Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project

CEQA/NEPA Process Update

March 2016

This document is intended to provide key stakeholders and the public with a clear articulation of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project), an effort undertaken by the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) pursuant to regulatory requirements. The Project largely focuses on infrastructure modifications to increase the number of juvenile salmonids that have access to floodplain habitat in the Yolo Bypass through the Fremont Weir and to increase the ability of adult salmon and sturgeon to migrate from the Yolo Bypass to the Sacramento River. Other related projects being pursued in the Yolo Bypass include the Wallace Weir Fish Rescue Project and the Fremont Weir Adult Fish Passage Modification Project.

Introduction

DWR and Reclamation are working to implement projects in the Yolo Bypass to comply with the 2009 National Marine Fisheries Service's (NMFS) Biological Opinion and Conference Opinion on the Long-term Operations of the Central Valley Project (CVP) and State Water Project (SWP) (2009 NMFS BO). The 2009 NMFS BO incudes a suite of Reasonable and Prudent Alternative actions that require DWR and Reclamation to: (1) reduce migratory delays and loss of winter-run Chinook salmon, spring-run Chinook salmon, Central Valley steelhead, and the Southern Distinct Population Segment (DPS) of North American green sturgeon; and (2) restore floodplain rearing habitat for juvenile salmonids.

Figure 1 - Yolo Bypass Vicinity Map

One effort to comply with the 2009 NMFS BO is the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project). The Project is being pursued in the Yolo Bypass, an extremely rich landscape that has tremendous value to local, State, and Federal interests. The approximately 59,000-acre Yolo Bypass is a state and federally authorized flood control facility; an

economically important agricultural area; habitat for hundreds of native fish, bird, and other wildlife species; and a focal point for nature-based recreational and educational opportunities. The Yolo Bypass is also generally considered the single best opportunity area for large-scale Central Valley floodplain habitat restoration. Detailed information on the Project can be found at http://www.usbr.gov/mp/BayDeltaOffice/yolo-bypass.html.

To comply with the requirements of the 2009 NMFS BO – and in accordance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) – DWR and Reclamation are developing multiple project alternatives for the Project, each designed to achieve the following objectives in the Yolo Bypass:

- Increase access to, and acreage of, seasonal floodplain habitat
- Increase aquatic primary and secondary biotic production to provide food through an ecosystem approach
- Provide access to seasonal habitat through volitional entry
- Improve connectivity within the Yolo Bypass for passage of juvenile salmonids and green sturgeon
- Improve connectivity between the Sacramento River and the Yolo Bypass to provide passage for adult Sacramento River winter-run Chinook salmon, adult Central Valley spring-run Chinook salmon, adult Central Valley steelhead, and adult Southern Distinct Population Segment of green sturgeon

One of the CEQA/NEPA project alternatives under development is the "Jointly Developed Alternative" (JDA), reflecting the inclusive process underway to envision and refine particular infrastructure and operational approaches, some of which were previously supported by several local agencies. Similar to the other alternatives, the JDA is being designed to meet the specific floodplain restoration and fish passage objectives included in the 2009 NMFS BO. The JDA is also being designed to maximize support from local agency, landowner, and non-profit interests. DWR and Reclamation engagement in this effort is an acknowledgement of the importance of working closely with local interests, especially on efforts that will affect large multiple-use landscapes.

Problem

Central Valley floodplains that once provided critical rearing habitat and unimpeded migration routes for California's anadromous fish have been severely diminished by over a century of infrastructure development and an incomplete understanding of the ecological importance of floodplain habitat. The natural floodplains that remain intact are often functionally cut off from adjacent rivers, limiting the ability of juvenile fish to access them for rearing habitat and limiting the ability of adult fish to successfully navigate to spawning grounds.

The Yolo Bypass is a prime example of how historic resource management has reduced floodplain habitat value. The construction of Fremont Weir, Sacramento Weir, and a series of flood control levees significantly reduced the frequency of Yolo Bypass inundation from Sacramento River waters. Additional-

ly, the 2009 NMFS BO noted that operations of the SWP and CVP have likely further reduced the frequency and duration that the Sacramento River inundates the Yolo Bypass. Given these factors, downstream juvenile salmonid presence no longer reliably coincides with Yolo Bypass inundation events.

The Knights Landing Ridge Cut, Cache Creek, Willow Slough, and Putah Creek – collectively referred to as Yolo Bypass Westside tributaries – also provide significant flows into the Yolo Bypass. Adult upmigrating fish can experience mortality or significant delays when the timing of these tributary attraction flows does not coincide with Fremont Weir overtopping, a mismatch of Yolo Bypass hydrology and ecology that is commonly observed.

A single Fremont Weir fish ladder does exist, but its ability to assist adult fish passage out of the Yolo Bypass is severely limited by design inadequacies and irregularities in the splash basin at the foot of the weir. Although a complementary project – the Fremont Weir Adult Fish Passage Modification Project – will address fish ladder modifications, adult fish passage challenges and opportunities remain central to this Project. Specifically, Fremont Weir modifications to increase juvenile salmonid access to floodplain habitat must be also designed to support and encourage improved upstream adult salmonid and sturgeon passage.

Proposed Measures

Pursuant to the requirements of the 2009 NMFS BO and informed by extensive analysis, the primary infrastructure components of the proposed Project are a gated notch built into or adjacent to the Fremont Weir and a modified scour channel connecting the gated notch to the Tule Pond (see Figure 2 for one potential Project configuration). A process is underway to determine a reasonable range of gated notch attributes (location, invert elevation, width, gate mechanisms, operations, etc.) that could achieve the biological goals and objectives of the 2009 NMFS BO. Also being analyzed are several related project components, such as downstream infrastructure features to reduce impacts.

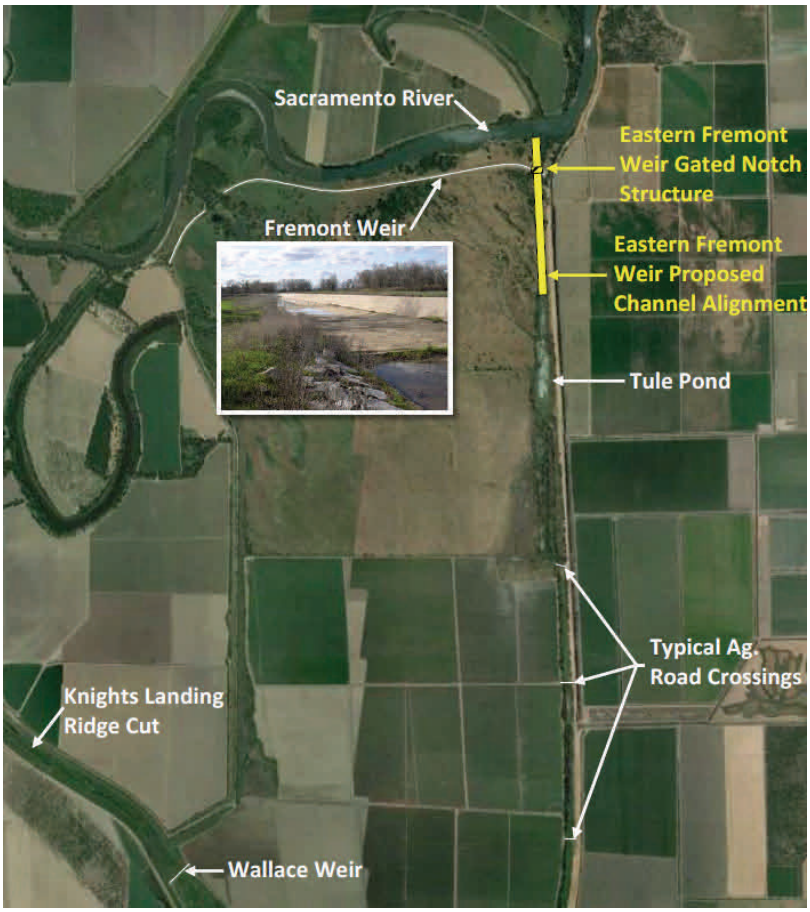


Figure 2 - Overview of the northern Yolo Bypass. Significant existing features are highlighted in white. Potential primary Project components are highlighted in yellow

DWR and Reclamation have analyzed the performance potential for a wide range of gated notch and corresponding channels to allow up to 6,000 cfs of Sacramento River flows to enter the Bypass for fish passage and creation of floodplain rearing habitat (Figure 3):

- A small gated notch with three 30-foot gates and an invert elevation of 14 feet, paired with a downstream 20-foot-wide trapezoidal channel with a slope ratio of 3:1
- A medium gated notch with six 30-foot gates and an invert elevation of 17.5 feet, paired with a downstream 225-foot-wide trapezoidal channel with a slope ratio of 3:1
- A large gated notch with six 30-foot gates and an invert elevation of 14 feet, paired with a downstream 225-foot wide trapezoidal channel with a slope ratio of 3:1

