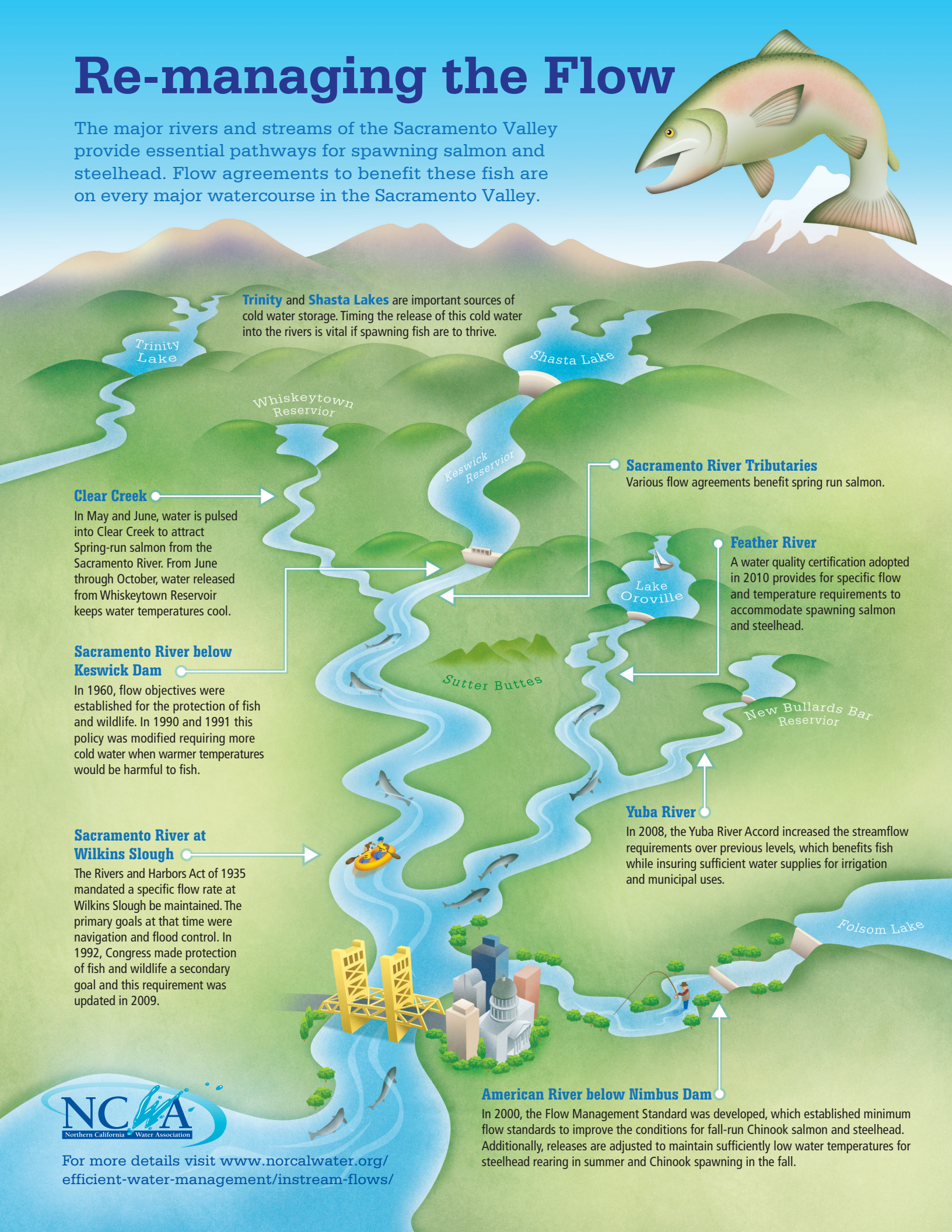
Re-managing the Flow

The major rivers and streams of the Sacramento Valley provide essential pathways for spawning salmon and steelhead. Flow agreements to benefit these fish are on every major watercourse in the Sacramento Valley.



Trinity and **Shasta Lakes** are important sources of cold water storage. Timing the release of this cold water into the rivers is vital if spawning fish are to thrive.

Clear Creek

In May and June, water is pulsed into Clear Creek to attract Spring-run salmon from the Sacramento River. From June through October, water released from Whiskeytown Reservoir keeps water temperatures cool.

Sacramento River below Keswick Dam

In 1960, flow objectives were established for the protection of fish and wildlife. In 1990 and 1991 this policy was modified requiring more cold water when warmer temperatures would be harmful to fish.

Sacramento River at Wilkins Slough

The Rivers and Harbors Act of 1935 mandated a specific flow rate at Wilkins Slough be maintained. The primary goals at that time were navigation and flood control. In 1992, Congress made protection of fish and wildlife a secondary goal and this requirement was updated in 2009.

Sacramento River Tributaries

Various flow agreements benefit spring run salmon.

Feather River

A water quality certification adopted in 2010 provides for specific flow and temperature requirements to accommodate spawning salmon and steelhead.

Yuba River

In 2008, the Yuba River Accord increased the streamflow requirements over previous levels, which benefits fish while insuring sufficient water supplies for irrigation and municipal uses.

American River below Nimbus Dam

In 2000, the Flow Management Standard was developed, which established minimum flow standards to improve the conditions for fall-run Chinook salmon and steelhead. Additionally, releases are adjusted to maintain sufficiently low water temperatures for steelhead rearing in summer and Chinook spawning in the fall.

