Stakeholder Situational Assessment
Folsom Dam Water Control Manual Update

Prepared for the U.S. Army Corps of Engineers

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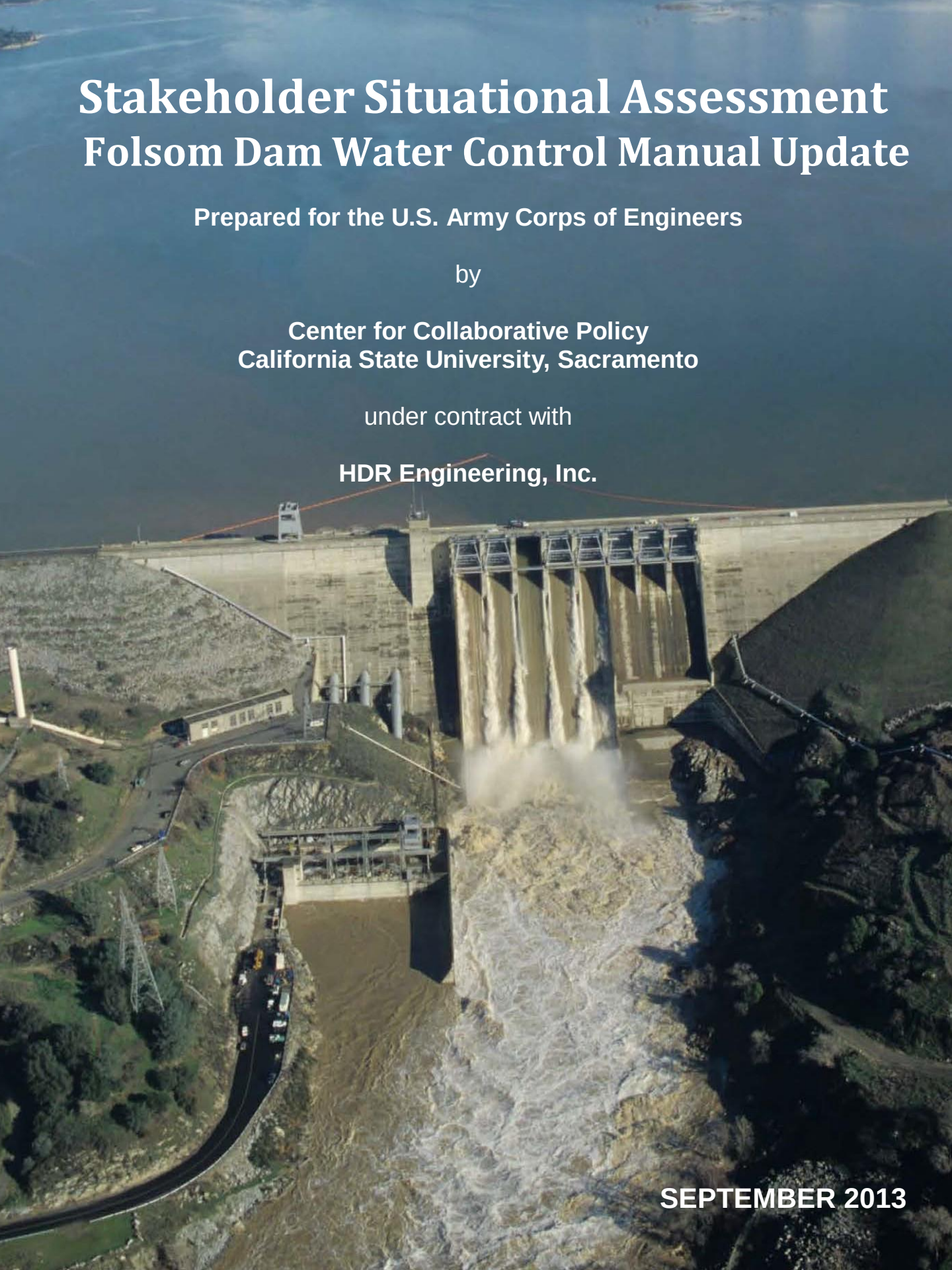

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Front Cover: Folsom Dam and Reservoir 1997

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Note Regarding Appendices 3 and 4: The information in these presentations was current as of the date listed. As the project progresses, information may evolve and change over time. For more current information, see http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamAuxiliarySpillway.aspx. Readers can access material on Folsom Dam Water Control Manual Update on the lower right side of the page.

Stakeholder Situational Assessment

Folsom Dam Water Control Manual Update

Introduction

Situated at the confluence of two large rivers - the American and Sacramento - the populated areas in and near the City of Sacramento have lived with the realities of floods and flood risk since the 1850's. Of course, tribal populations lived with the sometimes fierce rhythms of these rivers long before the settlers arrived. In recent history, the record flood of 1986 exposed the area's vulnerability when Folsom Reservoir exceeded its normal flood control storage capacity and several levees nearly collapsed under the strain of the storm.

The 1986 flood raised concerns over the adequacy of the existing flood management system and the safety of Folsom Dam, leading to a series of important actions over the past 25 years on the part of Congress and local, regional, state and federal agencies. The U.S. Army Corps of Engineers (USACE), U.S. Bureau of Reclamation (Reclamation), Sacramento Area Flood Control Agency (SAFCA), and the Central Valley Flood Protection Board through the California Department of Water Resources (CVFPB/DWR) have worked in partnership on these actions.

In addition to levee strengthening, one of the most important actions to reduce Sacramento area's flood risk will be the completion of the Folsom Dam Joint Federal Project (JFP). The JFP, authorized by Congress, is currently under construction and is anticipated to be built by the fall of 2017. One of the current limitations of Folsom Dam is that sufficient flood waters cannot be released at lower elevations due to the positioning of the dam gates, thus preventing the earlier and safe evacuation of flood waters. The JFP, consisting of a six submerged tainter gate structure and an auxiliary spillway, will address that problem by allowing more flood water to be safely released at a lower elevation and earlier in a storm event. This increased release efficiency effectively creates more storage capacity in Folsom Reservoir to hold flood waters throughout a storm.

In order to realize the full benefits of this new auxiliary spillway and gate structure, an updated Water Control Manual (Manual Update) needs to be developed. The Water Control Manual is the document that stipulates the flood control operations of Folsom Dam, and has provided the rules and criteria for operating the Dam since 1956.

The Manual Update effort, led by USACE with Reclamation as its federal partner, and assisted by its state and local cost-sharing partners (CVFPB/ DWR; SAFCA) will develop, evaluate, and recommend changes to the flood management operations of Folsom Dam and Reservoir in order to reduce flood risk to the Sacramento area.

In addition to the new spillway and gate structure, this ongoing effort will also evaluate other operational considerations to achieve an improved level of flood risk reduction while decreasing the volume of flood control space required in Folsom Reservoir at any one time. These additional considerations include various upstream watershed conditions (incidental upstream storage and degree of basin saturation); storm forecasting technologies; the status of the downstream levees; and aspects of the proposed Dam raise project, which is scheduled to be constructed by 2019.

Important factors in the development of the Manual Update include dam safety requirements; Endangered Species Act (ESA); fish and wildlife needs; water quality requirements; water supply and water rights permit terms; power generation and recreational needs.

For more background information on the Manual Update, see Appendix 1 for USACE's July 2012 Briefing Memorandum on Folsom Dam Water Control Manual Update.

Why Do a Stakeholder Situational Assessment?

In addition to its critical flood control function, Folsom Dam and Reservoir serve a number of other purposes including municipal and industrial water supply, agricultural irrigation supply, hydropower generation, fish and wildlife protection, water quality, and recreation at Folsom Lake. Thus, any changes in the operation of Folsom Dam to increase flood protection could also have the possibility of affecting the other purposes of the Dam as well as the stakeholders who have a "stake" in those purposes.

This Stakeholder Situation Assessment, and more importantly the foundational conversations held among stakeholders and the four government agencies developing the Manual Update, provide an important starting point to:

- Improve the Manual Update through stakeholder feedback;
- Anticipate and collaboratively resolve stakeholder concerns and problems;
- Develop information that could lead to mutual gain for the stakeholder groups as well as the government agencies working on the Manual Update; and
- Create the conditions for a timely and smooth federal approval of the proposed Manual Update modifications.

To lay the foundation for future stakeholder engagement in the Manual Update, this Stakeholder Situation Assessment will:

1. Identify organizations, groups, government entities and other interested parties who believe they could be adversely or positively affected by a revised Folsom Dam Water Control Manual;
2. Provide a summary of stakeholders' views, perspectives, concerns and needs;
3. Describe common interests as well as potential tensions among the stakeholders groups to better inform the Update; and
4. Recommend a process for meaningfully engaging stakeholder groups with the work of USACE, its partner and cost-sharing sponsors throughout the Manual Update process.

Who are the Stakeholders?

The first step in any stakeholder situation assessment is the identification of those groups and organizations - external to the responsible government entities - that have an active interest in a project and / or believe they could be adversely affected by a project.

Given the multi-purpose nature of Folsom Dam and the considerable attention given to the flood risk reduction issues in Sacramento, the major stakeholder groupings listed in the box below were easy to identify. What took more attention was the identification of the multiple organizations within each stakeholder grouping along with the individuals who could best represent those organizations in the Manual Update discussions. The six major stakeholder groupings in the box represent a total of 67 organizations/ sub-divisions /user groups and 100 individuals representing these interests. For a listing of the organizations and user groups associated with each of the following interest groups, see Appendix 2.

Major Stakeholder Groupings for Stakeholder Situation Assessment

(The notation following each grouping represents the number of organizations or user groups associated with that grouping. Some organizations are dual purpose and are included in more than one grouping.)

Regional Flood Management Entities *(9)*
Folsom Lake, Lake Natoma, and Lower American River Recreation Interests *(15)*
Regional Environmental Interests *(14)*
In-Basin Water Purveyors/ Suppliers *(18)*
Central Valley Project (CVP) and State Water Project (SWP) Contractors *(15)*
Electric Power Utilities and their Associations *(5)*

The other stakeholder groupings identified as having an interest in the operation of Folsom Dam include the metropolitan business community, the regional emergency response agencies, the downstream interests in the lower Sacramento River and North Delta region, and the regional tribes. USACE has its own separate process for engaging tribes and tribal governments. The other four groups have important concerns about and perspectives on flood risks in Sacramento, but not necessarily relating the fine points of how the Dam is operated. As described later in this report, these groups will be invited to participate in the quarterly all-stakeholder discussion sessions throughout the Manual Update Process.

How was the Stakeholder Situational Assessment Done?

The information for this Assessment came from a series of meetings, conversations and other communications with the stakeholders from the six major categories -- Regional Flood Management Organizations; Folsom Lake, Lake Natoma, and Lower American River Recreation Interests; Regional Environmental Interests; In-Basin Water Purveyors; Central Valley Project (CVP) and State Water Project (SWP) Contractors; and Electric Power Utilities and their Associations.

In September 2012, USACE, in concert with Reclamation, SAFCA and CVFPB/DWR, convened a series of facilitated conversation with each of the six groups identified above. The purpose of these separate discussions was to engage the stakeholders in the policy and technical work of the Manual Update; understand stakeholders' interests, views and concerns; and ask the stakeholders how best to involve them in the future work of the Manual Update . This effort consisted of five (three-hour) discussions. The Central Valley Project (CVP), State Water Project (SWP) Contractors, and Electric Power Utilities and their Associations were combined into one meeting.

The September 2012 series of meetings produced two products:

- The identification of each group's interests and issues, which was then sent to all the individuals in each grouping multiple times for corrections, additions and approvals.

- The development of a draft stakeholder engagement plan based on the level of involvement requested by the stakeholders.

Then, in February 2013 and again in March, USACE, in concert with Reclamation, CVFPB/DWR and SAFCA, convened facilitated sessions so that the stakeholders in all the interest groupings could come together to continue the discussions begun in September.

The purpose of the February and March 2013 sessions was to provide a forum for the four government agencies and the stakeholders to jointly review and discuss three documents: the Interests and Issues Statements of the stakeholder groupings; the Draft Stakeholder Engagement Plan; and the Project Schedule that would inform the timing of stakeholder involvement. As requested by the stakeholders, another key part of the session was a presentation and discussion on the technical work being done for the Manual Update.

Based on stakeholder feedback at the February and March 2013 sessions, the Draft Stakeholder Engagement Plan was modified. The Stakeholder Engagement Plan will be discussed later in this report.

See Appendices 3 and 4 for the power point presentations from the September 2012 and February/ March 2013 stakeholder sessions.

Stakeholder Interests and Issues

The identification of stakeholder interests and issues is one of the most important aspects of an assessment. The following tables capture each group's concerns, questions and observations. As mentioned above, the stakeholders reviewed and approved their respective statements.

These Interest and Issue Statements come directly from each of the interest groups. The inclusion of these statements in this Assessment does not imply that the four government agencies working on the Manual Update necessarily agree with these statements. However, these four agencies do recognize and respect the concerns expressed.

Each of the statements is organized into three columns, respectively providing Interests, Issues, and Questions / Observations. The Interests (first column) are the overarching needs. The Issues (second column) are the more specific policy, technical, operational, physical, procedural concerns and requests related to each Interest. The Interest and Issues Statement from the Central Valley Project (CVP), State Water Project (SWP) Contractors and Electric Power Utilities and their Associations are combined into one statement. See notations after each entry in that joint statement to identify the associated interest.

The Interest and Issues Statements for each of the groups can be found on the following pages:

Regional Flood Management Organizations' Interests and Issues

Interest	Issues	Questions/ Observations
Reducing and understanding impacts on systems so can plan and prepare for needed maintenance, restoration and improvements.	1. Concern with bank erosion on Sacramento River: i. Prolonged medium-sized flows. (70,000 – 80,000 cfs) can be more damaging than less frequent higher flows. Can tolerate higher flows if medium flows are managed. ii. Concerned with high/ peak flows if duration is long. 2. Concerns regarding exceeding the capacity of the Yolo Bypass. Bypass not designed for concurrent flood events on American, Sacramento, Yuba and Feather Rivers. Once weir gates are open, flows go into Bypass, not Sacramento River. 3. Need a detailed under-standing of routing – where and when do flows hit the Sacramento River?	1. Explore possibility of waiting to release flows/ stretching out Reservoir evacuation over time to make sure capacity of Yolo Bypass is not exceeded. 2. What are the impacts of various Folsom operations under a range of storms?
Financing of maintenance / restoration/ improvements to their systems due to WCM operation of Folsom	1. Will there be a change to the trigger for PL 84-99 based on WCM operations? Do not want to be ineligible for funding support. 2. Who pays for maintenance costs? 3. Study should evaluate need for compensation for floodway damages associated with WCM.	
Update triggers for population evacuations in flood situations	Involvement of emergency response agencies in the WCM process	

Recreationists' Interest and Issues

Folsom Lake and Lake Natoma Recreation		
Interests	**Issues**	**Questions/ Observations**
Maintain Lake levels for recreation use; particularly from May to September, with June – August being most important.	1. Impacts of low Folsom Lake shorelines: • Boat ramp access/ availability • Distance of parking area to swimming beaches and marina • Loss of Park revenue due to reduced day usage • Loss of revenue to private marinas and concession operations 2. WCM modeling effort needs to take advantage of existing data that correlates recreation use by reservoir level by month to conduct a sophisticated analysis. 3. Interested in review of impacts to/ thresholds of significance for Folsom Lake, especially in advance of issuance of draft EIS/EIR	Will PCWA's or SMUD's FERC new license requirements have an effect on Lake Folsom?
State Parks, private marinas and Sac State Aquatic Center need continued advance notification of high release rates from Folsom Reservoir for safety and informational purposes.	Lake Natoma and downstream: Rowing event safety and equipment impacts with high flows	

Recreationists' Interest and Issues

Lower American River (LAR) Recreation		
Interests	**Issues**	**Questions/ Observations**
Boating recreational and safety impacts related to flow levels and timing, especially on weekends from May - September. Flows over 6000 cfs can present boating safety issues.	1. Adequate flows for recreational boating in LAR are 1750 -6000 cfs, although can boat at 1500 cfs. Some locations are safe up to 8000 cfs, but 6,000 cfs is best safety threshold to use. Above 6,000 cfs, the danger can increase due to water flows through trees. Below 1750, the chance of puncturing a tube increases. 2. Continued advance notification of higher flows (above 6000 cfs) for boater safety reasons (routinely done now; some organizations want to be added to notification list).	Instances of increased releases catching wading fisherman by surprise
Loss of Sacramento County Park's recreational infrastructure in the American River Parkway with very high flows	1. High flows in the LAR Parkway can cause: • Submerged trails and bike paths • Bank damage • Submerged bathrooms • Damages to electrical equipment at Discovery Park	1. County Parks has good data correlating river stage with impacts to park land and infrastructure. Should be used in effects evaluation 2. Models should determine which American River Parkway infrastructure is submerged at what LAR flow levels. This will provide information to help County prepare for damages.
Recreational fishing interests concerned with health of fisheries, particularly temperature control issues.		

Regional Environmentalists' Interests and Issues

Interests	Issues	Questions/ Observations
Successful WCM operation of Folsom such that upstream detention dams are not necessary to reduce flood risks.	1. Need WCM that not only meets but exceeds the CA Standard (200 yr. flood). Through spillway and new tools, a larger number of hypothetical floods can be accommodated. 2. Support conditional storage (water stored in flood reserve space), when warranted, in exchange for draw down of conservation space when warranted. i. Confirm that USACE has fed authorities to do above. ii. Above "exchange" written into WCM rules so can count on it. 3. Need to create rules in WCM for early and aggressive releases/ forecasting for big storms (i.e. Pineapple Expresses don't sneak up on us). Need rules that do not constrict forecasting, and allow for outflows at beginning of a storm larger than in-flows. 4. Want rules optimized, but do want rules rather than open-ended flexibility so that the intended flood control benefits are realized. 5. Fed Authorities: 2 views i. Concern that USACE and its partners do not have a common understanding of the range of federal authorities that can be used. ii. May be better to engage in problem-solving on how to optimize operations rather than focus on authorities.	1. Primary risks with developing WCM: Releasing water "too early" that cannot be recovered; and risk of maintaining conditional storage leading to damaging high releases and possible flooding. 2. Need to review stream flow frequency curves to determine if WCM can meet and exceed 200 year CA Flood Standard. 3. What are assumptions for / characteristics of 200 year flood? 4. Want to discuss how to leverage different authorities, if needed for a robust WCM. 5. What is the magnitude of what can be done with forecasting? What operational flexibility is gained through using forecasting? 6. What would be the rules regarding conditional storage?

Regional Environmentalists' Interests and Issues, Continued

Interests	Issues	Questions/ Observations
The health of the downstream fisheries related to temperature/ cold water pool and flow regimens. Of particular concern is protecting, restoring and meeting the various life stage needs of the Chinook salmon and steelhead.	1. Cold water pool: • Use the WCM Project as an opportunity / obligation to improve the cold water pool • Cannot wait for Dam Raise Temperature Control Device (TCD) to improve cold water pool 2. Support of Conditional Storage (water stored in flood reserve space), when warranted, if: i. Potential new water is also available for Reclamation's revised water right for Folsom (Water Forum LAR Flow Standard), including storage targets for end of September. ii. Pulse releases provided during Jan.-May as conditional storage is associated with lost out-flow, effecting out-migration of young salmonoids. ii. Understanding that fish stranding occurs if sudden short duration, high releases are necessary. 3. Shutter Configuration: Congress authorized automated configuration. Needs to be implemented unless demonstrate that same effect can be achieved through other means (e.g. current lifting and blending of shutters). 4. Need Elephant Trunk	1. When is the strategic thinking for the cold water pool going to get done? There is $2 Million set aside now for cold water pool. 2. WCM Modeling analysis needs to provide opportunity for close review regarding what helps and hurts the cold water pool. 3. Need analysis of what out-flow levels are needed for young salmonoids in Jan – May period, especially Jan – March. 4. As part of WCM analysis: i. Identify biological needs of Chinook salmon and steelhead, including temperature information at selected downstream points. ii. Identify operational alternatives that are protective of Chinook salmon and steelhead. 5. Need effects analysis of high flows in the Lower American River (LAR). 6. Studies have shown that there is significant flow of water through the current shutters, which reduces the ability to conserve and manage the cold water pool. Potential fixes should be investigated, including rehabilitation and replacement.

In-Basin Purveyors' Interests and Issues

Interests	Issues	Questions/ Observations
Enhanced management of water supplies for the protection of in-basin municipal/industrial and environmental uses, particularly through a proactive approach to the acquisition and use of high quality data.	1. Concern that Folsom Reservoir could be drawn down below the intakes of several purveyors that do not have alternative sources of supply. 2. Modeling of the Bureau of Reclamation's current operating plan, under future level of demands, indicates that Folsom Reservoir will be drawn down to dead pool in back to back critically dry years. 2. Because Folsom Reservoir is relatively small compared to the size of potential flood events and in-basin municipal and environmental water needs, there is a natural conflict between water supply and flood control interests. It is the water purveyors' desire to investigate the ability to temporarily increase the amount of water allowed to be held in storage in Folsom Reservoir, while carefully monitoring water content within the watershed and projected precipitation, until either the probability of significant near term precipitation reaches a level of concern for possible flooding or the level of water content reaches a level needed to diminish concern for drought. 3. We believe that everyone involved in this effort would benefit from a thorough understanding of the risks (loss of stored water; flooding) and benefits (reduced drought impacts; reduced flood risks) associated with differing levels of flood and water storage, especially with the operation of	1. Does the Corps have the authority to be flexible in WCM operation of Folsom? 2. Upstream in-basin purveyors want to make a contribution to identifying and collecting quality data for modeling as well as real-time guidance during possible flood event. 3. How do we make sure we incorporate our additional data with data that is currently collected? 4. If we need more tools, where are they needed? 5. Request for model to address South Fork unimpaired flow as it is difficult to measure due to granite topography.

	In-Basin Purveyors' Interests and Issues, Continued the new flood outlet gates at Folsom. 4. Need more instrumentation monitoring, collection and use of accurate data for watershed modeling as well as for real-time guidance during possible flood event 5. Better understanding of level of confidence in technology tools (e.g. basin wetness parameters; conditions of upstream reservoirs; forecasting) 6. As related to outcome of WCM effort, USACE and USBR should engage in SWRCB process for establishing new Delta flow standards.	

CVP/SWP Contractors' and Electric Utilities' Interests and Issues

Interests	Issues	Questions/ Observations
Maximizing water resources for all purposes (CVP/SWP/Power)	1. Take advantage of opportunities to optimize end of May storage for additional and colder water than current condition. In particular, examine potential for higher carryover storage for critically dry years, made possible by better flood control capacity. Also enhances power generation and recreation. (CVP/SWP/Power) 2. Flexibility built into WCM to maximize water resources for all purposes. Specifically, need flexible rule curve for Folsom flood control depending upon basin moisture conditions, and the incorporation of forecast-based operations into the flood control guidelines. (CVP/SWP/Power) 3. Minimize operations/ conditions that would require releases to by-pass penstocks. (Power) 4. Update Folsom Dam shutters to improve control of water temperatures releases from Folsom Reservoir. (CVP/SWP/Power)	1. What are the confidence levels associated with forecasts? 2. What is the duration of peak downstream releases? 3. Who pays the operations and maintenance (O&M) costs on Folsom shutters, if updated?

	CVP/SWP Contractors' and Electric Utilities' Interest and Issues, Continued 5. Important to track Delta flow standard discussions at SWRCB as related to WCM Project. Particularly interested in salinity quality for Delta and sensitivity analysis regarding X-2 Standard. (CVP/SWP)	
Cost allocation related to WCM Operations (CVP/Power)	How will the revised WCM Operations affect authorized project purposes in the existing cost allocation for Folsom Dam/Reservoir and the ongoing CVP Cost Reallocation Study which is scheduled to be completed by 2016/2017? (CVP/Power)	
WCM assumptions (hydrological; environmental, etc.) should be carried forward in other studies (CVP/SWP/Power)	Downstream environmental regulatory baseline for Folsom Dam WCM should be coordinated with CVP Cost Reallocation Study (CVP/Power).	
Ensuring informed decision making processes exist by having access to integrated input from all other interests (CVP/SWP/Power)	Want to understand how all impacts fit together, especially environmental impacts. Do not want to get to the end of this effort and not be aware of integrated input and impacts. (CVP/SWP/Power)	

Shared Perspectives among the Six Stakeholder Groupings

This part of the Stakeholder Situational Assessment compares the interests and issues of the six major stakeholder groups to identify where their various perspectives align. (See box insert on page 4 for a list of the stakeholder groups.) Where interests align, there can be opportunities for approaches and solutions that meet the needs of multiple, and possibly, all constituencies.

For the Manual Update process, it is fortunate that many of the stakeholders' needs and concern are similar, or at least not contradictory. This provides a path for potential mutual gains, which are usually elusive in other water and flood endeavors.

There are nine key shared perspectives among the stakeholder groupings:

1. **Reduced Flood Risks for the Sacramento Area**: All stakeholders understand and support the reduction of flood risks for the Sacramento area.

2. **Use of Conditional Storage**: There is a potential, but not a guarantee, for all interests to benefit from a revised Manual Update that enhances conditional storage in Folsom Reservoir. This means that when there are no expectations of moderately high or severe precipitation and relatively dry conditions upstream, there is little risk in storing water in what otherwise would be dedicated to flood space in Folsom Reservoir. This could enhance water supplies, hydro-power, fishery, and recreational opportunities through higher seasonal water storage at Folsom Reservoir. And, in turn, conditional storage also means that when severe storms or high precipitation are anticipated, water can be evacuated from the Reservoir beyond what would otherwise be retained in the conservation space for water supply, thus reducing flood risks.

3. **Balancing Risks and Benefits**: Regarding conditional storage, stakeholders agree that the risks (loss of stored water; flooding; potentially damaging releases during flood situations) and benefits (reduced flood risks; increased water availability; lower volume of releases during potential flood situations) need to be carefully assessed. The challenge is to develop a Manual Update that neither releases water "too late" resulting in damaging high releases and possible flooding, nor releases water "too early" so that water cannot be recovered for water supply, hydropower, fishery and recreational needs.