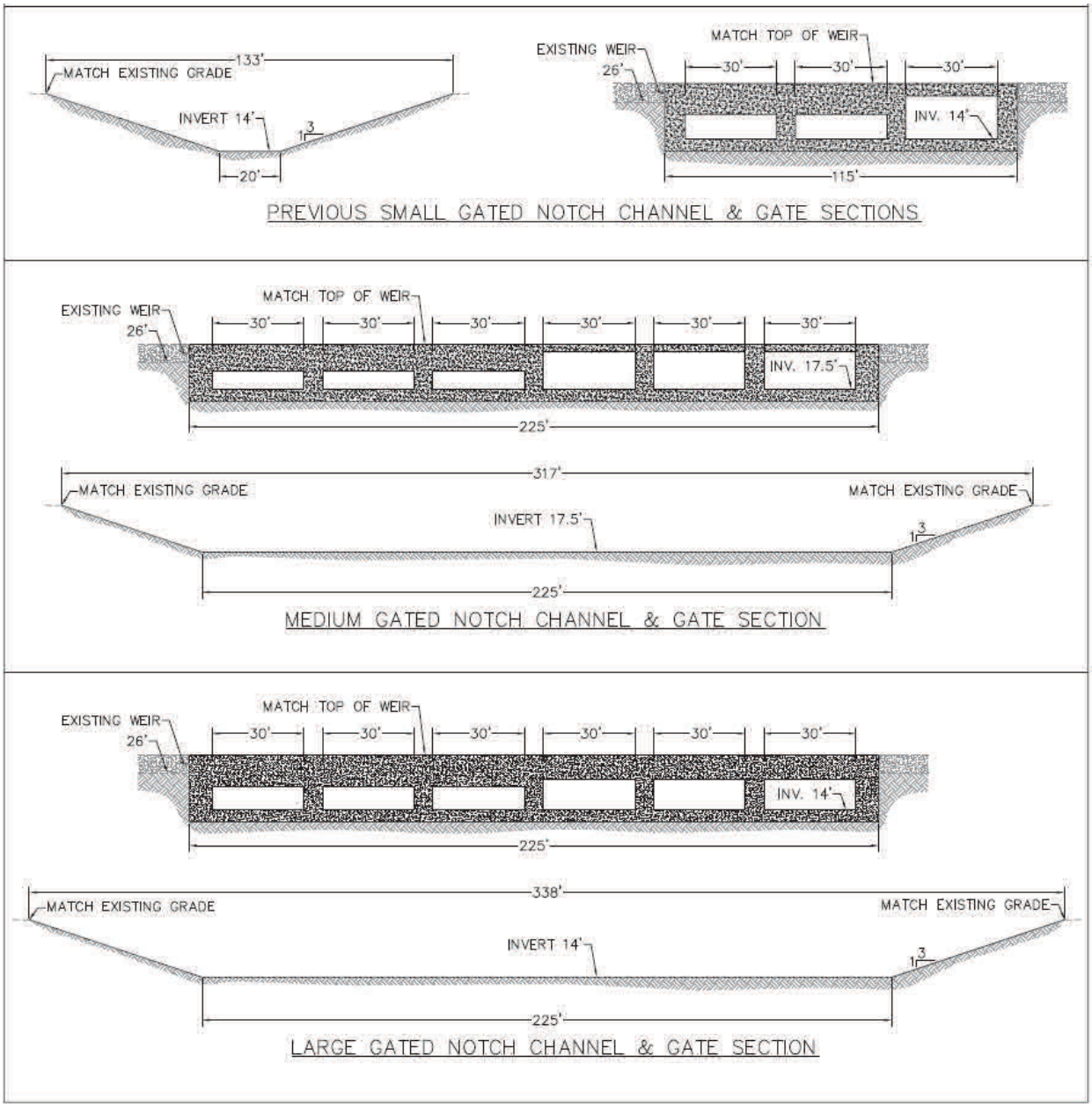


Figure 3 - Previous Channel and Gate Opening Configurations

The above configurations achieve their maximum flow of 6,000 cfs into the Yolo Bypass at different river stages: the Medium Gated Notch and Channel at 25 feet; the Large Gated Notch and Channel at 24 feet; and the Small Gated Notch and Channel at 28 feet. As such, the Small Gated Notch would convey 6,000 cfs less frequently than the other configurations.

Fish passage and juvenile entrainment analyses concluded that the Small Gated Notch best met the Project purpose and need and Project objectives. Several key findings resulted from this initial round of analysis:

- Greater volumes of flow diverted from the river and into the Yolo Bypass will have a potential to entrain greater amounts of juvenile salmon into the Yolo Bypass
- Lower (deeper) invert elevations perform better for adult fish passage
- Higher (shallower) invert elevations have a shorter adult fish migration window and limit when juvenile fish can access the floodplain (especially winter-run Chinook)
- Invert elevations lower than 14 feet created a potential for reverse flow in the system in low flow conditions and allowed more than 6,000 cfs into the Yolo Bypass prior to Fremont Weir overtopping
- Project goals to entrain juvenile salmonids in the Yolo Bypass and provide adult fish passage are likely achievable between December 1st and March 15th. See Appendix A for agricultural sector impact modeling that shows minimal agricultural sector economic impacts resulting from a March 15 Project operations end-date
- A 6,000 cfs Project would have negligible effects on downstream State Water Project (SWP) and Central Valley Project (CVP) operations.
- A 6,000 cfs gated notch helps create favorable inundation acreage

CEQA/NEPA Alternatives

Each of the initial alternatives being prepared for CEQA/NEPA review – except for the "no project" alternative – includes a similar gated notch and downstream channel configuration (see below and Figure 4 for additional detail). Each Project alternative also includes an identical operational window: December 1st through March 15th, within which the gates will be open to allow flows and fish to enter the Yolo Bypass when the Sacramento River stage rises above 17 feet. Each alternative will continue to undergo rigorous analysis and refinement as modeling and relevant scientific studies contribute additional data. For example, a 2015 fish telemetry study will help inform a fish behavior model being developed to further refine the alternatives, analyzing the benefits of configurations that vary in width, depth, diversion amounts, locations along the Fremont Weir, and other factors. A second telemetry study was implemented in 2016. Results from that work will also help inform further refinements to the range of alternatives. These analyses may yield scientific support for a gated notch facility with a maximum flow rate of less than 6,000 cfs.

Three of the four Project alternatives evaluate different locations along the Fremont Weir utilizing the current small gated notch configuration. Location varies between the East side of the Fremont Weir, the central Fremont Weir, and the West side of the Fremont Weir (Figure 5). Outside bends of the Sacramento River are being targeted due to results suggesting increased frequency of juvenile salmonid

Current Gated Notch concept:

- 6,000 cfs maximum flow rate
- One 40-foot wide bay at an invert elevation of 14 feet (~18 feet below the current weir crest)
- Two additional bays, each 27 feet wide with an invert elevation of 20 feet
- Bottom hinged gates within each bay

Current Downstream Channel concept:

- 20-foot bottom width trapezoidal channel with 3:1 slopes
- Raised bench on the left channel bank to provide a lower velocity area

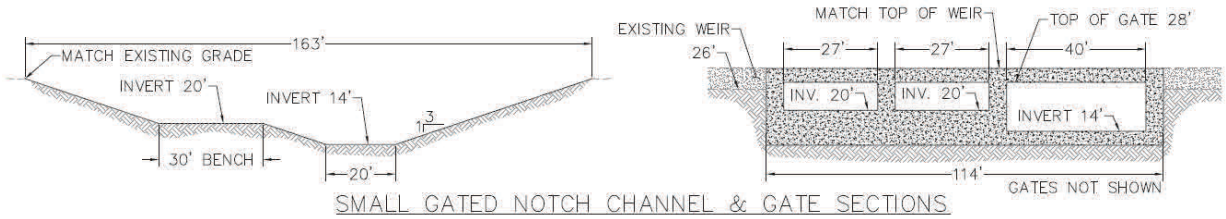


Figure 4 - Current Small Gated Notch and Channel Configuration

presence at these locations. The inundation footprint created by each of these three alternatives would be determined by flows through the gates, additional tributary flows if present, and existing Yolo Bypass topography.

The fourth alternative is the Jointly Developed Alternative (JDA). The JDA currently includes a gated notch (central Fremont Weir location) and modified channel, similar to the alternatives described above. However, the JDA also currently includes infrastructure intended to 1) increase the inundation period on specific properties North of Interstate 80, and 2) minimize increased inundation on properties South of Interstate 80, including the State-owned Yolo Wildlife Area. The northern floodplain areas (North of Interstate 80) would be created by constructing a small earthen berm parallel to the Tule Canal, and diverting most flow out of the Tule Canal into these areas (while leaving adequate water in the Tule Canal for fish passage). Downstream water control structures would manage water elevations and outflows back into the Tule Canal. South of Interstate 80, inundation would be minimized using an earthen berm set back from the Toe Drain.

Figures 5, 6, and 7 show the maximum inundation footprints expected from each of the four Project alternatives in the absence of Fremont Weir overtopping (dark blue depicts the footprint for the JDA; light blue depicts the footprint for the three other alternatives).

