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Attorneys for **SAN JOAQUIN TRIBUTARIES AUTHORITY**

BEFORE THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

IN THE MATTER OF

CALIFORNIA DEPARTMENT OF WATER RESOURCES AND UNITED STATES BUREAU OF RECLATION PETITION FOR WATER RIGHT CHANGE RE: CALIFORNIA WATERFIX.	**TESTIMONY OF DANIEL B. STEINER (San Joaquin Tributaries Authority [SJTA] SJTA REBUTTAL, EXHIBIT 401)**

I, Daniel B. Steiner, declare as follows:

STATEMENT OF QUALIFICATIONS

1. I am a registered civil engineer in the State of California (C32666). I hold a Bachelor's of Science Degree in Engineering from the University of California, Davis. My qualifications have previously been submitted as SJTA Exhibit 102.

2. The basis for this rebuttal testimony, and the case-in-chief evidence to which it is responsive, is set forth in SJTA Exhibit 404 (Declaration of Tim O'Laughlin).

SUMMARY OF TESTIMONY

3. The San Joaquin Tributaries Authority ("SJTA") asked me to review the State Water Resources Control Board's (SWRCB) report entitled "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem", dated August 3, 2010, ("DFCR", California WaterFix Exhibit No. SWRCB-25), as well as the draft of the DFCR dated July 20, 2010 ("Draft DFCR"). Specifically, I was asked to review Section 5.3 concerning the San Joaquin River, and to conduct

analyses and illustrate implications to San Joaquin watershed hydrology and operations assuming implementation of the flow criteria set forth in the DFCR.

4. The DFCR report states the following: "[a]vailable scientific information indicates that average March through June flows of 5,000 cfs on the San Joaquin River at Vernalis represent a flow threshold at which survival of juveniles and subsequent adult abundance is substantially improved for fall-run Chinook salmon and that average flows of 10,000 cfs during this period may provide conditions necessary to achieve doubling of San Joaquin basin fall-run." (DFCR, p. 119.) The DFCR further states that "60% of unimpaired flow from February through June is needed in order to achieve a threshold flow of 5,000 cfs or more in most years (over 85% of years) and flows of 10,000 cfs slightly less than half of the time (45% of years)." (DFCR, p. 120.)

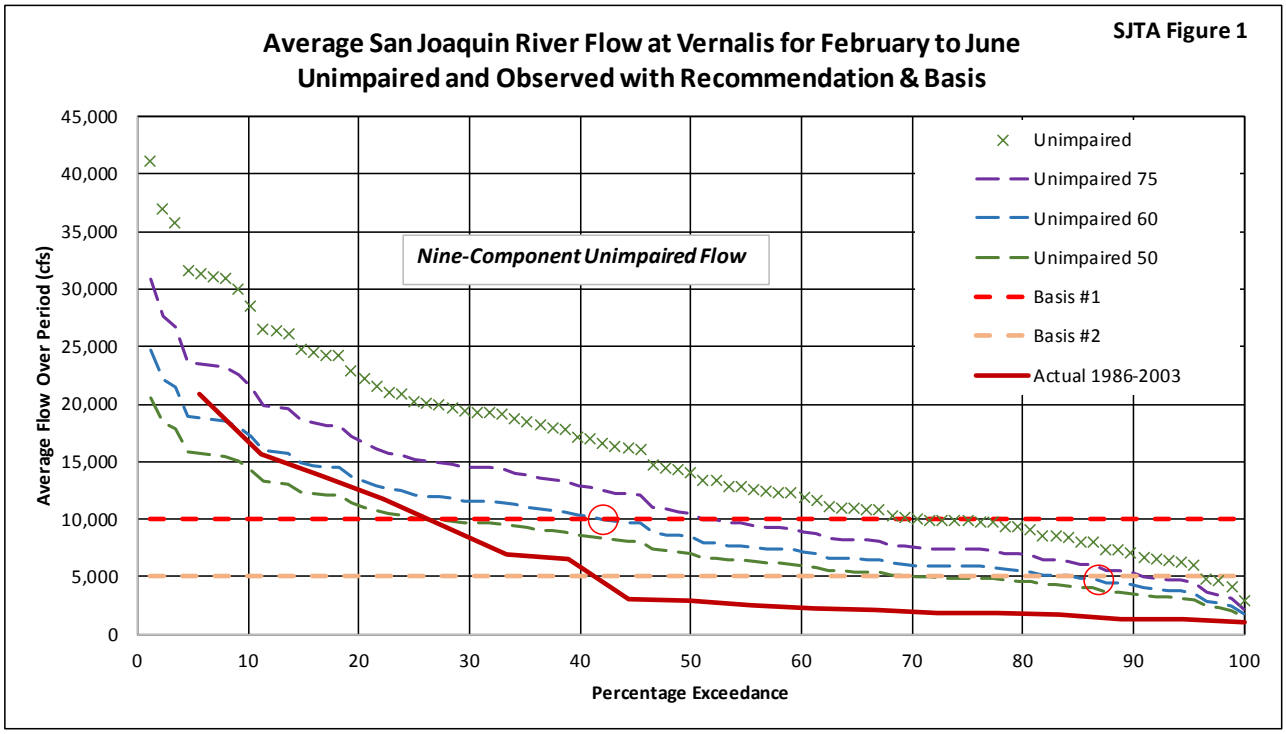
5. My analysis shows (1) that flows of 5,000 cfs and 10,000 cfs at Vernalis are not achievable in 85% of years or 45% of years, respectively, under reasonably anticipatable operations, using as an example the proposed Phase I revisions to the Water Quality Control Plan for the San Francisco Bay-Sacramento San Joaquin Delta Estuary (San Joaquin River Flows and Southern Delta Water Quality) ("Phase I Revisions to Bay-Delta Plan"), and (2) that reservoir levels are drawn down significantly with the implementation of a 60% unimpaired flow requirement. The DFCR admittedly did not evaluate or report on the impact on reservoirs of imposing a 60% unimpaired flow requirement.

PART 1 ANALYSIS

6. Using publicly available data, I replicated what I believe SWRCB Staff prepared for DFCR Figure 20 (DFCR, p. 122) purporting to illustrate hydrology at Vernalis. My replicate graph (SJTA Figure 1) is shown below.

7. The DFCR uses a 9-component unimpaired flow summation for the San Joaquin Valley as its basis of San Joaquin River flow at Vernalis. (DFRC, p. 97.) These components include not only the unimpaired flow of the Stanislaus, Tuolumne and Merced Rivers near their major reservoirs, but also include the San Joaquin River at Millerton Reservoir, overflows from the Tulare Lake Basin, the Fresno and Chowchilla Rivers, and a couple other San Joaquin Valley components. (DFCR, p. 97.)

SJTA Figure 1



8. "Unimpaired" flow in this analysis and used by the DFCR was acquired from the Department of Water Resources ("DWR") and described by DWR to indicate theoretically available flow at a location assuming existing river channel conditions absent storage regulation and stream diversions. "Actual" flow indicates the flow that was measured at a location.

9. More recently, DWR issued a report entitled, "Estimates of Natural and Unimpaired Flows for the Central Valley of California: Water Years 1922-2014" (attached hereto as Exhibit 1), in which DWR explained that the term "unimpaired" flow "is used to describe a theoretically available water supply assuming existing river channel conditions in the absence of (1) storage regulation for water supply and hydropower purposes, and (2) stream diversions for agricultural and municipal uses." (Exhibit 1, p. ES-1.) By contrast, the term "natural" flow is used by DWR "to describe the flows that would have occurred absent all anthropogenic influences and is considered to represent the period circa 1850 prior to significant landscape changes following the California Gold Rush." (Exhibit 1, p. ES-2.)

10. My graphic closely resembles Figure 20 in the DFCR. Differences may occur in the record used for the analyses. While I used DWR records through 2008, the DFCR may have relied on DWR's unimpaired analysis through 2003.

11. The use of the Nine-Component Index for San Joaquin Valley unimpaired flow is misleading in terms of the availability of water to achieve (1) the DFCR flow targets for the San Joaquin River and (2) any Delta flow criteria that may be informed by the DFCR and ultimately imposed upon the permits held by DWR and the United States Bureau of Reclamation ("USBR") as part of the California WaterFix project. A more appropriate comparison would have been made to the "Actual" flow which is illustrating the reported flow that has historically been measured at Vernalis and which shows significant deficit to the DFCR requirement. Similarly, and as shown below, the Nine-Component Index drastically overstates flow that could be provided under the Phase I Revisions to the Bay-Delta Plan currently under consideration by the SWRCB.

12. Since the Phase 1 Revisions to the Bay-Delta Plan currently look only at the Stanislaus, Tuolumne and Merced Rivers to meet future San Joaquin River requirements, it was of interest to the SJTA to illustrate the "60% requirement" superimposed onto the DFCR "basis" flows as if only the summation of the three-tributary unimpaired flows would be the water source metric. SJTA Figure 2 illustrates the results. This graphic illustrates the overall downward shifting of available flow to establish and support an objective at Vernalis. If still targeting 10,000 cfs and 5,000 cfs as "basis" flows, having only the three-tributary flow components as the implied source of water to establish the 60% flow requirement at Vernalis will produce the DFCR's basis flows less often. A 60% flow requirement based on a three-tributary unimpaired flow summation would result in the 10,000 cfs basis flow being achieved about 10% of the time and the 5,000 cfs basis flow would likely only be achieved during about 40% of the time, nearing the frequency of wetter years when such a requirement would be met incidentally without any unimpaired flow requirement.

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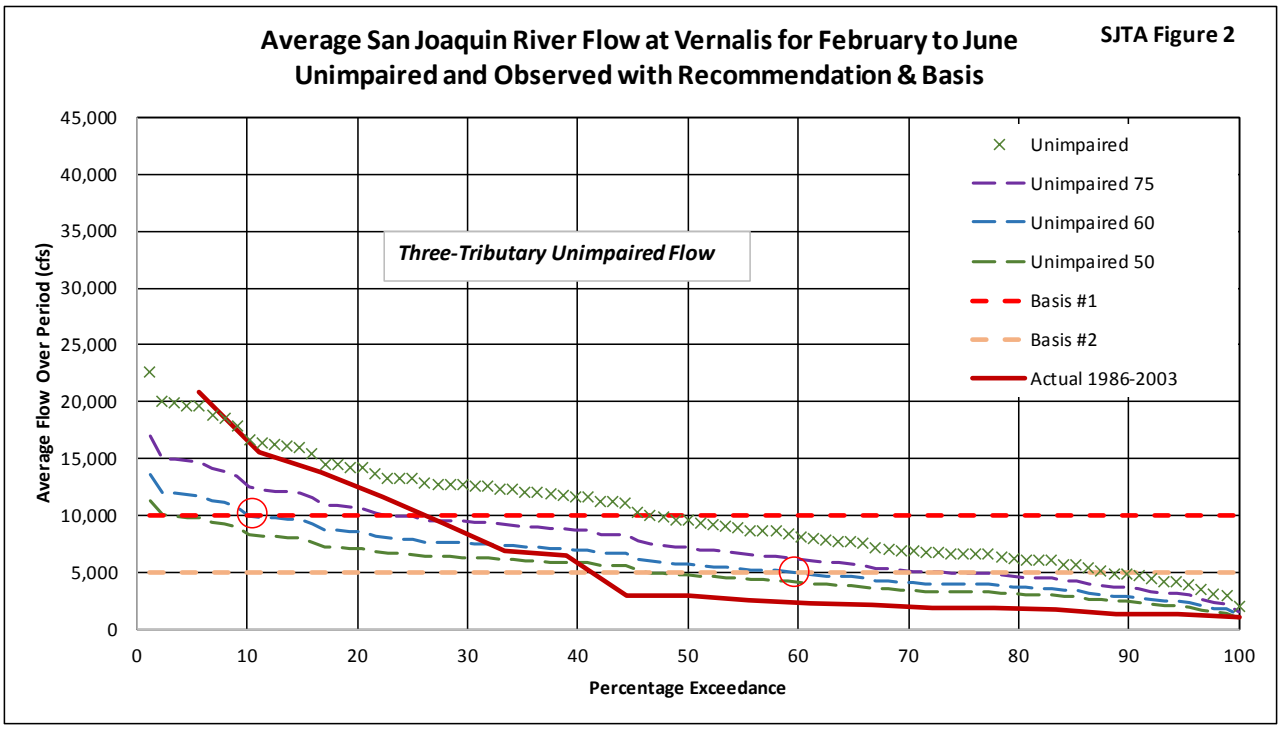
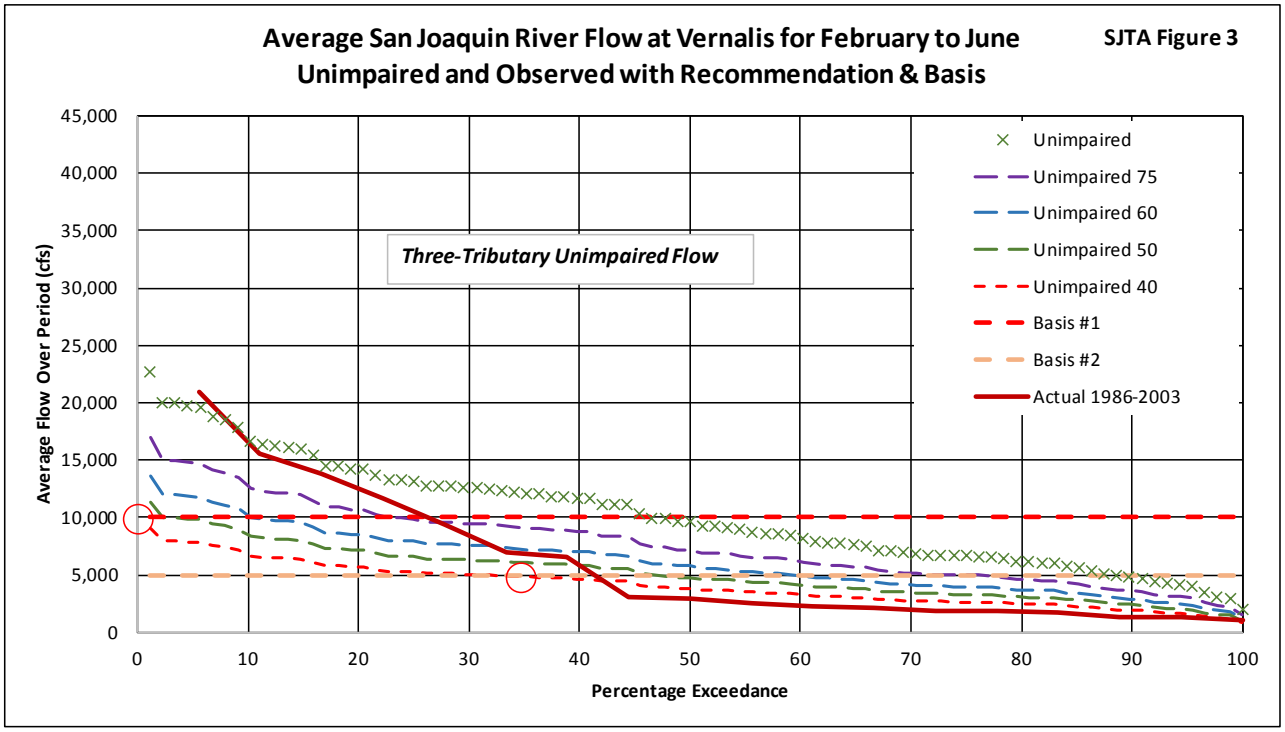


13. An additional graphic was developed to illustrate the hydrology associated with a linkage of a flow objective at Vernalis based on a 40% requirement at the Stanislaus, Tuolumne and Merced Rivers. This circumstance is reflective of the current Phase 1 Revisions to the Bay-Delta Plan. SJTA Figure 3 shows the results of the analysis.



14. SJTA Figure 3 shows that a 10,000 cfs basis flow objective would not occur, and the 5,000 cfs basis flow would occur about 35% of the time, likely during wetter years when that flow objective would be incidentally met without a flow objective.

15. The significant effects that the DFCR suggested 60% flow requirement could have upon the Stanislaus, Tuolumne and Merced Rivers was additionally analyzed through comparison between the DFCR flow requirement and historical Actual flow that occurred at Vernalis (deficit analysis).

16. The deficit analysis compares the DFCR 60% flow requirement at Vernalis, herein defined by 60% of the 150-day average daily flow during February through June using the unimpaired Nine-Component Index San Joaquin River flow at Vernalis, and the 150-day average Actual daily flow recorded at Vernalis. SJTA Table 1 shows the results of the comparison.

SJTA Table 1

WY	UF @ Vernalis TAF Feb-Jun	150 Days Ave CFS Feb-Jun	60% UF Ave CFS Feb-Jun	Vernalis Flow Ave CFS Feb-Jun	Deficit Ave CFS Feb-Jun	Deficit (TAF) 150-d Vol Feb-Jun	SWRCB 602020 Index Yr
1986	9,245	31,073	18,644	13,782	-4,862	-1,447	W
1987	1,859	6,248	3,749	2,526	-1,223	-364	C
1988	1,942	6,527	3,916	1,871	-2,045	-609	C
1989	3,205	10,772	6,463	1,751	-4,712	-1,402	C
1990	1,991	6,692	4,015	1,368	-2,647	-788	C
1991	2,933	9,858	5,915	1,073	-4,842	-1,441	C
1992	2,196	7,381	4,429	1,272	-3,157	-939	C
1993	6,591	22,153	13,292	3,023	-10,268	-3,055	W
1994	2,191	7,364	4,418	1,829	-2,590	-771	C
1995	9,394	31,574	18,944	15,618	-3,326	-990	W
1996	6,412	21,551	12,931	9,321	-3,610	-1,074	W
1997	5,058	17,000	10,200	11,702	Met	Met	W
1998	8,933	30,024	18,015	20,897	Met	Met	W
1999	4,833	16,244	9,746	6,943	-2,804	-834	AN
2000	5,406	18,170	10,902	6,513	-4,389	-1,306	AN
2001	2,915	9,797	5,878	2,926	-2,952	-878	D
2002	3,301	11,095	6,657	2,162	-4,495	-1,337	D
2003	3,966	13,330	7,998	2,287	-5,711	-1,699	BN
2004	3,237	10,880	6,528	2,498	-4,030	-1,199	D
2005	7,193	24,176	14,506	8,823	-5,683	-1,691	W
2006	9,193	30,898	18,539	17,734	-805	-239	W
2007	2,121	7,129	4,277	2,416	-1,861	-554	C
2008	3,057	10,275	6,165	2,159	-4,005	-1,192	C
2009	4,202	14,123	8,474	1,513	-6,961	-2,071	B
2010	5,040	16,940	10,164	3,686	-6,478	-1,927	AN
2011	7,838	26,344	15,806	14,461	-1,346	-400	W
2012	2,288	7,690	4,614	2,077	-2,537	-755	D
2013	2,154	7,240	4,344	1,787	-2,556	-761	C
2014	1,523	5,119	3,071	1,066	-2,005	-597	C

17. The unimpaired flow values are available from "Estimates of Natural and Unimpaired Flows for the Central Valley of California: Water Years 1922-2014", DWR, March 2016 (draft), and the Actual "Vernalis Flow" is from USGS records.

18. The deficits, which range widely from a 150-day volume of 364,000 acre-feet to over 3,000,000 acre-feet, would implicate required additional reservoir releases on the Stanislaus, Tuolumne and Merced Rivers if compliance would be solely implemented to those entities. Within this analysis period there were only two years during which supplemental releases would not theoretically be required (1997 and 1998).

19. A similar analysis was prepared that defined the flow requirement as 60% of the 150-day average daily flow during February through June using the unimpaired three-tributary components of San Joaquin River flow, and the 150-day average Actual daily flow recorded at Vernalis. SJTA Table 2 shows the results of the comparison.

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SJTA Table 2

WY	UF @ Vernalis TAF Feb-Jun	150 Days Ave CFS Feb-Jun	60% UF Ave CFS Feb-Jun	Vernalis Flow Ave CFS Feb-Jun	Deficit Ave CFS Feb-Jun	Deficit (TAF) 150-d Vol Feb-Jun	SWRCB 602020 Index Yr
1986	5,513	18,529	11,117	13,782	Met	Met	W
1987	1,170	3,933	2,360	2,526	Met	Met	C
1988	1,262	4,243	2,546	1,871	-675	-201	C
1989	2,367	7,956	4,774	1,751	-3,023	-899	C
1990	1,389	4,669	2,802	1,368	-1,433	-426	C
1991	1,964	6,602	3,961	1,073	-2,888	-859	C
1992	1,443	4,849	2,909	1,272	-1,637	-487	C
1993	4,286	14,406	8,644	3,023	-5,620	-1,672	W
1994	1,471	4,945	2,967	1,829	-1,138	-339	C
1995	5,827	19,584	11,750	15,618	Met	Met	W
1996	4,248	14,277	8,566	9,321	Met	Met	W
1997	3,075	10,335	6,201	11,702	Met	Met	W
1998	5,323	17,890	10,734	20,897	Met	Met	W
1999	3,510	11,799	7,079	6,943	-136	-41	AN
2000	3,574	12,014	7,208	6,513	-695	-207	AN
2001	1,896	6,373	3,824	2,926	-897	-267	D
2002	2,313	7,773	4,664	2,162	-2,502	-744	D
2003	2,760	9,276	5,566	2,287	-3,279	-976	BN
2004	2,235	7,510	4,506	2,498	-2,008	-598	D
2005	4,830	16,234	9,740	8,823	-918	-273	W
2006	5,589	18,786	11,271	17,734	Met	Met	W
2007	1,531	5,145	3,087	2,416	-671	-200	C
2008	2,024	6,803	4,082	2,159	-1,922	-572	C
2009	2,948	9,907	5,944	1,513	-4,431	-1,318	BN
2010	3,290	11,057	6,634	3,686	-2,948	-877	AN
2011	5,121	17,212	10,327	14,461	Met	Met	W
2012	1,586	5,329	3,197	2,077	-1,120	-333	D
2013	1,503	5,050	3,030	1,787	-1,243	-370	C
2014	1,095	3,680	2,208	1,066	-1,142	-340	C
2015	862	2,897	1,738	585	-1,153	-343	C
2016	3,046	10,239	6,143	1,494	-4,649	-1,383	D
2017	7,364	24,750	14,850	23,243	Met	Met	W

20. This version of the DFCR flow requirement established for Vernalis based on 60% of an alternative unimpaired three-tributary flow still implicates large supplemental releases from the Stanislaus, Tuolumne and Merced Rivers to achieve the Vernalis flow objective. The 150-day volume deficits range from 41,000 acre-feet to over 1,600,000 acre-feet over every year type. There are several additional years during which supplemental releases may not be required.

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PART 2 ANALYSIS

21. The DFCR did not evaluate, or at least report, the potential effects on reservoir levels with the implementation of the DFCR's 60% unimpaired flow criteria on the San Joaquin River at Vernalis, particularly if it is imposed only on the three tributaries targeted by the Phase 1 Revisions to the Bay-Delta Plan. Such a requirement would significantly impact reservoir water levels and, by extension, cold water reserves that are dependent on reservoir levels. I was asked by the SJTA to illustrate the effects of a 60% unimpaired flow requirement from February through June through a surrogate analysis for the Stanislaus River.

22. The surrogate analysis of implementing a 60% flow requirement assumes the seasonal flow requirement is determined as 60% of the monthly average unimpaired flow (each month) of the Stanislaus River (calculated at Goodwin Dam) during the five-month period February through June. This flow requirement component occurs February through June, and during the other months of the year the current Stanislaus River flow requirements associated with the USBR's obligations to the Biological Opinion (Appendix 2E), Dissolved Oxygen objectives and D-1641 salinity objectives at Vernalis continue.

23. Other operational objectives for the Stanislaus River include providing diversions to Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID) under their 1988 operations agreement and providing USBR's Stanislaus River CVP Water Contractors' annual allocations of water supply.

24. Current conditions of Stanislaus River operations are depicted by an operations study noted as "benchmark" and represent operational protocols identical to the surrogate study except for the February though June flow requirement. In the benchmark study, the flow requirement is defined by the Biological Opinion flows of Appendix 2E.

25. The benchmark study result for annual streamflow below Goodwin Dam is shown in SJTA Figure 4. The annual (March through September) minimum flow volume would range generally between a low of just over 200,000 acre-feet and up to about 600,000 acre-feet. Occasionally during wet years, the annual flow volume would exceed 600,000 acre-feet due to flood control releases.

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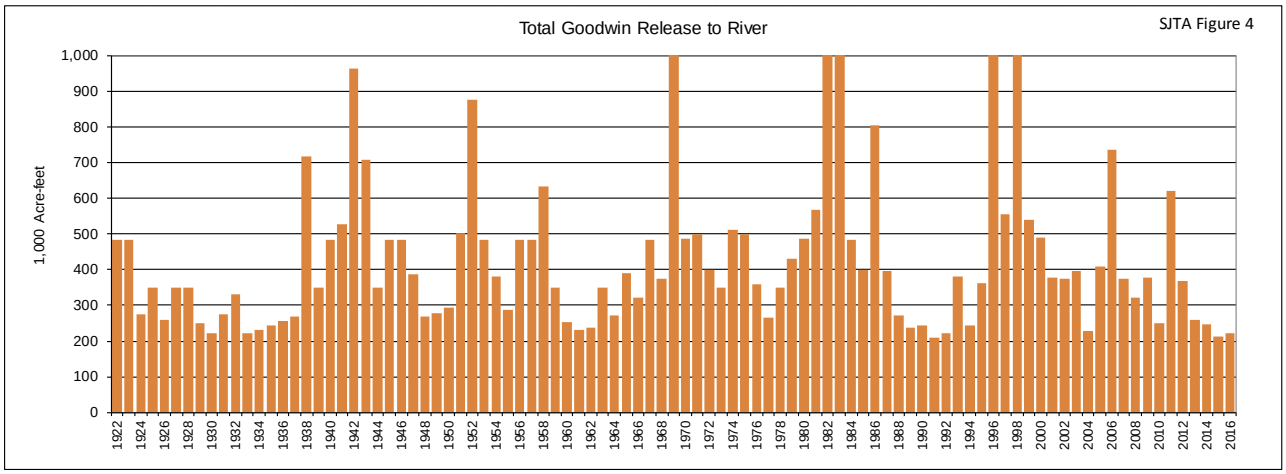
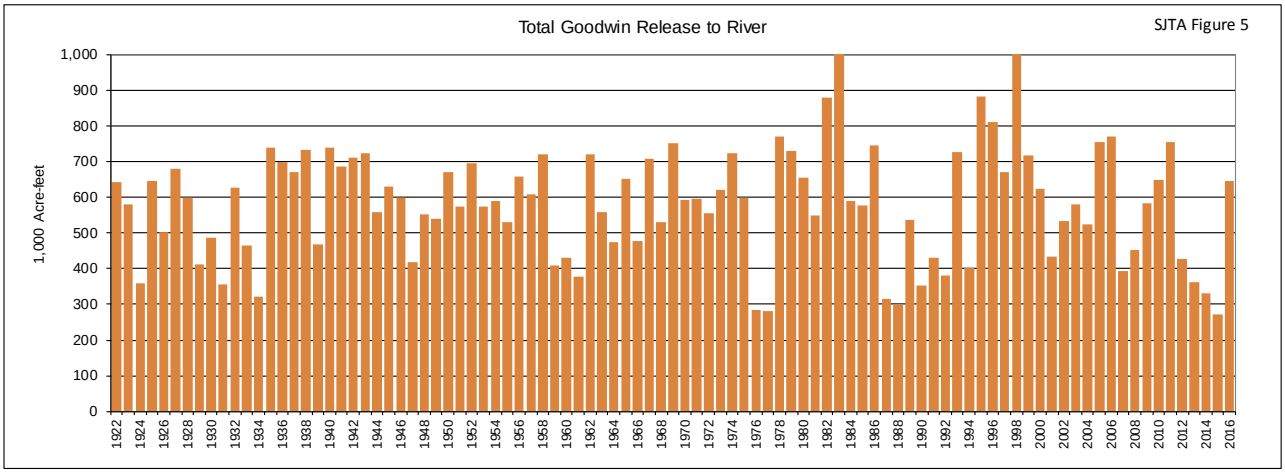


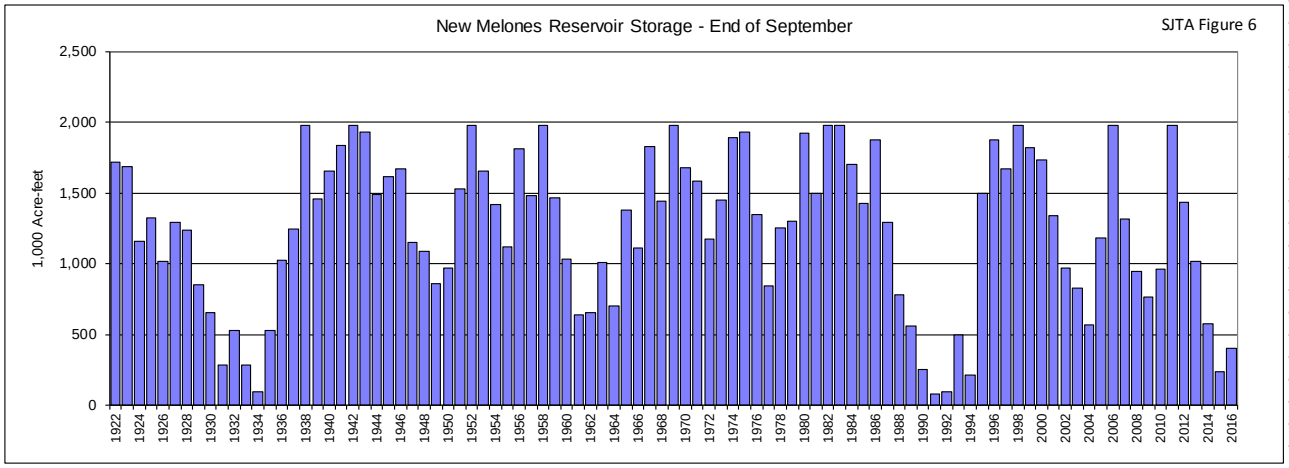
March-February Total; some year volumes may exceed graph maximum of 1,000,000 acre-feet.

26. For the surrogate study, requiring 60% Stanislaus River unimpaired flow to be released downstream during February through June, the annual flow volumes down the river are shown in SJTA Figure 5. The annual flow volume increases substantially in this study, generally always providing annual flow volumes of 300,000 acre-feet or more each year. Except for the year 1983, the annual flow volumes shown in SJTA Figure 5 also represent the "minimum" flow volumes required due to downstream objectives and requirements. The year 1983 is the only year during which flows in excess of minimum requirements were released, for flood control.



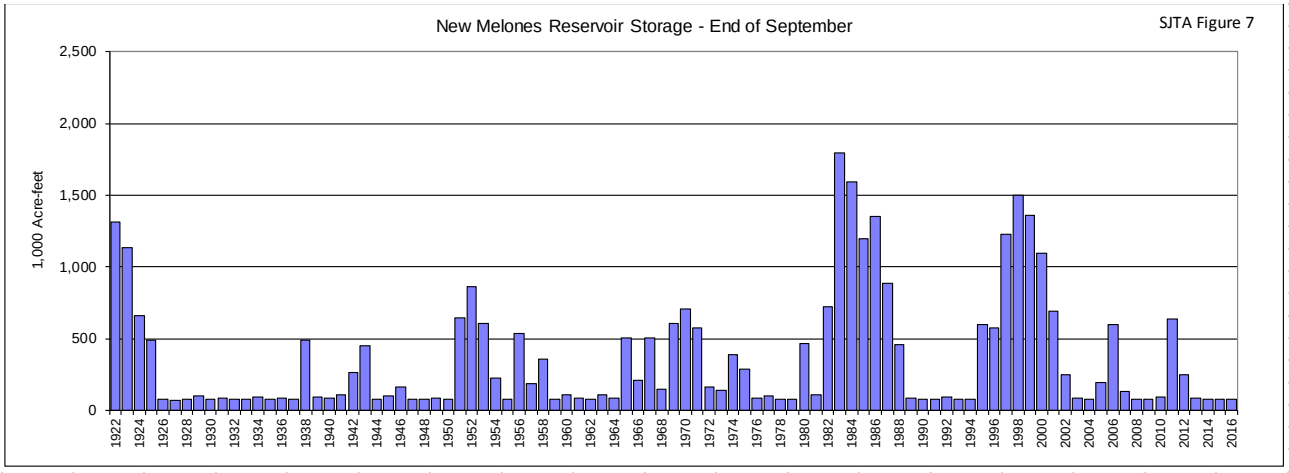
March-February Total; some year volumes exceed graph maximim of 1,000,000 acre-feet.

27. Another parameter to review concerning effects of the assumed 60% flow requirement is New Melones Reservoir storage. The storage that remains in the reservoir at the end of September is a typical parameter to review among alternative studies and provides an indication of the amount of reservoir storage "carried over" into the following water year. SJTA Figure 6 illustrates New Melones Reservoir storage at the end of each water year for the benchmark study.



28. As seen in SJTA Figure 6, New Melones Reservoir storage fluctuates widely from a typical maximum carry over target of about 2,000,000 acre-feet (maximum desired level for ensuing flood control season) down to a low of about 80,000 acre-feet during drought cycles. Note that any year that results in an ending storage of near 80,000 acre-feet is a manifestation of the model applying cuts to the 1988 Agreement entitlement deliveries of OID and SSJID, at times drastically, to maintain the assumed minimum storage at New Melones Reservoir and required river releases.

29. SJTA Figure 7 depicts New Melones Reservoir storage at the end of each water year for the surrogate 60% requirement study.



30. SJTA Figure 7 illustrates the significant draw from New Melones Reservoir to provide the larger flow requirement, many years requiring full use of reservoir storage down to the minimum assumed storage of 80,000 acre-feet. The maintaining of this minimum storage and the minimum flow requirements requires significant additional cuts to the OID and SSJID and CVP Water

Contractors' benchmark deliveries. The maintenance of a larger minimum reservoir storage as suggested by the SWRCB in the Phase 1 Revisions to the Bay-Delta Plan would further exacerbate water supply deliveries.

31. A summary of the results of the two Stanislaus River Operation Studies is shown in SJTA Table 3.

SJTA Table 3

	New Melones		Goodwin									OID / SSJID		
1922-2015/16	New Melones Inflow	New Melones Storage	OID/SSJID Canals (Districts)	SEWD CVP Water	CSJWCD CVP Water	CVP Contracts	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Total Goodwin Release to River	Release above Minimum	OID/SSJID Formula Water	OID/SSJID Land Use & Commit Div Reqd	OID/SSJID Shortage other than Formula
Average	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	WY	WY	WY
Benchmark	1,067	1,247	505	27	59	86	352	7	5	462	82	581	523	5
60% Surrogate	1,067	362	395	15	22	37	626	15	2	650	7	581	523	116

32. In terms of hydrologic water supply effects compared to the benchmark study, on average across the entire 95-water year study period, OID/SSJID needed to cut diversions an additional average of 111,000 acre-feet more in the 60% surrogate operation to maintain reservoir minimum storage and minimum flow requirements. The cuts to OID/SSJID range upward to almost 500,000 acre-feet a year, resulting in very little to no diversion. This was in addition to the CVP Water Contractors incurring a reduction in allocations by an average of 49,000 acre-feet per year.

33. Even with the water supply effects described for the 60% surrogate scenario, storage at New Melones Reservoir could be at minimum storage during about 46% of the years.

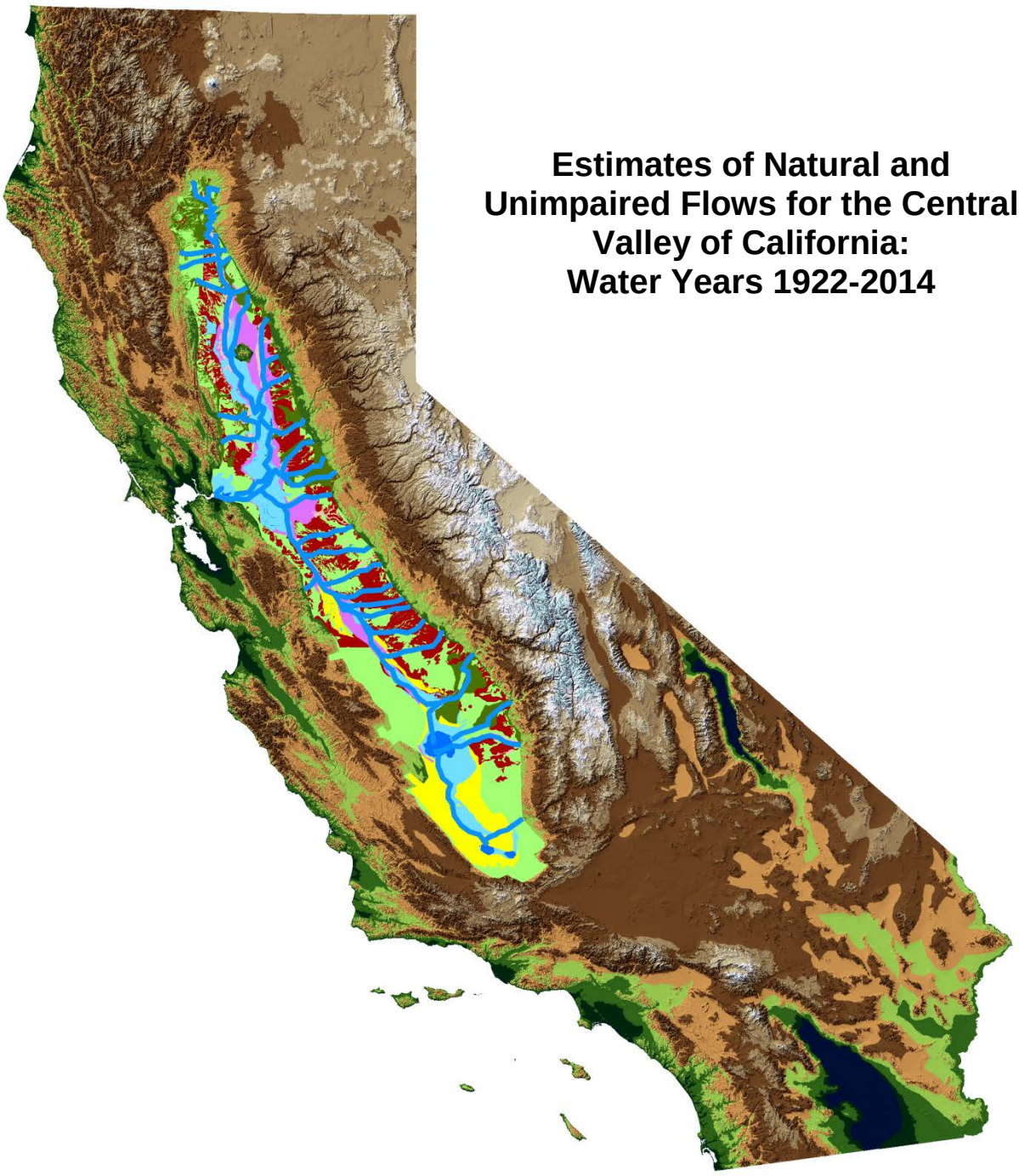
34. For this analysis the assumption used to formulate the 60% surrogate requirement for the Stanislaus used 60% of the unimpaired flow of the Stanislaus River as the flow requirement. The DFCR Nine-Component Index 60% requirement apportioned to the Stanislaus River could likely result in a flow requirement larger than that assumed in my analysis. Therefore, my analysis may understate the effects to the Stanislaus River due to the DFCR flow requirements.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration was executed on July 10, 2018, in Sacramento, California.

DANIEL B. STEINER

EXHIBIT 1

SJTA-Exhibit 401
D.Steiner Part 2 Rebuttal Testimony
CWF Hearing



Estimates of Natural and Unimpaired Flows for the Central Valley of California: Water Years 1922-2014

March 2016 (DRAFT)

Department of Water Resources, Bay-Delta Office

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State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Estimates of Natural and Unimpaired Flows for the Central Valley of California: WY 1922-2014

March 2016 – First Edition (DRAFT)

Edmund G. Brown Jr.
Governor
State of California

John Laird
Secretary for Natural Resources
California Natural Resources Agency

Mark W. Cowin
Director
Department of Water Resources

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State of California
Edmund G. Brown Jr., Governor

Natural Resources Agency
John Laird, Secretary for Resources

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Guobiao Huang.....Engineer, Water Resources

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FOREWORD

This report summarizes estimates of “natural” and “unimpaired” flows for all areas in the Central Valley tributary to the Sacramento – San Joaquin Delta (Delta) for the period spanning water years 1922-2014. A major objective of this report is to clarify the conceptual differences between natural and unimpaired flows. In spite of the Department’s previous attempts to distinguish between natural conditions and its calculation of theoretical unimpaired flows, unimpaired flow estimates have frequently been used as a surrogate measure of natural conditions, presumably because natural flow estimates were unavailable.

This report, which contains the Department’s first published estimates of natural flows in the Central Valley tributary to the Delta, builds upon a series of publications that chronicled the Department’s efforts to update estimates of unimpaired flow as new hydrologic data became available. The first edition, published in 1980, was titled *California Central Valley Natural Flow Data*. Subsequent editions in 1987, 1994, and 2007 were re-titled *California Central Valley Unimpaired Flow Data* in recognition of the conceptual differences between natural and unimpaired flows.

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EXECUTIVE SUMMARY

Purpose of Report

This report summarizes estimates of "natural" and "unimpaired" flows for all areas in the Central Valley tributary to the Sacramento – San Joaquin Delta (Delta) for the period spanning water years 1922-2014. A major objective of this report is to clarify the conceptual differences between natural and unimpaired flows. In spite of the Department's previous attempts to distinguish between natural conditions and its calculation of theoretical unimpaired flows, unimpaired flow estimates have frequently been used as a surrogate measure of natural conditions, presumably because natural flow estimates were unavailable. This report contains the Department's first published estimates of natural flows; these estimates are derived from complex simulation models and are based on published estimates of natural vegetation cover and associated evapotranspiration.

Summary of Findings

This report documents and compares a variety of natural and unimpaired flow estimates, including rim watershed inflows, valley floor water supply, and Delta inflows and outflows. Comparisons of Delta inflow and outflow estimates demonstrate that unimpaired estimates are consistently (and significantly) higher than natural estimates.

Annual average Delta outflow estimates are compared by 40-30-30 water year type, as well as over the long-term average, in Figure ES-1. For the long-term average, the annual unimpaired Delta outflow estimate (28.1 MAF) is 43 percent higher than the natural Delta outflow estimate of 19.7 MAF. Unimpaired outflow estimates are higher than natural flow estimates, primarily because the former estimates do not account for overbank flows and the resulting evapotranspiration associated with natural wetlands. The relative seasonal (i.e. monthly) distributions of unimpaired and natural Delta outflow estimates are not widely different. However, the relative distribution of unimpaired Delta outflow tends to be smaller in the winter (and larger in the other seasons) compared to natural Delta outflow. In sum, the findings of this report show that unimpaired flow estimates are poor surrogates for natural flow conditions.

Sensitivity analyses were conducted on several key model inputs and parameters. These analyses, supported by 30 model runs, suggested an uncertainty range of approximately ± 10 percent. Potential evapotranspiration from riparian and wetland vegetation was found to be the most sensitive model parameter.

Conceptual Differences between Natural and Unimpaired Flows

In this report, the term "unimpaired" flow is used to describe a theoretically available water supply assuming existing river channel conditions in the absence of (1) storage regulation for water supply and hydropower purposes and (2) stream diversions for agricultural and municipal uses. Unimpaired flow estimates are theoretical in that such conditions have not occurred historically. In pristine watersheds which have undergone little land use change, unimpaired flow estimates provide a fixed frame of reference to develop relationships between

precipitation, runoff, and water supply based on long-term hydrologic records. For many years these relationships were based on the assumption of stationarity, i.e. that the past is a good indicator of the future. However, global warming now requires hydrologists and water resources managers to analyze non-stationary processes, requiring more sophisticated tools and techniques to quantify future water supplies. This report updates and extends the Department's previous published estimates of unimpaired flows for 24 Central Valley subbasins and the Delta. Monthly unimpaired flows are presented for water years 1922-2014.

The term "natural" flow is used in this report to describe the flows that would have occurred absent all anthropogenic influences and is considered to represent the period circa 1850 prior to significant landscape changes following the California Gold Rush. These influences have dramatically affected Central Valley flows, including inflows to the Delta. For example, changes in land use, including (but not limited to) the clearance and drainage of wetlands, have affected the amount and timing of surface runoff. Groundwater pumping has impacted groundwater elevations and groundwater inflows to streams and rivers. Flood control measures, including an extensive network of levees, have ended the natural cycle of bank overflows and detention storage.

The estimates of natural flow provided in this report are not to be confused with estimates of actual flows that occurred under Paleolithic or more recent conditions prior to European settlement. Rather, these estimates assume the contemporary precipitation and inflow pattern to the valley floor (i.e. water years 1922-2014) with the valley floor in a natural or undeveloped state: before flood control facilities, levees, land reclamation, irrigation projects, imports, etc.

Summary of Methods

Methods used to estimate natural and unimpaired flows are detailed in the main body of the report. While methods used to estimate unimpaired flows generally follow the approach established in previous Department publications, those used to estimate natural flows are new. This new methodology relies on two complex models to simulate hydrology of the Central Valley rim watersheds and floor:

- SWAT (Soil Water Assessment Tool), a precipitation-runoff model, was used to simulate stream flows for most rim watersheds. SWAT, which is a public domain model developed by the U.S. Department of Agriculture, provides a tool for evaluating future potential impacts of climate change.
- C2VSim, an integrated hydrologic model, was used to simulate groundwater and surface water hydrology on the Central Valley floor. C2VSim is a Central Valley application of the Department's IWFM model.

The new approach to estimate natural flow, which is based on published estimates of the region's natural vegetation cover and associated evapotranspiration, was designed to overcome information gaps that were identified in previous unimpaired flow publications:

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 are 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.

SWAT-based estimates of natural rim watershed flows are somewhat different from the values used to estimate unimpaired rim watershed flows. These differences, as discussed in the main body of the report, were found to be small and therefore do not bias conclusions regarding differences between natural and unimpaired flows.

Previous Unimpaired Flow Reports

This report, which contains the Department's first published estimates of natural flows in the Central Valley tributary to the Delta, builds upon a series of publications that chronicled the Department's efforts to update estimates of unimpaired flow as new hydrologic data became available. The first edition, published in 1980, was titled *California Central Valley Natural Flow Data*. Subsequent editions in 1987, 1994, and 2007 were re-titled *California Central Valley Unimpaired Flow Data* in recognition of the conceptual differences between natural and unimpaired flows.

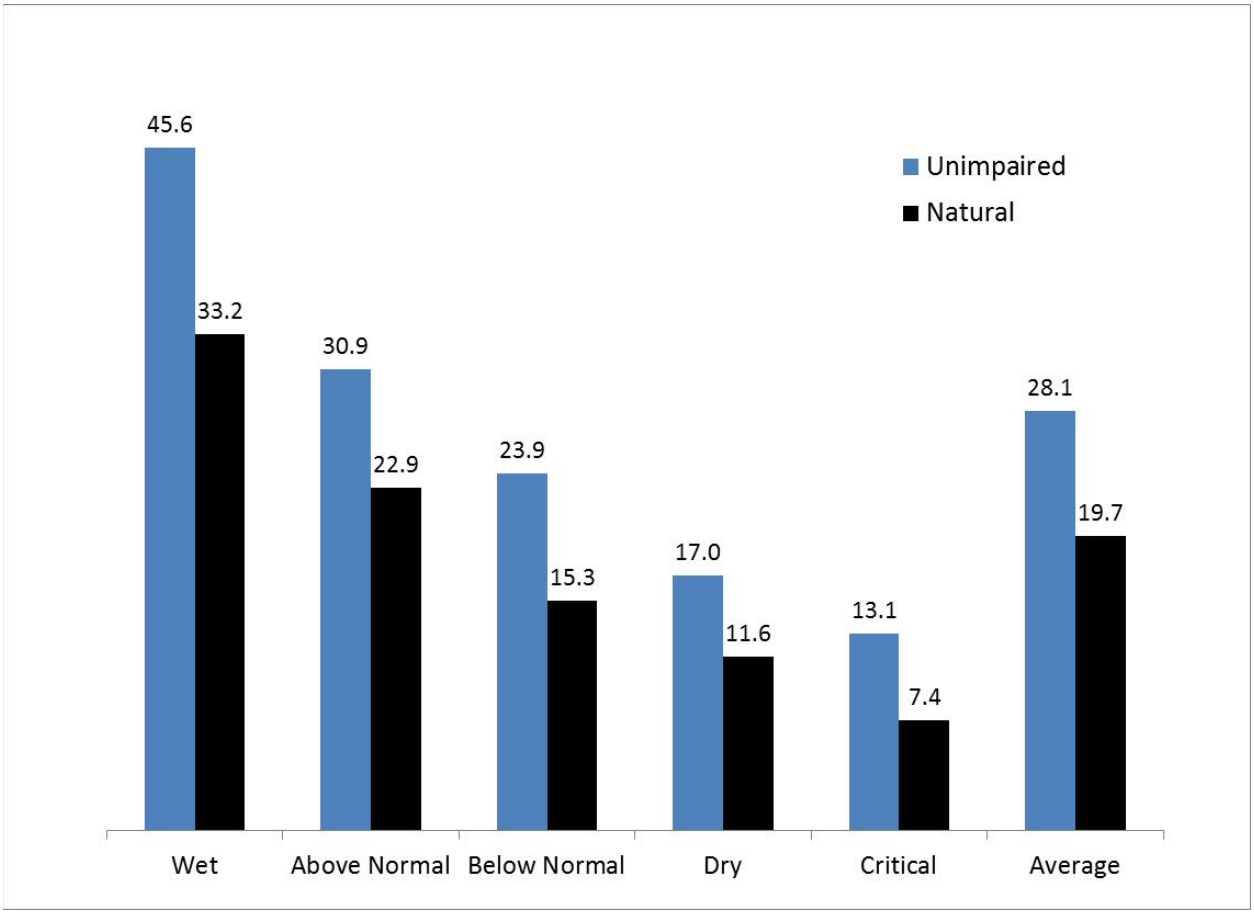

Figure ES-1. Average Annual Unimpaired and Natural Net Delta Outflow (MAF)

This chart compares annual average "unimpaired" and "natural" Delta outflow estimates (in units of million acre-feet) for the 93-year hydrologic period spanning water years 1922 through 2014. Comparisons are shown by 40-30-30 water year type as well as the full period average. This chart clearly shows that unimpaired flow estimates are significantly higher than natural flow estimates under all hydrologic conditions. Under average conditions, the annual unimpaired flow estimate is 43 percent higher than the natural flow estimate.

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ABBREVIATIONS AND ACRONYMS

AF	acre-foot
C2VSim	California Central Valley Groundwater-Surface Water Simulation Model
CSU Chico	California State University at Chico
DWR	California Department of Water Resources
ET	evapotranspiration
ET_c	Potential crop evapotranspiration
ET_o	Reference crop evapotranspiration
IWFM	Integrated Water Flow Model
MAF	million acre-feet
NF	natural flow
OWID	Oroville-Wyandotte Irrigation District
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
SWAT	Soil Water Assessment Tool
TAF	thousand acre-feet
UF	unimpaired flow
USGS	U.S. Geological Survey
WY	Water Year

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1. INTRODUCTION

Estimating regional water supplies that would have occurred absent human activities is a common practice in water resources planning. In this report, such theoretical water supply estimates are referred to as "unimpaired" flow. Since 1980, the Department of Water Resources (Department) has periodically published estimates of Central Valley unimpaired flows. In spite of the Department's previous attempts to distinguish between natural conditions and its calculation of theoretical unimpaired flows, unimpaired flow estimates have frequently been used as a surrogate measure of natural conditions, presumably because natural flow estimates were unavailable. A major objective of this report is to clarify the conceptual differences between natural and unimpaired flows.

In this report, the term "unimpaired" flow is used to describe a theoretically available water supply assuming existing river channel conditions in the absence of (1) storage regulation for water supply and hydropower purposes and (2) stream diversions for agricultural and municipal uses. Unimpaired flow estimates are theoretical in that such conditions have not occurred historically. In pristine watersheds which have undergone little land use change, unimpaired flow estimates provide a fixed frame of reference to develop relationships between precipitation, runoff, and water supply based on long-term hydrologic records. For many years these relationships were based on the assumption of stationarity, i.e. that the past is a good indicator of the future. However, global warming now requires hydrologists and water resources managers to analyze non-stationary processes, requiring more sophisticated tools and techniques to quantify future water supplies. This report updates and extends the Department's previous published estimates of unimpaired flows for 24 Central Valley subbasins and the Delta. Monthly unimpaired flows are presented for water years 1922-2014.

The term "natural" flow is used in this report to describe the flows that would have occurred absent all anthropogenic influences and is considered to represent the period circa 1850 prior to significant landscape changes following the California Gold Rush. These influences have dramatically affected inflows to the Delta. For example, changes in land use, including (but not limited to) the clearance and drainage of wetlands, have affected the amount and timing of surface runoff. Groundwater pumping has impacted groundwater elevations and groundwater inflows to streams and rivers. Flood control measures, including an extensive network of levees, have ended the natural cycle of bank overflows and detention storage.

The estimates of natural flow provided in this report are not to be confused with estimates of actual flows that occurred under Paleolithic or more recent conditions prior to European settlement. Rather, these estimates assume the contemporary precipitation and inflow pattern to the valley floor (i.e. water years 1922-2014) with the valley floor in a natural or undeveloped state: before flood control facilities, levees, land reclamation, irrigation projects, imports, etc.

The mountain and foothill watersheds that surround the Central Valley are relatively pristine. Land use changes have not dramatically affected the volume and timing of seasonal runoff in these watersheds. Furthermore, these watersheds have limited groundwater aquifers. Therefore, in these watersheds, unimpaired flows may be calculated relatively simply by adjusting observed gaged data to remove the effects of (1) upstream changes in surface water storage, (2) basin imports, and (3) basin exports. Given that anthropogenic impacts are relatively small in these upstream watersheds, unimpaired and natural flow estimates are likely to be similar, and for the purposes of this report are assumed to be the same.

The main body of this report, comprised of six chapters and references, provides conceptual differences between natural and unimpaired flow estimates, describes the methods used to develop these estimates, and presents summary results and conclusions. Details of the SWAT model, a model used as part of the natural flow methodology to estimate rim watershed contributions, are presented in A**ppendi**x A. Additional appendices summarize tables of monthly unimpaired and natural flow and differences between the two estimates.

2. CONCEPTUAL DIFFERENCES BETWEEN NATURAL AND UNIMPAIRED FLOWS

Full natural flow, natural flow, natural runoff and unimpaired flow are all phrases that have been used by the Department 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. Of special interest here is a series of publications that reported updates to the Department's Central Valley unimpaired flow estimates. The first edition of this series was titled *California Central Valley Natural Flow Data*. Subsequent editions were re-titled *California Central Valley Unimpaired Flow Data* in recognition of the conceptual differences between natural and unimpaired flows.

The word "natural" connotes that the Central Valley landscape is in a pre-development or pristine state. The word "unimpaired", on the other hand, implies 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 estimation procedure matched the natural flow estimation. In practice, this is not usually the case; it is customary to include only those items in the unimpaired flow estimation for which either reliable data are readily available or reasonable estimates can be made. In previous editions of the Department's *California Central Valley Unimpaired Flow Data* the data are better described as unimpaired data, primarily because of the difficulty in estimating four items of significance, as follows:

- First, groundwater accretions from the very large area of the Central Valley floor probably were considerably higher under natural conditions but no data are 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 were 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 natural low-lying basins for long periods of time, recharging groundwater and providing water for natural wetlands and perennial grasslands.
- Fourth, the outflow from the Tulare Lake Basin under natural conditions may have been significant in wet years, but are difficult to estimate.

The unimpaired flows in this report assume that the river channels of the valley are in their present configuration. Figure 2-1 shows the 24 subbasin boundaries established by the Department for reporting estimated monthly unimpaired flow time series data for the Central Valley beginning Water Year 1922 (DWR, 2007). The areas of the Central Valley (Figure 2-1) can be separated into three main regions: the upper watersheds of the Sierra Nevada and coastal mountain ranges (colored light blue in Figure 2-1); the valley floor, typically the areas below the 500-foot elevation contour, (shown in green in Figure 2-1); and the Delta. The Delta is part of the valley floor but for accounting purposes is identified separately (Area 24 in Figure 2-1). When referring to areas tributary to the Delta, the Tulare Basin (Area 23 and associated watersheds) contribute minimal surface water (flood flows from the Kings River to the San

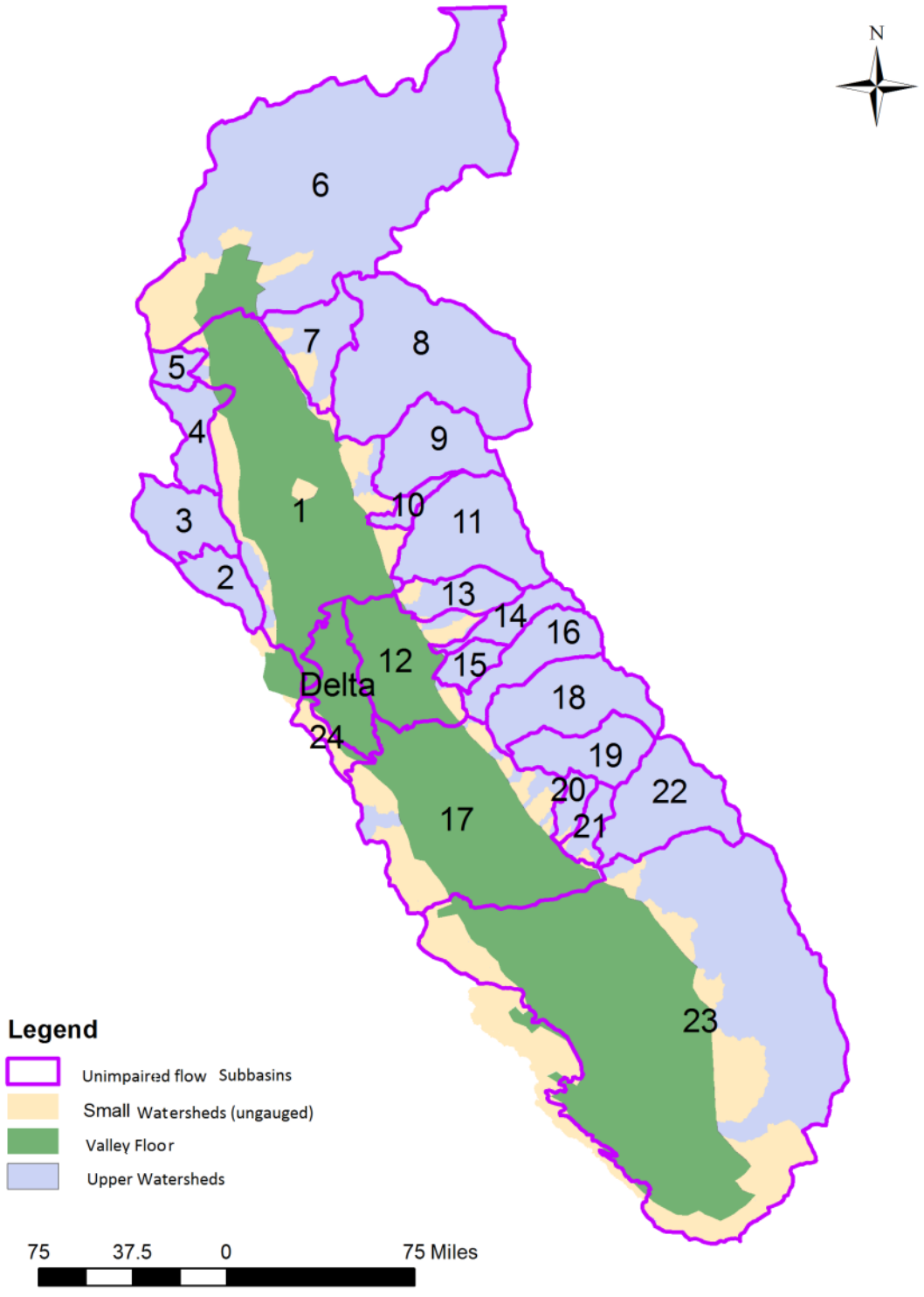

Figure 2-1. Unimpaired Flow Subbasins in the Central Valley

Joaquin River). However, the subsurface ground water system between the San Joaquin River Basin and Tulare Basin are connected.

The main source of natural water on any of the watersheds shown in Figure 2-1 is precipitation in the form of rainfall and snowfall. That precipitation is subjected to different physical processes (e.g., accumulation and melt for snowfall, runoff, soil moisture storage, deep percolation, evaporation and evapotranspiration). In addition, if the area is developed for agriculture and/or urbanized, streamflows from precipitation are subject to further modifications such as storage regulation, diversions and return flows. For general planning purposes and sometimes for regulatory needs, it is important to estimate the water supply generated in a watershed due to the precipitation that falls on that area prior to any human or anthropogenic development. One can approach this in two ways:

1. Start with a measured outflow (gaged) for an area, which represents impaired flow, and then "unimpair" (or modify) that flow for any anthropogenic impacts (e.g., diversions, return flows, imports into an areas, or exports from an area) to arrive at an estimate of unimpaired flow.
2. Use physically based computer models to simulate the outflow from the area under pre-development land use conditions to arrive at an estimate of natural flow.

How the unimpaired and natural flow estimates differ in magnitude and interpretation will depend on the degree of land use development (i.e., alteration of pre-development native conditions due to agriculture or urbanization). Figure 2-2 divides the major watersheds in the Central Valley tributary to the Sacramento – San Joaquin Delta into three distinct regions: the upper watersheds in the Sierra Nevada Mountains and Coastal Mountains (shown in green); the valley floor (shown in yellow); and the Delta (shown in red).

For the mountain watersheds, precipitation runoff (both rainfall and snowfall) is subject to changes in volume and timing as reflected in the watershed stream outflows. The causes for modifications to streamflows include vegetative evapotranspiration or consumptive use, sublimation, snow accumulation and snowmelt, overland and subsurface shallow flow, infiltration, and stream/groundwater interaction. Outflows from the upper watersheds become inflows to the Sacramento and San Joaquin Valley floor areas. Volumetrically most of these flows are surface streamflows (including shallow subsurface flows) while some are subsurface flows that feed the valley floor ground water systems. These outflows from the upper watersheds become inflows to the flat valley areas of the Central Valley. (Although the Tulare Basin contributes only a very small quantity of runoff to the Delta, selected flow estimates for this hydrologic region are included in this report for completeness.) Minimal runoff contributions to these upper watersheds are provided from areas outside of California.

For the valley floor, inflows from the upper watersheds along with local precipitation are modified in magnitude and timing before becoming inflow to the Delta. Causes of modifications include vegetative consumptive use (riparian, native vegetation, etc.), overbank flows from streams during high flow conditions, formation and disappearance of lakes and wetlands,

stream/groundwater interaction, infiltration, runoff, return flows, and uptake from groundwater to meet vegetative consumptive water demands.

Within the Delta, outflows from the Sacramento Valley, Eastside Streams, and San Joaquin Valley are subject to further modifications due to in-Delta vegetative consumptive use, evaporation from open water surfaces, wetlands, and lakes, and stream-groundwater interaction, before flowing into the San Francisco Bay and Pacific Ocean as Delta outflow.

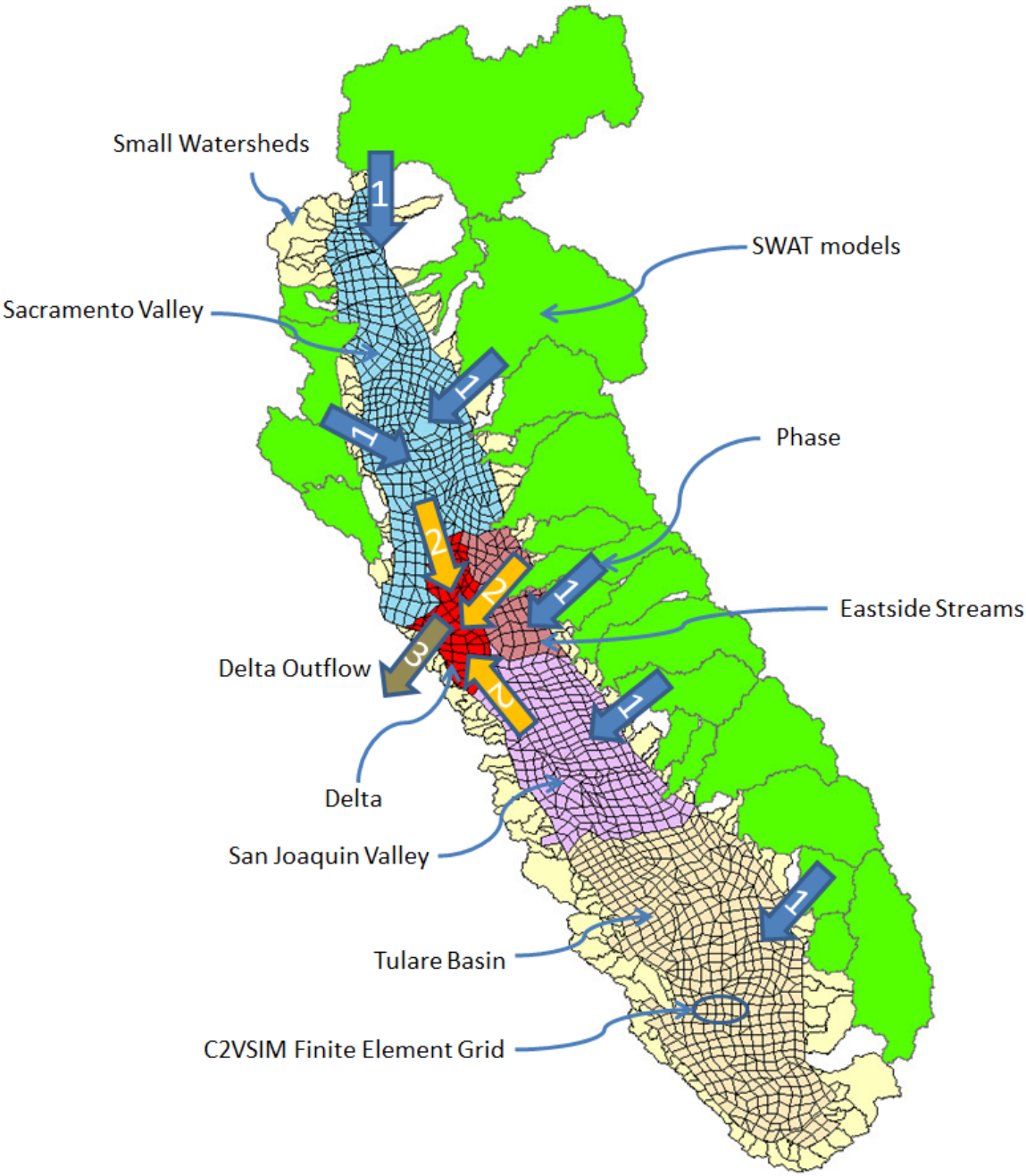

Figure 2-2. Three Major Phases Affecting Water Travel from the Upper Watersheds to Delta Outflow

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3. ESTIMATES OF UNIMPAIRED FLOWS

Introduction

The Department first published estimated unimpaired flows for 24 Central Valley subbasins and the Delta in a 1980 report titled Central Valley Natural Flow Data. The report presented monthly flows for water years 1920-1978. Data for October 1920 through September 1983 were published in a 1987 report titled California Central Valley Unimpaired Flow Data, Second Edition. The title of the second edition corrected the misuse of the term "Natural Flow." The extension of unimpaired flow data from October 1983 through September 1992 was published in August 1994 as the Third Edition. The Fourth Edition, published in 1997, added data for October 1992 through September 2003.

This chapter describes the extension of unimpaired flow data through water year 2014 of the 1921-2003 data found in the *California Central Valley Unimpaired Flow Data Fourth Edition - Draft* (DWR, 2007), prepared by the Bay-Delta Office. The text describing the procedures used to estimate the unimpaired flows is taken from the 2007 report (with minor editorial changes) and updated when necessary. The information below also explains any differences in calculations between the 2007 report and this report. For flow data taken directly from the Department's Snow Survey records, unimpaired flow estimation procedures are also provided where available.

The unimpaired flows as presented in this report are an extension in time of previous published values by the Department**. Appendix B contains tables of monthly unimpaired flows for each of the** 24 **subbasins in the Central Valley**. In addition, estimates are included of the total unimpaired inflow to the Delta, and the total unimpaired net Delta outflow.

Procedures Used to Estimate Unimpaired Flows

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 2-29). 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 (776/356=2.18). 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 estimated by multiplying 11 (2.18 x 5.05) by 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 estimation 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.

The unimpaired flow data for the 1993 – 2003 period was estimated using similar procedure as that of the 1961 – 1992 period flow data. However, we note the rationale for reducing June flows by one-half and setting the July to September flows to zero as subjective that need to be revisited and verified in future updates. For the 2011-2014 period, the subjective reduction for June-September was not applied.

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 flow USGS gage 11454000, Putah Creek near Winters. Flows for the 1955-1992 period were obtained from USGS gage 11454000, adjusted for the changes in storage and evaporation from Lake Berryessa starting in January 1957. Flows for the 1993 to 2014 period were extended similarly.

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 ungauged 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. Department of the Interior, Bureau of Reclamation (Reclamation) 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 Tables 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 estimated 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:

Accretions = 0.47674 (North Fork) – 11,688 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 estimated 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 estimated as the sum of historical flow of Cache Creek at Rumsey plus net effects of Clear Lake and Indian Valley Reservoir. The net effect of Clear Lake is estimated as:

Clear Lake outflow from the Cache HEC-3 Model minus historical Clear Lake flow near Lower Lake (Clear Lake historical outflow).

For the 1993 to 2003 period, similar procedure as the 1984 to 1992 period was used except that USGS gage (11451000) data for Clear Lake outflow was used instead of HEC-3 model output. It is assumed that the gage data are more representative than the HEC-3 model output.

For 2004 to 2014 period, unimpaired flow estimate was made as the sum of unimpaired North Fork Cache Creek near Clear Lake Oaks, unimpaired Cache Creek near Lower Lake, and Bear Creek above Holsten Chimney Canyon near Rumsey, a scale factor of 1.28 was applied for drainage area between Cache Creek above Rumsey and these three subbasins.

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 Reclamation 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 Reclamation personnel to cover water years 1950 through 1957. The flows for the 1958-1992 period were estimated 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. Flows for the 1993 to 2014 period were extended similarly.

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.

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 nine 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 estimated 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 the Redbank Group; Thomes Creek at Paskenta; Thomes Creek above the 500-foot contour; and Elder Creek at Gerber. Unimpaired runoff for the 1993 to 2003 period was estimated using the same procedure used for the 1984 to 1992 period unimpaired flow calculation.

UF 6 — Sacramento River near Red Bluff (CDEC ID SBB)

Data were taken from the Department's 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 the Department's 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.

Monthly unimpaired flows are calculated from measured flows reported by USGS gage 11377100, Sacramento River above Bend Bridge, then adjusting by:

1. Change in storage at Shasta and Whiskeytown reservoirs.
2. Adding evaporation (gross) at Shasta Reservoir reported by Reclamation.
3. Less import from the Trinity River at Judge Francis Carr powerhouse.
4. **Adding an estimate for change in storage, irrigation, and consumptive use upstream in the Pit River and Redding basins. The monthly pattern of the 315 thousand acre-feet (TAF) annual depletion adjustment is, in TAF:**

October	28.5	April	37.0
November	2.5	May	54.0
December	4.0	June	56.0
January	6.0	July	43.0
February	7.0	August	35.0
March	7.0	September	35.0

Before WY 1969 the Sacramento River flows were measured 10 miles downstream near Red Bluff. The older location included the small Paynes Creek drainage of 93 square miles.

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 estimated 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 are 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. Flows for the 2003 to 2014 period were extended similarly.

UF 8 — Feather River near Oroville (CDEC ID FTO)

Data were taken from the Department's Snow Survey records.

The unimpaired flow at this site is calculated from:

1. Observed flow at the USGS station No. 114070, "Feather River at Oroville", which is just upstream from the fish barrier dam.
2. Add Thermalito Afterbay releases to the Feather River. (In recent years the State Water Project provides the sum of Items 1 and 2 as "Oroville Complex River Release".)
3. Add diversions at the Thermalito Complex into Western Canal, Richvale Canal, the PG&E lateral, and Sutter Butte Canal.
4. Change in storage of the complex: Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay.
5. Add evaporation at Thermalito Afterbay from the Department of Water Resources, Northern District.
6. Lake Oroville change in storage.
7. Lake Oroville evaporation (gross).
8. Add Palermo and Bangor Canal diversions.
9. Add Oroville-Wyandotte Canal (aka Forbestown Ditch), Hendricks and Miocene Canal (diversions above Oroville Lake).
10. Change in storage at Lake Almanor, Mountain Meadows, Butt Valley, Bucks Lake, Frenchman, Antelope, Lake Davis, Little Grass Valley and Sly Creek reservoirs.
11. Add estimated evaporation for the reservoirs listed in item 11, taken as 1.4 times Lake Almanor evaporation, based on a monthly capacity – evaporation table from Great Western Power Company (PG&E predecessor). Summer amounts can easily be 300 cfs on Lake Almanor.
12. Subtract Slate Creek Tunnel import from the Yuba River basin.
13. Subtract Little Truckee River import into Sierra Valley. This has been taken to be 6.6 TAF in recent years on a pattern:

April	0.1	July	1.2
May	1.9	August	.2
June	3.1	September	.1

14. Add depletion for upstream irrigation and consumptive use of 75 TAF per year.

Some data on Little Truckee River imports are available in Northern District watermaster reports. It is recommended that this data be obtained and reviewed to see if the standard pattern is still reasonable.

The Oroville-Wyandotte Irrigation District (OWID) Canal annual diversion of 16.5 TAF per year were from about 1970 through August 2014. The closing of Woodleaf Lumber Mill in 1962 and other factors have reduced OWID Canal usage to around 6 TAF in recent years. The monthly upstream depletion amounts have apparently been taken as constant since about 1970.

The monthly distribution of depletion and the OWID Canal is as follows, TAF:

Month	Depletion	OWID	Month	Depletion	OWID
October	0.9	.74	April	1.3	1.0
November	.2	.29	May	7.5	.37
December	.1	.13	June	22.5	.71
January	.1	.07	July	21.3	1.11
February	0	.04	August	13.6	1.29
March	0	.05	September	7.5	1.19

Before the construction of Oroville Dam and the Thermalito Complex, the gage was upstream a few miles with 17 (out of 3,624) square miles less drainage area before July 1962. The estimations before completion of the Afterbay in 1967 did not include Thermalito complex releases because all the water being diverted flowed by the gage.

UF 9 — Yuba River at Smartville (CDEC ID YRS)

Data were taken from the Department's Snow Survey records.

These flows are taken as the measured flow of the Yuba River below Englebright Dam near Smartville, USGS Gage 11418000, (now measured by PG&E) plus Deer Creek near Smartville, Gage 11418500.

1. Plus diversions from PG&E's Drum Canal and South Yuba Canal, at Gage YB 31, Nevada Irrigation District's D-S Canal, Cascade Ditch, and in earlier years (pre Merle Collins Reservoir in 1963) Browns Valley Canal.
2. Plus exports to the Feather River via Slate Creek Tunnel.
3. Less imports to the Yuba from the Bear River in South Yuba Canal at Gage YB 34.

4. Change in storage at the Lake Spaulding South Yuba System (from PG&E), Bullards Bar, Englebright (Narrows), Bowman Lake, French Lake, Jackson Meadows, and Scotts Flat reservoirs.
5. Evaporation and consumptive use are neglected.

In earlier estimations prior to 1975, the estimations included small amounts in Nevada Irrigation District's Excelsior Ditch, which apparently ceased functioning in 1967 and Snow Mountain Ditch until summer 1974, when its flows were combined with and routed into Cascade Ditch.

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 Department's Snow Surveys Branch. The period 1964-1983 was calculated by adding the following:

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 Water District South Canal diversion
10. Camp Far West Water District North Canal diversion
11. South Sutter Water District diversion
12. Historical depletion

And deducting the following items:

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

Flows for the 2003 to 2014 period were extended in the same manner as that of the 1993 to 2003 extension.

UF 11 — American River at Fair Oaks (CDEC ID AMF)

Data were taken from DWR Snow Survey records.

The calculations of unimpaired flow start with observed flow of USGS station 11446500 then:

1. Add Lake Valley Canal diversion
2. Add diversion from the Folsom Lake pumps (old North Fork and Natomas Ditches.
3. Subtract imports from Echo Lake Flume (1.5 TAF per year estimate) and via South Canal (YB-90) from the Bear River Canal.
4. Change in storage at Folsom Lake, French Meadows, Hell Hole, Lake Valley, Caples Lake, Silver Lake, Ice House, Loon Lake, Union Valley, Slab Creek, Stumpy Meadows, and Lake Natoma.
5. Add Folsom Lake evaporation as estimated by Reclamation.
6. Add a constant estimate of depletion above Folsom Dam of 11.4 TAF per year on this pattern:

October	.4	April	.2
November	.2	May	.6
December	.2	June	2.1
January	.2	July	2.5
February	.2	August	2.6
March	.2	September	2.0

7. Add diversion through the American River Pump station near the site of the once-proposed Auburn Dam.

UF 12 — San Joaquin Valley East Side Minor Streams

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

UF 13 — Consumnes River at Michigan Bar (CDEC ID CSN)

Data were taken from DWR Snow Survey records.

Unimpaired monthly flows at this station consist of the observed flow of USGS station No. 11335000, Cosumnes River at Michigan Bar, adjusted by adding Camino Conduit diversions (shown as part of the Camp Creek near Somerset records), and adding change in storage at Jenkinson Lake. Data for both adjustments are provided by the Eldorado Irrigation District.

UF 14 — Mokelumne River at Pardee Reservoir (CDEC ID PAR)

Data were taken from DWR Snow Survey records.

The estimated unimpaired flow at this location is the total outflow from Pardee Reservoir plus change in storage at Pardee, and PG&E's Salt Springs and Lower Bear River reservoirs, and several small old upstream reservoirs (Upper Bear, Upper Blue, Lower Blue, Twin, and Meadow lakes). Pardee Reservoir outflows include:

1. Controlled releases through the powerplant and sluice valves.
2. Uncontrolled releases over the spillway overflow.
3. Estimated leakage.
4. Releases to Jackson Valley Irrigation District
5. Releases into the Mokelumne Aqueduct to the East Bay area.
6. Evaporation at Pardee Reservoir

The natural flow figures are estimated by East Bay Municipal Utility District and furnished to DWR Snow Surveys. Sometime prior to 1971, the estimated flows were developed by taking the measured flow at the USGS Station 11319500 "Mokelumne River near Mokelumne Hill",

adding Amador Canal diversions to the Jackson area, and adjusting for upstream PG&E storage. The exact time, prior to 1971, when the transition in methods took place is unknown.

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 estimated negative flows were assumed to be zero. The estimated unimpaired flow for the 1921 to 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. Before 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. 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 acre feet (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 TAF 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 estimated 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 square miles) of the Jenny Lind to New Hogan Reach to that of Cosgrove Creek near Valley Springs (21.1 square miles).

Flow for 1984-2003 was estimated 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. Flows for the 2003 to 2014 period were extended similarly.

UF 16 — Stanislaus River at Melones Reservoir (CDEC ID SNS)

Data were taken from DWR Snow Survey records.

Estimations begin with the USGS gage No. 113020 of the same name which has been operated since 1957. To the observed flow are added Tuolumne Canal near Long Barn, Oakdale Canal, and South San Joaquin Canal diversions. (Diversions to the Central Valley Project contractors in eastern San Joaquin County via the new Stockton East tunnel at Goodwin Dam are currently being made and included, but did not start until after 1994.)

Adjust for change in storage at New Melones (Old Melones prior to November 1978) Relief, Strawberry, Lyons, Donnell, Beardsley, Tulloch, Spicer Meadows (since 1989) and, prior to 1989, the Utica system reservoirs. The Utica system includes Lake Alpine (4.1 TAF) and Union (3.1 TAF) Reservoirs and also the old 4 TAF capacity Spicer Meadows reservoir. When the Utica System was accounted for, the storage change for a month was considered the same each year as follows: units are TAF:

October	-3.2	April	11.6
November	-0.8	May	0
December	0	June	-1.7
January	0	July	-3.0
February	0	August	-2.0
March	0	September	-0.9

The estimated evaporation from New Melones Reservoir is added. Before completion of New Melones Reservoir an estimate of monthly evaporation was used which was based on a curve of storage verses evaporation.

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 Dam site. The 1922-1954 average runoff for the Chowchilla River at the gage was 66 TAF. Comparable minor-stream 1922-1954 runoff was 172,400 AF. Runoff from Joint Depletion Study

Area 43 (Chowchilla River above Buchanan Dam site) was 67,600 AF, slightly higher than the gage because some adjacent drainage area was included. The resulting monthly runoff for the minor streams was estimated 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 estimated by multiplying the factor 2.55 by the sum of the historical outflow of DA43 Chowchilla River above Buchanan Dam site plus net effect of Eastman Lake.

Flows for the 2003 to 2014 period were extended similarly.

UF 18 — Tuolumne River at Don Pedro Reservoir (CDEC ID TLG)

Data were taken from DWR Snow Survey records.

The estimations begin with the measured flow at the USGS gage 11289650 "Tuolumne River below La Grange Dam" and add:

1. Diversions by the City and County of San Francisco through the Hetch Hetchy Aqueduct.
2. Change in storage at Hetch Hetchy, Lake Eleanor, and Lake Lloyd (Cherry Valley) reservoirs.
3. Estimated net evaporation of 2.0 feet per year at Hetch Hetchy, Lake Eleanor, and Lake Lloyd based on surface area. This is summed from daily estimations based on a fixed monthly rate and combined surface reservoir area.
4. Change in storage at New Don Pedro Reservoir beginning in November 1970 and at the Old Don Pedro Reservoir prior to then.
5. Evaporation at Don Pedro reservoir, estimated at 50.2 inches per year net, estimated from daily reservoir area and an average monthly rate, varying by month.
6. Diversion into Modesto and Turlock Canals near La Grange.

The natural flows at La Grange Dam are estimated by Turlock Irrigation District and provided to the Department.

UF 19 — Merced River at Exchequer Reservoir (CDEC ID MRC)

Data were taken from DWR Snow Survey records.

Estimated unimpaired flows start with measured flow at the above station, USGS gage 11270900, and add:

1. Diversions in the North Side Canal.
2. Change in storage at Lake McClure (Exchequer), enlarged in 1967, and McSwain Reservoir.
3. Estimated monthly average evaporation at Lake McClure and McSwain.

Estimated annual evaporation is 22.45 TAF and is listed below, by month, in TAF:

October	1.55	April	1.60
November	1.00	May	2.60
December	.60	June	3.25
January	.50	July	3.85
February	.70	August	3.30
March	1.30	September	2.20

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 Dam site). Historical upstream depletions and imports were considered to be negligible.

Flow for 1984-1992 was estimated as the sum of the historical outflow of DA43 Chowchilla River above Buchanan Dam site plus net effect of Eastman Lake. Flows for the 2003 to 2014 period were extended similarly.

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 estimated as the sum of the historical outflow of DA45 plus net effect of Hensley Lake (Hidden Dam). Flows for the 2003 to 2014 period were extended similarly.

UF 22 — San Joaquin River at Millerton Reservoir (CDEC ID SJF)

Data were taken from DWR Snow Survey records, as furnished by Reclamation. Unimpaired flow of the San Joaquin River is calculated from the observed flow of USGS gage 11251000 San Joaquin River below Friant and adding the following:

1. Diversions from Millerton Lake to the Friant-Kern and Madera canals.
2. Change in storage at Millerton Lake.
3. Evaporation from Millerton Lake, as determined by Reclamation.
4. **Change in storage at upstream reservoirs: Florence, Thomas A. Edison, Huntington, Shaver, Mammoth Pool, Redinger, Crane Valley (Bass Lake), and Kerckhoff reservoirs.**

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 outflow is measured by USGS gage 11253500, James Bypass (Fresno Slough) near the San Joaquin River. Gaged data were not adjusted for the effects of Pine Flat Dam on Kings River flows north to the Mendota Pool.

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 that are 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

Flows for 1921-2014 were estimated as the sum of UF 1 through UF 11.

East Side Streams Unimpaired Total Outflow

Flows for 1921-2014 were estimated as the sum of UF 12 through UF 15.

San Joaquin Valley Unimpaired Total Outflow

Flows for 1921-2014 were estimated as the sum of UF 16 through UF 24.

Delta Unimpaired Total Inflow

Flows for 1921-2014 were estimated 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

Delta water use was estimated 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 in-place.

In previous reports net use in the lowlands is estimated as the sum of water surface evaporation, consumptive use of riparian vegetation, and seepage from Delta 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 estimate 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).

In previous report net use in the uplands was estimated as the sum of the consumptive use of native vegetation, consumptive use of riparian vegetation, and 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 estimated using the Bay-Delta Office Consumptive Use Model.

In this report Delta net use was estimated as:

Delta net use = Delta Uplands net use + Delta Lowlands net use

Where:

Delta Uplands net use = Delta Uplands consumptive use – Delta uplands total precipitation

Delta Lowlands net use = Delta Lowlands consumptive use +
Delta seepage -Delta lowlands total precipitation

Delta Unimpaired Total Outflow

Flow for 1921-1992 was estimated as the Delta Unimpaired Total Inflow minus the Uplands Net Use (DA55) minus the Lowlands Unimpaired Net Use (DA54). Flows for the 1993 to 2013 period were extended similarly.

4. SIMULATION OF NATURAL FLOWS

Introduction

As described in the previous California Central Valley Unimpaired Flow Report (DWR 2007), natural flow represents streamflows that would have occurred under a pre-development or pristine landscape. In contrast, unimpaired flows are theoretical values based on measured flows that have been adjusted to remove the influences of upstream diversions, storage, and exports and imports from other basins. A series of modeling tools and extensive input data have to be used in estimating natural flow conditions. Daily simulations of natural flows from October 1, 1921 through September 30, 2014 were developed using precipitation-snowmelt-runoff models for the upper watersheds that are tributary to the California Central Valley. Subsequently, these flows are routed through the Central Valley floor area using a modified version of the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) for water years 1922 through 2014. Natural Delta inflows and natural net Delta outflow are estimated for the 93-year period.

Upstream Watersheds

A precipitation-runoff simulation model provides two important advantages over the use of the upper watershed unimpaired flows described in Chapter 3. First, such a model facilitates the use of a daily time step, which is important in routing flood flows across the flood plain and determining overbank spills. Second, such a model can be readily applied to assess future potential impacts of global warming and climate change.

The Central Valley drainage area consists of upstream watersheds and the valley floor. Upstream watersheds include major river watersheds above designated stream gauging stations and/or foothill reservoirs and ungauged small watersheds (Figure 4-1). The upstream watersheds include subbasins UF2-UF11, UF13-16, and UF18-24 (Figure 4-2). The precipitation-runoff model tool, SWAT (Soil Water Assessment Tool), was the Department's choice to simulate the daily stream outflow time series data for most rim watersheds. SWAT is a public domain, generic, semi-distributed precipitation-runoff model developed by U.S. Department of Agriculture Agricultural Research Service (Arnold et al. 2012). Twenty-three SWAT models were developed and calibrated to match available unimpaired observed streamflow data at watershed outlets. For some watersheds, an area ratio factor was also applied to consider rainfall-runoff from small local drainage areas located between a SWAT watershed outlet and its corresponding C2VSim stream inflow node location. The SWAT models are based on existing land use conditions, land surface elevations, and stream geomorphology.

There are 36 stream inflows locations in the C2VSim model of the valley floor. SWAT simulated daily flow time series data provide over 90 percent of these model boundary inflows. Observed USGS stream gage data are used for several inputs, since SWAT models have not been developed for a few smaller watersheds such as Cottonwood Creek and Cow Creek.

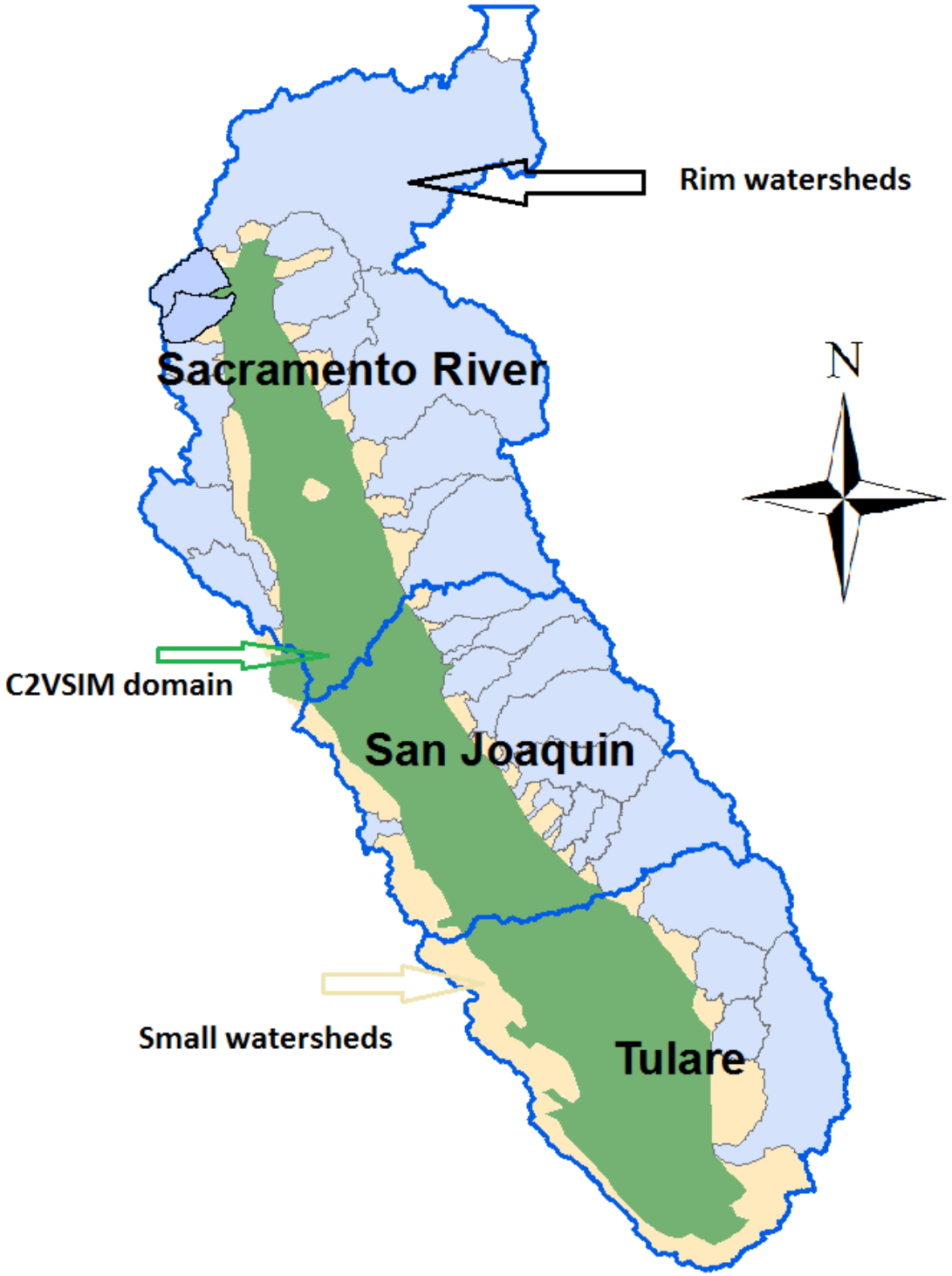


Figure 4-1. Drainage Area of the Central Valley and Natural Flow Model Sub Domains

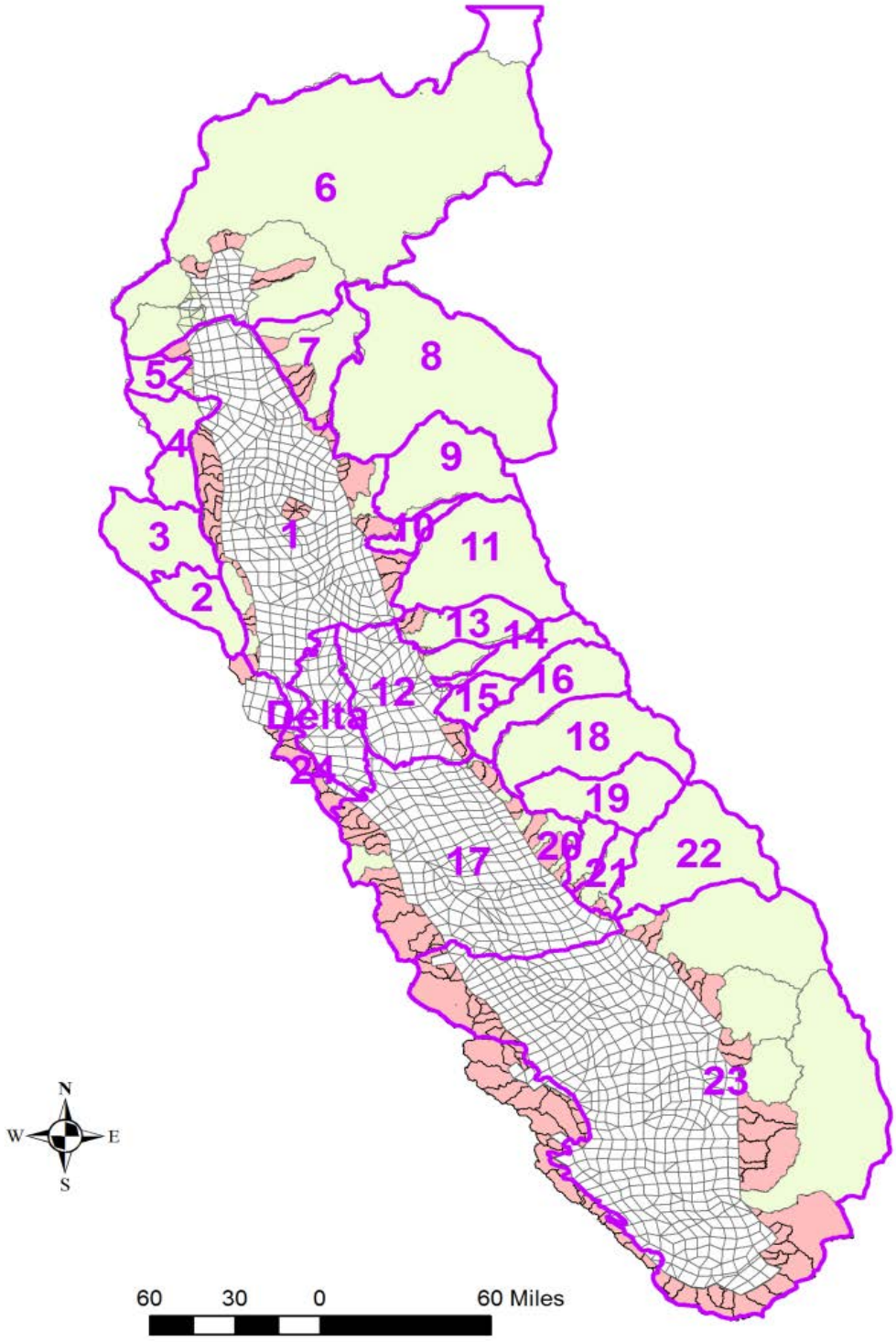


Figure 4-2. Comparison of the 24 Unimpaired Flow Subbasins and Natural Flow Modeling Domain

Sacramento Valley Rim Inflows

There are 19 stream inflow locations in the Sacramento Valley. They correspond to unimpaired subbasins UF2-UF11 (see Figure 4-2). UF1- Sacramento Valley Floor is mostly part of the C2VSim model domain. UF6 includes five separate stream inflows (Sacramento River at Shasta, Cow Creek, Battle Creek, Paynes and Seven Mile Creeks, and Cottonwood Creek) and a few small watersheds with a portion of Valley Floor rainfall-runoff in Subregion 1. Table 4-1 and Figure 4-3 compare average monthly simulated flows to unimpaired observed flows over the period of simulation (Water Years 1922-2014). A more detailed comparison for each subbasin is provided in Chapter 5.

Table 4-1. Sacramento Valley Simulated Rim Inflows and Corresponding Unimpaired Observed Flows

	UF2-UF11 basins: Average Monthly Flows 1922-2014 (TAF)												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
Unimpaired	521	941	2,032	2,781	3,061	3,222	2,880	2,510	1,383	649	444	417	20,842
SWAT	563	1,176	2,215	2,664	2,868	3,110	2,704	2,284	1,379	707	448	364	20,482

Key:
SWAT = Soil Water Assessment Tool
TAF = thousand acre-feet
UF = unimpaired flow

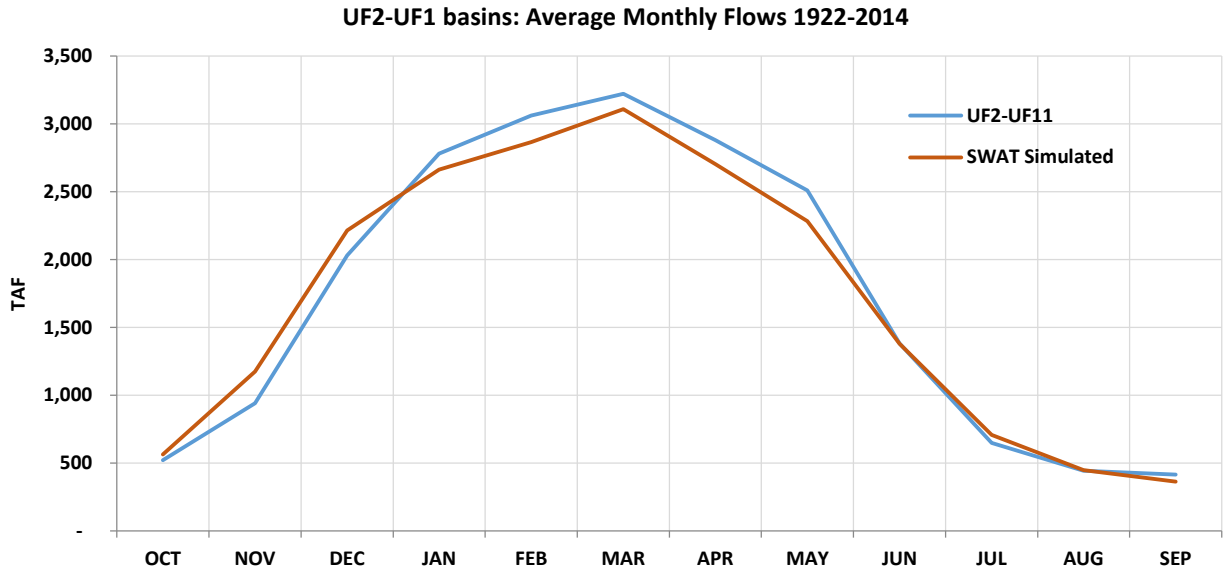


Figure 4-3. Sacramento Valley SWAT Simulated Rim Inflows and Corresponding Unimpaired Estimated Flows

East Side Streams

East side streams rim inflows include Cosumnes River, Mokelumne River, Calaveras River and Dry Creek at Galt. This corresponds to unimpaired flow subbasins UF12-15. About three quarters of UF12 is within the C2VSim model domain. A small portion of UF12 is considered in stream inflow (Dry Creek at Galt). Table 4-2 and Figure 4-4 compare average monthly simulated flows to unimpaired observed flows over the period of simulation (Water Years 1922-2014). A more detailed comparison for each subbasin is provided in Chapter 5.

Table 4-2. Eastside Streams SWAT Simulated Rim Inflows and Corresponding Unimpaired Observed Flows

	UF12-UF15 basins: Average Monthly Flows 1922-2014 (TAF)												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
Unimpaired	20	55	119	147	176	216	224	252	148	25	4	7	1,394
SWAT	9	33	95	161	190	220	228	247	139	32	7	4	1,364

Key:
SWAT = Soil Water Assessment Tool
TAF = thousand acre-feet
UF = unimpaired flow

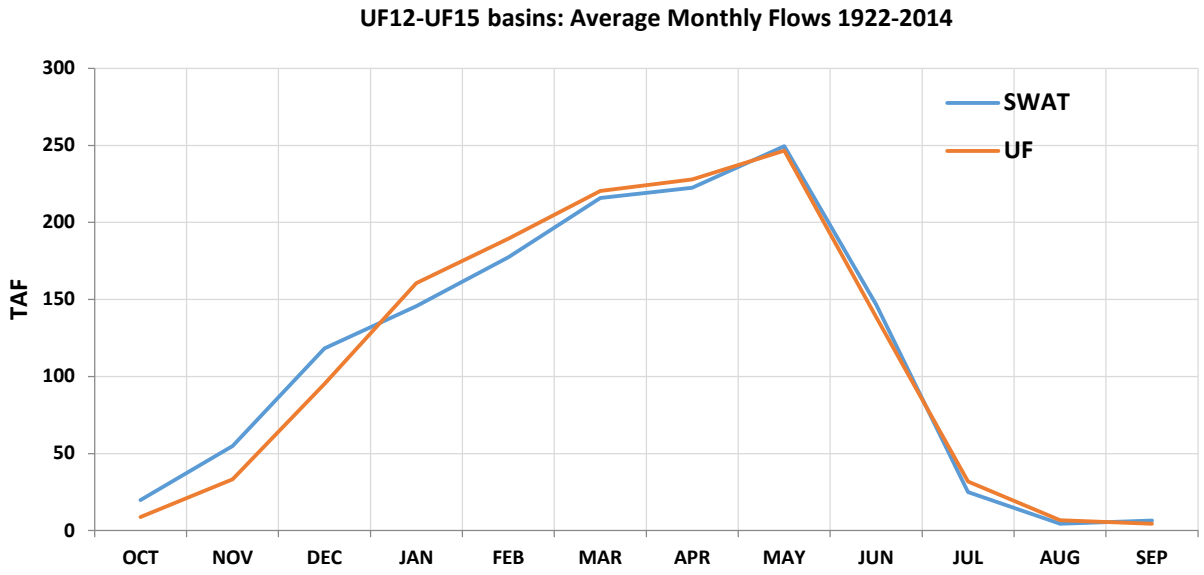


Figure 4-4. Eastside Streams SWAT Simulated Rim Inflows and Corresponding Unimpaired Estimated Flows

San Joaquin Valley

The San Joaquin Valley covers unimpaired flow subbasins UF16, and UF18-UF22. UF17 is a valley floor area that consists of a mix of C2VSIM elements, small watersheds and drainage area of stream inflows. And UF24 is for ungauged small watersheds draining into the Delta region. Table 4-3 and Figure 4-5 compare average monthly simulated flows to unimpaired observed flows over the period of simulation (Water Years 1922-2014). A more detailed comparison for each subbasin is provided in Chapter 5.

Table 4-3. Simulated San Joaquin Valley Rim Inflows and Corresponding Unimpaired Observed Flows

	UF 16, UF18-UF22 basins: Average Monthly Flows 1922-2014 (TAF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Unimpaired	59	131	268	390	469	629	911	1,460	1,113	412	104	48	5,993
SWAT	98	223	372	426	539	753	965	1,324	1,010	407	94	51	6,263

Key:
SWAT = Soil Water Assessment Tool
TAF = thousand acre-feet
UF = unimpaired flow

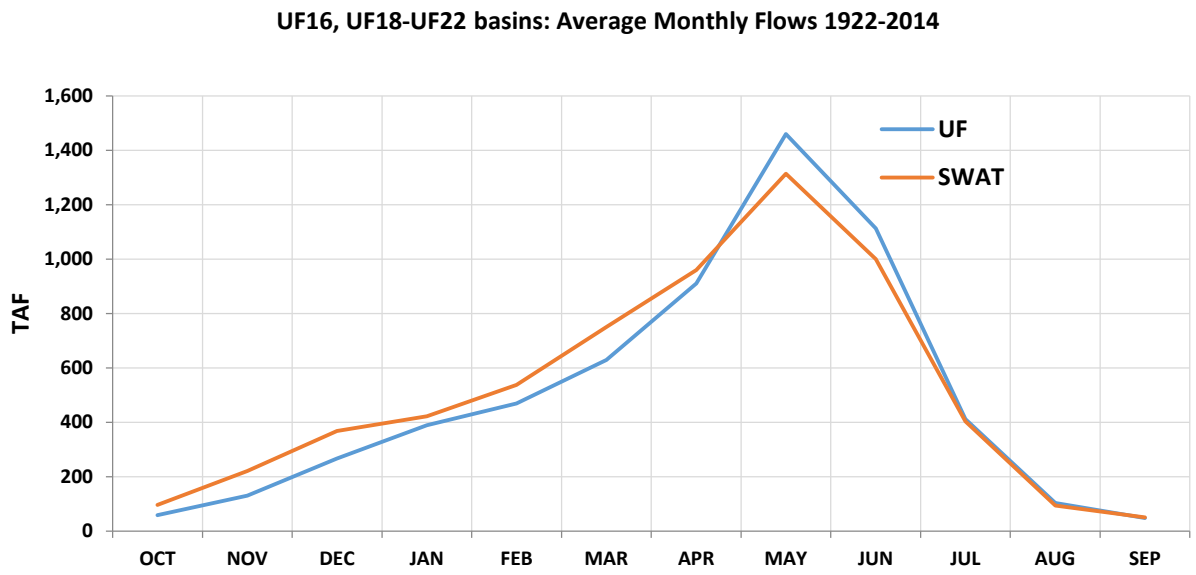


Figure 4-5. San Joaquin Valley SWAT Simulated Rim Inflows and Corresponding Unimpaired Estimated Flows

Tulare Lake Basin

The Tulare Lake Basin (UF23) is also fully simulated (see Figure 4-2). The Valley Floor rainfall-runoff is part of the Valley Floor integrated hydrologic modeling (UF1, UF12 and UF 17).

Valley Floor

Description of C2VSim Natural Flow Model Set up

The C2VSim is an integrated numerical model that simulates water movement through the linked land surface, groundwater and surface water flow systems in California's Central Valley. Valley floor hydrology is modelled with a natural flow version of C2VSim based on the Integrated Water Flow Model (IWFM) Version 2015 (DWR 2015). Although calibrated hydrologic parameters and main model framework are retained as in C2VSim-historical model from Brush et al. (2013), model inputs are substantially different.

