	1570	568	328	235	230	292	199	180	492
18	2470	2860	587	1480	556	365	239	210	315	211	177	478
19	2480	2810	538	1360	592	370	216	210	305	211	180	478
20	2440	2780	510	1160	592	342	218	220	302	211	180	492
21	2410	2790	502	912	607	312	228	232	325	213	182	506
22	2270	2680	498	764	670	280	216	222	285	206	187	512
23	2200	2500	485	709	703	282	224	220	272	187	189	509
24	1610	2310	480	727	730	278	242	226	275	182	192	526
25	1440	2190	478	795	706	282	236	214	275	194	196	548
26	1320	2030	520	858	619	298	214	218	340	196	204	545
27	1220	1770	612	851	553	258	220	228	335	196	208	545
28	1180	1650	815	767	514	252	220	250	325	192	208	562
29	1160		759	673	526	250	202	246	330	201	213	559
30	1180		760	634	481	250	240	242	322	192	216	542
31	1190		748		440		265	224		204		506
Mean	1967	2442	679	959	627	333	234	225	278	226	190	423
Ac.Ft. for Month	120900	135600	41770	57070	38550	19810	14410	13830	16530	13890	11320	26030

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 24

DISCHARGE OF SAN JOAQUIN RIVER AT GRAYSON - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	1350	1680	1885	1200	775	660	295	305	305	550	525	325
2	1300	1675	1640	1220	790	620	305	305	290	575	525	325
3	1550	1620	1365	1239	765	610	345	290	320	605	470	325
4	1740	1625	1140	1180	745	620	380	270	350	570	395	325
5	1840	1720	1060	1125	780	580	400	265	370	505	350	325
6	1890	2060	980	1100	850	520	340	275	365	495	340	335
7	2160	2500	890	1090	920	500	315	290	330	485	330	355
8	2270	2750	865	1070	990	490	295	300	330	475	315	415
9	2380	3020	945	1125	1045	480	285	270	350	465	315	470
10	2550	3220	1065	1214	1100	470	315	260	355	465	310	465
11	2730	3240	1100	1230	1180	450	340	260	360	435	315	440
12	2780	3230	1285	1245	1140	425	325	270	370	410	325	440
13	2780	3250	1230	1245	1055	410	290	305	355	400	330	460
14	2750	3280	1150	1310	1020	395	280	335	380	395	355	495
15	2730	3260	1085	1390	1020	385	270	325	400	410	360	525
16	2680	3170	1030	1475	1000	390	260	275	405	400	370	570
17	2660	3100	1045	1633	970	400	290	260	435	360	375	585
18	2630	3070	990	1690	875	410	275	270	445	410	345	575
19	2600	3020	970	1650	890	430	265	270	440	430	345	595
20	2605	2950	940	1515	960	445	240	310	405	410	340	565
21	2580	2960	920	1365	1000	400	230	310	410	395	340	580
22	2500	2950	845	1150	1090	430	225	300	405	425	350	590
23	2460	2820	775	1030	1150	400	225	290	380	435	345	595
24	2280	2630	750	979	1155	380	240	285	360	455	345	600
25	1995	2460	720	930	1155	390	260	290	405	470	335	610
26	1880	2370	810	985	1050	400	250	270	525	455	335	625
27	1760	2200	1005	1000	915	410	225	280	535	465	345	615
28	1700	2030	1100	980	870	370	225	310	530	450	350	625
29	1670		1220	880	780	355	235	320	520	435	330	635
30	1660		1220	790	820	325	250	300	535	445	315	635
31	1680		1240		735		290	305		475		620
Mean	2198	2638	1073	1201	955	452	283	289	399	457	358	504
Ac.Ft. for Month	135070	146500	65980	71470	58690	26880	17380	17790	23730	28080	21270	30970

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 25

DISCHARGE OF SAN JOAQUIN RIVER AT HETCH HETCHY AQUEDUCT CROSSING - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct	Nov.	Dec.
1	3120	2820	2860	1925	1170	1010	550	570	700	1340	1450	1210
2	2860	2860	2650	1875	1840	980	580	550	705	1550	1625	1210
3	2850	2840	2310	1840	2340	920	655	510	720	1585	1590	1215
4	3120	2800	1950	1610	1490	880	750	480	755	1810	1375	1195
5	3380	2820	1760	1450	1260	840	775	475	775	1730	1315	1200
6	3500	2960	1710	1350	1275	830	690	500	805	1625	1285	1210
7	3650	3380	1610	1300	1310	780	635	570	765	1575	1270	1230
8	3730	3900	1560	1350	1375	770	625	580	710	1530	1250	1285
9	3630	4800	1640	1520	1375	740	610	550	700	1525	1230	1335
10	3710	5120	1760	1530	1370	715	635	535	740	1500	1220	1335
11	4000	4900	1890	1515	1450	735	635	510	745	1440	1220	1305
12	4070	4630	2140	1480	1500	750	615	550	785	1390	1230	1285
13	4070	4500	2220	1435	1470	735	555	600	800	1365	1230	1290
14	4100	4470	2080	1470	1425	690	535	635	825	1395	1215	1330
15	4080	4470	2000	1625	1425	690	555	650	850	1365	1260	1365
16	3900	4400	1910	1740	1425	670	555	630	835	1335	1285	1400
17	3790	4250	1860	1885	1335	670	595	580	865	1185	1285	1425
18	3920	4160	1840	1950	1260	695	600	570	875	1150	1285	1440
19	3940	4140	1850	1980	1215	735	580	575	860	1165	1265	1430
20	3980	4060	1860	1750	1240	760	535	625	860	1115	1250	1430
21	3970	4020	1910	1550	1255	710	525	685	860	1110	1235	1455
22	3830	4020	1830	1400	1400	645	480	650	860	1135	1245	1465
23	3640	3940	1650	1280	1475	580	430	625	855	1140	1250	1475
24	3520	3730	1400	1280	1440	560	400	605	850	1140	1230	1480
25	3240	3520	1350	1280	1385	585	395	570	960	1145	1225	1475
26	3120	3350	1390	1270	1365	610	385	585	1080	1275	1220	1475
27	2980	3200	1690	1270	1230	610	380	600	1170	1350	1245	1465
28	2860	3000	1740	1225	1190	595	450	650	1200	1380	1250	1455
29	2810		1780	1140	1170	645	490	700	1220	1355	1245	1460
30	2740		1780	1100	1160	600	495	680	1225	1390	1220	1465
31	2720		1800		1075		520	670		1400		1475
Mean	3512	3824	1864	1516	1377	701	555	589	865	1370	1283	1364
Ac.Ft. for Month	215960	212350	114605	90218	84684	43111	34145	36228	51481	84228	76364	83841

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

TABLE 26

DISCHARGE OF SAN JOAQUIN RIVER NEAR VERNALIS - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	3820	3480	2970	2490	2240	1680	804	733	816	1500	1490	1380
2	3340	3660	2810	2570	2600	1560	854	716	838	1670	1640	1370
3	3220	3620	2480	2630	3100	1390	920	680	887	1720	1700	1380
4	3720	3570	2060	2400	2460	1300	1030	640	956	1850	1500	1360
5	4040	3640	1830	2220	2220	1260	1060	630	938	1840	1430	1350
6	4190	3560	1690	2120	2200	1170	914	660	985	1770	1420	1380
7	4320	3850	1570	2080	2200	1080	843	711	968	1720	1400	1470
8	4340	4360	1510	2350	2230	1030	826	722	882	1680	1420	1530
9	4050	5250	1590	2770	2150	998	832	690	865	1670	1410	1620
10	4010	5550	1790	2660	2020	962	850	665	904	1640	1390	1630
11	4430	5300	2000	2800	2130	980	865	655	914	1580	1380	1580
12	4440	5050	2290	2490	2200	980	826	670	932	1520	1400	1500
13	4470	4800	2410	2390	2210	920	750	733	986	1490	1410	1490
14	4940	4690	2290	2360	2150	876	716	744	998	1470	1380	1580
15	4670	4700	2200	2470	2110	854	738	760	1060	1470	1410	1660
16	4310	4600	2130	2650	2100	854	738	755	1050	1470	1450	1700
17	4150	4430	2030	2700	1990	870	810	706	1080	1330	1450	1740
18	4440	4360	2000	2710	1870	938	799	695	1100	1270	1440	1730
19	4590	4320	1990	2710	1710	974	750	670	1070	1290	1420	1680
20	4640	4200	2030	2570	1670	950	706	706	1020	1240	1420	1660
21	4620	4140	2080	2510	1660	892	685	804	1000	1220	1410	1710
22	4540	4110	2070	2690	1820	810	640	755	974	1260	1420	1740
23	4170	4020	1900	2710	1880	738	610	722	944	1260	1430	1760
24	4000	3860	1570	2760	1840	728	595	700	950	1260	1420	1720
25	4000	3660	1440	2510	1770	782	570	675	986	1270	1410	1670
26	3950	3500	1500	2340	1720	838	565	685	1250	1350	1410	1650
27	3840	3360	1940	2200	1690	810	545	695	1380	1420	1410	1630
28	3660	3140	2060	2100	1860	782	585	765	1410	1440	1410	1620
29	3560		2130	2020	1850	876	650	826	1430	1440	1410	1620
30	3360		2140	2050	1750	843	650	832	1420	1450	1380	1630
31	3280		2320		1710		706	772		1450		1640
Mean	4091	4171	2026	2467	2036	991	756	715	1033	1485	1436	1586
Ac.Ft. for Month	251500	231600	124600	146800	125200	58960	46500	43980	61500	91280	85430	97550

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 27

DISCHARGE OF MERCED RIVER AT YOSEMITE VALLEY RAILROAD CROSSING - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	18	40	376	83	11	18	26	31	24	4	0	3
2	18	33	120	80	29	18	26	26	26	2	2	3
3	17	33	58	78	17	20	26	24	18	2	3	3
4	137	564	114	78	13	20	26	24	17	1	3	3
5	1172	1396	114	78	22	22	26	26	15	0	3	3
6	1324	1770	100	80	29	24	29	26	13	0	3	3
7	1260	2740	83	80	35	26	31	24	13	0	3	3
8	1284	1780	108	75	31	26	31	24	11	0	3	3
9	1260	1052	177	69	22	22	29	26	13	0	3	3
10	1220	996	265	69	26	22	26	26	13	0	3	3
11	1220	948	86	66	22	20	26	24	11	0	3	4
12	1220	940	61	61	26	20	26	22	11	0	3	3
13	1140	1028	50	52	24	22	29	20	13	0	3	3
14	1140	1132	42	47	18	24	31	18	13	0	3	4
15	1140	1084	187	50	18	26	35	17	13	0	3	4
16	1100	1084	66	47	15	29	40	13	15	0	3	4
17	1084	1084	35	33	15	29	42	11	13	0	4	4
18	1076	1044	18	31	15	26	40	11	9	0	6	4
19	1060	1060	15	31	17	26	37	13	9	0	4	4
20	1044	1060	15	29	17	24	33	13	9	0	4	4
21	1020	1012	13	24	20	22	35	18	6	0	4	4
22	470	1012	11	20	22	22	37	22	4	0	3	4
23	143	1004	8	17	31	22	35	24	3	0	3	6
24	86	1004	44	13	31	24	42	22	2	0	3	4
25	55	1044	55	8	24	26	40	20	3	0	3	3
26	42	1020	117	4	22	29	31	22	13	0	4	3
27	35	1052	255	3	20	26	33	24	29	0	4	3
28	42	684	134	3	18	26	33	24	6	0	4	3
29	42		117	3	20	26	35	22	8	0	4	3
30	42		86	3	18	24	33	22	11	0	3	3
31	44		86		17		33	24		0		3
Mean	675	1025	97	44	21	24	32	21	12	0.3	3	3
Ac.Ft. for Month	41560	56930	5980	2610	1320	1400	1990	1320	722	18	192	212

NOTE: Station maintained by Division of Water Resources and Merced Irrigation District. Station is at Mile 42.1.

TABLE 28

DISCHARGE OF MERCED RIVER NEAR LIVINGSTON - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	125	220	879	257	205	146	137	187	154	144	108	113
2	124	220	612	259	191	177	141	159	170	142	108	112
3	125	222	403	253	178	156	154	142	202	141	107	112
4	120	253	373	222	182	153	120	130	189	139	107	114
5	468	1030	343	230	173	200	142	117	156	139	106	117
6	1070	1260	332	205	191	200	146	119	144	145	105	114
7	1140	1490	312	204	171	182	119	125	129	145	103	113
8	1160	1510	343	198	209	177	134	117	120	141	103	114
9	1190	1590	389	184	205	185	146	116	125	131	102	114
10	1190	1340	616	193	196	173	163	114	127	124	105	114
11	1210	1340	664	182	196	163	148	129	111	124	103	120
12	1210	1330	389	178	193	163	136	137	129	119	101	130
13	1220	1370	302	182	161	146	132	139	129	118	107	135
14	1220	1350	267	195	220	142	116	153	161	113	106	137
15	1220	1310	245	202	218	163	130	125	171	112	105	134
16	1210	1310	334	215	230	168	144	125	189	108	106	134
17	1180	1280	285	220	228	191	148	108	217	108	107	132
18	1200	1240	247	186	202	198	129	114	204	108	108	132
19	1200	1280	222	170	209	195	122	116	170	108	108	132
20	1200	1330	202	163	196	171	145	137	196	106	109	132
21	1010	1300	187	156	238	134	137	148	175	105	111	128
22	1160	1280	164	132	257	132	134	122	164	103	109	123
23	578	1280	158	158	238	151	158	142	161	105	111	126
24	348	1230	151	187	241	136	186	134	129	105	113	128
25	291	1260	164	171	204	166	153	124	112	106	117	128
26	263	1250	202	166	175	153	151	132	120	105	114	128
27	241	1300	396	173	164	130	159	158	130	107	114	129
28	234	1260	380	168	170	139	156	177	140	108	113	129
29	226		310	170	195	129	177	170	149	111	113	129
30	222		323	180	153	132	191	149	144	112	113	129
31	220		271		132		209	132		109		129
Mean	760	1158	338	192	197	162	147	135	154	119	108	125
Ac.Ft. for Month	46760	64330	20760	11420	12140	9620	9050	8330	9160	7330	6430	7660

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 29

DISCHARGE OF MERCED RIVER NEAR MOUTH - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1			1119	391	244	169	170	242	176	215	191	137
2			882	391	226	178	175	205	187	220	197	136
3			583	390	231	181	197	181	208	220	172	136
4			525	360	242	165	188	179	242	212	160	137
5			496	364	239	192	172	181	227	203	151	142
6			464	340	257	207	185	178	200	197	142	142
7			440	332	264	198	187	179	198	192	140	141
8			420	292	261	182	175	165	176	198	140	142
9			468	283	266	202	173	166	187	196	137	142
10			519	274	242	215	210	160	191	170	137	136
11			817	268	252	209	198	159	200	163	139	136
12			616	242	257	203	185	185	190	165	137	145
13			431	257	244	190	183	179	198	159	136	147
14			374	273	244	173	170	192	206	150	136	154
15			355	305	287	183	161	179	208	150	135	154
16			389	343	250	198	187	150	230	145	134	154
17			418	385	245	215	178	187	242	157	134	150
18			357	336	245	268	183	155	259	166	132	147
19	NO RECORD	NO RECORD	328	290	262	276	166	156	235	167	136	146
20			302	257	264	240	169	172	222	170	136	146
21			283	220	268	208	181	194	232	173	136	146
22			266	202	321	175	168	179	198	166	136	145
23		1190	257	200	313	191	185	175	198	154	135	143
24			252	245	294	194	198	178	203	145	136	146
25			247	251	269	208	196	168	187	148	140	146
26			309	232	230	225	172	178	237	157	139	145
27			379	210	198	187	179	190	218	160	137	146
28			336	215	190	183	181	218	212	159	139	147
29			429	216	216	173	165	210	223	172	139	150
30			468	224	198	175	206	200	223	163	137	151
31			420		178		235	179		170		151
Mean			450	286	248	199	183	182	210	174	143	145
Ac.Ft. for Month			27660	17030	15270	11830	11260	11180	12520	10680	8520	8900

NOTE: This is a recording gage station at bridge 1.1 mile above mouth. Recorder operated by United States Bureau of Reclamation. Flow measured by Division of Water Resources. For high stages see Livingston record (Table 28).

TABLE 30

DISCHARGE OF DRY CREEK NEAR MODESTO - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	73	96	49	66	80	58	51	45	40	50	46	38
2	73	160	49	66	96	58	45	51	40	50	46	38
3	80	122	49	60	88	58	51	51	37	54	46	38
4	80	96	49	60	88	58	51	51	37	54	43	38
5	88	88	49	49	73	58	51	45	37	50	43	38
6	88	96	49	49	73	58	57	51	37	50	43	38
7	96	122	54	66	73	58	51	51	37	50	43	38
8	66	*	54	66	80	58	51	45	37	46	43	38
9	60	*	54	60	80	58	51	45	40	46	43	38
10	54	*	54	60	73	58	51	51	46	46	43	38
11	54	150	54	60	80	52	45	45	49	46	43	38
12	54	113	54	60	73	58	45	51	49	46	43	38
13	54	96	54	60	73	64	45	45	46	46	43	38
14	54	80	54	66	88	64	45	45	46	50	43	38
15	54	73	54	60	96	64	51	45	46	50	43	38
16	54	66	60	60	78	51	40	40	46	54	43	38
17	49	60	60	60	64	57	36	40	46	54	43	38
18	49	54	60	60	58	57	40	40	46	50	43	38
19	49	54	60	60	78	57	40	43	46	46	43	38
20	54	54	60	54	64	51	40	40	46	46	43	38
21	60	49	60	54	71	45	40	40	46	50	40	38
22	60	49	66	54	86	40	40	40	46	46	40	35
23	60	49	66	60	71	45	40	40	46	50	40	35
24	60	49	66	60	64	51	40	40	46	49	40	35
25	54	44	66	73	71	51	36	40	46	46	40	35
26	54	49	66	88	64	51	40	37	92	46	40	35
27	54	49	122	80	64	63	40	40	76	46	40	35
28	54	49	80	88	64	77	40	40	60	46	40	35
29	54		54	96	64	57	40	40	50	46	40	35
30	60		54	96	58	45	40	40	50	46	38	35
31	73		66		58		40	40		46		35
Mean	62	-	60	65	69	56	41	41	47	48	42	37
Ac.Ft. for Month	3820	-	3660	3680	4320	3330	2720	2690	2800	2970	2510	2280
M.I.D.Spill Below Station,Ac.Ft.	0	-	0	700	660	170	140	260	500	330	0	0
Discharge to Tuolumne River,Ac.Ft.**	3820	-	3660	4380	4980	3500	2860	2950	3300	3300	2510	2280

NOTE: This is a recording gage station about 2 miles above mouth (near end of Oakdale road). Recorder operated by Modesto Irrigation District. Measurements of flow made by Division of Water Resources.

* Stage very high. Unable to determine discharge.

** Neglecting seepage return below station.

TABLE 31

DISCHARGE OF TUOLUMNE RIVER AT LA GRANGE BRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	749	686	460	4	1512	3	168	132	170	578	583	569
2	729	700	30	4	124	3	168	134	170	529	551	573
3	787	668	4	4	4	3	174	136	168	578	556	569
4	787	655	4	4	4	3	174	136	169	578	556	573
5	775	628	4	4	4	3	175	130	166	578	560	569
6	719	628	4	4	4	3	177	136	162	578	565	565
7	724	859	4	4	4	3	179	136	164	578	565	560
8	673	1070	4	4	4	3	179	130	160	524	574	560
9	754	1052	250	4	4	3	175	138	164	524	583	560
10	793	924	448	4	4	3	174	138	162	578	583	542
11	771	614	480	4	4	3	174	136	162	578	587	533
12	744	609	456	4	4	3	174	136	164	578	556	565
13	739	614	448	86	4	3	174	134	162	578	542	565
14	754	664	484	16	4	3	178	169	162	578	591	569
15	677	641	464	4	4	3	184	153	162	292	587	560
16	754	623	468	4	4	3	190	153	162	292	591	560
17	760	619	520	4	4	3	186	153	162	292	591	560
18	771	619	601	4	4	3	187	153	162	292	587	565
19	744	628	591	33	4	3	187	153	138	292	583	565
20	744	628	654	6	4	3	94	153	137	292	587	560
21	734	628	591	6	3	3	20	153	137	292	587	556
22	664	623	122	4	3	3	16	153	137	292	587	560
23	724	533	4	4	3	3	13	86	137	278	583	560
24	749	468	4	4	3	3	12	140	137	512	587	565
25	734	460	4	4	3	4	53	140	137	583	587	569
26	714	460	4	4	3	70	179	156	253	578	578	551
27	719	460	4	4	3	158	179	174	279	520	578	560
28	677	464	4	4	3	166	158	170	279	574	583	565
29	641		4	4	3	162	132	164	331	574	560	560
30	659		4	200	3	164	132	166	574	578	560	574
31	704		4		3		132	170		578		569
Mean	731	651	230	15	56	27	145	146	188	485	576	563
Ac.Ft. for Month	44960	36150	14140	879	3450	1600	8920	8980	11160	29840	34250	34570

NOTE: Recording gage station maintained throughout the year by Turlock Irrigation District. Supplemental current meter measurements by Division of Water Resources.

TABLE 32

DISCHARGE OF TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	865	716	180	56	506	40	184	160	187	542	542	532
2	735	673	115	51	912	42	195	157	187	532	532	542
3	735	704	101	48	147	42	191	163	191	537	516	532
4	735	673	81	48	81	40	198	160	191	548	511	542
5	735	673	77	51	66	42	198	157	187	537	516	542
6	735	661	72	55	58	42	198	160	187	564	532	537
7	704	692	72	55	56	40	214	163	132	564	522	532
8	767	865	72	55	55	38	214	163	180	564	532	532
9	723	944	424	55	48	40	214	163	184	542	537	532
10	780	944	466	55	48	37	210	160	184	558	516	532
11	757	800	434	54	48	35	202	163	187	564	532	522
12	767	643	403	52	48	36	198	163	187	558	506	532
13	735	631	374	52	48	34	202	163	187	553	496	548
14	735	643	345	124	48	35	206	184	191	558	537	542
15	757	637	318	77	46	34	202	163	191	431	537	532
16	735	625	287	71	43	37	214	166	191	309	537	258
17	757	613	256	64	42	37	218	157	191	296	532	569
18	748	613	217	59	42	36	214	157	187	296	532	569
19	735	613	191	56	42	36	210	173	180	296	532	569
20	735	557	166	71	46	38	184	170	160	338	537	558
21	735	502	147	75	44	38	77	180	157	296	548	558
22	735	450	128	66	43	35	59	180	147	284	553	542
23	673	398	109	59	43	34	54	115	163	284	542	548
24	704	350	93	55	42	35	51	151	110	309	542	704
25	704	305	79	52	43	36	46	163	184	516	548	548
26	685	250	65	49	43	37	124	163	138	532	548	537
27	704	217	65	51	43	124	206	187	288	482	548	542
28	685	180	65	48	43	180	210	195	296	532	553	542
29	704		63	48	43	187	170	184	511	543	542	548
30	704		60	48	41	180	163	184	527	548	548	553
31	704		58		41		157	184		548		553
Mean	734	592	180	59	93	55	174	166	206	470	533	544
Ac.Ft. for Month	45110	32890	11070	3490	5750	3270	10680	10220	12260	28890	31750	33470

NOTE: This is a recording gage station at Mile 39.9. Recorder operated by Modesto Irrigation District. Discharge measurements made by Division of Water Resources.

TABLE 33

DISCHARGE OF TUOLUMNE RIVER AT HICKMAN BRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1			260	140	696	115	250	220	250	696	928	642
2			200	140	1127	115	250	220	250	696	808	642
3			200	140	220	115	250	220	250	696	642	642
4			170	140	165	115	250	220	250	696	642	642
5			140	140	140	115	250	220	250	696	642	642
6			140	140	140	115	250	220	250	696	642	642
7			140	140	140	115	250	220	220	696	642	642
8			140	140	140	115	250	220	220	696	642	642
9			520	140	140	115	250	220	250	696	642	642
10			520	140	140	115	250	220	250	696	642	642
11			520	140	140	115	250	220	250	696	642	642
12			472	140	140	115	250	220	250	696	642	642
13			425	140	140	115	250	220	250	696	642	642
14			425	192	140	115	250	220	250	696	642	642
15			382	140	140	115	220	250	250	642	696	642
16			340	140	140	115	220	250	250	400	642	642
17			340	140	140	115	220	250	250	400	642	642
18			300	140	115	115	192	250	250	400	642	642
19			260	115	115	115	192	220	220	400	642	642
20			260	140	115	115	165	220	220	400	642	642
21			230	140	115	115	165	250	220	400	642	642
22			200	140	115	115	140	250	220	360	642	642
23			200	140	115	115	140	220	220	360	642	642
24			170	140	115	115	140	192	220	360	642	642
25			170	140	115	115	115	220	220	642	642	642
26			170	140	115	115	165	220	250	696	642	642
27			140	140	115	165	250	250	285	642	642	642
28			140	140	115	250	250	250	360	642	642	642
29			140	140	115	250	220	250	360	696	642	642
30			140	115	115	250	220	250	591	696	642	642
31			140		115		220	250		696		642
Mean			258	140	182	130	217	230	261	599	659	642
Ac.Ft. for Month			15860	8330	11180	7740	13360	14130	15520	36840	39200	39480

NOTE: This is a recording gage station at Mile 31.7. Recorder operated by Modesto Irrigation District. Discharge measurements made by Division of Water Resources. Recorder removed during January and February. Record for period March 1-25 by comparison with Roberts Ferry station.

TABLE 34

DISCHARGE OF TUOLUMNE RIVER AT TUOLUMNE CITY - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	1450	1030	705	503	435	328	452	426	470	850	915	840
2	1295	1040	700	487	1350	330	470	426	470	900	1140	840
3	1235	1045	575	462	1080	323	478	426	470	900	990	830
4	1255	1040	460	427	525	328	478	429	470	910	885	830
5	1300	1030	410	408	435	334	468	432	470	920	870	830
6	1295	1030	400	395	400	328	472	433	470	900	870	830
7	1240	1040	395	400	410	328	473	443	470	900	870	825
8	1210	1260	390	387	410	322	475	432	460	900	870	825
9	1205	1920	430	365	385	322	478	438	460	870	870	830
10	1180	1700	435	363	375	328	475	433	460	875	865	825
11	1210	1390	695	355	400	328	465	443	460	860	865	830
12	1215	1110	760	359	410	330	452	433	470	860	870	815
13	1175	1040	800	372	392	322	450	433	475	860	855	820
14	1160	1020	755	382	400	325	462	438	490	860	840	830
15	1155	1020	780	450	415	325	468	438	480	860	845	825
16	1125	1000	760	380	400	325	478	450	475	800	870	820
17	1110	990	740	360	386	334	484	432	490	695	870	815
18	1130	980	745	363	375	334	475	433	455	675	860	815
19	1130	970	825	357	395	334	465	438	465	650	860	815
20	1115	965	885	345	365	324	472	452	465	660	855	815
21	1130	950	950	360	395	327	472	442	450	660	855	815
22	1100	950	925	365	403	324	407	440	450	650	850	815
23	1050	930	685	385	405	310	365	445	450	645	850	815
24	1045	855	525	428	370	324	345	450	450	635	850	815
25	1050	765	460	415	370	327	330	450	460	655	850	810
26	1050	750	510	398	387	325	335	450	575	830	855	810
27	1045	715	590	400	360	314	367	455	575	875	850	805
28	1030	710	530	385	358	362	443	460	615	865	850	805
29	1020		530	425	350	452	462	472	615	900	845	805
30	1010		500	435	336	450	455	465	645	905	835	805
31	1000		505		330		432	465		900		815
Mean	1152	1044	624	397	445	336	445	442	489	814	874	820
Ac.Ft. for Month	70850	58010	38390	23630	27390	19970	27380	27180	29120	50030	52020	50420
Diversions Below Station-Ac.Ft.	0	0	0	20	30	40	30	70	30	20	0	0
M.I.D. Spill Below Station Ac.Ft.	0	0	0	280	1540	190	100	2	440	490	0	0
*Discharge to San Joaquin River Acre-feet	70850	58010	38390	23890	28900	20120	27450	27110	29530	50500	52020	50420

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

*Neglecting seepage return below station.

TABLE 35

DISCHARGE OF STANISLAUS RIVER AT ORANGE BLOSSOM BRIDGE - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1						586	23	25	15	17	56	
2					RECORD	275	26	25	15	17	45	
3						56	30	28	15	17	56	
4						45	30	28	15	15	110	
5						34	30	25	15	15	96	
6						34	30	25	15	15	143	
7					NO	34	30	26	15	15	82	
8						34	25	25	15	15	82	
9						34	25	25	15	15	82	
10						34	26	25	15	15	17	
11						30	28	25	13	15		
12	RECORD	RECORD	RECORD	RECORD		30	25	25	13	15		
13						30	25	25	13	15		
14						30	26	25	14	15		
15						30	26	23	15	15		
16					231	30	26	23	15	17		
17	NO	NO	NO	NO	56	30	28	21	15	17	RECORD	RECORD
18					34	30	17	19	15	17		
19					34	30	26	17	15	17		
20					34	30	25	17	15	17		
21					34	30	25	17	15	17		
22					34	30	25	17	15	17	NO	NO
23					34	30	25	17	15	17		
24					30	30	25	17	15	17		
25					30	30	25	17	15	15		
26					376	30	25	17	15	15		
27					301	30	25	17	15	15		
28					427	30	25	17	15	15		
29					696	30	25	15	15	15		
30					641	26	25	15	17	15		
31					613		25	15		56		
Mean					-	58	26	21	15	17		
Ac.Ft. for Month					-	3490	1590	1300	882	1050		

NOTE: Staff gage station 5.7 miles above Oakdale. Gage height observed by Oakdale Irrigation District. Discharge measurements made by Division of Water Resources.

TABLE 36

DISCHARGE OF STANISLAUS RIVER AT HATMARK RANCH - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	790	460	220	750	1150	700	180	230	120	200	150	220
2	550	630	310	830	1190	600	220	230	170	205	180	215
3	430	630	260	890	1090	490	190	210	200	210	210	210
4	690	590	220	870	1040	420	210	210	200	215	210	210
5	760	590	220	700	970	340	230	210	185	220	205	205
6	800	530	220	620	970	280	210	210	185	225	230	205
7	800	420	220	630	920	260	210	210	185	230	225	300
8	760	640	220	1240	880	230	210	180	145	235	250	350
9	530	1030	220	1480	670	210	230	160	185	235	260	370
10	450	740	260	1340	530	190	230	160	185	215	255	985
11	530	680	310	820	670	210	210	160	185	205	255	300
12	430	490	310	690	720	190	210	160	185	185	250	255
13	530	420	260	690	760	160	180	160	185	170	245	250
14	730	420	220	770	720	190	180	160	185	170	240	325
15	670	420	220	960	670	190	180	160	200	175	235	380
16	440	370	260	910	670	190	180	150	200	180	240	395
17	410	310	210	910	630	190	180	160	210	185	235	395
18	670	370	200	770	530	270	160	150	170	195	235	385
19	730	340	180	730	440	240	160	140	170	185	240	330
20	730	260	210	690	400	210	160	140	170	170	240	325
21	730	220	210	910	400	210	160	140	170	180	240	380
22	670	220	280	1300	400	170	190	140	150	175	240	390
23	450	220	300	1510	400	170	190	140	140	170	245	395
24	400	220	210	1510	350	170	190	140	170	185	245	330
25	600	240	130	1220	350	210	190	140	215	195	240	280
26	670	240	150	1020	310	270	170	140	235	185	235	255
27	670	240	300	800	460	190	170	170	235	180	235	240
28	600	220	430	730	770	160	170	170	235	175	230	225
29	550		460	760	740	160	190	170	235	170	230	220
30	410		470	800	700	190	190	190	180	165	225	220
31	380		620		700		220	150		145		220
Mean	599	434	270	928	684	255	192	175	186	191	232	295
Ac.Ft. for Month	36810	24120	16600	55240	42050	15190	11800	10440	11080	11770	13800	18180
Diversions Below Station-Ac.Ft.	0	0	0	140	160	130	170	120	90	0	0	0
Discharge * to San Joaquin River Acre-feet	36810	24120	16600	55100	41890	15060	11630	10320	10990	11770	13800	18180

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 1939 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 1939 this report records a total of 651 points of diversion, (an increase of 50 over last year), segregated to the various sources as follows: Sacramento River 280, Colusa Trough 14, Back Borrow Pit (carrying drainage water from Colusa Basin along the back levees of Reclamation Districts 108 and 787) 19, Lower Butte Creek and Butte Slough 24, By-Pass and Drainage Channels 44, Feather River 41, Yuba River 12, American River 33, from Old San Joaquin River 13, from Tom Paine Slough 9, and from San Joaquin River (below Vernalis gaging station) 49, San Joaquin River (above Vernalis gaging station) 21, Stanislaus River 24, Tuolumne River 14, and Merced River 55.

All of these diversions except five are accomplished by pumping. The five exceptions are gravity diversions, two on the Yuba River, two on the Feather River and one on the Sacramento River, and the records for these are obtained by means of canal ratings. In the case of the pumping diversions there are a few instances where the records are obtained by means of canal ratings but in the main the records are obtained from the relation established between electric power consumption and pump discharge. This is possible due to the fact that nearly all of the pumping plants are electrically operated. The relation between power input and water pumped is determined from current meter measurements of the discharge and a measured kilowatt input. At the larger pumping plants

several measurements are made during each season. At the smaller plants a number of measurements are made initially to determine the rating and thereafter at intervals to show any changes which may occur in the rating. Prior to 1933 a daily diversion record for each plant was compiled. However, since that year, except for the larger diversions, the monthly diversion records only are available.

For 1939 the amount of water diverted by the larger plants was computed, as above, and several discharge measurements were made at each of the larger plants during the season. Due to the intermittent operation of the smaller plants and the large area to be covered by the field engineers, it was not possible to make many discharge measurements at any one of these smaller plants. However, it is felt that possibly the rating as initially determined, remains more or less constant and that over a period of time, enough measurements will be secured to determine any change in the rating. The diversions for 1939 have been computed on a monthly basis only and the breakdown into daily records was not made.

A summary of the 1939 diversions throughout the Sacramento-San Joaquin territory is shown in Table 55. 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 54 summarizes the diversions and irrigated acreages between different points on the Sacramento River. Table 37 shows a comparison of the Sacramento River stream flow irrigation draft and gross duty of water for the years 1924 to 1939, inclusive. Tables 38, 39 and 40 show similar data for the Feather, Yuba and American Rivers. In Table 41 is shown the average monthly diversions in per cent of seasonal for the streams in the Sacramento and San Joaquin Valleys. A summary of the monthly diversions for the Sacramento Valley streams for the period of

record prior to 1939 is given in Tables 42 to 45. All available data regarding monthly diversions, acreage irrigated, and gross duty of water for the San Joaquin Valley streams and Delta Upland channels is given in Tables 46 to 52. Table 53 is given to show, for the Sacramento River only, the seasonal diversions and acreages irrigated for the period 1924-1939, segregated to the different river sections.

TABLE 37

SACRAMENTO RIVER - REDDING TO SACRAMENTO
STREAM FLOW - IRRIGATION DRAFT - GROSS DUTY OF WATER 1924-1939

Year	Seasonal Runoff at Red Bluff: in per cent of normal *	Discharge of Sacramento River at Kennett, Cubic feet per Sec.: Average Jul.-Sep. Inclusive	Average July	Irrigation Draft: Aver. cfs. Jul.-Sep. Inclusive	Acre-feet Mar.-Oct. Inclusive	Acreage Irrigated: General	Rice	Total	Gross Duty of Water: Acre-feet per Acre: Jul.-Sep. Inclusive	July	Mar.-Oct. Inclusive	Acres per Second-foot: Mar.-Oct. Inclusive	Jul.-Sep. Inclusive
1924	36	2920**	2890**	2470**	953000 /	104300	59700	164000	2.75	1.15	5.81	84	66
1925	86	3630**	3640**	2960**	843000 /	76200	58000	134200	4.03	1.57	6.28	77	45
1926	61	2780	2880	3210	1108000 /	76600	87500	164100	3.57	1.58	6.75	72	51
1927	117	3550	3950	3510	1159000 /	77900	79800	157700	4.07	1.60	7.35	66	45
1928	82	3320	3580	2920	1055000 /	88200	63500	151700	3.52	1.49	6.95	70	52
1929	47	2920	3060	2770	1066000 /	136900	43900	180800	2.80	1.15	5.90	83	65
1930	65	2970	3070	2880	1056000 /	96600	56200	152800	3.44	1.42	6.91	70	53
1931	36	2570	2600	3030	1335000	141500	73900	215400	2.57	1.13	6.20	78	71
1932	54	2730	2940	2570	1020000	130700	53800	184500	2.54	1.07	5.53	88	72
1933	49	2770	3010	2680	1042000	101100	53000	154100	3.17	1.28	6.76	72	57
1934	48	2540	2650	2750	1057000	93800	56500	150300	3.34	1.35	7.03	69	54
1935	80	3010	3330	2820	926000	98500	51100	149600	3.44	1.38	6.19	78	53
1936	76	2910	3280	2890	1055000	93100	62700	155800	3.38	1.39	6.77	72	54
1937	64	2950	3380	3210	1070000	101000	66500	167500	3.50	1.41	6.39	76	52
1938	157	4220	4870	2990	932000	85600	62600	148200	3.68	1.47	6.29	77	49
1939	47	3000	3100	2910	1301000	158800	63900	222700	2.38	1.03	5.84	83	77
Average 1924-1939		3050	3270	2920	1061000	103800	62000	165800	3.26	1.34	6.43	76	56

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

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

/ Diversions for March estimated.

TABLE 38

FEATHER RIVER - OROVILLE TO MOUTH
STREAM FLOW - IRRIGATION DRAFT - GROSS DUTY OF WATER 1924-1939

Year	Seasonal Runoff at Oroville in per cent of normal *	Discharge of Feather River at Oroville Cubic feet per Sec. Average Jul-Sep. Inclusive	Discharge of Feather River at Oroville Cubic feet per Sec. Average July	Irrigation Draft Aver. cfs. Jul.-Sep. Inclusive	Irrigation Draft Acre-feet Mar.-Oct. Inclusive	Acreage Irrigated General	Acreage Irrigated Rice	Acreage Irrigated Total	Gross Duty of Water Acre-feet per Acre Jul.-Sep. Inclusive	Gross Duty of Water Acre-feet per Acre July	Gross Duty of Water Acre-feet per Acre Mar.-Oct. Inclusive	Gross Duty of Water Acres per Second-foot Mar.-Oct. Inclusive	Gross Duty of Water Acres per Second-foot Jul.-Sep. Inclusive
1924 (1)	24	933	852	917	355346	22402	22541	44943	3.72	1.30	7.92	61	49
1925	68	1719	1770	1287	417150	25560	26734	52294	4.49	1.72	7.98	61	41
1926	61	1839	1840	1432	474025	23545	34694	58239	4.49	1.81	8.14	60	41
1927	121	1920	2110	1578	533615	24944	38513	63457	4.54	1.80	8.41	58	40
1928	85	1689	1930	1363	497201	23383	33145	56528	4.40	1.85	8.80	55	41
1929	36	2080	1920	1134	453464	29011	23917	52928	3.91	1.64	8.57	57	47
1930	72	1986	1890	1225	450020	25604	24258	49862	4.48	1.87	9.03	54	41
1931	28	1177	1230	1059	464138	24683	27079	51762	3.73	1.58	8.97	54	49
1932	63	1570	1990	1327	496713	24115	28108	52223	4.64	1.91	9.51	51	39
1933	37	1389	1590	1286	478326	21897	26541	48438	4.84	1.95	9.88	49	38
1934	39	1445	1530	1085	428008	23984	24918	48902	4.05	1.67	8.75	56	45
1935	82	1937	2067	1258	390873	25162	20849	46001	4.99	2.01	8.50	57	37
1936	82	2171	2242	1349	479093	23990	26546	50536	4.87	1.96	9.48	51	37
1937	60	1760	2138	1529	507765	26705	30203	56908	4.90	1.93	8.92	54	37
1938	163	2674	3334	1594	512600	26938	27144	54082	5.38	2.00	9.48	51	34
1939	36	1516	1460	1168	501357	29234	26303	55537	3.84	1.66	9.03	54	48
Average 1924-1939		1738	1871	1287	464980	25072	27593	52665	4.46	1.79	8.83	55	41

(1) Some of the smaller plants were omitted in 1924.
* 40 year mean (1889-1929) of natural run-off.

TABLE 39

YUBA RIVER - SMARTVILLE TO MOUTH
STREAM FLOW - IRRIGATION DRAFT - GROSS DUTY OF WATER 1925-1939

Year	Seasonal Runoff at Smartville in per cent of normal *	Discharge of Yuba River at Smartville Cubic feet per Sec. Average Jul.-Sep. Inclusive	Discharge of Yuba River at Smartville Cubic feet per Sec. Average July	Irrigation Draft Aver. cfs. Jul.-Sep. Inclusive	Irrigation Draft Acre-feet Mar.-Oct. Inclusive	Acreage Irrigated General	Acreage Irrigated Rice	Acreage Irrigated Total	Gross Duty of Water Acre-feet per Acre Jul.-Sep. Inclusive	Gross Duty of Water Acre-feet per Acre July	Gross Duty of Water Acre-feet per Acre Mar.-Oct. Inclusive	Gross Duty of Water Acres per Second-foot Mar.-Oct. Inclusive	Gross Duty of Water Acres per Second-foot Jul.-Sep. Inclusive
1925 (1)	80	417	637	10	4045	1796	0	1796	1.01	0.55	2.25	217	180
1926	60	226	280	133	35908	3234	3279	6513	3.73	1.37	5.51	88	49
1927	133	495	868	125	39750	4003	1930	5933	3.84	1.66	6.71	73	47
1928	92	374	546	114	36800	4935	1875	6810	3.04	1.42	5.40	90	60
1929	38	252	340	139	53254	5180	2450	7630	3.33	1.23	6.99	69	55
1930	69	296	347	163	58521	4680	2875	7555	3.93	1.56	7.74	63	46
1931	24	146	152	134	63320	4823	2950	7773	3.14	1.16	8.14	60	58
1932	80	359	603	137	58201	4950	2615	7565	3.32	1.26	7.70	63	55
1933	41	293	420	152	63369	5935	2645	8580	3.46	1.27	7.38	66	53
1934	37	185	222	127	52651	6305	1667	7972	2.91	1.40	6.51	74	63
1935	84	383	602	153	48850	6535	1552	8087	3.46	1.40	6.05	80	53
1936	98	394	584	155	64058	5202	2665	7867	3.58	1.31	8.14	60	51
1937	70	360	541	156	59163	6699	2598	9297	3.06	1.05	6.37	76	60
1938	152	748	1410	152	43257	5772	1605	7377	3.75	1.35	5.88	83	49
1939	34	213	238	186	73113	6642	1898	8540	3.97	1.51	8.56	57	46
Average 1925-1939		343	519	136	50284	5113	2174	7286	3.41	1.3	6.90	71	54

* 40 year mean (1889 - 1929) of natural run-off.
(1) Record obtained for Lower Yuba River only.

