Appendix G3a
Sacramento Water Allocation Model Methods and Results for the Proposed Voluntary Agreements

G3a.1 Introduction

This document describes the SacWAM model assumptions and methods used to simulate the proposed Voluntary Agreements (VA) proposed by parties in the Sacramento/Delta Watershed and results of the model simulations. The model assumptions were based on descriptions in the Memorandum of Understanding (MOU) term sheets signed on August 11, 2022, and the CalSim 3 draft model produced by DWR.

SacWAM is hydrologic and operations model developed by the State Water Board and consultants to facilitate the assessment of alternatives for the update of the Sacramento/Delta Update of the Water Quality Control Plan (Bay-Delta Plan). SacWAM includes a representation of all the major tributaries, reservoirs, and diversions in the Sacramento Watershed, Delta Eastside Tributaries and Legal Delta regions. For a full description, assumptions, and limitations of the SacWAM model, refer to the SacWAM Documentation (^SacWAM 2023).

G3a.1.1 Appropriate Use of Model Results

Understanding the appropriate use of model results is important. The changes in hydrology and supply associated with the proposed VAs are relatively small compared with the volume of water in the system, and some details of the VAs such as which reservoirs may be reoperated, which fields will be fallowed, when reservoirs can refill, and when groundwater substitution will occur, have not been fully specified. Further, because it simulates hypothetical conditions, SacWAM is not intended to be used in a real-time predictive manner. SacWAM results are intended to be used in a comparative manner, which allows for assessing the changes in system operations and resulting incremental effects between scenarios. For these reasons, SacWAM results should not be taken as indicating the exact changes in water supply and changes in hydrology from implementation of the proposed VAs but rather should be used to indicate the general timing and trends that may occur with the proposed VAs.

Actual operations of the proposed VAs may vary from modeled outcomes presented in this section. For example, the proposed VAs include flexibility in the timing of flow assets, so streamflows and reservoir levels could deviate from modeled results. In addition, the VA Term Sheet describes flow assets that would be provided through a water purchase program, but the sources of water purchases described in the VA Term Sheet are not fully known at this time. Nonetheless, the model results are an appropriate tool for estimating the relative effects of the proposed VAs on water supply and hydrology.

G3a.2 SacWAM Proposed Voluntary Agreements Modeling Methods

The VA Term Sheet describes VA flow assets as being additive to flows required by D-1641 and resulting from the 2019 Biological Opinions (BiOps), referred to as 2019 BiOps conditions. The general approach to using SacWAM to model the effects of the proposed VAs on hydrology and water supply is first to simulate the 2019 BiOps conditions scenario, and then build the VA scenario from the 2019 BiOps conditions scenario. For the purpose of modeling the VA, the 2019 BiOps conditions scenario also includes a notch in the Tisdale Weir as proposed in the VAs. The Tisdale Weir notch is one component of the Tisdale Weir Rehabilitation and Fish Passage Project, which is intended to rehabilitate the weir to extend the design life and also provide passage for fish to the Sacramento River. (DWR 2023). The VA proposes to operate the Tisdale Weir notch to increase flows into the Sutter Bypass during December through mid-March. The reason that the Tisdale Weir notch is included in the 2019 BiOps conditions is because changing the flows into the Sutter Bypass from the Sacramento River results in substantial changes to flow in the Sacramento River downstream of Tisdale Weir that are separate from the flow assets proposed in Chapter 9, *Proposed Voluntary Agreements*, Table 9.3-1. SacWAM version 2023.06.12 was used for the VA analysis which is the same as the model used in other analyses in the Staff Report, with the addition of logic required to implement the VA scenario described in this Appendix.

G3a.2.1 General Regulatory Assumptions

Table G3a-1 summarizes the major regulatory assumptions that vary among the scenarios used in the VA analysis presented in Chapter 9, *Proposed Voluntary Agreements*. Further discussion of the modeling assumptions for each scenario is presented in Sections G3a.2.2 through G3a.2.5, below.

Table G3a-1. SacWAM Model Assumptions for Each Scenario

Regulation	Project Baseline	2008-2009 BiOps Condition	2019 BiOps Condition	VA
D-1641	WQ Objectives Min NDOI Export Limits (E:I) Export Limits (SJ I:E) DCC Closures SJ Vernalis Min Flow[1] Table 4 (Spring X2)	WQ Objectives Min NDOI Export Limits (E:I) Export Limits (SJ I:E) DCC Closures SJ Vernalis Min Flow[1] Table 4 (Spring X2)	WQ Objectives Min NDOI Export Limits (E:I) Export Limits (SJ I:E) DCC Closures SJ Vernalis Min Flow[1] Table 4 (Spring X2)	WQ Objectives Min NDOI Export Limits (E:I) Export Limits (SJ I:E) DCC Closures SJ Vernalis Min Flow[1] Table 4 (Spring X2)
2008 / 2009 Biological Opinions		2006 American River FMS OMR Fall X2 HORB San Joaquin I:E Suisun Marsh Salinity Control Gate Ops (D-1641)		
2019 Biological Opinions	American River FMS OMR DCC Closures[2] Fall Action (Fall X2)		American River FMS OMR DCC Closures[2] Fall Action (Fall X2)	American River FMS OMR DCC Closures[2] Fall Action (Fall X2)
2020 ITP	Suisun Marsh Salinity Control Gate Ops (Summer) Summer Action OMR San Joaquin I:E[3]			

[1] Vernalis shoulder flows are assumed to apply for entire pulse period
[2] DCC may be closed as early as October pursuant to the 2019 BiOps
[3] The 2020 ITP I:E export limit was assumed to apply to SWP *and* CVP

G3a.2.2 Baseline Scenario

The project baseline scenario includes a representation of D-1641, 2019 Biological Opinions, and the 2020 ITP with some modifications to reflect how the SWP and CVP have been operated in recent years. More in-depth discussion of the project baseline is presented in Chapter 6, *Changes in Hydrology and Water Supply*, and Appendix A1, *Sacramento Water Allocation Model Methods and Results*.

G3a.2.3 2008-2009 BiOps Scenario

The 2008-2009 BiOps scenario represents the operational conditions associated with the implementation of the federal Endangered Species Act BiOps issued by USFWS in 2008 and NMFS in 2009 for long-term CVP/SWP operations. This scenario includes all D-1641 requirements but does not include more recent changes in regulations included in the 2019 Biological Opinions or the 2020 Incidental Take Permit.

The 2008-2009 BiOps scenario includes the 2006 American River Flow Management Standard (Water Forum 2006). Old and Middle River reverse flow limits are included as described in the 2008-2009 BiOps, which are slightly more restrictive than required in the 2019 BiOps and the 2020 ITP. The 2008-2009 BiOps scenario also includes the Fall X2 and San Joaquin I:E ratio as described in the BiOps. The Head of Old River Barrier (HORB) installation was included in the 2008-2009 BiOps scenario as well as Suisun Marsh Salinity Control Gate (SMSCG) operations to meet D-1641 water quality objectives.

The San Joaquin River inflow at Vernalis assumes D-1641 flow objectives with shoulder flows during the pulse period. This is the same assumption as the project baseline scenario; more information regarding the Vernalis boundary condition can be found in Appendix A1, *Sacramento Water Allocation Model Methods and Results*.

G3a.2.4 2019 BiOps Scenario

The 2019 BiOps Scenario includes the same infrastructure and regulatory requirements as the baseline scenario except that the 2019 BiOps scenario does not include the 2020 ITP, and it includes a change to Tisdale Weir operations.

A notch in Tisdale Weir is assumed to be operated from December 1 through March 15. With the notch closed, the weir is assumed to pass approximately 75% of Sacramento River flows over 18,000 cfs. When the notch is open, it is assumed to pass 54% of Sacramento River flows between 10,000 cfs and 18,000 cfs. Between 18,000 cfs and 23,760 cfs, the notch is assumed to pass 4,320 cfs of Sacramento River flows. The entire weir is assumed to be activated at flows over 23,760 cfs and can pass approximately 75% of flows. During March, the weir is assumed to behave according to a weighted average of 15 days with the notch open and 16 days closed.

The San Joaquin River inflow at Vernalis assumes D-1641 flow objectives with shoulder flows during the pulse period. This is the same assumption as the project baseline scenario; more information regarding the Vernalis boundary condition can be found in Appendix A1.

G3a.2.5 VA Scenario

G3a.2.5.1 Sacramento River

SacWAM modeling of the Sacramento VA includes a change to the overtopping flow into the Sutter Bypass through the Tisdale Weir, additional streamflows at Knights Landing, and land fallowing in the Sacramento Valley.

In the VA scenario, Tisdale Weir operations are consistent with those described in Section G3a.2.4, *2019 BiOps Scenario*.

Flow contributions from the Sacramento River include additional flows in the spring and summer based on year type and end-of-March Shasta storage. The total additional streamflow is represented as an instream flow requirement at Knights Landing. The required flow is calculated as the flow that occurs at Knights Landing under 2019 BiOps Condition with the Tisdale Weir notch, plus the additional flow shown in Table G3a-2 Although the Sacramento River VA itself provides 100 TAF of water in each of Above Normal, Below Normal, and Dry water years, as modeled in SacWAM, the 10 TAF Sacramento Valley north of Delta PWA fixed price purchase is included within the model logic to implement the Sacramento River VA. As such, 110 TAF are assumed to be provided in each of these three water year types.

Table G3a-2. Sacramento River Additional VA Flows by Water Year Type

Water Year Type	Quantity (TAF)
Above Normal	110
Below Normal	110
Dry	110

In Dry years the additional flows occur when there is a reduction in diversions because of the land fallowing. The delivery pattern of fallowed land is assumed to follow a fixed pattern of 10 percent April, 15 percent May, 20 percent each June to August, 10 percent September, and 5 percent October. In Above Normal and Below Normal years, the 110 TAF is provided either in the Spring or the Summer based on the end-of-March Shasta storage shown in Table G3a-3.

Table G3a-3. Shasta Storage Trigger for Spring Deployment

Shasta End-of-March Reservoir Storage	Sacramento VA Pulse Flow
Equal to or Greater than 3.8 MAF	55 TAF in April and May
Less than 3.8 MAF	36.67 TAF in each month June-August

The source of additional flows is assumed to be from land fallowing by CVP Settlement Contractors and from releases from Keswick Reservoir. Land fallowing is implemented by reducing irrigated acreage of all settlement contractor demands by 6% in all Above Normal, Below Normal and Dry years.

G3a.2.5.2 Feather River

The SacWAM simulation of the VA scenario includes additional flows in the Feather River above the confluence with the Yuba River and fallowing of land in the Feather River Basin.

The increased flows proposed in the VA are represented by a new instream flow requirement above the confluence with the Yuba. The instream flow requirement is calculated as the 2019 BiOps Condition with Tisdale Weir notch plus the additional VA flow and is only active in April and May. The additional Feather VA flows are shown in Table G3a-4.

Table G3a-4. Feather River VA Additional Flows by Water Year Type

	April	May
Above Normal	30 TAF	30 TAF
Below Normal	30 TAF	30 TAF
Dry	30 TAF	30 TAF

Land fallowing in the Feather River Service Area is assumed to occur in all demands associated with SWP Settlement Contractors, by decreasing irrigated acreage by 6% in Above Normal, Below Normal, and Dry years.

G3a.2.5.3 American River

The SacWAM representation of the VA proposal on the American River includes increased streamflows and groundwater substitution of surface water.

The increased streamflows are represented as a new instream flow requirement below Nimbus Dam distributed by year type and month shown below. Increased flows on the American are assumed to be increases from the 2019 BiOps Condition scenario with the Tisdale Weir notch in place. The VA flow requirement shown in Table G3a-5 occurs only in the first three non-Wet years of every eight-year cycle.

To reduce the effects of rebalancing storage in Folsom and Shasta in the VA scenario, releases from Lake Natoma were required to be no less than releases from the 2019 BiOps Condition with the Tisdale Weir Notch scenario between the months of January through June of all years.

Table G3a-5. American River Additional VA flows by Month and Water Year Type

Water Year Type	March (TAF)	April (TAF)	May (TAF)
Above Normal	5	5	0
Below Normal	5	5	0
Dry	13.33	13.33	13.33
Critical	15	15	0

Groundwater substitution of surface water is represented in Dry and Critical years when the VA flow requirements apply by limiting the surface water available. Surface water diversions from the American River to the Roseville WTP, Peterson WTP, Folsom WTP, Bajamont WTP, Fairbairn WTP, Sacramento River WTP, Folsom South Canal and Freeport PP demands are reduced by 35 TAF in Dry and 30 TAF in Critical years in the aggregate during March, April and May.

G3a.2.5.4 Yuba River

The Yuba River VA proposal is represented in SacWAM by reducing the New Bullards Bar Reservoir buffer pool volume. The buffer pool represents the volume below which releases will not be made for lower priority demands such as hydropower operations. In the 2019 BiOps Condition scenario, the end of September buffer pool volume is 650 TAF. In the VA scenario, the end of September buffer pool in Dry, Below Normal, and Above Normal water year types is 595 TAF (Figure G3a-1).

In the VA scenario the buffer pool is the same as baseline from November through March. Beginning in April the buffer pool is lower in VA, which results in greater releases from New Bullards Bar through Colgate Powerhouse.

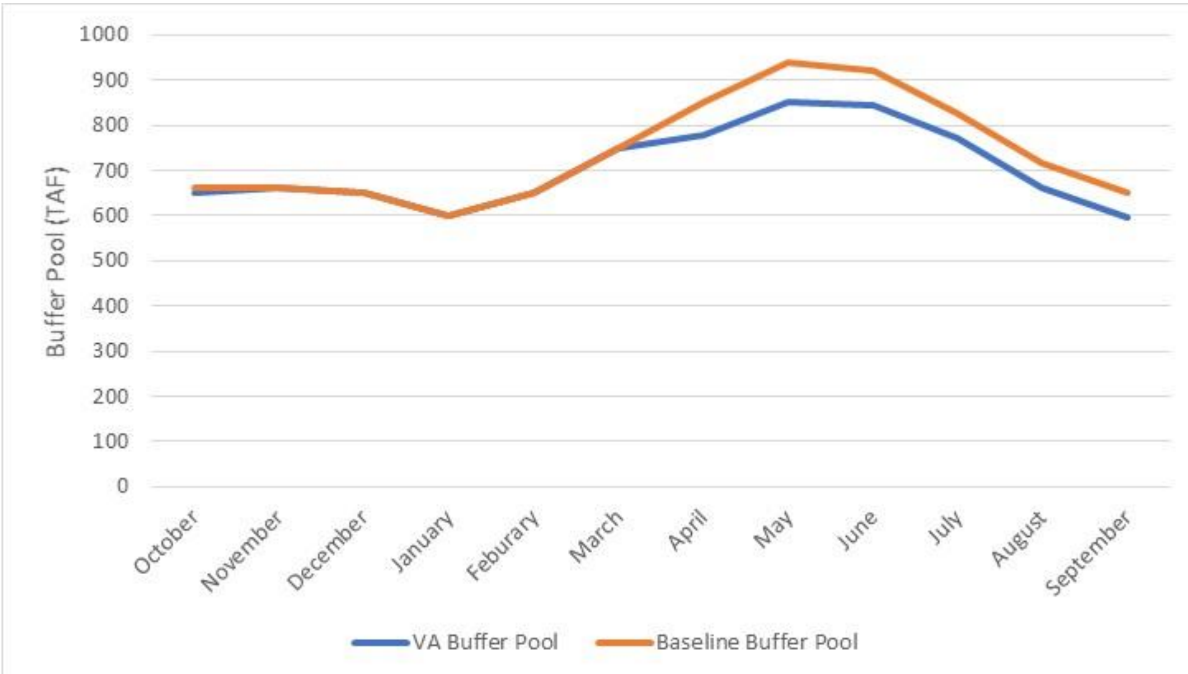

Figure G3a-1. New Bullards Bar Reservoir Buffer Storage Volume by Month

G3a.2.5.5 Putah Creek

The Putah Creek VA scenario includes additional flow at the bottom of Putah Creek above the Toe Drain. Additional VA flows occur in addition to Putah Creek Accord required flows in all water year types unless it is a drought year as defined by certain conditions when Lake Berryessa storage is below 750 TAF. The additional flows include a winter pulse, spring flushing flows, and ramping flows between the pulse and flushing flows. The additional flows on Putah Creek are shown in Table G3a-6.

Table G3a-6. Putah Creek Additional Flows by Month (TAF)

	November	December	January	February	March	April	May
Pulse Flow	1.67	0.83					
Ramping Flow		0.37	0.71	0.71	0.71		
Flushing Flow						0.5	0.5

G3a.2.5.6 Mokelumne River

The Mokelumne River VA scenario includes increased releases from Camanche Reservoir based on the April-September Mokelumne JSA water year type and includes a low storage off-ramp. In March, the model assumes perfect foresight of the April JSA water year type. In October, the VA flows are based on the preceding year's April-September JSA year type.

The total VA required release is calculated as the minimum JSA release plus the additional flows shown in Table G3a-7. If the March projected combined end of September storage in Pardee and Camanche is less than 350 TAF, it is assumed that no additional VA flows will be provided.

Table G3a-7. Mokelumne River VA Additional Flow by Month and JSA Water Year Type (TAF)

	March	April	May	September	October
Dry	2.7	2.7	2.7	0.95	0.95
Below Normal	5.4	5.4	5.4	1.9	1.9
Normal and Above	12.15	12.15	12.15	4.275	4.275

G3a.2.5.7 Export Reduction

Constraints are added to reduce exports at Banks and Jones Pumping Plants from 2019 BiOps Condition pumping rates in March, April, and May. The reductions shown in Table G3a-8 are first applied in March during Below Normal, Dry, and Critical years, but total exports are not reduced below 3,000 cfs. If the volumes listed in the table are not achieved in March, the remaining volume is reduced in April with a minimum total export of 1,500 cfs. In Wet and Above Normal years, export cuts are made during April and May, with a minimum total export of 1,500 cfs in each month. To reduce the effects of system reoperation, total Banks and Jones exports are limited to no more than 2019 BiOps Condition exports during months in the January through June period when export cuts are not applied.

Table G3a-8. Assumed Reduction in SWP and CVP Exports from South of Delta in the VA Scenario (TAF)

	Export Reduction
Critical	3
Dry	179
Below Normal	200
Above Normal	265
Wet	27

G3a.2.5.8 Delta Outflow Requirement

Increases in Delta outflow required in the VA scenario are a combination of tributary contributions. The VA Delta outflow requirement is calculated as the 2019 BiOps Condition Delta outflow + additional VA flows from the Sacramento River + Feather River + Yuba River + American River. Note that VA additional flows from the Mokelumne River and Putah Creek are not included in the VA Delta outflow requirement. Delta outflow VA contributions are enforced through an instream flow requirement during months when VA export reductions are not in place.

G3a.2.5.9 Delta Outflow Postprocessing

A postprocessing exercise is used to account for the Delta outflow effects of water purchases and potential Friant and Tuolumne VA flow actions that are not modeled in the SacWAM VA scenario.

Water purchases are assumed to be provided in the specified quantities by Sacramento water year type. Friant VA flows are included as the time series of forgone exports previously modeled by CalSim 3. Tuolumne River VA flows are represented as the change in flow at the mouth of the Tuolumne River as modeled by the State Water Board's Water Supply Effects model (WSE) for the lower San Joaquin tributaries and added to Delta outflows (see Attachment G3a1, *Water Supply Effects Model Updates for the Tuolumne Voluntary Agreement*). The water year type averaged values of each postprocessed component are shown in Table G3a-9 by Sacramento water year type (note that for the Friant and Tuolumne VAs these values differ from the San Joaquin water year type averaged values indicated shown in Chapter 9, *Proposed Voluntary Agreements*, Table 9.3-1).

Table G3a-9. Postprocessed VA Flow Actions (TAF) by Sacramento Water Year Type

Flow Action	Critical	Dry	Below Normal	Above Normal	Wet
PWA Market Price Purchases	0	50	60	83	0
Permanent State Water Purchases	65	108	9	52	123
Friant	8	23	19	13	5
Tuolumne	41	65	65	25	-13

In general, VA flow actions are intended to be concentrated during April and May, which are generally the most impaired months with respect to inflow to and outflow from the Delta. For the purposes of this report, water purchases are assumed to be provided in April and May, although they may also be deployed differently under the VAs. Modeled Delta outflow results including postprocessed purchases and with and without San Joaquin basin VA contributions from the Friant Division and Tuolumne River are shown on Figure G3a-2 and in Table G3a-10 and Table G3a-11.

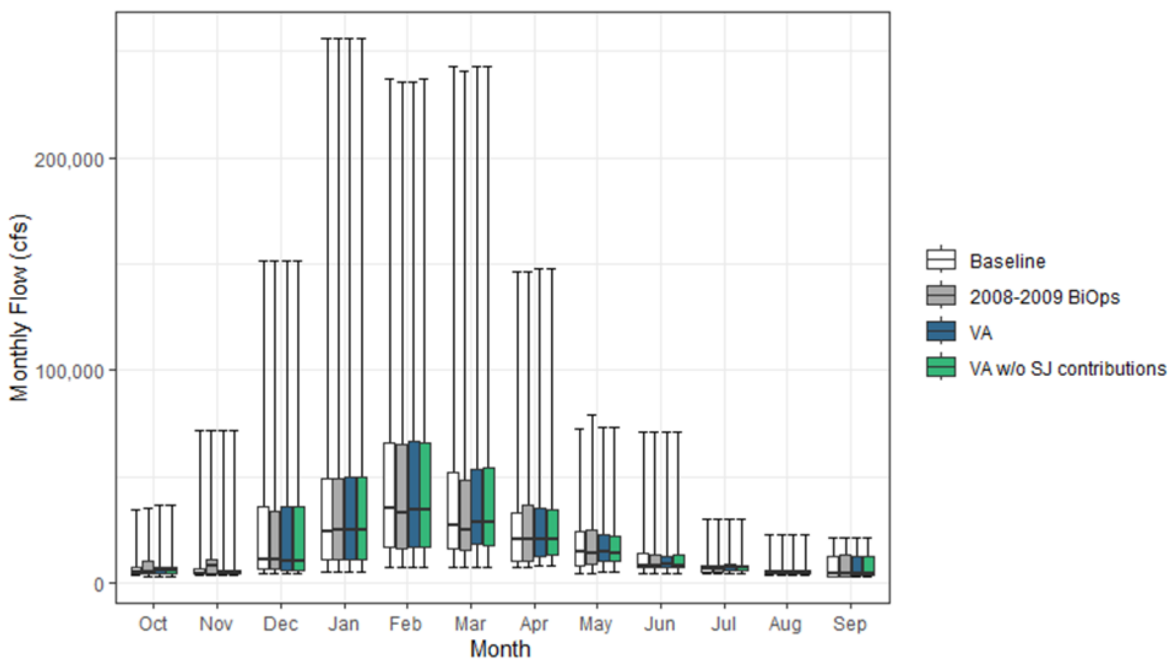

Figure G3a-2. Baseline, 2008-2009 BiOps, and VA Modeled Flow Including Postprocessed Components (cfs), Delta Outflow

Table G3a-10. Water Year Type Averaged January–June Total Baseline Flow and VA Change from Baseline (TAF), Delta Outflow (Including Postprocessed Components)

Water Year Type	Baseline	VA	VA without San Joaquin Contributions
Critical	3,659	142	92
Dry	5,127	488	400
Below Normal	8,014	206	122
Above Normal	14,128	218	180
Wet	22,106	-98	-91
All	11,691	169	123

Table G3a-11. Water Year Type Averaged January–June Total 2008-2009 BiOps Condition Flow and VA Change from 2008-2009 BiOps Condition (TAF), Delta Outflow (Including Postprocessed Components)

Water Year Type	2008-2009 BiOps	VA	VA without San Joaquin Contributions
Critical	3,636	165	116
Dry	5,058	556	469
Below Normal	7,881	340	256
Above Normal	13,907	439	402
Wet	22,337	-330	-323
All	11,689	172	126

As described in Chapter 9, *Proposed Voluntary Agreements*, two additional VA scenarios are included for evaluating January through June Delta outflows that provide a higher bookend of possible Delta outflows under the VAs. These additional scenarios are provided in recognition of the following: (1) additional VAs on the Merced River and Stanislaus River may be agreed upon in the future; (2) the VAs are intended to protect as Delta Outflows both VA flows and flows that may be provided by implementing the 2018 updated Lower San Joaquin River flow objectives; (3) different credible hydrology and operations modeling tools produce different estimates of the incremental effect on Delta outflow associated with changes in operations between the 2008-2009 BiOps condition and the 2019 BiOps condition.

Because the VA is modeled relative to the 2019 BiOps condition but compared to baseline and 2008-2009 BiOps conditions, estimates of the change in Delta outflow resulting from the VA are sensitive to the modeled incremental effect of 2019 BiOps on Delta outflow. At the time of this writing, the only model available to assess baseline, 2008-2009 BiOps, and 2019 BiOps conditions is SacWAM version 2023.06.12, as documented in this Staff Report. For comparisons of 2008-2009 BiOps and 2019 BiOps conditions, the CalSim II model jointly developed by DWR and Reclamation is also available. The CalSim II model scenarios relied upon for this analysis were produced for the 2019 incidental take permit application submitted to CDFW by DWR in December, 2019 and its supporting environmental documentation (DWR 2019a, 2019b). In Below Normal, Above Normal, Wet years, and over the long-term average SacWAM generally estimates a larger incremental reduction in Delta outflow during January through June associated with the 2019 BiOps (Table G3a-12) than CalSim II (Table G3a-13; 2008-2009 BiOps and 2019 BiOps correspond to Existing Conditions and Proposed Project simulations, respectively, as described in DWR 2019a). In Critical and Dry years, SacWAM estimates a smaller magnitude increase or decrease in January through outflow associated with the 2019 BiOps than CalSim II. SacWAM also estimates a larger increase in

South of Delta exports associated with the 2019 BiOps relative to CalSim II in all non-Critical water year types (Table G3a-14).

Table G3a-12. Water Year Type Averaged Incremental Change in January through June Delta Outflow (TAF), 2019 BiOps Relative to 2008-2009 BiOps, as Modeled by SacWAM

Water Year Type	2008-2009 BiOps	2019 BiOps	2019 Change
Critical	3,636	3,671	35
Dry	5,058	5,026	-32
Below Normal	7,881	7,663	-218
Above Normal	13,907	13,658	-249
Wet	22,337	21,868	-469
All	11,689	11,474	-215

Table G3a-13. Water Year Type Averaged Incremental Change in January through June Delta Outflow (TAF), 2019 BiOps Relative to 2008-2009 BiOps, as Modeled by CalSim II

Water Year Type	2008-2009 BiOps	2019 BiOps	2019 Change
Critical	3,344	3,272	-72
Dry	5,154	5,029	-126
Below Normal	7,526	7,476	-50
Above Normal	13,574	13,451	-123
Wet	22,666	22,405	-262
All	12,079	11,931	-148

Table G3a-14. Water Year Type Averaged Incremental Change in January through June South of Delta Exports (TAF), 2019 BiOps Relative to 2008-2009 BiOps, as Modeled by SacWAM and CalSim II

Water Year Type	SacWAM	CalSim II
Critical	26	53
Dry	239	176
Below Normal	393	353
Above Normal	476	417
Wet	538	378
All	354	288

The differing responses to changed BiOp assumptions observed in SacWAM and CalSim II result from multiple differences between the models that are not fully understood at the time of this writing. In recognition of this uncertainty, a bias correction was calculated by subtracting the SacWAM incremental change in Delta outflow from the corresponding CalSim II change (Table G3a-15).

Table G3a-15. Delta Outflow Bias Correction (TAF), 2019 BiOps Relative to 2008-2009 BiOps, as Modeled by SacWAM and CalSim II

Water Year Type	SacWAM Bias Correction
Critical	-107
Dry	-94
Below Normal	168
Above Normal	126
Wet	207

In addition to the uncertainty in the incremental effect of changes to Project operations associated with the 2019 BiOps, future flow conditions from the Stanislaus, Tuolumne, and Merced Rivers (lower San Joaquin River or LSJR tributaries) will be affected by water quality control planning and implementation activities outside the scope of the Sacramento/Delta effort. Potential activities include implementation of Bay-Delta Plan amendments adopted in 2018 requiring 40 percent of unimpaired flow, within a range of 30 to 50 percent of unimpaired flow, February through June from the Stanislaus, Tuolumne, and Merced Rivers and potential VA proposals, if approved. The potential flow contributions of the Merced and Stanislaus Rivers are considered in two bookends. For the lower bookend, The Merced and Stanislaus Rivers are assumed to provide the balance of San Joaquin River placeholder volumes identified in the VA Term sheet (Appendix G1, *Voluntary Agreement Proposal*) less the Tuolumne VA flow contributions. For the higher bookend, the Merced and Stanislaus are assumed to provide 40 percent of unimpaired flow during February through June, as modeled by WSE (Attachment G3a1, *Water Supply Effects Model Updates for the Tuolumne Voluntary Agreement*). In each instance, the additional flow contributions from San Joaquin basin sources are summarized as the net change from existing conditions during January through June, averaged by to Sacramento water year type. For modeled time series, such as those from WSE, this is accomplished by simple averaging by water year type. For San Joaquin River placeholder flows, the averaging is accomplished by assuming that the placeholder flow is provided in each year by San Joaquin water year type, then averaged by Sacramento water year type. In both instances the CalSim II period of record of 1922-2003 (which is common to WSE) is used. The resulting values for each bookend are summarized in Table G3a-16.

Table G3a-16. Merced and Stanislaus Higher Bookend Flow Contributions (TAF) by Sacramento Water Year Type

Water Year Type	Merced & Stanislaus Placeholder	Merced & Stanislaus 40% UF
Critical	18	137
Dry	73	218
Below Normal	90	226
Above Normal	66	264
Wet	26	192

The bias correction in Table G3a-15 is combined with the potential contributions from the Merced and Stanislaus Rivers in Table G3a-16 to formulate two higher bookend scenarios for future January through June Delta outflow conditions under the VA, presented in Table G3a-17. Both scenarios include the Tuolumne River VA and Friant contributions, as well as other VA contributions, including unspecified water purchases. They are only available as January through June flows and not for the full SacWAM hydrology timeseries because the bias correction and San Joaquin flow adjustments were only applied to total January through June flows for each water year type.

Table G3a-17. Water Year Type Averaged January–June Total 2008-2009 BiOps Flow and VA Change from 2008-2009 BiOps (TAF) for Delta Outflow (Including Postprocessed Components) for Higher Bookends of Possible VA Flows

Water Year Type	2008-2009 BiOps	VA with Bias Correction and LSJR Placeholder	VA with Bias Correction and 40% UF Merced & Stanislaus
Critical	3,636	76	195
Dry	5,058	535	680
Below Normal	7,881	599	735
Above Normal	13,907	631	829
Wet	22,337	-96	70

G3a.2.5.10 Artificial Neural Network (ANN) Blinding

The ANN was "blinded" for the VA scenario to prevent VA flows to change the flow required to meet salinity objectives. The ANN inputs such as Sacramento River flows, South of Delta (SOD) exports and Delta outflows are affected by VA actions. VA flows are removed from these inputs to keep ANN salinity outflow requirement similar to 2019 BiOps scenario.

G3a.2.5.11 San Joaquin River Inflow at Vernalis

The San Joaquin River inflow at Vernalis assumes D-1641 flow objectives with shoulder flows during the pulse period. This is the same assumption as the project baseline scenario, more information on how the timeseries was produced can be found in Appendix A1, *Sacramento Water Allocation Model Methods and Results*.

G3a.3 SacWAM Modeling Results

The sections that follow summarize model results for streamflows, Delta interior flows, interbasin diversions, reservoir storage volumes and elevations, water supply, groundwater storage and flows, and unmet instream flow requirements. The results presented here represent a subset of the locations summarized in Appendix A1, *Sacramento Water Allocation Model Methods and Results*, because the scenarios considered in the analysis of proposed VAs result in less widespread changes than those summarized in the remainder of the report. For streamflows, Delta interior flows, and interbasin diversions, results are presented for the subset of locations presented in Appendix A1, *Sacramento Water Allocation Model Methods and Results*, for which any scenario (2008-2009 BiOps, 2019 BiOps, or VA scenario) exhibited a flow change from baseline exceeding 500 AF (approximately 8 cfs) in any single month during the simulated period of record. Some tributaries that are not directly involved in the proposed VAs show changes of this magnitude due to modeled changes in interbasin diversions (e.g., Bear River), return flows (e.g., Thomes Creek), or Project operations (e.g., Trinity River). Reservoir storage results are shown for reservoirs that exhibit a change of one TAF or larger in end-of-April or end-of-September storage relative to baseline in any scenario. Water supply results are presented for water budget areas or other aggregations of demand sites that exhibit a change of greater than one percent in annual water supply relative to baseline in any scenario during any single year during the simulated period of record. The reader may refer to results presented in Appendix A1, *Sacramento Water Allocation Model Methods and Results*, for baseline results at locations not presented here.

All results presented in the following sections are summaries of results of the SacWAM scenarios as modeled within the WEAP platform. The reader should refer to Chapter 9, *Proposed Voluntary Agreements*, and Section G3a.2.5, *VA Scenario*, for results and methods related to VA scenario results that rely on postprocessing of SacWAM output.

G3a.3.1 Streamflows

G3a.3.1.1 American River below Folsom Reservoir (SWRCB Folsom)

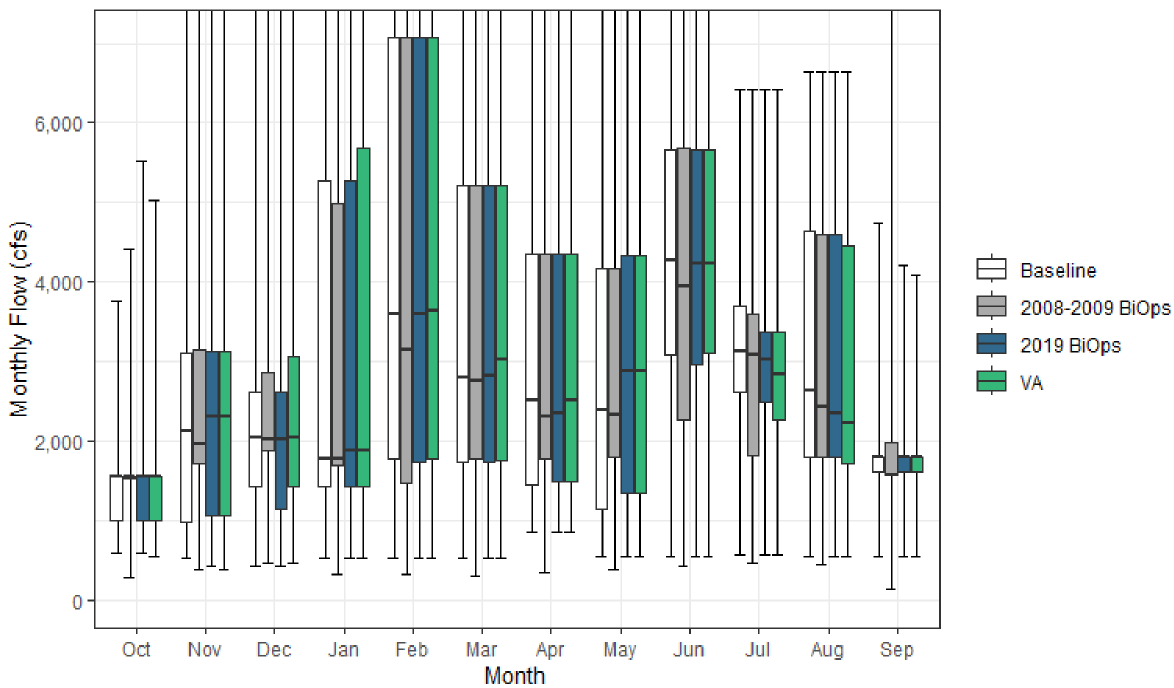

Figure G3a-3. American River below Folsom Reservoir (SWRCB Folsom) Monthly Boxplot

Table G3a-18. Cumulative Distribution of Monthly Flow (cfs) — American River below Folsom Reservoir (SWRCB Folsom)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	587	526	428	521	533	525	860	540	545	560	549	551	547
10%	677	646	639	668	1,376	971	988	995	1,292	1,552	1,333	1,249	1,053
25%	994	986	1,435	1,418	1,780	1,742	1,455	1,134	3,075	2,618	1,801	1,614	1,467
50%	1,539	2,130	2,031	1,780	3,598	2,804	2,519	2,387	4,269	3,124	2,625	1,792	1,993
75%	1,540	3,096	2,616	5,282	7,071	5,202	4,353	4,162	5,668	3,696	4,630	1,793	3,249
90%	1,542	4,685	8,851	8,963	11,678	9,175	7,003	7,809	8,016	4,285	4,964	2,258	4,263
100%	3,754	19,533	23,626	28,339	30,926	16,938	15,165	11,887	15,368	6,425	6,645	4,738	6,270
Mean	1,386	2,737	3,585	4,112	5,144	4,151	3,321	3,264	4,621	3,059	2,989	1,830	2,419
2008-2009 BiOps													
0%	280	391	461	322	328	298	348	384	427	458	438	128	407
10%	970	646	812	829	990	1,392	1,479	1,485	1,672	1,643	1,799	1,545	1,218
25%	1,528	1,715	1,874	1,690	1,469	1,770	1,783	1,790	2,273	1,813	1,800	1,575	1,406
50%	1,540	1,957	2,028	1,770	3,149	2,750	2,311	2,323	3,943	3,088	2,426	1,576	1,952
75%	1,541	3,137	2,867	4,989	7,071	5,202	4,353	4,162	5,686	3,596	4,606	1,989	3,503
90%	1,542	4,054	8,851	8,963	11,679	9,119	6,966	7,809	8,016	4,351	4,962	3,826	4,180
100%	4,408	19,746	21,861	28,339	30,926	16,938	15,165	11,887	15,368	6,425	6,644	8,068	6,269
Mean	1,522	2,752	3,595	4,016	4,898	4,134	3,363	3,405	4,488	2,944	3,009	2,078	2,420
2019 BiOps													
0%	587	418	428	520	534	524	860	540	545	560	549	551	599
10%	676	647	645	669	1,367	971	988	995	1,762	1,409	1,471	1,250	1,080
25%	987	1,054	1,135	1,419	1,723	1,742	1,489	1,346	2,968	2,497	1,800	1,614	1,452
50%	1,539	2,302	2,029	1,869	3,597	2,822	2,352	2,871	4,226	3,025	2,338	1,792	1,993
75%	1,540	3,115	2,617	5,281	7,071	5,202	4,353	4,329	5,668	3,366	4,604	1,793	3,246
90%	1,542	4,685	8,851	8,963	11,678	9,358	7,003	7,809	8,016	3,896	4,962	2,057	4,250
100%	5,520	19,540	24,595	28,339	30,926	16,942	15,165	11,887	15,368	6,425	6,644	4,207	6,270
Mean	1,402	2,792	3,586	4,132	5,138	4,158	3,319	3,442	4,602	2,892	2,986	1,747	2,419
VA													
0%	555	391	459	521	534	525	862	541	546	560	548	549	567
10%	677	647	644	695	1,379	981	1,162	1,000	1,817	1,345	1,333	1,174	1,063
25%	994	1,054	1,435	1,419	1,782	1,749	1,494	1,350	3,101	2,262	1,714	1,613	1,437
50%	1,539	2,303	2,030	1,869	3,645	3,022	2,519	2,872	4,238	2,834	2,221	1,791	2,015
75%	1,541	3,121	3,060	5,678	7,072	5,203	4,353	4,330	5,669	3,366	4,461	1,792	3,243
90%	1,542	4,688	8,851	8,964	11,679	9,362	7,003	7,811	8,017	4,078	4,965	1,996	4,251
100%	5,018	19,547	23,313	28,340	30,929	16,945	15,165	11,888	15,370	6,426	6,646	4,095	6,270
Mean	1,403	2,807	3,590	4,179	5,177	4,223	3,387	3,490	4,622	2,785	2,882	1,745	2,424

Table G3a-19. Water Year Average of Monthly Flows (cfs) — American River below Folsom Reservoir (SWRCB Folsom)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	1,309	1,512	1,246	1,302	1,358	959	1,672	1,246	1,958	1,191	1,343	1,149
D	1,241	2,235	1,910	1,348	2,448	2,559	1,735	1,586	3,506	2,990	2,326	1,585
BN	1,383	2,437	2,454	2,203	4,328	2,916	3,093	2,570	3,985	3,506	2,812	1,826
AN	1,333	3,421	3,070	5,248	6,577	6,269	3,270	3,437	4,439	3,410	3,073	2,647
W	1,559	3,660	7,000	8,361	9,077	6,898	5,554	5,950	7,347	3,691	4,439	2,031
All	1,386	2,737	3,585	4,112	5,144	4,151	3,321	3,264	4,621	3,059	2,989	1,830
2008-2009 BiOps												
C	1,428	1,805	1,631	1,343	1,167	1,132	1,413	1,260	1,802	1,373	1,447	1,206
D	1,395	2,034	2,012	1,412	1,933	2,447	2,086	2,049	3,112	2,691	2,472	1,576
BN	1,505	2,406	2,550	2,274	3,889	2,900	3,054	2,723	3,922	3,125	2,668	1,607
AN	1,371	3,434	3,087	4,699	6,457	6,139	3,296	3,464	4,419	3,327	3,095	2,473
W	1,744	3,714	6,686	8,164	9,064	6,897	5,580	5,959	7,333	3,701	4,418	3,037
All	1,522	2,752	3,595	4,016	4,898	4,134	3,363	3,405	4,488	2,944	3,009	2,078
2019 BiOps												
C	1,290	1,569	1,243	1,270	1,296	961	1,763	1,264	1,996	1,130	1,459	1,132
D	1,268	2,282	1,848	1,356	2,459	2,588	1,652	2,113	3,385	2,728	2,251	1,538
BN	1,386	2,427	2,455	2,227	4,333	2,916	3,106	2,771	3,959	3,080	2,775	1,746
AN	1,277	3,566	3,141	5,305	6,577	6,269	3,270	3,578	4,450	3,302	3,060	2,451
W	1,625	3,721	7,022	8,401	9,077	6,898	5,554	5,954	7,366	3,669	4,451	1,931
All	1,402	2,792	3,586	4,132	5,138	4,158	3,319	3,442	4,602	2,892	2,986	1,747
VA												
C	1,297	1,556	1,250	1,352	1,405	1,043	1,893	1,270	2,002	1,172	1,285	1,168
D	1,264	2,301	1,910	1,375	2,499	2,762	1,802	2,292	3,387	2,340	2,073	1,526
BN	1,396	2,514	2,454	2,268	4,401	2,955	3,146	2,773	4,024	3,069	2,584	1,745
AN	1,315	3,587	3,185	5,393	6,578	6,310	3,313	3,615	4,499	3,159	3,029	2,408
W	1,605	3,699	6,965	8,437	9,078	6,899	5,554	5,960	7,367	3,651	4,461	1,933
All	1,403	2,807	3,590	4,179	5,177	4,223	3,387	3,490	4,622	2,785	2,882	1,745

G3a.3.1.2 American River above Confluence with Sacramento River (SWRCB American River)

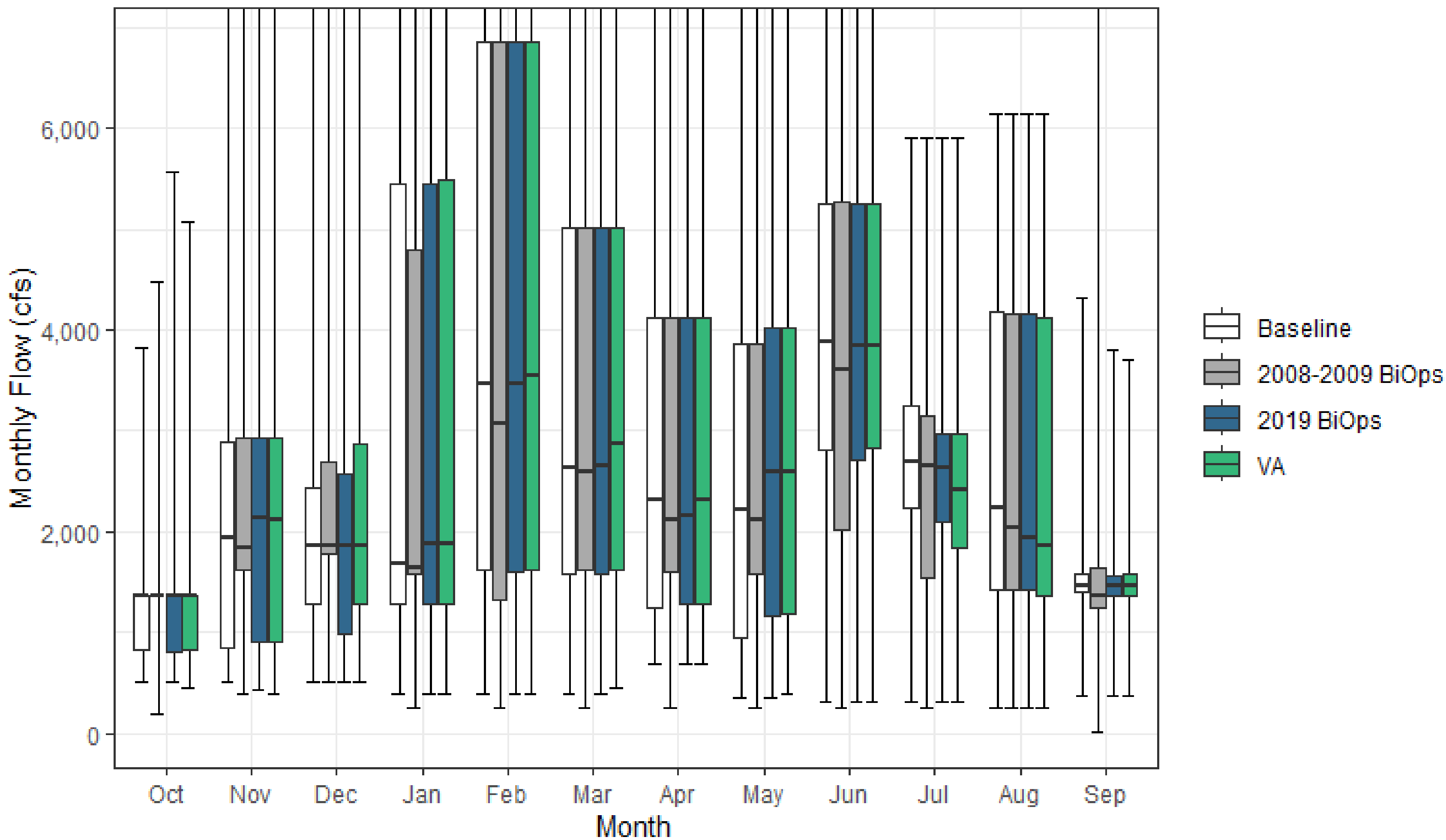

Figure G3a-4. American River above Confluence with Sacramento River (SWRCB American River) Monthly Boxplot

Table G3a-20. Cumulative Distribution of Monthly Flow (cfs) — American River above Confluence with Sacramento River (SWRCB American River)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	500	500	500	388	387	383	688	355	314	303	251	375	432
10%	503	501	528	561	1,277	831	814	807	1,056	1,166	1,028	977	917
25%	829	848	1,278	1,277	1,622	1,581	1,250	945	2,807	2,242	1,430	1,392	1,301
50%	1,365	1,934	1,865	1,680	3,471	2,637	2,321	2,209	3,877	2,686	2,244	1,457	1,819
75%	1,366	2,884	2,433	5,450	6,852	5,019	4,124	3,852	5,251	3,240	4,185	1,571	3,079
90%	1,402	4,478	8,700	9,007	11,538	8,970	6,819	7,510	7,558	3,815	4,510	1,910	4,072
100%	3,828	19,216	23,246	28,322	30,920	16,944	14,755	11,440	14,782	5,900	6,147	4,325	6,067
Mean	1,213	2,572	3,447	4,001	5,025	3,997	3,123	3,008	4,262	2,642	2,608	1,544	2,252
2008-2009 BiOps													
0%	188	396	500	250	250	250	250	250	250	250	251	9	299
10%	772	501	730	729	969	1,237	1,274	1,267	1,418	1,260	1,386	1,244	1,058
25%	1,355	1,629	1,788	1,573	1,325	1,618	1,595	1,589	2,019	1,534	1,429	1,246	1,251
50%	1,366	1,843	1,865	1,636	3,059	2,586	2,113	2,114	3,605	2,648	2,037	1,359	1,794
75%	1,366	2,924	2,693	4,796	6,852	5,019	4,124	3,852	5,269	3,143	4,161	1,647	3,327
90%	1,399	3,834	8,700	9,007	11,538	8,922	6,741	7,510	7,558	3,880	4,508	3,436	4,004
100%	4,471	19,425	21,512	28,322	30,920	16,944	14,755	11,440	14,782	5,900	6,147	7,569	6,067
Mean	1,348	2,586	3,457	3,906	4,782	3,981	3,165	3,146	4,132	2,529	2,627	1,787	2,253
2019 BiOps													
0%	500	423	500	387	387	383	689	354	315	304	252	375	482
10%	506	501	527	568	1,276	831	814	808	1,491	1,092	1,140	976	938
25%	800	903	984	1,277	1,594	1,582	1,283	1,155	2,703	2,097	1,429	1,358	1,288
50%	1,365	2,128	1,865	1,872	3,471	2,661	2,155	2,583	3,845	2,634	1,945	1,456	1,835
75%	1,366	2,920	2,566	5,450	6,852	5,019	4,124	4,014	5,251	2,977	4,160	1,571	3,064
90%	1,441	4,478	8,700	9,006	11,537	9,131	6,819	7,510	7,558	3,437	4,508	1,740	4,055
100%	5,564	19,223	24,199	28,322	30,920	16,948	14,755	11,440	14,782	5,900	6,147	3,809	6,067
Mean	1,228	2,626	3,448	4,021	5,019	4,004	3,121	3,183	4,243	2,479	2,605	1,464	2,252
VA													
0%	454	397	500	390	388	452	691	383	315	304	252	375	452
10%	503	501	528	623	1,279	862	986	825	1,545	929	1,029	936	927
25%	831	901	1,279	1,279	1,625	1,620	1,289	1,180	2,833	1,844	1,367	1,359	1,279
50%	1,367	2,121	1,865	1,873	3,551	2,872	2,322	2,585	3,848	2,407	1,866	1,457	1,858
75%	1,368	2,931	2,877	5,492	6,855	5,020	4,124	4,030	5,253	2,978	4,116	1,572	3,061
90%	1,443	4,482	8,700	9,010	11,540	9,137	6,820	7,512	7,560	3,613	4,512	1,718	4,057
100%	5,071	19,230	22,940	28,324	30,923	16,952	14,755	11,442	14,784	5,900	6,149	3,701	6,068
Mean	1,231	2,640	3,452	4,069	5,059	4,074	3,194	3,237	4,264	2,375	2,505	1,463	2,259

Table G3a-21. Water Year Average of Monthly Flows (cfs) — American River above Confluence with Sacramento River (SWRCB American River)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	1,128	1,361	1,130	1,178	1,262	838	1,486	1,045	1,676	886	1,034	923
D	1,074	2,072	1,797	1,230	2,326	2,411	1,555	1,379	3,191	2,571	1,976	1,345
BN	1,222	2,256	2,303	2,082	4,229	2,767	2,901	2,322	3,641	3,071	2,439	1,556
AN	1,162	3,254	2,933	5,200	6,478	6,092	3,067	3,171	4,078	2,963	2,676	2,308
W	1,379	3,494	6,840	8,241	8,927	6,729	5,337	5,627	6,906	3,238	3,999	1,692
All	1,213	2,572	3,447	4,001	5,025	3,997	3,123	3,008	4,262	2,642	2,608	1,544
2008-2009 BiOps												
C	1,244	1,649	1,508	1,219	1,073	1,009	1,235	1,058	1,525	1,059	1,133	983
D	1,226	1,876	1,897	1,293	1,817	2,301	1,900	1,834	2,804	2,280	2,118	1,337
BN	1,341	2,226	2,396	2,152	3,796	2,751	2,863	2,473	3,579	2,700	2,298	1,342
AN	1,203	3,270	2,950	4,658	6,359	5,964	3,092	3,198	4,058	2,882	2,698	2,139
W	1,560	3,547	6,532	8,047	8,915	6,729	5,363	5,636	6,891	3,248	3,978	2,673
All	1,348	2,586	3,457	3,906	4,782	3,981	3,165	3,146	4,132	2,529	2,627	1,787
2019 BiOps												
C	1,109	1,417	1,127	1,147	1,201	840	1,573	1,062	1,712	828	1,144	908
D	1,100	2,118	1,736	1,237	2,336	2,440	1,473	1,897	3,073	2,317	1,903	1,301
BN	1,225	2,246	2,303	2,106	4,234	2,767	2,913	2,521	3,615	2,656	2,403	1,477
AN	1,107	3,399	3,003	5,256	6,478	6,092	3,067	3,310	4,089	2,858	2,664	2,117
W	1,443	3,554	6,861	8,281	8,926	6,729	5,337	5,631	6,924	3,217	4,010	1,596
All	1,228	2,626	3,448	4,021	5,019	4,004	3,121	3,183	4,243	2,479	2,605	1,464
VA												
C	1,117	1,404	1,135	1,229	1,309	928	1,707	1,078	1,719	868	980	943
D	1,097	2,137	1,798	1,258	2,377	2,626	1,639	2,094	3,075	1,939	1,731	1,290
BN	1,235	2,331	2,303	2,148	4,302	2,807	2,953	2,522	3,680	2,646	2,218	1,478
AN	1,148	3,420	3,047	5,345	6,480	6,135	3,110	3,346	4,138	2,718	2,635	2,077
W	1,424	3,533	6,805	8,317	8,929	6,731	5,338	5,638	6,926	3,199	4,021	1,598
All	1,231	2,640	3,452	4,069	5,059	4,074	3,194	3,237	4,264	2,375	2,505	1,463

G3a.3.1.3 Bear River below Camp Far West Reservoir (SWRCB Camp Far West)

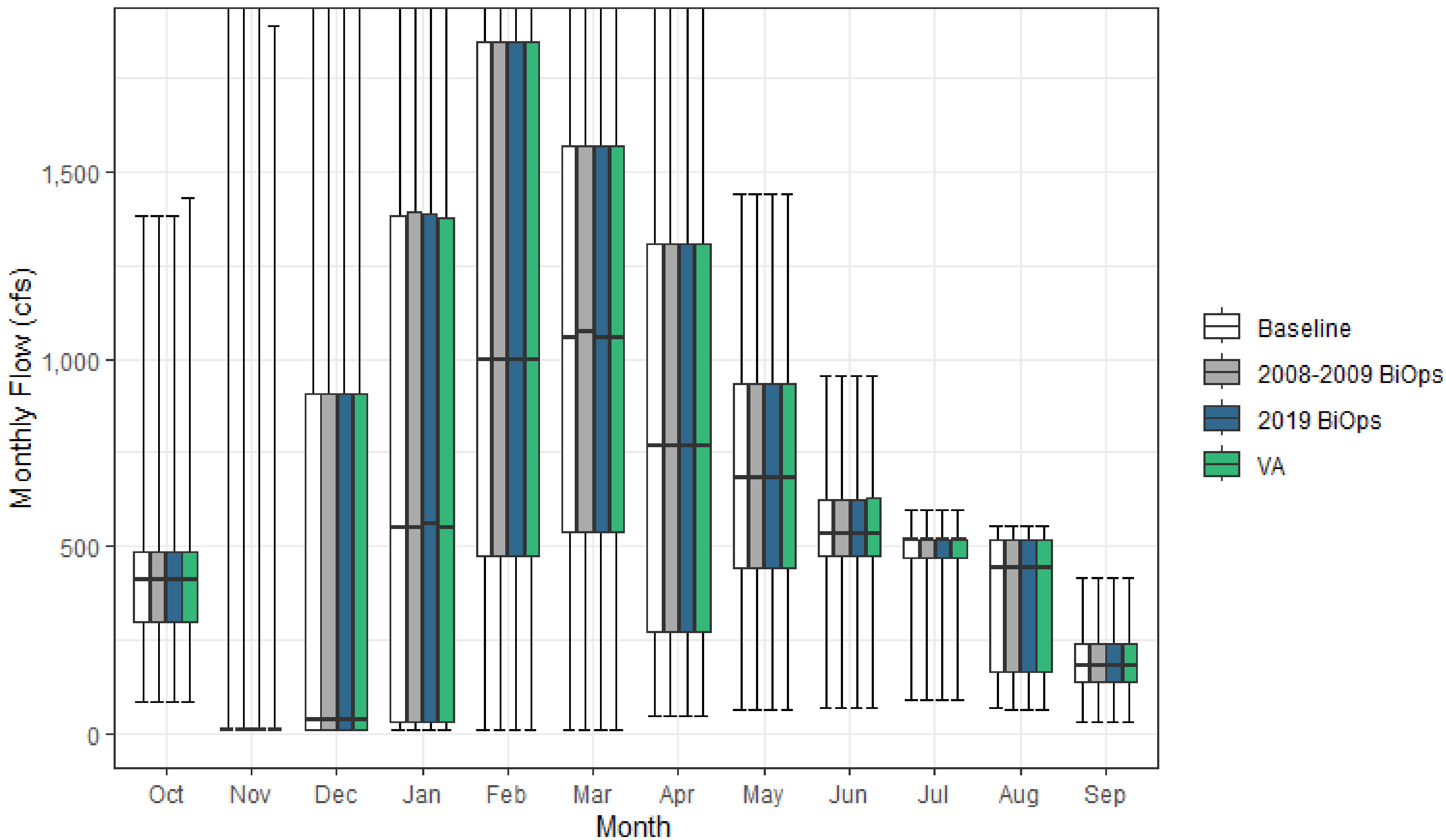

Figure G3a-5. Bear River below Camp Far West Reservoir (SWRCB Camp Far West) Monthly Boxplot

Table G3a-22. Cumulative Distribution of Monthly Flow (cfs) — Bear River below Camp Far West Reservoir (SWRCB Camp Far West)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	81	10	10	10	10	10	44	63	68	87	66	31	32
10%	222	10	10	10	63	238	135	317	329	286	119	108	150
25%	296	10	10	30	476	537	269	443	474	470	163	139	231
50%	411	10	34	551	999	1,056	767	685	530	515	442	183	392
75%	484	10	905	1,383	1,847	1,569	1,310	933	624	515	515	239	709
90%	515	350	2,314	2,697	2,894	2,594	1,813	1,125	767	534	515	267	834
100%	1,385	2,024	3,876	4,605	6,330	4,155	3,722	1,440	957	596	552	416	1,130
Mean	390	122	615	973	1,296	1,188	900	713	541	464	368	188	467
2008-2009 BiOps													
0%	81	10	10	10	10	10	44	63	68	87	61	31	33
10%	222	10	10	10	54	238	135	317	329	286	119	108	150
25%	296	10	10	30	476	537	269	443	474	470	163	139	231
50%	411	10	34	551	999	1,071	767	685	530	515	442	183	392
75%	484	10	905	1,393	1,847	1,569	1,310	933	624	515	515	239	709
90%	515	350	2,315	2,698	2,885	2,594	1,821	1,125	767	534	515	267	833
100%	1,385	2,024	3,875	4,605	6,342	4,155	3,763	1,440	957	596	552	416	1,132
Mean	391	122	616	972	1,296	1,189	901	713	541	464	368	188	467
2019 BiOps													
0%	81	10	10	10	10	10	44	63	68	87	62	31	33
10%	222	10	10	10	54	238	135	317	329	286	119	108	150
25%	296	10	10	30	476	537	269	443	474	470	163	139	231
50%	411	10	34	562	999	1,056	767	685	530	515	442	183	393
75%	484	10	905	1,388	1,847	1,569	1,310	933	624	515	515	239	709
90%	515	350	2,314	2,702	2,885	2,591	1,813	1,125	767	534	515	267	833
100%	1,385	2,024	3,876	4,605	6,342	4,154	3,722	1,440	957	596	552	416	1,130
Mean	391	122	617	974	1,296	1,188	900	713	541	464	368	188	467
VA													
0%	81	10	10	10	10	10	44	63	68	87	62	31	33
10%	222	10	10	10	54	238	135	317	329	286	117	108	150
25%	296	10	10	30	476	537	269	443	474	471	163	139	231
50%	411	10	34	551	999	1,056	767	685	530	515	442	183	392
75%	484	10	905	1,380	1,847	1,569	1,309	933	629	515	515	239	709
90%	515	350	2,314	2,710	2,885	2,591	1,821	1,110	767	534	515	267	834
100%	1,430	1,891	3,875	4,605	6,330	4,140	3,763	1,440	957	596	552	416	1,132
Mean	391	121	617	974	1,296	1,188	902	714	541	464	368	188	467

Table G3a-23. Water Year Average of Monthly Flows (cfs) — Bear River below Camp Far West Reservoir (SWRCB Camp Far West)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	325	38	37	66	252	268	159	328	346	356	173	118
D	364	41	195	239	615	793	464	541	475	425	275	158
BN	386	20	331	448	1,109	914	875	702	552	482	399	186
AN	373	187	466	1,474	1,788	1,652	1,026	867	605	515	435	199
W	455	263	1,475	2,113	2,268	1,946	1,585	990	661	519	495	243
All	390	122	615	973	1,296	1,188	900	713	541	464	368	188
2008-2009 BiOps												
C	327	39	37	66	250	268	159	328	346	356	172	118
D	364	41	196	239	614	793	464	541	475	425	275	158
BN	386	20	331	445	1,109	915	875	702	552	482	399	186
AN	373	187	466	1,475	1,789	1,652	1,026	867	605	515	435	199
W	455	263	1,478	2,113	2,268	1,946	1,587	990	661	519	495	243
All	391	122	616	972	1,296	1,189	901	713	541	464	368	188
2019 BiOps												
C	327	38	37	67	250	268	159	328	346	356	172	118
D	364	42	196	240	614	794	464	541	475	425	275	158
BN	386	20	330	450	1,109	914	875	702	552	482	399	186
AN	373	187	467	1,475	1,787	1,648	1,026	867	605	515	435	199
W	455	262	1,480	2,114	2,270	1,946	1,584	990	661	519	495	243
All	391	122	617	974	1,296	1,188	900	713	541	464	368	188
VA												
C	327	38	37	66	253	268	159	328	346	356	172	118
D	364	42	196	239	614	794	464	541	475	425	275	158
BN	386	20	331	450	1,109	914	875	703	552	482	399	186
AN	373	176	468	1,474	1,789	1,648	1,027	865	605	515	435	199
W	456	262	1,480	2,114	2,269	1,946	1,593	992	661	519	495	243
All	391	121	617	974	1,296	1,188	902	714	541	464	368	188

G3a.3.1.4 Bear River above Confluence with Feather River (SWRCB Bear River)

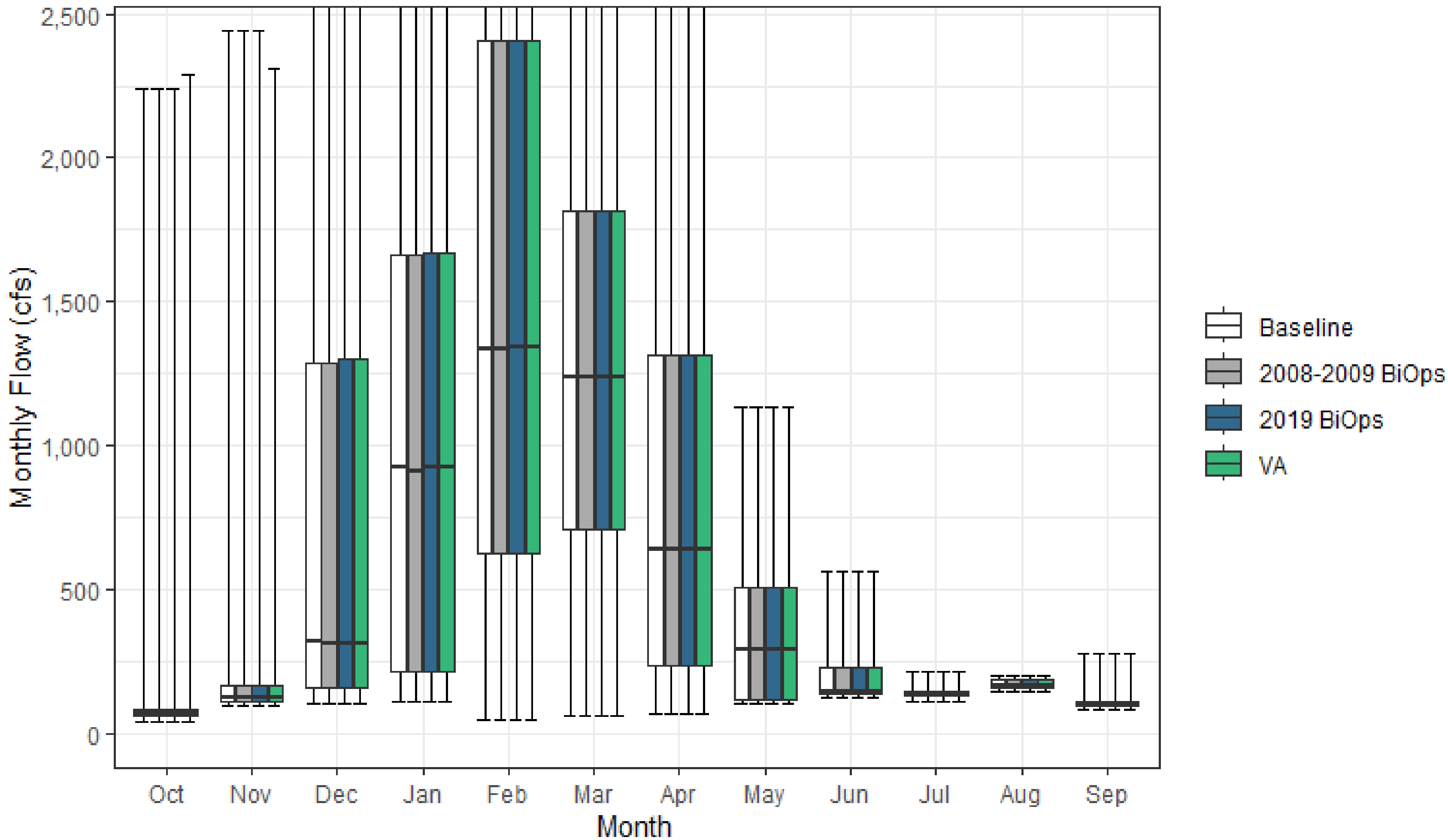

Figure G3a-6. Bear River above Confluence with Feather River (SWRCB Bear River) Monthly Boxplot

Table G3a-24. Cumulative Distribution of Monthly Flow (cfs) — Bear River above Confluence with Feather River (SWRCB Bear River)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	42	94	99	108	47	62	70	102	120	111	142	79	74
10%	52	101	119	157	258	317	104	108	128	123	148	93	136
25%	59	108	155	212	628	709	235	120	137	127	156	96	220
50%	67	123	315	921	1,331	1,237	639	290	147	134	163	104	363
75%	81	165	1,289	1,659	2,407	1,819	1,316	508	227	142	188	111	703
90%	107	491	2,842	3,508	3,700	3,067	1,907	765	372	145	194	119	868
100%	2,242	2,439	4,566	6,016	7,649	5,445	4,271	1,135	563	214	201	277	1,210
Mean	97	255	896	1,323	1,699	1,444	902	362	198	135	169	106	454
2008-2009 BiOps													
0%	42	94	99	108	47	62	70	102	120	111	142	79	74
10%	52	101	119	157	258	317	104	108	128	123	148	93	135
25%	59	108	155	212	628	708	235	120	137	127	156	96	220
50%	67	123	314	908	1,338	1,237	639	290	147	134	163	104	363
75%	81	165	1,289	1,659	2,407	1,819	1,316	508	227	142	188	111	707
90%	107	490	2,843	3,508	3,700	3,067	1,914	765	372	145	194	119	868
100%	2,242	2,439	4,566	6,016	7,660	5,445	4,310	1,135	563	214	201	277	1,212
Mean	97	255	897	1,322	1,699	1,445	902	362	198	135	169	106	454
2019 BiOps													
0%	42	94	99	108	47	62	70	102	120	111	142	79	74
10%	52	101	119	157	258	317	104	108	128	123	148	93	135
25%	59	108	155	212	628	708	235	120	137	127	156	96	220
50%	67	123	315	921	1,343	1,237	639	290	147	134	163	104	363
75%	81	165	1,302	1,672	2,407	1,819	1,316	508	227	142	188	111	708
90%	107	492	2,842	3,518	3,700	3,055	1,907	765	372	145	194	119	868
100%	2,242	2,439	4,566	6,016	7,660	5,445	4,271	1,135	563	214	201	277	1,210
Mean	97	255	898	1,324	1,699	1,444	901	362	198	135	169	106	454
VA													
0%	42	94	99	108	47	62	70	102	120	111	142	79	74
10%	52	101	119	157	258	317	104	108	128	123	148	93	136
25%	59	108	155	212	628	708	235	120	137	127	156	96	220
50%	67	123	315	921	1,343	1,237	639	290	147	134	163	104	363
75%	81	165	1,301	1,672	2,407	1,819	1,316	508	227	142	188	111	708
90%	107	491	2,843	3,521	3,700	3,055	1,914	743	372	145	194	119	868
100%	2,286	2,311	4,566	6,016	7,649	5,431	4,310	1,135	563	213	201	277	1,212
Mean	98	254	898	1,324	1,699	1,444	904	362	198	135	169	106	455

Table G3a-25. Water Year Average of Monthly Flows (cfs) — Bear River above Confluence with Feather River (SWRCB Bear River)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	67	139	222	244	439	393	136	112	135	142	186	109
D	71	161	418	428	853	984	440	209	147	144	193	117
BN	70	137	529	691	1,521	1,100	854	313	175	128	157	99
AN	73	330	712	1,981	2,362	1,962	1,004	473	213	130	152	98
W	161	428	1,918	2,674	2,831	2,339	1,643	592	279	132	157	103
All	97	255	896	1,323	1,699	1,444	902	362	198	135	169	106
2008-2009 BiOps												
C	67	139	222	244	437	393	136	112	135	142	186	109
D	71	161	418	428	852	984	440	209	147	144	193	117
BN	70	137	529	688	1,522	1,101	854	313	175	128	157	99
AN	73	330	712	1,982	2,363	1,962	1,004	472	213	130	152	98
W	161	428	1,921	2,673	2,832	2,340	1,645	592	279	132	157	103
All	97	255	897	1,322	1,699	1,445	902	362	198	135	169	106
2019 BiOps												
C	67	139	223	244	437	393	136	112	135	142	186	109
D	71	161	419	429	852	985	440	209	147	144	193	117
BN	70	137	529	692	1,522	1,100	854	313	175	128	157	99
AN	73	330	714	1,983	2,361	1,958	1,004	473	213	130	152	98
W	161	428	1,923	2,675	2,833	2,339	1,642	592	279	132	157	103
All	97	255	898	1,324	1,699	1,444	901	362	198	135	169	106
VA												
C	67	139	222	244	440	393	136	112	135	142	186	109
D	71	162	419	428	852	985	440	210	147	144	193	117
BN	70	137	529	693	1,521	1,100	854	313	175	128	157	99
AN	73	319	714	1,982	2,363	1,958	1,005	471	213	130	152	98
W	162	427	1,922	2,674	2,832	2,339	1,650	593	279	132	157	103
All	98	254	898	1,324	1,699	1,444	904	362	198	135	169	106

G3a.3.1.5 Butte Creek above Butte Slough (SWRCB Butte Creek)

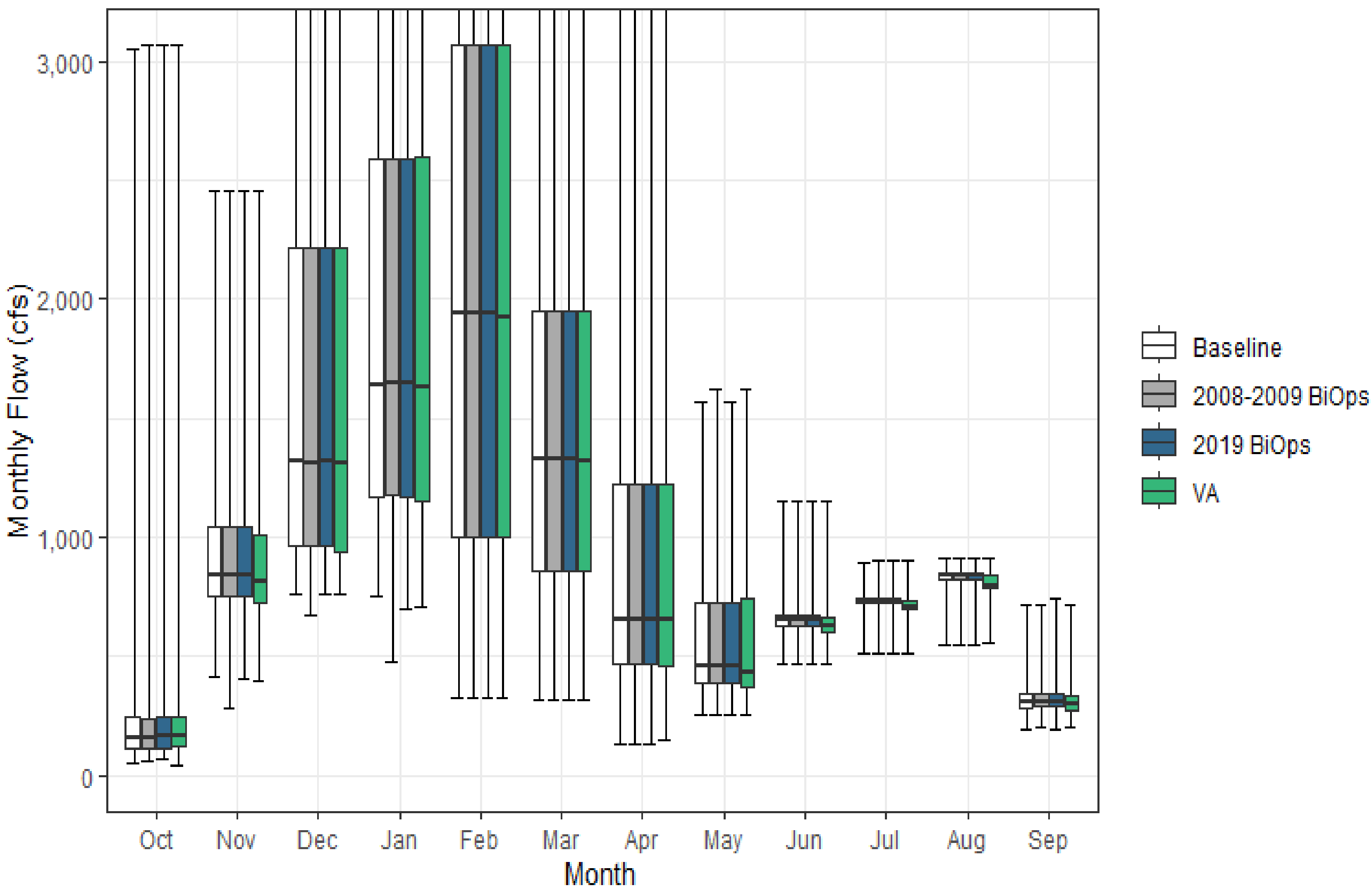

Figure G3a-7. Butte Creek above Butte Slough (SWRCB Butte Creek) Monthly Boxplot

Table G3a-26. Cumulative Distribution of Monthly Flow (cfs) — Butte Creek above Butte Slough (SWRCB Butte Creek)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	54	413	758	754	326	317	130	256	468	510	552	196	327
10%	94	696	836	913	579	533	325	363	601	659	756	253	502
25%	115	749	969	1,171	998	855	464	391	631	729	826	285	576
50%	161	839	1,316	1,643	1,944	1,328	657	456	652	736	837	309	704
75%	248	1,048	2,212	2,587	3,067	1,948	1,222	721	670	745	848	345	955
90%	358	1,244	3,232	3,781	4,598	2,944	1,755	1,059	784	769	858	367	1,121
100%	3,048	2,458	5,257	7,888	8,408	6,622	3,531	1,568	1,152	895	909	717	1,526
Mean	227	928	1,733	2,088	2,301	1,589	896	588	671	727	820	322	774
2008-2009 BiOps													
0%	59	285	676	480	326	317	130	256	468	510	552	199	327
10%	95	696	836	913	553	533	325	363	602	658	757	255	505
25%	109	752	969	1,178	998	855	464	392	631	728	825	288	575
50%	161	839	1,315	1,646	1,944	1,329	657	456	652	736	837	308	705
75%	237	1,048	2,212	2,587	3,067	1,948	1,222	721	670	745	847	347	955
90%	347	1,279	3,232	3,781	4,598	2,958	1,755	1,059	787	769	858	369	1,123
100%	3,070	2,458	5,257	7,888	8,370	6,622	3,531	1,620	1,152	903	909	719	1,526
Mean	224	925	1,731	2,084	2,298	1,586	898	590	672	728	820	322	774
2019 BiOps													
0%	65	409	758	702	326	317	130	256	468	510	552	196	327
10%	95	696	836	913	579	534	325	363	601	659	756	270	503
25%	115	752	969	1,171	998	855	464	389	631	729	825	290	578
50%	164	844	1,315	1,647	1,944	1,328	657	456	652	736	837	309	704
75%	248	1,048	2,212	2,591	3,067	1,948	1,223	721	670	745	849	345	956
90%	358	1,244	3,239	3,781	4,598	2,969	1,755	1,059	784	774	858	369	1,123
100%	3,070	2,458	5,257	7,889	8,370	6,622	3,531	1,568	1,152	903	909	738	1,526
Mean	229	926	1,733	2,088	2,300	1,590	896	587	671	729	820	323	775
VA													
0%	45	399	758	705	326	317	146	256	468	510	552	201	328
10%	94	664	806	898	575	531	326	356	589	658	756	251	488
25%	123	729	941	1,149	998	855	459	374	605	699	788	277	564
50%	167	815	1,308	1,632	1,923	1,323	653	433	627	709	798	301	698
75%	249	1,008	2,212	2,593	3,067	1,948	1,223	740	665	736	837	337	956
90%	353	1,210	3,229	3,781	4,571	2,955	1,727	1,044	784	769	857	364	1,120
100%	3,065	2,458	5,260	7,888	8,408	6,659	3,551	1,620	1,152	903	909	719	1,528
Mean	230	909	1,717	2,075	2,291	1,587	892	579	653	713	799	313	767

Table G3a-27. Water Year Average of Monthly Flows (cfs) — Butte Creek above Butte Slough (SWRCB Butte Creek)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	140	738	1,214	1,214	1,158	904	319	347	563	622	707	243
D	163	858	1,432	1,223	1,455	1,244	594	429	642	734	832	344
BN	193	846	1,333	1,715	2,270	1,267	893	538	668	740	837	319
AN	203	881	1,549	2,703	3,084	1,874	1,011	677	669	736	839	353
W	353	1,152	2,557	3,168	3,231	2,287	1,385	828	753	767	854	335
All	227	928	1,733	2,088	2,301	1,589	896	588	671	727	820	322
2008-2009 BiOps												
C	137	717	1,204	1,190	1,148	891	318	346	563	621	707	240
D	159	863	1,433	1,223	1,455	1,244	595	430	642	734	832	345
BN	193	849	1,333	1,715	2,270	1,267	893	540	668	739	837	317
AN	210	868	1,548	2,700	3,085	1,876	1,014	676	669	736	838	353
W	345	1,153	2,557	3,168	3,227	2,286	1,390	834	757	772	854	340
All	224	925	1,731	2,084	2,298	1,586	898	590	672	728	820	322
2019 BiOps												
C	145	731	1,214	1,212	1,153	904	316	346	563	621	706	242
D	161	865	1,434	1,223	1,455	1,245	595	429	642	734	832	347
BN	199	839	1,332	1,717	2,270	1,270	891	538	668	738	837	316
AN	209	875	1,551	2,703	3,087	1,877	1,014	675	669	739	839	353
W	354	1,152	2,558	3,169	3,229	2,287	1,384	828	753	772	854	340
All	229	926	1,733	2,088	2,300	1,590	896	587	671	729	820	323
VA												
C	150	737	1,215	1,213	1,156	905	318	346	563	622	707	244
D	161	823	1,408	1,195	1,445	1,239	590	408	611	704	794	332
BN	197	808	1,289	1,693	2,248	1,265	884	517	636	709	798	296
AN	202	850	1,529	2,682	3,057	1,872	997	655	637	710	797	332
W	357	1,152	2,558	3,167	3,230	2,287	1,388	838	751	773	853	340
All	230	909	1,717	2,075	2,291	1,587	892	579	653	713	799	313

G3a.3.1.6 Clear Creek above Confluence with Sacramento River (SWRCB Clear Creek)

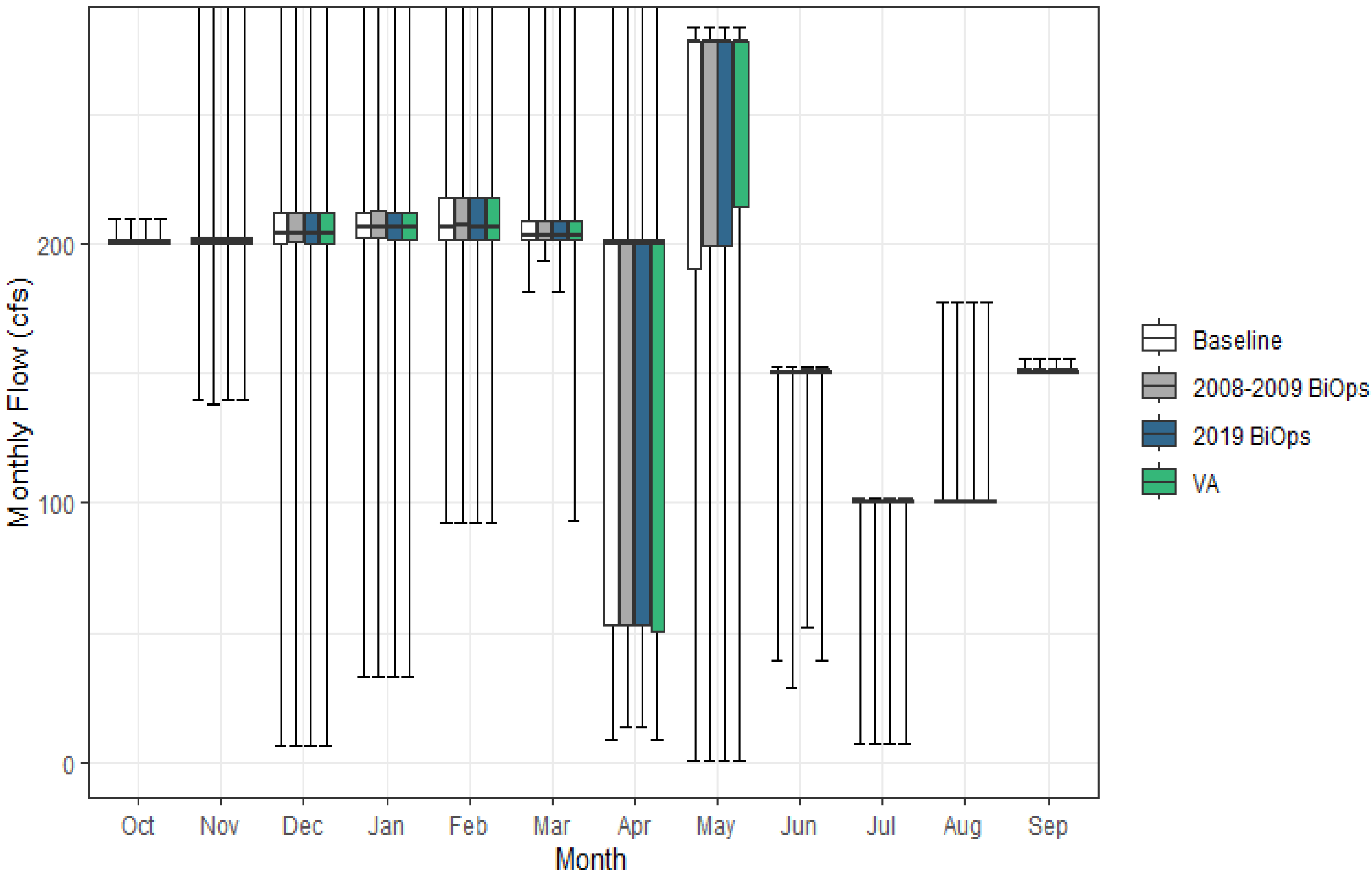

Figure G3a-8. Clear Creek above Confluence with Sacramento River (SWRCB Clear Creek) Monthly Boxplot

Table G3a-28. Cumulative Distribution of Monthly Flow (cfs) — Clear Creek above Confluence with Sacramento River (SWRCB Clear Creek)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	200	139	6	33	92	181	9	1	39	7	100	150	88
10%	200	199	103	200	200	200	30	20	89	100	100	150	104
25%	200	200	200	202	202	201	53	190	150	101	101	150	118
50%	201	201	204	206	206	203	200	278	150	101	101	151	129
75%	201	202	212	212	218	209	202	278	151	101	101	151	140
90%	203	205	224	289	355	292	217	278	151	101	101	152	150
100%	209	293	354	651	1,572	1,342	406	284	153	102	178	156	228
Mean	201	200	194	224	256	234	145	219	140	99	101	151	130
2008-2009 BiOps													
0%	200	138	6	33	92	193	13	1	29	7	100	150	81
10%	200	190	89	200	200	201	30	26	89	100	100	150	104
25%	200	200	200	202	202	201	53	199	150	101	100	150	118
50%	201	201	204	206	207	203	200	278	151	101	101	151	129
75%	202	202	212	213	218	209	202	278	151	101	101	151	140
90%	203	205	224	289	355	292	217	278	151	101	101	151	150
100%	209	293	354	650	1,572	1,342	406	284	153	102	178	156	228
Mean	201	199	192	223	257	235	146	223	139	99	101	151	130
2019 BiOps													
0%	200	139	6	33	92	181	13	1	52	7	100	150	81
10%	200	197	99	200	200	200	30	26	97	100	100	150	104
25%	200	200	200	202	202	201	53	199	150	101	101	150	118
50%	201	201	204	206	207	203	200	278	151	101	101	151	128
75%	202	202	212	212	218	209	202	278	151	101	101	151	140
90%	203	205	224	289	355	292	217	278	151	101	101	151	150
100%	209	293	354	651	1,572	1,342	406	284	153	102	178	156	228
Mean	201	199	193	223	256	234	142	222	142	99	101	151	130
VA													
0%	200	139	6	33	92	93	9	1	39	7	100	150	81
10%	200	198	105	200	200	201	29	26	103	100	100	150	104
25%	200	200	200	202	202	201	51	214	150	101	101	150	119
50%	201	201	204	206	207	203	200	278	151	101	101	151	130
75%	201	202	212	212	218	209	202	278	151	101	101	151	141
90%	203	205	224	289	355	292	217	278	151	101	101	151	150
100%	210	293	354	651	1,572	1,342	406	284	152	102	178	156	228
Mean	201	200	195	223	256	233	142	228	142	99	101	151	131

Table G3a-29. Water Year Average of Monthly Flows (cfs) — Clear Creek above Confluence with Sacramento River (SWRCB Clear Creek)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	201	194	154	186	189	201	85	172	143	101	101	151
D	201	199	181	200	215	210	79	178	147	101	101	151
BN	201	195	170	202	219	203	139	209	127	96	101	151
AN	201	201	212	242	265	227	191	272	142	101	101	151
W	202	206	233	270	342	293	209	259	140	97	103	151
All	201	200	194	224	256	234	145	219	140	99	101	151
2008-2009 BiOps												
C	201	189	147	179	192	202	89	188	147	101	101	151
D	201	199	181	200	215	210	79	182	144	101	101	151
BN	201	195	170	202	219	203	139	209	120	96	101	151
AN	201	201	204	242	265	227	191	272	142	101	101	151
W	202	206	233	269	342	293	210	260	140	97	103	151
All	201	199	192	223	257	235	146	223	139	99	101	151
2019 BiOps												
C	201	193	147	179	189	201	80	188	147	101	101	151
D	201	198	181	200	215	210	80	178	147	101	101	151
BN	201	195	170	202	219	203	139	214	132	96	101	151
AN	201	201	212	242	265	227	178	269	144	101	101	151
W	202	206	233	270	342	293	210	259	140	97	103	151
All	201	199	193	223	256	234	142	222	142	99	101	151
VA												
C	201	193	157	179	189	194	66	162	140	101	101	151
D	201	198	181	200	215	210	88	185	147	101	101	151
BN	201	195	170	202	219	203	139	253	143	98	101	151
AN	202	201	212	243	265	227	178	279	144	101	101	151
W	202	206	233	270	342	293	209	259	140	97	103	151
All	201	200	195	223	256	233	142	228	142	99	101	151

G3a.3.1.7 Cottonwood Creek above Confluence with Sacramento River (SWRCB Cottonwood Creek)

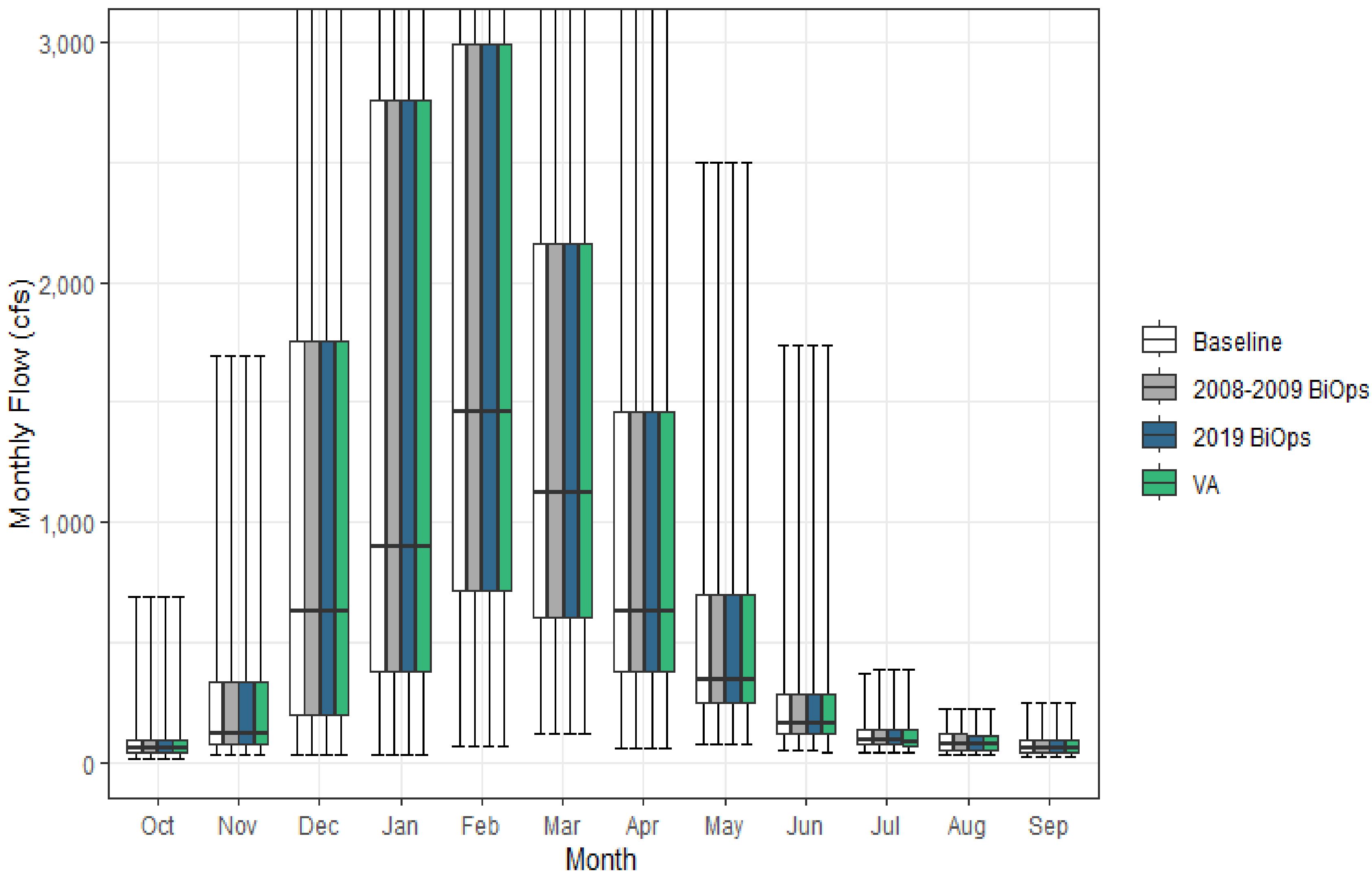

Figure G3a-9. Cottonwood Creek above Confluence with Sacramento River (SWRCB Cottonwood Creek) Monthly Boxplot

Table G3a-30. Cumulative Distribution of Monthly Flow (cfs) — Cottonwood Creek above Confluence with Sacramento River (SWRCB Cottonwood Creek)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	18	32	34	28	63	116	54	72	51	40	36	20	51
10%	32	48	82	187	320	325	237	152	80	54	45	32	157
25%	42	74	194	380	716	606	377	251	121	73	51	40	256
50%	60	122	626	899	1,462	1,123	627	345	164	89	75	54	423
75%	96	335	1,753	2,758	2,990	2,156	1,460	696	280	135	116	92	753
90%	144	684	3,303	4,296	4,764	3,506	2,141	1,013	440	186	133	102	1,049
100%	686	1,693	5,158	10,169	12,295	10,471	4,887	2,499	1,733	367	221	250	1,896
Mean	90	278	1,222	1,813	2,180	1,643	986	529	238	112	83	69	553
2008-2009 BiOps													
0%	18	32	34	28	63	116	54	73	51	40	36	20	51
10%	32	48	82	187	320	325	237	152	80	54	45	32	157
25%	41	74	194	380	716	606	377	251	121	73	51	40	256
50%	60	122	626	899	1,462	1,123	627	345	164	89	75	54	423
75%	96	335	1,753	2,758	2,990	2,156	1,460	696	280	135	115	92	753
90%	144	684	3,303	4,296	4,764	3,506	2,141	1,013	440	186	134	104	1,049
100%	686	1,693	5,158	10,169	12,295	10,471	4,887	2,499	1,733	391	221	250	1,896
Mean	90	278	1,222	1,813	2,180	1,643	986	529	238	112	83	70	553
2019 BiOps													
0%	18	32	34	28	63	116	54	72	51	40	36	20	51
10%	32	48	82	187	320	325	237	152	80	54	45	32	157
25%	42	74	194	380	716	606	377	251	121	73	51	40	256
50%	60	122	626	899	1,462	1,123	627	345	164	89	75	54	423
75%	96	335	1,753	2,758	2,990	2,156	1,460	696	280	135	111	92	753
90%	147	684	3,303	4,296	4,764	3,506	2,141	1,013	440	186	134	110	1,048
100%	686	1,693	5,158	10,169	12,295	10,471	4,887	2,499	1,733	391	221	250	1,896
Mean	91	278	1,222	1,813	2,180	1,643	986	529	238	112	83	70	553
VA													
0%	15	32	34	28	63	116	54	72	41	40	36	19	51
10%	28	48	82	187	320	325	237	151	79	57	41	32	157
25%	40	74	194	380	716	606	376	250	120	71	49	38	255
50%	60	122	626	899	1,462	1,123	626	344	162	86	72	54	422
75%	94	335	1,753	2,758	2,990	2,156	1,460	696	280	135	106	93	753
90%	147	684	3,303	4,296	4,764	3,506	2,141	1,013	440	186	130	113	1,049
100%	686	1,693	5,158	10,169	12,295	10,471	4,887	2,499	1,733	391	221	248	1,895
Mean	90	278	1,222	1,813	2,180	1,643	985	528	237	111	81	69	553

Table G3a-31. Water Year Average of Monthly Flows (cfs) — Cottonwood Creek above Confluence with Sacramento River (SWRCB Cottonwood Creek)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	68	78	466	524	782	560	268	184	104	58	54	40
D	63	249	700	639	1,263	1,045	485	276	134	73	54	58
BN	74	190	637	1,204	1,719	995	802	389	186	84	61	46
AN	113	287	1,232	2,589	2,954	2,127	1,108	810	302	141	96	91
W	122	456	2,368	3,423	3,565	2,857	1,805	868	391	174	126	99
All	90	278	1,222	1,813	2,180	1,643	986	529	238	112	83	69
2008-2009 BiOps												
C	68	78	466	524	782	560	268	184	104	58	54	40
D	63	249	700	639	1,263	1,045	485	276	134	73	54	58
BN	74	190	637	1,204	1,719	995	802	391	186	84	61	46
AN	111	287	1,232	2,589	2,954	2,127	1,108	810	302	141	99	91
W	122	456	2,368	3,423	3,565	2,857	1,805	868	392	176	128	99
All	90	278	1,222	1,813	2,180	1,643	986	529	238	112	83	70
2019 BiOps												
C	69	78	466	524	782	560	268	184	104	58	54	40
D	63	249	700	639	1,263	1,045	485	276	134	73	54	58
BN	74	190	637	1,204	1,719	995	802	389	186	84	61	46
AN	113	287	1,232	2,589	2,954	2,127	1,108	810	302	141	99	91
W	124	456	2,368	3,423	3,565	2,857	1,805	868	391	176	127	101
All	91	278	1,222	1,813	2,180	1,643	986	529	238	112	83	70
VA												
C	65	78	466	524	782	562	267	185	102	60	52	41
D	62	249	700	639	1,263	1,045	485	274	132	70	52	55
BN	73	190	638	1,204	1,719	995	802	388	184	81	59	45
AN	112	287	1,232	2,589	2,954	2,127	1,108	809	300	138	92	89
W	124	456	2,368	3,423	3,565	2,857	1,805	868	391	175	126	102
All	90	278	1,222	1,813	2,180	1,643	985	528	237	111	81	69

G3a.3.1.8 Feather River below Oroville Reservoir (SWRCB Oroville)

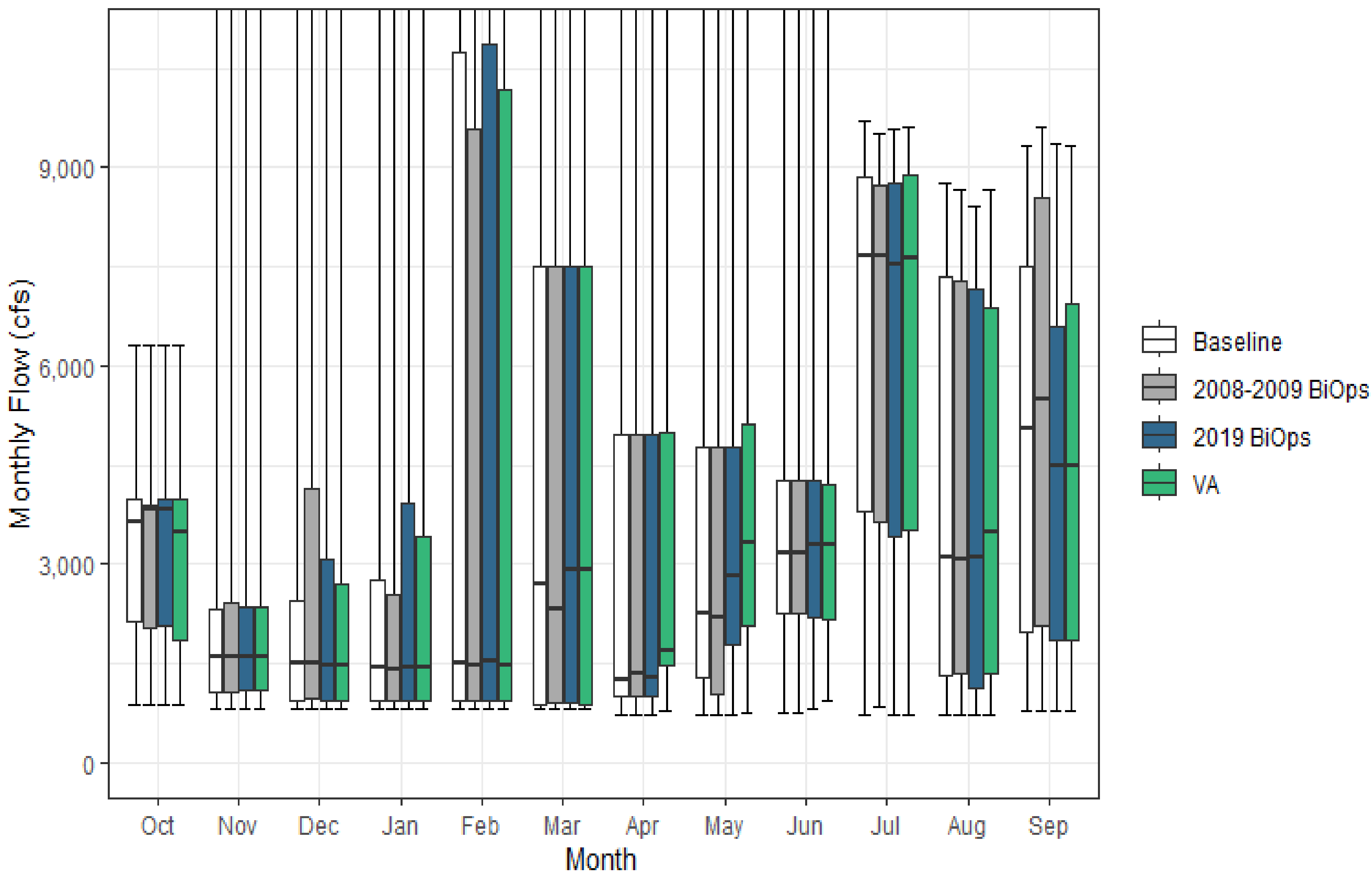

Figure G3a-10. Feather River below Oroville Reservoir (SWRCB Oroville) Monthly Boxplot

Table G3a-32. Cumulative Distribution of Monthly Flow (cfs) — Feather River below Oroville Reservoir (SWRCB Oroville)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	864	811	811	810	813	810	719	724	734	721	716	788	897
10%	1,099	831	836	834	841	820	768	981	1,309	2,463	719	1,026	1,334
25%	2,124	1,074	942	924	948	883	993	1,276	2,251	3,790	1,299	1,957	1,961
50%	3,634	1,593	1,489	1,426	1,487	2,705	1,250	2,259	3,160	7,674	3,100	5,061	2,612
75%	3,973	2,311	2,446	2,743	10,744	7,515	4,961	4,781	4,254	8,849	7,352	7,497	4,150
90%	4,586	2,402	8,664	13,528	16,882	15,868	11,161	10,159	6,831	9,168	8,054	8,769	5,584
100%	6,310	15,550	24,368	38,949	27,289	34,340	22,060	21,076	13,409	9,710	8,751	9,321	8,223
Mean	3,181	1,870	3,321	4,374	5,828	6,014	3,762	4,045	3,802	6,532	4,069	4,886	3,118
2008-2009 BiOps													
0%	864	811	811	811	813	809	717	722	734	849	716	791	877
10%	1,195	830	837	835	839	821	770	977	1,282	2,381	719	1,061	1,352
25%	2,041	1,071	950	934	945	889	996	1,028	2,250	3,630	1,338	2,066	1,818
50%	3,812	1,603	1,491	1,415	1,462	2,305	1,337	2,177	3,178	7,663	3,072	5,482	2,619
75%	3,892	2,397	4,142	2,528	9,579	7,515	4,962	4,781	4,253	8,726	7,297	8,559	4,215
90%	4,026	2,406	9,487	13,528	16,882	15,868	11,161	10,160	6,831	9,105	7,910	9,580	5,598
100%	6,310	15,550	24,368	38,949	25,134	34,340	22,060	21,076	13,409	9,514	8,662	9,623	8,232
Mean	3,113	2,048	3,379	4,226	5,567	5,900	3,772	4,020	3,792	6,393	4,095	5,401	3,119
2019 BiOps													
0%	863	811	811	811	813	812	718	724	818	716	717	789	798
10%	1,257	831	836	837	838	822	781	1,010	988	1,865	719	958	1,356
25%	2,076	1,099	942	931	945	889	1,003	1,782	2,198	3,409	1,129	1,840	1,944
50%	3,822	1,593	1,483	1,426	1,527	2,909	1,279	2,823	3,283	7,546	3,106	4,499	2,612
75%	3,994	2,360	3,057	3,906	10,868	7,515	4,962	4,781	4,254	8,769	7,162	6,580	4,124
90%	4,586	2,402	10,593	13,528	16,882	15,868	11,161	10,159	6,830	9,098	7,871	8,689	5,501
100%	6,310	15,550	24,368	38,949	27,487	34,340	22,060	21,076	13,409	9,583	8,431	9,363	8,223
Mean	3,258	1,912	3,511	4,490	5,817	6,116	3,783	4,358	3,772	6,193	4,006	4,439	3,117
VA													
0%	864	812	811	810	815	811	762	733	944	716	716	790	859
10%	996	831	836	835	838	820	1,068	1,434	1,015	2,369	719	1,009	1,326
25%	1,859	1,097	940	926	944	886	1,458	2,057	2,172	3,519	1,338	1,848	1,979
50%	3,485	1,594	1,481	1,430	1,465	2,909	1,690	3,327	3,294	7,618	3,467	4,499	2,646
75%	3,973	2,359	2,698	3,415	10,172	7,515	4,997	5,107	4,192	8,876	6,866	6,955	4,186
90%	4,586	2,402	9,751	13,528	16,521	15,868	11,164	10,160	6,830	9,307	7,918	8,484	5,511
100%	6,310	15,550	24,368	38,949	28,448	34,237	22,060	21,076	13,409	9,620	8,670	9,320	8,228
Mean	3,131	1,896	3,363	4,475	5,790	6,047	4,076	4,635	3,746	6,309	4,184	4,437	3,143

