

**Waivers and
Estimated Area of Origin Requirements
May-November 2014**

Submitted by

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for
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The Watershed Protection Act

California Water Code section 11640 holds that the Sacramento and San Joaquin Valley, and the Delta

“shall not be deprived ... directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein”

by operations of the State Water Project California Water Code section 11128 explicitly requires the Bureau, as operator of the CVP, comply with the watershed statute.

The State Water Resources Control Board has held that

"the water rights of the DWR and the USBR to appropriate uncontrolled flows for export from the southern Delta are junior to all other water rights in the watershed."

To the extent that the proposed waivers are proposals to appropriate uncontrolled flows in the Spring, reserved by the State Water Board for beneficial needs of fish, for export in the summer and fall, they should be denied.

In addition, the curtailment process last summer did not take into account the mandates in D990 terms for the Central Valley Project to supply stored water for the needs of the Sacramento Valley and the Delta.

Central Valley Project Operations Requirements

The requirements for operations of the Central Valley Project were first enumerated in Decision 990, which granted permits for the operation of Shasta Dam, for diversions on the Sacramento River, and into the Delta-Mendota Canal. At the 1960 hearings, the Bureau of Reclamation presented future plans for operation of the Central Project. The exhibit enumerated 7 principal requirements:

- (1) providing a supplemental supply to meet the requirements of areas diverting directly from the Sacramento River, and from the bypasses and drainage channels paralleling the River (Colusa Trough, Back Borrow Pit, Knights Landing Ridge Cut, Yolo By-pass, Lower Butte Creek and Butte Slough, Sutter By-pass and Sacramento Slough) under local rights;
- (2) requirements for Sacramento Canals Unit (Corning, Tehema-Colusa and Chico Canals), Cow Creek Unit and Yolo-Zsmora Unit;
- (3) providing a supplemental supply to meet the requirements of the Delta lowlands and Delta uplands;
- (4) "carriage water", estimated at 1500 cfs for the purpose of the study, to repel salinity incursion in channels of the Delta in order to provide water of the quality specified in the contracts for water deliveries to the Delta-Mendota and Contra Costa Canals;
- (5) requirements to be served through the Delta-Mendota Canal including the Amended Exchange Contract, estimate of requirements for rights described in Schedule 2 of the Purchase Contract, canal and operating losses, present contractual obligations and contemplated future deliveries limited to 4600 cfs, the capacity of the canal;
- (6) Contra Costa Canal diversion requirements limited by its capacity of 350 cfs; and
- (7) additional irrigation, municipal and industrial requirements from the Delta to be served through facilities not yet authorized or through non-project facilities.

Requirements (1), (3), and (6) specifically addressed pre-existing in-basin water rights. Requirement (4) was presented as a requirement for carriage water for exports, but was also a requirement for in-Delta water rights, and so was made a condition of the permit.

In addition, the Rivers and Harbors Act, which was part of the authorization and re-authorization of the Central Valley Project, mandated maintenance of flows of 5,000 cfs from Wilkins Slough to Sacramento.

Regarding requirements (1) and (3) above, the Bureau proposed that

Project water will be made available for diversion by and through the private facilities of water users to the extent necessary to assure the users a dependable supply over and above that which would have been available under local rights in dry years in the absence of the Project. These local rights include riparian; appropriative and other rights to use water in the Sacramento Valley and Delta. The quantity of water required for this Purpose is generally referred to as that quantity required to supplement local rights along the Sacramento River and in the Delta and may be determined from USBR Exhibits 122, 123 and 124.

As part of approving a maximum combined diversion and re-diversion rate of 22,000 cfs, the Board stated:

According to these exhibits, a maximum yield of water to local rights in a year of hydrologic conditions similar to 1924 would be 1,962,000 acre-feet, The assumed local rights along the Sacramento River between Shasta Dam and the Delta would have been, according to those exhibits, 4,325,000 acre-feet. This indicates a deficiency of 2,363,000 acre-feet which might be provided from the Project to supplement local rights

...

Ultimate annual irrigation from the Project are: (1) 2,969,000 afa to be diverted at the maximum rate of 7,234 cfs for Project canals; (2) 2,500,000 afa to be diverted at the maximum rate of about 11,200 cfs for supplementing local rights; and (3) 735,000 afa to be diverted at the maximum rate of 2,390 cfs for additional.. irrigation requirements within the proposed service area, to be diverted either through additional Project facilities or privately-owned facilities for new developments.

[emphasis added]

With regards to the needs of the Sacramento River and the Sacramento-Delta, the following terms were included:

23. The export of stored water under permits issued pursuant to Applications 5626, 9363 and 9364 outside the watershed of Sacramento River Basin or beyond the Sacramento-San Joaquin Delta shall be subject to the reasonable beneficial use of said stored water within said watershed and Delta, both present and prospective, provided, however, that agreements for the use of said stored water are entered into with the United States prior to March 1, 1964, by parties currently diverting water -from Sacramento River and/or Sacramento-San Joaquin Delta and prior to March 1, 1971, by parties not currently using water from Sacramento River and/or Sacramento-San Joaquin Delta.

25. The State Water Rights Board reserves continuing jurisdiction over permits issued pursuant to Applications 5625, 5626, 9365, 9364, 9365, 9366, 9367, 9368 and 10588 until March 1, 1964, or such additional time as may be prescribed by the Board, for the purpose of formulating terms and conditions relative to salinity control in the Sacramento-San Joaquin Delta. Permittee shall on or before January 1, 1962, and each six months thereafter submit to the Board a written report as to the progress of negotiations relative to agreement between permittee and the State of California and/or the permittee and water users in the Delta and in Northern Contra Costa County.

Contracts to supply 2.1 million acre feet of water to the Sacramento River Settlement Contractors were signed in 1964. The maximum shortage in the contracts was 25%, with the remainder to be supplied by the CVP. In 2014, the Settlement Contractors diverted over 1 million acre feet of water, and continued diversions through the curtailment period, including post-1914 contractors.

State Water Project and Area of Origin Needs

The State Water Project was initially prohibited from diverting water from the Delta in July, August, and September, because studies indicated there would be no water available during those months. From D1275:

According to USBR Exhibit 164, in the 31-year period 1924-54, after in-basin rights and demands for development of the Federal Central Valley Project were met, water was available in the Delta during June in 19 years, during July in only five years, during August and September in no years, and during October in 22 years.

..

Both these studies indicate that the season, to be allowed for diversion for export from the Delta should exclude the months of July, August, and September.

This limit was removed in D1291, however, on protest by the Bureau of Reclamation, the following paragraph was added to the permit:

29. The Department may divert in compliance with special conditions in these permits and all applicable laws only when it can do so without interfering with the exercise of vested rights, including those rights of the United States under permits granted by Decision D 990 which have priority dates earlier than the priority dates of the permits under which the Department is diverting.
(p. 12).

The State Water Project has supplied water to the Feather River Service Area Contractors, who have pre-1914 rights. The FRSA contractors have a right to over 900,000 acre feet of water from Oroville, and got a 100% allocation in water year 2014.

