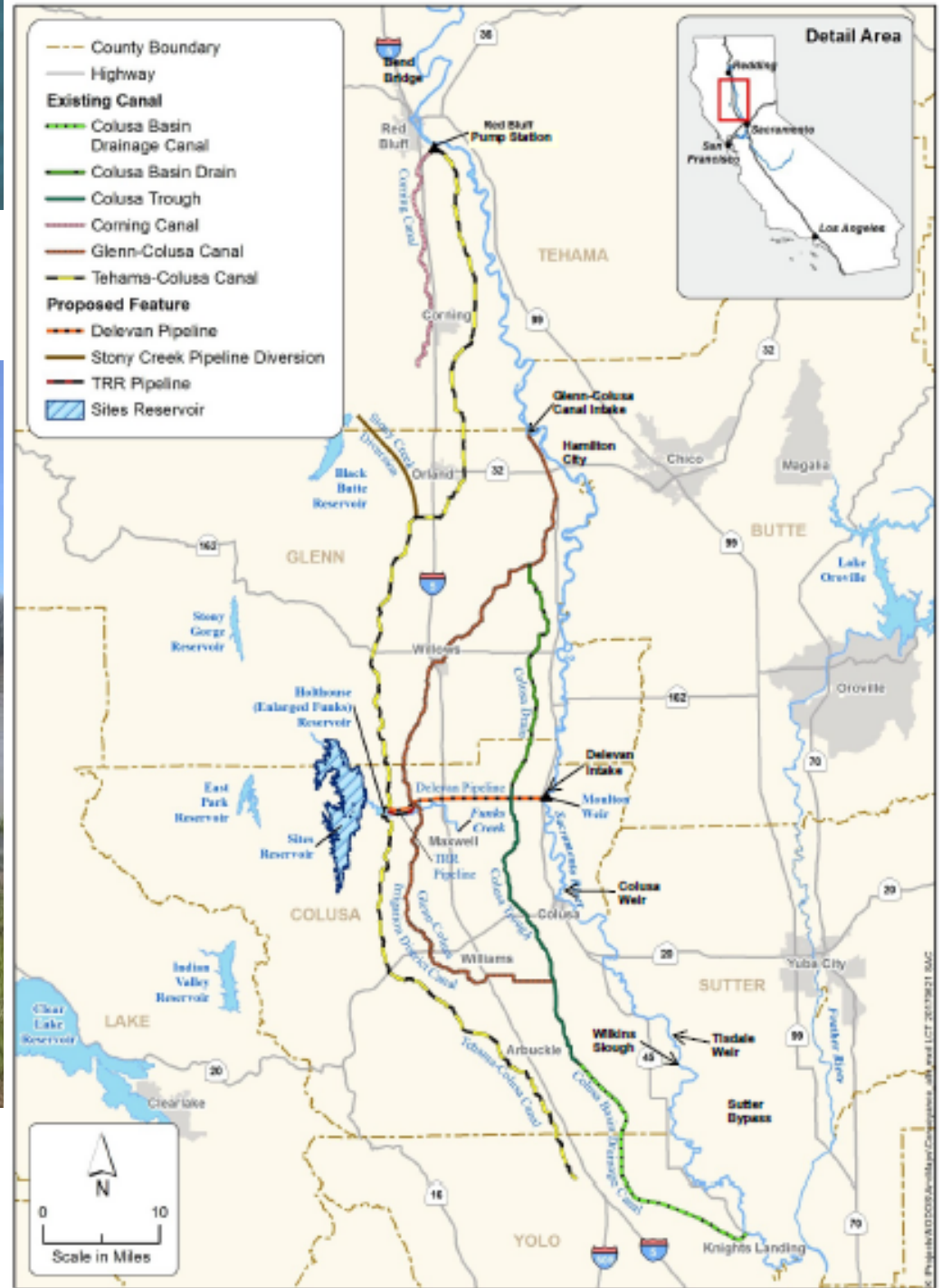


# Sites Project: Operations Overview

California Department of Fish and Wildlife

June 12, 2019

# Regional Map



# System Requirements

- Flexible operations to maximize system benefits
- Meet all required system deliveries/regulatory requirements
  - Water rights
  - CVP and SWP Contracts
  - USFWS/NMFS BiOps
  - Temperature control
  - D-1641
  - CVPIA etc.