NCWA
Northern California Water Association

For more details visit www.norcalwater.org/efficient-water-management/instream-flows/

Instream Flow Requirements in the Sacramento River Hydrologic Region Updated: November 2014

This briefing paper describes the existing instream flow requirements for the major rivers and streams in the Sacramento River hydrologic region. These requirements include provisions in State Water Resources Control Board (SWRCB) decisions, biological opinions, streamflow agreements, and other processes. New processes to develop different flow requirements should be aware of, and take into account, these existing flow requirements.

Upper Sacramento River

1. 1960 MOA between Reclamation and DFG

An April 5, 1960, Memorandum of Agreement (MOA) between Reclamation and the DFG originally established flow objectives in the Sacramento River for the protection and preservation of fish and wildlife resources. The agreement provided for minimum releases into the natural channel of the Sacramento River at Keswick Dam for normal and critically dry years (Table 1, below). Since October 1981, Keswick Dam has operated based on a minimum release of 3,250 cfs for normal years from September 1 through the end of February, in accordance with the MOA. This release schedule was included in Order 90-05 (described below), which maintains a minimum release of 3,250 cfs at Keswick Dam and Red Bluff Diversion Dam (RBDD) from September through the end of February in all water years, except critically dry years.

The 1960 MOA provides that releases from Keswick Dam (from September 1 through December 31) are made with minimum water level fluctuation or change to protect salmon to the extent compatible with other operations requirements. Releases from Shasta and Keswick Dams are gradually reduced in September and early October during the transition from meeting Delta export and water quality demands to operating the system for flood control and fishery concerns from October through December.

2. SWRCB Water Rights Order 90-05 and Water Rights Order 91-01

In 1990 and 1991, the SWRCB issued Water Rights Orders 90-05 and 91-01 modifying Reclamation's water rights for the Sacramento River. The orders stated Reclamation shall operate Keswick and Shasta Dams and the Spring Creek Powerplant to meet a daily average water temperature of 56°F as far downstream in the Sacramento River as practicable during periods when higher temperature would be harmful to fisheries. The optimal control point is the RBDD.

Under the orders, the water temperature compliance point may be modified when the objective cannot be met at RBDD. In addition, Order 90-05 modified the minimum flow requirements initially established in the 1960 MOA for the Sacramento River below Keswick Dam. The water right orders also recommended the construction of a Shasta Temperature Control Device (TCD) to improve the management of the limited cold water resources.

Pursuant to SWRCB Orders 90-05 and 91-01, Reclamation configured and implemented the Sacramento-Trinity Water Quality Monitoring Network to monitor temperature and other parameters at key locations in the Sacramento and Trinity Rivers. The SWRCB orders also required Reclamation to establish the Sacramento River Temperature Task Group (SRTTG) to formulate, monitor, and coordinate temperature control plans for the upper Sacramento and Trinity Rivers. This group consists of representatives from Reclamation, SWRCB, NMFS, the Service, DFG, Western, DWR, and the Hoopa Valley Indian Tribe.

Each year, with finite cold water resources and competing demands usually an issue, the SRTTG devises operation plans with the flexibility to provide the best protection consistent with the CVP's temperature control capabilities and considering the annual needs and seasonal spawning distribution monitoring information for winter-run and fall-run Chinook salmon. In every year since the SWRCB issued the orders, those plans have included modifying the RBDD compliance point to make best use of the cold water resources based on the location of spawning Chinook salmon. Reports are submitted periodically to the SWRCB over the temperature control season defining the temperature operation plans. The SWRCB has overall authority to determine if the plan is sufficient to meet water right permit requirements.

3. June 4, 2009 NMFS Biological Opinion

The National Marine Fisheries Service's (NMFS) June 4, 2009, Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS BiOp) contains numerous terms and conditions addressing instream flows on the Upper Sacramento River.

Table 1 below, as excerpted from the NMFS BiOp (at page 254), identifies the aforementioned MOA and SWRCB order requirements, and Reclamation's proposed flow objectives below Keswick that were analyzed in the NMFS BiOp.

Table 1: Minimum flow requirements and objectives (cfs) on the Sacramento River below Keswick Dam

Water year type	MOA	WR 90-5	MOA and WR 90-5	Proposed Flow Objectives below Keswick
Period	Normal	Normal	Critically dry	All
January 1 - February 28(29)	2600	3250	2000	3250
March 1 - March 31	2300	2300	2300	3250
April 1 - April 30	2300	2300	2300	---*
May 1 - August 31	2300	2300	2300	---*
September 1 - September 30	3900	3250	2800	---*
October 1 - November 30	3900	3250	2800	3250
December 1 - December 31	2600	3250	2000	3250
Note: * No regulation.				

The flow related components of the NMFS BiOp related to the Sacramento River Basin are detailed in the Reasonable and Prudent Alternatives (RPA) section of BiOp at pages 587 through 611. The RPA Actions include flow requirements on Clear Creek; release requirements from Whiskeytown Dam for temperature management; cold water pool management of Shasta Reservoir; development of recommended minimum flows at Wilkins Slough; and restoration of floodplain habitat in the lower Sacramento River basin for protection of certain listed species. A selection of the more specific flow-related requirements are described below.

Clear Creek Operations

RPA Action I.1.1 - Clear Creek Spring Attraction Flows

Reclamation shall annually conduct at least two pulse flows in Clear Creek in May and June of at least 600 cfs for at least three days for each pulse, to attract adult spring-run holding in the Sacramento River main stem. This may be done in conjunction with channel-maintenance flows (Action I.1.2).

RPA Action I.1.2. – Clear Creek Channel Maintenance Flows

Reclamation shall re-operate Whiskeytown Glory Hole spills during the winter and spring to produce channel maintenance flows of a minimum of 3,250 cfs mean daily spill from Whiskeytown for one day, to occur seven times in a ten-year period, unless flood control operations provide similar releases. Re-operation of Whiskeytown Dam should be implemented with other project facilities as described in the EWP Pilot Program (Reclamation 2008d).

