

State of California  
The Resources Agency  
DEPARTMENT OF WATER RESOURCES  
Division of Planning

**California Central Valley  
Unimpaired Flow Data**  
(October 1920 through September 1992)

**Third Edition**



August 1994

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**Foreword**

This report contains the estimated unimpaired flows for 24 Central Valley subbasins and the Sacramento-San Joaquin Delta for October 1920 through September 1992. Data for October 1920 through September 1983 were published in a 1987 report.

Unimpaired flow is runoff that would have occurred had water flow remained unaltered in rivers and streams instead of stored in reservoirs, imported, exported, or diverted. The data are a measure of the total water supply available for all uses after removing the impacts of most upstream alterations as they occurred over the years. Alterations such as channel improvements, levees, and flood bypasses are assumed to exist.

The description of the procedures used to calculate the unimpaired flows for each subbasin and the Delta was presented in the 1987 report and are included in the main text. The main text also describes any changes from previous procedures in extending the data through 1992.

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## Introduction

This report presents an extension of data through water year 1992 of the 1921-1983 data found in "California Valley Unimpaired Flow Data" (February 1987), published by the Division of Planning. The text describing the procedures used to estimate the unimpaired flows is taken from the 1987 report. The information below also explains any differences in how the calculations were made between the 1987 report and this report.

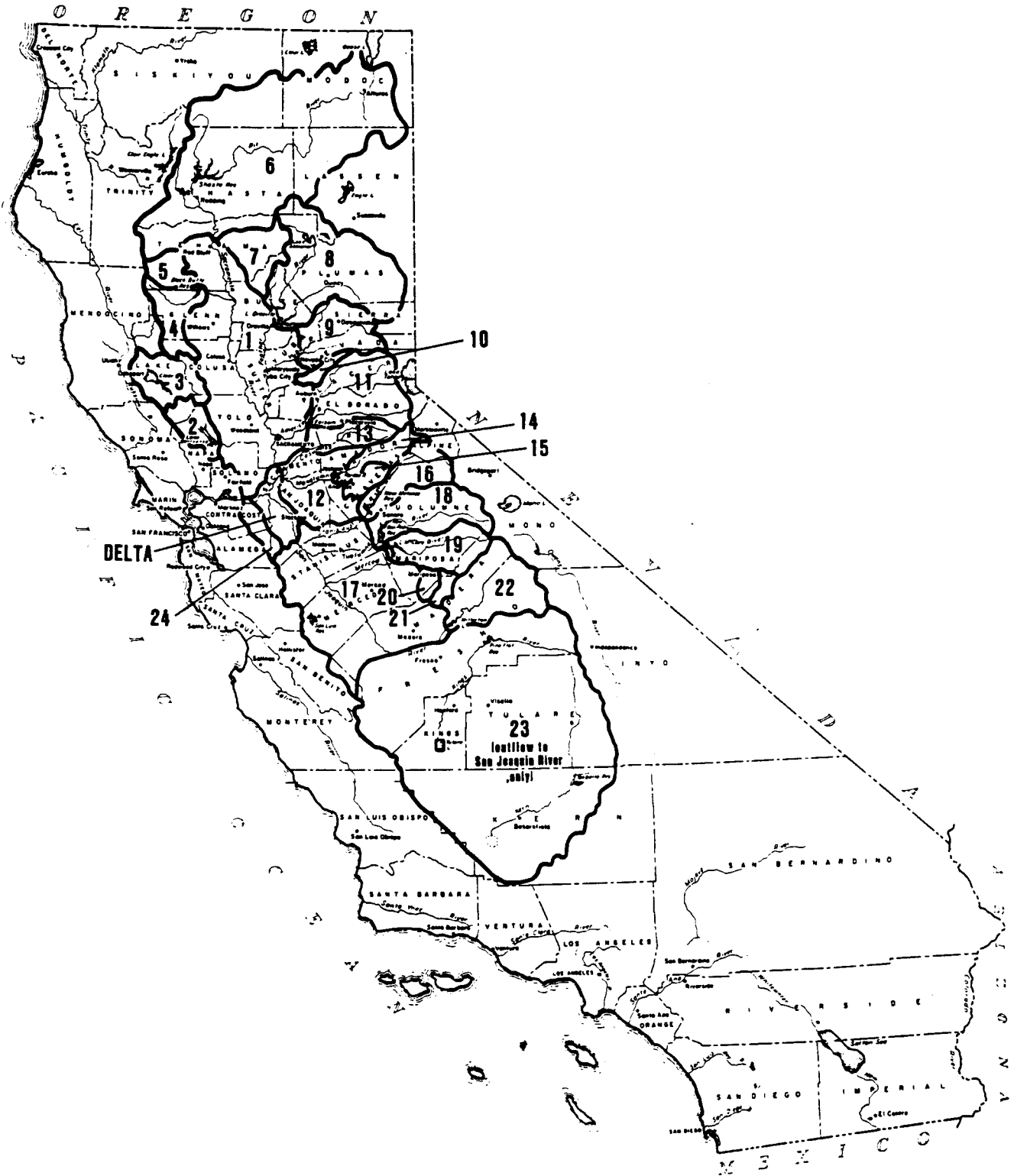
Full natural flow, natural flow, natural runoff and unimpaired flow are all phrases that have been used by the Department of Water Resources (DWR) in various publications to represent the runoff from a basin that would have occurred had man not altered the flow of water in the basin.

The first edition of this report was titled "California Central Valley Natural Flow Data". The title has been changed from NATURAL to UNIMPAIRED because it better describes the data contained herein. The word natural connotes that the Central valley landscape is in a prehistorical or virgin state. Unimpaired, on the other hand, implies only that certain items in the measured flows have been adjusted. Unimpaired flow could be synonymous with natural flow if all of the items in the unimpaired computation matched the natural flow computation. In practice, this is not usually the case; it is customary to include only those items in the unimpaired flow computation for which either reliable data are readily available or reasonable estimates can be made. In this report the data is better described as unimpaired data, primarily because of the difficulty in computing four times of significance.

First, the ground water accretions from the very large area of the Central Valley floor probably were considerably higher under natural conditions but no data is available. Second, the consumptive use of the riparian vegetation and the water surfaces in the swamps and channels of the Central Valley under a natural state could be significant but are difficult to estimate. Third, during periods of high flow, Central Valley rivers would overflow their banks and water could be stored in the valley for long periods of time and could interact with item two. Fourth, the outflow from the Tulare Lake Basin under natural conditions is difficult to estimate. The unimpaired flows in this report assume that the river channels of the valley are in their present configuration.

This report contains estimates of the monthly flow for 24 subbasins in the Central Valley. A table of the Sacramento River Index, previously known as Unimpaired Four Rivers Flow, is also included. In addition, estimates are included of the total unimpaired inflow to the Sacramento-San Joaquin Delta, net use in the Delta (unimpaired and natural), and the total unimpaired outflow from the Delta. The unimpaired inflow to the Delta is the sum of the unimpaired

**California Central Valley Unimpaired Flow Data 1921-1992**



**Figure 1. California Central Valley Unimpaired Flow Areas**

flow estimates of the 24 subbasins. The total Delta unimpaired outflow is the total unimpaired inflow minus the unimpaired Delta net use. Data were calculated for 72 years — October 1920 through September 1992.

A description of the procedures used to calculate the unimpaired flows is included. For some areas, the estimated flows were obtained from another source and therefore a detailed description of the calculation is not included.

#### **UF 1 — Sacramento Valley Floor**

These values represent the estimated unimpaired flow for the Sacramento Valley floor and the minor streams from the Stony Creek drainage area to the Cache Creek drainage area, from the Cache Creek drainage area to the mouth of the Sacramento River, and from the Feather River drainage area to the American River drainage area (Bulletin No. 1 areas 2-8, 2-9, 2-16, and 2-19). With Bulletin No. 1 mean seasonal runoff as a base, these minor streams were estimated to be 2.18 times the Bear River near Wheatland. In the unimpaired flow data published in the 1966 "Surface Water hydrology of Yuba-Bear Rivers Hydrographic Unit" office report, the 1911-1960 average runoff of the Bear River near Wheatland was 5.05 times that of Dry Creek near Wheatland. The resulting runoff for the 1921 through 1960 period was computed by multiplying 11 ( $2.18 \times 5.05$ ) times the estimated monthly runoff of Dry Creek near Wheatland.

Unimpaired runoff for the 1961-1992 period was estimated as the product of 2.18 times the estimated unimpaired flow of the Bear River near Wheatland due to the discontinued Dry Creek record. Since this computation showed abnormally high summer flows, the June flows were reduced by one-half and flows for July, August and September were made equal to zero.

#### **UF 2 — Putah Creek near Winters**

The unimpaired flow for Putah Creek near Winters for water year 1921 was obtained from the 1964 DWR office report "Surface Water Hydrology of Putah-Cache Hydrographic Unit". The unimpaired flow of Putah Creek near Winters for the 33 year period (1922-1954) was assumed to be equal to the historical outflow of Putah Creek near Winters. Flows for the 1955-1992 period were obtained from the U. S. Geological Survey (USGS) water supply papers and were adjusted for the changes in storage and evaporation from Lake Berryessa starting in January 1957.



**UF 3 — Cache Creek above Rumsey**

These flows represent the estimated unimpaired flow of Cache Creek above Rumsey.

The 1921 unimpaired flow was based on the 1964 "Surface Water Hydrology of Putah-Cache Creeks Hydrographic Unit" office report and was calculated by adding together Table 18 (Cache Creek at Lower Lake, unimpaired flow), Table 21 (Bear Creek near Rumsey), Table 22 (North Fork Cache Creek near Lower Lake), and data from an incremental ungaged area equivalent to 0.41 times the flow of North Fork Cache Creek. The factor 0.41 was used in estimating historical outflow of depletion Study Area 16 (Cache Creek above Rumsey) in the 1966 Joint DWR - U. S. Bureau of Reclamation (USBR) Central Valley Depletion Study.

Unimpaired runoff for the 1922 through 1960 water year period was obtained by adding the differences between Table 18 (Cache Creek at Lower Lake, unimpaired flow) and Table 20 (Cache Creek near Lower Lake, recorded flow) of the 1964 office report mentioned above to the historical outflow of Joint Depletion Study Area 16 (Cache Creek above Rumsey). The difference between Table 18 and 20 corrects the historical flow for upstream depletion and regulation due to Clear Lake.

Unimpaired flows for 1961-1970 were calculated by the same method except that the computer program OUTFLOW (developed by the DWR Statewide Planning Branch) was used to find Cache Creek at Lower Lake unimpaired flow instead of Table 18. This program determined the unimpaired outflow of Clear Lake with a given net supply. The net supply for Clear Lake was calculated by adding together the historical outflow of Cache Creek near Lower Lake, (USGS water supply papers), the average lake evaporation (lake area at average monthly gage height times average monthly evaporation), and change in gage height times average lake area).

Beginning with water year 1971, the unimpaired flow of Cache Creek above Rumsey was estimated as the sum of the computed unimpaired outflow of Clear Lake plus the flows from Bear Creek near Rumsey, North Fork Cache Creek near Lower Lake and the remaining area between the gages at those three locations and the Rumsey gage. For water years 1971 through 1973 and 1976 through 1978, the accretions were calculated as the difference in measured flow of Cache Creek above Rumsey and the three upstream gages. For water years 1974 and 1975, the accretions were estimated by graphical correlation with the unimpaired flow of North Fork Cache Creek near Lower Lake. The equation is:

$$\text{Accretions} = 0.47674 (\text{North Fork}) - 11688 \text{ acre-feet}$$

Adjustments for the estimated changes in storage and evaporation of Indian Valley Reservoir began in December 1974. For water years 1981 through 1983, the unimpaired flow was computed as the sum of the historical flow of Cache Creek at Rumsey plus the net effects of Indian Valley Reservoir and Clear Lake.

Flows for 1984–1992 were computed as the sum of historical flow of Cache Creek at Rumsey plus net effects of Clear Lake and Indian Valley Reservoir. The net effects of Clear Lake is computed as:

Clear Lake outflow from the Cache HEC3 Model minus historical Clear Lake flow near Lower Lake (Clear Lake historical outflow).

#### **UF 4 — Stony Creek at Black Butte**

These flows are the estimated unimpaired flows of Stony Creek at Black Butte Reservoir. Unimpaired flows for water year 1921 were obtained from the DWR office report "Surface Water Hydrology-Upper Sacramento Valley", January 1968. Runoff for 1922 through 1949 was obtained from USBR Appendix I "Hydrology on Black Butte Unit, Stony Creek Division, Central Valley Basin", February 1951. Extensions of the flows were made in about 1960 by USBR personnel to cover water years 1950 through 1957. The flows for the 1958-1992 period were computed by adding together the historical outflow of Stony Creek at Black Butte (USGS water supply papers), historical export of South Diversion Canal, and the changes in storage and evaporation from Stony Gorge, East Park, and Black Butte Reservoirs.

#### **UF 5 — Sacramento Valley West Side Minor Streams**

These flows represent the estimated unimpaired flow of the west side area between the Red Bluff gage on the Sacramento River and the Stony Creek drainage area on the west side of the Sacramento Valley.

The runoff for water year 1921 was derived by adding the historical outflows of the Redbank Creek group, Thomes Creek at Paskenta, Thomes Creek above 500-foot contour, and Elder Creek near Henleyville.

Flows for the 1922-1954 period were derived by adding the historical outflow of Thomes and Elder Creeks (Joint Depletion Study Area 5, Elder Creek group) to Tables 33 (Redbank Creek group) and 36 (unmeasured area, Thomes Creek above 500-foot contour) of the 1957 Joint Hydrology Study.

Estimated historical flows for Thomes Creek at Paskenta are from a DWR 1968 office report, "Surface Water Hydrology-Upper Sacramento Valley".

## California Central Valley Unimpaired Flow Data 1921-1992

The annual flows for Redbank Creek group and Elder Creek near Henleyville were derived by correlation with Elder Creek near Paskenta as set forth in the 1968 "Surface Water Hydrology-Upper Sacramento Valley" report. The data on annual flows for Elder Creek near Henleyville were then distributed according to the monthly flows of Elder Creek at Paskenta. Annual flow data for the Redbank Creek group were distributed according to the monthly flows of Thomes Creek at Paskenta.

Thomes Creek above the 500-foot contour was correlated to Thomes Creek at Paskenta to obtain the yearly flows, which were then distributed according to the monthly flows of the same creek.

Unimpaired runoff for the 1955-1983 period was derived by adding the outflow of the Redbank Creek group, Thomes Creek at Paskenta, Thomes Creek above 500-foot contour, and Elder Creek at Gerber.

Flows for Thomes Creek at Paskenta, Elder Creek at Paskenta, and Elder Creek at Gerber were obtained from the USGS water supply papers. The gage Elder Creek at Gerber was discontinued in 1979, and flows after that time were correlated with Elder Creek near Paskenta. Also, the gage Red Bank Creek near Red Bluff was discontinued in 1982 and later flows were estimated by correlation with Thomes Creek at Paskenta.

Annual flows (1955-1983) for Thomes Creek above 500-foot contour were obtained by correlation with Thomes Creek at Paskenta and distributed according to the monthly flows of Elder Creek at Gerber and Thomes Creek at Paskenta after Elder Creek at Gerber was discontinued.

Annual flows (1955-1959) for the Redbank Creek group were obtained by correlation with historical flows of Elder Creek near Paskenta and distributed according to the monthly flows of Elder Creek at Paskenta. Monthly flows (1960-1983) for the Redbank Creek group were computed by multiplying Redbank Creek near Red Bluff by an area precipitation ratio of 1.88.

Since there was negligible historical development within this area, historical flows were assumed to be unimpaired.

Unimpaired runoff for 1984 to 1992 was derived by adding the outflows of:

1. The Redbank group
2. Thomes Creek at Paskenta
3. Thomes Creek above 500-foot contour
4. Elder Creek at Gerber

**UF 6 — Sacramento River near Red Bluff**

Data was taken from DWR Snow Survey records.

In 1969 USGS moved the Red bluff gage upstream to a new site 3 miles above Bend Bridge. The new gage no longer measures Paynes Creek flows. To be consistent with pre-1969 Sacramento River near Red Bluff, the flows of Paynes Creek near Red Bluff are added to the unimpaired flows developed by DWR Snow Surveys Branch.

In 1970 USGS discontinued the gage of Paynes Creek near Red Bluff. Therefore, Paynes Creek was estimated by graphical correlation with Mill Creek near Los Molinos, using measured data from 1950-1960.

**UF 7 — Sacramento Valley East Side Minor Streams**

This area is located on the east side of the Sacramento Valley between the Red Bluff gage (Sacramento River) and the Feather River drainage area. Runoff for the 10/21-9/80 period was computed by adding the historical outflow of Joint Depletion Study Areas 6 (Antelope Creek Group), 7 (Mill Creek), 8 (Deer Creek Group), 9 (Big Chico Creek), and 14 (Minor East Side Tributaries, Big Chico to Feather). Runoff for the 10/20-9/21 period was estimated by correlation with Deer Creek near Vina.

Unimpaired runoff is equivalent to the historical runoff within these basins minus the historical import from the west branch of the Feather River. Import for the period 10/20-9/30 is estimated. Data for the period 10/30-9/83 is taken from USGS Water Supply Reports. The data is listed under "Butte Creek near Chico".

The flows for 1984-1992 were assumed to be the same as historical outflow of depletion areas 66 and 14, minus the import from the west branch of the Feather River.

**UF 8 — Feather River near Oroville**

Data was taken from DWR Snow Survey records.

**UF 9 — Yuba River at Smartville**

Data was taken from DWR Snow Survey records.