# Sites Operations Concept

## *Overall Concept:*

*Operate Sites in cooperation with existing CVP/SWP facilities to improve reliability to meet ecosystem and water quality objectives, and deliveries to agricultural, M&I, and environmental water users*

## Three primary operations assumptions:

1. Criteria for diversion of excess flows from the Sacramento River to fill Sites Reservoir;
2. Criteria to achieve benefits in specific year types (such as drought or driest periods) and other hydrologic conditions; and
3. Operate Sites Reservoir in cooperation with other SWP/CVP reservoirs (e.g. Shasta, Oroville, Folsom)



# Diversion Criteria for Filling Sites

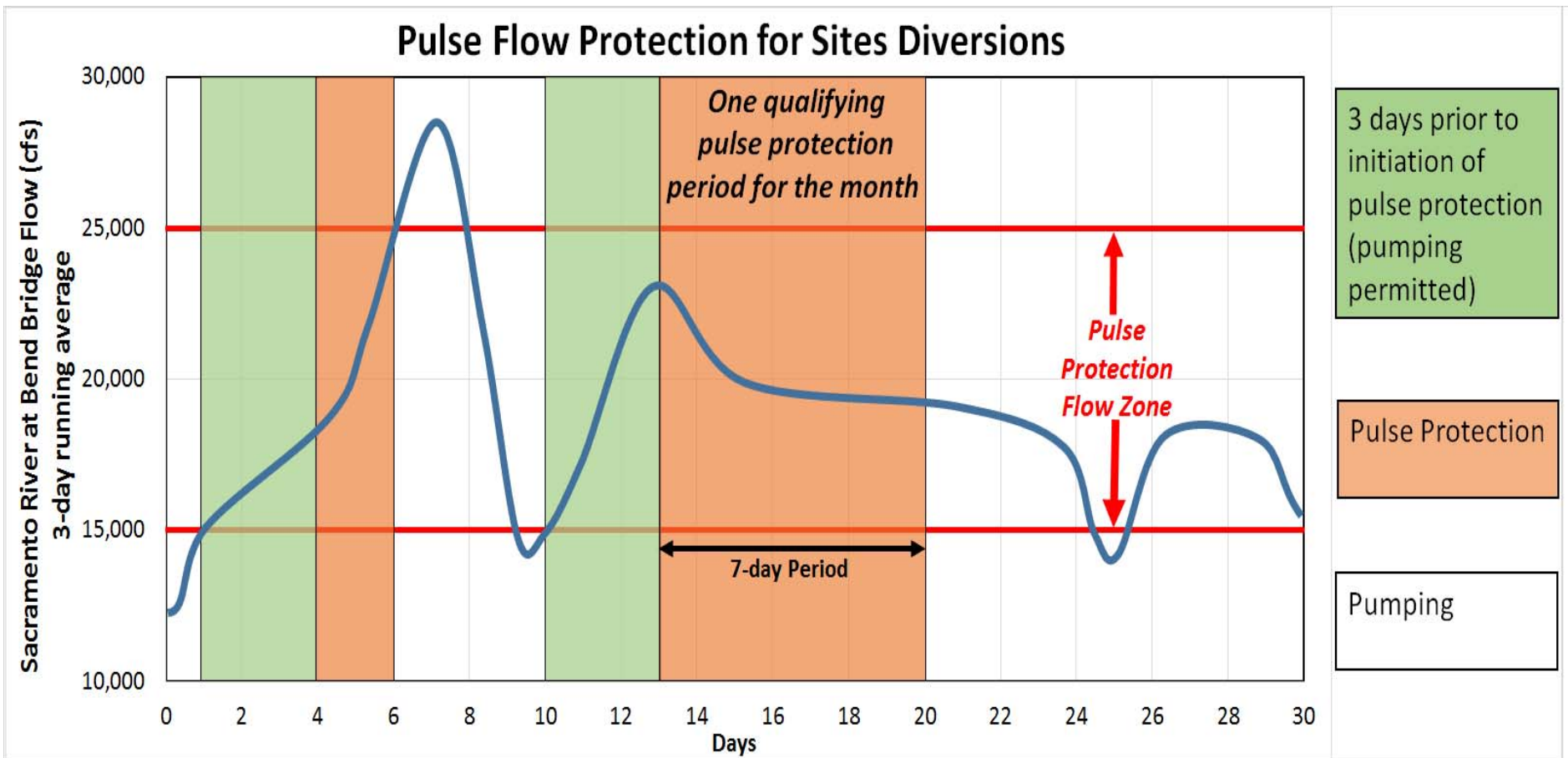
- Red Bluff, Hamilton City and New Delevan Pipeline diversions primarily Nov – March but can occur any month
  - Facility capacities account for irrigation deliveries and maintenance periods
- Allowable diversions during the fill season are “excess” water
- Diversions for filling Sites allowed once all other demands/requirements met
  - Existing CVP and SWP and other water rights diversions
  - Existing regulatory requirements (SWRCB D-1641, CVPIA 3406(b)(2), 2008 USFWS and 2009 NMFS BOs), other instream flow requirements
- Additional criteria for filling Sites
  - Bypass flow criteria for Sacramento River flows at Red Bluff, Hamilton City, Wilkins Slough, and Freeport
  - Diversion restrictions to minimize entrainment during pulse flow conditions to protect out-migrating anadromous fish