As a result of these contracts, the controlling requirement for upstream releases by Shasta and Oroville are the required instream flows on the Sacramento and Feather Rivers. There are also required instream flows below Englebright Dam on the Yuba River.

Estimate of Sacramento / Feather instream flows and resulting inflow to Delta
(Monthly Averages)

| Month | Minimum flow Wilkins to Sacramento | Minimum flow below Thermalito | Min Yuba flows at Marysville | Average inflow to Folsom | Total instream / natural flows at Sac | City of Sac pre-1914 | Sac Reg WTP | Estimated instream / natural flows at Freeport |
|-----------|------------------------------------|-------------------------------|------------------------------|--------------------------|---------------------------------------|----------------------|-------------|--|
| May | 3250 | 1000 | 600 | 1600 | 6450 | 75 | 181 | 6556 |
| June | 3250 | 1000 | 400 | 1018 | 5668 | 75 | 180 | 5773 |
| July | 3250 | 1000 | 400 | 1086 | 5736 | 75 | 180 | 5841 |
| August | 3250 | 1000 | 400 | 1308 | 5958 | 75 | 180 | 6063 |
| September | 3250 | 1000 | 400 | 963 | 5613 | 75 | 180 | 5718 |
| October | 3250 | 1200 | 400 | 587 | 5437 | 75 | 180 | 5542 |
| November | 3250 | 1200 | 500 | 660 | 5610 | 75 | 180 | 5715 |

Minimum flow Wilkins to Sacramento: the navigation requirement in the Rivers and Harbors Act statutes is actually 5,000 cfs, but NMFS allowed this to be reduced to 3250 cfs, and this appears to have been the minimum flow last summer. Lower levels can interfere with diversions by Sacramento River Settlement Contractors and compromise operations of fish screens.

Minimum flow below Thermalito: As specified in the FERC relicensing, and mandated in WRO WQ 2010-0016.

Minimum Yuba flows: As specified in the Yuba Accord, and mandated in WRO 2008-14. Assuming schedule 5.

Inflow to Folsom: curtailments required all summer inflow to be bypassed, except for pre-1914 contracts which amount to approximately 20,000 acre feet, and include the City of Folsom. This estimate only accurate from May 27, the date of the curtailment.

Total Delta inflow
(Monthly Averages)

| Month | Instream / natural flows at Freeport | Eastside streams | San Joaquin River | Total instream inflow |
|-----------|---|---------------------|-------------------------|-----------------------------|
| May | 6556 | 409 | 1603 | 8568 |
| June | 5773 | 295 | 330 | 6398 |
| July | 5841 | 220 | 253 | 6314 |
| August | 6063 | 210 | 306 | 6579 |
| September | 5718 | 167 | 402 | 6287 |
| October | 5542 | 188 | 582 | 6312 |
| November | 5715 | 181 | 1003 | 6899 |

Eastside stream and San Joaquin River flows from
Bureau of Reclamation Report, Calculations of Delta Outflow

Depletions of instream/natural inflow in the Delta and required supplemental water
(Monthly Averages)

| Month | Total instream / natural inflow | Net Delta Cons. Use | Instream inflow less NDCU | Net Delta Outflow Index | Req supplemental water for Delta outflow | CVP share* | SWP share* |
|-----------|--|------------------------|---------------------------------|-------------------------------|--|---------------|------------|
| May | 8,568 | 2,387 | 6,181 | 3,805 | 0 | 0 | 0 |
| June | 6,398 | 3,703 | 2,695 | 4,817 | 2,122 | 1,592 | 531 |
| July | 6,314 | 4,355 | 1,959 | 3,286 | 1,327 | 995 | 332 |
| August | 6,579 | 3,816 | 2,763 | 2,965 | 202 | 152 | 51 |
| September | 6,287 | 2,402 | 3,885 | 3,108 | 0 | 0 | 0 |
| October | 6,312 | 1,879 | 4,433 | 4,181 | 0 | 0 | 0 |
| November | 6,899 | 885 | 6,014 | 5,136 | 0 | 0 | 0 |
| Total | 47,357 | 19,427 | 27,930 | 27,298 | 3,651 | 2,738 | 913 |

*Assuming 75% CVP / 25% SWP obligations, as in 1986 COA

Net Delta Consumptive Use and Net Delta Outflow Index taken from Bureau of Reclamation Calculation of Delta Outflow reports.

CVP “carriage water” for salinity control in June is close to the 1960 estimate of 1500 cfs.

Estimates of water released for export and salinity control

| Month | Inflow at Freeport | Instream & unstored flows | Net stored export / carriage water | Average total exports |
|-----------|-----------------------|---------------------------------|--|-----------------------------|
| May | 5588 | 6556 | -968 | 1594 |
| June | 8786 | 5773 | 3013 | 1075 |
| July | 8913 | 5841 | 3072 | 1929 |
| August | 8421 | 6063 | 2358 | 2337 |
| September | 8312 | 5718 | 2594 | 3554 |
| October | 6353 | 5542 | 811 | 1246 |
| November | 7610 | 5715 | 1895 | 2970 |

Inflow at Freeport, average total exports taken from Bureau of Reclamation Calculation of Delta Outflow reports.

Note that exports exceed estimates in September, October, and November.

Accounting for in-basin entitlements

“Inbasin entitlements are defined as all rights to divert water from streams tributary to the Sacramento- San Joaquin Delta or the Delta for use within the respective basins of origin or the Legal Delta, unavoidable natural requirements for riparian habitat and conveyance losses, and flows required by the state Water Resources Control Board for maintenance of water quality and fish and wildlife.”

State Water Resources Control Board

There has been no accounting of Sacramento Valley in-basin entitlements, and there should be, particularly during curtailments. The Sacramento Valley should not be a “black box” to the State Water Resources Control Board.

The following analysis estimates unstored water released by Keswick as bypass flows released from Shasta dam. The analysis first allocates depletions along each stretch of the Sacramento River from Bend Bridge to Wilkins Slough to unstored water. The analysis then estimates the extra CVP water required to meet minimum instream flow requirements at Wilkins Slough.

It is likely that most of the depletions are due to Sacramento Settlement Contractors.