The C2VSim natural flow model was run on a daily time step with a coarse finite element grid of 1,392 elements ranging from 1,366 acres to 21,379 acres. Daily historical precipitation, potential evapotranspiration, natural vegetation, and stream inflows spanning water years 1922-2014 were the main time series input data. The CAL-SIMETAW (California Simulation of Evapotranspiration of Applied Water) 4km × 4km grid based dataset (Orang et al. 2013) was used to prepare precipitation and reference potential evapotranspiration (ET_o). Since the CAL-SIMETAW dataset was not updated to Water Year 2014, we extended precipitation with PRISM data (PRISM Climate Group 2015) and ET_o with USGS Basic Characterization Model 270 meters × 270 meters grid data (Alan and Lorraine Flint, personal communication, 2015).

In C2VSim, the valley floor was subdivided into 21 subregions and the water balance was grouped into five hydrologic regions: Sacramento Valley, Eastside Streams, San Joaquin Valley, Tulare Lake, and Delta. The consumptive use of native vegetation was simulated with daily root zone soil water routing, allowing for groundwater uptake to root zone, and stream water contribution to the riparian vegetation. Stream overflow through natural levees to the flood basins were also considered. Permanent wetlands in the flood basins were simulated with the IWFM Lake option, thereby facilitating overflow from streams using a flow rating table/curve, wetland-groundwater interaction, and flood basin storage. Potential evapotranspiration of permanent wetlands was used for lakes/wetlands since wetland vegetation is assumed to cover the lakes, not just the water surface.

Native Vegetation Types and Spatial Distribution

Pre-development land cover classifications and spatial distribution was compiled and developed from best available sources. California State University at Chico (CSU Chico, 2003) produced a pre-1900 historic vegetation map of the Central Valley based on hundreds of historic maps and collections (Figure 4-6). Kuchler (1977) provides vegetation mapping for the whole California that shows potential or pristine land cover before European-American settlement and the part of Central Valley is reproduced in Figure 4-7. Fox et al. (2015) conducted the latest extensive study of Central Valley native vegetation and provide further details on flood plains vegetation and vernal pools combining information from the CSU Chico

base map, Kuchler's map and early soil survey data, but the final spatial extent is limited to Sacramento and San Joaquin Valleys (Figure 4-8). We used the Fox et al. (2015) mapping data for overlapping common area within the C2VSim boundary, and applied their methodology for the Tulare Lake basin and any other missing area gaps using the CSU Chico and Kuchler geographic information system maps (Figure 4-9). A summary of the vegetation types and acreage is listed in Table 4-4. The area of each vegetation type was specified for each element (grid cell) in order to simulate surface water flow processes: rainfall-runoff, infiltration, soil moisture, deep percolation and evapotranspiration. From comparison of the three above mentioned maps, (rain fed) grassland in the current simulation and CSU Chico (2003) relates to California prairie, and permanent wetland (large stand wetland) is tule marsh in the Kuchler map. The category of "Other floodplain habitat" in the CSU Chico map has been further identified and classified in Fox et a. (2015).

As stated in CSU Chico (2003), the confidence in identifying specific native vegetation under pre-development condition varies significantly for different vegetation types. Pre-development conditions is usually referred to period before the 1850s, however, the earliest source map is dated 1894. No early maps identified specific location of native grasslands; vernal pool locations are even more uncertain. Fox et al. (2015) used early soil survey data to infer vernal pool locations. On the other hand, riparian forest and wetlands along major streams have more reliable historic map data (Figure 4-10). Since riparian and permanent wetlands are the major source of stream water depletion, this actually reduces uncertainties for natural flow estimation. Finally, different vegetation types have different sources of water supply and potential evapotranspiration, as follows:

- Grassland, hardwoods, seasonal wetland, vernal pool, saltbush and chaparral can only utilize soil water and groundwater uptake.
- Riparian forest can access nearby stream water to meet potential evapotranspiration after using up soil water and groundwater uptake.
- When flood plains are emulated with the lake option (Figure 4-11), the lake elements are assigned with potential evapotranspiration of permanent wetlands, and any predefined vegetation set up for the lake elements are ignored. Lakes can receive stream water from main stream channel overflowing into them and also small creeks direct inflows.

Table 4-4. Area Distribution of Vegetation Types (Acres)

Valley	Subregion	Water Surface	Chaparral	Seasonal Wetlands	Vernal Pools	Grasslands	Hardwood	Riparian	Saltbush	Permanent Wetlands
Sacramento	1	-	-	-	7,808	88,240	198,754	33,476	-	-
	2	5,401	-	2,415	63,287	306,557	179,675	140,424	-	253
	3	3,321	-	27,302	228,734	246,112	60,453	53,147	-	70,039
	4	5,183	-	41,443	211	225	2,399	109,236	-	192,878
	5	5,318	-	232,900	79,483	40,891	104,192	137,254	-	13,718
	6	12,564	-	15,581	108,825	220,624	88,927	54,173	-	157,170
	7	5,324	-	34,455	115,461	30,862	95,474	26,011	-	42,271
Delta	9	21,226	-	58,361	31,608	99,388	481	3,276	-	511,115
San Joaquin	8	2,298	61	150,753	264,734	148,709	246,739	71,130	-	11,110
	10	2,516	369	139,218	159,519	235,025	-	2,483	102,335	26,608
	11	2,186	-	24,939	173,680	170,047	3,220	33,564	-	4,906
	12	1,273	-	14,092	118,518	163,300	3,731	32,373	-	7,050
	13	4,464	-	49,686	583,563	313,335	367	18,201	20,850	47,173
Tulare Lake	14-21	163,740	-	55,320	485,000	2,104,121	414,336	40,808	1,105,854	655,931
TOTAL		234,814	430	846,465	2,420,431	4,079,196	1,199,994	722,080	1,229,039	1,740,222

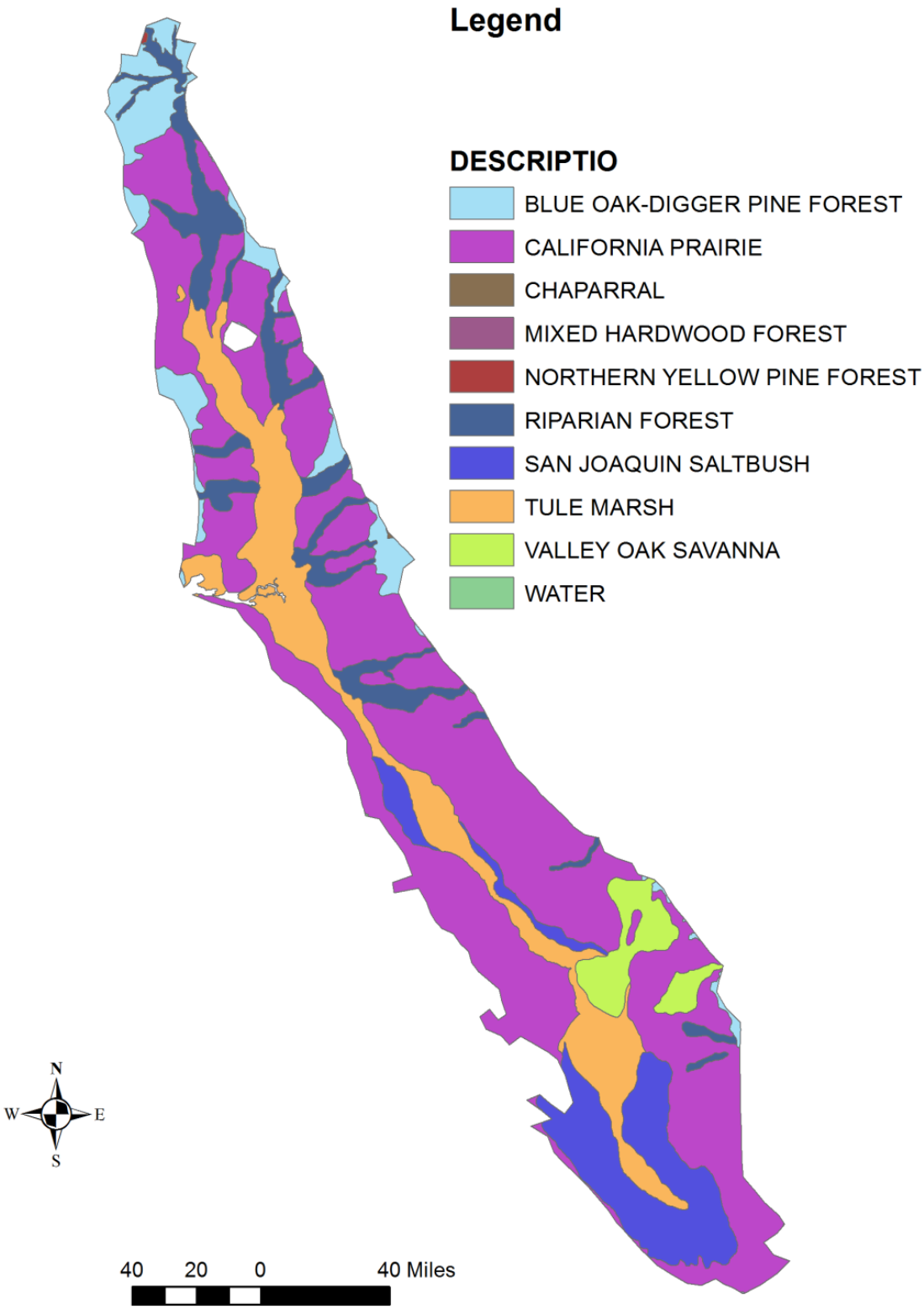


Figure 4-6. Valley Floor Native Vegetation from Kuchler (1977)

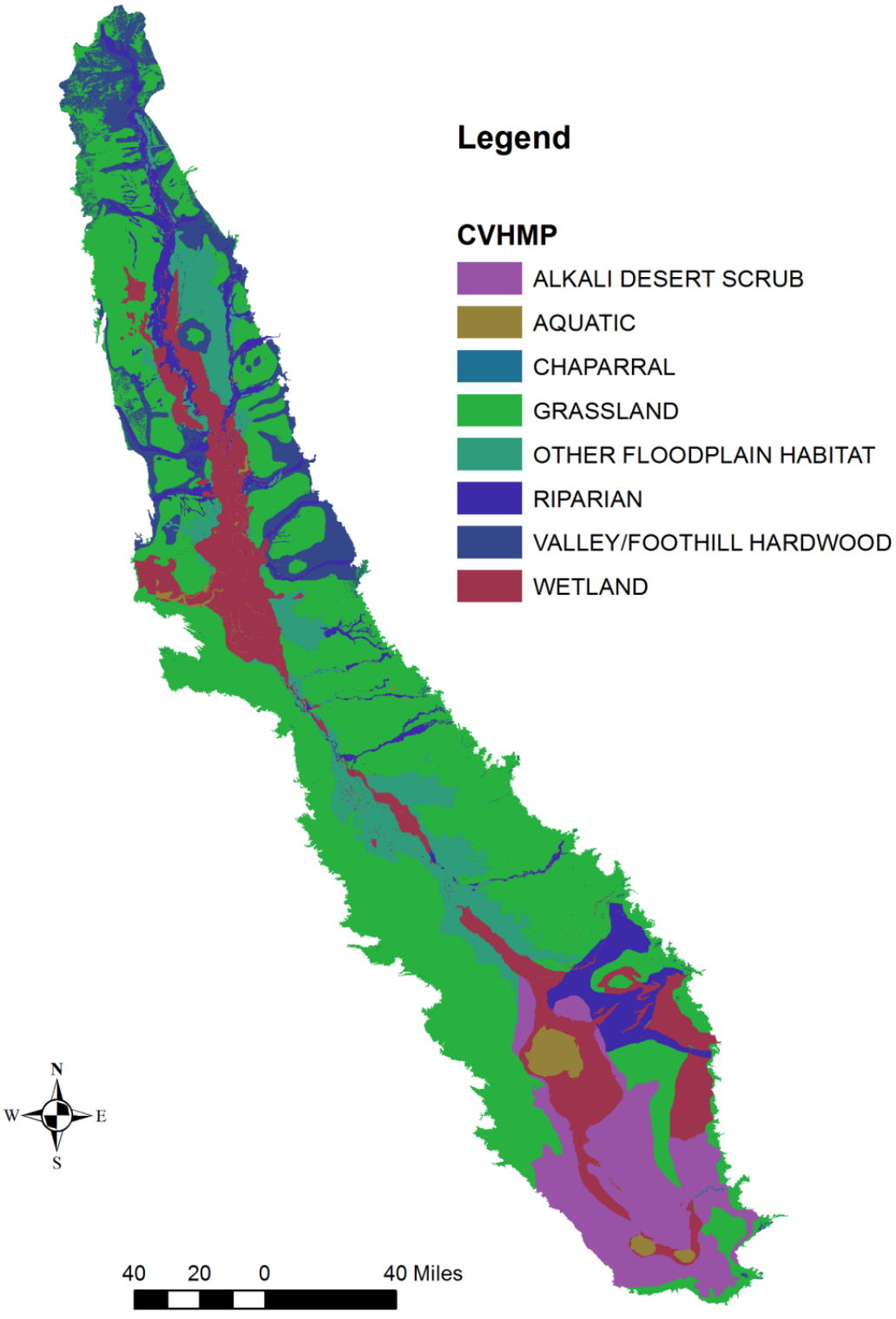


Figure 4-7. Valley Floor Vegetation from CSU Chico (2003)

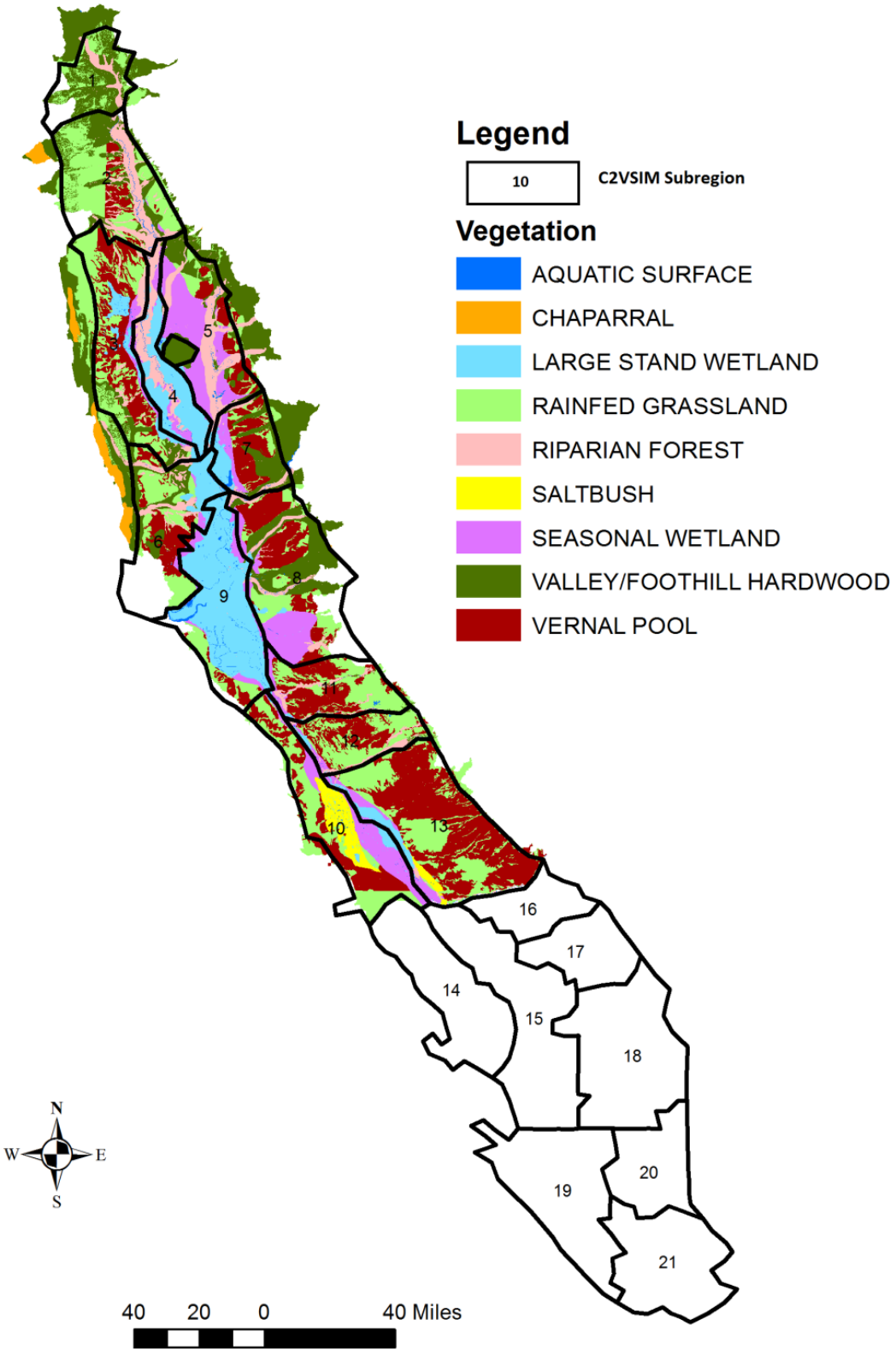


Figure 4-8. Valley Floor Vegetation from Fox et al. (2015)

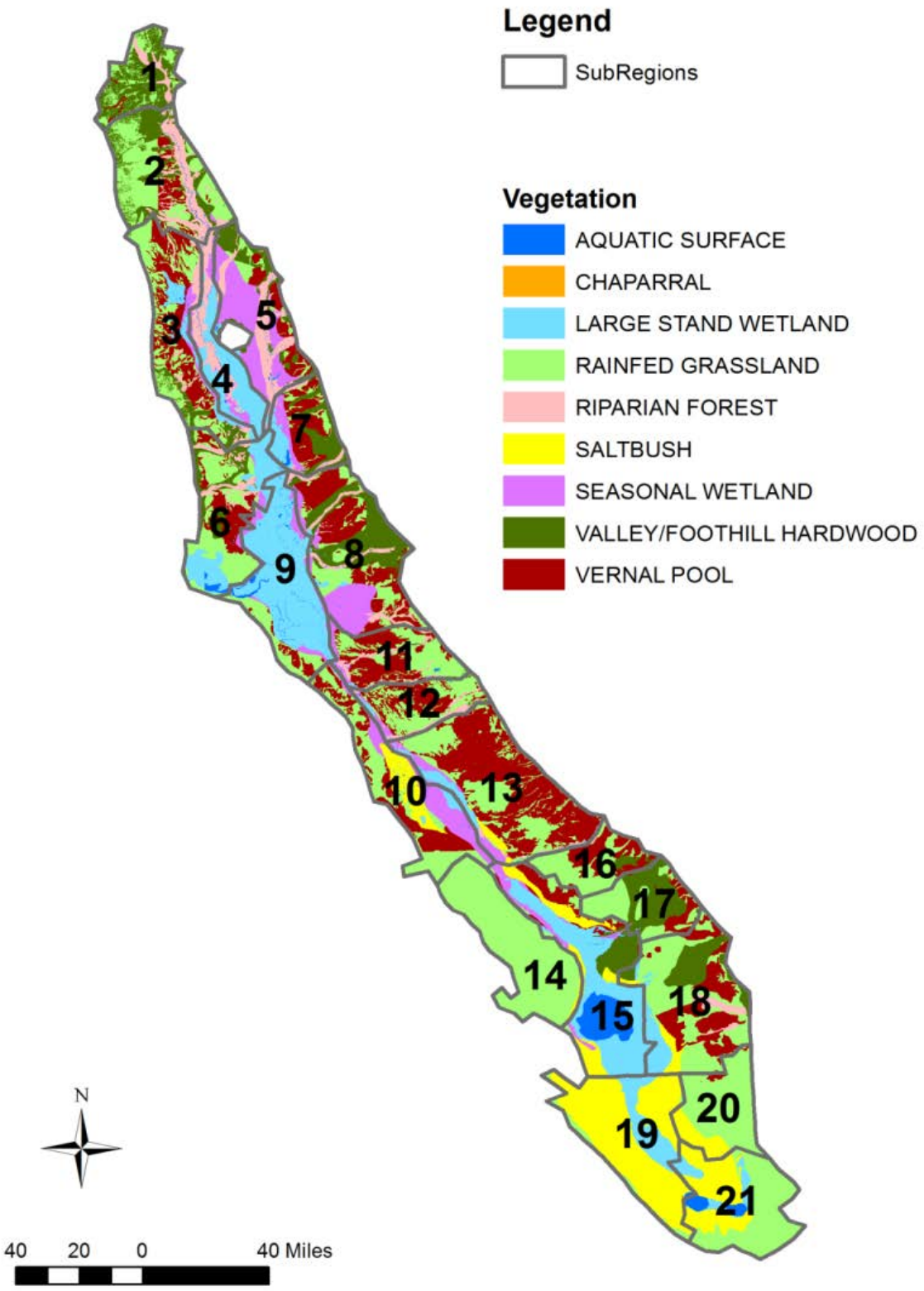
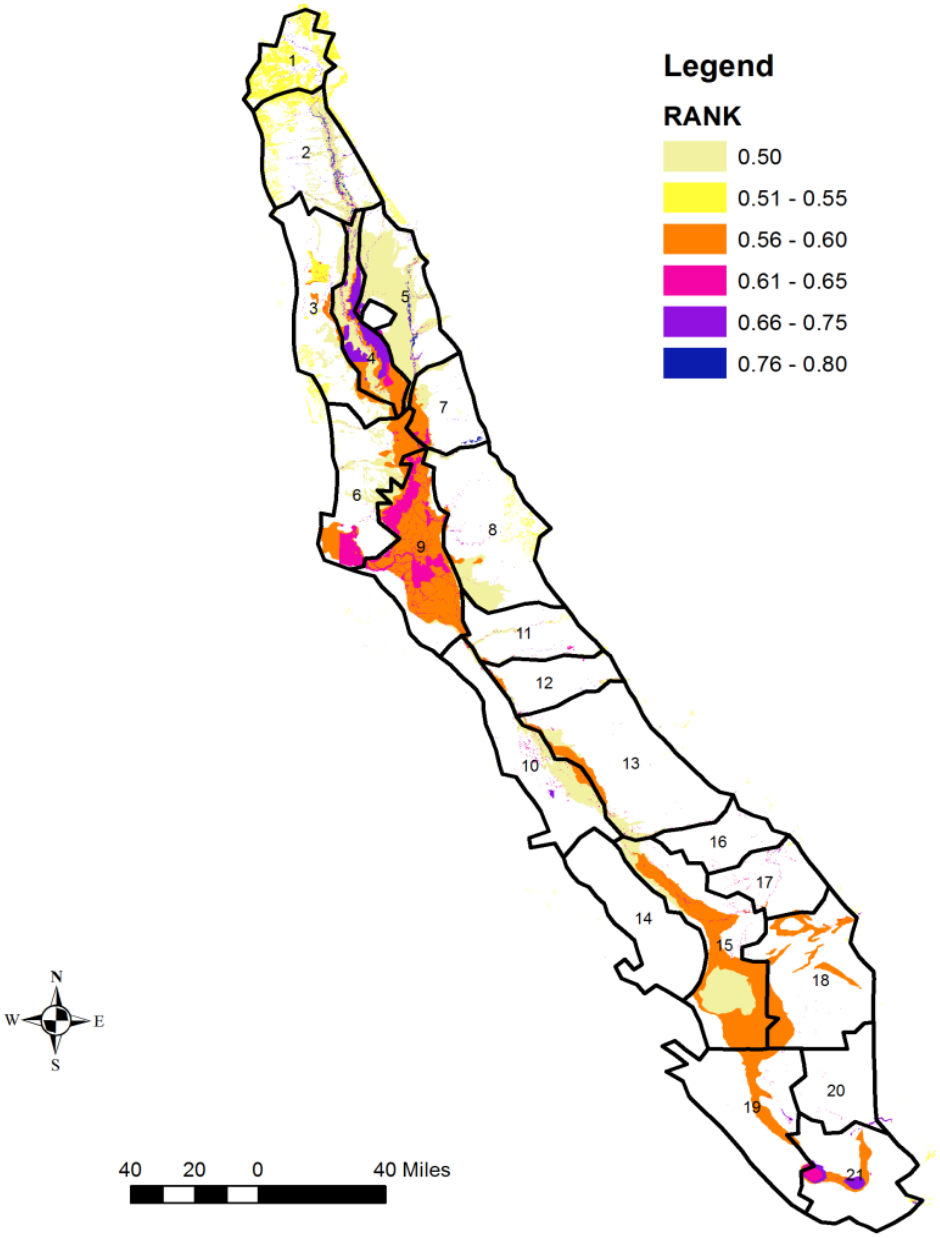


Figure 4-9. Native Vegetation Distribution under Pre-Development Condition Used in Natural Flow Simulations



Rank	Original Scale	Date Relevance to Time Period	Source Topic	Original Values
0.1 (Low)	<1:500,000	Potential, historic	Extremely unrelated	Extreme difference
0.3	>=1:500,000	+/- 100 years	Moderately unrelated	Significant difference
0.5	>=1:250,000	+/- 50 years	Equal target	Moderate difference
0.7	>=1:100,000	+/- 10 years	Significant target	Similar value
0.9 (High)	>=1:24,000	+/- 5 years	Exact target	Exact value

NOTES:
-Source topic refers to focus or intention of the map
-Original values are classifications used on the original data

Figure 4-10. Distribution of Mapping Source Ranking (>0.5) by CSU Chico (2003)

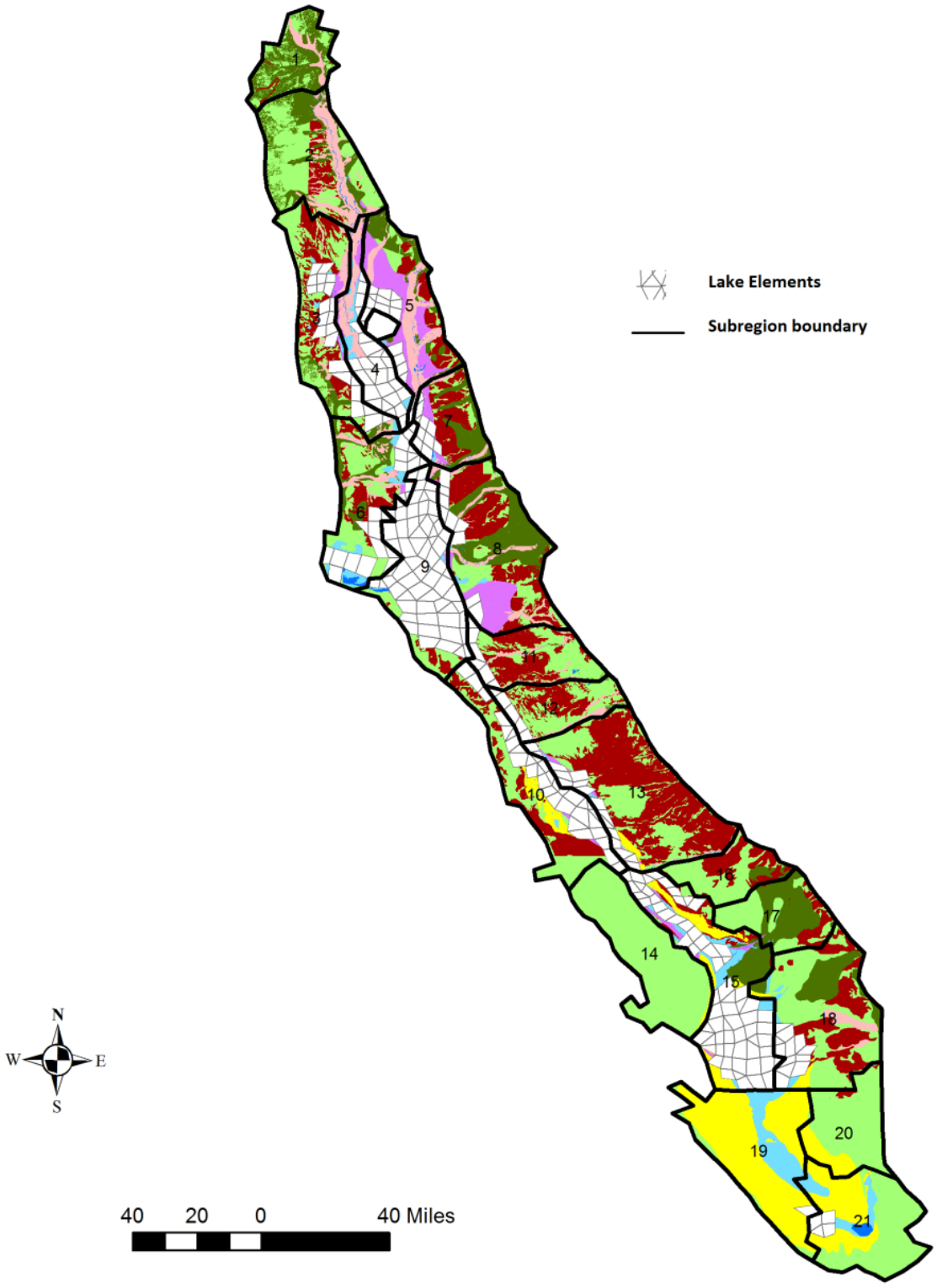


Figure 4-11. Permanent Wetlands and Some Vernal Pools are Represented as Lake Elements

Potential Evapotranspiration

Howes et al. (2015) is the best available data for evapotranspiration from natural vegetation in the Central Valley. We used their estimated monthly vegetation coefficients (Kc) with the grass reference crop evapotranspiration (ET_o) to estimate daily potential evapotranspiration ($ETc=Kc*ET_o$) for each vegetation type. Daily ET_o for each of 21 subregions was estimated from the CAL-SIMETAW model 4-km grid dataset (Orang et al. 2013). Actual evapotranspiration for all vegetation types is internally computed within C2VSim based on local water supply and ETc for each vegetation type at daily time step. Therefore, grassland, hardwoods, vernal pools, seasonal wetlands, saltbush, and chaparral all used potential evapotranspiration as evaporative demand input (Table 4-5).

Table 4-5. Monthly Vegetation Coefficients (Kc)

Vegetation	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rain fed Grassland	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Vernal Pool	1.00	1.00	1.00	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Permanent Wetland	0.70	0.70	0.80	1.00	1.05	1.20	1.20	1.20	1.05	1.10	1.00	0.75
Hardwood	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Seasonal Wetland	0.70	0.70	0.80	1.00	1.05	1.10	1.10	1.15	0.75	0.80	0.80	0.75
Riparian Forest	0.80	0.80	0.80	0.80	0.90	1.00	1.10	1.20	1.20	1.15	1.00	0.85
Saltbush	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Chaparral	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Aquatic Surface	0.65	0.70	0.75	0.80	1.05	1.05	1.05	1.05	1.05	1.00	0.80	0.60

Valley Floor Evapotranspiration and Delta Inflows

For long term averages under natural conditions, storage changes are negligible, and primary loss of water is through evapotranspiration. Actual evapotranspiration from each vegetation type is summarized in Table 4-6 with sources of water supply for Sacramento and San Joaquin Valleys and Eastside Streams regions, all draining into the Delta area. Soil water is derived from rainfall and groundwater uptake is limited by maximum root depths.

Since evapotranspiration demand peaks in the summer months, simulations reveal that seasonal storage changes play a key role in meeting the demand. As shown in Figure 4-12, for permanent wetlands, winter rainfall and overflowed flood waters fill up the flood basins before May, and then stored water will be used to meet evapotranspiration from June through October. As for riparian forest, stream water is consumed most during the summer months (Figure 4-13).

The overall long term water balance under natural condition for the Central Valley can be seen in Table 4-7 and Figure 4-14. From Figure 4-14, water supply sources (ignoring the Delta and Tulare Lake Basin) include rim stream inflows (28.1 MAF), ungauged small watersheds (2.6 MAF) and Valley Floor rainfall (9.7 MAF). However, 18.4 MAF was lost to evapotranspiration, and only 21.7 MAF reached the Delta boundary.

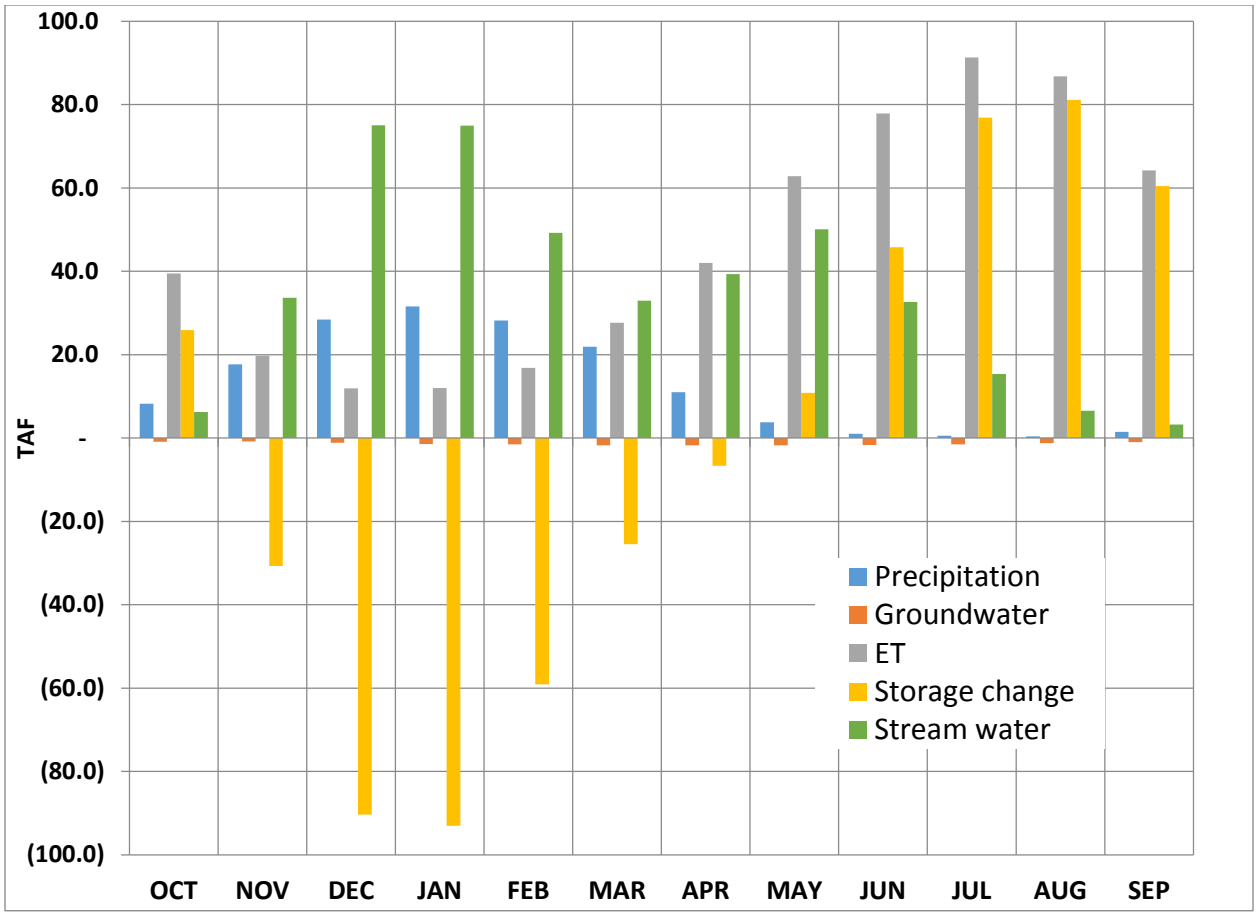


Figure 4-12. Stream Water Stored in the Wetlands/Lakes (negative yellow bar) and Used for Summer Month Evapotranspiration (positive yellow bar)

Table 4-6. Source of Simulated Water Supply for Different Native Vegetation Types

	Average Annual Evapotranspiration: 1922-2014 (TAF)[1]								
	Chaparral	Seasonal Wetlands	Vernal Pools	Grasslands	Hardwood	Riparian	Saltbush	Wetlands /Lakes[1]	Total
Soil water	0.3	419.4	773.1	1,992.4	1,555.3	1,929.2	44.7	0.0	6,714
Groundwater	0.0	194.1	53.5	367.1	1,235.4	430.8	59.8	-496.8	1,844
Stream water	0.0	0.0	0.0	0.0	0.0	3,688.8	0.0	4,220.1	7,909
Rainfall								1,570	1,570
Total	0.3	613.5	826.5	2,359.5	2,790.7	6,048.8	104.6	5,293.3	18,037

Notes:

[1] Excludes the Sacramento-San Joaquin Delta and the Tulare Lake Basin

[2] Riparian elements include vernal pools adjacent to streams. Lake elements are mainly permanent wetlands. Near the lake boundary, it could contain a small portion of seasonal wetlands, San Joaquin saltbush, and water surface or riparian forest.

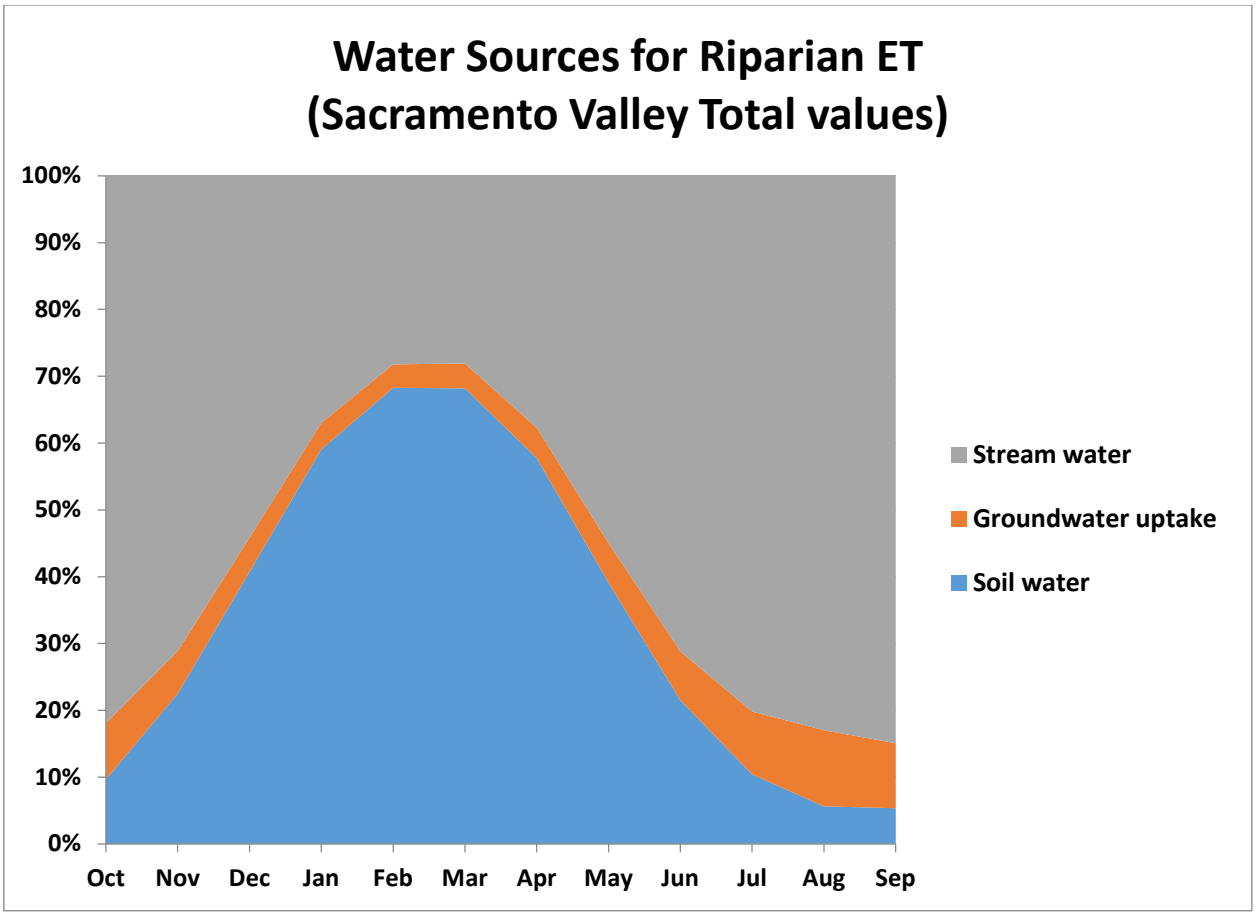
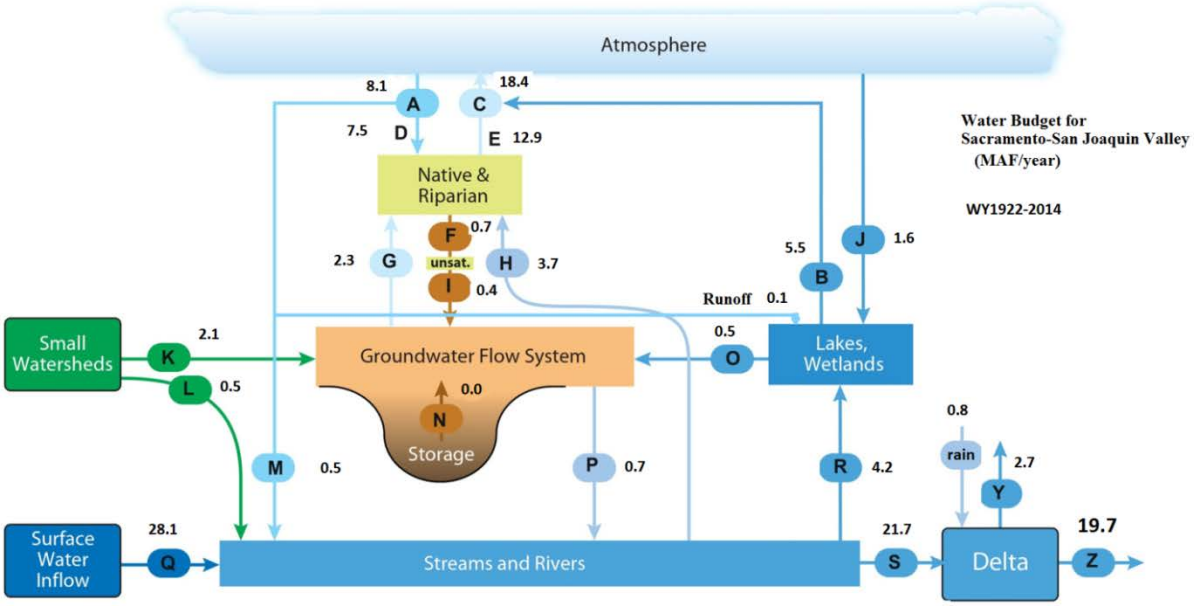


Figure 4-13. Partition of Water Sources for Riparian Evapotranspiration (Soil Water, Groundwater Uptake and Stream Water)

Table 4-7. Average Annual Water Budgets for Water Years 1922-2014 under Natural Conditions

Hydrologic Region	Area (sq. mile)	Average Annual Volumes: 1922-2014 (TAF)					
		Precipitation	Stream inflows	Small watershed inflows	Total Water Supply	Stream Outflows	Evapo-transpiration
Sacramento Valley	5,763	6,179	20,482	2,204	28,865	17,212	11,001
Eastside Streams	1,399	1,195	1,394	227	2,816	986	1,841
San Joaquin Valley	3,842	2,413	6,263	209	8,885	3,334	5,216
Subtotal	11,004	9,787	28,139	2,640	40,566	21,533	18,058
Delta	1,134	804	21,533	92	22,429	19,708	2,969
Tulare Lake Basin	7,852	3,310	2,438	350	6,098	41	6,057
Central Valley Total	19,990	13,901	30,577	3,083	46,664	19,708	27,169

Note:
Groundwater flows between boundaries are not significant.



Note: Tulare Lake Basin outflow toward the Delta is only 41 TAF

A Precipitation

B Evaporation from lakes and wetlands

C Total evapotranspiration and evaporation

D Precipitation to native and riparian Vegetation (N&RV) areas

E Evapotranspiration from N&RV areas

F Deep percolation below root zone from N&RV areas

G Ground water uptake to N&RV areas

H Stream flow to riparian vegetation

I Net deep percolation from N&RV (unsaturated zone to ground water)

J Precipitation on lakes and wetlands

K Boundary small watersheds to valley floor ground water

L Boundary small watersheds to valley floor streams

M Precipitation runoff to streams

N Increase in ground water storage

O Net deep percolation from lakes and wetlands

P Stream – ground water interaction

Q Major Stream inflows to valley floor (upper watersheds SWAT model outflows)

R Overbank flows from streams to lakes and wetlands

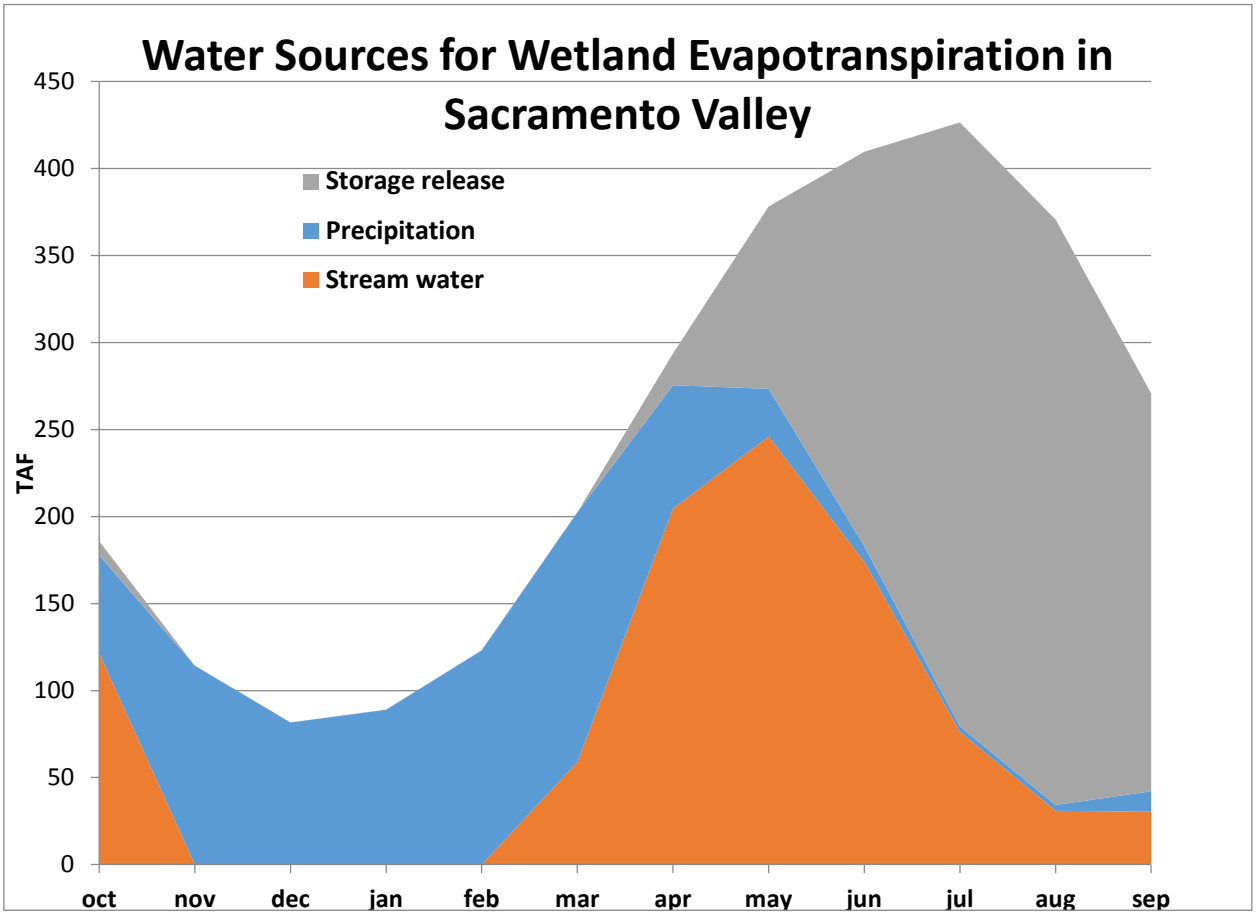
S Delta inflow

Y Delta depletion

Z Delta outflow

Key: MAF = million acre-feet SWAT = Soil Water Assessment Tool TAF = thousand acre-feet

Figure 4-14. Schematic of Central Valley Overall Water Budget



Note: Rainfall and overflowed stream water in the winter months fills up wetlands/lakes storage.

Figure 4-15. Stacked Area Plot of Monthly Water Supply Components for Wetlands (lakes) Evapotranspiration in Sacramento Valley

Sacramento-San Joaquin Delta Inflows and Outflows

Sacramento-San Joaquin Delta Inflows

Delta inflows consist of stream outflows at the Delta boundary from the Sacramento Valley, Eastside Streams, and San Joaquin Valley (Table 4-8 and Figure 4-16). Sacramento Valley inflow peaks in March while the peak flows in Eastside Streams and San Joaquin Valley are in May.

Because of evapotranspiration, the net stream depletion from natural rim inflows to Delta inflows actually peaks in May, comparing to unimpaired rim inflows, outflows from Eastside streams, and especially San Joaquin Valley have been greatly decreased, and as a result, the flow peak in May shown in unimpaired flows disappears from Delta Inflows (Figure 4-17).

Table 4-8. Estimated Natural Delta Inflows

Flow Items	Average Monthly Flows: 1922-2014 (TAF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Sacramento Valley	262	792	1,860	2,490	2,727	2,966	2,525	1,973	1,028	348	131	111	17,212
Eastside Streams	14	40	86	106	125	148	149	182	115	15	2	5	986
San Joaquin Valley	35	90	197	263	307	426	522	701	516	196	52	30	3,334
Total Delta Inflows	312	922	2,142	2,859	3,159	3,539	3,195	2,856	1,659	559	185	145	21,533
Natural Rim Inflows	700	1,455	2,689	3,227	3,567	4,043	3,881	3,876	2,559	1,151	559	437	28,144
Net Stream depletion	388	532	547	368	408	504	686	1,020	900	592	373	292	6,611

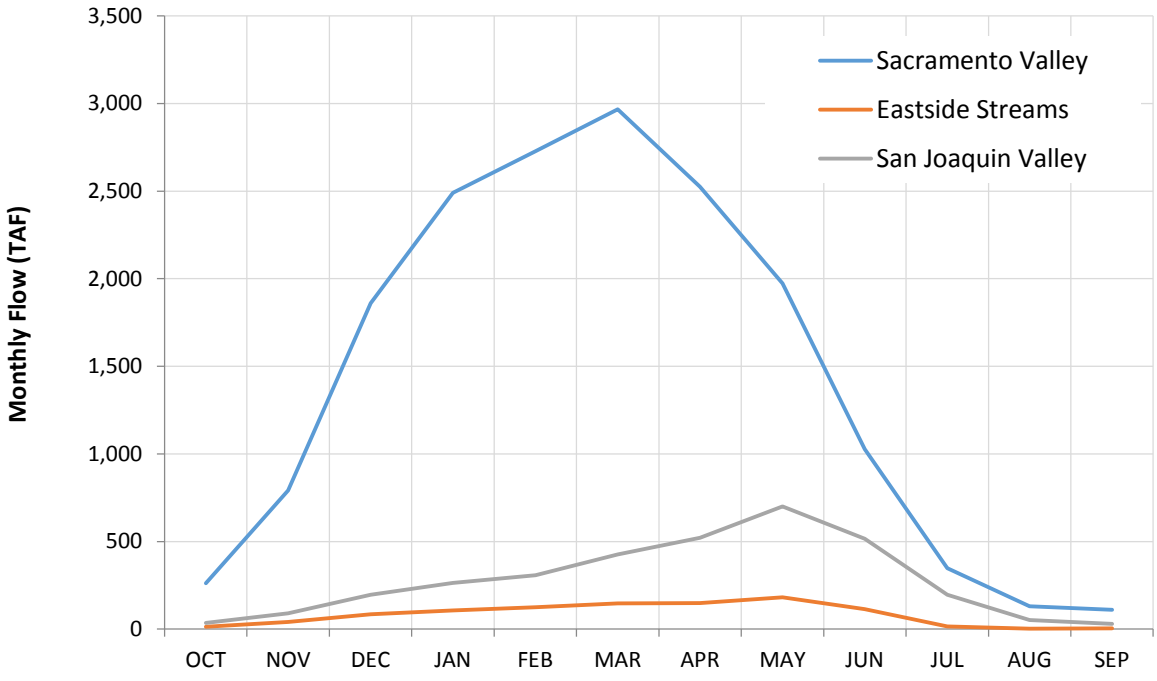


Figure 4-16. Estimated Natural Delta Inflows

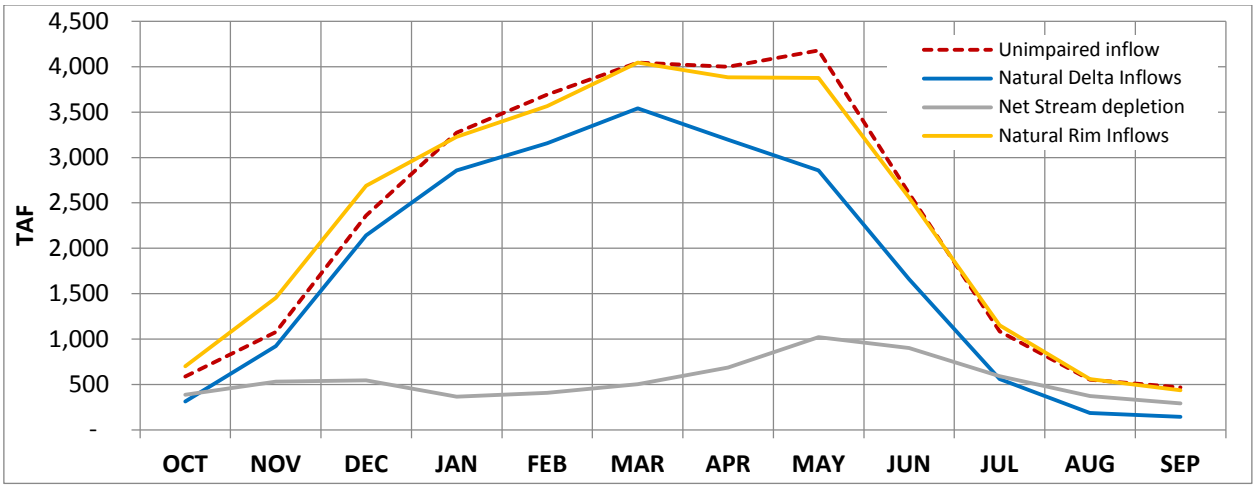


Figure 4-17. Natural Delta Inflows, and Natural/Unimpaired Rim Inflows Monthly Distribution

Sacramento-San Joaquin Delta Consumptive Use

Under natural conditions, about 86 percent of Delta area is covered with permanent wetlands or water surface. Of the remaining Delta area, riparian forest accounts for 4 percent and non-riparian native vegetation accounts for 10 percent. As shown in Table 4-9, at nearly 3 MAF, Delta evapotranspiration is significant. As shown in Table 4-10, this demand is effectively met by depletion of stream water (2.2 MAF) and rainfall (0.8 MAF).

Table 4-9. Delta Actual Evapotranspiration

	Average Annual Volumes: 1922-2014 (TAF)			
	Riparian ET	Non-riparian Native Vegetation ET	Wetlands/Lakes ET	Total
Delta	129	70	2,778	2,977

Table 4-10. Sources of Delta Water Supply for Evapotranspiration

Water Supply	Average Annual Volumes: 1922-2014 (TAF)	
	Wetlands	Root Zone (Including Riparian)
Stream water	2,138	109
Rainfall	709	96
Groundwater	(59)	10
Storage change	(10)	0
Total	2,778	215

Sacramento-San Joaquin Delta Outflows

Natural net Delta outflows equal Delta inflows minus Delta evapotranspiration. The baseline estimated net Delta outflow is 19.7 MAF. The water year 1922-2014 monthly distribution is listed in Table 4-11 and plotted in Figure 4-18. Compared to unimpaired outflow estimates,

natural Delta outflow is lower, particularly in the dry season. Under natural condition, riparian forests use stream water mostly in the dry season and wetland water storage in the flood plains is used for wetland evapotranspiration, with stream accretion occurring in the winter months.

Table 4-11. Average Monthly Natural Net Delta Outflow

	Average Monthly Flow: 1922-2014 (TAF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Delta Outflow	280	760	1,859	2,634	3,012	3,406	3,012	2,567	1,414	467	164	133	19,708

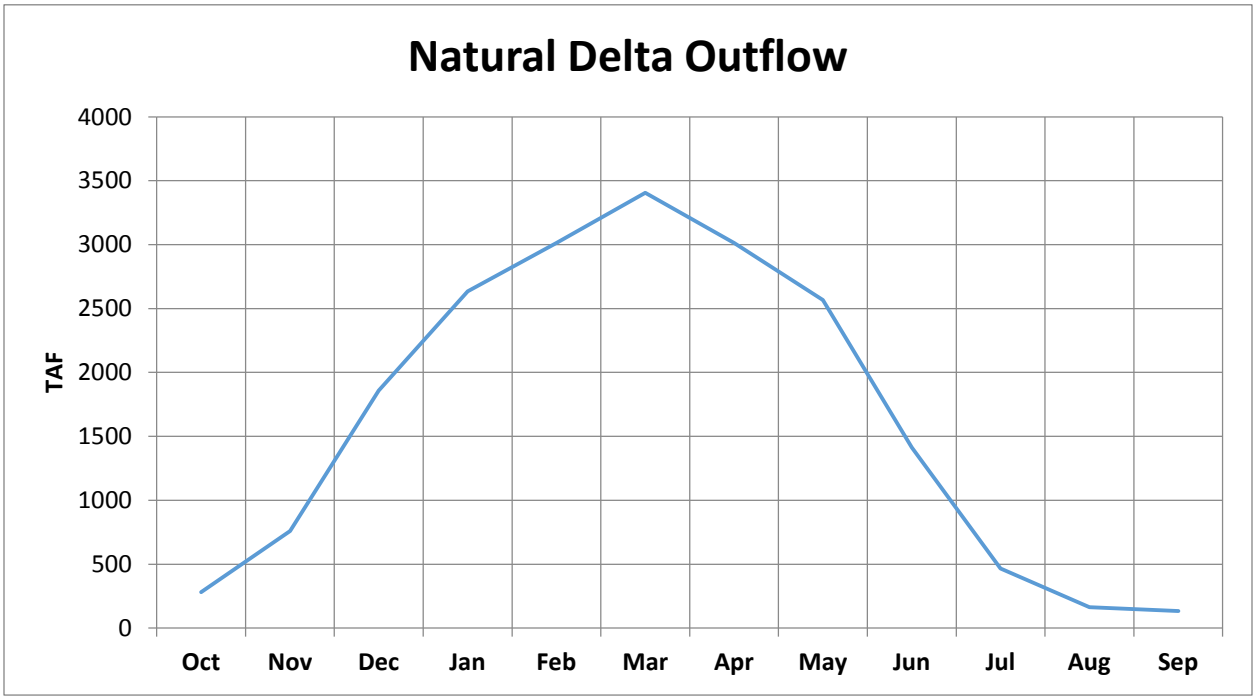


Figure 4-18. Estimated Natural Delta Outflow

Tulare Lake Basin

The Tulare Lake Basin water budget was simulated in detail as part of the Valley Floor. Tulare Lake Basin outflow into the Delta is through a stream reach (Fresno Slough) connecting to the San Joaquin River. The Kings River was assumed to generally flow south into Tulare Lake and spill into Fresno Slough only when Tulare Lake water levels exceed 206 feet elevation. Historically, Tulare Lake basin has been considered to be a closed basin.

Simulation results show that Tulare Lake Basin outflow into the Delta is very small; it averages only 41 TAF per year for the period spanning water years 1922-2014. The Kings, Kaweah, Tule and Kern River stream inflows are evaporated and transpired by riparian forest and wetlands (Tulare Lake and Buena Vista Lake). With all available stream inflows draining into Tulare Lake

before it can overflow to Fresno Slough, the lake rarely fills to the maximum water level (Figure 4-19). This demonstrates the very high evapotranspiration demand in the Tulare Lake Basin compared to its limited water supply under natural conditions.

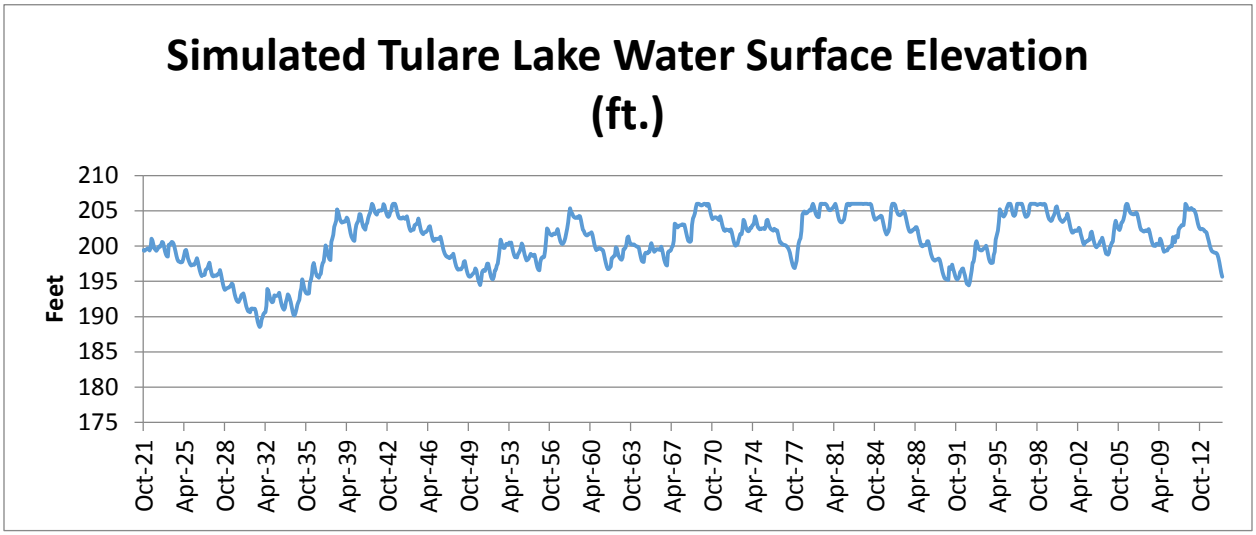


Figure 4-19. Simulated Tulare Lake Water Levels (WY1922-2014)

Delta Outflow ranges due to Model Input and Parameter Sensitivity and Uncertainties

Natural Delta outflow is fresh water that discharges into San Francisco Bay after Valley Floor and Delta evapotranspiration. Therefore, the main model simulation factors affecting Delta outflow are parameters for evapotranspiration (especially those for riparian vegetation and wetlands that have direct access to stream water), lake-groundwater interaction parameters, vegetation spatial distribution and the way each vegetation type is simulated, and extinction depth for groundwater uptake.

Potential Evapotranspiration (ET_c)

When the ET_c input is uniformly changed by a constant factor with other parameters and inputs held constant at the base case values, the effect on the natural Delta outflow estimate is summarized in Table 4-12. Actual evapotranspiration from non-riparian vegetation (e.g. grassland and hardwoods) is water supply limited. Thus, when ET_c for these vegetation classes is perturbed by -10 percent to +20 percent, the resulting change in Delta outflow is small (2 percent). However, when ET_c for riparian forest and permanent wetlands is perturbed by the same amounts, changes in actual evapotranspiration are more significant and result in greater changes in Delta outflow.

Table 4-12. Changes in Delta Outflow Due to Potential Evapotranspiration Values

	Changes in Potential Evapotranspiration-ET_c		
Changes in actual ET and Delta Outflow	-10%	10%	20%
Non-riparian	-2%	1%	2%
Riparian	-7%	6%	13%
Permanent wetlands	-8%	7%	13%
Delta Outflow	7%	-6%	-11%

Simulating Permanent Wetlands as Lakes

In the C2VSim natural flow model, 26 lakes are defined for major historical flood basins (Butte, Sutter, Colusa, Yolo, American, and Sacramento Basins), known lakes (Tulare Lake) and minor local seasonal wetlands or vernal pools (Figure 4-20). Lake parameters include conductance of lake bed materials that controls lake-groundwater interaction, maximum lake elevation defining lake surface wetted area and outflow volume and timing and rating for stream overflow into lakes.

Lakebed conductance values have significant impact on lake-groundwater interaction. Under natural flow condition, a very small conductance of 0.003 is used to constrain the interaction flux. If a larger value is used (0.3~3.0), water in the lakes would easily be drained through groundwater interaction and show up in the Delta as groundwater inflow, with corresponding reduced stream inflow. Large groundwater flux from the Valley Floor to the Delta was considered to be unrealistic.

Overflow rating tables are defined and adjusted to have reasonable maximum stream flow rates in the main stream channels. For example, maximum daily flows at the Sacramento River below Verona cannot exceed 120,000 cubic feet per second. Overflow rating into Yolo Basin is adjusted to meet this requirement. Stream water into flood basins (lakes/wetlands) flow back into streams or downstream lakes when maximum lake elevation is reached.

Maximum lake elevation is determined by GIS map boundary of permanent wetlands. If a lake element node has a land elevation higher than the maximum lake elevation, it would be dry throughout the simulation process.

Figure 4-20. Distribution of Lakes/Wetlands

Vernal Pools

A significant portion of native vegetation is designated as vernal pools. Vernal pool hydrology is more complex than rain fed grassland. In addition to soil water and groundwater uptake, local runoff, perched groundwater, and flood water from local streams and creeks can supply water to vernal pools. The current model configuration and algorithm only allows riparian vegetation to have access to stream water. Therefore, without any special treatment in the C2VSim model, water available to vernal pools is limited to soil water and groundwater uptake (similar to grassland and hardwood vegetation classes).

For the base case, vernal pools in elements next to river reaches are treated as riparian vegetation and can access stream water when there is stream water available. This special treatment implicitly takes into account the small watersheds and local rainfall-runoff draining into nearby vernal pools. A sensitivity model run restricting water availability to vernal pools results in a long term annual average Delta outflow of 21.2 MAF, which is 1.5 MAF more than the baseline value of 19.7 MAF.

In Howes et al. (2015) and Fox et al. (2015), vernal pool water use in the San Joaquin Valley is about 2.2-2.9 feet per year or about 3.5 MAF. Our analysis does not support such a high overall water use, because San Joaquin Valley Floor non-lake land surface precipitation is 1.9 MAF (shared with grassland, hardwoods, etc. in the area), and there is very little local rainfall-runoff or small watersheds runoff. Furthermore, rim stream water inflows concentrate at a few major streams: San Joaquin River above Millerton, Merced River, and Stanislaus River (Figure 4-21). Vernal pools adjacent to smaller rivers such as Fresno River, Chowchilla, and Calaveras Rivers would have very limited water supply. Element level water balance is an advantage of this distributed, integrated modeling approach. It is possible that total vernal pool area in the San Joaquin Valley may have been overestimated. Instead of a continuous area distribution, the vegetation could be distributed more sporadically. Vernal pool area definition should be limited to pool surface.

Figure 4-21. Location of Vernal Pools, Streams, Small and Rim Watersheds

Groundwater Uptake

Even though the area of hardwood vegetation is only 24 percent of the total non-riparian vegetation, groundwater uptake from this class exceed 50 percent of total groundwater uptake in the Valley Floor. Almost all of this is located in the Sacramento Valley and Eastside Streams regions. The volume of groundwater uptake is determined by groundwater tables and the maximum rooting depth. Canadell et al. (1996) reviewed maximum rooting depth of vegetation types in the scientific literature. Root depths of large trees and some shrubs can be as deep as 50-100 feet. The ranges vary greatly by species and locations. Doubling the maximum rooting depths of all vegetation classes results in a 1.2 MAF decrease of Delta outflow relative to the base case. On the other hand, reducing maximum rooting depths by 50 percent will increase Delta outflow by 0.6 MAF.

Uncertainties from Combination of Impact Factors

When major model parameters and inputs are perturbed within certain ranges simultaneously, one would expect a distribution for range of natural Delta outflows. We used the PEST (Doherty 2015) package tool to do random samplings of five screened major factors with predefined ranges:

- Scale factor for ET_c: (0.9, 1.2)
- Lakebed conductance (0.001, 0.006)
- Extinction depths of groundwater uptake for riparian forest (10,40) and hardwoods (20, 160)
- Partition parameter of surface runoff and groundwater flow in small watersheds (0.0, 20.0).

Because the clock time for a model run on a current PC is about 2.5 hours, only 30 model runs were conducted. The results (Figure 4-22) are still revealing. The estimated Delta outflow range is between 17.1 and 21.5 MAF, with the most sensitive parameter being ET_c (Figure 4-23). Figures 4-24 and 4-25 show the sensitivity of simulated Delta outflow to vegetative crop coefficients and unit evapotranspiration.

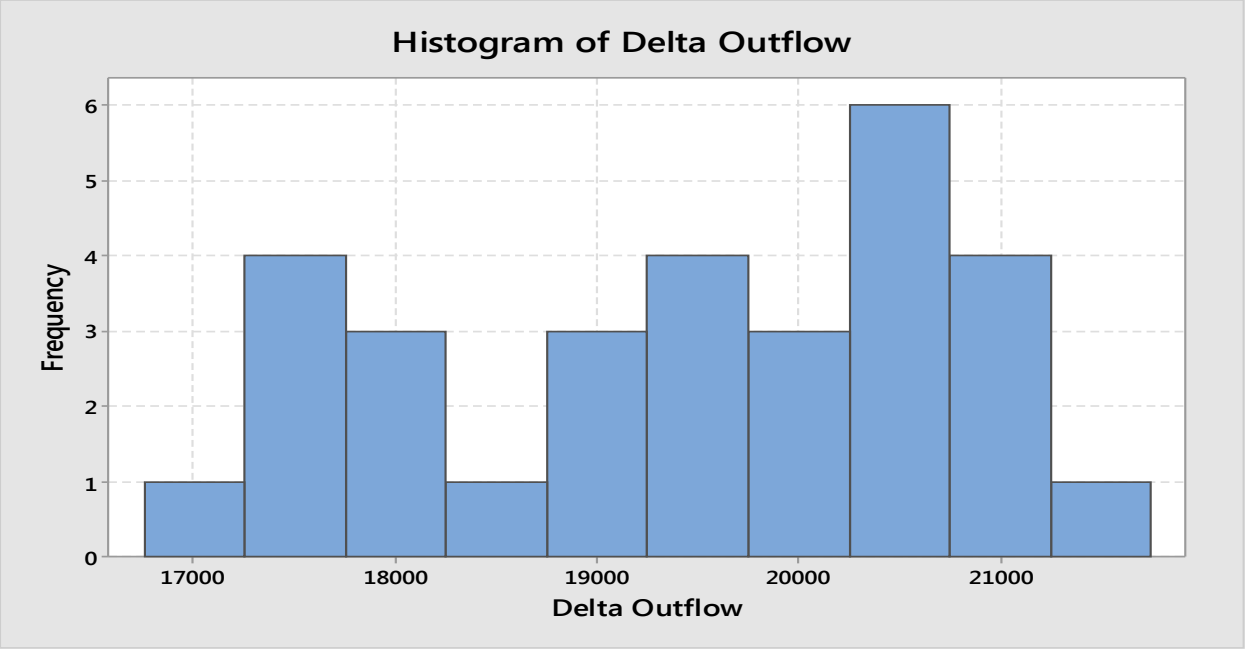


Figure 4-22. Histogram of Estimated Delta Outflows with 30 Sampling Combinations of Major Model Parameters and Inputs

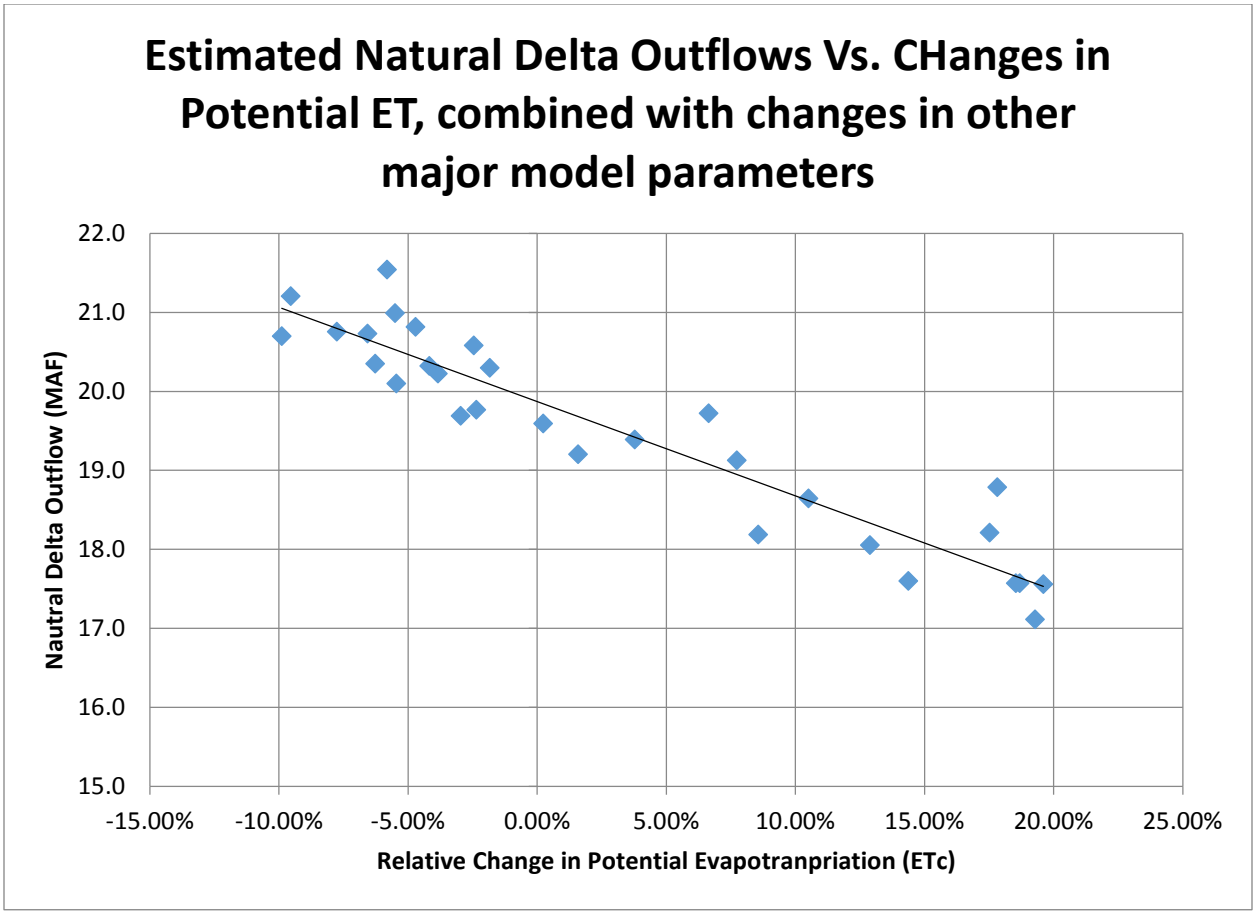


Figure 4-23. Sensitivity of Delta Outflow to Model Inputs and Parameters

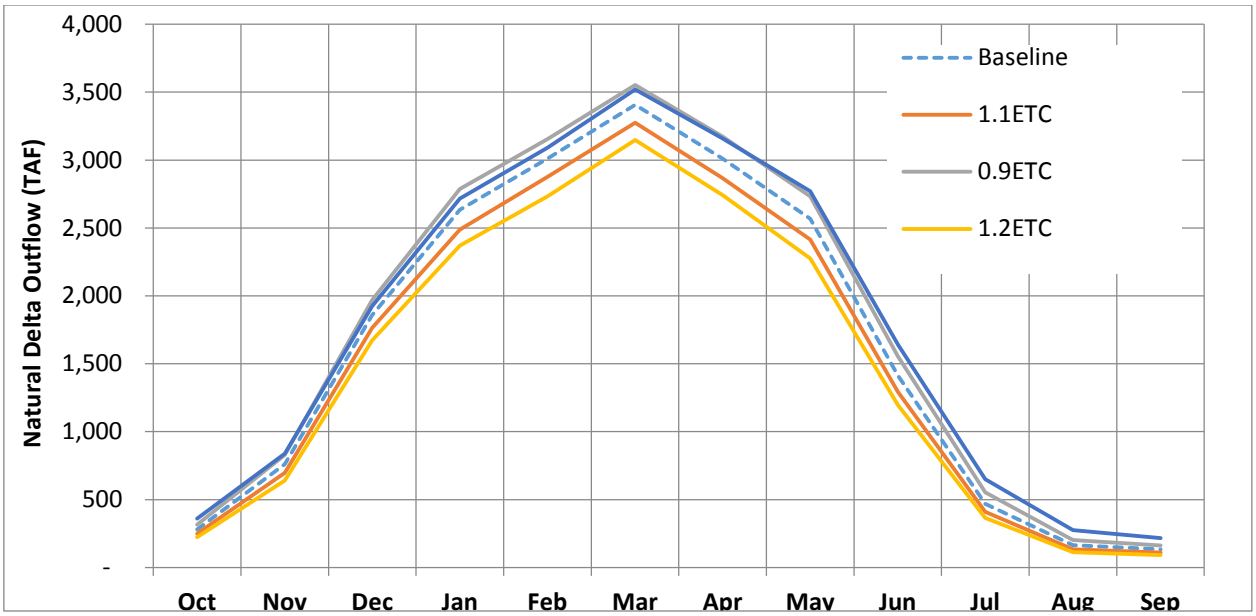


Figure 4-24. Monthly Distribution of Estimated Delta Outflow under Different Assumptions

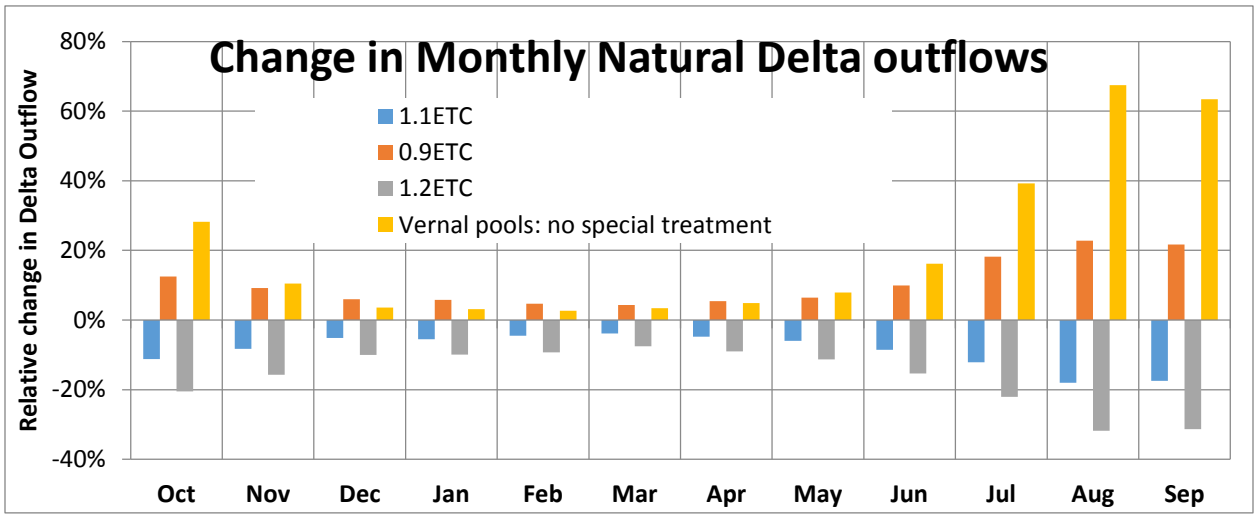


Figure 4-25. Changes in Monthly Delta Outflows for Different Sensitivity Model Runs

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5. COMPARISON BETWEEN NATURAL FLOWS AND UNIMPAIRED FLOWS

Estimated unimpaired flows reaching the Delta (i.e. Delta inflows) assume current channels and levees and, as a result, do not consider depletions or accretions on the valley floor other than depletions of valley floor rainfall runoff. The unimpaired flows estimates do not account for depletions from riparian vegetation, stream-groundwater interaction, and bank overflow to the flood plains and associated depletions from wetland vegetation. The natural flow estimates presented in this report, on the other hand, take into account all these depletions and accretions. The remainder of this chapter provides comparisons between natural and unimpaired flow estimates for rim watersheds, the valley floor and Delta inflow, and Delta outflow.

Rim Watershed Outflows

Upper rim watersheds, located in the foothill and mountain regions of the Sierra Nevada and California Coast Ranges, are relatively undeveloped. Precipitation-runoff processes are assumed to be assumed unchanged from natural condition for a given climate. Therefore, simulated natural outflows from these watersheds should be similar to estimates of unimpaired flows. As discussed in Chapter 4, the SWAT models used to simulate the upper rim watersheds were calibrated to match unimpaired flows. Table 5-1 compares SWAT simulated natural flows at unimpaired flow subbasin locations with unimpaired flow estimates for Water Years 1922-2014.

Unimpaired rim inflows entering the Valley Floor were not routed through main channels and bypasses. In the Delta, estimated natural inflows from Putah and Cache Creeks are very close numerically to estimated unimpaired flows but stream depletions or accretions from riparian vegetation and stream-groundwater interaction still applied before they directly entered the Yolo basin. Sacramento Valley, Eastside streams and San Joaquin Valley Delta inflows are significantly impaired after flowing through the valley floor before entering the Delta.

Table 5-1. Comparison of Natural and Unimpaired Average Monthly Flows

	Average Monthly Flows (thousand acre-feet)												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
UF 2 – Putah near Winters													
SWAT	2	8	47	81	78	61	37	23	14	9	5	3	368
Unimpaired	2	11	55	87	98	68	34	11	4	2	1	0	373
UF 3 – Cache above Rumsey													
SWAT	3	20	58	94	105	90	64	44	26	16	8	3	532
Unimpaired	5	11	52	93	120	109	68	39	23	15	10	6	551
UF 4 – Stony at Black Butte													
SWAT	4	23	75	103	93	81	45	19	7	3	1	1	454
Unimpaired	2	11	50	89	97	77	49	27	9	1	0	0	412
UF 5 – Sacramento Valley West Side Minor Streams													
Elder	1	3	11	14	13	11	5	2	1	0	0	0	61
Thomes	3	8	28	38	41	37	24	14	9	7	5	3	217
SWAT Total	4	12	39	52	55	47	29	16	10	7	5	3	278
Unimpaired	3	15	51	78	90	81	65	40	13	3	1	1	441
UF 6 – Sacramento River near Red Bluff													
Cow	7	23	66	86	86	78	51	33	13	4	2	2	450
Paynes	1	3	8	12	12	9	4	2	1	0	0	0	52
Cottonwood	7	18	72	120	123	111	67	39	18	7	4	4	591
Battle	16	21	33	40	40	41	38	36	27	18	14	14	338
Sacramento at Shasta	233	395	593	635	721	791	630	447	322	263	218	187	5,434
SWAT Simulated	263	459	772	892	983	1029	791	557	380	292	239	208	6,865
Unimpaired Flow	308	441	844	1134	1244	1251	975	704	443	303	259	262	8,168
UF 7 – Sacramento Valley East Side Minor Streams													
Deer	9	26	53	65	67	65	43	28	12	5	3	3	379
Big Chico	3	9	22	28	30	28	19	14	6	2	1	1	162
Butte and Chico	18	28	61	83	95	98	86	65	37	22	18	15	627
Mill	6	18	34	40	39	36	27	20	10	5	3	3	241
SWAT Simulated	36	81	170	216	231	228	175	126	65	34	25	22	1,410
Unimpaired Flow	35	59	128	169	181	182	155	123	72	41	31	28	1,204
UF 8 – Feather River near Oroville													
SWAT Simulated	105	206	393	504	570	710	667	543	318	171	99	72	4,357
Unimpaired Flow	105	184	375	480	539	658	678	627	325	152	101	86	4,310
UF 9 – Yuba River at Smartville													
SWAT Simulated	63	152	262	268	277	310	334	377	200	40	14	15	2,312
Unimpaired Flow	32	87	200	256	285	330	361	404	207	57	23	19	2,261
UF 10 – Bear River near Wheatland													
SWAT Simulated	6	22	45	55	65	62	40	17	5	3	2	2	323
Unimpaired Flow	5	13	41	57	66	61	39	18	7	3	1	2	313

Table 5-1. Comparison of Natural and Unimpaired Average Monthly Flows contd.

	Average Monthly Flows (thousand acre-feet)												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
UF 11 – American River at Fair Oaks													
SWAT Simulated	49	136	256	289	290	364	416	477	301	101	28	16	2,724
Unimpaired Flow	25	82	203	288	316	387	441	493	265	67	16	12	2,595
UF 13 – Cosumnes River at Michigan Bar													
SWAT Simulated	3	15	37	47	58	71	66	49	14	3	1	0	364
Unimpaired Flow	2	9	30	54	64	75	65	43	16	4	1	1	364
UF 14 – Mokelumne River at Pardee Reservoir													
SWAT Simulated	15	29	42	43	61	92	116	179	128	21	4	6	734
Unimpaired Flow	6	18	37	51	59	82	125	189	117	26	5	3	718
UF 15 – Calaveras River at Jenny Lind													
SWAT Simulated	1	7	26	40	40	31	21	8	1	0	0	0	176
Unimpaired Flow	1	4	16	31	39	36	22	7	2	1	0	0	159
UF 16 – Stanislaus River at Melones Reservoir													
SWAT Simulated	20	38	52	58	90	145	215	283	174	53	11	10	1,149
Unimpaired Flow	10	26	54	80	93	130	193	279	173	53	12	7	1,110
UF 18 – Tuolumne River at Don Pedro Reservoir													
SWAT Simulated	44	91	155	173	191	248	283	368	270	80	16	18	1,937
Unimpaired Flow	18	46	89	122	142	192	276	444	348	122	26	12	1,837
UF 19 – Merced River at Exchequer Reservoir													
SWAT Simulated	10	32	54	60	78	117	155	213	168	68	9	3	967
Unimpaired Flow	8	19	43	66	82	102	148	240	170	56	13	6	953
UF 20 – Chowchilla River at Buchanan Reservoir													
SWAT Simulated	1	4	12	17	23	23	11	3	1	0	0	0	95
Unimpaired Flow	0	1	6	12	17	17	11	4	1	0	0	0	69
UF 21 – Fresno River near Daulton													
SWAT Simulated	1	6	14	20	28	29	17	5	1	0	0	0	120
Unimpaired Flow	0	2	6	11	16	19	15	9	5	2	0	0	85
UF 22 – San Joaquin River at Millerton Reservoir													
SWAT Simulated	19	45	73	84	113	169	252	403	355	187	54	18	1,772
Unimpaired Flow	20	33	60	83	100	144	237	431	371	167	51	23	1,720

Notes:

[1] In C2VSim, UF 5 includes two separate stream inflows, Thomes Creek and Elder Creek. Furthermore, the Red Bank group and ungauged runoff in UF5 are part of small watersheds in C2VSim.

[2] UF6 includes five separate stream inflows: 1, Sacramento River (Shasta Lake), 2, Cow Creek, 3, Battle Creek, 4, Paynes and Seven mile Creek, 5, Cottonwood Creek, and a few small watersheds with a portion of Valley Floor rainfall-runoff in Subregion 1. Therefore, the sum of C2VSim stream inflows does not add up to unimpaired flow UF6.

[3] UF7 includes separate stream inflows from Mill Creek, Deer Creek and Big Chico Creek and adjacent ungauged runoff.

Key: SWAT = Soil Water Assessment Tool, UF = unimpaired flow

Valley Floor Water Supply and Delta Inflows

The valley floor water supply includes stream inflows from the major rim mountainous watersheds, inflows from the minor small watersheds, and valley floor rainfall. Water supply to the valley floor can be assumed to be the same for natural and unimpaired conditions. However, as previously discussed, natural Delta inflows are significantly reduced from rim inflows because of evaporative use of water from riparian forests, grasslands, and wetlands. Comparisons between natural and unimpaired Delta inflow estimates are provided in Table 5-2.

Table 5-2. Comparison of Natural and Unimpaired Delta Inflows

Flow Items	Average Annual Flows: 1922-2014 (TAF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
	Natural Flow Estimates												
Sacramento Valley	262	792	1,860	2,490	2,727	2,966	2,525	1,973	1,028	348	131	111	17,212
Eastside Streams	14	40	86	106	125	148	149	182	115	15	2	5	986
San Joaquin Valley	35	90	197	263	307	426	522	701	516	196	52	30	3,334
Total Delta Inflows	312	922	2,142	2,859	3,159	3,539	3,195	2,856	1,659	559	185	145	21,533
	Unimpaired Flow Estimates												
Sacramento Valley	526	938	2,092	2,870	3,187	3,333	2,937	2,515	1,375	646	443	416	21,278
Eastside Streams	10	39	119	205	251	278	263	257	140	33	7	5	1,607
San Joaquin Valley	58	133	282	416	509	667	934	1,457	1,102	409	104	48	6,119
Total **Delta Inflows**	594	1,110	2,492	3,492	3,947	4,278	4,134	4,230	2,617	1088	554	469	29,003
Total Difference	-282	-188	-350	-633	-788	-739	-939	-1374	-958	-529	-369	-324	-7,472

Delta Outflow

Table 5-3 compares average annual and monthly natural and unimpaired Delta outflow estimates for the period spanning water years 1922-2014. Average annual estimates are significantly lower for natural conditions (19.7 MAF) relative to unimpaired conditions (28.2 MAF). Figures 5-1 displays a comparison between natural and unimpaired annual values by 40-30-30 water year type. Similarly, Figures 5-2 through 5-7 display comparison between natural and unimpaired monthly values by water year type.

The annual and monthly natural and unimpaired Delta outflow estimates for the period spanning water years 1922-2014 were also compared by plotting exceedance curves. These charts are provided in Appendix D.

Table 5-3. Comparison of Natural Delta Outflow and Delta Outflow in Unimpaired Flow Report

	Average Annual Flows: 1922-2014 (TAF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Natural Net Delta Outflow	280	760	1,859	2,634	3,012	3,406	3,012	2,567	1,414	467	164	133	19,708
Unimpaired Net Delta Outflow	511	1,051	2,450	3,468	3,902	4,198	4,032	4,111	2,492	961	438	369	28,050

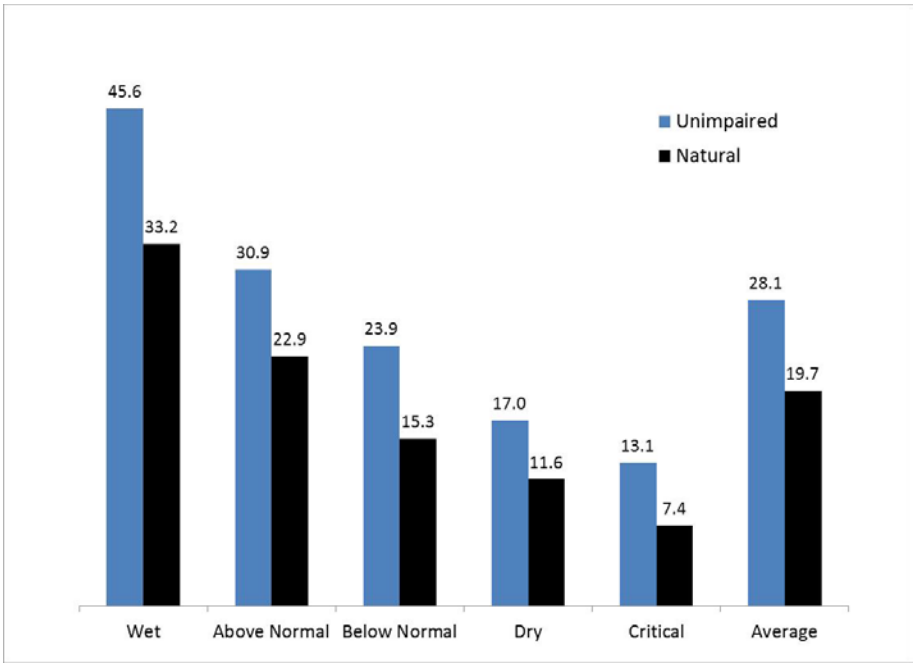

Figure 5-1. Comparison of Annual Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Averages (in MAF)

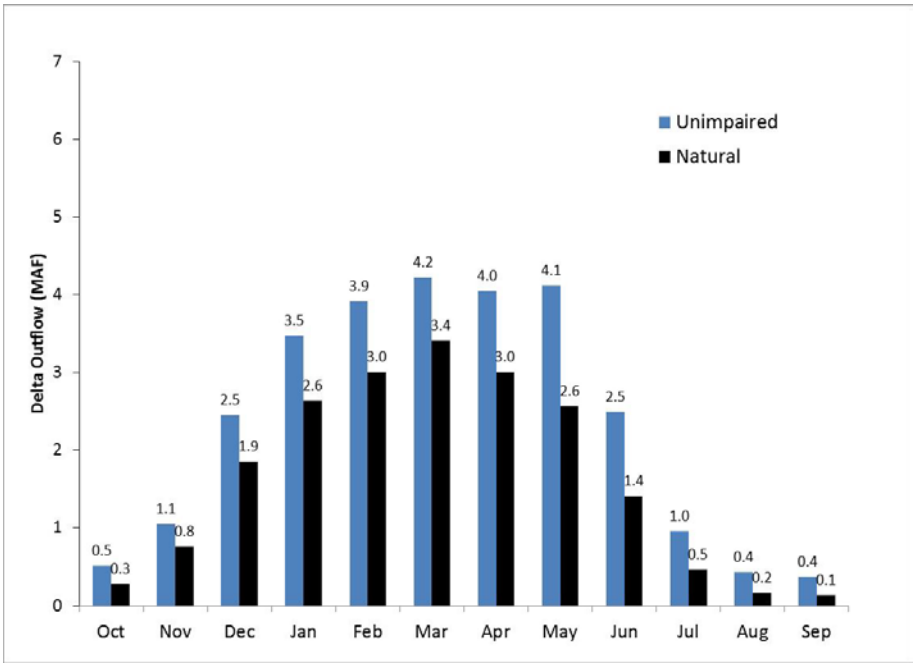

Figure 5-2. Comparison of Monthly Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Averages

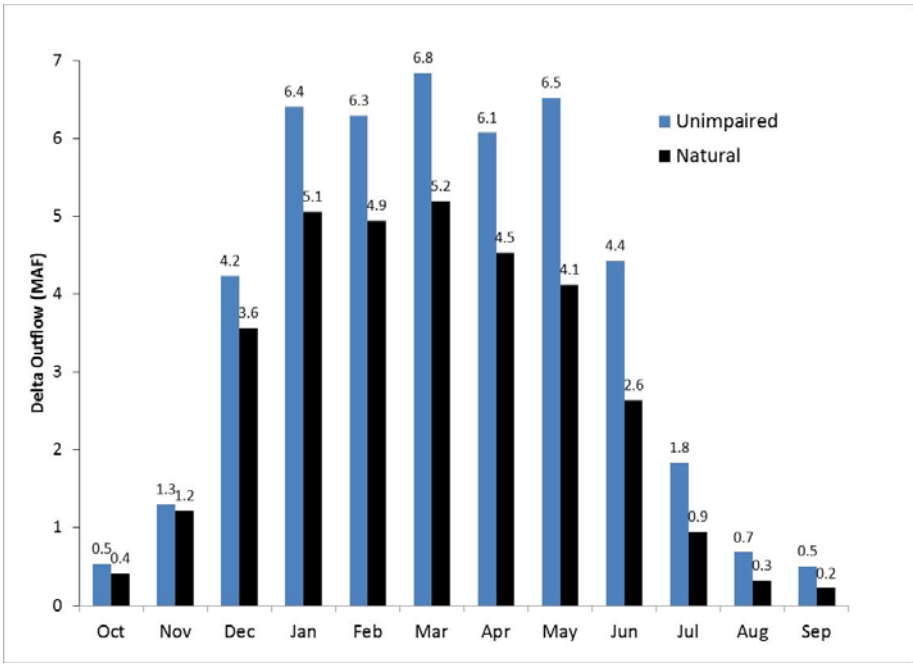

Figure 5-3. Comparison of Monthly Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Wet Year Averages

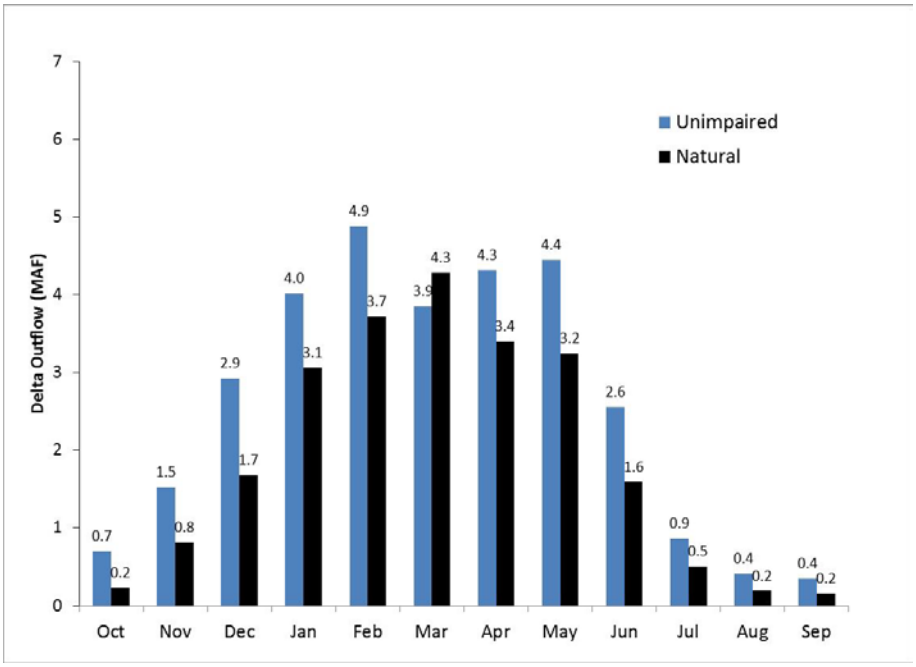

Figure 5-4. Comparison of Monthly Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Above Normal Water Year Averages

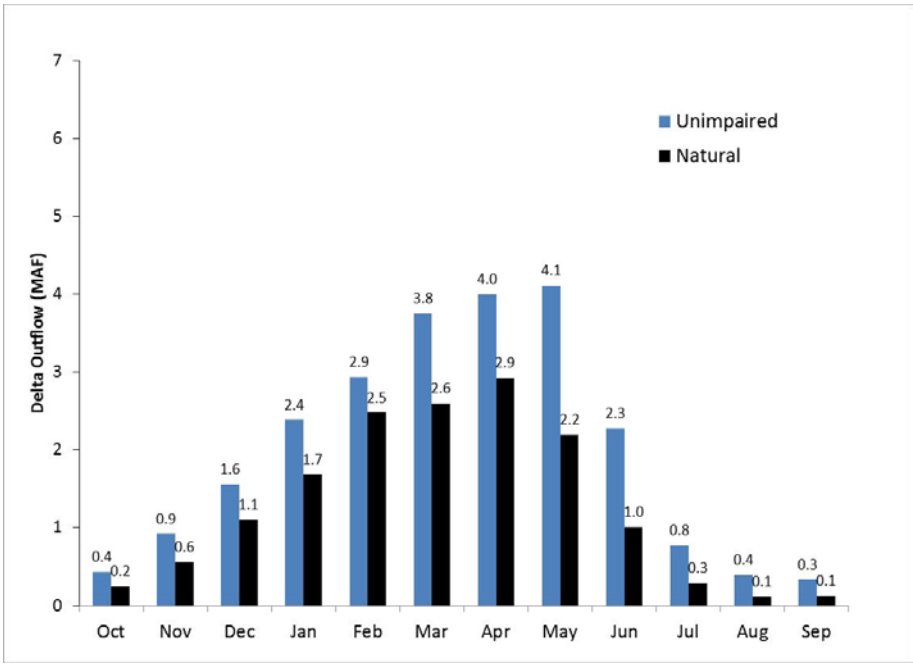

Figure 5-5. Comparison of Monthly Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Below Normal Water Year Averages

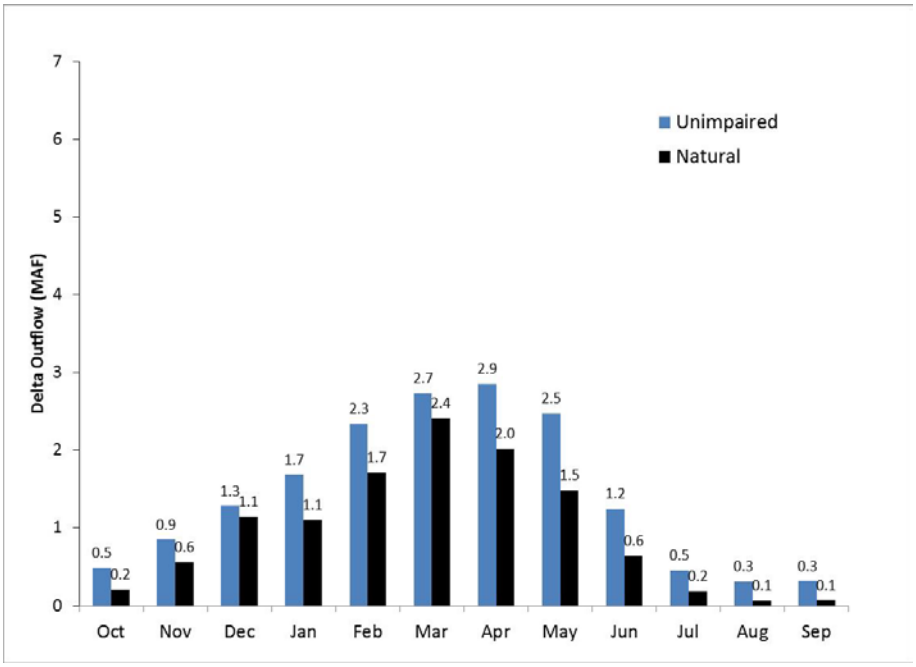

Figure 5-6. Comparison of Monthly Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Dry Water Year Averages

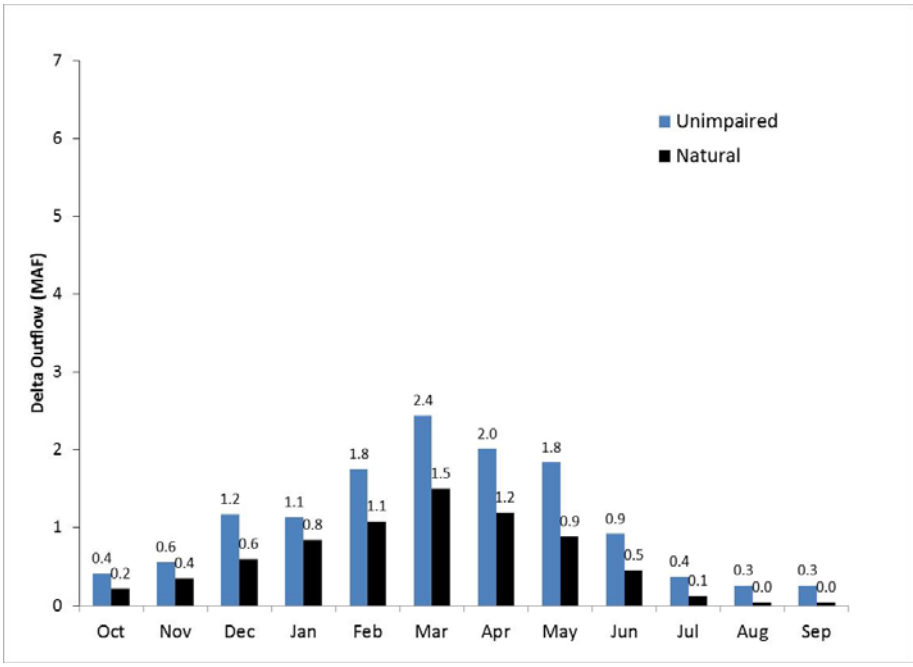

Figure 5-6. Comparison of Monthly Natural and Unimpaired Net Delta Outflow Estimates by 40-30-30 Water Year Type: Water Years 1922-2014 Critical Water Year Averages

6. SUMMARY

This report documents and compares a variety of natural and unimpaired flow estimates for the hydrologic period spanning water years 1922-2014, including rim watershed inflows, valley floor water supply, and Delta inflows and outflows. The natural flow estimates, the first to be published by the Department, were derived from complex simulation models (SWAT and C2VSim) and were based on published estimates of natural vegetation cover (Fox et al. 2015) and associated evapotranspiration (Howes et al. 2015). Methods used to estimate unimpaired flows generally followed the approach established in previous Department publications; the last update was published in 2007 (DWR 2007).

Comparisons of Delta inflow and outflow estimates demonstrate that unimpaired estimates are consistently (and significantly) higher than natural estimates. This difference is primarily the result of the unimpaired estimates not accounting for overbank flows and the resulting evapotranspiration associated with natural wetlands. The relative seasonal (i.e. monthly) distributions of unimpaired and natural Delta outflow estimates are not widely different. However, the relative distribution of unimpaired Delta outflow tends to be smaller in the winter (and larger in the other seasons) compared to natural Delta outflow. In sum, the findings of this report show that unimpaired flow estimates are poor surrogates for natural flow conditions.

To further evaluate the resulting annual average natural Delta outflow estimate of 19.7 MAF, sensitivity analyses were conducted on potential evapotranspiration, lakebed conductance, extinction depths of groundwater uptake (for riparian forest and hardwoods), and surface runoff and groundwater flow partition parameters. The sensitivity analyses, supported by 30 model runs, suggested an uncertainty range of approximately ± 10 percent. Potential evapotranspiration from riparian and wetland vegetation was found to be the most sensitive model parameter.