# Diversion Restrictions and Bypass Flows

- Diversions to storage are restricted until bypass requirements achieved (must be met for diversion to Sites to occur)
  - Below Red Bluff: 3250 cfs
  - Below Hamilton City: 4,000 cfs (3 day average)
  - At Wilkins Slough: 5,000 cfs (3 day average)
  - At Freeport/Hood (average monthly) to protect Delta water quality:
    - 15,000 cfs in January
    - 13,000 cfs in December or February through June
    - Otherwise 11,000 cfs
- Diversions to storage restricted to protect fish migration pulse events (surrogate for real time monitoring)
  - Up to one pulse event per month (October – May)
  - Pulse range 15,000 cfs – 25,000 cfs (based on Bend Bridge as indicator)
  - Pulse event qualified if duration of seven days
- Daily modeling conducted to inform CalSim II about flow availability for Sites fills, and fill restrictions (bypass flow and pulse flow criteria)



# Pulse Flow Diversion Restriction for Modeling Purposes



Pulse flow protection period is October through May

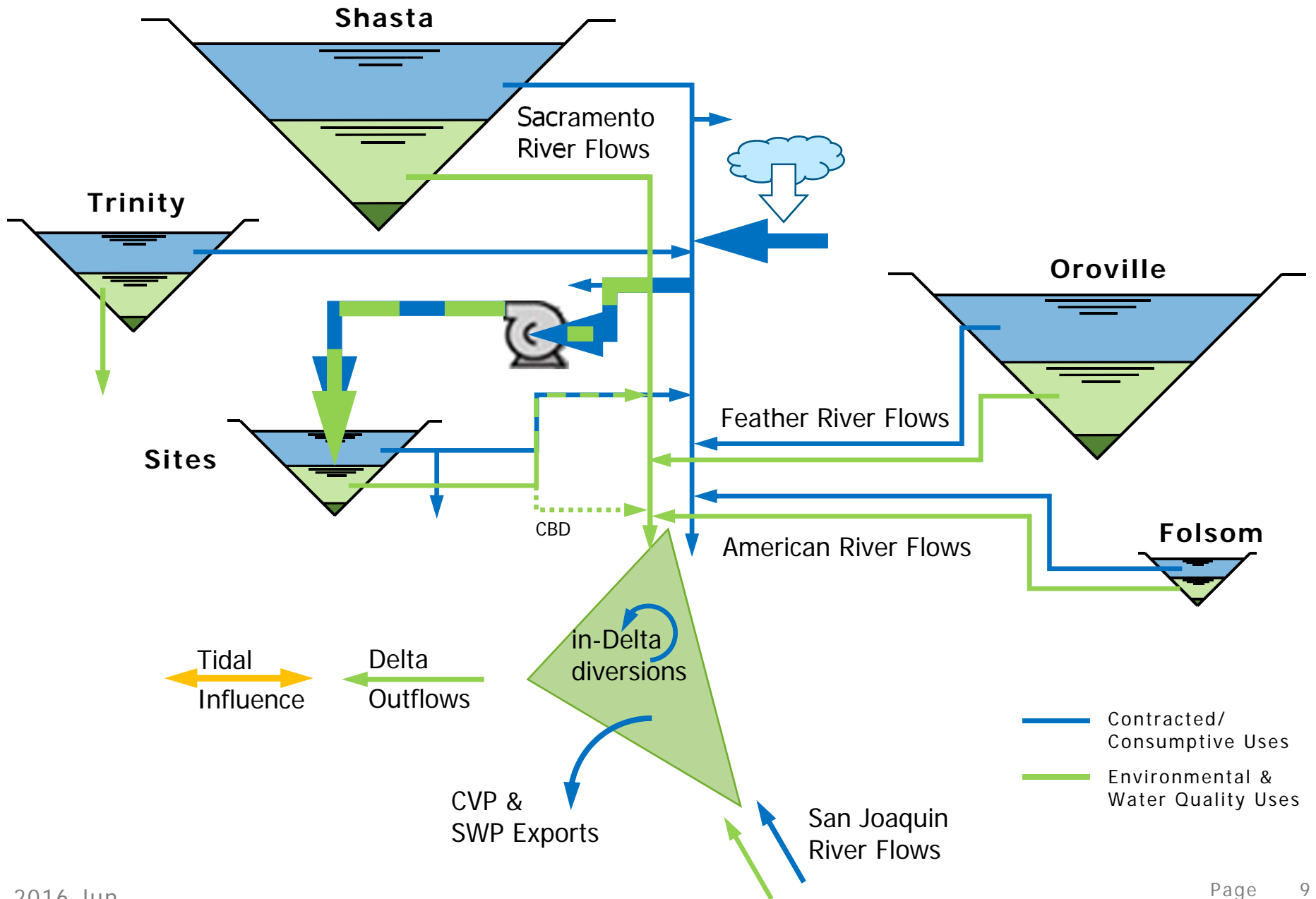
# CVP/SWP Cooperation

- Increase operational flexibility to maximize system benefits
- Work in cooperation with SWP/CVP including coordinating releases from all major reservoirs and conserving storage, to improve:
  - Cold water pool storage
  - Fish survival (in-river and Delta)
  - Delta water quality
  - Hydropower generation
  - Water supply reliability
  - Emergency Storage





