SENT VIA ELECTRONIC COMMUNICATION

June 28, 2012

Ms. Janice Pinero
Endangered Species Act Specialist
United States Bureau of Reclamation
Bay-Delta Office
801 I Street, Suite 140
Sacramento, CA 95814-2536
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RE: Comments on Scope of the Environmental Impact Statement Concerning Modifications to the Continued Long-Term Operation of the Central Valley Project, In A Coordinated Manner with the State Water Project

Dear Ms. Pinero:

The Oakdale Irrigation District ("OID"), South San Joaquin Irrigation District ("SSJID) and the Stockton East Water District ("SEWD) (collectively "Districts") provide the following comments on the scope of United States Bureau of Reclamation's ("Reclamation") environmental impact statement ("EIS") for modifications to the continued long-term operation of the Central Valley Project, in a coordinated manner with the State Water Project, that are likely to avoid jeopardy and destruction of adverse modification of designated critical habitat as described in the March 28, 2012 notice published in the Federal Register ("Notice"). (77 Fed. Reg. 18858-18860).

1. The Scope of the Proposed EIS is Incorrect and Needs to Be Changed.

The Notice indicates that Reclamation operates the Central Valley Project ("CVP") in coordination with the State Water Project ("SWP") in accordance with the Coordinated Operation Agreement ("COA") between the United States and the State of California. (Notice, p. 18858). The Notice goes on to indicate that the proposed action will "address continued operation of the CVP, in conjunction with the SWP…" (Notice, p. 18860) and that the "purpose of the action is to continue the operations of the CVP, in coordination with the SWP, as described in the 2008 Biological Assessment…" (Notice, p. 18859). The New Melones Unit is not operated pursuant to or in accordance with the COA, and is not otherwise coordinated with the operation of other units of the CVP or SWP. As such, the New Melones Unit of the CVP needs to be excluded from the scope of the EIS process being developed by Reclamation.

The Districts asserted in the litigation that the New Melones Unit of the CVP should not be included in the Biological Opinion analyzing the long-term operation of the CVP and SWP. There was no evidence in the Administrative Record supporting the notion that the New Melones Unit is, in fact, operated in a coordinated fashion with other units of the CVP or SWP. To the contrary, the evidence in the Administrative Record, including the 1992 OCAP Biological Opinion, 2004 OCAP Biological Opinion, 2008 OCAP Biological Assessment, and express language of the COA all demonstrated that the New Melones Unit's "operation is not included in the Coordinated Operating Agreement (COA), and it is operated as a separate feature." (2004 OCAP, p. 1-12).

In response, Reclamation submitted a declaration by Mr. Ronald Milligan which included five sentences concerning the New Melones Unit. In those five sentences, without detail or examples, Mr. Milligan asserted that Reclamation typically coordinates operations of the CVP and SWP, including the New Melones Unit. Mr. Milligan did not address how such coordination took place in light of the fact that the operation of the New Melones Unit is not covered by the COA, nor did he explain when such coordination began, which is important since Reclamation concluded in 1992 and 2004 that the New Melones Unit was properly not included in the OCAP Biological Opinion since it was operated as a separate unit. Despite these flaws, the court nonetheless relied exclusively on Mr. Milligan's declaration to determine that inclusion of the New Melones Unit was legally defensible.

To put it nicely, the Districts vehemently disagree with Mr. Milligan's statements and do not believe that they are accurate. First, as noted, Mr. Milligan himself provided no examples or details of coordination. Second, Mr. Milligan's declaration conflicts directly with that of Mr. Paul Fujitani dated September 19, 2005. (An electronic copy can be found here http://www.restoresjr.net/program_library/05-Pre-Settlement/Expert%20Reports/Federal%20Supplemental/Fujitani_Expert_Report9.19.05.pdf, and a hardcopy is attached hereto as Exhibit A). Mr. Fujitani, at the time the Chief of the Water Operations Division in the Central Valley Operations Office, testifying as an expert on behalf of the United States, stated that "The CVP facilities at New Melones and Friant are operated independently to serve their respective divisions of the CVP and are not identified in the COA for water management or accounting purposes." (Fujitani Decl. p. 3). This statement is in accord with the information contained in a PowerPoint presentation prepared by Mr. Fujitani and Reclamation entitled, "Forecasting and Operations Advances from a Reservoir Operator's Perspective." (An electronic copy can be found here http://ebookbrowse.com/fujitani-pdf-d15765075, and a hardcopy is attached hereto as Exhibit B). On page six of this presentation, Mr. Fujitani and Reclamation state "New Melones Dam and Reservoir and Friant Dam and Millerton Lake are part of the CVP, but are not operationally integrated into the CVP."

Third, Mr. Milligan's statements directly conflict with the findings of Reclamation concerning the 1992 and 2004 OCAP Biological Opinions, both of which excluded the New Melones Unit since it was operated as a separate feature and was not coordinated with other elements of the CVP and SWP.

Although Mr. Milligan does not say that Reclamation's typical, daily coordination of the operation of the New Melones Unit and other elements of the CVP and SWP is recent, it must be inferred that such coordination is recent since all prior evidence demonstrates that no such coordination occurred. Assuming Mr. Milligan is correct, and there is typical and daily coordination between the operation of the New Melones Unit and the other elements of the CVP and SWP, Reclamation must demonstrate the time, rationale, and purpose for such change. The Districts, which are intimately familiar with all legal, factual and policy aspects concerning the operation of New Melones, are frankly unaware of any change made by Reclamation which lead to or supports such coordination. Moreover, the Districts are unaware of any instance of coordination, let alone coordination that could be described as "typical" or "daily."

Absent the provision of policies, procedures and facts which demonstrate actual coordination between the operation of the New Melones Unit and the other elements of the CVP and SWP, Reclamation must amend its scope to exclude the New Melones Unit in its EIS. Even if such evidence of coordination can be presented, Reclamation should choose to exclude New Melones and conduct environmental review and a separate biological opinion for New Melones Unit operation. [1]

2. The Project Description and Modeling of Both Baseline Conditions and Conditions Expected Under the Evaluated Reasonable and Prudent Alternatives Must Identify an Operations Plan that Will Work Through the 1928-1934 Drought Sequence.

Reclamation's 2008 BA correctly noted that the 1997 Interim Plan of Operations ("NMIPO") was not designed or intended to establish the permanent operating plan for New Melones. (August 2008 BA, Chapter 2, p. 64). Further, the 2008 BA stated that the drought year sequence used to evaluate risk had changed from the 1987-1992 sequence to the 1928-1934 sequence. (Id.). As a result of these two changes, Reclamation developed a Transitional Operating Plan ("TOP") which utilizes three "allocation bands" for "high allocation years," "mid allocation years," and "conference years." (Id., p. 65, Table 2-11). The problem with the TOP is that the "conference year" contains no rules at all as to how the New Melones Unit will be operated. Indeed, under the "conference year" band, there is no stated plan at all for deliveries to the Districts, water quality objectives, fisheries or other requirements. Instead, in a "conference year," Reclamation "would meet with USFWS, stakeholders,[2] DFG, and NOAA Fisheries to coordinate a

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[1] This is not unusual, as the prior and presumably current effort excluded the operation of Black Butte Reservoir, notwithstanding that its operation is coordinated with the rest of the CVP and SWP. Such exclusion was based on the fact that its operation was covered under a separate biological opinion. (Appendix 1, p. 54).

[2] Reclamation's assumption that OID and SSJID, as stakeholders, will take less water than entitled pursuant to their superior rights as fulfilled by the 1988 Agreement has no basis. The 1988 Agreement was negotiated during the 1987-1992 drought, and the limitations built into it are the only limitations that OID and SSJID will accept. For planning purposes, Reclamation must in all instances assume that OID and SSJID will take all of the water allotted to them via

practical strategy to guide New Melones Reservoir Operations…" (Id. p. 65). This is not an operations plan that can be modeled, evaluated and altered; this is a plan to develop a plan. Moreover, there is no guiding or overarching principle that will inform a "conference year" operation save that it is a "practical strategy."

The Districts understand that the 1987-1992 multi-year drought sequence is an extreme event, estimated to occur once every 200-300 years and, thus, for planning purposes, it is not reasonable to develop an operations plan that will work through this event. That said, since Reclamation has adopted the 1928-1934 multi-year drought sequence for its planning purposes (BA, p. 2-64), it must develop a plan, complete with established rules, which can be successfully-utilized through the 1928-1934 multi-year drought sequence.

Certainly, any operations plan developed is unlikely to work through the 1987-1992 drought sequence, and the use of a "conference year" or other non-specified set of procedures to be determined by coordination of all affected parties is reasonable. However, such "conference years" must be an exception to the operating plan, not part of the operating plan itself. The inclusion of the "conference year" band as part of the TOP itself, instead of as an exception to the TOP, is inappropriate and must be rectified.[3]

When discussing the "conference year" appropriately as an exception to, and not a part of, an operations plan that will work through the 1928-1934 drought sequence, Reclamation must provide more information than stating that the affected parties will work it out. First, Reclamation must identify how often the "conference years" are expected to occur. Second, Reclamation must identify the available deviations from the operations plan that could be considered in a "conference year." This is extremely important since not all deviations are legal or appropriate and some depend upon the actions of third parties.

For example, in the prior litigation it became clear that when NMFS and Reclamation modeled the "conference years," it did so by making a host of assumptions that would require the approval of the State Water Resources Control Board, including the relaxation of the dissolved oxygen requirement at Ripon and waiver on meeting flow requirements at Vernalis. Reclamation should provide a discussion of whether it expects such waivers and relaxations to be granted, and why.

NMFS and Reclamation also assumed that deliveries to the Districts would be less than required under CVP contract and by law. As recent caselaw has confirmed, Reclamation's discretion

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the terms and conditions of the 1988 Agreement. Any other assumption is per se unreasonable and is designed solely to mask the deficiencies of Reclamation's other assumptions.

[3] As a matter of law, there is no way to comply with NEPA absent the development of an accurate baseline condition. (*See*, *e.g.*, Half Moon Bay Fishermans' Mktg. Ass'n v. Carlucci, 857 F.2d 505, 510 (9th Cir. 1988)). In the case of the TOP, there is no "baseline" as by its own terms there simply no way to know how New Melones will be operated in a "conference year," as it is impossible to speculate as to what the various agencies and stakeholders will agree to, if anything.

to limit deliveries to SEWD is extremely limited[4], and is non-existent as to OID and SSJID.[5] Assuming Reclamation may consider reduced deliveries to the Districts as part of any "conference year," it must disclose its lack of discretion and explain under what terms and conditions it would expect the Districts to accept deliveries that are less than they are entitled to by law and contract.[6]

Finally, assuming that the New Melones Unit is integrated with the operation of the rest of the CVP and SWP, Reclamation should identify actions that other elements of the CVP and SWP could take in an effort to achieve water quality and other requirements that Reclamation chooses to meet via the New Melones Unit. While no other element of the CVP or SWP could assist in meeting Reclamation's requirements in the Stanislaus River itself, such elements could be brought to bear to meet or assist in meeting requirements downstream of the confluence of the Stanislaus and San Joaquin Rivers.

Reclamation must develop an actual operations plan that is able, as identified in the 2008 BA, to be successfully-utilized through the 1928-1934 multi-year drought sequence. Such plan must identify the rules by which the New Melones Unit will be operated and be supported by modeling using CalSimII. Without the benefit of a baseline condition, it will be impossible for the agencies to accurately depict not only the environmental impacts, but also to develop and compare the range of alternatives. (*See*, *e.g.*, 40 C.F.R § 1502.14 [The alternatives analysis is the heart of any EIS]).[7] The TOP, which brazenly acknowledges no operating criteria or requirements for "conference years," is legally and factually inadequate. Reclamation must develop, identify and use an operations plan which (1) spells out how the New Melones Unit will be operated in all year types, and (2) is capable of successfully working through the 1928-1934 drought cycle.

3. Districts Have Developed an Operating Plan that Works Through the 1928-1934 Drought Sequence Which Reclamation Should Adopt.

Prior to the development and approval of Reclamations 2008 BA, OID and SSJID jointly developed an operating plan for the New Melones Unit, entitled "New Melones Operating Plan Current Performance and Proposed Transitional Plan." ("Districts' Plan")(A hardcopy is attached hereto as Exhibit "C;" an on-line version can be found here: http://www.savethestan.com/wp-content/uploads/2010/03/New-Melones-Operation-Plan-Current-Performance-and-Proposed-Transitional-Plan.pdf). The Districts' Plan was submitted to Reclamation in 2006, but as of this date,

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4 *See* Stockton East Water Dist. v. U.S., 583 F.3d 1344 (Fed. Cir. 2009), wherein the court found that Reclamation must comply with the terms and conditions of its contract with SEWD, and changes in law or policy did not absolve Reclamation of delivering water to SEWD pursuant to contract.

5 *See* In re Consolidated Salmonid Cases, 791 F.Supp.2d 802, 939 (E.D.Ca. 2011), wherein court states that "neither NMFS nor the Bureau has the discretion to violate [OID and SJID's] water rights."

6 Explaining such assumptions is required to comply with the law. That said, even a well-thought out and thorough explanation of the assumptions will not change the fact that such assumptions do not reflect actual conditions. The Districts intend to take all the water to which they are entitled in accordance with their CVP contract (SEWD) and their prior rights (OID and SSJID). Any assumption that is based upon allocations made to Districts on any other basis will be erroneous.

7 To be valid, an EIS must describe the environmental impacts of the proposed government action, any adverse environmental impacts associated with the proposed governmental action, and alternatives to the proposed action considered by the agency. (Roberts v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989)).

Reclamation has yet to provide any official comment. The Districts have collectively made modifications to the Districts' Plan as a result of the Stockton East Water Dist. v. U.S., 583 F.3d 1344 (Fed. Cir. 2009) litigation in the Federal District Court of Claims (see footnote 4). The Districts' submitted this revision to Reclamation in February 2012 and, to date, Reclamation has yet to provide any official comment (A hardcopy is attached hereto as Exhibit "D").

Using the 1928-1934 drought sequence as its worst-case scenario from a planning perspective, the Districts' Plan is designed and intended to (1) fully comply with OID and SSJID's entitlements under the 1988 Agreement, (2) fully meet all water quality and flow requirements at Vernalis, (3) provide a base instream fishery flow under all conditions, and (4) provide a minimum water allocation for Municipal and Industrial (M&I)- Public Health and Welfare uses to SEWD in all years and other CVP contractors when the New Melones Index exceeds 1400 TAF. The Districts' Plan achieves these goals by first providing an instream schedule for fishery protection, and then adding water on to the fishery schedule if necessary to meet water quality or flow objectives at Vernalis. Second, the Districts' Plan establishes fixed rules for the delivery of water to SEWD and CVP contractors which provides them with some water in all years, including full contractual allotments in wetter years, but which also restricts deliveries for agricultural purposes in the driest years. These deliveries are not strictly compliant with the terms and conditions of the CVP contracts, but for the purposes of finding a workable future operating plan, have the backing and support of SEWD in light of the overall changes to the management of the system which make the system more reliable and which provide SEWD with more water in more years than other operating plans. Third, the Districts' Plan recognizes that Reclamation has no discretion regarding the exercise of OID and SSJID's rights and provides them with water in strict compliance with the terms and conditions of the 1988 Agreement.

The modeling done for the Districts' Plan shows that it will work though the 1928-1934 drought sequence.[8] Significantly, the Districts' Plan results in more water being available for instream flow in dry and successive dry years when compared to the NMIPO or the TOP. The reason for this is that the NMIPO and TOP release significant amounts of water in wet years, reducing the amount left in storage and essentially driving the amount of available water down over time. This was one of the significant problems with the TOP, as modified by NMFS, which "result[ed] in more years under the lower flow conditions and fewer under the higher conditions…" (May 31, 2009 Memorandum from Rhonda Reed to Maria Rea "Determination on the Development of the Reasonable and Prudent Alternatives (RPA) to Avoid Jeopardy to CV Steelhead in the Stanislaus River, Specifically as Relates to Flow and Temperature", attached hereto as Exhibit "E"). Any plan which results in lower/worse flow conditions more often is not one that should be supported by Reclamation[9], particularly when there are demonstrated alternatives which can meet all of the essential needs without increasing the number of low flow conditions.

The flow requirements for CV steelhead in the prior RPAs were based upon the Instream Flow Incremental Methodology ("IFIM") by Aceituno in 1993. (Id., p. 1). The District's Plan is

[8] The Districts' Plan does not work through the 1987-1992 drought sequence.

[9] The National Research Council has recently concluded that dry years are perhaps the most significant problem facing fish species that rely upon the Delta. (Sustainable Water and Environmental Management in the California Bay-Delta (NRC 2012), p. 105.

similarly based, and satisfies Aceituno's proposed flows for maximizing weighted usable habitat for spawning, egg incubation/fry rearing, and juvenile rearing. (*Compare* Districts' Plan, Table 6, p. 10, with Reed Memo, Table 6-16, page 2). For the spring pulse flow to benefit outmigrating smolts, the Districts' Plan proposes to use the same amount of total water as proposed under the TOP, but to provide multiple, short duration pulses in lieu of the sustained 30 day pulse presently called for. The Districts' approach will be based upon real time conditions, will minimize instream losses, will provide a true "high flow" pulse of up to 1500 cfs, and is expected to result in earlier outmigration. (Districts' Plan, p. 17-19). The use of higher rate pulses of shorter duration has been shown to successfully stimulate smolt migration. (Id.).

In regards to temperature, the Districts' Plan achieves the CALFED proposed temperature requirements from approximately mid-November through mid-April of the following year. There are some minor temperature deviations from mid-April through mid-May and again from June through August. While the Districts' Plan does not meet the CALFED temperatures during late May or September through mid-November, the data on smoltification, ambient air temperature, conditions in the Delta and lower San Joaquin River, and observed spawning times, demonstrates that such temperature criteria are either unnecessary, unattainable or not a factor affecting CV steelhead. (Districts' Plan, p. 10-16).

The Districts have done all of the modeling necessary to support their plan, and are satisfied that such modeling demonstrates the superiority of their plan over the NMIPO, the TOP or any other plan considered publicly by Reclamation to date. The Districts recommend that Reclamation adopt the Districts Plan (as revised in February 2012) as the operating plan for New Melones, and that the EIS be conducted using the Districts' Plan as the baseline.

4. If Reclamation Refuses to Adopt the Districts' Plan, Reclamation Must Include an Evaluation of Districts' Plan as An Alternative to the TOP.

The Notice indicates that Reclamation "will develop and consider … a reasonable range of alternatives" and such reasonable alternatives "may include physical changes or *proposed changes in operations of CVP facilities*." (Notice, p. 18860)(emphasis added). If for any reason Reclamation does not adopt the Districts' Plan as its own operations plan for the New Melones Unit, in place of the TOP which is legally and factually deficient, Districts hereby submit that Reclamation must evaluate and consider the Districts' Plan as a reasonable alternative to the TOP. As is discussed in more detail above, the Districts' Plan provides adequate flow for fish, including steelhead, ensures compliance with Reclamations' permit requirements at Vernalis, provides water to CVP contractors on a more reliable and frequent basis, respects prior water rights of OID and SSJID, and works through the 1928-1934 drought. The Districts' Plan is technologically feasible, economically feasible, has stakeholder support, is within the authority and jurisdiction of Reclamation to implement, and meets Reclamation's stated needs.

5. Other Items.

A. Reasonable Alternatives Must Not Involve Limitations in Water Use By The Districts Which Are Beyond Reclamation's Discretion and Which Are Not Supported By Facts.

When discussing the New Melones Unit, Reclamation must identify with particularity those items that it has discretion over. In the prior litigation, Reclamation failed to do so, and NMFS assumed that any and all deliveries, including those to the Districts, were discretionary. Such assumption was incorrect, but needless time and energy was wasted by all involved. To avoid a repeat, Reclamation must make it clear that it has no discretion over the amount of water OID and SSJID are entitled to, and that its discretion over deliveries to SEWD is severely limited based upon recent interpretation of the terms and conditions of SEWD's CVP contract.

When preparing its EIS, Reclamation must not use or rely upon any future study, such as the 2030 land use study, or prior occurrence, that suggests that OID and SSJID will not consumptively use all of the water allotted to them. Usage within the Districts is changing to more permanent, tree-based agriculture, which require a consistent supply of water regardless of the year-type. Further, the Districts are expanding their boundaries and transferring more water. There is no basis upon which Reclamation can reasonably claim that OID and SSJID's overall usage in future years will be reduced, or that OID and SSJID will agree to "share the pain" in any dry or critically dry year type.

Indeed, when conducting its alternatives analysis, Reclamation must reject any alternative that proposes to restrict, cut or otherwise reduce deliveries to OID and SSJID in any fashion not expressly identified in the 1988 Agreement, or that proposes to restrict, cut or otherwise reduce deliveries to SEWD in any fashion not expressly called for in its CVP contract. Reclamation simply has no discretion over these items and it is misleading at best and disingenuous at worst, to identify a "reasonable alternative" that includes such limitations.

B. Temperature Modeling Done Must Be Done Using the Best Available Science, Which For the New Melones Unit Is the San Joaquin River Water Temperature Model.

For the prior BA and RPAs, Reclamation used a substandard model to predict and evaluate temperature. Reclamation's temperature model, with only a mean monthly temperature capability, was totally inappropriate to model and evaluate the ability of a plan to meet a seven day average daily maximum temperature. The use of such sub-standard model was based upon the alleged unavailability of the San Joaquin River Water Temperature Model. Without re-hashing the circumstances surrounding that claim, such unavailability does not now exist. To meet its legal requirement to utilize the best available science and data, Reclamation must use the San Joaquin River Water Temperature Model by Avry Dotan and Resource Management Associates. If Reclamation has any issues or concerns with the availability of the model or is in need of assistance with running the model, it can contact the Districts who will make sure that such availability and assistance are provided.

C. Reclamation Cannot Utilize or Rely Upon Any Salmon Model Developed By the California Department of Fish and Game, Nor Any Data or Studies that Are Based Upon Such Modeling.

The California Department of Fish and Game ("DFG") has been working on a model predicting the relationship between flow and salmon smolt survival for several years now. Version 1.0, developed in 2005, was subjected to heavy peer review criticism and resulted in the development of Versions 1.5 and 2.0. However, neither of those versions has been subjected to peer review. Nonetheless, DFG and other researchers continue to use the salmon model and rely upon the data generated by such model. In the absence of any peer review, reliance on such models, or studies that rely upon such model, is per se unreasonable. Reclamation must not use the salmon model directly, nor rely upon any study, paper, data or report that is derived, in whole or in part, from the use of such model.

Very truly yours,

O'LAUGHLIN & PARIS LLP

WILLIAM C. PARIS, III

HERUM\CRABTREE

KARNA E. HARRIGFELD

WCP/tlb
Attachments
cc: Oakdale Irrigation District—Steve Knell, General Manager
South San Joaquin Irrigation District—Jeff Shields, General Manager
Stockton East Water District—Kevin Kauffman, General Manager

EXHIBIT
“A”

Expert Report of Paul Fujitani
Central Valley Project Operations

1. Introduction and Summary of Opinions

I have been identified as an expert by the U.S. Department of Justice to provide testimony in *NRDC v. Rodgers*. I have been asked to express my opinion on the effects to Central Valley Project (CVP) operations if the Friant Division of the CVP were to be operated or managed in the manner proposed by NRDC experts to restore the San Joaquin River.

NRDC has proposed that Friant Dam be reoperated and releases be made from Millerton Lake to assist with the restoration of the San Joaquin River. It is my conclusion that very little of the incremental increase in flow down the San Joaquin River would make it past Mendota Dam to the confluence of the Merced River and even less as far downstream as Vernalis. CVP water users on the west side of the San Joaquin Valley and those served by New Melones Reservoir could potentially see water supply benefits as a result of additional flow in the San Joaquin River. However, due to current physical and institutional constraints it is unlikely that users in the Friant Division could fully recover the water supply impacts.

2. Professional Qualifications

I have been employed by the Bureau of Reclamation for approximately 22 years and have served as the Chief of the Water Operations Division in the Central Valley Operations Office since July 2000. As Chief of the Water Operations Division I am responsible for directing the flood control operations, water operations forecasts, water supply allocations, and the daily water operations of the CVP. The Water Operations Division operates the CVP to meet multipurpose project objectives while ensuring compliance with the contractual agreements, laws and regulations, water rights, and environmental obligations. Operations are coordinated with other agencies in California to meet the common goals of improving water supply reliability, improving water quality, and protecting and enhancing the environment. My duties include participating in the CALFED Operations Group and the Water Operations Management Team.

I began my career with Reclamation in 1979 with a Bachelor of Science degree in Civil Engineering from the University of California at Davis. I worked in the Division of Design and Construction and in the Division of Water and Power Resources Management before leaving the government in 1986. I worked for the engineering consulting firm of Brown and Caldwell managing various water projects and performing hydraulic analyses. In 1988, I returned to government service and joined the Corps of Engineers. While with the Corps of Engineers, I served as the Project Manager for the construction of a major water storage project in Utah. In November of 1989, I returned to Reclamation joining the Central Valley Operations Office as a hydraulic engineer.

I am a registered Professional Civil Engineer in the state of California, license number C34667.

I am serving as a rule 30(b)(6) witness on behalf of the United States for the case Stockton East Water District vs. United States currently in the United States Court of Federal Claims, and have submitted depositions in this case (Case 04-541L).

3. Data and Other Information Considered by the Witness in Forming Opinions

In forming the opinions set forth herein and in preparing this expert report, I relied on my 22 years of experience working for Reclamation, 16 of those years operating and supervising the water operations of the CVP. This includes coordinating operations with the State Water Project (SWP) and numerous local water projects that are related to our CVP operation. I also reviewed the following materials:

1. Bureau of Reclamation (June 30, 2004) Long-Term Central Valley Project Operations Criteria and Plan, CVP-OCAP
2. California State Water Rights Control Board Revised Water Rights Decision 1641 (D-1641) (March 15, 2000)
3. Agreement Between the United States of America and the State of California for the Coordinated Operation of the Central Valley Project and the State Water Project (also known as the COA) (1986)
4. Bureau of Reclamation, New Melones Reservoir Interim Plan of Operations (May 1997)
5. Public Law 102-575, Title 34 Central Valley Project Improvement Act (1992)
6. Department of Interior, Decision on Implementation of Section 3406(b)(2) of the Central Valley Improvement Act (May 9, 2003)

4. Discussion

This section will provide a brief description of the CVP features and operations. To the extent possible, I will then discuss how additional flow in the San Joaquin River from Millerton Lake as described by the NRDC experts could affect the operations of the CVP.

Description of the CVP

The CVP encompasses a vast area and stretches from Trinity Lake in northern California to Bakersfield in the southern San Joaquin Valley. The CVP is made up of several smaller project areas known by division or unit. The Divisions/Units include the Trinity River Division, Shasta Division, Sacramento River Division, American River Division, Delta Division, West San Joaquin Division, San Luis Unit, San Felipe Division, East Side Division, and the Friant Division.

The CVP is composed of some 20 reservoirs with a combined storage capacity of more than 11 million acre-feet, 11 powerplants, and more than 500 miles of major canals and aqueducts. Major facilities include Trinity Dam and Lake, Whiskeytown Dam and Lake, Shasta Dam and Lake, Folsom Dam and Lake, New Melones Dam and Reservoir, Contra Costa Pumping Plant and Canal, Friant Dam, Millerton Lake, San Luis Dam and Reservoir, Tehama-Colusa Canal, Tracy Pumping Plant, Delta-Mendota Canal (DMC), O'Neill Forebay, Pacheco Pumping Plant, and the San Luis Canal (Figure 1).

Authorized CVP purposes include flood control; river navigation; water supply for irrigation and municipal and industrial uses; fish and wildlife protection, restoration, and enhancement; and power generation.

The Central Valley Operations Office (CVOO) has the responsibility to perform the necessary duties to direct operations of most of the CVP. One exception is the Friant Division. The South Central California Area Office of the Mid Pacific Region located in Fresno operates the Friant Division facilities of the CVP, which include Friant Dam, Millerton Lake, the Friant Kern Canal, and Madera Canal.

CVOO operates the CVP to meet authorized purposes, consistent with facilities identified in the COA for water management and accounting purposes to meet the project demands within the Sacramento Valley Basin and the Sacramento-San Joaquin River Delta demands. The CVP operations are also coordinated with the operations of the SWP (The SWP is owned and operated by the Department of Water Resources). The CVP facilities at New Melones and Friant are operated independently to serve their respective divisions of the CVP and are not identified in the COA for water management or accounting purposes.

The CVP and SWP share the responsibility of meeting Sacramento Valley in-basin demands, including the Delta water quality objectives contained in D-1641. The COA is used to determine each project's share of responsibility for meeting the daily in-basin demands. If the releases from the CVP and SWP reservoirs and unregulated flow in the Delta approximately equal the water supply needed to meet Sacramento Valley in-basin uses, plus exports, the Delta is considered to be in "balanced" conditions as addressed in the COA. If releases from the projects' reservoirs and unregulated flow exceed the Sacramento Valley uses, plus exports, then the Delta is considered to be in "out of balance" or "excess" conditions. Typically, the Delta is in excess condition from about December through May, and balanced condition from June through November. This timing varies depending on the particular hydrologic conditions that exist at a given time.

An incremental change in the release from Millerton Lake to the San Joaquin River could directly affect CVP operations in the Friant Division area, and could affect operations in the Delta at Tracy pumping plant, operations of the DMC and the Mendota Pool (operations coordinated with Central California Irrigation District), or operations at New Melones Reservoir. To the extent that the proposed incremental release is not diverted at Mendota Pool or "absorbed" through operations of New Melones Reservoir, there is also the potential for some incremental impact to the northern storage reservoirs of the CVP if the Delta is under balanced conditions; this would be a potential incremental increase in storage and later release to meet Delta or in-basin demands.

Delta Operations

The COA accounting currently does not recognize or credit releases from either New Melones Reservoir or Millerton Lake as CVP releases, and therefore both the CVP and SWP share any water from these CVP facilities that reach the Delta. The CVP's ability to capture and utilize available flow from the San Joaquin River (including any release from New Melones Reservoir or Millerton Lake) may also be limited by D-1641 objectives controlling operations at the time and Tracy pumping plant capacity. Under excess Delta conditions, any additional water released from Millerton Lake that makes it to the Delta would only add to Delta outflow. Under balanced conditions any incremental increase in release from Millerton Lake that makes it to the Delta could be pumped by the SWP or CVP, or backed into reservoir storage.

Delta-Mendota Canal and Mendota Pool Operations

CVP water is conveyed from Tracy pumping plant to the O'Neill Forebay and Mendota Pool via the Delta-Mendota Canal (Figure 2). The San Luis Delta Mendota Water Authority (SLDMWA) operates the Delta-Mendota Canal under Reclamation's direction. Mendota Dam, which impounds water to form Mendota Pool, is owned and operated by Central California Irrigation District (CCID). CVP water is released from the DMC into Mendota Pool for delivery to CVP water service contractors and San Joaquin River Water Rights Exchange Contractors (Exchange Contractors). During high flow years, Mendota Pool also receives water from the San Joaquin River and Fresno Slough. The SLDMWA receives water delivery schedules and Mendota Pool operational data from CCID and delivers CVP water from the DMC to meet Mendota Pool demands that are not met by other flow entering the pool. CCID manages the water elevation of Mendota Pool by balancing demands with the inflow from the Delta Mendota Canal, Fresno Slough, and San Joaquin River. As currently operated, additional San Joaquin River flow entering Mendota Pool for NRDC's proposed restoration purposes would most likely result in assisting to meet Mendota Pool demands and less CVP water would be released from the DMC to the pool, absent an agreement between Reclamation and the Exchange Contractors to coordinate operations such that the objective flow would pass Mendota Dam.

There would be no net change in the release from Mendota Pool to the San Joaquin River unless the inflow from the San Joaquin River exceeds Mendota Pool demands. The CVP water remaining in the DMC as a result of an increased San Joaquin River flow could end up as additional water supply for delivery to CVP contractors on the west side of the San Joaquin Valley if conveyance capacity, storage, and demand are adequate.

Typically, CVP contractor demands in the San Joaquin Valley begin to increase substantially in April and continue at a high level through the middle of August.

Water entering Mendota Pool is a combination of flow from the San Joaquin River, flow from Fresno Slough, irrigation return flow, and water pumped from the Delta and delivered via the DMC. In addition to water pumped from the Delta, the DMC receives water released from San Luis Reservoir and O'Neill Forebay. Water pumped from the Delta is a mix of Sacramento River water, water from Cosumnes River, Mokelumne River, Calaveras River, San Joaquin River, and runoff from other small streams.

New Melones Reservoir Operations

New Melones Reservoir is operated to meet flood control requirements and the demands of prior water rights holders in the Stanislaus River basin, Stanislaus River instream fishery flow, Vernalis water quality objectives, Vernalis flow objectives, Ripon dissolved oxygen objectives, and deliveries to east side CVP contractors. Reclamation operates New Melones Reservoir to meet a Vernalis water quality electrical conductivity objective on the San Joaquin River of 0.7 mmhos/cm from April through August and 1.0 mmhos/cm from September through March. We also operate for the San Joaquin River minimum flow objective at Vernalis from February through June. Depending on the time of the year and hydrologic conditions, the minimum release from New Melones Reservoir to the Stanislaus River may be constrained by the Vernalis water quality objective, Vernalis flow objective, Ripon dissolved oxygen objective, or the required instream fishery flow.

If the New Melones Reservoir release to the Stanislaus River is controlled by the need to meet either the Vernalis water quality or flow objective, changes in San Joaquin River flow can potentially affect the reservoir release and storage in New Melones Reservoir. If the incremental release from Millerton Lake to the San Joaquin River results an incremental increase in San Joaquin River flow between the confluence of the Stanislaus River and Vernalis, Reclamation could reduce the release from New Melones Reservoir and still meet the Vernalis water quality or flow objectives. Conserved water in New Melones could be used to increase the operational flexibility in New Melones Reservoir and add to the available water supply from the reservoir. If New Melones Reservoir is operated in this manner, only a portion of the incremental Millerton Lake release would make it to the Delta. At times in the past under extremely dry conditions, Reclamation has been unable to meet either the Vernalis flow or Vernalis water quality objective. Under these conditions, Millerton Lake releases could assist in meeting the Vernalis objectives and no changes in New Melones Reservoir operations would occur.

It is possible that the additional release from Millerton Lake necessary to restore the San Joaquin River as proposed by NRDC could delay or reduce the amount of release from Millerton Lake previously made for flood control purposes. Additional modeling studies of Millerton Lake operations would be necessary to determine potential impacts of NRDC's proposal to flood releases. A reduction or delay in release from Millerton Lake for flood control purposes could have the effect of a loss of available water to downstream users such as in Mendota Pool and could also increase the demand on New Melones Reservoir. If a reoperation would result in less release from Millerton Lake at a time when there is a need for New Melones Reservoir releases to meet the Vernalis flow objective, additional releases from New Melones could be needed to compensate for the loss of flow.

Conclusions

Water released from Millerton Lake that might make it to Mendota Pool as proposed by NRDC would in most instances and in all likelihood be utilized by Exchange Contractors and would not make it past Mendota Dam, and therefore would fall short of satisfying the full restoration objective of connecting to the confluence of the Merced River.

Additional restoration flow in the San Joaquin River that makes it to the confluence with the Stanislaus River could benefit or adversely impact water supply in New Melones Reservoir. Additional modeling studies could assist in determining potential impacts to New Melones Reservoir water supply.

Additional restoration flow that makes it to the Delta could either benefit the water supply of the SWP and the CVP, or could flow out through the Delta to San Francisco Bay. This is dependent on the timing and quantity of flow reaching the Delta.

Under some adverse hydrological years, Reclamation may not have to ability to fully meet either the Vernalis water quality or flow objectives. If additional releases from Millerton Lake as proposed by NRDC flow past Mendota Dam, past the confluence with the Stanislaus River as far as Vernalis, the incremental increase in flow could assist in attaining the Vernalis objectives.

Under current operational practices, a release from Millerton Lake to the San Joaquin River may increase the available water supply to CVP users on the west side of the valley, SWP users, and contractors utilizing New Melones Reservoir.

It is my opinion that with the current and existing physical facilities and under current institutional constraints, the affected Friant users would not fully recover the lost water supply.

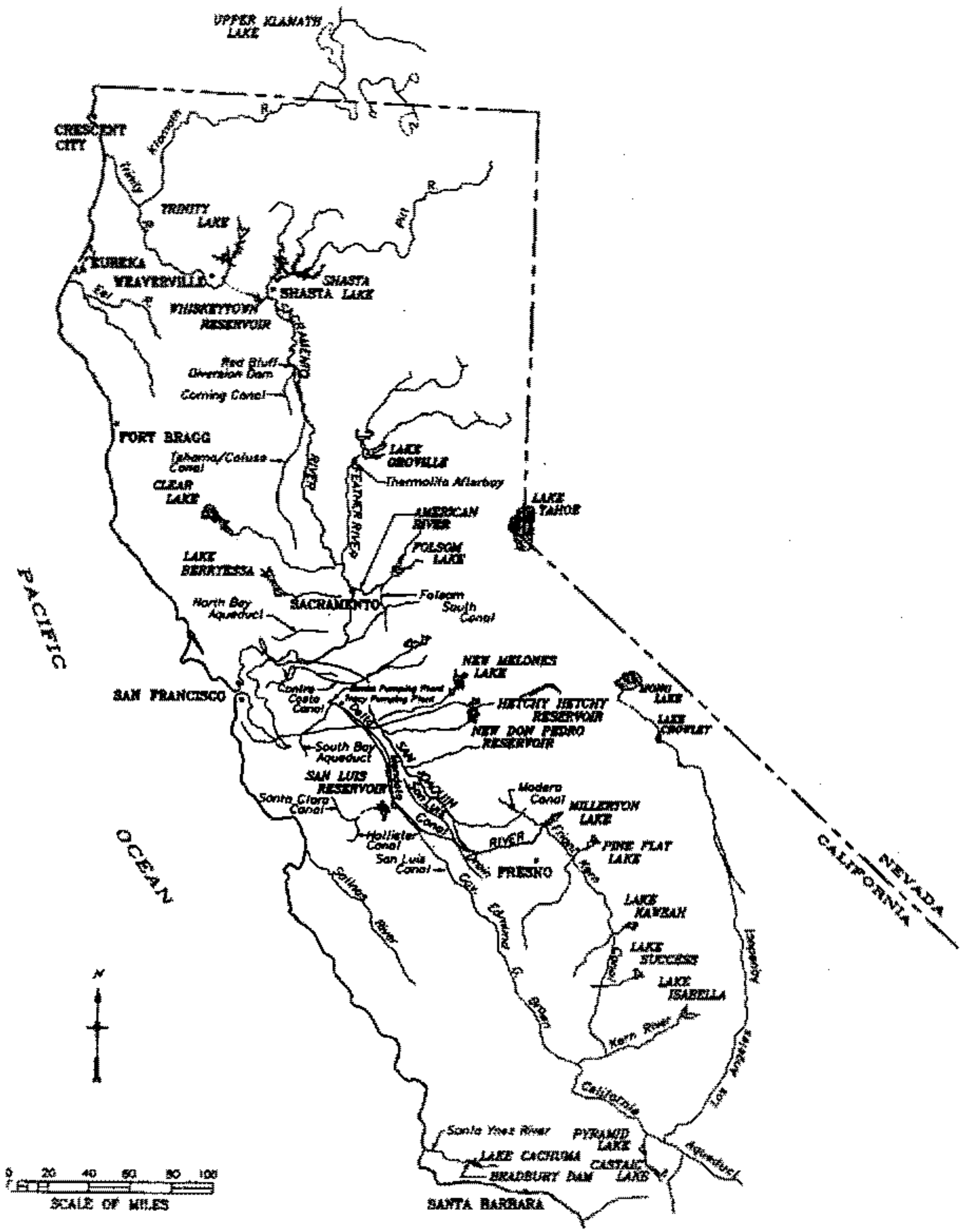


Figure 1 Major Components of the CVP including State Water Project

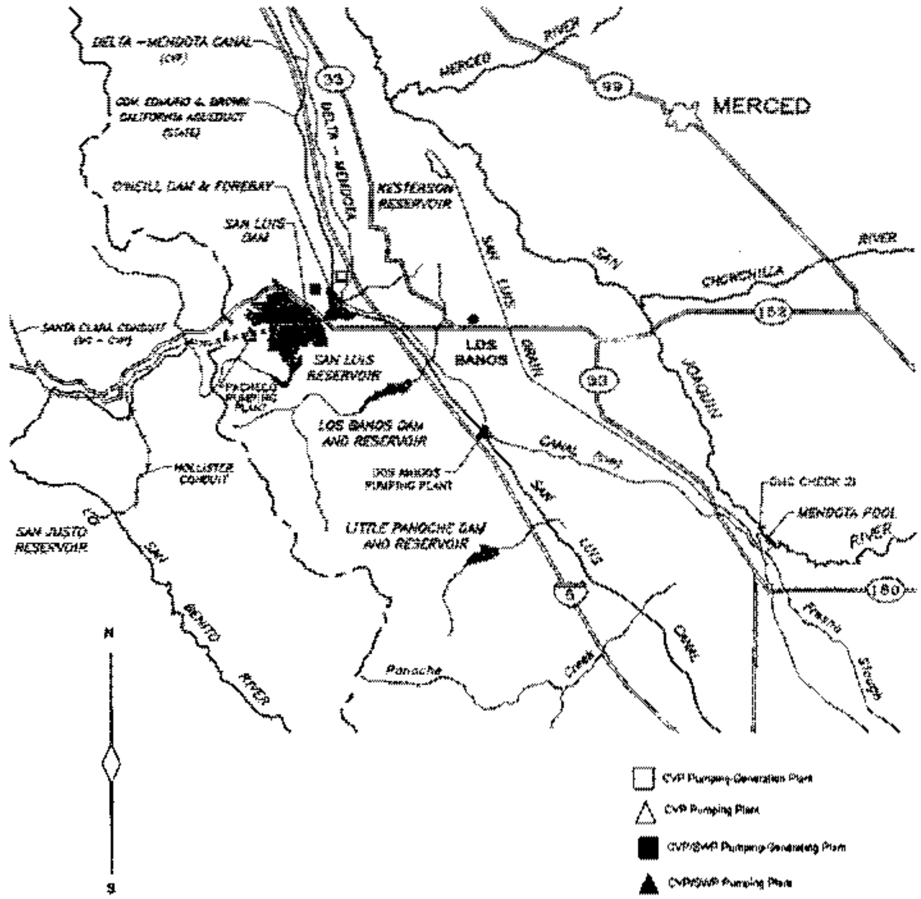


Figure 2. West San Joaquin Division and San Felipe Division

Dated: September 19, 2005

Paul Fujitani

Appendix A

Paul Fujitani

Current Position

Chief Water Operations Division, Central Valley Operations Office, Mid- Pacific Region, Bureau of Reclamation

Academic Background

University of California at Davis
Davis, California
Bachelor of Science, Civil Engineering
Graduated: June 1979, Honors

Professional Registration and Memberships

Registered Professional Civil Engineer, Number C34667, California Board of Professional Engineers

Member of Tau Beta Pi, Engineering honor society

Work History

2000 to Present - Chief of the Water Operations Division, Central Valley Operations Office, Bureau of Reclamation, Sacramento – Responsible for responsible for directing the flood control operations, water operations forecasts, water supply allocations, and the daily water operations of the CVP.

