United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

IN REPLY REFER TO:

MP-170
ENV-7.00

JUN 22 2012

Ms. Maria Rea
Supervisor, Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814

Subject: San Joaquin River Restoration Program (SJRRP; Proposed Action) - Response to the National Marine Fisheries Service (NMFS) Letter Dated January 27, 2012, Regarding the *SJRRP Biological Assessment* and Consultation

Dear Ms. Rea:

We are responding to your letter dated January 27, 2012, related to the *SJRRP Biological Assessment* for the Proposed Action. Your letter outlined specific areas where the information we provided to you was not sufficient for you to determine the level of effect of the Proposed Action on listed fish and their habitats.

You also outlined the need for additional information for the *SJRRP Biological Assessment*. You have requested information on the following issues:

1. Selection of a Preferred Alternative
2. Friant operations including flood operations
3. Temporal components of the Proposed Action
4. Use of the Hills Ferry Barrier
5. Monitoring information
6. Clarification on the choice of the Action Area for analysis
7. Inclusion of a discussion on steelhead and sturgeon critical habitat
8. Discussion of a full range of effects for species and habitats under NMFS jurisdiction
9. Additional information on Essential Fish Habitat.

We have worked diligently with NMFS to address these concerns. As a result, we have developed additional information and made relevant revisions to the *SJRRP Biological Assessment*. Enclosed you will find this new information and the revisions that address each of the specific concerns above.

Subject: SJRRP - Response to the NMFS Letter Dated January 27, 2012 Regarding the *SJRRP Biological Assessment* and Consultation

I appreciate your assistance in expeditiously processing this information in order to issue concurrence and to process consultation for the SJRRP. If you have any questions, please contact Michelle Banonis, Natural Resources Specialist, at (916) 978-5457 or mbanonis@usbr.gov.

Sincerely,

Alicia Forsythe

Alicia Forsythe
Program Manager

Enclosure

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RESPONSE TO NATIONAL MARINE FISHERIES SERVICE'S (NMFS) JANUARY 27, 2012 LETTER REGARDING THE SAN JOAQUIN RIVER RESTORATION PROGRAM (SJRRP) PROGRAMMATIC BIOLOGICAL ASSESSMENT (BA)

In their January 27, 2012 letter to Alicia Forsythe, SJRRP Program Manager, NMFS provided comments and requested additional information related to the SJRRP BA. The comments are provided below along with Reclamation's response.

ENDANGERED SPECIES CONSULTATION AND CONCURRENCE:

NMFS Comment:

1. *A description of the action to be considered [50 CFR 402.14(c)(1)].*

   The project must be described in sufficient detail so that an analysis of effects can be conducted.

   a) *Essentially, the Proposed Action from Alternative A1 of the SJRRP draft PEIR/S (sic) is presented as the project description for the purposes of ESA consultation even though that alternative has not been identified as the preferred alternative and a Record of Decision has not been made. Theis indicates that the project description could change and that ESA consultation is premature.*

Reclamation Response:

The Bureau of Reclamation (Reclamation) has made a good faith effort to include NMFS in multiple reviews of the administrative draft Program Environmental Impact Statement/Report (PEIS/R) as well as the Draft Biological Assessment (BA), including discussions on the approach to the BA for their preparation as early as 2009, which results in the culmination of over 2 years of continued coordination with NMFS as to the selection of an alternative and subsequent analysis. In 2010, Alternative A1 was selected for analysis for the BA because: 1) Both the United States Fish and Wildlife Service (USFWS) and NMFS concluded that consultation could not occur on all alternatives and, as a result, a single alternative was needed; and, 2) Alternative A1 presents the greatest potential range of impacts in the Sacramento-San Joaquin Delta (Delta) because it includes maximum recapture potential at existing Delta facilities. This approach was discussed in late 2009 and further information supplied through multiple Environmental Compliance and Permitting Workgroup meetings as well as correspondence with NMFS throughout 2011, which included several meetings between NMFS and Reclamation to discuss the approach as well as providing an Administrative Draft BA and two Administrative Draft PEIS/R documents for review. The BA stated that effects analyses were being performed on Alternative A1. If another alternative is selected as the preferred alternative in the Final PEIS/R document and the ultimate Record of Decision (ROD), Alternative A1 would still provide the greatest potential effects to species in the Delta as a result of all of the potential alternatives under existing conditions and utilizing existing facilities. If Alternatives B or C are selected, the proposed diversions or pumping facility would require additional analysis and planning under both the National Environmental Policy Act/California Environmental Quality Act and the Endangered Species Act. These future actions are addressed programmatically in the PEIS/R because specific details, such as locations, construction methodology, capacity, and similar are not currently available and would be beyond the scope of analysis for the current PEIS/R document. Additionally, there is no requirement under ESA or NEPA that mandates that a Record of Decision (ROD) be required prior to the completion of Section 7 consultation or vice versa. Thus, this approach is consistent with common practice and guidance issued under ESA and the approach discussed for over 2 years with NMFS.

Revised Approach to Project-Level Actions:

In order to proceed with the consultation and to initiate the release of flows provided for in the project description of the BA, starting on October 1, 2012, Reclamation and NMFS have discussed a shift in the project description based upon NMFS' recommendation. Thus, Reclamation requests that Interim and Restoration flow release for Friant Dam of up to 1,660 cubic feet per second (cfs) and conveyance of these flows through the Restoration Area be consulted through a project-level analysis by NMFS. As channel capacity improvements are made, Interim and Restoration flow releases from Friant Dam may be increased, which would increase the overall flows within the Restoration Area. As improvements are made to increase channel capacity and as project-level Conservation Strategy actions are implemented, Reclamation will consult with NMFS to increase flows up to the full flow releases called for in the Settlement. This approach does not eliminate other project-level actions analyzed in the project description of the BA such as the operation of downstream control structures, minimizing potential flood and seepage risks, establishment of a Recovered Water Account, monitoring activities, and the recapture of SJRRP flows within the Restoration Area and the Delta. The SJRRP Framework for Implementation, which is currently being coordinated through the Implementing Agencies and Settling Parties, will assist in guiding the appropriate timing for this additional consultation related to increases in flows.

Provided below is the analysis for species and habitats under the jurisdiction of NMFS for flow releases from Friant Dam up to 1,660 cfs. This discussion is similar to the analysis performed for previous years of SJRRP Interim Flows.

Central Valley Steelhead DPS

The geographic range and designated critical habitat of Central Valley steelhead overlap the Action Area in the south and central Delta, in the mainstem San Joaquin River downstream of the Merced River confluence, and in the San Joaquin River tributaries.

San Joaquin River Flow Upstream from the Merced River Confluence. Implementing the release of flows up to 1,660 cfs from Friant Dam would increase flows in the section of the San Joaquin River from Friant Dam to the Delta. Segments of the San Joaquin River upstream from the Merced River were often dry prior to the implementation of SJRRP Interim Flows. The release of 1,660 cfs will occur into the future until it is determined that through the implementation of channel improvement and/or other projects to increase channel capacities and reduce seepage, releases can be increased from Friant Dam. If this increase is scheduled to occur, Reclamation will confer with NMFS in order to determine the approach for consultation or concurrence and the determination of effects to species.

Increased flows in the San Joaquin River downstream from the Merced River confluence should improve overall conditions for migrating adult and juvenile steelhead with the potential to improve water quality, and provide slightly higher water velocities. Improved conditions would likely reduce or prevent migration delays by both adults and juveniles.

It is not anticipated that the release of flows up to 1,660 cfs from Friant Dam would affect the migratory behavior of steelhead. Historic streamflow conditions upstream from the Merced River confluence during the spring averaged 119 cfs to 13,050 cfs, with peak flows reaching 59,000 cfs in 1997 under flood conditions, when flood flows were released from Friant Dam. Based on Exhibit B of the Settlement, 350 cfs flows at Friant Dam would result in 155 cfs in December and 175 cfs in January additional flow at the Merced River Confluence. This additional flow amounts to approximately 19 thousand acre-feet, or about 5 percent of the flow at the Merced River Confluence during a Dry Year. During nonflood conditions, release of flows up to 1,660 cfs from Friant Dam could increase flows by an average of up to 220 cfs at this location beginning on February 1. The average annual flows under the action are within 7 percent of the average flow expected at this time and location under existing conditions. This small increase is not anticipated to trigger any change to Central Valley steelhead migration patterns in the San Joaquin River basin. Also, SJRRP flows would not be released if natural flows approach channel capacity.

Hills Ferry Barrier

Reclamation would continue to implement the Steelhead Monitoring Plan from December 1 through March 15, which calls for several options, alone or in combination, to collect, transport, and document potential strays. With the implementation of the Steelhead Monitoring Plan and with coordination/consultation with NMFS, effects to Central Valley steelhead as a result of SJRRP flow releases up to 1,660 cfs would not be likely to adversely affect the species. Reclamation currently holds a 10(a)(1)(A) permit from NMFS to perform this monitoring, which is valid until March 31, 2014. Reclamation will work with NMFS to determine if a future extension of these monitoring activities is required to allow monitoring activities to occur beyond 2014.

DFG operates and maintains the Hills Ferry Barrier at the confluence of the Merced River with the San Joaquin River to reduce or prevent the unintended upstream migration of anadromous fish into unsuitable San Joaquin River habitat and any false migratory pathways. Operations and maintenance of the barrier is funded annually by the Delta Fish (Four Pumps) Agreement. The Delta Fish Agreement, between the California Department of Water Resources (DWR) and the California Department of Fish and Game (DFG), provides measures to offset adverse impacts to fish caused by water diversions at the Banks Pumping Plant. Under the agreement, direct losses of Chinook salmon, steelhead (*Oncorhynchus mykiss*), and striped bass (*Morone saxatilis*) are offset or mitigated through funding and implementing fish mitigation projects. The redirected salmon migrate into the Merced River or other tributaries of the San Joaquin River, where survival and successful reproduction is increased. The Hills Ferry Barrier thus reduces the loss of adult salmon in the San Joaquin River, with the mitigation offsets determined based on a calculated level of barrier efficiency. The State of California will decide whether the Hills Ferry Barrier continues to fulfill this mitigation need under the Delta Fish Agreement, and thus continues to be funded under this agreement.

The barrier's main purpose is to redirect upstream-migrating adult fall-run Chinook salmon into suitable spawning habitat in the Merced River and prevent migration into the mainstem San Joaquin River upstream, where conditions are currently unsuitable for Chinook salmon. Central Valley steelhead migrate during fall and winter in a manner similar to migration by fall-run Chinook salmon, and they have a similar body type; therefore, maintenance of the Hills Ferry Barrier would continue into the near-term future for the purpose of redirecting Chinook salmon during the release of SJRRP flows from Friant Dam, up to 1,660 cfs. The barrier is expected to be equally effective in redirecting any Central Valley steelhead. If the State of California determines that the Hills Ferry Barrier will no longer be utilized, Reclamation will coordinate with NMFS to determine appropriate actions related to species effects.

NMFS permits the take of Federally listed threatened species for rescue and salvage by various State and nongovernmental agencies through the ESA Section 10a(1)A and 4(d) rules. In the unlikely event that ESA-listed anadromous fish, including Central Valley steelhead, stray into San Joaquin River reaches above the Merced River, these fish could be salvaged under these authorities. Additionally, CDFG applies annually for an ESA Section 4(d) research permit and accompanying take limit for Central Valley steelhead from NMFS for operation of the barrier. If Central Valley steelhead are encountered at or above the Hills Ferry Barrier during fall SJRRP flows, the Central Valley steelhead would be released downstream in suitable reaches, as would be required by permit. Salvaged fish will likely have genetic samples (i.e., fin clips) taken. Such recovery would be conducted under and consistent with CDFG's ESA Section 4(d) research permit. An ESA Section 4(d) research permit application for future years of operation of Hills Ferry Barrier will be submitted to NMFS by CDFG.

Central Valley Steelhead Monitoring Plan

The project includes implementation of a monitoring plan that was developed by the Fisheries Management Workgroup in February 2011 (Appendix H) to check for Central Valley steelhead in the Restoration Area through March 31, 2014. SJRRP flows of up to 1,660 cfs from Friant Dam will continue from October 1 through September 30, consistent with the Exhibit B Settlement hydrographs. Hills Ferry Barrier is scheduled to be removed on or around December 1 of each year. It is estimated that VAMP-like flows will occur in the lower San Joaquin River tributaries from March 15 through April 30. As a result, the critical timing for Central Valley steelhead monitoring within the Restoration Area would occur from approximately December 1 through March 15. The Steelhead Monitoring Plan calls for the implementation of up to three options to monitor for steelhead that could make it past Hills Ferry Barrier. The first option calls for the utilization of electrofishing at partial barriers and false upstream migration pathways such as Mud Slough, Salt Slough, Newman Wasteway, and drop structures at the mouth of the Eastside Bypass, Mariposa Bypass, and Sand Slough Control Structure. The second option would utilize large fyke trap(s) above the Merced River confluence and below false attraction and entrainment points. The third option would involve the use of weirs, with or without trapsat false attraction locations and existing structures to detect, trap, and relocate Central Valley steelhead. The three options presented here may be used singularly or in combination, depending on physical river conditions and in coordination with NMFS and the SJRRP Fisheries Management Workgroup. All captured Central Valley steelhead would be tagged and transported downstream of the mouth of the Merced River in transport tanks. In the event a steelhead is encountered in the Restoration Area, NMFS will be notified immediately.

In the absence of a monitoring plan and management plan, the impacts to Central Valley steelhead may result in potential undocumented straying during the time when steelhead would be migrating. However, because of measures adopted to prevent straying of Merced River adult steelhead into the San Joaquin River upstream from the confluence, releasing flows from Friant Dam of up to 1,660 cfs would not be likely to adversely affect Central Valley steelhead. SJRRP flows would not exacerbate straying conditions for steelhead during that period as the 350 cfs base flow from mid-December to the end of January would be within hydrologic conditions previously described for 350 cfs base flows from October 1 to October 31, February 1 to February 28, and July 1 through September 30 and as analyzed for previous years of Interim Flow releases.

During Water Year (WY) 2011 and 2012 Interim Flows were being held to 50 cfs or below past Sack Dam due to downstream seepage constraints and limitations. It is possible that these types of situations could occur in the future until channel capacity and seepage projects are undertaken. If this were to occur, this would not affect the straying of Central Valley steelhead as 50 cfs would not result in any measureable detection of flow at the Merced River confluence that could cause steelhead to move up the San Joaquin River. Flows at such a low level are most likely to infiltrate into the river channel or the Eastside Bypass, and would not connect to the downstream extents of the San Joaquin River. The Steelhead Monitoring Plan would only be implemented when SJRRP flows connect to the Merced River.

Figure 1 and 2 below shows plots of San Joaquin River flows at the Merced River confluence for the past 20 years and in relation to actual interim flow releases to-date. Figure 1 shows flows corresponding to year type designations. Comparison of WY 2011 flows is not wholly representative of standard flows or year type designations due to higher than normal flows from non-SJRRP flood releases and higher than normal precipitation and snow pack. Flood releases from Friant Dam are not associated with the proposed action and are not considered here for analysis of effects to species. Additionally, WY 2012 Interim Flows have been constrained by seepage limitations downstream of Sack Dam to no greater than 50 cfs. Therefore, WY 2010 Interim Flow releases are used as a more accurate comparison. When comparing the 2010 Merced River confluence flow with the calculated average for normal-wet years and the SJRRP Interim Flow releases at Sack Dam in WY 2010, WY 2010 had slightly above average releases in April/May and early June. When compared to Figure 2, which depicts flows on a per-year basis, the WY 2010 flows at the Merced River confluence fall well within the overall annual flow variations. It is anticipated that future flow releases not in excess of 1,660 cfs from Friant Dam will behave similarly in the system and that the flows will continue to fall within a similar range to WY 2010. With the regular removal of Hill’s Ferry Barrier in December, there will be little chance for straying of steelhead as the flows present from the Proposed Action should not create a false attraction.

Figure 1.: Water Year Type Averages for a 20-Year Period at the Merced River Confluence

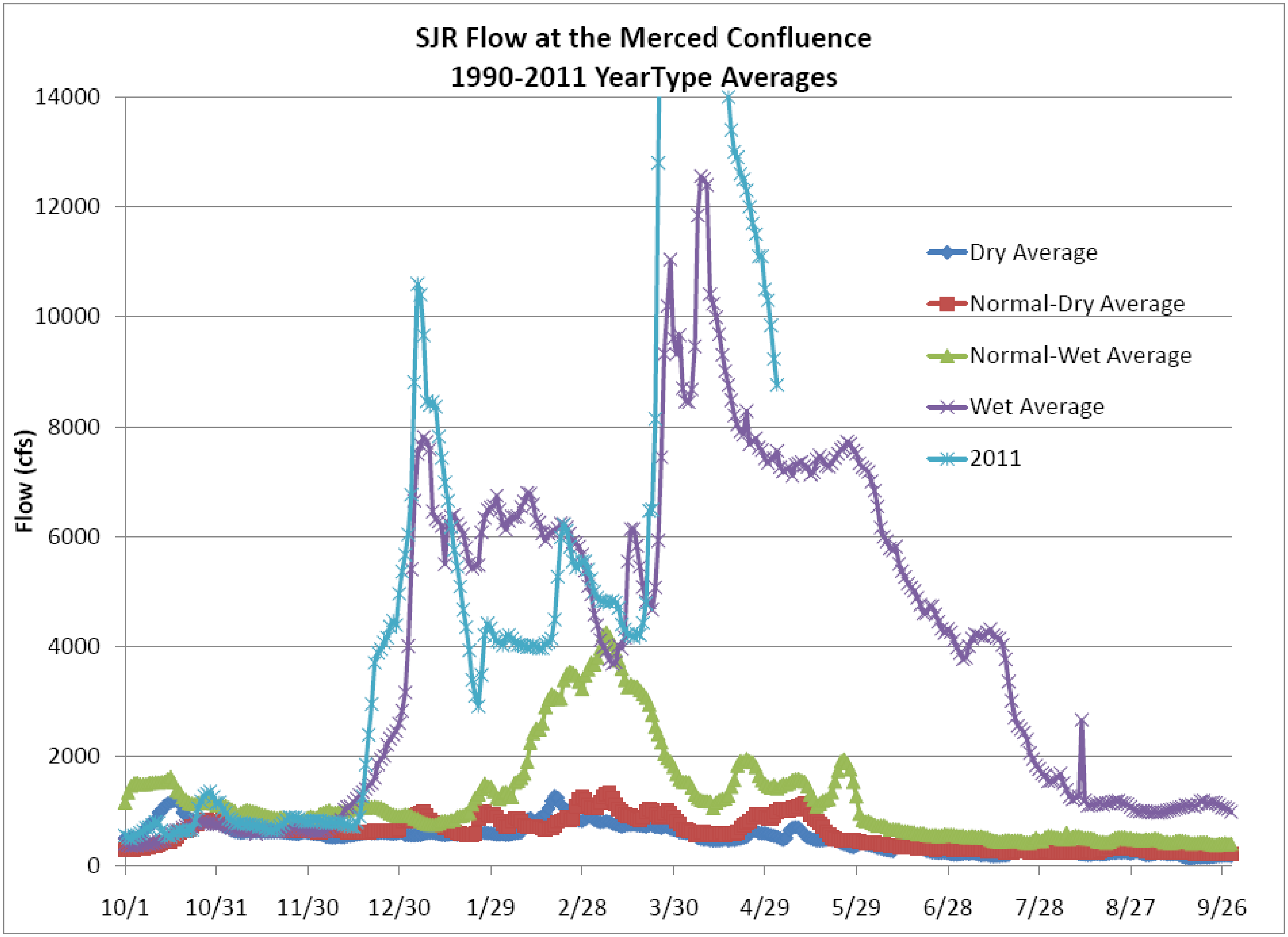
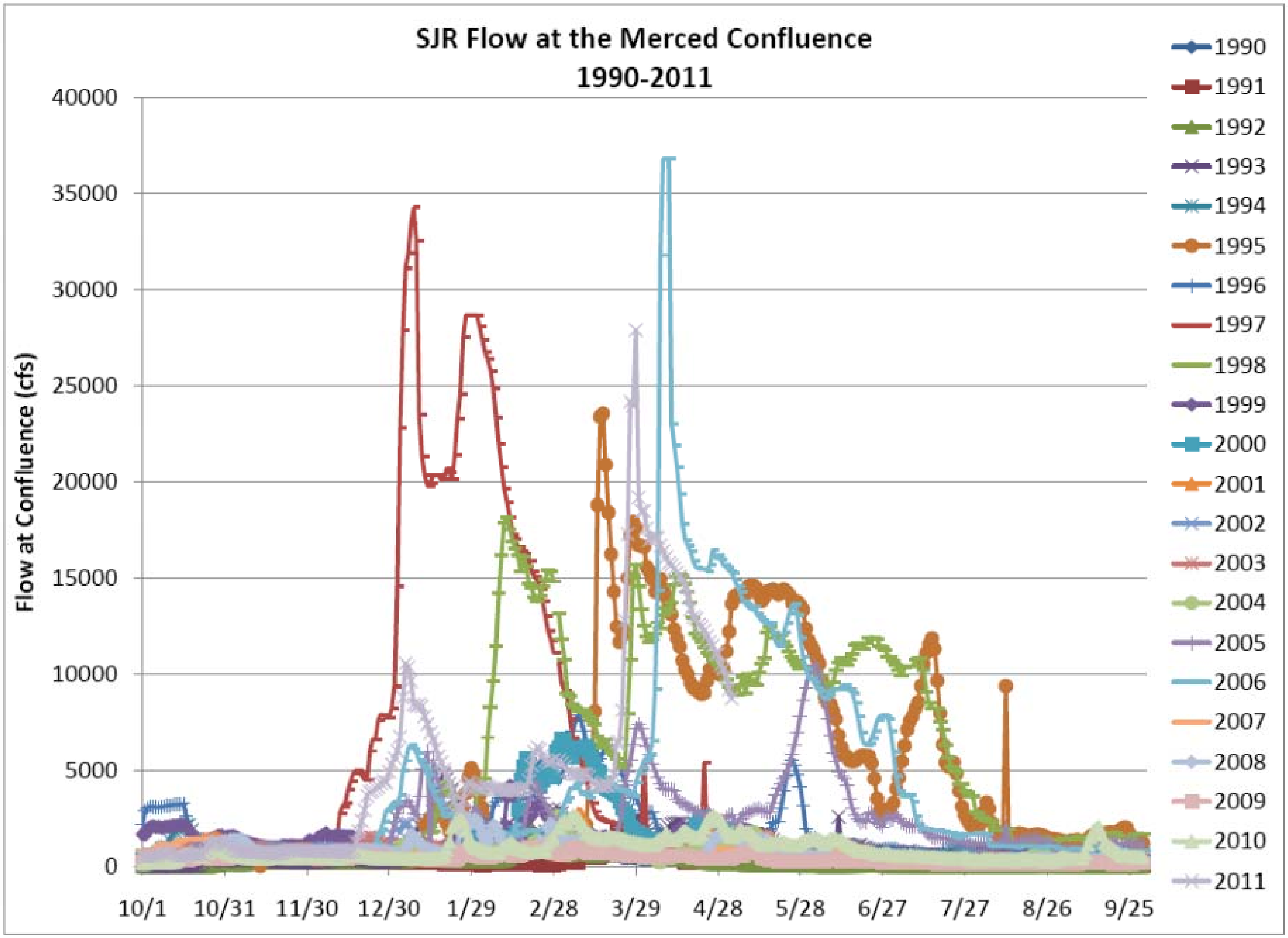


Figure 2: Actual Flows for a 20-Year Period at the Merced River Confluence



Flow in the Lower San Joaquin River and Tributaries. SJRRP Interim and Restoration Flow releases up to 1,660 cfs from Friant Dam could increase flows in the San Joaquin River, at the confluence of the Merced River, by up to 1,300 cfs. In response to SJRRP releases from Friant Dam up to 1,660 cfs, tributary releases to meet VAMP-like water quality objectives at Vernalis could be affected. The Settlement does not provide guidance on coordination with VAMP flows. However, flows for both the VAMP and the Proposed Action would occur during similar times of the year and have the potential to overlap in time. The SJRRP would meet flow targets at Vernalis under the prior VAMP agreement by contributing to the baseline that determines tributary contributions. Tributary releases to meet VAMP and water quality objectives at Vernalis would be affected in one of two ways. In conditions where SJRRP flows contribute toward meeting the same VAMP flow threshold that would have otherwise been in place, required releases from tributary reservoirs could be reduced. In conditions where SJRRP flows cause a higher VAMP flow threshold than would have otherwise been in place, required releases from tributary reservoirs would be made to achieve the higher threshold. As a result, tributary flows would increase in some years and decrease in other years. Changes in VAMP contribution releases from tributary reservoirs would not affect the ability to meet instream fish and water quality minimum flow requirements in the Merced, Tuolumne, Stanislaus, or mainstem San Joaquin rivers. However, it is possible that flows in the tributaries could be less because of VAMP operations with SJRRP flow releases up to 1,660 cfs from Friant Dam than they would be without SJRRP flows.