Table G3a-33. Water Year Average of Monthly Flows (cfs) — Feather River below Oroville Reservoir (SWRCB Oroville)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	2,950	1,443	1,133	1,179	1,067	1,100	1,528	1,826	3,145	4,192	2,654	1,964
D	2,955	1,555	1,554	1,165	1,707	1,471	1,007	1,840	3,435	8,159	6,249	2,764
BN	3,510	1,673	2,164	1,926	2,983	3,130	1,745	1,832	2,562	8,654	6,646	5,257
AN	2,956	1,458	2,393	3,061	7,069	7,731	2,712	3,652	2,696	7,746	4,192	8,621
W	3,370	2,632	6,918	10,543	12,664	13,067	8,701	8,400	5,655	4,757	1,576	6,216
All	3,181	1,870	3,321	4,374	5,828	6,014	3,762	4,045	3,802	6,532	4,069	4,886
2008-2009 BiOps												
C	2,996	1,387	1,613	1,244	1,009	1,045	1,521	1,856	3,150	4,169	2,668	2,287
D	2,876	1,619	1,831	1,152	1,622	1,449	1,055	1,758	3,360	7,700	6,544	2,535
BN	3,209	1,987	2,345	1,460	2,866	2,971	1,745	1,785	2,581	8,555	6,462	5,478
AN	2,725	1,674	2,865	2,690	5,952	7,424	2,746	3,627	2,726	7,627	4,069	7,883
W	3,459	2,919	6,335	10,467	12,441	12,963	8,687	8,400	5,653	4,765	1,596	8,109
All	3,113	2,048	3,379	4,226	5,567	5,900	3,772	4,020	3,792	6,393	4,095	5,401
2019 BiOps												
C	2,986	1,565	1,150	1,163	1,010	1,108	1,547	2,235	3,070	4,178	2,860	1,876
D	2,878	1,608	1,402	1,195	1,717	1,791	1,079	2,508	3,445	7,857	6,417	2,572
BN	3,715	1,691	2,469	2,022	3,036	3,240	1,746	2,380	2,593	8,585	6,137	3,516
AN	3,148	1,474	2,621	3,254	6,922	7,711	2,722	3,615	2,540	6,985	4,067	8,435
W	3,458	2,650	7,372	10,772	12,683	13,106	8,701	8,401	5,637	4,231	1,492	6,060
All	3,258	1,912	3,511	4,490	5,817	6,116	3,783	4,358	3,772	6,193	4,006	4,439
VA												
C	2,587	1,538	1,047	1,126	1,010	1,113	1,590	2,243	2,939	4,199	2,948	1,858
D	2,801	1,589	1,337	1,216	1,665	1,669	1,593	2,998	3,438	7,868	6,686	2,252
BN	3,519	1,669	2,469	2,080	2,804	3,144	2,261	2,923	2,705	8,628	6,554	4,002
AN	3,084	1,482	2,523	3,027	7,005	7,684	3,302	4,120	2,368	7,653	4,352	8,164
W	3,454	2,633	7,025	10,788	12,737	13,036	8,702	8,402	5,633	4,285	1,459	6,126
All	3,131	1,896	3,363	4,475	5,790	6,047	4,076	4,635	3,746	6,309	4,184	4,437

G3a.3.1.9 Feather River above Confluence with Sacramento River (SWRCB Feather River)

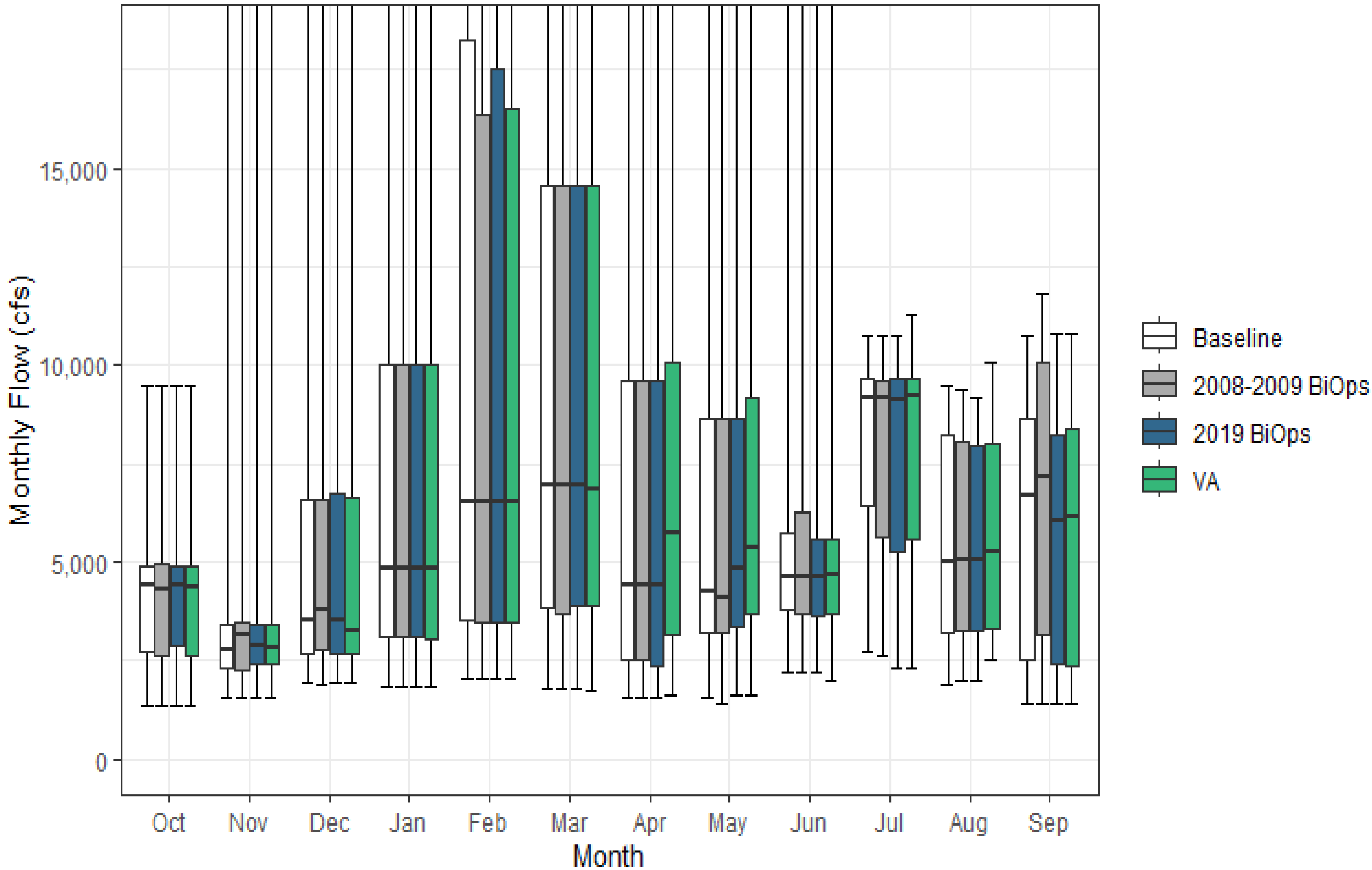

Figure G3a-11. Feather River above Confluence with Sacramento River (SWRCB Feather River) Monthly Boxplot

Table G3a-34. Cumulative Distribution of Monthly Flow (cfs) — Feather River above Confluence with Sacramento River (SWRCB Feather River)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	1,347	1,543	1,910	1,852	2,052	1,755	1,569	1,554	2,182	2,735	1,872	1,406	1,600
10%	1,822	1,871	2,106	2,471	2,984	2,820	1,983	2,427	2,879	3,720	2,985	1,968	2,161
25%	2,728	2,313	2,698	3,108	3,505	3,815	2,497	3,229	3,764	6,410	3,191	2,505	3,121
50%	4,399	2,807	3,522	4,864	6,509	6,939	4,411	4,237	4,605	9,151	5,012	6,710	4,233
75%	4,868	3,410	6,585	10,038	18,242	14,558	9,601	8,632	5,758	9,626	8,230	8,639	7,001
90%	5,702	3,809	19,339	22,604	27,057	26,986	17,413	16,042	11,212	9,990	8,946	10,384	8,903
100%	9,481	21,639	40,167	66,475	54,456	54,566	36,622	29,766	22,510	10,744	9,467	10,729	13,307
Mean	4,016	3,321	6,865	9,554	11,549	11,234	7,341	6,984	6,048	7,921	5,573	6,098	5,211
2008-2009 BiOps													
0%	1,347	1,543	1,910	1,854	2,048	1,755	1,569	1,422	2,176	2,647	2,009	1,425	1,612
10%	1,794	1,871	2,186	2,524	2,963	2,785	1,955	2,234	2,906	3,672	2,989	2,053	2,165
25%	2,633	2,272	2,767	3,094	3,485	3,671	2,525	3,210	3,704	5,626	3,253	3,125	3,081
50%	4,307	3,155	3,783	4,828	6,509	6,942	4,411	4,080	4,610	9,168	5,048	7,153	4,197
75%	4,964	3,475	6,588	10,038	16,323	14,560	9,565	8,629	6,252	9,607	8,039	10,046	7,331
90%	5,109	4,614	19,061	22,928	27,056	26,983	17,407	16,043	11,210	9,880	8,736	11,185	9,061
100%	9,480	21,636	40,167	66,499	52,148	54,566	36,626	29,772	22,510	10,769	9,363	11,797	13,309
Mean	3,953	3,487	6,919	9,418	11,304	11,127	7,352	6,957	6,040	7,788	5,598	6,596	5,213
2019 BiOps													
0%	1,348	1,543	1,910	1,856	2,052	1,755	1,569	1,637	2,187	2,297	2,003	1,432	1,609
10%	1,866	1,875	2,106	2,478	2,964	2,822	1,976	2,700	2,760	3,614	2,939	2,004	2,190
25%	2,901	2,426	2,680	3,094	3,487	3,869	2,380	3,382	3,629	5,285	3,253	2,414	3,142
50%	4,404	2,866	3,494	4,863	6,509	6,957	4,411	4,849	4,621	9,130	5,050	6,079	4,089
75%	4,870	3,410	6,728	10,038	17,524	14,556	9,598	8,630	5,587	9,619	7,967	8,228	7,123
90%	5,705	3,813	19,630	23,454	27,057	26,986	17,407	16,039	11,212	9,951	8,703	10,350	8,986
100%	9,479	21,639	40,167	66,477	54,615	54,566	36,625	29,770	22,510	10,763	9,159	10,821	13,307
Mean	4,088	3,361	7,044	9,663	11,538	11,330	7,360	7,283	6,020	7,593	5,511	5,667	5,209
VA													
0%	1,348	1,543	1,910	1,851	2,052	1,750	1,620	1,640	1,997	2,297	2,540	1,400	1,601
10%	1,699	1,869	2,105	2,473	2,966	2,761	2,245	2,983	2,744	3,623	3,054	1,911	2,114
25%	2,633	2,408	2,665	3,038	3,486	3,869	3,152	3,683	3,664	5,559	3,314	2,338	3,312
50%	4,379	2,857	3,273	4,864	6,509	6,823	5,744	5,350	4,661	9,216	5,241	6,173	4,315
75%	4,868	3,415	6,645	10,039	16,489	14,558	10,075	9,149	5,587	9,634	7,998	8,371	7,109
90%	5,705	3,553	18,117	21,268	27,055	26,982	17,410	16,046	11,213	10,016	8,827	10,004	8,963
100%	9,474	21,639	40,231	66,525	55,620	54,564	36,592	29,768	22,518	11,286	10,041	10,798	13,310
Mean	3,967	3,323	6,781	9,524	11,449	11,251	8,017	7,614	5,985	7,698	5,671	5,652	5,237

Table G3a-35. Water Year Average of Monthly Flows (cfs) — Feather River above Confluence with Sacramento River (SWRCB Feather River)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	3,471	2,506	2,596	2,922	3,032	2,796	2,249	2,561	3,593	4,520	3,202	2,479
D	3,681	2,772	3,516	3,471	4,831	4,927	2,852	3,385	4,434	8,775	7,085	3,607
BN	4,261	2,795	4,257	5,311	8,042	6,676	5,290	4,380	4,435	9,547	7,797	6,207
AN	3,660	3,187	5,620	9,757	14,341	15,044	6,873	7,155	5,041	9,378	6,083	10,120
W	4,564	4,546	13,780	20,159	22,082	21,619	14,880	13,559	9,985	7,491	4,142	8,116
All	4,016	3,321	6,865	9,554	11,549	11,234	7,341	6,984	6,048	7,921	5,573	6,098
2008-2009 BiOps												
C	3,513	2,457	3,041	2,985	2,977	2,745	2,242	2,589	3,599	4,500	3,216	2,782
D	3,607	2,832	3,774	3,459	4,753	4,905	2,898	3,305	4,363	8,332	7,372	3,387
BN	3,982	3,088	4,427	4,877	7,934	6,528	5,291	4,335	4,453	9,453	7,620	6,421
AN	3,443	3,391	6,063	9,411	13,299	14,760	6,906	7,131	5,072	9,262	5,964	9,407
W	4,648	4,815	13,234	20,094	21,871	21,520	14,874	13,555	9,982	7,498	4,161	9,947
All	3,953	3,487	6,919	9,418	11,304	11,127	7,352	6,957	6,040	7,788	5,598	6,596
2019 BiOps												
C	3,502	2,610	2,612	2,909	2,977	2,803	2,267	2,944	3,524	4,508	3,395	2,396
D	3,608	2,824	3,374	3,499	4,841	5,225	2,921	4,031	4,444	8,483	7,247	3,421
BN	4,453	2,817	4,543	5,400	8,091	6,779	5,291	4,909	4,464	9,480	7,304	4,523
AN	3,840	3,203	5,835	9,938	14,203	15,028	6,883	7,119	4,892	8,641	5,962	9,940
W	4,646	4,563	14,209	20,373	22,098	21,655	14,880	13,559	9,967	6,983	4,060	7,966
All	4,088	3,361	7,044	9,663	11,538	11,330	7,360	7,283	6,020	7,593	5,511	5,667
VA												
C	3,130	2,594	2,515	2,791	2,965	2,799	2,302	2,929	3,377	4,499	3,448	2,364
D	3,534	2,805	3,312	3,373	4,680	5,092	4,012	4,553	4,438	8,460	7,530	3,103
BN	4,266	2,795	4,471	5,255	7,725	6,665	6,581	5,648	4,496	9,501	7,658	4,979
AN	3,780	3,112	5,581	9,670	14,240	14,973	8,196	7,736	4,771	9,365	6,210	9,629
W	4,639	4,512	13,584	20,275	22,136	21,586	14,878	13,560	9,966	7,032	4,028	8,029
All	3,967	3,323	6,781	9,524	11,449	11,251	8,017	7,614	5,985	7,698	5,671	5,652

G3a.3.1.10 Mokelumne River below Camanche Reservoir (SWRCB Camanche)

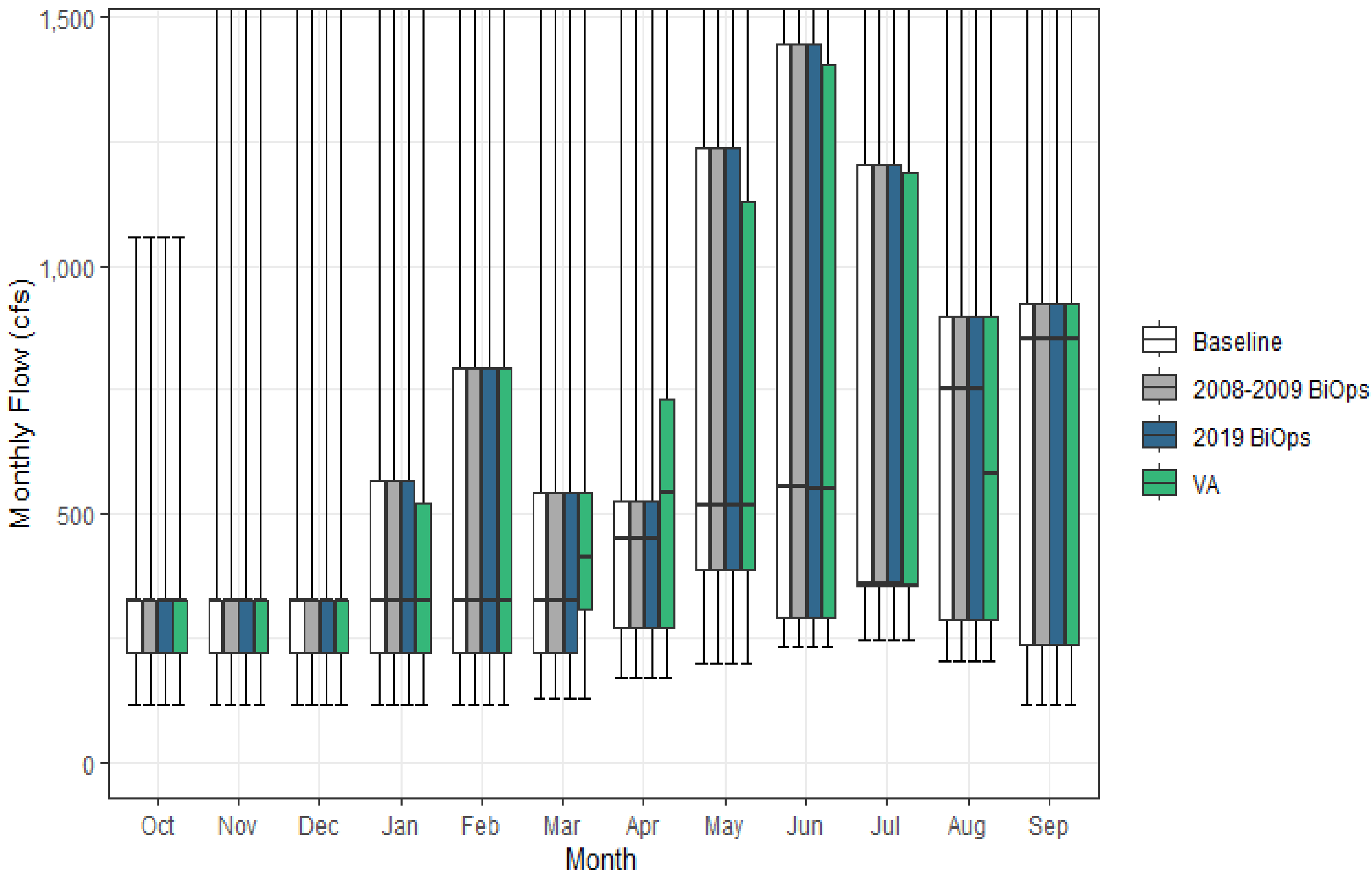

Figure G3a-12. Mokelumne River below Camanche Reservoir (SWRCB Camanche) Monthly Boxplot

Table G3a-36. Cumulative Distribution of Monthly Flow (cfs) — Mokelumne River below Camanche Reservoir (SWRCB Camanche)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	115	115	115	115	115	127	169	198	234	245	204	115	150
10%	220	220	220	220	220	220	170	198	234	286	233	190	176
25%	220	221	220	220	221	221	270	387	292	355	287	239	229
50%	326	326	326	326	326	326	450	518	553	356	751	851	356
75%	326	326	326	567	795	541	526	1,236	1,445	1,201	897	925	656
90%	326	371	1,174	1,629	1,750	1,465	1,429	2,788	2,063	1,544	1,014	1,028	974
100%	1,056	4,049	3,787	6,357	5,587	3,528	4,470	4,056	4,439	3,000	1,545	1,587	1,657
Mean	297	384	539	681	694	597	631	1,006	942	813	624	638	473
2008-2009 BiOps													
0%	115	115	115	115	115	127	169	198	234	245	204	115	150
10%	220	220	220	220	220	220	170	199	234	286	233	190	176
25%	220	221	220	220	221	221	270	387	292	355	287	239	229
50%	326	326	326	326	326	326	450	518	553	356	750	851	356
75%	326	326	326	566	792	541	526	1,236	1,445	1,201	897	925	656
90%	326	371	1,174	1,629	1,750	1,465	1,428	2,789	2,062	1,544	1,014	1,028	974
100%	1,056	4,049	3,787	6,358	5,586	3,528	4,470	4,056	4,439	3,000	1,545	1,587	1,657
Mean	297	384	539	681	694	597	631	1,006	942	813	624	638	473
2019 BiOps													
0%	115	115	115	115	115	127	169	198	234	245	204	115	150
10%	220	220	220	220	220	220	170	199	234	286	233	190	176
25%	220	221	220	221	221	221	270	387	292	355	287	239	228
50%	326	326	326	326	326	326	450	517	553	356	751	851	356
75%	326	326	326	566	793	541	526	1,236	1,445	1,201	897	925	656
90%	326	371	1,174	1,629	1,750	1,465	1,429	2,786	2,063	1,544	1,014	1,028	974
100%	1,056	4,049	3,787	6,357	5,587	3,528	4,470	4,055	4,439	3,000	1,545	1,587	1,657
Mean	297	384	539	681	694	597	631	1,006	942	813	624	638	473
VA													
0%	115	115	115	115	115	127	169	198	234	245	204	116	150
10%	220	220	220	220	220	220	170	198	234	286	233	190	178
25%	221	221	220	220	221	308	270	388	292	355	287	239	231
50%	326	326	326	326	326	413	541	517	553	356	580	851	351
75%	326	326	326	523	795	541	730	1,127	1,405	1,186	897	925	656
90%	326	371	1,174	1,629	1,750	1,465	1,429	2,789	2,062	1,544	1,014	1,028	973
100%	1,056	4,050	3,787	6,357	5,539	3,528	4,472	4,058	4,439	3,000	1,545	1,587	1,657
Mean	296	383	537	678	695	637	674	976	929	798	616	632	474

Table G3a-37. Water Year Average of Monthly Flows (cfs) — Mokelumne River below Camanche Reservoir (SWRCB Camanche)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	257	257	255	255	255	255	203	259	242	282	230	189
D	271	295	275	275	276	276	298	426	372	377	325	317
BN	303	312	377	366	437	378	443	600	740	666	582	638
AN	283	592	570	743	709	629	537	1,004	1,026	917	764	851
W	340	475	975	1,379	1,391	1,139	1,265	2,088	1,830	1,467	1,024	1,027
All	297	384	539	681	694	597	631	1,006	942	813	624	638
2008-2009 BiOps												
C	257	257	255	255	255	255	203	259	242	282	230	189
D	271	295	275	275	276	276	298	426	372	377	325	317
BN	303	312	377	366	437	378	443	600	740	667	582	637
AN	283	592	570	743	709	630	537	1,003	1,026	918	764	850
W	340	475	975	1,379	1,391	1,139	1,265	2,088	1,830	1,467	1,024	1,027
All	297	384	539	681	694	597	631	1,006	942	813	624	638
2019 BiOps												
C	257	257	255	255	255	256	203	259	242	282	230	189
D	271	295	275	275	276	276	298	426	372	377	324	317
BN	303	312	377	366	437	378	443	600	740	667	582	638
AN	283	592	570	743	709	630	537	1,003	1,026	918	764	850
W	340	475	975	1,379	1,391	1,139	1,265	2,088	1,830	1,467	1,024	1,027
All	297	384	539	681	694	597	631	1,006	942	813	624	638
VA												
C	257	257	255	255	255	270	204	259	242	282	230	189
D	271	295	275	275	276	316	319	423	371	377	314	312
BN	303	307	372	362	449	420	487	584	708	664	568	626
AN	277	592	570	729	708	661	642	943	1,008	877	750	835
W	340	472	970	1,376	1,389	1,194	1,321	2,026	1,815	1,438	1,023	1,027
All	296	383	537	678	695	637	674	976	929	798	616	632

G3a.3.1.11 Mokelumne River above Confluence with Delta (SWRCB Mokelumne River)

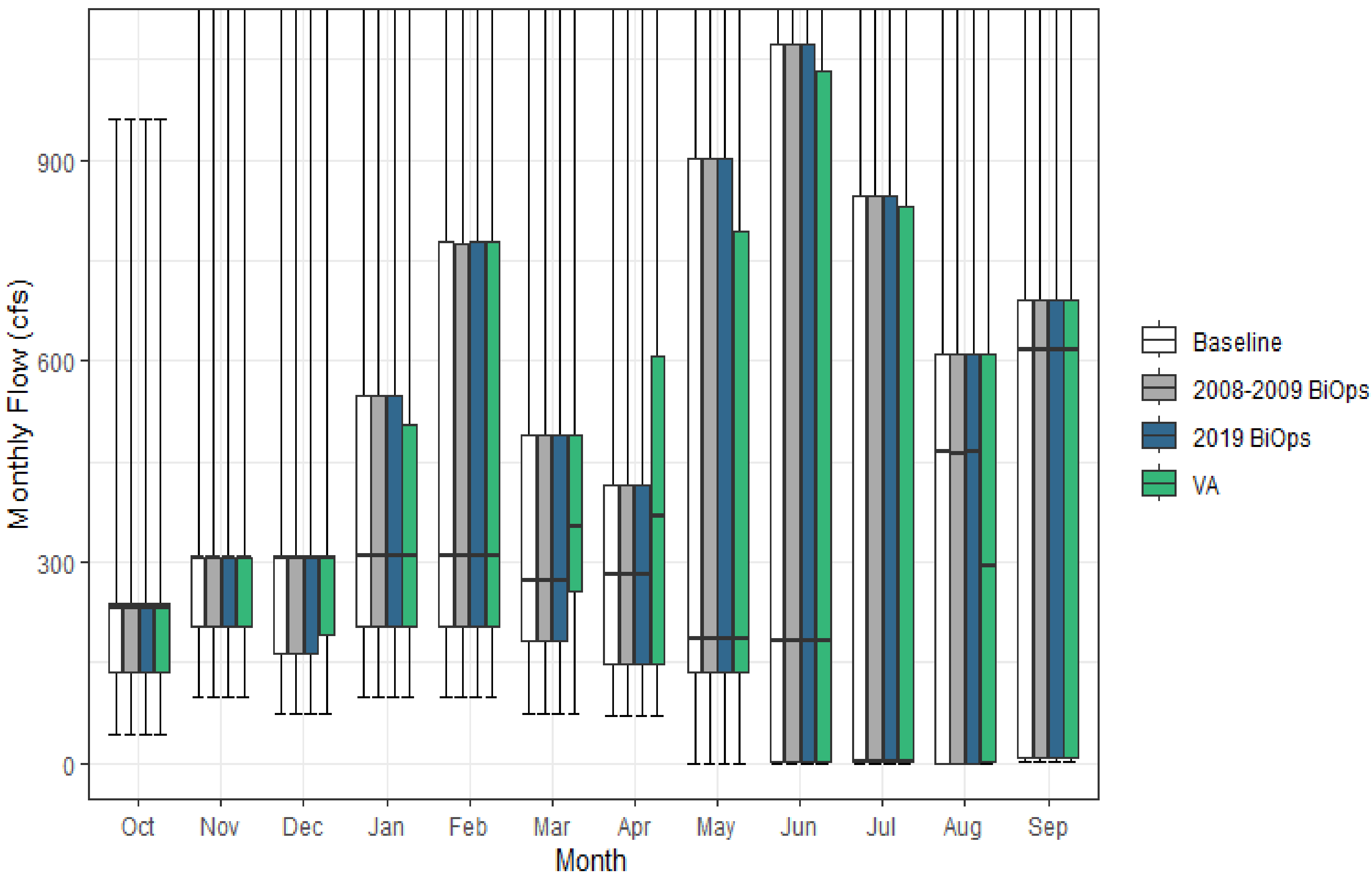

Figure G3a-13. Mokelumne River above Confluence with Delta (SWRCB Mokelumne River) Monthly Boxplot

Table G3a-38. Cumulative Distribution of Monthly Flow (cfs) — Mokelumne River above Confluence with Delta (SWRCB Mokelumne River)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	42	98	75	100	99	75	72	0	0	0	0	2	67
10%	126	200	162	165	202	168	72	1	1	0	0	7	81
25%	136	203	164	205	205	182	147	135	1	1	0	7	119
50%	231	305	307	308	308	274	280	186	182	3	464	618	244
75%	238	306	308	550	779	488	414	903	1,073	845	610	692	539
90%	261	352	1,156	1,611	1,709	1,412	1,313	2,508	1,689	1,141	727	811	855
100%	961	3,984	3,767	6,335	5,565	3,474	4,364	3,721	4,063	2,562	1,257	1,385	1,537
Mean	210	360	505	652	672	545	506	708	617	464	348	421	362
2008-2009 BiOps													
0%	42	98	75	100	99	75	72	0	0	0	0	2	67
10%	125	200	162	172	202	168	72	1	1	0	0	7	81
25%	136	203	164	205	205	182	147	135	1	1	0	7	117
50%	231	305	307	308	308	273	280	186	182	3	463	618	244
75%	238	306	308	548	776	489	414	903	1,073	845	610	692	539
90%	261	352	1,156	1,611	1,731	1,412	1,311	2,508	1,689	1,141	727	811	855
100%	961	3,984	3,767	6,337	5,565	3,434	4,365	3,720	4,063	2,562	1,257	1,385	1,533
Mean	210	360	505	657	672	544	506	708	617	464	348	421	362
2019 BiOps													
0%	42	98	75	100	99	75	72	0	0	0	0	2	66
10%	125	200	162	165	202	168	72	1	1	0	0	7	81
25%	136	203	164	205	205	182	147	135	1	1	0	8	117
50%	231	305	307	308	308	274	280	185	182	3	464	618	244
75%	238	306	308	548	777	488	414	903	1,073	845	610	692	539
90%	261	352	1,156	1,611	1,709	1,412	1,312	2,508	1,689	1,141	727	811	855
100%	961	3,984	3,767	6,335	5,566	3,474	4,364	3,720	4,063	2,562	1,257	1,385	1,537
Mean	209	361	505	653	671	545	506	707	617	464	348	421	362
VA													
0%	42	97	75	100	99	75	72	0	0	0	0	2	67
10%	126	200	162	165	202	182	72	1	1	0	0	7	82
25%	136	203	192	205	205	256	147	135	1	1	1	8	120
50%	231	305	307	308	308	354	369	185	182	3	293	618	236
75%	238	306	308	506	779	488	607	794	1,032	830	610	692	539
90%	261	352	1,156	1,611	1,691	1,412	1,312	2,508	1,689	1,141	727	811	855
100%	961	3,985	3,767	6,336	5,518	3,474	4,366	3,722	4,063	2,562	1,257	1,385	1,537
Mean	209	360	503	649	673	585	550	678	605	450	340	416	362

Table G3a-39. Water Year Average of Monthly Flows (cfs) — Mokelumne River above Confluence with Delta (SWRCB Mokelumne River)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	170	238	211	214	230	215	102	54	1	1	2	6
D	184	270	234	249	256	224	159	140	82	32	45	99
BN	217	290	338	328	419	324	303	282	405	311	295	411
AN	195	569	538	716	690	576	413	671	667	555	477	629
W	251	447	952	1,358	1,366	1,083	1,145	1,758	1,457	1,091	736	801
All	210	360	505	652	672	545	506	708	617	464	348	421
2008-2009 BiOps												
C	170	238	210	225	233	215	102	54	1	1	2	6
D	184	270	236	253	258	224	159	140	82	32	45	99
BN	217	290	340	337	419	324	303	282	406	311	295	411
AN	195	569	538	722	691	576	413	671	667	555	477	629
W	251	447	951	1,359	1,363	1,082	1,145	1,758	1,457	1,091	736	801
All	210	360	505	657	672	544	506	708	617	464	348	421
2019 BiOps												
C	170	238	211	220	230	215	102	54	1	1	2	6
D	184	270	234	247	256	224	159	140	82	32	45	99
BN	217	291	338	330	419	324	303	282	405	311	295	411
AN	195	569	538	716	690	576	413	671	667	555	477	629
W	251	449	952	1,360	1,364	1,085	1,144	1,757	1,457	1,091	737	801
All	209	361	505	653	671	545	506	707	617	464	348	421
VA												
C	170	238	214	214	233	230	104	54	1	1	2	6
D	184	270	234	249	256	264	180	137	81	32	35	94
BN	217	285	333	326	431	366	347	266	374	308	281	399
AN	189	569	542	702	686	608	518	611	656	514	462	614
W	251	447	947	1,355	1,363	1,140	1,202	1,696	1,442	1,061	735	801
All	209	360	503	649	673	585	550	678	605	450	340	416

G3a.3.1.12 Putah Creek below Lake Berryessa (SWRCB Lake Berryessa)

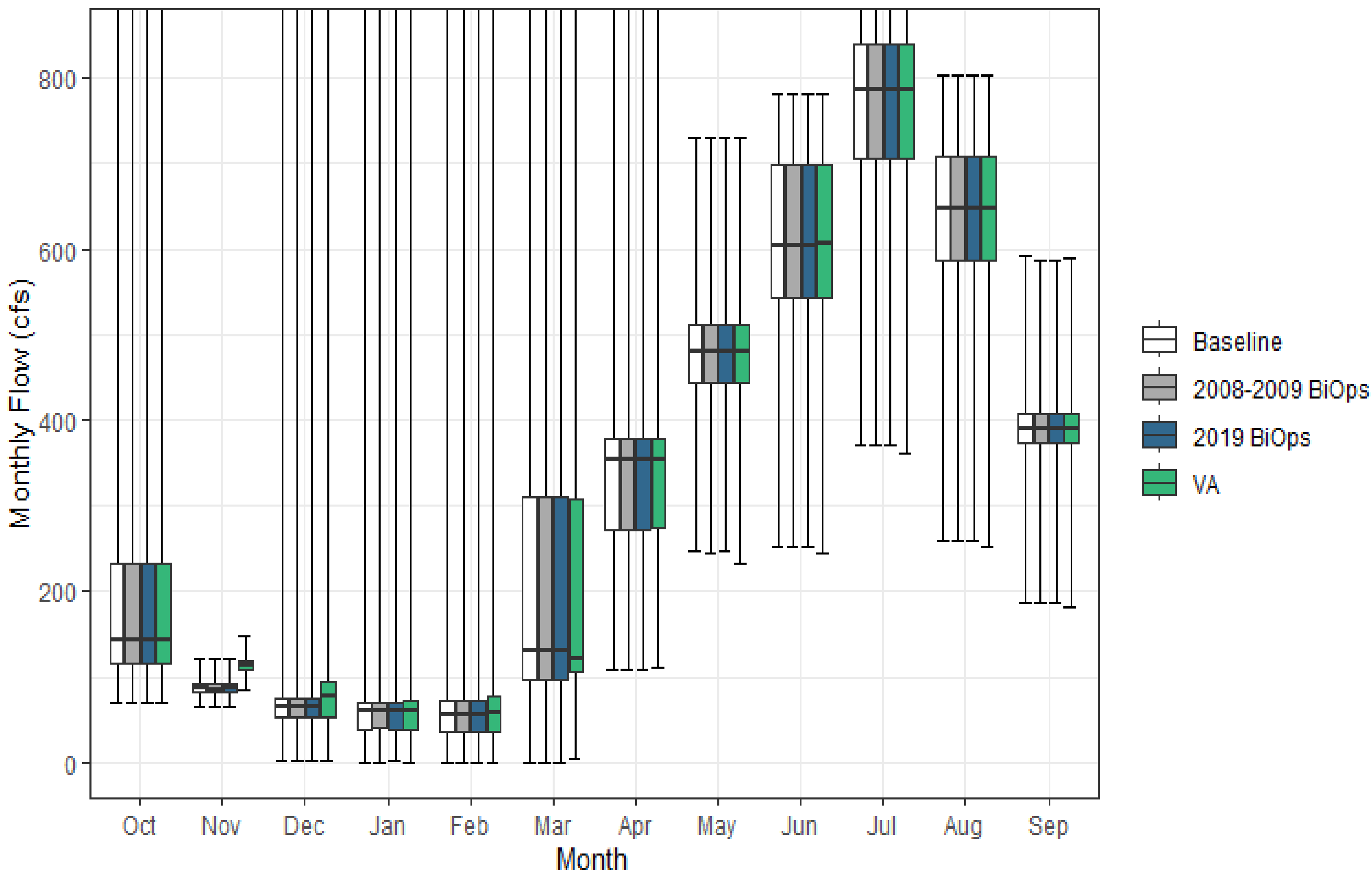

Figure G3a-14. Putah Creek below Lake Berryessa (SWRCB Lake Berryessa) Monthly Boxplot

Table G3a-40. Cumulative Distribution of Monthly Flow (cfs) — Putah Creek below Lake Berryessa (SWRCB Lake Berryessa)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	70	65	2	0	0	0	109	246	252	371	259	186	118
10%	95	79	24	13	7	70	138	406	517	666	546	343	219
25%	117	81	52	39	36	96	271	444	544	707	586	374	226
50%	143	86	65	61	56	131	353	479	605	787	646	390	232
75%	232	91	76	69	72	310	378	511	698	839	709	408	251
90%	263	102	79	314	842	991	640	598	742	868	742	436	521
100%	1,246	120	2,011	5,159	6,696	6,318	3,624	730	781	963	803	591	1,051
Mean	177	88	80	228	381	460	474	484	619	771	641	390	289
2008-2009 BiOps													
0%	70	66	2	0	0	0	109	244	252	371	259	186	118
10%	95	79	24	13	7	70	138	406	517	666	545	343	219
25%	117	82	52	39	36	96	271	444	544	707	586	374	226
50%	144	85	64	61	56	131	353	479	605	787	647	390	232
75%	233	92	76	69	72	310	378	511	699	839	709	408	250
90%	263	102	79	314	842	989	640	598	743	868	743	437	521
100%	1,246	120	2,011	5,157	6,696	6,318	3,624	730	781	963	803	588	1,051
Mean	177	88	80	228	381	460	474	484	619	771	641	390	289
2019 BiOps													
0%	70	65	2	1	0	0	109	246	252	371	259	186	118
10%	95	79	25	13	7	69	138	406	517	666	546	343	219
25%	117	81	52	39	36	96	271	444	544	707	586	374	226
50%	144	86	64	61	56	131	353	479	605	787	646	390	232
75%	232	91	76	69	72	310	377	511	698	839	709	408	251
90%	263	102	79	314	842	991	640	598	743	868	743	436	521
100%	1,246	120	2,011	5,157	6,701	6,318	3,624	730	781	963	803	588	1,051
Mean	177	88	80	228	381	460	474	484	619	771	641	390	289
VA													
0%	69	85	2	0	0	3	111	233	245	360	251	181	115
10%	95	105	24	13	7	74	138	400	517	666	545	339	221
25%	117	108	53	38	36	107	273	444	544	705	586	374	228
50%	142	112	77	61	57	120	353	479	606	786	646	390	235
75%	232	119	93	73	76	308	378	511	699	839	709	407	251
90%	263	130	97	264	842	968	622	598	742	867	743	436	511
100%	1,246	147	1,988	5,132	6,637	6,318	3,624	730	781	963	803	589	1,051
Mean	176	114	89	226	378	445	473	484	618	770	640	389	290

Table G3a-41. Water Year Average of Monthly Flows (cfs) — Putah Creek below Lake Berryessa (SWRCB Lake Berryessa)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	151	91	65	55	51	206	306	463	573	691	602	374
D	167	89	62	60	54	148	323	473	651	777	615	377
BN	185	85	66	49	171	153	307	475	629	791	635	395
AN	145	90	59	35	41	286	315	463	666	757	671	403
W	206	86	119	640	1,076	1,091	848	520	593	804	672	398
All	177	88	80	228	381	460	474	484	619	771	641	390
2008-2009 BiOps												
C	151	91	65	55	51	206	306	462	573	691	602	373
D	167	89	62	60	54	148	323	473	651	777	615	377
BN	185	85	66	49	171	153	307	475	629	791	635	395
AN	145	90	59	35	42	286	315	463	666	757	670	403
W	206	86	119	639	1,076	1,092	848	520	593	804	672	398
All	177	88	80	228	381	460	474	484	619	771	641	390
2019 BiOps												
C	151	91	65	55	51	206	305	463	573	691	602	374
D	167	89	62	60	54	148	323	473	651	777	615	377
BN	185	85	66	48	171	153	307	475	629	791	635	395
AN	145	90	59	35	41	285	315	463	666	757	670	403
W	206	86	118	639	1,076	1,092	848	520	593	804	672	398
All	177	88	80	228	381	460	474	484	619	771	641	390
VA												
C	150	117	77	56	52	215	305	461	571	689	600	372
D	167	116	74	62	56	161	322	471	649	774	613	376
BN	185	112	78	50	163	164	307	475	629	791	635	395
AN	145	116	68	35	41	259	315	463	666	757	671	403
W	206	113	123	627	1,069	1,031	845	520	594	804	672	398
All	176	114	89	226	378	445	473	484	618	770	640	389

G3a.3.1.13 Putah Creek above Yolo Bypass (SWRCB Putah Creek)

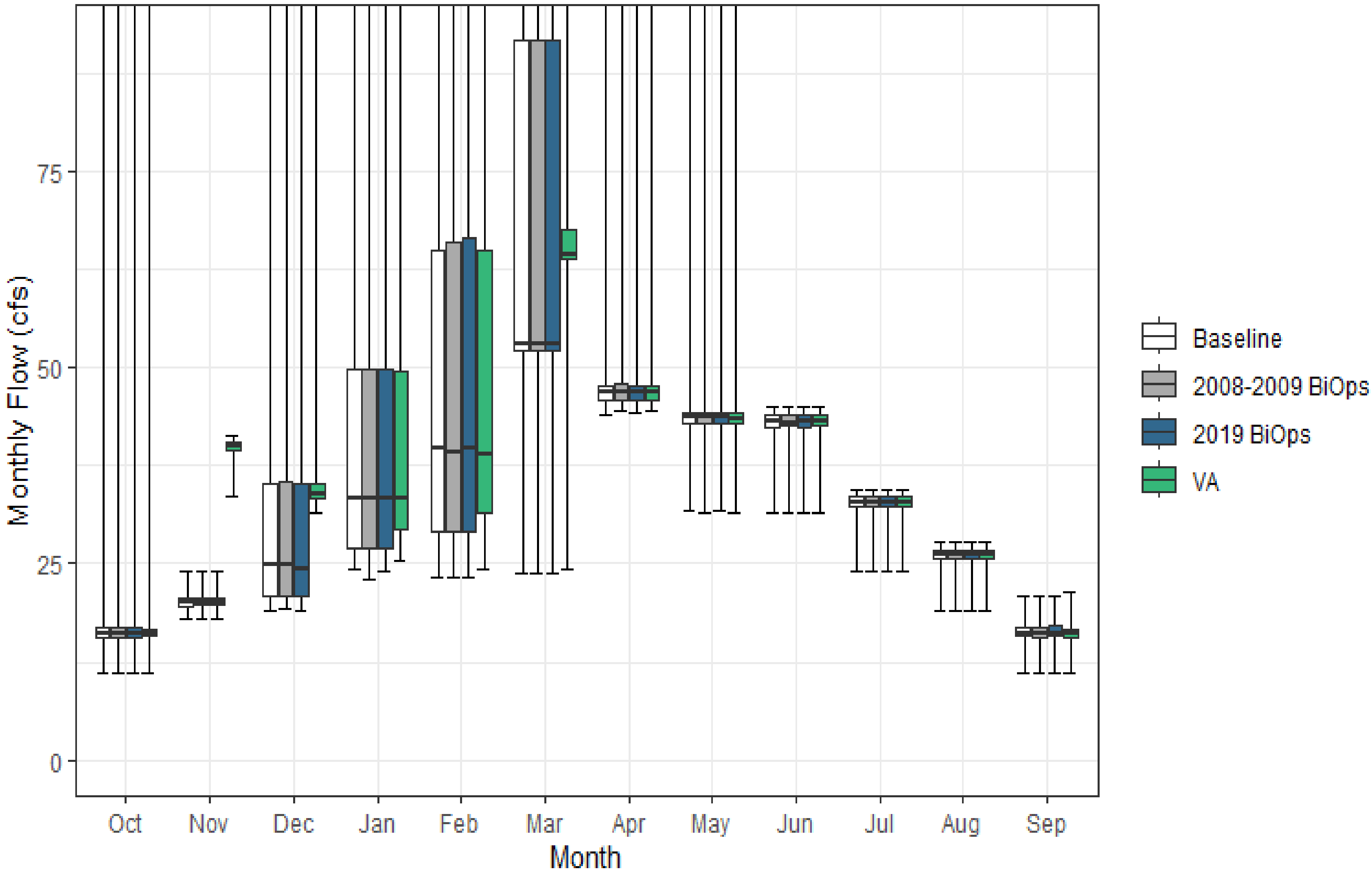

Figure G3a-15. Putah Creek above Yolo Bypass (SWRCB Putah Creek) Monthly Boxplot

Table G3a-42. Cumulative Distribution of Monthly Flow (cfs) — Putah Creek above Yolo Bypass (SWRCB Putah Creek)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	11	18	19	24	23	24	44	32	31	24	19	11	18
10%	14	19	20	25	26	50	45	36	34	26	21	13	22
25%	16	20	21	27	29	52	46	43	42	32	26	16	23
50%	16	20	25	33	40	53	47	44	43	33	26	16	24
75%	17	21	35	50	65	92	48	44	44	34	27	17	49
90%	18	21	51	271	715	863	320	45	45	34	27	17	309
100%	941	24	1,495	4,813	6,187	5,725	3,390	306	45	35	28	21	774
Mean	27	20	49	206	345	350	228	47	42	32	25	16	83
2008-2009 BiOps													
0%	11	18	19	23	23	24	45	31	31	24	19	11	18
10%	15	19	20	25	26	50	45	36	34	26	21	12	22
25%	16	20	21	27	29	52	46	43	43	32	26	16	23
50%	16	20	25	33	39	53	47	44	43	33	26	16	24
75%	17	21	35	50	66	92	48	44	44	34	27	17	49
90%	18	21	51	270	715	861	320	45	45	34	27	17	309
100%	941	24	1,495	4,811	6,187	5,725	3,390	306	45	35	28	21	774
Mean	27	20	49	206	345	350	228	47	42	32	25	16	83
2019 BiOps													
0%	11	18	19	24	23	24	44	32	31	24	19	11	18
10%	14	19	20	25	26	51	45	36	35	26	21	12	22
25%	16	20	21	27	29	52	46	43	42	32	26	16	23
50%	16	20	24	33	40	53	47	44	43	33	26	16	24
75%	17	21	35	50	67	92	48	44	44	34	27	17	49
90%	18	21	51	270	715	863	320	45	45	34	27	17	309
100%	941	24	1,495	4,811	6,192	5,725	3,390	306	45	35	28	21	774
Mean	27	20	49	206	345	350	228	47	42	32	25	16	83
VA													
0%	11	34	32	25	24	24	45	31	31	24	19	11	19
10%	15	35	33	29	30	63	45	36	34	26	21	12	24
25%	16	39	33	29	32	64	46	43	42	32	26	16	26
50%	16	40	34	33	39	64	47	43	43	33	26	16	27
75%	17	41	35	50	65	68	48	44	44	34	27	17	46
90%	18	41	51	252	715	834	320	45	45	34	27	17	299
100%	941	41	1,479	4,788	6,135	5,725	3,390	306	45	35	28	21	774
Mean	27	39	56	204	342	336	227	47	42	32	25	16	83

Table G3a-43. Water Year Average of Monthly Flows (cfs) — Putah Creek above Yolo Bypass (SWRCB Putah Creek)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	15	20	28	36	36	48	46	39	38	29	23	14
D	16	20	28	31	37	51	47	43	42	33	26	16
BN	17	20	25	37	157	82	47	42	41	31	25	16
AN	16	20	36	59	57	216	48	65	43	33	26	17
W	51	20	96	595	979	957	648	48	44	33	26	17
All	27	20	49	206	345	350	228	47	42	32	25	16
2008-2009 BiOps												
C	15	20	28	36	36	48	46	39	38	29	23	14
D	16	20	29	31	37	51	47	43	43	32	26	16
BN	17	20	25	37	157	82	47	42	41	31	25	16
AN	16	20	36	59	57	216	48	65	43	33	26	17
W	51	21	96	595	979	957	648	48	44	33	26	17
All	27	20	49	206	345	350	228	47	42	32	25	16
2019 BiOps												
C	15	20	28	36	36	48	46	39	38	29	23	14
D	16	20	29	31	37	51	47	43	43	32	26	16
BN	17	20	25	37	157	82	47	42	41	31	25	16
AN	16	20	36	59	57	216	48	65	43	33	26	17
W	51	21	96	595	979	957	648	48	44	33	26	17
All	27	20	49	206	345	350	228	47	42	32	25	16
VA												
C	15	39	37	37	38	57	46	39	39	29	23	14
D	16	40	37	33	39	62	47	43	42	32	26	16
BN	17	39	34	38	150	92	47	42	41	31	25	16
AN	16	39	43	59	57	192	48	65	43	33	27	16
W	51	40	99	584	973	902	645	48	44	33	26	17
All	27	39	56	204	342	336	227	47	42	32	25	16

G3a.3.1.14 Sacramento River below Shasta Reservoir (SWRCB Shasta)

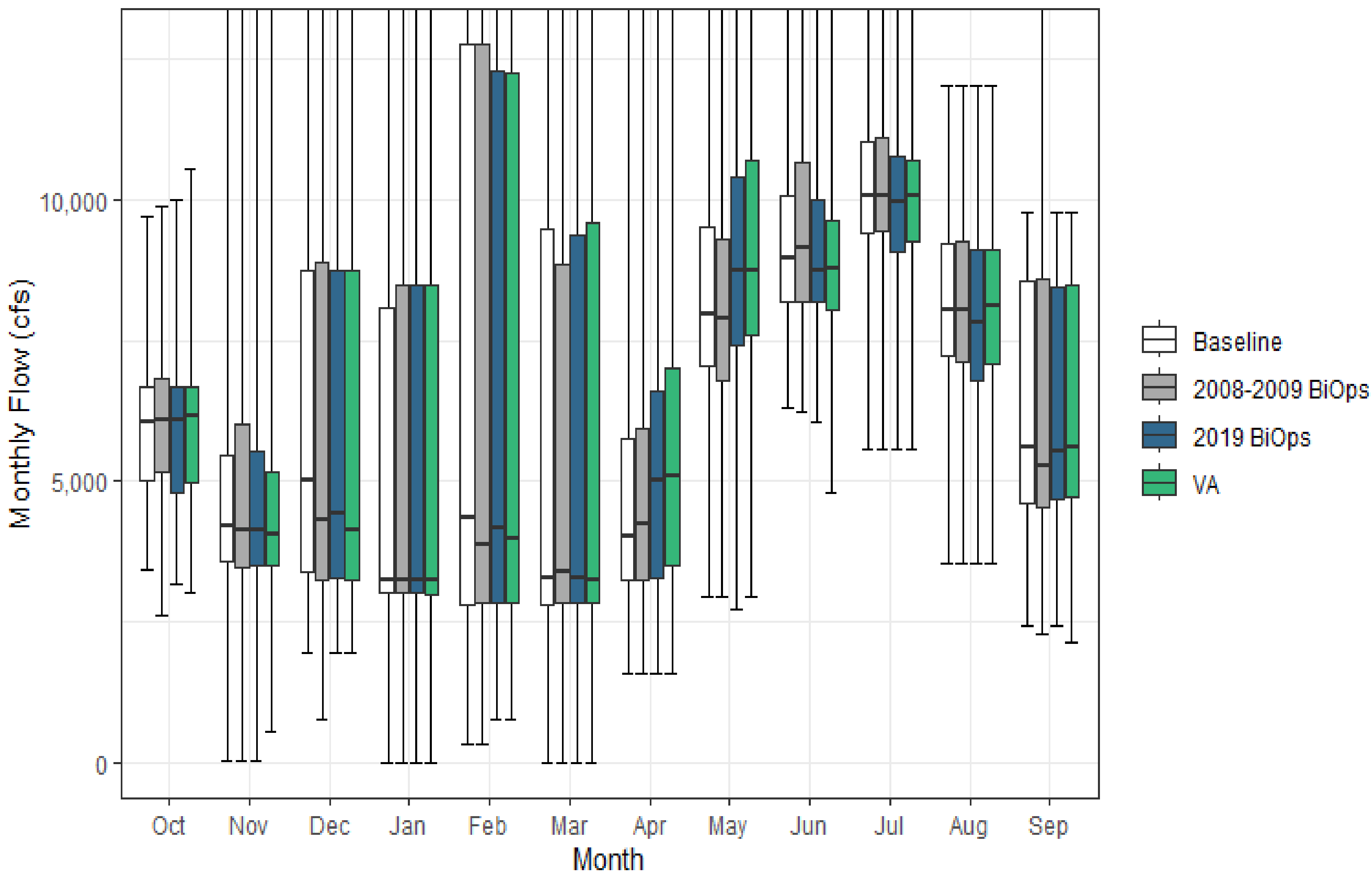

Figure G3a-16. Sacramento River below Shasta Reservoir (SWRCB Shasta) Monthly Boxplot

Table G3a-44. Cumulative Distribution of Monthly Flow (cfs) — Sacramento River below Shasta Reservoir (SWRCB Shasta)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	3,409	19	1,953	0	329	3	1,594	2,945	6,314	5,553	3,521	2,436	3,137
10%	4,372	3,002	2,989	2,428	1,931	2,401	3,145	5,831	7,613	8,696	5,869	3,922	3,803
25%	5,002	3,574	3,388	3,018	2,800	2,811	3,254	7,052	8,186	9,409	7,221	4,608	4,168
50%	6,050	4,180	5,020	3,238	4,346	3,259	4,013	7,973	8,942	10,081	8,048	5,586	4,966
75%	6,689	5,462	8,744	8,080	12,760	9,476	5,734	9,519	10,081	11,025	9,213	8,559	6,524
90%	7,148	7,721	16,284	19,420	28,033	17,835	10,251	11,035	11,364	12,444	10,958	8,871	8,196
100%	9,708	26,389	27,665	48,623	49,683	44,066	28,865	17,625	29,675	16,020	12,027	9,776	10,674
Mean	5,912	4,823	7,316	7,487	9,610	7,633	5,719	8,333	9,517	10,346	8,193	6,258	5,500
2008-2009 BiOps													
0%	2,617	16	766	0	323	3	1,594	2,945	6,229	5,553	3,521	2,272	3,175
10%	4,240	3,059	2,908	2,669	1,976	2,405	3,139	5,795	7,682	8,500	5,899	3,711	3,797
25%	5,164	3,469	3,247	3,021	2,845	2,827	3,254	6,765	8,178	9,436	7,109	4,538	4,185
50%	6,068	4,113	4,319	3,230	3,880	3,396	4,235	7,893	9,149	10,065	8,045	5,285	4,997
75%	6,809	5,993	8,883	8,482	12,760	8,843	5,929	9,290	10,646	11,085	9,252	8,602	6,548
90%	7,327	9,484	15,839	19,413	28,155	17,835	10,251	11,037	11,879	12,512	10,958	9,063	8,057
100%	9,885	26,455	27,612	48,623	50,513	44,066	28,865	17,625	29,675	15,100	12,027	13,461	10,674
Mean	5,927	5,223	7,070	7,401	9,606	7,539	5,723	8,252	9,673	10,326	8,180	6,265	5,502
2019 BiOps													
0%	3,177	18	1,953	0	746	3	1,594	2,738	6,058	5,553	3,521	2,439	3,135
10%	4,115	2,807	2,990	2,548	1,787	2,403	3,149	6,136	7,456	8,471	5,988	3,983	3,772
25%	4,796	3,512	3,279	3,020	2,831	2,815	3,270	7,420	8,178	9,085	6,795	4,674	4,147
50%	6,089	4,116	4,437	3,240	4,177	3,263	5,005	8,722	8,724	9,966	7,833	5,516	4,921
75%	6,690	5,519	8,744	8,482	12,274	9,357	6,603	10,401	9,978	10,762	9,124	8,447	6,524
90%	7,188	7,732	16,284	19,420	28,008	17,835	10,251	11,590	11,296	12,304	10,957	8,859	8,155
100%	10,011	26,456	27,665	48,623	49,683	44,066	28,865	17,625	29,675	14,453	12,027	9,776	10,674
Mean	5,848	4,866	7,106	7,466	9,570	7,607	6,122	8,766	9,353	10,139	8,095	6,239	5,502
VA													
0%	3,012	529	1,953	0	746	3	1,594	2,947	4,791	5,553	3,524	2,133	3,212
10%	4,154	2,582	2,971	2,551	1,786	2,397	3,202	5,635	7,322	8,220	5,980	3,650	3,788
25%	4,967	3,485	3,246	2,982	2,824	2,827	3,489	7,577	8,052	9,248	7,061	4,709	4,152
50%	6,142	4,065	4,138	3,234	3,991	3,256	5,098	8,722	8,784	10,065	8,125	5,601	4,934
75%	6,690	5,155	8,744	8,482	12,261	9,592	7,021	10,681	9,617	10,706	9,110	8,477	6,524
90%	7,280	6,948	16,284	19,464	28,306	17,835	11,317	11,575	11,258	12,087	10,958	8,843	8,031
100%	10,551	26,455	27,665	48,636	49,683	44,075	28,865	20,411	29,675	13,845	12,027	9,776	10,674
Mean	5,903	4,683	6,942	7,474	9,578	7,582	6,430	8,887	9,208	10,093	8,197	6,207	5,502

Table G3a-45. Water Year Average of Monthly Flows (cfs) — Sacramento River below Shasta Reservoir (SWRCB Shasta)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	5,448	3,766	3,931	3,568	2,915	3,738	4,089	7,698	9,283	8,978	7,636	4,685
D	6,119	3,904	4,958	3,401	2,801	3,724	4,089	8,052	10,184	10,159	7,636	4,535
BN	5,815	4,578	5,653	3,748	7,729	3,846	4,439	7,598	9,673	11,615	7,724	5,084
AN	5,655	5,200	5,749	6,886	13,873	8,867	4,936	9,152	8,662	11,506	7,224	7,564
W	6,173	6,064	12,580	15,178	17,618	14,423	8,929	8,980	9,416	9,951	9,608	8,547
All	5,912	4,823	7,316	7,487	9,610	7,633	5,719	8,333	9,517	10,346	8,193	6,258
2008-2009 BiOps												
C	5,375	4,040	4,427	3,613	2,953	3,532	4,407	7,454	9,468	8,919	7,935	4,553
D	6,159	4,229	4,630	3,329	2,978	3,709	3,923	7,893	10,592	10,329	7,327	4,466
BN	5,647	5,096	5,065	3,829	7,718	3,709	4,383	7,557	9,762	11,557	7,729	4,988
AN	5,660	6,208	5,226	6,685	13,403	8,633	4,934	9,164	8,722	11,229	7,236	7,181
W	6,333	6,257	12,324	14,959	17,658	14,416	8,929	8,980	9,446	9,942	9,627	8,913
All	5,927	5,223	7,070	7,401	9,606	7,539	5,723	8,252	9,673	10,326	8,180	6,265
2019 BiOps												
C	5,456	3,702	3,756	3,532	2,888	3,687	4,591	8,169	8,997	8,868	7,690	4,655
D	6,193	4,123	4,542	3,350	2,702	3,699	5,138	8,981	9,967	9,710	7,247	4,618
BN	5,760	4,494	5,552	3,764	7,640	3,841	4,797	8,131	9,360	11,248	7,617	5,117
AN	5,712	5,226	5,405	6,947	13,939	8,768	5,075	9,482	8,498	11,402	7,146	7,267
W	5,913	6,119	12,495	15,131	17,599	14,425	8,933	9,005	9,446	9,926	9,645	8,545
All	5,848	4,866	7,106	7,466	9,570	7,607	6,122	8,766	9,353	10,139	8,095	6,239
VA												
C	5,523	3,539	3,601	3,455	2,811	3,384	4,262	7,906	9,245	8,991	7,809	4,702
D	6,174	4,050	4,467	3,369	2,817	3,721	5,303	9,042	10,075	10,152	7,718	4,691
BN	5,839	4,322	5,320	3,776	7,581	3,831	5,752	8,491	8,791	10,775	7,710	4,844
AN	5,758	4,969	5,197	6,948	14,107	8,897	6,244	10,129	7,652	10,697	6,881	7,241
W	6,004	5,866	12,321	15,177	17,546	14,441	8,926	9,004	9,457	9,967	9,623	8,534
All	5,903	4,683	6,942	7,474	9,578	7,582	6,430	8,887	9,208	10,093	8,197	6,207

G3a.3.1.15 Sacramento River above Bend Bridge (SWRCB Sac Abv Bend Bridge)

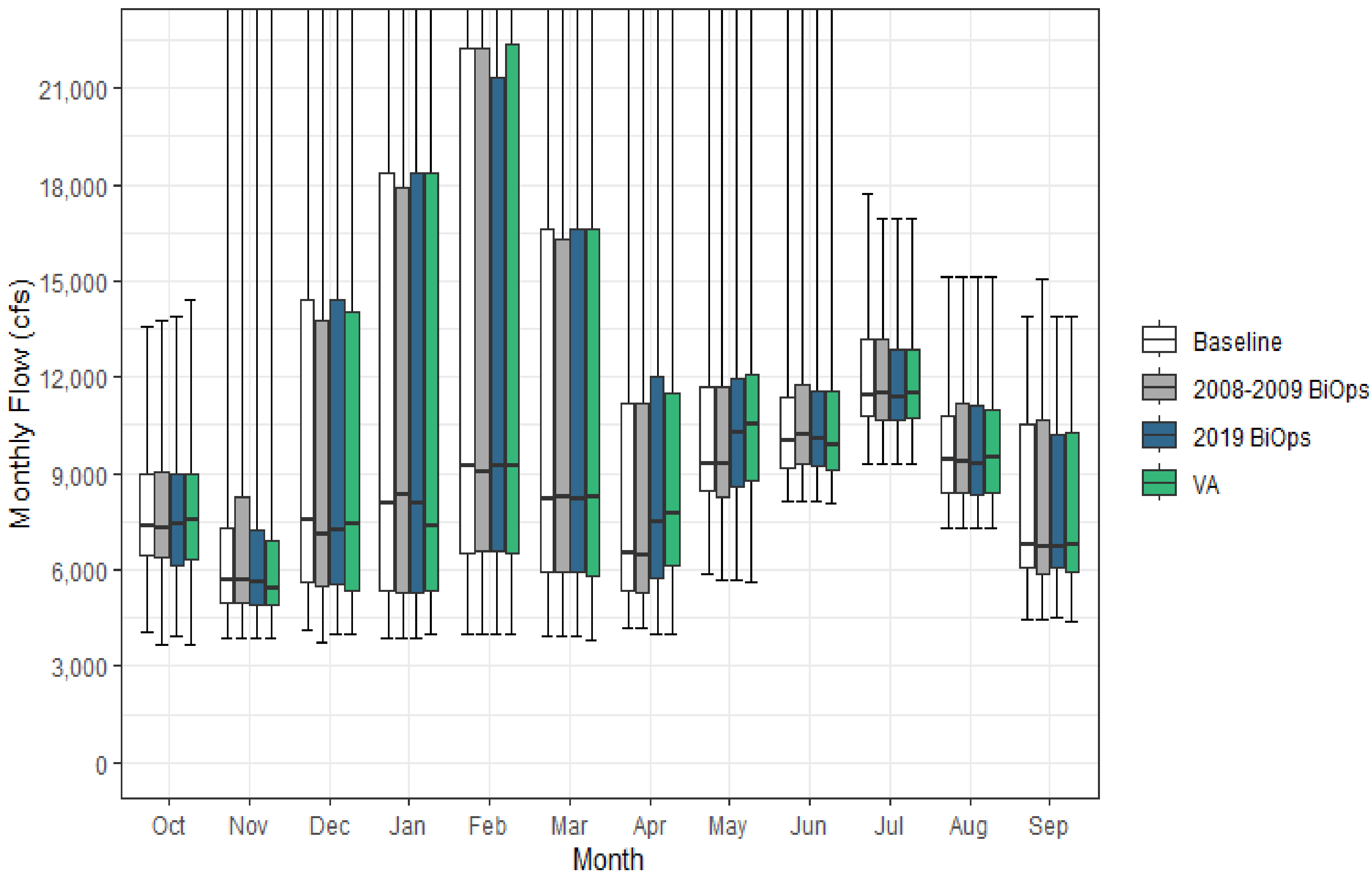

Figure G3a-17. Sacramento River above Bend Bridge (SWRCB Sac Abv Bend Bridge) Monthly Boxplot

Table G3a-46. Cumulative Distribution of Monthly Flow (cfs) — Sacramento River above Bend Bridge (SWRCB Sac Abv Bend Bridge)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	4,056	3,846	4,152	3,872	4,006	3,926	4,157	5,844	8,118	9,302	7,314	4,416	4,283
10%	5,546	4,173	4,667	4,509	5,487	5,164	4,721	7,311	8,850	10,009	7,989	5,332	5,131
25%	6,422	4,934	5,597	5,326	6,517	5,953	5,357	8,456	9,175	10,767	8,424	6,049	5,656
50%	7,377	5,704	7,546	8,090	9,245	8,182	6,487	9,276	10,009	11,425	9,422	6,751	7,181
75%	8,956	7,269	14,427	18,337	22,263	16,591	11,148	11,692	11,350	13,177	10,817	10,500	9,727
90%	9,881	10,524	28,094	33,689	43,402	30,508	17,804	15,048	13,291	14,739	12,765	11,353	12,411
100%	13,597	35,380	42,072	74,706	83,602	73,278	44,412	26,531	30,912	17,723	15,099	13,908	17,715
Mean	7,688	6,960	12,082	14,243	17,626	14,000	9,537	10,405	10,804	12,024	9,950	8,047	8,034
2008-2009 BiOps													
0%	3,646	3,849	3,750	3,875	4,002	3,927	4,199	5,692	8,119	9,302	7,314	4,423	4,276
10%	5,434	4,181	4,923	4,526	5,317	5,163	4,971	7,301	8,897	10,002	8,014	5,315	5,224
25%	6,414	4,985	5,498	5,300	6,589	5,955	5,277	8,237	9,297	10,674	8,382	5,880	5,658
50%	7,276	5,661	7,108	8,330	9,022	8,241	6,439	9,299	10,229	11,510	9,367	6,690	7,111
75%	9,042	8,294	13,788	17,908	22,265	16,308	11,147	11,692	11,749	13,167	11,194	10,668	9,684
90%	10,249	12,146	26,435	33,689	43,402	30,369	17,804	15,048	13,028	14,696	12,698	11,825	12,429
100%	13,771	35,445	43,110	74,706	83,602	73,278	44,412	26,531	30,912	16,961	15,099	15,059	17,715
Mean	7,673	7,330	11,944	14,128	17,597	13,915	9,541	10,362	10,960	12,008	9,893	8,110	8,039
2019 BiOps													
0%	3,949	3,847	4,008	3,887	4,003	3,930	4,004	5,695	8,125	9,302	7,314	4,481	4,283
10%	5,423	4,154	4,509	4,526	5,393	5,168	5,038	7,450	8,769	10,018	8,017	5,314	5,178
25%	6,132	4,878	5,575	5,314	6,598	5,956	5,716	8,603	9,219	10,671	8,334	6,036	5,667
50%	7,424	5,638	7,228	8,046	9,205	8,184	7,490	10,268	10,080	11,382	9,313	6,742	7,123
75%	8,956	7,218	14,427	18,337	21,339	16,591	11,988	11,966	11,541	12,845	11,101	10,226	9,727
90%	9,789	10,501	27,166	33,689	43,402	30,307	17,804	15,048	12,825	14,441	12,764	11,353	12,358
100%	13,895	35,446	42,072	74,706	83,602	73,278	44,412	26,531	30,912	16,961	15,099	13,908	17,715
Mean	7,598	6,932	11,879	14,216	17,578	13,971	9,952	10,843	10,785	11,880	9,879	8,010	8,044
VA													
0%	3,663	3,848	3,987	3,998	3,988	3,824	3,964	5,587	8,044	9,302	7,317	4,370	4,299
10%	5,428	4,082	4,455	4,526	5,150	5,136	5,049	7,464	8,740	9,973	8,026	5,419	5,120
25%	6,344	4,874	5,372	5,355	6,516	5,800	6,159	8,762	9,085	10,710	8,425	5,950	5,730
50%	7,570	5,420	7,441	7,376	9,246	8,238	7,719	10,541	9,869	11,504	9,491	6,796	7,108
75%	8,956	6,894	14,056	18,337	22,368	16,591	11,494	12,087	11,537	12,829	10,974	10,300	9,727
90%	9,883	10,503	27,393	33,700	43,402	30,304	18,500	15,075	12,829	14,286	12,696	11,353	12,223
100%	14,426	35,445	42,076	74,718	83,602	73,278	44,412	29,271	30,912	16,961	15,099	13,908	17,715
Mean	7,655	6,768	11,713	14,221	17,574	13,920	10,229	11,004	10,666	11,854	9,971	8,015	8,048

Table G3a-47. Water Year Average of Monthly Flows (cfs) — Sacramento River above Bend Bridge (SWRCB Sac Abv Bend Bridge)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	6,758	4,943	6,097	5,906	6,121	6,015	4,965	8,247	9,857	10,616	8,749	5,682
D	7,596	6,110	8,013	6,117	8,450	8,143	5,821	8,960	11,149	11,576	9,313	6,066
BN	7,597	6,125	8,510	8,960	14,540	8,536	7,890	9,159	10,661	12,736	9,285	6,611
AN	7,489	7,195	10,270	16,322	23,567	17,376	9,577	12,143	10,013	13,194	9,242	9,610
W	8,397	9,083	21,284	27,119	29,998	24,540	15,756	12,655	11,477	12,179	11,780	11,003
All	7,688	6,960	12,082	14,243	17,626	14,000	9,537	10,405	10,804	12,024	9,950	8,047
2008-2009 BiOps												
C	6,556	5,344	6,585	5,938	6,090	5,770	5,262	8,236	10,124	10,630	8,798	5,755
D	7,636	6,392	7,825	6,057	8,577	8,212	5,658	8,808	11,537	11,768	9,023	6,013
BN	7,467	6,534	8,111	8,994	14,524	8,410	7,853	9,117	10,708	12,608	9,276	6,589
AN	7,454	8,099	10,151	15,977	23,105	17,095	9,576	12,152	10,074	12,922	9,213	9,173
W	8,519	9,253	20,998	26,894	30,031	24,534	15,756	12,656	11,507	12,171	11,799	11,413
All	7,673	7,330	11,944	14,128	17,597	13,915	9,541	10,362	10,960	12,008	9,893	8,110
2019 BiOps												
C	6,720	4,872	5,919	5,860	6,077	5,944	5,437	8,719	9,699	10,586	8,674	5,675
D	7,622	6,094	7,614	6,072	8,337	8,132	6,853	9,891	11,210	11,356	9,041	6,071
BN	7,544	6,042	8,417	8,984	14,452	8,535	8,241	9,732	10,561	12,361	9,263	6,601
AN	7,505	7,252	9,947	16,335	23,636	17,260	9,690	12,455	10,034	13,092	9,165	9,297
W	8,124	9,067	21,201	27,069	29,970	24,543	15,846	12,679	11,507	12,154	11,834	11,018
All	7,598	6,932	11,879	14,216	17,578	13,971	9,952	10,843	10,785	11,880	9,879	8,010
VA												
C	6,875	4,738	5,776	5,769	5,995	5,593	5,107	8,457	9,654	10,657	8,782	5,746
D	7,613	6,087	7,541	6,096	8,398	8,107	7,026	9,961	11,290	11,824	9,573	6,266
BN	7,576	5,813	8,189	8,990	14,394	8,512	9,172	10,186	10,241	12,067	9,228	6,369
AN	7,553	6,988	9,691	16,332	23,801	17,347	10,845	13,264	9,551	12,331	8,917	9,292
W	8,197	8,853	21,030	27,114	29,920	24,556	15,753	12,679	11,477	12,186	11,811	10,994
All	7,655	6,768	11,713	14,221	17,574	13,920	10,229	11,004	10,666	11,854	9,971	8,015

G3a.3.1.16 Sacramento River below Wilkins Slough (SWRCB Sac Blw Wilkins Slough)

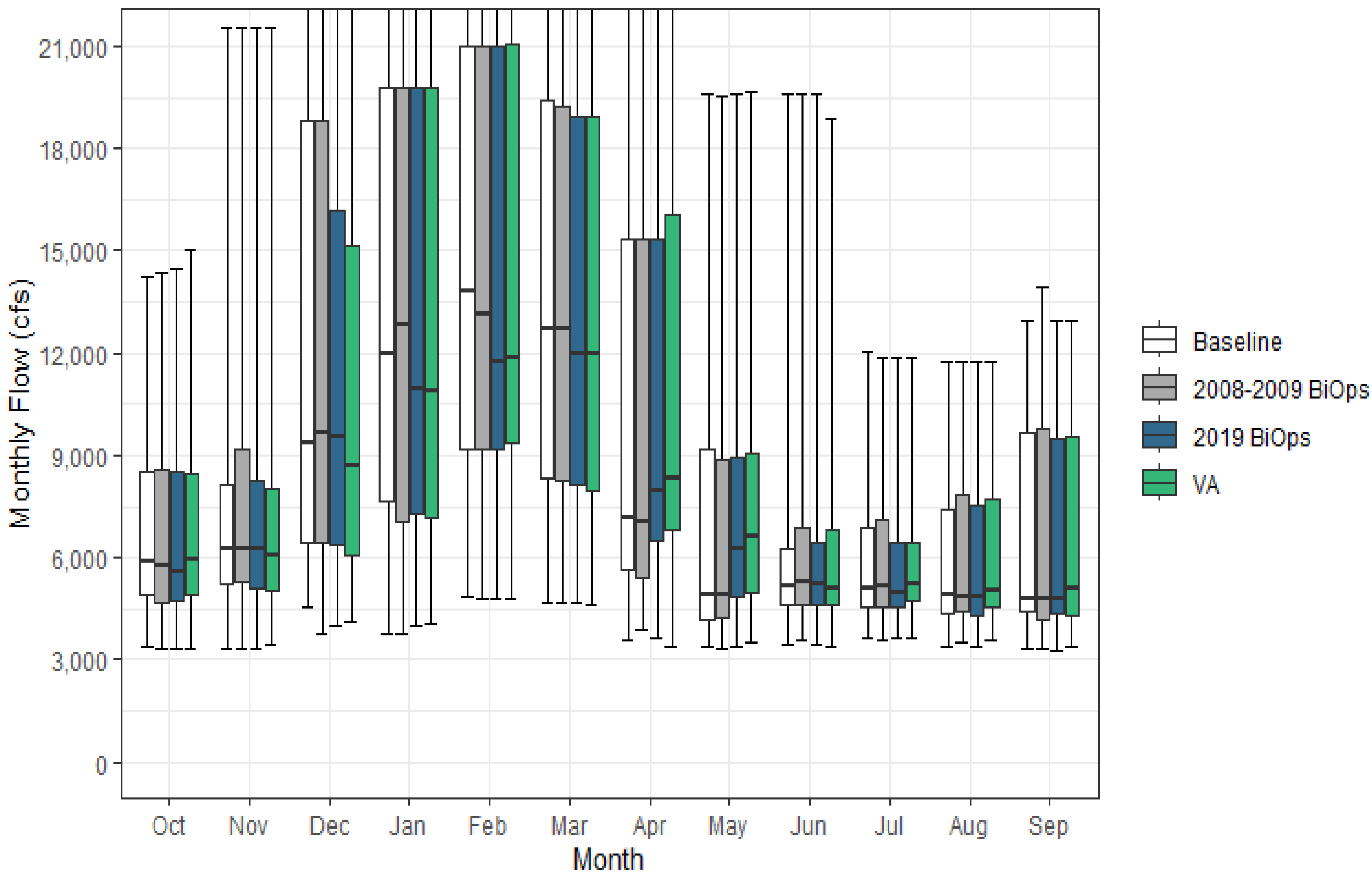

Figure G3a-18. Sacramento River below Wilkins Slough (SWRCB Sac Blw Wilkins Slough) Monthly Boxplot

Table G3a-48. Cumulative Distribution of Monthly Flow (cfs) — Sacramento River below Wilkins Slough (SWRCB Sac Blw Wilkins Slough)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	3,364	3,358	4,570	3,764	4,827	4,682	3,601	3,364	3,457	3,637	3,401	3,336	3,244
10%	4,218	4,253	5,405	5,773	7,261	6,890	4,803	3,640	3,683	3,789	3,732	3,461	4,031
25%	4,920	5,204	6,423	7,630	9,178	8,334	5,665	4,182	4,585	4,535	4,394	4,420	4,845
50%	5,919	6,246	9,355	12,001	13,824	12,685	7,152	4,903	5,159	5,102	4,935	4,765	6,217
75%	8,531	8,156	18,788	19,771	20,971	19,391	15,362	9,159	6,270	6,873	7,395	9,678	8,048
90%	9,626	12,225	21,302	21,827	22,429	21,620	19,212	14,161	8,134	8,853	9,239	10,536	9,573
100%	14,251	21,517	22,570	23,658	24,653	23,824	22,173	19,619	19,610	12,043	11,712	12,976	11,913
Mean	6,648	7,475	11,738	13,367	14,807	13,676	10,029	7,146	5,868	5,841	5,816	6,660	6,566
2008-2009 BiOps													
0%	3,338	3,359	3,774	3,766	4,823	4,683	3,852	3,359	3,565	3,601	3,490	3,348	3,240
10%	4,094	4,319	5,553	5,676	6,993	6,814	4,803	3,588	4,028	3,789	3,724	3,492	4,089
25%	4,672	5,262	6,460	7,066	9,178	8,280	5,375	4,272	4,597	4,580	4,442	4,191	4,787
50%	5,796	6,253	9,637	12,815	13,167	12,684	7,038	4,901	5,264	5,157	4,881	4,774	6,161
75%	8,578	9,165	18,789	19,771	20,992	19,228	15,362	8,866	6,873	7,086	7,812	9,818	8,048
90%	10,009	13,816	21,235	21,827	22,429	21,620	19,212	14,161	7,880	8,638	9,108	11,026	9,536
100%	14,371	21,521	22,570	23,658	24,654	23,872	22,173	19,544	19,579	11,884	11,712	13,907	11,934
Mean	6,643	7,832	11,675	13,319	14,750	13,605	10,004	7,112	6,024	5,838	5,786	6,704	6,579
2019 BiOps													
0%	3,342	3,357	4,024	3,980	4,824	4,686	3,649	3,381	3,462	3,637	3,408	3,279	3,267
10%	4,085	4,307	5,068	5,717	7,161	6,974	5,081	3,572	3,705	3,798	3,732	3,461	4,077
25%	4,731	5,073	6,392	7,274	9,178	8,172	6,485	4,874	4,585	4,550	4,304	4,339	4,792
50%	5,560	6,226	9,558	10,931	11,759	11,965	7,940	6,229	5,201	4,974	4,865	4,823	6,092
75%	8,481	8,242	16,185	19,782	20,991	18,935	15,358	8,958	6,436	6,417	7,507	9,473	7,905
90%	9,567	12,060	21,294	21,837	22,440	21,625	19,219	14,036	7,853	8,647	9,222	10,465	9,466
100%	14,468	21,570	22,580	23,669	24,663	23,829	22,173	19,627	19,610	11,884	11,712	12,976	11,927
Mean	6,570	7,462	11,194	12,752	14,239	13,313	10,415	7,565	5,850	5,703	5,761	6,623	6,469
VA													
0%	3,338	3,425	4,144	4,084	4,809	4,586	3,406	3,520	3,406	3,637	3,547	3,375	3,273
10%	3,791	4,226	5,161	5,868	6,879	6,900	5,049	3,686	3,970	3,733	3,928	3,601	4,103
25%	4,926	5,029	6,102	7,146	9,378	7,972	6,814	4,967	4,585	4,704	4,523	4,276	4,912
50%	5,924	6,059	8,698	10,864	11,851	11,976	8,343	6,622	5,093	5,211	5,056	5,070	6,135
75%	8,469	8,045	15,159	19,782	21,054	18,935	16,094	9,044	6,826	6,435	7,697	9,565	7,952
90%	9,644	12,039	21,275	21,840	22,440	21,626	19,214	14,237	7,824	8,687	9,130	10,382	9,433
100%	15,009	21,570	22,581	23,619	24,663	23,829	22,127	19,636	18,887	11,884	11,712	12,976	11,933
Mean	6,678	7,365	11,133	12,753	14,239	13,255	10,630	7,875	5,862	5,782	5,915	6,674	6,512

Table G3a-49. Water Year Average of Monthly Flows (cfs) — Sacramento River below Wilkins Slough (SWRCB Sac Blw Wilkins Slough)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	5,176	4,943	7,257	7,809	8,387	7,790	4,711	4,039	4,593	3,989	4,164	3,634
D	6,253	6,689	9,399	8,186	11,256	10,757	6,071	4,685	5,470	4,833	4,683	4,371
BN	6,684	6,636	8,895	12,712	14,817	12,026	9,471	5,585	5,484	5,990	4,694	4,929
AN	6,515	8,057	11,350	17,523	18,605	18,234	12,156	8,757	5,378	7,338	5,659	8,684
W	7,768	9,680	17,784	18,847	19,275	18,068	15,274	10,913	7,292	6,859	8,299	10,183
All	6,648	7,475	11,738	13,367	14,807	13,676	10,029	7,146	5,868	5,841	5,816	6,660
2008-2009 BiOps												
C	5,023	5,382	7,708	7,786	8,371	7,544	4,968	4,034	4,869	4,021	4,175	3,698
D	6,276	6,972	9,214	8,090	11,385	10,776	5,908	4,540	5,884	5,061	4,469	4,325
BN	6,574	7,052	8,635	12,683	14,717	11,881	9,394	5,562	5,563	5,852	4,765	4,868
AN	6,508	8,858	11,231	17,366	18,128	18,137	12,104	8,802	5,311	7,100	5,636	8,320
W	7,885	9,823	17,681	18,856	19,262	18,078	15,243	10,906	7,334	6,844	8,322	10,520
All	6,643	7,832	11,675	13,319	14,750	13,605	10,004	7,112	6,024	5,838	5,786	6,704
2019 BiOps												
C	5,163	4,878	6,973	7,407	8,076	7,698	5,161	4,478	4,451	3,978	4,098	3,635
D	6,266	6,663	8,726	8,049	10,532	10,423	7,107	5,618	5,517	4,629	4,472	4,388
BN	6,619	6,604	8,669	11,232	14,219	11,310	9,868	6,150	5,361	5,609	4,671	4,911
AN	6,484	8,090	10,737	16,768	18,147	17,638	12,217	9,041	5,308	7,267	5,629	8,370
W	7,558	9,698	17,035	18,343	18,657	17,850	15,270	10,904	7,377	6,821	8,339	10,189
All	6,570	7,462	11,194	12,752	14,239	13,313	10,415	7,565	5,850	5,703	5,761	6,623
VA												
C	5,292	4,776	6,842	7,307	7,977	7,370	4,802	4,240	4,342	4,015	4,140	3,718
D	6,379	6,706	8,746	8,099	10,622	10,380	7,325	5,944	5,777	5,257	5,021	4,679
BN	6,751	6,375	8,545	11,282	14,180	11,303	10,620	6,909	5,459	5,535	4,835	4,781
AN	6,614	7,887	10,599	16,776	18,157	17,692	12,926	10,099	5,106	6,735	5,643	8,446
W	7,628	9,622	17,022	18,330	18,663	17,846	15,254	10,905	7,309	6,864	8,309	10,144
All	6,678	7,365	11,133	12,753	14,239	13,255	10,630	7,875	5,862	5,782	5,915	6,674

G3a.3.1.17 Sacramento River at Knights Landing (SWRCB Sac at Knights Landing)

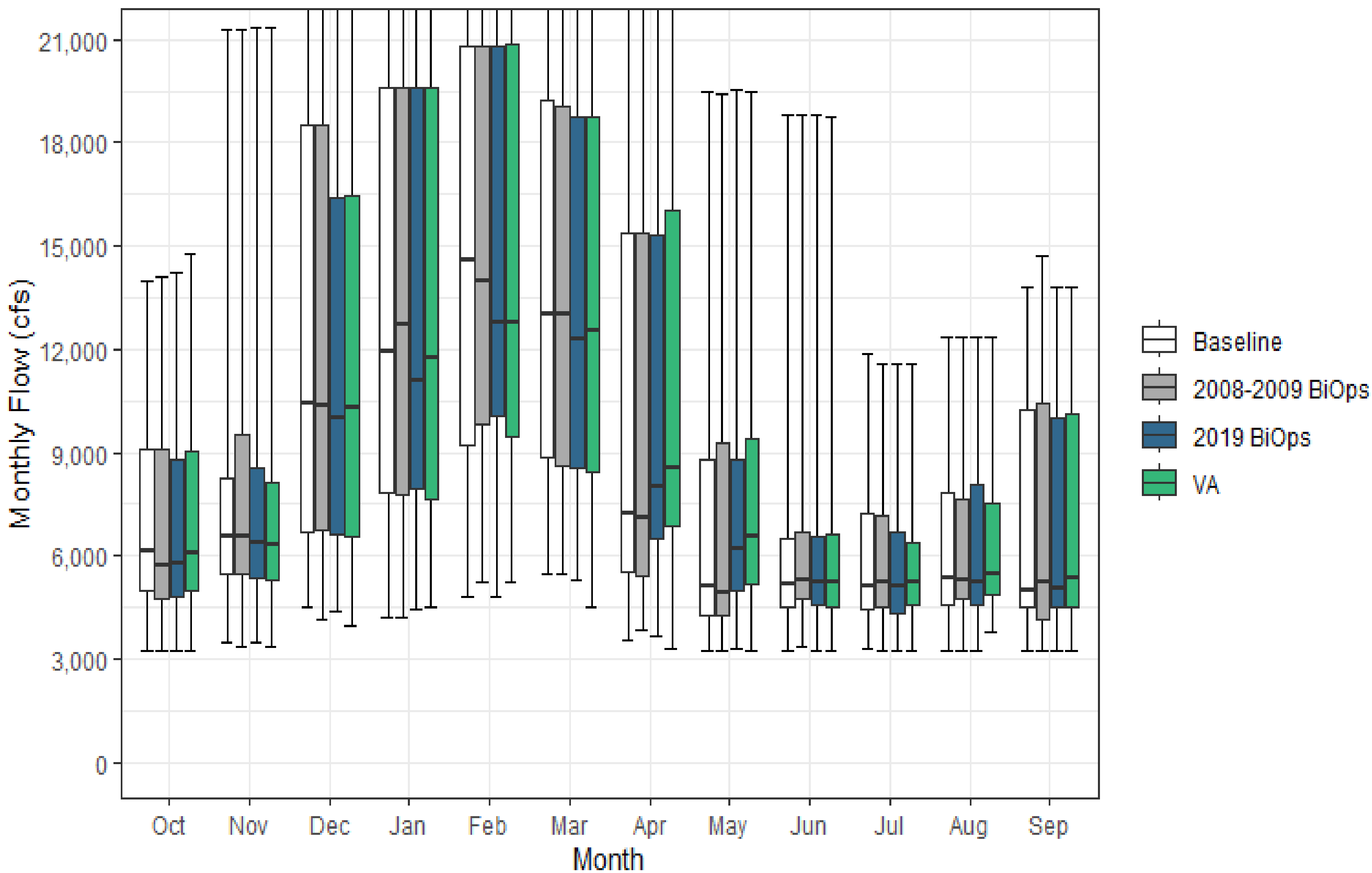

Figure G3a-19. Sacramento River at Knights Landing (SWRCB Sac at Knights Landing) Monthly Boxplot

Table G3a-50. Cumulative Distribution of Monthly Flow (cfs) — Sacramento River at Knights Landing (SWRCB Sac at Knights Landing)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	3,264	3,483	4,530	4,206	4,835	5,457	3,565	3,237	3,244	3,278	3,213	3,213	3,326
10%	4,126	4,335	5,722	6,128	7,303	7,402	4,828	3,503	3,644	3,559	4,062	3,557	4,239
25%	4,966	5,466	6,708	7,823	9,194	8,854	5,558	4,279	4,521	4,471	4,556	4,482	4,992
50%	6,122	6,530	10,405	11,955	14,602	13,028	7,196	5,112	5,178	5,115	5,325	4,992	6,271
75%	9,097	8,269	18,527	19,576	20,772	19,218	15,338	8,799	6,526	7,195	7,836	10,220	8,238
90%	10,057	12,601	21,019	21,599	22,207	21,411	19,126	14,065	7,958	9,066	10,097	11,296	9,648
100%	14,007	21,263	22,301	23,406	24,394	23,579	22,033	19,495	18,829	11,857	12,335	13,799	12,006
Mean	6,881	7,702	12,040	13,546	15,016	13,820	10,070	7,161	5,830	5,842	6,208	6,986	6,689
2008-2009 BiOps													
0%	3,230	3,338	4,165	4,208	5,231	5,460	3,844	3,238	3,378	3,213	3,213	3,217	3,352
10%	4,113	4,448	5,900	5,944	7,361	7,182	4,873	3,490	3,857	3,558	4,009	3,635	4,209
25%	4,742	5,480	6,762	7,791	9,827	8,592	5,385	4,275	4,746	4,509	4,737	4,150	4,939
50%	5,701	6,587	10,366	12,732	13,955	13,034	7,106	4,953	5,265	5,257	5,302	5,205	6,211
75%	9,105	9,539	18,527	19,576	20,793	19,058	15,338	9,285	6,681	7,176	7,639	10,405	8,329
90%	10,544	14,512	20,989	21,599	22,207	21,411	19,125	14,065	7,877	8,818	9,840	11,679	9,616
100%	14,125	21,266	22,301	23,406	24,396	23,626	22,033	19,420	18,798	11,585	12,335	14,696	12,021
Mean	6,884	8,038	11,997	13,465	14,931	13,760	10,075	7,152	6,032	5,848	6,203	7,079	6,710
2019 BiOps													
0%	3,261	3,475	4,387	4,418	4,832	5,261	3,640	3,273	3,249	3,213	3,240	3,213	3,333
10%	4,002	4,551	5,686	5,994	7,360	7,205	5,094	3,549	3,727	3,598	3,918	3,713	4,184
25%	4,810	5,341	6,637	7,924	10,033	8,544	6,514	4,999	4,545	4,340	4,556	4,489	5,002
50%	5,744	6,397	9,971	11,065	12,778	12,304	8,020	6,188	5,245	5,095	5,250	5,069	6,160
75%	8,762	8,573	16,378	19,587	20,792	18,770	15,334	8,762	6,560	6,662	8,058	10,021	7,996
90%	10,100	12,422	21,018	21,609	22,217	21,416	19,133	13,940	7,637	8,840	10,006	10,990	9,522
100%	14,220	21,315	22,311	23,416	24,404	23,584	22,033	19,502	18,829	11,585	12,335	13,799	12,020
Mean	6,786	7,657	11,515	13,084	14,640	13,460	10,427	7,562	5,820	5,708	6,170	6,981	6,611
VA													
0%	3,253	3,339	3,988	4,520	5,216	4,535	3,295	3,237	3,247	3,213	3,793	3,218	3,338
10%	3,759	4,331	5,652	6,251	7,155	7,097	5,026	3,611	3,567	3,634	4,078	3,789	4,260
25%	5,011	5,321	6,561	7,649	9,483	8,418	6,853	5,142	4,530	4,564	4,856	4,489	5,145
50%	6,047	6,309	10,308	11,745	12,768	12,555	8,546	6,581	5,238	5,239	5,478	5,367	6,215
75%	9,036	8,106	16,468	19,587	20,854	18,770	16,053	9,398	6,641	6,365	7,517	10,119	8,102
90%	10,180	12,314	21,013	21,611	22,217	21,417	19,125	14,140	7,977	8,702	10,015	11,002	9,552
100%	14,751	21,315	22,312	23,368	24,404	23,584	21,987	19,498	18,738	11,585	12,335	13,799	12,023
Mean	6,887	7,549	11,575	13,093	14,625	13,452	10,674	7,876	5,908	5,794	6,299	7,065	6,671

Table G3a-51. Water Year Average of Monthly Flows (cfs) — Sacramento River at Knights Landing (SWRCB Sac at Knights Landing)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	5,275	5,155	7,619	8,334	8,769	8,064	4,673	3,799	4,291	3,764	4,296	3,574
D	6,452	6,843	9,954	8,516	11,624	11,106	6,110	4,669	5,342	4,693	5,001	4,509
BN	6,867	6,942	9,404	13,073	15,171	12,306	9,575	5,552	5,311	5,852	4,914	5,047
AN	6,735	8,306	11,555	17,425	18,813	18,208	12,241	8,946	5,490	7,475	6,178	9,298
W	8,133	9,912	17,782	18,737	19,186	17,978	15,302	11,041	7,481	7,111	8,935	10,857
All	6,881	7,702	12,040	13,546	15,016	13,820	10,070	7,161	5,830	5,842	6,208	6,986
2008-2009 BiOps												
C	5,083	5,577	8,204	8,022	8,683	7,862	4,933	3,819	4,603	3,795	4,292	3,728
D	6,473	7,143	9,640	8,481	11,997	11,135	6,028	4,470	5,793	4,957	4,843	4,473
BN	6,845	7,345	9,211	12,840	14,811	12,110	9,421	5,557	5,421	5,697	5,104	5,149
AN	6,701	8,922	11,625	17,410	18,094	18,113	12,250	9,032	5,640	7,246	6,296	8,898
W	8,258	10,069	17,646	18,807	19,197	18,026	15,329	11,111	7,516	7,109	8,874	11,221
All	6,884	8,038	11,997	13,465	14,931	13,760	10,075	7,152	6,032	5,848	6,203	7,079
2019 BiOps												
C	5,240	5,086	7,327	8,107	8,890	7,973	5,113	4,306	4,178	3,721	4,282	3,687
D	6,476	6,872	9,441	8,529	11,259	10,791	7,167	5,580	5,432	4,496	4,738	4,588
BN	6,859	6,839	9,065	11,768	14,714	11,564	9,928	6,106	5,222	5,514	5,030	5,134
AN	6,708	8,243	10,923	16,957	18,370	17,587	12,215	9,211	5,476	7,400	6,187	9,063
W	7,834	9,868	17,055	18,304	18,613	17,782	15,254	10,971	7,500	7,075	8,941	10,771
All	6,786	7,657	11,515	13,084	14,640	13,460	10,427	7,562	5,820	5,708	6,170	6,981
VA												
C	5,383	4,966	7,300	8,294	8,599	7,653	4,750	4,038	4,101	3,797	4,273	3,806
D	6,527	6,871	9,394	8,547	11,312	10,722	7,375	5,917	5,884	5,093	5,422	5,007
BN	6,957	6,686	9,044	11,577	14,654	11,803	10,641	6,823	5,191	5,435	5,194	5,008
AN	6,822	7,957	11,097	16,959	18,493	17,675	13,066	10,056	5,363	6,924	5,976	9,059
W	7,948	9,788	17,241	18,337	18,662	17,797	15,318	11,107	7,564	7,124	8,853	10,748
All	6,887	7,549	11,575	13,093	14,625	13,452	10,674	7,876	5,908	5,794	6,299	7,065

G3a.3.1.18 Sacramento River at Freeport (SWRCB Sac at Freeport)

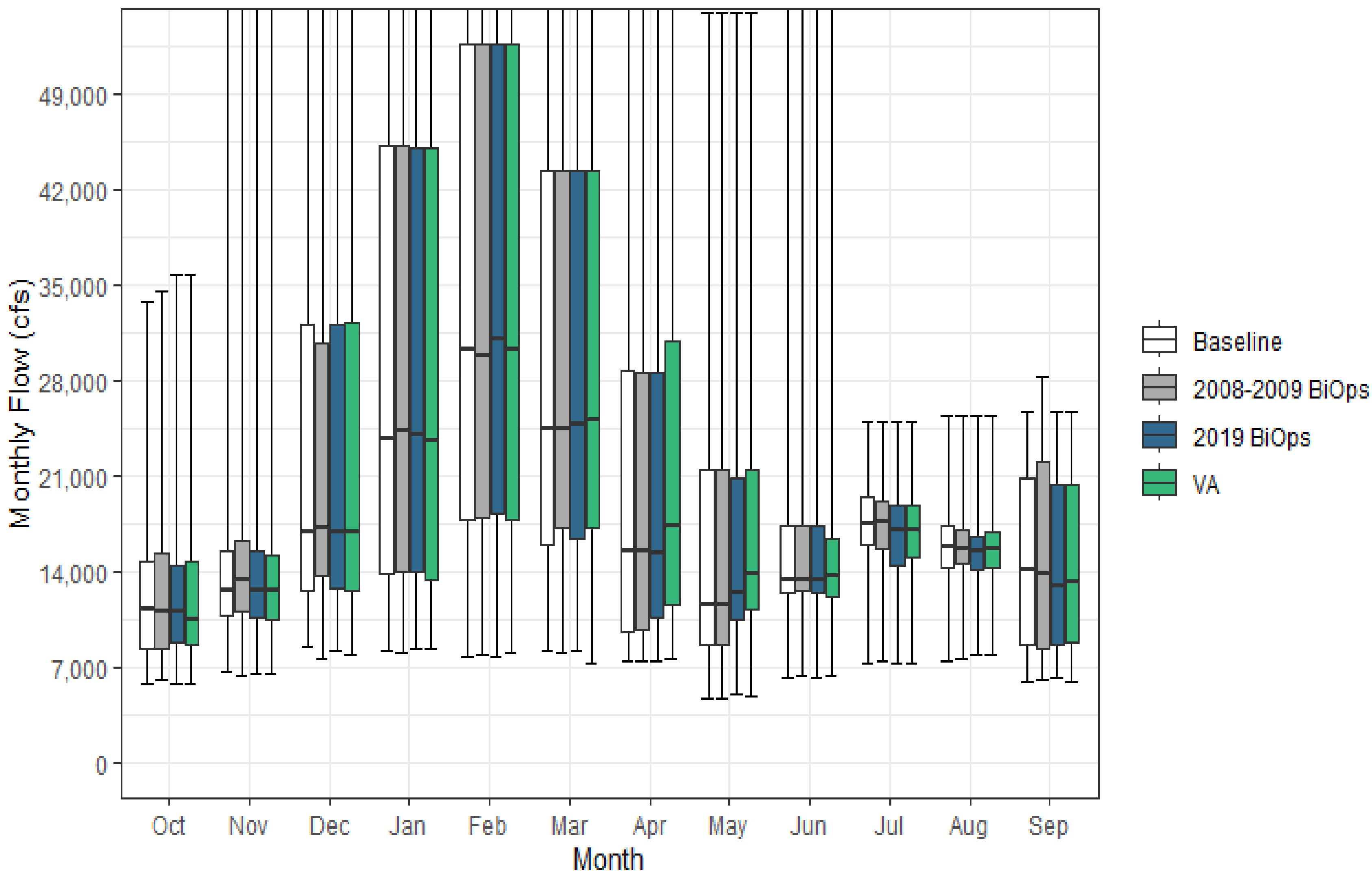

Figure G3a-20. Sacramento River at Freeport (SWRCB Sac at Freeport) Monthly Boxplot

Table G3a-52. Cumulative Distribution of Monthly Flow (cfs) — Sacramento River at Freeport (SWRCB Sac at Freeport)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	5,756	6,618	8,452	8,220	7,648	8,190	7,435	4,723	6,139	7,192	7,346	5,942	5,627
10%	6,759	8,284	11,422	11,469	13,066	12,110	8,346	7,881	10,421	8,492	9,272	6,682	7,791
25%	8,383	10,764	12,586	13,741	17,823	15,996	9,518	8,579	12,393	15,977	14,288	8,575	10,048
50%	11,164	12,655	16,865	23,656	30,265	24,479	15,546	11,488	13,331	17,533	15,799	14,043	12,852
75%	14,674	15,527	32,139	45,108	52,614	43,383	28,686	21,420	17,280	19,484	17,257	20,860	19,579
90%	17,414	22,966	54,310	60,168	66,637	58,163	49,752	39,162	26,619	21,810	19,193	22,655	24,154
100%	33,745	59,464	73,148	75,875	76,658	74,551	70,300	54,967	55,367	24,933	25,417	25,653	32,250
Mean	12,050	14,944	25,480	30,273	35,305	30,879	21,794	17,239	16,483	16,714	15,207	14,882	15,121
2008-2009 BiOps													
0%	6,070	6,296	7,616	8,070	7,899	7,994	7,433	4,657	6,286	7,380	7,513	6,096	5,932
10%	6,721	8,092	11,545	11,585	12,868	11,937	8,740	8,023	10,604	8,661	9,261	7,095	7,807
25%	8,386	11,031	13,645	13,883	17,905	17,108	9,671	8,694	12,579	15,620	14,585	8,385	10,268
50%	11,102	13,363	17,221	24,354	29,777	24,447	15,534	11,598	13,283	17,603	15,649	13,797	12,720
75%	15,330	16,250	30,630	45,109	52,614	43,378	28,586	21,440	17,272	19,085	17,024	22,097	20,003
90%	16,840	22,011	54,275	60,164	65,771	58,161	49,750	39,656	26,620	20,892	18,897	25,536	24,251
100%	34,523	59,463	72,746	75,875	76,615	74,550	70,302	54,968	55,367	24,866	25,417	28,250	32,250
Mean	12,130	15,438	25,514	29,976	34,828	30,718	21,882	17,335	16,545	16,472	15,247	15,709	15,154
2019 BiOps													
0%	5,766	6,566	8,104	8,277	7,646	8,192	7,385	4,926	6,139	7,195	7,856	6,140	5,663
10%	6,724	8,136	10,825	11,286	13,068	12,140	9,114	9,030	10,402	8,269	9,412	6,895	7,961
25%	8,856	10,632	12,758	13,909	18,273	16,401	10,672	10,456	12,364	14,407	14,155	8,609	10,330
50%	11,111	12,655	16,861	24,021	31,068	24,807	15,403	12,395	13,280	16,993	15,530	12,829	12,744
75%	14,457	15,495	32,104	45,039	52,614	43,372	28,592	20,756	17,280	18,832	16,558	20,414	19,336
90%	17,327	22,802	54,231	60,168	66,636	58,161	49,753	39,160	25,889	20,425	19,194	22,235	24,146
100%	35,711	59,464	73,185	75,875	76,649	74,551	70,301	54,967	55,370	24,866	25,417	25,653	32,250
Mean	12,044	14,977	25,374	30,469	35,419	30,933	22,194	18,154	16,439	16,103	15,100	14,385	15,142
VA													
0%	5,760	6,517	7,928	8,380	8,019	7,286	7,524	4,803	6,287	7,184	7,816	5,937	5,662
10%	6,608	7,862	10,554	11,428	12,216	11,967	9,406	8,489	9,854	8,417	9,525	6,998	7,922
25%	8,690	10,505	12,542	13,382	17,730	17,127	11,582	11,190	12,130	15,032	14,326	8,793	10,650
50%	10,459	12,646	16,850	23,524	30,173	25,052	17,369	13,816	13,698	17,051	15,662	13,209	12,974
75%	14,674	15,105	32,157	45,039	52,605	43,373	30,872	21,429	16,376	18,780	16,892	20,389	19,317
90%	17,429	22,878	54,003	60,170	66,638	58,164	49,751	39,168	26,610	20,077	18,889	22,016	24,180
100%	35,723	59,466	72,914	75,878	76,654	74,552	70,296	54,971	55,371	24,866	25,417	25,653	32,255
Mean	12,028	14,794	25,258	30,398	35,366	30,937	23,208	18,850	16,524	16,175	15,264	14,421	15,240

Table G3a-53. Water Year Average of Monthly Flows (cfs) — Sacramento River at Freeport (SWRCB Sac at Freeport)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	9,583	9,940	13,367	14,315	15,065	12,927	8,533	7,154	9,607	9,011	8,879	6,834
D	11,015	12,740	17,913	15,336	21,815	20,723	11,077	9,283	13,211	16,308	14,846	9,721
BN	12,250	13,080	18,749	23,238	33,157	23,405	18,819	12,183	13,642	18,728	15,989	13,079
AN	11,422	15,771	22,707	40,373	46,915	42,718	23,491	19,761	14,890	20,280	15,938	22,063
W	14,295	20,056	42,921	49,968	52,593	47,576	38,015	30,596	25,028	18,395	18,078	21,082
All	12,050	14,944	25,480	30,273	35,305	30,879	21,794	17,239	16,483	16,714	15,207	14,882
2008-2009 BiOps												
C	9,559	10,513	14,736	14,124	14,706	12,843	8,565	7,209	9,758	9,193	9,010	7,339
D	11,124	12,907	17,965	15,391	21,587	20,663	11,393	9,435	13,182	15,814	15,096	9,464
BN	12,077	13,709	18,722	22,701	32,332	23,072	18,670	12,267	13,693	18,124	15,861	13,161
AN	11,247	16,640	23,162	39,286	45,453	42,194	23,604	19,873	15,067	19,831	15,970	20,792
W	14,674	20,508	42,081	49,834	52,499	47,557	38,094	30,676	25,067	18,420	18,020	24,245
All	12,130	15,438	25,514	29,976	34,828	30,718	21,882	17,335	16,545	16,472	15,247	15,709
2019 BiOps												
C	9,557	10,059	13,211	14,384	15,315	12,870	9,083	8,049	9,465	8,912	9,161	6,846
D	10,992	12,875	17,520	15,470	22,062	21,042	12,112	11,405	13,191	15,568	14,648	9,573
BN	12,432	12,949	18,630	23,486	33,301	23,456	19,136	13,492	13,567	17,927	15,585	11,462
AN	11,556	15,881	22,663	40,807	46,819	42,524	23,529	20,207	14,784	19,357	15,813	21,467
W	14,140	20,031	43,037	50,144	52,606	47,598	38,062	30,580	25,063	17,855	18,020	20,773
All	12,044	14,977	25,374	30,469	35,419	30,933	22,194	18,154	16,439	16,103	15,100	14,385
VA												
C	9,345	9,894	13,103	14,546	15,149	12,639	8,935	7,785	9,263	9,015	9,072	6,952
D	10,974	12,818	17,389	15,337	21,918	21,055	13,492	12,425	13,600	15,722	15,383	9,616
BN	12,356	12,821	18,436	23,137	33,118	23,601	21,310	14,943	13,632	17,841	15,861	11,709
AN	11,652	15,484	22,598	40,773	46,973	42,600	26,117	21,782	14,595	19,459	15,790	21,087
W	14,217	19,802	42,952	50,149	52,674	47,604	38,047	30,712	25,188	17,932	17,905	20,815
All	12,028	14,794	25,258	30,398	35,366	30,937	23,208	18,850	16,524	16,175	15,264	14,421