**UF 10 — Bear River near Wheatland**

The unimpaired flow for the Bear River for the period 1921-58 were obtained from the DWR Nov. 1966 Office Report "Surface Water Hydrology of Yuba-Bear Rivers Hydrologic Unit". Flows for 1959-63 were obtained from the DWR Snow Surveys Branch. The period 1964-1983 was calculated by adding the following:

## **California Central Valley Unimpaired Flow Data 1921–1992**

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1. historical flow of Bear River near Wheatland - USGS water supply papers.
2. South Yuba Canal - DWR Snow Surveys.
3. Boardman Canal - USGS water supply papers.
4. Towle Canal - DWR Snow Surveys, until 1971, after which it was neglected.
5. Gold Hill Canal - Depletion Study Area 56 historical export data.
6. Bear River Canal - Depletion Study Area 56 historical export data.
7. Camp Far West Diversion - (Includes Camp Far West North and South Canals and South Sutter Conveyance Canal).

And deducting the following items:

1. Drum Canal - DWR Snow Surveys
2. Lake Valley Canal - Depletion Study Area 22 historical export data.
3. South Yuba Canal - DWR Snow Surveys
4. D. S. Canal to Bear River via Greenhorn Creek - DWR Snow Surveys.

Plus the changes in storage of the following reservoirs:

1. Camp Far West (1921-1958) - DWR Snow Surveys; (1959-1983) - USGS water supply papers.
2. Rollins - USGS water supply papers.
3. Combie - DWR Snow Surveys.

Unimpaired runoff for 1984 to 1992 was calculated by adding the following:

1. Unimpaired Bear River flow at the Van Trent gage (1922–29); flow at the gage near Wheatland (1929–92)
2. Evaporation from Camp Far West Reservoir
3. Evaporation from Combie Reservoir
4. Evaporation from Rollins Reservoir
5. Change in storage at Camp Far West Reservoir
6. Change in storage at Combie Reservoir
7. Change in storage at Rollins Reservoir
8. Total exports above Camp Far West Reservoir
9. Camp Far West WD South Canal diversion

10. Camp Far West WD North Canal diversion
11. South Sutter WD diversion
12. historical depletion

And deducting the following items:

1. Consumptive use of replaced native vegetation
2. Total imports above Camp Far West

**UF 11 — American River at Fair Oaks**

Data was taken from DWR Snow Survey records.

**UF 12 — San Joaquin Valley East Side Minor Streams**

These flows represent the estimated unimpaired runoff on the valley floor east of the Delta from the minor streams that lie between the Stanislaus River drainage area and the American River drainage area. The runoff was computed by multiplying the area precipitation ratio of 3.85 by the monthly runoff of Dry Creek near Galt.

**UF 13 — Cosumnes River at Michigan Bar**

Data was taken from DWR Snow Survey records.

**UF 14 — Mokelumne River at Pardee Reservoir**

Data was taken from DWR Snow Survey records.

**UF 15 — Calaveras River at Jenny Lind**

The unimpaired runoff of the Calaveras River at Jenny Lind was estimated to be the measured flow plus the change in storage and net evaporation of Old and New Hogan Reservoirs. Occasional computed negative flows were assumed to be zero.

The estimated unimpaired flow for the 1921-1948 period of the Calaveras River above Jenny Lind was assumed to be equal to the historical outflow of Joint Depletion Study Area 32 (Calaveras River above Jenny Lind). historical upstream depletions were considered to be negligible and probably offset by small imports from the Mokelumne River.

Adjustment for the effect of Old Hogan Reservoir was made for the period January 1949 to December 1963. Prior to 1949, no records were kept on the storage of Old Hogan Reservoir. Since there were no gates prior to 1949 with which to regulate Hogan Reservoir, the only effect on the runoff was a short-term delay in heavy flood runoff. Unimpaired runoff of the Calaveras River then was assumed to be the same as the measured flow.

## **California Central Valley Unimpaired Flow Data 1921–1992**

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Old Hogan Reservoir was inundated in the fall of 1963. No records of Old Hogan storage operation could be found from November 1, 1962 to December 1963. To determine the impairment during this period, the inflow to Hogan Reservoir was estimated from measured releases and estimates of net reservoir evaporation and storage changes. Inflow from November 1962 through December 1963 was estimated to be the sum of measured flow in the Calaveras River below Hogan Dam (159,360 AF) plus estimated net reservoir evaporation of 1,700 AF, plus the gain in storage at the end of December 1963 (1,240 AF in New Hogan Dam less the 1,000 AF in Old Hogan Dam on November 1, 1962). Thus, total inflow was 161,300 AF. The total inflow consisted of the sum of the North and South Forks of the Calaveras River plus Calaveritas Creek (all USGS stations) at 133,060 AF and an unmeasured accretion calculated to be 28,240 AF by difference. The monthly pattern of the unmeasured accretion was assumed to be distributed on the average of the pattern of the three upper stations and the pattern of Cosgrove Creek near Valley Springs.

After December 1963, unimpaired runoff was estimated by adjusting the Calaveras River flows for changes in storage in, evaporation from, and precipitation on New Hogan Reservoir. Storage and evaporation were reported in USGS water supply papers. Precipitation was computed by multiplying precipitation at the Hogan Dam station times New Hogan Reservoir area. The surface area was based on the storage-capacity table in the 1972 USGS water supply paper.

The Calaveras at Jenny Lind station was discontinued in 1966. The Jenny Lind station was extended by adding estimated accretions between Jenny Lind and New Hogan to the runoff of Calaveras River below New Hogan Dam. The accretions were estimated to be 1.42 times those of Cosgrove Creek near Valley Springs. The factor 1.42 is the ratio of the drainage area (30 sq. miles) of the Jenny Lind to New Hogan Reach to that of Cosgrove Creek near Valley Springs (21.1 sq. miles).

Flow for 1984–1992 was computed as the sum of historical flow of the Calaveras River below New Hogan Dam plus the net effects of New Hogan Dam, historical gross evaporation of New Hogan Reservoir and accretions to Calaveras River between Jenny Lind and New Hogan Dam.

### **UF 16 — Stanislaus River at Melones Reservoir**

Data was taken from DWR Snow Survey records.

### **UF 17 — San Joaquin Valley Floor**

These figures represent the estimated unimpaired valley-floor flows of the minor streams from the San Joaquin River at Friant to San Joaquin River at Vernalis, and the west side of the San Joaquin Valley above the valley

floor tributary to the San Joaquin River. With Bulletin No. 1 mean seasonal runoff as a base, these minor streams were found to be 2.615 (238,500/91,300) times the Chowchilla River flows at Buchanan Damsite. The 1922-1954 average runoff for the Chowchilla River at the gage was 66,000 acre-feet. Comparable minor-stream 1922-1954 runoff was 172,400 acre-feet. Runoff from Joint Depletion Study Area 43 (Chowchilla River above Buchanan Damsite) was 67,600 acre-feet, slightly higher than the gage because some adjacent drainage area was included. The resulting monthly runoff for the minor streams was computed by multiplying a factor of 2.55 (172,400/67,600) by the historical outflow of Joint Depletion Study Area 43. Flow for 1984–1992 was computed by multiplying the factor 2.55 by the sum of the historical outflow of DA43 Chowchilla River above Buchanan Damsite plus net effect of Eastman Lake.

**UF 18 — Tuolumne River at Don Pedro Reservoir**

Data was taken from DWR Snow Survey records.

**UF 19 — Merced River at Exchequer Reservoir**

Data was taken from DWR Snow Survey records.

**UF 20 — Chowchilla River at Buchanan Reservoir**

The estimated unimpaired flow for the Chowchilla River at Buchanan Reservoir was assumed to be equal to the historical outflow of Joint Depletion Study Area 43 (Chowchilla River above Buchanan Damsite). Historical upstream depletions and imports were considered to be negligible.

Flow for 1984–1992 was computed as the sum of the historical outflow of DA43 Chowchilla River above Buchanan Damsite plus net effect of Eastman Lake.

**UF 21 — Fresno River near Daulton**

The estimated unimpaired flow for the Fresno River near Daulton was assumed to be equal to the historical outflow from Joint Depletion Study Area 45 (Fresno River). Historical upstream depletions and imports were considered to be negligible.

Flow for 1984–1992 was computed as the sum of the historical outflow of DA45 plus net effect of Hensley Lake (Hidden Dam).



**UF 22 — San Joaquin River at Millerton Reservoir**

Data was taken from DWR Snow Survey records.

**UF 23 — Tulare Lake Basin Outflow**

The amounts of unimpaired flow originating in the Tulare Lake Basin that would reach the Delta are subject to considerable conjecture. The historical outflow of Joint Depletion Study Area 60 (Tulare Lake Basin) was considered to be a reasonable estimate for present purposes. The historical outflow represents that flow in Fresno Slough.

**UF 24 — San Joaquin Valley West Side Minor Streams**

The estimated unimpaired flows for the minor streams on the west side of the San Joaquin Valley tributary to the Delta were assumed to be equal to the historical outflow of Joint Depletion Study Area 51 (west side minor streams, south Delta). This consisted of the estimated historical flow of Marsh Creek near Byron.

**Sacramento Valley Unimpaired Total Outflow**

Flow for 1921–1992 was computed as the sum of UF 1 through UF 11.

**East Side Streams Unimpaired Total Outflow**

Flow for 1921–1992 was computed as the sum of UF 12 through UF 15.

**San Joaquin Valley Unimpaired Total Outflow**

Flow for 1921–1992 was computed as the sum of UF 16 through UF 24.

**Delta Unimpaired Total Inflow**

Flow for 1921–1992 was computed as the sum of:

1. Sacramento Valley Unimpaired Total Outflow
2. East Side Streams Unimpaired Total Outflow
3. San Joaquin Valley Unimpaired Total Outflow

### **Delta Unimpaired Net Use**

The Delta water use was computed as the sum of Delta uplands net water use and Delta lowlands net water use. Delta net water use under unimpaired conditions assumes that existing Delta levees and islands would remain intact.

Net use in the lowlands is computed as the sum of water surface evaporation, plus consumptive use of riparian vegetation, plus seepage from the channels, minus the precipitation on the lowland channels and riparian vegetation areas. Precipitation on the islands and seepage from the lowland channels are assumed to be fully depleted. The DOP Consumptive Use Model was used to compute water surface evaporation and evapotranspiration of riparian vegetation. Seepage losses were estimated using data from Chapter 4 of the Appendix to DWR Bulletin 76 (1962).

Net use in the uplands was computed as the sum of the consumptive use of native vegetation, plus the consumptive use of riparian vegetation, plus the evaporation from the water surfaces, minus the precipitation on the entire uplands. In the uplands, all historical irrigated agriculture and urban areas were replaced with native vegetation. Consumptive use of native vegetation is limited to precipitation and stored soil moisture, whereas a full water supply is assumed available for riparian vegetation. Consumptive uses for the uplands were computed using the DOP Consumptive Use Model.

### **Delta Unimpaired Total Outflow**

Flow for 1921–1992 was computed as the Delta Unimpaired Total Inflow minus the Uplands Net Use (DA55) <sup>1</sup> minus the Lowlands Unimpaired Net Use (DA54) <sup>2</sup>.

<sup>1</sup>This is equal to the Total Unimpaired Consumptive Use for the Delta Uplands minus Delta Upland Total Basin Precipitation (Area 55).

<sup>2</sup>This is equal to the Total Unimpaired Consumptive Use for the Delta Uplands plus Lowlands seepage (1369 cfs, DWR Bulletin 76, 1962) minus Delta Lowland Unimpaired Total Basin Precipitation (Area 54).

### **Delta Natural Net Use**

The Delta net water use under natural conditions was estimated based on the assumption that in the Delta lowlands all historical irrigated agriculture and urban areas are replaced with riparian vegetation. Under

## **California Central Valley Unimpaired Flow Data 1921–1992**

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this assumption, net use in the lowlands was equal to the sum of the consumptive use of riparian and native vegetation, plus the evaporation from water surfaces minus the precipitation on the lowlands. Net use in the Delta uplands under natural conditions is assumed to be the same as described under the unimpaired condition.

### **Sacramento River Index**

Flow for 1921–1992 was computed as the sum of

1. UF6 Sacramento River near Red Bluff
2. UF8 Feather River near Oroville
3. UF9 Yuba river at Smartville
4. UF11 American River at Fair Oaks.



## California Central Valley Unimpaired Flow Data 1921-1992

### UF 2 - Putah Creek near Winters

*estimated unimpaired flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	1	62	115	223	52	27	11	5	2	1	1	1	501
1922	0	0	35	8	132	35	15	4	1	0	0	0	230
1923	0	13	141	54	23	9	32	5	1	0	0	0	278
1924	0	0	0	4	32	2	1	0	0	0	0	0	39
1925	0	8	26	10	215	28	31	23	6	1	0	0	348
1926	0	0	1	36	167	15	121	7	1	0	0	0	348
1927	0	63	38	57	236	39	98	9	3	1	0	0	544
1928	0	25	24	28	67	100	48	7	1	0	0	0	300
1929	0	1	13	5	32	10	4	1	0	0	0	0	66
1930	0	0	113	76	53	63	11	5	1	1	0	0	323
1931	0	1	1	15	4	10	2	1	1	0	0	0	35
1932	0	0	109	41	33	7	4	4	2	1	0	0	201
1933	0	0	2	38	12	27	9	5	1	1	0	0	95
1934	0	0	44	34	42	17	5	2	1	0	0	0	145
1935	0	7	5	122	18	114	70	12	3	1	0	0	352
1936	0	0	1	63	215	27	30	6	3	1	0	0	346
1937	0	0	1	7	148	90	24	6	3	1	0	0	280
1938	0	24	136	45	359	216	52	14	4	1	1	1	853
1939	1	1	4	7	9	15	3	1	1	0	0	0	42
1940	0	0	2	138	312	149	56	11	4	1	1	1	675
1941	1	2	179	237	215	164	162	28	9	4	2	1	1004
1942	1	2	134	141	254	56	87	25	9	3	2	1	715
1943	1	6	21	183	37	42	16	8	3	1	1	1	320
1944	0	1	1	12	62	83	10	6	2	1	0	0	178
1945	0	8	18	12	108	38	14	6	2	0	0	0	206
1946	1	15	162	39	16	13	11	3	1	1	0	0	262
1947	0	7	14	3	40	45	16	2	2	0	0	0	129
1948	1	2	2	16	4	23	63	18	4	0	0	0	133
1949	1	1	6	10	37	120	12	4	1	0	0	0	192
1950	0	0	2	49	91	20	15	4	1	0	0	0	182
1951	3	48	142	88	45	42	10	9	1	0	0	0	388
1952	0	7	119	243	98	86	22	8	3	1	1	0	588
1953	0	1	139	190	19	43	17	10	3	1	0	0	423
1954	0	5	4	77	82	55	52	8	1	0	0	0	284
1955	0	10	26	13	8	9	19	7	1	0	0	0	93
1956	0	0	314	229	237	48	16	11	3	1	1	1	861
1957	0	2	2	13	70	29	13	18	4	1	1	1	154
1958	14	4	32	84	347	153	184	20	8	4	3	2	855
1959	0	0	3	46	112	15	7	5	5	4	2	3	202
1960	0	0	2	24	134	53	14	9	5	5	2	1	249
1961	0	4	25	36	38	34	13	5	6	4	2	0	167
1962	0	5	19	9	169	85	11	5	4	3	1	0	311
1963	82	3	49	141	111	65	129	28	9	6	3	1	627
1964	2	29	4	58	9	12	6	6	6	6	4	3	145
1965	4	14	216	214	26	13	49	11	5	6	4	0	562
1966	1	24	36	128	62	20	12	6	4	3	4	4	304
1967	0	39	100	259	47	98	110	31	17	5	4	1	711
1968	1	2	13	105	74	52	12	6	4	3	1	0	273
1969	0	3	72	289	228	77	29	13	4	4	1	0	720
1970	0	1	117	416	103	67	15	13	7	5	1	0	745
1971	0	55	171	72	14	50	18	10	7	7	3	1	408
1972	0	1	23	13	28	11	11	8	4	3	1	0	103
1973	2	31	27	242	178	82	23	12	6	4	0	0	607
1974	2	123	69	155	55	200	76	17	9	5	0	1	712
1975	1	0	10	9	158	160	29	14	7	5	1	1	395
1976	2	0	2	2	6	7	7	6	4	0	0	0	36
1977	0	0	0	2	3	6	4	3	3	2	1	1	25
1978	1	13	44	284	147	111	36	12	3	2	0	1	654
1979	0	0	0	47	97	41	17	10	4	1	0	0	217
1980	4	7	61	166	238	74	24	10	6	5	0	0	595
1981	0	0	26	80	28	37	12	7	7	0	1	0	198
1982	1	85	147	144	105	140	252	23	7	3	0	0	907
1983	3	52	89	208	295	421	85	46	13	6	2	1	1221
1984	0	92	248	46	34	36	13	10	5	3	2	1	490
1985	0	44	19	10	54	32	12	5	5	2	2	0	185
1986	0	6	16	57	493	188	23	10	2	0	0	0	795
1987	0	0	0	8	35	49	7	3	2	0	0	1	105
1988	1	0	36	67	9	4	0	58	2	1	0	0	178
1989	0	7	8	7	4	83	9	3	1	2	0	2	126
1990	3	1	0	25	23	8	2	11	4	1	0	0	78
1991	0	4	0	1	5	172	13	5	1	2	0	1	204
1992	0	0	2	3	59	36	6	2	4	2	2	1	117
Averages													
1921-92	2	13	53	84	99	64	34	10	4	2	1	0	366
1922-92	2	13	52	82	99	65	34	10	4	2	1	0	364
1928-34	0	4	44	34	35	33	12	4	1	0	0	0	166
1976-77	1	0	1	2	5	7	6	5	4	1	1	1	31
1981-92	1	24	49	55	95	101	36	15	4	2	1	1	384
1987-92	1	2	8	19	23	59	6	14	2	1	0	1	135

