1989 to 2000- Hydraulic Engineer, Bureau of Reclamation, Sacramento - Responsibilities include directing and monitoring the water control activities to provide for the management of the water resources of the Central Valley Project; a system of dams, powerplants, canals, and pumping plants in California. Performing operational studies and analyses necessary for the coordination and operation of the Central Valley Project.

1988 to 1989 - Civil Engineer, Army Corps of Engineers, Sacramento - Project Manager responsible for the overall management of the Little Dell Lake flood control project in Utah, including developing and implementing project design schedules and budgets, coordination of work, and serving as the point of contact with the local sponsors.

1986 to 1988 - Civil Engineer, Brown and Caldwell, Sacramento - Project Manager and Engineer responsible for various civil works projects, including Napa River flood evaluation, waste water treatment facility design, water treatment facility design, and storm drainage system design and construction management.

1979 to 1986 - Civil Engineer, Bureau of Reclamation, Sacramento - Civil Engineer in the Design Branch and Water Operations and Maintenance Branch. Responsibilities included performing operations and maintenance reviews of major water storage and conveyance facilities, administering the Regional Oil Spill and Hazardous Substance Spill and Countermeasure Program, designing various water conveyance facilities, and preparing plans, specifications, and cost estimates for construction of water conveyance facilities.

EXHIBIT
“B”

RECLAMATION

Managing Water in the West

Forecasting and Operations Advances from a Reservoir Operator's Perspective

U.S. Department of the Interior
Bureau of Reclamation

Forecasting and Operations Advances from an Operator's Perspective

- Introduction to Central Valley Project Features and Operations
- Co-location of NWS, DWR, and RFC
- Product and Tools
- Impacts to CVP Operations
- Future of Operations forecasts
- Challenges

RECLAMATION

California Water Projects

- Central Valley Project
- State Water Project
- Local Water Districts

RECLAMATION

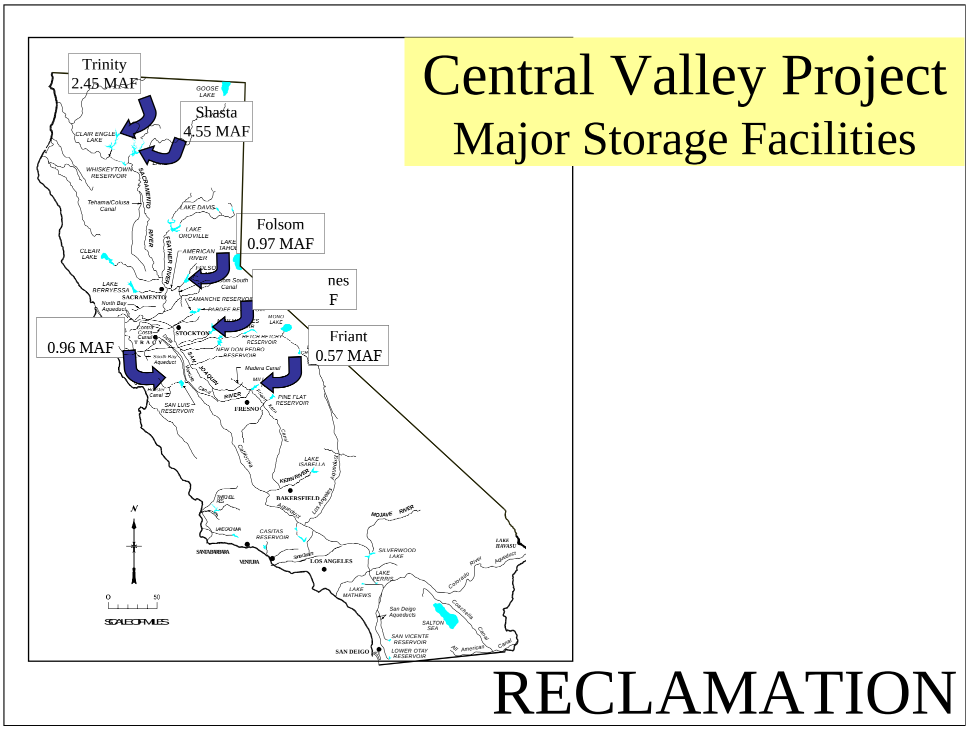
- Three major types of water projects in California
- Federal Central Valley Project (CVP)
- State of California State Water Project
- Numerous local irrigation districts and water districts

CVP Water Summary

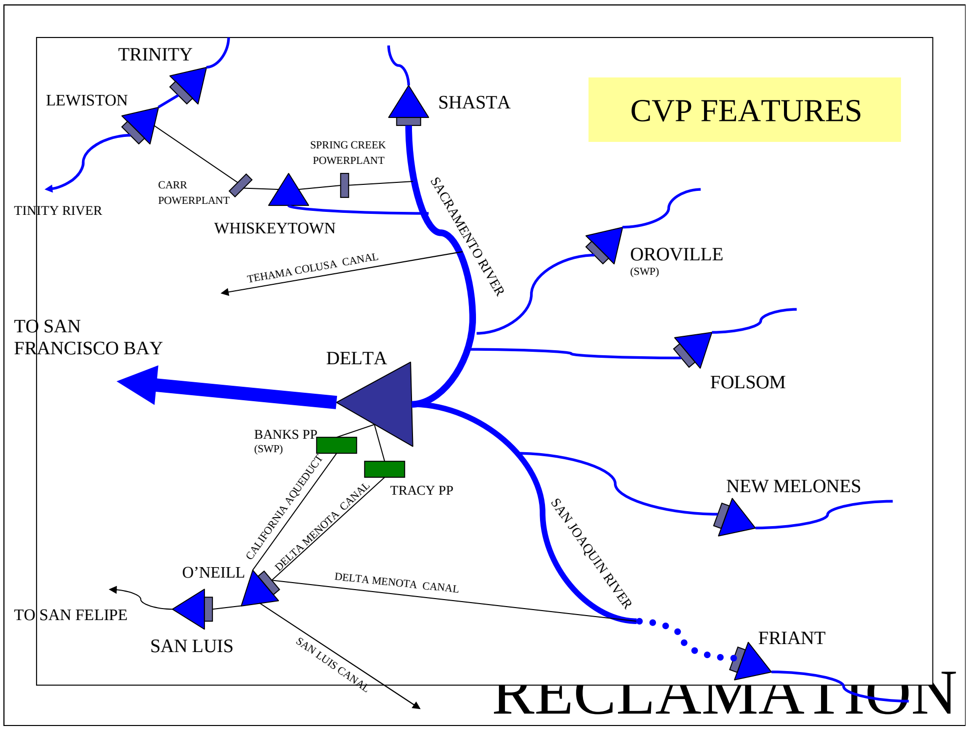
- 20 Dams and Reservoirs
- 500 Miles (800 Kilometers) of Canals
- 11 Powerplants
- 10 Pumping Plants
- 20 Percent of State's Developed Water Supply (about 7 million acre-feet, 8.6 billion cu meters)
- 30 Percent of the State's Agricultural Supply (about 3 million acres of farm land, 1.2 mil hectares)
- 13 Percent of State's M&I Supply (about 2 million people served)

RECLAMATION

- CVP facts



- The CVP is the nation’s largest water development project.
- The CVP stretches from the Cascade Range in Northern California to the southern San Joaquin Valley.
- 6 major storage reservoirs



- Schematic of the CVP
- The CVP consists of major storage facilties, power plants, pumping plants, canals, and distribution systems.
- The project utilizes rivers to convey water to the Delta where project water is pumped into the Delta-Mendota Canal for storage and delivery in the San Joaquin Valley, San Benito County, and Santa Clara County.
- CVP water is also delivered to Contra Costa Water District in the East Bay area
- New Melones Dam and Reservoir and Friant Dam and Millerton Lake are part of the CVP, but are not operationally integrated into the CVP.
- San Luis Reservoir, San Luis Canal, and Dos Amigos Pumping Plant are jointly owned and operated with the State Department of Water Resources.
- The CVP and SWP share the responsibility to meet the in-basin needs of the Sacramento Valley and Sacramento-San Joaquin River. This includes Delta water quality and flow objectives and Sacramento River diversions.

CVP Project Objectives

- Water Supply
- Flood Control
- Environmental Requirements
- Power Generation
- Recreation

RECLAMATION

- The CVP is a multipurpose project with often conflicting objectives.
- Maximize storage for irrigation, municipal and industrial, and refuge water supply.
- Vacate reservoir for flood protection.
- Provide adequate instream flow, cool water, minimum flow fluctuations, and attraction and pulse flows for the fishery
- Provide flow to protect Delta environment.
- Generate power to pump project water and for sales to customers
- Provide for reservoir and river recreation

CVP Operations Forecast

- Short Range Forecasts
  - Flood Operations
  - Delta Operations
  - Instream Flow Requirements
    - Temperature
    - Flow
- Mid-Range Forecasts
  - Instream Flow Considerations
  - Delta Operations
  - Reservoir Fill Management
  - Water Accounts
- Long-Range Forecasts
  - Seasonal Planning
  - Water Allocations
  - Reservoir Storage Objectives
  - Water Accounts

RECLAMATION

- Reclamation generally uses three types of forecasts to plan and operate the CVP.
- Short range weather, stream flow, and tidal forecasts are used for real time and daily decisions on flood control operations, releases for Delta water quality and export demands, and instream flow needs such as water temperature for fish habitat and minimum fishery flow.
- Medium range (3 to 5 day) forecasts are used to plan Delta needs, flood control operations, reservoir fill management, instream flow needs, power use and generation, and other water accounting.
- Long range forecasts (1 month to 12 months) are used in the seasonal planning of the CVP operations. These are used to determine water allocations to users, plan reservoir operations and carryover targets, plan and coordinate water operations and accounting, and plan power use and generation.
- This discussion will focus primarily on the short to medium range forecasts. A quick inspection of recent seasonal reservoir inflow projections the past five years compared against projections made in the early 1980’s did not show any readily apparent improvements. Improvements have surely been made but these are probably hidden due to the limited data set analyzed and the many factors that can influence runoff forecasts from year to year.

Co-Location with DWR, NWS, and RFC

- Joint Operations Center
- Communication internal and external
- Sharing Data
- Staffing and Interagency Cooperation

RECLAMATION

- One of the most significant improvement to planning and operations the CVP is the co-location of Central Valley Operations Office (CVO) with the Department of Water Resources, and the National Weather Service.
- Prior to 1995 CVO was located at the Federal building on Cottage Way while DWR and NWS were located in the downtown Sacramento in the Resources Building.
- CVO had one meteorologist as a member of the staff.
    - Served as a liaison between the operations center at the Resources building and CVO
    - Provided weather briefings and inflow forecasts to CVO
    - Provided CVO with his interpretation of upcoming events
- Since co-location with DWR and NWS at the JOC in 1995, we have had coordinated briefings and unlimited access to RFC
    - Personal contact with meteorologists and hydrologists as opposed to reading a bulletin
    - Benefits of interpretations from numerous models
    - Free flow of information to and from the RFC
- Direct line to CDEC system, eliminates delays from heavy internet traffic
- Coordination of reservoir releases and information on release plans
- Basin-wide, we now have ready access to real time information on unusual conditions in the river system via internet and cell phones

Products and Tools

- Similar documents but improved detail and accuracy
  - Forecast of smaller basins
  - Extended days
- Climate data
- Access to numerous forecasts
- Satellite and radar real time
- Hand prepared tables vs spreadsheet and computer use

RECLAMATION

- Looking back Sac Bulletin is still a Sac Bulletin, QPF still the same basic QPF, 3 day inflow forecast still 3 day inflow forecast, zonal weather forecast still zonal weather forecast...BUT….
  - Small basins identified and forecasted
  - Have more detailed forecast information, 3 day forecast is now extended to 5 days, 10 day forecast with fair level of confidence
  - More forecasted impaired runoff forecasts
  - Electronic transfer of inflow forecasts
  - Frequent updates on QPF and inflow forecasts during severe weather
- More climate data (long range forecasts) available today with more confidence in ability to predict long range trends. Eg. El Nino conditions
- Daily briefings often present various model output providing a broader perspective of potential events. Numerous models are also available on internet.
- Real time satellite and radar images available for operators adding much more information than past single point or station information. Nothing like seeing a line of orange or red on a radar image working the way toward your reservoir.
- A review of reservoir routings performed in 1986 finds pages of handwritten spreadsheets showing a single scenario. The capabilities that the personal computer have added are huge. Data can be loaded in an instant and dozens of potential scenarios reviewed. Historical storms events can be modeled easily.

Impacts to CVP Operations

- Improved accuracy and detail in planning operations
- Improved water supply
- Improved power generation
- Improved public safety
- Improved scheduling of outages
- Reduced fishery impacts - flow fluctuations, peak flow, larger cold water pool, sustaining instream flows
- Reduced high flow impacts from flood release
- Improved dissemination of information over internet

RECLAMATION

• Difficult to discern actual impact to operations, but benefits are there. It is difficult to create a base case with so much influencing the CVP operations and decision making process.

• Generally, improved planning of operations and operation of the facilities.

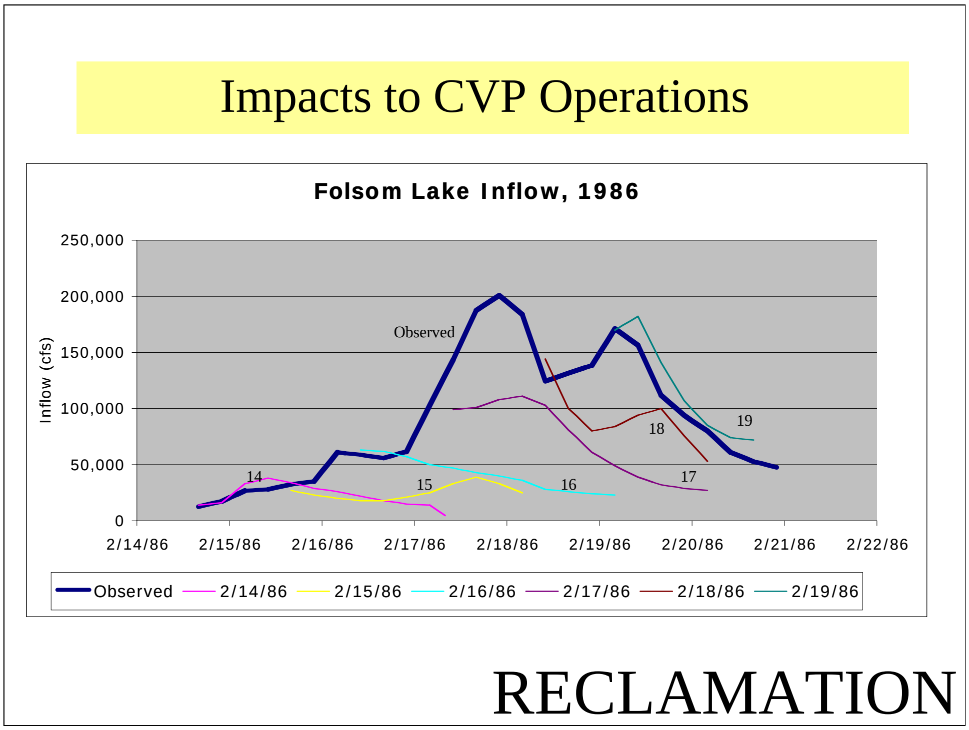
• Leads to enhanced ability to meet project objectives - water supply, power generation, improved public safety

• Improved planning assists in scheduling facility maintenance and system outages

• Improved flood operations assists in minimizing project impacts to the fishery by reducing flow fluctuations, reducing peak flow (debate on high flow benefits for river channel), developing larger water supply and cold water pool, and adding certainty to sustained instream flow

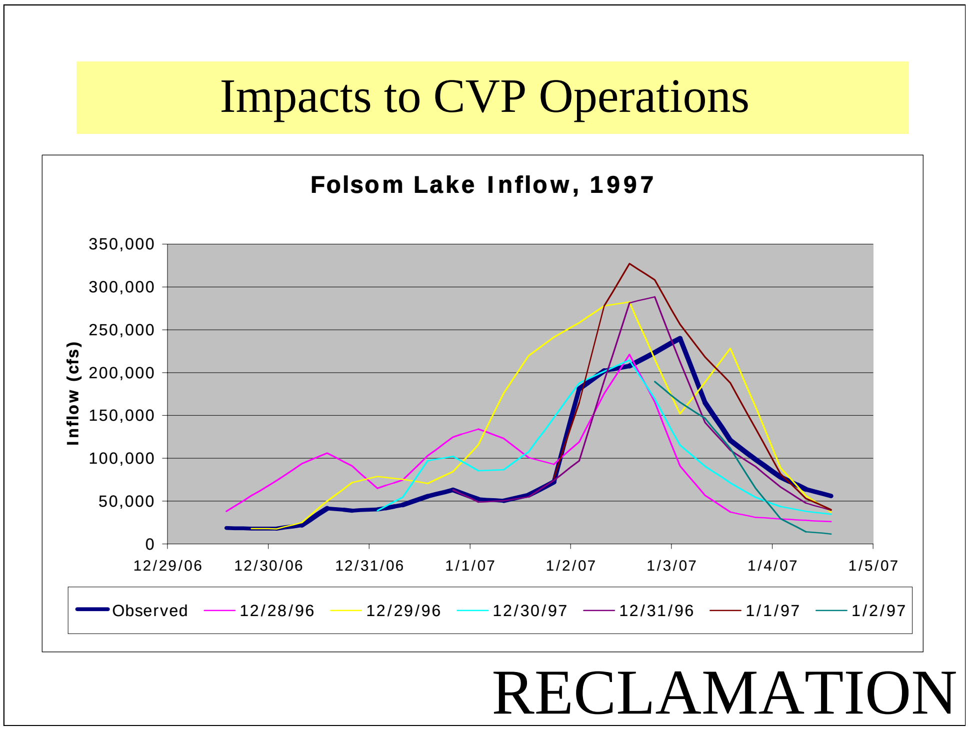
• Flood control diagrams often specify that once a reservoir is encroached, the release should match inflow and be maintained until the reservoir is out of encroachment. Improved forecasting can help us improve on this by allowing the operator minimize the peak release.

• Internet use has created a vast source of information for not only the operator but also for the general public. Now, the public has almost instant access to weather information as well as reservoir operations and streamflow data.

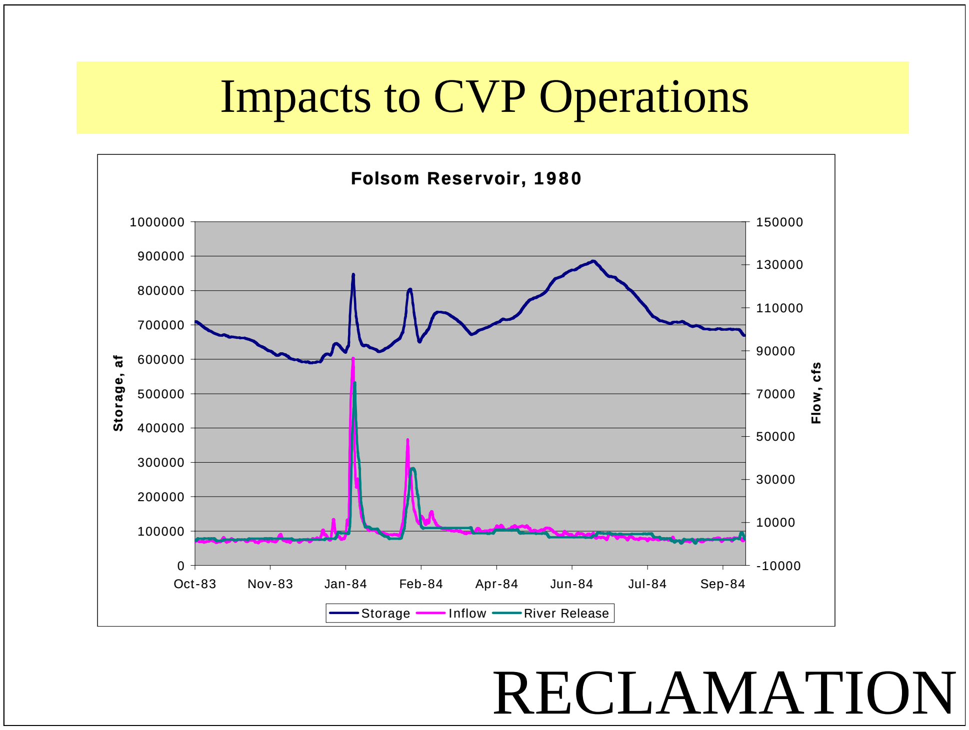


Forecast Data and Other Observations

- Folsom inflow forecast for 1986 flood from CVO files
- Typical 3 day forecast
- Consistently under forecast the peak inflow for this event

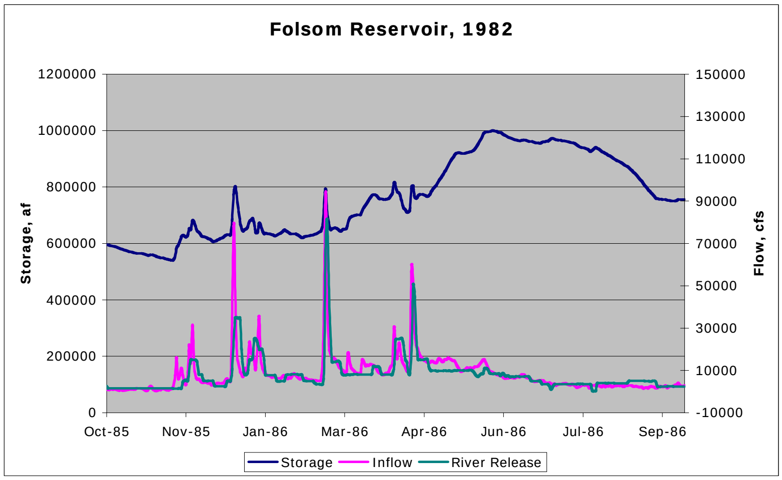


- 1997 New Year Flood event
- Increased number of days forecast with a good level of accuracy, 5 days in advance
- Predicted general shape and magnitude of the storm event a few days in advance. This is important in the amount of time it provides for operators prepare for the upcoming flood operation. Ensure that reservoir storage is at the proper level, check equipment and facility status (gates, generators/turbines, spillways), prepare staffing, coordinate with local agencies



- Typical reservoir operation from 1980
- Difficult to determine exactly the basis the decisions related to the reservoir operations without some serious analysis of historical data. But, note the quick efficient release response to inflow when encroached and the fluctuation of release flow in response to changing inflow. Reservoir release was near peak daily inflow

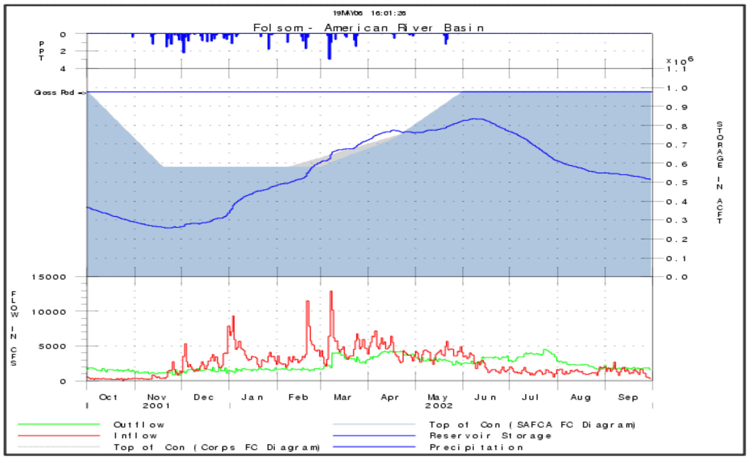
Impacts to CVP Operations



RECLAMATION

- Reservoir operation in 1982, a wetter year with Folsom filling

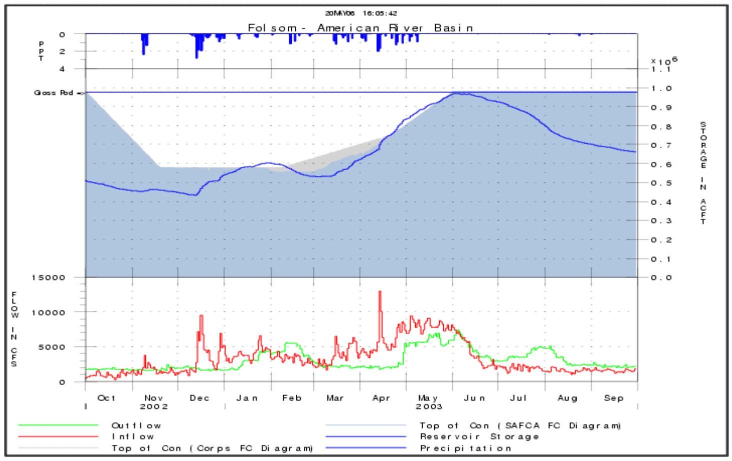
Impacts to CVP Operations



RECLAMATION

- More recent operation, Folsom Reservoir in 2002, maybe not a fair comparison with lower peak inflow, but useful to illustrate some operational objectives made easier with improved forecasting abilities.
- Note that this is a drier year and CVO might have been a little tighter reservoir release operations.
- When encroached in the flood control diagram on the fill side (spring), the release was typically less than inflow. This operation utilized short range forecasts of reservoir inflow, longer term forecasts of future storms, and snowmelt forecasts.
- Less flow fluctuations result in less stranding and isolation impacts to the fish and more water conservation with a greater cold water pool in the reservoir.
- Potential power generation benefits by staying within powerplant capacity
- Not to say that this may not have been done 20 years ago, but certainly the current technology makes it a lot easier. This is a result of factors such as improved forecasts, additional knowledge of fishery concerns, and improved interagency coordination

Impacts to CVP Operations



RECLAMATION

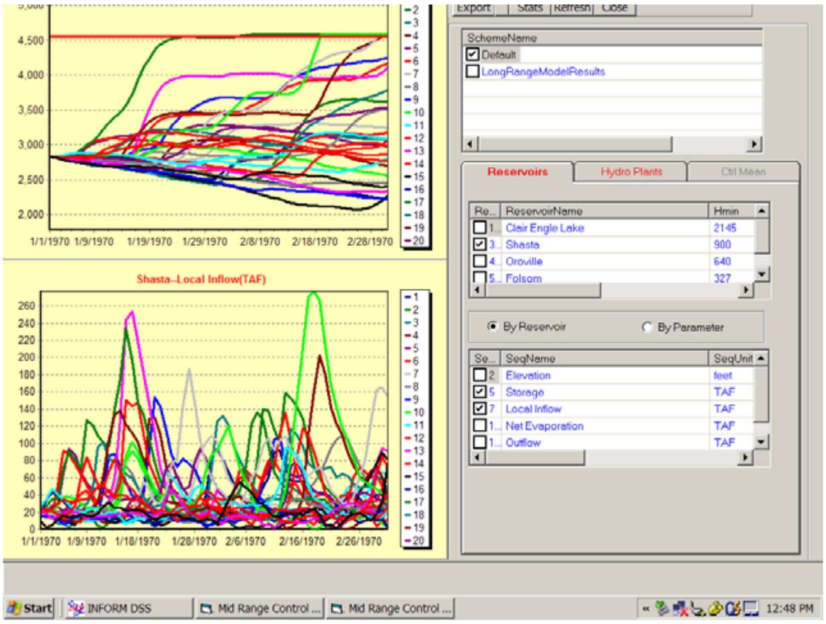
- Folsom Reservoir in 2003, wetter than 2002 and we did fill the reservoir
- Still note the attempt to minimize flow fluctuations through the flood season
- Tested a couple of methods to minimize fishery impacts while encroached in the flood pool. Tried to a shorter higher release to get out of encroachment as soon as possible to minimize the opportunity for steelhead to spawn at a higher flow that we would not be able to sustain through the season, and tried a lower more sustained release to slowly get out of encroachment.

Future of Operations Forecasts

- Use of forecasted inflow
  - Flood forecasting and seasonal
- Ensemble forecasting and probability distribution functions
- More detailed precipitation and runoff estimates in flood operations
- More scenarios to run and more time to anguish over operations

RECLAMATION

- Probably will see more flood control diagrams and flood operations place a high level of reliance of forecasted inflow. The use of forecasted inflow will grow from just the anticipated inflow over the next few hours to use of forecasts a day or days in advance.
- Ensemble forecasts of streamflow are becoming available. The operators challenge is to adequately incorporate them into reservoir operations. In flood operations we typically analyze only the most probable outcome as well as a one or two extremes. Our seasonal and mid-range operations forecasts usually reflect only the 90% and 50% exceedence forecasts. A forecast of a series of potential flows would present the operators with the difficult task of modeling each potential scenario. As the water project system grows the operational complexity grows, and operating rules and constraints do not necessarily follow a regular pattern. For example, the CVP water supply allocation can actually drop in a wetter year. There are studies under way attempting to evaluate the value of utilizing ensemble forecasts in water project operations
- More detailed precipitation and runoff estimates will improve difficult operations we have in operating for downstream flow requirements during flood events.
- More data means the opportunity to evaluate more scenarios and do more reservoir routings. More advanced knowledge of storms allow us more time to anguish over potential outcomes.



RECLAMATION

- Example of an ensemble inflow forecast for Shasta Reservoir with potential reservoir storage outcome for each scenario

Challenges

- Forecasting and planning operations in the land of theory
  - Forecasting
  - Equipment operation
  - System response
- Keep it simple

RECLAMATION

- For these extreme events, we are predicting events and operations that we may not have seen in the recent past, or ever experienced. How much confidence do we have that the forecasted events will unfold as predicted.
- Can models accurately reflect these monster storms?
- How will our equipment, valves, gates, and structures able to withstand the forces placed on them? These may be at the design limits of the facilities.
- Will the system respond as expected? The flow may be at levels previously unseen. We will be operating in areas on the design curves that were only experienced on a computer or in equations, eg flow rating tables, or gate release tables.
- In an extreme event our equipment and personnel may be tested to the limits. We may not know how effectively or quickly equipment and personnel can respond to the required actions in advance of these events.
- Exercise caution not to make flood operations overly complex or technical. Something to be said for a simple emergency spill diagram that can be utilized by an individual isolated at a dam operating knowing only the reservoir elevation and calculated storage, inflow, and release.
- Be wary of Murphy’s Law and Keep It Simple.

EXHIBIT
“C”

New Melones Operation Plan

Current Performance
and
Proposed Transitional Plan

Prepared by the
Oakdale Irrigation District
and
South San Joaquin Irrigation District
May 2006

Current Plan of Operation

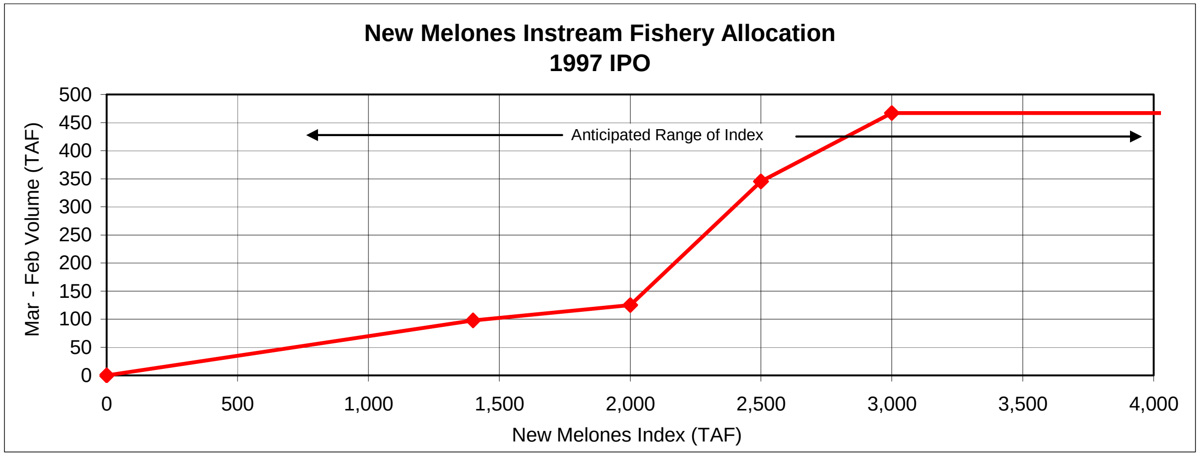
- New Melones Interim Plan of Operation, 1997

New Melones Storage Plus Inflow		Fishery		Vernalis Water Quality		Bay-Delta		CVP Contractors*	
From	To	From	To	From	To	From	To	From	To
0	1,400	0	98	0	70	0	0	0	0
1,400	2,000	98	125	70	80	0	0	0	0
2,000	2,500	125	345	80	175	0	0	0	59
2,500	3,000	345	467	175	250	75	75	90	90
3,000	6,000	467	467	250	250	75	75	90	90

* CVP Contractors: Stockton East Water District and Central San Joaquin Water Conservation District

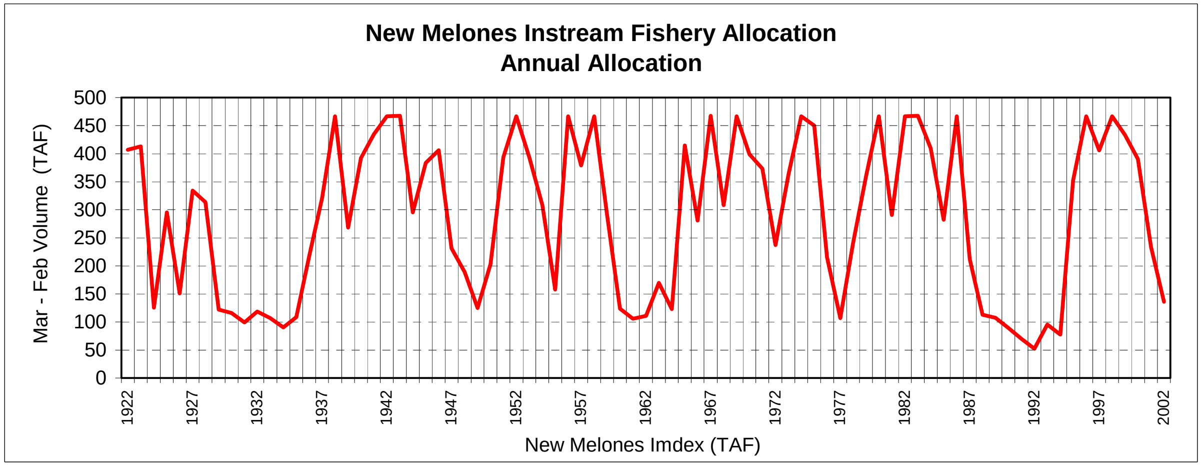
Current Performance

- New Melones modeled operation – Fishery



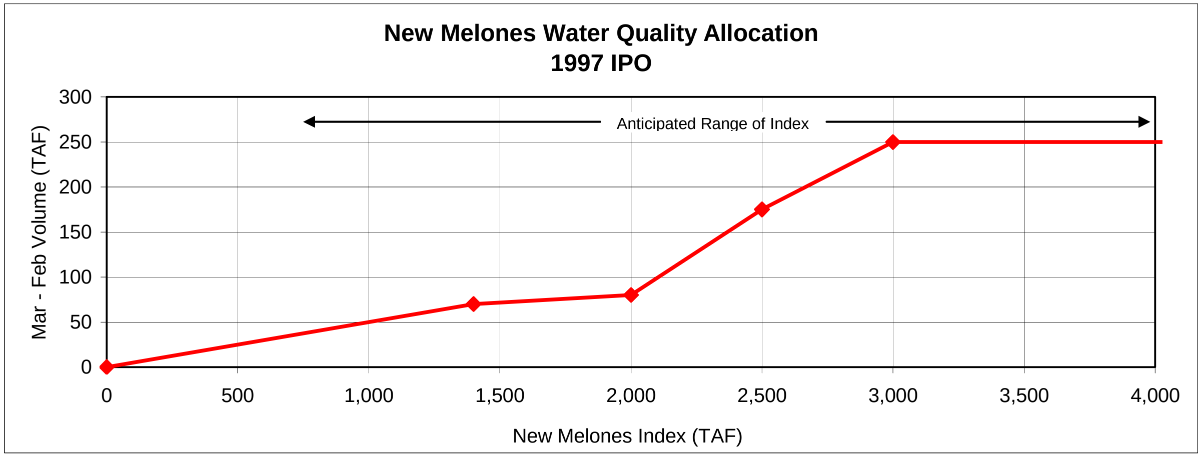
Average Allocation
288 TAF

Average Total
River Release
447 TAF
(Including fishery, water quality, Vernalis flow, dissolved oxygen and spills)



Current Performance

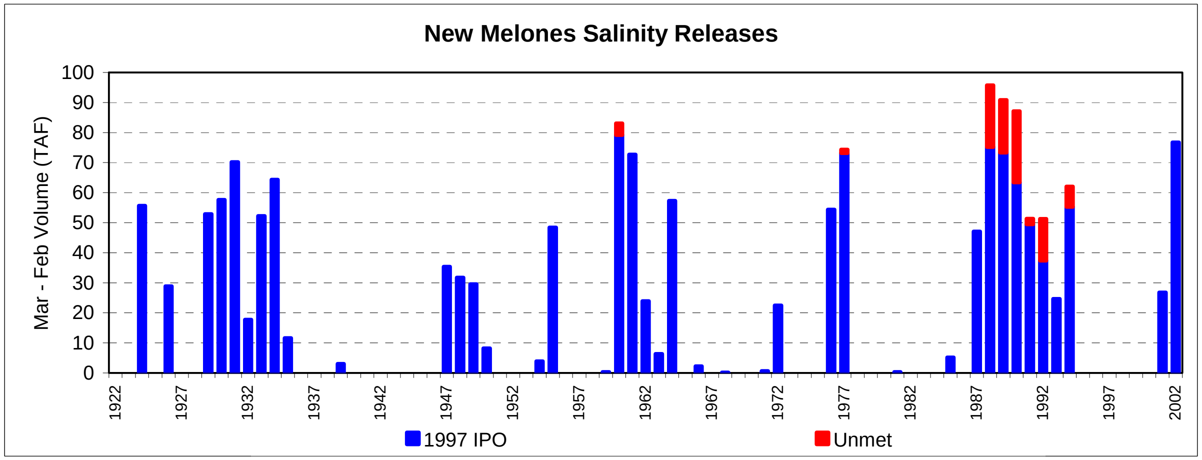
- New Melones modeled operation – Vernalis Water Quality



Average Allocation
156 TAF

Average Use
19 TAF

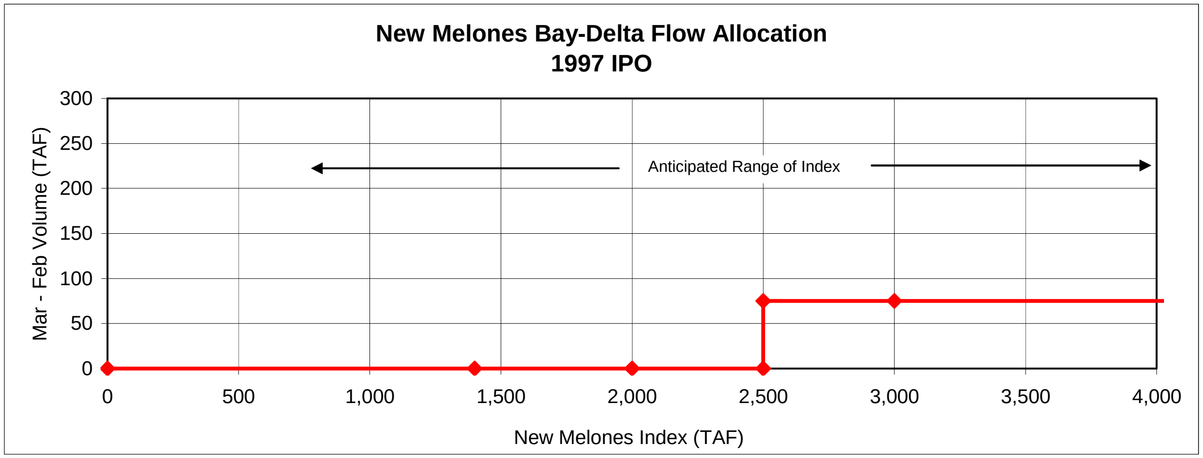
Average Unmet*
1 TAF



* "Unmet" represents the amount of additional release needed to fully comply with water quality objective, but Is not released due to modeled IPO annual constraint.