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APPENDIX A SWAT MODELS FOR RIM WATERSHEDS

Introduction

Soil Water Assessment Tool (SWAT) is a public domain, physically based, semi-distributed precipitation-runoff model tool developed by the US Department of Agriculture Agricultural Research Service (USDA-ARS) (Arnold et al., 2012). A few previous applications of SWAT in California have been reported. US EPA (2013) developed a SWAT model for Sacramento Valley floor of the drainage area between downstream of Shasta to the confluence of Feather River and Sacramento River. Ficklin et al. (2009) applied SWAT to San Joaquin Valley watershed focusing on Valley floor water quality. And Ficklin et al. (2012) developed monthly SWAT models of Western slope Sierra Nevada rim watersheds for climate change impact study. Hundreds of worldwide SWAT applications have been documented in peer-reviewed literature (http://swat.tamu.edu/). Expanding from our earlier work on upper Feather River watershed (Huang et al. 2012), 23 individual SWAT models were developed for the major upper watersheds in the Central Valley. These daily SWAT models were calibrated and validated with observed or reconstructed unimpaired streamflow data for the period Water Year 1922-2014. Common and consistent database of digital elevation, land use, soil and climate data were used with GIS to develop the SWAT models in a relatively short development time. Daily climate data of precipitation, maximum and minimum air temperature are based on the Hamlet and Lettenmaier (2005) 1915-2003 complete 1/8 degree (about 12*12 kilometers) grid dataset and extended with the 4*4 kilometers PRISM grid data.

SWAT Models for the Watersheds in Sacramento Valley and Eastside Streams

Currently the following watersheds in Sacramento Valley and Eastside Streams hydrologic regions have SWAT models (see Figure A-1):

- Sacramento River at Shasta Lake CDEC: SIS)
- Feather River at Lake Oroville (CDEC: FTO)
- Yuba River at Marysville (CDEC:YRS)
- American River at Folsom Lake (CDEC: AMF)
- Bear River
- Sacramento Valley East Side Minor Streams (Mill, Big Chico, and Deer Creeks)
- Putah Creek
- Cache Creek
- Stony Creek
- Sacramento Valley west Side Minor Streams (Thomes and Elder Creeks)
- Cosumnes River (CDEC: CSN)
- Mokelumne River (CDEC: MKM)

- Calaveras River at Jenny Lind
- Stanislaus River
- Tuolumne River
- Merced River
- Chowchilla River
- Fresno River
- San Joaquin River at Millerton Reservoir (CDEC: SJF)
- Kings River
- Kaweah River
- Tule River
- Kern River

Each separate SWAT model set up started with watershed delineation using 30-meter digital elevation model (DEM) land surface elevation data. Sub watersheds and stream network are automatically generated within ArcSWAT GIS tool (see Figure A-2 for example). The 2001 U.S. Geological Survey national land use survey spatial data was used to determine land use types (Figure A-3). Forest and rangeland are the dominant land use in the upper watersheds. Soil type data was based on the State Soil Geographic (STATSGO) dataset (Figure A-4). Sub watersheds are further subdivided into hydrologic response units (HRU) that consist of homogeneous land use, soil characteristics and land slopes.

Observed daily precipitation, maximum and minimum air temperature time series data are processed for each sub watershed. Since at most, each sub watershed can only be assigned to a climate station in SWAT. Solar radiation and Wind speed can also be input to estimate potential evapotranspiration if available.

Hydrologic processes simulated by SWAT include snowfall/snowmelt, surface runoff, infiltration, evapotranspiration, lateral flow, groundwater flow, and flow routing through cannel network to watershed outlet. A large number of model parameters are set to default values based on HRU level physical characteristics. However, these parameters must be adjusted to local conditions to get a good fit of simulated streamflow with observed data.

Figure A-1. Location of SWAT Watersheds

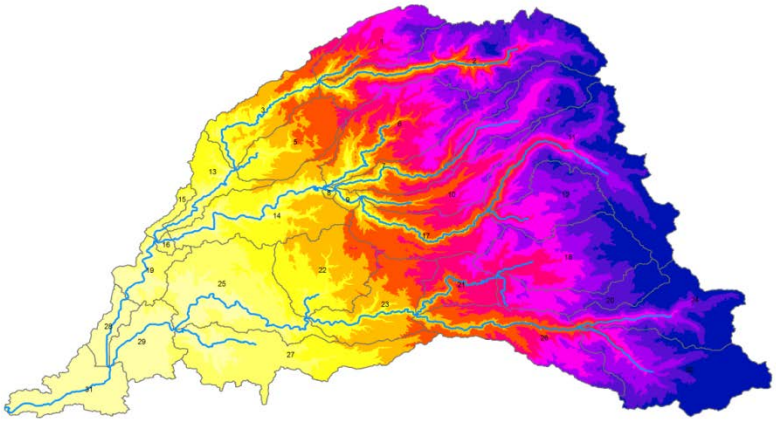

Figure A-2. American River Watershed: DEM, Subbasins and Stream Network

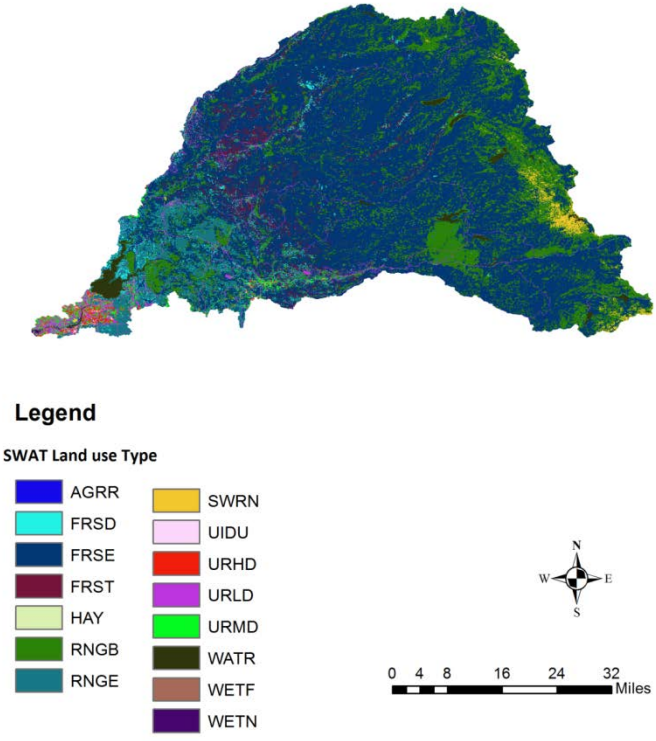

Figure A-3. American River Watershed: Land Use (Less than 1% of Urban and Agriculture Use Near the Watershed Outlet)

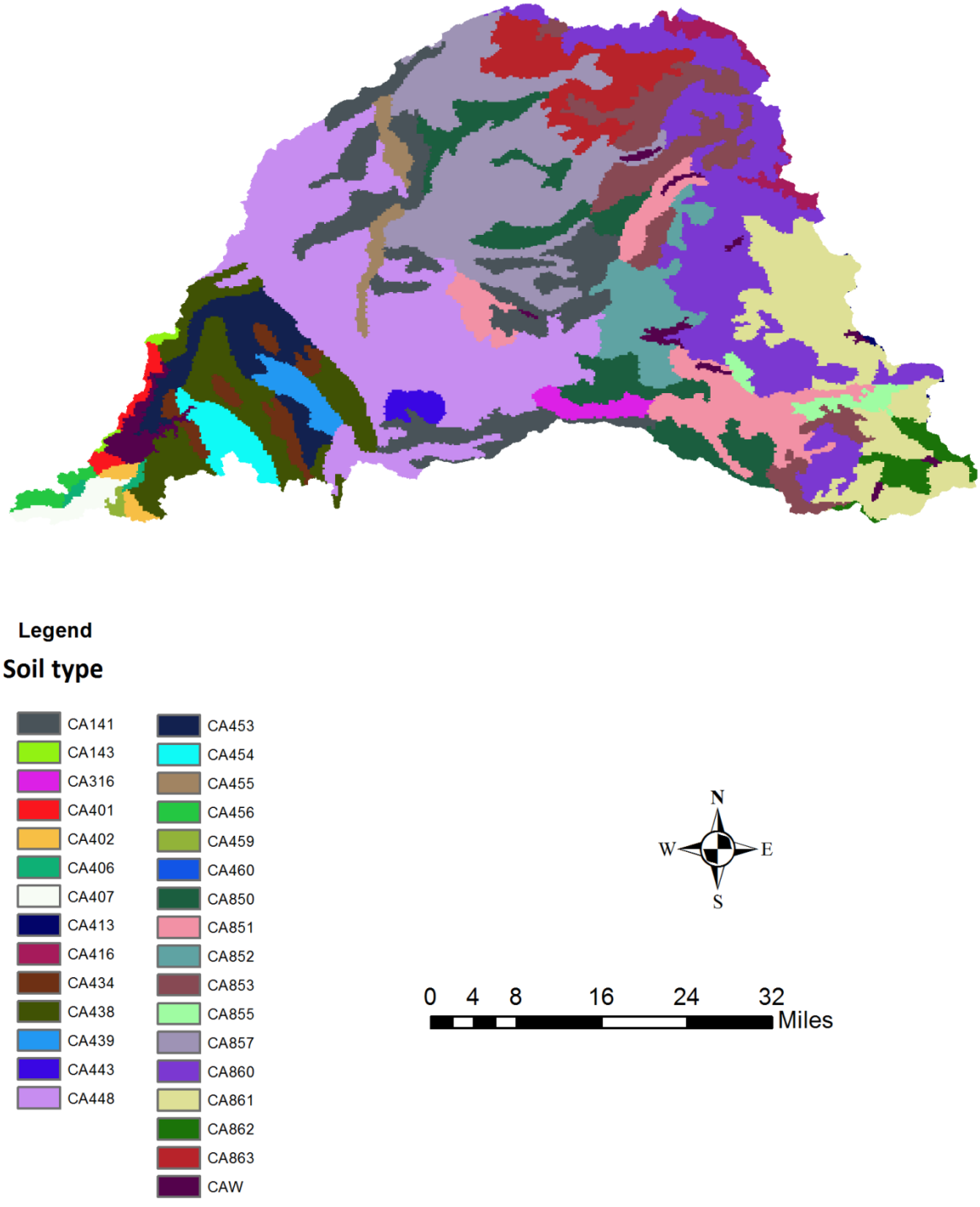

Figure A-4. American River Watershed: Soil Types

Model Calibration and Validation

Model calibration is a process of adjusting model parameters to get a better fit of simulated streamflows to corresponding observed data at selected sub-watersheds or watershed outlets. This is a time consuming and tedious process that may involve optimization and expert judgment. It could take hundreds of model runs for each target outlet to reach a satisfactory calibration result. Available observed streamflow data are usually split into two time periods for calibration and validation, respectively. During model validation, calibrated model parameters are fixed and simulated and observed streamflow are compared to see whether model prediction is still good.

In Central Valley, most upper watersheds are relatively undeveloped but streamflow is highly regulated by reservoirs and water diversion. Measured streamflow data at a U.S. Geological Survey stream gauge have to be unimpaired to correct for upstream reservoir storage and evaporation and water diversion. Therefore, observed streamflow data are already estimated. This complicates model calibration. Furthermore, most watersheds have only unimpaired monthly flow data for the whole time period. Unimpaired daily flow data are less reliable and of limited availability. For these reasons, model calibration and validation are performed and judged at monthly level.

Both SWAT-CUP: SWAT Calibration and Uncertainty Programs (Eawag. 2009) and manual calibration model runs were used in model development. Graphic time series or scatter plots (Figures A-6, A-7, and A-8) and statistical criteria (Tables A-1 and A-2) are used to guide calibration and validation. Although there is no absolute criteria for judging SWAT model performance, Both Nash-Sutcliffe efficiency >0.75 and R2 >0.75 is usually considered very good based on monthly flow data in reported SWAT applications (Arnold et al. 2012). The R2 statistic can range from 0 to 1, where 0 indicates no correlation and 1 represents perfect correlation, and it provides an estimate of how well the variance of observed values are simulated by the model estimates. Nash-Sutcliffe efficiency (NSE) values can range between $-\infty$ to 1 and provide a measure how well the simulated output matches the observed data along a 1:1 line regression line with slope equal to 1. A perfect fit between the simulated and observed data is indicated by an NSE value of 1.

Poorer calibration results only occur at minor streams and San Joaquin and Tulare Basins where less effort in model development and calibration are made. Tables A-1 and A-2 summarize combined period of calibration and Validation statistics.

Model limitation and Further Work

Since model development spans in the past few years, the SWAT2009 version was used. Arc SWAT in Arc Map has also been evolved such that earlier model set up files for some watersheds can only be read by older Arc Map 9.x version.

To improve model accuracy, further calibration at sub watershed scale and other hydrologic variables such as snow water equivalent and soil moisture data are recommended.

Table A-1. SWAT Calibration and Validation Statistics Summary: Sacramento River and Eastside Streams

Watershed	No. of Subbasins	No. of HRUs	Drainage Area (km^2)	Observed Data	R^2	Nash-Sutcliffe Efficiency
Sacramento River at Shasta	25	98	16,261	1922-2014	0.90	0.89
Feather River	64	99	9,335	1922-2014	0.90	0.90
Yuba River	39	122	3,174	1922-2014	0.85	0.84
American River	31	200	4,943	1922-2014	0.89	0.89
Bear River	19	46	752	1922-2014	0.84	0.84
Putah Creek	27	51	1,506	1922-2014	0.83	0.80
Cache Creek	25	45	2,440	1922-2014	0.79	0.72
Stony Creek	29	63	1,963	1922-2014	0.68	0.67
Thomes Creek	36	156	699	1921-1979	0.73	0.73
Elder Creek				1949-1979	0.70	0.69
Mill Creek	23	101	1,034	1931-2014	0.75	0.74
Deer Creek				1922-2014	0.76	0.67
Big Chico Creek				1931-1985	0.83	0.83
Cosumnes River	38	132	1,387	1921-2011	0.85	0.85
Mokelumne River	23	77	1,502	1921-2014	0.81	0.80
Calaveras River	25	117	933	1922-2014	0.86	0.85

Key:
HRU = hydrologic Response Unit
km^2 = square kilometer
R^2 = Coefficient of Determination

Table A-2. SWAT Calibration and Validation Statistics Summary: San Joaquin River and Tulare Basin

Watershed	No. of Subbasins	No. of HRUs	Drainage area (km^2)	Observed data	R^2	Nash-Sutcliffe Efficiency
Stanislaus River	23	53	2,518	1922-2014	0.85	0.85
Tuolumne River	29	246	3,980	1922-2014	0.90	0.90
Merced River	27	83	2,742	1921-2014	0.86	0.86
Chowchilla River	27	50	669	1922-2014	0.77	0.76
Fresno River	21	58	757	1922-2014	0.71	0.71
San Joaquin River	31	136	4,296	1921-2014	0.91	0.91
Kings River	38	223	4,413	1921-2014	0.75	0.68
Kaweah River	75	75	1,453	1922-2014	0.81	0.80
Tule River	30	85	986	1931-2014	0.70	0.69
Kern River	26	184	5,372	1930-2014	0.68	0.67

Key:
HRU = Hydrologic Response Unit
km^2 = square kilometer
R^2 = Coefficient of Determination

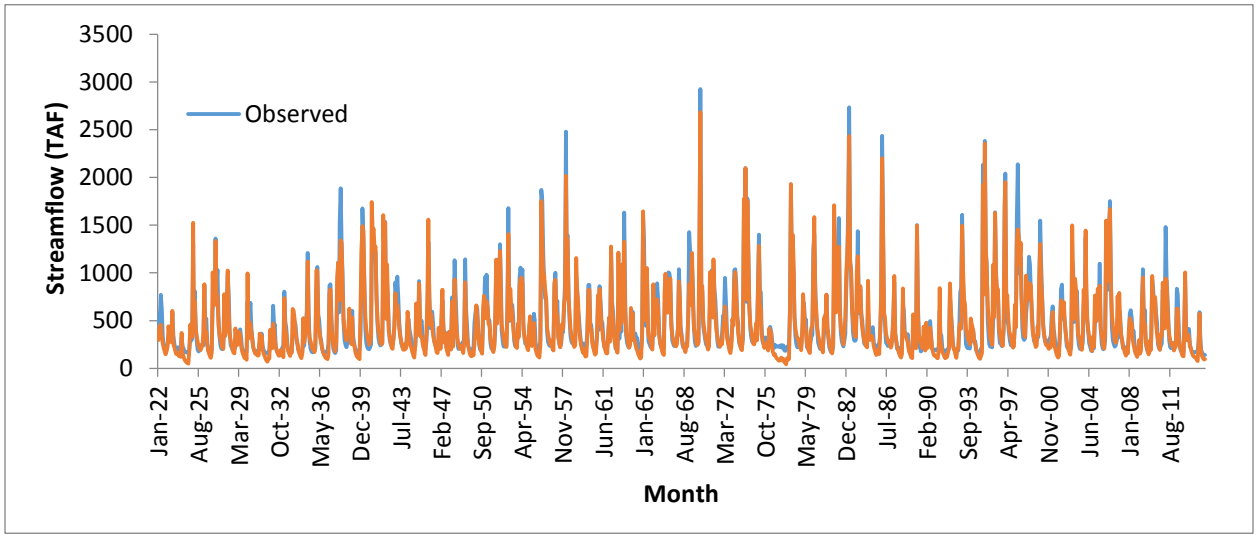

Figure A-5. SWAT Simulated and Unimpaired Observed Monthly Streamflow Sacramento River at Shasta: 1922-2014

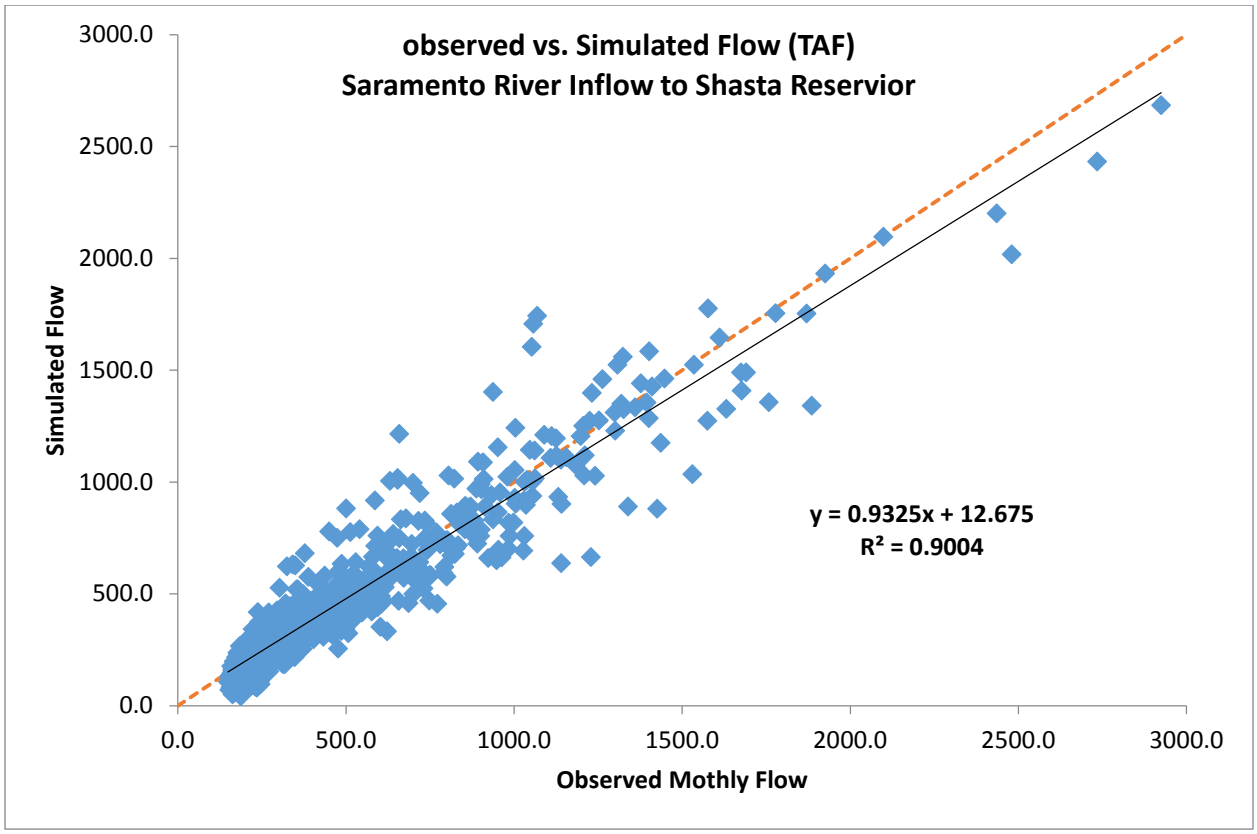

Figure A-6. Scatter Plot of SWAT Simulated and Unimpaired Observed Monthly Streamflow Sacramento River at Shasta: 1922-2014

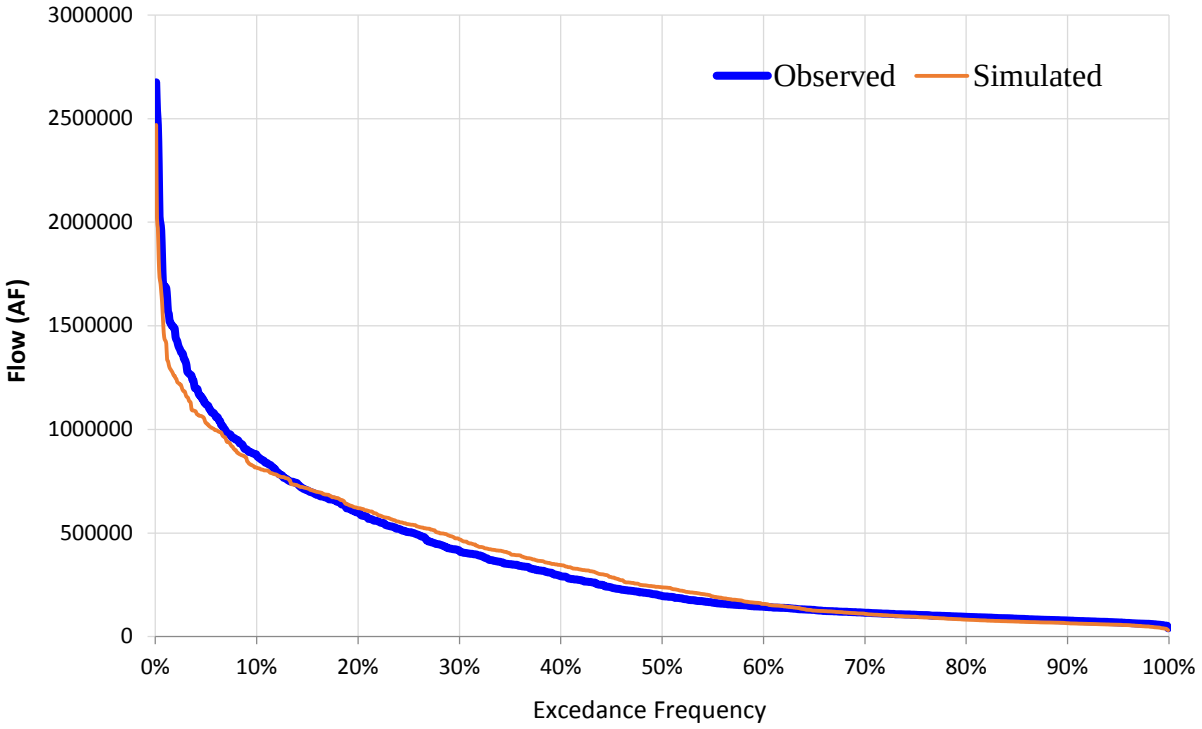

Figure A-7 Frequency Curves of SWAT Simulated and Unimpaired Observed Monthly Streamflow: 1915-2014

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APPENDIX B UNIMPAIRED FLOW TABLES WY 1922-2014

Table B-1. UF 1 – Sacramento Valley Floor Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	11	167	140	466	289	175	15	0	0	0	0	1263
1923	0	14	173	109	75	50	58	7	0	0	0	0	486
1924	0	0	4	8	17	2	3	0	0	0	0	0	34
1925	0	9	39	67	290	45	40	9	5	0	0	0	504
1926	0	3	8	20	113	23	25	2	0	0	0	0	194
1927	0	65	37	144	595	141	85	0	0	0	0	0	1067
1928	0	22	30	76	99	327	56	0	0	0	0	0	610
1929	0	3	11	8	25	22	17	0	0	0	0	0	86
1930	0	0	81	73	110	116	28	6	0	0	0	0	414
1931	0	2	1	8	8	10	1	0	0	0	0	0	30
1932	0	9	113	136	166	125	53	18	1	0	0	0	621
1933	0	0	5	18	13	54	12	10	0	0	0	0	112
1934	0	0	9	17	29	12	3	0	0	0	0	0	70
1935	0	14	28	109	147	107	195	23	0	0	0	0	623
1936	0	2	10	253	412	94	50	6	1	0	0	0	828
1937	0	0	5	14	142	136	104	25	0	0	0	0	426
1938	0	20	156	138	358	508	148	45	0	0	0	0	1373
1939	0	3	7	11	15	45	14	1	0	0	0	0	96
1940	0	0	7	194	395	267	49	4	1	0	0	0	917
1941	0	7	140	286	384	153	61	20	1	0	0	0	1052
1942	0	7	156	382	425	97	91	34	2	0	0	0	1194
1943	0	30	133	434	213	287	45	8	0	0	0	0	1150
1944	0	0	6	25	60	59	24	8	0	0	0	0	182
1945	0	14	37	38	270	59	35	8	1	0	0	0	462
1946	0	21	290	161	70	94	45	7	0	0	0	0	688
1947	0	2	28	3	70	115	37	3	0	0	0	0	258
1948	0	0	4	37	22	94	123	23	0	0	0	0	303
1949	0	0	16	7	30	278	13	10	0	0	0	0	354
1950	0	0	4	168	271	94	39	9	0	0	0	0	585
1951	0	353	493	371	103	47	20	30	5	0	0	0	1422
1952	0	4	235	744	170	302	19	3	0	0	0	0	1477
1953	0	0	63	285	27	153	41	13	0	0	0	0	582
1954	0	4	7	147	174	148	105	11	0	0	0	0	596
1955	0	2	41	131	20	12	21	5	0	0	0	0	232
1956	0	4	730	589	89	24	17	14	0	0	0	0	1467
1957	0	1	0	10	103	68	23	33	4	0	0	0	242
1958	1	1	21	119	401	207	406	20	1	0	0	0	1177
1959	0	1	4	39	211	13	6	2	0	0	0	0	276
1960	0	0	0	18	197	41	15	5	0	0	0	0	276
1961	2	22	26	15	53	57	31	18	3	0	0	0	227
1962	0	6	33	35	286	106	44	13	0	0	0	0	523
1963	187	22	86	66	178	95	251	62	8	0	0	0	955
1964	11	66	37	119	37	40	31	44	0	0	0	0	385
1965	11	35	464	341	48	44	147	29	6	0	0	0	1125
1966	2	40	53	88	66	66	42	22	2	0	0	0	381
1967	0	73	146	248	85	163	180	88	15	0	0	0	998
1968	10	10	32	66	164	71	22	8	0	0	0	0	383
1969	9	32	89	528	264	146	103	41	6	0	0	0	1218
1970	15	11	137	430	100	89	20	6	0	0	0	0	808

Table B-1. UF 1 – Sacramento Valley Floor Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	23	94	276	120	60	155	67	39	15	0	0	0	849
1972	1	10	73	46	97	61	48	17	1	0	0	0	354
1973	1	74	83	326	237	174	62	24	1	0	0	0	982
1974	12	172	202	262	84	292	161	36	13	0	0	0	1234
1975	0	7	19	41	195	197	100	46	1	0	0	0	606
1976	11	35	21	11	24	25	7	0	0	0	0	0	134
1977	0	2	1	19	11	10	0	3	0	0	0	0	46
1978	0	7	70	351	127	178	116	38	6	0	0	0	893
1979	0	17	10	93	134	141	54	43	0	0	0	0	492
1980	8	25	69	339	316	132	53	33	6	0	0	0	981
1981	0	1	18	55	29	95	20	0	0	0	0	0	218
1982	10	158	325	221	238	214	382	54	6	0	0	0	1608
1983	26	114	203	141	323	455	152	99	11	0	0	0	1524
1984	6	132	305	85	98	83	53	39	12	0	0	0	813
1985	19	49	30	23	66	81	49	20	5	0	0	0	342
1986	1	22	55	95	683	267	42	32	5	0	0	0	1202
1987	3	0	9	11	60	81	16	8	3	0	0	0	191
1988	0	1	40	101	16	21	19	12	4	0	0	0	214
1989	0	30	43	59	41	331	70	45	8	0	0	0	627
1990	5	16	14	63	61	58	20	8	16	0	0	0	261
1991	0	0	3	2	5	184	48	33	12	0	0	0	287
1992	0	5	6	13	145	61	22	7	0	0	0	0	259
1993	0	1	54	314	170	141	73	27	15	0	0	0	795
1994	4	0	27	15	58	34	15	12	2	0	0	0	167
1995	5	16	118	466	63	461	120	121	23	0	0	0	1394
1996	0	38	40	144	257	139	109	91	23	0	0	0	841
1997	5	29	392	535	52	34	23	36	12	0	0	0	1117
1998	4	0	90	303	435	140	141	113	33	0	0	0	1258
1999	13	17	80	168	328	151	92	61	15	0	0	0	925
2000	4	10	13	121	333	172	66	50	11	0	0	0	780
2001	23	10	9	15	68	54	31	15	4	0	0	0	230
2002	4	12	131	109	93	147	54	29	14	0	0	0	594
2003	9	4	123	91	52	77	115	104	15	0	0	0	591
2004	0	8	75	91	162	74	10	10	0	0	0	0	432
2005	12	7	68	135	81	161	85	127	28	0	0	0	705
2006	0	0	322	178	170	300	370	86	15	0	0	0	1439
2007	14	7	41	19	122	57	22	25	4	0	0	0	311
2008	2	2	45	78	99	44	25	0	5	0	0	0	299
2009	6	4	27	12	101	130	35	73	8	0	0	0	396
2010	23	0	0	34	52	36	62	74	38	0	0	0	319
2011	21	42	278	106	132	447	155	75	58	33	5	0	1354
2012	6	4	0	31	12	218	168	41	36	16	0	3	536
2013	8	33	286	45	26	28	12	18	24	16	4	0	501
2014	0	0	0	0	81	80	59	5	5	3	6	0	239
1922-2003 Average	5	25	90	149	159	127	68	25	4	0	0	0	653
1922-2014 Average	6	23	91	139	151	129	71	28	6	1	0	0	646

Table B-2. UF 2 – Putah Creek near Winters Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-2. UF 2 – Putah Creek near Winters Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	3	2	1	0	0	123
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
1993	3	0	50	278	157	47	18	7	5	0	0	0	565
1994	0	1	16	8	29	10	2	2	0	0	9	0	77
1995	0	5	16	466	49	382	49	39	10	0	0	0	1017
1996	2	0	63	105	198	113	43	27	7	3	0	0	562
1997	0	5	170	375	38	19	9	6	0	0	0	0	621
1998	0	26	41	157	459	78	63	42	21	5	1	0	894
1999	1	24	14	26	160	83	59	14	5	1	0	0	386
2000	0	2	0	38	171	76	18	10	4	0	0	0	320
2001	0	0	1	20	78	51	8	5	1	0	2	0	166
2002	0	16	119	115	20	21	7	5	2	1	1	1	309
2003	0	5	236	81	31	46	44	31	3	0	0	0	476
2004	0	1	122	67	220	55	12	5	2	0	0	0	483
2005	2	3	84	101	51	90	29	41	8	2	0	0	411
2006	0	1	216	126	72	194	197	29	12	4	1	0	851
2007	0	3	13	1	54	14	6	4	3	3	0	0	101
2008	0	0	4	119	70	13	5	3	1	1	0	0	215
2009	0	1	3	1	65	49	4	8	0	1	1	2	135
2010	3	0	5	137	56	50	56	16	7	3	2	2	335
2011	3	3	70	29	79	222	35	17	13	5	3	2	480
2012	0	3	0	20	6	92	41	9	4	5	4	2	188
2013	1	36	166	21	7	10	6	5	5	5	4	2	269
2014	0	0	0	1	28	18	17	4	4	3	1	1	76
1922-2003 Average	**2**	**12**	**54**	**91**	**103**	**67**	**34**	**11**	**4**	**2**	**1**	**0**	**380**
1922-2014 Average	**2**	**11**	**55**	**87**	**98**	**68**	**34**	**11**	**4**	**2**	**1**	**0**	**373**

Table B-3. UF 3 – Cache Creek Above Rumsey Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	5	4	9	11	48	41	38	27	17	10	6	3	219
1923	3	4	28	35	32	23	33	18	12	7	4	2	201
1924	2	2	1	3	7	3	2	1	0	0	0	0	21
1925	1	5	20	14	108	43	59	54	37	23	14	10	388
1926	7	6	8	15	61	35	44	35	24	16	9	5	265
1927	4	27	53	111	280	176	114	64	38	23	15	9	914
1928	7	10	15	37	51	93	76	48	30	19	12	7	405
1929	5	4	9	9	16	12	11	7	5	2	1	0	81
1930	0	0	26	29	36	41	30	22	14	8	4	2	212
1931	1	1	1	9	4	7	4	2	1	0	0	0	30
1932	0	0	51	27	19	13	10	10	5	2	0	0	137
1933	0	0	1	9	9	20	9	8	4	1	0	0	61
1934	0	0	16	16	19	16	10	7	4	2	0	0	90
1935	0	5	4	50	28	61	68	45	27	17	10	6	321
1936	4	3	4	61	146	86	67	43	33	20	13	8	488
1937	5	3	3	4	52	65	48	32	22	15	9	6	264
1938	4	35	119	72	378	424	190	81	43	26	17	11	1400
1939	8	7	9	11	15	17	11	8	4	2	0	0	92
1940	0	0	0	59	179	172	116	61	37	22	13	9	668
1941	6	6	103	234	290	279	225	109	53	31	20	13	1369
1942	8	8	67	123	245	139	117	84	52	30	20	13	906
1943	9	12	36	142	94	85	62	49	33	21	13	9	565
1944	6	5	6	14	27	52	27	22	15	8	4	2	188
1945	1	6	16	15	64	41	34	25	16	9	5	2	234
1946	4	14	123	79	52	48	40	28	18	10	6	3	425
1947	2	3	7	3	15	31	19	12	7	4	2	1	106
1948	1	1	1	10	4	16	56	33	22	13	7	4	168
1949	2	2	6	9	21	88	41	29	18	11	6	3	236
1950	2	2	2	23	45	36	32	23	14	7	4	2	192
1951	5	21	73	109	107	85	51	50	28	17	10	7	563
1952	5	11	113	178	204	154	85	54	36	22	14	9	885
1953	6	5	85	191	87	77	57	50	35	21	14	9	637
1954	6	10	10	74	64	65	71	44	30	18	12	8	412
1955	6	9	22	23	20	20	27	23	12	7	4	2	175
1956	1	1	183	306	342	173	66	51	35	21	14	9	1202
1957	6	6	5	15	53	60	36	44	25	15	9	6	280
1958	28	12	44	110	431	375	275	119	58	33	23	16	1524
1959	11	8	7	29	75	46	33	25	17	10	6	3	270
1960	2	2	2	9	75	56	35	29	20	11	7	4	252
1961	2	4	21	20	41	44	36	29	19	12	7	5	240
1962	3	6	16	11	84	81	47	35	23	15	9	6	336
1963	26	10	23	48	73	63	129	78	45	29	19	13	556
1964	10	17	13	34	22	21	16	13	9	5	2	1	163
1965	1	10	186	249	119	62	79	55	34	21	15	10	841
1966	8	17	28	100	75	61	43	31	20	15	10	7	415
1967	5	15	62	157	89	94	114	86	52	35	22	14	745
1968	10	8	14	74	99	78	50	36	23	15	11	9	427
1969	6	6	41	190	274	257	125	57	35	23	15	12	1041
1970	8	7	56	347	216	124	63	42	29	19	13	9	933

Table B-3. UF 3 – Cache Creek Above Rumsey Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	6	22	95	106	60	73	59	45	33	25	15	11	550
1972	6	5	13	20	27	26	22	17	11	5	2	1	155
1973	1	12	22	166	222	183	82	48	29	18	10	9	802
1974	6	74	105	220	144	237	175	72	40	28	18	12	1131
1975	9	7	12	13	113	188	123	59	34	24	16	10	608
1976	9	8	5	6	5	10	10	4	2	1	2	0	62
1977	0	0	0	1	0	0	0	0	0	0	0	0	1
1978	0	3	18	192	161	191	118	63	39	30	17	13	845
1979	8	7	6	28	64	61	43	40	25	18	14	6	320
1980	6	12	44	166	245	167	101	38	30	22	15	10	856
1981	7	4	15	50	41	44	31	24	19	14	6	2	257
1982	4	44	117	157	141	157	243	102	50	35	22	16	1088
1983	14	32	78	227	321	662	320	149	69	43	28	21	1964
1984	16	86	330	150	94	81	52	36	21	10	4	2	882
1985	3	35	39	30	39	40	34	19	9	1	1	0	250
1986	1	5	16	41	422	310	97	51	31	18	9	6	1007
1987	4	2	3	11	25	42	21	14	8	2	1	0	133
1988	0	0	25	82	30	24	20	17	13	6	0	1	218
1989	0	4	6	11	7	64	30	17	4	6	1	3	153
1990	4	3	3	19	20	17	10	9	6	1	0	0	92
1991	1	0	0	1	2	66	25	15	8	2	1	1	122
1992	0	2	4	6	50	43	28	23	14	9	3	0	182
1993	5	3	49	264	291	176	74	56	43	29	16	8	1014
1994	5	5	14	19	43	27	24	19	27	0	1	2	186
1995	0	2	8	484	158	476	210	78	28	39	26	20	1529
1996	10	0	27	108	286	208	61	45	46	44	15	6	857
1997	10	3	92	404	245	20	15	19	20	23	35	12	898
1998	5	54	77	396	809	235	119	99	51	14	9	0	1867
1999	26	29	50	68	309	187	94	34	17	7	3	10	835
2000	3	12	7	84	327	159	47	32	17	3	3	10	703
2001	2	3	7	39	145	122	22	26	8	11	4	6	395
2002	5	46	226	193	43	47	24	25	16	6	5	2	637
2003	2	15	355	201	63	93	150	82	14	15	4	2	996
2004	12	12	229	148	389	92	37	21	30	28	17	15	1029
2005	11	8	114	177	89	178	85	83	27	16	7	0	796
2006	5	20	298	254	122	356	343	46	27	16	10	6	1504
2007	1	10	50	14	146	53	19	15	5	13	12	1	340
2008	8	4	25	242	183	41	15	13	15	5	11	9	572
2009	7	12	11	10	122	104	14	34	5	10	0	5	335
2010	5	0	7	193	78	71	79	22	10	4	2	2	472
2011	15	17	178	61	119	399	68	30	35	32	24	9	988
2012	5	4	1	40	12	135	93	8	3	27	20	7	355
2013	0	45	290	41	14	24	12	2	0	19	18	4	471
2014	8	0	0	0	48	50	35	1	0	16	14	8	180
1922-2003 Average	**5**	**11**	**44**	**91**	**120**	**105**	**67**	**40**	**24**	**15**	**9**	**6**	**538**
1922-2014 Average	**5**	**11**	**52**	**93**	**120**	**109**	**68**	**39**	**23**	**15**	**10**	**6**	**550**

Table B-4. UF 4 – Stony Creek at Black Butte Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	1	1	12	12	68	36	50	41	13	0	0	0	234
1923	2	12	48	43	22	15	34	13	4	0	0	0	193
1924	1	1	3	6	16	4	2	0	0	0	0	0	33
1925	0	6	26	25	202	42	67	81	17	2	0	1	469
1926	2	3	5	22	137	27	72	12	1	0	0	0	281
1927	1	37	83	55	254	77	54	28	8	0	0	0	597
1928	1	9	23	47	87	98	62	18	2	0	0	0	347
1929	1	4	11	8	28	12	11	8	2	0	0	0	85
1930	0	0	33	33	44	69	26	14	4	0	0	0	223
1931	0	2	2	21	13	18	7	3	0	0	0	0	66
1932	0	2	49	48	23	37	21	22	7	0	0	0	209
1933	0	0	3	12	9	33	25	19	12	0	0	0	113
1934	0	1	29	39	37	27	11	5	2	0	0	0	151
1935	0	12	8	64	37	70	87	33	7	1	0	0	319
1936	0	1	4	83	143	48	41	15	9	0	0	0	344
1937	0	0	2	2	73	77	69	29	6	0	0	0	258
1938	1	44	133	51	214	248	101	79	27	5	0	0	903
1939	1	3	10	8	11	22	10	5	0	0	0	0	70
1940	0	0	6	114	225	119	63	21	4	0	0	0	552
1941	1	3	133	252	260	231	180	79	25	4	0	1	1169
1942	1	4	90	155	195	49	110	55	21	2	0	1	683
1943	0	11	39	162	52	69	29	23	6	1	0	0	392
1944	1	1	3	14	33	54	29	33	7	0	0	0	175
1945	1	10	27	25	76	28	32	14	4	0	0	0	217
1946	2	20	148	74	22	22	20	8	2	0	0	0	318
1947	0	8	14	2	36	53	19	2	1	0	0	0	135
1948	1	2	3	28	9	19	75	41	17	2	0	0	197
1949	0	2	6	7	21	134	57	24	5	1	0	0	257
1950	0	1	3	35	59	41	39	26	9	2	0	1	216
1951	5	36	96	102	93	49	24	38	9	4	0	0	456
1952	1	6	97	147	139	94	77	62	17	4	0	1	645
1953	1	2	104	233	39	45	45	47	18	5	0	1	540
1954	0	6	9	94	83	67	75	27	10	5	0	1	377
1955	1	13	29	15	13	16	22	24	3	2	0	0	138
1956	1	2	143	239	147	64	45	54	16	4	0	1	716
1957	5	3	2	17	83	45	45	45	16	5	0	2	268
1958	27	16	42	118	480	156	140	68	21	5	0	3	1076
1959	1	3	4	55	96	41	20	6	2	0	0	1	229
1960	0	0	0	14	139	79	22	16	5	0	0	0	275
1961	0	6	42	32	73	41	25	17	4	0	0	0	240
1962	0	4	24	11	100	75	44	16	5	0	0	0	279
1963	25	7	42	22	168	59	146	44	12	3	0	0	528
1964	3	23	8	30	18	11	9	6	2	0	0	0	110
1965	0	25	277	201	48	27	109	25	4	0	2	0	718
1966	0	36	22	115	64	45	40	17	5	0	0	0	344
1967	0	24	89	182	67	54	70	62	41	5	0	0	594
1968	1	3	15	82	142	47	19	9	3	0	0	0	321
1969	0	5	59	259	210	129	84	47	15	1	0	0	809
1970	2	3	80	406	89	65	19	10	4	0	0	0	678

Table B-4. UF 4 – Stony Creek at Black Butte Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0	37	123	138	38	87	39	26	11	2	0	0	501
1972	0	5	16	38	37	51	20	11	2	0	0	0	180
1973	3	40	60	207	228	119	53	30	5	0	0	0	745
1974	3	83	123	250	54	166	99	30	11	1	0	0	820
1975	0	4	16	20	149	226	67	44	15	0	0	0	541
1976	4	6	7	4	12	18	12	4	1	0	1	0	69
1977	0	2	2	3	2	6	0	2	0	0	0	0	17
1978	0	4	49	320	190	146	57	28	13	2	0	0	809
1979	1	2	2	30	55	70	30	24	5	0	0	0	219
1980	5	23	45	192	257	95	35	17	7	0	0	0	676
1981	0	2	15	82	51	43	21	8	3	0	0	0	225
1982	5	77	150	109	115	93	163	56	16	5	0	1	790
1983	7	36	122	235	284	461	130	107	40	9	2	2	1435
1984	2	100	304	70	48	40	22	10	0	0	0	0	596
1985	1	54	39	13	27	22	26	2	0	0	0	0	184
1986	1	7	30	70	441	171	36	13	0	0	0	0	769
1987	0	1	2	9	27	47	10	2	0	0	0	0	98
1988	0	2	59	108	31	15	9	5	0	0	0	0	229
1989	0	13	7	16	11	95	26	5	0	0	0	0	173
1990	2	3	2	20	11	17	4	5	6	0	0	0	70
1991	0	2	2	2	3	83	34	6	0	0	0	0	132
1992	0	0	8	9	82	65	51	5	0	0	0	0	220
1993	1	2	43	243	206	108	48	27	18	0	0	0	696
1994	0	0	7	9	28	18	5	4	0	0	0	0	71
1995	0	3	12	558	108	367	87	75	21	6	0	0	1237
1996	0	1	41	126	211	148	47	41	12	1	0	0	627
1997	0	9	138	294	57	31	16	7	0	0	0	0	552
1998	2	16	46	218	552	174	114	102	78	15	2	1	1320
1999	1	13	30	30	108	113	74	32	10	0	1	0	411
2000	0	6	6	33	45	49	42	24	7	1	0	0	211
2001	0	3	4	17	38	107	19	8	0	0	0	0	195
2002	0	21	125	149	35	29	15	7	0	0	0	0	382
2003	0	6	167	142	39	51	45	58	10	1	0	0	520
2004	0	5	121	79	206	90	27	14	4	0	0	0	545
2005	1	5	83	120	115	132	60	82	24	5	0	0	627
2006	1	6	202	143	82	150	247	65	16	2	0	0	912
2007	0	3	24	12	40	29	10	4	0	0	0	0	123
2008	0	1	7	118	116	57	25	22	4	0	0	0	349
2009	0	3	4	7	36	55	11	15	3	0	0	0	133
2010	1	0	6	122	91	57	95	44	22	2	0	0	440
2011	6	7	74	57	36	163	88	34	48	9	0	0	522
2012	2	4	2	16	9	44	44	10	1	0	0	0	133
2013	0	15	159	42	17	16	12	2	0	0	0	0	263
2014	0	1	1	1	13	51	16	1	0	0	0	0	85
1922-2003 Average	**2**	**12**	**48**	**93**	**101**	**77**	**48**	**27**	**9**	**1**	**0**	**0**	**418**
1922-2014 Average	**2**	**11**	**50**	**89**	**97**	**77**	**49**	**27**	**9**	**1**	**0**	**0**	**413**

Table B-5. UF 5 – Sacramento Valley West Side Minor Streams Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	3	38	49	53	44	117	78	10	2	0	0	394
1923	2	10	57	54	29	20	67	22	11	2	0	0	274
1924	1	1	4	8	29	7	6	3	0	0	0	0	59
1925	6	25	46	41	202	69	108	87	16	6	2	2	610
1926	3	6	14	19	117	43	57	14	4	0	0	0	277
1927	0	48	91	76	221	131	116	63	20	4	1	0	771
1928	0	52	31	64	104	161	87	30	13	2	0	0	544
1929	0	1	17	14	19	14	15	15	4	0	0	0	99
1930	0	1	68	32	59	60	38	14	5	0	0	0	277
1931	0	1	3	20	16	26	11	5	1	0	0	0	83
1932	1	4	17	25	22	52	28	27	8	1	0	0	185
1933	0	0	2	5	6	32	42	31	17	1	0	0	136
1934	0	1	18	31	32	35	19	10	2	0	0	0	148
1935	1	18	15	32	44	42	110	42	8	2	0	0	314
1936	0	2	5	103	106	52	41	18	9	1	0	0	337
1937	0	1	1	4	14	55	85	57	14	2	0	0	233
1938	2	82	143	44	114	220	185	141	39	7	2	1	980
1939	1	4	14	9	11	32	16	11	2	0	0	0	100
1940	0	1	22	108	206	146	82	31	8	2	0	0	606
1941	2	8	142	168	252	263	208	130	49	13	3	2	1240
1942	2	7	131	128	151	50	86	69	30	7	2	0	663
1943	0	19	57	130	71	74	44	23	9	2	0	0	429
1944	0	3	4	10	16	30	22	24	8	2	0	0	119
1945	0	16	31	19	71	24	45	26	9	1	0	0	242
1946	9	28	146	73	26	45	56	33	12	7	5	5	445
1947	0	9	13	4	36	51	22	7	6	0	0	0	148
1948	10	6	4	61	12	17	83	57	23	3	0	2	278
1949	2	7	14	6	16	94	92	36	9	2	0	0	278
1950	0	1	1	28	34	56	50	23	5	0	0	0	198
1951	22	32	71	80	100	34	30	30	7	1	0	0	407
1952	2	13	89	65	137	99	139	76	21	7	2	0	650
1953	0	3	54	198	55	40	65	47	28	8	2	1	501
1954	2	15	15	97	118	99	108	32	12	3	1	0	502
1955	0	24	39	20	15	15	29	35	6	1	0	0	184
1956	0	9	282	235	156	82	102	82	22	5	2	1	978
1957	3	4	4	13	94	69	38	40	8	1	0	1	275
1958	40	24	57	124	523	161	175	83	24	8	3	1	1223
1959	0	3	4	62	66	47	31	11	2	0	0	1	227
1960	0	0	2	9	144	89	31	22	7	1	0	0	305
1961	0	3	30	32	77	40	32	17	6	1	0	0	238
1962	0	2	15	7	77	62	52	15	4	1	0	0	235
1963	24	9	36	43	142	58	127	54	9	2	1	0	505
1964	1	36	8	24	19	10	11	6	12	0	0	0	127
1965	1	31	288	169	52	29	156	43	10	2	1	1	783
1966	1	44	15	97	52	64	62	20	4	1	0	0	360
1967	0	26	83	144	67	50	69	83	37	4	1	1	565
1968	1	2	12	86	134	43	25	13	3	1	1	0	321
1969	1	4	53	256	185	130	151	99	19	3	1	0	902
1970	1	3	86	364	67	67	18	14	6	2	1	0	629

Table B-5. UF 5 – Sacramento Valley West Side Minor Streams Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	1	34	92	142	53	95	58	41	14	4	1	1	536
1972	1	4	9	31	31	70	23	12	4	1	0	1	187
1973	5	41	71	148	120	93	74	38	8	2	1	1	602
1974	3	100	125	279	42	170	107	44	14	5	2	1	892
1975	1	2	16	15	111	232	71	75	20	5	2	1	551
1976	3	8	7	5	13	19	18	10	2	1	1	0	87
1977	0	1	1	1	2	6	5	5	1	0	0	0	22
1978	1	10	69	265	133	152	75	43	18	5	1	2	774
1979	1	1	1	22	43	74	34	27	6	2	0	1	212
1980	7	26	27	178	179	69	45	24	9	3	1	1	569
1981	1	1	26	80	68	55	29	11	3	1	0	0	275
1982	5	94	152	73	133	88	125	54	15	5	1	1	746
1983	8	39	112	169	203	300	134	178	70	16	5	3	1237
1984	3	102	209	62	38	51	28	20	8	2	0	0	523
1985	2	72	37	17	27	24	45	12	4	0	0	0	240
1986	2	4	20	65	391	158	43	20	6	2	0	3	714
1987	3	1	4	11	40	65	29	11	1	0	0	0	165
1988	0	3	84	61	40	26	21	15	8	2	0	0	260
1989	0	25	12	24	20	127	46	15	6	2	0	3	280
1990	6	4	3	24	12	24	9	17	13	1	0	0	113
1991	0	0	1	3	8	56	41	23	5	1	0	0	138
1992	0	3	4	11	70	76	51	13	4	3	0	0	235
1993	2	5	33	111	113	182	75	66	43	7	3	0	640
1994	1	1	6	10	14	25	11	10	2	0	0	0	80
1995	0	3	9	334	143	295	115	96	33	8	2	1	1039
1996	1	1	58	100	190	138	70	74	18	4	1	1	655
1997	3	13	161	245	62	33	17	9	4	1	1	1	550
1998	2	19	38	174	418	192	122	171	94	18	6	4	1257
1999	4	21	22	20	88	119	106	42	12	4	2	1	442
2000	2	7	7	36	194	119	116	39	12	5	2	2	541
2001	3	4	5	27	73	174	40	18	5	2	0	0	352
2002	1	21	124	178	39	35	30	14	5	2	0	0	448
2003	1	4	221	149	40	65	64	80	15	5	3	1	646
2004	1	7	103	82	219	106	39	17	6	2	1	0	583
2005	3	5	99	95	112	143	79	169	37	9	3	2	756
2006	2	5	189	117	68	129	252	72	18	6	3	2	863
2007	4	7	27	12	68	41	16	9	2	0	0	0	186
2008	2	2	7	104	105	53	40	33	6	2	0	0	354
2009	1	8	5	5	71	87	24	23	7	1	0	0	232
2010	4	2	7	138	107	66	130	62	25	6	2	1	550
2011	9	7	57	46	22	145	94	41	51	11	4	1	487
2012	5	6	5	23	11	56	74	17	4	1	0	0	203
2013	0	25	127	38	17	21	26	7	2	0	0	0	263
2014	1	2	3	3	20	72	31	6	1	0	0	0	139
1922-2003 Average	3	16	51	80	92	81	64	40	13	3	1	1	444
1922-2014 Average	3	15	51	78	90	81	65	40	13	3	1	1	441

Table B-6. UF 6 – Sacramento River near Red Bluff Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	242	289	542	432	967	880	1067	896	511	338	263	239	6666
1923	256	339	646	678	446	422	884	431	398	314	240	233	5287
1924	232	250	269	306	517	286	269	263	266	246	199	191	3294
1925	211	439	445	463	2508	789	1275	700	466	299	246	237	8078
1926	220	274	343	437	1598	548	832	431	314	266	212	199	5674
1927	206	858	1167	1205	2589	1345	1505	781	490	337	249	239	10971
1928	221	633	550	722	1059	1585	1194	538	359	306	236	231	7634
1929	215	338	381	369	647	482	526	432	350	257	200	202	4399
1930	196	219	973	662	881	1106	575	487	324	258	198	217	6096
1931	219	232	235	470	385	461	300	243	214	186	177	174	3296
1932	204	213	781	548	420	845	556	608	310	215	198	184	5082
1933	180	201	246	390	319	1117	644	552	356	218	188	180	4591
1934	193	200	505	738	728	609	438	324	232	192	176	167	4502
1935	197	483	400	986	732	965	1895	822	371	248	204	190	7493
1936	219	209	282	1571	1779	780	724	482	401	247	195	186	7075
1937	200	196	224	262	682	1441	1194	731	425	250	186	188	5979
1938	250	1165	1908	950	2614	3185	1769	1286	632	375	282	261	14677
1939	305	326	466	426	406	750	454	339	249	225	209	215	4370
1940	207	212	443	1729	2577	2188	1458	581	346	275	231	246	10493
1941	270	320	1881	2528	2339	2111	2048	1124	650	413	325	305	14314
1942	311	321	1655	1733	2540	751	1340	990	658	382	300	280	11261
1943	305	364	628	1687	1077	1409	1002	668	490	331	275	263	8497
1944	290	291	294	387	694	696	485	463	378	274	229	221	4703
1945	268	527	723	495	1416	794	630	673	453	268	235	219	6699
1946	332	620	2161	1249	556	755	767	598	357	283	257	236	8169
1947	256	354	421	275	624	995	618	342	480	259	228	221	5074
1948	370	302	288	1031	343	821	1720	1151	745	338	268	273	7650
1949	274	286	350	277	504	1937	811	584	332	234	226	217	6033
1950	243	243	250	750	962	883	816	542	333	244	225	227	5718
1951	665	768	1517	1263	1517	922	654	702	345	252	244	235	9086
1952	295	520	1765	1463	1753	1429	1621	1111	575	404	305	302	11544
1953	283	300	1271	2746	687	897	861	913	734	388	295	293	9668
1954	308	490	442	1487	1625	1474	1445	650	437	318	308	298	9283
1955	302	516	789	566	447	473	767	682	335	278	250	257	5663
1956	256	414	2898	3226	1849	1200	951	1009	542	361	311	290	13306
1957	371	325	321	423	1115	1446	817	968	459	316	278	330	7170
1958	584	527	913	1482	4414	2085	2149	1069	731	458	362	346	15121
1959	355	326	361	1308	1283	789	631	476	343	284	257	326	6737
1960	288	265	300	546	1431	1216	622	615	403	270	248	254	6459
1961	281	423	965	576	1344	1043	691	627	418	283	259	256	7165
1962	283	425	830	477	1861	1100	772	564	382	274	251	245	7463
1963	898	400	918	558	1360	913	2402	1033	476	347	309	286	9899
1964	353	699	400	850	473	451	470	415	404	246	223	232	5218
1965	263	498	2500	2089	804	593	1632	682	406	330	297	267	10360
1966	283	725	485	1121	950	1186	913	490	337	275	254	259	7278
1967	253	691	1279	1406	1083	1338	1544	1273	714	375	294	261	10510
1968	303	302	437	764	1668	1061	597	500	343	306	327	301	6909
1969	321	356	980	2549	2209	1307	1482	1072	539	361	293	329	11797
1970	356	330	1486	4536	1369	1233	561	514	411	323	306	288	11711

Table B-6. UF 6 – Sacramento River near Red Bluff Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	343	1032	1705	1648	766	1493	1110	957	674	421	313	322	10785
1972	370	360	512	731	760	1236	872	525	376	297	277	289	6606
1973	381	655	818	1818	1746	1436	802	677	397	324	292	295	9639
1974	407	2107	1846	3355	1054	2579	1849	911	595	458	362	354	15876
1975	345	380	503	507	1452	2307	1177	1044	634	379	327	332	9387
1976	435	379	402	371	443	625	554	391	304	258	304	295	4763
1977	298	272	275	303	282	313	255	338	271	242	245	318	3412
1978	282	320	969	3115	1632	2074	1459	801	441	336	281	314	12024
1979	271	264	270	474	945	1010	668	706	271	267	232	240	5617
1980	379	497	690	1776	2262	1520	783	592	362	309	257	309	9736
1981	299	278	509	969	908	1227	661	468	312	273	243	244	6392
1982	324	1546	2104	1293	1737	1687	2208	929	534	376	313	310	13361
1983	383	542	1367	1915	2925	4677	1817	1530	853	475	341	356	17180
1984	377	987	2569	1029	824	1069	726	615	441	314	277	293	9520
1985	372	963	661	428	497	554	555	338	329	252	245	312	5507
1986	330	343	551	1100	3671	2288	764	623	361	338	260	318	10945
1987	323	275	330	463	751	1337	455	373	245	270	219	239	5280
1988	250	279	1015	1045	473	419	426	492	354	247	201	210	5410
1989	231	537	397	470	384	2242	903	455	288	229	223	264	6622
1990	414	262	250	680	370	616	327	663	477	257	215	208	4738
1991	241	244	225	247	269	981	516	439	263	208	189	191	4013
1992	238	226	269	336	1268	921	635	353	265	244	190	212	5157
1993	259	244	650	1573	1410	2167	1339	914	808	319	260	249	10191
1994	311	256	447	458	653	537	382	374	244	185	159	220	4226
1995	229	267	396	3867	1431	3904	1744	1513	693	416	333	354	15147
1996	307	274	786	1046	2277	1527	967	1053	481	307	284	282	9591
1997	330	495	2299	3075	1032	708	621	464	359	276	276	296	10230
1998	375	614	667	2621	3960	2100	1541	1650	1322	562	384	381	16176
1999	426	768	942	953	1741	1590	1113	799	513	354	321	335	9855
2000	373	426	413	1186	2500	1793	1027	662	439	305	299	347	9769
2001	375	337	408	533	924	1067	585	461	316	273	273	276	5828
2002	293	557	1507	1477	811	829	650	507	331	273	270	266	7770
2003	271	319	1899	1841	746	1015	1225	1249	489	321	283	286	9944
2004	286	350	1206	1099	2304	1307	715	520	365	316	243	246	8957
2005	348	308	883	970	752	1240	874	1698	623	362	295	275	8627
2006	299	392	2099	2255	1308	2204	2856	1282	604	376	317	313	14303
2007	332	389	720	428	911	675	441	365	264	242	222	227	5216
2008	326	261	427	997	1003	702	455	523	298	225	224	191	5631
2009	266	317	302	318	1044	1392	575	829	394	293	262	236	6226
2010	366	255	373	1577	1356	925	1112	835	679	352	284	263	8378
2011	311	358	1346	715	706	2335	1368	982	810	423	304	279	9937
2012	352	341	311	446	350	1184	1124	551	344	281	254	251	5789
2013	267	547	1601	573	469	540	566	335	294	235	232	235	5893
2014	236	226	241	219	419	878	529	294	238	215	213	211	3918
1922-2003 Average	**308**	**455**	**841**	**1169**	**1281**	**1255**	**977**	**699**	**442**	**304**	**259**	**264**	**8254**
1922-2014 Average	**309**	**443**	**847**	**1142**	**1247**	**1255**	**974**	**702**	**442**	**303**	**259**	**262**	**8185**

Table B-7. UF 7 – Sacramento Valley East Side Minor Streams Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	39	37	109	83	228	167	188	259	149	51	36	32	1378
1923	37	69	227	123	70	70	150	75	45	31	29	33	959
1924	30	26	29	32	81	50	40	25	21	21	21	20	396
1925	25	38	57	42	245	92	154	73	38	25	22	22	833
1926	25	35	45	63	191	78	220	54	26	21	21	20	799
1927	26	146	85	138	372	178	206	128	54	34	28	26	1421
1928	29	96	64	70	131	379	152	82	44	29	28	25	1129
1929	27	37	43	34	66	60	59	53	35	23	20	20	477
1930	22	21	192	126	134	186	131	92	43	29	24	24	1024
1931	24	26	25	49	40	70	38	31	22	17	16	16	374
1932	23	26	140	75	61	103	121	126	53	27	22	20	797
1933	21	23	28	41	39	104	80	79	49	23	20	19	526
1934	23	22	98	88	106	86	58	37	26	19	17	17	597
1935	22	52	44	159	93	165	333	178	67	33	24	22	1192
1936	26	25	34	211	303	119	150	85	57	33	24	23	1090
1937	23	23	27	32	110	191	188	136	58	29	22	21	860
1938	31	137	395	129	419	461	272	333	208	96	52	44	2577
1939	36	36	44	39	42	95	67	44	29	22	20	21	495
1940	25	23	47	251	495	410	228	94	54	35	28	29	1719
1941	32	41	292	340	471	324	349	194	85	52	38	33	2251
1942	34	44	320	331	423	105	266	204	121	57	40	35	1980
1943	35	47	90	307	164	326	216	128	79	47	36	32	1507
1944	34	36	39	53	105	124	83	92	50	31	26	24	697
1945	29	67	109	62	249	132	104	107	63	37	28	26	1013
1946	41	75	370	146	73	97	119	96	47	34	28	26	1152
1947	28	54	79	34	106	116	114	46	38	26	24	22	687
1948	47	52	33	109	38	179	314	208	143	48	32	28	1231
1949	30	35	43	35	51	238	109	79	39	25	23	22	729
1950	24	27	29	111	218	123	169	117	56	32	25	23	954
1951	47	150	244	222	227	129	116	115	52	33	28	27	1390
1952	34	66	302	268	325	259	264	266	118	60	40	33	2035
1953	32	34	199	411	80	117	160	162	110	54	37	32	1428
1954	35	54	45	156	231	220	283	116	59	39	33	31	1302
1955	31	60	101	79	53	66	100	105	47	30	24	24	720
1956	26	37	556	533	347	152	140	192	95	49	35	32	2194
1957	37	34	35	52	157	180	96	153	61	35	29	43	912
1958	64	54	120	214	568	352	340	226	134	61	42	36	2211
1959	36	38	40	151	222	91	79	58	38	29	26	28	836
1960	29	27	31	60	183	159	89	74	46	28	25	24	775
1961	26	68	110	69	176	135	93	80	52	29	24	23	885
1962	25	39	114	62	296	139	122	96	54	29	24	22	1022
1963	217	48	183	123	209	139	385	164	64	39	32	29	1632
1964	34	80	40	117	54	53	74	67	45	28	24	25	641
1965	26	86	502	419	109	100	271	119	66	40	37	30	1805
1966	31	72	57	127	98	103	130	78	37	29	24	24	810
1967	25	109	186	298	142	234	244	270	143	56	35	30	1772
1968	35	37	59	172	248	150	89	68	41	30	32	25	986
1969	33	56	210	640	351	161	219	236	97	48	35	31	2117
1970	38	44	289	832	191	234	78	76	60	37	31	29	1939

Table B-7. UF 7 – Sacramento Valley East Side Minor Streams Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	33	162	251	195	85	237	149	147	96	52	38	32	1477
1972	34	37	67	65	91	142	127	74	45	31	28	29	770
1973	40	91	96	327	287	209	141	144	61	36	30	30	1492
1974	38	361	286	541	141	502	291	162	99	63	43	36	2563
1975	38	42	60	60	265	327	165	206	119	54	42	34	1412
1976	45	45	46	37	54	69	64	49	30	26	27	25	517
1977	27	27	28	34	27	34	30	34	24	20	19	23	327
1978	24	31	89	417	231	365	237	135	80	45	31	29	1714
1979	27	30	32	70	193	162	104	123	45	28	28	24	866
1980	46	68	148	416	432	189	105	108	61	40	30	27	1670
1981	32	30	69	143	97	137	77	56	33	26	23	23	746
1982	45	336	307	212	261	263	435	166	80	54	38	36	2233
1983	63	109	208	268	387	616	226	261	215	124	67	51	2595
1984	46	187	476	163	126	162	106	105	70	44	37	34	1556
1985	40	104	70	49	75	74	94	54	32	25	24	30	671
1986	33	52	64	150	741	346	113	103	64	43	32	38	1779
1987	34	36	40	61	104	218	79	59	28	22	20	21	722
1988	22	27	106	123	58	66	65	53	39	22	20	19	620
1989	24	53	46	60	56	394	142	71	48	28	25	29	976
1990	46	39	36	85	59	90	58	53	44	23	20	22	575
1991	22	25	28	29	34	173	91	63	36	23	19	17	560
1992	20	25	35	45	160	101	78	42	23	20	16	16	581
1993	27	30	70	273	214	264	198	197	163	78	47	35	1594
1994	33	32	63	49	80	74	58	64	36	24	20	20	552
1995	27	34	83	554	173	562	297	341	199	122	61	44	2498
1996	40	38	114	147	327	193	179	219	102	57	41	36	1494
1997	37	59	441	678	138	112	112	103	70	48	40	38	1876
1998	43	68	90	361	450	252	216	290	258	150	71	52	2301
1999	50	108	127	124	270	212	159	153	109	61	46	39	1458
2000	43	57	51	120	320	219	147	120	81	50	38	36	1284
2001	37	36	38	53	101	117	81	75	38	30	26	26	659
2002	29	57	143	149	79	119	121	88	62	36	30	26	940
2003	29	41	277	252	122	190	251	248	134	66	45	36	1690
2004	28	35	117	101	255	153	103	95	64	40	31	26	1048
2005	35	32	74	95	65	120	101	179	84	48	31	26	891
2006	32	46	364	265	187	335	418	236	121	72	48	39	2162
2007	32	39	65	43	102	75	55	52	32	25	21	20	560
2008	24	23	34	91	80	63	66	77	36	24	20	19	558
2009	22	30	28	39	140	165	63	100	43	27	21	19	698
2010	26	26	37	149	113	108	143	127	111	58	31	27	957
2011	47	51	217	96	134	338	259	246	210	122	62	44	1824
2012	43	41	38	59	41	178	167	106	59	36	29	26	824
2013	30	77	301	80	65	94	92	64	44	30	27	27	931
2014	25	26	26	26	54	128	66	41	25	21	20	19	475
1922-2003 Average	**35**	**62**	**130**	**178**	**191**	**185**	**157**	**124**	**71**	**41**	**31**	**28**	**1232**
1922-2014 Average	**35**	**59**	**128**	**169**	**181**	**182**	**155**	**123**	**72**	**41**	**31**	**28**	**1204**

Table B-8. UF 8 – Feather River near Oroville Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	81	100	194	192	422	433	933	1570	721	210	119	89	5065
1923	95	129	347	309	206	362	651	482	230	125	85	75	3096
1924	84	79	92	107	298	122	168	101	64	63	63	56	1295
1925	78	137	140	155	754	378	534	422	192	113	93	80	3076
1926	89	115	139	156	619	408	862	324	139	94	78	74	3098
1927	81	448	299	369	1270	782	931	750	382	164	108	86	5670
1928	83	291	187	229	365	1410	727	440	163	118	87	72	4172
1929	74	93	118	101	185	259	268	350	177	91	66	62	1844
1930	59	57	890	326	420	618	650	452	209	115	85	70	3952
1931	72	102	83	148	146	280	202	143	89	68	58	53	1443
1932	79	82	264	237	210	554	606	681	326	129	84	73	3324
1933	70	73	85	147	89	261	343	398	295	106	71	62	2000
1934	67	68	205	278	314	372	264	156	99	75	65	54	2017
1935	63	140	139	276	240	347	1380	962	401	149	96	77	4270
1936	80	78	102	663	944	601	719	521	278	130	93	81	4290
1937	70	69	78	92	252	505	705	784	319	132	89	72	3166
1938	77	337	1130	346	748	1370	1500	1700	828	293	158	117	8604
1939	114	122	141	144	130	328	364	194	109	82	67	63	1857
1940	69	66	123	675	1220	1500	977	498	226	132	101	88	5675
1941	101	152	660	686	1100	949	839	1060	451	219	145	120	6482
1942	106	139	817	892	1060	483	1070	923	637	253	152	120	6652
1943	108	214	405	986	585	1180	892	529	321	172	124	104	5620
1944	93	108	118	159	247	400	478	608	274	211	98	78	2872
1945	82	217	295	214	780	392	527	617	276	143	107	86	3736
1946	121	222	851	483	250	460	673	569	228	135	106	87	4185
1947	81	204	214	117	359	515	419	212	165	93	81	71	2532
1948	140	122	97	404	140	272	934	838	533	181	107	86	3854
1949	80	112	137	101	146	453	638	504	179	100	80	65	2595
1950	60	81	77	333	568	557	834	698	318	138	98	79	3841
1951	178	767	1090	668	768	522	601	546	230	134	101	86	5691
1952	108	191	644	532	830	677	1830	1690	820	336	176	128	7962
1953	107	110	276	1260	352	443	738	793	620	254	143	120	5216
1954	108	194	168	321	504	766	1020	559	241	145	108	96	4230
1955	89	148	220	187	159	277	347	537	231	115	85	77	2472
1956	74	111	1960	1370	748	717	898	1060	513	261	142	120	7974
1957	142	136	124	155	649	708	447	635	290	136	104	98	3624
1958	154	176	341	392	1435	852	1146	1275	663	265	160	111	6970
1959	105	119	131	418	459	427	436	301	159	118	90	88	2851
1960	80	72	104	153	688	758	502	380	219	114	81	74	3223
1961	72	147	200	160	396	361	388	403	232	113	94	72	2637
1962	70	95	169	133	696	425	868	579	318	139	92	76	3659
1963	855	186	487	389	1082	408	1267	903	317	164	104	104	6266
1964	112	311	156	266	192	241	416	404	225	124	83	59	2588
1965	69	152	1997	1199	510	504	1005	728	358	173	146	70	6912
1966	93	224	164	266	199	436	662	401	151	106	86	68	2856
1967	61	273	481	749	559	880	609	1265	891	279	135	101	6283
1968	116	121	167	320	797	583	466	379	187	130	115	79	3459
1969	114	161	308	1635	733	600	1196	1341	560	208	116	98	7069
1970	116	130	824	2471	654	678	361	423	261	151	105	97	6269

Table B-8. UF 8 – Feather River near Oroville Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	99	348	551	491	375	1009	885	1041	694	242	113	111	5958
1972	115	140	217	264	348	708	527	427	205	112	81	89	3233
1973	123	210	339	745	597	629	687	783	286	138	107	97	4741
1974	139	1041	713	1489	444	1559	1131	882	504	243	127	89	8363
1975	114	123	155	182	536	864	611	1159	662	202	127	120	4854
1976	151	180	145	130	181	265	222	184	113	98	111	69	1849
1977	64	71	68	90	94	92	100	125	92	74	62	62	994
1978	57	83	320	1114	618	1120	792	742	438	194	92	113	5685
1979	63	123	101	235	301	493	505	670	222	134	97	79	3023
1980	149	144	196	1447	1158	650	580	565	282	158	72	130	5533
1981	94	91	234	263	362	407	386	281	119	89	76	78	2478
1982	147	1240	1326	655	1146	883	1689	999	442	221	126	123	8998
1983	213	350	633	713	1196	2029	1024	1427	1122	368	197	146	9418
1984	156	747	1398	595	495	711	513	511	278	154	98	111	5767
1985	131	324	195	158	239	329	560	290	132	102	84	99	2642
1986	93	140	199	518	2677	1489	584	446	224	133	101	158	6760
1987	122	104	120	172	313	583	299	190	107	80	73	65	2227
1988	64	85	353	290	185	251	238	220	139	93	75	56	2049
1989	58	243	120	142	205	1517	683	309	162	80	78	92	3687
1990	152	132	68	250	172	398	318	217	212	95	71	86	2171
1991	40	66	62	69	97	539	397	364	186	104	73	58	2057
1992	60	72	89	101	386	343	370	172	97	86	66	56	1898
1993	73	67	231	672	566	1361	950	905	521	167	107	93	5713
1994	99	96	154	152	226	330	271	250	108	77	66	62	1891
1995	60	104	204	1521	606	2283	1338	1682	870	354	153	105	9280
1996	104	108	351	460	1279	857	882	1018	337	170	111	104	5783
1997	105	223	1506	2539	530	532	497	325	187	116	101	92	6754
1998	103	192	233	970	1117	981	886	1082	977	370	161	126	7199
1999	129	339	420	568	952	811	683	695	319	146	117	100	5278
2000	98	151	123	432	978	761	698	488	208	131	94	82	4245
2001	111	96	123	138	212	396	339	297	107	86	71	65	2041
2002	63	171	366	492	304	446	506	341	161	95	75	64	3084
2003	53	135	662	743	370	569	639	839	347	135	117	84	4693
2004	74	106	399	323	783	724	519	405	192	109	92	75	3800
2005	124	109	233	299	326	684	598	1116	393	172	112	99	4266
2006	85	144	1353	1023	725	1133	1706	1206	422	193	127	94	8212
2007	98	138	283	181	467	441	310	225	110	114	93	80	2540
2008	91	74	116	229	239	364	358	418	145	88	66	52	2239
2009	64	127	113	172	476	777	410	607	176	85	78	61	3147
2010	93	75	113	348	315	438	618	683	549	181	94	80	3586
2011	136	153	787	362	373	1111	1165	983	906	351	147	104	6579
2012	124	118	85	187	156	680	694	399	150	113	90	63	2859
2013	74	282	950	271	234	415	351	175	138	92	78	70	3130
2014	77	80	74	78	257	462	291	127	79	73	68	57	1722
1922-2003 Average	**106**	**192**	**371**	**502**	**558**	**659**	**684**	**634**	**329**	**153**	**101**	**88**	**4376**
1922-2014 Average	**105**	**184**	**375**	**480**	**539**	**658**	**679**	**628**	**325**	**152**	**101**	**86**	**4311**

Table B-9. UF 9 – Yuba River at Smartville Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	25	31	113	122	318	261	421	869	650	104	36	22	2972
1923	27	57	296	165	113	159	432	459	221	84	33	28	2073
1924	33	24	55	40	127	62	137	78	17	6	9	14	603
1925	33	53	121	111	563	232	403	396	127	38	25	21	2123
1926	25	38	55	64	411	220	454	213	72	20	17	19	1607
1927	30	314	201	226	745	422	586	539	366	67	23	21	3542
1928	22	149	135	178	155	798	465	380	87	33	17	17	2435
1929	20	36	48	42	84	145	190	275	118	23	0	30	1010
1930	13	13	291	179	209	321	345	269	113	26	19	19	1818
1931	5	48	17	61	61	148	140	94	37	8	9	12	641
1932	26	36	166	147	196	278	347	533	300	46	26	13	2114
1933	16	16	27	40	35	142	217	284	239	36	12	15	1078
1934	22	27	97	128	150	234	172	86	37	15	7	13	987
1935	17	66	72	153	150	199	672	558	274	44	21	16	2241
1936	27	32	42	345	528	332	500	461	226	54	21	21	2589
1937	17	16	31	32	231	281	415	566	198	42	18	13	1858
1938	22	107	496	141	423	711	590	845	527	114	36	23	4034
1939	34	39	47	56	55	214	263	126	48	13	3	9	907
1940	22	21	32	392	577	723	495	403	129	29	18	19	2860
1941	25	69	256	374	504	425	421	645	251	117	27	23	3138
1942	24	70	370	497	512	238	535	554	426	108	40	31	3406
1943	29	135	283	587	308	631	502	358	189	56	34	21	3133
1944	29	31	42	64	143	213	215	421	162	37	22	18	1395
1945	22	107	149	105	466	203	319	450	196	50	26	20	2112
1946	36	117	492	260	146	257	407	445	149	47	25	17	2401
1947	31	96	101	54	184	301	263	179	90	27	20	17	1365
1948	55	52	41	209	68	128	509	509	323	65	34	16	2010
1949	22	38	62	42	77	245	412	408	111	31	19	19	1485
1950	14	31	38	237	331	309	461	469	227	47	24	30	2219
1951	69	677	794	411	378	286	360	365	112	30	33	25	3539
1952	41	102	315	325	481	356	692	929	582	221	45	30	4118
1953	43	32	127	570	143	214	383	403	410	133	51	45	2554
1954	31	65	63	155	238	385	491	323	96	34	18	19	1917
1955	17	40	107	100	82	123	182	388	181	35	16	15	1285
1956	17	40	1192	776	308	287	334	576	296	86	23	28	3962
1957	45	48	44	65	313	389	252	493	222	45	23	19	1959
1958	41	59	140	182	686	443	582	799	434	99	32	32	3529
1959	20	37	33	201	226	189	232	171	71	25	12	21	1235
1960	10	17	19	74	389	418	313	265	133	32	15	11	1695
1961	14	50	64	37	155	176	219	251	108	22	17	12	1125
1962	17	21	73	56	435	219	454	363	204	44	25	13	1924
1963	451	79	248	214	596	205	557	608	204	56	31	24	3275
1964	33	212	77	133	108	123	247	320	152	40	19	16	1482
1965	16	63	1341	678	240	198	501	442	264	72	41	26	3883
1966	25	91	76	123	99	228	402	282	58	20	10	11	1424
1967	16	129	282	393	260	420	299	657	603	177	44	20	3299
1968	26	30	69	143	442	275	243	222	78	21	18	7	1573
1969	28	89	130	964	377	279	522	768	388	42	66	17	3669
1970	31	39	386	1278	263	287	173	275	127	34	14	8	2915

Table B-9. UF 9 – Yuba River at Smartville Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0	184	338	288	205	394	358	562	374	86	44	24	2857
1972	31	47	104	136	214	358	294	291	162	35	15	30	1714
1973	47	152	243	512	353	308	324	502	146	27	19	27	2660
1974	35	559	394	706	176	681	492	500	285	109	29	18	3984
1975	12	39	49	83	285	398	272	598	443	100	52	41	2372
1976	72	79	59	49	72	127	128	134	33	9	15	15	791
1977	0	39	17	27	29	35	58	79	40	23	12	11	369
1978	9	23	179	557	286	527	430	494	328	84	29	40	2985
1979	17	29	37	130	170	315	296	521	133	28	20	32	1727
1980	36	74	127	946	599	316	336	397	224	86	25	19	3186
1981	21	25	55	101	166	227	249	179	47	17	12	0	1100
1982	40	613	777	376	669	468	885	636	305	101	26	29	4926
1983	119	191	361	310	566	926	428	715	713	275	62	33	4699
1984	51	519	816	308	244	326	255	396	175	41	14	19	3163
1985	34	172	97	61	127	162	328	233	61	14	13	17	1319
1986	36	53	112	275	1351	792	317	294	144	36	18	42	3472
1987	37	24	26	49	156	218	200	114	25	16	13	6	883
1988	6	17	141	156	93	146	157	124	53	14	8	3	919
1989	7	137	71	85	137	854	508	282	78	62	18	22	2262
1990	61	58	38	138	101	232	243	191	121	35	11	9	1238
1991	14	19	21	20	31	323	263	294	143	31	7	13	1179
1992	17	29	34	40	242	197	219	91	19	13	4	6	912
1993	20	20	111	452	294	565	425	555	330	82	29	20	2903
1994	29	23	69	52	103	172	186	168	44	17	4	10	878
1995	17	43	146	806	322	993	555	829	552	238	45	24	4570
1996	19	17	202	267	829	403	457	762	197	41	33	20	3247
1997	22	114	912	1482	299	215	292	247	102	21	8	15	3729
1998	28	66	86	529	566	454	433	587	595	201	44	34	3622
1999	37	106	191	354	523	371	306	466	284	67	18	21	2744
2000	34	41	39	255	539	400	386	364	103	35	15	19	2229
2001	19	42	44	48	94	210	202	205	28	10	9	11	922
2002	14	67	190	229	187	282	326	287	96	22	12	10	1723
2003	12	67	293	326	172	284	344	557	219	24	50	21	2370
2004	22	33	185	150	310	328	286	237	76	26	16	14	1684
2005	41	35	108	176	162	362	319	785	277	64	26	21	2376
2006	25	40	854	519	426	491	822	706	224	69	28	18	4221
2007	20	42	116	82	249	244	206	178	44	19	12	14	1226
2008	34	25	50	124	139	182	231	316	71	19	13	8	1213
2009	21	51	39	89	227	378	254	499	89	25	12	11	1694
2010	22	19	46	137	135	204	328	406	427	71	22	19	1838
2011	73	91	544	204	187	609	599	559	645	248	68	29	3855
2012	47	36	26	82	54	424	467	282	73	27	15	10	1543
2013	23	173	515	136	102	172	187	105	40	19	5	18	1494
2014	22	23	22	24	188	245	192	104	27	13	10	10	881
1922-2003 Average	**33**	**91**	**197**	**269**	**296**	**329**	**362**	**408**	**210**	**57**	**23**	**20**	**2295**
1922-2014 Average	**32**	**87**	**200**	**256**	**285**	**330**	**361**	**404**	**207**	**57**	**23**	**19**	**2260**

Table B-10. UF 10 – Bear River near Wheatland Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-10. UF 10 – Bear River near Wheatland Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	3	60	140	39	45	38	24	18	11	7	4	4	393
1985	9	22	14	11	30	37	22	9	5	4	0	2	165
1986	0	10	25	44	313	123	19	15	4	6	1	0	560
1987	1	0	4	5	27	37	7	4	2	1	0	1	89
1988	0	0	19	46	7	10	9	6	3	0	0	0	100
1989	0	14	20	27	19	152	32	21	7	8	0	4	304
1990	2	8	6	29	28	27	9	4	15	3	0	0	131
1991	0	0	1	1	2	84	22	15	11	6	3	0	145
1992	0	2	3	6	66	28	10	3	0	2	0	1	121
1993	0	0	25	144	78	65	34	12	13	7	3	1	382
1994	2	0	13	7	27	16	7	6	2	1	0	0	81
1995	2	7	54	214	29	211	55	56	21	18	6	7	680
1996	0	17	18	66	118	64	50	42	21	11	6	3	415
1997	2	13	180	245	24	16	11	16	11	7	6	7	538
1998	2	0	41	139	199	64	65	52	30	15	7	3	618
1999	6	8	37	77	151	69	42	28	14	3	2	1	438
2000	2	5	6	55	153	79	30	23	10	0	3	3	369
2001	10	5	4	7	31	25	14	7	3	2	0	3	112
2002	2	6	60	50	43	68	25	14	13	0	2	4	285
2003	4	2	56	42	24	35	53	48	14	4	0	0	282
2004	0	4	34	42	74	34	5	5	0	3	0	2	203
2005	5	3	31	62	37	74	39	58	25	8	0	1	345
2006	0	0	148	82	78	137	170	39	13	6	0	3	675
2007	6	3	19	9	56	26	10	11	3	1	0	2	147
2008	1	1	21	36	45	20	12	0	4	2	0	0	141
2009	3	2	12	6	46	60	16	33	8	3	0	1	190
2010	11	0	0	16	24	17	28	34	35	12	0	0	176
2011	10	19	128	49	61	205	71	35	27	15	2	0	621
2012	3	2	0	14	6	100	77	19	17	7	0	2	246
2013	3	15	131	21	12	13	6	8	11	8	2	0	230
2014	0	0	0	0	37	37	27	2	2	1	3	0	110
1922-2003 Average	**5**	**14**	**41**	**60**	**69**	**61**	**38**	**18**	**7**	**3**	**1**	**2**	**318**
1922-2014 Average	**5**	**13**	**41**	**57**	**66**	**61**	**39**	**18**	**7**	**3**	**1**	**2**	**314**

Table B-11. UF 11 – American River at Fair Oaks Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	14	39	131	113	360	325	480	1027	677	94	14	6	3279
1923	19	56	398	275	183	225	564	616	283	97	18	18	2751
1924	23	21	27	42	112	58	123	105	26	4	1	2	543
1925	13	57	86	87	598	312	600	613	273	60	11	7	2717
1926	20	33	54	48	261	200	479	212	66	13	0	1	1387
1927	13	181	142	222	775	447	728	617	432	75	13	9	3652
1928	17	113	99	109	138	989	536	396	98	20	4	2	2521
1929	12	28	38	42	99	148	211	358	180	30	2	1	1147
1930	11	12	162	144	151	328	357	285	160	27	7	8	1652
1931	17	34	21	57	75	140	173	136	47	8	3	4	715
1932	16	30	165	161	320	298	403	659	426	93	17	9	2595
1933	11	14	23	43	47	135	239	354	342	42	10	9	1269
1934	22	34	108	159	171	255	196	106	49	11	7	6	1124
1935	11	59	54	156	148	213	818	668	360	70	17	11	2583
1936	21	30	34	408	775	432	636	587	358	83	18	14	3397
1937	11	15	23	44	336	396	503	688	234	52	15	12	2328
1938	20	54	436	130	539	806	732	1011	599	134	31	20	4511
1939	30	41	44	50	70	222	326	175	57	15	6	12	1046
1940	28	19	28	468	611	847	628	511	199	40	13	14	3406
1941	15	44	249	345	473	449	445	720	282	85	23	17	3145
1942	18	49	325	583	554	286	626	717	557	155	32	17	3917
1943	17	154	278	691	374	930	590	446	264	87	25	18	3875
1944	19	24	31	58	144	234	216	472	194	46	14	9	1462
1945	11	120	124	97	560	259	417	550	282	70	15	10	2516
1946	35	143	544	308	155	342	513	549	203	49	13	13	2866
1947	18	88	87	50	172	305	302	263	96	19	9	7	1417
1948	47	43	28	170	74	147	532	634	446	87	19	12	2239
1949	14	35	54	48	87	351	516	531	167	29	14	10	1857
1950	12	26	25	301	335	342	588	598	325	82	19	12	2664
1951	40	985	1054	576	425	431	431	456	156	44	18	14	4631
1952	30	98	317	540	545	501	817	1136	671	241	56	24	4976
1953	20	30	99	454	155	218	469	486	511	164	31	16	2653
1954	16	54	65	123	210	450	542	364	115	33	14	11	1997
1955	12	29	114	133	103	154	240	485	222	42	19	13	1564
1956	13	29	1247	952	327	306	408	754	431	124	34	21	4645
1957	32	31	49	58	284	443	305	567	289	53	18	8	2137
1958	22	37	98	164	588	553	846	1057	537	131	38	21	4090
1959	15	23	24	149	204	200	283	205	86	16	7	15	1226
1960	12	13	20	63	348	431	359	283	121	20	6	4	1680
1961	9	50	39	31	123	157	237	273	117	5	0	5	1045
1962	10	14	51	47	418	247	554	420	261	40	4	3	2069
1963	335	45	178	259	712	234	652	761	281	63	17	17	3552
1964	32	201	83	156	107	126	292	395	187	37	14	2	1632
1965	11	64	1509	774	282	238	618	510	316	95	52	15	4485
1966	26	75	81	122	113	237	412	276	48	3	0	0	1392
1967	7	77	278	421	266	540	439	898	751	241	34	15	3967
1968	19	45	85	143	450	292	291	250	92	11	18	4	1699
1969	14	100	128	1090	495	367	675	943	469	116	25	23	4445
1970	28	50	336	1315	334	341	208	295	199	40	10	7	3163

Table B-11. UF 11 – American River at Fair Oaks Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	10	179	342	297	212	405	414	554	419	107	25	10	2972
1972	14	54	134	110	194	456	333	381	160	26	5	7	1874
1973	25	93	227	597	395	355	419	637	199	34	13	15	3008
1974	31	430	349	819	187	585	649	539	468	163	34	18	4272
1975	27	30	46	99	252	448	303	762	503	105	30	14	2620
1976	82	84	66	44	67	120	141	152	22	3	11	9	801
1977	15	10	3	22	27	42	75	100	55	0	0	0	349
1978	0	19	181	550	293	568	522	595	377	88	7	24	3224
1979	2	22	32	181	217	360	364	653	170	34	4	2	2042
1980	31	66	94	1208	717	403	407	487	299	127	19	13	3871
1981	19	18	42	92	136	268	292	216	45	0	0	0	1128
1982	42	531	838	529	897	688	1130	842	387	136	41	61	6124
1983	169	278	565	454	696	1167	605	983	942	382	90	51	6382
1984	49	722	947	379	288	380	319	493	237	50	22	17	3901
1985	36	188	102	70	141	200	435	283	79	14	5	24	1574
1986	21	69	154	358	1866	967	402	419	310	51	25	12	4653
1987	28	12	12	50	133	209	212	177	31	9	3	4	880
1988	9	15	89	161	93	140	165	128	51	1	0	0	853
1989	6	85	62	66	109	866	553	316	145	17	3	19	2247
1990	36	40	29	101	101	241	271	181	109	6	2	3	1118
1991	4	7	12	11	24	331	276	327	169	25	0	8	1195
1992	17	32	24	25	231	210	239	92	17	14	0	0	901
1993	14	20	128	521	361	659	516	668	386	96	20	10	3399
1994	17	16	47	44	95	163	189	184	43	3	2	8	811
1995	10	62	152	926	304	1172	755	988	730	342	81	26	5549
1996	10	9	184	340	824	573	559	811	257	67	21	14	3668
1997	15	143	1024	1988	338	295	360	335	153	32	11	10	4704
1998	19	49	91	514	727	587	582	699	787	265	45	33	4398
1999	20	86	146	367	698	436	414	644	375	83	25	19	3316
2000	19	34	41	316	678	431	438	466	160	45	12	19	2658
2001	19	21	34	54	105	228	253	255	32	13	2	6	1022
2002	2	54	181	226	218	356	425	374	153	22	8	5	2025
2003	0	65	194	241	160	269	415	634	266	39	17	5	2305
2004	20	16	147	133	268	383	315	240	67	10	0	1	1600
2005	52	43	124	272	224	524	466	974	452	112	23	12	3278
2006	14	34	879	621	484	657	1254	915	365	88	25	13	5349
2007	0	47	100	85	257	282	251	223	46	3	0	4	1298
2008	17	15	47	120	137	185	252	325	86	12	0	0	1195
2009	6	45	35	102	240	449	332	606	107	23	3	5	1953
2010	24	11	53	144	161	254	403	521	537	78	13	8	2205
2011	104	104	680	270	236	884	734	684	763	310	49	25	4842
2012	46	24	23	100	64	431	561	292	79	20	7	0	1647
2013	19	134	545	156	109	217	240	155	66	15	7	6	1670
2014	6	11	11	20	237	232	234	143	34	10	3	5	945
1922-2003 Average	**25**	**88**	**198**	**302**	**329**	**384**	**439**	**497**	**269**	**68**	**17**	**12**	**2628**
1922-2014 Average	**25**	**83**	**203**	**288**	**316**	**387**	**441**	**493**	**265**	**67**	**16**	**12**	**2596**

Table B-12. UF 12 – San Joaquin Valley East Side Minor Streams Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-12. UF 12 – San Joaquin Valley East Side Minor Streams Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	58	9	32	40	141	54	18	0	5	0	0	0	357
1993	0	1	12	111	88	119	72	39	20	4	1	1	468
1994	0	1	2	2	5	5	3	3	1	0	0	0	22
1995	1	4	16	202	64	315	139	166	56	18	4	2	988
1996	2	2	9	45	111	104	63	59	15	5	2	2	420
1997	2	12	177	485	79	39	28	17	7	4	2	1	853
1998	3	6	11	106	220	161	132	124	73	19	6	4	866
1999	4	6	13	49	158	83	65	44	16	5	3	2	447
2000	2	4	4	44	135	71	36	29	8	3	1	2	339
2001	2	2	3	5	12	18	17	10	2	1	0	0	72
2002	0	3	14	25	24	40	26	15	5	1	0	0	155
2003	0	3	12	13	11	16	48	52	10	2	1	0	169
2004	0	1	9	13	30	32	17	8	2	1	0	0	113
2005	3	4	17	70	46	118	82	95	30	7	2	2	476
2006	2	3	102	125	70	182	359	110	28	8	4	3	996
2007	2	3	5	6	24	23	14	9	2	1	0	0	90
2008	1	1	2	12	15	13	12	9	2	1	0	0	69
2009	1	2	2	7	23	51	22	36	4	1	0	0	148
2010	1	1	4	18	22	34	49	54	31	4	1	1	219
2011	5	11	123	67	61	259	143	89	62	18	4	2	844
2012	3	3	2	6	4	35	51	17	4	1	1	1	128
2013	1	3	43	13	9	13	13	4	1	1	0	0	100
2014	0	1	1	1	7	9	6	2	0	0	0	0	27
1922-2003 Average	**1**	**9**	**37**	**75**	**98**	**86**	**49**	**15**	**4**	**1**	**0**	**1**	**377**
1922-2014 Average	**1**	**8**	**36**	**70**	**90**	**84**	**52**	**18**	**5**	**1**	**0**	**1**	**367**

Table B-13. UF 13 – Cosumnes River at Michigan Bar Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	1	14	18	104	70	84	97	33	4	1	0	425
1923	1	12	104	76	45	40	99	41	16	4	1	1	438
1924	2	2	3	5	11	5	8	3	0	0	0	0	40
1925	1	5	15	14	136	45	99	48	15	2	1	1	381
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	452
1928	1	8	13	12	25	146	80	22	5	1	0	0	315
1929	1	2	5	7	19	20	30	21	10	1	0	0	115
1930	0	0	6	20	19	57	35	20	6	1	0	0	165
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	113
1934	1	2	18	31	31	23	10	5	3	0	0	0	123
1935	0	4	6	33	24	44	174	61	18	3	1	0	369
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	683
1939	3	4	5	6	11	27	24	9	2	0	0	0	92
1940	2	1	2	77	130	160	94	28	7	2	0	0	502
1941	1	2	28	50	80	84	81	56	17	3	1	1	402
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	660
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	357
1946	3	15	108	56	28	65	65	37	11	3	1	0	390
1947	2	10	12	8	23	43	32	11	3	0	0	0	145
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	237
1950	1	3	3	40	69	57	92	47	15	3	1	1	331
1951	4	148	181	134	86	95	47	47	12	4	2	1	762
1952	4	10	59	141	117	131	141	117	43	13	4	3	782
1953	2	4	15	58	19	32	49	44	30	7	2	1	264
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	247
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	127
1960	0	1	2	7	47	51	30	19	4	2	1	0	165
1961	1	3	4	3	7	13	13	13	4	2	1	0	63
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	156
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	626
1968	3	4	9	19	55	45	28	14	5	3	2	0	188
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

Table B-13. UF 13 – Cosumnes River at Michigan Bar Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	2	19	72	75	32	63	55	44	20	5	2	1	389
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	475
1974	3	30	75	115	35	131	104	51	16	9	3	1	574
1975	2	4	7	13	59	105	71	85	31	7	3	2	390
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	20
1978	0	1	16	109	63	107	110	57	22	5	1	2	494
1979	0	2	4	32	58	93	71	71	9	0	0	0	342
1980	1	5	12	211	194	103	53	41	15	4	0	0	639
1981	0	2	4	16	13	52	28	14	0	0	0	0	129
1982	2	39	88	145	167	190	239	88	24	8	3	4	997
1983	12	50	149	146	194	329	135	138	67	23	7	4	1253
1984	4	103	201	68	58	67	39	26	11	3	2	0	581
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	710
1987	1	1	2	4	14	22	7	4	2	2	1	0	62
1988	0	1	2	15	7	11	11	8	5	3	2	1	65
1989	0	3	4	7	12	106	39	15	5	1	1	1	192
1990	3	4	3	9	13	33	19	9	9	3	0	0	107
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
1993	0	0	14	129	102	146	100	48	23	0	0	0	562
1994	0	0	5	5	16	16	11	11	3	1	1	0	67
1995	0	4	16	197	58	275	121	145	52	16	5	1	891
1996	0	1	10	53	125	111	66	63	19	8	4	2	459
1997	0	15	171	424	73	32	25	15	7	3	2	0	767
1998	2	5	9	104	217	145	119	112	69	19	7	5	812
1999	4	7	14	57	159	86	69	46	19	6	4	2	474
2000	1	4	4	52	152	77	40	33	10	5	3	3	383
2001	3	3	5	9	21	32	32	20	3	1	1	1	131
2002	1	4	21	37	35	59	37	22	7	2	1	1	226
2003	1	4	17	20	17	25	68	68	14	4	2	1	241
2004	1	2	14	20	47	52	25	12	3	2	1	1	181
2005	4	5	19	78	54	124	85	98	33	8	3	2	512
2006	2	3	95	115	62	159	313	98	26	8	4	3	889
2007	4	5	9	11	39	40	24	16	4	2	1	1	156
2008	2	2	4	22	27	27	23	18	5	1	2	2	135
2009	1	3	3	11	33	76	33	48	6	2	1	1	218
2010	2	2	6	23	29	45	64	66	39	6	2	1	285
2011	5	11	122	61	56	236	130	81	57	17	5	3	784
2012	3	4	4	10	6	53	75	24	6	3	1	1	191
2013	2	5	69	21	15	21	20	7	3	1	1	1	166
2014	1	2	2	2	20	28	18	5	0	0	0	0	80
1922-2003 Average	**2**	**9**	**29**	**56**	**68**	**74**	**64**	**43**	**16**	**4**	**1**	**1**	**368**
1922-2014 Average	**2**	**9**	**30**	**54**	**64**	**75**	**65**	**43**	**16**	**4**	**2**	**1**	**363**

Table B-14. UF 14 – Mokelumne River at Pardee Reservoir Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	2	2	12	22	60	57	108	334	284	40	3	1	925
1923	4	11	60	47	35	46	129	231	111	31	2	4	709
1924	8	5	6	8	17	19	56	69	2	0	0	0	190
1925	6	20	24	23	108	84	169	247	129	20	2	3	835
1926	4	6	15	15	39	49	136	95	16	1	0	0	376
1927	2	31	37	42	105	82	159	211	189	32	3	2	896
1928	5	26	19	23	35	188	140	172	29	5	0	0	641
1929	2	2	6	9	14	29	66	148	61	5	1	0	343
1930	1	1	20	19	31	65	116	116	84	6	1	1	460
1931	2	5	3	6	15	30	73	64	11	0	0	1	210
1932	2	5	19	22	59	68	109	229	196	30	3	3	745
1933	0	2	3	5	9	28	64	126	163	16	4	5	424
1934	5	6	20	24	29	73	78	40	21	1	0	0	297
1935	0	13	13	23	33	41	179	229	153	16	2	1	704
1936	4	4	4	39	138	102	187	246	145	22	4	2	897
1937	3	3	7	7	61	73	127	279	117	15	2	2	696
1938	3	6	125	27	78	158	180	334	265	51	8	4	1238
1939	7	12	12	13	15	55	125	76	17	2	1	2	337
1940	8	4	9	81	95	157	168	240	89	8	2	2	862
1941	3	6	31	38	69	95	107	285	167	31	7	3	841
1942	4	11	66	96	76	59	154	221	241	51	8	4	989
1943	3	35	54	107	76	192	184	208	113	25	6	3	1004
1944	5	4	8	14	22	46	66	188	79	11	3	0	447
1945	2	33	34	28	112	56	122	208	148	23	5	2	774
1946	5	38	84	60	33	75	153	207	80	10	2	1	748
1947	4	19	21	14	28	57	91	130	29	1	0	0	394
1948	14	12	9	28	17	29	105	206	184	25	2	2	634
1949	3	4	9	8	9	47	146	204	78	4	3	2	517
1950	1	4	5	36	60	69	173	228	150	21	3	3	753
1951	10	270	264	93	83	88	122	156	59	10	3	2	1160
1952	3	13	53	78	93	96	223	374	268	94	17	11	1322
1953	5	8	15	64	35	51	130	139	181	42	6	4	681
1954	4	8	10	16	35	84	157	165	42	8	1	0	531
1955	1	5	19	20	24	38	63	168	90	8	2	0	437
1956	1	4	239	186	78	85	139	258	206	30	14	7	1247
1957	7	9	12	13	55	85	92	179	131	13	5	1	601
1958	5	9	18	25	85	97	188	343	223	55	12	5	1064
1959	5	6	7	30	36	55	102	89	33	7	0	6	375
1960	4	2	3	7	49	72	111	119	42	4	0	2	413
1961	0	4	8	7	19	29	73	102	33	3	0	1	279
1962	1	3	10	8	65	49	180	163	140	16	4	1	639
1963	19	7	18	37	176	47	128	263	145	23	7	4	874
1964	6	40	19	17	18	27	87	137	66	10	0	1	428
1965	3	15	295	151	68	57	156	205	168	47	27	4	1195
1966	8	28	21	22	28	64	139	127	15	3	0	2	457
1967	2	15	71	51	59	119	102	294	292	118	13	4	1140
1968	7	4	9	15	69	59	86	114	36	4	4	0	407
1969	4	34	22	195	96	88	208	385	228	60	6	3	1327
1970	16	12	65	238	81	81	79	192	125	21	3	0	910

Table B-14. UF 14 – Mokelumne River at Pardee Reservoir Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	14	27	46	57	51	74	111	176	190	38	0	1	783
1972	6	12	28	22	32	104	81	159	70	10	2	3	529
1973	7	13	42	73	64	65	128	284	105	11	3	1	795
1974	7	85	68	105	40	118	136	246	146	38	9	3	1002
1975	3	6	10	19	40	83	72	257	235	42	8	4	776
1976	23	24	14	11	14	28	44	72	8	2	5	2	246
1977	3	2	2	4	6	9	34	42	25	0	1	1	129
1978	1	3	28	76	57	124	147	237	213	52	6	14	959
1979	2	5	9	45	43	91	121	261	94	11	3	1	685
1980	9	18	19	252	163	97	127	206	176	66	6	2	1140
1981	2	2	7	16	26	45	110	125	32	0	0	1	368
1982	6	78	131	90	201	150	296	305	172	56	9	16	1511
1983	65	62	101	95	141	254	140	317	377	203	29	16	1800
1984	8	156	192	85	56	84	87	218	98	16	14	0	1014
1985	5	30	16	16	29	43	131	142	34	4	1	3	453
1986	2	12	25	68	331	246	140	212	140	22	5	2	1204
1987	2	0	4	8	21	41	80	80	12	3	1	1	252
1988	2	6	11	17	19	41	67	68	23	2	0	0	256
1989	0	9	9	10	24	144	152	130	64	6	1	4	554
1990	12	16	12	17	16	57	97	73	33	4	1	0	338
1991	0	1	3	3	2	42	65	132	80	9	1	0	337
1992	4	7	8	8	35	51	106	54	7	8	0	0	289
1993	2	4	16	89	63	154	152	276	191	46	7	3	1001
1994	5	4	6	8	17	38	77	92	18	2	1	2	270
1995	4	15	20	134	74	249	191	332	314	189	26	12	1559
1996	12	4	26	53	159	131	152	263	111	21	8	6	945
1997	5	36	141	437	84	85	120	163	68	8	6	5	1158
1998	5	9	12	73	126	159	152	215	348	142	17	10	1268
1999	13	14	30	57	123	83	112	240	154	26	13	4	869
2000	4	11	9	59	102	100	140	212	74	16	7	7	741
2001	8	9	8	13	19	63	92	142	13	4	3	4	380
2002	0	14	32	46	38	67	138	164	65	10	4	2	580
2003	2	19	20	43	36	60	99	223	145	19	2	2	672
2004	2	6	32	17	47	114	122	131	34	0	0	0	506
2005	7	12	25	71	67	118	125	304	200	56	11	6	1000
2006	8	11	139	145	94	139	311	359	204	35	8	8	1460
2007	3	14	18	20	44	80	87	99	20	2	0	0	389
2008	0	0	5	19	30	51	85	138	62	0	0	0	390
2009	3	15	9	34	39	96	107	248	53	9	1	0	614
2010	9	3	11	27	31	59	104	170	236	30	2	1	683
2011	34	27	128	72	52	171	200	222	320	148	17	7	1399
2012	12	8	6	25	16	61	146	110	23	5	3	2	418
2013	4	16	88	34	25	52	98	78	20	2	0	1	418
2014	1	3	1	5	33	47	76	72	12	1	0	0	250
1922-2003 Average	**6**	**19**	**37**	**52**	**61**	**81**	**124**	**191**	**118**	**26**	**5**	**3**	**722**
1922-2014 Average	**6**	**18**	**37**	**51**	**59**	**82**	**125**	**189**	**117**	**26**	**5**	**3**	**718**

Table B-15. UF 15 – Calaveras at Jenny Lind Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-15. UF 15 – Calaveras at Jenny Lind Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	5	18	24	8	2	1	1	1	1	80
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	0	0	36
1988	0	0	1	5	1	3	3	1	0	1	1	0	16
1989	0	0	2	3	3	19	3	1	0	0	0	0	31
1990	1	1	1	4	11	11	3	1	1	0	0	0	34
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
1993	0	0	8	98	48	42	20	5	4	0	0	1	227
1994	1	1	3	3	14	4	3	2	1	1	0	1	36
1995	0	0	4	116	14	155	29	45	12	3	0	2	382
1996	2	3	7	44	84	43	20	10	4	3	2	1	225
1997	1	8	116	207	26	11	6	3	1	1	0	0	380
1998	1	3	5	80	189	62	65	34	12	5	3	2	460
1999	2	4	5	37	95	26	22	8	4	2	1	1	208
2000	1	2	2	36	108	38	11	9	3	1	1	1	212
2001	3	2	2	7	20	19	9	3	1	1	1	1	66
2002	0	2	19	19	14	27	6	4	2	0	0	0	92
2003	0	1	17	8	5	7	20	10	2	1	0	0	70
2004	0	0	11	16	27	12	3	1	0	0	1	0	71
2005	1	2	20	81	33	83	24	13	4	1	1	0	264
2006	1	1	33	62	16	104	176	16	5	2	1	1	418
2007	1	2	5	5	25	11	5	3	1	0	1	0	58
2008	0	0	3	25	23	7	3	1	1	1	0	0	63
2009	0	0	1	5	16	30	5	4	0	0	1	1	62
2010	1	0	4	31	21	26	27	11	4	1	0	0	126
2011	1	7	64	26	41	160	28	12	7	2	1	0	349
2012	2	1	1	5	3	20	25	3	1	1	1	2	63
2013	1	2	32	6	3	3	3	1	1	1	1	0	56
2014	0	0	0	0	5	6	4	0	0	0	1	1	18
1922-2003 Average	**0**	**4**	**16**	**32**	**41**	**35**	**21**	**7**	**2**	**1**	**0**	**0**	**161**
1922-2014 Average	**1**	**4**	**16**	**31**	**39**	**36**	**22**	**7**	**2**	**1**	**0**	**0**	**159**