# California Central Valley Unimpaired Flow Data 1921-1992

## UF 10 - Bear River near Wheatland

estimated unimpaired flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	2	30	112	137	79	77	24	16	8	2	1	0	488
1922	0	3	31	23	166	112	62	43	15	3	2	1	461
1923	7	14	110	63	35	33	79	25	16	6	5	4	397
1924	6	3	6	9	14	9	6	6	4	3	1	2	69
1925	5	6	18	17	99	43	53	21	11	7	6	4	290
1926	5	6	8	14	102	22	72	22	4	3	2	2	262
1927	4	41	19	58	221	55	112	20	10	6	4	3	553
1928	3	18	27	14	29	141	58	10	9	5	1	4	319
1929	6	10	16	11	33	21	13	7	4	2	1	0	124
1930	2	1	37	45	20	70	20	8	5	3	3	2	216
1931	4	9	13	12	14	14	4	2	0	0	0	0	72
1932	2	9	59	40	70	24	18	13	6	3	2	3	249
1933	4	5	12	13	16	35	14	16	3	2	1	0	121
1934	2	3	31	30	29	14	2	4	3	2	1	2	123
1935	3	14	21	52	39	70	114	21	10	5	3	4	356
1936	13	3	18	89	188	44	46	13	8	3	2	3	430
1937	4	4	16	13	94	99	58	18	7	5	2	3	323
1938	6	18	55	34	169	167	72	28	10	5	3	2	569
1939	6	8	13	12	19	37	14	5	3	1	1	0	119
1940	2	2	6	75	126	126	44	12	3	2	1	1	400
1941	2	9	71	106	106	74	74	22	9	4	3	1	481
1942	6	9	68	95	118	48	83	47	16	6	3	4	503
1943	4	21	39	134	62	134	33	18	9	4	3	2	463
1944	4	4	11	18	52	55	22	12	5	2	1	2	188
1945	3	26	25	13	111	52	28	12	8	4	2	4	288
1946	9	21	117	45	26	48	30	9	4	3	2	3	317
1947	6	16	23	9	35	51	17	4	3	2	1	1	168
1948	9	8	10	19	12	35	70	36	13	4	3	3	222
1949	5	7	20	14	24	104	21	14	4	2	1	0	216
1950	3	5	9	59	77	50	41	14	5	4	1	2	270
1951	7	108	149	133	74	74	18	24	4	2	2	2	597
1952	4	21	68	153	142	112	60	27	6	5	2	4	604
1953	3	6	28	95	13	37	35	26	9	2	2	3	259
1954	4	10	18	48	55	71	38	11	5	2	2	2	266
1955	4	8	33	44	20	20	23	16	3	1	0	1	173
1956	2	6	225	172	63	40	14	25	5	2	1	3	558
1957	7	7	10	14	46	59	23	51	7	3	1	2	230
1958	8	8	23	43	127	111	141	20	7	0	0	1	489
1959	1	6	4	28	57	20	6	1	0	0	0	0	123
1960	1	2	6	20	87	41	15	8	1	0	0	1	182
1961	1	10	12	7	24	26	14	8	3	1	0	2	108
1962	0	3	15	16	130	48	20	6	0	1	0	0	239
1963	85	10	39	30	81	43	114	28	7	1	0	2	440
1964	5	30	17	54	17	18	14	20	0	2	2	0	179
1965	5	16	211	155	22	20	67	13	6	3	3	0	521
1966	1	18	24	40	30	30	19	10	2	1	0	1	176
1967	0	33	67	114	39	75	82	40	14	0	0	0	464
1968	5	4	15	30	75	32	10	4	0	0	0	0	175
1969	4	14	41	242	121	67	47	19	5	0	0	0	560
1970	7	5	63	197	46	41	9	3	0	0	0	0	371
1971	11	43	127	55	27	71	31	18	7	0	0	0	390
1972	1	5	34	21	44	28	22	8	1	0	0	0	164
1973	1	34	38	149	109	80	28	11	1	0	0	0	451
1974	5	79	93	120	38	134	74	17	12	9	0	0	581
1975	0	3	9	19	89	90	46	21	1	0	0	0	278
1976	5	16	10	5	11	11	3	0	0	0	0	1	62
1977	0	1	0	9	5	4	0	1	0	0	0	0	20
1978	0	3	32	161	58	82	53	18	5	0	0	4	416
1979	0	8	5	43	62	65	25	20	0	0	0	0	228
1980	4	12	32	156	145	61	24	15	6	0	0	0	455
1981	0	1	8	25	14	44	9	0	0	0	0	0	101
1982	4	73	149	101	109	98	175	25	6	0	0	0	740
1983	12	52	93	65	148	208	70	46	10	3	0	0	707
1984	2	60	139	38	44	37	22	15	10	4	1	2	374
1985	9	22	13	9	29	36	21	7	3	0	0	2	151
1986	2	10	25	43	311	121	17	12	3	2	0	0	546
1987	0	0	2	3	21	28	4	0	0	0	0	0	58
1988	0	0	15	38	6	8	7	1	0	0	0	0	75
1989	0	11	18	26	18	148	28	14	1	0	0	0	264
1990	0	3	4	24	23	21	5	0	8	0	0	0	88
1991	0	0	1	1	2	75	17	7	3	0	0	0	106
1992	0	0	2	5	52	17	7	0	0	0	0	0	83
<b>Averages</b>													
1921-92	5	15	41	56	67	60	38	15	5	2	1	1	307
1922-92	5	15	40	55	67	60	39	15	5	2	1	1	305
1928-34	3	8	28	24	30	46	18	9	4	2	1	2	175
1976-77	3	9	5	7	8	8	2	1	0	0	0	1	41
1981-92	2	19	39	32	65	70	32	11	4	1	0	0	274
1987-92	0	2	7	16	20	50	11	4	2	0	0	0	112



# California Central Valley Unimpaired Flow Data 1921-1992

## UF 12 - San Joaquin Valley East Side Minor Streams

estimated unimpaired flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	0	8	50	277	100	100	19	4	0	0	0	0	558
1922	0	0	35	39	270	104	69	23	0	0	0	0	540
1923	0	15	150	92	42	31	69	19	8	0	0	0	426
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	15	8	12	166	39	92	35	0	0	0	0	367
1926	0	0	4	4	77	12	27	0	0	0	0	0	124
1927	0	12	8	42	169	46	96	8	0	0	0	0	381
1928	0	0	4	8	39	135	69	4	0	0	0	0	259
1929	0	0	0	12	23	19	15	0	0	0	0	0	69
1930	0	0	0	19	12	65	8	0	0	0	0	0	104
1931	0	0	0	0	4	0	0	0	0	0	0	0	4
1932	0	0	39	46	208	12	4	0	0	0	0	0	309
1933	0	0	0	4	4	8	0	0	0	0	0	0	16
1934	0	0	12	42	46	15	0	0	0	0	0	0	115
1935	0	0	0	42	15	54	177	15	0	0	0	0	303
1936	0	0	0	77	497	50	50	8	4	0	0	0	686
1937	0	0	0	23	258	273	50	8	0	0	0	0	612
1938	0	0	8	19	389	296	54	15	0	0	0	0	781
1939	0	0	0	4	19	19	4	0	0	0	0	0	46
1940	0	0	0	62	112	131	65	4	0	0	0	0	374
1941	0	0	27	39	89	81	69	12	0	0	0	0	317
1942	0	0	23	196	177	58	73	35	8	0	0	0	570
1943	0	12	23	212	96	389	58	12	4	0	0	0	806
1944	0	0	0	0	54	92	12	0	0	0	0	0	158
1945	0	27	19	12	254	92	31	8	4	0	0	0	447
1946	0	4	173	46	27	39	31	4	0	0	0	0	324
1947	0	0	4	0	12	23	12	0	0	0	0	0	51
1948	0	0	0	0	4	42	65	19	4	0	0	0	134
1949	0	0	0	8	23	154	12	0	0	0	0	0	197
1950	0	0	0	46	108	35	39	4	0	0	0	0	232
1951	0	189	235	239	100	116	19	15	0	0	0	0	913
1952	0	4	104	331	127	262	46	12	0	0	0	0	886
1953	0	0	15	77	12	23	12	8	0	0	0	0	147
1954	0	0	0	8	23	62	27	0	0	0	0	0	120
1955	0	0	23	108	27	19	15	8	0	0	0	0	200
1956	0	0	335	389	65	35	15	15	0	0	0	0	854
1957	0	0	0	0	23	104	15	23	0	0	0	0	165
1958	0	0	0	39	189	246	466	19	4	0	0	0	963
1959	0	0	0	15	89	12	4	0	0	0	0	0	120
1960	0	0	0	0	50	42	8	0	0	0	0	0	100
1961	0	0	0	0	0	4	0	0	0	0	0	0	4
1962	0	0	0	0	123	58	4	0	0	0	0	0	185
1963	8	0	8	4	131	65	146	27	4	0	0	0	393
1964	0	12	4	58	12	12	8	0	0	0	0	0	106
1965	0	0	296	235	31	19	73	12	0	0	0	0	666
1966	0	0	23	35	39	8	4	0	0	0	0	0	109
1967	0	0	35	154	73	104	208	39	8	0	0	0	621
1968	0	0	4	23	58	46	15	4	0	0	0	0	150
1969	0	0	19	296	277	123	69	12	4	0	0	0	800
1970	0	0	27	196	58	112	15	4	0	0	0	4	416
1971	0	12	104	46	12	42	15	4	0	0	0	0	235
1972	0	0	31	8	31	8	4	0	0	0	0	0	82
1973	0	4	8	193	239	146	35	8	0	0	0	0	633
1974	0	19	112	154	31	112	85	12	4	4	0	0	533
1975	0	0	4	8	135	166	58	12	0	0	0	0	383
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	4	146	85	123	112	23	4	0	0	0	497
1979	0	0	0	50	162	127	23	8	0	0	0	0	370
1980	0	0	8	219	262	89	23	8	4	0	0	0	613
1981	0	0	0	27	8	81	15	0	0	0	0	0	131
1982	0	19	58	273	227	262	347	27	8	4	0	0	1225
1983	0	85	293	358	296	535	139	104	19	12	8	8	1857
1984	4	129	289	82	84	65	20	10	3	1	1	1	689
1985	0	26	25	10	39	49	15	2	1	1	0	0	168
1986	0	5	22	45	613	286	34	12	6	1	0	0	1024
1987	0	0	0	2	23	51	5	0	0	0	0	0	81
1988	12	34	63	41	8	6	33	8	3	0	0	0	208
1989	3	33	45	13	19	54	4	0	7	0	2	33	213
1990	10	8	0	15	16	8	5	16	0	0	0	0	78
1991	2	2	10	2	19	49	4	2	2	0	1	0	93
1992	48	7	26	33	72	45	19	6	2	1	1	5	265
Averages													
1921-92	1	9	39	74	100	86	48	10	2	0	0	1	370
1922-92	1	9	39	71	100	86	48	10	2	0	0	1	367
1928-34	0	0	8	19	48	36	14	1	0	0	0	0	125
1976-77	0	0	0	0	0	0	0	0	0	0	0	0	0
1981-92	7	29	69	75	119	124	53	16	4	2	1	4	503
1987-92	13	14	24	18	26	36	12	5	2	0	1	6	156

## California Central Valley Unimpaired Flow Data 1921-1992

### UF 13 - Cosumnes River at Michigan Bar

*estimated unimpaired flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	3	11	39	99	59	89	48	38	17	3	0	0	406
1922	0	1	14	18	104	70	84	97	33	4	1	0	426
1923	1	12	104	76	45	40	99	41	16	4	1	1	440
1924	2	2	3	5	11	5	8	3	0	0	0	0	39
1925	1	5	15	14	136	45	99	48	15	2	1	1	382
1926	1	2	4	4	52	23	48	12	2	0	0	0	148
1927	1	15	14	34	133	71	122	42	17	3	1	0	453
1928	1	8	13	12	25	146	80	22	5	1	0	0	313
1929	1	2	5	7	19	20	30	21	10	1	0	0	116
1930	0	0	6	20	19	57	35	20	6	1	0	0	164
1931	1	2	2	6	11	12	7	4	1	0	0	0	46
1932	0	2	32	28	91	47	43	51	17	3	0	0	314
1933	0	1	2	5	7	19	24	34	20	2	0	0	114
1934	1	2	18	31	31	23	10	5	3	0	0	0	124
1935	0	4	6	33	24	44	174	61	18	3	1	0	368
1936	1	2	3	58	234	74	86	39	21	4	1	0	523
1937	1	1	3	10	92	114	91	67	16	3	1	0	399
1938	1	3	30	19	149	201	125	106	39	8	2	1	684
1939	3	4	5	6	11	27	24	9	2	0	0	0	91
1940	2	1	2	77	130	160	94	28	7	2	0	0	503
1941	1	2	28	50	80	84	81	56	17	3	1	1	404
1942	1	3	24	110	106	47	85	86	37	8	2	1	510
1943	2	21	38	138	82	249	74	34	15	5	2	1	661
1944	2	3	5	11	34	47	33	39	12	2	0	0	188
1945	0	23	18	15	120	56	59	40	20	3	1	0	355
1946	3	15	108	56	28	65	65	37	11	3	1	0	392
1947	2	10	12	8	23	43	32	11	3	0	0	0	144
1948	3	4	3	9	9	33	96	76	30	5	1	0	269
1949	1	2	6	8	17	84	63	42	11	2	0	0	236
1950	1	3	3	40	69	57	92	47	15	3	1	1	332
1951	4	148	181	134	86	95	47	47	12	4	2	1	761
1952	4	10	59	141	117	131	141	117	43	13	4	3	783
1953	2	4	15	58	19	32	49	44	30	7	2	1	263
1954	2	4	6	16	35	66	65	25	7	2	1	0	229
1955	1	3	20	43	24	27	33	40	10	2	0	0	203
1956	0	3	211	202	67	53	48	76	21	5	2	1	689
1957	3	4	5	8	38	87	33	50	15	3	1	1	248
1958	2	3	8	26	112	152	225	92	36	8	3	2	669
1959	2	3	3	16	41	26	20	9	2	2	1	1	126
1960	0	1	2	7	47	51	30	19	4	2	1	0	164
1961	1	3	4	3	7	13	13	13	4	2	1	0	64
1962	0	1	3	3	79	49	63	29	11	2	1	0	241
1963	22	3	12	20	125	43	133	84	21	6	2	1	472
1964	2	16	9	28	14	17	27	29	9	3	2	1	157
1965	1	7	222	176	54	39	100	48	21	5	3	1	677
1966	2	11	20	24	26	36	39	13	4	3	3	0	181
1967	0	5	41	84	54	104	128	132	57	14	4	2	625
1968	3	4	9	19	55	45	28	14	5	3	2	0	187
1969	1	7	17	234	126	86	117	82	26	6	2	2	706
1970	3	5	31	212	66	78	28	26	10	4	2	1	466
1971	2	19	72	75	32	63	55	44	20	5	2	1	390
1972	2	5	25	16	33	50	37	23	7	3	2	1	204
1973	2	8	18	125	107	91	59	47	12	3	2	2	476
1974	3	30	75	115	35	131	104	51	16	9	3	1	573
1975	2	4	7	13	59	105	71	85	31	7	3	2	389
1976	5	7	6	5	7	12	11	8	2	0	1	1	65
1977	1	1	1	2	3	3	3	4	1	0	0	0	19
1978	0	1	16	109	63	107	110	57	22	5	1	2	493
1979	0	2	4	32	58	93	71	71	9	0	0	0	340
1980	1	5	12	211	103	91	53	41	15	4	0	0	536
1981	0	2	4	16	13	52	28	14	0	0	0	0	129
1982	2	39	88	145	167	190	238	88	24	8	3	4	996
1983	12	50	149	146	194	329	135	138	67	23	7	4	1254
1984	4	103	201	68	58	67	39	26	11	3	2	0	582
1985	3	20	16	10	27	37	43	14	4	0	0	2	176
1986	1	8	20	48	350	199	46	25	9	3	1	1	711
1987	1	1	2	4	14	22	7	4	2	2	1	0	60
1988	0	1	2	15	7	11	11	8	5	3	2	1	66
1989	0	3	4	7	12	106	39	15	5	1	1	1	194
1990	3	4	3	9	13	33	19	9	9	3	0	0	105
1991	0	1	1	0	2	50	32	24	10	2	0	0	122
1992	0	1	2	4	40	41	19	4	2	2	1	0	116
<b>Averages</b>													
1921-92	2	10	30	51	63	72	64	42	15	4	1	1	353
1922-92	2	10	30	50	63	71	64	42	15	4	1	1	353
1928-34	1	2	11	16	29	46	33	22	9	1	0	0	170
1976-77	3	4	4	4	5	8	7	6	2	0	1	1	42
1981-92	2	19	41	39	75	95	55	31	12	4	2	1	376
1987-92	1	2	2	7	15	44	21	11	6	2	1	0	110