TABLE 40

AMERICAN RIVER - FAIROAKS TO MOUTH
STREAM FLOW - IRRIGATION DRAFT - GROSS DUTY OF WATER 1925-1939

Year	Seasonal Runoff at Fairoaks in per cent of normal *	Discharge of American River at Fairoaks Cubic feet per sec. Average Jul.-Sep. Inclusive	Discharge of American River at Fairoaks Cubic feet per sec. Average July	Irrigation Draft Aver. cfs Jul.-Sep. Inclusive	Irrigation Draft Acre-feet Mar.-Oct. Inclusive	Acreage Irrigated General	Acreage Irrigated Rice	Acreage Irrigated Total	Gross Duty of Water Acre-feet per acre Jul.-Sep. Inclusive	Gross Duty of Water Acre-feet per acre July	Gross Duty of Water Acre-feet per acre Mar.-Oct. Inclusive	Gross Duty of Water Acres per sec.-foot Mar.-Oct. Inclusive	Gross Duty of Water Acres per sec.-foot Jul.-Sep. Inclusive
1925	88	565	1080	16	4353	3510	—	3510	0.82	0.35	1.24	392	219
1926	45	207	247	16	4606	3073	—	3073	0.94	0.50	1.50	324	192
1927	119	653	1240	21	5636	3343	—	3343	1.16	0.52	1.68	288	159
1928	82	286	414	17	5635	3071	—	3071	1.00	0.41	1.83	264	181
1929	37	262	482	20	6324	3077	—	3077	1.20	0.50	2.04	239	154
1930	54	276	414	15	4955	2639	—	2639	1.06	0.49	1.87	262	176
1931	23	98	136	15	5620	2694	—	2694	1.03	0.46	2.09	232	179
1932	84	679	1500	17	5481	3165	—	3165	.96	0.42	1.73	281	187
1933	41	344	633	15	4615	2848	—	2848	.94	0.46	1.62	300	190
1934	37	179	192	15	5505	2770	—	2770	.98	0.46	1.99	245	185
1935	84	504	1009	15	4815	2808	—	2808	.97	0.46	1.71	284	187
1936	111	753	1364	16	4727	2492	—	2492	1.16	0.49	1.90	256	156
1937	76	497	873	20	5381	3353	—	3353	1.07	0.45	1.61	302	168
1938	147	1060	2101	16	4287	2923	—	2923(1)	1.03	0.43	1.47	331	182
1939	34	127	165	19	6654	3064	—	3064(1)	1.11	0.55	2.17	224	161
Average 1925-1939		433	790	17	5256	2989		2989	1.03	0.46	1.76	282	178

* 40-year mean (1889-1929) of natural run-off.

(1) An estimated 2200 acres have been added for Carmichael Irrigation District.

NOTE: Discharge of American River at Fairoaks not published in bulletin until 1935.

TABLE 41

AVERAGE MONTHLY DIVERSIONS IN PER CENT OF SEASONAL FOR SACRAMENTO AND SAN JOAQUIN VALLEY STREAMS

	Period of Record	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.
Sacramento Valley		Per Cent of Seasonal Diversion							
Sacramento River - Redding to Sacramento	1924 to 1939	1	8	18	20	21	19	10	3
Feather River - Oroville to mouth	1924 to 1939	.3	6.2	18.7	19.8	20.4	19.1	11.2	4.3
Yuba River - Smart.	1925 to 1939	-	9.4	17.5	18.8	19.3	18.3	11.9	4.8
American River - Fairoaks to mouth	1925 to 1939	-	5	11	21	26	21	11	5
Delta Uplands									
Old San Joaquin River	1924 to 1939	2.9	10.1	17.6	17.5	19.8	16.8	11.0	4.3
Tom Paine Slough	1924 to 1939	1.7	8.4	15.2	16.8	18.1	18.0	14.2	7.6
San Joaquin River below Vernalis	1924 to 1939	3.3	13.2	16.2	13.4	23.2	18.3	8.8	3.6
San Joaquin Valley									
San Joaquin River - Delta Bridge to Vernalis	1931 to 1939	4.	12	15	15.	21.	18.	11	4
Merced River - Yosemite Valley Railroad Crossing to mouth	1931 to 1939	2.0	8.5	15.1	17.9	21.2	18.8	12.2	4.3
Tuolumne River - La Grange to mouth	1931 to 1939	3.0	9.2	16.3	17.4	19.7	18.5	10.9	5.0
Stanislaus River - Orange Blossom Bridge to mouth	1931 to 1939	1.2	10.5	13.6	18.7	20.7	19.3	11.2	4.8

TABLE 42

SACRAMENTO RIVER - MONTHLY DIVERSIONS IN ACRE-FEET - SACRAMENTO TO REDDING 1924 - 1939

Year	March	April	May	June	July	August	September	October	Seasonal Diversion
1924	7324	102511	184043	186073	189081	163677	97976	22088	952773
1925	1200*	11177	87709	184151	211788	194888	134442	18108	843463
1926	4000*	34326	195052	258889	259777	226874	98632	30220	1107770
1927	600*	31327	206864	234116	260018	241876	139469	44993	1159263
1928	1900*	52335	207747	229261	227058	214549	92114	29574	1054538
1929	5600*	138283	204360	167378	207785	191346	107103	43954	1065809
1930	3100*	74236	198836	221852	217698	199875	107577	32681	1055855
1931	30199	222932	257156	227158	242076	209351	101822	44572	1335266
1932	4661	123973	176667	194500	197849	171122	99657	51571	1020000
1933	4452	118677	188004	189852	197452	185945	105071	52267	1041720
1934	2599	109638	204710	193469	202843	191488	107885	44331	1056963
1935	1524	18598	157817	203562	206813	195215	112498	30137	926164
1936	7320	76534	203802	194110	216217	206858	104203	45925	1054969
1937	3459	32727	210339	210927	235304	217924	133271	26510	1070461
1938	5285	29942	121847	199745	218572	208414	118177	30248	932230
1939	63636	202428	227491	233319	230319	209735	90708	43412	1301048
Average Acre-feet	9178	86228	189528	208023	220040	201821	109413	36912	1061143
Average c.f.s.	149	1449	3082	3496	3579	3282	1839	600	2184
Monthly Diversion in per cent of seasonal	1	8	18	20	21	19	10	3	

*Estimated

TABLE 43

FEATHER RIVER - MONTHLY DIVERSIONS IN ACRE FEET - OROVILLE TO MOUTH 1924 - 1939

Year	March	April	May	June	July	August	September	October	Seasonal Diversion
1924	2652	36448	75741	60132	58413	67365	41618	12980	355346
1925	0*	9506	70947	88956	90047	81340	63395	8829	413020
1926	0*	16528	83297	104100	105255	101623	54446	4083	469332
1927	0*	17522	96458	107706	114211	102251	71514	18669	528331
1928	0*	19912	101655	109875	104359	97452	46986	12040	492279
1929	1500*	48450	97295	83570	87061	82177	37711	12711	450475
1930	0*	31719	78154	91418	93250	89300	40912	20811	445564
1931	5887	67203	98054	85024	81941	71953	39288	14788	464138
1932	2158	50002	85950	94140	99640	93180	49359	22284	496713
1933	5388	31219	91529	91635	94231	85891	54515	23918	478326
1934	2245	34217	92225	82379	81467	72334	44121	19020	428008
1935	214	1538	51974	89713	92372	85835	51342	17885	390873
1936	768	14136	92675	92002	99147	90575	56374	33416	479093
1937	620	5647	92614	99882	109850	103248	65946	29958	507765
1938	0	3512	76975	98534	108039	104846	77969	42725	512600
1939	3583	71539	99567	90960	92044	83292	37752	22620	501357
Average Acre-feet	1560	28690	86570	91880	94460	88290	52080	19800	463300
Average c.f.s.	25	482	1408	1544	1536	1436	875	322	953
Monthly Diversion in per cent of seasonal	.3	6.2	18.7	19.8	20.4	19.1	11.2	4.3	

* Estimated

TABLE 44

YUBA RIVER - MONTHLY DIVERSIONS IN ACRE-FEET - SMARTVILLE TO MOUTH 1925 - 1939

Year	March	April	May	June	July	August	September	October	Seasonal Diversion
1925	-	-	617	1594	985	586	249	14	4045
1926	0	0	4681	6825	8893	10785	4604	120	35908
1927	-	304	6492	9761	9808	8733	4220	432	39750
1928	0	0	7329	8759	9651	8816	2245	0	36800
1929	0	3972	10808	8843	9376	8710	7308	4237	53254
1930	0	4803	9234	10293	11752	10825	7137	4477	58521
1931	0	10471	12111	10427	8991	8986	6468	5866	63320
1932	0	8778	10151	9973	9525	9188	6371	4215	58201
1933	0	7617	11048	10516	10917	10920	7724	4627	63369
1934	0	7112	11137	10985	11235	8454	3496	232	52651
1935	0	525	9034	11088	11313	10013	6674	283	48850
1936	0	9709	11579	10513	10330	10009	7908	4010	64058
1937	0	8093	9913	10055	9749	9815	8835	2703	59163
1938	0	360	4807	9371	9982	9433	8284	1020	43257
1939	176	8986	13174	12890	12889	12739	8304	3955	73113
Average Acre-feet	12	4715	8808	9454	9693	9201	5988	2413	50284
Average c.f.s.	-	79	143	159	158	150	101	39	103
Monthly Diversion in per cent of seasonal	-	9.4	17.5	18.8	19.3	18.3	11.9	4.8	

TABLE 45

AMERICAN RIVER - MONTHLY DIVERSIONS IN ACRE-FEET - FAIROAKS TO MOUTH 1925— 1939

Year	March	April	May	June	July	August	September	October	Seasonal Diversion
1925	10*	66	261	985	1233	1198	458	142	4353
1926	0*	5	390	1162	1519	894	480	156	4606
1927	5*	16	317	1028	1754	1577	529	410	5636
1928	10*	121	580	1406	1263	965	832	458	5635
1929	50*	482	812	936	1539	1280	864	361	6324
1930	30*	317	436	1250	1302	976	504	140	4955
1931	46	469	1127	916	1237	1027	510	288	5620
1932	39	390	598	1116	1317	1164	556	301	5481
1933	0	106	471	1070	1317	924	424	303	4615
1934	63	431	896	1078	1281	806	624	326	5505
1935	5	338	663	893	1289	824	603	200	4815
1936	44	312	355	786	1208	1005	667	350	4727
1937	3	119	329	1082	1518	1252	797	281	5381
1938	0	100	267	824	1256	1117	635	88	4287
1939	73	380	932	1616	1699	1151	557	246	6654
Average Acre-feet	25	243	562	1077	1383	1077	603	270	5240
Average c.f.s.	1	4	9	17	23	18	10	4	10.8
Monthly Diversion in per cent of seasonal	-	5	11	21	26	21	11	5	

*Estimated

TABLE 46

OLD SAN JOAQUIN RIVER - DELTA UPLANDS, MONTHLY DIVERSIONS IN ACRE-FEET AND GROSS SEASONAL DUTY OF WATER - 1924-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated: General	Acreage Irrigated: Rice	Gross Seasonal duty Acre-feet per acre
1924	10320	10311	12600	12434	12460	10845	8277	3633	80880	29190	0	2.8
1925	100*	1737	7330	13233	16264	13962	9404	2347	64377	34677	0	1.9
1926	500*	4440	15526	17420	16690	15283	12376	2151	84386	37480	0	2.3
1927	80	1815	16312	14758	14252	12651	9398	2504	71770	35351	0	2.0
1928	500*	3430	16895	15037	14526	13701	9185	2679	75953	39924	0	1.9
1929	2000*	12977	13170	8894	14735	13143	9465	3389	77773	37359	0	2.1
1930	400*	5624	15152	14488	15289	12958	8535	3019	75465	36480	0	2.1
1931	5735	17099	10400	9245	14125	10854	3522	389	71369	34232	0	2.1
1932	296	5460	9318	9343	9803	8379	5718	2636	50953	27942	0	1.8
1933	488	10114	10351	10092	10938	10414	6082	3463	61942	27851	0	2.2
1934	3204	14687	10321	8708	12827	9946	5817	3019	68529	29792	0	2.3
1935	10	30	11027	13473	12973	10171	6933	2082	56699	28307	0	2.0
1936	420	5310	12235	8621	14492	9994	6958	5239	63269	30232	0	2.1
1937	3	2621	13418	11093	13590	11934	7100	4853	64612	31913	0	2.0
1938	0	1313	8628	11989	9806	8841	6250	3566	50393	29658	0	1.7
1939	7728	12880	8746	12055	13453	9855	4977	1669	71363	34956	0	2.0
Average	1986	6865	11964	11930	13514	11433	7500	2915	68107	32834	0	2.1
Average c.f.s.	32	115	195	200	220	186	126	47	140			
Monthly Diversion in per cent of seasonal	2.9	10.1	17.6	17.5	19.8	16.8	11.0	4.3				

*Estimated.

TABLE 47

TOM PAINE SLOUGH - DELTA UPLANDS, MONTHLY DIVERSIONS IN ACRE FEET AND GROSS SEASONAL DUTY OF WATER - 1924-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated: General	Acreage Irrigated: Rice	Gross Seasonal duty: Acre-feet per acre
1924	1126	1926	2529	2696	2238	2419	1474	1242	15650	2810	0	5.6
1925	0*	500*	1672	3491	3027	3058	2205	933	14886	7441	0	2.0
1926	100*	926	3676	3095	3238	2903	2507	693	17138	4973	0	3.4
1927	0*	94	3700	2911	3099	3166	2630	1655	17255	6157	0	2.8
1928	200*	785	2111	2589	2456	2353	2497	1649	14640	4906	0	3.0
1929	500*	1554	2376	1642	3028	2814	2100	1154	15168	5195	0	2.9
1930	100*	764	2081	2132	2326	2124	1752	960	12239	4987	0	2.5
1931	530	2109	1324	1602	2325	2286	1981	523	12680	5322	0	2.4
1932	67	1809	926	1883	1952	2068	1894	775	11374	5040	0	2.3
1933	0	1306	1608	1775	1715	1898	1543	1351	11196	4450	0	2.5
1934	70	2069	1272	1433	1936	1616	1578	972	10946	4549	0	2.4
1935	0	0	1593	1917	1797	1826	1241	556	8930	3226	0	2.8
1936	38	990	1680	1670	2469	2373	1709	1308	12237	4450	0	2.7
1937	0	112	1545	1864	2173	2041	1426	503	9664	3302	0	2.9
1938	0	432	1219	1364	1296	1497	1062	427	7297	2887	0	2.5
1939	763	1620	1218	1703	1414	1789	1015	645	10167	3911	0	2.6
Average	218	1060	1910	2110	2280	2260	1790	959	12590	4600	0	2.7
Average c.f.s.	3	18	31	35	37	37	30	16	26			
Monthly Diversion in per cent of seasonal:	1.7	8.4	15.2	16.8	18.1	18.0	14.2	7.6				

*Estimated

TABLE 48

SAN JOAQUIN RIVER - DELTA UPLANDS, MONTHLY DIVERSIONS IN ACRE FEET AND GROSS SEASONAL DUTY OF WATER - 1924-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated		Gross Seasonal duty: Acre-feet per acre
										General	Rice	
1924	614	1126	1760	1889	2175	1819	1385	206	10974	4335	0	2.5
1925	0*	6	276	1149	1530	1694	1040	39	5734	3224	0	1.8
1926	2000*	5657	8800	7696	3251	7693	6308	1577	47982	11196	0	4.3
1927	0*	713	8530	8224	8927	9378	4317	746	40835	12870	0	3.2
1928	1000*	3075	7915	7523	9141	8159	4604	1849	43266	17579	0	2.5
1929	2000*	6747	9600	5497	10594	7624	4498	2586	49146	16941	0	2.9
1930	2000*	6823	11848	7555	12899	11800	4227	1257	58409	18486	0	3.2
1931	3009	9378	8007	5475	12617	11759	4141	2126	56512	17021	0	3.3
1932	1452	8519	5767	5133	9972	7349	4365	1704	44261	19088	0	2.3
1933	767	9174	6089	5799	10703	7581	3165	2099	45377	18025	0	2.5
1934	3744	10633	7861	5411	12805	8682	4068	1965	55169	19372	0	2.8
1935	12	1691	6790	8950	10353	7785	3637	1714	40932	16571	0	2.5
1936	1483	7467	6838	4166	11651	8629	3575	1865	45674	18993	0	2.4
1937	3	5355	6512	4285	12542	7737	2824	1970	41228	19648	0	2.1
1938	1	3062	6753	4154	9943	6622	3004	991	34530	17582	0	2.0
1939	4012	9394	5398	6901	11721	8744	3862	1178	51210	18672	0	2.7
Average	1380	5550	6800	5610	9740	7690	3690	1490	41950	15600	0	2.7
Average c.f.s.	22	93	111	94	158	125	62	24	86			
Monthly Diversion in per cent of seasonal	3.3	13.2	16.2	13.4	23.2	18.3	8.8	3.6				

*Estimated

TABLE 49

SAN JOAQUIN RIVER - FREMONT FORD BRIDGE TO VERNALIS, MONTHLY DIVERSIONS IN ACRE-FEET AND GROSS SEASONAL DUTY OF WATER - 1928-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated		Gross Seasonal duty: Acre-feet per acre
										General	Rice	
1928	*	*	*	*	11854	10574	8925	*	-	*	*	-
1929	*	*	*	*	12814	11021	10790	*	-	*	*	-
1930	*	12970	15632	15951	16472	16921	10860	1654	90460	*	*	-
1931	8084	18145	14765	14752	19847	15593	9607	5203	105996	34894	500	3.0
1932	3510	16745	11018	11802	15571	14886	11562	5010	90104	39813	80	2.3
1933	5496	14431	11244	11762	19043	18373	11437	3795	95581	35036	0	2.7
1934	5935	21809	17152	12615	24787	22392	12880	3123	120693	41696	290	2.9
1935	595	1228	14156	18502	23647	22541	13284	5211	99164	37320	155	2.6
1936	4511	12744	15608	21854	23594	15879	10614	3729	108533	41862	160	2.6
1937	212	3100	17198	16112	25933	21963	12183	3295	99996	41542	230	2.4
1938	69	4378	17054	15089	21991	17576	10842	2767	89766	42226	200	2.1
1939	7044	17485	17212	18955	25161	21288	10366	2505	120016	42379	420	2.8
Average**	3940	12230	15040	15720	22170	18940	11420	3850	103300	39640	230	2.6
Average c.f.s.**	64	206	245	264	361	308	192	63	213			
Monthly Diversion in per cent of seasonal	4	12	15	15	21	18	11	4				

NOTE: No records prior to 1928.

* No record

** 1931 to 1939

TABLE 50

MERCED RIVER-YOSEMITE VALLEY RAILROAD CROSSING TO MOUTH, MONTHLY DIVERSIONS IN ACRE-FEET AND GROSS SEASONAL DUTY OF WATER - 1928-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated		Gross Seasonal duty: Acre-feet per acre
										General	Rice	
1928	*	*	*	*	3451	3027	2343	*	-	*	*	-
1929	*	*	*	*	3420	2965	1942	*	-	*	*	-
1930	*	1062	2319	2750	2716	2253	1242	474	12816	*	*	-
1931	778	2836	3298	2902	3553	3232	2128	765	19492	3623	0	5.4
1932	524	1334	1808	2261	2539	2292	1787	711	13256	3299	0	4.0
1933	320	1406	1757	1990	2372	1900	1600	645	11990	3229	0	3.7
1934	627	2627	2989	2637	3202	2673	2018	826	17599	5091	0	3.5
1935	0	70	1612	2684	2764	2472	1607	632	11841	3305	0	3.6
1936	26	486	2192	2149	2426	2705	1623	411	12018	3662	0	3.3
1937	0	108	1341	2514	3114	2876	1671	387	12011	4155	0	2.9
1938	0	123	858	1523	2213	1933	1018	458	8126	3072	0	2.6
1939	38	951	1791	2162	2520	1803	808	236	10309	3478	0	3.0
Average**	257	1105	1960	2314	2745	2432	1584	563	12960	3660	0	3.5
Average c.f.s.**	4.1	18.6	31.9	38.9	44.6	39.6	26.7	9.2	26.7			
Monthly Diversion in per cent of seasonal	2.0	8.5	15.1	17.9	21.2	18.8	12.2	4.3				

NOTE: No records prior to 1928.

* No record

** 1931 to 1939

TABLE 51

TUOLUMNE RIVER-LA GRANGE BRIDGE TO MOUTH, MONTHLY DIVERSIONS IN ACRE-FEET

AND GROSS SEASONAL DUTY OF WATER - 1928-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated		Gross Seasonal duty Acre-feet per acre
										General	Rice	
1928	*	*	*	*	327	277	79	*	-	*	*	-
1929	*	*	*	*	477	338	189	*	-	*	*	-
1930	*	173	388	480	523	473	224	59	2320	*	*	-
1931	128	585	560	585	673	585	363	88	3567	894	0	4.0
1932	37	234	260	281	438	331	181	95	1857	653	0	2.8
1933	72	222	213	380	451	411	266	205	2220	855	0	2.6
1934	108	334	396	368	325	349	219	150	2249	845	0	2.7
1935	7	47	326	422	438	375	257	120	1992	770	0	2.6
1936	41	125	387	345	422	442	295	121	2178	736	0	3.0
1937	41	120	540	339	451	409	255	57	2212	752	0	2.9
1938	0	12	135	222	245	201	127	38	980	594	0	1.7
1939	160	149	414	501	455	558	193	104	2534	864	0	2.9
Average**	66	203	359	382	433	407	240	109	2199	774	0	2.8
Average ** c.f.s.	1.1	3.4	5.8	6.4	7.0	6.6	4.0	1.8	4.5			
Monthly Diversion in per cent of seasonal	3.0	9,2	16.3	17.4	19.7	18.5	10.9	5.0				

NOTE: No records prior to 1928

* No records

** 1931 to 1939

TABLE 52

STANISLAUS RIVER-ORANGE BLOSSOM BRIDGE TO MOUTH, MONTHLY DIVERSIONS IN ACRE-FEET

AND GROSS SEASONAL DUTY OF WATER - 1928-1939

Year	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Seasonal Diversion	Acreage Irrigated		Gross Seasonal duty Acre-feet per acre
										General	Rice	
1928	*	*	*	*	1248	1277	1089	*	-	*	*	
1929	*	*	*	*	1059	807	605	*	-	*	*	
1930	*	625	1057	1495	1336	1167	730	115	6525	*	*	
1931 *	108	2023	1692	2773	2855	2449	1308	706	13914	2261	0	6.2
1932	431	1142	1529	1994	1780	1678	1216	471	10241	2522	0	4.1
1933	103	1046	1158	1355	1350	1176	684	316	7188	2021	0	3.6
1934	240	1620	1274	1687	1697	1683	780	402	9383	2122	0	4.4
1935	0	250	1177	1702	1855	1745	759	304	7792	2076	0	3.8
1936	0	727	838	1256	1952	1407	943	429	7552	2313	0	3.3
1937	0	508	1816	2248	2530	2429	1756	650	11937	3849	75	3.0
1938	0	327	735	1239	1690	1748	997	309	7045	3198	0	2.2
1939	198	1848	2201	2873	3222	3310	1752	827	16231	6331	0	2.6
Average *	120	1060	1380	1900	2100	1960	1130	490	10140	2970	-	3.4
Average c.f.s.	2	18	22	32	34	32	19	8	21			
Monthly Diversion in per cent of seasonal	1.2	10.5	13.6	18.7	20.7	19.3	11.2	4.8				

NOTE: No records prior to 1928.

* No record

** 1931 to 1939

TABLE 53

SACRAMENTO RIVER - SEASONAL DIVERSIONS AND ACREAGES IRRIGATED 1924 - 1939
(SEGREGATED TO RIVER SECTIONS)

Year		River Sections							Redding to Sacramento
		Redding to Red Bluff	Red Bluff to Butte City	Butte City to Colusa	Colusa to Wilkins Slu	Wilkins Slu to Knights Ldg	Knights Ldg to Verona	Verona to Sacramento	
1924	Seasonal diversion acre-feet	99835	407427	67152	167217	99573	18422	93147	952773
	Average cubic feet per second	205	838	138	344	205	38	192	1960
	Acreage irrigated - Rice	0	25875	6950	10130	11000	770	4963	59688
	Acreage irrigated - General	20020	32488	12991	19401	6093	854	12422	104269
1925	Seasonal diversion acre-feet	105593	369570	69511	179953	33822	6731	78283	843463
	Average cubic feet per second	217	761	143	370	70	14	161	1736
	Acreage irrigated - Rice	0	30467	8761	9156	3054	0	6587	58025
	Acreage irrigated - General	15714	12979	7065	25408	3472	922	10662	76222
1926	Seasonal diversion acre-feet	107160	525287	134027	189515	41796	19700	90285	1107770
	Average cubic feet per second	220	1081	276	390	86	41	186	2280
	Acreage irrigated - Rice	0	47827	14117	13214	1781	1537	9025	87501
	Acreage irrigated - General	19890	13580	7534	18778	4440	1803	10600	76625
1927	Seasonal diversion acre-feet	103248	502946	95815	233466	113750	24786	85252	1159263
	Average cubic feet per second	212	1036	197	481	234	51	175	2386
	Acreage irrigated - Rice	0	37718	9110	16864	7574	2569	5926	79761
	Acreage irrigated - General	17823	17565	6445	18609	5371	1597	10451	77861
1928	Seasonal diversion acre-feet	113321	446674	68244	224477	77851	22153	101818	1054538
	Average cubic feet per second	234	919	140	461	160	46	210	2170
	Acreage irrigated - Rice	0	29911	5751	14024	4865	1642	7353	63546
	Acreage irrigated - General	20789	19996	7452	21875	5889	513	11704	88218
1929	Seasonal diversion acre-feet	120150	478947	70608	205659	76003	18246	96196	1065809
	Average cubic feet per second	247	986	146	423	156	37	198	2193
	Acreage irrigated - Rice	0	21680	4557	7979	4404	0	5274	43894
	Acreage irrigated - General	19105	39985	9168	45826	10859	464	11507	136914
1930	Seasonal diversion acre-feet	126760	440617	72341	229715	68169	21528	96725	1055855
	Average cubic feet per second	261	907	149	473	140	44	199	2173
	Acreage irrigated - Rice	0	29199	4963	11717	3155	1130	6020	56184
	Acreage irrigated - General	14571	24068	9461	30003	7659	491	10324	96577
1931	Seasonal diversion acre-feet	143543	553663	93184	313237	70966	21506	139167	1335266
	Average cubic feet per second	295	1139	192	645	146	44	286	2747
	Acreage irrigated - Rice	0	39532	5462	19067	780	200	8853	73894
	Acreage irrigated - General	14538	33254	10216	54487	9706	2417	16887	141505

TABLE 53 (Cont'd)

Year		River Sections							Redding to Sacramento
		Redding to Red Bluff	Red Bluff to Butte City	Butte City to Colusa	Colusa to Wilkins Slu	Wilkins Slu to Knights Ldg	Knights Ldg to Verona	Verona to Sacramento	
1932	Seasonal diversion acre-feet	132035	460462	31846	249723	37791	18573	89570	1020000
	Average cubic feet per second	272	947	66	514	78	38	184	2099
	Acreage irrigated - Rice	0	29673	3086	15529	0	567	4968	53823
	Acreage irrigated - General	12745	52084	7387	34883	9159	4707	9782	130747
1933	Seasonal diversion acre-feet	135323	474372	33281	250149	59381	17837	71377	1041720
	Average cubic feet per second	278	975	69	515	122	37	147	2143
	Acreage irrigated - Rice	0	31563	1640	15578	2126	270	2017	53294
	Acreage irrigated - General	12809	30479	4436	34925	6468	1847	10057	101021
1934	Seasonal diversion acre-feet	133625	448806	23531	243463	90826	20877	95835	1056963
	Average cubic feet per second	275	924	48	501	187	43	197	2175
	Acreage irrigated - Rice	0	29153	587	15853	4497	892	5534	56516
	Acreage irrigated - General	13620	27858	4591	28934	7035	1461	10284	93783
1935	Seasonal diversion acre-feet	121974	385508	19703	225702	74382	20989	77906	926164
	Average cubic feet per second	251	794	41	464	153	43	160	1906
	Acreage irrigated - Rice	0	26884	380	14462	4168	650	4546	51090
	Acreage irrigated - General	13405	28589	5142	30663	6804	1313	12577	98493
1936	Seasonal diversion acre-feet	149313	455981	36371	215313	80901	17072	100018	1054969
	Average cubic feet per second	307	937	75	443	167	36	206	2171
	Acreage irrigated - Rice	0	30087	2028	14409	7042	400	8696	62662
	Acreage irrigated - General	13254	27579	5423	27832	5884	1542	11579	93093
1937	Seasonal diversion acre-feet	114609	482048	42570	247130	72526	12949	98629	1070461
	Average cubic feet per second	236	992	88	508	149	27	203	2203
	Acreage irrigated - Rice	0	34214	2040	19235	3739	0	7318	66546
	Acreage irrigated - General	13324	30634	5843	29888	6710	2631	11806	100836
1938	Seasonal diversion acre-feet	120301	351901	31684	267085	66219	12447	82593	932230
	Average cubic feet per second	248	723	65	550	136	26	170	1918
	Acreage irrigated - Rice	0	29522	1790	19616	4264	0	7396	62588
	Acreage irrigated - General	9309	27193	5137	27788	6476	1757	7935	85595
1939	Seasonal diversion acre-feet	141403	587358	29668	292226	89153	21496	139744	1301048
	Average cubic feet per second	291	1209	61	601	183	44	288	2677
	Acreage irrigated - Rice	0	32917	750	17360	3667	0	9159	63853
	Acreage irrigated - General	13423	58185	6802	51711	13120	2727	12800	158768
	Average 1924 - 1939								
	Seasonal diversion acre-feet	123012	460723	57471	233377	72069	18457	96034	1061143
	Cubic feet per second	253	948	119	480	148	38	198	2184
	Per cent of seasonal draft	12	43	5	22	7	2	9	100
	Acreage irrigated - Rice	0	31646	4498	14637	4132	664	6477	62054
	Acreage irrigated - General	15271	29783	7193	31313	7197	1690	11336	103783

TABLE 54

SUMMARY OF SACRAMENTO RIVER DIVERSIONS AND ACREAGES IRRIGATED-1939

River Section	Acre-feet									Per Cent of Total Draft	Acreage Irrigated		Acre-feet per Acre
	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Total Draft		General	Rice	
Redding to Red Bluff	16	17269	20548	20115	21027	21735	20420	20273	141403	11	13423	0	10.5
Red Bluff to Butte City	29013	91820	101118	106180	107338	96102	36569	19218	587358	45	58195	32917	6.4
Butte City to Colusa	1542	4204	5532	5418	5999	4349	1744	881	29668	2	6802	750	3.9
Colusa to Wilkins Slough	23809	50761	55322	50331	48766	45492	17348	407	292226	22	51711	17360	4.2
Wilkins Slough to Knights Landing	4405	16490	14720	19098	16754	14058	3280	358	89153	7	13120	3667	5.3
Knights Landing to Verona	2054	3895	2945	4224	3924	2952	1490	12	21496	2	2727	0	7.9
Verona to Sacramento	2797	17989	27306	27963	26511	25058	9857	2263	139744	11	12800	9159	6.4
Total	63636	202428	227491	233319	230319	209735	90708	43412	1301048	100	158768	63853	5.8
Aver. cubic feet per sec.	1035	3402	3700	3921	3746	3411	1524	706	2677				
Monthly diversion in % of seasonal	5	16	17	18	18	16	7	3					

TABLE 55

DIVERSIONS, ACREAGE IRRIGATED, AND GROSS SEASONAL (MARCH TO OCTOBER, INCLUSIVE) DUTY OF WATER IN THE SACRAMENTO-SAN JOAQUIN AREA-1939

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	56	1301048	158768	63853	222621	5.8
Feather River below Oroville	61	501357	29234	26303	55537	9.0
Yuba River on Valley floor	62	73113	6642	1898	8540	8.6
American River below Fairoaks	63	6654	(1) 3064	0	(1) 3064	2.2
By-Pass and Drainage Channels	60	65693	10194	4266	14460	4.5
Lower Butte Creek and Slough	59	36314	5638	607	(2) 6245	5.8
Colusa Trough and Back Borrow Pit	57-58	(3) 74859	1713	6834	8547	8.8
Total above Sacramento		2059038	215253	103761	319014	6.4
Delta Uplands from-						
Old San Joaquin River	64	71363	34956	0	34956	2.0
Tom Paine Slough	65	10167	3911	0	3911	2.6
San Joaquin River (below Durham Ferry Bridge)	66	51210	18672	0	18672	2.7
San Joaquin River from Fremont Bridge to Durham Ferry Bridge	67	120016	42379	420	42799	2.8
Merced River below Snelling	68	10309	3478	0	3478	3.0
Tuolumne River below Roberts Ferry Bridge	69	2534	864	0	864	2.9
Stanislaus River below Orange Blossom Bridge	70	16231	6331	0	6331	2.6
Total delta uplands and pumping diversions of San Joaquin River and Tributaries*		281830	110591	420	111011	2.5
Sacramento-San Joaquin Delta **			(See Table 106)			

(1) Includes 2200 acres now classed as suburban lands.
(2) In addition, 625 acres of gun clubs were irrigated.
(3) A large portion of this diversion was used to supply acreages reported under Sacramento River Diversions (Provident Irrigation District 154.6R) See Table 57, note 13.

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

** Delta crop census not taken in 1939. See 1938 and reports prior to 1933 for data.

TABLE 56

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
—"M" STREET BRIDGE - SACRAMENTO - MILE 0.0—													
City of Sacramento	0.8L	1-18" 3-20"	1824	2504	2812	3511	3738	3574	2870	2027	22860	Municipal	
—AMERICAN RIVER - MILE 1.1 LEFT—													
—BACK BORROW PIT RECLAMATION DISTRICT 1000-MILE 1.3L—													
E. Fourness	1.45R	1-8"		12	26	132	37	62	16	10	295	142	
M. Zubiri	2.05L	1-8"			20	167	84	135	44		450	145	
—RECLAMATION DISTRICT 1000 DRAIN - MILE 2.1L—													
Frank and Elmer Christophel (1)	2.4L	1-5"	2	13	18	21	25	5	2		86	38	
H. M. Swalley	2.45L	1-5"		7	24	7	11	11	1		61	38	
N. J. Parr (2)	2.9L	1-5"		2		18	13				33	23	
Earl Fruit Company	3.55R	1-16"		31	173	202	67	71			544	165	
W. E. M. Beardslee Estate	3.75R	1-5"	2	34	36	45	34	28	19	15	213	59	
M. C. C. Van Loben Sels	4.0R	1-10"			NO DIVERSION								
Reese and Greer	4.65R	1-7"			14	47	34	26			121	58	
Harbinson Brothers	5.05R	1-14"		80		24	15				119	86	
R. S. Seydel	5.25R	1-8"	2	65	37	14	33	20	31	13	215	128	
C. H. Merkeley Estate	5.3R	1-8"			24	30					54	40	
A. Casselman	5.5R	1-6"		2	9	11	10				32	27	
A. A. Casselman	5.55R	1-6"			7	20	13				40	35	
K. L. Lovdal	5.7R	1-10"			NO DIVERSION								
J. E. Bandy	6.0R	1-5"		5	30	27	45	25			132	78	
Riverside Mutual Water Company	6.1L	2-18"		855	1416	1925	1553	1796	500		8050	1717	
O. A. and F. L. White	6.6R	1-6"					15	5			20	32	
E. S. Fisk	7.0R	1-4"			NO DIVERSION								
Fred C. Jones	7.5L	1-8"			36	20	18	50			124	75	
Calif.Western States Life Ins(3)	7.8L	1-10"			NO DIVERSION(4)						(4)	(4)85	
A. Marty	7.9R	1-8"	1	27	81	71	72	18	22	19	311	110	
Bennett Brothers (5)	7.9L	1-10"		144	161	123	70				498	(6)90	
M. Marty	8.3R	2-10"	29	63	139	137	100	97	81	59	705	151	
Blauth Estate	8.5R	1-7"			54	17	17				88	83	
H. Waldeck	8.7R	1-6"		27	22	47	47	4	3	2	152	44	
Hazel Goethe	8.95R	1-6"		22	40	74	30	2			168	38	

*Mileage along river above Sacramento.

(1) Formerly Frank Christophel.
(2) Formerly listed as N. E. Parr.
(3) Formerly F. L. Martin and A. B. Carter.
(4) Served through plant at Mile 7.9L.
(5) Formerly listed as M. E. and R. F. Bennett.
(6) An additional 85 acres irrigated for plant at Mile 7.8L.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
California Lands, Inc.	9.35R	1-14"		137	232	292	262	183	6		1112	(1)304	
R.G. Pearson and P.S. Driver	9.8L	1-14"		180	121	137	255	99	28		820	(2)208	
Carl Casselman	9.9R	1-12"		23	66	87	29	13	1		219	119	
Lloyd M. Robbins	10.25L	1-14"		89	123	69	65	61			407	61	
Reese Estate	10.75R	1-12"	96		16	98	46	124	144		524	207	
Fiddyment (Lauppe) and Natomas Company (Rosa) (3)	10.75L	1-12"		41	65	64	99	62	10		341	(4)140	
McKeehan and Harris	11.1R	1-12"	17	170	90	175	95	41	60	2	650	290	
A. L. White	11.6L	1-10"			91	115	25	41	34		306	(5)85	
—ELKHORN FERRY - MILE 11.9—													
Conaway Ranch	12.0R	4-36"		3748	11055	10277	9697	9275	3070	78	47200	3040	5690
Thomas O'Connor	12.5R	1-12"			122	85	126	59			392	144	
Gertrude Brown	12.7R	1-6"	3	20	21	25	37	38	10		154	100	
Julius Hauser	13.1R	1-12"			NO DIVERSION								
J. Corey	13.2R	1-8"		8	16	38	29	3			94	70	
M. Narahara (6)	13.25R	1-8"	11	10	5	25	23	34	19	5	132	65	
Elkhorn Mutual Water Company	14.1L	1-20"	454	1091	2309	2594	2036	2208	650		11402	2421	78
		1-24"											
Joseph Veress (7)	14.25R	1-10"			165	59	97	50	16		387	130	
M. E. Dole	14.4R	1-6"			23	19	12	9	5		68	35	
California Lands Inc.	15.15R	1-10"			179	172	174	24			549	200	
California Trust & Savings Bank	15.7L	1-6"			NO DIVERSION			(8)			(8)	(8)27	
Central Mutual Water Company	16.0L	1-12"	182	2801	2446	2751	3413	2651	945	33	(9)15222	(10)552	848
		2-20"											
		2-28"											

* Mileage along river above Sacramento.

(1) Includes 167 acres on adjoining Merkeley property.

(2) Acreage divided as follows: Pearson - 57, Driver - 151.

(3) Fiddyment's name erroneously dropped in 1937.

(4) Acreage divided as follows: Natomas Company - 50, Fiddyment - 90.

(5) Includes 15 acres on adjoining lands of C. G. White.

(6) Formerly Henry Schaefer.

(7) Listed in 1937 as M. E. Dole.

(8) Irrigation water received from Central Mutual Water Company for this acreage.

(9) This plant pumps to the irrigation canal both from a drain canal of R.D.1000 and from the Sacramento River. The diversions listed are those from the river only. The water obtained from the drain canal was as follows: (Acre-feet) April 385, May 508, June 282, July 63, August 492, September 863, October 168. Total 2761.

(10) An additional 27 acres served for plant at Mile 15.7L.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Fisher and Rich (Hershey Ranch)	16.2?R	1-20"		280			253	203			736	(1)278	
—SACRAMENTO-SUTTER COUNTY LINE INTERSECTS LEFT BANK - MILE 16.4—													
H. T. Silvius	16.4R	1-6"			21	13	1	2			37	36	
California Trust & Savings (In liquidation)(2)	16.62R	1-10"		11		35	25	10			81	55	
California Trust & Savings (In liquidation (2)	16.7R	1-12"			NO DIVERSION (3)						(3)	(3)61	
Fisher and Rich	17.4R	1-18"	174	515	892	397					1978	(4)359	(4)250
California Western States Life Insurance Company	17.75R	1-20"		429	174	81	31				715	155	
M. & J. Scheiber (Ashwandan)	18.45L	1-12"		79	60	66	140	78	55		478	106	
G. H. Lyall	18.7L	1-8"		26	53	60	64	6	124		333	65	
Northern Mutual Water Co. (5)	19.6L(5)	2-24"		4328	3592	3396	3250	3617	990		19173		2188
Natomas Ben May Plant (6)	19.6L(6)	1-10"		110	190	143	141	178	101		863		105
—VERONA GAGING STATION - MILE 19.6—													
SACRAMENTO TO VERONA													
Totals			2797	17989	27306	27963	26511	25058	9857	2263	139744	12800	9159
Average cubic feet per second			45	302	444	470	431	408	166	37	287		
Monthly use in per cent of seasonal			2.0	12.9	19.5	20.0	19.0	17.9	7.1	1.6			
—FEATHER RIVER - MILE 20.9L—													
—SACRAMENTO SLOUGH - MILE 21.2L—													
West Coast Life Insurance Co.(7)	21.7R	1-15"			109	176	94	75			454	200	
Frank Fisher & Henry Rich (Keller Plant)	22.5R	1-22"	6	828	63	366	377	110			1750	(8)673	
A. F. Johnston (9)	26.8L	1-8"		24	42	23					89	(10)130	

* Mileage along river above Sacramento.