RPA Action I.1.5. – Clear Creek Thermal Stress Reduction

Reclamation shall manage Whiskeytown releases to meet a daily water temperature of:

(1) 60 deg. F at the Igo gage from June 1 through September 15; and

(2) 56 deg. F at the Igo gage from September 15 to October 31.

Reclamation, in coordination with NMFS, will assess improvements to modeling water temperatures in Clear Creek and identify a schedule for making improvements.

RPA Action I.1.6. - Adaptively Manage to Habitat Suitability/IFIM Study Results on Clear Creek

Reclamation shall operate Whiskeytown Reservoir as described in the Project Description with the modifications described in Action I.1 until September 30, 2012, or until 6 months after current Clear Creek salmonids habitat suitability (*e.g.*, IFIM) studies are completed, whichever occurs later.

When the salmonid habitat suitability studies are completed, Reclamation will, in conjunction with the Clear Creek Technical Working Group (CCTWG), assess whether Clear Creek flows

shall be further adapted to reduce adverse impacts on spring-run and CV steelhead, and report their findings and proposed operational flows to NMFS within 6 months of completion of the studies. NMFS will review this report and determine whether the proposed operational flows are sufficient to avoid jeopardizing spring-run and CV steelhead or adversely modifying their critical habitat.

Reclamation shall implement the flows on receipt of NMFS' written concurrence. If NMFS does not concur, NMFS will provide notice of the insufficiencies and alternative flow recommendations. Within 30 days of receipt of non-concurrence by NMFS, Reclamation shall convene the CCTWG to address NMFS' concerns. Reclamation shall implement flows deemed sufficient by NMFS in the next calendar year.

Shasta Operations

RPA Action Suite I.2 – Shasta Operations

This suite of actions is designed to ensure that Reclamation uses maximum discretion to reduce adverse impacts of the projects to winter-run and spring-run in the Sacramento River by maintaining sufficient carryover storage and optimizing use of the cold water pool.

RPA Action I.2.1 – Performance Measures

The following long-term performance measures shall be attained. Reclamation shall track performance and report to NMFS at least every 5 years. If there is significant deviation from these performance measures over a 10-year period, measured as a running average, which is not explained by hydrological cycle factors (*e.g.*, extended drought), then Reclamation shall reinitiate consultation with NMFS.

Performance measures for end-of-season ("EOS") carryover storage at Shasta Reservoir:

- 87 percent of years: Minimum EOS storage of 2.2 MAF
- 82 percent of years: Minimum EOS storage of 2.2 MAF and end-of-April storage of 3.8 MAF in following year (to maintain potential to meet Balls Ferry compliance point)
- 40 percent of years: Minimum EOS storage 3.2 MAF (to maintain potential to meet Jelly's Ferry compliance point in following year)

Measured as a 10-year running average, performance measures for temperature compliance points during summer season shall be:

- Meet Clear Creek Compliance point 95 percent of time
- Meet Balls Ferry Compliance point 85 percent of time
- Meet Jelly's Ferry Compliance point 40 percent of time
- Meet Bend Bridge Compliance point 15 percent of time

RPA Actions I.2.2 through I.2.4 – Keswick Release Schedules

Depending on EOS carryover storage and hydrology, Reclamation is mandated to develop and implement Keswick release schedules, and reduce deliveries and exports, as detailed in RPA Actions I.2.2.A through I.2.2C, I.2.3.A through I.2.3.C, and I.2.4. (See NMFS BiOp at pp. 593-603.)

Required Technical Teams for Adaptive Management

The NMFS BiOp requires actions by various Fisheries and Operations Technical Teams whose function is to make recommendations for adjusting operations to meet contractual obligations for water delivery and minimize adverse effects on listed anadromous fish species. The two teams on the Upper Sacramento River are the SRTTG and the CCTWG. Each group must gather and analyze information, and make recommendations, regarding adjustments to water operations within the range of flexibility prescribed in the implementation procedures for a specific action in their particular geographic area.

4. Wilkins Slough Navigation Flow Requirements Under Federal Law

The NMFS BiOp requires the development of certain recommendations regarding the Wilkins Slough navigation flow requirements. Reclamation's compliance with the Wilkins Slough 5,000 cfs navigation flow standard, however, is not discretionary.

In this regard, Congress initially authorized the construction of certain facilities for the Central Valley Project ("CVP") under the Rivers and Harbors Act of 1935 (the "1935 Act"). (49 Stat. 1028, 1038). The 1935 Act mandated in relevant part that "the following works of improvement of rivers . . . are hereby adopted and authorized . . . in accordance with the plans recommended in the respective reports hereinafter designated and subject to the conditions set forth in such documents . . . Sacramento River, California; Rivers and Harbors Committee Document Numbered 35, Seventy-third Congress . . . ." (50 Stat. 1028, 1038.) As such, the 1935 Act incorporates by reference, and expressly requires the implementation of, the recommendations of the Rivers and Harbors Committee Document Number 35. This document is a 1934 report from the Corps' Chief Engineer recommending to Congress that Kennett Dam (predecessor to Shasta Dam) "shall be operated so as to provide a minimum flow of 5,000 cubic feet per second between Chico Landing and Sacramento." (*See* Central Valley Project Documents, Part I, 544, 548 [Committee Doc. 35, 73rd Cong.].)

Congress re-authorized the CVP under the Rivers and Harbors Act of 1937 (the "1937 Act"). (50 Stat. 844, 850.)[1] This re-authorization mandated in relevant part that "the $12,000,000 recommended for expenditure for a part of the Central Valley project, California, in accordance with the plans set forth in Rivers and Harbors Committee Document Numbered 35, Seventy-third Congress, and adopted and authorized by the provisions of section 1 of the Act of August 30, 1935 (49 Stat. 1028, at 1038) . . . shall, when appropriated, be available for expenditure in accordance with the said plans of the Secretary of Interior instead of the Secretary of War."