4. **Use of All of the Tools**: Stakeholders want to maximize the combined use of conditional storage within Folsom Reservoir, the auxiliary spillway, basin wetness information, weather forecasting, and incidental storage in upstream reservoirs to reduce flood risks as well as have the opportunity to store more water in Folsom Reservoir. Stakeholders also want a better understanding of the magnitude of what can be accomplished with the use of these tools as well as the levels of uncertainty with such use.

5. **Basin Wetness and Weather Forecasting**: The stakeholders agree that basin wetness and forecasting information can be powerful assets to reduce flood risks. But they also realize that there can be uncertainties in the use of this data. They would like to explore the level of confidence in technology tools related to basin wetness and forecasting.

6. **Folsom Dam Raise**: Stakeholders agree that, when built, the Folsom Dam raise will be another asset with which to reduce flood risks and store water. They would like to better understand how the Folsom Dam raise and associated flood control surcharge space would potentially effect Folsom's operations and impacts. Stakeholders acknowledge that the Dam raise is not a part of this Manual Update. However, Dam raise assumptions will be addressed as part of the CEQA and NEPA cumulative impacts. When the Dam raise is constructed (2019), the Water Control Manual will be updated again to reflect the raise.

7. **Access to Information by Stakeholders**: Stakeholders expressed a need for access to information on technical issues, integrated impacts, and the perspectives of other stakeholder interests.

8. **Cold Water Pool**: Although not central to all interests, stakeholders believe that there may be an opportunity to improve the cold water pool for the fisheries though conditional storage, assuming that that flood risks are appropriately managed. Stakeholders understand (but may not all necessarily agree with) the government agencies' determination that opportunities for improving the cold water pool are incidental to the main purpose of the Water Control Manual Update. Stakeholders would like to know what operations help and hurt the cold water pool.

9. **Downstream Releases in a Flood Situation**: Although not central to all interests, stakeholders share a need to understand and reduce the effects of medium and high flows as well as peak downstream releases on the American and Sacramento Rivers.

Potential Challenges

For the most part, stakeholders see much more commonality among their interests than differences. Yet, challenges do remain, but most believe that these challenges can be managed. The six challenges below reflect not only potential differing perspectives among the stakeholders but also possible differences between the government agencies working on the Manual Update and the various stakeholder groups. There are sure to be other challenges, but these are the ones that stand out at this point.

1. **Flood Risk Reduction and Water Supply:** Given the relatively small size of Folsom Reservoir, there has been a historic tension between flood risk reduction and water availability for municipal, environmental, agricultural, hydropower and recreational purposes. Among those concerned with water availability, there is not enough water even under optimal conditions to satisfy all the needs.

In the context of the Manual Update, the balancing act of neither releasing water "too late" nor "too early" from Folsom Reservoir is not an easy one. Even when more is learned about accurately predicting such parameters as precipitation and basin wetness, there will always be uncertainties. Although the Manual Update rules will be the decision of USACE in consultation with its partner (Reclamation), and its state and local cost-sharing sponsors (CVFPB/DWR and SAFCA), exactly how to balance these uncertainties in the Manual Update could be an area of tension among stakeholders.

2. **Water from Conditional Storage**: If conditional storage results in additional water yield from increased seasonal storage, there are likely to be differences of opinion among the stakeholders on "when" (timing) and "how much of" (amount) this water is used. The recreational, environmental, in-basin purveyors, electric power utilities and CVP/SWP contractors are the groups with an interest in this issue. Any additional water yield gained from conditional storage is the responsibility of Reclamation to manage under its CVP water rights authority.

3. **Flexibility of Manual Update**: Achieving the appropriate balance between operational flexibility and fixed operational rules is a challenge that is likely to be viewed differently by the various stakeholder groups.

4. **Use of Basin Wetness Information**: The In-Basin Water Purveyors have expressed a strong interest in monitoring, collecting and using basin wetness data as part of the guidance parameters in this Manual Update. Their concern is that the government agencies working on the Manual Update may be more cautionary in their use of basin wetness data than they (In-Basin Water Purveyors) believe is warranted.

5. **Use of Weather Forecasting Information**: Based on weather forecasts for big storms, the Environmental stakeholders have expressed a strong interest in early and aggressive Folsom Dam releases, including releases that could exceed in-flows into the Reservoir. Their concern is that the government agencies working on the Water Control Manual and possibly the water suppliers may be more cautionary in their use of weather forecasts than they (Environmentalists) believe is warranted. The National Weather Service will provide consultation to the government agencies producing the Manual Update, thereby possibly reducing the level of this challenge.

6. **Cold Water Pool:** Although the government agencies responsible for the Manual Update have determined that improvements to the cold water pool are incidental to the main purpose of the Manual Update, the Environmental stakeholders would like more consideration given to the cold water pool issues due to the important role cold releases play in the health of the fisheries. Reclamation and SAFCA have offered to convene side conversations on this issue, apart from the discussions on the Manual Update. What can be done now to improve Folsom's cold water pool is a challenge unto itself. The Temperature Control Device for Folsom is part of the future Dam raise, which is not scheduled to be constructed until 2019.

Stakeholder Engagement Plan

Overview

The following Stakeholder Engagement Plan is based on the seven discussion sessions that USACE, in partnership with the Reclamation, SAFCA, and CVFPB/DWR, convened with the stakeholders. (See previous section, "How was the Stakeholder Situational Assessment Done?" for a description of these sessions.)

Various stakeholder groups desire different levels of engagement in the Manual Update. The Regional Flood Management Organizations and the Recreational Representatives want occasional meetings tied to their interests and the overall project schedule.

The Environmental Group and In-Basin Purveyors desire more frequent, in-depth, technical, and policy-related sessions. Some CVP Contractors, SWP Contractors, and Electric Power Utilities and their Associations preferred occasional meetings, while others wanted more involvement. Stakeholder desiring more frequent and in-depth discussions expressed interest in such topics as modeling results, development of and criteria for NEPA and CEQA alternatives, impacts, and risk/benefit analyses.

Lastly, some groups asked for in-depth discussions on a particular topic. The In- Basin Purveyors, especially San Juan Water District, the City of Folsom and the City of Roseville, want more direct involvement in how basin wetness parameters will be incorporated into the Manual Update. The Environmental Interest Group requested more concentrated focus on weather forecasting as well as improvements to the cold water pool through the Manual Update process.

Almost all stakeholders want opportunities to provide feedback in advance of decisions and releases of the public draft and final Manual Update documents, particularly ones involving NEPA and CEQA. Most stakeholders also desire that relevant documents and analyses be sent to them in advance of meetings designed to get their feedback. Stakeholders expect that technical information will be shared with them at meetings. Meetings that include stakeholder feedback will be consistent with the Federal Advisory Committee Act (FACA).

There was an understanding among all the stakeholders that USACE, in concert with Reclamation, CVFPB/DWR and SAFCA, makes all final decisions, and that stakeholder input is seriously considered in their decisions-making.

The Stakeholder Engagement Plan

The Stakeholder Engagement Plan consists of four venues for stakeholders to provide feedback on the Water Control Manual Update:

1. **All-Stakeholder Policy Discussions on a Quarterly Basis:** Starting in Fall of 2013 and continuing throughout the Project Alternative Models period (October 2013 – August 2014), USACE will convene all-stakeholder sessions quarterly. These meetings will provide the venue for periodic policy and technical discussions on the Manual Update. The current project milestone calendar will be distributed and discussed at each of these meetings. The sessions will be publicly noticed, including invitations to the regional business community, emergency management and response agencies, Lower Sacramento River and North Delta Interests and other interested parties.

   After August 2014, USACE and its federal and non-federal partners will discuss with stakeholders the need for and frequency of similar sessions for the next phase of the Manual Update.

2. **More In-Depth Sessions for Governmental Stakeholders:** Government stakeholders are invited to attend USACE's Technical Working Group and Environmental Effects Working Group on the Manual Update. Starting in June 2013, each of the Working Groups will meet quarterly. For the In-Basin Purveyors, the Technical Working Group will be the forum within which to address basin wetness parameters.

3. **Non-Governmental Stakeholders:** SAFCA will provide two venues for non-governmental stakeholders, which are described below in (a) and (b). SAFCA has the responsibility to fully convey the perspectives, needs, and issues expressed in these meetings to USACE, Reclamation, and CVFPB/ DWR through official meetings on the Manual Update as well as through informal discussions with their project partners. The quarterly all-stakeholders meetings will provide a venue for the non-governmental stakeholders to have direct discussions with USACE, Reclamation and CVFPB/DWR.

   a. Lower American River (LAR) Task Force: SAFCA will provide briefings and discussions on the Manual Update at each of the Task Force meetings. The LAR Task Force meets quarterly.

   b. More In-Depth Sessions for Non-Governmental Stakeholders: SAFCA will hold discussions to provide more extensive information on the Manual Update to interested non-government stakeholders. The type of detailed information available to the governmental stakeholders through the USACE's Technical and Environmental Working Groups can be made available.

4. Other Conversations: If government or non-governmental stakeholders have questions or issues that are not addressed in the above venues, they are invited to contact USACE to set up a meeting through Mr. Art Ceballos at Arturo.Ceballos@usace.army.mil

Separate from the Manual Update process, Reclamation and SAFCA will jointly sponsor meetings for interested stakeholders on how to improve the cold-water pool. (The four government agencies working on the Manual Update believe improvements to the cold water pool are incidental to the main purpose of the Water Control Manual Update. However, all recognize the importance of this issue.)

Final Comments

This Assessment provides an overall framework for stakeholder participation in the Folsom Dam Water Control Manual Update. It identifies the organizations, groups and individuals with a direct interest in the Manual Update and provides stakeholder-approved Interest and Issues Statements for the six major stakeholder groupings. The discussion on common perspectives and potential tensions among the stakeholder groups can help to anticipate and resolve challenges that may arise. And finally, based on stakeholder feedback, the Assessment provides a specific Stakeholder Engagement Plan.

The Assessment and the framework it puts forward are "living documents." This means that as the stakeholders as well as the government agencies producing the Manual Update learn more, their needs might change. For example, stakeholders may want to refine their Interests and Issues Statements, or the Stakeholder Engagement Plan may need to be revised. Now there is a solid foundation from which to have those discussions and a point of departure for future changes.

As previously mentioned, it is fortunate that many of the underlying interests of the stakeholders and those agencies developing the Manual Update are similar – or at least not contradictory. These commonalities place the Manual Update on a course to substantially reduce flood risks in Sacramento while at the same time doing a better job than current operation at conserving Folsom Reservoir water for other purposes, including municipal and industrial water supply, agricultural irrigation supply, hydropower generation, fish and wildlife protection, water quality, and recreation.

The "Stakeholder Situational Assessment for Folsom Dam Water Control Manual Update" was developed and written by Susan Sherry, Executive Director, Center for Collaborative Policy, California State University Sacramento under contract to HDR Engineering, Inc. Ms. Sherry would like to thank all of the many stakeholders, USACE, Reclamation, CVFPB/DWR, SAFCA and HDR Engineering, Inc. for their thoughtful contributions to this effort.

Appendices

1. USACE Briefing Memorandum on Folsom Dam Water Control Manual Update, July 2012

2. Stakeholder Organizations and User Groups

3. Power Point Presentations from September 2012 Stakeholder Meetings

4. Power Point Presentation from February and March 2013 Stakeholder Meetings

Note Regarding Appendices 3 and 4: The information in these presentations was current as of the date listed. As the project progresses, information may evolve and change over time. For more current information, see http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamAuxiliarySpillway.aspx. Readers can access material on Folsom Dam Water Control Manual Update on the lower right side of the page.

Appendix 1

USACE Briefing Memorandum on Folsom Dam Water Control Manual Update July 2012

Briefing Memorandum

Overview of the Folsom Dam Water Control Manual Update

Introduction

As directed by Congress, the U.S. Army Corps of Engineers (USACE), in collaboration with the U.S. Department of Interior Bureau of Reclamation (Reclamation), the State of California Central Valley Flood Protection Board (CVFPB), and the Sacramento Area Flood Control Agency (SAFCA) are taking steps to reduce flood risk to the Sacramento area through a variety of authorized facilities (including existing, those under construction and those yet to be constructed). These steps also include the revision of operation rules and criteria for Folsom Dam and Reservoir.

A key component to improved flood risk management for the Sacramento area is the Folsom Dam Joint Federal Project (JFP), currently under construction. The JFP will improve the ability of Folsom Dam to manage large flood events by allowing more water to be safely released earlier in a storm event, resulting in more storage capacity remaining in the reservoir to hold back the peak inflow when it arrives. The JFP has twin goals that simultaneously serve the specific missions of two Federal agencies. The flood risk management goal of USACE and their non-Federal partners, CVFPB and SAFCA, is to reduce flood risk in the Sacramento area in conjunction with other elements of the regional flood control system. The safety of dams goal of Reclamation is to pass the probable maximum flood (PMF) without causing failure of Folsom Dam. The PMF peak inflow is 906,000 cfs, of which, up to 314,000 cubic feet per second (cfs) will pass through the auxiliary spillway. These goals will be accomplished through construction of a gated auxiliary spillway, with a spillway crest elevation 50 feet lower in elevation than the current gated spillways on the main dam. In order to fully realize the benefits of the new auxiliary spillway, the existing water control manual (*Water Control Manual, Folsom Dam and Lake, American River, California;* USACE 1987) must be updated.

USACE is responsible for prescribing operations for flood risk management at Folsom Dam. The dam's water control manual, which includes the water control diagram and emergency spillway release diagram, is the document that stipulates the flood control operations of the dam. The water control diagram has been modified several times since Folsom Dam was constructed in 1956.

USACE, Reclamation, CVFPB, and SAFCA are seeking to minimize the risk that flood operations have been imposing on other authorized Folsom Dam project purposes since 1995, due to the 670,000 ac-ft variable operation. Congress has directed USACE to utilize a variable operation of up to 600,000 ac-ft for flood risk management purposes. An important goal of the Water Control Manual Update is to identify the use of that space in a way that conserves as much water as possible and maximizes all other project functions to the extent practicable, consistent with the flood risk management objectives of the Water Control Manual Update.

Background and Congressional Authorities

Folsom Dam and Reservoir form a multipurpose water project, constructed by USACE in 1956 and operated by Reclamation as an integrated part of the Central Valley Project (CVP). The dam and reservoir reduces flood risk for the Sacramento area while serving other project purposes including water supply (agricultural, domestic, municipal, and industrial), hydropower, fish and wildlife protection, water quality (including water temperature), recreation, and navigation.

As directed by Congress in the Flood Control Act of 1944, USACE is responsible for prescribing regulations for the use of storage allocated for flood control at Folsom Dam and Reservoir. USACE maintains a flood operations plan and Water Control Manual, last updated in 1986, that utilizes a flood control storage space of 400,000 acre-feet (ac-ft).

The 1986 flood raised concerns over the adequacy of the existing flood risk management system of the Sacramento area. These concerns led to a series of investigations and subsequent study authorizations (beginning with the 1991 American River Watershed Investigation Feasibility Report) to reduce the level of flood risk in the Sacramento area, and address the dam safety issues (safe passage of Probable Maximum Flood) at Folsom Dam. This report was followed by the American River Watershed Project, Supplemental Information Report in 1996. Although both reports recommended construction of a flood detention dam on the North Fork of the American River, Congress chose not to authorize the flood detention dam, but instead chose to rely on a series of modifications to the Folsom Dam and Reservoir along with levee improvements downstream of Folsom Dam to provide additional flood risk reduction for the Sacramento area, and to address the safety issues at Folsom Dam.

In 1995, SAFCA entered into an agreement with Reclamation to provide additional flood risk reduction for the Sacramento area. In accordance with the 1995 agreement, Reclamation operates Folsom Dam and Reservoir to provide additional flood storage space in the reservoir on an as-needed basis. This operations plan, commonly referred to as a 400,000 - 670,000 ac-ft creditable space plan, states that beyond the 400,000 ac-ft (regulated by the USACE) up to an additional 270,000 ac-ft, for a total storage of 670,000 ac-ft, may be used for flood control in Folsom Reservoir based on creditable storage from upstream reservoirs. According to the 1995 agreement, SAFCA would purchase water to replace any water storage shortage caused by the creditable storage operation. SAFCA also agreed to fund several physical improvements to Folsom Dam and the downstream river channel to offset the risk of reduced reservoir storage levels. These included modifications to the temperature control shutters on the intakes to Folsom Dam's power penstocks; boat ramp extensions; and shallow floodplain habitat improvements in the lower portion of the American River.

In the Water Resources Development Act of 1996 (WRDA 1996) Congress directed Reclamation to continue the creditable 400,000 - 670,000 ac-ft operation and to extend the 1995 agreement with SAFCA until such time as a comprehensive flood damage reduction plan for the American River watershed has been implemented. WRDA 1996 and the Energy and Water Development Appropriations Act of 2002 established a new cost-sharing formula for the creditable flood control option; SAFCA shall be responsible for 25 percent of any costs incurred and Reclamation is responsible for the remaining 75 percent.

The Water Resources Development Act of 1999 (WRDA 99), Section 101, states that, upon completion of what is now the JFP, the variable space allocated to flood control within the reservoir shall be reduced

from the current operating range of 400,000-670,000 ac-ft to 400,000-600,000 ac-ft. Additionally, WRDA 99 states that USACE, in cooperation with Reclamation, shall update the flood management plan for Folsom Dam to reflect the operational capabilities created by authorized improvements and improved weather forecasts based on the Advanced Hydrologic Prediction System of the National Weather Service. In addition, WRDA 99, Section 556 states that USACE, in consultation with the State of California and local water resources agencies, shall undertake a study of increasing surcharge flood control storage and there is to be no increase in conservation storage at the Folsom Dam Reservoir. This section also authorized the American River Watershed, Long Term Study 2002, which recommended the Folsom Dam raise.

The Energy and Water Development Appropriations Act of 2004 authorized raising Folsom Dam by seven feet for flood risk management purposes (Dam Raise) as well as construction of a permanent bridge to replace Folsom Dam Road, which was closed to public access in 2001.

Shortly thereafter, the Energy and Water Development Appropriations Act of 2006 (2006 EWDAA) directed USACE and Reclamation to collaborate to maximize flood damage reduction and address dam safety at Folsom Dam. The 2006 EWDAA directed the USACE and Reclamation to consider reasonable modifications to the existing authorized activities, including an auxiliary spillway. This collaboration resulted in the JFP at Folsom Dam.

In March of 2007, the Folsom Dam Modification and Dam Raise, Post Authorization Change Report (2007 PACR) was completed and recommended the JFP (which addressed both USACE flood damage reduction project and Reclamation's dam safety issues) and the 3.5-foot Dam Raise (which addresses USACE's flood damage reduction only). The JFP includes a six submerged tainter gate structure and an auxiliary spillway. The 3.5-foot Dam Raise includes upgrades to the three emergency spillway tainter gates at the dam, and various dam safety features at and around Folsom Dam. The results of the 2007 PACR are anticipated to reduce flood risk downstream generally equivalent to the flood risk reduction intended to be provided by the Folsom Modification Project and the 7 foot Dam Raise. The new auxiliary spillway is now effectively the plan referred to in WRDA 99 subsection (A). Authorization to construct the auxiliary spillway and dam safety features were included in the Water Resources Development Act of 2007 (WRDA 2007).

Water Control Manual Update Purpose

The purpose of the analysis is to develop the technical information required to update the existing WCM, namely, *Water Control Manual, Folsom Dam and Lake, American River, California* (USACE 1987).

SPK will use the findings from the analysis to:

- Revise operation rules for Folsom Dam to reduce flood risk, and
- Integrate NWS forecasts into flood operation rules.

The new operation rules will be developed to, at a minimum, meet the following three (3) primary dam safety and flood risk management objectives of the Manual Update partners:

1. Pass the Probable Maximum Flood (PMF) while maintaining 3 feet of freeboard below the top of dam to stay within the Dam Safety constraints of Reclamation.

2. Control a 1/100 annual chance flow (i.e. "the 100-year flood") to a maximum release of 115,000 cubic feet per second (cfs) to support Federal Emergency Management Agency (FEMA) levee accreditation along the American River, by SAFCA.
3. Control a 1/200 annual chance flow (i.e. "the 200-year flood"), as defined by criteria set by the State of California Department of Water Resources (DWR), to a maximum release of 160,000 cfs, when taking into account all the authorized modifications within the American River Watershed.

Key considerations in the development of the water control plan include dam safety requirements; Endangered Species Act (ESA) requirements; other fish and wildlife needs; water quality requirements; and water supply, water rights permit terms and conditions, power generation, and recreational needs. In its development, the Manual Update will conform as equitably as possible with other authorized Folsom Dam Project purposes and operational criteria, including seasonal downstream flow and temperature requirements specified by National Marine Fisheries Service (NMFS) Biological Opinion. The Manual Update will also consider fishery requirements for ramping rates for releases from Folsom Dam.

The findings of the Water Control Manual Update will be used to define the dam's new operational rules. USACE will then update the existing water control manual, namely, *Water Control Manual, Folsom Dam and Lake, American River, California* (USACE 1987). This update will include a new water control diagram and emergency spillway release diagram. The Water Control Manual Update will be completed prior to completion of the auxiliary spillway, and will be accompanied by appropriate environmental documentation that will describe the decision-making process that was followed to arrive at the recommended changes to flood control operations.

Future updates to the water control manual are expected as additional modifications are completed. Future modifications would include the authorized 3.5-foot dam raise which will provide additional space for flood operations, and future downstream levee improvements (erosion protection) allowing for increased releases.

Partner Roles and Responsibilities

There are four partnering agencies on this Water Control Manual Update:

- U.S. Army Corps of Engineers: USACE is the lead Federal agency for the Water Control Manual Update, as well as the National Environmental Policy Act (NEPA) lead agency. USACE will prepare all necessary documents and update the water control manual in collaboration with the other partners.

- U.S. Department of Interior Bureau of Reclamation: Reclamation is the Federal partner responsible for operation and maintenance of Folsom Dam and Reservoir. Reclamation is also a cosignatory of the interim agreement with SAFCA and provides technical and policy support to the Manual Update. As operator of Folsom Dam, Reclamation will also be the cosignatory on the updated water control manual.

- Central Valley Flood Protection Board: The State legal entity for the JFP is the Central Valley Flood Protection Board (CVFPB). CVFPB is a non-Federal cost sharing partner with USACE for the JFP and the Water Control Manual Update. The project operational portion of the CVFPB for the JFP is represented by the State of California Department of Water Resources (DWR). CVFPB is

also the lead agency responsible for the California Environmental Quality Act (CEQA) and signatory of the decision document for the State. DWR provides policy and technical expertise and staff to support the CVFPB's activities associated with the Manual Update.

For JFP, DWR collaborates State's interest in Oversight Management Group, Change Management Board, Project Management Group, Integration Team and Project Delivery Team (PDT). For the Water Control Manual Update, DWR collaborates the State's interest in Project Alternative Solutions Study (PASS), Mid-level Management Group and PDT. Other roles and responsibilities for the State (CVFPB/DWR) are described in the Project Cooperation Agreement and the subsequent amendments between USACE, the State of California and SAFCA for Construction of the American River Watershed, California (Folsom Dam Modifications)

- Sacramento Area Flood Control Agency: SAFCA is the local cost sharing partner with CVFPB for the JFP and the Water Control Manual Update, a CEQA responsible agency, and cosignatory of the interim agreement with Reclamation.

Overview of the Engineering Modeling Process

The USACE engineering modeling process has three primary goals:

- To produce an updated water control manual for Folsom Dam that includes an updated Water Control Diagram and Emergency Spillway Release Diagram.

- To produce data that supports the decision making process for identifying the recommended plan.

- To produce data that supports fulfillment of the Water Control Manual Update partners' policy and legal requirements, such as compliance with NEPA, CEQA, and other laws and regulations.

Operators must be able to rely on the updated water control manual in flood situations. Each point of the manual must be studied and developed in detail, to ensure successful operation of the Dam for flood risk management and dam safety purposes.

Considerations in this modeling effort include the non-federal sponsors' flood management goals of successful operation of the dam and reservoir, to route both a one percent chance event (1/100 inflow design event) sustaining a release of 115,000 cubic feet per second (cfs), and a 0.5% chance event (1/200 inflow design event), sustaining releases at 160,000 cfs. The engineering models are being used to simulate hydrologic and hydraulic conditions on the American River as they relate to the Dam and Reservoir only. The analysis of risk and uncertainty, as related to inflow hydrology, operational variation, and geotechnical issues are not considered in these models, but will be addressed elsewhere.

The emergency spillway release diagram's purpose is operational consideration of dam safety. Reclamation is assisting USACE with an operations plan that will pass a Probable Maximum Flood (PMF) within 3' of freeboard of the top of dam.

USACE uses HEC-ResSim, developed by USACE's Hydraulic Engineering Center, for reservoir routing applications and development of the Reservoir Operation Sets (ROSs) to be evaluated as part of the Water Control Manual Update. HEC-RAS and FLO-2D will be used to perform floodplain analyses.

Reclamation and the DWR use CalSim II to evaluate CVP and SWP contract deliveries. Comparisons of period of record (1921 – 2002) model output from HEC-ResSim and CalSim II will be used to determine how a particular ROS could be modified to better meet CVP/SWP beneficial use criteria. These comparisons are referred to as Tier 1 analyses.

Fundamental engineering questions for USACE and partners to answer include:

- How will the JFP be operated in a flood event?
- What does the guide curve look like, including both the fall drawdown and spring refill components?
- How will the operation plan incorporate the use of forecasts from National Weather Service?
- How will the new plan include creditable storage considerations and the upstream reservoirs' capability for capturing inflow?
- How will accumulated precipitation in the basin and other basin wetness indices be incorporated into the updated plan?

Environmental Analyses Summary

The evaluation of environmental effects will be focused on changes that flood management operation alternatives would have on other authorized Folsom Dam Project purposes, including water supply, hydropower, water quality, fish and wildlife protection, recreation, and navigation.

USACE has prepared a Water Resources Modeling Work Plan describing the modeling strategy for integrating output data between HEC-ResSim and CalSim II. The Water Resources Modeling Work Plan identifies the approach for evaluating the potential project impacts to power generation, temperature, and other environmental considerations. As outlined within that plan, the following evaluations, in addition to the Tier 1 analyses noted above, will be conducted:

- Tier 2 Analysis – An assessment of metrics related to SWP/CVP beneficial water uses as reflected in output from CalSim II. The Tier 2 analysis will only be completed on selected operational alternatives that have been screened and brought forward as potential with-project conditions.