(1) Includes 150 acres on adjoining Hershey Estate lands.

(2) Formerly George Miyaoka.

(3) Served from plant at Mile 17.4R.

(4) Rice acreage served after July 1st by water in Pelican ditch which is supplied by drainage and from Knights Landing Ridge Cut. Pumping from ditch as follows (Acre-feet): July 939, August 939, September 152, Total 2030. An additional 61 acres of general crop served from plant at Mile 16.7R.

(5) Cross Canal, the main drain between Reclamation District 1000 and 1001, joins the Sacramento River at Mile 19.6 Left. Plant is on the south bank and 2.0 miles from junction with Sacramento River.

(6) Cross Canal - North Bank - 3.35 miles from junction with Sacramento River. New installation at an old point of diversion.

(7) Plant rehabilitated after period of non-use since 1927.

(8) Includes 300 acres on adjoining lands of H. C. Whitten.

(9) Plant said to have been installed in 1931 but not previously reported.

(10) Includes 75 acres on adjoining lands of A. Furlan.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Hershey Estate (Darnielle)(1)	(1)26.95R	1-18"	NO DIVERSION										
Frank B. Edson (A. F. Johnston) (2)	28.2L	1-4"		3		6					9	(3)33	
Morse Inglin	28.2R	1-6"	16	5	22	8	7	8	7		73	25	
Russell Brothers	29.2R	1-12"	8		21	53	45	18	41		186	85	
M. R. Richardson	29.7R	1-8"		53	18	43	47	36			197	84	
P.L.Traganza & Kate Russell	29.75R	1-8"			34						34	(4)65	
Laura Freitas	29.9L	1-12"			32	34	24	51			141	90	
Leo Giovanetti	30.2L	1-5"				9	7	10	8		34	(5)20	
M. R. Richardson (6)	30.6R	(6)1-12"		77	33	25	85	51			271	115	
Floyd Anderson	30.7R	1-6		3	2	3	2			2	12	8	
George Senf	30.9L	1-8"	NO DIVERSION										
A. C. Huston (Zane)	31.5R	1-12"		38	95	67	48	78	4	10	340	42	
M. Alonso	31.8L	1-6			1	6	1	2			10	23	
M. R. Richardson	32.0R	(7)1-12"		73	273	260	360	170	15		1151	378	
Sutter Mutual Water Company (Portuguese Bend)	32.0L	2-24"	1982	2525	1627	2642	2443	2088	1384		14691	(8)	(8)
Collier Brothers	32.5R	1-10"	12	51	100	80	39	23	22		327	126	
Walter H. Ziegler (9)	33.2L	2-10"		179	385	314	304	206	9		1397	(10)420	
J. G. Knox	33.35L	1-8"		24	56	85	13	26			204	90	
Snowball Estate	33.5R	1-12"	NO DIVERSION										
Leiser Brothers	33.75L	1-12"	30	12	32	24	28				126	120	
J. W. Snowball	33.85R	1-6"	NO DIVERSION										
—KNIGHTS LANDING GAGING STATION - MILE 34.0—													
VERON. TO KNIGHTS LANDING Totals			2054	3895	2945	4224	3924	2952	1490	12	21496	2727	0
Average cubic feet per second			33	65	48	71	64	48	25	-	44		
Monthly use in per cent of seasonal			9.6	18.1	13.7	19.6	18.3	13.7	6.9	.1			

* Mileage along river above Sacramento.

(1) This plant diverts water to Grays Bend (Old River channel) to supplement seepage therein. Hershey Estate maintains a booster plant on this channel. In 1939 there was no irrigation from booster plant.

(2) New installation 1939.

(3) Includes 15 acres in adjoining Fred Holmes property.

(4) Acreage divided as follows: Traganza - 30, Russell- 35.

(5) Includes 10 acres on adjoining lands of P. N. Ashley.

(6) Plant re-installed in 1939. Same pumping unit.

(7) Replaces former 10" unit.

(8) See plant at Mile 63.75L.

(9) Formerly R. B. Coulter.

(10) Includes 47 acres on adjoining lands of Joe Rossi.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversion in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.		General	Rice
—COLUSA BASIN DRAINAGE - MILE 34.15R—													
Meek Estate	34.2R	1-10"	349	569	346	972	851	491	82	22	3682	455	
		2-16"											
River Farms Co.(Townsite Plant)	34.25R	1-20"	193	1470	494	843	552				3552	1114	
		1-24"											
		1-26"											
Commercial Investment Company	34.85L	1-12"			NO DIVERSION								
Walter Raymond	35.2L	1-12"		122							122	160	
Walter Raymond	35.62L	1-7"			NO DIVERSION								
J.H.Donnelly Ranch(Bundock Bros)	35.8L	1-10"	26	22	17	29	16	22	8		140	(1)37	
F.T. Burrell (J.L. Sills)	36.2L	1-16"		130	204	4	173	78			589	280	
R. H. Bailey (Leiser Brothers)	36.45L	1-8"		22	23	45	34				124	50	
Amedeo Moroni	36.7L	1-5"			NO DIVERSION								
W. W. Bottimore	37.2L	1-14"			NO DIVERSION								
Bundock Brothers	37.75L	1-8"		3	19	34	16	5	10	20	107	103	
Addie Reel	38.4L	1-10"				84	26	74			184	80	
Calif.Lands Inc. (H.A.Kramer)	38.8L	1-10"				79	35	70			184	70	
F. D. Eastman (2)	39.4L	1-12"		19		50					69	76	
Commercial Investment Company	39.8L	1-10"					68	35			103	70	
William Duffy, Jr.	39.9L	1-6"		11	6	7	7				31	24	
Sutter Mutual Water Company (State Ranch Bend)	40.6L	2-24"	650	3337	2592	3753	3613	3975	1419		19339	(3)	(3)
Buell Ranch (M. K. Dean)	41.8L	1-4"					3				3	5	
Buell Ranch (M. K. Dean)	42.2L	1-6"		24				24			48	31	
Matteolli and Fratchia	42.3L	1-8"		2		58		36			96	48	
A. Kramer	43.1L	1-12"	28	63	15	55	108	87			356	110	
El Dorado Ranch	43.1R	1-18"	100	490	326	359	200	108	140	56	1779	423	
River Farms Co.(R.D.2047 Plant)	43.1R	2-50"	1088	5364	4029	5220	4351	3236	334	256	23878	(4)5202	(4)2803
—RECLAMATION DISTRICT 108 DRAINAGE PLANT - MILE 44.0R—													
John Clauss (Fuschlin)	47.3L	1-14"		564	379	497	540		280		2260	612	
P. J. Hiatt	48.7L	2-20"	445	998	997	1310	1027	626			5403	670	
P. J. Hiatt	49.7L	1-14"				27	20	42			89	53	
R.D.108 (Tyndall Mound Plant)	51.1R	1-36			NO DIVERSION								
		2-24"											

*Mileage along river above Sacramento.

(1) Includes 15 acres on adjoining Gofitzer land.

(2) Formerly listed as F. O. Eastman.

(3) See plant at Mile 63.75L.

(4) Includes 859 acres rice and 1709 acres general crops on lands of Reclamation District 108.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversion in Acre-feet								Total Diversion: March to October Acre-feet	Acreage Irrigated	
			Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.		General	Rice
Holmes & Noble (P. J. Hiatt)	51.2L	2-16"	1418	1230	1993	1872	1673	1814	266		10266	(1)1035	(1)450
J. F. White	51.5L	1-8"			3	3	13	2	6		27	15	
T.J.Cummins Ranch Company	52.0L	1-16"		154	187	78	109	12			540	240	
George Van Ruiten	52.9L	1-10"			24	54	88	115			281	145	
George Van Ruiten (Grant)	53.9L	1-12"				161	23	76	9		269	120	
Broomieside Farm	55.1L	1-20"		53	148	223	91	161	102		778	215	
R.D.108(Boyer Bend Plant)	56.4R	1-18"		604	1258	1258	1158	1153			5431	60	684
		1-30"											
J. M. Miller	56.65R	1-12"		43	115	142	120	91	105		616	(2)135	
Broomieside Farm(R.M.Chaplain)	56.95L	1-20"	95	166	204	180	326	200	11		1182	420	
Lamb Brothers	57.5L	1-16"	NO DIVERSION										
James A. Neilson (3)	58.2L	1-15"		37	89	118	201	105	56		606	(3)200	
Alex Grant	58.9L	1-16"	NO DIVERSION										
Lamb Brothers	59.8L	1-8"		740	1083	985	1051	1198	413		5470	(5)340	(5)450
		(4)1-12"											
		1-14"											
R.D. 108 (Steiner Bend Plant)	59.85R	1-16"	NO DIVERSION										
F. L. Burrell	60.4L	1-10"				225	6	144	1		376	142	
Blanche Coulter Brown	60.5L	1-12"	4	225		151	32	34	26		472	125	
Sutter Basin Corp.(Coles Ldg.Plant)	61.3L	1-12"		1	40	88	81				210	48	
Hines Ranch	62.3R	1-10"			51	50	66	4	2		173	74	
Blanche Coulter Brown (6)	62.3L	1-10"			33	34	48				115	(7)46	
Jake Locovich (8)	62.6R	1-8"		7	25						32	23	
R. L. Young	62.8L	1-8"	9	20	20	40	28	40	10	4	171	64	
—WILKINS SLOUGH GAGING STATION - MILE 62.9—													
KNIGHTS LANDING TO WILKINS SLOUGH Totals			4405	16490	14720	19088	16754	14058	3280	358	89153	13120	3667
Average cubic feet per second			72	277	239	321	272	229	55	6	183		
Monthly use in per cent of seasonal			4.9	18.5	16.5	21.4	18.8	15.8	3.7	.4			

*Mileage along river above Sacramento.

(1) Includes 300 acres rice and 300 acres general crops on lands of R.D.1500, also 150 acres general crops on lands of L. C. Middleton.
(2) Includes 66 acres on adjoining C. Miller lands.
(3) Plant (owned by Neilson) is on property of W.H. Saylor. Acreages irrigated as follows: Saylor - 114, Neilson - 86.
(4) "12" unit added in 1938 but not previously listed.
(5) All of rice and 225 acres of the general crops were on R.D. 1500 lands.
(6) Formerly Rowena B. Coulter
(7) Includes 8 acres on adjoining lands of L. L. Baker.
(8) Formerly William Baker.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.			
R.D.108 (Wilkins Slu Plant)	63.2R	5-42"	1637	12792	11163	10294	11500	7985	1135		56506	(1)3372	(1)5116
B. W. Meister (2)	63.65L	1-6"					152	15			167	123	
		1-12"											
Sutter Mutual Water Company (Tisdale Plant)	63.75L	6-42"	15304	25909	31355	26176	27639	28087	12279		166749	29604 (3)	11449 (3)
Ornbaum, Nobles Land & Livestock Company	64.3R	1-12"	10	35	12	8	3	13			81	50	
Tisdale Irrig. & Drainage Co.	64.4L	1-12"	30	348	507	493	410	157	69	12	2026	(4)	(4)
Van Horn Ranch (5)	64.9R	(6)1-8"		16	23	118	29	39	4		229	103	
M. Bettencourt	65.1R	(7)1-8"			79	26	2	2			109	40	
California Lands Inc.	65.7L	1-10"			1	129	232	241	81		684	115	
M.P.Schohr (Neil Zane)	65.8R	1-16"		45	38	54	103	110			350	160	
J. L. Browning	66.4R	1-18"			731	528	67	381	150		1857	430	
Tisdale Irrig. & Drainage Co.	67.1L	1-12"	486	691	845	1245	789	817	451		5324	2590	
		1-20"										(8)	
Desmond A. Winship	67.2L	1-10"			NO DIVERSION (9)						(9)	(9)	
Scott F.Ennis & E.S. Brown	67.5L	2-24"	1680	1844	553	206	356	328	150		5117	(10)2588	
—RECLAMATION DISTRICT #70 DRAIN - MILE 68.80L — (11)													
Meridian Farms Water Co. #5(11)	68.80L	1-24"			NO DIVERSION (12)						(12)	(13)	
J. L. Browning	69.0R	1-24"	69	520	536	798	385	71	166		2545	(14)654	
Faxon Ranch	69.2R	1-18"	290	247	389	345	315	165			1751	(15)600	
—EDDYS FERRY (GRIMES) - MILE 69.45—													
H. F. Daly (2)	69.9L	1-10"				7	6				13	9	
Wilber Jensen,Mary Cecil, et al	70.35R	1-24"			NO DIVERSION								

* Mileage along river above Sacramento.

(1) An additional acreage of 859 rice and 1709 general crops served through R.D. 2047 plant at Mile 43.1R.
(2) New installation 1939.
(3) These figures give the total acreage served by this plant and the plants at Miles 32.0 Left and 40.6 Left.
(4) See plant at Mile 67.1L.
(5) Formerly L. F. D'artenay and Van Horn.
(6) Replaces 12" unit.
(7) Replaces 10" unit.
(8) This is the total acreage served by this plant and the one at Mile 64.4L and includes 220 acres on adjoining Winship lands.
(9) See plant at Mile 67.1 Left.
(10) Includes acreages on adjoining lands as follows: A. C. Middleton - 65, and Sutter Buttes Land Company - 71.
(11) Combination irrigation and drainage plant.
(12) No diversion from river. All pumping was from R.D. 70 drain canal which enters river through this plant. Water pumped was as follows (Acre-feet): April 528, May 830, June 1005, July 1152, August 914, September 334. Total 4763.
(13) See plant at Mile 71.1L.
(14) Includes 16 acres irrigated from plant at Mile 69.2R.
(15) An additional 16 acres served from plant at Mile 69.0R.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Houchins, Hoffman, Beckley & Ritchie	70.4R	(2)1-20"	242	303	533	221	272	414			1985	(1)555	
Meridian Farms Water Company #4	71.1L	1-24"	107	1400	838	1822	682	1581	873		7303	(3)862	
J. L. Browning	71.9R	1-12"		24	211	173	71	82			561	142	
Antone Steidlmayer	71.9R	1-12"			106	42	69	56			273	120	
California Western States Life Insurance Company	72.3L	1-7"		44	52	73	35	17			221	90	
E. E. Vann	73.6R	(4)1-10"			30	17	9	15	26		97	36	
Meridian Farms Water Company #3	74.8L	1-18"	318	547	541	669	540	309	70		2994	774	
L. B. Westfall	75.3R	1-10"			56	47	17	35	2		157	76	
J. H. Yates	76.1L	1-12"		117	6	34	42	25			224	67	
Joe Miller (Sanborn)	76.2L	1- 8"	11	23	24	26					84	45	
Steidlmayer Brothers	76.5R	1-16"			37	409	10	104			560	240	
E. V. Jacobs	77.9L	1-12"	116	235	40	169					560	190	
Sebia Davis Estate	78.2R	1-16"			102						102	(5)193	
Sebia Davis Estate	78.8R	1-24"			NO DIVERSION								
C. E. Reische	79.0L	1-10"	90	47	71	74	70	25	8		385	(6)148	
Steidlmayer Brothers (7)	79.0R	1-12"			NO RECORD							(8)330	
Henry Schmidt	79.3R	1-10"		71	14	10	89	11			195	82	
E. V. Jacobs	79.5L	1-8"	17	29	34						80	38	
G. W. Wood	79.7L	1-10"		13	45	10	16	10			94	(9)77	
—MERIDIAN BRIDGE - MILE 79.85—													
Meridian Farms Water Co. #1 & #2	80.0L	1-18"	2230	4029	4811	3630	3378	3433	1073		22584	2339	795
		1-24"											
George P. Ahlf	80.3R	1-8"		67	16	45	39				167	40	
Wonderly and Lillienthal	81.5L	1-16"	55	64	24	157	120	128	78		626	(10)181	
Steidlmayer Brothers	81.9R	1-20"	245	212	103	564	85	311	291	44	1955	(11)685	
F. T. Reische and L. F. Wood	82.5L	1-12"		64	51	42	74	26	26		283	(12)112	
J. T. Pinkard (7)	83.05L	1-7"			9	13	13	9			44	33	

* Mileage along river above Sacramento.

(1) Acreage divided as follows: Houchins - 73, Hoffman - 277, Beckley - 176, Ritchie - 29.

(2) 6" unit has been removed.

(3) Additional water for this acreage was received by repumping of drainage at Mile 68.80 (Plant #5). An additional 71 acres served through plant at Mile 67.5L.

(4) Replaces 12" unit.

(5) Crop not matured.

(6) Includes acreage on adjoining lands as follows: Rockholt - 19, Kilgore - 30, Lemos - 31, and Staas - 24.

(7) New installation 1939.

(8) Includes 200 acres on adjoining lands of A. H. Tubbs.

(9) Includes 52 acres on adjoining lands of S. M. Burtis.

(10) Acreage divided as follows: Wonderly - 35, Lilienthal - 115. Includes 30 acres on adjoining Thrash property.

(11) Includes 70 acres on adjoining Tubbs property.

(12) Acreage divided as follows: Reisch - 52, Wood - 28 and includes adjoining acreages as follows: Staas - 25 and Hall - 7.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

Water Yser	*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	June	July	Aug.	Sep.	Oct.		General	Rice
George W. Kirkpatrick	83.3L	1-14"	7	22	16		27				72	25	
J. E. Clark	83.5L	1-8"	5		42	39	1				87	82	
—BUTTE SLOUGH - MILE 84.0L—													
Clifford Reichel	85.8L	1-8"	39	37	144	46	25	25			316	75	
Ewing and Halsey	86.1R	1-12"	41	54		48	50			41	234	105	
J. F. Peck	86.6L	1-18"			NO DIVERSION (1)						(1)	(1)65	
Lloyd Scoggins	86.8L	1-8"	112	16	134	111	99				472	(2)45	
California Lands Inc. (3)	86.9R	(4)1-10"		2	37	33	39		27		138	65	
California Lands Inc. (3)	87.4R	(5)1-10"		9	41	52	30		41		173	50	
Jacobsen and O'Rourke	87.6L	1-10"		25	39	8	1				73	(6)35	
Swinford Tract Irrigation Co.	87.7R	1-12"	136	110	67	119	215	11	82	19	759	136	
Edward K. Lange	88.0R	1-6"		7	5	2	9				23	20	
Nagle and Locovitch (7)	88.2L	1-10"	40	22	26	31	33				152	(8)38	
W. D. DeJarnett	88.7L	1-14"	201	268	224	383	369	260	212	163	2080	345	
Colusa Irrigation Company	89.2R	1-20"	283	348	172	420	184	184	14	128	1733	558	
Phil B. Arnold	89.25L	1-8"	8	105	74	66	58		40		351	70	
G. A. Berkey	89.26L	1-12"			315	199	7				521	(9)104	
—COLUSA GAGING STATION - MILE 89.4—													
WILKIN'S SLOUGH TO COLUSA													
Totals			23809	50761	55322	50331	48766	45432	17348	407	292226	51711	17360
Average cubic feet per second			387	853	900	846	793	740	292	7	601		
Monthly use in per cent of seasonal			8.2	17.4	18.9	17.2	16.7	15.6	5.9	.1			

*Mileage along river above Sacramento.

(1) Irrigated through plant at Mile 86.8L.
(2) An additional 65 acres served for J. F. Peck - Mile 86.6L.
(3) Formerly W. P. Dwyer
(4) Replaces 16" unit.
(5) Replaces 15" unit.
(6) Divided as follows: Jacobsen - 10, and O'Rourke - 25.
(7) Formerly W. D. DeJarnett. Plant on property of W. D. DeJarnett, but is owned by Nagle and Locovitch.
(8) Divided as follows: Nagle - 20, Locovitch - 18.
(9) Includes 14 acres on neighboring Davis lands.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Lillian and Hattie Boggs (1)	89.7L	1-6"		23	6	18	2	7			56	23	
Roberts Ditch Company	90.7R	2-20"	405	426	378	628	550	498	363	38	3286	1181	
Paul R. Westfall (2)	91.1L	1-6"						21			21	18	
I. G. Zumwalt	91.6R	1-12"			62		92				154	160	
George P. Ahlf	92.5L	1-8"	24	92	54	64	46	23	32	31	366	(3)115	
Colusa County Bank (4)	93.0L	(5)1-8"		22		20	18				60	30	
U. W. Brown	93.0R	1-12"	28	21	132		50				231	(6)75	
I. G. Zumwalt	93.2R	1-18"	NO DIVERSION										
		1-36"											
Paul R. Westfall	93.4L	1-10"			42	7		38	33		120	(7)85	
Tuttle Land Company	94.3R	1-15"	311	136	285	498	408	144	26	7	1815	(8)418	
		1-20"											
W. D. DeJarnett	(9)94.6R	1-8"	NO DIVERSION (10)								(10)	(10)	
California Lands Inc.	94.8R	1-12"			62		83				145	55	
A. N. Lewis	95.6L	1-16"		518	431	650	782	372			2753	(11)690	
		1-20"											
Bridget Graham Estate	95.8L	1-16"	13	101	191	217	267	127	64		980	478	
I. G. Zumwalt	96.8R	1-15"		251		167	98		114	72	702	185	
H. Heitman	97.7R	1-12"		20	25	21	37	44	29		176	71	
Frank Beckley	98.0L	1-10"	43	35	56	53	30			26	243	122	
J. L. Erisey	98.3R	1-10"		35	123	134	127			15	434	105	
R. A. Sperry and Colusa Development Company	98.6L	1-15"	NO DIVERSION										
D. Boggs	98.8L	1-18"		68	30	22	47	42	11		220	160	
Cheney Slough Irrigation Co.	99.0R	1-36"	116	357	249	455	142	123	59	309	1810	(12)314	
		2-26"											
J. P. Boggs	99.1L	1-10"	67	121	285	84	93	39	132	1	(13)822	100	

* Mileage along river above Sacramento.

(1) Formerly T. H. Boggs and sisters.
(2) New installation 1939.
(3) Includes acreages on adjoining lands as follows: Colusa Development Company - 45, Laux - 40.
(4) Formerly George P. Ahlf.
(5) Replaces 6" unit.
(6) Includes 30 acres on adjoining White property.
(7) Includes 9 acres on adjoining Lamb property.
(8) Includes 7 acres on adjoining lands of V. W. Brown. An additional 20 acres served for plant at Mile 94.6R.
(9) Plant moved .2 mile upstream in 1939.
(10) See plant at Mile 94.3R.
(11) Includes 65 acres on adjoining Colusa Development Company lands.
(12) Acreages served as follows: Mitchell - 80, Seaver - 234.
(13) A portion of this diversion used at Mile 99.2L.

TABLE 56(CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct		General	Rice
Terrill and Sartain	99.2L	1-20"			843	1062	1182	1099	622		(1)4808	(1)128	(1)400
Dave George (Cauzza)	99.8L	1-16"		126	88	84	84	81	23	94	(2) 580	130	
J. W. Browning	100.8L		PLANT REMOVED										
R. C. Wohlfrom (Gillenwater)	101.1R	1-20"	115	149		11	152	17	3		447	138	
Clara C. Packer	102.8R	2-18"		382	600	152	277	685	106	107	2309	765	
		2-30"											
		1-36"											
Charles W. Welch	103.7R	1-16"	2	763	754	681	724	678	15	65	3682	75	350
Compton Delevan Irrig. District (3)	103.8R	2-24"	NO DIVERSION (3)								(3)	(3)	(3)
		1-36"											
C. W. Tuttle	103.9R	1-16"	94	108	240	192	242	56	84		1016	(4)265	
		1-20"											
Colusa Development Company (5)	104.8L	1-26"	275	190	22	100	180				767	(6)203	
I. G. Zumwalt (5)	104.8L	(7) 1-12"			213		132				345	135	
Thousand Acre Ranch (H.W.Keller)	106.0R	1-14"		180	107	53	75	94		15	524	175	
California Lands Inc.	110.0R	1-12"	49	48	221		63	143	28	60	612	185	
California Lands Inc.	111.2R	1-6"		15	15					16	46	27	
—PRINCETON FERRY - MILE 112.0—													
Reclamation District 1004	112.1L	2-30"	NO DIVERSION (8)								(8)	(8)	
		1-50"											
Princeton-Codora-Glenn I.D.(3)	(3)112.4R	(3)3-24"	NO DIVERSION (3)								(3)	(3)	(3)
I. G. Zumwalt	112.6L	1-10"			18	27	16			25	(9) 86	145	
Edward L. Steele	115.5L	1-12"		17		18		17			52	46	
—BUTTE CITY GAGING STATION - MILE 115.8—													
COLUSA TO BUTTE CITY Totals			1542	4204	5532	5418	5999	4348	1744	881	29668	6802	750
Average cubic feet per second			25	71	90	91	98	71	29	14	61		
Monthly use in per cent of seasonal			5.2	14.2	18.6	18.3	20.2	14.6	5.9	3.0			

* Mileage along river above Sacramento.

(1) Additional water for the acreage under this plant received from plants at Miles 99.1L and 99.8L.

(2) A portion of this diversion used at Mile 99.2L.

(3) See plant at Mile 154.8R.

(4) Includes 185 acres on adjoining Helphenstein lands.

(5) Formerly Colusa Development Company and I.G. Zumwalt. Units now operated separately but use common ditch.

(6) Acreage segregated as follows: Colusa Development Company - 163, Dunham - 20, and Gould - 20.

(7) Unit added in 1939.

(8) Water was diverted from Butte Creek at Mile 3.9R and 9.3R.

(9) Some additional water received by pumping from a lake on property.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
—BUTTE CITY BRIDGE - MILE 115.9—													
California Lands Inc.	117.8R	1-10"		18	60	70	40	36			224	105	
C. T. White	123.7R	1-6"			NO DIVERSION								
S. Taylor	123.8R	1-3½"					1	1			2	2	
Princeton-Codora-Glenn I.D. (1)	123.9R	3-24"			NO DIVERSION (1)						(1)	(1)	(1)
Provident Irrigation Dist. (1)	124.2R	1-36"			NO DIVERSION (1)						(1)	(1)	(1)
		4-42"											
California Lands Inc. (Shellce Ranch)	124.4R	1-16"			NO DIVERSION (1)						(1)	(1)	
California Lands Inc. (2)	126.3R	1-12"			NO DIVERSION (1)						(1)	(1)	
F. S. Reager	130.75R	1-6"			7	7	11				25	25	
—ORD FERRY - MILE 130.8—													
M.& T. Inc., & Parrott Investment Company	141.5L	5-24"		719	50	434	2612	3208	604		7627 (3)	4115 (3)	700 (3)
—OLD CHICO LANDING RAILROAD BRIDGE SITE - MILE 142.1—													
Alameda Putney (4)	145.8L	1-6"					15	3	8		26	25	
Edward Fierro	146.5L	1-6"			2	5	4	2	2		15	10	
M. F. Rose	148.7R				PLANT REMOVED								
C. C. Dunning (5)	148.9R	(6)1-10"		3	8	28	12	18	8		77	34	
—GIANELLA BRIDGE - MILE 150.0L—													
California Lands Inc.	150.0L	1-10"		35	82	163	167	78	46		571	150	
Joseph Gianella	(7)150.0L	1-10"			NO DIVERSION								
Holly Sugar Corporation	151.0R	1-12"	581	533	674	827	1063	580	53		4311	1210	
		1-16"										(8)	
A. Holecak	152.2R	(9)1-6"	3	18	8	22	14	30	8	2	105	45	
Maas Brothers	154.6R	1-5"		3	1	7	8	6	5		30	10	
Glenn Colusa Irrigation Dist.	(10)154.8R	1-100"	21477	64905	76116	79463	78500	70596	28603	15930	(11)435590	40529 (12)	23314 (12)
		2-50"											
		4-72"											
		2-66"											
		1-42"											
		2-30"											

* Mileage along river above Sacramento

(1) See plant at Mile 154.8R.

(2) Formerly C. L. Leonard.

(3) Additional water for this acreage obtained from Butte Creek as follows(Acre-feet): March 0, April 4500, May 4650, June 3750, July 2390, August 2020, September 3130, October 4500. Total 24940.

(4) New installation 1939.

(5) Formerly M. F. Rose.

(6) Replaces 6" unit.

(7) Pump on Nord Slu or Pine Creek Lagoon which joins Sacramento River at Mile 147.0L. Plant is located 3 miles up slu on right bank or opposite Mile 150.0 L, Sacramento River.

(8) Includes 100 acres on adjoining Billiou place which is also served by a well. 305 acres on Holly Sugar land have supplemental well supply.

(9) Previously listed as 5" unit.

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

(11) No water from Stony Creek. Figure includes water for users outside of district as follows (Acre-feet): I.G. Zumwalt - 3564 and Golden State Orchards - 1100.

(12) Rice figure includes 375 acres of duck lakes and 500 acres rice for Zumwalt. General figures includes an estimate of 400 acres for Golden State Orchards Company.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Jacinto Irrigation District	154.8R	(1)	1374	3492	3054	3830	3360	2961	2232	1070	21373	(2)914	
Compton Delevan Irrigation Dist	154.8R	(1)		1591	1470	1500	1410	1036	30		7037	400	983
Provident Irrigation District	154.8R	(1)	284	956	8451	7915	8106	7217	747		(4)42236	(3)1270	(3)5734
Princeton-Codora-Glenn I.D.	154.8R	(1)	5213	9587	9960	9972	10375	9185	3546	1524	59362	2073	1697
Maxwell Irrigation District	154.8R	(1)		1070	930	1200	930	856	554	675	6215		489
California Lands Inc.(5)	154.8R	(1)	48								48	20	
California Lands Inc.(Shelloe Ranch)	154.8R	(1)		140	100	40					280	200	
Jonathon Carst (6)	161.7L	2-16"				395	129	3			527	325	
—CORNING-VINA BRIDGE - MILE 166.5—													
A. F. Landis	166.7R	1-3"	1	4	6	5	6	6	4	2	34	5	
Mrs. Guy Whitnack (7)	166.8R	1-2"		2	1	2	2	3	2		12	4	
—TEHAMA BRIDGE - MILE 177.5—													
E. B. Noble	184.5R	(8)1-14"	32	80	64	87	139	141	42	13	598	123	
Coneland Water Company	187.6L	1-12"				110	338	64			(9) 512	(9)493	
E. Sluiters	188.6L	1-8"				10	6	2	5		23	19	
—RED BLUFF BRIDGE - MILE 193.45—													
G. E. Sutton	196.2R	1-6"	NO DIVERSION										
J. Keithdriber	196.5L	1-4"			1	2	1	1	1		6	2	
J. Erickson	196.6L	1-5"		26	23	19	26	7	15	2	118	29	
C. Droz	197.0L	1-8"		78	50	67	63	62	54		374	48	
W. H. Freemeyer	197.65L	1-3"	NO DIVERSION										
—RED BLUFF GAGING STATION (IRON CANYON) MILE 198.6—													
BUTTE CITY TO RED BLUFF Totals			29013	91820	101118	106130	107338	96102	36569	19218	587358	58185	32917
Average cubic feet per second			472	1543	1645	1784	1746	1562	614	312	1210		
Monthly use in per cent of seasonal			4.9	15.6	17.2	18.1	18.3	16.4	6.2	3.3			
C. W. Griffin	206.75L	1-10"	NO DIVERSION										
—BEND FERRY BRIDGE - MILE 207—													
Mrs. A. A. Keene	209.0L	1-2½"	NO DIVERSION										
F. H. Jelly (6)	213.5L	1-2"					1				1	7	
J. F. Nunes	215.5R	1-7"	NO DIVERSION										

* Mileage along river above Sacramento.

(1) Same plant as that of Glenn Colusa Irrigation District.
(2) An additional 9 acres served for Provident Irrigation District.
(3) Includes 785 acres outside of District and 9 acres served by Jacinto Irrigation District.
(4) Additional water received from Colusa Trough plants.
(5) Formerly C. L. Leonard.
(6) New installation 1939.
(7) Formerly Laura B. Caro.
(8) Old unit replaced.
(9) Additional water obtained from east side creeks.

TABLE 56 (CONTINUED)

SACRAMENTO RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		Gen-eral	Rice
—JELLYS FERRY - MILE 215.6—													
J. F. Nunes	216.0R	1-3"			NO DIVERSION								
W. A. Huneaus	216.4L	1-3"				3	6	4	1	2	16	12	
T. A. Haakonson	217.5L	1-3½"		16	12	37	29	10	1		105	54	
J. L. Haskins	218.0L	1-5"			16	47	55				118	52	
Rio Alto Rancho	221.0R	1-10"			NO DIVERSION								
—BALLS FERRY BRIDGE - MILE 224.5—													
—ANDERSON BRIDGE - MILE 232.9—													
L. C. Smith (1)	233.0L	1-6"			NO DIVERSION								
Menzel Estate (2)	240.2L	1-12"		121	54	83	428	312	45		1043	142	
Graf and Graf	241.5L	1-8"		35	10	41	38	24	34		182	37	
—REDDING-ALTURAS BRIDGE - MILE 242.0—													
—REDDING-YREKA BRIDGE - MILE 245.9—													
Anderson-Cottonwood Irr. Dist.	246.0R	Gravity		17032	20393	19786	20329	21196	20237	20219	(3)139192	13100	
—SOUTHERN PACIFIC RAILROAD BRIDGE - MILE 246.25—													
John Diestelhorst	246.3R	1-10"		36	8	41	56	97	34		(4) 272	19	
City of Redding (5)	246.7R	2-6"	16	29	55	77	85	92	68	52	474	Municipal	
RED BLUFF TO REDDING Totals			16	17269	20548	20115	21027	21735	20420	20273	141403	13423	0
Average cubic feet per second			0	290	334	338	342	353	343	330	291		
Monthly use in per cent of seasonal			-	12.2	14.5	14.2	14.9	15.4	14.4	14.4			
TOTAL DIVERSIONS - SACRAMENTO TO REDDING													
Totals			63636	202428	227491	233319	230319	209735	90708	43412	1301048	158768	63853
Average cubic feet per second			1035	3402	3700	3921	3746	3411	1524	706	2677		
Monthly use in per cent of seasonal			4.9	15.6	17.5	17.9	17.7	16.1	7.0	3.3			

* Mileage along river above Sacramento.

(1) Formerly L. C. Smith and C. W. George

(2) Formerly William Menzel Meat Company.

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

(5) New installation, fall of 1938.

TABLE 57

*COLUSA TROUGH DIVERSIONS-1939

Water User	**Mile and Bank	Number and Size of Pump	Monthly Diversions in Acre-feet							Total Diversion March to October Acre-feet	Acreage Irrigated		
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		General	Rice	Gun Club
Hattie O'Hair (1)														
—COLUSA TROUGH GAGING STATION —	MILE 0													
I. G. Zumwalt	2.2L	1-15"			NO DIVERSION									
		1-20"												
		1-36"												
A. D. J. Land Company (Kindred)	3.0L	(2)1-7"			175	587	332	153	19		1266		150	
		1-28"												
Maxwell Irrig. Dist. (Plant #2A)	7.0R	1-15"			NO DIVERSION (3)						(3)	(3)	(3)	
		1-26"												
		1-36"												
Maxwell Irr.Dist.(Plant #3A)(4)	7.0R	1-20"			NO DIVERSION (3)						(3)	(3)	(3)	
S. Ashe	(5) 7.65R	1-10"			NO DIVERSION									
S. Ashe (Harlan and Juney)	8.0L	1-20"		522	1057	1010	1068	1082	490		5229		550	
El Dorado Sportsman's Prop.Inc. (6)	9.5R	1-15"						318	152	176	646			35
M. E. Rourke	10.5L	1-20"			NO DIVERSION									
Provident Irr.Dist.(Delevan Pump)	Opp.13.5(7)	1-20"		380	1180	1140	1180	1180	680		(3) 5740	(3)	(3)	
—LATERAL HIGHWAY - BUTTE CITY TO WEST SIDE - MILE 20.5—														
Provident Irrigation District	Opp.20.5(8)	1-12"		432	1109	1435	1500	1400	142		(3) 6018	(3)	(3)	
Henry Jameson Estate (9)	22.0R	(10)2-18"		335	350	589	749	757	176		2956		362	
Provident Irrigation District	Opp.24.2(11)	Gravity		1200	1240	1200	1240	1240	800		6920	(3)	(3)	
Provident Irrigation District	Opp.27.0(12)	Gravity		600	620	600	620	620	400		(3) 3460	(3)	(3)	
Total acre-feet			0	3469	5731	6561	6689	6750	2859	176	(13)32 235	0	1062	35
Average cubic feet per second			0	58	93	110	109	110	48	3	66			
Monthly use in per cent of seasonal			0	10.8	17.8	20.3	20.8	20.9	8.9	.5				

* Main drain of Reclamation District 2047.

** Mileage along Colusa Trough above Colusa-Williams Highway.

(1) This plant which is 0.35 mile below gaging station is now listed under "Back Borrow Pit Diversions" (Table 58).

(2) One 28" unit removed. Replaced by 7" unit.

(3) See Sacramento River Diversions Mile 154.8R.

(4) Plant is on Lateral E (Stone Corral Creek) and is 3/4 mile west of Plant #2A (Mile 7.0 R).

(5) Mileage formerly given as 8.65R.

(6) New installation 1939.

(7) Plant is on Hunter Creek at SW Corner, Section 36, T 18 N, R 3 W.

(8) Plant is on Willow Creek at SW Corner, NE¼, Section 33, T 19 N, R 2 W.

(9) Originally listed as Henry Jameson, last few years carried as Stevens Brothers.

(10) One 18" unit added in 1939.

(11) Works are on drain #55 and are in SW¼ NW¼, Section 86, Glenn Ranch survey.

(12) Works are on drain #13 and are in SW¼ SW¼, Section 51, Glenn Ranch survey.

(13) A large portion of this diversion was used to supply acreages reported under Sacramento River Diversions (Provident Irrigation District 154.8R).

TABLE 58

*BACK BORROW PIT DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
—SOUTHERN PACIFIC RAILROAD CROSSING - MILE 0.2—													
—KNIGHTS LANDING RIDGE CUT JUNCTION - MILE 0.4R—													
River Farms Company (1)	0.03L	1-16"		915	1096	1067	1127	939	367	5	5516	342	655
River Farms Company (Paulsen)	1.45R	(2)1-16"		661	611	429	402	348	57	129	(3)2637	240	(3)238
E. L. Wallace and W. Crawford(4)	4.35R	(5)1-16"		947	1513	1421	1489	1646	136		7152		1250
		(5)1-20"											
Recl. Dist.108(Geo. Youngmark)	8.8R	1-14"		430	697	622	655	475			2879		476
Hershey Estate	11.15R	1-12"			NO DIVERSION								
		1-14"											
Hershey Estate (H.T. Peterson)	13.75R	1-16"		521	804	673	667	438			3103		407
C. M. Mumma (6)	14.75R	1-10"		135	179	165	170	116			765	46	114
—COUNTY LINE BRIDGE - MILE 15.25—													
M. T. Emmert	15.75R	1-15"		176	23	93	27	76			395	230	
Katherine West (McCullough, Hughes, West)	18.1R	2-15"		513	596	550	554	337			2550		450
C. R. Sugget and Gregory Estate	20.0R	1-15"			NO DIVERSION								
Gregory Estate (G. W. Knox, Jr.)	21.35R	1-16"			NO DIVERSION						(7)		(7)50
Bean & Brindenberg(E.A. Johnson)	22.15R	1-14"		265	682	503	478	408			2336		(8)310

* 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) New installation 1939.
(2) Replaces 20" unit.
(3) October diversion was for gun club on rice land.
(4) Formerly W. P. Dwyer
(5) New units installed 1939. Old 20" pump dismantled.
(6) Formerly listed as B. F. Mumma.
(7) Water for this land received through plant at Mile 22.15R.
(8) An additional 50 acres served for plant at Mile 21.35R.

TABLE 58 (CONTINUED)

*BACK BORROW PIT DIVERSION-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
J. W. Browning Company	22.65L	1-24"	NO DIVERSION										
—HANNUM BRIDGE - MILE 22.8—													
—SOUTHERN PACIFIC RAILROAD CROSSING - MILE 23.0—													
H. Balsdon	24.6L	1-20"	208	400	581	630	229	106	48	12	2214	550	
A.M.Dobrowsky(Richard Moore)(1)	24.7L	1-8"	52	39	20	112	110	105			438	120	
—GRIMES-COLLEGE CITY CAUSEWAY - (SOUTH LINE RECLAMATION DISTRICT 207) - MILE 25.5—													
Fred Schutz (Morris and Sons, C. W. Tuttle) (2)	26.4L	1-16"	850	1202	1052	1236	1190	483			6023	(3)185	(3)772
		1-20"											
A. Davis Estate (Fred Wilkin)(2)	29.1R	1-12"			88	118	138	132			476		(4)110
—WALLACE CROSSING - MILE 29.2—													
Mrs. Belle W. Moore (Robert O'Hair)(2)	32.6L	1-14"		48	560	540	540	562	180		2430		300
W. H. O'Hair (Asa Kalfsbeek)(5)	(5)36.65R	1-20"		689	946	782	768	525			3710		640
—COLUSA - WILLIAMS HIGHWAY - MILE 37.0—													
—COLUSA TROUGH GAGING STATION AT COLUSA - WILLIAMS HIGHWAY—													
Totals			1110	6941	9458	8941	8544	6696	788	146	42624	1713	5772
Average cubic feet per second			18	117	154	150	139	109	13	2	88		
Monthly use in per cent of seasonal			2.6	16.3	22.2	21.0	20.0	15.7	1.9	.3			

* 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 not previously reported.

(2) New installation 1939.

(3) Acreage divided as follows: by Tuttle on Schutz land, 772 rice; by Morris, 125 general on Schutz land and 60 acres on adjoining Christian land.

(4) An additional 70 acres irrigated by seepage from adjoining lands.

(5) Formerly listed as Hattie O'Hair. Plant formerly listed under Colusa Trough diversions at Mile 0.35 R below Colusa-Williams Highway.