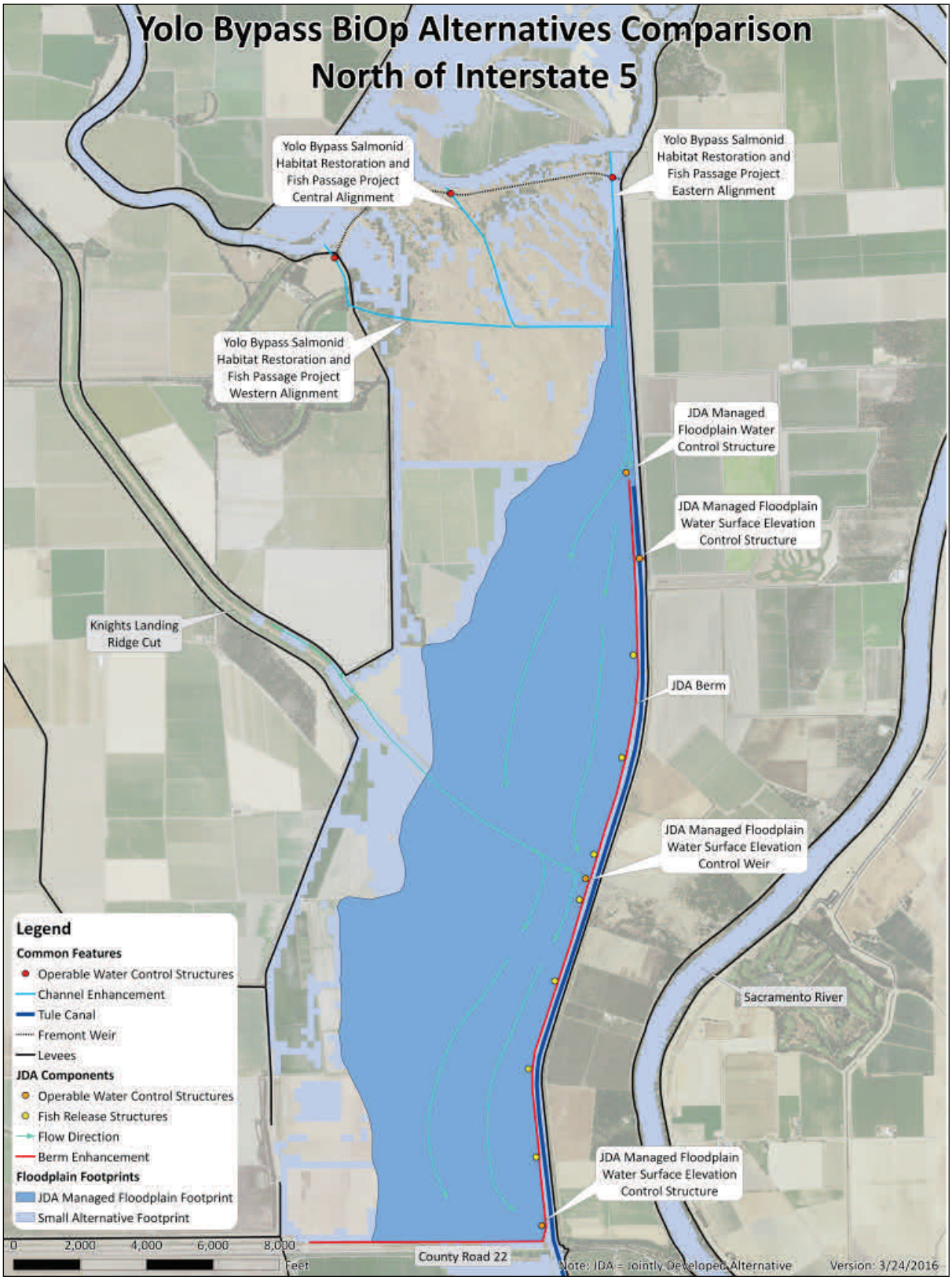


Figure 5 - Alternative Features North of Interstate 5

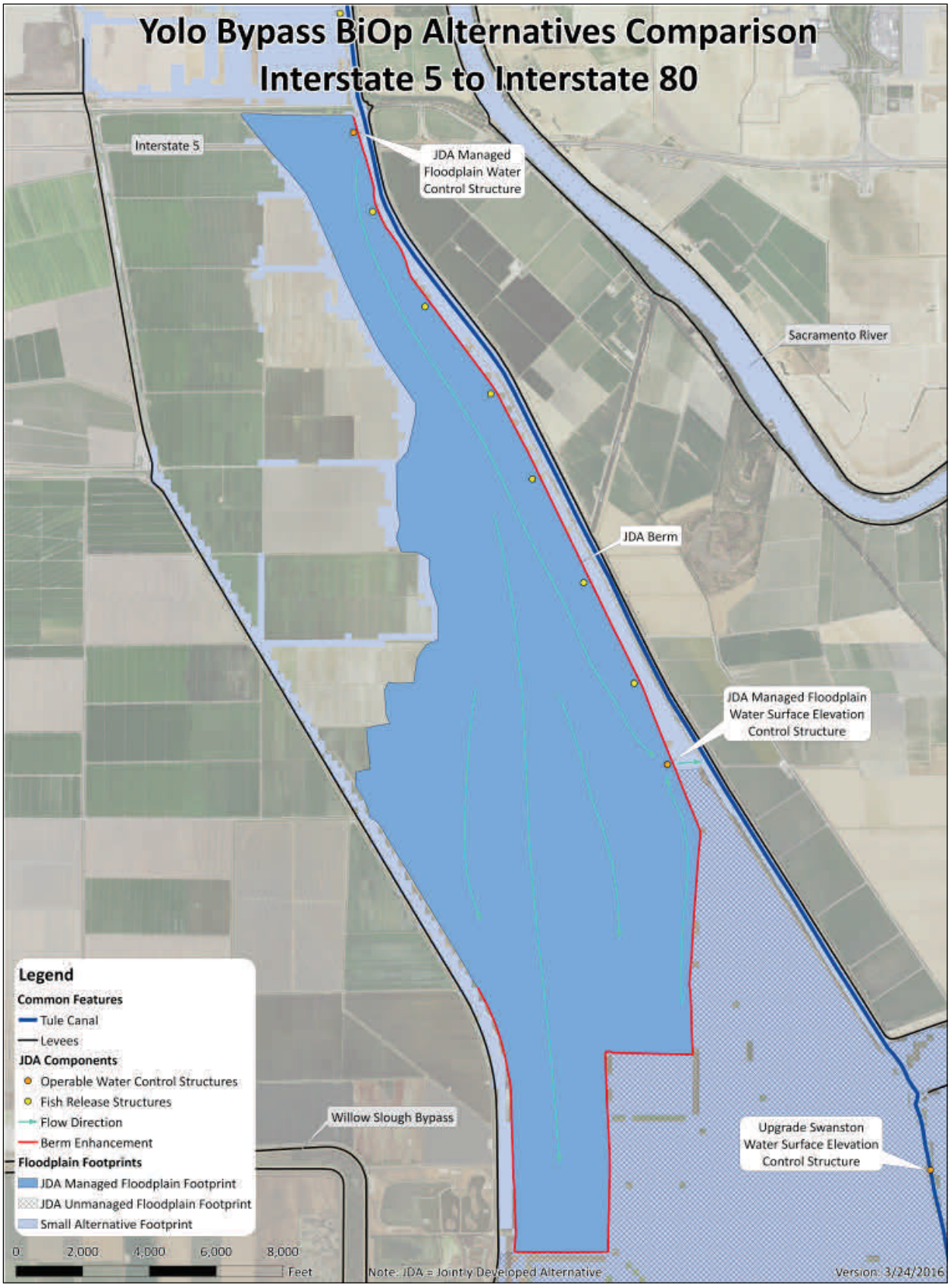


Figure 6 - Alternative Features between Interstate 5 and Interstate 80

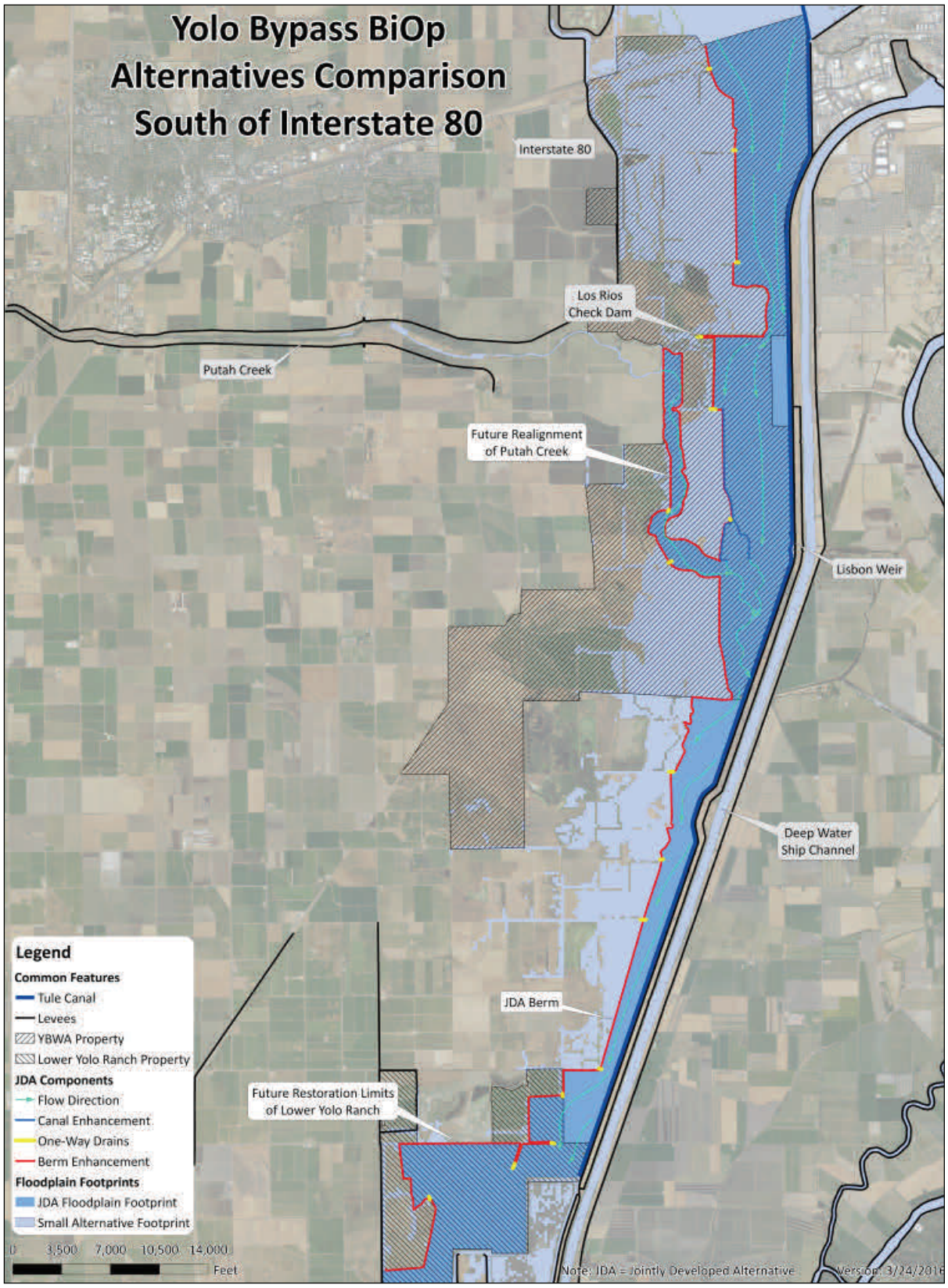


Figure 7 - Alternative Features South of Interstate 80

Increased Yolo Bypass inundation acreage and duration will be modeled for each Project alternative as well. Figures 8 through 10 show total inundation acreage duration for the non-JDA alternatives versus existing conditions, over a range of water-year types. See appendix B for results from all 16 years of the study period. Similar modeling for the current JDA configuration is underway.

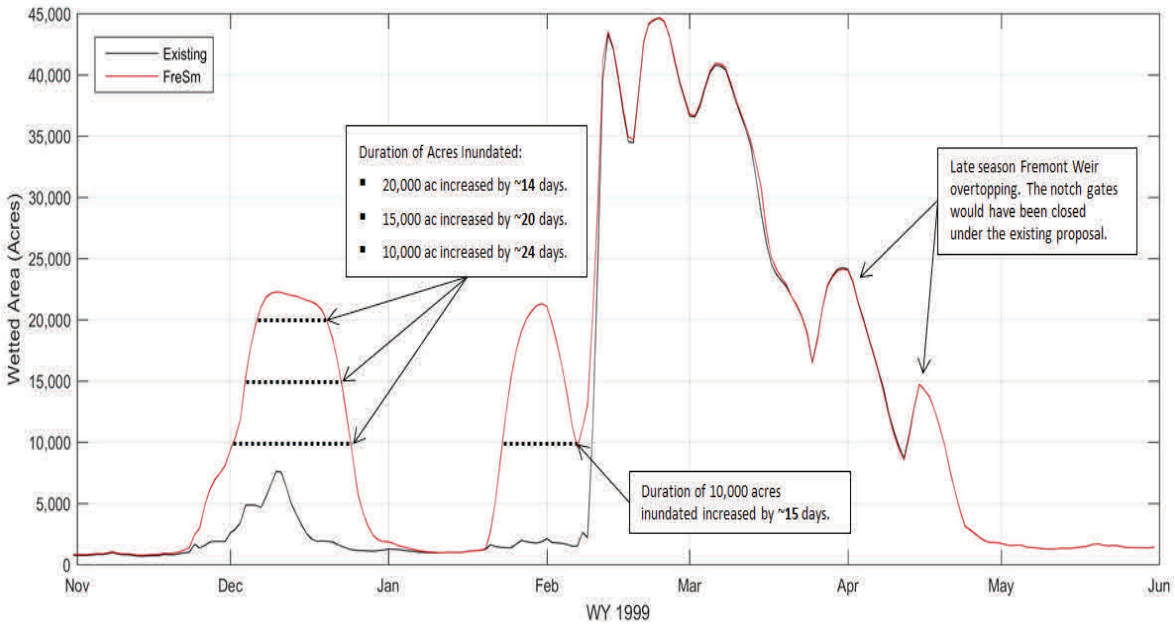


Figure 8 - Existing and Small Gated Notch Inundation for Water Year 1999 (Wet Year)