G3a.3.1.19

G3a.3.1.20 Sacramento River at Rio Vista (SWRCB Sac at Rio Vista)

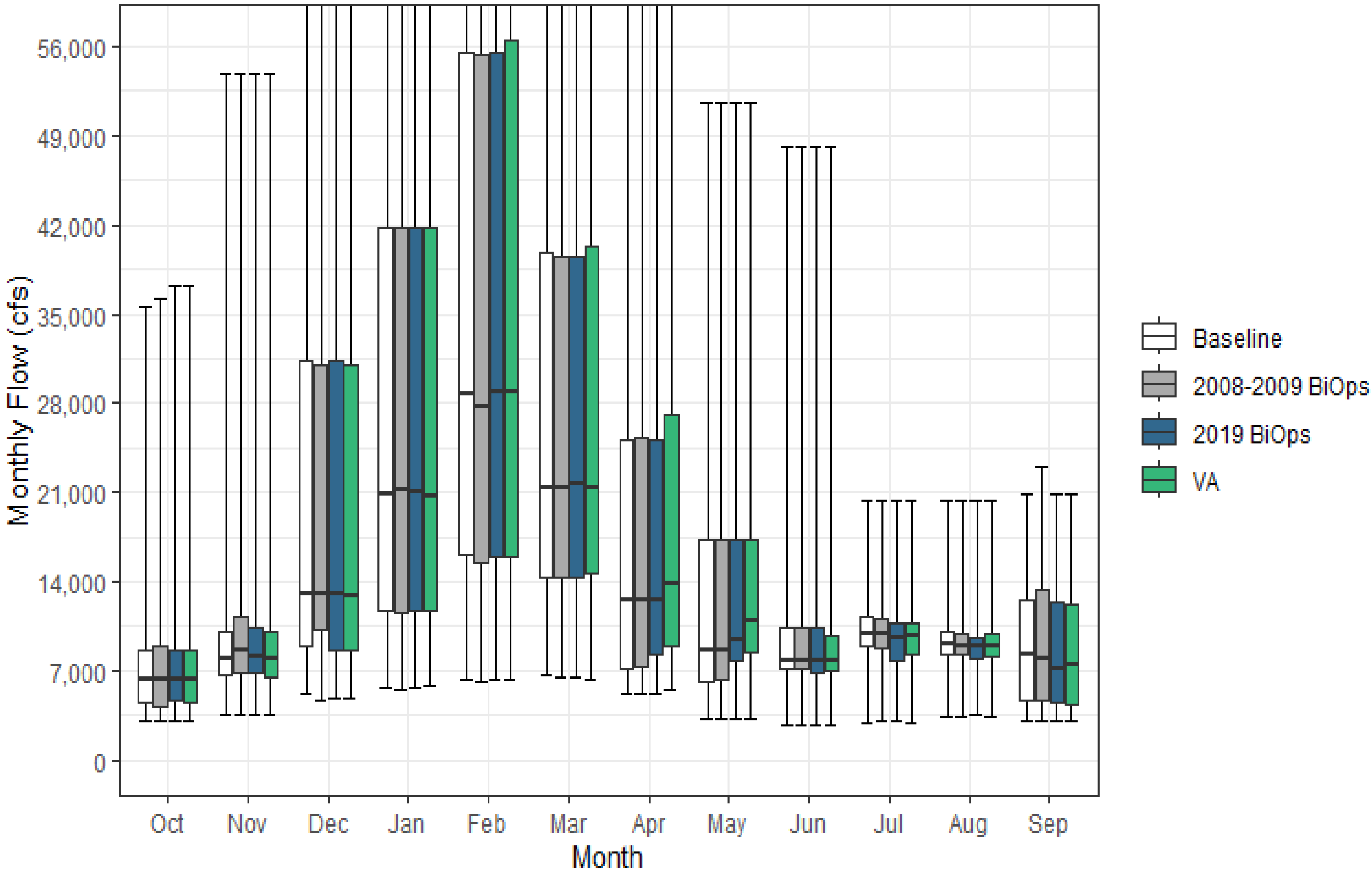

Figure G3a-21. Sacramento River at Rio Vista (SWRCB Sac at Rio Vista) Monthly Boxplot

Table G3a-54. Cumulative Distribution of Monthly Flow (cfs) — Sacramento River at Rio Vista (SWRCB Sac at Rio Vista)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	3,000	3,548	5,208	5,656	6,344	6,582	5,227	3,216	2,780	2,971	3,409	3,007	3,548
10%	3,150	4,638	7,520	9,040	11,185	9,811	6,191	5,631	5,848	3,949	4,456	3,177	5,724
25%	4,582	6,632	8,928	11,705	16,082	14,326	7,166	6,084	7,138	8,879	8,229	4,660	7,085
50%	6,319	7,932	12,953	20,952	28,660	21,397	12,471	8,673	7,782	9,958	9,120	8,210	9,642
75%	8,630	10,161	31,311	41,803	55,557	39,820	25,122	17,247	10,383	11,193	10,038	12,607	18,631
90%	10,346	15,896	60,107	78,366	103,587	74,379	45,527	32,947	21,475	12,742	11,155	13,795	25,032
100%	35,537	53,931	121,967	179,656	195,908	177,642	108,021	51,638	48,153	20,397	20,431	20,875	39,859
Mean	7,050	10,437	24,795	34,958	43,299	33,728	20,129	13,867	10,794	9,509	8,696	8,774	13,562
2008-2009 BiOps													
0%	3,000	3,553	4,676	5,527	6,162	6,526	5,225	3,165	2,736	3,117	3,369	3,004	3,762
10%	3,101	4,683	8,128	9,032	10,719	9,825	6,372	5,690	5,838	3,977	4,498	3,269	5,830
25%	4,235	6,740	10,286	11,606	15,511	14,269	7,283	6,299	7,101	8,696	8,283	4,646	7,121
50%	6,330	8,673	12,995	21,170	27,776	21,344	12,458	8,684	7,747	9,942	8,908	7,938	9,573
75%	8,967	11,233	30,951	41,803	55,421	39,548	25,260	17,264	10,378	11,038	9,971	13,349	18,336
90%	10,068	15,154	57,706	78,374	102,931	74,369	45,525	32,864	21,476	12,148	11,158	20,851	25,425
100%	36,207	53,928	121,967	179,654	194,443	177,620	108,025	51,641	48,153	20,397	20,431	23,032	39,856
Mean	7,111	10,780	24,700	34,658	42,849	33,546	20,174	13,919	10,796	9,287	8,680	9,983	13,589
2019 BiOps													
0%	3,000	3,547	4,867	5,721	6,325	6,442	5,221	3,275	2,781	2,973	3,464	3,006	3,515
10%	3,127	4,584	7,484	9,097	10,691	9,896	6,860	6,611	5,711	3,839	4,712	3,164	5,757
25%	4,707	6,735	8,567	11,640	16,023	14,317	8,300	7,776	6,891	7,797	8,035	4,550	7,373
50%	6,343	8,062	13,010	21,031	28,950	21,607	12,514	9,508	7,751	9,562	8,862	7,174	9,558
75%	8,548	10,345	31,311	41,743	55,566	39,554	25,055	17,350	10,383	10,722	9,514	12,391	18,735
90%	10,402	15,895	60,890	78,605	103,343	74,372	45,527	32,947	21,581	11,814	11,155	13,472	24,871
100%	37,228	53,931	121,967	179,656	195,608	177,642	108,023	51,638	48,163	20,397	20,431	20,875	39,859
Mean	7,063	10,496	24,810	35,019	43,205	33,790	20,502	14,673	10,745	9,046	8,601	8,399	13,582
VA													
0%	3,000	3,547	4,867	5,798	6,252	6,332	5,431	3,293	2,737	2,966	3,397	3,000	3,573
10%	3,071	4,641	7,154	8,928	10,198	9,516	7,008	6,116	5,339	3,846	4,758	3,157	5,554
25%	4,502	6,418	8,543	11,683	15,964	14,667	8,970	8,457	6,939	8,219	8,107	4,437	7,609
50%	6,307	7,984	12,861	20,772	28,908	21,402	13,864	10,846	7,870	9,740	8,963	7,433	9,781
75%	8,630	10,152	30,977	41,743	56,489	40,323	27,016	17,255	9,745	10,759	9,888	12,234	18,796
90%	10,316	15,857	58,883	78,494	103,405	74,231	45,532	32,955	21,468	11,692	11,177	13,568	24,694
100%	37,238	53,950	122,021	179,711	195,699	177,642	107,991	51,648	48,163	20,397	20,431	20,875	39,862
Mean	7,053	10,372	24,421	34,933	43,142	33,720	21,336	15,268	10,756	9,114	8,749	8,389	13,636

Table G3a-55. Water Year Average of Monthly Flows (cfs) — Sacramento River at Rio Vista (SWRCB Sac at Rio Vista)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	5,127	5,963	10,569	12,625	14,145	11,087	6,284	5,008	5,119	4,199	4,248	3,336
D	6,083	8,476	14,653	13,374	20,448	18,105	8,730	6,784	7,658	9,121	8,341	5,362
BN	7,074	8,335	15,811	21,239	33,729	20,652	15,555	9,341	7,930	10,721	9,237	7,599
AN	6,469	11,108	20,922	42,489	55,862	43,525	19,890	16,066	8,867	12,238	9,250	13,476
W	9,040	15,293	47,136	68,213	76,481	61,315	38,974	25,731	18,752	10,739	10,778	12,945
All	7,050	10,437	24,795	34,958	43,299	33,728	20,129	13,867	10,794	9,509	8,696	8,774
2008-2009 BiOps												
C	5,123	6,391	11,498	12,750	13,906	10,979	6,306	5,034	5,197	4,320	4,378	3,580
D	6,175	8,385	14,830	13,360	20,008	18,045	8,923	6,970	7,608	8,755	8,435	5,189
BN	6,895	8,792	15,699	20,990	33,292	20,420	15,504	9,392	7,921	10,359	8,971	7,549
AN	6,392	11,899	21,154	41,434	54,490	42,926	19,926	16,057	8,879	11,526	9,101	12,629
W	9,317	15,654	46,159	67,762	76,297	61,210	38,985	25,724	18,753	10,738	10,812	17,351
All	7,111	10,780	24,700	34,658	42,849	33,546	20,174	13,919	10,796	9,287	8,680	9,983
2019 BiOps												
C	5,111	6,017	10,454	12,517	13,930	11,041	6,762	5,741	4,987	4,178	4,397	3,226
D	6,069	8,533	14,165	13,344	20,313	18,366	9,605	8,601	7,615	8,620	8,243	5,190
BN	7,161	8,292	16,034	21,307	33,667	20,732	15,870	10,487	7,860	10,161	8,832	6,389
AN	6,573	11,288	20,907	42,654	55,793	43,422	20,011	16,449	8,793	11,204	9,076	13,018
W	9,006	15,367	47,485	68,383	76,454	61,345	39,059	25,791	18,765	10,373	10,777	12,819
All	7,063	10,496	24,810	35,019	43,205	33,790	20,502	14,673	10,745	9,046	8,601	8,399
VA												
C	4,977	5,941	10,269	12,370	13,982	10,849	6,641	5,526	4,868	4,199	4,375	3,250
D	6,080	8,524	14,126	13,262	20,256	18,413	10,779	9,521	7,821	8,822	8,711	5,055
BN	7,147	8,163	15,778	21,252	33,299	20,621	17,770	11,759	7,911	10,164	8,976	6,576
AN	6,637	11,080	20,472	42,464	55,903	43,451	22,101	17,945	8,605	11,271	9,232	12,814
W	9,017	15,169	46,663	68,352	76,433	61,236	38,963	25,781	18,762	10,405	10,776	12,847
All	7,053	10,372	24,421	34,933	43,142	33,720	21,336	15,268	10,756	9,114	8,749	8,389

G3a.3.1.21 Sutter Bypass (Sacramento Slough)

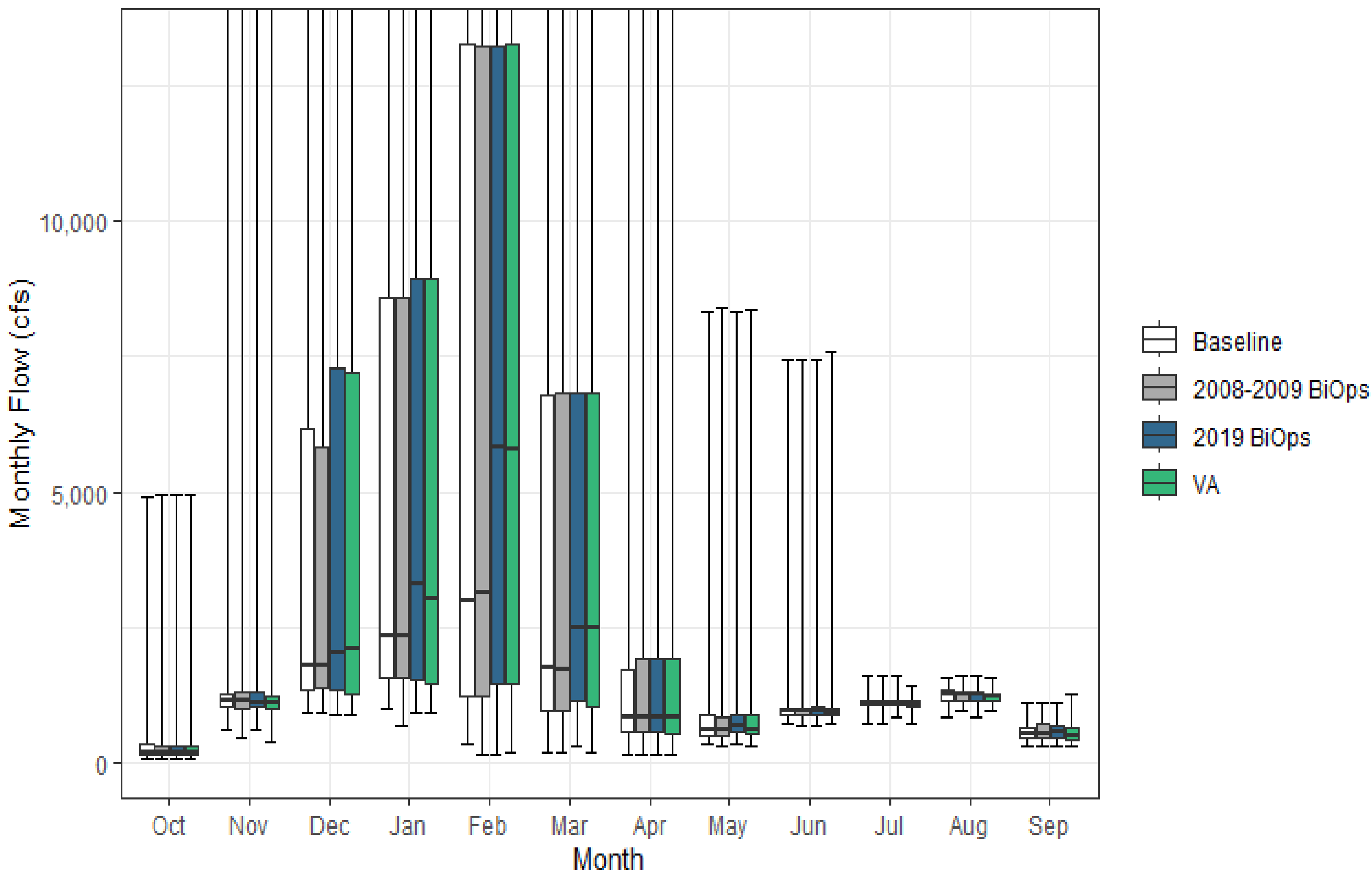

Figure G3a-22. Sutter Bypass (Sacramento Slough) Monthly Boxplot

Table G3a-56. Cumulative Distribution of Monthly Flow (cfs) — Sutter Bypass (Sacramento Slough)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	67	586	909	1,003	347	180	128	329	728	731	831	300	466
10%	106	878	1,097	1,164	715	585	317	429	794	890	1,074	366	682
25%	127	1,025	1,348	1,577	1,223	934	573	494	856	1,075	1,129	462	835
50%	168	1,122	1,805	2,350	2,989	1,744	826	593	938	1,099	1,271	541	1,400
75%	338	1,262	6,180	8,588	13,274	6,791	1,731	860	1,006	1,154	1,316	643	3,533
90%	539	1,514	18,807	26,572	38,388	22,405	6,526	1,186	1,120	1,206	1,398	762	6,278
100%	4,920	20,037	41,296	71,719	103,961	74,848	37,266	8,315	7,427	1,598	1,572	1,114	10,137
Mean	302	1,471	5,672	9,166	12,145	7,091	2,878	865	1,066	1,095	1,243	564	2,600
2008-2009 BiOps													
0%	60	456	918	683	151	180	135	310	671	732	943	303	469
10%	118	864	1,103	1,222	705	604	317	353	781	956	1,078	387	689
25%	130	1,004	1,357	1,577	1,221	935	578	477	866	1,067	1,144	444	817
50%	181	1,124	1,805	2,328	3,141	1,732	835	598	944	1,098	1,272	544	1,429
75%	281	1,301	5,823	8,581	13,247	6,816	1,901	851	1,003	1,142	1,304	700	3,529
90%	558	1,584	16,965	26,573	38,413	22,375	6,525	1,164	1,077	1,185	1,350	771	6,338
100%	4,942	20,092	41,296	71,718	103,959	74,767	37,266	8,383	7,452	1,598	1,604	1,085	10,118
Mean	306	1,471	5,600	9,099	12,168	7,077	2,908	857	1,066	1,090	1,244	574	2,594
2019 BiOps													
0%	67	584	882	896	151	285	127	335	671	830	831	300	480
10%	106	890	1,098	1,131	786	580	337	498	797	945	1,072	400	745
25%	127	1,031	1,324	1,517	1,462	1,128	571	570	872	1,074	1,129	456	934
50%	162	1,112	2,042	3,291	5,818	2,486	826	689	956	1,099	1,270	553	1,565
75%	300	1,279	7,280	8,934	13,246	6,825	1,910	890	1,033	1,152	1,301	675	3,781
90%	546	1,515	18,267	26,562	38,404	22,357	6,520	1,208	1,124	1,195	1,350	770	6,364
100%	4,945	20,044	41,286	71,709	103,950	74,844	37,267	8,308	7,428	1,599	1,604	1,103	10,123
Mean	303	1,459	6,009	9,732	12,646	7,416	2,908	911	1,079	1,098	1,237	574	2,709
VA													
0%	72	374	862	901	175	176	128	291	717	732	947	305	485
10%	109	884	1,079	1,120	721	585	321	430	823	964	1,078	380	687
25%	128	1,001	1,252	1,463	1,463	1,014	519	519	858	1,023	1,141	414	917
50%	161	1,088	2,084	3,006	5,777	2,485	816	600	913	1,052	1,209	503	1,509
75%	281	1,224	7,203	8,943	13,271	6,825	1,910	881	1,000	1,152	1,271	643	3,778
90%	559	1,494	18,484	26,605	38,345	22,356	6,537	1,165	1,114	1,238	1,380	731	6,326
100%	4,937	20,040	41,289	71,771	103,953	74,809	37,311	8,356	7,595	1,400	1,571	1,273	10,120
Mean	297	1,396	5,906	9,725	12,631	7,423	2,947	888	1,071	1,075	1,214	543	2,693

Table G3a-57. Water Year Average of Monthly Flows (cfs) — Sutter Bypass (Sacramento Slough)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	162	989	1,915	1,736	1,693	1,170	352	509	839	925	1,080	390
D	222	1,128	2,695	1,956	2,937	2,157	721	565	961	1,112	1,295	542
BN	266	1,147	3,493	2,624	7,322	1,573	1,208	613	936	1,106	1,316	567
AN	233	1,057	3,739	10,770	16,719	8,310	1,542	1,182	947	1,169	1,261	641
W	487	2,361	12,071	21,839	25,617	16,792	7,436	1,297	1,395	1,137	1,238	641
All	302	1,471	5,672	9,166	12,145	7,091	2,878	865	1,066	1,095	1,243	564
2008-2009 BiOps												
C	168	909	1,900	1,750	1,662	1,165	387	503	828	924	1,100	400
D	230	1,140	2,694	1,995	2,927	2,201	728	538	942	1,083	1,276	543
BN	268	1,128	3,392	2,674	7,403	1,594	1,250	587	922	1,118	1,317	554
AN	260	1,113	3,736	10,602	16,755	8,145	1,588	1,206	963	1,136	1,274	625
W	480	2,382	11,902	21,621	25,655	16,773	7,466	1,302	1,417	1,148	1,241	683
All	306	1,471	5,600	9,099	12,168	7,077	2,908	857	1,066	1,090	1,244	574
2019 BiOps												
C	158	1,019	2,034	2,078	1,944	1,193	365	511	840	937	1,080	389
D	220	1,137	2,974	2,044	3,532	2,467	722	627	961	1,103	1,267	544
BN	266	1,104	3,631	4,067	7,818	2,263	1,161	651	948	1,115	1,316	587
AN	273	1,069	4,018	11,508	17,227	8,782	1,597	1,263	991	1,142	1,258	641
W	479	2,317	12,713	22,278	26,185	17,004	7,532	1,346	1,412	1,149	1,241	659
All	303	1,459	6,009	9,732	12,646	7,416	2,908	911	1,079	1,098	1,237	574
VA												
C	161	998	2,038	2,091	1,969	1,188	398	500	852	936	1,114	378
D	217	1,075	2,870	1,993	3,488	2,483	630	541	891	1,052	1,221	497
BN	254	1,057	3,495	4,006	7,776	2,243	1,311	620	911	1,074	1,262	506
AN	264	1,015	3,919	11,479	17,330	8,803	2,000	1,317	951	1,119	1,217	607
W	469	2,217	12,571	22,333	26,133	17,020	7,450	1,336	1,473	1,149	1,232	660
All	297	1,396	5,906	9,725	12,631	7,423	2,947	888	1,071	1,075	1,214	543

G3a.3.1.22 Thomes Creek above Confluence with Sacramento River (SWRCB Thomes Creek)

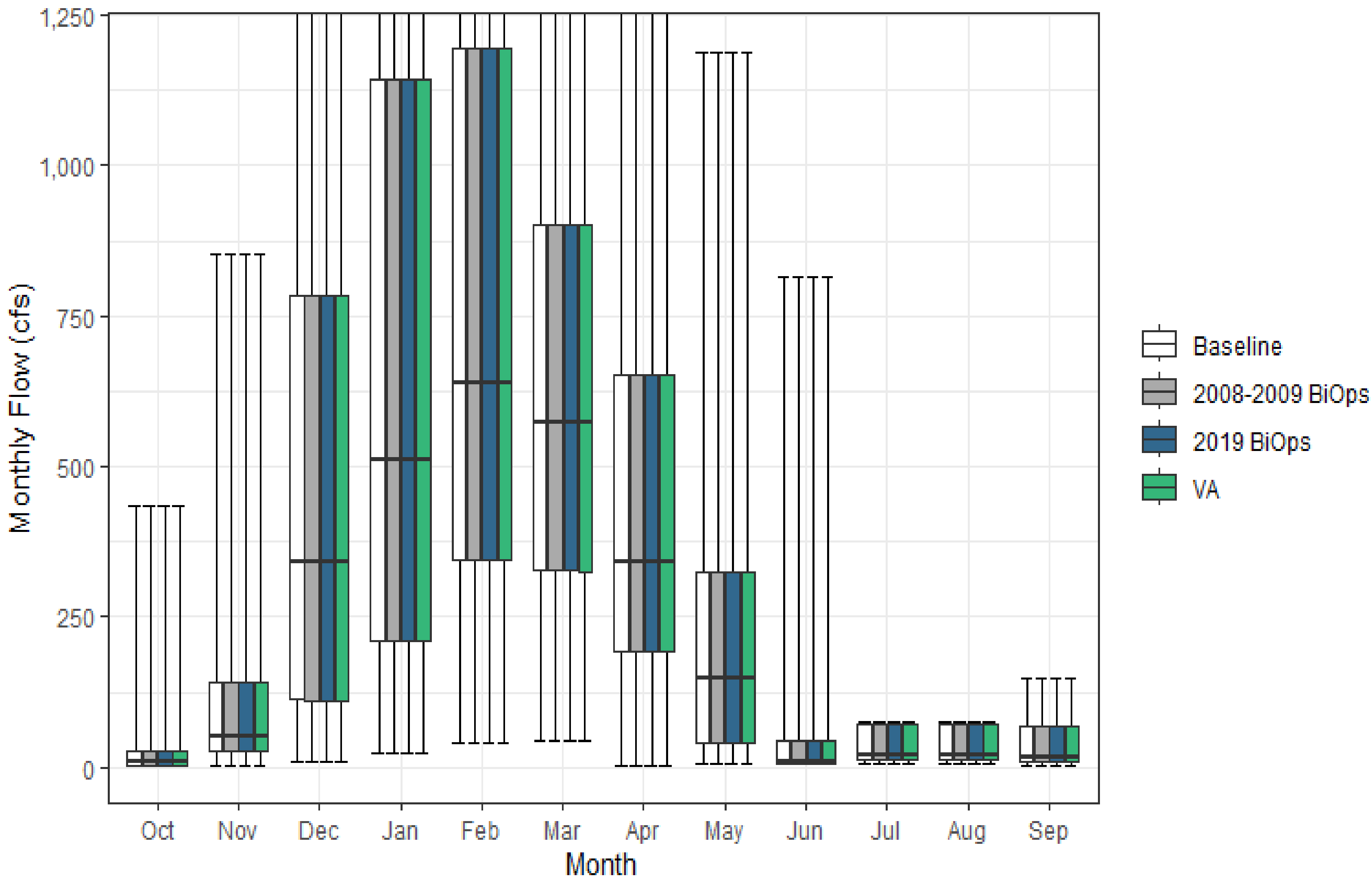

Figure G3a-23. Thomes Creek above Confluence with Sacramento River (SWRCB Thomes Creek) Monthly Boxplot

Table G3a-58. Cumulative Distribution of Monthly Flow (cfs) — Thomes Creek above Confluence with Sacramento River (SWRCB Thomes Creek)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	1	4	9	25	39	43	3	5	6	6	5	4	20
10%	2	13	34	109	164	214	92	14	6	8	7	5	75
25%	3	27	113	211	343	329	192	42	7	14	14	11	131
50%	10	52	341	509	640	572	341	147	9	18	19	17	193
75%	26	141	784	1,144	1,195	900	652	323	43	72	71	69	330
90%	73	298	1,251	1,765	2,011	1,418	925	611	144	73	72	70	445
100%	434	854	2,757	4,180	5,326	2,975	2,054	1,187	816	75	75	148	699
Mean	30	124	537	773	925	692	464	247	52	37	37	38	237
2008-2009 BiOps													
0%	1	4	9	25	39	43	3	5	6	6	5	4	20
10%	2	13	34	109	164	214	92	14	6	8	7	5	75
25%	3	27	111	210	343	329	192	42	7	14	14	11	131
50%	10	52	341	509	640	572	341	147	9	18	19	17	193
75%	26	141	784	1,144	1,195	900	652	323	43	72	71	69	330
90%	73	298	1,251	1,765	2,011	1,418	925	611	144	73	72	70	445
100%	435	854	2,757	4,180	5,326	2,975	2,054	1,187	816	75	75	148	699
Mean	30	123	537	773	925	692	464	247	52	37	37	38	237
2019 BiOps													
0%	1	4	9	25	39	43	3	5	6	6	5	4	20
10%	2	13	34	109	164	214	92	14	6	8	7	5	75
25%	3	27	111	211	343	329	192	42	7	14	14	11	131
50%	10	52	341	509	640	572	341	147	9	18	19	17	193
75%	26	141	784	1,144	1,195	900	652	323	43	72	71	69	330
90%	73	298	1,251	1,765	2,011	1,418	924	611	144	73	72	70	445
100%	435	854	2,757	4,180	5,326	2,975	2,054	1,187	816	75	75	148	699
Mean	30	124	537	773	925	694	464	247	52	37	37	38	237
VA													
0%	1	4	9	25	39	43	3	5	6	6	5	4	20
10%	2	13	34	109	164	214	92	14	6	8	7	5	75
25%	3	27	111	210	343	325	192	42	7	14	14	11	131
50%	10	52	341	509	640	572	341	147	9	18	19	17	193
75%	26	141	784	1,144	1,195	900	652	323	43	72	71	69	330
90%	73	298	1,251	1,765	2,011	1,418	925	611	144	73	72	70	445
100%	435	854	2,757	4,180	5,326	2,975	2,055	1,187	816	75	75	148	699
Mean	30	124	537	773	925	694	464	247	52	37	37	38	237

Table G3a-59. Water Year Average of Monthly Flows (cfs) — Thomes Creek above Confluence with Sacramento River (SWRCB Thomes Creek)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	17	25	266	295	407	304	124	50	14	7	7	6
D	14	110	337	290	606	487	267	106	9	14	14	20
BN	25	68	280	595	683	509	466	154	26	18	19	20
AN	34	129	556	1,116	1,246	896	500	336	55	61	60	59
W	51	218	978	1,354	1,450	1,075	777	477	120	72	72	70
All	30	124	537	773	925	692	464	247	52	37	37	38
2008-2009 BiOps												
C	17	25	266	295	407	304	124	50	14	7	7	6
D	14	110	337	290	606	488	267	106	9	14	14	20
BN	25	68	280	595	682	509	466	154	26	18	19	20
AN	34	129	556	1,116	1,246	896	500	336	55	61	60	59
W	51	218	978	1,354	1,450	1,075	777	477	120	72	72	70
All	30	123	537	773	925	692	464	247	52	37	37	38
2019 BiOps												
C	17	25	266	295	407	304	124	50	14	7	7	6
D	14	110	337	290	606	492	267	106	9	14	14	20
BN	25	68	280	596	683	512	466	154	26	18	19	20
AN	34	129	556	1,116	1,246	896	500	336	55	61	60	59
W	51	218	978	1,354	1,450	1,077	777	477	120	72	72	70
All	30	124	537	773	925	694	464	247	52	37	37	38
VA												
C	17	25	266	295	407	308	124	50	14	7	7	6
D	14	110	337	290	606	489	267	106	9	14	14	20
BN	25	68	280	595	683	513	466	154	26	18	19	20
AN	34	129	556	1,116	1,246	896	499	336	55	61	60	59
W	51	218	978	1,354	1,450	1,076	777	477	120	72	72	70
All	30	124	537	773	925	694	464	247	52	37	37	38

G3a.3.1.23 Trinity River below Lewiston Reservoir (SWRCB Trinity)

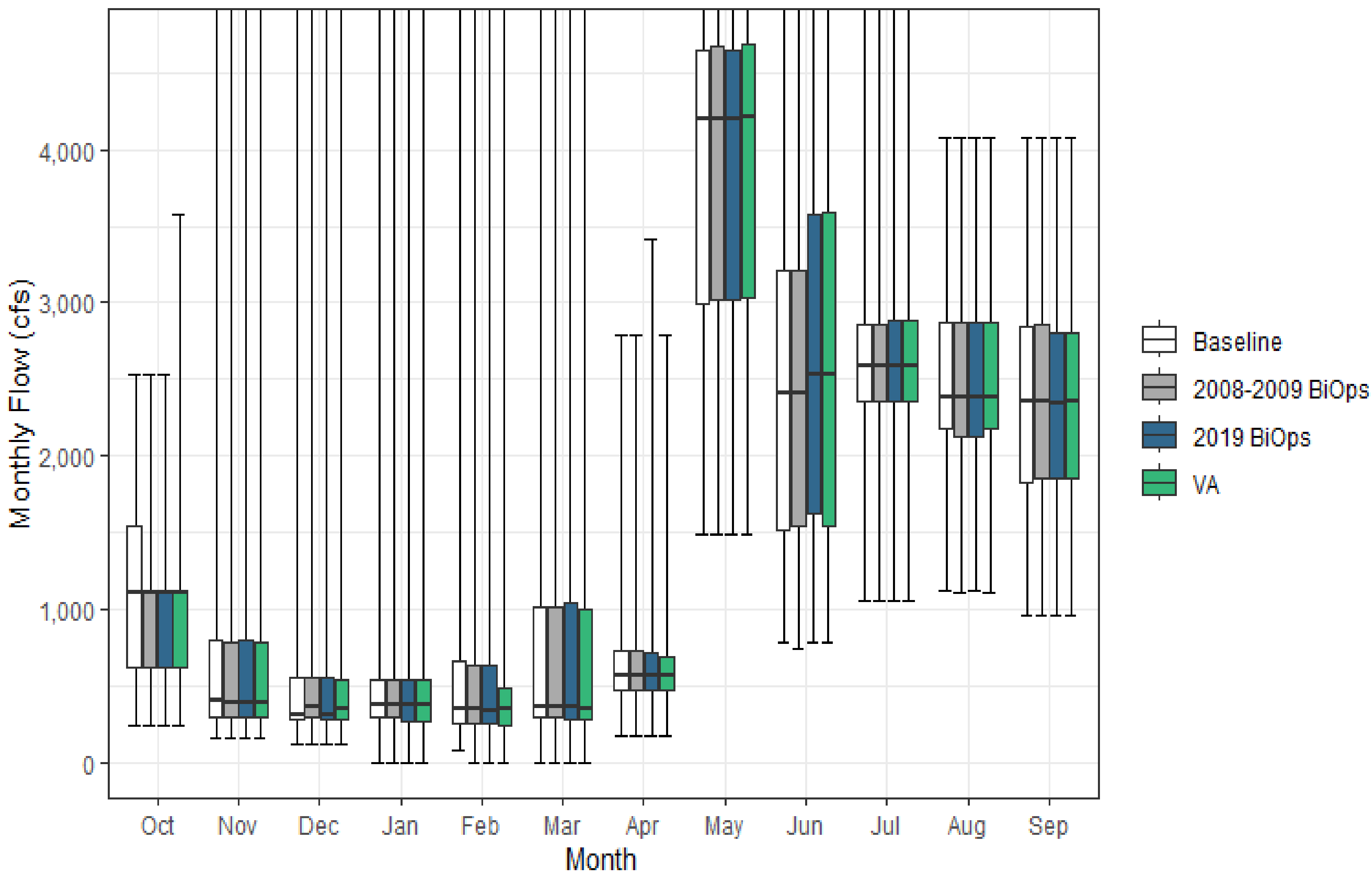

Figure G3a-24. Trinity River below Lewiston Reservoir (SWRCB Trinity) Monthly Boxplot

Table G3a-60. Cumulative Distribution of Monthly Flow (cfs) — Trinity River below Lewiston Reservoir (SWRCB Trinity)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	239	164	124	0	74	0	177	1,481	786	1,055	1,117	954	657
10%	370	278	242	231	181	215	396	2,833	1,026	1,111	1,863	1,267	821
25%	625	300	284	288	260	294	464	2,990	1,519	2,353	2,174	1,822	965
50%	1,114	401	307	381	350	364	568	4,193	2,409	2,585	2,377	2,350	1,083
75%	1,536	795	546	539	666	1,018	724	4,645	3,206	2,852	2,867	2,842	1,355
90%	2,185	1,944	1,763	2,262	2,870	2,071	1,458	4,814	4,477	3,946	3,329	2,924	1,695
100%	2,525	6,121	5,264	7,952	9,484	6,173	2,784	8,635	7,810	6,616	4,078	4,075	2,828
Mean	1,187	784	744	880	878	873	769	3,932	2,542	2,624	2,476	2,263	1,210
2008-2009 BiOps													
0%	239	164	124	0	0	0	177	1,481	739	1,055	1,113	954	602
10%	416	275	242	226	185	215	401	2,833	1,018	1,111	1,256	1,240	849
25%	625	294	287	287	258	290	465	3,014	1,538	2,350	2,120	1,857	978
50%	1,113	394	360	371	350	365	565	4,194	2,404	2,584	2,377	2,354	1,095
75%	1,126	785	546	539	639	1,018	724	4,672	3,206	2,852	2,866	2,851	1,353
90%	2,182	1,600	3,283	1,960	2,655	2,071	1,608	4,826	4,477	4,056	3,316	2,935	1,695
100%	2,525	6,124	5,264	7,952	9,484	6,173	2,784	8,635	7,810	6,616	4,078	4,075	2,828
Mean	1,156	761	847	842	850	851	771	3,972	2,545	2,628	2,431	2,320	1,211
2019 BiOps													
0%	239	164	124	0	0	0	177	1,481	786	1,055	1,117	954	619
10%	376	279	232	226	177	215	395	2,833	1,018	1,111	1,863	1,230	835
25%	625	300	284	272	248	284	464	3,014	1,622	2,353	2,128	1,851	964
50%	1,113	387	307	375	340	357	561	4,193	2,527	2,585	2,377	2,348	1,093
75%	1,126	795	545	532	639	1,045	710	4,640	3,574	2,879	2,867	2,796	1,335
90%	2,182	1,403	1,763	1,960	2,315	1,982	1,608	4,814	4,477	4,069	3,616	2,924	1,739
100%	2,525	5,222	5,486	7,952	9,484	6,173	3,413	8,635	7,767	6,616	4,079	4,074	2,828
Mean	1,159	703	743	841	844	851	788	3,942	2,667	2,685	2,501	2,243	1,211
VA													
0%	239	164	124	0	0	0	177	1,481	786	1,056	1,113	954	602
10%	376	278	232	221	177	215	391	2,833	1,018	1,115	1,339	1,560	844
25%	625	300	284	272	242	285	464	3,027	1,540	2,358	2,174	1,857	964
50%	1,112	387	351	370	343	351	565	4,214	2,530	2,586	2,378	2,350	1,103
75%	1,126	789	541	532	480	994	685	4,686	3,589	2,879	2,867	2,806	1,335
90%	2,203	1,617	1,403	1,960	2,298	1,982	1,431	4,835	4,535	4,056	3,473	2,935	1,750
100%	3,576	5,118	5,264	7,952	9,484	6,173	2,784	8,635	7,810	6,616	4,079	4,075	2,828
Mean	1,159	718	715	837	822	811	755	3,990	2,708	2,692	2,488	2,277	1,211

Table G3a-61. Water Year Average of Monthly Flows (cfs) — Trinity River below Lewiston Reservoir (SWRCB Trinity)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	947	642	408	432	562	421	761	2,346	1,492	2,970	2,381	1,971
D	1,010	970	351	363	878	364	554	3,236	1,957	2,609	2,746	2,261
BN	1,256	558	465	573	804	801	665	3,878	2,220	2,308	2,545	2,261
AN	1,191	667	432	609	696	655	787	4,583	2,736	2,424	2,460	2,270
W	1,407	909	1,523	1,810	1,169	1,635	991	5,058	3,654	2,729	2,290	2,419
All	1,187	784	744	880	878	873	769	3,932	2,542	2,624	2,476	2,263
2008-2009 BiOps												
C	814	775	408	419	493	377	744	2,583	1,583	3,043	2,132	2,178
D	1,010	932	488	375	829	450	551	3,244	1,940	2,632	2,758	2,275
BN	1,287	456	644	526	797	696	683	3,876	2,176	2,234	2,531	2,335
AN	1,154	579	833	406	609	603	799	4,581	2,738	2,424	2,419	2,207
W	1,371	889	1,479	1,799	1,194	1,607	993	5,058	3,654	2,729	2,290	2,471
All	1,156	761	847	842	850	851	771	3,972	2,545	2,628	2,431	2,320
2019 BiOps												
C	900	633	402	421	545	399	749	2,355	1,615	3,049	2,249	1,993
D	962	735	361	369	862	378	555	3,255	2,237	2,832	2,858	2,184
BN	1,256	557	465	582	804	805	665	3,930	2,435	2,293	2,631	2,217
AN	1,154	699	447	561	631	610	751	4,579	2,926	2,424	2,460	2,249
W	1,389	806	1,510	1,699	1,106	1,579	1,075	5,041	3,584	2,729	2,308	2,436
All	1,159	703	743	841	844	851	788	3,942	2,667	2,685	2,501	2,243
VA												
C	977	660	412	405	538	353	707	2,364	1,329	3,000	2,241	2,026
D	968	800	361	373	809	331	565	3,263	2,195	2,854	2,917	2,296
BN	1,204	496	426	575	811	792	657	4,027	2,673	2,455	2,492	2,246
AN	1,154	687	394	558	631	573	761	4,748	3,270	2,338	2,460	2,262
W	1,375	837	1,456	1,695	1,071	1,530	980	5,058	3,613	2,702	2,306	2,423
All	1,159	718	715	837	822	811	755	3,990	2,708	2,692	2,488	2,277

G3a.3.1.24 Yolo Bypass below Putah Creek Inflow

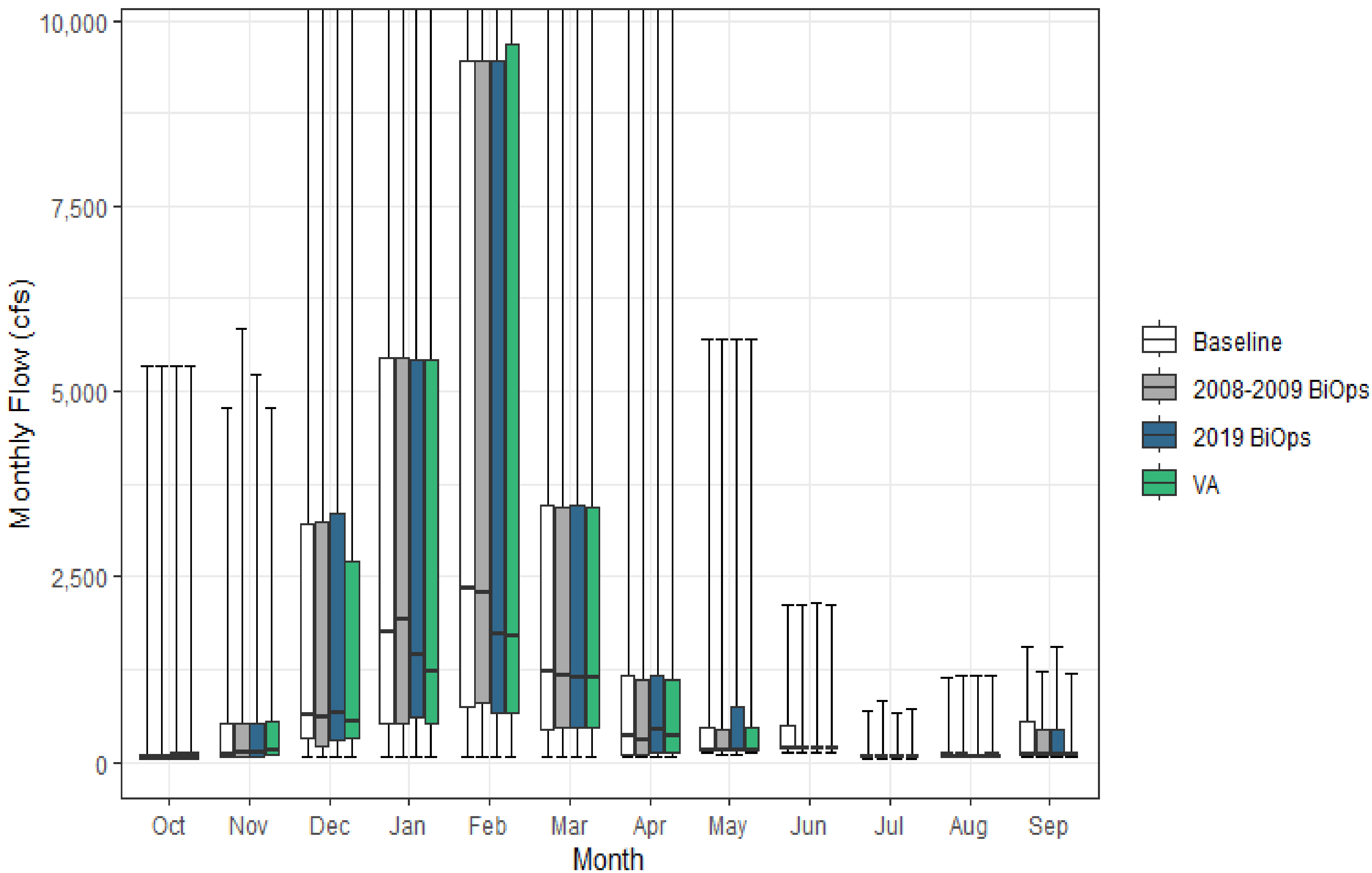

Figure G3a-25. Yolo Bypass below Putah Creek Inflow Monthly Boxplot

Table G3a-62. Cumulative Distribution of Monthly Flow (cfs) — Yolo Bypass below Putah Creek Inflow

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	48	73	76	82	72	87	66	127	126	59	71	64	129
10%	51	78	101	195	252	168	85	147	173	67	77	78	230
25%	55	81	327	513	760	429	105	155	179	68	79	89	336
50%	64	109	630	1,744	2,333	1,233	344	163	187	69	95	95	668
75%	103	517	3,218	5,454	9,443	3,454	1,163	472	481	69	111	558	2,889
90%	217	758	14,031	27,343	47,053	26,977	4,281	863	851	386	904	610	7,924
100%	5,332	4,773	58,709	111,355	125,897	111,615	48,205	5,693	2,126	703	1,141	1,567	12,475
Mean	172	383	4,304	9,172	12,741	7,687	2,454	420	340	127	251	295	2,281
2008-2009 BiOps													
0%	48	74	76	82	72	87	65	111	126	58	71	64	157
10%	52	78	98	261	204	173	84	145	172	67	77	78	210
25%	56	80	219	513	800	468	98	152	178	68	79	89	340
50%	70	132	599	1,911	2,296	1,175	310	161	187	69	91	94	678
75%	110	526	3,250	5,454	9,449	3,432	1,114	434	196	69	108	453	2,847
90%	214	784	12,654	27,340	47,450	26,391	4,279	849	553	325	852	601	7,914
100%	5,334	5,839	58,709	111,354	124,468	111,593	48,208	5,695	2,126	832	1,171	1,221	12,473
Mean	174	401	4,203	9,126	12,700	7,643	2,423	390	297	121	207	263	2,257
2019 BiOps													
0%	48	73	77	82	72	87	65	111	126	58	71	67	98
10%	51	77	99	219	231	172	85	145	172	67	78	80	206
25%	55	83	307	594	657	457	117	153	179	68	79	90	305
50%	64	136	663	1,450	1,723	1,126	443	162	188	69	89	94	684
75%	122	511	3,347	5,425	9,444	3,454	1,163	747	199	69	109	438	2,972
90%	353	882	14,625	28,006	47,382	26,835	4,281	866	847	350	893	600	7,940
100%	5,336	5,234	58,709	111,355	125,605	111,615	48,207	5,693	2,133	672	1,167	1,567	12,475
Mean	187	417	4,399	9,065	12,550	7,703	2,482	438	323	124	228	255	2,271
VA													
0%	48	91	89	87	86	89	66	125	126	57	71	67	138
10%	51	97	110	223	291	161	87	145	172	65	77	76	201
25%	56	102	314	516	658	461	119	154	177	67	79	89	293
50%	69	158	558	1,225	1,686	1,135	360	165	185	68	99	92	675
75%	124	537	2,712	5,429	9,676	3,440	1,115	463	192	69	117	109	2,895
90%	308	897	13,054	28,029	47,441	26,784	4,277	862	502	396	1,062	648	7,843
100%	5,335	4,788	58,746	111,396	125,677	111,615	48,179	5,699	2,132	713	1,167	1,187	12,474
Mean	185	433	4,104	9,039	12,531	7,630	2,448	438	270	148	263	220	2,243

Table G3a-63. Water Year Average of Monthly Flows (cfs) — Yolo Bypass below Putah Creek Inflow

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	80	228	1,003	1,095	1,379	699	128	190	209	82	122	331
D	78	345	1,180	1,015	1,797	946	338	185	295	115	210	420
BN	193	182	1,576	1,718	4,999	1,160	463	249	288	108	327	374
AN	105	311	2,949	7,294	14,978	7,264	806	468	351	161	343	210
W	308	647	10,654	24,946	30,776	20,632	7,202	802	472	157	265	170
All	172	383	4,304	9,172	12,741	7,687	2,454	420	340	127	251	295
2008-2009 BiOps												
C	90	230	870	1,384	1,449	662	122	171	181	79	162	239
D	95	307	1,314	954	1,552	936	257	243	264	81	136	418
BN	126	172	1,498	1,929	5,271	1,213	540	230	244	150	145	271
AN	143	457	2,828	7,172	14,861	7,114	746	363	238	162	172	220
W	322	677	10,388	24,610	30,673	20,543	7,144	727	441	138	338	172
All	174	401	4,203	9,126	12,700	7,643	2,423	390	297	121	207	263
2019 BiOps												
C	82	193	1,009	927	952	702	132	154	178	96	83	218
D	82	303	1,001	871	1,450	933	316	177	265	114	247	345
BN	157	235	1,896	1,574	4,814	1,197	504	268	266	87	189	254
AN	119	410	2,973	7,086	14,992	7,327	895	464	347	159	253	154
W	368	736	10,895	24,965	30,738	20,643	7,245	876	468	155	304	252
All	187	417	4,399	9,065	12,550	7,703	2,482	438	323	124	228	255
VA												
C	88	239	906	643	1,147	709	141	170	199	80	120	172
D	103	337	1,065	904	1,517	969	317	225	184	211	210	176
BN	190	198	1,782	1,818	4,603	961	540	295	273	146	149	273
AN	117	503	2,597	6,925	14,970	7,289	763	611	291	157	423	205
W	325	722	10,151	24,929	30,658	20,528	7,162	753	362	135	380	252
All	185	433	4,104	9,039	12,531	7,630	2,448	438	270	148	263	220

G3a.3.1.25 Yuba River, North Fork above New Bullards Bar Reservoir (SWRCB New Bullards Bar Inflow)

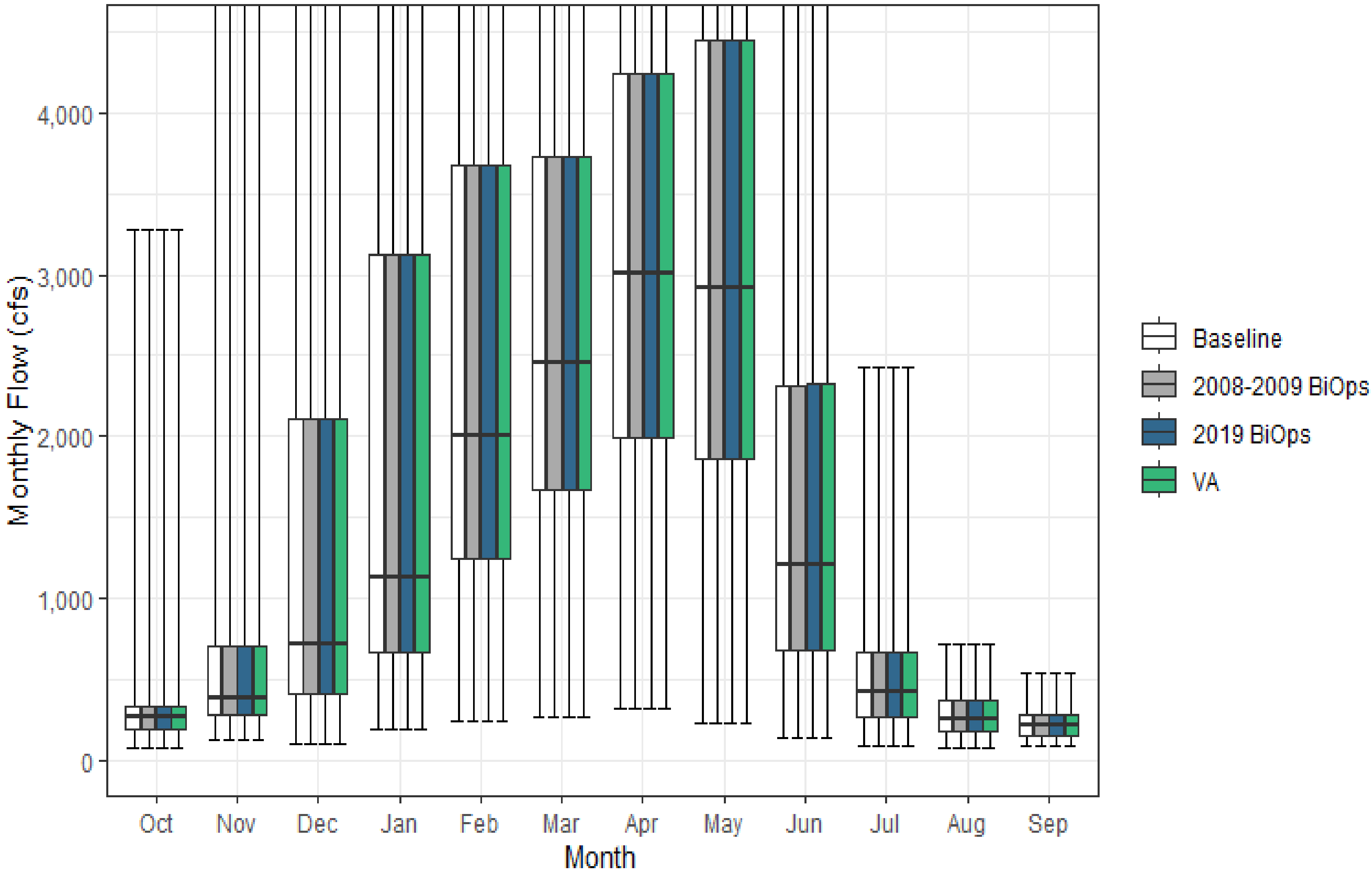

Figure G3a-26. Yuba River, North Fork above New Bullards Bar Reservoir (SWRCB New Bullards Bar Inflow) Monthly Boxplot

Table G3a-64. Cumulative Distribution of Monthly Flow (cfs) — Yuba River, North Fork above New Bullards Bar Reservoir (SWRCB New Bullards Bar Inflow)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	76	128	102	195	240	271	314	226	143	83	67	85	141
10%	163	214	282	358	667	1,075	1,361	727	273	158	131	121	424
25%	195	283	402	663	1,249	1,668	1,989	1,856	676	268	182	145	669
50%	260	383	718	1,131	2,004	2,448	3,007	2,920	1,203	422	252	210	1,046
75%	327	705	2,100	3,123	3,682	3,729	4,247	4,447	2,318	666	371	275	1,664
90%	445	1,326	4,631	5,472	5,276	5,420	5,189	6,004	3,640	1,043	471	328	1,927
100%	3,272	5,167	9,326	11,386	10,903	7,962	7,315	7,518	6,189	2,424	721	531	2,648
Mean	310	702	1,670	2,150	2,619	2,829	3,195	3,214	1,690	546	280	219	1,169
2008-2009 BiOps													
0%	76	128	102	195	240	271	314	226	143	83	67	85	141
10%	163	214	282	358	667	1,075	1,361	727	273	158	131	121	424
25%	195	283	402	663	1,249	1,668	1,989	1,856	676	268	182	145	669
50%	260	383	718	1,131	2,004	2,448	3,007	2,920	1,203	422	252	210	1,046
75%	327	705	2,100	3,123	3,682	3,729	4,247	4,447	2,318	666	371	275	1,664
90%	445	1,326	4,631	5,472	5,276	5,420	5,189	6,004	3,640	1,043	471	328	1,927
100%	3,272	5,167	9,326	11,386	10,903	7,962	7,649	7,518	6,189	2,424	722	531	2,668
Mean	310	702	1,670	2,150	2,619	2,829	3,199	3,214	1,690	546	281	219	1,169
2019 BiOps													
0%	76	128	102	195	240	271	314	226	143	83	67	85	141
10%	163	214	282	358	667	1,075	1,361	727	273	158	131	121	424
25%	195	283	402	663	1,249	1,668	1,989	1,856	676	268	182	145	669
50%	260	383	718	1,131	2,004	2,448	3,007	2,920	1,203	422	252	210	1,046
75%	327	705	2,100	3,123	3,682	3,729	4,247	4,447	2,319	666	371	275	1,664
90%	445	1,326	4,631	5,472	5,276	5,420	5,189	6,004	3,640	1,043	471	328	1,927
100%	3,272	5,167	9,326	11,386	10,903	7,962	7,315	7,518	6,189	2,424	721	531	2,648
Mean	310	702	1,670	2,150	2,619	2,829	3,195	3,214	1,690	546	281	219	1,169
VA													
0%	76	128	102	195	240	271	314	226	143	83	67	85	141
10%	163	214	282	358	667	1,075	1,361	727	273	158	131	121	424
25%	195	283	402	663	1,249	1,668	1,989	1,856	676	268	182	145	669
50%	260	383	718	1,131	2,004	2,448	3,008	2,920	1,203	422	252	210	1,046
75%	327	705	2,100	3,123	3,682	3,729	4,236	4,447	2,319	666	371	275	1,664
90%	445	1,326	4,658	5,472	5,276	5,420	5,189	6,004	3,640	1,043	471	328	1,944
100%	3,272	5,167	9,326	11,386	10,903	7,962	7,315	7,518	6,189	2,424	721	531	2,682
Mean	310	702	1,681	2,162	2,619	2,830	3,190	3,214	1,690	545	281	219	1,170

Table G3a-65. Water Year Average of Monthly Flows (cfs) — Yuba River, North Fork above New Bullards Bar Reservoir (SWRCB New Bullards Bar Inflow)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	250	294	534	519	901	1,268	1,312	1,069	497	177	132	116
D	235	529	910	770	1,666	2,237	2,486	2,071	806	284	189	166
BN	263	413	873	1,303	2,188	2,286	3,649	3,266	1,489	440	264	206
AN	300	892	1,313	3,083	3,287	4,049	3,474	3,772	1,577	531	314	250
W	430	1,144	3,486	4,174	4,232	3,917	4,342	4,952	3,162	1,010	424	310
All	310	702	1,670	2,150	2,619	2,829	3,195	3,214	1,690	546	280	219
2008-2009 BiOps												
C	250	294	534	519	901	1,268	1,312	1,069	497	177	132	116
D	235	529	910	770	1,666	2,237	2,486	2,071	806	285	189	166
BN	263	413	873	1,303	2,188	2,286	3,649	3,266	1,489	440	264	206
AN	300	892	1,313	3,083	3,287	4,049	3,474	3,772	1,577	531	314	250
W	430	1,144	3,486	4,174	4,232	3,915	4,354	4,952	3,162	1,010	424	310
All	310	702	1,670	2,150	2,619	2,829	3,199	3,214	1,690	546	281	219
2019 BiOps												
C	250	294	534	519	901	1,268	1,312	1,069	497	177	132	116
D	235	529	910	770	1,666	2,237	2,486	2,071	806	284	189	166
BN	263	413	873	1,303	2,188	2,286	3,649	3,266	1,489	440	264	206
AN	300	892	1,313	3,083	3,287	4,049	3,474	3,772	1,577	531	314	250
W	430	1,144	3,486	4,174	4,232	3,917	4,342	4,952	3,162	1,010	424	310
All	310	702	1,670	2,150	2,619	2,829	3,195	3,214	1,690	546	281	219
VA												
C	250	294	534	519	901	1,268	1,312	1,069	496	177	132	116
D	235	529	910	773	1,666	2,237	2,486	2,071	806	284	189	166
BN	263	413	873	1,303	2,188	2,286	3,649	3,266	1,489	440	264	206
AN	300	892	1,313	3,118	3,287	4,049	3,434	3,772	1,577	525	314	250
W	430	1,144	3,523	4,195	4,232	3,920	4,342	4,952	3,162	1,010	424	310
All	310	702	1,681	2,162	2,619	2,830	3,190	3,214	1,690	545	281	219

G3a.3.1.26 Yuba River below Englebright Reservoir (SWRCB Englebright)

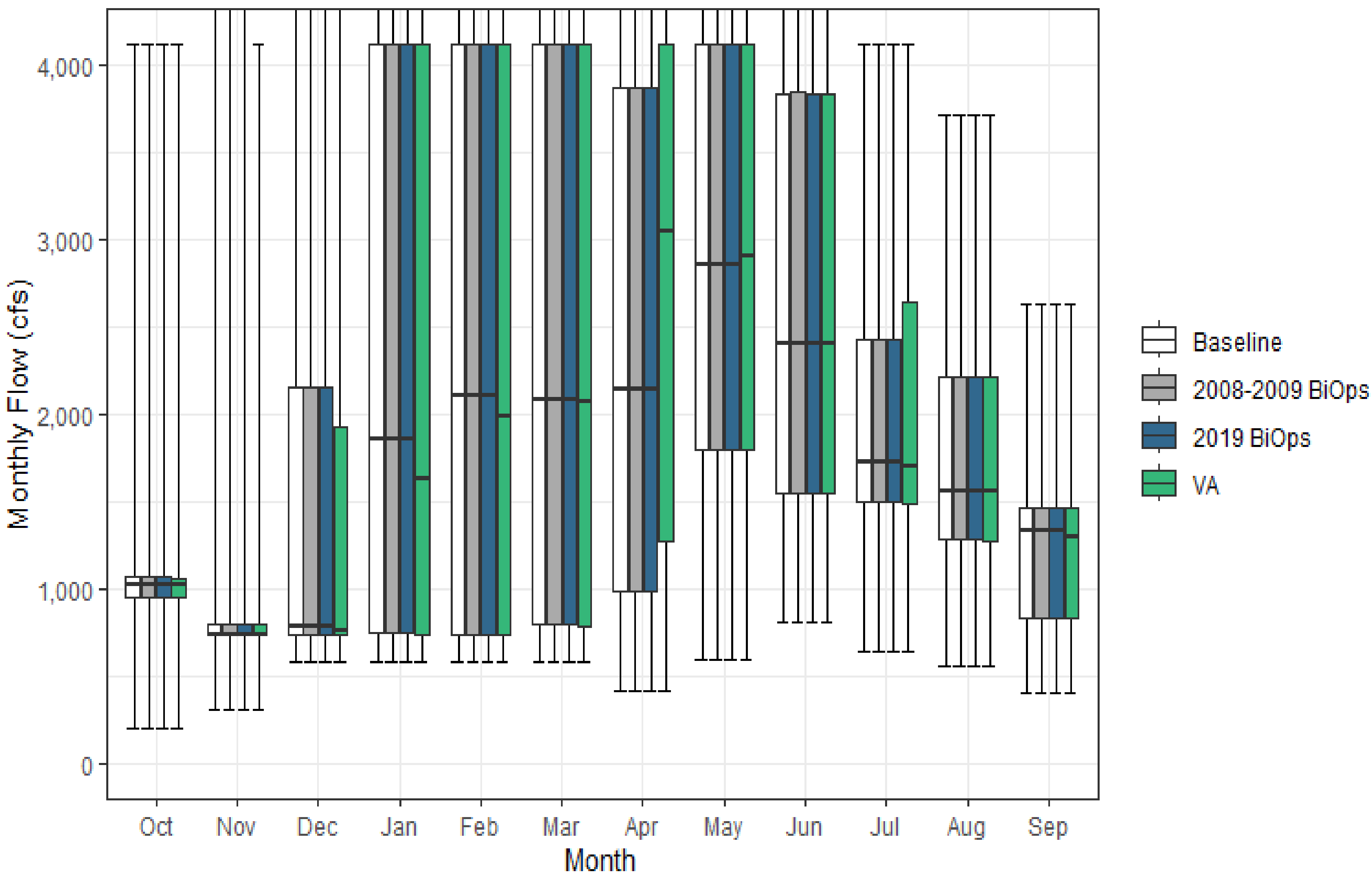

Figure G3a-27. Yuba River below Englebright Reservoir (SWRCB Englebright) Monthly Boxplot

Table G3a-66. Cumulative Distribution of Monthly Flow (cfs) — Yuba River below Englebright Reservoir (SWRCB Englebright)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	202	305	580	581	581	581	412	593	803	640	553	404	471
10%	913	731	731	731	731	731	870	1,669	1,336	1,465	1,182	780	746
25%	953	731	731	749	731	796	983	1,801	1,545	1,497	1,282	835	900
50%	1,019	741	779	1,862	2,108	2,089	2,146	2,860	2,411	1,721	1,561	1,333	1,375
75%	1,064	796	2,151	4,121	4,121	4,121	3,877	4,120	3,835	2,435	2,212	1,458	2,328
90%	1,101	963	4,121	5,429	5,591	6,455	4,183	6,324	5,378	3,269	2,334	1,617	2,991
100%	4,120	4,901	14,920	20,088	17,286	13,604	10,523	9,753	10,043	4,120	3,723	2,635	3,896
Mean	1,034	945	2,063	2,969	2,899	3,005	2,581	3,414	3,019	2,100	1,771	1,216	1,630
2008-2009 BiOps													
0%	202	305	580	581	581	580	412	593	805	640	552	403	471
10%	913	731	731	731	731	731	870	1,669	1,336	1,465	1,182	780	746
25%	953	731	731	749	731	796	983	1,801	1,545	1,497	1,282	834	900
50%	1,019	741	779	1,862	2,108	2,089	2,146	2,861	2,411	1,721	1,561	1,333	1,375
75%	1,064	796	2,151	4,121	4,121	4,121	3,877	4,120	3,842	2,435	2,212	1,458	2,328
90%	1,101	963	4,121	5,429	5,591	6,455	4,183	6,324	5,374	3,269	2,334	1,617	2,991
100%	4,120	4,897	14,915	20,113	17,261	13,604	10,824	9,758	10,044	4,120	3,723	2,635	3,916
Mean	1,034	945	2,062	2,970	2,899	3,005	2,584	3,413	3,020	2,100	1,771	1,216	1,630
2019 BiOps													
0%	202	305	580	581	581	580	412	593	805	640	552	403	471
10%	913	731	731	731	731	731	870	1,669	1,336	1,465	1,182	780	746
25%	953	731	731	749	731	796	983	1,801	1,545	1,497	1,282	835	900
50%	1,019	741	779	1,862	2,108	2,089	2,146	2,858	2,411	1,721	1,561	1,333	1,375
75%	1,064	796	2,151	4,121	4,121	4,121	3,877	4,120	3,835	2,435	2,212	1,458	2,328
90%	1,101	963	4,121	5,429	5,591	6,455	4,183	6,324	5,374	3,269	2,334	1,617	2,991
100%	4,120	4,898	14,916	20,090	17,261	13,604	10,499	9,753	10,043	4,120	3,723	2,635	3,896
Mean	1,034	945	2,063	2,969	2,899	3,005	2,581	3,414	3,019	2,100	1,771	1,216	1,630
VA													
0%	202	305	580	580	581	580	412	593	805	640	552	403	471
10%	912	730	731	731	731	731	875	1,648	1,334	1,431	1,156	758	723
25%	950	731	731	731	731	786	1,273	1,800	1,545	1,491	1,270	828	934
50%	1,017	731	763	1,625	1,989	2,070	3,045	2,907	2,405	1,698	1,554	1,302	1,397
75%	1,063	791	1,930	4,121	4,121	4,121	4,121	4,121	3,842	2,646	2,212	1,458	2,266
90%	1,101	894	4,121	5,429	5,591	6,455	4,350	5,979	5,377	3,477	2,364	1,617	2,947
100%	4,120	4,120	14,021	20,141	17,372	13,685	10,489	9,754	10,051	4,120	3,723	2,628	3,847
Mean	1,029	922	1,930	2,837	2,831	2,989	2,967	3,472	3,004	2,091	1,756	1,201	1,630

Table G3a-67. Water Year Average of Monthly Flows (cfs) — Yuba River below Englebright Reservoir (SWRCB Englebright)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	1,003	769	772	869	761	763	788	1,470	1,303	1,354	1,108	797
D	1,011	821	947	1,234	1,253	1,537	1,451	2,136	1,833	1,605	1,399	1,007
BN	1,024	754	1,107	1,883	2,166	1,606	2,592	3,040	2,640	1,897	1,735	1,181
AN	947	1,087	2,000	3,349	3,480	4,540	2,985	3,783	3,017	2,124	1,876	1,369
W	1,110	1,189	4,199	5,890	5,476	5,499	4,208	5,484	5,060	2,984	2,382	1,551
All	1,034	945	2,063	2,969	2,899	3,005	2,581	3,414	3,019	2,100	1,771	1,216
2008-2009 BiOps												
C	1,003	769	772	869	761	763	788	1,471	1,303	1,354	1,108	797
D	1,011	821	947	1,234	1,253	1,537	1,451	2,136	1,833	1,605	1,399	1,007
BN	1,024	754	1,107	1,883	2,166	1,606	2,592	3,039	2,641	1,897	1,735	1,181
AN	947	1,087	2,000	3,350	3,480	4,540	2,985	3,783	3,018	2,124	1,876	1,369
W	1,110	1,189	4,197	5,895	5,475	5,498	4,220	5,480	5,060	2,984	2,382	1,551
All	1,034	945	2,062	2,970	2,899	3,005	2,584	3,413	3,020	2,100	1,771	1,216
2019 BiOps												
C	1,003	769	772	870	761	763	788	1,471	1,303	1,354	1,108	797
D	1,011	821	947	1,234	1,253	1,537	1,451	2,136	1,833	1,605	1,399	1,007
BN	1,024	754	1,107	1,883	2,166	1,606	2,592	3,039	2,640	1,897	1,735	1,181
AN	947	1,087	2,001	3,349	3,480	4,540	2,984	3,783	3,018	2,124	1,876	1,369
W	1,110	1,189	4,200	5,891	5,475	5,499	4,209	5,483	5,060	2,984	2,381	1,551
All	1,034	945	2,063	2,969	2,899	3,005	2,581	3,414	3,019	2,100	1,771	1,216
VA												
C	1,003	768	772	781	747	754	777	1,433	1,266	1,310	1,068	776
D	1,001	821	946	1,079	1,134	1,517	2,065	2,177	1,828	1,571	1,422	998
BN	1,018	754	1,030	1,672	2,005	1,582	3,410	3,254	2,557	1,875	1,683	1,167
AN	947	993	1,826	3,291	3,436	4,507	3,760	3,909	3,064	2,206	1,847	1,318
W	1,106	1,151	3,878	5,770	5,463	5,496	4,209	5,480	5,062	2,982	2,381	1,551
All	1,029	922	1,930	2,837	2,831	2,989	2,967	3,472	3,004	2,091	1,756	1,201

G3a.3.1.27 Yuba River above Confluence with Feather River (SWRCB Yuba River)

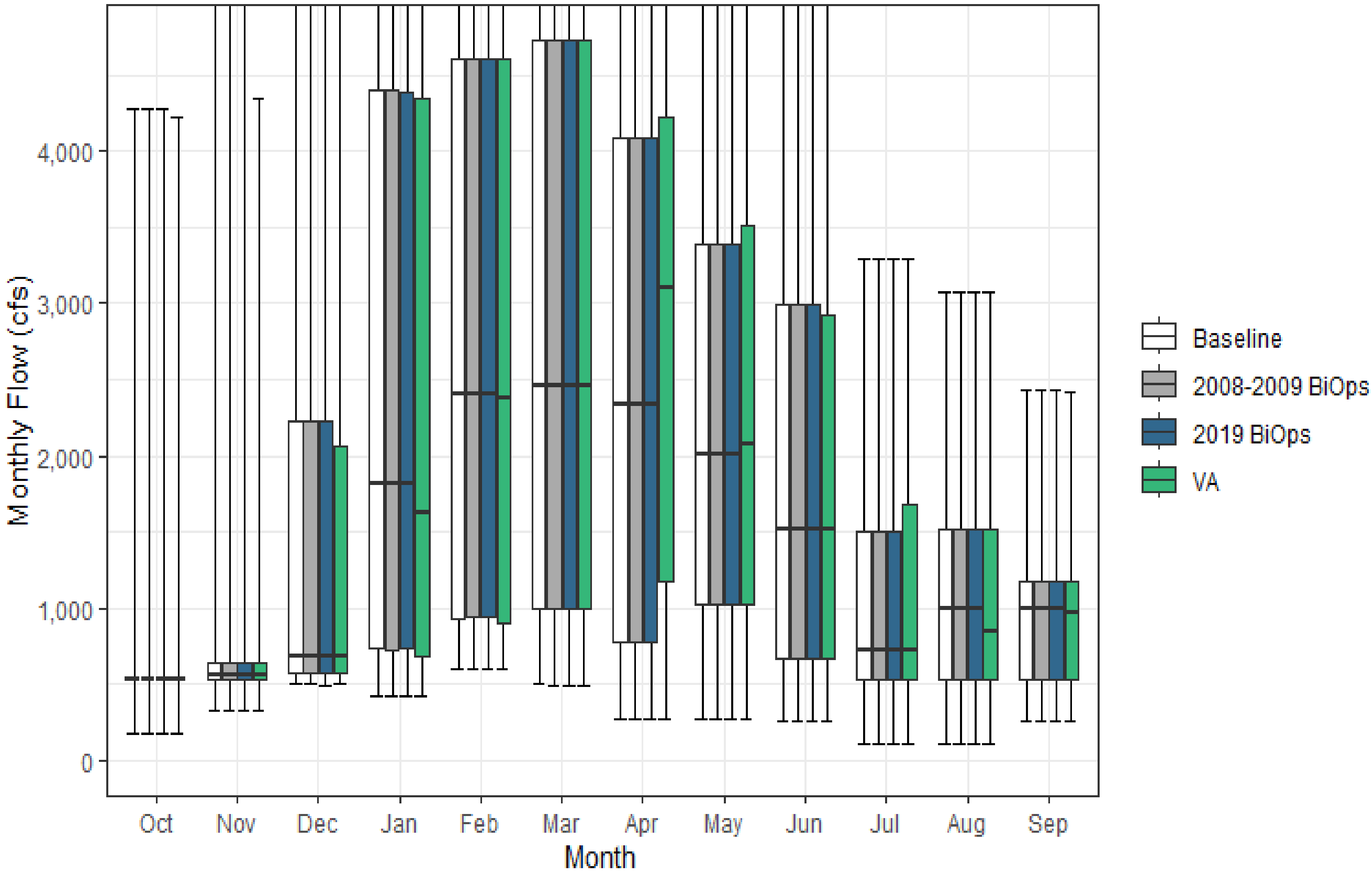

Figure G3a-28. Yuba River above Confluence with Feather River (SWRCB Yuba River) Monthly Boxplot

Table G3a-68. Cumulative Distribution of Monthly Flow (cfs) — Yuba River above Confluence with Feather River (SWRCB Yuba River)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	169	322	496	426	601	495	269	270	250	99	100	259	261
10%	517	523	524	617	786	817	715	910	519	525	525	525	471
25%	523	524	568	736	933	993	772	1,019	673	528	528	528	630
50%	523	560	686	1,812	2,398	2,464	2,331	2,007	1,513	727	992	990	1,139
75%	524	640	2,225	4,407	4,608	4,727	4,080	3,388	2,996	1,504	1,515	1,175	2,173
90%	524	832	4,591	5,943	6,693	7,508	4,738	5,688	4,481	2,411	1,730	1,334	2,889
100%	4,278	5,063	15,368	22,279	19,091	15,119	11,621	9,325	9,194	3,300	3,073	2,426	3,934
Mean	554	789	2,076	3,150	3,359	3,445	2,647	2,681	2,143	1,155	1,093	926	1,445
2008-2009 BiOps													
0%	169	322	496	426	601	495	269	270	250	99	99	257	261
10%	517	523	524	617	786	817	715	910	519	525	525	525	471
25%	523	524	568	724	933	993	772	1,019	673	528	528	528	630
50%	523	560	685	1,812	2,398	2,464	2,331	2,007	1,513	727	992	990	1,138
75%	524	640	2,225	4,407	4,607	4,727	4,080	3,388	2,995	1,504	1,515	1,176	2,173
90%	524	832	4,591	5,941	6,696	7,508	4,738	5,687	4,477	2,410	1,730	1,335	2,885
100%	4,278	5,059	15,363	22,304	19,050	15,119	11,868	9,330	9,194	3,300	3,068	2,426	3,950
Mean	554	789	2,075	3,152	3,358	3,444	2,650	2,679	2,144	1,155	1,093	926	1,446
2019 BiOps													
0%	169	322	495	427	601	495	269	270	250	99	99	257	261
10%	517	523	524	617	786	817	715	910	519	525	525	525	470
25%	523	524	568	736	946	993	772	1,019	673	528	528	528	630
50%	523	560	685	1,812	2,398	2,464	2,331	2,007	1,513	727	992	990	1,139
75%	524	640	2,226	4,389	4,605	4,728	4,080	3,388	2,996	1,506	1,515	1,176	2,173
90%	524	832	4,591	5,930	6,693	7,508	4,738	5,688	4,477	2,410	1,733	1,334	2,888
100%	4,278	5,060	15,364	22,282	19,052	15,119	11,597	9,325	9,194	3,300	3,068	2,426	3,934
Mean	554	789	2,075	3,148	3,358	3,445	2,648	2,680	2,143	1,155	1,093	926	1,445
VA													
0%	169	322	496	425	601	495	269	270	250	99	99	257	261
10%	517	523	524	603	783	807	715	799	445	448	448	461	451
25%	523	523	570	675	902	993	1,175	1,018	673	528	528	528	671
50%	523	560	675	1,627	2,383	2,464	3,097	2,071	1,513	727	837	968	1,174
75%	524	640	2,055	4,344	4,608	4,729	4,223	3,517	2,922	1,673	1,513	1,176	2,133
90%	524	736	4,540	5,927	6,693	7,508	4,948	5,395	4,480	2,505	1,739	1,334	2,860
100%	4,226	4,352	14,481	22,332	19,176	15,218	11,538	9,326	9,202	3,300	3,073	2,423	3,882
Mean	550	766	1,944	3,019	3,291	3,430	3,027	2,740	2,130	1,149	1,080	912	1,446

Table G3a-69. Water Year Average of Monthly Flows (cfs) — Yuba River above Confluence with Feather River (SWRCB Yuba River)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	508	536	636	790	890	855	615	734	491	441	455	506
D	508	643	881	1,169	1,459	1,799	1,341	1,372	924	656	709	712
BN	523	567	1,014	1,890	2,569	1,914	2,613	2,283	1,754	928	1,043	883
AN	493	973	1,955	3,660	4,081	5,119	3,072	3,059	2,143	1,160	1,221	1,083
W	657	1,088	4,442	6,445	6,277	6,280	4,555	4,785	4,179	2,048	1,697	1,271
All	554	789	2,076	3,150	3,359	3,445	2,647	2,681	2,143	1,155	1,093	926
2008-2009 BiOps												
C	508	536	636	790	890	855	615	734	491	440	455	506
D	508	643	880	1,169	1,460	1,799	1,341	1,372	924	656	709	712
BN	523	568	1,014	1,893	2,568	1,913	2,613	2,283	1,754	928	1,043	883
AN	493	973	1,955	3,658	4,080	5,119	3,072	3,058	2,144	1,160	1,221	1,083
W	657	1,088	4,439	6,451	6,275	6,277	4,564	4,781	4,180	2,048	1,697	1,271
All	554	789	2,075	3,152	3,358	3,444	2,650	2,679	2,144	1,155	1,093	926
2019 BiOps												
C	508	536	636	789	890	855	615	734	491	440	455	506
D	508	642	880	1,169	1,460	1,798	1,341	1,372	924	656	709	712
BN	523	567	1,014	1,888	2,568	1,914	2,613	2,283	1,754	928	1,043	883
AN	493	973	1,954	3,657	4,081	5,124	3,072	3,058	2,144	1,160	1,221	1,083
W	657	1,089	4,439	6,445	6,273	6,280	4,557	4,784	4,179	2,048	1,697	1,271
All	554	789	2,075	3,148	3,358	3,445	2,648	2,680	2,143	1,155	1,093	926
VA												
C	508	536	636	703	874	846	610	711	466	411	425	489
D	502	644	880	1,017	1,343	1,777	1,948	1,412	919	622	732	703
BN	517	568	937	1,678	2,410	1,889	3,420	2,495	1,672	906	993	869
AN	493	880	1,782	3,599	4,037	5,091	3,837	3,183	2,190	1,241	1,193	1,032
W	652	1,053	4,123	6,325	6,262	6,276	4,546	4,781	4,181	2,047	1,697	1,271
All	550	766	1,944	3,019	3,291	3,430	3,027	2,740	2,130	1,149	1,080	912

G3a.3.1.28 Yuba River, South Fork above Englebright Reservoir (SWRCB S Yuba Inflow)

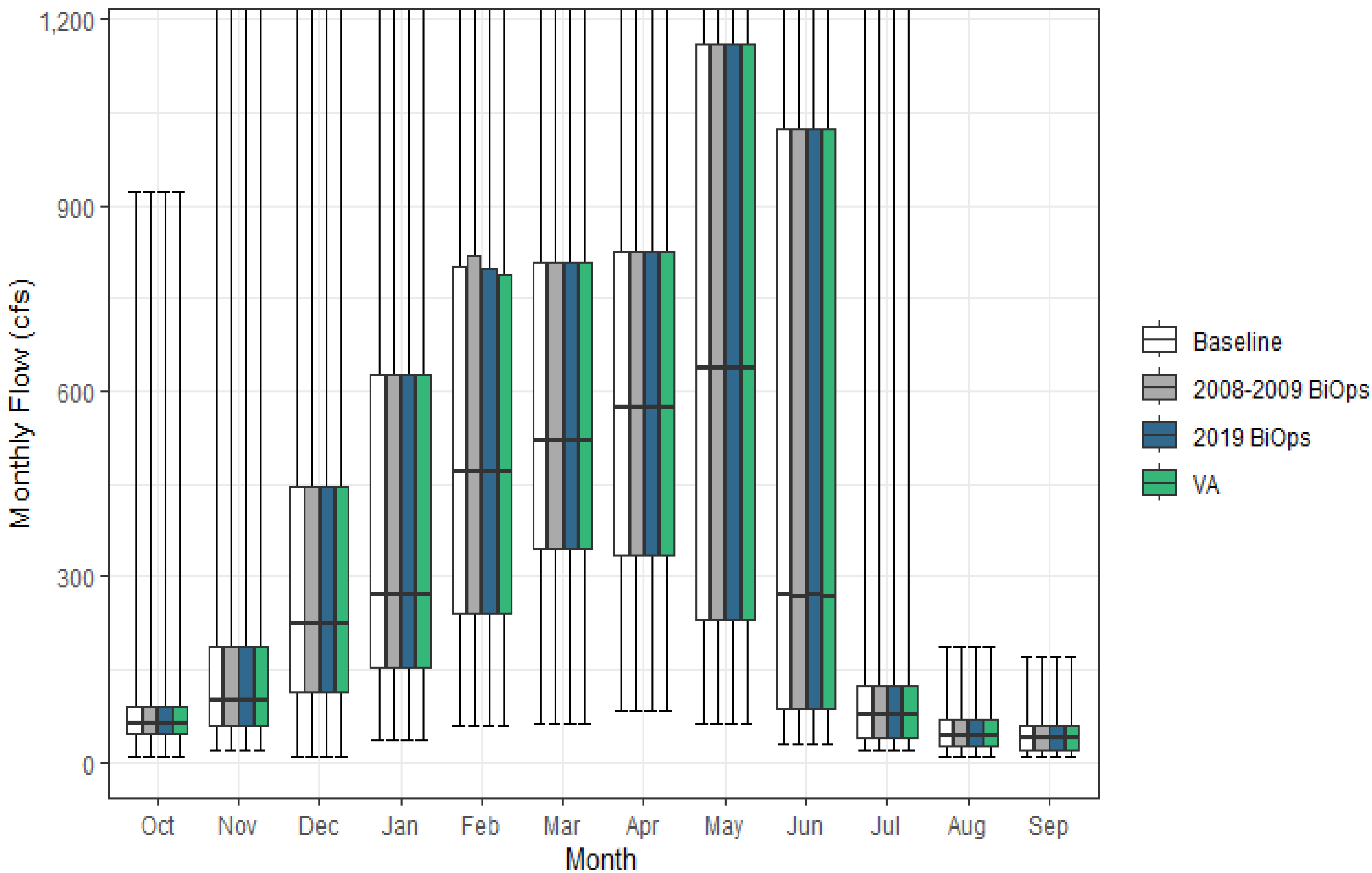

Figure G3a-29. Yuba River, South Fork above Englebright Reservoir (SWRCB S Yuba Inflow) Monthly Boxplot

Table G3a-70. Cumulative Distribution of Monthly Flow (cfs) — Yuba River, South Fork above Englebright Reservoir (SWRCB S Yuba Inflow)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	10	18	8	36	60	62	83	61	30	20	9	9	35
10%	21	38	67	97	140	216	208	116	50	29	15	13	92
25%	45	60	115	154	241	344	335	229	88	40	24	18	138
50%	62	99	225	269	469	518	572	637	269	75	44	41	228
75%	90	189	446	626	801	808	826	1,161	1,022	124	70	59	433
90%	162	340	1,053	1,247	1,436	1,263	1,240	2,002	1,975	212	104	94	561
100%	923	1,369	2,731	3,954	3,233	2,486	2,709	3,532	3,848	1,625	189	170	879
Mean	85	173	412	528	623	669	668	848	744	158	53	46	301
2008-2009 BiOps													
0%	10	18	8	36	60	62	83	61	30	20	9	9	35
10%	21	38	67	97	140	216	208	116	50	29	15	13	92
25%	45	60	115	154	241	344	335	229	88	40	24	18	138
50%	62	99	225	269	469	518	572	637	267	75	44	41	228
75%	90	189	446	626	818	808	826	1,160	1,021	124	70	59	428
90%	162	340	1,053	1,247	1,436	1,263	1,240	2,003	1,980	212	104	94	561
100%	923	1,365	2,726	3,979	3,208	2,487	2,677	3,521	3,848	1,625	189	170	879
Mean	85	173	412	529	622	669	667	847	745	158	53	46	301
2019 BiOps													
0%	10	18	8	36	60	62	83	61	30	20	9	9	35
10%	21	38	67	97	140	216	208	116	50	29	15	13	92
25%	45	60	115	154	241	344	335	229	88	40	24	18	138
50%	62	99	225	269	469	518	572	637	269	75	44	41	228
75%	90	189	446	626	799	808	826	1,161	1,021	124	70	59	428
90%	162	340	1,053	1,247	1,436	1,263	1,240	2,001	1,974	211	104	94	561
100%	923	1,366	2,727	3,957	3,208	2,487	2,685	3,530	3,848	1,625	189	170	879
Mean	85	173	413	528	622	669	667	848	744	158	53	46	301
VA													
0%	10	18	8	36	60	62	83	61	30	20	9	9	35
10%	21	38	67	97	140	216	208	116	50	29	15	13	92
25%	45	60	115	154	241	344	335	229	88	40	24	18	138
50%	62	99	225	269	469	518	572	637	269	75	44	41	228
75%	90	189	446	626	787	808	826	1,161	1,022	124	70	59	428
90%	162	340	1,053	1,247	1,436	1,263	1,240	1,997	1,977	211	104	94	560
100%	923	1,510	2,724	4,007	3,319	2,430	2,675	3,534	3,856	1,618	189	170	879
Mean	85	174	413	529	622	668	667	846	745	157	53	46	301

Table G3a-71. Water Year Average of Monthly Flows (cfs) — Yuba River, South Fork above Englebright Reservoir (SWRCB S Yuba Inflow)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	62	63	121	141	231	275	238	181	87	42	33	26
D	69	144	221	182	368	492	425	396	173	71	55	41
BN	78	86	184	278	598	508	662	595	502	68	53	46
AN	91	261	487	734	639	815	834	1,197	724	111	50	58
W	112	268	819	1,057	1,030	1,047	1,011	1,549	1,681	359	63	56
All	85	173	412	528	623	669	668	848	744	158	53	46
2008-2009 BiOps												
C	62	63	121	141	231	275	238	181	87	42	33	26
D	69	144	221	182	368	492	425	396	173	71	55	41
BN	78	86	184	278	598	508	662	595	502	68	53	46
AN	91	260	488	734	639	815	834	1,197	725	111	50	58
W	112	268	816	1,062	1,030	1,047	1,010	1,545	1,682	359	63	56
All	85	173	412	529	622	669	667	847	745	158	53	46
2019 BiOps												
C	62	63	121	141	231	275	238	181	87	42	33	26
D	69	144	221	182	368	492	425	396	173	71	55	41
BN	78	86	184	278	598	508	662	595	502	68	53	46
AN	91	260	488	733	639	815	834	1,196	725	111	50	58
W	112	268	819	1,057	1,029	1,047	1,010	1,549	1,681	359	63	56
All	85	173	413	528	622	669	667	848	744	158	53	46
VA												
C	62	63	121	141	231	275	238	181	87	42	33	26
D	69	144	221	182	368	492	425	396	173	71	55	41
BN	78	86	184	278	598	508	662	595	502	68	53	46
AN	91	272	488	734	639	815	834	1,199	723	111	50	58
W	112	268	820	1,063	1,030	1,043	1,010	1,543	1,683	358	63	56
All	85	174	413	529	622	668	667	846	745	157	53	46

G3a.3.1.29 Yuba River, Middle Fork above Confluence with North Fork Yuba (SWRCB M Yuba Inflow)

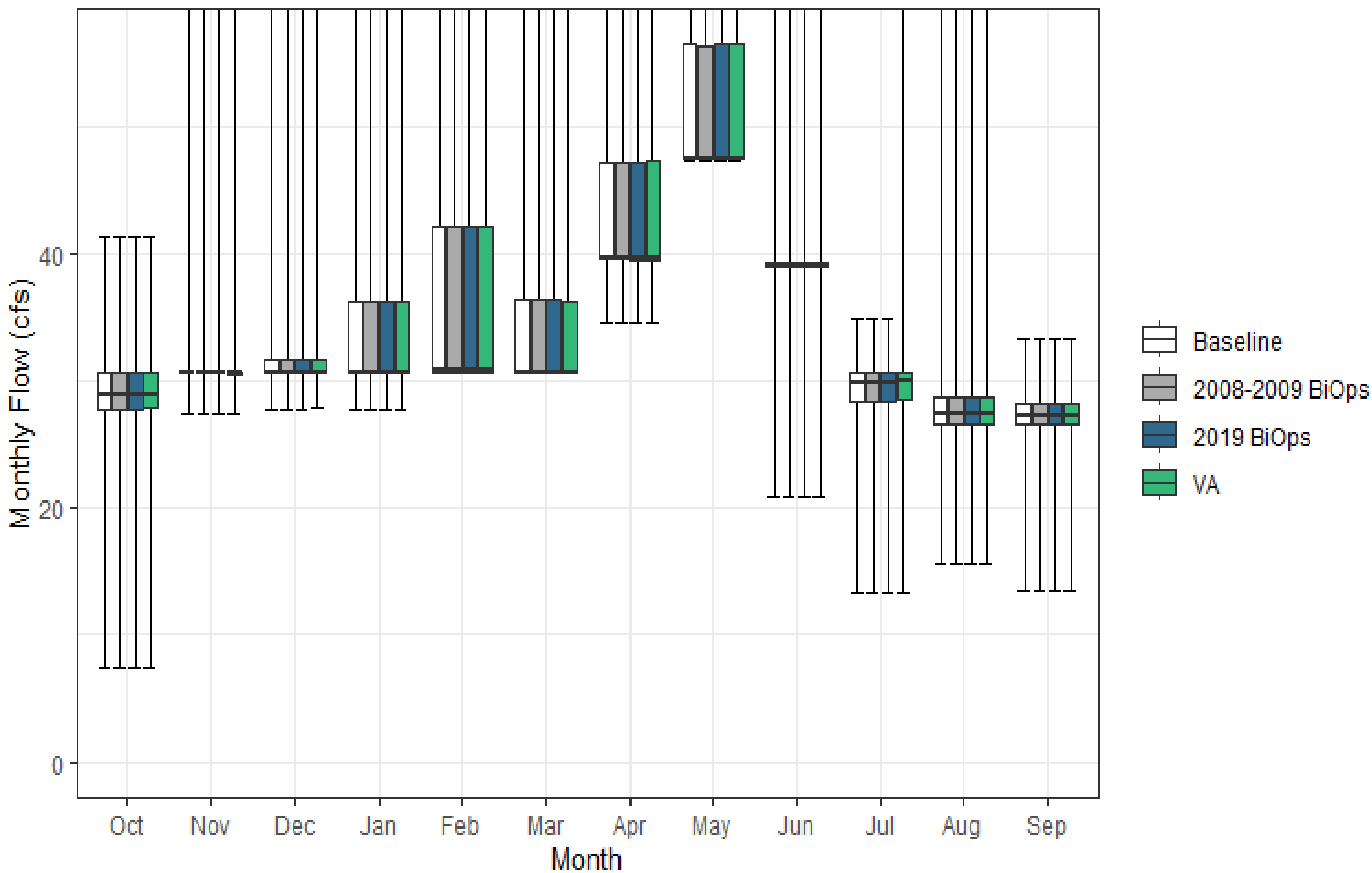

Figure G3a-30. Yuba River, Middle Fork above Confluence with North Fork Yuba (SWRCB M Yuba Inflow) Monthly Boxplot

Table G3a-72. Cumulative Distribution of Monthly Flow (cfs) — Yuba River, Middle Fork above Confluence with North Fork Yuba (SWRCB M Yuba Inflow)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	7	27	28	28	31	31	35	47	21	13	16	13	23
10%	27	29	31	31	31	31	40	47	38	27	25	24	23
25%	28	31	31	31	31	31	40	47	39	28	27	27	24
50%	29	31	31	31	31	31	40	48	39	30	27	27	26
75%	31	31	32	36	42	36	47	56	39	31	29	28	63
90%	31	36	103	267	380	166	189	184	44	31	30	29	167
100%	41	217	2,982	3,087	3,164	2,173	2,132	718	648	35	96	33	400
Mean	29	35	156	198	155	154	100	86	49	29	29	27	63
2008-2009 BiOps													
0%	7	27	28	28	31	31	35	47	21	13	16	13	23
10%	27	29	31	31	31	31	40	47	38	27	25	24	23
25%	28	31	31	31	31	31	40	47	39	28	27	27	24
50%	29	31	31	31	31	31	40	48	39	30	27	27	26
75%	31	31	32	36	42	36	47	56	39	31	29	28	63
90%	31	36	103	267	380	166	189	184	44	31	30	29	167
100%	41	217	2,982	3,087	3,164	2,173	2,132	718	648	35	96	33	400
Mean	29	35	156	198	155	154	100	86	49	29	29	27	63
2019 BiOps													
0%	7	27	28	28	31	31	35	47	21	13	16	13	23
10%	27	29	31	31	31	31	40	47	38	27	25	24	23
25%	28	31	31	31	31	31	40	47	39	28	27	27	24
50%	29	31	31	31	31	31	40	48	39	30	27	27	26
75%	31	31	32	36	42	36	47	56	39	31	29	28	63
90%	31	36	103	267	380	166	189	184	44	31	30	29	167
100%	41	217	2,982	3,087	3,164	2,173	2,132	718	648	35	96	33	400
Mean	29	35	156	198	155	154	100	86	49	29	29	27	63
VA													
0%	8	27	28	28	31	31	35	47	21	13	16	13	23
10%	27	29	31	31	31	31	40	47	38	27	25	24	23
25%	28	31	31	31	31	31	40	47	39	29	27	27	24
50%	29	31	31	31	31	31	40	48	39	30	27	27	26
75%	31	31	32	36	42	36	47	56	39	31	29	28	63
90%	31	36	42	267	380	166	213	183	44	31	30	29	149
100%	41	217	2,982	3,087	3,164	2,173	2,132	718	648	97	96	33	366
Mean	29	35	145	186	155	154	105	86	49	30	29	27	62

Table G3a-73. Water Year Average of Monthly Flows (cfs) — Yuba River, Middle Fork above Confluence with North Fork Yuba (SWRCB M Yuba Inflow)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	29	31	31	32	37	37	47	56	41	28	25	24
D	30	32	33	36	49	66	43	49	40	30	27	27
BN	29	31	36	31	54	31	78	48	39	29	27	27
AN	29	48	176	165	150	310	40	66	39	29	27	28
W	29	38	379	524	361	291	210	161	70	30	35	28
All	29	35	156	198	155	154	100	86	49	29	29	27
2008-2009 BiOps												
C	29	31	31	32	37	37	47	56	41	28	25	23
D	30	32	33	36	49	66	43	49	40	30	27	27
BN	29	31	36	31	54	31	78	48	39	29	27	27
AN	29	48	176	165	150	310	40	66	39	29	27	28
W	29	38	379	524	361	291	210	161	70	30	35	28
All	29	35	156	198	155	154	100	86	49	29	29	27
2019 BiOps												
C	29	31	31	32	37	37	47	56	41	28	25	23
D	30	32	33	36	49	66	43	49	40	30	27	27
BN	29	31	36	31	54	31	78	48	39	29	27	27
AN	29	48	176	165	150	310	40	66	39	29	27	28
W	29	38	379	524	361	291	210	161	70	30	35	28
All	29	35	156	198	155	154	100	86	49	29	29	27
VA												
C	29	31	31	32	37	37	47	56	42	28	25	24
D	30	32	33	33	49	66	43	49	40	30	27	27
BN	29	31	36	31	54	31	78	48	39	29	27	27
AN	29	48	176	130	150	310	80	66	39	35	27	28
W	29	38	342	503	361	291	210	161	70	30	35	28
All	29	35	145	186	155	154	105	86	49	30	29	27

G3a.3.1.30 Delta Inflow

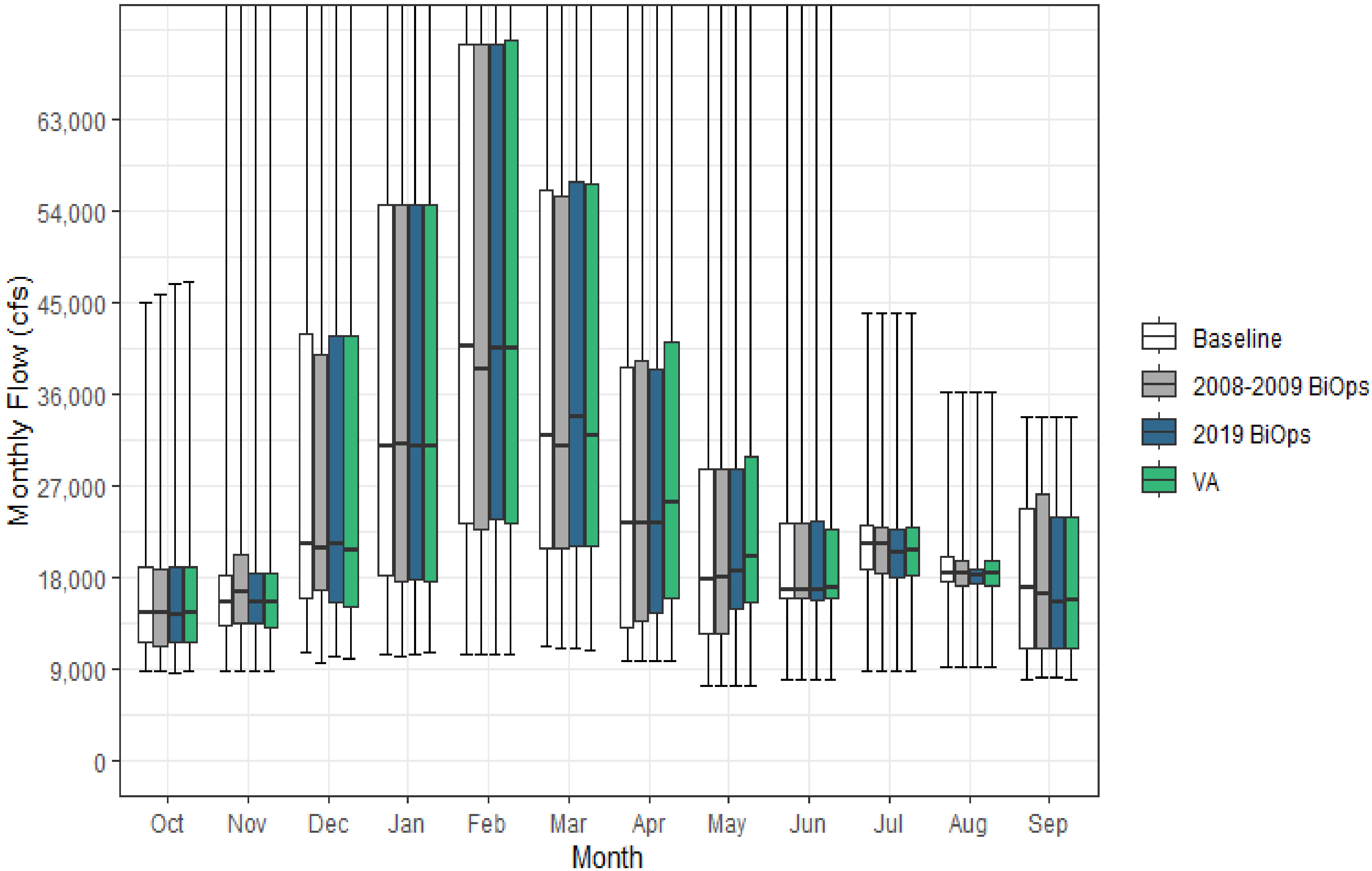

Figure G3a-31. Delta Inflow Monthly Boxplot

Table G3a-74. Cumulative Distribution of Monthly Flow (cfs) — Delta Inflow

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	8,670	8,715	10,527	10,310	10,491	11,145	9,838	7,284	8,011	8,796	9,189	7,916	7,273
10%	9,560	10,508	13,785	14,694	16,411	15,199	11,734	10,924	12,625	10,031	10,845	8,689	10,225
25%	11,601	13,265	15,873	18,098	23,376	20,798	13,126	12,410	15,907	18,743	17,626	11,044	12,938
50%	14,503	15,445	21,175	30,900	40,695	31,835	23,314	17,768	16,762	21,299	18,469	16,959	16,949
75%	18,927	18,283	42,020	54,677	70,532	56,169	38,648	28,731	23,383	23,037	20,036	24,739	28,873
90%	21,554	26,830	75,556	106,258	130,014	97,910	70,994	54,982	41,023	25,236	23,275	25,992	38,882
100%	45,029	82,392	160,399	263,573	243,155	248,232	154,285	84,828	84,760	44,128	36,315	33,683	64,071
Mean	15,800	18,417	34,952	47,231	57,607	47,756	32,697	25,146	22,560	20,570	18,265	17,957	21,575
2008-2009 BiOps													
0%	8,707	8,709	9,583	10,257	10,343	10,948	9,838	7,218	8,011	8,780	9,081	8,083	7,568
10%	9,325	10,441	14,030	14,510	16,021	15,312	11,878	10,944	12,641	10,240	10,835	8,883	10,330
25%	11,232	13,450	16,667	17,479	22,606	20,899	13,579	12,481	15,976	18,401	17,234	11,011	12,838
50%	14,557	16,591	20,950	31,085	38,566	30,841	23,300	18,012	16,754	21,186	18,385	16,404	16,881
75%	18,898	20,188	39,910	54,677	70,532	55,455	39,393	28,729	23,384	22,923	19,577	26,241	28,782
90%	21,429	25,199	75,658	106,037	129,811	97,907	70,987	54,981	41,051	24,781	23,277	29,098	39,240
100%	45,809	82,389	160,400	263,573	241,683	248,168	154,290	84,835	84,760	44,128	36,315	33,679	64,064
Mean	15,883	18,928	34,888	46,894	57,089	47,550	32,755	25,213	22,578	20,321	18,263	18,752	21,584
2019 BiOps													
0%	8,578	8,698	10,087	10,464	10,448	11,023	9,834	7,367	8,011	8,814	9,207	8,062	7,256
10%	9,515	10,348	13,431	14,692	16,222	15,513	12,452	11,830	12,381	9,920	11,273	8,716	10,318
25%	11,685	13,490	15,472	17,871	23,750	21,086	14,418	14,868	15,707	17,960	17,318	11,077	13,031
50%	14,384	15,535	21,189	30,850	40,465	33,721	23,341	18,698	16,815	20,348	18,238	15,483	16,728
75%	18,920	18,383	41,870	54,607	70,532	57,047	38,569	28,727	23,557	22,778	18,842	23,946	28,697
90%	21,552	26,772	77,844	106,249	129,903	97,908	70,993	54,982	41,021	24,743	23,275	25,741	38,922
100%	46,999	82,392	160,400	263,573	242,855	248,232	154,289	84,828	84,760	44,128	36,315	33,683	64,072
Mean	15,809	18,485	34,941	47,321	57,530	47,827	33,125	26,079	22,497	19,954	18,135	17,421	21,586
VA													
0%	8,652	8,751	10,083	10,531	10,469	10,894	9,835	7,365	8,011	8,816	9,212	7,911	7,315
10%	9,323	10,380	13,122	14,153	15,395	15,319	12,304	11,289	11,813	10,046	11,170	8,711	10,045
25%	11,657	12,976	15,085	17,533	23,329	20,969	15,998	15,541	15,897	18,277	17,085	11,077	13,303
50%	14,447	15,544	20,694	30,865	40,535	31,945	25,434	20,131	16,943	20,561	18,390	15,780	17,118
75%	18,931	18,413	41,870	54,607	70,875	56,761	41,248	29,812	22,654	22,803	19,641	23,986	28,728
90%	21,370	26,746	74,625	105,386	129,847	97,448	70,995	54,990	41,051	23,948	23,301	25,789	38,834
100%	47,009	82,411	160,474	263,616	242,883	248,232	154,257	84,841	84,835	44,128	36,315	33,683	64,075
Mean	15,790	18,316	34,528	47,220	57,460	47,797	34,149	26,745	22,519	20,037	18,328	17,416	21,657