Table B-16. UF 16 – Stanislaus River at Melones Reservoir Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	4	6	25	35	107	103	170	495	378	87	17	4	1430
1923	6	16	79	78	55	77	207	356	161	73	12	10	1130
1924	12	9	10	12	27	24	70	85	11	1	0	0	261
1925	6	27	32	31	153	120	261	356	172	51	11	5	1225
1926	8	10	14	13	74	79	216	139	41	7	3	3	607
1927	5	23	61	52	162	134	267	332	245	63	14	7	1364
1928	10	41	26	31	48	253	214	240	67	13	5	3	950
1929	2	8	10	13	23	44	100	196	98	18	4	1	517
1930	1	4	20	31	48	104	184	169	133	27	5	6	732
1931	8	10	8	14	21	39	93	92	25	6	0	0	315
1932	3	5	58	43	132	117	204	385	299	85	19	5	1353
1933	6	4	8	12	14	38	106	178	206	28	6	4	609
1934	3	7	20	29	45	101	100	69	42	9	1	1	424
1935	4	16	20	43	47	70	315	379	249	53	13	4	1214
1936	8	8	8	54	206	154	288	332	193	51	12	8	1322
1937	7	6	12	23	110	124	192	411	167	39	11	5	1109
1938	7	9	178	50	174	239	301	541	392	113	28	12	2045
1939	18	21	16	22	22	74	179	110	44	13	2	5	526
1940	15	9	11	128	173	264	257	346	155	30	8	4	1400
1941	8	7	45	55	108	161	184	433	233	81	17	4	1338
1942	11	12	76	115	103	105	249	354	323	112	18	7	1485
1943	7	44	59	164	118	302	308	299	174	66	19	6	1565
1944	8	7	11	19	31	69	100	259	123	38	8	2	676
1945	7	48	44	37	183	97	208	333	230	70	14	7	1277
1946	22	50	126	86	49	115	238	306	135	36	10	5	1178
1947	10	30	32	22	45	94	136	182	62	14	5	2	634
1948	17	9	10	24	18	38	156	316	247	51	10	2	898
1949	5	13	17	15	19	61	194	277	115	20	7	2	745
1950	4	7	8	42	73	95	255	339	194	45	9	5	1076
1951	10	366	412	120	113	127	175	209	114	32	9	5	1694
1952	10	17	58	106	106	142	334	590	370	144	34	9	1919
1953	6	11	24	77	41	73	209	192	231	87	13	4	967
1954	7	10	12	21	44	145	264	261	90	25	6	4	888
1955	5	9	25	37	37	54	102	229	148	27	7	1	681
1956	4	9	365	274	102	121	204	396	283	93	20	10	1883
1957	11	16	14	15	61	116	136	281	189	38	11	7	894
1958	13	15	19	35	117	172	282	568	325	100	27	5	1678
1959	12	11	8	37	66	87	148	115	68	17	4	13	584
1960	6	5	5	14	61	102	161	157	71	10	1	1	594
1961	0	11	12	10	24	46	108	120	57	7	5	4	404
1962	3	6	9	11	95	76	271	251	206	56	7	3	995
1963	14	8	19	67	216	67	156	417	219	63	13	8	1268
1964	10	48	28	36	31	50	122	183	106	21	5	4	643
1965	5	22	368	221	104	101	241	308	244	96	38	10	1757
1966	8	46	38	42	39	101	205	167	41	12	4	1	703
1967	3	25	114	90	81	196	176	493	491	212	37	14	1932
1968	9	10	13	24	95	90	144	161	70	13	7	4	640
1969	8	39	49	355	181	154	346	595	336	116	24	9	2211
1970	17	20	74	355	118	143	123	255	172	30	11	4	1320

Table B-16. UF 16 – Stanislaus River at Melones Reservoir Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	5	39	72	79	71	109	172	239	209	65	11	3	1074
1972	7	21	51	32	54	141	135	208	107	16	2	2	776
1973	12	17	45	117	128	126	211	417	168	29	6	5	1281
1974	11	103	106	159	64	200	247	372	209	62	20	7	1560
1975	0	15	23	28	71	143	123	401	332	76	19	10	1242
1976	32	26	21	18	19	43	75	99	17	1	8	10	371
1977	2	5	4	6	8	13	35	44	36	0	0	2	155
1978	0	5	37	109	108	223	261	393	302	98	26	27	1590
1979	16	7	16	79	108	160	206	385	142	28	9	7	1164
1980	11	23	32	383	257	136	202	321	268	134	26	13	1804
1981	9	7	12	40	40	82	164	165	57	6	3	5	591
1982	10	100	187	169	329	253	433	441	251	109	26	38	2345
1983	88	122	160	183	245	411	213	504	632	287	77	29	2952
1984	24	225	153	144	98	137	157	297	148	41	10	0	1434
1985	11	48	31	26	48	79	206	171	53	3	0	2	678
1986	0	40	43	99	532	353	253	300	215	57	19	25	1936
1987	13	3	9	13	29	59	104	94	27	11	6	4	372
1988	3	10	14	27	35	59	86	83	40	12	6	3	378
1989	9	6	14	18	30	181	234	162	94	24	7	1	778
1990	22	17	13	25	24	83	134	87	51	12	1	0	469
1991	3	2	3	3	1	81	97	183	106	21	3	6	511
1992	12	14	13	18	72	78	136	95	17	19	6	6	486
1993	6	8	27	182	108	234	249	407	241	76	17	3	1557
1994	10	10	13	15	29	61	106	159	41	4	0	6	455
1995	5	24	26	230	100	415	276	484	460	261	50	18	2348
1996	11	10	42	86	276	215	255	377	175	38	4	0	1489
1997	7	50	265	659	90	129	180	231	110	22	11	4	1759
1998	12	17	20	146	250	231	245	341	511	245	40	28	2085
1999	15	31	39	101	197	124	173	370	215	49	16	17	1348
2000	9	18	12	91	189	160	222	292	128	24	7	10	1162
2001	13	13	12	23	36	96	134	200	28	5	2	4	565
2002	5	21	57	62	55	103	213	217	97	16	4	2	853
2003	3	30	48	58	55	91	152	323	178	20	11	5	974
2004	2	8	47	42	76	164	175	153	61	17	5	0	751
2005	17	23	41	146	111	194	211	533	292	101	15	6	1692
2006	13	11	210	199	138	229	470	538	277	77	23	16	2201
2007	16	13	29	27	78	112	124	124	32	5	2	1	565
2008	9	3	14	47	52	73	130	192	85	13	4	3	625
2009	2	24	15	53	73	168	186	331	96	26	7	4	985
2010	21	9	20	54	65	99	175	261	312	70	9	6	1101
2011	46	42	213	116	98	305	321	364	449	217	41	20	2231
2012	38	13	12	37	27	89	202	136	41	15	10	3	624
2013	8	23	119	45	43	86	132	111	36	10	10	4	627
2014	7	4	6	9	35	62	111	91	21	12	7	4	370
1922-2003 Average	**10**	**28**	**53**	**81**	**96**	**128**	**192**	**282**	**176**	**53**	**12**	**7**	**1117**
1922-2014 Average	**10**	**26**	**54**	**80**	**93**	**130**	**193**	**279**	**173**	**53**	**12**	**7**	**1112**

Table B-17. UF 17 – San Joaquin Valley Floor Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	5	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

Table B-17. UF 17 – San Joaquin Valley Floor Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	32	90	139	183	274	88	55	15	6	2	2	890
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	8	2	4	2	0	0	58
1992	1	0	0	2	32	10	1	5	0	6	0	0	57
1993	0	0	4	121	52	50	24	8	5	0	0	1	267
1994	0	0	2	2	6	3	3	5	4	3	0	0	28
1995	1	0	1	89	21	198	44	38	11	1	0	3	407
1996	0	0	5	20	68	54	26	9	2	7	4	0	196
1997	1	18	157	320	59	24	11	4	1	1	1	0	598
1998	3	2	3	54	179	91	95	41	25	7	2	2	503
1999	0	2	4	13	31	13	20	6	3	1	1	0	96
2000	0	0	1	16	106	59	17	7	2	0	1	0	209
2001	0	1	1	5	13	24	11	3	0	0	0	1	59
2002	0	1	15	14	6	9	4	2	1	1	0	0	54
2003	0	2	15	8	5	8	11	10	1	0	0	0	60
2004	0	0	2	8	20	10	2	0	0	0	0	0	43
2005	3	2	23	125	58	91	35	23	4	0	0	0	363
2006	0	0	14	45	10	74	174	26	4	0	0	3	351
2007	2	1	2	2	8	5	2	0	0	3	2	0	28
2008	0	0	1	15	31	8	2	1	0	0	0	0	59
2009	0	0	1	7	17	17	5	3	1	1	0	0	54
2010	1	0	8	22	31	35	31	12	3	0	0	0	144
2011	1	3	80	54	59	155	52	22	12	4	1	1	443
2012	1	1	2	5	3	10	14	2	0	5	10	0	52
2013	0	0	28	7	4	3	2	1	2	4	1	0	52
2014	0	0	0	0	1	1	1	0	0	0	0	0	3
1922-2003 Average	**0**	**4**	**16**	**32**	**45**	**44**	**28**	**10**	**3**	**1**	**0**	**0**	**184**
1922-2014 Average	**0**	**3**	**16**	**32**	**43**	**44**	**28**	**10**	**3**	**1**	**0**	**0**	**179**

Table B-18. UF 18 – Tuolumne River at Don Pedro Reservoir Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	6	6	55	72	189	181	260	718	752	195	27	10	2471
1923	11	32	124	114	80	113	266	521	319	158	27	22	1786
1924	29	14	14	25	42	38	139	209	17	17	0	0	543
1925	15	48	51	44	227	166	350	538	352	112	23	6	1932
1926	15	16	33	19	101	127	382	304	89	19	3	1	1110
1927	5	74	60	63	223	160	352	454	476	146	25	13	2051
1928	15	87	44	51	82	343	264	448	153	28	7	3	1525
1929	0	6	18	19	40	99	148	378	225	41	5	0	979
1930	2	1	23	39	70	147	246	275	286	49	10	0	1148
1931	9	20	11	26	44	66	154	209	49	10	1	2	602
1932	2	6	94	79	240	172	245	524	533	176	32	12	2114
1933	6	3	11	27	31	83	171	251	426	75	16	5	1104
1934	0	8	41	65	90	150	186	149	95	12	6	5	807
1935	11	48	52	106	107	137	465	531	511	110	21	4	2103
1936	12	20	18	105	352	208	393	520	390	122	18	3	2160
1937	4	9	27	31	274	210	296	634	399	91	17	5	1997
1938	9	19	313	102	323	425	422	720	712	305	55	20	3424
1939	40	43	37	43	60	144	282	216	74	17	7	17	981
1940	45	17	20	226	250	344	325	571	348	54	11	2	2213
1941	11	15	129	115	219	260	280	663	534	224	30	8	2489
1942	7	38	162	165	142	149	337	472	598	253	30	3	2356
1943	5	86	93	246	164	372	385	495	353	141	25	5	2370
1944	12	16	21	43	80	135	165	456	267	88	11	2	1295
1945	9	89	81	56	305	164	284	455	462	163	17	0	2086
1946	60	98	208	119	70	156	348	489	265	56	8	3	1879
1947	16	64	77	42	80	136	192	353	111	21	0	3	1094
1948	38	28	17	40	26	73	221	436	434	88	5	2	1409
1949	5	8	18	20	39	123	318	436	240	29	5	4	1246
1950	4	14	13	77	124	128	329	467	319	62	7	0	1546
1951	24	522	509	159	139	169	254	373	257	60	10	0	2475
1952	9	31	121	219	148	240	466	791	594	292	54	17	2982
1953	9	12	53	145	64	107	270	260	414	170	18	5	1525
1954	7	17	24	42	101	213	349	448	185	38	3	1	1429
1955	4	15	50	67	61	82	144	366	292	39	1	1	1124
1956	4	13	650	431	156	179	282	560	582	244	41	12	3153
1957	21	24	24	35	124	154	173	380	405	67	9	2	1418
1958	11	18	48	58	177	257	425	761	579	232	55	17	2638
1959	6	6	5	79	116	119	224	231	139	18	2	45	990
1960	5	10	12	25	119	150	238	303	162	16	6	5	1052
1961	5	16	33	19	47	71	165	220	122	19	13	4	732
1962	5	8	24	24	233	139	389	362	446	117	14	5	1766
1963	17	9	29	93	309	112	248	534	463	179	32	16	2041
1964	18	105	48	54	52	75	169	323	225	41	12	8	1130
1965	9	52	517	289	141	141	326	449	477	228	87	23	2738
1966	7	130	89	78	75	146	299	355	86	22	9	10	1306
1967	7	67	222	135	115	306	290	649	744	473	78	20	3105
1968	10	11	32	47	134	123	187	288	141	19	10	5	1007
1969	13	81	81	578	286	263	490	960	716	316	55	13	3852
1970	39	39	112	408	134	192	161	411	336	95	23	12	1962

Table B-18. UF 18 – Tuolumne River at Don Pedro Reservoir Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	11	87	123	121	94	146	194	349	418	111	20	10	1683
1972	6	35	77	59	78	182	156	344	220	28	11	11	1207
1973	11	36	86	140	186	173	259	655	400	57	20	6	2031
1974	17	171	136	180	69	229	274	561	442	123	29	10	2239
1975	15	12	35	54	144	224	176	582	596	151	28	15	2033
1976	70	56	32	8	38	71	100	209	40	14	21	14	671
1977	12	9	3	11	17	23	79	106	105	12	3	3	383
1978	2	12	96	190	196	331	354	602	663	316	61	82	2903
1979	12	29	33	154	151	239	260	626	315	67	17	10	1914
1980	29	42	49	532	394	221	313	497	539	347	59	22	3045
1981	11	8	26	48	63	126	243	328	151	22	19	9	1056
1982	29	174	220	228	388	340	660	693	567	323	80	104	3806
1983	153	176	245	261	328	560	304	696	1016	630	205	58	4631
1984	44	310	402	175	151	200	203	536	330	93	21	7	2471
1985	26	85	48	41	69	126	302	341	135	23	15	18	1229
1986	31	49	94	129	616	493	320	540	507	144	30	18	2971
1987	18	8	13	6	37	89	194	203	65	10	8	3	656
1988	11	26	50	70	57	105	159	213	98	24	6	1	821
1989	4	21	27	37	62	285	309	321	207	28	2	10	1312
1990	49	25	22	38	53	130	220	182	100	20	4	1	843
1991	1	8	5	5	8	168	180	336	295	67	19	7	1099
1992	16	25	18	25	93	115	230	189	46	59	14	4	835
1993	10	14	46	278	161	319	335	631	524	226	54	25	2624
1994	19	7	18	22	53	108	195	275	119	33	25	10	885
1995	10	64	58	348	160	579	385	659	811	652	162	35	3922
1996	12	7	72	129	348	290	323	576	389	133	26	11	2316
1997	8	112	387	1033	170	232	277	542	336	57	49	21	3224
1998	10	18	35	202	358	354	351	477	855	559	84	35	3338
1999	21	48	68	136	252	171	262	569	436	109	35	20	2127
2000	11	17	10	132	277	253	334	539	322	70	35	18	2019
2001	17	17	22	32	60	179	227	408	55	12	2	2	1034
2002	4	40	93	109	79	141	301	372	223	24	8	6	1401
2003	0	69	69	89	65	124	218	520	372	55	30	15	1627
2004	5	13	82	70	110	257	264	318	148	33	13	7	1321
2005	54	55	71	260	192	325	305	837	589	258	40	21	3006
2006	15	16	248	248	154	296	610	816	649	208	37	15	3313
2007	11	19	29	28	94	147	175	251	61	15	10	8	849
2008	7	7	18	78	101	124	189	360	204	32	5	4	1129
2009	4	62	27	105	118	228	260	563	225	57	9	7	1665
2010	54	11	39	90	103	161	250	386	629	143	14	6	1888
2011	108	81	336	172	139	414	433	520	773	446	78	25	3524
2012	41	19	5	48	33	107	289	251	57	13	8	4	875
2013	4	33	192	73	50	126	232	246	99	20	9	4	1087
2014	5	5	6	4	52	94	169	189	54	12	6	5	601
1922-2003 Average	**16**	**48**	**89**	**124**	**147**	**190**	**274**	**446**	**352**	**124**	**27**	**12**	**1849**
1922-2014 Average	**18**	**46**	**89**	**122**	**142**	**192**	**276**	**444**	**348**	**122**	**26**	**12**	**1837**

Table B-19. UF 19 – Merced River at Exchequer Reservoir Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	3	4	44	40	163	117	124	417	400	86	16	6	1421
1923	6	16	58	66	50	56	158	288	155	66	13	9	942
1924	13	9	8	10	15	19	67	91	13	4	2	1	252
1925	5	22	23	21	106	78	180	261	147	49	15	5	910
1926	8	8	12	10	63	55	217	173	48	11	4	2	610
1927	2	31	27	33	137	87	179	296	226	54	10	3	1084
1928	9	43	22	21	48	159	142	206	68	15	2	0	737
1929	3	5	7	11	22	47	78	194	97	19	2	2	487
1930	3	2	4	13	26	73	118	137	112	18	3	4	513
1931	3	7	4	10	19	26	73	91	20	4	3	0	262
1932	1	4	85	52	152	79	131	278	251	64	12	4	1113
1933	5	3	5	14	15	44	88	133	179	25	3	3	516
1934	2	4	27	23	45	65	93	56	33	8	2	4	361
1935	5	17	23	79	50	86	276	322	258	41	13	2	1171
1936	2	8	8	37	254	100	219	299	163	52	10	0	1152
1937	4	5	19	22	226	131	163	400	192	45	8	0	1215
1938	1	6	142	67	240	326	229	442	442	140	32	12	2080
1939	22	20	17	19	28	72	151	101	32	10	1	5	477
1940	16	7	7	124	135	148	182	305	140	25	6	0	1095
1941	2	6	88	71	148	154	158	394	296	108	22	7	1454
1942	7	16	76	84	83	90	185	283	336	100	20	8	1287
1943	7	36	39	135	96	238	219	292	152	55	15	5	1289
1944	4	8	10	20	47	80	80	250	133	44	7	0	684
1945	1	36	33	26	184	113	156	264	207	60	15	3	1097
1946	20	42	103	55	33	82	194	262	115	32	6	0	942
1947	12	38	48	27	40	62	104	173	51	11	0	0	564
1948	9	11	8	13	11	34	107	237	217	38	5	0	688
1949	4	4	8	10	23	78	143	237	112	18	2	0	638
1950	2	6	7	37	61	53	172	233	125	22	2	0	719
1951	6	259	272	88	72	86	131	176	104	28	4	0	1225
1952	4	9	59	159	65	157	206	445	305	116	29	9	1563
1953	5	7	31	60	28	41	121	122	158	50	4	0	626
1954	3	6	8	20	48	99	170	223	74	17	0	0	668
1955	2	6	19	30	23	37	65	194	137	22	0	0	534
1956	2	4	373	224	82	88	154	319	287	109	24	9	1675
1957	8	13	10	14	41	63	88	201	176	30	5	0	648
1958	5	9	22	32	83	163	248	411	295	102	28	11	1409
1959	5	6	5	21	56	56	118	112	51	6	0	20	455
1960	6	3	4	10	55	61	125	147	64	8	0	0	483
1961	2	8	16	8	18	30	84	95	44	4	3	1	312
1962	1	3	10	10	159	74	198	206	205	52	10	0	928
1963	6	4	6	42	173	61	131	268	210	68	14	1	984
1964	6	38	22	22	19	28	76	140	81	14	0	1	447
1965	3	21	224	174	61	69	165	259	242	95	37	9	1360
1966	5	72	46	41	32	65	159	182	47	11	4	5	669
1967	12	14	112	60	51	168	213	363	428	237	43	15	1716
1968	7	8	14	17	48	48	94	121	50	10	4	5	426
1969	2	22	37	346	217	163	264	565	396	142	26	8	2188
1970	19	18	34	159	65	109	89	218	127	32	8	5	883

Table B-19. UF 19 – Merced River at Exchequer Reservoir Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	3	19	54	48	39	59	98	182	180	42	7	2	733
1972	1	11	39	23	33	80	79	166	95	11	1	12	550
1973	6	14	30	66	124	114	129	378	199	32	13	3	1108
1974	6	56	59	88	37	132	161	326	203	45	16	5	1133
1975	4	5	16	24	108	129	98	312	330	64	13	8	1108
1976	25	21	14	9	19	33	49	93	19	7	6	3	298
1977	5	3	1	3	4	8	31	39	46	8	2	1	150
1978	1	1	35	113	148	188	234	378	407	163	39	48	1756
1979	16	16	13	97	107	137	132	344	155	37	17	4	1075
1980	10	9	21	266	258	156	172	286	289	137	31	12	1646
1981	10	6	10	21	27	52	122	159	69	16	5	5	501
1982	6	50	64	135	203	189	429	418	263	123	36	31	1947
1983	51	84	150	186	232	370	197	382	656	352	97	29	2787
1984	28	114	204	93	81	97	129	265	114	47	8	0	1181
1985	8	28	21	19	33	59	147	171	57	12	5	6	567
1986	12	16	34	45	362	287	191	316	228	51	12	5	1558
1987	7	3	5	6	18	36	95	95	25	6	3	0	298
1988	4	15	13	28	24	48	93	107	55	19	6	3	415
1989	1	5	10	12	23	96	160	132	73	13	5	5	534
1990	15	11	9	15	21	56	114	87	48	23	6	2	406
1991	2	1	1	5	3	96	81	184	145	36	4	2	560
1992	5	11	8	13	54	51	131	105	31	33	6	2	448
1993	2	7	22	190	100	157	181	455	280	96	34	8	1531
1994	8	5	8	9	28	40	87	121	48	12	9	2	375
1995	16	22	25	200	70	364	206	388	471	340	59	13	2173
1996	11	7	30	66	191	161	197	317	157	51	14	6	1209
1997	2	57	230	634	102	116	169	278	114	29	13	6	1749
1998	1	7	17	103	253	168	201	251	478	286	51	29	1845
1999	15	19	28	49	111	67	128	282	154	35	11	7	905
2000	4	10	2	57	171	116	166	276	130	26	11	7	974
2001	4	6	10	13	31	86	108	215	33	10	3	1	521
2002	2	12	48	44	33	57	150	182	88	15	4	1	636
2003	1	30	32	41	34	63	117	258	189	32	14	6	816
2004	2	9	26	35	60	120	139	135	54	17	7	4	608
2005	20	22	41	200	105	191	152	467	325	126	25	12	1684
2006	8	7	74	129	68	171	344	496	332	85	17	9	1741
2007	13	10	15	16	37	69	94	103	29	13	8	6	413
2008	5	6	7	48	64	56	104	196	93	25	7	4	617
2009	3	22	13	50	61	105	149	288	96	32	12	6	837
2010	27	8	24	57	69	91	137	221	331	77	17	8	1067
2011	37	36	181	105	105	263	217	305	415	197	48	18	1927
2012	21	9	7	20	16	44	149	117	26	8	5	3	426
2013	2	9	81	32	25	59	123	102	33	9	3	1	479
2014	2	3	3	2	13	33	75	73	21	9	4	0	239
1922-2003 Average	**7**	**20**	**43**	**66**	**85**	**101**	**147**	**242**	**171**	**56**	**13**	**6**	**957**
1922-2014 Average	**8**	**19**	**43**	**66**	**82**	**102**	**148**	**240**	**170**	**56**	**13**	**6**	**952**

Table B-20. UF 20 – Chowchilla River at Buchanan Reservoir Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-20. UF 20 – Chowchilla River at Buchanan Reservoir Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	55	72	108	35	22	6	2	1	1	351
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
1993	0	0	2	48	20	20	10	3	2	0	0	0	105
1994	0	0	1	1	2	1	1	2	1	1	0	0	11
1995	0	0	1	35	8	78	17	15	4	0	0	1	160
1996	0	0	2	8	27	21	10	4	1	3	1	0	77
1997	0	7	62	126	23	10	4	2	1	0	0	0	235
1998	1	1	1	21	70	36	37	16	10	3	1	1	197
1999	0	1	2	5	12	5	8	2	1	1	0	0	38
2000	0	0	0	6	41	23	7	3	1	0	0	0	82
2001	0	0	0	2	5	9	4	1	0	0	0	0	23
2002	0	0	6	5	2	4	2	1	0	0	0	0	21
2003	0	1	6	3	2	3	4	4	0	0	0	0	24
2004	0	0	1	3	8	4	1	0	0	0	0	0	17
2005	1	1	9	49	23	35	14	9	2	0	0	0	142
2006	0	0	5	18	4	29	68	10	2	0	0	1	138
2007	1	0	1	1	3	2	1	0	0	1	1	0	11
2008	0	0	0	6	12	3	1	0	0	0	0	0	23
2009	0	0	0	3	7	7	2	1	0	0	0	0	21
2010	1	0	3	8	12	14	12	5	1	0	0	0	57
2011	0	1	31	21	23	61	20	9	5	2	0	0	174
2012	0	0	1	2	1	4	5	1	0	2	4	0	21
2013	0	0	11	3	1	1	1	0	1	2	0	0	20
2014	0	0	0	0	0	0	0	0	0	0	0	0	1
1922-2003 Average	**0**	**1**	**6**	**12**	**18**	**17**	**11**	**4**	**1**	**0**	**0**	**0**	**72**
1922-2014 Average	**0**	**1**	**6**	**12**	**17**	**17**	**11**	**4**	**1**	**0**	**0**	**0**	**70**

Table B-21. UF 21 – Fresno River near Daulton Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	5	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

Table B-21. UF 21 – Fresno River near Daulton Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	0	0	0	18	6	4	2	2	2	0	34
1992	0	0	1	1	8	6	4	1	0	1	1	0	23
1993	0	0	2	43	27	25	15	10	8	4	1	0	135
1994	2	1	1	1	3	2	3	3	3	0	1	0	21
1995	0	1	1	37	16	80	20	20	6	2	1	1	185
1996	1	0	3	6	27	23	14	8	3	1	1	1	90
1997	1	9	48	116	24	12	8	5	3	2	1	1	231
1998	1	1	2	16	56	35	39	24	15	4	1	1	196
1999	1	2	3	7	12	8	11	6	3	0	0	2	54
2000	1	1	1	6	35	24	11	6	3	0	0	1	89
2001	2	1	1	2	6	10	7	4	1	1	1	0	35
2002	0	1	5	6	4	8	3	3	1	0	0	0	32
2003	0	2	3	3	3	4	5	6	3	2	1	0	33
2004	0	0	2	3	5	5	2	2	1	0	0	0	21
2005	1	1	5	31	21	36	17	14	6	3	1	1	136
2006	0	0	5	18	6	30	67	16	6	2	1	1	152
2007	0	1	2	2	4	4	3	2	1	0	0	0	19
2008	0	0	1	6	12	5	3	4	1	0	0	0	34
2009	0	0	0	4	7	8	4	5	1	0	0	0	30
2010	1	1	2	9	14	16	16	7	3	1	0	0	71
2011	1	1	28	24	19	64	27	15	10	4	1	1	195
2012	1	1	1	3	2	7	8	3	1	0	0	0	27
2013	0	1	5	3	2	3	2	1	0	0	0	0	15
2014	0	0	0	1	1	1	1	0	0	0	0	0	5
1922-2003 Average	**0**	**2**	**6**	**11**	**17**	**19**	**15**	**9**	**5**	**2**	**0**	**0**	**87**
1922-2014 Average	**0**	**2**	**6**	**11**	**16**	**19**	**15**	**9**	**5**	**2**	**0**	**0**	**84**

Table B-22. UF 22 – San Joaquin River at Millerton Reservoir Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	11	10	59	66	99	105	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	17	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	378	146	43	12	7	1161
1927	6	56	50	47	155	151	275	508	496	197	48	15	2001
1928	20	69	33	33	48	150	189	373	176	44	14	6	1154
1929	9	10	15	16	23	65	107	309	211	75	19	5	862
1930	5	6	8	18	36	80	165	214	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	492	544	239	51	15	2047
1933	13	9	15	27	30	73	159	213	410	119	29	15	1111
1934	7	10	38	47	50	109	166	146	69	27	13	8	692
1935	13	27	36	73	85	111	357	497	519	144	44	19	1923
1936	14	16	16	38	196	164	349	510	348	151	42	11	1853
1937	11	13	36	35	253	191	304	705	457	160	34	11	2208
1938	10	12	211	71	207	434	434	795	913	431	128	43	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	22	30	96	113	103	129	299	466	633	284	65	17	2254
1943	10	43	43	170	113	268	335	503	325	179	50	16	2054
1944	11	15	20	31	55	112	141	408	280	143	35	16	1265
1945	13	58	56	44	238	148	276	477	488	240	74	27	2138
1946	59	66	118	79	54	126	310	464	280	118	37	19	1730
1947	29	65	85	48	64	100	171	348	146	43	17	12	1126
1948	23	18	15	19	20	43	165	391	373	108	26	15	1215
1949	11	8	15	16	26	73	235	410	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	83	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	278	440	218	80	20	9	1314
1955	6	18	31	42	49	74	127	338	348	88	30	11	1161
1956	6	13	461	271	141	170	278	568	614	318	87	34	2960
1957	26	22	21	30	67	90	142	327	440	115	32	16	1327
1958	16	19	43	43	113	181	363	796	622	288	108	41	2631
1959	16	15	15	37	89	114	203	209	153	41	17	42	949
1960	18	9	10	18	55	86	178	240	148	43	17	8	829
1961	8	22	31	19	31	49	124	172	128	27	25	10	647
1962	10	15	23	23	185	110	381	397	505	203	52	20	1924
1963	18	11	11	82	208	101	192	464	492	265	71	31	1945
1964	26	64	36	31	30	52	127	257	200	60	29	11	922
1965	10	34	204	188	114	128	250	432	473	267	138	35	2272
1966	18	101	66	62	56	126	277	362	148	51	25	9	1299
1967	6	29	213	92	101	243	250	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	874	463	137	41	4040
1970	33	32	47	159	83	137	146	376	279	107	37	11	1446

Table B-22. UF 22 – San Joaquin River at Millerton Reservoir Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	10	39	73	75	72	110	172	293	365	141	48	22	1418
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	45	15	2047
1974	21	88	82	138	66	210	267	597	482	162	60	20	2191
1975	19	17	32	37	76	136	131	546	575	161	41	26	1796
1976	49	33	24	18	38	59	82	174	60	35	24	35	629
1977	20	10	7	12	15	19	57	75	111	20	11	4	362
1978	6	9	80	159	196	326	346	697	826	462	149	146	3402
1979	34	30	33	96	101	183	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	1068
1982	19	70	65	119	199	231	613	725	585	371	148	170	3316
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	2049
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	3031
1987	24	14	15	21	40	66	172	229	121	33	15	10	758
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	939
1990	23	22	17	25	34	85	173	165	122	54	14	8	743
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	809
1993	13	17	32	189	124	243	330	701	599	317	82	26	2673
1994	19	17	21	23	42	75	150	258	159	36	14	12	826
1995	43	45	48	213	122	485	350	634	881	752	239	66	3878
1996	24	15	50	70	229	222	333	589	412	184	55	18	2203
1997	18	99	213	735	181	219	302	539	280	130	44	21	2782
1998	18	24	36	102	210	232	288	446	886	686	159	72	3160
1999	36	39	50	69	111	102	182	446	337	105	32	17	1527
2000	12	12	16	80	155	164	280	530	351	91	37	15	1742
2001	20	17	16	26	42	126	188	445	115	47	13	10	1065
2002	10	22	58	64	57	94	247	323	223	53	13	8	1171
2003	7	62	45	62	60	109	158	436	375	89	34	12	1450
2004	8	14	44	48	69	192	223	284	173	55	13	7	1131
2005	36	41	58	165	133	226	257	818	662	343	73	17	2830
2006	18	22	110	163	113	198	498	884	763	326	64	23	3181
2007	20	14	26	24	47	96	137	197	71	25	14	11	684
2008	10	9	17	58	72	102	176	351	230	68	16	8	1117
2009	10	43	26	75	82	139	231	492	223	96	28	10	1455
2010	54	22	41	71	101	142	222	383	687	243	47	16	2029
2011	60	53	225	153	114	277	393	545	828	477	133	47	3305
2012	48	29	19	39	35	75	209	244	77	28	22	6	832
2013	11	28	88	52	45	96	190	200	96	33	13	5	857
2014	9	10	14	11	23	46	112	161	77	26	15	6	510
1922-2003 Average	**19**	**34**	**60**	**83**	**103**	**144**	**237**	**433**	**373**	**168**	**52**	**24**	**1730**
1922-2014 Average	**20**	**33**	**60**	**82**	**100**	**144**	**237**	**431**	**371**	**167**	**51**	**23**	**1718**

Table B-23. UF 23 – Tulare Lake Basin Outflow Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-23. UF 23 – Tulare Lake Basin Outflow Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	33	159	228	87	77	2	0	586
1996	0	0	5	0	0	7	0	67	0	0	0	0	80
1997	0	0	5	170	224	39	0	0	0	0	0	0	437
1998	0	0	0	0	0	0	212	278	266	158	0	0	915
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	38	22	0	0	0	61
2006	0	0	0	0	0	0	186	256	169	0	0	0	612
2007	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
1922-2003 Average	**1**	**4**	**7**	**11**	**16**	**22**	**25**	**42**	**33**	**10**	**1**	**1**	**173**
1922-2014 Average	**1**	**3**	**6**	**10**	**14**	**19**	**24**	**40**	**31**	**9**	**1**	**1**	**159**

Table B-24. UF 24 – San Joaquin Valley West Side Minor Streams Unimpaired Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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

Table B-24. UF 24 – San Joaquin Valley West Side Minor Streams Unimpaired Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	1	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
1993	0	0	5	5	5	3	0	2	0	0	0	0	22
1994	0	1	1	1	2	0	1	2	0	0	0	0	8
1995	1	1	1	5	0	4	0	0	0	0	0	0	13
1996	0	0	3	0	3	1	0	1	0	0	0	0	8
1997	1	1	1	3	0	0	0	0	0	0	0	0	7
1998	0	4	2	5	9	2	2	4	0	0	0	0	27
1999	1	1	0	2	1	1	1	1	0	0	0	0	9
2000	0	0	0	2	3	0	1	0	0	0	0	0	8
2001	0	0	0	0	1	1	0	0	0	0	0	0	4
2002	0	0	2	1	0	1	0	0	0	0	0	0	6
2003	0	0	5	1	0	0	0	0	0	0	0	0	9
2004	0	0	1	1	3	1	0	0	0	0	0	0	7
2005	1	0	1	3	3	2	1	1	0	0	0	0	12
2006	0	0	3	6	1	5	7	1	0	0	0	0	24
2007	0	0	0	0	1	0	0	0	0	0	0	0	3
2008	0	0	0	2	1	0	0	0	0	0	0	0	5
2009	0	0	0	0	1	1	0	0	0	0	0	0	3
2010	1	0	0	3	1	1	1	0	0	0	0	0	9
2011	0	0	1	1	1	5	1	0	0	0	0	0	10
2012	0	0	0	0	0	0	1	0	0	0	0	0	2
2013	0	1	4	0	0	0	0	0	0	0	0	0	6
2014	0	0	0	2	1	0	0	0	0	0	0	0	5
1922-2003 Average	**0**	**0**	**1**	**2**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**7**
1922-2014 Average	**0**	**0**	**1**	**2**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**7**

Table B-25. Sacramento Valley Unimpaired Total Outflow Estimated Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	408	518	1381	1184	3228	2623	3546	4829	2764	811	475	392	22160
1923	448	717	2471	1908	1234	1388	2984	2153	1222	665	414	393	15994
1924	412	407	489	565	1250	605	757	582	398	342	293	285	6387
1925	372	784	1023	1032	5784	2073	3324	2479	1188	574	419	384	19435
1926	396	519	680	894	3776	1619	3238	1326	651	433	339	320	14191
1927	365	2228	2215	2662	7557	3793	4535	2999	1803	711	441	394	29701
1928	384	1418	1185	1573	2285	6081	3461	1949	805	531	385	359	20416
1929	359	554	705	642	1234	1185	1325	1505	875	429	290	316	9418
1930	304	325	2866	1725	2117	2978	2211	1654	878	468	340	342	16207
1931	342	458	402	870	766	1184	882	660	412	288	263	259	6786
1932	351	411	1914	1485	1540	2336	2167	2701	1444	517	348	302	15515
1933	302	333	434	756	594	1960	1634	1756	1318	430	302	285	10102
1934	329	356	1160	1558	1657	1677	1178	737	455	316	272	259	9954
1935	314	870	790	2159	1676	2353	5742	3364	1527	569	375	326	20064
1936	390	386	536	3850	5540	2615	3004	2237	1383	572	366	336	21214
1937	329	326	410	506	2134	3335	3393	3072	1286	528	341	314	15975
1938	414	2023	5107	2080	6335	8316	5611	5562	2917	1056	581	481	40481
1939	536	589	799	773	783	1776	1542	910	502	359	306	319	9194
1940	353	344	716	4203	6923	6647	4196	2227	1011	538	406	407	27971
1941	455	661	4106	5556	6394	5422	5012	4130	1866	942	586	516	35645
1942	511	660	4133	5059	6477	2301	4411	3702	2529	1004	591	502	31880
1943	508	1013	2010	5443	3038	5166	3431	2258	1402	722	512	449	25951
1944	477	504	555	814	1583	2000	1611	2161	1095	613	393	354	12160
1945	417	1117	1553	1095	4171	2022	2185	2488	1310	583	417	367	17725
1946	590	1295	5405	2917	1392	2181	2682	2345	1021	569	442	390	21228
1947	423	841	1001	555	1677	2579	1846	1071	888	430	366	342	12019
1948	681	590	511	2094	727	1752	4479	3548	2269	742	470	423	18286
1949	431	525	714	556	1014	4042	2722	2223	865	434	369	336	14232
1950	357	416	440	2095	2991	2511	3084	2524	1292	556	396	376	17039
1951	1041	3946	5724	4022	3837	2621	2315	2365	949	517	436	396	28170
1952	519	1039	4064	4658	4824	4069	5626	5362	2849	1302	642	532	35484
1953	495	522	2444	6633	1657	2284	2872	2949	2478	1030	575	521	24461
1954	510	907	845	2780	3385	3800	4231	2144	1006	596	497	466	21167
1955	462	858	1521	1311	940	1184	1776	2307	1040	511	397	390	12698
1956	390	652	9730	8627	4613	3093	2990	3828	1957	914	564	506	37863
1957	648	597	596	835	2967	3496	2095	3047	1385	610	464	510	17250
1958	983	919	1831	3032	10000	5448	6384	4756	2618	1064	663	568	38265
1959	543	563	615	2485	3010	1878	1763	1261	723	486	399	486	14212
1960	422	397	486	990	3816	3341	2016	1705	960	480	383	373	15371
1961	407	787	1534	1015	2500	2114	1779	1728	967	470	403	374	14077
1962	409	620	1358	864	4552	2587	2988	2112	1254	547	405	365	18060
1963	3185	818	2289	1893	4712	2281	6159	3764	1432	710	516	477	28236
1964	596	1704	844	1842	1057	1106	1587	1696	1042	488	371	338	12671
1965	407	995	9492	6488	2259	1828	4634	2657	1474	742	598	419	31993
1966	470	1366	1040	2327	1807	2476	2736	1634	668	454	388	374	15740
1967	367	1489	3053	4369	2705	3946	3760	4752	3278	1178	569	442	29908
1968	527	564	917	1985	4293	2684	1824	1495	774	517	523	424	16526
1969	531	825	2111	8642	5446	3520	4633	4636	2137	806	552	510	34347
1970	601	623	3859	12591	3432	3226	1525	1671	1103	610	481	438	30161

Table B-25. Sacramento Valley Unimpaired Total Outflow Estimated Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	527	2190	4071	3551	1895	4069	3188	3439	2344	945	552	512	27283
1972	573	668	1202	1474	1871	3146	2299	1771	970	511	409	445	15339
1973	628	1434	2024	5238	4472	3667	2695	2906	1138	583	471	474	25728
1974	681	5130	4304	8197	2419	7106	5104	3210	2050	1084	615	528	40428
1975	546	638	894	1048	3606	5438	2964	4027	2439	874	597	553	23625
1976	819	841	770	663	888	1296	1167	934	511	396	472	414	9171
1977	404	426	396	511	482	547	527	689	486	362	338	415	5583
1978	374	516	2020	7326	3877	5514	3895	2968	1748	786	459	539	30023
1979	389	504	496	1353	2282	2792	2140	2836	881	511	395	383	14963
1980	675	955	1533	6990	6547	3676	2493	2286	1293	750	420	509	28128
1981	474	451	1018	1940	1901	2584	1786	1249	587	419	362	347	13118
1982	627	4799	6393	3870	5551	4780	7688	3885	1848	936	568	577	41521
1983	1017	1794	3831	4704	7344	11923	4991	5541	4058	1701	794	664	48362
1984	709	3733	7742	2927	2333	2976	2111	2252	1258	626	457	481	27604
1985	646	2028	1302	870	1322	1555	2160	1265	660	413	374	484	13078
1986	518	711	1242	2772	13049	7099	2440	2026	1151	626	445	577	32656
1987	556	456	550	849	1670	2885	1334	955	452	399	329	337	10773
1988	353	430	1967	2239	1035	1122	1130	1076	666	386	303	289	10995
1989	326	1148	793	967	994	6725	3001	1539	746	433	348	438	17458
1990	730	565	449	1435	958	1728	1270	1358	1023	422	318	328	10584
1991	323	367	355	386	480	2992	1727	1584	834	402	292	289	10031
1992	353	395	479	595	2760	2081	1708	803	443	394	281	292	10583
1993	404	391	1444	4845	3860	5735	3752	3434	2343	784	485	417	27894
1994	502	430	862	823	1356	1405	1150	1094	508	307	262	321	9020
1995	351	547	1198	10197	3387	11107	5326	5819	3180	1541	706	582	43941
1996	493	503	1884	2910	6796	4363	3425	4184	1501	706	512	465	27740
1997	529	1105	7313	11861	2815	2015	1971	1567	920	524	477	472	31569
1998	582	1104	1499	6382	9692	5256	4283	4886	4245	1616	731	634	40910
1999	714	1521	2059	2755	5328	4141	3141	2968	1673	726	535	527	26088
2000	576	753	705	2677	6237	4258	3014	2278	1051	576	467	518	23108
2001	600	558	677	951	1869	2551	1592	1372	543	427	387	393	11921
2002	412	1028	3171	3369	1870	2379	2185	1692	853	457	403	379	18197
2003	381	663	4483	4108	1820	2693	3345	3930	1527	610	518	437	24515
2004	443	576	2738	2315	5190	3345	2069	1569	806	534	400	380	20365
2005	636	559	1900	2503	2014	3708	2735	5314	1977	799	497	438	23079
2006	463	689	6924	5583	3721	6086	8634	4682	1835	832	558	486	40493
2007	506	689	1458	887	2471	1935	1346	1112	513	421	361	349	12049
2008	505	408	782	2257	2216	1725	1482	1730	671	377	334	278	12766
2009	396	600	578	760	2568	3645	1737	2827	841	467	378	341	15139
2010	578	389	647	2993	2488	2227	3054	2824	2440	766	449	402	19255
2011	736	852	4359	1993	2083	6858	4637	3685	3566	1558	667	493	31487
2012	633	584	491	1018	722	3541	3511	1735	771	533	419	364	14323
2013	426	1382	5072	1424	1071	1551	1510	876	624	438	377	363	15115
2014	375	368	378	372	1382	2252	1495	730	416	354	338	310	8771
1922-2003 Average	**528**	**978**	**2063**	**2985**	**3298**	**3331**	**2938**	**2522**	**1383**	**646**	**444**	**420**	**21536**
1922-2014 Average	**526**	**938**	**2092**	**2870**	**3187**	**3333**	**2937**	**2515**	**1375**	**646**	**443**	**416**	**21277**

Table B-26. Eastside Streams Unimpaired Total Outflow Estimated Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	3	4	74	93	543	273	290	463	319	44	4	1	2111
1923	5	43	378	248	148	128	317	299	138	36	2	5	1745
1924	11	8	11	16	32	26	67	74	2	0	0	0	248
1925	7	43	55	55	493	179	400	335	146	22	3	4	1742
1926	5	9	25	26	207	89	226	107	18	1	0	0	713
1927	3	76	63	131	488	217	418	266	208	35	4	2	1910
1928	6	37	45	48	120	537	310	201	35	6	0	0	1345
1929	2	5	14	33	67	78	118	170	72	7	1	0	568
1930	1	2	26	70	74	224	162	138	90	6	1	1	795
1931	2	7	5	16	35	46	81	68	13	0	0	1	273
1932	2	6	128	118	421	135	160	284	214	32	4	3	1507
1933	1	3	5	24	26	63	90	164	183	18	4	5	585
1934	6	7	62	111	129	116	90	45	25	1	0	0	593
1935	1	18	23	133	80	171	588	314	173	22	2	2	1526
1936	5	6	8	206	1066	246	350	298	173	26	5	2	2392
1937	4	4	13	52	510	542	292	362	136	19	3	2	1939
1938	4	10	182	78	777	781	389	470	309	61	10	5	3074
1939	11	18	20	28	56	109	157	86	19	2	1	2	509
1940	10	5	12	266	390	507	366	277	98	11	3	2	1946
1941	3	10	104	151	285	310	306	361	186	36	7	3	1761
1942	5	15	127	470	399	184	340	361	291	61	10	5	2269
1943	4	77	134	519	297	940	335	262	136	31	8	4	2746
1944	8	8	15	30	131	222	117	231	93	14	3	0	871
1945	2	94	81	60	553	245	228	261	175	26	5	2	1733
1946	8	61	410	180	97	198	265	252	93	12	2	2	1580
1947	6	35	43	25	73	139	141	142	33	2	0	0	639
1948	17	17	14	39	34	129	303	310	222	30	3	3	1119
1949	3	6	19	29	60	335	230	248	90	6	4	2	1032
1950	2	8	9	156	279	179	326	285	166	24	4	3	1440
1951	14	672	764	527	301	345	197	227	72	15	5	4	3144
1952	7	30	255	660	382	585	436	515	315	110	21	14	3329
1953	9	14	57	234	71	119	201	197	214	49	9	5	1180
1954	6	15	19	47	110	241	261	194	51	10	2	0	957
1955	2	8	77	208	89	94	120	222	102	10	2	0	934
1956	1	7	918	890	237	189	212	363	230	37	16	8	3108
1957	11	14	18	25	128	310	145	263	149	16	6	2	1085
1958	7	13	30	112	461	584	1025	465	268	64	14	7	3049
1959	7	10	12	68	205	99	129	99	35	8	1	7	681
1960	4	2	5	18	169	172	154	140	46	6	1	2	721
1961	1	7	15	11	28	51	89	116	36	5	1	2	361
1962	2	3	14	13	342	190	253	194	151	18	5	1	1186
1963	50	11	41	75	469	178	467	388	174	30	10	6	1899
1964	9	78	36	123	50	63	129	170	77	14	2	2	751
1965	4	28	917	642	167	127	378	273	192	54	31	5	2818
1966	10	46	80	98	110	115	186	142	18	6	3	2	815
1967	2	22	175	350	204	376	550	491	363	135	18	7	2694
1968	10	10	25	65	204	166	134	134	42	7	6	0	805
1969	5	43	74	884	612	349	428	489	262	68	9	5	3228
1970	20	20	136	744	229	316	131	227	138	26	6	6	1998

Table B-26. Eastside Streams Unimpaired Total Outflow Estimated Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	16	70	274	202	102	198	189	227	213	45	3	3	1541
1972	8	19	109	53	115	167	128	185	77	13	4	5	883
1973	9	27	75	466	501	357	238	344	120	17	7	4	2164
1974	11	143	292	415	115	430	367	316	169	54	13	6	2329
1975	6	11	23	46	270	427	225	363	266	50	11	6	1705
1976	29	33	21	18	23	44	57	80	11	2	7	3	328
1977	3	4	3	7	10	13	38	47	27	2	2	1	157
1978	1	5	52	396	254	410	421	328	242	57	7	17	2191
1979	2	8	16	158	330	375	232	347	105	13	3	1	1589
1980	10	25	46	774	700	324	215	259	198	74	7	4	2638
1981	2	5	13	80	54	205	160	140	33	1	1	1	695
1982	8	147	305	606	678	705	994	433	209	71	14	22	4192
1983	83	235	609	698	737	1304	463	593	471	244	45	30	5510
1984	19	441	766	254	223	239	156	261	115	21	16	1	2513
1985	9	86	65	41	113	152	196	160	40	6	2	5	877
1986	4	29	73	174	1482	813	233	254	157	26	6	4	3257
1987	4	3	8	18	66	132	95	84	13	4	3	1	430
1988	14	41	77	78	35	61	114	85	31	6	3	1	545
1989	3	45	60	33	58	323	198	145	76	7	4	38	990
1990	26	29	16	45	56	110	124	98	44	7	1	0	557
1991	2	3	13	5	24	180	106	160	92	11	2	0	599
1992	63	18	43	56	254	161	146	59	14	10	2	0	826
1993	3	5	49	427	301	461	344	367	238	50	8	4	2257
1994	6	6	15	17	52	64	95	108	23	4	2	4	395
1995	4	24	57	649	210	995	480	689	433	225	36	18	3820
1996	16	10	53	195	480	389	300	395	149	37	16	11	2049
1997	8	71	604	1553	262	166	179	197	84	16	10	7	3159
1998	10	23	37	363	751	527	468	485	503	185	32	21	3405
1999	22	32	63	200	535	278	268	339	193	38	21	9	1998
2000	7	21	19	191	497	285	226	284	94	25	12	12	1675
2001	16	17	18	34	71	132	151	175	19	7	4	6	650
2002	2	23	86	127	111	193	206	204	78	14	6	3	1053
2003	3	27	66	84	69	108	235	354	171	25	5	4	1152
2004	3	10	66	65	151	211	168	152	40	3	2	1	872
2005	15	23	80	299	199	443	316	511	267	73	17	10	2253
2006	13	17	369	446	243	584	1159	583	263	54	17	15	3763
2007	11	24	37	42	132	155	130	126	27	5	2	2	693
2008	3	4	14	77	94	97	123	166	70	3	2	3	656
2009	5	19	16	56	111	253	167	336	64	12	3	1	1042
2010	12	6	25	98	102	164	244	301	309	42	5	4	1313
2011	45	56	436	226	209	826	501	405	446	186	27	13	3376
2012	20	16	14	45	29	169	296	154	34	10	6	6	800
2013	7	26	232	74	52	89	134	91	25	4	2	2	740
2014	2	5	4	7	65	90	104	80	13	2	1	1	375
1922-2003 Average	**9**	**41**	**120**	**215**	**268**	**277**	**258**	**256**	**140**	**32**	**7**	**5**	**1629**
1922-2014 Average	**10**	**39**	**119**	**205**	**251**	**278**	**263**	**257**	**140**	**33**	**7**	**5**	**1607**

Table B-27. 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
1922	24	25	248	282	781	658	836	2489	2535	651	128	45	8703
1923	36	98	449	411	305	369	953	1796	970	494	103	69	6054
1924	83	49	50	67	113	121	376	550	76	39	11	7	1539
1925	35	127	139	129	643	492	1064	1602	993	359	102	28	5714
1926	51	52	85	64	323	373	1229	1012	325	79	22	13	3629
1927	19	221	221	214	841	594	1149	1664	1507	461	96	38	7023
1928	55	266	143	164	266	977	852	1275	464	100	28	11	4601
1929	14	30	56	64	122	274	443	1085	633	153	29	8	2910
1930	10	13	55	115	198	434	720	797	777	155	35	15	3325
1931	31	52	33	71	113	174	421	566	154	37	16	9	1676
1932	12	24	410	305	911	570	847	1715	1644	565	113	36	7153
1933	30	20	39	96	107	265	537	789	1227	246	54	26	3436
1934	12	29	132	174	255	436	550	421	240	56	23	17	2344
1935	33	112	140	388	339	492	1570	1780	1569	351	91	29	6896
1936	35	52	55	261	1341	701	1326	1730	1110	377	82	22	7093
1937	26	34	103	135	1237	849	1075	2308	1337	338	70	21	7532
1938	28	47	937	373	1362	2156	1630	2753	2708	1031	246	87	13359
1939	124	125	105	127	180	430	879	645	262	84	35	41	3038
1940	115	48	55	764	867	1109	1113	1899	1030	207	45	13	7265
1941	32	40	445	464	955	1066	1077	2395	1888	774	157	43	9337
1942	47	102	502	597	550	554	1144	1675	2043	766	134	34	8149
1943	29	219	250	855	608	1484	1395	1708	1052	442	108	32	8182
1944	35	50	67	122	259	467	510	1403	821	313	61	20	4130
1945	29	249	225	172	1134	675	997	1634	1487	541	120	37	7301
1946	163	274	631	375	222	519	1139	1557	804	243	60	28	6016
1947	74	223	272	148	252	409	616	1061	370	89	22	16	3554
1948	87	66	50	99	90	236	686	1395	1277	287	46	19	4338
1949	24	33	58	66	119	399	910	1373	741	132	39	21	3915
1950	21	43	46	222	404	384	1062	1432	905	217	39	19	4793
1951	57	1534	1676	554	484	549	784	1100	756	236	54	17	7802
1952	35	78	379	847	492	968	1510	2857	2076	926	220	68	10454
1953	38	52	176	429	196	309	815	799	1132	481	65	22	4513
1954	26	51	66	126	284	632	1092	1387	571	162	29	14	4440
1955	18	49	129	200	181	262	452	1150	930	177	37	14	3598
1956	16	41	2212	1397	621	623	958	1880	1777	766	171	66	10527
1957	67	77	73	99	310	451	553	1216	1217	251	56	25	4395
1958	45	62	139	188	571	973	1659	2670	1928	729	220	74	9257
1959	40	39	35	182	371	389	702	674	412	82	22	119	3066
1960	36	27	32	72	326	416	719	858	447	76	24	14	3047
1961	15	60	97	61	125	204	487	609	353	57	45	19	2133
1962	19	33	69	190	812	449	1256	1227	1369	429	82	28	5963
1963	55	31	68	320	994	381	843	1732	1400	580	129	56	6590
1964	61	272	141	156	142	221	510	914	616	137	46	24	3242
1965	26	142	1424	1012	457	472	1094	1476	1448	689	302	77	8619
1966	39	379	273	261	232	458	952	1075	323	96	42	25	4154
1967	29	137	741	436	392	1029	1293	2464	2670	1616	313	116	11235
1968	54	52	103	135	372	363	583	809	394	86	44	21	3017
1969	37	183	243	2059	1466	1321	1977	3564	2662	1181	255	72	15019
1970	113	115	278	1183	435	668	541	1270	919	264	77	31	5894

Table B-27. San Joaquin Valley Unimpaired Total Outflow Estimated Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	28	190	362	353	292	443	650	1079	1181	360	86	36	5057
1972	27	95	238	162	230	552	502	992	636	102	30	69	3635
1973	49	104	215	448	745	698	908	2181	1238	246	84	30	6945
1974	57	426	406	629	259	875	1079	1897	1390	392	123	41	7574
1975	38	51	114	153	488	747	609	1879	1848	455	100	59	6540
1976	177	140	96	58	123	219	312	577	137	58	59	62	2018
1977	39	26	17	33	45	65	204	266	298	39	16	11	1060
1978	8	28	265	717	905	1384	1607	2345	2267	1044	276	303	11150
1979	77	90	101	496	574	855	901	1992	962	252	85	39	6424
1980	73	108	141	1697	1451	1126	1130	1730	1761	1069	229	84	10601
1981	55	43	81	169	201	382	755	977	486	96	46	32	3324
1982	63	401	551	807	1254	1221	2578	2536	1745	953	292	346	12746
1983	427	677	1153	1328	1673	2603	1464	2719	3793	2151	731	261	18978
1984	263	983	1256	774	483	635	713	1599	864	345	108	44	8069
1985	80	222	151	133	228	381	926	997	419	95	43	46	3721
1986	67	151	251	381	2316	1969	1384	1942	1642	477	140	82	10802
1987	63	30	44	52	138	277	569	624	241	61	34	17	2149
1988	35	77	105	194	170	311	499	626	337	105	42	19	2520
1989	21	46	75	93	159	719	948	857	523	108	34	37	3620
1990	109	76	61	109	137	362	645	524	322	112	25	11	2494
1991	14	18	18	23	26	538	510	987	875	232	53	28	3321
1992	47	69	59	82	341	342	711	635	169	166	44	21	2686
1993	32	46	139	1056	598	1051	1145	2216	1659	719	188	63	8912
1994	58	42	65	74	165	291	545	826	375	88	49	29	2608
1995	76	157	160	1156	496	2235	1458	2466	2731	2086	513	138	13672
1996	58	40	211	386	1169	995	1159	1949	1141	418	106	37	7669
1997	37	354	1368	3796	873	781	952	1601	845	241	120	55	11022
1998	46	74	115	649	1386	1148	1472	1878	3046	1948	338	169	12267
1999	88	143	194	383	728	491	785	1682	1149	300	96	64	6104
2000	38	59	41	390	977	800	1036	1654	935	212	93	51	6285
2001	56	55	62	104	193	532	679	1276	233	76	22	19	3307
2002	21	96	285	306	237	417	921	1100	633	111	30	17	4175
2003	12	197	223	265	225	403	666	1557	1118	200	90	38	4992
2004	18	44	206	210	351	753	807	893	437	123	38	18	3899
2005	132	144	248	979	646	1100	992	2740	1902	830	154	57	9925
2006	55	57	670	827	494	1033	2425	3044	2203	698	142	67	11714
2007	64	59	106	100	271	436	536	678	194	62	38	26	2571
2008	30	25	58	260	347	372	606	1105	613	139	33	20	3608
2009	21	151	84	298	365	673	837	1685	642	212	56	26	5050
2010	160	52	138	315	397	558	843	1275	1967	534	88	36	6364
2011	252	217	1096	645	558	1544	1464	1781	2491	1346	304	110	11809
2012	150	73	47	156	118	337	878	753	202	72	58	17	2860
2013	24	94	527	214	170	374	681	661	268	78	37	15	3143
2014	24	22	30	30	127	238	469	515	174	58	33	15	1734
1922-2003 Average	**55**	**140**	**280**	**423**	**530**	**667**	**931**	**1468**	**1114**	**414**	**106**	**50**	**6176**
1922-2014 Average	**58**	**133**	**282**	**416**	**508**	**667**	**934**	**1457**	**1102**	**409**	**104**	**48**	**6119**

Table B-28. Delta Unimpaired Total Inflow Estimated Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	434	547	1703	1560	4552	3554	4672	7782	5618	1507	607	438	32974
1923	489	857	3297	2567	1687	1884	4254	4248	2330	1195	519	467	23793
1924	506	464	550	648	1394	752	1200	1206	477	381	304	292	8174
1925	414	954	1217	1216	6920	2744	4787	4416	2328	955	523	416	26891
1926	452	580	789	984	4306	2080	4693	2445	994	513	361	333	18532
1927	387	2524	2499	3006	8887	4603	6103	4929	3517	1206	541	434	38635
1928	445	1721	1373	1785	2672	7595	4623	3425	1304	637	413	370	26362
1929	375	589	775	740	1423	1536	1886	2761	1580	589	320	323	12896
1930	315	340	2947	1909	2390	3637	3093	2589	1745	629	376	358	20327
1931	375	517	440	956	914	1403	1384	1294	578	324	279	269	8734
1932	364	441	2452	1907	2872	3042	3173	4700	3303	1114	466	341	24175
1933	332	355	479	876	727	2288	2261	2708	2728	694	360	316	14123
1934	346	391	1354	1842	2041	2229	1819	1203	720	373	295	276	12891
1935	347	1000	952	2680	2095	3016	7901	5458	3270	942	468	356	28486
1936	430	444	599	4317	7947	3562	4679	4265	2666	976	453	360	30699
1937	359	364	526	693	3881	4726	4759	5742	2759	885	414	337	25445
1938	445	2080	6226	2531	8474	11252	7630	8785	5934	2148	837	572	56914
1939	670	732	925	927	1019	2316	2579	1641	783	445	341	362	12740
1940	478	397	783	5233	8181	8262	5675	4403	2140	756	453	422	37183
1941	490	711	4655	6171	7634	6798	6394	6886	3940	1751	750	563	46743
1942	563	777	4762	6127	7426	3039	5895	5738	4863	1831	735	541	42297
1943	541	1309	2393	6817	3943	7590	5161	4229	2590	1196	628	485	36880
1944	520	562	637	967	1973	2689	2238	3795	2009	940	458	374	17160
1945	449	1461	1860	1327	5858	2941	3410	4383	2972	1150	542	407	26759
1946	761	1630	6445	3473	1711	2898	4086	4153	1918	824	504	419	28824
1947	503	1099	1315	728	2003	3127	2603	2274	1292	521	389	358	16211
1948	785	673	575	2233	850	2116	5468	5252	3768	1058	519	445	23743
1949	459	565	791	651	1193	4776	3863	3844	1696	572	412	359	19178
1950	380	467	494	2473	3674	3074	4473	4241	2362	796	438	399	23272
1951	1113	6152	8164	5104	4622	3516	3295	3692	1777	769	496	417	39115
1952	562	1147	4697	6164	5698	5622	7572	8733	5240	2337	882	614	49267
1953	542	589	2677	7296	1924	2712	3887	3945	3825	1559	649	548	30154
1954	543	972	930	2953	3779	4672	5585	3725	1628	768	528	481	26563
1955	481	916	1728	1719	1209	1540	2349	3679	2072	698	436	404	17231
1956	407	700	12859	10914	5471	3905	4160	6071	3964	1716	751	580	51498
1957	726	688	687	959	3404	4258	2792	4525	2751	876	526	537	22730
1958	1034	993	2000	3332	11032	7005	9068	7892	4814	1856	897	649	50572
1959	590	611	662	2736	3586	2366	2595	2034	1170	576	422	611	17959
1960	462	426	524	1079	4311	3929	2890	2703	1453	563	408	389	19139
1961	423	853	1645	1086	2652	2369	2356	2453	1357	533	449	394	16570
1962	429	656	1441	1067	5706	3226	4497	3532	2774	994	492	394	25209
1963	3290	860	2398	2288	6176	2840	7469	5883	3007	1320	655	539	36725
1964	666	2054	1021	2121	1249	1390	2226	2780	1736	638	419	364	16664
1965	438	1164	11833	8143	2882	2427	6106	4406	3114	1485	930	502	43431
1966	520	1791	1393	2685	2149	3048	3874	2851	1010	555	433	401	20709
1967	398	1648	3969	5156	3301	5352	5603	7707	6311	2928	899	565	43837
1968	591	626	1044	2184	4870	3213	2542	2439	1210	610	573	446	20348
1969	573	1051	2428	11584	7523	5190	7039	8688	5061	2054	816	587	52594
1970	734	759	4273	14518	4096	4210	2197	3167	2160	900	564	475	38053

Table B-28. Delta Unimpaired Total Inflow Estimated Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	571	2450	4707	4105	2289	4710	4027	4745	3737	1349	640	551	33880
1972	608	781	1549	1689	2215	3865	2929	2948	1683	626	443	520	19858
1973	686	1565	2313	6151	5718	4722	3841	5431	2496	847	562	507	34838
1974	749	5699	5002	9240	2793	8411	6549	5423	3609	1530	751	575	50331
1975	589	700	1032	1247	4363	6612	3798	6270	4554	1378	709	618	31870
1976	1025	1013	887	739	1034	1558	1536	1592	658	456	538	479	11517
1977	446	455	416	552	537	626	768	1003	811	402	356	427	6800
1978	384	549	2338	8440	5036	7308	5922	5641	4257	1888	742	860	43364
1979	468	602	613	2007	3185	4022	3274	5176	1949	776	483	422	22976
1980	759	1088	1720	9461	8699	5126	3838	4276	3253	1893	656	597	41366
1981	531	499	1112	2189	2156	3171	2701	2365	1107	517	409	380	17136
1982	698	5347	7249	5283	7483	6706	11260	6854	3802	1960	874	945	58460
1983	1526	2706	5594	6730	9754	15830	6917	8852	8322	4095	1571	954	72851
1984	990	5158	9764	3956	3039	3850	2980	4112	2238	992	581	525	38186
1985	735	2335	1518	1044	1663	2089	3282	2422	1119	515	420	535	17675
1986	589	891	1566	3327	16848	9881	4058	4222	2950	1130	591	662	46714
1987	623	489	602	918	1874	3294	1998	1663	707	464	366	355	13352
1988	402	548	2149	2511	1239	1494	1742	1787	1034	497	349	308	14060
1989	350	1239	927	1092	1211	7767	4147	2541	1346	548	386	513	22068
1990	866	671	527	1589	1151	2200	2038	1981	1389	541	344	339	13636
1991	339	388	386	414	531	3710	2343	2731	1800	645	346	317	13951
1992	463	482	581	733	3355	2584	2565	1496	626	570	327	312	14095
1993	439	443	1633	6328	4759	7247	5241	6017	4240	1553	681	484	39063
1994	566	477	942	915	1573	1760	1790	2027	905	399	313	354	12023
1995	431	728	1415	12001	4093	14337	7263	8974	6345	3852	1255	738	61433
1996	567	553	2147	3491	8444	5747	4884	6527	2791	1160	633	513	37458
1997	574	1530	9286	17210	3950	2963	3102	3365	1848	781	607	533	45750
1998	638	1201	1651	7394	11828	6932	6222	7248	7794	3748	1101	824	56582
1999	824	1696	2316	3338	6591	4910	4194	4989	3015	1064	652	600	34190
2000	622	832	765	3257	7711	5343	4277	4216	2081	813	572	581	31068
2001	672	629	757	1089	2133	3215	2422	2823	795	511	413	418	15878
2002	435	1147	3542	3802	2218	2989	3313	2996	1564	581	440	399	23425
2003	396	887	4771	4457	2114	3204	4246	5841	2817	834	614	478	30659
2004	465	630	3009	2590	5692	4310	3043	2614	1283	660	440	400	25135
2005	782	726	2228	3782	2859	5250	4043	8565	4146	1703	668	504	35257
2006	531	763	7962	6855	4458	7703	12217	8309	4301	1584	717	568	55970
2007	581	772	1601	1029	2874	2527	2012	1916	734	488	401	377	15313
2008	538	437	855	2595	2657	2194	2211	3001	1354	519	370	300	17030
2009	421	770	678	1114	3044	4572	2741	4847	1547	691	436	368	21231
2010	750	446	809	3406	2987	2949	4141	4400	4716	1341	542	442	26931
2011	1033	1125	5890	2865	2851	9228	6602	5871	6504	3090	998	616	46673
2012	803	674	551	1219	870	4046	4685	2643	1008	615	483	386	17983
2013	458	1503	5832	1712	1293	2014	2325	1628	917	520	415	380	18998
2014	401	396	412	409	1573	2580	2069	1325	603	414	371	326	10879
1922-2003 Average	**591**	**1158**	**2463**	**3624**	**4096**	**4274**	**4126**	**4247**	**2637**	**1092**	**557**	**475**	**29341**
1922-2014 Average	**594**	**1110**	**2492**	**3491**	**3947**	**4278**	**4134**	**4230**	**2617**	**1088**	**554**	**469**	**29003**

Table B-29. Delta Unimpaired Total Outflow Estimated Flow in TAF

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	352	485	1672	1536	4544	3493	4581	7671	5498	1379	495	336	32042
1923	413	809	3300	2548	1624	1794	4195	4136	2218	1070	407	370	22884
1924	423	393	489	594	1336	674	1098	1089	353	258	191	192	7090
1925	343	892	1192	1177	6907	2678	4726	4320	2206	831	414	323	26010
1926	370	514	731	942	4287	1986	4634	2327	860	378	243	232	17504
1927	308	2486	2447	2975	8879	4538	6034	4814	3399	1077	426	334	37717
1928	370	1666	1331	1743	2621	7556	4533	3308	1180	509	294	267	25379
1929	289	536	735	690	1362	1460	1788	2644	1467	462	202	223	11859
1930	228	265	2897	1885	2353	3588	3005	2484	1624	506	265	266	19364
1931	294	450	374	921	862	1319	1273	1186	461	188	157	167	7652
1932	279	380	2460	1877	2850	2960	3078	4590	3180	987	347	233	23220
1933	244	280	426	854	660	2222	2159	2600	2613	558	241	214	13071
1934	262	317	1319	1792	2014	2137	1712	1087	600	243	176	173	11830
1935	264	947	911	2663	2038	2982	7852	5344	3140	812	347	253	27553
1936	352	376	548	4295	7951	3493	4595	4152	2547	842	332	256	29738
1937	275	290	484	661	3870	4741	4663	5624	2638	755	294	235	24529
1938	362	2023	6203	2505	8515	11250	7549	8668	5808	2017	718	470	56088
1939	591	663	865	877	961	2251	2472	1527	655	314	221	258	11655
1940	393	323	723	5245	8218	8227	5588	4286	2011	626	334	322	36297
1941	407	642	4663	6186	7669	6755	6340	6775	3818	1624	635	460	45974
1942	484	713	4742	6122	7395	2980	5848	5632	4736	1700	616	439	41406
1943	457	1257	2349	6808	3907	7552	5082	4110	2469	1067	511	379	35948
1944	435	493	580	921	1958	2604	2158	3681	1890	811	337	267	16134
1945	367	1412	1821	1278	5831	2903	3303	4274	2843	1015	424	302	25774
1946	693	1565	6432	3427	1655	2834	3984	4041	1795	696	384	315	27821
1947	419	1046	1265	671	1951	3068	2496	2153	1169	393	273	250	15153
1948	714	607	514	2168	783	2065	5408	5155	3650	929	403	344	22740
1949	377	494	748	601	1138	4737	3764	3731	1570	443	297	258	18158
1950	294	400	439	2446	3631	3011	4375	4124	2241	665	319	301	22246
1951	1039	6116	8157	5085	4592	3452	3208	3582	1655	640	379	314	38218
1952	483	1091	4693	6204	5654	5591	7505	8608	5125	2207	762	509	48431
1953	454	530	2675	7269	1847	2635	3814	3841	3711	1426	537	446	29185
1954	458	909	869	2906	3727	4619	5505	3609	1507	642	414	379	25543
1955	395	859	1695	1701	1149	1458	2283	3567	1951	572	317	302	16248
1956	322	636	12885	10989	5411	3817	4069	5980	3839	1601	628	478	50656
1957	646	614	622	908	3363	4196	2711	4441	2629	748	406	438	21722
1958	962	923	1957	3325	11071	7010	9014	7791	4697	1733	781	545	49809
1959	503	540	598	2699	3560	2276	2488	1925	1046	443	308	528	16912
1960	374	353	464	1037	4266	3859	2794	2598	1323	432	290	284	18073
1961	337	808	1587	1064	2588	2312	2261	2347	1230	400	333	295	15562
1962	343	602	1384	1010	5715	3165	4390	3423	2647	866	374	293	24214
1963	3245	793	2361	2275	6140	2802	7432	5783	2886	1199	535	440	35891
1964	591	2012	969	2096	1174	1308	2120	2676	1622	507	305	264	15642
1965	361	1111	11821	8124	2813	2354	6051	4289	2997	1359	812	409	42501
1966	432	1746	1369	2655	2102	2967	3770	2735	888	433	315	301	19712
1967	312	1614	3951	5214	3240	5325	5569	7593	6197	2804	777	461	43056
1968	502	561	987	2157	4829	3160	2440	2324	1082	479	465	345	19331
1969	490	996	2396	11595	7572	5117	6950	8569	4955	1928	697	484	51750
1970	651	691	4245	14526	4055	4134	2096	3048	2038	768	445	371	37068

Table B-29. Delta Unimpaired Total Outflow Estimated Flow in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	479	2429	4703	4075	2220	4641	3936	4638	3610	1215	528	450	32924
1972	523	714	1513	1634	2154	3772	2833	2828	1558	498	325	423	18775
1973	619	1547	2285	6204	5749	4681	3736	5309	2366	717	444	405	34063
1974	675	5664	4983	9216	2724	8373	6476	5304	3485	1405	626	473	49403
1975	508	631	984	1189	4339	6578	3718	6150	4427	1256	594	514	30888
1976	955	942	820	671	968	1472	1441	1469	532	327	431	381	10411
1977	359	386	353	497	469	548	663	908	685	273	240	331	5711
1978	296	487	2304	8462	5040	7297	5860	5522	4132	1759	623	759	42541
1979	380	546	550	1996	3163	3974	3188	5056	1823	651	369	317	22014
1980	684	1026	1694	9443	8709	5059	3759	4162	3136	1775	542	496	40485
1981	442	426	1061	2162	2089	3127	2604	2250	978	387	290	277	16093
1982	624	5313	7220	5303	7455	6737	11204	6735	3707	1845	766	864	57773
1983	1457	2691	5574	6784	9790	15899	6860	8736	8222	3989	1465	862	72330
1984	914	5142	9769	3907	3004	3774	2892	4003	2126	870	455	422	37277
1985	664	2314	1484	1009	1610	2048	3184	2299	991	387	305	441	16737
1986	510	851	1535	3307	16918	9854	3974	4100	2834	1004	473	572	45931
1987	541	418	544	866	1829	3234	1894	1541	582	341	248	250	12287
1988	317	489	2118	2490	1167	1404	1649	1674	911	361	230	203	13014
1989	262	1177	882	1035	1153	7721	4046	2425	1227	414	269	426	21039
1990	786	608	464	1554	1117	2116	1936	1884	1262	409	225	234	12594
1991	252	315	327	346	472	3688	2246	2617	1677	514	229	211	12894
1992	381	410	525	683	3351	2543	2467	1372	505	443	208	206	13095
1993	358	369	1620	6411	4808	7205	5147	5907	4120	1425	562	379	38311
1994	482	419	892	869	1540	1673	1693	1922	786	266	191	246	10978
1995	337	675	1363	12054	4018	14342	7170	8859	6215	3724	1133	623	60511
1996	470	464	2127	3474	8472	5683	4801	6417	2663	1023	502	402	36498
1997	488	1464	9292	17273	3883	2869	2987	3234	1718	648	483	420	44759
1998	544	1164	1600	7373	11967	6927	6139	7161	7667	3622	981	724	55868
1999	717	1631	2259	3288	6541	4838	4099	4854	2887	945	540	500	33099
2000	527	753	683	3206	7679	5240	4171	4090	1942	696	456	478	29921
2001	588	551	688	1039	2079	3129	2321	2674	657	393	300	315	14734
2002	336	1077	3515	3750	2140	2902	3193	2853	1414	454	326	290	22248
2003	294	825	4758	4399	2047	3121	4169	5703	2674	702	510	375	29578
2004	373	570	2983	2562	5680	4215	2947	2475	1152	535	325	295	24112
2005	701	676	2214	3776	2846	5206	3971	8488	4035	1577	553	407	34450
2006	447	702	8005	6853	4423	7720	12206	8228	4193	1465	619	469	55329
2007	487	714	1548	951	2825	2421	1937	1786	603	375	293	286	14225
2008	456	372	790	2579	2582	2088	2108	2906	1212	407	261	202	15964
2009	324	704	614	1058	3031	4506	2657	4722	1420	568	328	267	20199
2010	664	383	804	3507	2997	2968	4206	4370	4570	1226	437	346	26478
2011	918	1077	5841	2820	2804	9199	6636	5982	6421	2975	854	505	46030
2012	715	600	487	1141	783	3884	4520	2505	834	435	338	271	16514
2013	347	1419	5367	1668	1206	1920	2206	1514	774	350	276	276	17322
2014	396	396	396	396	396	396	396	396	396	396	396	396	10879
1922-2003 Average	**509**	**1099**	**2425**	**3600**	**4065**	**4218**	**4039**	**4133**	**2514**	**964**	**440**	**373**	**28380**
1922-2013 Average	**511**	**1051**	**2450**	**3468**	**3902**	**4198**	**4032**	**4111**	**2492**	**961**	**438**	**369**	**28050**

Table B-30. Delta Unimpaired Net Use in TAF (WY2014 data was assumed to be same as WY2013)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	83	62	31	23	8	61	92	111	120	128	112	103	932
1923	76	48	-3	19	63	90	59	112	112	125	113	97	909
1924	83	71	61	54	58	78	102	117	123	122	113	100	1084
1925	71	61	26	39	13	66	61	95	122	124	110	93	882
1926	82	66	58	42	20	94	59	119	133	135	118	101	1028
1927	79	38	52	31	8	65	68	114	119	130	115	99	918
1928	74	55	41	42	50	39	89	118	124	129	119	103	983
1929	86	53	40	49	61	76	98	117	113	127	118	100	1037
1930	87	75	51	24	36	49	88	105	121	123	110	93	963
1931	81	68	67	36	52	81	109	116	119	138	122	101	1088
1932	84	60	-8	32	21	82	96	112	126	129	119	107	960
1933	88	74	53	23	68	66	103	104	122	137	120	101	1058
1934	84	74	36	53	27	93	108	117	120	130	120	103	1065
1935	84	54	42	18	58	35	49	116	130	130	121	103	938
1936	79	68	53	23	-3	69	84	113	120	134	122	104	966
1937	84	75	42	32	12	-13	97	118	122	131	122	103	924
1938	84	58	24	27	-41	2	82	118	126	130	120	104	834
1939	80	71	61	50	58	66	108	115	129	131	121	104	1093
1940	85	75	61	-12	-37	35	88	118	130	130	120	101	892
1941	84	70	-7	-14	-35	44	55	111	123	131	113	103	777
1942	80	65	21	6	31	60	47	107	128	131	120	103	899
1943	85	53	43	9	37	38	79	120	121	130	118	106	938
1944	85	70	57	45	16	85	80	115	119	130	122	108	1032
1945	82	49	39	49	27	39	107	110	129	136	120	105	991
1946	72	63	14	46	56	64	103	113	123	129	121	105	1008
1947	85	53	49	56	54	60	107	122	123	129	117	108	1064
1948	71	67	62	65	66	52	62	97	119	130	119	101	1011
1949	81	72	41	49	55	38	104	114	126	129	115	101	1025
1950	86	68	56	27	44	64	98	118	122	132	120	98	1032
1951	74	36	7	19	31	65	88	110	123	130	117	103	903
1952	79	55	5	-37	43	31	74	119	115	129	120	104	838
1953	89	59	6	28	75	78	73	106	116	135	114	103	982
1954	85	64	62	50	51	54	81	117	121	131	113	102	1032
1955	87	57	34	19	61	83	69	111	122	127	121	103	992
1956	87	64	-27	-74	60	89	76	109	126	128	116	100	853
1957	81	74	66	51	41	62	81	86	127	130	117	101	1019
1958	74	71	43	8	-40	-5	44	112	118	126	118	103	771
1959	88	73	63	38	29	90	105	115	128	133	118	82	1062
1960	88	75	60	43	44	74	92	111	131	132	120	105	1075
1961	87	46	58	23	65	57	94	109	129	132	117	100	1015
1962	87	55	57	58	-8	61	106	112	127	130	118	102	1004
1963	45	68	38	21	29	37	35	106	122	127	117	100	844
1964	76	43	52	26	76	82	102	111	114	128	116	101	1028
1965	78	54	10	20	70	74	61	117	118	127	113	99	941
1966	89	45	25	30	41	88	105	117	123	123	119	101	1007
1967	87	36	19	-57	59	31	35	116	115	130	121	102	793
1968	87	66	58	28	40	53	103	115	128	131	107	103	1020
1969	84	56	32	-14	-57	72	86	119	118	131	123	105	856
1970	79	68	27	-8	42	78	101	121	123	132	120	106	988

Table B-30. Delta Unimpaired Net Use in TAF contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	82	25	9	34	70	66	91	103	122	130	118	104	954
1972	85	67	36	55	62	93	96	120	126	129	118	96	1083
1973	67	18	28	-53	-31	41	105	122	130	130	118	101	775
1974	74	35	19	25	70	37	73	119	124	125	120	107	928
1975	83	69	49	59	23	31	80	120	127	125	115	105	986
1976	70	71	67	68	66	86	95	123	126	129	106	99	1107
1977	88	69	63	55	68	78	105	95	126	129	116	96	1089
1978	87	61	34	-23	-3	12	62	120	125	129	119	101	824
1979	90	56	63	11	18	47	87	118	128	127	115	106	967
1980	76	62	26	10	-16	66	86	110	118	122	115	101	877
1981	89	74	51	26	67	42	97	116	131	130	119	102	1045
1982	74	33	26	-21	29	-33	53	120	115	126	116	86	723
1983	70	15	21	-56	-42	-76	54	113	124	126	118	101	569
1984	85	21	-4	55	41	83	97	119	124	130	117	106	975
1985	74	25	39	38	53	45	105	123	128	128	115	97	969
1986	83	42	35	22	-61	18	87	118	124	128	120	93	810
1987	88	74	60	52	43	57	109	122	124	124	118	105	1077
1988	86	58	30	21	72	89	92	112	122	136	119	105	1042
1989	88	61	44	57	57	43	106	118	122	134	118	87	1037
1990	80	63	62	34	34	84	103	96	128	132	119	105	1041
1991	87	73	59	68	58	22	97	114	123	131	117	107	1056
1992	81	73	55	49	2	41	98	124	122	127	120	106	996
1993	81	72	12	-82	-51	42	94	108	118	128	119	105	746
1994	85	57	51	45	30	92	94	104	128	131	122	106	1045
1995	85	47	40	-73	63	-28	85	103	116	125	119	103	784
1996	89	75	12	-1	-47	48	79	99	127	133	122	103	840
1997	78	58	0	-67	70	92	104	120	122	130	116	105	926
1998	84	37	37	1	-159	51	73	65	116	130	121	99	656
1999	81	54	54	29	20	53	83	115	124	125	115	102	955
2000	88	63	67	29	0	77	92	114	128	126	120	102	1006
2001	67	63	55	30	22	61	78	129	128	121	120	102	976
2002	91	54	4	31	59	56	101	118	126	130	118	106	994
2003	87	55	-7	34	45	59	58	113	128	134	115	106	927
2004	90	61	21	25	8	90	105	119	125	129	119	105	996
2005	66	48	18	10	15	46	78	111	118	133	122	102	865
2006	86	67	-5	22	48	6	45	115	128	135	118	104	869
2007	86	60	51	66	41	93	92	120	127	129	121	101	1085
2008	81	70	51	4	47	91	104	119	129	130	121	107	1053
2009	88	63	54	53	27	77	98	118	124	133	119	105	1059
2010	60	71	47	9	25	65	57	108	123	126	115	102	910
2011	78	54	9	35	26	5	97	105	108	121	115	105	859
2012	77	64	65	49	67	53	75	117	124	129	121	104	1045
2013	82	44	-4	39	74	83	101	114	123	129	114	96	996
2014	82	44	-4	39	74	83	101	114	123	129	114	96	996
1922-2003 Average	**82**	**58**	**37**	**22**	**29**	**55**	**85**	**113**	**123**	**129**	**118**	**102**	**953**
1922-2014 Average	**81**	**58**	**36**	**23**	**30**	**56**	**86**	**113**	**123**	**129**	**118**	**102**	**956**

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APPENDIX C SWAT SIMULATED FLOW TABLES WY 1922-2014

Table C-1. UF 2 – Putah Creek near Winters Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.5	0.2	10.4	30.5	49.0	43.4	27.7	18.9	12.0	7.5	4.0	1.8	205.8
1923	0.9	6.4	54.7	53.3	33.5	25.9	18.2	13.6	8.2	4.9	2.7	1.3	223.5
1924	0.7	0.3	0.3	0.8	21.6	16.8	13.2	9.4	5.6	3.0	1.3	0.5	73.6
1925	0.4	3.7	35.5	34.6	140.6	68.0	46.7	30.6	20.2	13.2	7.7	4.0	405.2
1926	2.1	1.0	0.9	56.5	94.6	52.3	53.8	29.2	18.4	12.1	6.9	3.4	331.2
1927	1.6	38.0	92.4	63.3	113.6	73.9	61.7	28.0	17.5	11.4	6.5	3.2	511.1
1928	1.5	11.5	19.5	34.5	53.2	44.0	42.7	26.8	17.2	11.4	6.6	3.3	272.3
1929	1.6	3.1	9.0	15.6	25.0	21.5	14.5	9.8	5.7	3.2	1.5	0.6	111.2
1930	0.2	0.1	85.6	64.2	47.8	49.8	26.8	18.0	11.1	6.8	3.5	1.5	315.3
1931	0.7	0.3	0.3	14.5	19.4	19.3	14.5	9.6	5.4	2.9	1.3	0.5	88.7
1932	0.2	0.3	98.3	88.1	49.8	31.5	20.3	13.7	7.9	4.3	1.9	0.7	317.1
1933	0.2	0.1	4.4	31.0	36.5	33.2	23.7	16.5	10.5	6.6	3.6	1.6	167.9
1934	0.7	0.7	32.5	62.0	32.9	29.4	19.3	13.7	8.5	5.1	2.5	1.0	208.2
1935	0.4	4.1	11.6	94.5	48.4	75.3	39.7	25.4	16.1	10.6	6.2	3.1	335.4
1936	1.5	0.6	0.5	78.5	121.7	64.8	36.2	24.0	15.1	9.6	5.3	2.5	360.3
1937	1.1	0.4	0.2	2.3	88.0	69.9	46.8	27.6	17.2	11.0	6.1	2.9	273.5
1938	1.3	16.9	140.6	89.2	159.6	128.2	57.7	32.0	20.1	13.1	7.5	3.7	669.9
1939	1.8	0.9	1.5	5.3	9.1	12.1	10.7	8.4	5.7	3.5	1.8	0.8	61.7
1940	0.4	0.2	5.2	112.9	193.8	155.7	77.6	40.0	24.2	15.8	9.3	4.7	639.7
1941	2.3	1.8	137.8	204.7	160.4	142.6	102.2	42.6	25.4	16.8	10.2	5.4	852.2
1942	2.8	1.6	89.9	121.9	188.1	73.8	48.7	29.6	19.0	12.8	7.8	4.3	600.4
1943	2.4	4.0	19.7	154.9	78.0	52.9	29.3	20.4	12.8	8.0	4.4	2.1	388.8
1944	1.1	0.6	0.5	9.5	51.9	68.6	30.8	22.0	14.1	8.9	4.8	2.2	215.0
1945	1.0	7.4	17.7	38.2	83.7	40.4	27.5	18.6	11.8	7.5	4.1	1.9	259.6
1946	6.2	12.4	106.5	89.3	39.9	27.5	17.5	11.3	6.1	3.2	1.4	0.6	321.8
1947	0.2	5.5	19.9	18.2	24.9	31.1	22.0	15.6	10.0	6.4	3.5	1.6	158.9
1948	1.0	1.4	2.2	7.2	8.5	9.2	35.3	30.9	21.0	14.7	9.2	5.1	145.7
1949	2.6	1.1	5.5	8.0	15.3	62.1	37.4	26.0	16.7	11.0	6.3	3.0	195.0
1950	1.4	0.7	0.9	32.3	83.5	46.0	29.1	19.7	12.1	7.4	3.9	1.7	238.6
1951	0.9	39.5	122.5	87.0	57.8	38.0	23.9	16.5	10.3	6.3	3.4	1.6	407.8
1952	0.9	2.5	115.1	182.7	108.0	62.4	35.7	24.5	15.3	9.8	5.3	2.5	564.6
1953	1.2	0.7	110.6	187.1	61.2	43.3	27.3	19.0	12.0	7.5	4.1	2.0	475.9
1954	1.0	5.2	10.1	83.2	68.9	50.5	45.6	27.5	17.3	11.3	6.4	3.2	330.2
1955	1.5	5.0	38.7	30.7	22.6	18.5	13.1	12.0	8.4	5.7	3.7	2.0	161.8
1956	1.1	0.6	303.0	235.9	182.1	104.2	44.7	27.1	16.6	10.4	5.6	2.6	933.9
1957	1.3	1.3	1.5	5.9	43.6	53.0	32.8	24.9	17.6	11.4	6.4	3.2	202.8
1958	9.5	14.4	28.6	52.1	193.6	144.4	146.4	52.7	27.8	18.4	11.3	6.2	705.4
1959	3.3	1.6	0.9	57.1	96.5	58.8	31.0	21.0	12.9	7.9	4.1	2.0	296.9
1960	1.1	0.8	0.8	10.8	123.4	74.6	34.3	22.7	14.0	8.6	4.5	2.0	297.5
1961	0.9	0.9	35.3	52.7	49.8	37.0	26.2	18.0	11.4	7.1	3.7	1.7	244.5
1962	0.7	0.6	24.9	20.0	103.7	99.8	42.3	26.7	16.5	10.5	5.6	2.6	354.0
1963	74.4	35.7	49.2	127.5	106.6	67.8	77.8	43.2	25.7	17.2	10.6	5.7	641.5
1964	3.0	11.7	19.1	48.3	33.0	25.0	16.2	10.8	6.2	3.4	1.5	0.6	178.9
1965	0.3	18.0	200.4	240.6	69.0	39.0	33.0	21.2	13.5	8.7	5.0	2.6	651.3
1966	1.3	11.8	40.7	159.1	67.1	39.3	23.8	15.7	9.3	5.3	2.5	1.1	377.1
1967	0.5	13.9	101.2	177.0	101.5	78.6	51.4	32.9	21.7	15.1	9.5	5.3	608.5
1968	2.8	1.4	7.7	71.1	77.3	55.3	31.6	21.9	14.0	8.8	4.8	2.2	299.0
1969	1.1	0.8	46.7	229.5	186.1	97.0	42.5	26.3	16.2	10.2	5.6	2.7	664.7
1970	1.4	0.9	77.9	289.9	155.9	75.9	35.2	23.1	14.2	8.8	4.8	2.4	690.3

Table C-1. UF 2 – Putah Creek near Winters Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	1.4	40.2	177.3	83.6	41.2	35.0	23.4	16.4	10.4	6.7	3.9	2.0	441.5
1972	1.2	0.8	11.6	28.1	28.2	23.6	16.0	11.4	6.9	4.0	2.0	0.8	134.6
1973	0.7	19.0	31.7	187.6	142.3	73.9	38.3	25.4	15.8	10.0	5.5	2.7	552.8
1974	1.5	106.2	100.5	121.5	61.1	95.3	59.2	30.8	19.6	13.1	7.8	4.2	620.9
1975	2.4	1.4	3.2	12.3	89.7	93.2	54.3	30.7	19.5	13.0	7.7	4.1	331.5
1976	2.3	1.8	1.8	2.8	2.4	4.6	4.4	3.7	2.7	1.9	1.1	0.5	29.9
1977	0.2	0.1	0.1	0.7	1.3	2.0	2.0	1.7	1.2	0.8	0.4	0.2	10.6
1978	0.1	5.3	59.8	276.8	167.6	96.5	42.5	26.5	16.2	10.1	5.4	2.5	709.3
1979	1.1	0.5	0.3	43.6	72.0	62.0	33.2	22.9	14.4	9.0	4.8	2.2	266.1
1980	1.5	8.7	46.0	150.2	160.3	100.9	43.7	27.0	16.6	10.4	5.6	2.6	573.3
1981	1.1	0.5	23.8	61.6	59.1	40.8	26.6	18.1	11.4	7.2	3.9	1.8	255.9
1982	0.9	30.0	138.4	151.6	99.0	124.0	128.0	53.9	28.5	18.9	11.5	6.2	790.8
1983	3.3	28.1	77.3	120.0	188.5	268.5	90.6	49.5	28.2	19.4	12.6	7.6	893.6
1984	4.8	42.0	157.1	97.0	46.0	31.0	20.9	14.3	9.2	6.3	4.1	2.7	435.3
1985	2.2	37.9	48.7	32.9	47.9	32.8	24.7	17.3	11.3	7.5	4.4	2.4	270.0
1986	1.4	1.1	17.2	55.7	293.9	194.2	67.6	35.2	21.5	14.1	8.4	4.7	715.1
1987	2.9	1.8	1.4	1.7	16.2	35.3	28.3	20.8	13.7	8.9	5.0	2.4	138.5
1988	1.1	0.8	36.7	102.6	48.6	30.6	19.5	12.9	7.3	4.0	1.9	0.8	266.9
1989	0.3	4.0	12.0	17.2	15.4	39.4	31.3	22.3	14.4	9.4	5.2	2.5	173.6
1990	2.5	4.3	6.1	25.9	25.2	23.1	16.1	11.6	9.9	8.3	5.6	3.4	141.9
1991	2.0	1.0	0.5	0.3	0.8	48.0	35.3	26.9	17.5	11.8	6.9	3.4	154.3
1992	1.6	0.8	0.6	4.1	42.8	46.3	30.2	21.4	13.7	8.6	4.6	2.1	176.7
1993	0.9	0.8	51.7	207.4	128.6	77.9	36.9	23.7	14.5	8.8	4.6	2.1	557.8
1994	1.0	0.5	13.7	15.5	32.8	30.5	20.7	14.5	8.9	5.3	2.7	1.2	147.2
1995	0.5	2.0	16.9	359.7	115.6	201.5	75.3	38.6	23.0	14.9	8.7	4.5	861.3
1996	2.2	0.9	46.8	87.1	154.0	81.8	39.9	26.5	17.4	11.3	6.3	3.2	477.5
1997	1.6	1.3	107.0	259.7	97.2	48.7	26.8	17.6	10.4	5.9	3.0	1.4	580.6
1998	0.8	5.8	21.9	92.6	234.5	97.3	47.2	29.7	20.1	14.3	9.2	5.6	579.0
1999	3.5	10.7	17.3	24.2	96.7	61.2	38.7	26.3	16.8	11.2	6.8	3.8	317.1
2000	2.3	2.0	4.1	10.2	70.8	76.3	38.9	26.3	16.6	10.9	6.5	3.5	268.3
2001	2.1	1.5	1.4	5.0	26.8	57.5	31.9	22.5	14.3	9.0	4.9	2.3	179.2
2002	1.1	9.0	88.1	103.8	43.4	30.4	19.2	12.3	6.8	3.7	1.7	0.7	320.3
2003	0.3	1.0	184.3	117.3	50.6	39.0	27.7	23.7	15.6	10.8	7.1	4.1	481.4
2004	2.3	1.3	56.4	88.5	107.6	75.3	35.7	23.8	14.8	9.4	5.3	2.7	422.9
2005	1.6	1.8	53.7	95.4	50.7	54.5	35.5	26.0	17.7	11.8	7.2	4.0	359.8
2006	2.3	1.4	164.9	163.1	76.5	105.1	85.2	46.0	27.5	18.7	12.0	7.2	710.0
2007	4.5	2.9	10.5	12.1	28.5	28.8	21.2	15.7	10.4	7.0	4.2	2.2	148.0
2008	1.2	0.6	1.2	99.8	79.3	45.9	27.1	18.2	11.0	6.4	3.1	1.3	294.9
2009	0.6	0.9	1.9	5.4	31.2	63.7	31.2	21.5	13.4	8.3	4.3	1.9	184.2
2010	2.6	3.8	5.1	82.9	78.7	56.2	41.4	26.9	17.4	11.8	7.0	3.6	337.3
2011	2.0	2.6	31.8	39.0	26.8	20.8	13.2	8.2	4.2	2.0	0.8	0.3	151.6
2012	0.1	0.1	0.0	4.6	8.8	63.9	58.2	33.7	22.3	15.2	9.2	4.8	220.8
2013	2.3	26.2	166.4	87.6	36.9	25.6	15.7	9.8	5.1	2.5	1.0	0.3	379.3
2014	0.1	0.0	0.0	0.0	23.1	39.2	27.6	19.5	12.6	8.1	4.4	2.0	136.6
Average	2.4	7.6	46.6	80.7	77.7	61.4	37.4	22.9	14.3	9.2	5.3	2.7	368.1
Minimum	74.4	106.2	303.0	359.7	293.9	268.5	146.4	53.9	28.5	19.4	12.6	7.6	933.9
Maximum	0.1	0.0	0.0	0.0	0.8	2.0	2.0	1.7	1.2	0.8	0.4	0.2	10.6

Table C-2. UF 3 – Cache Creek above Rumsey Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.5	1.1	23.7	33.9	88.6	79.3	64.1	41.6	25.0	14.6	6.4	2.3	381.1
1923	2.0	26.6	65.4	70.4	57.0	41.2	44.2	27.1	19.4	12.6	6.4	3.3	375.5
1924	2.2	2.0	3.7	15.9	42.3	35.5	27.1	18.7	9.4	4.2	1.5	0.4	162.9
1925	3.0	20.4	57.6	59.2	187.7	105.7	84.8	65.5	40.8	27.2	16.7	8.1	676.6
1926	3.6	2.4	9.2	96.9	103.9	73.9	83.1	45.9	27.2	17.3	8.2	3.1	474.7
1927	1.8	71.1	85.7	102.4	182.7	103.7	96.1	51.3	28.1	17.6	8.1	3.0	751.6
1928	1.1	23.9	39.8	47.1	75.0	83.9	74.3	54.5	32.2	21.3	10.5	4.1	467.9
1929	1.5	14.6	26.1	30.3	46.9	35.0	25.5	17.1	9.3	5.1	2.4	0.9	214.6
1930	0.3	0.1	60.6	65.8	78.2	76.7	54.8	34.9	22.4	12.6	5.6	2.1	414.1
1931	0.8	1.1	2.6	36.3	30.3	37.8	28.8	23.2	16.1	9.5	4.6	2.0	193.1
1932	1.0	3.4	69.2	76.1	71.7	50.4	29.4	20.0	11.2	6.5	3.3	1.4	343.6
1933	0.5	0.6	12.4	45.1	48.2	59.4	43.1	32.5	21.9	13.1	6.2	2.5	285.6
1934	1.4	3.5	46.8	50.7	53.4	49.2	34.1	25.9	16.2	9.2	4.4	1.8	296.4
1935	1.2	20.7	27.5	96.2	79.2	79.2	65.5	45.6	28.3	18.9	9.2	3.7	475.2
1936	1.7	1.6	5.3	97.6	150.5	95.3	78.7	43.8	27.4	16.7	8.3	3.7	530.7
1937	1.6	0.7	0.9	12.3	120.7	97.2	72.0	48.1	27.7	17.6	8.4	3.4	410.7
1938	2.0	58.9	202.2	132.4	200.0	156.3	101.2	67.4	34.2	21.3	10.1	3.9	989.8
1939	2.2	3.3	24.0	33.2	40.8	47.8	30.8	23.4	14.3	8.2	3.9	1.6	233.4
1940	0.6	0.3	10.8	97.6	225.2	171.3	101.5	73.1	38.5	23.8	12.1	4.9	759.6
1941	2.0	7.0	119.4	180.5	197.5	156.9	127.3	78.7	44.1	26.2	14.5	6.1	960.1
1942	2.5	5.1	94.2	115.3	191.5	104.6	88.2	56.4	34.2	23.0	12.1	5.1	732.2
1943	2.1	16.5	42.9	175.7	83.6	86.4	59.6	39.1	25.2	16.1	8.0	3.3	558.5
1944	1.3	1.0	4.3	34.7	66.1	79.2	50.8	35.8	24.0	14.8	7.4	3.1	322.4
1945	2.0	25.6	41.2	68.0	80.9	66.0	50.1	34.3	23.2	13.7	6.4	2.5	414.1
1946	13.0	25.9	127.2	107.3	77.7	57.9	35.5	24.9	14.5	7.6	3.2	1.1	496.0
1947	0.4	19.3	30.2	31.0	51.9	58.0	46.5	33.1	22.5	13.1	6.0	2.3	314.1
1948	5.1	11.2	13.5	27.5	29.1	45.2	74.3	61.3	40.5	26.6	15.6	7.0	356.8
1949	3.1	1.9	9.9	22.3	39.7	99.7	62.3	42.7	25.4	15.0	6.6	2.4	331.0
1950	0.8	1.6	4.6	57.5	98.9	71.7	56.4	37.7	24.7	15.0	7.0	2.7	378.5
1951	6.4	49.1	118.1	116.3	101.3	79.1	47.1	44.7	23.7	15.0	7.8	3.4	611.9
1952	1.8	22.4	116.0	152.6	119.6	103.8	65.5	37.7	22.7	12.4	5.5	2.1	662.2
1953	0.8	2.0	113.3	173.0	85.7	82.8	50.6	35.3	25.4	17.4	9.9	4.8	600.9
1954	2.4	28.7	17.1	116.8	89.2	88.6	73.7	45.7	27.0	17.0	8.2	3.6	517.9
1955	1.7	17.8	50.1	47.6	35.6	32.4	32.6	25.4	18.9	13.5	7.4	3.3	286.5
1956	1.4	3.1	234.7	251.3	231.0	112.9	77.9	45.9	25.2	14.6	6.4	2.3	1,006.7
1957	1.6	5.4	5.5	37.2	81.0	70.6	66.9	57.7	36.7	25.8	15.3	8.7	412.4
1958	35.5	23.1	41.1	81.2	267.9	188.8	165.4	85.6	47.5	26.8	14.7	6.1	983.8
1959	2.3	0.9	0.8	78.3	119.0	79.0	54.4	32.1	19.5	9.9	3.9	2.0	402.2
1960	1.8	1.2	1.4	21.9	147.3	100.6	71.8	46.8	28.6	19.3	10.0	4.3	454.9
1961	2.0	18.9	76.5	73.1	69.6	75.4	54.1	38.0	25.1	15.7	7.6	3.1	459.1
1962	1.2	28.7	54.2	45.4	140.1	119.6	72.2	44.2	24.9	14.1	5.9	2.1	552.4
1963	68.2	38.5	56.2	135.0	98.4	93.8	99.7	73.9	43.1	26.1	14.4	6.0	753.5
1964	3.3	39.0	34.8	66.3	42.7	38.3	27.2	19.5	11.0	5.8	2.5	0.8	291.0
1965	0.5	56.9	237.4	259.3	97.2	75.3	65.1	38.9	26.4	17.6	9.0	3.9	887.6
1966	1.6	42.1	47.2	134.2	105.2	75.5	45.4	28.1	17.2	9.0	3.8	1.4	510.5
1967	0.5	57.3	103.5	167.5	89.2	117.2	80.2	58.7	37.9	24.8	13.7	6.0	756.5
1968	3.1	3.8	29.8	106.4	87.2	91.1	60.5	36.2	22.2	11.9	5.1	1.9	459.2
1969	1.2	6.0	75.0	208.6	203.3	117.2	78.6	45.4	25.2	14.6	6.4	2.3	783.7
1970	1.3	3.5	79.3	293.6	159.0	107.6	67.2	35.9	20.7	10.2	3.9	1.2	783.4