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[1] *See also Stockton East Water District, et al. v. United States*, 583 F.3d 1344, 1349 (Fed. Cir. 2009) [citing to the 1935 and 1937 Acts as Congress' initial authorization and reauthorization of the CVP].

(50 Stat. 844, 850.) As such, the 1937 Act also incorporates by reference, and expressly requires the implementation of, the recommended minimum flow of 5,000 cfs between Chico Landing and Sacramento. There has been no subsequent action by Congress that has "discontinued" or otherwise changed this minimum navigation flow requirement.

The 1937 Act also mandates that CVP "dams and reservoirs *shall* be used, *first*, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power." (50 Stat. 844, 850, emphasis added; *see also United States v. SWRCB* (1986) 182 Cal.App.3d 82, 135.) In 1992, Congress explicitly amended this hierarchy of use by enacting sections 3406(a) and (b) of the Central Valley Project Improvement Act (Pub. L. No. 102-575 (1992)), which make protection of non-ESA listed fish and wildlife co-equal priorities with irrigation. Even with this amendment, however, Reclamation's first priority remains river regulation, navigation and flood control.

On the Sacramento River, all major diversions have positive barrier flat-plate fish screens installed that provide protection to listed fishery species. These screens have been designed with an approach velocity of 0.33 ft/s as required by NMFS and the Department of Fish and Game. During design, the screens, velocities, and diversion rates were based upon the Wilkins Slough Navigational Flow requirement of 5,000 cfs since this requirement under federal law was controlling.

The NMFS BiOp states that flows could be reduced to 3,250 cfs, which is lower than the Wilkins Slough flow requirement. If the Bureau of Reclamation reduced flows below the Wilkins Slough control point requirement and depending on the diversion rate, some screens may not meet the velocity criteria as designed. The agencies should coordinate with the Sacramento River diverters to develop contingency plans and wells as a coordinated operations plan that would benefit the Sacramento River system for fisheries and water users.

Sacramento River Tributaries

1. Antelope Creek

2014 Voluntary Agreement with Water Users, National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (CDFW)

Spring pulse flows: To meet the needs of out-migrating juvenile spring-run Chinook salmon and for the upstream migration of spring-run Chinook salmon for 2014, a pulse flow was conducted using water volunteered by Los Molinos Mutual Water Company and Mr. Jim Edwards, equal to full natural flow in Antelope Creek. The pulse flow was conducted on May 14-16, 2014 for a 48 hour period.

Fall base flows: Once there is a freshet that doubles the full natural flow (measured at a gage above Edward's Dam) after October 15, but prior to November 1, then a base flow of 35 cfs, or full natural flows (measured at Cone Grove Park), whichever is less, will be maintained through December 31, 2014. If there is not a freshet that doubles the full natural flow, then a base flow

of 35 cfs or the full natural flow, whichever is less, will be maintained from November 1 through December 31, 2014.

These were voluntary agreements covering substantially all of the water diverted on Antelope Creek, thus the State Water Resources Control Board emergency regulations did not go into effect.

2. Battle Creek

1998, 2003 and 2006 Agreements with PG&E and the Bureau of Reclamation

For winter-run and spring-run Chinook salmon, the instream flow objective for the North Fork of Battle Creek is 30 cubic feet per second (± 5 cfs). The South Fork of Battle Creek instream flow objective would vary from the Federal Energy Regulatory Commission license condition minimum flow of 5 cfs, to 30 cfs (± 5 cfs). All flows reaching Wildcat Diversion Dam will be released, and no diversion will occur at the main spring collectors at Eagle Canyon. PG&E will block the downstream entrances to fish ladders at the Eagle Canyon and Coleman Diversion Dams unless California Department of Fish and Game, NOAA Fisheries, and US Fish and Wildlife jointly provide PG&E 48 hours advance written notice to open either or both of such downstream entrances.

3. Butte Creek

M&T Ranch and Llano Seco Ranch

In 1997, M&T Ranch and Llano Seco Ranch agreed to dedicate approximately 40 cfs in instream flows from October through June in Butte Creek from Parrott-Phelan diversion to confluence with Sacramento River, for spring-run Chinook and steelhead migration and rearing.

Resource Renewal Institute Court Order

In 1998, the Butte County Superior Court issued an order to change the authorized place of use and point of diversion of 5 cfs of pre-1914 appropriative water rights the Resource Renewal Institute had acquired on Butte Creek, which included the following provisions:

a. The authorized purpose of use in these water rights is now protection of fish and wildlife dependent on instream flows in the portions of Butte Creek that is specified as the place of use;
b. The authorized place of use in these water rights now is Butte Creek between diversion number 54 and the confluence of Butte Creek and Butte Slough (Butte Slough outfall); and,
c. The present authorized point of diversion of these water rights has been eliminated.

4. Deer Creek

2014 Voluntary Agreement with Deer Creek Irrigation District, Grant Leininger, National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (CDFW)

For adult spring-run Chinook and juvenile spring-run chinook: From May 30 until June 14, 2014, 50 cubic feet per second (cfs), as measured at the Department of Water Resources (DWR) Gage below Stanford-Vina Ranch Irrigation Company (SVRIC) Diversion Dam, as long as 100 cfs is coming out of the canyon. There will be a proportional reduction in base flow obligation of 1 cfs for each 1 cfs reduction in natural flow below 100 cfs.