Current Performance

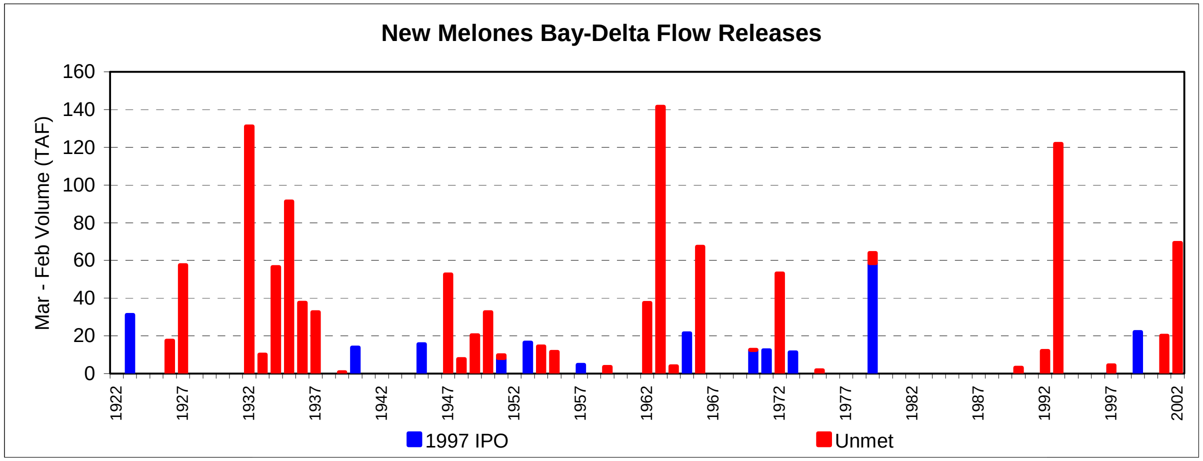
- New Melones modeled operation – Vernalis Bay-Delta Flow



<u>Average Allocation</u>
35 TAF

<u>Average Use</u>
3 TAF

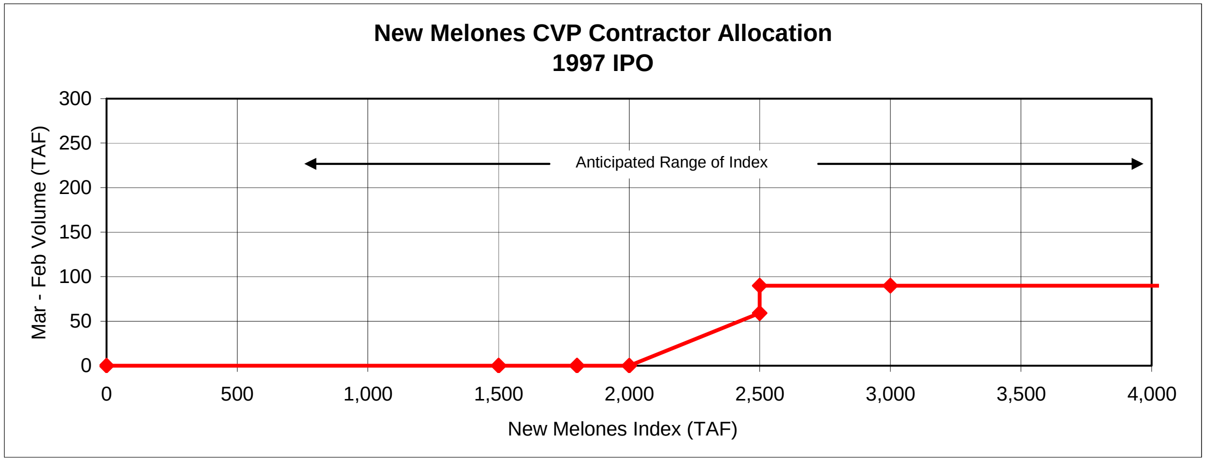
<u>Average Unmet*</u>
14 TAF



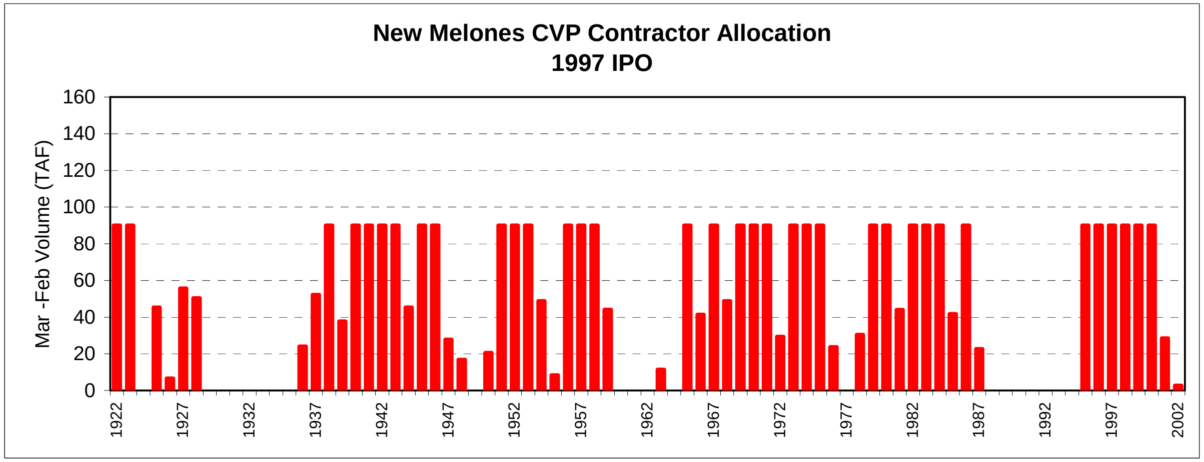
* "Unmet" represents the amount of additional release needed to fully comply with Vernalis Bay-Delta flow objective, but Is not released due to modeled IPO annual or Goodwin release constraint.

Current Performance

- New Melones modeled operation – CVP Contractors



Average Allocation
and Use
49 TAF



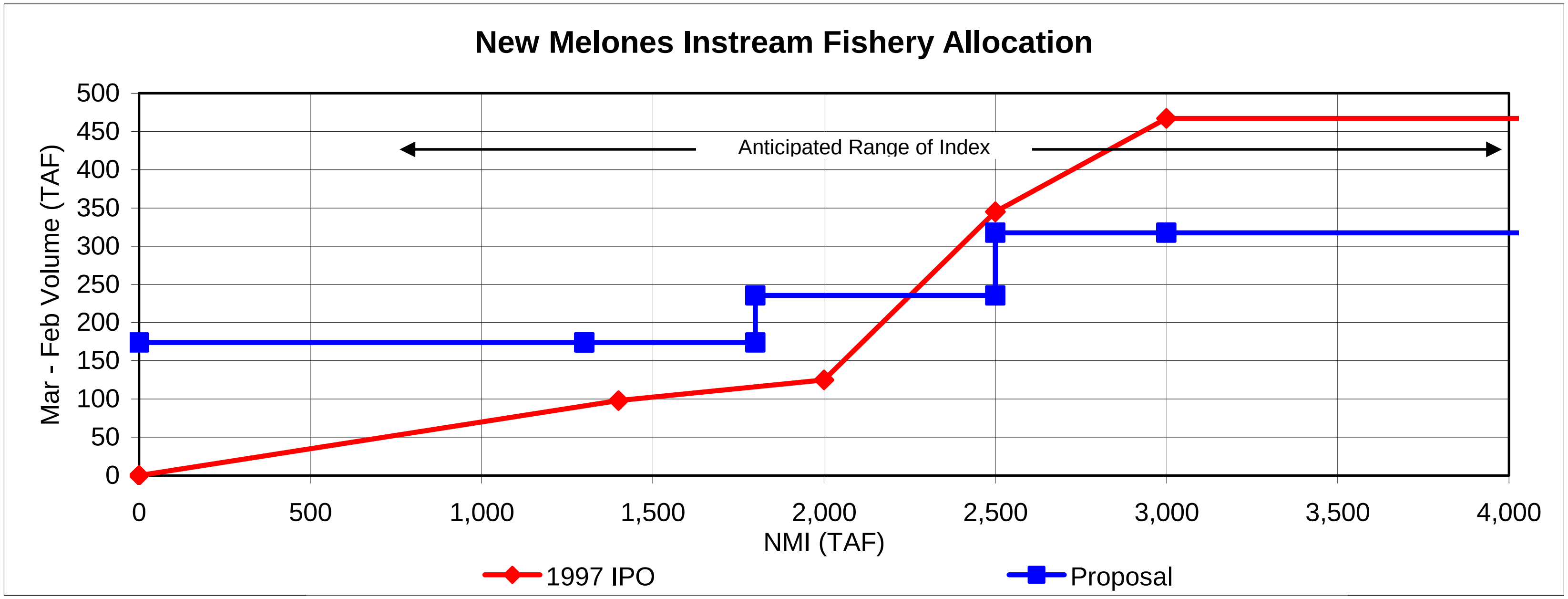
OID/SSJID Proposal

- New Melones Index Based Allocations
  - Operations are pivoted at three NMI points, 1,500, 1,800 and 2,500
- Instream Fishery Releases
  - When NMI > 2,500, 318 TAF
  - When NMI > 1,800 and < 2,500, 235 TAF
  - When NMI < 1,800, 174 TAF
- Water Quality Releases
  - Unconstrained
- Vernalis Bay-Delta Flow Releases
  - Unconstrained (except when Goodwin is limited to 1,500 cfs)
- Ripon Dissolved Oxygen Releases
  - Assumed to be subsumed by other objectives
- CVP Contractors
  - When NMI >1,500 and < 1,800, 49 TAF
  - When NMI > 1,800, 155 TAF

OID/SSJID Proposal

- Results and Comparison to Current IPO – Instream Fishery Allocation

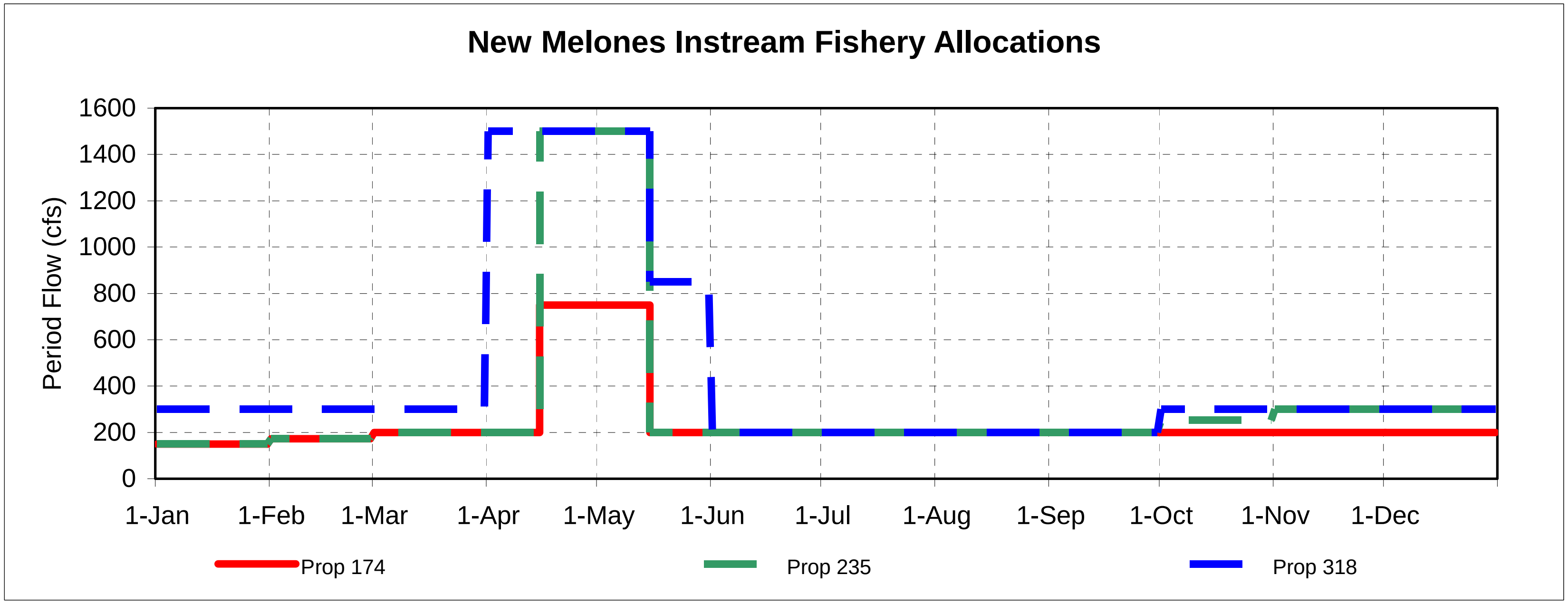
Annual Allocation



OID/SSJID Proposal

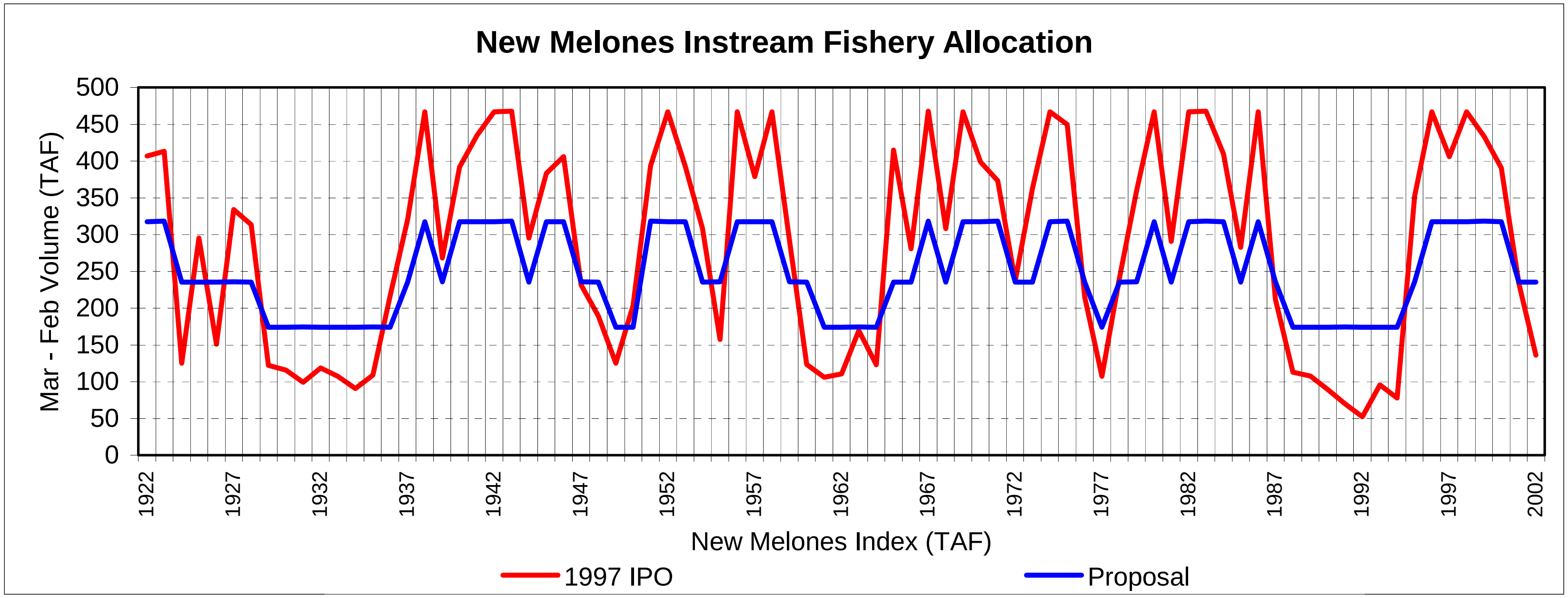
- Results and Comparison to Current IPO – Instream Fishery Allocation

Monthly Distribution



OID/SSJID Proposal

- Results and Comparison to Current IPO – Instream Fishery Allocation

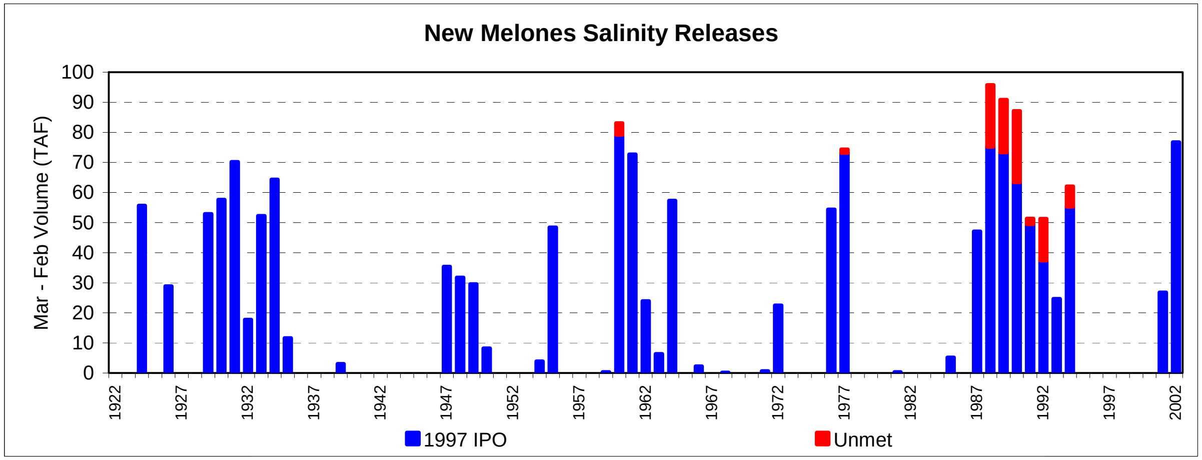


Average Allocation	Average Allocation
<u>IPO</u>	<u>Proposal</u>
288 TAF	250 TAF

(Does not include other releases adding to flow)

OID/SSJID Proposal

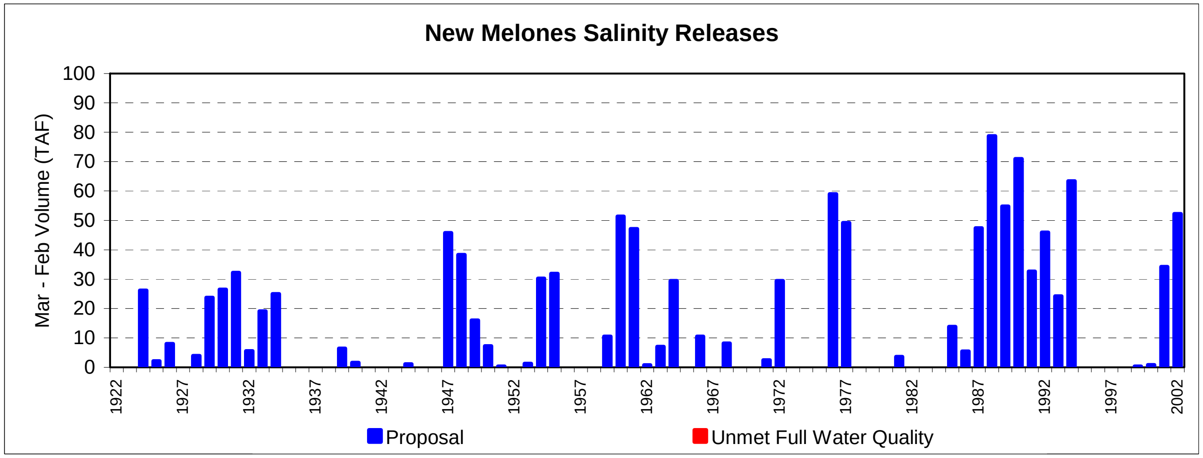
- Results and Comparison to Current IPO – Vernalis Water Quality



“Unmet” represents the amount of additional release needed to fully comply with water quality objective, but Is not released due to modeled IPO annual constraint. Average unmet: 1 TAF.

Average Release
<u>IPO</u>
19 TAF

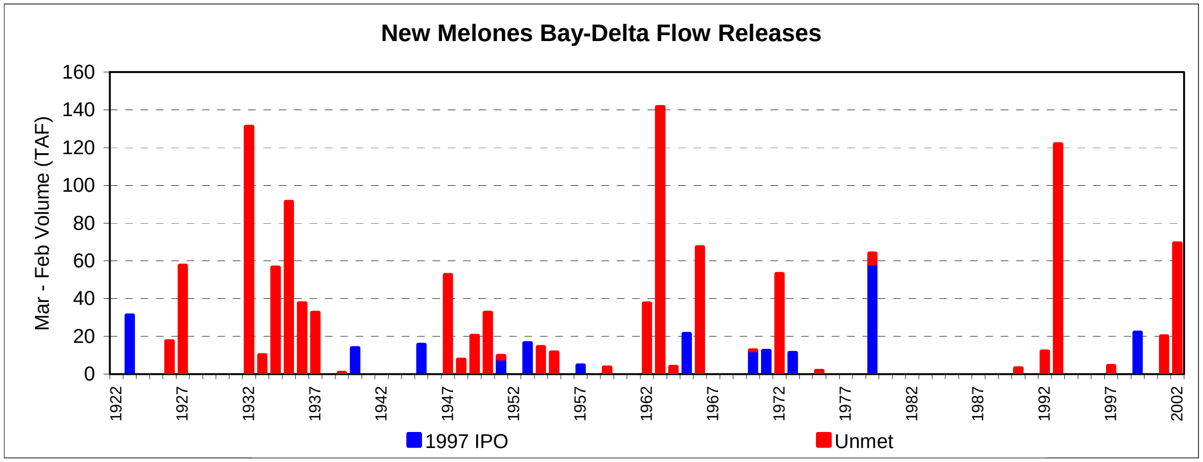
Average Release
<u>Proposal</u>
15 TAF



Water quality objective is met in all years.

OID/SSJID Proposal

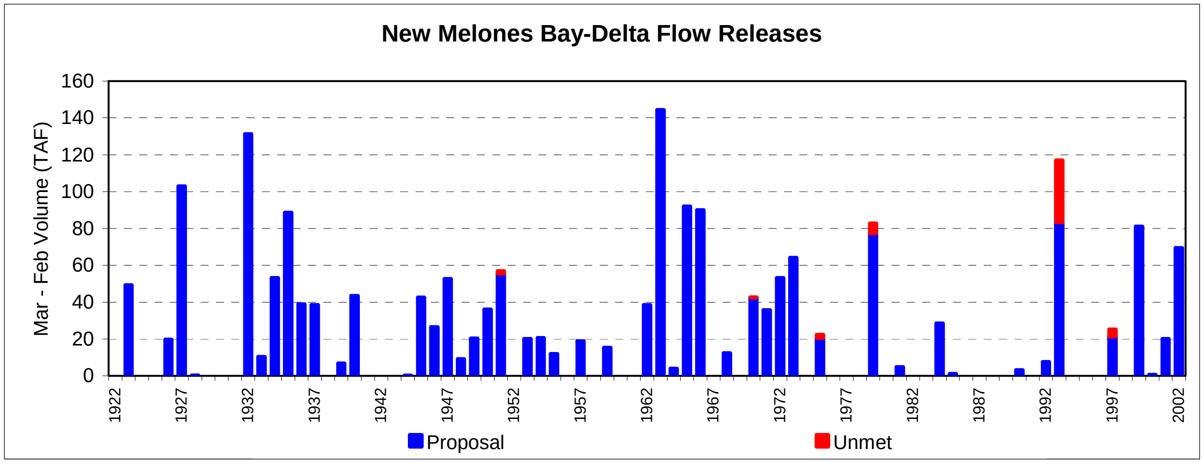
- Results and Comparison to Current IPO – Vernalis Bay-Delta Flow Release



"Unmet" represents the amount of additional release needed to fully comply with Vernalis Bay-Delta flow objective, but Is not released due to modeled IPO annual and Goodwin release constraint. Average unmet: 14 TAF.

Average Release
IPO
3 TAF

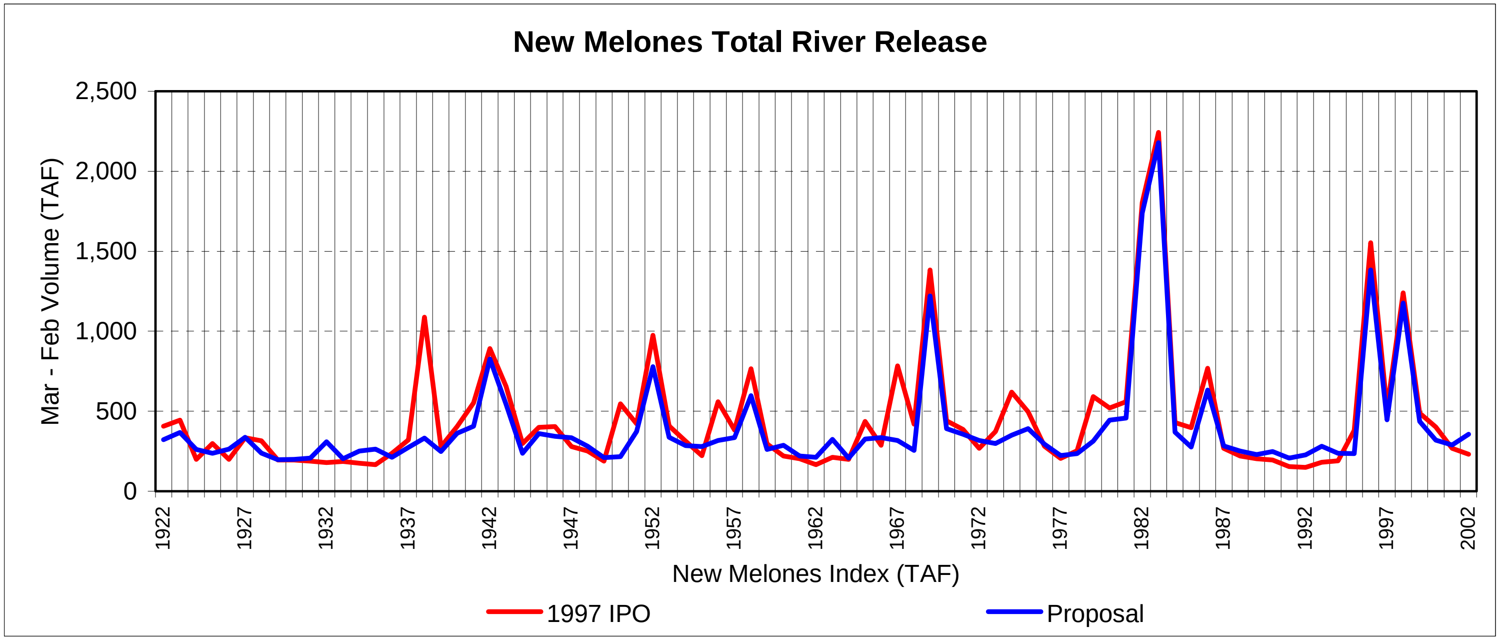
Average Release
Proposal
24 TAF



"Unmet" only occurs during conditions when Goodwin release is assumed to be constrained to 1,500 cfs.

OID/SSJID Proposal

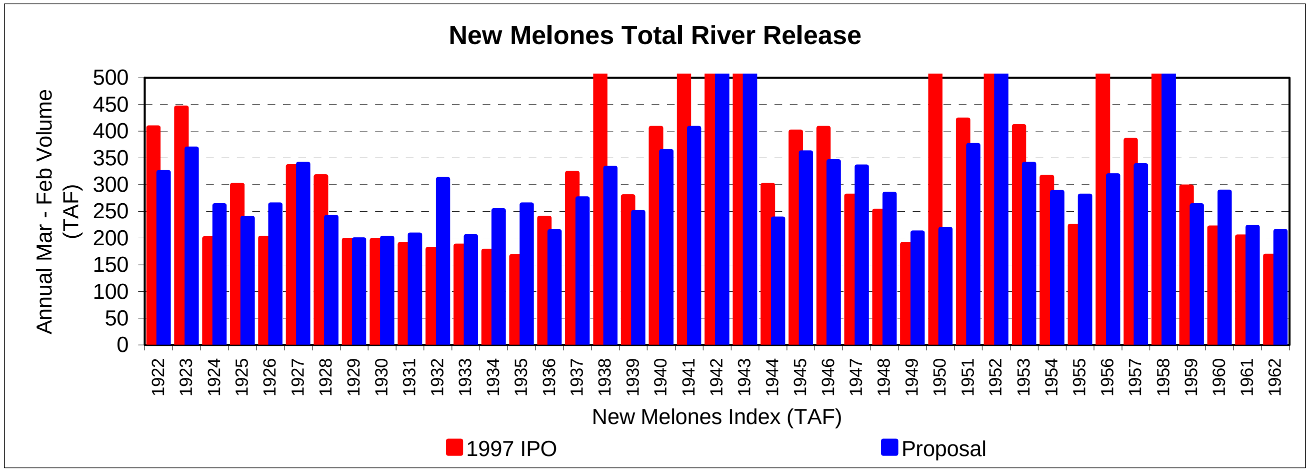
- Results and Comparison to Current IPO – Total River Release



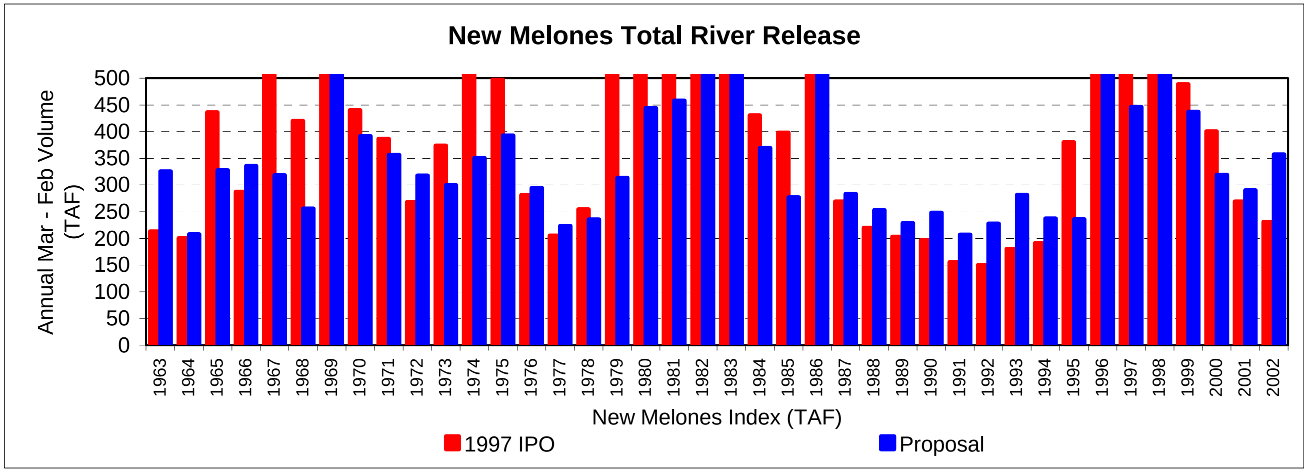
Average Release <u>IPO</u>	Average Release <u>Proposal</u>	Average Release <u>IPO</u>	Average Release <u>Proposal</u>
447 TAF	395 TAF	321 TAF	288 TAF
(Represents all releases including spills)		(Represents all releases excluding spills)	

OID/SSJID Proposal

- Results and Comparison to Current IPO – Total River Release

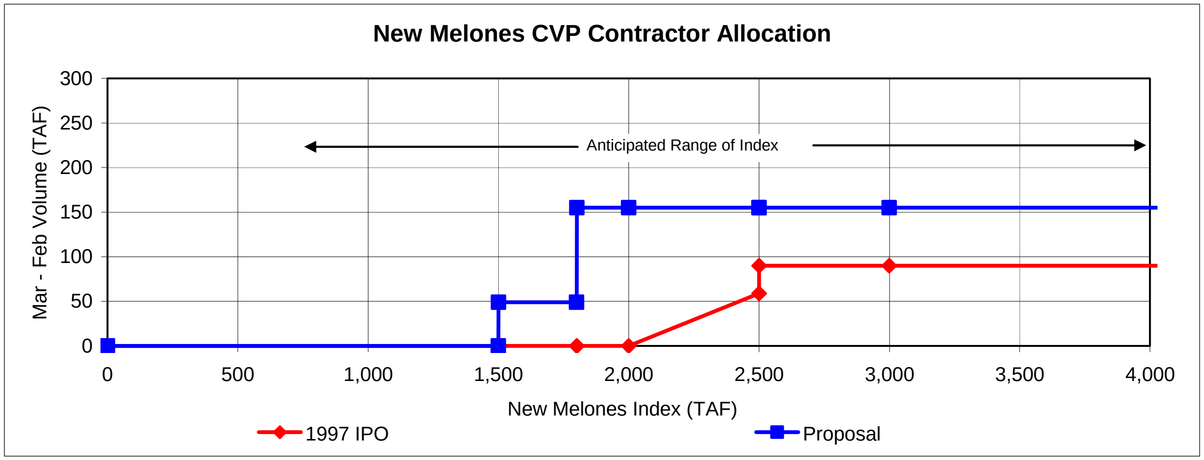


Scale limited to 500 TAF



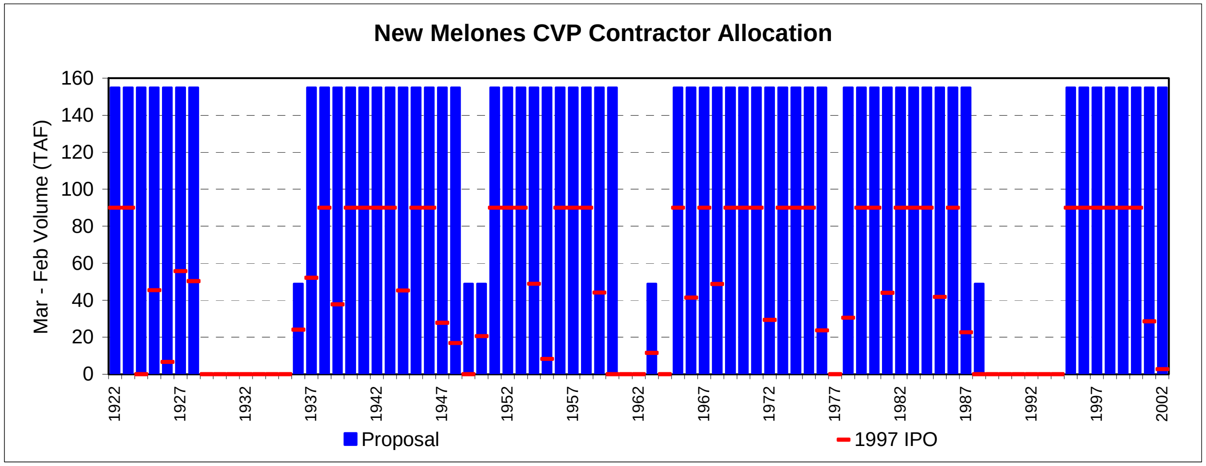
OID/SSJID Proposal

- Results and Comparison to Current IPO – CVP Contractors



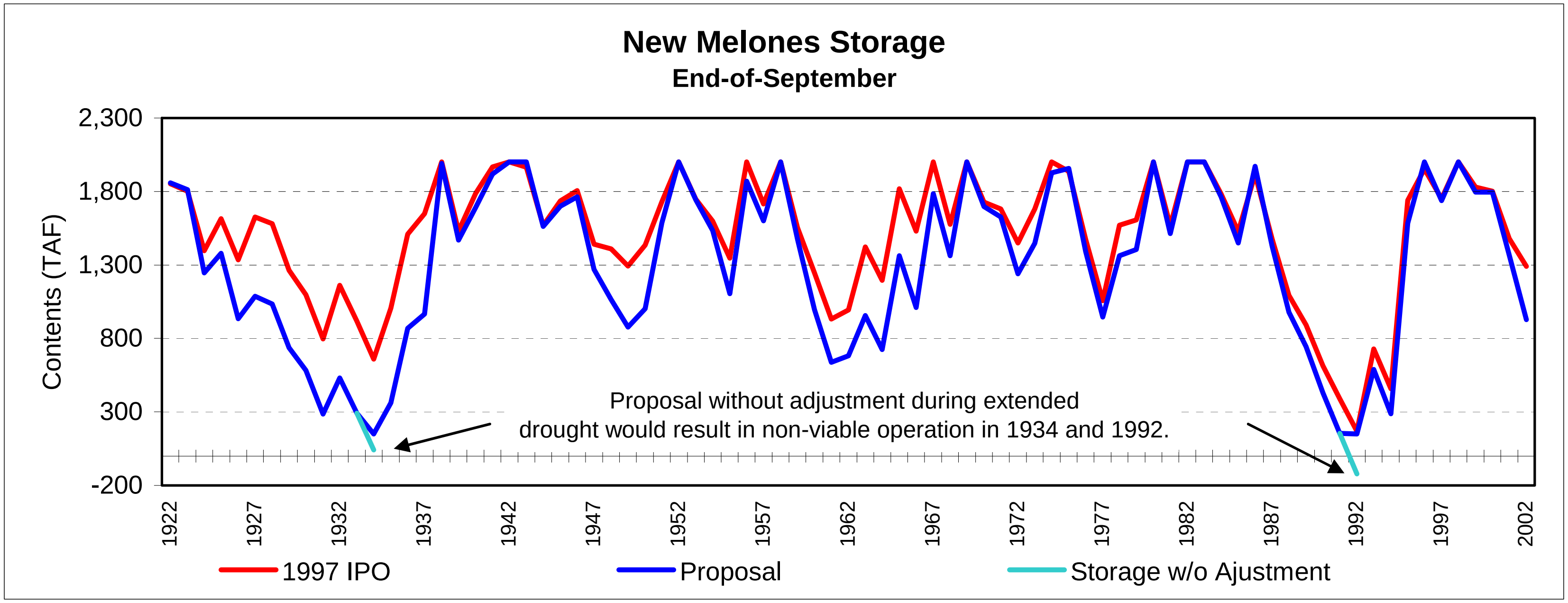
Average Allocation
IPO
49 TAF

Average Allocation
Proposal
116 TAF



OID/SSJID Proposal

- Results and Comparison to Current IPO – New Melones Storage



OID/SSJID Proposal

- Viable Operation
  - Temporary until Revised Plan of Operation
  - Can function through all periods except long-duration drought
- Other Actions Are Occurring Relieving Competition for New Melones Water
  - River betterment (Grassland Bypass Project)
  - Friant ?
  - Recirculation
  - Periodic Review of water quality and flow objectives at Vernalis
- Contingency Measures Are Available Should Extended Drought Occur

Introduction

The Interim Plan of Operations (IPO) for New Melones has been in place since 1997. Since development of the IPO the runoff and water quality in the San Joaquin River Basin has changed and so too has our ability to quantify and understand those changes. We now have an improved model, CALSIM II, which better depicts the hydrology, flow and water quality in the San Joaquin River Basin (Basin). Finally, the IPO through its operation over the last ten years has shown some significant operational deficiencies and disconnects. To address these changing conditions in the Basin and the operational deficiencies of the IPO, Reclamation has undertaken the task of implementing a transitional operating plan by 2007 and a long term plan by 2012. South San Joaquin Irrigation District (SSJID), Oakdale Irrigation District (OID) and Stockton East Water District (SEWD),[1] collectively referred to as Districts, support Reclamation in its endeavor to implement a transitional and long term plan. This paper is written in the hope of providing a catalyst for interested parties to engage in this process and have a new operational plan for New Melones.

1997 New Melones Interim Plan of Operations

The New Melones Interim Plan of Operations (IPO) was Reclamation's attempt to allocate supply to four purposes: fishery, water quality, Bay-Delta flow, and water supply. Table 1 below identifies the allocation of annual water supply to each of the purposes. The allocations are linearly interpolated based on the value of the end-of-February New Melones Storage, plus the March - September forecast of inflow to the reservoir. Water is provided to OID and SSJID in accordance with their settlement with Reclamation. Required and discretionary releases to the Stanislaus River below Goodwin Dam are accounted in a cumulative order, currently in the following order: 1) fishery releases; 2) releases to meet the Vernalis water quality requirement; and 3) D-1641 Bay-Delta flow requirement releases

[1] SEWD is in litigation against Reclamation over New Melones operations [Court of Federal Claims No. 04-541 L Judge Christine Odell Cook Miller]. Nothing contained in this document shall constitute an admission or waiver of any claim, right or defense in the litigation. The proposed transitional plan of operations is for discussion purposes only.

Table 1. New Melones Interim Plan of Operation Allocations (1,000 AF)

New Melones Storage Plus Inflow		Fishery		Vernalis Water Quality		Bay-Delta		CVP Contractors	
From	To	From	To	From	To	From	To	From	To
0	1,400	0	98	0	70	0	0	0	0
1,400	2,000	98	125	70	80	0	0	0	0
2,000	2,500	125	345	80	175	0	0	0	59
2,500	3,000	345	467	175	250	75	75	90	90
3,000	6,000	467	467	250	250	75	75	90	90

Additional releases are made to the Stanislaus River below Goodwin Dam if necessary, to meet the Decision 1422 (D-1422) dissolved oxygen content objective. Releases from Goodwin Dam to the Stanislaus River (except for flood control) do not exceed 1,500 cfs.