SACFLOW Database

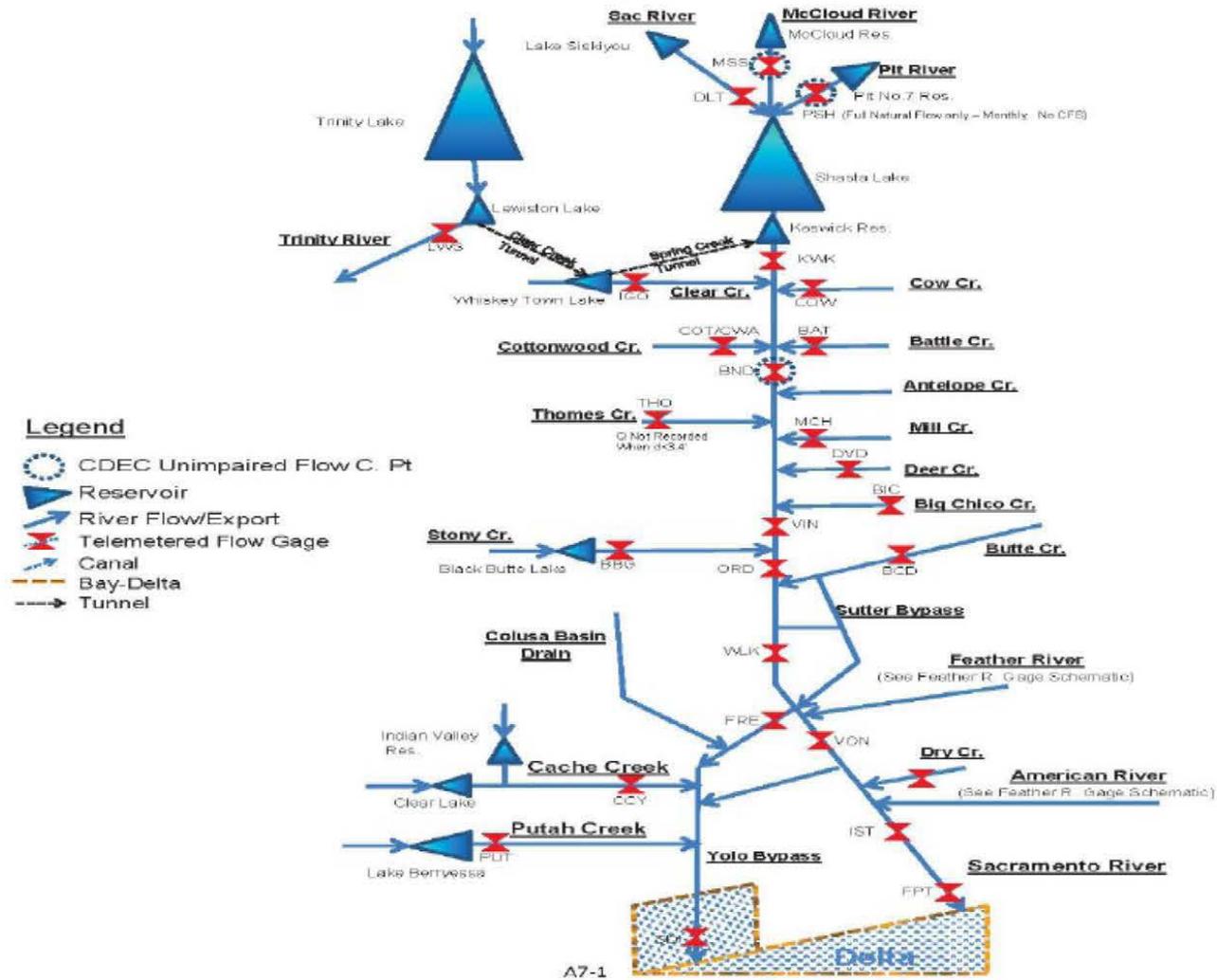
Like DAYFLOW, but for the Sacramento River

Uses same gauges as SWRCB staff presentation
(Also used in USBR Sacramento-San Joaquin Valley streamflow report)

Estimates net depletions or net inflow along each stretch of river

| Location | Km | CDEC Sensor | County | Agency | Notes |
|-------------------------|-----|----------------|------------|-----------------|-------------------------------------|
| Shasta | | SHA | Shasta | USBR | inflow |
| Keswick | 485 | KES | Shasta | USBR | releases |
| Bend Bridge | 414 | BND | Tehama | USGS and DWR | flow |
| Vina Bridge | | VIN | Tehama | DWR | flow |
| Ord Ferry | 295 | ORD | Glenn | DWR | flow |
| Colusa | 231 | COL | Colusa | USGS | flow |
| Below Wilkins Slough | | WLK | Sutter | USGS | flow |
| Verona | 128 | VON | Sutter | USGS and DWR | flow |
| I Street Bridge | 97 | IST | Sacramento | DWR | Flow has been below rating table |
| Freeport | 75 | FPT | Sacramento | USGS | flow |

Appendix 7: Sacramento River Watershed Hydrology Schematic



Source: SWRCB, July 2014 staff presentation

Location of flow gauges in relation to tributaries, diversions

| Location | Km | CDEC Sensor | Tributaries above | Major diversions above |
|----------------------|-----|-------------|---|--|
| Shasta | 485 | SHA | | Shasta dam |
| Keswick | 485 | KES | Spring Creek pumping plant | |
| Bend Bridge | 414 | BND | Clear Creek, Cow Creek, Bear Creek, Cottonwood Creek, Battle Creek | Anderson-Cottonwood, Cow Creek Canal, City of Redding |
| Vina Bridge | | VIN | Antelope Creek, Thomes Creek, Mill Creek, Deer Creek, Big Chico Creek | Red Bluff Diversion Dam, Corning and Tehama-Colusa Canal |
| Ord Ferry | 295 | ORD | Stony Creek | Glenn-Colusa Canal |
| Colusa | 231 | COL | Butte Creek, Moulton Weir, Hamilton Weir, Colusa Weir | Provident and Princeton-Codora-Glenn Irrigation Districts |
| Below Wilkins Slough | | WLK | | Reclamation District #108, Sutter Mutual Water Company, Meridian Farms |
| Verona | 128 | VON | Sutter Bypass confluence, Feather River | Tisdale Weir, Fremont Weir, Natomas Central Mutual Water Company |
| I Street | 97 | IST | American River | City of Sacramento |
| Freeport | 75 | FPT | | |

SACFLOW Database results from May-November 2014

Period selected because of curtailment notices for Sacramento and San Joaquin River watersheds