June 15 to June 30: 25 cfs, as measured at the DWR Gage below SVRIC Diversion Dam, with Deer Creek Irrigation District (DCID) providing 8.3 cfs during the 25 cfs period.

October 15 to December 31: 50 cfs, as measured at the DWR Gage below the SVIC Diversion Dam, is required for out-migrating yearling juvenile spring-run Chinook and coincidentally Central Valley juvenile and adult steelhead (*Oncorhynchus mykiss*), which are federally listed as Threatened. In the event of a rain freshet, base flows could start on October 1, 2014 if mutually agreed to by NMFS, CDFW and DCID.
Pulse Flows: A minimum of 50 cfs over base flow or full natural flows as recorded at the U.S. Geological Survey (USGS) Stream Gage at the mouth of the canyon above DCID Dam. The duration of the pulse flow in terms of time at which peak flow is maintained will be a minimum of 24 hours but not more than 72 hours. A pulse flow event occurred on May 18-20, 2014 and DCID shall create one more pulse flow event before June 15, 2014. Another pulse flow event may be necessary in June 2014 if monitoring detects fish holding below the SVRIC Diversion Dam.

5. Hat Creek

2002 Federal Energy Regulatory Commission License for the Hat Creek Project

On November 4, 2002, the Federal Energy Regulatory Commission (FERC) issued a new license for the Hat Creek Project. As stipulated in the new license, minimum instream flows in the Hat 1 Bypass Reach were increased from 2 cfs to 8 cfs. In addition, the flow release at the Baum Lake Dam (a minimum of 8 cfs) and accretion flow from the Hat 2 Springs must provide a minimum flow in the lower portion of the Hat 2 Bypass Reach of 43 cfs (measured at the Joerger Diversion Dam).

6. Mill Creek

2014 Voluntary Agreement with Water Users, National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (CDFW)

For adult spring-run Chinook and juvenile spring-run Chinook: 50 cubic feet per second (cfs) between April 1 and June 14, 2014, and 25 cfs between June 15 and 30, 2014 for fish passage

through the 2.8 miles of stream between the confluence with the Sacramento River and Ward Dam.

If monitoring and evaluations conducted by CDFW determine that fish are not present in lower Mill Creek or water temperatures are not conducive to fish survival during the period of June 15 to 30, 201, and it is mutually agreed to by CDFW and Los Molinos Mutual Water Company (LMMWC), base flows may be reduced below 25 cfs.

For juvenile spring-run Chinook: For the fall period, 50 cfs is required for out-migrating yearling juvenile spring-run Chinook and coincidentally Central Valley juvenile and adult steelhead (*Oncorhynchus mykiss*), which are federally listed as Threatened. In the event of a rain freshet, base flows could start on October 1, 2014 if mutually agreed to by NMFS, CDFW and LMMWC.

Pulse Flows: A minimum of 50 cfs over base flow or full natural flows as recorded at the U.S. Geological Survey (USGS) Stream Gage at the mouth of the canyon above Upper Dam. The duration of the pulse flow in terms of time at which peak flow is maintained will be a minimum of 24 hours but not more than 72 hours. The pulse flows will occur from April 1 through June 30 at a minimum of once every two weeks. If monitoring and evaluations conducted by CDFW determine that fish are not present in lower Mill Creek or water temperatures are not conducive to fish survival during June, and it is mutually agreed to by NMFS, CDFW and LMMWC, pulse flows may cease prior to June 30, 2014.

These were voluntary agreements covering substantially all of the water diverted on Mill Creek, thus the State Water Resources Control Board emergency regulations did not go into effect.

1990, 1996 and 2007 Flow Agreements with Water Users, Department of Water Resources and Department of Fish and Game

The 1990 Agreement: The Department of Water Resources and Fish and Game paid for the construction, operation and maintenance of wells with a capacity of 25 cubic feet per second (the actual well capacity is closer to 10 cfs) for the purpose of increasing flows in Mill Creek for fisheries transportation in the late spring of some years, during the upstream migration of adult spring-run salmon and downstream migration of juvenile salmon and steelhead.

The 1996 Agreement: Los Molinos Mutual Water Company shall provide a minimum of 10 cubic feet per second in addition to the state's instantaneous capacity (of 10 cfs) for fall-run Chinook immigration and spawning and spring-run Chinook juvenile migration. Los Molinos Mutual Water Company shall release such water upon Fish and Game's request on or after October 15 and allow such water to continue to flow uninterrupted for the remainder of the calendar year.

The 2007 Agreement: Reaffirms and expands and refines the intent of the earlier agreements to provide spring flows (May 1 through June 15) and fall flows (October 15 through November 30) for spring and fall run Chinook salmon.

Lower American River

The American River provides important fish and wildlife habitat, a high-quality water source, a critical floodway, and a spectacular regional recreational parkway. The Bureau of Reclamation (Reclamation) operates Folsom and Nimbus Dams to provide flood control and water for irrigation, municipal and industrial uses, hydroelectric power, recreation, water quality, and the protection of aquatic resources.

In April of 2000, a diverse group of over 40 local business and agricultural leaders, citizen groups, environmentalists, water managers and local governments ended decades of conflict concerning the American River by signing the Water Forum Agreement (WFA). The foundational elements of the WFA are two coequal objectives: to provide a reliable safe water supply for the region and to preserve fishery, wildlife, recreational, and aesthetic values of the lower American River.