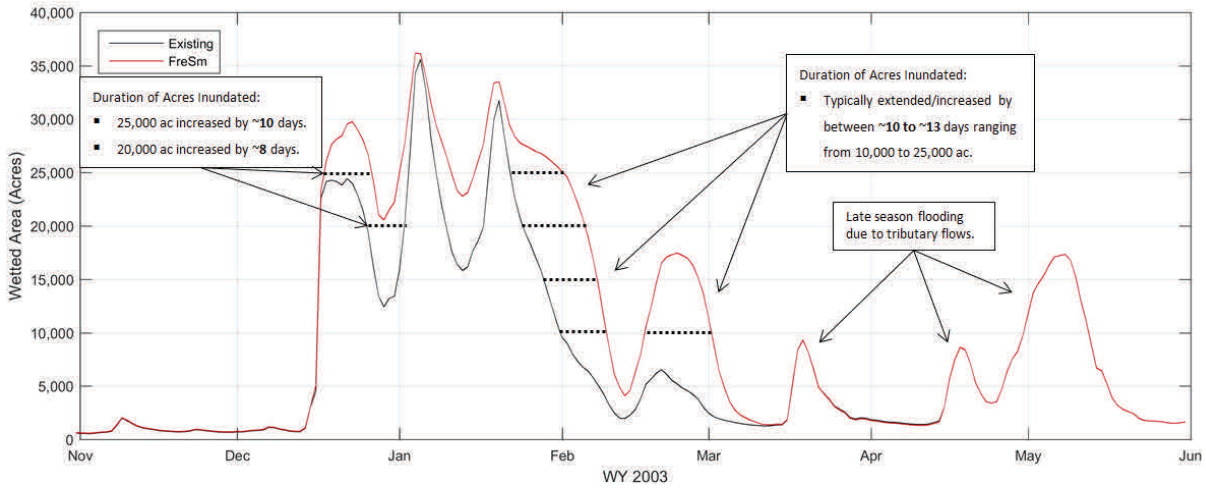


Figure 9 - Existing and Small Gated Notch Inundation for Water Year 2003 (Above Normal Year)

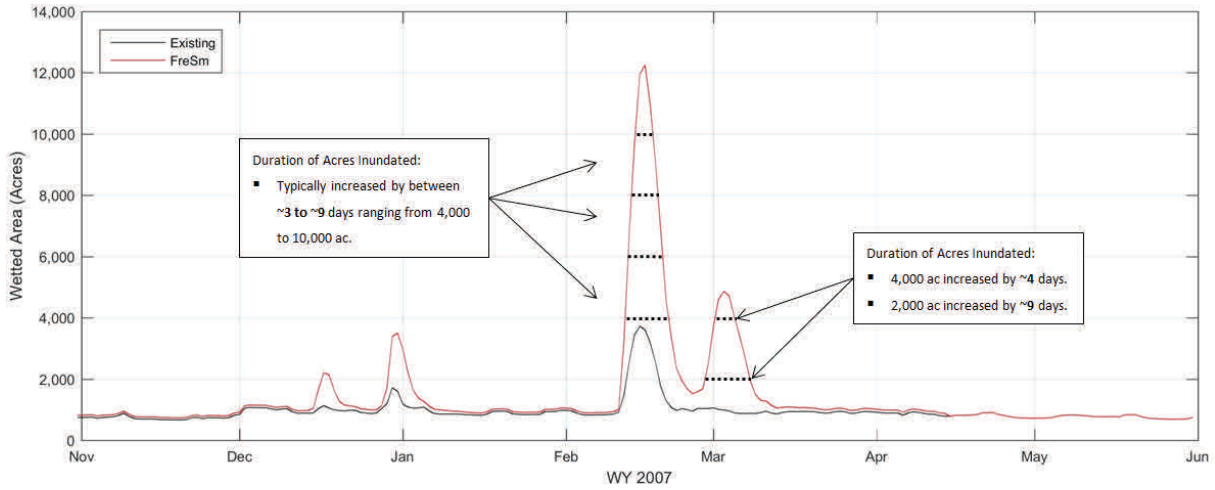


Figure 10 - Existing and Small Gated Notch Inundation for Water Year 2007 (Dry Year)

Figure 11, below, shows wetted-acre model results for the non-JDA alternative annualized over Water Year 1997 - 2012 for the period between November and May.

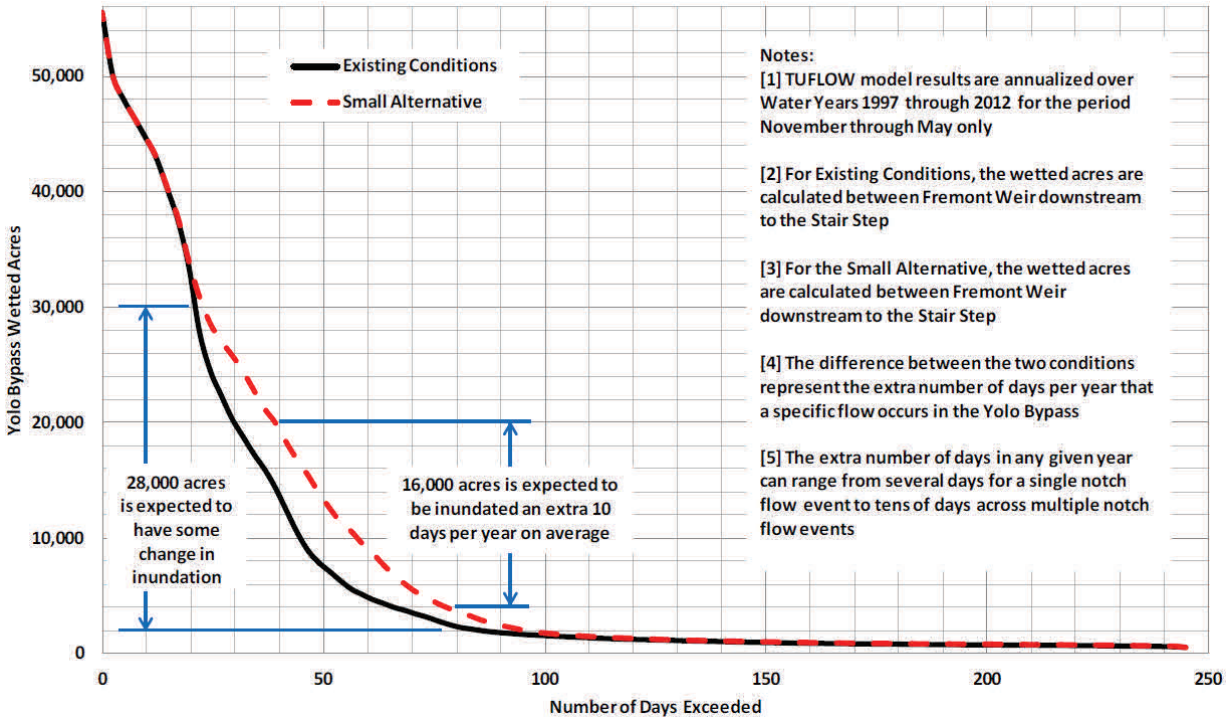


Figure 11 - Increase in Wetted Acres (inundation) in the Yolo Bypass for Non-JDA alternatives

Additional modeling will provide greater insights into expected site-specific increases in inundation frequency and duration during the operational window for a wide range of water year types (i.e. dry years, normal years, wet years). For the non-JDA alternatives, early site-specific modeling shows that Lisbon Weir will on average experience flows of 12,000 cfs for an additional 3-5 days per year, and flows of 6,000 cfs for an additional 15 days per year (Figure 12). Lisbon Weir is a good indication of how much water is in the Yolo Bypass since it is downstream from all of the Yolo Bypass flow sources.

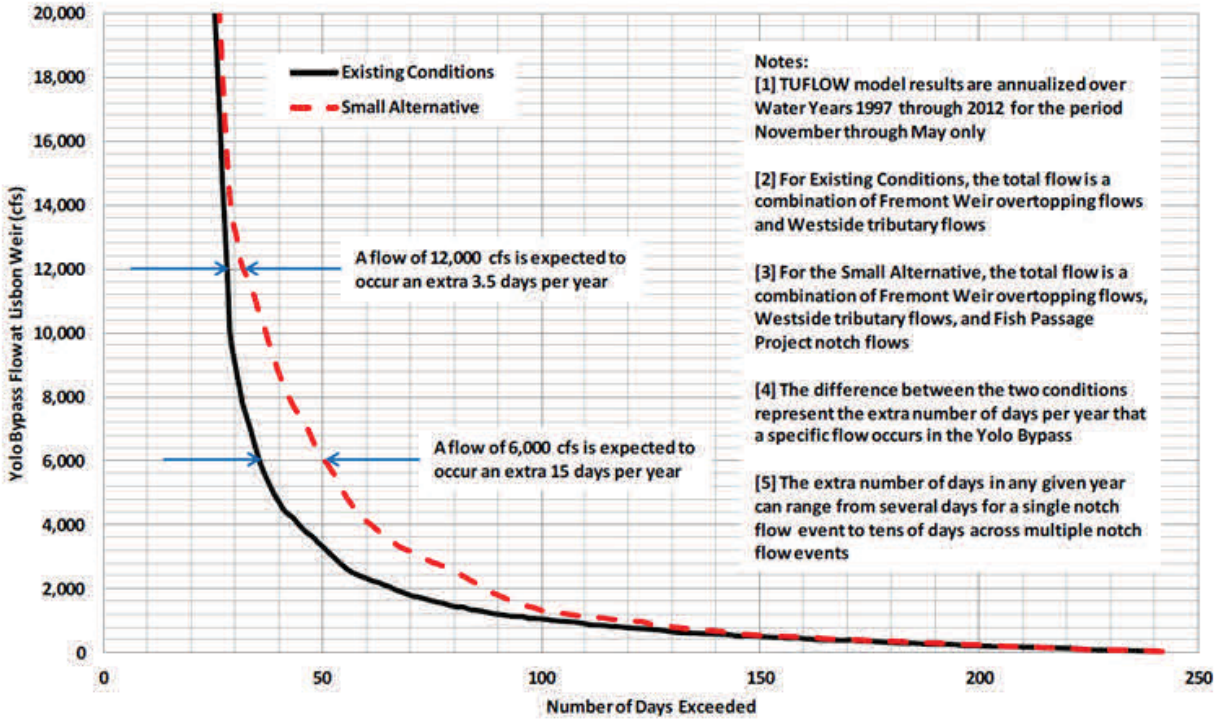


Figure 12 - Increase in Frequent Yolo Bypass Flows at Lisbon Weir for Non-JDA alternatives

CEQA/NEPA Process: Looking Ahead

NEPA requires consideration of a range of alternatives that could accomplish the proposed action's purpose and need. Similarly, CEQA requires the lead agency to include a reasonable range of alternatives that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the project. DWR and Reclamation have used existing documents, public scoping, and technical resources to identify initial alternatives. These alternatives were presented to stakeholders during a "Value Planning" session in August 2014, and the stakeholders suggested additional alternatives. The stakeholders continued to meet after this value planning session concluded, and that group is the basis for the stakeholder participation in carrying forward a JDA.