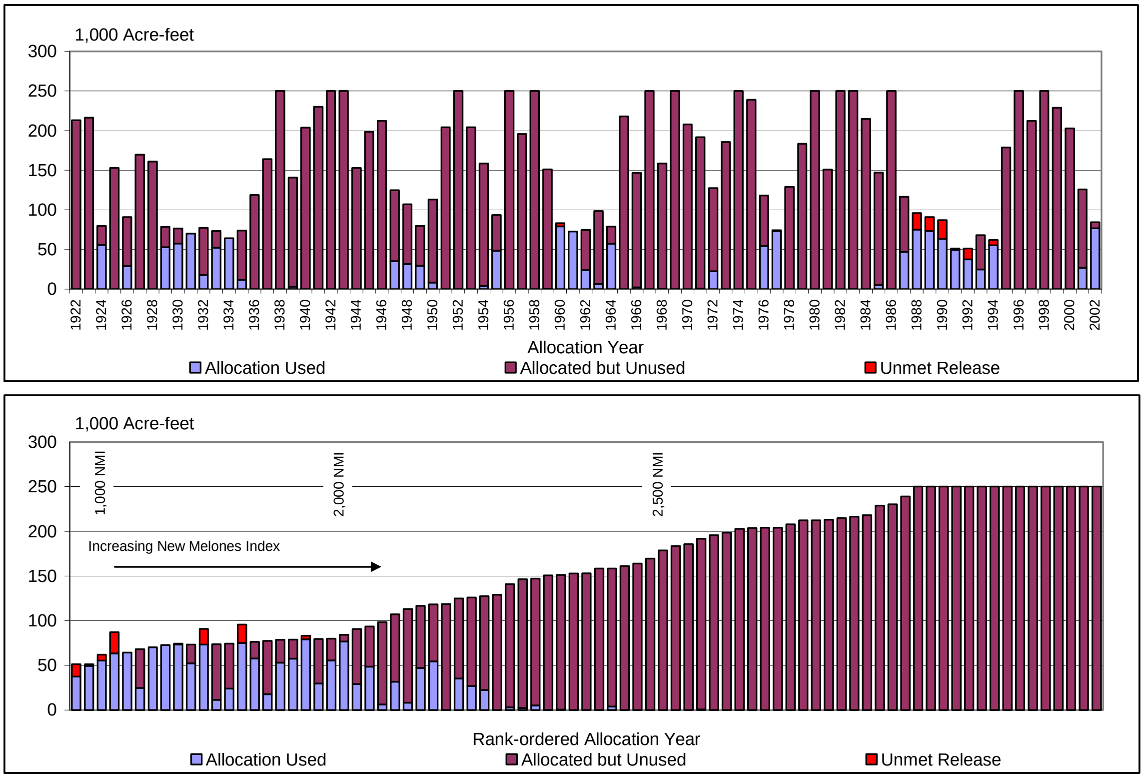
The IPO works as an integral part of D-1641's incorporation of the San Joaquin River Agreement's (SJRA) contribution towards meeting flow requirements at Vernalis. Although not requiring Reclamation's implementation of the IPO, the IPO provides the baseline hydrologic conditions upon which the flow contributions of the other signatories are based.

Deficiencies and Disconnect

Water Quality at Vernalis

Information for water quality allocation is set forth in Table 1. As can be seen water quality is allocated in an increasing manner up to 250,000 acre feet of water when the New Melones Index (designated in Table 1 as "New Melones Storage Plus Inflow") is equal to or greater than 3,000,000 acre-feet. The non-effectiveness of this approach is that the amount of water needed for water quality in wetter years is normally declining because there is good water quality in the San Joaquin River without any specific water quality release from New Melones. So while a water quality release is allocated, it is not used. This circumstance is shown in Figure 1 below where each year of modeled water quality operations is illustrated. The upper graphic shows the year-to-year used and unused water quality allocation of the IPO. In many years water is allocated but not needed. The lower graphic illustrates the same data with the results arranged in ascending order of the New Melones Index, driest conditions to wettest. It is seen how as wetter conditions prevail water is allocated but unneeded for release.

Figure 1. New Melones Water Quality Allocation, Use and Shortfall

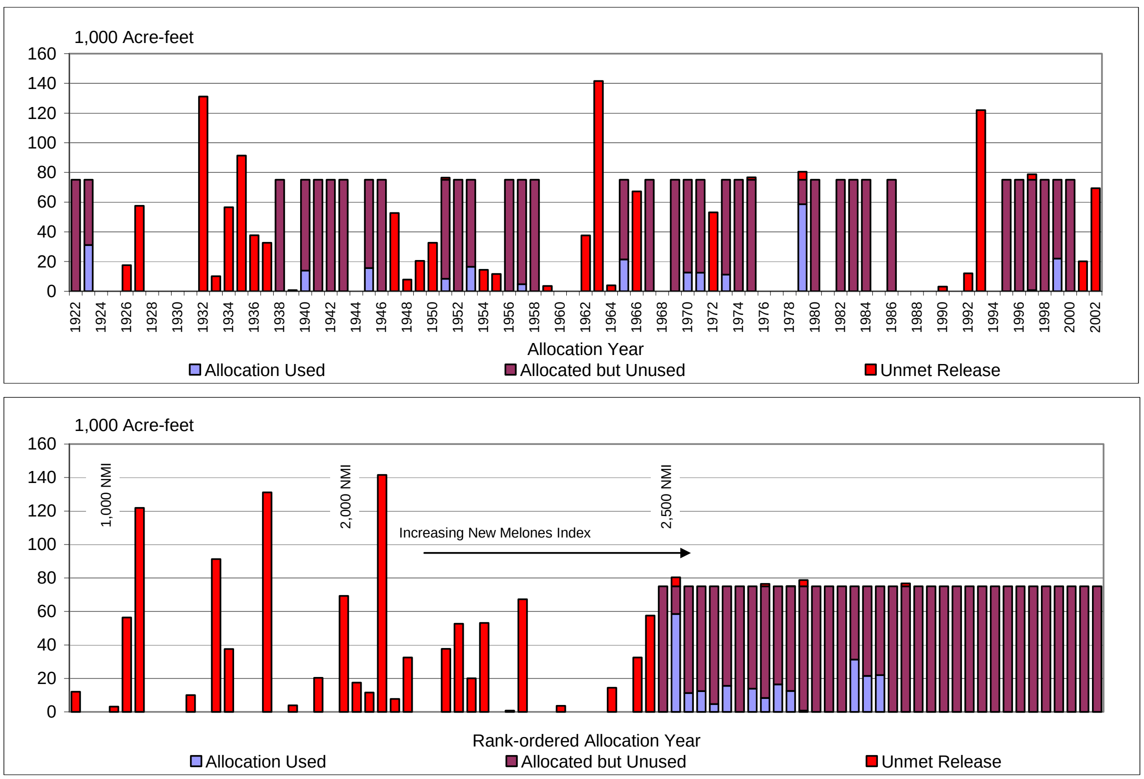


These graphs also depict a second undesired outcome of the water quality allocation under the IPO. When water is needed for water quality at Vernalis, it is sometimes constrained by the amount allocated. Thus in sequential droughts such as occurred during the 1987-1992 time period Reclamation would not meet water quality at Vernalis if the IPO was strictly adhered to. Also, while the shortfall is small on an average annual basis, 1,000 acre-feet per annum (afa), the impact in a given year can be substantial, 1988 20 TAF, and 1990 24 TAF.

Bay-Delta Releases (X2)

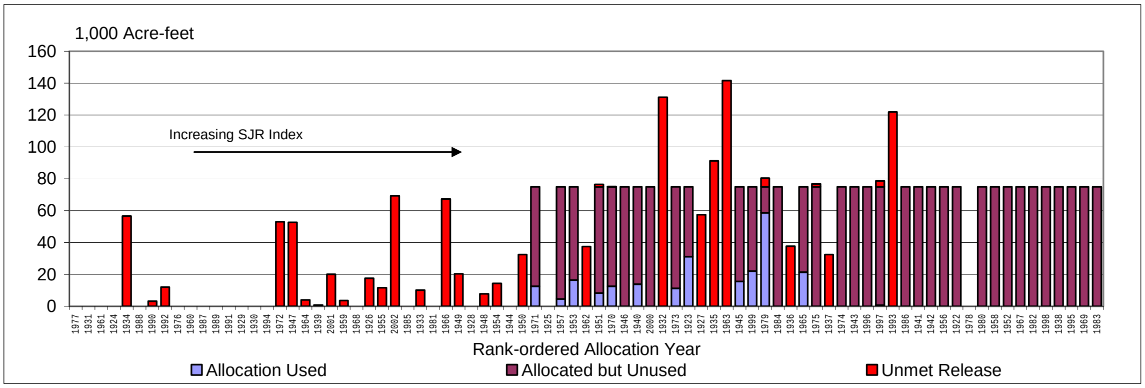
The IPO also allocates releases for compliance to the D-1641 San Joaquin River and Delta flow objectives at Vernalis. As seen in Table 1, an allocation to this purpose is limited to only wetter years when the New Melones Index exceeds 2,500,000 acre-feet. In effect, during the years when a release is allowed under the IPO the 75 TAF allocation is adequate to meet the flow objectives; however it is usually a moot point since there is not a significant call for this release during these years due to wet hydrologic conditions in the basin. Figure 2 below depicts the allocation and shortfall of the IPO in meeting the current Bay-Delta flow objective at Vernalis.

Figure 2. New Melones Bay-Delta Allocation, Use and Shortfall



The graphs show a disconnect between the IPO allocations and project demands. When the New Melones Index is high and water is allocated for Bay-Delta releases, not much if any is needed because there is already sufficient water in the system. During years when the IOP does not allow a release, the unmet release could be as much as 140 TAF. Figure 3 additionally illustrates the disconnection with the IOP allocation for Bay-Delta releases. The same data described above is shown in Figure 3, but is arranged by increasing San Joaquin River Basin Index.

Figure 3. New Melones Bay-Delta Allocation, Use and Shortfall by San Joaquin River Index

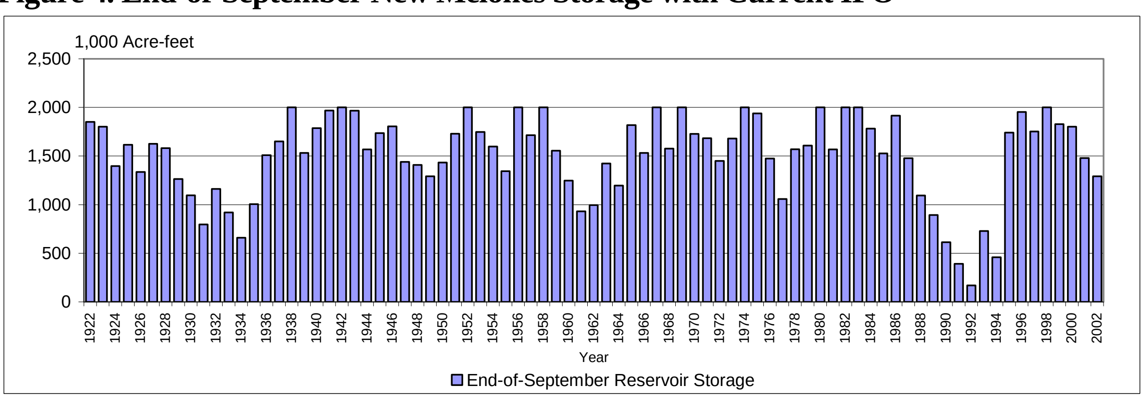


In Figure 3 above it can be seen that during drier years there is not water allocated for Bay-Delta releases, but there also in not much need for a release. It is normally within the range of dry to above normal years when the current Bay-Delta objectives require supplemental releases, sometimes with no allocation provided. With the allocation based on the New Melones Index, no allocation will be provided during certain wetter Delta conditions (e.g., 1932, 1963 and 1993) when the flow requirement is large but the San Joaquin Basin (including New Melones) is capturing significant runoff into storage.

Drought Protection Planning Period

The development of the IPO allocations was partially founded on the ability to sustain Reclamation's desired operation through sequences of years. Although intended to be an "interim" operation not likely required to experience a severe sequence of drought years, the allocations of the IPO proved to be viable if planning for a repeat of the 1987-1992 drought sequence. However, this ability to sustain an operation through the 1987-1992 drought sequence has a profound effect on other sequences of years, manifesting in the underutilization of New Melones storage. This circumstance can be seen in Figure 4 that illustrates the modeled end-of-September storage at New Melones.

Figure 4. End-of-September New Melones Storage with Current IPO



Except for the recurrence of the 1987-1992 drought sequence, storage is not exercised below 600,000 acre-feet. The conservatism of protecting against the recurrence of such an extreme drought sequence leads to lesser allocations in many other sequences, and likely needs to be revisited.

Lack of Water Deliveries to New Melones CVP Contractors

The IPO failed to adequately allocate contractual water supplies to the New Melones CVP Contractors. SEWD and Central San Joaquin Water Conservation District (CSJWCD) contracted with Reclamation in 1983 for 155,000 acre-feet annual water supply from New Melones. Reclamation built New Melones reservoir pursuant to water right permits issued by the State Water Resources Control Board (SWRCB). The SWRCB would not allow Reclamation to fill New Melones Reservoir to its' full capacity until it demonstrated that the water would be put to beneficial use.

Reclamation presented the contracts with SEWD and CSJWCD as this proof to the SWRCB, and only then was Reclamation allowed to fully exercise its New Melones water rights. As part of the IPO, contractual deliveries were artificially capped at 90,000 acre-feet even though the contractual amount is 155,000 acre feet, and the IPO provided water deliveries to the CVP contractors only in the wettest of year types. These deficiencies must be addressed in the proposed transitional operational plan.

Proposed Transitional Plan of Operation

Objective and Basic Structure

A new operational plan must have as a principle that the SWRCB permit terms and conditions must be met. This would include meeting salinity and flow requirements at Vernalis. The USBR permits at New Melones and other CVP and State Water Project reservoirs water right permits are conditioned to meet the salinity and flow requirement at Vernalis, and Reclamation has been given wide discretion as to how to meet the those requirements,[2] a has been directed to minimize the demand from New Melones for those purposes.[3]

This proposed plan of operation for New Melones is premised on water quality and flow requirements at Vernalis being met under all conditions. Water allocated to meet water quality and flow requirements is not constrained. The unconstrained allocation of water for water quality and flow purposes is conditioned on an important

[2] Other available options include releases from other CVP reservoirs such as Friant; releases from San Luis Reservoir; recirculation of water from the Delta Mendota Canal, through the Newman Wasteway; construction of a drain to eliminate saline discharge into the San Joaquin River; and purchases of water from willing sellers to release to meet these objectives.

[3] HR 2828 directed the Secretary of the Interior to meet San Joaquin River water quality objectives in a manner to reduce the demand on water from New Melones Reservoir used for that purpose and to assist the Secretary in meeting obligations to CVP contractors from the New Melones project.

change in the accounting methodology at New Melones. This proposal is premised on the condition that instream flows are the primary flows or foundation flows in the Stanislaus River. Any flows to meet water quality and Bay-Delta flows at Vernalis, or dissolved oxygen at Ripon, would be added to the fish flows when needed. Thus the current gaming between the USBR, USFWS and CDFG regarding whether a release is for water quality purposes ahead of a fishery release would be eliminated.

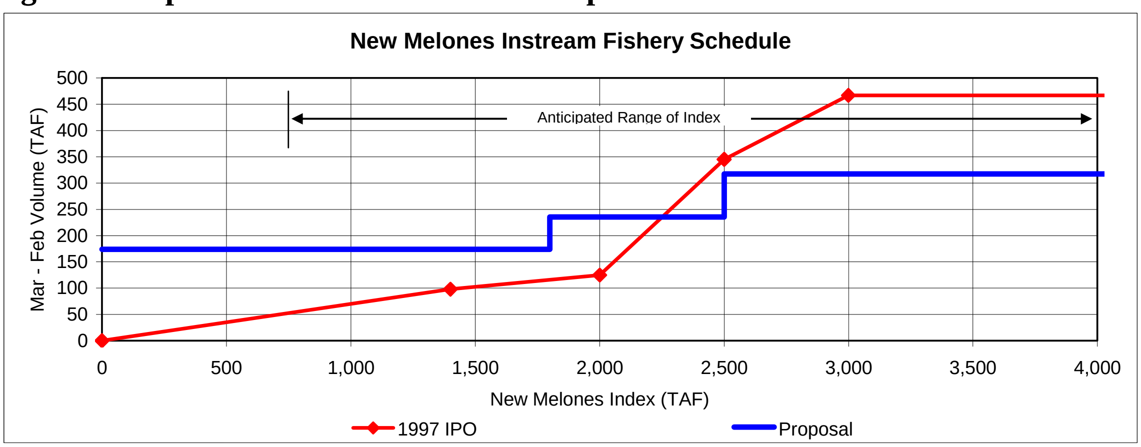
The release schedule for fishery purposes is determined by the New Melones Index. Three levels of releases have been identified, increasing with water availability at New Melones. Table 2 identifies these schedules and Figure 5 provides an illustration of the proposed schedules in comparison to the IPO.

Table 2. Proposed Release Schedule for Stanislaus River Fishery

New Melones Storage Plus Inflow		Fishery
From	To	
0	1,800	174
1,800	2,500	235
2,500	6,000	318

Units: 1,000 acre-feet

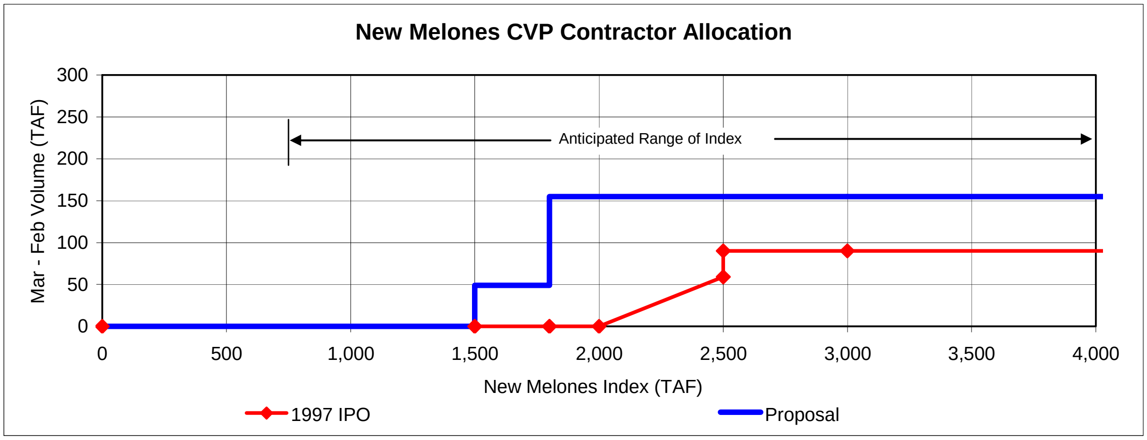
Figure 5. Proposed Release Schedules in Comparison to IPO Schedules



The proposed plan of operation anticipates a change to the DO objective at Ripon. The change would be a modification of the DO objective compliance point for June through September to Orange Blossom Bridge. The standard of 7 mg/l would remain.

The proposed plan of operation also provides increased deliveries to the CVP contractors based on the New Melones Index. Two levels of annual delivery are provided, 49 TAF for an index ranging from 1,500 TAF to 1,800 TAF, and 155 TAF for an index greater than 1,800 TAF. No deliveries would be provided when the index is less than 1,500 TAF. Figure 6 illustrates the proposed allocation, and provides a comparison to the allocation provided by the IPO.

Figure 6. Proposed CVP Contractor Allocations and IPO Allocations



A significant predicate of the transitional plan is that the water supply planning is changed from providing protection against highly infrequent droughts to providing water allocations that can better exercise New Melones storage. Reclamation's drought frequency analysis of the 1987-1992 period indicates the recurrence frequency of the 1987-92 drought is once every 250-400 years. Given the unlikely recurrence of the 1987-1992 drought, it appears the beneficial use of water from New Melones would be better served by basing allocations on a less severe drought. The next most severe drought occurs during the 1928-1934 period, with the Reclamation analysis indicating a recurrence frequency once every 40-50 years, but also takes several consecutive years of drought to occur. Given that New Melones will enter the 2006-07 water year with a full reservoir and the anticipation that the proposal is intended to be transitional, water allocations have been developed to increase utilization of New Melones storage while maintaining a lessened concern for extended severe drought.

Performance and Additional Considerations

Just as the 1997 IPO was developed with the aid of modeling and re-analyzed with subsequent modeling, the proposed plan has been developed and analyzed with modeling. A brief description of the model used for the projected operation of New Melones is included in Appendix A. Results described hereafter will primarily represent the performance of the proposed plan as if the 1922-2003 period of hydrology in the San Joaquin River Basin recurred again with the current demands, water systems and requirements within the basin.

Fishery

The proposed fishery schedule is designed to accomplish instream fishery protection on the Stanislaus River and is based on a fundamental principle that we need to manage water supplies better, particularly so that more water is made available in Dry and successive Dry years.

Special consideration was given to the following factors: meeting Fall Run Chinook Salmon (FRCS) spawning, egg incubation/fry rearing, and juvenile rearing flows identified by an instream flow study (IFS) conducted by the USFWS (Aceituno 1993; Table 3); meeting incidental take statement temperature requirements for over-summering steelhead identified by NMFS in the OCAP Section 7 biological opinion (NMFS 2004; Table 4); and meeting temperature objectives for all lifestages of FRCS identified by the CALFED sponsored Stanislaus River Temperature Criteria Peer Review (Deas and others 2004; Table 5). Although the Districts previously agreed to the temperature objectives put forth by the CALFED Peer Review Panel for purposes of Temperature Modeling, outside of the modeling exercises, the Districts do not agree with some of the recommended timing and compliance points as described in the discussion of water temperature beginning on page 9.

Table 3. Instream flows (cfs) which would provide the maximum weighted usable area of habitat for FRCS in the Stanislaus River between Goodwin and Riverbank, California (Aceituno 1993).

Lifestage	*Dates*	*# Days*	*Goodwin Dam Releases*
Spawning	Oct 15-Dec 31	78	300
Egg incubation/fry rearing	Jan 1-Feb 15	46	150
Juvenile rearing	Feb 15-Oct 15	241	200

Table 4. NMFS incidental take statement temperature requirements for over-summering steelhead (NMFS 2004).

Dates	*Lifestage*	*Temperature Objective*	*Compliance Point*
Jun 1- Nov 30	Over-summering	≤65°F	Orange Blossom Bridge

Table 5. CALFED Peer Review objectives for all lifestages of FRCS and steelhead (Deas and others 2004).

Dates	*Lifestage*	*Temperature Objective*[1]	*Compliance Point*
Sep 4 - Oct 1	Adult migration	<64°F	Confluence[1]
Oct 2 - Dec31	Incubation	<55°F	Riverbank [1]
Jan 1 - Apr 15	Juvenile rearing	<61°F	Riverbank (all years)
Apr 16 - Jun 3	Smoltification	<57°F	Confluence (all years)
Jun 4 – Sep 3	Over-summering	<64°F	Orange Blossom Bridge (all years)

[1] CDFG proposed modifying the CALFED Peer Review objectives such that the compliance points for some lifestages dynamically change depending on hydrologic year type as follows: Adult migration= Confluence (Above Normal/Wet); Ripon (Below Normal); McHenry Bridge (Dry/Critical). Incubation= Riverbank (Above Normal/Wet); Oakdale (Below Normal); Valley Oak (Dry/Critical)

The following sections indicate the ability of the transitional plan flows to meet a variety of objectives/criteria including those for maximum weighted usable habitat, water temperature, adult upstream migration, and SJRA/VAMP April-May pulse flows. In addition, the transitional plan proposes to provide improved flow management for juvenile outmigration during Dry and CD years.

Maximum Weighted Usable Habitat

The proposed transitional flows meet the flow levels identified in the USFWS IFS (Aceituno 1993) for maximizing the weighted usable habitat for FRCS spawning, egg incubation/fry rearing, and juvenile rearing (Table 6). The IFS did not specifically address the flows necessary for juvenile outmigration or for adult upstream migration. Adult and juvenile migration flows are discussed in subsequent sections entitled *Adult Upstream Migration Flows* (see page 17) and *Juvenile Outmigration Flows* (see page 18), respectively.

Table 6. Comparison of instream flows (cfs) identified by the USFWS' IFS as providing the maximum weighted useable habitat for various lifestages of FRCS versus flows proposed for the transitional period.

Lifestage	Dates	Goodwin Dam Releases	
		IFS	Proposed Transitional
Spawning	Oct 15-Dec 31	300	200-300
Egg incubation/fry rearing	Jan 1-Feb 15	150	150-300
Juvenile rearing	Feb 15-Oct 15	200	173-300[1]

[1] Excludes outmigration flows of 750-1500 cfs during April and May.

Water Temperature

The Districts used the CALFED Temperature Model to model the affects of the proposed transitional plan on water temperatures in the Stanislaus River. The model, the CALFED Peer Review report, the Districts proposed operation, and CALFED's analysis of the proposed operation are attached. The following focuses on the impacts analysis and rationale for proposed temperature objectives.

The proposed transitional plan consistently meets the CALFED proposed temperature objectives from approximately mid-November through mid-April and deviations are low from mid-April through mid-May and from June through August. Although the Districts' proposed transitional plan does not meet the CALFED proposed temperature objectives during late-May and again from September through mid-November, the need for these objectives during these periods is not warranted for the following reasons:

Late-May. In our proposed transitional plan, we have made a deviation from the CALFED temperature objectives during the April-May pulse flow time period. CALFED objectives recommend 57°F to the confluence from April 16 to June 3 for smoltification. However, this objective is not justified based on information presented in the CALFED Peer Review Report, by over 10 years of outmigrant trapping data, and factors influencing water temperatures in the Stanislaus and San Joaquin Rivers, as discussed below. Rather than providing a temperature objective for smoltification through June 3, the transitional plan proposes to shorten the timeframe to between April 16 and May 15.

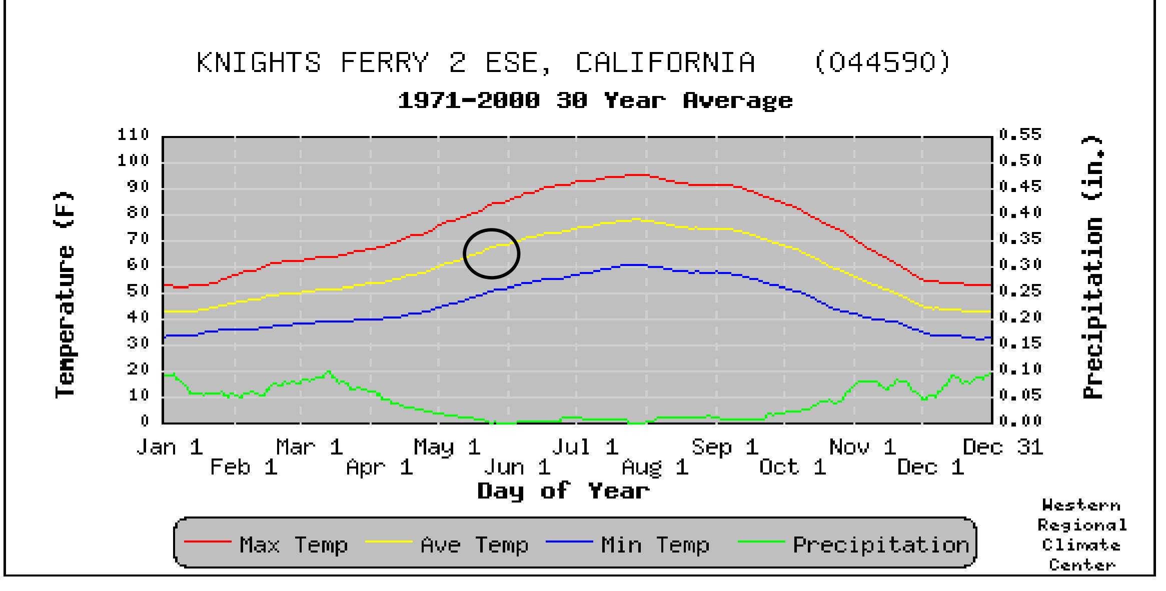
The temperature objective for over-summer juvenile rearing at Orange Blossom Bridge would then begin on May 16 instead of June 4.

Specifically, the objectives recommended by the CALFED Peer Review Report extend the composite smoltification period to June 3 in order to accommodate more protective measures for steelhead smoltification. However, the timing of steelhead smoltification is described in the same report as extending only from April to early May; therefore, the extended coverage period is not warranted for steelhead smoltification.

As for FRCS smoltification, rotary screw trap data collected annually since 1995 indicate that about 97% of salmon juveniles migrate out of the Stanislaus River by May 15; therefore, temperatures at the confluence to protect smoltification after May 15 are not necessary for such a small portion (i.e., 3%) of the population.

Third, ambient air temperature has been identified as the largest determinative factor on water temperature in the Stanislaus River (AD and RMA 2002). The average ambient air temperature for late May is 65-70°F (Figure 7). Thus, meeting a 57°F requirement at the confluence is difficult when antecedent conditions are dry and ambient air temperature is high. In fact, CALFED temperature modelers calculated that the amount of water that would be required to meet the temperature objective at the confluence during late-May would exceed the allowable maximum of 1,500 cfs, or approximately 45,000 acre-ft due to ambient temperature influences.

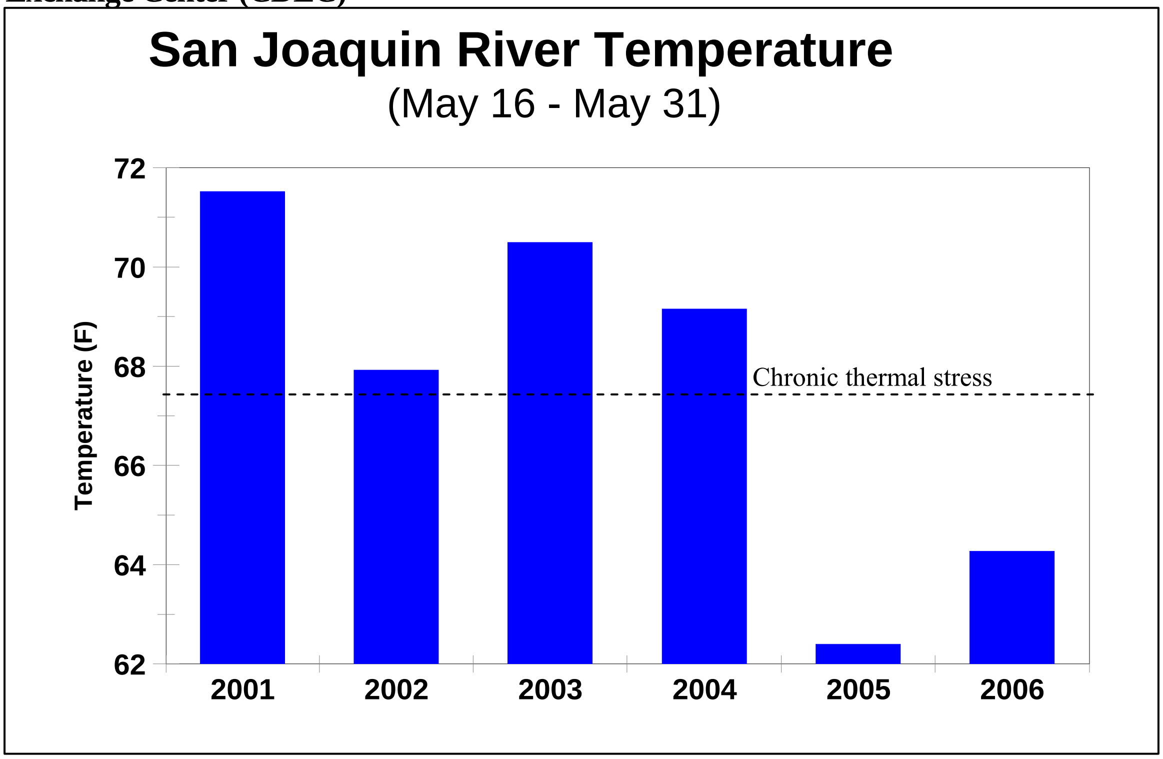
Figure 7. Minimum, maximum, and average daily ambient air temperature at Knights Ferry, 1971-2000. Source: Western Regional Climate Center (http://www.wrcc.dri.edu)



Finally, even if temperatures at the confluence of the Stanislaus River were 57°F between May 16 and June 3, any juveniles migrating out of the river during this period would experience chronic stress due to the excessive water temperatures in the San Joaquin River. Chronic stress can cause an increased susceptibility to predation and disease. The chronic thermal stress threshold identified in CDFG annual performance reports is 67.5 °F for juvenile salmon. Average water temperatures in the San Joaquin River in late May ranged from 67.9°F to 71.5°F during 2001-2004 when flows at Vernalis were managed (i.e., 2,150-2,900 cfs) and from 52.4 to 64.3 under flood control conditions (i.e., average flow 12,500-25,000 cfs) during 2005 and 2006 (Figure 8). The CALFED modeling effort revealed that operating the Stanislaus River to maintain cooler water temperatures in the San Joaquin River at Vernalis is pointless because there is only a negligible influence from incremental Stanislaus River flow changes up to the allowable 1,500 cfs maximum Goodwin releases.

Based on smoltification and migration timing of juvenile salmon and steelhead and the inability to significantly alter water temperatures regardless of flow levels because of the large influence of ambient air temperature conditions, it is reasonable to shorten the timeframe of the smoltification objective from June 3 to May 15 and to begin the temperature objective for over-summer rearing at OBB on May 16.

Figure 8. Average water temperature (°F) in the San Joaquin River at Vernalis during late-May, 2001-2006. Source: Temperature data obtained from the California Data Exchange Center (CDEC)



September. The next period in dispute for temperature objectives is September. CALFED proposes 64°F at the confluence from September 4 through October 1, and CDFG proposes 64°F at the confluence during above normal and wet years, at Ripon (RM 15) during below normal years, and at McHenry Bridge (RM 30) during dry/critical years for immigrating adult FRCS. However, these objectives are not justified based on observed adult migration patterns and on environmental conditions in the lower San Joaquin that do not support adult migration during much of September, as discussed below. The transitional plan proposes to change the adult migration temperature objective start date to October 1 with the compliance point located at the confluence.

Observations of adult immigration at the Stanislaus River weir during the past several years indicates that 97% of adult FRCS migrate into the Stanislaus River after October 1 (Table 7). This coincides with environmental factors in the San Joaquin becoming conducive to upstream migration. What little migration occurs earlier in the Stanislaus River generally takes place in the latter part of September as a combination of environmental factors becomes adequate for migrations (i.e., DO levels increase in the Stockton Deep Water Ship Channel and ambient air temperatures decrease resulting in concomitant water temperature decreases).

Table 7. Generalized upstream migration timing pattern observed at the Stanislaus River Weir near Riverbank (River Mile 31.2) during 2003-2005.

Date	% Adult Chinook Passing Weir
Sep 1-15	<0.05
Sep 16-30	2.7
Oct 1-15	184
Oct 16-31	26.6
Nov 1-15	32.7
Nov 16-30	12.7
Dec 1-15	5.6
Dec 16-31	1.2
Jan 1-15	0.2
Jan 16-31	<0.05

In many years, there is a dissolved oxygen problem in the Stockton Deep Water Ship Channel in September. A study of FRCS adult migration conducted by Hallock and others (1970) revealed that salmon did not generally migrate past Stockton until the DO had risen to about 4.5 mg/L, and the run did not become steady until concentrations were above 5 mg/L. To protect the homing ability FRCS, the 1995 SWRCB Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary established a minimum DO standard of 6 mg/L at Rough and Ready Island from September 1 through November 30. Actual recordings from 2001-2005 show that daily average concentrations during September seldom met the 6 mg/L standard (i.e., 7.3% of the time), and there is only a 36% probability that concentrations will exceed 5 mg/L during September (Table 8). Consequently, FRCS will not typically be able to move through the DWSC in September during the transitional plan period because the DO problem in the DWSC will not have been resolved by 2010. The aeration project is not set to commence until 2007 and will likely take several years for full implementation.

Table 8. **Exceedance probability of average daily dissolved oxygen concentration at Rough and Ready Island during September (calculated from 2001-2005 data downloaded from CDEC).**

Dissolved oxygen concentration (mg/L)	Exceedance Probability (%)
1	99.3
2	96.0
3	84.0
4	60.0
5	36.0
6	7.3

Third, water temperatures in the San Joaquin River in September are generally too high for FRCS to migrate. The CALFED Peer Review report identifies 69.8°F as the chronic lethal temperature for adult salmon. Further, Hallock and others (1970) found that adult migration did not become steady until water temperatures were 66°F or less. Average water temperatures at Vernalis over the past seven years have ranged from 69°F to 74°F with higher temperatures typically occurring early in the month and declining to approximately 69°F by the end of the month (Table 9). Temperatures in the San Joaquin River during September have only been below the chronic lethal temperature for adult salmon 27.9% of the past seven years, and were 66°F or less on only 3 days out of the 204 daily records.

Table 9. Average daily water temperature (°F) of the San Joaquin River at Vernalis, 1999-2005. Source: Data obtained from CDEC

Date	1999	2000	2001	2002	2003	2004	2005	AVG
01-Sep	69.5	68.3	75.7	76.2	76.3	76.2	74.0	73.8
02-Sep	69.7	67.8	76.0	76.9	77.2	75.6	74.3	73.9
03-Sep	70.3	68.8	76.1	77.2	78.1	72.0	74.1	73.8
04-Sep	70.6	68.4	75.9	75.9	77.7	70.9	73.5	73.3
05-Sep	71.6	68.3	74.7	71.4	76.3	73.0	73.1	72.6
06-Sep	72.6	68.3	72.7	70.0	74.6	74.8	73.2	72.3
07-Sep	73.5	--	72.2	69.0	73.1	75.5	72.7	72.7
08-Sep	73.4	--	72.3	69.2	72.3	76.0	72.3	72.6
09-Sep	73.3	--	71.9	70.4	71.4	76.0	72.1	72.5
10-Sep	72.6	--	71.7	71.9	71.5	75.0	71.2	72.3
11-Sep	72.1	--	71.8	73.0	72.9	74.5	69.9	72.4
12-Sep	72.3	--	71.8	73.3	74.2	74.2	69.2	72.5
13-Sep	72.3	70.7	71.8	73.0	73.7	72.5	68.8	71.8
14-Sep	71.8	71.9	72.9	72.8	73.7	71.5	68.3	71.9
15-Sep	71.9	72.0	73.5	72.2	73.6	71.4	68.4	71.8
16-Sep	71.7	68.5	72.7	70.9	72.2	73.1	68.5	71.1
17-Sep	71.2	69.6	72.0	71.1	70.3	73.3	68.6	70.9
18-Sep	70.8	72.0	72.6	71.4	69.3	68.5	68.3	70.4
19-Sep	70.2	73.5	72.9	72.7	70.2	65.2	68.4	70.4
20-Sep	70.0	74.4	72.7	73.8	71.5	65.2	69.0	70.9
21-Sep	70.5	73.6	72.0	73.9	72.6	65.5	69.7	71.1
22-Sep	72.1	71.3	71.6	73.6	73.6	67.2	70.5	71.4
23-Sep	73.1	69.5	70.9	73.9	73.8	69.1	70.2	71.5
24-Sep	73.0	68.6	69.9	73.6	72.9	70.4	68.0	70.9
25-Sep	72.8	68.7	69.9	72.9	71.5	71.1	66.8	70.5
26-Sep	71.7	69.5	70.2	72.1	71.0	70.6	67.1	70.3
27-Sep	69.7	69.4	70.3	70.7	71.0	70.2	67.6	69.9
28-Sep	67.7	68.8	68.6	69.1	70.9	69.4	68.2	69.0
29-Sep	68.2	68.3	68.2	68.0	70.4	69.0	69.1	68.7
30-Sep	69.3	69.4	69.5	67.3	70.4	69.0	69.7	69.2

Fourth, the amount of water needed to try meeting CALFED temperature objective during September, as quantified by the CALFED temperature modelers, was approximately 1,500 cfs or 90,000 acre feet. Modeling was not conducted to determine if CDFG's proposed criteria with dynamic compliance points could be met.

Based on migration timing of adults and on the lack of adequate migration conditions (i.e., dissolved oxygen and water temperatures) in the lower San Jaoquin during September, it is reasonable to change the start date of the adult migration temperature objective from September 4 to October 1 and to make the compliance point at the confluence. Based on adult migration timing observations and typical San Joaquin River conditions, it is anticipated that this start date would provide the greatest protection for most emigrating adult FRCS.

October through mid-November. The final period in dispute for temperature objectives is October through mid-November. CDFG proposes 55°F at Riverbank (RM

34) during above normal and wet years, at Oakdale (RM 39) during below normal years, and near Valley Oak (RM 44) from October 2 through November 12 for FRCS egg incubation. However, this objective is not justified based on observed spawning timing and distribution. According to CDFG annual spawning surveys, only 1.6% of spawning generally occurs prior to October 15, and 98.2% of this spawning activity occurs above Oakdale (Table 10). Therefore, protective temperatures at Riverbank as early as October 2 are not necessary for such a small portion of the population that may spawn prior to October 15. Additionally, spawning activity prior to December 1 generally occurs above Oakdale so placing the objective at Riverbank prior to December 1 is not justified. Instead of the incubation temperature objective beginning on October 2, the transitional plan proposes to start the incubation temperature objective of 55°F on October 15 at Oakdale, and to move the compliance point to Riverbank on December 1.

Table 10. Generalized timing pattern of spawning in the Stanislaus River based on redd counts from CDFG spawning surveys. Source: Electronic data and annual reports provided by CDFG

		Distribution of Redds[2]			
Date	%Redds Observed[1]	Goodwin	Knights Ferry to Horseshoe	Horseshoe to Oakdale	Oakdale to Riverbank
Before Oct 1	0.1%	100.0%	0.0%	0.0%	0.0%
Oct 1-15	1.5%	32.1%	61.3%	4.8%	1.8%
Oct 16-31	10.5%	17.5%	55.0%	24.5%	3.0%
Nov 1-15	29.4%	15.1%	51.4%	31.1%	2.5%
Nov 16-30	29.4%	13.6%	49.5%	33.6%	3.3%
Dec 1-15	19.0%	19.7%	38.9%	33.2%	8.2%
Dec 16-31	9.0%	14.5%	44.6%	34.3%	6.6%
Jan 1-15	1.1%	0.0%	46.5%	43.9%	9.7%

[1] Based on 1998-2005 CDFG spawning survey data.
[2] Based on 2000-2005 CDFG spawning survey data. CDFG indicated that there are problems with earlier data.