- Tier 3 – Analysis of temperature, water quality, fish mortality, sediment transport, power generation, and recreation. As with the Tier 2 assessment, the Tier 3 analysis will only be completed on selected operational alternatives that have been screened and brought forward as potential with-project conditions.

The environmental effects analyses will be based on comparisons between computer model simulations of the alternatives, including the No Action/Future Without-Project Condition (FWOP), and baseline/existing conditions. The existing condition baseline flood management operation will reflect the current 400,000 – 670,000 ac-ft water control plan without the auxiliary spillway in place. The No Action/FWOP will reflect a 400,000 – 670,000 ac-ft operation similar to the current plan, but with the auxiliary spillway in place.

There is interest from certain stakeholders to compare project alternatives to a historic reference condition that reflects flood management operations prior to the implementation of creditable space storage operations. This reference condition would reflect operations utilizing the USACE 1986 WCD with a maximum flood storage capacity of 400,000 ac-ft at Folsom Dam. The need for carrying out full

environmental effects analyses against this reference condition will be determined during the scoping process.

Effects, both adverse and beneficial, will be identified and quantified to the appropriate extent. Adverse effects will be avoided, minimized, or mitigated to the extent practicable.

Depending on results of the environmental effects analyses, formal consultation with U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act (ESA) may be necessary if adverse effects to federally protected species could occur as a result of implementation of the selected flood management operations alternative. Likewise, consultation with California Department of Fish and Game (CDFG) would be necessary if the selected alternative could have adverse effects on state-protected species. Along with NEPA, CEQA, ESA, and the California Endangered Species Act, all other applicable Federal, state, and local laws will be complied with.

NEPA and CEQA public involvement efforts will include hosting public scoping meetings, providing study information and status updates on a study website and through periodic workshops, and soliciting comments on the Draft and Final NEPA and CEQA documents through public meetings, mailings, and email.

Appendix 2

Stakeholder Organizations and User Groups
Folsom Dam Water Control Manual Update

Stakeholder Organizations and User Groups

Regional Flood Management Organizations	**In-Basin Purveyors/ Water Suppliers**
Reclamation District 1000	County of Sacramento - Water Agency
City of West Sacramento	City of Folsom - Utilities Dept.
DWR Maintenance Area 4	Placer County Water Agency
Yolo Basin Foundation	El Dorado Irrigation District
Central Valley Flood Control Association	El Dorado Water and Power Authority
American River Flood Control District	Sacramento Suburban Water District
DWR Maintenance Area 9	City of Sacramento - Utilities Dept.
Extreme Precipitation Symposium	County of Sacramento - Engineering & Admin.
County of Sacramento	City of Roseville - Utilities Dept.
	San Juan Water District
Regional Environmental Interests	El Dorado County Water Agency
Save the American River Association (SARA)	Carmichael Water District
The Nature Conservancy	Sacramento Municipal Utility District
California Waterfowl Association	Carmichael Water District
League Women Voters	Sacramento Municipal Utility District
Fish User Group (5 Individuals)	Carmichael Water District
CA Fly Fishers Unlimited	Sacramento Municipal Utility District
Sacramento Water Forum	
Friends of the River (FOR)	**CVP / SWP Contractors**
Sierra Club	Central Valley Project Water Association
Planning and Conservation League	Westlands Water District
Ducks Unlimited	Kern County Water Agency
Environmental Council of Sacramento	Metropolitan Water District
Federation of Fly Fishers	San Joaquin River Exchange Contractors
Audubon Society	State Water Project Contractors Association
California - American Water Company	State & Federal Contractors Water Agency
Golden State Water Company	San Luis Delta Mendota Water Authority
Sacramento Regional Water Authority	Santa Clara Valley Water District
	Contra Costa Water District
Regional Recreation Interests	Northern California Water Association
State Department of Parks and Recreation	Santa Clara Valley Water District
Folsom Lake Marina	East Bay Municipal Utilities District
River Rat Rentals	
Sac State Aquatic Center	**Electric Power Utilities and Their Associations**
Adventure Sports	Western Area Power Administration
California Canoe and Kayak	Sacramento Municipal Utility District
Current Adventures	Northern California Power Agency
Sacramento Area Bicycle Advocates	El Dorado Water and Power Authority
Gold Fields District, State Parks	
Larson Marine	
El Dorado Co. River Recreation Department	
Sacramento County Parks	
River City Paddlers, Inc.	
American Raft Rental	
Adventure Connections	

Appendix 3

Power Point Presentation
September 2012 Stakeholder Meetings

Note Regarding Appendix 3: The information in this presentation was current as of the date listed. As the project progresses, information may evolve and change over time. For more current information, see http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamAuxiliarySpillway.aspx. Readers can access material on Folsom Dam Water Control Manual Update on the lower right side of the page.

Folsom Dam Water Control Manual Update

Stakeholder Discussion

September 26, 2012

Tsakopoulos Library, Downtown Sacramento

Sacramento Area Flood Control Agency

Reclamation
Mid-Pacific Region
Sacramento, CA

US Army Corps of Engineers
BUILDING STRONG®

WELCOME AND INTRODUCTIONS

PURPOSE OF WATER CONTROL MANUAL UPDATE (Manual Update)

PURPOSE OF MANUAL UPDATE

- Revise operation rules for Folsom Dam to reduce flood risk based on the capabilities of the Folsom Joint Federal Project (JFP)
- Reflect operational capabilities created by improved weather forecasts
- Potentially reduce the volume of flood control reservation in Folsom Reservoir at any particular time by comparison to the operations that have been in effect since 1995

DISCUSSION OVERVIEW

* Purpose of discussion
* Flood Risk Reduction for Sacramento Area
* Folsom Dam Background
* Current Project Activities
* Current Project Status
* Next Steps
* Questions and Discussion

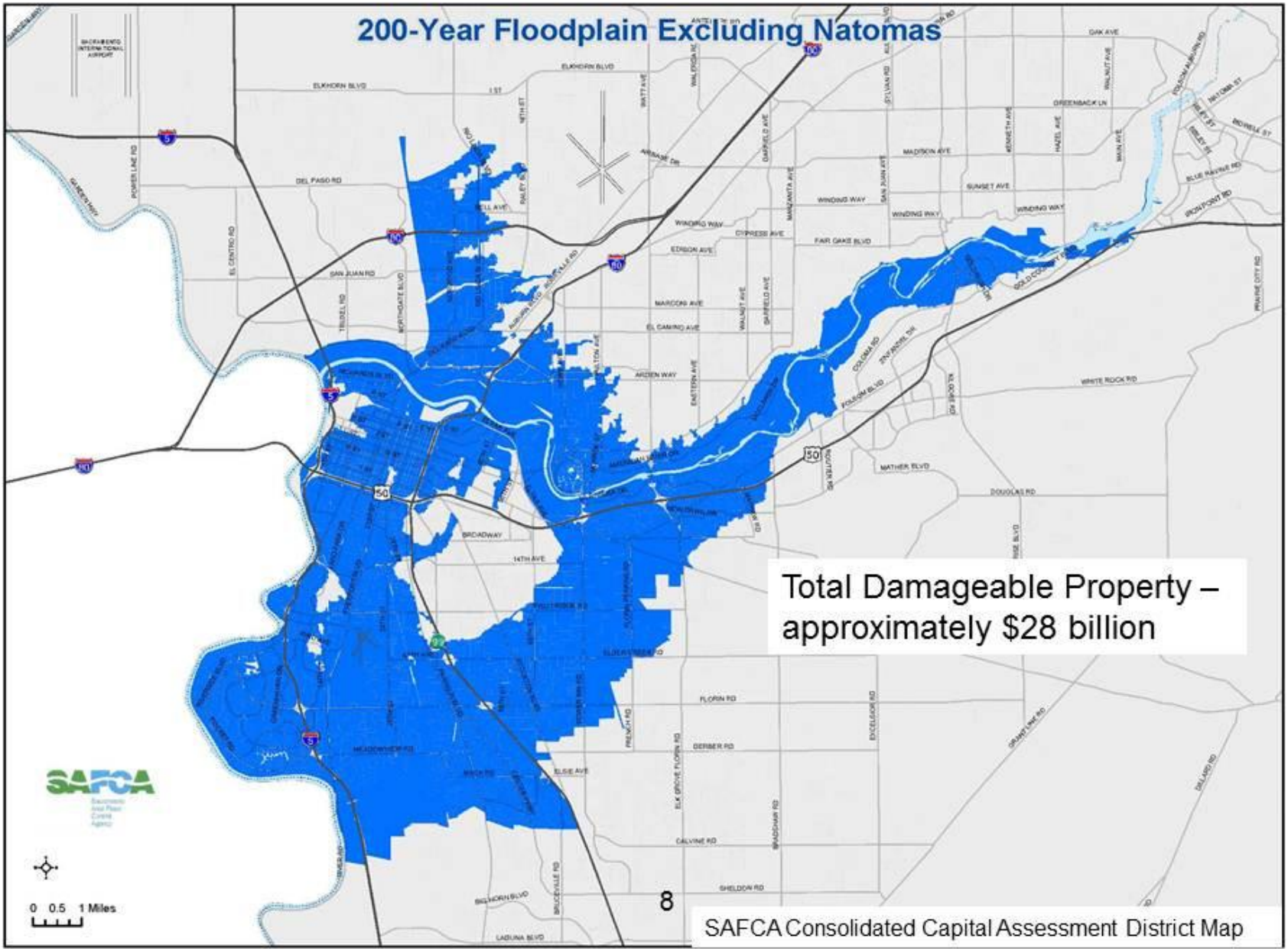
PURPOSE OF DISCUSSION

* Engage key stakeholders in the policy and technical work of the Manual Update.

* Understand stakeholders' interests, concerns and suggestions

*Discuss how best to involve stakeholders in future

FLOOD RISK REDUCTION IN SACRAMENTO AREA


200-Year Floodplain Excluding Natomas
Total Damageable Property – approximately $28 billion
SAFCA
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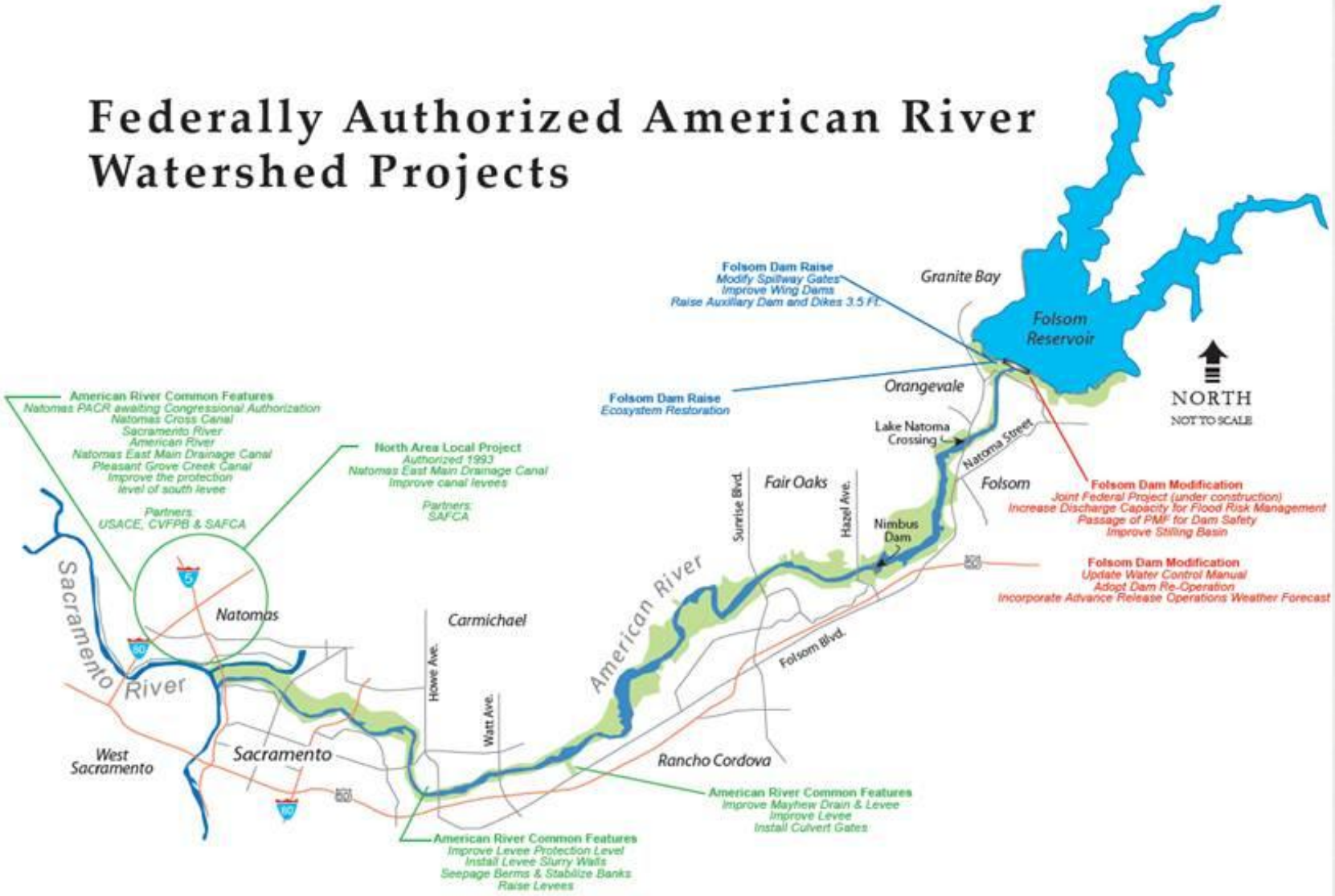
8
SAFCA Consolidated Capital Assessment District Map

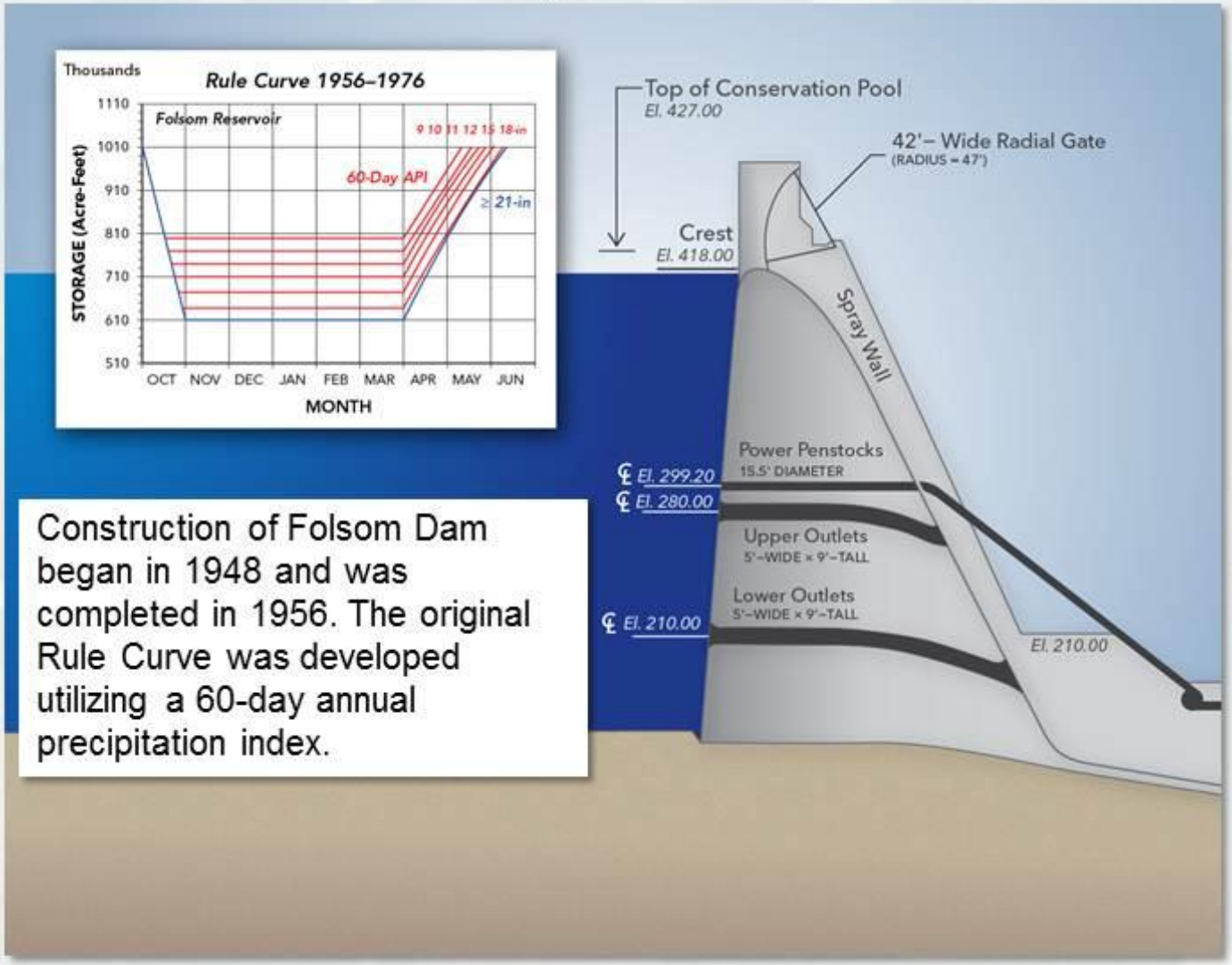
Federally Authorized American River Watershed Projects



FOLSOM DAM BACKGROUND
Past and Present

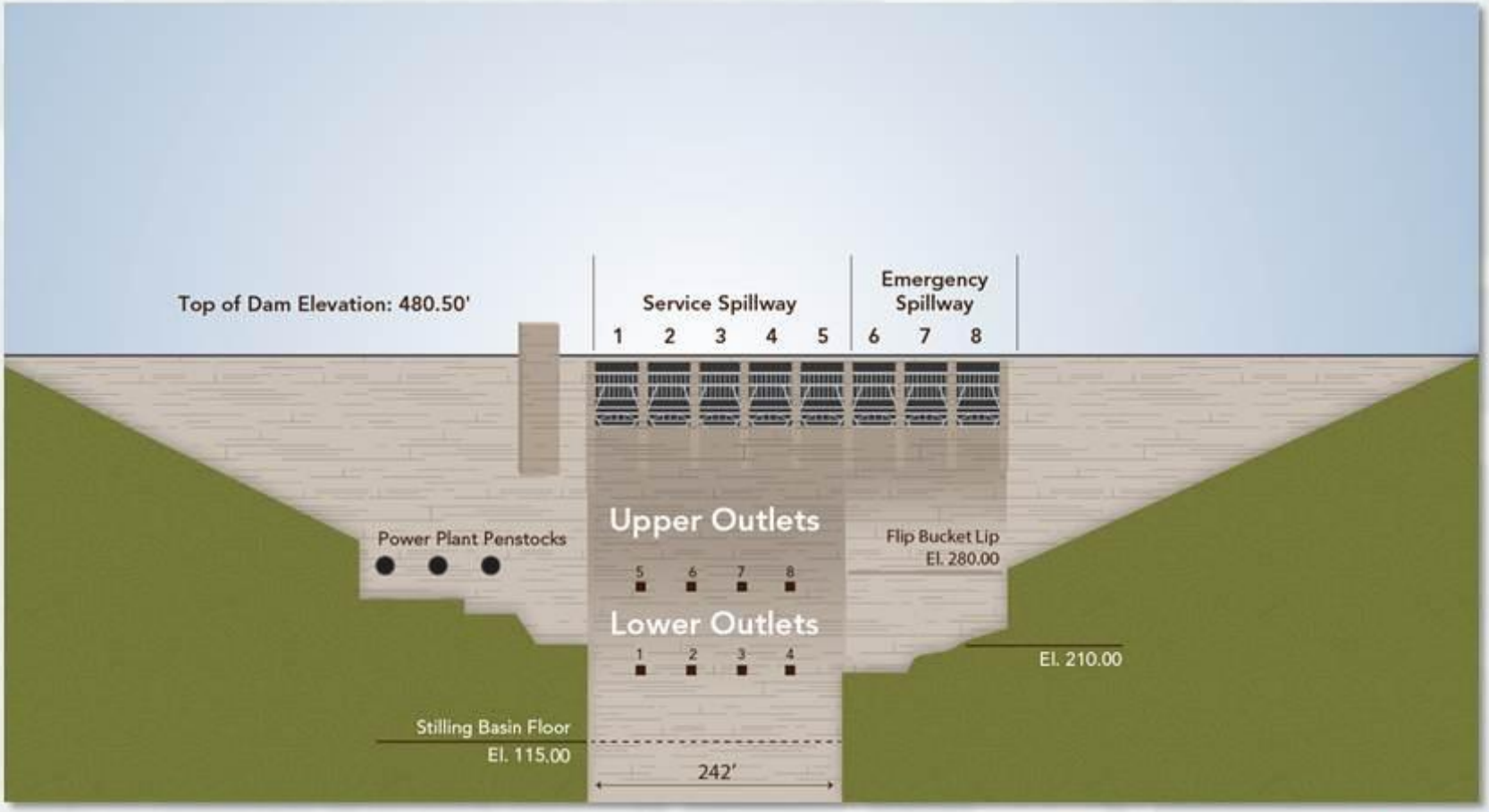
- Construction
- Modifications – Past, Present, Future
- Rule Curve – Past, Present, Future

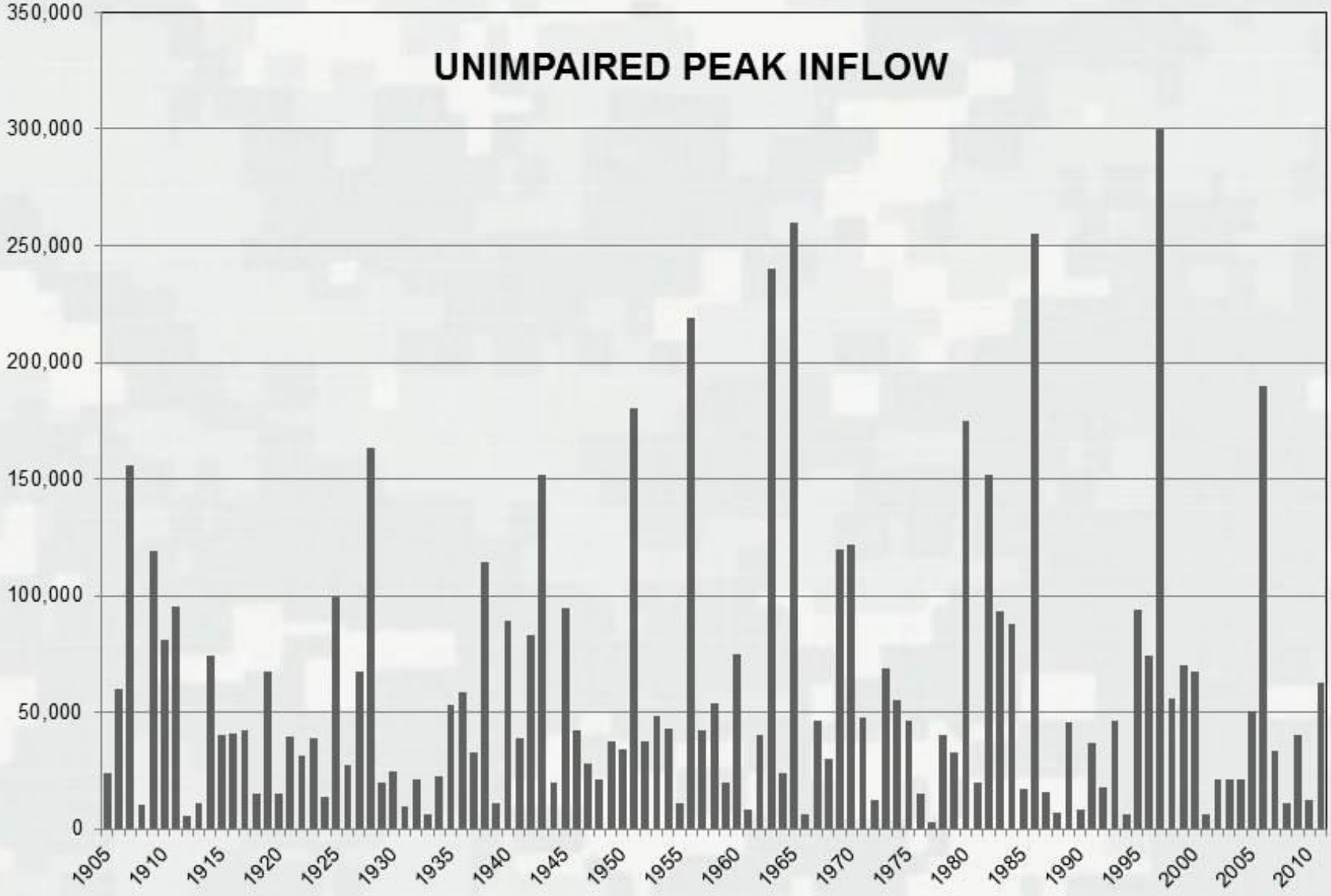
Folsom Dam, As Built - 1956



Construction of Folsom Dam began in 1948 and was completed in 1956. The original Rule Curve was developed utilizing a 60-day annual precipitation index.