The JDA conceptual design will begin mid-April. The JDA and other alternative environmental impact analyses will begin in August 2016. Drafting of the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) will start in September 2016 and result in release of a public draft EIS/EIR in August 2017 (Figure 13). DWR and Reclamation have asked the group working on the JDA to continue meeting while this work is being completed to provide input and help address issues that may arise as

the alternatives are designed and analyzed. Appendix C includes a more detailed timeline of the JDA's CEQA/NEPA process.

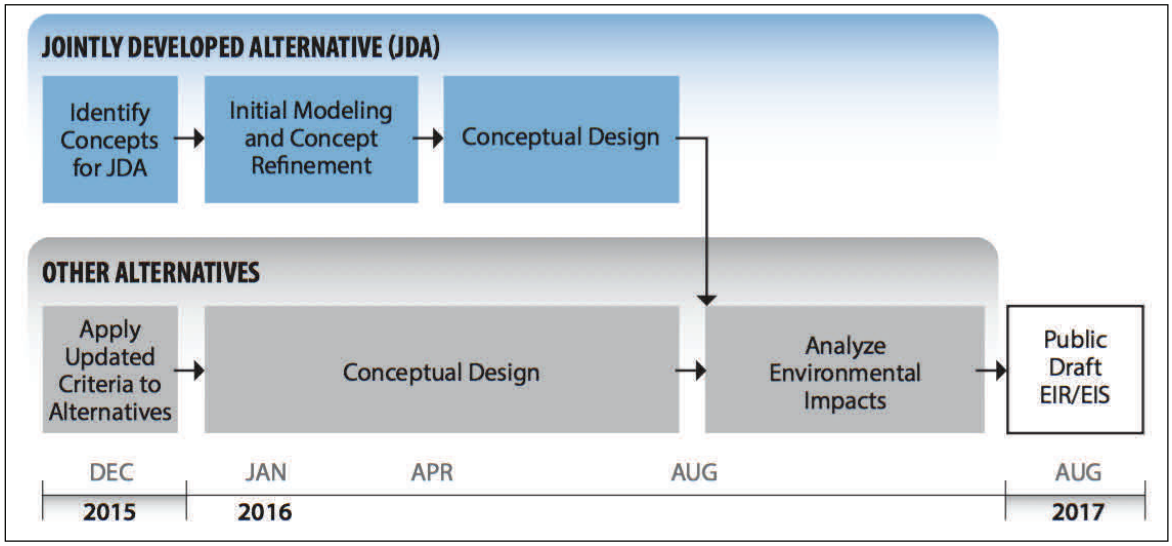


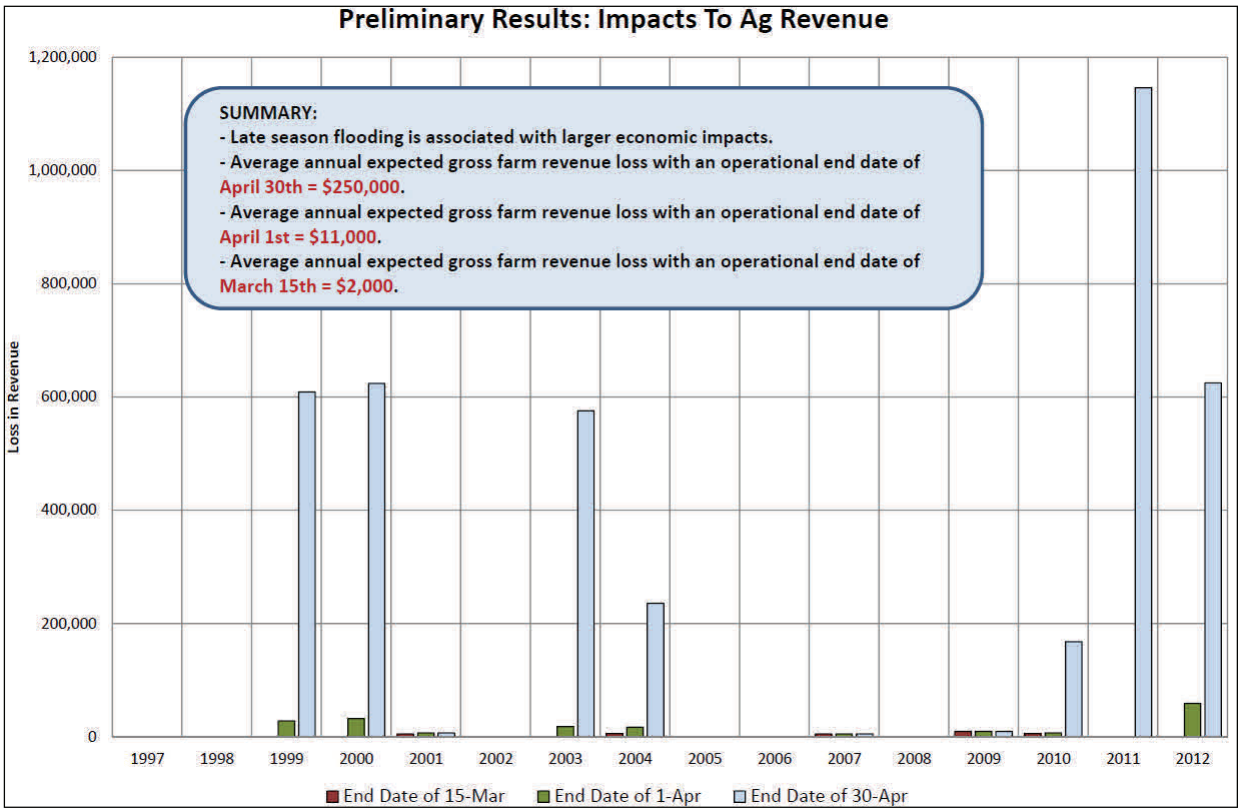
Figure 13 – Overview of CEQA/NEPA Process

Additional Work Ahead

In addition to the significant ongoing CEQA/NEPA work that is scheduled for the coming months, other critical issues must also be addressed concurrently. DWR and Reclamation acknowledge the importance of addressing issues of significant concern to landowners, other private interests, and local/State/Federal agencies. Some of the issues requiring resolution include adaptive management, long-term Project operations, and habitat and economic impact mitigation.

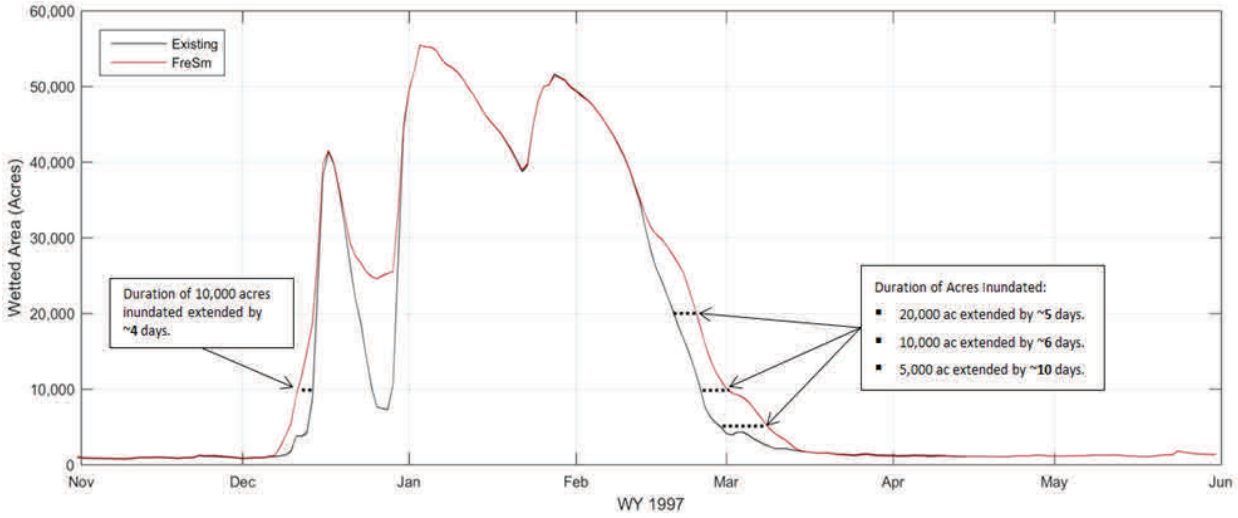
Appendix A – Modeled agricultural revenue impact across three Project operational end-date scenarios.

Water Year 2000

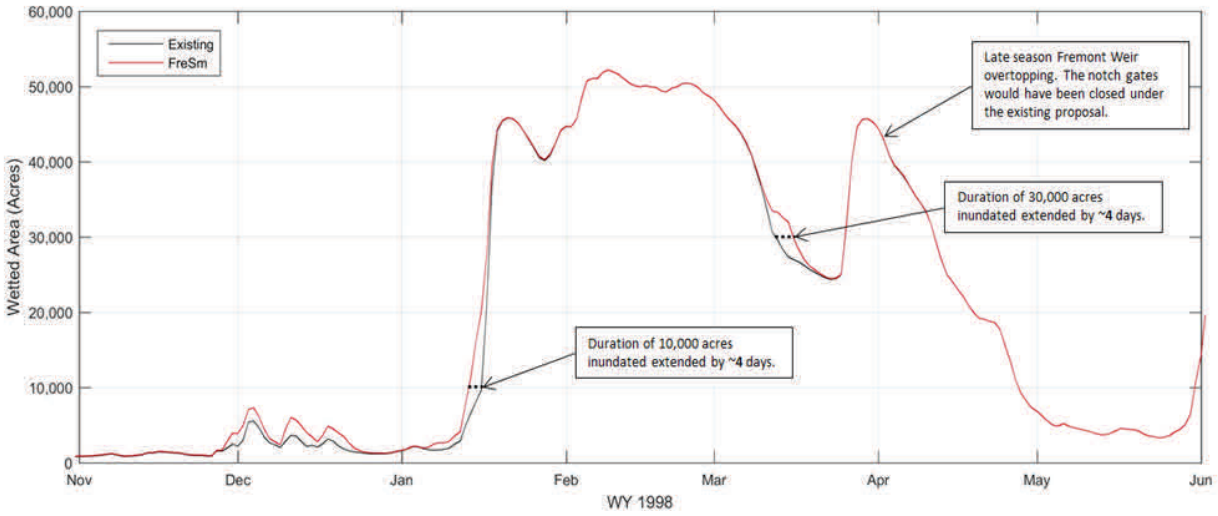


Appendix B – Existing and Small Gated Notch Inundation Graphs for water years 1997 – 2012