TABLE 59

LOWER BUTTE CREEK & BUTTE SLOUGH DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice	**Gun Club
Lower Butte Creek														
—SACRAMENTO RIVER JUNCTION - MILE 0														
Reclamation Dist.833(R.C.Ingram) (1)	1.5L	1-8"		15	33						48	(2)		
Reclamation Dist.833(R.C.Ingram)	2.9L	1-36"			32	327	684	771			1814	600 (3)		
West Butte Farms Company (4)	3.85L	1-8"			21	25	64	34			144	400		
Reclamation District 1004 (5)	3.9R	1-15"					331				331	(6)		
Butte Lodge Outing Club (7)	4.0R	1-22"							155	649	804			(8)550
El Anzar Duck Club (9)	5.35L	1-12"					93	93			186	250		
Reclamation District 1004 (5)	9.3R	Gravity	1290	1785	2050	1807	2364	2251	1464	1477	(10)14488	3041 (10)		1075 (10)
Butte Basin Gun Clubs (11)	(11)10.	Gravity							3530	4610	(12)8140			5000 (11)
Murdock Land Company	(13)14.4R	1-12"			131	98	109	73			411	125		
—GRIDLEY ROAD - MILE 15.4—														
Murdock Land Company	19.3R	1-14"			28	281	234	161	125	67	896	125		
—BIGGS - AFTON ROAD - MILE 19.4—														
O. W. Baker and Sons, Inc.	20.2R		PLANT NOT INSTALLED											
Glen Rice Farms	(14) 20.4R	1-24"		393	455	396	403	404		96	(15)2147		200	
O. W. Baker and Sons, Inc.	21.2R		PLANT NOT INSTALLED											
O. W. Baker and Sons, Inc. (9)	23.0R	1-16"		112	1075	1031	839	818	363		4238		407	

*Approximate mileage from junction with Sacramento River.

**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.

(1) Temporary installation 1939.
(2) See plant at Mile 2.9L.
(3) This is the total acreage served by this plant and the one at mile 1.5L.
(4) Formerly West Butte Country Club.
(5) Reclamation District 1004 diversion points are: Sacramento River 112.1 Left and Butte Creek, Mile 3.9 Right and 9.3 Right.
(6) See diversion at Mile 9.3R.
(7) Formerly Butte Lodge Gun Club.
(8) See acreage note at Mile 9.3R.
(9) New installation 1939.
(10) This is the combined acreage served by this plant and the one at Mile 3.9R. In addition a portion of the diversion at this point was used to supplement the diversion at Mile 4.0R.
(11) 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 59.7R. 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.
(12) See Feather River diversions Mile 59.7R.
(13) Previously listed as 14.8R.
(14) Plant is on Howard Slu but opposite this mileage on Butte Creek. Mileage formerly given as 19.8R.
(15) October diversion for gun club on rice land.

TABLE 59 (CONTINUED)

LOWER BUTTE CREEK AND BUTTE SLOUGH DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice	** Gun Club
Butte Slough														
Butte Slough Irrig. Co. Ltd. (Diversion to Sutter By-Pass)(1)	0.3 West:	Gravity									(1)	(2)		
M. Marty	0.3 West:	1-12"	39	33	120	22	50	48	23	3	338	151		
G. S. and D. C. Smith	1.4 East:	1-8"				98	172	118	4		392	120		
—MAWSON BRIDGE - MILE 2.1—														
J. E. Smith	3.0 West:	1-10"		18	14	30	9	31	11		113	46		
I. E. Nall	3.5 West:	1-10"	10	62	33	61	23	38	18		245	109		
Ullrey Brothers	3.7 West:	1-10"	7	21	7	17	14	18	4		88	43		
S. E. and P. A. Reische	4.1 West:	1-12"	92	69	43	102	99	126	22		553	(3)207		
E. V. Jacobs	4.8 West:	1-10"	34	87	16	110	49	92			388	115		
Armstrong, Hensen, Locovitch	5.1 West:	(4)1-12"		31	14	180	36	149			410	(5)144		
W. Nall	6.3 West:	1-7"		31			7				38	30		
T. J. Hageman	6.8 West:	1-5"		11	89		2				102	132		
—LONG BRIDGE - MILE 7.5 WEST—		3-8"												
Totals (Lower Butte Creek and Butte Slough)			1472	2668	4161	4585	5582	5225	5719	6902	36314	5638	607	6625
Average cubic feet per second			24	45	68	77	91	85	96	112	75			
Monthly return in % of seasonal			4.0	7.3	11.5	12.6	15.4	14.4	15.8	19.0				

*Approximate mileage from junction with Sacramento River.

**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.

(1) 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 shown in Table 84. Rediversions from West Borrow Pit of Sutter By-Pass are made. See Sutter By-Pass Diversions, Table 60.

(2) See acreages under rediversions - 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, Table 85. See East Borrow Pit Sutter By-Pass Diversions, Table 60.

(3) Includes adjoining acreages as follows: C. P. Reische - 80, L. H. Feith - 3, F. R. Grannemann - 4, J. E. Messick - 14, J. P. Hemphill - 20.

(4) Formerly listed as 10" unit.

(5) Acreage divided as follows: Armstrong - 0, Hensen - 56, Locovitch - 88.

TABLE 60

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
West Borrow Pit of Sutter By-Pass													
(1)													
—WEST BORROW PIT GAGING STATION - MILE 0.4—													
—SOUTHERN PACIFIC RAILROAD CROSSING - MILE 2.5—													
C. Fred Holmes (Alonso Bros.)(2)	7.1L	1-10"			52	100		40			192	250	
—KNIGHTS LANDING - MARYSVILLE CAUSEWAY - MILE 12.7—													
—SOUTH LEVEE TISDALE BY-PASS - MILE 18.9—													
—RECLAMATION DISTRICT 1660 GRAVITY RETURN - MILE 19.3—													
State Recl. Bd. (Doty Bros.)(2)	26.3L	1-30"		24	33						57	47	
State Recl. Bd. (Meier Bros)(2)	26.8L	1-6"			9						(3) 9	85	
D. C. Smith, E. I. McGrath and S. A. McKeehan (4)	27.1R	1-16"			NO DIVERSION (4)							(4)	
Butte Slu. Irrig. Co. Ltd. (5)	28.4R	Gravity	1637	2171	2111	1931	2190	2205	1236		13481	3834	
Fred and George Tarke (6)	28.6R	2-10"		67		26	102	83	16		294	125	
Frye Brothers (7)	29.0R	1-7"		18		19					37	26	
—NEW COLUSA-MARYSVILLE HIGHWAY - MILE 29.1—													
—NOTHERN ELECTRIC RAILROAD CROSSING - MILE 29.15—													
East Borrow Pit of Sutter By-Pass													
(8)													
R. E. Hughes (Souza,Ostrom,Fong)	0.4S*	1-14"		152			182	132	28		494	(10)250	
(9)													
R.E.Hughes(Souza,Ostrom,Fong)(9)	0.1S*	1-16"	144								144	(11)	
—GAGING STATION - "WILLOW SLOUGH AT CHANDLER" - MILE 0—													
R.E.Hughes(Souza,Ostrom,Fong)(9)	0.5N*	(12)1-14"		264			89	264	110		727	297	
—DRAINAGE PLANT #1 - MILE 1.4N—													
E. H. Christenson	(13)1.4N				PLANT REMOVED								
A. W. Kimerer	(13)1.4N	1-14"			NO DIVERSION								
E. H. Christensen and Son	(13)1.4N	1-16"		237	436	812	729	762	125		3101	100	220
Nelson Brothers (2)	(13)1.4N	1-12"				89	126	160	38		413	100	
R. E. Hughes (9)	1.5N*	1-14"		70		66	93	57	34		320	300	

(1) Mileage is given northerly from drainage plant of Reclamation District 1500. Mile 9.15 West Borrow Pit is opposite Chandler.
(2) New installation 1939.
(3) 3.5 acre-feet received from plant at Mile 18.5R.
(4) See diversion at Mile 28.4R.
(5) Diversions at Mile 28.4R, 28.6R and 29.0 R are from water diverted to the West Borrow Pit from Butte Slough.
(6) Formerly S. F. Robertson. Plant rehabilitated 1939.
(7) Plant re-installed 1939.
(8) 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.
(9) Formerly listed as Woodland Livestock Company.
(10) This is the total acreage served by this plant and the one at Mile 0.1S*.
(11) See acreage note for plant at Mile 0.4S*.
(12) One unit removed.
(13) Plant is on drain canal which enters By-Pass at this point.

TABLE 60 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
East Borrow Pit of Sutter By-Pass (Continued)													
	(1)												
Arnold Christensen	2.2N	1-16"			NO DIVERSION								
State Reclamation Board	2.3N*	1-10"			NO DIVERSION								
State Recl. Bd. (Wm. Baird, Jr., C. Baird) (2)	2.65N*	1-10"			48	60	5				113	115	
R.E.Hughes (E.H.Christensen & Son)(3)	2.9N*	(4)1-12"			567	574	524	652	81		2398	(5)570	
		1-14"											
R.E.Hughes (E.H.Christensen & Son)(6)	3.85N*	2-14"			420	416	500	545	82		1963	(7)	
		1-24"											
R.E.Hughes(Alonso Brothers)(3)	4.0N*	1-14"			202						202	175	
—KNIGHTS LANDING - MARYSVILLE CAUSEWAY - MILE 4.4N—													
R.E.Hughes (Sam Arnold)(3)	4.5N*	1-14"		224	479	536	547	547	109		2242		230
State Recl. Bd. (F.L.Lang)(8)	6.6N*	1-20"			997	1320	1357	1370	548		5592	80	615
		1-24"											
—DRAINAGE PLANT #2 - MILE 10 N—													
—EAST LEVEE OF WADSWORTH CANAL - MILE 16.0N—													
—DRAINAGE PLANT #3 - MILE 16.5N —													
State Recl. Bd. (W. Nall) (6)	17.0R*	1-30"			149						149	100	
State Recl.Bd.(Stohlman Bros.)(6)	17.8R*	1-12"		34	79						113	187	
State Recl.Bd.(Clinton DeWitt)(6)	18.5R*	1-12"		70	87	139					296	400	
		1-30"											
R. H. Morehead	18.75N	1-10"			NO DIVERSION (9)						(9)	(9)	
Meyer, Platter, Morehead, DeWitt Bros., Epperson & Middleton	19.1L	(10)1-8"	157		47	119	202	146			671	(11)591	
		1-14"											
State Recl. Bd. (C. W. Jones)(6)	19.2R*	1-10"			76						76	190	
State Recl. Bd. (La Montagne Bros.)(6)	19.97R	1-3"		1	1						2	5	
—NEW COLUSA - MARYSVILLE HIGHWAY - MILE 19.98N—													
—NORTHERN ELECTRIC RAILROAD CROSSING - MILE 20.0N—													
Sacramento Slough													
	(12)												
C.Fred Holmes(W.F.Baird Jr., C.Baird)(3)	1.4R	1-24"			155	489		246	56		946	400	

(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) Plant reinstalled 1939.
(3) Formerly listed as Woodland Livestock Company.
(4) Unit installed 1939.
(5) This is the total acreage served by this plant and the one at Mile 3.85N*.
(6) New installation 1939.
(7) See acreage note for plant at Mile 2.9N*.
(8) New installation 1939 at an old point of diversion.
(9) See plant at Mile 19.1N.
(10) Unit added in 1939.
(11) Acreage divided as follows: Meyer - 90, Platter on Morehead land - 100, Meyer and DeWitt Bros. - 146, DeWitt Bros. on Middleton land - 110, DeWitt Bros. on Epperson land - 145.
(12) Mileage is given easterly from drainage plant of Reclamation District 1500 which is at head of slough.

TABLE 60 (CONTINUED)
BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Knights Landing Ridge Cut (1)													
—RECLAMATION DISTRICT 730 DRAIN PLANT NO. 2 - MILE 3.8— (2)													
Ralph W. Pollock	4.5SL	1-12"		116							116	250	
Hershey Estate(A.J.Darnielle)	4.7L	1-15"		94	187	375	324				980	283	
Sieber Brothers	4.7R	1-6"				21	7	10			38	18	
—WEST LEVEE YOLO BY-PASS - MILE 6.3—													
Frank Fisher & Henry Rich and E. L. Wallace	6.3	Gravity									(3)	(3)	(3)
Yolo By-Pass (East Borrow Pit or Tule Canal) (4)													
Robert Swanston(Joe Mello, S.E.Sakata)(6) (5)	0.7S	1-10"			70		33	36			139	(7)270	
Robert Swanston(Joe Mello, S.E.Sakata)(8)	0.3S	1-6"		3	9						12	(9)	
St.of California (Harbinson Bros)(6)	0.02S	1-14"			60	13	35		33	11	152	156	
Robt Swanston (Wallace & Crawford)(10)	1.8N*	(11)1-20"		1134	1153	1436	1349	1393		300	(12)6765		(12)820
California Packing Corporation	2.4N	(13)1-12"	179	128	271	395	207	58	79		1317	(14)1150	
		1-20"											
California Packing Corporation	3.4N	1-8"		3	14		18				35	(15)	
Smith and Roberts	5.9N	1-10"	NO DIVERSION										
—SACRAMENTO-WOODLAND HIGHWAY - MILE 6.18—													
—SACRAMENTO-WOODLAND RAILROAD CROSSING - MILE 6.2—													
Julius Kauser (Louis Ulrich)(6)	7.0N*	1-14"			281	518	645	638	529	87	2698		260
—RECLAMATION DISTRICT 1600 DRAINAGE PLANT - MILE 10.0—													
Frank Fisher and Henry Rich	10.0	1-18"			116	66		165			347	(16)200	
Frank Fisher and Henry Rich	10.1N	Gravity		299	1901	1384	2066	2111	293		8054	210	(17)1019
E. L. Wallace (18)	10.1N	Gravity		704	4170	2811	2495	1543	40		(19)11763		532
—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 94.
(2) Mileage is given southerly from head in Back Borrow Pit near Knights Landing.
(3) See Yolo By-Pass diversions at Mile 10.
(4) Diversions from East Borrow Pit of Yolo By-Pass are primarily from water diverted through Knights Landing Ridge Cut (Table 94).
(5) Mileage is given northerly or southerly from North levee of Sacramento By-Pass. Asterisk indicates land irrigated is in By-Pass area.
(6) New installation 1939.
(7) This is the total area served by this plant and the one at Mile 0.3S. Some additional water received from a well.
(8) New installation 1939 at an old point of diversion
(9) See plant at Mile 0.7S.
(10) Formerly listed as George Swanston Estate.
(11) 15" unit removed.
(12) Diversion in October for gun club use on rice land.
(13) Temporary installation 1939.
(14) This is the total area served by this plant and the one at Mile 3.4N.
(15) See plant at Mile 2.4N.
(16) Area is within Reclamation District 1600. Water backed up through drainage plant.
(17) Area irrigated is on following lands: State of California - 375, Hershey Estate - 644.
(18) Area irrigated is on C. A. Hershey, et al. lands.
(19) Surplus water, received directly from Knights Landing Ridge Cut, is spilled and is available for users below this point and goes toward making the flow recorded in Table 95.

TABLE 60 (CONTINUED)

BY-PASS AND DRAINAGE CHANNEL DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Back Borrow Pit Reclamation District 1000													
	(1)				NO DIVERSION								
Totals - By-Pass and Drainage Channel Diversions													
West Borrow Pit of Sutter By-Pass			0	2280	2205	2076	2292	2328	1252	0	12433	4367	0
East Borrow Pit of Sutter By-Pass			301	1052	3583	4131	4354	4535	1155	0	19216	2890	1635
Sacramento Slough			0	0	155	439	0	246	56	0	946	400	0
Knights Landing Ridge Cut			0	210	187	396	331	10	0	0	1134	551	0
Yolo By-Pass (East Borrow Pit or Tule Canal)			179	2271	8045	7305	6848	5944	974	398	31964	1980	2631
Back Borrow Pit Reclamation District 1000			0	0	0	0	0	0	0	0	0	0	0
Totals			480	5813	14180	14337	13825	13163	3437	398	65693	10194	4266
Average cubic feet per second			8	98	231	242	225	214	58	6	135		
Monthly use in per cent of seasonal			.7	8.9	21.6	21.9	21.1	20.0	5.2	.6			

(1) Mileage is given easterly from Sacramento River.

TABLE 61

FEATHER RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Sutter Basin Corporation	0.6R	1-16"			NO DIVERSION								
Punter and Rutz	1.55L	1-8"		113	55	56	78	28	3		333	(1)121	
Sutter Basin Corporation	2.60R	1-20"		566	3144	2095	2065	2518	496		10884	954	786
		1-26"											
California Lands Incorporated	6.44L	1-10"			NO DIVERSION								
M. Scheiber	7.7L	1-10"		49	120	161	168	151	145		794	(2)178	
—NICOLAUS GAGING STATION - MILE 9.3—													
—NICOLAUS BRIDGE - MILE 9.4—													
Bercut - Richards Company	9.75R	1-20"		110	178		244	283	51		866	200	
Garden Highway Mutual Water Co.	13.1R	1-20"	441	524	589	880	1178	743	269		4624	(3)1254	
		1-24"											
Feather River Water Company	16.35R	1-14"	178	170	222	360	410	209	115		1664	306	
Plumas Mutual Water Company	17.5L	1-22"		455	836	814	1069	652	611		4437	1333	
G. C. Shannon	18.75R	1-6"		63	78	145	118	37	67		508	77	
Oswald Water District	21.4R	1-16"	453	782	690	830	876	657			4288	(4)653	
Alicia Mutual Water Company	24.0L	1-26"		1768	1486	1171	1399	1238	518		7580	776	332
		1-30"											
Cunningham Brothers	25.2R	1-10"		35	41	156					232	40	
Levee District #1	(5)26.8R	Gravity			NO DIVERSION								
R. Saturi	27.0L	1-10"			NO DIVERSION								
—MOUTH OF YUBA RIVER - MILE 27.3R—													
—YUBA CITY - MARYSVILLE BRIDGE - MILE 28.0—													
J. L. Sullivan, Jr.	33.9R	1-10"	301	193	103	153	186	116	77		1129	185	
Sutter Butte Canal Co(Sunset Plant)	38.1R	2-42"			NO DIVERSION (6)						(6)	(6)	(6)
		1-26"											
J. L. Sullivan & C. J. Mathew	(7)43.7L H.Sl. 0.4L	1-18"		78	143	182	135	182	125	17	862	260	
Thomas Mathew	(7)43.7L H.Sl.0.7L	1-5"	2	15	18	24	29	8	1		97	(8)44	

*Mileage along river above mouth.

(1) Of this acreage 9 acres received one irrigation from a well.
(2) Includes 70 acres on adjoining Paulen property.
(3) Includes 167 acres on adjoining Bank of America land.
(4) This acreage also received some water from wells.
(5) Diversion point moved in 1939 from Mile 28R.
(6) See Sutter Butte Canal Company's diversion at Mile 58.1 Right.
(7) Plant diverts Feather River water backed into Honcut Slough. Slough is tributary to Feather River at Mile 43.7 Left. Mileage of plant above mouth of Honcut Slough is indicated.
(8) Includes 20 acres on adjoining J. Mathew land.

TABLE 61 (CONTINUED)

FEATHER RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
Moznett and Wetmore, Sub. #1	(1)43.7L H.S1.1.2L	1-10"	126	116	118	132	145	29	33		699	158	
Manuel A. Barba	(1)43.7L H.S1.1.25L	1-8"		53	49	36	43	73	14	13	281	65	
A. P. Barba (M. Aquiar)	47.9L	1-12"			38	142	93	157	100	3	533	110	
E. F. Biggs	48.3L	1-10"			40	137	81	132			390	352	
Edward Dunning	49.0L	1-8"			32	29	54	12			127	55	
Clyne Ranch (Penecaldo)	51.0R	1-6"				48	66	55	2		171	(2)31	
C. E. Porter (Bettencourt)	51.1L	1-7"		35	25	65	39	42	29	7	242	52	
Edward Steadman	51.4R	1-10"				74	69	101			244	(3)120	
California Lands Inc.	51.6R	1-6"	NO DIVERSION										
W. E. Blower	52.1L	1-10"	NO DIVERSION										
California Lands Inc.	52.5L	1-6"	7								7	(4)42	
F. L. Morris	52.7L	1-8"	60		31	14	33	13		14	165	(4)42	
Frank Dutra	52.9R	1-6"				11	9	7	2		29	16	
Ruby Chambers	53.1R	1-6"	37		1	24	9	6	12		89	44	
Budh Singh Banes (5)	54.7R	1-8"	82		10	52	76	14	13	22	269	50	
Hearst Estate (Gibson)	55.1L	1-14"	83		170	472	492	199			1416	383	
L. A. Kister Estate	55.5L	1-8"	NO AGRICULTURAL DIVERSION(6)									(6)	
Rio Bonita Rancho	56.6R		PLANT REMOVED										
Alvin Kister (M. Gibson)	57.0L	1-8"			1	62	87	11			161	30	
Henry Haselbusch	57.9R	1-10"		33	33	45	33	7			151	70	
Sutter Butte Canal Company	(7)58.1R	Gravity	1650	44786	59561	48885	48357	43086	22948	10374	(8)279687	19596	7333
Richvale Irrigation District	(7)58.1R	Gravity	432	11714	15552	17657	17570	15650	8334	3772	(9) 90681	4044	(10)1356
Western Canal Company	59.7R	Gravity		9012	16203	16048	16833	16876	3787	8398	(11)87757	1233	8990
—U.S.G.S. OROVILLE GAGING STATION - MILE 65—													
Total acre-feet			3583	71539	99567	90960	92044	83292	37752	22620	501357	29234	26303
Average cubic feet per second			58	1202	1619	1529	1497	1355	634	368	1032		
Monthly use in per cent of seasonal			.7	14.3	19.9	18.1	18.4	16.6	7.5	4.5			

* 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) An additional 15 acres served on adjoining Steadman lands, Mile 51.4.

(3) Includes 15 acres served through plant at Mile 51.0R.

(4) The diversions at Mile 52.5L and Mile 52.7L were combined for use on both properties.

(5) Formerly listed as Budg Singh.

(6) Any diversion at this point was for dredge flotation.

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

(8) An additional 3066 acre-feet were diverted in November. A portion of the diversion was used on 1405 acres of rice in Richvale District.

(9) An additional 1106 acre-feet were diverted in November.

(10) Includes 1405 acres served by Sutter Butte Canal Company.

(11) Diversion in October and 10,428 acre-feet diverted in November and December were for gun club purposes in Butte Basin. See Lower Butte Creek Diversions (Table 59).

TABLE 62

YUBA RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
—SEVENTH STREET BRIDGE - MILE 0.9—													
California Lands, Inc.	0.9L				PLANT REMOVED								
Davis Brothers	1.6L	1-12"			9	116	116	174	90		505	(1)205	
Charles Shinkle (Harrington)	1.8R	1-5"		4	14	20	21	21	7		87	12	
G. E. Edwards	1.9L				PLANT REMOVED								
Davis Brothers	3.0L	1-10"			33	135	95	200	84		547	(2)350	
Yuba River Farms	(3) 3.4R	1-6"				23	10	38	22		93	30	
E. O. Rubke (4)	4.1L	1-8"				52	69	94	23		238	(5)125	
James Traynor	4.2R				PLANT REMOVED								
S. J. Monaco	4.3R				PLANT REMOVED								
C. R. Perkins	4.70L				PLANT REMOVED								
Earl Fruit Company and Dinsmore	4.75L	(6)1-10"	124	24	28	72		30			278	56	
Dantoni Orchards Co (Earl Fruit Co)	5.3L	1-8"	52	37	50	50		57			246	50	
Marysville River Farms Company	5.9L	1-10"			NO DIVERSION								
Marysville River Farms Company	6.35L	1-10"			NO DIVERSION								
—DAGUERRE POINT DAM - MILE 11.0													
Hallwood Irrigation Company (7)	(7)11.0R	Gravity		6360	9161	8764	8493	7876	5629	2669	(8)48952	4724	463
Cordua Irrigation District (7)	(7)11.0R	Gravity		2561	3879	3658	4085	4249	2449	1286	(9)22167	(10)1090	(10)1435
Yuba Consolidated Gold Field Co.	14.5L	Gravity			NO AGRICULTURAL DIVERSION								
—SMARTVILLE GAGING STATION - MILE 20—													
Total acre-feet			176	8986	13174	12890	12889	12739	8304	3955	73113	6642	1898
Average cubic feet per second			3	151	214	217	210	207	140	64	150		
Monthly use in per cent of seasonal			—	12	18	18	18	18	11	5			

*Approximate mileage along river above highway crossing at Marysville.

(1) Of this acreage, 30 were served also by wells.
(2) Additional water for this acreage procured from wells.
(3) Corrected mileage.
(4) Formerly G. F. Sherbourne.
(5) Includes 30 acres on adjoining Hendricks lands.
(6) Replaces former 6" unit.
(7) Hallwood Irrigation Company and Cordua Irrigation District have a common point of diversion and common canal for about one-half mile.
(8) Includes 450 acre-feet direct spill during August, also 1586 acre-feet in October for duck club purposes.
(9) Includes 200 acre-feet direct spill during August, also 944 acre-feet in October for duck club purposes
(10) Includes 300 acres rice and 77 acres general crops outside of District.

TABLE 63

AMERICAN RIVER DIVERSIONS-1939

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	June	July	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	2.4R	1-6"			6	22	6	1			15	(1)
North Sacramento Land Company	2.55R	(2)1-5"				3	1				4	10
North Sacramento Land Company(3)	2.65R	1-8"			10	12	10	10			42	(4) 44
North Sacramento Land Company			PLANT REMOVED									
G. A. Meister	3.1L	1-10"	NO DIVERSION									
—SOUTHERN PACIFIC RAILROAD BRIDGE - MILE 3.5—												
G. A. Meister	3.7L	1-4"		2	2	5	18				(5) 27	18
		1-6"										
G. A. Meister (Azevedo and Brazil)	4.1L	1-10"		30		39	39		20		(5)128	73
W. S. Kendall Estate	5.7L	1-10"	NO DIVERSION									
—GAGING STATION - AMERICAN RIVER AT SACRAMENTO - MILE 6.1												
S. H. Cowell	7.1L	1-7"	NO DIVERSION									
E. Clemens Horst Company	7.5R	1-8"			59	94	75				228	104
Hagginbottom Land Company	7.7R		PLANT REMOVED									
Hagginbottom Land Company	7.8R	1-5"			22	30	16				68	44
Hagginbottom Land Co. (Azevedo)(6)	7.95R	1-10"				80	130	57	12		279	45
J. H. Kerby	9.0L	1-6"			30	30	61	5			126	43
Hagginbottom Land Company (6)	9.2R	1-12"			60	253	88	138	1		540	70
W. Wright	9.2L	1-8"	NO DIVERSION									
C. E. Wells (Y. Sumeda)	9.35L	1-5"			6	20	17				43	(7)
C. E. Wells (Y. Sumeda)	9.5L	1-5"				11	4				15	(8)50

*Mileage along river above mouth.

**All general crops - no rice.

(1) See plant at Mile 2.65R.

(2) Replaces 3" unit.

(3) New installation 1939.

(4) This is the combined acreage served by this plant and the one at Mile 2.4R.

(5) An undetermined amount of water received from a well opposite Mile 4.1.

(6) Previously listed as Azevedo dairy.

(7) See plant at Mile 9.5L

(8) This is the total acreage served by this plant and the one at Mile 9.35L.

TABLE 63 (CONTINUED)

AMERICAN RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		
C. E. Wells (Maruoka)	9.5SL	1-5"			12	18	24	20			74	15
Henry Cowell	9.6L	1-6"	NO DIVERSION									
Frank E. Krause (1)	10.2R	(2)1-5"								26	26	35
Guy H. Roddan	10.3L	1-10"	1	3	8	14	38	57	30	10	161	27
Gold Nugget Orchard Co.(E.A.Boyle)	10.4R	1-5"			19	35	9				63	17
Hagginbottom Land Company	10.5R	1-6"			10	10	14	7			41	15
Mucke Sand and Gravel Company	11.2L	1-6"	1	4	4	6	6	5	5	3	34	20
J. T. Gore Estate	11.5L	1-6"	NO DIVERSION									
William A. Meyer (Harry Nakatomi)	11.7L	1-4"					36				36	27
Harry Nakatomi	11.7L	1-5"		16	42	28	39	4		20	149	37
H. T. Danielson	13.1R	1-5"			5	8	7	6	3		29	12
P. Osterli	13.2R	1-6"			41	58	104	77			280	55
Mary Deterding	13.9R	1-6"			37	93	125	42			297	87
Mary Deterding	14.7R	1-4"	NO DIVERSION									
Mary Deterding	15.1R	1-6"			22	16	18	4			60	10
Carmichael Irrigation District	16.0R	(3)2-12"	71	324	536	749	812	717	485	187	(4)3881	(5)
		1-6"										
William H. Delvin	17.1R	1-6"		1	1	2	2	1	1		8	6
—GAGING STATION—AMERICAN RIVER AT FAIROAKS - MILE 19.2—												
Total acre-feet			73	380	932	1616	1699	1151	557	246	6654	(6) 864
Average cubic feet per second			1	6	15	27	28	19	9	4	14	
Monthly use in per cent of seasonal			1.1	5.7	14.0	24.3	25.5	17.3	8.4	3.7		

*Mileage along river above mouth.
**All general crops - no rice
(1) Formerly Hagginbottom Land Company.
(2) Replaces 8" unit.
(3) 8" unit removed and 12" unit added in 1939.
(4) An undetermined amount of water received from Fairoaks Water Company.
(5) 2200 acres classed as suburban lands.
(6) An additional 2200 acres now classed as suburban lands are not included.

TABLE 64

DELTA UPLANDS DIVERSIONS FROM OLD SAN JOAQUIN RIVER-1939

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	June	July	Aug.	Sep.	Oct.		
East Contra Costa Irr. Dist.	(1)36.5L	2-18" 1-24" 2-30"	2096	5819	4087	4749	6293	3916	1536	133	(2)28629	14931
Byron Bethany Irrigation Dist.	(3)40.9L	1-26" 1-30"	1943	2813	2245	2646	2611	2355	1345	193	16151	6586
Federal Land Bank (4)	(5)44.6L	1-7"				33					33	65
E. H. Stevenson Estate	45.3L	1-12"			NO DIVERSION							
H. Lindeman	47.2L	1-12"			105				90		195	(6) 200
Gus Lindeman	47.2L	1-10"			NO DIVERSION (7)						(7)	(7) 100
West Side Irrigation District	(8)47.65L	(8)7-15"	2930	3289	1847	2244	3037	2090	1049	869	17355	10100
Noy Welty	48.7L	1-8"		15	5	8	5	7	9		49	70
Naglee Burke Irrigation District	50.4L	1-16" 1-18"	664	681	139	2030	1138	1148	677	461	6938	(9)2157
Freemont Irrigation Association	50.9L	1-14"	90	205	283	242	293	255	228	13	1609	(10)547
Joe Freitas	51.0L	1-8"		5	5	5	6	6	8		35	35
Attilio Casserini	51.2L	1-8"		5		5	5	6	5		26	40
Excelsior Ranch #2	52.4L	1-10"	5	48	30	93	65	72	30		343	125
—TOM PAINE SLOUGH - MILE 54.3—												
Totals			7728	12880	8746	12055	13453	9855	4977	1669	71363	34956
Average cubic feet per			126	216	142	203	219	160	84	27	147	
Monthly use in per cent of seasonal			10.6	18.0	12.3	16.9	18.9	13.8	7.0	2.3		

*Distance along river from its mouth 4½ miles below Antioch. Mileage as established by War Department Survey of 1913-15.

**All general crops. No rice.

(1) To junction of Old River and Indian Slough. Pumping plant is located two and one-half miles west along Indian Slough.

(2) An additional 5966 acre-feet were pumped from wells and drains within district.

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

(4) Formerly Joe Santos.

(5) Plant is on cut which joins river at Mile 44.6 Left.

(6) An additional 100 acres served for Gus Lindeman plant - Mile 47.2L.

(7) See H. Lindeman plant - Mile 47.2L.

(8) To junction of Old River with Intake Cut. Pumping plant is located one mile south along Intake Cut.

(9) An additional 7 acres served for Freemont Irrigation Association - Mile 50.9L.

(10) Includes 7 acres served through plant at Mile 50.4L.

TABLE 65

DELTA UPLANDS DIVERSIONS FROM TOM PAINE SLOUGH-1939

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	June	July	Aug.	Sep.	Oct.		
Stimson Estate Company	0.7S	2-18"	138	463	81	199	229	191	114	136	1551	(1)1353
Stimson Estate	1.2S	1-18"		92	56	83	64	53	43		391	(2)
Holly Sugar Corporation (3)	(4)2.1S	1-10"	29	34	83	86		161	156	161	(5) 710	170
		1-12"										
Tracy Clover Irrigation Dist	(4)2.1S	1-16"			N O	D I V E R S I O N						
Pescadero R. D. #2058-Plant #1	2.9S	1-12"	38	42	61	66	52	100	76		435	(6)2388
Pescadero R. D. #2058-Plant #3	6.3S	1-24"	438	727	772	951	752	1002	498	312	5452	(7)
Pescadero R.D. #2058-Plant #5	8.3S	1-12"	63	140	112	260	201	205	93	14	1088	(7)
Pescadero R. D. #2058-Plant #5a	9.0S	1-12"	57	122	53	58	116	77	35	22	540	(7)
—SOUTHERN PACIFIC RAILROAD CROSSING - MILE 9.1S—												
—LINCOLN HIGHWAY - MILE 9.9S—												
Totals			763	1620	1218	1703	1414	1789	1015	645	10167	3911
Average cubic feet per second			12	27	20	29	23	29	17	10	21	
Monthly use in per cent of seasonal			7.5	15.9	12.0	16.8	13.9	17.6	10.0	6.3		

* 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 1.2S. The figure includes 326 acres on adjoining lands and 265 acres served by wash water from diversion at Mile 2.1S which was available after August 1.
(2) See plant at Mile 0.7S.
(3) Formerly listed as Holly Western Sugar Company
(4) To junction of Tom Paine Slough and dredger cut. Pumping plant is located 1½ miles south along dredger cut.
(5) Diversions after August 1 for use in sugar factory. Water then re-used (see plant at Mile 1.2S).
(6) This is the total uplands area (South of Tom Paine Slough) irrigated from all Pescadero Reclamation District plants on Tom Paine Slu.
(7) See plant at Mile 2.9S.

TABLE 66

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER-1939

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	June	July	Aug.	Sep.	Oct.		
—GARWOOD BRIDGE - MILE 45.3—												
Katten and Morengo Ranch (1)	45.45R	1-8"		74	118	86	94	76	61		509	90
A. Jury (F. Jury)	(2)45.5R	1-6"		8	7	9	13	7	7		48	25
C. R. Van Buskirk	45.6R	1-5"		28	22	56	50	33	21		210	62
		1-8"										
Paul Weston	46.3R	1-6"			NO DIVERSION							
Ivy Rainey (F. M. Danner)	46.65R	(3)1-6"				11	9	12	3		35	12
Wilhoit and Hamill (E. V. Santos)	46.85R	1-10"				63	57	44			164	120
L. F. Grimsley (Geo. Daviner)	47.2R	1-6"		3	14	8	18	10			53	45
Wolfinger Brothers	47.3R	1-10"			NO DIVERSION							
Alma A. Haack (E. Strecker)	48.0R	1-12"	4	86	112	137	143	200	57	11	750	365
H. G. Learned (Lee Young)	48.3R	1-4"	1	2	4	8	7	8	4	2	36	9
H. G. Learned (I. Yoshida)	48.5R	1-3"		2	7	11	6	11	10	5	52	16
Joe Calgano	48.5R	1-6"	2	14	1	9	21	37	5	5	94	(4) 129
F. Piccardo, J. Vagliani and J. Calcagno	48.5R	1-6"	4	15	16	21	28	22	12	5	123	(5)
G. B. Figari	48.6R	1-5"			NO DIVERSION							
M. O. Couper	49.0R	1-10"			NO DIVERSION							
Mettler, Cross and Drury (S. B. Chapman)	49.5R	1-14"		10	43	26	25	33	14	25	176	40
A. A. Rodgers	50.1R	1-10"		11	25	44	43	63	13	31	230	40
—BRANDT BRIDGE - MILE 50.2—												
Frank Reichmuth (N. Lagler)	50.4R	1-8"		4	4	10	8	11	5		42	17
Brandt Brothers (C. E. Brandt)	50.55R	1-6"	1	1	1	1	4	5	2	2	17	5
Brandt Brothers (C. E. Brandt)	50.8R	(6)1-6"	5	9	13	17	20	18	10	5	97	59
California Lands, Inc.	52.4R	1-12"			NO DIVERSION							
Julia Battilana	52.9R	1-5"			NO DIVERSION							
California Lands, Inc.	53.2R	1-12"			NO DIVERSION							
Arthur Green (7)	53.4R	1-8"		8	13	22	13	5	5		66	30
M. Dos Reis (Borges)	53.7R	1-12"		96	86	43	48	72	34		379	145
R. E. Albertson	54.9R	1-10"				42	59	47	50		198	(8) 120

* 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) Formerly listed as A. Divini.
(2) Plant moved from 45.55 in 1939.
(3) New united replaced 8" in 1938.
(4) This is the total acreage served by this plant and the other plant at Mile 48.5. Acreage divided as follows: J. Calcagno - 66, F.Piccardo and S. Vigliana - 63.
(5) See other plant at Mile 48.5.
(6) 7" and 10" units have been removed.
(7) Formerly F. de Lima.
(8) Includes 40 acres partially served by wells.

TABLE 66 (CONTINUED)

DELTA UPLANDS DIVERSIONS FROM SAN JOAQUIN RIVER-1939

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	June	July	Aug.	Sep.	Oct.		
—JUNCTION WITH MIDDLE RIVER - MILE 56.2L—												
Oakwood Stock Farm (1)	57.0R	1-14"	58	108	120	161	152	253	60		912	213
James Tobin	57.15R	1-7"			NO DIVERSION							
T. J. Dutnall Estate	57.3R	1-3"			NO DIVERSION							
A. J. Thompson	57.3R	1-5"			NO DIVERSION							
A. Calori (2)	57.45R	1-3"				3	4	2			9	8
G. Gardella Company	57.5R	1-4"	3	9	12	15	18	11	6	5	79	27
V. Sanquenetti	58.4R	1-2½"		1	1	2	5	3	1		13	5
G. B. Figari (G. Alfieri)	58.6R	1-3"		1	3	1	3	2	1		11	6
R. Mauro	58.7R	1-4"			NO DIVERSION							
—MOSSDALE BRIDGE - MILE 58.9 - RECORDING GAGE —												
C. C. Abersold (S. Tacozon)	59.25R	1-6"	2	5	24	30	21	25	11	5	123	22
H. A. Neistrath (Madruga)	59.3R	1-14"		132	78	151	124	151	119		755	160
H. A. Neistrath (Madruga)	(3)60.1R	1-6"		1	16	24	74	28			144	52
—JUNCTION WITH PARADISE CUT - PARADISE DAM - MILE 62.2L—												
Banta Carbona Irrigation Dist.	67.5L	1-36"	3601	8563	4278	5336	9684	6900	3185	955	42502	(4)15476
		2-20"										
		3-24"										
Reclamation District #2075	71.0R	1-16"	331	203	333	380	746	417	125	113	2648	1064
Mortensen, Borges and Whitman	73.2R	1-12"			47	176	224	238	41	9	735	310
J. Lawrence	75.0R	1-4"			NO DIVERSION							
Henry Gard	75.1R	1-6"			NO DIVERSION							
J. W. Cannon	75.2R	1-4"			NO DIVERSION							
S. G. Paxton	75.25R	1-5"			NO DIVERSION							
R. R. Swank	75.35R	1-4"			NO DIVERSION							
R. N. Jansen	75.45R	1-6"			NO DIVERSION							
Ralph Martin	75.7R	1-7"			NO DIVERSION							
Ralph Martin	76.2R	1-6"			NO DIVERSION							
—U.S.G.S. GAGING STATION - SAN JOAQUIN RIVER NEAR VERNALIS - MILE 76.7—												
Totals			4012	9394	5398	6901	11721	8744	3862	1178	51210	18672
Average cubic feet per second			65	158	88	116	191	142	65	19	105	
Monthly use in per cent of seasonal			7.8	18.3	10.5	13.5	22.9	17.1	7.6	2.3		

*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) Acreage divided between owners as follows: Oliveira - 128, Silveria - 85.

(2) New installation 1939.

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

(4) Includes 1200 acres outside of district.

TABLE 67

SAN JOAQUIN RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
—U.S.G.S. GAGING STATION - "SAN JOAQUIN RIVER NEAR VERNALIS" - MILE 76.7—													
—STANISLAUS RIVER - MILE 79.7R—													
—MAZE ROAD BRIDGE - MILE 81.85—													
W. C. Blewett Estate	81.95L	3-12"	201	411	291	450	473	403	217	108	2554	1275	
El Solyo Ranch	82.05L	1-12"	1276	1655	2492	2029	2566	2576	1462	1168	15224	4564	260
		3-18"											
—GAGING STATION - "SAN JOAQUIN RIVER AT HETCH HETCHY WATER SUPPLY CROSSING" - MILE 82.65—													
—TUOLUMNE RIVER - MILE 91.0R—													
West Stanislaus Irrigation Dist.	91.8L	3-26"	2811	8645	7655	7843	13865	10890	4243	766	56718	21190	
El Pescadero Ranch #1 (1)	(2)91.8L	1-12"		144			12		39		195	110	
El Pescadero Ranch #2 (3)	(2)91.8L	(4)1-14"	NO DIVERSION										
Burkhard Investment Co. (3)	(2)91.8L	(5)1-14"	6	270	5						281	240	
El Pescadero Ranch #3 (6)	(2)91.8L	1-12"			9	25	21	14	25	7	101	66	
—LAIRD SLOUGH BRIDGE - GAGING STATION - "SAN JOAQUIN RIVER NEAR GRAYSON" - MILE 96.05—													
Rancho El Pescadero	98.9L	1-16"	NO DIVERSION										
—PATTERSON BRIDGE - MILE 104.4													
Patterson Water Company	104.4L	1-14"	2096	5356	4896	7057	6616	5488	3626	405	35540	13050	
		1-18"											
		4-26"											
Turlock Garden Land Company(7)	104.5L	1-10"	29	12	8	10	11	13	10		93	74	
Mortgage Guarantee Company	106.5L	1-10"	NO DIVERSION										
Patterson Ranch Company	109.8L	(8)1-12"	585	915	1681	1490	1536	1867	691	48	8813	1545	160
		2-16"											

*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) Formerly White Lake Ranch No. 1.
(2) Pump is on cut leading to West Stanislaus Irrigation District plant.
(3) Formerly White Lake Ranch No. 2.
(4) Units now separately owned.
(5) Unit formerly part of White Lake Ranch No. 2 plant.
(6) Formerly White Lake Ranch No. 3.
(7) Formerly Wisnom and Ross.
(8) New unit in 1939.

