

Summary of The LOWER AMERICAN RIVER FLOW MANAGEMENT STANDARD

January 2007

Introduction

The American River is the second largest tributary to the Sacramento River, a critical component of the San Francisco Bay/Sacramento-San Joaquin Delta system that provides drinking water to two thirds of the state and irrigation water to half of California's agriculture industry. The lower American River is a particularly valuable asset within the Sacramento region, providing important fish and wildlife habitat, a high-quality water source, a critical floodway, and a spectacular regional recreational parkway. In recognition of its attributes, the lower American River has been federally and state designated as a "Wild and Scenic River."

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. Folsom Reservoir has a capacity of 977,000 acre-feet (AF). Average annual inflow into Folsom Reservoir is about 2.7 million AF.

The aquatic resources protection requirements for the lower American River were adopted in 1958 as part of State Water Resources Control Board (SWRCB) Decision 893 (D-893). This decision established minimum flows in the lower American River at its confluence with the Sacramento River of 250 cubic feet per second (cfs) from January through mid-September, and 500 cfs for the remainder of the year under all hydrologic conditions. The SWRCB, Reclamation, Water Forum and other stakeholders agree that D-893 does not sufficiently protect the aquatic resources of the lower American River.

The SWRCB has acknowledged the need for enhanced instream flows to protect public trust resources in the lower American River in its 1990 "Report of Referee" in the *Environmental Defense Fund et al. v. East Bay Municipal Utility District* case. During recent years, Reclamation has operated Folsom and Nimbus dams to provide flows in the lower American River typically well in excess of those required by D-893.

Since 1994, environmental, agency, business and water purveyor stakeholders in the Sacramento region (the Water Forum) have advocated an enhanced Lower American River flow regime. This effort is reflected in the Water Forum Agreement adopted in 2000, and in the Water Forum EIR certified by the City and County of Sacramento in 1999.

To increase the protection afforded by D-893, the Water Forum joined with Reclamation, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the California Department of Fish and Game (CDFG) to work

Water Forum's Objectives- An improved flow standard is one of the seven key elements of the historic Water Forum Agreement, a complex pact among stakeholders in the Sacramento region that will provide a reliable water supply to the year 2030 while protecting the resources of the lower American River. Additional information is available at www.waterforum.org



on a proposal to improve the flow standard for the lower American River. As a result of this collaborative approach, the Flow Management Standard (FMS) has been developed. The FMS consists of: new recommended Minimum Flow Requirements and Water Temperature Objectives; the lower American River Group (ARG) to play a consultative role in operational decisions; and Monitoring and Evaluation to ascertain the biological and ecological status of the river, and to provide input into the river management process.

Purpose of the Flow Management Standard

The FMS is intended to improve the condition of aquatic resources in the lower American River, particularly fall-run Chinook salmon and steelhead. 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 benefit 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.

Framework of the Flow Management Standard

The FMS provides flexibility in the prescriptive Minimum Flow Requirements in consideration of hydrologic variability. FMS water availability indices and resultant Minimum Flow Requirements apply to the vast majority of water availability (water year type) conditions, and are routinely put into operation. Exceptions to the Minimum Flow Requirements are provided for extreme dry year conditions.

Routine Operations

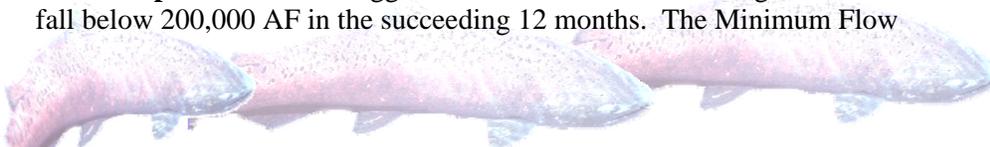
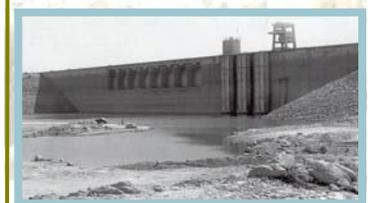
- ❖ **“Routine Operations”**- occur when the projected March through November unimpaired inflow to Folsom Reservoir equals or exceeds 400,000 AF. Based on the FMS indices of water availability, Minimum Flow Requirements can range from 800-2,000 cfs, depending on the time of year. Descriptions of the FMS water availability indices and Minimum Flow Requirements pertinent to routine operations are provided in subsequent sections of this report. FMS indices and Minimum Flow Requirements do not apply to extreme dry years.