The following analysis compares the flows from the major San Joaquin River tributaries (Merced, Tuolumne and Stanislaus rivers) to the San Joaquin River from CalSim simulations performed for the for the No Action and Proposed Action for Interim Flows. These flows result in increased flows along the San Joaquin River downstream from the Merced River which would be included in the VAMP "Existing Flows". Because the tributary rivers share the responsibility of meeting any VAMP flow requirements at Vernalis, this increase in the "Existing Flows" would cause changes in tributary operations and inflows to the San Joaquin River.

The changes in tributary flows under the Proposed Action include both increases and decreases. Generally, flows shift to later in the year with a decrease during the SJRRP flow pulse period (February 1 through May 28) as the additional San Joaquin River flow allows a reduction in releases from the tributary reservoirs. The water that is stored on the tributaries is then released at a later date to meet water supply demands, causing tributary flow increases during those periods. The magnitude of the changes is different between the tributaries because of the sharing agreement for meeting the VAMP requirements. Tables 1 through 3 contain the mean monthly tributary flows, by D-1641[1] San Joaquin Valley Water Supply Index, and the predicted change in these flows due to SJRRP flows.

Additionally, Figures 3 through 17 show the minimum and maximum flows from the No Action scenario and the mean flow for both the No Action and the Proposed Action for tributaries for different year types. The bars for minimum and maximum identify the historical range of flows.

[1] State Water Resources Control Board, D-1641. This decision implemented flow objectives for the Bay-Delta Estuary and approved a petition to change the points of diversion of the Central Valley Project (CVP) and the State Water Project in the southern Delta. It further approved a petition to change the place of use and purpose of the CVP.

The columns for the means allow a comparison between alternatives. The figures ultimately depict that the change in the flows is small relative to the overall magnitude of the flows. They also show that the flow under the Proposed Action is within the same range of the monthly variation found in the No Action.

Table 1. Merced River Inflows to the San Joaquin with the Proposed Action

	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff
		0%		0%		0%		0%		0%		0%		-10%		3%		1%		0%		0%		6%
Above Normal	536	4%	438	0%	606	0	900	1%	1487	2%	784	0%	602	-4%	1105	2%	835	0%	619	2%	481	0%	270	6%
Below Normal	335	0%	394	0%	515	0	522	0%	729	0%	504	1%	805	-11%	822	0%	793	2%	674	0%	389	0%	213	0%
Dry	311	0%	385	0%	385	0	798	1%	1188	0%	884	0%	976	-5%	1352	5%	908	-1%	714	0%	623	0%	397	0%
Critical	277	0%	333	0%	357	0	419	0%	443	0%	601	0%	374	-6%	444	8%	812	0%	647	0%	315	0%	199	0%

Table 2. Tuolumne River Inflows to the San Joaquin with the Proposed Action

	Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep	
	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff
		0%		0%		0%		0%		0%		0%		-3%		0%		1%		0%		0%		0%
Above Normal	662	0%	593	1%	853	0	1023	-1%	1803	1%	2387	1%	2135	-2%	1524	1%	1704	1%	1039	0%	473	0%	492	0%
Below Normal	497	0%	385	0%	749	0	788	0%	875	0%	1285	1%	1956	-3%	1675	-2%	1309	0%	1110	0%	440	0%	438	0%
Dry	403	0%	380	0%	397	0	1176	1%	2015	1%	2337	0%	2544	-2%	2156	1%	1848	0%	1145	0%	468	0%	618	0%
Critical	302	0%	317	0%	312	0	378	0%	416	0%	874	0%	1133	-1%	1488	1%	1028	0%	918	0%	411	0%	355	0%

Table 3. Stanislaus River Inflows to the San Joaquin with the Proposed Action

	Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep	
	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff
		0%		1%		1%		0%		2%		-3%		0%		0%		0%		0%		0%		0%
Above Normal	685	0%	451	3%	410	0	395	1%	612	-1%	557	-10%	1275	1%	1265	2%	991	0%	557	0%	514	0%	547	1%
Below Normal	655	1%	434	1%	593	0	537	1%	545	-7%	413	-15%	1098	-3%	1096	2%	888	-2%	697	4%	659	0%	657	0%
Dry	578	0%	396	0%	372	0	378	0%	1064	-3%	1090	-9%	1417	0%	1273	3%	1188	3%	634	0%	643	0%	813	5%
Critical	463	1%	355	1%	335	0	248	1%	284	4%	261	-37%	648	-1%	682	5%	369	6%	353	0%	361	1%	366	0%

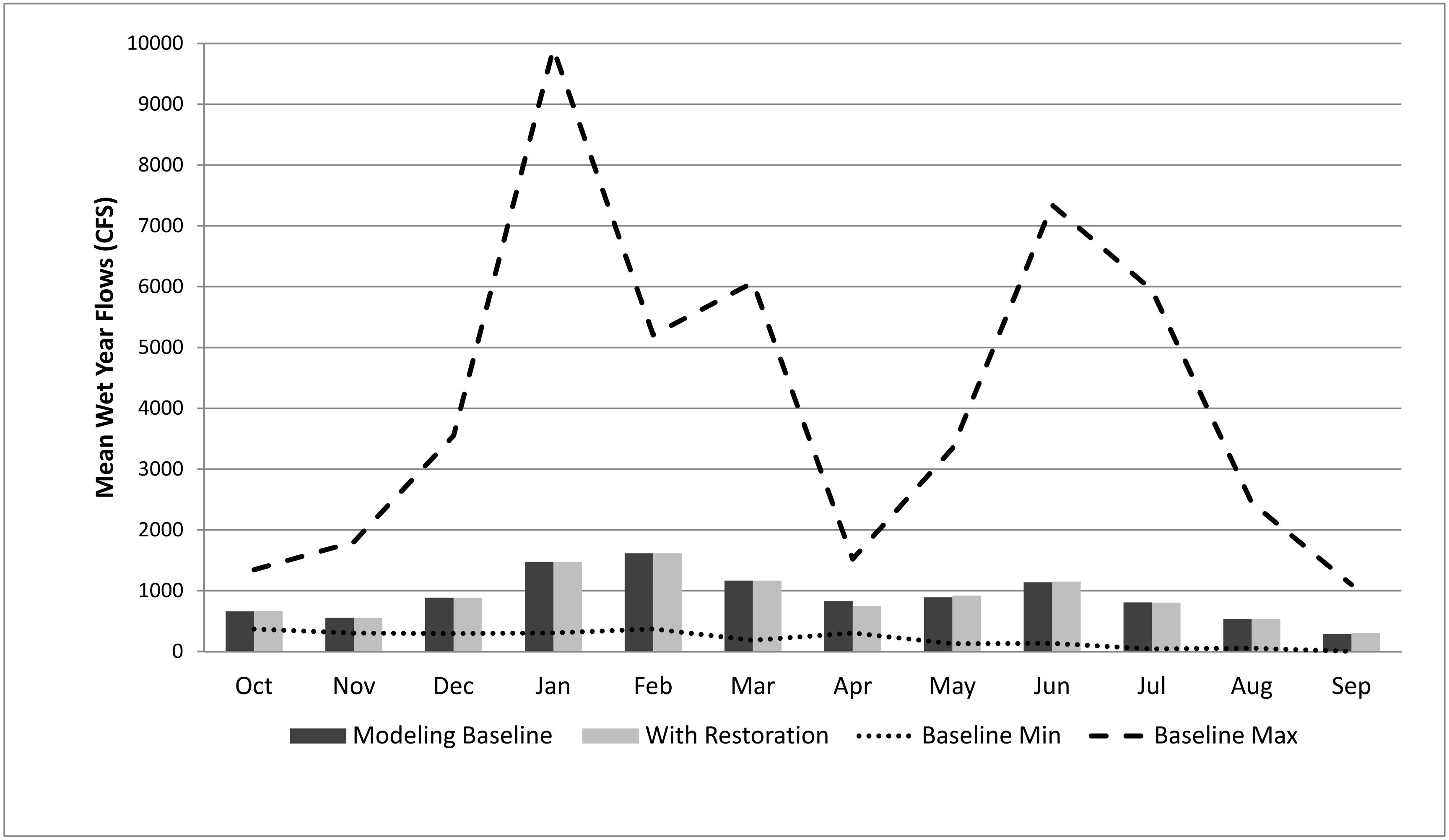


Figure 3. Wet Year Comparison of No Action and Proposed Action Merced River Flows

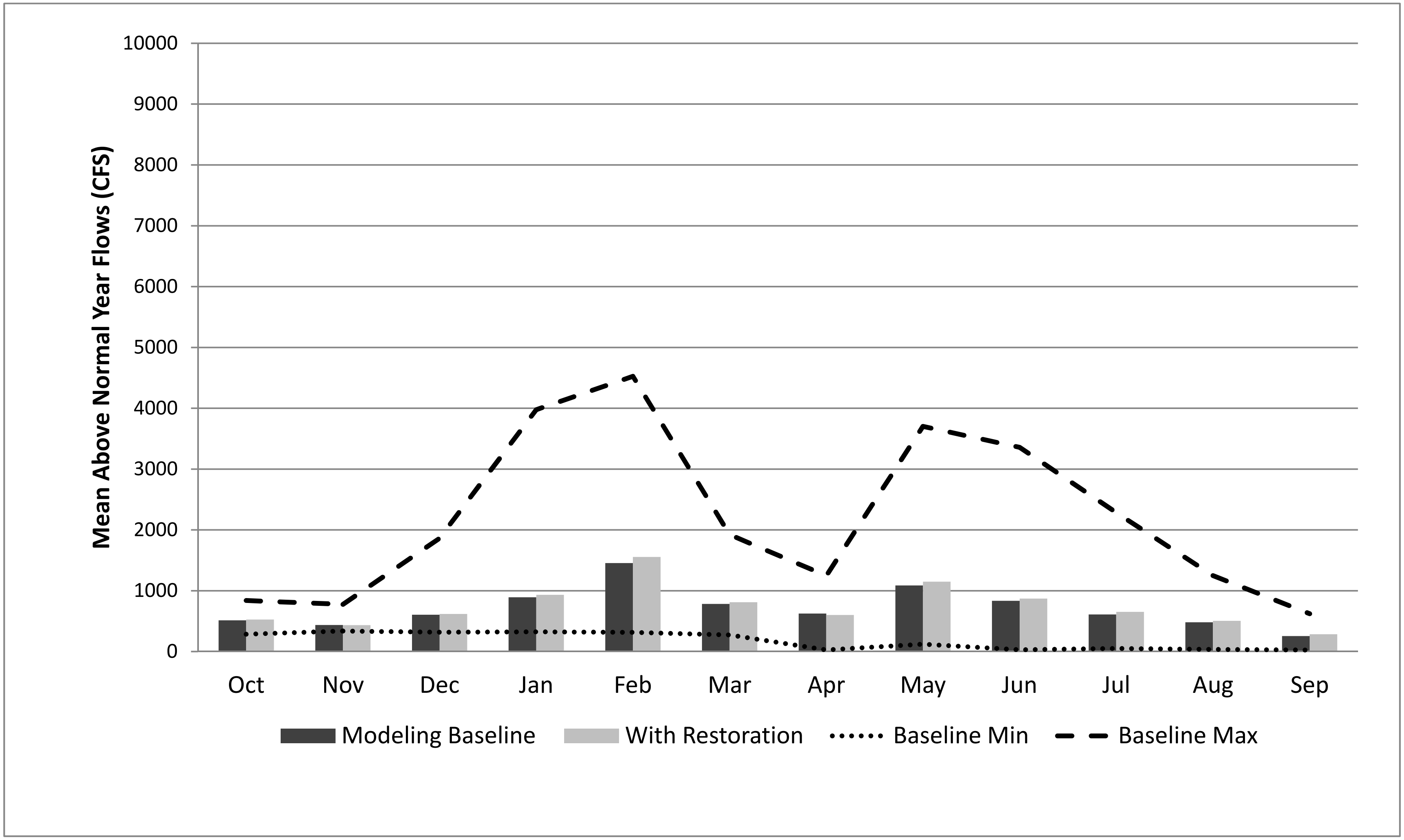


Figure 4. Above Normal Year Comparison of No Action and Proposed Action Merced River Flows

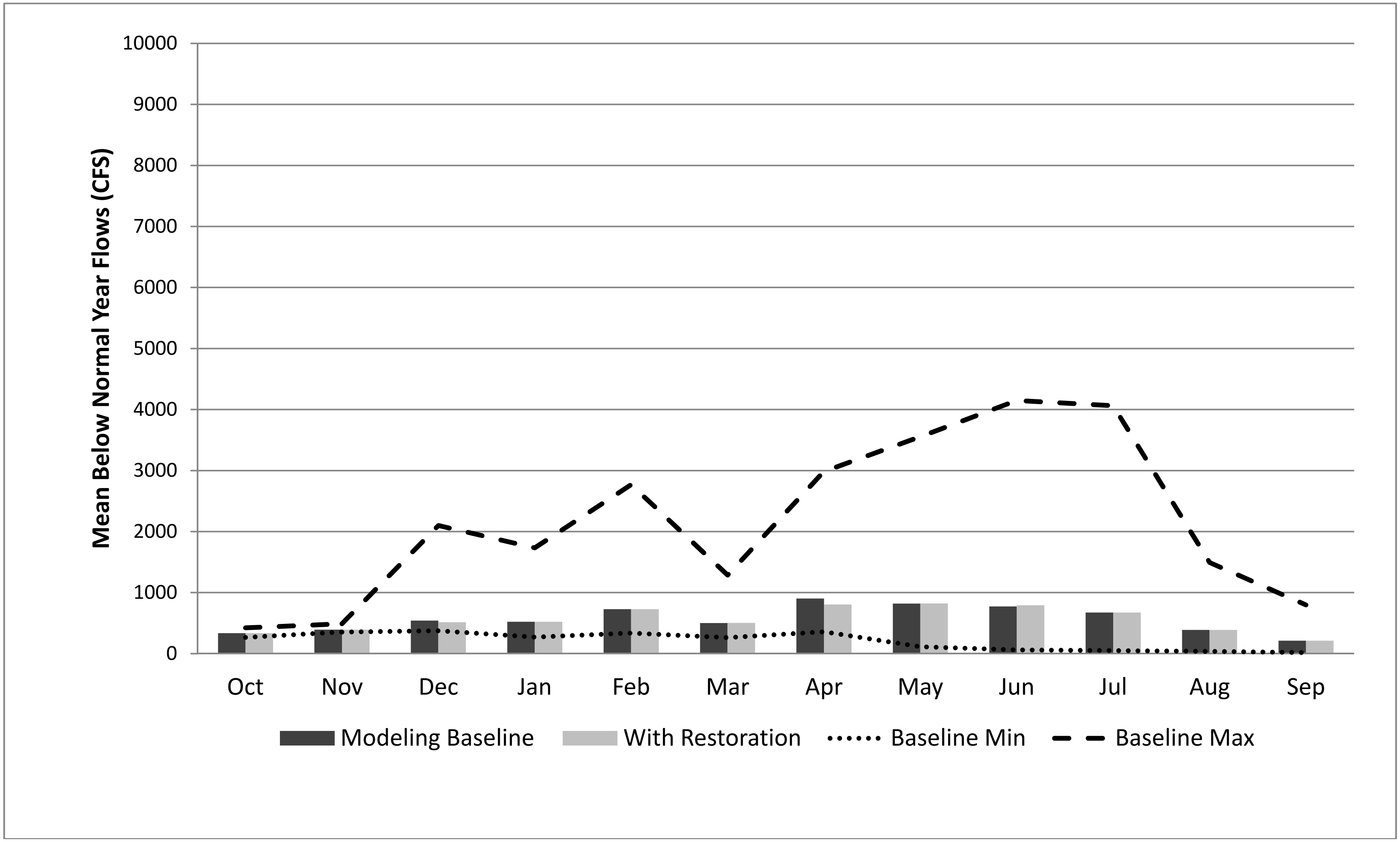


Figure 5. Below Normal Year Comparison of No Action and Proposed Action Merced River Flows

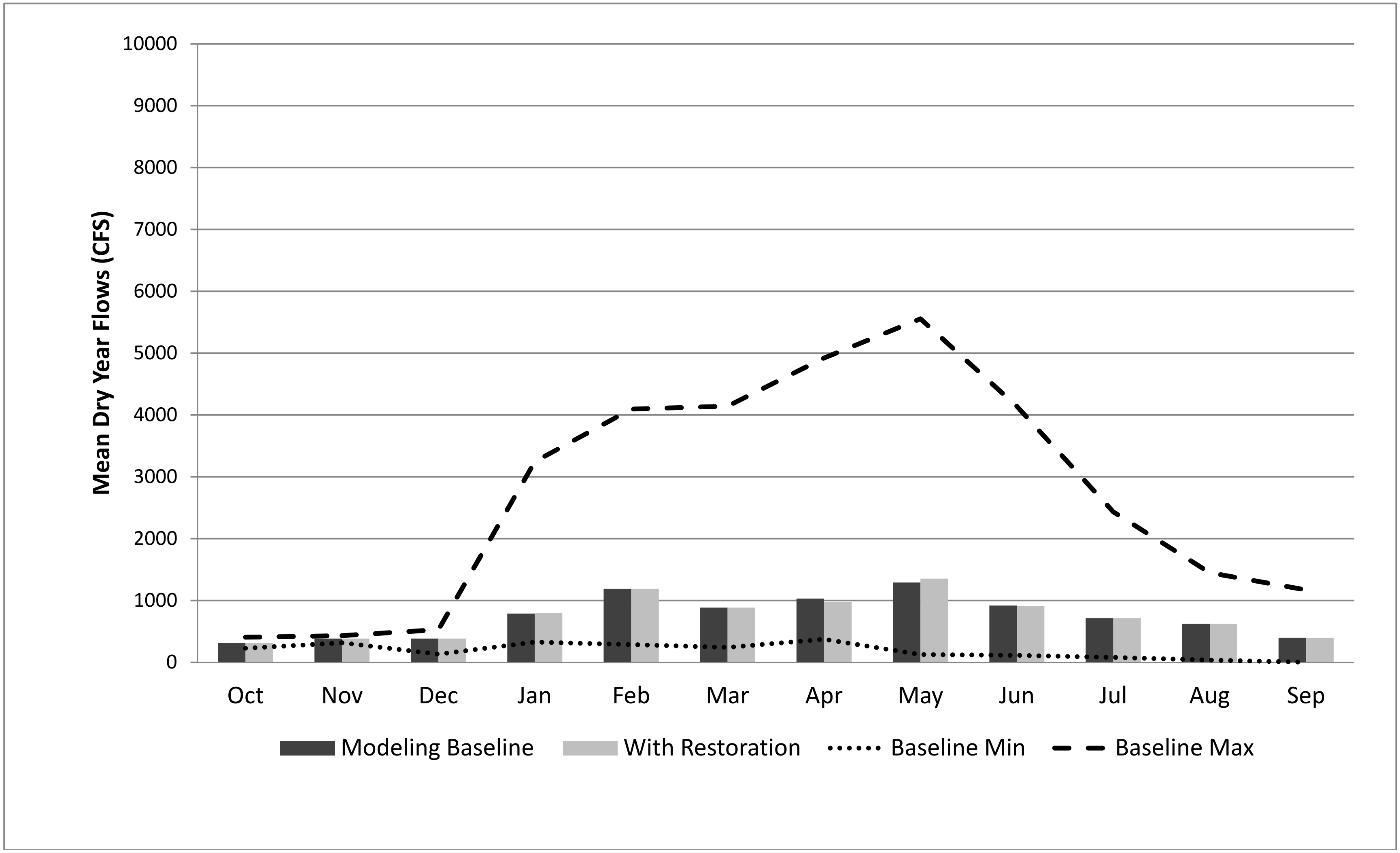


Figure 6. Dry Year Comparison of No Action and Proposed Action Merced River Flows

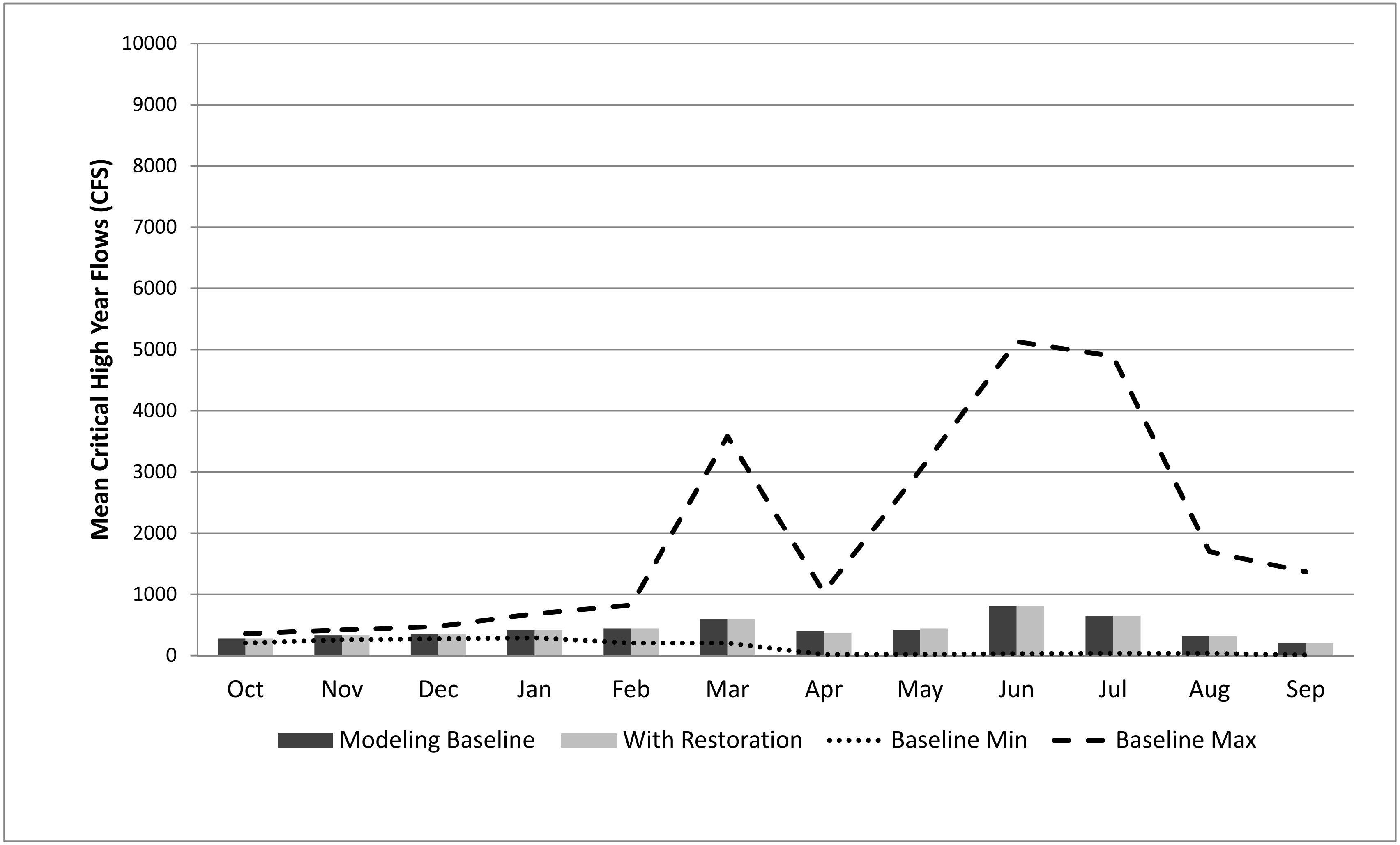


Figure 7. Critical Year Comparison of No Action and Proposed Action Merced River Flows