Adult Upstream Migration Flows

Similar to existing conditions, the proposed transitional flows during the adult FRCS upstream migration period are expected to provide suitable instream migration conditions for adult passage (i.e., water depths >0.78 ft and velocities <7.9 ft/s) within the Stanislaus River (SRFG 2006). Proposed transitional flows do not include attraction flow targets because attraction flows are not necessary for the maintenance of suitable migration conditions in the Stanislaus River but are a Delta issue that will be addressed in a separate forum.

Since the early 1990s, adult attraction flows have been released from the Stanislaus, Tuolumne, and Merced rivers during mid- to late October to reduce adult straying resulting from low DO concentrations within the Deep Water Ship Channel (DWSC). The DO deficiency in the DWSC is a Delta issue that cannot be addressed by managing Stanislaus River flows alone; therefore, this issue has been, is, and will continue to be addressed in the SWRCB Bay-Delta Periodic Review hearings. Further, it is anticipated that the SWRCB will identify several actions to address the DO problem, not just flow. If coordinated releases between the three tributaries are prescribed through the SWRCB process, the proposed transitional flows would need to be adjusted accordingly.

Juvenile Outmigration flows

There is a great discrepancy between the parties regarding what amount of water is necessary for juvenile salmonid outmigration. In our opinion, the problem needs to be addressed in three segments: 1) what flow is necessary to move fish from the Stanislaus to the San Joaquin River; 2) what flow is necessary in the San Joaquin River to maintain and move fish; and 3) what flow, barrier operations, and export reductions are necessary to move fish past/through the South Delta to the bay.

The last two issues are not part of this process. Those issues have been, are, and will continue to be addressed in the SWRCB Bay-Delta Periodic Review hearings. One of the issues identified during this process has been the April–May pulse flow on the San Joaquin River, and it is currently unknown how the SWRCB will address this issue. A draft staff report is due to be released in September, and it is anticipated that the SWRCB will keep the current pulse flow standard in place for the duration of the SJRA/VAMP which is set to run through December 31, 2011. Therefore, the only obligations the USBR will have during the transitional operation is meeting the X2 flow standard established under the 1995 Bay-Delta Water Quality Control Plan, and a contractual obligation to fulfill the SJRA/VAMP. Under proposed transitional flows, the USBR will meet its obligations for X2 and for the SJRA/VAMP, including providing the Stanislaus River's share of the San Joaquin River's April–May pulse flow. However, if the SWRCB changes the current pulse flow standard, then the proposed transitional flows would need to be adjusted accordingly. Once the SJRA/VAMP is completed, the SWRCB will undertake another periodic review to address what flows and other actions are necessary to move FRCS through the San Joaquin River and Southern Delta.

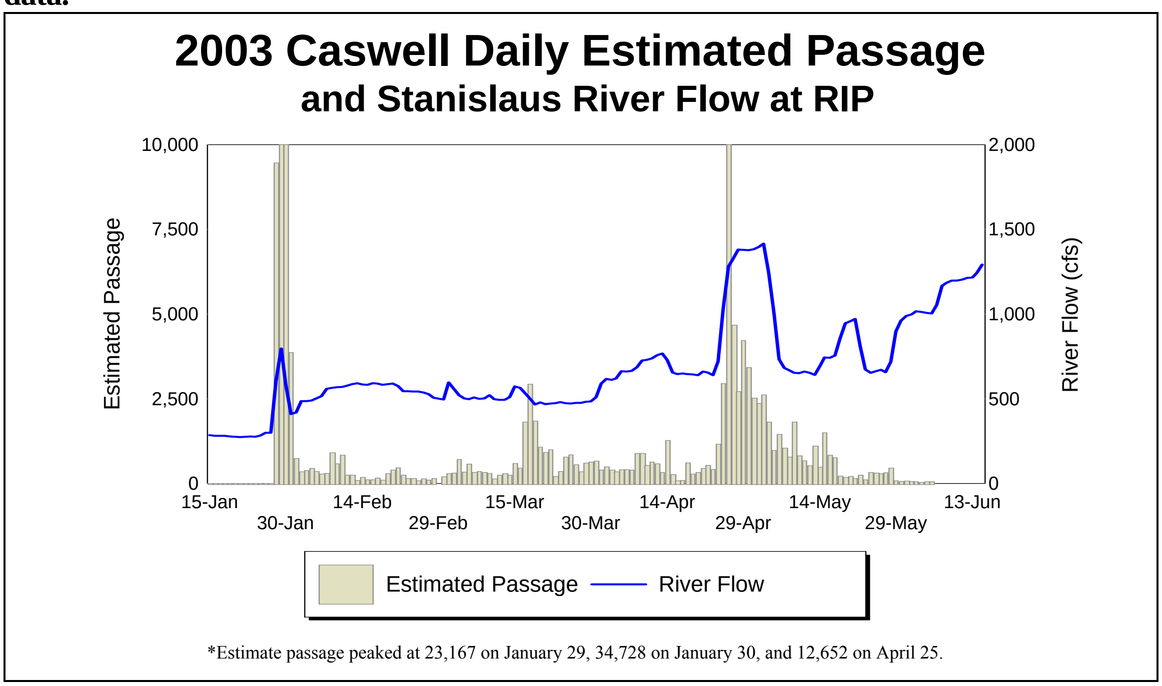
During years when San Joaquin River flows are low and the Basin index is Dry or Critical, the current flow objective in the Stanislaus River for smolt outmigration consists of relatively low (i.e., 500-1,200 cfs) "pulse" flows for extended durations (i.e, approximately 10-30 days) during a 30 day target window from mid-April to mid-May. No current flow management exists for juvenile outmigration earlier in the year. The existing flow objective is not justified in Dry or Critical years based on observed migration behavior, survival, and Delta export conditions, as discussed below. The transitional plan proposes to implement a "true" pulse flow management approach whereby multiple, short duration pulse flow events consisting of higher releases (i.e., five to six pulses up to the maximum allowable 1,500 cfs for two to three days each) are provided. The primary concept would be to pulse fish out earlier in the season, using short duration, high pulse flows to lessen instream losses while using the same total amount of pulse flow water available. In order to assist both fry and smolt outmigration during Dry and Critical years, pulse events would be provided in February (fry) and between April through early May (smolt). Base flows between individual pulse events would be provided at a level that would maintain rearing conditions for the fishery and to ensure that migration initiated by the pulse is not subsequently impeded.

Outmigrant sampling has been conducted annually with rotary screw traps at two locations in the Stanislaus River since 1995. This sampling program provides some of the best scientific data to help determine what flows are necessary to move FRCS from the Stanislaus to the San Joaquin River. The studies done to date indicate three key findings:

- A high proportion of juvenile salmon move within the first few days of a flow fluctuation, either when flows are increasing or decreasing.
- Flows as low as 750-1,000 cfs move salmon fry out of the river.
- Juvenile salmon are able to reach the Stanislaus River confluence within as little as two days and the Delta pumping stations within as little as five days of an initial flow pulse.
- Fry survival within the lower river in Dry and Critical years is low, and a better flow regime is needed to improve survival in these types of years.

Rotary screw trap data indicate that fluctuating flows stimulate both fry and smolt migration (Demko 2004, Demko and Cramer 1995). Figure 9 shows a representative outmigration pattern where peaks in migration abundance are observed within the first day or two of an increase or decrease in flow.

Figure 9. Juvenile abundance versus flow. Source: Cramer Fish Sciences unpublished data.



Rotary screw trap data from dry years (2001 and 2002), indicate that FRCS fry migrate past the upper rotary screw trap at Oakdale similar to other years, but they do not survive to the lower rotary screw traps at Caswell under dry year conditions (Demko

2004, SRFG 2004). Low flows and clear water conditions between the two locations likely resulted in high levels of predation.

A 2-day pulsed flow experiment conducted in January 2003 indicates that fry migration can be stimulated with flows as low as 750-1,000 cfs and that migration past Caswell begins within one to two days of initial flow increases during a pulse event (note: Caswell located at RM 8.6, so fish anticipated to reach confluence within two days). In addition, fish arrival at CVP and SWP Delta export facilities appears to occur within as early as five days following an initial Stanislaus River pulse flow. Although the pulse experiment provided the first targeted account of migration speed between various locations, fish arrival time at Caswell and Delta pumping stations is consistent with multiple years of rotary screw trapping data. Based on the results of the pulsed experiment, it is anticipated that higher flows of shorter pulsed duration during February would stimulate fry migration and may provide higher turbidity levels that would help fry move safely through the lower river. In addition, short duration pulse flows are expected to stimulate smolt migration during April and May similar to that observed during the pulse experiment for fry, as corroborated by multiple years of observed smolt migration responses to flow fluctuations (Demko and Cramer 1995, Cramer Fish Sciences unpublished data).

The fate of outmigrating fry after they exit the Stanislaus River is largely unknown, and identifying actions to improve survival in the San Joaquin River and Delta is not part of this process. These issues are being addressed through the SWRCB Bay-Delta Periodic Review hearings. Results from the 2003 Stanislaus River experiment suggest that fry were able to successfully migrate from the Stanislaus River, through the lower San Joaquin River, and into the Delta (Demko 2004). However, the large numbers of fry observed at the Delta Export facilities within a few days of the Stanislaus River pulse still leave open the possibility that fry may not survive in the Delta until they reach the smolt stage. Since survival through the Delta is influenced by export rates, a real-time export management approach should be explored within the SWRCB Bay-Delta Periodic Review hearings that would take into consideration the anticipated arrival time of fish (i.e., based on rotary screw traps and trawling) following a pulse flow.

Non-flow factors

River flow is only one factor among several which influence the health and abundance of Stanislaus River FRCS. Other critical factors include the quantity and quality of existing spawning, incubation, and juvenile rearing habitat. Each of these non-flow factors has been compromised by instream gravel mining, changes in streamside land use, and reduced gravel recruitment. Analyses of juvenile and adult FRCS abundance estimates suggest that the carrying capacity of the Stanislaus River under existing habitat conditions is between 1,000 and 3,000 Age 3 equivalent spawners, or 1.5 to 2.0 million juveniles (SRFG 2004). Therefore, habitat restoration actions are necessary before full benefits of improved flow management can be realized. In the absence of habitat restoration efforts sufficient enough to increase carrying capacity, the Central Valley Project Improvement Act (CVPIA) production goal of approximately 20,000 fall-run Chinook for the Stanislaus River (equivalent to approximately 10,000 plus spawners escaping to the river) cannot be achieved.

In order to improve the quantity and quality of the habitat for FRCS with the goal of increasing production, several habitat restoration projects have been completed in the Stanislaus River since 1994, and several others are in various stages of planning or implementation (Table 11). Due to the severity of past habitat degradation, numerous restoration efforts will be required to re-establish properly functioning conditions within the river. It is anticipated that it will be at least several years before restoration priorities are established and implemented, and it will likely take even longer for noticeable population responses to be observed.

Table 11. Habitat restoration projects completed or planned for the Stanislaus River.

Project Name/ Location	Type of Restoration Completed/ Proposed	Project Status
Goodwin Canyon	Gravel augmentation	Ongoing since 1997; conducted annually
Knights Ferry Gravel Replenishment	Gravel augmentation; riffle restoration	Completed in 1999
Horseshoe Recreation Area	Gravel augmentation; riffle restoration	Completed in 1994
Mohler Tract	Floodplain acquisition and riparian planting[1]	Completed in 2003[1]
Lovers Leap	Gravel augmentation; riffle restoration	Completion anticipated in 2006 or 2007, permits pending
Honolulu Bar	Channel modification; gravel augmentation; riffle restoration	Completion anticipated in 2007
Oakdale Rec. Area	Elimination of instream mine pits; floodplain and riffle restoration; gravel augmentation	Draft designs and initial environmental surveys completed
Two Mile Bar	Floodplain and riffle restoration; gravel augmentation	Feasibility analysis completed

[1] Project plan included breaching a segment of an un-maintained berm adjacent to the river which would have allowed this area to periodically inundate, promoting natural floodplain re-generation and succession. However, this aspect was opposed by the City of Ripon and was not implemented.

Fish Species Management

The proposed transitional plan has as its goal the maintenance and enhancement of FRCS. There exists within the Stanislaus River Basin a robust fishery of at least 39 species, and one additional fish species (e.g., Green sturgeon) may also be present, but their potential existence in the basin is currently under review by NMFS. Of these, there are two fish species that have been specially designated and one species under consideration for special designation under the federal ESA: Central Valley Fall Run Chinook Salmon (Species of Concern), Central Valley Steelhead (Threatened), and Green Sturgeon (Proposed Threatened). There is on-going litigation as to whether or not steelhead should remain listed. The transitional plan meets the OCAP Section 7 Biological Opinion and CALFED Peer Review proposed temperature regime for steelhead. Green sturgeon are currently going through a listing decision and critical habitat designation process. It is unclear whether green sturgeon exist on the Stanislaus River so the Stanislaus River may be excluded from any critical habitat designation. Although the transitional plan is targeted for FRCS, it is anticipated that proposed transitional flow management strategies will also benefit listed steelhead and will be adequate for other species.

Pursuant to CVPIA, D-1641, and the CDFG Central Valley Plan for Anadromous fish, the goal is to increase the population of FRCS. (USFWS 2001; SWRCB 2000; Reynolds et al. 1993). The USBR, DWR, USFWS, CDFG and the Districts have spent millions of dollars trying to improve fish habitat, water resource management, and other factors for FRCS in the Stanislaus River Basin, San Joaquin River Basin, and Bay-Delta. It is the belief of the Districts' policy makers that the goals and policy directives should, to the degree reasonable, be implemented.

Table 12. List of fish species captured in the Stanislaus River rotary screw traps at Oakdale and Caswell, 1996-2006. Source: Cramer Fish Sciences unpublished data

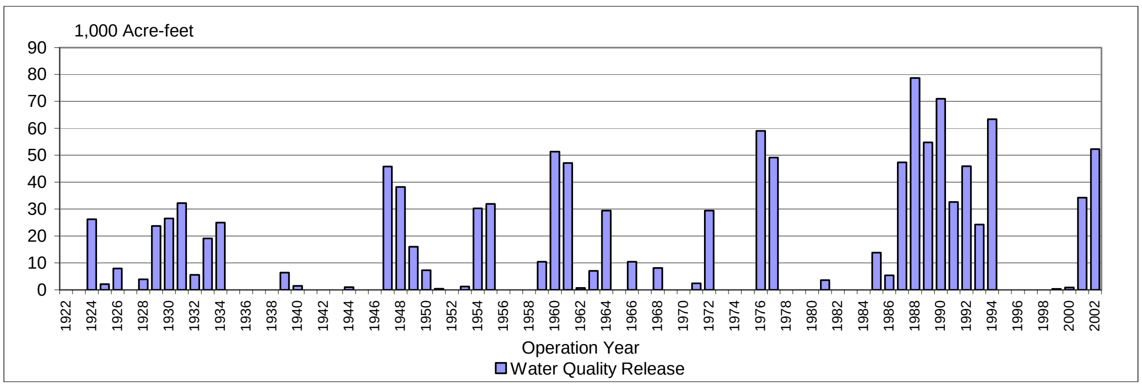
Common Name	Scientific Name
American Shad	*Alosa sapidissima*
Bigscale Logperch	*Percina macrolepida*
Black Bullhead	*Ameiurus melas*
Black Crappie	*Pomoxis nigromaculatus*
Bluegill Sunfish	*Lepomis macrochirus*
Brown Bullhead	*Ictalurus nebulosus*
Channel Catfish	*Ictalurus punctatus*
Chinook Salmon	*Onchorynchus tshawytscha*
Common Carp	*Cyprinus carpio*
Golden Shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Green Sunfish	*Lepomis cyanellus*
Hardhead	*Mylopharodon conocephalus*
Hitch	*Lavinia exilicauda*
Inland Silverside	*Menidia beryllina*
Largemouth Bass	*Micropterus salmoides*
Pacific Lamprey	*Lampetra tridentata*
Prickly Sculpin	*Cottus asper*
Pumpkinseed	*Lepomis gibbosus*
Red Shiner	*Cyprinella lutrennsis*
Redear Sunfish	*Lepomis microlophus*
Redeye Bass	*Micropterus coosae*
Riffle Sculpin	*Cottus gulosus*
River Lamprey	*Lampetra ayresi*
Sacramento Blackfish	*Orthodon microlepidotus*
Sacramento Perch	*Archoplites interruptus*
Sacramento Pikeminnow	*Ptychochelius grandis*
Sacramento Splittail	*Pogonichthys macrolepidotus*
Sacramento Sucker	*Catostomus occidentalis*
Smallmouth Bass	*Micropterus dolomieu*
Steelhead/Rainbow Trout	*Onchorynchus mykiss*
Striped Bass	*Morone saxatilis*
Threadfin Shad	*Dorosoma petenense*
Tule Perch	*Hysterocarpus traski*
Warmouth	*Lepomis gulosus*
Western Mosquitofish	*Gambusia affinis*
White Catfish	*Ictalurus catus*
White Crappie	*Pomoxis annularis*
Yellow Bullhead	*Ictalurus natalis*

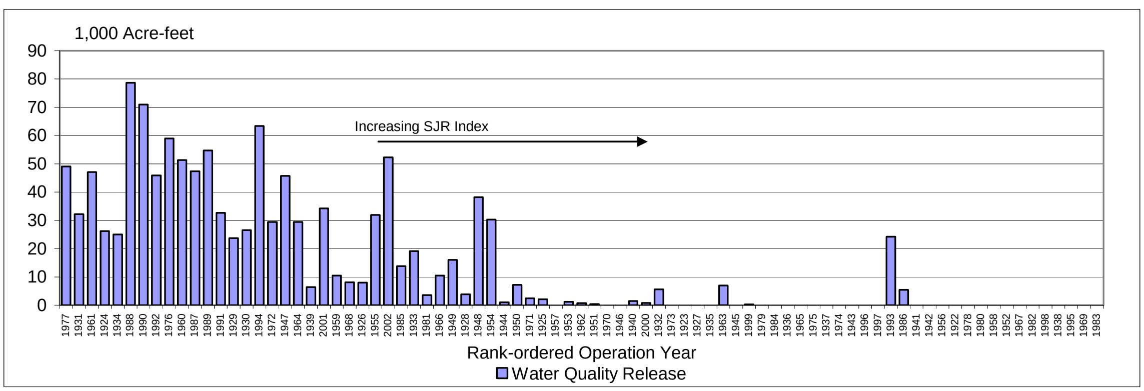
Water Quality

As described above, the fishery release component of the proposed plan serves as the foundation of releases to the Stanislaus River. Those releases are intended to be absolute. The additional release of water to the Stanislaus River for the purpose of water quality and flow objectives at Vernalis will then be provided, if needed, to supplement the incidental benefits of the fishery releases.

No constraint is placed upon the annual release for water quality or flow requirements at Vernalis; therefore the order of providing supplemental Vernalis water quality or flow releases is irrelevant. However, for (b)(2) accounting purposes, it is assumed that supplemental water quality releases occur first. Figure 10 (upper graph) illustrates the year to year supplemental provision of releases to meet water quality requirements at Vernalis. The lower graph illustrates the same data arranged by ascending San Joaquin River Index.

Figure 10. Water Quality Releases of Proposed Plan





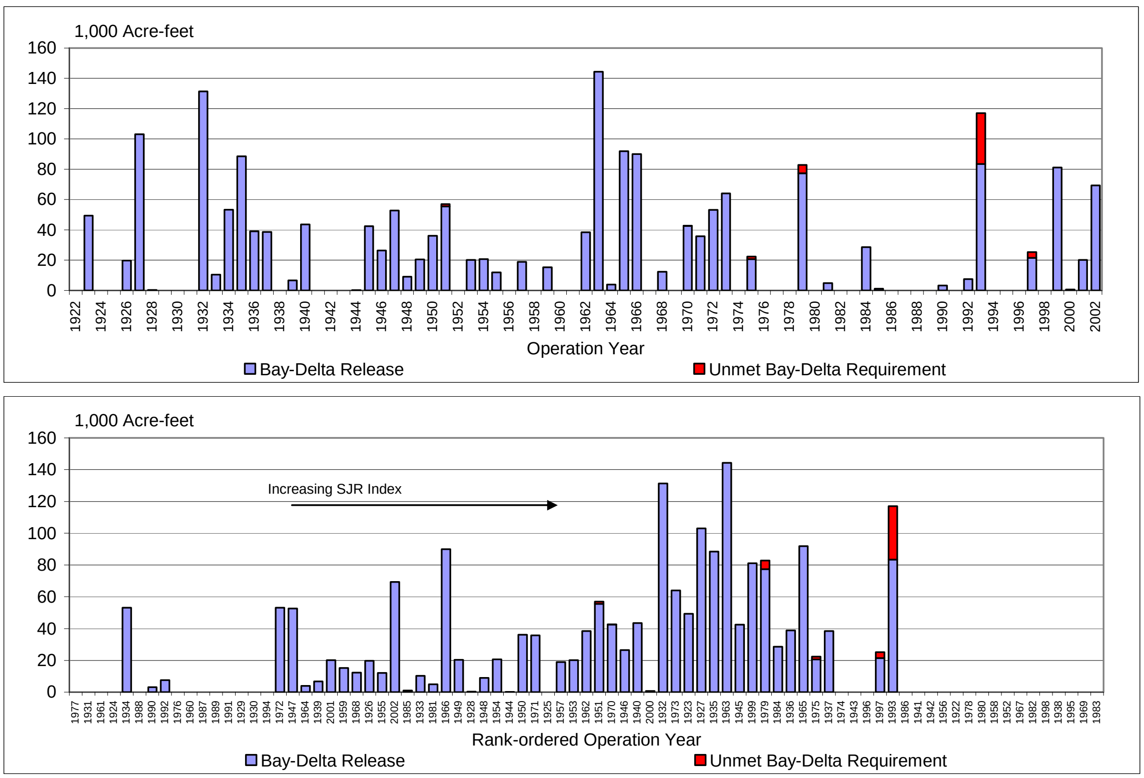
Bay-Delta Releases

The flow requirement at Vernalis, Feb-June, excluding the April-May pulse, has been severely questioned. The SJRGA and other entities have offered extensive comments in the SWRCB Periodic Review process regarding the proposed objectives, their implementation, and the potential impacts. (See Master List of Exhibits for the Periodic Review of the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento – San Joaquin Delta Estuary, available at http://www.waterrights.ca.gov/baydelta/exhibits_list.htm#sj, accessed September 7, 2006.)

The SWRCB in D-1641 conditioned all CVP water right permits with the obligation of meeting the Vernalis salinity objective and all CVP and SWP water right permits with the obligation to meet the Delta outflow objectives, and provided the USBR and DWR with great latitude on how these requirements would be achieved.[4] The proposed plan however has as its premise the goal of ensuring current permit conditions, including the D-1641 San Joaquin River and Delta flow requirements at Vernalis are met through releases of water from New Melones. The current IPO does not meet the Bay-Delta flow requirement.

The proposed plan would meet the Vernalis flow requirement. Figure 11 illustrates the release to the Stanislaus River for Vernalis flow requirements. These supplemental releases occur over and above the fishery and water quality releases described above.

Figure 11. Bay-Delta Releases of Proposed Plan



While at times requiring substantial supplemental releases, the proposed plan will meet the Vernalis flow requirement. The only time the modeling indicates that the requirement is not met is when the Stanislaus River release is constrained by the 1,500 cfs flow limitation at Goodwin. (See Appendix A: Modeling Appendix, Jeanne Zollezi's

[4] Other available options include releases from other CVP reservoirs such as Friant; releases from San Luis Reservoir; recirculation of water from the Delta Mendota Canal, through the Newman Wasteway; construction of a drain to eliminate saline discharge into the San Joaquin River; and purchases of water from willing sellers to release to meet these objectives.

letter and attached docs to Bill Loudermilk re: 1,500 cfs flow limitation.) During these periods there is sufficient water in New Melones storage to meet the requirement but the release constraint limits the amount of water that can be contributed.

Dissolved Oxygen at Ripon

SWRCB Water Rights Decision 1422, revised by the 1995 Bay-Delta Water Quality Control Plan, established a minimum DO concentration of 7 mg/l, as measured on the Stanislaus River near Ripon.

The current IPO allocates up to 60,000 afa to meet the dissolved oxygen requirement at Ripon. The USBR assumes that a flow of approximately 250 cfs during June, July, August and September is needed to meet the standard. Currently Reclamation accounts for this release outside of any of the existing IPO allocations.

It was assumed for the purposes of this proposed transitional plan that since June-September flows would be 200 cfs for the fishery release alone, and greater if water quality releases are occurring, the DO at Ripon would be met.

The Districts propose as part of the transitional plan to modify the DO objective at Ripon. The proposed modification would be to change the DO objective compliance point during June through September from the Ripon location to Orange Blossom Bridge. The standard of 8 mg/l would remain. (See Draft Petition to Change the Dissolved Oxygen Compliance Point on the Stanislaus River from Ripon to Orange Blossom Bridge, submitted separately.)

Operations Criteria and Plan (OCAP) Section 7 Opinions

There currently exists a Section 7 opinion for OCAP. The OCAP maintain daily average water temperature in the Stanislaus River between Goodwin Dam and the Orange Blossom Road bridge at no more than 65°F during the period of June 1 through November 30 to protect rearing juvenile Central Valley steelhead. (USBR, Long-Term Central Valley Project Operations Criteria and Plan (June 30, 2004), p[3-43]; NMFS Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan (October 2004), p224.)

This requirement has not been incorporated into the IPO. It is not known if the USBR coordinates its releases with the temperature gage at Orange Blossom Bridge. It is not known what policy or procedure the USBR has implemented to meet the Section 7 opinion.

Initial modeling done under the CALFED temperature model process would indicate that the temperature objectives contained in the Section 7 OCAP opinion can be met using the proposed flow schedule. Table 13 set forth below shows the Temperature degree violation days using the proposed flow schedule.

Table 13. Monthly temperature exceedance levels at Orange Blossom Bridge

	Apr				May				Jun			
Degrees F	**49**	**52**	**55**	**57**	**52**	**55**	**58**	**60**	**53**	**55**	**60**	**64**
D1485 (1991)	-	83.0%	43.0%	15.0%	99.0%	71.0%	43.0%	6.0%	98.0%	92.0%	65.0%	3.0%
D1485 (1992)	-	82.0%	43.0%	15.0%	99.0%	71.0%	43.0%	6.0%	98.0%	92.0%	65.0%	3.0%
D1485(1993)	-	83.0%	43.0%	15.0%	99.0%	71.0%	43.0%	6.0%	98.0%	92.0%	65.0%	3.0%
D1641(1994)	98.0%	57.0%	15.0%	4.0%	89.0%	45.0%	7.0%	3.0%	97.0%	92.0%	47.0%	1.0%
D1641(1997)	98.0%	57.0%	15.0%	4.0%	90.0%	45.0%	7.0%	3.0%	97.0%	92.0%	51.0%	1.0%
Today EWA	98.0%	57.0%	15.0%	4.0%	90.0%	45.0%	7.0%	3.0%	97.0%	92.0%	50.0%	1.0%
	Jul				Aug				Sep			
Degrees F	**57**	**60**	**61**	**63**	**56**	**58**	**60**	**65**	**57**	**58**	**60**	**63**
D1485 (1991)	95.0%	51.0%	34.0%	5.0%	99.0%	75.0%	38.0%	1.0%	98.0%	97.0%	53.0%	4.0%
D1485 (1992)	96.0%	54.0%	39.0%	5.0%	99.0%	77.0%	39.0%	1.0%	98.0%	97.0%	53.0%	4.0%
D1485(1993)	95.0%	54.0%	37.0%	5.0%	99.0%	75.0%	39.0%	1.0%	98.0%	97.0%	53.0%	4.0%
D1641(1994)	95.0%	47.0%	27.0%	5.0%	97.0%	84.0%	40.0%	2.0%	97.0%	91.0%	55.0%	5.0%
D1641(1997)	95.0%	47.0%	31.0%	5.0%	97.0%	86.0%	43.0%	2.0%	97.0%	91.0%	54.0%	5.0%
Today EWA	95.0%	46.0%	30.0%	5.0%	97.0%	85.0%	43.0%	1.0%	97.0%	91.0%	54.0%	5.0%

Water Supply

SSJID and OID Agreement. The proposed operating plan meets the terms and conditions of the 1987 Agreement.

CVP Contractors - SEWD and CSJWCD.

SEWD and CSJWCD contracted with the USBR in 1983 for 155,000 acre-feet annual water supply from New Melones. The extensive hydrologic studies undertaken by the USBR prior to execution of the contracts in 1983 confirmed that the yield of the New Melones project was approximately 180,000 acre feet annually and as such contracted with SEWD for 75,000 acre-feet annual “interim supply” and CSJWCD 80,000 acre-feet annually (49,000 “firm” and 31,000 “interim”). The Congressional authorization for the New Melones Project and the contracts provide a preference for water needed within the in-basin counties of origin – Tuolumne, Stanislaus and Calaveras. As such, the “interim” water supplies are available to CVP contractors until needed for use in the counties of origin. To date, no additional water service contracts have been entered into by the Bureau for the delivery of in-basin water from the New Melones Project and no additional in-basin needs have been identified. Should any in-basin user (e.g., Tuolumne Utility District, Calaveras County Water District or Stanislaus County) contract with the USBR for water from New Melones, the “interim” contract supplies of SEWD and CSJWCD would decrease in that amount.

The USBR operates New Melones reservoir pursuant to water right permits issued by the SWRCB. The SWRCB would not allow the USBR to fill New Melones Reservoir to its’ full capacity until it showed proof that the water would be put to beneficial use. The USBR presented the contracts with SEWD and CSJWCD as this proof, and only then was the USBR allowed to fully exercise its New Melones water rights.

The contracts required SEWD and CSJWCD to build the Goodwin Tunnel and related facilities to take the water from New Melones to their service area. These facilities were built at an expense of over $65 million. In 1993, these facilities were completed. Water deliveries pursuant to the contracts are critical for SEWD and CSJWCD because of the condition of the groundwater basin. Both SEWD and CSJWCD are located in the Eastern San Joaquin County Groundwater Basin. In Bulletin 118-800, the DWR declared the Eastern San Joaquin County Groundwater Basin to be in a critical state of overdraft. There are only 11 such basins in the State of California.

A number of reports have been prepared on the condition of the Eastern San Joaquin County Groundwater Basin and have reported the following:

<u>1980 Report – Bulletin 118-80</u>

In 1980 the state identified the basin as one subject to critical conditions of overdraft, which means that: the continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social or economic impacts.

Further, this report indicated that "this basin for many years has experienced overdraft, the adverse effects of which include declining water levels that have induced the movement of poor quality water from the Delta sediments eastward. . . Migration of these saline waters has severely impacted the utility of groundwater. . . Wells have been abandoned and replacement water supplies have been obtained by drilling additional wells generally to the east."

<u>1985 Brown and Caldwell Report</u>

In 1985, local agencies drafted a report confirming that groundwater levels were still declining. Conclusions of the report indicated that (1) Serious overdrafting is continuing; (2) The saline front advanced inland approximately one mile between 1963 and 1983; (3) Water levels declined at an average rate of 1.7 feet per year during the period from 1947 to 1984, in the areas of the greatest groundwater depression, average water levels were over 60 feet below sea level in 1980; and (4) If no additional surface water is imported into the service area and all demands are met from groundwater, the groundwater model indicates that water levels will decline to as much as 160 feet below sea level (up to 200 feet below the ground surface) and the saline front will advance approximately an additional two miles by the year 2020.

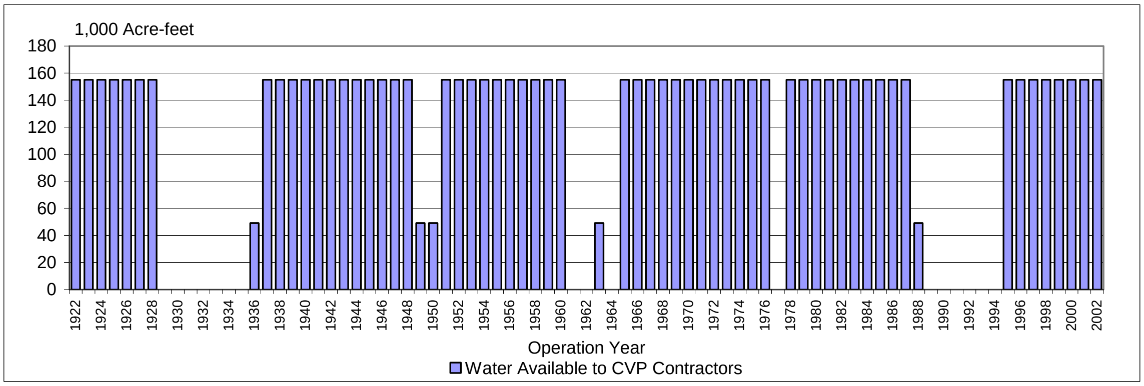
<u>2004 Eastern San Joaquin Groundwater Basin Groundwater Management Plan</u>

Based on the San Joaquin County Water Management Plan, the Basin is overdrafted by an average 150,000 af/yr. Long-term groundwater overdraft has lowered the groundwater table by two feet per year in some areas to -70 ft below sea level and has induced the intrusion of saline groundwater into the Basin from the west. Without additional surface water supplies, such intrusion will degrade portions of the Basin, rendering the groundwater unusable for municipal supply and irrigation.

These reports and studies reveal the critical condition of the future of Eastern San Joaquin County groundwater basin, and the predicted permanent destruction of an additional two miles of that basin if additional sources of supplemental surface water are not obtained.

The proposed plan of operation provides deliveries to the CVP contractors based on the New Melones Index. Two levels of annual delivery are provided, 49 TAF for an index ranging from 1,500 TAF to 1,800 TAF, and 155 TAF for an index greater than 1,800 TAF. No deliveries would be provided when the index is less than 1,500 TAF. Water available to the CVP contractors under the proposed plan is illustrated in Figure 12.

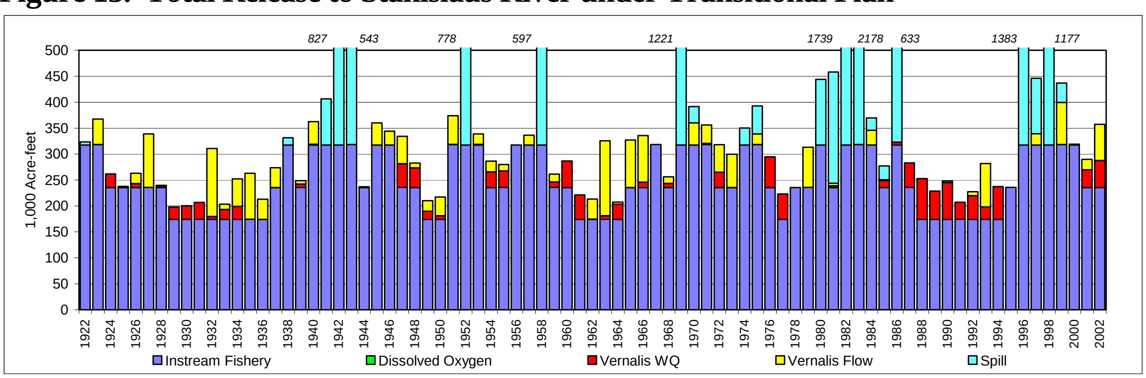
Figure 12. Water Available to CVP Contractors



Total Releases to the Stanislaus River

An important outcome of the transitional plan is a more reliable release of flow to the Stanislaus River during dry and successive dry years. In addition to this absolute release, additional releases for water quality and Bay-Delta flow objectives will occur. Figure 13 illustrates the modeled total annual release to the Stanislaus River for the 1922-2002 simulation period.

Figure 13. Total Release to Stanislaus River under Transitional Plan



Illustrated is the foundational flow provided by the fishery flow allocations, ranging annually from 174,000 acre-feet to 318,000 acre-feet. Added to this flow would be releases for water quality and Bay-Delta flow objectives. Occasionally there will still be spills from New Melones in excess of allocations.

Contingency Planning

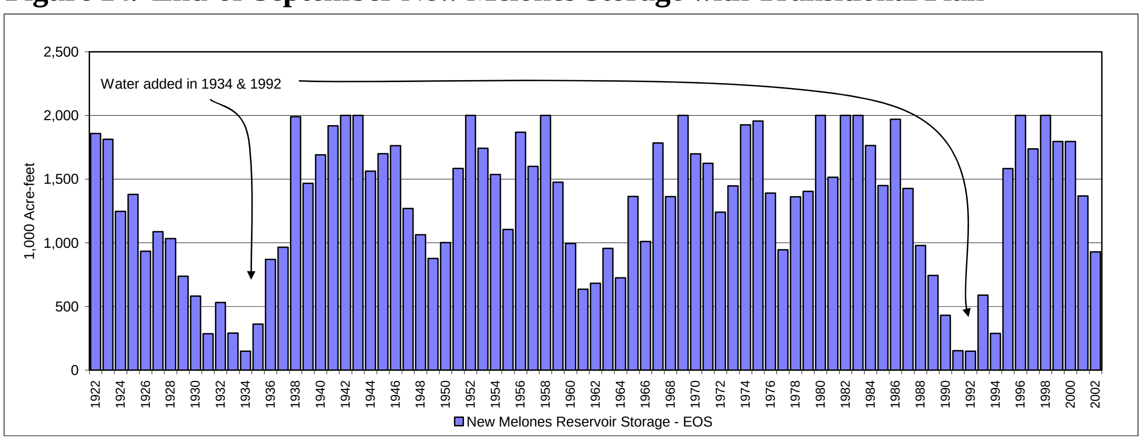
The importance of successive Critical, Dry and Below Normal years at New Melones cannot be overstated. New Melones has been subjected to several notable successive drought years 1928-1934, 1958-1962, 1975-1976 and 1987-1992. An operational plan must identify the hydrologic sequence it is planned to meet.

This proposed transitional plan is designed to meet the 1928-1934 drought. This was done because planning for the 1987-1992 drought would be too conservative and leave too much water in storage or spill too much water. This is shown in the accompanying graph comparing and contrasting reservoir levels and spills at New Melones under the IPO and the proposed plan.

As described above, the transitional plan's planning perspective is changed from providing protection against highly infrequent droughts to providing water allocations that can better exercise New Melones storage. Given that New Melones will enter the 2006-07 water year with a full reservoir and the anticipation that the proposal is intended to be transitional, water allocations have been developed to increase utilization of New Melones storage while maintaining a lessened concern for extended severe drought.

However, it is to be recognized that the transitional plan's allocation methodology is not without risk if its use continues beyond the anticipated transitional period. Figure 14 illustrates the end-of-September storage associated with the implementation of the transitional plan over the historical 82-year simulation period.

Figure 14. End-of-September New Melones Storage with Transitional Plan



As can be seen in Figure 14, New Melones storage is exercised more often and to a greater extent that under the IPO, indicating greater allocations to New Melones water uses. The note in Figure 14 regarding "added" water indicates that during a recurrence of the prolonged droughts of the 1920s-30s and 1987-1992 allocations under the transitional plan would lead to a non-viable operation by the end of those drought periods. Initial interpretation of the water supply studies indicate that during implementation of the transitional plan Reclamation and the stakeholders should re-evaluate needs and allocations if the New Melones Index is anticipated to be near 1,300,000 acre-feet or less. This point in hydrology essentially provides at least three years of the proposed allocations within the 1987-1992 drought period. Re-evaluation of needs and allocations at this point would provide sufficient time to adjust operations and provide a viable operation through historically experienced drought cycles.

Spills decrease, reservoir levels decrease and more water is put to beneficial use under the proposed transitional plan.

CVPIA (b)(2) Accounting

In 1992 the Central Valley Project Improvement Act – Public Law 102-575 (CVPIA) was signed into federal law. Section 3406 (b)(2) requires the USBR to dedicate and manage annually 800,000 acre feet of CVP yield for the primary purpose of implementing fish, wildlife and habitat restoration purposes; to assist the State of California in its efforts to protect the water of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of the this title, including but not limited to additional obligation under the Federal Endangered Species Act.

Project yield is defined in Section 3406(b)(2) as the delivery capability of the CVP during the drought period of 1928-1934 as it would have been with all facilities and requirements on the date of enactment of the CVPIA (October 31, 1992) in place. Since enactment of the CVPIA, up to 151.3 TAF annually has been dedicated from New Melones for (b)(2) purposes. In 1999 the Department of the Interior calculated CVP Yield for the Stanislaus River Basin for (b)(2) purposes at 3 TAF.

In order for the USBR to be consistent with the Decision on Implementation of Section 3406(b)(2) decision dated May 9, 2003, the USBR will need to continue to run a pre-CVPIA run utilizing the new model in order to account for the (b)(2) water utilized from New Melones. Pre-CVPIA assumptions remain the same, including the 1987 Fish and Game Agreement, D-1422 and Corps of Engineers Flood Control requirements.

Study Results

A summary of the annual operation of New Melones under the IPO and the proposed transitional plan are included in Appendix B. The results are from the output provided by NEWMOM simulations.

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Appendix A

Modeling Appendix

New Melones Operations Model
Users Guide

The New Melones Operations Model[5] (NEWMOM) was developed to perform simulations of the operation of the New Melones Project under varying assumptions for Stanislaus River water allocations and alternative boundary conditions within the San Joaquin River Basin. The model is an Excel workbook with a single model worksheet and several ancillary worksheets that provide input and reporting functions. The model provides a simulation of operations for an 82-year trace of hydrology, water years 1922 through 2003. Annual operations can be divided among two periods per month, with the two periods within a month capable of being divided into any two groups of days.