TABLE 67 (CONTINUED)

SAN JOAQUIN RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		General	Rice
E. Ustick	112.55R	1-12"			126						126	160	
—CROWS LANDING BRIDGE - MILE 113.4—													
Laura C. Johnson	113.5R	1-10"			NO DIVERSION								
A. J. Silveria	113.85R	1-6"			10	5	14	6		3	38	15	
A. J. Silveria	114.35R	1-8"		6	4	9	5	7	8		39	8	
King Ranch	114.95R	1-10"			NO DIVERSION								
L. B. Crow (Joseph Ramos)	116.05L	1-14"	40	71	35	37	42	24	45		294	82	
Oscar Hogan	116.45R	1-12"			NO DIVERSION								
C. L. Olinger	116.95R	1-12"			NO DIVERSION								
—U.S.G.S. GAGING STATION - "SAN JOAQUIN RIVER NEAR NEWMAN" - MILE 123.7—													
—MERCED RIVER - MILE 123.75R—													
Stevinson Water District (1)	129.4R	1-10"			NO DIVERSION								
—FREMONT FORD BRIDGE GAGING STATION - MILE 129.5—													
—DELTA BRIDGE - (TURNER ISLAND) - GAGING STATION - MILE 158.7—													
Totals			7044	17485	17212	18955	25161	21288	10366	2505	120016	42379	420
Average cubic feet per second			115	294	280	319	409	346	174	41			
Monthly use in per cent of seasonal			5.9	14.6	14.3	15.8	21.0	17.7	8.6	2.1			

* 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) Formerly listed as J. J. Stevinson Corporation.

TABLE 68

MERCED RIVER DIVERSIONS - 1939

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	3.8R	1-15"		190	329	430	463	353	215	37	2017	500
E. C. Brown	4.0L	1-8"			NO DIVERSION							
E. C. Brown	4.2L	1-4"			NO DIVERSION							
H. De Angeles	5.8L	1-10"	1	28	37	72	72	56	9	6	281	80
J. F. Peck	6.1L	1-18"			207	136	127	128	65		663	114
Stevinson Water District	6.55L	1-15"			NO DIVERSION							
Francis Hartman	8.5L	1-12"		8	43	52	16				119	20
Mary Collier	8.85L	1-8"		6	27	35	8	9	10	13	108	50
Grace McCullagh	9.4L	1-10"		133	112	164	252	152	56	60	929	(1) 330
R. W. Adams and J. B. Silva	10.35L	1-8"		243	222	240	281	315	97	42	1440	403
		1-10"										
W. D. Adams	10.85L	(2)1-12"	37	194	161	117	251	126	87	14	987	408
C. G. McLaughlin	11.4L	1-8"			NO DIVERSION							
C. G. McLaughlin	11.55L	1-4"			1	1	1	1			4	4
H. F. Milliken Estate	11.6L	1-10"			4	104					108	130
J. Regello (Tatarakis)	11.6L	1-12"				28	46	35			109	60
—NEW MILLIKEN BRIDGE - MILE 11.65—												
A. J. Azevedo (Tatarakis)	12.35L	1-10"				14					14	10
Pacific Coast Joint Stock Land Bank: (Kuge)	12.85L	1-10"		15	76	110	53				254	150
California Lands Inc. (Nutsher)	16.5L	1-12"		35							35	40
Merced River Farms Co. (Mariuchi)	17.05L	1-6"			5	11	6	3			25	18
—U.S.G.S. GAGING STATION - "MERCED RIVER NEAR LIVINGSTON" - MILE 17.1—												
R. G. Woodward	17.3L	(3)1-4"				1	3				4	3
J. Clark (Dunivin)	17.7L	1-3"			2		2	2			6	4
		(4)1-6"										
O. B. Daniels (Yoshida)	17.7L	1-5"		2	9	11	12	14	6	5	59	10
C. P. Hockett and F. Simpkins	18.7L				PLANT REMOVED							
George Bloss (Garrett)	20.3R	1-3½"			2	3	1				6	10
John Reininghaus	20.4L	1-6"			31	9	10	19			(5) 69	100
W. J. Hoskins	20.65	1-3½"		1	1	1	1	1	1		6	9
—SOUTHERN PACIFIC RAILROAD (MAIN LINE) - MILE 21.05—												
Wm. Collier (Togo Farm Company)(6)	21.1R	1-6"			15	10	7	6			38	20
Wm. Collier	21.75R	1-6"			NO DIVERSION							
Wm. Collier	22.0R(7)	1-8"			NO DIVERSION							

* Mileage along river above mouth.

** All general crops. No rice.

(1) Includes 100 acres on adjoining lands.

(2) 5" unit has been removed.

(3) Replaces 6" unit moved to Mile 17.7.

(4) 6" unit added in 1939.

(5) Some additional water received from wells.

(6) Formerly Sunbeam Farm Company

(7) Pump moved to this location from Mile 21.5.

TABLE 68 (CONTINUED)
MERCED RIVER DIVERSIONS - 1939

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversion in Acre-feet								Total Diversion March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.		
Wm. Collier	22.2R	(1)1-12"		18	65	106	65	15			269	141
Wm. Collier	23.3R	1-6"			12	53	57	13			135	44
M. McConnell	23.4L	1-5"	NO DIVERSION									
W. F. McConnell	24.2L	1-5"	NO DIVERSION									
California Lands Incorporated	24.3R		PLANT REMOVED									
W. F. McConnell	24.5L	1-6"	NO DIVERSION									
California Lands Inc. (Yenokida)	24.6R	1-6"		1	14	8	20		5		48	(2) 80
California Lands Inc. (Yenokida)	25.0R	1-5"		13	13	9	7	18	11	9	80	(3)
California Lands Inc. (Yenokida)	25.5R	1-6"		16		5	2	6	4	1	34	(3)
Merced River Farms Association	26.3R	1-8"		47	72	83	147	97	32		478	98
W. C. Magneson	26.55R	1-5"				6	3	4			13	(4) 25
W. C. Magneson (Tanabe)	27.0R	1-6"			1						1	(5)
—SANTA FE RAILROAD CROSSING - MILE 27.05—												
W. C. Magneson	27.6R	1-10"			10	55	36	48	35		184	55
M. Nishihara	27.8R	1-4"		1	2	5	9	4	9	3	33	26
Y. Tanabe (Tashiro)	28.1R	1-6"					6	28	19	12	65	20
G. H. Lovely	28.4R	1-4"	NO DIVERSION									
J. Campadonica	28.6R	1-6"	NO DIVERSION									
D. S. Enright (Alves)	28.6R	1-5"			7	17	45	48	19	20	156	73
		1-8"										
C. L. Mehrton (Fegundes)	29.1R	1-7"			34	28	37	36	27	8	170	46
Tony Demchilli (Bettencourt)	29.75R	1-6"			31	23	29	21	22		126	47
American Trust Co. (Parreira)	29.9R	1-6"			32	68	40	17			157	(6) 100
California Lands Inc. (Maitoza)	30.2L	1-6"			35						35	15
American Trust Co. (Parreira)	30.95R	1-12"			69	88	36	61	11		265	(7)
California Lands Inc. (Maitoza)	31.1L	1-8"			84	25	58	42			209	60
T. H. Carlos (Mondo Brothers) (8)	(9)31.5R	1-6"	NO DIVERSION									
		1-8"										
—SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) - MILE 32.52—												
B. H. Arkellian	32.9R	1-6"					87	43	24	6	160	45
B. H. Arkellian	33.55R	1-7"			26	26	129	60	21		262	80
C. P. Stout (Westfall)	39.2L	1-24"				8	95	22	23		148	50
—GAGING STATION "MERCED RIVER AT YOSEMITE VALLEY RAILROAD CROSSING" - MILE 42.1—												
Total acre-feet			38	951	1791	2162	2520	1803	808	236	10309	3478
Average cubic feet per second			1	16	29	36	41	29	14	4	21	
Monthly use in per cent of seasonal			.4	9.2	17.4	21.0	24.4	17.5	7.8	2.3		

*Mileage along river above mouth.
** All general crops. No rice.
(1) 6" unit has been removed.
(2) This is the total acreage served by this plant and the ones at Miles 25.0 and 25.5R.
(3) See plant at Mile 24.6R.
(4) This is the total acreage served by this plant and the one at Mile 27.0R.
(5) See plant at Mile 26.55R.
(6) This is the total acreage served by this plant and the one at Mile 30.95R.
(7) See plant at Mile 29.9R.
(8) Formerly listed as Mondo Brothers.
(9) Mileage formerly given as 32.0R.

TABLE 69

TUOLUMNE RIVER DIVERSIONS-1939

Water User	*Mile and Bank	Number and Size of Pump	Monthly Diversion in Acre-feet								Total Diversion March to October Acre-feet	** Acreage Irrigated
			Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.		
E. T. Mapes	(1)1.9R	(1)1-14"						15	15	15	45	20
J. de Souza and J. B. Silva	2.2R	1-3"			7	17	6	14			44	20
E. B. Henry	3.1R	1-16"		19	20	20	24	38	14		135	40
—GAGING STATION - "TUOLUMNE RIVER AT TUOLUMNE CITY" - MILE 3.35												
Bancroft Fruit Farm	4.1R	1-10"	73	37	38	27	59	42	38	7	321	(2)237
Bancroft Fruit Farm	5.0R	1-10"	43	36	38	76	64	104	27	41	429	(3)
Randolph Marketing Company (4)	7.1R	1-10"			147	59	85	128			419	100
J. J. and E. J. Schivo (5)	7.8L	1-10"	NO DIVERSION									
W. F. Duffy	7.9R	(6)1-4"	NO DIVERSION									
W. F. Duffy	8.4R	1-10"	44	39	63	100	129	102	30	6	513	80
Otis Burch (Suzuki)(7)	9.2L	1-4"				11	11		2	1	25	30
A. Holmes (Kissamos and Pavlakias)	10.2R	1-11"			50	122	24	56	16		268	58
—SOUTHERN PACIFIC RAILROAD (MAIN LINE) - MILE 15.8—												
—DRY CREEK INFLOW - MILE 16.5R—												
Mrs. L. R. Hughson (8)	20.3R	1-8"			24	17	16	14	18	14	103	32
W. J. Leckron (8)	20.5R	1-10"		13	13	13	13	13	22	19	105	52
—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	39.8L	1-6"		5	14	39	24	32	11	1	126	195
—GAGING STATION - "TUOLUMNE RIVER AT ROBERTS FERRY BRIDGE" - MILE 39.9—												
Total acre-feet			160	149	414	501	455	558	193	104	2534	864
Average cubic feet per second			3	3	7	8	7	9	3	2	5	
Monthly use in per cent of seasonal			6.3	5.9	16.3	19.8	18.0	22.0	7.6	4.1		

* Mileage along river above mouth.
** All general crops. No rice.
(1) New unit was installed and plant moved in 1939.
(2) This is the total acreage served by this plant and the one at Mile 5.0R.
(3) See plant at Mile 4.1R.
(4) Formerly W. F. Nicolson.
(5) Formerly R. S. Brown.
(6) 8" unit removed in 1939.
(7) New installation 1939.
(8) Plant not previously reported.

TABLE 70

STANISLAUS RIVER DIVERSIONS-1939

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	June	July	Aug.	Sep.	Oct.		
Frank Coker	1.1R	1-6"			7	6	12	12			37	28
E. W. Hawkins (1)	1.6R	1-7"					15				15	27
J. Chisholm	2.9R	1-8"					18				18	25
J. W. Smith (2)	3.1R	1-6"			6	11	5				22	18
Will Hawkins (3)	3.2R	1-4"			1	2	6	8	1		18	4
Hatmark Ranch	5.25L	2-14"		144	144	112	104	104	92		700	280
—GAGING STATION - "STANISLAUS RIVER AT HATMARK RANCH" - MILE 5.3—												
Bret Harte Water Users Ass'n	5.9R	1-16"	142	684	705	809	785	662	344	269	4400	1040
McMullin Reclamation Dist. #2075	5.95R	2-16"		329	458	725	716	815	408	15	3466	805
Henry Pelucca	6.7L	1-15"		38	66	69	79	40	38	1	331	57
J. W. Updike	7.4L	1-8"	NO DIVERSION									
C. C. Updike	8.2L	1-12"		6	4	4	3	38	16	26	97	83
Caswell Brothers	9.8R	1-14"	45	217	221	286	289	280	176	122	1636	282
D. F. Koetitz	10.1L	1-10"	11	131	178	158	223	184	155	175	1215	300
D. F. Koetitz	10.4L	1-18"	NO DIVERSION									
—SOUTHERN PACIFIC RAILROAD BRIDGE (MAIN LINE) - MILE 15.9—												
J. E. Alldrin (4)	18.5R	1-12"			20	23	23	23	23	23	135	135
G. R. Stoddard	19.9L	1-7"	NO DIVERSION									
Palo Alto Company	20.75R	1-14"		143	125	252	417	590	164		1691	225
Heath Ranch	20.9L	(5)1-5"		19	28	20	42	22			131	16
Earl Fruit Company	21.75R	1-8"			58	32	20	21			131	90
Cornelious de Boer (6)	22.0L	1-5"	NO DIVERSION									
Riverside Ranch (6)	22.3R	1-5"					29				29	8
		1-6"										
		1-10"										
—MODESTO-ESCALON BRIDGE - MILE 28.15—												
—SANTA FE RAILROAD CROSSING - MILE 31.85—												
Oakdale Irr. Dist.(Riverbank Pump) (3) (7)	32.9L	1-14"	137	142	269	307	364	261	189		(7) 1669	(7) 1700
Oakdale I.D. (Kaufman Pump)(3)(7)	35.9L	1-14"		38	95	129	76	44	7		(7) 389	(7) 672
Oakdale I.D.(Brady Pump) (3)	37.0L	1-14"					71	30			(7) 101	(7) 536
—SOUTHERN PACIFIC RAILROAD (OAKDALE BRANCH) - MILE 39.0 —												
—GAGING STATION - "STANISLAUS RIVER AT ORANGE BLOSSOM BRIDGE" - MILE 44.7—												
Totals			198	1848	2201	2873	3222	3310	1752	827	16231	6331
Average cubic feet per second			3	31	36	48	52	54	29	13	33	
Monthly use in per cent of seasonal			1.2	11.4	13.6	17.7	19.8	20.4	10.8	5.1		

*Mileage along river above mouth.

**All general crops. No rice.

(1) Formerly H. Salyer

(2) Plant installed about 1935 but not previously reported.

(3) New installation 1939.

(4) Plant reinstalled 1939 at an old point of diversion.

(5) Formerly listed as 4" unit.

(6) Plant not previously reported.

(7) Oakdale Irrigation District maintains plants at Miles 32.9L, 35.9L, and 37.0 L to supplement the gravity supply.

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 72 lists these channels in downstream order and gives the total flow as computed from the measurements. The report for 1939 gives, for most of the channels, the flow for the entire year.

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 72, 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 73 and 74 record the Sacramento River return water for the entire year of 1939, and indicate the relation between the return and the diversions from which it was derived. Since, in Tables 73 and 74 it is the purpose to show the return water from Sacramento River diversions only, the inflow from Butte Slough, that portion of Sacramento Slough derived from

Feather River sources (Table 90A), and from the Feather and American Rivers has been excluded. In Table 73 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 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 74. 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 73 and 74 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 20 per cent, the total return being 36 per cent. The data in Table 74 shows the monthly return flow in the Sacramento River for 1939. It also shows the monthly return in per cent of seasonal. The return percentages for the months of April, May and June are high because of a minor storm which occurred in March causing the streams to rise with a consequent percolation from the river into the adjoining water table. This water then returned to the river as the stage fell. It is probable that 11, 11 and 10 per cent for the months of April, May and June, respectively, would

be closer to the true figure. The percentages for the balance of the year represent a true picture for conditions existing during 1939.

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 units are available. Included in such units are the area above the Colusa-Williams Highway Crossing of Colusa Trough, Reclamation District 70, Reclamation District 108, Reclamation District 1500 and Reclamation District 1000. The relation between draft and return water for the Colusa Trough area is shown in Table 75, and for Reclamation Districts 70, 108 and 1500, in Tables 76, 77 and 78. It will be noted that the data for Tables 76, 77 and 78 is presented for the entire year. In computing the return water percentages no account was taken of precipitation as it is not thought that it had any material effect upon the runoff. In Tables 97 to 104 is presented the rainfall data for stations in and surrounding the above areas.

Tables 82 to 96, inclusive, present in detail the discharge records for the Sacramento valley return water channels. Wherever possible to do so the records of return was expanded to take in the entire year of 1939.

San Joaquin Return Waters

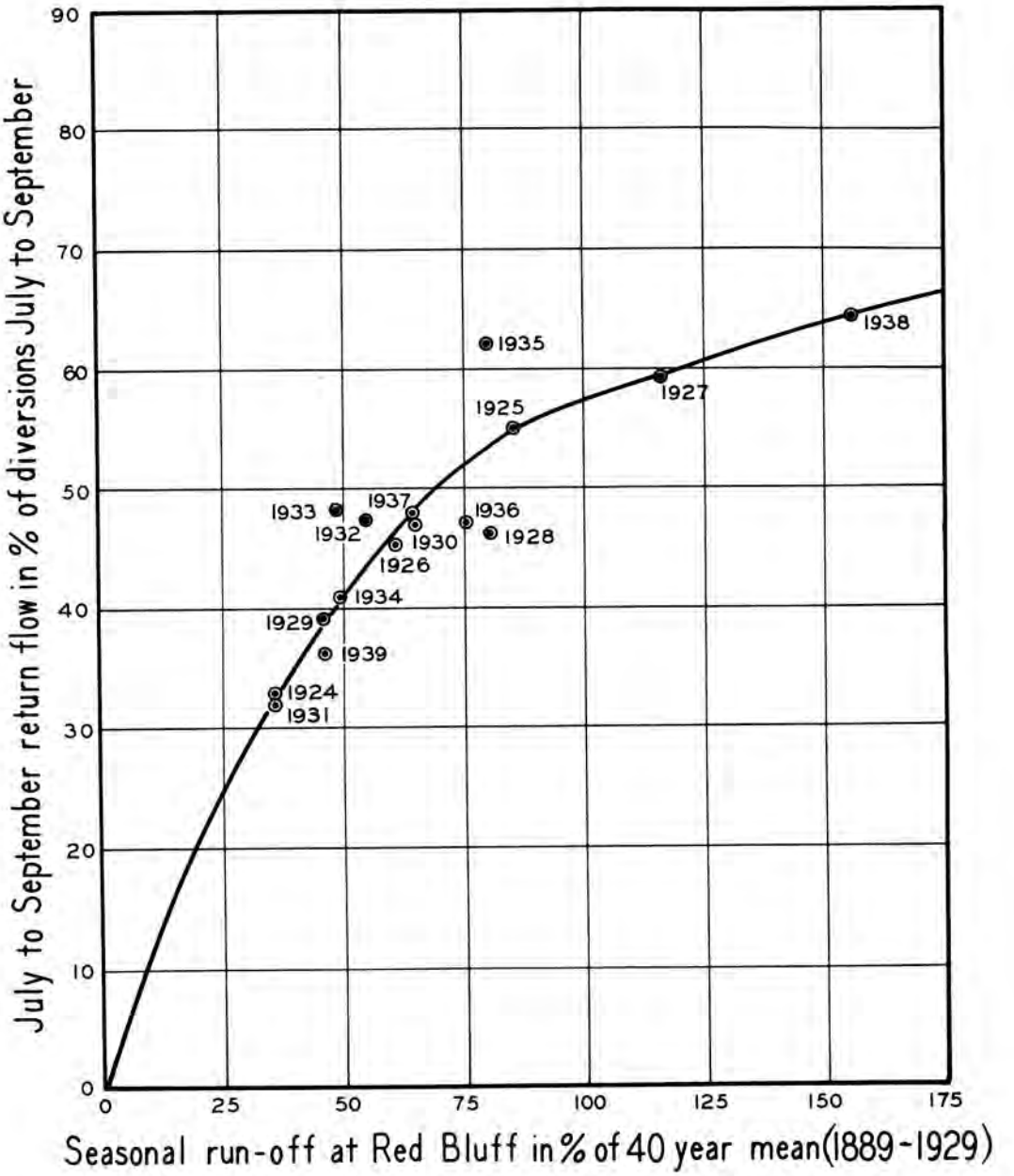
In the 1939 San Joaquin Valley return water measurements, the gaging stations were located at the same points as in previous years beginning with 1928, and the same methods were followed. A continuous record of the discharge during the summer season was obtained at all stations on each stream and in many instances the record is available for the entire year. An upper and lower station was maintained on each stream, to-wit: 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 and one at Hickman Bridge. 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 20 to 36, inclusive, and the diversion records for the San Joaquin streams above Durham Ferry Bridge, are given in Chapter III, Tables 67 to 70, inclusive.

Table 80 tabulates the results of the San Joaquin return water measurements and Table 81 shows a comparison of the return water with the irrigation draft in the San Joaquin Valley.

Comparative Sacramento and San Joaquin Return Water, 1924 to 1939

Comparative figures, 1924 to 1939, for the Sacramento and San Joaquin seasonal return water in per cent of the irrigation draft are shown in Table 71. 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 is a close relationship between the seasonal run-off at Red Bluff and the return flow percentages.



SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

SACRAMENTO RIVER

RELATION BETWEEN SEASONAL RUN-OFF AT RED BLUFF IN PER CENT OF 40 YEAR MEAN AND JULY TO SEPTEMBER RETURN FLOW IN PER CENT OF JULY TO SEPTEMBER DIVERSIONS

This is graphically shown in Plate 1 which indicates clearly that during years of good runoff the July to September return flow is greater than in years of low runoff. The higher return flow percentages occurred in the years of good runoff and the decrease in percentage in the years when the runoff was 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 71 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 runoff 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 low 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 71

SACRAMENTO AND SAN JOAQUIN RETURN WATER PERCENTAGES 1924-1939

Year	Sacramento River			San Joaquin River and Tributaries						
	Seasonal Run-off at Red Bluff in per cent of Normal *	Return Water in per cent of Diversions		Seasonal Run-off in per cent of Normal S.J.River and Tributaries**	Return Water in per cent of Diversions					Aug.-Sep. Return in per cent of Jul.-Aug. Diversions
		Jun.-Sep. Inc.	Jul.-Sep. Inc.		Jun.-Sep. Inc.	Jul.-Sep. Inc.	Aug.-Sep. Inc.	Jul.-Oct. Inc.	Aug.-Oct. Inc.	
1924	36	33	33	24		35	41			29
1925	86		(1)55	86			38			23
1926	61	49	45	55		28	32			22
1927	117	66	59	100			32			23
1928	82	49	46	67		28	28			23
1929	47	42	39	44		19	21			16
1930	65	55	47	50	20	21	22			17
1931	36	(2)33	32	26	(3)23	27	40			18
1932	54	56	47	101			26		29	21
1933	49	56	48	52		22	20	25	25	17
1934	48	45	41	35	(4)20	21	28	(5)25	33	16
1935	80		62	98		30	24	34	31	19
1936	76	56	47	100		31	25	35	32	20
1937	64		48	100		35	28	38	35	22
1938	157		64	172			41		47	29
1939	47	38	36	44	20	20	23	24	29	17

* 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 72

WATER DISCHARGED TO THE SACRAMENTO RIVER ABOVE SACRAMENTO AS MEASURED AT DEFINITE RETURN CHANNEL - 1939

Return Flow Channel	Table No.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	June to October	July to October
		Acre-feet													
Butte Slough (1)	83	20300	15500	-14100	8280	6610	1490	0	1590	4500	830	4370	21600	8410	6920
R. D. 70 Drain	86	50	0	340	980	2040	910	670	1430	1410	320	0	0	4740	3830
R. D. 108 Drain	87	320	400	0	3280	5260	4500	4640	5170	4340	2890	840	870	21540	17040
Colusa Basin Drainage (2)	89	N.R.	N.R.	N.R.	N.R.	22580	10130	9540	17510	26170	9140	N.R.	N.R.	72490	62360
Sacramento Slough (3)	90	6730	5620	91710	21890	33640	27000	19790	25140	28230	9630	10280	6630	109790	82790
R. D. 1000 Drain	96	570	510	380	0	1500	260	0	420	1400	360	240	0	2440	2180
Totals		—	—	—	—	71630	44290	34640	51260	66050	23170	—	—	219410	175120

(1) This flow is practically all from lands irrigated by Feather River diversions.

(2) A portion of the water which normally should return to the Sacramento River at this point is diverted to the Knights Landing Ridge Cut. (See Table 94).

(3) This is the combined daily flow as given in Tables 91 and 93 and includes return water from Feather River diversions (See Tables 90A and 92).

TABLE 73

RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO
(USING ONLY RETURN WATER WHICH ENTERED THROUGH DEFINITE RETURN CHANNELS*) - 1939

Return Flow Channel	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	January to Dec.	June to Sept.	July to Sept.
	Acre-feet														
Reclamation District 70 Drain	50	0	340	980	2040	910	670	1430	1410	320	0	0	8150		
Reclamation District 108 Drain	320	400	0	3280	5260	4500	4640	5170	4340	2890	840	870	32510		
Colusa Basin Drainage **	N.R.	N.R.	N.R.	N.R.	28670	14350	14130	21150	26550	9140	N.R.	N.R.	—		
Sacramento Slough	4530	4700	52870	10190	6680	5320	3880	4400	3900	3200	8240	5670	113580		
Reclamation Dist. 1000 Drain	570	510	380	0	1500	260	0	420	1400	360	240	0	5640		
Total Return	—	—	—	—	44150	25340	23320	32570	37600	15910	—	—	—	118830	93490
Diversions (Red Bluff to Sacramento)	(1) 0	(1)8500	63620	185160	206940	213200	209290	188000	70290	23130	10000	(1) 0	1178100	680760	467540
Return in % of diversions	—	—	—	—	21.3	11.9	11.1	17.3	53.5	68.8	—	—	—	17.5	20.0

NOTE: In order to show return water from Sacramento River irrigation only, the discharge to the river of Butte Slough is excluded, as is also the portion of the return through Sacramento Slough derived from Feather River diversions (Table 90A) and the surplus water diverted to Sutter By-Pass from Butte Slough (Table 84).

* As distinguished from use of all accretions as indicated in Table 74.

** Includes water diverted to Knights Landing Ridge Cut (Table 94).

(1) Estimated.

TABLE 74

RELATION BETWEEN RETURN WATER AND DRAFT, SACRAMENTO RIVER, RED BLUFF TO SACRAMENTO
(INCLUDING ALL ACCRETIONS) - 1939

River Section	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan-Dec
	Acre-feet												
Red Bluff to Butte City	33640	31700	56790	29740	29540	27500	13470	7140	2570	11520	-2900	-11000	229710
Butte City to Colusa	30700	49300	27860	73300	4430	4220	8130	2840	-460	3280	3300	12200	219100
Colusa to Wilkins Slough	-17600	-6200	-11880	11380	13810	10760	3340	4780	-1450	-520	-1570	-24300	-19450
Wilkins Slough to Knights Landing	1700	19500	-38590	26390	37710	26990	26070	31120	38060	9360	2500	19100	199910
Knights Landing to Verona	-43520	-35510	35960	2010	22830	17120	11210	11980	10160	7830	20770	-10340	50500
Verona to Sacramento	570	510	380	0	1500	260	0	420	1400	360	240	0	5640
Total return	5490	59300	70520	142820	109820	86850	62220	58280	50280	31830	22340	-14340	685400
Total Diversion-Red Bluff-Sacramento	(1) 0	(1)8500	63620	185160	206940	213200	209290	188000	70290	23130	(1)10000	(1) 0	1178100
Return in % of draft	—	—	111	77.1	53.1	40.7	29.7	31.0	71.6	138	—	—	58.2
Monthly return in % of seasonal	.80	8.65	10.29	20.84	16.02	12.67	9.08	8.50	7.34	4.64	3.26	-2.09	

River Section	Return flow Acre-feet		Red Bluff to Lower End of Section						In River Section			Red Bluff to Lower End of Section		
			Return flow Acre-feet		Diversions Acre-feet		Return flow in % of diversion		January to December			January to December		
	June to Sept.	July to Sept.	June to Sept.	July to Sept.	June to Sept.	July to Sept.	June to Sept.	July to Sept.	Return	Diversion	Return in % of Diver.	Return	Diversion	Return in % of Diver.
Red Bluff to Butte City	50680	23180	50680	23180	346170	239970	14.6	9.6	229710	601290	38.	229710	601290	38.2
Butte City to Colusa	14730	10510	65410	33690	363680	252060	18.0	13.4	219100	29660	739.	448810	630950	71.1
Colusa to Wilkins Slough	17430	6670	82840	40360	525610	363660	15.7	11.1	-19450	294230	-6.6	429360	925810	46.4
Wilkins Slu to Knights Ld	122240	95250	205080	135610	578790	397750	35.4	34.1	199910	90160	222.	629270	1015340	62.0
Knights Ldg. to Verona	50470	33350	255550	168960	591370	406110	43.2	41.6	50500	21980	230.	679770	1037320	65.5
Verona to Sacramento	2080	1820	257630	170780	680760	467540	37.8	36.5	5640	140760	4.0	685410	1178100	58.2
Total	257630	170780							685400	1178100	58.2			
Diversions (Red Bluff to Sacramento	680760	467540							1178100					
Return in % of diversions	37.8	36.5							58.2					

(1) Estimated

TABLE 75

RELATION BETWEEN THE RETURN WATER IN COLUSA TROUGH AT COLUSA-WILLIAMS HIGHWAY
AND
THE PRINCIPAL DIVERSIONS FROM WHICH THE RETURN WATER WAS DERIVED-1939
(Acre-feet except as noted)

Diversion	Mile and Bank	May	June	July	Aug.	Sep.	Oct.	June to Sept. (Inc.)	July to Sept. (Inc.)	Acreage Irrigated: General	Acreage Irrigated: Rice
Sacramento River (Table 56)											
Glenn Colusa Irrigation District	154.8R	76116	79463	78500	70596	28603	15930	257162	177699	40529	23314
Jacinto Irrigation District	154.8R	3054	3830	3360	2961	2232	1070	12383	8553	6914	0
Compton Delevan Irrigation District	154.8R	1470	1500	1410	1036	30	0	3976	2476	400	983
Provident Irrigation District	154.8R	8451	7915	8106	7217	747	0	23985	16070	1270	5734
Princeton-Codora-Glenn Irrigation Dist.	154.8R	9960	9972	10375	9185	3546	1524	33078	23106	2073	1697
Maxwell Irrigation District	154.8R	930	1200	930	856	554	675	3540	2340	0	489
Colusa Trough Plants (Table 57)		5731	6561	6689	6750	2859	176	22859	16298	0	1062
Total diversions		105712	110441	109370	98601	38571	19375	356983	246542	51186	33279
Return Flow											
Colusa Trough at Colusa-Williams Highway (1)		34270	21900	22290	25880	22320	6375	92390	70490		
Colusa Trough diversions		5731	6561	6689	6750	2859	176	22859	16298		
Total return (Acre-feet)		40001	28461	28979	32630	25179	6551	115249	86788		
Total return (Average cubic feet per second)		651	478	471	531	423	107	476	476		
Return in % of diversions		38	26	26	33	65	34	32	35		

(1) Record of flow in Colusa Trough is only available for the period May to October inclusive.

TABLE 76

RELATION BETWEEN DIVERSIONS FROM AND RETURN TO THE SACRAMENTO RIVER FROM RECLAMATION DISTRICT #70 FOR 1939

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.-Dec. inc.	Mar.-Oct. inc.	Jul.-Sep. inc.	Acreage Irrigated	
	Acre-feet															Gen.	Rice
Diversions (1)	0	1040	3363	7244	6924	7315	5339	6108	2226	3	0	0	39562	38522	13673	8275	795
Return water (2)	52	0	338	982	2040	908	668	1430	1410	320	0	0	8148	8096	3508		
Return in % of diversion	-	0	10	13	30	12	12	23	63	-	0	0	21	21	26		
Return in % of annual diversions	0.2(3)	0(3)	0.9	2.5	5.2	2.3	1.7	3.6	3.6	0.8	0	0	20.8				
Drainage rediverted (4)	0	0	0	528	830	1005	1152	914	334	0	0	0	4763	4763	2400		
Rainfall (5)																	

(1) The diversions comprise those from the Sacramento River, left bank, Mile 67.5 to Mile 83.5 (Table 56) and those from Butte Slough, Mile 0.3W to 7.5W (Table 59).
(2) The return water is the discharge to the Sacramento River through the drainage plant of Reclamation District 70 at Mile 68.8L (Table 86). This is a combined drainage and irrigation plant which also discharges into an irrigation canal at the plant.
(3) The diversion for the previous year (22154 acre-feet) has been used to determine these percentages.
(4) This is the water re-used within the district. It has not been taken into account in the percentage computations.
(5) Rainfall not taken into account in percentage figures. See Tables 97 to 104 for daily rainfall records.

TABLE 77

RELATION BETWEEN DIVERSIONS FROM AND RETURN TO THE SACRAMENTO RIVER FROM RECLAMATION DISTRICT #108 FOR 1939

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.-Dec. inc.	Mar.-Oct. inc.	Jul.-Sep. inc.	Acreage Irrigated	
	Acre-feet															Gen.	Rice
Diversions (1)	0	0	2111	15781	14366	14016	14738	10642	1387	111	0	0	73152	73152	26767	5373	6659
Return water (2)	320	400	0	3280	5260	4500	4640	5170	4340	2890	840	870	32510	30080	14150		
Return in % of diversion	-	-	0	21	37	32	32	49	313	2600	-	-	44	41	53		
Return in % of annual diversions	(3).4	(3)0.5	0	4.5	7.2	6.2	6.3	7.1	5.9	4.0	1.1	1.2	44.4				
Drainage rediverted (4)																	
Rainfall (5)																	

(1) The diversions comprise those from the Sacramento River, right bank, from Mile 43.1 to Mile 63.2 (Table 56).
(2) The return water is the discharge to Sacramento River of Reclamation District 108 drain at Rough and Ready Bend (Table 87) and on Back Borrow Pit (Table 88).
(3) The diversion for the previous year (75221 acre-feet) has been used to determine these percentages.
(4) No report of any rediversion of drainage water.
(5) Rainfall not taken into account in percentage figures. See Tables 97 to 104 for daily rainfall records.

TABLE 78

RELATION BETWEEN DIVERSIONS FROM AND RETURN TO THE SACRAMENTO RIVER FROM RECLAMATION DISTRICT #1500 FOR 1939

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.-Dec. inc.	Mar.-Oct. inc.	Jul.-Sep. inc.	Acreage Irrigated Gen.	Acreage Irrigated Rice
	Acre-feet																
Diversions (1)	0	1643	17237	35626	40195	38511	38897	37971	15514	24	0	0	225618	223975	92382	32897	12042
Return water (2)	2030	840	6720	10640	16420	14700	13590	17700	17070	3810	1860	870	106250	100650	48360		
Return in % of diversion	–	51	39	30	41	38	35	47	110	159	–	–	47	45	52		
Return in % of annual diversion	(3)0.9	(3)0.4	3.0	4.8	7.3	6.6	6.1	7.9	7.6	1.7	0.8	0.4	47.5				
Drainage rediverted (4)	0	0	0	0	880	2200	4400	4870	450	0	0	0	12800	12800	9720		
Rainfall (5)																	

(1) The diversions comprise those from the Sacramento River, left bank, from Mile 29.9 to Mile 63.75 (Table 56). The principal ones are the Sutter Mutual Water Company's plants at Tisdale, State Ranch Bend and Portuguese Bend.
(2) The return water is the discharge through the drainage plant of Reclamation District 1500 on the West Borrow Pit of the Sutter By-Pass (Table 91). This water reaches Sacramento River via Sacramento Slough (Table 90).
(3) The diversion for the previous year (217,865 acre-feet) has been used to determine these percentages.
(4) This is the water pumped from drains and re-used within district. It has not been taken into account in the percentage computations.
(5) Rainfall not taken into account in percentage figures. See Tables 97 to 104 for daily rainfall records.

TABLE 79

RELATION BETWEEN DIVERSIONS FROM AND RETURN TO THE SACRAMENTO RIVER FROM RECLAMATION DISTRICT #1000 FOR 1939

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.-Dec. inc.	Mar.-Oct. inc.	Jul.-Sep. inc.	Acreage Irrigated Gen.	Acreage Irrigated Rice
	Acre-feet																
Diversions (1)	0	0	638	9656	10535	11533	11126	10880	3383	33	0	0	57784	57784	25389	5876	3114
Return Water (2)	573	506	383	0	1500	264	0	420	1400	359	236	0	5641	4326	1820		
Return in % of diversion	–	–	60	0	14	2	0	4	41	–	–	–	10	8	7		
Return in % of annual diversion	(3)1.3	(3)1.2	0.7	–	2.6	0.5	–	0.7	2.4	0.6	0.4	–	10.4				
Drainage rediverted (4)	0	0	0	385	508	282	63	492	863	168	0	0	2761	2761	1418		
Rainfall (5)																	

(1) The diversions comprise those from the Sacramento River, left bank, from Mile 2.4 to Mile 19.6 (Table 56).
(2) The return water is the discharge through the drainage plant of Reclamation District #1000 at 2nd Bannon Slough (Table 96).
(3) The diversion for the previous year (43,787 acre-feet) has been used to determine these percentages.
(4) *This is the water pumped from the drain at the Central Mutual Water Company plant. It has not been taken into account in the percent-*age computations. In addition to this rediversion there are many small plants on drains within the district.
(5) Rainfall not taken into account in percentage figures. See Tables 97 to 104 for daily rainfall records.

TABLE 80

RETURN FLOW IN SAN JOAQUIN VALLEY STREAMS - 1939

(Acre-feet)

River Section	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
						SAN JOAQUIN RIVER						
Fremont Ford Bridge to Vernalis												
Fremont Ford Bridge to Newman	-1480	-6260	-5620	1170	2100	560	90	250	170	880	460	2570
Newman to Grayson	14170	10900	26960	20760	26900	15680	11190	11360	11580	14650	9950	4940
Grayson to Hetch Hetchy Crossing	10040	7840	13050	3920	4760	3980	3210	2230	2530	6420	3070	2450
Hetch Hetchy Crossing to Vernalis	-1270	-4870	-5120	3550	1410	3270	4040	410	710	-3440	-4730	-4470
Total net return flow*	21460	7610	29270	29400	35170	23490	18530	14250	14990	18510	8750	5490
Total diversions	0	0	7050	17490	17210	18960	25150	21280	10370	2510	0	0
						STANISLAUS RIVER						
Orange Blossom Bridge to Hatmark Ranch												
Discharge at Orange Blossom Bridge	N.R.	N.R.	N.R.	N.R.	N.R.	3490	1590	1300	882	1050	N.R.	N.R.
Discharge at Hatmark Ranch	38810	24120	16600	55240	42050	15190	11800	10440	11080	11770	13800	18180
Total net return flow**	N.R.	N.R.	N.R.	N.R.	N.R.	14440	13260	12330	11860	11550	N.R.	N.R.
Total diversions	0	0	200	1710	2040	2740	3050	3190	1660	830	0	0
						TUOLUMNE RIVER						
La Grange Bridge to Tuolumne City												
La Grange Bridge to Roberts Ferry Bridge	150	-3260	-3070	2610	2300	1670	1760	1240	1100	-950	-2500	-1100
Roberts Ferry Bridge to Hickman Bridge	N.R.	N.R.	4790	4840	5440	4510	2700	3940	3270	7950	7450	6010
Hickman Bridge to Tuolumne City	N.R.	N.R.	22690	15420	16580	12650	13620	13500	13750	13270	12820	10940
Total net return flow**	25890	21860	24410	22870	24320	18830	18880	18680	18120	20270	17770	15850
Total diversions	0	0	160	150	410	500	460	560	190	100	0	0
						MERCED RIVER						
Yosemite Valley Railroad Crossing to Mouth												
Yosemite Valley R.R. Crossing to Livingston	5200	7400	14780	8910	12390	8870	8000	7630	8710	7370	6240	7450
Livingston to mouth	N.R.	N.R.	6940	6460	3350	3720	3790	4030	3900	3520	2090	1240
Total net return flow**	N.R.	N.R.	21720	15370	15740	12590	11790	11660	12610	10890	8330	8690
Total diversions	0	0	40	950	1790	2160	2520	1800	810	240	0	0

* The return flow figure is obtained by making due allowance for diversions and deducting all measured inflow from tributaries, but it is apparent that there is a large unmeasurable accretion from lands irrigated from the tributaries.

** The excessive return flow in relation to diversions here shown is due to large irrigation district diversions which are made above upper station shown for each stream. This return flow enters the channels below the initial points on each.