# California Central Valley Unimpaired Flow Data 1921-1992

## UF 15 - Calaveras River at Jenny Lind

*estimated unimpaired flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	1	6	29	110	32	25	7	4	1	0	0	0	215
1922	0	0	14	15	109	42	29	9	2	0	0	0	220
1923	0	5	64	33	26	11	20	8	3	1	0	0	171
1924	1	1	2	3	4	2	3	2	0	0	0	0	18
1925	0	3	8	6	83	12	39	6	2	0	0	0	159
1926	0	1	2	3	39	5	14	1	0	0	0	0	65
1927	0	18	4	13	81	17	41	5	2	0	0	0	181
1928	0	3	8	5	21	68	21	3	1	0	0	0	130
1929	0	1	3	5	12	9	8	2	1	0	0	0	41
1930	0	0	0	12	12	37	3	2	0	0	0	0	66
1931	0	0	0	4	5	3	1	0	0	0	0	0	13
1932	0	0	38	21	63	8	4	4	1	0	0	0	139
1933	0	0	0	10	7	8	3	3	1	0	0	0	32
1934	0	0	13	14	23	6	1	0	1	0	0	0	58
1935	0	1	4	34	8	32	58	9	2	2	0	0	150
1936	0	0	1	31	197	21	26	5	4	1	0	0	286
1937	0	0	2	13	99	82	24	8	3	1	0	0	232
1938	0	1	19	13	161	126	30	15	5	2	0	0	372
1939	1	2	3	4	10	8	4	2	0	0	0	0	34
1940	0	0	1	46	54	59	40	5	2	1	0	0	208
1941	0	2	18	24	47	50	49	8	3	1	0	0	202
1942	0	1	15	68	40	20	28	20	6	2	0	0	200
1943	0	10	19	63	43	110	19	8	3	1	0	0	276
1944	1	1	2	6	21	36	6	4	1	0	0	0	78
1945	0	11	9	5	67	41	15	5	2	0	0	0	155
1946	0	4	45	18	9	19	16	4	2	0	0	0	117
1947	0	6	6	3	10	16	6	1	1	0	0	0	49
1948	0	1	2	2	4	24	37	9	3	0	0	0	82
1949	0	0	3	4	11	50	9	2	1	0	0	0	80
1950	0	1	1	33	41	18	22	6	1	0	0	0	123
1951	1	64	84	61	31	46	9	9	2	1	0	0	308
1952	0	3	39	110	45	96	26	12	4	3	0	1	339
1953	1	2	13	34	5	13	9	6	3	0	1	0	87
1954	0	2	3	8	17	29	12	3	2	0	1	0	77
1955	0	1	16	37	14	10	9	6	1	0	0	0	94
1956	0	0	133	114	28	16	9	14	3	1	0	0	318
1957	1	1	2	4	12	34	5	11	2	0	0	0	72
1958	0	1	4	22	75	89	146	11	5	1	0	0	354
1959	0	1	2	7	39	6	3	1	0	0	0	0	59
1960	0	0	1	3	24	7	5	3	0	0	0	0	43
1961	0	0	2	1	2	5	3	1	0	0	0	0	14
1962	0	0	1	2	76	34	6	2	0	0	0	0	121
1963	1	1	3	14	37	22	60	14	4	2	1	1	160
1964	1	9	4	20	6	7	7	4	2	1	0	0	61
1965	0	6	104	81	14	12	49	8	3	2	1	0	280
1966	1	7	15	16	17	7	4	1	0	0	0	0	68
1967	0	2	28	62	18	49	112	26	7	2	1	0	307
1968	1	2	3	8	22	16	5	2	1	0	0	0	60
1969	0	2	16	159	113	52	34	10	4	2	1	1	394
1970	1	3	13	98	25	45	9	5	3	2	1	1	206
1971	1	12	52	24	7	19	8	4	3	2	1	1	134
1972	0	2	25	7	19	5	5	3	1	0	0	1	68
1973	0	2	7	75	91	56	16	5	3	3	2	1	261
1974	1	8	37	40	9	69	41	7	3	3	1	1	220
1975	1	1	3	6	36	73	24	9	1	1	0	1	156
1976	1	2	1	2	2	4	2	1	1	0	1	0	17
1977	0	0	0	1	1	1	1	1	1	1	1	0	8
1978	0	0	4	65	49	56	51	12	3	1	0	1	242
1979	0	1	3	31	66	64	17	7	2	1	0	0	192
1980	0	2	8	92	82	35	12	5	3	3	1	2	245
1981	0	1	2	20	6	27	7	1	1	1	1	0	67
1982	0	11	28	98	82	103	113	13	5	3	1	2	459
1983	5	38	66	100	106	186	49	33	8	5	2	2	600
1984	3	53	84	20	25	23	10	6	3	1	0	0	228
1985	2	9	8	6	18	24	8	2	1	1	1	1	81
1986	1	5	6	13	188	83	13	6	2	0	0	1	318
1987	1	1	2	3	8	18	3	0	0	0	1	0	37
1988	0	0	1	5	2	3	3	1	0	1	1	0	17
1989	0	0	2	3	3	19	3	1	0	0	0	0	31
1990	1	1	1	4	11	11	3	2	1	0	0	0	35
1991	0	0	0	0	1	40	5	1	0	0	0	0	47
1992	1	0	1	4	38	15	3	1	0	0	1	0	64
<b>Averages</b>													
1921-92	0	5	16	29	39	35	21	6	2	1	0	0	154
1922-92	0	5	16	28	39	35	21	6	2	1	0	0	153
1928-34	0	1	9	10	20	20	6	2	1	0	0	0	68
1976-77	1	1	1	2	2	3	2	1	1	1	1	0	13
1981-92	1	10	17	23	41	46	18	6	2	1	1	1	165
1987-92	1	0	1	3	11	18	3	1	0	0	1	0	39



# California Central Valley Unimpaired Flow Data 1921-1992

## UF 17 - San Joaquin Valley Floor

*estimated unimpaired flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	0	14	20	63	51	40	18	8	2	0	0	0	216
1922	0	0	31	26	107	66	33	13	5	0	0	0	281
1923	0	3	36	41	28	13	43	10	5	0	0	0	179
1924	0	0	2	3	5	8	0	0	0	0	0	0	18
1925	0	2	3	3	38	15	26	8	2	0	0	0	97
1926	0	0	3	3	15	8	33	2	0	0	0	0	64
1927	0	18	13	10	84	33	38	8	3	0	0	0	207
1928	0	13	10	15	21	38	20	3	0	0	0	0	120
1929	0	0	3	3	8	10	2	2	0	0	0	0	28
1930	0	0	0	8	10	15	3	0	0	0	0	0	36
1931	0	0	0	3	3	2	0	0	0	0	0	0	8
1932	0	0	61	43	138	25	10	8	3	0	0	0	288
1933	0	0	0	10	10	16	5	5	0	0	0	0	46
1934	0	0	3	5	15	5	3	0	0	0	0	0	31
1935	0	2	5	59	28	51	87	23	5	0	0	0	260
1936	0	0	3	15	194	44	38	10	5	0	0	0	309
1937	0	0	5	13	174	94	48	15	5	0	0	0	354
1938	0	0	25	38	181	324	64	31	10	3	0	0	676
1939	2	3	3	5	15	20	10	3	0	0	0	0	61
1940	2	0	3	84	82	56	26	10	2	0	0	0	265
1941	0	0	38	41	125	99	79	20	8	3	0	0	413
1942	0	3	43	36	41	43	36	23	8	2	0	0	235
1943	0	5	5	56	38	112	31	13	5	0	0	0	265
1944	0	3	3	5	23	36	10	5	2	0	0	0	87
1945	0	8	5	5	87	74	30	10	5	0	0	0	224
1946	0	2	26	10	10	23	23	5	3	0	0	0	102
1947	0	8	13	5	13	8	5	2	0	0	0	0	54
1948	0	0	0	3	13	38	8	2	0	0	0	0	64
1949	0	0	0	3	8	36	10	2	0	0	0	0	59
1950	0	0	0	13	33	10	13	2	0	0	0	0	71
1951	0	69	76	41	31	25	10	8	0	0	0	0	260
1952	0	0	33	110	38	125	51	19	5	2	0	0	383
1953	0	2	13	31	8	8	8	5	2	0	0	0	77
1954	0	0	3	5	15	26	15	5	0	0	0	0	69
1955	0	0	2	13	5	7	6	9	1	0	0	0	43
1956	0	0	208	101	42	19	20	18	4	1	0	0	413
1957	0	1	2	3	9	14	6	13	2	0	0	0	50
1958	0	0	3	11	43	108	167	20	6	1	0	0	359
1959	0	1	1	4	24	6	3	2	0	0	0	0	41
1960	0	0	1	2	21	9	8	4	0	0	0	0	45
1961	0	1	2	2	3	4	2	1	0	0	0	0	15
1962	0	1	2	119	41	11	4	1	0	0	0	0	179
1963	0	0	1	21	44	19	67	25	6	1	0	0	184
1964	1	9	3	7	5	8	8	4	1	0	0	0	46
1965	0	7	64	76	18	16	59	14	5	1	0	0	260
1966	0	17	21	22	16	9	5	2	0	0	0	0	92
1967	0	0	41	31	23	64	166	54	15	3	0	0	397
1968	0	0	0	5	10	10	5	3	0	0	0	0	38
1969	0	0	13	191	196	125	71	20	8	3	0	0	627
1970	3	3	5	54	18	48	10	2	0	0	0	0	143
1971	0	3	20	15	8	8	5	5	3	0	0	0	67
1972	0	1	7	3	8	3	3	1	0	0	0	0	26
1973	0	1	3	22	99	85	30	9	2	0	0	0	251
1974	0	4	12	37	12	60	63	9	2	0	0	0	199
1975	0	1	4	6	55	66	45	18	4	1	0	0	200
1976	0	2	2	2	5	6	3	1	0	0	0	0	21
1977	0	0	0	0	0	1	1	1	0	0	0	0	3
1978	0	0	8	82	140	116	118	37	7	2	0	0	510
1979	0	4	4	42	60	76	32	13	4	3	0	0	238
1980	0	3	3	73	92	76	23	12	4	0	0	0	286
1981	1	1	2	14	7	18	9	3	0	0	0	1	56
1982	0	4	8	87	76	113	155	23	7	3	0	1	477
1983	4	33	90	131	183	274	90	55	15	6	2	2	885
1984	2	23	76	26	23	19	10	5	2	0	1	1	188
1985	1	5	4	4	12	17	8	2	3	1	0	0	57
1986	0	2	5	5	179	102	22	9	3	1	1	0	329
1987	0	1	1	2	7	13	3	1	0	0	1	0	29
1988	1	0	1	4	2	3	4	1	1	0	1	0	18
1989	0	0	2	2	4	13	3	1	0	1	0	1	27
1990	0	0	0	3	4	4	1	1	0	1	0	0	14
1991	0	0	0	0	1	41	7	2	3	2	0	0	56
1992	0	0	0	2	32	10	1	4	0	4	0	0	53
Averages													
1921-92	0	4	15	28	45	44	29	10	3	1	0	0	178
1922-92	0	4	15	28	45	44	29	10	3	1	0	0	178
1928-34	0	2	11	12	29	16	6	3	0	0	0	0	80
1976-77	0	1	1	1	3	4	2	1	0	0	0	0	12
1981-92	1	6	16	23	44	52	26	9	3	2	1	1	182
1987-92	0	0	1	2	8	14	3	2	1	1	0	0	33





# California Central Valley Unimpaired Flow Data 1921-1992

## UF 20 - Chowchilla River at Buchanan Reservoir

estimated unimpaired flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	1	1	3	22	13	15	6	2	1	0	0	0	64
1922	0	0	12	10	42	26	13	5	2	0	0	0	110
1923	0	1	14	16	11	5	17	4	2	0	0	0	70
1924	0	0	1	1	2	3	0	0	0	0	0	0	7
1925	0	1	1	1	15	6	10	3	1	0	0	0	38
1926	0	0	1	1	6	3	13	1	0	0	0	0	25
1927	0	7	5	4	33	13	15	3	1	0	0	0	81
1928	0	5	4	6	8	15	8	1	0	0	0	0	47
1929	0	0	1	1	3	4	1	1	0	0	0	0	11
1930	0	0	0	3	4	6	1	0	0	0	0	0	14
1931	0	0	0	1	1	1	0	0	0	0	0	0	3
1932	0	0	24	17	54	10	4	3	1	0	0	0	113
1933	0	0	0	4	4	6	2	2	0	0	0	0	18
1934	0	0	1	2	6	2	1	0	0	0	0	0	12
1935	0	1	2	23	11	20	34	9	2	0	0	0	102
1936	0	0	1	6	76	17	15	4	2	0	0	0	121
1937	0	0	2	5	68	37	19	6	2	0	0	0	139
1938	0	0	10	15	71	127	25	12	4	1	0	0	265
1939	1	1	1	2	6	8	4	1	0	0	0	0	24
1940	1	0	1	33	32	22	10	4	1	0	0	0	104
1941	0	0	15	16	49	39	31	8	3	1	0	0	162
1942	0	1	17	14	16	17	14	9	3	1	0	0	92
1943	0	2	2	22	15	44	12	5	2	0	0	0	104
1944	0	1	1	2	9	14	4	2	1	0	0	0	34
1945	0	3	2	2	34	29	12	4	2	0	0	0	88
1946	0	1	10	4	4	9	9	2	1	0	0	0	40
1947	0	3	5	2	5	3	2	1	0	0	0	0	21
1948	0	0	0	0	1	5	15	3	1	0	0	0	25
1949	0	0	0	1	3	14	4	1	0	0	0	0	23
1950	0	0	0	5	13	4	5	1	0	0	0	0	28
1951	0	27	30	16	12	10	4	3	0	0	0	0	102
1952	0	0	13	43	15	49	20	7	2	1	0	0	150
1953	0	1	5	12	3	3	3	2	1	0	0	0	30
1954	0	0	1	2	6	10	6	2	0	0	0	0	27
1955	0	0	1	5	2	3	3	4	0	0	0	0	18
1956	0	0	82	40	16	7	8	7	2	0	0	0	162
1957	0	0	1	1	4	6	2	5	1	0	0	0	20
1958	0	0	1	5	17	42	65	8	2	1	0	0	141
1959	0	0	0	2	10	2	1	1	0	0	0	0	16
1960	0	0	0	1	8	4	3	2	0	0	0	0	18
1961	0	1	1	1	1	1	1	0	0	0	0	0	6
1962	0	0	0	1	47	16	4	2	0	0	0	0	70
1963	0	0	0	8	18	8	26	10	2	1	0	0	73
1964	0	4	1	3	2	3	3	2	0	0	0	0	18
1965	0	3	25	30	7	6	23	6	2	0	0	0	102
1966	0	7	8	8	6	4	2	1	0	0	0	0	36
1967	0	0	16	12	9	25	65	21	6	1	0	0	155
1968	0	0	2	2	4	4	2	1	0	0	0	0	15
1969	0	0	5	75	77	49	28	8	3	1	0	0	246
1970	0	1	2	21	7	19	4	2	1	0	0	0	57
1971	0	1	8	6	3	3	2	2	1	0	0	0	26
1972	0	0	3	1	3	1	1	0	0	0	0	0	9
1973	0	1	1	9	39	33	12	4	1	0	0	0	100
1974	0	2	5	14	5	24	25	4	1	0	0	0	80
1975	0	0	2	2	22	26	18	7	2	0	0	0	79
1976	0	1	1	1	2	3	1	0	0	0	0	0	9
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	3	32	55	45	46	15	3	1	0	0	200
1979	0	1	1	16	24	30	13	5	2	1	0	0	93
1980	0	1	1	28	36	30	9	5	2	0	0	0	112
1981	0	0	1	6	3	7	4	1	0	0	0	0	22
1982	0	1	3	34	30	44	61	9	2	1	0	1	186
1983	1	13	35	52	72	107	35	22	6	2	1	1	347
1984	1	9	30	10	9	7	4	2	1	0	0	0	73
1985	0	2	2	2	5	7	3	1	1	0	0	0	23
1986	0	1	2	2	70	40	9	4	1	0	0	0	129
1987	0	0	0	1	3	5	1	0	0	0	0	0	10
1988	0	0	0	2	1	1	1	1	0	0	0	0	6
1989	0	0	1	1	1	5	1	0	0	0	0	0	9
1990	0	0	0	1	1	2	1	0	0	0	0	0	5
1991	0	0	0	0	0	16	3	1	1	1	0	0	22
1992	0	0	0	1	12	4	0	2	0	2	0	0	21
Averages													
1921-92	0	1	6	10	18	17	12	4	1	0	0	0	70
1922-92	0	1	6	10	18	17	12	4	1	0	0	0	70
1928-34	0	1	4	5	11	6	2	1	0	0	0	0	31
1976-77	0	1	1	1	1	2	1	0	0	0	0	0	5
1981-92	0	2	6	9	17	20	10	4	1	1	0	0	71
1987-92	0	0	0	1	3	6	1	1	0	1	0	0	12