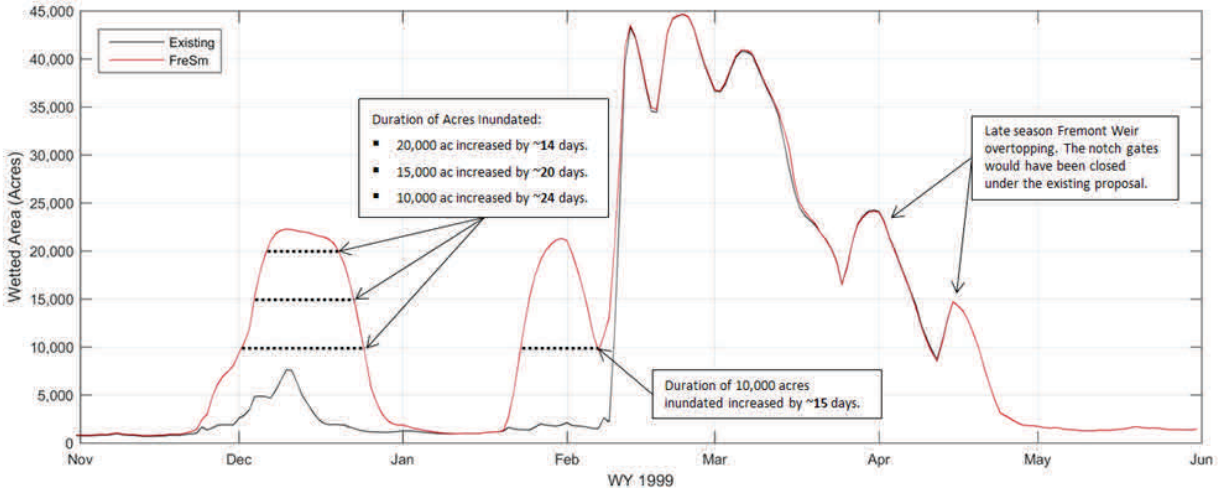
Water Year 1997 (Wet Year)



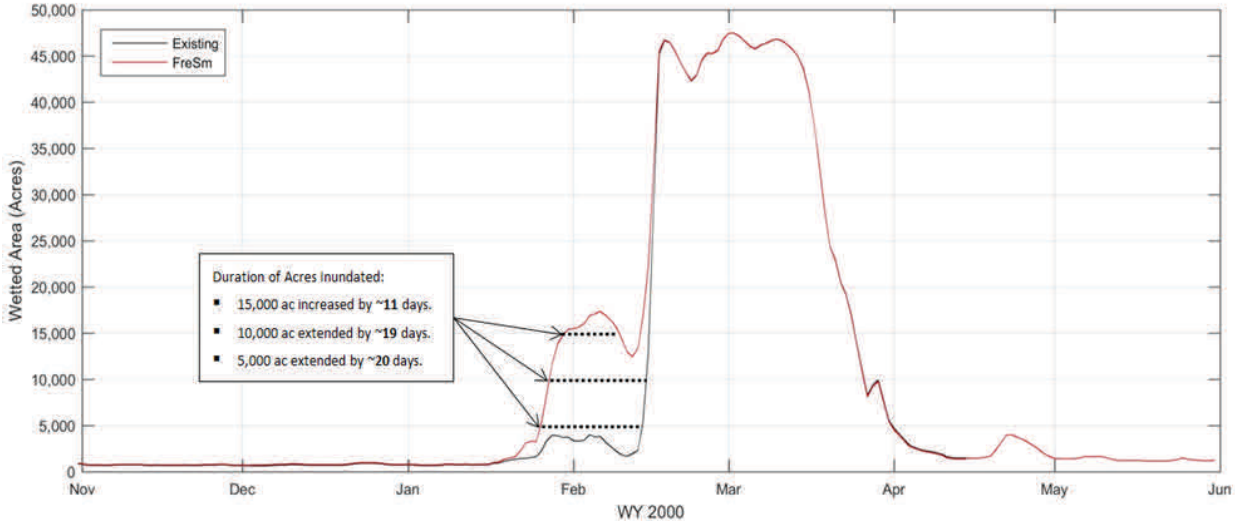
Water Year 1998 (Wet Year)



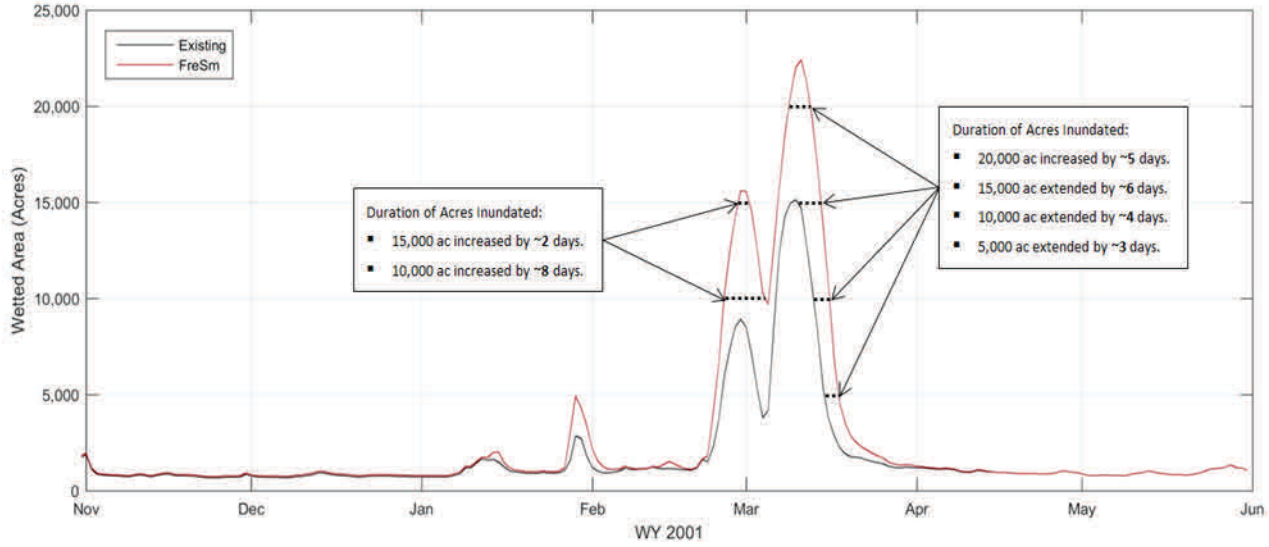
Water Year 1999 (Wet Year)



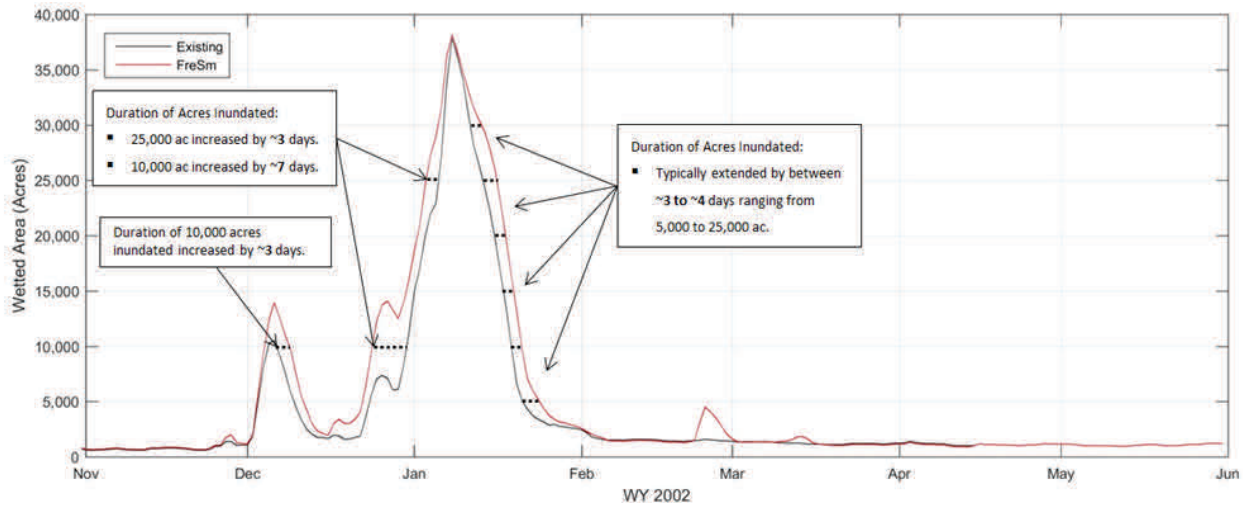
Water Year 2000 (Above Normal Year)



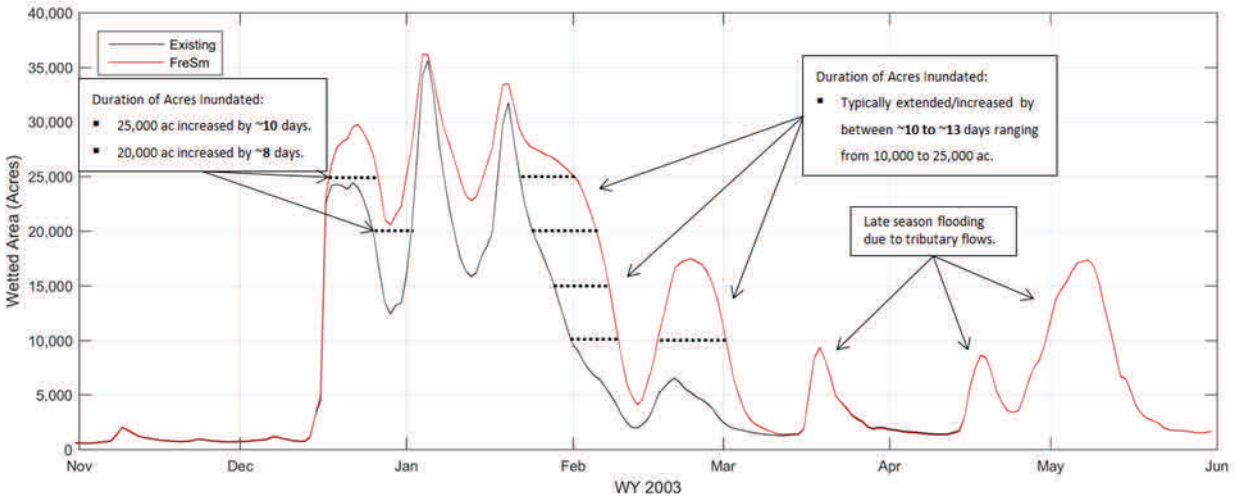
Water Year 2001 (Dry Year)