TABLE 81

COMPARISON OF DIVERSIONS AND RETURN FLOW - SAN JOAQUIN VALLEY 1939
(Quantities in acre-feet except as noted)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	January to December
DIVERSIONS													
San Joaquin River near Friant (1)(2) (Miller & Lux, etc.)	0	0	105100	173600	138000	94120	84000	75200	50870	49500	38130	30470	838990
Merced at Exchequer (1) (Merced I.D.etc)	0	0	21960	67670	85790	88340	97190	84400	45620	3010	2560	2850	499390
Turlock Irrigation District Canal (1)	1330	11750	38290	89920	76540	75290	69490	74980	48080	16580	11300	15030	528580
Modesto Irrigation District Canal (1)	100	3940	22810	54680	49660	34160	49890	42280	34400	18290	6460	3110	319780
South San Joaquin & Oakdale I.D.Canal(1)	700	2850	16510	41890	49930	45290	45200	18540	7280	13510	12050	8150	261900
Oakdale Irrigation District Canal (1)	0	0	0	15100	21740	20950	20480	8470	3340	5780	3090	0	98950
Pumping Diversions-Tables 67,68,69,70.	0	0	7440	20430	21620	24490	31360	26960	13120	3670	12840	4340	166270
Total diversions - acre-feet	2130	18540	212110	463290	443280	383640	397610	330830	202710	110340	86430	63950	2713860
Total diversion - average c.f.s.	35	334	3450	7786	7209	6430	6467	5380	3407	1795	1452	1040	3749
Monthly diversion in % of seasonal	.1	.7	7.8	17.1	16.3	14.1	14.6	12.2	7.5	4.0	3.2	2.4	
RETURN FLOW													
San Joaquin River near Vernalis (1)	251500	231600	124600	146800	125200	58960	46590	43980	61500	91280	85430	97550	1364900
Pumping diversions-Tables 67,68,69,70.	0	0	7440	20430	21620	24490	31360	26960	13120	3670	12840	4340	166270
Undiverted Flow (3)													
at Fremont Ford Bridge(San Joaquin R.)(4)	74130	74930	0	0	0	0	0	0	0	0	0	10000	159060
at La Grange (Tuolumne River)	44960	39150	14140	880	3450	1600	8920	8980	11160	29840	34250	34570	228900
at Yosemite Val.R.R.Crossing(Merced R.)	41560	56930	5980	2610	1320	1400	1990	1320	720	20	190	200	114240
at Orange Blossom Bridge (Stanislaus R.)	(5)32300	(5)6630	(5)9970	(5)51110	(5)25700	3490	1590	1300	880	1050	2750	7990	144760
Power release and spill (3)													
Net return - acre-feet (6)	58550	56960	101950	112530	116350	76960	65360	59340	61860	64040	61080	49130	884210
Net return - average c.f.s.	952	1025	1658	1893	1892	1293	1062	965	1039	1041	1026	799	1221
Return in % of diversions	—	—	48	24	26	20	16	18	30	58	71	77	33
Monthly return in % of seasonal	6.6	6.5	11.5	12.7	13.2	8.7	7.4	6.7	7.0	7.2	6.9	5.6	

NOTE: For periodic relation between diversion and return flow, see Table 71.
(1) U.S.G.S. station.
(2) The entire flow of the river is considered as being diverted after March.
(3) It is assumed that these stations which are above the valley diversions and below the foothill diversions represent all undiverted flow and include all spill or power release.
(4) Corrected, using data for Delta bridge and Friant for guide.
(5) Flow below Melones dam corrected for canal diversions.
(6) Includes any valley floor run-off and all accretions.

TABLE 92

DISCHARGE OF COLUSA TROUGH AT COLUSA-WILLIAMS HIGHWAY - 1939

Day	Daily Discharge in Second-feet						
	Apr.	May	June	July	Aug.	Sep.	Oct.
1		488	350	355	335	579	137
2		509	350	378	350	573	137
3		528	345	408	362	552	160
4		554	319	392	353	522	134
5		605	311	406	362	520	127
6		600	328	426	382	558	126
7		592	366	433	376	552	140
8		622	375	420	374	495	178
9		641	348	420	380	477	151
10		607	359	415	378	484	113
11		609	366	388	385	482	92
12		600	390	331	394	452	90
13		590	404	325	394	579	79
14		533	383	328	402	588	81
15		508	397	336	411	571	91
16		497	420	328	422	345	90
17		468	436	335	428	325	84
18		464	424	357	433	287	73
19		461	411	362	424	274	69
20		464	397	385	419	245	67
21	*	549	387	362	428	229	66
22	297	688	366	340	441	201	75
23	316	728	348	347	454	176	90
24	359	696	357	342	457	157	96
25	371	652	345	338	450	173	96
26	406	615	357	331	455	207	96
27	390	556	353	323	492	198	95
28	435	504	360	323	495	160	98
29	459	491	350	319	506	149	99
30	454	464	350	342	547	142	91
31		394		345	571		103
Mean		516	368	363	421	375	104
Ac.Ft. for Month		34270	21900	22290	25890	22320	6375

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

*Beginning of record for season.

TABLE 83

DISCHARGE OF BUTTE SLOUGH TO SACRAMENTO RIVER - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	525	0	239	266	0	216	0	0	142	79	13	146
2	455	266	138	287	0	160	0	0	110	30	16	158
3	455	266	146	396	0	140	0	0	125	0	31	202
4	455	455	101	351	0	86	0	0	125	0	46	217
5	525	371	111	268	0	74	0	0	85	0	50	215
6	787	455	63	266	0	28	0	0	57	0	63	360
7	0	371	64	288	0	5	0	0	49	0	64	354
8	0	0	107	254	0	0	0	0	49	0	37	240
9	0	266	473	271	0	0	0	0	49	0	17	294
10	228	371	0	254	17	0	0	0	40	0	15	250
11	532	371	0	270	43	0	0	0	36	0	43	0
12	455	371	266	247	25	15	0	0	49	0	63	0
13	371	741	525	224	27	20	0	0	77	0	70	0
14	371	193	-1253*	229	52	5	0	0	85	0	70	0
15	371	282	-2345	115	52	0	0	0	111	0	70	371
16	371	250	-1813	36	52	0	0	0	125	0	69	525
17	371	221	-1078	60	25	0	0	0	203	0	70	525
18	371	217	-525	62	0	0	0	41	283	0	70	588
19	371	221	-525	30	6	0	0	42	85	0	70	525
20	371	211	-525	0	20	0	0	53	59	0	71	525
21	266	190	-371	0	70	0	0	58	66	4	72	525
22	371	226	0	0	149	0	0	42	28	24	91	455
23	266	269	0	0	240	0	0	36	27	24	101	525
24	266	258	-371	0	317	0	0	46	68	32	129	455
25	266	244	-266	0	322	0	0	41	70	36	141	525
26	266	238	-371	0	335	0	0	54	57	35	121	525
27	266	234	-266	0	366	0	0	58	11	32	118	455
28	266	242	0	0	359	0	0	58	0	42	125	455
29	266		0	0	356	0	0	58	0	43	144	455
30	371		371	0	283	0	0	92	0	24	143	588
31	0		0		217		0	125		12		455
Mean	331	278	-229	139	108	25	0	26	76	13	73	352
Ac.Ft. for Month	20300	15500	-14100*	8280	6610	1490	0	1590	4500	827	4370	21600
Flow over Colusa Weir	0	0	420	0	0	0	0	0	0	0	0	0

* During the period March 14-29 water was permitted (by open flap gates) to flow from Sacramento River into Butte Slough.

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 together with that shown in Tables 59 and 84 is made up almost entirely of return water from lands irrigated by Feather River diversions during the summer months. Discharge from the Sacramento River over Colusa Weir is shown at bottom of table.

TABLE 84

DISCHARGE OF BUTTE SLOUGH TO SUTTER BY-PASS - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0	98	69	200	82	186	89	89	98	80	80	96
2	0	37	82	98	75	167	89	82	98	33	88	88
3	0	0	98	98	82	167	98	75	98	43	96	104
4	0	0	108	98	98	184	89	69	98	43	96	112
5	0	0	120	98	108	167	82	75	89	38	96	96
6	28	0	98	108	108	167	75	82	82	33	88	18
7	450	0	108	98	149	167	82	89	98	25	72	0
8	450	98	82	120	186	167	89	82	98	26	65	0
9	186	98	23	108	186	149	82	82	89	25	80	0
10	48	48	40	98	212	149	82	82	83	26	100	0
11	28	25	220	98	167	149	82	89	98	25	104	65
12	0	0	200	98	167	186	82	82	108	26	96	320
13	0	34	150	120	184	187	82	89	98	25	88	420
14	0	98	2400	108	186	133	75	89	98	25	88	420
15	0	58	4000	98	186	98	82	98	108	26	88	104
16	0	59	4200	212	167	98	98	98	108	25	80	25
17	0	59	3400	185	149	149	108	98	82	26	88	16
18	0	69	2700	185	187	167	98	98	69	25	88	0
19	0	69	2300	167	187	149	89	108	38	33	88	0
20	0	69	1900	149	187	120	83	108	65	43	96	0
21	0	75	1650	133	212	120	83	98	53	53	96	0
22	0	82	1600	120	186	120	83	98	43	59	96	0
23	0	63	1400	149	186	108	83	98	53	59	120	0
24	0	58	1350	149	212	98	75	98	33	59	104	0
25	0	69	1300	186	186	98	75	98	13	53	80	0
26	0	69	1050	167	186	98	82	98	8	48	72	0
27	0	69	1040	149	186	98	75	98	9	43	72	0
28	0	69	1050	149	186	108	69	108	16	59	104	0
29	0		900	98	186	98	69	98	25	59	96	0
30	0		600	98	166	82	69	108	33	65	88	0
31	0		400		186		75	108		80		0
Mean	38	53	1117	131	166	138	83	93	70	41	90	61
Ac.Ft. for Month	2360	2960	68700	7820	10180	8200	5100	5700	4140	2550	5340	3740

NOTE: This is the discharge from Butte Slough to the East and West Borrow Pits of the Sutter By-Pass at Long Bridge. This flow is primarily from Feather River sources. During March some water entered Butte Slough over Colusa weir and also by back flow through gravity gates at mouth of Butte Slough. See Table 83 for detailed flow.

TABLE 85

DISCHARGE OF WADSWORTH CANAL TO SUTTER BY-PASS - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	35	35	30	65	45	45	38	45	51	71	54	33
2	35	35	30	85	38	45	38	45	59	71	46	33
3	35	35	30	85	38	38	38	45	67	71	46	33
4	35	35	30	72	38	38	53	45	67	80	46	33
5	35	35	60	100	45	45	53	45	67	71	46	33
6	35	35	65	257	38	45	53	45	59	62	46	33
7	35	35	65	0	38	38	53	45	51	71	54	33
8	40	35	65	24	38	38	53	45	44	54	54	33
9	40	30	65	45	45	38	45	45	59	46	46	26
10	35	30	72	62	53	38	53	45	59	54	46	26
11	35	30	72	53	62	38	62	45	59	62	54	26
12	35	30	72	45	53	45	45	45	51	71	62	26
13	35	30	72	38	53	45	38	45	44	62	90	26
14	35	30	65	45	53	38	31	45	51	62	80	26
15	35	30	72	38	53	38	38	45	51	62	62	26
16	35	30	72	38	53	38	38	45	51	62	54	33
17	35	30	65	38	38	45	45	53	59	62	46	33
18	35	30	65	38	38	45	45	53	67	62	46	33
19	35	30	65	38	45	45	45	53	59	62	46	33
20	35	30	65	45	45	38	45	53	59	62	39	33
21	35	30	65	38	53	38	45	51	59	62	39	33
22	35	30	65	45	62	38	45	51	59	54	39	33
23	35	30	65	45	70	38	38	59	80	54	39	33
24	35	30	65	53	70	31	38	59	71	54	39	33
25	35	30	65	45	70	38	38	59	80	46	39	33
26	35	30	65	45	62	38	38	59	80	54	33	33
27	35	30	65	38	70	45	38	59	71	54	33	33
28	35	30	65	38	70	45	38	59	71	62	33	33
29	35		65	31	62	45	38	59	71	62	33	33
30	35		85	45	53	45	38	59		62		33
31	35		72		45		38	59				33
Mean	35	31	63	40	51	41	43	50	62	61	49	31
Ac.Ft. for Month	2170	1740	3850	2370	3170	2430	2660	3100	3660	3780	2900	1930

NOTE: This is the discharge (measured at Weir #4) to the East Borrow Pit of the Sutter By-Pass at Mile 16.0 (north from Chandler). This flow is made up entirely of Feather River drainage or return flows. This flow and the flow from Butte Slough (Table 84) make up the entire Feather River contribution to the Sutter By-Pass.

TABLE 86

DISCHARGE OF RECLAMATION DISTRICT #70 DRAIN - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0	0	0	0	38	38	4	4	28	9	0	0
2			7	0	26	38	5	6	40	10		
3			19	0	27	23	4	7	37	9		
4			20	18	25	22	3	16	33	10		
5			20	16	30	17	5	24	34	1		
6			20	15	19	30	4	24	30	4		
7			20	13	13	30	6	9	27	4		
8			20	10	18	22	8	4	26	5		
9	0		18	6	25	17	10	11	27	4		
10	10		14	14	25	29	10	29	26	5		
11	17		6	14	40	25	7	23	31	4		
12	0		0	24	38	21	24	17	16	5		
13			5	18	39	14	29	5	8	5		
14			0	14	43	12	24	2	8	5		
15				10	49	3	14	18	9	5		
16	DISCHARGE	DISCHARGE		7	42	4	14	34	69	5	DISCHARGE	DISCHARGE
17				13	39	4	21	33	30	5		
18				14	38	8	19	33	26	5		
19				14	39	7	9	32	23	5		
20				7	40	33	6	29	27	5		
21				2	25	25	6	28	28	5		
22	NO	NO	DISCHARGE	2	38	5	6	29	27	5	NO	NO
23				29	50	4	6	28	27	5		
24				8	45	0	6	34	16	6		
25				20	38	0	5	33	12	5		
26				32	23	6	5	33	0	5		
27				54	19	4	16	33	9	5		
28		0		28	32	5	34	37	10	5		
29				38	32	4	14	36	9	5		
30				51	30	5	8	33	10	2		
31	0		0		33		8	31		2		
Mean	0	0	2.7	8.2	17	7.6	5.4	12	12	2.6	0	0
Ac.Ft. to Sacramento River	54	0	338	982	2040	908	668	1430	1410	320	0	0
Ac.Ft. to irrigation canal	0	0	0	528	830	1005	1152	914	334	0	0	0

NOTE: This is the drainage from Reclamation District #70 returned to the Sacramento River at Mile 68.8 Left. Discharge to Sacramento River both by pumping and controlled gravity flow. This is a combination irrigation and drainage plant and discharges both to the Sacramento River and to an irrigation canal.

TABLE 87

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN AT ROUGH AND READY BEND - 1939

Day	Daily Diversions in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0	0	0	0	28	73	70	80	94	44	24	12
2	0	0		0	59	77	68	52	91	35	18	18
3	0	0		0	89	83	55	110	90	44	18	24
4	0	0		0	197	87	69	105	89	37	24	32
5	0	203		0	0	90	71	96	91	35	30	24
6	0	0		0	49	91	75	85	92	40	18	42
7	0			0	310	90	76	77	94	46	18	35
8	159			0	70	91	79	77	95	48	18	32
9	0			392	68	91	76	77	95	46	24	24
10				C	71	91	76	79	93	46	30	30
11				0	75	89	77	80	91	44	30	0
12				0	77	84	69	82	86	42	30	0
13				0	76	80	85	83	83	42	6	0
14				0	76	76	82	80	84	50	6	0
15				0	79	71	76	77	82	54	6	0
16				313	83	74	75	80	73	55	12	0
17				0	84	71	73	77	68	57	12	165
18				0	87	69	73	85	67	57	0	0
19				0	89	63	73	86	61	59	0	
20				0	92	91	73	86	63	60	0	
21				0	90	61	75	86	61	60	6	
22				59	87	91	74	90	60	61	6	
23				318	83	68	76	90	34	63	12	
24	NO DISCHARGE	NO DISCHARGE	NO DISCHARGE	0	77	67	79	93	32	67	12	NO DISCHARGE
25				42	142	67	80	91	61	67	12	
26				57	7	67	80	89	67	65	12	
27				67	109	68	80	85	57	17	12	
28		0		67	170	68	76	85	50	97	12	
29				69	12	69	79	85	42	0	6	
30				272	54	70	77	57	40	0	12	
31	0		0	-	63		80	103		18		0
Mean	5	7	0	55	86	76	75	84	73	47	14	14
Ac.Ft. for Month	320	400	0	3280	5260	4500	4640	5170	4340	2890	840	870

NOTE: This is the drainage from Reclamation District 108 discharged to the Sacramento River at Mile 44.0 Right. Discharge through siphon and by pumping. Additional drainage from Reclamation District 108 is sometimes discharged to Back Borrow Pit at Mile 20.2 Left. See Table 88.

TABLE 88

DISCHARGE OF RECLAMATION DISTRICT 108 DRAIN ON BACK BORROW PIT - 1939

Day	Daily Diversions in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12			NOTE: This gravity drain remained closed during the 1939 season. All drainage from Reclamation District 108 was returned to the Sacramento River at Mile 44.0 Right. See Table 87.									
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
Mean												
Ac.Ft. for Month												

TABLE 99

DISCHARGE OF COLUSA BASIN DRAINAGE TO SACRAMENTO RIVER AT KNIGHTS LANDING
1939

Day	Daily Discharge in Second-feet						
	Apr.	May	June	July	Aug.	Sep.	Oct.
1		181	223	170	153	574	214
2		190	180	179	149	594	228
3		206	151	204	152	533	228
4		321	153	215	152	553	241
5		418	153	219	152	553	251
6		389	154	221	163	645	231
7		370	156	226	226	657	235
8		399	158	224	254	592	231
9		439	160	210	240	571	241
10		460	161	130	226	529	191
11		488	163	134	240	690	152
12		480	166	124	255	628	124
13		423	180	118	269	606	109
14		425	186	118	258	585	99
15		383	183	125	284	539	102
16		330	190	134	279	522	113
17		320	207	136	279	476	128
18		285	211	138	279	390	123
19		310	207	138	293	338	106
20		267	177	136	316	296	96
21	15*	279	165	134	309	277	93
22	15	372	145	136	300	251	87
23	15	530	136	148	342	198	84
24	15	578	178	157	360	160	106
25	15	520	164	149	368	171	110
26	16	460	163	144	378	228	106
27	16	400	159	138	378	281	106
28	16	347	158	122	414	308	113
29	160	302	160	125	414	261	114
30	168	263	159	127	453	200	120
31		259		130	492		128
Mean		367	170	155	285	440	149
Ac.Ft. for Month		22580	10130	9540	17510	26170	9140

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 any 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 94.

*Beginning of record for season.

TABLE 90

DISCHARGE OF SACRAMENTO SLOUGH TO SACRAMENTO RIVER ABOVE VERONA-1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1					365	646	238	331	480	280		
2					354	606	243	325	492	250		
3					365	473	255	322	555	216		
4					426	548	295	328	579	227		
5					408	507	293	267	550	201		
6					367	507	333	329	584	219		
7					486	540	290	267	567	106		
8					383	573	328	326	589	262		
9					439	542	499	353	788	106		
10					436	634	394	369	760	212		
11					452	668	390	371	518	86		
12					452	380	390	332	473	197		
13					450	396	350	451	595	86		
14	(1)	(1)	(1)	(1)	621	425	280	400	555	86	(1)	(1)
15					486	463	280	421	477	262		
16					643	495	326	406	447	86		
17					436	404	267	407	638	86		
18					481	546	338	409	353	206		
19					406	414	337	474	591	78		
20				409*	438	396	288	676	433	189		
21				482	619	384	353	279	387	86		
22				500	330	405	293	431	384	204		
23				618	623	405	346	426	285	78		
24				538	803	312	310	422	433	78		
25				373	1120	440	380	422	287	192		
26				366	1140	319	305	420	311	66		
27				392	1050	348	320	682	273	66		
28				416	667	343	320	446	275	61		
29				368	476	254	316	564	315	351		
30				464	590	240	342	500	258	78		
31				-	646	-	267	518	-	156		
Mean					547	454	315	409	474	157		
Ac.Ft. for Month	(1) 6730	(1) 5620	(1) 91710	(1) 21890	33640	27000	19790	25140	28230	9630	(1) 10280	(1) 6630

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 91) and West Borrow Pit of Sutter By-Pass 1.4 miles above Reclamation District 1500 Drain (Table 93). The flow in Table 93 includes the flow in Table 92.

* Beginning of record at this point for season.

(1) Due to backwater from Sacramento River it would be difficult to record the flow throughout the year. However as this flow is primarily made up of the measured flow entering the Sutter By-Pass, the flows shown in Tables 84, 85 and 91 have been used to make the estimate of flow given for months when Sacramento Slu data was lacking. See Table 90A.

TABLE 90A

SACRAMENTO SLOUGH - COMPONENT PARTS OF FLOW - 1939

Acre-feet

	From: Table No.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
From Feather River via Butte Slu(2)	84	2360	2960	68700	7820	10180	8200	5100	5700	4140	2550	5340	3740
From Sacramento R. via Colusa Weir	83	0	0	(1)420	0	0	0	0	0	0	0	0	0
From Sacramento River via Butte Sl	83	0	0	(1)19260	0	0	0	0	0	0	0	0	0
From Feather River via Wadsworth canal (2)	85	2170	1740	3850	2370	3170	2430	2660	3100	3660	3780	2900	1930
From Sacramento River via R.D.1500	91	2030	840	6720	10640	16420	14700	13590	17700	17070	3810	1860	870
From Feather River via Sutter By-Pass at Chandler	92	5420	5410	9990	3790	(3)10210	(3)6740	(3)2630	(3)3770	(3)9430	(3)4370	3690	5810
From Sacramento & Feather Rivers via Sutter By-Pass at R.D.1500	93	N.R.	N.R.	N.R.	N.R.	17220	12300	6200	7440	11160	5820	N.R.	N.R.
From Sacramento River via Tisdale Weir	93	0	0	11770	0	0	0	0	0	0	0	0	0
Sacramento Slough	90	(7)(4)6730	(7)(4)5620	(7)(4) 91710	(7)(4) 21890	(5) 33640	(5) 27000	(5) 19790	(5) 25140	(5) 28230	(5)9630	(7)(4) 10280	(7)(4) 6630
Sacramento River Water		(7)2200	(7) 920	(7)38840	(7)11700	(6)27960	(6)21680	(6)15910	(6)20740	(6)24330	(6)6430	(7)2040	(7)960
Feather River Water		4530	4700	52870	10190	6680	5320	3880	4400	3900	3200	8240	5670
Diversions East Borrow Pit	60	0	0	301	1052	3588	4131	4354	4635	1155	0	0	0
Diversions West Borrow Pit	60	0	0	0	2280	2205	2076	2292	2321	1252	0	0	0
Total Diversions		0	0	301	3332	5793	6207	6646	6956	2407	0	0	0

(1) Included in March flow for Table 84.
(2) These flows after serving irrigation demands together with any accumulated drainage and a portion of the flow shown in Table 84 is again recorded in Table 92 and Table 93.
(3) Included in flow shown in Table 93.
(4) Tables 84, 85, 91 and 93 combined.
(5) Tables 91 and 93 combined.
(6) Table 90 -.50(84 + 85)
(7) 10% added to R.D. 1500 to allow for accretions in West Borrow Pit above discharge point.

TABLE 91

DISCHARGE OF RECLAMATION DISTRICT 1500 DRAIN - 1939

Day	Daily Diversions in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	110	108	0	0	222	278	167	260	337	137	0	0
2	0	0	0	219	211	276	177	254	349	92	78	0
3	0	0	95	226	222	281	184	251	449	73	0	0
4	94	0	105	204	283	356	209	257	387	97	0	0
5	0	114	115	102	278	270	187	196	313	71	118	0
6	93	0	154	106	237	270	227	258	371	89	0	0
7	0	0	172	109	343	276	184	196	375	0	0	0
8	116	0	124	120	225	278	210	255	376	144	0	0
9	0	101	296	227	281	278	356	257	630	0	0	0
10	0	0	298	111	278	397	251	251	496	116	65	0
11	99	0	0	115	278	476	260	253	326	0	131	0
12	0	102	361	119	278	188	260	202	315	101	41	59
13	95	0	0	120	237	222	254	321	421	0	37	0
14	0	0	0	119	357	212	184	257	363	0	0	0
15	85	0	0	120	222	226	202	263	303	176	0	0
16	0	0	0	429	379	231	260	253	255	0	0	0
17	0	0	0	0	223	167	196	264	425	0	0	118
18	0	0	0	113	217	333	250	266	116	120	0	0
19	100	0	209	167	214	222	251	331	261	0	185	0
20	0	0	0	172	201	222	192	533	259	103	34	0
21	0	0	96	245	382	226	257	136	213	0	29	0
22	131	0	146	236	0	231	187	288	210	118	15	0
23	0	0	128	354	173	231	228	283	111	0	46	0
24	0	0	137	243	473	154	192	279	241	0	27	125
25	0	0	0	160	439	282	262	279	113	114	0	0
26	98	0	220	192	420	161	187	277	119	0	55	0
27	0	0	142	218	420	190	202	539	99	0	0	0
28	0	0	137	273	217	200	202	303	101	0	0	0
29	0		138	225	68	124	210	421	157	294	75	0
30	0		154	321	222	154	256	357	115	0	0	0
31	0		159	-	278		196	375		78		135
Mean	33	15	109	179	267	247	221	288	287	62	31	14
Ac.Ft. for Month	2030	840	6720	10640	16420	14700	13590	17700	17070	3810	1860	870

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 90.

TABLE 92

DISCHARGE OF SUTTER BY-PASS - EAST BORROW PIT (WILLOW SLOUGH AT CHANDLER) - 1939

Day	Daily Diversions in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	8	60	40	177	104	243	12	15	86	89	60	57
2	8	108	40	134	104	42	12	15	140	89	60	53
3	8	115	40	80	114	114	28	14	168	89	60	53
4	8	103	20	17	104	59	51	14	167	88	60	53
5	8	92	5	17	87	87	51	14	165	86	60	53
6	81	92	6	17	104	166	51	14	151	81	60	53
7	219	80	6	17	104	189	60	24	160	79	60	53
8	233	86	6	17	104	168	73	48	156	81	60	50
9	237	123	45	17	87	155	73	66	155	86	60	50
10	230	150	128	17	80	132	73	66	155	71	60	50
11	219	160	103	17	66	118	68	70	154	69	60	53
12	212	135	135	17	87	118	49	76	153	68	60	219
13	203	115	175	59	114	141	43	76	153	67	60	227
14	113	103	213	59	114	166	27	76	153	66	63	229
15	93	97	252	59	144	166	12	76	193	66	72	237
16	80	103	307	47	144	164	26	76	234	66	77	229
17	72	92	307	47	166	127	37	76	229	66	72	214
18	93	86	304	59	177	112	40	76	226	66	72	203
19	60	82	302	66	199	100	51	76	213	66	67	122
20	57	82	299	80	210	91	51	76	198	60	63	92
21	53	82	296	80	210	91	51	76	188	63	60	77
22	50	77	293	66	243	91	53	76	166	63	60	67
23	47	73	290	66	279	91	53	76	159	62	60	57
24	47	60	200	66	267	91	53	76	144	67	60	53
25	47	57	205	80	255	95	53	74	135	66	60	50
26	47	53	238	104	255	89	53	73	123	64	60	50
27	43	53	134	114	255	84	50	76	113	64	60	50
28	43	50	125	114	243	67	27	79	107	64	60	47
29	47	50	147	114	243	31	15	81	99	63	57	43
30	47	50	164	87	243	12	15	83	90	63	57	43
31	50	50	162		243		15	86	0	63		43
Mean	88	88	162	64	166	113	43	61	158	71	62	95
Ac.Ft. for Month	5420	5410	9990	3790	10210	6740	2630	3770	9430	4370	3690	5810

NOTE: This is return water originating from Feather River and Butte Slough diversions (Tables 84 and 85). It is discharged to Willow Slough through a controlled culvert at Chandler, thence across Sutter By-Pass to the West Borrow Pit (Table 93) and thence via the latter and Sacramento Slough (Table 90) (in the By-Pass) to Sacramento River.

TABLE 93

DISCHARGE OF SUTTER BY-PASS - WEST BORROW PIT 0.4 MILE ABOVE RECLAMATION DISTRICT 1500 DRAINAGE PLANT-1939

Day	Daily Discharge in Second-feet						
	Apr.	May	June	July	Aug.	Sep.	Oct.
1		143	368	71	71	143	143
2		143	330	66	71	143	158
3		143	192	71	71	106	143
4		143	192	86	71	192	130
5		130	237	106	71	237	130
6		130	237	106	71	213	130
7		143	264	106	71	192	106
8		158	295	118	71	213	118
9		158	264	143	96	158	106
10		158	237	143	118	264	96
11		174	192	130	118	192	86
12		174	192	130	130	158	96
13		213	174	96	130	174	86
14		264	213	96	143	192	86
15		264	237	78	158	174	96
16		264	264	66	143	192	86
17		213	237	71	143	213	86
18		264	213	78	143	237	96
19		192	192	96	143	330	78
20	237*	237	174	96	143	174	96
21	237	237	158	106	143	174	86
22	264	330	174	106	143	174	86
23	264	450	174	118	143	174	78
24	295	330	158	118	143	192	78
25	213	678	158	118	143	174	78
26	174	724	158	118	143	192	66
27	174	632	158	118	143	174	66
28	143	450	143	118	143	174	61
29	143	408	130	106	143	158	57
30	143	368	86	86	143	143	78
31		368		71	143		78
Mean		280	207	101	121	188	95
Ac.Ft. for Month		17220	12300	6200	7440	11160	5820

NOTE: This is the flow in the West Borrow Pit below the confluence of the East Borrow Pit flow entering via Willow Slough. This flow is joined by the discharge through R.D. 1500 drainage plant and the combined flow is thence discharged via Sacramento Slough (in the By-Pass) to Sacramento River. This is one of the sources measured to obtain the total flow in Sacramento Slough. See Table 90. In addition to the flow from the Sacramento River entering the By-Pass during March indicated in Table 84, there was a flow over Tisdale Weir on March 15 and 16 amounting to 11,770 acre-feet.

*Beginning of record for season.

TABLE 94

DISCHARGE OF KNIGHTS LANDING RIDGE CUT AT WEST LINE OF YOLO BY-PASS - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1				0	122	14	65	72	37			
2					133	0	72	69	33			
3					139	0	76	71	30			
4					136	8	86	71	31			
5					105	7	91	71	33			
6					100	11	96	75	19			
7					98	20	101	78	6			
8					98	36	100	74	1			
9					106	57	92	62	0			
10					111	83	72	57	0			
11					116	92	75	58	0			
12					117	101	55	61	0			
13	FLOW	FLOW	NITUDE*	FLOW	107	112	44	46	0	FLOW	FLOW	FLOW
14					104	116	49	42	0			
15					99	114	65	46	0			
16					93	118	75	46	0			
17	NO	NO	MAG	NO	84	121	78	47	0	NO	NO	NO
18					76	125	80	47	0			
19			ANY		79	121	80	52	0			
20					69	110	78	59	0			
21				17	78	107	75	57	0			
22			OF	15	102	93	78	57	0			
23				16	121	87	74	62	0			
24			FLOW	21	119	74	74	65	0			
25				31	113	70	69	99	0			
26				51	104	69	66	65	0			
27			NO	69	93	66	72	52	0			
28				73	82	65	62	48	0			
29				96	70	67	65	54	0			
30				116	57	66	68	56	0			
31					40		71	46	0			
Mean	0	0	*		99	71	75	59	24	0	0	0
Ac.Ft. for Month	0	0	*		6090	4220	4590	3640	377	0	0	0

NOTE: This is Colusa Basin drainage (Table 89) diverted to the Ridge Cut above the outfall gates on the Back Borrow Pit of R.D. 108. Diversion is made possible by blocking the gates. Water so diverted is available for Yolo By-Pass diverters (Table 60).

* During March there may have been a small flow of short duration but no record was obtained.

TABLE 95

DISCHARGE OF YOLO BY-PASS - EAST BORROW PIT (TULE CANAL) - 1939

Day	Daily Discharge in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	6	6	8	52	0	21	16	8	0	14	1	1
2	8	9	6	32	0	18	15	7	0	14	1	1
3	10	3	4	22	0	13	15	8	0	13	1	2
4	13	11	2	13	5	13	18	9	0	12	1	2
5	15	10	0	6	14	12	19	9	20	11	1	2
6	18	10	0	4	22	9	21	9	163	11	1	3
7	20	13	0	2	26	6	22	9	125	12	1	3
8	22	14	0	2	23	4	22	9	102	11	1	3
9	22	16	0	0	28	4	22	10	83	10	1	3
10	28	64			31	5	22	9	67	10	1	2
11	32	78			37	6	22	9	50	9	1	4
12	32	76			48	6	21	10	44	9	1	4
13	32	74			154	6	21	10	47	9	1	4
14	30	64			106	6	19	9	56	8	1	4
15	28	62			82	8	17	7	57	8	0	4
16	28	62			72	12	15	9	51	8	0	4
17	23	58			57	14	14	6	44	7	0	4
18	22	51	FLOW		48	18	13	5	37	6	0	4
19	21	55		FLOW	50	23	14	4	34	5	0	4
20	20	53			50	28	14	5	32	4	0	4
21	19	49			52	32	14	6	29	2	0	4
22	18	46	NO	NO	62	33	14	6	26	1	1	4
23	18	45			59	32	12	6	24	1	0	4
24	17	41			57	31	12	5	22	1	0	3
25	16	34			47	30	12	5	21	2	1	3
26	14	28			40	28	11	6	20	1	1	3
27	13	20			33	27	10	7	19	1	1	3
28	13	14			29	24	9	7	18	1	1	3
29	8	-			24	22	8	7	16	0	1	3
30	7	-			22	20	8	7	15	1	1	3
31	7	-	94		22		8	4		1		2
Mean	19	38	4	4	42	17	15	7	41	7	1	3
Ac.Ft. for Month	1150	2110	226	264	2580	1010	952	444	2420	403	42	192

NOTE: Station is 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 12 gives total flow passing Sacramento to Delta.

TABLE 96

DISCHARGE OF RECLAMATION DISTRICT 1000 DRAIN (2ND BANNON SLOUGH) - 1939

Day	Daily Diversions in Second-feet											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1												
2												
3	35	14			100				69			
4		80			60							
5						93						
6	43										56	
7									92	84	63	
8			78									
9	37	13	115		67							
10		17							88			
11									83			
12					93							
13	48			FLOW	87		FLOW					FLOW
14		27						42				
15		104							45			
16												
17				NO			NO					NO
18					84			43				
19	61								46			
20												
21									84			
22					88							
23						40			105			
24												
25					91			52	56			
26	65									31		
27										66		
28									36			
29					84							
30												
31								75				
Mean	9.3	8.8	6.2	0	25	4.4	0	6.8	2.3	5.8	4.0	0
Ac.Ft. for Month	573	506	383	0	1500	264	0	420	1400	359	236	0

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

TABLE 97

DAILY RECORD OF PRECIPITATION (IN INCHES) AT COLUSA-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1										.01		
2				.03						.26		
3	.15	.13										
4	.08	.04										
5	.58											
6	.03	.03	.02							.13		.01
7										.04		
8			.36									.05
9		Tr.	.70									Tr.
10		.12	.27				0.1					Tr.
11		.02			Tr.							.44
12			.01						Tr.			
13			.02	Tr.					.03			
14												
15												Tr.
16						Tr.						
17						Tr.						
18												
19												
20												Tr.
21	.15				.56							
22					.09							
23					.05							.05
24								Tr.		.04		Tr.
25											.22	
26									.39		.07	
27	.11		.02						.02			
28												.03
29	.02											.31
30	.38											
31												.30
Total for Month	1.50	.34	1.40	.03	.70	Tr.	0.1	Tr.	.44	.48	.29	1.19
Total for Year	6.38											

*United States Weather Bureau records.

TABLE 98

DAILY RECORD OF PRECIPITATION (IN INCHES) AT MARYSVILLE-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1										.23		
2												
3	.17	.25										
4	.15											
5	1.01									.14		.01
6		.05	.04									
7		.02	.33									Tr.
8			.66									
9		.05	.89									
10		.02	.01		.05							.61
11												
12				.13								
13			Tr.	.27								
14												
15												
16						.12						
17												
18												
19												Tr.
20	.06		Tr.		.52							
21	.01				.55							
22					.05							
23												.06
24										.54		
25									.36		.03	
26			.12						.06			
27	.14											
28												.32
29												.17
30	.52											.10
31												.58
Total for Month	2.06	.39	2.05	.40	1.17	.12	0	0	.42	.91	.03	1.85
Total for Year	9.40											

*United States Weather Bureau records.

TABLE 99

DAILY RECORD OF PRECIPITATION (IN INCHES) AT NOAH RANCH-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1										.26		
2	.13	.09										
3												
4	.50											
5		Tr.										
6										.12		
7		Tr.										
8		Tr.	.72									
9		Tr.	.75									
10		.06										
11												
12												
13												
14												
15												
16												
17												.48
18												
19												
20												
21					1.19							
22												
23												
24										.16		
25												
26									.78			
27			.19									
28												
29												.37
30	.12											
31												.50
Total for Month:	.75	.15	1.66	0	1.19	0	0	0	.78	.54	0	1.35
Total for Year:	6.42											

*South end of Reclamation District 1660. One mile north of Tisdale weir. Record kept by Robert Noah.

TABLE 100

DAILY RECORD OF PRECIPITATION (IN INCHES) AT WILKINS SLOUGH-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1				.01						.33		
2	.15	.12										
3												
4	.44											
5	.06									.20		
6		.07										
7			.67									
8			.56									
9		.15	.24									
10												.52
11												
12				.02								
13												
14												
15												
16												
17												
18												
19												
20	.09		.05		.76							
21					.13							
22												.05
23										.28		
24											.03	
25									1.23			
26												
27	.17		.10									
28												.32
29	.18											
30									0.03			.14
31												.48
Total for Month	1.09	.34	1.62	.03	.89	0	0	0	1.26	.81	.03	1.51
Total for Year	7.58											

*Near Grimes, at Reclamation District 108 pumping plant.
Record kept by District.

TABLE 101

DAILY RECORD OF PRECIPITATION (IN INCHES) AT NICOLAUS-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1										.15		
2				.04						.39		
3	.13	.20										
4	.02	.19										
5	.91											
6	.12	.05	.03							.19		.12
7			.01									
8		.09	.43									.03
9			.69									
10		.12	.23									
11												.50
12												
13			.03	.05								
14												
15												
16												
17												.03
18												
19												
20			.02									
21					.61							
22												
23					.04							.03
24										.30		
25										.02	Tr.	
26									.98			
27			.72									
28	.19											.04
29												.32
30	.32											
31												
Total for Month	1.69	.65	2.16	.09	.65	0	0	0	.98	1.05	Tr.	1.07
Total for Year	8.34											

*United States Weather Bureau Station.

TABLE 102

DAILY RECORD OF PRECIPITATION (IN INCHES) AT ROBBINS-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1				.04						.33		
2	.18	.22										
3		.09										
4	1.92											
5	.14	.07	.03							.13		.02
6		.03										
7		.04	.82									
8			.83				Tr.					
9		.18	.27									.57
10												
11												
12			.04	.12								
13												
14												
15												.02
16												
17												
18												
19			.05		.41							
20	.07				.02							.03
21					.01					.21		.04
22										Tr.		
23									.27		.04	
24												
25			.10									.04
26	.07											.30
27												.07
28	.31											.34
29												.28
30												
31												
Total for Month:	2.69	.63	2.14	.16	.44	0	Tr.	0	.27	.67	.04	1.71
Total for Year:	8.75											

*South central portion of Reclamation District 1500.
Record kept by Reclamation District 1500.

TABLE 103

DAILY RECORD OF PRECIPITATION (IN INCHES) AT KNIGHTS LANDING-1939 *

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1										.05		
2				.03						.35		
3	.12	.20										
4	Tr.	.06										
5	.52											Tr.
6	.10	.03	.02							.15		
7		.06	Tr.							.03		
8		Tr.	.55									Tr.
9			.90									Tr.
10		.13	.33									Tr.
11												.36
12												
13			Tr.	.10					Tr.			
14												
15												
16					Tr.							
17												
18												
19												
20			Tr.									
21	.07		Tr.		.30							
22												
23				Tr.								Tr.
24										.12		Tr.
25										.07	Tr.	
26			Tr.						.67		.02	
27			.07									
28	.08											.03
29												.28
30	.20											
31												.03
Total for Month:	1.09	.48	1.87	.13	.30	0	0	0	.67	.77	.02	.70
Total for Year:	6.03											

* United States Weather Bureau station.

TABLE 104

DAILY RECORD OF PRECIPITATION (IN INCHES) AT SACRAMENTO-1939*

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1				.03						.20		
2	.09	.20		.21						Tr.		
3	.01	.16	Tr.									
4	.90	.01										
5	.29									.03		.03
6		.28	.11							.08		
7		.32	.05									Tr.
8			1.37									Tr.
9		.07	.68				Tr.					Tr.
10		.01			.26		Tr.					.45
11									Tr.			
12		.01	Tr.									
13			Tr.	.01	Tr.				Tr.			
14						Tr.						
15						Tr.						
16						Tr.						
17												
18					Tr.				Tr.			
19	Tr.								Tr.			.02
20	.06		Tr.		.13							
21	.01		Tr.		.45							
22					.08							
23												.03
24	Tr.		Tr.						Tr.	.14		
25	.01		Tr.						.21		.07	
26	Tr.		.21						.03			
27	.08											
28												.24
29	.32											.13
30	.14								.11			Tr.
31												.25
Total for Month	1.91	1.06	2.42	.25	.92	Tr.	Tr.	0	.35	.45	.07	1.15
Total for Year					8.58							

*United States Weather Bureau station.

CHAPTER V

USE OF WATER IN THE SACRAMENTO-SAN JOAQUIN DELTA

As outlined in detail in preceding reports, (1924 to 1933, inclusive) an investigation having as its objective, a complete annual determination of the consumptive use of water in the entire Sacramento-San Joaquin Delta, comprised of experimental work to determine the unit consumptive use of water by the various irrigated crops and vegetation in the Delta and the general field work to obtain annually a complete census of the irrigated crops and water consuming areas. With the unit consumptive use of water determined by the experimental work and the complete census available, the former may be applied to the data of the latter to derive the consumptive use of water in the Delta as a whole or on individual tracts or islands.