Table G3a-75. Water Year Average of Monthly Flows (cfs) — Delta Inflow

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	12,726	12,411	17,015	18,546	20,363	16,907	11,440	10,061	11,553	10,527	10,370	8,731
D	14,327	15,627	22,313	19,887	28,163	25,942	15,485	13,483	16,051	18,442	16,908	12,177
BN	16,093	16,060	23,954	29,666	46,155	30,664	25,988	18,277	17,702	21,512	18,621	15,987
AN	14,793	19,431	30,678	56,756	73,130	60,109	33,058	28,029	20,918	24,086	19,130	25,258
W	18,805	24,725	62,551	89,687	99,941	85,727	60,913	44,910	36,991	25,466	22,926	25,304
All	15,800	18,417	34,952	47,231	57,607	47,756	32,697	25,146	22,560	20,570	18,265	17,957
2008-2009 BiOps												
C	12,713	12,986	18,251	18,654	20,078	16,787	11,465	10,096	11,675	10,707	10,540	9,144
D	14,452	15,755	22,504	19,885	27,693	25,871	15,721	13,691	15,991	17,914	17,085	11,918
BN	15,854	16,679	23,854	29,351	45,603	30,384	25,917	18,341	17,709	20,951	18,311	15,966
AN	14,655	20,445	31,016	55,554	71,553	59,435	33,111	28,035	20,982	23,640	18,995	23,996
W	19,197	25,206	61,448	89,219	99,740	85,618	60,935	44,914	36,999	25,472	22,940	28,469
All	15,883	18,928	34,888	46,894	57,089	47,550	32,755	25,213	22,578	20,321	18,263	18,752
2019 BiOps												
C	12,703	12,495	16,866	18,452	20,186	16,855	11,994	10,920	11,379	10,442	10,613	8,630
D	14,307	15,717	21,742	19,874	28,064	26,248	16,499	15,597	15,999	17,699	16,747	11,955
BN	16,241	15,983	24,155	29,772	46,116	30,752	26,346	19,604	17,606	20,687	18,080	14,250
AN	14,941	19,637	30,659	56,983	73,048	59,978	33,185	28,471	20,808	23,164	18,920	24,605
W	18,709	24,793	62,907	89,884	99,914	85,762	61,004	44,967	37,021	24,921	22,904	25,076
All	15,809	18,485	34,941	47,321	57,530	47,827	33,125	26,079	22,497	19,954	18,135	17,421
VA												
C	12,496	12,378	16,658	18,325	20,219	16,643	11,854	10,672	11,199	10,529	10,561	8,690
D	14,311	15,694	21,674	19,776	27,987	26,337	17,901	16,662	16,330	17,952	17,434	11,824
BN	16,197	15,813	23,843	29,664	45,732	30,703	28,601	21,066	17,648	20,662	18,302	14,505
AN	15,028	19,335	30,221	56,775	73,175	60,048	35,746	30,132	20,552	23,222	19,051	24,261
W	18,743	24,548	62,074	89,848	99,901	85,708	60,964	44,914	37,025	24,949	22,865	25,119
All	15,790	18,316	34,528	47,220	57,460	47,797	34,149	26,745	22,519	20,037	18,328	17,416

G3a.3.1.31 Delta Outflow (SWRCB Delta)

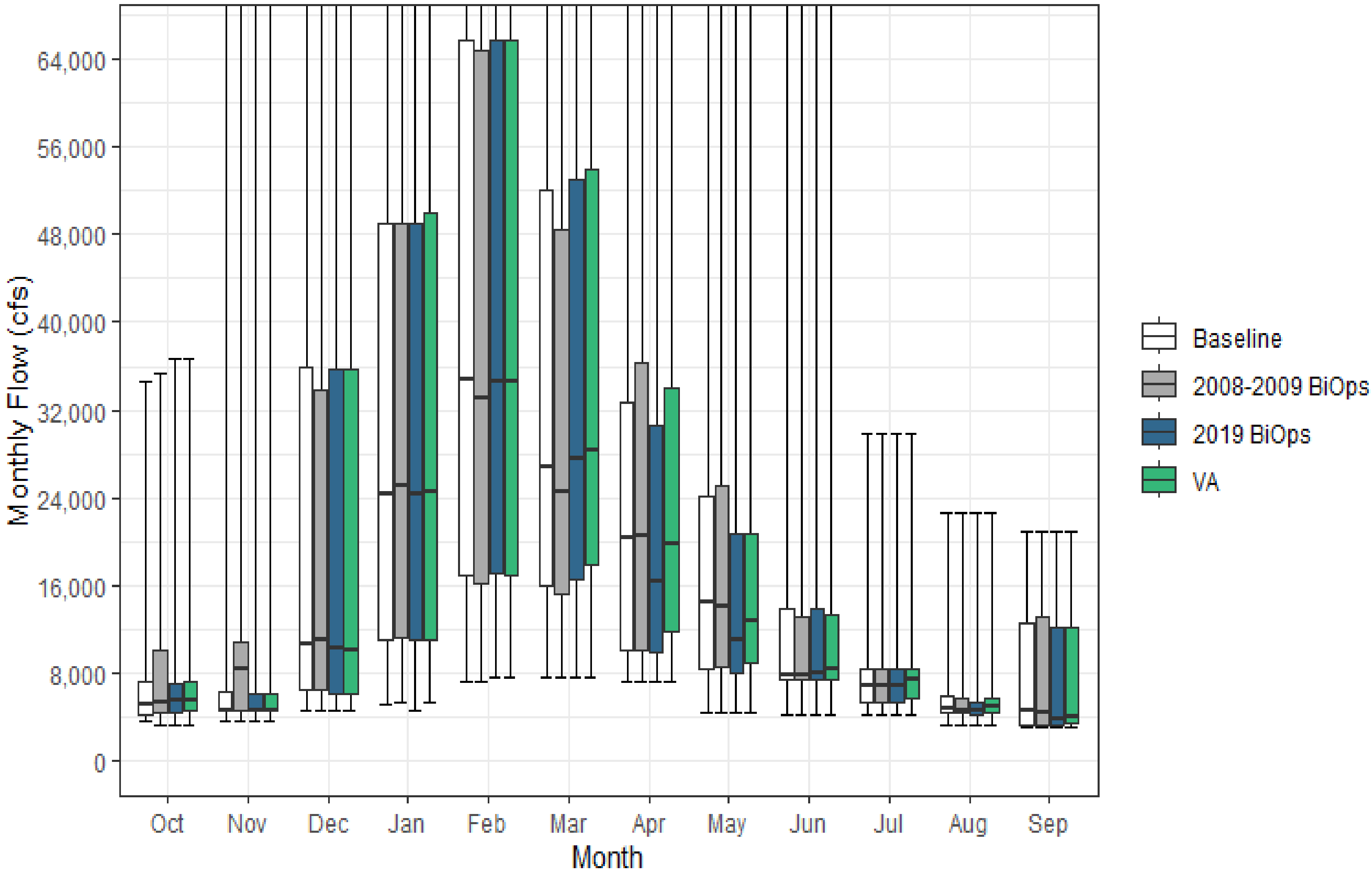

Figure G3a-32. Delta Outflow (SWRCB Delta) Monthly Boxplot

Table G3a-76. Cumulative Distribution of Monthly Flow (cfs) — Delta Outflow (SWRCB Delta)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	3,638	3,568	4,562	5,038	7,242	7,518	7,208	4,223	4,220	4,197	3,219	3,078	3,986
10%	4,055	3,641	4,642	6,871	10,861	10,212	8,485	7,333	7,332	4,222	3,757	3,115	5,510
25%	4,111	4,573	6,442	11,071	16,964	16,011	9,987	8,323	7,368	5,199	4,239	3,148	7,133
50%	5,121	4,600	10,648	24,354	34,712	26,817	20,233	14,315	7,694	6,786	4,790	4,570	10,561
75%	7,252	6,145	35,871	49,063	65,766	52,110	32,683	24,017	13,843	8,240	5,849	12,438	21,544
90%	9,257	15,108	68,664	99,123	123,716	90,747	61,237	45,791	29,387	10,820	9,263	13,097	31,560
100%	34,611	71,971	151,227	255,993	237,025	243,221	146,102	72,102	70,789	29,894	22,559	20,836	56,060
Mean	6,519	8,338	26,218	40,606	51,243	41,790	28,508	20,212	13,701	7,816	5,899	7,479	15,489
2008-2009 BiOps													
0%	3,114	3,568	4,567	5,258	7,242	7,518	7,208	4,223	4,220	4,197	3,219	3,078	4,136
10%	4,050	3,641	4,703	7,104	9,998	9,945	8,800	7,333	7,332	4,219	3,773	3,114	5,821
25%	4,267	4,578	6,319	11,106	16,182	15,084	10,103	8,469	7,371	5,199	4,231	3,153	7,165
50%	5,268	8,218	10,990	25,144	33,082	24,482	20,458	14,085	7,783	6,732	4,494	4,248	10,437
75%	10,101	10,876	33,903	49,063	64,773	48,542	36,346	25,148	13,123	8,233	5,581	13,096	21,941
90%	11,715	15,121	68,486	99,223	123,827	89,867	65,655	51,431	28,853	10,278	9,265	17,085	32,276
100%	35,391	71,968	151,227	255,993	235,552	240,879	146,106	78,688	70,789	29,894	22,559	20,833	55,808
Mean	7,292	10,240	25,934	40,282	50,706	40,784	29,579	21,047	13,603	7,678	5,789	8,268	15,661
2019 BiOps													
0%	3,134	3,568	4,562	4,578	7,483	7,518	7,208	4,223	4,220	4,197	3,219	3,078	4,002
10%	4,056	3,641	4,623	7,619	9,854	10,268	8,180	7,340	7,331	4,222	3,744	3,116	5,565
25%	4,369	4,573	6,021	11,063	16,974	16,409	9,831	7,891	7,353	5,199	4,221	3,141	7,026
50%	5,504	4,602	10,185	24,354	34,482	27,537	16,317	11,005	7,974	6,732	4,513	3,777	10,049
75%	6,997	6,115	35,721	49,110	65,766	52,990	30,546	20,775	13,879	8,237	5,244	12,114	21,219
90%	9,256	15,065	69,625	99,955	125,236	90,745	60,061	45,712	29,385	10,983	9,263	12,906	31,264
100%	36,581	71,971	151,227	255,993	236,724	243,221	146,106	72,102	70,789	29,894	22,559	20,836	56,061
Mean	6,605	8,389	26,288	40,801	51,138	41,874	26,383	18,488	13,765	7,753	5,716	7,278	15,257
VA													
0%	3,171	3,568	4,562	5,324	7,483	7,518	7,208	4,223	4,220	4,197	3,219	3,078	4,055
10%	4,094	3,641	4,610	7,346	9,735	10,893	9,131	7,333	7,334	4,221	4,033	3,131	5,795
25%	4,489	4,573	5,965	10,954	16,848	17,786	11,658	8,895	7,456	5,557	4,237	3,344	7,323
50%	5,546	4,600	9,962	24,445	34,552	28,339	19,767	12,710	8,333	7,305	4,827	3,992	10,524
75%	7,214	6,092	35,721	49,914	65,746	53,933	34,078	20,715	13,240	8,243	5,643	12,114	21,637
90%	9,228	14,780	67,521	97,767	125,031	90,284	61,319	45,723	29,408	10,543	9,289	12,891	31,296
100%	36,591	71,991	151,238	256,068	236,769	243,221	146,526	72,112	70,865	29,894	22,559	20,836	56,092
Mean	6,651	8,307	26,050	40,770	51,109	42,738	28,536	19,205	13,859	7,831	5,901	7,290	15,485

Table G3a-77. Water Year Average of Monthly Flows (cfs) — Delta Outflow (SWRCB Delta)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	5,413	4,460	9,272	12,826	15,019	12,006	8,525	6,424	6,469	4,310	4,056	3,234
D	5,442	5,922	13,162	12,794	22,406	21,092	12,494	9,515	7,762	5,203	4,748	3,436
BN	6,456	5,798	14,595	22,976	39,979	25,140	23,210	14,606	8,800	7,209	4,863	4,380
AN	5,684	9,401	21,236	51,036	66,786	53,891	29,188	24,373	11,243	9,805	4,939	12,693
W	8,315	13,315	54,278	82,583	92,454	78,191	54,150	37,241	26,057	11,168	8,791	12,432
All	6,519	8,338	26,218	40,606	51,243	41,790	28,508	20,212	13,701	7,816	5,899	7,479
2008-2009 BiOps												
C	5,388	5,487	9,943	12,894	14,445	12,016	8,554	6,445	6,475	4,289	4,036	3,257
D	6,262	7,526	13,312	12,738	22,006	20,000	12,715	9,674	7,789	5,204	4,630	3,328
BN	7,011	7,995	14,376	22,785	39,537	23,693	23,126	14,631	8,728	6,878	4,523	4,108
AN	6,596	11,462	21,145	49,856	65,301	52,162	30,121	24,198	11,173	9,206	4,765	11,179
W	9,554	15,661	53,037	82,133	92,184	77,284	57,176	39,945	25,785	11,180	8,805	15,937
All	7,292	10,240	25,934	40,282	50,706	40,784	29,579	21,047	13,603	7,678	5,789	8,268
2019 BiOps												
C	5,427	4,438	9,129	13,293	14,504	12,005	8,555	6,607	6,452	4,291	3,994	3,272
D	5,522	5,878	12,980	12,843	22,329	21,398	11,124	8,863	7,828	5,202	4,508	3,365
BN	6,432	5,772	14,980	23,081	39,938	25,228	19,408	12,263	8,961	6,996	4,379	3,628
AN	5,903	9,616	21,108	51,262	66,879	53,761	25,265	20,223	11,352	9,606	4,727	12,562
W	8,456	13,451	54,547	82,780	92,424	78,243	52,094	35,106	26,086	11,185	8,781	12,311
All	6,605	8,389	26,288	40,801	51,138	41,874	26,383	18,488	13,765	7,753	5,716	7,278
VA												
C	5,449	4,442	9,439	13,427	14,586	11,995	8,679	6,557	6,433	4,308	4,004	3,316
D	5,531	5,903	13,321	12,820	22,286	23,306	13,426	9,925	8,274	5,570	5,070	3,593
BN	6,559	5,759	14,490	23,030	39,664	27,501	22,590	13,740	9,012	7,057	4,594	3,690
AN	5,880	9,422	20,902	51,054	67,006	53,961	32,180	22,003	11,137	9,494	4,867	12,134
W	8,523	13,250	53,720	82,745	92,428	78,223	52,554	35,060	26,136	11,172	8,777	12,303
All	6,651	8,307	26,050	40,770	51,109	42,738	28,536	19,205	13,859	7,831	5,901	7,290

G3a.3.2 Delta Interior Flows

G3a.3.2.1 Delta Cross Channel

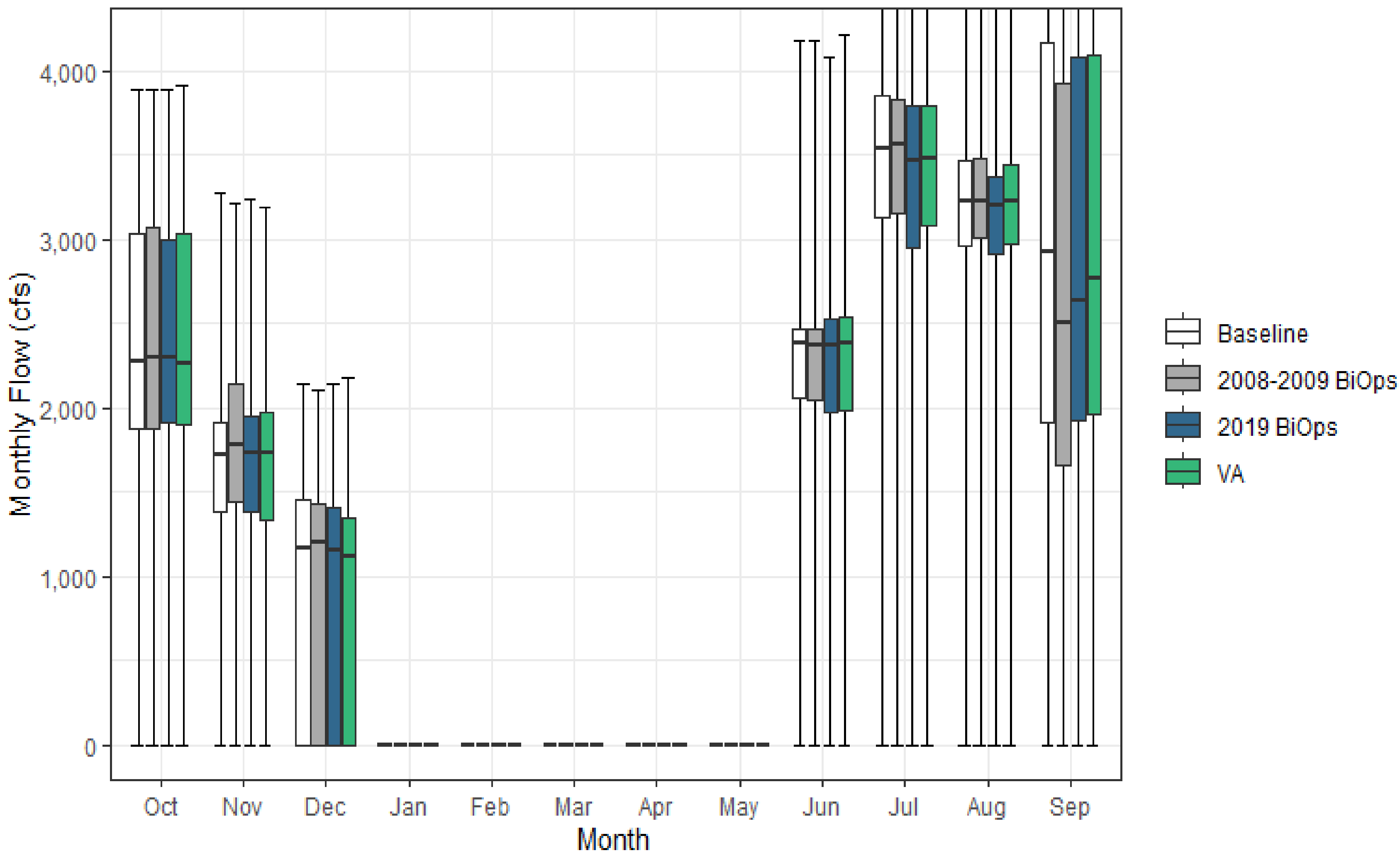

Figure G3a-33. Delta Cross Channel Monthly Boxplot

Table G3a-78. Cumulative Distribution of Monthly Flow (cfs) — Delta Cross Channel

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	0	0	0	0	0	0	0	0	0	0	0	0	0
10%	1,555	1,037	0	0	0	0	0	0	0	1,853	1,954	1,564	729
25%	1,881	1,377	0	0	0	0	0	0	2,051	3,132	2,964	1,912	955
50%	2,277	1,723	1,166	0	0	0	0	0	2,386	3,539	3,231	2,927	1,042
75%	3,030	1,917	1,456	0	0	0	0	0	2,465	3,856	3,468	4,166	1,123
90%	3,355	2,278	1,723	0	0	0	0	0	3,081	4,279	3,825	4,509	1,196
100%	3,892	3,278	2,146	0	0	0	0	0	4,181	4,630	4,632	4,784	1,296
Mean	2,444	1,625	934	0	0	0	0	0	2,127	3,311	3,088	3,033	1,005
2008-2009 BiOps													
0%	0	0	0	0	0	0	0	0	0	0	0	0	0
10%	1,557	1,076	0	0	0	0	0	0	0	1,907	2,000	0	726
25%	1,871	1,445	0	0	0	0	0	0	2,050	3,149	3,008	1,657	883
50%	2,304	1,784	1,196	0	0	0	0	0	2,368	3,564	3,224	2,504	1,019
75%	3,070	2,145	1,436	0	0	0	0	0	2,468	3,827	3,476	3,929	1,098
90%	3,428	2,550	1,744	0	0	0	0	0	3,089	4,159	3,781	4,448	1,192
100%	3,893	3,214	2,109	0	0	0	0	0	4,180	4,630	4,502	4,875	1,329
Mean	2,457	1,727	956	0	0	0	0	0	2,135	3,320	3,096	2,503	983
2019 BiOps													
0%	0	0	0	0	0	0	0	0	0	0	0	0	0
10%	1,556	1,036	0	0	0	0	0	0	0	1,847	1,958	1,593	748
25%	1,917	1,382	0	0	0	0	0	0	1,972	2,955	2,912	1,920	939
50%	2,300	1,734	1,148	0	0	0	0	0	2,371	3,465	3,200	2,640	1,027
75%	2,999	1,948	1,406	0	0	0	0	0	2,523	3,797	3,375	4,086	1,109
90%	3,334	2,275	1,724	0	0	0	0	0	3,107	4,049	3,825	4,407	1,166
100%	3,893	3,235	2,141	0	0	0	0	0	4,076	4,639	4,501	4,583	1,296
Mean	2,439	1,628	923	0	0	0	0	0	2,122	3,246	3,069	2,942	993
VA													
0%	0	0	0	0	0	0	0	0	0	0	0	0	0
10%	1,551	1,025	0	0	0	0	0	0	0	1,884	2,040	1,599	736
25%	1,903	1,334	0	0	0	0	0	0	1,980	3,086	2,974	1,956	942
50%	2,261	1,727	1,120	0	0	0	0	0	2,383	3,477	3,226	2,774	1,034
75%	3,028	1,969	1,350	0	0	0	0	0	2,535	3,787	3,442	4,088	1,107
90%	3,351	2,220	1,700	0	0	0	0	0	3,041	4,010	3,777	4,384	1,173
100%	3,909	3,185	2,177	0	0	0	0	0	4,221	4,630	4,501	4,582	1,278
Mean	2,436	1,612	917	0	0	0	0	0	2,131	3,265	3,099	2,948	996

Table G3a-79. Water Year Average of Monthly Flows (cfs) — Delta Cross Channel

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	2,112	1,446	1,078	0	0	0	0	0	1,827	1,995	1,974	1,601
D	2,376	1,615	1,302	0	0	0	0	0	2,403	3,342	3,076	2,136
BN	2,606	1,833	1,095	0	0	0	0	0	2,472	3,789	3,287	2,756
AN	2,455	1,684	1,063	0	0	0	0	0	2,672	3,664	3,278	4,413
W	2,570	1,577	428	0	0	0	0	0	1,638	3,553	3,493	4,051
All	2,444	1,625	934	0	0	0	0	0	2,127	3,311	3,088	3,033
2008-2009 BiOps												
C	2,107	1,517	1,190	0	0	0	0	0	1,851	2,029	1,998	1,694
D	2,396	1,814	1,302	0	0	0	0	0	2,398	3,251	3,122	2,088
BN	2,574	1,910	1,105	0	0	0	0	0	2,480	3,677	3,263	2,772
AN	2,422	1,789	1,100	0	0	0	0	0	2,700	3,993	3,284	4,178
W	2,635	1,638	419	0	0	0	0	0	1,639	3,557	3,482	2,365
All	2,457	1,727	956	0	0	0	0	0	2,135	3,320	3,096	2,503
2019 BiOps												
C	2,107	1,461	1,065	0	0	0	0	0	1,804	1,943	2,026	1,603
D	2,372	1,632	1,274	0	0	0	0	0	2,400	3,206	3,039	2,109
BN	2,639	1,817	1,091	0	0	0	0	0	2,460	3,641	3,212	2,458
AN	2,480	1,698	1,064	0	0	0	0	0	2,655	3,905	3,255	4,303
W	2,529	1,571	420	0	0	0	0	0	1,651	3,453	3,482	3,994
All	2,439	1,628	923	0	0	0	0	0	2,122	3,246	3,069	2,942
VA												
C	2,068	1,440	1,056	0	0	0	0	0	1,772	1,996	2,010	1,623
D	2,369	1,625	1,265	0	0	0	0	0	2,465	3,234	3,175	2,116
BN	2,625	1,801	1,067	0	0	0	0	0	2,470	3,625	3,263	2,504
AN	2,497	1,658	1,070	0	0	0	0	0	2,625	3,924	3,250	4,233
W	2,543	1,558	425	0	0	0	0	0	1,656	3,467	3,461	4,001
All	2,436	1,612	917	0	0	0	0	0	2,131	3,265	3,099	2,948

G3a.3.2.2 Georgiana Slough

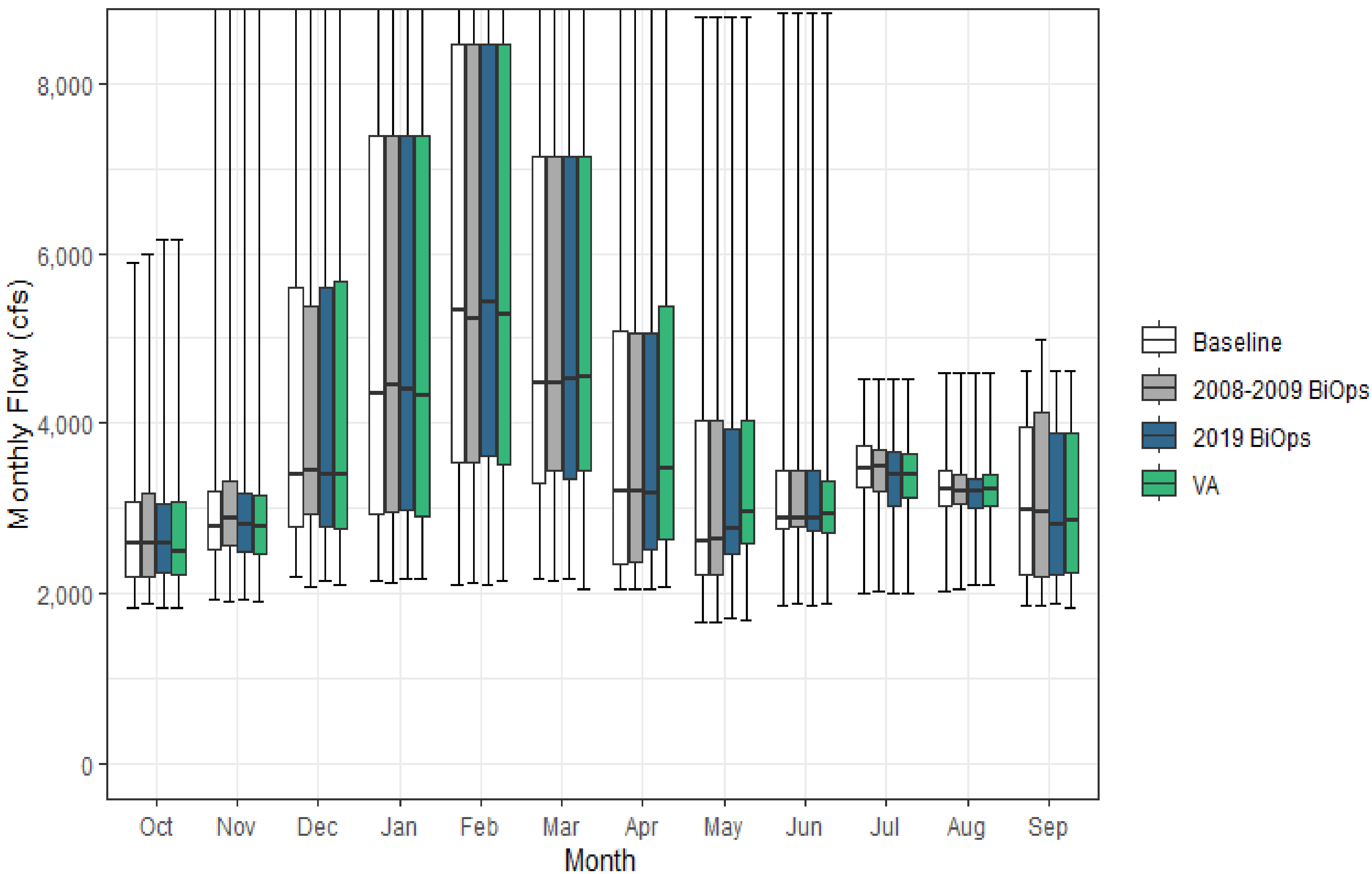

Figure G3a-34. Georgiana Slough Monthly Boxplot

Table G3a-80. Cumulative Distribution of Monthly Flow (cfs) — Georgiana Slough

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	1,830	1,930	2,184	2,151	2,094	2,166	2,051	1,668	1,863	2,010	2,036	1,841	1,519
10%	1,955	2,171	2,608	2,627	2,863	2,721	2,181	2,111	2,470	2,194	2,306	1,945	1,833
25%	2,200	2,524	2,772	2,940	3,540	3,290	2,349	2,209	2,749	3,253	3,018	2,211	2,149
50%	2,593	2,795	3,394	4,355	5,324	4,473	3,198	2,622	2,880	3,475	3,231	2,988	2,547
75%	3,077	3,211	5,587	7,394	8,461	7,150	5,082	4,029	3,440	3,749	3,436	3,950	3,505
90%	3,464	4,252	8,758	9,567	10,472	9,258	8,040	6,538	4,762	4,079	3,712	4,206	4,150
100%	5,885	9,453	11,477	11,870	12,014	11,644	10,958	8,776	8,831	4,521	4,593	4,630	5,306
Mean	2,708	3,116	4,619	5,303	6,033	5,386	4,091	3,436	3,327	3,358	3,147	3,106	2,869
2008-2009 BiOps													
0%	1,869	1,903	2,071	2,130	2,129	2,138	2,051	1,659	1,884	2,036	2,059	1,862	1,562
10%	1,949	2,148	2,633	2,633	2,835	2,697	2,236	2,131	2,496	2,218	2,305	2,003	1,836
25%	2,185	2,552	2,924	2,963	3,546	3,447	2,375	2,227	2,774	3,205	3,058	2,185	2,180
50%	2,584	2,889	3,445	4,453	5,233	4,474	3,196	2,636	2,874	3,483	3,211	2,950	2,531
75%	3,169	3,315	5,384	7,394	8,461	7,149	5,059	4,032	3,439	3,695	3,403	4,125	3,558
90%	3,383	4,107	8,755	9,536	10,407	9,257	8,040	6,608	4,762	3,950	3,670	4,613	4,166
100%	5,996	9,453	11,349	11,870	12,008	11,644	10,958	8,776	8,831	4,512	4,593	4,996	5,306
Mean	2,719	3,186	4,624	5,261	5,966	5,363	4,103	3,450	3,336	3,324	3,153	3,222	2,873
2019 BiOps													
0%	1,826	1,916	2,140	2,159	2,093	2,166	2,051	1,697	1,863	2,010	2,106	1,867	1,524
10%	1,951	2,145	2,521	2,591	2,863	2,722	2,294	2,275	2,468	2,163	2,326	1,975	1,857
25%	2,254	2,497	2,794	2,970	3,605	3,351	2,509	2,474	2,743	3,031	2,998	2,216	2,188
50%	2,585	2,796	3,394	4,396	5,419	4,516	3,177	2,750	2,873	3,398	3,192	2,815	2,531
75%	3,044	3,186	5,587	7,384	8,461	7,148	5,064	3,935	3,440	3,656	3,338	3,886	3,463
90%	3,451	4,231	8,750	9,567	10,471	9,257	8,041	6,537	4,659	3,883	3,712	4,146	4,149
100%	6,164	9,453	11,453	11,870	12,012	11,645	10,958	8,776	8,831	4,512	4,593	4,630	5,306
Mean	2,707	3,121	4,604	5,331	6,049	5,394	4,147	3,566	3,321	3,272	3,132	3,035	2,872
VA													
0%	1,831	1,910	2,110	2,174	2,146	2,038	2,077	1,679	1,884	2,009	2,099	1,841	1,524
10%	1,934	2,102	2,488	2,617	2,738	2,699	2,332	2,198	2,390	2,184	2,345	1,989	1,852
25%	2,228	2,476	2,767	2,899	3,521	3,433	2,643	2,581	2,711	3,120	3,023	2,244	2,233
50%	2,479	2,789	3,393	4,332	5,281	4,552	3,458	2,950	2,933	3,406	3,212	2,868	2,564
75%	3,077	3,147	5,661	7,384	8,460	7,148	5,374	4,031	3,312	3,650	3,386	3,884	3,460
90%	3,465	4,239	8,717	9,567	10,472	9,258	8,040	6,539	4,761	3,833	3,669	4,114	4,154
100%	6,165	9,453	11,368	11,870	12,013	11,645	10,958	8,777	8,831	4,512	4,593	4,630	5,307
Mean	2,705	3,095	4,588	5,321	6,042	5,394	4,291	3,664	3,333	3,282	3,155	3,040	2,886

Table G3a-81. Water Year Average of Monthly Flows (cfs) — Georgiana Slough

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	2,357	2,401	2,896	3,029	3,161	2,840	2,210	2,009	2,354	2,268	2,252	1,966
D	2,560	2,801	3,546	3,175	4,114	3,945	2,570	2,310	2,864	3,301	3,096	2,376
BN	2,736	2,846	3,656	4,298	5,733	4,325	3,669	2,721	2,925	3,643	3,258	2,851
AN	2,620	3,237	4,223	6,756	7,685	7,063	4,328	3,794	3,102	3,862	3,251	4,121
W	3,028	3,848	7,103	8,106	8,485	7,755	6,392	5,328	4,537	3,596	3,554	3,982
All	2,708	3,116	4,619	5,303	6,033	5,386	4,091	3,436	3,327	3,358	3,147	3,106
2008-2009 BiOps												
C	2,354	2,482	3,090	3,002	3,111	2,828	2,214	2,016	2,375	2,293	2,270	2,037
D	2,575	2,825	3,553	3,182	4,082	3,937	2,615	2,331	2,860	3,231	3,132	2,339
BN	2,711	2,935	3,652	4,222	5,616	4,278	3,648	2,733	2,932	3,557	3,240	2,863
AN	2,595	3,360	4,287	6,603	7,478	6,989	4,344	3,810	3,127	3,799	3,256	3,941
W	3,081	3,912	6,984	8,087	8,472	7,753	6,404	5,339	4,542	3,600	3,546	4,430
All	2,719	3,186	4,624	5,261	5,966	5,363	4,103	3,450	3,336	3,324	3,153	3,222
2019 BiOps												
C	2,353	2,418	2,874	3,039	3,197	2,832	2,288	2,135	2,334	2,254	2,292	1,967
D	2,557	2,820	3,490	3,193	4,149	3,990	2,717	2,610	2,861	3,196	3,068	2,355
BN	2,762	2,827	3,639	4,333	5,753	4,333	3,714	2,906	2,914	3,529	3,201	2,623
AN	2,639	3,252	4,217	6,818	7,672	7,036	4,334	3,857	3,086	3,732	3,233	4,037
W	3,006	3,845	7,119	8,131	8,487	7,758	6,399	5,325	4,542	3,520	3,546	3,939
All	2,707	3,121	4,604	5,331	6,049	5,394	4,147	3,566	3,321	3,272	3,132	3,035
VA												
C	2,323	2,395	2,859	3,062	3,173	2,799	2,267	2,098	2,305	2,268	2,279	1,983
D	2,554	2,812	3,472	3,175	4,128	3,992	2,912	2,754	2,919	3,218	3,172	2,361
BN	2,751	2,809	3,612	4,284	5,727	4,353	4,022	3,112	2,923	3,517	3,240	2,658
AN	2,653	3,196	4,207	6,813	7,693	7,047	4,700	4,080	3,060	3,746	3,230	3,983
W	3,017	3,812	7,107	8,131	8,497	7,759	6,397	5,344	4,559	3,531	3,529	3,945
All	2,705	3,095	4,588	5,321	6,042	5,394	4,291	3,664	3,333	3,282	3,155	3,040

G3a.3.2.3 San Joaquin River at Jersey Point (QWEST)

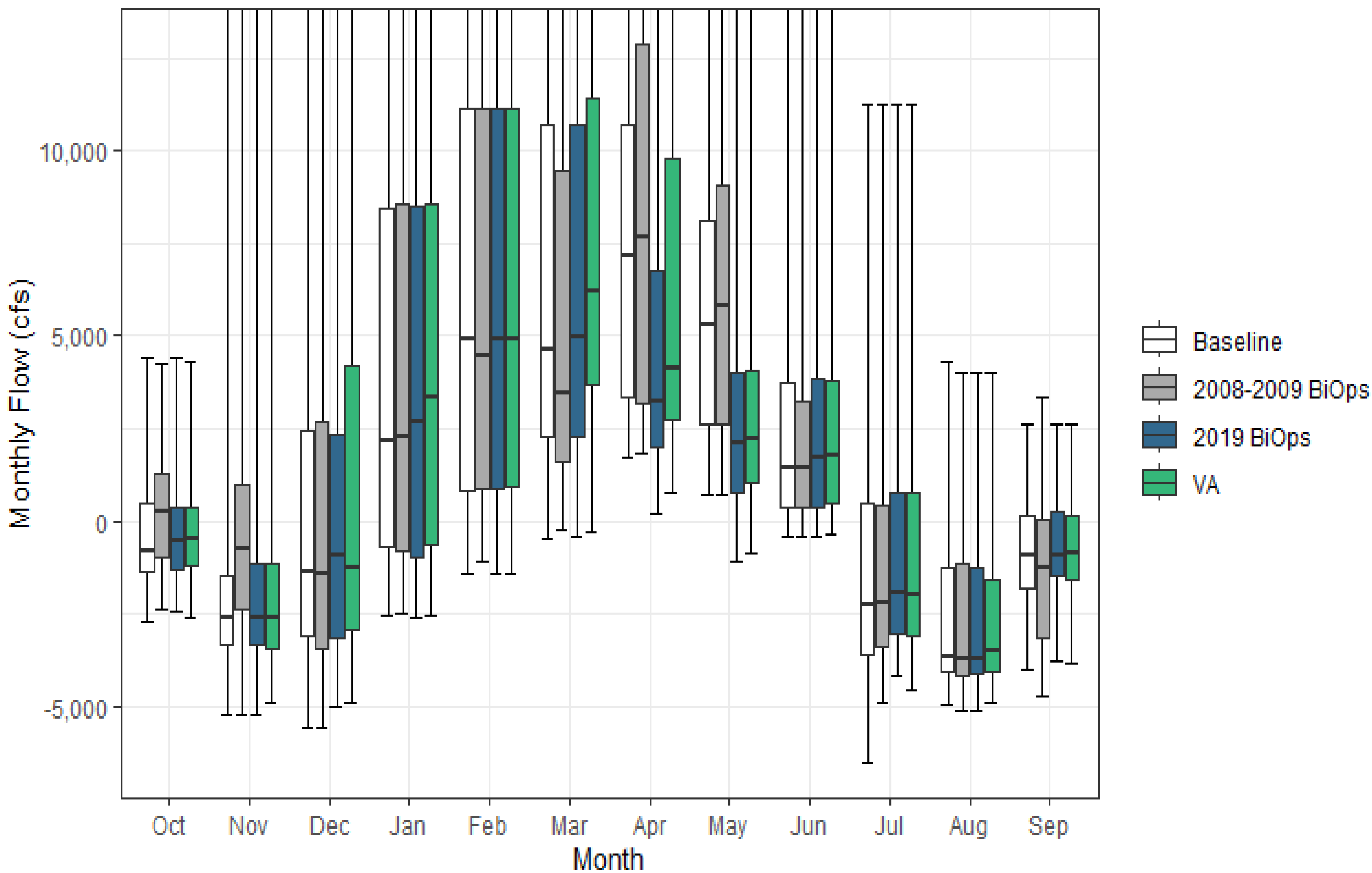

Figure G3a-35. San Joaquin River at Jersey Point (QWEST) Monthly Boxplot

Table G3a-82. Cumulative Distribution of Monthly Flow (cfs) — San Joaquin River at Jersey Point (QWEST)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	-2,709	-5,235	-5,567	-2,536	-1,408	-498	1,709	721	-403	-6,512	-4,970	-4,025	-799
10%	-1,753	-3,986	-3,915	-1,602	-619	580	2,385	1,588	-87	-4,181	-4,410	-3,464	-434
25%	-1,346	-3,345	-3,121	-704	818	2,296	3,321	2,614	348	-3,633	-4,060	-1,823	39
50%	-780	-2,592	-1,390	2,141	4,894	4,630	7,167	5,287	1,457	-2,246	-3,651	-944	1,035
75%	455	-1,478	2,468	8,470	11,144	10,697	10,715	8,092	3,709	503	-1,260	144	3,279
90%	1,143	78	8,727	15,648	20,939	18,873	16,195	13,507	9,473	1,790	890	561	5,489
100%	4,396	18,013	29,038	75,680	45,117	64,775	37,842	27,723	27,285	11,276	4,319	2,609	16,191
Mean	-416	-1,975	1,447	5,621	7,827	8,054	8,516	6,584	3,206	-1,373	-2,514	-1,084	2,024
2008-2009 BiOps													
0%	-2,388	-5,233	-5,568	-2,504	-1,077	-237	1,806	709	-416	-4,912	-5,118	-4,726	-738
10%	-1,522	-3,238	-4,677	-1,691	-575	146	2,375	1,586	-7	-4,070	-4,415	-4,083	-258
25%	-997	-2,371	-3,456	-830	893	1,609	3,198	2,591	353	-3,405	-4,177	-3,156	197
50%	258	-761	-1,411	2,296	4,479	3,469	7,677	5,813	1,439	-2,183	-3,721	-1,247	1,120
75%	1,250	1,013	2,659	8,578	11,144	9,475	12,876	9,048	3,240	413	-1,150	25	3,237
90%	2,292	2,670	8,743	15,643	20,908	19,165	22,159	18,054	9,070	1,709	624	458	6,152
100%	4,259	18,013	29,038	75,681	43,470	62,456	37,842	27,639	27,285	11,276	3,995	3,331	15,941
Mean	300	-412	1,257	5,597	7,740	7,231	9,541	7,368	3,107	-1,289	-2,609	-1,503	2,170
2019 BiOps													
0%	-2,442	-5,232	-4,988	-2,607	-1,409	-427	197	-1,099	-394	-4,176	-5,118	-3,789	-923
10%	-1,797	-4,076	-3,846	-1,631	-628	581	791	10	40	-3,856	-4,447	-3,008	-624
25%	-1,287	-3,337	-3,170	-967	880	2,295	1,979	781	353	-3,066	-4,142	-1,471	-109
50%	-501	-2,628	-912	2,686	4,891	4,958	3,235	2,086	1,707	-1,935	-3,708	-904	610
75%	396	-1,165	2,349	8,490	11,144	10,697	6,785	4,014	3,857	758	-1,279	265	2,903
90%	1,202	59	8,819	15,674	20,940	18,846	15,305	11,815	9,629	1,997	926	581	5,379
100%	4,403	18,013	29,038	75,680	43,459	64,775	37,844	27,729	27,285	11,276	3,992	2,609	16,192
Mean	-342	-1,983	1,501	5,754	7,815	8,077	6,018	4,053	3,320	-973	-2,603	-910	1,772
VA													
0%	-2,602	-4,915	-4,919	-2,536	-1,405	-301	755	-840	-370	-4,595	-4,908	-3,810	-721
10%	-1,797	-4,097	-3,862	-1,674	-520	965	1,916	151	130	-3,726	-4,401	-2,823	-371
25%	-1,184	-3,440	-2,913	-648	931	3,688	2,752	1,033	487	-3,101	-4,084	-1,592	76
50%	-465	-2,592	-1,260	3,326	4,891	6,198	4,154	2,240	1,775	-1,959	-3,490	-867	824
75%	343	-1,132	4,176	8,588	11,144	11,402	9,796	4,094	3,789	772	-1,598	171	3,011
90%	1,206	87	9,036	15,671	20,937	18,904	15,856	12,083	9,182	1,914	906	778	5,432
100%	4,312	18,014	28,995	75,698	43,965	64,775	38,295	27,728	27,296	11,276	3,996	2,610	16,219
Mean	-286	-1,940	1,653	5,809	7,849	9,011	7,337	4,175	3,403	-963	-2,566	-887	1,946

Table G3a-83. Water Year Average of Monthly Flows (cfs) — San Joaquin River at Jersey Point (QWEST)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	411	-1,346	-1,213	284	871	992	2,437	1,658	1,645	437	92	114
D	-522	-2,423	-1,436	-506	1,911	3,041	3,941	2,981	412	-3,599	-3,311	-1,718
BN	-499	-2,405	-1,159	1,761	6,136	4,519	7,808	5,510	1,175	-3,193	-4,090	-3,010
AN	-675	-1,596	337	8,412	10,745	10,330	9,443	8,548	2,683	-2,112	-4,032	-575
W	-618	-1,877	7,091	14,222	15,765	16,769	15,238	11,738	7,596	747	-1,706	-299
All	-416	-1,975	1,447	5,621	7,827	8,054	8,516	6,584	3,206	-1,373	-2,514	-1,084
2008-2009 BiOps												
C	390	-744	-1,473	228	536	1,110	2,443	1,654	1,573	293	-59	-107
D	211	-725	-1,466	-548	1,950	2,009	3,969	2,953	489	-3,232	-3,523	-1,653
BN	236	-661	-1,266	1,818	6,130	3,303	7,774	5,484	1,111	-3,160	-4,164	-3,233
AN	317	-326	10	8,286	10,631	9,201	10,339	8,382	2,601	-1,998	-4,057	-1,242
W	351	113	6,827	14,223	15,680	15,966	18,254	14,449	7,322	761	-1,724	-1,198
All	300	-412	1,257	5,597	7,740	7,231	9,541	7,368	3,107	-1,289	-2,609	-1,503
2019 BiOps												
C	441	-1,421	-1,241	859	570	1,040	1,988	1,109	1,760	438	-120	262
D	-427	-2,522	-1,132	-428	1,968	3,086	1,696	507	521	-3,098	-3,453	-1,618
BN	-610	-2,390	-997	1,798	6,156	4,526	3,690	2,016	1,406	-2,844	-4,168	-2,553
AN	-562	-1,559	223	8,474	10,906	10,303	5,398	4,015	2,867	-1,279	-4,069	-247
W	-442	-1,815	7,010	14,249	15,763	16,791	13,097	9,542	7,612	1,131	-1,716	-293
All	-342	-1,983	1,501	5,754	7,815	8,077	6,018	4,053	3,320	-973	-2,603	-910
VA												
C	597	-1,341	-747	1,139	599	1,222	2,233	1,273	1,860	434	-88	282
D	-430	-2,489	-751	-369	1,982	4,946	2,824	649	762	-2,932	-3,359	-1,254
BN	-469	-2,271	-1,231	1,801	6,250	6,911	4,972	2,224	1,406	-2,787	-4,099	-2,677
AN	-646	-1,546	453	8,455	10,923	10,474	10,224	4,298	2,839	-1,457	-4,087	-471
W	-386	-1,818	7,006	14,245	15,787	16,880	13,653	9,506	7,665	1,086	-1,716	-330
All	-286	-1,940	1,653	5,809	7,849	9,011	7,337	4,175	3,403	-963	-2,566	-887

G3a.3.2.4 Old and Middle Rivers Net Flow

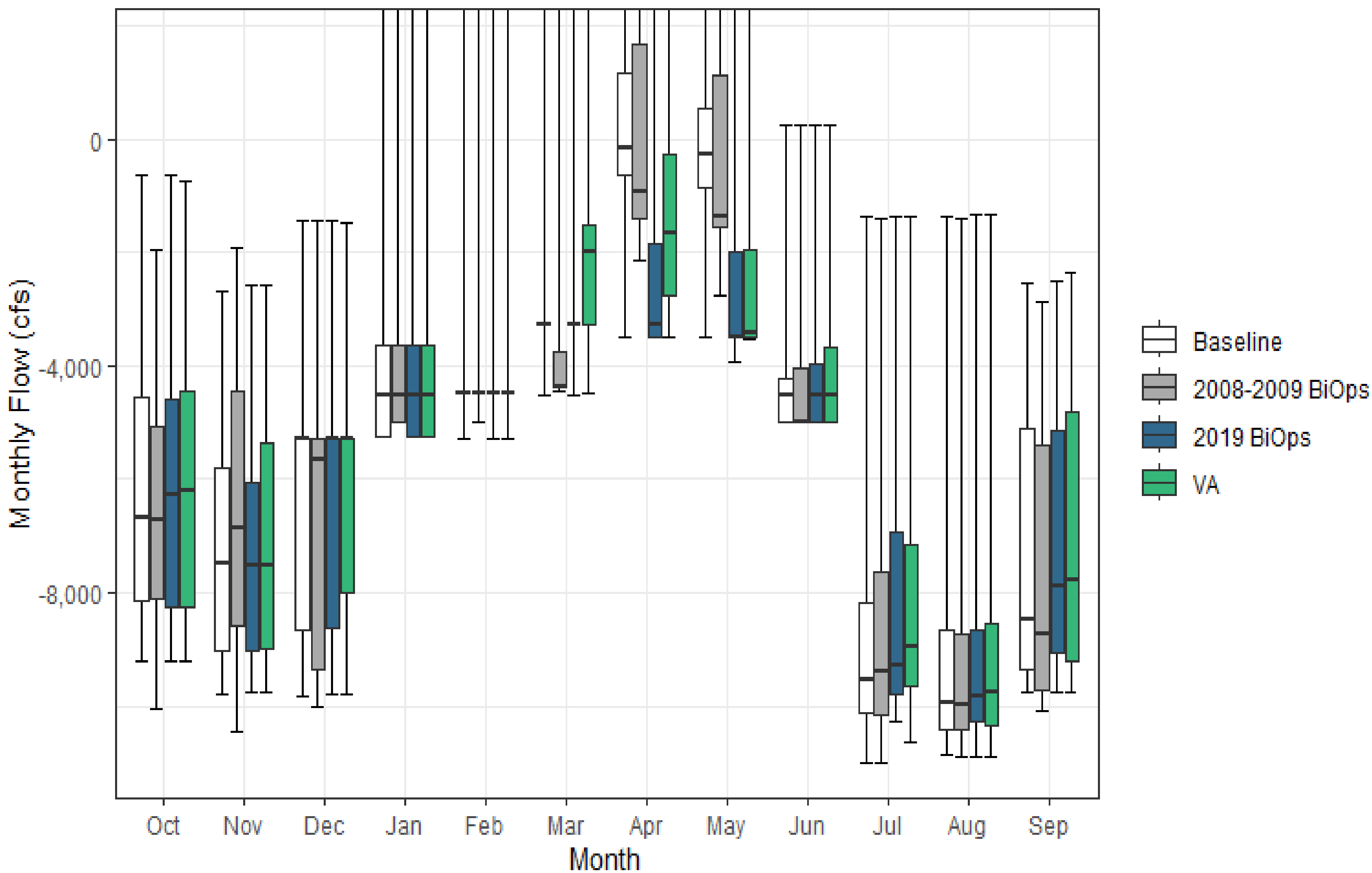

Figure G3a-36. Old and Middle Rivers Net Flow Monthly Boxplot

Table G3a-84. Cumulative Distribution of Monthly Flow (cfs) — Old and Middle Rivers Net Flow

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	-9,221	-9,776	-9,819	-5,242	-5,268	-4,516	-3,500	-3,500	-5,000	-10,990	-10,847	-9,750	-4,596
10%	-8,493	-9,294	-9,493	-5,242	-5,000	-3,500	-2,743	-1,944	-5,000	-10,470	-10,533	-9,645	-4,291
25%	-8,158	-9,012	-8,675	-5,241	-4,483	-3,258	-627	-862	-5,000	-10,120	-10,397	-9,356	-4,179
50%	-6,672	-7,486	-5,300	-4,516	-4,464	-3,258	-161	-255	-4,500	-9,523	-9,934	-8,477	-3,846
75%	-4,559	-5,814	-5,290	-3,645	-4,464	-3,258	1,150	555	-4,225	-8,193	-8,650	-5,102	-3,460
90%	-3,211	-3,713	-4,425	-3,349	-3,668	-2,188	1,701	1,447	-1,588	-2,706	-4,526	-2,862	-2,264
100%	-650	-2,687	-1,430	19,429	6,048	17,668	8,057	4,018	259	-1,380	-1,361	-2,528	280
Mean	-6,221	-7,124	-6,459	-4,058	-4,149	-2,839	-11	-220	-4,165	-8,245	-8,664	-7,282	-3,595
2008-2009 BiOps													
0%	-10,041	-10,447	-10,028	-5,000	-5,000	-4,452	-2,137	-2,755	-5,000	-10,990	-10,892	-10,103	-4,642
10%	-9,214	-9,942	-9,739	-5,000	-5,000	-4,371	-1,593	-1,896	-5,000	-10,442	-10,565	-9,963	-4,446
25%	-8,104	-8,574	-9,345	-5,000	-4,483	-4,371	-1,390	-1,552	-5,000	-10,157	-10,418	-9,708	-4,212
50%	-6,728	-6,873	-5,642	-4,516	-4,464	-4,371	-943	-1,367	-5,000	-9,390	-9,967	-8,739	-3,849
75%	-5,078	-4,449	-5,290	-3,645	-4,464	-3,751	1,673	1,125	-4,055	-7,647	-8,714	-5,386	-3,372
90%	-3,656	-3,343	-4,552	-3,644	-3,720	-2,201	2,993	2,164	-2,251	-2,821	-4,614	-3,365	-2,442
100%	-1,956	-1,924	-1,430	19,429	4,435	15,526	7,980	5,380	259	-1,385	-1,397	-2,850	-287
Mean	-6,519	-6,603	-6,655	-4,046	-4,167	-3,568	333	-336	-4,272	-8,143	-8,764	-7,646	-3,654
2019 BiOps													
0%	-9,221	-9,772	-9,794	-5,242	-5,268	-4,516	-3,500	-3,923	-5,000	-10,285	-10,892	-9,750	-4,861
10%	-8,534	-9,281	-9,479	-5,242	-5,000	-3,500	-3,500	-3,500	-5,000	-9,992	-10,533	-9,520	-4,626
25%	-8,260	-9,023	-8,624	-5,240	-4,483	-3,258	-3,500	-3,500	-5,000	-9,799	-10,256	-9,052	-4,487
50%	-6,265	-7,522	-5,290	-4,516	-4,464	-3,258	-3,259	-3,485	-4,500	-9,263	-9,827	-7,896	-4,124
75%	-4,605	-6,042	-5,290	-3,645	-4,464	-3,258	-1,836	-1,983	-3,973	-6,943	-8,650	-5,135	-3,501
90%	-3,148	-3,863	-4,105	-3,035	-4,016	-2,189	-221	-1,009	-1,456	-2,430	-4,700	-2,861	-2,496
100%	-651	-2,568	-1,430	19,430	6,049	17,668	8,057	4,023	259	-1,383	-1,325	-2,487	281
Mean	-6,149	-7,139	-6,385	-3,963	-4,173	-2,826	-2,339	-2,643	-4,050	-7,737	-8,714	-6,976	-3,816
VA													
0%	-9,221	-9,770	-9,794	-5,242	-5,268	-4,472	-3,500	-3,529	-5,000	-10,629	-10,892	-9,750	-4,840
10%	-8,565	-9,274	-9,406	-5,242	-5,000	-3,258	-3,087	-3,500	-5,000	-10,062	-10,533	-9,580	-4,500
25%	-8,260	-9,001	-8,013	-5,240	-4,483	-3,258	-2,761	-3,500	-5,000	-9,657	-10,355	-9,203	-4,317
50%	-6,185	-7,504	-5,290	-4,516	-4,464	-2,006	-1,676	-3,414	-4,500	-8,937	-9,756	-7,775	-3,946
75%	-4,431	-5,375	-5,289	-3,645	-4,464	-1,525	-276	-1,956	-3,677	-7,151	-8,542	-4,795	-3,454
90%	-3,275	-3,579	-3,190	-2,362	-3,821	-821	557	-1,004	-1,451	-2,348	-4,831	-2,850	-2,333
100%	-738	-2,569	-1,489	19,447	6,049	17,668	8,483	4,023	259	-1,380	-1,324	-2,366	306
Mean	-6,093	-7,060	-6,226	-3,899	-4,136	-2,012	-1,307	-2,594	-3,981	-7,739	-8,723	-6,961	-3,673

Table G3a-85. Water Year Average of Monthly Flows (cfs) — Old and Middle Rivers Net Flow

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	-4,644	-5,072	-5,603	-3,620	-4,116	-3,210	-466	-723	-2,141	-3,024	-3,553	-3,107
D	-5,932	-6,866	-7,082	-4,870	-4,720	-3,247	-294	-495	-4,657	-9,260	-8,766	-5,916
BN	-6,471	-7,189	-7,082	-4,658	-4,643	-3,287	533	359	-4,853	-10,053	-10,164	-8,522
AN	-6,296	-7,292	-7,083	-4,181	-4,179	-3,258	427	983	-4,875	-9,663	-10,390	-9,196
W	-7,099	-8,305	-5,805	-3,267	-3,425	-1,883	-74	-612	-4,158	-8,576	-9,676	-8,970
All	-6,221	-7,124	-6,459	-4,058	-4,149	-2,839	-11	-220	-4,165	-8,245	-8,664	-7,282
2008-2009 BiOps												
C	-5,454	-5,262	-6,116	-3,657	-4,377	-3,092	-1,269	-1,560	-2,249	-3,211	-3,732	-3,684
D	-6,158	-6,188	-7,115	-4,919	-4,657	-4,179	-1,346	-1,778	-4,578	-8,772	-9,038	-6,072
BN	-6,698	-6,487	-7,186	-4,544	-4,542	-4,351	-133	-698	-4,926	-9,842	-10,194	-9,091
AN	-6,191	-7,060	-7,470	-4,161	-4,094	-4,219	694	120	-5,000	-9,803	-10,419	-9,809
W	-7,392	-7,506	-5,928	-3,249	-3,490	-2,611	2,578	1,427	-4,417	-8,572	-9,676	-9,143
All	-6,519	-6,603	-6,655	-4,046	-4,167	-3,568	333	-336	-4,272	-8,143	-8,764	-7,646
2019 BiOps												
C	-4,610	-5,170	-5,597	-3,110	-4,422	-3,162	-946	-1,339	-1,995	-2,962	-3,833	-2,976
D	-5,838	-6,990	-6,728	-4,814	-4,700	-3,246	-2,472	-3,018	-4,552	-8,576	-8,838	-5,781
BN	-6,626	-7,143	-6,916	-4,658	-4,643	-3,287	-3,259	-2,989	-4,619	-9,494	-10,116	-7,625
AN	-6,231	-7,288	-7,182	-4,181	-4,015	-3,258	-3,263	-3,204	-4,676	-8,993	-10,383	-8,721
W	-6,883	-8,241	-5,886	-3,267	-3,427	-1,867	-2,033	-2,609	-4,161	-8,061	-9,667	-8,874
All	-6,149	-7,139	-6,385	-3,963	-4,173	-2,826	-2,339	-2,643	-4,050	-7,737	-8,714	-6,976
VA												
C	-4,405	-5,057	-5,127	-2,870	-4,375	-2,980	-705	-1,155	-1,846	-3,028	-3,777	-2,990
D	-5,835	-6,946	-6,355	-4,744	-4,669	-1,590	-1,641	-3,016	-4,441	-8,467	-8,963	-5,458
BN	-6,475	-7,001	-7,077	-4,607	-4,544	-1,171	-2,411	-2,974	-4,606	-9,408	-10,121	-7,801
AN	-6,332	-7,187	-6,973	-4,181	-4,015	-3,141	704	-3,096	-4,638	-9,151	-10,379	-8,798
W	-6,855	-8,201	-5,880	-3,266	-3,412	-1,836	-1,572	-2,602	-4,118	-8,098	-9,633	-8,919
All	-6,093	-7,060	-6,226	-3,899	-4,136	-2,012	-1,307	-2,594	-3,981	-7,739	-8,723	-6,961

G3a.3.2.5 Jones Pumping Plant (CVP)

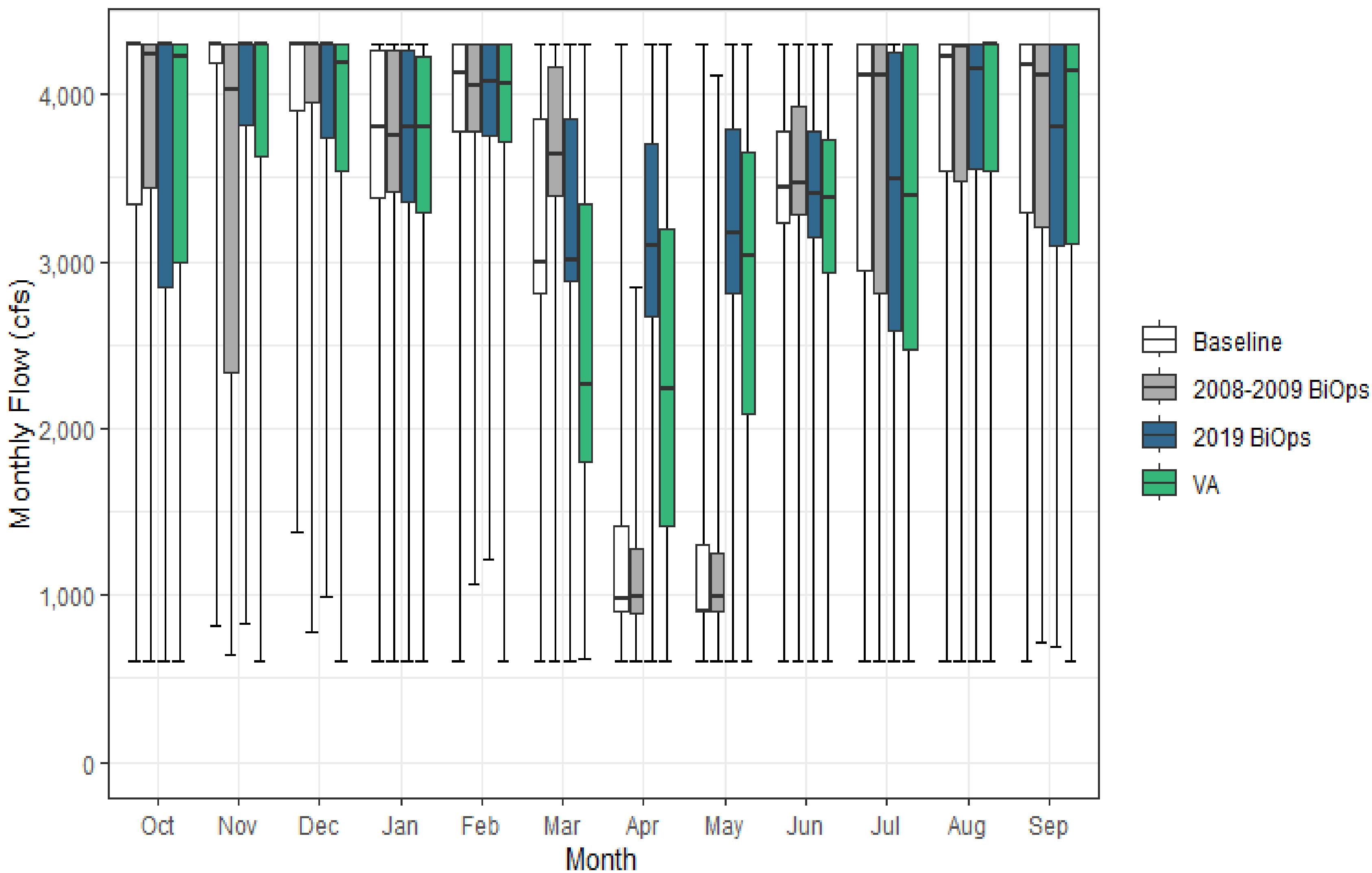

Figure G3a-37. Jones Pumping Plant (CVP) Monthly Boxplot

Table G3a-86. Cumulative Distribution of Monthly Flow (cfs) — Jones Pumping Plant (CVP)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	600	818	1,382	600	600	600	600	601	601	600	600	603	953
10%	2,521	2,085	2,691	2,769	3,578	2,184	600	898	2,125	1,992	2,486	2,708	1,812
25%	3,342	4,191	3,897	3,381	3,782	2,812	898	899	3,229	2,939	3,538	3,288	2,280
50%	4,297	4,298	4,297	3,798	4,131	2,996	982	904	3,437	4,116	4,230	4,173	2,446
75%	4,300	4,300	4,298	4,267	4,297	3,847	1,410	1,301	3,777	4,300	4,300	4,300	2,575
90%	4,300	4,300	4,300	4,298	4,298	4,278	3,227	4,097	4,299	4,300	4,300	4,300	2,894
100%	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,299	4,300	4,300	4,300	4,300	3,089
Mean	3,704	3,818	3,898	3,600	3,940	3,122	1,457	1,513	3,307	3,520	3,759	3,725	2,374
2008-2009 BiOps													
0%	600	642	783	600	1,061	600	600	601	600	602	605	715	1,084
10%	2,398	1,861	3,143	2,823	3,578	2,330	601	898	2,131	2,002	2,975	2,594	1,882
25%	3,444	2,336	3,947	3,424	3,781	3,389	898	899	3,279	2,812	3,475	3,202	2,217
50%	4,235	4,033	4,298	3,757	4,048	3,640	996	987	3,469	4,118	4,284	4,116	2,457
75%	4,299	4,298	4,299	4,268	4,297	4,158	1,281	1,254	3,927	4,300	4,300	4,300	2,579
90%	4,300	4,300	4,300	4,297	4,298	4,297	2,053	1,610	4,299	4,300	4,300	4,300	2,688
100%	4,300	4,300	4,300	4,300	4,300	4,300	2,849	4,109	4,300	4,300	4,300	4,300	3,014
Mean	3,689	3,396	3,922	3,603	3,961	3,479	1,187	1,220	3,367	3,500	3,795	3,673	2,341
2019 BiOps													
0%	601	826	989	600	1,222	600	600	601	601	601	607	688	890
10%	2,149	1,717	2,173	2,178	3,346	2,118	823	2,094	1,893	1,623	2,355	2,596	1,942
25%	2,848	3,814	3,745	3,356	3,756	2,886	2,667	2,808	3,144	2,583	3,553	3,100	2,366
50%	4,297	4,298	4,297	3,798	4,082	3,006	3,095	3,169	3,409	3,491	4,156	3,800	2,635
75%	4,300	4,300	4,298	4,267	4,297	3,851	3,701	3,791	3,777	4,252	4,300	4,300	2,804
90%	4,300	4,300	4,300	4,298	4,298	4,297	4,182	4,107	4,299	4,300	4,300	4,300	2,975
100%	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,299	4,300	4,300	4,300	4,300	3,033
Mean	3,501	3,743	3,797	3,539	3,908	3,151	2,937	3,141	3,245	3,246	3,703	3,577	2,503
VA													
0%	600	608	604	600	600	617	600	600	601	604	605	601	982
10%	2,454	1,759	1,880	2,097	3,345	1,797	800	1,467	1,337	1,606	2,625	2,605	1,811
25%	2,998	3,630	3,538	3,297	3,719	1,797	1,416	2,090	2,928	2,469	3,537	3,107	2,253
50%	4,224	4,297	4,189	3,798	4,061	2,263	2,241	3,036	3,386	3,399	4,300	4,141	2,470
75%	4,300	4,300	4,298	4,230	4,297	3,343	3,194	3,656	3,729	4,300	4,300	4,300	2,757
90%	4,300	4,300	4,300	4,297	4,297	4,269	3,915	4,104	4,299	4,300	4,300	4,300	2,945
100%	4,300	4,300	4,300	4,300	4,300	4,300	4,299	4,299	4,300	4,300	4,300	4,300	3,027
Mean	3,563	3,692	3,672	3,489	3,869	2,564	2,297	2,923	3,132	3,233	3,729	3,668	2,403

Table G3a-87. Water Year Average of Monthly Flows (cfs) — Jones Pumping Plant (CVP)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	3,268	2,882	3,363	2,732	3,292	2,551	851	1,065	1,588	1,522	2,301	2,564
D	3,679	3,727	3,979	3,576	3,934	2,822	1,053	1,143	3,316	3,581	3,708	3,740
BN	3,753	4,090	3,893	3,678	4,119	3,159	908	918	3,421	3,796	3,874	3,758
AN	3,553	3,778	4,010	3,809	4,092	3,570	1,425	931	3,741	3,885	4,243	3,860
W	3,991	4,239	4,078	3,946	4,116	3,439	2,432	2,639	3,967	4,219	4,300	4,257
All	3,704	3,818	3,898	3,600	3,940	3,122	1,457	1,513	3,307	3,520	3,759	3,725
2008-2009 BiOps												
C	3,021	3,038	3,447	2,784	3,521	2,387	852	1,061	1,695	1,675	2,532	2,834
D	3,810	2,967	4,008	3,613	3,842	3,497	1,052	1,182	3,328	3,499	3,660	3,812
BN	3,776	3,550	3,915	3,622	4,074	3,692	956	931	3,462	3,568	3,906	3,431
AN	3,516	3,482	3,976	3,796	4,092	3,887	1,052	1,016	3,785	4,026	4,275	4,112
W	3,977	3,778	4,092	3,941	4,159	3,746	1,664	1,597	4,057	4,211	4,300	3,978
All	3,689	3,396	3,922	3,603	3,961	3,479	1,187	1,220	3,367	3,500	3,795	3,673
2019 BiOps												
C	3,265	2,797	3,232	2,417	3,442	2,473	1,339	1,604	1,427	1,382	2,307	2,639
D	3,632	3,557	3,899	3,571	3,835	2,794	2,680	2,933	3,223	3,123	3,502	3,856
BN	3,505	4,032	3,567	3,678	4,120	3,201	3,331	3,221	3,331	3,191	3,822	3,007
AN	3,308	3,736	3,886	3,809	4,092	3,656	3,447	3,603	3,740	3,750	4,236	3,565
W	3,608	4,216	4,124	3,916	4,003	3,535	3,528	3,874	3,972	4,154	4,300	4,223
All	3,501	3,743	3,797	3,539	3,908	3,151	2,937	3,141	3,245	3,246	3,703	3,577
VA												
C	3,350	2,687	3,030	2,267	3,397	2,204	1,092	1,258	1,205	1,530	2,261	2,436
D	3,557	3,670	3,659	3,467	3,725	1,797	1,851	2,626	3,023	3,189	3,649	3,998
BN	3,736	3,928	3,561	3,678	4,014	1,921	2,657	2,966	3,278	3,133	3,828	3,449
AN	3,353	3,592	3,721	3,809	4,092	3,308	1,407	3,273	3,616	3,434	4,231	3,617
W	3,666	4,148	4,072	3,908	4,044	3,404	3,441	3,863	3,950	4,152	4,300	4,236
All	3,563	3,692	3,672	3,489	3,869	2,564	2,297	2,923	3,132	3,233	3,729	3,668

G3a.3.2.6 Banks Pumping Plant (SWP)

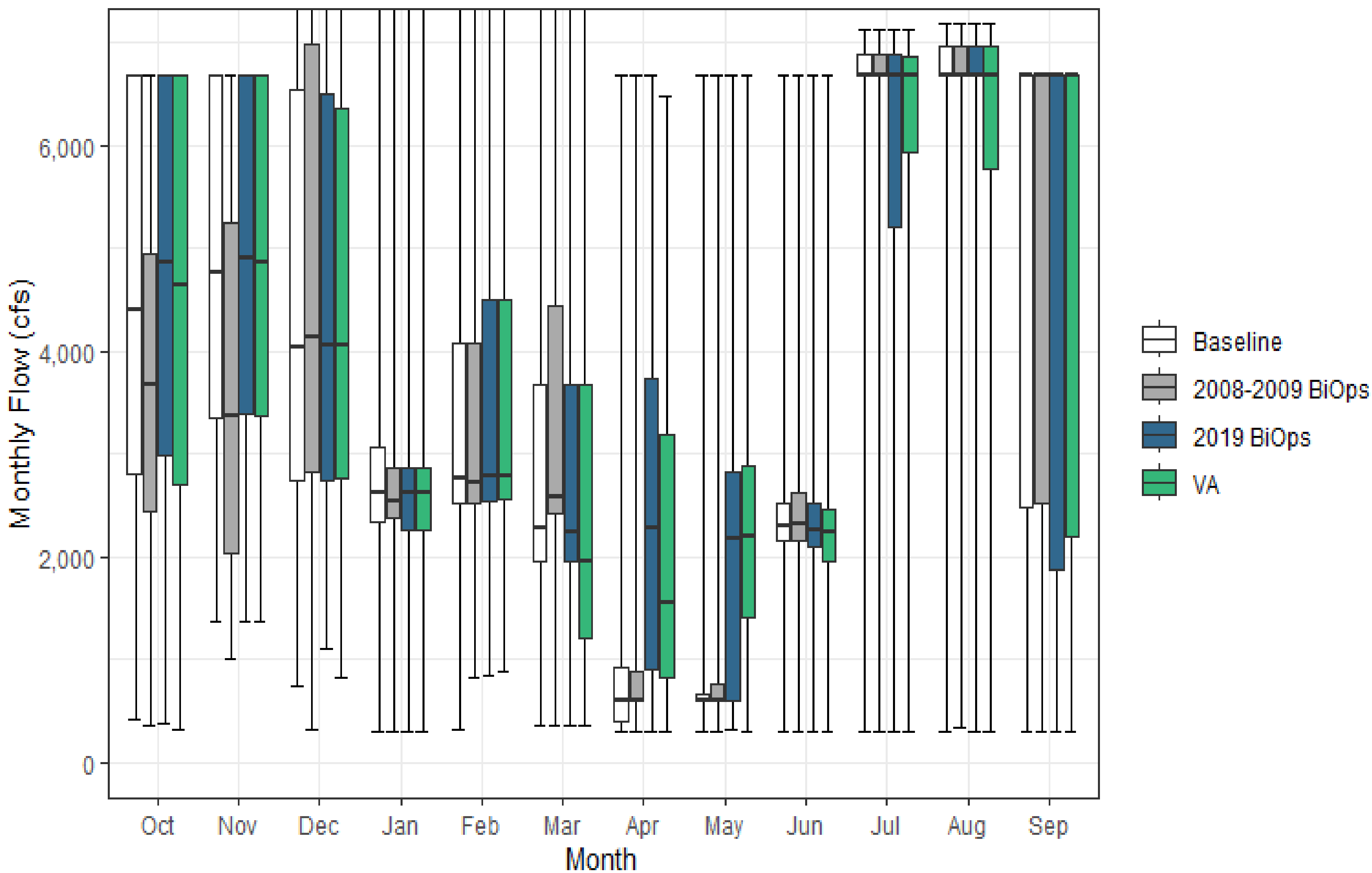

Figure G3a-38. Banks Pumping Plant (SWP) Monthly Boxplot

Table G3a-88. Cumulative Distribution of Monthly Flow (cfs) — Banks Pumping Plant (SWP)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	427	1,363	740	302	307	356	301	301	304	305	307	304	724
10%	1,243	2,151	2,094	1,955	2,390	1,806	317	312	321	313	800	527	1,240
25%	2,808	3,348	2,750	2,331	2,525	1,951	401	596	2,146	6,680	6,680	2,486	2,155
50%	4,390	4,753	4,032	2,615	2,760	2,283	605	601	2,293	6,680	6,680	6,680	2,767
75%	6,680	6,680	6,535	3,057	4,070	3,675	916	665	2,520	6,879	6,966	6,680	3,253
90%	6,680	6,680	7,043	4,342	6,772	7,134	5,580	4,426	5,202	6,928	7,030	6,680	3,895
100%	6,680	6,680	7,678	8,500	8,500	7,561	6,680	6,680	6,680	7,116	7,180	6,680	4,904
Mean	4,400	4,688	4,401	2,948	3,620	3,129	1,579	1,279	2,494	5,652	5,613	4,765	2,694
2008-2009 BiOps													
0%	357	996	309	303	824	362	301	301	305	304	328	304	710
10%	1,259	1,434	2,359	2,022	2,390	1,716	315	316	322	319	872	490	1,249
25%	2,429	2,039	2,824	2,383	2,526	2,417	594	600	2,154	6,680	6,680	2,527	2,121
50%	3,667	3,372	4,128	2,536	2,727	2,581	604	601	2,326	6,680	6,680	6,680	2,665
75%	4,941	5,253	6,981	2,855	4,070	4,445	873	754	2,619	6,879	6,966	6,680	3,040
90%	6,680	6,680	7,043	4,343	6,772	7,483	1,401	1,061	5,743	6,928	7,030	6,680	3,511
100%	6,680	6,680	7,678	8,500	8,500	7,561	6,680	6,680	6,680	7,116	7,180	6,680	5,033
Mean	3,727	3,723	4,592	2,932	3,618	3,573	837	802	2,550	5,562	5,684	4,821	2,565
2019 BiOps													
0%	379	1,357	1,104	302	837	349	306	309	306	306	304	304	748
10%	1,147	2,154	2,047	1,775	2,414	1,806	330	325	320	437	903	428	1,159
25%	2,988	3,392	2,750	2,261	2,536	1,951	907	602	2,097	5,196	6,680	1,872	2,363
50%	4,855	4,894	4,061	2,612	2,790	2,240	2,277	2,167	2,263	6,680	6,680	6,680	2,843
75%	6,680	6,680	6,498	2,857	4,497	3,674	3,731	2,825	2,520	6,875	6,963	6,680	3,488
90%	6,680	6,680	7,043	4,343	6,769	6,866	6,061	4,635	5,201	6,928	7,030	6,680	4,069
100%	6,680	6,680	7,678	8,500	8,500	7,561	6,680	6,680	6,680	7,116	7,180	6,680	4,903
Mean	4,524	4,780	4,421	2,905	3,679	3,087	2,654	2,310	2,432	5,376	5,722	4,576	2,808
VA													
0%	324	1,377	827	301	890	358	300	303	300	303	305	305	699
10%	1,173	2,167	2,025	1,603	2,413	1,202	373	712	453	322	902	525	1,239
25%	2,692	3,366	2,753	2,261	2,556	1,203	832	1,411	1,955	5,930	5,761	2,199	2,223
50%	4,642	4,861	4,060	2,612	2,790	1,960	1,541	2,187	2,246	6,680	6,680	6,680	2,832
75%	6,680	6,680	6,355	2,864	4,497	3,674	3,180	2,889	2,463	6,869	6,963	6,680	3,408
90%	6,680	6,680	7,034	4,342	6,769	7,104	5,132	4,629	5,202	6,928	7,030	6,680	4,047
100%	6,680	6,680	7,678	8,500	8,500	7,561	6,477	6,680	6,680	7,116	7,180	6,680	4,876
Mean	4,400	4,744	4,370	2,884	3,678	2,780	2,162	2,474	2,470	5,391	5,706	4,469	2,752

Table G3a-89. Water Year Average of Monthly Flows (cfs) — Banks Pumping Plant (SWP)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	2,854	3,021	3,243	1,912	2,422	1,951	425	416	560	1,153	997	973
D	3,992	4,330	4,473	2,570	2,603	1,959	504	575	1,883	6,037	5,426	3,002
BN	4,646	4,464	4,666	2,532	3,302	2,383	678	598	2,329	6,855	6,877	5,924
AN	4,446	4,836	4,849	2,830	3,857	3,251	1,284	582	2,773	6,763	6,951	6,680
W	5,364	5,921	4,614	4,089	5,115	5,039	3,677	2,982	3,970	6,568	6,885	6,593
All	4,400	4,688	4,401	2,948	3,620	3,129	1,579	1,279	2,494	5,652	5,613	4,765
2008-2009 BiOps												
C	3,114	2,418	3,722	1,899	2,480	1,985	423	432	570	1,202	960	1,089
D	3,168	3,618	4,481	2,586	2,625	2,308	521	586	1,784	5,591	5,767	2,781
BN	3,832	3,431	4,757	2,463	3,236	3,019	642	622	2,367	6,855	6,877	6,500
AN	3,436	4,089	5,308	2,821	3,766	3,990	777	679	2,864	6,773	6,951	6,680
W	4,535	4,520	4,735	4,076	5,141	5,530	1,440	1,324	4,161	6,572	6,885	6,535
All	3,727	3,723	4,592	2,932	3,618	3,573	837	802	2,550	5,562	5,684	4,821
2019 BiOps												
C	2,819	3,213	3,368	1,667	2,608	1,975	464	553	562	1,225	1,294	753
D	3,936	4,637	4,165	2,513	2,680	1,988	1,268	1,555	1,862	5,756	5,709	2,738
BN	5,064	4,472	4,809	2,532	3,301	2,341	2,416	1,969	2,166	6,855	6,877	5,691
AN	4,620	4,872	5,082	2,830	3,683	3,166	3,313	2,506	2,559	6,172	6,951	6,453
W	5,509	5,873	4,657	4,120	5,231	4,926	4,728	3,940	3,968	6,076	6,876	6,522
All	4,524	4,780	4,421	2,905	3,679	3,087	2,654	2,310	2,432	5,376	5,722	4,576
VA												
C	2,509	3,200	3,054	1,554	2,602	2,045	446	698	624	1,149	1,279	972
D	4,009	4,475	3,996	2,541	2,756	1,165	1,185	1,860	1,941	5,571	5,698	2,241
BN	4,667	4,421	4,992	2,475	3,298	1,299	2,160	2,209	2,205	6,820	6,877	5,441
AN	4,686	4,906	5,017	2,830	3,683	3,385	997	2,717	2,641	6,660	6,951	6,485
W	5,421	5,898	4,702	4,126	5,173	5,024	4,315	3,944	3,944	6,118	6,839	6,558
All	4,400	4,744	4,370	2,884	3,678	2,780	2,162	2,474	2,470	5,391	5,706	4,469

G3a.3.3 Interbasin Diversions

G3a.3.3.1 Bowman-Spaulding Conduit

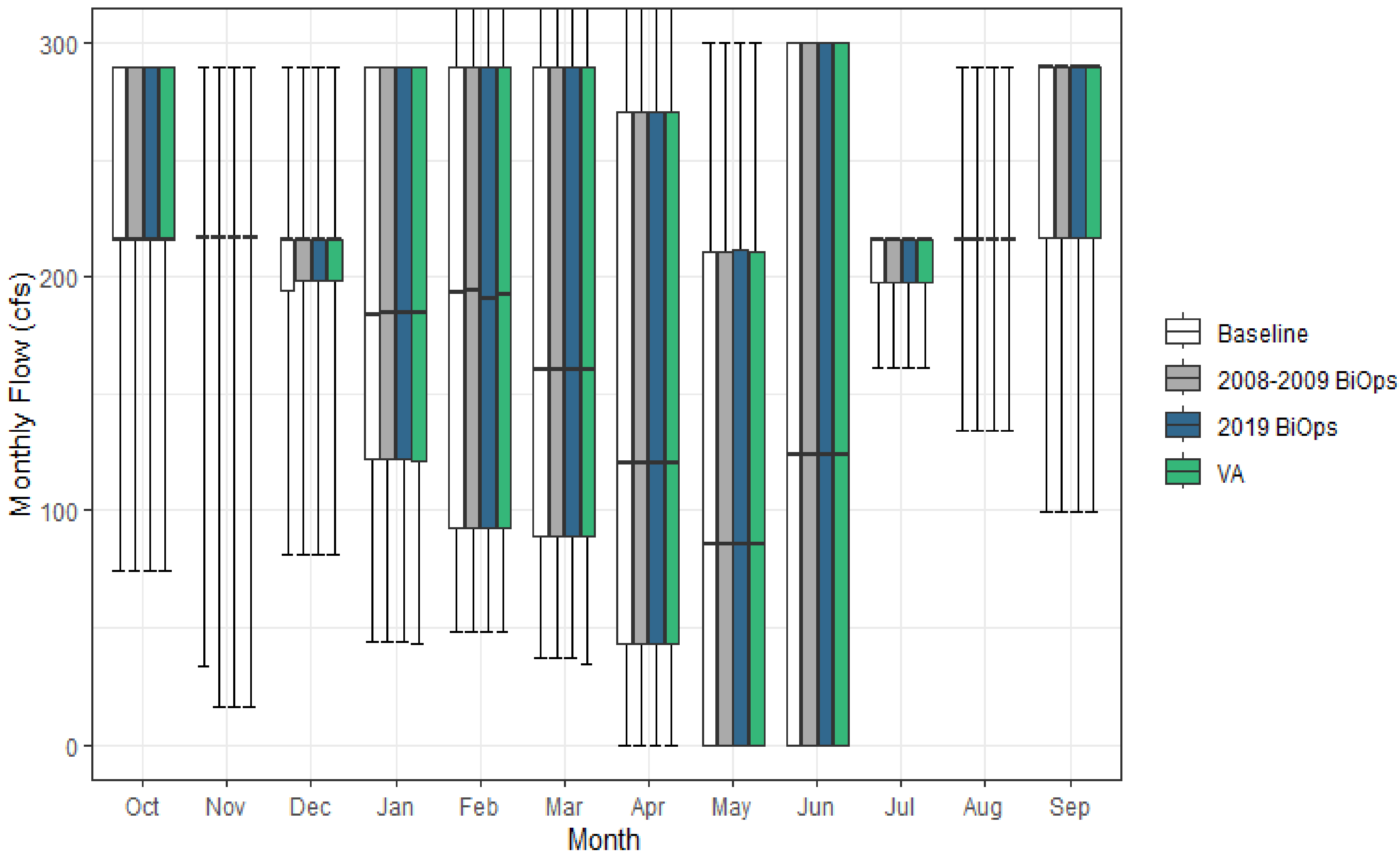

Figure G3a-39. Bowman-Spaulding Conduit Monthly Boxplot

Table G3a-90. Cumulative Distribution of Monthly Flow (cfs) — Bowman-Spaulding Conduit

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	74	33	81	44	48	37	0	0	0	161	134	100	72
10%	151	217	127	72	72	47	0	0	0	176	166	123	89
25%	216	217	194	122	93	89	43	0	0	198	216	217	101
50%	216	217	216	184	193	161	120	86	124	216	216	290	134
75%	290	217	216	290	290	290	271	211	300	216	216	290	177
90%	290	217	290	290	314	290	325	300	300	216	290	290	194
100%	290	290	290	290	325	325	325	300	300	216	290	290	207
Mean	231	219	213	190	190	177	145	117	144	204	222	238	138
2008-2009 BiOps													
0%	74	16	81	44	48	37	0	0	0	161	134	100	73
10%	151	217	127	72	72	47	0	0	0	176	166	123	89
25%	216	217	198	122	93	89	43	0	0	198	216	217	101
50%	216	217	216	184	194	161	120	86	124	216	216	290	134
75%	290	217	216	290	290	290	271	211	300	216	216	290	177
90%	290	217	290	290	314	290	325	300	300	216	290	290	194
100%	290	290	290	290	325	325	325	300	300	216	290	290	207
Mean	230	219	214	190	190	177	144	117	144	204	221	239	138
2019 BiOps													
0%	74	16	81	44	48	37	0	0	0	161	134	100	73
10%	151	217	127	72	72	47	0	0	0	176	166	123	89
25%	216	217	198	122	93	89	43	0	0	198	216	217	101
50%	216	217	216	184	191	161	120	86	124	216	216	290	134
75%	290	217	216	290	290	290	271	211	300	216	216	290	177
90%	290	217	290	290	314	290	325	300	300	216	290	290	195
100%	290	290	290	290	325	325	325	300	300	216	290	290	207
Mean	231	219	214	190	190	177	144	117	144	204	221	238	138
VA													
0%	74	16	81	44	48	34	0	0	0	161	134	100	73
10%	151	217	127	72	72	47	0	0	0	176	166	129	89
25%	216	217	198	121	93	89	43	0	0	197	216	217	101
50%	216	217	216	184	193	160	120	86	124	216	216	290	134
75%	290	217	216	290	290	290	271	211	300	216	216	290	177
90%	290	217	290	290	313	294	325	300	300	216	290	290	194
100%	290	290	290	290	325	325	325	300	300	216	290	290	207
Mean	230	219	214	190	190	177	144	116	144	204	222	238	138

Table G3a-91. Water Year Average of Monthly Flows (cfs) — Bowman-Spaulding Conduit

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	216	222	187	121	98	97	11	0	3	200	173	154
D	219	218	198	146	123	110	54	28	47	206	197	202
BN	235	217	202	170	151	130	103	93	157	203	218	263
AN	219	203	215	205	231	202	200	189	204	195	235	272
W	251	227	243	265	297	288	286	229	260	210	263	281
All	231	219	213	190	190	177	145	117	144	204	222	238
2008-2009 BiOps												
C	211	224	190	121	98	97	11	0	3	200	173	154
D	219	218	198	146	123	110	54	28	47	206	197	202
BN	235	217	202	170	151	130	103	93	157	203	218	263
AN	219	202	215	205	231	202	200	189	204	195	229	278
W	251	227	246	265	297	288	285	229	260	210	263	281
All	230	219	214	190	190	177	144	117	144	204	221	239
2019 BiOps												
C	211	224	190	121	98	97	11	0	3	200	173	154
D	219	218	198	146	123	110	54	28	47	206	197	202
BN	235	217	202	170	151	130	103	93	157	203	218	263
AN	225	202	215	205	229	202	200	189	204	195	229	278
W	251	227	246	265	297	289	285	229	260	210	263	279
All	231	219	214	190	190	177	144	117	144	204	221	238
VA												
C	211	224	191	122	98	96	11	0	3	200	173	155
D	219	218	198	146	123	110	54	28	48	206	197	202
BN	235	217	202	170	151	130	103	93	157	203	218	263
AN	219	202	215	205	231	202	200	188	204	195	235	272
W	251	227	246	265	297	289	284	228	260	210	263	281
All	230	219	214	190	190	177	144	116	144	204	222	238

G3a.3.3.2 Drum Canal

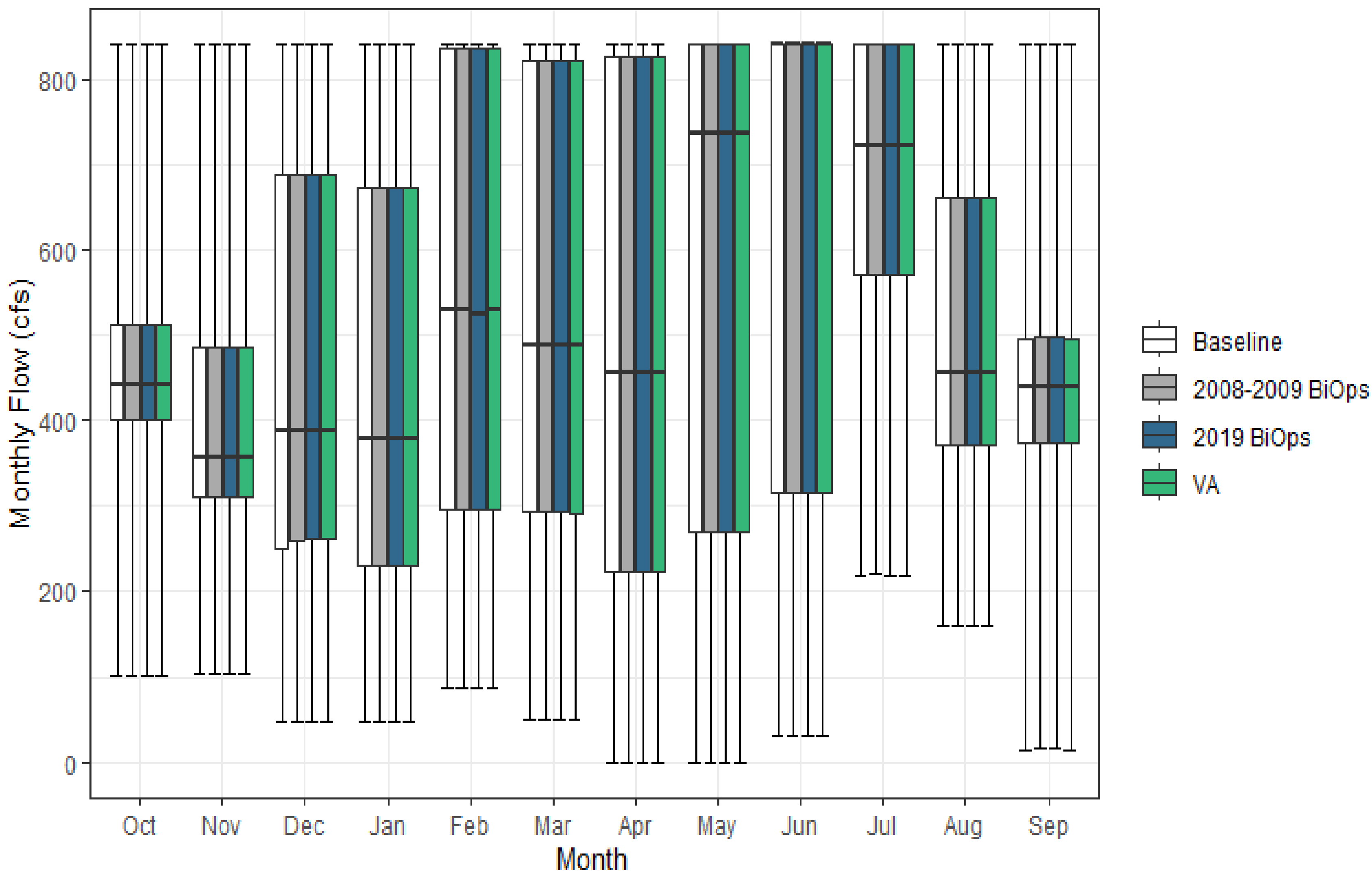

Figure G3a-40. Drum Canal Monthly Boxplot

Table G3a-92. Cumulative Distribution of Monthly Flow (cfs) — Drum Canal

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	101	103	49	48	87	51	0	0	31	219	160	15	83
10%	348	286	187	125	181	188	92	8	68	341	273	131	183
25%	401	310	250	230	296	294	222	270	314	570	371	374	264
50%	441	357	387	378	530	488	457	737	840	721	456	440	353
75%	512	484	688	672	834	821	825	840	840	840	660	496	480
90%	592	642	840	840	840	840	840	840	840	840	832	559	530
100%	840	840	840	840	840	840	840	840	840	840	840	840	575
Mean	456	417	454	447	527	516	482	555	597	665	503	407	364
2008-2009 BiOps													
0%	101	103	49	49	87	51	0	0	31	220	160	15	84
10%	348	286	187	125	181	188	92	8	68	341	273	131	183
25%	401	310	260	230	296	294	222	270	314	570	370	374	264
50%	441	357	387	378	530	488	457	737	840	721	456	440	353
75%	512	484	688	672	834	821	825	840	840	840	660	496	480
90%	592	642	840	840	840	840	840	840	840	840	832	559	530
100%	840	840	840	840	840	840	840	840	840	840	840	840	575
Mean	455	417	455	447	527	516	482	555	597	665	502	407	364
2019 BiOps													
0%	101	103	49	49	87	51	0	0	31	219	160	15	84
10%	348	286	187	125	181	188	92	8	68	341	273	131	183
25%	401	310	261	230	296	294	222	270	314	570	371	374	264
50%	441	357	387	377	525	488	457	737	840	721	456	438	353
75%	512	484	688	672	834	821	825	840	840	840	660	496	480
90%	592	642	840	840	840	840	840	840	840	840	832	559	530
100%	840	840	840	840	840	840	840	840	840	840	840	840	575
Mean	456	417	455	447	527	516	482	555	597	665	502	406	364
VA													
0%	101	103	49	48	87	51	0	0	31	219	160	15	84
10%	348	286	187	125	181	188	92	8	68	341	273	131	183
25%	401	310	261	230	296	291	222	270	314	570	371	374	264
50%	441	357	387	377	530	488	457	737	840	721	456	440	353
75%	512	484	688	672	834	821	825	840	840	840	660	496	480
90%	592	642	840	840	840	840	840	840	840	840	832	559	530
100%	840	840	840	840	840	840	840	840	840	840	840	840	575
Mean	455	417	455	447	527	516	482	555	597	665	503	407	364

Table G3a-93. Water Year Average of Monthly Flows (cfs) — Drum Canal

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	419	337	300	192	295	285	115	118	231	409	289	167
D	442	397	350	262	390	354	328	341	455	575	386	358
BN	433	364	345	362	423	433	397	620	642	728	519	464
AN	447	414	472	580	614	627	665	786	712	710	541	460
W	505	507	673	717	782	763	769	812	824	813	678	513
All	456	417	454	447	527	516	482	555	597	665	503	407
2008-2009 BiOps												
C	414	338	303	192	295	285	115	118	231	409	289	167
D	442	397	350	262	390	354	328	341	455	575	386	358
BN	433	364	345	362	423	433	397	620	642	727	519	464
AN	447	414	472	580	614	627	665	786	712	710	535	466
W	505	507	676	717	782	763	769	812	824	813	678	513
All	455	417	455	447	527	516	482	555	597	665	502	407
2019 BiOps												
C	414	338	304	192	295	285	115	118	231	409	289	167
D	442	397	350	262	390	354	328	341	455	575	386	358
BN	433	364	345	362	423	433	397	620	642	728	519	464
AN	453	414	472	580	613	627	665	786	712	710	535	466
W	505	507	676	717	782	763	769	812	824	813	678	510
All	456	417	455	447	527	516	482	555	597	665	502	406
VA												
C	414	338	304	193	295	284	115	118	231	409	289	168
D	442	397	350	262	390	354	328	341	455	575	386	358
BN	433	364	345	362	423	433	397	620	642	728	519	464
AN	447	414	472	579	614	627	665	786	712	710	541	460
W	505	507	676	717	782	763	769	812	824	813	678	513
All	455	417	455	447	527	516	482	555	597	665	503	407

G3a.3.3.3 Hell Hole Tunnel

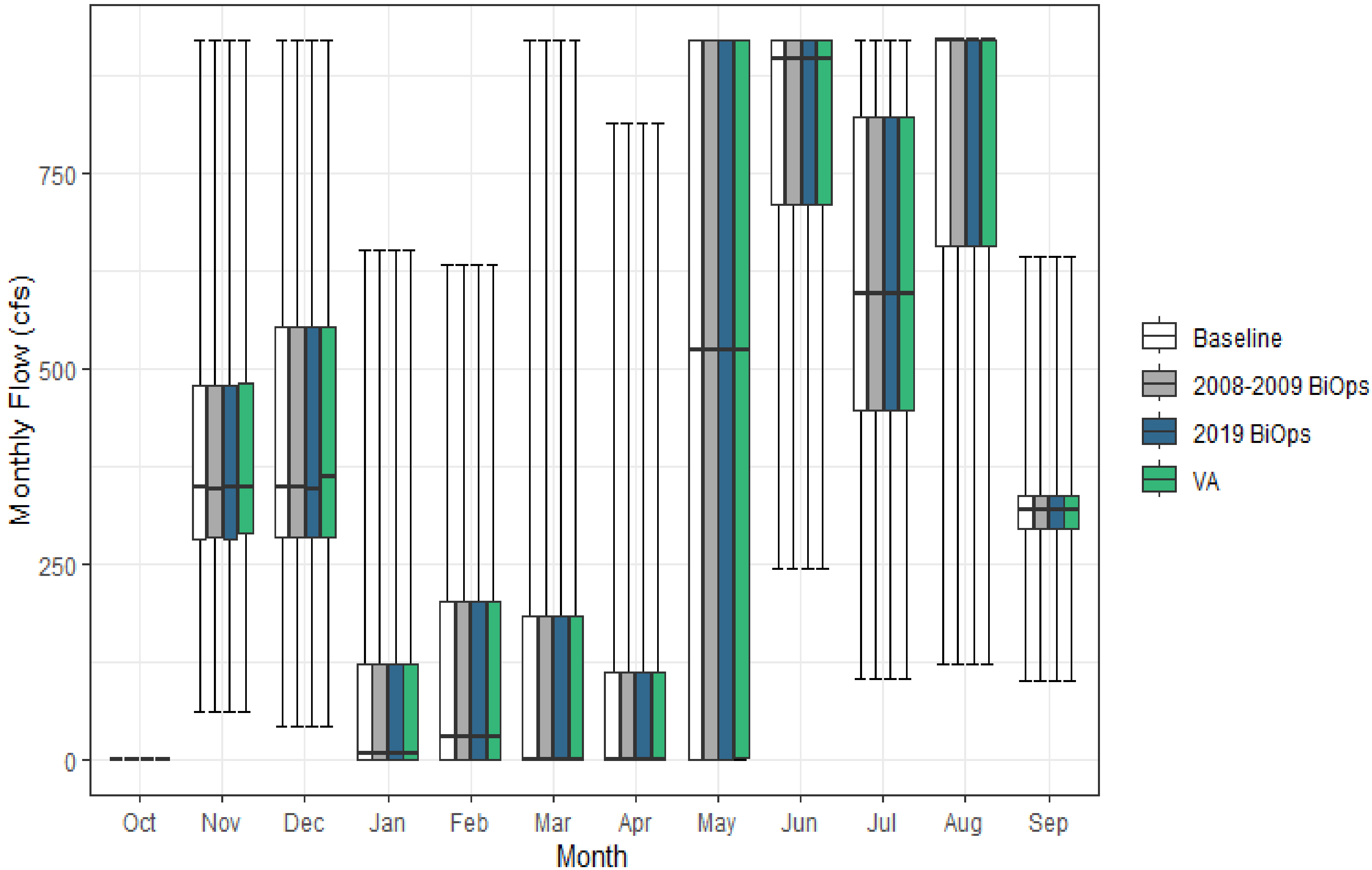

Figure G3a-41. Hell Hole Tunnel Monthly Boxplot

Table G3a-94. Cumulative Distribution of Monthly Flow (cfs) — Hell Hole Tunnel

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	0	61	41	0	0	0	0	0	244	102	123	99	53
10%	0	219	235	0	0	0	0	0	409	317	300	214	121
25%	0	282	283	0	0	0	0	0	710	446	657	296	173
50%	0	347	348	6	29	0	0	524	897	596	920	319	254
75%	0	478	552	121	201	182	111	920	920	822	920	338	332
90%	0	668	920	244	339	385	500	920	920	893	920	419	389
100%	0	920	920	650	634	920	814	920	920	920	920	643	470
Mean	0	401	447	80	115	112	116	484	788	618	766	317	257
2008-2009 BiOps													
0%	0	61	41	0	0	0	0	0	244	102	123	99	53
10%	0	219	235	0	0	0	0	0	409	317	300	214	121
25%	0	283	283	0	0	0	0	0	710	446	657	296	173
50%	0	345	348	6	29	0	0	524	896	596	920	319	254
75%	0	478	552	121	201	182	111	920	920	822	920	338	329
90%	0	668	920	244	339	385	500	920	920	893	920	419	389
100%	0	920	920	650	634	920	814	920	920	920	920	643	475
Mean	0	401	448	80	115	112	116	484	787	618	766	317	257
2019 BiOps													
0%	0	61	41	0	0	0	0	0	244	102	123	99	53
10%	0	219	235	0	0	0	0	0	409	317	300	214	121
25%	0	282	283	0	0	0	0	0	710	446	657	296	173
50%	0	347	346	6	29	0	0	524	896	596	920	319	254
75%	0	478	552	121	201	182	111	920	920	822	920	338	332
90%	0	668	920	244	339	385	500	920	920	893	920	419	388
100%	0	920	920	650	634	920	814	920	920	920	920	643	475
Mean	0	401	447	80	115	112	116	481	788	618	766	317	257
VA													
0%	0	62	41	0	0	0	0	0	244	102	123	99	53
10%	0	225	236	0	0	0	0	0	409	317	300	214	121
25%	0	290	284	0	0	0	0	0	710	446	657	296	176
50%	0	349	361	6	29	0	0	524	896	596	920	319	254
75%	0	480	552	121	201	182	111	920	920	822	920	338	331
90%	0	669	920	244	339	385	500	920	920	893	920	419	389
100%	0	920	920	650	634	920	814	920	920	920	920	643	475
Mean	0	404	450	80	115	112	116	483	787	618	766	317	257

Table G3a-95. Water Year Average of Monthly Flows (cfs) — Hell Hole Tunnel

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	0	305	334	2	0	0	0	0	495	304	349	275
D	0	400	339	31	31	9	22	207	727	494	686	319
BN	0	362	381	60	68	50	0	466	841	653	868	338
AN	0	386	441	92	199	110	133	735	889	690	920	280
W	0	485	633	165	232	287	313	852	914	827	920	340
All	0	401	447	80	115	112	116	484	788	618	766	317
2008-2009 BiOps												
C	0	305	334	2	0	0	0	0	495	304	349	275
D	0	402	339	31	31	9	22	207	727	494	686	319
BN	0	360	381	60	68	50	0	466	842	653	868	338
AN	0	382	441	92	199	110	133	735	889	690	920	280
W	0	484	635	165	232	287	313	853	913	827	920	340
All	0	401	448	80	115	112	116	484	787	618	766	317
2019 BiOps												
C	0	305	334	2	0	0	0	0	495	304	349	275
D	0	400	339	31	31	9	22	207	727	494	686	319
BN	0	362	381	60	68	50	0	464	840	653	868	338
AN	0	386	441	92	199	110	133	735	889	690	920	280
W	0	485	632	165	232	287	313	845	915	827	920	340
All	0	401	447	80	115	112	116	481	788	618	766	317
VA												
C	0	312	340	2	0	0	0	0	495	304	349	275
D	0	403	343	31	31	9	22	207	727	494	686	319
BN	0	363	380	60	68	50	0	466	841	653	868	338
AN	0	386	441	92	199	110	133	741	888	690	920	280
W	0	485	635	165	232	287	313	847	911	827	920	340
All	0	404	450	80	115	112	116	483	787	618	766	317