Table C-2. UF 3 – Cache Creek above Rumsey Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.6	87.3	145.1	126.6	78.0	77.6	48.2	34.5	24.1	14.8	7.0	2.7	646.6
1972	1.0	2.1	33.8	41.5	50.4	45.9	37.8	27.1	17.5	10.0	4.6	1.8	273.7
1973	3.9	38.2	61.1	172.7	180.4	115.3	75.8	42.9	24.1	13.2	5.4	1.9	734.8
1974	2.4	149.3	122.8	162.0	113.7	144.9	94.7	62.5	33.6	21.8	11.0	4.4	923.1
1975	1.8	1.6	19.2	30.2	138.8	154.1	95.2	69.8	36.2	22.8	11.4	4.5	585.6
1976	3.6	8.6	12.3	13.3	21.7	29.0	32.7	26.8	18.5	11.1	5.3	2.1	185.0
1977	0.9	1.1	1.3	11.1	11.9	19.7	17.5	14.6	9.8	5.7	2.6	1.3	97.5
1978	0.8	22.2	57.0	252.9	186.8	137.4	93.0	59.3	31.8	20.7	10.1	4.4	876.3
1979	1.8	1.1	1.2	60.4	94.2	88.3	67.5	47.3	28.1	18.8	9.5	4.0	422.1
1980	7.9	38.1	83.8	143.3	188.9	112.4	78.3	45.6	25.6	15.1	6.6	2.4	748.0
1981	0.9	0.6	29.5	63.4	61.3	66.7	48.5	31.9	20.7	11.3	4.9	1.8	341.7
1982	6.2	77.7	140.7	150.2	134.6	148.7	123.7	81.0	46.2	26.7	14.6	6.1	956.5
1983	4.8	72.2	93.2	171.3	221.1	296.0	127.1	95.7	56.5	30.9	18.1	8.0	1,195.0
1984	3.6	95.0	188.1	101.0	85.2	64.9	41.9	28.6	18.5	10.3	4.7	1.8	643.4
1985	1.3	71.7	65.5	55.1	74.0	56.9	43.6	30.7	20.7	11.6	5.1	2.1	438.4
1986	1.3	10.8	39.2	78.3	349.5	195.3	93.6	61.8	31.1	19.1	8.6	3.5	892.0
1987	1.6	1.2	3.5	18.0	58.6	78.6	56.0	37.2	23.4	13.1	5.6	2.0	298.8
1988	0.8	6.9	63.2	111.5	71.3	51.4	30.7	22.2	12.3	6.6	3.2	1.3	381.3
1989	0.5	24.4	32.1	44.8	35.1	78.4	55.2	40.2	25.4	15.6	7.2	3.2	362.1
1990	14.2	14.1	15.5	45.3	48.4	45.5	30.9	41.1	26.5	20.8	14.3	8.0	324.4
1991	4.1	2.3	1.9	2.0	19.0	103.6	66.9	49.5	28.4	18.0	8.4	3.2	307.1
1992	1.4	4.3	9.6	26.7	87.4	80.8	60.3	37.4	23.5	13.5	6.2	2.5	353.6
1993	1.8	5.8	74.3	188.5	142.1	106.0	73.0	47.5	35.6	25.9	16.0	7.8	724.4
1994	3.6	2.3	24.2	31.2	63.7	49.2	35.7	27.6	17.6	10.4	5.1	2.1	272.8
1995	1.0	17.2	37.1	368.2	110.3	270.9	106.8	88.6	49.9	29.0	17.2	7.7	1,103.8
1996	3.1	1.0	77.1	118.1	181.8	114.5	85.1	57.9	33.2	22.9	12.6	5.7	712.8
1997	2.4	9.6	121.2	239.2	100.0	83.0	47.4	28.2	17.1	9.0	4.2	2.0	663.3
1998	1.6	29.0	50.0	128.4	327.3	130.1	98.3	78.4	47.8	29.1	18.3	9.0	947.4
1999	4.2	32.7	38.4	47.8	129.1	104.6	86.1	56.6	30.3	19.2	8.9	3.4	561.2
2000	1.2	11.1	18.4	35.9	115.6	101.3	73.3	45.6	26.5	16.6	8.0	3.3	456.8
2001	1.7	3.6	8.8	27.3	59.1	81.0	51.9	32.0	19.8	10.3	4.2	1.5	301.2
2002	0.6	29.6	100.1	124.1	76.3	60.6	36.4	25.5	15.3	8.0	3.3	1.1	481.0
2003	0.3	11.6	210.7	122.0	92.8	92.9	66.8	59.2	39.4	26.5	15.6	6.9	744.7
2004	2.7	11.2	92.8	94.8	164.0	92.3	61.3	34.9	21.3	11.4	4.8	1.7	593.3
2005	3.1	9.2	77.6	87.7	73.7	86.6	69.0	61.8	38.8	26.4	16.0	7.6	557.4
2006	3.4	7.1	191.8	164.6	139.4	152.4	138.2	84.7	47.4	27.1	15.1	6.2	977.4
2007	2.4	3.8	25.7	30.6	74.9	60.2	44.5	30.2	19.4	10.9	5.0	1.9	309.3
2008	1.3	1.3	14.4	129.8	94.1	75.2	43.4	26.1	14.2	6.5	2.4	0.7	409.3
2009	0.8	8.0	12.3	18.0	56.8	69.9	47.9	38.2	24.1	14.9	7.5	3.1	301.7
2010	5.8	9.7	14.7	98.8	83.7	87.8	86.0	57.2	36.1	25.0	14.4	6.6	525.8
2011	6.4	19.0	58.7	63.6	41.2	28.6	16.9	8.2	3.1	1.0	0.2	0.0	246.9
2012	0.0	0.0	0.0	25.2	21.4	109.3	80.0	61.2	34.4	22.3	11.0	4.3	369.2
2013	1.7	60.2	198.8	93.1	62.6	42.7	26.6	15.2	7.1	3.3	1.3	0.4	513.0
2014	0.2	0.2	0.6	0.7	42.0	52.4	49.0	35.3	23.7	14.0	6.4	2.4	226.7
Average	3.4	19.7	58.3	93.6	104.6	90.3	64.4	43.7	26.2	16.0	8.1	3.4	531.9
Minimum	68.2	149.3	237.4	368.2	349.5	296.0	165.4	95.7	56.5	30.9	18.3	9.0	1,195.0
Maximum	0.0	0.0	0.0	0.7	11.9	19.7	16.9	8.2	3.1	1.0	0.2	0.0	97.5

Table C-3. UF 4 – Stony Creek at Black Butte Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.3	4.2	35.4	83.5	68.4	105.4	59.2	30.4	7.6	1.6	0.0	0.1	396.2
1923	10.6	26.7	52.5	77.2	39.4	22.6	38.3	16.1	1.5	1.5	0.1	1.5	288.0
1924	25.0	9.4	25.0	16.8	65.9	31.6	8.2	1.8	0.2	0.0	1.0	0.7	185.7
1925	8.3	55.3	58.0	36.6	151.4	72.9	61.6	28.9	7.4	1.7	0.1	1.6	483.7
1926	2.5	13.4	48.6	15.7	144.5	50.0	24.0	12.5	1.2	0.0	0.0	0.6	312.9
1927	4.1	11.5	179.7	72.1	149.2	118.9	51.0	11.1	3.7	2.3	0.1	0.0	603.8
1928	0.0	42.7	55.8	90.3	114.8	55.4	98.0	20.0	1.6	0.3	0.0	0.1	479.0
1929	1.1	32.3	48.3	35.6	68.4	34.9	19.8	11.4	4.4	5.2	0.4	0.0	261.7
1930	0.2	0.2	61.2	60.3	45.5	100.2	38.8	15.4	2.2	0.2	0.0	0.6	324.6
1931	1.8	8.9	23.9	80.6	50.8	37.8	22.2	2.9	8.0	11.8	1.3	0.3	250.2
1932	0.9	12.2	36.3	152.0	32.3	27.1	32.3	23.9	4.6	0.6	0.0	0.0	322.3
1933	0.1	1.7	34.4	59.2	44.3	48.2	49.8	20.4	4.4	0.1	0.0	0.0	262.8
1934	0.2	12.2	33.7	146.4	31.9	25.1	32.0	9.4	2.4	0.9	0.0	0.0	294.3
1935	1.3	50.8	52.1	74.1	49.6	94.3	57.1	29.8	3.3	0.1	0.0	0.3	412.6
1936	4.3	6.9	14.7	217.1	99.0	65.1	48.5	13.2	22.0	14.8	1.2	0.3	507.2
1937	0.1	0.4	2.2	32.0	76.2	127.0	100.6	44.3	22.8	23.4	2.4	0.0	431.6
1938	7.4	90.6	215.2	106.3	191.1	208.5	87.0	24.7	3.8	0.6	0.0	0.0	935.5
1939	10.8	12.7	145.1	75.7	54.4	54.1	37.8	10.9	7.3	1.3	0.0	0.3	410.5
1940	3.7	2.0	51.2	159.7	98.9	130.4	58.1	15.6	5.1	1.2	0.0	0.1	526.0
1941	0.8	29.3	56.1	221.2	174.6	151.5	80.0	27.8	6.8	2.8	0.7	0.2	751.7
1942	0.4	11.2	105.9	118.8	162.7	45.6	36.9	27.8	9.3	1.7	0.0	0.3	520.5
1943	0.7	10.5	75.5	143.0	106.9	65.4	37.8	22.3	4.7	1.3	0.1	0.0	468.4
1944	0.5	11.9	20.2	46.5	72.1	51.7	16.1	16.0	6.9	6.3	0.7	0.0	248.8
1945	0.2	38.3	66.1	75.7	147.8	37.5	44.3	10.9	8.9	2.5	0.1	0.0	432.2
1946	0.3	38.7	110.5	182.4	35.2	42.4	47.7	10.6	0.9	0.3	3.0	0.6	472.6
1947	6.0	10.7	59.1	21.2	57.2	83.6	32.8	6.0	4.5	3.9	0.3	0.0	285.2
1948	11.5	37.3	13.2	86.4	34.6	26.5	58.3	38.0	20.0	9.7	0.6	2.2	338.4
1949	9.6	22.4	42.4	42.2	11.3	136.8	64.2	31.4	10.3	1.6	0.2	0.1	372.4
1950	8.0	16.3	15.9	29.3	63.4	54.5	70.4	24.6	4.3	2.6	0.1	0.2	289.6
1951	1.7	45.1	108.6	93.6	136.9	48.6	20.1	24.1	4.7	0.1	0.0	0.0	483.4
1952	1.1	14.0	118.9	124.0	83.4	50.1	43.8	36.8	8.2	8.5	3.3	0.6	492.8
1953	1.7	35.8	167.5	221.8	64.3	40.4	25.3	18.3	17.0	7.5	0.5	1.5	601.5
1954	1.7	22.5	136.6	171.6	167.2	69.5	47.3	16.0	31.0	20.5	1.7	6.3	692.0
1955	6.5	26.1	148.5	56.3	32.7	39.9	28.5	35.2	7.7	0.9	0.0	0.1	382.6
1956	1.3	9.5	109.8	243.7	125.7	118.7	38.0	28.3	7.1	2.5	0.2	0.3	685.4
1957	1.4	15.1	48.2	59.0	55.4	122.7	50.5	17.3	3.2	0.2	0.0	0.0	373.0
1958	40.8	40.8	54.3	113.8	270.5	212.0	89.1	23.2	10.0	7.0	1.2	0.2	862.9
1959	3.1	9.7	17.7	106.7	109.7	82.0	52.9	11.4	1.4	0.1	0.0	1.0	395.8
1960	6.1	1.3	2.3	34.9	194.9	110.8	32.0	15.5	11.5	1.7	0.0	0.0	411.0
1961	1.4	10.0	124.0	40.2	155.3	67.3	38.5	14.5	4.0	0.8	0.6	1.6	458.4
1962	3.6	19.2	127.9	33.7	72.1	110.5	35.7	23.3	4.1	1.8	2.6	2.4	436.8
1963	21.5	53.6	106.7	35.0	84.2	50.9	92.0	37.6	5.4	0.4	0.0	0.0	487.2
1964	9.4	44.9	103.1	101.2	70.6	34.0	35.8	7.6	1.9	1.1	0.0	0.2	409.9
1965	0.1	87.8	137.9	260.6	59.3	29.6	59.1	30.0	3.2	0.1	4.9	6.1	678.8
1966	6.0	51.7	65.8	198.0	84.4	109.3	37.4	7.0	0.3	0.0	0.0	0.7	560.6
1967	0.9	23.9	181.9	65.1	110.0	41.3	46.9	31.1	30.6	12.5	0.8	0.2	545.2
1968	5.0	13.2	129.5	88.3	109.2	89.1	47.0	15.7	3.9	0.3	3.2	15.1	519.5
1969	2.2	30.6	127.7	190.4	141.5	108.4	58.4	32.9	28.2	8.9	0.6	0.0	729.7
1970	4.2	20.1	72.9	224.8	165.5	66.1	17.9	6.5	1.4	1.4	0.2	0.0	581.2

Table C-3. UF 4 – Stony Creek at Black Butte Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.9	36.4	233.8	218.1	72.2	57.5	76.4	19.5	2.7	0.8	0.1	0.3	718.7
1972	2.9	24.9	55.4	89.0	117.2	99.3	61.8	13.5	4.5	1.7	0.1	0.3	470.7
1973	9.2	60.8	93.7	97.5	138.4	133.9	71.8	35.8	5.9	0.4	0.0	0.1	647.5
1974	4.5	73.0	150.9	151.0	100.6	95.8	73.2	27.1	3.3	3.3	2.7	0.2	685.6
1975	0.1	27.0	63.0	128.8	92.8	179.2	109.9	35.2	9.9	1.2	1.7	1.5	650.3
1976	9.5	55.5	60.5	79.2	27.7	68.4	28.4	11.0	0.8	1.0	13.3	15.6	371.1
1977	3.7	3.6	5.9	25.6	15.0	48.6	31.7	9.6	3.9	0.2	0.0	0.3	148.3
1978	3.4	8.0	43.3	179.9	146.6	104.0	47.4	17.4	2.0	0.2	0.0	1.2	553.3
1979	1.8	4.2	36.7	56.4	65.8	85.8	33.5	16.7	3.3	0.1	0.0	0.7	305.0
1980	4.5	47.1	55.1	128.7	109.0	133.9	28.2	10.0	2.8	0.9	0.0	0.0	520.3
1981	0.4	0.9	21.4	35.4	91.6	49.6	23.2	5.9	1.8	0.2	0.0	0.0	230.4
1982	3.5	48.4	122.4	150.6	62.2	58.7	82.1	26.5	2.4	4.2	0.9	0.1	562.1
1983	2.8	66.0	131.8	109.8	156.3	231.7	77.6	40.2	9.4	0.6	0.2	3.0	829.3
1984	2.7	40.6	139.8	113.1	28.5	24.5	16.9	8.1	0.8	0.0	0.0	0.0	375.0
1985	5.5	62.7	81.4	23.2	21.2	23.9	27.0	6.0	0.3	0.0	0.0	1.7	252.9
1986	3.5	10.0	67.9	48.2	238.9	243.1	56.2	8.8	0.8	0.0	0.0	0.2	677.6
1987	1.6	6.4	5.0	26.1	52.4	83.0	33.6	5.0	0.2	0.0	0.0	0.0	213.4
1988	0.4	13.4	128.5	146.4	37.7	7.5	2.5	10.5	4.8	2.8	0.1	0.0	354.6
1989	0.0	13.0	54.6	56.5	17.4	64.7	47.2	11.4	2.7	0.4	0.0	2.9	270.8
1990	12.4	33.0	11.7	53.9	51.3	26.5	5.6	0.9	16.7	5.0	0.3	0.2	217.6
1991	0.4	2.7	3.1	7.8	25.7	108.9	72.4	15.4	4.9	1.7	0.7	0.0	243.7
1992	0.0	4.2	5.7	41.3	80.3	82.1	31.3	9.1	0.7	2.6	0.9	0.0	258.4
1993	0.7	15.3	119.0	224.5	195.2	108.4	28.2	17.8	25.2	7.1	0.3	0.0	741.6
1994	0.7	3.1	33.0	31.5	80.1	50.5	8.0	9.7	4.7	0.2	0.0	0.0	221.5
1995	0.3	16.2	69.0	348.9	240.6	218.1	118.9	35.3	9.8	4.2	0.9	0.1	1,062.4
1996	0.0	0.1	3.5	35.7	168.9	139.8	33.6	20.3	15.1	2.0	0.0	0.0	419.0
1997	0.2	14.8	139.1	263.9	139.9	40.7	24.1	7.2	3.0	1.0	0.1	0.9	634.9
1998	5.0	24.9	114.3	165.1	331.6	213.2	93.8	26.5	32.1	10.0	1.2	0.6	1,018.4
1999	2.0	34.2	98.5	28.0	89.2	99.9	66.3	24.6	3.7	0.2	0.0	0.0	446.6
2000	0.0	25.1	48.8	36.5	113.3	88.8	25.4	15.4	6.6	1.6	0.0	0.4	362.0
2001	0.4	10.7	32.7	40.0	60.3	131.1	27.7	5.2	0.6	0.4	0.0	0.0	309.2
2002	0.5	30.8	147.7	121.5	29.8	17.5	6.4	2.0	1.1	0.1	0.0	0.0	357.3
2003	0.0	8.8	131.5	200.1	46.7	44.5	50.5	79.9	17.2	1.2	0.5	1.1	582.0
2004	0.6	15.4	119.1	154.3	101.2	102.0	18.8	3.2	0.5	0.0	0.0	0.0	515.2
2005	1.7	24.2	82.4	191.1	59.3	51.4	52.6	31.5	19.0	7.4	0.8	0.0	521.4
2006	0.0	10.8	109.5	260.4	70.8	114.0	100.4	35.0	7.9	1.2	0.0	0.0	709.9
2007	0.2	3.4	38.8	58.4	56.2	58.3	11.6	3.4	0.6	0.2	0.8	0.0	231.8
2008	2.0	6.0	16.0	139.8	144.7	41.4	7.2	2.0	1.1	0.1	0.0	0.0	360.2
2009	5.9	26.6	19.8	31.6	51.4	129.5	31.6	9.7	8.0	1.4	0.0	0.0	315.5
2010	3.5	9.1	17.3	100.0	143.8	64.2	52.0	36.7	11.2	2.6	0.1	0.2	440.7
2011	2.4	44.3	32.0	8.0	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	87.3
2012	0.0	0.0	0.0	9.6	43.6	26.2	70.7	19.2	1.5	0.0	0.0	0.0	170.9
2013	0.0	4.7	188.6	126.2	19.1	4.1	4.1	1.9	0.1	0.5	0.1	0.0	349.5
2014	0.3	0.2	2.2	0.7	18.3	105.4	37.9	10.7	0.7	0.5	0.1	0.0	177.0
Average	3.7	23.3	74.9	102.8	93.4	81.4	45.3	18.6	6.8	2.6	0.6	0.8	454.3
Minimum	40.8	90.6	233.8	348.9	331.6	243.1	118.9	79.9	32.1	23.4	13.3	15.6	1,062.4
Maximum	0.0	0.0	0.0	0.7	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	87.3

Table C-4. Sacramento Valley West Side Minor Streams (Thomes and Elder Creeks only) Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	1.7	1.6	27.4	24.8	56.5	41.8	21.9	13.4	8.7	6.4	4.2	2.6	211.1
1923	3.1	12.9	60.7	35.8	22.2	13.4	18.8	10.2	7.5	6.5	4.6	3.3	198.9
1924	3.6	2.9	4.0	7.4	29.9	11.4	8.7	6.8	4.6	3.1	2.0	1.2	85.6
1925	2.8	15.5	23.5	21.6	102.8	35.5	29.9	16.2	11.5	8.3	6.0	4.1	277.8
1926	3.1	2.7	6.9	37.3	64.9	20.4	39.8	13.2	8.2	6.0	4.0	2.5	209.0
1927	2.2	46.5	43.4	51.2	116.2	47.3	40.3	14.0	8.9	6.6	4.4	2.7	383.7
1928	1.9	18.4	28.6	30.9	38.4	59.9	36.8	14.5	8.7	6.4	4.2	2.5	251.2
1929	1.6	8.2	13.8	15.5	29.1	15.3	10.7	8.1	6.2	5.1	3.6	2.5	119.6
1930	1.8	1.2	52.3	35.0	39.0	38.3	20.0	13.0	8.5	6.1	4.0	2.5	221.7
1931	1.9	2.5	2.8	29.1	14.3	21.9	11.8	8.7	7.0	5.6	3.8	2.5	111.8
1932	2.1	3.5	60.8	37.2	21.8	14.5	10.5	9.9	7.7	6.1	4.4	3.0	181.5
1933	2.1	1.4	9.7	28.2	21.5	37.3	17.6	14.0	9.2	7.0	5.0	3.2	156.2
1934	2.3	4.0	41.3	33.1	25.5	24.3	14.5	10.4	7.5	5.8	4.0	2.6	175.3
1935	6.6	19.3	22.3	62.4	40.8	37.4	54.9	18.8	10.4	7.1	4.7	2.8	287.4
1936	2.2	2.2	10.2	90.6	83.3	31.1	32.0	12.4	9.6	7.4	5.3	3.6	290.1
1937	2.5	1.7	2.1	6.5	43.7	65.3	32.2	17.0	10.9	8.3	5.8	3.7	199.6
1938	4.3	48.9	84.5	68.8	144.9	137.0	43.8	16.9	9.6	6.7	4.3	2.6	572.3
1939	2.6	6.2	19.2	20.2	19.6	24.9	11.6	8.5	7.0	5.3	3.6	2.4	131.2
1940	2.1	1.6	24.6	82.8	108.6	85.0	30.0	17.2	10.4	7.4	5.1	3.2	377.9
1941	2.6	6.3	96.3	138.5	140.2	78.8	66.9	21.2	11.9	8.1	5.8	3.7	580.3
1942	2.5	4.8	90.3	78.0	107.0	29.4	46.5	21.3	11.8	8.0	5.7	3.7	409.0
1943	2.6	8.7	34.4	87.0	30.7	39.8	26.8	15.4	10.5	7.5	5.3	3.4	272.0
1944	2.4	2.7	4.2	25.6	33.7	30.8	14.4	11.6	8.5	6.6	4.9	3.3	148.7
1945	3.5	18.7	35.7	38.5	51.4	31.0	19.2	14.0	9.5	7.1	4.9	3.1	236.5
1946	12.2	21.0	118.2	52.8	25.0	19.9	14.1	9.3	6.6	4.7	3.1	2.0	288.9
1947	1.4	8.9	20.3	10.1	26.1	40.4	20.2	11.8	8.7	6.8	4.6	2.9	162.2
1948	8.2	8.6	9.1	40.4	14.8	24.2	59.1	22.8	14.9	9.9	6.7	4.5	223.2
1949	3.5	2.8	11.7	11.4	14.8	81.6	22.4	13.2	8.5	6.1	3.9	2.4	182.2
1950	1.6	2.3	3.2	24.5	39.0	37.6	24.0	14.9	9.2	6.9	4.8	3.0	171.2
1951	19.8	21.0	67.6	76.6	57.0	26.7	14.1	15.0	8.6	6.3	4.2	2.6	319.6
1952	2.2	15.4	90.7	79.7	64.7	57.7	20.7	13.3	8.3	7.0	5.0	3.1	367.8
1953	2.2	3.3	90.1	118.6	26.7	34.0	24.7	13.9	13.3	8.5	6.3	4.3	346.0
1954	3.1	10.5	13.7	107.8	68.4	60.4	49.5	17.7	10.4	7.6	5.2	3.7	358.0
1955	2.7	11.4	46.0	26.2	14.4	11.9	14.9	11.4	7.7	5.8	3.9	2.5	158.9
1956	1.7	5.0	123.6	147.0	109.5	32.6	17.3	14.7	9.0	6.8	4.6	2.9	474.8
1957	7.5	4.8	4.0	18.0	37.8	45.6	22.8	22.1	13.6	8.9	6.4	4.4	196.0
1958	21.4	19.1	41.4	84.5	210.6	97.0	74.0	19.8	12.4	8.5	6.0	3.9	598.7
1959	2.7	1.9	3.2	61.7	67.8	23.3	15.2	10.1	6.9	4.9	3.1	2.3	203.1
1960	2.2	1.5	1.9	13.2	87.9	50.9	19.8	17.7	11.2	7.9	5.7	3.7	223.6
1961	2.6	5.9	41.2	39.7	41.1	36.2	18.2	13.3	9.0	6.9	5.0	3.2	222.3
1962	2.3	11.2	27.3	15.1	63.0	47.1	16.7	10.6	7.2	5.3	3.6	2.3	211.6
1963	37.4	14.9	31.2	40.3	46.8	41.7	68.2	23.3	12.9	8.4	5.8	3.6	334.4
1964	3.1	31.0	18.1	43.2	16.7	13.8	9.6	7.7	5.9	4.4	2.9	2.0	158.2
1965	1.5	25.9	153.2	112.7	29.0	17.0	48.6	16.4	9.2	6.6	4.5	3.0	427.5
1966	1.9	20.5	23.6	70.1	39.3	31.3	15.1	10.1	7.0	5.2	3.4	2.1	229.7
1967	1.4	20.6	62.2	90.2	26.4	46.3	44.2	22.6	17.1	9.4	6.5	4.1	350.9
1968	3.1	3.7	28.0	63.1	66.2	37.4	16.9	10.6	7.2	5.2	3.4	2.7	247.5
1969	2.2	6.7	81.3	124.4	136.4	44.9	21.3	13.3	8.3	6.3	4.2	2.6	451.8
1970	2.8	3.8	73.5	196.6	61.5	43.4	15.9	9.7	6.6	4.8	3.0	1.9	423.5

Table C-4. UF 5 — Sacramento Valley West Side Minor Streams (Thomes and Elder Creeks only) Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	1.6	47.8	93.3	66.3	19.9	52.3	20.2	13.6	8.8	6.8	4.6	2.8	337.9
1972	2.0	3.3	22.3	24.2	34.2	28.2	17.9	12.5	8.5	6.5	4.4	2.8	167.1
1973	4.3	29.4	38.6	94.2	105.2	55.1	21.1	11.9	7.5	5.3	3.3	2.0	377.9
1974	5.6	82.2	82.8	107.3	65.3	88.3	47.9	17.7	10.1	7.4	5.3	3.2	523.0
1975	2.1	2.5	14.9	27.0	83.7	125.3	31.7	19.1	10.7	7.3	5.1	3.1	332.6
1976	6.1	8.4	14.6	11.0	25.6	21.2	16.6	10.3	7.1	5.2	3.7	2.8	132.6
1977	2.1	1.6	1.6	6.0	4.4	7.5	7.3	7.6	6.1	4.5	3.0	2.3	54.1
1978	2.2	10.6	52.5	126.8	84.2	81.2	37.8	17.1	9.6	7.0	4.8	3.2	437.1
1979	2.3	1.7	2.1	22.1	52.2	35.3	17.5	15.6	9.5	7.1	5.0	3.1	173.5
1980	10.3	22.5	42.9	57.3	99.3	50.2	31.3	13.1	8.6	6.5	4.3	2.7	349.1
1981	2.1	1.6	16.9	44.1	40.1	47.1	20.9	13.5	8.8	6.3	4.2	2.6	208.1
1982	5.4	39.4	90.4	45.3	64.5	75.5	69.9	21.1	11.7	8.4	5.9	3.8	441.1
1983	4.9	28.1	77.4	96.9	138.0	199.9	79.7	36.4	16.0	9.6	6.6	4.8	698.4
1984	3.7	49.1	125.3	30.6	41.3	34.5	17.8	13.0	8.4	6.4	4.4	2.9	337.4
1985	2.6	43.6	28.7	16.6	16.8	15.3	14.5	10.8	7.5	5.7	3.8	3.0	169.0
1986	2.7	4.5	23.8	52.2	143.3	94.6	23.8	15.6	9.4	6.9	4.8	3.3	384.9
1987	2.8	1.9	2.7	18.0	38.1	57.6	20.7	12.8	8.1	6.0	3.9	2.3	174.8
1988	1.5	2.1	51.5	48.0	22.8	15.2	13.8	14.3	10.1	7.7	5.7	3.7	196.3
1989	2.5	17.5	15.1	17.2	12.4	79.7	26.2	18.6	10.8	7.6	5.3	4.1	216.9
1990	11.0	7.8	7.0	31.1	14.6	22.4	13.4	18.3	16.3	10.0	7.1	4.8	163.7
1991	3.3	2.6	2.4	2.8	8.4	60.6	26.4	16.2	9.9	7.4	5.3	3.3	148.6
1992	2.2	2.2	4.5	12.9	52.2	44.9	29.0	15.3	9.1	7.2	5.1	3.2	187.7
1993	2.4	4.8	49.2	69.9	69.8	71.8	42.3	38.5	22.8	12.9	8.2	5.5	398.1
1994	4.0	2.9	16.3	19.5	41.1	24.5	13.7	13.0	8.7	6.5	4.4	2.8	157.3
1995	1.9	4.0	15.8	213.5	52.7	179.9	59.5	32.2	16.1	10.5	7.1	4.6	597.9
1996	3.0	1.8	1.1	18.2	64.5	39.8	23.8	21.7	13.9	9.0	6.3	4.0	207.1
1997	2.7	7.9	118.4	119.3	36.8	31.5	15.8	11.0	7.8	6.2	4.4	3.2	365.1
1998	3.4	21.8	34.2	121.2	204.4	120.4	50.0	36.3	22.9	12.8	8.0	5.2	640.6
1999	3.5	24.7	25.1	27.5	69.2	66.5	43.3	19.7	11.4	7.8	5.4	3.3	307.4
2000	2.3	6.7	13.3	46.8	83.2	50.1	26.8	15.6	10.2	7.4	5.2	3.4	270.9
2001	2.5	3.6	6.6	15.1	33.2	40.3	16.4	11.1	7.4	5.7	3.8	2.4	148.0
2002	1.8	15.5	69.8	61.7	36.9	28.9	15.9	10.9	7.6	5.6	3.7	2.3	260.7
2003	1.5	4.0	112.7	60.5	37.8	47.8	61.0	38.2	15.9	9.5	6.5	4.1	399.4
2004	2.6	3.6	55.5	40.7	106.9	45.8	19.6	12.3	8.0	6.0	3.9	2.4	307.2
2005	3.0	6.6	52.9	42.6	31.7	57.8	33.7	46.2	18.0	11.7	7.9	5.5	317.4
2006	3.7	5.5	121.9	81.1	75.2	87.9	116.2	31.4	16.3	10.0	6.8	4.4	560.3
2007	2.9	2.8	22.1	15.5	37.2	25.5	17.8	13.6	8.7	6.5	4.7	3.0	160.4
2008	3.0	3.3	10.6	54.5	30.8	30.4	20.5	14.5	9.3	6.9	4.8	3.0	191.7
2009	3.5	5.3	6.3	8.7	38.8	47.2	19.7	23.8	11.3	8.0	5.6	3.5	181.7
2010	3.9	4.0	11.0	48.9	47.5	53.1	50.6	24.3	16.1	10.4	7.1	4.8	281.6
2011	10.1	13.7	10.8	10.7	20.0	89.4	68.6	37.6	23.9	14.8	9.1	6.2	314.9
2012	7.3	5.3	4.2	4.2	4.5	24.3	30.9	19.5	11.6	7.9	5.6	3.5	128.9
2013	2.3	13.1	63.9	22.5	13.3	14.3	17.5	11.7	7.9	6.3	4.2	2.6	179.7
2014	1.9	1.2	1.3	1.1	11.9	45.4	20.9	13.4	8.5	6.6	4.5	2.7	119.3
Average	4.0	11.8	38.9	51.8	54.7	48.3	29.4	16.5	10.2	7.2	4.9	3.2	280.9
Minimum	1.4	1.2	1.1	1.1	4.4	7.5	7.3	6.8	4.6	3.1	2.0	1.2	54.1
Maximum	37.4	82.2	153.2	213.5	210.6	199.9	116.2	46.2	23.9	14.8	9.1	6.2	698.4

Table C-5. UF 7 — Sacramento Valley Eastside Minor Streams Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	27.8	30.8	147.3	108.1	322.7	186.3	151.6	186.4	130.8	45.3	28.9	23.0	27.8
1923	32.1	78.7	285.8	164.6	94.1	66.5	171.0	71.6	44.9	23.8	15.5	21.0	32.1
1924	26.2	19.8	43.0	61.5	119.9	50.2	52.4	19.4	11.1	10.6	9.8	9.8	26.2
1925	37.0	53.1	117.4	77.8	301.0	81.0	144.2	57.5	36.3	21.4	16.2	15.8	37.0
1926	23.1	35.7	58.7	71.4	281.8	69.3	195.2	43.2	24.4	14.1	11.2	11.6	23.1
1927	24.5	172.4	88.3	176.3	377.7	133.1	198.2	110.6	55.6	35.1	22.8	20.2	24.5
1928	26.3	118.2	86.7	95.3	120.5	386.9	135.5	56.1	36.3	20.1	20.7	17.1	26.3
1929	18.5	48.4	79.4	57.7	104.5	86.6	81.8	51.5	39.2	19.7	16.8	13.1	18.5
1930	11.2	11.6	224.0	166.4	137.9	200.7	116.0	70.7	32.7	25.3	19.8	15.0	11.2
1931	12.6	34.6	14.7	94.2	67.0	70.3	33.5	23.0	12.9	5.6	4.0	6.4	12.6
1932	23.7	40.3	153.1	128.7	122.0	72.5	98.2	100.1	50.8	16.6	12.6	11.1	23.7
1933	14.6	14.3	33.8	67.1	45.0	119.5	64.2	80.1	33.6	11.6	10.1	9.1	14.6
1934	19.1	22.1	114.1	128.5	132.1	55.0	31.4	25.2	17.1	7.4	6.0	8.0	19.1
1935	15.1	70.1	58.1	171.4	82.7	148.1	255.6	103.0	35.1	19.4	14.0	12.7	15.1
1936	24.7	21.4	43.3	295.4	376.4	82.3	131.6	51.6	41.9	23.4	15.2	12.3	24.7
1937	11.5	15.4	32.2	61.6	193.1	228.8	165.8	111.6	45.8	23.3	16.3	12.2	11.5
1938	21.5	94.9	249.5	121.4	384.4	351.4	166.0	145.3	73.1	38.0	25.8	19.4	21.5
1939	29.6	32.9	60.7	72.8	78.7	107.2	58.1	35.2	13.2	7.9	7.1	10.0	29.6
1940	19.1	12.0	39.6	324.6	328.2	294.8	156.7	51.1	30.0	20.5	15.8	14.0	19.1
1941	22.7	54.9	280.6	328.1	293.8	195.1	204.6	114.9	52.6	35.8	24.6	19.3	22.7
1942	24.1	42.5	279.7	289.9	298.8	99.8	188.4	131.2	66.8	33.3	22.7	19.1	24.1
1943	19.7	93.4	147.8	315.9	159.8	262.1	111.1	67.1	49.8	25.9	15.2	12.6	19.7
1944	18.2	23.6	56.5	98.5	146.0	152.4	78.3	79.7	34.3	16.4	12.1	10.4	18.2
1945	15.4	113.8	108.8	64.0	301.8	119.5	88.4	71.8	36.4	21.2	14.6	11.2	15.4
1946	25.4	99.9	299.8	150.5	84.0	105.0	107.1	77.1	31.0	20.9	15.3	13.1	25.4
1947	17.9	71.9	79.4	34.3	120.5	140.1	76.3	27.8	25.1	11.0	8.5	8.2	17.9
1948	48.2	42.7	26.5	106.6	53.0	118.1	226.0	131.0	57.6	23.7	18.3	15.8	48.2
1949	16.3	30.4	62.1	44.4	72.3	227.2	98.9	81.8	22.8	15.3	12.2	9.3	16.3
1950	13.3	27.9	36.0	188.4	198.9	135.6	129.9	94.6	38.4	17.9	14.7	13.8	13.3
1951	40.0	259.1	304.3	240.4	170.6	153.0	93.6	89.5	36.2	27.1	18.1	13.1	40.0
1952	38.6	76.9	227.6	315.3	225.3	192.4	193.9	160.5	108.9	59.3	30.2	25.3	38.6
1953	24.2	35.1	156.0	318.3	59.3	129.6	129.5	121.0	78.4	26.4	19.9	17.5	24.2
1954	24.7	58.1	77.2	167.5	173.6	177.7	181.9	62.2	33.2	19.2	14.7	13.9	24.7
1955	15.7	41.9	139.6	120.8	62.1	76.1	89.6	90.7	28.7	18.3	13.3	13.2	15.7
1956	15.2	34.8	583.3	397.6	183.5	117.7	100.3	140.9	71.6	32.0	24.5	22.5	15.2
1957	35.7	39.0	48.8	80.1	163.2	182.0	88.1	116.0	32.1	18.5	14.1	15.1	35.7
1958	34.4	41.7	120.1	156.3	370.8	242.4	248.2	143.0	99.2	40.0	28.2	24.6	34.4
1959	26.4	30.1	37.1	169.4	184.4	92.7	70.8	40.1	16.8	12.2	11.1	18.8	26.4
1960	10.2	10.5	22.1	113.8	225.2	161.0	79.1	57.8	23.3	15.2	12.0	10.7	10.2
1961	13.2	70.6	70.6	47.7	150.6	121.5	68.5	53.5	25.7	14.7	10.0	9.5	13.2
1962	10.3	21.8	84.7	63.5	330.4	140.6	94.5	68.1	30.2	19.5	15.3	12.1	10.3
1963	223.1	43.2	174.6	126.2	247.4	120.4	260.7	117.0	41.0	26.9	20.9	17.6	223.1
1964	25.9	125.2	67.1	148.1	59.0	86.1	85.7	71.1	33.6	16.3	11.9	11.8	25.9
1965	14.2	86.1	540.0	336.0	86.4	94.2	184.9	100.0	48.4	28.9	27.1	19.4	14.2
1966	19.3	91.4	85.8	155.3	111.0	113.5	117.0	48.0	23.9	12.6	10.6	9.8	19.3
1967	10.4	110.7	226.2	304.6	142.9	188.1	170.7	166.7	93.9	36.7	26.7	25.3	10.4
1968	28.4	32.3	106.5	144.2	233.0	128.1	78.1	53.1	28.1	14.2	14.8	12.1	28.4
1969	24.4	78.1	155.9	574.1	260.9	138.4	164.2	148.7	78.5	37.7	27.7	24.5	24.4
1970	36.5	45.2	247.9	601.8	139.7	152.1	61.9	54.0	41.2	20.8	12.9	12.8	36.5

Table C-5. UF 7 — Sacramento Valley Eastside Minor Streams Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	23.8	120.0	258.4	161.5	70.8	182.6	110.5	105.7	61.4	29.5	20.3	17.2	23.8
1972	22.1	40.2	111.8	99.4	128.7	101.5	105.1	52.2	26.0	16.2	11.5	14.3	22.1
1973	27.7	105.1	105.1	332.8	228.2	182.5	102.6	97.4	41.3	27.6	18.9	17.4	27.7
1974	30.0	271.9	233.1	317.8	121.6	330.8	204.6	99.4	54.6	49.6	28.0	20.0	30.0
1975	23.7	45.5	62.0	79.2	236.3	240.2	114.6	127.3	72.7	32.2	27.1	16.9	23.7
1976	44.9	49.6	51.2	32.4	57.5	73.3	49.3	21.2	11.5	8.8	14.1	11.6	44.9
1977	10.4	16.6	10.6	46.4	37.7	33.5	14.9	25.7	6.4	4.6	4.9	7.0	10.4
1978	9.0	34.9	143.3	371.0	173.7	241.5	170.7	110.8	60.8	27.2	22.0	23.5	9.0
1979	16.9	46.1	49.4	157.9	171.7	157.9	102.1	114.6	31.7	21.2	17.4	12.7	16.9
1980	39.3	66.0	94.1	397.7	422.3	161.4	100.9	69.5	46.0	27.6	17.8	12.7	39.3
1981	21.3	18.6	137.4	151.3	140.3	211.0	73.3	50.5	24.0	16.3	10.2	13.5	21.3
1982	84.9	478.6	336.2	162.4	297.5	268.0	416.1	174.2	65.4	63.4	43.8	44.1	84.9
1983	108.6	192.2	277.2	321.4	414.5	653.1	250.1	268.5	152.3	81.3	65.4	51.6	108.6
1984	51.0	323.8	482.3	168.9	176.4	228.8	130.0	90.1	59.6	26.9	21.8	24.9	51.0
1985	48.4	219.3	79.9	55.7	98.3	135.1	124.9	47.1	25.1	14.4	12.5	37.9	48.4
1986	21.7	61.9	80.1	237.6	767.7	334.5	105.6	98.2	48.8	36.2	23.6	61.2	21.7
1987	32.9	30.6	47.3	80.9	166.2	282.4	112.4	56.7	22.1	17.9	11.6	8.3	32.9
1988	12.1	36.0	235.7	155.4	87.5	120.6	83.4	61.3	36.9	13.6	9.8	5.9	12.1
1989	8.0	154.2	53.8	59.2	90.7	513.3	152.8	49.5	37.1	24.8	20.0	37.7	8.0
1990	99.2	40.0	29.7	152.6	61.2	165.5	55.4	76.4	56.8	13.4	11.1	9.9	99.2
1991	12.2	21.0	18.1	17.3	56.1	280.1	164.3	81.6	24.3	19.6	9.4	8.7	12.2
1992	20.1	31.5	63.8	53.8	267.5	174.0	83.5	33.2	25.5	22.7	8.1	5.4	20.1
1993	28.9	31.9	129.8	263.1	258.0	318.5	257.3	268.1	183.9	47.0	41.9	30.4	28.9
1994	55.2	41.8	130.5	101.3	151.0	151.7	88.6	62.2	20.9	12.4	8.8	8.8	55.2
1995	12.7	55.7	103.9	704.3	169.0	658.6	351.9	366.6	135.2	64.6	54.8	39.8	12.7
1996	37.4	35.3	208.1	209.7	394.8	243.1	239.0	197.2	62.1	34.6	21.7	28.0	37.4
1997	31.2	99.5	525.0	616.0	125.0	157.3	87.1	58.1	53.1	28.6	22.4	21.6	31.2
1998	40.5	117.9	132.6	442.6	506.7	275.2	231.7	358.4	230.7	82.5	64.7	55.9	40.5
1999	62.6	188.1	191.5	187.3	308.7	233.2	198.8	139.9	61.3	31.7	26.5	20.1	62.6
2000	31.3	95.8	57.9	220.3	400.3	257.8	172.7	75.5	53.8	32.2	19.4	20.6	31.3
2001	42.3	35.2	49.3	82.8	128.3	183.2	131.6	50.8	25.1	14.6	10.8	12.5	42.3
2002	13.4	121.1	187.4	203.8	121.8	154.0	155.6	62.7	32.9	21.3	17.0	11.9	13.4
2003	10.6	76.6	412.1	339.5	135.6	226.0	236.7	204.7	63.4	41.2	34.4	22.1	10.6
2004	17.6	50.2	217.0	135.1	371.3	197.4	142.0	70.6	47.5	23.3	15.1	13.1	17.6
2005	62.7	45.8	131.1	157.3	140.9	225.1	146.3	208.2	69.4	35.8	23.2	15.3	62.7
2006	20.6	92.3	511.6	325.2	227.9	396.6	470.2	286.8	112.7	64.4	58.1	40.8	20.6
2007	37.3	67.5	152.4	52.2	237.7	134.3	85.3	38.1	19.5	17.4	11.8	15.1	37.3
2008	30.3	22.4	64.1	150.3	132.2	128.9	120.9	115.0	26.4	17.4	14.7	11.1	30.3
2009	23.2	81.9	43.0	79.3	269.5	268.1	120.0	104.6	40.8	23.4	16.8	12.0	23.2
2010	34.1	37.1	79.1	243.4	175.7	165.7	224.7	208.3	93.4	40.0	26.9	24.3	34.1
2011	68.3	77.5	291.1	110.3	172.2	394.8	225.3	293.6	165.7	68.8	47.2	33.0	68.3
2012	53.0	52.6	30.6	101.1	69.6	207.6	166.0	43.8	22.9	12.5	10.3	8.9	53.0
2013	14.7	66.1	322.0	84.7	59.8	90.3	56.2	23.8	18.8	10.8	9.3	10.5	14.7
2014	5.1	10.4	5.7	6.1	84.0	144.7	70.9	9.3	8.8	6.3	4.5	5.2	5.1
Average	30.2	72.8	147.5	183.6	192.4	187.5	140.7	100.3	50.4	26.2	19.4	17.7	30.2
Minimum	5.1	10.4	5.7	6.1	37.7	33.5	14.9	9.3	6.4	4.6	4.0	5.2	5.1
Maximum	223.1	478.6	583.3	704.3	767.7	658.6	470.2	366.6	230.7	82.5	65.4	61.2	223.1

Table C-6. UF 8 — Feather River near Oroville Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	71.5	76.2	337.7	247.4	404.3	473.8	703.9	1,042.4	553.5	314.6	150.4	84.9	4,460.5
1923	117.8	185.1	422.6	318.4	298.2	441.6	672.8	376.8	259.2	133.3	78.2	82.8	3,386.7
1924	86.9	55.6	70.0	96.2	379.0	133.8	216.4	110.6	71.4	60.6	50.6	40.4	1,371.6
1925	93.0	161.5	182.8	234.9	731.9	530.0	624.3	416.2	235.4	111.1	75.5	71.2	3,467.7
1926	81.6	85.3	117.5	180.4	653.3	546.1	866.4	400.5	177.2	101.1	70.8	57.3	3,337.4
1927	95.0	540.3	294.6	394.5	767.7	720.3	830.4	556.3	361.1	179.4	96.8	67.5	4,904.1
1928	88.8	430.0	244.5	257.4	333.9	1,034.7	685.5	412.0	228.8	117.8	76.3	60.2	3,970.0
1929	55.6	119.5	107.3	102.8	199.4	305.5	343.4	287.5	244.5	111.8	69.5	57.0	2,003.9
1930	52.0	40.4	854.5	391.6	455.6	744.7	604.1	409.2	205.2	106.9	72.5	63.4	4,000.2
1931	60.0	89.8	56.9	190.6	170.3	381.5	210.8	163.1	118.5	66.9	53.7	43.3	1,605.4
1932	83.3	94.9	236.2	207.6	214.7	580.7	633.3	556.9	344.2	173.3	88.9	64.2	3,278.2
1933	61.2	66.1	76.4	128.3	157.0	488.8	513.6	422.5	248.5	120.3	76.0	61.3	2,420.1
1934	121.9	93.6	311.1	428.0	514.7	445.6	313.7	194.4	114.9	69.6	57.2	46.7	2,711.4
1935	61.5	211.1	190.5	433.5	330.2	439.3	1,184.1	743.3	418.8	223.4	116.0	74.9	4,426.6
1936	95.1	68.2	112.9	829.1	977.2	681.4	660.2	406.4	263.6	119.2	73.8	64.8	4,351.8
1937	54.3	43.7	46.7	64.0	251.1	533.3	770.0	729.2	418.4	211.5	105.5	70.2	3,298.0
1938	109.2	412.1	1,108.3	460.3	749.3	844.3	1,013.7	1,100.1	575.5	339.4	162.9	99.1	6,974.2
1939	109.7	100.0	127.5	123.0	112.9	394.2	331.4	242.4	118.3	70.7	58.5	48.0	1,836.6
1940	59.9	44.6	143.0	1,023.6	1,227.4	1,381.8	936.3	560.8	323.9	157.2	88.9	70.2	6,017.7
1941	100.5	236.5	712.5	756.8	1,082.3	1,039.6	918.6	741.2	405.2	218.2	110.7	77.0	6,399.1
1942	73.1	148.6	839.0	823.8	817.5	593.0	963.7	815.9	463.8	262.3	128.0	77.1	6,006.0
1943	68.6	228.4	321.8	913.4	661.5	1,011.6	770.6	514.7	344.4	154.3	83.4	63.0	5,135.8
1944	62.6	91.7	102.0	202.4	311.4	560.1	555.9	463.2	255.7	128.5	79.0	60.7	2,873.3
1945	88.7	439.1	370.8	244.9	930.9	483.0	547.7	500.5	278.1	139.9	81.0	61.8	4,166.3
1946	155.8	302.9	782.0	505.4	280.9	534.0	620.6	465.1	240.7	128.1	76.9	62.4	4,154.9
1947	63.3	279.7	307.3	109.2	564.1	709.4	482.6	238.4	163.2	82.5	63.1	51.8	3,114.5
1948	175.3	178.2	85.1	636.7	170.2	329.3	817.6	711.6	474.6	248.5	129.3	80.2	4,036.7
1949	66.7	142.1	133.4	83.0	136.1	447.3	673.6	510.1	285.1	142.7	84.9	65.2	2,770.4
1950	59.2	104.4	77.1	270.0	762.9	707.4	808.8	627.8	345.7	183.8	102.1	72.7	4,121.9
1951	248.4	780.0	1,125.7	687.9	713.6	692.8	543.4	490.4	248.2	129.5	79.0	61.0	5,799.8
1952	114.7	222.7	640.8	497.1	611.6	539.0	1,138.8	1,327.8	770.8	428.9	233.0	120.4	6,645.5
1953	86.8	111.4	406.1	1,289.6	463.7	558.0	659.4	541.0	353.0	184.2	103.6	66.8	4,823.6
1954	91.7	189.4	168.9	484.5	723.5	861.7	825.1	453.7	256.5	126.0	79.8	61.9	4,322.7
1955	57.8	181.7	368.2	200.9	153.0	327.3	372.6	474.8	274.6	138.5	78.0	62.7	2,690.2
1956	70.9	114.8	1,668.9	1,258.9	678.0	738.8	754.7	840.9	478.2	269.6	144.6	90.6	7,109.0
1957	118.0	129.7	83.4	155.0	553.1	741.4	544.9	538.7	272.4	136.7	82.2	78.6	3,433.9
1958	148.3	143.2	377.5	485.4	1,075.2	829.9	1,040.3	864.5	503.0	290.5	142.7	84.2	5,984.6
1959	78.2	81.7	96.4	570.3	505.2	568.5	395.2	270.6	132.4	79.1	63.4	78.7	2,919.6
1960	53.2	39.4	55.6	247.2	776.1	900.5	577.6	426.5	221.6	108.3	72.8	61.6	3,540.3
1961	61.1	204.0	283.0	245.4	537.1	539.1	436.9	353.2	212.2	103.8	69.8	57.6	3,103.2
1962	50.9	99.9	270.6	161.7	680.7	515.1	879.7	633.4	372.7	194.8	109.3	69.6	4,038.3
1963	1,002.6	261.9	622.4	419.8	1,019.8	550.5	938.2	582.1	298.5	157.9	91.2	72.5	6,017.3
1964	94.2	350.9	206.0	312.3	220.3	330.5	415.0	350.5	240.3	115.6	71.0	63.1	2,769.8
1965	57.9	242.4	1,721.3	1,263.8	581.7	720.5	806.8	521.9	332.8	167.9	127.8	73.3	6,618.0
1966	61.5	321.2	213.0	358.3	232.8	570.2	630.0	368.0	180.5	97.8	68.9	57.8	3,160.0
1967	50.5	410.5	738.2	906.1	733.8	791.4	564.1	871.9	585.7	339.8	169.6	96.3	6,257.9
1968	119.6	97.4	186.2	330.5	756.0	797.4	573.0	389.1	208.5	109.4	87.7	63.2	3,718.0
1969	122.4	218.1	294.2	1,227.8	624.4	657.3	1,016.6	1,058.0	581.5	338.7	172.4	93.5	6,404.8
1970	127.8	144.4	759.8	2,039.3	991.0	832.4	474.8	360.5	214.9	116.6	72.4	58.8	6,192.7

Table C-6. UF 8 — Feather River near Oroville Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	92.4	459.0	575.0	391.3	327.5	817.0	783.6	602.7	426.1	248.0	121.1	81.7	4,925.4
1972	72.4	109.4	125.9	176.4	358.4	692.6	596.9	360.5	188.3	100.1	70.4	65.4	2,916.8
1973	130.1	272.3	231.3	717.0	675.2	561.9	728.0	658.5	358.0	197.9	106.0	85.2	4,721.4
1974	143.9	1,052.9	668.3	993.9	488.8	1,209.4	1,066.5	719.0	419.6	273.2	128.8	74.7	7,239.0
1975	83.8	111.7	155.8	148.1	550.0	710.0	474.9	749.9	434.4	256.0	149.3	83.4	3,907.3
1976	187.1	165.2	145.3	78.2	152.8	250.7	225.9	132.4	82.2	63.2	64.5	54.8	1,602.3
1977	45.4	62.4	38.5	56.3	56.4	65.8	99.6	117.5	61.7	51.8	43.3	45.8	744.6
1978	40.0	63.4	406.0	1,301.6	753.1	1,376.2	995.9	758.9	395.1	212.4	113.4	103.4	6,519.4
1979	65.8	87.2	80.7	290.4	420.1	652.3	557.2	556.7	300.6	152.7	91.5	68.2	3,323.3
1980	181.0	203.0	216.2	1,334.8	1,144.9	736.5	625.9	522.5	323.3	171.2	89.6	70.8	5,619.7
1981	65.7	67.0	326.2	360.3	545.7	702.3	576.8	398.8	200.6	108.2	71.1	73.7	3,496.5
1982	191.9	1,208.8	1,235.4	699.8	1,144.3	1,030.5	1,415.3	841.6	422.0	245.6	119.6	98.9	8,653.6
1983	245.1	363.2	438.2	819.1	1,334.0	1,769.5	1,030.9	1,167.5	908.0	462.4	264.5	146.7	8,949.1
1984	138.2	766.9	1,066.3	531.7	548.3	954.0	680.8	546.4	368.6	177.8	99.5	69.9	5,948.1
1985	101.4	416.4	229.1	133.0	281.6	346.5	618.7	346.5	186.6	99.8	70.2	97.5	2,927.2
1986	76.9	119.0	270.7	742.5	2,306.7	1,516.1	734.8	549.1	328.7	168.8	91.4	145.8	7,050.3
1987	99.7	67.8	77.2	125.6	353.3	574.0	393.3	251.4	121.5	81.0	62.9	51.3	2,259.1
1988	45.9	72.8	358.1	281.5	335.0	398.4	288.2	201.8	118.7	72.1	59.6	47.4	2,279.5
1989	39.4	314.9	157.4	174.6	215.9	1,341.7	771.3	440.2	259.1	120.3	81.5	89.7	4,005.9
1990	219.0	125.8	93.3	268.6	166.6	473.5	366.3	335.8	245.1	104.7	73.7	59.4	2,531.9
1991	57.7	53.5	59.4	46.5	82.9	588.0	498.1	338.5	190.1	107.8	73.3	58.2	2,154.0
1992	72.9	81.3	109.0	154.7	529.8	585.0	422.1	222.3	135.1	88.8	64.2	51.7	2,516.8
1993	89.2	77.1	246.1	515.5	452.8	1,057.9	1,092.1	1,094.9	722.8	377.6	199.8	101.2	6,027.0
1994	116.8	93.4	267.9	196.1	269.8	605.1	334.9	265.3	126.8	75.1	60.7	50.0	2,461.9
1995	50.7	122.8	252.6	1,792.3	828.9	1,884.5	1,278.5	1,302.6	800.1	447.4	243.7	120.2	9,124.3
1996	78.1	68.2	565.8	467.5	1,203.3	983.0	881.1	756.3	373.4	209.1	105.0	81.1	5,771.9
1997	78.4	219.8	1,271.1	2,085.9	652.5	800.7	540.4	391.7	247.8	120.2	75.9	68.2	6,552.7
1998	104.6	247.2	319.9	1,112.9	1,059.6	1,020.7	966.7	928.7	739.3	407.5	220.4	125.9	7,253.4
1999	98.2	364.5	434.8	507.7	748.9	760.7	686.0	616.0	393.7	216.3	115.6	70.7	5,012.9
2000	87.3	164.9	127.0	538.2	1,031.0	971.3	785.1	533.8	306.1	161.4	91.9	68.5	4,866.5
2001	110.0	84.0	106.3	154.7	229.4	512.1	338.5	198.4	103.0	75.9	61.1	49.6	2,022.8
2002	50.7	213.2	512.3	519.2	469.2	645.3	527.1	369.6	182.0	101.9	69.7	57.0	3,717.1
2003	48.9	255.8	1,021.8	1,127.8	564.4	730.3	698.8	663.4	313.4	160.0	106.9	69.5	5,761.0
2004	59.3	92.4	404.5	349.1	802.6	929.3	640.2	423.2	219.8	110.4	71.7	58.5	4,160.9
2005	155.3	148.2	590.4	429.7	491.5	972.0	871.3	1,101.4	595.0	326.2	162.8	89.7	5,933.5
2006	76.9	151.3	1,484.2	1,259.0	937.3	1,134.1	1,539.6	1,107.8	610.5	362.0	190.1	92.6	8,945.6
2007	74.1	122.2	296.0	163.8	597.6	551.2	417.9	298.1	165.6	82.2	62.1	54.0	2,884.8
2008	78.0	62.3	137.6	303.7	353.8	390.2	350.9	388.4	235.5	127.1	69.0	55.8	2,552.3
2009	99.4	207.5	100.9	220.3	624.7	904.1	523.5	695.9	327.8	152.7	82.3	62.3	4,001.2
2010	143.9	74.8	145.5	630.5	540.8	626.1	812.3	789.7	520.8	307.4	146.8	80.9	4,819.5
2011	254.7	251.9	947.1	502.1	556.0	1,195.4	930.4	893.1	627.3	309.3	155.2	88.2	6,710.7
2012	147.1	82.9	60.0	223.1	152.8	799.6	762.0	417.2	202.6	108.4	75.4	58.7	3,089.7
2013	70.6	450.1	1,356.1	515.1	369.2	446.6	319.4	172.0	111.8	74.8	57.3	56.1	3,999.2
2014	42.5	52.4	35.3	31.9	415.4	708.1	422.8	184.3	96.0	70.6	63.4	46.8	2,169.5
Average	105.4	207.2	395.7	508.3	574.2	715.7	672.4	546.7	320.1	172.7	99.7	72.1	4,390.1
Minimum	1,002.6	1,208.8	1,721.3	2,085.9	2,306.7	1,884.5	1,539.6	1,327.8	908.0	462.4	264.5	146.7	9,124.3
Maximum	39.4	39.4	35.3	31.9	56.4	65.8	99.6	110.6	61.7	51.8	43.3	40.4	744.6

Table C-7. UF 9 — Yuba River at Smartville Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	6.8	16.5	225.0	78.3	326.5	281.8	337.9	884.6	470.7	29.3	13.8	10.4	2,681.4
1923	17.1	156.6	478.9	143.3	64.4	124.9	372.7	290.8	211.0	29.8	13.8	50.7	1,954.1
1924	26.7	16.7	36.0	84.7	281.3	37.4	114.2	66.6	16.0	12.5	8.5	3.6	704.2
1925	122.6	136.3	185.6	140.5	581.5	203.5	411.3	400.0	189.6	20.0	13.9	13.8	2,418.4
1926	30.5	77.9	79.8	251.6	432.4	175.4	566.9	211.4	23.1	13.5	10.5	5.4	1,878.3
1927	58.4	609.3	81.9	272.2	529.3	246.0	463.7	535.2	423.7	40.6	13.9	10.8	3,284.7
1928	35.9	342.3	105.3	98.3	137.6	929.7	268.6	320.5	54.5	14.5	11.6	6.8	2,325.7
1929	3.5	39.8	60.1	33.5	106.5	157.7	216.9	318.5	218.7	20.7	13.0	9.1	1,197.9
1930	4.6	2.4	756.3	163.6	183.6	320.8	359.1	210.5	173.9	17.4	12.6	10.1	2,214.9
1931	6.8	75.8	19.6	140.9	117.6	263.6	179.5	154.3	60.2	15.2	12.1	8.7	1,054.3
1932	103.7	48.0	251.0	76.7	161.6	316.3	435.2	593.0	309.9	27.2	13.5	10.2	2,346.4
1933	5.7	9.0	13.2	39.6	20.9	291.2	313.7	349.1	213.0	18.8	13.0	9.6	1,296.7
1934	174.2	28.1	275.5	183.9	322.8	256.8	153.7	55.8	43.2	14.5	11.4	16.4	1,536.2
1935	47.7	229.5	124.3	214.6	217.3	177.7	834.7	459.4	187.4	17.2	12.7	8.8	2,531.3
1936	30.6	11.2	65.5	662.5	860.5	255.6	398.2	353.7	239.6	19.1	12.9	9.8	2,919.2
1937	6.8	4.3	12.5	14.5	205.6	405.1	433.8	696.5	211.9	20.9	13.4	9.8	2,035.1
1938	35.0	305.3	789.0	277.5	476.0	576.2	469.6	719.3	548.3	39.1	15.2	11.6	4,262.1
1939	44.0	44.6	69.9	101.0	35.7	301.3	283.0	193.3	23.0	13.8	10.9	6.1	1,126.5
1940	49.1	14.7	77.5	836.0	956.2	801.6	264.9	419.5	200.2	17.1	12.6	8.9	3,658.3
1941	21.3	144.8	654.5	410.1	605.6	325.9	358.7	549.8	388.4	60.8	15.2	12.1	3,547.3
1942	14.0	113.1	679.0	545.8	420.7	163.4	584.4	541.2	438.6	78.5	14.6	11.5	3,604.7
1943	7.9	283.9	329.7	701.5	205.6	584.2	426.6	411.8	218.7	26.2	13.5	10.5	3,220.0
1944	19.1	26.3	49.8	164.6	273.0	228.4	258.2	390.4	120.4	18.8	13.5	10.6	1,573.1
1945	189.4	296.4	264.0	118.7	644.7	145.1	306.7	402.1	184.4	18.9	13.0	9.8	2,593.2
1946	192.9	185.9	728.3	148.8	102.1	203.1	370.2	408.8	70.1	16.0	12.8	11.9	2,451.0
1947	7.8	202.6	172.5	21.4	310.1	508.2	220.6	171.6	113.8	15.2	11.8	7.2	1,762.9
1948	232.9	68.8	20.4	439.9	53.2	189.4	534.4	511.2	301.2	26.1	14.0	10.9	2,402.5
1949	7.1	89.0	73.6	18.5	44.2	357.5	509.8	347.4	43.5	15.3	12.1	8.5	1,526.5
1950	5.8	48.4	22.0	291.2	367.2	354.7	481.1	511.6	171.8	18.7	13.1	9.9	2,295.4
1951	193.1	974.7	832.8	344.3	242.3	228.4	386.9	408.5	100.5	16.2	12.5	8.6	3,748.8
1952	125.1	223.9	465.3	256.9	332.1	201.0	637.4	904.3	553.7	145.5	18.7	13.1	3,876.9
1953	10.7	33.8	235.3	673.4	74.5	274.3	516.9	376.4	335.3	112.6	15.6	12.2	2,671.0
1954	28.6	156.6	74.5	347.6	349.6	411.7	592.5	217.7	59.2	15.6	12.3	8.4	2,274.3
1955	5.8	133.1	307.3	72.5	60.3	141.4	223.4	456.0	133.5	18.0	12.9	10.9	1,575.0
1956	8.5	38.7	1,606.3	621.8	163.9	196.3	374.6	626.9	418.5	54.2	15.6	13.6	4,138.8
1957	111.8	21.1	36.0	104.9	600.7	442.8	320.2	600.3	104.0	16.9	12.7	19.7	2,391.2
1958	101.5	132.8	300.2	342.1	700.6	339.3	497.3	803.9	438.2	48.6	15.4	13.3	3,733.2
1959	11.3	20.3	47.9	366.8	224.9	255.5	296.5	147.5	31.8	14.4	11.9	71.3	1,499.9
1960	11.4	10.3	31.4	206.5	580.4	538.7	300.1	310.6	166.8	16.8	12.7	9.4	2,195.2
1961	6.3	133.6	111.5	182.5	204.9	282.9	208.9	281.7	102.7	16.6	12.7	9.4	1,553.6
1962	9.0	106.9	110.8	82.1	608.2	213.3	536.9	347.6	240.8	20.7	14.2	11.4	2,302.1
1963	1,097.8	97.9	389.1	661.0	423.9	219.8	497.4	514.9	195.4	20.8	13.6	11.6	4,143.1
1964	51.9	425.4	47.4	200.7	49.7	131.8	227.8	299.7	191.1	20.8	14.6	11.1	1,671.9
1965	16.1	182.4	1,540.4	386.3	160.9	228.1	464.4	360.9	347.1	42.6	69.5	16.1	3,814.8
1966	13.5	241.1	88.9	129.8	74.9	272.4	475.2	175.8	19.9	13.8	11.3	7.1	1,523.7
1967	4.5	400.9	422.2	585.5	128.5	344.3	165.1	744.8	621.7	139.1	16.1	12.7	3,585.4
1968	42.7	54.0	59.7	179.9	474.7	349.7	207.2	191.6	66.2	15.9	27.9	11.2	1,680.7
1969	77.3	246.9	217.7	1,035.8	248.5	212.9	550.5	776.5	354.2	41.1	14.4	11.5	3,787.3
1970	65.6	53.7	640.4	1,343.2	203.0	230.1	115.0	328.7	273.3	21.7	13.5	10.7	3,298.8

Table C-7. UF 9 — Yuba River at Smartville Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	33.1	512.0	288.4	129.0	94.1	463.4	327.2	395.0	464.0	105.5	16.5	24.3	2,852.4
1972	11.3	55.3	66.0	67.1	275.8	366.8	335.7	307.9	68.5	15.3	12.3	28.5	1,610.5
1973	105.1	268.8	207.9	519.0	389.6	176.9	364.2	694.5	162.4	18.0	13.1	21.4	2,940.9
1974	106.9	908.4	396.9	463.2	187.7	652.0	398.9	554.9	466.4	180.8	18.2	12.4	4,346.5
1975	38.1	38.5	71.5	104.1	328.8	336.8	200.1	746.2	441.9	26.0	22.2	12.9	2,367.2
1976	153.3	94.6	66.5	29.1	150.3	51.1	119.1	137.3	30.0	14.4	39.5	24.9	910.3
1977	12.7	25.6	10.0	19.5	31.1	27.3	69.6	149.3	45.5	16.2	12.6	14.9	434.2
1978	10.0	60.3	359.8	673.7	234.5	612.5	469.6	586.3	492.9	80.3	15.5	68.0	3,663.6
1979	13.5	25.8	23.1	223.1	238.7	346.0	414.7	606.4	102.2	18.1	13.2	10.8	2,035.6
1980	150.4	158.5	185.5	864.2	670.5	207.1	389.0	395.9	328.7	121.5	16.2	12.3	3,499.8
1981	12.1	34.6	91.8	179.3	213.6	337.2	306.7	217.0	29.8	14.6	11.9	13.7	1,462.3
1982	157.0	1,022.7	992.5	129.5	580.5	404.7	739.4	597.9	414.5	114.4	16.6	46.1	5,215.8
1983	294.0	445.8	317.8	356.5	542.6	743.3	328.6	722.1	801.1	316.2	28.9	58.7	4,955.5
1984	140.2	737.9	564.8	99.0	255.7	378.1	288.8	467.5	311.3	25.9	15.0	12.1	3,296.3
1985	35.7	335.8	65.3	33.8	112.1	174.6	428.6	195.8	42.9	15.3	12.5	31.0	1,483.3
1986	19.0	95.7	178.3	487.8	1,393.8	695.3	241.7	352.6	291.4	20.5	13.4	101.2	3,890.6
1987	33.9	21.2	32.7	107.1	288.6	291.0	293.0	133.1	18.7	14.0	11.9	8.3	1,253.4
1988	5.9	43.0	283.7	197.6	139.8	167.4	271.4	198.6	67.7	18.1	13.3	10.7	1,417.2
1989	7.8	345.6	53.9	70.8	121.7	1,027.8	537.9	340.7	134.7	17.4	18.7	52.3	2,729.2
1990	240.9	136.5	23.2	266.0	61.8	257.4	292.4	418.1	76.0	17.9	13.1	11.7	1,815.1
1991	11.2	12.0	26.5	20.9	80.3	510.0	290.1	368.1	215.3	24.0	17.5	12.4	1,588.4
1992	92.0	57.9	96.4	89.3	390.5	284.6	297.3	74.8	74.7	21.8	13.2	10.3	1,502.6
1993	117.0	27.3	220.9	512.7	263.2	619.0	477.9	714.0	447.1	47.4	16.5	12.4	3,475.3
1994	33.2	81.7	163.3	105.9	166.7	205.2	214.9	175.7	25.1	14.5	12.0	8.5	1,206.6
1995	11.3	95.8	243.0	1,121.4	182.1	1,048.8	558.5	772.5	608.8	401.6	31.4	13.8	5,088.9
1996	11.9	10.0	554.8	372.7	724.1	398.5	581.0	734.6	110.7	18.5	13.3	15.0	3,545.1
1997	20.0	257.9	1,357.5	1,173.8	107.5	275.4	212.7	387.6	165.2	19.1	13.9	13.0	4,003.5
1998	61.9	227.2	161.5	729.9	510.3	417.0	409.8	557.9	541.3	290.0	19.6	21.0	3,947.4
1999	21.3	374.6	159.3	456.9	487.0	169.3	270.9	459.8	353.4	38.5	17.1	12.4	2,820.5
2000	53.7	171.5	44.3	501.9	649.1	259.7	437.2	446.9	119.2	17.4	13.0	18.8	2,732.8
2001	78.4	42.4	76.8	77.2	106.7	340.7	269.1	222.2	20.4	14.7	12.2	9.7	1,270.5
2002	28.8	181.1	414.7	191.9	261.1	388.8	343.0	329.9	99.2	17.3	13.1	10.5	2,279.4
2003	7.7	236.9	662.9	341.6	162.1	397.8	356.3	520.5	150.9	18.0	18.8	12.8	2,886.2
2004	13.4	48.7	409.4	144.5	396.9	380.3	309.8	241.7	36.5	15.2	12.6	9.6	2,018.6
2005	121.8	67.8	266.2	250.8	220.2	458.9	267.5	704.2	306.5	33.2	14.3	11.8	2,723.1
2006	18.3	115.6	1,300.7	310.0	401.6	379.9	776.4	681.3	368.4	27.4	14.3	11.8	4,405.6
2007	9.5	72.1	262.7	81.5	476.9	220.2	272.5	186.1	33.1	14.9	12.3	9.5	1,651.3
2008	60.8	40.6	129.2	187.5	158.9	216.9	215.4	331.0	44.1	16.5	12.9	10.2	1,423.8
2009	54.7	142.1	31.9	115.9	403.4	418.2	271.0	561.6	54.6	15.3	12.5	9.6	2,090.6
2010	90.3	29.3	97.1	318.2	230.9	244.6	390.9	416.8	343.2	35.1	15.1	12.1	2,223.7
2011	319.2	157.2	731.6	116.9	136.0	479.1	480.4	524.5	735.5	309.8	20.4	13.5	4,024.1
2012	68.7	17.4	13.9	201.3	52.9	540.0	577.4	324.3	90.8	17.0	13.0	10.7	1,927.3
2013	17.9	370.0	754.5	59.9	49.0	231.4	217.6	95.0	58.1	16.1	12.7	20.7	1,902.9
2014	10.2	18.7	11.1	27.5	411.4	384.8	273.3	82.5	17.4	13.3	11.7	10.7	1,272.5
Average	69.0	167.1	287.5	293.8	304.2	340.7	366.8	413.8	219.7	44.5	15.3	16.1	2,538.3
Minimum	1,097.8	1,022.7	1,606.3	1,343.2	1,393.8	1,048.8	834.7	904.3	801.1	401.6	69.5	101.2	5,215.8
Maximum	3.5	2.4	10.0	14.5	20.9	27.3	69.6	55.8	16.0	12.5	8.5	3.6	434.2

Table C-8. UF 10 — Bear River near Wheatland Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	2.4	4.0	28.3	31.4	69.8	78.4	69.7	33.9	6.9	3.5	3.0	2.6	334.0
1923	4.5	25.4	119.6	43.2	36.6	16.5	45.7	6.5	4.2	2.0	0.6	0.7	305.5
1924	3.6	2.8	8.2	12.2	36.5	4.5	4.6	1.0	0.0	0.0	0.0	0.0	73.6
1925	4.4	12.8	33.9	26.3	106.9	15.5	33.0	7.0	3.2	0.5	0.1	0.5	244.1
1926	1.7	5.6	11.0	36.4	90.1	11.4	49.3	4.8	1.3	0.2	0.0	0.1	211.9
1927	2.1	76.3	22.7	46.6	125.0	49.3	64.9	12.0	5.9	2.9	2.1	2.8	412.5
1928	3.7	34.6	25.5	29.4	35.9	135.2	28.2	6.5	3.1	1.6	0.6	0.7	305.0
1929	1.9	5.1	15.8	15.8	35.7	26.8	21.8	4.2	2.5	1.0	0.0	0.0	130.6
1930	0.0	0.0	80.6	24.1	39.7	56.6	15.5	6.1	1.7	0.2	0.0	0.1	224.7
1931	0.6	5.1	5.9	29.1	26.6	24.5	3.7	1.2	0.6	0.3	0.0	0.0	97.7
1932	2.6	6.2	24.6	27.4	54.4	69.7	34.5	13.1	3.9	1.2	0.5	0.5	238.6
1933	1.4	2.2	3.2	4.3	4.8	71.7	24.0	14.5	2.3	0.2	0.0	0.0	128.6
1934	6.3	3.9	39.6	45.8	44.7	11.6	4.5	2.4	1.0	0.1	0.0	0.0	160.0
1935	0.7	26.2	13.4	36.7	53.9	40.3	88.9	10.3	3.7	2.1	1.0	1.2	278.4
1936	3.3	4.8	10.7	114.7	146.5	37.6	40.1	8.8	6.3	2.6	1.4	1.9	378.8
1937	2.6	3.7	4.6	4.9	29.9	106.4	91.6	15.1	5.5	2.5	1.4	1.9	270.0
1938	3.4	29.3	99.1	43.8	65.7	113.4	112.4	38.9	10.3	7.0	5.2	5.2	533.8
1939	8.8	11.8	15.2	13.0	24.0	53.8	12.4	4.6	2.2	0.3	0.0	0.0	146.3
1940	0.9	1.3	5.6	124.0	133.2	113.0	32.0	8.8	4.3	2.3	1.4	2.3	429.2
1941	3.7	17.9	95.5	82.4	109.7	54.7	48.0	19.7	7.9	4.6	3.6	4.0	451.6
1942	5.0	13.0	82.3	100.2	86.3	43.7	71.6	32.9	8.9	4.4	3.1	3.6	455.1
1943	4.5	42.4	54.4	130.4	57.4	103.5	22.8	10.9	7.6	3.8	2.3	2.2	442.4
1944	3.7	5.8	10.6	24.4	57.9	57.9	20.9	6.0	3.4	0.8	0.1	0.0	191.5
1945	4.0	48.9	39.7	21.1	114.0	29.0	31.2	8.2	3.9	0.8	0.1	0.1	300.9
1946	10.3	29.7	107.3	39.5	33.3	34.9	25.9	5.1	3.0	0.8	0.2	0.4	290.3
1947	1.4	18.7	30.3	9.1	49.4	53.8	14.5	3.0	1.9	0.4	0.0	0.0	182.6
1948	10.2	9.1	4.2	45.7	12.0	30.6	84.3	32.0	5.6	2.0	0.9	1.0	237.5
1949	2.1	6.8	5.6	4.6	12.8	84.2	66.3	7.6	2.8	0.7	0.4	0.6	194.5
1950	1.5	5.6	4.0	48.1	96.0	62.5	49.4	10.5	4.1	1.6	1.0	1.3	285.6
1951	10.4	166.4	122.4	66.0	69.5	60.0	19.6	23.4	5.8	3.3	2.3	2.6	551.7
1952	10.0	35.7	92.7	49.7	89.4	63.7	99.7	54.5	12.4	7.2	5.8	6.0	526.9
1953	6.6	10.9	28.6	118.6	32.9	44.2	46.4	21.1	9.1	3.1	2.2	2.2	325.9
1954	3.5	15.5	17.7	48.0	66.7	62.6	45.7	8.2	4.1	1.6	0.8	1.4	275.8
1955	2.0	9.9	49.6	25.1	25.9	33.4	24.3	16.8	2.3	0.7	0.1	0.1	190.2
1956	0.5	2.2	262.5	102.3	43.5	57.2	34.4	32.4	6.3	3.9	3.1	3.2	551.4
1957	8.9	8.5	9.6	14.4	83.4	74.6	23.4	42.7	5.3	2.1	1.4	1.6	275.8
1958	6.7	12.1	47.4	51.5	127.4	71.0	97.7	27.8	10.3	6.1	4.4	4.5	466.8
1959	5.6	8.0	8.9	62.1	46.5	40.9	10.6	5.4	2.0	0.3	0.0	1.7	192.0
1960	1.4	1.4	3.3	44.2	124.3	64.0	12.0	6.7	2.0	0.5	0.1	0.2	260.2
1961	0.5	17.5	25.8	19.9	40.4	34.8	10.0	8.9	2.1	0.1	0.0	0.0	160.0
1962	0.1	5.3	16.8	15.0	149.8	48.6	38.0	6.9	2.8	0.8	0.4	0.4	284.9
1963	134.8	14.6	54.4	96.2	65.7	24.2	92.2	26.2	5.6	3.3	1.7	2.0	520.9
1964	4.3	49.9	16.5	27.4	40.9	25.1	16.7	5.7	2.8	0.6	0.0	0.2	190.1
1965	0.2	19.3	239.2	103.9	44.4	31.7	52.1	10.3	5.6	3.0	2.5	2.8	515.1
1966	3.2	26.3	15.6	29.7	41.9	45.7	22.4	4.3	1.8	0.4	0.0	0.1	191.5
1967	0.3	39.2	74.7	96.4	49.3	68.1	36.0	52.3	8.5	3.7	2.4	2.6	433.4
1968	5.2	7.0	13.1	42.9	83.4	53.8	16.3	5.6	2.6	0.6	0.5	0.8	231.8
1969	3.1	23.7	30.5	190.3	58.1	67.4	77.8	38.4	9.0	5.1	3.2	3.6	510.3
1970	8.6	11.4	93.7	195.9	49.6	49.3	17.3	8.9	4.6	2.4	1.2	1.6	444.6

Table C-8. UF 10 — Bear River near Wheatland Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	3.5	64.9	60.3	44.2	53.0	74.3	32.3	10.8	5.0	2.4	0.9	1.2	352.7
1972	2.8	7.1	10.0	31.3	65.5	44.3	20.6	4.8	1.8	0.4	0.1	0.2	188.9
1973	4.7	36.7	31.1	104.0	91.4	54.9	47.7	10.5	4.6	2.4	1.5	2.1	391.6
1974	6.8	115.6	75.2	80.7	53.3	114.0	66.4	26.1	7.8	9.0	4.5	4.0	563.6
1975	6.8	11.2	13.3	30.3	80.6	77.2	41.0	41.2	5.5	3.6	2.3	2.6	315.7
1976	10.7	13.7	12.8	8.1	25.0	15.4	6.3	1.6	0.1	0.0	0.3	0.6	94.4
1977	0.3	0.6	0.4	1.4	6.8	3.5	1.0	1.2	0.5	0.0	0.0	0.0	15.6
1978	0.1	1.6	48.5	130.6	48.4	101.7	63.5	25.0	5.6	3.7	1.9	4.6	435.4
1979	3.6	7.2	7.7	46.6	52.3	77.6	42.7	16.6	3.7	2.0	1.1	1.2	262.3
1980	6.1	17.3	27.4	151.6	130.6	52.9	33.0	12.1	6.7	4.0	2.2	2.6	446.5
1981	3.4	5.3	11.9	33.9	41.1	54.0	14.3	4.0	1.6	0.3	0.0	0.0	169.7
1982	6.6	103.8	138.2	41.2	122.2	84.9	118.3	28.1	11.7	8.2	5.9	7.9	677.1
1983	27.9	81.1	75.0	72.5	110.8	156.0	79.1	65.1	19.4	11.9	9.6	10.2	718.6
1984	15.4	114.2	109.3	59.3	61.9	60.5	22.8	12.4	6.7	3.5	2.7	2.8	471.7
1985	6.5	44.2	23.6	20.8	35.7	38.3	19.7	4.3	1.8	0.5	0.3	0.8	196.4
1986	1.2	14.5	33.9	71.5	250.0	105.3	20.1	10.6	5.1	3.3	2.0	7.0	524.4
1987	6.2	5.5	8.0	15.6	57.9	49.7	8.1	3.0	1.0	0.2	0.1	0.0	155.4
1988	0.2	3.0	29.3	40.9	34.4	19.3	7.3	3.7	1.3	0.1	0.0	0.0	139.6
1989	0.0	34.3	9.7	24.3	31.6	152.7	26.2	6.7	3.7	1.5	0.8	1.8	293.3
1990	10.2	14.3	8.4	49.2	27.9	42.8	6.6	11.7	7.6	1.0	0.2	0.3	180.2
1991	0.5	1.5	2.9	2.6	8.0	69.7	49.9	8.2	2.3	1.0	0.2	0.1	146.9
1992	2.1	5.1	11.6	16.5	75.7	41.3	8.1	2.8	0.7	0.8	0.1	0.0	164.8
1993	3.7	3.2	27.5	73.6	72.6	113.6	58.8	23.9	12.3	4.9	3.7	3.4	401.2
1994	5.3	13.0	27.4	23.0	41.6	34.1	6.2	5.0	1.5	0.2	0.0	0.1	157.4
1995	0.7	18.8	46.4	168.6	51.2	158.4	78.1	62.6	15.0	8.9	6.7	6.7	622.0
1996	7.9	8.8	55.8	51.2	136.8	75.4	50.9	41.4	9.2	5.4	4.0	4.8	451.6
1997	6.6	34.4	179.3	210.6	54.9	51.0	24.6	10.5	7.2	4.0	2.9	3.5	589.4
1998	6.9	24.5	35.0	118.4	100.8	83.2	61.5	55.9	17.4	7.7	5.7	6.7	523.7
1999	8.8	35.1	37.6	84.5	92.1	57.8	43.4	24.9	6.8	3.8	3.4	2.9	401.1
2000	4.2	16.2	11.0	87.3	105.1	71.0	36.6	14.6	5.5	3.5	2.2	3.2	360.5
2001	7.9	8.6	12.4	13.6	29.4	60.4	17.9	4.1	1.1	0.4	0.1	0.1	155.9
2002	0.4	14.1	48.1	44.9	57.1	69.9	30.1	7.7	3.3	1.2	0.7	0.9	278.4
2003	1.8	15.2	76.0	57.8	31.9	42.7	46.3	27.5	4.0	1.8	1.5	1.6	308.0
2004	2.0	6.3	44.5	29.6	72.6	56.5	10.2	4.9	2.3	0.7	0.3	0.4	230.5
2005	8.4	17.1	36.4	47.5	65.5	70.5	34.6	43.6	8.4	3.8	2.4	2.9	340.9
2006	4.2	8.7	191.1	68.0	69.6	69.5	132.7	38.3	11.2	7.1	6.5	6.4	613.3
2007	8.5	12.8	25.0	25.0	77.9	42.8	15.4	7.4	2.6	1.0	0.6	0.6	219.4
2008	4.4	5.7	13.1	19.0	39.2	68.5	14.0	3.9	1.6	0.2	0.0	0.0	169.8
2009	0.7	9.8	3.3	28.5	51.2	63.9	16.9	25.6	3.4	0.9	0.3	0.4	204.9
2010	3.5	3.7	14.2	40.9	52.3	49.8	45.5	18.8	5.8	2.1	1.2	1.4	239.2
2011	19.7	19.5	116.1	45.4	34.4	102.1	95.3	37.3	15.7	7.1	5.4	4.9	502.8
2012	10.7	9.3	8.5	21.3	20.7	114.0	62.3	10.2	4.4	2.2	0.9	1.0	265.6
2013	2.8	43.5	115.1	35.5	23.0	21.0	11.3	3.5	1.4	1.0	0.3	0.5	259.0
2014	0.8	1.0	1.8	1.5	80.0	46.1	15.3	2.5	0.5	0.6	0.1	0.2	150.5
Average	6.1	21.3	44.1	53.6	63.9	60.5	39.2	16.4	5.0	2.4	1.6	1.9	316.0
Minimum	134.8	166.4	262.5	210.6	250.0	158.4	132.7	65.1	19.4	11.9	9.6	10.2	718.6
Maximum	0.0	0.0	0.4	1.4	4.8	3.5	1.0	1.0	0.0	0.0	0.0	0.0	15.6

Table C-9. UF 11 — American River at Folsom Lake Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	3.7	4.3	220.4	216.6	382.2	324.8	384.1	865.5	459.4	113.3	26.9	11.7	3,012.9
1923	10.4	155.6	551.0	296.6	148.4	187.9	530.9	386.4	252.6	81.4	26.6	37.0	2,664.8
1924	44.8	24.9	25.0	63.0	179.1	64.1	156.5	96.3	30.9	18.6	6.7	2.3	712.2
1925	52.2	177.5	117.5	131.4	672.7	287.3	518.3	443.0	231.4	62.6	23.8	12.6	2,730.3
1926	24.3	34.5	86.8	122.5	543.5	252.0	495.1	212.1	51.1	23.4	10.2	2.5	1,857.9
1927	30.3	368.3	230.6	259.8	459.3	297.2	522.4	626.9	420.4	124.5	26.7	10.9	3,377.1
1928	26.4	198.9	134.0	112.6	164.7	808.7	352.4	403.7	197.7	38.2	17.1	5.6	2,460.0
1929	1.5	25.1	52.3	56.6	124.9	204.8	209.6	300.8	287.2	71.5	23.5	9.3	1,367.0
1930	2.7	1.5	426.3	165.9	150.8	402.2	407.4	275.3	194.6	43.9	19.5	7.8	2,097.9
1931	6.7	56.1	27.8	130.9	115.2	189.0	213.5	184.9	106.9	34.8	17.5	5.7	1,089.0
1932	36.1	58.8	216.5	172.0	213.1	282.5	418.7	621.3	392.6	104.9	25.9	10.8	2,553.2
1933	2.9	3.4	18.0	24.4	29.0	224.3	308.6	358.5	295.0	61.5	22.9	9.6	1,358.2
1934	88.9	103.3	237.9	231.7	214.9	264.7	232.9	104.0	80.0	29.6	16.6	7.0	1,611.3
1935	18.7	159.4	108.2	273.4	153.8	234.9	743.7	523.9	341.9	64.6	22.6	9.6	2,654.8
1936	23.3	22.2	31.4	545.6	772.6	390.2	559.0	497.8	382.0	73.8	23.8	11.8	3,333.4
1937	6.5	6.1	13.0	20.0	301.1	499.1	464.5	736.8	351.1	73.1	24.7	10.8	2,506.8
1938	15.2	125.1	757.4	198.6	487.9	590.3	555.9	795.7	629.3	155.8	31.8	15.6	4,358.6
1939	26.7	42.3	60.4	89.3	57.7	280.6	318.1	199.8	75.1	26.3	13.0	8.9	1,198.2
1940	37.3	24.2	40.6	674.0	703.0	831.7	456.9	483.6	259.5	47.6	19.6	6.8	3,584.8
1941	4.2	101.5	364.0	399.1	408.6	419.8	382.6	640.5	452.4	165.1	32.3	15.6	3,385.9
1942	6.8	90.1	397.6	499.5	451.1	209.6	525.7	605.6	512.2	203.1	35.1	15.3	3,551.6
1943	5.8	263.5	228.5	687.3	297.6	727.8	445.9	433.2	370.2	78.2	25.8	11.9	3,575.8
1944	4.9	9.3	28.3	75.6	197.1	289.6	323.7	387.6	194.1	40.2	21.1	9.0	1,580.5
1945	87.6	349.7	159.2	87.8	563.1	198.9	380.9	565.1	305.6	65.2	24.6	11.3	2,798.9
1946	114.5	236.4	553.7	269.1	77.8	249.9	397.5	493.1	218.3	39.0	20.6	8.9	2,678.9
1947	12.3	129.3	125.6	37.5	186.7	408.0	389.7	228.2	128.3	31.0	15.2	4.4	1,696.3
1948	145.1	111.7	29.0	205.8	44.1	174.2	562.9	622.9	390.2	104.9	26.3	11.5	2,428.7
1949	4.1	51.7	40.3	27.1	19.0	416.1	550.1	426.2	130.3	30.7	16.2	6.7	1,718.4
1950	4.0	36.9	27.1	211.9	338.4	339.8	621.1	576.9	284.5	49.9	21.2	8.7	2,520.6
1951	92.3	1,331.5	914.8	380.7	237.0	268.1	409.5	495.3	231.2	45.6	20.0	7.2	4,433.2
1952	86.0	163.3	321.3	378.3	321.6	316.5	708.5	986.9	621.2	243.4	47.4	21.5	4,215.9
1953	12.2	23.6	134.9	453.5	125.4	252.3	523.2	444.3	368.7	178.5	35.1	16.8	2,568.4
1954	10.5	87.2	85.9	177.1	275.3	465.4	602.5	397.1	116.4	31.5	16.8	5.9	2,271.6
1955	2.0	54.8	313.5	156.4	58.7	122.0	259.5	440.8	275.1	49.1	21.0	8.4	1,761.4
1956	4.7	7.3	1,302.5	594.7	180.7	226.7	448.4	843.2	495.8	190.2	38.1	18.6	4,350.8
1957	42.1	51.2	29.0	48.9	314.6	516.2	352.4	627.9	380.7	71.0	23.6	9.8	2,467.4
1958	42.7	74.5	192.5	227.3	559.9	487.3	697.0	964.7	535.5	185.8	37.3	20.5	4,024.9
1959	13.7	9.9	18.2	239.2	191.0	203.9	342.3	249.4	72.3	27.0	14.7	55.3	1,436.9
1960	32.6	17.0	11.1	99.7	404.9	464.1	439.7	343.7	223.9	43.6	19.0	7.3	2,106.6
1961	4.1	68.1	99.0	50.4	179.7	194.3	303.7	305.8	172.8	36.6	19.5	16.2	1,450.2
1962	12.0	20.6	109.2	42.1	399.6	267.7	684.9	449.3	256.3	52.1	22.8	10.0	2,326.7
1963	962.8	88.5	312.3	447.8	545.9	148.2	514.5	596.3	403.1	131.1	30.0	18.3	4,198.7
1964	58.5	273.2	104.0	105.4	50.7	140.9	284.6	359.2	284.0	63.1	23.8	11.1	1,758.4
1965	13.3	164.1	1,510.1	447.3	154.3	254.9	498.8	484.7	399.3	156.7	81.6	34.9	4,200.0
1966	20.9	149.0	110.0	116.4	90.0	226.2	467.2	266.0	49.4	23.9	11.3	3.6	1,534.0
1967	1.1	192.9	464.5	344.8	260.3	338.6	305.8	931.7	683.9	275.9	42.5	20.5	3,862.5
1968	50.4	47.8	75.0	122.0	271.7	376.7	287.6	253.6	109.6	30.7	21.3	15.0	1,661.5
1969	32.3	256.1	160.6	907.2	347.2	307.6	642.8	847.6	474.5	116.5	27.9	13.3	4,133.7
1970	71.8	112.8	396.8	1,034.0	290.9	261.5	151.2	412.4	380.7	90.8	25.4	10.8	3,239.2

Table C-9. UF 11 — American River at Folsom Lake Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	7.5	340.5	387.7	105.5	93.6	414.9	422.7	362.1	465.4	222.5	38.8	17.5	2,878.6
1972	13.2	49.9	120.7	61.4	151.1	417.0	354.7	335.4	153.3	32.4	15.9	20.9	1,725.9
1973	61.9	220.7	177.1	651.4	349.0	284.1	397.8	687.5	291.7	51.7	20.7	11.6	3,205.3
1974	75.2	573.8	445.5	500.0	199.6	534.0	522.7	704.8	552.6	333.6	45.5	18.5	4,505.8
1975	23.5	58.0	83.5	151.8	306.0	342.9	241.8	770.5	528.2	98.9	31.6	21.1	2,657.7
1976	121.6	133.5	58.3	26.5	53.6	74.2	127.5	177.3	44.9	25.5	37.1	41.3	921.2
1977	25.8	27.4	16.6	22.5	24.0	25.3	46.1	99.5	75.1	29.0	16.9	7.1	415.3
1978	7.5	33.6	233.5	654.5	275.6	558.2	570.2	641.9	614.5	186.8	34.7	109.3	3,920.5
1979	31.0	28.8	34.7	295.6	195.8	362.4	383.5	632.6	268.1	49.7	22.8	9.9	2,314.9
1980	64.4	118.9	161.0	913.7	530.0	296.3	375.3	577.7	397.2	280.9	49.6	19.1	3,784.1
1981	9.7	13.1	74.0	114.0	177.3	304.1	317.8	316.5	101.9	27.8	13.7	4.2	1,474.2
1982	48.5	698.9	838.0	313.0	632.5	461.0	794.7	825.1	605.8	347.8	89.1	81.7	5,736.2
1983	304.5	423.6	464.3	393.5	501.0	747.4	387.5	993.7	999.0	454.9	94.9	40.5	5,804.8
1984	93.4	637.7	605.6	235.2	215.2	329.2	343.3	575.1	444.1	104.6	26.7	12.2	3,622.1
1985	28.4	227.5	116.4	41.3	126.8	184.9	472.4	288.7	74.6	26.9	13.8	24.0	1,625.7
1986	34.2	93.1	222.3	460.1	1,400.5	895.1	354.2	368.0	320.9	67.0	22.8	38.0	4,276.1
1987	37.4	20.8	14.6	61.7	225.2	315.5	259.5	182.6	38.1	23.1	10.7	2.9	1,192.2
1988	1.0	32.3	148.5	212.9	104.0	197.2	237.0	197.4	99.7	32.7	18.2	6.7	1,287.7
1989	2.0	135.7	91.3	62.6	85.1	933.0	653.9	385.3	203.9	43.6	22.0	52.3	2,670.7
1990	175.9	155.4	87.5	194.1	112.4	247.8	210.3	208.2	207.0	39.9	20.1	9.2	1,667.8
1991	8.2	13.4	17.1	13.8	80.2	446.9	292.2	295.2	307.4	114.2	27.5	14.6	1,630.8
1992	59.4	80.0	87.4	120.8	325.4	309.2	266.4	140.3	47.0	70.9	24.4	11.1	1,542.5
1993	41.3	92.9	308.7	604.4	353.6	719.6	463.6	502.6	479.1	177.2	34.1	14.5	3,791.5
1994	22.4	42.8	228.7	104.5	188.1	196.3	182.7	197.9	53.9	25.0	12.1	3.3	1,257.8
1995	11.5	171.5	328.5	1,006.6	303.4	1,031.7	564.5	742.7	587.1	428.8	103.0	24.6	5,304.1
1996	10.8	2.9	399.3	394.9	698.0	496.7	601.4	789.6	278.0	65.6	23.1	10.0	3,770.4
1997	7.0	334.7	1,187.3	1,575.1	235.3	233.5	246.4	392.2	273.1	60.7	22.3	9.5	4,577.0
1998	36.2	106.6	222.2	648.3	642.8	618.0	535.8	539.9	537.5	342.3	64.1	41.2	4,334.8
1999	30.3	147.3	256.7	566.5	639.1	336.3	268.4	450.5	368.8	103.8	26.8	13.2	3,207.8
2000	21.3	129.7	89.9	488.4	754.5	408.6	366.0	463.5	189.6	38.8	16.9	22.5	2,989.8
2001	54.0	61.0	72.0	84.7	91.4	301.9	322.2	258.1	48.4	22.4	9.7	2.7	1,328.4
2002	6.0	154.3	361.3	311.8	289.4	487.1	375.7	307.2	153.3	34.7	16.7	5.7	2,503.3
2003	1.4	218.8	366.6	269.0	165.9	272.2	385.6	572.3	307.0	51.7	22.8	13.8	2,647.0
2004	7.6	12.4	283.4	229.5	286.5	374.1	326.2	231.7	59.8	25.2	12.3	3.4	1,852.1
2005	92.8	107.0	242.3	394.7	218.2	451.8	374.3	750.3	529.2	186.9	33.9	15.7	3,397.2
2006	7.2	33.9	1,128.3	501.5	322.1	432.7	916.0	829.4	488.1	149.6	29.9	13.1	4,851.8
2007	4.7	39.7	171.8	131.9	342.3	278.4	262.2	258.4	55.1	24.9	12.0	3.3	1,584.6
2008	24.3	40.9	97.2	208.7	167.0	218.8	175.6	262.7	98.9	30.1	16.4	5.2	1,345.8
2009	26.6	144.6	51.3	107.6	253.1	439.8	295.1	606.5	171.7	33.7	17.1	5.7	2,152.8
2010	91.5	42.2	88.9	209.9	224.7	308.9	398.0	420.7	417.3	120.2	28.0	13.2	2,363.5
2011	263.4	206.5	618.3	204.9	114.5	381.7	535.3	704.8	776.6	484.3	120.0	26.9	4,437.4
2012	58.9	23.7	12.3	117.8	54.4	313.5	545.6	413.2	160.8	35.6	18.2	7.6	1,761.5
2013	3.9	77.5	542.2	81.0	35.8	199.1	290.8	276.3	118.0	53.2	21.7	9.4	1,709.1
2014	7.9	5.7	8.7	8.7	359.8	309.2	330.0	273.5	87.9	49.6	21.2	9.0	1,471.2
Average	48.2	134.2	253.0	285.1	286.2	358.9	410.2	471.0	297.2	100.1	27.9	15.8	2,687.8
Minimum	962.8	1,331.5	1,510.1	1,575.1	1,400.5	1,031.7	916.0	993.7	999.0	484.3	120.0	109.3	5,804.8
Maximum	1.0	1.5	8.7	8.7	19.0	25.3	46.1	96.3	30.9	18.6	6.7	2.3	415.3

Table C-10. UF 13 — Cosumnes River at Michigan Bar Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.0	0.3	15.9	30.7	72.7	91.1	86.7	95.2	19.2	4.8	0.9	0.0	417.5
1923	0.1	18.5	114.3	50.5	23.4	34.0	106.9	52.6	10.5	3.5	0.8	0.1	415.3
1924	3.8	2.8	1.4	3.6	12.5	7.8	17.7	9.8	2.8	0.5	0.0	0.0	62.8
1925	2.4	20.6	24.7	20.3	151.2	37.6	76.2	35.6	8.7	2.5	0.5	0.0	380.3
1926	1.2	2.7	5.8	6.4	79.0	34.1	76.8	9.8	2.6	0.7	0.0	0.0	219.0
1927	0.4	59.6	47.9	41.6	124.5	47.7	93.0	31.3	7.8	2.5	0.4	0.0	456.6
1928	0.0	20.4	19.1	16.5	32.2	171.7	80.3	13.7	3.8	0.8	0.0	0.0	358.5
1929	0.0	1.8	5.3	6.9	22.4	33.3	59.1	41.6	11.0	6.6	1.6	0.1	189.7
1930	0.0	0.1	24.9	36.1	33.8	72.9	55.5	24.2	9.1	2.4	0.3	0.0	259.3
1931	0.3	5.7	6.5	8.7	24.8	33.7	27.6	12.7	4.7	2.6	0.7	0.0	128.0
1932	0.1	6.7	66.4	53.7	59.0	47.2	53.2	72.8	12.9	3.5	0.6	0.0	376.0
1933	0.0	0.0	1.7	6.1	7.3	54.6	52.2	43.0	10.8	2.9	0.4	0.0	179.2
1934	5.5	9.9	28.7	38.1	62.6	38.5	13.9	6.3	2.5	1.7	0.4	0.0	208.2
1935	1.1	14.7	12.9	60.3	29.1	36.8	169.9	59.4	12.2	3.2	0.5	0.0	400.2
1936	0.4	3.1	2.3	83.3	208.7	59.0	79.3	57.7	19.6	5.5	1.0	0.1	520.0
1937	0.4	0.4	1.8	11.2	84.5	105.3	89.1	96.0	13.0	4.5	0.9	0.1	407.1
1938	0.3	5.6	73.0	37.1	113.6	143.8	100.6	108.0	39.6	6.3	1.5	0.2	629.6
1939	0.6	5.5	5.6	9.7	13.4	39.9	37.8	9.3	6.1	1.9	0.2	0.0	130.1
1940	3.6	4.1	2.6	110.9	143.3	135.0	86.1	20.4	5.4	1.3	0.1	0.0	512.8
1941	0.1	5.4	68.4	85.8	100.4	69.4	75.1	57.2	11.6	3.6	0.8	0.0	477.7
1942	0.1	4.4	49.4	90.9	94.6	32.9	90.5	84.6	36.3	7.2	1.6	0.1	492.7
1943	0.0	46.6	51.1	138.6	57.4	160.5	59.7	37.1	11.3	3.3	0.6	0.0	566.1
1944	0.0	0.9	2.5	10.7	40.5	43.3	44.1	58.9	10.4	3.1	0.5	0.0	215.0
1945	5.3	52.6	22.0	12.1	124.3	43.5	62.9	48.5	11.4	3.9	0.8	0.0	387.4
1946	9.1	34.2	112.9	43.5	15.7	52.2	69.8	47.9	9.5	2.5	0.3	0.0	397.6
1947	0.8	11.4	18.1	10.2	26.2	78.9	51.3	13.5	3.8	1.7	0.3	0.0	216.3
1948	8.9	13.9	4.7	9.2	8.3	55.9	111.7	75.7	19.4	4.6	0.8	0.0	313.2
1949	0.0	1.6	5.6	8.0	9.7	89.8	85.8	35.8	8.0	2.0	0.2	0.0	246.7
1950	0.1	2.3	4.5	29.9	56.3	69.7	100.5	56.2	12.3	3.5	0.6	0.0	335.9
1951	6.6	202.0	157.6	67.5	56.7	68.8	53.5	49.2	8.3	2.0	0.2	0.0	672.4
1952	1.8	15.3	75.7	102.5	67.8	72.2	121.2	111.8	33.0	6.4	1.5	0.3	609.5
1953	0.4	0.7	21.9	77.4	12.3	37.1	75.2	56.7	21.4	6.1	1.3	0.1	310.5
1954	0.0	3.7	9.5	14.0	35.5	74.5	94.1	23.8	5.7	2.1	0.4	0.0	263.4
1955	0.0	1.4	35.8	31.6	16.7	31.7	36.7	65.7	12.5	3.6	0.6	0.0	236.4
1956	0.1	0.3	213.7	137.5	30.5	44.0	60.8	107.4	25.4	5.5	1.1	0.1	626.4
1957	0.9	6.5	3.5	3.2	37.5	101.7	52.9	69.7	13.0	3.6	0.6	0.0	293.0
1958	0.4	2.7	9.5	36.3	120.9	93.3	144.4	106.7	22.1	5.7	1.2	0.2	543.5
1959	0.3	0.6	1.1	20.7	45.9	38.4	44.0	12.8	4.1	1.0	0.0	1.0	169.8
1960	4.1	1.5	0.4	7.5	76.0	76.4	44.2	31.8	7.4	1.8	0.2	0.0	251.2
1961	0.1	3.2	12.5	3.4	20.4	38.6	42.7	23.3	6.9	1.7	0.2	0.0	153.1
1962	1.2	1.1	7.0	3.4	90.7	54.6	86.7	44.1	10.6	3.0	0.6	0.0	302.9
1963	59.5	11.1	21.1	34.7	115.9	35.9	100.2	91.8	21.5	5.3	1.0	0.1	498.3
1964	2.2	25.0	10.9	17.2	10.4	28.5	54.4	40.0	10.7	3.7	0.7	0.0	203.6
1965	0.1	16.1	218.7	75.1	28.8	54.0	101.1	80.2	20.1	5.2	1.2	1.5	602.0
1966	1.0	17.3	20.0	20.6	20.5	45.2	69.7	11.5	3.3	0.6	0.0	0.0	209.6
1967	0.0	13.8	75.5	65.4	39.9	72.2	67.2	146.3	58.7	9.8	2.3	0.3	551.4
1968	1.9	2.6	10.7	10.1	55.6	63.5	42.7	13.1	4.2	1.1	0.1	0.4	205.9
1969	0.5	19.1	21.2	170.1	75.8	67.6	115.1	101.1	24.2	5.5	1.1	0.1	601.4
1970	1.8	8.1	47.1	178.8	46.6	49.7	24.0	52.4	11.5	3.9	0.8	0.0	424.9

Table C-10. UF 13 — Cosumnes River at Michigan Bar Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.0	37.8	94.2	18.3	16.8	74.7	57.7	50.5	12.8	4.6	1.3	0.1	368.7
1972	0.5	2.7	21.3	12.1	40.9	58.0	50.8	26.6	6.4	1.7	0.2	0.0	221.3
1973	1.9	15.5	12.1	110.7	92.9	57.0	67.6	72.4	10.6	2.8	0.4	0.0	443.9
1974	0.9	58.2	72.7	64.3	32.8	119.8	88.5	78.4	16.9	8.2	4.1	0.9	545.8
1975	0.2	4.5	10.2	10.9	54.3	79.4	48.8	114.2	31.8	6.1	1.3	1.0	362.7
1976	5.6	12.6	6.2	2.1	2.2	10.4	20.5	13.1	3.9	0.8	0.3	2.7	80.4
1977	2.5	1.2	1.5	1.6	0.8	4.6	7.2	8.8	4.7	1.5	0.2	0.0	34.8
1978	0.3	0.7	27.2	139.5	52.8	128.8	88.6	87.4	22.8	5.1	1.0	3.9	558.3
1979	4.8	1.6	4.4	30.4	51.7	80.5	69.9	82.7	11.7	3.3	0.7	0.2	341.6
1980	0.4	10.7	14.1	157.1	109.2	54.8	54.3	59.6	23.0	6.7	1.9	0.2	492.1
1981	0.1	0.6	2.6	15.4	26.4	67.0	57.4	17.5	6.9	1.8	0.2	0.0	196.0
1982	1.4	91.7	116.7	51.7	133.7	125.0	150.4	99.7	15.1	4.9	1.4	2.0	793.8
1983	27.3	71.2	90.9	80.8	111.2	180.8	76.2	128.4	101.3	12.2	3.5	1.5	885.3
1984	3.1	104.4	119.4	40.2	51.1	84.2	49.7	66.5	13.4	4.2	0.8	0.0	536.8
1985	0.6	35.6	18.6	5.5	11.8	36.4	76.1	21.1	4.9	1.2	0.1	0.8	212.6
1986	2.9	6.1	19.5	57.3	278.7	138.0	40.0	58.9	14.1	3.9	0.7	0.1	620.2
1987	2.2	2.1	0.9	3.1	15.4	47.9	39.2	11.5	3.4	0.8	0.0	0.0	126.6
1988	0.0	1.5	7.7	15.1	11.8	37.3	29.9	11.8	4.2	1.5	0.3	0.0	120.9
1989	0.0	2.6	8.6	4.1	1.9	157.3	83.7	20.0	5.4	1.6	0.2	0.5	285.8
1990	9.5	10.8	7.9	6.7	7.4	55.3	33.0	13.3	10.1	3.7	0.7	0.0	158.2
1991	0.2	0.9	1.2	0.9	3.7	54.6	54.1	48.4	10.8	3.9	1.4	0.2	180.3
1992	0.2	5.4	4.5	8.0	52.4	56.0	41.4	10.4	2.6	1.4	1.4	0.2	184.1
1993	0.2	5.5	22.7	84.8	62.4	130.6	90.7	90.5	24.7	5.6	1.0	0.0	518.7
1994	0.1	2.5	8.0	5.4	16.6	40.0	28.6	15.9	5.8	1.3	0.1	0.0	124.3
1995	0.7	11.4	20.4	153.5	38.9	198.6	113.5	123.5	69.0	11.3	2.9	0.4	744.2
1996	0.0	0.0	23.5	67.9	122.3	86.8	76.3	88.7	12.0	3.5	0.9	0.0	481.9
1997	0.2	20.1	169.9	239.6	39.6	46.3	39.8	34.7	8.3	3.2	0.7	0.0	602.4
1998	0.4	6.1	17.9	113.4	149.5	100.7	91.8	107.1	50.4	8.1	1.7	0.3	647.3
1999	1.6	4.9	18.5	74.2	125.0	68.6	60.8	53.1	11.3	3.2	0.5	0.0	421.9
2000	0.1	7.6	10.9	88.9	137.1	62.7	47.2	47.5	9.2	2.5	0.3	0.7	414.7
2001	2.2	7.1	4.4	7.6	33.3	55.4	52.4	27.8	5.2	1.0	0.0	0.0	196.5
2002	0.1	11.8	71.5	43.8	44.4	83.2	50.0	19.5	7.2	1.8	0.2	0.0	333.6
2003	0.0	17.2	76.3	32.4	23.5	53.2	92.0	58.1	8.2	1.9	0.2	0.3	363.3
2004	0.2	0.6	48.9	35.5	77.8	72.6	17.0	6.7	1.7	0.4	0.0	0.0	261.4
2005	17.3	22.2	70.8	123.2	66.5	129.9	56.9	44.9	9.8	3.8	0.8	0.0	546.1
2006	0.1	1.2	167.3	146.1	56.1	145.1	224.8	26.5	7.7	2.1	0.3	0.0	777.2
2007	0.1	4.5	25.0	22.3	78.2	56.2	21.9	12.6	3.8	0.7	0.0	0.0	225.4
2008	0.3	2.6	6.5	51.4	45.3	47.6	22.0	8.6	3.1	1.3	0.1	0.0	188.9
2009	0.7	12.6	7.2	17.9	70.0	103.4	44.3	39.2	6.0	1.3	0.1	0.0	302.7
2010	4.4	5.9	13.6	52.5	66.1	81.7	81.6	31.0	11.4	3.3	0.5	0.0	351.9
2011	20.6	33.7	156.4	43.9	44.3	175.7	101.0	53.8	18.5	6.4	1.8	0.2	656.3
2012	2.6	3.7	1.6	9.8	13.3	100.9	63.3	12.5	3.7	1.5	0.2	0.0	213.2
2013	0.1	24.2	129.1	18.1	8.4	28.0	17.6	5.5	1.9	1.3	0.9	0.1	235.1
2014	0.8	0.9	1.9	1.1	94.8	61.3	21.4	7.3	2.3	0.5	0.0	0.0	192.5
Average	2.6	15.0	37.7	47.5	58.2	72.1	67.1	49.1	13.7	3.4	0.7	0.2	367.5
Minimum	59.5	202.0	218.7	239.6	278.7	198.6	224.8	146.3	101.3	12.2	4.1	3.9	885.3
Maximum	0.0	0.0	0.4	0.9	0.8	4.6	7.2	5.5	1.7	0.4	0.0	0.0	34.8