Working in cooperation with Reclamation, California Department of Fish and Game, National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the Water Forum developed the Flow Management Standard (FMS) as an alternative to the standards set by the State Water Resources Control Board in 1958's Decision 893 (the current instream flow requirements on the lower American River). The FMS is intended to improve the condition of aquatic resources in the lower American River, particularly fall-run Chinook salmon and steelhead by improving flow-related habitat and water temperature. In addition, the FMS benefits other fish species, the aquatic environment and the riparian ecosystem of the lower American River Corridor. Designed to achieve these benefits over a wide range of hydrologic conditions, the FMS provides a forum through which biologic and ecologic factors are considered in the river management process, and provides for the analysis of hydrologic and biologic information collected though the monitoring and evaluation component.

The lower American River FMS is designed to allocate flow releases from Folsom and Nimbus Dams in consideration of variable hydrology and cold water pool availability in Folsom Reservoir. The FMS includes: (1) minimum flow requirements; (2) water temperature objectives; (3) implementation criteria; (4) an agency group to address river management and operational actions (the American River Group); and (5) a monitoring and evaluation component.

1. Minimum Flow Requirements

The minimum flow requirements prescribe the flows in the lower American River water to meet fishery needs throughout the entire water year. These minimum flow requirements include minimum release requirements (MRR) measured downstream of Nimbus Dam, and downstream flow requirements (250 cfs from January through mid-September and 500 cfs from mid-September through December) between Nimbus Dam and the mouth of the lower American River. The prescribed flows are minimums only and do not preclude Reclamation from making higher releases.

The MRR varies from 800 to 2,000 cfs throughout the year in response to the hydrology of the Sacramento and American River basins and a set of prescriptive and discretionary adjustments. As such, the specified MRR is higher in wet years and lower in dry years. These adjustments are made in response to specific conditions related to the need for spawning flow progressions, fish protection, and reservoir water conservation. The resultant MRR varies throughout the season as shown in Table 1.

Table 1. Seasonal Variation in the Minimum Release Requirement

Time Period	MRR Range (cfs)	Index	Relevance of Index
October	800 to 1,500	Four Reservoir Index (FRI)	Indicates the amount of upstream storage available during the fall and winter months
November and December	800 to 2,000	FRI	
January and February	800 to 1,750	Sacramento River Index (SRI)	Indicates current multi-basin water availability
March through Labor Day	800 to 1,750	Folsom Inflow Index (IFII)	Forecasts water availability for the American River Basin for the remainder of the current water year
Post-Labor Day through September	800 to 1,500	IFII	

The FMS also includes exceptions to the MRR during extreme dry conditions, including:

- **Conference Years:** Occur when the projected March through November unimpaired inflow to Folsom Reservoir is less than 400,000 AF. A minimum flow of 190 cfs is required downstream of the H Street Bridge.
- **Off-ramp Criteria:** Triggered if Folsom Reservoir storage is forecasted to fall below 200,000 AF in the succeeding 12 months. In this case, downstream flow requirements rather than MRR become the minimum flow requirement throughout the lower American River.

2. Water Temperature Objectives

The water temperature objectives of the FMS have been developed to allocate the available lower American River cold water resources for juvenile steelhead rearing in summer, and fall-run Chinook salmon spawning in fall. These objectives are met through use of an Annual Operations Forecast (Operations Forecast) and Annual Water Temperature Management Plan (Temperature Plan).

The Operations Forecast will be prepared by May 1 of each year to describe forecasted American River operations, including flows and water temperatures for the next 12 months, with implementation of the Minimum Flow Requirements and Water Temperature Objectives.

The Temperature Plan will be developed by May 1 of each year to describe how Reclamation will meet the following water temperature objectives for the lower American River:

- 65ºF or less from May 15 through October at Watt Avenue for steelhead juvenile rearing. This objective may be relaxed to 68ºF if Temperature Plan analysis indicates that lower temperature targets will prematurely exhaust the available cold water.
- 60ºF or less as early in October as possible at Hazel Avenue for Chinook salmon spawning and egg incubation.

3. Implementation Criteria

Implementation criteria serve as a tool to determine the conditions by which the FMS Minimum Flow Requirements may be implemented, and to define the method of measuring compliance with the FMS Minimum Flow Requirements. The implementation criteria that are applied for decision-making purposes regarding operational adjustments affecting lower American River flows and water temperatures address the following: (1) end-of-month Folsom Reservoir storage, particularly during May and September; (2) Nimbus Dam releases and flows at the mouth of the lower American River measured over a 5-day averaging period; (3) water conservation adjustments; (4) fish protection adjustments; and (5) other considerations.

4. Lower American River Group

The Lower American River Group (ARG) is an advisory group consisting of agency representatives convened regularly by Reclamation. Through the regularly scheduled ARG meetings, which are open to the public, the ARG provides information to the public and formulates CVP operational recommendations for the protection of fisheries and other in-stream resources consistent with the FMS.

5. Monitoring and Evaluation

Monitoring and evaluation of physical and biological factors are included in the FMS to provide information to support operational decisions and to evaluate operational effects on the aquatic resources of the lower American River including river hydrology, water temperature, salmonid population and downstream movement.

6. Current Status

Sacramento County recently adopted a revised American River Parkway Plan which includes specific policies related to implementing water flows protective of the lower American River ecosystem. The Parkway Plan serves as a guide for other local, state and federal agencies with authority within the American River Parkway under the Wild and Scenic Rivers Act and the Urban American River Parkway Preservation Act. Sacramento County, through the Water Forum, is in the process of preparing a draft environmental impact report to institute the FMS consistent with the American River Parkway Plan and the coequal goals of the Water Forum Agreement by entering into an operations agreement with Reclamation or by seeking to modify Reclamation's Folsom Dam water right permits or other measures.

Reclamation has been operating the Folsom and Nimbus Dams in accordance with the minimum release requirements of the FMS since 2006. In 2009, the National Marine Fisheries Service

(NMFS) included the FMS flow, operational criteria, American River Group, and monitoring requirements in the Reasonable and Prudent Alternatives of the Biological Opinion (BO) for operating the CVP. The NMFS BO also called for an iterative temperature management planning process that is consistent with the water temperature objectives of the FMS.