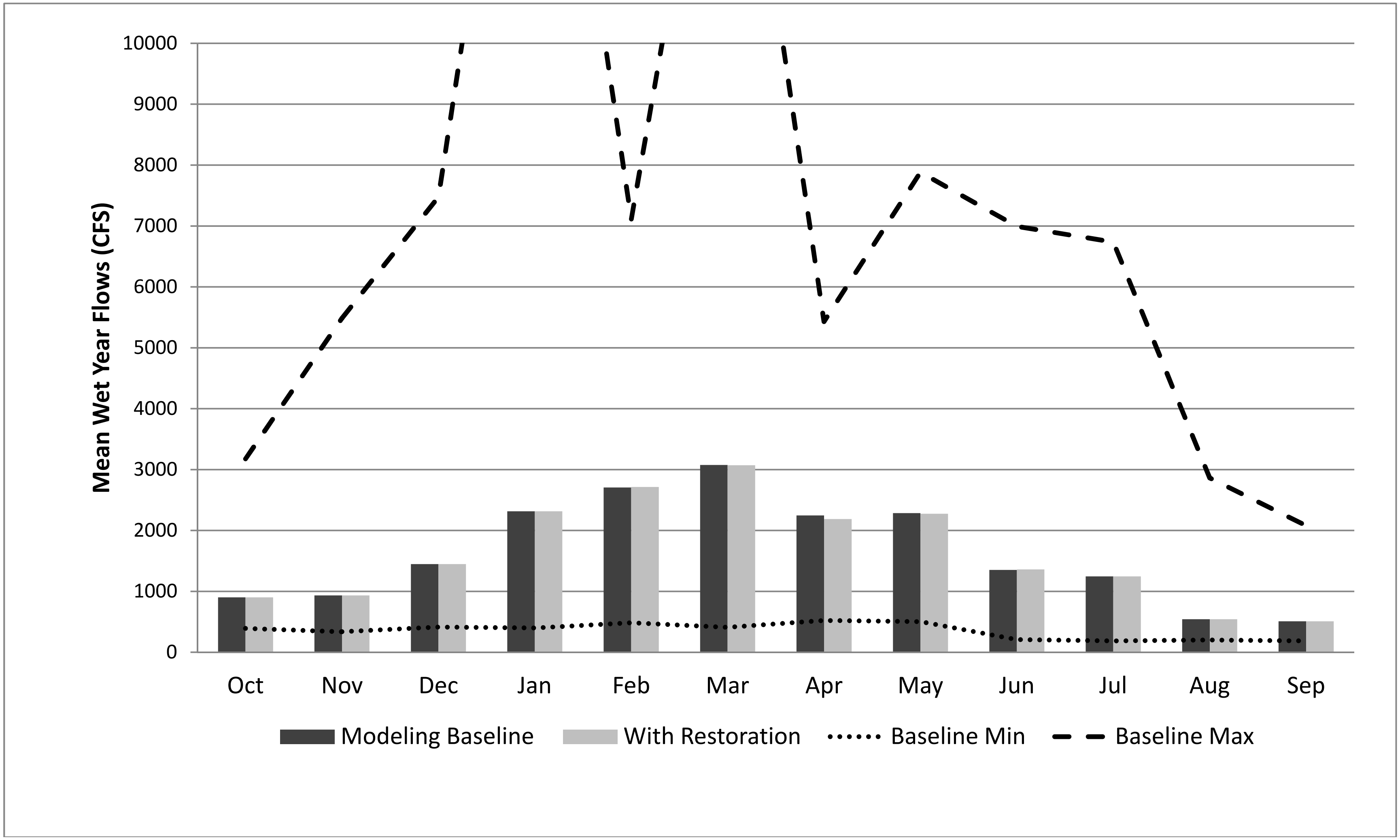


Figure 8. Wet Year Comparison of No Action and Proposed Action Tuolumne River Flows

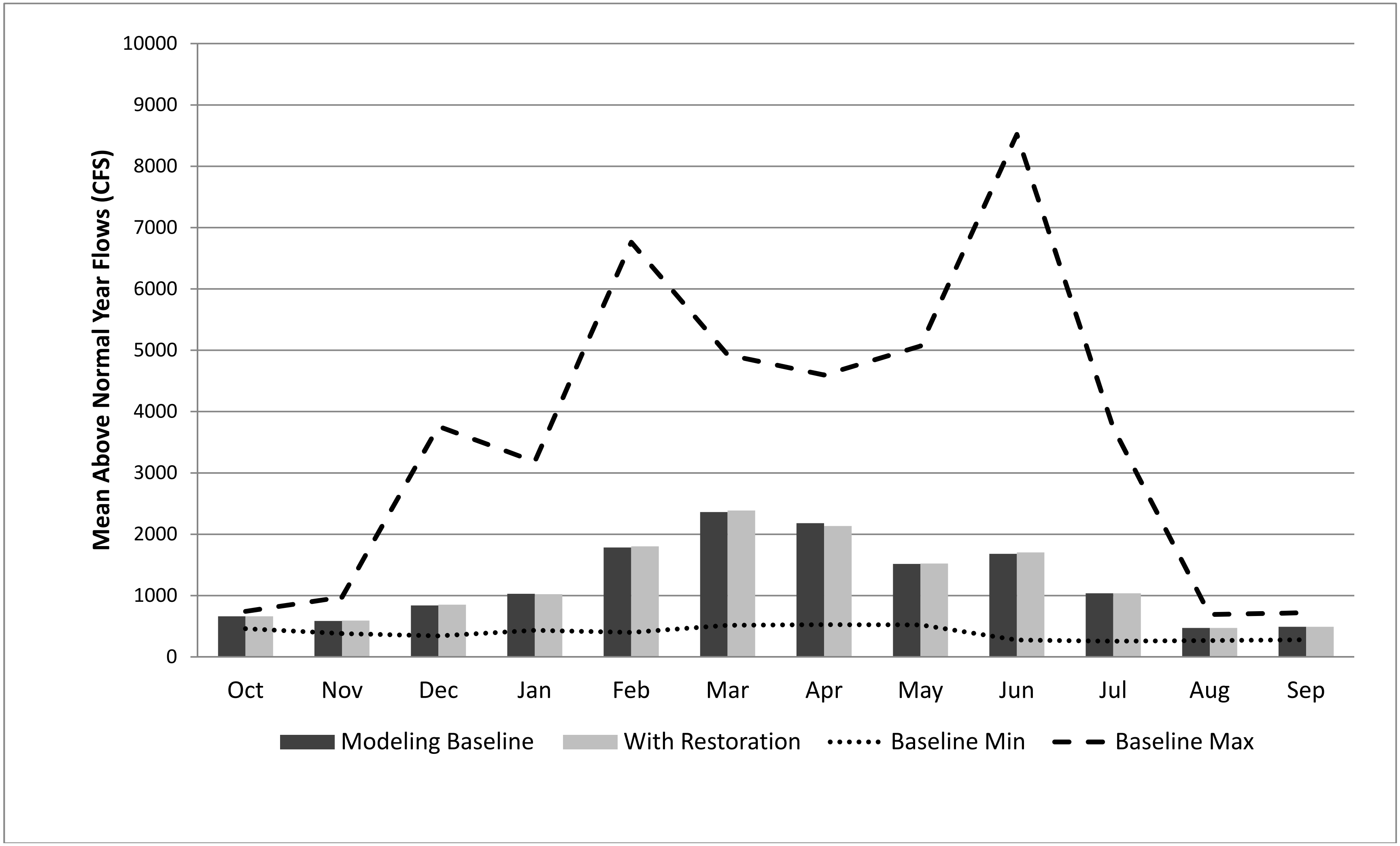


Figure 9. Above Normal Year Comparison of No Action and Proposed Action Tuolumne River Flows

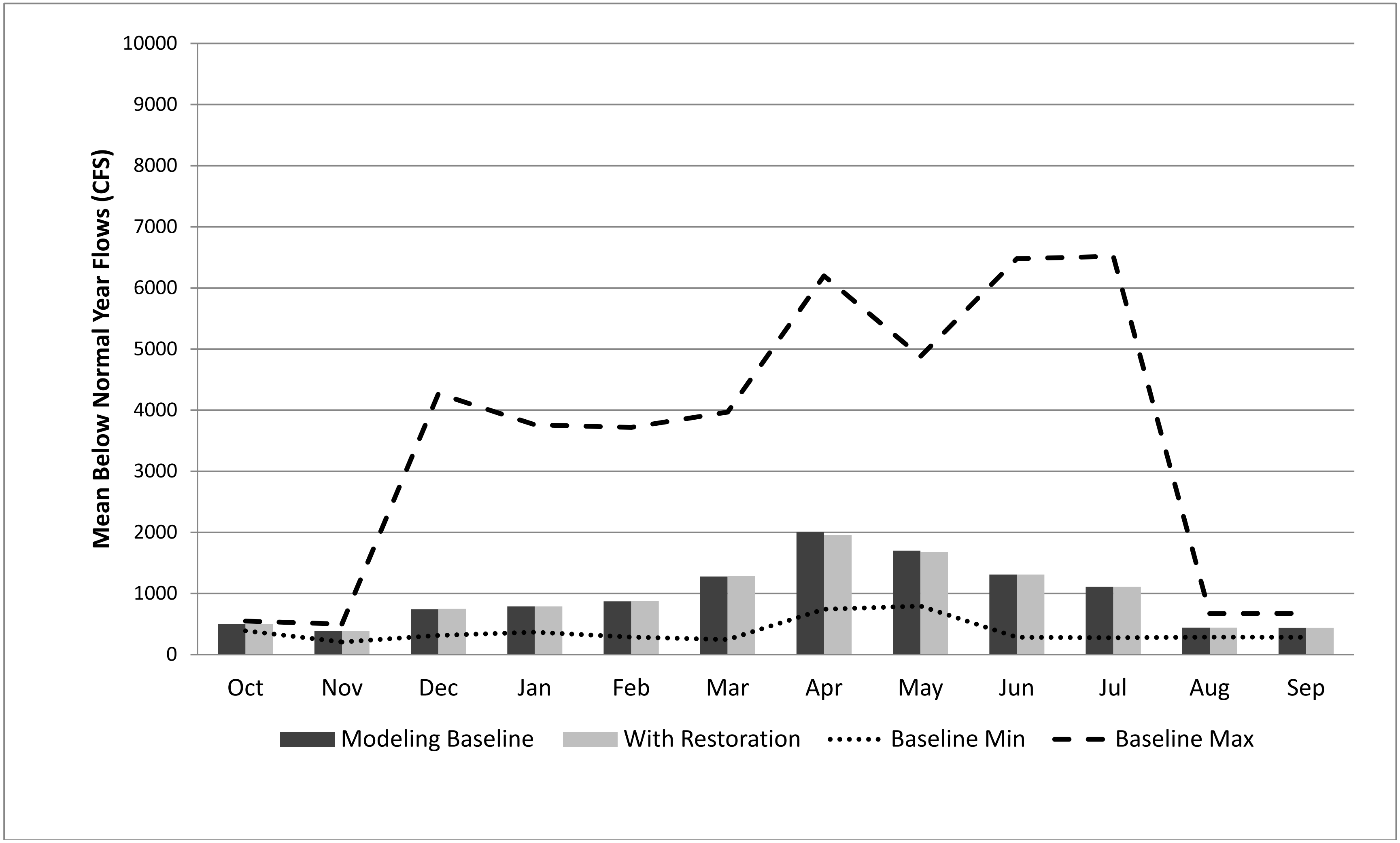


Figure 10. Below Normal Year Comparison of No Action and Proposed Action Tuolumne River Flows

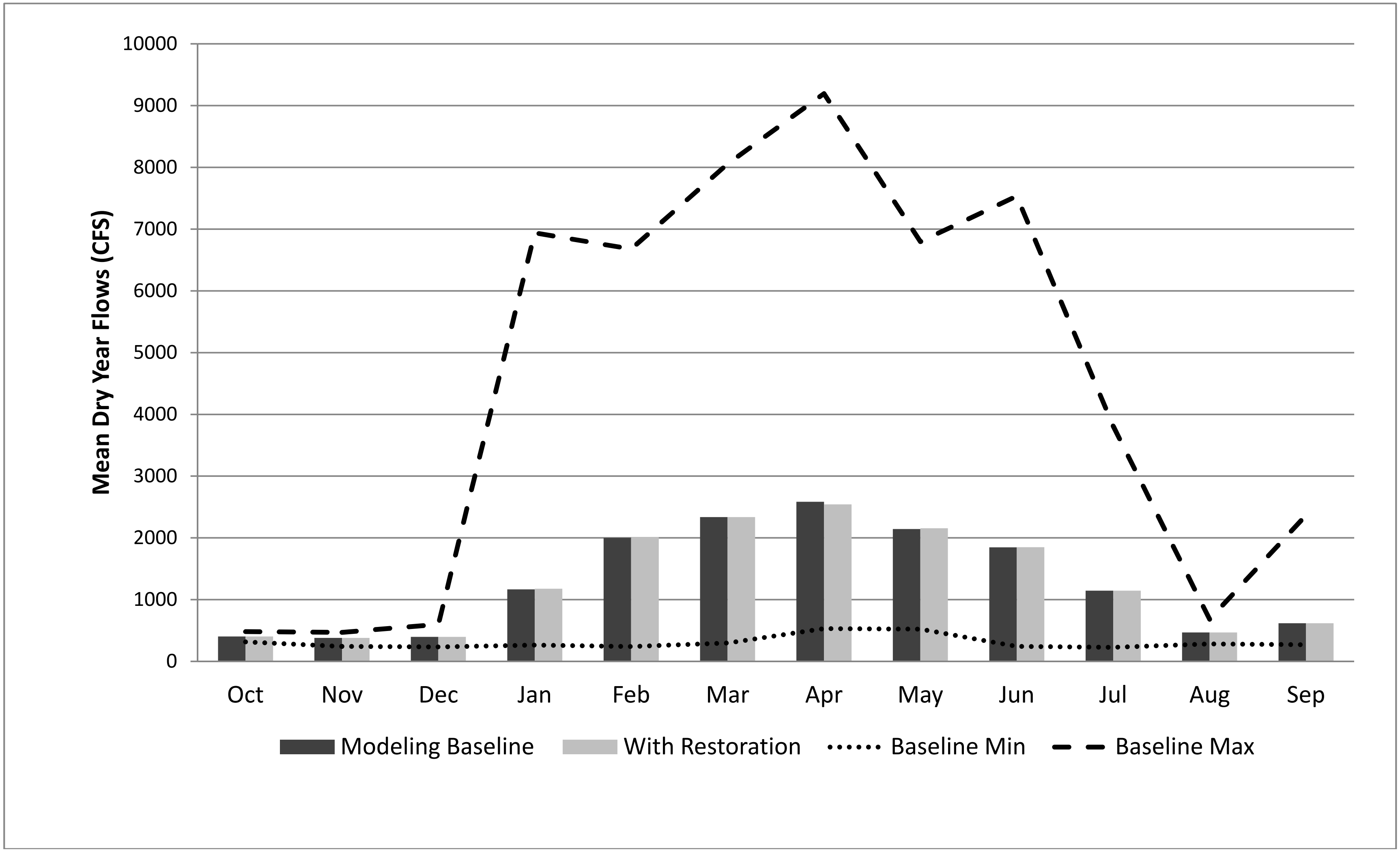


Figure 11. Dry Year Comparison of No Action and Proposed Action Tuolumne River Flows

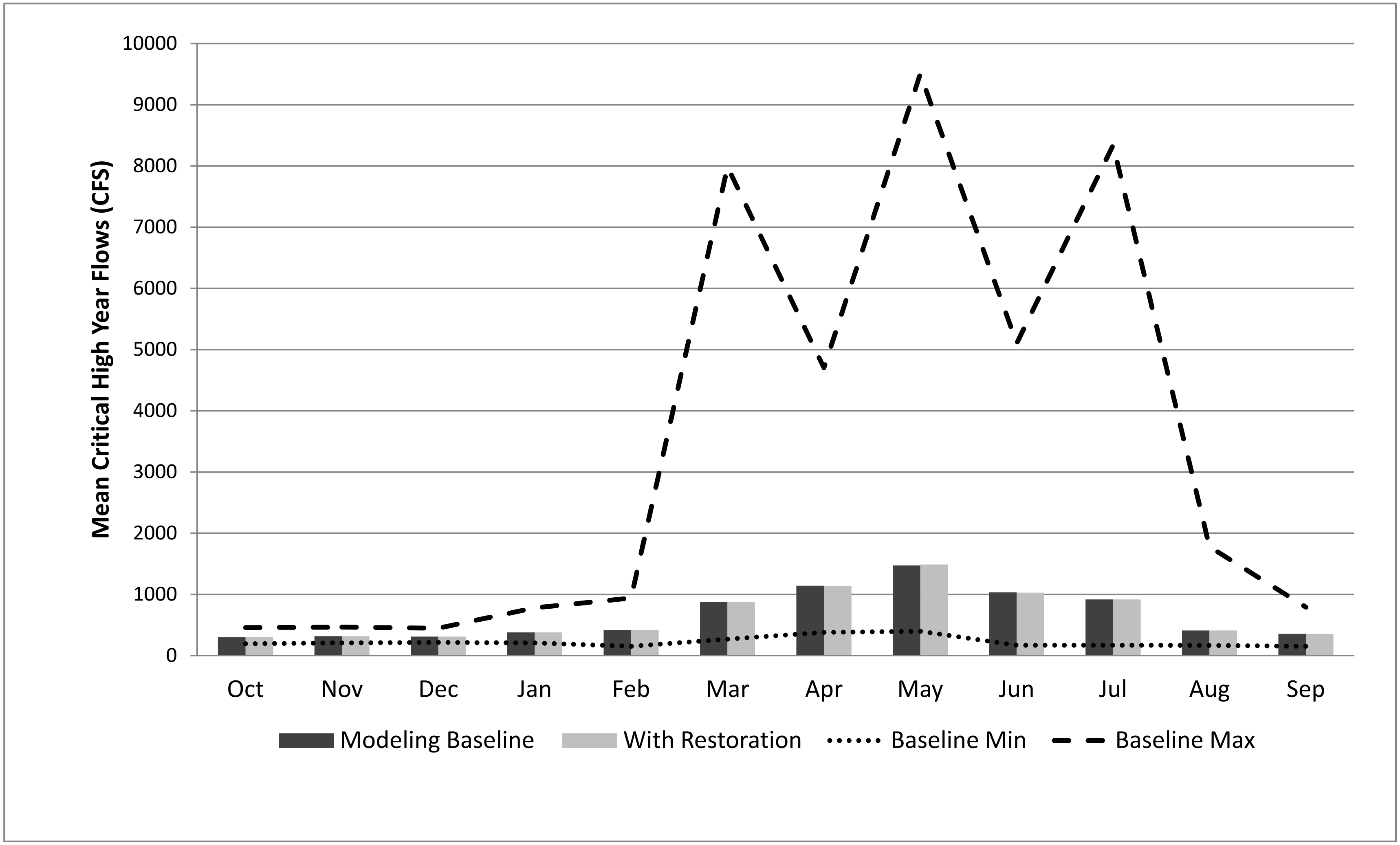


Figure 12. Critical High Year Comparison of No Action and Proposed Action Tuolumne River Flows

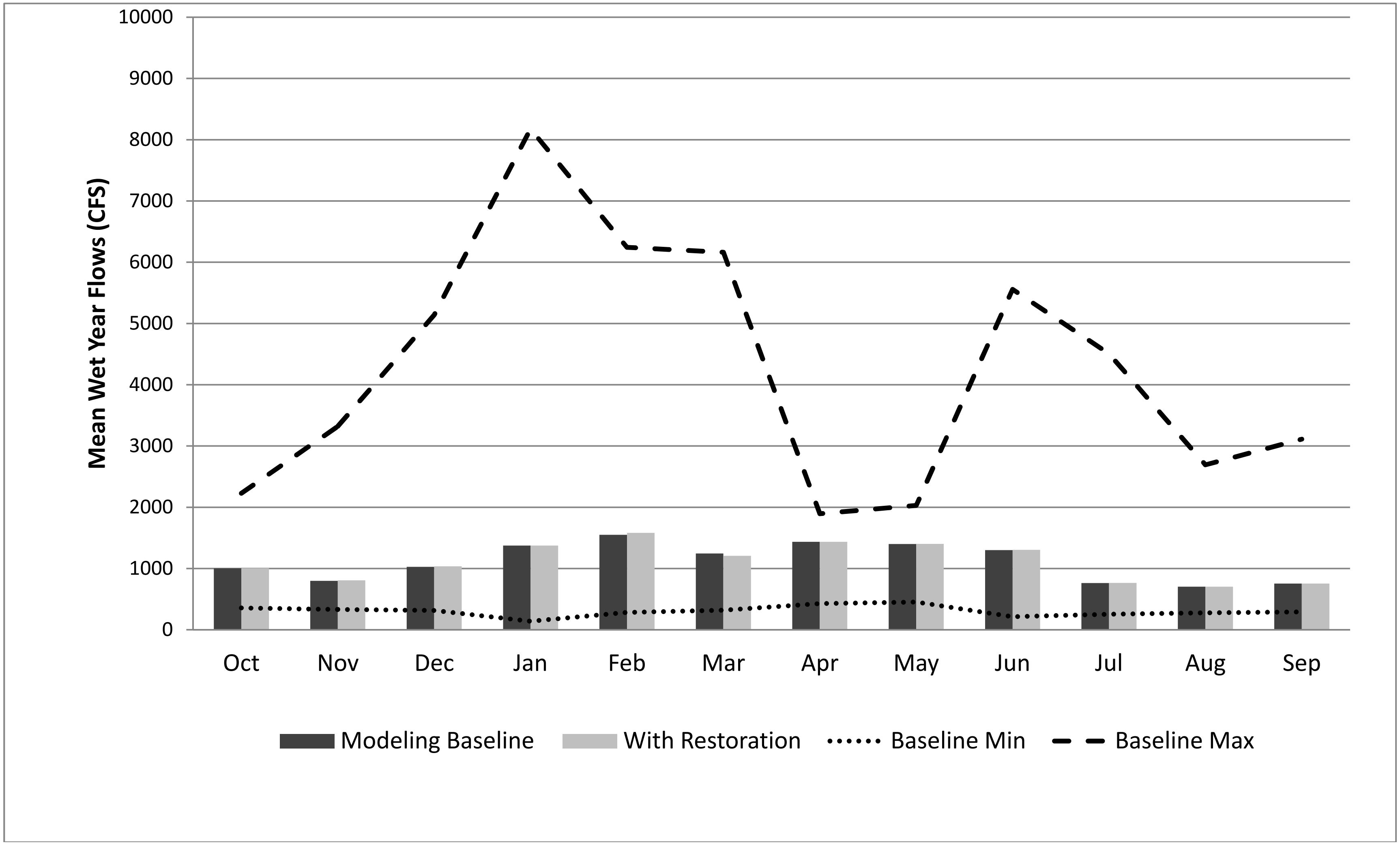


Figure 13. Wet Year Comparison of No Action and Proposed Action Stanislaus River Flows