# Operations Schematic

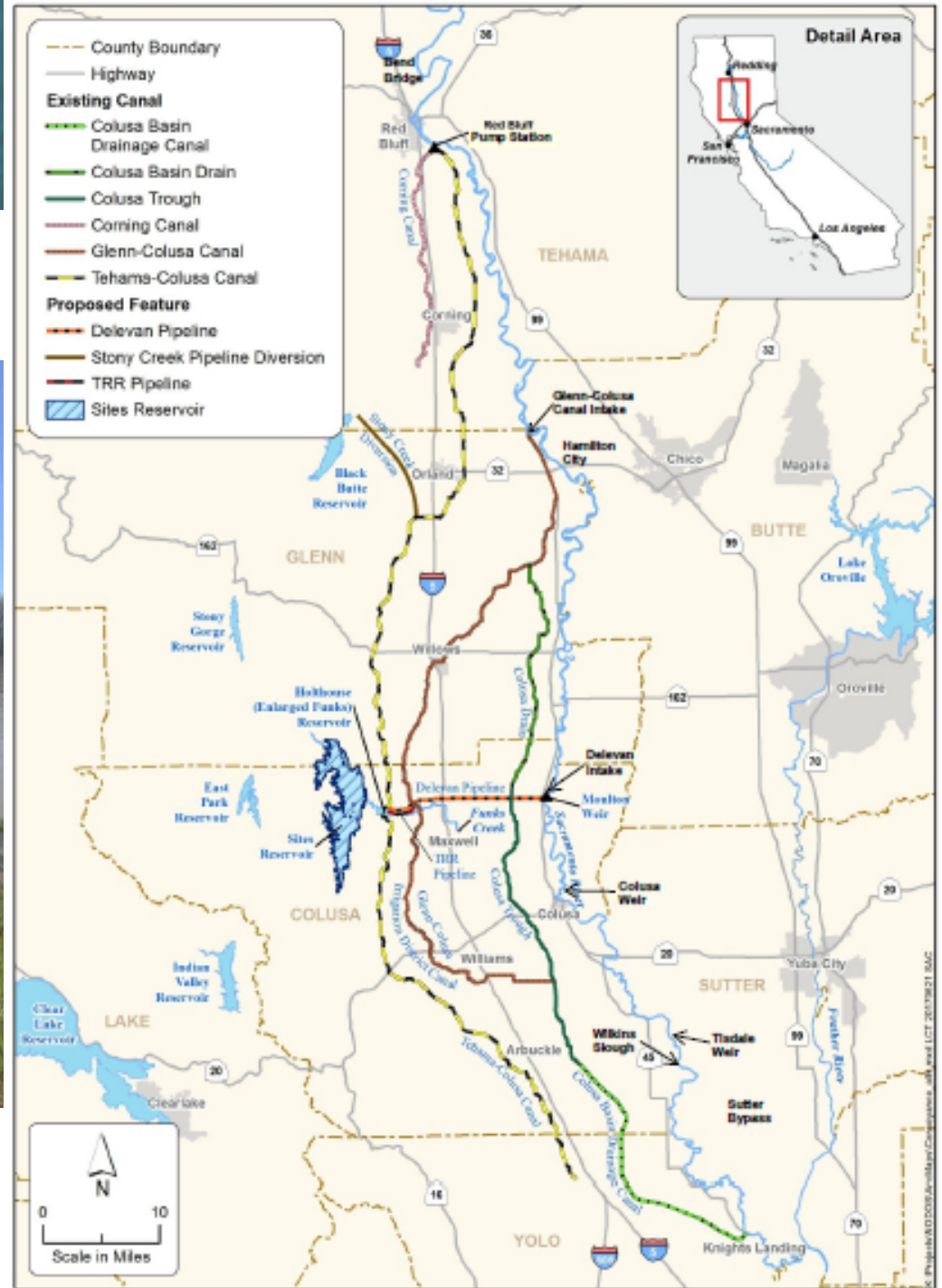


# Proposed Sites Operations Priorities

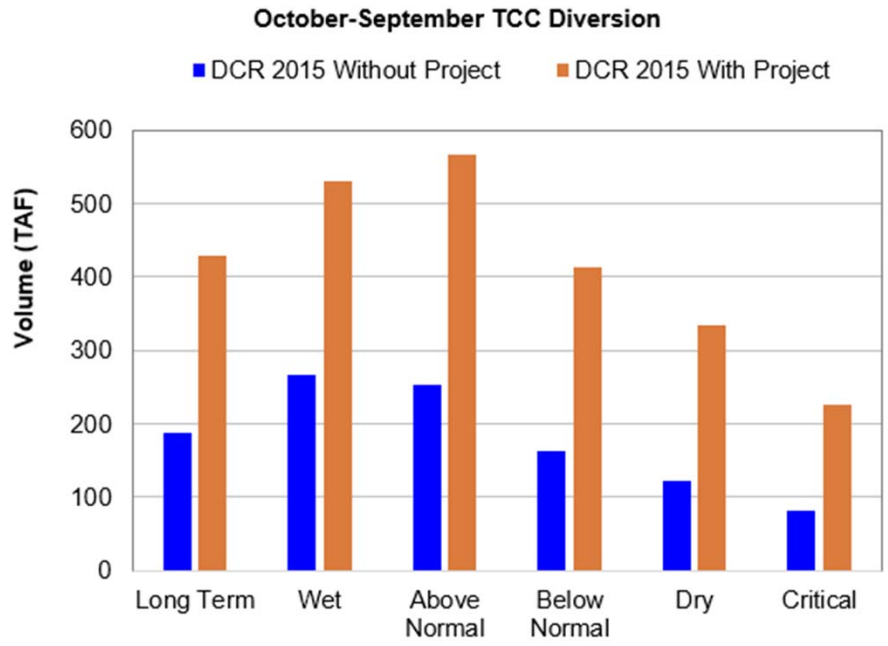
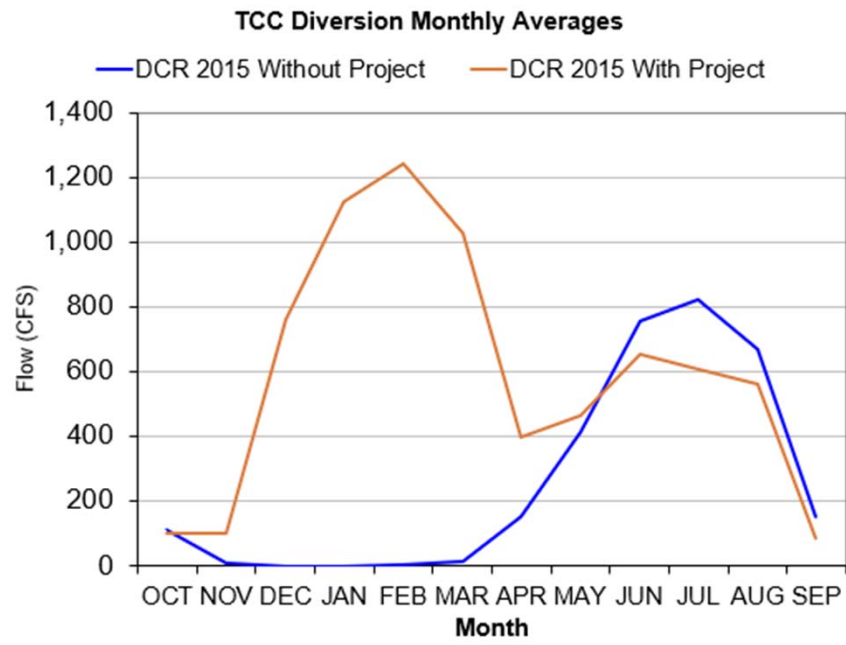
- In drought conditions, the priority operations are:
  - Cold water pool conservation in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake;
  - Regulation of Sacramento River summer flows for best use of cold water for control of temperature conditions for anadromous fish
  - Improve water supply reliability
- In other hydrologic conditions (non-drought), the priority operations are:
  - Cold water pool conservation in Shasta Lake, Lake Oroville, and Folsom Lake;
  - Manage and improve Yolo Bypass flows and Delta water quality
  - Improve flows for Delta fisheries habitat based on the X2 location;
  - Stabilize Sacramento River fall flows for improving spawning and rearing success of anadromous fish.
  - Provide water for Level 4 refuge deliveries