Extreme Dry Year Exceptions

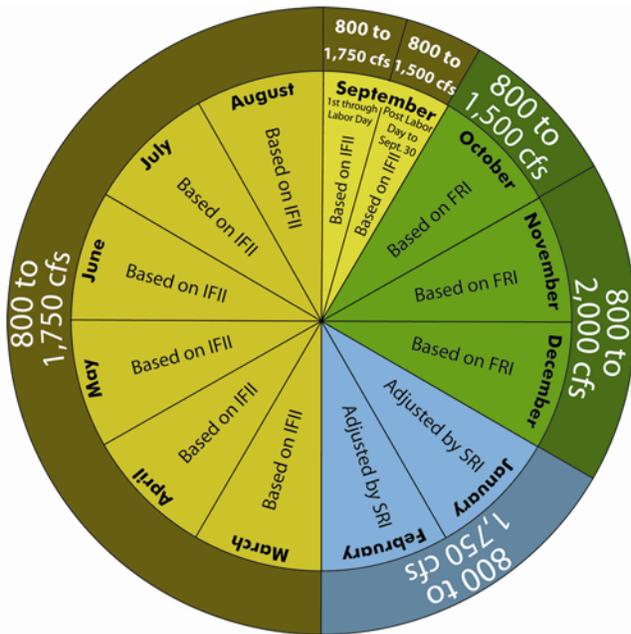
- ❖ **“Conference years”**- occur when the projected March through November unimpaired inflow to Folsom Reservoir is less than 400,000 AF. During conference years, a Minimum Flow Requirement of 190 cfs (the extreme critical year flow requirement in D-893) will apply downstream of the H Street Bridge. All stakeholders will meet during conference years to discuss how the available water supply should be managed to achieve, to the extent possible: (1) a safe and reliable water supply; and (2) preservation of the fishery, wildlife, recreational, and aesthetic values of the lower American River. As stated in the Water Forum Agreement, *“the guiding principle will be to share the pain so that both instream and consumptive uses bear an equitable burden.”*
- ❖ **“Off-ramp criteria”**- are triggered if Folsom Reservoir storage is forecasted to fall below 200,000 AF in the succeeding 12 months. The Minimum Flow

The Three Elements of the FMS

- Minimum Flow Requirements and Water Temperature Objectives
- American River Group
- Monitoring and Evaluation



Requirements will be reduced to 250 cfs from January 1 through September 15, and 500 cfs from September 16 through December 31.



Minimum Flow Requirements

The Minimum Flow Requirements are the cornerstone of the FMS. While the Minimum Flow Requirements prescribe the required flows below Nimbus Dam, they do not preclude Reclamation from making higher releases. The Minimum Flow Requirements vary throughout the year in response to the hydrology of the Sacramento and American river basins. Three indices are used at different times of the year as

the basis for the Minimum Flow Requirements, thereby adapting to available hydrological information and changing operational considerations.

In October, with nearly the entire precipitation season still to come, little or no data are available to support runoff forecasts. Consequently, the only measure of water availability is one that considers water already contained in the American River Basin reservoirs. For this reason, during the months of October through December, Minimum Flow Requirements are based on the Four Reservoir Index (FRI) - an index of the end-of-September combined carryover storage in Folsom, French Meadows, Hell Hole, and Union Valley reservoirs.

On January 1, the December Minimum Flow Requirement is adjusted upward, downward, or held constant based on an index of forecasted water year runoff for the entire Sacramento River Basin (i.e., Sacramento River Index (SRI)). At this time of the year, long-term runoff forecasts for individual basins can still be quite variable, and reservoir storage is not a good indication of current water availability. For example, reservoir storage may be influenced by previous dry hydrologic conditions, or by flood control operational constraints, and does not take into account current basin-wide conditions affecting near-term water availability. By contrast, the SRI provides an updated measure of water availability upon which to base current integrated Central Valley Project/State Water Project actions.

March through September Minimum Flow Requirements are based on the forecasted Impaired Folsom Inflow Index (IFII) - an index of the volume of flow into Folsom Reservoir after all legal diversions take place in the upstream watershed. By March, water supply availability is reasonably certain for the remainder of the water year, and can be used to make informed flow management decisions.