Annual Census of Irrigated Crop Acreages and Water Consuming Areas

Detailed results of the census of the irrigated crop acreages in water consuming areas of the Delta as conducted by the Division of Water Resources are shown in the Reports for the years 1924 to 1932 inclusive and 1938, the detailed census being omitted for the years 1933 to 1937 inclusive. In the course of the Delta investigations it has been found that in general all lands below certain elevation (5.0 U.S.G.S. datum) whether idle or cropped, receive and consume water derived by seepage from the adjacent channels. It was necessary therefor that all such lands be accounted for in computing the total consumptive use of water.

The cropped area is not suddenly changed from year to year so it is possible that by making detailed surveys at intervals to determine the trend of use and thereby determine the total consumptive use for any particular year.

Consumptive Use of Water in the Sacramento-San Joaquin Delta

In Table 105 is shown the unit consumptive use of water in the Sacramento-San Joaquin Delta. These unit figures are those developed from experimental data and with one exception are those which were used in the computation for Bulletin No. 27 of the Division of Water Resources. The exception was the use of water by weeds which has been increased to correspond with a total annual consumption of 2.15 acre-feet per acre. This change was based on later weed tank experiments. It is possible that a continuation of the experimental work terminated in 1932 would indicate certain other changes in these unit figures with respect to acquatic growths, weeds and open water surfaces, but other than the above mentioned change for the item of idle land with weeds, the results of the work to date would apparently afford no justification for any material revision at this time of the figures previously used.

Table 106 shows the consumptive use of water in the Sacramento-San Joaquin Delta for the period 1924-1932 inclusive and 1938.

In previous reports the total consumptive use of water has been segregated to show the use in each river delta. Previous reports have also shown a classification of the irrigated crops with respect to the peat and sedimentary soils on which they were produced.

TABLE 105

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

Crop or Classification	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total Seasonal Use	Total Annual Use
Alfalfa	(.06)	(.08)	.10	.30	.40	.50	.65	.55	.50	.20	(.10)	(.07)	3.20	3.51
Asparagus	.05	.05	.05	.05	.08	.14	.40	.68	.55	.42	.12	.10	2.69	2.69
Beans	(.06)	(.08)	(.08)	(.16)	(.20)	.14	.24	.58	.37	(.09)	(.07)	(.05)	1.33	2.12
Beets	(.06)	(.08)	(.08)	.13	.32	.51	.61*	.53*	.20*	(.13)	(.10)	(.07)	2.30	2.82
Celery	(.04)	(.04)	(.04)	(.08)	(.10)	.10	.10	.20	.25	.30	.20	.05	1.20	1.50
Corn	(.04)	(.04)	(.04)	(.08)	(.10)	.24	.85	.94*	.40*	.10	(.10)	(.07)	2.43	2.90
Fruit	(.04)	(.04)	(.04)	.18	.32	.50	.57	.40	.43	.07	(.07)	(.05)	2.27	2.51
Grain and Hay	(.04)	(.04)	.07	.60	.93	.20	(.14)	(.23)	(.21)	(.14)	(.07)	(.05)	1.70	2.62
Onions	(.04)	(.04)	.08	.13	.27	.49	.43	.20	(.16)	(.13)	(.10)	(.07)	1.60	2.14
Pasture	.08	.10	.20	.25	.25	.25	.25	.25	.20	.15	.10	.08	2.16	2.16
Potatoes	(.06)	(.08)	(.08)	(.16)	.15	.38	.52	.30	.15	(.09)	(.07)	(.05)	1.50	2.09
Seed	(.06)	(.08)	(.08)	.10	.25	.50	.50	.50	.35	.10	(.10)	(.07)	2.30	2.69
Truck	(.06)	(.08)	.10	.10	.25	.50	.45	.45	.30	.15	.10	(.07)	2.40	2.61
Tules	.16	.09	.30	.74	1.10	1.28	1.53	1.32	1.18	.98	.59	.36	9.63	9.63
Willows	.05	.03	.09	.22	.33	.38	.46	.40	.35	.29	.18	.10	2.88	2.88
Bare Land	.04	.04	.04	.08	.10	.13	.14	.13	.11	.09	.07	.05	1.02	1.02
Idle Land with Weeds***	.07	.09	.10	.19	.24	.31	.33	.28	.19	.15	.12	.08	2.15	2.15
Open Water Surfaces	.08	.13	.23	.34	.60	.76	.94	.78	.60	.33	.14	.08	4.91	4.91

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

* Includes estimated additional use by weeds during these months.

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

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

TABLE 106

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

Year *	Water Consuming Area in Acres		Seasonal (2) Use of Water in Acre-feet		Seasonal Unit Consumption in Ac.-feet per Ac.		Annual(3) Use of Water in Acre-feet		Annual Unit Consumption in Acre-feet per Ac.	
	Total (1)	Irr. Crops	Total	Irr. Crops	Total	Irr. Crops	Total	Irr. Crops	Total	Irr. Crops
1924		319800		674840		2.11				
1925		315600		660900		2.10				
1926		316200		649560		2.06				
1927		315600		649090		2.06				
1928		321500		674920		2.10				
1929	420900	321900	1100140	699550	2.62	2.14	1250190	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	907970	2.96	2.68
1932	447430	336440	1181030	746900	2.64	2.22	1334060	899830	2.98	2.67
1938	449750	335670	1226850	760850	2.73	2.27	1390120	914120	3.08	2.72

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

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

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

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

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

CHAPTER VI

SALINITY INVESTIGATIONS

Purpose

The purpose of the salinity investigation, as outlined in previous reports, has been to record the occurrence and extent of salinity encroachment 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 general scope of this investigation each season has been such as to insure that samples of water to be tested for salinity would be taken at regular intervals at a sufficient number of stations throughout the Delta and upper bay region so that the advance and retreat of the salinity from early summer to late fall would be completely recorded. Plate 2 shows the limit of encroachment into the Delta of 100 parts salinity for the years

1920 to 1939 inclusive.

Twenty Bay and Delta sampling stations are maintained permanently throughout the year. Because of the low flow conditions prevailing during 1939, 27 additional sampling stations were established throughout the Delta area.

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 Materials and Research laboratory of the Division of Highways. The records of the tests of all samples taken in 1939 are given in Table 109 and Table 108 gives the location and description of each station.

The maximum salinity as recorded at the stations operated in 1939 is shown in Table 107. For comparative purposes, This table shows also the maximum salinity recorded at these stations in previous years beginning with 1929.

Salinity Bulletins

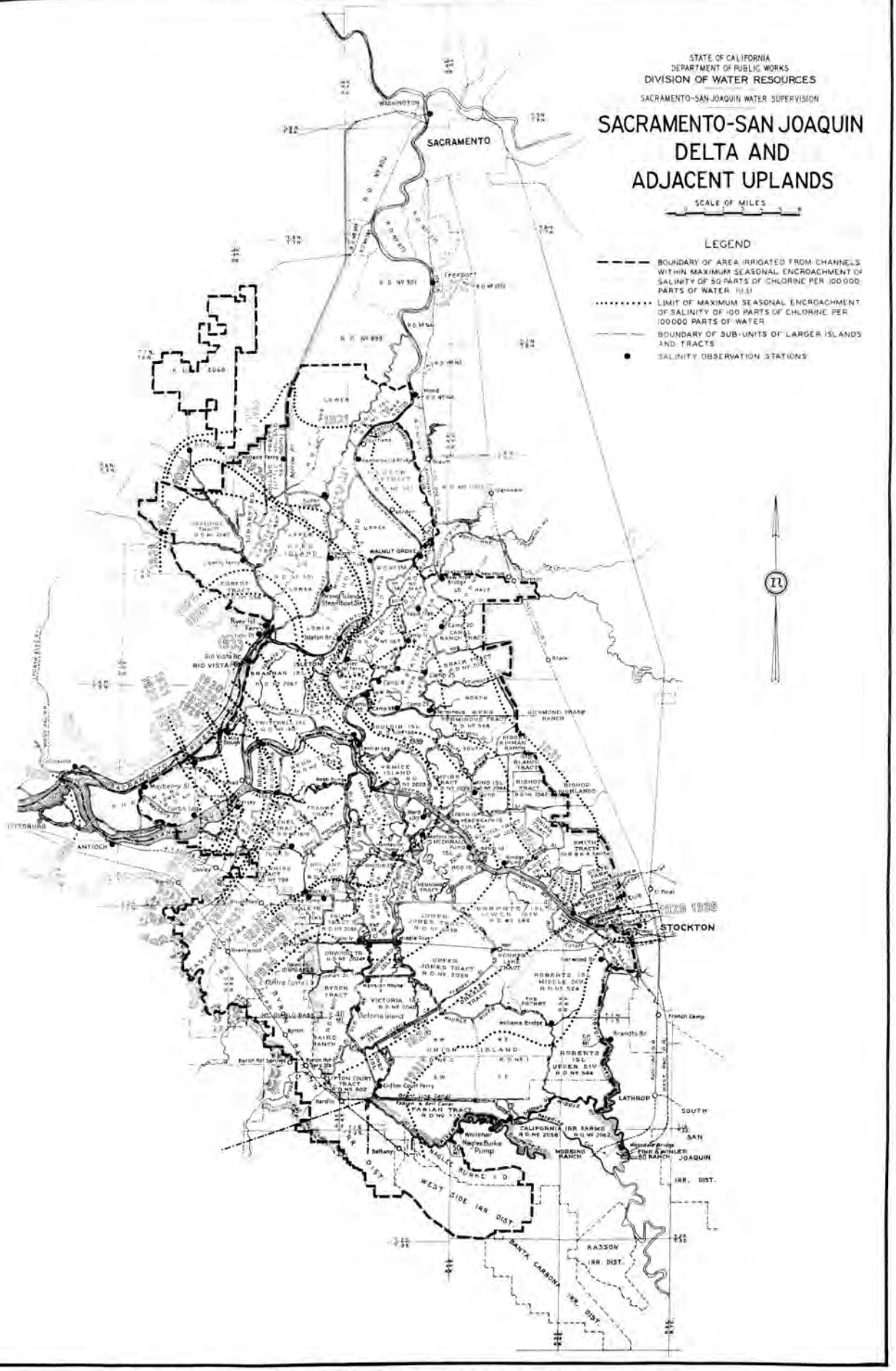
During 1939 because of low river flows and rapid encroachment of salinity, and because of the vital interest of the water users throughout the Delta, the results of the salinity tests were made known to the water users as soon as possible. This was done through the medium of mimeographed bulletins mailed at intervals of from four to ten days, dependent upon the rate of encroachment. The mailing list for the bulletin contained 206 names.

Area of Salinity Encroachment

There is a definite relation between the minimum ten-day stream flow to the Deltas to the area affected by salinity encroachment. This relationship is shown in Plate 3. The relation of the flow of the Sacramento and San Joaquin Rivers to the area of their respective deltas affected by salinity has been shown rather than combining the flows and treating the Delta as one area. Inspection of the plate indicates that when the flow to either delta drops below a certain point, the rate of salinity encroachment greatly accelerates. This point for the Sacramento-Mokelumne Delta is about 1750 cubic feet per second and for the San Joaquin Delta about 750 cubic feet per second. This shows that with a combined flow into the Delta, measured at Sacramento and Vernalis, of 2500 cubic feet per second, the whole delta with the exception of 25000 acres in the extreme lower end is protected from a salinity encroachment greater than 100 parts of chlorine per 100,000 parts of water. It also shows that when the flow drops below 2500 cubic feet per second the area affected increases much faster per unit of drop in flow than the area would decrease for the same unit of increase in flow. The areas shown on this plate are gross areas within the Delta boundaries and include all water surfaces, channels, levees, etc. and are not net irrigable areas. In Table 110 is shown the data from which Plate 3 has been constructed.

Salinity Observations of Stream and Return Flow Channels

During 1939 through the combined efforts of the maintenance foreman of the State Highway Department, pump operators and the field engineers from this office, water samples were taken from most of the stream and return flow channels in the Sacramento-San Joaquin areas. These samples were, in most instances taken at bi-monthly intervals and for each sampling an effort



MAXIMUM SEASONAL SALINITY ENCROACHMENT OF 100 PARTS OF CHLORINE PER 100,000 PARTS OF WATER, SACRAMENTO-SAN JOAQUIN DELTA 1920-1939

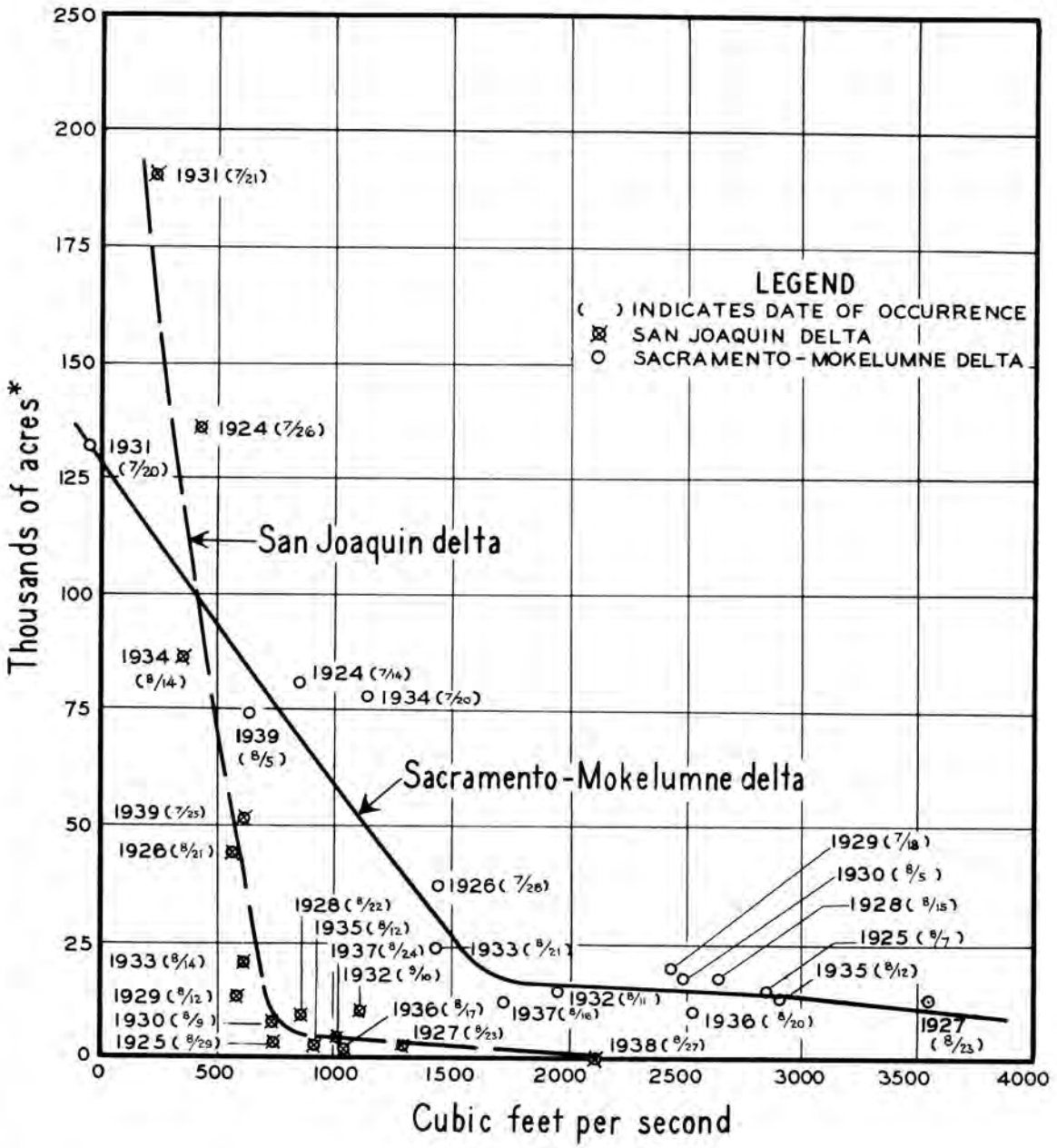
has been made to indicate in the table the amount of water flowing at the time of sampling. This was not always possible so in lieu thereof the mean discharge for the day has been given. It will be noted that for some of the drain plants the flow is shown to be zero while the chlorine content of the water is indicated. This is because the sample was taken from the drain canal while the plant was shut down.

TABLE 107

MAXIMUM RECORDED SALINITY AT BAY AND DELTA STATIONS
1929 to 1939 INCLUSIVE*

Year	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Sacramento-San Joaquin Runoff in per cent of Normal**	42	63	29	78	46	40	86	91	75	160	41
Station (1)	Maximum Recorded Salinity in parts of Chlorine per 100,000										
San Francisco, San Pablo and Suisun Bays											
Point Orient	1830	1780	1870	1720	1800	1840	1720	1740	1700	1700	1920
Point Davis	1660	1620	1810	1520	1680	1800	1500	1440	1460	1460(2)	1840
Bulls Head Point	1370	1380	1690	1320	1380	1640	1260	1340	1270	1160	1640
Bay Point	1050	1060	1540	1010	1160	1460	720	960	920	580	1480
O and A Ferry	830	800	1390	620	900	1200	540	580	660	256	1180
Innisfail Ferry	870	810	1400	680	900	1260	720	580	700	330	1360
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	680	570	1260	500	620	1080	390	300	490	86	1040
Emmaton	310	250	1000	166	380	760	88	54	102	7	580
Three Mile Slough Bridge	205	150	860	90	320	660	77	57	120		590
Rio Vista Bridge	67	52	740	28	130	520	12	8	33		405
Junction Point	17	26	620	(3) 7	74	410					
Ryer Island Ferry											375
Liberty Ferry	14	6	560			230					241
Grand Island (Steamboat Slu)	5					350					271
Isleton Bridge	6	10	635	(3) 6	46	310					250
Reclamation District 2068			280			176					82
Howard Ferry	7		500			232					158
Sutter Slough	11		320			50					
Little Holland Ferry	11		300			14					43
Ryde	9		280			11					38
Walnut Grove	8		220			10					18
Paintersville Bridge	9		144			8					
Lisbon											8
Sacramento	8	5	10	6	7	7	4	4	13	6	7

* For maximum salinities recorded 1924-1928, 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 108.
(2) Estimated. Samples not taken during period of maximum salinity.
(3) Maximum salinity obtained from first sample taken in season.



SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

RELATION OF MINIMUM 10 DAY STREAM FLOW OF SACRAMENTO AND SAN JOAQUIN RIVERS TO THEIR RESPECTIVE DELTAS, TO THE AREA OF EACH AFFECTED BY A SALINITY ENCROACHMENT GREATER THAN 100 PARTS OF CHLORINE PER 100.000 PARTS OF WATER

* AREA INCLUDES ALL LANDS, LEVEES, WATER SURFACES

TABLE 107 (CONTINUED)

MAXIMUM RECORDED SALINITY AT BAY AND DELTA STATIONS
1929 TO 1939 INCLUSIVE*

Year	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Sacramento-San Joaquin Runoff in per cent of Normal**	42	63	29	78	46	40	86	91	75	160	41
Station (1)	Maximum Recorded Salinity in parts of Chlorine per 100,000										
Mokelumne River Delta											
Southwest Point	9	9	390		17	107					86
Camp 33, Staten Island	8	7	245		13						
Tyler Island Ferry	9	9	200			10					16
Camp 11, Staten Island	7		134		5	25					13
Camp 29, Staten Island	11		182			52					32
Camp 25, Staten Island	7		164		7						31
Camp 20, Staten Island	8		124			18					22
San Joaquin River Delta											
Antioch	600	470	1240	400	580	960	290	270	350	51	620
Curtis Landing	450		1060	280	470	810	180				
Jersey	365	220	910	150	280	(2)620	86	78	102	9	500
Opposite Jersey									136		
Webb Pump	80	61	680	35	122	(3)340	16	16	25	8	265
Central Landing	20	15	425	8	25	(4) 90	8	7			
Opposite Central Landing									11	10	138
Dutch Slough			510	37	80	280	21	21	28	11	225
Rock Slough West of Dam							8	11	13	9	94
Camp 2, Medford Island											121
Ward Landing	23	16	350			190					
Holland Pump	42	23	325	11							
Bacon Pump					25	160	11				
Mandeville Pump	25	17	350	18	29	166					104
King Island Pump	16		261			104					79
Rock Slough East of Dam							8	11	12	11	71
Rindge Pump	28	16	198	16	22	94	18	20	20	15	62
Orwood Bridge	18	12	277			107					54
East Contra Costa Irr. Dist.	16	17	200			73					32
Middle River	17	13	270	12	18	108	11	12	16	13	60
Mansion House	16	11	240			90					
Victoria Island											35
Stockton Country Club	36	18	122			44					
Clifton Court Ferry	23		130			40					19
Stockton	200	120	132	72	66	76					32
Garwood Bridge			92			38					
Brandts Bridge			43			21					
Williams Bridge	12		118			43					
Naglee Burke Pump											14
Whitehall	15		31			12					
Mossdale Bridge	16	10	12	14	13	25	12	14	12	12	16

* For maximum salinities recorded 1924-1928 see previous reports.

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

(1) For location and description, see Table 108.

(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 108

DESCRIPTION OF SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN

STATION	Miles from Golden Gate (1)	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.
				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.
Ryer Island Ferry	66.5	6	20	Lower end of Cache Slough just above Steamboat Slough junction.
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.
Reclamation District 2068	70.7	6	45	Haas Slough, at Reclamation District 2068 pumping plant.
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.
Walnut Grove	77.4	7	25	Sacramento River, Highway Bridge, at Walnut Grove.
Paintersville Bridge	77.5	7	25	Sacramento River one mile below Courtland.
Lisbon	85.0	8	20	East Borrow Pit of Yolo By-Pass at Lisbon
Sacramento*	103.5	9	30	Sacramento River at Southern Pacific Railroad Bridge.

* Permanent station maintained throughout the year.

(1) Mileage measured to station along main channel. For stations off the main channel, the mileage shown is the distance along the main channel to a point whereon the time of the occurrence of the tidal phase is the same as that of the observation station.

TABLE 108 (CONTINUED)

DESCRIPTION OF SALINITY STATIONS AT WHICH OBSERVATIONS WERE TAKEN

STATION	Miles from Golden Gate (1)	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 Is.
Dutch Slough*	73.0	7	05	At Bethel Island Bridge.
Rock Slough West of Dam*	77.0	7	20	In Rock Slough, West of Dam at Junction of Sand Mound Slough and Rock Slough.
Camp 2, Medford Island	78.0	7	25	San Joaquin River (Stockton Channel) at north end of Medford Island
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, 1⅛ 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.
Victoria Island	89.6	8	35	Old River at Borden Highway Crossing.
Stockton Country Club	90.8	8	45	On Lindley Cutoff (San Joaquin R.), North Bank, about 3/4 Mi. above Burns Cutoff Junc.
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.
Port Stockton*	94.0	9	15	At Lower End of Port Stockton Wharves.
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 Railraod Crossing.
Williams Bridge	101.6	9	55	Middle River, about four miles below Salmon Slough Junction.
Naglee Burke Pump	102.5	10	00	Old River at Naglee Burke Pumping Plant.
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. (1) See Note 1 on preceding page.

TABLE 109

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
1939

Station	JANUARY															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1440		1520		1460		1500		1460		1320		1400		1200	
Point Davis					920				1020	ab			960			
Bullshead Point	950	a	720		310		410	ab			640		680		410	ab
Bay Point									170		214					
O and A Ferry	224		134		20		52		34						147	
Innisfail Ferry	102		254	a	200		150		120		134	a	126		120	
Sacramento River Delta																
Collinsville	44		85		4		3		4		4		3		4	
Emmaton	2			a	2				4	a	2					
Sacramento	2	ab	2		2		2	ab	2	a	3		2		2	
San Joaquin River Delta																
Antioch	20		27		9		8		8		6	a	7		8	
Webb Pump	7			a	5		6		7		6		5			
Opposite Central Landing	3	a	5		1		2		4		4		2			
Dutch Slough	9		7		7	ab	5		8		7		6		7	
Rindge Pump	7	a	9		6		7		5		5		5		9	
Middle River	8		6		7		8		7		6		7		8	
Rock Slough West of Dam	7	a	8		8		8		9	a	10		8		9	
Rock Slough East of Dam	8	a	8		6		7		9	a	8		8		7	
Port Stockton	12	a	13		13		7	ab	10				6			
Mossdale Bridge	7	d	6		7		6		4		6		3		6	

Station	FEBRUARY													
	2		6		10		14		18		22		26	
San Francisco, San Pablo and Suisun Bays														
Point Orient	1520		1500		1320		1140		1380		1280		1340	
Point Davis	1120				600						880		820	
Bullshead Point	400	ab	610		200		362	ab	500	ab	410		420	
Bay Point							100		142	a	96			
O and A Ferry	74		34	a	8	ab	6		18	a	20	a	9	
Innisfail Ferry	124		120		114		82		60	a	84		86	
Sacramento River Delta														
Collinsville		a	3		4		3						3	
Emmaton		a	4				3	ab	3				5	
Sacramento	1	a	2		2		2	a	2		2		1	
San Joaquin River Delta														
Antioch	7		7		8		5		4		5		6	
Webb Pump			4		7				6		7		6	
Opposite Central Landing	3	a	2		2		2		5		4		4	
Dutch Slough	9	a	6		8		7		7		8		9	
Rindge Pump	12	ab			6		7		5		9		6	
Middle River	6		7		7		7		5		7		6	
Rock Slough West of Dam	7		9		8		11		7		4		9	
Rock Slough East of Dam	8		6		8		8		8		7		8	
Port Stockton		ad	12					ab	9	a	8			
Mossdale Bridge	2		4		3		4		5				4	

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

TABLE 109 (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
1939

Station	MARCH															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1400		1600		1580		1200		1200		1220		1220		1340	
Point Davis	900				1120						740		600			
Bullshead Point	400	ab	524	ab	548		210	ab	290	ab	290		480		230	ab
Bay Point	264		196				51	a	162		18		30		52	ab
O and A Ferry	46		34	a	29		11		7		3		4		6	
Innisfail Ferry	70		88		102		102		78	a	82		58		56	
Sacramento River Delta																
Collinsville	3		4		4		5	cd	3	a	3		2		3	
Emmaton			4				3			a	3		2			
Sacramento	2	ab	1		2		3	ab	3		2		3		2	
San Joaquin River Delta																
Antioch	7		9		13		6		4		5		3		2	
Webb Pump			6								5		6		4	
Opposite Central Landing	5	e	1		5		3		4		4		3		3	
Dutch Slough	7		7	d	9		7		8		7		6		10	
Rindge Pump	7		6		9		10		14		16		14		15	
Middle River	7		6		7		5		8		12		12		12	
Rock Slough West of Dam	7		7		7		7		9		11		12		11	
Rock Slough East of Dam	5		7		8		9		10		12		10		11	
Port Stockton					15										21	
Mossdale Bridge	3		3		5		7		5		8		7		4	

Station	APRIL															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1480	b	1380		1280		1200	b	1340		1260		1360		1480	
Point Davis					560											
Bullshead Point	210	a	190	a	202	b	146	b	370		340	a	440	b	685	
Bay Point		a	14		40	a	46	a	53						119	
O and A Ferry	4	a	9	a	3			a	19	a	9		15	a	44	
Innisfail Ferry	42		32		39	a	49	a	41	a	48		56	a	58	
Sacramento River Delta																
Collinsville			5		1	a	3	a	2		10		4	a	3	
Emmaton		a	2		3			a	3		3					
Sacramento	1		1		2	a	1	b	2		2		7	a	4	
San Joaquin River Delta																
Antioch	4		2		4	a	4	a	5	a	4		5			
Webb Pump	6		5		5			b	7		7		5	a	7	
Opposite Central Landing	2		6		3	a	3	a	2		5		4	a	3	
Dutch Slough	8		10		8	a	9	a	8		7		7	a	8	
Rindge Pump	14		13		11	a	12	a	10				10	a	10	
Middle River	13		13		11	b	12	b	9		9		11	a	11	
Rock Slough West of Dam	9		10		10	a	10	b	11		10		10		11	
Rock Slough East of Dam	10		13		13	a	12	b	10		10		9	a	10	
Port Stockton			13		12	a	17						14			
Mossdale Bridge	10	b	10		9			b	7		7		8	a	7	

a, b, c, d, e, f, see foot notes last page of this table.

TABLE 109 (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
1939

Station	MAY															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	b	1620		1480		1430		1500	b	1700		1600		1780		1620
Point Davis		1120				1040		1200	b	1360		1260		1160	b	1080
Bullshead Point				800		680	a	690	b	830		880		780	a	790
Bay Point	a	193	a	265	a	234					a	290		300	a	380
O and A Ferry	b	78				58	a	56	a	92	a	98		120	b	128
Innisfail Ferry	a	58	a	83	a	89	a	118	a	122		210	a	184		
Sacramento River Delta																
Collinsville		5		18	a	15	a	18	a	18	a	35	a	33	a	39
Emmaton		5			a	4			a	5		4			a	4
Three Mile Slough Bridge													b	4	b	6
Rio Vista													b	6		1
Sacramento		2		4	a	3	a	3		5		7	a	3	b	2
San Joaquin River Delta																
Antioch	a	10	a	16	a	14	a	13	a	20		50	a	18		19
Jersey												9		7		
Webb Pump				7			a	6				6	a	6	a	7
Opposite Central Landing	b	4		5	a	4	a	5	b	6		6	a	6		7
Dutch Slough	b	17		7	a	7	a	8	a	9		7	a	7	a	6
Rindge Pump	a	10		11	a	10	a	10	a	9		9	a	10	a	11
Middle River	a	5		7	a	8	a	9	a	7		8	a	9	a	9
Rock Slough West of Dam	b	9		10	a	9	a	9	b	10		8	a	8	a	8
Rock Slough East of Dam	b	13		10	a	10	a	8	b	9		8	a	7	a	6
Port Stockton				14								18				
Mossdale Bridge	b	7		8		8	b	7	b	8		7	b	9	b	8

Station	JUNE															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	b	1600		1640		1600		1680	b	1700				1700		1760
Point Davis	b	1260		1160		1400		1400	b	1380		1460		1340	a	1400
Bullshead Point	b	960		820		1020	b	1100	b	1060		1080				
Bay Point		420		500	a	490	a	560			a	770		768	a	810
O and A Ferry	a	124	a	274		360	a	300	a	345		405	a	440	a	500
Innisfail Ferry	a	230	a	230	a	255	a	275	a	380	a	430	a	450	a	550
Sacramento River Delta																
Collinsville	db	65		63	a	75	a	125	b	255	a	268	a	272		
Emmaton	a	5			d	7			a	24			a	56		
Three Mile Slough Bridge	b	6	a	5	b	5	b	14	b	23		28		74		
Rio Vista Bridge		4		3	b	5	b	4	b	4		6		12		17
Sacramento	b	4		4	a	5	a	2	b	4	a	3	a	2	a	4
San Joaquin River Delta																
Antioch		29		40	a	32	a	73	a	106		183	a	154	a	216
Jersey	a	10		9	a	10	a	10								
Webb Pump	b	7		7	a	7	d	7	b	8	a	10	a	12	a	18
Opposite Central Landing	b	6		5	a	7	a	7	b	7	a	8	a	7	a	10
Dutch Slough	b	7		8	a	8	a	11	b	9	a	14	a	12	a	19
Rock Slough West of Dam	b	8		7	a	8	a	8	b	9	a	9	a	8	a	8
Rock Slough East of Dam	b	8		8	a	9	a	8	b	8	a	9	a	7	a	8
Rindge Pump		11		9	a	11	a	14	a	10	a	12	a	14	a	15
Middle River	a	8		8	a	8	a	10	a	8	a	9	a	9	a	10
Port Stockton				20	a	19										
Mossdale Bridge	b	7		8	b	9	b	10	b	7	b	9	b	8		9

a, b, c, d, e, f, see foot notes last page of this table.

TABLE 109 (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

Station	JULY													
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays														
Point Orient	b	1780		1760		1800		1740	b	1800		1760		1840	b	1860
Point Davis	a	1460		1440		1500		1560	b	1660		1620		1660	b	1720
Bullshead Point	a	1200		1120		1140	b	1380	b	1380		1440		1400	b	1440
Bay Point	a	790	a	890	a	940	a	880	a	960			a	1160	a	1180
O and A Ferry	a	560		580		658	b	790	a	760		810			b	980
Innisfail Ferry	A	590	a	640	a	610	a	700	a	810	a	790	a	880	a	1000
Sacramento River Delta														
Collinsville	a	330	a	430	d	460	a	520	a	590	a	640	a	760		
Emmaton	d	133													a	410
Three Mile Slough Bridge	b	129	a	110		140	b	209	b	234		305	b	380	b	440
Rio Vista Bridge	b	21		25		50	b	76		101		154	b	200	b	245
Ryer Island Ferry										36		86		114		127
Liberty Ferry						7		7		11		28		55		65
Grand Island (Steamboat Slough)					b	7	b	20	b	36	a	47	a	74	b	109
Isleton Bridge							b	23	b	33		65		69	b	106
Ryde					b	5			b	6		7	a	7	b	22
Howard Ferry									b	19	a	18		26	b	75
Reclamation Dist. 2068													a	7	a	4
Sacramento	b	4	a	4	a	5			b	5	a	7	b	6	b	7
San Joaquin River Delta														
Antioch			a	325	a	320	a	370		570	a	470	a	520	a	620
Jersey			a	112	d	70	d	92	b	300						
Webb Pump	ab	21			a	20	a	43	b	116	a	81	a	111	ad	139
Opposite Central Landing	b	12	a	14	a	13	a	16		31	a	31	a	45	b	86
Dutch Slough		28	a	27	a	28	a	37	b	79	a	77	a	109	b	162
Rock Slough West of Dam		11	a	11	a	10	a	14	b	19	a	23	a	29	b	44
Camp 2, Medford Island														37	b	49
Mandeville Pump									a	18	a	17	a	25	a	23
King Island Pump										15	a	13	a	18	b	25
Rock Slough East of Dam		10	a	10	a	10	a	11	b	20	a	19	a	23	b	23
Rindge Pump	a	15	a	15	a	16	a	15	a	20	a	18	a	18	a	19
Orwood Bridge									d	9	a	14	b	16	b	16
Middle River	b	9	a	9	a	9	a	12	a	13	a	13	a	14	a	18
Victoria Island							c	13	d	13	d	11		14	b	16
Port Stockton			a	28											b	29
Mossdale Bridge	b	9		11	b	13	b	9	b	12		13	b	11	b	12
Mokelumne River Delta														
Southwest Point							a	10	b	21	a	15	a	19	b	49
Tyler Island Ferry						6	b	6	b	7	b	7	b	10	b	12
Camp 11, Staten Island							a	5	b	7	a	5	a	8	b	11
Camp 29, Staten Island							a	7	b	9	a	9	a	12	b	18
Camp 25, Staten Island							a	10		10	a	11	a	12	b	14
Camp 20, Staten Island													a	14	b	15

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

TABLE 109 (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
1939

Station	AUGUST													
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays														
Point Orient	1800		1800		1840	b	1920		1860		1860		1840	b	1820	
Point Davis	1640	a	1660		1620	a	1780		1700		1740			b	1740	
Bullshead Point			1420		1520	b	1640		1420		1520		1560	a	1460	
Bay Point	1200	a	1180	a	1320	a	1280	a	1300			a	1360	a	1360	
O and A Ferry	1000	a	980	a	980	a	1040		1240	a	1100	a	1060	a	1080	
Innisfail Ferry	980	a	1000	a	980	a	1140		1180		1120	a	1360	a	1180	
Sacramento River Delta														
Collinsville	820	a	840		830	a	860		1040	a	930	a	910	a	850	
Emmaton	500	a	460			a	530		580			a	550	b	540	
Three Mile Slough Bridge	440		460	ab	550	ab	525		540		590	b	590		510	
Rio Vista Bridge	270		275	b	320	b	375		405		405	b	360	a	325	
Ryer Island Ferry	143		169				293		310		360		375			
Liberty Ferry	62		82		117		143		190		241		231			
Grand Island (Steamboat Slough)	117		144	a	126	b	218		270	a	200	a	195	b	175	
Isleton Bridge	114		140	b	160	b	240		260		250	b	210		74	
Reclamation Dist. 2068	5	a	6	a	3	a	8	a	11	a	26	a	37	a	37	
Howard Ferry	77		98	a	98	b	146		158	a	98	a	78		43	
Little Holland Ferry		d	34	e	10	a	26		38	a	15	a	11	b	7	
Ryde	18		26	a	18	b	38		30	a	13	a	10	b	8	
Walnut Grove				ab	13	ab	18		17	a	11		12	b	8	
Lisbon		a	5	a	7	a	6	a	8	ad	8					
Sacramento	6	a	7	b	7	b	6	a	6	a	6	b	5	b	4	
San Joaquin River Delta														
Antioch	640	a	650	a	610	a	730		920		830	a	740	a	760	
Jersey	150					a	412	a	500					a	440	
Webb Pump	162	ad	142	a	157	a	160	a	200	a	215	a	265	a	260	
Opposite Central Landing	77	a	76	a	92	a	136	a	132	a	124	a	138	b	136	
Dutch Slough	170	a	130	a	148	e	202	a	210	a	215	a	200	b	205	
Rock Slough West Dam	44	a	52	a	48	b	59	a	58	a	66	a	74	ab	88	
Camp 2, Medford Island	54			b	76	b	91		102	a	103					
Mandeville Pump	31	a	38		45		55			a	76	a	80	a	89	
King Island Pump	22		20			b	41	a	51	a	50	a	57	b	71	
Rock Slough East of Dam	24	a	34	a	36	b	35	a	38	a	54	a	56	b	54	
Rindge Pump	21	a	22	a	32	a	28	a	35	a	42	a	38	a	46	
Orwood Bridge	21	e	19	b	24	b	29		37	b	38	ab	45	d	32	
East Contra Costa I.D.						a	19	a	20	a	26	a	26	a	29	
Middle River P.O.	16	a	22	a	24	a	30		39	a	44	a	45	a	51	
Victoria Island	15		17	b	19	b	21		27	b	28	b	30		32	
Clifton Court Ferry				a	12	a	14	a	14	a	15	a	15	a	15	
Port Stockton								a	21					b	32	
Naglee Burke										db	12	a	10	a	13	
Mossdale Bridge	9	b	9	b	11	b	11	b	14	b	12	b	13	b	16	
Mokelumne River Delta														
Southwest Point	49	a	30	a	36	b	89	a	74	a	42		35		41	
Tyler Island Ferry	9	ab	9	b	9	b	16		13	b	11	b	10	b	7	
Camp 11, Staten Island	8	a	8	a	6	b	12	a	13	a	12	a	11	b	12	
Camp 29, Staten Island	17	a	19	a	18	b	25	a	28	a	32	a	32	b	28	
Camp 25, Staten Island	13	a	15	a	15		20	a	20	a	24	a	23	b	30	
Camp 20, Staten Island	14	a	11	a	13		17	a	19	a	16	a	21	b	22	

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

TABLE 109 (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
1939

Station	SEPTEMBER						
	2	6	10	14	18	22	26	30
San Francisco, San Pablo and Suisun Bays								
Point Orient	1860	1860	1840	1860	1780	1800	1840	1780
Point Davis	1740	1760	1780	ab1700	1700		1700	
Bullshead Point	1410	:a	1440	ab1580	1440	1440		1400
Bay Point	1440	1380	1380	1380	1140	:a 1200	1260	1100
O and A Ferry	:a 1060	:a 1040	:b 1060	ab1180	:a 860	:a 860	880	:a 800
Innisfail Ferry		1220	:a 1240			:a 1220	1180	1140
Sacramento River Delta								
Collinsville	900	:a 880	:a 835	860	:a 670	:a 500	640	660
Emmaton	:a 510	400	:a 510	340	:a 380		300	:a 295
Three Mile Slough Bridge	420	380	:b 530	300		:b 280	325	295
Rio Vista Bridge	230	245	:b 340	:a 215	adb235	:b 190	191	155
Ryer Island Ferry	264	206		121	223	232	106	72
Liberty Ferry	195	149	126	102	143	135	130	62
Grand Island (Steamboat Slough)	:a 60	:a 13	:a 168	92	:a 16	:a 77	38	37
Isleton Bridge	127	:b	128	40	108	:b 16	4	7
Reclamation Dist. 2068	:a 33	:a 69	:a 76	77	:a 77			82
Howard Ferry	:a 20	:ad 7	:a 5	7	:a 6	:a 5	3	5
Little Holland Ferry	:a 7							
Ryde	:a 8	:a 7	:a 5	5	:a 6	:a 5	4	5
Walnut Grove			:b 5	7	:b	3	4	7
Sacramento	:a 7	:a 6	:ab 4	:ab 5	:b 4	:a 2	:ab 4	5
San Joaquin River Delta								
Antioch	800	830	:a 740	700	610	:a 570	530	
Webb Pump		:a 220	:a 205	:ab 185		:a 148	158	:a 152
Opposite Central Landing	138	:a 100	:a 100	104	:a 66	:a 90	62	:a 44
Dutch Slough	:a 205	:a 180	:b 225	125	:a 134	:a 185	182	188
Rock Slough West of Dam	:a 77	:a 84	:a 91	:ab 92	:a 94	:a 88	84	81
Camp 2, Medford Island	115	:a 121	:ad 112	:b 112	:a 103			
Mandeville Pump	:a 91	:a 94	:a 104	100	:a 103	:a 94	96	:a 84
King Island Pump	:a 66	:b 58		79	:a 55	:a 52		63
Rock Slough East of Dam	:a 55	:a 60	:a 66	:ab 68	:a 70	:a 71	68	:d 65
Rindge Pump	:a 37	:a 44	:a 52	56	:a 40	:a 60	48	47
Orwood Bridge	:b 46	:ab 38	:b 54	46	38	:b 46	38	33
East Contra Costa I.D.	:a 25	:a 30	:a 31	:a 30	:a 32	:a 29	25	24
Middle River P.O.	54	:a 53	:a 50	60	:a 57	:a 48	55	:a 44
Victoria Island	32	:b 33	:b 35	29	38	:b 25	19	15
Clifton Court Ferry	:a 11	:b 12	:a 12		19	:a 10	:ab 11	
Port Stockton	:a 26	:a 22						
Naglee Burke	:a 11	:b 12	:b 14	11	:a 14	:b 12	:a 10	:a 10
Mossdale Bridge	:b 10	:b 14	:b 9	10	:b 11	:ab 7	9	10
Mokelumne River Delta								
Southwest Point	:a 28	:a 20	:a 26	:b 25	:a 17	:a 12	11	:ad 7
Tyler Island Ferry	7	7	:b 6		6	:b	5	
Camp 11, Staten Island	:a 9	:a 6	:a 7	:ab 6	:a 5	:a 5	3	:a 2
Camp 29, Staten Island	:a 25	:a 23	:a 18	:ab 15	:a 17	:a 12	17	:a 13
Camp 25, Staten Island	:a 31	:a 27	:a 30	:ab 23	:a 20	:a 15	12	:a 6
Camp 20, Staten Island	:a 16	:a 18	:a 16	:ab 16	:a 5	:a 3	2	:a 2