Folsom Dam, As Built - 1956




UNIMPAIRED PEAK INFLOW
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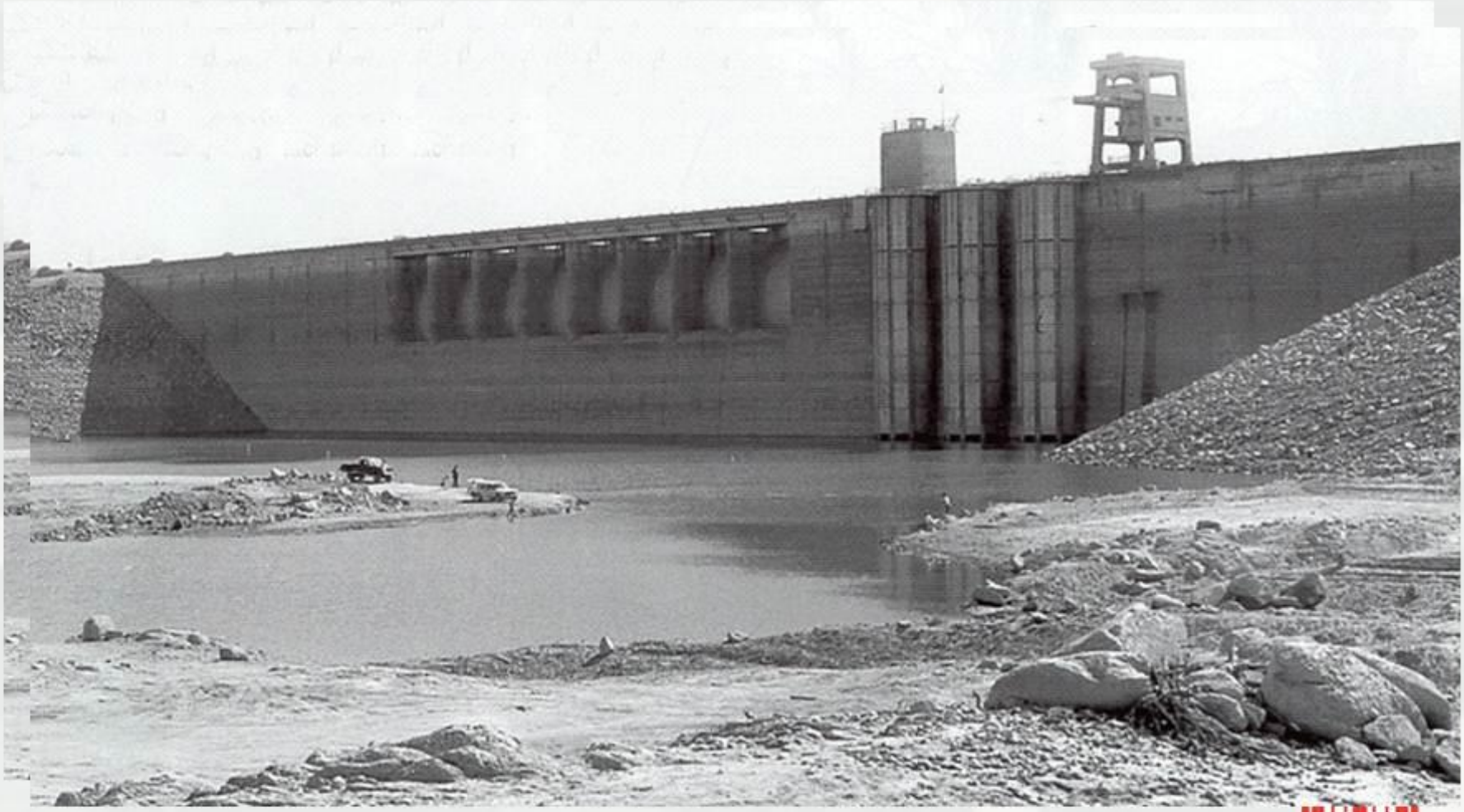
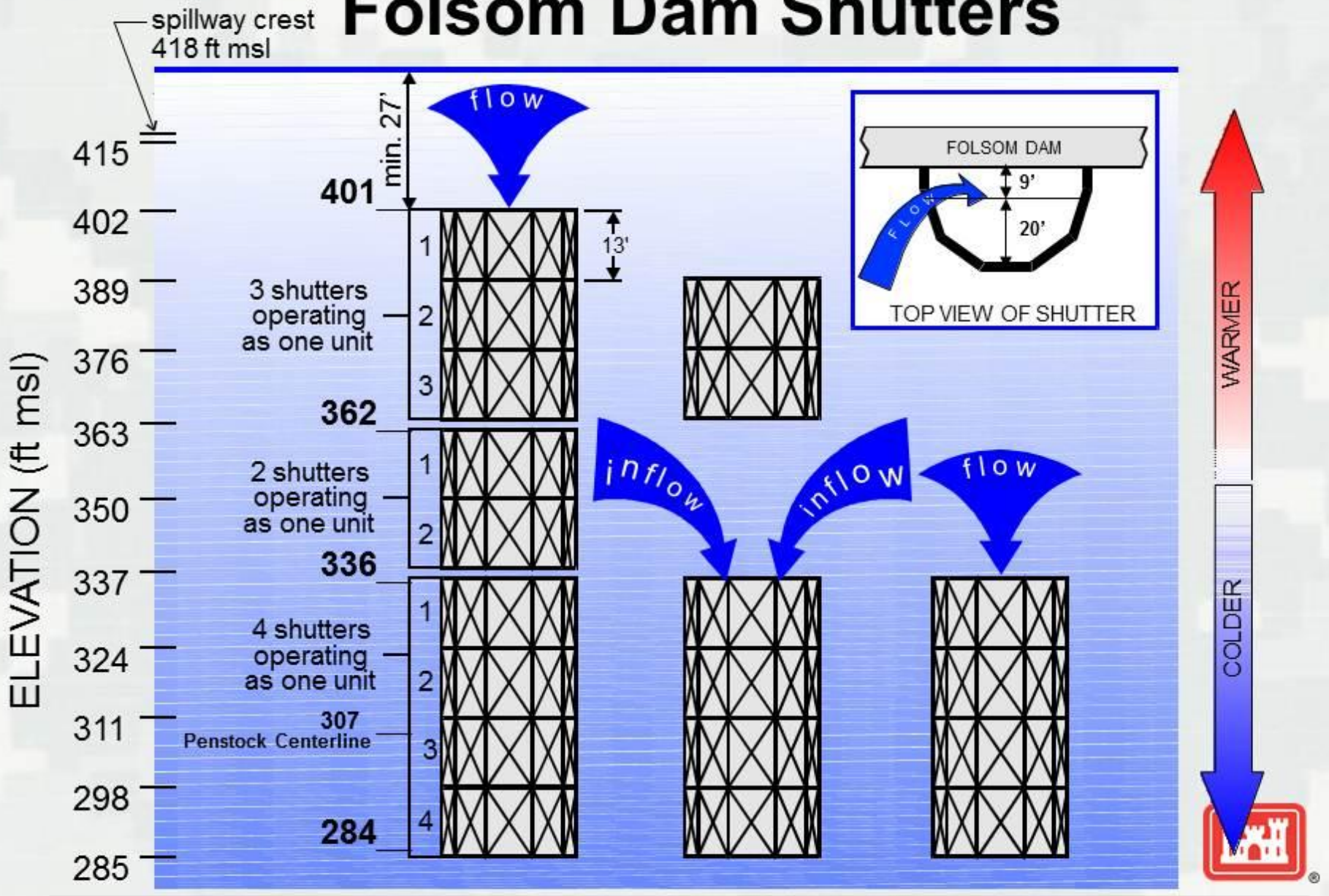
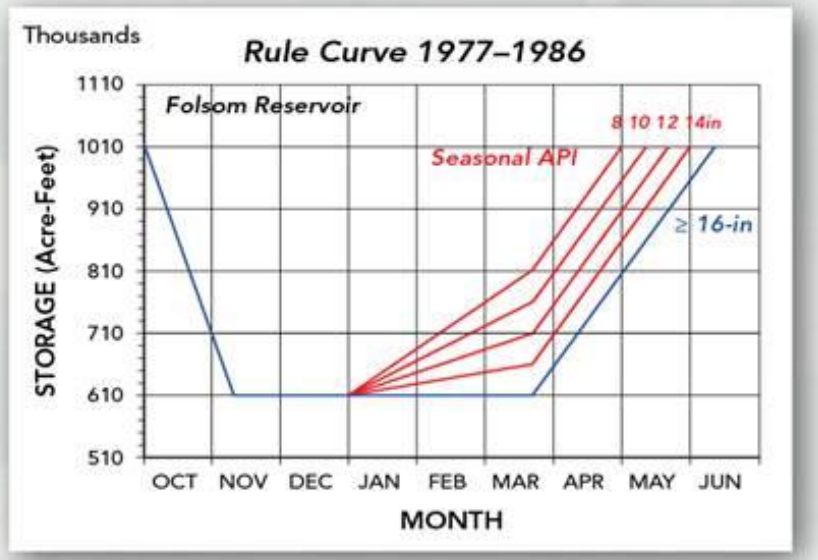
Temperature Shutters on Penstocks for Selective Withdrawal



Folsom Dam Shutters

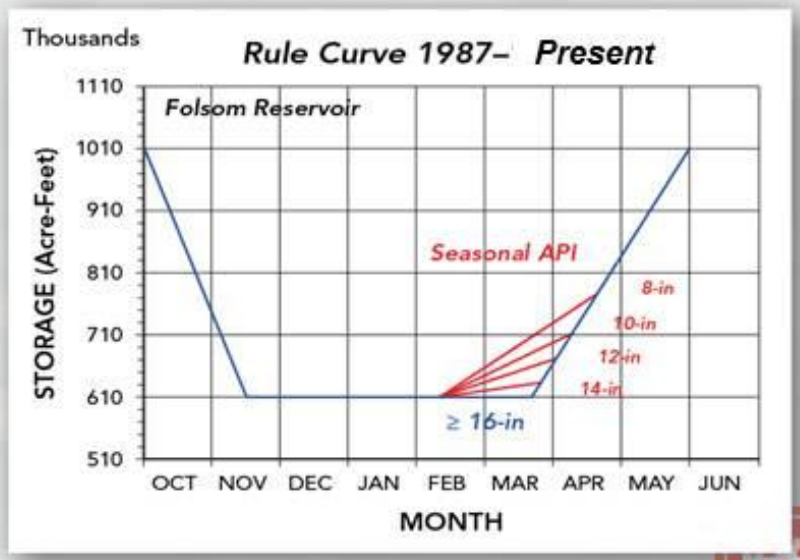


Water Control Manual Updates

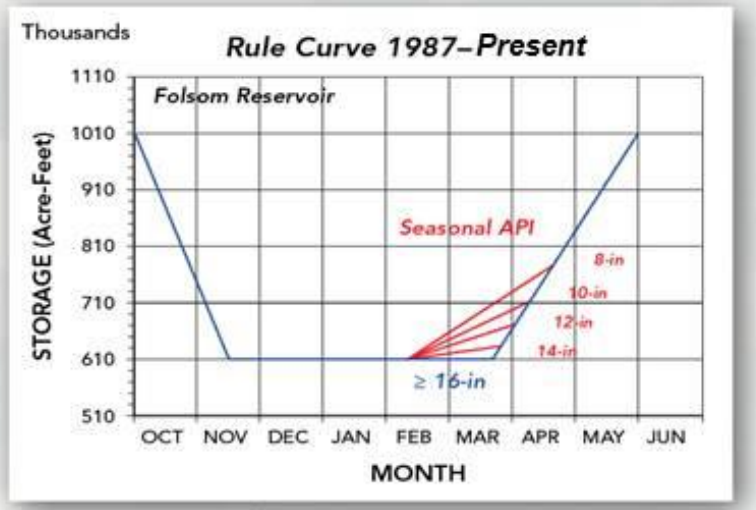


1986 Rule Curve changes include modification to reservoir filling curves starting on February, again based on seasonal precipitation and hydrologic conditions.

The Water Control Manual has been updated twice since construction. 1977 Rule Curve changes include reduction of the Seasonal API and initiation of reservoir filling based on seasonal hydrologic conditions.



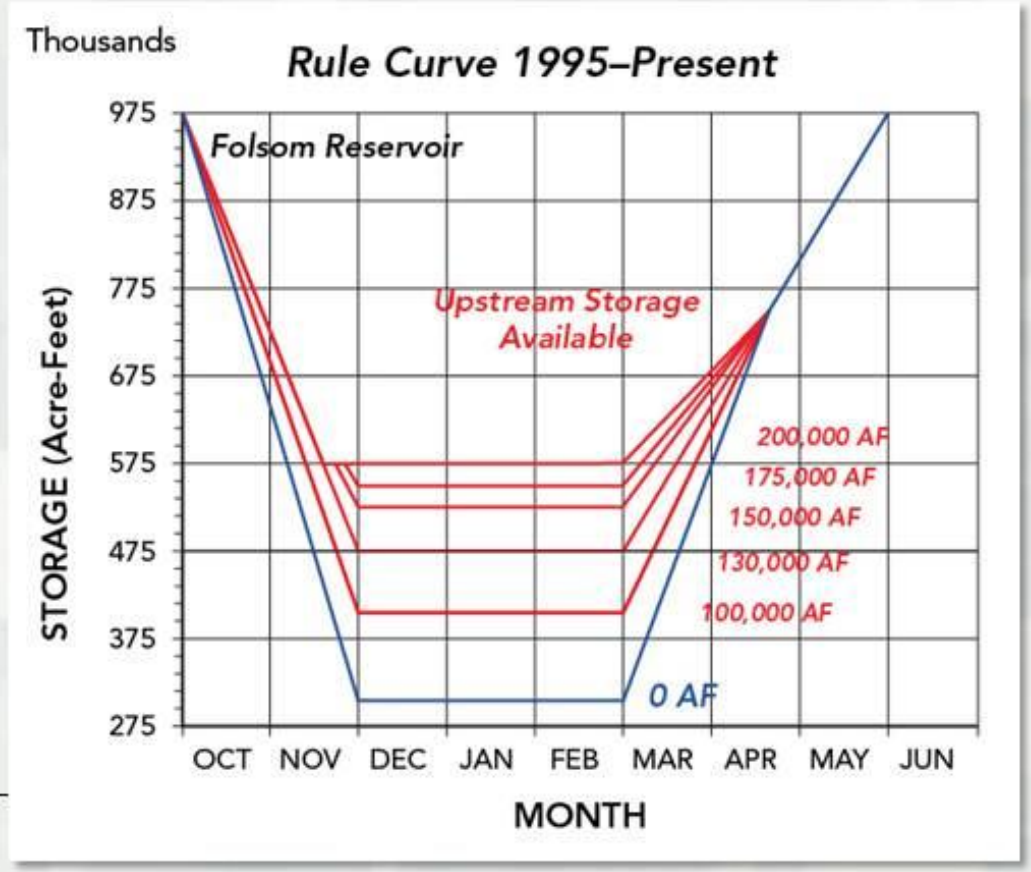
Current Operations



Sacramento Area Flood Control Agency

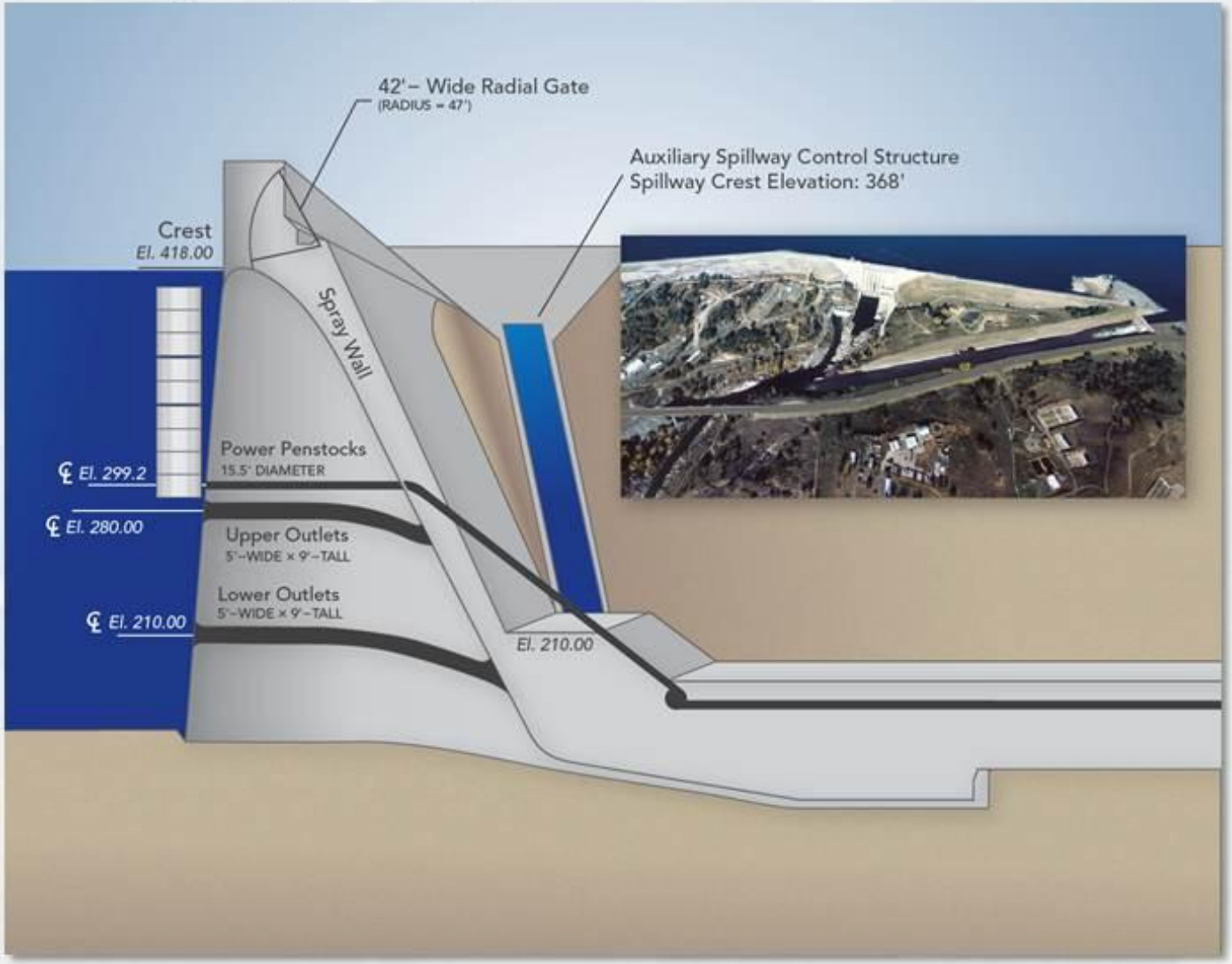
Reclamation
Mid-Pacific Region
Sacramento, CA

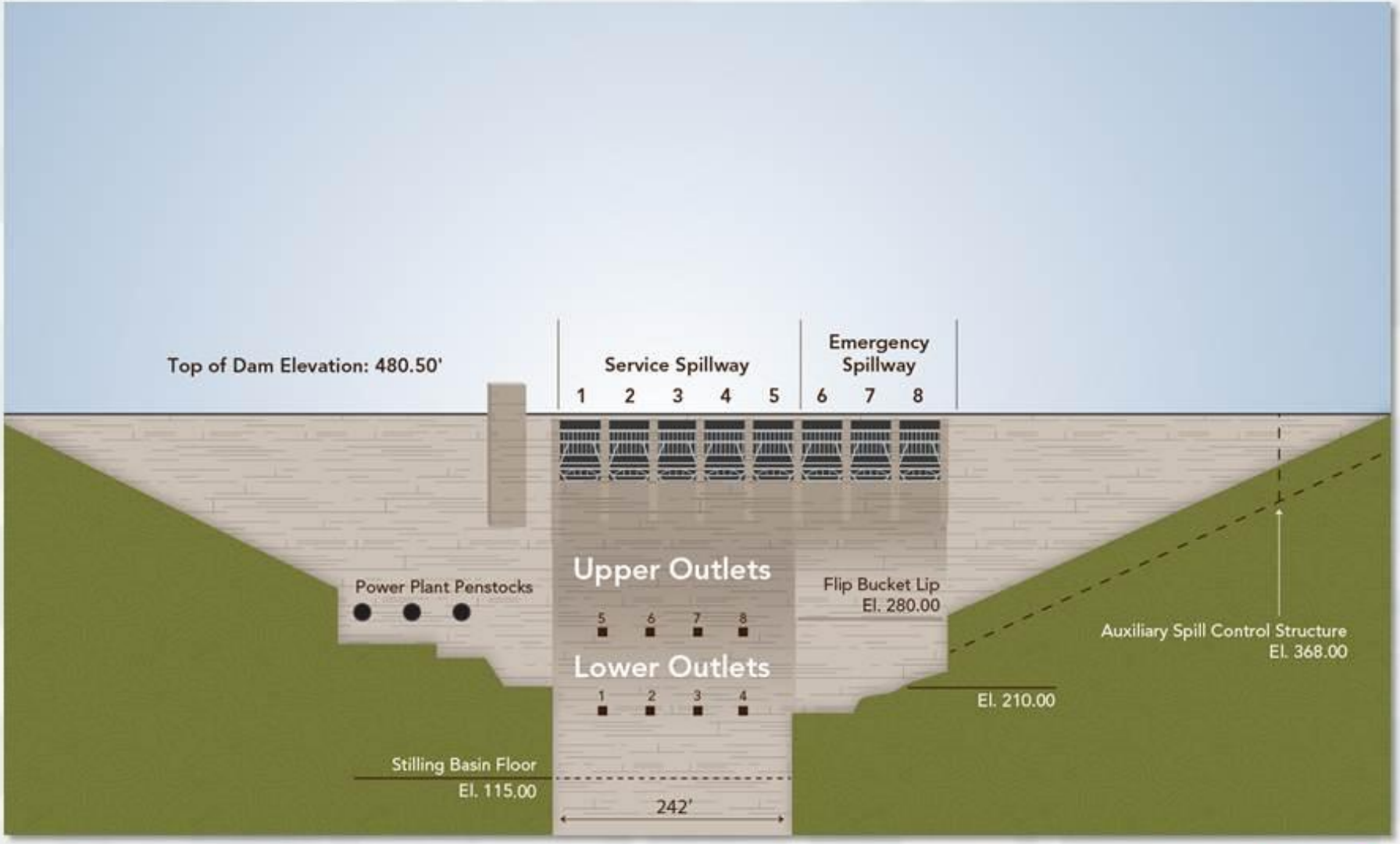
US Army Corps
of Engineers
Sacramento District



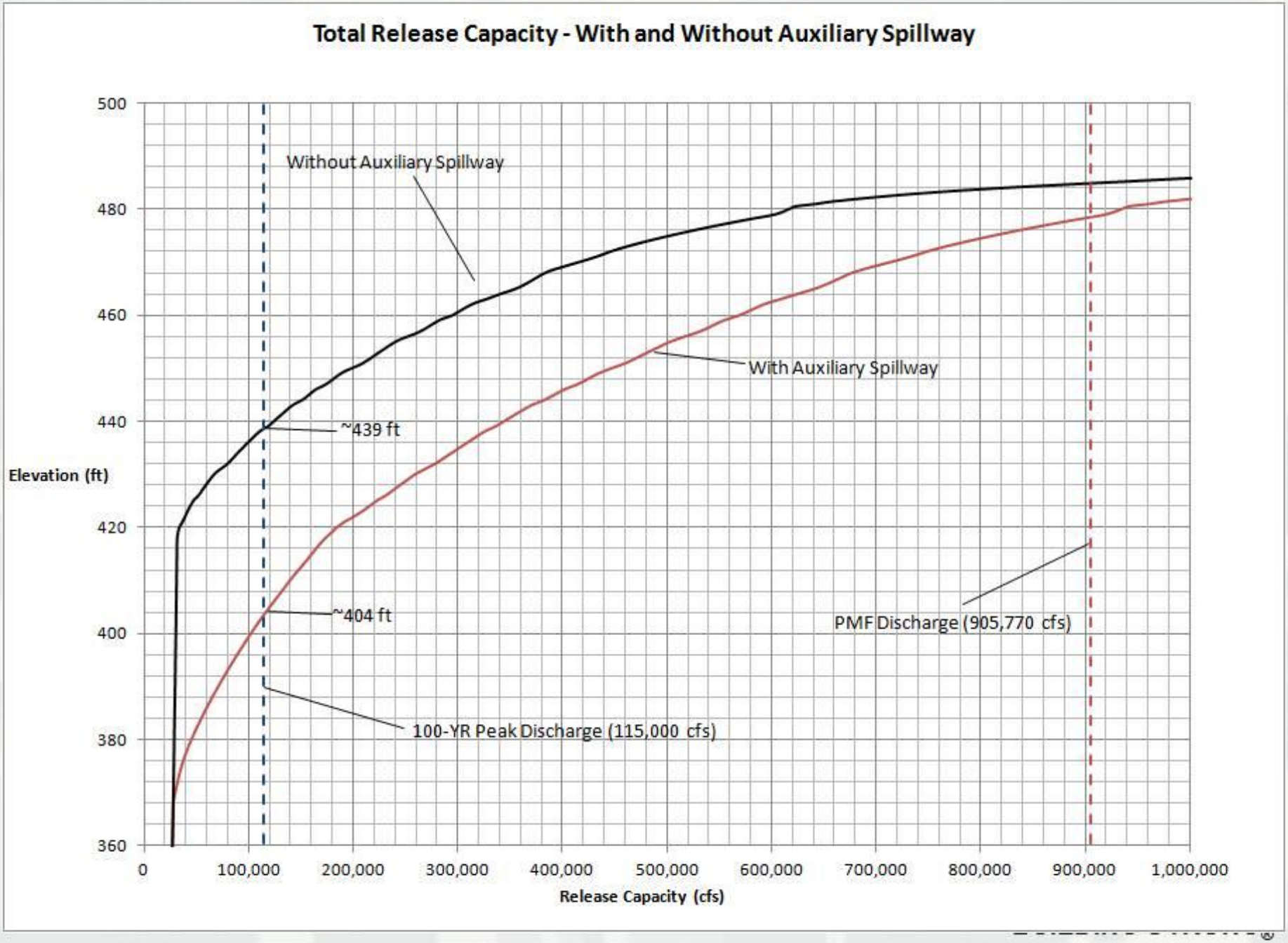
*Requirements of both rule curves are met as part of current operations

Auxiliary Spillway – Current Construction




Top of Dam Elevation: 480.50'
Service Spillway
1 2 3 4 5
Emergency Spillway
6 7 8
Upper Outlets
5 6 7 8
Lower Outlets
1 2 3 4
Power Plant Penstocks
Flip Bucket Lip
El. 280.00
Auxiliary Spill Control Structure
El. 368.00
El. 210.00
Stilling Basin Floor
El. 115.00
242'