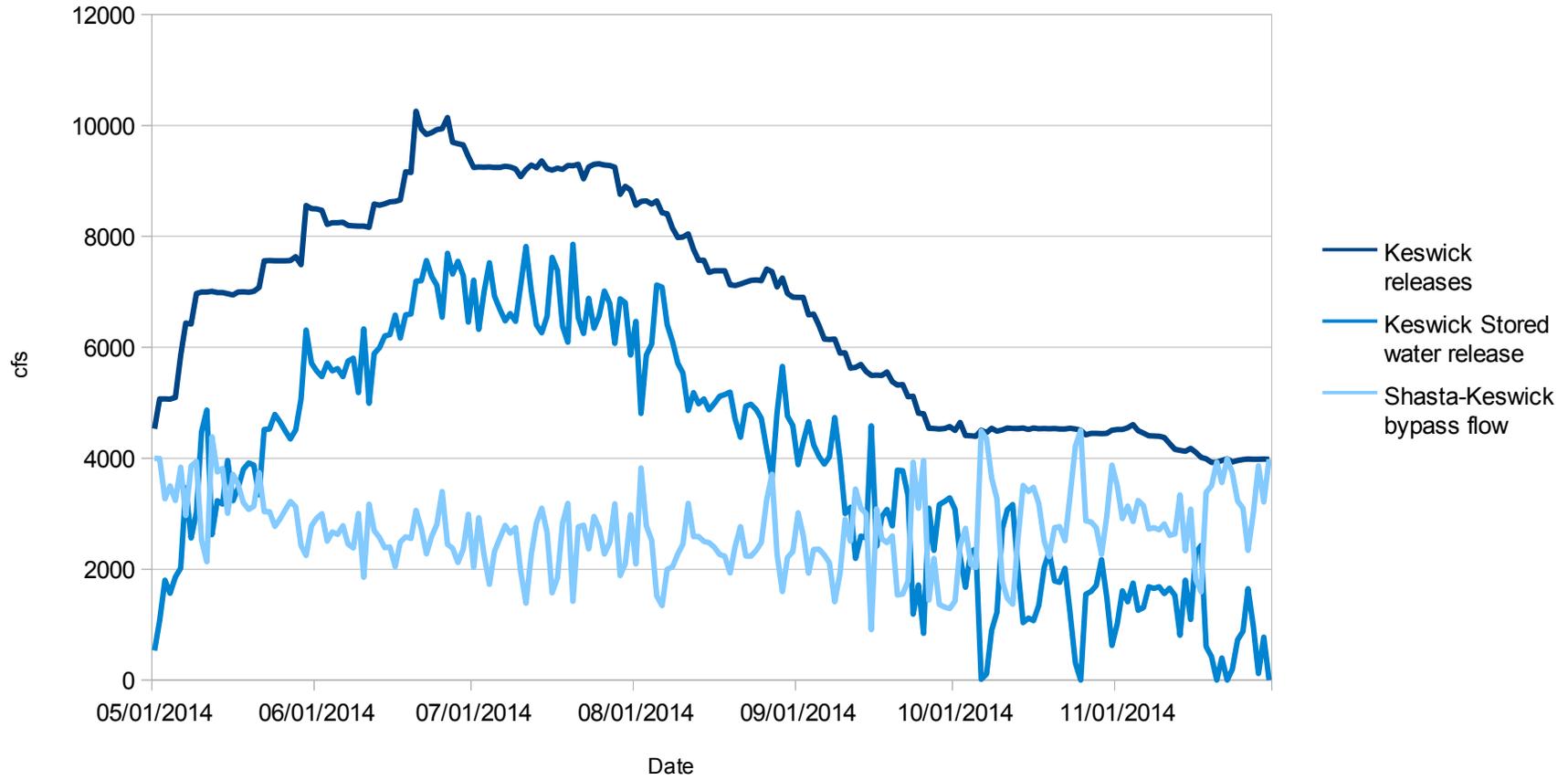
May 13, 2014 – Term 91 water rights curtailed

May 27, 2014 – all post-1914 water rights curtailed

Nov 12, 2014 – curtailments lifted for all pre-1954 water rights

Nov 19, 2014 – curtailments temporarily lifted for all post-1953 water rights

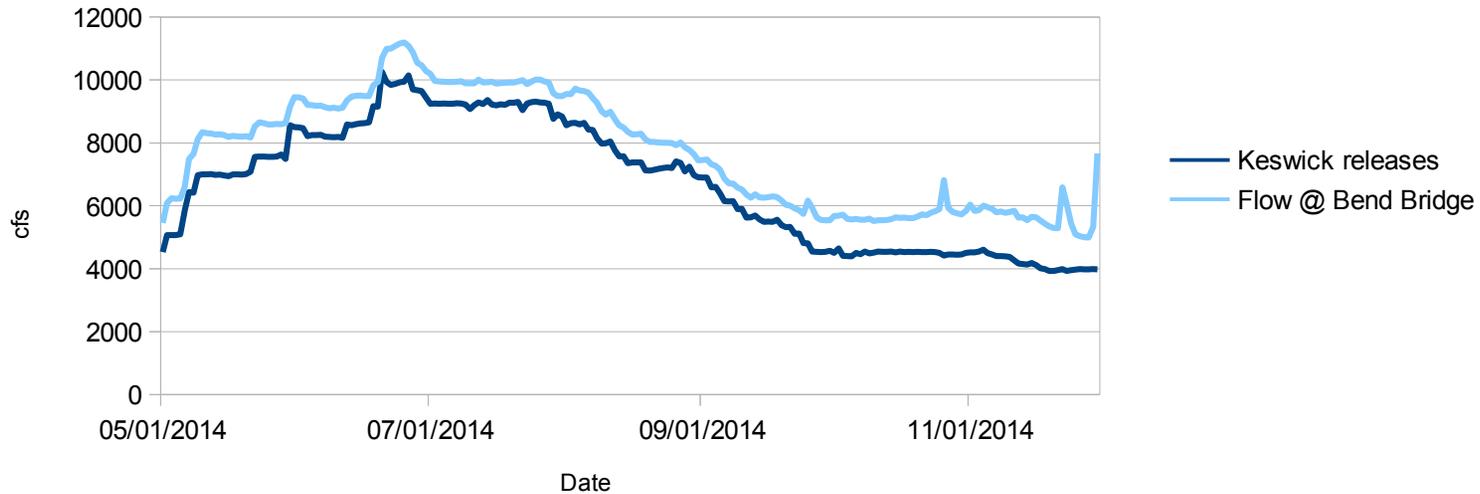
Shasta / Keswick Releases



Bypass flow is inflow to Shasta that is released by Keswick. There is a fairly substantial bypass flow all summer.