G3a.3.3.4 Toadtown Canal

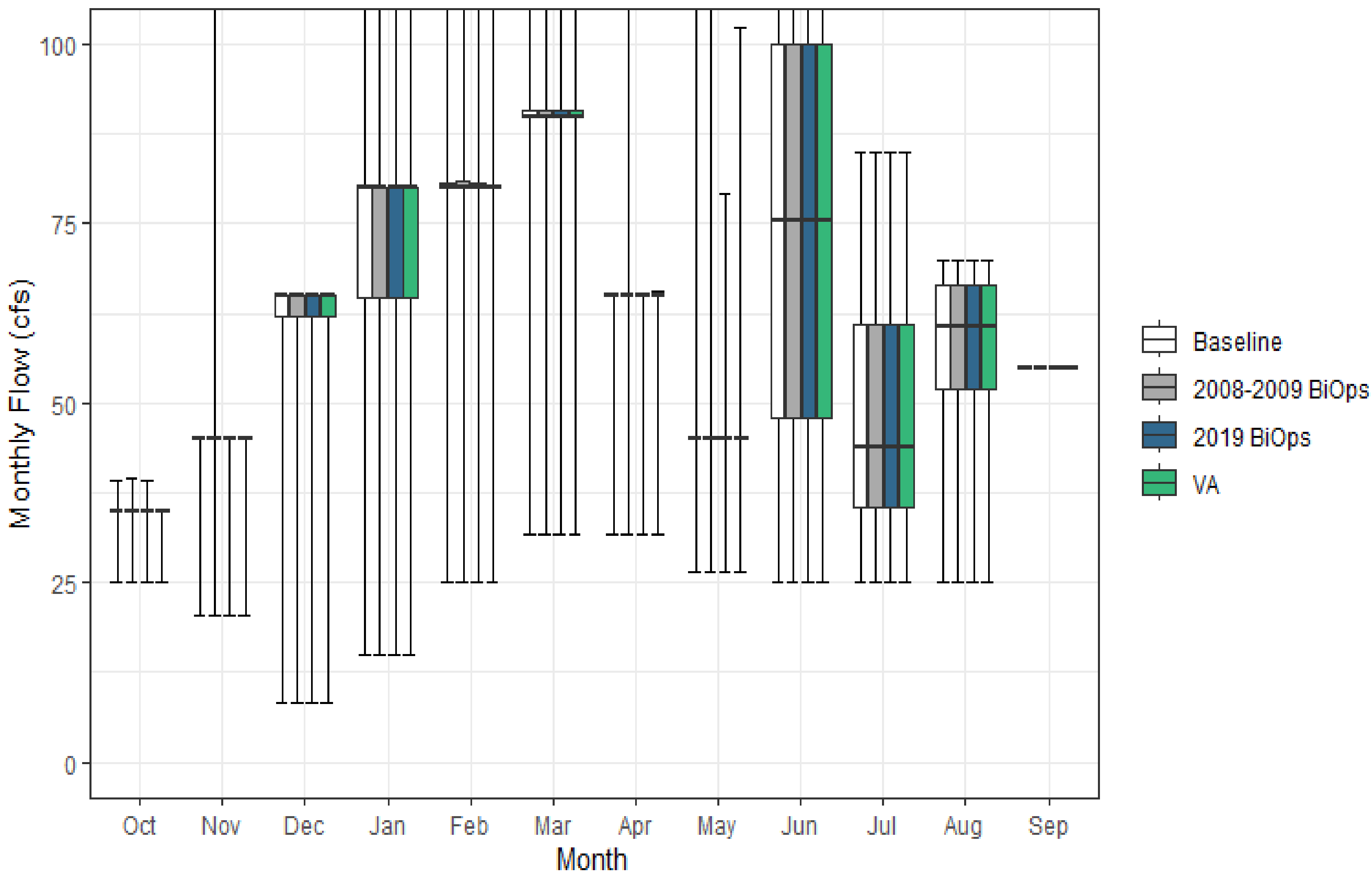

Figure G3a-42. Toadtown Canal Monthly Boxplot

Table G3a-96. Cumulative Distribution of Monthly Flow (cfs) — Toadtown Canal

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	25	21	8	15	25	32	32	26	25	25	25	55	26
10%	34	34	33	31	77	90	65	45	35	28	47	55	36
25%	35	45	62	65	80	90	65	45	48	35	52	55	41
50%	35	45	65	80	80	90	65	45	75	44	61	55	45
75%	35	45	65	80	81	91	65	45	100	61	67	55	48
90%	35	45	65	81	81	91	65	84	101	83	70	55	49
100%	39	45	65	117	120	127	65	115	113	85	70	55	54
Mean	35	43	58	71	79	90	64	51	73	50	58	55	44
2008-2009 BiOps													
0%	25	21	8	15	25	32	32	26	25	25	25	55	26
10%	34	34	33	31	77	90	65	45	35	28	47	55	36
25%	35	45	62	65	80	90	65	45	48	35	52	55	41
50%	35	45	65	80	80	90	65	45	75	44	61	55	45
75%	35	45	65	80	81	91	65	45	100	61	67	55	48
90%	35	45	65	81	81	91	65	81	100	83	70	55	50
100%	40	109	65	117	120	127	119	117	113	85	70	55	55
Mean	35	45	58	71	78	89	65	52	73	50	58	55	44
2019 BiOps													
0%	25	21	8	15	25	32	32	26	25	25	25	55	26
10%	34	34	33	31	77	90	65	45	35	28	47	55	36
25%	35	45	62	65	80	90	65	45	48	35	52	55	41
50%	35	45	65	80	80	90	65	45	75	44	61	55	44
75%	35	45	65	80	81	91	65	45	100	61	67	55	47
90%	35	45	65	81	81	91	65	46	100	83	70	55	49
100%	39	45	65	117	120	127	65	79	113	85	70	55	54
Mean	35	43	58	71	78	90	64	45	73	50	58	55	43
VA													
0%	25	21	8	15	25	32	32	26	25	25	25	55	26
10%	34	34	33	31	77	90	65	45	35	28	47	55	36
25%	35	45	62	65	80	90	65	45	48	35	52	55	41
50%	35	45	65	80	80	90	65	45	75	44	61	55	44
75%	35	45	65	80	80	91	65	45	100	61	67	55	47
90%	35	45	65	81	81	91	65	46	101	83	70	55	49
100%	35	45	65	117	120	127	66	102	113	85	70	55	54
Mean	35	43	58	71	78	90	64	48	73	50	58	55	43

Table G3a-97. Water Year Average of Monthly Flows (cfs) — Toadtown Canal

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	34	40	45	51	68	81	59	44	43	32	45	55
D	34	43	58	61	76	90	65	56	56	37	54	55
BN	35	42	53	73	77	90	65	59	75	45	59	55
AN	34	43	63	76	80	90	65	45	82	50	61	55
W	35	45	65	87	87	93	65	49	98	72	67	55
All	35	43	58	71	79	90	64	51	73	50	58	55
2008-2009 BiOps												
C	34	40	45	51	68	81	59	43	43	32	45	55
D	34	46	58	61	76	90	65	56	55	37	54	55
BN	35	44	53	73	78	91	65	64	75	45	59	55
AN	34	50	63	76	83	93	65	45	81	50	61	55
W	35	47	65	87	83	92	67	50	98	72	67	55
All	35	45	58	71	78	89	65	52	73	50	58	55
2019 BiOps												
C	34	40	45	51	68	81	59	41	43	32	45	55
D	34	43	58	61	76	90	65	45	56	37	54	55
BN	35	42	53	73	77	90	65	47	75	45	59	55
AN	34	43	63	76	83	93	65	45	81	50	61	55
W	35	45	65	87	85	93	65	45	98	72	67	55
All	35	43	58	71	78	90	64	45	73	50	58	55
VA												
C	34	40	45	52	68	81	59	41	43	32	45	55
D	34	43	58	61	76	90	65	50	56	37	54	55
BN	35	42	53	73	77	91	65	53	75	45	59	55
AN	34	43	63	76	80	93	65	49	81	50	61	55
W	35	45	65	86	86	93	65	45	98	72	67	55
All	35	43	58	71	78	90	64	48	73	50	58	55

G3a.3.3.5 Slate Creek Tunnel

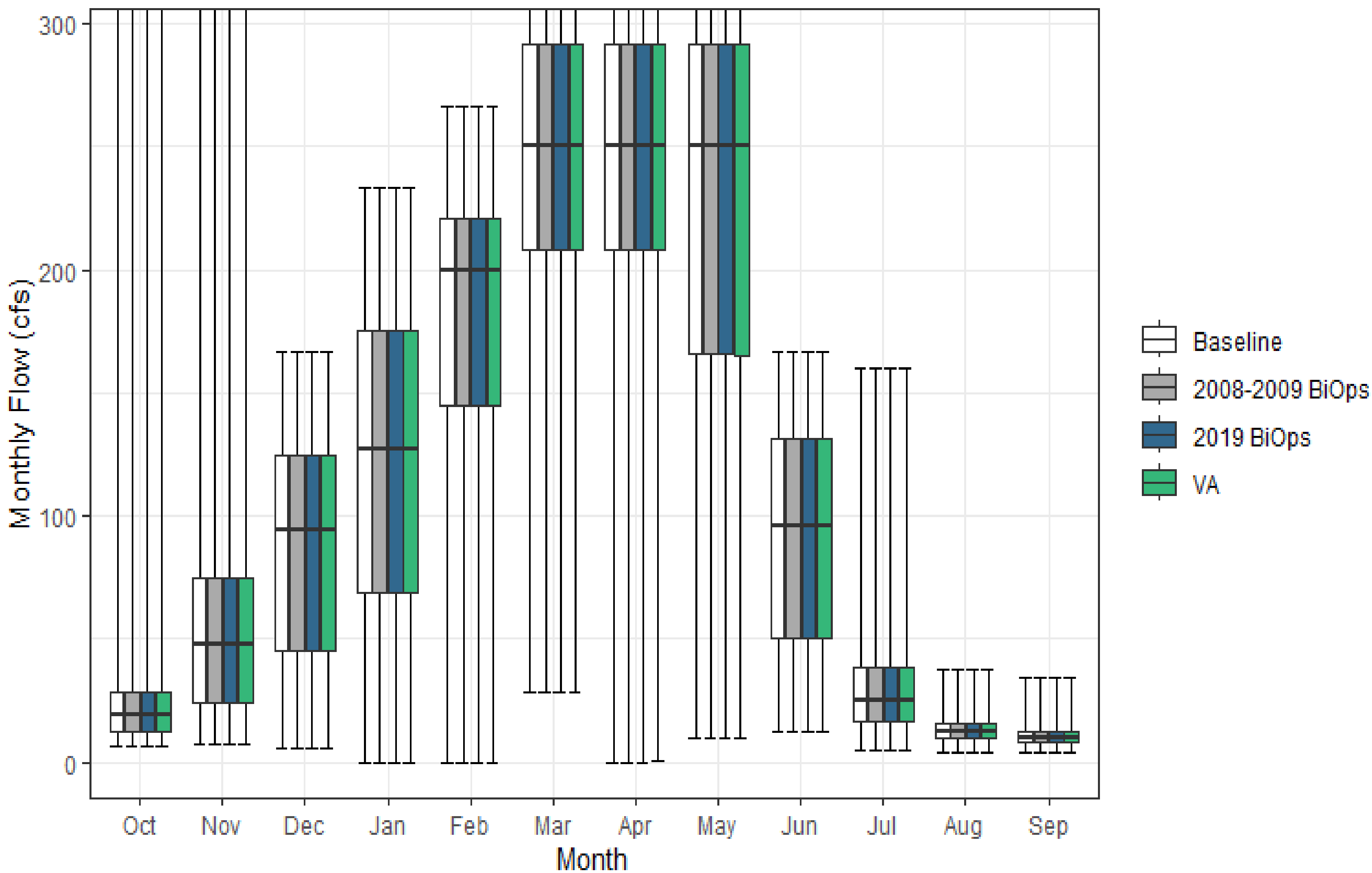

Figure G3a-43. Slate Creek Tunnel Monthly Boxplot

Table G3a-98. Cumulative Distribution of Monthly Flow (cfs) — Slate Creek Tunnel

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	6	8	6	0	0	29	0	10	12	5	4	4	13
10%	8	16	28	43	71	156	150	84	27	13	8	7	50
25%	12	24	46	69	145	208	208	166	50	17	10	8	65
50%	19	48	94	127	200	250	250	250	96	25	13	10	79
75%	28	75	125	175	221	292	292	292	131	38	16	13	97
90%	42	181	146	204	233	292	292	292	146	58	20	14	110
100%	437	470	167	233	267	333	333	333	167	160	38	34	134
Mean	27	79	88	124	172	237	237	217	92	33	13	11	80
2008-2009 BiOps													
0%	6	8	6	0	0	29	0	10	12	5	4	4	13
10%	8	16	28	43	71	156	148	84	27	13	8	7	50
25%	13	24	46	69	145	208	208	166	50	17	10	8	65
50%	19	48	94	127	200	250	250	250	96	25	13	10	79
75%	28	75	125	175	221	292	292	292	131	38	16	13	97
90%	42	181	146	204	233	292	292	292	146	58	20	14	110
100%	437	470	167	233	267	333	333	333	167	160	38	34	130
Mean	27	79	88	124	172	237	234	217	92	33	13	11	80
2019 BiOps													
0%	6	8	6	0	0	29	0	10	12	5	4	4	13
10%	8	16	28	43	71	156	150	84	27	13	8	7	50
25%	12	24	46	69	145	208	208	166	50	17	10	8	65
50%	19	48	94	127	200	250	250	250	96	25	13	10	79
75%	28	75	125	175	221	292	292	292	131	38	16	13	97
90%	42	181	146	204	233	292	292	292	146	58	20	14	110
100%	437	470	167	233	267	333	333	333	167	160	38	34	134
Mean	27	79	88	124	172	237	237	217	92	33	13	11	80
VA													
0%	6	8	6	0	0	29	0	10	12	5	4	4	13
10%	8	16	28	43	71	156	150	84	27	13	8	7	50
25%	13	24	46	69	145	208	208	165	50	17	10	8	65
50%	19	48	94	127	200	250	250	250	96	25	13	10	79
75%	28	75	125	175	221	292	292	292	131	38	16	13	97
90%	42	181	146	204	233	292	292	292	146	58	20	14	110
100%	437	470	167	233	267	333	333	333	167	160	38	34	134
Mean	27	79	88	124	172	236	237	217	92	33	13	11	80

Table G3a-99. Water Year Average of Monthly Flows (cfs) — Slate Creek Tunnel

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	23	30	47	62	102	160	165	120	47	15	8	7
D	19	73	78	85	154	218	233	187	64	18	10	9
BN	20	44	66	128	171	231	257	240	100	28	13	10
AN	26	93	90	154	200	284	288	273	100	29	14	12
W	39	127	130	172	211	275	245	255	130	58	19	14
All	27	79	88	124	172	237	237	217	92	33	13	11
2008-2009 BiOps												
C	23	30	47	62	102	160	165	120	47	15	8	7
D	19	73	78	85	154	218	233	187	64	18	10	9
BN	20	44	66	128	171	231	257	240	100	28	13	10
AN	26	93	90	154	200	284	288	273	100	29	14	12
W	39	127	130	172	211	277	233	255	130	58	19	14
All	27	79	88	124	172	237	234	217	92	33	13	11
2019 BiOps												
C	23	30	47	62	102	160	165	120	47	15	8	7
D	19	73	78	85	154	218	233	187	64	18	10	9
BN	20	44	66	128	171	231	257	240	100	28	13	10
AN	26	93	90	154	200	284	288	273	100	29	14	12
W	39	127	130	172	211	275	245	255	130	58	19	14
All	27	79	88	124	172	237	237	217	92	33	13	11
VA												
C	23	30	47	62	102	160	165	120	47	15	8	7
D	19	73	78	85	154	218	233	187	64	18	10	9
BN	20	44	66	128	171	231	257	240	100	28	13	10
AN	26	93	90	154	200	284	288	273	100	29	14	12
W	39	127	130	172	211	272	245	255	130	58	19	14
All	27	79	88	124	172	236	237	217	92	33	13	11

G3a.3.3.6 Chalk Bluff Canal

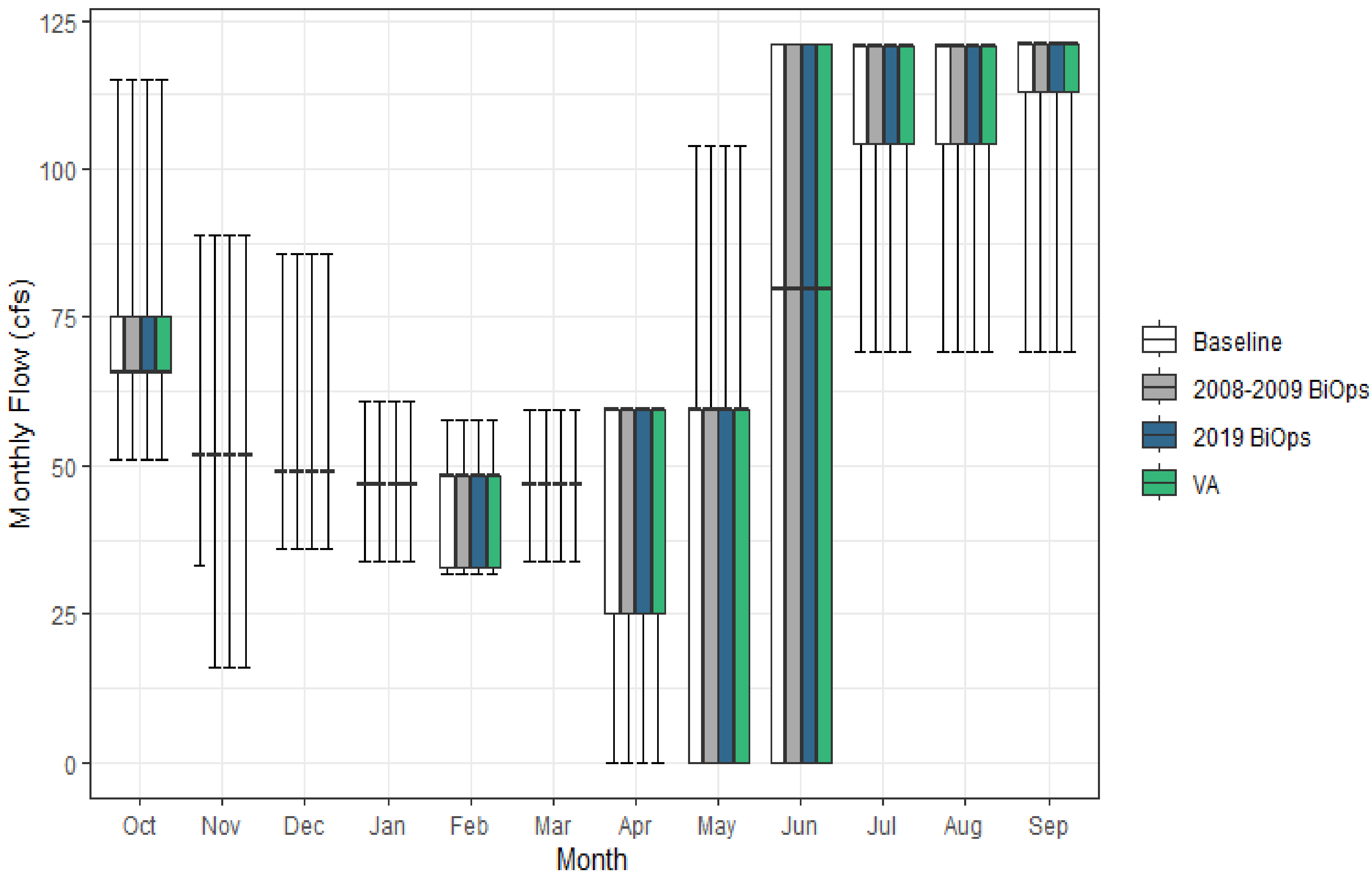

Figure G3a-44. Chalk Bluff Canal Monthly Boxplot

Table G3a-100. Cumulative Distribution of Monthly Flow (cfs) — Chalk Bluff Canal

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	51	33	36	34	32	34	0	0	0	69	69	69	35
10%	66	52	36	34	33	34	0	0	0	93	92	100	38
25%	66	52	49	47	33	47	25	0	0	104	104	113	43
50%	66	52	49	47	48	47	59	59	80	121	121	121	49
75%	75	52	49	47	48	47	59	59	121	121	121	121	55
90%	82	67	70	59	48	47	59	83	121	121	121	121	57
100%	115	89	85	61	58	59	59	104	121	121	121	121	60
Mean	70	54	51	46	43	44	44	43	69	113	113	113	49
2008-2009 BiOps													
0%	51	16	36	34	32	34	0	0	0	69	69	69	35
10%	66	52	36	34	33	34	0	0	0	93	92	100	38
25%	66	52	49	47	33	47	25	0	0	104	104	113	43
50%	66	52	49	47	48	47	59	59	80	121	121	121	49
75%	75	52	49	47	48	47	59	59	121	121	121	121	55
90%	82	67	70	59	48	47	59	83	121	121	121	121	57
100%	115	89	85	61	58	59	59	104	121	121	121	121	60
Mean	70	54	51	46	43	44	44	43	69	113	113	113	49
2019 BiOps													
0%	51	16	36	34	32	34	0	0	0	69	69	69	35
10%	66	52	36	34	33	34	0	0	0	93	92	100	38
25%	66	52	49	47	33	47	25	0	0	104	104	113	43
50%	66	52	49	47	48	47	59	59	80	121	121	121	49
75%	75	52	49	47	48	47	59	59	121	121	121	121	55
90%	82	67	70	59	48	47	59	83	121	121	121	121	57
100%	115	89	85	61	58	59	59	104	121	121	121	121	60
Mean	70	54	51	46	43	44	44	43	69	113	113	113	49
VA													
0%	51	16	36	34	32	34	0	0	0	69	69	69	35
10%	66	52	36	34	33	34	0	0	0	93	92	100	38
25%	66	52	49	47	33	47	25	0	0	104	104	113	43
50%	66	52	49	47	48	47	59	59	80	121	121	121	49
75%	75	52	49	47	48	47	59	59	121	121	121	121	55
90%	82	67	70	59	48	47	59	83	121	121	121	121	57
100%	115	89	85	61	58	59	59	104	121	121	121	121	60
Mean	70	54	51	46	43	44	44	43	69	113	113	113	49

Table G3a-101. Water Year Average of Monthly Flows (cfs) — Chalk Bluff Canal

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	68	55	52	52	41	41	11	0	3	109	110	107
D	68	57	51	47	39	42	31	16	34	115	118	117
BN	74	58	56	41	43	45	54	58	90	117	118	121
AN	72	50	51	44	44	46	59	73	94	107	114	116
W	70	52	48	46	47	47	59	65	107	112	106	109
All	70	54	51	46	43	44	44	43	69	113	113	113
2008-2009 BiOps												
C	68	55	52	52	41	41	11	0	3	109	110	107
D	68	57	51	47	39	42	31	16	34	115	118	117
BN	74	58	56	41	43	45	54	58	90	117	118	121
AN	72	48	51	44	44	46	59	73	94	107	114	116
W	70	52	48	46	47	47	59	65	107	112	106	109
All	70	54	51	46	43	44	44	43	69	113	113	113
2019 BiOps												
C	68	55	52	52	41	41	11	0	3	109	110	107
D	68	57	51	47	39	42	31	16	34	115	118	117
BN	74	58	56	41	43	45	54	58	90	117	118	121
AN	72	48	51	44	44	46	59	73	94	107	114	116
W	70	52	48	46	47	47	59	65	107	112	106	109
All	70	54	51	46	43	44	44	43	69	113	113	113
VA												
C	68	55	52	52	41	41	11	0	3	109	110	107
D	68	57	51	47	39	42	31	16	34	115	118	117
BN	74	58	56	41	43	45	54	58	90	117	118	121
AN	72	48	51	44	44	46	59	73	94	107	114	116
W	70	52	48	46	47	47	59	65	107	112	106	109
All	70	54	51	46	43	44	44	43	69	113	113	113

G3a.3.3.7 Clear Creek Tunnel

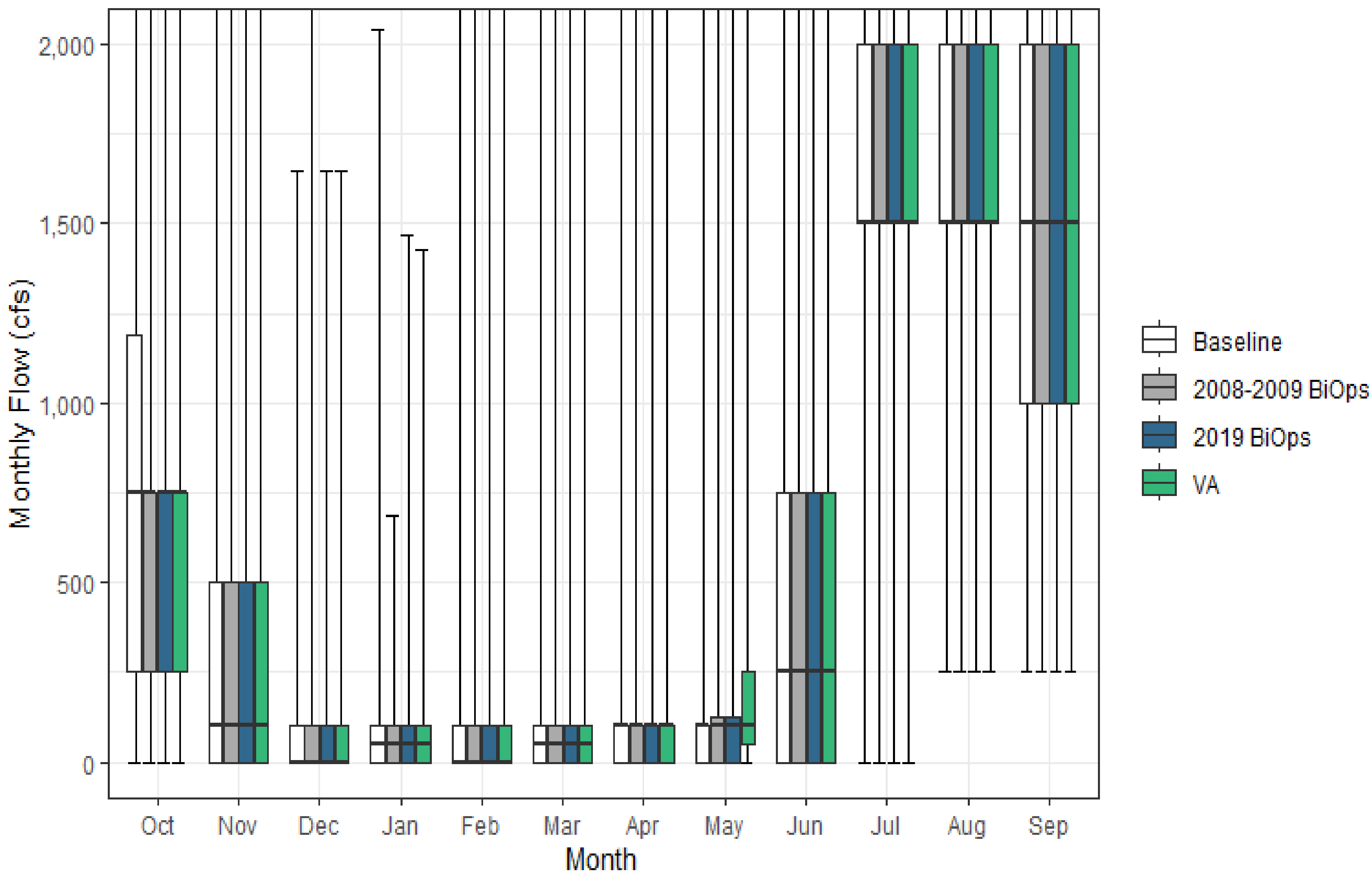

Figure G3a-45. Clear Creek Tunnel Monthly Boxplot

Table G3a-102. Cumulative Distribution of Monthly Flow (cfs) — Clear Creek Tunnel

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	0	0	0	0	0	0	0	0	0	0	250	250	137
10%	0	0	0	0	0	0	0	0	0	8	1,000	750	234
25%	250	0	0	0	0	0	0	0	0	1,500	1,500	1,000	326
50%	750	100	0	50	0	50	100	100	250	1,500	1,500	1,500	450
75%	1,188	500	100	100	100	100	100	100	750	2,000	2,000	2,000	550
90%	1,818	1,029	280	250	403	705	455	250	1,500	3,033	2,505	2,125	685
100%	2,155	3,200	1,647	2,038	3,200	2,405	2,345	3,200	3,200	3,200	3,200	3,200	1,077
Mean	832	415	130	109	246	185	201	184	502	1,574	1,669	1,469	456
2008-2009 BiOps													
0%	0	0	0	0	0	0	0	0	0	0	250	250	122
10%	50	0	0	0	0	0	0	0	0	8	750	750	223
25%	250	0	0	0	0	0	0	0	0	1,500	1,500	1,000	330
50%	750	100	0	50	0	50	100	100	250	1,500	1,500	1,500	451
75%	750	500	100	100	100	100	100	123	750	2,000	2,000	2,000	584
90%	1,818	850	280	250	173	690	468	250	1,500	3,200	2,576	2,374	684
100%	2,155	3,200	3,200	687	3,200	2,405	2,345	3,200	3,200	3,200	3,200	3,200	993
Mean	800	392	236	79	220	192	201	224	505	1,577	1,623	1,526	459
2019 BiOps													
0%	0	0	0	0	0	0	0	0	0	0	250	250	128
10%	0	0	0	0	0	0	0	0	0	8	1,000	575	236
25%	250	0	0	0	0	0	0	0	0	1,500	1,500	1,000	324
50%	750	100	0	50	0	50	100	100	250	1,500	1,500	1,500	449
75%	750	500	100	100	100	100	100	125	750	2,000	2,000	2,000	586
90%	1,818	931	280	250	403	695	417	250	1,500	3,200	3,110	2,113	707
100%	2,155	3,200	1,647	1,468	3,200	2,405	3,200	3,200	3,200	3,200	3,200	3,200	1,101
Mean	803	343	135	103	237	183	221	199	649	1,634	1,694	1,449	464
VA													
0%	0	0	0	0	0	0	0	0	0	0	250	250	128
10%	0	0	0	0	0	0	0	0	0	83	800	750	219
25%	250	0	0	0	0	0	0	50	0	1,500	1,500	1,000	335
50%	750	100	0	50	0	50	100	100	250	1,500	1,500	1,500	449
75%	750	500	100	100	100	100	100	250	752	2,000	2,000	2,000	557
90%	1,844	1,128	265	250	240	382	306	267	1,500	3,200	2,719	2,340	709
100%	3,200	3,200	1,647	1,429	3,200	2,405	2,345	3,200	3,200	3,200	3,200	3,200	1,055
Mean	803	360	129	100	224	156	189	242	669	1,647	1,680	1,483	466

Table G3a-103. Water Year Average of Monthly Flows (cfs) — Clear Creek Tunnel

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	593	352	123	152	294	151	218	226	750	2,119	1,510	1,107
D	663	689	75	86	630	121	77	121	824	1,688	1,886	1,410
BN	894	271	82	149	223	340	242	76	485	1,294	1,688	1,412
AN	842	387	172	187	25	89	215	54	146	1,336	1,625	1,445
W	1,044	343	188	47	40	197	253	331	290	1,467	1,598	1,750
All	832	415	130	109	246	185	201	184	502	1,574	1,669	1,469
2008-2009 BiOps												
C	460	484	123	139	225	107	201	463	841	2,191	1,262	1,314
D	663	651	212	98	581	207	74	129	807	1,712	1,898	1,424
BN	925	170	264	102	218	349	260	74	441	1,221	1,674	1,485
AN	800	299	573	37	25	37	215	52	148	1,336	1,583	1,383
W	1,008	323	152	38	33	197	255	331	290	1,467	1,598	1,802
All	800	392	236	79	220	192	201	224	505	1,577	1,623	1,526
2019 BiOps												
C	547	343	116	142	277	130	206	236	873	2,197	1,378	1,129
D	615	454	85	92	614	135	78	140	1,104	1,912	1,997	1,333
BN	894	271	88	158	223	344	242	127	700	1,279	1,774	1,368
AN	800	419	186	139	29	69	179	50	336	1,336	1,625	1,425
W	1,027	272	188	43	30	197	341	331	290	1,467	1,615	1,767
All	803	343	135	103	237	183	221	199	649	1,634	1,694	1,449
VA												
C	624	369	127	126	270	83	164	244	587	2,148	1,371	1,162
D	621	519	85	96	560	88	88	148	1,062	1,933	2,057	1,445
BN	841	210	88	151	223	331	234	225	938	1,441	1,635	1,397
AN	800	407	133	136	29	29	188	218	680	1,250	1,625	1,437
W	1,013	307	188	43	32	195	253	331	249	1,457	1,614	1,754
All	803	360	129	100	224	156	189	242	669	1,647	1,680	1,483

G3a.3.3.8 Spring Creek Conduit

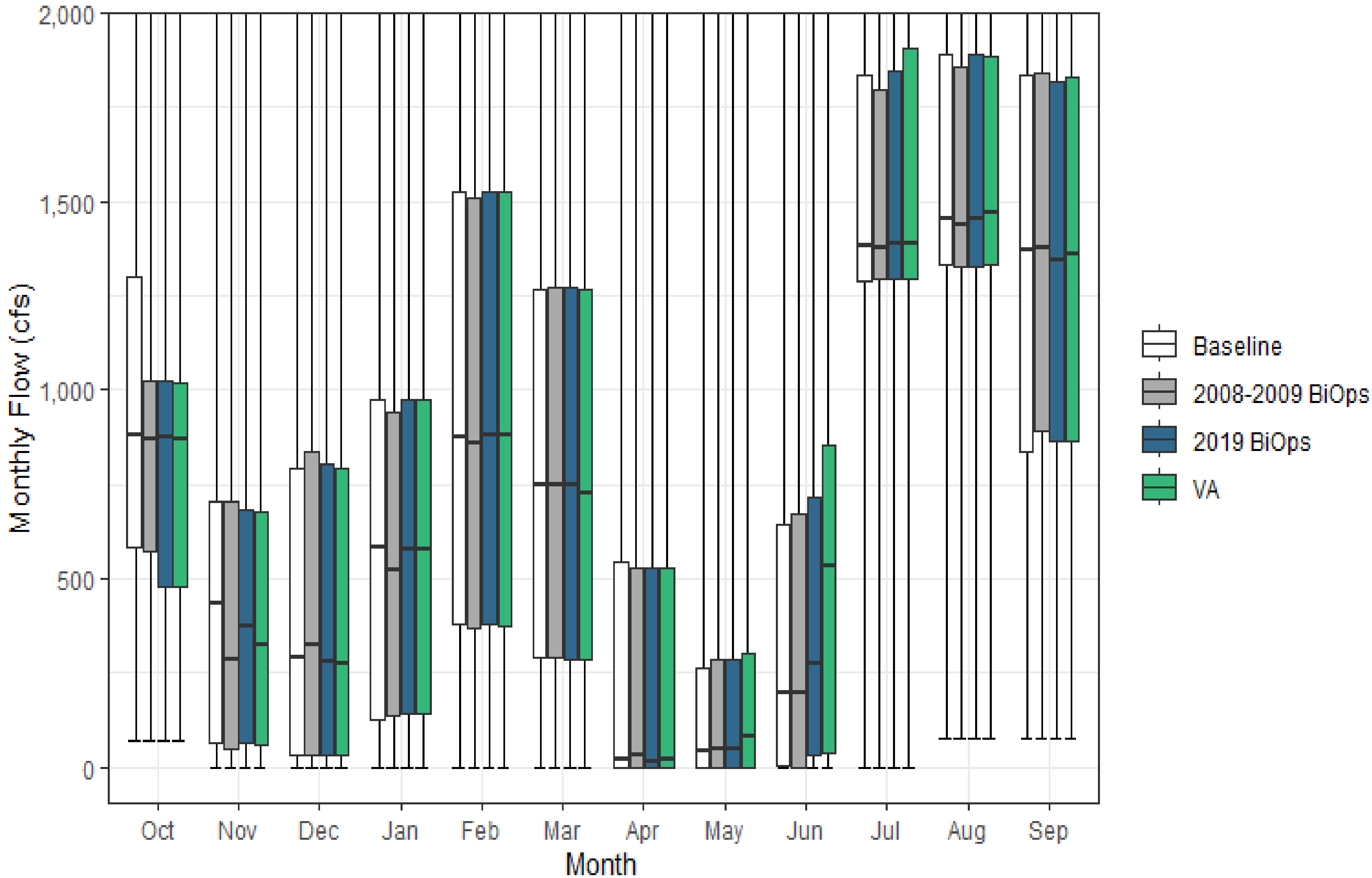

Figure G3a-46. Spring Creek Conduit Monthly Boxplot

Table G3a-104. Cumulative Distribution of Monthly Flow (cfs) — Spring Creek Conduit

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (TAF)
Baseline													
0%	70	0	0	0	0	0	0	0	0	0	76	77	166
10%	230	0	0	31	130	135	0	0	0	63	842	570	375
25%	585	67	32	123	381	293	0	0	5	1,291	1,331	837	460
50%	879	432	292	585	873	745	21	42	196	1,383	1,453	1,368	611
75%	1,297	702	795	973	1,524	1,266	545	262	642	1,834	1,887	1,835	727
90%	1,975	1,579	1,374	1,675	2,314	1,813	1,227	577	1,317	2,935	2,471	2,126	876
100%	2,365	3,564	2,071	3,659	4,200	4,200	2,755	3,507	3,507	3,396	3,191	3,200	1,651
Mean	988	577	504	716	1,106	892	364	243	474	1,471	1,567	1,359	620
2008-2009 BiOps													
0%	70	0	0	0	0	0	0	0	0	0	77	77	148
10%	251	0	0	13	130	135	0	0	0	63	622	574	366
25%	570	45	32	134	368	293	0	0	0	1,291	1,327	889	473
50%	872	285	324	524	858	745	33	46	196	1,374	1,435	1,378	589
75%	1,023	702	838	942	1,510	1,269	529	285	670	1,793	1,855	1,842	731
90%	1,966	1,529	1,503	1,635	2,314	1,845	1,227	629	1,319	2,994	2,549	2,354	889
100%	2,365	3,293	3,222	3,659	4,200	4,200	2,755	3,507	3,507	3,396	3,190	3,200	1,651
Mean	956	555	612	688	1,080	899	365	277	479	1,475	1,522	1,417	623
2019 BiOps													
0%	70	0	0	0	0	0	0	0	0	0	76	77	148
10%	230	0	0	14	109	135	0	0	0	63	842	533	359
25%	477	66	32	143	381	285	0	0	34	1,292	1,328	864	455
50%	873	374	279	575	881	745	13	46	273	1,389	1,453	1,345	601
75%	1,022	684	806	973	1,524	1,269	529	285	717	1,845	1,889	1,817	741
90%	1,966	1,310	1,374	1,635	2,308	1,813	1,227	628	1,496	3,007	2,930	2,113	872
100%	2,365	3,293	2,071	3,659	4,200	4,200	4,140	3,507	3,507	3,396	3,191	3,200	1,651
Mean	960	505	509	712	1,097	890	388	254	617	1,532	1,592	1,340	628
VA													
0%	70	0	0	0	0	0	0	0	0	0	76	77	149
10%	230	0	0	5	98	112	0	0	0	125	823	585	357
25%	477	58	32	143	374	285	0	0	37	1,292	1,333	864	478
50%	869	323	273	575	881	727	22	79	533	1,389	1,469	1,357	605
75%	1,016	674	795	973	1,524	1,266	529	303	853	1,905	1,882	1,827	741
90%	1,975	1,526	1,374	1,635	2,218	1,817	1,227	773	1,514	2,998	2,601	2,320	897
100%	3,434	3,470	2,071	3,659	4,200	4,200	2,755	3,507	3,507	3,396	3,191	3,200	1,651
Mean	959	522	503	708	1,084	865	361	286	633	1,543	1,579	1,374	629

Table G3a-105. Water Year Average of Monthly Flows (cfs) — Spring Creek Conduit

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline												
C	738	345	210	238	595	296	48	121	604	1,984	1,387	983
D	799	812	249	223	1,113	630	36	49	694	1,542	1,738	1,284
BN	1,041	380	229	572	901	747	328	76	442	1,187	1,552	1,269
AN	1,018	558	498	1,162	1,387	1,124	386	254	217	1,250	1,542	1,366
W	1,220	652	1,022	1,240	1,377	1,398	792	549	368	1,410	1,557	1,669
All	988	577	504	716	1,106	892	364	243	474	1,471	1,567	1,359
2008-2009 BiOps												
C	605	484	217	232	523	250	32	337	689	2,057	1,139	1,191
D	799	773	387	234	1,064	715	36	50	683	1,567	1,750	1,299
BN	1,072	279	411	525	896	756	346	75	408	1,114	1,538	1,343
AN	977	470	907	1,013	1,387	1,072	386	252	219	1,250	1,500	1,303
W	1,184	631	987	1,231	1,370	1,398	792	549	368	1,410	1,557	1,721
All	956	555	612	688	1,080	899	365	277	479	1,475	1,522	1,417
2019 BiOps												
C	691	338	210	235	578	274	39	120	721	2,063	1,255	1,006
D	752	577	259	228	1,097	644	36	68	974	1,766	1,849	1,207
BN	1,041	380	235	581	901	751	328	121	647	1,173	1,637	1,225
AN	978	590	513	1,114	1,391	1,104	376	245	401	1,250	1,542	1,344
W	1,202	580	1,022	1,236	1,367	1,398	880	549	368	1,410	1,575	1,686
All	960	505	509	712	1,097	890	388	254	617	1,532	1,592	1,340
VA												
C	768	364	210	219	572	235	41	138	430	2,014	1,247	1,039
D	758	642	259	233	1,044	596	38	64	934	1,788	1,909	1,320
BN	989	319	235	574	901	738	320	175	868	1,328	1,500	1,255
AN	976	578	460	1,111	1,391	1,064	380	405	744	1,164	1,542	1,358
W	1,188	615	1,022	1,236	1,369	1,396	791	549	326	1,401	1,573	1,673
All	959	522	503	708	1,084	865	361	286	633	1,543	1,579	1,374

G3a.3.4 Reservoir Storage

End of month storage volumes and elevations for April and September are presented below for all reservoirs that exhibit a change relative to baseline of greater than one thousand acre-feet in at least scenario in April or September during the modeled period of record. Results are not shown for the reservoirs listed in Table G3a-106.

Table G3a-106. Reservoirs with No Change Relative to Baseline Greater Than One Thousand Acre-Feet in April or September

Reservoir	Watershed
Antelope Reservoir	Feather
Belden Reservoir	Feather
Black Butte Reservoir	Stony
Buck Island	American
Bucks Lake	Feather
Butt Valley	Feather
Camino Reservoir	American
Caples Lake	American
Chili Bar Reservoir	American
Clear Lake	Cache
Clifton Court Forebay	–
Cresta Reservoir	Feather
East Park Reservoir	Stony
EBMUD Terminal Reservoirs	–
Englebright Reservoir	Yuba
Farmington Reservoir	Littlejohns
French Meadows	American
Frenchman Lake	Feather
Gerle Creek Reservoir	American
Grizzly Reservoir	Feather
Hell Hole	American
Ice House	American
Indian Valley Reservoir	Cache
Jackson Meadows Reservoir	Yuba
Jenkinson Lake	Cosumnes
Junction Reservoir	American
Keswick Reservoir	Sacramento
Lake Almanor	Feather
Lake Aloha	American
Lake Amador	Mokelumne
Lake Combie	Bear
Lake Davis	Feather
Lake Fordyce	Yuba

Reservoir	Watershed
Lake Natoma	American
Lake Spaulding	Yuba
Lake Tableaud	Mokelumne
Lake Valley	American
Lewiston Lake	Trinity
Little Grass Valley Reservoir	Feather
Loon Lake	American
Los Vaqueros Reservoir	Kellogg
Lower Bear	Mokelumne
Lower Bucks Lake	Feather
Merle Collins Reservoir	Yuba
Mountain Meadows Reservoir	Feather
PGE Old Reservoirs	Mokelumne
PhilbrookRoundValley	Feather
Poe Reservoir	Feather
Rock Creek Reservoir	Feather
Rollins Reservoir	Bear
Rubicon	American
Salt Springs	Mokelumne
Schaads Reservoir	Mokelumne
Scotts Flat Reservoir	Yuba
Silver Lake	American
Slab Creek Reservoir	American
Sly Creek Reservoir	Feather
Stony Gorge Reservoir	Stony
Stumpy Meadows	American
Thermalito Afterbay	Feather
Union Valley Reservoir	American
Upper Bear	Mokelumne

G3a.3.4.1 Bowman Lake (Yuba)

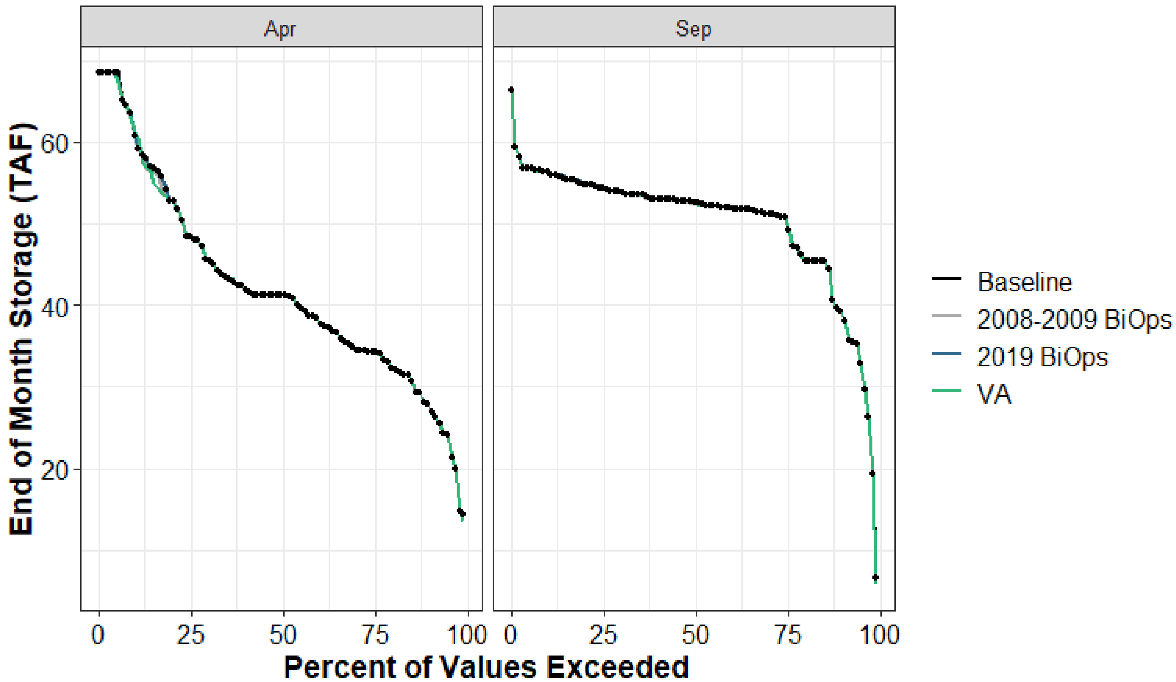

Figure G3a-47. Bowman Lake End of April and End of September Storage (TAF) Percent Exceedance Plot

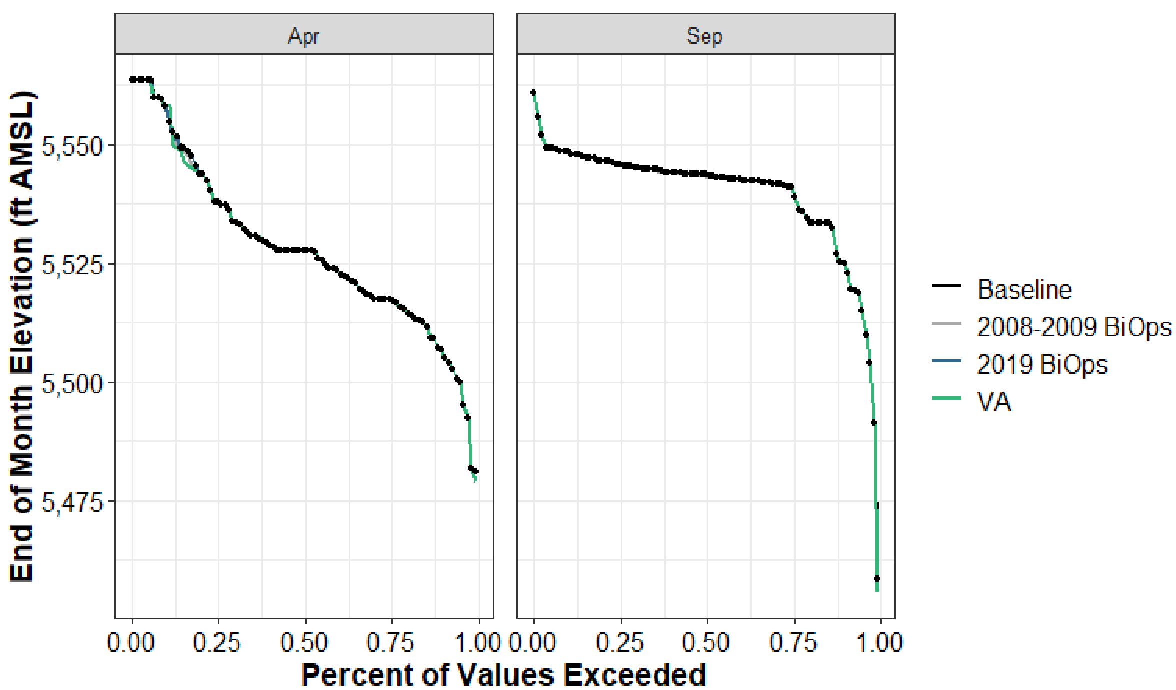

Figure G3a-48. Bowman Lake Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-107. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	7	-1	-1	-1
10%	39	0	0	0
25%	51	0	0	0
50%	53	0	0	0
75%	54	0	0	0
90%	56	0	0	0
100%	66	0	0	0
Mean	50	0	0	0

Table G3a-108. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	5459	-3	-3	-3
10%	5525	0	0	0
25%	5541	0	0	0
50%	5544	0	0	0
75%	5546	0	0	0
90%	5548	0	0	0
100%	5561	0	0	0
Mean	5540	0	0	0

Table G3a-109. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	14	-1	-1	-1
10%	28	0	0	0
25%	34	0	0	0
50%	41	0	0	0
75%	48	0	0	0
90%	60	0	0	1
100%	69	0	0	0
Mean	42	0	0	0

Table G3a-110. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	5481	-2	-2	-2
10%	5507	0	0	0
25%	5517	0	0	0
50%	5528	0	0	0
75%	5538	0	0	0
90%	5557	0	0	1
100%	5564	0	0	0
Mean	5528	0	0	0

G3a.3.4.2 Camanche Reservoir (Mokelumne)

Figure G3a-49. Camanche Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

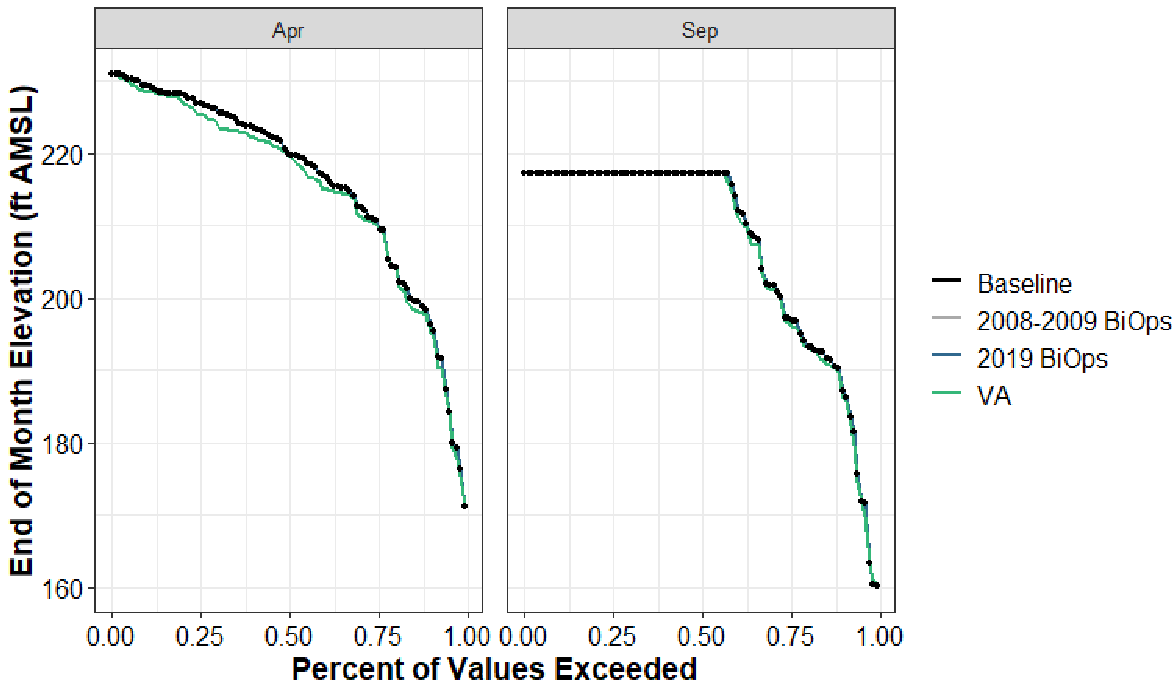

Figure G3a-50. Camanche Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-111. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	54	0	0	1
10%	137	0	0	-3
25%	179	0	0	-2
50%	290	0	0	0
75%	290	0	0	0
90%	291	0	0	0
100%	291	0	0	0
Mean	240	0	0	-1

Table G3a-112. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	160	0	0	0
10%	188	0	0	-1
25%	197	0	0	0
50%	217	0	0	0
75%	217	0	0	0
90%	217	0	0	0
100%	217	0	0	0
Mean	207	0	0	0

Table G3a-113. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	80	0	0	0
10%	177	0	0	-5
25%	251	0	0	-3
50%	308	0	0	-2
75%	355	0	0	-11
90%	372	0	0	-6
100%	383	0	0	0
Mean	291	0	0	-6

Table G3a-114. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	171	0	0	0
10%	197	0	0	-1
25%	211	0	0	0
50%	220	0	0	0
75%	227	0	0	-2
90%	229	0	0	-1
100%	231	0	0	0
Mean	216	0	0	-1

G3a.3.4.3 Camp Far West (Bear)

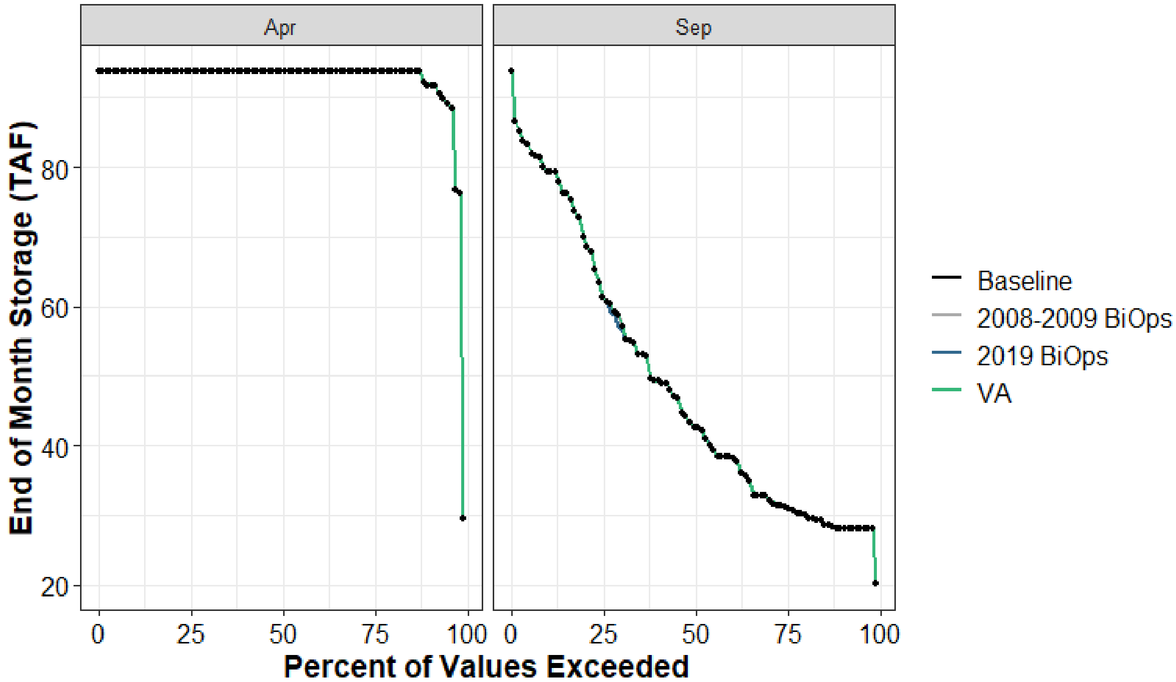

Figure G3a-51. Camp Far West End of April and End of September Storage (TAF) Percent Exceedance Plot

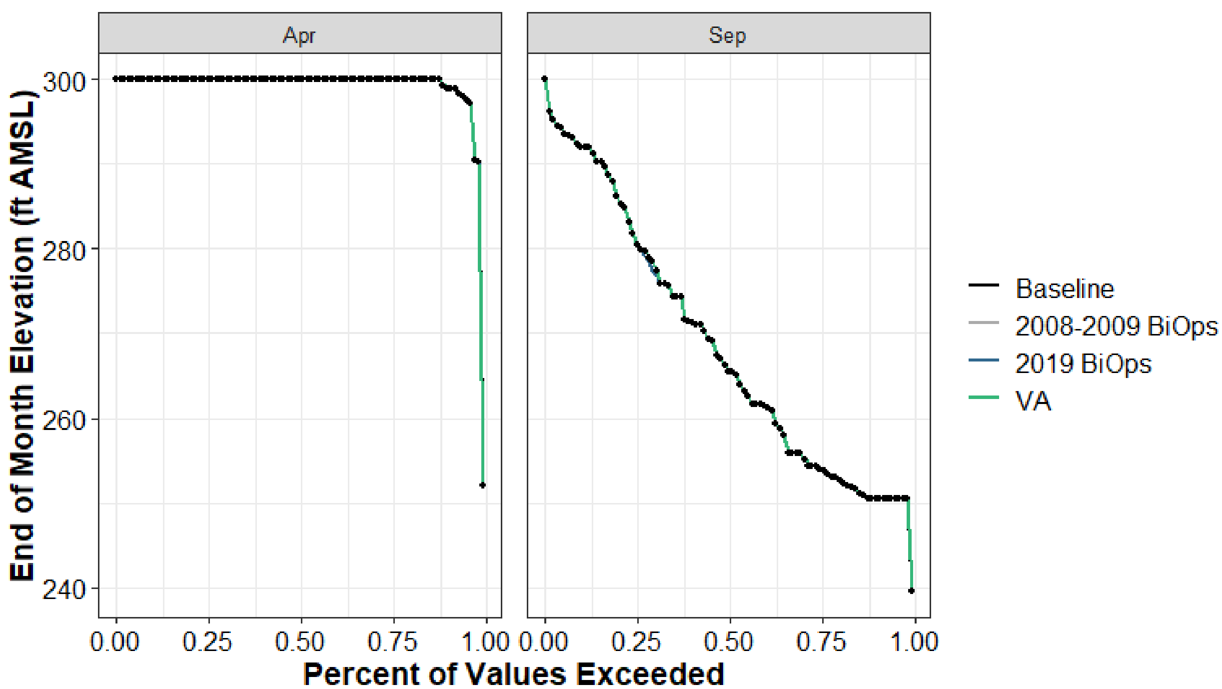

Figure G3a-52. Camp Far West Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-115. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	20	0	0	0
10%	28	0	0	0
25%	31	0	0	0
50%	43	0	0	0
75%	61	0	0	0
90%	79	0	0	0
100%	94	0	0	0
Mean	49	0	0	0

Table G3a-116. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	240	0	0	0
10%	250	0	0	0
25%	254	0	0	0
50%	265	0	0	0
75%	280	0	0	0
90%	292	0	0	0
100%	300	0	0	0
Mean	269	0	0	0

Table G3a-117. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	29	0	0	0
10%	92	0	0	0
25%	94	0	0	0
50%	94	0	0	0
75%	94	0	0	0
90%	94	0	0	0
100%	94	0	0	0
Mean	92	0	0	0

Table G3a-118. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	252	0	0	0
10%	299	0	0	0
25%	300	0	0	0
50%	300	0	0	0
75%	300	0	0	0
90%	300	0	0	0
100%	300	0	0	0
Mean	299	0	0	0

G3a.3.4.4 CVP San Luis Reservoir (South of Delta Off stream)

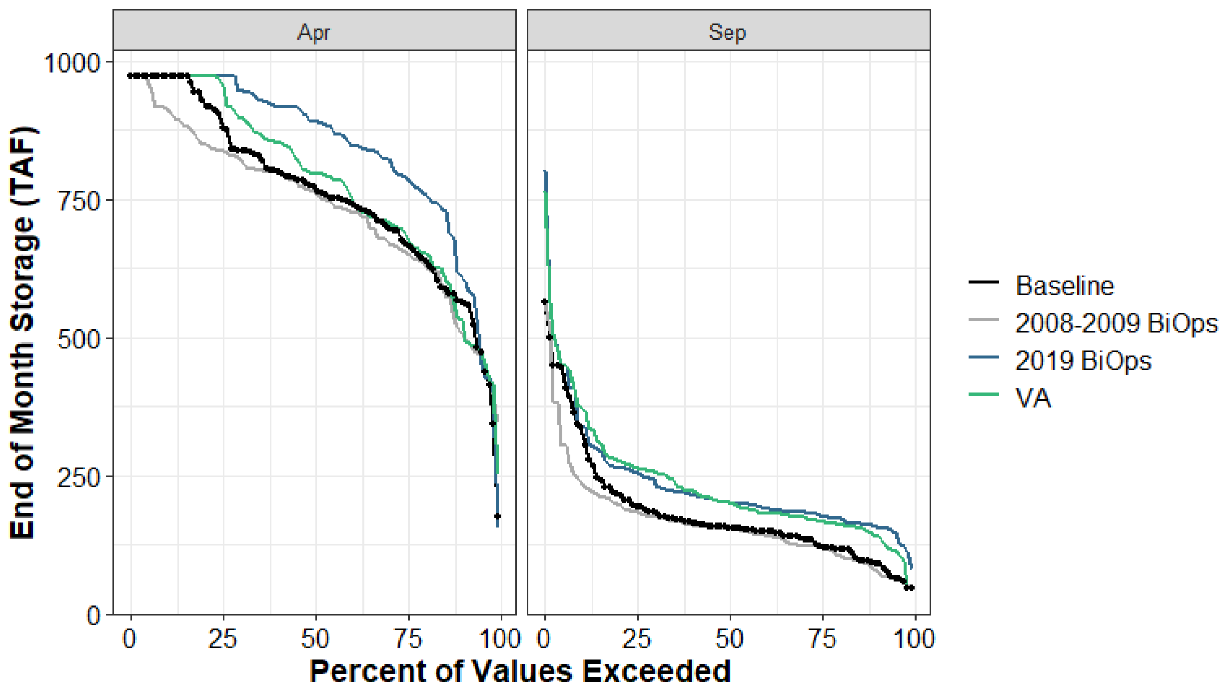

Figure G3a-53. CVP San Luis Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

Table G3a-119. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	45	4	36	0
10%	90	-10	69	52
25%	121	-2	58	46
50%	155	-1	47	45
75%	194	-11	62	69
90%	332	-96	6	40
100%	562	0	240	202
Mean	180	-17	52	50

Table G3a-120. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	174	171	-19	76
10%	565	-58	45	-31
25%	670	-16	120	18
50%	773	-11	116	24
75%	879	-43	93	76
90%	972	-59	0	0
100%	972	0	0	0
Mean	761	-23	81	21

G3a.3.4.5 Folsom Lake (American)

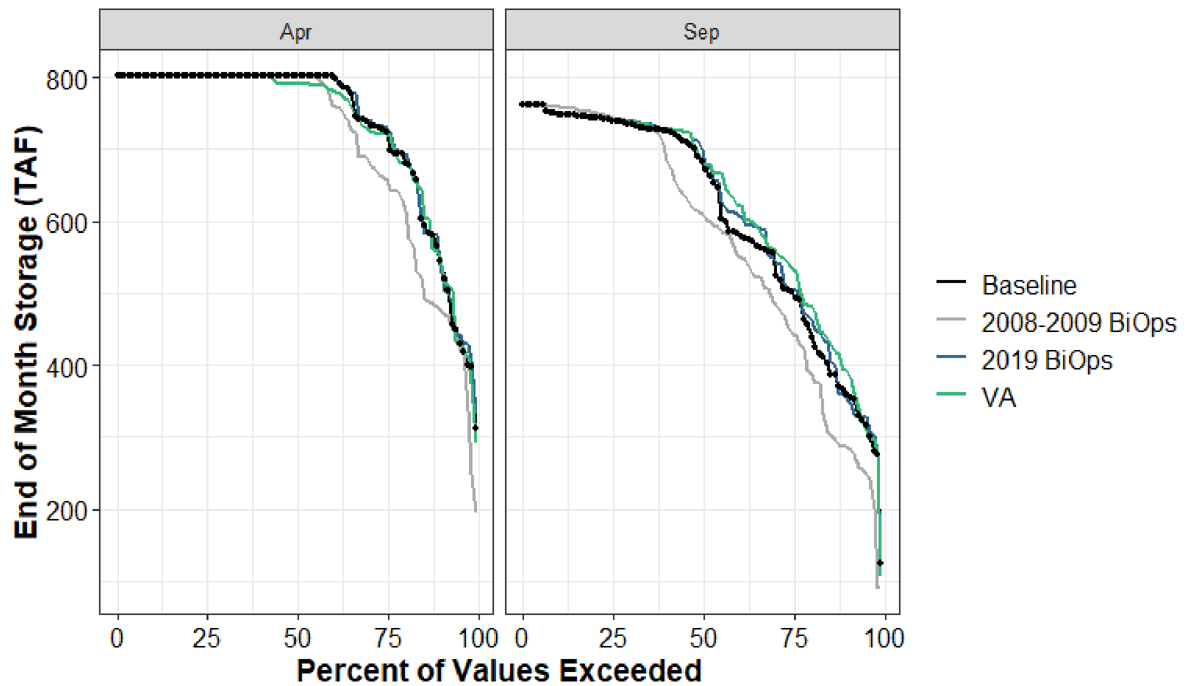

Figure G3a-54. Folsom Lake End of April and End of September Storage (TAF) Percent Exceedance Plot

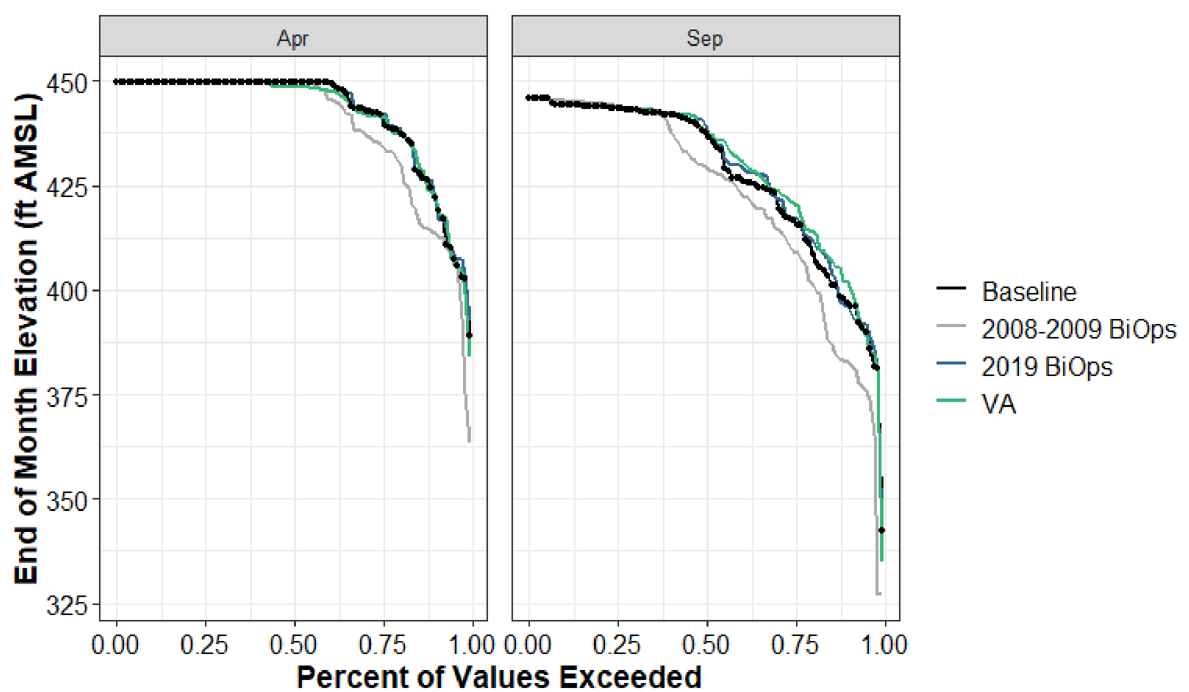

Figure G3a-55. Folsom Lake Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-121. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	125	-35	-10	-18
10%	361	-74	-6	32
25%	501	-57	4	34
50%	684	-73	14	-2
75%	740	4	3	2
90%	748	10	1	1
100%	762	0	0	0
Mean	606	-34	8	14

Table G3a-122. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	342	-15	-4	-7
10%	397	-14	-1	5
25%	417	-7	0	4
50%	438	-8	1	0
75%	443	0	0	0
90%	444	1	0	0
100%	446	0	0	0
Mean	427	-5	1	2

Table G3a-123. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	312	-117	20	-20
10%	549	-70	-1	5
25%	724	-66	5	-4
50%	802	0	0	-10
75%	802	0	0	0
90%	802	0	0	0
100%	802	0	0	0
Mean	734	-25	2	-3

Table G3a-124. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	389	-26	3	-5
10%	423	-9	0	1
25%	442	-7	1	0
50%	450	0	0	-1
75%	450	0	0	0
90%	450	0	0	0
100%	450	0	0	0
Mean	442	-3	0	0

G3a.3.4.6 French Lake (Yuba)

Figure G3a-56. French Lake End of April and End of September Storage (TAF) Percent Exceedance Plot

Table G3a-125. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	0	0	0	0
10%	0	0	0	0
25%	0	0	0	0
50%	0	0	0	0
75%	0	0	0	0
90%	0	0	0	0
100%	0	0	0	0
Mean	0	0	0	0

Table G3a-126. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	0	0	0	0
10%	0	0	0	0
25%	0	0	0	0
50%	0	0	0	0
75%	0	0	0	0
90%	0	0	0	0
100%	3	0	0	1
Mean	0	0	0	0

G3a.3.4.7 Lake Berryessa (Putah)

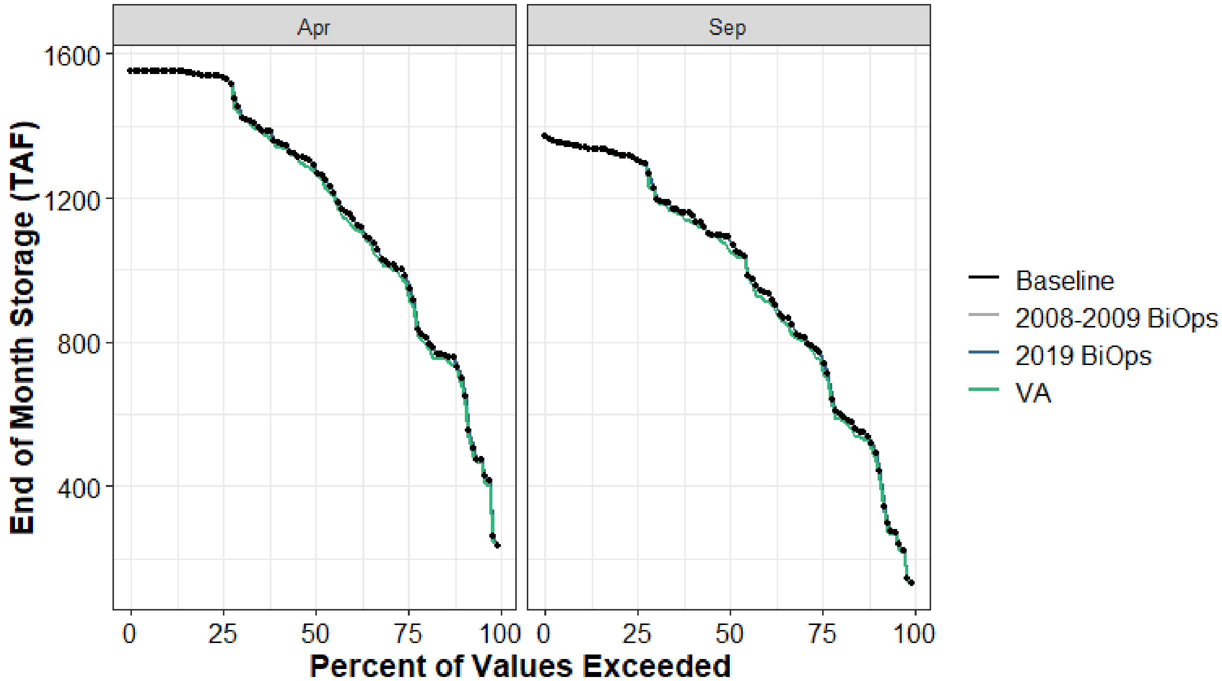

Figure G3a-57. Lake Berryessa End of April and End of September Storage (TAF) Percent Exceedance Plot

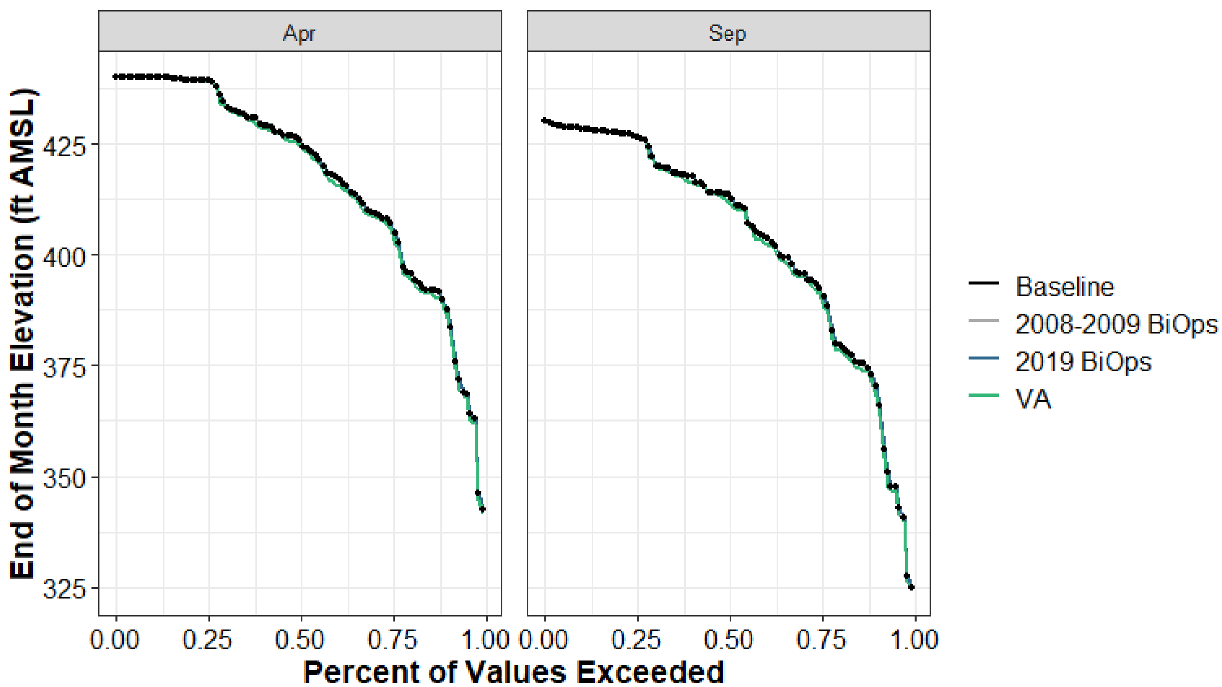

Figure G3a-58. Lake Berryessa Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-127. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	133	0	0	-3
10%	499	0	0	-23
25%	770	0	0	-18
50%	1090	0	0	-33
75%	1304	0	0	-1
90%	1341	0	0	0
100%	1370	0	0	0
Mean	971	0	0	-11

Table G3a-128. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	325	0	0	-1
10%	371	0	0	-2
25%	393	0	0	-1
50%	414	0	0	-2
75%	426	0	0	0
90%	428	0	0	0
100%	430	0	0	0
Mean	404	0	0	-1

Table G3a-129. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	233	0	0	-6
10%	708	0	0	-23
25%	983	0	0	-18
50%	1293	0	0	-18
75%	1536	0	0	-4
90%	1551	0	0	0
100%	1551	0	0	0
Mean	1180	0	0	-11

Table G3a-130. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	342	0	0	-1
10%	388	0	0	-2
25%	407	0	0	-1
50%	426	0	0	-1
75%	439	0	0	0
90%	440	0	0	0
100%	440	0	0	0
Mean	417	0	0	-1

G3a.3.4.8 New Bullards Bar Reservoir (Yuba)

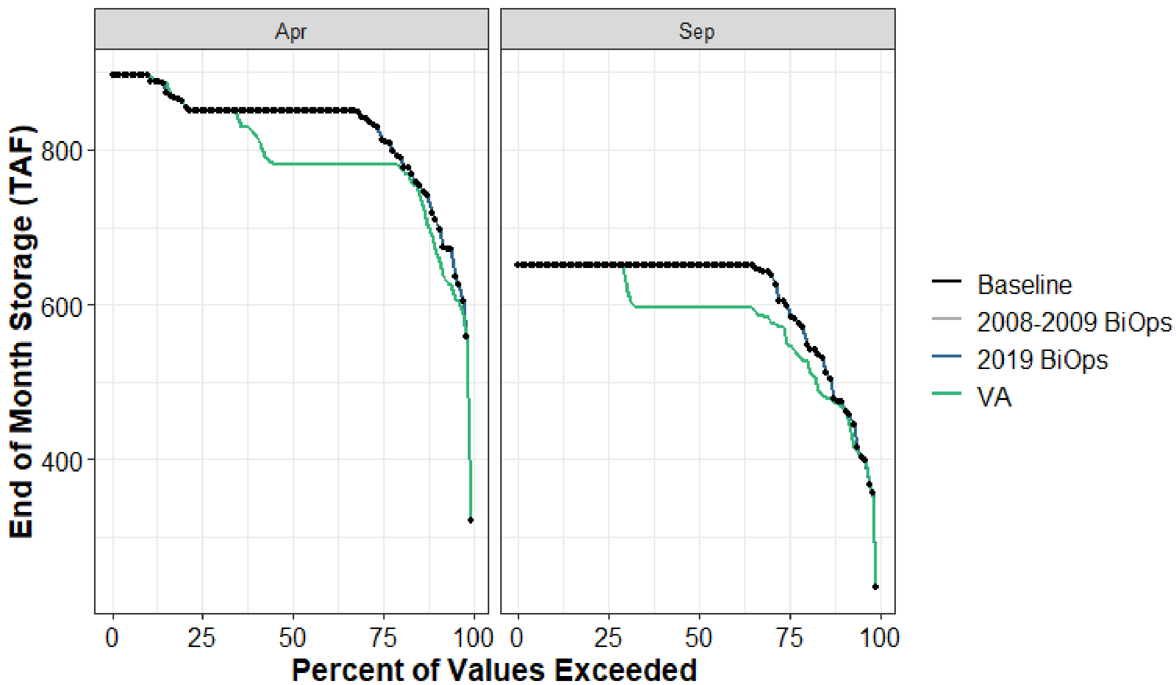

Figure G3a-59. New Bullards Bar Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

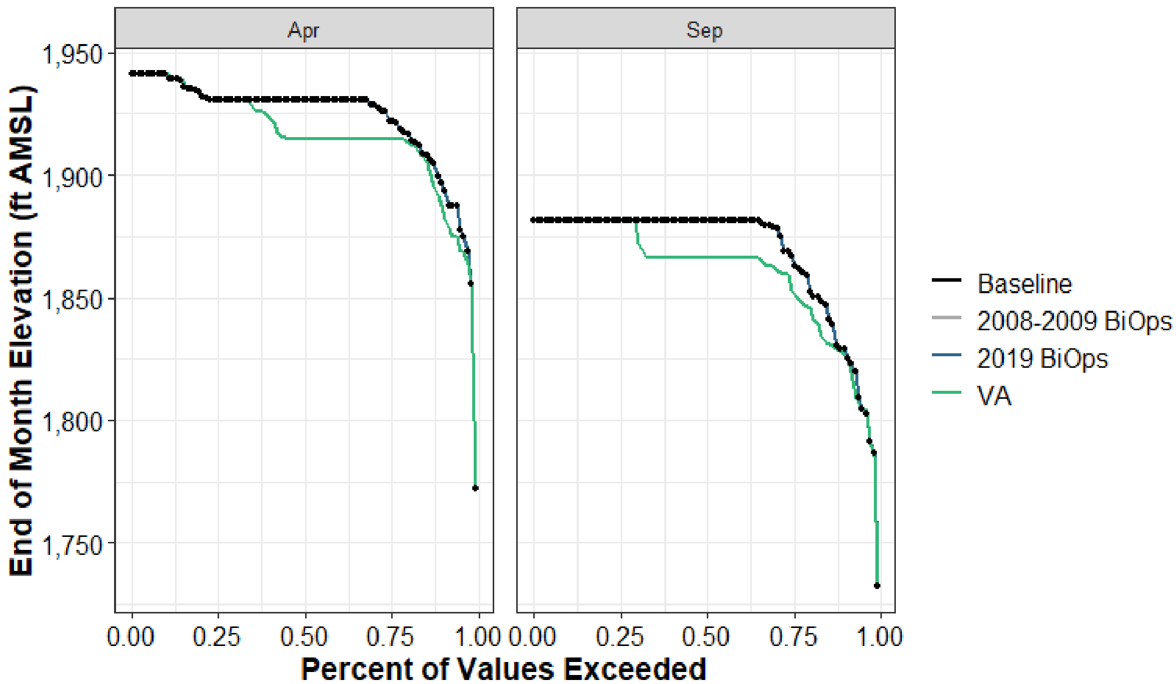

Figure G3a-60. New Bullards Bar Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-131. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	234	0	0	0
10%	474	0	0	-6
25%	598	0	0	-47
50%	650	0	0	-55
75%	650	0	0	0
90%	650	0	0	0
100%	650	0	0	0
Mean	605	0	0	-29

Table G3a-132. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1732	0	0	0
10%	1829	0	0	-2
25%	1867	0	0	-14
50%	1881	0	0	-15
75%	1881	0	0	0
90%	1881	0	0	0
100%	1881	0	0	0
Mean	1868	0	0	-8

Table G3a-133. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	320	0	0	0
10%	711	0	0	-35
25%	813	0	0	-33
50%	850	0	0	-70
75%	850	0	0	0
90%	895	0	0	1
100%	896	0	0	0
Mean	820	0	0	-29

Table G3a-134. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1772	0	0	0
10%	1897	0	0	-9
25%	1922	0	0	-8
50%	1931	0	0	-16
75%	1931	0	0	0
90%	1941	0	0	0
100%	1941	0	0	0
Mean	1923	0	0	-7

G3a.3.4.9 New Hogan Reservoir (Calaveras)

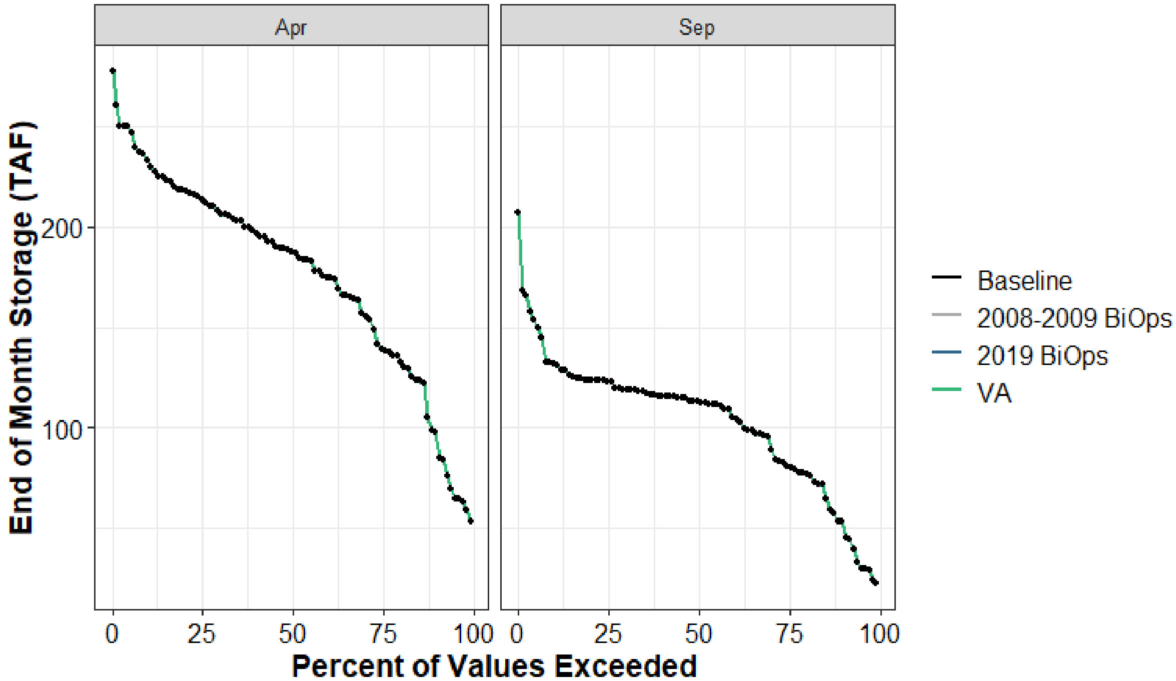

Figure G3a-61. New Hogan Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

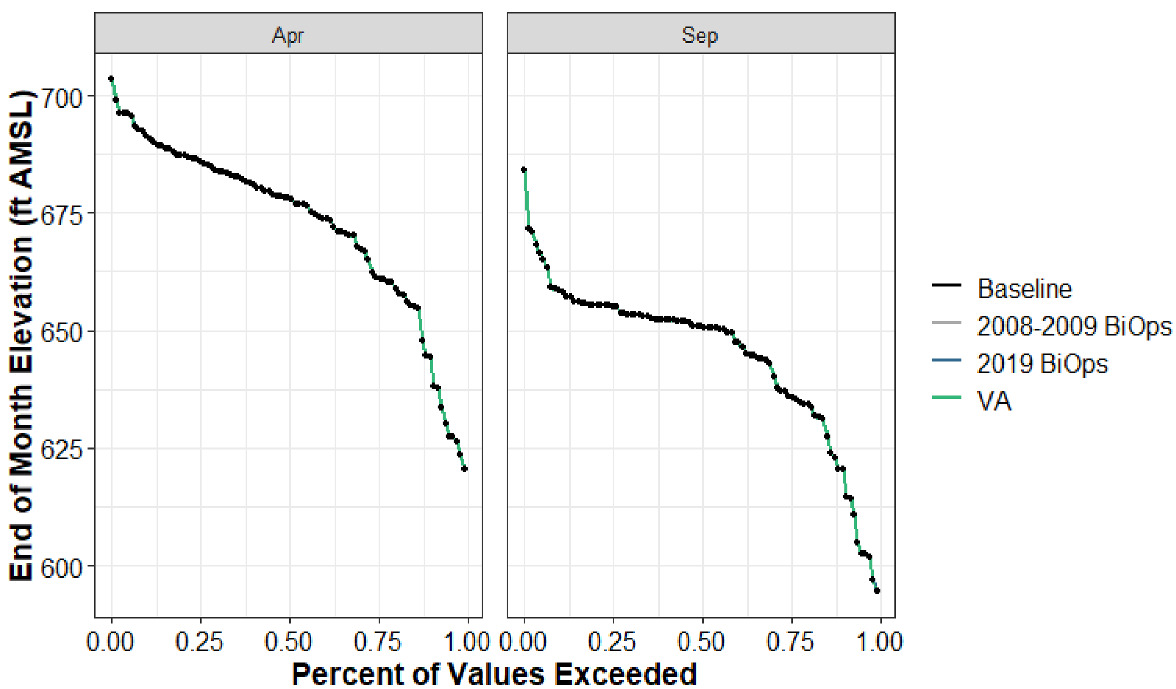

Figure G3a-62. New Hogan Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-135. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	22	0	0	0
10%	53	0	0	0
25%	80	0	0	0
50%	113	0	0	0
75%	123	0	0	0
90%	131	0	0	0
100%	208	0	0	0
Mean	103	0	0	0

Table G3a-136. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	594	0	0	0
10%	620	0	0	0
25%	636	0	0	0
50%	651	0	0	0
75%	655	0	0	0
90%	658	0	0	0
100%	684	0	0	0
Mean	645	0	0	0

Table G3a-137. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	53	0	0	0
10%	98	0	0	0
25%	139	0	0	0
50%	188	0	0	0
75%	214	0	0	0
90%	232	0	0	0
100%	278	0	0	0
Mean	176	0	0	0

Table G3a-138. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	620	0	0	0
10%	644	0	0	0
25%	661	0	0	0
50%	678	0	0	0
75%	686	0	0	0
90%	691	0	0	0
100%	703	0	0	0
Mean	673	0	0	0

G3a.3.4.10 Oroville Reservoir (Feather)

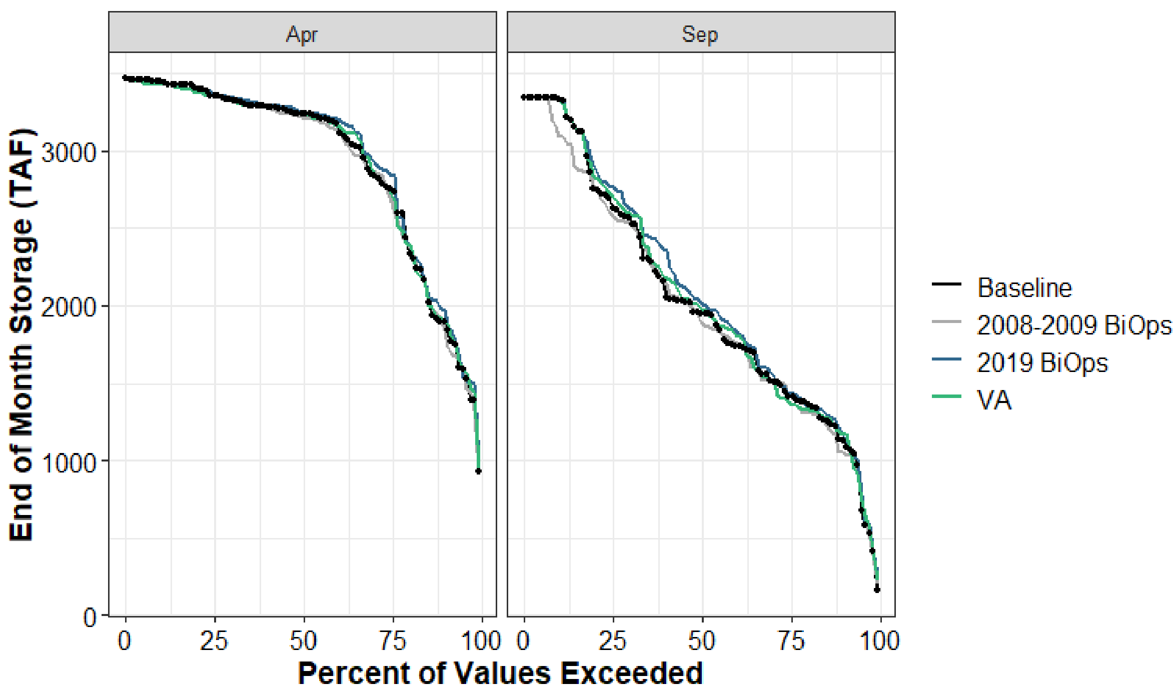

Figure G3a-63. Oroville Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

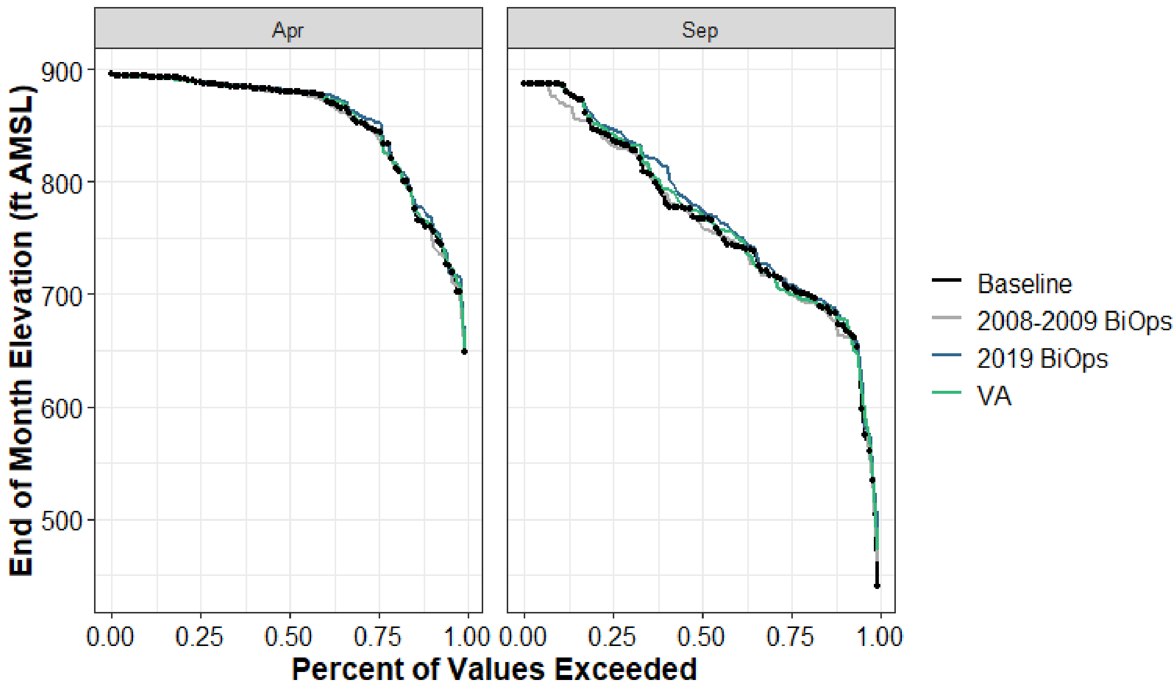

Figure G3a-64. Oroville Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-139. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	157	42	99	61
10%	1130	-79	40	46
25%	1411	-36	25	-30
50%	1950	-55	72	32
75%	2633	-54	130	76
90%	3335	-239	0	-4
100%	3351	0	0	0
Mean	2037	-36	64	21

Table G3a-140. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	440	22	52	32
10%	672	-9	5	5
25%	705	-4	3	-3
50%	767	-6	8	4
75%	836	-4	10	6
90%	887	-16	0	0
100%	888	0	0	0
Mean	766	-3	7	3

Table G3a-141. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	930	-18	22	3
10%	1891	-31	80	20
25%	2755	-47	92	-14
50%	3239	-21	11	-3
75%	3354	0	13	0
90%	3449	0	0	-21
100%	3470	0	0	0
Mean	2937	-14	30	1

Table G3a-142. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	649	-2	3	0
10%	760	-4	9	2
25%	846	-4	7	-1
50%	880	-1	1	0
75%	888	0	1	0
90%	894	0	0	-1
100%	896	0	0	0
Mean	853	-1	3	0

G3a.3.4.11 Pardee Reservoir (Mokelumne)

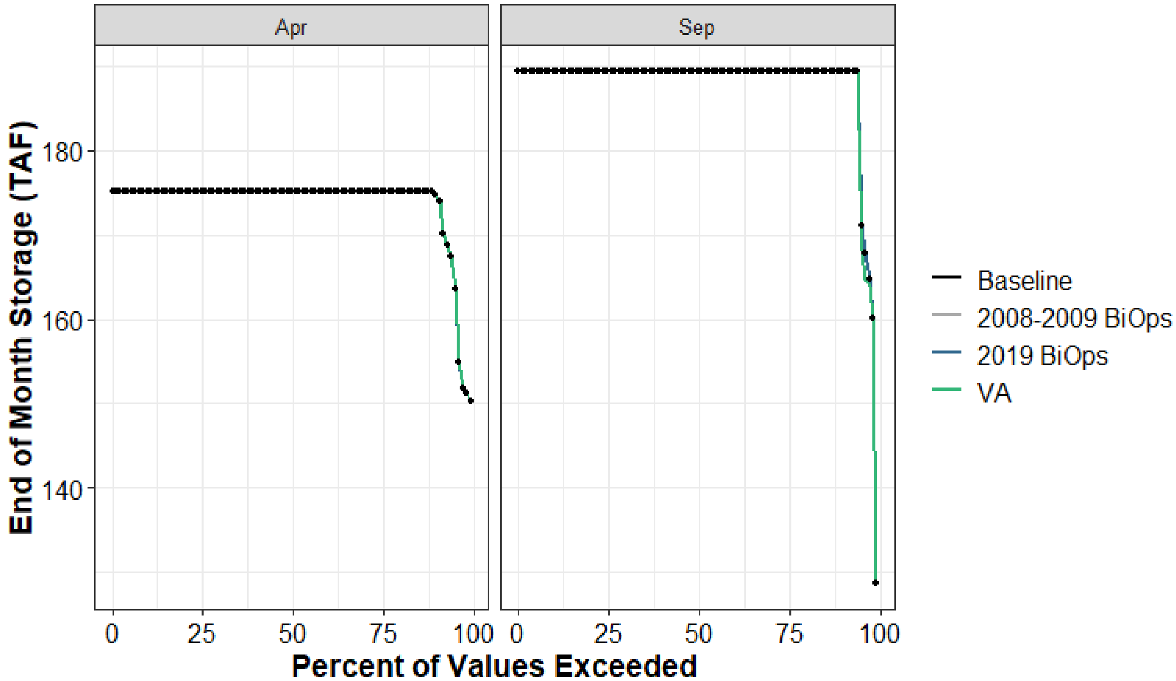

Figure G3a-65. Pardee Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

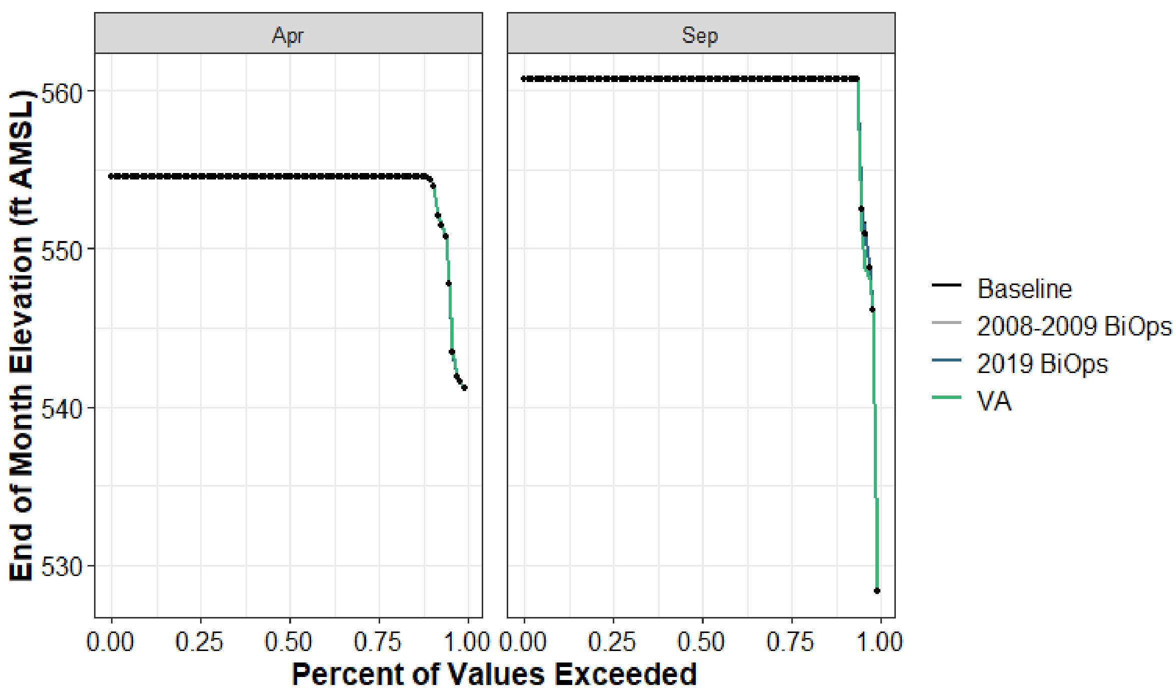

Figure G3a-66. Pardee Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-143. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	129	0	0	0
10%	189	0	0	0
25%	189	0	0	0
50%	189	0	0	0
75%	189	0	0	0
90%	189	0	0	0
100%	189	0	0	0
Mean	188	0	0	0

Table G3a-144. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	528	0	0	0
10%	561	0	0	0
25%	561	0	0	0
50%	561	0	0	0
75%	561	0	0	0
90%	561	0	0	0
100%	561	0	0	0
Mean	560	0	0	0

Table G3a-145. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	150	0	0	0
10%	175	0	0	0
25%	175	0	0	0
50%	175	0	0	0
75%	175	0	0	0
90%	175	0	0	0
100%	175	0	0	0
Mean	174	0	0	0

Table G3a-146. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	541	0	0	0
10%	554	0	0	0
25%	555	0	0	0
50%	555	0	0	0
75%	555	0	0	0
90%	555	0	0	0
100%	555	0	0	0
Mean	554	0	0	0

G3a.3.4.12 San Luis Reservoir Total (South of Delta Offstream)

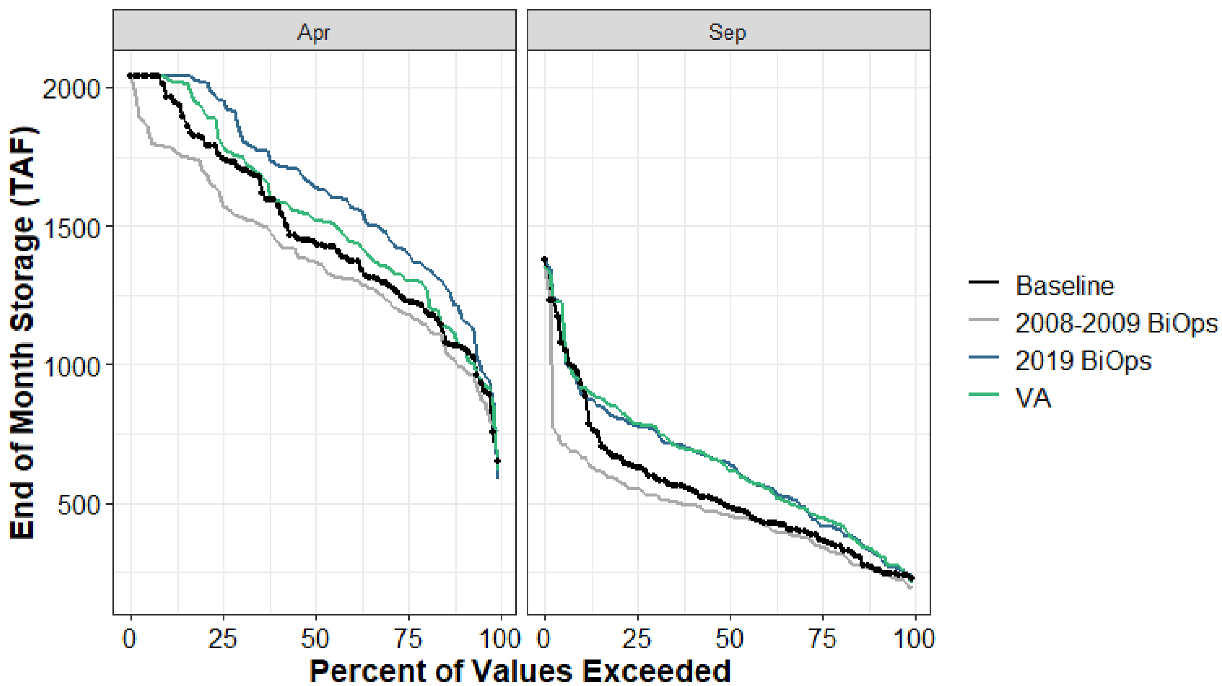

Figure G3a-67. San Luis Reservoir Total End of April and End of September Storage (TAF) Percent Exceedance Plot