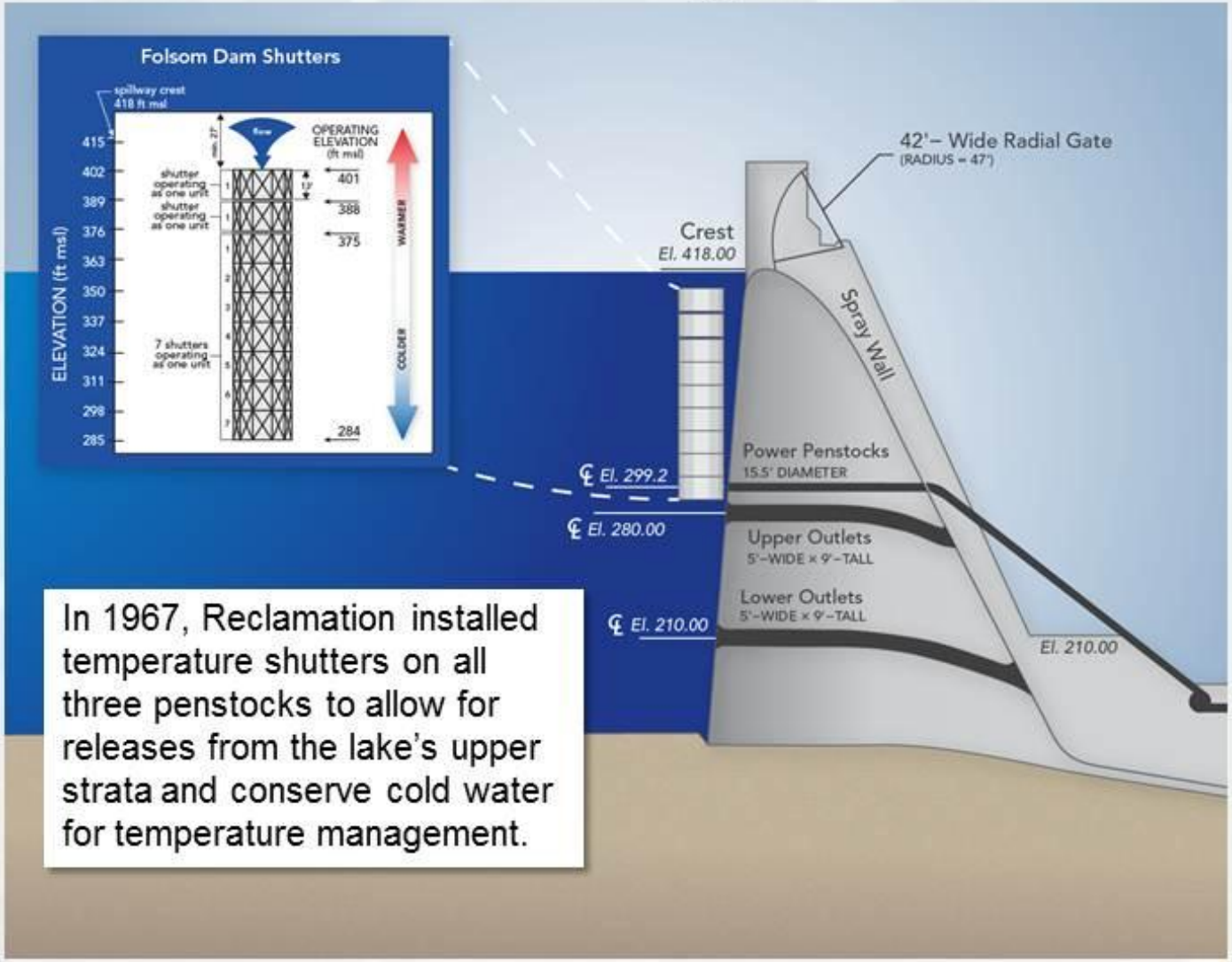
Total Release Capacity - With and Without Auxiliary Spillway



Dam Raise – Future Construction

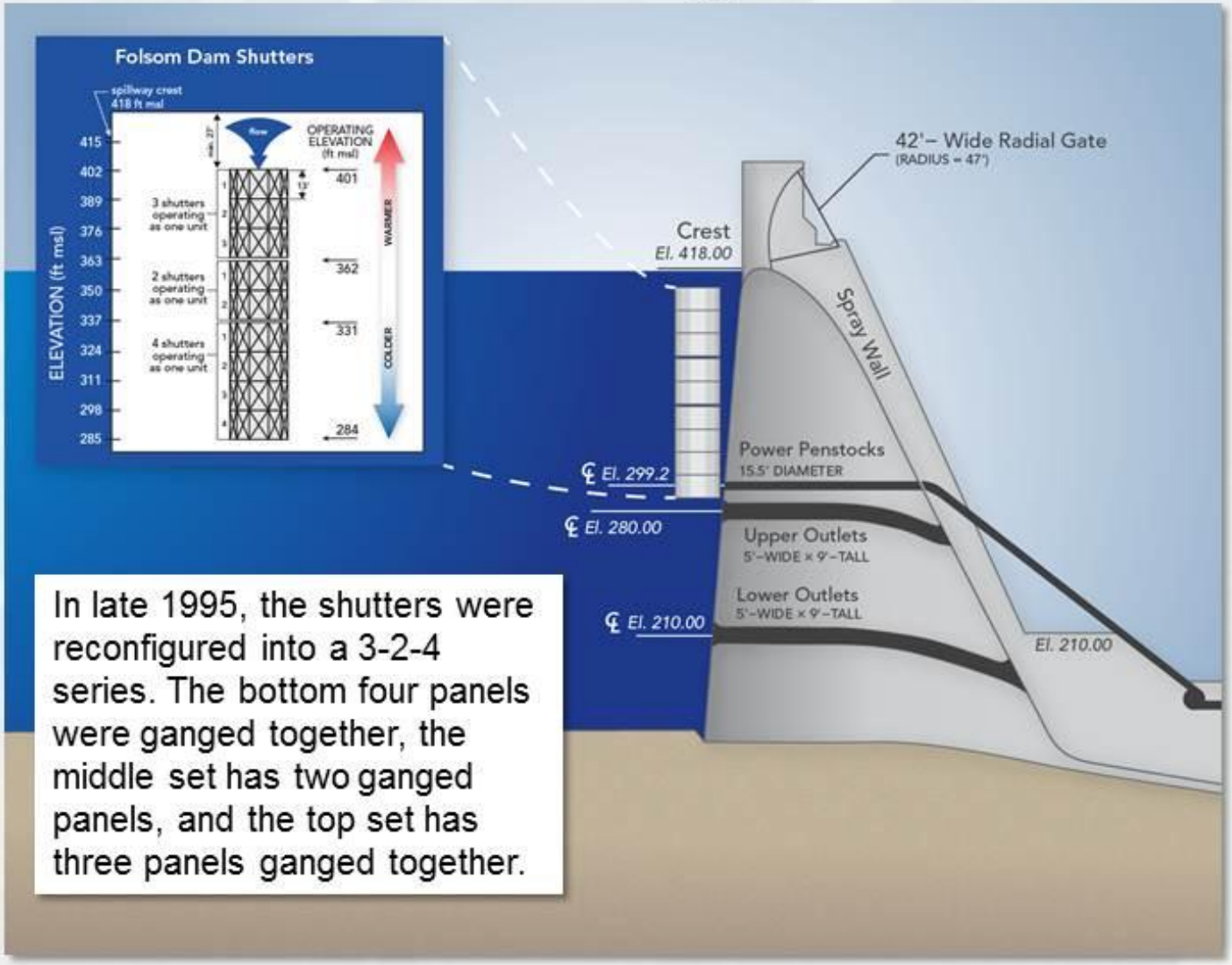
BUILDING STRONG®

1-1-7 Shutter Configuration - 1967



In 1967, Reclamation installed temperature shutters on all three penstocks to allow for releases from the lake's upper strata and conserve cold water for temperature management.

3-2-4 Shutter Configuration - 1995



In late 1995, the shutters were reconfigured into a 3-2-4 series. The bottom four panels were ganged together, the middle set has two ganged panels, and the top set has three panels ganged together.

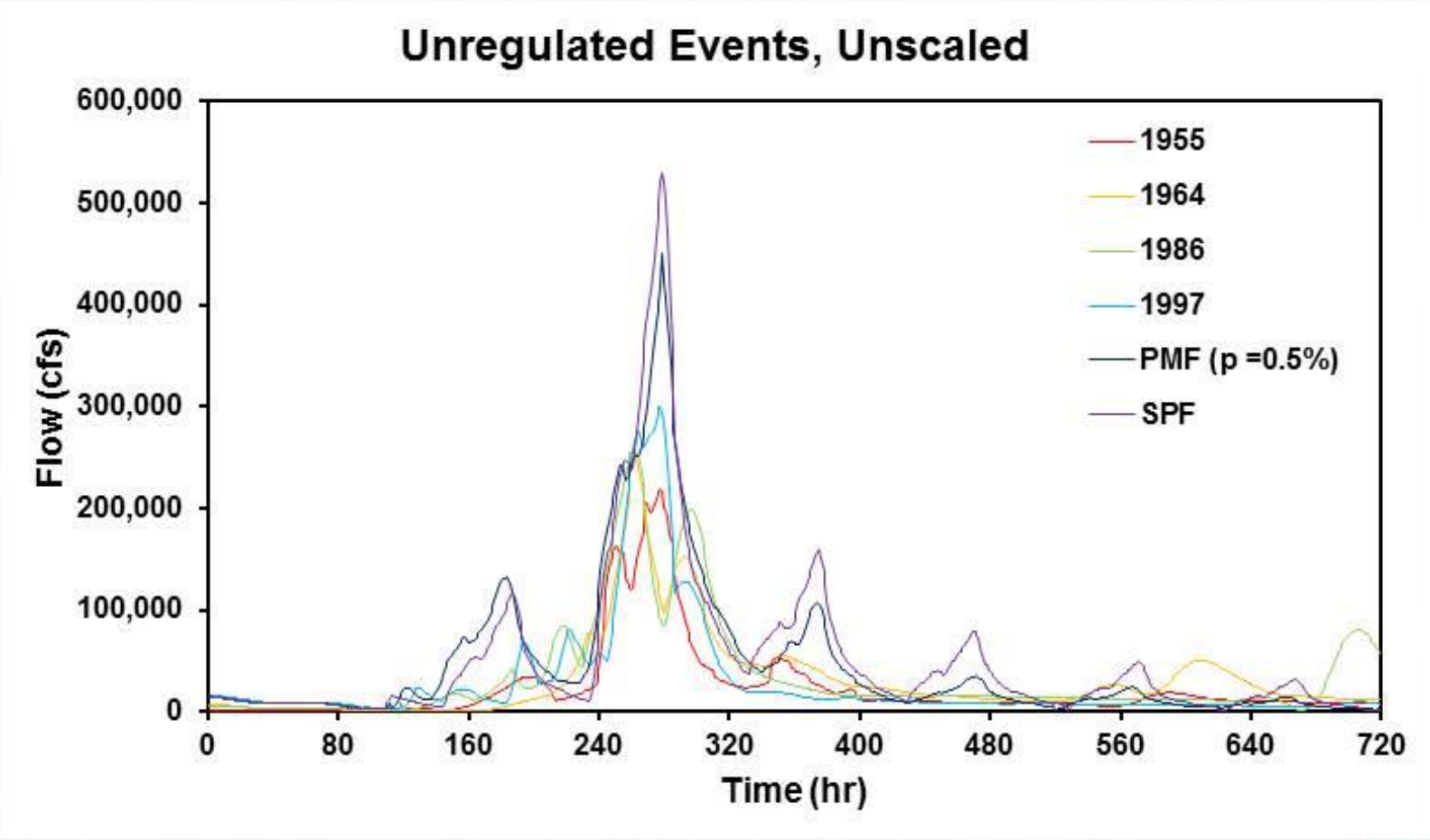
CURRENT PROJECT STATUS

- Hydrology
- Flood Routing Models
- Basin Wetness and Forecasts
- Manual Update Objectives
- Alternatives Development
- Collaboration

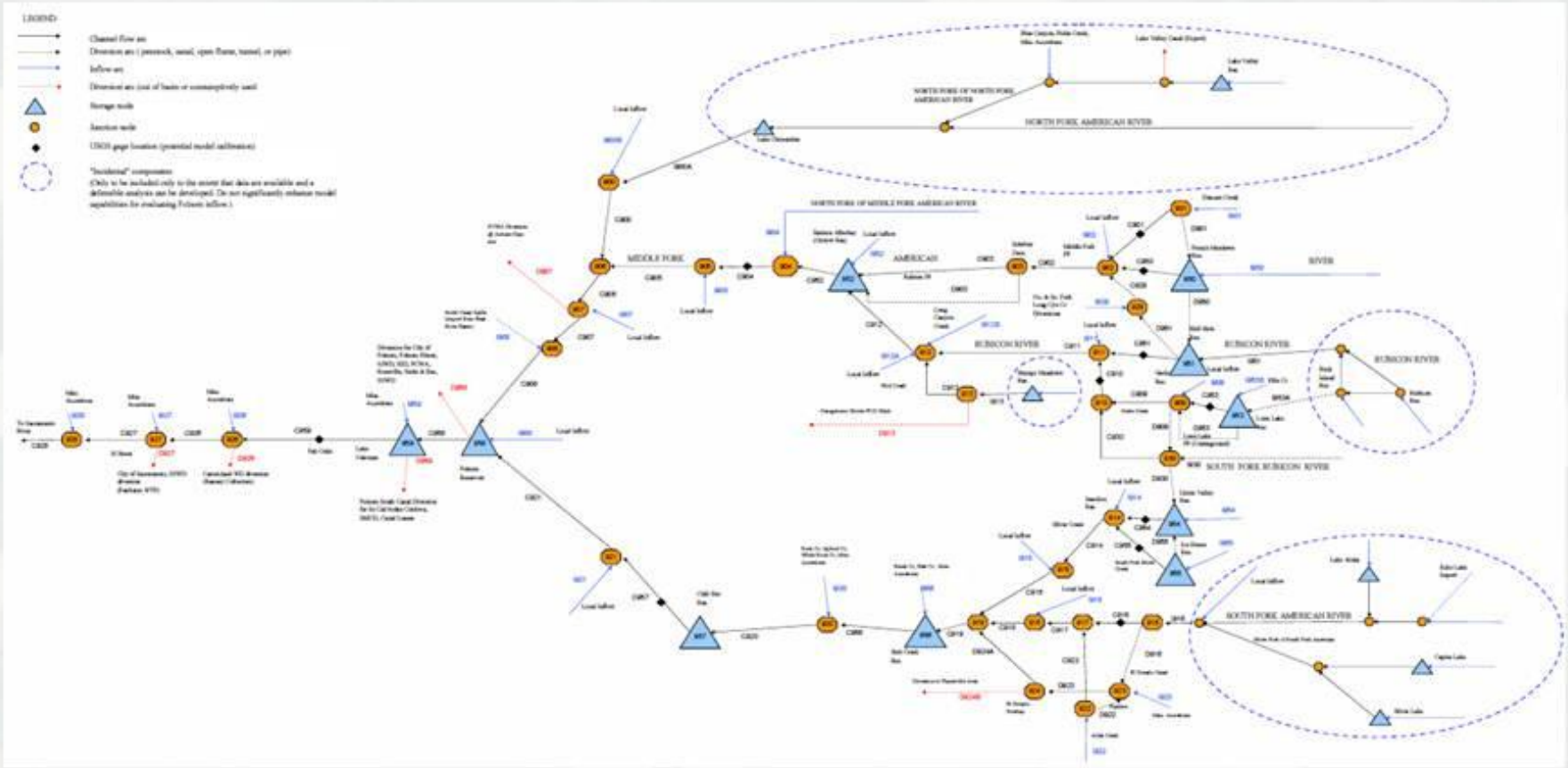
Hydrology

- Models simulate an 86 year period of record (1922 – 2002)
- Models simulate 43 exceedence events (< 1yr → PMF)
- Inflow hydrology is structured around historical patterns:
  '55, '64, '86, '97, SPF, PMF

Hydrology

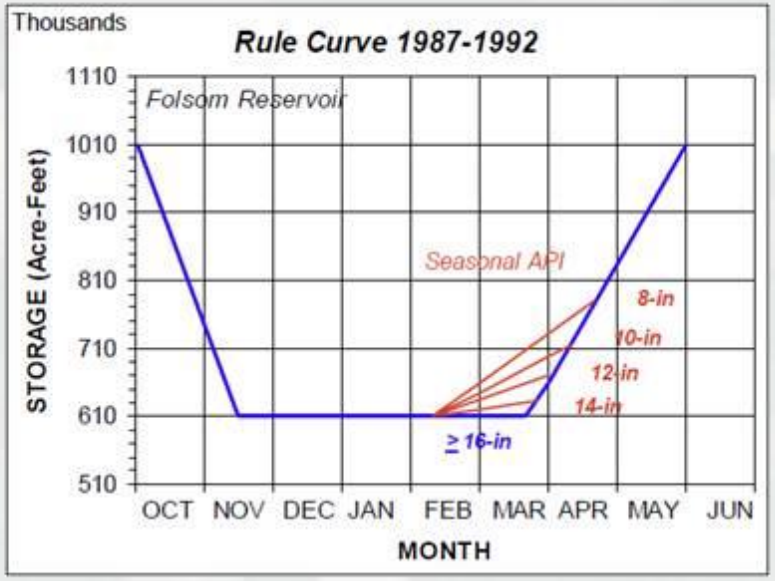

Unregulated Events, Unscaled
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow (cfs)
0
80
160
240
320
400
480
560
640
720
Time (hr)
1955
1964
1986
1997
PMF (p =0.5%)
SPF

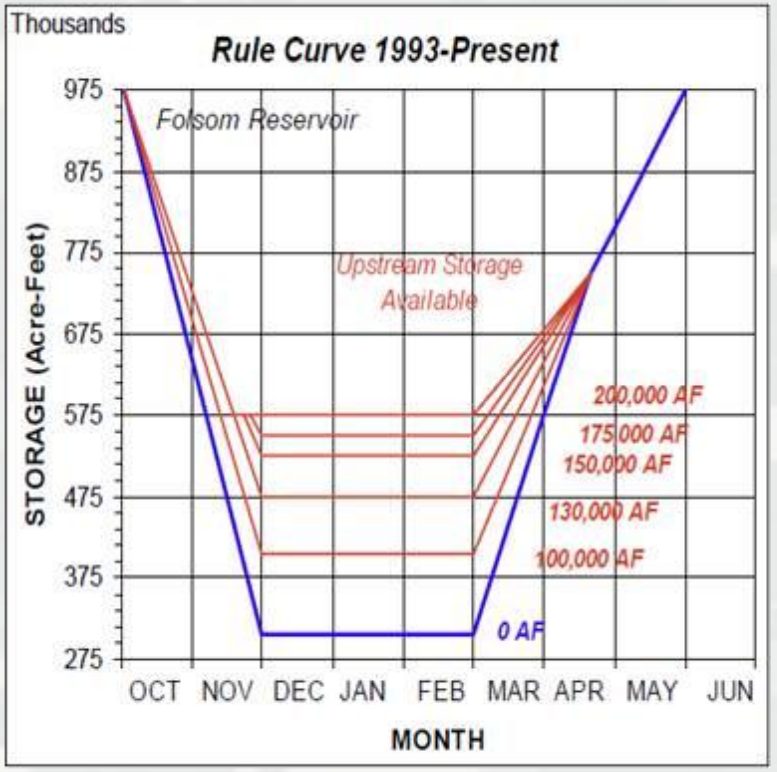
Flood Routing Models



Loon Lake, Ice House, Union Valley – Hell Hole, French Meadows

Basin Wetness & Forecasts





Manual Update Objectives

- Pass the Probable Maximum Flood (PMF) while maintaining 3 feet of freeboard below the top of dam.
  - Meets Reclamation's Dam Safety Requirements.

Manual Update Objectives

- Control a 1/100 annual chance flow (i.e. “the 100-year flood”) to a maximum release of 115,000 cubic feet per second (cfs).
  - ►Supports FEMA levee accreditation along the American River.

Manual Update Objectives

- Control a 1/200 annual chance flow (i.e. “the 200-year flood”) to a maximum release of 160,000 cfs.
  - ►Supports California urban area flood protection standards.

BASIS OF ALTERNATIVE DEVELOPMENT

- Flood Storage: As authorized by Congress, 400/600 TAF
- Outlet Configuration: Existing outlets and auxiliary spillway
- TCD Configuration: 3-2-4 shutter configuration
- Operating Rules: Rule curves that derive flood storage reserve requirements from some combination of the following:
  - Storage Reserve in Folsom Reservoir
  - Basin Wetness
  - Forecast Information

ENVIRONMENTAL EFFECTS ANALYSIS

NEPA and CEQA

Corps of Engineers

NEPA Lead Agency

Central Valley Flood Protection Board

CEQA Lead Agency

Bureau of Reclamation

NEPA Cooperating Agency

Department of Water Resources

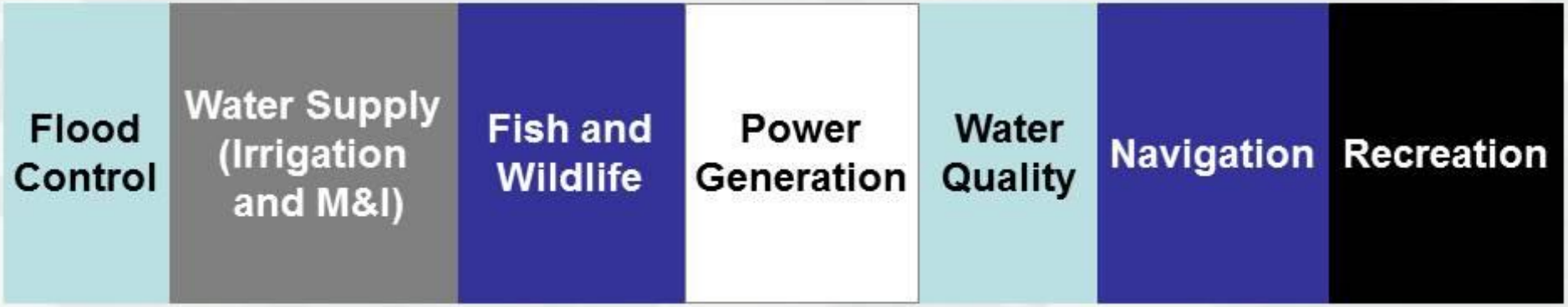
CEQA Responsible Agency

Sacramento Area Flood Control Agency

CEQA Responsible Agency

Effects Analysis Overview

- Environmental effects analyses will be centered around effects flood management operations alternatives would have on the other Folsom Dam Project purposes:



Effects Analysis Overview

- Based on previous environmental analysis approach for past flood management operation changes (e.g., Long-term Reop)
- Key resources: water supply, power supply, fisheries, water quality, terrestrial resources, and recreation

Effects Analysis

- Based primarily on output from the CalSim II model, but will include other models, such as:
  - Water temperature models (Reclamation and Water Forum)
  - Fish mortality models (Reclamation)
  - Delta Simulation Model 2 (DSM 2)
  - Economic models (SWAP, LCPSim, OMWEM)
  - Power Generation (LTGen and SWPGen)
  - Others

Water Resource Management Conditions for Effects Evaluation

- CalSim II Build from 2011 DWR Delivery Reliability Report subject to concurrence between USACE, Reclamation and DWR
  - ►Base model concurrence in October 2012
- Any minor modifications to base model assumptions will be further discussed by the partner agencies

Folsom Reservoir
Flood Operation and Configuration
Baseline Conditions-
Pre-Existing Condition

- Flood Storage: 400 TAF (Fixed)
- Outlet Configuration: Existing (No Auxiliary Spillway)
- TCDs: 1-1-7 Shutter configuration
- Operations: 1987 Water Control Manual

Folsom Reservoir
Flood Operation and Configuration
Baseline Conditions-
CEQA Existing Conditions

- Flood Storage: 400/670 TAF
- Outlet Configuration: Existing (No Auxiliary Spillway)
- TCDs: 3-2-4 shutter configuration
- Operations: Current

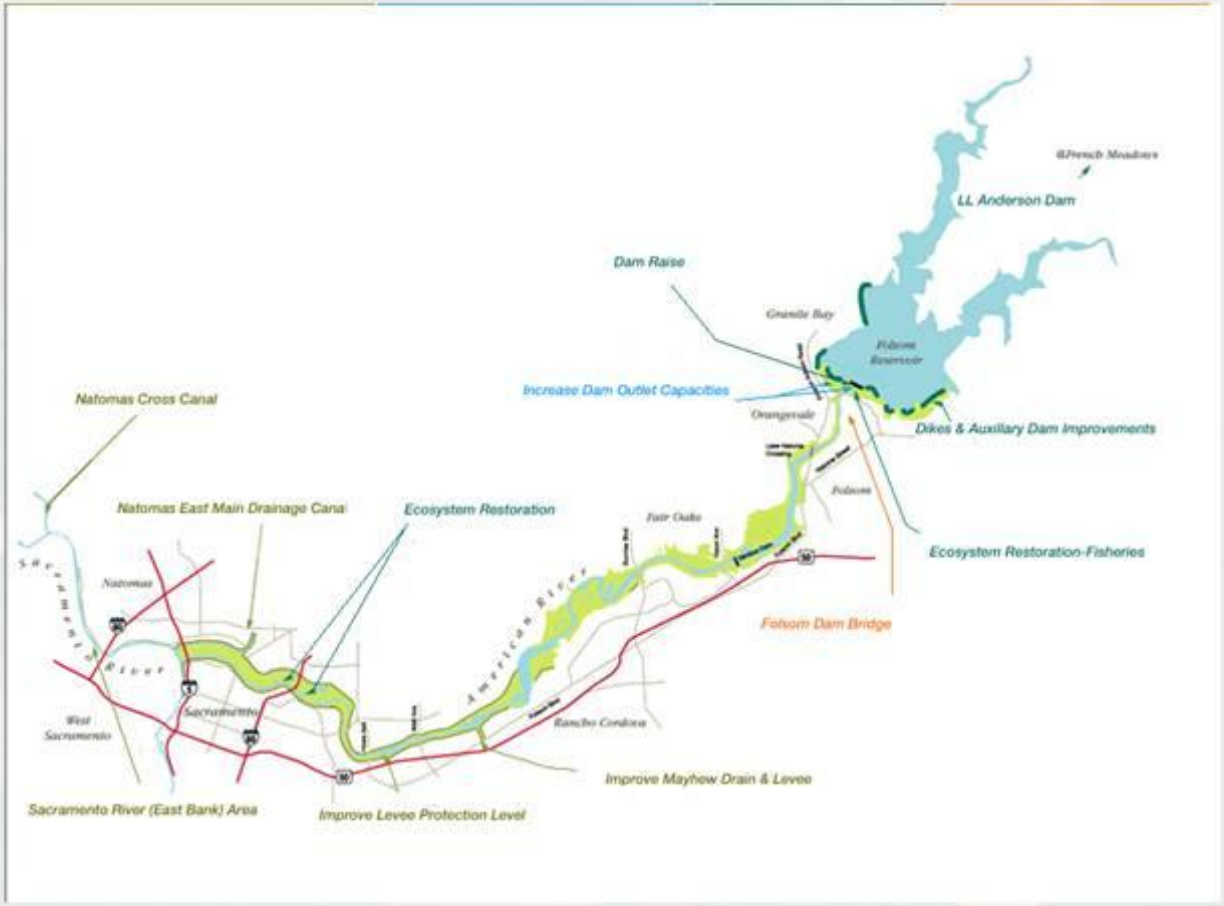
Folsom Reservoir
Flood Operation and Configuration
Baseline Conditions-
NEPA Future No Action/No Project

- Flood Storage: 400/670 TAF
- Outlet Configuration: Existing plus Auxiliary Spillway (JFP)
- TCDs: 3-2-4 shutter configuration
- Operations: Current

Approach to Effects Analysis

- Comparison of alternatives to baseline conditions
  - ► Long-term average values (period of record) and sorted by water year type
- Closer evaluation of effects in Lower American River
- Screening level evaluation for more distant parts of CVP/SWP system followed by detailed evaluation, as needed

Local Project Area



Regional Project Area

Tier 3 Work Plan

- Roadmap for effects analysis
- Developed with input from partners, NMFS, FWS, NCPA, DFG, and State Parks at Tier 3 Working Group Meetings

Ag, M&I Water Supply

Model Parameter	Index Location
Central Valley Project (CVP) deliveries (TAF)	Refuges north and south of Delta (NOD, SOD, respectively)) Lower American River Water Purveyors City of Folsom Sacramento Suburban Water District Placer County Water Agency City of Roseville San Juan Water District and Consortium In Sacramento San Juan Water District South Sacramento County Agriculture Sacramento Municipal Utility District Carmichael Water District City of Sacramento Municipal and Industrial (M&I) Contractors (NOD) Agricultural (Ag) Contractors (NOD) Settlement Contractors (NOD) M&I Contractors south of Delta (SOD) Ag Contractors (SOD) Exchange Contractors (SOD)
State Water Project (SWP) deliveries (TAF)	Upper Feather River Delta Exports
End-of- May Storage (TAF)	Shasta, Oroville, and Folsom Reservoirs
End-of-September Storage (TAF)	Shasta, Oroville, and Folsom Reservoirs

Power

- CalSim II reservoir storages and releases applied to LTGen and SWPGen models
- Evaluation of:
  - Total capacity, quantity and timing of energy production
  - Any changes in Project use
  - Net capacity and energy at load center
  - Effects to peaking operations at Folsom Dam

Fisheries Resources

- Effects analysis based on river flows, lake levels and water temperature modeling.
- Focus on special-status and recreationally important fish species.