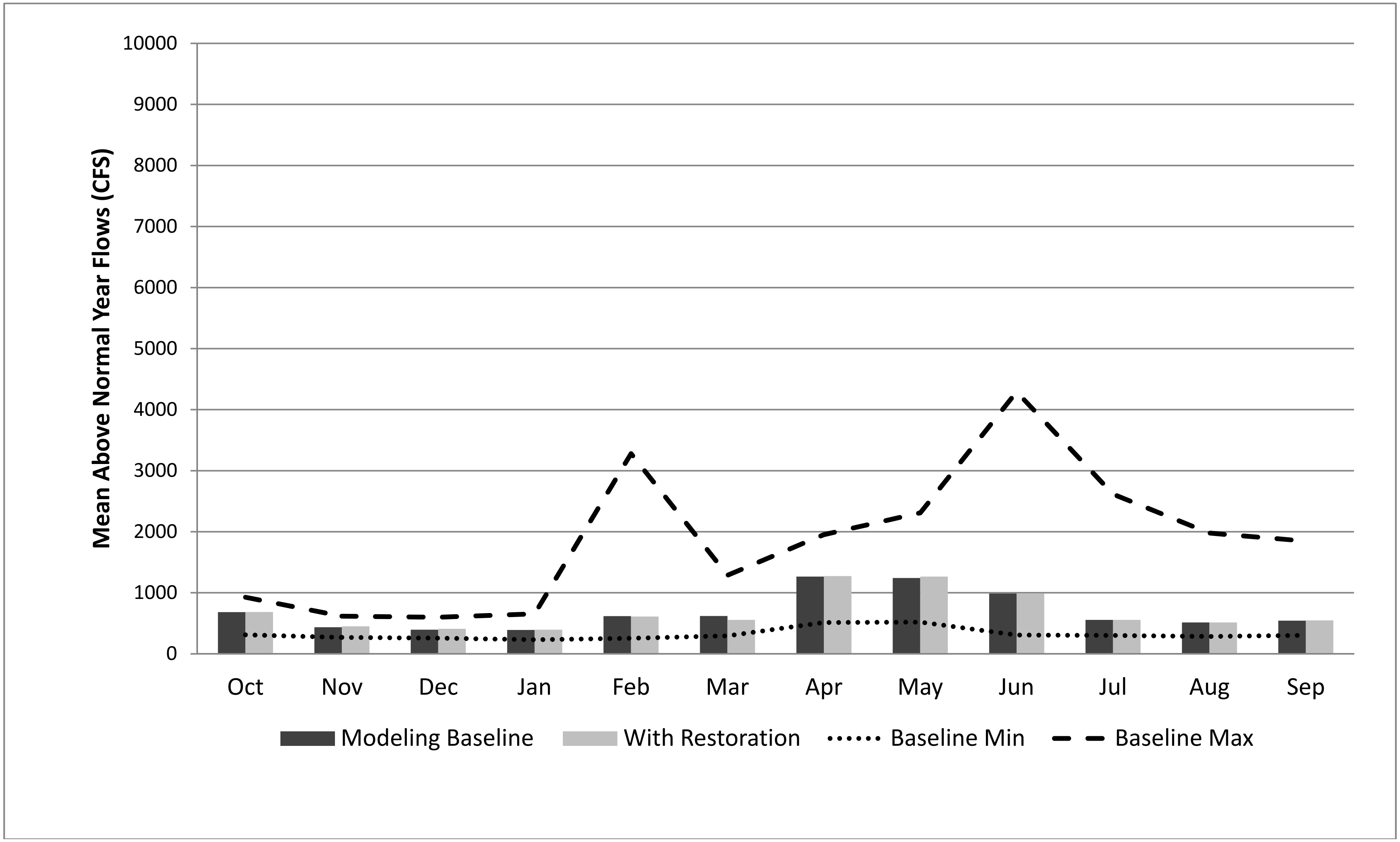


Figure 14. Above Normal Year Comparison of No Action and Proposed Action Stanislaus River Flows

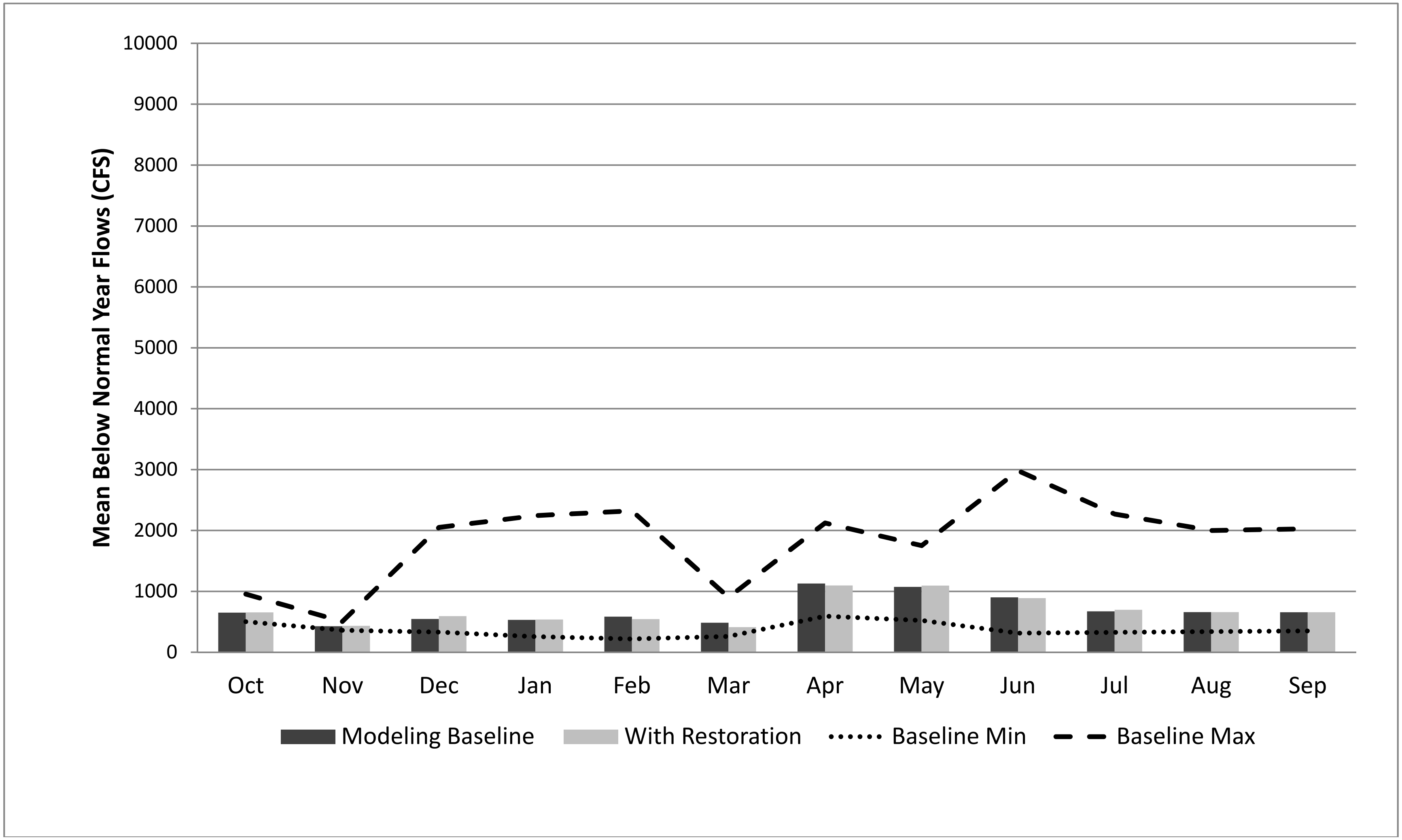


Figure 15. Below Normal Year Comparison of No Action and Proposed Action Stanislaus River Flows

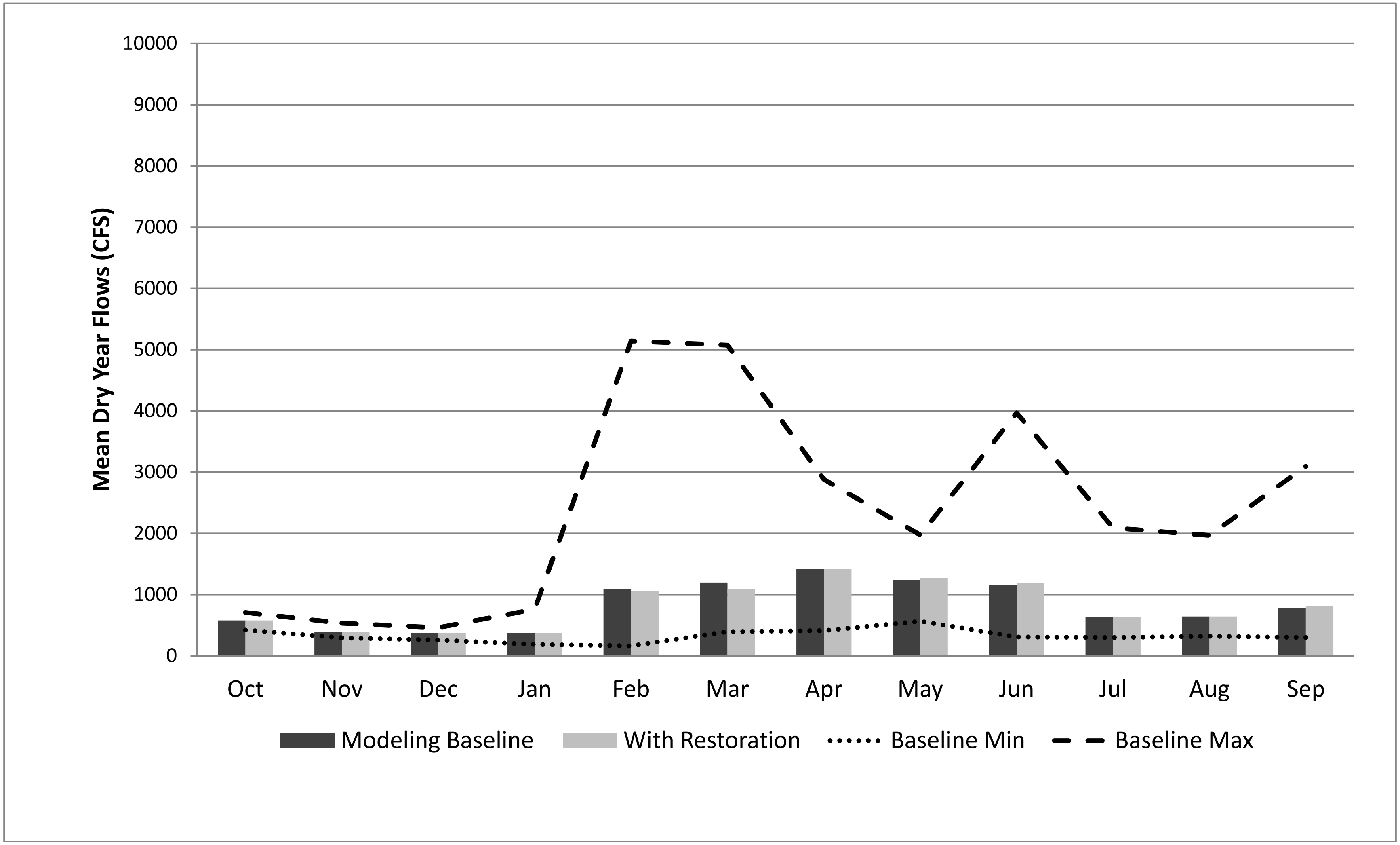


Figure 16. Dry Year Comparison of No Action and Proposed Action Stanislaus River Flows

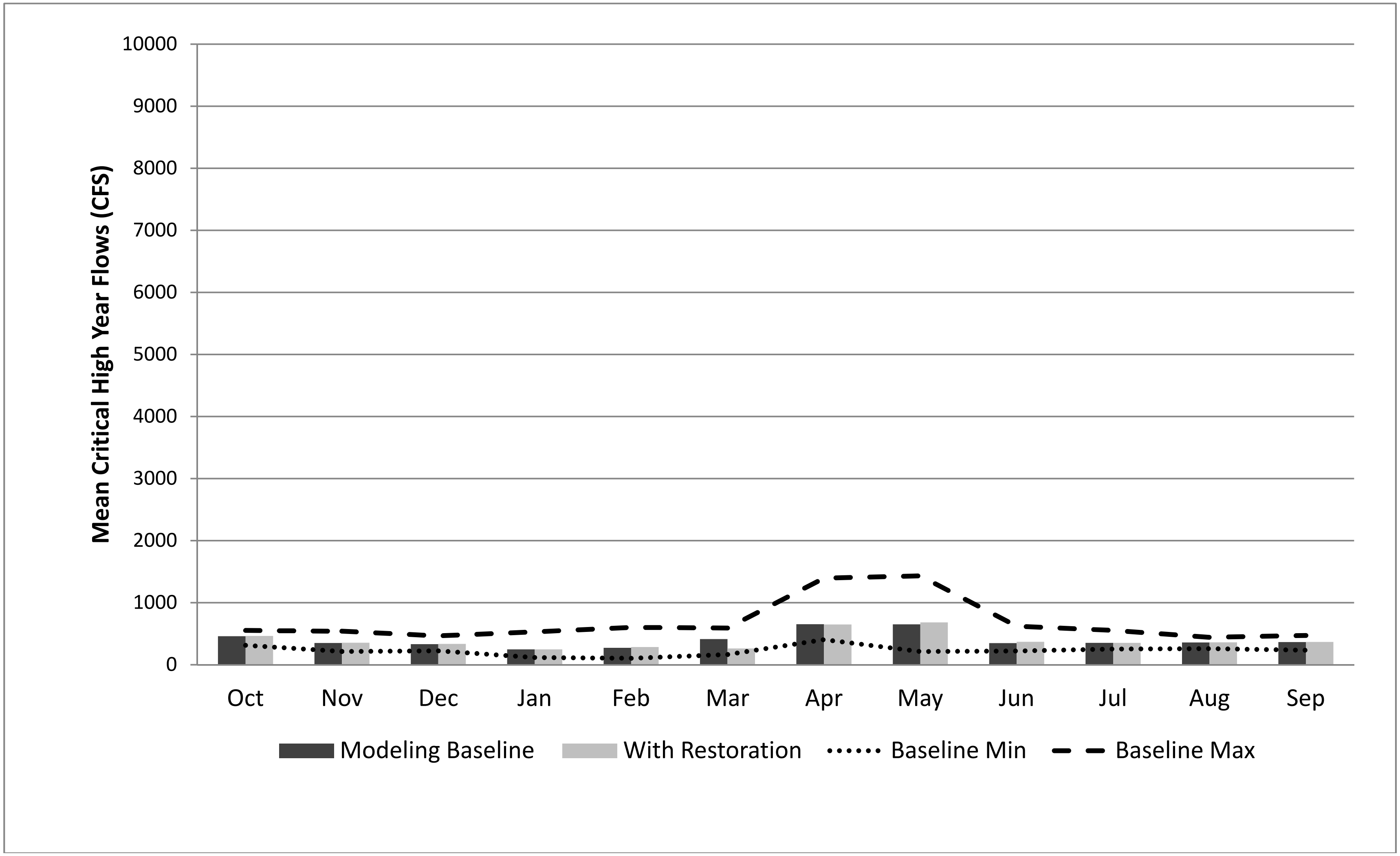


Figure 17. Critical High Year Comparison of No Action and Proposed Action Stanislaus River Flows

The Vernalis water quality requirement is an electrical conductivity (EC) requirement of 700 and 1000 micromhos/cm for the irrigation (April to August) and non-irrigation (September to March) seasons, respectively. This is modeled in CalSim by estimating the water quality at Vernalis using a link-node salinity algorithm, consisting of a series of EC mass balance equations, covering the San Joaquin River from Lander Avenue to Vernalis. The computed EC from an upstream node is used as the input EC of a downstream node. Flow-EC regressions are used for the San Joaquin River at Lander Avenue, Merced River near Stevinson, and the Tuolumne River near Modesto. Mud and Salt sloughs, both return flow and accretion EC, use monthly average values. If the estimated EC does not meet the standard at Vernalis, higher quality releases are made from New Melones Reservoir on the Stanislaus River to mix with the San Joaquin River to meet the standard.

The 2009 NMFS Biological and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS Operations BO) and RPAs addressing San Joaquin and Stanislaus River effects on steelhead establish conditions that include those contained in VAMP, exclusive of requirements to meet Vernalis flows, per D-1641, with releases from the Merced and Tuolumne rivers. Per Appendix 5 of the NMFS Operations BO, the following RPA specifies actions to be taken to accommodate uncertainties regarding the status of VAMP experiments beginning in 2012.

Phase II: *From April 1 through May 31:*

1. *Reclamation shall continue to implement the Goodwin flow schedule for the Stanislaus River prescribed in Action III.1.3 and Appendix 2-E.*
2. *Reclamation and DWR shall implement the Vernalis flow-to-combined export ratios in the following table, based on a 14-day running average:*

San Joaquin Valley Classification	*Vernalis flow (cfs): CVP/SWP combined export ratio*
Critically dry	*1:1*
Dry	*2:1*
Below normal	*3:1*
Above normal	*4:1*
Wet	*4:1*
Vernalis flow equal or greater than 21,750 cfs	*Unrestricted exports until flood recedes below 21,750*

Exception procedure for multiple dry years: If the previous 2 years plus current year of San Joaquin Valley "60-20-20" Water Year Hydrologic Classification and Indicator as defined in D-1641 and provided in the following table, is 6 or less, AND the New Melones Index is less than 1 MAF, export shall be limited to a 1:1 ratio with San Joaquin River inflow, as measured at Vernalis:

San Joaquin Valley Classification	*Indicator*
Critically dry	*1*
Dry	*2*
Below normal	*3*
Above normal	*4*
Wet	*5*

Although the NMFS Operations BO and RPAs state that agreements for VAMP-like conditions will be pursued, the future of VAMP is uncertain, and Reclamation and interested parties are discussing the future approach for VAMP. No decisions on the future of VAMP have been made at the time of preparation of this BA. However, because of the requirements in the NMFS Operations BO, it is reasonable to assume that a VAMP-like action would occur in the future.

During the release of SJRRP flows up to 1,660 cfs from Friant Dam, tributary releases to meet VAMP water quality objectives at Vernalis could be affected if SJRRP flows reached Vernalis during the VAMP period. Since releases from tributary streams under VAMP were tied to flow and water quality conditions at Vernalis, changes in those conditions at Vernalis due to SJRRP flows would allow reductions in tributary flows. In response to SJRRP flows, tributary releases to meet VAMP water quality objectives at Vernalis could be affected. As with Interim Flow releases to-date, Reclamation would routinely coordinate with NMFS regarding flows at Vernalis and will take actions necessary to prevent SJRRP flow releases up to 1,660 cfs from Friant Dam from reducing tributary flows subject to VAMP or VAMP-like conditions. Furthermore, flow requirements in the Stanislaus River are subject to the NMFS Operations BO RPAs, and flows and water quality at Vernalis, export/inflow requirements and Old and Middle River (OMR) flows are subject to both D-1641 and the Operation BO RPAs. Since SJRRP flows will be managed to comply with these regulations and others in effect at the time, implementation of the action will maintain conditions that avoid adverse effects to protected fish resources in the lower San Joaquin River and tributaries. In addition, when flows in the Stanislaus River are increased above those required by the NMFS BO and RPAs to accommodate water quality and flow requirements at Vernalis, SJRRP flows could contribute to the baseline condition at Vernalis and reduce flows in the Stanislaus River to those required by the RPAs. The reduction in flow could save cold water in New Melones Reservoir for release later in the season that could improve instream habitat conditions for Central Valley steelhead and Chinook salmon.

Increased flow between the Merced River confluence and the Delta also has the potential to improve water quality conditions within the lower San Joaquin River to the benefit of listed fish species in the Action Area. To assure that water quality is improved or, at worst, not degraded, the SJRRP water quality monitoring plan will be in effect in its current form until 2013, including monitoring for targeted contaminants and a contingency to alter flows as necessary to avoid any adverse effect on water quality.

Delta Flow Patterns. Central Valley steelhead migrate through the Delta as adults moving upstream to spawn and as juveniles and smolts emigrating on their way to the ocean. Most Central Valley steelhead spawn in the Sacramento River and its tributaries, but the effects of releasing SJRRP flows up to 1,660 cfs from Friant Dam down the San Joaquin River on these fish would be less substantial than on those spawning in the San Joaquin River basin, so this analysis will focus on the San Joaquin River basin spawners. The spawning migrations bring the steelhead to the Delta in November through January, and the emigration of smolts occurs during spring, peaking in April and May. SJRRP flows at or below a 1,660 cfs release from Friant Dam in the Delta are low or zero during most of the adult migration period; they are highest, however, during the smolt emigration period. This information is presented in the flow schedule provided in Exhibit B of the Settlement and represented below in Figure 18.

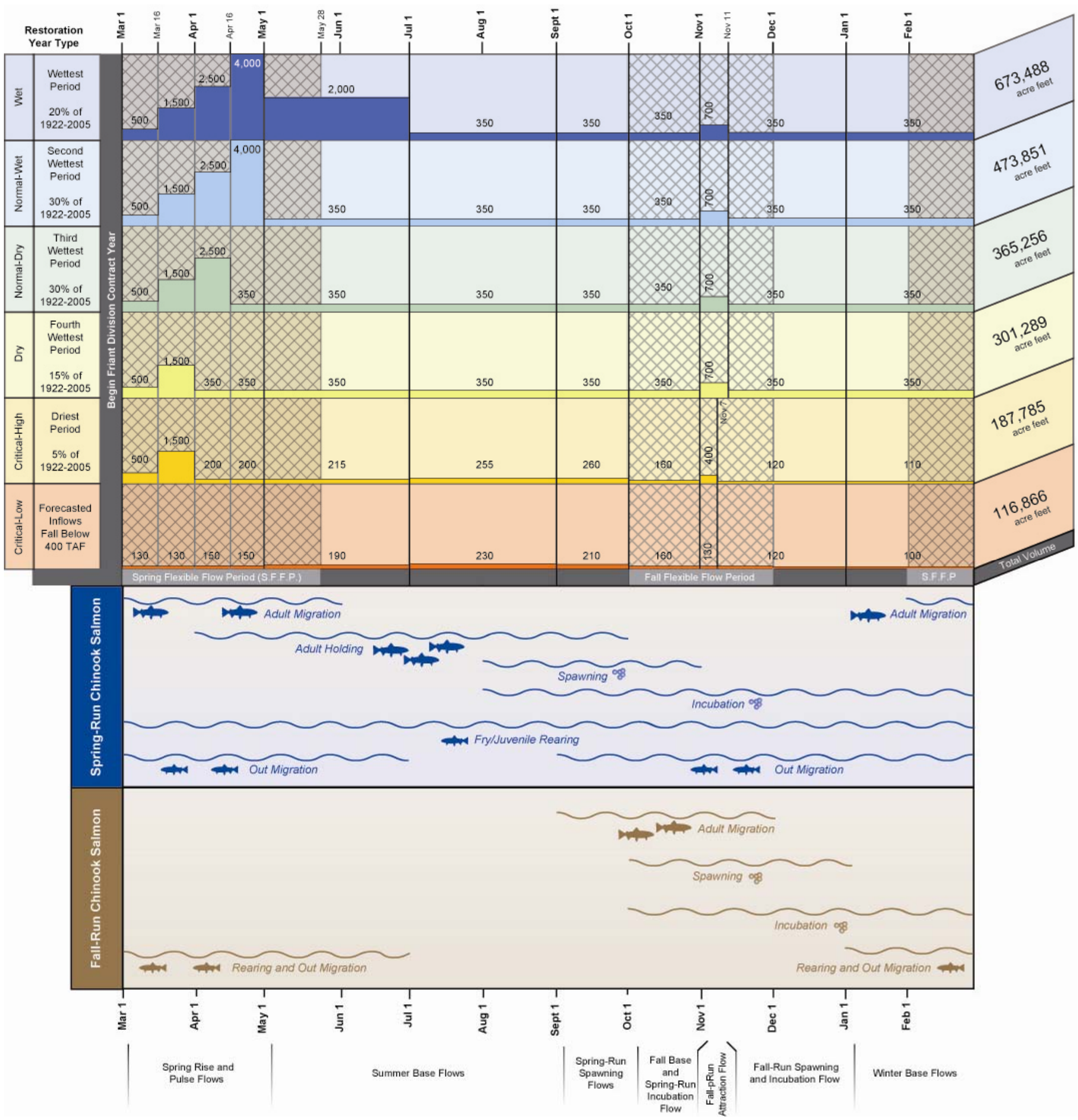


Figure 18. Restoration Flow Schedules Specified in Exhibit B of the Settlement in Relation to Chinook Salmon Life Stages

The direct effects of having SJRRP flows in the Delta would include increased inflow from the San Joaquin River and increased exports at the Jones and Banks export. The export facilities are located in the southwestern Delta and are connected by Old and Middle rivers to the San Joaquin River close to where it enters the southeastern Delta. The facilities are also connected by the same two rivers to a more downstream reach of the San Joaquin River. Other channels between these locations connect the middle reach of the river to the export facilities. When the export pumps are not operating, flow in Old and Middle rivers moves from the upstream portions that join the San Joaquin River in the southeastern Delta to the downstream portions that join the lower portion of the river. However, when the pumps are operating, they often export such large volumes of water that flow in the downstream portions of Old and Middle rivers moves upstream toward the pumps.

The NMFS Operations BO places restrictions on reverse flows in the downstream Old and Middle rivers, which helps to protect steelhead. Increased flows often help trigger adult steelhead to begin moving upstream, so increased San Joaquin River inflow during late fall and winter would potentially help to initiate the spawning migrations. Increased inflow also potentially would provide stronger environmental cues that would help to keep the steelhead from straying out of the river channel into the south Delta. However, when export pumping is increased to recapture San Joaquin River inflow, increased flow toward the pumps in upper Old and Middle rivers would potentially cause increased straying of the migrating adults into the south Delta, where their progress would be potentially impeded by barriers and irregular flow patterns (Mesick 2001).