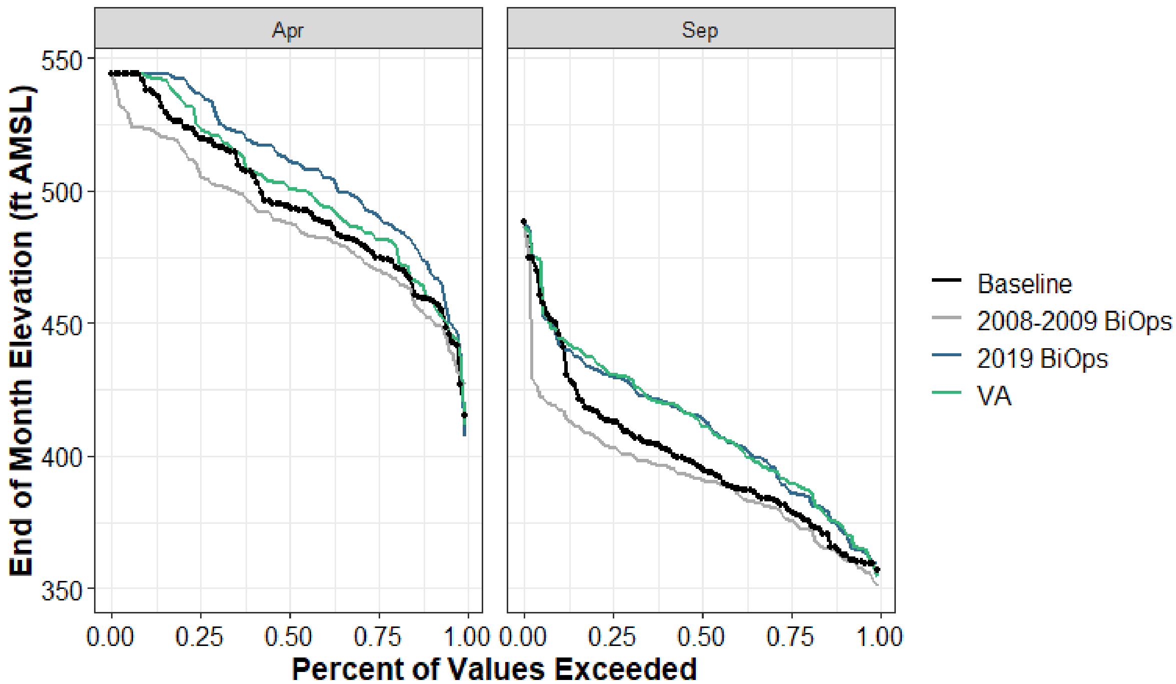

Figure G3a-68. San Luis Reservoir Total Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-147. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	228	-36	12	-15
10%	260	-7	56	67
25%	371	-25	53	74
50%	489	-34	158	129
75%	629	-80	151	157
90%	925	-258	-31	-8
100%	1375	-23	0	-18
Mean	537	-70	97	101

Table G3a-148. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	357	-6	2	-3
10%	363	-1	9	11
25%	380	-4	7	10
50%	396	-4	19	16
75%	413	-10	17	18
90%	445	-28	-3	-1
100%	488	-2	0	-2
Mean	399	-8	12	12

Table G3a-149. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	648	106	-64	-31
10%	1060	-69	117	6
25%	1229	-44	181	75
50%	1441	-71	199	79
75%	1739	-169	212	44
90%	1966	-183	73	66
100%	2039	0	0	0
Mean	1482	-96	146	55

Table G3a-150. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	415	12	-8	-4
10%	459	-7	11	1
25%	475	-4	17	7
50%	494	-6	17	7
75%	520	-14	17	4
90%	538	-15	6	5
100%	544	0	0	0
Mean	497	-8	13	5

G3a.3.4.13 Shasta Lake (Sacramento)

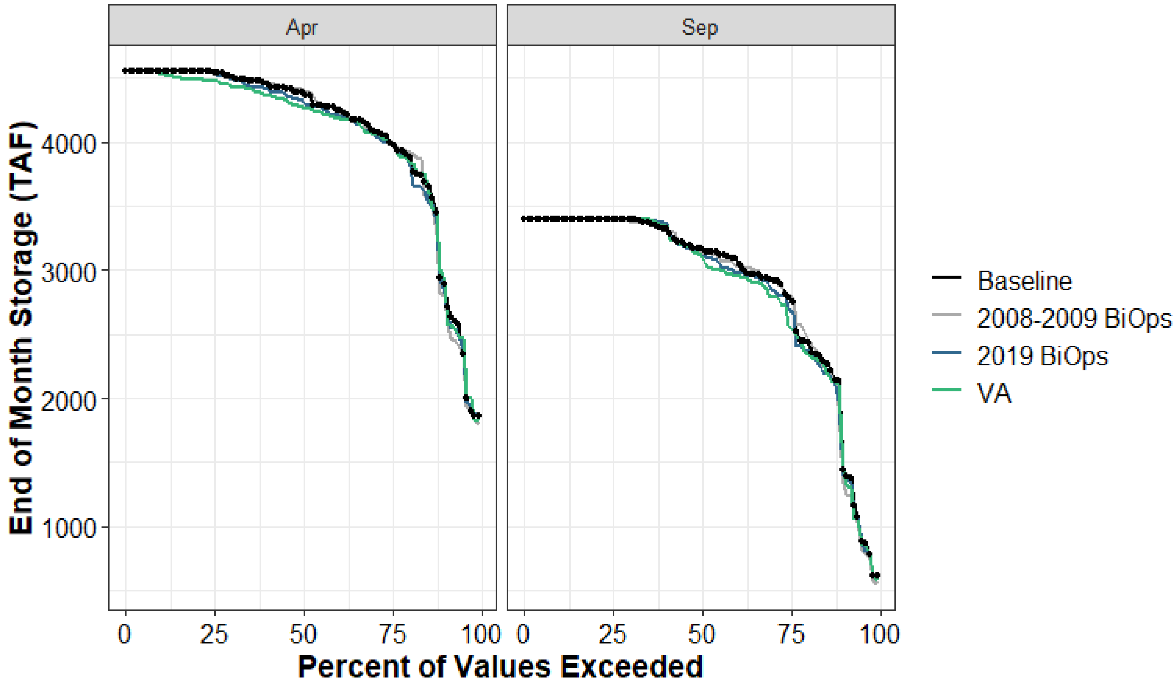

Figure G3a-69. Shasta Lake End of April and End of September Storage (TAF) Percent Exceedance Plot

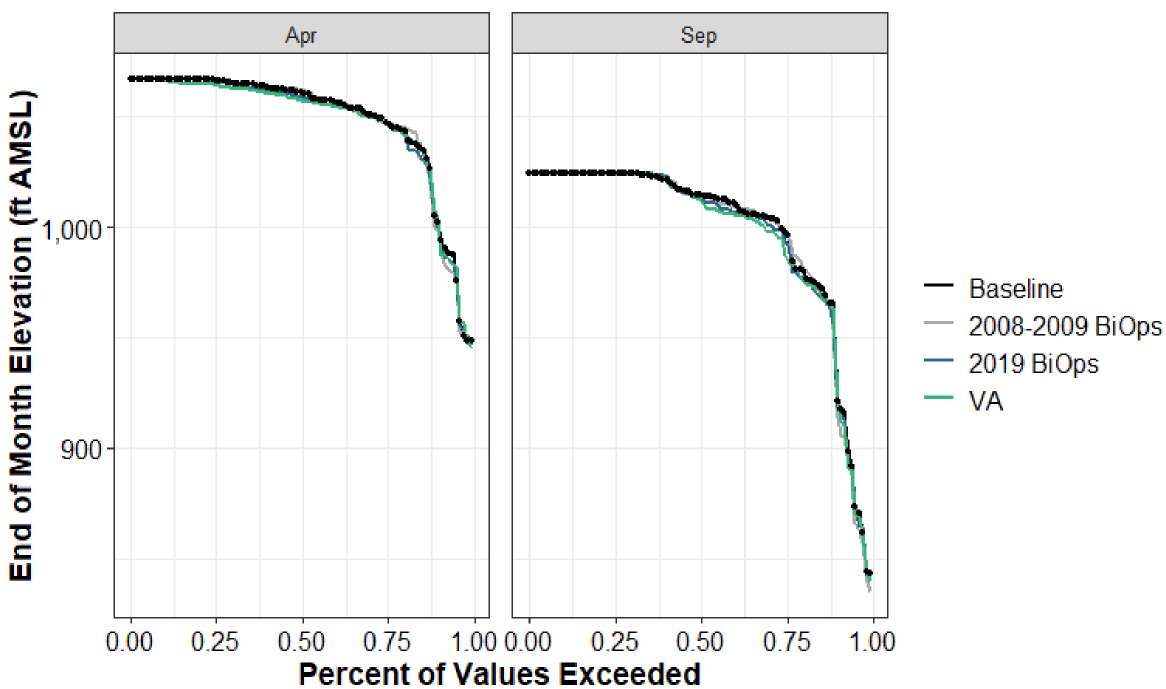

Figure G3a-70. Shasta Lake Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-151. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	614	-64	-8	-30
10%	1578	-111	-60	-9
25%	2790	25	-89	-211
50%	3165	-28	-54	-44
75%	3400	-10	0	0
90%	3400	0	0	0
100%	3400	0	0	0
Mean	2879	-10	-25	-38

Table G3a-152. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	843	-8	-1	-3
10%	930	-8	-4	-1
25%	998	1	-4	-11
50%	1015	-1	-2	-2
75%	1024	0	0	0
90%	1024	0	0	0
100%	1024	0	0	0
Mean	998	-1	-1	-2

Table G3a-153. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1856	-59	7	-33
10%	2898	-95	-50	36
25%	3994	16	0	0
50%	4389	23	-59	-114
75%	4546	0	-7	-67
90%	4552	0	0	-18
100%	4552	0	0	0
Mean	4086	-8	-29	-42

Table G3a-154. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	949	-3	0	-2
10%	1003	-4	-2	2
25%	1047	1	0	0
50%	1061	1	-2	-4
75%	1067	0	0	-2
90%	1067	0	0	-1
100%	1067	0	0	0
Mean	1049	0	-1	-1

G3a.3.4.14 SWP San Luis Reservoir (South of Delta Offstream)

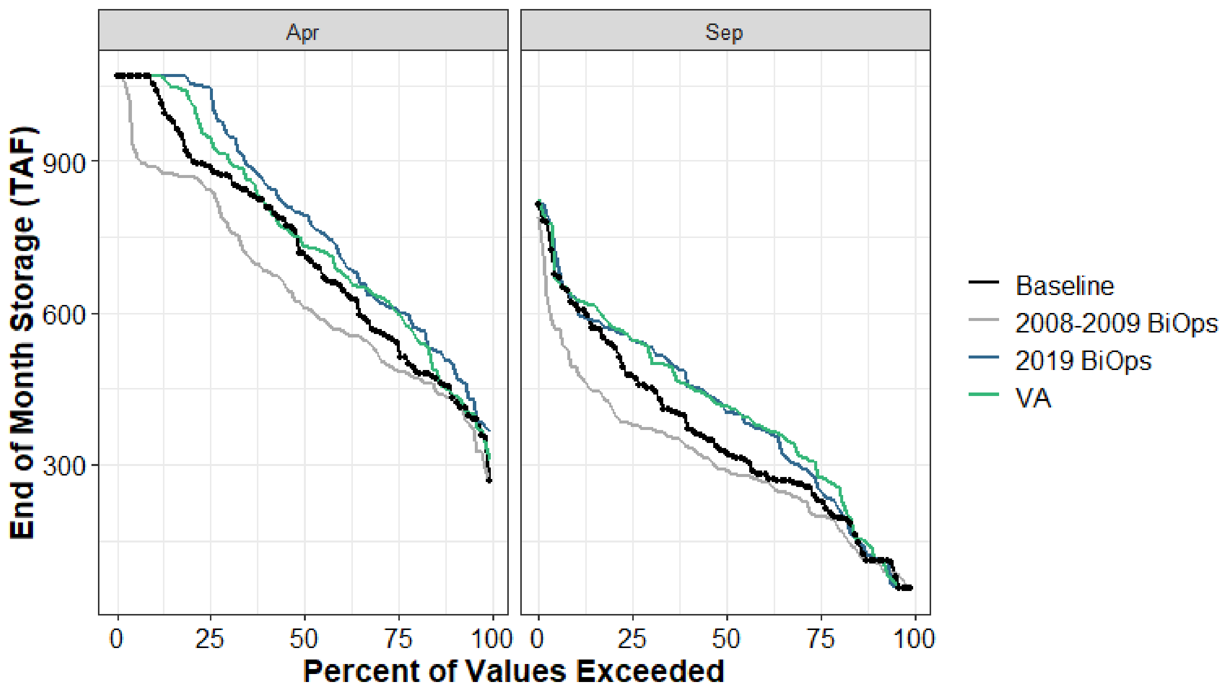

Figure G3a-71. SWP San Luis Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

Table G3a-155. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	55	1	0	0
10%	111	0	7	5
25%	231	-32	26	47
50%	325	-35	82	90
75%	475	-94	69	73
90%	613	-125	10	11
100%	813	-23	7	11
Mean	357	-53	45	51

Table G3a-156. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	266	-2	99	43
10%	437	-5	62	4
25%	542	-56	68	57
50%	716	-104	77	19
75%	888	-45	157	58
90%	1051	-162	16	16
100%	1067	0	0	0
Mean	721	-72	64	34

G3a.3.4.15 Trinity Reservoir (Trinity)

Figure G3a-72. Trinity Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

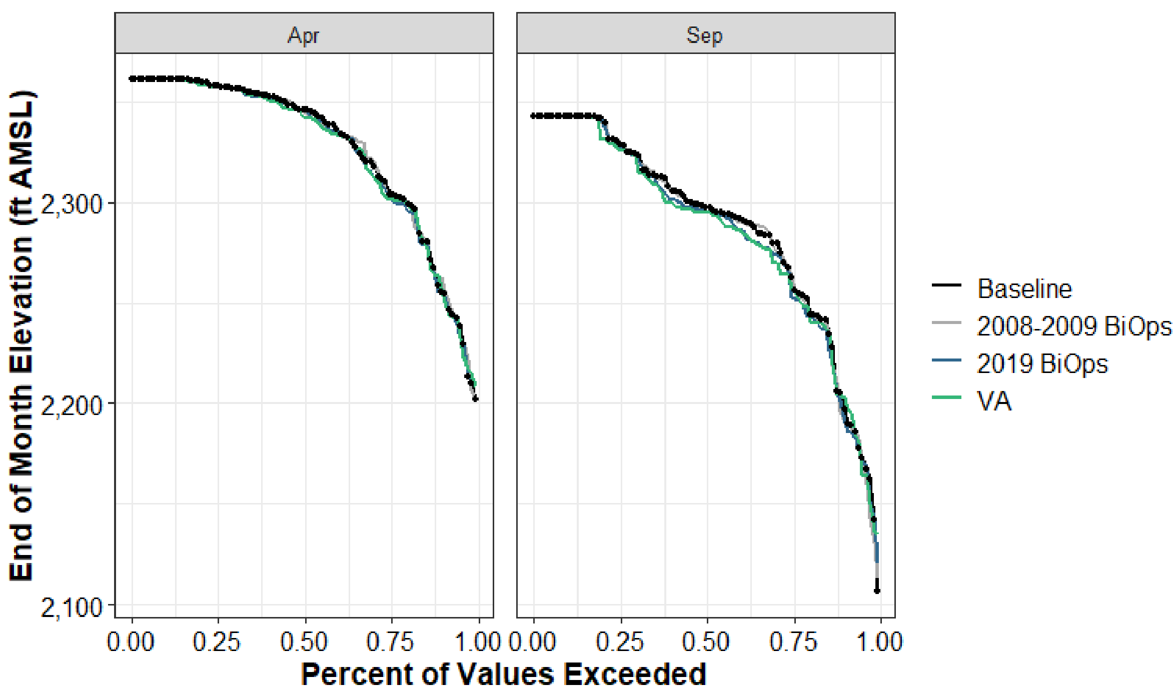

Figure G3a-73. Trinity Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-157. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	246	10	21	44
10%	580	-34	-30	30
25%	1065	17	-85	-45
50%	1439	-25	-30	-30
75%	1807	0	-15	-31
90%	1972	0	0	0
100%	1973	0	0	0
Mean	1389	-4	-26	-36

Table G3a-158. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	2106	7	14	29
10%	2199	-6	-6	5
25%	2262	2	-10	-5
50%	2297	-2	-3	-2
75%	2329	0	-1	-3
90%	2343	0	0	0
100%	2343	0	0	0
Mean	2287	-1	-3	-3

Table G3a-159. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	601	-9	53	47
10%	1011	58	-7	18
25%	1517	-8	-19	-30
50%	2014	-6	-6	-48
75%	2239	0	-6	-7
90%	2299	1	1	0
100%	2300	0	0	0
Mean	1845	-1	-15	-17

Table G3a-160. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	2202	-1	8	7
10%	2256	7	-1	2
25%	2304	-1	-2	-3
50%	2346	0	0	-4
75%	2358	0	0	0
90%	2361	0	0	0
100%	2361	0	0	0
Mean	2327	0	-1	-1

G3a.3.4.16 Whiskeytown Reservoir (Clear)

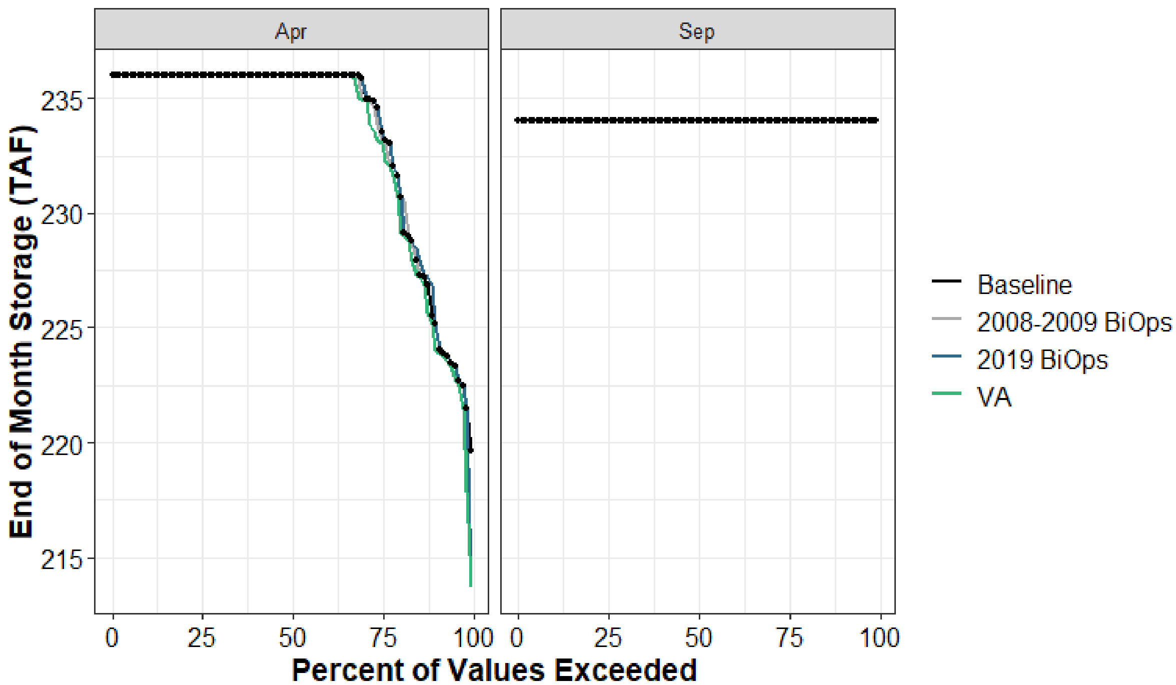

Figure G3a-74. Whiskeytown Reservoir End of April and End of September Storage (TAF) Percent Exceedance Plot

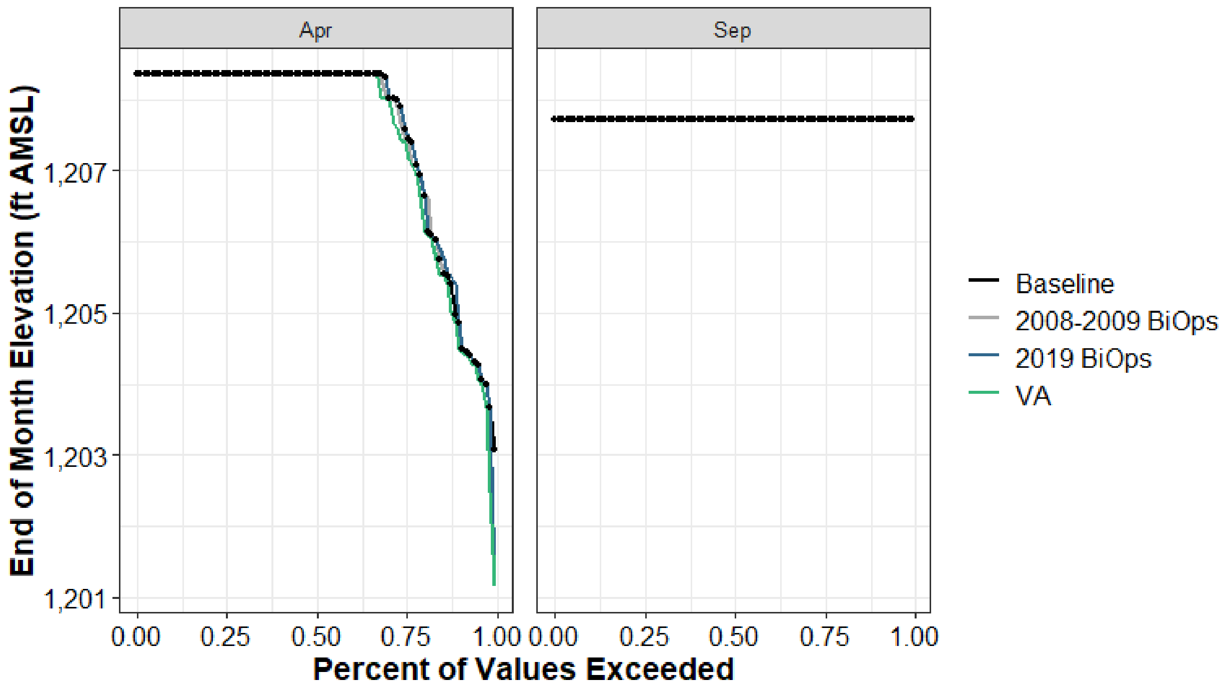

Figure G3a-75. Whiskeytown Reservoir End of April and End of September Elevation (ft AMSL) Percent Exceedance Plot

Table G3a-161. Distribution of Baseline September Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	234	0	0	0
10%	234	0	0	0
25%	234	0	0	0
50%	234	0	0	0
75%	234	0	0	0
90%	234	0	0	0
100%	234	0	0	0
Mean	234	0	0	0

Table G3a-162. Distribution of Baseline September Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1208	0	0	0
10%	1208	0	0	0
25%	1208	0	0	0
50%	1208	0	0	0
75%	1208	0	0	0
90%	1208	0	0	0
100%	1208	0	0	0
Mean	1208	0	0	0

Table G3a-163. Distribution of Baseline April Carryover Storage (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	220	-6	-6	-6
10%	225	0	0	-1
25%	234	0	0	-1
50%	236	0	0	0
75%	236	0	0	0
90%	236	0	0	0
100%	236	0	0	0
Mean	234	0	0	0

Table G3a-164. Distribution of Baseline April Storage Elevation (TAF) and Absolute Difference by Scenario

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1203	-2	-2	-2
10%	1205	0	0	0
25%	1208	0	0	0
50%	1208	0	0	0
75%	1208	0	0	0
90%	1208	0	0	0
100%	1208	0	0	0
Mean	1208	0	0	0

G3a.3.5 Water Supply

In this section, SacWAM results for water supply are presented by water budget area (WBA), other logical groupings of demand sites within the model domain but outside of the valley floor (upper watershed and foothill, San Francisco Bay Area), CVP contract type, and SWP contract type. The values presented by WBA include total water supplied including surface and groundwater to the demand locations by water year. Results presented for CVP and SWP deliveries only include surface supplies and are also summarized by water year. All water supply results are presented as simple aggregations of transmission link flows to the set of demand sites identified for each summary. WBAs in the Sacramento Valley include water delivered to SWP and CVP contractors in those WBAs.

Water supplies for many demand sites groups remain essentially unchanged among the model scenarios presented here. The WBAs and other demand site groups identified in Table G3a-165 show a change from baseline of less than one percent for all water years in all scenarios summarized and are not presented in this appendix. The reader may refer to Appendix A1, Section A1.12.8, *Water Supply*, for additional information regarding modeled baseline water supplies to these demand site groups.

Table G3a-165. Water Budget Areas and Demand Site Groups with Less than One Percent Maximum Annual Change in Supply from Baseline

WBA or Demand Site Group	Demand Type
Water Budget Area 2	Agricultural
Water Budget Area 2	Urban
Water Budget Area 3	Agricultural
Water Budget Area 7	Agricultural
Water Budget Area 8	Agricultural
Water Budget Area 8	Refuge
Water Budget Area 9	Agricultural
Water Budget Area 9	Refuge
Water Budget Area 11	Agricultural
Water Budget Area 11	Refuge
Water Budget Areas 14 and 15N	Agricultural
Water Budget Area 15S	Agricultural
Water Budget Area 16	Agricultural
Water Budget Area 17	Agricultural
Water Budget Area 17	Refuge
Water Budget Areas 18 and 19	Agricultural
Water Budget Areas 20 and 25	Urban
Water Budget Area 21	Agricultural
Water Budget Area 21	Urban
Water Budget Area 22	Agricultural
Delta	Urban
Water Budget Area 60N	Urban
San Francisco Bay Area	Urban
Total CVP Deliveries	Total
Total CVP North of Delta	Total
CVP North of Delta Water Service	Agricultural
CVP North of Delta Water Service	Urban
CVP Settlement	Agricultural
CVP Settlement	Urban
CVP North of Delta	Refuge

WBA or Demand Site Group	Demand Type
Total CVP South of Delta	Total
CVP South of Delta Water Service	Agricultural
CVP South of Delta Water Service	Urban
CVP SOD Exchange	Agricultural
CVP SOD Refuge	Refuge
Total SWP Deliveries	Total
Total SWP Table A	Total
SWP Table A North of Delta	Total
SWP Table A South of Delta	Total
Total SWP Article 21	Article 21
SWP Article 21 Central Coast and Tulare	Article 21
SWP Article 21 South Bay Aqueduct	Article 21
SWP Article 21 South Coast	Article 21
SWP Article 21 Napa	Article 21
SWP Feather River Service Area	Agricultural
SWP Settlement	Urban

G3a.3.5.1 Water Budget Area 2 (Agricultural)

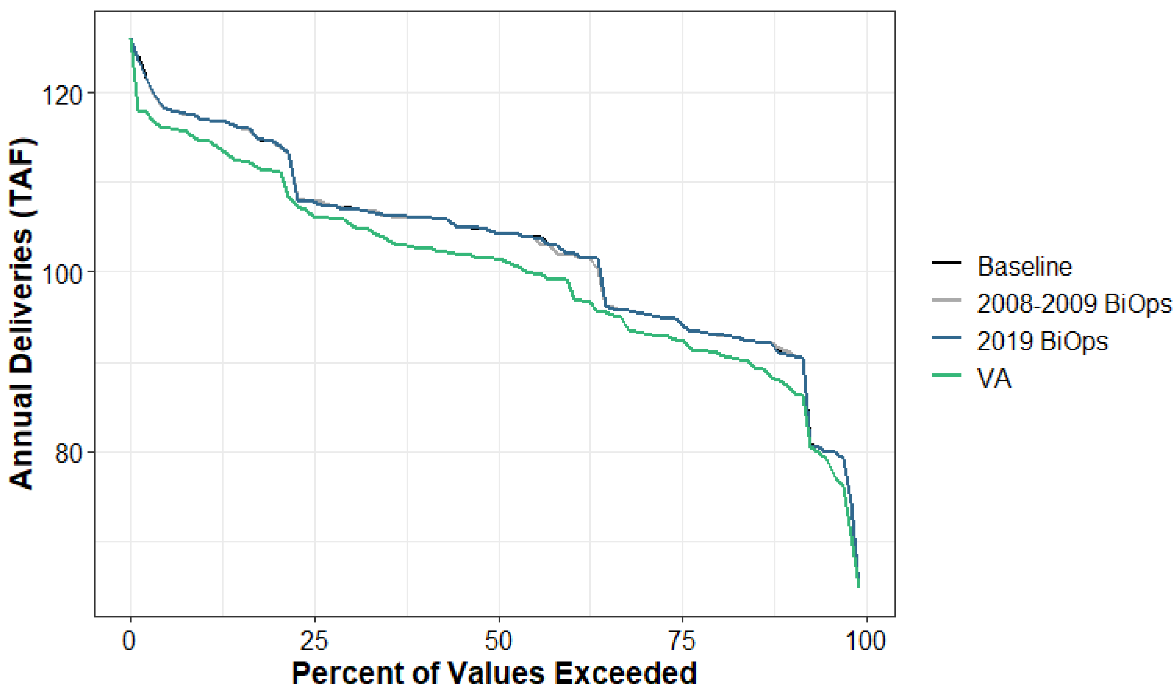

Figure G3a-76. Total Water Supplied to Water Budget Area 2 (Agricultural) Annual Percent Exceedance Plot

Table G3a-166. Total Water Supplied to Water Budget Area 2 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	126	126	126	126
10%	117	117	117	115
20%	114	114	114	111
30%	107	107	107	105
40%	106	106	106	103
50%	104	104	104	101
60%	102	102	102	99
70%	95	95	95	93
80%	93	93	93	91
90%	91	91	91	87
100%	65	65	65	65
Mean	103	103	103	100

Table G3a-167. Total Water Supplied to Water Budget Area 2 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	111	110	111	110
D	105	105	105	100
BN	104	104	104	99
AN	100	100	100	95
W	97	97	97	97
All	103	103	103	100

G3a.3.5.2 Water Budget Area 2 (Urban)

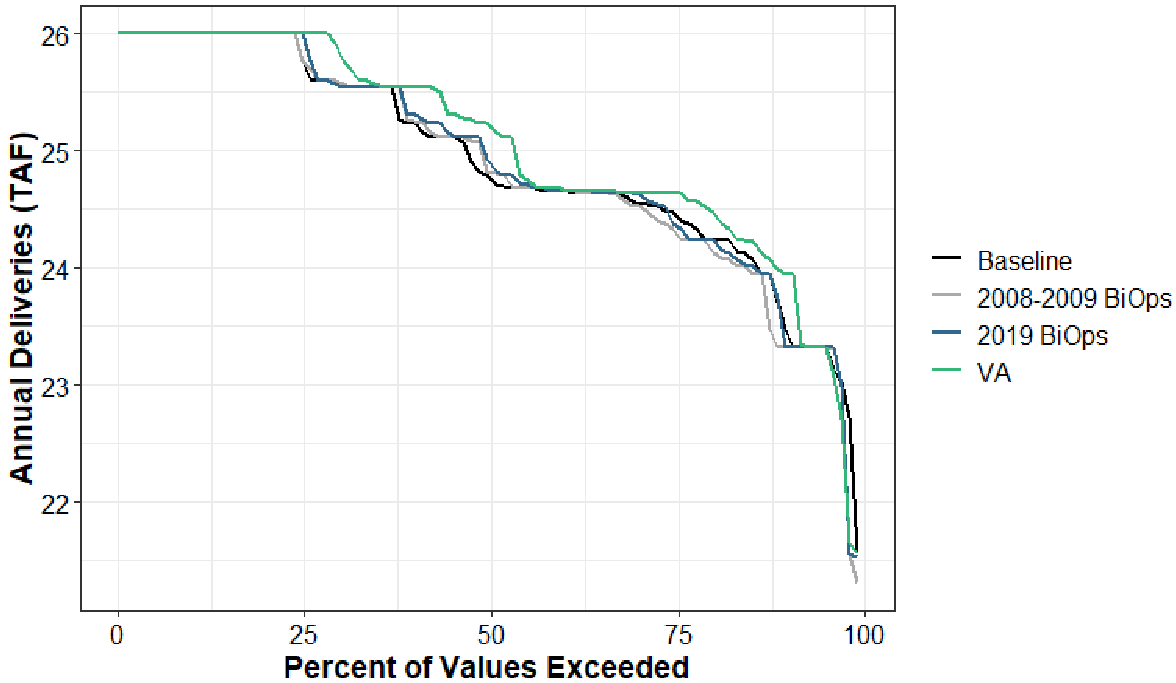

Figure G3a-77. Total Water Supplied to Water Budget Area 2 (Urban) Annual Percent Exceedance Plot

Table G3a-168. Total Water Supplied to Water Budget Area 2 (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	26	26	26	26
10%	26	26	26	26
20%	26	26	26	26
30%	25.6	25.6	25.6	25.8
40%	25.2	25.3	25.3	25.5
50%	24.8	24.8	24.9	25.2
60%	24.7	24.7	24.7	24.7
70%	24.6	24.5	24.6	24.6
80%	24.2	24.2	24.2	24.5
90%	23.5	23.3	23.4	24
100%	21.6	21.3	21.5	21.6
Mean	24.9	24.9	24.9	25

Table G3a-169. Total Water Supplied to Water Budget Area 2 (Urban) Average by Water Year Type (TAF).

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	24.5	24.5	24.4	24.4
D	24.8	24.7	24.8	24.9
BN	24.4	24.3	24.5	24.9
AN	25.5	25.5	25.4	25.6
W	25.3	25.3	25.3	25.3
All	24.9	24.9	24.9	25

G3a.3.5.3 Water Budget Area 3 (Agricultural)

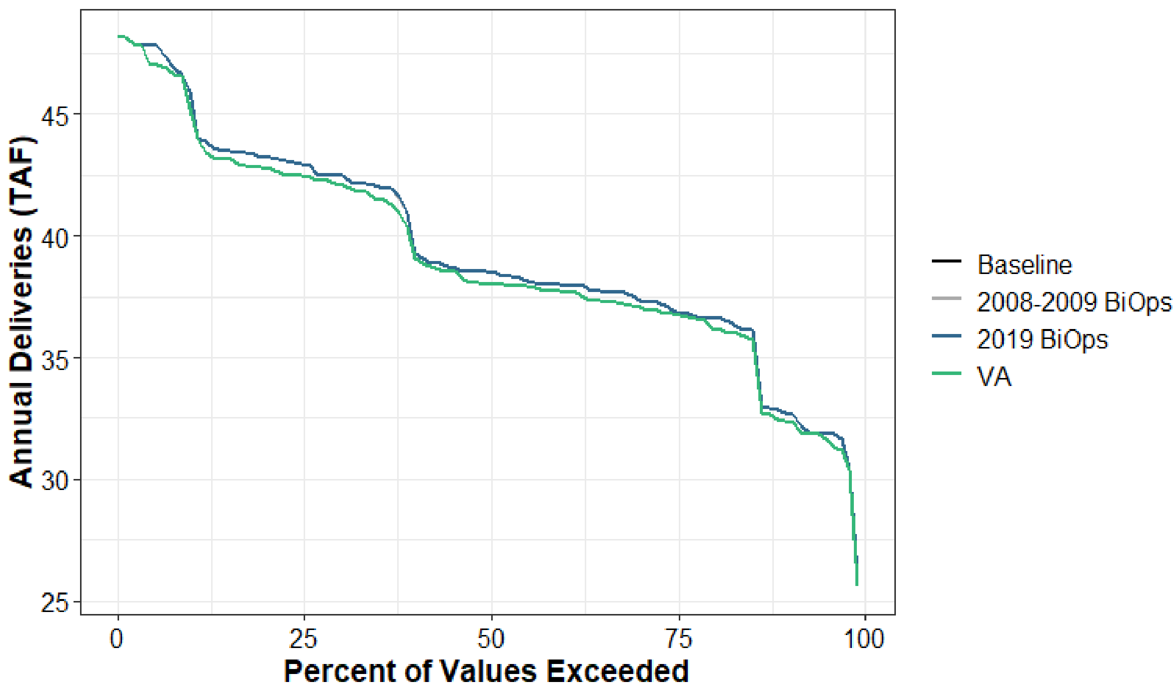

Figure G3a-78. Total Water Supplied to Water Budget Area 3 (Agricultural) Annual Percent Exceedance Plot

Table G3a-170. Total Water Supplied to Water Budget Area 3 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	48	48	48	48
10%	46	46	46	45
20%	43	43	43	43
30%	42	42	42	42
40%	40	40	40	39
50%	39	39	39	38
60%	38	38	38	38
70%	37	37	37	37
80%	37	37	37	36
90%	33	33	33	32
100%	26	26	26	26
Mean	39	39	39	39

Table G3a-171. Total Water Supplied to Water Budget Area 3 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	43	43	43	43
D	41	41	41	41
BN	39	39	39	38
AN	37	37	37	37
W	38	38	38	38
All	39	39	39	39

G3a.3.5.4 Water Budget Area 7 (Agricultural)

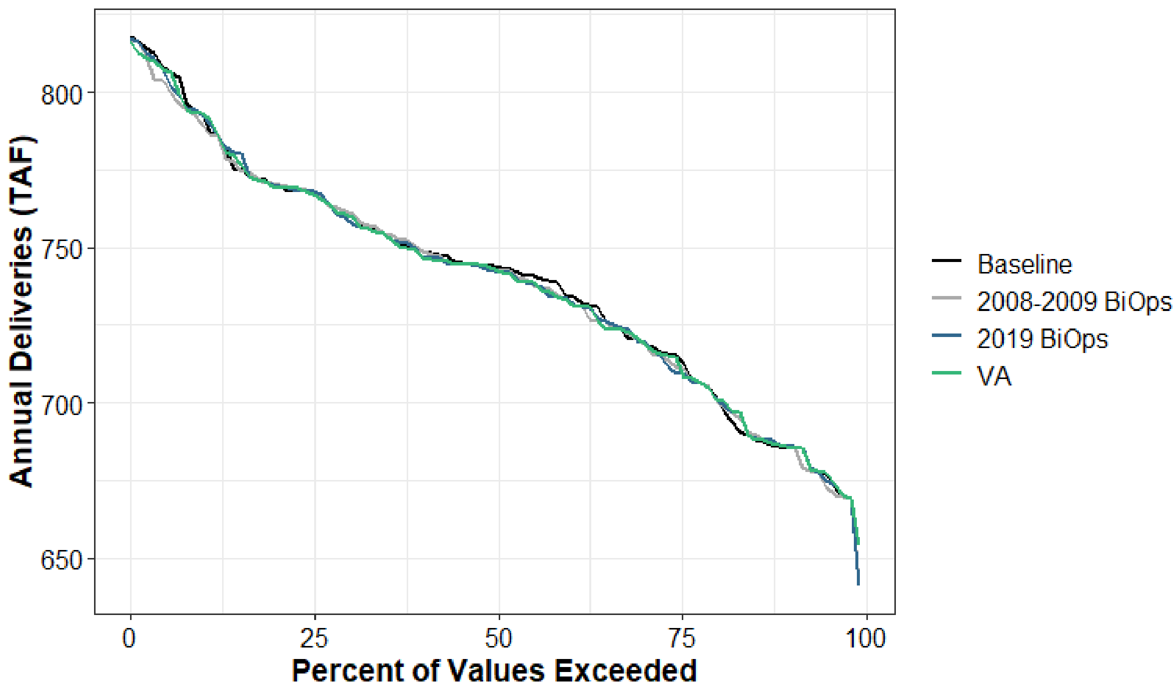

Figure G3a-79. Total Water Supplied to Water Budget Area 7 (Agricultural) Annual Percent Exceedance Plot

Table G3a-172. Total Water Supplied to Water Budget Area 7 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	818	816	817	816
10%	792	789	792	793
20%	770	770	770	769
30%	760	761	759	760
40%	749	749	747	747
50%	744	743	743	743
60%	734	733	733	733
70%	720	720	720	720
80%	703	703	703	702
90%	686	686	686	686
100%	642	641	641	654
Mean	739	739	739	739

Table G3a-173. Total Water Supplied to Water Budget Area 7 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	745	745	743	744
D	758	755	758	756
BN	753	753	752	753
AN	735	734	734	735
W	716	717	717	717
All	739	739	739	739

G3a.3.5.5 Water Budget Area 8 (Agricultural)

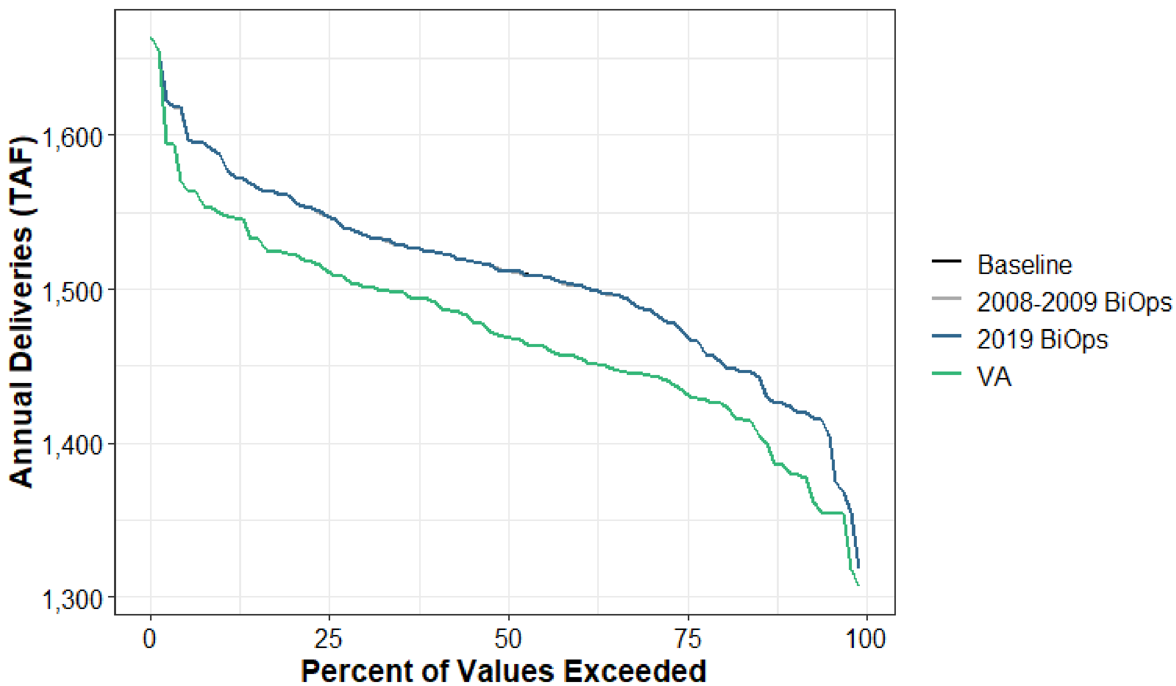

Figure G3a-80. Total Water Supplied to Water Budget Area 8 (Agricultural) Annual Percent Exceedance Plot

Table G3a-174. Total Water Supplied to Water Budget Area 8 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1,664	1,664	1,664	1,664
10%	1,585	1,585	1,585	1,549
20%	1,559	1,559	1,559	1,523
30%	1,536	1,536	1,536	1,502
40%	1,524	1,524	1,524	1,492
50%	1,512	1,512	1,512	1,470
60%	1,503	1,502	1,503	1,457
70%	1,487	1,487	1,487	1,444
80%	1,455	1,454	1,455	1,426
90%	1,425	1,425	1,425	1,382
100%	1,318	1,318	1,318	1,307
Mean	1,509	1,508	1,508	1,472

Table G3a-175. Total Water Supplied to Water Budget Area 8 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,562	1,562	1,562	1,561
D	1,536	1,536	1,536	1,468
BN	1,517	1,517	1,517	1,450
AN	1,484	1,484	1,484	1,417
W	1,464	1,464	1,464	1,464
All	1,509	1,508	1,508	1,472

G3a.3.5.6 Water Budget Area 8 (Refuge)

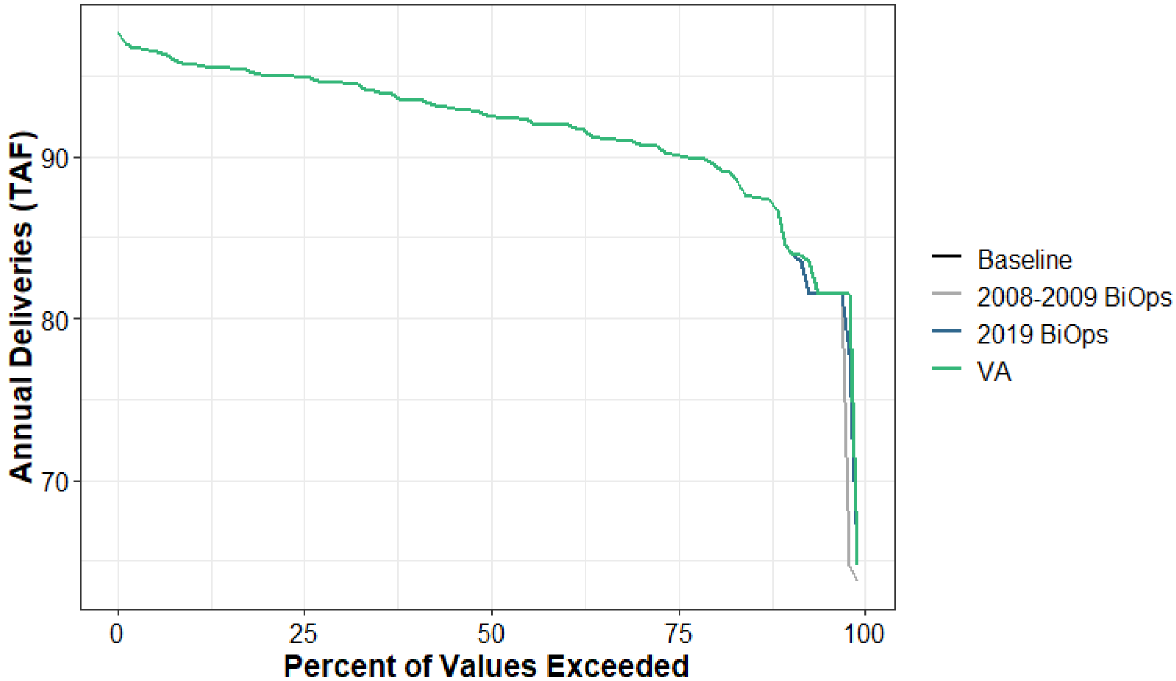

Figure G3a-81. Total Water Supplied to Water Budget Area 8 (Refuge) Annual Percent Exceedance Plot

Table G3a-176. Total Water Supplied to Water Budget Area 8 (Refuge) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	98	98	98	98
10%	96	96	96	96
20%	95	95	95	95
30%	95	95	95	95
40%	93	93	93	93
50%	93	93	93	93
60%	92	92	92	92
70%	91	91	91	91
80%	90	90	90	90
90%	85	85	85	85
100%	65	64	65	65
Mean	92	91	92	92

Table G3a-177. Total Water Supplied to Water Budget Area 8 (Refuge) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	90	90	90	90
D	93	93	93	93
BN	92	92	92	92
AN	91	89	91	91
W	91	91	91	91
All	92	91	92	92

G3a.3.5.7 Water Budget Area 9 (Agricultural)

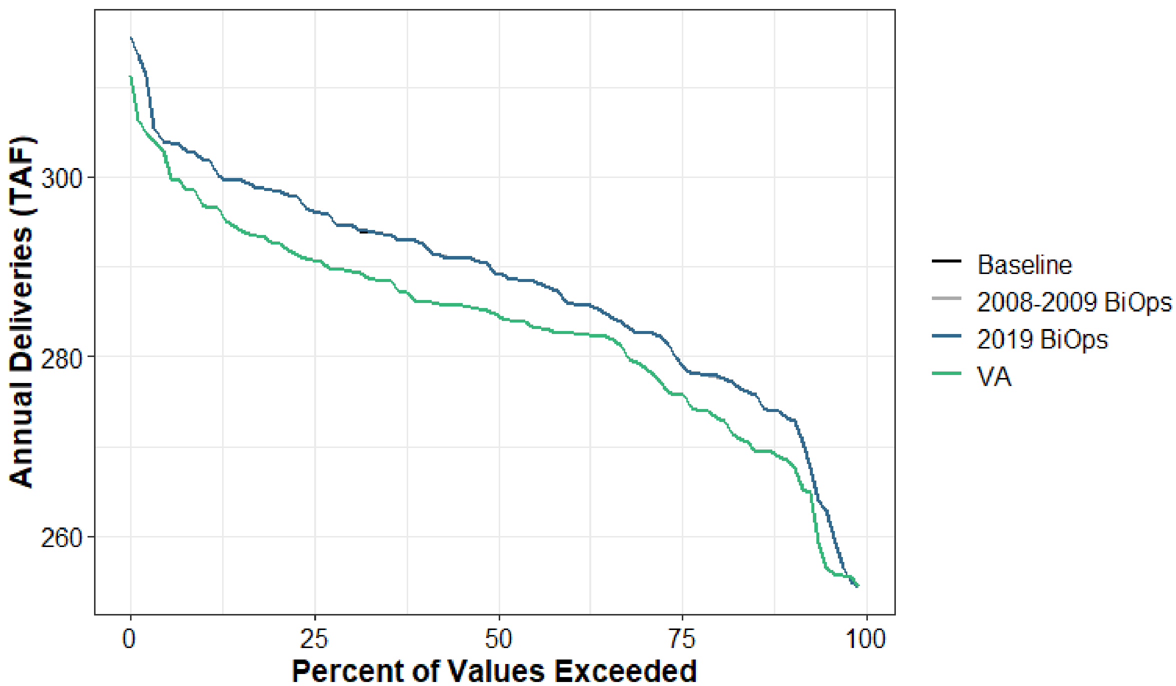

Figure G3a-82. Total Water Supplied to Water Budget Area 9 (Agricultural) Annual Percent Exceedance Plot

Table G3a-178. Total Water Supplied to Water Budget Area 9 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	316	316	316	311
10%	302	302	302	297
20%	299	299	299	293
30%	295	295	295	289
40%	293	293	293	286
50%	289	289	289	285
60%	286	286	286	283
70%	283	283	283	279
80%	278	278	278	273
90%	273	273	273	269
100%	254	254	254	254
Mean	288	288	288	283

Table G3a-179. Total Water Supplied to Water Budget Area 9 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	296	296	296	296
D	294	294	294	285
BN	292	292	292	283
AN	284	284	284	276
W	278	278	278	278
All	288	288	288	283

G3a.3.5.8 Water Budget Area 9 (Refuge)

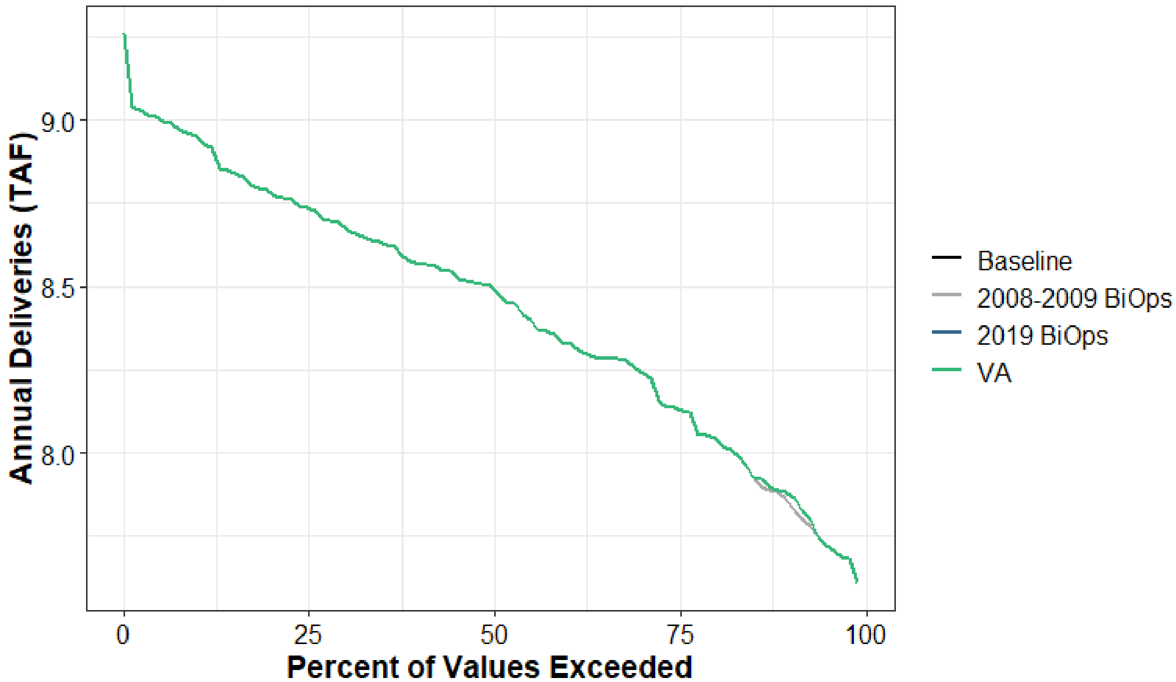

Figure G3a-83. Total Water Supplied to Water Budget Area 9 (Refuge) Annual Percent Exceedance Plot

Table G3a-180. Total Water Supplied to Water Budget Area 9 (Refuge) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	9.3	9.3	9.3	9.3
10%	8.9	8.9	8.9	8.9
20%	8.8	8.8	8.8	8.8
30%	8.7	8.7	8.7	8.7
40%	8.6	8.6	8.6	8.6
50%	8.5	8.5	8.5	8.5
60%	8.3	8.3	8.3	8.3
70%	8.3	8.3	8.3	8.3
80%	8	8	8	8
90%	7.9	7.9	7.9	7.9
100%	7.6	7.6	7.6	7.6
Mean	8.4	8.4	8.4	8.4

Table G3a-181. Total Water Supplied to Water Budget Area 9 (Refuge) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	8.8	8.8	8.8	8.8
D	8.6	8.6	8.6	8.6
BN	8.5	8.5	8.5	8.5
AN	8.3	8.3	8.3	8.3
W	8.1	8.1	8.1	8.1
All	8.4	8.4	8.4	8.4

G3a.3.5.9 Water Budget Area 11 (Agricultural)

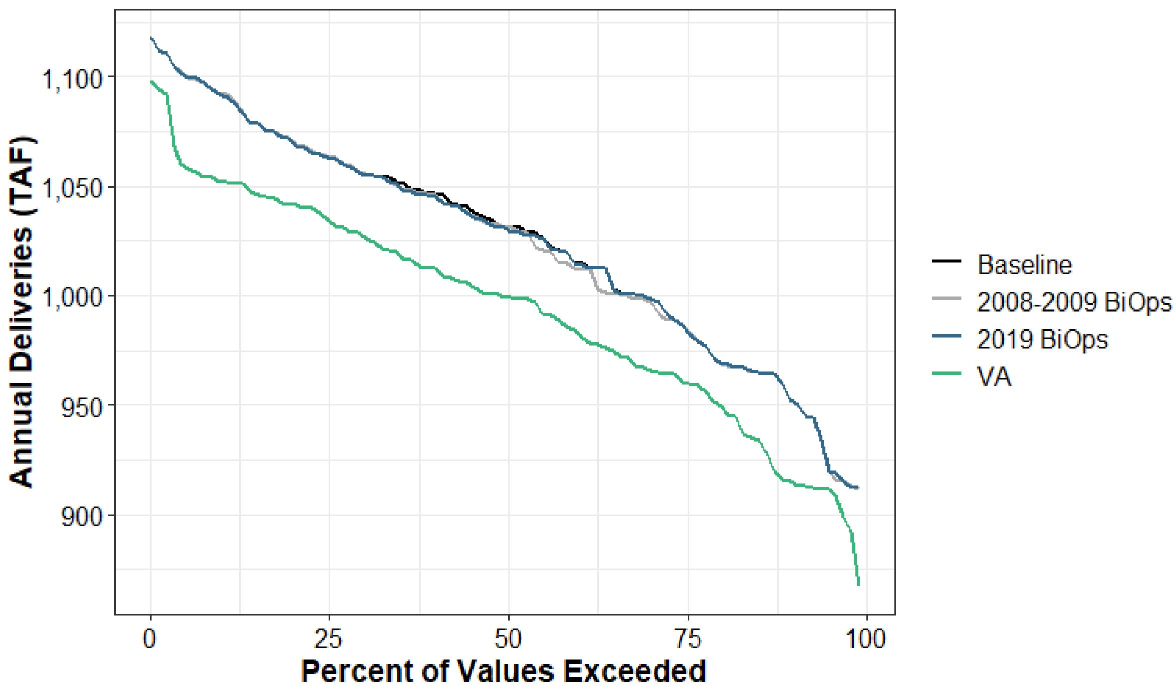

Figure G3a-84. Total Water Supplied to Water Budget Area 11 (Agricultural) Annual Percent Exceedance Plot

Table G3a-182. Total Water Supplied to Water Budget Area 11 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1,118	1,118	1,118	1,098
10%	1,092	1,092	1,092	1,052
20%	1,071	1,071	1,070	1,042
30%	1,056	1,056	1,056	1,027
40%	1,047	1,046	1,045	1,013
50%	1,031	1,032	1,031	1,000
60%	1,015	1,012	1,015	983
70%	999	998	999	967
80%	970	970	970	950
90%	954	954	954	916
100%	912	912	912	867
Mean	1,025	1,024	1,024	994

Table G3a-183. Total Water Supplied to Water Budget Area 11 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,041	1,035	1,039	1,041
D	1,051	1,051	1,051	993
BN	1,046	1,046	1,046	989
AN	1,009	1,008	1,008	953
W	991	991	991	991
All	1,025	1,024	1,024	994

G3a.3.5.10 Water Budget Area 11 (Refuge)

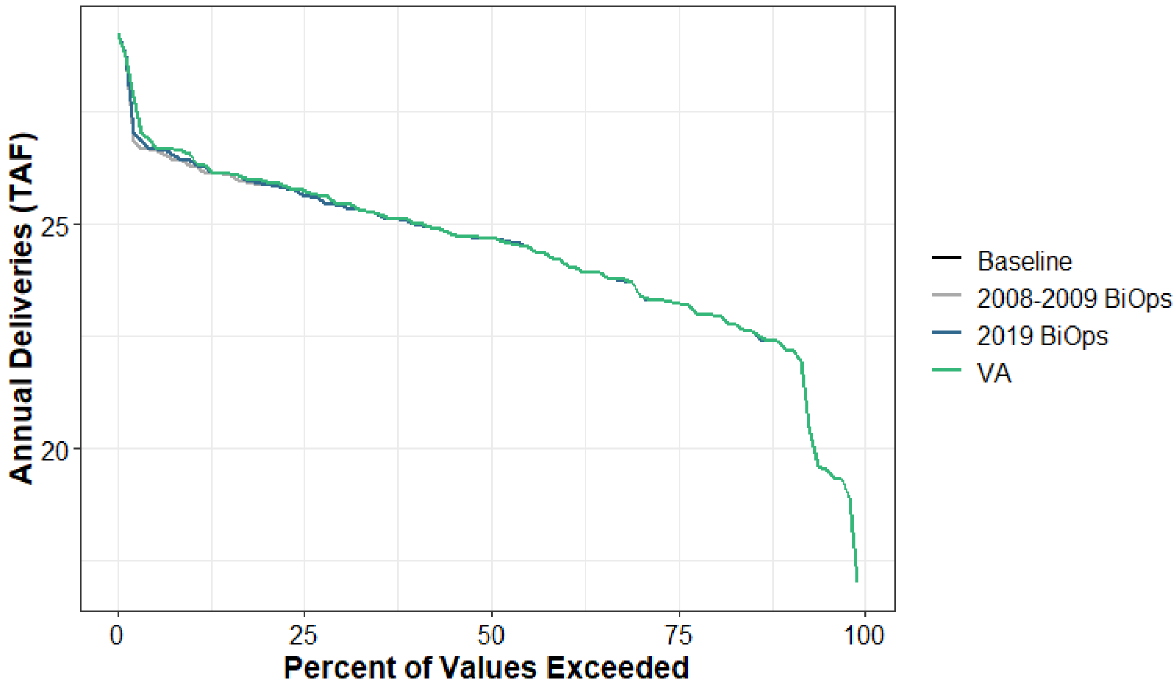

Figure G3a-85. Total Water Supplied to Water Budget Area 11 (Refuge) Annual Percent Exceedance Plot

Table G3a-184. Total Water Supplied to Water Budget Area 11 (Refuge) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	29.2	29.3	29.3	29.3
10%	26.4	26.3	26.4	26.5
20%	25.9	25.9	25.9	26
30%	25.4	25.4	25.4	25.5
40%	25	25	25	25
50%	24.7	24.7	24.7	24.7
60%	24.2	24.2	24.2	24.2
70%	23.6	23.6	23.6	23.6
80%	23	23	23	23
90%	22.3	22.3	22.3	22.3
100%	17	17	17	17
Mean	24.3	24.3	24.3	24.4

Table G3a-185. Total Water Supplied to Water Budget Area 11 (Refuge) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	22.6	22.6	22.6	22.6
D	25.6	25.6	25.6	25.7
BN	25.2	25.2	25.2	25.2
AN	24.6	24.5	24.6	24.7
W	23.6	23.6	23.6	23.6
All	24.3	24.3	24.3	24.4

G3a.3.5.11 Water Budget Areas 14 and 15N (Agricultural)

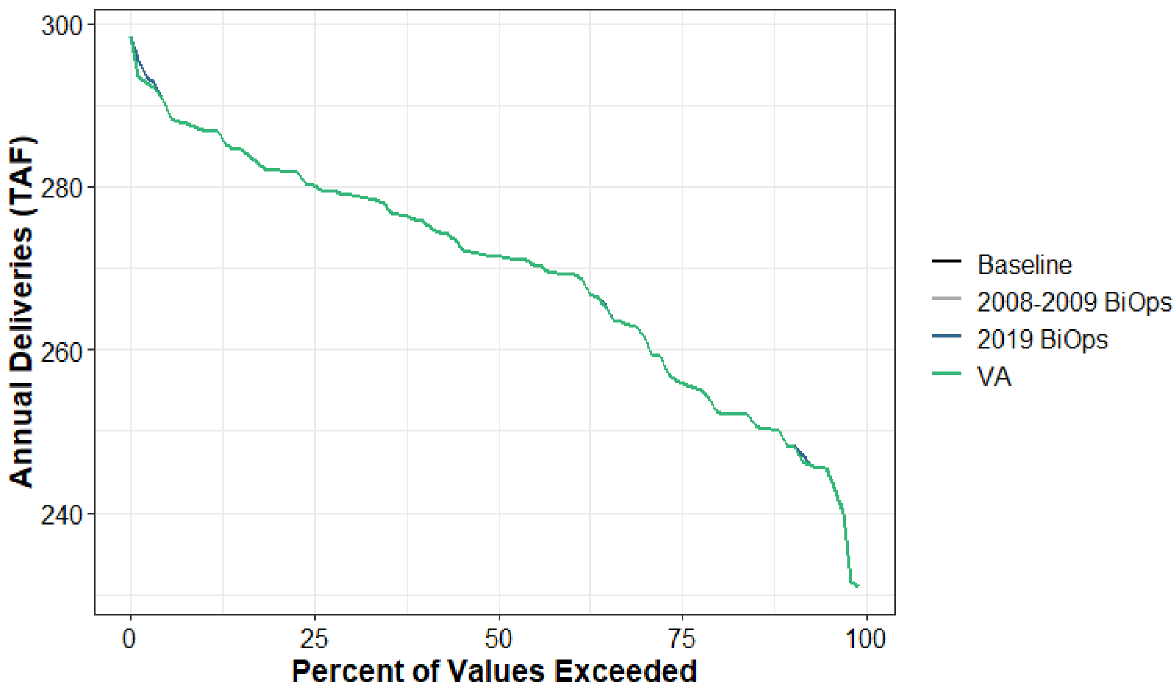

Figure G3a-86. Total Water Supplied to Water Budget Areas 14 and 15N (Agricultural) Annual Percent Exceedance Plot

Table G3a-186. Total Water Supplied to Water Budget Areas 14 and 15N (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	298	298	298	298
10%	287	287	287	287
20%	282	282	282	282
30%	279	279	279	279
40%	276	276	276	276
50%	271	271	271	271
60%	269	269	269	269
70%	262	262	262	262
80%	253	253	253	253
90%	249	249	249	249
100%	231	231	231	231
Mean	269	269	269	269

Table G3a-187. Total Water Supplied to Water Budget Areas 14 and 15N (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	280	280	280	280
D	277	277	277	277
BN	273	273	273	273
AN	265	265	265	265
W	258	258	258	258
All	269	269	269	269

G3a.3.5.12 Water Budget Area 15S (Agricultural)

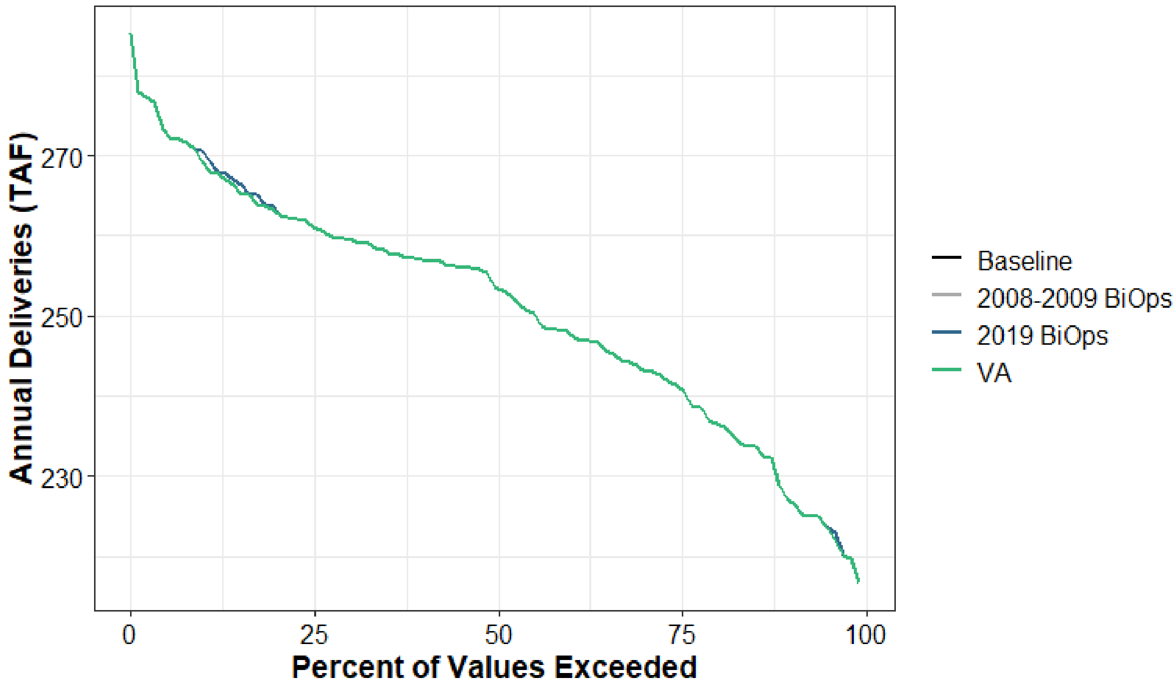

Figure G3a-87. Total Water Supplied to Water Budget Area 15S (Agricultural) Annual Percent Exceedance Plot

Table G3a-188. Total Water Supplied to Water Budget Area 15S (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	285	285	285	285
10%	270	270	270	269
20%	263	263	263	263
30%	260	260	260	260
40%	257	257	257	257
50%	254	254	254	254
60%	248	248	248	248
70%	244	244	244	244
80%	237	237	237	237
90%	228	228	228	228
100%	217	217	217	217
Mean	251	251	251	251

Table G3a-189. Total Water Supplied to Water Budget Area 15S (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	263	263	263	262
D	258	258	258	258
BN	253	253	253	253
AN	247	247	247	247
W	240	240	240	240
All	251	251	251	251

G3a.3.5.13 Water Budget Area 16 (Agricultural)

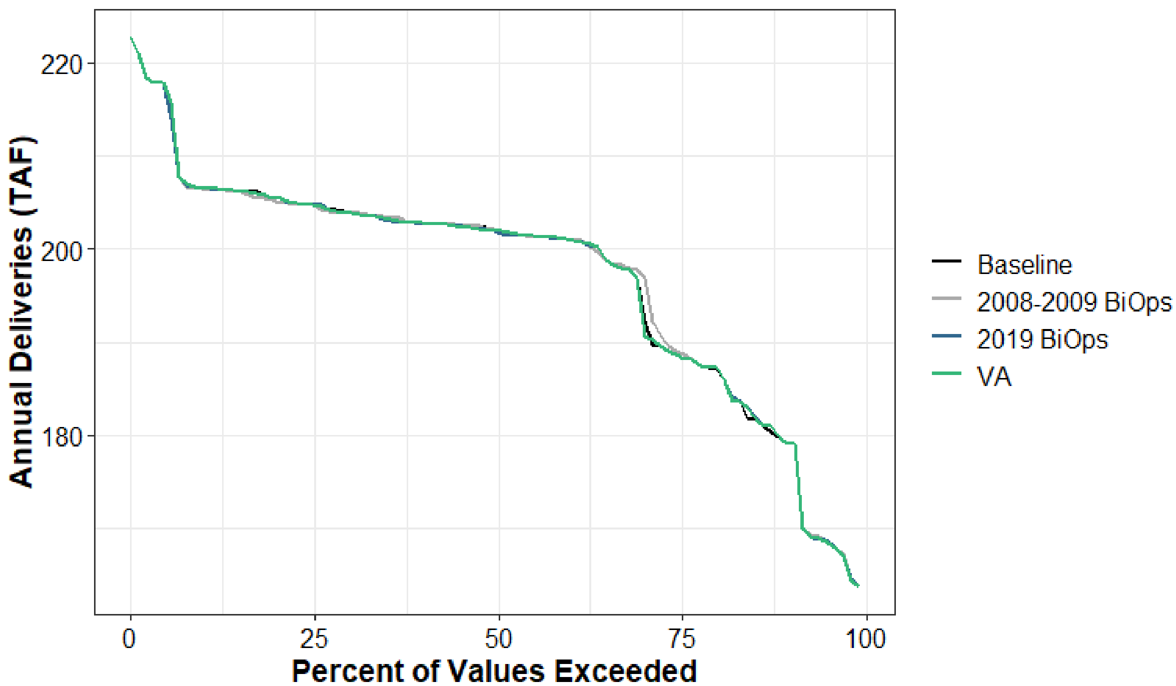

Figure G3a-88. Total Water Supplied to Water Budget Area 16 (Agricultural) Annual Percent Exceedance Plot

Table G3a-190. Total Water Supplied to Water Budget Area 16 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	223	223	223	223
10%	206	206	207	206
20%	205	205	205	205
30%	204	204	204	204
40%	203	203	203	203
50%	202	202	202	202
60%	201	201	201	201
70%	195	197	194	194
80%	187	187	187	187
90%	179	179	179	179
100%	164	164	164	164
Mean	197	197	197	197

Table G3a-191. Total Water Supplied to Water Budget Area 16 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	207	207	207	207
D	202	202	202	201
BN	198	198	198	198
AN	194	194	194	194
W	190	190	190	190
All	197	197	197	197

G3a.3.5.14 Water Budget Area 17 (Agricultural)

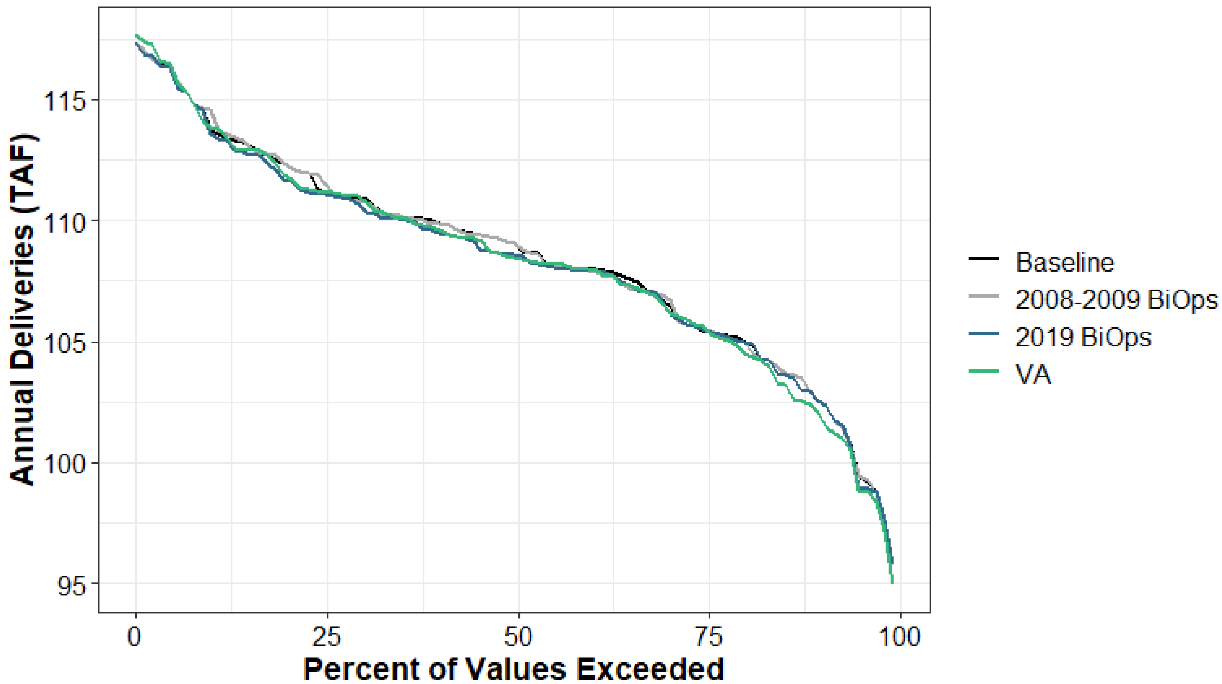

Figure G3a-89. Total Water Supplied to Water Budget Area 17 (Agricultural) Annual Percent Exceedance Plot

Table G3a-192. Total Water Supplied to Water Budget Area 17 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	117	117	117	118
10%	114	114	114	114
20%	112	112	112	112
30%	111	111	110	111
40%	110	110	109	110
50%	109	109	109	108
60%	108	108	108	108
70%	107	107	106	106
80%	105	105	105	105
90%	103	103	103	102
100%	96	96	96	95
Mean	109	109	108	108

Table G3a-193. Total Water Supplied to Water Budget Area 17 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	111	111	111	112
D	110	110	109	110
BN	109	109	109	109
AN	107	107	107	107
W	106	106	106	106
All	109	109	108	108

G3a.3.5.15 Water Budget Area 17 (Refuge)

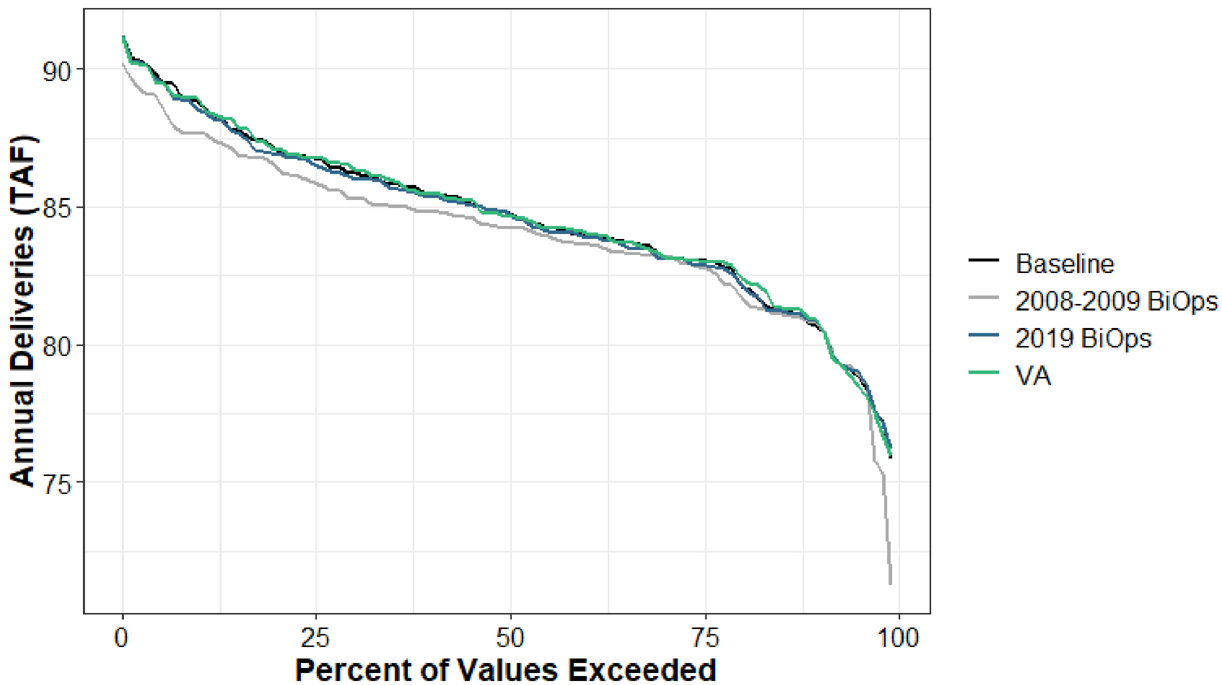

Figure G3a-90. Total Water Supplied to Water Budget Area 17 (Refuge) Annual Percent Exceedance Plot

Table G3a-194. Total Water Supplied to Water Budget Area 17 (Refuge) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	91	90	91	91
10%	89	88	89	89
20%	87	86	87	87
30%	86	85	86	86
40%	85	85	85	85
50%	85	84	85	85
60%	84	84	84	84
70%	83	83	83	83
80%	82	82	82	83
90%	81	81	81	81
100%	76	71	76	76
Mean	85	84	85	85

Table G3a-195. Total Water Supplied to Water Budget Area 17 (Refuge) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	84	84	84	84
D	85	84	85	85
BN	85	84	85	85
AN	84	83	84	84
W	85	84	85	85
All	85	84	85	85

G3a.3.5.16 Water Budget Areas 18 and 19 (Agricultural)

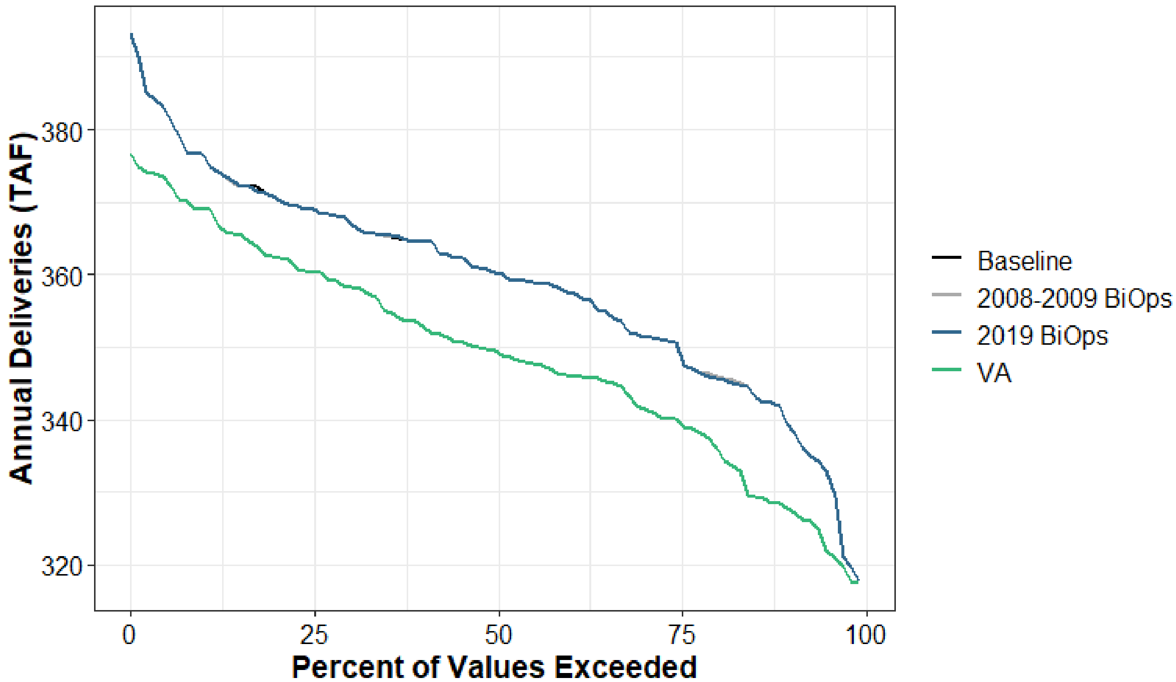

Figure G3a-91. Total Water Supplied to Water Budget Areas 18 and 19 (Agricultural) Annual Percent Exceedance Plot

Table G3a-196. Total Water Supplied to Water Budget Areas 18 and 19 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	393	393	393	377
10%	376	376	376	369
20%	371	371	371	362
30%	367	367	367	358
40%	365	365	365	353
50%	360	360	360	350
60%	358	358	358	346
70%	352	352	352	342
80%	346	346	346	337
90%	340	340	340	328
100%	318	318	318	318
Mean	359	359	359	349

Table G3a-197. Total Water Supplied to Water Budget Areas 18 and 19 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	364	364	364	364
D	365	365	365	348
BN	365	365	365	346
AN	355	356	355	337
W	349	349	349	349
All	359	359	359	349

G3a.3.5.17 Water Budget Areas 20 and 25 (Urban)

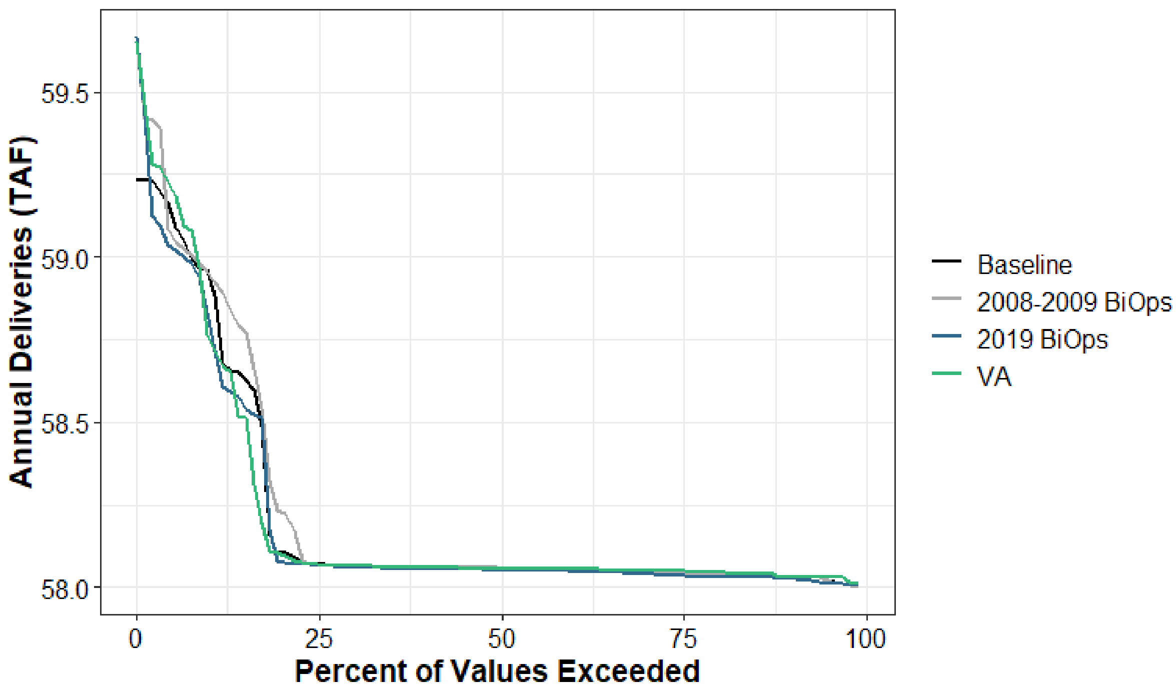

Figure G3a-92. Total Water Supplied to Water Budget Areas 20 and 25 (Urban) Annual Percent Exceedance Plot

Table G3a-198. Total Water Supplied to Water Budget Areas 20 and 25 (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	59	60	60	60
10%	59	59	59	59
20%	58	58	58	58
30%	58	58	58	58
40%	58	58	58	58
50%	58	58	58	58
60%	58	58	58	58
70%	58	58	58	58
80%	58	58	58	58
90%	58	58	58	58
100%	58	58	58	58
Mean	58	58	58	58

Table G3a-199. Total Water Supplied to Water Budget Areas 20 and 25 (Urban) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	59	59	59	59
D	58	58	58	58
BN	58	58	58	58
AN	58	58	58	58
W	58	58	58	58
All	58	58	58	58

G3a.3.5.18 Water Budget Area 21 (Agricultural)

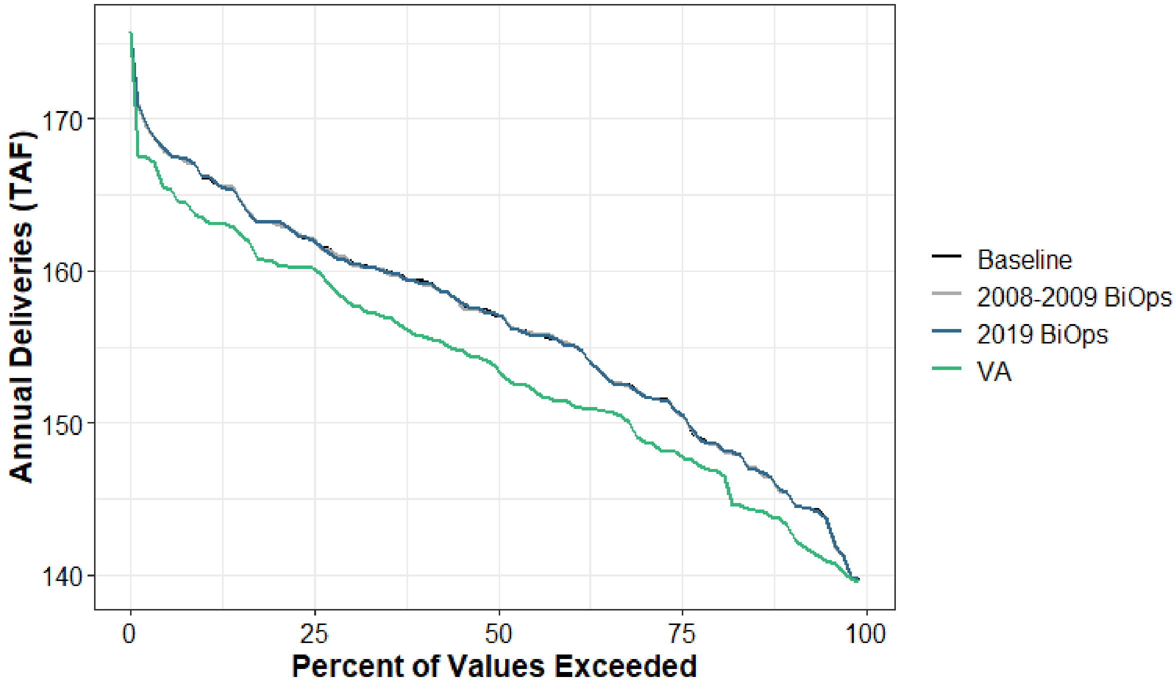

Figure G3a-93. Total Water Supplied to Water Budget Area 21 (Agricultural) Annual Percent Exceedance Plot

Table G3a-200. Total Water Supplied to Water Budget Area 21 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	176	176	176	176
10%	166	166	166	163
20%	163	163	163	160
30%	161	161	161	158
40%	159	159	159	156
50%	157	157	157	154
60%	155	155	155	151
70%	152	152	152	149
80%	149	149	149	147
90%	145	145	145	143
100%	140	140	140	140
Mean	156	156	156	154

Table G3a-201. Total Water Supplied to Water Budget Area 21 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	163	163	163	163
D	160	160	160	154
BN	157	157	157	152
AN	155	155	155	150
W	151	151	151	151
All	156	156	156	154

G3a.3.5.19 Water Budget Area 21 (Urban)

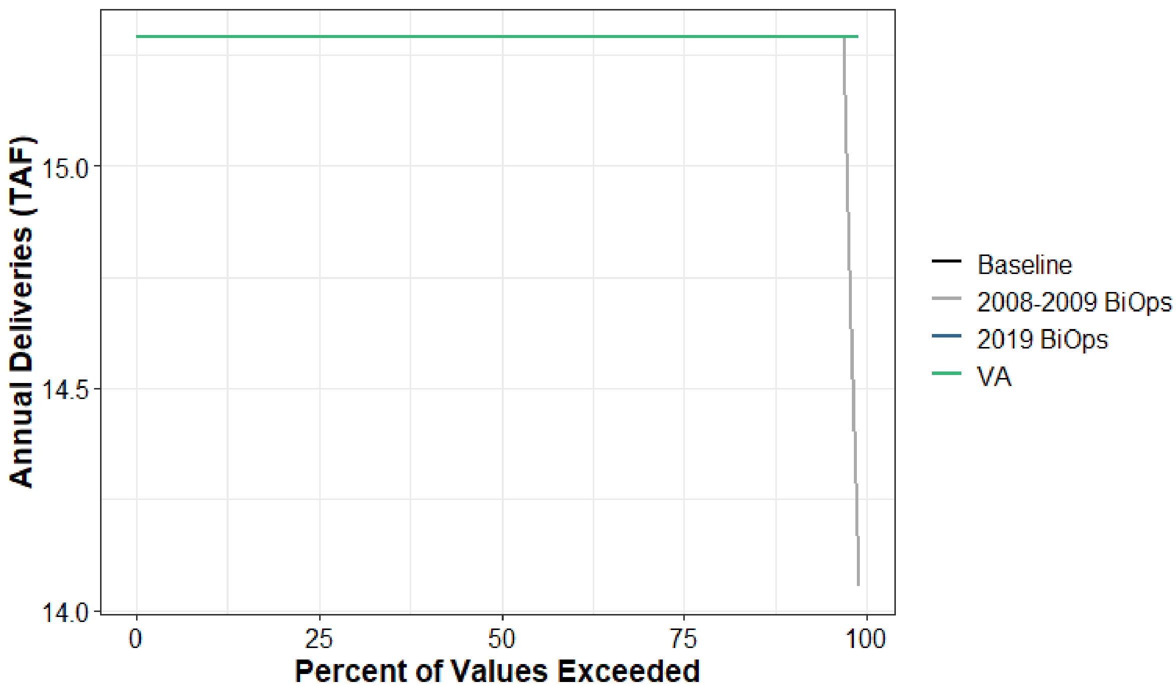

Figure G3a-94. Total Water Supplied to Water Budget Area 21 (Urban) Annual Percent Exceedance Plot

Table G3a-202. Total Water Supplied to Water Budget Area 21 (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	15.3	15.3	15.3	15.3
10%	15.3	15.3	15.3	15.3
20%	15.3	15.3	15.3	15.3
30%	15.3	15.3	15.3	15.3
40%	15.3	15.3	15.3	15.3
50%	15.3	15.3	15.3	15.3
60%	15.3	15.3	15.3	15.3
70%	15.3	15.3	15.3	15.3
80%	15.3	15.3	15.3	15.3
90%	15.3	15.3	15.3	15.3
100%	15.3	14.1	15.3	15.3
Mean	15.3	15.3	15.3	15.3

Table G3a-203. Total Water Supplied to Water Budget Area 21 (Urban) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	15.3	15.2	15.3	15.3
D	15.3	15.3	15.3	15.3
BN	15.3	15.3	15.3	15.3
AN	15.3	15.2	15.3	15.3
W	15.3	15.3	15.3	15.3
All	15.3	15.3	15.3	15.3

G3a.3.5.20 Water Budget Area 22 (Agricultural)

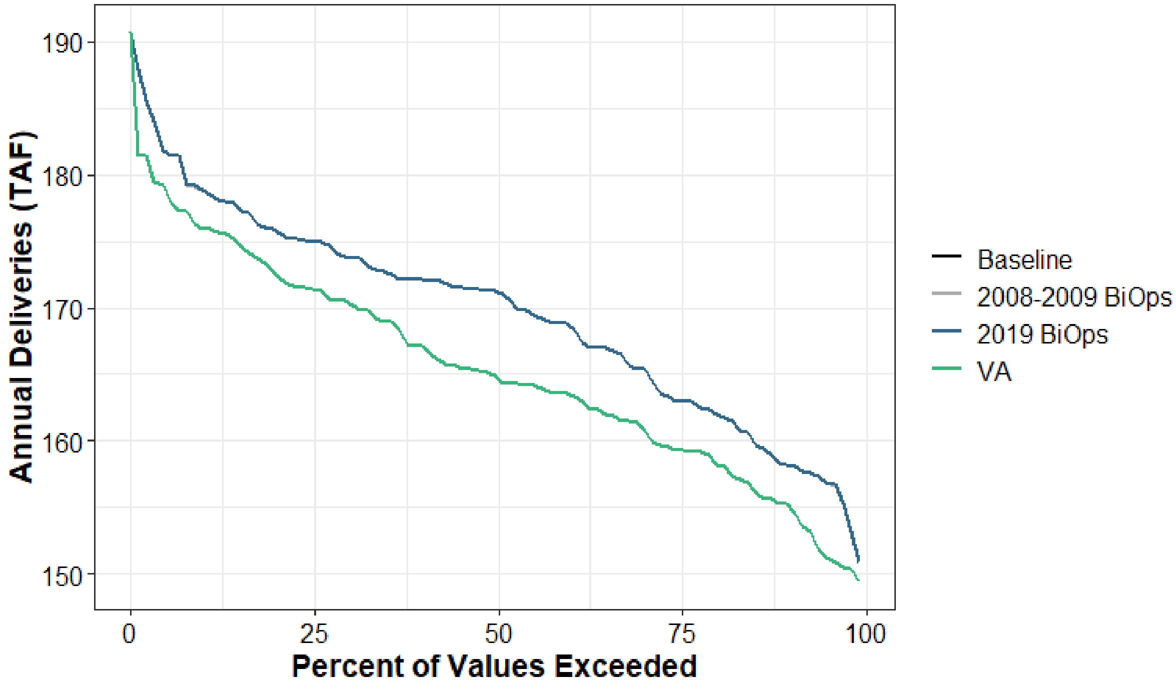

Figure G3a-95. Total Water Supplied to Water Budget Area 22 (Agricultural) Annual Percent Exceedance Plot

Table G3a-204. Total Water Supplied to Water Budget Area 22 (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	191	191	191	191
10%	179	179	179	176
20%	176	176	176	172
30%	174	174	174	170
40%	172	172	172	167
50%	171	171	171	165
60%	169	169	169	164
70%	165	165	165	161
80%	162	162	162	159
90%	158	158	158	155
100%	151	151	151	149
Mean	170	170	170	165

Table G3a-205. Total Water Supplied to Water Budget Area 22 (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	177	177	177	177
D	173	173	173	165
BN	171	171	171	163
AN	167	167	167	159
W	164	164	164	164
All	170	170	170	165

G3a.3.5.21 Delta (Urban)

The values in the figure and tables that follow summarize diversions to the City of Antioch (demand site U_ANTOC_NU).