The Water Forum is currently investigating the potential for an improved Flow Standard for the lower American River that would provide increased protection of salmonid species and improved water supply reliability.

Yuba River

In 2008, the State Water Resources Control Board (the SWRCB) adopted minimum streamflow requirements and related measures proposed by Yuba County Water Agency (YCWA) that implemented the Yuba River Accord Fisheries Agreement, which YCWA developed with the Department of Fish and Game (DFG), the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS) and several conservation groups. The Accord and the SWRCB's related order – Corrected Order WR 2008-14 – resolved 20 years of disputes concerning the Yuba River's minimum streamflows. The Accord streamflow requirements, as implemented by the SWRCB, are depicted in Exhibit A. The SWRCB adopted Corrected Order WR 2008-14, after considering a $6 million environmental impact report that YCWA certified and that was not challenged in court. The Yuba River Accord is summarized below and additional information is available on YCWA's website at http://www.ycwa.com/projects/detail/8.

Disputes concerning the Yuba River's streamflows began in 1988 and continued through a 14-day SWRCB hearing in 1992, a 13-day SWRCB hearing in 2000 and a three-day SWRCB hearing in 2003. In 2003, the SWRCB adopted Revised Water Right Decision 1644 (RD-1644). Many lawsuits, including one by YCWA, were filed to challenge RD-1644.

As an alternative to litigating these disputes to a conclusion, YCWA, DFG, NMFS, USFWS and environmental groups engaged in a collaborative, science-based process to identify and prioritize the key stressors on salmon and steelhead in the lower Yuba River and then to develop streamflow requirements that would address these stressors. The resulting Yuba Accord Fisheries Agreement sets new, substantially-higher streamflow requirements that allocate more water to fishery benefits than RD-1644 would have required. Specifically, the Fisheries Agreement's streamflow schedules include up to more than 174,000 acre-feet of water annually, and more than 100,000 acre-feet in the springtime of about 60% of all years, to fishery benefits than RD-1644 would have required. The Fisheries Agreement allocates these fishery streamflows in a manner that enables YCWA to deliver approximately 350,000 acre-feet of water per year for consumptive use in Yuba County and to transfer water to downstream water users, including Delta-export agencies, for irrigation, municipal and environmental uses.

The Fisheries Agreement is one of four agreements that make up the Yuba River Accord. The other agreements are: (1) Conjunctive Use Agreements with local Yuba County water suppliers; (2) a Water Transfer Agreement with the state Department of Water Resources (DWR); and (3) an agreement with PG&E to allow modified operations at YCWA's New Bullards Bar Reservoir.

Under the Conjunctive Use Agreements, Yuba County water suppliers agreed to pump up to 30,000 acre-feet of groundwater to substitute for surface water deliveries in certain dry years to provide water allocated by the Fisheries Agreement for fishery benefits. Also under the Conjunctive Use Agreements, YCWA agreed to provide funding from its Accord transfer proceeds to assist water suppliers in pumping the necessary groundwater and to monitor local groundwater conditions to ensure that pumping under the Accord does not cause overdrafts. Under the Water Transfer Agreement, YCWA agreed to transfer at least 60,000 acre-feet per year of water to the Environmental Water Account (and successor programs) and potentially 140,000 acre-feet of water in drier years to DWR. In addition to assisting local Yuba County water suppliers in implementing conjunctive use, YCWA has used Accord transfer proceeds to contribute to the funding of setback-levee projects and other flood risk management projects.

The Accord Fisheries Agreement contains several unique elements besides the new streamflow requirements depicted in Exhibit A. The Agreement establishes a River Management Team (RMT), which includes representatives of YCWA, DFG, NMFS, USFWS, PG&E and conservation groups. The RMT may modify flows at certain times for fishery benefits (subject to SWRCB approval). The RMT also is responsible for allocating 50% of the volume of any supplemental surface water transfer by YCWA and up to 20% of the streamflows enabled by implementation of the Accord Conjunctive Use Agreements. The RMT oversees a monitoring and evaluation program that has the goal of determining the efficacy of the Fisheries Agreement's streamflows. That Agreement also establishes a cap on irrigation diversions in extremely dry (1-in-100) "conference years" at about 70% of annual irrigation demands.

Consistent with the Accord agreements, the SWRCB's Corrected Order WR 2008-14 approved water-right permit terms under which, in conference years, YCWA will operate its project to maintain the minimum streamflows required by a 1965 streamflow agreement between YCWA and DFG, but without certain reductions authorized by that agreement and subject to supplemental flow release requirements developed by the RMT's Planning Group under the Fisheries Agreement and approved by the SWRCB's Deputy Director for Water Rights. Under Corrected Order WR 2008-14, if the Planning Group does not make any streamflow recommendations in a conference year by April 1 or if no streamflow requirements are in place by April 11 of such a year, then YCWA must comply with streamflow requirements ordered by the SWRCB after a hearing.

When YCWA operates its facilities, it must comply with the requirements of its existing license for Project No. 2246, which was issued by the Federal Energy Regulatory Commission (FERC). Those FERC license requirements, however, typically are satisfied through implementation of the Accord Fisheries Agreement's streamflow requirements.

The Yuba River Accord has been recognized as a landmark achievement in collaborative water management to achieve water supply reliability and habitat protection. For example, the Accord received the 2008 ACWA Theodore Roosevelt Environmental Award for Excellence in Conservation and Natural Resources Management, the 2009 National Hydropower Association Award for Outstanding Stewards of America's Waters and the 2009 Governor's Environmental and Economic Leadership Award.