Reverse flows in the lower Old and Middle rivers, north of the south Delta export facilities, draw some Sacramento River water from upstream of the confluence of the Sacramento and San Joaquin rivers through the Delta Cross Canal (DCC) and Georgiana Slough into the San Joaquin side of the Delta. After the Sacramento River water reaches the confluence, the reverse flows may draw more of this water upstream into the San Joaquin River and the south Delta. These flows likely cause straying and delays in the migrations of Sacramento River Central Valley steelhead (Brandes and McLain 2001). However, as a result of the NMFS Operations BO, reverse flows in Old and Middle River will be regulated, restricting the potential effect of SJRRP flows on these flows. Therefore, implementing the action is not likely to adversely affect Central Valley steelhead during their upstream or downstream migrations through the Delta.

Increased San Joaquin River inflow would likely benefit emigrating Central Valley steelhead. Tagging studies conducted for VAMP have demonstrated that fall-run Chinook smolt survival through the south and central Delta is positively correlated with San Joaquin River inflow. Higher inflow likely reduces the transit time of the smolts through the Delta, thus reducing their time of exposure to predators, poor water quality, low food supply, and other mortality factors. High inflow also helps to prevent straying into the south Delta, where habitat conditions are especially poor and risks of entrainment greatly increase. Effects of increased San Joaquin River inflow on Central Valley steelhead emigrating from the San Joaquin River are expected to be similar.

Increased San Joaquin River inflow would potentially improve conditions for emigrating steelhead in the spring. However, increased reverse flows in upper Old and Middle rivers and higher levels of pumping required to recapture the increased inflow from SJRRP flows would potentially increase rates of straying by the smolts. Straying of smolts into the south Delta would likely increase entrainment and predation risks and delay migrations. When such conditions threaten to exceed the limits set by the BO RPAs or regulations in effect at the time, Reclamation would implement actions to reduce pumping and/or inflow to assure compliance and maintain conditions that have been determined in the operation BOs to avoid adverse effects to listed fishes.

Potential increases in exports at the Jones Pumping Plant and Banks Pumping Plant as a result of the release of 1,660 cfs of SJRRP flows from Friant Dam would fall within the allowable pumping criteria of the NMFS Operations BO(NMFS 2009) and the 2008 USFWS Delta Smelt BO of the Operating Criteria and Plan for the Continued Operations of the Central Valley Project and State Water Project (USFWS 2008) in place at the time of pumping. These flows would not be diverted at unscreened facilities until ESA authorization is complete.

Water Temperature and Dissolved Oxygen. Increased flow in the lower San Joaquin River and the Delta from releasing SJRRP flows up to 1,660 cfs from Friant Dam could moderate temperature changes resulting from low inflow during the warmer portions of the migration periods. Similarly, increased inflow could improve water quality, and potentially improve dissolved oxygen (DO) levels in the San Joaquin River near the Stockton Deep Water Ship Canal (DWSC) during late summer and early fall. However, low DO at the Stockton DWSC is less a problem during late fall and winter, November through January, when adult steelhead are migrating upstream, so there would be little effect of the change in summer-through-fall DO levels on steelhead.

Releasing flows from Friant Dam up to 1,660 cfs is expected to have no effect on water temperatures in the lower San Joaquin River or the Delta, but it would potentially improve the low DO conditions at the Stockton DWSC during late summer and fall. There would be no effect on Central Valley steelhead or its designated critical habitat.

Contaminants. Releasing flows from Friant Dam up to 1,660 cfs would increase San Joaquin River flow, which would dilute contaminants from agricultural drainage or other sources. Therefore, it would likely have a beneficial effect on Central Valley steelhead and its designated critical habitat in the lower San Joaquin River. The effect would likely not extend far into the Delta, because much of the increased water volume would be offset by exports at the Jones and Banks facilities.

Predation. The potential effects of releasing flows from Friant Dam up to 1,660 cfs to the San Joaquin River on predation of Central Valley steelhead smolts are expected to be largely determined by the effects of the flows on the straying of smolts into the south Delta. Predation rates are higher for most fishes in the south Delta than in other parts of the Delta for a variety of reasons: (1) turbidity is generally lower in the south Delta, so fish are more visible to their predators; (2) many of the structures and facilities in the south Delta concentrate or disorient prey fish and provide ambush sites for predacious fish, particularly Clifton Court Forebay and the fish louver screens at the Jones and Banks export facilities; and (3) recent invasions by the submerged plant *Egeria densa* provide favorable habitat conditions for black bass species, which prey heavily on young fish life stages. Similar to the above discussion on Delta flow patterns, adverse effects of increased San Joaquin River flows and increased flows in Delta channels will be avoided by managing inflow and recapture operations to be in compliance with the NMFS Operations BO RPAs and other requirements in effect at the time. Therefore, implementing the action is considered not likely to adversely affect predation on Central Valley steelhead smolts.

Sacramento River Winter-Run Chinook Salmon ESU and Central Valley Spring-Run Chinook Salmon ESU

The ranges of both Sacramento River winter-run and Central Valley spring-run Chinook salmon overlap very little with the Action Area. Both runs spawn in the Sacramento River or its tributaries, and both use the Sacramento River as a migration corridor through the Delta. However, both upstream migrating adults and outmigrating smolts can occur in the Action Area, particularly when the DCC gates are open and/or south Delta export rates are high relative to San Joaquin River inflow. The NMFS BO RPAs were established to minimize risk of these fishes occurring within the south Delta and of entrainment when they do occur there. Managing SJRRP flows to comply with the BO RPAs will eliminate or reduce the effects to winter and spring-run Chinook salmon. The action includes a process to alter inflow and/or recapture, including continued coordination with NMFS and USFWS and available options to reduce SJRRP flow releases and change points of recapture to assure compliance with those measures in effect at the time that have been developed to protect listed fish species within the Action Area.

Winter-run Chinook salmon migrate upstream through the Delta from approximately December through June, and the smolts emigrate through the Delta from January through May. Releasing flows from Friant Dam up to 1,660 cfs is expected to increase San Joaquin River inflow and flow through the Delta during most of the migration and emigration period. Any change in flows in the Old and Middle rivers in the central Delta would maintain conditions that comply with BO RPAs and would not be likely to adversely affect Sacramento River winter-run Chinook salmon or its designated critical habitat.

Spring-run Chinook salmon migrate upstream through the Delta from approximately March through June. Timing of smolt emigration is variable because smolt may emigrate as young-of-the-year or as yearlings. As a result, most spring-run emigration occurs either during November and December or during March through May. As indicated for winter-run Chinook salmon, releasing flows from Friant Dam up to 1,660 cfs to the San Joaquin River is expected to increase San Joaquin River inflow and increased flow in the river through the Delta, which as with the other anadromous salmonids, Central Valley steelhead and winter-run Chinook salmon, should not encourage straying from the Sacramento River. Releasing SJRRP flows is not likely to adversely affect Central Valley spring-run Chinook salmon or its designated critical habitat.

Southern DPS of the North American Green Sturgeon

Adult green sturgeon migrate up the Sacramento River to spawn from April through June. It is unknown whether the species spawns in the San Joaquin River. Juveniles are entrained in the Jones and Banks export facilities, but numbers are low relative to those of most Delta species. It may be assumed that sturgeon are adversely affected by the same poor conditions in the south

Delta that affect other species and that they would similarly benefit from conditions that reduced their exposure to this portion of the Delta. Adult and juvenile green sturgeon may be found in the Delta at any time of year.

Because they reside in the Delta throughout the year, green sturgeon would be potentially affected by changes in Delta flow patterns resulting from releasing flows from Friant Dam up to1,660 cfs to the San Joaquin River in any month. Whether San Joaquin River inflows and increased flows in the southeast Delta channels leading into the south Delta affect movement of adult or juvenile green sturgeon is unknown, but it is assumed that they do. As previously described for Central Valley steelhead, flow conditions expected under the action would likely result in reduced movement to the south Delta or no change in such movement, and it is expected that this also would be true for green sturgeon. Therefore, releasing SJRRP flows from Friant Dam up to 1,660 cfs to the San Joaquin River is considered not likely to adversely affect Southern DPS of the North American green sturgeon or its designated critical habitat.

Temperatures on the San Joaquin and Merced Rivers

Table 4 below reports modeled temperatures on the San Joaquin River at the Merced River confluence for WY 2010 Interim Flows and the results for the period 1981-2003. As flood flows were released for a large portion of WY 2011 when Interim Flows would have been released, WY 2010 data was used in the analysis as flood flows may not accurately depict temperatures that would be indicative of Interim Flows. Additionally, WY 2012 Interim Flows were constrained past Sack Dam to 50 cfs or below due to seepage threshold constraints downstream. Therefore, WY 2012 information was not used as there has been no connectivity with the Merced River confluence at the terminus of Reach 5. The actual results were collected from the United States Geological Survey real-time stream gage located just upstream from the San Joaquin River’s confluence with the Merced River. The modeled results were obtained through use of the RMA model of the San Joaquin River, SJR5Q. The SJR5Q includes a representation of operations on the San Joaquin River, and a boundary condition for the Merced River operations. This allows the model to investigate changes in temperatures on the San Joaquin River as a result of operations at Friant Dam, and holds operations on the Merced River constant. Table 4 showing modeled data and Figure 19 plotting modeled versus actual data are represented below. Table 5 represents modeled data and actual WY 2010 collected data at the SMN (San Joaquin River near Newman) stream gage. Generally, the trend line for WY 2010 mimics the modeled data, although real water temperatures were colder than the modeled average for a similar water year type. It is important to note that WY 2010 was considered a normal wet year water type classification and that temperatures remained cooler than average.

The San Joaquin River downstream from the confluence with the Merced River could experience temperature changes from releasing SJRRP flows up to 1,660 cfs at Friant Dam. However, general, ambient air temperatures control water temperatures in the lower San Joaquin River and operations exert little influence.

Modeling results indicate that with the release of SJRRP flows up to 1,660 cfs, water temperatures, particularly downstream from the Merced River confluence, would change on four different occasions to a different level of suitability for salmonids; two of the changes are positive. Most steelhead emigrate from the San Joaquin system in spring, primarily between

February and May, but may emigrate in January and June as well. Recommended water temperatures for steelhead smoltification based on a 7-day average of the daily maximum (7DADM) are 57°F and below, but emigration may take place before or after smoltification, when water temperature tolerances are higher (up to 68°F). Fall-run Chinook salmon juveniles emigrate between January and June, with most juveniles emigrating between February and May. Optimal water temperatures for Chinook salmon smoltification is 56°F, but rearing/emigrating juveniles can tolerate warmer water temperatures up to 68°F.

Water temperatures in the San Joaquin River downstream from the Merced River would be suitable for steelhead and fall-run Chinook salmon migration and/or smoltification, both with and without the release of SJRRP flows, during January of all simulated years, and most years in February. The increment of change between existing conditions and flows releases below 1,660 cfs is small (less than 2°F), particularly since the natural variability in the system is already high. In addition, the differences in water temperature between existing conditions and releasing SJRRP flows are typically fractional, and may be a result of model noise.

In March, both with and without the release of SJRRP flows from Friant Dam, average monthly water temperatures in the San Joaquin River downstream from the confluence with the Merced River would almost always exceed 58°F (and therefore would not be suitable for smoltification), but would not exceed 68°F (and therefore would be suitable for emigration before or after smoltification). Water temperatures in April are sometimes greater than 68°F without 1,660 cfs flow release from Friant Dam, and the action increases the temperatures by no more than 2°F. Because water temperatures through March in most years would continue to be within the suitable range during flow releases below 1,660 cfs (less than 68°F), and because April temperatures which typically already exceed healthy steelhead and Chinook salmon criteria would change slightly, the changes would not adversely affect steelhead and Chinook salmon beyond those effects and stressors to the species that currently exist. In May and June, water temperatures typically exceed healthy criteria for steelhead and Chinook salmon; however, on two occasions, SJRRP flow releases would improve water temperatures. In general, water temperatures improve downstream from the Merced River confluence, particularly in May.

Linear regressions of recorded water temperature and mean daily flow were also performed to estimate the correlation between temperature and flow in the Merced, Tuolumne, and Stanislaus rivers in the months of March and April. Based on this analysis, flows in these three tributaries of the San Joaquin River have a negligible correlation with water temperature. The relationship between flow and temperature was not linear and the range of possible temperatures varied by +/- 10ºF, particularly during lower releases expected by the CalSim modeling under both No–Action Alternative and SJRRP flow releases up to 1,660 cfs from Friant Dam. The results indicate that as water flows farther from Friant Dam, ambient air temperature conditions dominate over the flow rate in controlling temperature. Therefore, flow releases up to 1,660 cfs from Friant Dam are not likely to affect temperatures on the tributaries.

The San Joaquin River downstream from the confluence with the Merced River would experience an increase, or no change, in flows in all months. Immediately downstream from the confluence, water temperature would increase very slightly in October, March, April, and May. Because the increase would be only 1°F to 2°F, it is expected that the water would equilibrate quickly downstream, thus minimizing any effects to fish. In addition, Reclamation would continue to monitor water temperatures on the Merced River near the San Joaquin River confluence using existing gages and data. The changes in flow, which would be small, would have no impact to fish, and the water temperature increase would be less than significant.

Records of flow rates and temperatures were compiled for the tributary rivers, as close to the confluences as could be found. The relationship between flow and temperature was not linear: the range of possible temperatures varied by +/- 10ºF, particularly during lower releases expected by CalSim modeling. Conceptually, as water flows farther from Friant Dam, ambient air temperature conditions dominate over the flow rate in controlling water temperature. At the confluence of the tributaries with the San Joaquin River, flow rates do not appear to influence temperatures at lower ranges of release. Changes in tributary flows as a result of SJRRP flow releases are unlikely to change water temperatures because ambient air temperature conditions dominate.

The temperature model, SJR5Q, is a 6-hour time step model of the San Joaquin River from Millerton Lake to the confluence with the Merced River. SJR5Q is a subset of a larger model of the San Joaquin River system that extends downstream to the Delta and upstream on the tributary rivers.

A short "stub" represents the Merced River in the SJR5Q model. This does not include any storage on the Merced River or in most of the reach of the river from Lake McClure to the San Joaquin River. All of the information on how the Merced River flows could change because of SJRRP flows comes from the CalSim monthly model.

Real-time flow changes could be much different on a daily basis because of operational and local inflow variations, especially since the VAMP-like period and the SJRRP flows could move within their respective time windows, changing the days when they do or do not interact.

Historical data were used to determine whether a relationship exists between flow and temperature in the tributary rivers near the confluence with the San Joaquin River that could be used to approximate any potential changes in Merced River inflow to the San Joaquin. Historical data showed almost zero correlation between Merced River flows and temperature at the confluence with the San Joaquin River. This indicates that the temperatures at this location have reached equilibrium and would not change because of changes in Merced River flows, including potential changes that could occur as a result of releasing up to 1,660 cfs from Friant Dam.

Table 4: Simulated Water Temperatures in San Joaquin River Downstream from Merced River During Water Year 2010 Interim Flows and the Difference from Existing Conditions

Water Year	October		November		December		January		February		March		April		May		June		July		August		September	
	°F	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**	**°F**	**Diff**
1981	65	0.7	56	0.5	48	0.0	48	0.0	55	0.5	60	0.4	69	0.9	73	1.1	81	0.7	82	0.4	81	0.4	77	0.5
1982	66	0.6	56	0.6	48	0.0	46	0.1	53	0.3	58	0.1	61	0.0	67	-0.2	74	-0.3	79	0.1	80	0.3	73	0.3
1983	62	0.3	52	-0.1	48	-0.2	46	0.0	52	0.1	57	0.0	60	0.0	67	0.1	70	0.1	73	0.0	77	0.1	71	0.0
1984	62	0.2	55	0.1	49	-0.1	49	0.0	53	0.1	63	0.8	66	1.0	75	1.1	79	0.5	83	0.4	81	0.3	77	0.4
1985	64	0.4	54	0.3	50	-0.2	46	0.0	54	0.3	61	0.8	69	1.0	72	1.1	79	0.5	82	0.3	80	0.3	74	0.3
1986	65	0.6	53	0.5	46	0.1	49	0.0	54	0.3	59	0.3	63	0.0	70	-0.1	77	0.1	82	0.1	80	0.2	73	0.2
1987	66	0.4	56	0.7	46	0.0	46	0.0	54	0.4	61	0.6	71	0.9	74	0.7	78	0.5	80	0.3	80	0.3	76	0.5
1988	69	0.9	54	0.6	48	0.1	48	0.0	57	0.6	64	1.2	67	1.1	71	0.7	77	0.4	83	0.3	81	0.3	76	0.4
1989	68	0.7	55	0.9	48	0.0	48	0.0	54	0.3	61	1.2	70	1.5	73	1.2	77	0.5	81	0.3	80	0.2	75	0.3
1990	67	0.6	57	0.7	47	0.1	48	0.0	51	0.0	62	1.3	69	1.4	72	0.7	77	0.4	83	0.2	82	0.2	77	0.2
1991	69	0.8	55	0.9	46	0.0	48	0.0	55	0.7	61	1.2	67	1.5	73	1.6	78	0.5	83	0.3	81	0.2	78	0.4
1992	69	1.0	56	1.0	48	0.1	46	0.0	55	0.3	63	1.2	70	1.1	76	0.9	79	0.4	81	0.2	82	0.2	76	0.3
1993	69	0.6	55	1.1	47	0.1	48	0.0	54	0.0	64	0.6	64	-0.1	70	0.1	76	0.8	81	0.1	76	0.3	72	0.4
1994	64	0.5	56	0.5	48	0.0	48	0.0	53	0.1	63	1.4	67	1.1	71	0.7	79	0.4	80	0.3	82	0.2	77	0.2
1995	66	0.5	52	0.4	47	0.0	50	0.0	55	0.6	58	0.1	62	0.0	66	0.0	68	-0.9	76	-0.1	80	0.1	75	0.3
1996	62	0.4	60	0.7	52	0.1	50	0.0	55	0.0	60	0.1	66	0.8	68	-0.2	78	-0.2	82	0.2	81	0.1	75	0.2
1997	65	0.3	56	0.3	50	0.1	50	0.0	53	0.0	61	0.6	66	1.5	74	1.3	79	1.1	83	0.3	82	0.1	78	0.2
1998	67	0.3	58	0.7	48	0.1	50	0.0	53	0.3	60	0.0	63	0.0	65	0.1	70	-0.2	77	0.2	79	0.2	71	0.3
1999	63	0.5	56	0.4	48	0.2	49	0.0	54	0.1	60	0.6	63	1.5	70	1.2	79	0.4	83	0.3	81	0.1	77	0.3
2000	69	0.5	58	0.7	50	0.1	51	0.0	54	0.1	58	0.5	68	2.0	72	1.2	79	0.1	80	0.2	81	0.2	75	0.3
2001	65	0.4	53	0.1	50	0.0	49	0.0	52	0.2	63	0.9	66	1.7	74	1.6	79	0.4	80	0.2	79	0.2	77	0.3
2002	67	0.5	57	0.6	48	0.0	49	0.0	55	0.4	61	0.9	68	1.9	70	1.2	77	0.5	82	0.3	80	0.3	79	0.3
2003	67	0.5	56	0.7	51	0.1	51	0.0	56	0.4	63	1.0	66	2.0	71	1.3	79	0.4	82	0.3	79	0.3	76	0.3

Source: Water Year 2010 Interim Flows Draft Environmental Assessment/Initial Study

Key: °F = degrees Fahrenheit; Diff = difference in water temperatures (Interim Flow minus No Action)

Table 5: Modeled HEC(SJR)5Q Results in Comparison to Actual WY 2010 Temperature Data
Upstream from Merced River Confluence[1,2]

Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
1-Mar	57.14	57.17725
2-Mar	57.850625	57.86175
3-Mar	56.575745	58.23625
4-Mar	55.724375	58.22475
5-Mar	55.356875	58.18075
6-Mar	55.5275	58.397
7-Mar	56.795	58.7355
8-Mar	57.245	58.7965
9-Mar	56.616875	59.15425
10-Mar	55.848125	59.82425
11-Mar	55.593125	60.35425
12-Mar	55.761875	60.52125
13-Mar	55.480625	60.87475
14-Mar	54.965	61.2005
15-Mar	56.384375	61.014
16-Mar	58.589375	60.96075
17-Mar	61.330625	60.719
18-Mar	62.88875	61.05125
19-Mar	62.984375	61.73625
20-Mar	63.734375	61.544
21-Mar	63.978125	61.15175
22-Mar	64.011875	61.66275
23-Mar	63.284375	62.12875
24-Mar	63.4925	62.4375
25-Mar	63.03125	62.7445
26-Mar	62.299362	63.3975
27-Mar	62.22875	63.37825
28-Mar	63.344375	63.27025
29-Mar	64.335435	63.84775
30-Mar	64.495625	64.27875
31-Mar	62.969375	64.46975
1-Apr	61.626875	63.93
2-Apr	59.66375	64.0505

Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
3-Apr	58.694375	64.42825
4-Apr	57.310625	63.96825
5-Apr	57.809375	64.20275
6-Apr	58.671875	64.84325
7-Apr	60.3575	65.68625
8-Apr	62.8325	65.906
9-Apr	63.404375	65.85125
10-Apr	63.65375	66.16625
11-Apr	61.015625	66.122
12-Apr	58.758125	66.134
13-Apr	59.525	66.16075
14-Apr	60.88129	67.14625
15-Apr	62.489375	68.006
16-Apr	64.435625	67.34275
17-Apr	66.048125	65.93125
18-Apr	67.525625	65.49875
19-Apr	68.571875	65.8775
20-Apr	67.1675	65.81475
21-Apr	64.045625	65.82
22-Apr	61.473125	65.84375
23-Apr	61.533125	65.8205
24-Apr	64.278125	66.06875
25-Apr	67.135625	66.199
26-Apr	69.070625	66.53825
27-Apr	69.1625	66.751
28-Apr	67.051613	65.8775
29-Apr	64.51625	65.90675
30-Apr	63.303125	67.20325
1-May	63.895625	68.40175
2-May	64.97375	68.19675
3-May	67.13	67.521
4-May	68.320625	67.899
5-May	68.185625	68.56575
6-May	66.044375	69.15475
7-May	65.945	68.6485

Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
8-May	66.88625	68.43125
9-May	67.113125	68.53375
10-May	65.8025	69.08
11-May	64.82	69.86875
12-May	65.313125	71.4185
13-May	67.33625	72.244
14-May	70.14875	72.099
15-May	71.96375	71.6425
16-May	72.933125	71.25225
17-May	70.863125	71.23625
18-May	70.375625	71.39175
19-May	70.29875	71.922
20-May	68.965106	73.04125
21-May	68.30375	74.069
22-May	66.6575	75.00875
23-May	65.076875	75.0815
24-May	66.1175	74.7555
25-May	65.916875	74.94875
26-May	66.49625	75.561
27-May	67.19375	76.11775
28-May	67.05875	77.0605
29-May	67.555625	76.54525
30-May	69.53375	76.05225
31-May	71.894375	76.11625
1-Jun	73.66625	76.807
2-Jun	74.598125	77.335
4-Jun	76.80125	77.6905
5-Jun	78.205625	77.60825
6-Jun	79.158125	77.91775
7-Jun	79.075625	77.8315
8-Jun	78.62	77.32575
9-Jun	77.688125	77.403
10-Jun	75.12125	77.25575
11-Jun	71.825	77.31575
12-Jun	70.89875	77.65525