Upper Sacramento River

Measured Flows Keswick-Bend

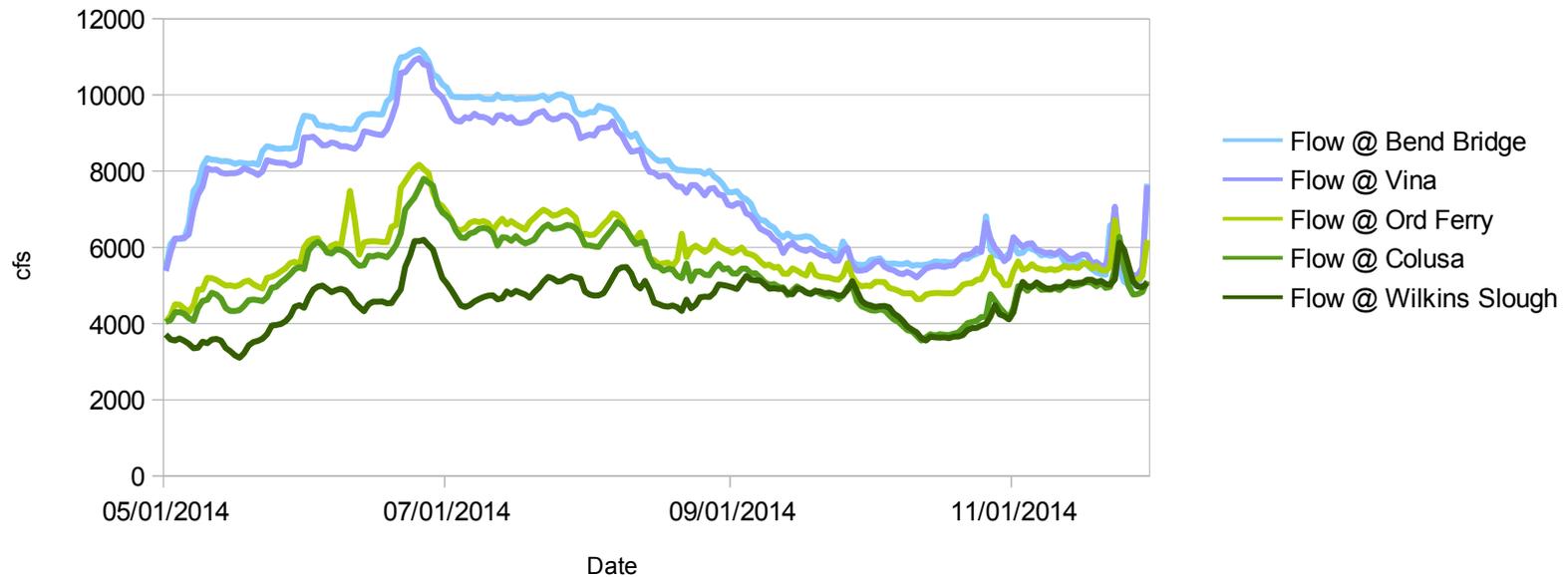


There is an increase in flows between Keswick and Bend Bridge all summer. Clear Creek, Cow Creek, Cottonwood Creek, and Battle Creek all flow into the Sacramento River above Bend Bridge. Water for salmon was released from Clear Creek in June (8,900 acre feet.)

The main depletions in this stretch are from Anderson-Cottonwood Irrigation District, which has the right to divert up to 125 cfs, the Cow Creek Canal, which can divert up to 92 cfs, and the City of Redding. ACID and the City of Redding are both Settlement Contractors, and the Cow Creek Canal is a USBR project.

Upper / Middle Sacramento River

Measured Flows



Flows in the Sacramento decrease progressively as the river flows South past Bend Bridge.

Between Bend Bridge and Vina, the biggest diversions are from the Tehama-Colusa and Corning Canals at the Red Bluff Diversion Dam. The canals are operated by the US Bureau of Reclamation as part of the Sacramento Canals Unit and have a joint capacity of 3,030 cfs.

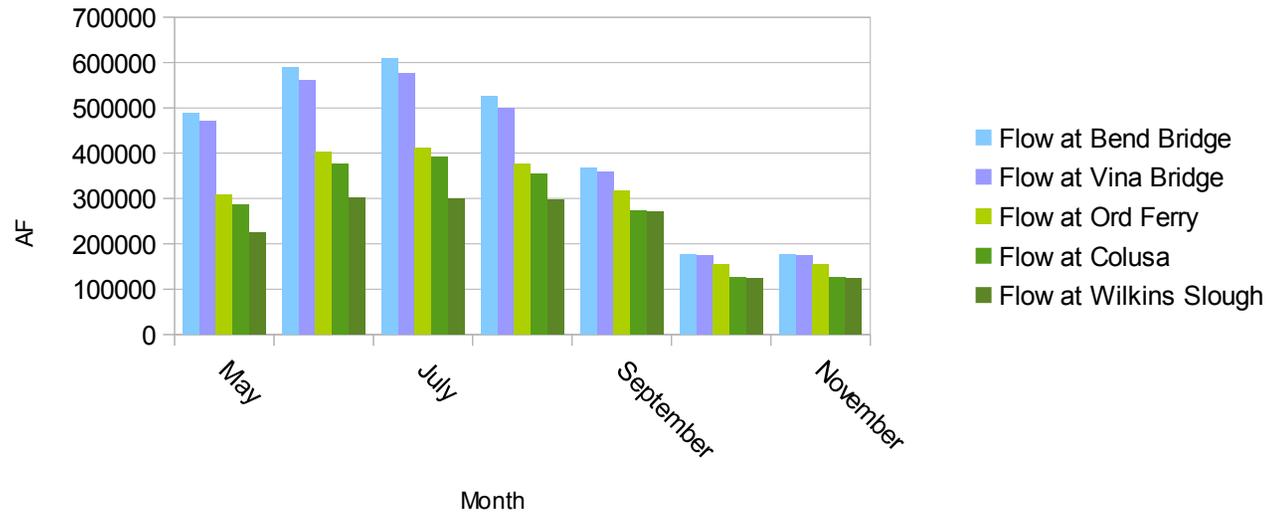
Settlement Contractors

The majority of depletions on the river between Vina Bridge and Wilkins Slough are by Sacramento River Settlement Contractors.

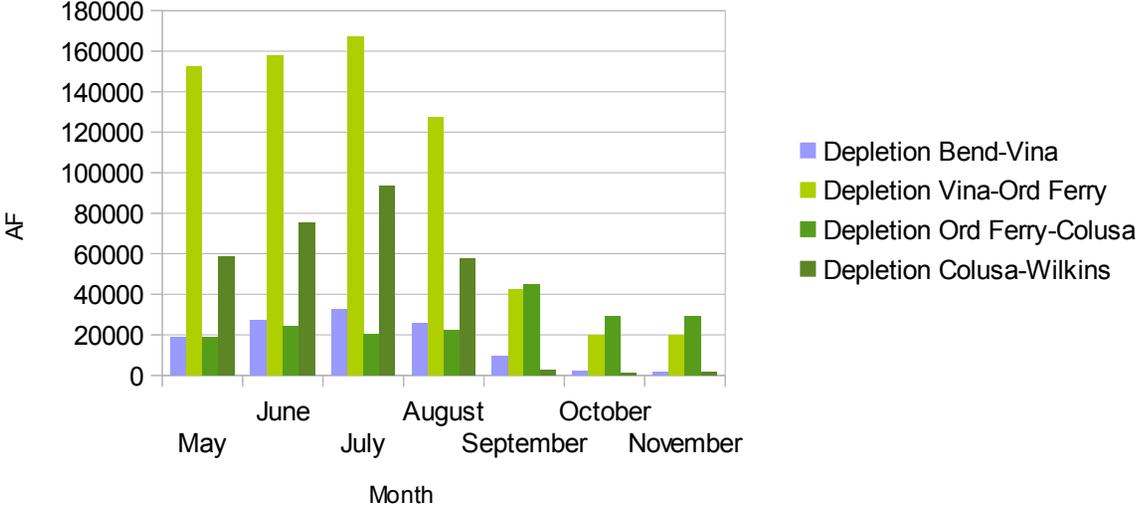
| District | Location | Water Rights Date | Max Total Diversion Rate Apr-Nov (cfs) |
|------------------------------|----------|-----------------------|--|
| Glenn-Colusa | VIN-ORD | Pre-1914 | 3000 |
| Provident | ORD-COL | 1903 | 805 |
| Princeton-Codora-Glenn | ORD-COL | Pre-1914 and 1916 | included in Provident |
| Meridian Farms Water Company | COL-WLK | 1918 | 135 |
| RD #108 | COL-WLK | 1800s, and 1917, 1918 | 1430 |
| RD #1004 | COL-WLK | 1912 | 16 |
| Sutter Mutual Water Company | COL-WLK | 1917-39 | 1444 |
| River Garden Farms | COL-WLK | 1917 | 62 |

Water Rights Dates are from the SWRCB database. Diversion rates are best estimates from publicly available data.