In order to secure a flow regime that is reliable and feasible, ranges have been established for the Minimum Flow Requirements. For instance, during wetter years, Minimum Flow Requirements are generally higher, but not so high as to substantially reduce the coldwater pool volume in Folsom Reservoir by the end of summer. During drier years, Minimum Flow Requirements are reduced to most effectively utilize the limited volume of Folsom Reservoir storage and the coldwater pool.

As a general rule, the Minimum Flow Requirements equal or exceed 800 cfs year round. There are exceptions to this rule, aimed at avoiding depletion of water storage in Folsom Reservoir when dry or critical hydrologic conditions are forecasted to occur. If water storage in Folsom Reservoir is not protected during these conditions, subsequent water supplies necessary for maintaining appropriate instream flows and water temperatures could be reduced, thereby threatening adequate fish protection.

Based on particular indices, Minimum Flow Requirements are designed to address conditions at specific times of the year for the identified target species, particularly steelhead and fall-run Chinook salmon. Minimum Flow Requirements during October, November, and December are primarily designed to address fall-run Chinook salmon spawning. Minimum Flow Requirements during January and February are formulated for fall-run Chinook salmon egg incubation and steelhead spawning. Minimum Flow Requirements for March through May are primarily designed to address steelhead spawning and egg incubation, as well as fall-run Chinook salmon and steelhead juvenile rearing and downstream movement. Finally, Minimum Flow Requirements during June through September are designed to address steelhead juvenile over-summer rearing, although this period partially overlaps with adult fall-run Chinook salmon immigration.

October through December Minimum Flow Requirements

During October through December, the Minimum Flow Requirements range from 800 to 2,000 cfs. Flow requirements within that range are based on the FRI -- the combined end-of-September storage in Folsom, French Meadows, Hell Hole and Union Valley reservoirs. These reservoirs encompass over 85 percent of the total reservoir storage capacity in the American River Basin.

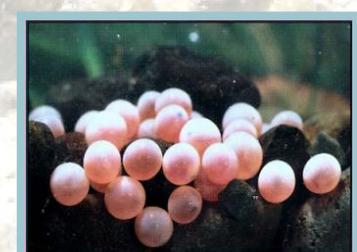
During this time of the year, Minimum Flow Requirements are designed to provide the maximum possible amount of spawning habitat for fall-run Chinook salmon, within the constraints of water availability. A flow progression has been developed for efficient use of the water supply, which provides higher flows as more fish are expected to be spawning and water temperatures become suitable. The flow progression makes additional spawning habitat available as the spawning season progresses, thereby reducing the potential for fish spawning on top of existing redds (nests) by gradually stepping up the flows to the prescribed Minimum Flow Requirement.

January and February Minimum Flow Requirements

During January and February, the Minimum Flow Requirements range from 800 to 1,750 cfs. The Minimum Flow Requirements for this period are based on the preceding month's Minimum Flow Requirement, adjusted by the SRI. As previously discussed, the SRI is an index of water year runoff for the entire Sacramento River Basin. If the SRI is predicting low basin-wide runoff, then the Minimum Flow

Minimum Flow Requirements

- Range from 800 to 2,000 cfs
- Based on indices of water availability
- Target fish species and life stages throughout the year



Requirements may be reduced to as low as 800 cfs; if the SRI is predicting high basin wide runoff, the Minimum Flow Requirements may be as high as 1,750 cfs.

The Minimum Flow Requirements also may be adjusted based on the previous end of month Folsom Reservoir storage. If storage is below 300,000 acre-feet at the end of December or 350,000 acre-feet at the end of January, then the Minimum Flow Requirements are established at 85 percent of the previous month's Minimum Flow Requirement, or at 800 cfs, whichever is greater.

Minimum Flow Requirements during January and February are designed to: (1) maximize the frequency, over a range of water availabilities, of suitable spawning habitat availability for steelhead; and (2) limit month-to-month flow reductions, thereby minimizing steelhead and Chinook salmon redd dewatering.

Flow Exception

If the SRI predicts a critically dry year and the Previous Month Minimum Flow Requirement is less than 800 cfs, then an "off-ramp condition" (described below) applies, wherein the January and/or February Minimum Flow Requirements are reduced to 250 cfs.