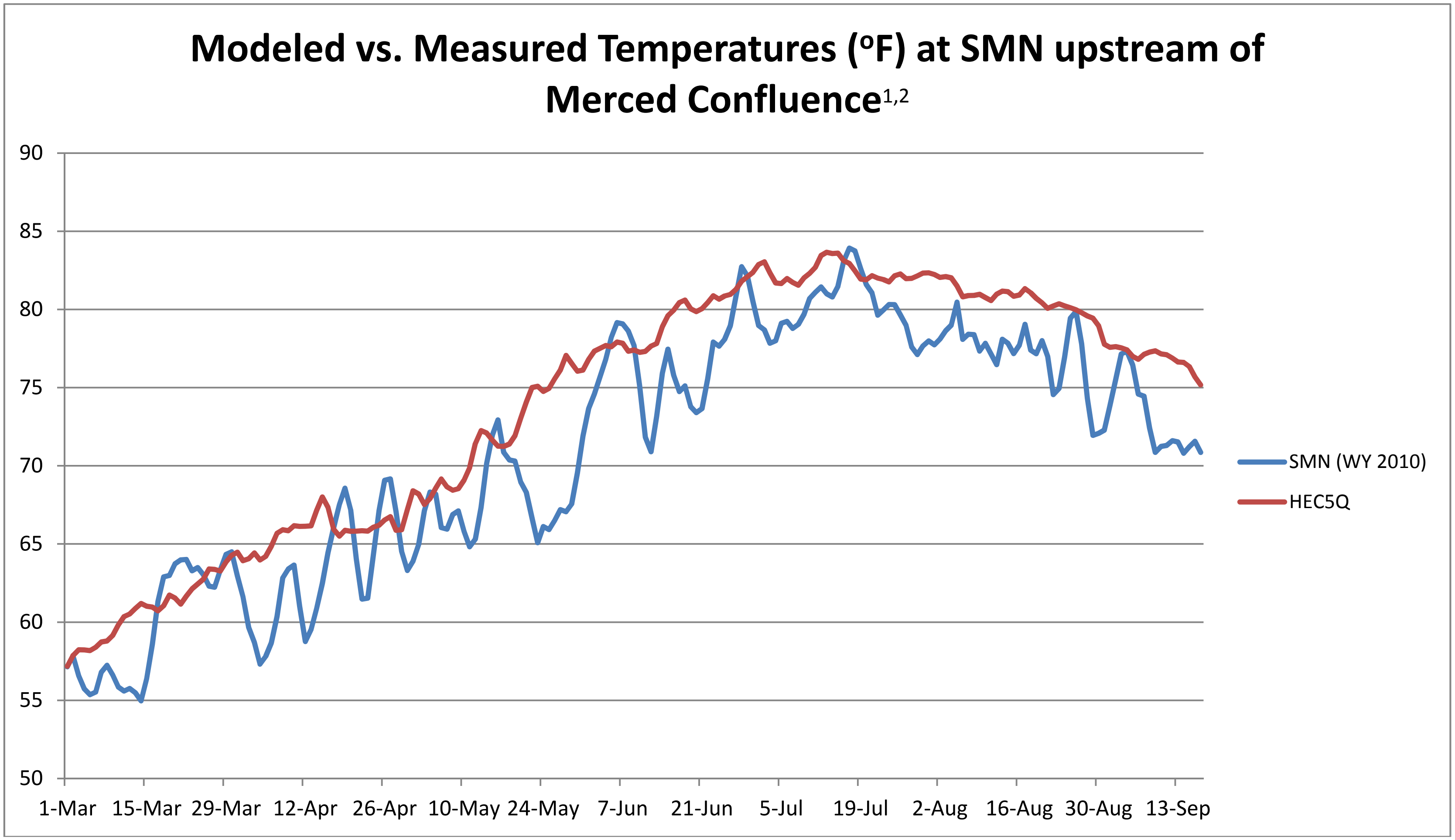
Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
13-Jun	73.16	77.81975
14-Jun	75.925625	78.89325
15-Jun	77.459375	79.60525
16-Jun	75.794375	79.954
17-Jun	74.74617	80.445
18-Jun	75.11	80.60125
19-Jun	73.78625	80.03675
20-Jun	73.4	79.86275
21-Jun	73.65875	80.0515
22-Jun	75.576875	80.4425
23-Jun	77.91875	80.8795
24-Jun	77.645	80.6585
25-Jun	78.081875	80.86075
26-Jun	78.963125	80.9615
27-Jun	80.87	81.2925
28-Jun	82.738478	81.8045
29-Jun	82.146875	82.0915
30-Jun	80.504375	82.3675
1-Jul	78.96875	82.8745
2-Jul	78.695	83.04925
3-Jul	77.83625	82.33325
4-Jul	77.995625	81.6885
5-Jul	79.11125	81.65225
6-Jul	79.236875	81.9735
7-Jul	78.78125	81.72675
8-Jul	79.041875	81.5495
9-Jul	79.694375	82.01775
10-Jul	80.699375	82.30425
11-Jul	81.093125	82.69375
12-Jul	81.441875	83.44625
13-Jul	81.00125	83.658
14-Jul	80.79875	83.5775
15-Jul	81.47375	83.60325
16-Jul	83.065625	83.119
17-Jul	83.9225	82.94225

Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
18-Jul	83.744375	82.463
19-Jul	82.610968	81.94175
20-Jul	81.595625	81.892
21-Jul	81.059375	82.16725
22-Jul	79.626875	82.007
23-Jul	79.95875	81.9115
24-Jul	80.315	81.76025
25-Jul	80.30375	82.15775
26-Jul	79.65875	82.273
27-Jul	78.985625	81.9705
28-Jul	77.601875	81.98075
29-Jul	77.114375	82.1475
30-Jul	77.6675	82.324
31-Jul	77.98625	82.3375
1-Aug	77.740625	82.23725
2-Aug	78.1025	82.04725
3-Aug	78.633696	82.10175
4-Aug	78.9975	82.01825
5-Aug	80.470769	81.5055
6-Aug	78.085625	80.804
7-Aug	78.411875	80.8855
8-Aug	78.3875	80.8915
9-Aug	77.335625	80.96625
10-Aug	77.83625	80.7605
11-Aug	77.14625	80.5685
12-Aug	76.47125	80.97525
13-Aug	78.096875	81.174
14-Aug	77.830625	81.141
15-Aug	77.178125	80.8425
16-Aug	77.72	80.92025
17-Aug	79.0475	81.33425
18-Aug	77.39375	81.06325
19-Aug	77.162391	80.71025
20-Aug	78.005	80.4245
21-Aug	76.983125	80.0645

Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
22-Aug	74.553125	80.216
23-Aug	74.939375	80.356
24-Aug	76.955	80.22325
25-Aug	79.428125	80.111
26-Aug	79.865	79.975
27-Aug	77.800625	79.78875
28-Aug	74.31875	79.58025
29-Aug	71.94125	79.44275
30-Aug	72.078125	78.95025
31-Aug	72.284375	77.76825
1-Sep	73.832391	77.57625
2-Sep	75.515	77.61875
3-Sep	77.15375	77.5415
4-Sep	77.316875	77.416
5-Sep	76.443125	76.99475
6-Sep	74.586875	76.805
7-Sep	74.45375	77.12775
8-Sep	72.40625	77.274
9-Sep	70.85033	77.3495
10-Sep	71.24	77.158
11-Sep	71.301875	77.09925
12-Sep	71.6	76.8875
13-Sep	71.526875	76.63875
14-Sep	70.805	76.608
15-Sep	71.223125	76.34775
16-Sep	71.571875	75.6805
17-Sep	70.856774	75.1785

[1] Actual WY 2010 Temperatures are a daily average (gage is on a 15-minute increment sampling schedule)
[2] Modeled HEC5Q results are an annual average for normal wet year designations based on data collected between 1980 and 2005

Figure 19. Plotted HEC(SJR)5Q Results in Comparison to Actual WY 2010 Temperature Data Upstream from Merced River Confluence



[1]HEC 5Q San Joaquin River upstream of Merced River Confluence, daily average for Normal-Wet years
[2] SMN- Daily average 2010 Interim Flows temperatures at SJR near Newman

Data

Tables 7 through 11 report flows and temperatures at three locations, as reported by SJR-5Q.

1. On the San Joaquin River, just upstream of its confluence with the Merced (without Flows)

2. On the San Joaquin River, just upstream of its confluence with the Merced (with Interim Flows)

3. On the Merced River, just upstream of its confluence with the San Joaquin

4. On the San Joaquin River, just downstream of its confluence with the Merced (without Interim Flows)

5. On the San Joaquin River, just downstream of its confluence with the Merced (with Interim Flows)

6. Differences between #4 and #5, above

Differences between #4 and #5 are the topic of Table 12 below.

Table 7. Monthly San Joaquin River Flows and Temperatures,
Upstream from the Merced River Confluence (without releases up to 1,660 cfs from Friant Dam)

Existing-Base Flow (CFS) Upstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	142	97	116	98	104	407	287	148	162	232	257	176
Average	553	555	1090	1939	2519	2473	2248	2108	1595	1471	587	542
Max	2388	2658	8423	16659	15241	16539	13477	11523	12838	9738	1452	1639

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	477	286	309	486	704	959	543	410	310	389	410	367
1982	314	359	447	1066	2802	3433	8353	7456	2973	1280	754	1019
1983	1142	2229	8423	9822	15241	16539	13477	11523	12838	9738	1452	1639
1984	2388	2658	6118	5801	879	859	717	550	558	538	627	602
1985	620	218	128	295	503	711	676	488	482	545	603	572
1986	407	269	402	545	5080	9187	6063	3823	3329	1190	874	793
1987	558	366	359	417	561	868	587	461	478	552	544	423
1988	299	374	282	479	447	611	493	358	433	415	537	448
1989	339	174	238	295	344	417	514	351	370	434	484	433
1990	425	391	394	359	425	407	329	273	277	377	421	303
1991	210	161	116	98	104	592	316	158	162	232	257	176
1992	142	111	118	163	485	460	287	148	195	237	274	246
1993	193	97	150	1556	1256	1042	1273	1338	791	878	475	399
1994	418	468	457	445	730	533	332	223	271	333	403	351
1995	281	232	292	1608	2445	6537	6409	7525	3084	6347	957	785
1996	652	483	523	634	1870	2836	778	2338	1333	613	735	617
1997	533	703	3110	16659	11725	1511	463	1163	395	434	536	473
1998	547	458	609	1070	8383	4905	7800	7996	6378	7076	861	822
1999	913	705	605	441	896	888	560	412	402	505	583	528
2000	588	470	290	415	1285	1264	595	531	573	530	495	401
2001	535	575	525	628	680	947	487	382	398	417	452	380
2002	389	517	446	669	546	612	316	299	313	379	378	351
2003	352	468	732	654	547	762	337	288	355	394	396	343

Existing-Base Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	65	53	46	44	51	57	61	67	73	75	80	74
Average	68	56	48	48	54	61	67	73	78	82	81	76
Max	70	60	52	52	57	64	71	78	80	83	83	79

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	68	56	47	47	55	61	69	73	80	82	81	77
1982	66	56	48	46	54	59	63	71	77	81	81	74
1983	66	53	48	45	52	57	61	68	73	75	80	75
1984	66	55	48	48	53	63	66	75	79	83	81	77
1985	65	53	46	44	54	61	69	72	79	82	80	74
1986	66	53	46	49	53	60	66	72	78	82	80	74
1987	67	56	47	46	54	61	71	75	78	80	80	75
1988	69	55	49	48	56	64	66	71	77	83	80	76
1989	68	55	48	48	54	61	69	74	78	81	80	75
1990	67	57	48	48	51	61	69	72	78	83	82	77
1991	69	56	46	47	54	62	67	73	79	83	82	78
1992	70	57	48	46	55	63	70	77	79	81	82	77
1993	70	56	47	48	55	64	68	74	79	83	81	77
1994	69	56	48	48	53	62	67	73	80	83	82	77
1995	68	53	46	50	55	58	64	69	76	79	83	78
1996	69	60	52	50	57	62	67	71	78	82	81	75
1997	66	56	50	49	53	62	66	76	78	83	82	78
1998	67	58	48	50	52	62	64	67	74	80	83	78
1999	67	56	47	48	55	61	65	72	79	83	81	77
2000	69	58	50	51	55	61	68	73	79	80	81	75
2001	66	54	50	49	53	63	68	78	79	80	80	77
2002	68	57	47	49	55	61	68	73	78	83	81	79
2003	68	57	51	52	56	62	66	73	79	82	80	77

Table 8. Monthly San Joaquin River Flows and Temperatures, Upstream from the Merced River confluence (with releases up to 1,660 cfs from Friant Dam)

Existing-Interim Flow (CFS) Upstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	256	319	154	100	275	1073	590	261	245	293	314	264
Average	681	766	1008	1884	2337	2895	2756	2028	1568	1496	659	631
Max	2492	2904	7662	16286	14212	16504	13467	10748	12312	9658	1484	1640

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	659	548	384	495	911	1675	1343	697	445	478	527	498
1982	490	605	515	993	1639	2644	8013	6272	2197	1315	875	1157
1983	1184	1881	7662	9420	14212	16504	13467	10748	12312	9658	1484	1640
1984	2492	2904	5149	5519	1051	1579	1899	979	690	659	745	736
1985	799	497	205	304	715	1445	1456	768	599	657	723	705
1986	571	536	476	473	4142	8270	5717	3458	3083	1315	993	925
1987	744	635	422	425	760	1565	914	597	605	661	652	555
1988	459	639	348	483	629	1280	806	500	545	502	621	558
1989	479	404	295	305	532	1123	1270	623	475	505	548	533
1990	569	624	434	368	617	1073	631	385	362	436	475	384
1991	331	384	154	100	275	1297	1087	416	245	293	314	264
1992	256	334	157	164	664	1130	590	261	277	295	327	317
1993	304	319	189	1550	1211	1543	1369	1431	1697	1093	529	470
1994	531	695	497	447	899	1199	634	339	353	392	456	422
1995	393	455	331	1536	1393	6714	5913	5817	2245	6130	999	862
1996	764	705	562	635	1917	2984	1634	1112	1042	674	789	691
1997	645	934	1945	16286	10886	1799	1705	1714	1560	782	589	544
1998	659	679	648	1014	6481	4953	7528	6857	4988	6028	913	893
1999	1025	896	643	441	1059	1613	1810	817	498	576	636	599
2000	704	710	343	418	1479	1750	1754	950	536	589	552	472
2001	647	797	564	630	850	1652	1248	653	480	478	506	451
2002	500	739	485	671	716	1306	1068	554	400	439	438	427
2003	464	691	771	656	714	1483	1544	688	436	453	455	414

Existing-Interim Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	65	53	46	44	51	57	61	68	73	76	80	74
Average	68	56	48	48	54	62	68	73	78	82	81	77
Max	71	61	52	52	57	65	72	79	81	84	83	79

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	68	57	47	47	55	61	69	74	81	83	81	77
1982	66	57	48	46	54	60	64	72	77	82	81	75
1983	66	53	48	45	52	57	61	68	73	76	80	75
1984	67	55	48	48	54	63	67	76	80	84	81	78
1985	65	54	46	44	54	62	70	74	80	83	80	74
1986	66	54	46	49	54	60	66	73	78	82	80	74
1987	67	57	47	46	55	62	72	75	79	80	80	76
1988	70	55	49	48	57	65	68	72	77	83	81	76
1989	68	55	48	48	54	62	70	75	78	81	80	75
1990	68	58	48	48	51	62	70	73	78	83	82	77
1991	70	56	46	47	55	62	68	74	79	83	82	78
1992	70	58	48	46	55	64	71	78	80	81	83	77
1993	71	57	47	48	54	65	68	74	78	83	81	77
1994	70	57	48	48	53	64	69	74	80	84	82	78
1995	68	53	46	50	55	58	64	70	77	79	83	78
1996	69	61	52	50	57	62	67	72	78	82	82	75
1997	66	56	49	49	53	63	67	76	79	83	83	79
1998	67	58	48	50	53	61	64	68	74	81	83	78
1999	67	57	47	48	55	61	65	73	80	83	81	78
2000	70	59	50	51	55	61	70	74	79	81	81	76
2001	66	54	50	49	53	64	68	79	80	80	80	77
2002	68	58	47	49	56	62	69	73	78	83	81	79
2003	68	58	51	52	56	63	67	73	80	82	80	77

Table 9. Monthly Merced River Flows and Temperatures, Upstream from the San Joaquin River confluence (identical with and without releases up to 1,660 cfs from Friant Dam)

Existing-Base Flow (CFS) Upstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	63	181	160	148	119	186	149	142	71	52	46	24
Average	522	331	538	842	1158	1081	1144	1012	631	441	173	246
Max	2156	868	2031	7648	6785	4401	4619	3702	4083	2772	707	1118

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	539	500	445	279	188	268	158	143	89	63	65	67
1982	74	195	194	291	1239	1711	4619	3702	1097	693	250	520
1983	1359	868	2030	2199	3677	4401	4119	3013	4083	2772	693	1118
1984	2156	655	1810	3098	1051	423	297	273	224	115	75	90
1985	211	506	1167	605	238	189	199	220	150	74	67	123
1986	219	188	247	159	551	2943	2854	1735	539	103	80	123
1987	325	181	160	175	193	217	152	193	151	80	64	66
1988	77	195	187	204	194	186	149	170	112	57	59	24
1989	63	190	212	216	218	254	222	201	138	60	54	42
1990	72	206	204	204	228	200	201	189	127	56	46	40
1991	71	204	210	148	119	330	151	142	71	52	55	82
1992	87	248	257	251	306	257	159	146	79	52	55	54
1993	243	275	225	337	273	269	1488	1339	660	404	707	690
1994	1304	220	231	239	265	265	389	441	137	365	57	63
1995	350	237	235	338	226	2291	3371	3680	3080	2486	423	636
1996	1618	461	480	292	2169	2640	840	1134	259	103	96	143
1997	429	291	2031	7648	6785	1588	669	603	146	83	79	111
1998	155	253	229	781	4618	2525	2896	2672	2469	1981	648	1096
1999	1101	321	468	824	1614	735	1124	769	195	107	61	111
2000	280	269	282	288	1735	2349	792	577	190	123	103	172
2001	531	406	321	277	254	324	553	617	149	102	76	95
2002	408	470	518	298	248	247	391	664	186	94	82	78
2003	333	264	235	209	241	252	510	649	181	108	94	104

Existing-Base Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	57	50	45	47	50	54	55	59	61	65	71	64
Average	63	54	48	49	53	58	62	67	73	77	77	72
Max	66	57	51	51	55	61	67	73	78	81	79	76

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	62	55	48	48	54	58	65	70	78	80	78	74
1982	63	53	48	47	52	56	56	59	68	73	76	70
1983	59	51	50	49	52	54	55	60	61	65	71	64
1984	57	53	51	50	53	60	63	71	76	80	78	75
1985	62	52	50	47	54	58	66	69	77	80	77	71
1986	62	52	45	49	53	56	58	63	73	79	77	71
1987	63	54	46	47	53	59	67	70	76	78	77	73
1988	66	52	48	48	55	61	64	68	75	81	78	75
1989	65	52	48	48	53	59	66	69	75	79	78	74
1990	64	54	46	48	51	59	66	69	75	81	79	75
1991	65	53	46	49	54	55	63	67	75	80	78	76
1992	66	55	48	47	55	61	67	73	76	79	79	73
1993	65	54	46	48	53	61	60	65	71	77	71	68
1994	62	53	47	49	52	60	64	69	76	77	79	75
1995	64	50	47	51	55	56	57	59	62	66	75	70
1996	59	57	51	50	54	56	63	65	76	80	79	72
1997	62	54	51	50	52	59	63	70	76	80	78	75
1998	64	56	48	51	52	57	58	59	62	67	74	66
1999	59	54	49	50	54	58	60	67	76	80	78	74
2000	65	55	49	51	54	57	64	68	77	78	78	72
2001	63	53	49	48	50	60	62	68	75	78	77	74
2002	65	55	49	48	54	58	64	66	74	79	77	75
2003	64	54	49	50	54	60	62	67	76	79	76	73

Table 10. San Joaquin River Flows and Temperatures, Downstream from the Merced River confluence (without releases up to 1,660 cfs from Friant Dam)

Existing-Base Flow (CFS) Downstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	228	359	326	247	223	608	448	294	233	284	312	259
Average	1075	886	1622	2776	3676	3555	3393	3124	2227	1920	761	788
Max	4539	3307	10399	24247	18943	20943	17611	14550	16873	12613	2147	2753

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	1020	785	754	761	897	1227	703	554	400	452	475	433
1982	389	551	642	1355	4022	5137	12934	11197	4085	1987	1003	1533
1983	2489	3095	10399	11964	18943	20943	17611	14550	16873	12613	2147	2753
1984	4539	3307	7875	8940	1934	1285	1015	823	781	654	701	692
1985	832	723	1295	901	742	897	877	708	632	618	669	694
1986	628	456	651	700	5587	12123	8941	5566	3882	1298	955	916
1987	885	548	519	592	754	1084	741	653	629	633	607	490
1988	375	571	469	682	641	798	642	527	545	472	595	474
1989	402	365	449	512	562	670	734	555	508	494	538	476
1990	497	597	599	563	653	608	530	460	405	433	467	343
1991	280	365	326	247	223	920	470	300	233	284	312	259
1992	228	359	375	415	790	716	448	294	274	289	328	300
1993	436	372	375	1891	1521	1312	2755	2689	1448	1285	1181	1091
1994	1723	689	689	684	993	800	722	666	408	699	460	415
1995	631	470	526	1932	2673	8783	9789	11205	6190	8844	1384	1419
1996	2273	945	1002	924	4024	5481	1630	3471	1596	717	831	761
1997	961	995	5095	24247	18617	3135	1136	1769	542	516	615	584
1998	702	710	839	1841	12957	7442	10701	10670	8835	9108	1509	1917
1999	2017	1027	1075	1264	2507	1628	1682	1183	599	611	643	639
2000	868	740	572	702	3001	3629	1381	1113	764	653	598	573
2001	1062	983	847	904	932	1275	1040	1001	547	520	528	475
2002	794	987	963	974	794	859	707	965	499	473	461	429
2003	685	732	964	865	786	1015	847	939	535	502	491	447

Existing-Base Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	62	52	46	46	51	57	60	65	69	73	75	71
Average	65	55	48	48	54	60	65	70	77	81	80	75
Max	68	59	51	51	56	63	70	75	80	83	82	78

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	65	55	48	48	55	60	68	72	80	82	80	76
1982	65	55	48	46	53	58	61	67	74	79	79	73
1983	62	52	48	46	52	57	60	67	70	73	77	71
1984	62	54	49	49	53	62	65	74	78	83	81	77
1985	64	53	50	46	54	60	68	71	78	82	80	73
1986	65	53	46	49	53	59	63	70	77	82	80	73
1987	66	56	46	46	54	61	70	73	78	80	79	75
1988	68	54	48	48	56	63	66	70	76	83	80	76
1989	67	54	48	48	54	60	68	72	77	81	80	75
1990	67	56	47	48	51	60	68	71	77	83	82	77
1991	68	54	46	48	54	59	66	71	78	82	81	77
1992	68	55	48	46	55	62	69	75	78	81	82	76
1993	68	54	47	48	54	63	64	70	75	81	75	72
1994	64	55	48	48	52	62	66	70	78	80	82	77
1995	66	52	47	50	55	58	62	66	69	76	80	74
1996	62	59	51	50	55	59	65	68	78	82	81	75
1997	64	55	50	50	53	61	64	73	77	82	82	78
1998	66	57	48	50	52	60	63	65	71	77	79	71
1999	62	56	48	49	54	60	61	69	78	83	81	77
2000	68	57	50	51	54	58	66	70	79	80	80	75
2001	64	53	50	49	52	62	65	73	78	79	79	76
2002	67	56	48	49	55	60	66	69	77	82	80	78
2003	66	56	51	51	55	62	64	69	78	82	79	76

Table 11. San Joaquin River Flows and Temperatures,
Downstream from the Merced River confluence (with releases up to 1,660 cfs from Friant Dam)

Existing-Interim Flow (CFS) Downstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	342	582	366	249	391	1273	753	407	316	345	369	347
Average	1203	1096	1541	2721	3494	3974	3903	3045	2199	1944	832	876
Max	4642	3554	9643	23875	17919	20899	17603	13777	16347	12531	2178	2755