California Central Valley Unimpaired Flow Data 1921-1992

UF 21 - Fresno River near Daulton

*estimated unimpaired flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	1	2	3	16	14	15	11	9	5	1	0	0	77
1922	0	0	11	9	37	30	21	20	5	2	0	0	135
1923	0	2	18	17	12	9	31	16	8	3	0	0	116
1924	1	1	1	1	1	3	5	1	0	0	0	0	14
1925	0	1	1	1	18	7	16	9	6	1	0	0	60
1926	0	1	1	2	7	4	18	6	1	0	0	0	40
1927	0	7	5	4	32	15	20	10	6	1	0	0	100
1928	1	5	4	6	9	16	14	5	1	0	0	0	61
1929	0	1	1	1	3	4	6	6	3	0	0	0	25
1930	0	0	0	3	4	8	3	3	2	0	0	0	23
1931	0	1	0	1	1	1	1	0	0	0	0	0	5
1932	0	0	15	11	27	11	14	14	8	2	0	0	102
1933	0	0	1	2	3	6	7	6	6	0	0	0	31
1934	0	0	2	2	4	4	2	1	1	0	0	0	16
1935	0	1	3	5	11	17	35	17	10	3	0	0	102
1936	1	1	1	4	47	14	20	16	7	1	0	0	112
1937	0	1	2	4	55	34	20	16	10	3	0	0	145
1938	1	1	10	10	66	108	41	25	18	11	3	1	295
1939	2	3	3	4	6	10	13	5	2	0	0	0	48
1940	1	1	1	27	29	26	19	12	4	1	0	0	121
1941	0	1	15	15	42	47	29	15	14	6	1	1	186
1942	1	1	14	17	19	21	19	16	11	5	1	0	125
1943	0	3	4	20	15	44	20	13	5	2	0	0	126
1944	1	0	1	2	12	15	10	10	6	1	0	0	58
1945	0	6	3	3	34	35	18	12	8	2	0	0	121
1946	1	1	8	4	3	9	12	11	4	1	0	0	54
1947	0	3	7	3	5	5	4	4	1	0	0	0	33
1948	0	0	0	0	1	4	14	9	6	2	0	0	36
1949	0	0	1	1	2	12	6	10	5	1	0	0	38
1950	0	0	1	3	9	4	7	8	4	1	0	0	37
1951	0	16	25	14	12	11	8	8	3	1	0	0	98
1952	0	1	8	33	14	53	26	13	9	5	1	0	163
1953	1	1	6	14	5	6	7	7	6	2	0	0	55
1954	0	1	1	3	5	11	10	9	4	1	0	0	45
1955	0	1	2	5	4	5	6	9	4	1	0	0	37
1956	0	1	65	48	22	10	11	13	5	1	0	0	176
1957	0	1	1	2	4	8	6	10	5	1	0	0	38
1958	0	1	2	3	16	45	72	13	8	4	2	1	167
1959	1	1	1	3	8	6	5	4	1	0	0	0	30
1960	0	0	1	1	6	5	6	5	2	0	0	0	26
1961	0	1	2	2	2	3	3	2	1	0	0	0	16
1962	0	0	1	2	49	22	9	8	7	1	0	0	99
1963	0	0	1	5	21	11	21	14	7	3	0	0	83
1964	1	4	3	3	3	4	6	6	3	1	0	0	34
1965	0	3	18	30	10	10	30	9	6	2	1	0	119
1966	1	6	6	8	7	7	6	6	1	0	0	0	48
1967	0	2	20	11	11	25	80	30	14	6	2	0	201
1968	1	0	2	3	5	6	5	4	2	0	0	0	28
1969	0	1	5	75	84	52	36	17	11	6	2	1	290
1970	2	2	3	20	8	20	7	7	4	1	0	0	74
1971	0	2	8	8	5	7	7	8	5	1	0	0	51
1972	0	1	4	3	4	5	4	4	1	0	0	0	26
1973	0	1	3	9	36	32	17	10	4	1	0	0	113
1974	1	2	5	13	5	18	22	8	4	1	0	0	79
1975	0	1	2	3	11	21	17	14	8	2	0	0	79
1976	1	1	2	1	3	4	3	2	1	1	0	0	19
1977	0	0	1	1	1	1	1	1	1	0	0	0	7
1978	0	0	4	28	52	57	48	21	10	3	1	1	225
1979	0	2	1	12	20	29	14	10	5	2	0	0	95
1980	0	1	2	26	36	37	17	12	6	3	0	0	140
1981	0	1	2	3	4	8	6	3	1	1	0	0	29
1982	0	2	3	20	24	46	63	13	7	4	2	1	185
1983	3	11	34	54	73	115	41	27	9	5	3	2	377
1984	5	10	27	14	12	12	8	6	3	2	1	0	100
1985	1	2	2	2	5	8	6	3	2	1	1	0	33
1986	1	2	3	5	69	53	13	8	5	2	1	1	163
1987	1	1	1	2	4	9	0	2	4	0	1	0	25
1988	0	1	1	3	2	3	3	2	1	1	0	0	17
1989	0	0	1	1	2	6	3	2	0	1	1	0	17
1990	0	1	1	1	1	3	2	1	1	2	0	0	13
1991	0	0	6	0	0	18	0	0	35	0	12	1	72
1992	6	0	7	1	8	6	0	0	3	13	7	0	51
<b>Averages</b>													
1921-92	1	2	6	10	17	19	15	9	5	2	1	0	86
1922-92	1	2	6	10	17	19	16	9	5	2	1	0	86
1928-34	0	1	3	4	7	7	7	5	3	0	0	0	38
1976-77	1	1	2	1	2	3	2	2	1	1	0	0	13
1981-92	1	3	7	9	17	24	12	6	6	3	2	0	90
1987-92	1	1	3	1	3	8	1	1	7	3	4	0	33



# California Central Valley Unimpaired Flow Data 1921-1992

## UF 22 - San Joaquin River at Millerton Reservoir

estimated unimpaired flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	26	35	34	64	78	168	204	368	434	145	32	16	1604
1922	11	10	59	66	98	104	205	685	758	266	69	24	2355
1923	13	28	84	63	66	97	221	506	304	194	50	28	1654
1924	28	16	14	14	21	26	95	164	35	16	9	6	444
1925	10	26	27	27	85	101	219	419	313	146	53	13	1439
1926	20	16	21	17	57	96	347	379	146	43	12	7	1161
1927	6	56	49	47	154	151	275	508	495	197	48	15	2001
1928	20	69	33	33	48	150	189	373	175	44	14	6	1154
1929	8	10	15	16	23	65	107	309	210	75	19	5	862
1930	5	6	8	18	36	80	165	213	244	61	17	6	859
1931	11	13	10	16	23	39	100	174	60	16	11	7	480
1932	6	8	72	59	168	157	238	491	543	239	51	15	2047
1933	13	9	15	26	30	73	159	213	410	119	29	15	1111
1934	7	10	38	47	50	110	166	146	69	27	13	8	691
1935	13	27	36	72	85	111	356	497	519	144	44	19	1923
1936	14	16	16	38	196	163	349	510	348	150	42	11	1853
1937	11	12	36	35	253	190	304	705	457	160	34	11	2208
1938	10	12	211	71	207	434	434	795	913	431	128	42	3688
1939	39	33	29	33	43	103	240	209	110	43	25	14	921
1940	35	14	11	134	140	210	290	559	363	97	21	7	1881
1941	10	12	98	106	183	209	242	711	642	331	86	23	2653
1942	21	30	96	113	103	129	298	465	633	284	65	17	2254
1943	10	43	43	170	113	268	335	502	325	179	50	16	2054
1944	10	15	20	31	55	112	141	408	279	143	35	16	1265
1945	13	58	56	44	238	148	276	477	487	240	74	27	2138
1946	59	66	118	79	54	126	310	464	280	118	37	19	1730
1947	28	65	84	48	64	100	171	348	146	43	17	12	1126
1948	23	18	15	19	20	43	165	390	373	108	26	15	1215
1949	11	8	15	16	26	73	234	409	268	63	26	15	1164
1950	10	16	17	43	90	90	280	379	263	87	22	14	1311
1951	17	247	300	111	104	119	202	322	278	115	32	12	1859
1952	12	20	84	133	99	177	385	820	641	335	101	33	2840
1953	17	19	43	85	48	72	197	211	320	172	30	13	1227
1954	9	17	17	33	65	127	279	440	218	80	20	9	1314
1955	6	18	31	42	49	74	126	338	348	88	30	11	1161
1956	6	13	461	271	141	170	278	568	614	318	86	34	2960
1957	26	22	21	29	67	90	142	327	440	115	32	16	1327
1958	16	19	43	43	112	181	363	795	622	288	108	41	2631
1959	16	15	15	37	89	113	203	208	153	41	17	42	949
1960	18	9	10	18	55	86	178	240	147	43	17	8	829
1961	8	22	31	19	31	49	125	172	128	27	25	10	647
1962	10	15	23	23	185	110	381	397	505	203	52	20	1924
1963	17	11	11	82	208	101	192	464	492	265	71	31	1945
1964	26	64	36	31	30	52	126	257	200	60	29	11	922
1965	10	34	204	188	114	128	250	432	472	267	138	35	2272
1966	18	101	66	62	56	126	276	362	148	50	25	9	1299
1967	6	29	213	92	101	243	249	660	823	595	154	67	3232
1968	27	23	34	37	75	83	146	231	131	44	22	9	862
1969	15	40	52	396	234	227	464	1096	875	463	137	41	4040
1970	33	32	47	159	83	137	146	376	278	107	37	11	1446
1971	10	38	73	75	71	111	172	293	364	140	48	22	1417
1972	13	26	58	41	50	138	124	268	213	47	16	45	1039
1973	20	34	47	82	128	131	248	708	463	127	44	15	2047
1974	21	87	82	137	66	208	267	597	482	162	60	20	2189
1975	19	17	32	36	76	136	131	546	575	161	41	26	1796
1976	48	33	24	18	38	59	82	173	60	35	24	35	629
1977	20	10	7	12	15	19	57	75	111	20	11	4	361
1978	6	9	80	159	196	326	346	697	826	462	149	146	3402
1979	34	30	33	96	101	182	243	599	339	114	42	17	1830
1980	24	29	34	327	282	216	315	528	642	426	113	37	2973
1981	24	19	29	36	57	87	206	318	208	51	19	13	1067
1982	19	70	65	119	199	231	613	725	585	371	148	170	3315
1983	126	146	212	227	271	428	280	728	1166	686	280	92	4642
1984	53	149	227	126	107	162	203	489	266	162	67	36	2047
1985	31	50	41	40	56	84	254	308	169	55	22	19	1129
1986	24	38	68	93	472	426	361	624	593	222	76	32	3029
1987	24	14	15	21	39	66	172	229	121	33	15	10	759
1988	16	24	25	59	48	91	153	220	142	49	23	12	862
1989	7	14	20	22	37	133	237	240	149	41	19	19	938
1990	23	22	17	25	34	85	173	165	122	54	14	8	742
1991	8	6	9	10	11	118	135	277	321	102	24	13	1034
1992	12	19	18	21	68	77	209	238	76	46	17	9	810
<b>Averages</b>													
1921-92	19	33	60	73	100	138	233	424	367	159	50	24	1680
1922-92	19	33	61	73	100	137	234	425	366	159	50	24	1681
1928-34	10	18	27	31	54	96	161	274	244	83	22	9	1029
1976-77	34	22	16	15	27	39	70	124	86	28	18	20	495
1981-92	31	48	62	67	117	166	250	380	327	156	60	36	1698
1987-92	15	17	17	26	40	95	180	228	155	54	19	12	858

## California Central Valley Unimpaired Flow Data 1921-1992

### UF 23 - Tulare Lake Basin Outflow

*estimated unimpaired flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	0	0	0	0	0	0	0	15	58	0	0	0	73
1922	0	0	10	23	34	29	7	138	235	16	0	0	492
1923	0	0	32	16	3	0	9	95	16	0	0	0	171
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	8	0	0	0	0	8
1926	0	0	0	0	0	0	3	8	0	0	0	0	11
1927	0	5	1	0	13	1	1	54	54	0	0	0	129
1928	0	3	0	0	0	0	0	0	0	0	0	0	3
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	12	6	0	0	0	18
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	3	14	0	0	0	17
1936	0	0	0	0	7	0	2	39	2	0	0	0	50
1937	0	0	0	0	73	27	31	121	104	0	0	0	356
1938	0	0	46	19	90	167	109	186	218	27	0	0	862
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	5	25	36	2	93	18	0	0	0	179
1941	0	0	15	44	80	96	71	151	159	19	0	0	635
1942	0	0	18	50	43	0	4	52	132	9	0	0	308
1943	0	0	4	37	48	101	83	89	35	0	0	0	397
1944	0	0	0	0	0	5	0	14	9	0	0	0	28
1945	0	1	0	0	67	13	12	80	86	6	0	0	265
1946	0	14	31	18	0	0	5	18	2	0	0	0	88
1947	8	12	6	0	0	0	1	0	0	0	0	0	27
1948	0	0	0	0	0	0	0	2	0	0	0	0	2
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	2	0	0	0	0	2
1951	0	29	44	0	0	0	0	1	0	0	0	0	74
1952	0	0	0	36	6	22	20	171	150	31	0	0	436
1953	0	0	0	4	0	0	0	0	0	0	0	0	4
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	4	0	58	29	0	0	0	0	0	0	91
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	1	27	93	91	1	0	0	213
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	3	0	0	0	49	194	150	89	0	0	485
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	38	184	286	279	302	318	133	11	0	1551
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	18	20	48	0	0	0	86
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	7	95	199	202	49	0	0	0	552
1979	0	0	0	0	0	0	1	9	1	0	0	0	11
1980	0	0	0	57	87	252	78	70	12	23	0	0	579
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	158	213	63	19	0	0	453
1983	0	92	224	218	261	319	302	303	292	184	66	48	2309
1984	106	141	135	185	1	1	0	0	0	0	0	0	569
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	11	212	215	140	91	1	0	0	670
1987	0	0	1	1	0	0	0	0	0	0	0	0	2
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
Averages													
1921-92	2	4	8	10	15	24	23	40	34	8	1	1	170
1922-92	2	4	8	11	15	24	24	41	33	8	1	1	171
1928-34	0	0	0	0	0	0	0	2	1	0	0	0	3
1976-77	0	0	0	0	0	0	0	0	0	0	0	0	0
1981-92	9	19	30	34	23	44	56	55	37	17	6	4	334
1987-92	0	0	0	0	0	0	0	0	0	0	0	0	0

# California Central Valley Unimpaired Flow Data 1921-1992

## UF 24 - San Joaquin Valley West Side Minor Streams

estimated unimpaired flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	0	0	1	5	1	1	0	0	0	0	0	0	8
1922	0	0	1	1	3	1	2	0	0	0	0	0	8
1923	0	0	3	1	1	0	1	0	0	0	0	0	6
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	1	0	2	0	2	0	0	0	0	0	5
1926	0	0	0	0	1	0	0	0	0	0	0	0	1
1927	0	0	0	1	3	0	2	0	0	0	0	0	6
1928	0	0	0	0	1	2	1	0	0	0	0	0	4
1929	0	0	0	0	0	0	1	0	0	0	0	0	1
1930	0	0	0	0	0	1	0	0	0	0	0	0	1
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	2	1	1	0	0	0	0	0	0	0	4
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	1	0	0	0	0	0	0	0	0	1
1935	0	0	0	1	0	1	2	0	0	0	0	0	4
1936	0	0	0	2	9	1	2	0	0	0	0	0	14
1937	0	0	0	1	4	2	2	0	0	0	0	0	9
1938	0	0	2	1	10	6	4	1	0	0	0	0	24
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	2	2	2	2	0	0	0	0	0	8
1941	0	0	1	1	1	1	3	0	0	0	0	0	7
1942	0	0	1	3	1	0	2	0	0	0	0	0	7
1943	0	0	1	4	2	4	2	0	0	0	0	0	13
1944	0	0	0	0	1	1	0	0	0	0	0	0	2
1945	0	0	1	0	2	1	1	0	0	0	0	0	5
1946	0	0	1	1	0	0	1	0	0	0	0	0	3
1947	0	0	0	0	0	1	0	0	0	0	0	0	1
1948	0	0	0	0	0	1	1	0	0	0	0	0	2
1949	0	0	0	0	0	1	1	0	0	0	0	0	2
1950	0	0	0	1	1	0	1	0	0	0	0	0	3
1951	0	0	7	5	1	2	0	0	0	0	0	0	15
1952	0	0	3	9	2	3	1	0	0	0	0	0	18
1953	0	0	1	1	0	0	0	0	0	0	0	0	2
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	1	0	0	0	0	0	0	0	0	1
1956	0	0	5	7	2	1	0	0	0	0	0	0	15
1957	0	0	0	0	0	1	0	0	0	0	0	0	1
1958	0	0	0	1	5	4	10	1	0	0	0	0	21
1959	0	0	0	0	1	0	0	0	0	0	0	0	1
1960	0	0	0	0	1	0	0	0	0	0	0	0	1
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	2	1	0	0	0	0	0	0	3
1963	0	0	0	2	5	1	3	1	0	0	0	0	12
1964	0	0	0	1	0	0	0	0	0	0	0	0	1
1965	0	0	4	4	1	1	1	0	0	0	0	0	11
1966	0	0	0	0	1	0	0	0	0	0	0	0	1
1967	0	0	0	5	1	2	4	1	0	0	0	0	13
1968	0	0	0	0	1	0	0	0	0	0	0	0	1
1969	0	0	0	5	6	3	0	0	0	0	0	0	14
1970	0	0	1	6	1	1	0	0	0	0	0	0	9
1971	0	0	3	1	0	1	0	0	0	0	0	0	5
1972	0	0	0	0	0	3	0	0	0	0	0	0	3
1973	0	1	0	4	5	3	1	0	0	0	0	0	14
1974	0	0	1	1	1	2	2	0	0	0	0	0	7
1975	0	0	0	0	1	2	1	0	0	0	0	0	4
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	1	5	3	3	1	0	0	0	0	0	13
1979	0	0	0	1	2	1	0	0	0	0	0	0	4
1980	0	0	0	5	8	2	1	0	0	0	0	0	16
1981	0	0	0	0	0	1	0	0	0	0	0	0	1
1982	0	0	1	14	5	4	6	1	0	0	0	0	31
1983	0	1	3	5	8	18	3	2	0	0	0	0	40
1984	0	2	2	0	1	0	0	0	0	0	0	0	5
1985	1	2	1	0	0	1	0	0	0	0	0	0	5
1986	0	2	2	2	4	3	0	0	0	0	0	1	14
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	1	1	0	0	0	0	0	0	0	0	2
1989	0	0	1	0	1	1	0	0	0	0	0	0	4
1990	0	0	0	1	0	0	0	1	0	0	0	0	2
1991	0	0	0	0	1	1	0	0	0	0	0	0	2
1992	1	0	1	1	3	1	0	0	0	0	0	0	7
Averages													
1921-92	0	0	1	2	2	1	1	0	0	0	0	0	6
1922-92	0	0	1	2	2	1	1	0	0	0	0	0	6
1928-34	0	0	0	0	0	0	0	0	0	0	0	0	2
1976-77	0	0	0	0	0	0	0	0	0	0	0	0	0
1981-92	0	1	1	2	2	3	1	0	0	0	0	0	9
1987-92	0	0	1	1	1	1	0	0	0	0	0	0	3