Table C-11. UF 14 — Mokelumne River at Pardee Reservoir Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	2.1	4.3	19.7	16.4	48.0	81.3	113.8	217.1	246.7	16.8	2.8	1.5	770.7
1923	8.4	24.3	92.1	33.7	26.0	52.1	105.5	218.2	176.9	31.6	3.3	17.0	789.0
1924	15.8	6.1	7.9	9.5	24.7	11.0	36.7	90.4	3.5	0.7	0.0	3.6	209.9
1925	23.5	36.5	25.7	17.0	145.3	38.0	88.1	161.3	151.1	9.3	4.1	5.4	705.0
1926	14.4	8.4	10.8	15.5	62.3	76.5	216.1	24.4	4.1	1.7	0.4	0.1	434.6
1927	10.4	206.2	30.2	26.1	179.5	97.1	202.9	71.0	10.4	1.4	0.2	0.9	836.5
1928	27.2	37.8	12.1	9.7	41.5	267.5	86.5	168.9	10.3	2.1	0.7	0.3	664.5
1929	0.4	6.0	5.9	5.4	12.5	30.0	73.8	220.4	46.8	3.1	0.6	0.3	405.1
1930	1.3	0.7	24.1	18.3	53.5	82.5	76.8	79.6	200.6	4.1	2.0	3.6	547.1
1931	4.6	14.2	3.3	24.4	35.9	32.2	62.6	126.8	15.0	1.9	0.3	0.4	321.8
1932	4.6	9.3	44.1	19.6	36.3	72.6	118.4	208.5	195.0	5.3	1.4	0.7	715.7
1933	0.9	2.8	5.3	9.7	5.4	91.1	86.6	117.0	118.6	3.8	0.9	2.1	444.0
1934	10.4	11.0	32.4	20.0	58.7	115.6	102.4	27.1	13.0	2.3	1.0	1.7	395.6
1935	15.5	23.4	12.4	17.9	26.5	47.2	247.4	168.2	195.3	6.0	2.8	1.7	764.4
1936	12.0	5.3	5.6	51.1	191.4	82.3	144.8	227.2	227.6	31.7	3.2	5.9	988.0
1937	7.8	7.0	15.0	13.0	66.9	96.3	128.7	382.2	62.8	4.6	2.1	1.1	787.4
1938	10.7	13.8	138.5	28.9	71.4	117.5	141.0	325.0	367.0	43.3	4.9	6.0	1,268.1
1939	25.3	14.2	20.9	16.0	15.9	66.8	113.1	80.5	17.3	2.0	0.6	11.9	384.5
1940	17.3	4.5	6.1	117.5	151.4	148.9	86.0	247.0	98.4	3.5	1.4	2.0	884.0
1941	7.0	12.4	73.3	39.5	122.3	89.2	83.3	214.6	229.7	17.9	3.0	4.0	896.1
1942	7.4	30.8	50.5	81.4	68.9	57.2	118.0	172.2	330.7	49.0	2.9	3.3	972.2
1943	6.4	71.0	57.2	81.6	65.1	198.6	148.9	231.9	151.0	13.8	3.1	2.8	1,031.5
1944	7.8	9.8	11.4	16.8	39.0	58.8	68.8	207.6	80.9	5.4	1.7	1.3	509.4
1945	36.4	69.0	29.3	8.7	123.8	35.7	132.2	213.7	189.5	8.7	2.8	2.3	851.9
1946	70.8	40.1	84.4	19.4	15.8	66.1	173.6	228.0	87.8	6.1	2.3	3.4	797.7
1947	15.4	32.0	23.6	7.5	48.4	96.8	93.7	153.4	14.4	2.1	0.6	0.6	488.6
1948	33.5	14.1	4.3	14.0	8.7	50.1	107.2	166.4	211.4	9.0	1.4	0.8	620.8
1949	3.6	5.5	7.0	6.3	7.1	46.4	190.1	203.3	39.4	3.8	2.8	2.1	517.5
1950	2.6	13.8	7.2	18.1	60.9	89.6	155.2	205.0	137.4	4.7	1.9	3.9	700.3
1951	30.6	288.0	157.3	63.2	48.4	75.1	108.2	196.0	181.2	5.8	2.1	2.5	1,158.3
1952	17.3	24.3	66.8	47.3	51.2	57.8	206.8	357.7	283.9	32.3	6.1	7.9	1,159.4
1953	7.8	12.6	28.7	69.8	27.4	63.5	132.2	89.6	182.1	60.9	5.1	3.5	683.1
1954	5.7	14.5	10.5	26.2	50.5	89.7	178.9	176.9	11.8	2.2	1.2	0.6	568.7
1955	0.6	9.8	33.3	20.8	23.3	42.4	45.4	181.5	129.2	3.6	1.6	1.5	493.1
1956	1.6	3.3	176.9	91.5	18.8	52.7	127.3	294.1	330.8	64.5	4.8	9.0	1,175.4
1957	15.7	15.0	11.6	14.2	64.3	101.4	87.2	180.1	132.5	4.8	2.0	2.8	631.9
1958	7.4	8.1	16.2	39.1	118.6	89.0	151.7	355.1	226.8	25.5	10.0	8.9	1,056.5
1959	6.4	9.0	8.8	39.0	40.4	68.9	113.0	79.3	25.3	4.1	1.5	22.1	417.7
1960	4.0	1.5	2.2	8.8	61.3	109.9	96.9	137.4	48.2	3.4	2.4	1.7	477.7
1961	4.1	8.9	6.4	8.8	23.8	40.4	78.9	127.1	40.3	3.6	2.2	19.9	364.3
1962	3.7	5.1	5.5	4.5	79.5	47.8	216.0	118.3	149.9	5.7	2.0	1.1	639.0
1963	76.8	13.0	18.7	76.3	117.4	46.7	98.5	242.1	243.1	23.4	3.5	15.7	975.3
1964	27.9	40.5	9.2	14.2	16.4	44.3	81.1	151.8	94.6	4.9	2.0	1.7	488.6
1965	4.0	21.8	199.7	39.6	42.1	63.0	152.1	208.4	291.3	92.7	41.1	11.0	1,166.6
1966	6.9	46.4	21.3	18.7	16.4	82.9	194.9	107.0	5.3	1.8	1.9	1.0	504.6
1967	1.6	23.6	53.3	55.3	34.9	94.1	42.4	336.0	345.1	140.1	8.9	10.4	1,145.7
1968	18.1	18.1	14.5	25.5	69.9	78.3	82.7	109.9	22.3	1.9	6.5	2.3	450.0
1969	4.1	33.3	24.5	179.0	36.7	57.9	173.6	345.8	309.8	53.6	4.0	8.6	1,231.0
1970	21.6	26.7	89.8	173.9	53.8	70.2	40.3	208.4	217.8	6.6	2.1	2.7	913.8

Table C-11. UF 14 — Mokelumne River at Pardee Reservoir Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	5.2	53.9	55.9	19.0	38.7	82.7	87.9	118.0	249.6	35.1	3.0	3.2	752.3
1972	7.0	26.4	31.4	10.9	37.3	118.5	71.6	156.8	35.8	2.1	0.6	13.9	512.2
1973	12.3	18.3	12.8	61.4	63.1	37.5	141.0	346.9	76.4	3.7	6.5	3.3	783.2
1974	15.6	80.1	57.5	44.2	30.4	126.6	119.4	237.0	280.9	44.3	6.2	2.4	1,044.6
1975	9.1	12.1	12.8	18.6	45.7	84.1	44.4	290.1	268.3	6.8	11.5	5.7	809.3
1976	29.9	15.6	7.8	6.3	18.5	17.4	32.7	120.0	5.4	5.1	20.1	10.7	289.5
1977	8.2	3.1	1.6	2.6	8.6	7.4	46.8	29.2	16.9	3.1	0.5	4.1	132.2
1978	2.0	4.8	33.4	80.0	44.9	181.7	134.9	233.0	294.3	21.5	2.6	50.0	1,083.2
1979	3.3	6.7	10.7	35.3	36.0	93.7	119.7	292.5	105.5	6.8	2.1	1.6	714.0
1980	15.3	20.5	25.9	149.2	125.3	61.0	111.1	175.9	234.4	112.6	5.0	7.8	1,044.0
1981	9.1	8.9	12.7	33.5	39.9	76.5	113.8	155.4	12.5	1.8	0.6	2.7	467.5
1982	14.5	95.6	88.9	26.6	133.3	128.8	157.5	286.3	340.0	119.4	7.5	46.9	1,445.3
1983	84.4	83.3	60.7	68.9	93.6	160.0	92.8	317.5	426.4	195.9	20.5	28.1	1,632.1
1984	30.8	141.3	118.1	37.0	64.2	119.1	69.8	267.8	176.4	8.9	3.9	6.4	1,043.9
1985	20.2	53.5	14.3	10.4	32.2	48.2	151.1	157.2	16.7	2.0	1.9	14.5	522.2
1986	10.0	16.3	24.0	60.5	260.8	173.3	79.3	221.8	274.1	10.2	3.8	8.5	1,142.7
1987	14.6	8.2	8.1	10.7	28.0	57.6	153.4	56.4	4.8	1.6	0.5	0.6	344.7
1988	4.8	9.8	7.8	9.9	30.6	56.0	74.4	79.3	8.5	2.6	0.9	0.7	285.3
1989	0.9	7.9	7.1	1.9	8.4	185.3	183.5	157.5	34.9	2.7	2.2	25.7	618.1
1990	25.2	12.8	4.7	12.0	10.5	84.1	131.4	77.4	20.7	2.8	2.4	4.8	388.9
1991	3.8	2.7	2.3	1.7	16.2	56.9	67.5	128.4	118.1	5.2	2.2	3.0	408.0
1992	10.0	13.1	6.8	5.8	59.1	75.9	138.2	61.0	9.2	9.2	1.9	1.5	391.5
1993	9.0	7.7	20.0	46.4	43.0	169.2	151.0	292.6	239.3	13.7	2.5	1.9	996.1
1994	14.2	8.6	12.2	14.2	24.4	70.5	94.9	83.7	6.3	1.2	0.2	2.1	332.4
1995	9.2	15.8	13.6	87.9	59.8	207.9	162.7	209.5	297.0	299.0	7.7	5.0	1,375.0
1996	7.7	12.2	47.1	45.7	142.7	109.3	129.5	292.0	192.2	6.3	3.1	4.3	992.0
1997	6.8	38.2	138.2	247.1	29.3	101.7	114.7	317.0	125.3	5.7	3.4	4.3	1,131.6
1998	12.4	18.5	17.8	79.6	86.4	139.9	128.4	282.3	363.0	46.4	4.7	25.3	1,204.8
1999	13.5	25.9	23.1	89.8	97.5	52.2	95.2	250.2	196.5	6.7	4.7	3.7	859.0
2000	13.7	28.5	9.3	110.8	104.4	55.9	132.9	281.6	55.9	3.1	1.3	13.3	810.7
2001	13.4	7.0	7.5	22.0	25.4	96.2	113.7	157.3	3.7	1.3	0.6	2.1	450.3
2002	8.5	53.5	69.0	32.3	55.8	106.7	122.6	163.8	25.4	2.1	1.1	1.0	641.7
2003	1.1	69.8	81.3	32.8	36.1	89.2	101.1	227.1	49.2	4.4	4.5	2.8	699.5
2004	1.0	5.5	82.7	29.4	98.6	164.7	103.5	46.5	5.1	1.5	0.5	0.5	539.6
2005	49.6	36.6	119.0	120.4	107.7	192.9	107.7	199.7	79.2	5.7	2.5	4.7	1,025.9
2006	10.9	24.4	359.6	130.0	130.0	153.3	283.3	182.2	59.9	5.5	4.6	4.2	1,347.8
2007	10.9	35.0	52.0	25.3	116.7	116.0	60.8	32.9	4.0	1.2	0.4	2.2	457.5
2008	10.4	8.2	18.2	61.3	62.0	82.6	73.7	76.9	8.8	1.6	0.6	0.1	404.4
2009	14.3	46.7	11.9	83.3	97.8	159.4	95.4	109.2	9.1	1.7	1.0	1.3	631.2
2010	48.0	8.0	31.3	83.8	100.8	101.2	128.7	100.4	92.6	8.7	1.9	1.5	706.7
2011	115.0	48.5	242.5	95.9	65.8	251.6	139.8	136.5	141.9	48.5	4.4	7.8	1,298.2
2012	29.8	10.4	8.6	56.7	23.8	154.8	107.4	26.1	8.9	1.1	0.9	1.3	429.8
2013	4.7	87.3	161.1	28.8	14.2	67.3	40.8	29.3	8.0	2.2	0.9	2.8	447.5
2014	1.5	7.3	2.8	4.2	149.8	88.4	53.6	25.1	2.8	2.6	2.5	3.7	344.3
Average	15.2	28.6	42.5	43.2	61.3	91.8	115.8	179.0	127.8	20.5	3.5	6.1	735.3
Minimum	115.0	288.0	359.6	247.1	260.8	267.5	283.3	382.2	426.4	299.0	41.1	50.0	1,632.1
Maximum	0.4	0.7	1.6	1.7	5.4	7.4	32.7	24.4	2.8	0.7	0.0	0.1	132.2

Table C-12. UF 15 — Calaveras River at Jenny Lind Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.1	0.7	22.3	27.4	85.6	41.9	14.0	3.8	0.5	0.0	0.0	0.0	196.3
1923	0.8	12.0	65.1	54.1	18.1	1.5	48.7	2.7	0.7	0.0	0.0	0.7	204.5
1924	1.8	0.3	2.0	8.3	9.3	3.6	3.7	0.5	0.0	0.0	0.0	0.0	29.5
1925	2.9	7.4	17.0	16.2	82.3	17.8	42.7	6.4	1.6	0.1	0.0	0.2	194.4
1926	1.3	1.6	5.0	6.0	52.6	4.6	26.6	1.6	0.1	0.0	0.0	0.0	99.5
1927	1.7	16.3	21.6	36.3	64.4	15.6	30.5	1.3	1.0	0.1	0.0	0.0	189.0
1928	1.0	11.5	15.7	17.7	22.6	58.9	25.1	1.0	0.2	0.0	0.0	0.0	153.6
1929	0.0	4.5	9.2	9.5	18.8	18.0	22.6	1.6	6.3	1.2	0.0	0.0	91.7
1930	0.0	0.0	10.1	23.4	28.5	43.0	6.3	7.2	0.5	0.0	0.0	0.0	118.9
1931	0.3	4.6	1.1	13.3	14.6	9.7	1.4	1.0	1.7	0.4	0.0	0.0	48.2
1932	0.3	5.3	55.9	48.5	56.4	8.1	5.7	11.6	1.4	0.0	0.0	0.0	193.2
1933	0.0	0.1	4.5	18.0	16.9	23.4	4.0	26.7	1.2	0.0	0.0	0.0	94.8
1934	1.6	2.2	28.6	29.2	36.2	10.9	0.6	1.6	1.6	0.1	0.0	0.1	112.5
1935	1.4	7.6	12.3	49.9	15.8	33.2	68.7	9.1	0.4	0.0	0.0	0.0	198.5
1936	1.2	1.5	2.5	58.0	154.2	15.0	25.2	0.9	6.1	0.5	0.0	0.1	265.1
1937	0.0	0.7	8.8	19.0	95.4	60.9	17.1	1.8	0.6	0.3	0.0	0.0	204.5
1938	0.7	2.0	24.2	28.5	121.2	80.7	19.0	7.6	0.3	0.0	0.0	0.0	284.0
1939	1.7	3.1	3.3	8.8	18.0	16.7	4.0	4.7	1.5	0.0	0.0	0.1	62.0
1940	2.6	1.1	2.5	79.5	67.6	50.3	21.0	1.6	0.1	0.0	0.0	0.0	226.3
1941	0.5	2.1	37.5	53.4	51.2	34.5	41.4	2.5	0.4	0.0	0.0	0.1	223.6
1942	0.2	2.1	33.5	84.2	49.3	14.7	41.2	38.6	3.5	0.1	0.0	0.0	267.5
1943	0.1	31.3	35.2	89.0	39.9	70.3	13.5	4.6	1.5	0.1	0.0	0.0	285.4
1944	0.5	1.2	4.2	17.3	37.7	31.0	19.6	4.4	0.8	0.0	0.0	0.0	116.8
1945	1.0	23.7	24.6	12.8	82.9	39.2	11.8	1.7	6.9	0.4	0.0	0.0	205.1
1946	1.5	15.8	88.1	29.4	17.4	27.4	14.6	1.3	1.1	0.0	0.0	0.0	196.6
1947	1.1	12.7	23.7	10.9	24.6	27.3	14.7	0.6	1.2	0.1	0.0	0.0	117.0
1948	3.8	5.5	2.8	7.9	15.1	56.8	58.5	19.2	4.5	0.3	0.0	0.0	174.4
1949	0.3	0.5	9.5	17.5	27.7	65.4	5.1	0.5	0.3	0.0	0.0	0.0	126.8
1950	0.2	3.7	5.6	63.8	51.1	30.3	33.5	2.7	0.2	0.0	0.0	0.1	191.1
1951	4.1	73.7	112.4	76.9	33.6	31.5	3.3	16.2	0.5	0.0	0.0	0.0	352.4
1952	1.8	9.9	68.1	115.6	49.2	57.8	9.4	2.0	0.1	0.2	0.0	0.1	314.2
1953	0.0	2.6	30.8	62.2	3.6	21.9	20.5	12.0	7.8	0.3	0.0	0.0	161.6
1954	1.1	4.3	9.7	24.9	34.9	39.2	17.8	6.5	1.4	0.2	0.0	0.0	140.0
1955	0.0	2.4	26.7	52.8	22.3	9.1	25.9	15.2	0.4	0.0	0.0	0.0	154.9
1956	0.0	2.6	179.9	105.0	27.0	9.1	12.4	45.6	1.2	0.0	0.0	0.1	382.8
1957	1.9	2.6	5.4	12.4	26.7	53.7	13.6	44.8	4.3	0.1	0.0	0.0	165.6
1958	1.4	2.0	12.7	42.8	85.1	63.3	95.0	2.0	1.1	0.1	0.0	0.0	305.5
1959	0.0	0.6	1.1	23.4	50.9	6.0	2.8	1.6	0.1	0.0	0.0	1.5	87.9
1960	0.7	0.0	0.7	12.0	57.9	14.0	11.7	6.9	0.4	0.0	0.0	0.0	104.4
1961	0.1	6.8	7.1	2.0	9.6	19.0	9.5	9.3	0.7	0.0	0.0	0.0	64.0
1962	0.0	1.5	8.3	4.7	87.7	41.0	4.4	2.5	0.2	0.0	0.0	0.0	150.3
1963	12.7	1.6	13.7	24.8	57.9	26.3	74.2	26.2	2.7	0.3	0.0	0.0	240.5
1964	2.2	15.3	3.9	29.6	6.9	17.0	10.6	7.1	2.3	0.2	0.0	0.0	95.3
1965	0.9	16.6	134.9	66.0	10.1	15.3	54.9	2.6	0.2	0.0	0.5	0.2	302.1
1966	0.3	13.2	23.4	30.0	24.0	5.7	6.4	1.1	0.1	0.0	0.0	0.0	104.1
1967	0.0	8.3	50.4	78.8	23.6	40.6	100.3	19.5	3.3	0.2	0.0	0.0	325.1
1968	1.7	2.2	11.8	22.3	44.5	26.9	6.2	1.1	0.4	0.0	0.1	0.1	117.3
1969	0.6	11.3	31.2	126.0	81.9	36.8	24.2	1.8	0.0	0.0	0.0	0.0	313.8
1970	2.5	5.8	29.3	115.0	27.0	28.6	8.7	2.7	1.6	0.3	0.0	0.0	221.7

Table C-12. UF 15 — Calaveras River at Jenny Lind Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.3	12.6	87.8	28.2	2.0	27.1	7.0	6.4	0.6	0.6	0.0	0.0	172.7
1972	0.7	5.1	57.2	19.8	23.6	5.2	13.4	1.6	0.1	0.0	0.0	0.3	127.0
1973	1.5	11.8	21.8	100.0	75.4	45.5	10.5	1.4	0.0	0.0	0.0	0.0	267.9
1974	3.0	24.1	64.8	49.5	17.0	45.2	37.5	4.4	0.3	1.3	0.2	0.0	247.3
1975	1.0	3.9	8.7	17.6	62.5	64.1	26.3	3.5	0.2	0.1	0.5	0.4	188.9
1976	3.5	4.7	2.9	1.4	11.5	7.7	6.7	1.2	0.0	0.0	0.8	0.9	41.4
1977	0.3	1.4	0.5	3.2	2.2	3.5	1.0	6.4	0.7	0.0	0.0	0.1	19.4
1978	0.1	2.8	32.6	109.8	47.4	53.6	66.1	7.8	0.3	0.3	0.0	1.5	322.4
1979	0.3	1.7	8.9	53.6	57.4	56.0	12.8	10.3	0.6	0.0	0.0	0.0	201.5
1980	2.2	10.0	13.7	125.6	63.0	29.3	9.9	5.5	0.7	0.4	0.0	0.0	260.2
1981	0.1	0.3	3.5	26.4	22.7	32.7	12.7	2.5	0.8	0.0	0.0	0.0	101.8
1982	2.6	22.8	52.1	120.2	82.9	75.6	68.1	1.9	0.1	0.3	0.0	1.1	427.8
1983	9.1	43.2	73.1	84.5	72.4	107.6	43.2	25.4	0.9	0.0	0.0	0.3	459.7
1984	1.1	61.0	117.0	21.9	34.4	25.7	10.2	3.8	0.7	0.1	0.0	0.0	276.0
1985	2.6	21.2	12.7	11.3	27.8	30.8	7.9	0.4	0.2	0.0	0.0	0.6	115.5
1986	1.1	9.1	20.8	41.5	176.9	67.7	6.1	3.4	0.2	0.0	0.0	0.5	327.2
1987	1.3	0.1	1.1	8.9	22.5	36.9	3.4	0.4	0.2	0.0	0.0	0.0	74.8
1988	0.1	2.3	10.5	22.6	4.0	11.4	14.1	4.1	0.6	0.1	0.0	0.0	69.8
1989	0.0	7.3	10.7	11.7	19.1	63.9	12.2	2.4	0.3	0.0	0.0	1.4	129.0
1990	5.8	5.9	2.7	20.2	24.4	26.5	7.9	18.4	11.7	0.4	0.0	0.0	123.8
1991	0.1	0.6	1.6	0.9	2.3	62.7	10.8	8.6	2.0	1.3	0.0	0.0	91.0
1992	3.4	2.9	5.4	8.1	60.0	29.4	3.3	0.4	0.1	0.9	0.0	0.0	114.0
1993	0.6	1.9	34.3	107.5	62.8	38.6	19.2	2.6	10.3	0.5	0.0	0.0	278.2
1994	0.8	0.9	6.8	7.6	30.6	9.0	12.6	12.5	1.0	0.0	0.0	0.0	81.7
1995	2.1	11.2	32.6	153.3	23.3	99.5	43.8	61.6	3.2	0.6	0.0	0.0	431.1
1996	0.0	0.0	16.4	82.8	94.2	37.1	29.6	27.3	2.5	0.8	0.0	0.0	290.7
1997	0.2	10.3	141.7	158.0	20.9	4.1	1.5	1.0	1.6	0.2	0.0	0.0	339.5
1998	1.5	5.6	18.8	112.7	134.8	40.5	48.8	46.0	10.7	0.6	0.0	0.2	420.1
1999	0.2	4.5	12.2	52.6	103.0	25.4	27.8	3.3	0.4	0.0	0.0	0.0	229.3
2000	0.3	5.0	4.1	82.1	108.4	31.2	10.5	23.5	2.0	0.1	0.0	0.8	267.9
2001	2.6	3.5	6.6	19.3	43.8	24.0	29.2	3.4	0.1	0.0	0.0	0.0	132.5
2002	0.2	5.4	56.6	39.3	29.9	38.3	6.6	12.1	2.5	0.1	0.0	0.0	190.9
2003	0.0	5.3	58.4	22.5	18.1	21.9	60.9	22.1	0.6	0.0	0.3	0.0	210.1
2004	0.0	2.9	64.2	31.2	39.4	15.9	1.9	0.1	0.1	0.0	0.0	0.0	155.7
2005	9.7	9.2	36.7	78.4	34.8	61.9	23.1	26.7	2.3	0.3	0.0	0.0	283.2
2006	0.1	0.6	71.5	64.6	19.8	60.8	106.1	14.7	2.3	0.1	0.0	0.0	340.6
2007	0.9	1.8	11.1	6.4	46.8	23.5	17.2	7.9	0.3	0.0	0.0	0.0	115.9
2008	0.5	1.3	6.1	44.0	32.9	13.5	3.7	4.5	1.9	0.1	0.0	0.0	108.5
2009	0.6	3.4	3.9	11.6	33.0	46.4	16.1	25.5	0.6	0.0	0.0	0.0	141.2
2010	3.2	0.8	9.5	37.4	29.7	28.3	27.8	9.2	2.8	0.1	0.0	0.0	148.8
2011	4.6	14.4	60.8	26.7	34.2	89.2	14.0	6.8	6.8	1.1	0.0	0.0	258.8
2012	2.2	0.9	0.4	7.6	4.9	34.3	29.8	2.6	0.6	0.0	0.0	0.0	83.1
2013	0.5	6.4	47.6	11.0	1.8	4.8	7.3	0.6	0.1	0.3	0.0	0.2	80.7
2014	0.4	0.8	1.0	0.2	20.6	20.5	11.9	1.7	0.1	0.0	0.0	0.0	57.4
Average	1.4	7.7	28.5	43.1	43.2	33.9	22.5	8.9	1.6	0.2	0.0	0.1	191.2
Minimum	12.7	73.7	179.9	158.0	176.9	107.6	106.1	61.6	11.7	1.3	0.8	1.5	459.7
Maximum	0.0	0.0	0.4	0.2	1.8	1.5	0.6	0.1	0.0	0.0	0.0	0.0	19.4

Table C-13. UF 16 — Stanislaus River at Melones Reservoir Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	1.9	1.8	15.7	24.6	41.1	80.4	172.0	396.8	271.0	46.5	5.0	1.7	1,058.6
1923	5.2	40.0	91.5	37.5	37.9	95.3	258.4	253.6	151.9	124.1	9.8	11.1	1,116.3
1924	28.7	6.8	3.9	12.7	61.3	31.0	99.9	167.3	22.5	3.8	0.9	1.4	440.1
1925	20.1	65.8	29.9	23.1	206.7	135.1	212.6	205.0	256.3	98.4	11.6	4.3	1,269.0
1926	9.9	10.7	29.2	24.0	96.2	158.0	305.0	105.4	24.7	6.3	2.0	0.9	772.4
1927	5.6	123.9	43.5	22.6	120.6	141.0	337.4	247.9	150.3	17.8	3.4	2.2	1,216.2
1928	27.0	63.0	15.9	10.0	50.9	307.0	172.7	292.3	71.4	9.7	2.7	1.1	1,023.6
1929	1.2	8.6	18.7	5.1	19.7	67.9	120.6	292.9	155.4	17.7	3.8	2.0	713.4
1930	3.3	1.8	33.5	24.8	110.7	206.5	185.3	127.0	257.5	16.2	3.2	1.7	971.5
1931	8.7	17.9	13.3	65.4	58.1	81.7	112.2	163.0	58.5	9.1	2.8	1.9	592.6
1932	3.8	10.2	35.0	17.9	77.1	155.9	240.7	367.3	240.3	33.6	4.2	1.7	1,187.7
1933	2.6	2.0	2.3	3.2	19.9	150.9	158.8	179.2	193.2	15.2	3.2	1.7	732.4
1934	5.0	8.7	33.8	25.5	82.2	164.9	147.3	68.8	41.4	7.6	2.4	2.1	589.8
1935	14.4	34.1	26.7	21.2	36.6	82.5	443.7	245.1	248.8	37.8	5.4	2.9	1,199.0
1936	10.9	7.3	5.6	54.8	213.8	129.5	273.1	334.2	254.5	54.0	6.0	3.2	1,346.9
1937	3.8	4.8	13.2	6.2	142.7	122.2	177.7	579.6	158.4	28.6	5.6	2.3	1,244.9
1938	5.5	23.2	230.7	29.5	90.1	152.2	248.9	509.8	443.1	117.6	9.7	3.8	1,864.0
1939	23.1	18.8	20.4	15.8	26.0	107.5	201.2	151.7	64.2	8.9	4.9	27.6	670.3
1940	42.7	13.9	16.4	143.5	167.8	254.9	196.6	295.4	145.1	12.8	3.4	2.9	1,295.5
1941	5.3	19.7	100.3	35.1	141.2	188.6	196.1	322.0	264.7	147.3	9.5	4.6	1,434.4
1942	3.7	25.3	81.7	98.4	75.0	96.6	224.3	370.5	432.4	180.6	8.6	3.8	1,600.9
1943	4.8	57.9	63.3	127.6	100.6	217.8	307.2	342.9	212.6	80.6	8.2	3.3	1,526.9
1944	5.8	7.4	14.8	23.9	38.2	105.9	154.2	257.8	121.1	39.1	5.8	3.2	777.2
1945	7.7	85.4	35.9	15.0	193.6	62.2	272.7	306.7	272.7	55.0	6.2	4.6	1,317.7
1946	38.4	59.7	123.9	26.2	19.9	98.9	329.3	302.5	216.0	29.3	6.4	5.0	1,255.4
1947	19.1	74.3	57.6	17.8	89.7	158.9	190.2	197.2	57.5	8.6	4.0	3.5	878.3
1948	37.5	20.0	7.1	37.3	18.8	73.4	209.0	291.0	238.0	53.6	6.5	3.7	996.0
1949	4.3	5.2	4.9	4.1	11.2	80.9	296.7	252.1	73.7	8.8	4.7	4.9	751.6
1950	5.5	24.9	14.4	90.9	153.2	157.7	345.9	250.0	92.3	14.0	5.4	4.5	1,158.7
1951	39.0	312.3	298.5	117.2	128.3	157.4	201.5	275.4	199.2	55.9	7.1	4.2	1,795.9
1952	12.5	25.5	70.7	63.7	75.0	131.1	454.3	636.7	247.3	121.6	17.6	6.8	1,862.8
1953	7.5	17.3	20.7	91.4	51.2	153.3	271.4	156.3	173.7	84.1	7.8	5.1	1,039.6
1954	6.5	25.5	17.0	36.7	114.3	185.0	308.8	185.9	58.2	15.7	6.3	4.4	964.3
1955	4.5	11.9	52.2	49.6	74.4	88.4	133.9	259.0	133.8	15.1	6.7	4.6	834.1
1956	5.4	5.4	258.0	119.9	63.7	218.9	298.2	572.5	307.5	102.6	16.5	7.8	1,976.4
1957	13.4	17.5	17.1	74.8	131.9	180.7	146.7	278.1	176.2	28.3	6.4	4.9	1,075.9
1958	17.0	16.5	28.5	76.7	214.2	137.4	293.8	591.1	220.1	54.9	10.0	10.5	1,670.6
1959	8.4	8.3	11.6	75.0	107.4	154.0	156.5	91.2	49.9	8.5	6.1	40.0	717.0
1960	27.4	8.7	6.6	25.1	185.8	163.6	152.4	146.8	51.9	8.1	6.5	6.4	789.3
1961	16.5	28.5	22.2	25.5	43.7	83.6	141.6	157.6	97.0	12.9	9.2	11.6	649.8
1962	10.1	11.5	13.5	16.8	128.6	87.7	368.8	147.0	182.9	31.8	7.5	5.7	1,011.8
1963	90.9	23.5	40.2	56.0	236.0	89.6	186.2	386.1	249.7	83.1	9.3	8.8	1,459.3
1964	37.3	70.6	15.4	16.0	35.4	81.6	187.6	225.9	145.5	20.4	7.5	6.4	849.7
1965	17.1	53.0	232.8	57.7	77.3	143.8	254.3	379.2	329.5	136.4	35.8	8.5	1,725.4
1966	7.7	79.5	21.5	14.5	27.0	122.7	303.0	176.8	27.7	8.1	6.8	5.9	801.1
1967	7.5	52.4	116.6	49.8	63.5	175.4	117.8	579.3	424.5	188.9	11.3	10.6	1,797.5
1968	15.7	17.3	16.0	35.0	107.9	136.4	141.5	138.5	82.5	10.6	9.6	9.4	720.4
1969	14.2	79.6	30.2	261.1	54.7	122.3	337.5	676.2	358.5	143.6	17.4	10.8	2,106.1
1970	34.8	40.8	129.4	256.9	87.3	137.5	157.8	320.8	294.3	42.2	7.7	7.0	1,516.5

Table C-13. UF 16 — Stanislaus River at Melones Reservoir Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	7.4	82.1	61.3	22.3	73.3	122.7	179.9	196.4	303.6	81.7	11.6	10.0	1,152.4
1972	13.0	25.6	27.8	15.8	74.2	217.2	125.2	190.0	96.2	10.2	7.0	14.8	816.9
1973	18.0	37.3	46.5	79.2	87.9	71.9	293.6	532.2	167.6	15.2	9.2	8.1	1,366.6
1974	30.9	124.6	86.7	56.6	38.1	205.8	243.5	400.3	311.0	75.4	12.5	7.4	1,592.7
1975	16.8	23.8	38.5	45.2	96.6	118.9	100.5	491.4	284.7	26.6	21.3	14.1	1,278.3
1976	37.3	31.3	13.2	11.3	37.2	55.3	70.9	178.4	33.9	14.2	28.4	34.6	546.0
1977	15.4	12.7	9.6	10.5	39.4	29.9	95.1	63.6	79.9	11.5	7.6	8.3	383.4
1978	10.0	22.5	79.8	124.1	91.2	295.3	265.1	460.8	346.8	69.8	10.9	55.2	1,831.5
1979	14.7	9.5	10.5	67.7	58.8	167.8	212.1	456.5	132.6	17.5	9.3	7.5	1,164.6
1980	24.7	47.0	29.5	220.5	187.8	96.0	274.1	279.5	277.8	213.1	16.4	9.3	1,675.9
1981	9.2	9.7	16.1	59.5	68.1	110.9	224.9	191.0	63.1	11.4	7.6	8.1	779.8
1982	30.6	161.2	117.8	23.6	225.4	223.2	367.7	439.3	373.9	241.5	25.7	53.0	2,282.7
1983	123.7	102.9	74.3	66.2	129.2	255.0	174.6	640.8	545.5	281.1	55.9	33.5	2,482.6
1984	27.2	207.6	114.7	37.8	73.7	186.4	217.8	360.6	231.4	44.8	9.9	8.5	1,520.6
1985	21.3	62.5	17.9	15.8	61.6	92.9	277.0	162.4	79.4	15.7	11.9	29.4	847.8
1986	29.6	28.8	36.3	92.1	417.0	384.4	247.7	321.3	315.9	68.3	13.1	11.8	1,966.3
1987	24.3	12.1	10.7	13.9	65.8	130.8	222.7	116.4	22.2	10.0	8.6	8.4	645.8
1988	14.0	22.3	13.4	28.2	91.5	110.0	139.6	155.4	62.0	15.4	10.8	8.8	671.3
1989	9.5	24.5	21.2	15.2	46.3	244.1	324.0	193.9	81.2	15.2	10.3	42.7	1,028.0
1990	63.2	39.0	19.3	40.8	38.6	174.3	198.7	159.6	119.8	20.8	10.6	10.3	894.9
1991	11.2	10.6	11.2	10.1	33.9	123.9	136.2	217.7	197.8	37.8	11.0	10.7	811.9
1992	21.7	26.2	22.2	17.2	105.9	151.0	195.6	162.1	24.4	74.1	11.0	9.9	821.3
1993	17.6	19.2	30.0	56.6	73.3	275.8	292.0	518.2	339.8	97.5	11.5	8.5	1,740.1
1994	15.5	13.7	14.4	28.1	48.4	121.6	162.7	166.1	42.6	10.0	8.6	11.4	643.3
1995	27.5	22.2	20.8	133.1	103.1	309.1	303.5	471.1	452.7	457.3	81.5	11.4	2,393.4
1996	9.0	8.9	71.3	46.4	217.2	179.3	295.3	429.8	312.2	50.3	10.7	9.6	1,640.1
1997	11.1	74.9	153.6	359.9	70.6	199.5	269.3	409.0	299.8	47.1	10.8	10.0	1,915.4
1998	16.7	24.7	29.3	87.6	82.1	167.1	253.4	342.3	646.7	324.5	38.2	26.9	2,039.5
1999	14.7	23.4	36.4	112.0	101.2	71.7	202.8	450.9	281.2	38.4	11.3	10.2	1,354.3
2000	15.7	35.1	13.7	154.7	139.2	111.6	318.7	438.5	115.8	16.1	10.1	18.7	1,388.0
2001	21.3	14.8	15.7	68.3	41.5	150.7	200.0	229.3	16.4	17.8	10.8	11.3	798.0
2002	13.1	69.2	109.0	56.8	90.4	179.0	191.3	234.7	89.1	12.4	9.8	10.1	1,065.0
2003	10.3	101.0	122.6	54.1	74.1	120.8	176.4	372.3	98.3	16.6	23.8	11.8	1,182.3
2004	9.9	23.2	153.1	49.2	92.6	286.6	179.1	78.6	15.8	9.9	9.5	9.6	917.2
2005	69.3	51.7	75.9	116.6	84.1	231.1	226.6	520.4	161.2	27.0	10.0	12.2	1,586.0
2006	15.9	21.0	197.6	122.1	149.0	163.0	379.5	618.0	117.4	12.6	10.5	10.3	1,816.9
2007	17.0	33.1	49.7	32.9	122.0	188.6	121.8	71.7	12.3	9.9	10.0	13.0	682.1
2008	16.1	19.9	34.1	64.7	73.2	125.4	199.1	182.8	28.6	13.7	10.1	9.6	777.4
2009	21.3	84.3	26.0	136.8	99.8	206.0	222.3	242.7	23.8	12.3	13.8	11.0	1,100.2
2010	90.0	18.1	42.7	80.8	83.9	143.8	280.2	233.9	155.2	15.9	9.7	9.4	1,163.5
2011	151.0	75.8	184.2	75.3	61.0	203.5	264.8	376.7	373.3	111.9	11.2	16.9	1,905.4
2012	35.3	14.4	13.8	58.2	34.6	114.5	230.6	121.7	28.1	10.5	11.5	10.1	683.2
2013	12.1	60.8	154.6	44.0	41.9	102.8	133.5	139.6	39.9	14.0	9.6	10.9	763.5
2014	11.8	15.1	14.9	26.4	124.7	118.6	6.7	0.0	0.0	0.0	0.0	0.0	318.2
Average	20.9	39.8	54.2	60.2	93.1	150.0	222.6	293.3	180.6	55.4	11.0	10.3	1,191.4
Minimum	151.0	312.3	298.5	359.9	417.0	384.4	454.3	676.2	646.7	457.3	81.5	55.2	2,482.6
Maximum	1.2	1.8	2.3	3.2	11.2	29.9	6.7	0.0	0.0	0.0	0.0	0.0	318.2

Table C-14. UF 18 — Tuolumne River at Don Pedro Reservoir Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	4.5	6.7	150.4	76.9	251.8	218.2	238.9	596.1	397.8	31.4	6.3	2.1	1,981.1
1923	19.3	89.1	268.3	170.2	91.3	139.9	250.5	382.0	237.0	110.0	9.7	22.9	1,790.4
1924	40.8	13.3	12.8	52.2	80.3	59.2	156.4	154.9	11.5	3.3	1.1	1.9	587.6
1925	48.6	115.7	94.0	67.5	351.7	228.6	321.4	367.1	279.6	48.6	16.4	9.1	1,948.3
1926	28.3	28.5	49.2	84.2	242.1	161.3	378.5	222.3	55.3	10.9	4.9	1.5	1,267.1
1927	7.3	223.2	68.1	137.7	289.4	163.0	378.1	406.9	293.3	17.7	5.6	5.3	1,995.6
1928	107.8	153.1	82.2	83.1	113.1	483.5	223.5	412.4	107.8	9.4	3.3	1.7	1,781.0
1929	1.8	36.0	59.2	38.4	67.4	194.2	184.1	351.3	200.4	15.0	4.7	4.4	1,156.9
1930	7.1	3.4	64.7	108.5	188.2	275.0	218.2	168.1	219.5	11.0	5.1	6.8	1,275.7
1931	19.9	50.4	21.7	112.9	81.6	125.7	171.6	225.8	45.6	8.6	7.0	7.6	878.4
1932	9.4	31.0	246.7	110.8	254.6	237.5	236.2	468.5	558.1	104.2	7.5	3.5	2,267.9
1933	6.1	9.2	20.7	71.5	66.8	245.2	235.7	270.6	323.7	17.0	5.6	4.5	1,276.7
1934	23.1	38.8	216.4	125.4	171.6	266.7	173.1	85.4	55.4	9.2	6.0	6.4	1,177.5
1935	48.1	121.9	102.0	187.7	127.7	194.8	513.4	395.5	489.8	42.3	9.5	7.4	2,240.0
1936	35.2	21.1	31.6	223.2	498.5	311.2	434.2	391.8	292.7	41.8	9.6	6.8	2,297.6
1937	16.3	14.9	133.9	39.8	426.0	302.9	259.9	625.0	309.0	35.7	8.4	3.6	2,175.3
1938	14.3	46.3	575.6	164.5	301.6	384.0	418.3	608.8	616.2	178.0	11.9	10.8	3,330.3
1939	82.7	39.5	49.6	62.2	78.3	311.9	288.4	149.2	44.0	9.3	5.5	41.4	1,162.0
1940	85.4	25.1	40.2	414.8	286.1	399.9	297.9	513.7	193.3	11.9	4.6	4.6	2,277.5
1941	18.4	33.6	279.1	152.9	295.5	218.0	252.5	518.1	482.3	219.0	14.0	6.7	2,490.2
1942	8.1	78.1	254.1	236.1	126.2	161.1	325.1	404.6	582.0	205.1	10.9	6.4	2,397.7
1943	10.6	183.5	178.1	321.7	176.6	400.2	319.7	433.9	288.2	139.9	10.9	5.0	2,468.2
1944	15.9	28.5	38.1	100.8	137.6	212.6	181.0	399.3	206.1	59.6	8.4	5.2	1,393.1
1945	76.0	206.3	110.2	49.7	328.5	167.8	355.6	349.8	410.1	77.6	10.3	9.5	2,151.5
1946	165.2	126.6	360.8	97.6	80.8	183.5	357.3	357.2	248.6	28.8	10.7	10.7	2,027.7
1947	53.8	180.2	142.6	40.3	139.5	220.5	190.3	296.2	59.3	10.2	5.4	7.0	1,345.1
1948	102.1	43.8	13.6	62.0	48.0	179.8	385.5	376.9	294.8	37.5	8.0	4.8	1,556.8
1949	10.7	20.2	31.2	30.7	73.8	210.2	499.2	340.0	181.7	13.0	9.3	8.2	1,428.1
1950	8.0	67.3	32.8	132.7	236.9	217.9	438.9	403.9	141.1	16.4	9.9	7.9	1,713.7
1951	133.9	730.8	561.3	135.4	140.5	179.7	215.7	382.3	273.2	38.8	10.3	8.5	2,810.2
1952	24.1	101.5	216.4	254.5	173.2	238.1	492.3	653.0	463.0	269.5	26.2	12.4	2,924.1
1953	12.2	30.4	130.8	226.0	64.1	143.1	265.4	180.7	340.4	127.1	15.1	10.5	1,546.0
1954	11.0	62.3	60.9	111.3	226.4	254.6	433.1	377.6	86.2	12.7	7.7	5.8	1,649.4
1955	5.9	50.8	173.6	82.5	95.5	122.2	121.7	414.2	279.9	26.4	10.0	7.0	1,389.7
1956	9.1	20.3	968.6	297.9	74.8	187.1	306.8	581.4	550.0	214.8	15.3	10.5	3,236.5
1957	39.9	50.2	38.8	80.3	236.9	227.7	195.5	386.3	265.2	15.6	8.3	8.0	1,552.8
1958	28.8	35.1	160.8	171.0	301.5	294.1	484.2	631.0	356.1	94.2	20.1	26.0	2,602.7
1959	11.6	16.4	26.3	178.9	184.6	159.6	255.7	139.0	81.8	11.0	9.0	146.8	1,220.6
1960	24.2	10.8	11.0	76.9	244.0	306.5	264.9	250.0	97.9	15.1	11.1	10.0	1,322.3
1961	20.2	78.8	87.2	58.1	68.1	139.9	194.2	157.7	136.7	16.8	24.0	21.3	1,003.0
1962	14.5	36.0	66.6	65.8	391.2	195.9	504.7	237.5	330.7	31.8	12.1	18.5	1,905.5
1963	121.8	22.6	112.3	408.2	418.7	139.5	288.4	493.4	361.7	154.6	14.3	17.3	2,553.0
1964	53.6	200.9	51.8	79.5	61.8	129.6	199.0	289.3	181.1	19.8	13.2	12.4	1,292.0
1965	32.6	136.6	730.9	244.0	153.5	142.3	363.6	338.3	421.5	270.3	97.8	15.3	2,946.6
1966	14.3	221.2	121.6	74.8	69.3	190.0	324.6	286.8	41.8	11.3	9.3	11.1	1,375.9
1967	11.1	155.5	295.6	220.5	124.2	258.5	224.6	730.0	627.7	377.0	22.9	22.7	3,070.2
1968	24.3	39.1	57.0	142.8	217.3	180.8	148.9	190.8	104.3	13.8	17.4	12.1	1,148.8
1969	48.4	184.2	97.2	743.5	197.0	276.5	392.9	736.4	581.5	346.3	26.0	11.8	3,641.7
1970	87.7	92.3	177.1	503.6	144.4	178.2	100.1	486.9	411.7	47.0	10.8	8.5	2,248.2

Table C-14. UF 18 — Tuolumne River at Don Pedro Reservoir Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	10.1	199.5	167.9	123.0	112.9	197.4	153.5	239.4	439.5	122.7	20.4	17.7	1,804.1
1972	14.3	69.0	111.6	75.4	168.9	256.1	163.0	285.4	148.6	13.0	9.5	27.8	1,342.6
1973	27.0	88.3	115.4	219.5	236.1	145.8	319.1	614.4	262.8	16.8	20.5	10.8	2,076.6
1974	76.9	238.5	286.7	161.6	68.3	330.7	257.0	470.8	384.3	89.3	18.6	9.7	2,392.5
1975	38.2	49.0	99.3	124.5	244.9	280.9	183.5	560.7	402.1	30.0	28.3	19.7	2,061.0
1976	111.3	77.4	37.0	26.6	64.5	112.8	100.1	221.7	27.0	27.6	42.5	39.3	887.7
1977	22.8	21.1	13.4	28.7	60.6	37.8	117.6	97.5	112.5	13.5	10.0	10.9	546.5
1978	13.8	62.8	275.1	310.3	239.1	512.2	352.3	448.6	550.5	207.0	18.2	111.2	3,101.1
1979	14.0	27.6	44.6	218.6	186.5	326.4	269.1	558.1	294.1	20.6	12.9	10.5	1,983.0
1980	52.7	96.4	116.7	591.7	365.9	149.6	333.6	368.4	459.2	385.8	25.5	16.2	2,961.7
1981	16.8	22.5	88.4	148.0	137.2	188.5	315.8	261.0	119.2	14.4	10.0	12.4	1,334.3
1982	70.3	343.4	291.7	166.9	384.7	326.2	514.6	532.3	497.8	311.6	32.0	107.9	3,579.5
1983	215.3	229.9	202.5	270.3	323.5	435.3	237.0	733.5	796.2	400.4	74.4	36.5	3,954.7
1984	53.0	304.2	377.6	108.7	141.7	190.7	193.9	575.2	292.8	42.0	15.1	13.6	2,308.5
1985	53.7	164.8	50.2	49.6	143.7	159.1	405.1	203.6	87.0	16.5	14.5	37.2	1,385.1
1986	59.6	84.6	170.8	242.2	714.9	522.3	194.1	420.1	371.7	41.6	14.4	22.1	2,858.6
1987	31.0	14.8	21.9	52.5	132.9	194.2	319.2	152.1	39.9	14.4	11.8	11.9	996.7
1988	40.6	50.5	53.1	136.5	130.0	142.6	197.3	234.6	85.1	16.2	14.0	13.6	1,114.0
1989	12.7	59.9	55.5	59.5	106.0	443.1	405.2	237.8	167.9	15.7	16.6	69.9	1,649.8
1990	121.1	78.7	38.3	93.6	86.0	222.4	215.0	145.5	141.3	30.3	16.7	14.6	1,203.5
1991	23.7	22.1	18.4	23.3	78.0	333.9	203.2	261.6	346.5	49.5	14.7	16.4	1,391.5
1992	66.6	75.0	58.8	71.7	219.3	216.7	263.3	172.7	37.3	59.0	16.6	15.6	1,272.6
1993	59.8	44.9	144.3	348.5	184.5	568.8	320.2	511.3	425.4	124.5	14.8	11.3	2,758.2
1994	31.1	33.6	57.4	69.9	142.6	203.0	192.6	226.3	53.2	13.0	11.7	17.8	1,052.1
1995	65.3	81.7	93.7	486.7	222.4	543.9	411.2	491.4	598.4	531.3	73.1	14.1	3,613.1
1996	12.5	14.4	221.0	228.9	428.7	369.4	334.7	466.0	363.8	55.6	17.1	12.7	2,524.8
1997	22.2	220.3	518.7	840.1	91.4	268.9	203.2	535.7	306.6	77.0	15.9	15.8	3,115.9
1998	24.5	72.5	79.0	346.6	349.7	445.1	356.6	318.8	603.1	394.8	20.2	39.6	3,050.5
1999	23.8	80.9	94.9	284.3	289.6	141.7	276.6	395.0	316.8	31.8	17.6	16.8	1,969.8
2000	33.8	83.4	24.9	376.1	377.8	255.2	362.8	445.6	179.0	17.3	15.0	28.2	2,199.2
2001	52.0	37.0	49.7	107.8	100.4	384.5	288.7	310.6	21.9	22.2	13.5	17.2	1,405.6
2002	31.6	139.5	234.3	114.8	179.7	236.2	284.0	321.9	163.7	16.3	13.4	16.2	1,751.7
2003	15.2	228.8	211.3	179.3	74.6	223.5	254.8	524.5	203.4	23.4	31.0	16.5	1,986.4
2004	13.3	47.3	278.8	116.7	181.1	425.3	218.0	220.2	72.3	15.1	13.9	13.5	1,615.6
2005	159.7	86.0	215.9	340.7	211.7	358.5	235.9	633.4	430.8	229.5	17.3	18.8	2,938.1
2006	27.2	39.9	553.3	252.6	232.3	251.0	553.3	638.7	486.8	50.3	14.7	12.7	3,112.6
2007	25.6	57.9	91.5	64.3	210.4	281.4	183.3	129.9	16.8	13.5	14.8	17.9	1,107.2
2008	27.3	24.4	72.8	192.5	218.1	187.3	190.9	291.0	127.2	18.2	13.7	12.7	1,376.0
2009	59.2	134.5	64.8	244.9	212.1	288.6	247.4	536.6	99.8	17.2	17.4	14.8	1,937.4
2010	168.1	32.4	101.4	199.4	197.7	246.7	302.3	279.1	456.9	74.6	14.6	13.0	2,086.2
2011	223.5	123.1	463.4	190.9	130.9	465.6	397.4	429.3	629.3	193.4	18.0	31.1	3,295.9
2012	65.9	26.0	20.3	117.5	61.5	218.0	369.7	152.2	32.4	14.5	16.3	14.5	1,108.8
2013	17.8	170.7	340.7	99.0	53.9	188.1	210.1	202.6	55.9	17.0	13.8	17.7	1,387.4
2014	18.2	25.9	24.6	48.0	206.7	189.0	193.8	112.8	19.9	25.8	16.3	18.1	899.0
Average	44.4	91.4	156.2	174.9	192.5	250.4	285.6	371.9	272.5	81.2	15.9	17.8	1,954.6
Minimum	223.5	730.8	968.6	840.1	714.9	568.8	553.3	736.4	796.2	531.3	97.8	146.8	3,954.7
Maximum	1.8	3.4	11.0	23.3	48.0	37.8	100.1	85.4	11.5	3.3	1.1	1.5	546.5

Table C-15. UF 19 — Merced River at Exchequer Reservoir Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	1.8	1.7	69.2	39.8	98.7	108.3	139.6	352.8	246.7	73.4	4.4	0.5	1,136.7
1923	5.1	41.6	93.7	68.0	39.6	70.5	160.1	229.3	72.6	129.7	11.7	4.8	926.8
1924	10.9	4.4	2.9	14.3	21.0	24.2	60.0	70.0	21.1	1.5	0.0	0.0	230.3
1925	13.7	47.5	28.3	29.2	127.3	103.5	186.1	202.8	146.2	56.8	5.4	2.1	948.9
1926	9.8	8.0	16.9	12.7	105.0	82.0	195.0	89.8	83.7	9.3	1.6	0.0	613.9
1927	1.4	110.9	33.8	49.2	114.1	70.1	185.8	261.8	152.5	28.6	3.3	1.7	1,013.2
1928	27.2	78.3	21.6	21.8	49.0	184.2	110.9	233.8	77.8	13.9	2.3	0.1	821.0
1929	0.0	13.7	21.3	15.0	33.0	78.2	86.6	179.0	102.7	22.6	2.6	2.4	557.1
1930	3.3	0.7	23.1	41.9	82.3	134.8	122.1	66.9	146.5	11.9	1.2	0.3	635.1
1931	5.5	20.9	6.0	30.0	36.4	50.5	64.9	88.9	44.5	10.0	1.5	0.9	360.0
1932	2.3	7.4	97.5	39.7	105.7	168.3	131.5	250.8	324.0	97.5	6.1	0.6	1,231.6
1933	0.4	1.0	8.6	12.8	40.7	118.5	136.3	93.3	211.8	25.0	2.6	0.1	651.0
1934	1.0	17.2	82.5	54.9	67.3	149.7	83.2	71.6	33.7	10.1	0.9	1.0	573.2
1935	12.6	65.6	46.7	95.0	62.3	80.7	266.4	239.7	275.5	42.5	5.6	2.4	1,194.9
1936	10.9	6.5	7.8	84.1	200.0	161.5	265.5	181.9	155.2	46.7	3.9	0.8	1,124.9
1937	4.1	7.1	50.0	14.9	177.2	157.8	154.3	400.7	165.8	70.0	4.2	0.3	1,206.3
1938	3.2	9.3	262.5	67.5	122.7	211.5	220.5	364.4	365.3	164.6	18.3	3.2	1,813.2
1939	19.2	20.3	8.0	19.2	30.8	141.7	133.0	55.8	86.0	7.9	0.8	9.8	532.4
1940	38.5	6.8	5.3	170.2	107.7	171.5	210.5	297.2	149.6	13.8	1.3	0.1	1,172.5
1941	5.2	12.3	101.5	75.6	137.7	119.5	131.3	396.3	256.8	153.9	14.8	3.2	1,408.0
1942	1.0	21.6	90.3	92.8	62.3	76.4	169.9	253.3	354.7	161.8	7.7	0.9	1,292.6
1943	3.0	64.3	57.4	103.9	95.2	190.8	222.8	286.6	138.5	138.1	9.2	1.0	1,310.8
1944	1.8	9.3	15.2	38.6	46.2	101.7	90.3	221.9	82.6	84.7	4.8	0.3	697.4
1945	4.2	116.8	32.5	11.4	118.7	59.7	202.6	234.1	206.9	77.7	4.8	1.8	1,071.3
1946	24.6	73.0	118.8	31.4	22.1	81.1	249.7	197.3	150.9	78.5	6.8	1.5	1,035.7
1947	18.7	70.6	65.7	12.5	47.7	96.7	119.8	175.1	51.5	10.3	3.1	0.6	672.2
1948	26.3	14.4	2.6	11.0	8.9	74.4	192.8	186.1	146.4	75.2	5.0	0.4	743.5
1949	2.7	5.5	7.2	6.8	28.4	114.5	268.1	145.5	135.6	13.7	2.3	1.1	731.4
1950	0.9	19.3	10.5	33.2	110.1	74.2	259.6	173.2	98.8	35.8	2.5	0.6	818.6
1951	19.2	311.7	218.1	41.1	69.6	83.2	142.4	241.7	197.4	67.9	5.4	0.4	1,398.2
1952	4.2	27.9	74.8	97.4	89.2	98.8	296.0	391.4	225.6	169.5	32.1	3.3	1,510.1
1953	2.6	5.6	46.7	77.0	36.6	67.1	128.6	87.2	160.5	97.7	5.2	1.1	715.8
1954	1.4	16.0	15.4	39.1	88.0	119.1	257.5	174.2	54.8	33.6	3.0	0.1	802.2
1955	0.0	21.6	65.7	38.0	32.6	49.1	62.6	227.4	146.7	28.9	4.9	0.4	677.8
1956	0.2	3.1	388.0	133.4	30.4	98.0	209.0	376.0	382.0	202.8	21.6	6.1	1,850.7
1957	10.4	9.5	5.0	22.4	74.1	83.4	95.1	181.1	202.6	18.6	1.8	0.6	704.6
1958	5.5	8.3	68.5	60.8	120.5	126.0	269.6	406.3	171.5	114.1	13.2	7.8	1,372.0
1959	4.4	3.7	2.3	67.6	67.9	92.9	126.2	72.3	76.7	6.8	1.0	47.9	569.7
1960	12.1	3.6	1.1	31.4	80.9	163.9	141.9	92.4	107.0	6.1	1.0	0.4	641.7
1961	8.3	31.4	32.0	14.1	28.5	50.8	102.0	55.3	117.6	11.8	4.9	2.9	459.6
1962	2.7	11.2	35.1	5.5	184.1	81.4	327.9	116.1	173.1	48.8	5.8	1.7	993.5
1963	20.7	6.1	26.0	23.6	288.5	59.5	112.6	322.5	190.5	131.0	15.8	4.7	1,201.5
1964	13.8	80.1	14.2	11.1	22.0	47.3	109.5	113.6	93.2	38.2	4.5	3.2	550.8
1965	4.3	58.5	206.1	90.5	75.1	76.6	184.0	251.4	287.4	191.7	49.6	5.0	1,480.2
1966	2.3	109.9	28.4	22.7	27.5	72.9	232.1	131.6	52.5	10.0	1.2	0.6	691.8
1967	1.5	38.5	133.7	63.5	69.9	129.6	99.7	468.8	391.9	235.3	11.9	5.4	1,649.7
1968	6.9	7.3	16.8	29.2	91.8	78.3	92.1	86.7	89.8	9.4	2.0	1.3	511.7
1969	7.9	55.4	44.4	275.1	81.9	131.2	272.1	532.2	364.3	242.9	59.2	5.2	2,071.8
1970	20.4	32.3	46.9	174.5	57.2	100.2	67.1	313.1	210.5	40.2	3.0	0.1	1,065.6

Table C-15. UF 19 — Merced River at Exchequer Reservoir Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.2	47.2	78.1	36.6	56.1	96.8	105.3	138.6	208.4	82.3	9.3	4.7	863.5
1972	2.0	19.5	38.7	17.5	67.9	143.9	74.9	157.3	124.5	20.3	2.1	7.1	675.5
1973	6.3	36.0	28.7	75.6	107.6	72.6	173.5	367.1	158.9	17.6	5.2	1.0	1,050.0
1974	17.7	77.4	89.9	65.3	29.7	149.1	158.6	275.3	231.4	47.7	6.3	0.7	1,149.1
1975	8.8	16.7	38.1	40.6	92.0	133.0	86.0	319.5	238.4	39.0	7.9	5.8	1,025.8
1976	25.1	32.8	5.9	2.8	24.7	50.8	32.6	85.8	28.3	10.2	6.9	12.0	317.9
1977	7.8	3.2	1.7	9.9	13.1	9.5	38.4	28.2	73.5	6.1	0.5	0.1	191.9
1978	0.5	19.9	100.9	143.8	115.3	230.6	235.3	303.8	336.2	148.6	30.8	30.0	1,695.6
1979	6.6	7.1	13.8	77.2	69.7	161.7	144.4	351.2	165.0	31.9	5.5	0.5	1,034.7
1980	6.4	30.9	19.8	246.1	154.7	88.7	204.6	271.1	257.7	239.8	40.7	3.7	1,564.3
1981	1.5	3.7	23.7	35.0	72.0	84.1	157.3	131.0	105.7	7.7	0.9	0.4	623.0
1982	18.8	114.5	63.5	80.1	159.1	134.0	259.8	405.1	268.5	181.5	36.5	22.6	1,744.1
1983	46.2	99.6	84.2	93.7	124.6	204.7	145.8	413.3	547.2	145.5	71.2	22.3	1,998.3
1984	19.7	108.6	134.0	45.0	60.5	107.8	106.0	315.4	150.2	63.2	5.8	1.0	1,117.1
1985	12.8	53.9	20.6	9.5	52.7	65.7	193.8	73.3	90.8	7.2	3.1	2.8	586.2
1986	12.2	30.1	51.2	89.9	286.8	243.3	161.9	239.3	280.0	63.1	10.1	1.8	1,469.7
1987	5.4	2.2	1.8	11.2	47.3	61.4	149.2	84.9	27.1	4.7	0.5	0.4	396.2
1988	8.9	24.8	14.3	44.3	53.4	80.6	86.6	125.2	64.8	9.0	1.8	0.3	514.0
1989	0.3	13.7	15.4	13.0	45.9	185.3	234.6	88.1	82.3	21.1	3.4	13.4	716.6
1990	41.9	18.7	7.4	50.2	36.9	105.5	84.5	54.1	98.9	22.1	3.0	0.5	523.6
1991	2.1	3.4	3.7	2.3	13.1	122.9	110.5	170.2	199.7	55.4	4.3	1.9	689.7
1992	13.6	20.8	16.6	25.3	91.4	102.7	135.1	124.0	35.0	29.7	4.7	1.1	600.2
1993	4.3	18.3	43.1	132.7	87.0	323.4	157.6	311.8	244.1	147.8	21.5	2.3	1,494.0
1994	4.5	5.8	18.4	12.5	57.2	86.2	89.0	95.0	59.2	6.6	0.6	0.8	435.7
1995	23.7	24.5	26.8	183.8	105.7	251.5	170.9	278.2	399.1	350.5	71.5	6.5	1,892.7
1996	1.1	0.1	61.6	72.4	183.1	183.1	172.2	298.7	239.6	59.8	4.8	0.8	1,277.4
1997	1.4	83.0	177.6	270.5	49.3	178.6	149.6	356.5	194.4	102.9	16.7	4.3	1,584.7
1998	3.4	19.3	39.2	125.7	140.7	223.9	163.9	194.1	338.4	285.7	31.0	8.7	1,574.0
1999	4.0	14.2	37.9	90.3	105.8	65.9	151.5	199.1	173.1	47.1	3.6	1.1	893.4
2000	2.8	20.3	6.9	125.1	145.9	148.6	218.2	225.1	154.4	11.5	1.5	4.3	1,064.5
2001	13.5	10.4	6.0	26.2	37.2	167.4	124.0	201.9	32.1	7.6	1.3	0.3	627.8
2002	2.5	42.8	62.6	62.5	68.4	90.6	188.2	133.6	170.3	19.0	1.8	0.9	843.2
2003	1.1	86.3	70.6	54.1	38.0	109.2	111.9	284.4	208.1	15.5	13.9	2.2	995.2
2004	0.5	6.6	81.5	42.1	71.7	251.7	119.8	94.4	107.3	10.1	1.3	0.0	787.0
2005	55.0	29.8	60.8	148.0	84.7	167.8	127.9	409.2	277.8	197.9	9.8	3.4	1,572.1
2006	3.6	6.4	148.3	123.6	49.3	153.8	229.3	488.6	317.1	67.8	3.8	0.2	1,591.7
2007	4.8	9.6	26.9	16.9	60.8	137.6	71.1	86.0	23.7	3.5	0.4	1.7	443.0
2008	2.4	4.6	22.3	75.6	89.5	94.4	102.5	173.2	102.5	9.2	1.0	0.0	677.1
2009	9.0	42.7	17.7	77.3	85.0	126.0	156.5	318.0	51.5	39.6	3.3	1.6	928.2
2010	54.3	12.9	38.6	75.8	71.6	127.9	152.8	146.3	277.0	102.1	5.1	0.4	1,064.8
2011	53.0	45.8	263.6	62.3	43.8	150.3	244.4	235.3	329.7	226.1	28.5	9.9	1,692.6
2012	18.7	6.3	1.5	21.0	24.2	74.4	194.5	93.6	37.9	4.3	0.4	0.2	477.1
2013	0.3	18.2	117.0	31.0	28.4	92.6	137.9	120.8	74.1	10.1	0.8	0.3	631.5
2014	2.2	2.4	2.0	2.1	32.9	68.7	72.9	67.7	23.5	4.0	2.3	0.5	281.1
Average	10.1	32.4	54.2	60.9	79.0	118.0	156.3	214.8	169.8	68.3	9.4	3.5	976.6
Minimum	55.0	311.7	388.0	275.1	288.5	323.4	327.9	532.2	547.2	350.5	71.5	47.9	2,071.8
Maximum	0.0	0.1	1.1	2.1	8.9	9.5	32.6	28.2	21.1	1.5	0.0	0.0	191.9

Table C-16. UF 20 — Chowchilla River at Buchanan Reservoir Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.2	0.2	11.6	11.4	33.2	27.4	14.1	3.2	1.3	0.4	0.0	0.0	103.0
1923	0.1	5.1	14.0	17.0	11.3	6.5	22.3	2.1	0.8	0.2	0.0	0.1	79.4
1924	1.1	0.7	0.5	1.2	2.7	8.3	3.9	1.4	0.3	0.0	0.0	0.0	20.1
1925	0.5	8.9	6.3	4.9	30.3	10.0	14.1	2.4	1.1	0.3	0.0	0.0	78.9
1926	0.6	1.2	2.3	4.4	30.6	4.7	19.1	1.8	0.5	0.1	0.0	0.0	65.3
1927	0.1	11.0	8.6	11.0	36.6	12.7	19.9	1.6	0.7	0.2	0.0	0.0	102.4
1928	0.5	6.7	7.2	6.0	15.6	35.6	15.6	1.5	0.5	0.1	0.0	0.0	89.2
1929	0.0	2.1	3.5	5.2	11.1	18.1	15.3	2.1	0.9	0.7	0.1	0.0	59.2
1930	0.3	0.1	0.9	4.9	15.3	22.0	7.3	3.3	0.9	0.1	0.0	0.0	55.0
1931	0.5	2.5	1.6	6.7	8.7	5.1	1.9	1.8	1.1	0.3	0.0	0.0	30.2
1932	0.2	1.3	27.6	15.6	32.8	17.9	10.1	4.0	1.0	0.2	0.0	0.0	110.6
1933	0.1	0.0	0.6	5.6	8.4	19.8	4.3	3.5	1.1	0.3	0.0	0.0	43.6
1934	0.0	0.4	5.9	9.4	14.0	4.4	1.1	0.6	0.4	0.2	0.0	0.0	36.4
1935	0.5	5.8	8.9	22.5	10.7	23.8	30.4	4.6	0.9	0.1	0.0	0.0	108.2
1936	0.4	1.1	1.3	15.3	65.1	11.4	16.7	1.7	0.6	0.3	0.0	0.0	113.8
1937	0.0	0.8	7.3	7.7	60.4	38.5	15.5	2.2	0.6	0.1	0.0	0.0	133.2
1938	0.0	0.6	24.1	21.5	65.1	72.7	16.8	6.1	1.1	0.5	0.1	0.0	208.6
1939	0.8	2.4	4.1	8.5	12.8	21.1	8.2	1.2	0.9	0.2	0.0	0.3	60.4
1940	2.2	1.1	1.9	46.3	29.2	21.4	10.7	1.9	0.6	0.1	0.0	0.0	115.3
1941	0.1	1.3	26.1	23.6	39.2	24.1	20.6	3.5	0.8	0.1	0.0	0.0	139.4
1942	0.0	0.8	23.4	24.4	27.0	18.7	18.7	7.7	1.7	0.4	0.0	0.0	122.8
1943	0.1	12.9	11.1	49.0	25.4	45.6	7.8	3.4	1.2	0.3	0.0	0.0	157.0
1944	0.0	0.9	3.1	10.3	21.1	17.0	5.7	2.0	0.8	0.1	0.0	0.0	61.1
1945	0.1	16.1	8.1	3.4	55.8	32.5	8.2	1.3	0.8	0.3	0.0	0.0	126.5
1946	0.6	4.2	26.2	12.7	11.6	23.1	12.4	1.2	0.9	0.2	0.0	0.0	93.1
1947	0.7	15.6	15.1	6.6	15.3	11.9	6.0	1.2	0.5	0.2	0.0	0.0	73.1
1948	0.6	1.7	1.4	3.7	7.0	32.3	30.1	4.0	1.5	0.5	0.0	0.0	82.8
1949	0.1	0.5	1.0	3.5	11.4	36.8	9.0	1.6	0.9	0.2	0.0	0.0	65.0
1950	0.0	2.0	2.5	11.9	23.6	19.2	14.1	1.9	0.5	0.0	0.0	0.0	75.9
1951	0.6	40.6	33.2	17.5	17.9	18.7	3.7	3.9	0.8	0.1	0.0	0.0	137.1
1952	0.2	2.7	20.5	37.0	22.9	45.1	25.5	5.3	1.0	0.4	0.1	0.0	160.6
1953	0.2	1.4	14.9	24.6	9.1	13.6	4.6	3.3	1.7	0.6	0.0	0.0	73.9
1954	0.0	1.5	3.3	14.7	28.8	29.3	7.8	3.0	0.8	0.3	0.0	0.0	89.4
1955	0.0	1.5	9.4	13.1	10.8	10.2	5.7	5.1	0.9	0.1	0.0	0.0	56.8
1956	0.0	0.5	82.0	36.4	20.2	9.9	7.9	5.5	1.1	0.2	0.0	0.0	163.6
1957	0.2	0.8	1.2	4.6	17.4	20.9	3.4	6.9	2.0	0.5	0.0	0.0	57.9
1958	0.7	1.2	7.0	13.0	35.6	49.4	38.8	3.1	1.1	0.4	0.0	0.1	150.3
1959	0.4	0.3	0.9	9.1	27.4	6.7	2.7	1.8	0.5	0.0	0.0	2.8	52.7
1960	1.7	0.4	0.1	2.6	27.7	14.4	6.9	2.9	0.7	0.0	0.0	0.0	57.7
1961	0.5	3.8	6.9	2.3	5.1	9.8	2.5	1.4	0.7	0.1	0.0	0.0	33.1
1962	0.1	1.1	6.9	1.7	56.4	23.5	3.1	1.2	0.6	0.1	0.0	0.0	94.6
1963	1.2	1.0	2.5	14.3	39.1	14.7	23.2	5.0	1.2	0.3	0.0	0.0	102.6
1964	0.7	10.9	4.6	3.6	2.7	11.0	4.9	2.1	0.9	0.3	0.0	0.1	41.7
1965	0.5	10.5	32.2	21.1	11.4	13.2	19.0	2.0	0.7	0.1	0.0	0.0	110.8
1966	0.1	18.2	11.3	9.2	13.6	7.5	1.9	1.1	0.4	0.0	0.0	0.0	63.3
1967	0.0	3.4	36.2	15.1	11.7	39.6	36.4	6.3	1.5	0.5	0.0	0.0	150.6
1968	0.3	1.0	5.3	9.2	19.8	15.9	3.6	1.0	0.5	0.1	0.0	0.0	56.8
1969	0.2	4.1	19.3	92.4	57.5	41.0	28.3	5.7	1.7	0.8	0.2	0.0	251.2
1970	1.4	3.9	10.7	49.2	18.0	22.7	4.4	1.8	0.5	0.3	0.0	0.0	113.0

Table C-16. UF 20 — Chowchilla River at Buchanan Reservoir Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.0	6.2	21.8	13.8	7.0	14.0	4.2	3.0	1.1	0.3	0.0	0.1	71.5
1972	0.3	2.2	8.7	6.3	11.5	4.6	6.6	1.5	0.5	0.1	0.0	0.3	42.8
1973	0.6	8.3	7.1	24.3	33.6	30.8	6.6	1.5	0.6	0.2	0.0	0.0	113.6
1974	1.0	12.7	15.4	20.0	10.2	36.1	20.9	2.3	0.7	0.1	0.0	0.0	119.4
1975	0.3	2.2	10.0	10.0	31.6	33.6	18.2	3.9	0.8	0.1	0.0	0.1	110.7
1976	0.7	2.1	1.2	1.1	9.3	8.7	3.0	1.2	0.2	0.0	0.0	0.5	27.9
1977	1.1	0.7	0.6	1.5	1.4	2.5	1.3	0.9	0.9	0.4	0.0	0.0	11.4
1978	0.1	1.4	15.5	39.3	38.9	32.5	25.4	5.0	0.8	0.2	0.0	1.3	160.4
1979	0.8	1.1	3.6	24.0	30.9	35.8	9.8	2.6	0.6	0.0	0.0	0.0	109.3
1980	0.2	2.3	4.5	51.2	51.5	30.7	6.7	3.1	1.0	0.3	0.0	0.1	151.6
1981	0.1	0.6	3.1	9.5	13.2	19.0	4.0	1.1	0.3	0.0	0.0	0.0	51.0
1982	0.4	11.3	15.4	30.6	46.6	48.1	44.9	4.4	1.1	1.0	0.4	0.4	204.7
1983	3.3	25.9	45.7	30.8	52.5	64.5	25.5	11.9	2.2	0.8	0.3	0.3	263.9
1984	1.9	18.4	36.8	15.9	19.4	12.6	4.7	1.6	0.5	0.1	0.0	0.0	112.0
1985	0.7	9.1	8.2	3.1	17.3	17.6	4.8	1.0	0.2	0.0	0.0	0.1	62.2
1986	0.5	6.6	10.9	10.3	92.3	41.7	7.0	2.7	0.6	0.0	0.0	0.2	173.0
1987	1.1	0.5	0.9	3.4	14.6	18.4	2.8	0.8	0.4	0.1	0.0	0.0	42.9
1988	0.1	2.5	2.8	10.5	3.4	9.2	5.8	2.4	0.9	0.2	0.0	0.0	37.7
1989	0.0	5.2	5.9	3.8	10.0	31.0	4.0	1.7	0.9	0.1	0.0	0.5	63.1
1990	2.1	3.1	2.1	6.9	9.2	7.9	2.0	1.7	1.4	0.5	0.0	0.0	36.7
1991	0.0	0.2	0.6	0.6	2.1	62.2	6.5	1.4	0.6	0.1	0.0	0.0	74.4
1992	0.5	1.8	1.9	3.7	20.0	10.4	3.0	0.9	0.1	0.0	0.1	0.0	42.4
1993	0.1	1.0	10.1	44.1	34.5	28.4	9.3	1.5	1.3	0.7	0.0	0.0	131.2
1994	0.1	0.6	2.6	2.0	15.9	4.5	4.7	3.1	1.0	0.2	0.0	0.0	34.7
1995	1.6	4.2	5.6	45.4	15.4	96.1	15.3	14.6	1.9	0.8	0.2	0.0	201.1
1996	0.0	0.1	8.9	15.3	35.9	30.1	11.6	3.7	1.3	0.4	0.0	0.0	107.3
1997	0.1	17.4	46.5	71.7	25.2	10.1	4.3	1.3	0.4	0.1	0.0	0.0	177.0
1998	0.2	1.5	7.7	32.0	59.6	33.5	24.9	11.8	3.1	0.9	0.1	0.1	175.3
1999	0.3	1.0	4.6	18.4	33.8	13.1	13.4	1.9	0.5	0.1	0.0	0.0	87.0
2000	0.0	1.3	1.5	26.8	49.2	19.9	5.6	2.2	0.8	0.2	0.0	0.2	107.6
2001	0.6	1.5	1.5	9.3	20.3	22.6	7.9	2.0	0.4	0.0	0.0	0.0	66.1
2002	0.0	7.3	30.3	10.8	10.5	12.2	2.0	1.3	1.0	0.2	0.0	0.0	75.6
2003	0.1	14.1	23.3	7.6	7.2	12.3	15.1	8.1	1.0	0.1	0.2	0.1	89.2
2004	0.0	0.6	12.8	13.1	20.4	8.6	1.3	0.3	0.0	0.0	0.0	0.0	57.1
2005	12.8	6.2	22.6	50.1	25.6	34.3	9.2	10.3	1.5	0.4	0.0	0.0	173.0
2006	0.1	0.2	23.8	37.5	9.9	38.6	51.3	3.6	1.3	0.3	0.0	0.0	166.5
2007	0.1	0.6	4.3	4.6	19.3	6.1	1.5	0.9	0.2	0.0	0.0	0.0	37.5
2008	0.1	0.3	4.7	41.2	25.2	5.7	1.2	0.2	0.4	0.2	0.0	0.0	79.3
2009	0.3	3.4	7.3	16.7	24.9	16.8	3.6	3.2	1.0	0.4	0.0	0.0	77.5
2010	6.2	1.5	18.0	22.4	23.2	21.9	18.8	3.5	1.3	0.3	0.0	0.0	117.1
2011	3.4	8.8	57.7	26.1	31.4	64.2	19.1	8.2	4.8	1.5	0.4	0.0	225.6
2012	1.0	0.9	1.0	9.3	6.1	15.2	13.8	2.0	0.5	0.1	0.0	0.0	49.7
2013	0.1	2.6	47.2	6.7	2.7	2.7	1.5	0.8	0.3	0.0	0.0	0.0	64.6
2014	0.2	0.5	1.1	0.8	4.5	7.6	4.9	1.6	0.4	0.0	0.0	0.0	21.6
Average	0.7	4.5	12.2	17.2	23.8	23.0	11.5	3.1	0.9	0.3	0.0	0.1	97.1
Minimum	12.8	40.6	82.0	92.4	92.3	96.1	51.3	14.6	4.8	1.5	0.4	2.8	263.9
Maximum	0.0	0.0	0.1	0.6	1.4	2.5	1.1	0.2	0.0	0.0	0.0	0.0	11.4

Table C-17. UF 21 — Fresno River near Daulton Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.2	0.2	3.8	8.6	30.7	26.0	22.1	8.2	1.9	0.4	0.0	0.0	0.2
1923	0.1	5.1	10.7	12.9	10.0	11.6	30.0	2.9	0.8	0.3	0.0	0.5	0.1
1924	1.7	0.8	0.5	0.4	2.1	6.2	4.2	1.2	0.3	0.0	0.0	0.0	1.7
1925	0.9	12.2	4.1	5.1	36.2	10.8	15.0	2.2	1.1	0.3	0.0	0.0	0.9
1926	1.1	1.0	2.1	5.3	39.8	5.7	30.5	2.1	0.4	0.1	0.0	0.0	1.1
1927	0.1	11.2	10.3	11.3	49.8	16.0	27.3	2.2	0.7	0.2	0.0	0.1	0.1
1928	0.7	7.5	4.6	4.9	14.4	35.0	20.6	1.4	0.4	0.1	0.0	0.0	0.7
1929	0.0	2.6	2.7	2.5	9.7	20.9	18.9	2.9	1.5	0.7	0.1	0.1	0.0
1930	0.5	0.2	1.0	2.3	19.1	21.2	8.9	2.9	0.6	0.2	0.0	0.0	0.5
1931	1.1	2.2	1.2	3.4	8.4	5.6	2.1	2.3	1.3	0.3	0.0	0.0	1.1
1932	0.2	0.5	12.2	5.6	30.4	40.3	27.5	8.8	1.7	0.3	0.0	0.0	0.2
1933	0.0	0.0	0.6	0.9	5.1	32.5	5.4	3.4	0.8	0.2	0.0	0.0	0.0
1934	0.0	0.7	6.5	14.4	16.2	5.0	0.7	0.4	0.7	0.3	0.0	0.0	0.0
1935	1.3	7.9	7.8	20.4	14.3	24.1	53.5	8.2	0.8	0.1	0.0	0.0	1.3
1936	0.4	1.2	1.1	18.5	79.1	18.0	20.1	2.7	1.5	0.3	0.0	0.0	0.4
1937	0.1	1.1	8.1	4.3	67.1	47.3	17.8	4.6	0.8	0.2	0.0	0.0	0.1
1938	0.0	1.1	44.3	24.4	88.9	94.2	23.7	13.1	3.6	1.4	0.3	0.5	0.0
1939	4.3	6.5	6.8	7.9	7.4	20.8	10.9	1.6	0.8	0.2	0.0	0.6	4.3
1940	3.3	0.7	1.4	55.0	33.4	30.4	16.9	2.4	0.4	0.0	0.0	0.0	3.3
1941	0.4	1.5	29.5	27.9	39.1	24.8	17.8	4.1	0.9	0.2	0.0	0.0	0.4
1942	0.0	1.2	34.3	30.8	27.7	19.2	31.5	10.9	2.0	0.3	0.0	0.0	0.0
1943	0.0	18.7	11.7	78.3	33.7	54.9	15.3	6.5	1.8	0.4	0.0	0.0	0.0
1944	0.2	1.1	3.3	8.3	22.7	25.4	9.9	3.3	0.6	0.2	0.0	0.0	0.2
1945	0.1	19.9	4.0	2.1	67.0	33.8	10.2	2.3	1.2	0.3	0.0	0.0	0.1
1946	1.2	4.6	32.8	13.5	7.6	24.3	16.2	1.8	1.1	0.2	0.0	0.1	1.2
1947	1.5	20.7	19.5	6.0	15.7	9.6	4.5	0.6	0.7	0.2	0.0	0.1	1.5
1948	1.3	1.3	0.9	2.8	2.4	35.4	44.1	7.1	1.8	0.3	0.0	0.0	1.3
1949	0.1	0.3	0.4	1.3	5.0	46.0	14.1	3.3	0.8	0.2	0.0	0.0	0.1
1950	0.0	2.9	1.7	6.7	30.8	18.6	16.6	2.2	0.3	0.0	0.0	0.0	0.0
1951	1.1	54.9	46.5	19.3	19.6	17.5	6.7	4.5	0.5	0.2	0.0	0.0	1.1
1952	0.2	3.0	20.4	30.2	23.5	44.9	48.3	12.7	3.6	0.8	0.1	0.3	0.2
1953	0.6	2.7	8.7	28.4	11.3	16.7	7.7	3.8	1.6	0.3	0.0	0.0	0.6
1954	0.1	1.7	1.5	17.1	35.7	35.4	11.2	3.2	0.8	0.3	0.0	0.0	0.1
1955	0.0	2.8	9.1	10.3	9.7	10.6	9.4	6.7	0.6	0.1	0.0	0.0	0.0
1956	0.0	0.1	114.2	51.3	26.4	12.7	13.9	11.7	1.3	0.3	0.0	0.0	0.0
1957	0.6	1.0	0.7	5.5	18.3	21.4	3.7	8.9	1.9	0.3	0.0	0.1	0.6
1958	0.8	1.2	7.0	14.9	43.3	64.6	56.5	11.3	3.5	0.5	0.1	0.4	0.8
1959	0.8	1.2	2.5	14.1	34.8	13.0	3.6	2.0	0.3	0.0	0.0	6.2	0.8
1960	1.8	0.3	0.1	3.0	29.7	17.2	8.1	2.8	0.4	0.0	0.0	0.0	1.8
1961	0.9	3.6	7.3	2.5	5.5	12.0	3.6	1.7	0.7	0.1	0.0	0.0	0.9
1962	0.3	1.3	5.9	1.0	69.6	26.6	6.6	3.0	0.8	0.1	0.0	0.0	0.3
1963	1.9	0.8	1.6	17.7	50.1	15.0	31.3	7.9	1.0	0.2	0.0	0.1	1.9
1964	1.2	14.6	3.6	0.7	0.9	6.4	6.3	2.2	0.9	0.3	0.0	0.2	1.2
1965	0.8	11.0	30.1	23.0	19.4	22.2	24.1	5.6	0.8	0.1	0.0	0.0	0.8
1966	0.2	23.1	6.7	4.7	12.3	8.5	2.4	1.0	0.3	0.0	0.0	0.0	0.2
1967	0.0	4.1	63.7	12.6	14.1	62.5	49.0	13.9	5.2	0.5	0.0	0.1	0.0
1968	0.5	0.8	4.2	6.5	16.3	14.0	3.1	0.8	0.6	0.2	0.0	0.0	0.5
1969	0.3	4.4	15.9	134.2	63.3	44.4	54.5	15.6	8.6	1.8	0.4	0.5	0.3
1970	5.0	6.8	15.0	60.7	22.4	27.3	7.5	2.6	0.6	0.5	0.1	0.0	5.0

Table C-17. UF 21 — Fresno River near Daulton Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0.0	9.2	20.8	6.9	12.0	19.8	7.8	4.1	1.1	0.3	0.0	0.1	0.0
1972	0.5	2.4	6.9	2.4	9.9	5.3	10.8	1.5	0.6	0.3	0.0	0.9	0.5
1973	0.8	9.1	5.2	31.2	37.2	30.5	10.2	3.4	1.0	0.2	0.0	0.0	0.8
1974	1.3	19.5	19.3	18.9	10.7	55.6	28.2	4.2	0.5	0.1	0.0	0.0	1.3
1975	0.2	2.0	10.5	7.1	26.0	47.2	23.0	7.6	0.8	0.1	0.0	0.2	0.2
1976	1.6	1.9	0.9	0.7	7.9	6.0	2.7	0.9	0.2	0.0	0.0	1.4	1.6
1977	1.2	0.6	0.5	1.0	1.5	2.1	0.8	1.6	1.1	0.4	0.0	0.0	1.2
1978	0.1	2.0	17.3	51.4	46.4	48.8	30.6	9.4	1.1	0.4	0.1	2.6	0.1
1979	0.7	1.3	4.4	26.5	30.4	45.3	16.1	5.7	0.6	0.1	0.0	0.0	0.7
1980	0.6	2.7	2.9	65.2	78.2	38.6	13.2	6.8	1.9	0.3	0.0	0.1	0.6
1981	0.2	1.0	4.2	10.1	16.9	25.0	6.2	1.0	0.4	0.1	0.0	0.1	0.2
1982	0.7	12.1	11.8	15.7	53.0	60.9	68.4	10.3	3.9	2.7	0.3	1.6	0.7
1983	6.8	33.4	55.9	31.5	61.2	69.4	26.5	19.5	6.4	3.0	1.4	1.8	6.8
1984	6.3	26.1	43.6	19.7	22.5	18.1	5.7	1.7	0.4	0.2	0.0	0.0	6.3
1985	1.0	8.2	5.7	2.2	14.6	20.0	5.8	0.7	0.3	0.1	0.0	0.3	1.0
1986	0.8	7.3	12.7	13.8	123.5	55.2	9.8	4.4	0.8	0.1	0.0	0.4	0.8
1987	1.7	0.8	2.8	6.8	19.4	19.3	2.7	0.7	0.4	0.1	0.0	0.2	1.7
1988	0.5	4.1	2.9	8.9	7.4	13.2	8.2	2.7	0.7	0.2	0.1	0.0	0.5
1989	0.0	3.3	3.2	2.3	7.7	31.1	4.0	2.5	0.7	0.1	0.0	1.2	0.0
1990	2.6	3.4	2.1	7.6	5.0	11.3	1.7	1.9	1.7	0.4	0.0	0.0	2.6
1991	0.0	0.2	0.7	0.8	1.8	72.1	9.8	2.1	0.6	0.2	0.1	0.0	0.0
1992	0.6	2.3	2.0	5.1	22.6	14.2	4.0	0.6	0.1	0.2	0.2	0.0	0.6
1993	0.2	1.7	8.0	48.8	34.8	44.1	17.2	5.7	3.4	0.5	0.0	0.0	0.2
1994	0.1	0.8	3.4	3.6	15.9	5.2	6.6	4.5	0.8	0.1	0.0	0.0	0.1
1995	2.8	2.9	3.4	53.7	18.1	120.1	19.5	21.8	3.9	0.9	0.1	0.1	2.8
1996	0.2	0.9	14.5	12.5	49.5	42.2	19.0	6.5	1.4	0.4	0.1	0.0	0.2
1997	0.1	23.5	47.2	88.8	25.1	13.0	9.0	4.9	1.0	0.2	0.0	0.1	0.1
1998	0.2	1.6	7.6	28.6	58.5	33.6	24.1	17.8	8.4	1.2	0.2	0.5	0.2
1999	1.5	2.8	4.7	19.4	31.0	10.9	13.6	2.2	0.5	0.1	0.0	0.0	1.5
2000	0.0	1.7	1.0	30.3	55.1	19.4	6.6	2.3	0.6	0.2	0.0	0.5	0.0
2001	0.7	1.6	0.8	7.4	25.0	27.2	10.2	2.5	0.3	0.1	0.0	0.0	0.7
2002	0.1	6.6	35.6	13.1	9.1	17.3	2.8	1.8	0.9	0.1	0.0	0.1	0.1
2003	0.1	16.9	24.8	8.6	8.4	13.5	16.3	10.6	0.7	0.1	0.3	0.2	0.1
2004	0.0	1.2	17.7	16.9	19.2	11.5	1.2	0.2	0.0	0.0	0.0	0.0	0.0
2005	13.4	5.7	23.3	51.9	24.3	34.8	10.9	11.5	1.4	0.3	0.0	0.0	13.4
2006	0.1	0.3	27.6	46.3	9.6	39.4	57.5	5.4	1.6	0.3	0.0	0.0	0.1
2007	0.4	1.6	4.9	4.6	17.4	7.1	1.9	0.8	0.2	0.0	0.0	0.0	0.4
2008	0.0	0.4	5.0	44.5	27.1	7.8	0.9	0.3	0.7	0.2	0.0	0.0	0.0
2009	0.4	4.8	6.1	17.1	24.1	17.7	4.6	4.1	1.0	0.3	0.0	0.0	0.4
2010	12.3	1.4	18.2	24.0	25.4	26.1	26.0	5.6	1.2	0.2	0.0	0.0	12.3
2011	6.0	9.1	60.5	30.3	21.4	74.9	27.2	11.1	5.8	2.0	0.6	0.3	6.0
2012	2.8	2.7	2.3	13.8	7.7	15.9	16.0	2.2	0.4	0.1	0.0	0.0	2.8
2013	0.2	2.9	43.0	7.0	3.0	5.3	2.1	0.7	0.2	0.0	0.0	0.0	0.2
2014	0.4	1.0	0.9	0.6	5.3	10.3	6.4	1.7	0.3	0.0	0.0	0.0	0.4
Average	1.2	5.6	13.2	18.8	26.6	27.6	16.0	4.9	1.3	0.3	0.0	0.2	1.2
Minimum	0.0	0.0	0.1	0.4	0.9	2.1	0.7	0.2	0.0	0.0	0.0	0.0	0.0
Maximum	13.4	54.9	114.2	134.2	123.5	120.1	68.4	21.8	8.6	3.0	1.4	6.2	13.4

Table C-18. UF 22 — San Joaquin River at Millerton Reservoir Simulated Flow (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	6.7	4.0	63.9	52.3	87.6	81.3	230.8	641.6	499.5	281.6	50.6	13.2	2,013.2
1923	4.7	34.5	64.2	63.9	52.0	116.3	244.3	350.0	240.8	274.0	59.3	20.6	1,524.5
1924	25.8	25.1	13.6	12.4	28.4	65.7	119.6	230.9	91.8	37.3	12.5	1.9	665.0
1925	11.0	79.6	64.4	29.3	169.0	181.4	237.8	376.6	417.8	195.1	43.6	15.0	1,820.5
1926	13.2	19.4	32.9	34.6	125.3	150.9	314.1	360.0	268.5	71.3	22.4	4.3	1,416.9
1927	1.0	106.9	94.6	40.8	150.8	148.2	347.7	456.7	363.2	168.9	40.2	10.7	1,929.7
1928	25.4	110.3	51.6	36.7	80.3	236.3	196.6	399.1	235.6	64.0	21.8	4.5	1,462.3
1929	0.9	10.8	29.0	24.3	37.9	131.2	184.1	392.3	256.2	132.6	30.2	7.4	1,236.9
1930	5.8	3.5	4.5	31.4	98.1	154.2	224.8	210.1	346.3	87.9	24.5	5.2	1,196.3
1931	8.6	20.2	15.1	29.1	47.0	88.5	167.6	306.0	131.2	47.3	15.5	5.0	881.0
1932	5.2	14.4	86.6	50.3	112.6	201.9	283.1	436.7	566.2	387.2	65.9	18.7	2,228.6
1933	5.3	4.1	8.3	40.5	35.3	146.5	268.6	265.6	376.0	112.1	29.2	6.7	1,298.1
1934	2.0	10.8	103.5	71.4	83.4	199.2	216.0	263.7	111.2	66.4	22.7	5.8	1,156.1
1935	13.4	82.1	73.7	97.3	90.2	111.8	399.3	408.7	633.5	217.6	46.6	14.5	2,188.9
1936	11.5	17.2	14.5	83.0	233.3	204.2	420.0	513.2	441.1	203.2	52.2	15.9	2,209.1
1937	7.9	20.4	110.1	47.8	213.6	216.2	241.4	681.5	402.4	256.6	49.8	12.9	2,260.6
1938	3.5	6.9	338.1	88.7	195.2	257.3	276.0	593.9	740.6	423.1	120.5	28.1	3,072.0
1939	25.6	33.2	24.6	44.7	38.1	138.3	291.1	226.2	185.0	60.5	20.0	7.9	1,095.2
1940	56.0	37.6	22.1	187.7	177.9	255.2	268.2	574.3	414.5	120.1	28.3	6.4	2,148.5
1941	6.1	19.5	117.2	102.0	156.7	164.3	199.4	581.4	540.0	409.9	94.1	30.7	2,421.3
1942	9.8	16.1	167.4	93.3	105.0	119.2	318.1	405.3	611.7	348.9	60.1	16.5	2,271.3
1943	4.7	62.7	65.2	178.5	130.1	317.7	358.4	504.1	370.2	258.8	61.7	17.7	2,329.5
1944	6.2	9.3	21.3	44.1	96.2	123.5	193.0	451.7	229.6	190.6	47.8	13.8	1,426.9
1945	11.1	138.8	52.1	29.1	236.8	106.0	267.2	460.3	434.6	256.3	49.7	15.4	2,057.4
1946	33.3	87.3	127.7	60.2	37.5	159.2	379.6	369.4	288.4	105.7	35.4	12.7	1,696.3
1947	27.2	116.4	113.7	51.1	76.1	148.7	203.2	366.9	151.9	55.2	19.4	6.6	1,336.4
1948	18.5	30.2	15.2	16.2	31.0	76.8	294.3	397.2	300.2	183.8	37.4	8.7	1,409.4
1949	4.9	13.5	25.0	19.9	36.2	132.3	352.9	332.8	284.9	75.0	23.1	8.2	1,308.6
1950	5.6	15.7	38.1	49.0	115.3	161.9	382.5	369.7	266.8	79.7	26.0	7.4	1,517.7
1951	18.9	362.2	265.4	69.7	85.0	118.5	258.1	401.7	485.9	197.3	39.7	10.5	2,312.8
1952	4.9	27.8	103.0	135.8	87.2	124.5	433.4	708.1	543.4	385.7	127.5	41.6	2,722.9
1953	22.3	14.8	47.8	75.4	52.5	106.4	245.8	230.6	323.6	236.0	48.6	13.8	1,417.6
1954	5.0	16.1	22.7	67.8	157.3	231.4	363.7	452.4	190.8	86.9	27.9	7.1	1,629.0
1955	3.0	21.3	72.5	56.0	54.5	98.6	156.9	373.4	408.7	117.9	46.6	14.4	1,424.0
1956	5.2	6.4	369.1	200.0	88.2	130.3	366.4	588.6	575.3	413.7	143.9	48.6	2,935.8
1957	27.0	21.4	15.2	46.7	91.6	160.0	156.5	341.8	401.0	117.1	28.2	7.5	1,413.9
1958	11.2	19.7	70.6	60.6	161.1	217.7	367.6	812.9	425.5	293.8	67.6	30.7	2,539.1
1959	26.9	11.6	7.4	46.7	114.7	155.1	278.6	206.0	166.1	50.9	15.3	61.5	1,140.9
1960	51.9	21.7	8.8	21.4	121.5	181.6	299.2	291.5	204.3	51.0	17.9	6.0	1,276.8
1961	7.3	32.1	47.5	22.7	52.1	100.5	220.1	219.7	223.6	63.9	21.1	12.5	1,023.1
1962	13.3	14.8	36.3	23.0	303.0	119.7	501.3	350.5	419.4	244.6	51.7	15.9	2,093.5
1963	23.7	20.4	12.6	207.3	359.7	127.9	222.3	535.4	410.8	351.8	119.5	33.2	2,424.6
1964	28.5	96.1	58.5	37.8	27.3	71.8	219.9	333.0	233.6	85.0	27.9	11.1	1,230.7
1965	7.0	70.5	189.4	146.0	80.5	119.7	290.3	543.4	511.5	383.0	108.4	36.1	2,485.9
1966	13.2	101.7	76.6	35.7	38.5	120.9	350.9	350.3	149.7	54.9	18.6	5.9	1,316.8
1967	6.1	31.7	239.0	67.4	98.4	279.1	184.3	711.5	713.9	644.0	135.9	35.5	3,146.8
1968	27.9	15.7	37.1	36.2	85.2	146.0	185.6	256.3	224.2	53.0	18.7	7.8	1,093.5
1969	14.6	60.9	94.1	366.9	193.9	144.2	460.7	969.5	701.6	520.0	209.2	46.1	3,782.0
1970	31.1	38.2	50.9	155.5	114.0	170.3	154.2	497.1	451.4	152.2	34.5	9.4	1,859.0

Table C-18. UF 22 — San Joaquin River at Millerton Reservoir Simulated Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	3.7	51.4	111.3	42.4	65.8	139.0	230.0	256.7	413.6	254.8	53.6	20.0	1,642.3
1972	13.6	26.0	76.8	27.9	58.2	244.4	165.8	296.3	289.0	76.4	23.5	17.4	1,315.4
1973	20.4	39.5	28.8	88.4	136.9	112.8	241.1	727.4	406.2	160.7	36.4	13.1	2,011.5
1974	12.8	125.6	104.1	103.7	72.6	236.3	286.2	511.0	514.8	142.1	40.4	14.6	2,164.5
1975	8.8	24.5	59.2	47.8	145.9	214.8	143.8	585.1	520.7	150.9	38.5	19.7	1,959.8
1976	52.5	57.8	22.1	11.6	59.8	98.8	110.0	287.5	105.0	46.0	24.3	38.4	913.7
1977	43.6	18.8	8.5	23.3	25.1	49.0	105.6	125.6	199.7	54.7	17.7	5.8	677.5
1978	5.7	14.9	117.1	211.9	203.9	368.2	317.3	579.9	713.8	413.4	184.5	100.3	3,230.8
1979	35.8	16.7	26.2	86.2	101.1	231.3	268.9	601.6	392.7	156.5	47.7	14.8	1,979.6
1980	12.7	48.6	50.8	292.2	310.7	187.1	309.8	449.7	538.9	512.1	207.4	38.4	2,958.3
1981	15.7	12.4	23.5	44.4	85.8	178.8	265.8	359.1	261.0	60.5	18.4	5.5	1,331.0
1982	17.4	164.7	100.1	127.3	204.5	292.4	461.1	573.5	561.3	434.1	178.0	82.7	3,197.0
1983	138.2	175.1	154.9	106.6	193.3	295.9	196.5	619.3	956.1	557.3	242.5	80.3	3,716.0
1984	56.3	128.6	172.2	74.1	106.5	192.0	220.7	551.1	371.3	125.8	36.6	13.3	2,048.4
1985	14.0	78.1	56.6	21.1	55.4	129.8	343.1	248.6	199.8	66.4	25.0	14.1	1,251.9
1986	34.5	56.3	89.7	108.8	548.6	364.6	248.7	443.0	587.3	264.1	66.5	24.5	2,836.5
1987	21.0	13.1	8.8	16.7	91.0	128.1	271.0	255.3	127.0	49.0	17.3	7.0	1,005.3
1988	9.2	63.4	48.3	80.8	79.8	146.3	203.1	294.8	213.3	81.8	29.1	11.3	1,261.3
1989	7.9	20.9	44.7	26.6	50.3	298.8	415.4	273.5	169.1	74.6	27.4	21.5	1,430.7
1990	64.0	54.6	28.0	54.5	57.2	181.1	226.7	224.6	186.8	84.9	30.5	10.6	1,203.5
1991	10.6	11.7	11.7	10.5	41.7	290.1	171.5	331.3	424.6	167.2	41.8	15.2	1,527.7
1992	16.6	36.4	32.9	45.7	104.1	148.9	299.5	318.5	120.4	66.3	34.6	11.6	1,235.4
1993	12.9	40.1	75.4	159.7	154.2	323.3	314.1	591.1	513.3	376.7	90.6	24.9	2,676.3
1994	11.2	17.4	35.9	31.1	88.9	151.5	203.5	277.3	193.8	53.2	17.3	5.8	1,086.9
1995	54.7	57.3	45.5	218.2	128.2	538.4	295.8	572.6	609.7	674.7	279.6	53.4	3,528.1
1996	18.6	6.5	56.7	96.6	258.7	258.7	359.9	575.2	527.1	196.4	49.3	16.3	2,420.0
1997	7.4	135.7	217.2	391.4	91.6	237.1	284.7	661.9	485.1	242.0	61.8	22.4	2,838.1
1998	14.0	17.8	57.5	131.2	222.6	218.9	264.6	376.7	629.5	720.5	239.9	53.7	2,947.0
1999	31.4	24.3	52.8	98.7	137.4	118.6	232.5	394.6	392.7	186.1	39.2	13.1	1,721.4
2000	10.6	21.4	23.8	115.5	261.7	177.7	358.8	502.4	378.1	96.4	26.7	13.5	1,986.5
2001	18.4	35.7	18.2	49.3	89.3	185.1	265.2	538.3	193.7	50.3	22.4	7.5	1,473.4
2002	7.9	59.6	130.4	106.4	86.9	156.7	258.1	301.4	379.9	87.0	25.1	8.4	1,607.8
2003	8.5	149.7	135.6	73.7	70.0	102.9	151.0	519.9	580.8	85.0	35.3	18.5	1,931.1
2004	9.7	12.6	110.5	91.6	92.4	261.0	162.9	270.8	309.1	115.5	37.3	12.8	1,486.2
2005	67.3	81.0	96.5	239.2	163.8	261.4	195.4	699.1	583.8	376.4	75.2	25.1	2,864.0
2006	13.6	17.6	260.1	283.3	140.7	207.6	385.3	684.0	666.2	264.3	61.5	18.1	3,002.4
2007	10.9	19.7	44.4	44.4	128.3	218.6	175.2	203.9	104.8	46.4	16.6	9.2	1,022.6
2008	13.1	15.4	36.2	125.5	106.7	151.7	190.1	378.5	272.2	96.5	31.9	9.3	1,427.1
2009	16.0	90.0	69.1	154.9	151.7	185.4	224.4	542.5	168.5	100.0	35.2	13.3	1,751.0
2010	108.8	55.5	72.0	96.8	120.7	169.0	223.7	314.6	638.7	283.6	57.5	17.2	2,158.1
2011	64.6	95.7	269.8	139.7	118.1	201.4	340.6	438.4	645.3	522.4	145.3	36.3	3,017.5
2012	27.7	34.6	21.0	68.3	57.1	90.8	320.0	268.8	87.0	35.9	12.8	6.6	1,030.7
2013	6.3	15.6	214.6	255.2	136.9	268.2	319.3	299.6	211.0	60.9	20.5	7.7	1,815.8
2014	6.6	9.4	12.4	17.0	39.7	123.7	188.8	193.2	82.0	31.4	14.4	8.5	727.1
Average	20.1	47.4	77.6	88.5	119.2	179.1	266.8	426.0	375.2	197.6	57.4	19.1	1,873.8
Minimum	138.2	362.2	369.1	391.4	548.6	538.4	501.3	969.5	956.1	720.5	279.6	100.3	3,782.0
Maximum	0.9	3.5	4.5	10.5	25.1	49.0	105.6	125.6	82.0	31.4	12.5	1.9	665.0

APPENDIX D COMPARISON BETWEEN MONTHLY NATURAL FLOW AND UNIMPAIRED FLOWS FOR WY 1922-2014

Note on comparison tables:

- Major rim watersheds with CDEC unimpaired flow data consist of Sacramento River at Shasta Reservoir, Feather River at Lake Oroville, Yuba River, American River, Cosumnes River, Mokelumne River, Stanislaus River, Merced River, Tuolumne River, and San Joaquin River at Millerton, their total inflows are about 80 percent of total rim inflow.
- Smaller and minor streams unimpaired flows are maintained and updated by DWR's Bay Delta Office. Exact corresponding comparisons were made by identifying unimpaired flow equation and components where possible.
- Valley floor or Tulare basin subwatersheds UF1, UF12, UF17, UF23 and UF24 were not compared.