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	1201	1047	831	769	1101	1940	1504	843	535	542	592	565
1982	564	797	711	1283	2865	4344	12594	10016	3303	2021	1124	1671
1983	2541	2738	9643	11561	17919	20899	17603	13777	16347	12531	2178	2755
1984	4642	3554	6907	8655	2104	2002	2197	1258	913	774	820	826
1985	1010	1002	1374	910	953	1629	1658	990	749	730	790	827
1986	792	723	725	629	4650	11206	8594	5201	3634	1423	1073	1048
1987	1070	817	582	600	951	1780	1070	789	756	741	716	622
1988	535	836	535	686	821	1466	957	669	657	560	679	583
1989	541	595	508	521	748	1374	1491	829	612	565	601	575
1990	640	830	639	572	843	1273	834	573	490	492	521	424
1991	402	588	366	249	391	1623	1243	560	316	345	369	347
1992	342	582	415	416	967	1385	753	407	356	348	382	371
1993	547	594	414	1885	1475	1812	2854	2781	2345	1511	1234	1162
1994	1836	916	729	686	1160	1464	1026	782	490	758	513	486
1995	742	693	566	1862	1623	8956	9300	9500	5347	8623	1426	1496
1996	2385	1168	1042	924	4069	5626	2490	2249	1302	777	885	834
1997	1072	1226	3946	23875	17780	3417	2375	2320	1709	868	669	655
1998	813	931	879	1786	11059	7485	10432	9534	7472	8028	1561	1988
1999	2129	1218	1114	1264	2668	2349	2932	1592	694	682	697	709
2000	984	980	627	704	3193	4116	2537	1536	727	712	656	644
2001	1174	1205	886	906	1100	1977	1802	1275	630	580	582	546
2002	905	1210	1002	977	962	1552	1460	1223	587	533	520	504
2003	796	955	1004	867	952	1733	2055	1343	616	561	549	518

Existing-Interim Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	62	52	46	46	51	57	60	65	68	73	76	71
Average	66	55	48	48	54	61	66	71	77	81	80	75
Max	69	60	52	51	57	64	71	76	81	83	82	79

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	65	56	48	48	55	60	69	73	81	82	81	77
1982	66	56	48	46	53	58	61	67	74	79	80	73
1983	62	52	48	46	52	57	60	67	70	73	77	71
1984	62	55	49	49	53	63	66	75	79	83	81	77
1985	64	54	50	46	54	61	69	72	79	82	80	74
1986	65	53	46	49	54	59	63	70	77	82	80	73
1987	66	56	46	46	54	61	71	74	78	80	80	76
1988	69	54	48	48	57	64	67	71	77	83	81	76
1989	68	55	48	48	54	61	70	73	77	81	80	75
1990	67	57	47	48	51	62	69	72	77	83	82	77
1991	69	55	46	48	55	61	67	73	78	83	81	78
1992	69	56	48	46	55	63	70	76	79	81	82	76
1993	69	55	47	48	54	64	64	70	76	81	76	72
1994	64	56	48	48	53	63	67	71	79	80	82	77
1995	66	52	47	50	55	58	62	66	68	76	80	75
1996	62	60	52	50	55	60	66	68	78	82	81	75
1997	65	56	50	50	53	61	66	74	79	83	82	78
1998	67	58	48	50	53	60	63	65	70	77	79	71
1999	63	56	48	49	54	60	63	70	79	83	81	77
2000	69	58	50	51	54	58	68	72	79	80	81	75
2001	65	53	50	49	52	63	66	74	79	80	79	77
2002	67	57	48	49	55	61	68	70	77	82	80	79
2003	67	56	51	51	56	63	66	71	79	82	79	76

Table 12. Differences in San Joaquin River Flows and Temperatures, Downstream from the Merced River Confluence (1,660 cfs Friant Dam Releases minus Existing Condition)

Difference (Interim-Base) Flow (CFS)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	52	-357	-1149	-403	-1898	-917	-489	-1706	-1362	-1081	31	1
Average	128	210	-81	-55	-183	419	510	-79	-27	24	71	89
Max	185	279	78	9	210	731	1250	551	1167	353	121	137

Water Yea	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	181	262	76	8	205	714	801	290	134	90	117	132
1982	176	246	69	-71	-1158	-793	-340	-1181	-782	34	121	137
1983	52	-357	-756	-403	-1024	-44	-7	-774	-526	-82	31	1
1984	103	247	-968	-286	170	717	1182	434	132	120	119	134
1985	178	279	78	9	210	731	781	282	117	112	121	133
1986	163	267	74	-70	-937	-917	-347	-365	-248	125	119	132
1987	185	269	64	8	197	695	329	136	127	109	108	132
1988	160	265	67	4	180	668	315	142	112	88	84	110
1989	139	230	59	9	186	704	757	274	104	71	63	100
1990	143	233	41	9	191	664	304	113	85	59	54	81
1991	121	222	40	2	169	703	772	260	83	61	57	88
1992	114	222	40	1	177	668	305	113	82	59	53	71
1993	111	222	40	-6	-46	500	99	92	897	226	53	71
1994	113	228	41	2	167	665	304	116	82	59	53	71
1995	111	222	40	-70	-1050	172	-489	-1706	-843	-221	42	76
1996	111	222	40	0	45	145	859	-1222	-294	61	54	73
1997	111	231	-1149	-371	-837	282	1239	551	1167	353	53	71
1998	111	221	40	-55	-1898	43	-269	-1137	-1362	-1081	53	71
1999	111	191	39	0	161	721	1250	409	95	71	53	71
2000	116	240	55	2	192	487	1155	423	-37	59	57	71
2001	111	222	40	2	168	702	762	274	83	60	54	71
2002	111	222	40	2	168	693	754	258	88	60	60	76
2003	111	223	40	2	165	719	1208	404	81	59	58	71

Difference (Interim-Base) Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	0	0	0	0	0	0	0	0	-1	0	0	0
Average	1	1	0	0	0	1	1	1	0	0	0	0
Max	1	1	0	0	1	1	2	2	1	0	0	1

Water Yea	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	0.7	0.5	0.0	0.0	0.5	0.4	0.9	1.1	0.7	0.4	0.4	0.5
1982	0.6	0.6	0.0	0.1	0.3	0.1	0.0	-0.2	-0.3	0.1	0.3	0.3
1983	0.3	-0.1	-0.2	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0
1984	0.2	0.1	-0.1	0.0	0.1	0.8	1.0	1.1	0.5	0.4	0.3	0.4
1985	0.4	0.3	-0.2	0.0	0.3	0.8	1.0	1.1	0.5	0.3	0.3	0.3
1986	0.6	0.5	0.1	0.0	0.3	0.3	0.0	-0.1	0.1	0.1	0.2	0.2
1987	0.4	0.7	0.0	0.0	0.4	0.6	0.9	0.7	0.5	0.3	0.3	0.5
1988	0.9	0.6	0.1	0.0	0.6	1.2	1.1	0.7	0.4	0.3	0.3	0.4
1989	0.7	0.9	0.0	0.0	0.3	1.2	1.5	1.2	0.5	0.3	0.2	0.3
1990	0.6	0.7	0.1	0.0	0.0	1.3	1.4	0.7	0.4	0.2	0.2	0.2
1991	0.8	0.9	0.0	0.0	0.7	1.2	1.5	1.6	0.5	0.3	0.2	0.4
1992	1.0	1.0	0.1	0.0	0.3	1.2	1.1	0.9	0.4	0.2	0.2	0.3
1993	0.6	1.1	0.1	0.0	0.0	0.6	-0.1	0.1	0.8	0.1	0.3	0.4
1994	0.5	0.5	0.0	0.0	0.1	1.4	1.1	0.7	0.4	0.3	0.2	0.2
1995	0.5	0.4	0.0	0.0	0.6	0.1	0.0	0.0	-0.9	-0.1	0.1	0.3
1996	0.4	0.7	0.1	0.0	0.0	0.1	0.8	-0.2	-0.2	0.2	0.1	0.2
1997	0.3	0.3	0.1	0.0	0.0	0.6	1.5	1.3	1.1	0.3	0.1	0.2
1998	0.3	0.7	0.1	0.0	0.3	0.0	0.0	0.1	-0.2	0.2	0.2	0.3
1999	0.5	0.4	0.2	0.0	0.1	0.6	1.5	1.2	0.4	0.3	0.1	0.3
2000	0.5	0.7	0.1	0.0	0.1	0.5	2.0	1.2	0.1	0.2	0.2	0.3
2001	0.4	0.1	0.0	0.0	0.2	0.9	1.7	1.6	0.4	0.2	0.2	0.3
2002	0.5	0.6	0.0	0.0	0.4	0.9	1.9	1.2	0.5	0.3	0.3	0.3
2003	0.5	0.7	0.1	0.0	0.4	1.0	2.0	1.3	0.4	0.3	0.3	0.3

Sensitivity of Temperatures on the Merced, Tuolumne, and Stanislaus Rivers to Changes in Flow

Plots of water temperature and mean daily flow were evaluated to identify potential linkages between flow rates and temperature conditions in the Merced, Tuolumne, and Stanislaus rivers for March and April. Measured data was then used to formulate relationships between flow and temperature. These relationships were used to check the potential sensitivity of temperatures on the San Joaquin River arising from changes in flow on the Merced, Tuolumne and Stanislaus rivers seen in CalSim model results. These relationships are shown in Figure 20 below.

Summary

Records of flow rates and temperatures were compiled for the tributary rivers, as close to the confluences as could be found. The relationship between flow and temperature was not linear: the range of possible temperatures varied by +/- 10ºF, particularly during lower releases expected by the CalSim modeling. Conceptually, as water flows further from the dams, ambient air temperature conditions dominate over the flow rate in controlling the water temperature. At the confluence of the tributaries with the San Joaquin River, flow rates do not appear to influence temperatures at lower ranges of release. Changes in tributary flows to meet VAMP requirements as a result of SJRRP releases are unlikely to change water temperatures because ambient air temperature conditions dominate.

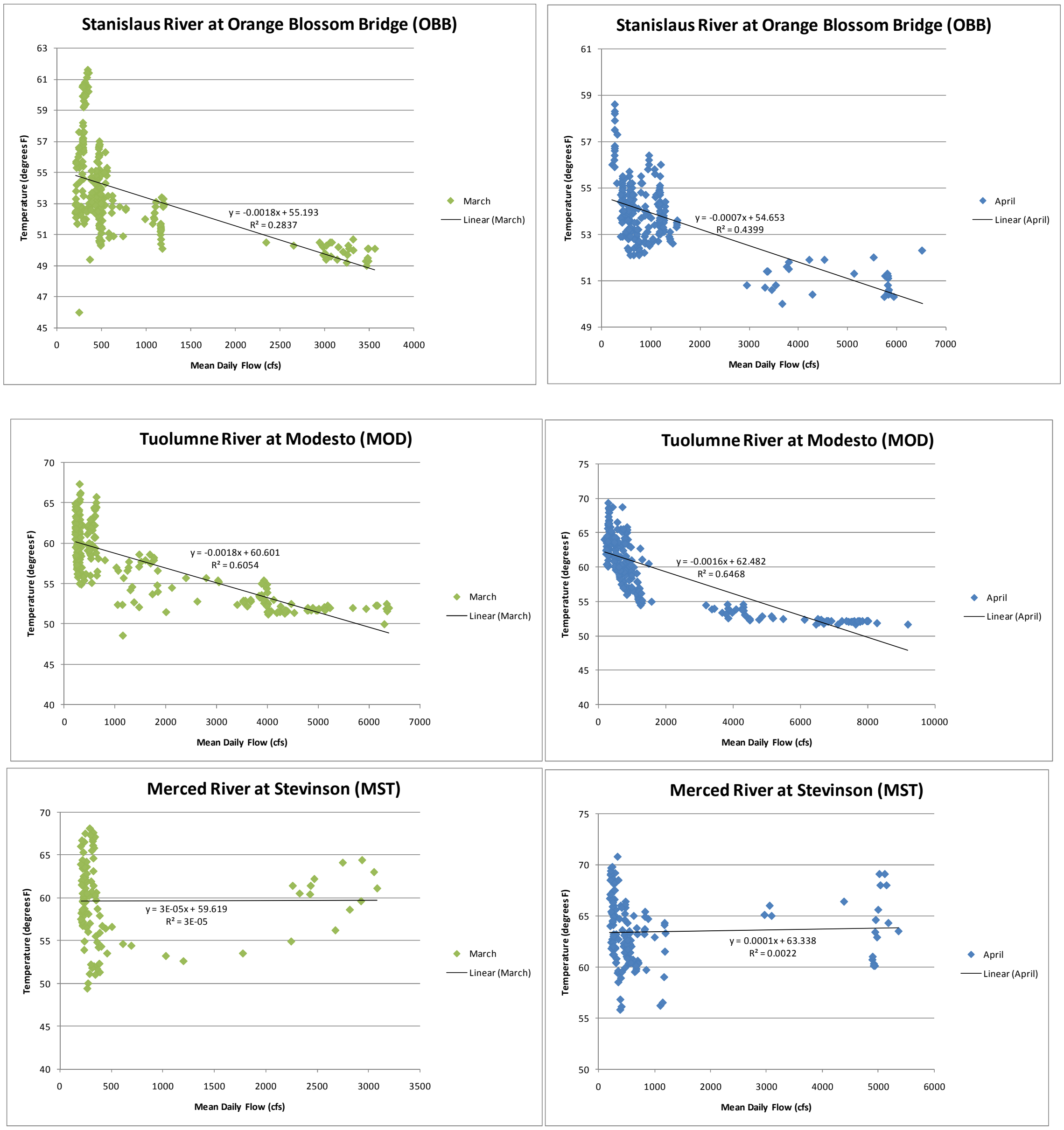


Figure 20. Records and Linear Relationships Between Flow and Temperature for the Merced River at Stevinson, for March and April

Table 13. Linear Relationships between Flow and Temperature

River	Month	Equation (x = flow, result = temperature)	R^2
Merced	March	-0.00003x + 59.619	0.00003
	April	-0.0001x + 63.338	0.0022
Tuolumne	March	-0.0018x + 60.601	0.6054
	April	-0.0016x + 62.482	0.6468
Stanislaus	March	-0.0018x + 55.193	0.2837
	April	-0.0007x + 54.653	0.4399

Essential Fish Habitat

Starry Flounder EFH

As described for delta smelt above, the increased inflows in the San Joaquin River and Delta are also expected to reduce the straying of starry flounder into the south Delta, and the increase in exports within the allowable pumping criteria of the 2009 NMFS Operations BO and the 2008 USFWS' Operations BO may increase entrainment. However, the regulatory requirements embodied in the 2009 NMFS Operations BO and the 2008 USFWS' Operations BO would be applicable to the implementation of the SJRRP. These regulatory requirements would ensure that allowable take limits at the Delta export facilities would not be exceeded, which would provide additional protection for starry flounder.

NMFS did not establish any measures in the Operations BO for the protection of starry flounder, however, for the reasons described below, restrictive measures identified in the USFWS BO on Delta diversions to protect larval delta smelt would also protect starry flounder. Starry flounder spend most of their life downstream of the Action Area, in San Francisco Bay and the Pacific Ocean. Spawning occurs in the ocean generally near the mouth of San Francisco Bay. Starry flounder spawn typically between February and April, while delta smelt spawn between February and June. Because of the common spawning times, the restrictive measures identified in the USFWS BO on Delta diversions to protect larval delta smelt would also protect larval starry flounder. The majority of yearling and older starry flounder live in bay and ocean environs, which is outside of the Action Area.

Starry flounder primarily occur within the Action Area during the early part of their juvenile life stage as young-of-the-year. After hatching, young starry flounder begin to move upstream, toward and into the Delta as their swimming ability improves. Small (20 millimeters fork length [mm FL]) starry flounder have been found as far upstream as Rio Vista on the Sacramento River. These smaller, younger juvenile starry flounder primarily occupy shallow habitats, often less than 60 cm deep. Larger juveniles (> 100 mm FL) tend to move into deeper habitats downstream of the riverine areas. The majority of the young-of-the-year starry flounder appear to move out of the Delta in spring (March through June).

Starry flounder that use the interior Delta deeper habitats downstream of the riverine areas are primarily young-of-the-year. They use shallow habitats during the period when the USFWS 2008 Operations BO and RPAs in that BO reduce entrainment risks and should have a low vulnerability to entrainment due to both their habitat preference and the conditions established to reduce the risk of entrainment for delta smelt. The RPAs in the USFWS 2008 Operations BO that protect delta smelt and that will also be protective of starry flounder include, but are not limited to:

1. To protect adults delta smelt, daily Old and Middle River (OMR) flow requirements must be no more negative than the required OMR flow for a 14-day average, and no more than 25 percent negative than the requirement when there is a 5-day running average.

2. To protect adult delta smelt, Delta operations should maintain OMR flows no more negative than -2,000 cfs (14-day average) with a simultaneous 5-day running average flow no more negative than -2,500 cfs to protect adult delta smelt for 14 days.

3. To protect delta smelt larvae and juveniles, the CVP and SWP shall operate to maintain OMR flows no more negative than 1,250 to -5,000 cfs based on a 14-day running average with simultaneous 5-day running average within 25 percent of the applicable 14-day OMR flow requirements.

4. The Spring Head of Old River shall be installed only if USFWS determines delta smelt entrainment is not a concern.

5. Restoration of a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh shall be implemented.

Food sources are likely similar for larval and small juvenile starry flounder and delta smelt (Emmet et al. 1991, Bennet 2005), so protective measures for delta smelt food resources would also protect food resources for starry flounder. In addition, starry flounder salvage numbers are historically low indicating that entrainment has not been a major influence on starry flounder even before the USFWS 2008 Operations BO and RPAs have taken effect. Increases in exports at the Jones and Banks facilities as a result of the release of up to 1,660 cfs from Friant Dam would fall within the allowable pumping criteria of the Operations BOs in place at the time of pumping. It is too speculative at this time to determine what method of analysis will be conducted in the event that the NMFS Operations 2009 BO or the USFWS 2008 Operations BO are vacated or modified by the Federal Court as it would depend on the modifications and any subsequent direction by the Court related to Delta operations. However, in the event that this where to happen, Reclamation would work with NMFS as to what, if any, additional actions would need to be taken. Overall, there would be no adverse effect to starry flounder EFH.

Pacific Salmon EFH

Protective measures in the NMFS Operations BO would protect Pacific salmon. Therefore, there would be no adverse effect on Pacific salmon EFH. Increased flows in the Restoration Area, the San Joaquin River from its confluence with the Merced River to the Delta, and in the San Joaquin River tributaries will directly benefit EFH for Pacific salmon in the Action for all ESUs of Chinook salmon. Potential changes in flows on the tributaries as a result of the release of up to 1,660 cfs from Friant Dam vary based on the implementation of VAMP or a VAMP-like action and also by hydrologic conditions and time of year and include potential increases and decreases in flows in the same tributary. While this approach results in changes to water supply and habitat conditions related to flow on the tributaries, these changes are within the simulated historical range of variability in flows on the tributaries. Potential changes in flows on the tributaries as a result of the action could be limited to the Stanislaus River. With VAMP or a VAMP-like action, there is a 60 to 90 percent chance flows will not be reduced in the tributaries as a result of the Proposed Action during the VAMP period. These changes range from flow increases as high as 6 percent and flow decreases as high as 11 percent during the VAMP period.

Flow from the Stanislaus River potentially used to meet flow and water quality conditions at Vernalis could exceed those required to protect Central Valley steelhead per the 2009 NMFS Operations BO. When SJRRP flows are sufficient to allow Stanislaus River releases to be reduced to the RPA required conditions, coldwater would be saved in New Melones Reservoir and become available to improve habitat for salmonids in the Stanislaus River later in the season, which would not occur without the contribution of flows up to 1,660 cfs from Friant Dam to the baseline conditions at Vernalis.

Overall, changes in habitat conditions within the San Joaquin River, its tributaries and in the Delta attributable to SJRRP releases of not more than 1,660 cfs from Friant Dam are not likely to adversely affect EFH for starry flounder and Pacific salmon.

Continued Approach to Program-Level Actions:

Channel capacity improvement projects and the specific projects called for in Paragraph 11(a) and 11(b) of the Settlement, which include improvements to Reach 2B, Reach 4B, the Eastside Bypass, and the Mariposa Bypass would each have their own specific site-specific or project-level ESA consultation in a future BA. This future consultation will address the construction-related actions of these improvement projects on the landscape. Additionally, all program-level actions addressed in the BA will continue to need future consultation and coordination by the Implementing Agencies, as appropriate. These actions include the reintroduction of Chinook salmon, gravel pit filling or isolation, habitat enhancements, installation of fish barriers or passage structures, modifications to flow control structures, long-term monitoring actions, and implementation of the Conservation Strategy.

NMFS Comment:

1) a) *(sic) All Friant operations, including flood operations should be included in the project description. The operations of the Friant Dam/Division were not included in the 2008 BA for the Continued Long-term Operations of the Central Valley Project and the State Water Project as described on page 2-70 of the BA;*

> *" At this time, the Friant Division is generally hydrologically disconnected from the Delta as the San Joaquin River is dewatered in two reaches, between Friant Dam and the confluence of the Merced River, except in extremely wet years. Under flood conditions, water is diverted into two bypass channels that carry flood flows to the confluence of the Merced River.*
>
> *In 2006, parties to NRDC v. Rodgers executed a stipulation of settlement that calls for, among other things, restoration of flows from Friant Dam to the confluence of the Merced River. Implementation of the settlement is not included in this consultation as it is a large project which has not been sufficiently developed to allow for analysis of the effects of implementation of settlement action on listed aquatic species at this time. At some point in the future, consultation may need to be reinitiated to evaluate the effects of the Restoration Program on continued CVP and SWP operations."*

There are several options for conducting this large consultation, and we request a meeting with you to decide on the best course of action.

Reclamation Response:

The SJRRP and Reclamation's Bay-Delta Office (BDO) are currently discussing the most appropriate approach to addressing potential effects to species related to Friant operations. This approach will continue to be coordinated with NMFS. The SJRRP does not include flood releases and this is not stated as part of the project description in the BA or reflected as part of the implementation of the SJRRP in either the Settlement or the Act.

NMFS Comment:

1) b) *The project description must have a temporal component based on the current implementation schedule of the SJRRP. For example, Interim Flows 2009-2012 have already been consulted on so cannot be consulted on again. Full Restoration Flows are scheduled to occur in 2014, but give the levee instability and seepage issues this is unlikely to occur. The actual flows that can be expected during any given year must be represented in the project description.*

Reclamation Response:

The Implementing Agencies are currently in discussions with the Settling Parties on the SJRRP Framework for Implementation (Framework). The Framework provides a range of actions developed in consideration of the need to release and convey Interim and Restoration flows, reintroduce fish and provide for fishery needs, protect Third Parties, and reduce or avoid water supply impacts. A viable set of actions for the Settlement's Restoration Goal would result in the conveyance of non-damaging flows and provide, at a minimum, a migration corridor for Chinook adults and juveniles at an adequate level of survival for fish to complete their life cycles. A viable set of actions for the Water Management Goal would result in the completion of the actions in the Settlement and Act to reduce or avoid water supply impacts from the release of Interim and Restoration flows. NMFS, as an Implementing Agency, has been actively involved in this development and review of this Framework. We will continue to work towards achieving goals set out in the Framework, the Settlement, and the Act in coordination with the Implementing Agencies.

The temporal component of the project will be coordinated through the request by Reclamation to NMFS on the effects to species under their jurisdiction for future SJRRP actions. As improvements are made to increase channel capacity or increase flow releases and as project-level Conservation Strategy actions are implemented, Reclamation will consult with NMFS to increase flows up to the full flow releases called for in the Settlement. The SJRRP Framework for Implementation, once completed, will assist in guiding the appropriate timing for this additional consultation related to increases in flows. Reclamation will continue to coordinate with NMFS on the appropriate timing for future consultation requests.

NMFS Comment:

1) c) *The operation of Hills Ferry Barrier with respect to the SJRRP and in relation to the reintroduction of fall-run and/or spring-run Chinook salmon is unclear. At present, the Hills Ferry Barrier is operated by the California Department of Fish and Game (CDFG) to mitigate losses of fall-run Chinook salmon at the State Water Project export facilities. NMFS has consulted on ESA effects with the Army Corps of Engineers, with CDFG as their applicant, and has authorized CDFG management and monitoring actions at the barrier through section 4(d) permitting. This original purpose appears to be transitioning to a merged function with the SJRRP which is not well defined as to function and duration. For example, under what conditions would the Hills Ferry Barrier no longer be operated in order to allow anadramous fish unimpeded access to the Restoration Area?*

Reclamation Response:
The long-term use of the Hills Ferry Barrier is unknown; however, it will continue to be used to block upstream migration of Chinook salmon until the Restoration Area is ready for anadromous fish reintroduction. After salmon reintroduction, it may be necessary to continue to use the Hills Ferry Barrier for salmon and steelhead management; the barrier may potentially be operated as a control structure to minimize interactions between spring- and fall-run Chinook salmon upstream after their populations become established. The BA describes that the Hills Ferry Barrier could be used to reduce redd superimposition and/or hybridization between spring- and fall-run Chinook salmon (page 3-37). The State of California will decide whether the Hills Ferry Barrier continues to fulfill mitigation needed under the Delta Fish Agreement and thus, continues to be funded under that agreement.