# California Central Valley Unimpaired Flow Data 1921-1992

## Sacramento Valley Unimpaired Total Outflow

*estimated flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	424	2877	3784	5599	3837	4500	2959	2968	1841	751	478	416	30434
1922	407	518	1381	1185	3228	2623	3546	4829	2764	812	476	392	22161
1923	448	717	2471	1908	1234	1388	2984	2153	1221	666	414	393	15997
1924	412	407	490	565	1250	605	757	582	398	343	294	285	6388
1925	372	783	1024	1032	5784	2073	3324	2479	1188	574	419	384	19436
1926	396	519	680	894	3777	1619	3238	1326	651	433	339	320	14192
1927	365	2228	2215	2661	7558	3793	4535	2999	1803	711	441	393	29702
1928	383	1418	1185	1574	2285	6081	3461	1949	806	532	385	358	20417
1929	360	555	705	643	1234	1185	1325	1506	875	428	290	315	9421
1930	303	324	2866	1725	2117	2978	2211	1654	878	467	340	342	16205
1931	342	458	402	870	766	1184	882	660	412	287	263	259	6785
1932	351	411	1914	1485	1540	2336	2167	2701	1444	517	349	302	15517
1933	302	332	434	756	594	1960	1634	1756	1318	430	302	285	10103
1934	329	356	1160	1558	1657	1677	1178	737	455	316	273	259	9955
1935	314	870	790	2159	1676	2353	5742	3364	1528	570	375	326	20067
1936	390	385	536	3850	5539	2615	3004	2237	1383	572	366	336	21213
1937	330	327	411	506	2134	3336	3393	3072	1286	528	341	315	15979
1938	413	2023	5107	2080	6335	8316	5611	5563	2917	1056	582	480	40483
1939	536	590	799	773	783	1777	1542	909	502	360	306	320	9197
1940	353	344	716	4203	6923	6647	4196	2227	1011	538	406	407	27971
1941	455	661	4106	5556	6394	5422	5012	4131	1865	942	586	516	35646
1942	511	660	4133	5060	6477	2302	4411	3702	2529	1003	591	502	31881
1943	508	1013	2009	5443	3037	5166	3431	2258	1403	722	511	449	25950
1944	476	504	556	814	1583	2000	1611	2161	1095	612	394	354	12160
1945	417	1118	1554	1095	4171	2022	2184	2487	1310	582	418	367	17725
1946	590	1295	5404	2917	1392	2181	2681	2345	1020	569	442	390	21226
1947	422	841	1001	554	1677	2578	1846	1072	888	430	365	340	12014
1948	681	590	511	2094	726	1751	4479	3548	2269	741	470	424	18284
1949	430	525	714	556	1014	4042	2722	2223	865	435	369	336	14231
1950	358	417	440	2094	2991	2511	3084	2523	1293	556	396	376	17039
1951	1041	3945	5723	4023	3837	2621	2315	2365	949	517	436	396	28168
1952	520	1039	4064	4658	4824	4069	5626	5362	2849	1301	641	531	35484
1953	495	523	2440	6633	1657	2284	2871	2950	2478	1030	575	520	24456
1954	510	907	846	2779	3384	3800	4230	2145	1006	597	496	466	21166
1955	462	859	1521	1311	940	1185	1777	2307	1041	511	398	389	12701
1956	390	653	9730	8627	4613	3093	2991	3828	1958	914	563	506	37866
1957	648	597	596	835	2967	3496	2095	3047	1385	610	463	510	17249
1958	983	918	1831	3032	10000	5448	6384	4756	2618	1064	663	569	38266
1959	544	564	615	2486	3011	1878	1764	1261	723	486	400	486	14218
1960	422	398	486	990	3815	3341	2017	1706	960	481	384	373	15373
1961	408	787	1534	1015	2500	2114	1779	1729	967	471	402	375	14081
1962	408	620	1359	864	4552	2587	2988	2110	1255	546	407	365	18061
1963	3185	819	2289	1893	4712	2282	6159	3763	1432	710	516	476	28236
1964	596	1704	843	1841	1056	1106	1586	1696	1042	488	371	338	12667
1965	407	995	9491	6488	2259	1828	4635	2658	1475	742	598	444	32020
1966	471	1366	1040	2327	1808	2475	2737	1633	668	453	388	379	15745
1967	367	1489	3053	4369	2705	3946	3761	4753	3278	1177	569	442	29909
1968	527	564	918	1985	4293	2684	1824	1495	773	516	522	424	16525
1969	530	825	2111	8642	5447	3519	4633	4636	2137	806	552	510	34348
1970	602	623	3860	12592	3432	3226	1525	1671	1104	611	481	438	30165
1971	526	2190	4071	3552	1895	4068	3188	3440	2344	946	552	512	27284
1972	573	668	1202	1474	1871	3147	2299	1771	969	510	409	446	15339
1973	628	1433	2024	5237	4472	3667	2695	2906	1139	583	472	474	25730
1974	681	5129	4305	8196	2419	7105	5104	3210	2052	1084	615	529	40429
1975	547	637	894	1048	3605	5437	2964	4028	2439	877	597	553	23626
1976	819	840	770	664	888	1296	1166	934	511	396	484	414	9182
1977	404	425	395	511	482	548	527	691	486	361	339	415	5584
1978	374	516	2020	7326	3876	5514	3895	2969	1748	786	458	540	30022
1979	390	503	496	1354	2281	2792	2139	2837	881	512	394	384	14963
1980	675	936	1533	6990	6548	3677	2493	2286	1292	750	419	509	28108
1981	473	451	1017	1940	1899	2584	1787	1250	588	420	361	347	13117
1982	627	4797	6392	3870	5551	4779	7687	3885	1848	850	567	577	41430
1983	1016	1795	3831	4705	7344	11922	4991	5541	4058	1701	794	670	48368
1984	711	3765	7793	2944	2346	2992	2117	2255	1263	627	459	481	27753
1985	650	2056	1315	873	1330	1563	2177	1270	663	414	377	484	13172
1986	522	714	1248	2788	13130	7130	2449	2025	1147	567	414	577	32711
1987	554	458	546	851	1699	2838	1340	950	445	385	327	331	10724
1988	351	429	1987	2236	1046	1130	1132	1123	660	383	301	280	11058
1989	331	1150	791	975	998	6721	3007	1524	735	464	333	430	17459
1990	726	554	444	1435	961	1720	1271	1361	1020	427	314	303	10536
1991	343	368	355	379	488	2990	1739	1573	821	395	285	287	10023
1992	349	398	470	608	2731	2087	1733	800	469	379	278	274	10576
<b>Averages</b>													
1921-92	530	1034	2052	2772	3186	3218	2927	2453	1346	630	435	412	20996
1922-92	532	1008	2028	2732	3177	3200	2927	2446	1339	628	435	412	20863
1928-34	339	551	1238	1230	1456	2486	1837	1566	884	425	315	303	12629
1976-77	612	633	583	588	685	922	847	813	499	379	412	415	7383
1981-92	554	1411	2182	1967	3294	4038	2619	1963	1143	584	401	420	20577
1987-92	442	560	766	1081	1321	2914	1704	1222	692	406	306	318	11729

# California Central Valley Unimpaired Flow Data 1921-1992

## East Side Streams Unimpaired Total Outflow

estimated flow in taf

MATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	12	48	154	566	253	324	199	271	201	23	1	1	2053
1922	2	3	75	94	543	273	290	463	319	44	4	1	2111
1923	5	43	378	248	148	128	317	299	138	36	3	5	1748
1924	11	8	11	16	32	26	67	74	2	0	0	0	247
1925	7	43	55	55	493	180	399	336	146	22	3	4	1743
1926	5	9	25	26	207	89	225	108	18	1	0	0	713
1927	3	76	63	131	488	216	418	266	208	35	4	2	1910
1928	6	37	44	48	120	537	310	201	35	6	0	0	1344
1929	3	5	14	33	68	77	119	171	72	6	1	0	569
1930	1	1	26	70	74	224	162	138	90	7	1	1	795
1931	3	7	5	16	35	45	81	68	12	0	0	1	273
1932	2	7	128	117	421	135	160	284	214	33	3	3	1507
1933	0	3	5	24	27	63	91	163	184	18	4	5	587
1934	6	8	63	111	129	117	89	45	25	1	0	0	594
1935	0	18	23	132	80	171	588	314	173	21	3	1	1524
1936	5	6	8	205	1066	247	349	298	174	27	5	2	2392
1937	4	4	12	53	510	542	292	362	136	19	3	2	1939
1938	4	10	182	78	777	781	389	470	309	61	10	5	3076
1939	11	18	20	27	55	109	157	87	19	2	1	2	508
1940	10	5	12	266	391	507	367	277	98	11	2	2	1948
1941	4	10	104	151	285	310	306	361	187	35	8	4	1765
1942	5	15	128	470	399	184	340	362	292	61	10	5	2271
1943	5	78	134	520	297	940	335	262	135	31	8	4	2749
1944	8	8	15	31	131	221	117	231	92	13	3	0	870
1945	2	94	80	60	553	245	227	261	174	26	6	2	1730
1946	8	61	410	180	97	198	265	252	93	13	3	1	1581
1947	6	35	43	25	73	139	141	142	33	1	0	0	638
1948	17	17	14	39	34	128	303	310	221	30	3	2	1118
1949	4	6	18	28	60	335	230	248	90	6	3	2	1030
1950	2	8	9	155	278	179	326	285	166	24	4	4	1440
1951	15	671	764	527	300	345	197	227	73	15	5	3	3142
1952	7	30	255	660	382	585	436	515	315	110	21	15	3331
1953	8	14	58	233	71	119	200	197	214	49	9	5	1177
1954	6	14	19	48	110	241	261	193	51	10	3	0	956
1955	2	9	78	208	89	94	120	222	101	10	2	0	935
1956	1	7	918	891	238	189	211	363	230	36	16	8	3108
1957	11	14	19	25	128	310	145	263	148	16	6	2	1087
1958	7	13	30	112	461	584	1025	465	268	64	15	7	3051
1959	7	10	12	68	205	99	129	99	35	9	1	7	681
1960	4	3	6	17	170	172	154	141	46	6	1	2	722
1961	1	7	14	11	28	51	89	116	37	5	1	1	361
1962	1	4	14	13	343	190	253	194	151	18	5	1	1187
1963	50	11	41	75	469	177	467	388	174	31	10	6	1899
1964	9	77	36	123	50	63	129	170	77	14	2	2	752
1965	4	28	917	643	167	127	378	273	192	54	31	5	2819
1966	11	46	79	97	110	115	186	141	19	6	3	2	815
1967	2	22	175	351	204	376	550	491	364	134	18	6	2693
1968	11	10	25	65	204	166	134	134	42	7	6	0	804
1969	5	43	74	884	612	349	428	489	262	68	9	6	3229
1970	20	20	136	744	229	316	131	226	138	27	6	6	1999
1971	17	70	274	202	101	198	189	228	213	45	3	3	1543
1972	8	19	109	53	115	167	127	185	78	13	4	5	883
1973	9	27	75	466	501	357	238	344	120	17	7	4	2165
1974	11	142	292	414	115	430	366	316	169	54	13	5	2327
1975	6	11	24	46	270	427	225	363	267	50	11	7	1707
1976	29	33	21	18	23	44	57	81	11	2	7	3	329
1977	4	3	3	7	10	13	38	47	27	1	2	1	156
1978	1	4	52	396	254	410	420	329	242	58	7	17	2190
1979	2	8	16	158	329	375	232	347	105	12	3	1	1588
1980	10	25	47	774	610	312	215	260	198	73	7	4	2535
1981	2	5	13	79	53	205	160	140	33	1	1	1	693
1982	8	147	305	606	677	705	994	433	209	71	13	22	4190
1983	82	235	609	699	737	1304	463	592	471	243	46	30	5511
1984	19	441	766	255	223	239	156	260	115	21	17	1	2513
1985	10	85	65	42	113	153	197	160	40	6	2	6	879
1986	4	30	73	174	1482	814	233	255	157	26	6	4	3258
1987	4	2	8	17	66	132	95	84	14	5	3	1	431
1988	14	41	77	78	36	61	114	85	31	6	3	1	547
1989	3	45	60	33	58	323	198	146	76	7	4	38	991
1990	25	26	15	46	58	110	123	100	45	6	0	0	554
1991	2	4	13	6	25	187	107	155	92	10	3	0	604
1992	54	16	37	51	187	154	148	66	12	11	3	5	744
Averages													
1921-92	9	44	123	200	260	270	255	246	135	28	6	4	1581
1922-92	9	44	123	195	260	269	256	245	134	28	6	4	1575
1928-34	3	10	41	60	125	171	145	153	90	10	1	1	810
1976-77	17	18	12	13	17	29	48	64	19	2	5	2	243
1981-92	19	90	170	174	310	366	249	206	108	34	8	9	1743
1987-92	17	22	35	39	72	161	131	106	45	8	3	8	645

# California Central Valley Unimpaired Flow Data 1921-1992

## San Joaquin Valley Unimpaired Total Outflow

*estimated flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	96	153	213	582	488	735	824	1399	1413	340	64	31	6338
1922	24	26	248	282	780	657	835	2491	2535	652	129	44	8703
1923	36	98	448	412	305	370	953	1796	970	495	102	69	6054
1924	83	49	50	66	112	121	376	550	76	38	11	7	1539
1925	36	126	139	128	644	492	1064	1602	993	359	102	29	5714
1926	51	51	85	65	324	373	1229	1012	325	79	22	13	3629
1927	18	221	221	214	841	594	1149	1665	1506	460	97	38	7024
1928	55	267	143	164	265	976	852	1276	464	100	28	12	4602
1929	13	30	55	64	122	273	443	1085	633	153	30	8	2909
1930	11	13	55	115	198	434	720	797	777	155	35	16	3326
1931	31	51	33	71	113	174	422	567	154	36	15	9	1676
1932	12	23	411	305	912	571	846	1715	1644	566	114	36	7155
1933	30	19	40	95	107	264	538	788	1227	247	54	27	3436
1934	12	29	132	174	255	437	550	421	240	56	22	18	2346
1935	33	112	141	388	339	493	1569	1781	1568	351	91	29	6895
1936	37	53	55	261	1341	700	1326	1730	1110	376	82	22	7093
1937	26	33	103	134	1237	849	1075	2308	1336	338	70	21	7530
1938	28	47	938	374	1364	2157	1632	2768	2717	1031	246	88	13390
1939	124	125	106	128	180	430	879	645	262	83	35	41	3038
1940	115	48	54	763	868	1108	1113	1900	1031	207	46	13	7266
1941	31	41	444	464	955	1066	1077	2395	1890	773	156	43	9335
1942	47	101	503	597	550	554	1144	1674	2044	766	134	35	8149
1943	29	218	249	855	609	1486	1393	1687	1068	442	106	29	8171
1944	35	50	67	122	258	468	509	1404	820	314	61	20	4128
1945	30	249	225	173	1134	675	997	1635	1486	541	120	37	7302
1946	162	274	631	376	223	520	1139	1556	804	243	61	27	6016
1947	74	222	272	149	252	409	616	1061	371	89	22	17	3554
1948	87	66	49	99	90	236	687	1394	1278	287	46	20	4339
1949	25	33	59	66	120	398	909	1373	740	131	40	21	3915
1950	20	43	46	222	404	384	1062	1432	905	216	40	19	4793
1951	56	1535	1675	554	484	549	783	1100	756	236	55	17	7800
1952	35	78	379	848	493	968	1509	2856	2076	926	219	68	10455
1953	38	53	176	429	196	310	814	798	1132	483	68	25	4522
1954	26	51	66	126	285	631	1093	1388	571	161	29	14	4441
1955	17	49	130	200	181	262	452	1150	930	177	38	13	3599
1956	16	40	2213	1396	621	623	957	1881	1777	766	171	65	10526
1957	66	77	73	99	310	452	553	1216	1218	251	57	25	4397
1958	45	62	138	188	570	973	1659	2670	1928	729	220	75	9257
1959	40	40	35	183	370	388	702	674	412	82	22	120	3068
1960	35	27	33	71	326	416	719	859	447	77	24	14	3048
1961	15	60	97	61	124	204	488	610	352	57	45	19	2132
1962	19	33	69	190	811	449	1256	1227	1369	429	83	28	5963
1963	54	32	67	320	994	380	844	1733	1399	580	130	56	6589
1964	62	272	141	157	142	220	510	915	616	137	46	24	3242
1965	28	142	1419	1008	455	471	1092	1475	1448	692	303	79	8612
1966	39	379	274	261	232	458	952	1075	323	95	42	25	4155
1967	28	137	741	436	392	1029	1291	2465	2671	1616	314	116	11236
1968	54	52	102	135	372	364	583	809	394	86	43	23	3017
1969	38	183	242	2059	1465	1322	1978	3563	2663	1180	255	72	15020
1970	113	115	278	1182	434	669	540	1271	918	265	79	32	5896
1971	28	189	361	353	291	444	650	1079	1180	358	86	37	5056
1972	25	95	238	175	220	565	492	1019	606	106	30	70	3641
1973	49	105	215	449	746	698	909	2184	1239	246	83	30	6953
1974	56	425	406	629	259	873	1079	1897	1391	392	124	42	7573
1975	46	51	114	153	488	748	609	1880	1847	455	101	59	6551
1976	176	140	96	58	124	219	313	577	137	62	59	62	2023
1977	39	27	17	33	45	65	204	266	299	40	16	10	1061
1978	9	27	264	718	905	1384	1607	2345	2267	1045	276	303	11150
1979	78	89	101	497	573	854	901	1991	963	252	85	38	6422
1980	74	108	142	1697	1450	1126	1130	1731	1762	1070	229	84	10603
1981	55	42	82	168	201	381	754	977	486	96	46	33	3321
1982	64	401	551	806	1254	1220	2578	2536	1745	953	292	346	12746
1983	426	678	1153	1317	1673	2602	1465	2719	3792	2151	731	261	18968
1984	263	781	1256	773	483	635	714	1600	864	345	108	54	7876
1985	79	222	150	134	228	382	926	997	420	98	43	45	3724
1986	68	150	251	380	2315	1968	1384	1941	1643	478	139	82	10799
1987	63	30	45	52	137	277	569	624	242	60	34	17	2150
1988	35	76	105	194	169	310	499	627	337	105	42	19	2518
1989	21	46	76	93	159	720	947	858	523	108	34	37	3622
1990	109	76	62	109	138	363	645	524	322	220	25	11	2604
1991	14	17	24	23	25	539	503	983	906	229	63	29	3355
1992	52	69	65	82	342	342	707	633	173	176	50	21	2712
<b>Averages</b>													
1921-92	56	141	282	371	512	642	921	1439	1096	389	99	48	5997
1922-92	56	141	283	368	512	641	922	1440	1092	389	99	48	5992
1928-34	23	62	124	141	282	447	624	950	734	188	43	18	3636
1976-77	108	84	57	46	85	142	259	422	218	51	38	36	1542
1981-92	104	216	318	344	594	812	974	1252	954	418	134	80	6200
1987-92	49	52	63	92	162	425	645	708	417	150	41	22	2827