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

TABLE 109(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

Station	OCTOBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1840		1800		1840		1780		1780		1740		1780		1800	
Point Davis	1700		1640		1580		1840		1520		1460		1500		1500	
Bullshead Point	1340			a	1280		1080		1280		1060	ab	1460	a	1140	
Bay Point	1080				1020			a	800				660			
O and A Ferry	700	a	780		600	a	600	a	560	ab	620	ab	450	a	480	
Innisfail Ferry	1100	a	1020		960				820		860		840		790	
Sacramento River Delta																
Collinsville	580	a	510		330	a	430	a	365		305		375	a	295	
Emmaton		a	165		146	b	178				90			a	92	
Three Mile Slough Bridge	235		195		130		160		92	ab	92	a	97		75	
Rio Vista Bridge	100		72		66		64		35		44		18		25	
Ryer Island Ferry	42		22		29		22		10		8				8	
Liberty Ferry	48		24		23		20		16		12		12		12	
Grand Island (Steamboat Slough)		a	14		13			a	6				6		4	
Isleton Bridge	4		2		5		7		3		2		3		3	
Reclamation Dist. 2068	78	a	77	a	79											
Howard Ferry		a	3		3			a	3				7		3	
Ryde		a	5		4			a	4				3		3	
Walnut Grove	3		4				4		2		5		3	a	6	
Sacramento	4	a	2	a	3	a	2	a	2		3	ab	2		4	
San Joaquin River Delta																
Antioch	470	a	410		380		385		285	a	230		280		300	
Jersey	204	a														
Webb Pump	146	a									68		65		60	
Opposite Central Landing	76		52		53	a	50	a	25		40		29	a	22	
Dutch Slough	174	a	160		126		122	a	95		90		83		76	
Rock Slough West of Dam	72	a	67		58	a	45	a	40		40		32	a	32	
Mandeville Pump		a	72		61			a	52		45		44		39	
King Island Pump	68	a	59		54		51	a	48				43			
Rock Slough East of Dam	57	a	43		40	a	28	a	29		24		24	a	22	
Rindge Pump	41	a	62		25		26	a	23		20		22			
Orwood Bridge	30		17		14				12		12	d	11		15	
East Contra Costa I.D.		a	24		21	a	17	a	13				13	a	15	
Middle River P.O.	44	a	30		19	a	23	a	18		17		18		15	
Victoria Island	15	b	10		8		8		9		11		9		11	
Clifton Court Ferry	11	a	6	a	7	a	9	a	8	ab	8	a	8		10	
Port Stockton	23	a														
Naglee Burke	10	a	7		7	a	9	a	8							
Mossdale Bridge	11	b	9		10		9	b	13		12		9		9	
Mokelumne River Delta																
Southwest Point	6	a	10		3	a	9	a	3		6		4			
Camp 11, Staten Island	6	a	2		2	a	2	a	2		2		2			
Camp 29, Staten Island	8	a	8		10	a	5	a	6		7		7			
Camp 25, Staten Island	7	a	9		5	a	7	a	7		6		6			
Camp 20, Staten Island	3	a	3		3	a	2	a	2		4		2			

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

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

Station	NOVEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1780		1780		1720		1720		1720		1740		1760		1620	
Point Davis	1700		1480		1480		1480		1360		1580		1480	a	1480	
Bullshead Point	1280	a	1340	ab	1000		1140			ab	1120		1200		1180	
Bay Point	640		880		920		680		620				850		780	
C and A Ferry	480		520	ab	480	a	460		440		470		580		530	
Innisfail Ferry	780	a	720		720		690		590		670		710		710	
Sacramento River Delta																
Collinsville	325		285		340	a	265		245		280				295	
Emmaton	98				82				54				55			
Three Mile Slough Bridge	78		59	b	64		55		50		44				35	
Rio Vista Bridge	16		10		10		12	a	6		5		4		5	
Sacramento	2	a	7	ab	3	a	2		2		5	ab	4		2	
San Joaquin River Delta																
Antioch	240	a	235		270		255				230		280			
Webb Pump			53	ab	44			a	36			ab	30		31	
Opposite Central Landing	20	a	27	ab	10	a	7		19		18	ab	15	a	7	
Dutch Slough	62	a	63		54	a	48		41		40		39		35	
Rock Slough West of Dam	24	a	24		22	a	20		17		18		19	a	16	
Mandeville Pump	39	a			32	a	27		25				26	a	22	
Rock Slough East of Dam	24	a	21		17	a	15		15		17		15	a	14	
Orwood Bridge	14		13		15		10		10	b	17		9		12	
East Contra Costa I.D.					20											
Middle River P.O.	18	a	15		15		15		12		11		12		12	
Victoria Island	9		11		11		9		10		9		7		10	
Port Stockton												b	18			
Mossdale Bridge	11		14		10		10		10		10		9		9	

Station	DECEMBER															
	2		6		10		14		18		22		26		30	
San Francisco, San Pablo and Suisun Bays																
Point Orient	1780		1760		1760		1750		1620		1680		1720		1580	
Point Davis	1280	b	1460		1520				1220		1300	b	1280		1260	
Bullshead Point	1120	a			1360		980	a	660			ab	680		860	
Bay Point					820		430						510			
C and A Ferry	410		600	ab	220		162		158	ab	204		137	a	270	
Innisfail Ferry	730		650			a	670		410		460			a	440	
Sacramento River Delta																
Collinsville	240		288	d	299	a	120	a	54		91		142	a	82	
Emmaton	36	a			38		8						8			
Three Mile Slough Bridge	38	a	40	ab	64		7	a	4		6		6		6	
Rio Vista Bridge	3	a	2		20		4		2		2		3		2	
Reclamation Dist. 2068					33											
Sacramento	2		1		5	a	2		3		2		1		3	
San Joaquin River Delta																
Antioch			235		345		115		46		50		69		44	
Webb Pump	26			ab	27						17		17		17	
Opposite Central Landing	14		12		15	a	4	ab	10		8	ab	6		8	
Dutch Slough	32		37		33		28		28		23		20		20	
Rock Slough West of Dam	16		16		15	a	17		17		17		16		14	
Mandeville	23				18	a	17		17		15		16	a	14	
Rock Slough East of Dam	15		13		15	a	17		15		14		13		16	
Rindge Pump	15				18	a	18				16		15		19	
Orwood Bridge			10		12		13		14		10					
Middle River P.O.	13		15		14		14		11		12		12		13	
Victoria Island	9		12	a	11				10	a	10		10		9	
Port Stockton															12	
Mossdale Bridge	8		8	a	8		10		10		10		9	b	11	

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.

TABLE 110

MINIMUM TEN-DAY STREAM FLOW TO DELTAS OF SACRAMENTO AND SAN JOAQUIN RIVERS AND AREA OF EACH AFFECTED BY SALINITY ENCROACHMENT GREATER THAN 100 PARTS OF CHLORINE PER 100,000 PARTS OF WATER

Year	Flow for Minimum 10-day period (1)					Runoff in % of Normal *			Area Affected by Salinity					
	Sacramento River at Sacramento		San Joaquin River at Vernalis		Sacramento and San Joaquin to Delta	Sacramento and San Joaquin to Delta	At Sacramento	At Vernalis	All Deltas		Sacramento and Mokelumne		San Joaquin	
	Date	C.F.S.	Date	C.F.S.	C.F.S.				% of Total	Acres (2)	% of Total	Acres (3)	% of Total	Acres
1920		540(4)		450(4)		50	45	63	15.1	65800	7.7	33500	7.4	32300
1921						112	118	91	2.1	9150	2.0	8715	0.1	435
1922						100	92	118	2.9	12600	2.4	10420	0.5	2180
1923						74	68	85	2.1	9150	2.0	8715	0.1	435
1924	7/14	858	7/26	407	1280	28	30	24	50.0	217500	18.4	80100	31.6	137400
1925	8/7	2860	8/29	743	3730	83	81	86	3.6	15630	3.1	13450	0.5	2180
1926	7/28	1460	8/21	586	2080	57	59	55	18.5	80500	8.5	37000	10.0	43500
1927	8/23	3560	8/23	1300	4850	114	119	100	2.9	12600	2.4	10420	0.5	2180
1928	8/15	2690	8/22	866	3550	80	84	67	5.7	24800	3.7	16100	2.0	8700
1929	7/18	2460	8/12	590	3090	42	42	44	7.1	30900	4.2	18300	2.9	12600
1930	8/5	2500	8/9	735	3230	63	67	50	5.4	23500	3.8	16500	1.6	7000
1931	7/20	- 79	7/21	211	131	29	30	26	73.8	321000	30.2	131000	43.6	190000
1932	8/11	1980	9/10	1030	3030	78	64	101	5.7	24800	3.4	14800	2.3	10000
1933	8/21	1450	8/14	607	2070	46	43	51	9.8	42600	5.2	22600	4.6	20000
1934	7/20	1150	8/14	346	1530	40	42	35	37.5	163000	17.8	77500	19.7	85500
1935	8/12	2920	8/12	922	3940	86	82	98	2.9	12600	2.4	10420	0.5	2180
1936	8/20	2540	8/17	1040	3600	91	86	100	2.6	11600	2.2	9840	0.4	1760
1937	8/16	1720	8/24	1020	2820	75	65	100	3.5	15200	2.6	11280	0.9	3920
1938	8/12	5190	8/27	2130	7365	160	156	172	0	0	0	0	0	0
1939	8/5	630	7/25	610	1315	41	40	44	29.0	126000	17.0	74000	12.0	52000

* Normal = 40-year mean (1889-1929)

(1) For minimum daily flow see Tables 1 and 2.

(2) Delta area taken at 435,000 acres which includes all lands, levees, water surfaces, etc., within delta boundary.

(3) Sacramento and Mokelumne deltas combined as the Sacramento River contributes a large flow to Mokelumne River delta through Georgiana and Three Mile Sloughs.

(4) No continuous record. Lowest discharge measured.

TABLE 111

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin Area

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

Location	Jan.			Feb.			Mar.			Apr.			May			June		
	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs
- SACRAMENTO VALLEY -																		
Stream Channels																		
Sacramento River																		
at Kennett	(16)	.3	4580	(13)	.3	5210	(13)	.2	33800	(17)	.3	4790	(15)	.3	3830	(12)	.3	3380
at Red Bluff				16	1	6980	1	2	5980	1	4	8700	1	3	4870	1	1	4180
at Red Bluff							15	3	18300	15	2	6420	15	1	4180	15	3	3630
at Red Bluff										29	2	5390						
at Butte City				16	1	7400	1	4	6200	1	4	8950	1	2	4080	1	1	3240
at Butte City							15	3	33400	15	2	5520	15	3	3170	15	1	2200
at Colusa				16	2	8160	1	3	6720	1	4	11300	1	2	4380	1	1	3210
at Colusa							15	2	30200	15	2	6490	15	1	3110	15	2	2120
at Meridian				16	2		1	3		1	2		1	6		1	1	
at Meridian							15	1		15	2		15	1		15	3	
at Knights Landing				16	3	9000	1	1	6800	1	3	11600	1	2	3670	1	3	3290
at Knights Landing							15	2	18600	15	3	5800	15	2	2830	15	2	1470
at Verona	(11)	1	13200	(9)	.3	16000	(9)	.5	12400	(3)	.2	19500	3	3	6300	1	2	4730
at Verona													15	3	4700	16	1	2110
at Verona													29	4	6040			
at Elkhorn Ferry				2	1		1	4		1	1		1	3		1	3	
at Elkhorn Ferry				16	1		15	1		14	2		15	5		15	5	
at Elkhorn Ferry																30	6	
at Sacramento (1)																		
Feather River																		
at Oroville													3	3	2730	3	1	722
at Nicolaus													16	1	1130	16	1	303
Yuba River																		
at Marysville																		
American River																		
at Folsom																9	1	850
at Sacramento													3	1	3100	17	1	814
Cosumnes River																		
at U. S. 99 Crossing													3	2		1	2	
													16	2				
Mokelumne River																		
at U. S. 99 Crossing													3	1		1	3	
													16	2		29	1	
Return Flow Channels																		
Colusa Trough at Colusa-Williams Highway				16	11	65	1	9		1	5		1	4	488	1	Bkn	350
Colusa Trough at Colusa-Williams Highway							15	10		15	3		15	6	508	13	4	413
Colusa Trough at Colusa-Williams Highway																15	4	397
Wadsworth Canal at mouth																		
Butte Slough at mouth				1	2	0	1	3	239	1	3	266	1	3	0	1	4	200
Butte Slough at mouth				15	3	280	15	2	-2300	15	2	115	15	1	50	15	1	0

() United States Bureau of Reclamation records. (1) See Table 109 for observations at 4 day intervals.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin Area

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

Location	Jan.			Feb.			Mar.			Apr.			May			June		
	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs
Return Flow Channels (Continued)																		
Butte Slough at Long Bridge										26	3	167	19	2	187	15	2	98
Butte Slough at Long Bridge													30	3	166			
Reclamation District 70 Drain at Plant	13	19	0	1	16	0	1	11	0	15	13	10	15	11	50			
Reclamation District 70 Drain at Plant				15	9	0	15	9	0	29	11	38	31	10	33	7	13	30
Reclamation District 70 Drain at Plant							31	11	0				15	11	42	16	15	4
Reclamation District 108 Drain at Plant				1	22	0	1	14	0	15	13	300	16	5	80	15	10	70
Reclamation District 108 Drain at Plant				14	14	0	14	15	0	29	7	70	30	10	50	29	11	70
Reclamation District 108 Drain at Plant							30	18	0									
Reclamation District 108 on Back Borrow Pit										28	12	0	31	2	0	12	4	0
Knights Landing Ridge Cut at End													11	6	110	16	4	117
Knights Landing Ridge Cut at End													31	5	53			
Colusa Basin Drain at Knights Landing										(11)	4		3	5	206	16	3	200
Colusa Basin Drain at Knights Landing													8	3	370	8	Bkn	160
Colusa Basin Drain at Knights Landing													29	6	300			
Sacramento Slough at Mouth													3	21	360	16	13	390
Sacramento Slough at Mouth													9	7	400			
Sacramento Slough at Mouth													29	9	480			
Reclamation District 1500 Drain at Plant				1	30	108	1	23	0	15	30	120	1	30	220	1	20	280
Reclamation District 1500 Drain at Plant				16	37	0	15	24	0				9	32	280	16	21	230
Reclamation District 1500 Drain at Plant							16	37	0				15	30	220			
Reclamation District 1500 Drain at Plant							31	20	160									
Sutter By-Pass East Borrow Pit																		
at Chandler													3	1	114	7	1	190
at Chandler													9	3	87	15	1	166
at Chandler													16	4	144			
at Chandler													29	3	243			
at West Borrow Pit																		
at Reclamation District 1500				1	9	108	1	6	0	15	Bkn	120	1	7	140	1	5	370
at Reclamation District 1500				16	4	0	15	5	0				9	7	160	16	5	250
at Reclamation District 1500							31	3	159				15	6	260			
Yolo By-Pass East Borrow Pit																		
at Elkhorn				2	11	9	1	10	8	1	15	50	1	4	0	1	8	21
at Elkhorn				16	11	60	15	11	0	14	7	0	15	8	80	15	8	15
at Elkhorn													23	8	55	30	5	20
at East Borrow Pit																		
at Southern Pacific Railroad										24	9		12	7		16	14	
													31	16				
Reclamation District 1000 Drain at Plant				1	17	0	1	17	0	1	22	0	1	14	0	1	11	0
Reclamation District 1000 Drain at Plant				15	20	100	15	17	0	15	17	0	15	11	0	15	12	0

() United States Bureau of Reclamation records.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin Area

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

Location	Jan.			Feb.			Mar.			Apr.			May			June		
	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																		
at Mendota																		
at Fremont Ford Bridge				17	5	1570	15	14	398	1	16	309	5	7	*476	2	17	*172
at Fremont Ford Bridge				28	11	570				15	4	1180	15	11	300	15	25	120
at Fremont Ford Bridge				23	4	*1220				29	8	350	31	6	190	22	25	106
at Fremont Ford Bridge																30	35	*70
above Merced River													19	16		2	28	
above Merced River																30	57	
near Newman				17	4	2900	(28)	11	*806	6	14	740	5	7	690	2	16	410
near Newman				23	4	2500							19	7	590	22	17	280
near Newman																30	22	250
at Crows Landing				17	4					6	11		5	12		2	17	
at Crows Landing				23	5											30	21	
near Grayson				17	4	3100	(23)	13	*765	4	12	*1260	3	13	*749	2	15	*618
near Grayson				23	5	2820							19	10	890	23	18	400
near Grayson																30	21	*359
at Patterson Bridge				17	3					6	11		5	11		2	17	
at Patterson Bridge				23	6								19	10		23	19	
at Patterson Bridge																30	20	
at Maze Road Bridge				17	6	4250	1	8	2860	1	10	1920	2	11	1840	1	14	1010
at Maze Road Bridge				23	6	*3680	15	12	2000	15	10	1620	5	11	*1260	2	16	980
at Maze Road Bridge													15	11	1420	15	16	690
at Maze Road Bridge																30	15	*616
at Durham Ferry Bridge				17	5	4430	(15)	8	2200	6	10	2120	5	7	2220	2	9	1560
at Durham Ferry Bridge				23	5	4020							19	9	1710	14	9	870
at Durham Ferry Bridge																23	11	740
at Mossdale Bridge (1)																		
Mud Slough at Gustine Highway				17	32	60	15	104	3	1	290	0	5	110	*3	2	125	*3
Mud Slough at Gustine Highway				28	79	0				15	50	18	15	130	2	15	175	2
Mud Slough at Gustine Highway				23	63	*24				29	130	2	31	185	2	30	285	0
Middle Fork				17	243	0	15	275	0	1	280	0	5	280	0	2	295	0
Middle Fork				23	270	0				15	275	0	15	280	0	15	290	0
Middle Fork				28	265	0				29	270	0	31	300	0	30	315	0

( ) United States Bureau of Reclamation records.
(1) See Table 109 for observation at four-day intervals.
* Discharges given are mean daily discharges unless marked with an asterisk indicating discharge measured at time of sampling.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin Area

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

Location	Jan.			Feb.			Mar.			Apr.			May			June		
	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs
Mud Slough at Gustine Highway (Continued)																		
North Fork				17	10	0	15	181	0	1	230	0	5	265	0	2	310	0
North Fork				28	92	0				15	250	0	15	285	0	15	325	0
North Fork				23	12	0				29	270	0	31	310	0	30	360	0
Merced River																		
at Yosemite Valley Railroad Crossing				21	3	* 760				5	3	* 74	4	2	* 12	1	1	* 18
at Yosemite Valley Railroad Crossing																29	3	* 23
at U. S. 99				17	2	1280	15	2	245	1	7	257	15	1	218	15	3	163
at U. S. 99				28	2	1260				15	4	202	31	2	132			
at U. S. 99										29	2	170						
near Mouth				17	2		(28)	.6	565	6	3	* 282	5	3	* 241	2	1	* 174
near Mouth				23	4	*1190							19	3		22	3	175
near Mouth																30	4	* 174
Dry Creek																		
near Modesto				22	4	* 49				4	2	* 60	4	1	* 83	1	3	* 50
near Modesto													16	2	80			
Tuolumne River																		
at La Grange				21	3	* 625				5	3	* 2	4	2	* 3	1	2	* 1
at La Grange																29	1	* 142
at Roberts Ferry Bridge				21	3	* 664				5	9	* 51	4	4	* 69	1	9	* 40
at Roberts Ferry Bridge																29	3	* 186
at Hickman Bridge				22	5	* 752				5	12	* 129	4	12	* 155	1	13	* 111
at U. S. 99				17	3		1	7		1	12		2	3		1	13	
at U. S. 99							15	5					15	9		15	13	
at Tuolumne City Bridge				17	8		1	5	705	1	10	503	2	7	1350	1	12	328
at Tuolumne City Bridge				20	6	* 945	(15)	4	* 834	15	12	450	3	4	* 841	2	11	* 344
at Tuolumne City Bridge													15	10	415	15	7	325
at Tuolumne City Bridge													19	7	396	23	11	310
at Tuolumne City Bridge																30	9	* 476
Stanislaus River																		
at Orange Blossom Bridge				22	2	* 17				5	2	* 401	4	2	* 633	1	3	* 595
at Orange Blossom Bridge													19	3		29	1	* 26
at U. S. 99				17	2		1	2		1	2		2	2		1	1	
at U. S. 99							15	2		15	6		15	2		15	3	
at Hatmark Ranch				21	4	* 256	(15)	1	* 237	4	2	* 672	3	2	*1070	2	2	* 645
at Hatmark Ranch													17	4	* 644	21	3	210
at Hatmark Ranch													19	6	440			

() United States Bureau of Reclamation records.
* Discharges given are mean daily discharges unless marked with an asterisk indicating discharge measured at time of sampling.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS 1939
Sacramento-San Joaquin Area

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

Location	July			Aug.			Sept.			Oct.			Nov.			Dec.		
	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs
- SACRAMENTO VALLEY -																		
Stream Channels																		
Sacramento River																		
at Kennett	(10)	.4	3210	(15)	.4	2970	(11)	.4	2920	(14)	.3	3140	(13)	.4	3110	(11)	.2	16000
at Red Bluff	1	2	3280	1	4	2970	1	2	2970	16	2	3320	1	4	3380	1	3	3650
at Red Bluff	15	2	3050	15	3	2960	15	1	3350									
at Red Bluff							30	4	3250									
at Butte City	1	4	1740	1	2	1430	1	2	1940	2	12	3140	1	2	3330	1	4	3640
at Butte City	15	4	1610	15	3	1390	15	3	2940	16	2	3210				15	3	7400
at Colusa	1	3	1810	1	2	1430	1	3	1840	16	2	3200	1	4	3360	2	3	3640
at Colusa	15	2	1620	17	3	1400	15	2	2750				18	3	3360	15	2	10240
at Colusa							30	4	3030									
at Meridian	1	2		1	2		1	2		16	2		1	3		2	2	
at Meridian	15	2		17	2		15	4					18	2		15	1	
at Meridian							30	3										
at Knights Landing	1	2	860	1	4	844	1	3	2050	2	5	3400	1	4	3420	1	2	3900
at Knights Landing				15	3	1020	15	3	3150	16	2	3310				15	2	13000
at Verona	(12)	4		2	5	1020	1	3	2870	3	2	5020	3	2	4790			
at Verona				14	8	1250	15	3	4370	18	2	4490						
at Verona				18	3	1430												
at Elkhorn Ferry	16	6		1	8		2	6		3	4		1	2		1	3	
at Elkhorn Ferry				15	7					16	7		15	5		15	2	
at Sacramento (1)																		
Feather River																		
at Oroville				18	3	1940												
at Nicolaus	11	3	176	2	1	91	1	3	805	3	2	1480	3	2	968			
at Nicolaus				14	3	140	15	4	955	18	2	1010						
at Nicolaus				18	3	528												
Yuba River																		
at Marysville	11	1	69	18	2	43												
at Marysville	13	2	75															
American River																		
at Folsom				15	3	60												
at Sacramento				15	4	64												
Cosumnes River																		
at U. S. 99 Crossing																		
Mokelumne River																		
at U. S. 99 Crossing				2	1		29	2										
at U. S. 99 Crossing				28	1													

( ) United States Bureau of Reclamation records.
(1) See Table 109 for observation at four-day intervals.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin Area

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

Location	July			Aug.			Sept.			Oct.			Nov.			Dec.		
	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs
Return Flow Channels																		
Colusa Trough at Colusa-Williams Highway	1	5	355	1	6	335	1	7	579	16	5	90	1	7	103	2	6	
Colusa Trough at Colusa-Williams Highway	15	6	336	17	2	428	15	3	571				18	4		15	8	
Colusa Trough at Colusa-Williams Highway							30	6	142									
Wadsworth Canal at Mouth				11	2	41												
Butte Slough at Mouth	1	2	0	1	4	0	1	3	140	1	4	80	1	4	10	1	4	150
Butte Slough at Mouth	15	4	0	15	3	0	15	2	110	15	2	0	15	5	70	15	2	370
Butte Slough at Mouth													17	2	70			
Butte Slough at Long Bridge	3	3	98				6	3	82	20	4	43						
Butte Slough at Long Bridge	13	4	82	11	2	89												
Reclamation District 70 Drain at Plant	4	13	4	3	8	7	1	8	28	2	17	10	2	20	0	1	20	0
Reclamation District 70 Drain at Plant				11	9	23	14	8	8				15	18	0	14	4	0
Reclamation District 70 Drain at Plant				15	9	18												
Reclamation District 108 Drain at Plant	14	10	80	14	11	80	16	7	70	2	11	30	1	9	20	2	8	20
Reclamation District 108 Drain at Plant	31	12	80	30	10	50				17	12	60				17	10	160
Recl. District 108 Drain on Rock Borrow Pit																		
Knights Landing Ridge Cut at End	13	6	96	18	8	60	5	3	33									
Colusa Basin Drain at Knights Landing	4	8	206	2	4	150	15	7	540	17	10	135	13	5		(7)	5	
Colusa Basin Drain at Knights Landing	14	7	120	17	8	310	5	5	530	4	7	240						
Colusa Basin Drain at Knights Landing				18	6	280												
Sacramento Slough at Mouth	4	24	350	8	21	260	6	7	250	4	10	230	3	20				
Sacramento Slough at Mouth							15	8	360	8	4	260						
Reclamation District 1500 Drain at Plant	4	20	210	1	19	260	15	19	300	15	28	180	16	28	0	16	42	0
Reclamation District 1500 Drain at Plant	15	17	200	15	16	260	30	35	115	31	44	78	29	32	75			
Reclamation District 1500 Drain at Plant				31	22	380												
Sutter By-Pass East Borrow Pit																		
at Chandler				8	4	48	17	4	230	3	2	89	3	2	60			
at Chandler				14	3	79				18	2	66						
at Chandler				31	4	86												
at West Borrow Pit																		
at Reclamation District 1500	3	16	67	1	14	71	15	8	170	15	6	86	16	4	0	16	6	0
at Reclamation District 1500	4	20	88	15	10	158	30	5	140	31	8	78	29	5	0			
at Reclamation District 1500	15	14	78	31	11	140												
Yolo By-Pass East Borrow Pit																		
at Elkhorn	16	9	14	1	8	8	2	6	0	3	11	13	1	15	1	1	30	1
at Elkhorn				15	9	7				16	11	8	15	12	0	15	13	4
East Borrow Pit																		
at Southern Pacific Railroad	18	9		7	11		15	12		4	14							
at Southern Pacific Railroad										30	17							
Reclamation District 1000 Drain at Plant	1	10	0	1	19	0	1	16	0	1	14	0	1	24	0	1	23	0
Reclamation District 1000 Drain at Plant	15	16	0	15	20	40	15	8	50	16	14	0	15	18	0	15	22	0

() United States Bureau of Reclamation records.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin Area

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

Location	July			Aug.			Sept.			Oct.			Nov.			Dec.		
	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																		
at Mendota																		
at Fremont Ford Bridge	15	35	50	4	40	* 40	1	23	37	16	31	36	1	32	30	2	20	60
at Fremont Ford Bridge	31	44	40	15	30	35	15	14	50	25	35	* 37	17	32	40			
at Fremont Ford Bridge				30	23	* 43	29	11	* 86									
at Fremont Ford Bridge							30	14	70									
above Merced River				4	57		29	15										
above Merced River				30	42													
near Newman	(26)	16	* 214	4	15	220	29	9	330	25	17	190	(22)	17	187	(20)	5	492
near Newman				30	11	220												
at Crows Landing				4	16		29	9		25	16							
at Crows Landing				30	13													
near Grayson	(26)	15	* 256	3	13	* 301	28	9	* 550	23	15	* 430	(22)	19	* 321	21	9	* 547
near Grayson				28	16	* 354												
at Patterson Bridge				4	14		29	9		25	13							
at Patterson Bridge				30	13													
at Maze Road Bridge	1	14	550	1	12	570	15	10	850	16	9	1340	2	9	1620	1	11	1210
at Maze Road Bridge	15	13	555	4	11	* 486	28	9	*1255	23	12	*1100				15	8	1360
at Maze Road Bridge				15	12	650												
at Maze Road Bridge				28	12	650												
at Maze Road Bridge				31	12	670												
at Durham Ferry Bridge	1	11	800	4	10	640	29	10	1430	25	9	1270						
at Durham Ferry Bridge				28	8	770												
at Mossdale Bridge (1)																		
Mud Slough at Gustine Highway	1	255	0	4	365	0	1	390	0	16	375	0	1	415	0	2	455	0
Mud Slough at Gustine Highway	15	320	0	15	390	0	15	370	0	28	420	0	17	370	0	16	14	40
Mud Slough at Gustine Highway	31	375	0				29	375	0									
Mud Slough at Gustine Highway							30	380	0									
Middle Fork	1	310	0	4	330	0	1	345	0	16	295	0	1	340	0	2	360	0
Middle Fork	15	325	0	15	335	0	15	340	0	28	355	0	17	345	0	16	355	0
Middle Fork	31	330	0				30	355	0									
North Fork	1	355	0	4	420	0	1	465	0	16	460	0	1	500	0	2	495	0
North Fork	15	385	0	15	430	0	15	480	0	28	510	0	17	490	0	16	485	0
North Fork	31	430	0				30	485	0									

( ) United States Bureau of Reclamation records.
(1) See Table 109 for observation at four-day intervals.
* Discharges given are mean daily discharges unless marked with an asterisk indicating discharge measured at time of sampling.

TABLE 111 (CONTINUED)

SALINITY OBSERVATIONS - 1939
Sacramento-San Joaquin area

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

Location	July			Aug.			Sep.			Oct.			Nov.			Dec.		
	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs	Day	Cl.	cfs
Stream Channels (Continued)																		
Merced River																		
at Yosemite Valley Railroad				2	2	*23	27	3	*25	24	2	*4						
at Yosemite Valley Railroad				29	3	*17												
at U. S. 99	15	3	130				1	7	154	16	2	108	1	2	108	16	3	134
at U. S. 99	31	3	209				15	3	171				18	2	108			
at U. S. 99							30	4	144									
near Mouth	1	4	174	4	3	*178	29	5	*232	25	3	*146	(22)	2	*128	2	5	136
near Mouth				15	3	180												
near Mouth				30	3	*197												
Dry Creek																		
near Modesto	1	4	*48	3	1	*46	28	3	*55	25	3	*46						
near Modesto				29	4	*39												
Tuolumne River																		
at La Grange				2	2	*141	27	2	*418	24	2	*428						
at La Grange				29	13	*140												
at Roberts Ferry Bridge				2	4	*174	27	5	*181	24	3	*428						
at Roberts Ferry Bridge				29	4	*171												
at Hickman Bridge	1	7	*256	3	8	*221	27	3	*325	24	5	*478						
at Hickman Bridge				29	10	*240												
at U. S. 99	1	11		1	9		15	6		16	5		15	6		1	8	
at U. S. 99	19	7		15	9		30	6					2	6		15	3	
at U. S. 99				31	9													
at Tuolumne City Bridge	1	8	450	1	10	426	15	6	480	16	3	800	2	4	1140	1	9	840
at Tuolumne City Bridge	17	10	484	3	8	*466	27	7	*618	23	6	*681	15	5	845	14	4	*787
at Tuolumne City Bridge				15	9	438	30	7	645							15	7	830
at Tuolumne City Bridge				28	8	469												
at Tuolumne City Bridge				31	9	465												
Stanislaus River																		
at Orange Blossom Bridge				2	1	*24	27	2	*15	25	2	*19						
at Orange Blossom Bridge				30	15	*15												
at U. S. 99	1	3		1	2		1	2		16	2		2	4		1	5	
at U. S. 99	17	3		15	4		15	1					15	4		15	1	
at U. S. 99							30	2										
at Hatmark Ranch	1	2	*201	3	2	*213	28	2	*255	23	3	*159	(15)	6	*202	(14)	3	*360
at Hatmark Ranch				30	2	*187												

() United States Bureau of Reclamation records.
* Discharges given are mean daily discharges unless marked with an asterisk indicating discharge measured at time of sampling.

CHAPTER VII

TIDE GAGES

In order to determine the behavior of the tides in the Sacramento-San Joaquin Delta and upper bay 24 recording tide gages are being operated, 15 by the Division of Water Resources, 4 by the U. S. Army Engineers and 5 are, or soon will be, operated by the United States Bureau of Reclamation. These gages are scattered throughout the area and the location and a description of each station is given in Table 112. The table also shows when the gage was first installed. The gages have been operated continuously since their installation with the exception of minor breaks in the record due to stoppages, etc. Only one gage has been out of commission for any length of time, this one being at the San Joaquin end of Three Mile Slough. It was out of operation from September 1935 until July 1938.

The charts from the State-owned and operated gages are on file and the data for some of them have been tabulated.

During 1929, 1930 and 1931 gages were operated at many other points for short periods. Bulletin 27 of the Division of Water Resources gives the data obtained from these gage operations.

During the fall of 1939 the United States Coast and Geodetic Survey ran a line of first order levels between Galt - Fairfield and Stockton to which it is planned these gages will be tied thus bringing all staffs to one datum plane.

Plate 4 shows the location of all the recording gages now in operation.

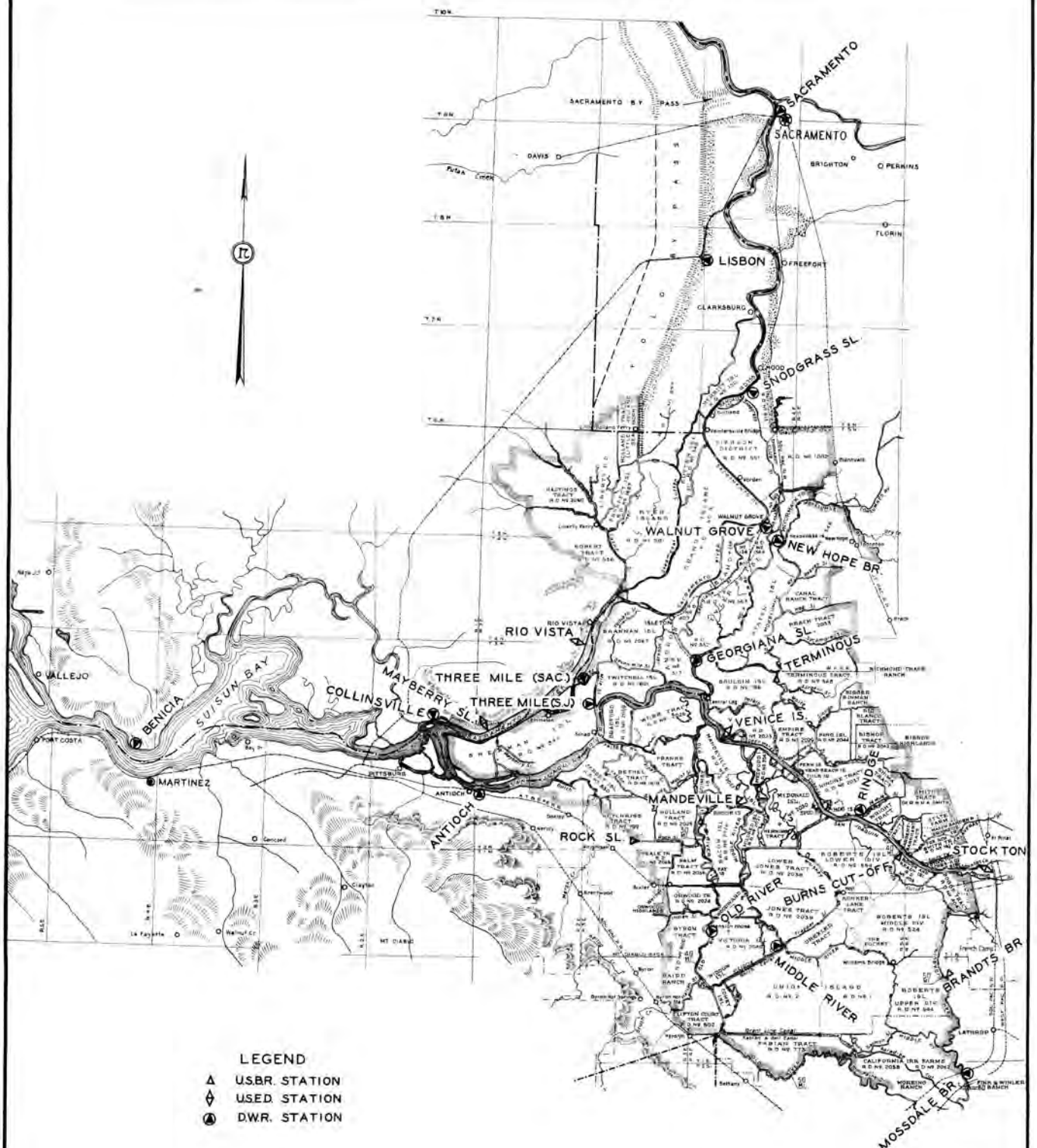
TABLE 112

LOCATION AND DATE OF INSTALLATION OF RECORDING TIDE GAGES IN SACRAMENTO-SAN JOAQUIN DELTA AND SUISUN BAY

Name of Station	Operated by *	Location	Date Installed
		SACRAMENTO DELTA	
Sacramento	D.W.R.	Left bank of Sacramento River at Southern Pacific Railroad bridge	1920
Snodgrass Slough	D.W.R.	Left bank, Sacramento River; about 0.1 mile above Hollister landing about $\frac{1}{4}$ mile above head of Snodgrass Slough (now leveed off).	August 1939
Walnut Grove	D.W.R.	Left bank of Sacramento River at head of Georgiana Slough; lower end of town of Walnut Grove	February 1929
Rio Vista	U.S.E.D.	Right bank of Sacramento River at U.S. Engineers depot below Rio Vista; about $1\frac{1}{2}$ miles below Rio Vista Bridge	April 1908
Three Mile Slough (Sac.)	D.W.R.	On Brannon Island side of Slu. Pile dolphin about 0.1 mi. from 3 Mile Slu Bridge	April 1929
Mayberry Slough	U.S.E.D.	Right bank of Sacramento River about four miles above Collinsville	Prior to 1929
Collinsville	D.W.R.	Right bank of Sacramento River. On pile dolphin about 0.1 mile upstream from junction of main street and river.	June 1929
		MOKELUMNE DELTA	
New Hope Bridge	D.W.R.	Right bank of the south fork of the Mokelumne River; just below New Hope Bridge	August 1920
Terminous	U.S.B.R.	On highway bridge over Potato Slough between Terminous Tract and Bouldin Island	July 1940**
Georgiana Slough	D.W.R.	On Andrus Island near junction of Georgiana Slough and Mokelumne River. At former location of Golden State Asparagus Company Plant.	June 1929
		SAN JOAQUIN DELTA	
Mossdale Bridge	D.W.R.	Right bank of San Joaquin River just below U.S. 40 crossing	1920
Brandts Bridge	U.S.B.R.	Right bank of San Joaquin River at Brandts Bridge between Roberts Island and mainland	July 1940**
Stockton	U.S.E.D.	At head of McLeod Lake; El Dorado Street.	December 1927

* D.W.R. - Division of Water Resources; U.S.E.D. - United States Army Engineers; U.S.B.R. - United States Bureau of Reclamation.

** Estimated that installation will be complete by this time.



SACRAMENTO – SAN JOAQUIN WATER SUPERVISION

LOCATIONS OF RECORDING TIDE GAGE STATIONS

SACRAMENTO–SAN JOAQUIN DELTA AND SUISUN BAY

SCALE OF MILES

2 0 2 4 6 8 10

TABLE 112 (CONTINUED)

LOCATION AND DATE OF INSTALLATION OF RECORDING TIDE GAGES IN SACRAMENTO-SAN JOAQUIN DELTA AND SUISUN BAY

Name of Station	Operated by *	Location	Date Installed
		SAN JOAQUIN DELTA (Continued)	
Burns Cut-off	U.S.B.R.	On Stockton ship canal at East Bay Municipal Utility District Crossing; northwest corner of Rough and Ready Island	May 1940
Rindge	D.W.R.	At southeast corner of Ridge Tract; on Fourteen Mile Slough at Junction with Ship Canal	July 1939
Middle River (Borden)	D.W.R.	Left bank of Middle River just below Borden Highway Bridge. On Victoria Island	July 1939
Old River (Mansion House)	D.W.R.	Right bank of Old River at Mansion House. On Victoria Island. On timber dolphin.	August 1939
Mandeville	U.S.B.R.	South side of Mandeville Island; on Mandeville cut; at beet dump about one mile west of Bacon-Mandeville ferry.	July 1940**
Rock Slough	U.S.B.R.	North bank of Rock Slough near head of slough. About $1\frac{1}{2}$ miles east of Knightsen	May 1936
Venice Island	U.S.E.D.	On Stockton ship canal near Venice Island headquarters at Blakes Landing	January 1928
Three Mile Slough (S.J.)	D.W.R.	On Sherman Island at R.D. 341 drainage plant; near junction of slough with San Joaquin River. Pile dolphin	June 1929
Antioch	D.W.R.	On wharf of Antioch Water works	June 1929
		SUISUN BAY	
Benicia	D.W.R.	North side of Suisun Bay; on Benicia Arsenal wharf	April 1940
		YOLO BY-PASS	
Lisbon	D.W.R.	Left bank of Yolo By-Pass near north end of San Francisco and Sacramento Railroad trestle.	1920

* D.W.R. - Division of Water Resources; U.S.E.D. - United States Army Engineers; U.S.B.R. - United States Bureau of Reclamation.

** Estimated that installation will be complete by this time.