The boundary condition affecting Stanislaus River operations is imported from a CALSIM II simulation. Specifically required information required from CALSIM II include flow and water quality conditions for the San Joaquin River above the confluence of the Stanislaus River (Maze Boulevard), accretion and loss information (flow and water quality) upstream of Vernalis to Goodwin Dam (Stanislaus River) and Maze Boulevard (San Joaquin River), diversions and commitments by Oakdale Irrigation District and South San Joaquin Irrigation District, and the Vernalis flow objective based on the required location of X2 (if the simulation includes compliance with D1641).

Water allocations from New Melones can be fashioned various ways, along with the capability to vary the order of priority of these allocations. The structure of the water allocations has a resemblance to the methodology used for the 1997 New Melones Interim Plan of Operations, with allocations triggered by a water supply index comprised of the current year's storage plus anticipated inflow. The categories of water allocation include a) in-stream fishery releases, b) water quality at Vernalis, c) in-stream dissolved oxygen (flow surrogate), d) flow requirement at Vernalis, e) CVP(1) diversions at Goodwin, and f) CVP(2) diversions at Goodwin.

Diversions to Oakdale Irrigation District and South San Joaquin Irrigation District are derived from a land-use calculation, and incorporate district operations. Other commitments of the districts (e.g., transfers and SJRA) can be incorporated into the diversions. The districts' annual entitlement is limited by their settlement agreement with Reclamation.

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[5] The New Melones Operations Model was developed by Walter Bourez, MBK Engineers and Daniel B. Steiner, Consulting Engineer through funding by the Oakdale Irrigation District, South San Joaquin Irrigation District and Tri Dam Project.

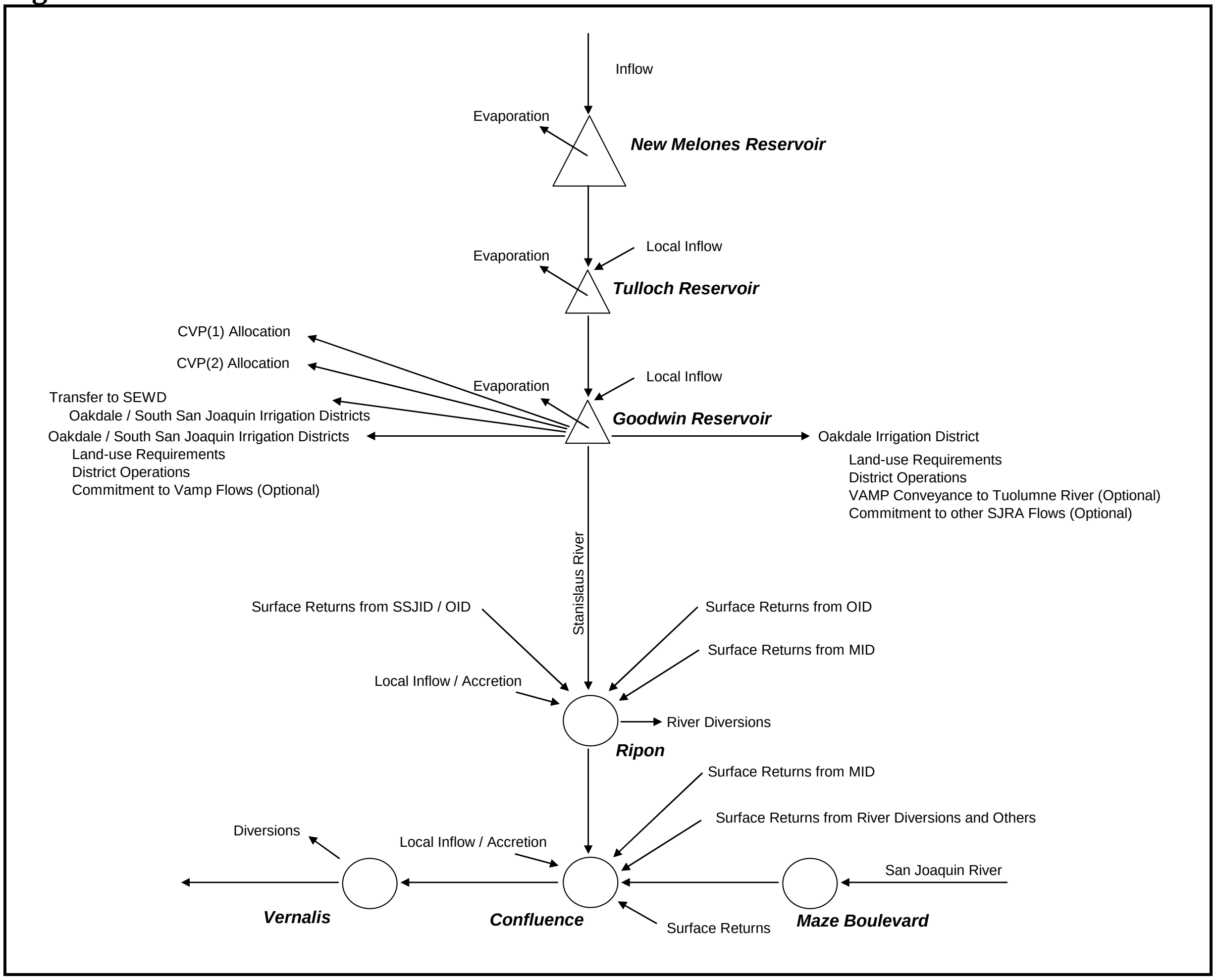
Facility Representation

The model is structured to allow relatively easy modification to its structure, content, logic and data. Figure 1 is a schematic representation for the hydrologic content of the model. In relation to geography and facilities, the model is separated into four sections: 1) New Melones Reservoir, 2) Tulloch Reservoir, 3) Goodwin Reservoir, and 4) the Lower Stanislaus River and San Joaquin River.

New Melones Reservoir

The New Melones Reservoir section provides a mass balance of inflows, outflows and constraints for the reservoir. Inflow is a time series data-set that has been incorporated into previous models and CALSIM II. The data-set is a combination of study results (Reclamation origin unavailable) and historical computed inflow (1980-2003). The evaporation at New Melones Reservoir is computed using a monthly evaporation rate (CALSIM II) and storage-area equations. An initial flood control release is determined by computing the amount of release required after considering the previous month's storage, evaporation, the current month's allowable storage (USCOE data-set) and inflow. The model will release from New Melones this initial amount if downstream demands do not incidentally call for this water. The downstream demands at New Melones Reservoir include all facets of the net requirements at Tulloch Reservoir and Goodwin Reservoir.

Figure 1 – Model Schematic



Tulloch Reservoir

The operation at Tulloch Reservoir modifies the otherwise direct interaction between net downstream demands at Goodwin Reservoir and New Melones Reservoir. Local inflow, reservoir evaporation and flood control operations at Tulloch Reservoir intercedes the direct interaction between the two reservoirs. Local inflow (CALSIM II) represents the accretion from runoff that occurs between New Melones Reservoir and Tulloch Reservoir. The evaporation at Tulloch Reservoir is computed using a monthly evaporation rate (CALSIM II) and storage-area equations. The flood control storage reservation requirements (CALSIM II) at Tulloch Reservoir are based on Reclamation information.

Goodwin Reservoir

The Goodwin Reservoir section of the model identifies the out-of-stream demands at Goodwin Reservoir and restates the releases to the Stanislaus River. Various components of out-of-stream demands are incorporated or computed in this section. The demands of the Oakdale Irrigation District and South San Joaquin Irrigation District are time series data-sets from CALSIM II. These data-sets can be created by additional spreadsheet logic in the future if necessary. Currently the water demands of the two districts include:

- Land-use based consumptive requirements
- District operation requirements (operational spills, canal seepage/losses, Woodward Reservoir)
- Commitments to the Stockton East Water District transfer
- Commitments to San Joaquin River Agreement flows (VAMP and other releases)

In addition to the water demands of the two districts, two components of CVP out-of-stream diversions can be modeled. Akin to the modeling of the 1997 IPO, these components can represent the allocation of water to the Stockton East Water District and the Central San Joaquin Water Conservation District. Two separate components have been incorporated to allow separate allocation procedures and diversion patterns.

Although their values are established elsewhere in the model, the minimum release to the Stanislaus River and computed release to the Stanislaus River are provided in this section. The minimum release to the Stanislaus River represents the required release necessary to satisfy the operator-identified required downstream objectives, e.g., salinity at Vernalis and instream fishery flows. The computed release to the Stanislaus River represents that required release plus any additional release that may have been required for flood control at New Melones Reservoir.

Local inflow between Tulloch Reservoir and Goodwin Reservoir are incorporated in the net demand at Goodwin Reservoir.

San Joaquin River

The San Joaquin River section of the model represents the hydrologic components that occur between Vernalis and upstream to Goodwin Reservoir on the Stanislaus River and Maze Boulevard on the San Joaquin River. The components of inflow and diversions are needed to calculate the flow and quality of water arriving at Vernalis. These hydrologic components are directly extracted from a selected CALSIM II study.

For this prototype model the selected CALSIM II study represents the current condition of the San Joaquin River inclusive of operating the basin to D1641 and the San Joaquin River Agreement. New Melones Reservoir is operated to the 1997 IPO.

The model utilizes the same data and performs the same calculation as CALSIM II for the calculation of flow and quality of water. Four CALSIM II nodes provide information for the model: Stanislaus River at Ripon (Node 528), San Joaquin River at Maze Boulevard (Node 636), San Joaquin River at Stanislaus River Confluence (Node 637) and San Joaquin River at Vernalis (Node 639). The hydrologic components identified at these nodes include:

- Surface returns from Oakdale Irrigation District and South San Joaquin Irrigation District
- Surface returns from Modesto Irrigation District
- Surface returns from adjacent lands and river diverters
- Surface returns from Westside lands
- River diversions
- Local inflow and accretions/depletions
- Flow and water quality at Maze Boulevard (boundary condition)

Each component of the surface flows (boundary flow or accretions) is represented by a flow (TAF) and quality (EC – uS/cm). Releases from Goodwin Reservoir are assumed to have a quality of 85 EC. Diversions are assigned a water quality value (to be removed from the mass balance) associated with the general location of the diversion. All of the components associated with the San Joaquin River section will remain relatively stable (without variation) for a given boundary condition, regardless of the Stanislaus River operation.

The water quality objective at Vernalis is incorporated into this section of the model, and any non-compliance with the objective, if any, is determined.

Initial River Requirements and Allocations

This section of the model calculates the minimum release requirements at Goodwin Dam. The model initially computes the required release from Goodwin Dam that satisfies each independent component of downstream requirement as though there is no coincidental use of releases. Subsequently, the model will prioritize the releases and one release requirement may be incidentally satisfied by a higher priority release.

The initial required release from Goodwin Dam to satisfy water quality objectives at Vernalis is computed by performing a mass balance for the hydrologic components between Vernalis, Maze and Goodwin Dam as though there is no release from Goodwin Dam. Assuming Goodwin Dam will release water at a quality of 85 EC, the amount of dilution water (if any) required to achieve the water quality objective at Vernalis is determined.

The initial required fishery release from Goodwin Dam is determined by the model's allocation procedures. An annual (March through February) allocation is determined from an input table included in the Control worksheet. The annual allocation is dependent upon the New Melones Water Supply Index, which is a sum of the end-of-February New Melones Reservoir storage and the reservoir's March through September inflow. The monthly distribution of this annual allocation is then established from additional input data included in the Control worksheet. A time-series for the split-month flow requirement can be imported to this section.

Similarly, the annual allocation for water quality releases is determined in this section. The annual (March through February) allocation is determined from an input table included in the Control worksheet. The annual allocation is dependent upon the New Melones Water Supply Index. Also included in this section is the running balance of available water quality allocation subsequent to prior usage.

The dissolved oxygen release requirement is established from look-up values included in the Control worksheet. The release requirement is described as a flow surrogate at Goodwin Dam. This input parameter can represent any minimum flow component desired at Goodwin Dam.

Like the water quality allocation, an allocation for flow requirements at Vernalis can be provided. The annual (March through February) allocation is determined from an input table included in the Control worksheet. The annual allocation is dependent upon the New Melones Water Supply Index. Also included in this section is the running balance of available water for release subsequent to prior usage.

Order of Controlling Minimum Goodwin Release

The order of controlling Goodwin Dam releases is identified in this section. The model allows the ordering of instream fishery releases, water quality releases and dissolved oxygen releases. The first flow requirement "switched on" becomes the initial release from Goodwin Dam. This flow is allowed to coincidentally meet the next identified flow requirement. If the next "layer" of flow requirement requires additional release, that release will be shown in this section. This logic continues for the third layer of flow requirement if one is identified. This layering of required releases recognizes the annual allocation constraint for water quality releases.

Vernalis Flow Requirement

Releases to meet a Vernalis flow objective are always layered last in the model. Releases for the Vernalis flow objective are constrained to the available annual allocation and the release capacity available at Goodwin Dam up to 1,500 cfs (user specified in Control worksheet). Any unmet flow objective at Vernalis is identified.

Control Worksheet

The constraints and objectives for the operation of New Melones Reservoir are identified through the Control worksheet. The following is a general overview of the parameters entered.

New Melones Forecast and Allocations

Annual Volume in 1,000 acre-feet

	New Melones Forecast Index	Instream Fish	SEWD	CSJWCD	Vernalis Water Quality	Vernalis Flow Objective
	0	1	2	3	4	5
New Melones Forecast Index	0	0	0	0	0	0
equals end-of-February	1400	98	0	0	70	0
storage plus March through	2000	125	0	0	80	0
September inflow	2499.99	345	10	49	175	0
	2500	345	10	80	175	1000
	3000	467	10	80	250	1000
	6000	467	10	80	250	1000
	7000	467	10	80	250	1000
	8000	467	10	80	250	1000
	9000	467	10	80	250	1000
Form of lookup between indices:		Interpolate	Interpolate	Interpolate	Interpolate	Lookup
Threshold cutoff for interpolation:		NA	0	0	0	NA

Instream fish allocation procedure works identical to other allocations.
To force schedules at certain indices, assign explicit volume (eg., 9999) with a paired distributed schedule below.

Release for Vernalis Flow is On
Release for Vernalis Quality is On

This table relates the New Melones Forecast Index to an annual allocation. For each of the instream fish, SEWD, CSJWCD and water quality parameters, a built-in macro will interpolate between table values. Also, for the SEWD, CSJWCD and water quality parameters a threshold cutoff index can be identified that overrides the interpolation procedure and produces a zero allocation below such index value. For the Vernalis flow objective, a simple lookup table procedure is used rather than interpolation. The stating of a large value for this parameter allows any amount of flow to be used to meet the flow objective.

Stanislaus Instream Fish Flow Requirement Monthly Distribution

Flow in CFS

	Lookup Period	Month	Lookup Reference	Breakpoints of Flow Distribution Schedules - 1,000 Acre-feet and Period Schedules - CFS							Special Forced Schedules		
Days			0	0.0	98.4	243.3	253.8	310.3	410.2	466.8	9999	99999	999999
15	10_1	Oct	1	0	110	200	250	250	350	350	200	252	
16	10_2	Oct	2	0	110	200	250	250	350	350	200	252	
15	11_1	Nov	3	0	200	250	275	300	350	400	200	300	
15	11_2	Nov	4	0	200	250	275	300	350	400	200	300	
15	12_1	Dec	5	0	200	250	275	300	350	400	200	300	
16	12_2	Dec	6	0	200	250	275	300	350	400	200	300	
15	1_1	Jan	7	0	125	250	275	300	350	400	150	150	
16	1_2	Jan	8	0	125	250	275	300	350	400	150	150	
15	2_1	Feb	9	0	125	250	275	300	350	400	173	173	
13	2_2	Feb	10	0	125	250	275	300	350	400	173	173	
15	3_1	Mar	11	0	125	250	275	300	350	400	200	200	
16	3_2	Mar	12	0	125	250	275	300	350	400	200	200	
14	4_1	Apr	13	0	250	300	300	900	1500	1500	200	200	
16	4_2	Apr	14	0	500	1500	1500	1500	1500	1500	750	1500	
15	5_1	May	15	0	500	1500	1500	1500	1500	1500	750	1500	
16	5_2	May	16	0	250	300	300	900	1500	1500	200	200	
15	6_1	Jun	17	0	0	200	200	250	800	1500	200	200	
15	6_2	Jun	18	0	0	200	200	250	800	1500	200	200	
15	7_1	Jul	19	0	0	200	200	250	300	300	200	200	
16	7_2	Jul	20	0	0	200	200	250	300	300	200	200	
15	8_1	Aug	21	0	0	200	200	250	300	300	200	200	
16	8_2	Aug	22	0	0	200	200	250	300	300	200	200	
15	9_1	Sep	23	0	0	200	200	250	300	300	200	200	
15	9_2	Sep	24	0	0	200	200	250	300	300	200	200	
	Equivalent Volume 1,000 Acre-feet:			0.0	98.9	245.7	256.2	311.5	410.2	466.8	174.0	235.4	0.0

This table provides the split-month distribution of annual allocations for instream fishery releases. The year is divided by month, and then divided into two periods within a month. The section of flow schedules centered in the above illustration is representative of the 1997 IPO flow schedules. Discrete distributions of flow schedules by six incremental annual volumes are shown. Annual allocations that fall between two discrete schedules are interpolated. Special forced schedules can be achieved by pairing a unique flow distribution with a specific allocation within the New Melones Forecast and Allocations data set.

Stanislaus Dissolved Oxygen - Surrogate Required Flow below Goodwin Dam

Flow in 1,000 acre-feet

Lookup Period	Month	Split-month Required Flow for DO
10_1	Oct	0.0
10_2	Oct	0.0
11_1	Nov	0.0
11_2	Nov	0.0
12_1	Dec	0.0
12_2	Dec	0.0
1_1	Jan	0.0
1_2	Jan	0.0
2_1	Feb	0.0
2_2	Feb	0.0
3_1	Mar	0.0
3_2	Mar	0.0
4_1	Apr	0.0
4_2	Apr	0.0
5_1	May	0.0
5_2	May	0.0
6_1	Jun	6.6
6_2	Jun	6.6
7_1	Jul	7.8
7_2	Jul	8.4
8_1	Aug	7.9
8_2	Aug	8.5
9_1	Sep	7.2
9_2	Sep	7.2
	Sum	60.1

Month	Monthly Required Flow for DO TAF	Monthly Required Flow for DO CFS
Oct	0	0
Nov	0	0
Dec	0	0
Jan	0	0
Feb	0	0
Mar	0	0
Apr	0	0
May	0	0
Jun	13.2	222
Jul	16.2	263
Aug	16.4	267
Sep	14.3	240
Sum	60.1	

Release for DO Requirement is On in Model

These tables identify an absolute minimum flow required below Goodwin Dam, in this case a surrogate flow representing the release required to meet dissolved oxygen objectives at Ripon. The split-month flow requirement is automatically updated with modifications to the monthly flow requirement table.

Maximum Goodwin Release

Flow in CFS	1500

The maximum non-flood control release from Goodwin Dam is identified by this input. Typically, only the Vernalis flow objective would call for releases in excess of 1,500 cfs. In these instances the model will limit releases to 1,500 cfs and the Vernalis flow objective will be violated. This constraint does not override the need to release greater than 1,500 cfs to maintain flood control reservation storage in New Melones Reservoir.

Reservoir Data

Storage in 1,000 acre-feet

Values currently assume split-month approximates one-half of the month

Lookup Period	Month	New Melones Flood Control (with drawdown)	New Melones Flood Control (no drawdown)	Tulloch Flood Control Storage rule	
10_1	Oct	1970.0	1970.0	57.0	
10_2	Oct	1970.0	1970.0	57.0	
11_1	Nov	1970.0	1970.0	57.0	
11_2	Nov	1970.0	1970.0	57.0	
12_1	Dec	1970.0	1970.0	57.0	
12_2	Dec	1970.0	1970.0	57.0	
1_1	Jan	1970.0	1970.0	57.0	
1_2	Jan	1970.0	1970.0	57.0	
2_1	Feb	1970.0	1970.0	57.0	
2_2	Feb	1970.0	1970.0	57.0	
3_1	Mar	2000.0	2000.0	57.8	
3_2	Mar	2030.0	2030.0	58.5	
4_1	Apr	2125.0	2125.0	60.5	
4_2	Apr	2220.0	2220.0	62.5	
5_1	May	2320.0	2320.0	64.8	
5_2	May	2420.0	2420.0	67.0	
6_1	Jun	2420.0	2420.0	67.0	
6_2	Jun	2420.0	2420.0	67.0	
7_1	Jul	2360.0	2420.0	67.0	
7_2	Jul	2300.0	2420.0	67.0	
8_1	Aug	2215.0	2420.0	67.0	
8_2	Aug	2130.0	2420.0	67.0	
9_1	Sep	2065.0	2420.0	65.3	
9_2	Sep	2000.0	2420.0	63.5	

Area-Capacity Curves

Storage Area Coefficients

A*Stor+B*Stor^.5+C*Stor^.333+D

	New Melones	Tulloch
A	1.121	24.122
B	244.644	-142.512
C	-166.985	227.93
D	2.407	-7.024

These data represent end-of-period flood control storage reservation requirements (October through June) and user-defined drawdown storage objectives (July through September). The equations define the storage to surface area relationship for New Melones Reservoir and Tulloch Reservoir for use in the computation of reservoir evaporation.

Water Quality Data

Water Quality in EC uS/cm

Lookup Period	Month	Vernalis Water Quality Standard	Goodwin EC	Stanislaus Return EC	Stanislaus Accretion EC
10_1	Oct	1000.0	85.0	380.0	380.0
10_2	Oct	1000.0	85.0	380.0	380.0
11_1	Nov	1000.0	85.0	380.0	380.0
11_2	Nov	1000.0	85.0	380.0	380.0
12_1	Dec	1000.0	85.0	380.0	380.0
12_2	Dec	1000.0	85.0	380.0	380.0
1_1	Jan	1000.0	85.0	380.0	380.0
1_2	Jan	1000.0	85.0	380.0	380.0
2_1	Feb	1000.0	85.0	380.0	380.0
2_2	Feb	1000.0	85.0	380.0	380.0
3_1	Mar	1000.0	85.0	190.0	190.0
3_2	Mar	1000.0	85.0	190.0	190.0
4_1	Apr	700.0	85.0	190.0	190.0
4_2	Apr	700.0	85.0	190.0	190.0
5_1	May	700.0	85.0	190.0	190.0
5_2	May	700.0	85.0	190.0	190.0
6_1	Jun	700.0	85.0	190.0	190.0
6_2	Jun	700.0	85.0	190.0	190.0
7_1	Jul	700.0	85.0	190.0	190.0
7_2	Jul	700.0	85.0	190.0	190.0
8_1	Aug	700.0	85.0	190.0	190.0
8_2	Aug	700.0	85.0	190.0	190.0
9_1	Sep	1000.0	85.0	190.0	190.0
9_2	Sep	1000.0	85.0	190.0	190.0

This look-up table allows the user to define several water quality parameters used in the model. The Vernalis water quality objective is defined in this data set. Also defined are the assumed values of quality associated with Goodwin Dam releases, and surface returns and accretions to the Stanislaus River. The water quality of Westside return flows and the boundary flow at Maze are defined by time-series data within the model.

Diversion Patterns

Values currently assume split-month approximates one-half of the month

Split-month Pattern

Lookup Period	Month	SEWD	CSJWCD
10_1	Oct	0.000	0.035
10_2	Oct	0.000	0.035
11_1	Nov	0.000	0.021
11_2	Nov	0.000	0.021
12_1	Dec	0.000	0.021
12_2	Dec	0.000	0.021
1_1	Jan	0.000	0.021
1_2	Jan	0.000	0.021
2_1	Feb	0.000	0.021
2_2	Feb	0.000	0.021
3_1	Mar	0.000	0.021
3_2	Mar	0.000	0.021
4_1	Apr	0.075	0.058
4_2	Apr	0.075	0.058
5_1	May	0.075	0.058
5_2	May	0.075	0.058
6_1	Jun	0.075	0.058
6_2	Jun	0.075	0.058
7_1	Jul	0.100	0.065
7_2	Jul	0.100	0.065
8_1	Aug	0.100	0.065
8_2	Aug	0.100	0.065
9_1	Sep	0.075	0.058
9_2	Sep	0.075	0.058
		1.000	1.000

Monthly Pattern

Month	SEWD	CSJWCD
Oct	0.000	0.070
Nov	0.000	0.042
Dec	0.000	0.042
Jan	0.000	0.042
Feb	0.000	0.042
Mar	0.000	0.042
Apr	0.150	0.115
May	0.150	0.115
Jun	0.150	0.115
Jul	0.200	0.130
Aug	0.200	0.130
Sep	0.150	0.115
Sum	1.000	1.000

These tables establish the diversion patterns for the two CVP contracting entities. Currently the monthly distribution is split equally for the two periods within each month.

CALSIM II Input

Several parameters from CALSIM II are required to perform studies using the model. These parameters mostly concern the underlying hydrology of the boundary condition of the San Joaquin River and the fundamental hydrology of the Stanislaus River system, such as inflow to New Melones Reservoir and the evaporation rate at the reservoir. The following is a table of imported data from CALSIM II. These data are imported to the CALSIMInput worksheet. Subsequently, these data are disaggregated into split-month period values.

CALSIM II Parameter	Description	CALSIM II Parameter	Description
I10	Inflow to New Melones Reservoir		New Melones and Tulloch Evaporation
I78	Local Inflow to Tulloch Reservoir	R528A	Surface Returns from OID (Ripon)
I520	Local Inflow to Goodwin Reservoir	R528B	Surface Returns from OID/SSJID (Ripon)
I528	Inflow/Accretion to Ripon	R528C	Surface Returns from Modesto ID (Ripon)
I637	Inflow/Accretion to Confluence	R637A	Surface Returns from Modesto ID (Confluence)
D520B	Joint Main Canal Diversion	R637B	Surface Returns from Adjacent Lands (Confluence)
D520C	South Main Canal Diversion	R637C	Surface Returns from Adjacent Lands (Confluence)
D528	River Diversions (Above Ripon)	R637D	Surface Returns from Westside (Confluence)
D637	River Diversions (Above Confluence)	ECR637D	EC of Westside Returns
C520INSTREAM	OID SJRA Instream Water	VERNMIN_REQDV	Vernalis Flow Requirement
C520VAMP	OID/SSJID VAMP Water Stanislaus R	D520A	OID/SSJID Transfer to SEWD
D530_VAMP	OID/SSJID VAMP Water to Tuolumne	C636_NP_DV	Non-pulse Period Flow at Maze
		C636_P_DV	Pulse Period Flow at Maze
		EC_636_NP_DV	Non-pulse Period Quality at Maze
		EC_636_P_DV	Pulse Period Quality at Maze

Period Conversions

The model is structured to automatically disaggregate monthly parameters into split-month values. The Period Conversion worksheet allows the user to specify the number of days encompassed by the first period of a month. The model will then compute the appropriate conversion factors and flow volumes associated with each period within a month.

Appendix B
Study Results – Annual Summary

Table 1
Stanislaus River Operations under IPO

Table 2
Stanislaus River Operations under Transitional Plan

New Melones Operations Model - Annual Summary **1997 IPO Allocations w/ Revised October 2005 CALSIM Boundary**

	New Melones		Goodwin													
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	Districts Other	Districts SEWD	Total OID & SSJID	SEWD / SCJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release
Avg	1087		507	30	26	562	49	288	12	19	3	447	126		1	14
	WY	EOS	WY	M-F	WY		M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F
1922	1389	1852	519	26	29	574	90	407	0	0	0	407	0	2754	0	0
1923	1109	1801	528	30	27	585	90	413	0	0	31	444	0	2776	0	0
1924	385	1397	422	26	8	456	0	125	19	56	0	199	0	1986	0	0
1925	1092	1616	472	31	29	532	45	295	4	0	0	299	0	2384	0	0
1926	619	1335	539	31	29	599	7	151	21	29	0	201	0	2056	0	18
1927	1256	1626	527	33	29	589	56	334	0	0	0	335	0	2472	0	57
1928	952	1581	518	36	28	582	50	314	2	0	0	315	0	2426	0	0
1929	506	1263	475	32	29	535	0	122	22	53	0	197	0	1916	0	0
1930	671	1098	540	31	30	601	0	116	22	58	0	196	0	1782	0	0
1931	438	797	457	26	8	491	0	99	20	70	0	189	0	1410	0	0
1932	1160	1161	545	26	30	601	0	119	43	18	0	180	0	1843	0	131
1933	586	918	535	27	30	591	0	107	27	52	0	186	0	1589	0	10
1934	498	659	493	28	13	533	0	91	21	64	0	176	0	1287	0	56
1935	1082	1006	487	33	30	550	0	109	45	12	0	166	0	1623	0	91
1936	1291	1509	498	26	29	553	24	217	21	0	0	238	0	2204	0	38
1937	1080	1649	520	26	28	574	52	321	1	0	0	322	0	2442	0	33
1938	2032	2000	510	26	27	563	90	467	0	0	0	1088	621	3521	0	0
1939	562	1531	513	37	27	577	38	268	7	3	0	278	0	2319	0	1
1940	1327	1786	531	26	27	584	90	392	0	0	14	406	0	2692	0	0
1941	1290	1967	507	26	27	559	90	435	0	0	0	553	118	2868	0	0
1942	1450	2000	484	26	27	537	90	467	0	0	0	892	426	3100	0	0
1943	1538	1965	511	26	27	564	90	468	0	0	0	655	188	3090	0	0
1944	649	1567	535	36	27	598	45	295	4	0	0	299	0	2384	0	0
1945	1228	1736	497	34	27	558	90	384	0	0	16	399	0	2657	0	0
1946	1175	1806	501	35	27	563	90	406	0	0	0	406	0	2750	0	0
1947	632	1441	535	33	28	596	28	231	13	35	0	280	0	2236	0	53
1948	853	1409	499	31	29	559	17	189	30	32	0	251	0	2143	0	8
1949	732	1292	544	26	29	600	0	125	34	30	0	189	0	1981	0	20
1950	1027	1435	539	33	29	602	20	203	22	8	0	546	313	2174	0	32
1951	1654	1729	524	31	28	583	90	393	0	0	8	422	20	2695	0	1
1952	1844	2000	518	26	27	571	90	467	0	0	0	975	508	3415	0	0
1953	965	1747	537	35	27	599	90	393	0	0	16	409	0	2695	0	0
1954	882	1598	542	26	27	595	49	308	2	4	0	314	0	2413	0	14
1955	656	1345	538	26	29	593	8	158	17	48	0	223	0	2071	0	12
1956	1825	2000	540	31	28	599	90	467	0	0	0	560	93	3073	0	0
1957	878	1715	534	35	27	596	90	379	0	0	5	384	0	2637	0	0
1958	1599	2000	444	26	27	496	90	467	0	0	0	766	299	3147	0	0
1959	624	1554	542	37	27	606	44	292	4	0	0	296	0	2374	0	4
1960	574	1247	516	31	29	576	0	124	17	79	0	219	0	1950	4	0
1961	446	932	462	26	8	496	0	106	24	73	0	203	0	1560	0	0
1962	863	994	541	31	30	601	0	111	32	24	0	167	0	1668	0	38
1963	1227	1423	495	37	30	561	11	170	37	6	0	213	0	2097	0	142
1964	632	1195	540	31	29	600	0	123	20	57	0	200	0	1934	0	4
1965	1666	1819	521	31	28	580	90	415	0	0	21	436	0	2786	0	0
1966	733	1530	536	36	27	599	41	281	4	2	0	287	0	2350	0	67
1967	1831	2000	506	27	27	560	90	468	0	0	0	784	317	3203	0	0
1968	670	1577	533	36	27	596	49	308	2	0	0	420	110	2413	0	0
1969	2118	2000	524	27	27	577	90	467	0	0	0	1383	917	3474	0	0
1970	1321	1728	537	36	27	599	90	399	0	0	13	440	28	2720	0	0
1971	1064	1681	534	38	27	598	90	373	0	1	12	386	0	2611	0	0
1972	764	1449	537	31	28	596	29	237	9	22	0	268	0	2249	0	53
1973	1237	1681	517	26	27	570	90	363	0	0	11	374	0	2570	0	0
1974	1500	2000	476	31	27	534	90	467	0	0	0	620	153	3026	0	0
1975	1210	1938	502	30	27	558	90	450	0	0	0	497	47	2927	0	2
1976	467	1475	473	33	13	519	24	215	11	54	0	281	0	2201	0	0
1977	271	1057	344	30	8	382	0	107	25	73	0	205	0	1589	1	0
1978	1311	1571	477	26	29	532	30	241	13	0	0	254	0	2258	0	0
1979	1139	1606	539	31	27	597	90	360	0	0	59	592	173	2556	0	5
1980	1721	2000	511	26	27	563	90	467	0	0	0	521	54	3005	0	0
1981	634	1568	532	36	27	596	44	291	5	0	0	560	264	2373	0	0
1982	2229	2000	456	25	27	508	90	467	0	0	0	1804	1337	3419	0	0
1983	2900	2000	437	26	27	490	90	468	0	0	0	2243	1776	3965	0	0
1984	1621	1783	538	33	27	598	90	410	0	0	0	430	20	2765	0	0
1985	744	1528	526	29	27	582	42	282	4	5	0	398	107	2354	0	0
1986	1869	1916	502	26	27	555	90	467	0	0	0	770	303	3149	0	0
1987	497	1477	490	29	13	531	23	212	10	47	0	269	0	2192	0	0
1988	390	1094	425	26	8	459	0	113	32	75	0	220	0	1714	20	0
1989	648	892	546	26	30	601	0	107	23	73	0	203	0	1598	18	0
1990	491	614	489	26	13	527	0	89	44	63	0	197	0	1268	24	3
1991	502	390	478	26	30	533	0	70	36	49	0	156	0	989	2	0
1992	459	170	465	26	13	504	0	53	60	37	0	150	0	747	14	12
1993	1275	729	501	33	30	564	0	96	60	25	0	180	0	1359	0	122
1994	501	458	477	26	30	532	0	78	58	55	0	191	0	1105	7	0
1995	2160	1740	479	26	28	533	90	352	0	0	0	380	28	2525	0	0
1996	1512	1952	530	26	27	583	90	467	0	0	0	1553	1087	3024	0	0
1997	1902	1752	537	36	27	600	90	406	0	0	1	514	107	2749	0	4
1998	1876	2000	472	27	27	525	90	467	0	0	0	1239	772	3374	0	0
1999	1326	1828	523	37	27	586	90	433	0	0	22	489	33	2860	0	0
2000	1062	1802	495	33	27	554	90	391	0	0	0	401	10	2686	0	0
2001	588	1479	490	37	28	555	29	234	8	27	0	269	0	2242	0	20
2002	710	1291	540	31	29	600	3	136	18	77	0	231	0	2023	0	69
2003	896	1302	540		30									2035		

All units in 1,000 acre-feet unless otherwise noted. Instream Fish Release from Goodwin (1) Vernalis WQ Release from Goodwin (1) DO Release from Goodwin (1)

New Melones Operations Model - Annual Summary

Proposed Transitional Plan

	New Melones		Goodwin														
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	Districts Other	Districts SEWD	Total OID & SSJID	SEWD / CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release	Added Water
Avg	1087		507	30	26	562	116	250	0	15	24	395	107		0	1	
	WY	EOS	WY	M-F	WY		M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	
1922	1389	1858	519	26	29	574	155	318	0	0	0	323	6	2750	0	0	
1923	1109	1813	528	30	27	585	155	318	0	0	49	367	0	2791	0	0	
1924	385	1247	422	26	8	456	155	235	0	26	0	262	0	2012	0	0	
1925	1092	1381	472	31	29	532	155	235	0	2	0	238	0	2197	0	0	
1926	619	934	539	31	29	599	155	235	0	8	20	263	0	1825	0	0	
1927	1256	1087	527	33	29	589	155	236	0	0	103	339	0	2039	0	0	
1928	952	1034	518	36	28	582	155	235	0	4	0	240	0	1902	0	0	
1929	506	737	475	32	29	535	0	174	0	24	0	198	0	1375	0	0	
1930	671	582	540	31	30	601	0	174	0	27	0	201	0	1255	0	0	
1931	438	286	457	26	8	491	0	174	0	32	0	207	0	892	0	0	
1932	1160	532	545	26	30	601	0	174	0	6	131	311	0	1325	0	0	
1933	586	292	535	27	30	591	0	174	0	19	10	203	0	958	0	0	
1934	498	150	493	28	13	533	0	174	0	25	53	252	0	658	0	0	108
1935	1082	361	487	33	30	550	0	174	0	0	89	263	0	1051	0	0	
1936	1291	870	498	26	29	553	49	174	0	0	39	213	0	1557	0	0	
1937	1080	965	520	26	28	574	155	235	0	0	38	274	0	1808	0	0	
1938	2032	1991	510	26	27	563	155	318	0	0	0	332	14	2844	0	0	
1939	562	1468	513	37	27	577	155	236	0	6	7	249	0	2345	0	0	
1940	1327	1692	531	26	27	584	155	318	0	2	43	363	0	2629	0	0	
1941	1290	1918	507	26	27	559	155	318	0	0	0	406	89	2786	0	0	
1942	1450	2000	484	26	27	537	155	318	0	0	0	827	510	3100	0	0	
1943	1538	2000	511	26	27	564	155	318	0	0	0	543	224	3090	0	0	
1944	649	1563	535	36	27	598	155	235	0	1	0	237	0	2431	0	0	
1945	1228	1700	497	34	27	558	155	318	0	0	42	360	0	2656	0	0	
1946	1175	1763	501	35	27	563	155	318	0	0	26	344	0	2724	0	0	
1947	632	1270	535	33	28	596	155	236	0	46	53	334	0	2207	0	0	
1948	853	1064	499	31	29	559	155	235	0	38	9	283	0	1936	0	0	
1949	732	877	544	26	29	600	49	174	0	16	20	210	0	1612	0	0	
1950	1027	1001	539	33	29	602	49	174	0	7	36	217	0	1744	0	0	
1951	1654	1585	524	31	28	583	155	318	0	0	55	374	0	2577	0	1	
1952	1844	2000	518	26	27	571	155	318	0	0	0	778	461	3283	0	0	
1953	965	1742	537	35	27	599	155	318	0	1	20	339	0	2695	0	0	
1954	882	1536	542	26	27	595	155	235	0	30	21	286	0	2419	0	0	
1955	656	1105	538	26	29	593	155	236	0	32	12	280	0	1999	0	0	
1956	1825	1870	540	31	28	599	155	318	0	0	0	318	0	2802	0	0	
1957	878	1601	534	35	27	596	155	318	0	0	19	336	0	2548	0	0	
1958	1599	2000	444	26	27	496	155	318	0	0	0	597	279	3042	0	0	
1959	624	1475	542	37	27	606	155	236	0	10	15	261	0	2374	0	0	
1960	574	995	516	31	29	576	155	235	0	51	0	287	0	1876	0	0	
1961	446	637	462	26	8	496	0	174	0	47	0	221	0	1268	0	0	
1962	863	682	541	31	30	601	0	174	0	1	38	213	0	1367	0	0	
1963	1227	956	495	37	30	561	49	174	0	7	144	326	0	1758	0	0	
1964	632	725	540	31	29	600	0	174	0	29	4	207	0	1456	0	0	
1965	1666	1363	521	31	28	580	155	235	0	0	92	327	0	2314	0	0	
1966	733	1011	536	36	27	599	155	235	0	10	90	336	0	1932	0	0	
1967	1831	1784	506	27	27	560	155	318	0	0	0	318	0	2633	0	0	
1968	670	1363	533	36	27	596	155	235	0	8	12	256	0	2254	0	0	
1969	2118	2000	524	27	27	577	155	318	0	0	0	1221	904	3364	0	0	
1970	1321	1699	537	36	27	599	155	318	0	0	43	391	31	2720	0	0	
1971	1064	1625	534	38	27	598	155	318	0	2	36	356	0	2595	0	0	
1972	764	1241	537	31	28	596	155	235	0	29	53	318	0	2199	0	0	
1973	1237	1447	517	26	27	570	155	235	0	0	64	300	0	2349	0	0	
1974	1500	1927	476	31	27	534	155	318	0	0	0	350	33	2818	0	0	
1975	1210	1956	502	30	27	558	155	318	0	0	21	393	54	2927	0	2	
1976	467	1392	473	33	13	519	155	235	0	59	0	294	0	2240	0	0	
1977	271	945	344	30	8	382	0	174	0	49	0	223	0	1484	0	0	
1978	1311	1362	477	26	29	532	155	235	0	0	0	235	0	2139	0	0	
1979	1139	1404	539	31	27	597	155	236	0	0	77	313	0	2335	0	5	
1980	1721	2000	511	26	27	563	155	318	0	0	0	444	126	3002	0	0	
1981	634	1514	532	36	27	596	155	235	0	4	5	458	214	2381	0	0	
1982	2229	2000	456	25	27	508	155	318	0	0	0	1739	1421	3419	0	0	
1983	2900	2000	437	26	27	490	155	318	0	0	0	2178	1860	3965	0	0	
1984	1621	1764	538	33	27	598	155	318	0	0	29	370	23	2765	0	0	
1985	744	1450	526	29	27	582	155	235	0	14	1	277	27	2349	0	0	
1986	1869	1970	502	26	27	555	155	318	0	5	0	633	310	3149	0	0	
1987	497	1428	490	29	13	531	155	236	0	47	0	283	0	2267	0	0	
1988	390	979	425	26	8	459	49	174	0	79	0	253	0	1643	0	0	
1989	648	744	546	26	30	601	0	174	0	55	0	229	0	1447	0	0	
1990	491	431	489	26	13	527	0	174	0	71	3	248	0	1097	0	0	
1991	502	153	478	26	30	533	0	174	0	33	0	207	0	772	0	0	
1992	459	150	465	26	13	504	0	174	0	46	8	227	0	488	0	0	271
1993	1275	589	501	33	30	564	0	174	0	24	83	282	0	1315	0	34	
1994	501	289	477	26	30	532	0	174	0	63	0	237	0	957	0	0	
1995	2160	1583	479	26	28	533	155	236	0	0	0	236	0	2339	0	0	
1996	1512	2000	530	26	27	583	155	318	0	0	0	1383	1065	2919	0	0	
1997	1902	1737	537	36	27	600	155	318	0	0	21	446	107	2749	0	4	
1998	1876	2000	472	27	27	525	155	318	0	0	0	1177	859	3374	0	0	
1999	1326	1796	523	37	27	586	155	318	0	0	81	437	37	2860	0	0	
2000	1062	1795	495	33	27	554	155	318	0	1	1	319	0	2673	0	0	
2001	588	1368	490	37	28	555	155	235	0	34	20	290	0	2246	0	0	
2002	710	929	540	31	29	600	155	235	0	52	69	357	0	1881	0	0	
2003	896	828	540		30									1622			

All units in 1,000 acre-feet unless otherwise noted.   Instream Fish Release from Goodwin (1)   Vernalis WQ Release from Goodwin (1)

EXHIBIT
“D”

O'Laughlin & Paris LLP

Attorneys at Law

SENT VIA EMAIL/FIRST-CLASS MAIL

February 8, 2012

Mike Finnegan
Bureau of Reclamation
Mid-Pacific Region
2800 Cottage Way
Sacramento, California 95825-1898

Re: *District Operations*

Mr. Finnegan:

Attached is the revised operations plan from the Districts. This plan is slightly different than the plan sent to the USBR in 2005. The change in this proposal firms up an M&I supply to SEWD in all year types.