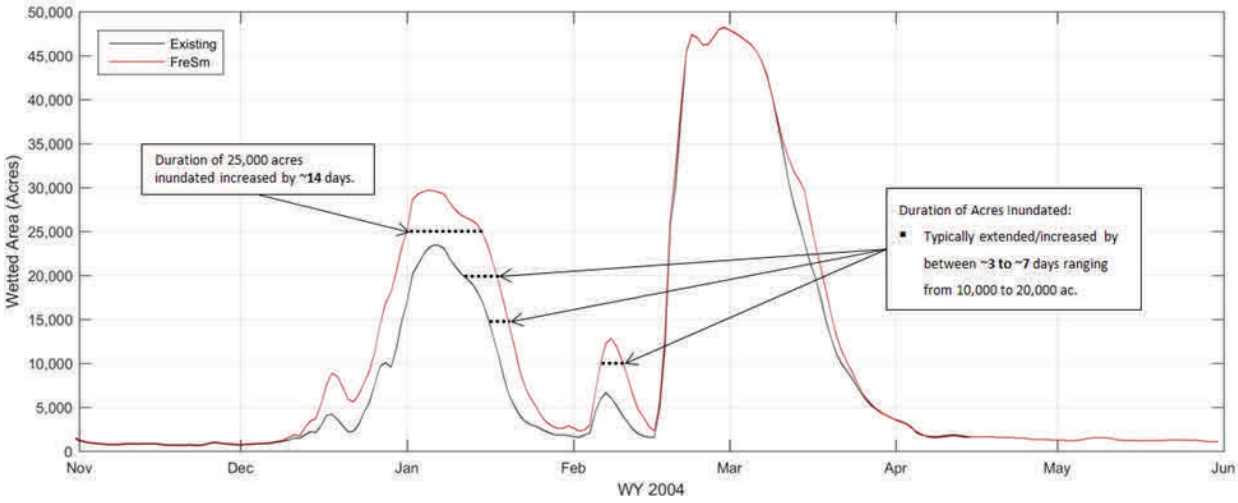
Water Year 2002 (Dry Year)



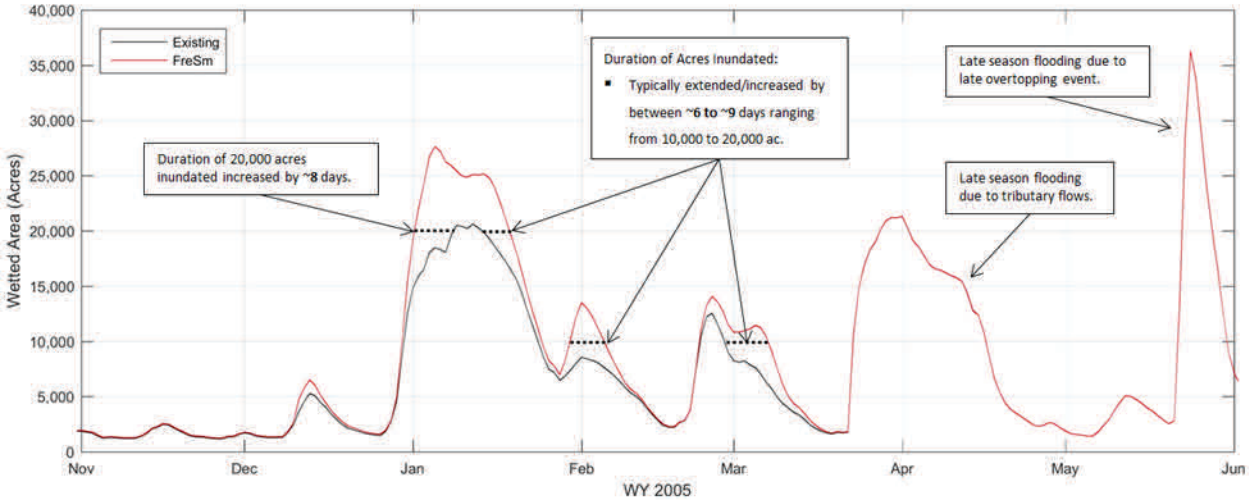
Water Year 2003 (Above Normal Year)



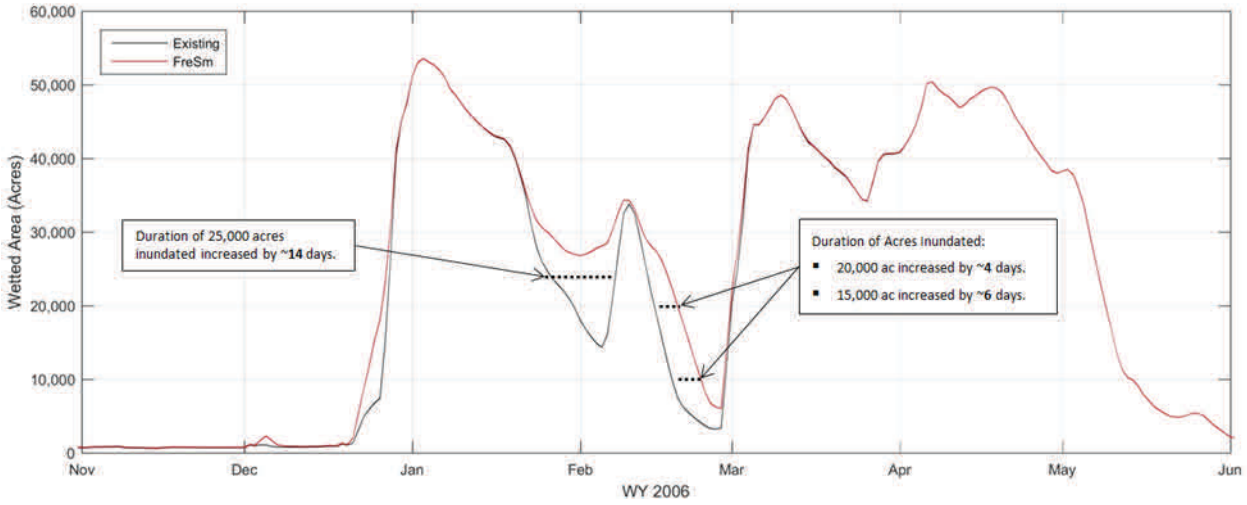
Water Year 2004 (Below Normal Year)



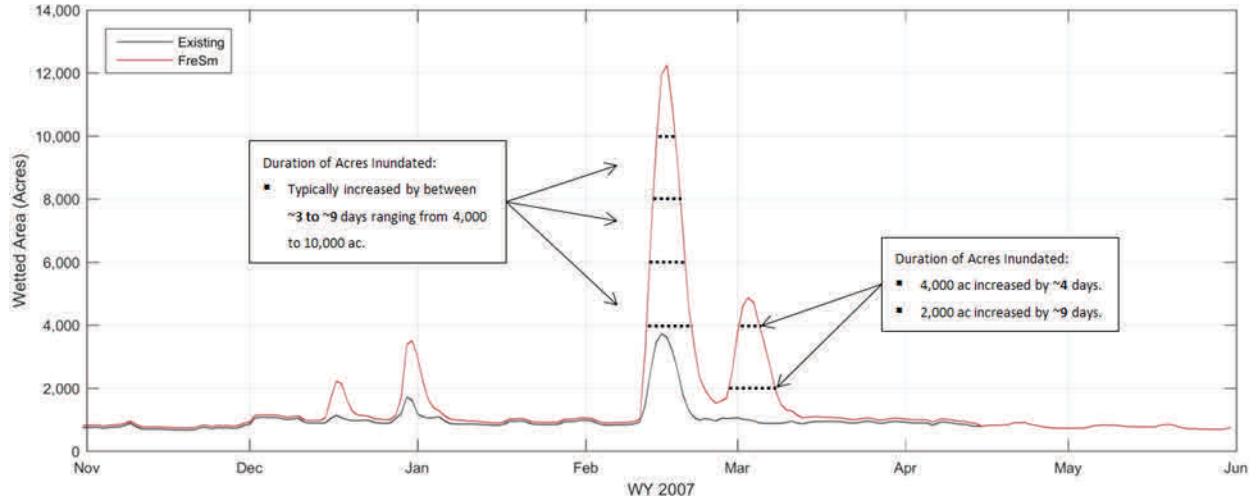
Water Year 2005 (Above Normal Year)



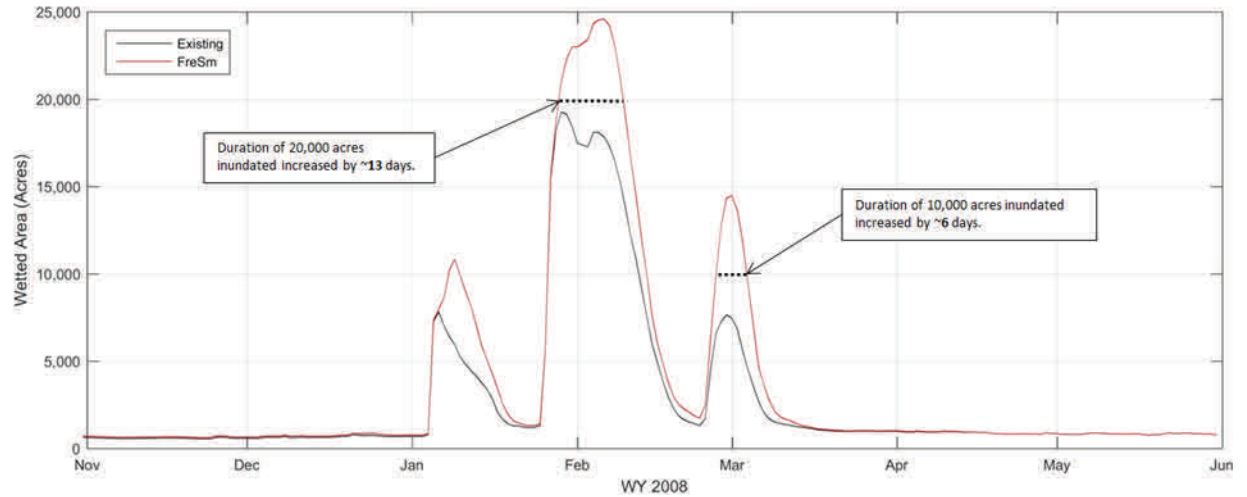
Water Year 2006 (Wet Year)