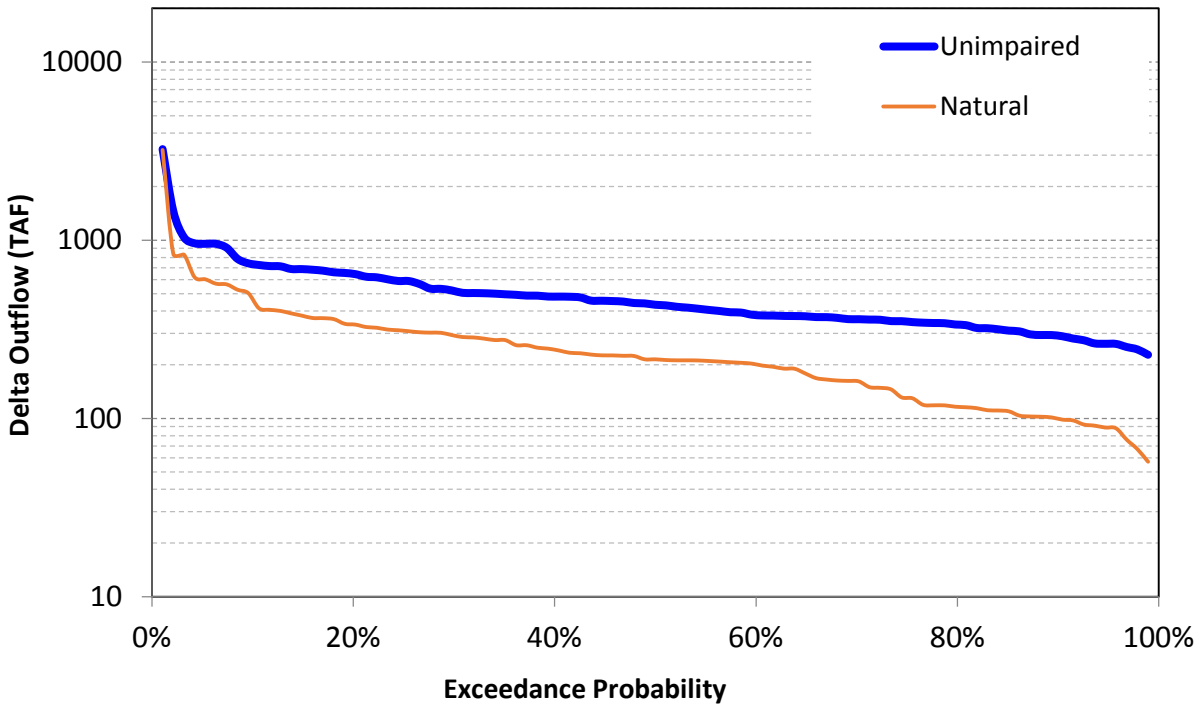

Figure D-1. October Net Delta Outflow

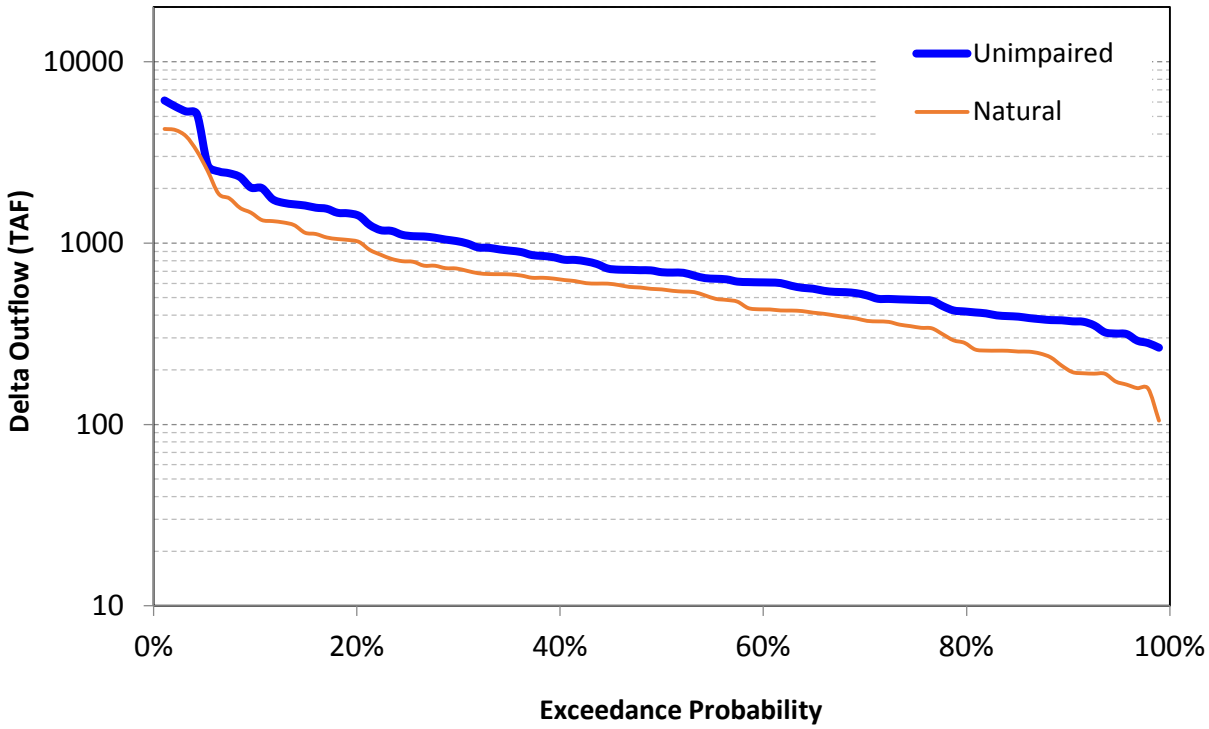

Figure D-2. November Net Delta Outflow

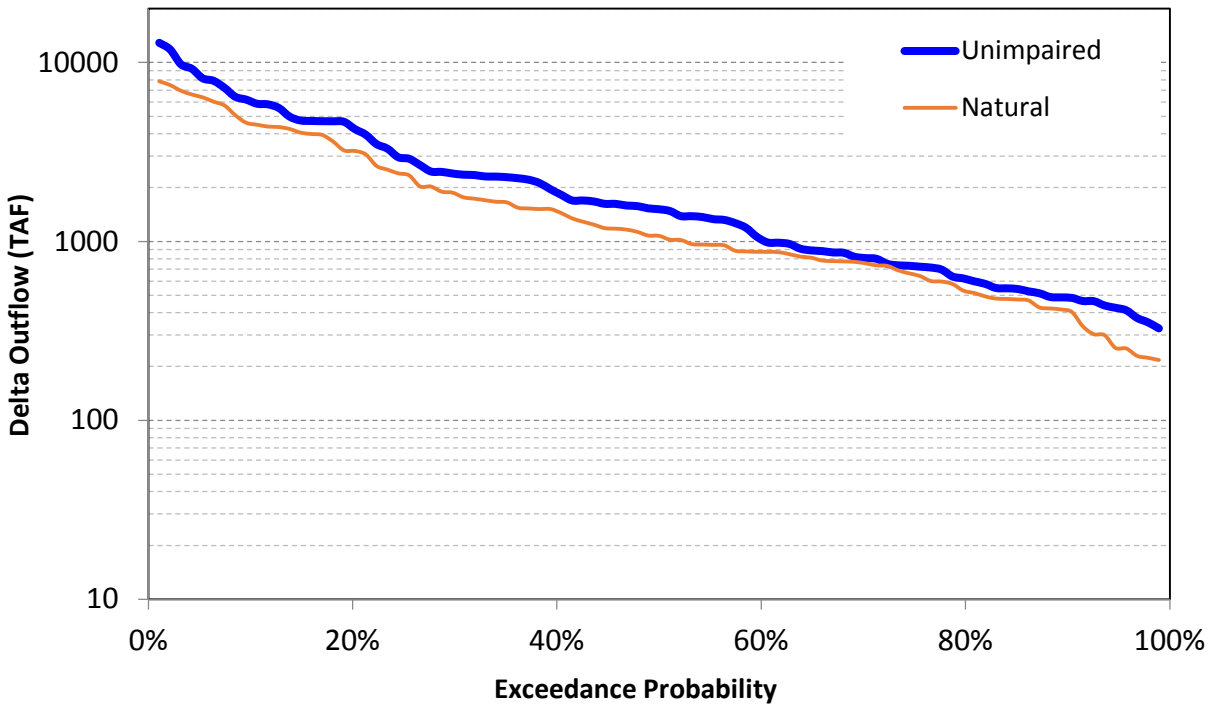

Figure D-3. December Net Delta Outflow

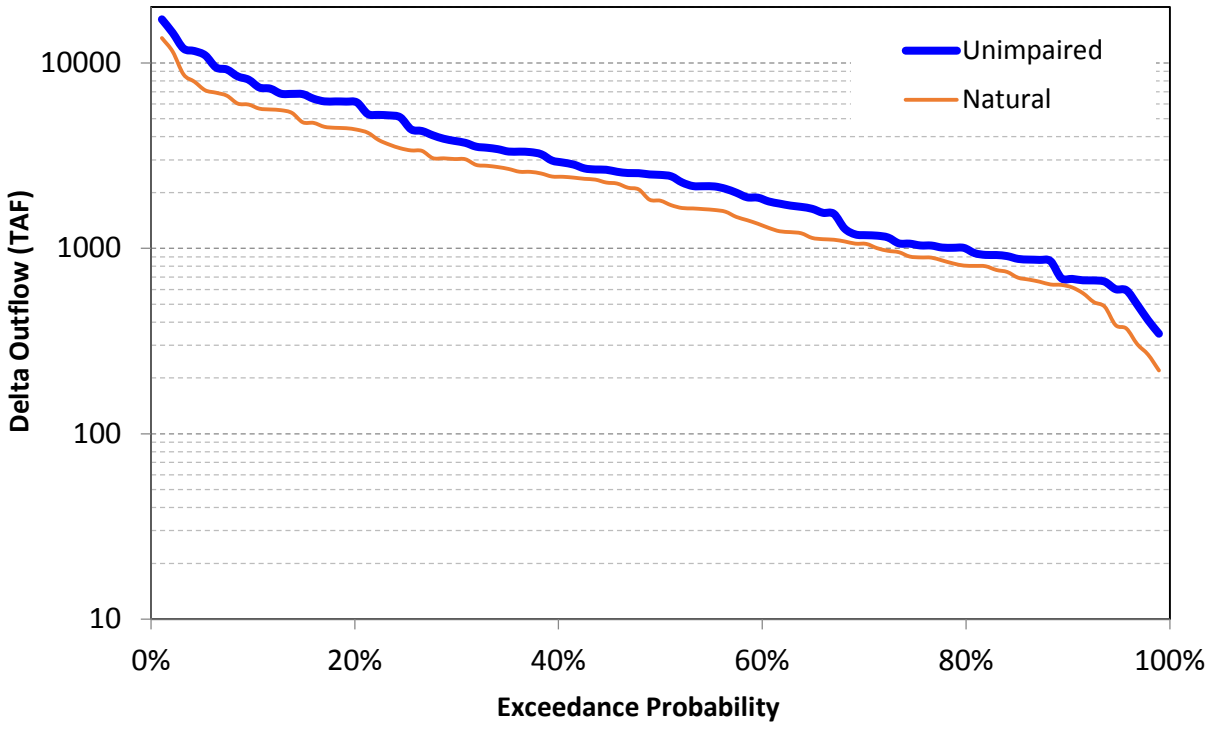

Figure D-4. January Net Delta Outflow

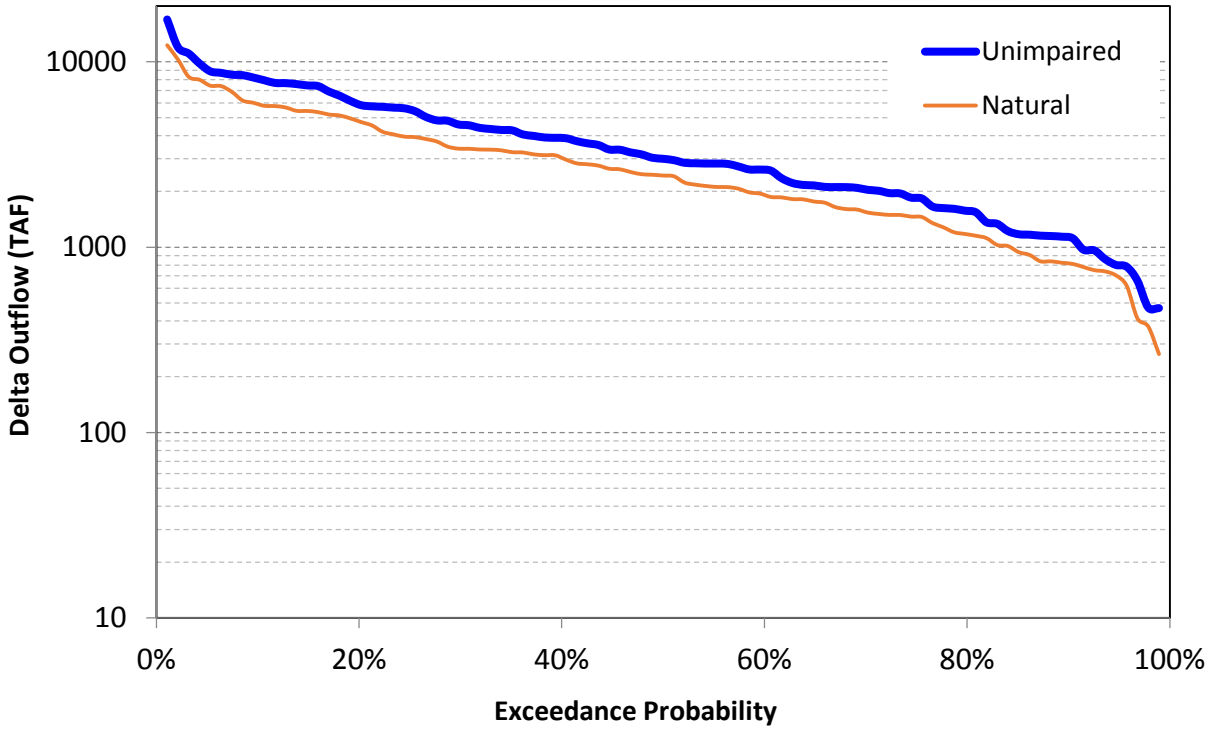

Figure D-5. February Net Delta Outflow

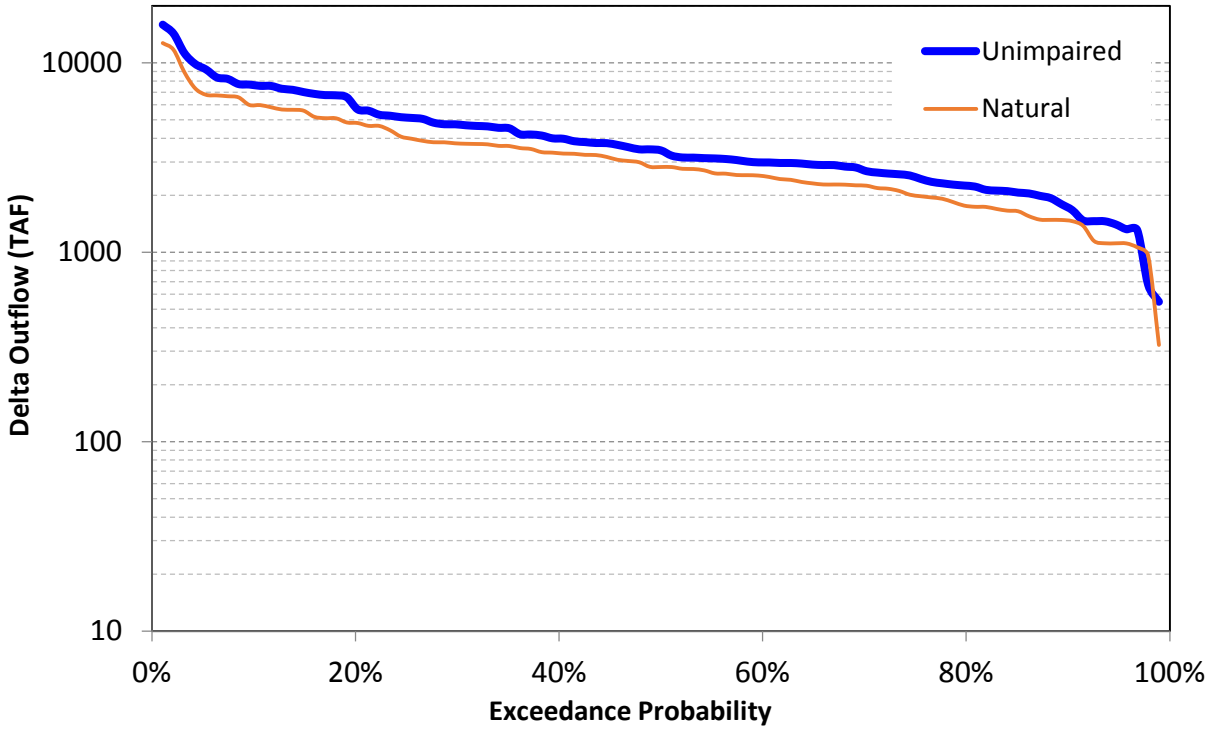

Figure D-6. March Net Delta Outflow

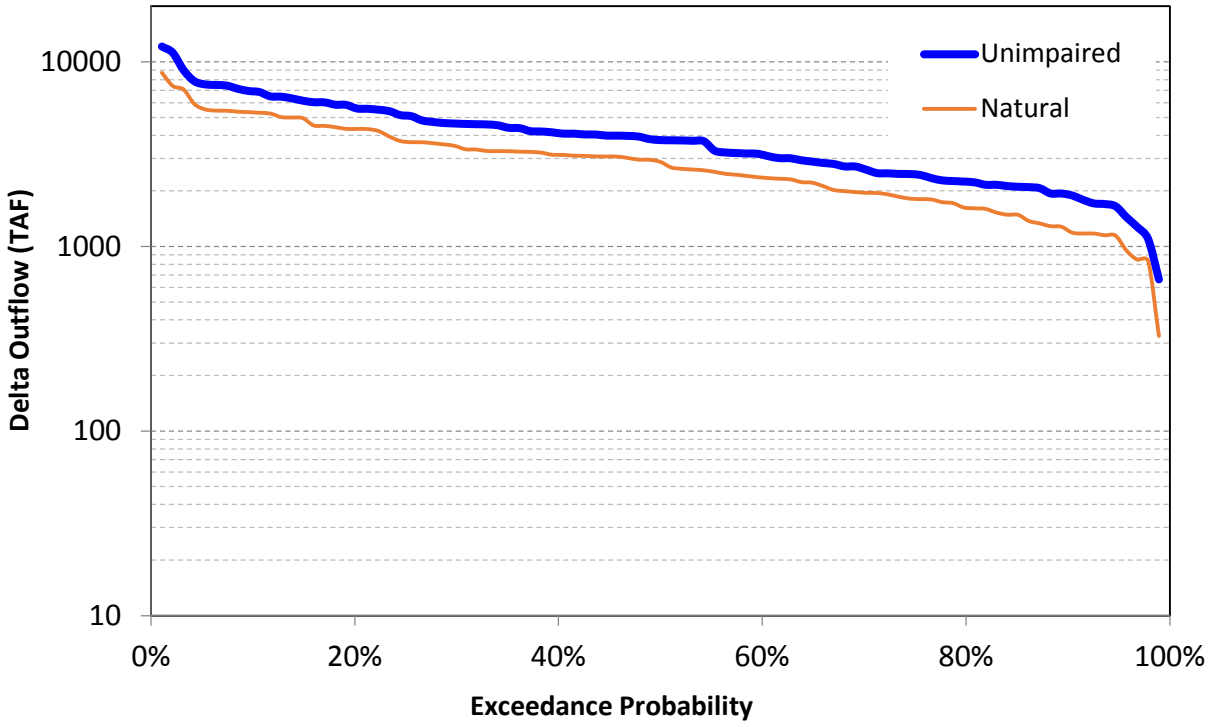

Figure D-7. April Net Delta Outflow

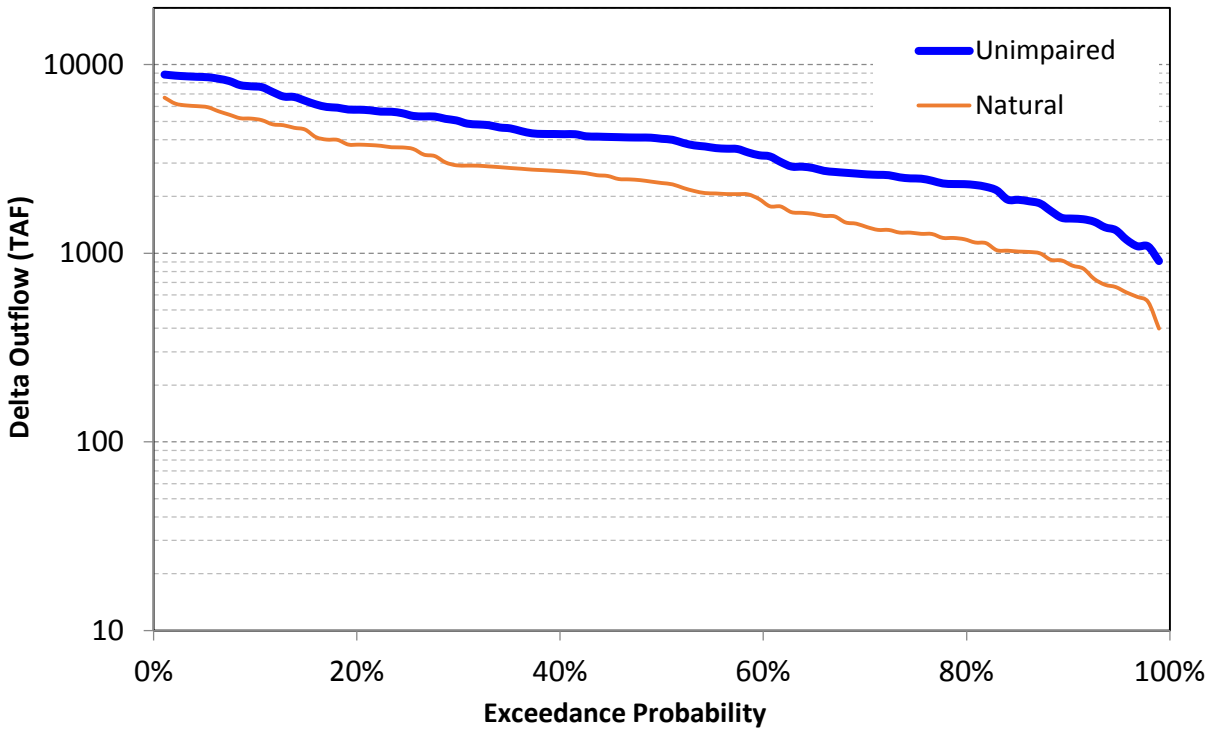

Figure D-8. May Net Delta Outflow

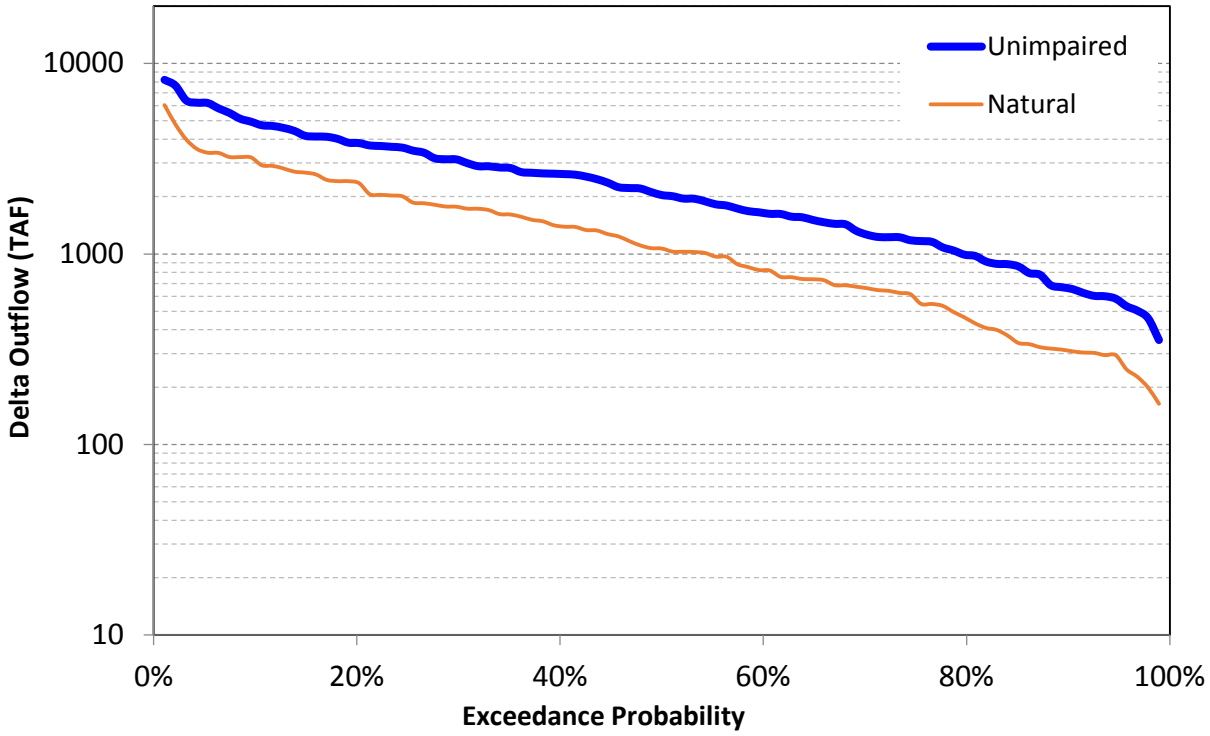

Figure D-9. June Net Delta Outflow

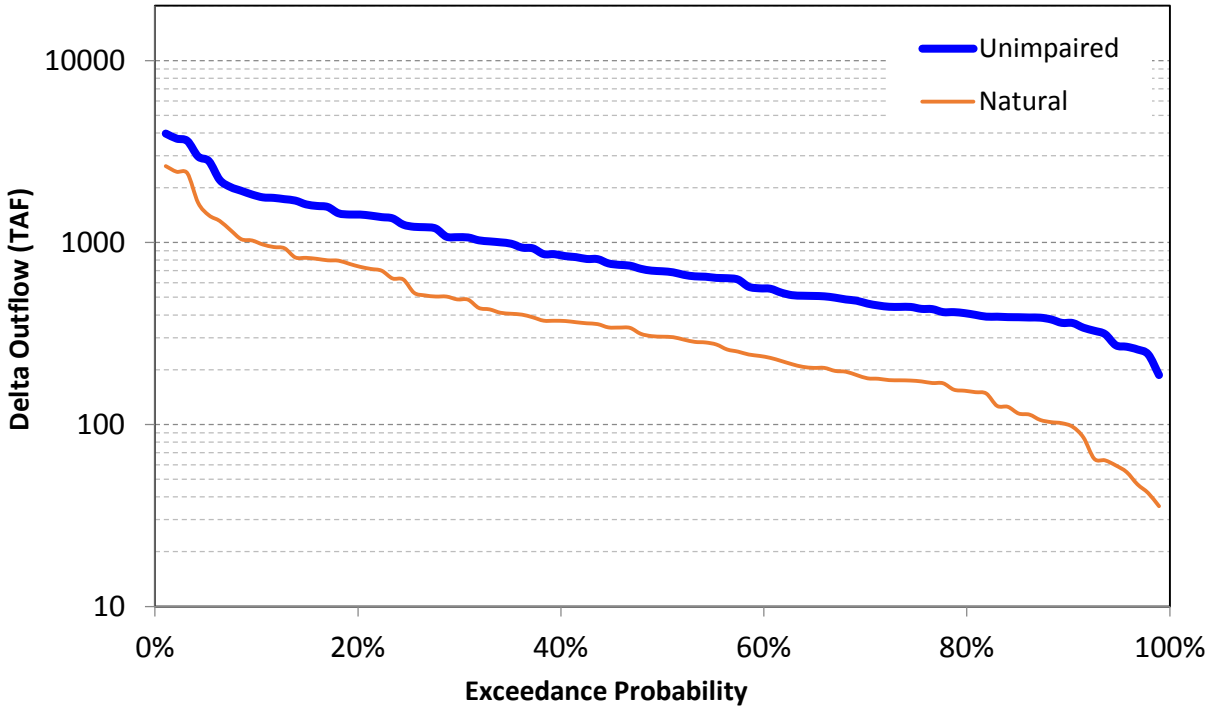

Figure D-10. July Net Delta Outflow

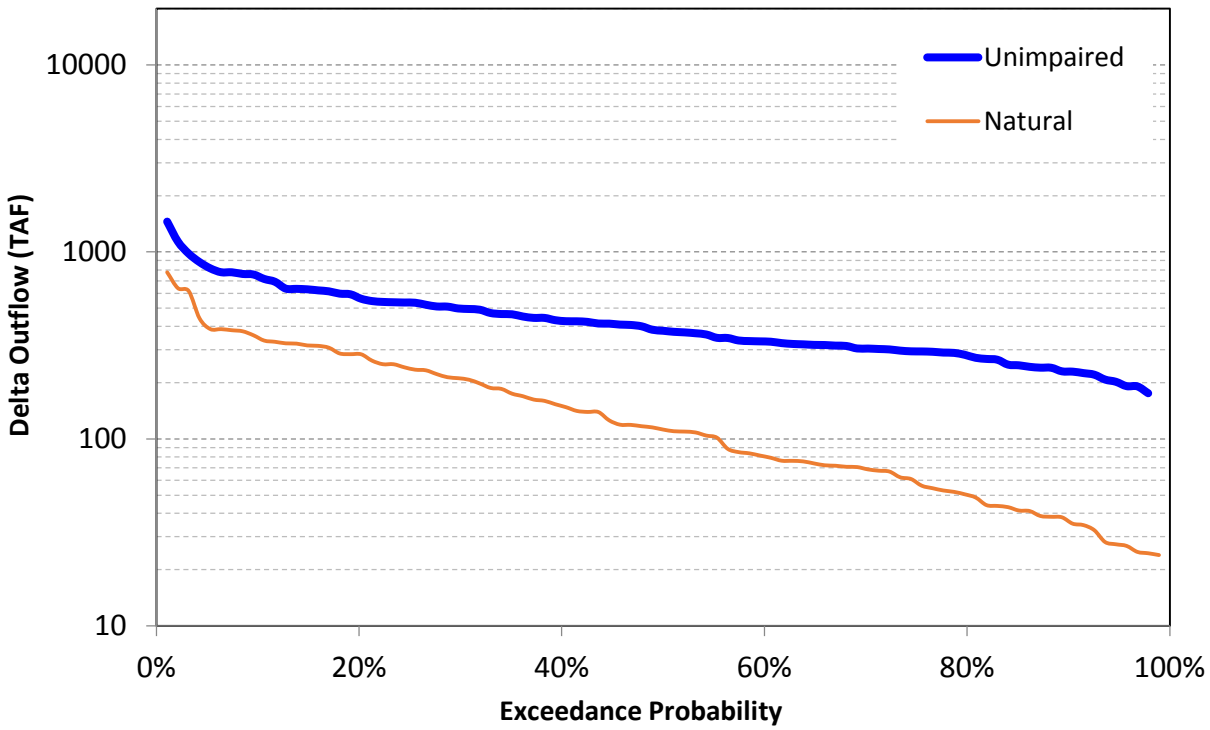

Figure D-11. August Net Delta Outflow

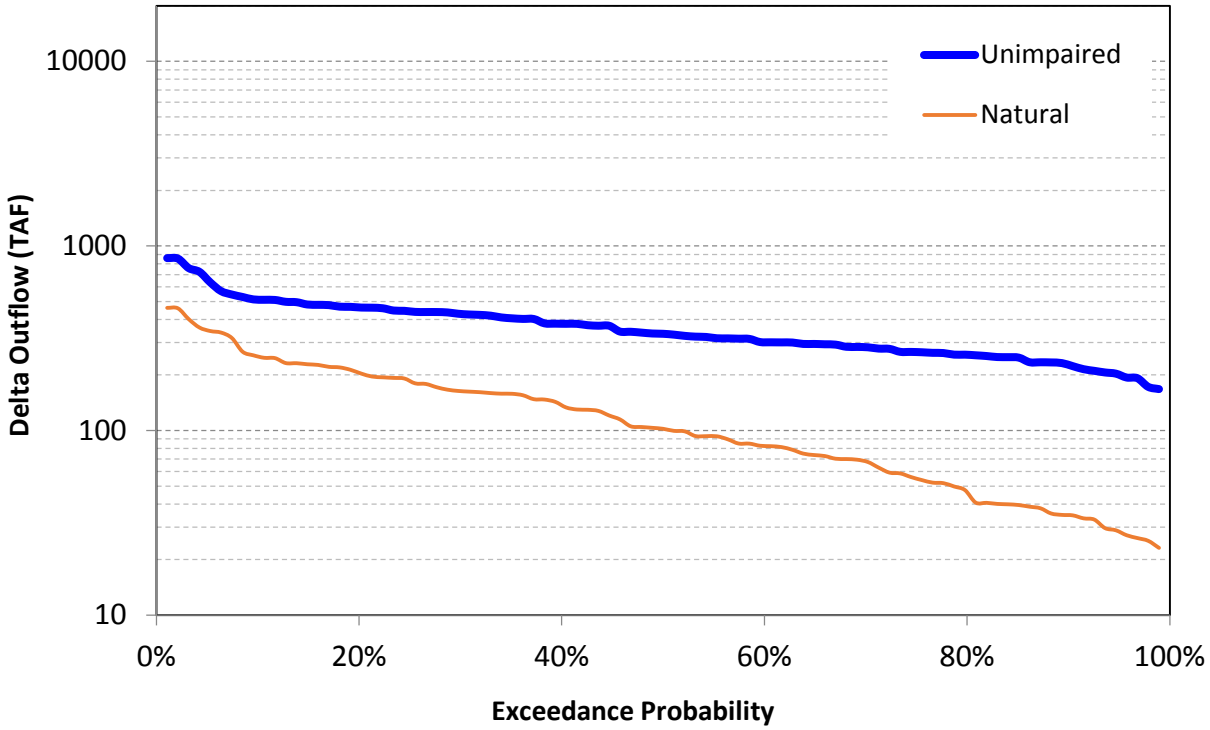

Figure D-12. September Net Delta Outflow

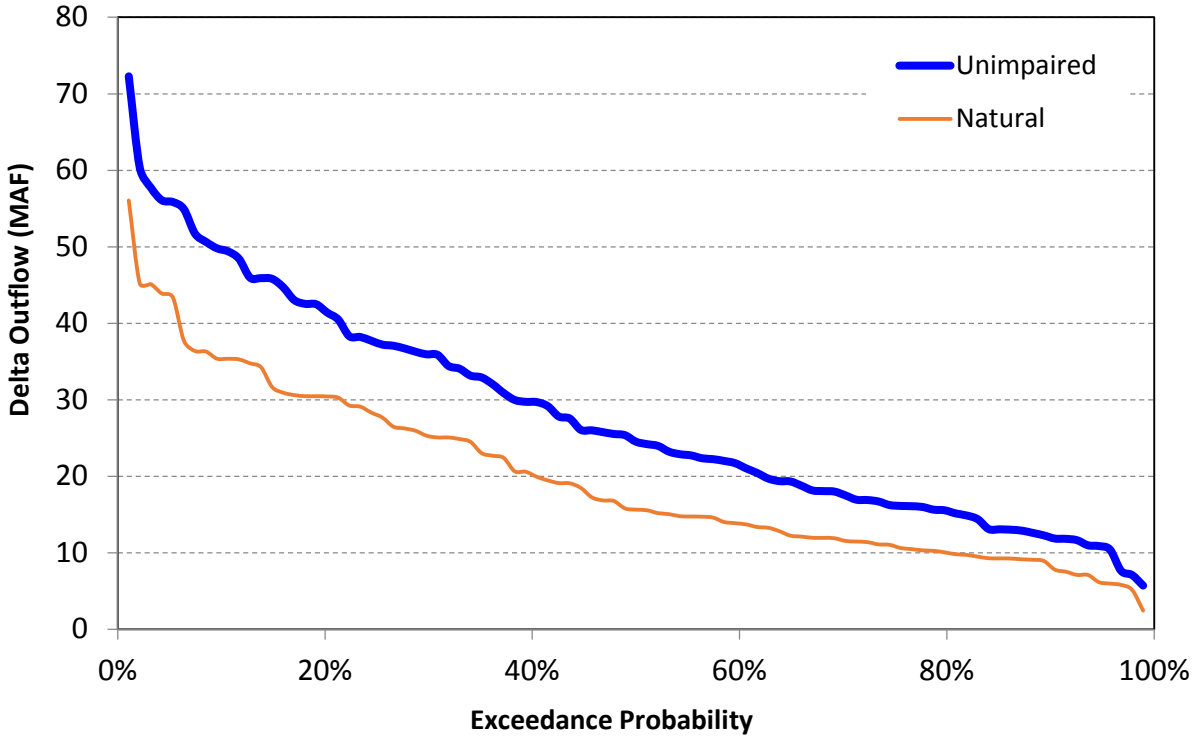

Figure D-13. Annual Net Delta Outflow

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Table D-1. UF 2 – Putah Creek near Winters Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	1	0	-25	22	-83	8	13	15	11	7	4	2	-24
1923	1	-7	-86	-1	11	17	-14	9	7	5	3	1	-55
1924	1	0	0	-3	-10	15	12	9	6	3	1	0	35
1925	0	-4	10	25	-74	40	16	8	14	12	8	4	57
1926	2	1	0	20	-72	37	-67	22	17	12	7	3	-17
1927	2	-25	54	6	-122	35	-36	19	14	10	6	3	-33
1928	2	-13	-4	7	-14	-56	-5	20	16	11	7	3	-28
1929	2	2	-4	11	-7	12	11	9	6	3	1	1	45
1930	0	0	-27	-12	-5	-13	16	13	10	6	3	2	-8
1931	1	-1	-1	-1	15	9	12	9	4	3	1	1	54
1932	0	0	-11	47	17	25	16	10	6	3	2	1	116
1933	0	0	2	-7	24	6	15	12	9	6	4	2	73
1934	1	1	-11	28	-9	12	14	12	7	5	3	1	63
1935	0	-3	7	-27	30	-39	-30	13	13	10	6	3	-17
1936	1	1	-1	16	-93	38	6	18	12	9	5	2	14
1937	1	0	-1	-5	-60	-20	23	22	14	10	6	3	-6
1938	1	-7	5	44	-199	-88	6	18	16	12	6	3	-183
1939	1	0	-2	-2	0	-3	8	7	5	4	2	1	20
1940	0	0	3	-25	-118	7	22	29	20	15	8	4	-35
1941	1	0	-41	-32	-55	-21	-60	15	16	13	8	4	-152
1942	2	0	-44	-19	-66	18	-38	5	10	10	6	3	-115
1943	1	-2	-1	-28	41	11	13	12	10	7	3	1	69
1944	1	0	-1	-2	-10	-14	21	16	12	8	5	2	37
1945	1	-1	0	26	-24	2	13	13	10	7	4	2	54
1946	5	-3	-55	50	24	15	6	8	5	2	1	1	60
1947	0	-2	6	15	-15	-14	6	14	8	6	4	2	30
1948	0	-1	0	-9	5	-14	-28	13	17	15	9	5	13
1949	2	0	-1	-2	-22	-58	25	22	16	11	6	3	3
1950	1	1	-1	-17	-8	26	14	16	11	7	4	2	57
1951	-2	-9	-19	-1	13	-4	14	8	9	6	3	2	20
1952	1	-5	-4	-60	10	-24	14	16	12	9	4	3	-23
1953	1	0	-28	-3	42	0	10	9	9	6	4	2	53
1954	1	0	6	6	-13	-5	-6	19	16	11	6	3	46
1955	2	-5	13	18	15	9	-6	5	7	6	4	2	69
1956	1	1	-11	7	-55	56	29	16	14	9	5	2	73
1957	1	-1	-1	-7	-26	24	20	7	14	10	5	2	49
1958	-5	10	-3	-32	-153	-9	-38	33	20	14	8	4	-150
1959	3	2	-2	11	-16	44	24	16	8	4	2	-1	95
1960	1	1	-1	-13	-11	22	20	14	9	4	2	1	48
1961	1	-3	10	17	12	3	13	13	5	3	2	2	78
1962	1	-4	6	11	-65	15	31	22	13	7	5	3	43
1963	-8	33	0	-14	-4	3	-51	15	17	11	8	5	15
1964	1	-17	15	-10	24	13	10	5	0	-3	-2	-2	34
1965	-4	4	-16	27	43	26	-16	10	8	3	1	3	89
1966	0	-12	5	31	5	19	12	10	5	2	-1	-3	73
1967	0	-25	1	-82	54	-19	-59	2	5	10	5	4	-103
1968	2	-1	-5	-34	3	3	20	16	10	6	4	2	26
1969	1	-2	-25	-60	-42	20	14	13	12	6	5	3	-55
1970	1	0	-39	-126	53	9	20	10	7	4	4	2	-55

Table D-1. UF 2 – Putah Creek near Winters Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	1	-15	6	12	27	-15	5	6	3	0	1	1	34
1972	1	0	-11	15	0	13	5	3	3	1	1	1	32
1973	-1	-12	5	-54	-36	-8	15	13	10	6	5	3	-54
1974	-1	-17	31	-33	6	-105	-17	14	11	8	8	3	-91
1975	1	1	-7	3	-68	-67	25	17	13	8	7	3	-64
1976	0	2	0	1	-4	-2	-3	-2	-1	2	1	0	-6
1977	0	0	0	-1	-2	-4	-2	-1	-2	-1	-1	-1	-14
1978	-1	-8	16	-7	21	-15	7	15	13	8	5	1	55
1979	1	0	0	-3	-25	21	16	13	10	8	5	2	49
1980	-3	2	-15	-16	-78	27	20	17	11	5	6	3	-22
1981	1	0	-2	-18	31	4	15	11	4	7	3	2	58
1982	0	-55	-9	8	-6	-16	-124	31	22	16	12	6	-116
1983	0	-24	-12	-88	-106	-153	6	3	15	13	11	7	-327
1984	5	-50	-91	51	12	-5	8	4	4	3	2	2	-55
1985	2	-6	30	23	-6	1	13	12	6	6	2	2	85
1986	1	-5	1	-1	-199	6	45	25	20	14	8	5	-80
1987	3	2	1	-6	-19	-14	21	18	12	9	5	1	33
1988	0	1	1	36	40	27	20	10	5	3	2	1	144
1989	0	-3	4	10	11	-44	22	19	13	7	5	1	48
1990	-1	3	6	1	2	15	14	1	6	7	6	3	64
1991	2	-3	0	-1	-4	-124	22	22	17	10	7	2	-50
1992	2	1	-1	1	-16	10	24	19	10	7	3	1	60
1993	-2	1	2	-70	-28	31	18	16	9	9	5	2	-7
1994	1	-1	-2	8	3	21	19	13	9	5	-7	1	70
1995	1	-3	1	-107	67	-181	26	-1	13	15	9	4	-156
1996	1	1	-16	-18	-44	-32	-3	-1	11	8	6	3	-84
1997	2	-4	-62	-115	59	30	18	12	10	6	3	1	-41
1998	1	-20	-19	-64	-225	19	-16	-13	-1	9	8	6	-314
1999	2	-13	3	-2	-63	-21	-20	13	11	10	7	4	-69
2000	2	0	4	-28	-101	0	21	16	13	11	6	4	-52
2001	2	1	0	-15	-52	7	24	17	14	9	3	2	13
2002	1	-7	-31	-11	24	10	12	7	4	3	1	0	11
2003	0	-4	-51	36	19	-7	-16	-7	13	11	7	4	5
2004	2	1	-65	21	-112	20	23	19	13	9	5	3	-60
2005	0	-1	-30	-6	0	-36	6	-15	10	10	7	4	-52
2006	2	0	-51	37	5	-89	-111	17	16	15	11	7	-141
2007	4	0	-3	11	-25	15	15	12	7	4	4	2	47
2008	1	1	-3	-19	9	33	23	15	10	6	3	1	80
2009	1	0	-1	5	-34	15	27	13	13	8	4	0	49
2010	-1	4	0	-54	23	6	-15	11	10	9	5	2	2
2011	-1	-1	-39	10	-52	-201	-21	-8	-9	-3	-2	-1	-328
2012	0	-3	0	-15	2	-28	17	24	18	10	5	2	33
2013	1	-10	0	67	30	15	9	5	0	-2	-3	-2	110
2014	0	0	0	-1	-5	21	11	16	8	5	4	1	61
Average	**1**	**-4**	**-8**	**-6**	**-21**	**-6**	**3**	**12**	**10**	**7**	**4**	**2**	**-6**

Table D-2. UF 3 – Cache Creek above Rumsey Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-4	-3	15	23	41	38	26	15	8	5	0	-1	162
1923	-1	23	37	35	25	18	11	9	7	6	2	1	175
1924	0	0	3	13	35	33	25	18	9	4	1	0	142
1925	2	15	38	45	80	63	26	11	4	4	3	-2	289
1926	-3	-4	1	82	43	39	39	11	3	1	-1	-2	210
1927	-2	44	33	-9	-97	-72	-18	-13	-10	-5	-7	-6	-162
1928	-6	14	25	10	24	-9	-2	7	2	2	-1	-3	63
1929	-3	11	17	21	31	23	15	10	4	3	1	1	134
1930	0	0	35	37	42	36	25	13	8	5	2	0	202
1931	0	0	2	27	26	31	25	21	15	10	5	2	163
1932	1	3	18	49	53	37	19	10	6	5	3	1	207
1933	1	1	11	36	39	39	34	25	18	12	6	2	225
1934	1	3	31	35	34	33	24	19	12	7	4	2	206
1935	1	16	23	46	51	18	-2	1	1	2	-1	-2	154
1936	-2	-1	1	37	5	9	12	1	-6	-3	-5	-4	43
1937	-3	-2	-2	8	69	32	24	16	6	3	-1	-3	147
1938	-2	24	83	60	-178	-268	-89	-14	-9	-5	-7	-7	-410
1939	-6	-4	15	22	26	31	20	15	10	6	4	2	141
1940	1	0	11	39	46	-1	-14	12	1	2	-1	-4	92
1941	-4	1	16	-54	-92	-122	-98	-30	-9	-5	-6	-7	-409
1942	-6	-3	27	-8	-54	-34	-29	-28	-18	-7	-8	-8	-174
1943	-7	5	7	34	-10	1	-2	-10	-8	-5	-5	-6	-7
1944	-5	-4	-2	21	39	27	24	14	9	7	3	1	134
1945	1	20	25	53	17	25	16	9	7	5	1	1	180
1946	9	12	4	28	26	10	-4	-3	-3	-2	-3	-2	71
1947	-2	16	23	28	37	27	28	21	15	9	4	1	208
1948	4	10	13	17	25	29	18	28	19	14	9	3	189
1949	1	0	4	13	19	12	21	14	7	4	1	-1	95
1950	-1	0	3	34	54	36	24	15	11	8	3	1	187
1951	1	28	45	7	-6	-6	-4	-5	-4	-2	-2	-4	49
1952	-3	11	3	-25	-84	-50	-19	-16	-13	-10	-9	-7	-223
1953	-5	-3	28	-18	-1	6	-6	-15	-10	-4	-4	-4	-36
1954	-4	19	7	43	25	24	3	2	-3	-1	-4	-4	106
1955	-4	9	28	25	16	12	6	2	7	6	3	1	112
1956	0	2	52	-55	-111	-60	12	-5	-10	-6	-8	-7	-195
1957	-4	-1	1	22	28	11	31	14	12	11	6	3	132
1958	7	11	-3	-29	-163	-186	-110	-33	-11	-6	-8	-10	-540
1959	-9	-7	-6	49	44	33	21	7	2	0	-2	-1	132
1960	0	-1	-1	13	72	45	37	18	9	8	3	0	203
1961	0	15	56	53	29	31	18	9	6	4	1	-2	219
1962	-2	23	38	34	56	39	25	9	2	-1	-3	-4	216
1963	42	29	33	87	25	31	-29	-4	-2	-3	-5	-7	197
1964	-7	22	22	32	21	17	11	6	2	1	0	0	128
1965	0	47	51	10	-22	13	-14	-16	-8	-3	-6	-6	47
1966	-6	25	19	34	30	14	2	-3	-3	-6	-6	-6	96
1967	-4	42	41	10	0	23	-34	-27	-14	-10	-8	-8	12
1968	-7	-4	16	32	-12	13	11	0	-1	-3	-6	-7	32
1969	-5	0	34	19	-71	-140	-46	-12	-10	-8	-9	-10	-257
1970	-7	-4	23	-53	-57	-16	4	-6	-8	-9	-9	-8	-150

Table D-2. UF 3 – Cache Creek above Rumsey Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-5	65	50	21	18	5	-11	-10	-9	-10	-8	-8	97
1972	-5	-3	21	21	23	20	16	10	7	5	3	1	119
1973	3	26	39	7	-42	-68	-6	-5	-5	-5	-5	-7	-67
1974	-4	75	18	-58	-30	-92	-80	-9	-6	-6	-7	-8	-208
1975	-7	-5	7	17	26	-34	-28	11	2	-1	-5	-5	-22
1976	-5	1	7	7	17	19	23	23	17	10	3	2	123
1977	1	1	1	10	12	20	18	15	10	6	3	1	96
1978	1	19	39	61	26	-54	-25	-4	-7	-9	-7	-9	31
1979	-6	-6	-5	32	30	27	25	7	3	1	-4	-2	102
1980	2	26	40	-23	-56	-55	-23	8	-4	-7	-8	-8	-108
1981	-6	-3	15	13	20	23	18	8	2	-3	-1	0	85
1982	2	34	24	-7	-6	-8	-119	-21	-4	-8	-7	-10	-132
1983	-9	40	15	-56	-100	-366	-193	-53	-12	-12	-10	-13	-769
1984	-12	9	-142	-49	-9	-16	-10	-7	-2	0	1	0	-239
1985	-2	37	27	25	35	17	10	12	12	11	4	2	188
1986	0	6	23	37	-72	-115	-3	11	0	1	0	-3	-115
1987	-2	-1	1	7	34	37	35	23	15	11	5	2	166
1988	1	7	38	29	41	27	11	5	-1	1	3	0	163
1989	0	20	26	34	28	14	25	23	21	10	6	0	209
1990	10	11	12	26	28	29	21	32	21	20	14	8	232
1991	3	2	2	1	17	38	42	35	20	16	7	2	185
1992	1	2	6	21	37	38	32	14	9	5	3	3	172
1993	-3	3	25	-76	-149	-70	-1	-8	-7	-3	0	0	-290
1994	-1	-3	10	12	21	22	12	9	-9	10	4	0	87
1995	1	15	29	-116	-48	-205	-103	11	22	-10	-9	-12	-425
1996	-7	1	50	10	-104	-93	24	12	-13	-21	-3	-1	-144
1997	-7	6	30	-164	-145	63	33	9	-3	-14	-31	-10	-234
1998	-3	-25	-27	-267	-481	-105	-21	-20	-3	15	10	9	-919
1999	-22	4	-12	-20	-180	-82	-8	23	13	12	6	-7	-273
2000	-2	-1	11	-48	-211	-57	27	14	10	13	5	-6	-246
2001	0	1	2	-12	-86	-41	30	6	12	-1	0	-4	-94
2002	-4	-16	-126	-68	34	13	12	1	-1	2	-1	0	-156
2003	-1	-4	-144	-79	30	0	-83	-23	25	12	12	5	-252
2004	-10	-1	-136	-53	-225	1	24	14	-8	-16	-12	-13	-436
2005	-8	1	-36	-90	-16	-91	-16	-22	12	10	9	7	-238
2006	-2	-13	-106	-89	17	-204	-205	39	20	11	5	0	-527
2007	1	-6	-25	17	-71	7	25	15	14	-2	-7	1	-31
2008	-7	-2	-11	-112	-89	34	29	13	-1	2	-9	-8	-162
2009	-6	-4	1	8	-65	-34	34	4	19	4	7	-2	-34
2010	1	10	8	-94	5	17	7	35	26	21	12	4	54
2011	-9	2	-119	2	-78	-370	-51	-22	-32	-31	-24	-9	-741
2012	-5	-4	-1	-15	9	-26	-13	53	31	-4	-9	-3	14
2013	1	15	-91	52	49	18	14	13	7	-16	-17	-4	42
2014	-8	0	0	1	-6	2	14	34	23	-2	-7	-5	47
Average	**-2**	**9**	**6**	**1**	**-15**	**-18**	**-3**	**5**	**3**	**1**	**-1**	**-3**	**-17**

Table D-3. UF 4 – Stony Creek at Black Butte Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-1	3	26	77	5	76	13	-9	-5	2	0	0	188
1923	9	16	8	39	20	9	7	4	-2	2	0	2	114
1924	26	9	24	12	54	30	7	2	0	0	1	1	165
1925	9	53	36	14	-41	36	-1	-50	-9	0	0	1	46
1926	1	11	47	-5	17	26	-46	1	0	0	0	1	52
1927	3	-25	108	22	-95	50	0	-16	-4	2	0	0	46
1928	-1	37	36	49	35	-39	42	3	0	0	0	0	163
1929	0	30	40	30	45	25	10	4	3	5	0	0	194
1930	0	0	32	31	4	38	15	2	-2	0	0	1	123
1931	2	7	23	65	41	22	17	0	8	13	1	0	200
1932	1	11	-10	114	11	-8	13	3	-2	1	0	0	134
1933	0	2	34	51	38	18	28	3	-7	0	0	0	167
1934	0	12	7	117	-3	0	23	5	1	1	0	0	162
1935	1	42	47	15	16	30	-26	-1	-4	-1	0	0	120
1936	5	6	12	148	-38	21	11	-1	14	16	1	0	196
1937	0	0	0	32	8	58	38	18	18	25	3	0	202
1938	7	53	96	62	-10	-26	-8	-53	-23	-4	0	0	93
1939	11	10	145	73	47	36	30	7	8	1	0	0	367
1940	4	2	49	56	-120	20	-1	-4	1	1	0	0	8
1941	0	28	-73	-16	-74	-70	-95	-49	-18	-1	1	-1	-368
1942	-1	8	23	-28	-22	0	-71	-25	-11	0	0	-1	-129
1943	1	0	41	-10	62	1	11	1	-1	0	0	0	107
1944	0	12	19	36	44	1	-12	-16	0	7	1	0	90
1945	-1	31	43	56	81	12	15	-2	5	3	0	0	243
1946	-2	21	-30	120	15	23	31	3	-1	0	3	1	185
1947	6	3	49	21	25	36	16	4	4	4	0	0	169
1948	11	38	11	64	28	9	-13	0	4	8	1	2	163
1949	10	22	39	38	-9	12	11	9	6	1	0	0	140
1950	9	16	14	-4	9	17	36	0	-4	1	0	-1	92
1951	-3	12	20	-2	53	3	-3	-12	-4	-4	0	0	59
1952	0	9	30	-15	-50	-41	-30	-23	-8	5	4	0	-120
1953	1	36	74	3	30	-2	-18	-27	0	3	1	1	101
1954	2	18	136	89	95	7	-25	-10	23	17	2	6	360
1955	6	15	129	45	22	27	8	14	5	-1	0	0	270
1956	0	8	-26	21	-13	62	-4	-24	-8	-1	0	-1	14
1957	-4	13	49	46	-24	86	9	-27	-13	-5	0	-2	129
1958	16	27	16	3	-192	70	-45	-43	-10	2	1	-3	-157
1959	2	7	15	59	21	46	36	6	-1	0	0	0	193
1960	6	1	2	23	69	39	12	0	7	2	0	0	163
1961	2	5	90	11	92	31	16	-2	0	1	1	2	248
1962	4	16	112	25	-23	43	-6	9	-1	2	3	3	186
1963	-2	50	72	15	-78	-5	-48	-4	-6	-3	0	0	-9
1964	7	25	102	78	57	25	29	2	0	1	0	0	327
1965	0	68	-130	77	15	5	-46	7	-1	0	3	6	5
1966	6	19	48	96	26	71	0	-10	-5	0	0	1	253
1967	1	1	105	-113	50	-10	-20	-29	-8	8	1	0	-13
1968	4	11	123	12	-26	48	31	8	1	0	3	16	232
1969	2	28	77	-56	-59	-14	-22	-12	15	8	1	0	-32
1970	3	18	-2	-167	87	5	0	-3	-3	1	0	0	-59

Table D-3. UF 4 – Stony Creek at Black Butte Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	1	2	126	94	39	-26	42	-5	-8	-1	0	0	264
1972	3	22	43	57	88	55	46	3	3	2	0	0	321
1973	7	25	40	-103	-81	24	23	8	1	0	0	0	-55
1974	2	-5	38	-89	53	-64	-21	-1	-8	2	3	0	-90
1975	0	25	51	117	-50	-35	50	-7	-4	1	2	2	152
1976	6	53	57	80	17	55	18	8	0	1	13	17	326
1977	4	2	4	24	14	46	34	8	4	0	0	0	141
1978	4	5	-3	-128	-34	-35	-7	-10	-11	-2	0	1	-220
1979	1	2	37	30	15	21	6	-6	-1	0	0	1	106
1980	0	27	14	-55	-141	48	-5	-6	-4	1	0	0	-122
1981	0	-1	8	-44	47	10	4	-2	-1	0	0	0	20
1982	-1	-25	-20	51	-49	-30	-76	-28	-13	-1	1	-1	-191
1983	-4	34	18	-118	-118	-214	-47	-64	-30	-8	-2	1	-552
1984	1	-57	-155	50	-18	-14	-4	-1	1	0	0	0	-197
1985	5	13	48	12	-4	3	3	4	0	0	0	2	85
1986	3	4	42	-19	-187	88	24	-4	1	0	0	0	-47
1987	2	6	3	19	29	41	26	3	0	0	0	0	129
1988	0	12	78	48	9	-7	-6	6	5	3	0	0	149
1989	0	1	51	44	8	-26	24	7	3	0	0	3	115
1990	11	32	11	37	44	11	2	-4	12	5	0	0	162
1991	0	1	1	6	24	33	43	10	5	2	1	0	128
1992	0	5	-2	35	4	22	-18	5	1	3	1	0	55
1993	0	14	84	-4	2	7	-18	-8	9	8	0	0	94
1994	1	3	28	25	57	36	4	6	5	0	0	0	165
1995	0	14	62	-187	148	-135	40	-37	-11	-1	1	0	-105
1996	0	-1	-37	-88	-31	1	-12	-19	4	1	0	0	-181
1997	0	7	10	-13	92	12	10	1	3	1	0	1	124
1998	4	10	76	-42	-199	53	-14	-74	-44	-5	-1	0	-235
1999	1	23	75	0	-13	-6	-3	-6	-6	0	-1	0	65
2000	0	21	46	6	76	45	-15	-7	0	1	0	0	174
2001	0	9	31	26	26	33	11	-3	0	0	0	0	134
2002	1	12	32	-20	-3	-10	-9	-5	1	0	0	0	-1
2003	0	3	-27	71	11	-4	9	27	9	0	1	1	100
2004	1	11	6	85	-98	19	-7	-11	-3	0	0	0	3
2005	0	20	5	84	-51	-77	-4	-48	-3	2	1	0	-72
2006	0	6	-85	135	-7	-29	-140	-27	-7	-1	0	0	-156
2007	0	0	17	50	20	33	2	-1	1	0	1	0	124
2008	2	6	10	31	39	-13	-18	-20	-2	0	0	0	35
2009	6	25	18	27	19	83	23	-5	6	1	0	0	203
2010	3	10	13	-15	63	12	-40	-5	-10	1	0	0	30
2011	-4	40	-40	-48	-36	-163	-88	-34	-48	-9	0	0	-429
2012	-2	-4	-2	-6	37	-16	31	10	1	0	0	0	49
2013	0	-10	42	92	4	-12	-8	0	0	1	0	0	109
2014	0	-1	1	-1	6	61	25	10	1	1	0	0	104
Average	**2**	**13**	**30**	**20**	**2**	**10**	**-1**	**-7**	**-2**	**1**	**1**	**1**	**70**

Table D-4. UF5 — Sacramento Valley West Side Minor Streams (Thomes and Elder Creeks only) Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	2	0	5	-3	24	15	-45	-30	3	5	4	3	-18
1923	2	7	27	3	5	1	-22	-3	1	5	5	3	33
1924	3	2	1	1	10	6	4	4	5	3	2	1	44
1925	0	2	-1	-1	-12	-3	-30	-30	3	5	5	3	-60
1926	1	-1	-2	25	-7	-6	6	4	5	6	4	2	39
1927	2	20	-8	6	-11	-25	-26	-20	-2	5	4	3	-52
1928	2	-9	11	-5	-20	-29	-12	-3	2	5	4	2	-53
1929	2	7	2	5	15	6	0	-3	3	5	4	2	48
1930	2	0	11	15	2	1	-3	4	5	6	4	3	49
1931	2	2	0	14	2	2	3	5	6	6	4	3	48
1932	2	0	48	19	5	-23	-10	-9	2	5	4	3	47
1933	2	1	8	24	17	12	-15	-10	-3	6	5	3	51
1934	2	4	30	15	5	4	3	4	7	6	4	3	85
1935	6	8	12	41	13	9	-15	-7	6	6	5	3	88
1936	2	1	6	21	10	-4	4	0	3	7	5	4	58
1937	3	1	1	3	34	31	-18	-16	3	7	6	4	58
1938	3	0	-6	40	63	-5	-69	-66	-13	2	3	2	-47
1939	2	3	8	13	10	-1	-1	-1	5	5	4	2	50
1940	2	1	11	16	-19	-6	-21	-1	6	6	5	3	2
1941	2	2	21	44	7	-53	-42	-38	-11	2	5	3	-58
1942	1	1	15	5	15	1	-4	-17	-5	4	4	4	24
1943	3	-3	1	8	-12	-4	1	2	5	6	5	3	17
1944	2	0	1	18	22	10	-1	-5	3	5	5	3	65
1945	4	8	16	26	4	15	-9	-2	4	7	5	3	80
1946	11	5	26	2	11	-6	-20	-8	2	4	3	2	31
1947	1	3	11	7	1	5	5	7	4	7	5	3	60
1948	2	5	6	4	7	13	6	-12	1	8	7	3	50
1949	3	-2	3	7	4	15	-35	-10	3	5	4	2	-1
1950	1	1	2	4	13	-5	-14	-2	5	6	5	3	18
1951	5	0	19	22	-11	3	-6	-5	4	5	4	3	43
1952	1	7	32	35	-21	-7	-66	-35	-5	2	4	3	-50
1953	2	1	50	-8	-8	8	-17	-16	-4	3	5	4	19
1954	2	1	5	44	-5	-2	-18	-2	3	6	4	3	40
1955	2	-1	24	12	4	0	-3	-15	2	5	4	2	36
1956	1	-1	-38	14	31	-19	-47	-39	-7	3	4	2	-95
1957	5	2	2	12	-16	-1	-3	-8	5	7	6	3	15
1958	-2	1	4	14	-44	18	-23	-37	-5	3	4	3	-63
1959	2	0	0	21	37	-11	-8	1	4	4	3	1	55
1960	2	1	1	7	3	-11	-1	2	4	7	5	4	24
1961	2	2	18	21	-8	6	-8	-3	2	6	5	3	46
1962	2	9	17	9	28	15	-31	-3	2	4	3	2	57
1963	16	7	1	14	-44	10	-14	-20	3	6	5	3	-14
1964	1	7	11	27	1	4	-1	1	3	4	3	2	63
1965	1	10	-64	10	-11	-7	-35	-17	1	4	3	2	-102
1966	1	-4	14	17	14	-20	-41	-8	3	4	3	2	-16
1967	1	-2	5	11	-19	13	8	-46	-12	5	5	3	-29
1968	1	1	18	3	-23	5	-4	0	4	4	3	2	14
1969	1	2	58	-14	63	-41	-107	-71	-8	3	3	2	-111
1970	2	1	9	-36	21	1	3	-2	2	4	3	2	9

Table D-4. UF 5 — Sacramento Valley West Side Minor Streams (Thomes and Elder Creeks only) Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	1	25	35	-36	-20	-18	-23	-18	-2	4	4	2	-47
1972	1	0	15	-2	8	-30	-1	2	5	6	4	2	11
1973	0	8	-11	9	37	0	-34	-18	2	4	3	1	1
1974	3	12	-4	-76	37	-16	-24	-14	0	3	4	3	-72
1975	1	1	6	14	15	-10	-22	-43	-7	4	4	2	-35
1976	3	1	8	8	14	5	2	1	5	5	3	2	57
1977	2	1	1	5	3	2	3	4	5	4	3	2	34
1978	2	3	8	-19	1	-14	-10	-15	-4	3	4	1	-40
1979	2	0	1	8	28	-15	-10	-7	5	6	5	3	26
1980	5	3	29	-70	-13	3	-3	-5	2	4	4	2	-38
1981	1	0	-2	5	-9	13	-1	5	6	6	4	2	31
1982	2	-24	-13	1	-29	23	-15	-18	1	5	5	3	-60
1983	0	5	8	-10	8	4	-3	-72	-26	0	4	3	-80
1984	2	-16	-15	-11	17	2	-1	0	4	5	4	3	-6
1985	1	-7	3	5	-2	-1	-17	2	5	5	4	2	0
1986	2	2	11	11	-113	-8	-4	2	5	6	4	2	-80
1987	1	0	0	10	10	10	1	5	7	6	4	2	55
1988	1	0	-7	4	-4	-3	-1	3	5	7	5	4	15
1989	2	0	7	1	-1	-7	-6	9	8	7	5	3	28
1990	6	5	5	12	6	3	7	5	6	9	7	5	75
1991	3	2	2	0	3	16	-6	-1	6	6	5	3	40
1992	2	0	1	5	-1	-12	-8	6	6	5	5	3	12
1993	1	1	28	-6	-6	-44	-7	-4	-6	8	7	5	-23
1994	3	2	11	11	28	2	4	4	7	6	4	3	84
1995	2	2	10	6	-36	-3	-11	-27	-4	6	6	4	-45
1996	2	1	-35	-44	-53	-46	-20	-24	3	7	6	4	-199
1997	1	0	19	-33	-2	11	5	6	5	5	4	3	25
1998	2	10	11	13	-54	2	-26	-70	-35	2	4	3	-137
1999	1	11	11	15	15	-7	-22	-6	4	5	4	3	33
2000	1	2	9	24	-37	-24	-45	-8	3	4	4	2	-64
2001	0	1	3	-2	-12	-68	-8	0	5	5	4	2	-70
2002	1	3	-7	-48	13	7	-3	2	5	5	3	2	-17
2003	1	2	-24	-32	13	8	21	-11	6	6	5	3	-1
2004	2	-1	-8	-10	-29	-20	-4	1	4	5	4	2	-54
2005	1	4	-8	-16	-38	-31	-15	-58	-5	6	6	4	-151
2006	2	2	5	9	33	8	-40	-13	5	6	5	3	26
2007	1	-2	5	8	-5	0	8	8	7	6	5	3	45
2008	2	2	6	-10	-34	-3	-4	-6	5	6	5	3	-28
2009	3	0	3	6	-5	-7	5	10	7	7	6	3	38
2010	1	2	7	-36	-19	12	-30	-14	1	7	6	4	-59
2011	5	9	-24	-18	7	0	10	12	-8	8	7	5	13
2012	4	1	1	-10	-2	-11	-15	9	9	7	6	3	3
2013	2	-2	-15	-1	3	2	2	7	7	6	4	3	17
2014	1	0	-1	-1	-1	1	2	10	8	7	4	3	33
Average	**2**	**2**	**6**	**3**	**0**	**-3**	**-13**	**-10**	**1**	**5**	**4**	**3**	**0**

Table D-5. UF 7 — Sacramento Valley Eastside Minor Streams Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-11	-6	38	25	95	19	-36	-73	-18	-6	-7	-9	11
1923	-5	10	59	42	24	-3	21	-3	0	-7	-14	-12	111
1924	-4	-6	14	29	39	0	12	-6	-10	-10	-11	-10	38
1925	12	15	60	36	56	-11	-10	-16	-2	-4	-6	-6	126
1926	-2	1	14	8	91	-9	-25	-11	-2	-7	-10	-8	41
1927	-2	26	3	38	6	-45	-8	-17	2	1	-5	-6	-6
1928	-3	22	23	25	-10	8	-16	-26	-8	-9	-7	-8	-9
1929	-9	11	36	24	39	27	23	-2	4	-3	-3	-7	140
1930	-11	-9	32	40	4	15	-15	-21	-10	-4	-4	-9	7
1931	-11	9	-10	45	27	0	-4	-8	-9	-11	-12	-10	5
1932	1	14	13	54	61	-30	-23	-26	-2	-10	-9	-9	33
1933	-6	-9	6	26	6	16	-16	1	-15	-11	-10	-10	-23
1934	-4	0	16	40	26	-31	-27	-12	-9	-12	-11	-9	-31
1935	-7	18	14	12	-10	-17	-77	-75	-32	-14	-10	-9	-207
1936	-1	-4	9	84	73	-37	-18	-33	-15	-10	-9	-11	29
1937	-11	-8	5	30	83	38	-22	-24	-12	-6	-6	-9	58
1938	-10	-42	-146	-8	-35	-110	-106	-188	-135	-58	-26	-25	-886
1939	-6	-3	17	34	37	12	-9	-9	-16	-14	-13	-11	18
1940	-6	-11	-7	74	-167	-115	-71	-43	-24	-14	-12	-15	-412
1941	-9	14	-11	-12	-177	-129	-144	-79	-32	-16	-13	-14	-624
1942	-10	-2	-40	-41	-124	-5	-78	-73	-54	-24	-17	-16	-484
1943	-15	46	58	9	-4	-64	-105	-61	-29	-21	-21	-19	-227
1944	-16	-12	18	46	41	28	-5	-12	-16	-15	-14	-14	29
1945	-14	47	0	2	53	-13	-16	-35	-27	-16	-13	-15	-46
1946	-16	25	-70	5	11	8	-12	-19	-16	-13	-13	-13	-123
1947	-10	18	0	0	14	24	-38	-18	-13	-15	-15	-14	-66
1948	1	-9	-6	-2	15	-61	-88	-77	-85	-24	-14	-12	-363
1949	-14	-5	19	9	21	-11	-10	3	-16	-10	-11	-13	-36
1950	-11	1	7	77	-19	13	-39	-22	-18	-14	-10	-9	-45
1951	-7	109	60	18	-56	24	-22	-26	-16	-6	-10	-14	55
1952	5	11	-74	47	-100	-67	-70	-106	-9	-1	-10	-8	-381
1953	-8	1	-43	-93	-21	13	-31	-41	-32	-28	-17	-14	-313
1954	-10	4	32	11	-57	-42	-101	-54	-26	-20	-18	-17	-298
1955	-15	-18	39	42	9	10	-10	-14	-18	-12	-11	-11	-10
1956	-11	-2	27	-135	-164	-34	-40	-51	-23	-17	-11	-9	-470
1957	-1	5	14	28	6	2	-8	-37	-29	-17	-15	-28	-79
1958	-30	-12	0	-58	-197	-110	-92	-83	-35	-21	-14	-11	-662
1959	-10	-8	-3	18	-38	2	-8	-18	-21	-17	-15	-9	-126
1960	-19	-16	-9	54	42	2	-10	-16	-23	-13	-13	-13	-34
1961	-13	3	-39	-21	-25	-13	-24	-27	-26	-14	-14	-13	-229
1962	-15	-17	-29	2	34	2	-27	-28	-24	-9	-9	-10	-131
1963	6	-5	-8	3	38	-19	-124	-47	-23	-12	-11	-11	-213
1964	-8	45	27	31	5	33	12	4	-11	-12	-12	-13	101
1965	-12	0	38	-83	-23	-6	-86	-19	-18	-11	-10	-11	-239
1966	-12	19	29	28	13	10	-13	-30	-13	-16	-13	-14	-12
1967	-15	2	40	7	1	-46	-73	-103	-49	-19	-8	-5	-269
1968	-7	-5	48	-28	-15	-22	-11	-15	-13	-16	-17	-13	-113
1969	-9	22	-54	-66	-90	-23	-55	-87	-18	-10	-7	-6	-404
1970	-2	1	-41	-230	-51	-82	-16	-22	-19	-16	-18	-16	-512

Table D-5. UF 7 — Sacramento Valley Eastside Minor Streams Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-9	-42	7	-33	-14	-54	-38	-41	-35	-22	-18	-15	-315
1972	-12	3	45	34	38	-40	-22	-22	-19	-15	-16	-15	-41
1973	-12	14	9	6	-59	-27	-38	-47	-20	-8	-11	-13	-206
1974	-8	-89	-53	-223	-19	-171	-86	-63	-44	-13	-15	-16	-802
1975	-14	3	2	19	-29	-87	-50	-79	-46	-22	-15	-17	-334
1976	0	5	5	-5	3	4	-15	-28	-18	-17	-13	-13	-92
1977	-17	-10	-17	12	11	0	-15	-8	-18	-15	-14	-16	-108
1978	-15	4	54	-46	-57	-124	-66	-24	-19	-18	-9	-5	-326
1979	-10	16	17	88	-21	-4	-2	-8	-13	-7	-11	-11	34
1980	-7	-2	-54	-18	-10	-28	-4	-39	-15	-12	-12	-14	-215
1981	-11	-11	68	8	43	74	-4	-6	-9	-10	-13	-9	122
1982	40	143	29	-50	36	5	-19	8	-15	9	6	8	201
1983	46	83	69	53	27	37	24	8	-63	-43	-2	1	241
1984	5	137	6	6	50	67	24	-15	-10	-17	-15	-9	229
1985	8	115	10	7	23	61	31	-7	-7	-11	-11	8	228
1986	-11	10	16	88	27	-12	-7	-5	-15	-7	-8	23	98
1987	-1	-5	7	20	62	64	33	-2	-6	-4	-8	-13	147
1988	-10	9	130	32	30	55	18	8	-2	-8	-10	-13	238
1989	-16	101	8	-1	35	119	11	-21	-11	-3	-5	9	225
1990	53	1	-6	68	2	75	-3	23	13	-10	-9	-12	196
1991	-10	-4	-10	-12	22	107	73	19	-12	-3	-10	-8	153
1992	0	6	29	9	107	73	5	-9	2	3	-8	-11	208
1993	2	2	60	-10	44	55	59	71	21	-31	-5	-5	264
1994	22	10	68	52	71	78	31	-2	-15	-12	-11	-11	281
1995	-14	22	21	150	-4	96	55	25	-64	-57	-7	-4	219
1996	-2	-3	94	63	68	50	60	-22	-40	-23	-19	-8	217
1997	-6	41	84	-62	-13	45	-25	-45	-17	-19	-17	-16	-51
1998	-2	49	43	81	57	24	15	68	-27	-67	-7	4	238
1999	13	80	64	64	39	21	40	-13	-47	-29	-20	-19	192
2000	-12	38	7	100	81	39	25	-45	-27	-18	-19	-16	153
2001	5	-1	11	30	27	67	51	-24	-13	-16	-15	-13	108
2002	-16	64	44	55	43	35	34	-26	-29	-15	-13	-14	163
2003	-18	35	135	87	14	36	-14	-43	-71	-24	-11	-14	112
2004	-11	16	100	34	116	44	39	-24	-17	-17	-16	-13	253
2005	28	14	57	62	76	105	45	29	-15	-12	-8	-11	370
2006	-11	46	148	60	41	61	52	51	-8	-7	10	2	445
2007	6	28	88	9	136	60	30	-13	-12	-8	-9	-5	308
2008	6	0	30	59	52	66	55	38	-10	-6	-6	-7	276
2009	1	52	15	41	130	103	57	4	-3	-3	-5	-7	385
2010	8	11	42	94	62	57	82	82	-17	-18	-4	-3	396
2011	21	27	74	15	38	57	-33	48	-44	-53	-14	-11	124
2012	10	11	-8	42	28	30	-1	-62	-36	-23	-18	-17	-45
2013	-16	-10	21	5	-5	-4	-35	-41	-25	-19	-17	-16	-164
2014	-20	-15	-20	-20	30	17	5	-32	-17	-14	-15	-13	-114
Average	**-4**	**14**	**19**	**15**	**11**	**5**	**-14**	**-23**	**-21**	**-15**	**-11**	**-10**	**-34**

Table D-6. UF 8 — Feather River near Oroville Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-10	-24	144	55	-18	41	-229	-528	-168	105	31	-4	-604
1923	23	56	76	9	92	80	22	-105	29	8	-6	8	291
1924	3	-23	-22	-11	81	12	48	10	8	-2	-12	-15	76
1925	15	24	43	80	-22	152	90	-6	43	-2	-17	-9	392
1926	-8	-30	-21	24	34	138	4	76	38	7	-7	-17	240
1927	14	92	-4	25	-502	-62	-101	-194	-21	15	-11	-19	-766
1928	6	139	58	28	-31	-375	-41	-28	66	0	-10	-12	-202
1929	-18	27	-11	2	14	47	75	-62	67	21	3	-5	160
1930	-7	-17	-35	66	36	127	-46	-43	-4	-8	-12	-7	48
1931	-12	-12	-26	43	24	101	9	20	30	-2	-4	-9	162
1932	5	13	-28	-29	5	27	27	-124	18	44	5	-9	-46
1933	-9	-7	-8	-19	68	228	171	25	-47	14	5	0	421
1934	55	26	106	150	201	74	50	38	16	-5	-7	-7	695
1935	-1	71	51	157	90	92	-196	-219	18	74	20	-2	157
1936	15	-10	11	166	33	80	-59	-115	-14	-11	-20	-16	61
1937	-15	-25	-31	-28	-1	28	65	-55	99	80	16	-1	132
1938	32	75	-22	114	1	-526	-486	-600	-252	46	5	-18	-1630
1939	-4	-22	-13	-21	-17	66	-33	48	9	-11	-9	-15	-20
1940	-9	-21	20	349	7	-118	-41	63	98	25	-12	-18	343
1941	0	85	52	71	-18	91	80	-319	-46	-1	-34	-43	-83
1942	-33	10	22	-68	-243	110	-106	-107	-173	9	-24	-43	-646
1943	-39	14	-83	-73	77	-168	-121	-14	23	-18	-41	-41	-484
1944	-31	-16	-16	43	64	160	78	-145	-18	-82	-18	-18	1
1945	7	222	76	31	151	91	21	-117	2	-3	-26	-24	431
1946	35	81	-69	22	31	74	-52	-104	13	-7	-29	-24	-30
1947	-18	76	93	-8	205	194	64	26	-2	-11	-18	-19	583
1948	35	56	-12	233	30	57	-116	-126	-58	68	22	-6	183
1949	-14	30	-4	-18	-10	-6	36	6	106	43	5	0	175
1950	0	24	0	-63	195	150	-25	-70	28	46	4	-7	281
1951	70	13	36	20	-54	171	-58	-56	18	-5	-22	-25	109
1952	7	32	-3	-35	-218	-138	-691	-362	-49	93	57	-8	-1316
1953	-20	1	131	30	112	115	-79	-252	-267	-70	-39	-53	-392
1954	-16	-5	1	163	219	96	-195	-105	15	-19	-28	-34	93
1955	-31	34	148	14	-6	50	26	-62	44	24	-7	-14	218
1956	-3	4	-291	-111	-70	22	-143	-219	-35	9	3	-29	-865
1957	-24	-6	-41	0	-96	33	98	-96	-18	1	-22	-19	-190
1958	-6	-33	36	94	-360	-22	-106	-411	-160	25	-17	-27	-986
1959	-26	-37	-35	153	46	141	-41	-30	-27	-39	-27	-10	68
1960	-27	-33	-48	94	88	143	76	47	3	-5	-8	-13	318
1961	-11	57	83	85	141	178	49	-50	-20	-9	-24	-14	466
1962	-19	5	101	29	-16	90	12	54	55	56	17	-6	380
1963	147	76	136	31	-62	143	-329	-321	-18	-6	-13	-32	-249
1964	-18	40	50	46	28	90	-1	-53	15	-8	-11	4	182
1965	-11	90	-276	65	72	216	-198	-207	-25	-6	-18	3	-294
1966	-32	97	50	92	34	134	-32	-33	29	-8	-17	-10	304
1967	-11	137	257	158	174	-88	-45	-393	-305	61	35	-5	-25
1968	3	-23	19	11	-41	214	107	10	22	-21	-27	-16	259
1969	8	58	-14	-407	-108	57	-180	-283	22	131	57	-5	-664
1970	12	14	-64	-431	337	155	114	-62	-46	-34	-32	-39	-76

Table D-6. UF 8 — Feather River near Oroville Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-7	111	24	-99	-48	-192	-101	-438	-268	6	8	-29	-1033
1972	-43	-31	-91	-87	11	-16	70	-66	-16	-12	-11	-23	-316
1973	7	62	-108	-28	78	-67	41	-124	72	60	-1	-12	-19
1974	4	11	-45	-495	45	-350	-65	-163	-85	30	2	-14	-1124
1975	-30	-11	1	-34	14	-154	-136	-409	-228	54	22	-36	-947
1976	36	-15	0	-51	-29	-14	4	-51	-31	-35	-47	-14	-247
1977	-18	-9	-30	-34	-38	-26	0	-8	-31	-22	-19	-16	-250
1978	-17	-19	86	188	135	256	204	17	-43	18	21	-10	834
1979	3	-36	-20	55	119	159	52	-113	79	19	-5	-10	301
1980	32	59	20	-113	-13	86	46	-43	41	13	17	-59	87
1981	-28	-24	93	97	183	296	191	118	82	19	-5	-4	1019
1982	45	-32	-91	45	-2	147	-274	-157	-20	25	-6	-25	-344
1983	32	13	-195	107	138	-259	7	-259	-214	94	67	1	-469
1984	-18	20	-332	-63	54	243	168	36	91	23	1	-41	181
1985	-29	92	34	-25	42	18	59	56	55	-2	-13	-2	286
1986	-16	-21	72	225	-370	27	151	103	105	36	-9	-12	290
1987	-22	-36	-43	-46	41	-9	94	61	14	1	-11	-13	32
1988	-18	-13	5	-8	150	147	50	-19	-20	-21	-15	-8	231
1989	-19	72	37	33	11	-175	89	132	97	40	3	-2	319
1990	67	-6	25	18	-5	76	49	119	33	9	3	-27	361
1991	17	-13	-2	-23	-14	49	101	-25	4	4	0	0	97
1992	12	10	20	54	144	242	52	50	38	2	-2	-4	619
1993	16	10	15	-157	-113	-303	142	190	202	211	92	8	314
1994	17	-2	114	44	43	275	64	15	19	-2	-5	-12	571
1995	-10	19	49	272	223	-398	-59	-380	-70	94	91	15	-155
1996	-26	-39	215	7	-76	126	-1	-262	36	39	-6	-23	-11
1997	-27	-3	-235	-454	122	269	44	66	61	4	-25	-24	-202
1998	1	55	87	143	-57	40	80	-153	-238	38	59	0	54
1999	-31	26	15	-60	-203	-50	3	-79	74	70	-1	-29	-265
2000	-10	14	4	106	53	210	87	46	98	30	-2	-14	622
2001	-1	-12	-16	17	18	116	0	-99	-4	-10	-10	-16	-18
2002	-12	42	147	27	165	199	21	28	21	7	-5	-7	633
2003	-4	121	360	385	194	162	60	-176	-34	25	-10	-15	1068
2004	-14	-13	5	26	20	206	121	18	28	1	-21	-17	361
2005	31	39	357	130	165	288	274	-15	202	155	51	-9	1667
2006	-8	7	131	236	213	1	-167	-98	189	169	63	-2	733
2007	-24	-16	13	-17	131	110	108	73	56	-32	-31	-26	344
2008	-13	-12	22	75	115	27	-7	-29	91	39	3	4	314
2009	35	80	-12	48	149	127	114	89	152	67	4	1	854
2010	51	0	32	283	226	188	194	107	-28	126	53	1	1234
2011	118	99	160	141	183	84	-235	-90	-279	-42	8	-16	132
2012	23	-35	-25	36	-3	120	68	18	52	-5	-14	-4	230
2013	-3	168	406	244	135	31	-31	-3	-26	-17	-20	-14	870
2014	-34	-27	-39	-46	158	246	132	57	17	-2	-5	-10	448
Average	**1**	**23**	**20**	**28**	**36**	**57**	**-6**	**-81**	**-5**	**21**	**-1**	**-14**	**79**

Table D-7. UF 9 — Yuba River at Smartville Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-19	-16	92	-50	-21	-5	-113	-64	-221	-77	-23	-12	-530
1923	-11	86	141	-34	-54	-45	-93	-194	-29	-57	-21	18	-293
1924	-9	-9	-22	37	130	-28	-33	-18	-3	5	-1	-11	38
1925	79	71	49	17	-34	-47	-28	-31	45	-20	-12	-9	80
1926	3	33	18	165	-17	-60	62	-21	-51	-8	-7	-14	104
1927	23	241	-127	22	-263	-198	-164	-52	20	-30	-10	-11	-550
1928	10	163	-39	-88	-30	48	-220	-88	-37	-19	-6	-11	-317
1929	-17	0	7	-11	13	-1	7	16	81	-4	12	-22	81
1930	-9	-11	397	-30	-42	-29	-18	-77	46	-11	-7	-10	200
1931	1	21	1	67	46	92	24	46	18	6	2	-4	319
1932	68	8	62	-77	-49	10	49	7	-18	-21	-14	-4	23
1933	-11	-8	-15	-4	-16	124	69	34	-45	-18	0	-6	103
1934	137	-1	154	40	144	0	-32	-36	2	-2	4	2	412
1935	26	143	41	42	48	-37	88	-139	-103	-28	-9	-8	64
1936	1	-22	18	258	255	-100	-137	-138	-8	-37	-9	-12	69
1937	-11	-12	-19	-19	-44	88	-20	69	-5	-23	-6	-4	-5
1938	9	171	223	112	11	-186	-162	-190	-28	-78	-22	-13	-152
1939	6	2	17	36	-23	61	-6	50	-27	0	7	-3	119
1940	23	-7	38	369	294	7	-254	-21	53	-14	-7	-11	472
1941	-6	63	340	-1	48	-128	-94	-144	102	-62	-13	-12	93
1942	-11	33	248	1	-129	-89	-3	-61	-27	-37	-27	-21	-123
1943	-22	123	17	52	-121	-99	-114	17	11	-32	-22	-11	-201
1944	-11	-7	4	86	106	-5	20	-65	-52	-20	-9	-8	37
1945	150	163	92	3	121	-71	-40	-84	-28	-33	-14	-11	249
1946	139	52	171	-124	-53	-72	-70	-73	-86	-33	-13	-7	-168
1947	-24	89	56	-35	98	162	-62	-23	14	-13	-10	-11	240
1948	157	11	-23	191	-20	44	-22	-43	-49	-42	-21	-6	178
1949	-16	43	5	-26	-36	81	52	-92	-71	-17	-8	-11	-94
1950	-9	13	-18	28	3	14	-23	-3	-70	-30	-12	-21	-129
1951	107	210	-36	-97	-157	-78	-7	7	-20	-15	-22	-17	-125
1952	73	101	109	-91	-178	-172	-111	-106	-78	-89	-28	-19	-587
1953	-34	-1	88	43	-75	36	88	-60	-105	-30	-37	-34	-122
1954	-5	78	5	161	80	-10	49	-124	-42	-20	-7	-11	154
1955	-11	81	173	-34	-27	6	21	28	-59	-19	-4	-5	150
1956	-9	-5	271	-209	-158	-108	7	-5	85	-36	-9	-15	-192
1957	57	-29	-11	30	234	14	40	54	-127	-29	-12	-1	219
1958	51	62	133	129	-48	-134	-129	-67	-35	-55	-18	-20	-129
1959	-10	-18	11	133	-21	44	38	-37	-42	-12	-1	44	131
1960	0	-7	10	114	140	73	-40	18	19	-16	-3	-2	304
1961	-9	72	37	129	31	81	-28	5	-14	-7	-5	-3	290
1962	-9	76	28	19	119	-25	35	-46	15	-25	-12	-3	172
1963	549	10	106	388	-210	-5	-105	-139	-26	-37	-19	-14	498
1964	14	175	-34	50	-63	-3	-40	-47	22	-21	-6	-6	41
1965	-2	103	62	-327	-93	10	-78	-113	52	-33	22	-12	-408
1966	-12	128	5	-5	-31	21	31	-122	-39	-7	0	-4	-36
1967	-11	237	103	140	-143	-107	-149	22	-37	-51	-30	-8	-34
1968	13	19	-14	21	-10	43	-54	-48	-18	-6	7	4	-43
1969	42	136	68	-20	-150	-85	-21	-61	-66	-5	-52	-6	-220
1970	29	9	197	-55	-78	-78	-68	24	122	-14	-2	2	90

Table D-7. UF 9 — Yuba River at Smartville Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	30	282	-75	-170	-119	28	-60	-202	49	10	-29	-1	-259
1972	-20	4	-44	-74	37	-24	12	-10	-99	-21	-4	-4	-247
1973	49	93	-54	-40	2	-146	8	130	2	-11	-7	-8	19
1974	62	268	-32	-284	-5	-87	-128	5	140	56	-13	-7	-26
1975	23	-4	16	11	15	-92	-90	82	-40	-76	-32	-29	-217
1976	68	7	1	-23	65	-80	-19	-9	-5	4	21	8	38
1977	12	-15	-8	-9	-1	-10	6	57	1	-8	0	2	26
1978	0	32	149	57	-72	31	-3	40	121	-11	-15	22	352
1979	-4	-6	-16	73	47	0	82	32	-40	-11	-8	-22	127
1980	101	70	42	-159	12	-127	18	-37	75	25	-11	-7	1
1981	-10	6	28	62	28	80	31	18	-20	-4	-1	13	232
1982	103	318	127	-258	-141	-99	-212	-91	73	3	-11	13	-176
1983	148	216	-72	15	-72	-250	-129	-57	16	13	-35	20	-186
1984	76	153	-302	-218	-11	19	8	30	108	-18	0	-8	-161
1985	-1	133	-37	-30	-25	-3	62	-55	-22	0	-2	12	32
1986	-19	34	50	169	-82	-158	-97	27	121	-18	-5	50	72
1987	-6	-4	3	49	107	47	67	7	-8	-3	-2	1	258
1988	-1	22	117	24	35	7	90	57	9	2	4	6	372
1989	0	178	-22	-21	-27	82	-18	28	45	-46	-1	26	224
1990	159	67	-17	104	-45	3	23	190	-52	-19	1	1	415
1991	-4	-8	3	-1	42	141	1	41	53	-9	9	-2	268
1992	66	23	54	41	113	62	52	-23	49	6	8	3	456
1993	86	5	90	14	-54	-1	10	96	78	-39	-14	-9	262
1994	1	52	79	45	49	15	9	-8	-22	-3	6	-2	221
1995	-7	44	75	215	-156	-38	-46	-126	2	128	-16	-12	64
1996	-8	-8	303	72	-169	-40	72	-93	-96	-24	-21	-6	-19
1997	-4	120	325	-413	-201	36	-98	106	48	-3	5	-3	-83
1998	29	141	61	136	-101	-74	-60	-79	-102	63	-26	-15	-27
1999	-18	235	-46	62	-80	-216	-60	-47	38	-32	-2	-10	-175
2000	15	115	2	202	52	-163	13	43	6	-19	-4	-2	260
2001	53	-4	26	22	3	100	43	-3	-10	4	2	-2	235
2002	12	98	188	-54	51	73	-13	13	-6	-7	0	-1	353
2003	-5	149	310	-15	-25	78	-20	-83	-81	-8	-33	-10	258
2004	-10	11	188	-18	51	19	-4	-17	-43	-12	-5	-5	154
2005	70	27	135	53	38	56	-75	-144	2	-34	-13	-10	104
2006	-8	65	330	-237	-60	-145	-115	-86	112	-44	-15	-7	-209
2007	-11	23	123	-8	185	-43	42	-8	-14	-5	-1	-6	278
2008	21	12	67	47	6	15	-34	-14	-31	-4	-1	2	84
2009	29	78	-10	17	140	3	-7	13	-39	-11	-1	-2	210
2010	60	7	42	152	75	19	28	-27	-115	-39	-8	-8	187
2011	218	52	122	-97	-63	-173	-162	-81	24	35	-49	-17	-190
2012	15	-20	-14	102	-6	68	59	13	9	-12	-3	0	212
2013	-6	164	173	-81	-58	38	11	-18	13	-4	7	1	239
2014	-13	-6	-12	1	187	105	56	-29	-11	-1	1	-1	278
Average	**30**	**66**	**61**	**12**	**-8**	**-19**	**-27**	**-27**	**-7**	**-16**	**-9**	**-5**	**51**

Table D-8. UF 10 — Bear River near Wheatland Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	2	1	-2	9	-95	-32	9	-8	-8	1	1	2	119
1923	-2	12	12	-19	2	-16	-32	-18	-12	-4	-4	-3	-84
1924	-2	0	2	4	23	-4	-1	-5	-4	-3	-1	-2	6
1925	-1	7	17	10	10	-27	-19	-14	-8	-6	-6	-3	-40
1926	-3	0	3	23	-10	-10	-22	-17	-3	-3	-2	-2	-45
1927	-2	37	4	-10	-93	-5	-46	-8	-4	-3	-2	0	-131
1928	1	17	-1	16	8	-3	-29	-3	-6	-3	0	-3	-7
1929	-4	-5	0	5	3	6	9	-3	-1	-1	-1	0	10
1930	-2	-1	45	-20	21	-12	-4	-2	-3	-3	-3	-2	14
1931	-3	-4	-7	18	13	11	0	-1	1	0	0	0	28
1932	1	-3	-34	-12	-14	47	17	0	-2	-2	-1	-3	-5
1933	-3	-3	-9	-9	-11	38	11	-1	-1	-2	-1	0	11
1934	4	1	10	17	17	-2	3	-2	-2	-2	-1	-2	41
1935	-2	13	-7	-14	16	-29	-23	-10	-6	-3	-2	-3	-71
1936	-10	2	-7	28	-38	-6	-5	-4	-2	0	-1	-1	-42
1937	-1	0	-11	-8	-63	10	36	-3	-1	-2	-1	-1	-47
1938	-3	12	46	11	-102	-51	43	12	1	2	2	3	-23
1939	3	4	3	1	6	18	-1	0	-1	-1	-1	0	31
1940	-1	-1	0	52	10	-10	-11	-3	1	0	0	1	39
1941	2	9	27	-22	6	-18	-25	-2	-1	1	1	3	-19
1942	-1	4	16	8	-30	-3	-10	-13	-7	-1	0	0	-37
1943	1	22	17	-1	-3	-28	-10	-7	-1	0	-1	0	-10
1944	0	2	0	7	7	4	-1	-6	-2	-1	-1	-2	8
1945	1	24	16	9	6	-22	4	-4	-4	-3	-2	-4	20
1946	1	9	-7	-5	8	-12	-3	-4	-1	-2	-2	-3	-20
1947	-5	3	8	0	16	4	-2	-1	-1	-2	-1	-1	19
1948	1	1	-6	28	0	-4	16	-3	-7	-2	-2	-2	21
1949	-3	0	-14	-9	-11	-18	47	-6	-1	-1	-1	1	-17
1950	-1	1	-5	-10	21	14	10	-3	-1	-2	0	-1	22
1951	4	62	-24	-66	-3	-13	2	0	2	1	0	1	-32
1952	6	16	27	-102	-50	-47	42	29	7	2	4	2	-65
1953	4	5	1	26	21	8	12	-4	0	1	0	-1	75
1954	0	6	0	1	13	-7	9	-3	-1	0	-1	-1	16
1955	-2	2	18	-18	7	14	2	1	-1	0	0	-1	22
1956	-1	-4	44	-67	-19	19	21	8	1	2	2	0	6
1957	2	2	0	1	39	17	1	-7	-2	-1	0	0	52
1958	-1	4	25	10	3	-38	-41	8	4	6	4	4	-11
1959	5	2	5	36	-9	22	5	5	2	0	0	2	73
1960	0	-1	-3	25	40	24	-3	-1	1	0	0	-1	84
1961	-1	8	14	13	17	10	-4	1	-1	-1	0	-2	56
1962	0	2	2	-1	23	2	19	1	3	0	0	0	53
1963	53	5	17	68	-14	-18	-20	-1	-1	2	2	0	93
1964	-1	21	0	-26	25	8	3	-14	3	-1	-2	0	16
1965	-5	4	34	-49	23	12	-14	-2	0	0	0	3	6
1966	2	9	-8	-10	13	17	4	-6	0	-1	0	-1	20
1967	0	7	9	-15	11	-5	-45	13	-5	4	2	3	-21
1968	0	3	-2	14	10	23	7	2	3	1	1	1	62
1969	-1	10	-10	-47	-62	2	33	20	4	5	3	4	-38
1970	2	7	33	3	5	9	9	6	5	2	1	2	84

Table D-8. UF 10 — Bear River near Wheatland Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-7	23	-65	-10	27	5	2	-7	-2	2	1	1	-29
1972	2	2	-24	11	23	17	-1	-3	1	0	0	0	29
1973	4	4	-6	-43	-15	-24	21	0	4	2	2	2	-50
1974	2	39	-16	-37	17	-17	-6	10	-4	0	5	4	-4
1975	7	8	5	12	-7	-11	-4	21	5	4	2	3	45
1976	6	-2	3	3	15	5	3	2	0	0	0	0	35
1977	0	0	0	-8	2	0	1	0	0	0	0	0	-4
1978	0	-1	18	-27	-8	22	12	8	1	4	2	1	30
1979	4	-1	3	5	-8	14	19	-3	4	2	1	1	40
1980	2	6	-4	-1	-11	-7	10	-3	1	4	2	3	2
1981	3	4	4	10	28	11	6	4	2	0	0	0	73
1982	3	33	-8	-59	16	-11	-54	4	6	8	6	8	-47
1983	17	31	-16	9	-35	-48	11	21	10	9	10	10	28
1984	13	57	-28	22	18	24	-1	-5	-4	-3	-1	-1	90
1985	-2	23	10	10	6	2	-2	-5	-3	-4	0	-1	36
1986	1	5	10	29	-57	-15	2	-4	1	-3	1	7	-23
1987	5	6	4	11	32	14	1	-1	-1	-1	0	-1	70
1988	0	3	11	-4	28	10	-1	-2	-2	0	0	0	43
1989	0	21	-10	-2	13	4	-5	-14	-3	-6	1	-2	-4
1990	8	7	3	21	1	17	-2	8	-7	-2	0	0	53
1991	1	2	2	2	6	-13	29	-7	-9	-5	-3	0	5
1992	2	3	9	11	11	14	-2	0	1	-1	0	-1	48
1993	4	3	3	-69	-4	51	26	12	0	-2	1	2	29
1994	3	13	15	17	16	19	-1	-1	0	-1	0	0	80
1995	-2	12	-6	-41	23	-49	25	8	-6	-8	1	0	-44
1996	8	-8	39	-14	22	13	2	0	-12	-5	-2	2	47
1997	4	22	4	-30	32	36	15	-6	-4	-3	-3	-3	65
1998	5	25	-5	-18	-96	21	-2	6	-12	-7	-1	3	-82
1999	3	28	2	10	-56	-10	2	-2	-7	1	1	2	-27
2000	2	12	5	34	-45	-6	7	-8	-4	3	0	0	0
2001	-2	4	8	7	-1	37	4	-3	-2	-2	0	-3	47
2002	-1	9	-11	-4	16	4	6	-6	-9	1	-2	-3	0
2003	-3	14	21	17	9	8	-6	-19	-10	-2	2	1	33
2004	2	3	11	-12	0	24	6	0	2	-2	0	-2	33
2005	3	14	6	-14	30	-2	-4	-14	-17	-4	2	2	3
2006	4	9	48	-12	-7	-66	-34	0	-2	2	7	4	-48
2007	2	10	7	17	24	18	6	-4	-1	0	1	-1	77
2008	4	5	-7	-16	-5	50	3	4	-3	-2	0	0	32
2009	-2	8	-9	24	6	6	1	-7	-4	-2	0	-1	20
2010	-7	4	15	26	30	34	18	-15	-29	-10	1	1	69
2011	11	1	-9	-2	-25	-101	26	4	-11	-8	3	5	-107
2012	8	8	9	8	16	17	-14	-8	-12	-5	1	0	26
2013	-1	29	-13	15	11	9	6	-5	-9	-6	-2	0	35
2014	1	1	2	2	45	11	-11	0	-2	-1	-3	0	44
Average	**2**	**9**	**4**	**-2**	**0**	**0**	**1**	**-1**	**-2**	**-1**	**0**	**0**	**10**

Table D-9. UF 11 — American River at Folsom Lake Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-10	-35	89	104	22	0	-96	-161	-218	20	13	6	-266
1923	-9	100	153	22	-34	-37	-33	-230	-31	-15	9	20	-86
1924	22	4	-2	21	67	6	34	-8	5	15	6	0	169
1925	39	120	32	44	74	-24	-82	-170	-41	3	13	6	13
1926	4	2	33	74	283	52	16	0	-15	11	10	1	471
1927	17	188	89	37	-315	-150	-206	10	-11	50	13	2	-275
1928	9	86	35	4	26	-180	-184	8	100	18	13	3	-61
1929	-10	-2	14	15	26	57	-1	-57	107	41	22	8	220
1930	-9	-10	264	22	0	74	50	-10	35	17	13	0	446
1931	-10	22	7	74	40	49	41	49	60	27	15	2	374
1932	20	28	52	11	-106	-15	16	-38	-33	12	9	2	-42
1933	-8	-11	-5	-19	-18	89	70	4	-47	19	13	0	89
1934	67	70	130	73	43	9	37	-2	31	18	10	1	487
1935	8	100	54	117	6	22	-74	-144	-18	-5	6	-1	72
1936	2	-8	-3	137	-3	-42	-77	-89	24	-10	6	-2	-63
1937	-4	-8	-10	-24	-35	104	-38	49	117	21	10	-1	179
1938	-5	72	321	69	-51	-216	-176	-215	31	22	1	-5	-152
1939	-3	2	16	39	-12	59	-8	24	18	12	8	-3	153
1940	10	5	12	206	92	-15	-171	-28	61	8	7	-7	178
1941	-11	58	115	54	-64	-29	-62	-79	170	81	10	-1	241
1942	-11	41	73	-83	-103	-76	-100	-111	-44	48	3	-2	-366
1943	-11	109	-50	-4	-76	-202	-144	-13	106	-9	0	-6	-299
1944	-14	-15	-2	17	53	56	108	-84	0	-6	7	0	119
1945	77	229	35	-9	3	-60	-36	15	23	-5	10	1	283
1946	79	94	9	-39	-77	-92	-115	-56	15	-10	7	-4	-188
1947	-6	41	39	-13	14	103	88	-34	32	12	6	-3	279
1948	98	68	1	36	-30	27	31	-11	-56	17	8	0	189
1949	-10	16	-13	-21	-68	65	34	-105	-37	2	2	-3	-138
1950	-8	11	3	-90	4	-2	33	-22	-40	-32	3	-3	-144
1951	52	347	-139	-195	-188	-163	-22	40	75	1	2	-6	-198
1952	56	65	4	-162	-223	-185	-109	-149	-49	3	-9	-3	-760
1953	-8	-6	36	-1	-29	34	54	-41	-143	14	5	0	-85
1954	-6	33	21	54	65	16	60	33	2	-1	3	-6	275
1955	-10	26	199	23	-44	-32	20	-45	54	8	2	-5	197
1956	-9	-21	56	-357	-146	-79	41	89	65	66	4	-2	-294
1957	10	20	-19	-9	31	73	47	61	92	18	5	2	331
1958	21	37	95	64	-28	-65	-149	-92	-1	55	-1	0	-65
1959	-1	-13	-6	90	-13	4	59	44	-14	11	8	41	211
1960	21	4	-9	37	56	33	80	61	103	24	14	3	427
1961	-5	18	60	19	57	38	67	33	56	31	20	11	405
1962	2	7	59	-5	-18	20	131	29	-4	12	19	7	258
1963	628	44	134	189	-166	-85	-137	-165	122	68	13	2	647
1964	26	72	21	-51	-57	15	-7	-36	97	27	10	9	126
1965	3	100	1	-327	-128	17	-120	-26	84	61	30	20	-284
1966	-5	75	30	-5	-23	-11	55	-10	1	21	11	4	142
1967	-6	116	187	-76	-6	-201	-133	34	-67	35	9	5	-104
1968	32	3	-9	-21	-178	84	-4	3	18	20	4	12	-38
1969	18	156	33	-183	-147	-60	-32	-95	5	1	3	-9	-311
1970	44	63	61	-281	-43	-80	-57	118	182	51	15	4	76