# Regional Map

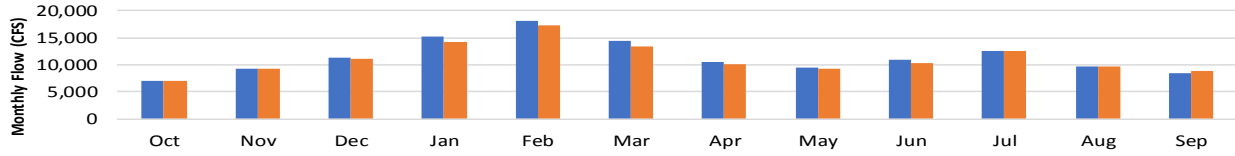


# Sacramento River Diversion RBDD

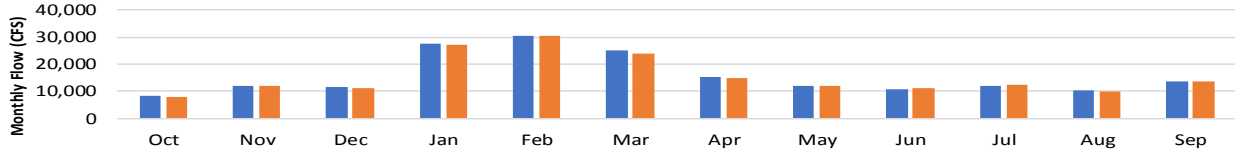


**Sacramento River flow below Red Bluff, Monthly Flow**

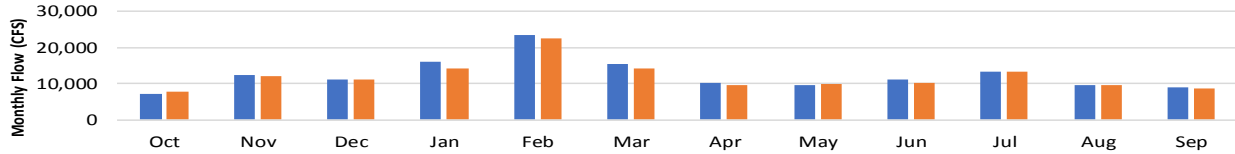
**Full Simulation Period**



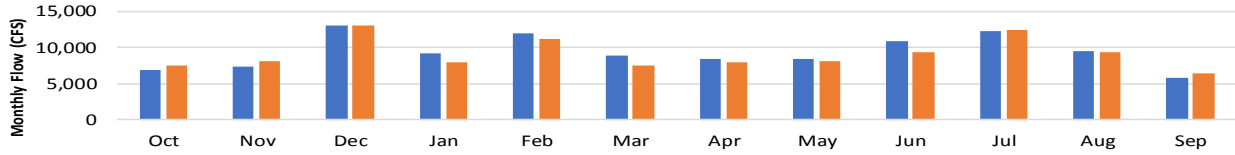
**Wet Water Year Types**



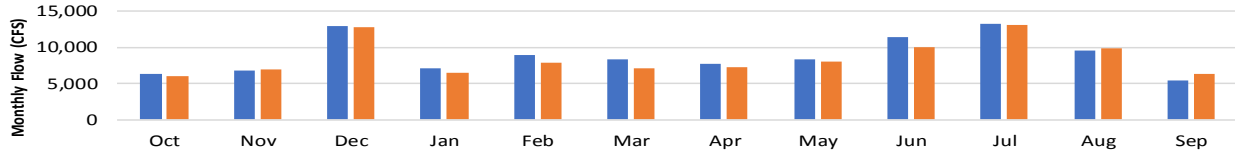
**Above Normal Water Year Types**



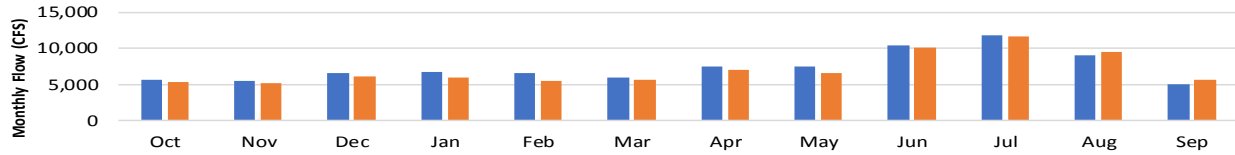
**Below Normal Water Year Types**



**Dry Water Year Types**

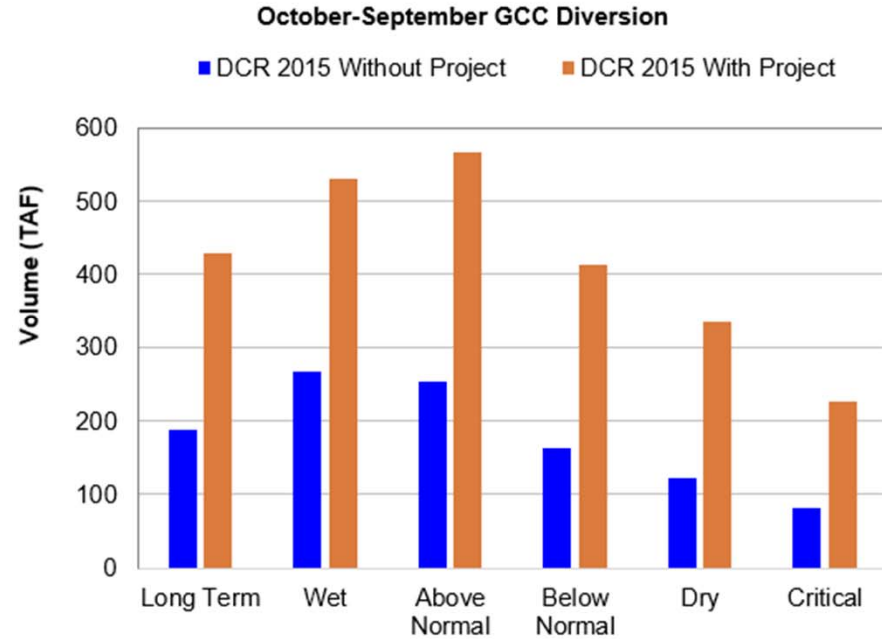
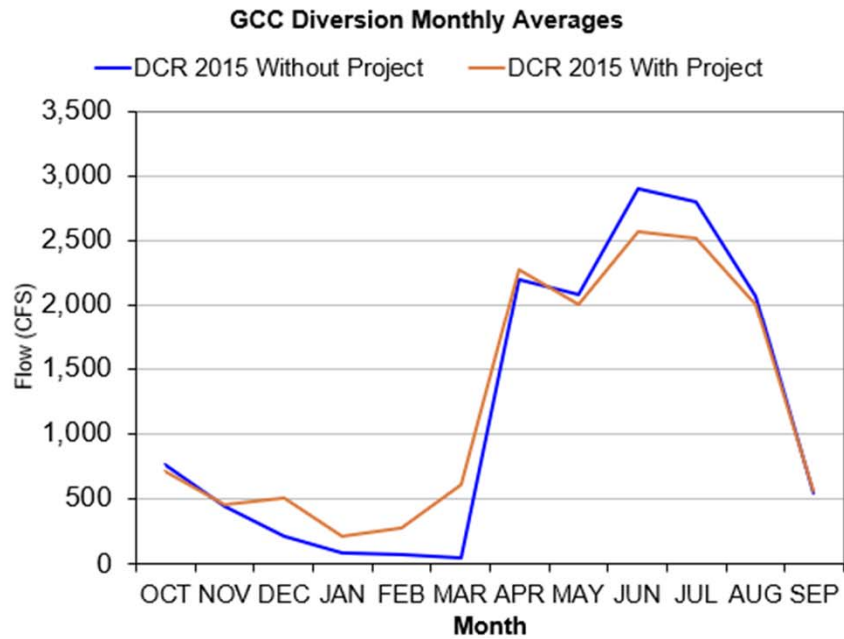