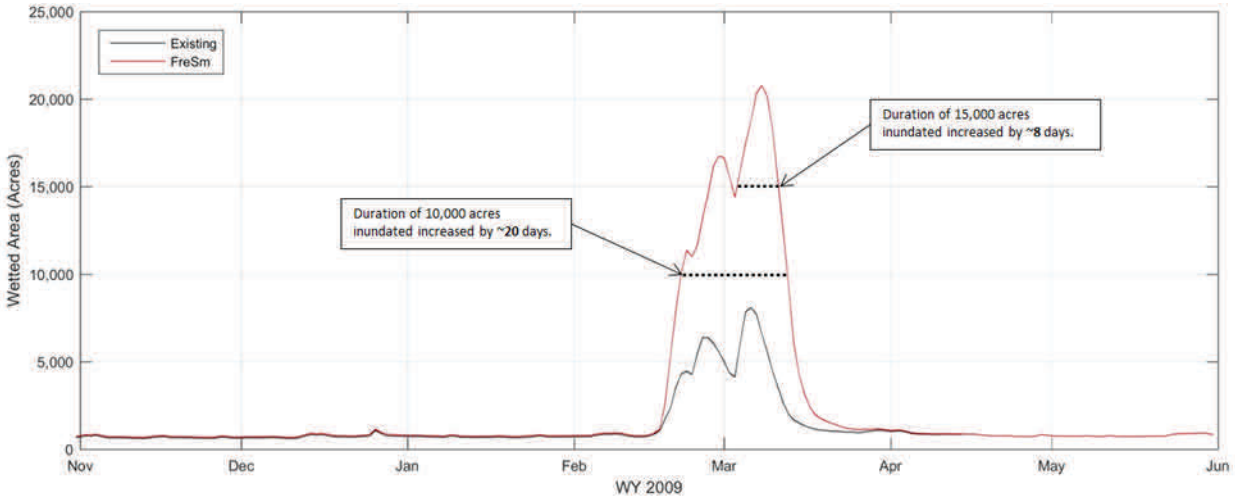
Water Year 2007 (Dry Year)



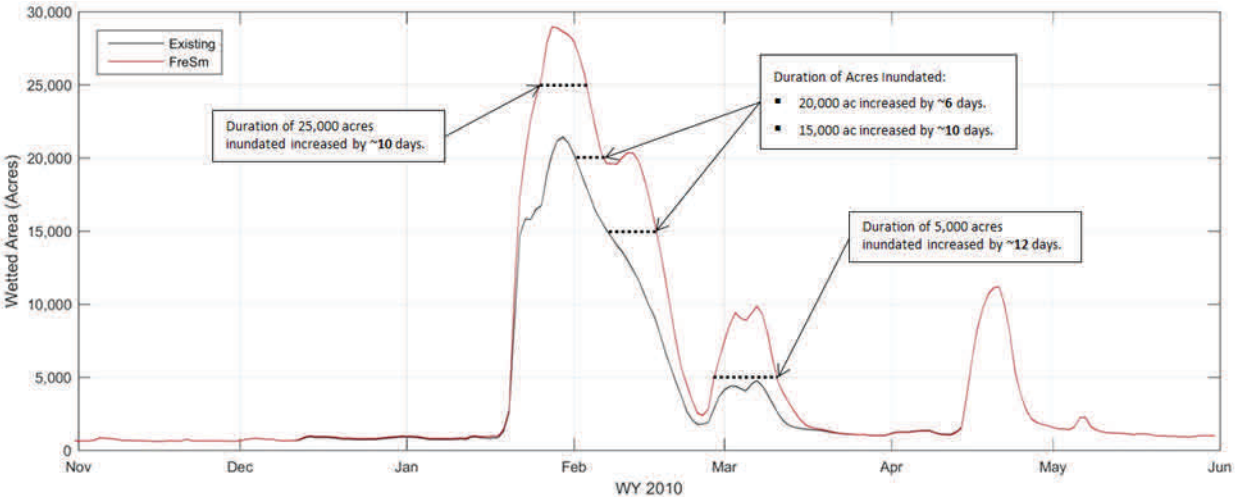
Water Year 2008 (Critical Dry Year)



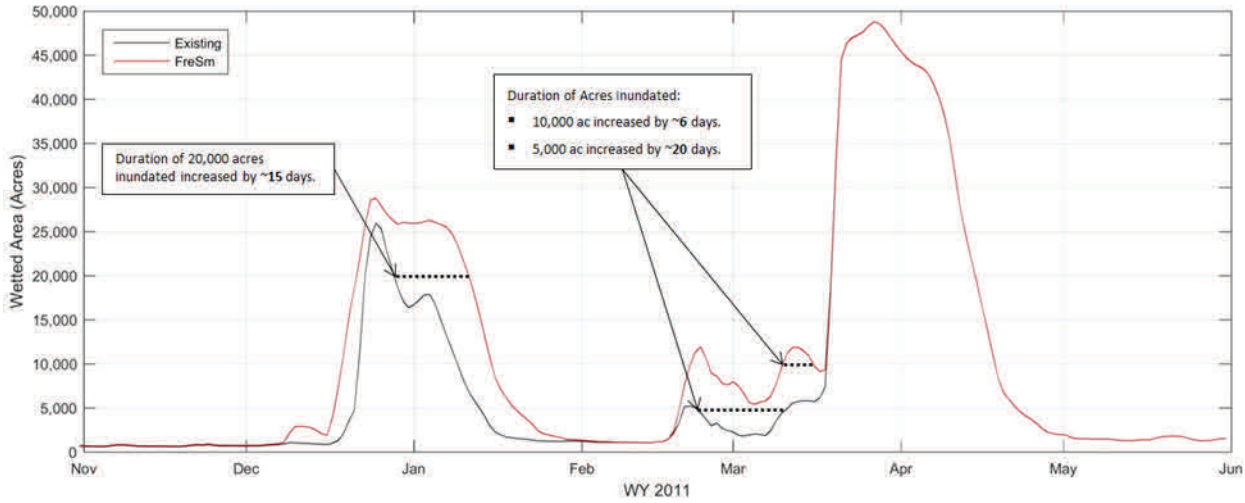
Water Year 2009 (Dry Year)



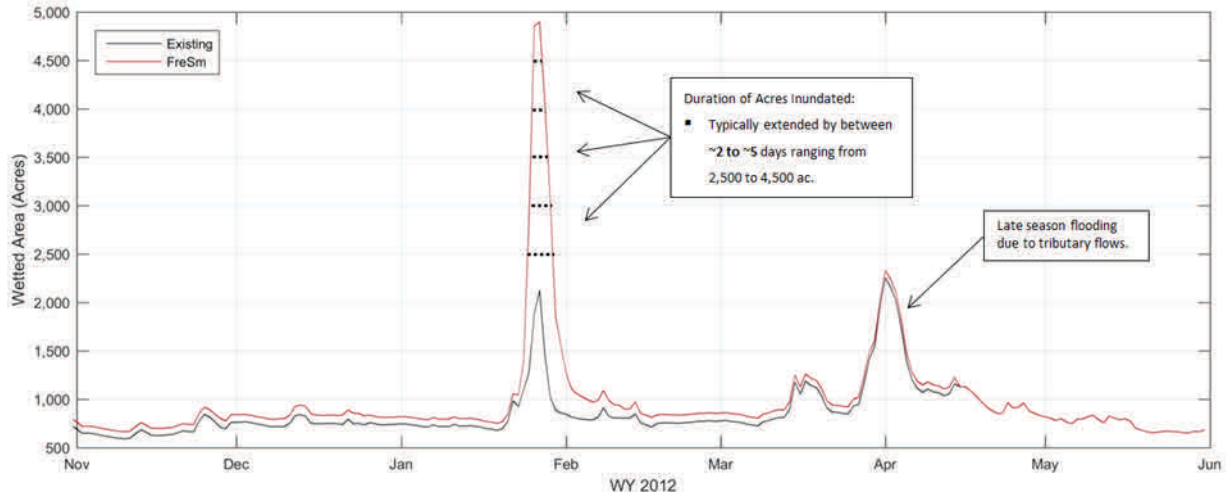
Water Year 2010 (Below Normal Year)



Water Year 2011 (Wet Year)



Water Year 2012 (Below Normal Year)



YOLO BYPASS SALMONID HABITAT RESTORATION AND FISH PASSAGE
JDA PLANNING PROCESS

	Identify Concepts for JDA Oct 2015 - Jan 2016				Initial Modeling and Concept Refinement Feb 2016 - Apr 2016					Conceptual Design May 2016 - Aug 2016		Analyze Environmental Impacts Sep 2016 - Jul 2017		Public Draft EIS/EIR Aug 2017
	October 29, 2015	**November 12, 2015**	**December 3, 2015**	**January 7, 2016**	**February 4, 2016**	**February 22, 2016**	**March 14, 2016**	**April 4, 2016**	**April 18, 2016**	**May, 2016**	**August, 2016**	**Nov/Dec, 2016**	**March, 2017**	**Aug/Sep, 2017**
JDA Team Meeting and Involvement	**Purpose:** Introduce JDA process, objectives, and schedule	**Purpose:** Review evaluation criteria used to determine how well alternatives perform	**Purpose:** Discuss potential JDA components	**Purpose:** Discuss Strawman JDA proposal	**Purpose:** Discuss updates to Strawman JDA based on technical work	**Purpose:** Clarify JDA process timeline and gain common understanding of currently-proposed JDA components	**Purpose:** Update JDA team on technical progress	**Purpose:** Review and discuss JDA modeling and evaluation results	**Purpose:** Brainstorm changes to JDA based on evaluation results	**Purpose:** Discuss progress on JDA conceptual design	**Purpose:** Discuss final JDA conceptual design	**Purpose:** Review preliminary effects analysis	**Purpose:** Discuss potential environmental impacts and mitigation measures	**Purpose:** **Public Meetings on Draft EIS/EIR** Collect formal comments and feedback on Public Draft EIS/EIR
	Key Topics: • JDA purpose, objectives, and schedule • Early implementation project updates (Wallace Weir, Fremont Weir Adult Fish Passage)	**Key Topics:** • Existing evaluation criteria • Discussion to capture revisions from team	**Key Topics:** • Revised evaluation criteria based on 11/12 comments • Strawman JDA proposal for detailed evaluation from Post Value Planning team • The Strawman JDA is a rough first draft of a JDA alternative for technical evaluation	**Key Topics:** • Discussion on Strawman JDA proposal from 12/3 • Removal of Elkhorn setback levees from Strawman JDA because it is being addressed in a separate process	**Key Topics:** • Progress of technical small group in refining details of Strawman JDA • Schedule updates	**Key Topics:** • Clarify JDA process timeline • "Lessons learned" during technical small group meetings • JDA components and operations • Stakeholder concerns for each component • Desired outcomes for each component • Discussion of how to obtain input from Boards and wider stakeholder group	**Key Topics:** • Updated concepts for southern Bypass area • Modifications to the JDA to improve technical performance • Telemetry study update • Local project updates	**Key Topics:** • JDA hydraulic modeling results • Alternative evaluation results for other evaluation criteria • Effectiveness in meeting fisheries objectives • Economic, education, biological, recreation, cultural, flood, and water supply impacts	**Key Topics:** • Modifications to JDA to address comments or improve performance	**Key Topics:** • Local project updates • Updates on conceptual design • Changes identified in the design process to improve alternative feasibility	**Key Topics:** • JDA conceptual designs • Conceptual design for remaining alternatives	**Key Topics:** • Updates on analytical tools for environmental compliance effort • Preliminary modeling results	**Key Topics:** • Potential environmental impacts on key resource areas • Concepts to mitigate environmental impacts	