# California Central Valley Unimpaired Flow Data 1921-1992

## Delta Unimpaired Total Inflow

*estimated flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	532	3078	4151	6747	4578	5559	3982	4638	3455	1114	543	448	38825
1922	433	547	1704	1561	4551	3553	4671	7783	5618	1508	609	437	32975
1923	489	858	3297	2568	1687	1886	4254	4248	2329	1197	519	467	23799
1924	506	464	551	647	1394	752	1200	1206	476	381	305	292	8174
1925	415	952	1218	1215	6921	2745	4787	4417	2327	955	524	417	26893
1926	452	579	790	985	4308	2081	4692	2446	994	513	361	333	18534
1927	386	2525	2499	3006	8887	4603	6102	4930	3517	1206	542	433	38636
1928	444	1722	1372	1786	2670	7594	4623	3426	1305	638	413	370	26363
1929	376	590	774	740	1424	1535	1887	2762	1580	587	321	323	12899
1930	315	338	2947	1910	2389	3636	3093	2589	1745	629	376	359	20326
1931	376	516	440	957	914	1403	1385	1295	578	323	278	269	8734
1932	365	441	2453	1907	2873	3042	3173	4700	3302	1116	466	341	24179
1933	332	354	479	875	728	2287	2263	2707	2729	695	360	317	14126
1934	347	393	1355	1843	2041	2231	1817	1203	720	373	295	277	12895
1935	347	1000	954	2679	2095	3017	7899	5459	3269	942	469	356	28486
1936	432	444	599	4316	7946	3562	4679	4265	2667	975	453	360	30698
1937	360	364	526	693	3881	4727	4760	5742	2758	885	414	338	25448
1938	445	2080	6227	2532	8476	11254	7632	8801	5943	2148	838	573	56949
1939	671	733	925	928	1018	2316	2578	1641	783	445	342	363	12743
1940	478	397	782	5232	8182	8262	5676	4404	2140	756	454	422	37185
1941	490	712	4654	6171	7634	6798	6395	6887	3942	1750	750	563	46746
1942	563	776	4764	6127	7426	3040	5895	5738	4865	1830	735	542	42301
1943	542	1309	2392	6818	3943	7592	5159	4207	2606	1195	625	482	36870
1944	519	562	638	967	1972	2689	2237	3796	2007	939	458	374	17158
1945	449	1461	1859	1328	5858	2942	3408	4383	2970	1149	544	406	26757
1946	760	1630	6445	3473	1712	2899	4085	4153	1917	825	506	418	28823
1947	502	1098	1316	728	2002	3126	2603	2275	1292	520	387	357	16206
1948	785	673	574	2232	850	2115	5469	5252	3768	1058	519	446	23741
1949	459	564	791	650	1194	4775	3861	3844	1695	572	412	359	19176
1950	380	468	495	2471	3673	3074	4472	4240	2364	796	440	399	23272
1951	1112	6151	8162	5104	4621	3515	3295	3692	1778	768	496	416	39110
1952	562	1147	4698	6166	5699	5622	7571	8733	5240	2337	881	614	49270
1953	541	590	2674	7295	1924	2713	3885	3945	3824	1562	652	550	30155
1954	542	972	931	2953	3779	4672	5584	3726	1628	768	528	480	26563
1955	481	917	1729	1719	1210	1541	2349	3679	2072	698	438	402	17235
1956	407	700	12861	10914	5472	3905	4159	6072	3965	1716	750	579	51500
1957	725	688	688	959	3405	4258	2793	4526	2751	877	526	537	22733
1958	1035	993	1999	3332	11031	7005	9068	7891	4814	1857	898	651	50574
1959	591	614	662	2737	3586	2365	2595	2034	1170	577	423	613	17967
1960	461	428	525	1078	4311	3929	2890	2706	1453	564	409	389	19143
1961	424	854	1645	1087	2652	2369	2356	2455	1356	533	448	395	16574
1962	428	657	1442	1067	5706	3226	4497	3531	2775	993	495	394	25211
1963	3289	862	2397	2288	6175	2839	7470	5884	3005	1321	656	538	36724
1964	667	2053	1020	2121	1248	1389	2225	2781	1735	639	419	364	16661
1965	439	1165	11827	8139	2881	2426	6105	4406	3115	1488	932	528	43451
1966	521	1791	1393	2685	2150	3048	3875	2849	1010	554	433	406	20715
1967	397	1648	3969	5156	3301	5351	5602	7709	6313	2927	901	564	43838
1968	592	626	1045	2185	4869	3214	2541	2438	1209	609	571	447	20346
1969	573	1051	2427	11585	7524	5190	7039	8688	5062	2054	816	588	52597
1970	735	758	4274	14518	4095	4211	2196	3168	2160	903	566	476	38060
1971	571	2449	4706	4107	2287	4710	4027	4747	3737	1349	641	552	33883
1972	606	782	1549	1702	2206	3879	2918	2975	1653	629	443	521	19863
1973	686	1565	2314	6152	5719	4722	3842	5434	2498	846	562	508	34848
1974	748	5696	5003	9239	2793	8408	6549	5423	3612	1530	752	576	50329
1975	599	699	1032	1247	4363	6612	3798	6271	4553	1382	709	619	31884
1976	1024	1013	887	740	1035	1559	1536	1592	659	460	550	479	11534
1977	447	455	415	551	537	626	769	1004	812	402	357	426	6801
1978	384	547	2336	8440	5035	7308	5922	5643	4257	1889	741	860	43362
1979	470	600	613	2009	3183	4021	3272	5175	1949	776	482	423	22973
1980	759	1069	1722	9461	8608	5115	3838	4277	3252	1893	655	597	41246
1981	530	498	1112	2187	2153	3170	2701	2367	1107	517	408	381	17131
1982	699	5345	7248	5282	7482	6704	11259	6854	3802	1874	872	945	58366
1983	1524	2708	5593	6721	9754	15828	6919	8852	8321	4095	1571	961	72847
1984	992	4988	9815	3972	3051	3866	2987	4114	2241	993	584	536	38139
1985	739	2364	1530	1049	1671	2098	3299	2428	1123	518	422	535	17776
1986	594	894	1572	3342	16927	9913	4066	4221	2946	1072	559	663	46769
1987	621	490	599	920	1901	3247	2003	1658	701	450	363	349	13302
1988	401	546	2169	2508	1250	1500	1745	1835	1028	493	346	300	14121
1989	355	1242	926	1100	1215	7765	4152	2527	1334	579	371	505	22071
1990	860	655	520	1591	1157	2193	2039	1985	1387	653	339	315	13694
1991	359	389	386	408	538	3716	2356	2715	1786	636	341	315	13945
1992	449	484	566	740	3260	2583	2592	1500	651	554	324	300	14003

Averages													
1921-92	596	1219	2458	3342	3958	4131	4103	4138	2576	1047	540	464	28573
1922-92	597	1193	2434	3294	3949	4111	4105	4131	2564	1046	540	465	28428
1928-34	365	622	1403	1431	1863	3104	2606	2669	1708	623	358	322	17075
1976-77	736	734	651	646	786	1093	1153	1298	736	431	454	453	9168
1981-92	677	1717	2670	2485	4197	5215	3843	3421	2202	1036	542	509	28514
1987-92	508	634	861	1211	1554	3501	2481	2037	1148	561	347	347	15189

## California Central Valley Unimpaired Flow Data 1921-1992

### Delta Unimpaired Net Use

*estimated flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	103	83	68	75	64	95	106	118	124	132	126	113	1207
1922	103	83	68	75	64	95	106	118	124	132	126	113	1207
1923	99	75	57	78	83	102	93	120	123	132	126	110	1198
1924	102	89	84	81	76	96	108	120	124	132	126	113	1251
1925	95	83	70	83	63	95	96	110	123	132	126	113	1189
1926	103	86	81	75	62	101	89	120	124	132	126	113	1212
1927	97	69	85	78	60	95	99	120	122	132	126	113	1196
1928	93	79	77	82	79	83	104	119	124	132	126	113	1211
1929	103	76	74	85	80	95	107	120	119	132	126	113	1230
1930	103	91	77	68	74	89	104	120	124	132	126	112	1220
1931	99	85	88	71	78	96	109	115	122	132	126	113	1234
1932	102	82	52	82	70	98	106	118	124	132	126	113	1205
1933	104	90	78	67	82	91	109	117	124	132	126	113	1233
1934	99	91	69	83	68	102	107	119	122	132	126	112	1230
1935	101	77	76	70	82	85	91	120	124	132	126	113	1197
1936	98	87	78	69	52	96	103	116	121	131	126	112	1189
1937	101	91	72	74	62	47	106	120	123	132	126	113	1167
1938	101	80	68	78	22	61	104	120	124	132	126	112	1128
1939	99	88	84	80	78	90	108	118	124	132	126	112	1239
1940	100	90	84	50	19	79	105	119	124	132	126	113	1141
1941	100	88	50	49	17	88	93	117	124	132	126	113	1097
1942	99	85	65	66	75	93	90	116	124	132	126	113	1184
1943	101	76	78	66	77	86	102	120	123	132	126	113	1200
1944	102	88	81	77	62	99	102	117	122	132	126	113	1221
1945	98	75	75	86	69	86	109	118	124	132	126	113	1211
1946	93	85	64	86	81	94	108	117	124	132	126	113	1223
1947	102	77	79	87	77	91	109	120	122	132	126	113	1235
1948	93	87	85	87	81	86	97	111	123	132	126	113	1221
1949	100	89	72	82	78	83	109	120	124	131	126	113	1227
1950	103	87	80	69	76	95	105	120	124	132	126	111	1228
1951	95	71	65	76	77	95	105	117	124	132	126	113	1196
1952	99	78	62	33	80	84	101	120	123	132	126	113	1151
1953	104	81	60	80	86	97	100	118	122	132	126	113	1219
1954	103	86	84	79	77	90	102	119	123	132	126	113	1219
1955	104	81	71	73	80	99	99	117	124	132	126	112	1218
1956	103	85	44	-8	80	102	98	117	124	132	126	110	1113
1957	99	91	87	79	70	94	102	109	123	132	126	112	1224
1958	96	90	75	63	23	52	88	117	123	132	126	113	1098
1959	103	91	85	71	66	100	107	120	124	132	126	101	1226
1960	104	91	83	74	70	96	105	119	124	132	126	113	1237
1961	103	73	85	73	81	92	105	120	124	132	126	112	1226
1962	103	78	83	84	50	95	108	120	124	132	126	113	1216
1963	80	89	80	73	73	87	89	118	124	132	126	112	1183
1964	98	76	88	75	86	97	108	120	120	132	126	113	1239
1965	96	79	65	76	83	97	98	120	124	131	124	113	1206
1966	103	73	72	80	78	101	107	119	124	131	126	113	1227
1967	104	68	72	15	83	84	92	120	120	132	126	113	1129
1968	103	86	82	69	76	91	107	120	124	132	122	113	1225
1969	102	80	74	39	8	96	104	120	124	132	126	113	1118
1970	97	87	68	55	79	95	108	120	123	132	126	113	1203
1971	101	64	68	85	84	94	105	115	124	132	126	113	1211
1972	103	87	69	86	81	102	105	120	123	132	126	110	1244
1973	91	66	79	21	19	89	108	120	124	132	126	113	1088
1974	94	70	72	79	83	86	100	120	122	129	126	113	1194
1975	99	88	77	85	64	81	104	120	124	131	125	113	1211
1976	92	90	87	88	79	98	105	120	123	132	122	110	1246
1977	102	88	84	84	81	95	107	113	123	132	126	110	1245
1978	103	82	70	44	47	59	99	120	124	132	126	112	1118
1979	104	80	86	60	65	92	105	120	124	131	126	113	1206
1980	95	84	70	68	37	93	104	119	124	130	126	113	1163
1981	103	90	80	69	81	87	106	120	124	132	126	112	1230
1982	96	70	75	54	69	36	96	120	123	132	126	105	1102
1983	94	64	75	21	16	-8	94	119	124	132	126	109	966
1984	102	67	65	88	79	97	106	120	123	132	126	113	1218
1985	96	64	81	85	79	87	108	120	123	132	126	112	1213
1986	101	73	77	76	3	59	105	119	124	131	126	110	1104
1987	103	90	83	80	69	87	108	120	124	132	126	113	1235
1988	101	82	72	75	83	101	103	116	121	132	126	113	1225
1989	103	82	77	85	79	89	108	120	123	132	126	101	1225
1990	97	85	88	79	76	98	107	107	124	132	126	113	1232
1991	102	90	83	88	76	77	107	117	116	132	126	113	1227
1992	94	89	83	83	58	89	106	120	123	132	126	113	1216
Averages													
1921-92	100	82	75	71	67	88	103	118	123	132	126	112	1196
1922-92	100	82	75	71	67	88	103	118	123	132	126	112	1196
1928-34	100	85	74	77	76	93	107	118	123	132	126	113	1223
1976-77	97	89	86	86	80	97	106	117	123	132	124	110	1246
1981-92	99	79	78	74	64	75	105	118	123	132	126	111	1183
1987-92	100	86	81	82	74	90	107	117	122	132	126	111	1227