The analysis by Dan Steiner, as described in his write-up, has changed since 2005. The goal of the analysis was to provide the best picture of current conditions now. We have also analyzed the proposed operation plan to meet temperature objectives at OBB June 1-October 1. We have also done other modeling under a variety of different assumptions.

The proposed plan does not work through the 1987-1992 drought. The Districts understand this point. To operate to 1987-1992, would require more conservative operations and, thus, less water to the CVP contractors and less controlled in-stream flows. Dan Steiner ran New Melones to maintain 150,000 of minimum pool. In the 1928-34 time-period, we would need to "add water" to maintain such a minimum pool.

The Districts' proposal runs New Melones to the edge. Any further increased in allocations to either in-stream flows or CVP contractors would have significant impacts on carryover storage on New Melones' storage. This is why the Districts have tried to impress upon the Bureau that neither 2(e) or the State Water Board percentage of unimpaired flow is sustainable or desirable.

Some disclaimers:

- Stockton East Water District Board has not approved this allocation.

- Central San Joaquin Water Conservation District needs to approve of the New Melones operations plan.

- Stockton East Water District is in litigation against Reclamation over New Melones operations [Court of Federal Claims No. 04-541 L Judge Christine Odell Cook Miller]. Nothing contained

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in this document shall constitute an admission or waiver of any claim, right or defense in the litigation. The proposed transitional plan of operations is for discussion purposes only.

- The instream releases proscribed herein are the total releases for Vernalis flow, Vernalis water quality, Ripon DO, OCAP-BO and RPA's, and B-2. Any such regulatory requirement is subsumed and incorporated into these flows. If there is any deviation from the proscribed flows, then SEWD shall seek its full contractual amount.

We look forward to meeting with you on February 16, 2012, and discussing this proposed operation plan.

Very truly yours,

O'LAUGHLIN & PARIS LLP

TIM O'LAUGHLIN

TO/tb
Attachment
cc: Jeff Shields
Steve Emrick
Steve Knell
Karna Harrigfeld

Revised Transitional Plan – January 2012

Assumptions

Upstream San Joaquin River (above Stanislaus River confluence)

- Existing FERC and other Tributary instream flow requirements
- Pre-SJRRP Friant
- No SJRA/VAMP

New Melones

- D1641 Vernalis water quality requirements
- No Vernalis flow requirements (assumed satisfied with tributary requirements)
- Stanislaus River DO requirements modified – non-controlling
- Instream flow requirement, greater of:
  - Transitional schedule (monthly schedule providing the following annual total)

New Melones Storage Plus Inflow		Fishery (TAF)
From	To	
0	1,800	174
1,800	2,500	235
2,500	6,000	318

  - 20% Stanislaus River unimpaired flow during February through June
- CVP Contractors
  - Annual allocation

New Melones Storage Plus Inflow		Contractors (TAF)
From	To	
0	1,400	10 (SEWD)
1,400	1,800	59 (10 SEWD)
1,800	6,000	155

- OID/SSJID
  - Formula Water, occasionally not fully used according to land use and commitments

Additional Notes/Observations

- Water quality releases would be less with incorporation of additional tributary releases if assigned to other tributaries.
- Water quality releases would be less with incorporation of SJRRP.
- “Added Water” was needed to maintain New Melones Reservoir storage above 150 TAF during droughts of 1930s and 1990s.
- Severity of Added Water during 1930s is dependent on study initial-storage assumption.

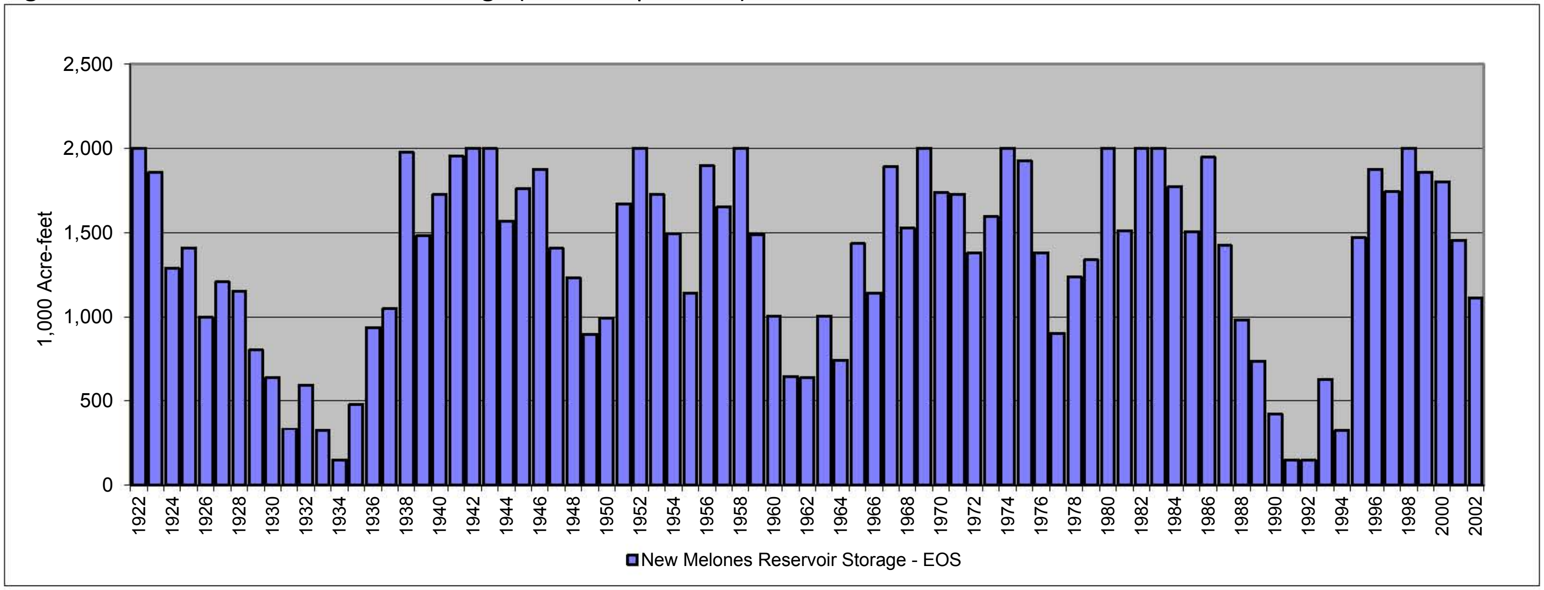
Table 1

New Melones Operations Model - Annual Summary — **Transitional Plan Redo: Fish Higher of 174-235-318 or 20% UF, WQ, CVP 10-59-155**

	New Melones		Goodwin															
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	Districts Other	Districts SEWD	Total OID & SSJID	SEWD NM Water	CSJWCD NM Water	Stan VAMP & Instream	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Added Water
Avg	1087		509	0	0	509	58	65	0	321	0	7	0	440	113		0	
	WY	EOS	WY	M-F	WY		M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F
1922	1391	2000	506	0	0	506	75	80	0	411	0	0	0	623	213	2975	0	0
1923	1109	1856	507	0	0	507	75	80	0	348	0	0	0	348	0	2791	0	0
1924	385	1287	457	0	0	457	75	80	0	260	0	18	0	278	0	2090	0	0
1925	1092	1410	444	0	0	444	75	80	0	324	0	0	0	324	0	2275	0	0
1926	619	997	559	0	0	559	75	80	0	284	0	2	0	286	0	1891	0	0
1927	1256	1206	515	0	0	515	75	80	0	335	0	0	0	335	0	2132	0	0
1928	952	1151	509	0	0	509	75	80	0	308	0	0	0	308	0	2066	0	0
1929	506	801	530	0	0	530	10	49	0	199	0	3	0	202	0	1534	0	0
1930	671	640	559	0	0	559	10	0	0	220	0	5	0	225	0	1353	0	0
1931	438	333	492	0	0	492	10	0	0	197	0	20	0	217	0	1009	0	0
1932	1160	593	531	0	0	531	10	49	0	295	0	6	0	301	0	1414	0	0
1933	586	323	574	0	0	574	10	0	0	220	0	5	0	225	0	1053	0	0
1934	498	150	532	0	0	532	10	0	0	186	0	7	0	193	0	752	0	99
1935	1082	479	464	0	0	464	10	0	0	326	0	0	0	327	1	1179	0	0
1936	1291	936	480	0	0	480	10	49	0	298	0	0	0	298	0	1706	0	0
1937	1080	1048	498	0	0	498	75	80	0	343	0	0	0	343	0	1916	0	0
1938	2032	1978	495	0	0	495	75	80	0	455	0	0	0	493	38	2960	0	0
1939	562	1480	529	0	0	529	75	80	0	279	0	1	0	280	0	2357	0	0
1940	1327	1725	514	0	0	514	75	80	0	385	0	0	0	385	0	2659	0	0
1941	1290	1953	486	0	0	486	75	80	0	388	0	0	0	557	170	2866	0	0
1942	1450	2000	454	0	0	454	75	80	0	389	0	0	0	917	528	3100	0	0
1943	1538	2000	484	0	0	484	75	80	0	388	0	0	0	580	191	3090	0	0
1944	649	1570	547	0	0	547	75	80	0	301	0	0	0	301	0	2464	0	0
1945	1228	1762	474	0	0	474	75	80	0	360	0	0	0	391	31	2686	0	0
1946	1175	1878	481	0	0	481	75	80	0	342	0	0	0	342	0	2801	0	0
1947	634	1405	600	0	0	600	75	80	0	262	0	27	0	290	0	2362	0	0
1948	853	1231	489	0	0	489	75	80	0	308	0	23	0	332	0	2126	0	0
1949	732	897	583	0	0	583	75	80	0	286	0	0	0	286	0	1812	0	0
1950	1027	992	549	0	0	549	10	49	0	281	0	0	0	285	4	1787	0	0
1951	1656	1672	505	0	0	505	75	80	0	340	0	0	0	342	2	2602	0	0
1952	1844	2000	496	0	0	496	75	80	0	436	0	0	0	984	548	3417	0	0
1953	965	1728	546	0	0	546	75	80	0	352	0	2	0	354	0	2695	0	0
1954	882	1493	590	0	0	590	75	80	0	298	0	12	0	310	0	2436	0	0
1955	656	1138	516	0	0	516	75	80	0	285	0	14	0	306	7	2022	0	0
1956	1825	1896	527	0	0	527	75	80	0	382	0	0	0	382	0	2875	0	0
1957	878	1655	557	0	0	557	75	80	0	357	0	0	0	357	0	2617	0	0
1958	1599	2000	419	0	0	419	75	80	0	429	0	0	0	760	331	3129	0	0
1959	624	1489	556	0	0	556	75	80	0	259	0	0	0	259	0	2374	0	0
1960	574	1002	583	0	0	583	75	80	0	265	0	14	0	279	0	1932	0	0
1961	446	645	497	0	0	497	10	0	0	194	0	20	0	214	0	1337	0	0
1962	863	640	540	0	0	540	10	49	0	286	0	0	0	286	0	1424	0	0
1963	1227	1005	481	0	0	481	10	49	0	271	0	7	0	278	0	1738	0	0
1964	632	740	578	0	0	578	10	49	0	213	0	14	0	232	5	1545	0	0
1965	1666	1434	500	0	0	500	75	80	0	322	0	0	0	322	0	2354	0	0
1966	733	1142	552	0	0	552	75	80	0	274	0	1	0	276	1	2050	0	0
1967	1831	1890	486	0	0	486	75	80	0	454	0	0	0	454	0	2861	0	0
1968	670	1528	534	0	0	534	75	80	0	288	0	0	0	384	95	2403	0	0
1969	2118	2000	502	0	0	502	75	80	0	440	0	0	0	1388	949	3474	0	0
1970	1321	1739	528	0	0	528	75	80	0	350	0	0	0	373	23	2720	0	0
1971	1066	1728	528	0	0	528	75	80	0	351	0	3	0	355	0	2684	0	0
1972	764	1378	600	0	0	600	75	80	0	297	0	2	0	300	2	2345	0	0
1973	1237	1595	490	0	0	490	75	80	0	362	0	0	0	362	0	2520	0	0
1974	1500	2000	439	0	0	439	75	80	0	380	0	0	0	618	238	3012	0	0
1975	1210	1925	492	0	0	492	75	80	0	397	0	0	0	447	50	2927	0	0
1976	467	1379	511	0	0	511	75	80	0	241	0	36	0	276	0	2240	0	0
1977	271	903	381	0	0	381	10	49	0	186	0	38	0	226	2	1506	0	0
1978	1311	1237	454	0	0	454	75	80	0	381	0	0	0	381	0	2123	0	0
1979	1139	1336	529	0	0	529	75	80	0	361	0	0	0	363	3	2256	0	0
1980	1721	1998	481	0	0	481	75	80	0	374	0	0	0	459	85	2943	0	0
1981	634	1512	540	0	0	540	75	80	0	316	0	0	0	523	207	2381	0	0
1982	2229	2000	429	0	0	429	75	80	0	439	0	0	0	1815	1376	3419	0	0
1983	2900	2000	413	0	0	413	75	80	0	528	0	0	0	2256	1728	3965	0	0
1984	1621	1771	549	0	0	549	75	80	0	348	0	0	0	363	15	2765	0	0
1985	744	1507	510	0	0	510	75	80	0	361	0	4	0	426	61	2402	0	0
1986	1869	1948	475	0	0	475	75	80	0	405	0	2	0	654	247	3149	0	0
1987	497	1422	531	0	0	531	75	80	0	243	0	25	0	269	0	2289	0	0
1988	390	983	460	0	0	460	10	49	0	179	0	51	0	229	0	1678	0	0
1989	648	737	548	0	0	548	10	49	0	233	0	12	0	245	0	1501	0	0
1990	491	422	527	0	0	527	10	0	0	188	0	40	0	228	0	1116	0	0
1991	502	150	526	0	0	526	10	0	0	208	0	8	0	216	0	804	0	17
1992	459	150	506	0	0	506	10	0	0	200	0	19	0	223	3	529	0	292
1993	1275	630	477	0	0	477	10	0	0	318	0	7	0	325	0	1377	0	0
1994	501	326	529	0	0	529	10	0	0	199	0	39	0	241	4	1043	0	0
1995	2160	1471	452	0	0	452	75	80	0	498	0	0	0	498	0	2421	0	0
1996	1512	1878	517	0	0	517	75	80	0	378	0	0	0	1350	972	2814	0	0
1997	1902	1745	556	0	0	556	75	80	0	368	0	0	0	502	133	2749	0	0
1998	1876	2000	444	0	0	444	75	80	0	467	0	0	0	1248	781	3374	0	0
1999	1326	1861	508	0	0	508	75	80	0	387	0	0	0	479	92	2860	0	0
2000	1062	1803	488	0	0	488	75	80	0	348	0	0	0	363	15	2702	0	0
2001	588	1453	469	0	0	469	75	80	0	265	0	18	0	283	0	2299	0	0
2002	710	1110	548	0	0	548	75	80	0	283	0	21	0	304	0	2026	0	0
2003	896	954	530		0											1870		

All units in 1,000 acre-feet unless otherwise noted. Instream Fish Release from Goodwin (1) Vernalis WQ Release from Goodwin (1) #N/A

Figure 1 – New Melones Reservoir Storage (End of September)



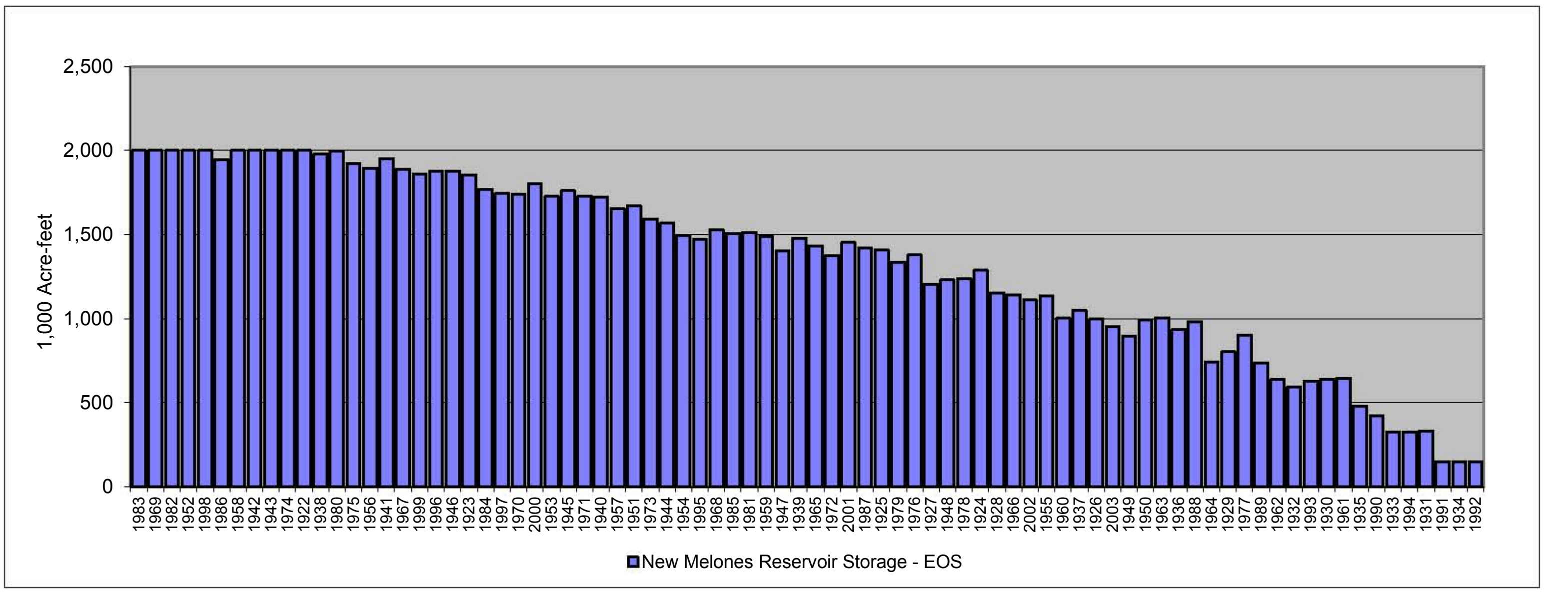
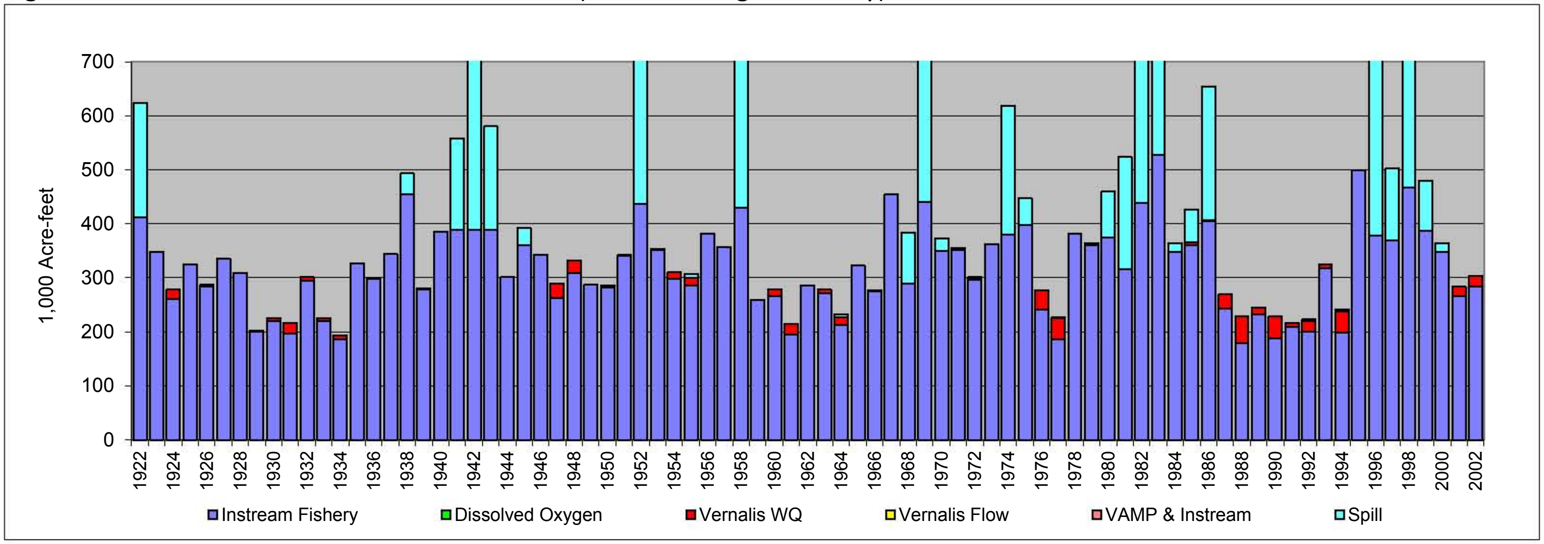


Figure 2 – Goodwin Releases to Stanislaus River (March through February)



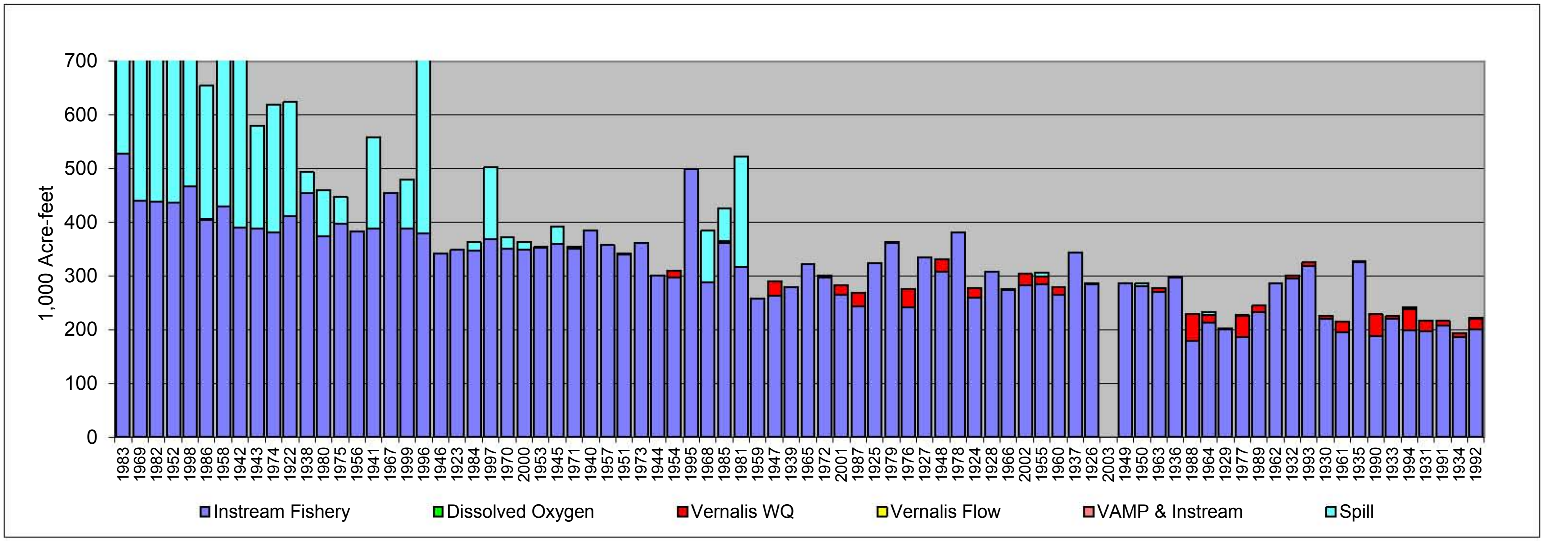
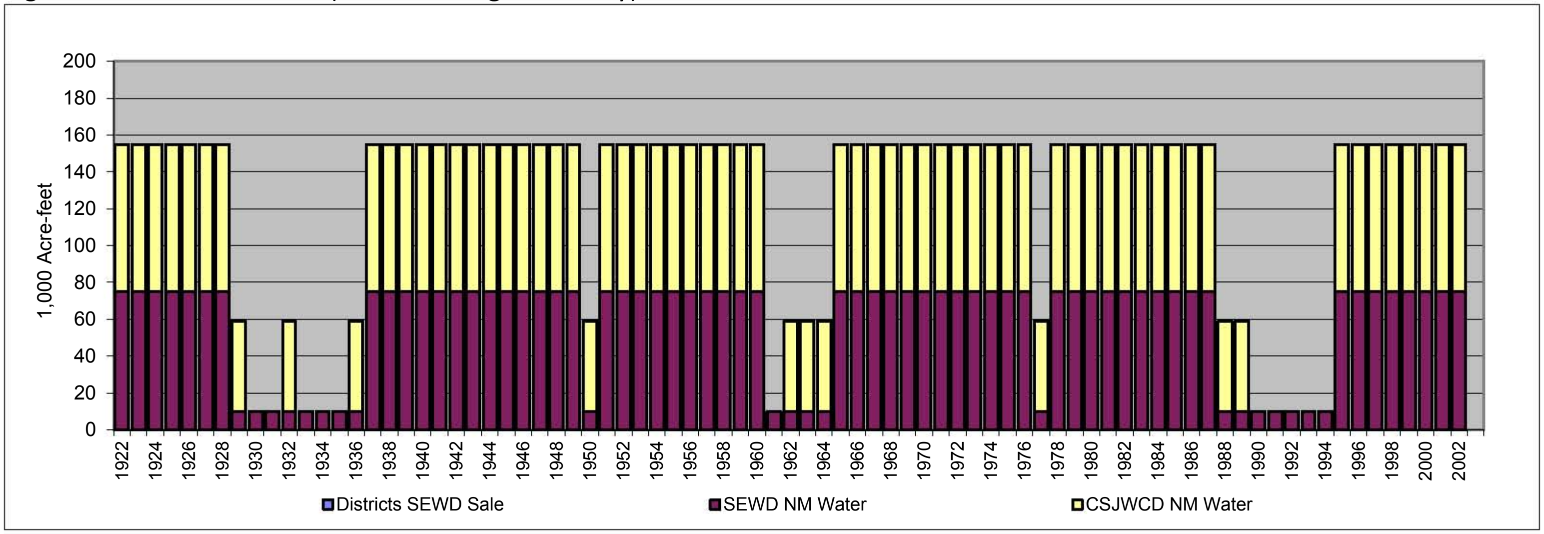


Figure 3 – CVP Contractors (March through February)



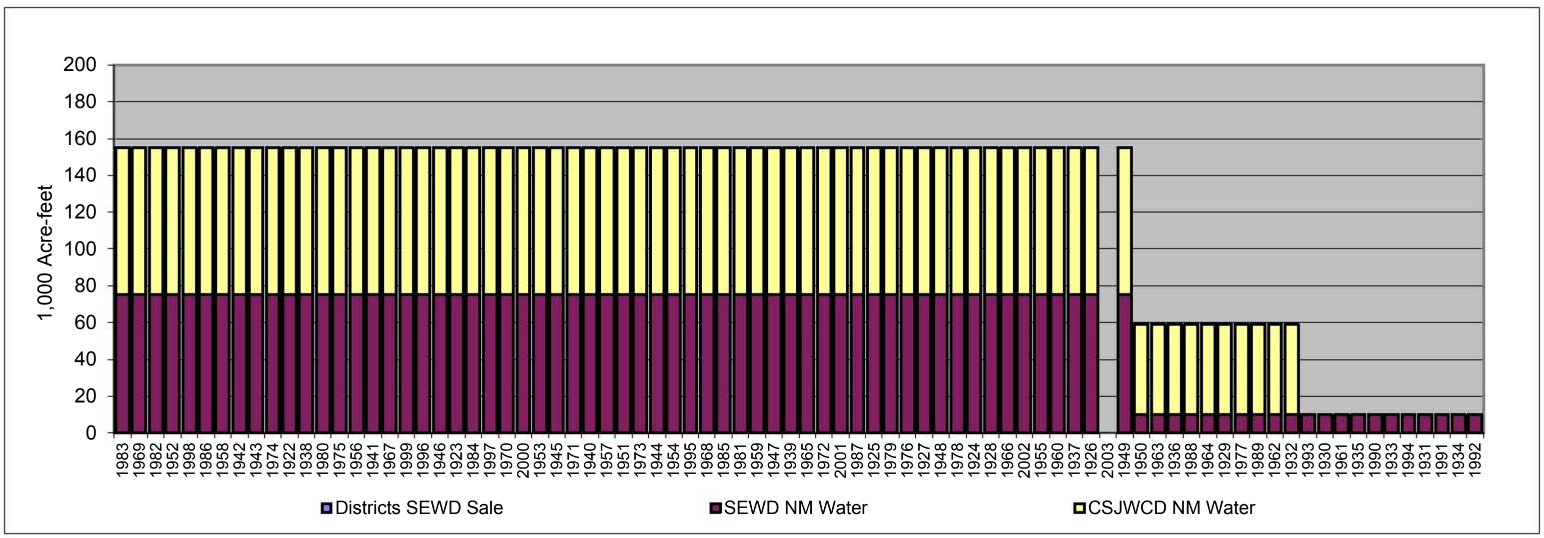


Table 1 – 20% Release Requirement in excess of 174-235-318 Plan Requirement

20% UF Release in Excess of 174-235-318 Plan
1,000 acre-feet

Transitional Plan Redo: Fish Higher of 174-235-318 or 20% UF, WQ, CVP 10-59-155

WY	Oct - 1	Oct - 2	Nov - 1	Nov - 2	Dec - 1	Dec - 2	Jan - 1	Jan - 2	Feb - 1	Feb - 2	Mar - 1	Mar - 2	Apr - 1	Apr - 2	May - 1	May - 2	Jun - 1	Jun - 2	Jul - 1	Jul - 2	Aug - 1	Aug - 2	Sep - 1	Sep - 2	Total	Mar-Feb
1922	0	0	0	0	0	0	0	0	4	4	1	1	0	0	3	24	32	32	0	0	0	0	0	0	101	93
1923	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	10	0	0	0	0	0	0	30	30
1924	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	3	24
1925	0	0	0	0	0	0	0	0	11	10	6	6	19	0	0	30	11	11	0	0	0	0	0	0	104	89
1926	0	0	0	0	0	0	0	0	3	2	2	2	15	0	0	8	0	0	0	0	0	0	0	0	31	49
1927	0	0	0	0	0	0	0	0	12	11	7	7	19	0	0	28	19	19	0	0	0	0	0	0	122	99
1928	0	0	0	0	0	0	0	0	0	0	19	20	14	0	0	18	1	1	0	0	0	0	0	0	73	73
1929	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	14	4	4	0	0	0	0	0	0	25	25
1930	0	0	0	0	0	0	0	0	0	0	4	4	12	0	0	11	7	7	0	0	0	0	0	0	46	46
1931	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	6	23
1932	0	0	0	0	0	0	0	0	9	8	5	6	13	0	15	33	24	24	0	0	0	0	0	0	137	121
1933	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	12	15	15	0	0	0	0	0	0	46	46
1934	0	0	0	0	0	0	0	0	0	0	4	4	4	0	0	1	0	0	0	0	0	0	0	0	12	12
1935	0	0	0	0	0	0	0	0	0	0	1	1	24	10	14	33	19	19	0	0	0	0	0	0	120	152
1936	0	0	0	0	0	0	0	0	16	15	9	10	21	7	10	28	13	13	0	0	0	0	0	0	142	124
1937	0	0	0	0	0	0	0	0	7	6	6	6	12	0	0	36	11	11	0	0	0	0	0	0	95	108
1938	0	0	0	0	0	0	0	0	14	12	14	15	0	0	9	30	34	34	0	0	0	0	0	0	163	137
1939	0	0	0	0	0	0	0	0	0	0	1	1	11	0	0	5	0	0	0	0	0	0	0	0	19	43
1940	0	0	0	0	0	0	0	0	13	12	17	18	0	0	0	9	10	10	0	0	0	0	0	0	87	67
1941	0	0	0	0	0	0	0	0	3	2	7	7	0	0	0	18	17	17	0	0	0	0	0	0	71	70
1942	0	0	0	0	0	0	0	0	2	2	1	1	0	0	0	10	26	26	0	0	0	0	0	0	69	72
1943	0	0	0	0	0	0	0	0	4	3	20	22	0	0	0	2	13	13	0	0	0	0	0	0	77	70
1944	0	0	0	0	0	0	0	0	0	0	1	1	4	0	0	20	6	6	0	0	0	0	0	0	38	65
1945	0	0	0	0	0	0	0	0	14	13	0	0	0	0	0	7	17	17	0	0	0	0	0	0	69	42
1946	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	5	8	8	0	0	0	0	0	0	24	24
1947	0	0	0	0	0	0	0	0	0	0	3	3	7	0	0	12	0	0	0	0	0	0	0	0	27	27
1948	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	26	19	19	0	0	0	0	0	0	73	73
1949	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	22	6	6	0	0	0	0	0	0	46	51
1950	0	0	0	0	0	0	0	0	3	2	3	3	18	3	10	29	13	13	0	0	0	0	0	0	99	107
1951	0	0	0	0	0	0	0	0	7	6	3	4	0	0	0	0	5	5	0	0	0	0	0	0	31	22
1952	0	0	0	0	0	0	0	0	2	2	5	5	0	0	12	34	31	31	0	0	0	0	0	0	122	118
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17	0	0	0	0	0	0	34	34
1954	0	0	0	0	0	0	0	0	0	0	8	9	19	0	0	21	3	3	0	0	0	0	0	0	62	62
1955	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	17	9	9	0	0	0	0	0	0	39	49
1956	0	0	0	0	0	0	0	0	5	5	3	3	0	0	0	14	22	22	0	0	0	0	0	0	75	64
1957	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	2	13	13	0	0	0	0	0	0	33	39
1958	0	0	0	0	0	0	0	0	4	3	8	8	0	0	10	32	27	27	0	0	0	0	0	0	118	111
1959	0	0	0	0	0	0	0	0	0	0	2	3	8	0	0	6	1	1	0	0	0	0	0	0	21	23
1960	0	0	0	0	0	0	0	0	1	1	4	4	9	0	0	10	1	1	0	0	0	0	0	0	32	30
1961	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	6	0	0	0	0	0	0	0	0	11	20
1962	0	0	0	0	0	0	0	0	5	4	1	1	20	5	2	20	15	15	0	0	0	0	0	0	88	112
1963	0	0	0	0	0	0	0	0	18	16	1	1	9	0	18	37	16	16	0	0	0	0	0	0	130	97
1964	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	13	5	5	0	0	0	0	0	0	28	39
1965	0	0	0	0	0	0	0	0	6	5	4	4	17	0	0	25	19	19	0	0	0	0	0	0	98	87
1966	0	0	0	0	0	0	0	0	0	0	4	4	14	0	0	11	0	0	0	0	0	0	0	0	32	39
1967	0	0	0	0	0	0	0	0	4	3	10	11	0	0	3	24	43	43	0	0	0	0	0	0	141	136
1968	0	0	0	0	0	0	0	0	1	1	3	3	8	0	0	10	1	1	0	0	0	0	0	0	28	53
1969	0	0	0	0	0	0	0	0	14	12	6	6	0	0	13	34	28	28	0	0	0	0	0	0	142	122
1970	0	0	0	0	0	0	0	0	4	3	5	5	0	0	0	0	11	11	0	0	0	0	0	0	40	33
1971	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	15	15	0	0	0	0	0	0	33	33
1972	0	0	0	0	0	0	0	0	0	0	9	9	6	0	0	18	2	2	0	0	0	0	0	0	45	61
1973	0	0	0	0	0	0	0	0	9	7	3	3	0	0	0	16	11	11	0	0	0	0	0	0	61	45
1974	0	0	0	0	0	0	0	0	0	0	10	11	0	0	0	11	15	15	0	0	0	0	0	0	63	63
1975	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	14	27	27	0	0	0	0	0	0	79	79
1976	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	0	0	0	0	5	5
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
1978	0	0	0	0	0	0	0	0	6	6	16	17	19	0	0	34	24	24	0	0	0	0	0	0	146	146
1979	0	0	0	0	0	0	0	0	6	6	10	10	14	0	0	33	8	8	0	0	0	0	0	0	95	125
1980	0	0	0	0	0	0	0	0	21	20	4	5	0	0	0	6	21	21	0	0	0	0	0	0	98	57
1981	0	0	0	0	0	0	0	0	0	0	2	2	10	0	0	11	0	0	0	0	0	0	0	0	25	81
1982	0	0	0	0	0	0	0	0	30	26	16	17	0	0	0	19	19	19	0	0	0	0	0	0	145	121
1983	0	0	0	0	0	0	0	0	17	15	31	33	0	0	4	25	57	57	0	0	0	0	0	0	240	210
1984	0	0	0	0	0	0	0	0	1	1	4	5	0	0	0	4	9	9	0	0	0	0	0	0	33	30
1985	0	0	0	0	0	0	0	0	0	0	2	2	14	0	0	11	0	0	0	0	0	0	0	0	28	125
1986	0	0	0	0	0	0	0	0	52	45	25	27	0	0	0	4	16	16	0	0	0	0	0	0	184	87
1987	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	3	0	0	0	0	0	0	0	0	8	8
1988	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	5	5
1989	0	0	0	0	0	0	0	0	0	0	12	12	16	1	0	10	3	3	0	0	0	0	0	0	59	59
1990	0	0	0	0	0	0	0	0	0	0	2	2	7	0	0	3	0	0	0	0	0	0	0	0	14	14
1991	0	0	0	0	0	0	0	0	0	0	2	2	3	0	0	13	5	5	0	0	0	0	0	0	29	34
1992	0	0	0	0	0	0	0	0	2	2	2	2	7	0	0	3	0	0	0	0	0	0	0	0	18	26
1993	0	0	0	0	0	0	0	0	6	6	17	18	18	3	17	36	18	18	0	0	0	0	0	0	156	144
1994	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	10	0	0	0	0	0	0	0	0	14	25
1995	0	0	0	0	0	0	0	0	6	5	34	36	20	0	2	44	40	40	0	0	0	0	0	0	227	262
1996	0	0	0	0	0	0	0	0	23	22	12	13	0	0	0	12	12	12	0	0	0	0	0	0	105	61
1997	0	0	0	0	0	0	0	0	1	1	4	4	0	0	0	0	5	5	0	0	0	0	0	0	19	51
1998	0	0	0	0	0	0	0	0	18	15	13	14	0	0	0	8	45	45	0	0	0	0	0	0	160	149
1999	0	0	0	0	0	0	0	0	12	11	3	3	0	0	0	11	16	16	0	0	0	0	0	0	71	69
2000	0	0	0	0	0	0	0	0	11	10	7	7	0	0	0	3	7	7	0	0	0	0	0	0	51	30
2001	0	0	0	0	0	0	0	0	0	0	3	4	7	0	0	14	0	0	0	0	0	0	0	0	28	30
2002	0	0	0	0	0	0	0	0	1	1	4	4	14	0	0	16	4	4	0	0	0	0	0	0	47	47
2003	0	0	0	0	0	0	0	0	1	1	3	4	9	0	0	27	12	12	0	0	0	0	0	0	69	
Avg	0	0	0	0	0	0	0	0	5	4	6	6	6	0	2	15	12	12	0	0	0	0	0	0	69	68
Max	0	0	0	0	0	0	0	0	52	45	34	36	24	10	18	44	57	57	0	0	0	0	0	0	240	
Min	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 2 – Water Quality Release

Vernalis WQ Release from Goodwin (1)
1,000 acre-feet

Transitional Plan Redo: Fish Higher of 174-235-318 or 20% UF, WQ, CVP 10-59-155

WY	Oct - 1	Oct - 2	Nov - 1	Nov - 2	Dec - 1	Dec - 2	Jan - 1	Jan - 2	Feb - 1	Feb - 2	Mar - 1	Mar - 2	Apr - 1	Apr - 2	May - 1	May - 2	Jun - 1	Jun - 2	Jul - 1	Jul - 2	Aug - 1	Aug - 2	Sep - 1	Sep - 2	Total	Mar-Feb
1922	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	5	5	3	0	0	1	1	1	1	1	0	0	0	0	18	18
1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2
1927	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	3
1930	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
1931	0	0	0	0	0	0	0	0	3	2	5	5	3	0	0	3	0	0	1	1	0	0	0	0	25	20
1932	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
1933	0	0	0	0	0	0	0	0	3	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	11	5
1934	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	1	1	0	0	0	0	7	7
1935	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1940	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	4	4	2	0	0	0	0	0	0	0	0	0	0	0	11	27
1948	0	0	0	0	0	0	0	0	8	8	7	7	2	0	0	0	0	0	0	0	0	0	0	0	32	23
1949	0	0	0	0	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1954	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12
1955	0	0	0	0	0	0	0	0	6	5	4	4	3	0	0	0	0	0	1	1	0	0	0	0	25	14
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3	14
1961	0	0	0	0	0	0	0	0	6	5	6	7	2	0	0	2	1	1	1	1	0	0	0	0	31	20
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
1964	0	0	0	0	0	0	0	0	4	3	6	7	1	0	0	0	0	0	0	0	0	0	0	0	21	14
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1972	0	0	0	0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5	2
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	4	5	5	0	0	3	0	0	1	1	0	0	0	0	19	36
1977	0	0	0	0	0	0	0	0	9	8	9	9	6	0	0	8	1	1	1	1	1	1	0	0	55	38
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	4	4
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1987	0	0	0	0	0	0	0	0	1	1	0	0	3	0	0	4	0	0	0	0	0	0	0	0	10	25
1988	0	0	0	0	0	0	0	0	9	8	11	12	5	0	0	6	1	1	0	0	0	0	0	0	54	51
1989	0	0	0	0	0	0	0	0	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	12
1990	0	0	0	0	0	0	0	0	6	6	8	8	0	0	0	5	1	1	0	0	0	0	0	0	35	40
1991	0	0	0	0	0	0	0	0	9	8	0	0	6	0	0	0	0	0	1	1	0	0	0	0	25	8
1992	0	0	0	0	0	0	0	0	0	0	4	5	1	0	0	5	0	0	0	0	2	2	0	0	19	19
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
1994	0	0	0	0	0	0	1	1	3	3	14	14	2	0	0	0	1	1	2	2	1	1	0	0	46	39
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	3	18
2002	0	0	0	0	0	0	0	0	8	7	1	1	0	0	0	0	0	0	1	1	0	0	0	0	19	21
2003	0	0	0	0	0	0	0	0	9	8	4	4	0	0	0	0	0	0	0	0	0	0	0	0	26	
Avg	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	7	7
Max	0	0	0	0	0	0	1	1	9	8	14	14	6	0	0	8	1	1	2	2	2	2	0	0	55	
Min	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

EXHIBIT
"E"

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814-4706

May 31, 2009

MEMORANDUM FOR: ARN: 151422SWR04SA9116, (PCTS # 2008/09022)

FROM: Rhonda Reed, Section 7 Biologist, Southwest Region

REVIEWED BY: Maria Rea, Supervisor, Sacramento Area Office

SUBJECT: Documentation on the Development of the Reasonable and Prudent Alternatives (RPA) to Avoid Jeopardy to CV Steelhead in the Stanislaus River, Specifically as Relates to Flow and Temperature

I. Introduction

The overarching objectives of the RPA Actions to Avoid Jeopardy to CV Steelhead in the Stanislaus River are:

1) Maintain suitable conditions (temperature and flow) for steelhead survival year round below the East Side Division dams, to the greatest extent downstream that is used by *O.mykiss,* and create seasonally suitable conditions for adult and juvenile migration; and

2) Restore and maintain critical habitat for spawning, rearing, and passage that is adversely modified by operations and that also affects survival and reproductive success.