**Critical Water Year Types**



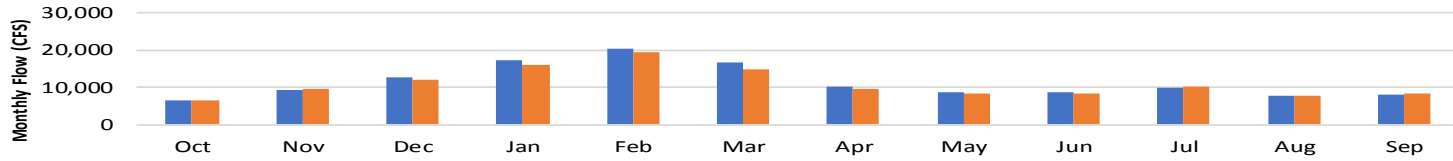
DCR 2015 Without Project
  DCR 2015 With Project

# Sacramento River Diversion to GCC

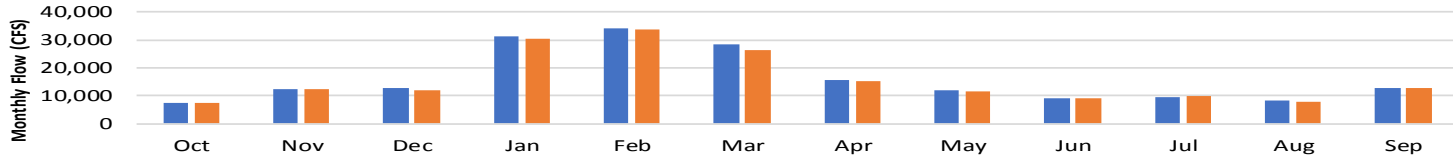


**Sacramento River flow below Hamilton City, Monthly Flow**

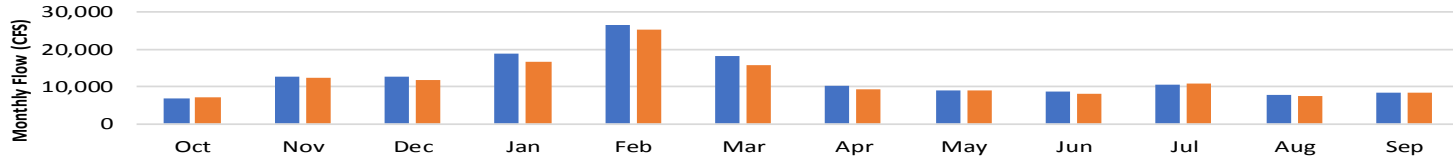
**Full Simulation Period**



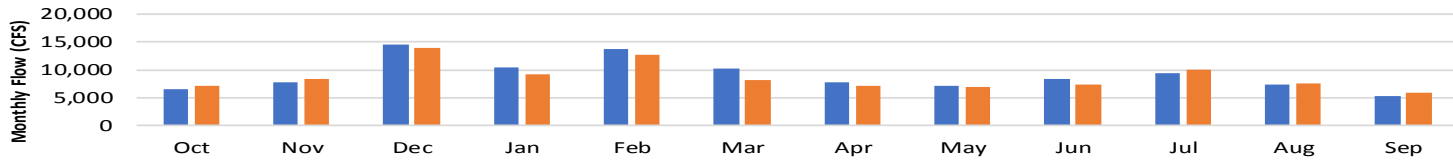