Lower American River

Species	Status
Central Valley spring-run Chinook salmon (non-natal rearing only)	Federally and state threatened
Central Valley fall-/late fall-run Chinook salmon	Federal species of concern State species of special concern Recreational and/or commercial importance
Central Valley steelhead	Federally threatened Recreational and/or commercial importance
Southern DPS of North American green sturgeon	Federally threatened State species of special concern
Hardhead	State species of special concern
River lamprey	State species of special concern
Pacific lamprey	Federal species of concern
Sacramento splittail	State species of special concern
Sacramento-San Joaquin roach	State species of special concern
American shad	Recreational and/or commercial importance
Striped bass	Recreational and/or commercial importance
Warmwater game fish*	Recreational and/or commercial importance

Fisheries Resources

Tool	Parameter Evaluated	Location
CalSim II	End-of-month reservoir water surface elevation End-of-month reservoir storage Average monthly flow	American River watershed CVP/SWP region
CalSim II	Delta Outflow X2 Old and Middle Rivers (OMR) Flows	Delta
Upper Sacramento River Daily Operations Model (USRDOM)	Daily average flows	Upper Sacramento River
Reclamation Water Temperature	Average monthly water temperature	American River watershed CVP/SWP region
Upper Sacramento River Water Quality Model (USRWQM)	Daily average water temperature	Upper Sacramento River
DSM 2	Hourly electrical conductivity ([EC], indicative of salinity) Hourly water temperature	Delta
HEC-RAS	Daily average hydraulics Daily average and hourly temperature	Lower American River
Flow-Habitat Relationships	Average monthly Chinook salmon and steelhead spawning habitat availability (Weighted Useable Area [WUA])	Lower American River Lower Feather River Upper Sacramento River
Flow-Habitat Relationships	Useable Flooded Area (UFA) – splittail spawning habitat	Lower American River Lower Feather River
Reclamation Salmon Mortality Model	Water temperature-related early life stage mortality of all runs of Chinook salmon	Lower American River Lower Feather River Upper Sacramento River Trinity River
Export-Salvage Density Relationships	Estimated salvage of fish	CVP and SWP south Delta pumping facilities
Interactive Object-Oriented Simulation (IOS)/Delta Passage Model (DPM)	Winter-run Chinook salmon life cycle	Sacramento River and Delta
Sacramento River Ecological Flow Tool (SacEFT)	Steelhead spawning habitat availability, redd dewatering, redd scour, juvenile habitat availability, juvenile stranding, and egg-to-fry survival Green sturgeon water temperature-related egg mortality	Upper Sacramento River
SALMOD	Juvenile Chinook salmon production	Sacramento River

Water Quality

- Parameters evaluated as part of the Fisheries analysis:
  - Water temperature in the Lower American River
  - Salinity dynamics in the Delta
- Salinity dynamics in the Delta
  - addressed at a screening level (changes in X2, total Delta inflow/outflow, and the E/I ratio).
  - Substantial changes may warrant more detailed evaluation using DSM2
- Salinity quality at key in-Delta points for local Ag and M&I supplies

Terrestrial Resources

- Shoreline understory and wooded areas.

- Reservoir parameters:
  - ► water surface elevations
- Riverine parameters:
  - ► Flow

Recreation

- Primary focus is Folsom Lake and Lower American River

- Folsom Lake
  - Water surface elevation as it relates to access, inundation, aesthetics, and time of year

- Lower American River
  - Flows and timing

Recreation

Reductions in water surface elevations for accessibility and safety thresholds evaluated to identify significant effects to recreation

Model Parameter	Index Location
Reservoir Water Surface Elevations	Trinity Shasta Keswick Whiskeytown Oroville Folsom
Flow	Lower American River at Nimbus Lower American River below H Street Sacramento River below Keswick Sacramento River below Freeport Feather River below Thermalito Afterbay

Next Steps

Questions and Comments

Appendix 4

Power Point Presentation
February and March 2013 Stakeholder Meetings

Note Regarding Appendix 4: The information in this presentation was current as of the date listed. As the project progresses, information may evolve and change over time. For more current information, see http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamAuxiliarySpillway.aspx. Readers can access material on Folsom Dam Water Control Manual Update on the lower right side of the page.

Folsom Dam Water Control Manual Update

Stakeholder Discussion

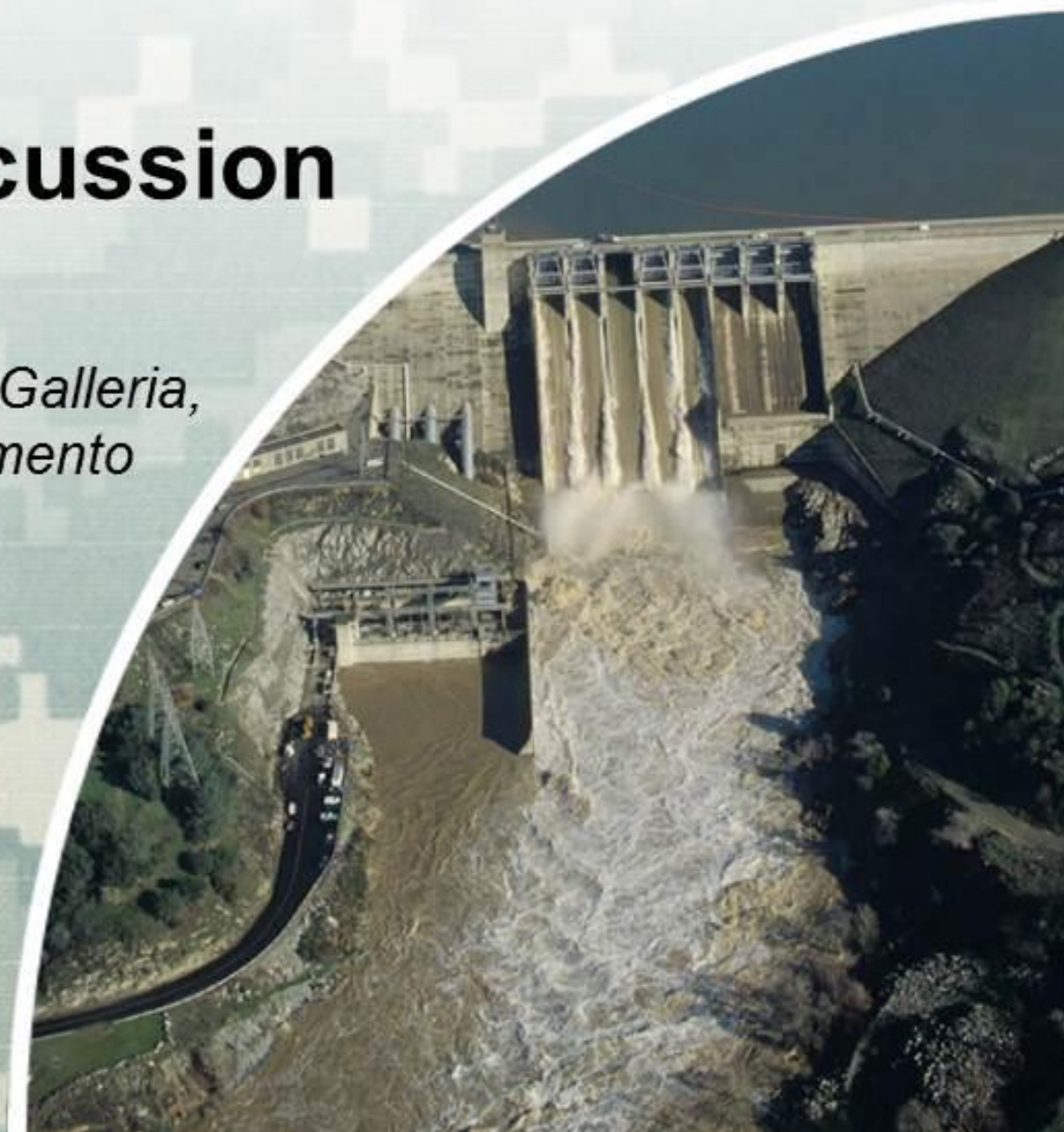
March 28, 2013

Location: Tsakopoulos Library Galleria, East Room, 828 I Street, Sacramento

Reclamation
Mid-Pacific Region
Sacramento, CA

Sacramento Area
Flood Control Agency

US Army Corps of Engineers
BUILDING STRONG®



WELCOME AND INTRODUCTIONS

PURPOSE OF MANUAL UPDATE

- Revise operation rules for Folsom Dam to reduce flood risk based on the capabilities of the Folsom Joint Federal Project (JFP).
- Reflect operational capabilities created by improved weather forecasts.
- Potentially reduce the volume of flood control reservation in Folsom Reservoir at any particular time by comparison to the operations that have been in effect since 1995.

PURPOSE OF TODAY'S SESSION

- Review project schedule
- Present/discuss stakeholder assessment
- Discuss stakeholder engagement plan
- Present/discuss technical update
- Discuss next steps

PROJECT MILESTONE SCHEDULE

Oct 2012	*NEPA/CEQA Initial Public Scoping*
Apr 2012–Aug 2013	Develop and Run Existing Condition Reservoir Routing Models
Apr 2012–Jul 2013	*Stakeholder Input for Existing Condition Models*
Jun 2013–Dec 2013	Develop and Run Future without Project Conditions Models
Nov 2013–0ct 2014	*Stakeholder Input for Future without Project Conditions*
Sept 2013–Sept 2014	Establish Existing System Water Operations Conditions
Jun 2013–Apr 2014	*Stakeholder Input for Existing Conditions*
Oct 2013–Sept 2014	Develop and Run With Project Alternative Models
Oct 2013–Aug 2014	*Stakeholder Input for Project Alternative Models*
Jan 2014–May 2014	Establish Future without Project Environmental Condition
May 2014	In Progress Review Conference- SPD/USACE HQ
Jan 2014–Feb 2015	Establish with Project Environmental Conditions and carry out Environmental Effects Analysis for With-Project Alternatives
Jan 2014–Dec 2014	*Stakeholder Input for with Project Environmental Conditions and Effects Analysis for With Project Alternatives*
Jan 2015–Mar 2015	Identification of Recommended Plan with Input from Stakeholders
Jul 2015	In Progress Review Conference- SPD/USACE HQ
Nov 2015	In Progress Review Conference- SPD/USACE HQ
Jan 2016	*Public Review of Draft EIS/EIR*
Mar 2016	Response to Public Comment of Draft EIS/EIR
Aug - Sep 2016	*Public Review of Final EIS/EIR*
Oct 2016	CEQA Notice of Determination
Oct 2016	NEPA Record of Decision
Nov 2016	Final Approval of Water Control Manual Update

STAKEHOLDER ASSESSMENT & ENGAGEMENT PLAN

STAKEHOLDER ASSESSMENT

- Introduction
- Stakeholder Issues and Interests
- Assessment Findings

ASSESSMENT INTRODUCTION

- Why do an Assessment?
- What Stakeholders were part of the Assessment?
- How was the Assessment done?
- What about other stakeholders?

STAKEHOLDERS

- Regional Flood Management Entities
- Folsom Lake, Lake Natoma and Lower American River Recreational Interests
- Regional Environmental Organizations
- In-Basin Purveyors
- CVP and SWP Contractors
- Electric Power Utilities and their Associations

HOW WAS ASSESSMENT DONE?

- Rigorous identification of stakeholders
- Five stakeholder-specific discussions in Sept.
- Significant outreach for stakeholder attendance

- Focus of September Discussions:
  - Engage stakeholders in policy & technical info
  - Understand stakeholders' interests & issues
  - Ask stakeholders how best to involve them

WHAT ABOUT OTHER STAKEHOLDERS?

- Business Community
- Emergency Response Agencies
- Lower Sac/ North Delta
- Tribal
- Agencies/ parties w/ infrastructure in floodway (e.g. Caltrans)

STAKEHOLDER ISSUES & INTERESTS

What is an Interest?
What is an Issue?

REGIONAL FLOOD ORGANIZATIONS INTERESTS

- Understanding/reducing impacts related to:
  - Planning and preparation
  - Financing maintenance & improvements
- Updating of population evacuation triggers (working with emergency management agencies)

REGIONAL FLOOD ORGANIZATIONS ISSUES

- Bank erosion of channels downstream of Dam
  - Medium-sized flows more damaging over time
  - High flows are damaging if prolonged
- Increased Flows in the By-Pass
- Costs
  - Changes to PL 84-99 trigger?
  - Maintenance costs
  - Study to evaluate need for floodway compensation for damages

RECREATION
FOLSOM LAKE/LAKE NATOMA INTERESTS

- Lake levels to support recreation, especially May – September
- Continued advanced notification of high releases for informational and safety purposes

RECREATION
FOLSOM LAKE/LAKE NATOMA ISSUES

- Low Folsom Lake Levels
  - Boat ramp access
  - Distance from parking area
  - Loss of daily use revenue
  - Loss of revenue for marinas and concessions
- Safety of rowing events with high flows
- Modeling Analysis: Recreation use by lake levels, by month

LAR RECREATION INTERESTS

- Recreational and safety impacts of flow levels and timing of flows, especially weekends May- September
- Effects to Sac County infrastructure with high flows
- Recreation Fishing: Health of Fisheries

LAR RECREATION ISSUES

- Adequate Flows: 1750 – 6,000 cfs. Over 6000 cfs is a safety threshold
- LAR Infrastructure
  - Submerged trails, bike paths, bathrooms
  - Bank damage
  - Electrical equipment damage - Discovery Park
- Continued and expanded advance notification of high flows

REGIONAL ENVIRONMENTAL ORGANIZATIONS INTERESTS

- Successful WCM Operations – Avoid need for new upstream dams to reduce flood risks
- Healthy fisheries, especially for salmon and steelhead, related to temperature/ cold water pool & flow regimens.

REGIONAL ENVIRONMENTAL ORGANIZATIONS RESERVOIR OPERATIONS ISSUES

- Once all authorized improvements done to Folsom Dam, WCM ops control floods exceeding 1/200 frequency
- Water stored in flood space, in exchange for draw down of conservation space when warranted (Conditional Storage)
- WCM rules for early & aggressive release and forecasting for big storms
- Rules optimized, but not open flexibility

REGIONAL ENVIRONMENTAL ORGANIZATIONS HEALTHY FISHERIES ISSUES

- Use WCM to improve cold water pool
- Con'd storage if "additional" water also used for:
  - USBR revised water right - LAR Flow Standard
  - Pulse releases provided Jan – May
- Understand fish stranding issue
- Authorized automatic shutters – Implement, unless effect achieved through other means
- Need Elephant Trunk

IN-BASIN PURVEYORS INTERESTS

- Enhanced water supplies for the protection of in-basin M&I and environmental uses, particularly through a proactive approach to the acquisition and use of high quality basin wetness data

IN-BASIN PURVEYORS ISSUES

- Folsom drawn down below M&I intake in back-to-back critically dry years.
- Investigate: Temporarily increase water held in storage, while carefully monitoring basin wetness & forecasts, until either the probability of significant near term precip. reaches level of concern for possible flooding, or water reaches level needed to diminish concern for drought.

IN-BASIN PURVEYORS ISSUES (cont.)

- Thorough understanding of risks & benefits associated with different levels of flood and water storage
- More instrumentation for and monitoring, collection & use of watershed wetness data
- USACE/ USBR engage in process for establishing new Delta flow standards, as relates to WCM Update

CVP/SWP/ELECTRIC UTILITIES INTERESTS

- Maximize water resources for all purposes
- CVP cost allocation implications related to WCM operations
- Informed decision-making on WCM through access to integrated input from other interests

CVP/SWP/ELECTRIC UTILITIES ISSUES

- Optimize end of May storage for cold water pool & higher carry-over for critically dry years
- Flexible rule curve depending on basin wetness & forecasting
- Minimize releases that by-pass penstocks
- Update shutters to improve cold water pool

CVP/SWP/ELECTRIC UTILITIES ISSUES (cont.)

- Track Delta standards discussion as relates to WCM, esp. as related to X-2 sensitivity analysis
- WCM affect on existing cost allocation & CVP Cost Reallocation Study
- Assumptions (e.g. hydrology; environmental) carried forward in other studies
  - Downstream environ. regulatory baseline coordination w/ CVP Cost Reallocation Study

ASSESSMENT FINDINGS

Shared Perspectives & Potential Tensions among Stakeholders

SHARED PERSPECTIVES AMONG ALL

- WCM Update potential (not guarantee) to benefit all, particularly through Con'd Storage (increased end-of-May storage), increased Folsom Lake levels, and managed flood releases.
- Need for understanding risks and benefits associated with combined use of:
  - Auxiliary spillway
  - Increased basin wetness data
  - NWS forecasting application
  - Incidental storage in upstream Reservoirs

SHARED PERSPECTIVES AMONG ALL

- Want better understanding:
  - What can be accomplished through basin wetness & forecasting tools
  - Effect of Folsom Dam raise and associated surcharge space on operations and impacts
- Informed decisions-making on WCM through access to integrated input from all interests
- WCM as opportunity to improve cold water pool

POTENTIAL TENSIONS

- Historic tension between flood management & water supply: Balance of neither releasing water "too late" nor "too early" in face of uncertainties.
- "Additional" water potentially gained from conditional storage is CVP Project water. Although outside the scope of the WCM, this raises issues/ tensions re: use of that water.

STAKEHOLDER ENGAGEMENT PLAN

STAKEHOLDER ENGAGEMENT PLAN

Three Different Needs Expressed

1. Periodic progress meetings and updates
2. More in-depth and frequent discussions
3. Focus on special topics - examples:
   - Basin wetness data: instrumentation, monitoring, collections and use
   - Improvement to cold water pool

STAKEHOLDER ENGAGEMENT PLAN

1. Two – Three "Progress Meetings" a Year: All stakeholders invited
2. Three venues for in-depth and frequent discussions, designed to comply with FACA:
   - USACE Work Groups for governmental agencies (Water, power, other gov't agencies)
   - SAFCA work groups and discussions for NGO's (environmental and recreation organizations; others)
   - For Flood Organizations, SAFCA to integrate discussion of WCM into regional planning effort

STAKEHOLDER ENGAGEMENT PLAN

USACE Work Groups for Governmental Agencies

1. Technical Working Group: Discusses technical topics, including basin wetness

   Staff: Kyle Keer

2. Environmental Effects Working Group:

   Staff: Dan Artho

STAKEHOLDER ENGAGEMENT PLAN

SAFCA Forums for NGOs

(Environmental; Recreation Interests; Others)

1. SAFCA reconvening Lower American River Task Force. Will be co-sponsored by Water Forum. Half of meeting dedicated to WCM; half to LAR Flow Standard

2. SAFCA available for more in-depth discussions for topics not fully covered at LAR TF

SAFCA's Role with Environmental, Recreation, Regional Flood, other NGOs

SAFCA has the responsibility to provide in-depth information on WCM to these groups and to share stakeholder perspectives with PASS Task Force, USACE Technical Working Group, USACE Environmental Effects Working Group, and other WCM meetings with USACE, USBR and DWR, and to advocate for the perspectives with which they agree.

COLD WATER POOL ISSUE

- Perspective of WCM Update Agencies: Other than incidental gains, WCM does not have responsibility for improving cold water pool.
- USBR and SAFCA will work with stakeholder group on cold water pool issues. Interested stakeholders invited. Stay tuned for specifics.

QUESTIONS & DISCUSSION

Stakeholder Assessment & Engagement Plan

CURRENT PROJECT ACTIVITIES

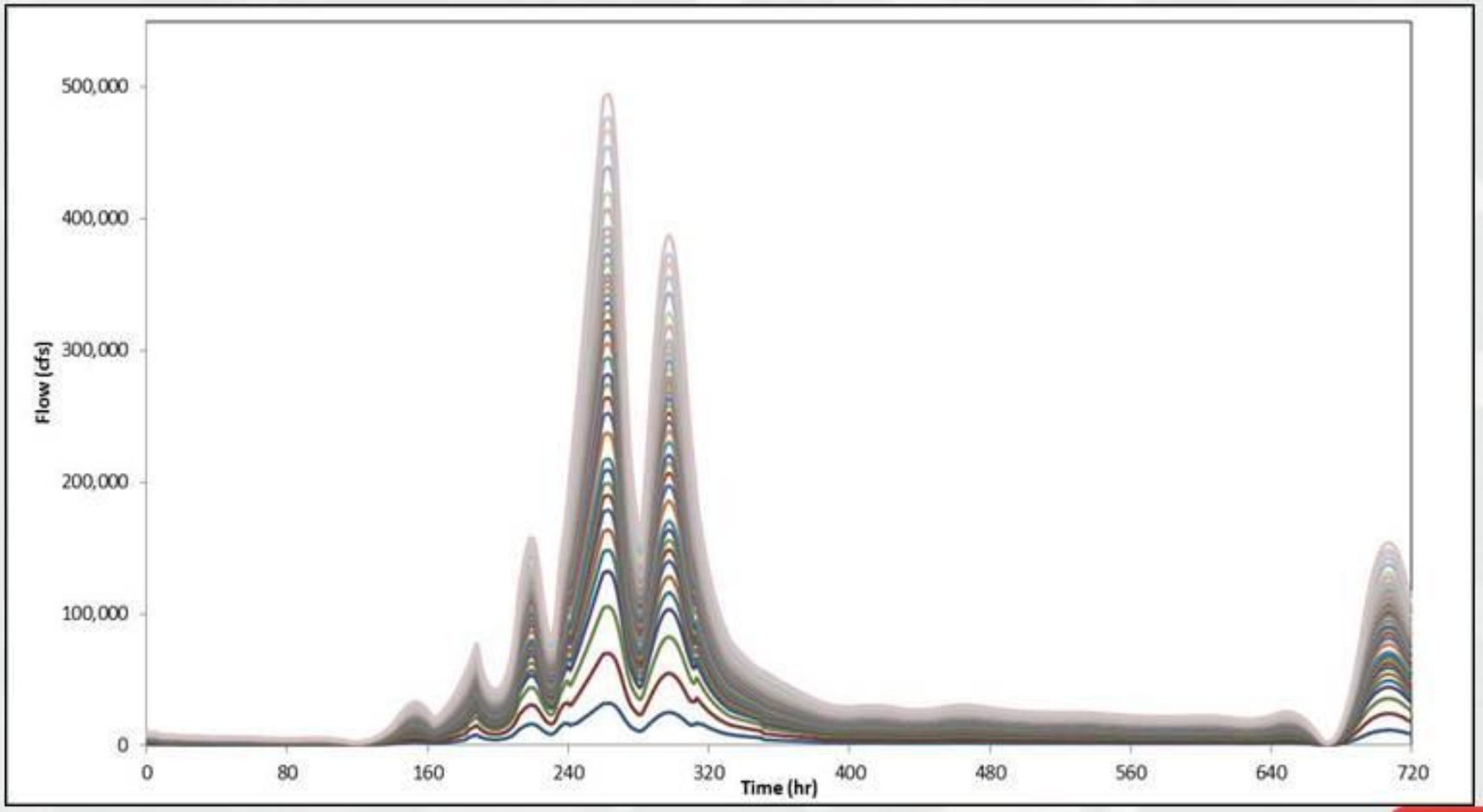
- Development of ResSim models to evaluate existing conditions, future without project conditions, and with project conditions.
- Development of methods for:
  - Developing a basin wetness index.
  - Incorporating forecasts in the operational decision process.
  - Integrating HEC-ResSim and CalSim II output for water supply assessments.