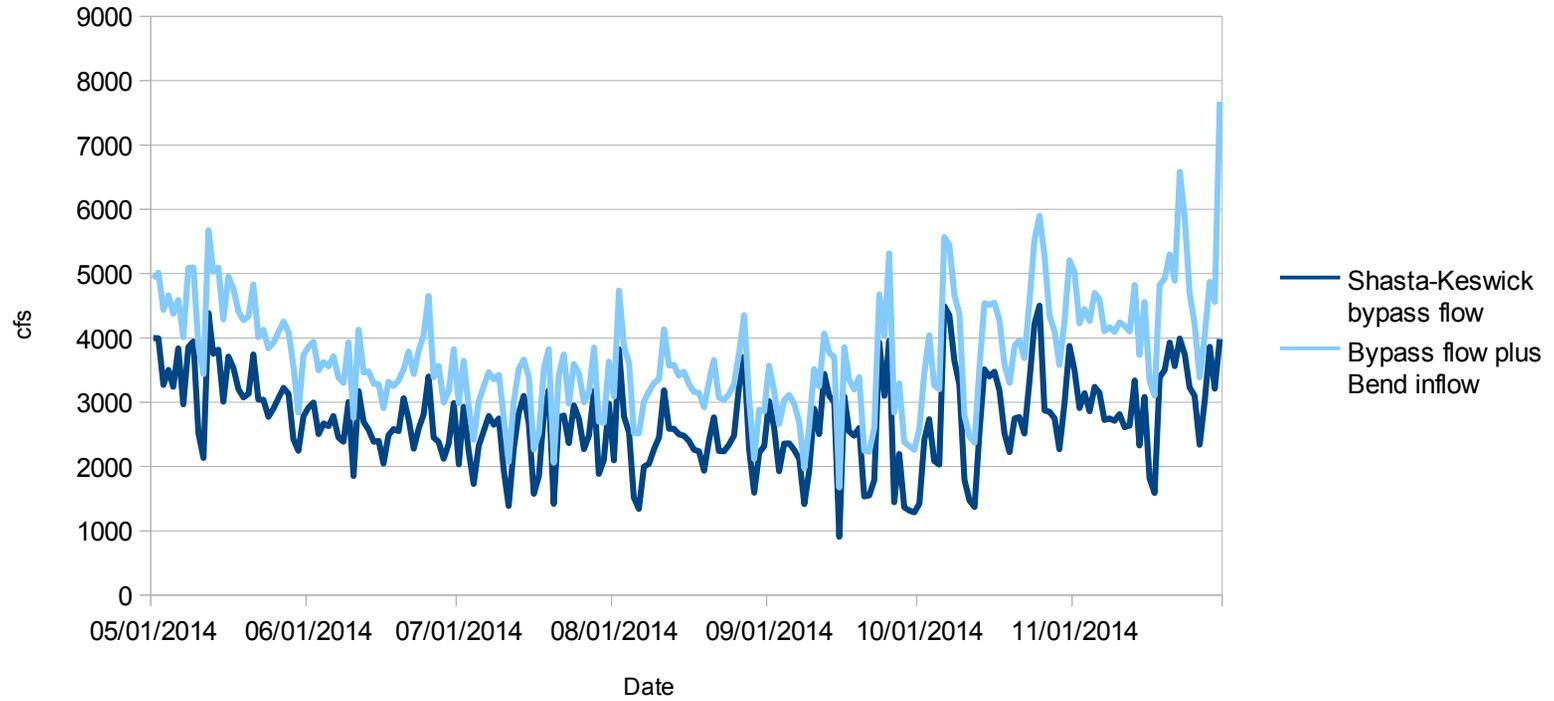
Upper/Middle Sacramento Monthly Flows (AF)



Upper/Middle Sacramento Monthly Depletions (AF)

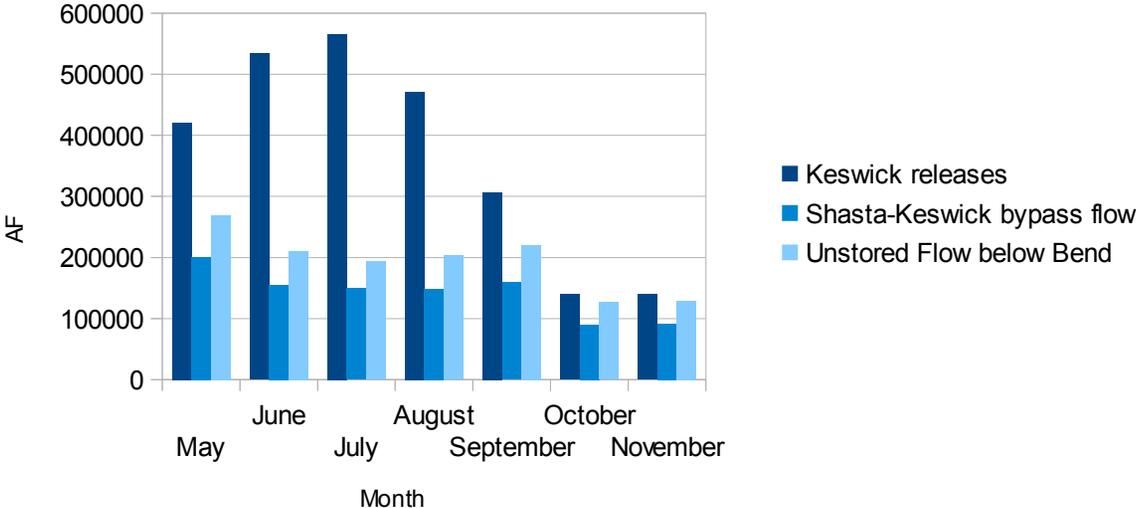


Estimated Unstored Flow at Bend Bridge



The net accretions between Keswick Dam and Bend Bridge is allocated to unstored flow.