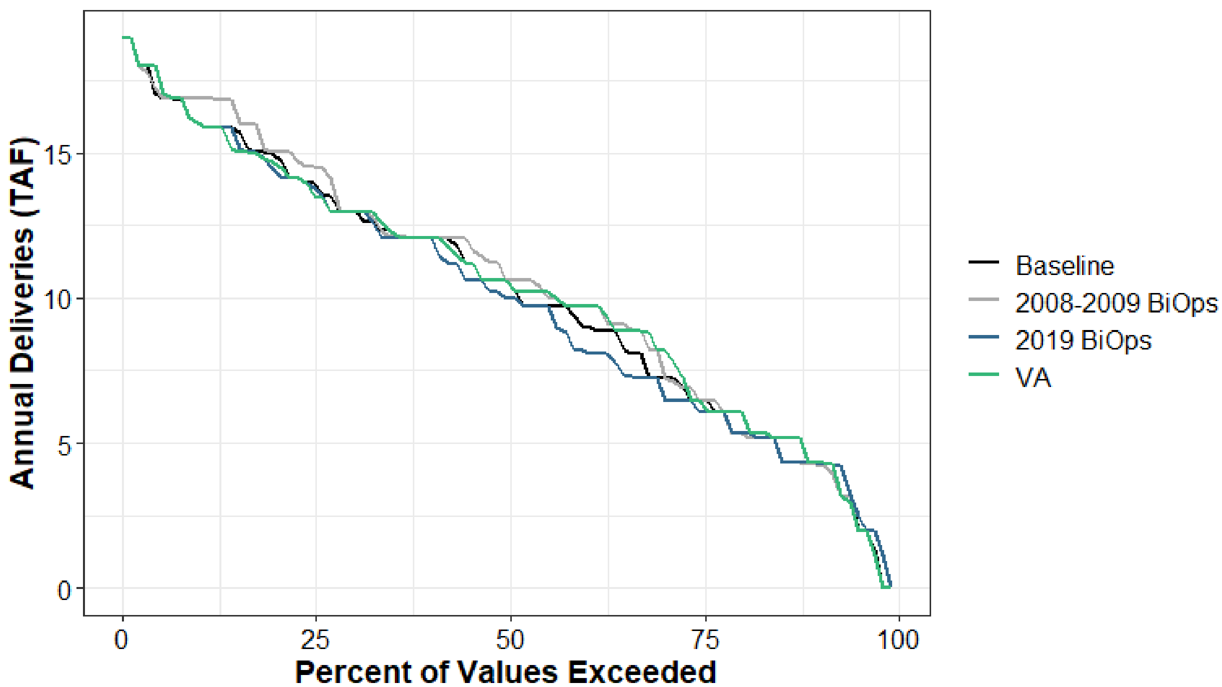

Figure G3a-96. Surface Water Supplied to Delta (Urban) Annual Percent Exceedance Plot

Table G3a-206. Surface Water Supplied to Delta (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	19	19	19	19
10%	16	16.9	16	16
20%	14.9	15.1	14.4	14.6
30%	13	13	13	13
40%	12.1	12.1	12.1	12.1
50%	10.6	10.6	10	10.6
60%	9.1	9.7	8.2	9.7
70%	7.2	7.8	6.9	8.2
80%	5.4	5.3	5.4	6.1
90%	4.3	4.2	4.3	4.3
100%	0	0	0	0
Mean	10.2	10.5	10	10.4

Table G3a-207. Surface Water Supplied to Delta (Urban) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	3.3	3.4	3.5	3.3
D	7.3	7.5	6.7	7.5
BN	10.1	10.4	9.7	10.4
AN	12	12.9	12.7	12.6
W	15.5	15.7	15.2	15.3
All	10.2	10.5	10	10.4

G3a.3.5.22 Water Budget Area 60N (Urban)

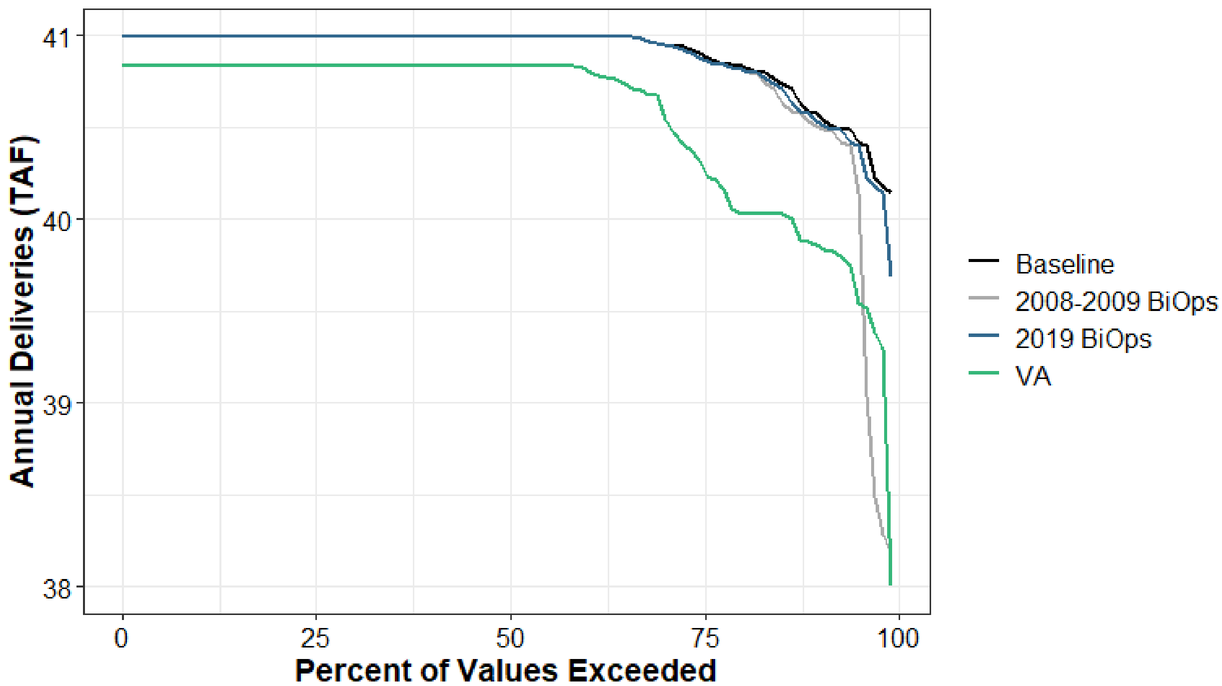

Figure G3a-97. Total Water Supplied to Water Budget Area 60N (Urban) Annual Percent Exceedance Plot

Table G3a-208. Total Water Supplied to Water Budget Area 60N (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	41	41	41	41
10%	41	41	41	41
20%	41	41	41	41
30%	41	41	41	41
40%	41	41	41	41
50%	41	41	41	41
60%	41	41	41	41
70%	41	41	41	41
80%	41	41	41	40
90%	41	41	41	40
100%	40	38	40	38
Mean	41	41	41	41

Table G3a-209. Total Water Supplied to Water Budget Area 60N (Urban) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	41	40	41	40
D	41	41	41	40
BN	41	41	41	41
AN	41	41	41	41
W	41	41	41	41
All	41	41	41	41

G3a.3.5.23 San Francisco Bay Area (Urban)

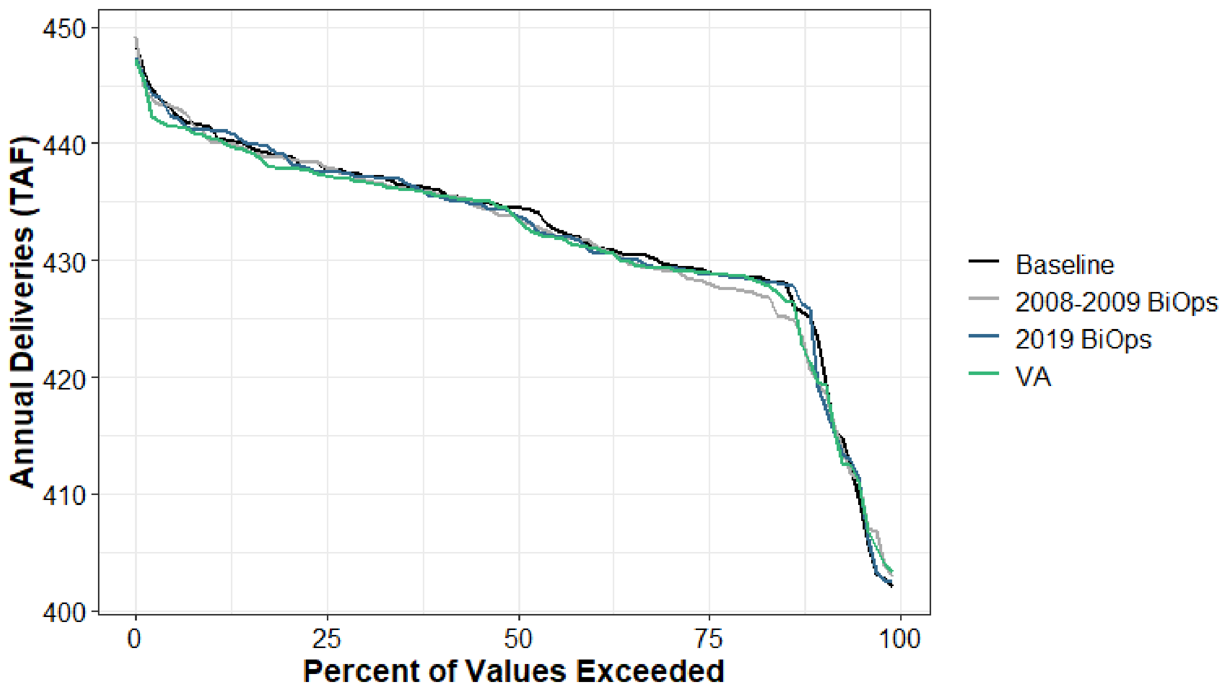

Figure G3a-98. Surface Water Supplied to San Francisco Bay Area (Urban) Annual Percent Exceedance Plot

Table G3a-210. Surface Water Supplied to San Francisco Bay Area (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	449	449	447	447
10%	441	440	441	441
20%	439	439	439	438
30%	437	437	437	437
40%	436	436	435	436
50%	434	434	434	434
60%	431	432	431	431
70%	430	429	429	429
80%	429	427	428	429
90%	424	420	421	420
100%	402	403	402	403
Mean	432	432	432	432

Table G3a-211. Surface Water Supplied to San Francisco Bay Area (Urban) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	420	420	420	420
D	435	434	435	434
BN	437	436	436	436
AN	434	433	433	433
W	434	433	434	433
All	432	432	432	432

G3a.3.5.24 Total CVP Deliveries

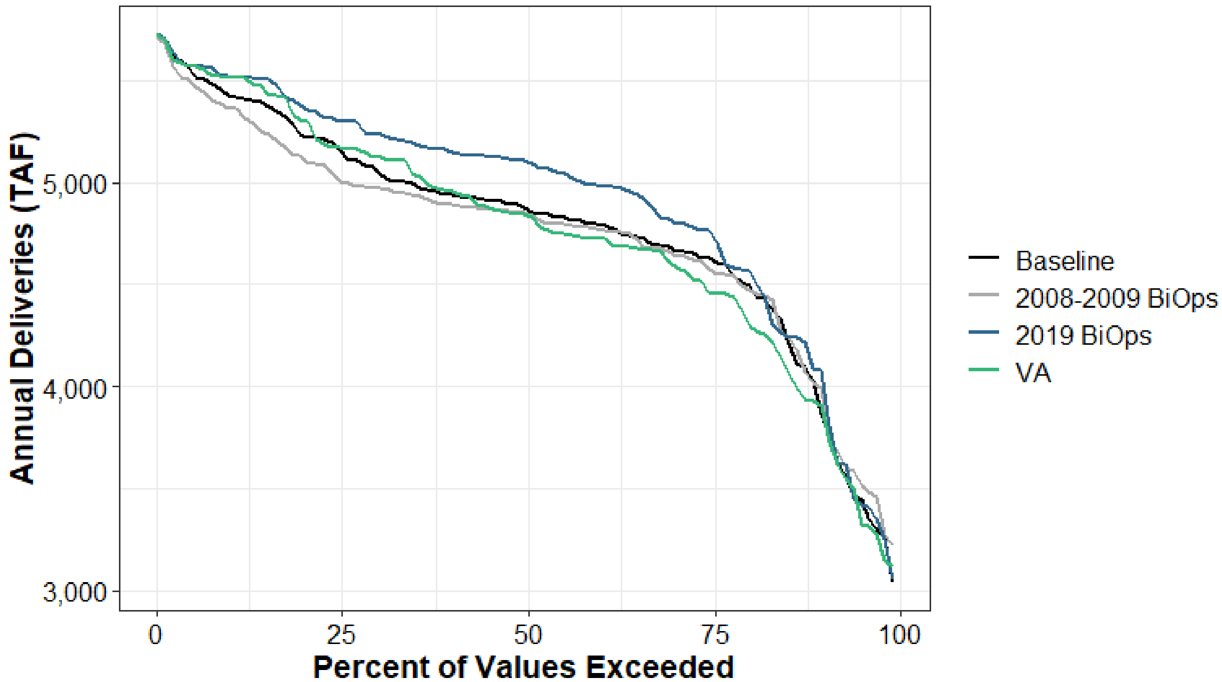

Figure G3a-99. Surface Water Supplied to Total CVP Deliveries Annual Percent Exceedance Plot

Table G3a-212. Surface Water Supplied to Total CVP Deliveries Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	5,710	5,710	5,731	5,730
10%	5,422	5,365	5,521	5,515
20%	5,226	5,115	5,369	5,307
30%	5,053	4,970	5,236	5,122
40%	4,940	4,890	5,151	4,958
50%	4,874	4,853	5,107	4,843
60%	4,797	4,774	4,986	4,725
70%	4,679	4,652	4,814	4,603
80%	4,501	4,478	4,571	4,329
90%	3,895	4,000	4,085	3,910
100%	3,038	3,225	3,052	3,115
Mean	4,783	4,747	4,912	4,759

Table G3a-213. Surface Water Supplied to Total CVP Deliveries Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	3,869	3,901	3,902	3,821
D	4,664	4,641	4,805	4,551
BN	4,792	4,738	4,956	4,746
AN	4,893	4,894	5,125	4,830
W	5,310	5,222	5,415	5,394
All	4,783	4,747	4,912	4,759

G3a.3.5.25 Total CVP North of Delta

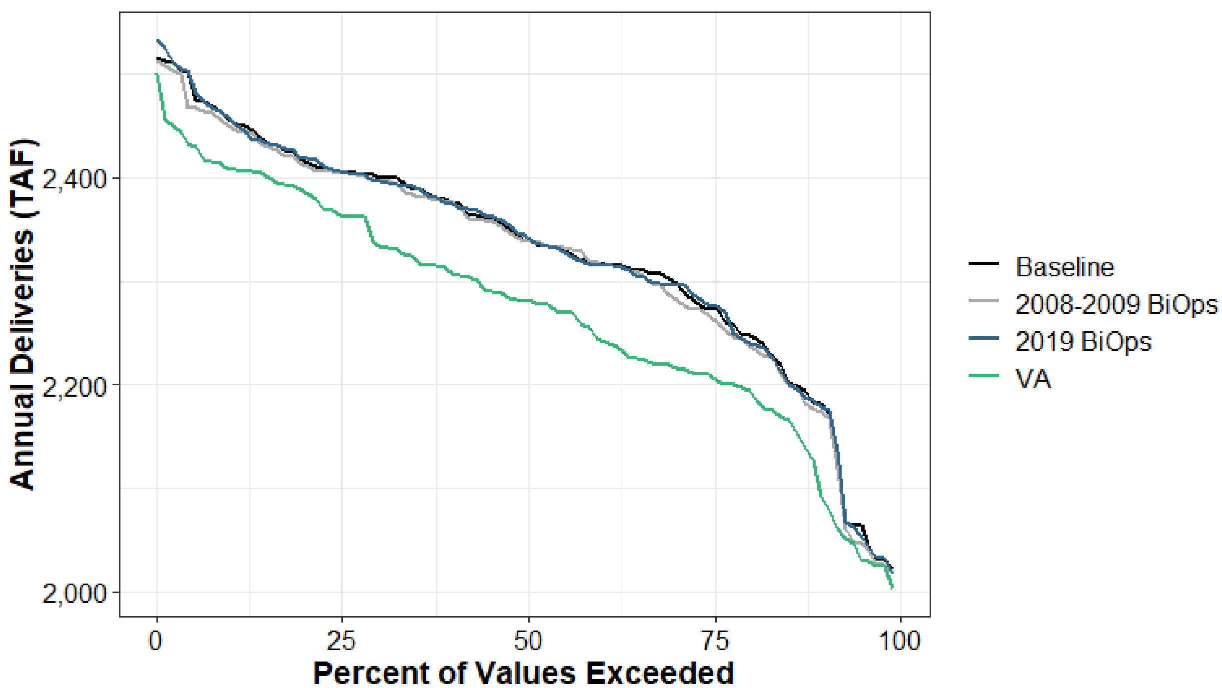

Figure G3a-100. Surface Water Supplied to Total CVP North of Delta Annual Percent Exceedance Plot

Table G3a-214. Surface Water Supplied to Total CVP North of Delta Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	2,515	2,513	2,534	2,501
10%	2,456	2,449	2,456	2,407
20%	2,416	2,413	2,419	2,386
30%	2,401	2,398	2,396	2,335
40%	2,376	2,377	2,375	2,308
50%	2,339	2,339	2,345	2,281
60%	2,316	2,318	2,315	2,244
70%	2,301	2,285	2,297	2,218
80%	2,247	2,239	2,242	2,196
90%	2,181	2,174	2,179	2,099
100%	2,021	2,019	2,016	2,003
Mean	2,328	2,323	2,328	2,272

Table G3a-215. Surface Water Supplied to Total CVP North of Delta Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	2,166	2,159	2,162	2,161
D	2,332	2,323	2,331	2,225
BN	2,366	2,358	2,367	2,265
AN	2,380	2,377	2,381	2,281
W	2,367	2,366	2,368	2,368
All	2,328	2,323	2,328	2,272

G3a.3.5.26 CVP North of Delta Water Service (Agricultural)

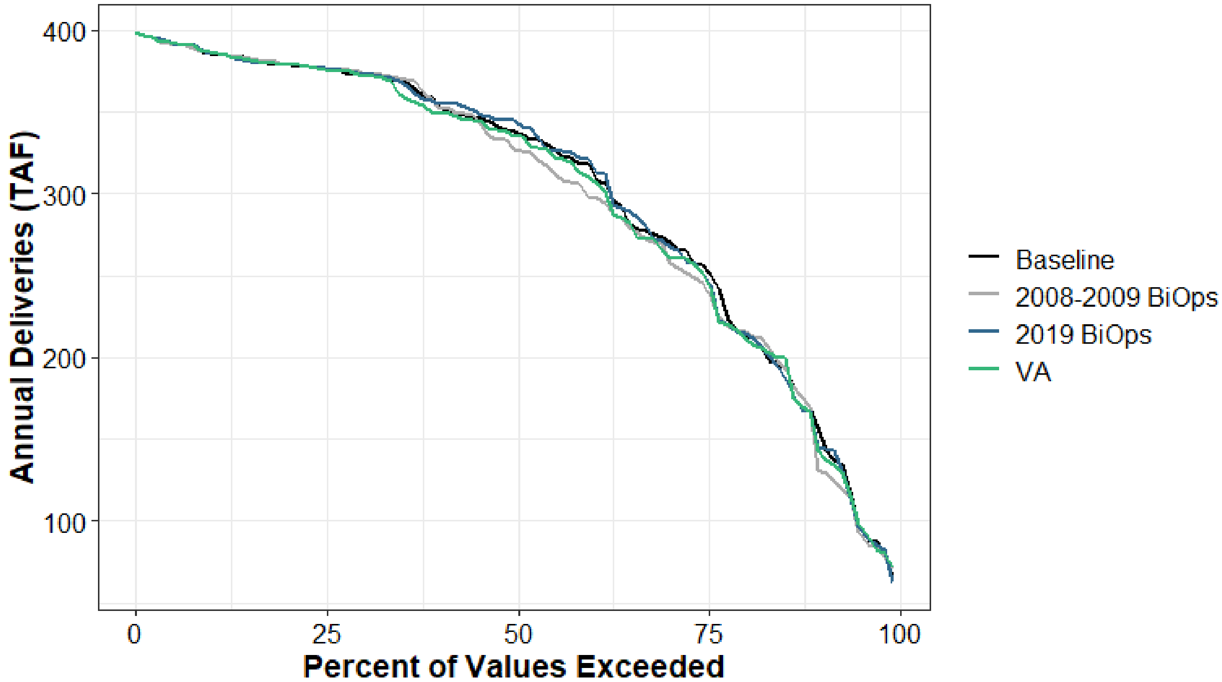

Figure G3a-101. Surface Water Supplied to CVP North of Delta Water Service (Agricultural) Annual Percent Exceedance Plot

Table G3a-216. Surface Water Supplied to CVP North of Delta Water Service (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	399	399	399	399
10%	386	386	386	386
20%	379	379	379	379
30%	373	374	374	372
40%	354	353	355	349
50%	338	328	345	336
60%	316	297	319	309
70%	272	264	270	263
80%	215	216	215	214
90%	160	139	150	148
100%	66	70	62	71
Mean	303	299	303	300

Table G3a-217. Surface Water Supplied to CVP North of Delta Water Service (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	163	157	159	160
D	270	262	270	264
BN	314	308	315	310
AN	363	364	364	360
W	369	369	370	370
All	303	299	303	300

G3a.3.5.27 CVP North of Delta Water Service (M&I)

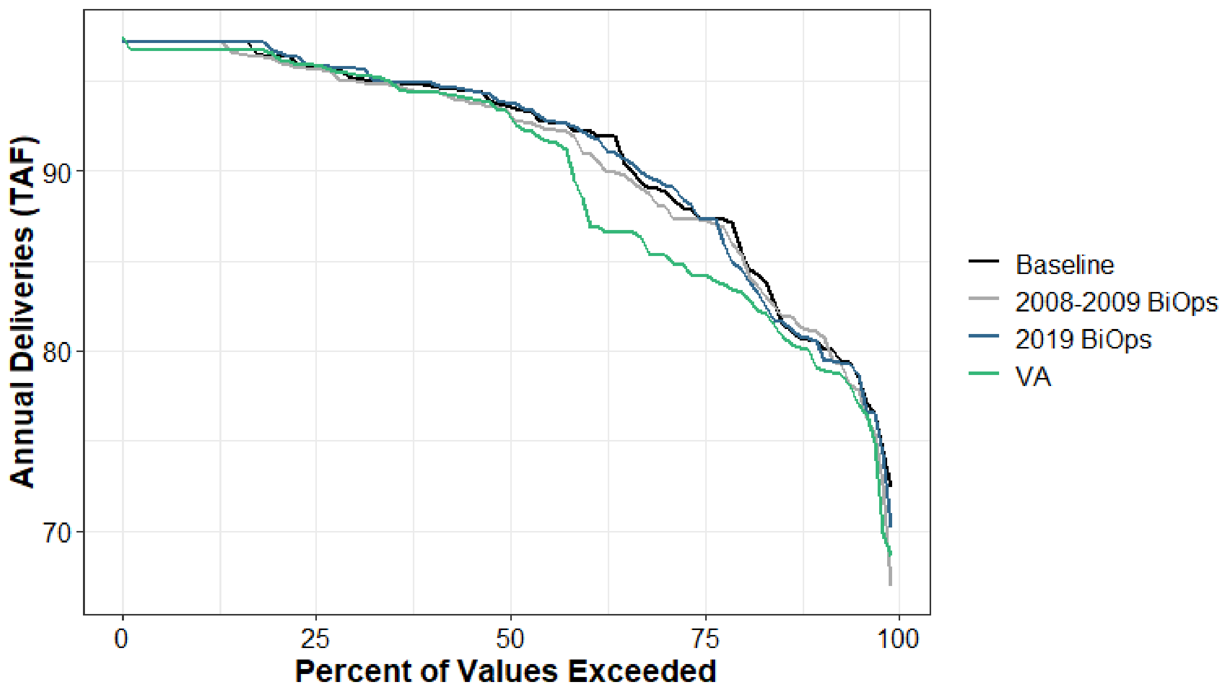

Figure G3a-102. Surface Water Supplied to CVP North of Delta Water Service (M&I) Annual Percent Exceedance Plot

Table G3a-218. Surface Water Supplied to CVP North of Delta Water Service (M&I) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	97	97	97	97
10%	97	97	97	97
20%	96	96	97	96
30%	95	95	96	95
40%	95	94	95	94
50%	94	93	94	93
60%	92	91	92	88
70%	89	88	89	85
80%	86	86	85	83
90%	81	81	81	79
100%	72	67	70	69
Mean	91	91	91	90

Table G3a-219. Surface Water Supplied to CVP North of Delta Water Service (M&I) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	84	83	83	83
D	90	90	90	85
BN	90	90	91	91
AN	93	92	93	93
W	95	95	95	95
All	91	91	91	90

G3a.3.5.28 CVP Settlement (Agricultural)

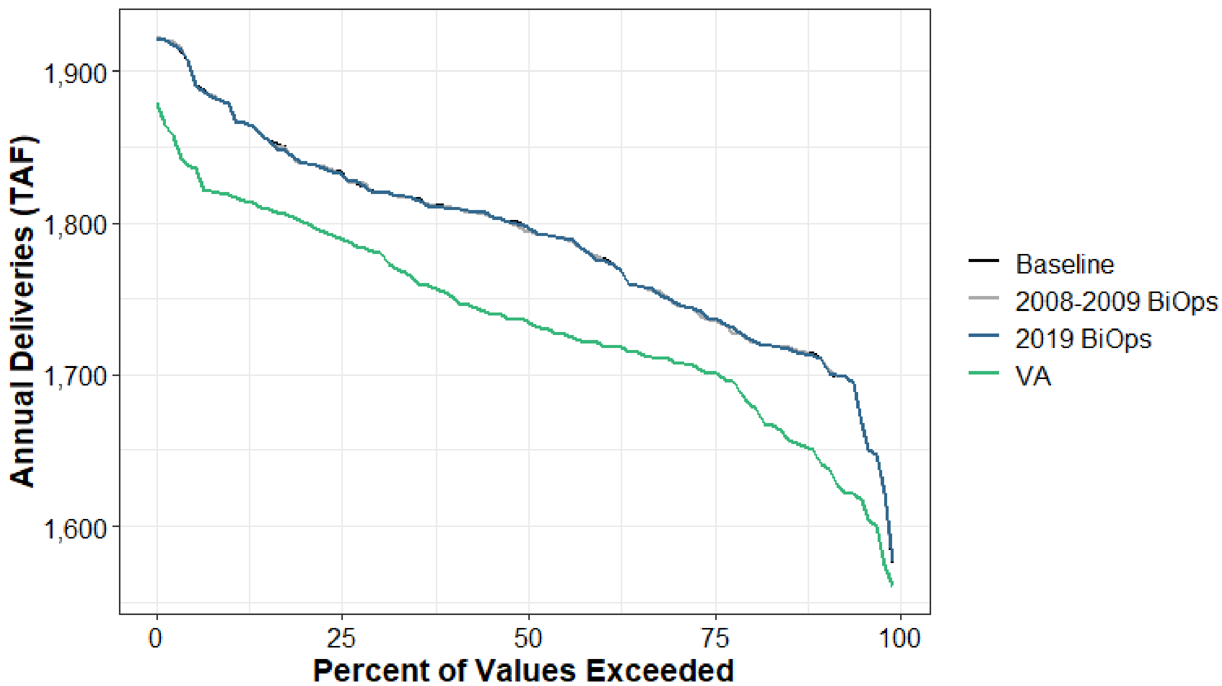

Figure G3a-103. Surface Water Supplied to CVP Settlement (Agricultural) Annual Percent Exceedance Plot

Table G3a-220. Surface Water Supplied to CVP Settlement (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1,922	1,923	1,922	1,879
10%	1,876	1,876	1,876	1,818
20%	1,839	1,839	1,840	1,801
30%	1,821	1,820	1,820	1,781
40%	1,811	1,811	1,810	1,752
50%	1,799	1,795	1,799	1,736
60%	1,776	1,777	1,775	1,721
70%	1,749	1,749	1,749	1,709
80%	1,724	1,724	1,724	1,683
90%	1,711	1,711	1,711	1,643
100%	1,576	1,577	1,577	1,560
Mean	1,788	1,788	1,788	1,736

Table G3a-221. Surface Water Supplied to CVP Settlement (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,778	1,778	1,778	1,777
D	1,824	1,824	1,824	1,729
BN	1,814	1,814	1,814	1,716
AN	1,777	1,777	1,777	1,681
W	1,755	1,754	1,755	1,755
All	1,788	1,788	1,788	1,736

G3a.3.5.29 CVP Settlement (M&I)

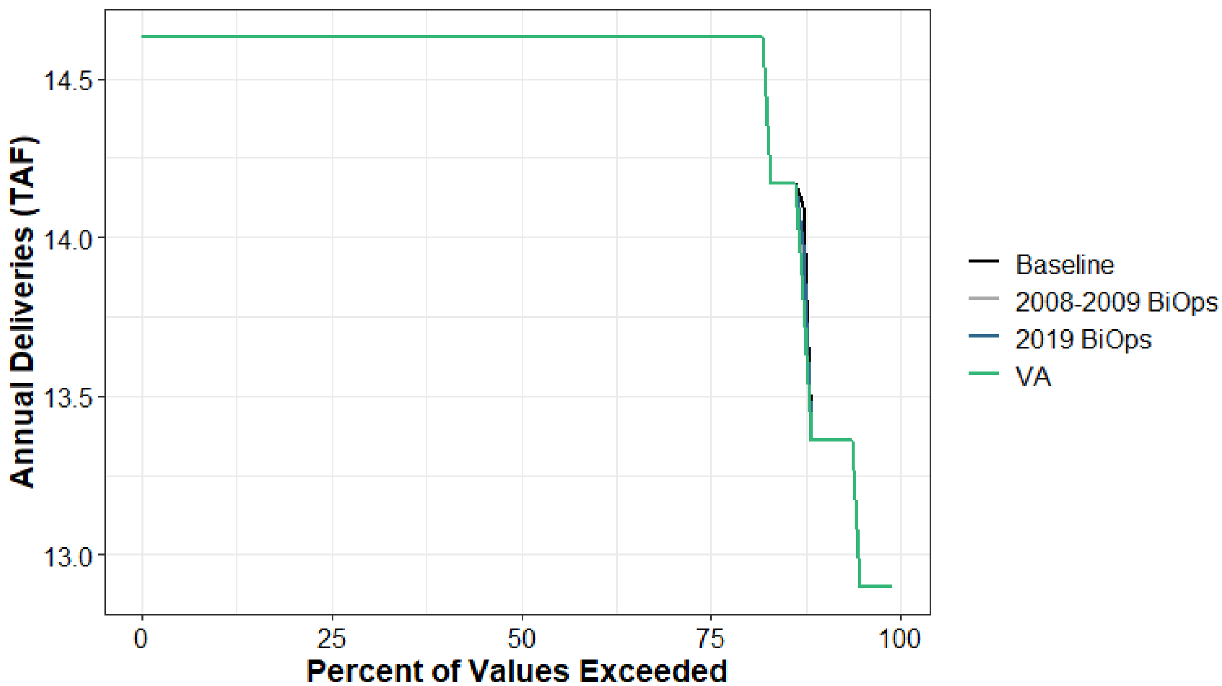

Figure G3a-104. Surface Water Supplied to CVP Settlement (M&I) Annual Percent Exceedance Plot

Table G3a-222. Surface Water Supplied to CVP Settlement (M&I) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	14.6	14.6	14.6	14.6
10%	14.6	14.6	14.6	14.6
20%	14.6	14.6	14.6	14.6
30%	14.6	14.6	14.6	14.6
40%	14.6	14.6	14.6	14.6
50%	14.6	14.6	14.6	14.6
60%	14.6	14.6	14.6	14.6
70%	14.6	14.6	14.6	14.6
80%	14.6	14.6	14.6	14.6
90%	13.4	13.4	13.4	13.4
100%	12.9	12.9	12.9	12.9
Mean	14.4	14.4	14.4	14.4

Table G3a-223. Surface Water Supplied to CVP Settlement (M&I) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	13.7	13.7	13.7	13.7
D	14.5	14.5	14.5	14.5
BN	14.6	14.6	14.6	14.6
AN	14.6	14.6	14.6	14.6
W	14.6	14.6	14.6	14.6
All	14.4	14.4	14.4	14.4

G3a.3.5.30 CVP North of Delta (Refuge)

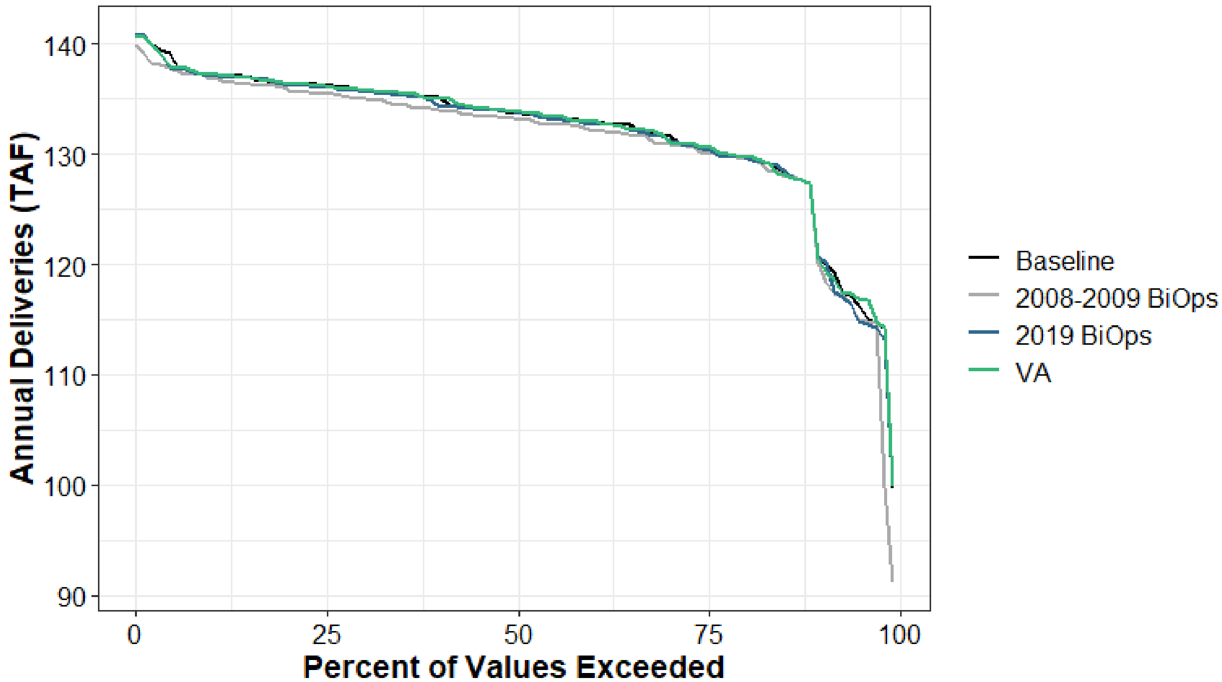

Figure G3a-105. Surface Water Supplied to CVP North of Delta (Refuge) Annual Percent Exceedance Plot

Table G3a-224. Surface Water Supplied to CVP North of Delta (Refuge) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	141	140	141	141
10%	137	137	137	137
20%	136	136	136	136
30%	136	135	136	136
40%	135	134	134	135
50%	134	133	134	134
60%	133	132	133	133
70%	132	131	131	132
80%	130	130	130	130
90%	122	122	122	122
100%	100	91	100	100
Mean	132	131	132	132

Table G3a-225. Surface Water Supplied to CVP North of Delta (Refuge) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	128	127	127	128
D	133	132	133	133
BN	133	132	132	133
AN	132	129	131	132
W	134	133	134	134
All	132	131	132	132

G3a.3.5.31 Total CVP South of Delta

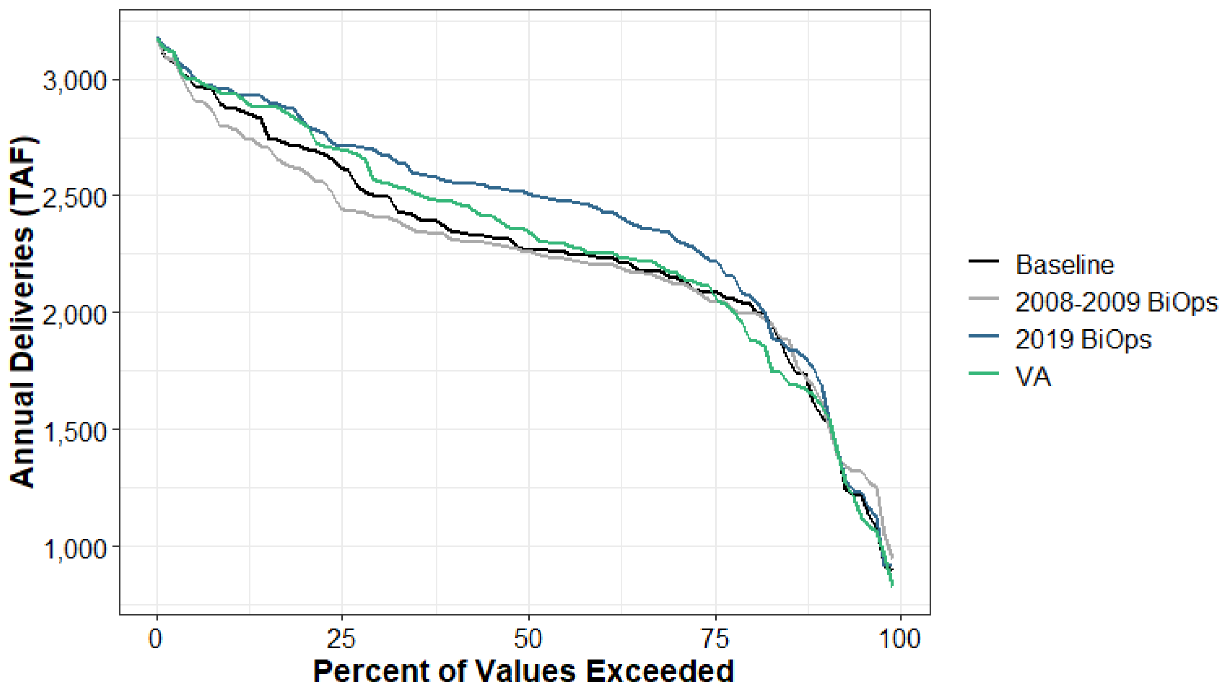

Figure G3a-106. Surface Water Supplied to Total CVP South of Delta Annual Percent Exceedance Plot

Table G3a-226. Surface Water Supplied to Total CVP South of Delta Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	3,179	3,161	3,179	3,173
10%	2,874	2,790	2,953	2,935
20%	2,707	2,606	2,820	2,809
30%	2,500	2,409	2,684	2,565
40%	2,352	2,317	2,558	2,473
50%	2,277	2,262	2,520	2,355
60%	2,241	2,207	2,442	2,254
70%	2,156	2,129	2,327	2,174
80%	2,040	1,998	2,079	1,915
90%	1,571	1,637	1,705	1,615
100%	900	948	918	828
Mean	2,274	2,242	2,403	2,305

Table G3a-227. Surface Water Supplied to Total CVP South of Delta Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,532	1,567	1,569	1,490
D	2,149	2,135	2,290	2,142
BN	2,243	2,196	2,406	2,298
AN	2,329	2,333	2,561	2,365
W	2,760	2,673	2,864	2,843
All	2,274	2,242	2,403	2,305

G3a.3.5.32 CVP South of Delta Water Service (Agricultural)

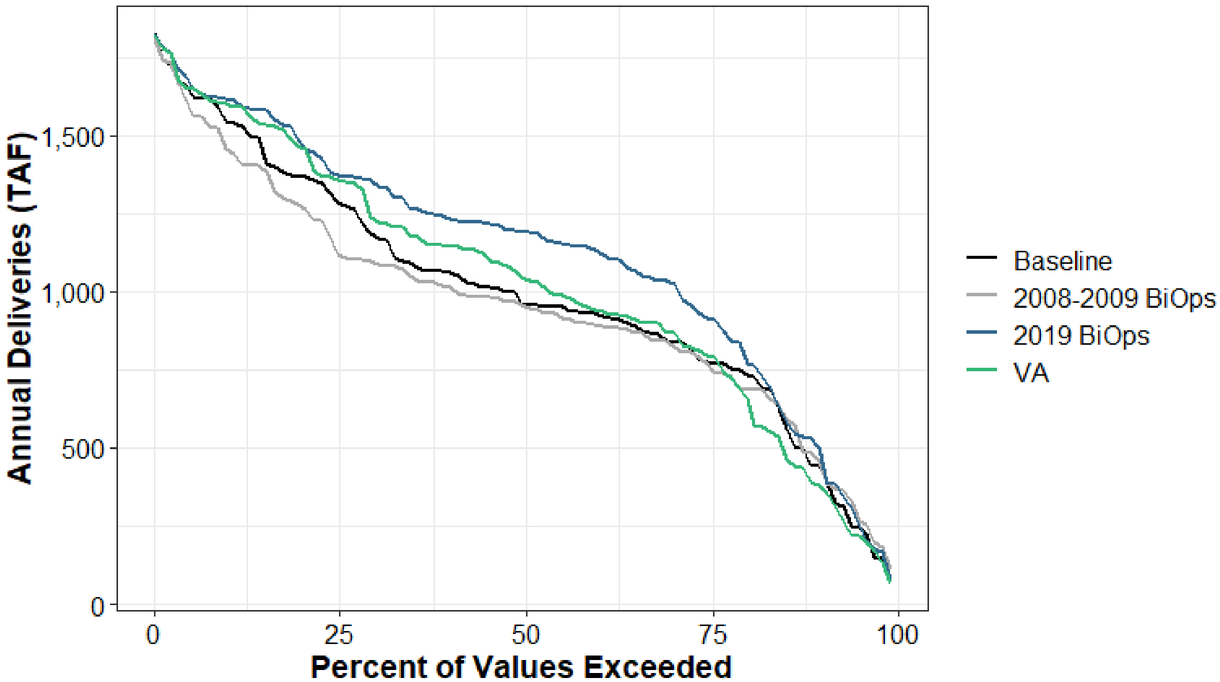

Figure G3a-107. Surface Water Supplied to CVP South of Delta Water Service (Agricultural) Annual Percent Exceedance Plot

Table G3a-228. Surface Water Supplied to CVP South of Delta Water Service (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1,828	1,810	1,827	1,822
10%	1,543	1,455	1,618	1,601
20%	1,368	1,274	1,476	1,464
30%	1,176	1,093	1,346	1,230
40%	1,064	1,017	1,233	1,147
50%	960	959	1,192	1,046
60%	928	894	1,131	940
70%	840	834	1,030	870
80%	741	688	799	670
90%	441	465	506	384
100%	75	112	71	68
Mean	999	963	1,120	1,029

Table G3a-229. Surface Water Supplied to CVP South of Delta Water Service (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	467	476	499	429
D	851	836	986	845
BN	936	883	1,083	981
AN	1,020	1,025	1,241	1,059
W	1,426	1,342	1,523	1,505
All	999	963	1,120	1,029

G3a.3.5.33 CVP South of Delta Water Service (M&I)

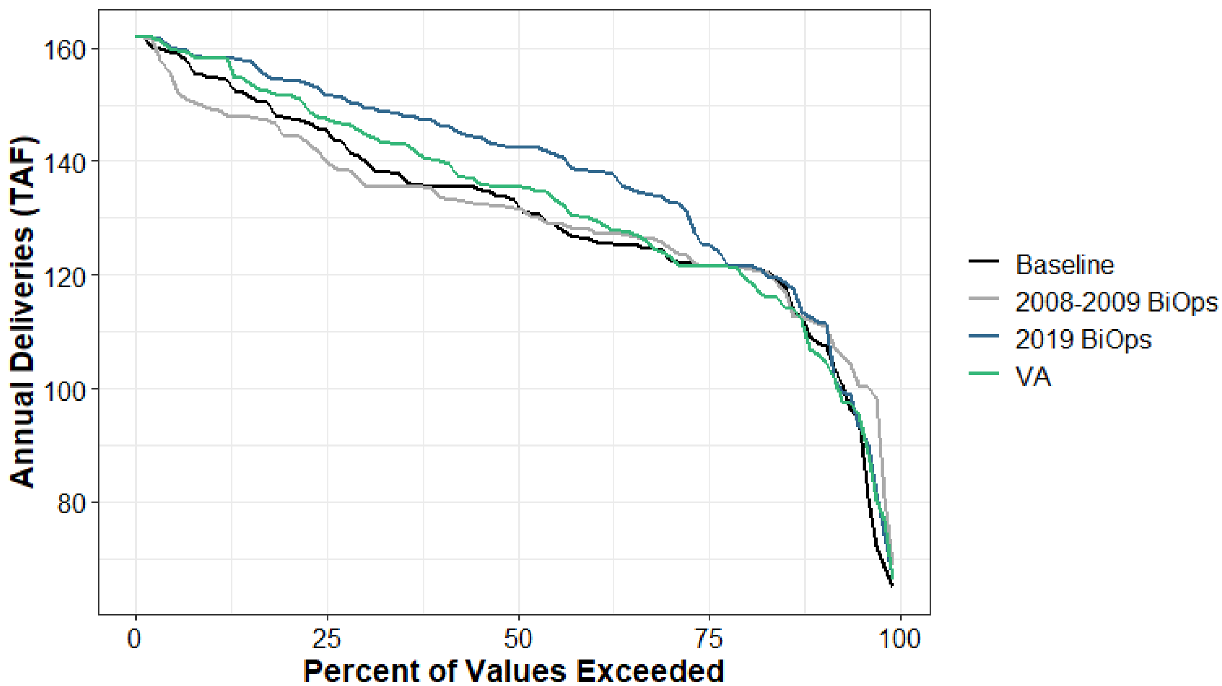

Figure G3a-108. Surface Water Supplied to CVP South of Delta Water Service (M&I) Annual Percent Exceedance Plot

Table G3a-230. Surface Water Supplied to CVP South of Delta Water Service (M&I) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	162	162	162	162
10%	155	149	158	158
20%	148	144	154	152
30%	140	136	150	145
40%	136	134	147	140
50%	133	132	143	136
60%	126	128	138	130
70%	124	125	133	124
80%	122	121	122	120
90%	108	112	112	106
100%	65	69	66	66
Mean	131	131	137	133

Table G3a-231. Surface Water Supplied to CVP South of Delta Water Service (M&I) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	104	107	108	105
D	126	127	132	126
BN	129	129	138	132
AN	133	132	143	136
W	150	147	155	153
All	131	131	137	133

G3a.3.5.34 CVP SOD Exchange

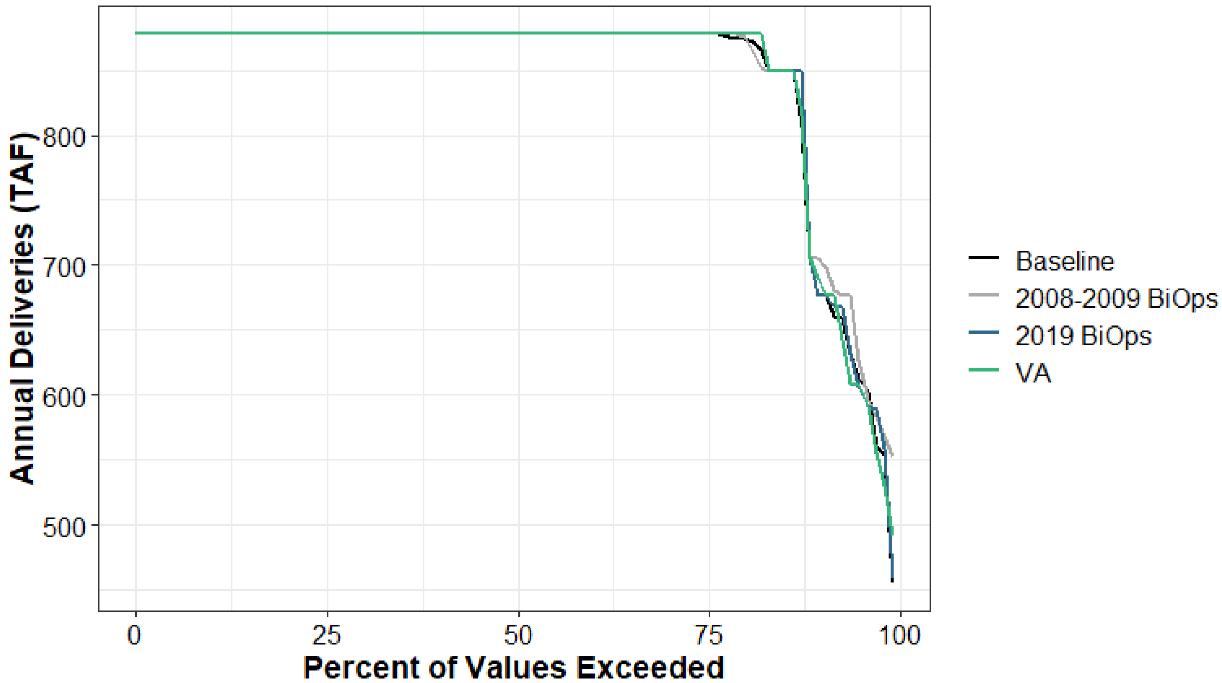

Figure G3a-109. Surface Water Supplied to CVP SOD Exchange Annual Percent Exceedance Plot

Table G3a-232. Surface Water Supplied to CVP SOD Exchange Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	879	879	879	879
10%	879	879	879	879
20%	879	879	879	879
30%	879	879	879	879
40%	879	879	879	879
50%	879	879	879	879
60%	879	879	879	879
70%	879	879	879	879
80%	874	877	879	879
90%	682	705	682	693
100%	455	553	458	492
Mean	845	849	847	846

Table G3a-233. Surface Water Supplied to CVP SOD Exchange Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	701	719	703	700
D	868	868	868	868
BN	874	877	877	877
AN	874	874	874	871
W	876	876	878	878
All	845	849	847	846

G3a.3.5.35 CVP SOD Refuge

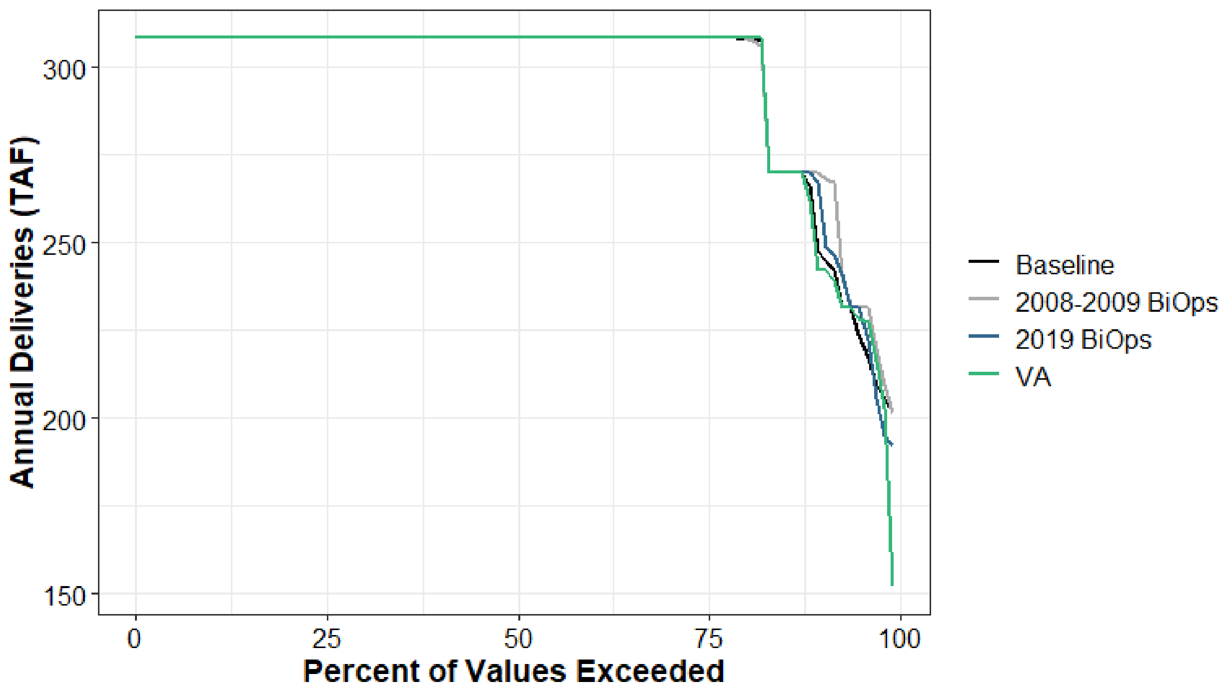

Figure G3a-110. Surface Water Supplied to CVP SOD Refuge Annual Percent Exceedance Plot

Table G3a-234. Surface Water Supplied to CVP SOD Refuge Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	309	309	309	309
10%	309	309	309	309
20%	309	309	309	309
30%	309	309	309	309
40%	309	309	309	309
50%	309	309	309	309
60%	309	309	309	309
70%	309	309	309	309
80%	308	308	309	309
90%	252	270	268	246
100%	202	201	192	152
Mean	297	298	297	297

Table G3a-235. Surface Water Supplied to CVP SOD Refuge Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	260	264	258	255
D	303	303	303	303
BN	303	306	306	306
AN	302	302	302	299
W	307	307	307	307
All	297	298	297	297

G3a.3.5.36 Total SWP Deliveries

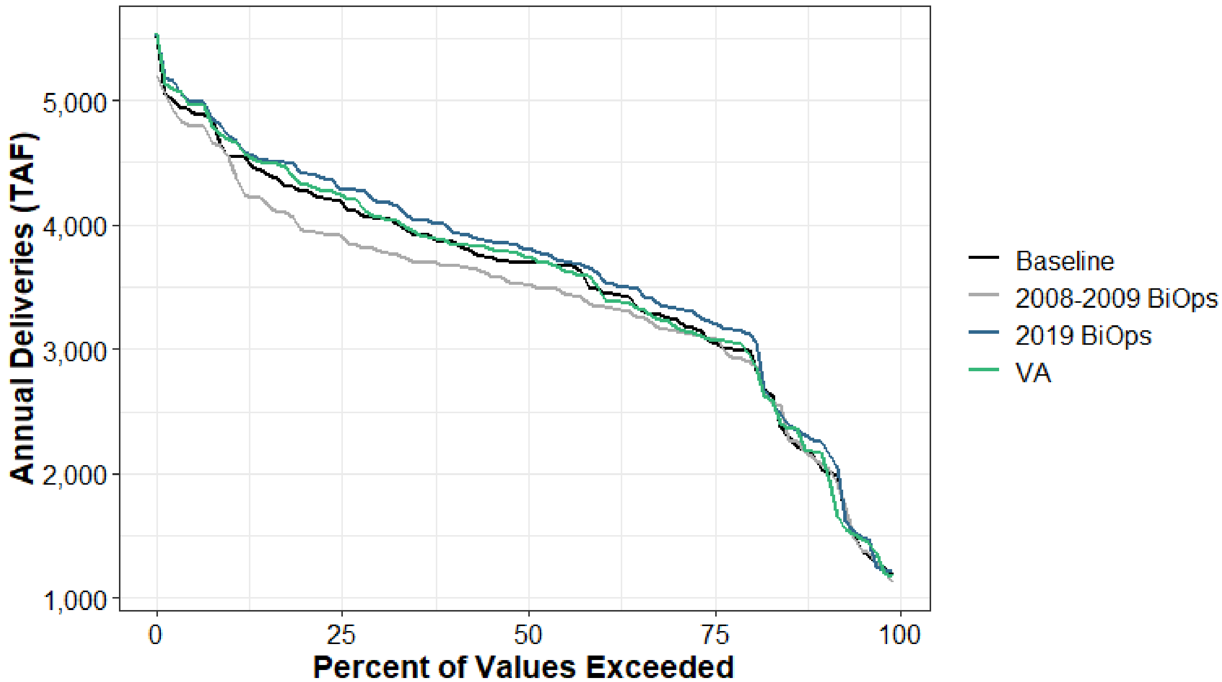

Figure G3a-111. Surface Water Supplied to Total SWP Deliveries Annual Percent Exceedance Plot

Table G3a-236. Surface Water Supplied to Total SWP Deliveries Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	5,512	5,192	5,521	5,542
10%	4,549	4,510	4,710	4,684
20%	4,272	3,961	4,426	4,330
30%	4,052	3,800	4,186	4,069
40%	3,862	3,668	3,953	3,846
50%	3,697	3,523	3,800	3,750
60%	3,474	3,346	3,603	3,491
70%	3,246	3,153	3,338	3,199
80%	2,990	2,910	3,134	2,991
90%	2,061	2,090	2,257	2,164
100%	1,190	1,121	1,210	1,174
Mean	3,530	3,398	3,641	3,556

Table G3a-237. Surface Water Supplied to Total SWP Deliveries Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,964	1,962	2,043	2,009
D	3,255	3,131	3,360	3,239
BN	3,646	3,526	3,793	3,636
AN	3,760	3,666	3,923	3,784
W	4,406	4,175	4,494	4,475
All	3,530	3,398	3,641	3,556

G3a.3.5.37 Total SWP Table A

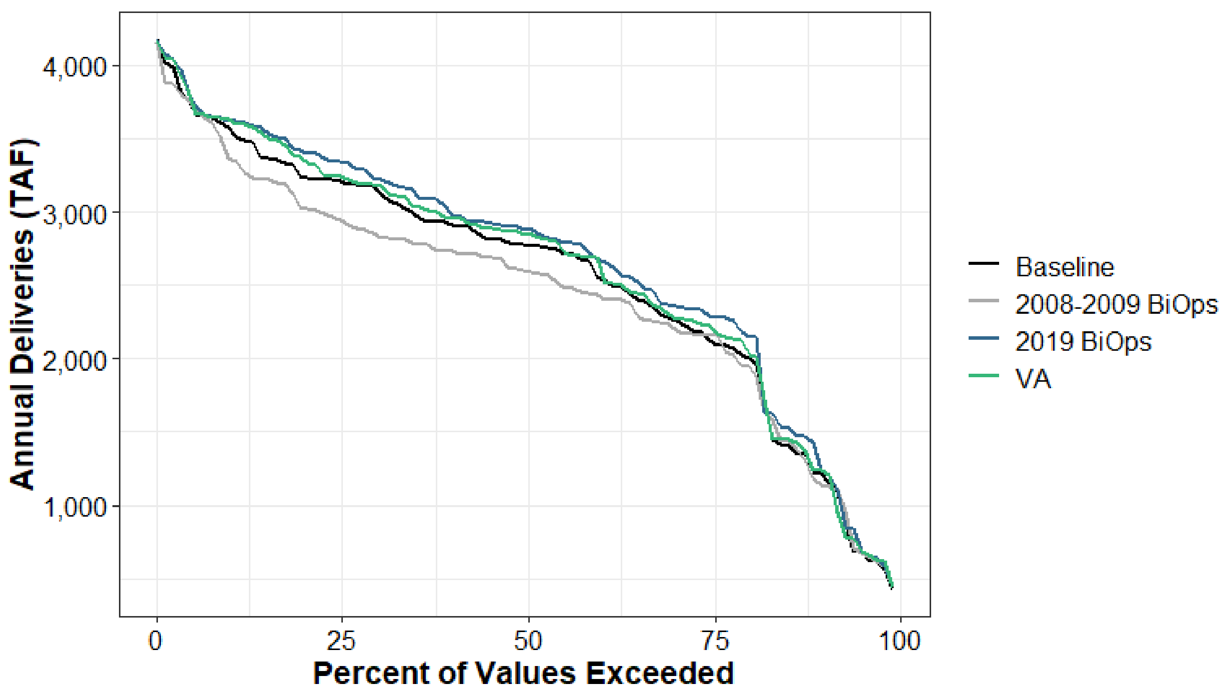

Figure G3a-112. Surface Water Supplied to Total SWP Table A Annual Percent Exceedance Plot

Table G3a-238. Surface Water Supplied to Total SWP Table A Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	4,180	4,150	4,179	4,170
10%	3,564	3,363	3,622	3,627
20%	3,242	3,034	3,412	3,361
30%	3,143	2,839	3,225	3,183
40%	2,920	2,734	2,995	2,964
50%	2,776	2,605	2,885	2,847
60%	2,553	2,427	2,677	2,656
70%	2,275	2,218	2,362	2,286
80%	2,015	1,951	2,160	2,063
90%	1,221	1,144	1,273	1,235
100%	429	438	448	436
Mean	2,579	2,460	2,682	2,626

Table G3a-239. Surface Water Supplied to Total SWP Table A Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,124	1,131	1,215	1,171
D	2,305	2,181	2,396	2,338
BN	2,694	2,570	2,832	2,734
AN	2,813	2,714	2,963	2,874
W	3,394	3,206	3,470	3,449
All	2,579	2,460	2,682	2,626

G3a.3.5.38 SWP Table A North of Delta

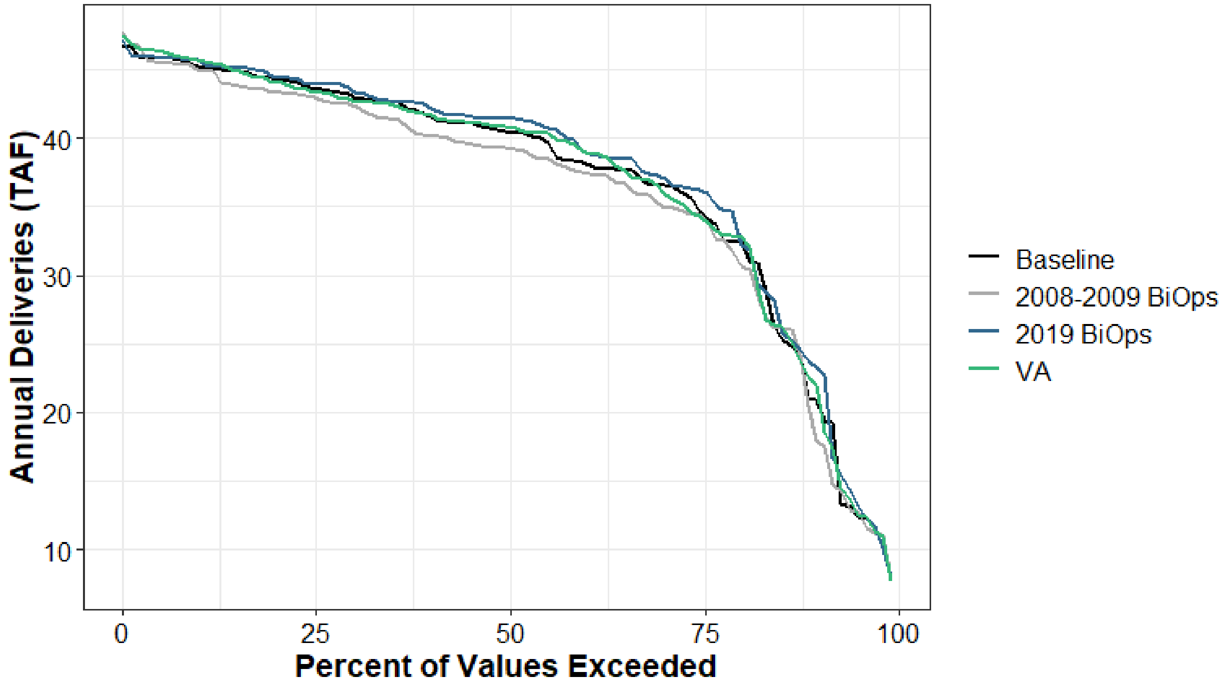

Figure G3a-113. Surface Water Supplied to SWP Table A North of Delta Annual Percent Exceedance Plot

Table G3a-240. Surface Water Supplied to SWP Table A North of Delta Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	47	48	47	47
10%	45	45	46	46
20%	44	43	45	44
30%	43	42	43	43
40%	42	40	42	42
50%	41	39	41	41
60%	38	38	39	39
70%	37	35	37	36
80%	32	31	33	33
90%	21	18	23	22
100%	8	8	8	8
Mean	37	36	38	37

Table G3a-241. Surface Water Supplied to SWP Table A North of Delta Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	20	19	21	20
D	35	34	36	35
BN	40	39	41	40
AN	41	40	42	41
W	44	44	45	45
All	37	36	38	37

G3a.3.5.39 SWP Table A South of Delta

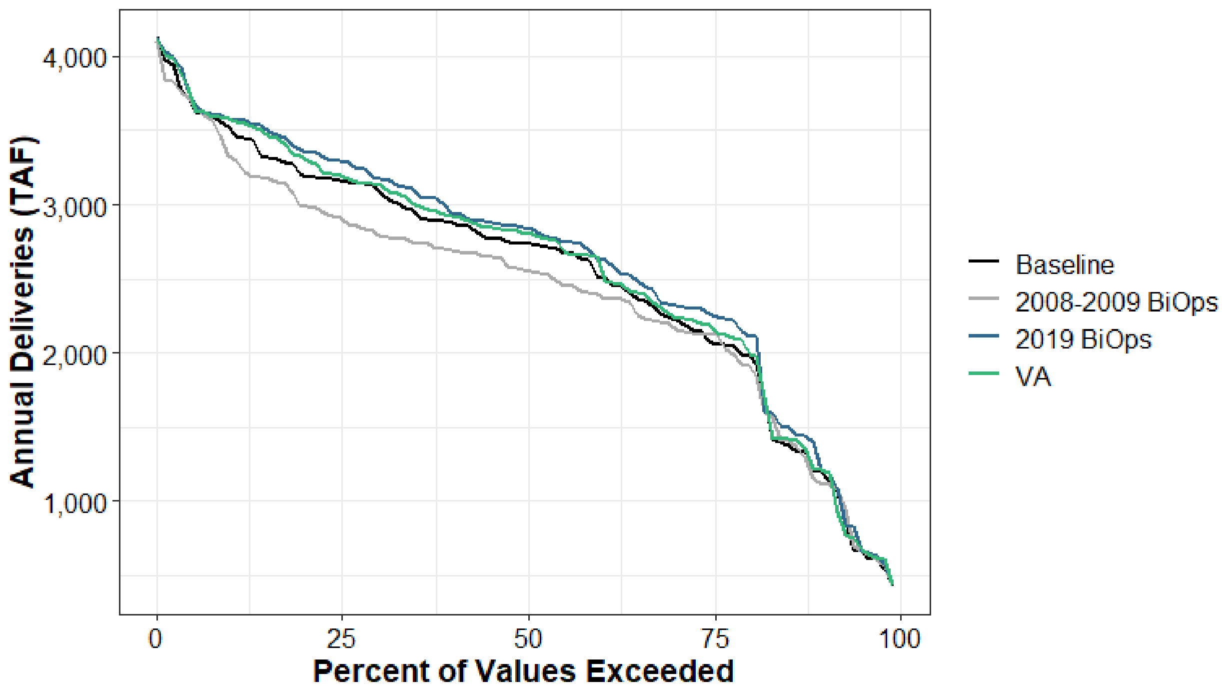

Figure G3a-114. Surface Water Supplied to SWP Table A South of Delta Annual Percent Exceedance Plot

Table G3a-242. Surface Water Supplied to SWP Table A South of Delta Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	4,134	4,102	4,133	4,122
10%	3,518	3,319	3,577	3,581
20%	3,199	2,990	3,369	3,317
30%	3,099	2,798	3,183	3,140
40%	2,883	2,693	2,952	2,922
50%	2,734	2,567	2,842	2,807
60%	2,513	2,388	2,637	2,616
70%	2,237	2,183	2,323	2,253
80%	1,983	1,919	2,127	2,030
90%	1,202	1,125	1,250	1,210
100%	421	430	440	428
Mean	2,542	2,424	2,644	2,589

Table G3a-243. Surface Water Supplied to SWP Table A South of Delta Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	1,104	1,112	1,194	1,151
D	2,270	2,147	2,360	2,303
BN	2,654	2,532	2,792	2,694
AN	2,772	2,674	2,921	2,833
W	3,350	3,162	3,425	3,404
All	2,542	2,424	2,644	2,589

G3a.3.5.40 Total SWP Article 21

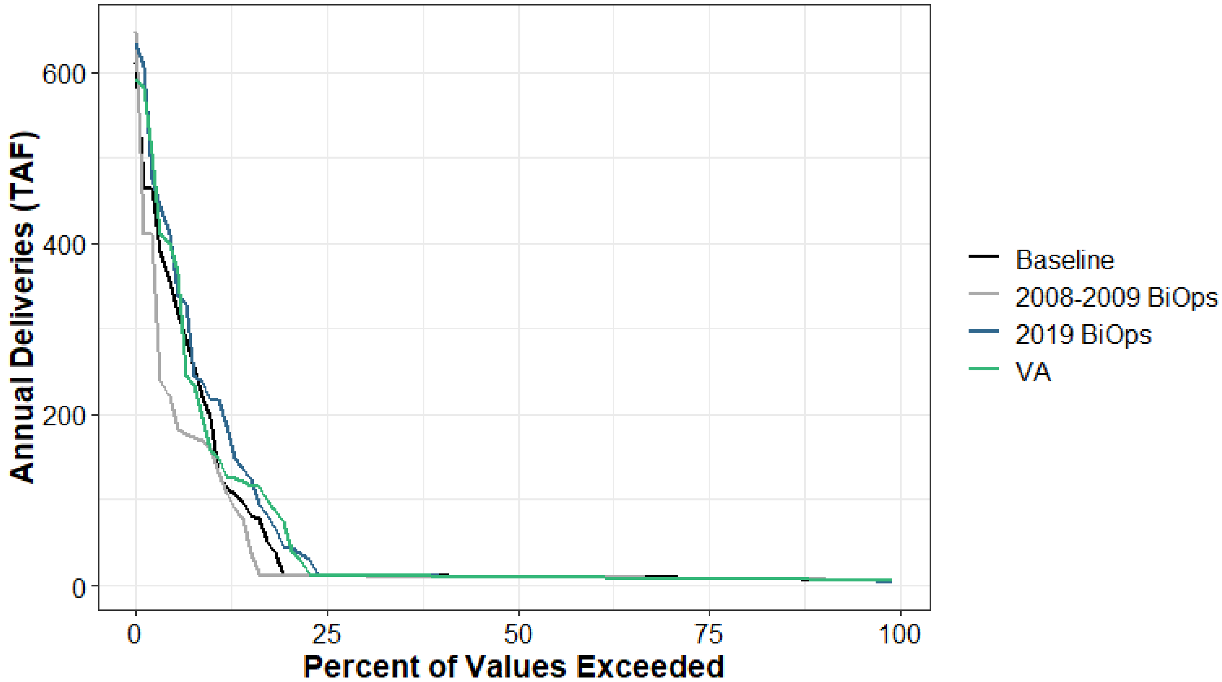

Figure G3a-115. Surface Water Supplied to Total SWP Article 21 Annual Percent Exceedance Plot

Table G3a-244. Surface Water Supplied to Total SWP Article 21 Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	610	647	634	592
10%	183	153	217	157
20%	12	12	45	60
30%	11	11	12	11
40%	11	10	11	10
50%	10	10	9	9
60%	9	9	9	9
70%	9	8	8	8
80%	8	8	7	8
90%	7	7	7	7
100%	4	5	4	5
Mean	53	42	62	58

Table G3a-245. Surface Water Supplied to Total SWP Article 21 Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	19	22	11	17
D	17	17	31	16
BN	16	20	25	16
AN	54	59	67	63
W	121	79	134	136
All	53	42	62	58

G3a.3.5.41 SWP Article 21 Central Coast and Tulare

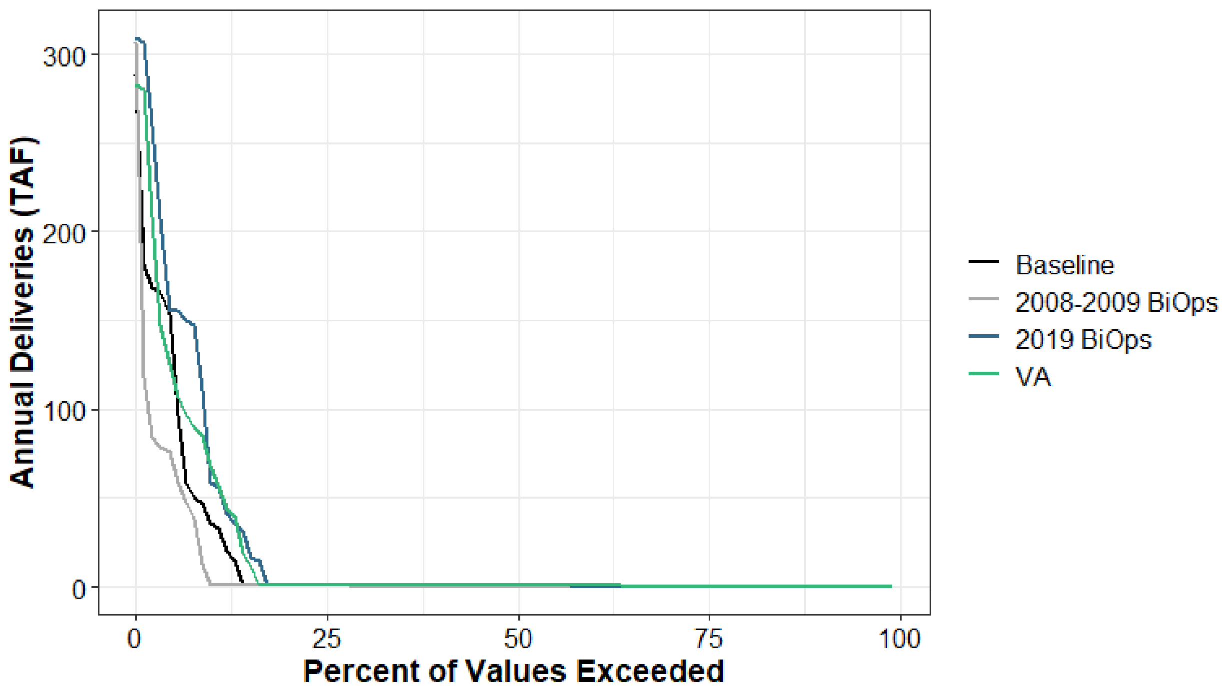

Figure G3a-116. Surface Water Supplied to SWP Article 21 Central Coast and Tulare Annual Percent Exceedance Plot

Table G3a-246. Surface Water Supplied to SWP Article 21 Central Coast and Tulare Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	288	306	309	283
10%	35	1	58	65
20%	1	1	1	1
30%	1	0	1	1
40%	1	0	1	1
50%	0	0	1	1
60%	0	0	0	1
70%	0	0	0	0
80%	0	0	0	0
90%	0	0	0	0
100%	0	0	0	0
Mean	15	9	22	18

Table G3a-247. Surface Water Supplied to SWP Article 21 Central Coast and Tulare Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	7	8	3	6
D	4	4	17	7
BN	3	5	11	6
AN	6	5	15	8
W	37	17	47	45
All	15	9	22	18

G3a.3.5.42 SWP Article 21 South Bay Aqueduct

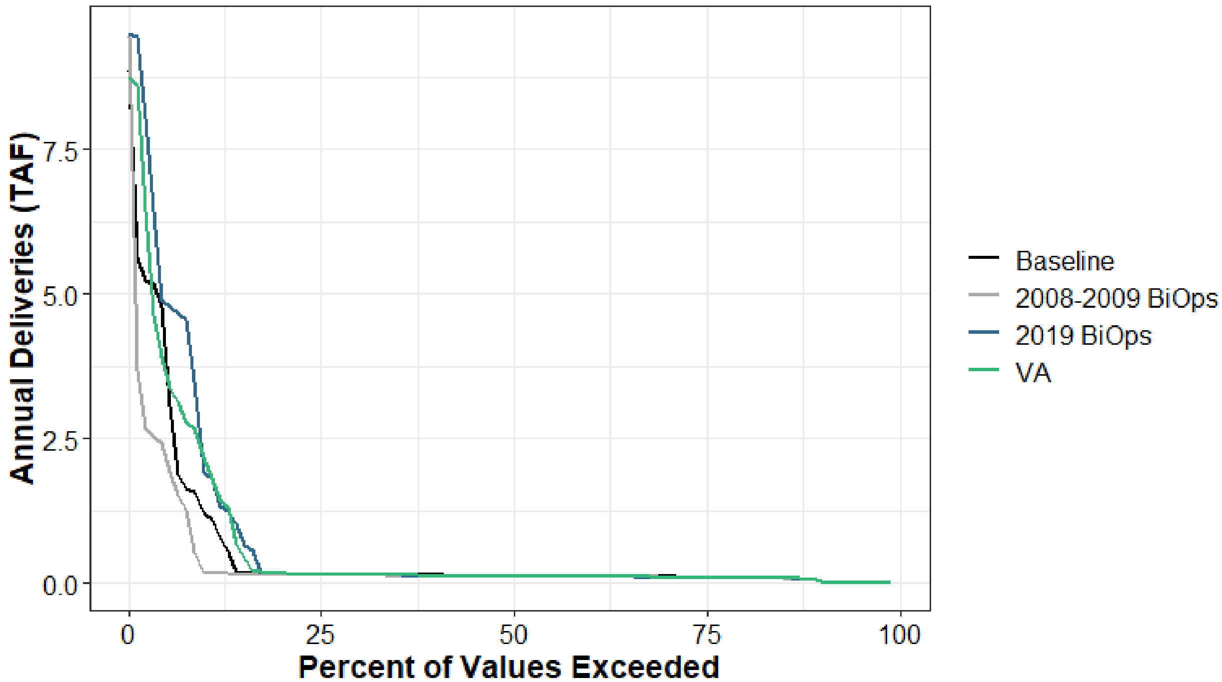

Figure G3a-117. Surface Water Supplied to SWP Article 21 South Bay Aqueduct Annual Percent Exceedance Plot

Table G3a-248. Surface Water Supplied to SWP Article 21 South Bay Aqueduct Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	8.8	9.4	9.5	8.7
10%	1.2	0.2	1.9	2.1
20%	0.1	0.1	0.2	0.2
30%	0.1	0.1	0.1	0.1
40%	0.1	0.1	0.1	0.1
50%	0.1	0.1	0.1	0.1
60%	0.1	0.1	0.1	0.1
70%	0.1	0.1	0.1	0.1
80%	0.1	0.1	0.1	0.1
90%	0.1	0.1	0.1	0.1
100%	0	0	0	0
Mean	0.5	0.4	0.8	0.6

Table G3a-249. Surface Water Supplied to SWP Article 21 South Bay Aqueduct Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	0.3	0.4	0.2	0.3
D	0.2	0.2	0.6	0.3
BN	0.2	0.3	0.4	0.3
AN	0.3	0.2	0.5	0.3
W	1.2	0.6	1.5	1.4
All	0.5	0.4	0.8	0.6

G3a.3.5.43 SWP Article 21 South Coast

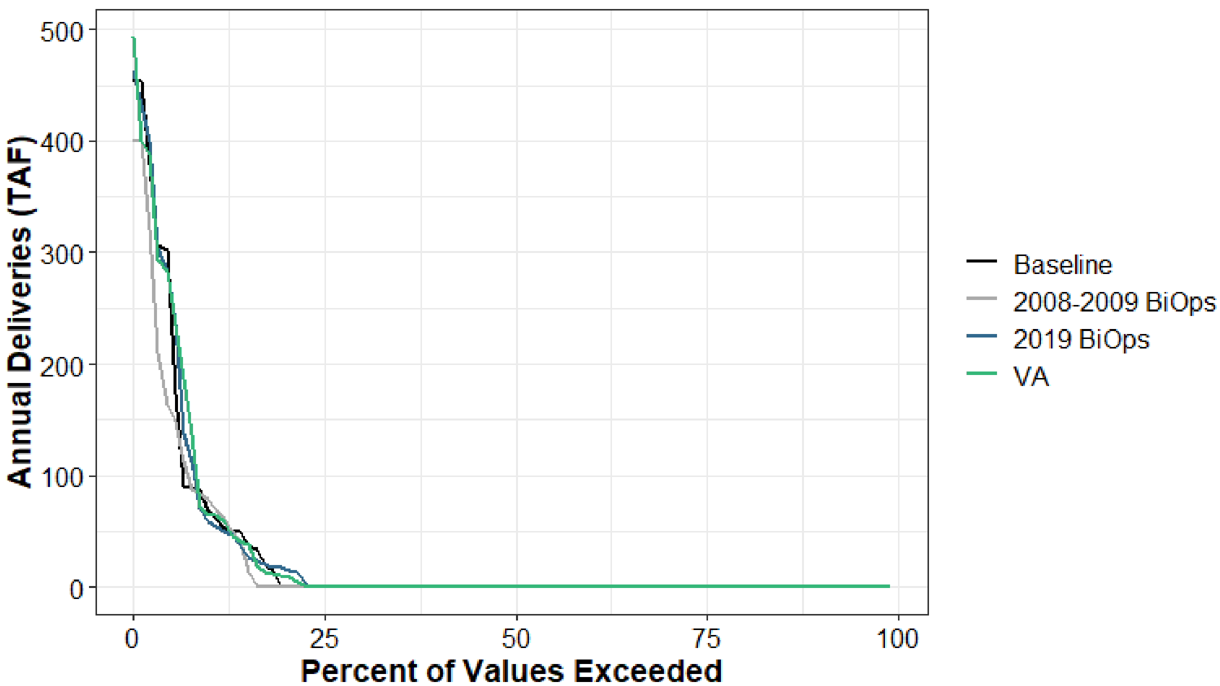

Figure G3a-118. Surface Water Supplied to SWP Article 21 South Coast Annual Percent Exceedance Plot

Table G3a-250. Surface Water Supplied to SWP Article 21 South Coast Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	454	400	463	494
10%	68	77	58	64
20%	0	0	16	10
30%	0	0	0	0
40%	0	0	0	0
50%	0	0	0	0
60%	0	0	0	0
70%	0	0	0	0
80%	0	0	0	0
90%	0	0	0	0
100%	0	0	0	0
Mean	30	24	31	31

Table G3a-251. Surface Water Supplied to SWP Article 21 South Coast Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	6	8	1	4
D	4	4	6	1
BN	3	5	5	1
AN	38	44	43	46
W	73	51	75	80
All	30	24	31	31

G3a.3.5.44 SWP Article 21 Napa

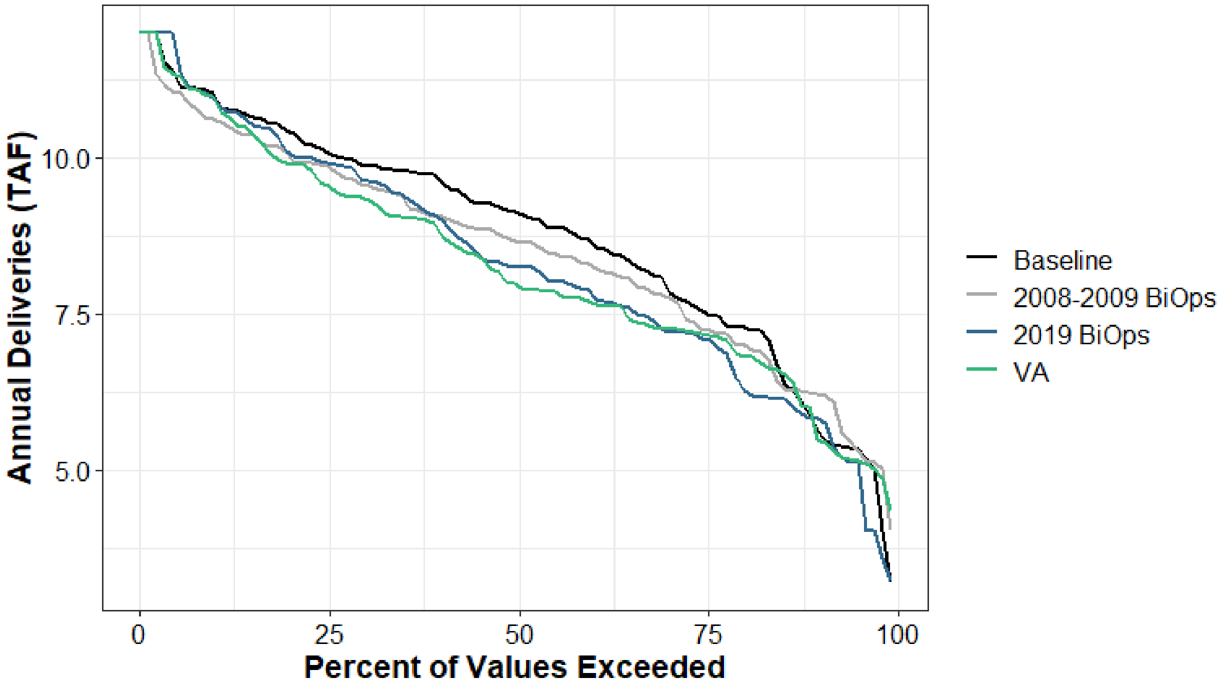

Figure G3a-119. Surface Water Supplied to SWP Article 21 Napa Annual Percent Exceedance Plot.

Table G3a-252. Surface Water Supplied to SWP Article 21 Napa Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	12	12	12	12
10%	11	10.6	10.9	10.9
20%	10.4	10	10.1	9.9
30%	9.9	9.6	9.6	9.3
40%	9.6	9	9	8.8
50%	9.1	8.7	8.3	8
60%	8.7	8.3	7.9	7.7
70%	8	7.8	7.2	7.3
80%	7.3	7	6.4	6.8
90%	5.7	6.2	5.8	5.6
100%	3.2	4	3.2	4.3
Mean	8.8	8.5	8.3	8.3

Table G3a-253. Surface Water Supplied to SWP Article 21 Napa Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	5.9	6	5.7	6.2
D	7.8	7.8	7.1	7
BN	9.4	9.2	8.3	8.4
AN	9.4	8.9	8.9	8.5
W	10.4	9.9	10.4	10.2
All	8.8	8.5	8.3	8.3

G3a.3.5.45 SWP Feather River Service Area (Agricultural)

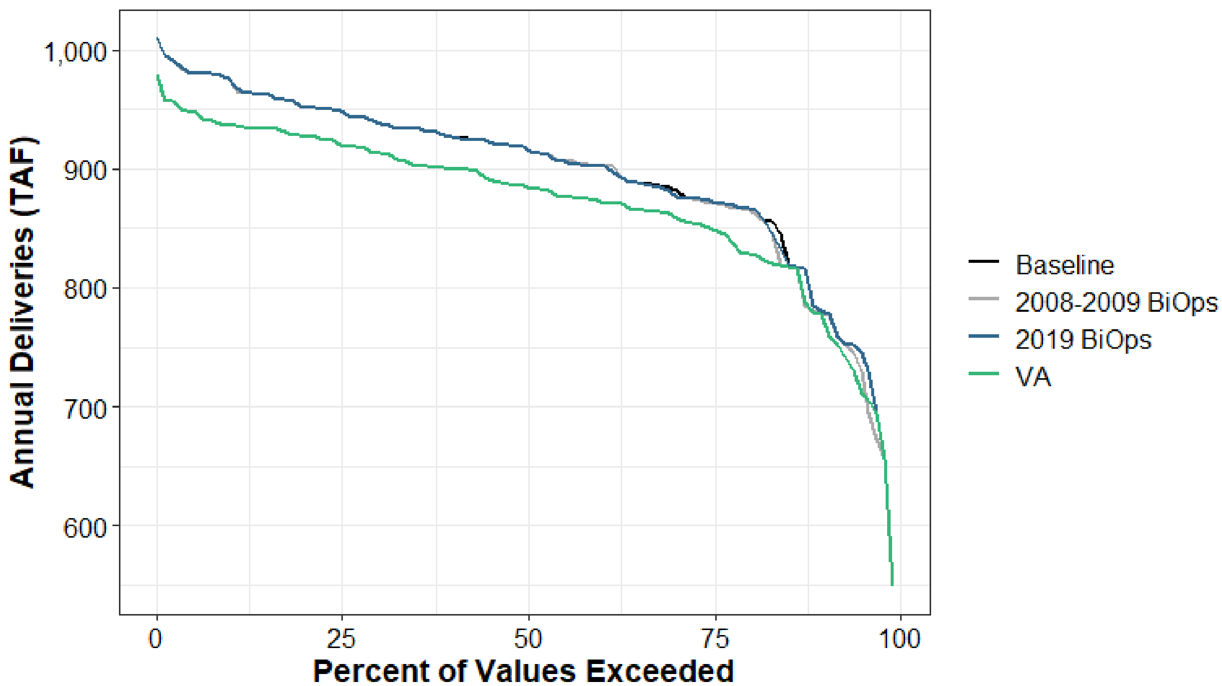

Figure G3a-120. Surface Water Supplied to SWP Feather River Service Area (Agricultural) Annual Percent Exceedance Plot

Table G3a-254. Surface Water Supplied to SWP Feather River Service Area (Agricultural) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	1,011	1,011	1,011	979
10%	974	974	974	937
20%	952	952	952	927
30%	939	939	939	913
40%	927	927	927	900
50%	918	918	918	886
60%	902	902	902	873
70%	884	880	880	861
80%	867	866	867	828
90%	781	779	781	779
100%	549	549	549	549
Mean	897	895	897	871

Table G3a-255. Surface Water Supplied to SWP Feather River Service Area (Agricultural) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	819	806	815	818
D	933	933	934	884
BN	936	937	936	886
AN	893	893	893	847
W	890	890	890	890
All	897	895	897	871

G3a.3.5.46 SWP Settlement (Urban)

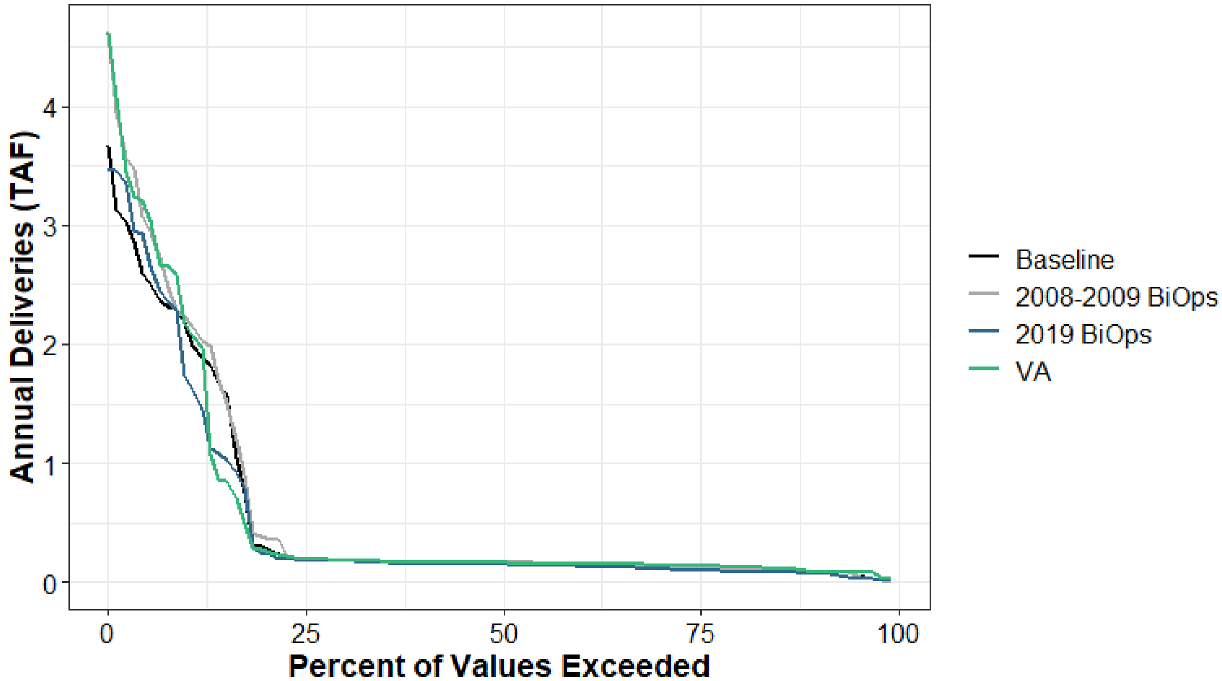

Figure G3a-121. Surface Water Supplied to SWP Settlement (Urban) Annual Percent Exceedance Plot

Table G3a-256. Surface Water Supplied to SWP Settlement (Urban) Annual Exceedance Probability Distribution by Scenario (TAF)

	Baseline	2008-2009 BiOps	2019 BiOps	VA
0%	3.7	4.6	3.5	4.6
10%	2.1	2.2	1.7	2.2
20%	0.3	0.4	0.2	0.3
30%	0.2	0.2	0.2	0.2
40%	0.2	0.2	0.2	0.2
50%	0.2	0.2	0.1	0.2
60%	0.1	0.1	0.1	0.2
70%	0.1	0.1	0.1	0.1
80%	0.1	0.1	0.1	0.1
90%	0.1	0.1	0.1	0.1
100%	0	0	0	0
Mean	0.5	0.6	0.5	0.5

Table G3a-257. Surface Water Supplied to SWP Settlement (Urban) Average by Water Year Type (TAF)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	2	2.4	2	2.3
D	0.4	0.4	0.3	0.2
BN	0.3	0.3	0.3	0.3
AN	0.2	0.2	0.2	0.2
W	0.1	0.1	0.1	0.1
All	0.5	0.6	0.5	0.5

G3a.3.6 Groundwater Storage and Flows

G3a.3.6.1 Total Groundwater Pumping

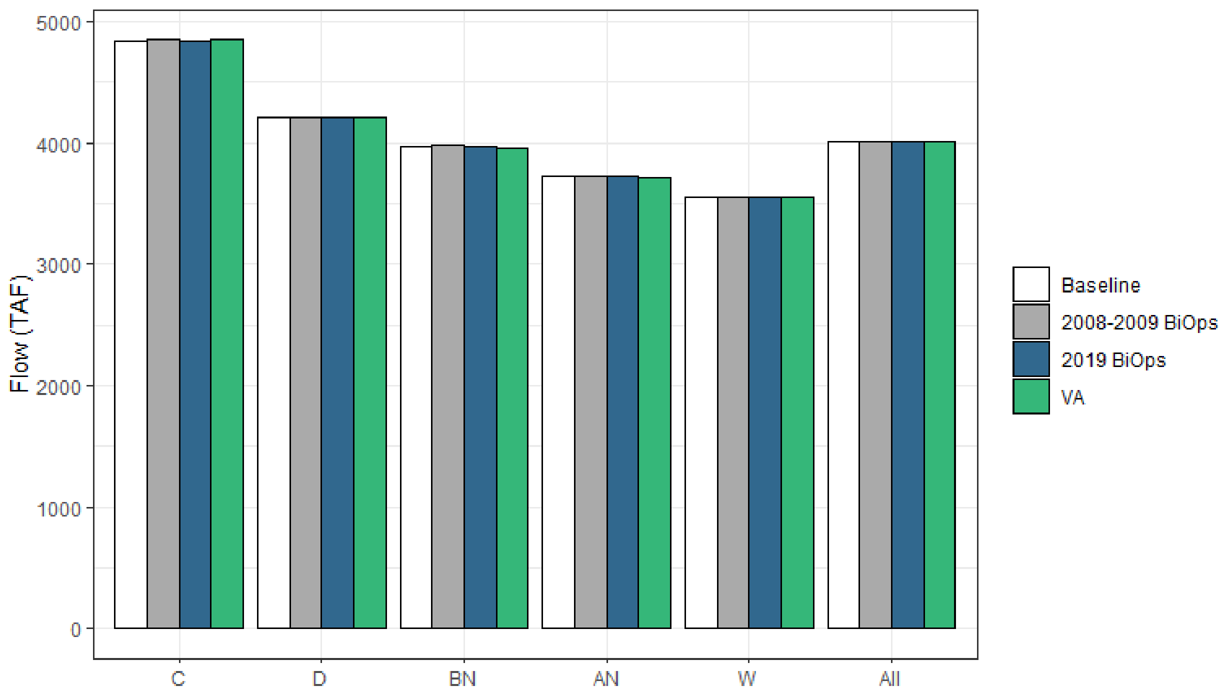

Figure G3a-122. Average Annual Groundwater Pumping Across All Basins by WYT and Scenario (TAF/yr)

Table G3a-258. Average Annual Groundwater Pumping Across All Basins by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	4840	4852	4844	4854
D	4212	4215	4216	4212
BN	3973	3977	3975	3960
AN	3730	3731	3733	3719
W	3552	3554	3554	3558
All	4009	4013	4012	4009

G3a.3.6.2 Total Groundwater Pumping — Delta Eastside Tributaries

The groundwater basins underlying the Delta Eastside Tributaries region include the Cosumnes and a portion of the Eastern San Joaquin basins. Groundwater pumping for this region is considered to be the sum of groundwater pumping for all demands in water budget areas 60N and 60S; pumping for demands in water budget area 61N is excluded.

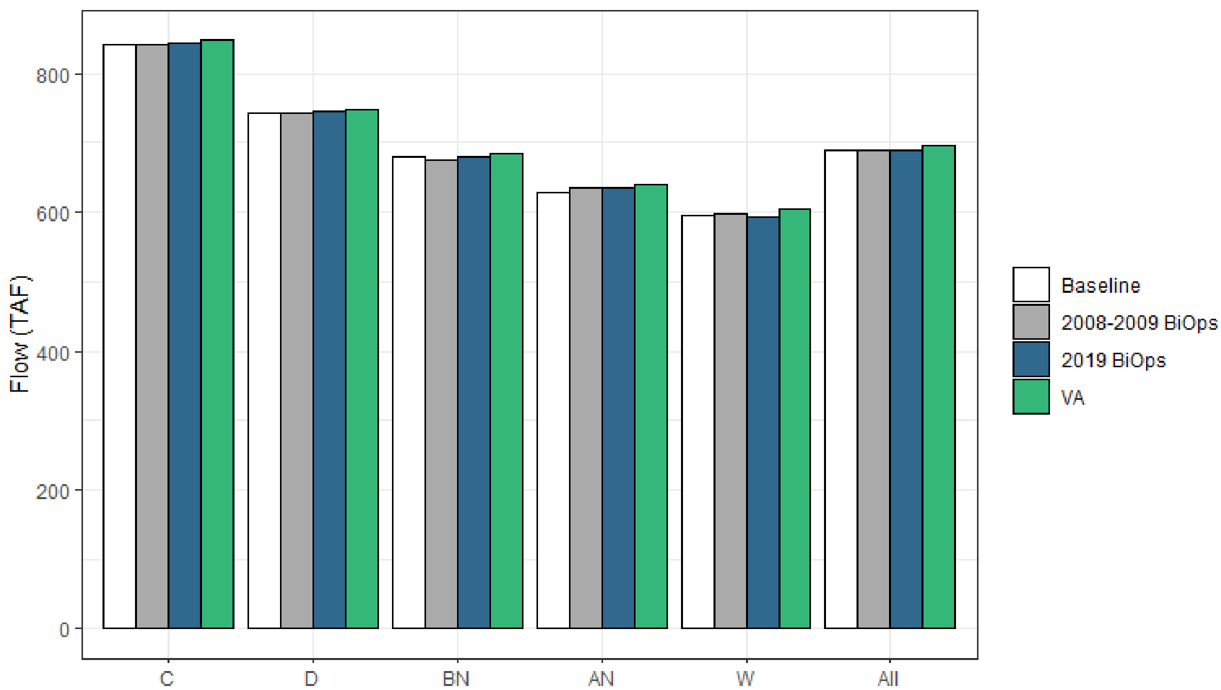

Figure G3a-123. Average Total Annual Groundwater Pumping for the Delta Eastside Tributaries Region by WYT and Scenario (TAF/yr)

Table G3a-259. Average Total Annual Groundwater Pumping for the Delta Eastside Tributaries Region by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	842	841	842	848
D	742	743	746	747
BN	679	674	679	685
AN	629	634	635	641
W	596	597	594	604
All	688	688	689	695

G3a.3.6.3 Groundwater Pumping — Sacramento River Watershed

The groundwater basins underlying the Sacramento River Watershed region include the American, Butte, Red Bluff-Corning, Redding, Sutter-Yuba, Yolo-Solano, and Colusa basins.

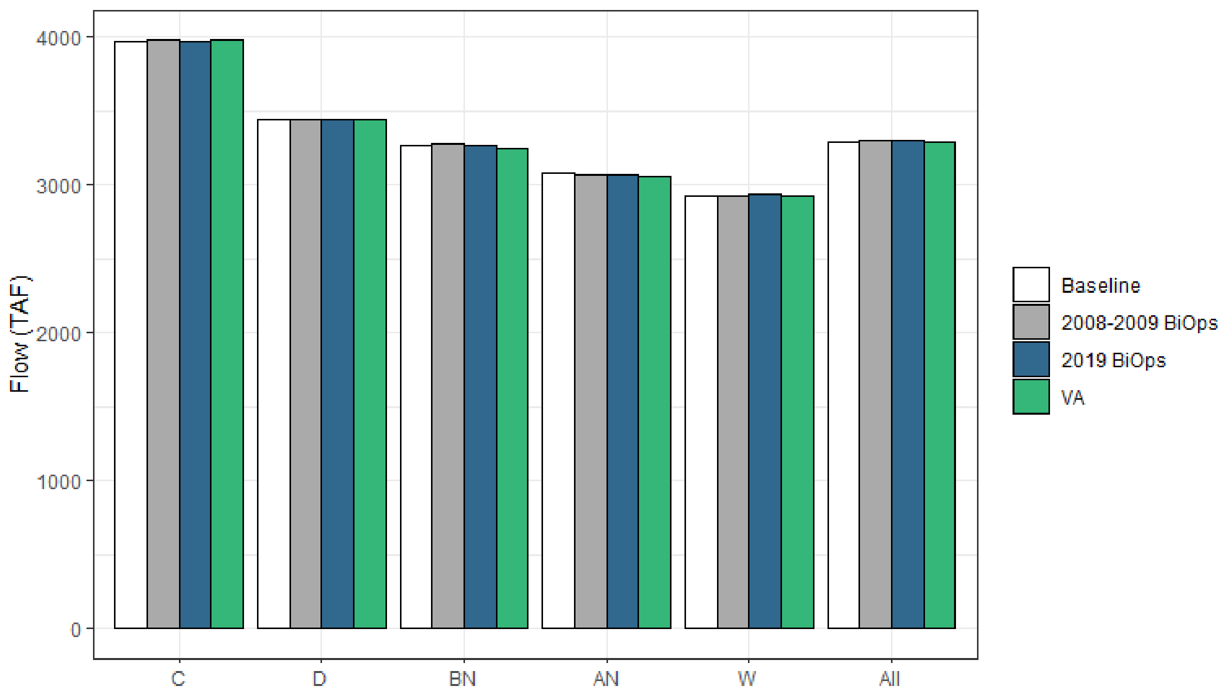

Figure G3a-124. Average Total Annual Groundwater Pumping for the Sacramento Watershed Region by WYT and Scenario (TAF/yr)

Table G3a-260. Average Total Annual Groundwater Pumping for the Sacramento Watershed Region by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	3968	3980	3971	3975
D	3440	3442	3440	3436
BN	3262	3272	3265	3243
AN	3074	3070	3070	3051
W	2929	2930	2933	2927
All	3291	3295	3293	3285

G3a.3.6.4 Groundwater Pumping by Basin

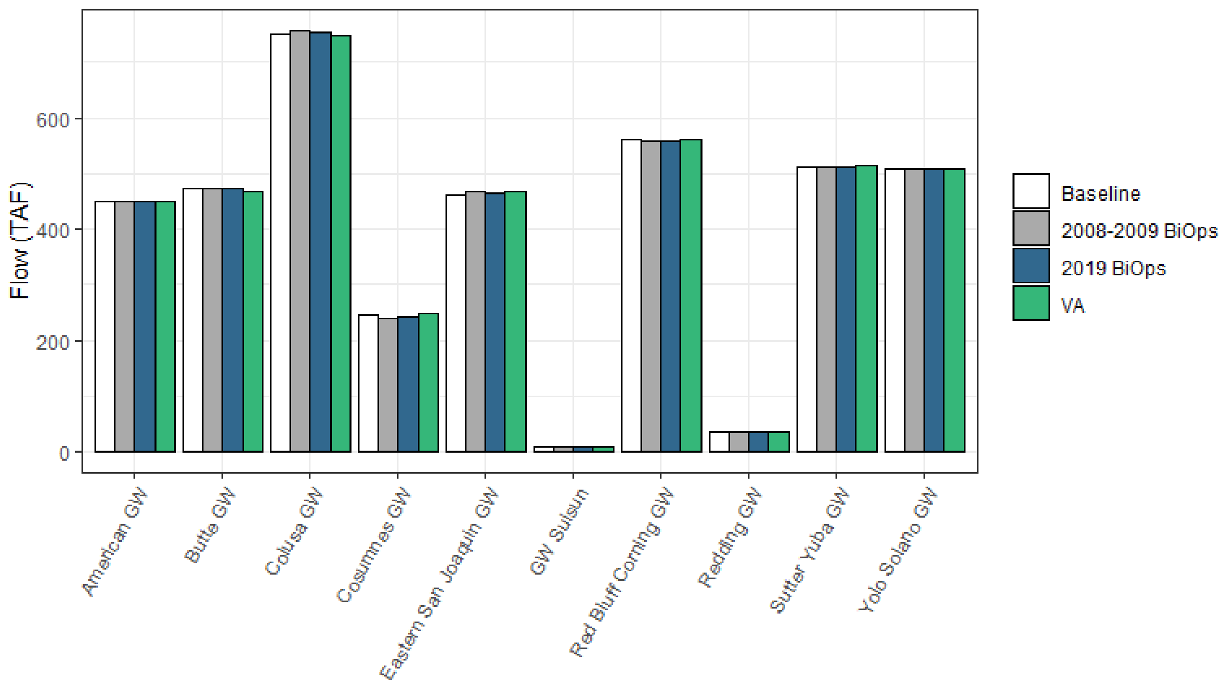

Figure G3a-125. Annual Average Groundwater Pumping by Basin (TAF/yr)

Table G3a-261. Annual Average Groundwater Pumping by Basin and Change from Baseline (TAF/yr)

Basin	Baseline	2008-2009 BiOps	2019 BiOps	VA
American GW	451	0	-1	0
Butte GW	472	1	2	-6
Colusa GW	750	7	4	-2
Cosumnes GW	245	-6	-1	2
Eastern San Joaquin GW	463	6	2	5
GW Suisun	10	0	0	0
Red Bluff Corning GW	561	-5	-4	-1
Redding GW	36	0	0	0
Sutter Yuba GW	511	0	1	4
Yolo Solano GW	510	0	0	-1

G3a.3.6.5 Total Groundwater Recharge

Total groundwater recharge includes stream gain/loss, infiltration from applied water and precipitation, and transmission losses to all of the groundwater basins.

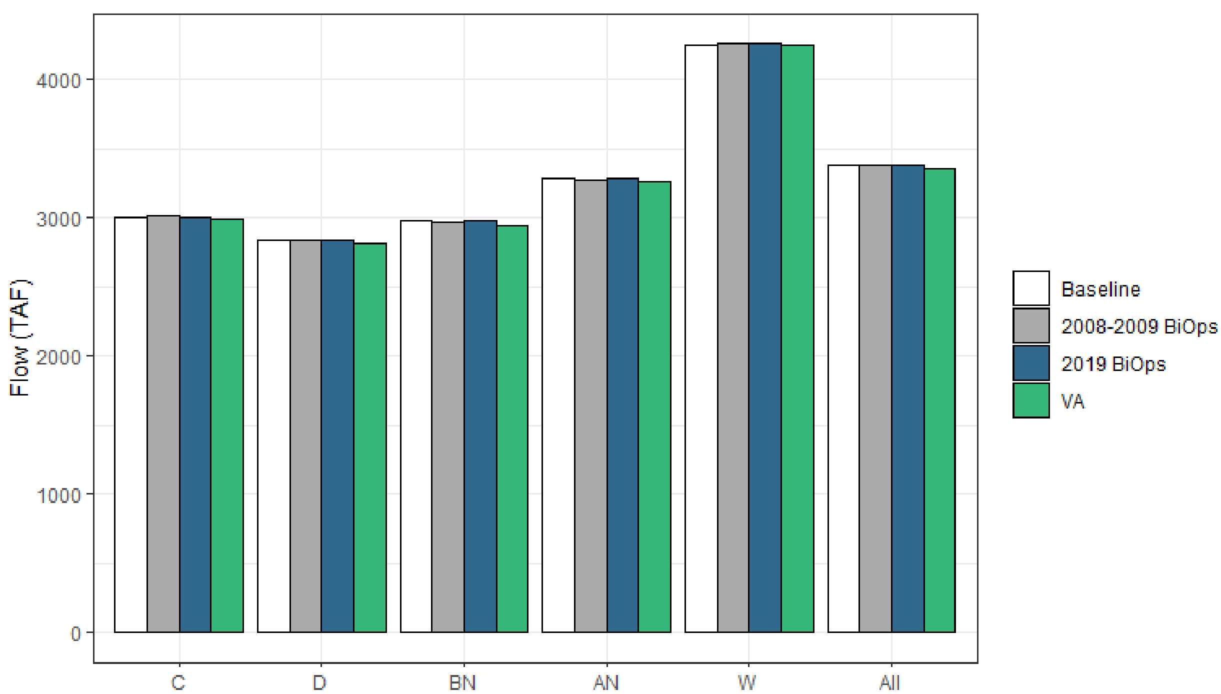

Figure G3a-126. Total Average Annual Groundwater Recharge by WYT and Scenario (TAF/yr)

Table G3a-262. Total Average Annual Groundwater Recharge by WYT and Scenario (TAF/yr).

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	3001	3012	3005	2998
D	2841	2841	2843	2822
BN	2982	2975	2979	2951
AN	3292	3274	3287	3259
W	4258	4265	4259	4253
All	3378	3378	3378	3361

G3a.3.6.6 Total Groundwater Recharge — Delta Eastside Tributaries

Total groundwater recharge includes stream gain/loss, infiltration from applied water and precipitation, and transmission losses to all of the groundwater basins. The groundwater basins underlying the Delta Eastside Tributaries region include the Cosumnes and a portion of the Eastern San Joaquin basins. All sources of recharge within water budget areas 60S and 60N are included in the summary of recharge for the Delta Eastside Tributaries region.

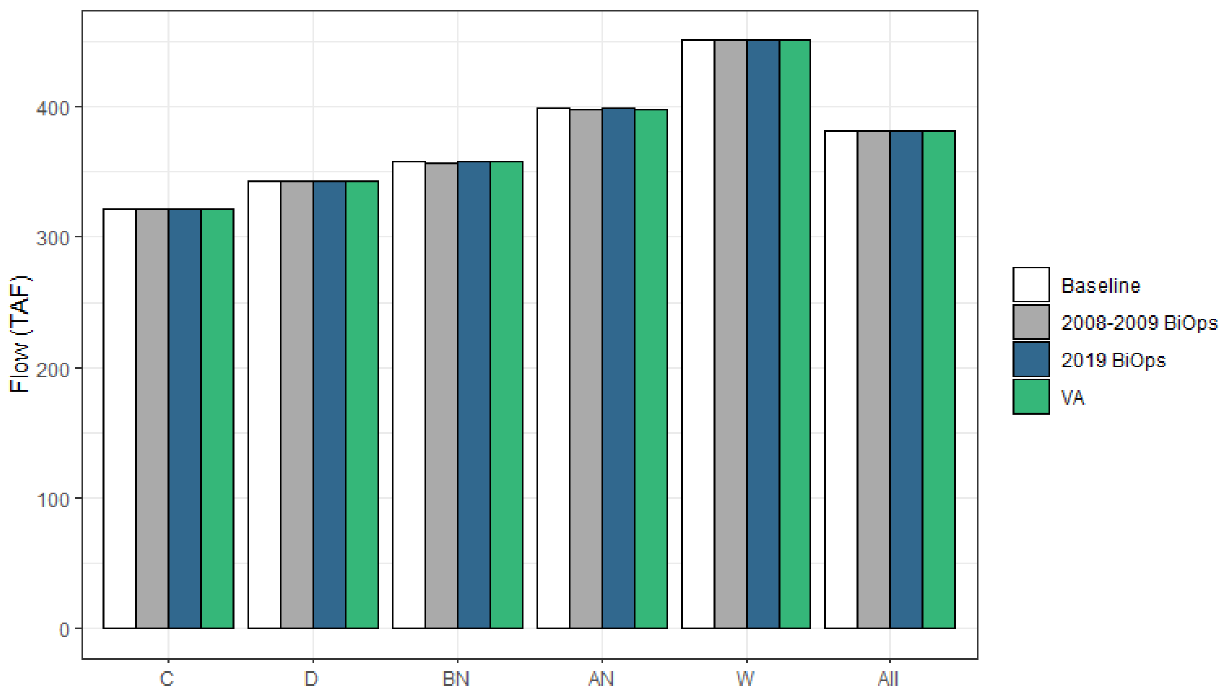

Figure G3a-127. Total Average Annual Groundwater Recharge for the Delta Eastside Tributaries Region by WYT and Scenario (TAF/yr)

Table G3a-263. Total Average Annual Groundwater Recharge for the Delta Eastside Tributaries Region by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	322	321	322	321
D	343	343	343	342
BN	357	357	357	357
AN	398	398	398	398
W	451	451	451	450
All	382	381	382	381

G3a.3.6.7 Total Groundwater Recharge — Sacramento River Watershed

Total groundwater recharge includes stream gain/loss, infiltration from applied water and precipitation, and transmission losses to all of the groundwater basins. The groundwater basins underlying the Sacramento watershed region include the American, Butte, Red Bluff-Corning, Redding, Sutter-Yuba, Yolo-Solano, and Colusa basins.

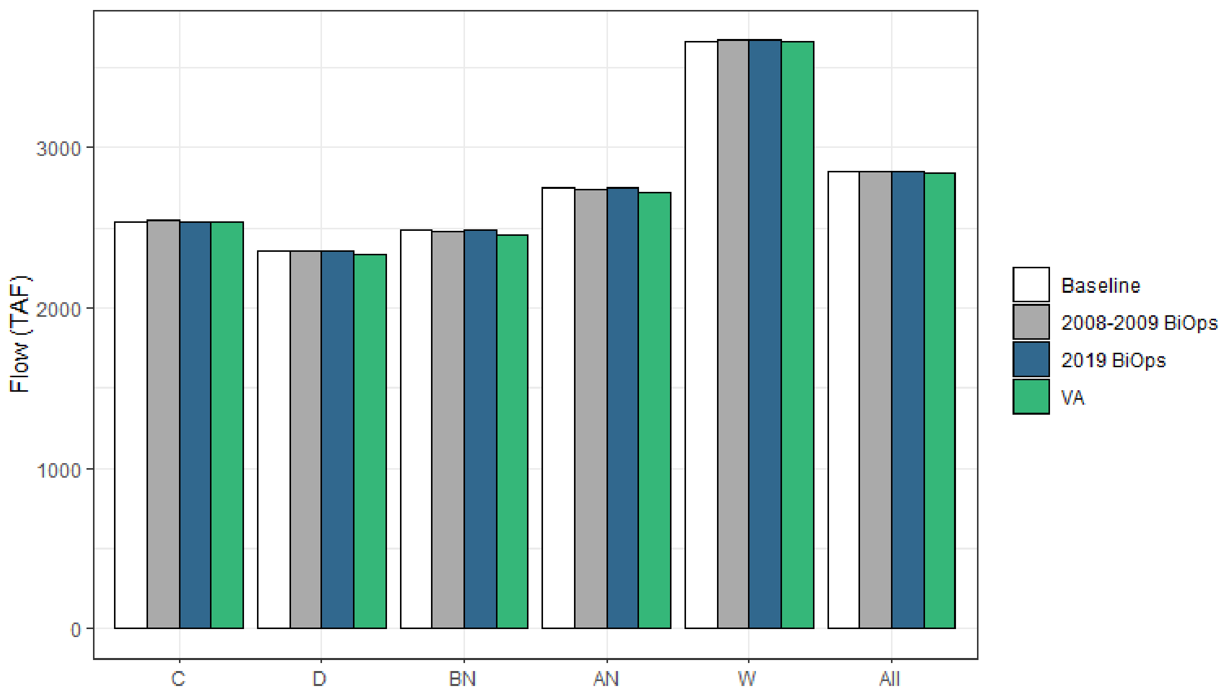

Figure G3a-128. Total Average Annual Groundwater Recharge for the Sacramento River Watershed by WYT and Scenario (TAF/yr)

Table G3a-264. Total Average Annual Groundwater Recharge for the Sacramento River Watershed by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	2537	2548	2541	2533
D	2353	2353	2355	2335
BN	2485	2478	2482	2453
AN	2753	2736	2748	2720
W	3664	3671	3665	3659
All	2853	2853	2853	2837

G3a.3.6.8 Total Groundwater Recharge by Basin

Total groundwater recharge includes stream gain/loss, infiltration from applied water and precipitation, and transmission losses.