March through May Minimum Flow Requirements

The March through May Minimum Flow Requirements range from 800 to 1,750 cfs, based on the IFII -- the forecasted May through September impaired Folsom Reservoir inflow. However, if the forecasted end-of-May Folsom Reservoir storage is less than 700,000 AF, then the Minimum Flow Requirements for March through May are based on either the IFII, or the Minimum Flow Requirement for February, whichever is less.

March through May Minimum Flow Requirements are designed to stabilize flows during the steelhead egg incubation period and minimize redd dewatering, and to minimize juvenile salmonid stranding and isolation. In addition, the Minimum Flow Requirements during this time of year facilitate managing flow releases and reservoir storage to effectively utilize the available coldwater pool.

June through September Minimum Flow Requirements

The IFII is used to establish June through September Minimum Flow Requirements ranging from 800 to 1,750 cfs. After Labor Day through September 30, the Minimum Flow Requirement ranges from 800 to 1,500 cfs.

For the June through September steelhead juvenile over-summer rearing period, Minimum Flow Requirements are intended to provide habitat conditions that minimize fish crowding and disease transmission, supports macroinvertebrate food production, and provides shaded riverine aquatic habitat and riparian vegetation. The Minimum Flow Requirements during this time of year also are intended to provide flows and water temperatures for fall-run Chinook salmon immigration.

Flow Exception

Forecasted end-of-September storage is examined in late May to determine if the IFII-based Minimum Flow Requirements could cause end-of-September Folsom Reservoir storage to fall below 300,000 AF. If storage is forecasted to be less than 300,000 AF due to the Minimum Flow Requirements, then the requirements are reduced to the



release necessary to achieve 300,000 AF of storage by the end of September. Resulting flows from this reduction shall not be less than 250 cfs.

Water Conservation and Fish Protection Adjustments to Minimum Flow Requirements

For the period of August 15 through Labor Day, the Minimum Flow Requirements may be adjusted downward as much as 250 cfs, as long as resultant flows are not lower than 1,500 cfs based on either water conservation or fish protection.

- ❖ Water conservation adjustments only will be made in consultation with the ARG, and if they do not cause or exacerbate harmful conditions to fish habitat.
- ❖ Fish protection adjustments will only occur with prior ARG concurrence. Concurrence shall be based on protection of the lower American River fisheries (including conservation of remaining cold water reserves), taking into account effects of the fish protection adjustment on in-river water temperature and habitat.

For the period after Labor Day through October 31, the Minimum Flow Requirements are subject to a fish protection adjustment of as much as 250 cfs, as long as resultant flows are not lower than 1,250 cfs, and concurrence from the ARG is obtained.

Annual Operations Forecast

The Annual Operations Forecast (Operations Forecast) will be prepared by May 1 of each year and will 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. Neither water conservation nor fish protection adjustments to the Minimum Flow Requirements will be relied on or incorporated into the Operations Forecast. The Operations Forecast will be updated periodically as needed.

Water Temperature Objectives

An Annual Water Temperature Management Plan (Temperature Plan) will be developed by May 1 of each year consistent with the FMS Water Temperature Objectives. The FMS Water Temperature Objectives, described below, are designed to allow the budgeting of available cold water resources for juvenile steelhead rearing in the summer, and fall-run Chinook salmon spawning in the fall.

- ❖ 65°F or less from May 15 through October 31 at the Watt Avenue Bridge for steelhead juvenile rearing
- ❖ If analysis during the formulation of the Temperature Plan indicates that meeting a 65°F water temperature target will prematurely exhaust the available cold water in Folsom Reservoir, the target water temperature in the summer may be increased by 1°F increments up to 68°F
- ❖ 60°F or less as early in October as possible at Hazel Avenue for Chinook salmon spawning and egg incubation



Lower American River Group

The ARG will conduct open discussions regarding the biological and operational status of the lower American River, and will provide information and formulate recommendations for the protection of fisheries and other instream resources consistent with the FMS. Also, the ARG will provide input regarding operation of Folsom and Nimbus dams as a unit of the overall Central Valley Project.