EXHIBIT A
Yuba Accord Streamflows, Approved by SWRCB in Corrected Order WR 2008-14

MARYSVILLE GAGE (CFS)																	
Schedule	OCT		NOV	DEC	JAN	FEB	MAR	APR		MAY		JUN		JUL	AUG	SEP	Total Annual
	1-15	16-31	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	Volume (AF)
1	500	500	500	500	500	500	700	1000	1000	2000	2000	1500	1500	700	600	500	574,200
2	500	500	500	500	500	500	700	700	800	1000	1000	800	500	500	500	500	429,066
3	500	500	500	500	500	500	500	700	700	900	900	500	500	500	500	500	398,722
4	400	400	500	500	500	500	500	600	900	900	600	400	400	400	400	400	361,944
5	400	400	500	500	500	500	500	500	600	600	400	400	400	400	400	400	334,818
6	350	350	350	350	350	350	350	350	500	500	400	300	150	150	150	350	232,155

* Indicated flows represent average volumes for the specified time period. Actual flows may vary from the indicated flows according to established criteria.
* Indicated Schedule 6 flows do not include an additional 30 TAF available from groundwater substitution to be allocated according to established criteria

SMARTVILLE GAGE (CFS)																	
Schedule	OCT		NOV	DEC	JAN	FEB	MAR	APR		MAY		JUN		JUL	AUG	SEP	Total Annual
	1-15	16-31	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	Volume (AF)
A	700	700	700	700	700	700	700	700	-	-	-	-	-	-	-	700	-
B	600	600	600	550	550	550	550	600	-	-	-	-	-	-	-	500	-

* Schedule A used with Schedules 1, 2, 3 and 4 at Marysville.
* Schedule B used with Schedules 5 and 6 at Marysville.

Feather River

On December 15, 2010, the SWRCB adopted, as Order WQ 2010-0016, a water quality certification for the Oroville Facilities, FERC # 2100, for the relicensing of the Oroville project by DWR. The water quality certification contains instream-flow and temperature-control requirements for the Feather River's reaches downstream of DWR's Oroville Dam.

In general, the streamflow requirements adopted by the SWRCB in the certification are as follows.

For the Low Flow Channel – which is the reach between DWR's Fish Barrier Dam and the outlet of the Thermalito Afterbay – the certification requires that DWR release into that Channel 800 cfs from September 9 to March 31 of each water year to accommodate spawning anadromous fish and 700 cfs the remainder of the time, with both standards subject to possible revision as recommended by resource agencies under a settlement agreement signed by parties to DWR's relicensing proceeding. The SWRCB's Deputy Director for Water Rights would have to approve changes from the indicated streamflows for the Low Flow Channel.

For the High Flow Channel – which is the reach between the Thermalito Afterbay's outlet and the Feather River's confluence with the Sacramento River – the certification applies the following instream-flow requirements, provided that they, along with project operations, are not projected to cause Oroville

Reservoir to be drawn below elevation 733 feet (approximately 1,500,000 acre-feet of storage):

Preceding April through July unimpaired runoff	Minimum Flow in HFC October-February	Minimum Flow in HFC March	Minimum Flow in HFC April-September
Percent of Normal			
55% or greater	1,700 cfs	1,700 cfs	1,000 cfs
Less than 55%	1,200 cfs	1,000 cfs	1,000 cfs

Under the certification, if applying these requirements would be projected to cause Oroville Reservoir to be drawn below elevation 733 feet, then the minimum streamflows in the High Flow Channel could be reduced by the same percentage as State Water Project deliveries for agricultural use, provided that streamflows would not ever be reduced more than 25 percent below the requirements. In addition, if the highest one-hour streamflow between October 15 and November 30 were to exceed 2,500 cfs because of project operations and not a flood flow, then DWR is required to maintain a minimum flow within 500 cfs of the peak flow.

The certification also contains complex terms that require DWR to operate the Oroville project to meet temperature standards in the Low Flow Channel and the High Flow Channel.

For the Low Flow Channel at the Robinson Riffle, the certification sets the following temperature standards: (1) October 1-April 30, 56 degrees F; (2) May 1-15, 56-63 degrees F (as a transition); (3) May 16-August 31, 63 degrees F; (4) September 1-8, 63-58 degrees F (as a transition); and (5) September 9-30, 58 degrees F. If DWR were to demonstrate that it cannot meet these requirements with its current facilities, then the certification would require DWR to submit an interim operations plan to the SWRCB and, within three years of the renewed FERC license's issuance, submit a long-term facility-modification and operations plan to the SWRCB. If after implementing the facility modifications, DWR were to demonstrate that it still cannot meet the above temperature standards, then DWR would be required to propose alternate temperature standards that would provide "reasonable protection of the COLD beneficial use." Upon the approval of the SWRCB's Deputy Director for Water Rights, DWR would be required to operate to the alternate standards.

For the High Flow Channel, DWR is required to operate the project "to protect the COLD beneficial use in [that Channel], as measured in the Feather River at the downstream Project Boundary, to the extent reasonably achievable." Within one year of the renewed FERC license's issuance, DWR would be required to submit an operations plan for the period before facility modifications, which plan would be required to include proposed interim temperature standards and interim measures to reduce temperatures. Within three years of the renewed FERC license's issuance, DWR would be required to submit a long-term facility modification and operations plan, which plan would have to include proposed temperature standards to take effect within 10 years of the renewed license's issuance.

Bay-Delta Standards

The following map shows the existing Bay-Delta standards in SWRCB Decision 1641. Water supplies in the Sacramento Valley are operated to meet these standards.

D-1641 Bay-Delta Standards Stations