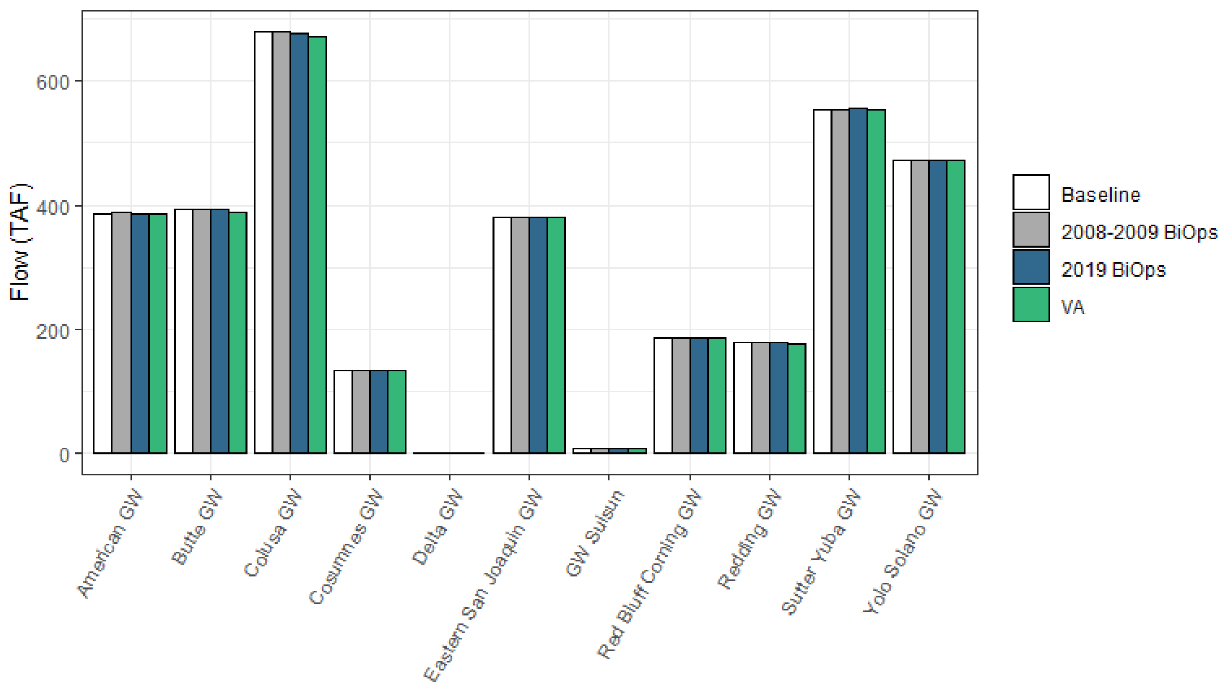

Figure G3a-129. Annual Average Groundwater Recharge by Basin (TAF/yr)

Table G3a-265. Annual Average Groundwater Recharge by Basin and Change from Baseline (TAF/yr)

Basin	Baseline	2008-2009 BiOps	2019 BiOps	VA
American GW	387	1	0	-1
Butte GW	395	0	-1	-5
Colusa GW	680	0	-2	-9
Cosumnes GW	134	0	0	0
Delta GW	0	0	0	0
Eastern San Joaquin GW	381	0	0	0
GW Suisun	9	0	0	0
Red Bluff Corning GW	188	0	0	0
Redding GW	177	0	0	-1
Sutter Yuba GW	554	0	3	0
Yolo Solano GW	472	1	0	0

G3a.3.6.9 Total Stream-Groundwater Flux

Total stream-groundwater flux represents the net flow from streams to underlying groundwater basins.

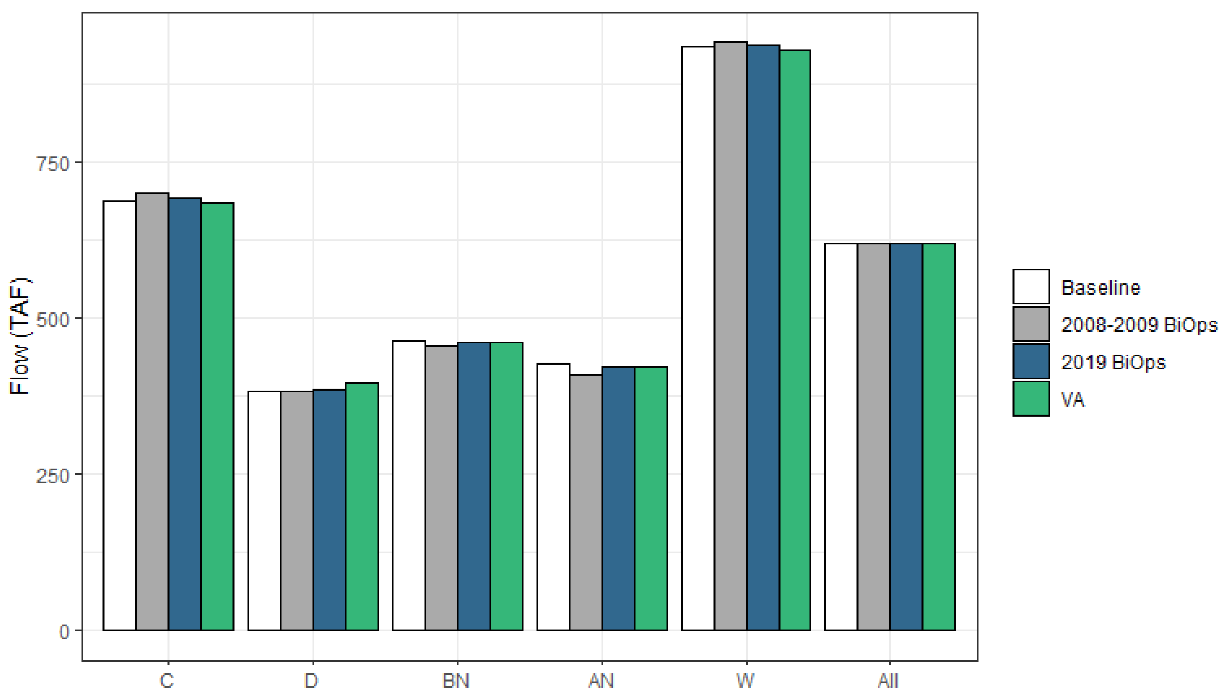

Figure G3a-130. Total Average Annual Stream-Groundwater Flux (Net GW Gain) by WYT and Scenario (TAF/yr)

Table G3a-266. Total Average Annual Stream-Groundwater Flux (Net GW Gain) by WYT and Scenario (TAF/yr).

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	688	701	693	686
D	384	384	386	395
BN	463	456	461	461
AN	426	410	423	422
W	935	942	936	930
All	619	620	620	619

G3a.3.6.10 Total Stream-Groundwater Flux — Delta Eastside Tributaries

For the Delta Eastside Tributaries, this summary includes stream-groundwater flows associated with the Cosumnes, Mokelumne, and Calaveras River watersheds.

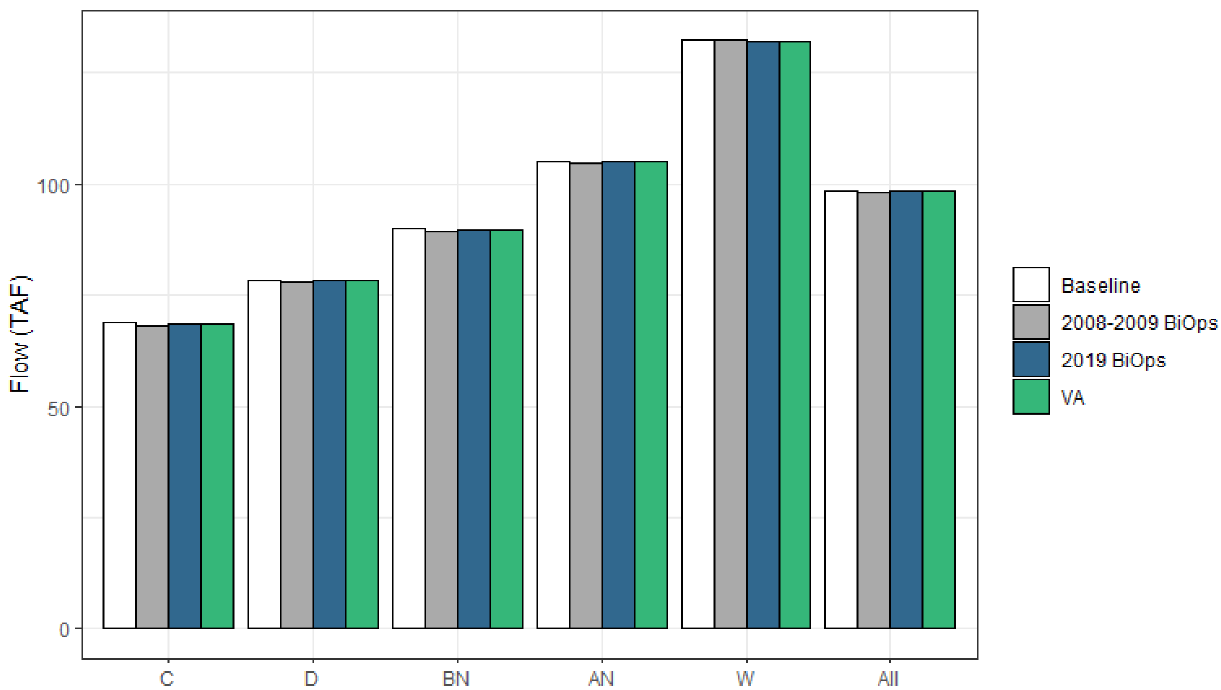

Figure G3a-131. Total Average Annual Stream-Groundwater Flux (Net GW Gain) for Delta Eastside Tributaries Region by WYT and Scenario (TAF/yr).

Table G3a-267. Total Average Annual Stream-Groundwater Flux (Net GW Gain) for Delta Eastside Tributaries Region by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	69	68	69	69
D	78	78	79	78
BN	90	89	90	90
AN	105	105	105	105
W	132	133	132	132
All	99	98	99	99

G3a.3.6.11 Total Stream-Groundwater Flux — Sacramento River Watershed

For the Sacramento River Watershed, this summary includes all stream-groundwater flows in the American, Butte, Red Bluff-Corning, Redding, Sutter-Yuba, Yolo-Solano, and Colusa basins.

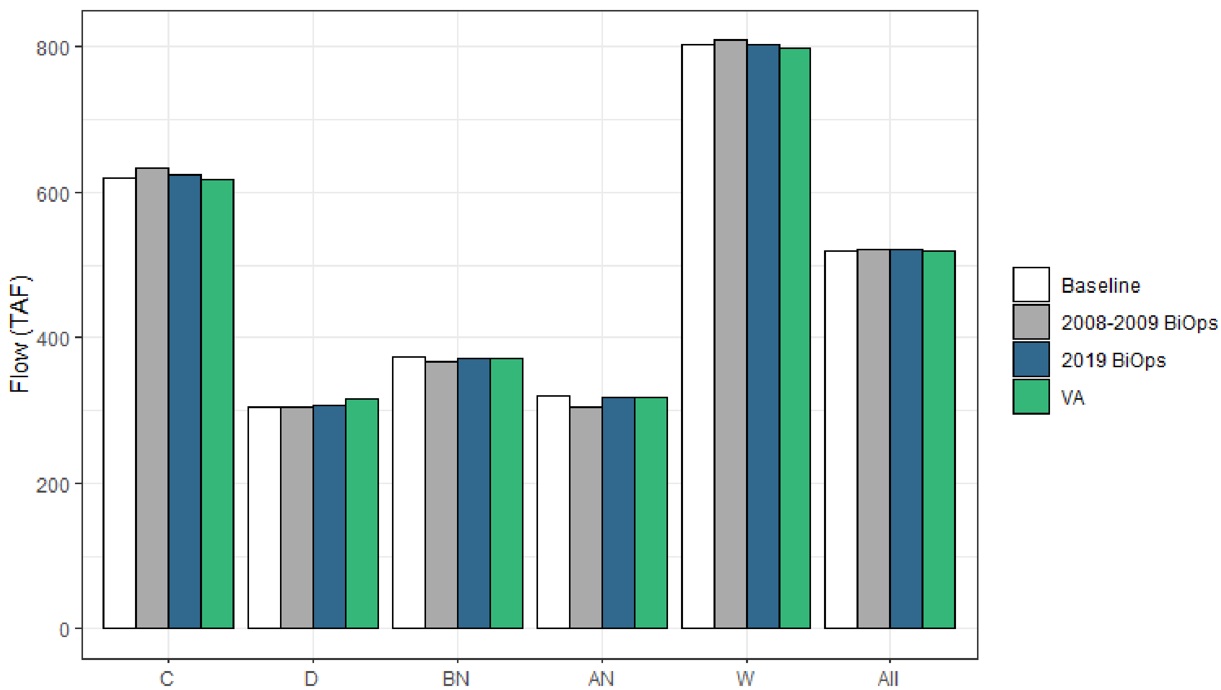

Figure G3a-132. Total Average Annual Stream-Groundwater Flux (Net GW Gain) for Sacramento River Watershed by WYT and Scenario (TAF/yr)

Table G3a-268. Total Average Annual Stream-Groundwater Flux (Net GW Gain) for Sacramento River Watershed by WYT and Scenario (TAF/yr)

WYT	Baseline	2008-2009 BiOps	2019 BiOps	VA
C	619	633	624	617
D	305	306	308	317
BN	373	367	371	371
AN	321	306	318	317
W	803	810	804	798
All	520	521	521	520

G3a.3.6.12 Stream-Groundwater Flux by Basin

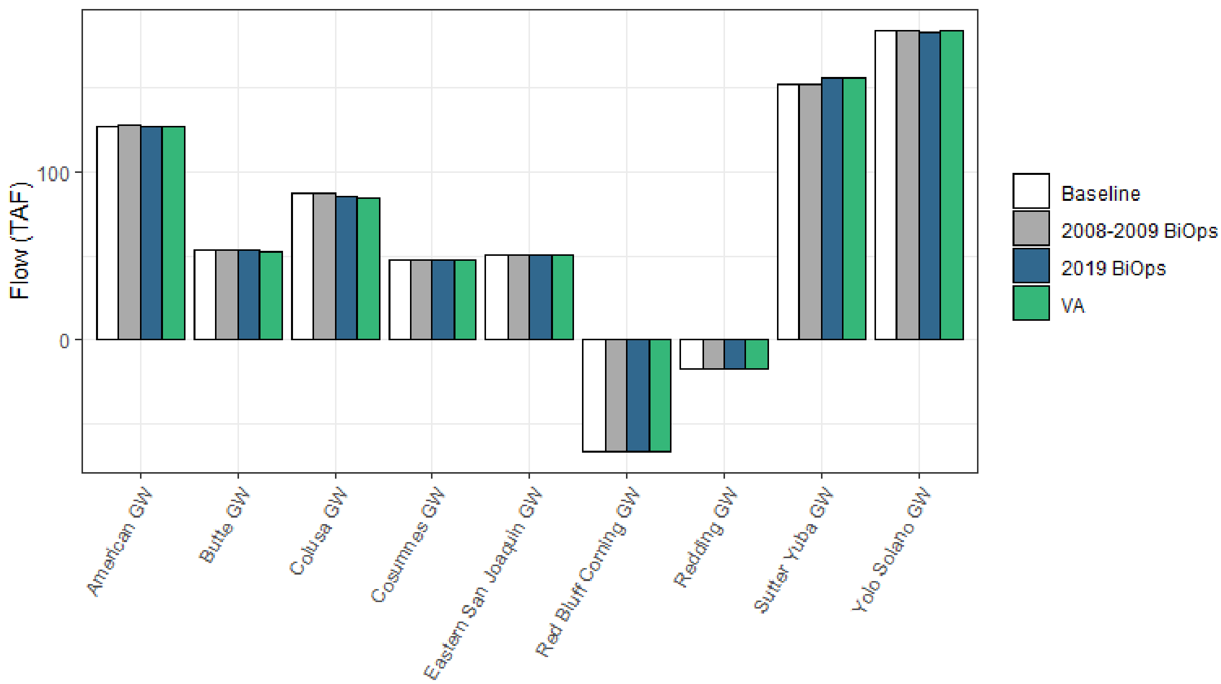

Figure G3a-133. Stream-Groundwater Flux (Net GW Gain) by Basin (TAF/yr)

Table G3a-269. Annual Average Stream-Groundwater Flux by Basin and Change from Baseline (TAF/yr)

Basin	Baseline	2008-2009 BiOps	2019 BiOps	VA
American GW	127	1	0	0
Butte GW	54	0	-1	-1
Colusa GW	87	0	-2	-3
Cosumnes GW	48	0	0	0
Eastern San Joaquin GW	51	0	0	0
Red Bluff Corning GW	-66	0	0	0
Redding GW	-17	0	0	0
Sutter Yuba GW	152	0	4	3
Yolo Solano GW	184	1	0	0

G3a.3.6.13 Groundwater Storage by Basin

Table G3a-270. Annual Average Rate of Change in Storage by Basin (TAF/yr)

Basin	Baseline	2008-2009 BiOps	2019 BiOps	VA
American GW	-64	-63	-63	-65
Butte GW	-78	-79	-80	-77
Colusa GW	-70	-77	-76	-77
Cosumnes GW	-111	-105	-110	-114
Eastern San Joaquin GW	-81	-87	-84	-86
GW Suisun	-1	-1	-1	-1
Red Bluff Corning GW	-374	-369	-370	-373
Redding GW	142	141	142	141
Sutter Yuba GW	43	42	45	39
Yolo Solano GW	-37	-37	-38	-37

G3a.3.6.14 Groundwater Basin Storage Relative to Baseline

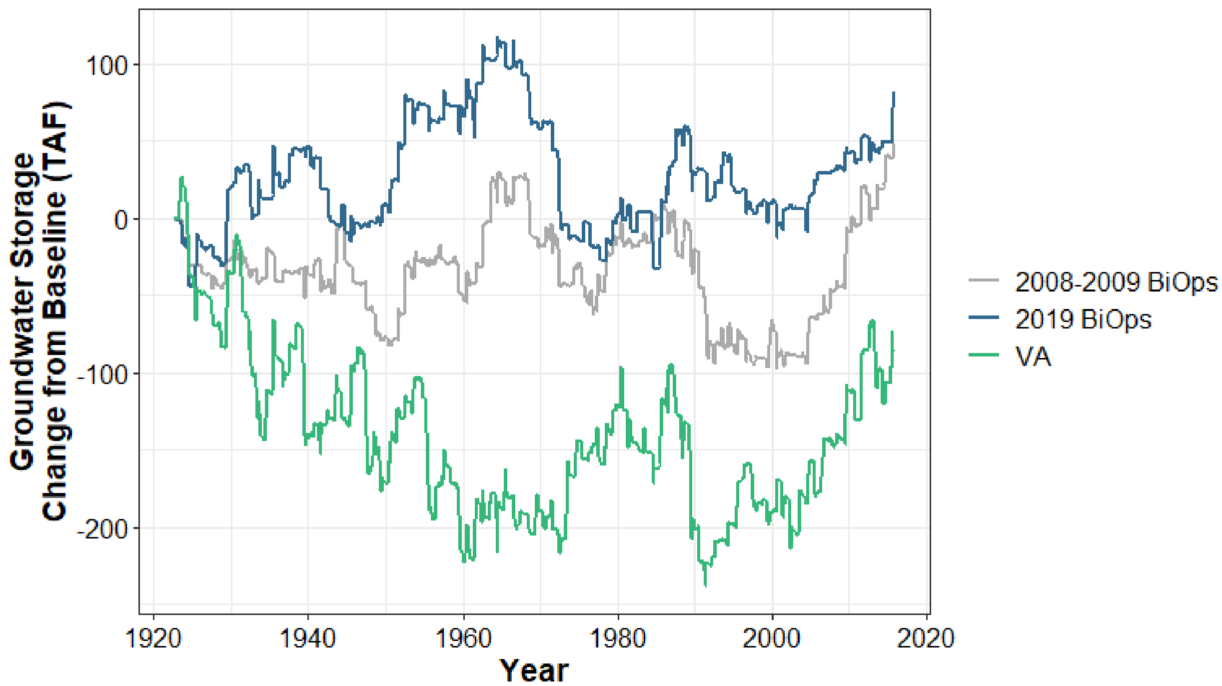

Figure G3a-134. American River Groundwater Basin End of Year Storage—Change from Baseline

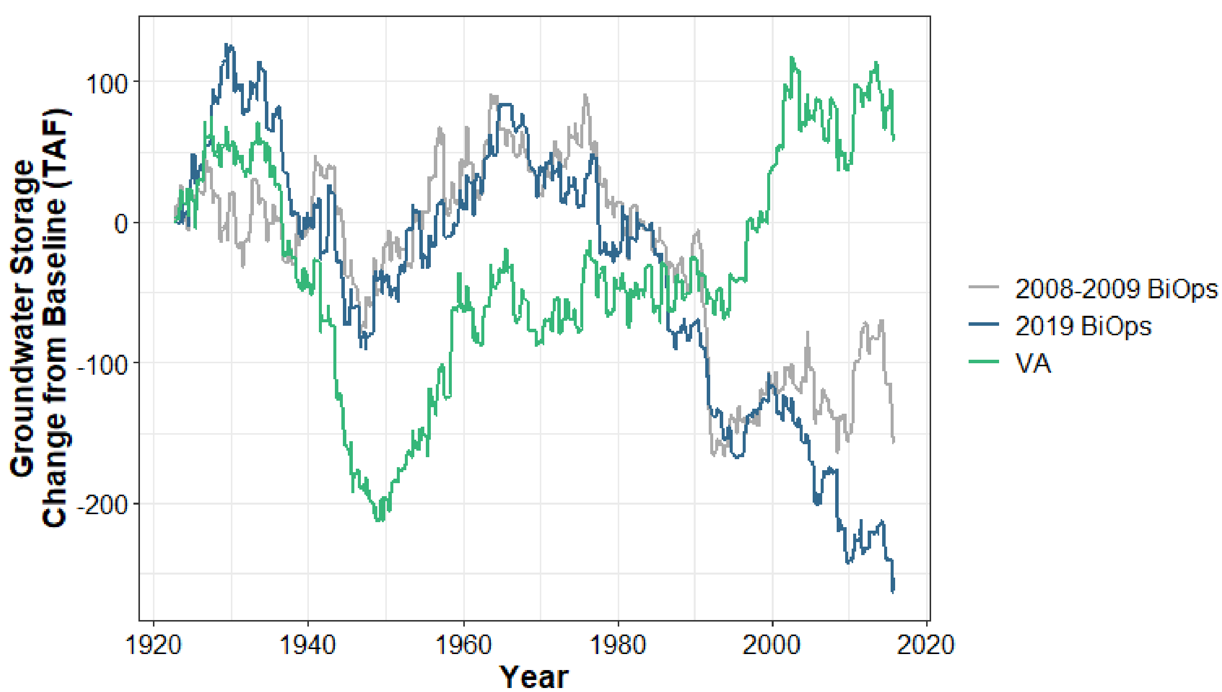

Figure G3a-135. Butte Groundwater Basin End of Year Storage—Change from Baseline

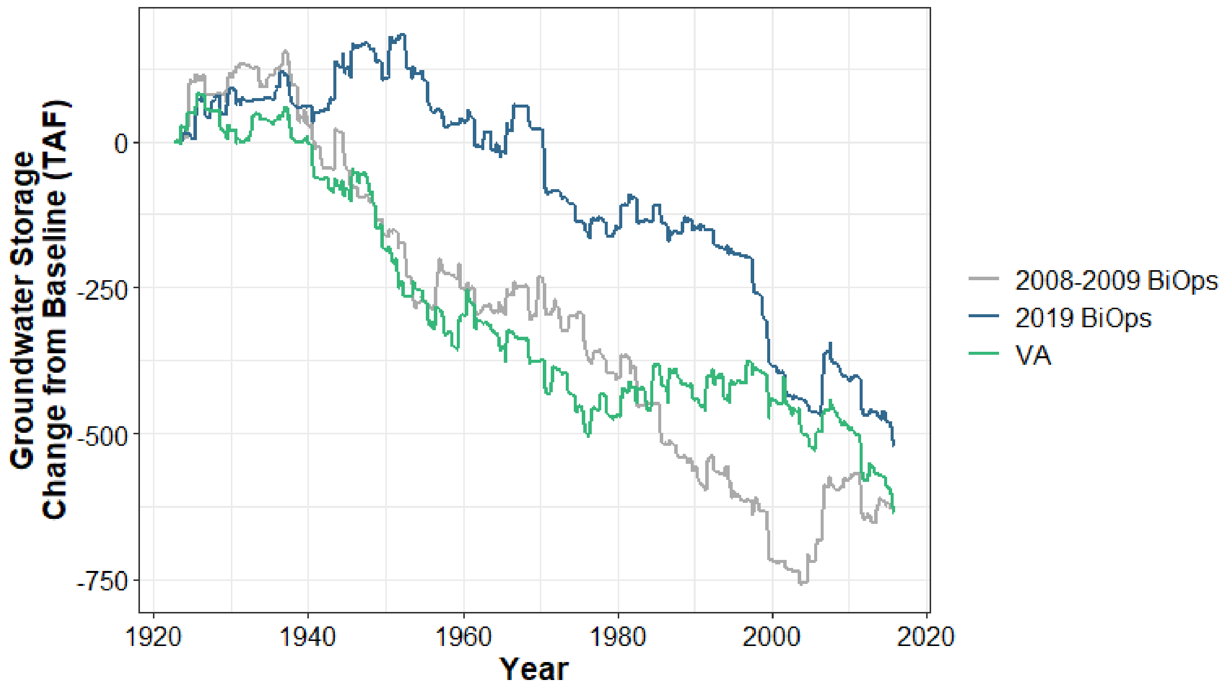

Figure G3a-136. Colusa Groundwater Basin End of Year Storage—Change from Baseline

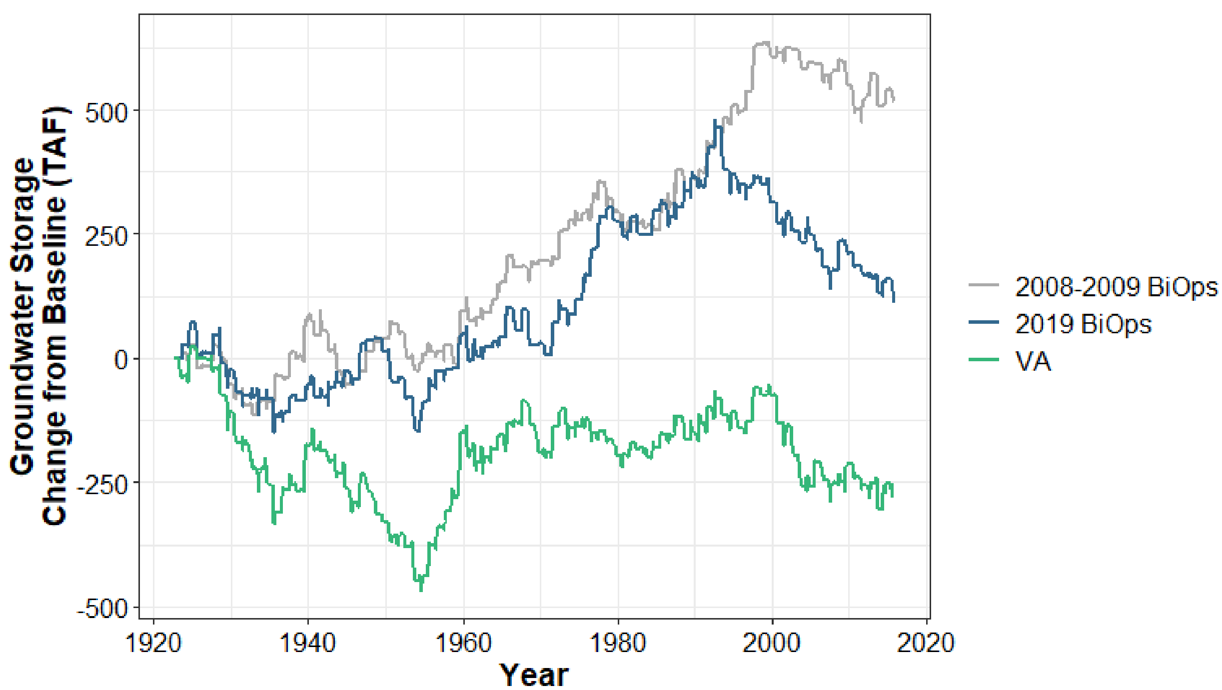

Figure G3a-137. Cosumnes Groundwater Basin End of Year Storage—Change from Baseline

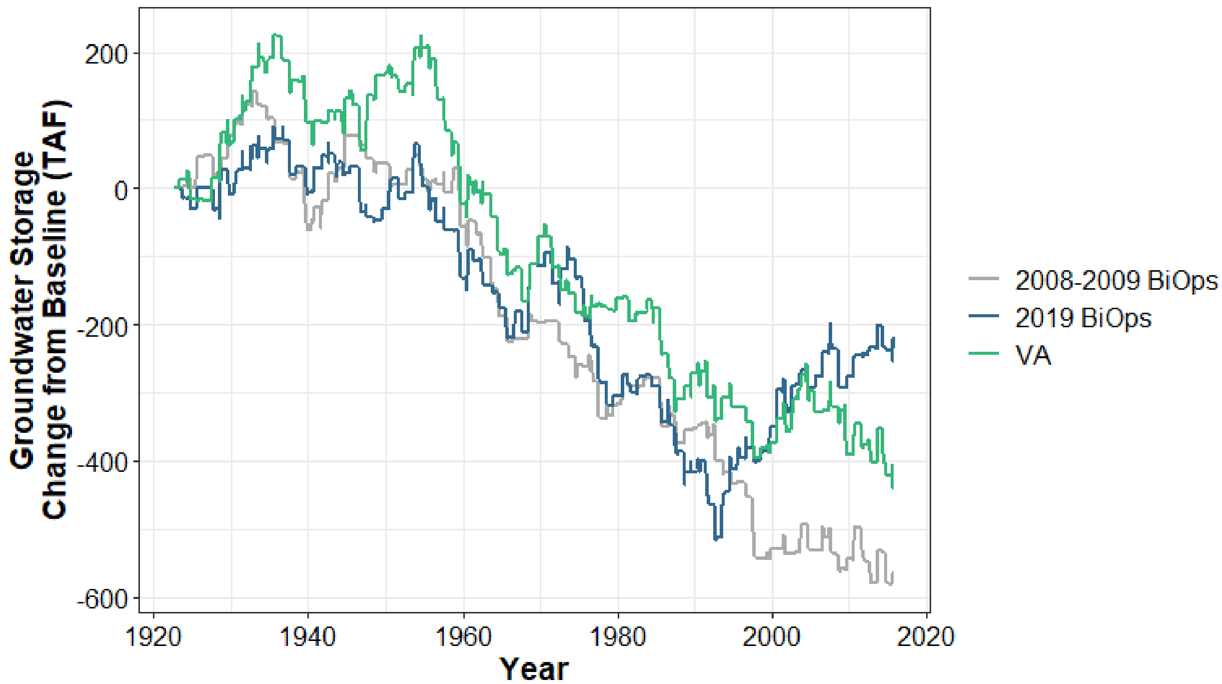

Figure G3a-138. Eastern San Joaquin Groundwater Basin End of Year Storage—Change from Baseline

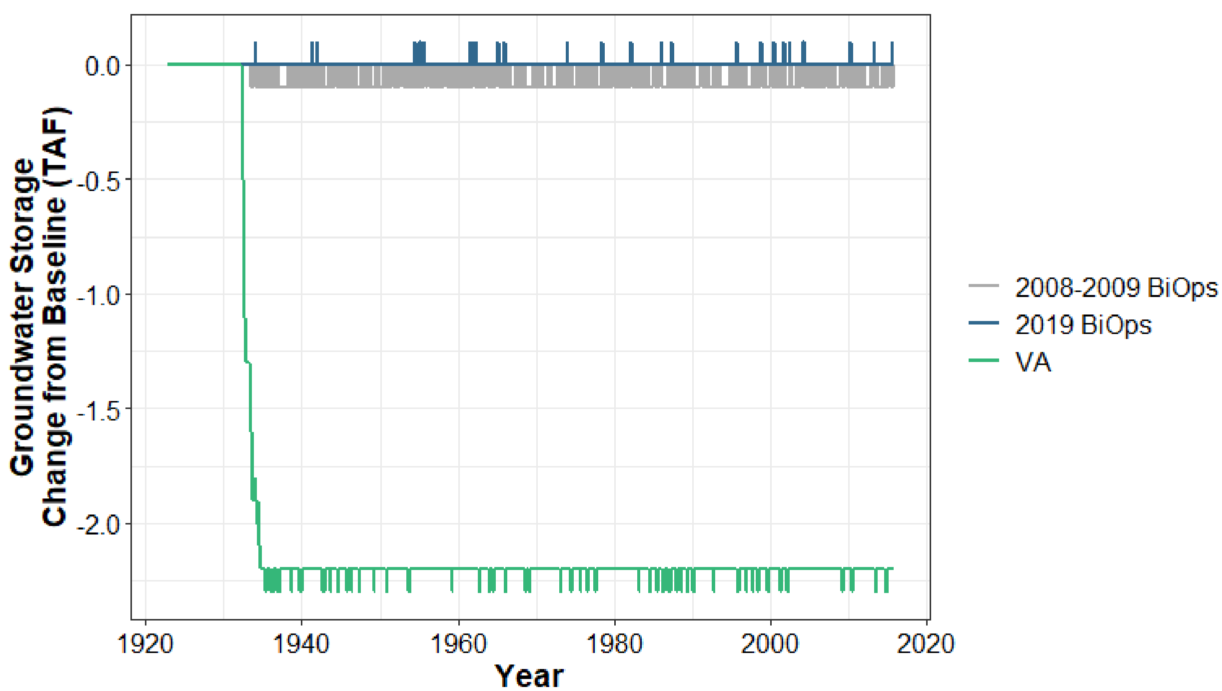

Figure G3a-139. Suisun Groundwater Basin End of Year Storage—Change from Baseline

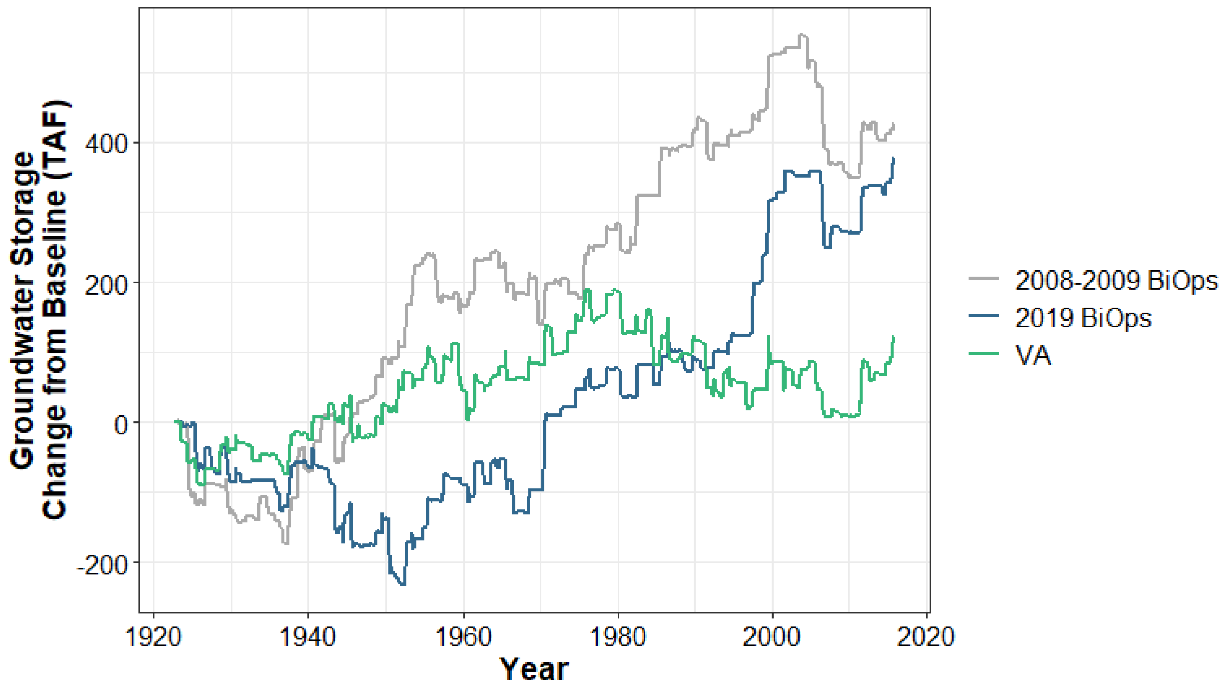

Figure G3a-140. Red Bluff-Corning Groundwater Basin End of Year Storage—Change from Baseline

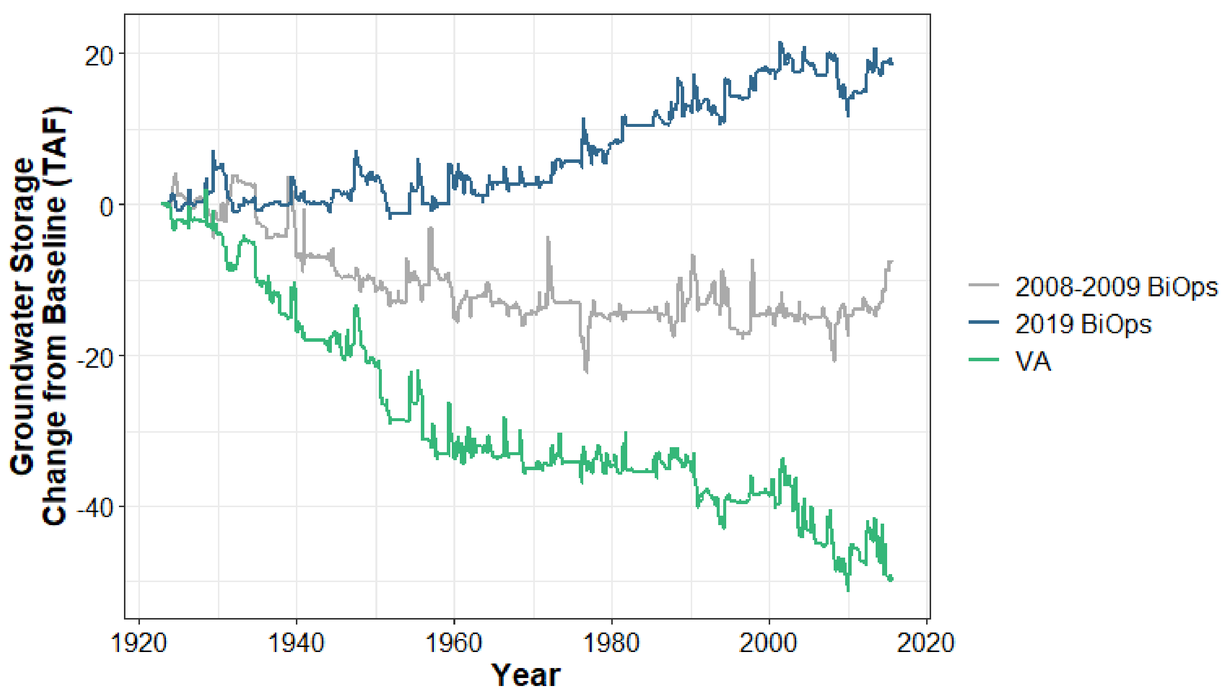

Figure G3a-141. Redding Groundwater Basin End of Year Storage—Change from Baseline

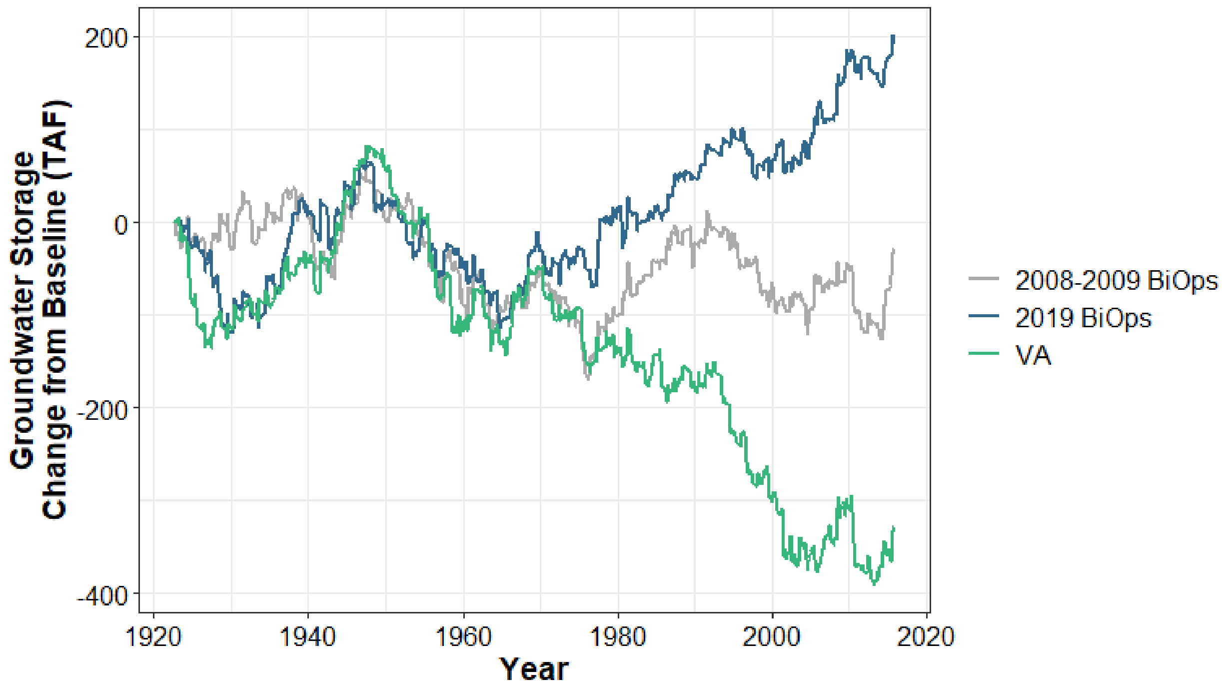

Figure G3a-142. Sutter-Yuba Groundwater Basin End of Year Storage—Change from Baseline

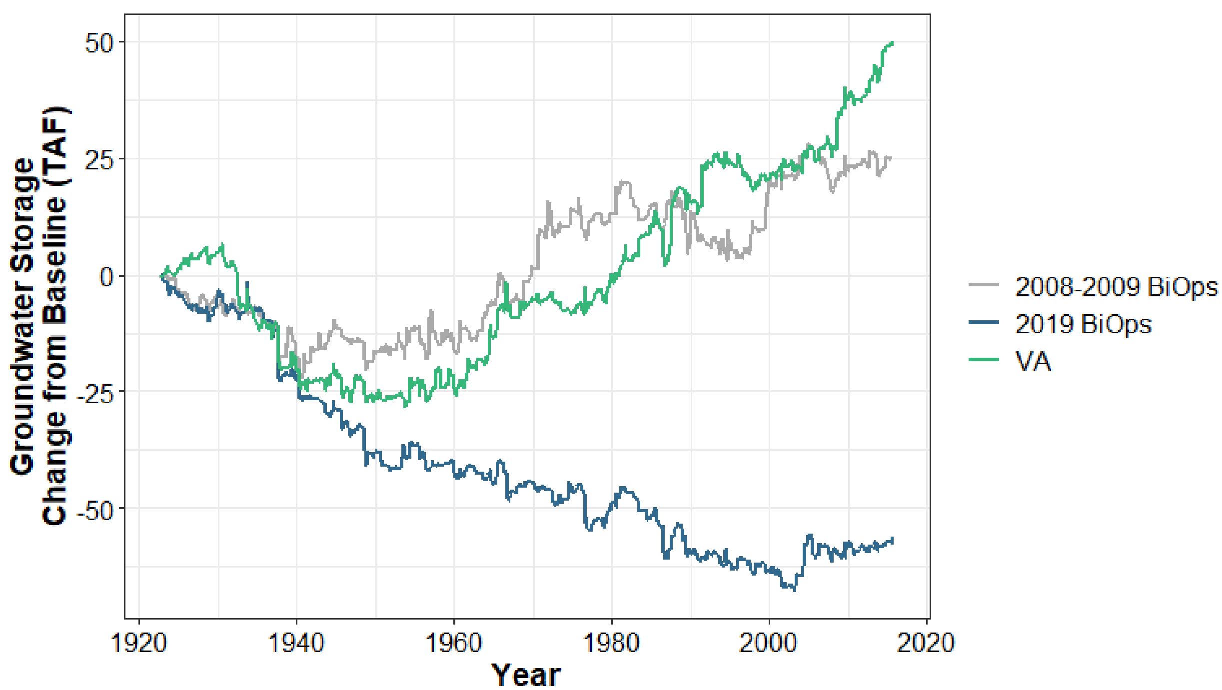

Figure G3a-143. Yolo-Solano Groundwater Basin End of Year Storage—Change from Baseline

G3a.3.7 Unmet Instream Flow Requirements

Unmet instream flow requirements are presented as a count of months and percent of months in which the flow requirement was not met. There are a total of 1,116 months in the 1923–2015 simulation period presented here, though many instream flow requirements are not in effect in every month of the simulation period. The flow requirement was considered unmet if the shortfall was greater than 5% of the monthly requirement. Results are presented for "REG" flow requirements, which represent existing regulatory flow requirements. The VA scenario makes use of a subset of "SWRCB" flow requirements (SWRCB Camanche, SWRCB Folsom, SWRCB Delta, SWRCB Putah Creek, and SWRCB Sacramento at Knights Landing) as well as REG High Flow Channel to implement VA flow requirements. These requirements are always met in the VA scenario.

Table G3a-271. Number of Months (Percent of Months) with Unmet REG Instream Flow Requirements

Requirement	Baseline	2008-2009 BiOps	2019 BiOps	VA
REG American River at Fair Oaks	0 (0)	5 (0)	1 (0)	1 (0)
REG Bear River below Lower Bear Dam	15 (1)	15 (1)	15 (1)	15 (1)
REG Below Little Grass Valley Dam	10 (1)	10 (1)	10 (1)	10 (1)
REG below SFF Tunnel	10 (1)	10 (1)	10 (1)	10 (1)
REG Below Tiger River Regulator	2 (0)	2 (0)	2 (0)	2 (0)
REG Clear Creek below Igo	134 (12)	134 (12)	136 (12)	128 (11)
REG Cole Creek below Diversion Dam	10 (1)	10 (1)	10 (1)	10 (1)
REG D893 H St	0 (0)	4 (0)	1 (0)	2 (0)
REG Downstream of Forbestown Dam	1 (0)	1 (0)	1 (0)	1 (0)
REG Downstream of Lost Creek Dam	2 (0)	2 (0)	2 (0)	2 (0)
REG Kellogg Creek below Los Vaqueros	183 (16)	183 (16)	183 (16)	183 (16)
REG Little Rubicon below Diversion	37 (3)	37 (3)	37 (3)	37 (3)
REG Lodi1950 Base	10 (1)	10 (1)	10 (1)	10 (1)
REG Lodi1950 HiMayStorage	65 (6)	65 (6)	65 (6)	65 (6)
REG Lodi1950 LoMayStorageHiEOMStorage	42 (4)	42 (4)	42 (4)	42 (4)
REG Lodi22415 Base	10 (1)	10 (1)	10 (1)	10 (1)
REG Lodi22415 HiPrecipHiEOMStorage	16 (1)	16 (1)	16 (1)	16 (1)
REG Middle Yuba below Our House Dam	49 (4)	49 (4)	49 (4)	49 (4)
REG Mormon Ravine	93 (8)	93 (8)	93 (8)	93 (8)
REG NF American below Lake Valley Canal	115 (10)	115 (10)	115 (10)	115 (10)
REG NF Mokelumne below Salt Spring Dam	2 (0)	2 (0)	2 (0)	2 (0)
REG Rubicon below Rubicon Dam	36 (3)	36 (3)	36 (3)	36 (3)
REG Silver Creek below Oyster Creek	90 (8)	89 (8)	90 (8)	89 (8)
REG Stony Creek below Black Butte	3 (0)	3 (0)	3 (0)	3 (0)
REG Stony Creek below East Park Dam	3 (0)	3 (0)	3 (0)	3 (0)
REG Stony Creek below Northside Dam	3 (0)	3 (0)	3 (0)	3 (0)
REG Stony Creek below Stony Gorge	3 (0)	3 (0)	3 (0)	3 (0)
REG Trinity River below Lewiston	1 (0)	0 (0)	0 (0)	0 (0)
REG Yuba River near Marysville	2 (0)	2 (0)	2 (0)	2 (0)
REG Yuba River near Smartville	3 (0)	3 (0)	3 (0)	3 (0)

G3a.4 References

G3a.4.1 Common References

^SacWAM 2023: State Water Resources Control Board (SWRCB). 2023. Sacramento Water Allocation Model (SacWAM) Documentation.

G3a.4.2 Section References

Department of Water Resources (DWR). 2019a. Incidental Take Permit Application for Long-Term Operation of the California State Water Project. December. Available: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Files/1_DWR_LTO_ITP_Application_2019-12-13_a_y19.pdf.

Department of Water Resources (DWR). 2019b. Draft Environmental Impact Report for Long-Term Operation of the California State Water Project. Volume 2: Appendices. November. Available: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Files/Deliv-42DEIRv1-112119-Volume-II-Appendices_a_y19.pdf.

Department of Water Resources (DWR). 2023. Tisdale Weir Rehabilitation and Fish Passage Project. Available: https://water.ca.gov/Programs/Flood-Management/Flood-Projects/Tisdale-Weir

Water Forum. 2006. Lower American River Flow Management Standard. Available: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/Folsom/ARWA_103.pdf.

Attachment G3a1

Water Supply Effects Model Updates for the Tuolumne Voluntary Agreement

Attachment G3a1
Water Supply Effects Model Updates for the Tuolumne Voluntary Agreement

This document describes the State Water Resources Control Board's (State Water Board's) modeling efforts to represent proposed Voluntary Agreement (VA) provisions on the Tuolumne River. Staff performed the analysis using a revised version of the Water Supply Effects (WSE) spreadsheet model that was originally developed to evaluate potential changes in flow and water supplies in the San Joaquin basin associated with the 2018 update to the Bay-Delta Plan.[1] WSE was used to model the Tuolumne VA because it is already set up to analyze the impacts of new flow requirements on the Tuolumne River and it allows for the most direct method to compare the effects of the VA flow requirements with current flow requirements or with unimpaired flow (UF) requirements. The revised version of WSE, titled "WSE-VA_082123" (referred to in this document as WSE-VA), also includes some general updates and corrections that improve the model's representation of the LSJR and the current conditions. The sections below describe all the mathematical and operational changes applied since the release of the 2018 version of WSE to produce the latest WSE-VA version.

G3a1.1 General Updates

The changes described here represent those updates that directly affect the calculation of results, primarily for instream flow, but are not tied to any specific model alternative. Some of these changes may affect results of UF alternatives when compared with results in the SED. In addition, there were various organizational, text, and cosmetic updates in WSE-VA that do not affect results and are not described here. These changes were made primarily to improve the usability of the model or to remove redundant or unused information. This includes reorganizing the model control tabs and the addition of new tabs to organize input data. These updates are described in more detail on the "README" tab within the model spreadsheet.

G3a1.1.1 CALSIM II Model Data

As described in Appendix F.1 of the SED, the WSE model was developed using the CALSIM II model as a framework, incorporating many of the same node-link designations to identify locations in WSE. In addition, various CALSIM II timeseries serve as inputs and boundary conditions for WSE, representing parameters that are not dynamically modeled. The version of CALSIM II used to support WSE in the SED was based on a model run provided to the State Water Board by the United States Bureau of Reclamation (Reclamation) in response to comments on the draft 2012 SED release. For WSE-VA, it was desired to have a baseline more analogous to the existing conditions, in part, to reflect new modeling information and changes in operational parameters since the State Water Board adopted the SED. Therefore, the Department of Water Resources (DWR) provided a

[1] The 2018 Bay-Delta Plan established new flow objectives based on unimpaired flow for the Lower San Joaquin River (LSJR) and its three eastside tributaries, the Stanislaus, Tuolumne, and Merced Rivers. Documentation of the WSE model was released with the substitute environmental document (SED) for the 2018 Bay-Delta Plan in Appendix F.1.

more recent CALSIM II model run, titled “*CALSIM_011319_rev06_NoCC*”, which was based on the version of CALSIM II used for the 2017 Delivery Capability Report (DWR 2017). Furthermore, this CALSIM II model run served as the starting point for DWR’s own CALSIM II VA analysis and using the same base data would improve consistency in representing the San Joaquin basin between the two analyses.

With regards to the San Joaquin basin, the major differences between this newer version of CALSIM II and the CALSIM II version from the SED include the following.

- Land Use is modeled at 2030 level of development rather than 2020.
- New Melones Starting Storage (Sep 1922) is set to 1,700 TAF rather than 1,000 TAF.
- The Vernalis Adaptive Management Plan (VAMP) is turned off.
- The San Joaquin River Restoration Program (SJRRP) flows are turned on.
- It includes updated Tuolumne River Operations.

Table G3a1-1 lists the CALSIM II timeseries imported into WSE-VA from *CALSIM_011319_rev06_NoCC* and stored in the new “*CALSIM Data*” tab, along with a description of what they were in CALSIM II and how they are applied in WSE-VA. The CALSIM II data primarily represents boundary conditions for WSE-VA, such as inflows, or parameters that WSE-VA cannot directly calculate, including reservoir evaporation rates and agricultural consumptive use demands. Some of the CALSIM II timeseries in Table G3a1-1 are not used for specific calculations in WSE-VA, but are instead imported to characterize the CALSIM II water balance and for comparison with final WSE-VA results. Finally, a few of the timeseries are used only to represent parameters under *CALSIM* mode (see SED Appendix F.1 for more information about the modes in WSE).

Table G3a1-1. CALSIM II Timeseries Imported into WSE-VA

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
R564A	Return flow from local/riparian Merced diverters back to the Merced River	Local Inflow to the Merced River
R564B	Return flow from MeID to the Merced River	Component of MeID demand Local inflow to the Merced River
R620	Return flow from Stevinson ID to the San Joaquin River	Local Inflow to the San Joaquin River
R545A	Return flow from TID to the Tuolumne River	Component of TID demand Local inflow to the Tuolumne River
R545C	Return flow from MoID to the Tuolumne River	Component of MoID demand Local inflow to the Tuolumne River
R630J	Return flow from local/riparian Tuolumne diverters to the San Joaquin River	Local Inflow to the San Joaquin River
R630K	Return flow from non-district lands on the south side of the Tuolumne River to the San Joaquin River	Local Inflow to the San Joaquin River
R630L	Return flow from TID to the San Joaquin River	Component of TID demand Local inflow to the San Joaquin River
R566	Return flow from TID to the Merced River	Component of TID demand Local inflow to the Merced River
R636A	Return flow from MoID to the San Joaquin River	Component of MoID demand Local inflow to the San Joaquin River
R636B	Return flow from non-district lands on the north side of the Tuolumne River to the San Joaquin River	Local Inflow to the San Joaquin River
R636C	Return flow from MoID to the San Joaquin River	Component of MoID demand Local inflow to the San Joaquin River
R637A	Return flow from MoID to the San Joaquin River	Component of MoID demand Local inflow to the San Joaquin River
R637B	Return flow from non-district lands on the north side of the Tuolumne to the San Joaquin River	Local Inflow to the San Joaquin River

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
R528C	Return flow from MoID to the Stanislaus River	Component of MoID demand Local inflow to the Stanislaus River
R528A	Return flow from OID south to the Stanislaus River	Component of OID south demand Local inflow to the Stanislaus River
R528B	Return flow from SSJID/OID north to the Stanislaus River	Component of SSJID/OID north demand Local inflow to the Stanislaus River
R637C	Return flow from local/riparian Stanislaus diverters to the San Joaquin River	Local Inflow to the San Joaquin River
R534B	Return flow from OID south to non-district lands on the north side of the Tuolumne River	Component of OID south demand
R545B	Return flow from OID south to the Tuolumne River	Component of OID south demand Local inflow to the Tuolumne River
R532	Return flow from OID south to MoID	Component of OID south demand Component of MoID demand
R526	Return flow from SSJID to non-district lands east of SSJID	Component of SSJID/OID north demand
R630M	Return flow from local San Joaquin diverters back to the San Joaquin River	Local Inflow to the San Joaquin River
R630WEST	Return flow from the west side of the San Joaquin River	Local Inflow to the San Joaquin River
R637D	Return flow from local San Joaquin diverters back to the San Joaquin River	Local Inflow to the San Joaquin River
R639A	Return flow from local San Joaquin diverters back to the San Joaquin River	Local Inflow to the San Joaquin River
R639WEST	Return flow from the west side of the San Joaquin River	Local Inflow to the San Joaquin River
D561	MeID surface water diversion from the Merced River	Calibration of MeID diversions (*CALSIM* mode only)
D562	Local/Riparian surface water diversions from the Merced River	Cowell Agreement diversion (CAD) demand (*CALSIM* mode only)
D566	Stevinson ID, El Nido, riparian surface water diversions from the Merced River	Riparian diversion demand on the Merced River
D562A	Delivery to Local/Riparian Lands on the Merced River	Characterizing CALSIM II water delivery in the Merced River watershed

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
D574	Delivery to Stevinson ID, El Nido, and riparian lands	Characterizing CALSIM II water delivery in the Merced River watershed
D571	Delivery to MeID	Characterizing CALSIM II water delivery in the Merced River watershed
D572	Delivery to Merced National Wildlife Refuge from MeID	Characterizing CALSIM II water delivery in the Merced River watershed
D540A	MoID surface water diversions from the Tuolumne River	Calibration of TID and MoID diversions (*CALSIM* mode only)
D540B	TID surface water diversions from the Tuolumne River	Calibration of TID and MoID diversions (*CALSIM* mode only)
D545	Local/Riparian surface water diversions from the Tuolumne River	Riparian diversion demand on the Tuolumne River
D551	Delivery to Non-district lands south of the Tuolumne River	Characterizing CALSIM II water delivery in the Tuolumne River watershed
D549	Delivery to TID	Characterizing CALSIM II water delivery in the Tuolumne River watershed
D545A	Delivery to Local/Riparian Lands on the Tuolumne River	Characterizing CALSIM II water delivery in the Tuolumne River watershed
D79_SEEP	Turlock regulating reservoir groundwater seepage	Turlock reservoir seepage (*CALSIM* mode only)
D535	Delivery to Non-district lands north of the Tuolumne River	Characterizing CALSIM II water delivery in the Tuolumne River watershed
D533	Delivery to MoID	Characterizing CALSIM II water delivery in the Tuolumne River watershed
D78_SEEP	Modesto regulating reservoir groundwater seepage	Modesto reservoir seepage (*CALSIM* mode only)
D78A	Surface water delivery to Modesto M&I	Modesto M&I diversion demand (*CALSIM* mode only)
D520A	SEWD and CSJWCD surface water diversion from the Stanislaus River	Characterizing CALSIM II water delivery in the Stanislaus River watershed
D520A1	OID and SSJID water sales to SEWD	Characterizing CALSIM II water delivery in the Stanislaus River watershed
D520B	SSJID/OID north surface water diversion from the Stanislaus River	Calibration of OID and SSJID diversions (*CALSIM* mode only)

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
D520C	OID south surface water diversion from the Stanislaus River	Calibration of OID and SSJID diversions (*CALSIM* mode only)
D528	Local/Riparian surface water diversions from the Stanislaus River	Riparian diversion demand on the Stanislaus River
D528A	Delivery to Local/Riparian Lands on the Stanislaus River	Characterizing CALSIM II water delivery in the Stanislaus River watershed
D531	Delivery to OID south	Characterizing CALSIM II water delivery in the Stanislaus River watershed
D530_VAMP	Transfer of water from OID to MoID in exchange for MoID meeting OID's Vernalis Adaptive Management Plan (VAMP) requirement	Characterizing CALSIM II water delivery in the Stanislaus River watershed
D75_SEEP	Woodward regulating reservoir groundwater seepage	Woodward reservoir seepage (*CALSIM* mode only)
D523	Delivery to SSJID/OID north	Characterizing CALSIM II water delivery in the Stanislaus River watershed
D620C	Stevinson ID, El Nido, riparian surface water diversions from the San Joaquin River	San Joaquin River Baseline diversion
D620A	Non-district diversion from the San Joaquin River on the south side of the Tuolumne River	San Joaquin River Baseline diversion
D620B	Local surface water diversion from the San Joaquin River between the Merced and Tuolumne Rivers	San Joaquin River Baseline diversion
D630A	Non-district diversion from the San Joaquin River on the north side of the Tuolumne River	San Joaquin River Baseline diversion
D630B	Local surface water diversion from the San Joaquin River between the Tuolumne and Stanislaus Rivers	San Joaquin River Baseline diversion
D637	Local surface water diversion from the San Joaquin River downstream of the Stanislaus River	San Joaquin River Baseline diversion
D639	Non-Project surface water diversions near Vernalis	San Joaquin River Baseline diversion
S20	Lake McClure storage	Characterizing CALSIM II water storage on the Merced River

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
S81	New Don Pedro reservoir storage	Characterizing CALSIM II water storage on the Tuolumne River
S79	Turlock regulating reservoir storage	Characterizing CALSIM II water storage on the Tuolumne River
S78	Modesto regulating reservoir storage	Characterizing CALSIM II water storage on the Tuolumne River
S10	New Melones reservoir storage	Calculation of New Melones Index (*CALSIM* mode only)
S76	Tulloch reservoir storage	Tulloch reservoir storage
S75	Woodward regulating reservoir storage	Characterizing CALSIM II water storage on the Stanislaus River
E20	Lake McClure evaporation	Estimate of evaporative losses from Lake McClure to determine water available for diversion
E81	New Don Pedro reservoir evaporation	Estimate of evaporative losses from New Don Pedro to determine water available for diversion
E10	New Melones reservoir evaporation	Estimate of evaporative losses from New Melones to determine water available for diversion
E76	Tulloch reservoir evaporation	Evaporative loss from Tulloch
GP573	Stevinson ID, El Nido, riparian groundwater pumping	Characterizing CALSIM II groundwater use in the Merced River watershed
GP570	MeID groundwater pumping	Characterizing CALSIM II groundwater use in the Merced River watershed
GP550	Non-district groundwater pumping on the south side of the Tuolumne River	Characterizing CALSIM II groundwater use in the Tuolumne River watershed
GP548	TID groundwater pumping	Characterizing CALSIM II groundwater use in the Tuolumne River watershed
GP534	Non-district groundwater pumping on the north side of the Tuolumne River	Characterizing CALSIM II groundwater use in the Tuolumne River watershed
GP532	MoID groundwater pumping	Characterizing CALSIM II groundwater use in the Tuolumne River watershed
GP78A	Groundwater pumping for Modesto M&I	Characterizing CALSIM II groundwater use in the Tuolumne River watershed
GP530	OID south groundwater pumping	Characterizing CALSIM II groundwater use in the Stanislaus River watershed
GP522	SSJID/OID north groundwater pumping	Characterizing CALSIM II groundwater use in the Stanislaus River watershed
GP528A	Riparian groundwater pumping	Characterizing CALSIM II groundwater use in the Stanislaus River watershed

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
C20	Lake McClure release	Characterizing CALSIM II Flow on the Merced River
C561	Crocker Huffman release	Characterizing CALSIM II Flow on the Merced River
C562	Merced River Crocker Huffman to Snelling, after riparian diversions	Characterizing CALSIM II Flow on the Merced River
C564	Merced River from Snelling to Cressy	Characterizing CALSIM II Flow on the Merced River
C566	Merced River above the confluence with the San Joaquin River	Characterizing CALSIM II Flow on the Merced River
C81	New Don Pedro reservoir release	Characterizing CALSIM II Flow on the Tuolumne River
C540	Tuolumne River from La Grange to Modesto	Characterizing CALSIM II Flow on the Tuolumne River
C545	Tuolumne River above the confluence with the San Joaquin River	Characterizing CALSIM II Flow on the Tuolumne River
C10	New Melones reservoir release	Characterizing CALSIM II Flow on the Stanislaus River
C76	Tulloch reservoir release	Characterizing CALSIM II Flow on the Stanislaus River
C520	Stanislaus River from Goodwin to Ripon	Characterizing CALSIM II Flow on the Stanislaus River
C528	Stanislaus River above the confluence with the San Joaquin River	Characterizing CALSIM II Flow on the Stanislaus River
C614	San Joaquin River above Salt Slough	Boundary flow on the mainstem San Joaquin River
C619	Westside return flows to the San Joaquin River near the Merced River confluence	Local Inflow to the San Joaquin River
C620	San Joaquin River between the Merced and Tuolumne Rivers	Characterizing CALSIM II Flow on the San Joaquin River
C630	San Joaquin River between the Tuolumne River and Maze	Characterizing CALSIM II Flow on the San Joaquin River
C636	San Joaquin River between Maze and the Stanislaus River	Characterizing CALSIM II Flow on the San Joaquin River
C637	San Joaquin River between the Stanislaus River and Vernalis	Characterizing CALSIM II Flow on the San Joaquin River
C639	San Joaquin River below Vernalis	Characterizing CALSIM II Flow on the San Joaquin River
VERNWQFINAL	Vernalis Electrical Conductivity	Determining flow needed to meet D1641 salinity requirements
I20	Inflow to Lake McClure	Inflow to Lake McClure
I561	Merced River accretions between New Exchequer dam and Crocker Huffman	Local inflow to the Merced River

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
I562	Merced River accretions between Crocker Huffman and Cressy	Local inflow to the Merced River
I566	Merced River accretions between Cressy and Stevinson	Local inflow to the Merced River
I81	Inflow to New Don Pedro reservoir	Inflow to New Don Pedro reservoir
I545	Tuolumne River accretions between La Grange and Modesto	Local inflow to the Tuolumne River
I10	Inflow to New Melones reservoir	Inflow to New Melones reservoir
I76	Stanislaus River accretions between New Melones reservoir and Tulloch	Local inflow to the Stanislaus River
I520	Stanislaus River accretions between Tulloch and Goodwin	Local inflow to the Stanislaus River
I528	Stanislaus River accretions between Goodwin and Ripon	Local inflow to the Stanislaus River
I636	San Joaquin River accretions between the Tuolumne River and Maze	Local inflow to the San Joaquin River
I637	Stanislaus River accretions below Ripon	Local inflow to the San Joaquin River
CUAW_562A_PAG	CUAW demand for local/riparian diverters on the Merced River	Characterizing CALSIM II demands in the Merced River watershed
CUAW_571_ND	CUAW demand for non-district lands in MeID	Characterizing CALSIM II demands in the Merced River watershed
CUAW_571_PAG	CUAW demand for MeID	Component of MeID demand
CUAW_574_PAG	CUAW demand for Stevinson, El Nido, and riparian lands on the Merced River	Characterizing CALSIM II demands in the Merced River watershed
DEMAND_D572	Bear Creek Refuge demand	Bear Creek Refuge demand
CUAW_545A_PAG	CUAW demand for local/riparian diverters on the Tuolumne River	Characterizing CALSIM II demands in the Tuolumne River watershed
CUAW_549_ND	CUAW demand for non-district lands in TID	Characterizing CALSIM II demands in the Tuolumne River watershed
CUAW_533_PAG	CUAW demand for MoID	Component of MoID demand
CUAW_535_PAG	CUAW demand for non-district lands on the north side of the Tuolumne River	Characterizing CALSIM II demands in the Tuolumne River watershed
CUAW_549_PAG	CUAW demand for TID	Component of TID demand

CALSIM II Timeseries	CALSIM II Description	What is it used for in WSE-VA?
CUAW_551_PAG	CUAW demand for non-district lands on the south side of the Tuolumne River	Characterizing CALSIM II demands in the Tuolumne River watershed
CUAW_511_ND	CUAW demand for non-district lands in SEWD	Characterizing CALSIM II demands in the Stanislaus River watershed
CUAW_511_PAG	CUAW demand for SEWD	Characterizing CALSIM II demands in the Stanislaus River watershed
CUAW_512_PAG	CUAW demand for CSJWCD	Characterizing CALSIM II demands in the Stanislaus River watershed
DEMAND_D523_MI_A	Non-district M&I demand in SSJID	Characterizing CALSIM II demands in the Stanislaus River watershed
CUAW_528A_PAG	CUAW demand for local/riparian diverters on the Stanislaus River	Characterizing CALSIM II demands in the Stanislaus River watershed
CUAW_523OID_PAG	CUAW demand for OID north	Component of OID north demand
CUAW_523SSJ_PAG	CUAW demand for SSJID	Component of SSJID demand
CUAW_531_ND	CUAW demand for non-district lands in OID south	Component of OID south demand
CUAW_531_PAG	CUAW demand for OID south	Component of OID south demand
EVAP_S20	Lake McClure evaporation rate	Lake McClure evaporation rate
EVAP_S81	New Don Pedro evaporation rate	New Don Pedro evaporation rate
S81LEVEL4	New Don Pedro CALSIM storage zone 4	New Don Pedro flood storage curve
EVAP_S10	New Melones evaporation rate	New Melones evaporation rate

Abbreviations:
MeID = Merced Irrigation District,
MoID = Modesto Irrigation District,
TID = Turlock Irrigation District,
OID = Oakdale Irrigation District,
SSJID = South San Joaquin Irrigation District,
SEWD = Stockton East Water District,
CSJWCD = Central San Joaquin Water Conservation District,
M&I = Municipal and Industrial,
CUAW = Consumptive use of applied water
Notes: Shaded rows are extracted from CALSIM_011319_rev06_NoCC\common\DSS\2020D09ESV.dss. Non-shaded rows are extracted from CALSIM_011319_rev06_NoCC\CONV\DSS\2020D09EDV.dss.

G3a1.1.2 Merced River Representation

Two changes were made to the calculation of Merced River instream flow requirements to be more representative of current conditions. First, the Davis-Grunsky flow requirement, based on a 1967 agreement between DWR and Merced Irrigation District for recreation and fish enhancement flows (DWR 1967), was turned off to reflect that the agreement ended in 2017. Second, implementation of the Merced FERC requirement was updated to use its dry year flow schedule in Dry and Critically Dry years, as determined based on the San Joaquin River water year type (SJR WYT) index. See Table G3a1-2 for the Merced FERC flow requirements implemented in WSE-VA. Like in the SED, Merced flow requirements also include an additional fall fishery release of 12,500 acre-feet, about 203 cubic feet per second (cfs), in October.

Table G3a1-2. Minimum Monthly Flow Requirements on the Merced River

Calendar Month	Normal Year FERC Requirement (cfs)[1]	Dry Year FERC Requirement (cfs)[2]
1	75	60
2	75	60
3	75	60
4	75	60
5	75	60
6	25	15
7	25	15
8	25	15
9	25	15
10	50	38
11	100	75
12	100	75

Notes: Requirements based on FERC license 2179, Article 40 and 41

[1] Normal year schedule applied in years with a Wet, Above Normal, or Below Normal WYT based on the SJR WYT index.

[2] Dry year schedule applied in years with a Dry or Critically Dry WYT based on the SJR WYT index.

G3a1.1.3 Tuolumne River Representation

A reference error related to the New Don Pedro evaporation rates was found and corrected in WSE-VA. In the 2018 version of WSE, the monthly evaporation rate from CALSIM II was being applied one month later than it should have been (i.e., October 1921 evaporation rates was applied to determine November 2021 evaporation). Over the long term the effect of this error would have been minimized.

G3a1.1.4 Stanislaus River Representation

On the Stanislaus River, the baseline minimum instream flow requirements have been updated to reflect the 2019 biological opinion and the New Melones Stepped Release Plan (SRP) (Reclamation 2019). The SRP provides default daily hydrographs on the Stanislaus for each water year type, which are shown in Table G3a1-3 through Table G3a1-7. As WSE is a monthly model, the SRP flows are implemented based on the total monthly flows resulting from each default daily hydrograph. These requirements are similar to those set forth in Reclamation's 2009 biological opinion Table 2E, which defined the Baseline flow requirements on the Stanislaus in SED version of WSE. For Critically Dry, Dry, and Below Normal WYTs the requirements are the same as those in Table 2E. In Above Normal and Wet Years the minimum requirements are reduced such that Above Normal Years would release the same as Below Normal Years in Table 2E and Wet Years would release the same as Above Normal Years in Table 2E. The requirements in wetter years would be reduced from current operations to promote storage for potential future droughts and preserve cold water pool. Another difference is that WYTs in the New Melones SRP would be determined based on the SJR WYT index rather than the New Melones Index which was used for the Table 2E requirements.

Table G3a1-3. New Melones Stepped Release Plan Daily Hydrographs for Critically Dry Year Types

Day of Month	Target Daily Flow Hydrographs in Critically Dry Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	200	200	200	200	200	200	200	725	150	150	150	150
2	200	200	200	200	200	200	200	725	150	150	150	150
3	200	200	200	400	200	200	200	725	150	150	150	150
4	200	200	200	400	200	200	200	725	150	150	150	150
5	200	200	200	200	400	200	200	725	150	150	150	150
6	200	200	200	200	400	200	200	725	150	150	150	150
7	200	200	200	200	200	200	200	725	150	150	150	150
8	200	200	200	200	200	200	200	725	150	150	150	150
9	200	200	200	200	200	200	200	725	150	150	150	150
10	200	200	200	200	200	200	200	725	150	150	150	150
11	200	200	200	200	200	200	200	725	150	150	150	150
12	200	200	200	200	200	200	200	725	150	150	150	150
13	200	200	200	200	200	200	200	550	150	150	150	150
14	200	200	200	200	200	200	200	450	150	150	150	150
15	500	200	200	200	200	200	350	300	150	150	150	150
16	750	200	200	200	200	200	500	150	150	150	150	150
17	1,000	200	200	200	200	200	725	150	150	150	150	150
18	1,250	200	200	200	200	200	725	150	150	150	150	150
19	1,250	200	200	200	200	200	725	150	150	150	150	150
20	1,250	200	200	200	200	200	725	150	150	150	150	150
21	1,250	200	200	200	200	200	725	150	150	150	150	150
22	1250	200	200	200	200	200	725	150	150	150	150	150
23	1,250	200	200	200	200	200	725	150	150	150	150	150
24	1,250	200	200	200	200	200	725	150	150	150	150	150
25	1,250	200	200	200	200	200	725	150	150	150	150	150
26	1,000	200	200	200	200	200	725	150	150	150	150	150
27	750	200	200	200	200	200	725	150	150	150	150	150

Day of Month	Target Daily Flow Hydrographs in Critically Dry Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
28	500	200	200	200	200	200	725	150	150	150	150	150
29	200	200	200	200		200	725	150	150	150	150	150
30	200	200	200	200		200	725	150	150	150	150	150
31	200		200	200		200		150		150	150	
Monthly Flow (AF)	35,505	11,901	12,298	13,091	11,901	12,298	27,372	24,595	8,926	9,223	9,223	8,926

Table G3a1-4. New Melones Stepped Release Plan Daily Hydrographs for Dry Year Types

Day of Month	Target Daily Flow Hydrographs in Dry Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	200	200	200	200	200	200	200	1000	200	200	200	200
2	200	200	200	200	200	200	200	1000	200	200	200	200
3	200	200	200	400	200	200	200	1000	200	200	200	200
4	200	200	200	400	200	200	200	1000	200	200	200	200
5	200	200	200	400	400	200	200	1000	200	200	200	200
6	200	200	200	200	400	200	200	1000	200	200	200	200
7	200	200	200	200	400	200	200	1000	200	200	200	200
8	200	200	200	200	200	200	350	1000	200	200	200	200
9	200	200	200	200	200	200	500	1000	200	200	200	200
10	200	200	200	200	200	200	750	1000	200	200	200	200
11	200	200	200	200	200	200	1000	1000	200	200	200	200
12	200	200	200	200	200	200	1000	1000	200	200	200	200
13	200	200	200	200	200	200	1000	1000	200	200	200	200
14	200	200	200	200	200	200	1000	1000	200	200	200	200
15	500	200	200	200	200	200	1000	1000	200	200	200	200
16	750	200	200	200	200	200	1000	800	200	200	200	200
17	1,000	200	200	200	200	200	1000	600	200	200	200	200
18	1,250	200	200	200	200	200	1000	450	200	200	200	200
19	1,250	200	200	200	200	200	1000	300	200	200	200	200

Day of Month	Target Daily Flow Hydrographs in Dry Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20	1,250	200	200	200	200	200	1000	200	200	200	200	200
21	1,500	200	200	200	200	200	1000	200	200	200	200	200
22	1500	200	200	200	200	200	1000	200	200	200	200	200
23	1,500	200	200	200	200	200	1000	200	200	200	200	200
24	1,250	200	200	200	200	200	1000	200	200	200	200	200
25	1,250	200	200	200	200	200	1000	200	200	200	200	200
26	1,250	200	200	200	200	200	1000	200	200	200	200	200
27	1000	200	200	200	200	200	1000	200	200	200	200	200
28	750	200	200	200	200	200	1000	200	200	200	200	200
29	500	200	200	200		200	1000	200	200	200	200	200
30	200	200	200	200		200	1000	200	200	200	200	200
31	200		200	200		200		200		200	200	
Monthly Flow (AF)	39,075	11,901	12,298	13,488	12,298	12,298	45,621	38,777	11,901	12,298	12,298	11,901

Table G3a1-5. New Melones Stepped Release Plan Daily Hydrographs for Below Normal Year Types

Day of Month	Target Daily Flow Hydrographs in Below Normal Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	250	200	200	200	200	200	400	1500	900	250	250	250
2	250	200	200	200	200	200	750	1500	600	250	250	250
3	250	200	200	400	200	200	1000	1500	600	250	250	250
4	250	200	200	400	200	200	1250	1500	600	250	250	250
5	250	200	200	400	400	200	1500	1500	600	250	250	250
6	250	200	200	400	400	200	1700	1500	600	250	250	250
7	250	200	200	200	400	200	2000	1500	450	250	250	250
8	250	200	200	200	400	200	2000	1500	450	250	250	250
9	250	200	200	200	200	200	2000	1500	450	250	250	250
10	250	200	200	200	200	200	1500	1500	450	250	250	250
11	250	200	200	200	200	200	1500	1500	300	250	250	250

Day of Month	Target Daily Flow Hydrographs in Below Normal Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
12	250	200	200	200	200	200	1500	1500	300	250	250	250
13	250	200	200	200	200	200	1500	1500	300	250	250	250
14	250	200	200	200	200	200	1500	1250	300	250	250	250
15	500	200	200	200	200	200	1500	1250	250	250	250	250
16	750	200	200	200	200	200	1500	1250	250	250	250	250
17	1,000	200	200	200	200	200	1500	1250	250	250	250	250
18	1,250	200	200	200	200	200	1500	1250	250	250	250	250
19	1,500	200	200	200	200	200	2000	1250	250	250	250	250
20	1,500	200	200	200	200	200	2000	1000	250	250	250	250
21	1,500	200	200	200	200	200	2000	1000	250	250	250	250
22	1500	200	200	200	200	200	2000	1000	250	250	250	250
23	1,500	200	200	200	200	200	1500	1000	250	250	250	250
24	1,500	200	200	200	200	200	1500	1000	250	250	250	250
25	1,500	200	200	200	200	200	1500	1000	250	250	250	250
26	1,500	200	200	200	200	200	1500	1000	250	250	250	250
27	1500	200	200	200	200	200	1500	900	250	250	250	250
28	1250	200	200	200	200	200	1500	900	250	250	250	250
29	1000	200	200	200		200	1500	900	250	250	250	250
30	750	200	200	200		200	1500	900	250	250	250	250
31	500		200	200		200		900		250	250	
Monthly Flow (AF)	47,604	11,901	12,298	13,885	12,694	12,298	91,439	76,365	21,620	15,372	15,372	14,876

Table G3a1-6. New Melones Stepped Release Plan Daily Hydrographs for Above Normal Year Types

Day of Month	Target Daily Flow Hydrographs in Above Normal Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	250	200	200	200	200	200	400	1500	900	250	250	250
2	250	200	200	200	200	200	750	1500	600	250	250	250
3	250	200	200	400	200	200	1000	1500	600	250	250	250
4	250	200	200	400	200	200	1250	1500	600	250	250	250
5	250	200	200	400	400	200	1500	1500	600	250	250	250
6	250	200	200	400	400	200	1700	1500	600	250	250	250
7	250	200	200	200	400	200	2000	1500	450	250	250	250
8	250	200	200	200	400	200	2000	1500	450	250	250	250
9	250	200	200	200	200	200	2000	1500	450	250	250	250
10	250	200	200	200	200	200	1500	1500	450	250	250	250
11	250	200	200	200	200	200	1500	1500	300	250	250	250
12	250	200	200	200	200	200	1500	1500	300	250	250	250
13	250	200	200	200	200	200	1500	1500	300	250	250	250
14	250	200	200	200	200	200	1500	1250	300	250	250	250
15	500	200	200	200	200	200	1500	1250	250	250	250	250
16	750	200	200	200	200	200	1500	1250	250	250	250	250
17	1,000	200	200	200	200	200	1500	1250	250	250	250	250
18	1,250	200	200	200	200	200	1500	1250	250	250	250	250
19	1,500	200	200	200	200	200	2000	1250	250	250	250	250
20	1,500	200	200	200	200	200	2000	1000	250	250	250	250
21	1,500	200	200	200	200	200	2000	1000	250	250	250	250
22	1500	200	200	200	200	200	2000	1000	250	250	250	250
23	1,500	200	200	200	200	200	1500	1000	250	250	250	250
24	1,500	200	200	200	200	200	1500	1000	250	250	250	250
25	1,500	200	200	200	200	200	1500	1000	250	250	250	250
26	1,500	200	200	200	200	200	1500	1000	250	250	250	250
27	1500	200	200	200	200	200	1500	900	250	250	250	250
28	1250	200	200	200	200	200	1500	900	250	250	250	250

Day of Month	Target Daily Flow Hydrographs in Above Normal Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
29	1000	200	200	200		200	1500	900	250	250	250	250
30	750	200	200	200		200	1500	900	250	250	250	250
31	500		200	200		200		900		250	250	
Monthly Flow (AF)	47,604	11,901	12,298	13,885	12,694	12,298	91,439	76,365	21,620	15,372	15,372	14,876

Table G3a1-7. New Melones Stepped Release Plan Daily Hydrographs for Wet Year Types

Day of Month	Target Daily Flow Hydrographs in Wet Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	300	200	200	200	200	200	3000	3000	1200	300	300	300
2	300	200	200	200	200	350	3000	3000	1200	300	300	300
3	300	200	200	400	200	700	3000	3000	1200	300	300	300
4	300	200	200	400	200	1200	3000	3000	1200	300	300	300
5	300	200	200	400	400	1800	2300	2300	1200	300	300	300
6	300	200	200	400	400	2300	1500	1500	1200	300	300	300
7	300	200	200	400	400	3000	1200	1500	1200	300	300	300
8	300	200	200	200	400	3000	800	1500	1200	300	300	300
9	300	200	200	200	400	3000	800	1500	1000	300	300	300
10	300	200	200	200	200	3000	800	1500	1000	300	300	300
11	300	200	200	200	200	3000	800	1500	1000	300	300	300
12	300	200	200	200	200	3000	800	1500	1000	300	300	300
13	300	200	200	200	200	1200	800	1500	1000	300	300	300
14	300	200	200	200	200	800	800	1500	1000	300	300	300
15	500	200	200	200	200	800	800	1200	1000	300	300	300
16	750	200	200	200	200	800	800	1200	1000	300	300	300
17	1,000	200	200	200	200	800	800	1200	1000	300	300	300
18	1,250	200	200	200	200	800	800	1200	1000	300	300	300
19	1,500	200	200	200	200	800	800	1200	1000	300	300	300
20	1,500	200	200	200	200	800	800	1200	1000	300	300	300

Day of Month	Target Daily Flow Hydrographs in Wet Years (cfs)											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
21	1,500	200	200	200	200	800	800	1200	1000	300	300	300
22	1500	200	200	200	200	800	800	1200	1000	300	300	300
23	1,500	200	200	200	200	800	800	1200	1000	300	300	300
24	1,500	200	200	200	200	800	800	1200	750	300	300	300
25	1,500	200	200	200	200	800	800	1200	750	300	300	300
26	1,500	200	200	200	200	800	800	1200	500	300	300	300
27	1500	200	200	200	200	1200	1500	1200	500	300	300	300
28	1250	200	200	200	200	1500	2300	1200	500	300	300	300
29	1000	200	200	200		2300	3000	1200	300	300	300	300
30	750	200	200	200		3000	3000	1200	300	300	300	300
31	500		200	200		3000		1200		300	300	
Monthly Flow (AF)	48,992	11,901	12,298	14,281	13,091	93,522	83,307	95,605	55,935	18,447	18,447	17,852

G3a1.1.5 San Joaquin River Representation

Implementation of February through June Decision 1641 (D-1641) flow requirements was modified to be consistent with CALSIM II implementation of D-1641. The CALSIM II representation only includes D-1641 base flows from February 1 to April 14 and May 16 to June 30 and does not include the D-1641 pulse flow from April 15 to May 15 because responsibility was never agreed on. Table G3a1-8 shows the D-1641 base flow requirement modeled in WSE-VA; the higher flow target would occur for days where X2[2] is west of Chipps Island. The number of days at the higher and lower base flow is determined in WSE-VA using the CALSIM II estimate of monthly "Chipps Days", or the number of days that X2 is at or west of Chipps Island in each month (see the "chs_days" column of CALSIM_011319_rev06_NoCC\CONV\Run\Lookup\x2days.table). As WSE is a monthly model the daily flow targets are averaged to produce a constant monthly base flow target. However, in April and May no requirement is applied during the pulse flow period (4/15 to 5/15), which results in only 14 days of base flow during April and 16 days of base flow during May. Therefore, the averaged D-1641 monthly base flow volume is multiplied by 14/30 in April and 16/31 in May to produce the final D-1641 base flow targets.

Table G3a1-8. D-1641 Base Flow Requirement by San Joaquin River Basin (60-20-20) Water Year Type

	Flow Requirements at Vernalis from Feb 1 - Apr 14 and May 16 - June 30	
SJR 60-20-20 Water Year Type	Target if X2 is East of Chipps Island (cfs)	Target if X2 is West of Chipps Island (cfs)
W	2,130	3,420
AN	2,130	3,420
BN	1,420	2,280
D	1,420	2,280
C	710	1,140

G3a1.2 Tuolumne River Voluntary Agreement Alternatives

The primary source for information on the Tuolumne VA flow requirements is Appendix A6 to the "Project Description for Proposed Voluntary Agreements" submitted by DWR and the California Department of Fish and Wildlife (CDFW) to the State Water Board on March 1st, 2019.[3] The Tuolumne VA flow requirements include updated base flows year-round, a fall flushing pulse, a floodplain inundation pulse in the early spring, and an outmigration pulse from mid-April through May. Both the floodplain and outmigration pulses also include dry year off ramps that are triggered in sequences of multiple Dry and Critically Dry years, as described below. Finally, an infiltration

[2] The X2 standard, introduced in the 1995 Bay-Delta Plan, refers to the position at which 2 parts per thousand (ppt) salinity occurs in the Delta estuary and is designed to improve shallow-water fish habitat in the spring of each year and can limit export pumping.

[3] The VA project description can be found here: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/bay_delta/complete_va_package03012019.pdf.

gallery (IG) diversion at about half river on the Tuolumne (RM 25.9) is included to protect water supply by recapturing some of the base flows during the summer. Another source of information useful in providing background to the Tuolumne VA work is the Amended Final License Application (AFLA) for the Don Pedro Hydroelectric Project, submitted to the Federal Energy Regulatory Commission (FERC) (TID/MID 2017). The Tuolumne VA incorporates many of the measures proposed in the AFLA.

WSE modeling of the Tuolumne VA provisions was updated from what is described in the March 2019 project description based on discussions with the Tuolumne VA parties in 2020 and again in 2022 to reflect ongoing negotiations. These updates include modifications to the duration and volume for the floodplain inundation pulse and reductions in summer baseflows. A switch is included in the model (cell I2 of the "Tuol VA with pulses" tab) to control whether these updates are included on top of the March 2019 version of the VA. For the results in this report the Tuolumne VA model runs were set up to be consistent with discussions from 2022.

The latest version of the Tuolumne VA was released on November 9, 2022 in the "Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements to Update and Implement the Bay-Delta Water Quality Control Plan, and Other Related Actions - Revised" (MOU).[4] The MOU presents a summary of the flow to be provided under the Tuolumne VA but lacks the modeling detail needed to implement it in WSE and was, therefore, not used in updating the model. However, it should be noted that the MOU presents the Tuolumne VA as only applying from January through June, while the March 2019 VA project description presented flow requirements year-round. The WSE modeling in this report is based on the year-round flow schedules shown in the VA project description (with updates based on Tuolumne VA party discussions), but actual effects may be different if the Tuolumne VA is only adopted for January through June.

G3a1.2.1 VA Base Flow Requirements

Table G3a1-9 below presents the year-round Tuolumne VA base flows to be released at La Grange diversion dam, as determined by SJR WYT. This table is based on the preferred AFLA minimum flow schedule, modified by the VA to decrease the flow requirement from 350 cfs to 300 cfs in Below Normal, Above Normal, and Wet years during July 1 to October 15. Since the base flow requirements for April, May, and October are defined on a half month basis and WSE-VA uses a monthly timestep, average monthly flow targets are produced weighted by the number of days at each flow requirement. Over the month the average cfs target will result in the same total volume released as the original half month flow requirements.

Table G3a1-9. Base Flow Requirements at La Grange

		Base Flow Release Targets (cfs)				
Period	Days in Period	Critically Dry	Dry	Below Normal	Above Normal	Wet
January	31	175	200	225	225	225
February	28/29	175	200	225	225	225
March	31	200	225	250	250	250
April 1 - 15	15	200	225	250	250	250

[4] The MOU can be found here: https://resources.ca.gov/-/media/CNRA-Website/Files/NewsRoom/Voluntary-Agreement-Package-March-29-2022.pdf.

Period	Days in Period	Base Flow Release Targets (cfs) Critically Dry	Dry	Below Normal	Above Normal	Wet
April 16 - 30	15	200	250	275	275	275
May 1 - 15	15	200	250	275	275	275
May 1 - 31	16	225	275	300	300	300
June[1]	30	200 (125)	200 (125)	200 (150)	200 (150)	200 (150)
July[1]	31	300 (150)	300 (175)	300 (225)	300 (225)	300 (225)
August[1]	31	300 (150)	300 (175)	300 (225)	300 (225)	300 (225)
September[1]	30	300 (150)	300 (175)	300 (225)	300 (225)	300 (225)
October 1 - 15[1]	15	300 (150)	300 (175)	300 (225)	300 (225)	300 (225)
October 1 – 31	16	200	225	275	275	275
November[2]	30	200	225	275	275	275
December[2]	31	200	225	275	275	275

[1] Values in Parentheses are from the AFLA, Exhibit E, Table 5.6-2 and represent the interim release requirement at La Grange to be provided until both infiltration galleries are operational.

G3a1.2.2 VA Pulse Flow Requirements and Dry Year Off Ramps

Table G3a1-10 and Table G3a1-11 describes the outmigration and floodplain pulse flows associated with the Tuolumne VA, including the duration, volume, and assumed modeling period in WSE. As with the base flows, the pulse flow requirements are dependent on WYT. The spring outmigration pulse is intended to encourage outmigration and increase survival of parr and smolt salmon during the spring and generally has decreasing pulse volumes as the WYT gets drier. The floodplain inundation pulse is designed to provide floodplain habitat for juvenile Chinook salmon during the rearing life stage by maintaining flows at 2,750 cfs (when added on top of the base flow described above) for a continuous period of 9 to 20 days. The floodplain pulse generally has a decreasing pulse length as WYT gets drier. The VA project description also includes an additional 1000 cfs fall flushing pulse for 3 days (about 5950 AF), intended for maintenance to clean gravels of built-up algae, debris, and surface fines prior to the start of substantial spawning. The fall flushing pulse is only released in Wet (W), Above Normal (AN), and Below Normal (BN) water years. In WSE, the flushing pulse is applied in October on top of the base flows.

Both the outmigration and floodplain pulses also include dry year relief off ramps to conserve water supply during droughts. For the outmigration pulse, in any sequence of C years all but the 1st C year will have an offramp and in any sequence of D years all but the 1st D year will have an offramp. Furthermore, the sequence of off ramps is not reset unless a BN or wetter water year type occurs. For example, if there was a sequence of five WYTs of D-D-C-D-C, the second and third D and second C water years would have reduced outmigration pulse flow volumes. If there was a sequence of six WYTs of C-D-BN-C-D-C, only the third C water year would have a reduced outmigration pulse flow volume. For the floodplain pulse, any sequence of years that begins with either a C or D year will trigger offramps in all successive C, D, and BN years, until the next AN or W year. For example, if there were a sequence of five WYTs of D-D-C-D-C, the second and third D and both C water years would have reduced floodplain pulse flow durations. If there were a sequence of six WYTs of C-D-BN-C-D-C, off ramps would be applied in all years except for the first C year. Table G3a1-10 shows the years that trigger off ramps in WSE-VA for both pulses based on actual historical water year type, assuming perfect foresight.

Based on discussions with the Tuolumne VA parties in 2022, 10,000 AF was added to the Floodplain Inundation pulse in Dry and Critical Years with off-ramps that was not included in the VA project description from March 2019. In those discussions it was assumed that this increase in pulse volume would be followed by a 10,000 AF reduction in summer baseflow releases. In WSE-VA this reduction is distributed evenly each month (2,500 AF/month) from July through October.

As the pulse periods do not match the monthly timestep of WSE-VA, the pulses are modeled as total volumes of water released in each month or months with no shaping. The intent of WSE-VA is to understand the overall system water balance, focusing on the total water released for instream flow, how it will affect the water available for diversions, and what will be left in storage. When river flows are reported as cfs in WSE-VA, they represent the monthly average flow rate.

Table G3a1-10. Outmigration Pulse Flow Assumptions used in WSE

Water Year Type	Pulse Period Start Date[1]	Pulse Period End Date[1]	Pulse Length (Days)	Pulse Volume (AF)[2]
Wet	16-Apr	31-May	46	150,000
Above Normal	16-Apr	31-May	46	150,000
Below Normal	16-Apr	31-May	46	100,000
Dry	16-Apr	31-May	46	75,000
Critical	16-Apr	31-May	46	35,000
Dry Year Off-Ramp	16-Apr	31-May	46	45,000
Critical Year Off-Ramp	16-Apr	31-May	46	11,000

[1] Assumed pulse period based on when fall-run Chinook salmon are large parr or smolt-sized. In reality, adaptive management principles will be applied to optimize timing, duration, and flow rate.

[2] Pulse volumes in this table are in addition to the base flows.

Table G3a1-11. Floodplain Inundation Pulse Flow Assumptions used in WSE

Water Year Type	Pulse Period Start Date	Pulse Period End Date	Pulse Length (Days)	Pulse Volume (AF)[1]	Target Flow Rate (cfs)[2]
Wet	1-Mar	20-Mar	20	99,174	2,750
Above Normal	1-Mar	20-Mar	20	99,174	2,750
Below Normal	1-Mar	20-Mar	20	99,174	2,750
Dry	1-Mar	16-Mar	14	70,116	2,750
Critical	1-Mar	9-Mar	9	55,521	2,750
Below Normal Year Off-Ramp	1-Mar	14-Mar	14	69,421	2,750
Dry Year Off-Ramp[3]	1-Mar	2-Mar	2	10,000	NA
Critical Year Off-Ramp[3]	1-Mar	2-Mar	2	10,000	NA

[1] Pulse volumes are additive on top of the base flows.

[2] Target flow rate is inclusive of the baseflow, which in March is 200 cfs for critical years, 225 cfs for dry years, and 250 cfs for below normal, above normal, and wet years.

[3] The 10,000 AF pulse volume available in dry and critical years with off-ramps applied is not associated with reaching a flow rate of 2750 cfs. The 2-day pulse length is assumed so that it will average 5000 AF per day, which is similar to the other year types. However, since WSE has a monthly timestep all pulse durations of less than a month will produce the same results for total monthly flow.

Table G3a1-12. Dry Year Off Ramps for VA Pulse Flows based on Actual SJR WYT

		Is the Off Ramp Applied?				Is the Off Ramp Applied?	
Year	Actual SJR WYT	Floodplain Inundation Pulse	Outmigration Pulse	Year	Actual SJR WYT	Floodplain Inundation Pulse	Outmigration Pulse
1922	W	No	No	1963	AN	No	No
1923	AN	No	No	1964	D	No	No
1924	C	No	No	1965	W	No	No
1925	BN	Yes	No	1966	BN	No	No
1926	D	Yes	No	1967	W	No	No
1927	AN	No	No	1968	D	No	No
1928	BN	No	No	1969	W	No	No
1929	C	No	No	1970	AN	No	No
1930	C	Yes	Yes	1971	BN	No	No
1931	C	Yes	Yes	1972	D	No	No
1932	AN	No	No	1973	AN	No	No
1933	D	No	No	1974	W	No	No
1934	C	Yes	No	1975	W	No	No
1935	AN	No	No	1976	C	No	No
1936	AN	No	No	1977	C	Yes	Yes
1937	W	No	No	1978	W	No	No
1938	W	No	No	1979	AN	No	No
1939	D	No	No	1980	W	No	No
1940	AN	No	No	1981	D	No	No
1941	W	No	No	1982	W	No	No
1942	W	No	No	1983	W	No	No
1943	W	No	No	1984	AN	No	No
1944	BN	No	No	1985	D	No	No
1945	AN	No	No	1986	W	No	No
1946	AN	No	No	1987	C	No	No
1947	D	No	No	1988	C	Yes	Yes
1948	BN	Yes	No	1989	C	Yes	Yes
1949	BN	Yes	No	1990	C	Yes	Yes
1950	BN	Yes	No	1991	C	Yes	Yes
1951	AN	No	No	1992	C	Yes	Yes
1952	W	No	No	1993	W	No	No
1953	BN	No	No	1994	C	No	No
1954	BN	No	No	1995	W	No	No
1955	D	No	No	1996	W	No	No
1956	W	No	No	1997	W	No	No
1957	BN	No	No	1998	W	No	No
1958	W	No	No	1999	AN	No	No
1959	D	No	No	2000	AN	No	No

		Is the Off Ramp Applied?				Is the Off Ramp Applied?	
Year	Actual SJR WYT	Floodplain Inundation Pulse	Outmigration Pulse	Year	Actual SJR WYT	Floodplain Inundation Pulse	Outmigration Pulse
1960	C	Yes	No	2001	D	No	No
1961	C	Yes	Yes	2002	D	Yes	Yes
1962	BN	Yes	No	2003	BN	Yes	No

G3a1.2.3 VA Infiltration Gallery Diversions

During the period from June 1st through October 15th, Turlock Irrigation District and Modesto Irrigation District plan to operate two in-river infiltration galleries (IGs) at approximately RM 25.9.[5] The IGs would divert a portion of the base flows released upstream allowing the districts to reduce their diversion requirements at La Grange diversion dam. Until the IGs are fully operational the VA base flow release requirement at La Grange for June 1st through October 15th would be set to the interim flow values, which are shown above in Table G3a1-9 in parentheses. The VA project description from March 2019 includes the expected instream flow just downstream of the infiltration galleries, which is shown in Table G3a1-13 for the period when the IGs would be operational. These flows do not indicate a flow requirement and assume that there are no other losses between the La Grange release and the IG diversions. As part of the VA, the expected downstream flow was modified from its proposal in the AFLA to increase the flow from 75 cfs to 125 cfs in Critically Dry and Dry years during June 1st to October 15th, effectively reducing the expected infiltration gallery diversion during those periods. The difference between Table G3a1-13 and Table G3a1-9 represents the expected infiltration gallery diversion modeled in WSE-VA, which is shown in Table G3a1-14. For the results presented in this report, the IGs are turned off and the interim base flow releases are applied since the IGs are not currently operational and it is not clear when they will be.

Table G3a1-13. Potential Flow downstream of the Infiltration Galleries at RM 25.9 during the Period of IG Operation

		Potential Flow Downstream of Infiltration Galleries (cfs)				
Period	Days in Period	Critically Dry	Dry	Below Normal	Above Normal	Wet
June[1]	30	125 (125)	125 (125)	100 (150)	100 (150)	100 (150)
July[1]	31	125 (150)	125 (175)	150 (225)	150 (225)	150 (225)
August[1]	31	125 (150)	125 (175)	150 (225)	150 (225)	150 (225)
September[1]	30	125 (150)	125 (175)	150 (225)	150 (225)	150 (225)
October 1 – 15[1]	15	125 (150)	125 (175)	150 (225)	150 (225)	150 (225)
October 1 – 31	16	200	225	275	275	275

[1] Values in Parentheses are from the AFLA, Exhibit E, Table 5.6-2 and represent the interim release requirement at La Grange to be provided until both infiltration galleries are operational.

[5] For reference, La Grange diversion dam is located at about RM 52.2.

Table G3a1-14. Assumed Infiltration Gallery Diversion used in WSE

		Infiltration Galleries Diversions (cfs)				
Period	Days in Period	Critically Dry	Dry	Below Normal	Above Normal	Wet
June	30	75	75	100	100	100
July	31	175	175	150	150	150
August	31	175	175	150	150	150
September	30	175	175	150	150	150
October 1 - 15[1]	15	175	175	150	150	150
October 1 - 31[1]	16	0	0	0	0	0

Notes:
[1] For use in the WSE model with its monthly timestep, the October values are averaged based on the number of days in each period. For Critically Dry and Dry years the average October IG diversion is about 85 cfs and for Below Normal, Above Normal, and Wet years it is about 73 cfs.

G3a1.2.4 Representation of New Don Pedro Operations under the Tuolumne VA

The Tuolumne VA project definition does not contain reservoir operating rules or information on how New Don Pedro operations may change. In discussions with the Tuolumne River VA parties, they indicated that the reservoir carryover guideline should be set to reflect minimum dead pool storage levels. However, historical evidence shows that reservoir operators and water districts generally operate to meet multiple objectives of maximizing water delivery to meet demands, saving some water in reservoirs, and providing minimum allocations when water supply is low. A dead pool carryover guideline would not simulate the process of meeting these multiple objectives and as a result low storage conditions could occur much more often than they are observed in the historical record. Because a dead pool carryover guideline does not reflect actual past practices, it may not be a reasonable representation of how the VA would be implemented. Therefore, two Tuolumne VA alternatives with different reservoir operating parameters are included in WSE-VA. The first alternative is called “CC_VA_NCS” and is characterized by reservoir operations parameters that maximize the use of the reservoir without letting it fall below a minimum operating pool of 309 TAF. The second alternative, referred to as “CC_VA”, includes reservoir operations the same as in the 2018 SED. Table G3a1-15 presents the reservoir parameters for New Don Pedro under both Tuolumne VA alternatives. The results presented in this report were produced using the CC_VA alternative.

Table G3a1-15. Reservoir Operating Parameters for Tuolumne VA alternatives

	Tuolumne VA Alternatives	
Reservoir Parameters	CC_VA_NCS	CC_VA
Minimum Annual District Diversion (%)	0%	50%
Carryover Storage Target (TAF)	375	800
Maximum Storage Drawdown (%)	100%	65%

G3a1.3 Other Pre-Defined Model Alternatives

For WSE-VA, the "Current Conditions" Baseline alternative serves as the basis for the comparative assessment of the Tuolumne VA effects. This baseline is intended to reflect the existing or current condition on top of which the VA will be implemented. In the SED, the WSE Baseline alternative represented the existing water regulatory and infrastructure conditions for around when the project (the Bay-Delta Plan Update) began, which was 2009. Apart from the differences described in the General Updates section above, the only other difference from the SED between the Baseline alternatives is that the Vernalis Adaptive Management Plan (VAMP) pulse flow requirement in April and May, established by the San Joaquin River Agreement (Reclamation and SJRGA 1999), was turned off in WSE-VA to reflect that the Agreement expired in 2011.

In addition, WSE-VA still includes all the UF scenarios available in the SED version of the model with flow requirements ranging from 20% to 60% UF, in increments of 5%, on each of the Eastside tributaries. The only difference in implementation of the UF alternatives compared to the SED are those changes listed in the General Updates section above.

G3a1.4 References Cited

California Department of Water Resources (DWR). 1967. Contract between State of California and Merced Irrigation District for Recreation and Fish Enhancement Grants under the Davis-Grunsky Act. Available: http://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/mrcdrvr2179/mr_davis_grunsky_contract.pdf. Accessed: August 18, 2023.

California Department of Water Resources (DWR) 2017. The Final State Water Project Delivery Capability Report 2017. March 2018. Available: https://data.cnra.ca.gov/dataset/dcr2017/resource/be3e5c05-e4d2-450e-8f61-b55cc7a71301. Accessed: August 18, 2023.

Turlock and Modesto Irrigation Districts (TID/MID). 2017. Don Pedro Hydroelectric Project FERC NO. 2299. Amendment of Application. Exhibit E – Environmental Report. Available: https://donpedro-relicensing.com/license-application/. Accessed: August 18, 2023.

U.S. Bureau of Reclamation and the San Joaquin River Group Authority (Reclamation and SJRGA). 1999. Meeting Flow Objectives for the San Joaquin River Agreement, 1999–2010, Final Environmental Impact Statement/Environmental Impact Report. January 28. Prepared by EA Engineering, Science, and Technology. Sacramento, CA.

U.S. Bureau of Reclamation (Reclamation). 2019. Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project, Appendix B New Melones Stepped Release Plan Daily Hydrographs for Critical, Dry, Below Normal, Above Normal and Wet Year Types. October 2019. https://www.usbr.gov/mp/bdo/docs/ba-appendix-b-new-melones-srp-daily-hydrographs.pdf. Accessed: August 18, 2023.