Objectives

The objectives of the ARG are to:

- ❖ Provide information and recommendations to Reclamation for the development and implementation of management strategies and actions beneficial to aquatic resources of the lower American River, including the Temperature Plan and the Operations Forecast
- ❖ Review the physical, biological, and ecological status of the lower American River aquatic resources
- ❖ Share information to help create a common understanding of operational constraints and biological responses
- ❖ Provide outreach and opportunity for discussion in a public forum
- ❖ Report on specific actions taken

Sponsor and Cooperating Agencies

Reclamation will serve as the ARG sponsor, facilitating meetings and maintaining the meeting record. Reclamation also will maintain and disseminate operational data (flow and water temperature) and operation forecasts. Reclamation will prepare a Temperature Plan for submission to NMFS by May 1 of each year, and an Operations Forecast covering the 12-month period beginning on May 1 of each year. The Operations Forecast will be in support of the Temperature Plan and will be consistent with the Minimum Flow Requirements and Water Temperature Objectives.

USFWS, NMFS, and CDFG will be the Cooperating Agencies. Among other activities, the ARG will review and comment on the Temperature Plan and Operations Forecast, assess the biological effects of past and proposed changes, processes, or procedures, and discuss and interpret data from monitoring efforts in the lower American River.

Regularly Scheduled and Other Meetings

The ARG will hold regularly scheduled meetings that will be convened no less often than every six weeks. Regularly scheduled meetings will be open to the public and will include, but not be limited to, reviews of the current biologic and hydrologic conditions, forecasted operations, and other special studies or events, followed by discussion to identify biological issues or concerns. As a result of these discussions, operational and specific-action recommendations will be formulated. Reclamation will take the lead in the preparation of an annual report distributed during February of each year that includes the notes from ARG meetings, description and evaluation of lower American River actions taken and effects, and lessons learned during the previous calendar year.

ARG Membership

The ARG will consist of representatives from Reclamation, USFWS, NMFS and CDFG.



Public Input

Members of the public and other agencies will be encouraged to attend ARG meetings and comment on matters under consideration by the ARG, and the ARG will consider these comments when developing recommendations to Reclamation and/or the Cooperating Agencies.

Monitoring and Evaluation

Introduction

Monitoring and evaluation of physical and biological factors is needed to provide information to support real-time operational decision making, and to evaluate operational effects on the aquatic resources of the lower American River. Monitoring and evaluation also will assist the ARG in developing and evaluating relationships between various riverine ecosystem influences, learn from previous actions, build on successes, and provide input to Reclamation regarding operational adjustments associated with fisheries and habitat changes.

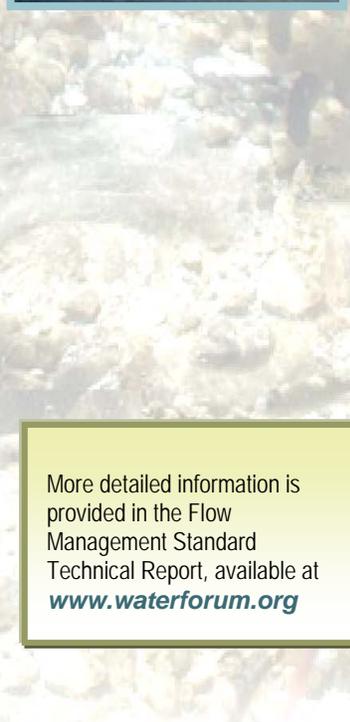
A number of monitoring activities are needed for the evaluation of operational effects, and compliance with Minimum Flow Requirements and Water Temperature Objectives. Over time, monitoring objectives are expected to change as scientific uncertainty is resolved, new questions are revealed, or changes in the regulatory environment require different information. Information needs will be updated periodically by the ARG to clarify the type and extent of monitoring. This flexibility will support an adaptive management approach to monitoring as a living process that will retain its utility as a management tool over many years. Monitoring includes both physical and biological factors. The basic monitoring components include:

- ❖ River Hydrology
- ❖ Water Temperature
- ❖ Adult Chinook Salmon Population
- ❖ Chinook Salmon Spawning
- ❖ Steelhead Spawning
- ❖ Steelhead Rearing
- ❖ Chinook Salmon Downstream Movement

Next Steps

Development of the FMS has been a significant effort that has involved intense collaboration among Reclamation, USFWS, NMFS, CDFG, the Water Forum and other interested stakeholders. Although development of the FMS is a major accomplishment, the process ahead is equally important. Next steps associated with the FMS include:

- ❖ Outreach sessions for federal, state and local agencies, interested stakeholders and the public.
- ❖ SWRCB process to amend Reclamation's Folsom Unit water right permits to incorporate the FMS
- ❖ Development of the appropriate documentation to comply with environmental laws.



More detailed information is provided in the Flow Management Standard Technical Report, available at www.waterforum.org