Table D-9. UF 11 — American River at Folsom Lake Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-2	162	46	-191	-118	10	9	-192	46	116	14	7	-93
1972	-1	-4	-13	-48	-43	-39	22	-46	-6	7	11	14	-148
1973	37	127	-50	54	-46	-71	-21	51	93	18	8	-3	197
1974	44	143	97	-319	13	-51	-126	166	85	170	12	1	234
1975	-3	28	37	53	54	-105	-61	8	25	-6	1	7	37
1976	40	50	-7	-18	-13	-46	-14	25	23	22	26	32	121
1977	10	17	13	0	-3	-16	-29	0	21	29	17	7	66
1978	8	15	52	104	-18	-10	48	47	238	99	28	86	697
1979	29	6	3	114	-22	2	19	-20	98	16	18	8	273
1980	33	52	67	-294	-187	-107	-32	91	98	154	30	6	-87
1981	-10	-5	32	22	41	36	26	101	57	28	14	4	346
1982	6	168	0	-216	-264	-227	-336	-17	218	212	48	21	-388
1983	136	146	-101	-61	-195	-420	-218	11	57	73	5	-10	-577
1984	45	-84	-341	-144	-72	-51	24	82	207	55	5	-5	-279
1985	-7	40	15	-28	-14	-15	38	6	-4	13	9	0	51
1986	13	24	68	102	-466	-72	-47	-51	11	16	-2	26	-377
1987	9	8	2	12	92	107	48	5	7	15	7	-1	312
1988	-8	18	59	52	11	57	72	69	49	32	18	7	435
1989	-4	51	29	-4	-24	67	101	70	59	27	19	33	423
1990	140	116	58	93	11	7	-60	28	98	34	19	6	550
1991	4	6	5	3	56	116	16	-32	138	89	28	7	436
1992	42	48	63	96	94	99	28	49	30	57	24	11	642
1993	27	73	180	84	-7	60	-53	-165	93	81	14	4	392
1994	5	26	182	61	94	34	-7	13	11	22	10	-4	447
1995	1	109	176	81	-1	-141	-191	-245	-143	87	22	-2	-245
1996	1	-6	216	55	-126	-76	43	-21	21	-2	2	-4	103
1997	-8	192	163	-413	-103	-62	-113	58	121	28	11	-1	-127
1998	18	57	131	134	-84	31	-46	-159	-250	77	19	8	-63
1999	10	61	110	199	-59	-100	-146	-194	-6	21	2	-6	-108
2000	3	95	49	172	77	-22	-72	-3	30	-6	5	4	332
2001	35	40	38	31	-14	74	69	3	16	10	7	-4	306
2002	4	100	181	85	71	131	-49	-66	0	13	8	0	478
2003	1	154	172	28	5	3	-30	-62	41	13	6	9	342
2004	-12	-4	137	97	18	-9	11	-8	-7	15	12	2	252
2005	41	64	118	123	-5	-72	-92	-224	77	75	11	3	119
2006	-7	0	249	-119	-162	-225	-338	-86	123	61	5	0	-497
2007	5	-7	71	47	85	-3	11	35	9	22	12	-1	287
2008	7	26	50	89	30	34	-76	-63	13	18	16	5	150
2009	21	100	16	5	13	-9	-37	0	64	11	14	1	200
2010	67	32	36	66	64	55	-5	-100	-120	42	15	6	158
2011	159	103	-62	-65	-121	-502	-199	21	14	175	71	2	-404
2012	13	0	-10	18	-9	-117	-16	121	82	16	12	8	114
2013	-15	-56	-3	-75	-73	-18	50	121	52	39	14	3	39
2014	2	-5	-2	-12	123	77	96	131	54	40	18	4	526
Average	**23**	**52**	**50**	**-3**	**-30**	**-28**	**-31**	**-22**	**32**	**33**	**12**	**4**	**92**

Table D-10. UF 13 — Cosumnes River at Michigan Bar Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	-1	2	13	-31	22	3	-2	-14	1	0	0	-8
1923	-1	6	10	-26	-22	-6	8	12	-5	0	0	-1	-23
1924	2	1	-2	-1	1	3	9	7	3	0	0	0	22
1925	2	15	10	6	15	-7	-23	-12	-6	0	0	-1	-1
1926	0	1	2	2	27	11	28	-2	1	0	0	0	71
1927	0	45	34	7	-9	-24	-29	-11	-9	0	0	0	4
1928	-1	12	6	4	7	26	0	-8	-1	0	0	0	43
1929	-1	0	1	0	4	13	30	21	1	5	1	0	74
1930	0	0	19	16	15	16	20	4	3	2	0	0	94
1931	0	3	5	3	14	22	20	9	4	2	1	0	82
1932	0	5	34	26	-32	0	10	22	-5	1	0	0	62
1933	0	-1	0	1	1	36	29	9	-9	1	0	0	66
1934	5	8	11	7	32	16	4	2	0	1	0	0	86
1935	1	10	7	27	5	-7	-4	-2	-6	0	0	0	31
1936	-1	1	-1	25	-25	-14	-7	18	-1	2	0	0	-3
1937	0	-1	-1	2	-8	-9	-2	29	-3	1	0	0	8
1938	-1	2	43	18	-35	-57	-24	2	1	-1	-1	-1	-54
1939	-2	1	1	3	2	13	14	1	4	2	0	0	38
1940	2	3	0	34	14	-24	-8	-8	-2	0	0	0	11
1941	-1	3	41	36	21	-14	-6	2	-5	0	0	0	76
1942	-1	1	26	-19	-12	-14	5	-1	0	-1	-1	-1	-18
1943	-2	26	13	1	-24	-88	-14	3	-4	-2	-1	-1	-94
1944	-2	-2	-2	0	6	-4	11	20	-2	1	0	0	27
1945	5	30	3	-3	4	-13	4	9	-9	1	0	0	31
1946	7	20	5	-13	-12	-13	5	11	-1	0	0	0	7
1947	-1	1	6	2	3	36	19	3	0	1	0	0	71
1948	6	10	2	0	-1	23	16	0	-11	0	0	0	44
1949	-1	-1	-1	0	-7	5	23	-7	-3	0	0	0	9
1950	-1	-1	2	-11	-13	13	9	9	-3	1	0	-1	5
1951	3	54	-24	-67	-30	-26	6	2	-3	-2	-2	-1	-90
1952	-2	6	17	-38	-49	-59	-19	-5	-10	-6	-2	-2	-172
1953	-2	-4	7	19	-7	5	26	13	-9	0	0	-1	46
1954	-2	-1	3	-2	1	9	29	-2	-1	0	0	0	34
1955	-1	-1	16	-12	-7	5	4	26	2	2	0	0	34
1956	0	-2	3	-64	-36	-9	13	31	4	0	-1	-1	-63
1957	-2	3	-1	-5	-1	15	20	20	-2	1	0	-1	46
1958	-1	-1	2	10	9	-59	-81	15	-14	-2	-2	-1	-125
1959	-1	-2	-2	4	5	12	24	3	2	-1	-1	0	43
1960	4	1	-1	0	29	25	14	13	4	0	-1	0	87
1961	0	0	8	1	13	25	30	11	3	-1	-1	0	90
1962	1	0	4	1	12	6	23	15	0	1	0	0	62
1963	38	8	9	15	-9	-7	-33	8	0	0	-1	-1	26
1964	0	9	2	-11	-4	12	27	11	2	1	-1	-1	47
1965	-1	9	-3	-101	-25	15	1	32	0	0	-2	0	-75
1966	-1	7	0	-4	-6	10	30	-2	0	-3	-3	0	28
1967	0	9	34	-18	-14	-32	-61	14	2	-5	-2	-2	-74
1968	-1	-1	2	-9	0	18	15	-1	-1	-2	-2	0	18
1969	0	13	4	-64	-50	-18	-2	19	-2	-1	-1	-2	-105
1970	-1	3	16	-34	-19	-28	-4	26	1	0	-1	-1	-41

Table D-10. UF 13 — Cosumnes River at Michigan Bar Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-2	19	23	-57	-16	12	3	7	-7	-1	0	-1	-20
1972	-1	-2	-4	-4	8	8	13	4	0	-2	-2	-1	18
1973	0	8	-6	-15	-14	-34	9	25	-1	-1	-2	-2	-31
1974	-2	28	-2	-51	-2	-11	-16	27	1	-1	1	-1	-28
1975	-2	0	3	-2	-5	-25	-23	29	1	-1	-2	-1	-27
1976	0	6	0	-3	-5	-1	9	6	2	0	-1	2	15
1977	2	0	0	-1	-2	1	4	5	4	1	0	0	15
1978	0	0	11	31	-10	22	-22	31	1	0	0	2	65
1979	5	-1	0	-2	-7	-12	-2	12	2	3	1	0	0
1980	-1	5	2	-54	-84	-48	2	19	8	2	2	0	-147
1981	0	-1	-2	-1	13	15	29	4	7	2	0	0	67
1982	0	53	29	-93	-34	-65	-88	12	-9	-3	-2	-2	-203
1983	15	21	-58	-65	-83	-148	-59	-10	35	-11	-3	-3	-368
1984	-1	2	-81	-27	-7	17	10	40	2	1	-1	0	-45
1985	-2	15	2	-5	-16	0	33	7	1	1	0	-1	36
1986	2	-2	-1	9	-72	-61	-6	34	5	1	0	-1	-90
1987	1	1	-2	-1	1	26	32	7	2	-1	-1	0	65
1988	0	0	5	0	5	26	19	4	-1	-1	-2	-1	56
1989	0	0	5	-3	-10	52	45	5	1	0	-1	0	93
1990	6	6	4	-2	-5	22	14	4	1	1	0	0	51
1991	0	0	1	0	2	5	22	24	1	2	1	0	59
1992	0	4	2	4	13	15	22	6	1	-1	0	0	68
1993	0	5	9	-45	-40	-15	-10	43	2	5	1	0	-43
1994	0	2	3	1	1	24	18	5	3	0	-1	0	57
1995	1	7	4	-44	-19	-77	-8	-22	17	-4	-2	-1	-147
1996	0	-1	13	15	-3	-24	10	26	-7	-4	-3	-2	23
1997	0	5	-1	-185	-33	15	15	20	1	0	-1	0	-165
1998	-1	2	9	9	-67	-45	-27	-5	-19	-11	-5	-4	-165
1999	-2	-2	4	17	-34	-18	-8	7	-8	-2	-4	-2	-52
2000	-1	4	6	37	-15	-14	7	15	-1	-3	-3	-2	32
2001	-1	4	0	-1	12	23	20	8	2	0	-1	-1	66
2002	-1	8	51	7	9	24	13	-2	0	0	-1	-1	108
2003	-1	13	59	12	7	28	24	-10	-6	-2	-1	0	122
2004	-1	-2	34	16	31	21	-8	-6	-2	-1	-1	-1	81
2005	14	17	52	46	13	6	-28	-54	-23	-5	-2	-2	34
2006	-2	-2	72	31	-6	-14	-88	-72	-18	-6	-4	-3	-111
2007	-4	-1	16	12	39	16	-2	-3	-1	-1	-1	-1	69
2008	-2	1	2	30	18	21	-1	-10	-2	0	-2	-2	54
2009	-1	10	4	7	37	27	11	-9	0	-1	-1	-1	85
2010	2	4	8	29	37	36	17	-35	-27	-2	-1	-1	67
2011	15	23	35	-17	-11	-60	-29	-27	-39	-11	-3	-3	-127
2012	-1	0	-2	0	7	47	-11	-12	-2	-1	-1	-1	22
2013	-1	19	60	-3	-7	7	-3	-1	-1	0	0	-1	69
2014	0	-1	0	-1	75	33	3	2	2	0	0	0	113
Average	**1**	**6**	**8**	**-6**	**-6**	**-3**	**2**	**6**	**-2**	**-1**	**-1**	**-1**	**3**

Table D-11. UF 14 — Mokelumne River at Pardee Reservoir Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	2	8	-5	-12	24	6	-117	-37	-23	0	0	-155
1923	5	14	32	-13	-9	6	-24	-13	66	1	2	13	80
1924	8	1	2	1	8	-8	-19	21	1	1	0	4	20
1925	17	16	2	-6	37	-46	-81	-85	22	-11	2	2	-130
1926	10	2	-4	1	23	27	80	-70	-12	1	0	0	59
1927	8	175	-7	-15	74	15	43	-140	-179	-30	-3	-1	-60
1928	23	12	-7	-13	6	79	-53	-3	-19	-3	1	0	24
1929	-1	4	0	-3	-1	1	8	73	-15	-2	-1	0	62
1930	1	0	4	0	22	17	-39	-36	117	-2	1	3	87
1931	3	9	0	19	21	2	-10	63	4	2	0	0	112
1932	3	5	25	-3	-23	4	9	-21	-1	-24	-2	-2	-29
1933	1	1	2	5	-3	63	23	-9	-44	-12	-3	-3	20
1934	5	5	13	-4	29	43	24	-13	-8	1	1	2	99
1935	15	11	0	-6	-6	6	69	-61	43	-10	1	0	61
1936	8	1	1	12	53	-20	-42	-19	83	10	-1	4	91
1937	5	4	8	6	6	23	2	103	-54	-11	0	-1	92
1938	8	8	14	2	-6	-40	-39	-9	102	-8	-3	2	30
1939	18	2	8	3	1	12	-12	5	1	0	0	10	48
1940	9	1	-3	37	57	-8	-82	7	9	-5	-1	0	22
1941	4	7	42	2	53	-6	-23	-70	63	-13	-3	1	55
1942	4	20	-15	-15	-7	-2	-36	-48	90	-2	-5	0	-16
1943	4	36	4	-25	-11	7	-35	24	38	-11	-3	0	27
1944	3	6	3	3	17	13	3	19	1	-6	-1	1	63
1945	35	36	-5	-19	12	-20	10	5	41	-14	-2	0	78
1946	66	2	1	-41	-17	-9	20	21	8	-4	1	2	49
1947	11	13	3	-6	20	40	3	24	-15	1	0	1	95
1948	19	2	-4	-14	-8	21	3	-40	27	-16	-1	-1	-13
1949	1	2	-2	-2	-2	0	44	-1	-39	0	0	1	0
1950	1	10	2	-18	1	20	-18	-23	-12	-16	-1	1	-53
1951	21	18	-107	-30	-35	-13	-14	40	123	-4	-1	0	-2
1952	14	11	14	-30	-42	-38	-16	-16	16	-62	-11	-3	-163
1953	2	5	14	5	-7	13	2	-50	1	19	-1	-1	2
1954	1	6	0	11	15	6	22	11	-30	-6	1	1	38
1955	0	5	14	1	0	5	-17	13	39	-5	0	1	56
1956	1	-1	-62	-94	-59	-32	-12	37	125	34	-9	2	-71
1957	9	6	0	1	10	16	-4	1	1	-8	-3	2	31
1958	3	-1	-1	15	34	-8	-36	12	4	-30	-2	4	-7
1959	2	3	2	9	4	14	11	-9	-8	-2	1	16	43
1960	1	0	0	2	13	38	-14	19	6	0	2	0	64
1961	4	5	-2	2	5	12	5	25	7	0	2	18	85
1962	2	3	-4	-4	15	-1	36	-45	10	-11	-2	0	0
1963	58	6	1	40	-59	-1	-30	-21	98	1	-3	12	101
1964	22	0	-10	-3	-2	17	-6	15	28	-5	2	1	60
1965	1	7	-95	-111	-26	6	-4	3	123	46	14	7	-29
1966	-1	18	0	-4	-11	19	56	-20	-9	-1	2	-1	48
1967	0	8	-18	5	-24	-25	-60	42	54	22	-4	6	6
1968	12	14	6	10	1	20	-3	-4	-14	-2	3	2	43
1969	0	-1	2	-16	-59	-30	-34	-39	82	-6	-2	6	-96
1970	5	14	25	-64	-27	-11	-38	17	93	-14	0	3	4

Table D-11. UF 14 — Mokelumne River at Pardee Reservoir Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-9	27	10	-38	-12	9	-23	-58	59	-3	3	3	-31
1972	1	14	4	-11	6	14	-10	-3	-34	-8	-2	11	-17
1973	5	5	-29	-12	-1	-27	13	63	-28	-7	4	2	-12
1974	9	-5	-11	-61	-9	9	-17	-9	135	6	-3	-1	43
1975	7	6	3	0	6	1	-27	33	34	-35	3	2	33
1976	7	-9	-6	-4	5	-11	-12	48	-3	3	16	8	44
1977	6	1	-1	-1	2	-1	13	-13	-8	3	0	4	3
1978	1	1	5	4	-12	58	-12	-4	81	-30	-3	37	125
1979	2	2	2	-10	-8	3	-1	31	12	-4	0	1	29
1980	6	3	7	-103	-37	-36	-16	-30	58	46	-1	6	-96
1981	7	7	6	17	14	31	4	31	-20	2	1	2	100
1982	8	17	-42	-64	-68	-22	-138	-19	168	63	-2	31	-66
1983	19	22	-41	-26	-47	-94	-47	0	49	-7	-8	12	-168
1984	23	-15	-74	-48	8	35	-17	50	78	-7	-10	6	30
1985	15	23	-1	-6	3	6	20	16	-17	-2	0	12	70
1986	8	5	-1	-7	-70	-72	-61	10	134	-12	-1	6	-62
1987	13	8	5	2	7	17	73	-23	-7	-1	-1	0	93
1988	3	4	-3	-7	11	15	7	11	-15	0	1	1	29
1989	1	-1	-2	-8	-16	41	31	28	-29	-3	2	22	65
1990	13	-3	-7	-5	-5	27	35	5	-13	-1	1	5	51
1991	4	2	0	-1	14	15	3	-4	38	-4	1	3	71
1992	6	6	-1	-3	24	25	33	7	2	1	2	2	103
1993	7	4	4	-43	-20	15	-1	17	48	-32	-4	-1	-5
1994	10	5	6	6	8	33	17	-9	-12	-1	-1	0	63
1995	5	1	-7	-46	-14	-41	-28	-122	-17	110	-19	-7	-184
1996	-4	8	21	-7	-17	-22	-22	29	82	-15	-5	-2	47
1997	1	2	-3	-190	-55	16	-6	154	57	-2	-3	0	-27
1998	8	9	5	6	-39	-19	-24	67	15	-96	-12	16	-63
1999	1	12	-7	33	-25	-31	-17	10	43	-20	-8	-1	-10
2000	9	18	0	51	2	-44	-7	69	-18	-13	-6	7	70
2001	5	-2	-1	9	7	33	21	15	-10	-3	-2	-2	70
2002	8	39	37	-14	18	39	-15	0	-39	-8	-3	-1	61
2003	-1	50	61	-10	0	29	2	4	-96	-14	2	0	28
2004	-1	-1	51	12	52	50	-19	-85	-29	1	1	1	34
2005	43	25	94	50	41	75	-17	-105	-120	-51	-9	-1	26
2006	3	14	220	-15	36	15	-28	-176	-144	-30	-4	-4	-112
2007	8	21	34	5	73	36	-27	-66	-16	-1	0	2	69
2008	10	8	13	43	32	32	-12	-61	-53	2	1	0	15
2009	11	32	3	50	59	63	-12	-139	-44	-7	0	1	17
2010	39	5	20	57	70	42	25	-70	-143	-22	0	0	24
2011	81	21	115	24	14	80	-60	-86	-178	-100	-13	1	-101
2012	18	2	2	32	8	94	-39	-84	-14	-4	-2	-1	12
2013	1	72	73	-5	-11	16	-57	-49	-12	0	1	2	29
2014	1	5	1	0	117	42	-23	-47	-9	2	3	4	95
Average	**9**	**11**	**5**	**-8**	**3**	**9**	**-9**	**-10**	**11**	**-6**	**-1**	**3**	**17**

Table D-12. UF 15 — Calaveras River at Jenny Lind Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	1	7	10	-30	-3	-16	-5	-2	0	0	0	-39
1923	1	6	-4	17	-9	-10	25	-6	-2	-1	0	1	17
1924	1	-1	0	5	5	1	0	-2	0	0	0	0	9
1925	3	4	8	9	-7	4	0	0	-1	0	0	0	20
1926	1	0	3	2	9	-1	10	0	0	0	0	0	27
1927	2	-3	16	20	-22	-3	-13	-4	-1	0	0	0	-7
1928	1	8	6	11	0	-14	2	-2	-1	0	0	0	12
1929	0	3	5	4	5	8	13	-1	5	1	0	0	43
1930	0	0	9	10	14	3	3	5	0	0	0	0	44
1931	0	4	1	8	8	6	0	1	2	0	0	0	31
1932	0	5	13	24	-11	-1	1	7	0	0	0	0	39
1933	0	0	4	7	9	14	1	22	0	0	0	0	55
1934	1	2	13	13	10	4	0	1	0	0	0	0	46
1935	1	6	7	12	7	-1	5	-1	-2	-2	0	0	33
1936	1	1	1	22	-55	-7	-3	-4	2	-1	0	0	-42
1937	0	1	6	4	-11	-26	-8	-6	-2	-1	0	0	-44
1938	1	1	3	13	-49	-52	-13	-8	-5	-2	0	0	-110
1939	1	1	0	4	7	7	0	2	1	0	0	0	23
1940	2	1	1	27	8	-13	-21	-4	-2	-1	0	0	0
1941	0	0	17	25	0	-18	-11	-6	-3	-1	0	0	4
1942	0	1	16	10	5	-6	10	16	-3	-2	0	0	46
1943	0	19	13	19	-6	-45	-7	-4	-2	-1	0	0	-13
1944	-1	0	2	10	14	-7	12	0	0	0	0	0	30
1945	1	11	14	7	9	-5	-4	-3	4	0	0	0	34
1946	1	11	36	9	7	6	-3	-3	-1	0	0	0	64
1947	1	6	16	7	13	9	8	0	0	0	0	0	59
1948	4	4	1	5	10	28	17	9	1	0	0	0	79
1949	0	0	6	12	15	10	-4	-2	-1	0	0	0	37
1950	0	2	4	26	6	10	9	-4	-1	0	0	0	53
1951	3	4	20	10	0	-17	-6	6	-2	-1	0	0	17
1952	2	6	24	-4	0	-43	-17	-10	-4	-3	0	-1	-50
1953	-1	0	15	23	-2	7	10	5	4	0	-1	0	62
1954	1	2	6	15	15	7	4	3	-1	0	-1	0	52
1955	0	1	9	12	7	-2	15	8	-1	0	0	0	49
1956	0	2	33	-17	-3	-8	2	28	-2	-1	0	0	35
1957	1	1	3	7	13	15	8	30	2	0	0	0	81
1958	1	1	8	17	3	-31	-58	-9	-4	-1	0	0	-73
1959	0	0	-1	15	8	0	0	0	0	0	0	1	22
1960	1	0	0	8	29	6	6	3	0	0	0	0	53
1961	0	6	5	1	7	13	6	8	1	0	0	0	45
1962	0	1	7	2	5	4	-2	0	0	0	0	0	17
1963	11	0	10	9	16	2	8	10	-2	-2	-1	-1	62
1964	1	5	0	7	0	9	3	3	0	-1	0	0	27
1965	1	9	20	-20	-5	2	2	-6	-3	-2	-1	0	-2
1966	-1	5	7	12	5	-2	2	0	0	0	0	0	28
1967	0	6	18	11	4	-12	-20	-8	-4	-2	-1	0	-8
1968	1	0	8	13	19	9	1	-1	-1	0	0	0	48
1969	1	8	13	-43	-38	-18	-12	-8	-4	-2	-1	-1	-105
1970	1	2	14	8	0	-19	-1	-2	-2	-2	-1	-1	-2

Table D-12. UF 15 — Calaveras River at Jenny Lind Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-1	0	29	2	-5	6	-2	2	-2	-1	-1	-1	25
1972	1	3	28	11	3	0	7	-2	-1	0	0	-1	49
1973	1	9	13	17	-22	-14	-6	-4	-3	-3	-2	-1	-14
1974	2	14	23	6	7	-27	-6	-3	-3	-2	-1	-1	8
1975	0	3	5	10	22	-14	0	-6	-1	-1	0	-1	18
1976	2	2	2	-1	9	3	4	0	-1	0	0	1	21
1977	0	1	0	2	1	2	0	5	0	-1	-1	0	10
1978	0	3	26	36	-5	-7	10	-5	-3	-1	0	0	55
1979	0	1	5	18	-13	-12	-5	2	-1	-1	0	0	-6
1980	2	7	5	24	-24	-8	-3	0	-2	-3	-1	-2	-5
1981	0	-1	1	4	15	3	5	1	0	-1	-1	0	27
1982	2	10	20	13	-6	-33	-50	-11	-5	-3	-1	-1	-65
1983	3	2	1	-22	-39	-87	-9	-10	-7	-5	-2	-2	-177
1984	-2	3	24	0	7	1	-1	-3	-2	-1	0	0	26
1985	0	11	4	5	8	4	-1	-2	-1	-1	-1	0	26
1986	0	3	13	25	-25	-21	-7	-3	-2	0	0	-1	-17
1987	0	-1	-1	5	13	16	0	0	0	0	0	0	33
1988	0	2	9	16	3	7	10	3	1	-1	-1	0	48
1989	0	7	8	8	15	40	8	1	0	0	0	1	88
1990	4	4	2	15	11	13	4	16	10	0	0	0	80
1991	0	1	1	1	1	18	5	7	2	1	0	0	37
1992	2	3	4	3	17	12	0	-1	0	1	-1	0	41
1993	1	2	23	1	10	-7	-3	-2	6	0	0	-1	30
1994	-1	0	4	4	14	4	8	10	0	-1	0	-1	40
1995	2	10	26	25	7	-63	11	11	-9	-3	0	-2	15
1996	-2	-3	8	32	2	-9	8	15	-2	-2	-2	-1	43
1997	-1	2	15	-61	-7	-7	-5	-3	0	-1	0	0	-67
1998	1	2	13	24	-65	-24	-20	9	-3	-5	-3	-2	-73
1999	-2	0	6	11	-1	-3	4	-5	-4	-2	-1	-1	3
2000	-1	2	2	39	-8	-9	-1	12	-1	-1	-1	-1	34
2001	0	2	4	11	21	3	18	0	-1	-1	-1	-1	56
2002	0	3	33	17	14	9	0	8	1	0	0	0	84
2003	0	4	37	13	12	13	37	10	-2	-1	0	0	123
2004	0	2	48	13	9	2	-1	-1	0	0	-1	0	72
2005	8	6	14	-9	-1	-26	-3	12	-2	-1	-1	0	-3
2006	-1	0	33	-2	2	-48	-78	-2	-3	-2	-1	-1	-104
2007	0	0	5	1	18	11	11	5	0	0	-1	0	49
2008	0	1	3	16	8	6	1	3	1	-1	0	0	37
2009	1	3	2	6	14	13	10	20	0	0	-1	-1	68
2010	2	1	5	4	7	0	-1	-2	-1	-1	0	0	11
2011	4	6	-8	-2	-9	-78	-15	-6	-1	-1	-1	0	-111
2012	0	-1	-1	2	2	12	3	-1	0	-1	-1	-2	13
2013	0	4	11	4	-2	1	4	-1	-1	0	-1	0	19
2014	0	0	1	0	14	13	7	1	0	0	-1	-1	34
Average	**1**	**3**	**10**	**8**	**1**	**-5**	**-1**	**2**	**-1**	**-1**	**0**	**0**	**17**

Table D-13. UF 16 — Stanislaus River at Melones Reservoir Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-2	-4	-9	-11	-66	-23	2	-98	-107	-40	-11	-3	-372
1923	-1	24	13	-40	-17	19	51	-102	-9	51	-2	1	-14
1924	17	-3	-6	1	35	7	30	83	11	2	1	1	179
1925	14	39	-2	-8	54	15	-48	-151	85	47	1	-1	45
1926	2	1	15	11	22	79	89	-34	-16	0	-1	-2	166
1927	0	101	-17	-29	-41	7	70	-84	-95	-45	-10	-4	-147
1928	17	22	-10	-21	2	54	-41	52	5	-3	-2	-1	74
1929	-1	1	8	-8	-3	24	21	97	58	-1	0	1	197
1930	3	-2	14	-6	62	102	2	-42	124	-11	-2	-4	240
1931	1	8	5	52	37	43	20	71	34	3	2	2	278
1932	1	5	-23	-25	-54	39	37	-17	-58	-51	-14	-4	-165
1933	-3	-2	-5	-9	6	113	53	1	-13	-12	-3	-2	123
1934	2	2	14	-3	38	64	48	0	-1	-1	1	1	166
1935	10	18	7	-22	-11	13	129	-134	-1	-15	-8	-2	-15
1936	3	-1	-3	1	7	-24	-15	2	61	3	-6	-5	25
1937	-3	-1	2	-17	33	-2	-15	168	-9	-11	-6	-3	136
1938	-1	14	52	-21	-84	-87	-53	-32	51	5	-18	-8	-181
1939	6	-3	5	-6	4	34	22	41	20	-4	3	23	144
1940	27	5	5	15	-5	-9	-60	-50	-10	-17	-4	-1	-105
1941	-3	13	55	-20	33	27	12	-111	32	66	-8	0	96
1942	-7	13	6	-17	-28	-9	-25	16	109	69	-10	-3	115
1943	-2	14	5	-37	-17	-84	0	44	38	15	-10	-2	-38
1944	-2	0	3	5	7	37	54	-1	-2	1	-2	1	101
1945	1	37	-8	-22	10	-35	65	-26	43	-15	-8	-2	41
1946	16	9	-2	-60	-29	-16	92	-4	81	-7	-3	0	77
1947	9	44	26	-4	44	65	54	16	-4	-6	-1	2	245
1948	21	11	-3	13	1	35	53	-25	-9	3	-4	2	98
1949	-1	-8	-12	-11	-8	20	103	-25	-41	-11	-2	3	6
1950	1	18	6	49	80	62	91	-89	-101	-31	-3	-1	83
1951	29	-54	-114	-2	15	30	26	66	85	24	-2	-1	102
1952	2	9	13	-42	-31	-11	120	47	-123	-22	-16	-3	-57
1953	2	7	-4	15	10	80	62	-36	-57	-3	-5	1	72
1954	0	16	5	16	70	40	45	-75	-32	-10	1	0	76
1955	-1	3	28	12	38	34	32	30	-14	-12	0	4	153
1956	1	-4	-107	-154	-39	98	94	176	25	9	-4	-3	94
1957	2	1	4	60	71	65	11	-2	-12	-10	-4	-2	182
1958	4	2	9	42	97	-34	12	23	-105	-46	-17	6	-7
1959	-3	-2	4	38	41	67	8	-24	-18	-8	3	27	133
1960	21	4	2	11	125	62	-8	-10	-19	-2	5	6	195
1961	16	18	10	15	20	38	34	38	40	6	4	8	246
1962	7	5	4	6	33	12	97	-104	-23	-25	1	3	17
1963	77	16	21	-11	20	23	30	-31	30	20	-4	1	192
1964	28	23	-13	-20	5	31	66	43	40	0	3	2	206
1965	12	31	-135	-164	-27	43	14	72	86	41	-2	-2	-31
1966	-1	33	-16	-27	-12	21	98	10	-13	-3	3	4	98
1967	4	28	3	-40	-17	-21	-59	86	-66	-23	-26	-3	-134
1968	7	7	3	11	13	47	-2	-23	12	-2	2	6	80
1969	7	41	-19	-94	-126	-31	-8	81	23	27	-7	2	-104
1970	18	21	56	-98	-31	-5	34	66	122	13	-3	3	196

Table D-13. UF 16 — Stanislaus River at Melones Reservoir Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	2	43	-11	-57	2	14	8	-42	95	17	0	7	78
1972	6	4	-23	-16	20	76	-10	-18	-11	-6	5	13	41
1973	6	20	2	-38	-40	-54	82	115	-1	-14	3	3	85
1974	20	21	-20	-102	-26	5	-3	28	102	13	-7	1	32
1975	17	9	15	17	26	-25	-22	91	-48	-50	2	4	37
1976	5	5	-8	-7	18	12	-4	79	16	13	21	24	175
1977	13	8	6	5	32	17	60	19	44	12	8	6	228
1978	10	17	42	15	-17	72	4	68	45	-28	-15	28	242
1979	-1	2	-6	-11	-49	7	6	71	-9	-11	0	0	1
1980	14	24	-2	-163	-69	-40	72	-41	10	80	-9	-3	-129
1981	0	2	5	19	28	28	61	26	6	5	5	3	189
1982	21	62	-69	-146	-104	-30	-65	-1	123	133	0	15	-62
1983	35	-19	-86	-117	-116	-156	-39	137	-87	-5	-21	5	-469
1984	3	-17	-39	-106	-25	49	61	64	84	4	0	8	87
1985	10	15	-13	-10	14	14	71	-9	27	12	12	27	170
1986	30	-12	-7	-7	-115	32	-5	21	101	12	-6	-13	30
1987	11	9	2	1	37	72	119	22	-5	-1	3	4	274
1988	11	12	0	2	56	51	53	72	22	3	5	6	293
1989	1	19	7	-2	16	63	90	32	-12	-8	3	41	250
1990	41	22	7	16	15	92	65	72	69	9	10	10	426
1991	8	8	8	7	32	43	39	35	91	16	8	5	301
1992	9	12	9	-1	34	73	60	67	8	56	5	4	335
1993	12	11	3	-126	-35	42	43	111	99	21	-5	6	183
1994	6	4	1	13	20	60	57	7	1	6	9	6	188
1995	22	-2	-5	-96	3	-105	27	-13	-7	196	31	-6	45
1996	-2	-1	29	-40	-59	-36	41	53	137	12	7	9	151
1997	5	25	-112	-299	-20	70	90	178	190	25	0	6	156
1998	5	8	9	-58	-167	-64	8	1	136	79	-2	-1	-45
1999	-1	-8	-2	11	-95	-53	30	81	66	-10	-4	-7	7
2000	7	17	2	63	-50	-48	96	146	-12	-8	3	9	226
2001	8	2	4	46	6	55	66	29	-12	13	9	8	233
2002	8	48	52	-5	36	76	-22	18	-7	-3	6	8	212
2003	7	71	75	-4	19	29	24	49	-79	-3	13	7	208
2004	8	15	106	7	17	122	4	-74	-45	-7	4	10	166
2005	52	28	35	-30	-27	37	15	-13	-131	-74	-5	6	-106
2006	3	10	-13	-77	11	-66	-91	80	-160	-65	-12	-5	-384
2007	1	20	20	6	44	76	-2	-53	-20	5	8	12	117
2008	7	17	20	18	21	53	69	-9	-56	1	6	7	153
2009	19	61	11	84	27	38	37	-88	-72	-13	7	7	115
2010	69	9	22	26	18	45	106	-27	-157	-54	1	4	63
2011	105	34	-28	-41	-37	-102	-56	12	-76	-105	-30	-3	-326
2012	-2	1	2	21	7	26	28	-14	-13	-5	1	7	59
2013	4	38	36	-1	-1	16	2	28	3	4	0	7	137
2014	4	11	9	18	90	56	-104	-91	-21	-12	-7	-4	-52
Average	**10**	**14**	**0**	**-20**	**0**	**20**	**29**	**14**	**7**	**2**	**-1**	**4**	**79**

Table D-14. UF 18 — Tuolumne River at Don Pedro Reservoir Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-1	1	96	5	62	37	-21	-121	-354	-163	-21	-8	-490
1923	9	57	144	57	12	27	-15	-139	-82	-48	-18	1	4
1924	12	0	-1	27	39	21	18	-54	-5	-14	1	2	45
1925	34	68	43	23	125	63	-29	-171	-73	-63	-6	3	16
1926	13	12	16	65	142	34	-4	-81	-34	-8	2	0	157
1927	2	149	8	74	66	3	27	-47	-183	-129	-19	-8	-56
1928	93	66	38	32	31	140	-40	-35	-45	-18	-4	-1	256
1929	2	30	41	19	27	95	36	-27	-24	-26	0	4	178
1930	5	2	42	69	118	128	-28	-107	-67	-38	-5	7	128
1931	11	30	11	87	37	59	18	16	-3	-2	6	6	276
1932	8	25	153	31	14	66	-9	-56	25	-72	-24	-9	154
1933	0	6	10	45	35	163	65	20	-102	-58	-10	0	172
1934	23	31	176	60	82	116	-13	-64	-40	-3	0	2	370
1935	37	74	50	82	20	58	48	-135	-22	-67	-11	3	137
1936	24	2	13	118	147	104	41	-128	-98	-81	-8	4	137
1937	12	6	107	8	152	93	-36	-9	-90	-56	-8	-1	178
1938	5	28	263	63	-21	-41	-4	-111	-95	-127	-44	-9	-94
1939	42	-4	13	20	18	168	7	-67	-30	-8	-2	25	181
1940	40	8	20	188	36	56	-27	-57	-154	-42	-6	3	65
1941	7	19	150	37	76	-42	-27	-145	-52	-5	-16	-1	1
1942	1	41	93	71	-16	12	-12	-67	-16	-48	-19	3	42
1943	6	97	85	75	13	28	-65	-61	-65	-1	-14	0	98
1944	4	13	17	58	57	77	16	-56	-61	-28	-3	3	98
1945	67	117	29	-6	24	3	71	-105	-52	-85	-7	10	66
1946	105	28	153	-21	11	28	9	-131	-16	-27	3	7	148
1947	38	116	66	-2	59	84	-2	-56	-51	-11	5	4	251
1948	64	16	-4	22	22	107	164	-59	-139	-50	3	2	148
1949	6	12	13	11	35	87	181	-96	-59	-16	5	4	182
1950	4	53	19	55	113	90	110	-64	-178	-46	3	8	167
1951	109	209	52	-24	2	11	-38	9	17	-21	1	8	335
1952	15	71	95	36	25	-2	26	-138	-131	-22	-28	-5	-58
1953	4	19	78	81	1	36	-4	-79	-74	-43	-3	5	21
1954	4	45	37	69	125	41	84	-70	-99	-25	5	5	220
1955	2	35	124	16	34	40	-22	48	-12	-13	9	6	266
1956	5	7	319	-133	-81	9	25	22	-32	-29	-25	-2	84
1957	19	26	15	45	113	74	23	6	-140	-52	0	6	135
1958	17	17	113	113	125	37	59	-130	-223	-138	-35	9	-36
1959	6	11	21	100	68	41	32	-92	-57	-7	7	102	231
1960	19	1	-1	52	125	157	26	-53	-64	-1	5	5	270
1961	15	63	55	39	22	69	29	-62	14	-2	11	17	271
1962	9	28	43	42	158	57	116	-125	-115	-85	-2	14	140
1963	105	14	83	315	110	27	41	-40	-102	-25	-18	1	512
1964	36	96	4	26	10	54	30	-34	-44	-21	1	4	162
1965	24	84	214	-45	12	1	38	-111	-55	43	10	-8	208
1966	7	92	33	-3	-6	44	26	-68	-45	-11	0	1	70
1967	4	88	74	86	9	-48	-65	81	-116	-96	-55	2	-34
1968	14	28	25	96	83	58	-39	-97	-37	-5	7	8	142
1969	36	103	16	166	-89	13	-97	-224	-135	30	-29	-1	-211
1970	49	53	65	95	10	-13	-61	76	75	-48	-12	-3	286

Table D-14. UF 18 — Tuolumne River at Don Pedro Reservoir Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-1	113	45	3	19	51	-41	-110	21	12	1	8	121
1972	8	34	35	16	91	75	7	-59	-71	-15	-2	17	136
1973	16	52	29	80	50	-28	60	-41	-138	-41	1	5	46
1974	60	67	150	-18	0	102	-17	-90	-57	-33	-10	0	154
1975	23	37	64	71	101	57	7	-21	-194	-121	1	5	28
1976	41	22	5	19	27	42	1	13	-13	13	22	26	217
1977	11	13	10	18	43	15	39	-9	8	2	7	8	164
1978	12	51	179	120	43	181	-1	-153	-113	-109	-42	29	198
1979	2	-2	11	65	35	87	9	-68	-21	-46	-4	1	69
1980	23	54	67	60	-28	-72	21	-129	-80	39	-33	-6	-83
1981	6	14	63	100	74	63	73	-68	-32	-7	-9	4	279
1982	41	170	71	-61	-4	-14	-146	-161	-69	-11	-48	4	-226
1983	62	54	-42	9	-4	-125	-66	38	-220	-229	-131	-22	-677
1984	9	-6	-25	-67	-9	-9	-9	39	-37	-51	-6	7	-162
1985	28	80	2	9	75	33	103	-138	-48	-6	-1	19	157
1986	29	35	77	113	98	30	-126	-120	-135	-103	-16	4	-112
1987	13	6	9	46	96	105	125	-51	-25	4	4	9	341
1988	30	24	3	66	73	38	38	22	-13	-7	8	13	293
1989	9	39	29	23	44	158	96	-83	-40	-12	14	60	338
1990	72	54	17	55	33	93	-5	-36	41	10	13	14	361
1991	22	14	14	18	70	166	24	-74	51	-18	-4	10	292
1992	51	50	41	46	126	102	33	-17	-9	0	3	12	438
1993	49	31	98	70	23	250	-15	-120	-99	-101	-39	-14	135
1994	12	26	39	48	89	95	-3	-49	-66	-20	-13	8	167
1995	55	17	36	139	62	-35	26	-168	-212	-120	-88	-21	-309
1996	0	7	149	99	81	80	11	-110	-25	-77	-9	2	208
1997	14	108	132	-193	-79	37	-73	-6	-29	20	-33	-5	-108
1998	14	54	44	144	-9	91	5	-158	-252	-164	-63	4	-288
1999	3	32	27	148	37	-29	15	-174	-119	-78	-18	-3	-158
2000	23	66	15	245	101	2	29	-94	-143	-53	-21	10	180
2001	35	20	28	76	40	205	62	-97	-33	10	12	15	372
2002	28	100	141	6	100	95	-17	-50	-60	-8	5	10	350
2003	15	160	142	90	10	100	37	4	-169	-32	1	2	359
2004	8	34	197	46	71	168	-46	-98	-75	-18	1	6	295
2005	106	31	145	81	19	34	-69	-203	-158	-28	-23	-2	-68
2006	12	24	305	5	78	-45	-57	-178	-163	-157	-22	-3	-200
2007	15	39	62	36	116	134	8	-121	-45	-1	4	10	259
2008	20	17	55	115	117	64	2	-69	-77	-14	9	8	247
2009	55	73	37	140	94	60	-12	-27	-125	-40	9	8	272
2010	114	21	63	109	94	86	52	-107	-173	-68	1	7	199
2011	116	43	127	19	-8	52	-36	-91	-144	-252	-60	6	-228
2012	25	7	15	69	28	111	80	-98	-24	2	9	10	233
2013	14	138	149	26	4	63	-22	-43	-43	-3	5	13	300
2014	13	21	19	44	154	95	25	-76	-34	14	10	14	298
Average	**27**	**46**	**67**	**53**	**50**	**58**	**10**	**-73**	**-75**	**-41**	**-10**	**6**	**118**

Table D-15. UF 19 — Merced River at Exchequer Reservoir Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-1	-2	25	0	-65	-9	15	-64	-154	-13	-11	-6	-284
1923	-1	26	35	2	-11	15	2	-59	-82	63	-2	-5	-15
1924	-2	-5	-5	4	6	5	-7	-21	8	-2	-2	-1	-22
1925	9	26	6	8	21	26	6	-58	-1	8	-10	-3	39
1926	2	0	5	3	42	27	-22	-83	36	-1	-2	-2	4
1927	-1	80	7	16	-23	-17	7	-34	-73	-25	-7	-1	-71
1928	18	35	-1	0	1	25	-31	28	9	-1	0	0	84
1929	-3	9	14	4	11	31	9	-15	5	4	1	0	71
1930	1	-2	19	29	56	62	4	-70	35	-6	-1	-3	122
1931	2	14	2	20	18	25	-8	-2	24	6	-2	0	98
1932	1	3	13	-13	-46	89	0	-27	73	34	-5	-3	118
1933	-5	-2	4	-2	26	75	49	-40	33	0	0	-3	135
1934	-1	14	55	31	22	85	-9	16	1	3	-1	-2	212
1935	7	48	24	16	13	-5	-9	-82	17	1	-8	1	24
1936	9	-2	0	47	-54	61	46	-117	-8	-5	-6	1	-27
1937	0	2	31	-7	-49	27	-9	0	-26	25	-4	0	-8
1938	2	3	120	0	-118	-115	-9	-77	-77	25	-13	-9	-267
1939	-3	1	-9	0	3	70	-18	-45	54	-2	0	4	56
1940	23	0	-2	46	-27	23	29	-7	9	-11	-4	0	78
1941	3	7	13	5	-10	-35	-27	2	-39	46	-7	-3	-46
1942	-6	5	15	9	-20	-14	-15	-30	19	62	-12	-7	6
1943	-4	28	19	-31	-1	-47	3	-5	-14	83	-6	-4	22
1944	-2	1	5	18	-1	21	10	-28	-50	41	-3	0	13
1945	3	81	0	-14	-66	-53	46	-30	0	18	-11	-2	-26
1946	4	31	16	-23	-11	-1	56	-65	36	46	1	2	93
1947	7	33	18	-14	8	35	16	3	1	-1	3	0	108
1948	17	4	-5	-2	-2	41	86	-51	-70	37	0	0	55
1949	-1	1	-1	-3	6	36	126	-91	23	-4	0	1	93
1950	-2	14	4	-4	49	21	88	-60	-26	14	1	1	100
1951	14	53	-54	-47	-2	-3	12	65	93	40	2	0	173
1952	1	19	16	-61	24	-58	90	-54	-79	53	3	-5	-52
1953	-3	-2	16	17	9	26	8	-35	2	48	2	1	90
1954	-2	10	7	19	40	20	87	-48	-19	17	3	0	134
1955	-2	16	47	8	10	12	-3	33	10	7	5	0	144
1956	-2	-1	15	-91	-51	10	55	57	95	94	-2	-3	176
1957	2	-3	-5	8	33	21	7	-19	27	-11	-3	1	57
1958	1	-1	46	29	37	-37	22	-4	-123	12	-15	-3	-37
1959	-1	-2	-3	47	12	37	8	-40	26	1	1	28	114
1960	6	1	-2	21	26	103	17	-54	43	-2	1	0	159
1961	6	23	16	6	11	21	18	-40	74	8	2	2	147
1962	2	8	25	-4	25	8	130	-90	-32	-3	-4	2	66
1963	14	2	20	-18	116	-2	-19	55	-20	63	2	3	217
1964	8	42	-8	-11	3	19	34	-26	12	24	4	2	104
1965	1	38	-18	-84	14	8	19	-7	45	96	13	-4	120
1966	-3	38	-18	-18	-4	8	73	-51	5	-1	-3	-4	23
1967	-11	24	21	3	18	-38	-113	106	-36	-2	-31	-9	-66
1968	0	-1	2	13	44	30	-2	-35	40	-1	-2	-3	85
1969	6	33	7	-71	-135	-31	9	-33	-32	101	33	-3	-117
1970	1	14	13	16	-8	-9	-22	95	84	8	-4	-4	183

Table D-15. UF 19 — Merced River at Exchequer Reservoir Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-2	28	24	-12	17	38	8	-44	28	40	2	3	130
1972	2	8	0	-5	35	64	-5	-9	30	9	1	-5	126
1973	0	22	-1	10	-17	-42	44	-11	-40	-14	-8	-2	-58
1974	11	21	31	-22	-7	17	-3	-51	29	3	-9	-4	16
1975	5	11	22	17	-16	4	-12	8	-92	-25	-5	-2	-83
1976	0	12	-8	-7	6	18	-17	-7	10	3	0	9	20
1977	3	1	1	7	9	1	7	-11	28	-2	-1	-1	42
1978	-1	19	66	30	-33	43	2	-74	-71	-14	-9	-18	-60
1979	-9	-9	1	-20	-37	25	12	7	10	-5	-12	-4	-41
1980	-3	22	-1	-19	-104	-67	32	-15	-31	103	10	-8	-81
1981	-8	-2	14	14	45	32	35	-28	37	-8	-4	-5	122
1982	13	64	0	-55	-44	-55	-169	-13	6	58	0	-8	-203
1983	-5	15	-66	-92	-107	-165	-52	31	-109	-206	-26	-7	-788
1984	-9	-6	-70	-48	-20	10	-23	51	36	16	-2	1	-63
1985	4	26	-1	-9	19	7	47	-98	34	-5	-2	-4	19
1986	1	14	18	45	-75	-44	-30	-76	52	13	-2	-3	-89
1987	-1	0	-3	5	29	25	54	-10	2	-1	-2	0	98
1988	5	10	1	17	29	32	-6	19	10	-10	-5	-3	99
1989	-1	9	6	1	23	90	74	-44	9	8	-1	8	183
1990	27	8	-2	35	16	49	-29	-33	51	-1	-3	-2	117
1991	0	2	2	-3	10	27	30	-14	55	19	1	0	129
1992	9	10	8	13	38	52	4	19	4	-3	-1	-1	152
1993	2	12	21	-57	-13	167	-24	-143	-36	52	-12	-6	-37
1994	-3	1	11	3	29	47	2	-26	11	-5	-8	-1	61
1995	8	3	2	-16	36	-112	-35	-110	-72	10	13	-6	-280
1996	-10	-7	32	6	-8	22	-24	-19	82	8	-9	-5	68
1997	0	26	-52	-363	-53	63	-19	79	80	74	4	-2	-165
1998	2	12	23	23	-112	56	-37	-57	-140	0	-20	-21	-271
1999	-11	-5	10	41	-5	-1	24	-83	19	12	-8	-6	-12
2000	-1	10	5	69	-25	33	52	-51	25	-15	-10	-2	91
2001	9	4	-4	13	6	81	16	-13	-1	-3	-2	-1	107
2002	1	31	15	18	35	34	38	-48	82	4	-2	0	207
2003	0	57	39	14	4	46	-5	26	19	-16	0	-3	180
2004	-2	-2	55	7	12	132	-19	-41	53	-7	-5	-3	179
2005	35	8	20	-52	-21	-23	-24	-57	-47	72	-15	-8	-112
2006	-5	-1	74	-6	-18	-18	-114	-7	-15	-17	-14	-9	-150
2007	-8	-1	11	1	24	69	-22	-17	-5	-10	-8	-4	30
2008	-3	-1	15	28	25	38	-2	-23	9	-15	-6	-4	61
2009	6	21	4	27	24	21	8	30	-44	8	-8	-4	92
2010	27	4	15	19	3	37	16	-75	-54	25	-12	-7	-2
2011	16	10	82	-43	-62	-113	27	-70	-85	29	-20	-8	-234
2012	-2	-3	-5	1	8	30	45	-24	12	-4	-4	-3	51
2013	-2	9	36	-1	4	34	15	19	41	1	-2	-1	152
2014	1	0	-1	0	20	35	-2	-6	2	-5	-2	0	42
Average	**2**	**13**	**11**	**-5**	**-3**	**16**	**8**	**-25**	**0**	**13**	**-4**	**-2**	**24**

Table D-16. UF 20 — Chowchilla River at Buchanan Reservoir Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	0	0	1	-9	1	1	-2	-1	0	0	0	-7
1923	0	4	0	1	0	1	5	-2	-1	0	0	0	9
1924	1	1	0	0	1	5	4	1	0	0	0	0	13
1925	1	8	5	4	15	4	4	-1	0	0	0	0	41
1926	1	1	1	3	25	2	6	1	1	0	0	0	40
1927	0	4	4	7	4	0	5	-1	0	0	0	0	21
1928	1	2	3	0	8	21	8	0	0	0	0	0	42
1929	0	2	2	4	8	14	14	1	1	1	0	0	48
1930	0	0	1	2	11	16	6	3	1	0	0	0	41
1931	1	2	2	6	8	4	2	2	1	0	0	0	27
1932	0	1	4	-1	-21	8	6	1	0	0	0	0	-2
1933	0	0	1	2	4	14	2	1	1	0	0	0	26
1934	0	0	5	7	8	2	0	1	0	0	0	0	24
1935	1	5	7	0	0	4	-4	-4	-1	0	0	0	6
1936	0	1	0	9	-11	-6	2	-2	-1	0	0	0	-7
1937	0	1	5	3	-8	2	-3	-4	-1	0	0	0	-6
1938	0	1	14	7	-6	-54	-8	-6	-3	-1	0	0	-56
1939	0	1	3	7	7	13	4	0	1	0	0	0	36
1940	1	1	1	13	-3	-1	1	-2	0	0	0	0	11
1941	0	1	11	8	-10	-15	-10	-4	-2	-1	0	0	-23
1942	0	0	6	10	11	2	5	-1	-1	-1	0	0	31
1943	0	11	9	27	10	2	-4	-2	-1	0	0	0	53
1944	0	0	2	8	12	3	2	0	0	0	0	0	27
1945	0	13	6	1	22	4	-4	-3	-1	0	0	0	38
1946	1	3	16	9	8	14	3	-1	0	0	0	0	53
1947	1	13	10	5	10	9	4	0	1	0	0	0	52
1948	1	2	1	4	6	27	15	1	1	1	0	0	58
1949	0	1	1	2	8	23	5	1	1	0	0	0	42
1950	0	2	2	7	11	15	9	1	1	0	0	0	48
1951	1	14	3	1	6	9	0	1	1	0	0	0	35
1952	0	3	8	-6	8	-4	6	-2	-1	-1	0	0	11
1953	0	0	10	13	6	11	2	1	1	1	0	0	44
1954	0	2	2	13	23	19	2	1	1	0	0	0	62
1955	0	2	8	8	9	7	3	1	1	0	0	0	39
1956	0	1	0	-4	4	3	0	-2	-1	0	0	0	2
1957	0	1	0	4	13	15	1	2	1	1	0	0	38
1958	1	1	6	8	19	7	-26	-5	-1	-1	0	0	9
1959	0	0	1	7	17	5	2	1	1	0	0	3	37
1960	2	0	0	2	20	10	4	1	1	0	0	0	40
1961	0	3	6	1	4	9	1	1	1	0	0	0	27
1962	0	1	7	1	9	8	-1	-1	1	0	0	0	25
1963	1	1	3	6	21	7	-3	-5	-1	-1	0	0	30
1964	1	7	4	1	1	8	2	0	1	0	0	0	24
1965	0	8	7	-9	4	7	-4	-4	-1	0	0	0	9
1966	0	11	3	1	8	3	0	0	0	0	0	0	27
1967	0	3	20	3	3	15	-29	-15	-5	-1	0	0	-4
1968	0	1	3	7	16	12	2	0	1	0	0	0	42
1969	0	4	14	17	-20	-8	0	-2	-1	0	0	0	5
1970	1	3	9	28	11	4	0	0	0	0	0	0	56

Table D-16. UF 20 — Chowchilla River at Buchanan Reservoir Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0	5	14	8	4	11	2	1	0	0	0	0	46
1972	0	2	6	5	9	4	6	2	1	0	0	0	34
1973	1	7	6	15	-5	-2	-5	-2	0	0	0	0	14
1974	1	11	10	6	5	12	-4	-2	0	0	0	0	39
1975	0	2	8	8	10	8	0	-3	-1	0	0	0	32
1976	1	1	0	0	7	6	2	1	0	0	0	0	19
1977	1	1	1	2	1	3	1	1	1	0	0	0	11
1978	0	1	12	7	-16	-13	-21	-10	-2	-1	0	1	-40
1979	1	0	3	8	7	6	-3	-2	-1	-1	0	0	16
1980	0	1	3	23	16	1	-2	-2	-1	0	0	0	40
1981	0	1	2	3	10	12	0	0	0	0	0	0	29
1982	0	10	12	-3	17	4	-16	-5	-1	0	0	-1	19
1983	2	13	11	-24	-19	-43	-9	-10	-4	-1	-1	-1	-87
1984	1	9	7	6	10	6	1	0	-1	0	0	0	39
1985	1	7	6	1	12	11	2	0	-1	0	0	0	39
1986	1	6	9	8	22	2	-2	-1	0	0	0	0	44
1987	1	0	1	2	12	13	2	1	0	0	0	0	33
1988	0	3	3	8	2	8	5	1	1	0	0	0	32
1989	0	5	5	3	9	26	3	2	1	0	0	0	54
1990	2	3	2	6	8	6	1	2	1	0	0	0	32
1991	0	0	1	1	2	46	3	0	0	-1	0	0	52
1992	0	2	2	3	8	6	3	-1	0	-2	0	0	21
1993	0	1	8	-3	14	9	0	-2	0	1	0	0	27
1994	0	0	2	1	13	3	4	1	-1	-1	0	0	24
1995	1	4	5	11	7	18	-2	0	-2	0	0	-1	41
1996	0	0	7	8	9	9	1	0	0	-2	-1	0	30
1997	0	10	-15	-54	2	1	0	0	0	0	0	0	-58
1998	-1	1	6	11	-11	-2	-12	-4	-7	-2	-1	-1	-22
1999	0	0	3	13	21	8	5	0	-1	-1	0	0	49
2000	0	1	1	21	8	-3	-1	-1	0	0	0	0	26
2001	1	1	1	7	15	13	3	1	0	0	0	0	43
2002	0	7	24	5	8	9	0	0	1	0	0	0	54
2003	0	13	17	5	5	9	11	4	1	0	0	0	66
2004	0	1	12	10	13	5	0	0	0	0	0	0	40
2005	12	6	14	1	3	-1	-4	1	0	0	0	0	31
2006	0	0	18	20	6	9	-17	-7	0	0	0	-1	29
2007	-1	0	3	4	16	4	1	1	0	-1	-1	0	27
2008	0	0	4	35	13	2	0	0	0	0	0	0	56
2009	0	3	7	14	18	10	1	2	1	0	0	0	56
2010	6	1	15	14	11	8	7	-1	0	0	0	0	61
2011	3	8	26	5	8	3	-1	0	0	0	0	0	52
2012	1	0	0	7	5	11	8	1	1	-2	-4	0	29
2013	0	2	36	4	1	1	1	1	-1	-2	0	0	44
2014	0	1	1	1	4	7	5	2	0	0	0	0	21
Average	**1**	**3**	**6**	**5**	**7**	**6**	**0**	**-1**	**0**	**0**	**0**	**0**	**27**

Table D-17. UF 21 — Fresno River near Daulton Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0	0	-7	0	-6	-4	1	-12	-3	-2	0	0	-33
1923	0	3	-7	-4	-2	3	-1	-13	-7	-3	0	0	-31
1924	1	0	0	-1	1	3	-1	0	0	0	0	0	3
1925	1	11	3	4	18	4	-1	-7	-5	-1	0	0	28
1926	1	0	1	3	33	2	12	-4	-1	0	0	0	48
1927	0	4	5	7	18	1	7	-8	-5	-1	0	0	29
1928	0	2	1	-1	5	19	7	-4	-1	0	0	0	29
1929	0	2	2	2	7	17	13	-3	-2	1	0	0	37
1930	0	0	1	-1	15	13	6	0	-1	0	0	0	34
1931	1	1	1	2	7	5	1	2	1	0	0	0	23
1932	0	0	-3	-5	3	29	13	-5	-6	-2	0	0	25
1933	0	0	0	-1	2	26	-2	-3	-5	0	0	0	18
1934	0	1	4	12	12	1	-1	-1	0	0	0	0	29
1935	1	7	5	15	3	7	18	-9	-9	-3	0	0	36
1936	-1	0	0	15	32	4	0	-13	-6	-1	0	0	31
1937	0	0	6	0	12	13	-2	-11	-9	-3	0	0	6
1938	-1	0	34	14	23	-14	-17	-12	-14	-10	-3	-1	0
1939	2	3	4	4	1	11	-2	-3	-1	0	0	1	20
1940	2	0	0	28	4	4	-2	-10	-4	-1	0	0	23
1941	0	0	15	13	-3	-22	-11	-11	-13	-6	-1	-1	-40
1942	-1	0	20	14	9	-2	13	-5	-9	-5	-1	0	33
1943	0	16	8	58	19	11	-5	-6	-3	-2	0	0	95
1944	-1	1	2	6	11	10	0	-7	-5	-1	0	0	17
1945	0	14	1	-1	33	-1	-8	-10	-7	-2	0	0	20
1946	0	4	25	9	5	15	4	-9	-3	-1	0	0	49
1947	1	18	13	3	11	5	0	-3	0	0	0	0	46
1948	1	1	1	3	1	31	30	-2	-4	-2	0	0	61
1949	0	0	-1	0	3	34	8	-7	-4	-1	0	0	33
1950	0	3	1	4	22	15	10	-6	-4	-1	0	0	43
1951	1	39	21	5	8	6	-1	-4	-3	-1	0	0	73
1952	0	2	12	-3	9	-8	22	0	-5	-4	-1	0	25
1953	0	2	3	14	6	11	1	-3	-4	-2	0	0	27
1954	0	1	1	14	31	24	1	-6	-3	-1	0	0	62
1955	0	2	7	5	6	6	3	-2	-3	-1	0	0	22
1956	0	-1	49	3	4	3	3	-1	-4	-1	0	0	56
1957	1	0	0	4	14	13	-2	-1	-3	-1	0	0	24
1958	1	0	5	12	27	20	-16	-2	-5	-4	-2	-1	37
1959	0	0	2	11	27	7	-1	-2	-1	0	0	6	48
1960	2	0	-1	2	24	12	2	-2	-2	0	0	0	37
1961	1	3	5	0	4	9	1	0	0	0	0	0	22
1962	0	1	5	-1	21	5	-2	-5	-6	-1	0	0	16
1963	2	1	1	13	29	4	10	-6	-6	-3	0	0	44
1964	0	11	1	-2	-2	2	0	-4	-2	-1	0	0	3
1965	1	8	12	-7	9	12	-6	-3	-5	-2	-1	0	18
1966	-1	17	1	-3	5	1	-4	-5	-1	0	0	0	11
1967	0	2	44	2	3	37	-31	-16	-9	-5	-2	0	25
1968	0	1	2	4	11	8	-2	-3	-1	0	0	0	19
1969	0	3	11	59	-21	-8	18	-1	-2	-4	-2	-1	54
1970	3	5	12	41	14	7	0	-4	-3	-1	0	0	74

Table D-17. UF 21 — Fresno River near Daulton Simulated minus Unimpaired (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	0	7	13	-1	7	13	1	-4	-4	-1	0	0	31
1972	0	1	3	-1	6	0	7	-3	0	0	0	1	15
1973	1	8	2	22	1	-1	-7	-7	-3	-1	0	0	16
1974	0	17	14	6	6	38	6	-4	-3	-1	0	0	79
1975	0	1	9	4	15	26	6	-6	-7	-2	0	0	46
1976	1	1	-1	0	5	2	0	-1	-1	-1	0	1	5
1977	1	1	0	0	1	1	0	1	0	0	0	0	4
1978	0	2	13	23	-6	-8	-17	-12	-9	-3	-1	2	-15
1979	1	-1	3	14	10	16	2	-4	-4	-2	0	0	36
1980	1	2	1	39	42	2	-4	-5	-4	-3	0	0	70
1981	0	0	2	7	13	17	0	-2	-1	-1	0	0	36
1982	1	10	9	-4	29	15	5	-3	-3	-1	-2	1	56
1983	4	22	22	-22	-12	-46	-15	-7	-3	-2	-2	0	-60
1984	1	16	17	6	10	6	-2	-4	-3	-2	-1	0	44
1985	0	6	4	0	10	12	0	-2	-2	-1	-1	0	26
1986	0	5	10	9	55	2	-3	-4	-4	-2	-1	-1	66
1987	1	0	2	5	15	10	3	-1	-4	0	-1	0	30
1988	1	3	2	6	5	10	5	1	0	-1	0	0	32
1989	0	3	2	1	6	25	1	1	1	-1	-1	1	39
1990	3	2	1	7	4	8	0	1	1	-2	0	0	25
1991	0	0	1	1	2	54	4	-2	-1	-2	-2	0	54
1992	1	2	1	4	15	8	0	0	0	-1	-1	0	29
1993	0	1	6	6	8	19	2	-4	-4	-4	-1	0	30
1994	-2	0	2	2	13	3	4	2	-2	0	-1	0	20
1995	3	2	2	17	3	40	-1	2	-2	-1	-1	-1	62
1996	-1	1	12	6	22	19	5	-2	-2	-1	-1	-1	57
1997	-1	14	-1	-27	2	1	1	0	-2	-2	-1	-1	-18
1998	-1	0	6	13	2	-2	-15	-6	-7	-3	-1	-1	-14
1999	1	1	1	13	19	3	2	-4	-2	0	0	-2	32
2000	-1	1	0	24	20	-4	-4	-4	-2	0	0	0	29
2001	-1	1	0	5	19	17	3	-1	0	0	-1	0	41
2002	0	6	31	7	5	9	-1	-1	0	0	0	0	56
2003	0	15	22	5	5	9	11	4	-2	-2	0	0	68
2004	0	1	16	14	14	6	-1	-2	0	0	0	0	47
2005	12	5	18	21	4	-1	-6	-3	-4	-2	-1	-1	42
2006	0	0	22	28	4	10	-10	-11	-4	-2	-1	-1	36
2007	0	1	3	3	14	3	-1	-1	0	0	0	0	20
2008	0	0	4	38	15	2	-2	-3	-1	0	0	0	53
2009	0	5	6	13	17	10	0	-1	0	0	0	0	50
2010	12	1	16	15	12	10	10	-1	-2	-1	0	0	70
2011	5	8	33	6	3	11	0	-4	-4	-2	0	0	54
2012	2	2	1	11	6	9	8	0	-1	0	0	0	37
2013	0	2	38	4	1	3	0	0	0	0	0	0	49
2014	0	1	0	0	4	9	5	1	0	0	0	0	22
Average	**1**	**4**	**7**	**8**	**11**	**9**	**1**	**-4**	**-3**	**-1**	**0**	**0**	**33**

Table D-18. UF 22 — San Joaquin River at Millerton Reservoir Simulated minus Unimpaired (TAF)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	-4	-6	1	-17	-16	-28	13	-78	-285	1	-21	-11	-451
1923	-9	4	-24	-3	-16	13	10	-175	-77	66	6	-8	-212
1924	-4	8	-1	-2	6	36	18	54	52	19	3	-4	185
1925	1	49	34	1	75	71	6	-63	82	38	-12	1	283
1926	-7	2	10	16	61	46	-50	-38	108	24	9	-3	179
1927	-5	45	40	-8	-12	-11	54	-76	-152	-37	-10	-5	-176
1928	4	36	16	1	28	74	-3	4	47	17	7	-1	229
1929	-8	0	13	7	13	59	67	62	32	50	10	2	308
1930	0	-3	-4	12	57	66	48	-15	84	22	6	-1	272
1931	-2	6	4	12	21	45	58	116	64	29	4	-2	353
1932	-1	5	10	-11	-61	34	30	-78	-8	127	11	3	60
1933	-8	-5	-7	12	3	65	95	38	-54	-13	-2	-8	116
1934	-5	0	60	21	29	79	38	103	36	36	8	-2	402
1935	0	51	34	20	0	-5	21	-110	80	62	0	-5	147
1936	-3	0	-3	40	25	30	49	-25	69	42	7	4	236
1937	-3	7	68	10	-51	14	-75	-60	-76	83	13	1	-70
1938	-7	-6	109	13	-23	-190	-173	-233	-212	-31	-14	-16	-783
1939	-15	-2	-5	10	-7	28	35	5	65	14	-6	-7	115
1940	18	21	10	43	29	31	-36	-15	29	17	6	-1	151
1941	-4	7	12	-9	-35	-53	-54	-161	-131	57	3	6	-362
1942	-12	-15	62	-25	-3	-16	2	-82	-54	46	-8	-1	-106
1943	-6	17	18	-1	10	33	4	-26	25	66	8	1	150
1944	-5	-6	0	11	36	5	42	19	-62	38	10	-3	84
1945	-2	73	-7	-17	-14	-48	-23	-41	-77	2	-27	-12	-192
1946	-28	17	2	-22	-18	25	49	-115	-7	-18	-3	-7	-125
1947	-3	45	23	1	8	40	21	-1	-2	10	2	-5	139
1948	-5	10	-1	-4	9	30	114	-15	-89	66	9	-7	118
1949	-6	5	9	3	8	52	99	-95	1	8	-4	-7	74
1950	-5	-1	19	3	19	64	82	-29	-11	-12	3	-7	125
1951	1	96	-49	-45	-24	-7	42	58	182	72	6	-2	329
1952	-8	6	14	-5	-16	-59	25	-150	-127	29	19	6	-265
1953	4	-5	2	-14	2	29	35	7	-14	52	16	0	114
1954	-5	-1	5	31	83	92	66	-12	-37	2	6	-2	227
1955	-3	2	37	11	3	19	22	15	38	24	14	2	186
1956	-1	-7	-111	-82	-57	-46	68	-11	-70	73	50	12	-183
1957	-1	-1	-6	15	20	61	6	-3	-61	-4	-5	-9	11
1958	-6	0	24	15	40	25	-15	-27	-220	-10	-44	-11	-229
1959	9	-4	-8	7	19	33	61	-14	4	7	-2	16	130
1960	31	11	-1	2	60	86	105	35	46	6	0	-2	379
1961	-1	8	14	2	19	46	84	36	83	33	-5	2	321
1962	3	-1	11	-2	102	3	93	-65	-109	28	-3	-5	56
1963	5	9	1	114	132	20	18	43	-104	68	42	0	348
1964	1	27	19	4	-4	16	82	58	21	21	-2	0	242
1965	-3	33	-25	-50	-38	-15	25	82	11	95	-36	-1	79
1966	-5	-5	7	-29	-19	-11	55	-31	-6	1	-7	-3	-53
1967	-1	1	13	-29	-8	21	-75	13	-148	14	-25	-33	-256
1968	-1	-8	1	-3	5	55	29	11	81	6	-4	-1	172
1969	-1	18	37	-49	-51	-90	-29	-179	-211	29	61	3	-463
1970	-3	4	1	-12	25	24	0	94	148	37	-4	-2	313

Table D-18. UF 22 — San Joaquin River at Millerton Reservoir Simulated minus Unimpaired Flow (TAF) contd.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1971	-6	10	32	-35	-10	22	46	-51	27	100	3	-3	136
1972	0	-1	15	-15	5	93	33	12	60	25	6	-28	205
1973	0	4	-20	2	1	-24	-20	-20	-79	25	-10	-3	-144
1974	-9	31	17	-39	2	14	4	-113	5	-27	-21	-6	-143
1975	-10	6	24	9	62	67	5	8	-83	-18	-4	-7	58
1976	1	22	-3	-7	19	34	22	98	39	9	-1	1	235
1977	21	8	1	10	9	28	43	44	78	32	5	1	279
1978	0	5	30	42	-3	22	-46	-149	-151	-71	26	-51	-346
1979	0	-14	-8	-15	-5	36	11	-30	32	34	3	-3	42
1980	-12	17	15	-50	11	-39	-22	-102	-132	58	83	-1	-175
1981	-9	-8	-7	6	24	82	45	22	39	6	-2	-8	191
1982	-2	85	30	1	-5	45	-177	-183	-54	39	20	-92	-292
1983	5	20	-65	-126	-88	-148	-95	-142	-262	-159	-51	-16	-1127
1984	0	-27	-64	-56	-7	19	6	32	85	-43	-33	-24	-111
1985	-18	24	13	-20	-3	38	71	-73	20	8	2	-6	55
1986	9	15	17	10	46	-81	-126	-205	-38	28	-14	-9	-349
1987	-4	-2	-6	-5	47	55	85	13	0	13	1	-3	193
1988	-8	36	20	17	27	47	39	59	60	29	5	-1	331
1989	0	6	23	3	10	150	155	18	11	29	7	1	414
1990	37	30	10	27	21	86	42	47	54	26	14	2	396
1991	2	5	2	0	28	157	27	36	80	56	15	1	411
1992	3	15	13	22	31	64	74	63	38	16	16	2	360
1993	-1	21	40	-38	22	63	-33	-142	-114	40	3	-3	-142
1994	-9	-1	13	6	42	68	43	4	24	15	2	-6	202
1995	9	10	-5	-7	0	24	-70	-92	-304	-114	25	-16	-541
1996	-6	-9	3	21	15	23	7	-45	87	2	-9	-3	86
1997	-11	29	-7	-365	-94	5	-33	87	179	99	14	0	-97
1998	-5	-8	19	23	0	-25	-38	-89	-291	-5	68	-21	-373
1999	-6	-16	0	24	19	10	38	-73	34	71	5	-5	101
2000	-2	8	7	29	93	4	60	-55	7	0	-12	-2	137
2001	-2	17	2	20	43	49	63	64	69	0	8	-3	328
2002	-2	35	65	37	26	54	-2	-38	136	29	11	0	350
2003	1	79	83	8	6	-12	-15	56	174	-9	-1	6	377
2004	1	-2	60	39	18	55	-69	-28	119	54	23	5	275
2005	28	36	34	61	22	22	-72	-157	-110	13	-2	6	-121
2006	-5	-5	136	105	20	-2	-134	-237	-133	-76	-5	-6	-341
2007	-10	4	16	18	74	111	29	-4	28	19	1	-2	283
2008	3	6	18	60	29	42	4	7	28	23	14	1	233
2009	5	42	39	72	62	36	-19	21	-63	-2	6	3	201
2010	49	31	27	21	13	18	-10	-86	-83	25	7	0	12
2011	1	38	30	-21	-3	-87	-71	-131	-218	17	4	-13	-451
2012	-21	4	1	25	19	10	93	10	5	6	-10	0	143
2013	-5	-13	115	190	84	158	112	83	104	25	6	2	861
2014	-3	-1	-2	5	14	71	67	22	1	4	-1	3	178
Average	**-1**	**12**	**14**	**1**	**13**	**25**	**15**	**-28**	**-16**	**20**	**3**	**-5**	**54**

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APPENDIX E CONCEPTUAL DIFFERENCES BETWEEN NATURAL AND UNIMPAIRED FLOWS

How unimpaired flows and natural flows differ in magnitude and interpretation depends on the degree of land use development (i.e., alteration of pre-development native conditions due to agriculture or urbanization).

Consider an undeveloped (no agricultural, urban, or other anthropogenic influences) upper watershed area in the Central Valley (Figure E-1). It is subject to precipitation in the form of both rainfall and snowfall. Precipitation runoff from both rainfall and snowmelt (F1) would appear as outflow at the location 1. If the flow is gaged (observed or measured) at location 1 (labelled O1) then that flow would be an approximation of the water supply generated in the area due to precipitation runoff; a water supply index. In this case the runoff F1 would be equal to O1. So using the gaged flow one can come up with a water supply index for the area (F1) indirectly through the measured flow O1, which will be called Unimpaired Flow UF1. In other words the observed streamflow O1 is a surrogate for the runoff which is difficult to measure directly.

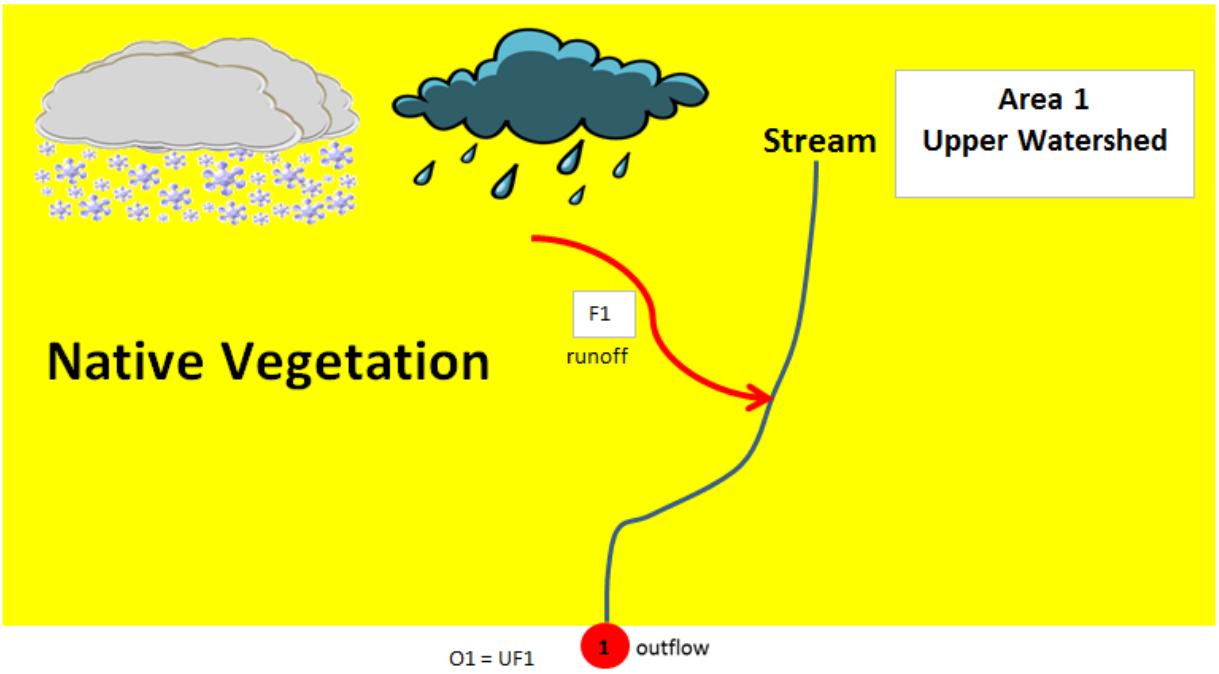

Figure E-1. An Undeveloped Upper Watershed Area

If we call USF1* the estimated "unimpaired streamflow" at location 1, then USF1*=UF1=O1

Now consider the same watershed of Figure E-1 but subject to an import M1 from outside the area, an export X1 to outside the area, and a gaged measured/observed flow O1 (Figure E-2). Conceptually, if M1 and X1 did not exist (i.e., under unimpaired conditions) the observed or gaged outflow O1 would be modified as follows to get the unimpaired outflow at G1:

UF1 = O1 – M1 + X1

Again the unimpaired streamflow USF1* = UF1

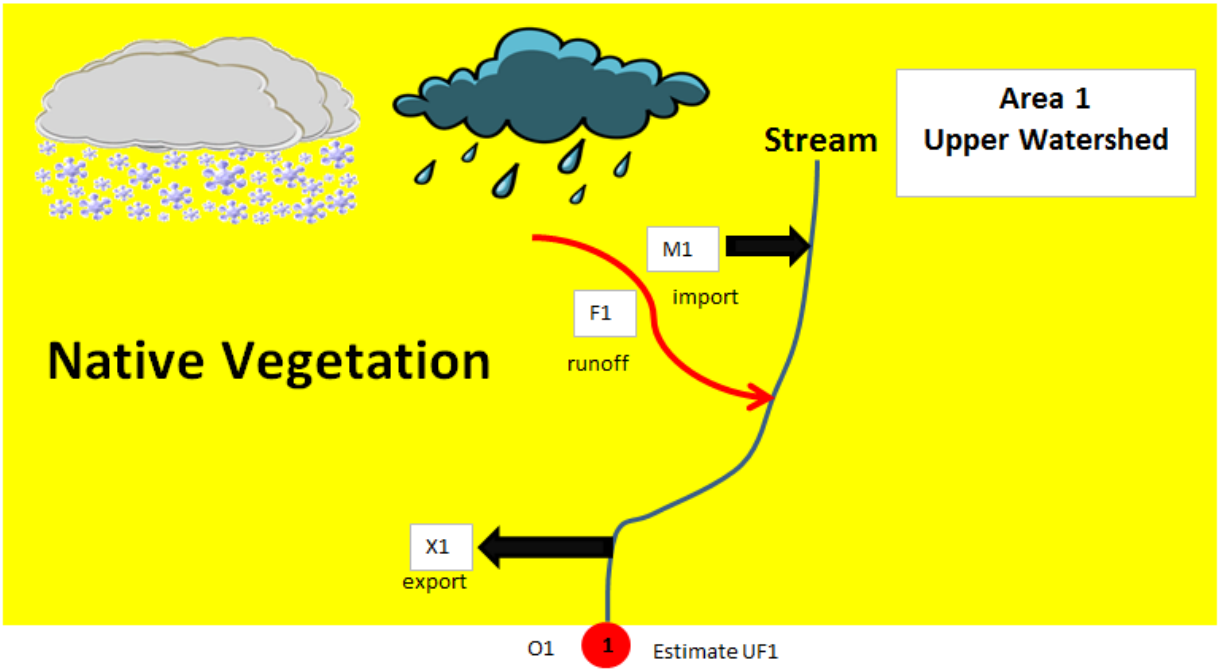

Figure E-2. An Upper Watershed Area with Simple Import and Export

Now consider a slightly more complicated situation. Suppose the upper watershed in Figure E-2 also include a regulated reservoir and some agricultural and urban development with estimated or measured diversion D1 and return flow R1, and the gaged location 1 is just below the reservoir, as show in Figure E-3. The reservoir release is the gaged flow O1 at location 1, and there is a reservoir storage increase of DELS1 and reservoir evaporation of E1. (Note: if the reservoir storage actually decreased then the value of DELS1 is negative.)

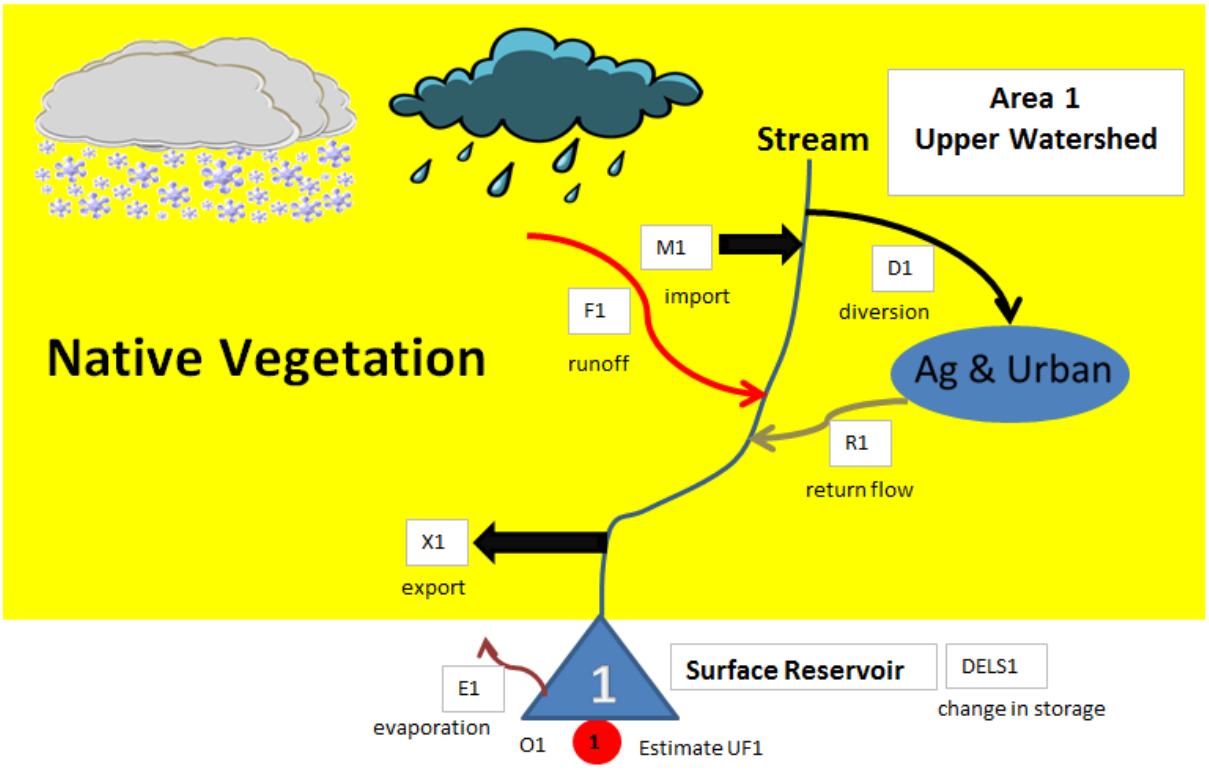

Figure E-3. A Developed Upper Watershed with a Regulated Surface Reservoir

Estimating the Unimpaired Flow for the area is similar to the previous example for Figure E-2 except now it includes the modification to the outflow due to the regulated surface reservoir.

UF1 = O1– M1 + X1 + D1 – R1 + DELS1 + E1

Again, the unimpaired streamflow USF1* = UF1

Note: Computing USF1 would now have to include building back in the consumptive use from the native vegetative lands that would exist if the agricultural and urban areas were not there.

Next consider the same watershed shown previously but under natural conditions, as shown in Figure E-4. As mentioned earlier this report discusses how to estimate the natural outflow using simulation models which will be described later. The additional hydrological components than need to be considered include consumptive use of the native vegetative land classes Cnv1, deep percolation Pn1, runoff F1, and stream seepage S1. The result is estimated natural flow NF1 at the outflow location 1.

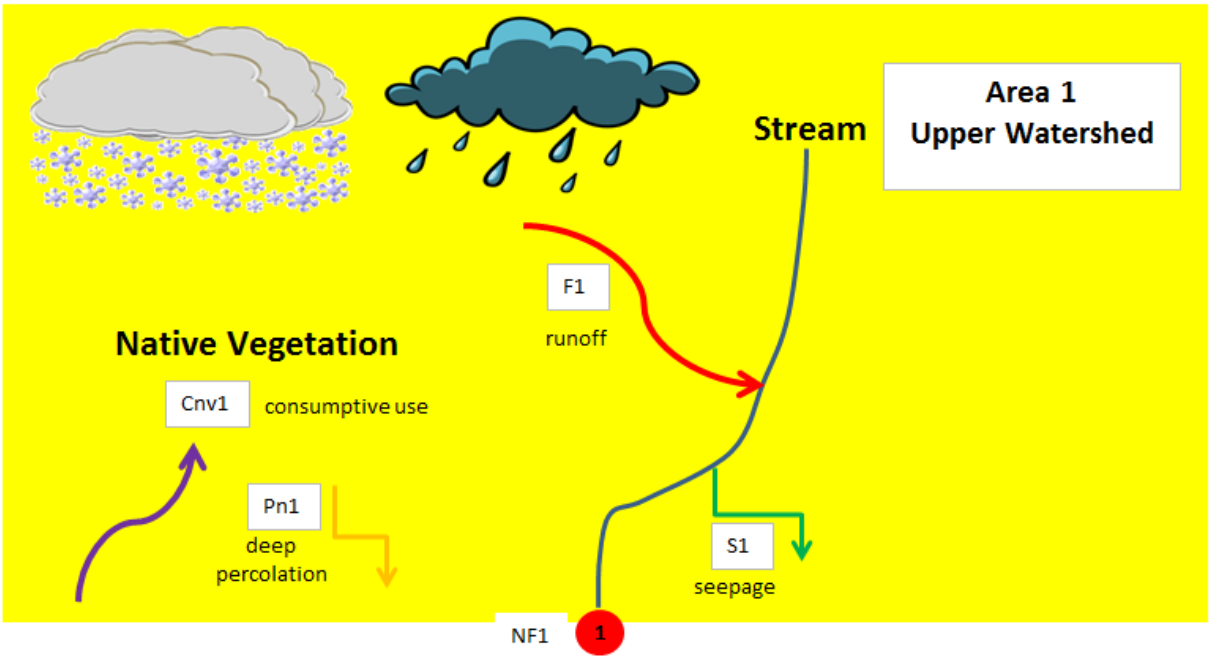

Figure E-4. An Upper Watershed Area Simulated for Natural Outflow

How different are the values NF1, UF1, and USF1? That depends to a large extent on how developed the area is, how complete all the diversion and return flow records are, and how good (calibrated) is the natural flow simulation model. In general, with good record keeping and technical simulation, the values UF1, USF1, and NF1 will be close numerically to one another.

Now consider a developed watershed Area 2 that is downstream of Area 1 (from previous figures) shown in Figure E-5. Under developed conditions key differences compared to Area 1 (from previous figures) include:

1. Precipitation is almost all rainfall, thus no snow accumulation and melting as would occur in an upper watershed.

2. The amount of agricultural and urban development is significantly greater than in Area 1.

3. As part of flood protection, man-made levees are built on streams to protect both urban and agricultural areas from extreme flood events. These levees in effect “channel” the water along the stream to prevent over topping the embankments, and allow passage of the flow to downstream areas.

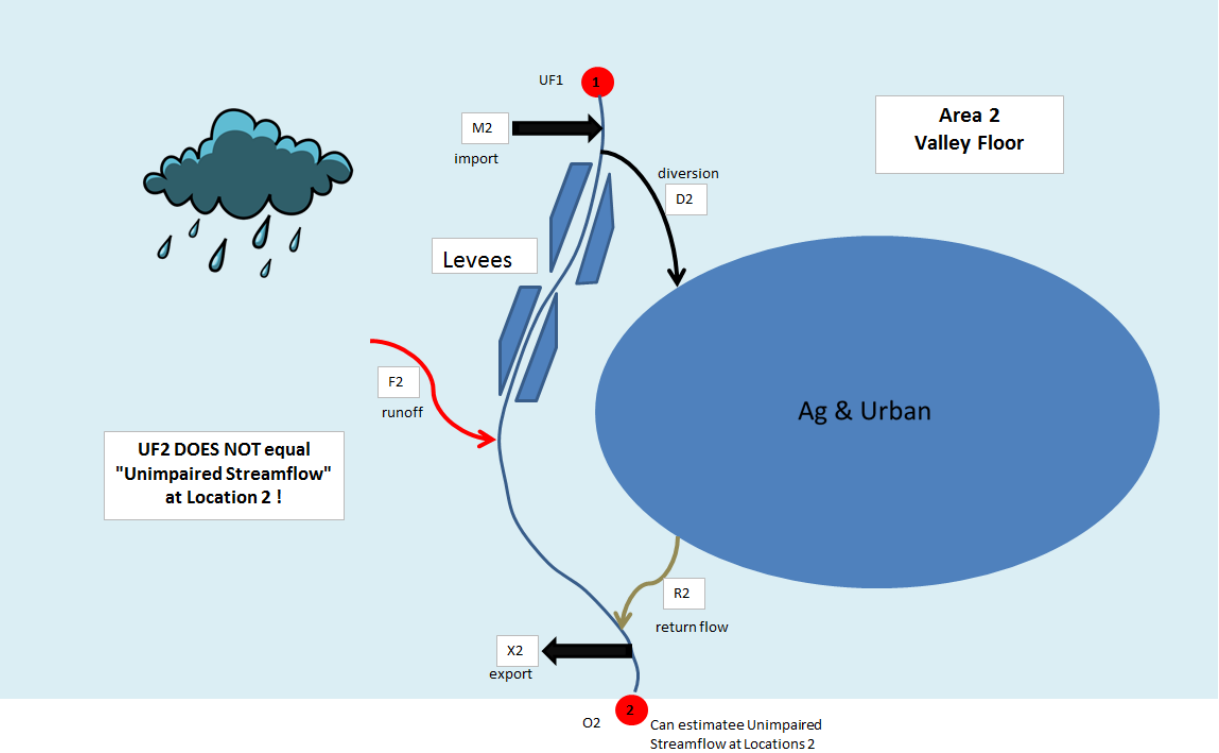

Figure E-5. A Lower Elevation Developed Watershed Area

The measure of the water supply index in this case is again the precipitation runoff (F2). This is termed UF2. In addition, one can estimate an "unimpaired streamflow" at the outflow location 2 in a manner similar to Area 1, as follows:

"Unimpaired Streamflow at 2" or USF2= O2 – USF1 + D2 – R2 – M2 + X2 + F2

The actual computation shown in the above equation needs to also be modified for the precipitation consumptive use of the native vegetation that would occur if the agricultural and urban areas did not exist. This minor adjustment will not be considered in this report to simplify the discussion. It is important to re-emphasize at this point that UF2 does not equal in value to USF2. The two terms now mean two different things: UF2 is the supply index for Area 2, while USF2 is an "unimpaired streamflow" at the outflow of Area 2. In other words USF2 implies modifying a gaged historical flow at location 2, O2, and "building back in" anthropogenic hydrologic affects such as diversions, returns, etc, while maintaining levees, etc. Also, considering Central Valley floor area for example diversion D2 far exceeds locally developed water supplies; it would be met to a large extent by surface water inflows from the upper watersheds (regulated). Note that relying completely on imported surface water and/or ground water is an extreme and unlikely sustainable alternative.

UF2 represents local (Area 2) water supply generated from precipitation (i.e., the precipitation runoff that would show up at the outflow location 2), whereas USF2* is an estimate of the unimpaired streamflow at location 2.

Area 2 under natural conditions is shown in Figure E-6. Under natural flow (pre-development) conditions the landscape is composed of various native vegetative classes such as grasslands, hardwood, riparian areas, as well as lakes, wetlands, and vernal pools. There are only natural levees on the riverbanks which are would frequently be overtopped or breached during flood events. These waters can then flow into interconnected lakes and wetlands, and possibly reconnect to streams downstream. Note: Vernal pools are natural depressions that fill with rainfall during to the wintertime.

Figure E-6. A Lower Elevation Watershed Area Simulated for Natural Outflow

As shown in Figure E-6 the hydrological components that need to be simulated are more complicated than under developed conditions. However, with simulation models one can estimate the natural flow at outflow location 2, NF2.

Comparing unimpaired flows to natural flows one would expect USF2* (the estimated "unimpaired streamflow") to be closer to NF2 in magnitude annually, but differing within the year both spatially and temporally.

Finally consider Area 3 representing the Delta under developed (historical) conditions as shown in Figure E-7. Similar to Area 2 one can estimate an estimate of the locally generated water supply (= UF3). However, to estimate an "unimpaired streamflow" at the outflow location 3, one must start with the unimpaired streamflow at location 3 (USF3*) and modify for anthropogenic impacts.

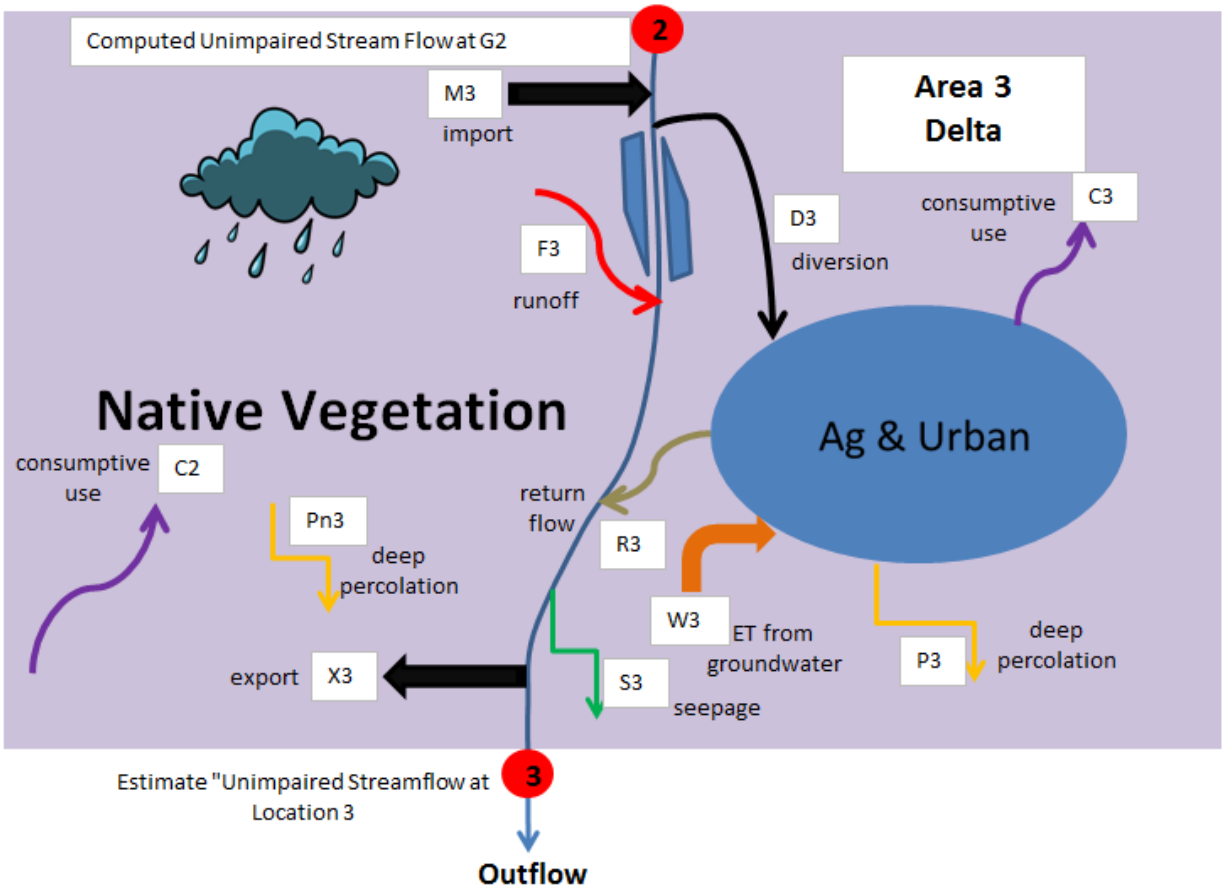

Figure E-7. A Developed Watershed Area Representing the Delta

USF3* = USF2* - M3 + X3 + D3 – R3 + F3

Area 3 under natural conditions is shown in Figure E-8. Similar to Area 2 one can use a simulation model to estimate the natural flow NF3, which is the stream outflow at location 3.

For estimating unimpaired flows interconnected watersheds can be represented as shown if Figure E-9. For simulating natural flow conditions interconnected watersheds can be represented as shown if Figure E-10.

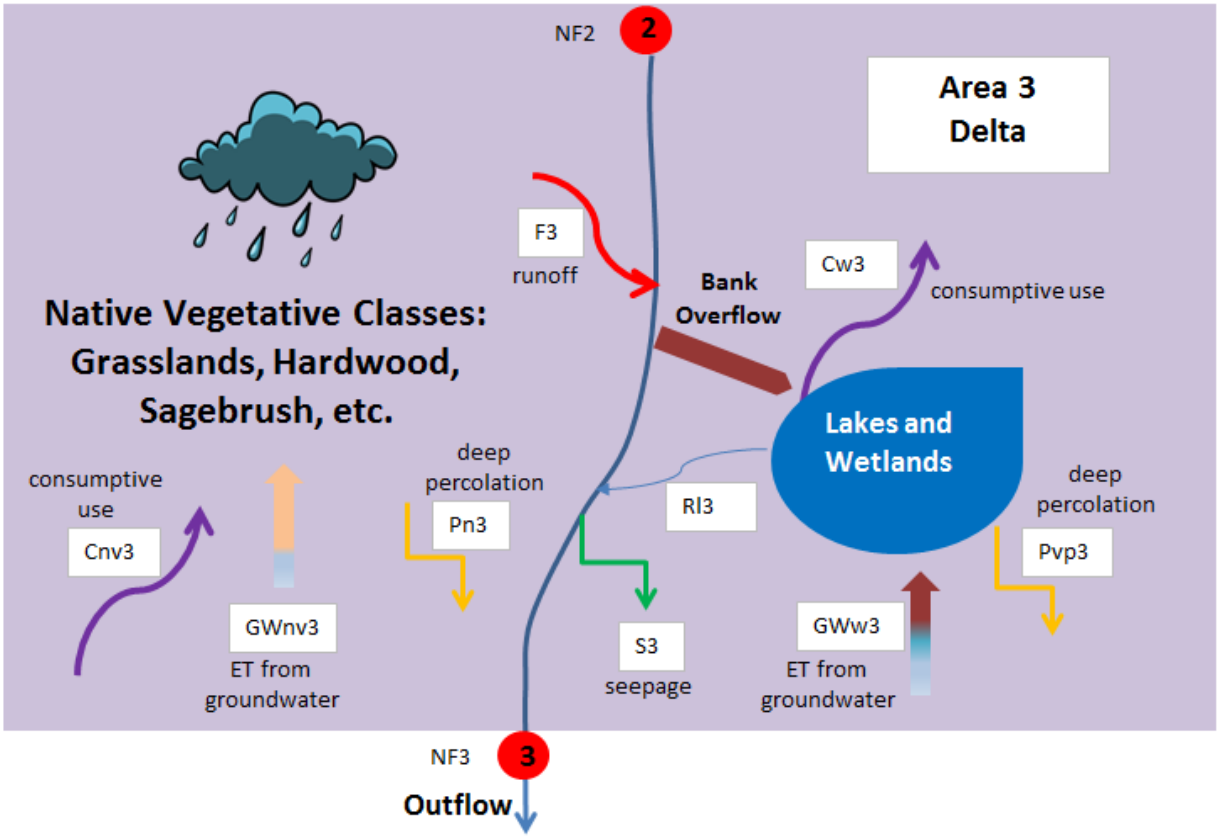

Figure E-8. A Developed Watershed Area Representing the Delta Simulated for Natural Flow

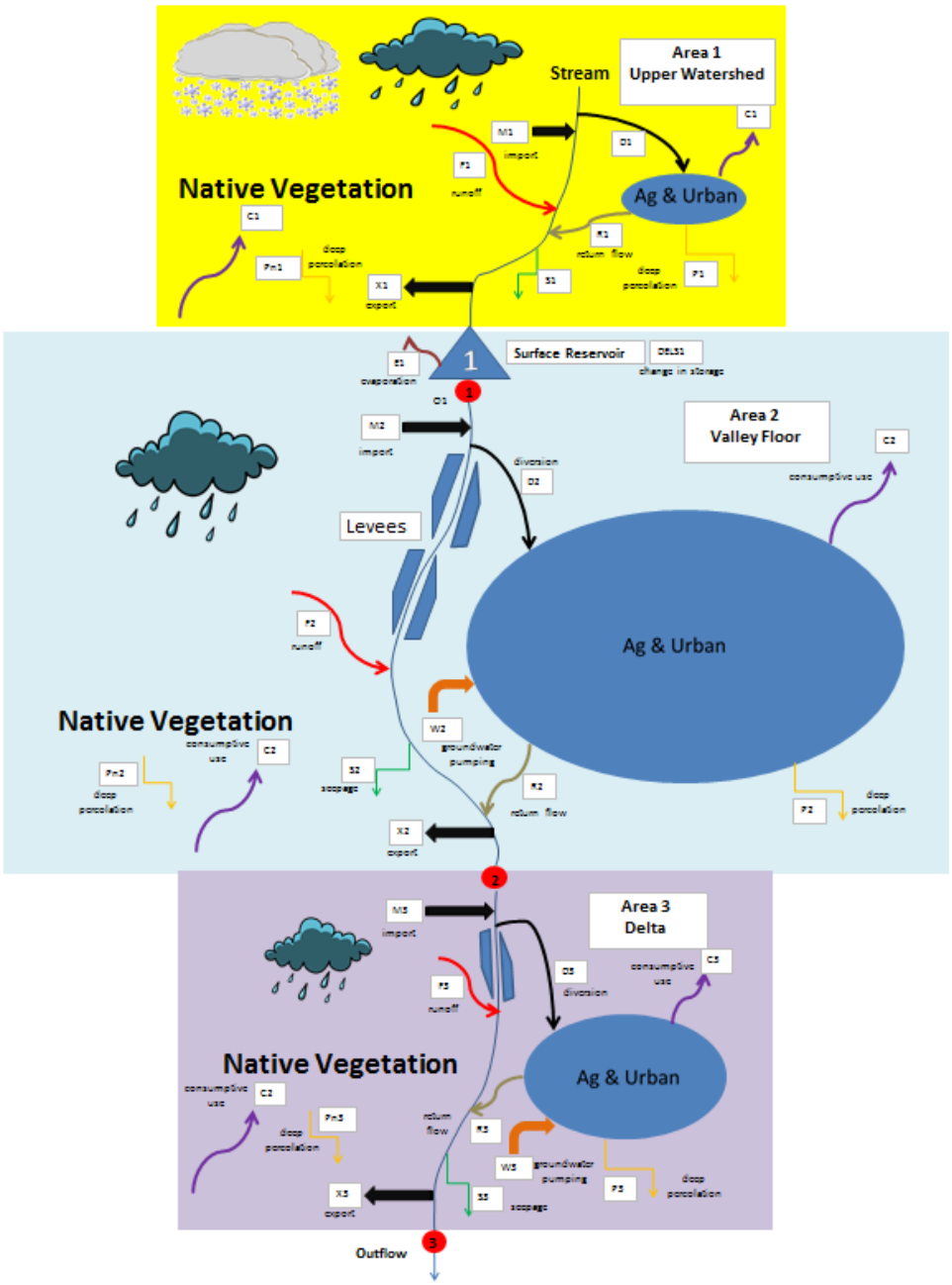

Figure E-9. Representative Areas for Historical (Developed) Conditions

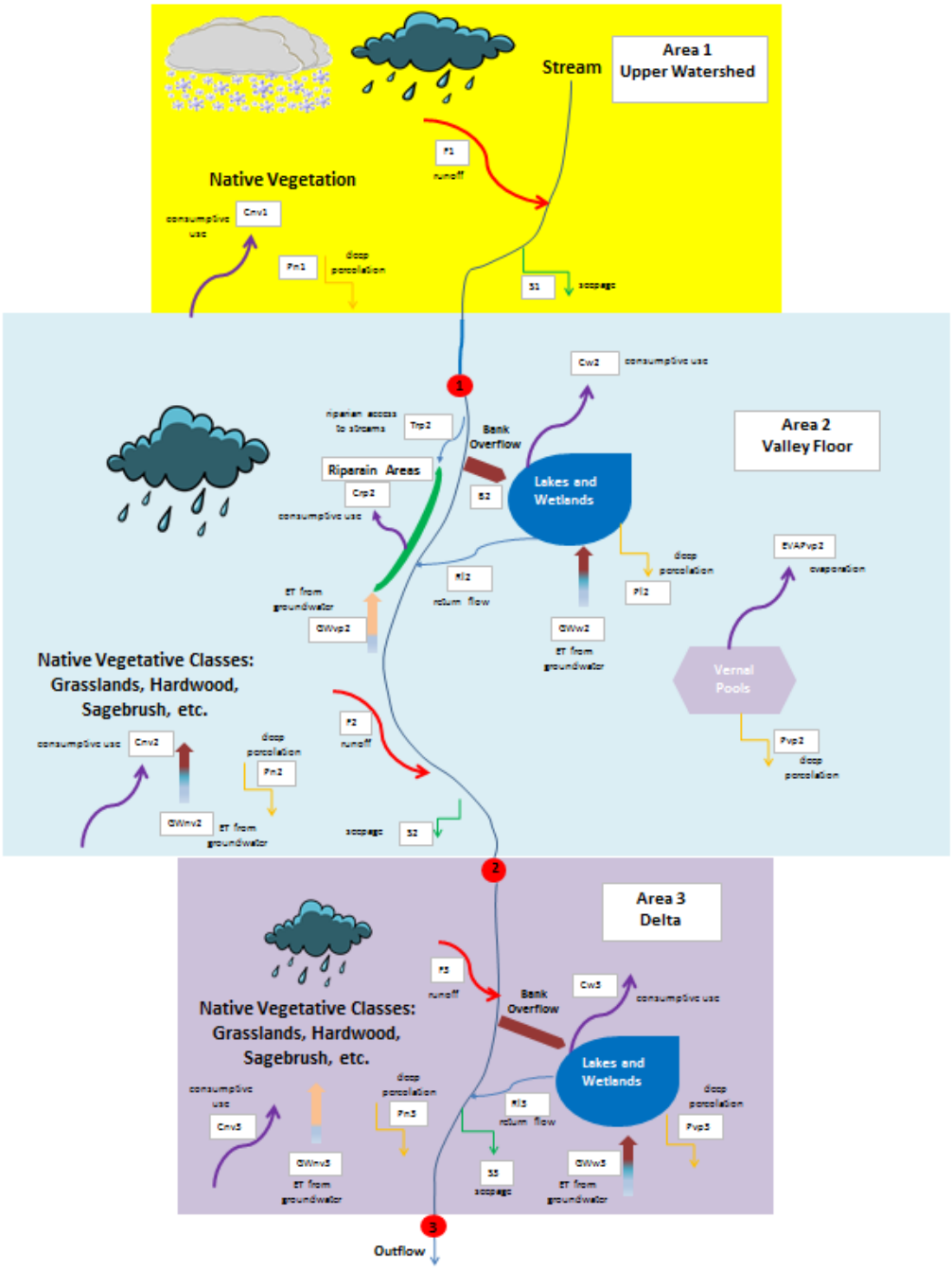

Figure E-10. Representative Areas for Natural (Pre-development)