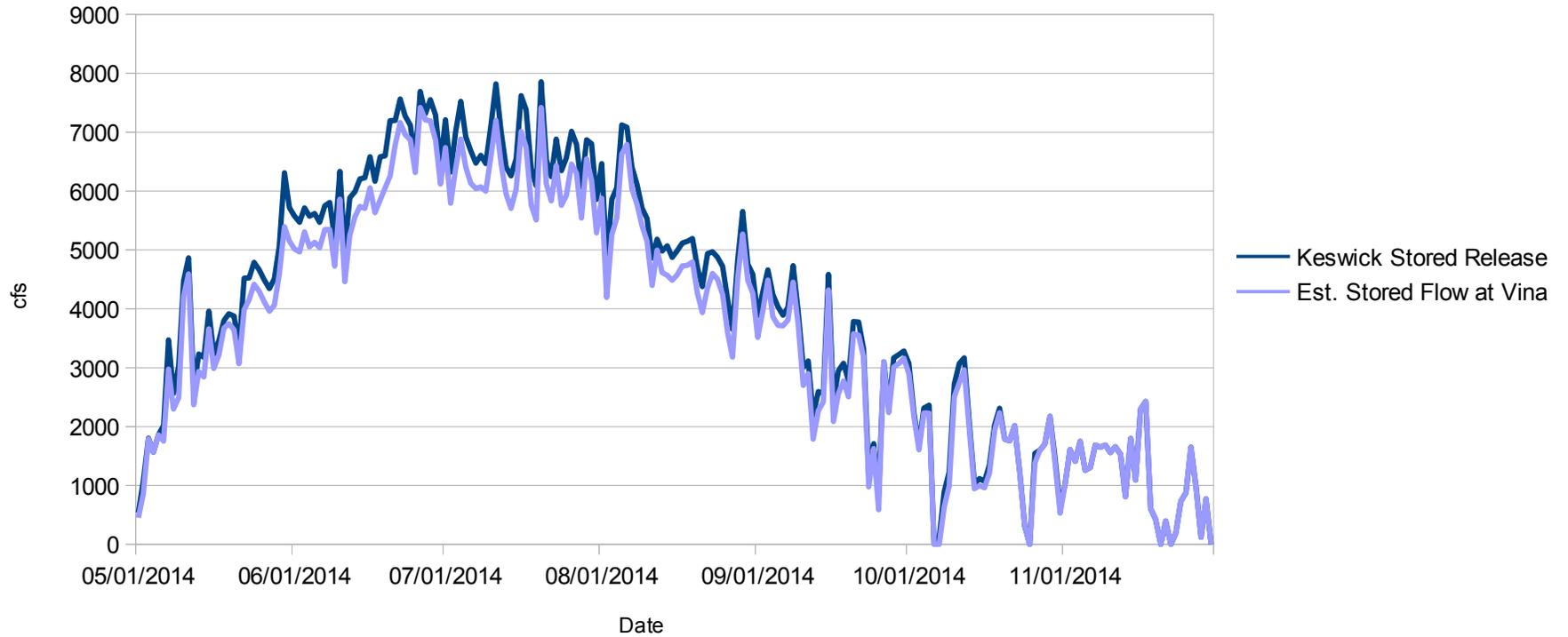
Estimated Monthly Unstored Flow at Bend Bridge (AF)



Accretions at Bend Bridge is reduced by diversions from Anderson-Cottonwood Irrigation District and the City of Redding.

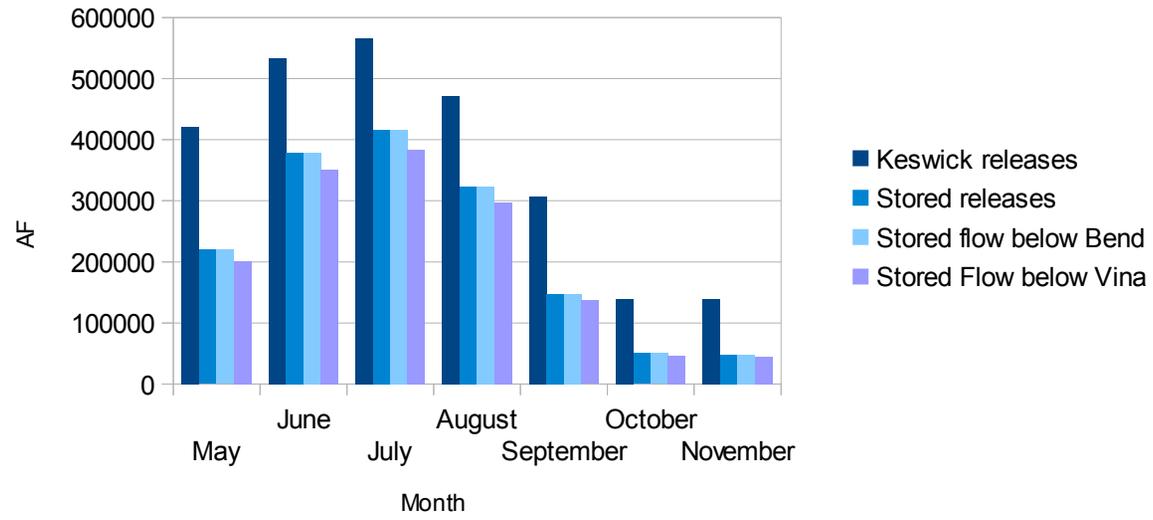
ACID diverted 69,933 acre feet from April to August of 2014. The ACID Settlement contract provides for 121,000 acre feet to be base supply, and 4,000 acre feet of project supply. During critically dry years this is reduced by 25%.