RESSIM MODEL DEVELOPMENT PROCESS

- Build model with a reservoir operation set (ROS)(i.e., existing conditions and future auxiliary spillway).
- Test model to confirm that it meets project flood protection objectives (1%, 0.5%, and PMF).
- District Quality Control (DQC) Review.
- Revise model, as needed, until objectives are met (iterative).

HYDROLOGY UPDATE

Unregulated Events, 1986 Pattern



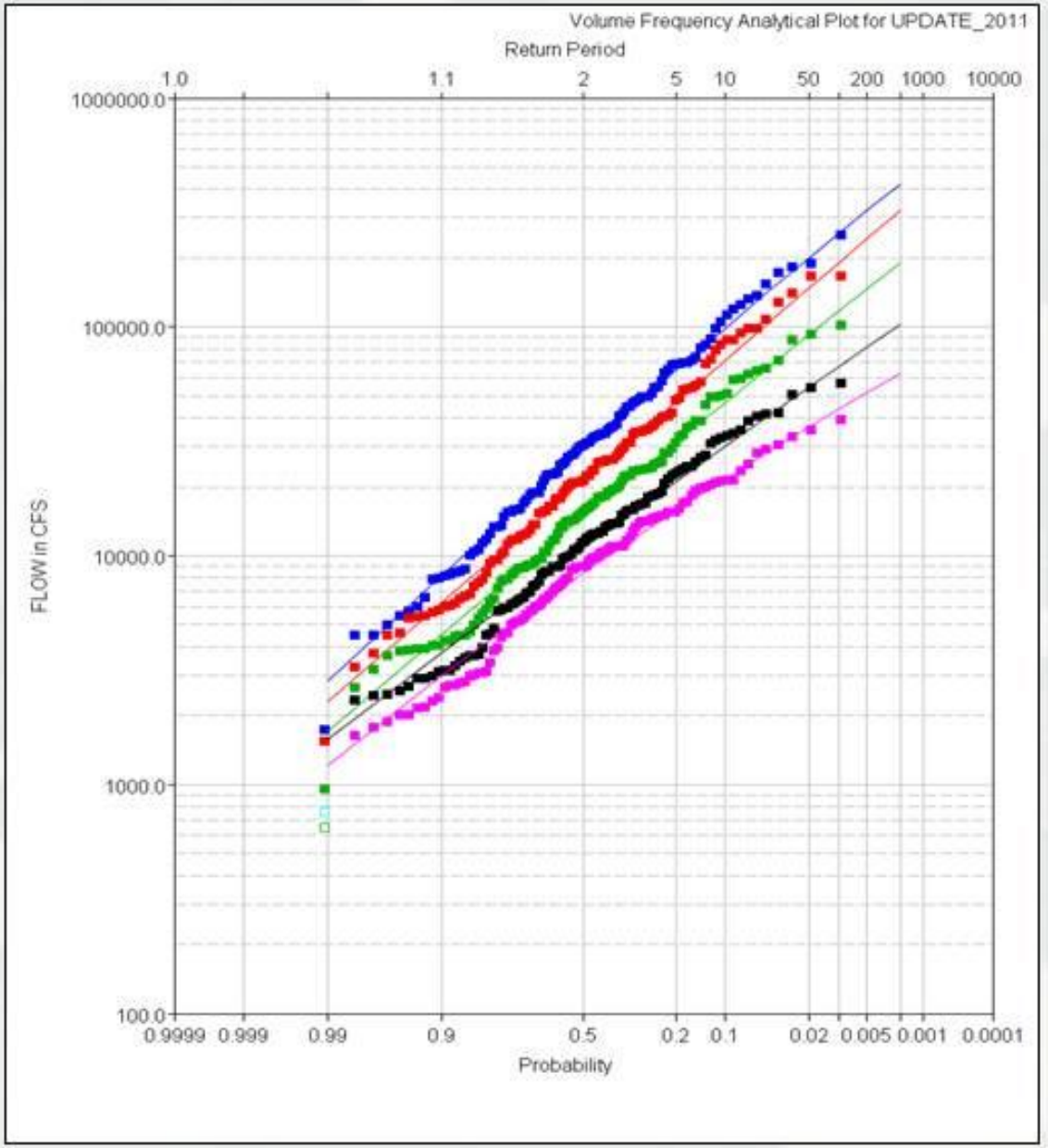
HYDROLOGY UPDATE

1.0% Chance Exceedence Event

	1 Day	3 Day	7 Day
	cfs	cfs	cfs
1997	276,000	196,000	113,000
2006	267,000	188,000	112,000
2011	257,000	191,000	117,000
Δ%	-3.4	**1.6**	**4.5**

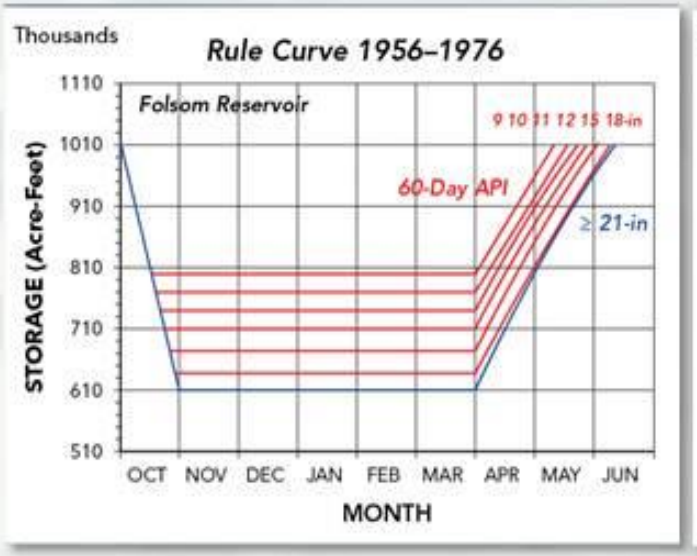
0.5% Chance Exceedence Event

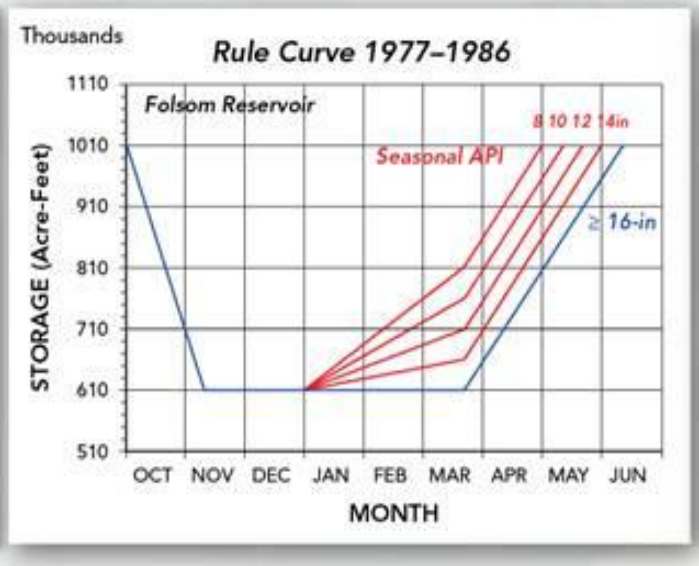
	1 Day	3 Day	7 Day
	cfs	cfs	cfs
1997	349,000	247,000	137,000
2006	337,000	237,000	138,000
2011	322,000	242,000	146,000
Δ%	-4.5	**2.1**	**5.8**

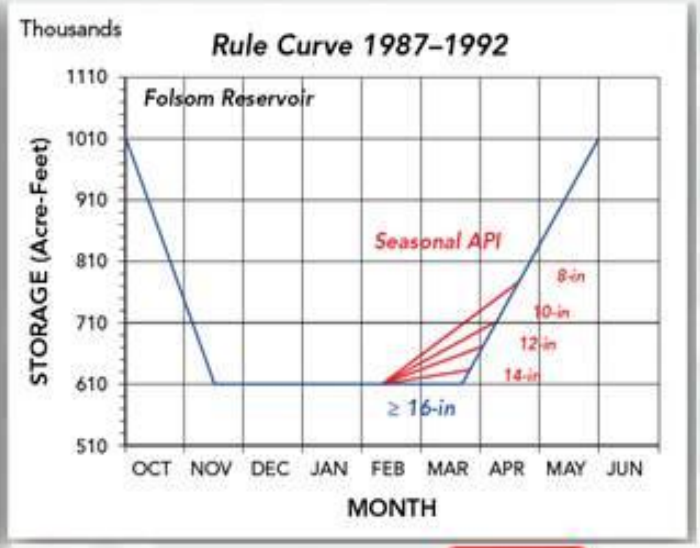


INCORPORATING BASIN WETNESS & FORECASTS IN RESSIM MODELS

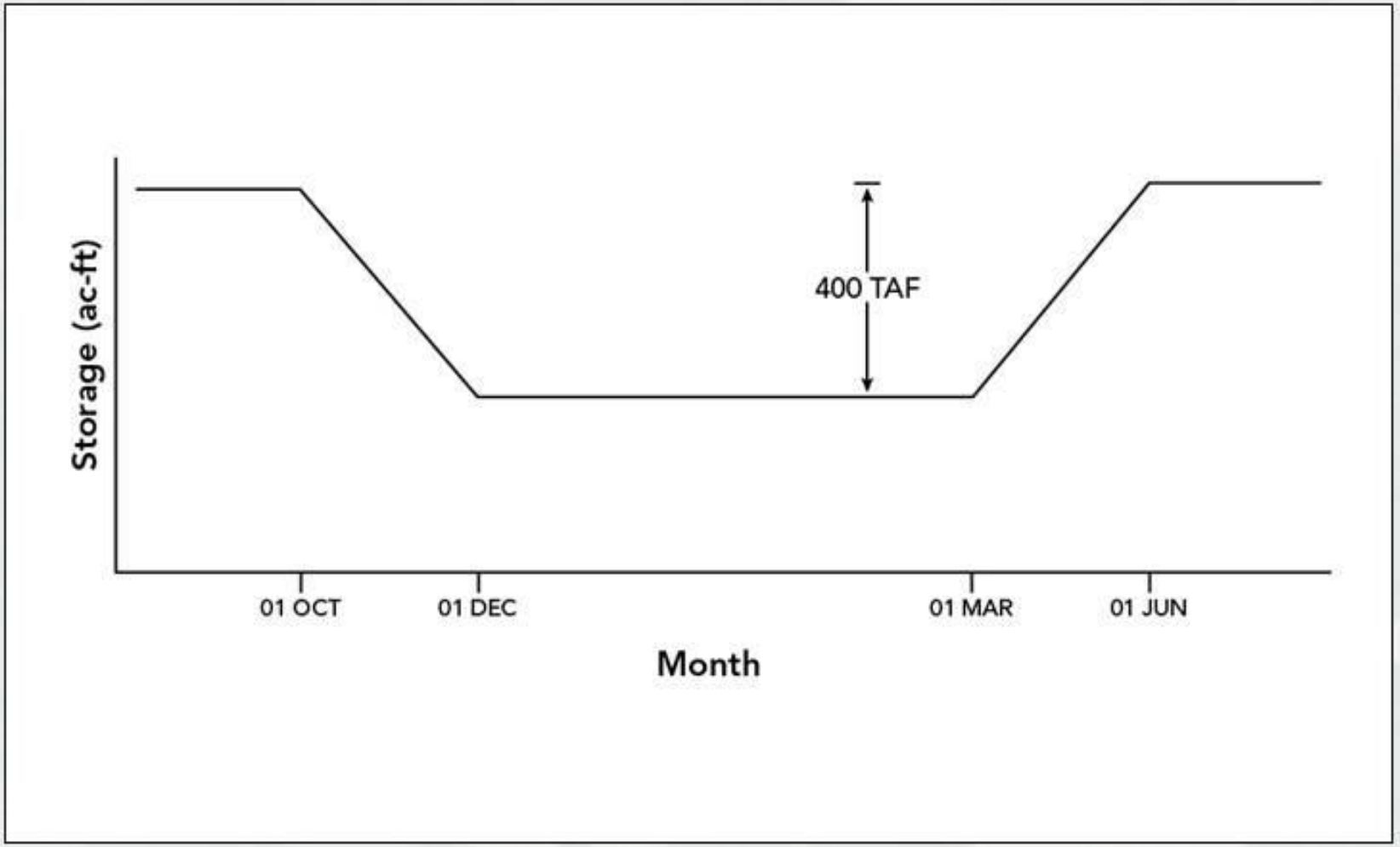
- Index could be based on basin precipitation, reservoir inflow, or projected snowmelt runoff.
- Index had been utilized in the past:



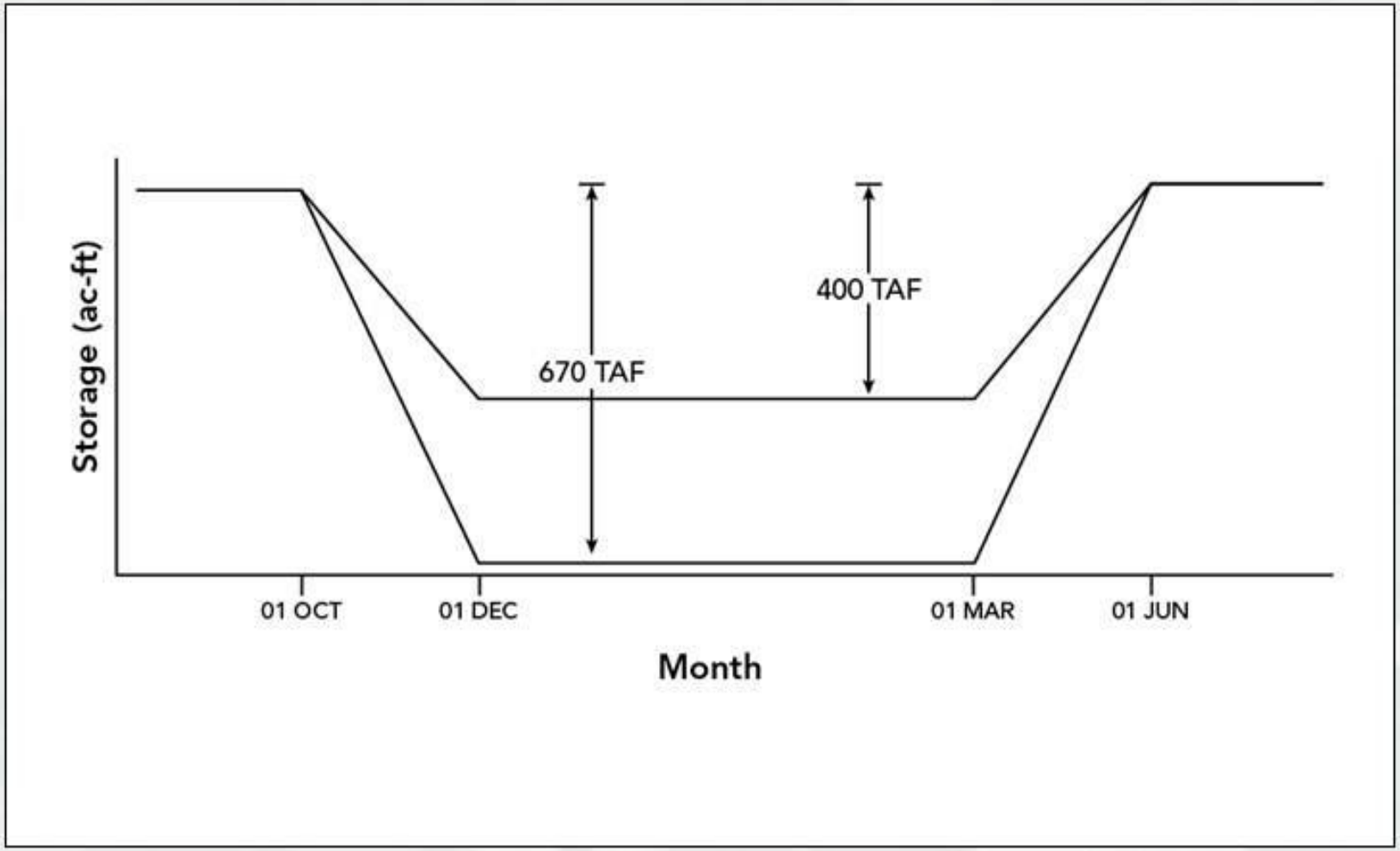




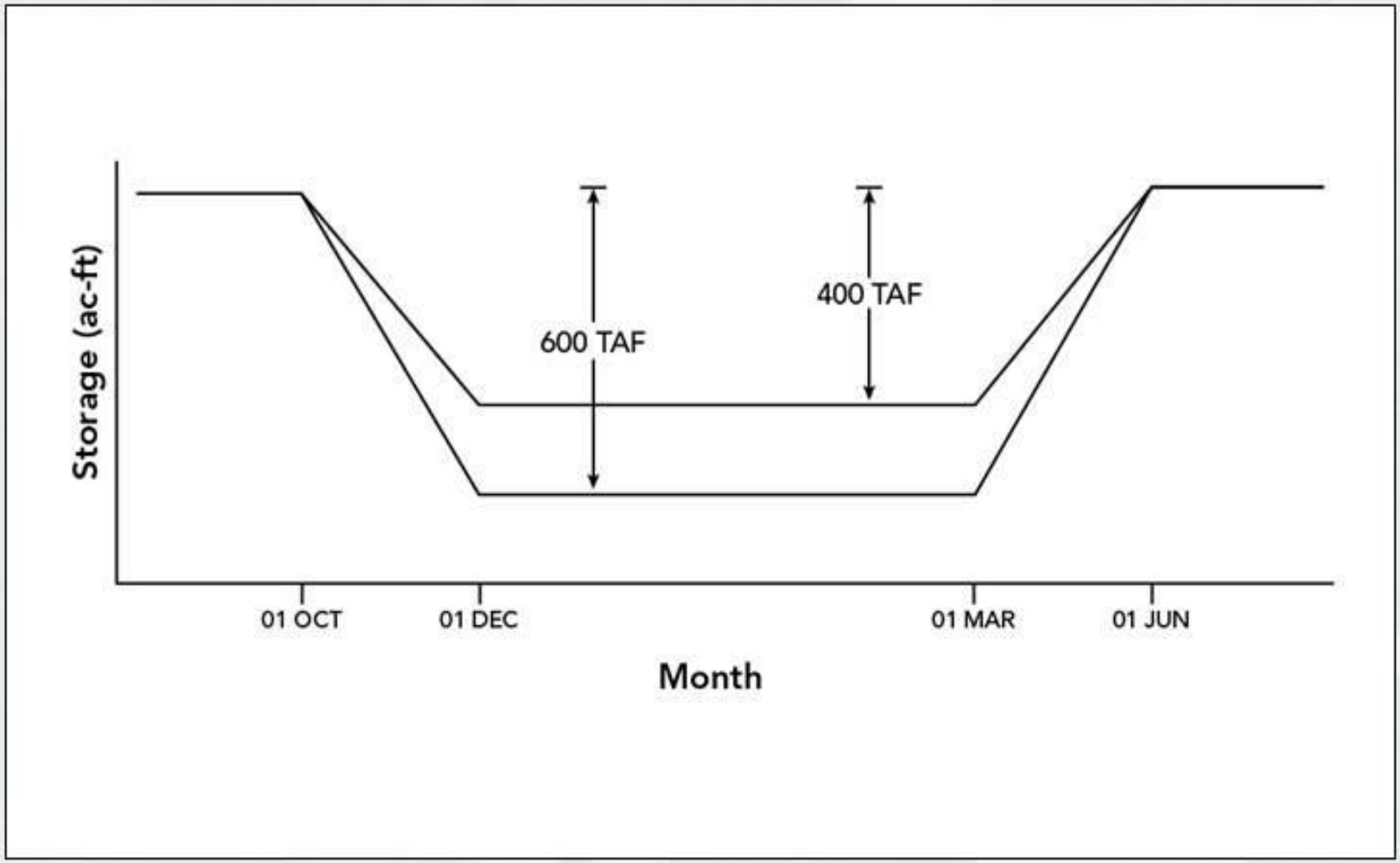
400-FIXED WCD



400/670 WCD

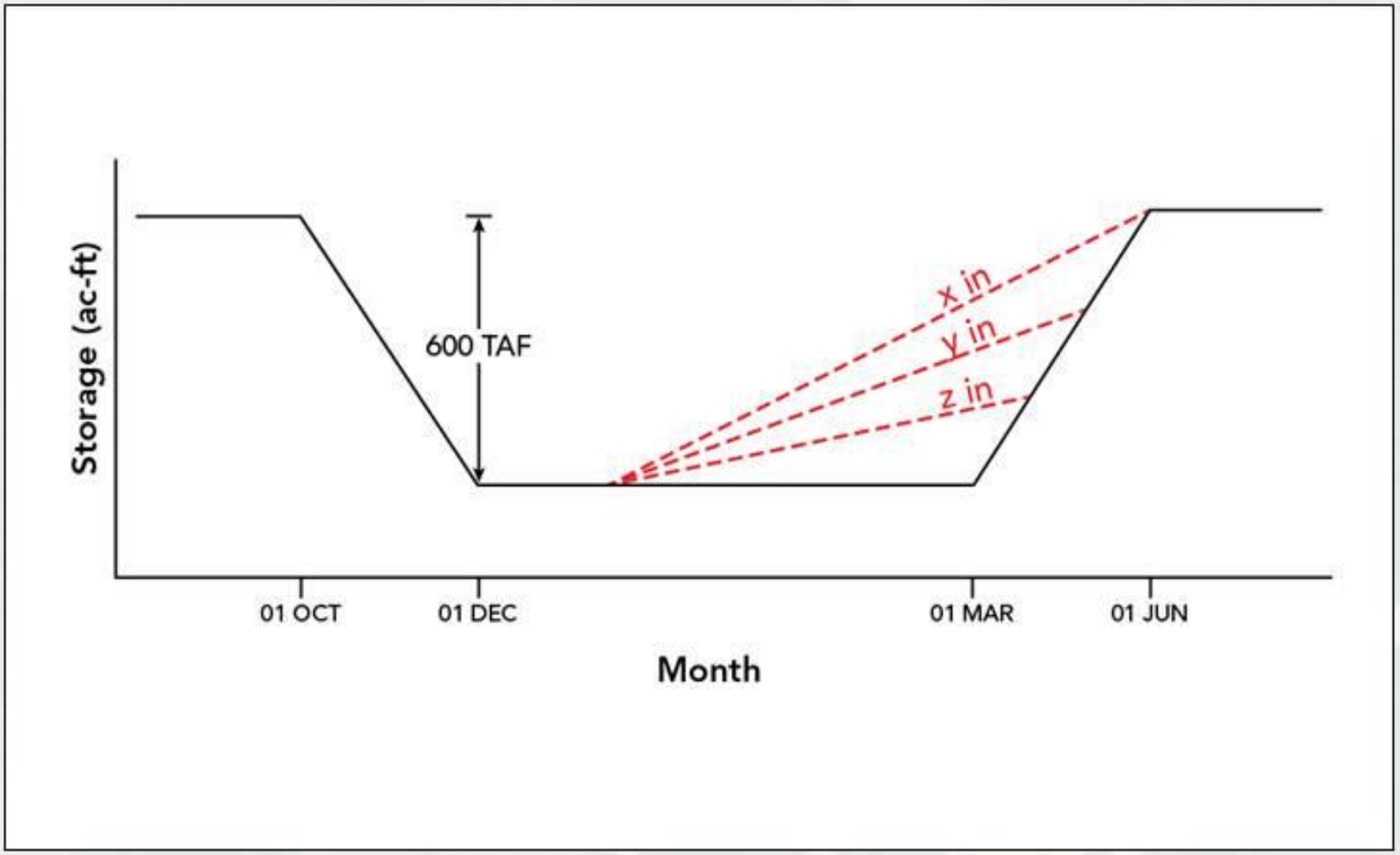


400/600 WCD



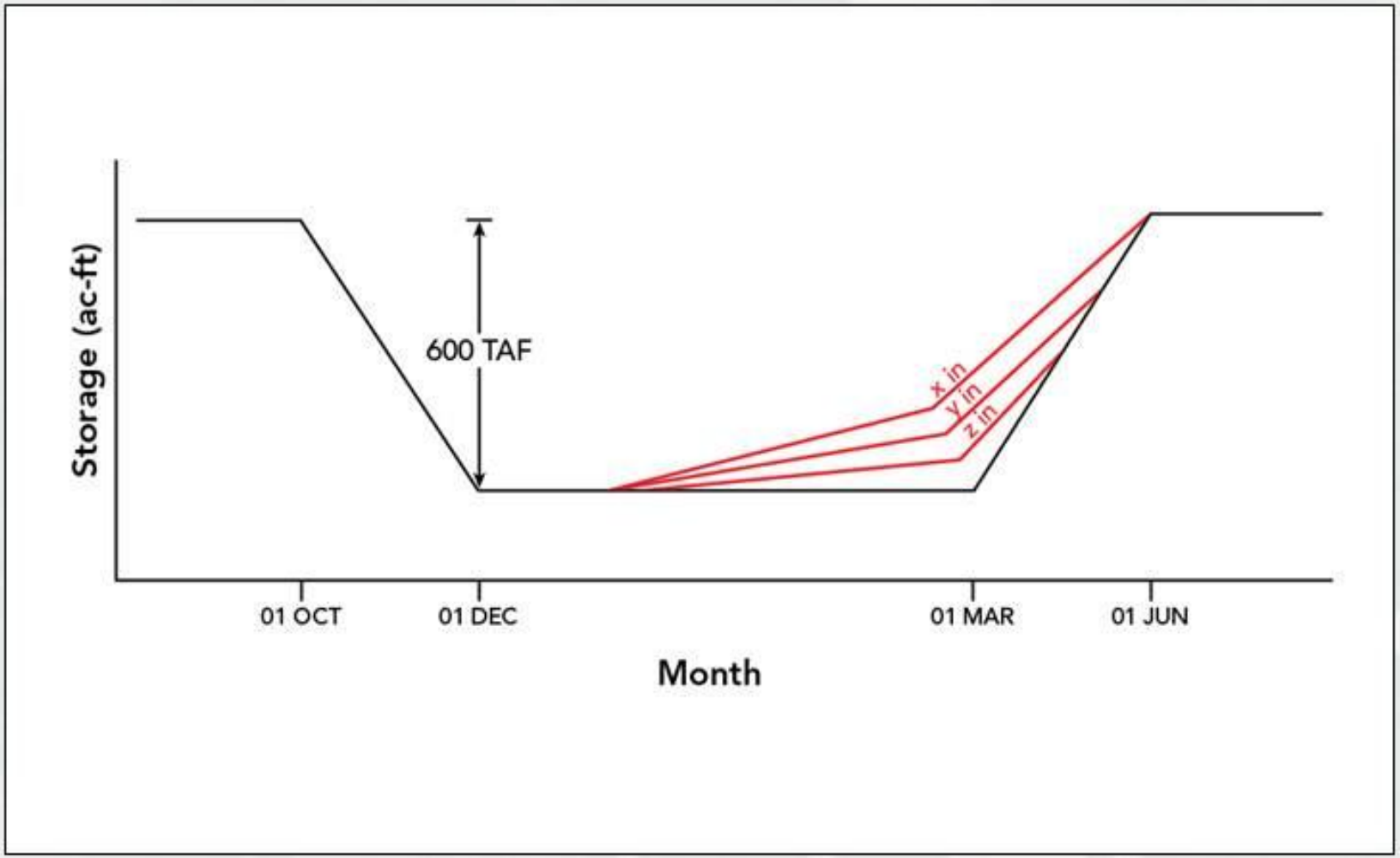
BASIN WETNESS INDEX

TOP OF CONSERVATION ADJUSTMENT



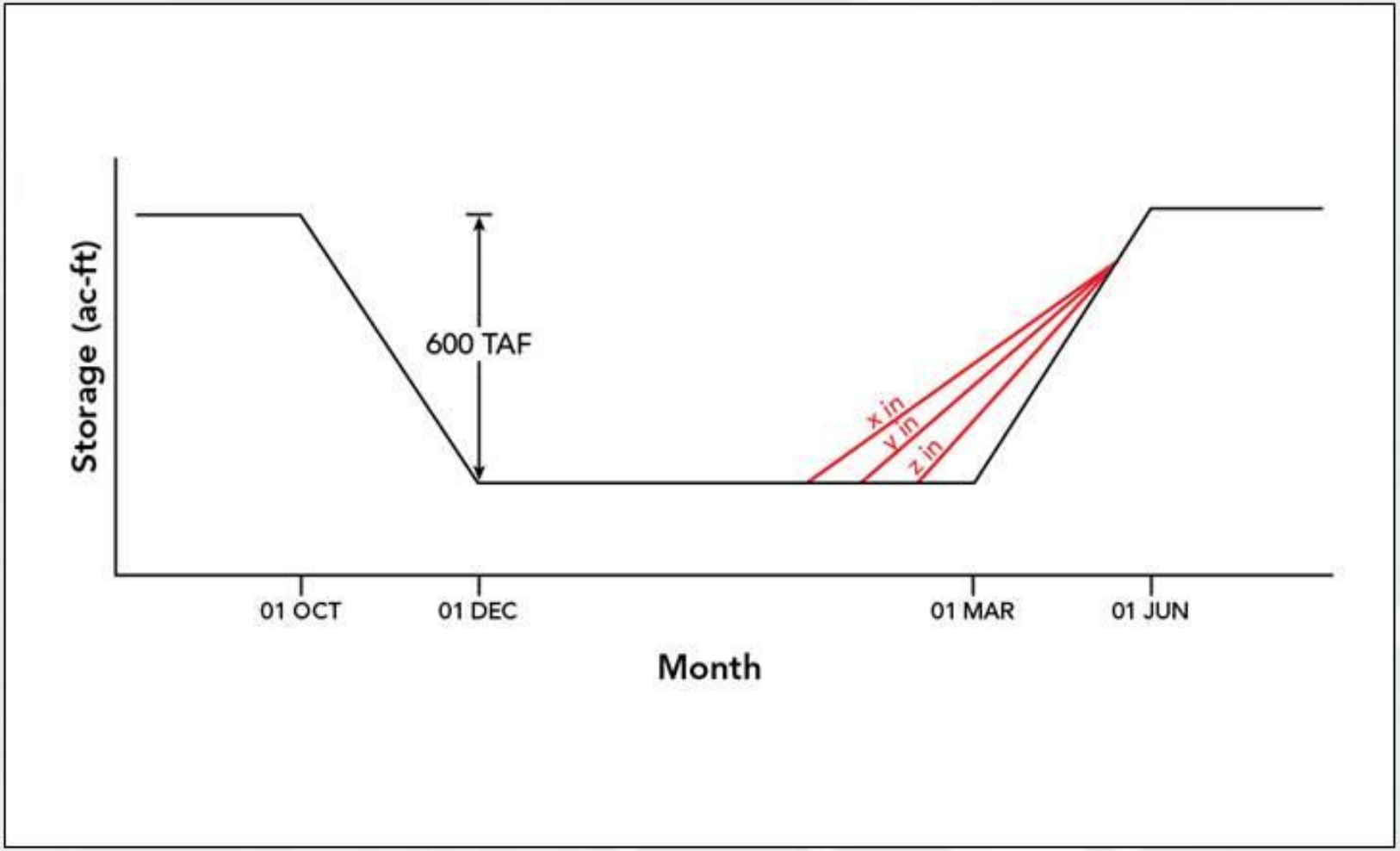
BASIN WETNESS INDEX

TOP OF CONSERVATION ADJUSTMENT



BASIN WETNESS INDEX

TOP OF CONSERVATION ADJUSTMENT



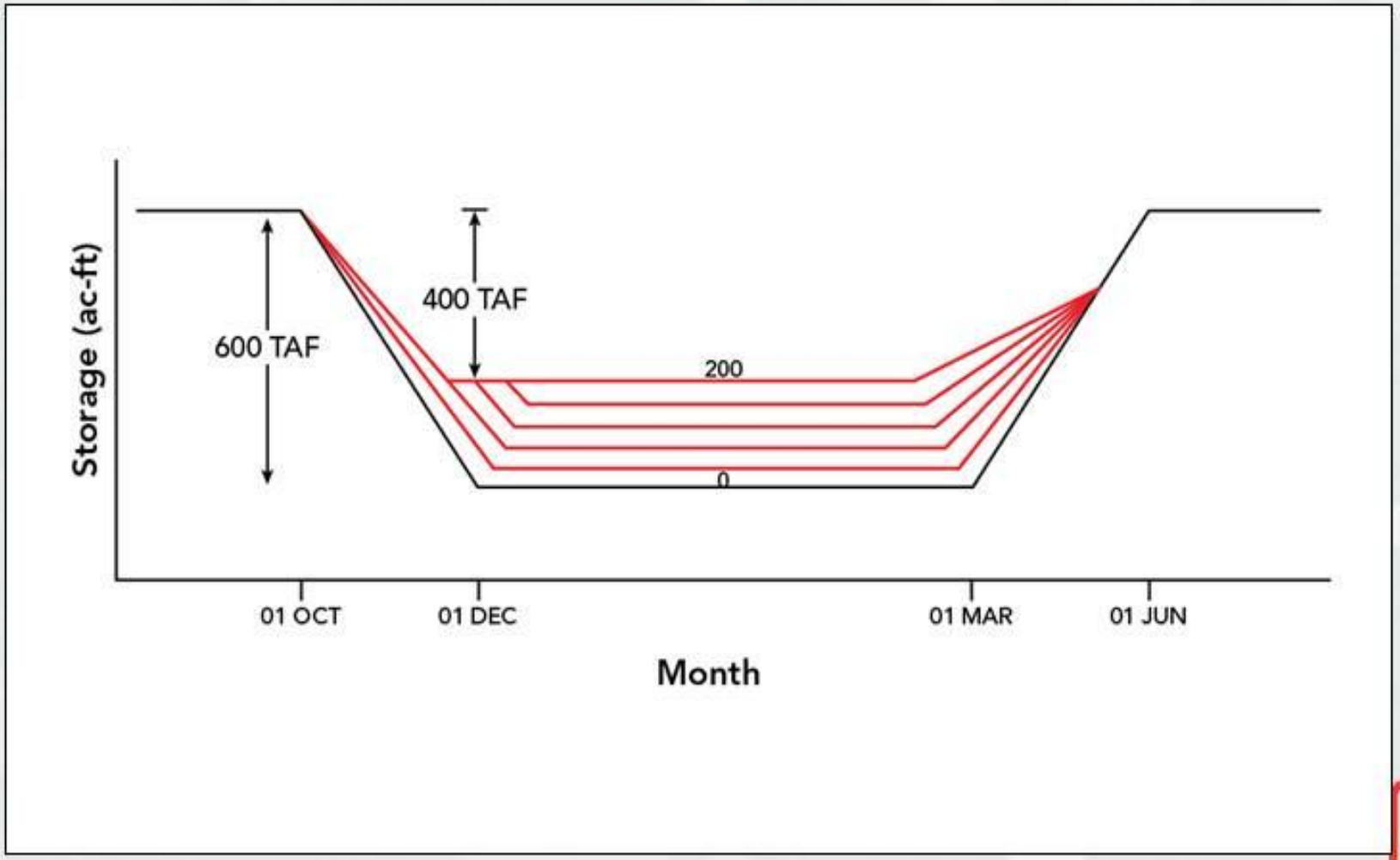
CREDITABLE FLOOD CONTROL TRANSFER SPACE

TOP OF CONSERVATION ADJUSTMENT

	CURRENT STORAGE	STORAGE AT SPILLWAY CREST	AVAILABLE STORAGE (y-x)	MAXIMUM CREDITABLE SPACE	ACTUAL CREDITABLE SPACE, LESSER OF A, B, C, OR Z
FRENCH MEADOWS	*x*	*y*	*z*	*a*	*z*
HELL HOLE	*x*	*y*	*z*	*b*	*b*
UNION VALLEY	*x*	*y*	*z*	*c*	*z*
				∑=200	*z+a+z*

CREDITABLE FLOOD CONTROL TRANSFER SPACE

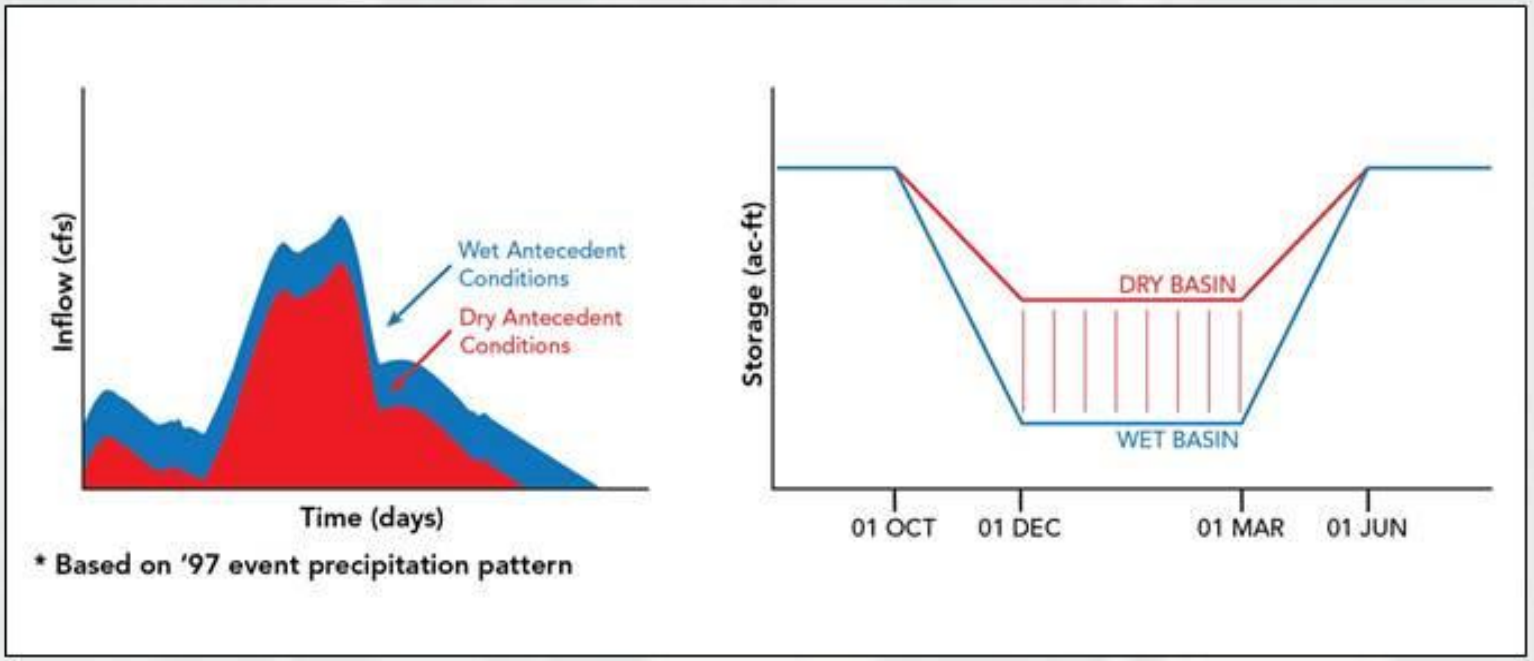
TOP OF CONSERVATION ADJUSTMENT



CREDITABLE FLOOD CONTROL TRANSFER SPACE

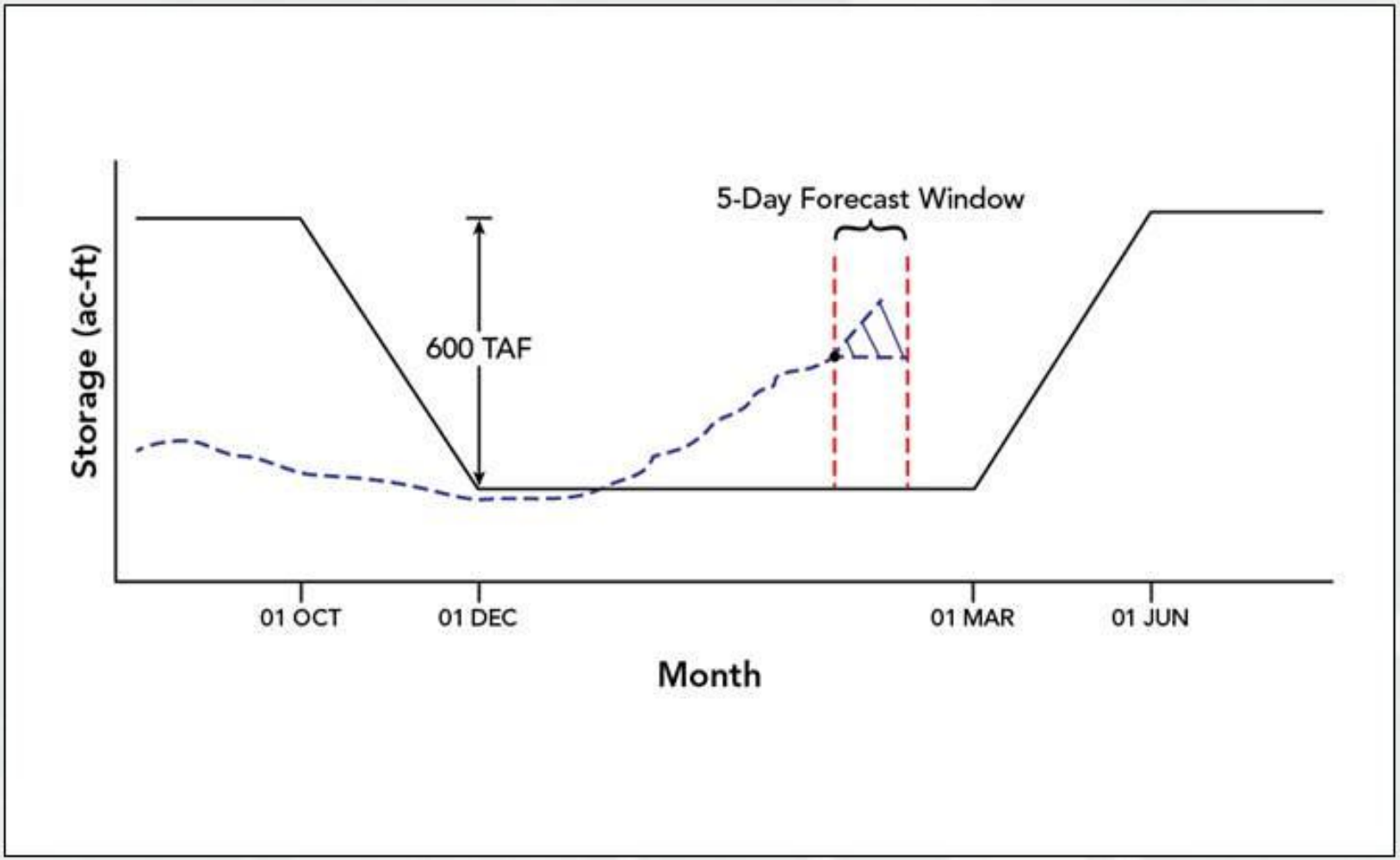
TOP OF CONSERVATION ADJUSTMENT

200-Yr Inflow Hydrograph Sensitivity Analysis Dry vs. Wet Condition



FORECASTS

TOP OF CONSERVATION POOL ADJUSTMENT



WATER SUPPLY EVALUATION TIER 1

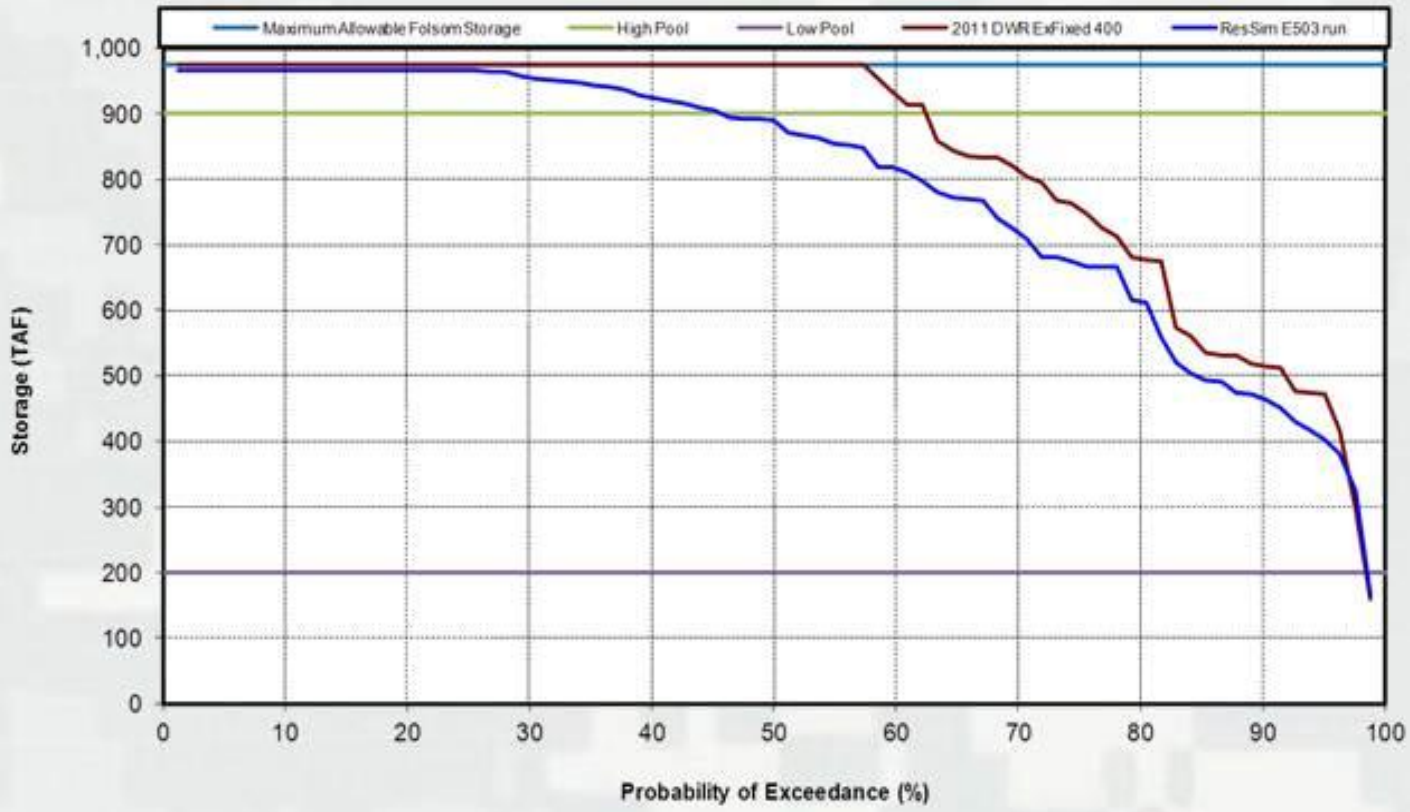
- Will operation set be likely to change water supply for system-wide beneficial uses?
- Approach includes comparison of HEC ResSim and CalSim II Period of Record Runs (WY 1921 – WY 2002).

WATER SUPPLY EVALUATION TIER 1 (cont.)

- Data products for Key System Metrics are compared (end of May Storage and Lower American River Flows).
- Assumption is that CalSim II output reflects prioritization of CVP and SWP beneficial uses.
- Similar output implies operation set reasonably able to satisfy water supply for project beneficial uses.

TIER 1 DATA COMPARISONS

Folsom Reservoir End-of-month Storage during May under 2011 DWR ExFixed 400 and ResSim E503 run

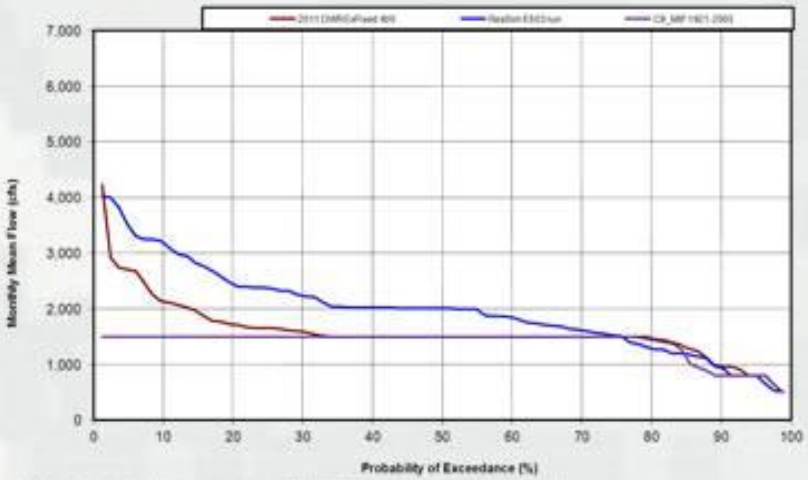


Data Source : 2011_Fixed_400; CALSIM modeling performed by HDR (2011DRR_EX_Fixed400); Simulation period: Oct 1921 - Sep 2003
USACE ResSim E503 ResSim (2012-12-19 E503 E503/rss/E503-POR/simulation.dss); Simulation period: 6 Oct 1921 - 30 Sep 2002
Minimum Release Requirement from DWR SWP Delivery Reliability Study Existing conditions Scenario

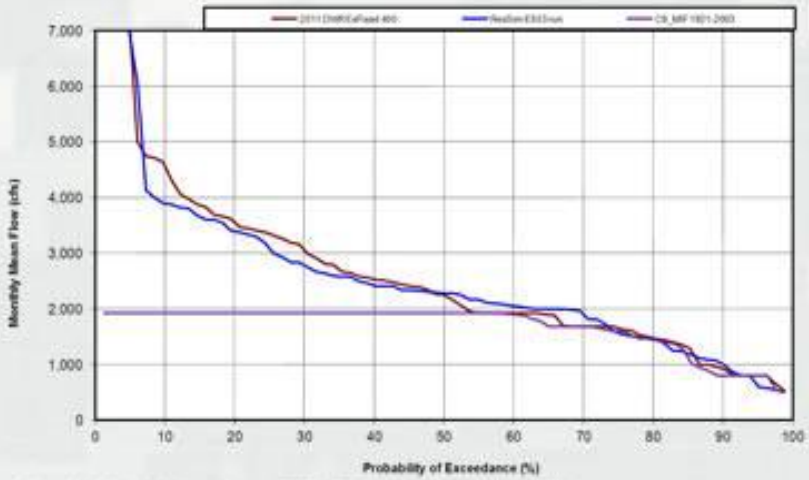
Originator: DK 1/22/13
QC: JF 1/23/13

TIER 1 DATA COMPARISONS

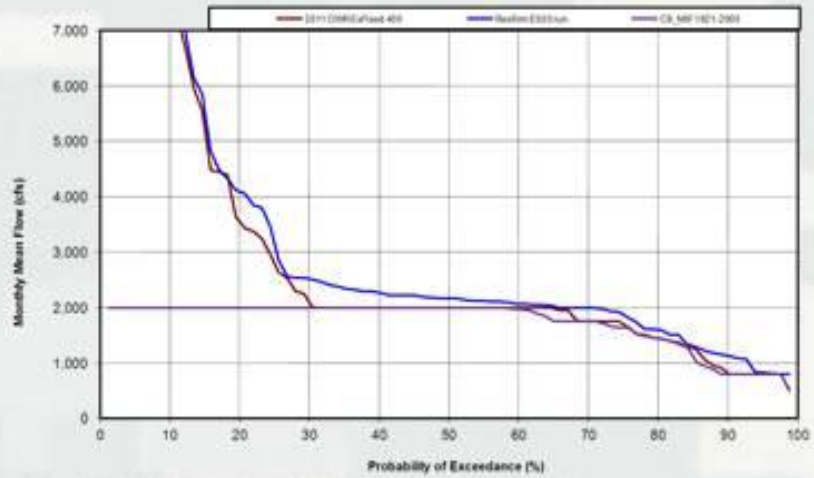
Lower American River Flow below Nimbus Dam during October under 2011 DWR ExFixed 400 and ResSim E503 run



Lower American River Flow below Nimbus Dam during November under 2011 DWR ExFixed 400 and ResSim E503 run



Lower American River Flow below Nimbus Dam during December under 2011 DWR ExFixed 400 and ResSim E503 run



NEXT STEPS

- Continue with details and model iterations-refinement.
- Real-time review and quality control of model builds and output data sets.
- Outreach and Coordination.

QUESTIONS & COMMENTS