This technical memo primarily addresses investigations used to develop operational criteria of the East Side Division that affect Objective 1 above. The RPA actions for the Stanislaus River are based on information provided in the effects analysis of the opinion. Temperature guidance for steelhead life history stages is based on EPA (2003), and flow requirements are based on In-stream Flow Incremental Methodology (IFIM) by Aceituno (1993).

II. Information and Rationale Used in The Process of Developing Stanislaus River Flow Schedule For Central Valley (CV) Steelhead

The Project Description (PD) of the Biological Assessment (BA) describes that under the New Melones Transitional Plan (NMTP), New Melones operations will be based, in part, on annual allocations of water to various purposes or users, based on a three tier system: High-Allocation Years, Mid-Allocation Years, and Conference Years (BA Chapter 2, pg 2-65). Based on Aceituno (1993), CV steelhead habitat requirements may be met only in High-Allocation Years. Based on the 28-year history of New Melones operations, this condition has occurred in only 40 percent of years. The process for allocating water in Conference Years is basically that the parties will negotiate allotments. In Mid-Allocation years, the fishery allotment is less than what is needed for CV steelhead. However, under the past IPO operations, downstream water quality objectives frequently provide flows that are beneficial to salmonid needs, and these flows have not been attributed to the fishery allotment. Consequently, it is possible that flow conditions might be suitable for steelhead habitat, but the modeling tools and operational guidance do not provide sufficient information to determine that daily and seasonal flows are within optimum parameters for CV steelhead. Further, the models tend to use a variety of "look-up tables" in place of operational rules, so a look-up table for water quality needs may allocate 10 cfs daily for the month of May; and the look-up table for fishery needs may allocate 150 cfs daily for the month, but there are no definitions or rationale for these allocation levels and no interplay among these factors that would ensure that minimum flows are provided consistently for CV steelhead. Therefore, not only are the operational criteria for New Melones releases unclear, there are no operational parameters defined that would provide beneficial flows for CV steelhead. The most common examples of the problems with this approach under the present IPO occur in January and in September. Flows are typically dropped in January when regulated water quality standards change, resulting in decreasing the wetted spawning habitat and dewatering early-spawned eggs. In September when factors other than Stanislaus River flows cause Delta water quality standards to be met, Reclamation typically drops in-stream flows which reduces habitat for rearing CV Steelhead and causes more frequent temperature exceedances for rearing temperatures. Modeled results identify the same problem periods under the NMTP).

The task at hand was to identify operational criteria that would minimize or prevent flows below optimal levels as defined by the IFIM (Aceituno 1993) and presented as follows in the Opinion:

Table 6-16. Comparison by life stage of in-stream flows which would provide maximum weighted usable area of habitat for steelhead and Chinook salmon in the Stanislaus River, between Goodwin Dam and Riverbank, California (adapted from Aceituno 1993). No value for Chinook salmon adult migration flows was reported.

Life Stage	Steelhead Flow	Steelhead Timing	Fall-Run Flow	Fall-Run Timing
Spawning	200	Dec-Feb	300	Oct 15-Dec 31
Egg incubation/fry rearing	50	Jan - Mar	150	Jan. 1-Feb 15
Juvenile rearing	150	all year	200	Feb 15-Oct 15
Adult migration	500	Oct-April	-	

It is important to note that Aceituno (1993) made no analysis of flow needs for salmonid emigration in the spring.

Several approaches to define such operational criteria were deployed in the process of developing the final Stanislaus River Flow Schedule. These included: (1) a "look-up table"; (2) a fractional unimpaired flow approach; (3) flow schedules built with fall-run in mind which were then modified to address specific steelhead life history requirements; and finally, (4) adaptation of (3) to provide sufficient flows for CV steelhead as well as preventing excessive drawdown of New Melones Reservoir.

The Look-up Table

The initial attempt at defining such operational criteria was to propose a "look-up table" that would set minimum flows by month, as a minimum operational standard to be applied to within +_ 10 percent (Draft Opinion RPA, December 11, 2008). This was combined with additional flow management actions to create an adult attraction flow in October, augmented spring emigration flows, and periodic channel forming flows of 5,000cfs on a one to three-year schedule. Although the look-up table was an attempt to state fish flow needs in a format that appeared to be familiar to Reclamation, the comments we received from Reclamation and California Department of Water Resources about this action indicated general confusion in the presentation of the table and about how the flow-related actions would interact. This response prompted an evaluation of other approaches.

1) The Fractional Unimpaired Flow Approach

This approach considered devoting a set percentage of daily unimpaired flow as the release schedule for fish needs. This approach was abandoned because it was not clear how to define what the appropriate percentage allocation should be given that this schedule would mimic the natural hydrograph with which CV steelhead evolved. However, inflow into New Melones is not unimpaired, owing to many upstream dams for hydropower and other purposes, so it was not clear that such an operational approach could be implemented. Further, if the percentage were set incorrectly, the frequency of unsuitable flow conditions could be increased. Without a substantial level of time and modeling expertise, it did not appear feasible that NMFS could develop this approach, so it was abandoned from consideration in this RPA.

2) The Modified Fall-run Flow Schedules

In January 2009 I consulted with California Department of Fish and Game (CDFG) biologists (Dean Marston, Tim Heyne) and U.S. Fish and Wildlife Service (FWS) biologists (John Wikert, Roger Guinee), requesting their recommendations. The Anadromous Fish Restoration Program (AFRP) flows were discussed as an option. I did not actively pursue them because I felt that these recommendations were heavily focused on salmon and presented a set of priorities for flow allocation that balanced steelhead needs in the context of fall-run priority needs. Additionally, my understanding is that the AFRP flow recommendations are lower than what was recommended in the Working Papers, because the flow schedules ultimately recommended they had to meet the "reasonable-ness" criterion as implied by the Central Valley Project Improvement Act. More recent modeling studies by CDFG on spring outmigration flows for salmon provide further indication that the AFRP flows may not be inadequate for some life history stages (CDFG 2008).

The first flow schedule suggested by CDFG was a simple schedule, including a fall adult attraction flow and "table-shaped" spring emigration flows. These schedules would vary by water-year type, with higher flows in wetter years (Figure 1).

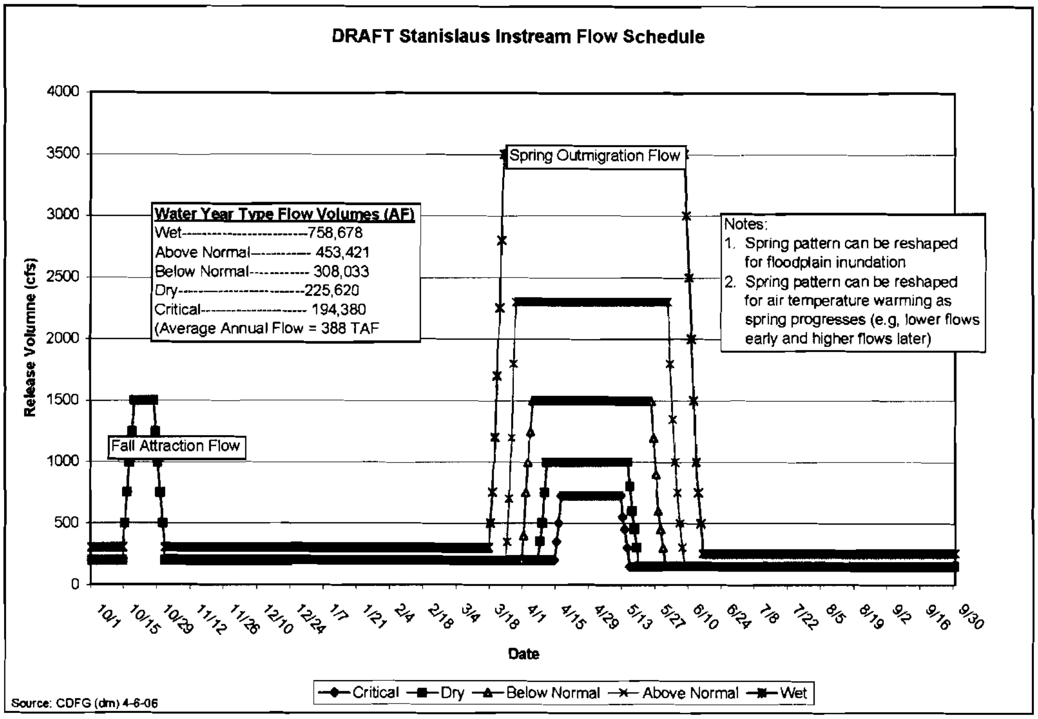


Figure 1. CDFG initial flows for salmonids schedule (rec'd. January 14, 2009)

Subsequent discussion continued by telephone among the parties about the relative needs for steelhead in such a flow schedule, compared to fall run. Topics discussed included:

- Did CV steelhead need a fall attraction pulse? (Yes, based on the fact that the counting weir detects adult CV steelhead at the same time [and not before]; that the fall attraction flows bring in adult fall-run; and based on the likely improvements of these flows on poor water quality conditions further downstream.)

- Variability in flow triggers appears to be important to promote anadromy in steelhead versus residualization.

- Variability in spring pulse flows tends to show elevated activity in out-migrants at rotary screw traps (RST).

- Do steelhead need spring pulse flows, or can they just swim out on their own? CV steelhead are captured at the RSTs before the pulse flows, so early smolts may not need a spring pulse. However, the spring pulse does improve downstream water quality conditions for smolts that are leaving later, and this may be more important than for swimming assistance.

- The unimpaired hydrograph showed elevated flows in the San Joaquin River at Vernalis, well into July in most years. So, would it be beneficial to extend the falling limb of the spring pulse to better replicate evolved conditions? Would there be added benefits to riparian tree recruitment?

- How could, or should, this schedule accommodate geomorphic flows?

- Can we get a temperature model run of the proposed flow schedule?

In response to these discussions, the March 3, 2009, version of the Draft RPA proposed the flow schedule in Figure 2.

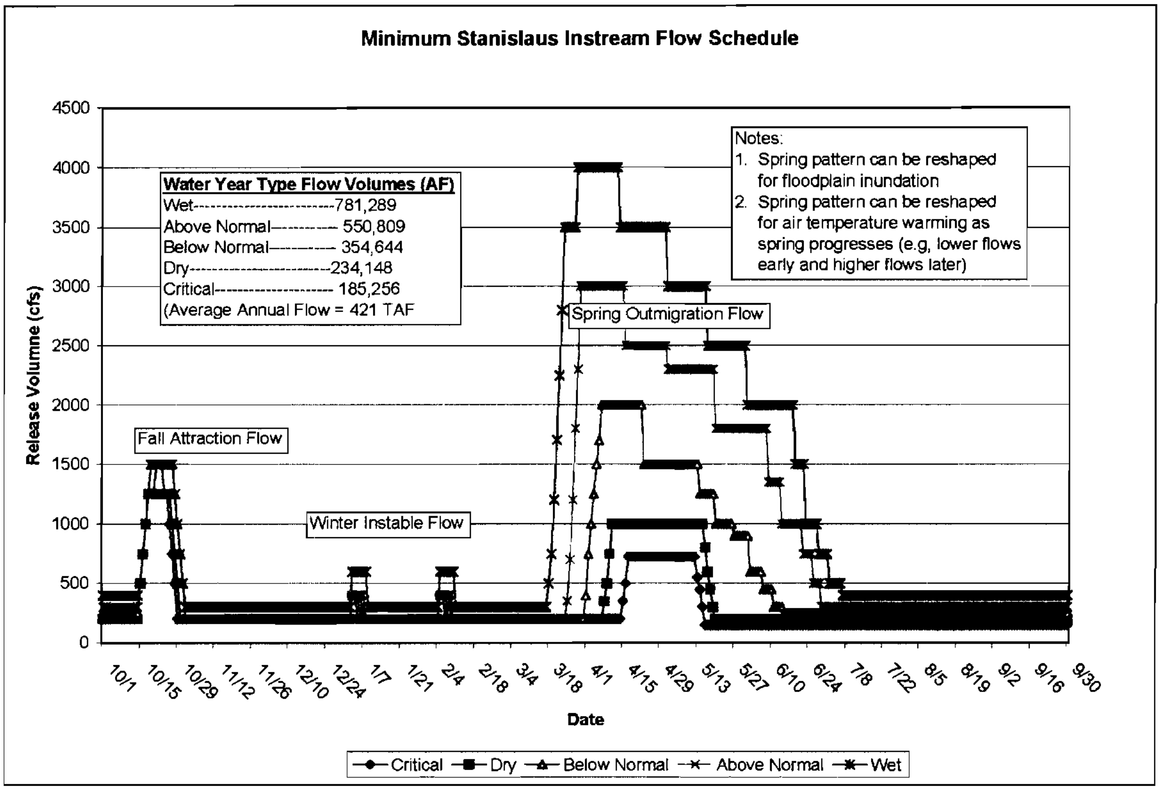


Figure 2. March 3, 2009, Draft RPA Stanislaus Minimum Flow Schedule.

The schedule was developed from: (1) the SJR salmon model (V.1.0) (output for doubling salmon and calculating the Stanislaus flow contribution (spring time); then (2) using other information (such as RST data, escapement patterns, and Aceituno [1993]) to fill in and shape the non-spring time periods. The basic approach was to take the standard salmon needs hydrograph and insert higher flows in time periods where the flow was not at least at the steelhead minimum based on the IFIM. In the dry years, we leaned toward meeting what was described in the IFIM as rainbow trout minimum flows, and in the wetter years the base is more the minimum flows recommendation for steelhead. The biggest change was in the summer where we added more minimum flow both to ensure that the IFIM need of 150 cfs is met for rearing, and, in wetter years, to provide better summer temperatures. The spring pulse flow was changed to have an extended recession limb to give smolts an extended invitation to leave. It also helps maintain a better riparian zone, particularly the large trees which germinate in spring and need a slow drop in water elevation to give their roots time to grow. Small pulse flows were inserted in the winter months to mimic unimpaired flow variability, which seems to be important in increasing the modeled frequency of anadromy in steelhead (Cramer Fish Sciences 2009).

CDFG recommended that these scenarios (especially the driest three scenarios) be run through the San Joaquin Basin temperature model to identify if there are any issues with temperature in summer and fall. This post processing of the proposed flows would likely identify a few corrections for hot spots. CDFG also expressed concern that fall pulse flows in the driest years should be considered on a real-time management basis to prevent drawing in fish only to leave them in the spawning reach at low flows during a time when the ambient air temperatures may remain high in late October and early November; causing warm water temperatures.

On March 20, 2009, NOAA's National Marine Fisheries Service (NMFS) received comments on Stanislaus flows in this March 3 Draft RPA. They asserted that the flows used too much water and that Reclamation is prohibited from releasing more than 1500 cfs in non-flood conditions.

To evaluate these comments, we were able to borrow the time and skills of Derek Hilts, Hydrologist from U.S. Fish and Wildlife Service Sacramento Office, Division of Water Operations. He initially used EcoSim to quickly evaluate the effect of the Stanislaus flow schedule on New Melones storage over time (Hilts 2009). The results indicated that the flow schedule more fully used the storage capacity of the reservoir, and it did result in lower storage levels; especially in successive drought years such as the early 1990's (Figure 3). Reclamation's analysis of likely hydrological scenarios discounts the probability of the extreme drought of the 1990's, and instead uses the dry period of 1922-34 as representative of sustained drought conditions. Nonetheless, we considered that we should develop an exception process to prevent substantially depleting the reservoir under these conditions, for both water supply and temperature management considerations. Higher flow rates in wetter years resulted in more operational dry and critically dry years, but overall flow-related habitat conditions were appreciably better for fish in approximately 66 percent of years. The NMTP would produce good flow conditions for CV steelhead in only 40 percent of years.

When evaluating the effect on salmonids of an operational strategy on the Stanislaus River, Reclamation would normally take the CalSim modeled results and conduct post processing to determine temperature effects. When we met in early March to discuss the March 3 version of the RPA with the action agencies, we requested help from Reclamation to do temperature modeling on these flows using their tools. In subsequent discussion with USFWS and CDFG, the need to perform temperature modeling on these flows was also identified, but NMFS and USFWS lacked internal expertise to perform the modeling. CDFG was unable to assist with running the San Joaquin River Basin temperature model because of funding freezes. Tetra Tech was hired by NMFS to assist with such activities under the guidance of Craig Anderson, Hydrologist, NMFS, Habitat Conservation Division, Southwest Region. Insufficient time was available for them to learn and apply the specifics of operating the model.

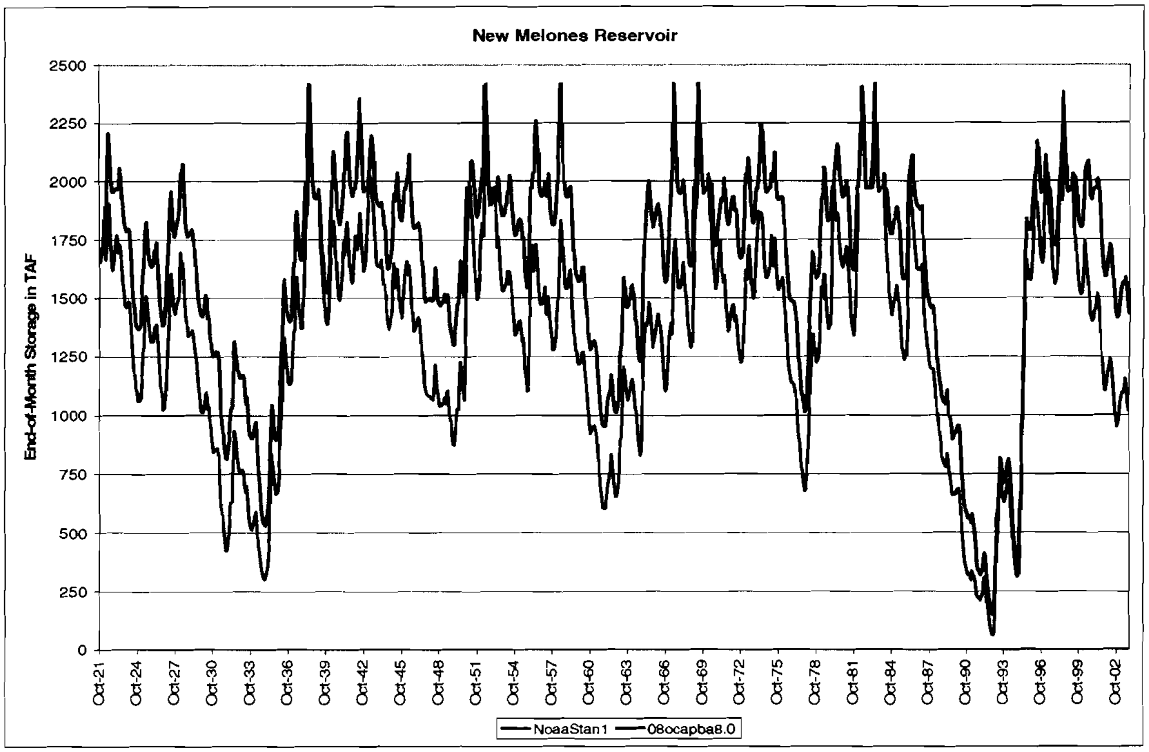


Figure 3. EcoSim evaluation comparing New Melones Reservoir storage when operated under the March 3 proposed Stanislaus River flows (Pink-NoaaStan1) and when operated under Study 8.0 (full implementation of Proposed Action) from the BA.

In an April 14 meeting with Ron Milligan, Reclamation, and others, Ron asked for something other than block allocations. I explained the Stanislaus River minimum flows graphic from the March 3 draft RPA. Issues raised were his understanding that Reclamation couldn't exceed 1500 cfs because of seepage. Roger Guinee pointed out that the 1500 cfs cap related to a ruling in a judgment that applied only to the period that New Melones reservoir was filling, and no longer applies (per Jim Monroe, FWS). Kaylee Allen (Reclamation) said she was researching the issue and wasn't sure of outcome. I asked how long it takes for high flows to cause seepage problems. Ron was not definite, but implied about ten days.

Ron also asked if it were possible to move channel-forming flows into their flood management period, as those would be easier to do without the seepage issues. I agreed to look into it, and John Hannon agreed to revisit the RST data for smolts and key migration times. Derek Hilts asked if Reclamation could run their temperature model on this flow schedule, and Ron indicated he would discuss that with his modeling staff.

3) CV Steelhead Modified Pulse Flow Schedule:

In response to the comments received in the meeting with Ron Milligan and others on April 14, I looked at how to modify the peak flows to achieve migration cueing, geomorphic flows, and minimize seepage issues. I did not limit flows to 1500 cfs, but decreased the duration of the flows in excess of that level. The changes were applied in the spring, with higher peak flows scaled to water-year type, repeated thru spring to give migration cues and facilitate geomorphic processes (Figure 4).

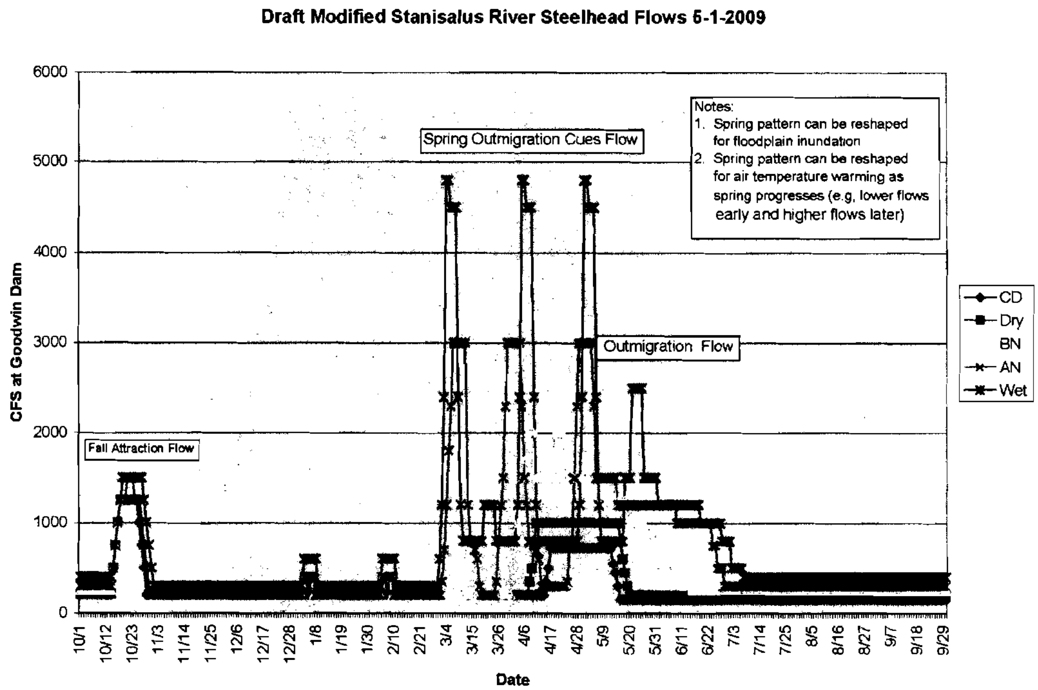


Figure 4. Modified Stanislaus flow schedule with Multiple Spring Pulses and ramp down to 800cfs. (Created May 1, 2009)

I evaluated whether it was possible to do channel-forming flows earlier, looking at John Hannon's steelhead emigration analysis (Hannon 2009). His analysis showed a median departure date of March 1, so an earlier pulse could assist earlier exiting smolts to cue their migration; but high flows in January through March risk scouring of both steelhead and fall-run redds. Hannon also included a historical presentation of monthly flows (Flow Charts Tab in Hannon 2009 spreadsheet), which showed that pre-New Melones Dam high flows would occur in February (peak ~5,000 cfs, median ~1,000 cfs), but were highest in May (peak ~8,000cfs, median ~ 2,300cfs). So, as a compromise to correlate geomorphic flows with flood releases, I proposed the first pulse in early March. This could cause some redd scouring, but it would be closer to the period when unimpaired flows would have produced similar high flows and would allow for some fry to have emerged. The EcoSim modeling (Hilts 2009a) showed less impact on New Melones storage with this schedule of multiple pulses of shorter duration, still scaled to water-year type. That said, an exception procedure should still be developed for the instances of multiple dry years as no action (even in the proposed BA PD) could seriously deplete reservoir levels.

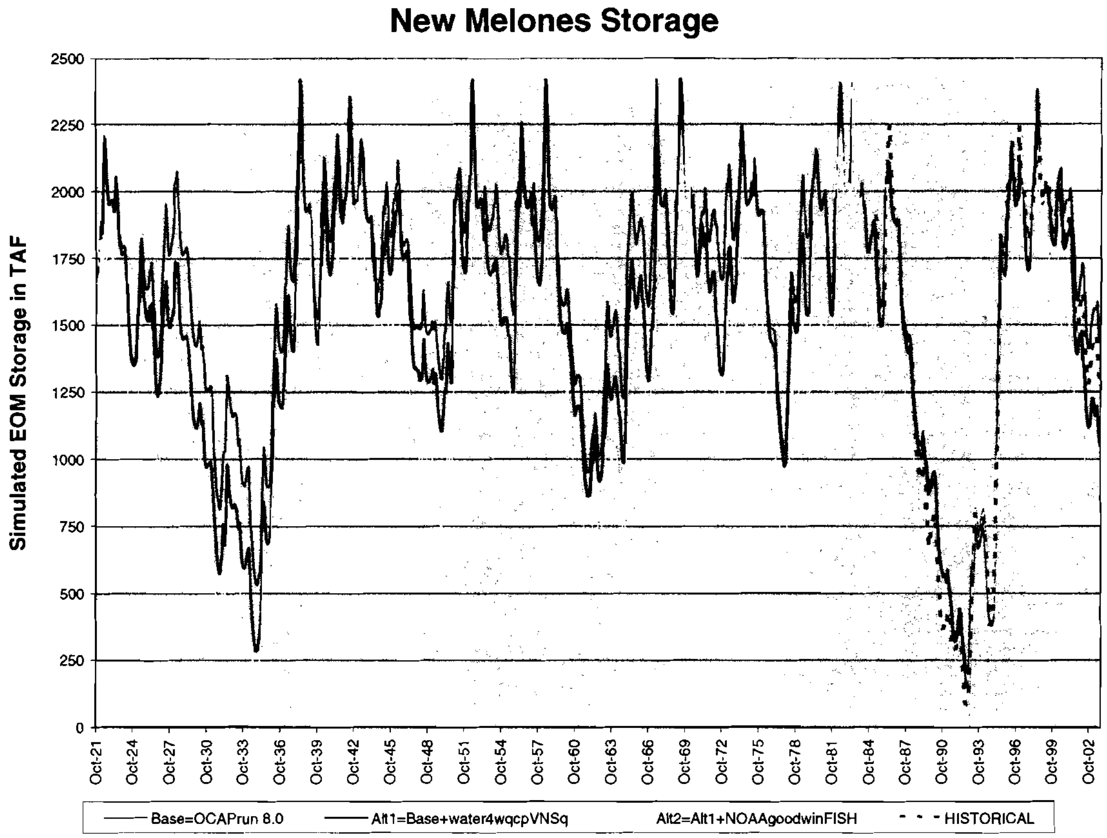


Figure 5. New Melones Storage Levels as Operated with CV Steelhead Modified Pulse Flow Schedule (Hilts 2009a)

The final flow schedule was adjusted to prevent pulse flow drops from falling below 800 cfs and prevent a known stranding problem (Roger Guinee 2009 pers comm.) and to slightly increase highest flows to 5,000 cfs in order to provide a minimum channel forming flow (Kondolf *et al.*, 2001). In practice, peak flows may get be higher in wetter years if 1999 is any indicator, but would require higher storage (Figure 6), starting the water year. These minor changes showed no ostensible difference in New Melones storage levels.

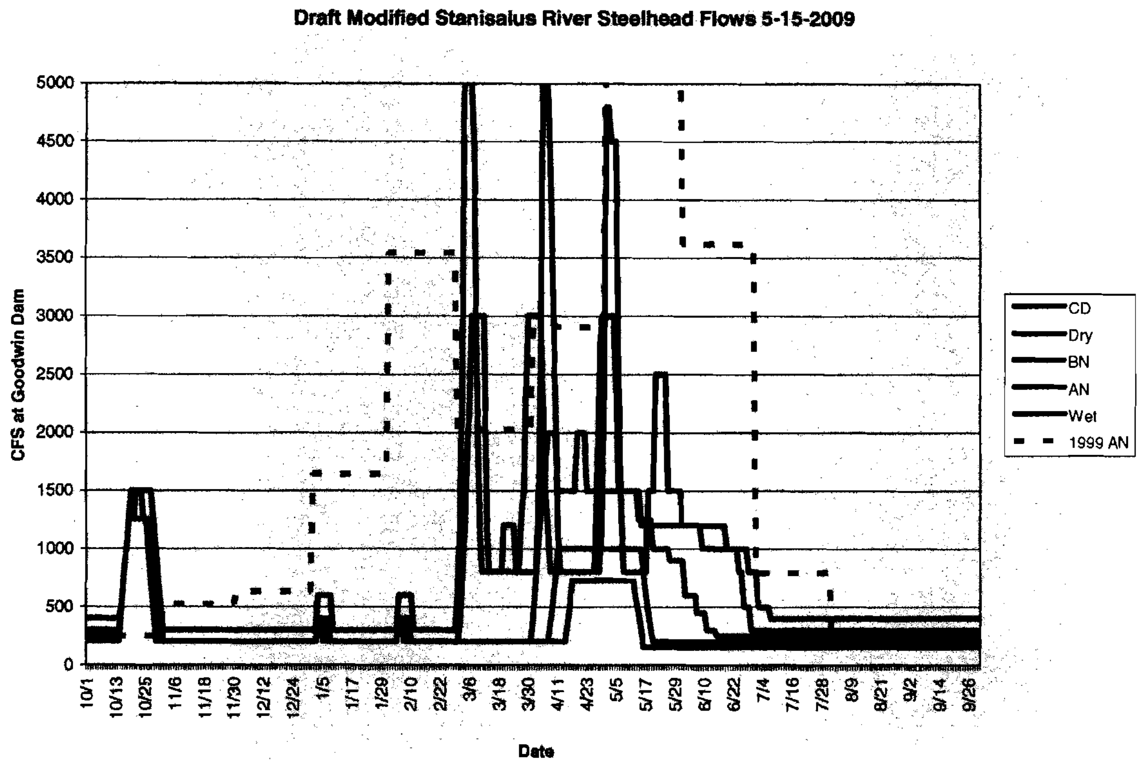


Figure 6. Final Stanislaus River Flow Schedule for RPA, With Example of Above Normal Release Pattern From 1999 (dotted line).

Upon seeing the applied release pattern from 1999, I am satisfied that the proposed minimum flow schedule provides a default minimum flow pattern that is a significant improvement for CV steelhead in all but driest of years and that can fall within the operational patterns conducted by Reclamation in recent years.

III. Interaction of San Joaquin River Inflow to Export Ratio Action and the Minimum Stanislaus River Flows Action

The Stanislaus River flow schedule for the RPA was developed from the initial perspective of providing appreciable benefits to CV steelhead as they inhabit the Stanislaus River, to avoid jeopardy from project operations. However, these flows and operations are an integral part of a larger migratory route and a larger water management system. Additional actions proposed in the RPA addressed the conditions encountered by CV steelhead further downstream in the San Joaquin River. Additional modeling was conducted to evaluate actions relating to the ratio of San Joaquin River inflow at Vernalis to export levels. For complete discussion of these analyses, see Craig Anderson's CVP/SWP operations biological opinion technical memorandum under the subject heading *Modeling Tools and Associated Analyses Utilized in Developing the San Joaquin River Inflow to Export Ratio Action and the Minimum Stanislaus River Flows Action for the 2009 NMFS OCAP BO* (Anderson 2009). This modeling was conducted in an exploratory manner; first looking at the inflow:export relationship, and ultimately uniting the analyses of these actions in their upstream to downstream relationship. The ability to achieve inflow:export ratios was determined to be related to available storage at upstream reservoirs, including New Melones; so the action evolved to include a relationship between the New Melones Index (NMI) and in-stream flows.. While the initial development of the Stanislaus River flow schedule considered the water-year classification system from a general perspective, such as the 60-20-20 index for the San Joaquin River, the rate of depletion of New Melones Reservoir in successive years of drought suggested that some mechanism, related to storage levels, should be developed to manage operations in these exceptional conditions. The integration of the NMI into that process appears to offer a useful planning tool.

The effect of dedicating Stanislaus water to purposes at Vernalis generally reduced the NMI for any given year. This increases the likelihood that for the same inflow, a water year will fall into a drier classification. As the annual flow pattern is determined by the water-year type and the NMI is expected to be lower, this will reduce the frequency of the highest final flow regimes and increase the frequency of the lowest flow regimes. This is illustrated in Figure 6 below. When the Vernalis RPA was imposed (yellow line), modeled as a minimum flow requirement at Vernalis April 1 through May 31, the frequency of each Goodwin minimum in-stream flow allocation generally shifted to the right as compared to the condition without the Vernalis RPA (blue line). This results in more years under the lower flow conditions and fewer under the higher conditions, but the flow patterns and peak magnitudes do not change for a given year type. The lower flow (drier year) patterns provide adequate conditions for the fish comparable or better than the Study 8 conditions, and the higher flows provide an appreciable benefit for survival conditions and habitat quality.

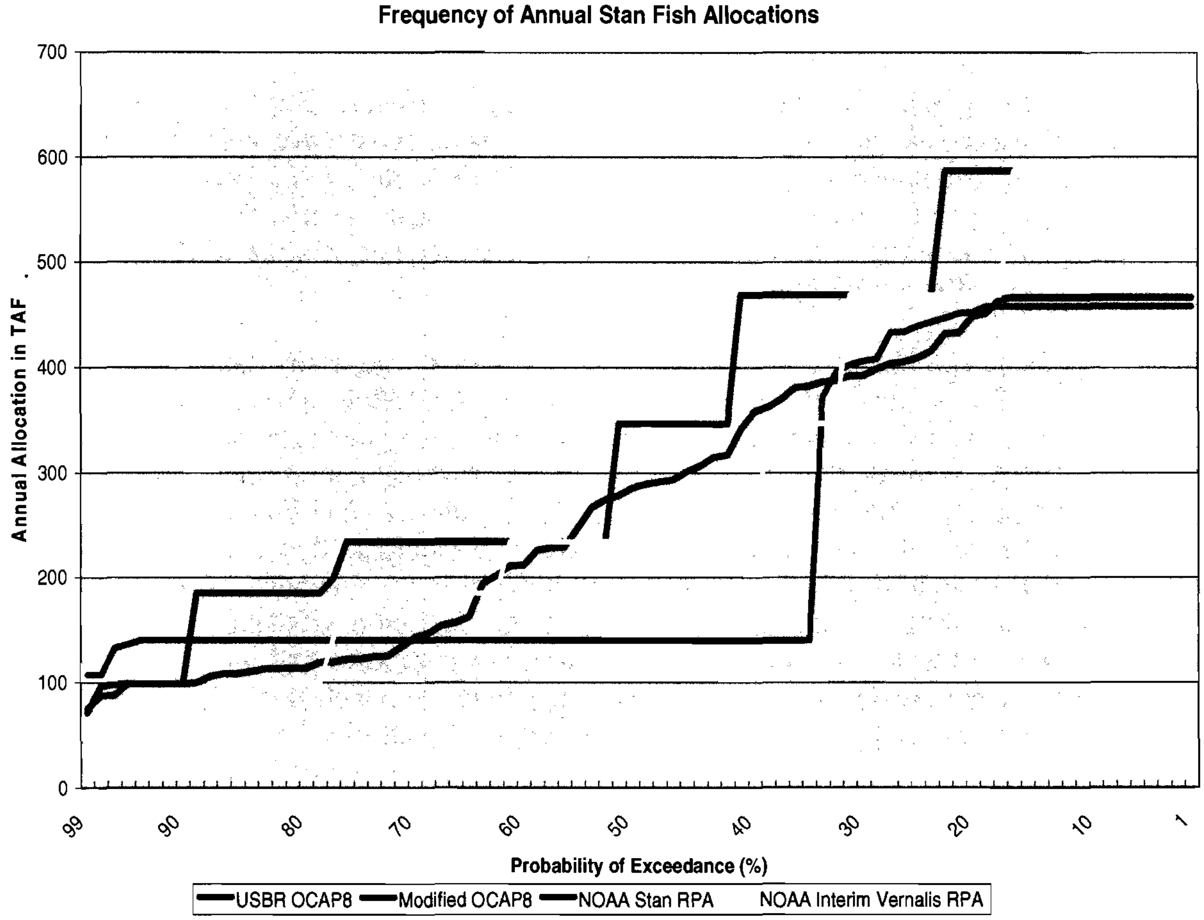


Figure 6. Probability of exceedance for simulated annual Stanislaus Fish flow allocations for OCAP study 8.0 simulation, the modified OCAP study 8.0 simulation, the minimum Stanislaus flows (Stan) RPA simulation, and the interim SJRI:export (Vernalis) RPA simulation.

IV. Temperature Modeling

Reclamation did conduct temperature modeling on the Modified Fall-run Flow Schedules presented in the March 3, 2009, draft RPA, and provided a copy of the results to NMFS on May 5 (Reclamation 2009). At that point in time, we had modified the March 3 Stanislaus flow schedule to the CV Steelhead Modified Pulse Flow Schedule. Nonetheless, the temperature analyses were informative. The results showed similar temperature exceedance problems as compared to Study 8.0 results in summer of dry and critically dry years, but the RPA action provides better flows for habitat quality and thus survivability. Given that these model runs were done on large continuous spring flow (March 3 version), I would expect that temperature evaluations for subsequent flow schedules would show no change or an improvement in temperature conditions. This expectation is based on the fact that Reclamation's temperature model didn't show much change in temperature as a result of the proposed fish-friendly flow pattern, and that the subsequent flow schedules required less water to be delivered from storage; which would preserve a larger coldwater pool.

V. Summary

The Stanislaus Flow pattern developed through this process is intended as default minimum flow schedule to avoid jeopardy on CV steelhead. The RPA identifies that this schedule shall be implemented in consideration of maintaining appropriate temperatures for CV steelhead life history requirements as identified in the RPA. NMFS recommends that additional temperature modeling runs be conducted to fine tune the precise flow schedule, within the constraints of the RPA as written. The action is written so that the flow schedule can be modified in real-time operations management process and can be improved with new information, such as from in-stream flow habitat evaluations underway or subsequent temperature modeling. A possible mechanism for an exception procedure to prevent extreme draw-down of New Melones Reservoir in extended drought conditions was to tie the flow schedule to the New Melones Index in Anderson (2009).

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