Estimated Stored Flow at Vina Bridge

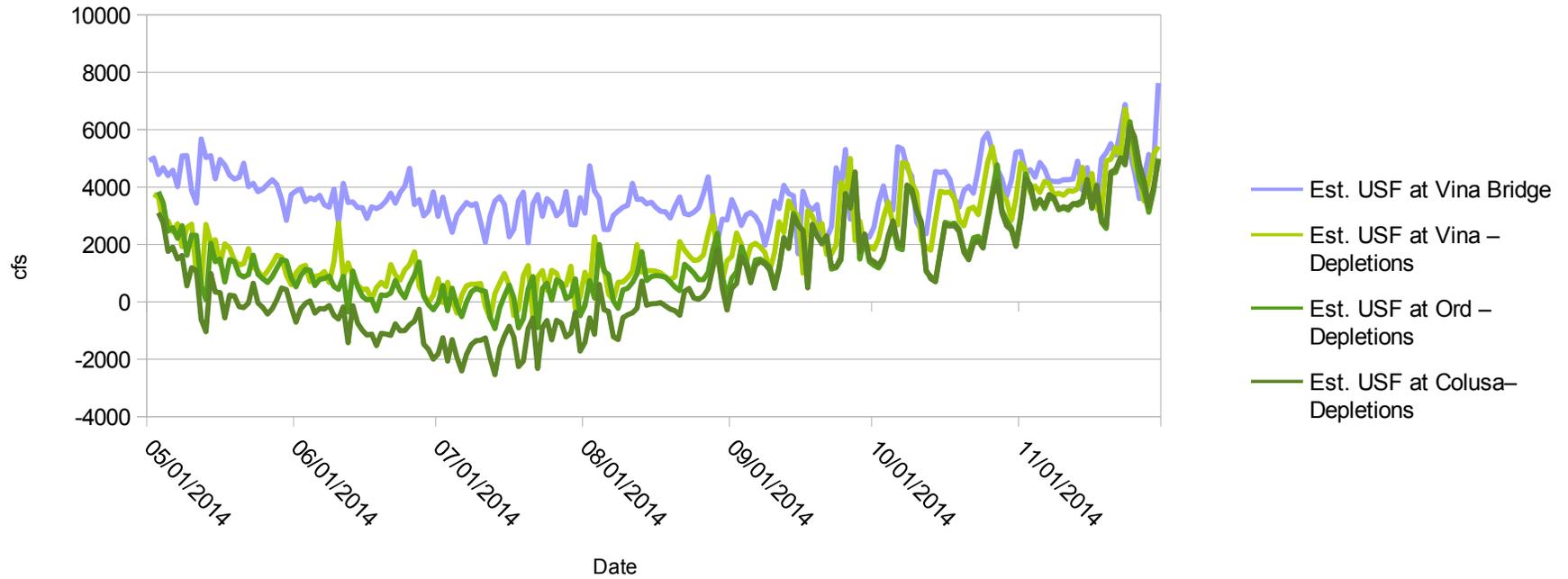


Since there is a net increase in flow between Keswick and Bend, there is assumed to be no loss to stored flows in this stretch of the river. As a rough estimate, depletions between Bend and Vina are allocated to the Tehama-Colusa and Corning Canals, and are assumed to come from stored project water.

Estimated Stored Flow at Vina



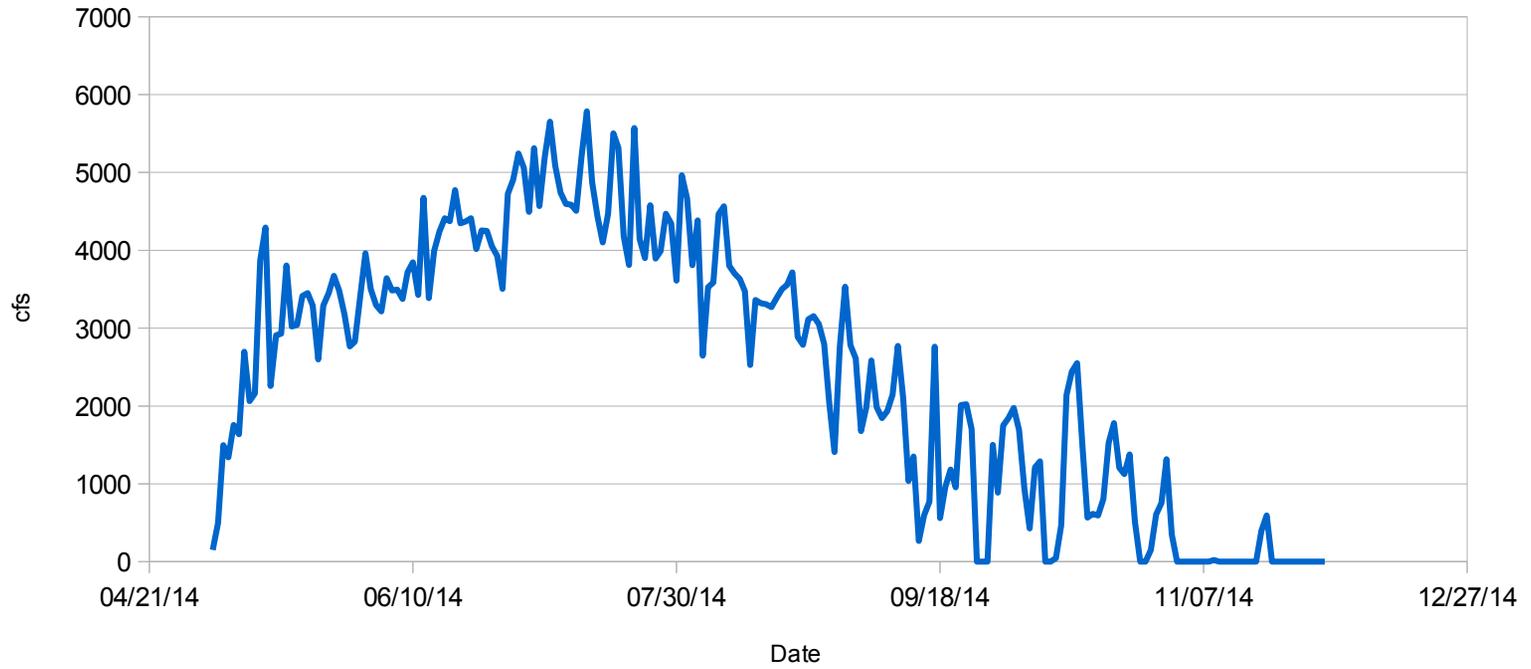
Estimated Unstored Flow at Vina Bridge Less Depletions



Allocating all riparian depletions in the Upper and Middle Sacramento River to unstored flows leads to negative flows in excess of -2000 cfs during July. Clearly supplemental stored water is needed from Shasta / Keswick.

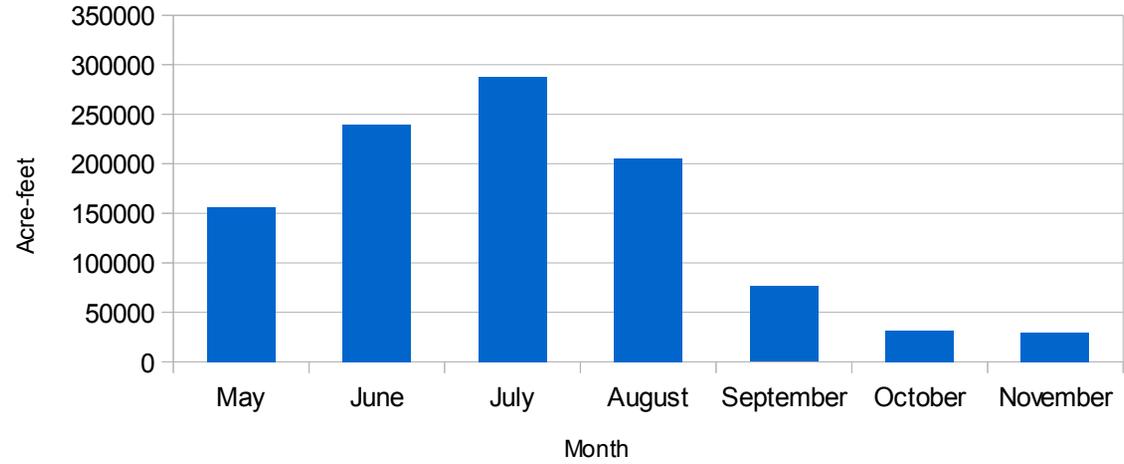
Supplemental Water

to keep flow at Wilkins > 3250 cfs



Supplemental Water

to keep flow at Wilkins Slough > 3250 cfs



Total is 1.03 MAF