# California Central Valley Unimpaired Flow Data 1921-1992

## Delta Unimpaired Total Outflow

estimated flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	429	2995	4083	6672	4515	5464	3876	4520	3332	982	417	335	37620
1922	330	464	1636	1486	4487	3458	4565	7665	5494	1376	483	324	31768
1923	390	783	3240	2491	1604	1784	4161	4128	2206	1065	393	357	22602
1924	404	375	468	566	1318	656	1092	1085	352	249	179	179	6923
1925	320	869	1148	1132	6858	2650	4691	4307	2204	823	397	304	25703
1926	350	494	708	909	4246	1979	4603	2326	871	382	234	220	17322
1927	288	2456	2414	2928	8827	4508	6003	4810	3395	1074	416	320	37439
1928	351	1643	1295	1704	2591	7511	4519	3306	1181	507	287	257	25152
1929	273	514	700	655	1343	1440	1780	2642	1462	456	195	210	11670
1930	211	247	2870	1842	2315	3547	2989	2470	1621	497	250	247	19106
1931	277	430	353	886	837	1307	1277	1180	455	192	152	156	7502
1932	263	359	2401	1825	2804	2943	3066	4582	3179	985	339	228	22974
1933	228	264	401	808	645	2195	2154	2590	2605	564	234	204	12892
1934	248	302	1286	1760	1974	2129	1709	1084	598	242	169	165	11666
1935	245	923	879	2609	2013	2933	7808	5338	3145	811	343	242	27289
1936	334	357	521	4247	7894	3466	4576	4148	2546	844	327	248	29508
1937	260	273	454	620	3819	4680	4653	5622	2635	753	288	225	24282
1938	344	2000	6158	2454	8455	11193	7528	8681	5820	2016	712	461	55822
1939	573	645	841	849	940	2226	2470	1523	659	314	216	250	11506
1940	378	307	699	5181	8164	8184	5572	4285	2016	624	328	310	36048
1941	390	624	4603	6123	7616	6710	6302	6770	3819	1618	624	449	45648
1942	464	692	4698	6062	7351	2947	5806	5622	4742	1699	609	429	41121
1943	441	1232	2315	6752	3866	7506	5056	4087	2482	1063	498	369	35667
1944	417	474	558	890	1910	2591	2135	3680	1885	807	331	261	15939
1945	350	1386	1784	1243	5788	2856	3299	4264	2846	1017	418	293	25544
1946	667	1546	6381	3387	1631	2804	3977	4036	1793	693	379	305	27599
1947	400	1021	1236	641	1925	3035	2495	2155	1170	389	260	244	14971
1948	692	586	489	2145	769	2029	5372	5141	3645	926	393	333	22520
1949	359	475	719	567	1116	4693	3752	3724	1571	441	286	246	17949
1950	277	381	414	2402	3596	2980	4366	4120	2240	665	314	288	22043
1951	1017	6080	8097	5028	4545	3420	3190	3575	1654	637	370	303	37916
1952	463	1068	4636	6133	5619	5538	7470	8613	5117	2205	754	501	48117
1953	438	509	2614	7216	1839	2617	3785	3826	3702	1430	526	437	28939
1954	439	887	847	2875	3703	4583	5482	3606	1505	636	402	367	25332
1955	378	836	1658	1646	1130	1442	2250	3562	1948	566	312	290	16018
1956	304	616	12817	10923	5392	3803	4060	5955	3842	1584	624	469	50389
1957	627	598	600	880	3336	4164	2692	4417	2627	746	399	425	21511
1958	939	904	1924	3269	11008	6953	8980	7775	4691	1725	772	539	49479
1959	488	523	577	2666	3520	2265	2488	1914	1047	445	297	511	16741
1960	357	337	442	1004	4241	3833	2785	2587	1330	433	283	276	17908
1961	320	781	1560	1014	2571	2277	2251	2335	1232	402	322	283	15348
1962	324	580	1359	982	5656	3131	4388	3411	2651	861	368	281	23992
1963	3210	773	2317	2215	6102	2753	7381	5767	2882	1189	529	426	35544
1964	570	1977	932	2046	1162	1292	2117	2661	1615	508	294	251	15425
1965	343	1086	11762	8063	2798	2329	6007	4286	2991	1357	807	415	42244
1966	417	1719	1321	2606	2072	2947	3767	2729	886	423	307	293	19487
1967	293	1579	3898	5141	3218	5267	5510	7588	6193	2795	775	452	42709
1968	489	540	963	2115	4793	3123	2434	2318	1086	477	449	334	19121
1969	471	971	2354	11546	7516	5094	6935	8568	4938	1923	690	475	51481
1970	638	671	4206	14463	4016	4115	2089	3048	2038	771	440	364	36859
1971	470	2385	4639	4022	2202	4617	3921	4632	3614	1217	514	439	32672
1972	503	695	1481	1616	2125	3777	2813	2856	1531	497	316	411	18621
1973	595	1499	2235	6131	5700	4633	3733	5314	2374	715	436	395	33760
1974	654	5627	4932	9160	2710	8322	6449	5302	3490	1401	626	463	49136
1975	500	610	955	1161	4299	6531	3694	6151	4430	1251	584	506	30672
1976	932	924	800	652	956	1461	1431	1472	536	328	428	369	10289
1977	345	367	331	467	456	530	662	891	688	270	231	316	5554
1978	281	465	2266	8395	4988	7250	5823	5523	4134	1757	615	748	42245
1979	367	520	527	1948	3118	3928	3167	5055	1825	645	356	310	21766
1980	664	985	1653	9393	8571	5021	3734	4158	3128	1764	529	484	40084
1981	426	408	1032	2118	2072	3083	2595	2248	983	385	282	269	15901
1982	603	5275	7174	5228	7413	6668	11163	6733	3679	1743	745	840	57264
1983	1430	2644	5518	6700	9738	15836	6824	8733	8197	3963	1445	852	71880
1984	891	4921	9750	3884	2972	3769	2881	3994	2118	862	458	423	36923
1985	643	2300	1449	964	1592	2011	3192	2307	1001	387	295	424	16565
1986	493	820	1495	3266	16924	9854	3962	4102	2823	941	432	552	45664
1987	518	399	515	840	1833	3160	1895	1537	578	318	237	236	12066
1988	300	464	2097	2433	1167	1399	1642	1718	907	362	220	187	12896
1989	252	1160	849	1015	1135	7676	4044	2407	1211	448	245	404	20846
1990	762	570	432	1512	1082	2095	1932	1878	1263	521	213	202	12462
1991	257	299	303	320	462	3639	2248	2599	1670	504	215	202	12718
1992	355	395	483	658	3202	2494	2486	1380	529	422	198	187	12789
Averages													
1921-92	496	1137	2383	3272	3891	4043	4000	4020	2454	915	414	352	27377
1922-92	497	1111	2359	3224	3882	4023	4002	4013	2441	914	414	353	27233
1928-34	264	537	1329	1354	1787	3010	2499	2551	1586	492	232	210	15852
1976-77	639	646	566	560	706	996	1047	1182	612	299	330	343	7922
1981-92	578	1638	2591	2412	4133	5140	3739	3303	2080	905	415	398	27331
1987-92	407	548	780	1130	1480	3411	2375	1920	1026	429	221	236	13963

## California Central Valley Unimpaired Flow Data 1921-1992

### Delta Natural Net Use

*estimated flow in taf*

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	77	-23	-106	-110	39	82	166	213	271	310	276	204	1399
1922	122	10	-102	-56	-96	75	156	222	271	310	276	204	1392
1923	101	-41	-179	-51	48	119	71	237	267	310	276	187	1345
1924	119	46	1	-17	6	78	170	237	272	310	276	204	1702
1925	73	11	-90	-5	-94	75	91	169	270	310	276	204	1290
1926	124	27	-13	-54	-95	115	47	235	272	310	276	204	1448
1927	88	-80	10	-35	-123	72	111	233	258	310	276	204	1324
1928	62	-18	-42	-10	24	-10	147	230	272	310	276	204	1445
1929	128	-34	-62	10	32	72	163	238	238	310	276	204	1575
1930	127	62	-43	-103	-17	31	145	234	272	310	275	199	1492
1931	98	23	27	-82	14	79	174	205	262	310	275	204	1589
1932	118	1	-214	-20	-51	97	159	224	272	309	276	204	1375
1933	130	51	-35	-106	44	49	177	213	271	310	276	204	1584
1934	99	61	-93	-1	-53	118	166	227	262	310	276	197	1569
1935	114	-33	-51	-96	39	-3	58	238	272	310	276	204	1328
1936	92	38	-34	-95	-182	77	140	211	254	309	276	195	1281
1937	109	60	-77	-66	-107	-121	159	238	269	310	276	204	1254
1938	110	-10	-100	-33	-241	-65	143	234	272	310	276	198	1094
1939	97	44	2	-26	13	41	170	222	272	310	276	199	1620
1940	107	58	2	-224	-205	-19	148	229	272	310	276	202	1156
1941	106	41	-217	-159	-136	24	71	217	271	310	276	204	1008
1942	98	20	-116	-129	-11	58	50	210	272	310	276	203	1241
1943	112	-37	-38	-120	8	9	135	235	270	310	276	204	1364
1944	122	40	-19	-40	-89	98	130	215	265	310	276	204	1512
1945	95	-43	-54	14	-45	12	175	226	271	310	276	204	1441
1946	59	20	-130	15	37	70	171	217	272	309	276	204	1520
1947	122	-28	-25	20	12	45	175	232	260	309	276	204	1602
1948	62	35	13	25	34	18	100	178	264	310	276	203	1518
1949	107	51	-73	-8	18	-6	177	234	272	307	274	201	1554
1950	126	33	-19	-97	6	70	153	233	271	310	276	193	1555
1951	75	-71	-122	-64	3	72	150	216	272	310	275	202	1318
1952	97	-22	-140	-217	24	-3	128	236	269	309	276	203	1160
1953	130	-3	-152	-33	67	85	117	225	258	310	274	204	1482
1954	126	26	6	-30	8	39	133	230	267	310	274	204	1593
1955	130	-3	-82	-68	28	99	113	218	272	310	276	198	1491
1956	125	22	-264	-230	30	117	108	213	272	310	276	183	1162
1957	97	60	25	-28	-37	67	129	161	270	310	276	197	1527
1958	83	52	-54	-140	-213	-67	34	213	268	310	273	201	960
1959	126	58	10	-82	-61	108	164	238	272	310	276	129	1548
1960	130	62	-3	-61	-34	77	149	227	272	309	276	204	1608
1961	128	-57	9	-66	38	54	152	234	272	310	274	199	1547
1962	128	-26	-1	4	-180	75	173	236	272	309	276	204	1470
1963	-27	50	-22	-69	-24	13	46	220	271	310	276	197	1241
1964	91	-41	27	-56	66	87	170	234	246	309	272	204	1609
1965	79	-15	-121	-56	48	84	103	238	272	308	264	204	1408
1966	128	-57	-74	-29	13	112	166	230	271	305	276	204	1545
1967	130	-86	-77	-254	50	-2	67	237	251	310	276	203	1105
1968	126	30	-9	-92	6	49	163	233	272	310	267	204	1539
1969	119	-9	-64	-225	-170	80	143	237	271	310	276	201	1169
1970	87	32	-102	-206	19	78	170	238	266	310	276	202	1370
1971	114	-116	-109	3	57	64	154	205	272	310	276	203	1433
1972	126	36	-97	14	36	118	149	235	266	310	276	184	1653
1973	45	-101	-26	-250	-141	33	174	237	272	310	276	201	1030
1974	68	-80	-76	-40	49	12	118	238	262	294	276	204	1325
1975	97	45	-44	10	-75	-22	145	238	271	304	267	204	1440
1976	53	54	26	29	23	95	151	238	267	310	250	187	1683
1977	119	41	2	1	38	75	161	190	269	309	276	184	1665
1978	126	0	-89	-236	-71	-59	111	237	272	310	276	198	1075
1979	130	-11	16	-153	-87	58	151	235	272	307	276	204	1398
1980	74	16	-91	-110	-146	63	145	226	272	297	276	204	1226
1981	128	58	-18	-92	36	20	158	235	272	310	276	194	1577
1982	77	-76	-57	-190	-11	-120	96	238	267	310	276	156	966
1983	71	-114	-54	-212	-163	-226	82	228	271	310	274	180	647
1984	117	-96	-123	26	20	84	159	238	270	310	275	204	1484
1985	81	-117	-13	11	20	17	167	237	266	310	276	195	1450
1986	110	-53	-42	-49	-267	-48	148	230	272	309	276	188	1074
1987	129	57	-1	-24	-44	22	171	238	272	310	276	204	1610
1988	110	1	-72	-57	50	113	137	212	254	310	276	204	1538
1989	124	2	-39	12	25	35	172	237	269	310	271	127	1545
1990	88	23	32	-28	2	94	166	154	272	310	276	203	1592
1991	119	54	-3	29	4	-40	167	212	219	309	271	204	1545
1992	69	47	-3	-3	-108	35	156	238	264	309	275	202	1481
<b>Averages</b>													
1921-92	103	1	-55	-69	-31	42	138	225	267	309	275	198	1401
1922-92	103	1	-54	-68	-32	41	137	225	267	309	274	198	1401
1928-34	109	21	-66	-45	-1	62	162	224	264	310	276	202	1518
1976-77	86	48	14	15	31	85	156	214	268	310	263	186	1674
1981-92	102	-18	-33	-48	-36	-1	148	225	264	310	275	188	1376
1987-92	107	31	-14	-12	-12	43	162	215	258	310	274	191	1552

# California Central Valley Unimpaired Flow Data 1921-1992

## Sacramento River Index = UF 6 + UF 8 + UF 9 + UF 11

estimated flow in taf

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1921	389	2222	2710	3861	2738	3551	2509	2646	1687	681	431	376	23801
1922	362	459	980	859	2067	1899	2901	4362	2559	746	432	356	17982
1923	397	581	1687	1427	948	1168	2531	1988	1132	620	376	354	13209
1924	372	374	443	495	1054	528	697	547	373	319	272	263	5737
1925	335	686	792	816	4423	1711	2812	2131	1058	510	375	345	15994
1926	354	460	591	705	2889	1376	2627	1180	591	393	307	293	11766
1927	330	1801	1809	2022	5379	2996	3750	2687	1670	643	393	355	23835
1928	343	1186	971	1238	1717	4782	2922	1754	707	477	344	322	16763
1929	321	495	585	554	1015	1034	1195	1415	825	401	268	295	8403
1930	279	301	2316	1311	1661	2373	1927	1493	806	426	309	314	13516
1931	313	416	356	736	667	1029	815	616	387	270	247	243	6095
1932	325	361	1376	1093	1146	1975	1912	2481	1362	483	325	279	13118
1933	277	304	381	620	490	1655	1443	1588	1232	402	281	266	8939
1934	304	329	915	1303	1363	1470	1070	672	417	293	255	240	8631
1935	288	748	665	1571	1270	1724	4765	3010	1406	511	338	294	16590
1936	347	349	460	2987	4026	2145	2579	2051	1263	514	327	302	17350
1937	298	296	356	430	1501	2623	2817	2769	1176	476	308	285	13335
1938	369	1663	3970	1567	4324	6072	4591	4842	2586	916	507	421	31828
1939	483	528	698	676	661	1514	1407	834	463	335	285	299	8183
1940	326	318	626	3264	4985	5258	3558	1993	900	476	363	367	22434
1941	411	585	3046	3933	4416	3934	3753	3549	1634	834	520	465	27080
1942	459	579	3167	3705	4666	1758	3571	3184	2278	898	524	448	25237
1943	459	867	1594	3951	2344	4149	2986	2001	1264	646	458	405	21124
1944	431	454	486	668	1228	1543	1394	1964	1008	568	363	326	10433
1945	383	971	1291	911	3222	1648	1892	2289	1207	531	383	335	15063
1946	524	1101	4048	2300	1107	1814	2360	2161	936	514	401	353	17619
1947	386	742	823	496	1339	2116	1602	996	831	398	338	316	10383
1948	612	519	454	1814	625	1368	3695	3132	2047	671	428	387	15752
1949	390	471	603	468	814	2986	2377	2027	789	394	339	311	11969
1950	329	381	390	1621	2196	2091	2699	2307	1203	511	366	348	14442
1951	952	3197	4455	2918	3088	2161	2046	2069	843	460	396	360	22945
1952	474	911	3041	2860	3609	2963	4960	4866	2648	1202	582	484	28600
1953	453	472	1768	5030	1337	1772	2451	2595	2275	939	520	474	20086
1954	463	803	738	2086	2577	3075	3498	1896	889	530	448	424	17427
1955	420	733	1230	986	791	1027	1536	2092	969	470	370	362	10986
1956	360	594	7297	6324	3232	2510	2591	3399	1782	832	510	459	29890
1957	590	540	538	701	2361	2986	1821	2663	1260	550	423	455	14888
1958	801	799	1492	2220	7123	3933	4723	4200	2365	953	592	510	29711
1959	495	505	549	2076	2172	1605	1582	1153	659	443	366	450	12055
1960	390	367	443	836	2856	2823	1796	1543	876	436	350	343	13059
1961	377	670	1268	804	2018	1737	1535	1555	874	424	369	345	11976
1962	380	555	1123	713	3410	1991	2648	1924	1165	497	373	337	15116
1963	2539	710	1831	1420	3750	1760	4878	3305	1278	630	461	431	22993
1964	530	1423	716	1405	880	941	1425	1534	968	447	339	309	10917
1965	359	778	7347	4740	1835	1533	3757	2363	1344	670	536	403	25665
1966	427	1115	805	1632	1361	2086	2389	1449	594	404	350	343	12955
1967	337	1170	2320	2967	2169	3178	2892	4093	2959	1072	507	396	24060
1968	464	498	758	1370	3357	2211	1597	1351	699	467	477	390	13639
1969	477	705	1546	6238	3814	2552	3875	4124	1956	727	500	467	26981
1970	531	549	3032	9600	2620	2539	1303	1507	998	548	435	400	24062
1971	452	1743	2936	2724	1558	3300	2767	3114	2161	856	495	467	22573
1972	530	601	967	1240	1516	2758	2026	1624	901	470	378	415	13426
1973	575	1110	1627	3672	3091	2727	2232	2599	1028	523	431	434	20049
1974	612	4137	3302	6369	1861	5404	4121	2832	1854	973	552	479	32496
1975	498	572	752	871	2525	4017	2363	3563	2242	789	536	507	19235
1976	740	722	672	594	763	1137	1045	861	472	368	453	388	8215
1977	377	392	363	442	432	482	488	643	458	339	319	391	5126
1978	348	445	1649	5336	2829	4289	3203	2632	1584	702	409	491	23917
1979	353	438	440	1021	1633	2178	1832	2550	796	463	352	353	12409
1980	595	763	1107	5377	4736	2890	2106	2041	1167	680	373	471	22306
1981	433	412	840	1425	1571	2129	1588	1144	523	379	331	322	11097
1982	553	3930	5045	2853	4449	3726	5912	3405	1668	748	506	523	33318
1983	883	1361	2926	3392	5383	8799	3874	4655	3630	1500	690	592	37685
1984	633	2975	5730	2311	1851	2486	1813	2015	1131	559	411	440	22355
1985	573	1647	1055	717	1004	1245	1878	1144	601	382	347	452	11045
1986	478	605	1015	2249	9566	5533	2066	1778	1031	500	371	526	25718
1987	508	415	487	733	1382	2295	1163	849	403	358	302	309	9204
1988	327	396	1597	1651	843	954	984	961	592	348	278	259	9190
1989	307	1002	649	763	833	5443	2644	1358	670	423	304	393	14789
1990	661	491	385	1169	753	1478	1161	1252	918	396	291	281	9236
1991	319	336	318	337	425	2175	1456	1421	757	363	264	266	8437
1992	328	367	412	517	2127	1688	1477	705	420	341	256	258	8896
Averages													
1921-92	474	868	1599	2085	2386	2539	2454	2187	1225	570	395	377	17158
1922-92	475	849	1584	2060	2381	2525	2453	2181	1219	568	394	377	17064
1928-34	309	485	986	979	1151	2045	1612	1431	819	393	290	280	10781
1976-77	559	557	518	518	598	810	767	752	465	354	386	390	6671
1981-92	500	1161	1705	1510	2516	3163	2168	1724	1029	525	363	385	16748
1987-92	408	501	641	862	1061	2339	1481	1091	627	372	283	294	9959