NMFS Comment:

1) d) *Monitoring is an important component of the project description. The proposed monitoring primarily involves physical monitoring related to flow, seepage, channel capacity, native vegetation, and spawning gravel but does not involve biological monitoring directly related to fisheries. We are concerned that no monitoring is proposed at a program-level, in particular to monitor the Chinook salmon reintroduction and proposed benefits of the SJRRP to steelhead. We acknowledge that Reclamation has included a Steelhead Monitoring Plan to assess and minimize effects on steelhead, although it is unclear if Reclamation plans to carry out this monitoring for the life of the SJRRP. The Restoration Flow Guidelines are not described in the project description and yet these guidelines are essential to future flow schedule determinations. These guidelines and subsequent flow schedule implementation are an important piece in determining the overall impacts of the restoration program to listed species.*

Reclamation Response:
The project description in the BA states that "monitoring activities include past, present, and future physical and nonphysical activities within the Restoration Area." At the time of the submittal of this addendum, it should be noted that multiple fisheries monitoring activities are being performed or proposed for the SJRRP. These activities are provided in the annual Monitoring and Analysis Plan and currently include monitoring for: temperature; the effectiveness of Hills Ferry Barrier; egg survival; gravel mobility; juvenile survival; captive rearing techniques; adult passage, ecosystem modeling; and assessment of the existing fish community within the Restoration Area. While all monitoring activities could not be included in the BA project description on a project-level because these future activities are still speculative as to their nature, it can be assumed that some of the Implementing Agencies would implement monitoring activities related to fisheries actions on a program level. Reclamation would continue to coordinate with the Implementing Agencies to target key monitoring for implementation in the future. Monitoring steelhead for "the life of the SJRRP" is unknown at this time. The current Steelhead Monitoring Plan and relevant 10(a)(1)(A) permit expires on March 31, 2014. Reclamation and NMFS shall continue to coordinate to determine if an extension to this permit is necessary or warranted.

Monitoring in the PEIS/R is currently tied to impacts resulting from the implementation of the Settlement consistent with the Act. Therefore, monitoring was not needed nor identified for fish in the document. The Implementing Agencies anticipate that monitoring for specific fisheries studies will be coordinated through the Monitoring and Analysis Plan process and in coordination with the SJRRP Fisheries Management Workgroup. Reclamation and NMFS are currently part of a 5-year interagency agreement whereby Reclamation funds NMFS' full-time staff in order to obtain technical support and recommendations for fisheries-related actions. We recommend that NMFS, in utilizing funding provided under this agreement, provide meaningful feedback related to monitoring proposals so that Reclamation, USFWS, and DFG can implement fisheries monitoring for existing species and habitats as well as those under the jurisdiction of NMFS and NMFS' rule-making.

NMFS Comment:

2) *A description of the specific area that may be affected by the action [50 CFR 402.14(c)(2)].*

   Although the geographic boundaries for the action area are clearly defined, the rationale for ending the downstream boundary of the action area at the south Delta is not clearly demonstrated in the analysis of impacts. The action area as described was appropriate for the Interim Flows 2009-2012 consultations due to the small amount of flow releases from Friant Dam and the unlikely event that the released water would be recaptured at the Delta facilities. Because the proposed action involves full Restoration Flows, the amount of water released from Friant and subsequently recaptured at the Delta facilities may influence anadramous fish habitat conditions or behavior downstream of the Delta.

Reclamation Response:

As improvements are made to increase channel capacity or increase flow releases and as project-level Conservation Strategy actions are implemented, Reclamation will consult with NMFS to increase flows up to the full flow releases called for in the Settlement. The SJRRP Framework for Implementation, when completed, will assist in guiding the appropriate timing for this additional consultation related to increases in flows. Reclamation will continue to coordinate with NMFS on the appropriate timing for future consultation requests. Therefore, future effects to species in the Delta will be coordinated with NMFS as Reclamation assesses and proposes future flow increases. While future flow releases up to 4,500 cfs are not anticipated to revise the boundary of the Action Area presented in the BA, this approach will be discussed with NMFS in advance of effects analyses performed for future flow increases. As the SJRRP flows attenuate as they reach the lower San Joaquin River and because these flows are nominal in comparison to overall Delta inflows during the peak SJRRP hydrograph period, it is not anticipated that there will be a need to extend the Action Area beyond the extents of the Delta.

Channel capacity improvement projects and the specific projects called for in Paragraph 11(a) and 11(b) of the Settlement, which include improvements to Reach 2B, Reach 4B, the Eastside Bypass, and the Mariposa Bypass would each have their own specific site-specific or project-level ESA consultation in a future BA. This future consultation will address the construction-related actions of these improvement projects on the landscape. Additionally, all program-level actions addressed in the BA will continue to need future consultation and coordination by the Implementing Agencies, as appropriate. These actions include the reintroduction of Chinook salmon, gravel pit filling or isolation, habitat enhancements, installation of fish barriers or passage structures, modifications to flow control structures, long-term monitoring actions, and implementation of the Conservation Strategy.

NMFS Comment:

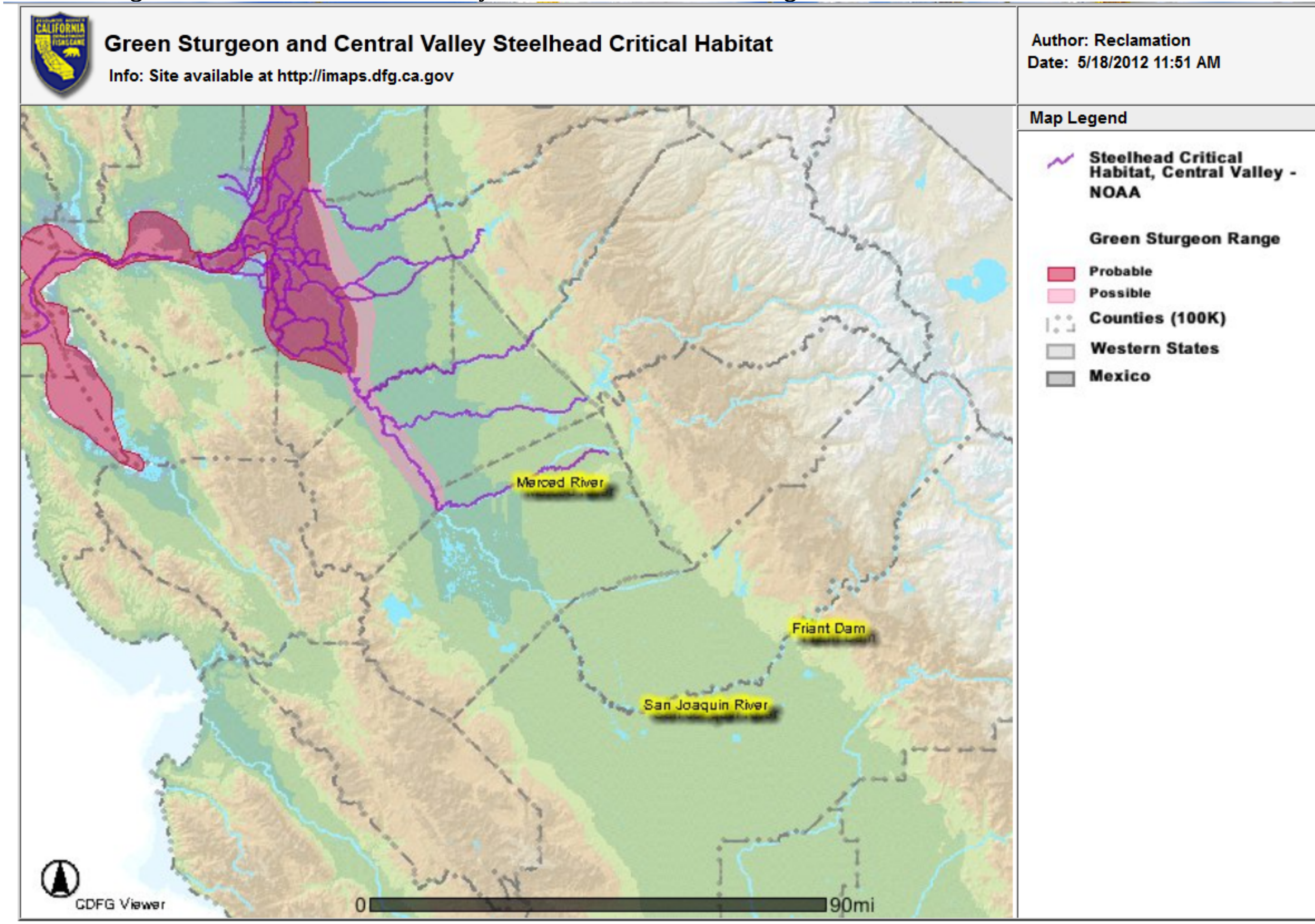
3) *A description of any listed species or critical habitat that may be affected by the action [50 CFR 402.14(c)(3)].*

   The description of listed species potentially affected by this action has been described accurately in the BA. However, the extent of critical habitat within the action area and relative to the proposed action has not been described for steelhead or green sturgeon.

Reclamation Response:

The range of Central Valley steelhead and green sturgeon critical habitat is characterized in *Figure 1: Extent of Central Valley Steelhead and Green Sturgeon Critical Habitat in the Action Area*. Central Valley steelhead critical habitat extends through the Action Area from the Delta along the San Joaquin River, to the confluence of, and including, the Merced River. Per Figure 1 and 50 CFR Part 226, which designates critical habitat for the species, green sturgeon critical habitat includes the Delta. The critical habitat designation states that, while green sturgeon do not appear to occupy the San Joaquin River presently, the system is accessible to the species. *Id*.

Figure 1: Extent of Central Valley Steelhead and Green Sturgeon Critical Habitat in the Action Area



NMFS Comment:

4) b) *(sic) The effects analysis (as with the project description) must have a temporal component. There is likely a time period between now and when all Phase I actions are completed that listed species may be affected by the project due to poor habitat conditions. Between Phases I and II fish habitat conditions will presumably improve but there may be specific actions that impact listed species. These impacts must be described based on expected conditions and the proposed actions over time.*

Reclamation Response:

See response to NMFS Comments 1(b) and 2. As improvements are made to increase channel capacities or increase flow releases, Reclamation will consult with NMFS to increase flows, consistent with the Settlement and as required by law.

NMFS Comment:

4) c) *The effects analysis must also describe any take and/or impact to critical habitat that could occur as a result of the proposed action. Under the SJRRP, take of listed anadramous fish could potentially occur from a variety of causes including; operation of Hills Ferry Barrier, unscreened diversions, flow fluctuations causing stranding or stress, inadequate flow and/or barriers blocking migration, inadequate flow causing elevated water temperatures, or thermal loading to areas downstream of the Restoration area, monitoring.*

Reclamation Response:

See response to NMFS Comments 1(b) and 2. As improvements are made to increase channel capacities or increase flow releases, Reclamation will consult with NMFS to increase flows, consistent with the Settlement and as required by law. If take authorization is needed, based on a review of the potential effects to species related to these flow increases, then Reclamation will coordinate this request with NMFS, as appropriate. The release of SJRRP flows up to 1,660 cfs from Friant Dam would not result in any take of listed species under the jurisdiction of NMFS, as outlined in the response to NMFS Comment 1(a). Additionally, the Steelhead Monitoring Plan will continue to be implemented in order to account for the potential presence of the species within the Restoration Area and the transportation of the species downstream, if discovered. The 10(a)(1)(A) permit for the Steelhead Monitoring Plan expires on March 31, 2014. Reclamation will coordinate with NMFS to determine the need for monitoring beyond this expiration date.

NMFS Comment:

4) d) *The project description must include all Friant operations and the full range of effects of these operations on listed species so that NMFS can use this information in our jeopardy analysis.*

Reclamation Response:

See response to NMFS Comment 1(a)(*sic*) regarding the request for consultation on Friant operations.

NMFS Comment:

5) *Relevant reports, including any environmental impact statement, environmental assessment, or BA prepared [50 CFR 402.14(c)(5)].*

   At this time it would appear that relevant reports have been made accessible, although we reserve the option to request additional clarifying information in the consultation process.

Reclamation Response:
The comment is acknowledged. We will continue to work with NMFS and share information as it becomes available.

NMFS Comment:

6) *Any other relevant available information on the action, the affected listed species, or critical habitat [50 CFR 402.14(c)(6)].*

   At this time it would appear that the relevant reports have been made accessible, although we reserve the option to request additional clarifying information in the consultation process.

Reclamation Response:
The comment is acknowledged. We will continue to work with NMFS and share information as it becomes available.

ESSENTIAL FISH HABITAT (EFH):

NMFS Comment:

1) *The EFH Assessment needs to have a clear delineation of the action area.*

   Although the geographic boundaries for the action area are clearly defined, the rationale for ending the downstream boundary of the action area at the south bay is not clearly demonstrated in the analysis of impacts. The action area as described was appropriate for the Interim Flows 2009-2012 consultations due to the small amount of flow release from Friant Dam and the unlikely event that the released water would be recaptured at the Delta facilities. Because the proposed action involves full Restoration Flows, the amount of water released from Friant and subsequently recaptured at the Delta facilities may influence anadramous fish habitat conditions or behavior downstream of the south Delta.

Reclamation Response:
See response to NMFS Endangered Species Consultation and Concurrence, Comment 2. Additionally, the updated effects determination for the revised consultation approach, which includes up to 1,660 cfs in SJRRP flow releases from Friant Dam, is provided in response to NMFS Endangered Species Consultation and Concurrence, Comment 1(a) for EFH.

NMFS Comment:

2) *An analysis of the potential adverse effects of the action on EFH of the managed species [50 CFR 600.920(e)(3)(ii)].*

   The EFH assessment lacks an in-depth analysis of the proposed action on EFH habitat conditions for managed species that may be affected , including sufficient detail to accurately assess potential impacts to EFH for specific Pacific salmon life history stages.

   a) *Information from Appendix A entitled "Identification and Description of Essential Fish Habitat, Adverse impacts, and Recommended Conservation Measures for Salmon") (sic) of the Salmon Fishery Management Plan (FMP) should be incorporated into the EFH Assessment.*

   b) *Salmon FMP Appendix A, Section 3.2: Tables A-8 an (sic) A-9 should be used to develop a comprehensive list of all habitat types and components that can be impacted by activities associated with the implementation of the SJRRP. Once established, this list should serve as the basis for evaluation (sic) impacts to EFH within the action area to ensure a consistent and comprehensive assessment. Tables A-10 and A-11 should be used to evaluate the function and performance of the project elements, and to further address habitat concerns during specific Pacific salmon life stages.*

Reclamation Response:

While not clearly stated in the comment, it appears that the reference is to Appendix A, provided as Amendment 14 to the Pacific Coast Salmon Plan, August 1999 (Appendix A). The Program BA explains on page 6-30 that program-level actions would directly benefit EFH for Pacific salmon in the Action Area in the same manner as described for the ESUs of Chinook salmon and often for steelhead. Further, the BA concludes that because there would be no change as a result of increased San Joaquin River inflow to the western Delta and San Francisco Bay that there would be no direct or indirect effects to starry flounder EFH. Finally, the BA concludes there would be no effect to EFH from program- or project-level SJRRP actions. The document discusses effects from the SJRRP to Chinook salmon and steelhead ESUs related to hydrology, flow patterns, water quality, water temperature, habitat modifications, disease risk, food web sources, and predation. Drawing a correlation to the discussion for Chinook salmon and steelhead ESUs, this discussion covers a wide range of Appendix A's recommendations for discussion of EFH impacts resulting from proposed actions. Table A-8 recommends that this discussion include analysis of effects to EFH as a result the action on water quality, sediment, habitat access, channel structure, hydrology, alteration of riparian forest, exogenous material, estuarine characteristics, and marine water quality. Further, Table A-9 defines actions likely to effect salmon EFH as those that creation compaction of soils or create impervious surfaces, discharge wastewater or runoff, introduce or transfer exotic organisms or disease, create migration barriers or hazards, alter marine habitat, cause the direct removal of prey species, or cause direct redd disturbance. Many program-level actions in the BA discuss potential effects to species. At this time, it the effects related to construction projects or flow increases beyond 1,660 cfs are not well-defined and will be assessed in future environmental documentation, in coordination with the Implementing Agencies. Therefore, the functional assessment provided in Tables A-10 and A-11 will need to be evaluated as new information becomes available to evaluate effects to EFH associated with the implantation of flow releases above 1,660 cfs from Friant Dam and for site-specific program-level actions. This is consistent with the approach provided in responses to NMFS comments 1(a) and 1(b). Additionally, the effects to EFH for flows up to 1,660 cfs from Friant Dam are discussed as a response to NMFS comment 1(a).

NMFS Comment:

3) *Given the general scope and complexity of the project, as much additional information as possible, as described in section 600.920(e)(4) of the EFH regulations, should be provided in the EFH Assessment.*

Reclamation Response:

Reclamation will continue to work with NMFS to ensure the most appropriate information is provided to aid in the decision-making and approval process. While NMFS comment on this matter is general and non-specific in nature, we will continue to work to provide the information required under 50 CFR 600.920(e)(4), which provides that an assessment conducted under the Magnuson-Stevens Act may contain the following additional information, if appropriate:

- The results of an on-site inspection to evaluate the habitat and the site-specific effects of the project;
- The views of recognized experts on the habitat or species that may be affected;
- A review of pertinent literature and related information;
- An analysis of alternatives to the action. Such analysis should include alternatives that could avoid or minimize adverse effects on EFH; and,
- Other relevant information.

Banonis, Michelle

From: Banonis, Michelle
Sent: Tuesday, July 10, 2012 8:11 AM
To: 'Erin Strange'
Cc: 'Leslie.Mirise@noaa.gov'
Subject: Additional Program BA Information, As Requested

Hi Erin,

Based on the conversation we had on June 25, 2012, here are responses to your questions/concerns. Please let me know if you have additional questions.

1. **Selection and Description of Preferred Alternative (C1) in Program EIS/R:**

During the time of distribution of the original Biological Assessment (BA) to National Marine Fisheries Service (NMFS), a Preferred Alternative had not yet been identified. As explained in the BA Addendum, submitted on June 25, 2012, NMFS Comments 1 – Endangered Species Consultation and Concurrence, the response outlines the methodology for initially choosing Alternative A1 for the BA.

While the PEIS/R has not yet been publically distributed, at this time, Alternative C1 has been selected as the Preferred Alternative. In our telephone conversation you requested that we include a description of the types of effects that could occur to species as a result of the selection and implementation of this alternative. Also as discussed, we recognize that the construction actions associated with Alternative C1 are analyzed at a program-level and would require additional National Environmental Policy Act (NEPA), California Environmental Quality Act (CEQA), and Endangered Species Act (ESA) review, as required.

The Preferred Alternative, Alternative C1, includes reoperation of Friant Dam to release Interim and Restoration flows, and a range of actions to achieve the Restoration and Water Management goals, as stipulated in the Settlement. Reach 4B1 would convey at least 475 cfs, and the Eastside and Mariposa bypasses would convey any remaining Interim and Restoration flows. Alternative C1 includes the potential for recapture of Interim and Restoration flows in the Restoration Area and Interim and Restoration flows in the Delta using existing diversion facilities, along with the potential for recirculation of all recaptured Interim and Restoration flows. Alternative C1 includes additional Water Management actions for the recapture of Interim and Restoration flows in the San Joaquin River below the confluence of the Merced River, using existing facilities with potential in-district modifications. This alternative further includes the recapture of Interim and Restoration flows through new infrastructure to increase pumping capacity on the San Joaquin River below the confluence of the Merced River.

A Physical Monitoring and Management Plan is included in Alternative C1 to provide guidelines for observing and adjusting to changes in conditions regarding flow, seepage, channel capacity, propagation of native vegetation, and suitability of spawning gravel. Alternative C1 also includes a conservation strategy consisting of management actions necessary to provide a net increase in the extent and quality of riparian and wetland habitats in the Restoration Area, to avoid reducing the long-term viability of sensitive species, and to be consistent with adopted conservation plans.

<u>Program-Level Effects to ESA-Listed Species:</u>

Effects related to common Restoration and Water Management actions are already covered in the BA and Addendum and will not be discussed further here.

This discussion will focus on program-level effects analysis in relation to Water Management actions identified in Alternative C1 that could recapture Interim and Restoration flows in the San Joaquin River below the confluence of the Merced River using existing facilities, potential in-district modifications, or new infrastructure to increase pumping capacity. The implementation of the planning, design, and construction of new facilities will be an undertaking that requires additional environmental review and will require consultation for ESA-listed species at a currently unknown future date. The location, construction methodology, and operation of these facilities is currently unknown and would need to be evaluated through further analysis.

Recapturing Interim and Restoration flows at existing or modified facilities or the placement of a new pumping facility could cause both short-term, temporary construction-related effects to species in the San Joaquin River as well as effects resulting from the operation of these facilities. The species that may be effected as a result of these program-level recapture actions could include Central Valley steelhead, Central Valley spring-run Chinook salmon, and green sturgeon. Additionally, these types of actions could also result in modifications to Essential Fish Habitat.

Construction-Related Effects to ESA-Listed Species:

Effects to species under NMFS' jurisdiction could occur as a result of the construction or modification to diversion or pumping facilities. These construction-related effects could include: increases in stormwater discharges or turbidity, removal of vegetation, noise, vibration, and other physical changes. Program-level actions related to the construction or modification of water diversion or pumping facilities would abide by all applicable federal and/or state statutes to minimize environmental impacts. Additionally, measures included in the SJRRP Conservation Strategy would be included in construction projects, where applicable. Construction activities may cause short-term water quality changes (including both chemical and physical properties such as contaminant mobilization or temperature changes) and removal of vegetation that could result in negative effects to Central Valley steelhead, Central Valley spring-run Chinook salmon, green sturgeon, or Essential Fish Habitat. Construction activities resulting in noise or vibration could also cause effects to fish behavior or cause adverse effects to fish spawning, incubation, rearing, migration, or foraging. At this time, the full scope of effects to listed species or the components that could be utilized to minimize or reduce program-level effects to species are not currently known and are speculative. Therefore, a determination on the magnitude of the effects is not presented here. Reclamation will continue to coordinate with NMFS in order to consult on future program-level SJRRP actions and to avoid or reduce effects to species.

Operational Effects to ESA-Listed Species:

The long-term program-level operations of new pumping or diversion facilities on the San Joaquin River could result in effects to Central Valley steelhead, Central Valley spring-run Chinook salmon, green sturgeon, or Essential Fish Habitat. Program-level effects from the operation of these facilities could include: changes in flow patterns, flow fluctuations, alterations to temperature, entrainment of fish at unscreened diversions, stress or mortality of fish from contact with fish screens, structural changes that could alter predation, false migration pathways, contaminant mobilization, or other changes that could result in negative effects to listed species. The magnitude of effects to listed species is currently unknown because the information provided for Alternative C1 in the SJRRP PEIS/R is analyzed on a program-level. Effects analysis for each species related to the selection of project locations, the utilization of the facilities, timing, seasonality of use, maintenance, or other similar issues is not available at this time and would be unreasonably speculative. Reclamation will continue to coordinate with NMFS in order to consult on future program-level SJRRP actions and to avoid or reduce effects to species.

2. Hills Ferry Barrier Operation or Removal

In our conversation, you mentioned that because DFG operates and maintains Hills Ferry Barrier (HFB) and because the State of California will decide if HFB is meeting mitigation needs under the Delta Fish Agreement and continues to operate, that Reclamation should address effects to steelhead upon its potential removal or disuse.

HFB is installed in mid-September and removed by mid-December of each year. Central Valley steelhead upstream migration begins in June, peaks in September, and continues through February or March. Fall Interim and Restoration Flows would occur from approximately November 1 to November 11 of each year. Because the peak migration occurs in September, SJRRP flows would be at a steady base flow of 350 cfs or less during this time and there would not be an additional flow that could cause steelhead to stray into the San Joaquin River during the time that HFB would have previously been in-place. The SJRRP would not be releasing flows that could cause an attraction during September and the peak of steelhead migration. Therefore, the SJRRP would not be likely to adversely affect Central Valley steelhead in the absence of HFB.

Thanks,

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SAN JOAQUIN RIVER
RESTORATION PROGRAM