**Wet Water Year Types**



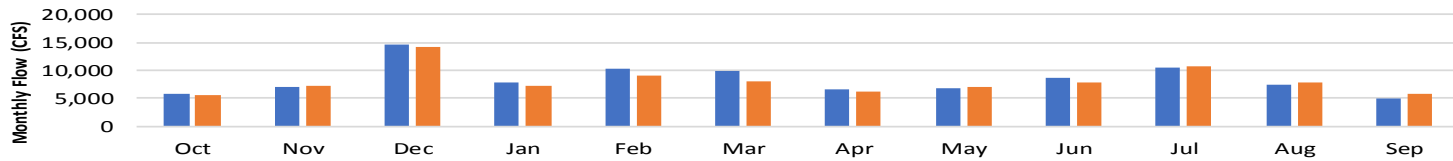
**Above Normal Water Year Types**



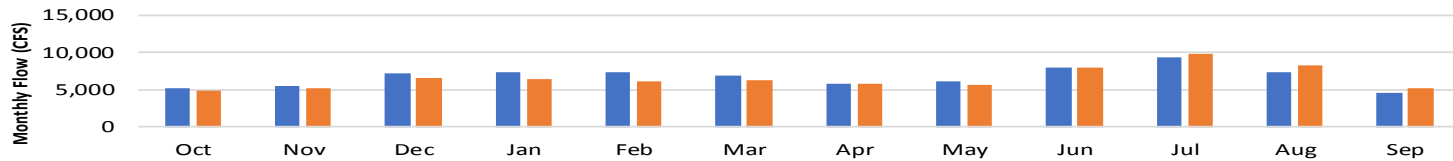
**Below Normal Water Year Types**



**Dry Water Year Types**



**Critical Water Year Types**

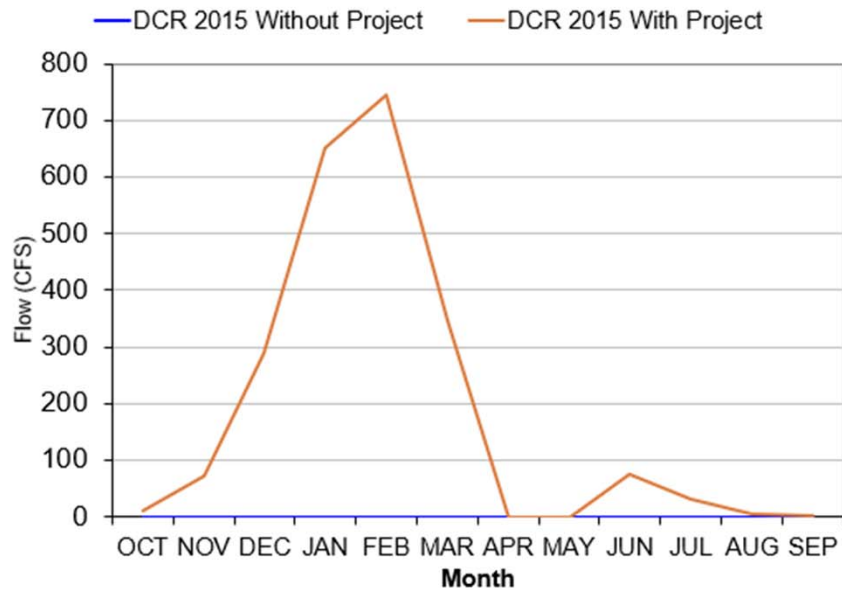


DCR 2015 Without Project

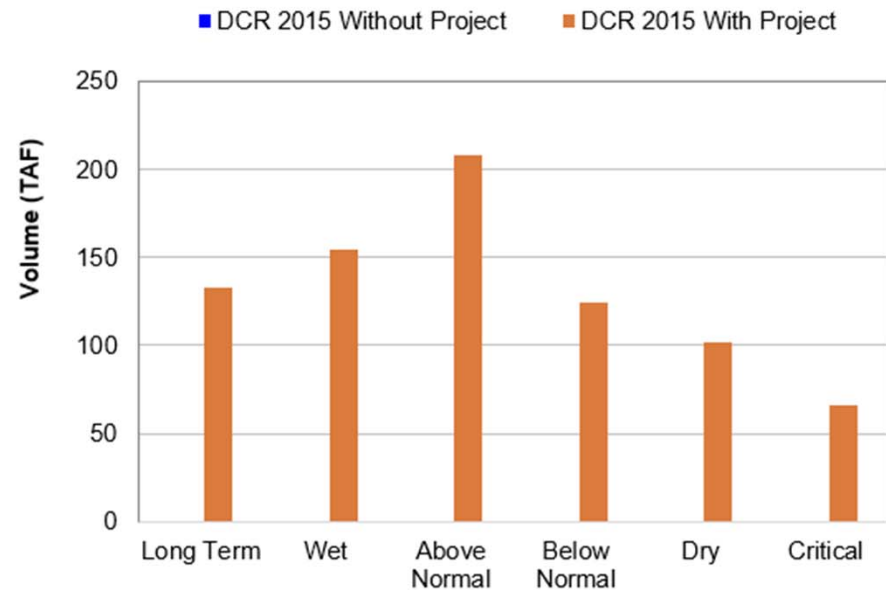
DCR 2015 With Project

# Delevan Pipeline Diversion Used to Fill Sites Reservoir

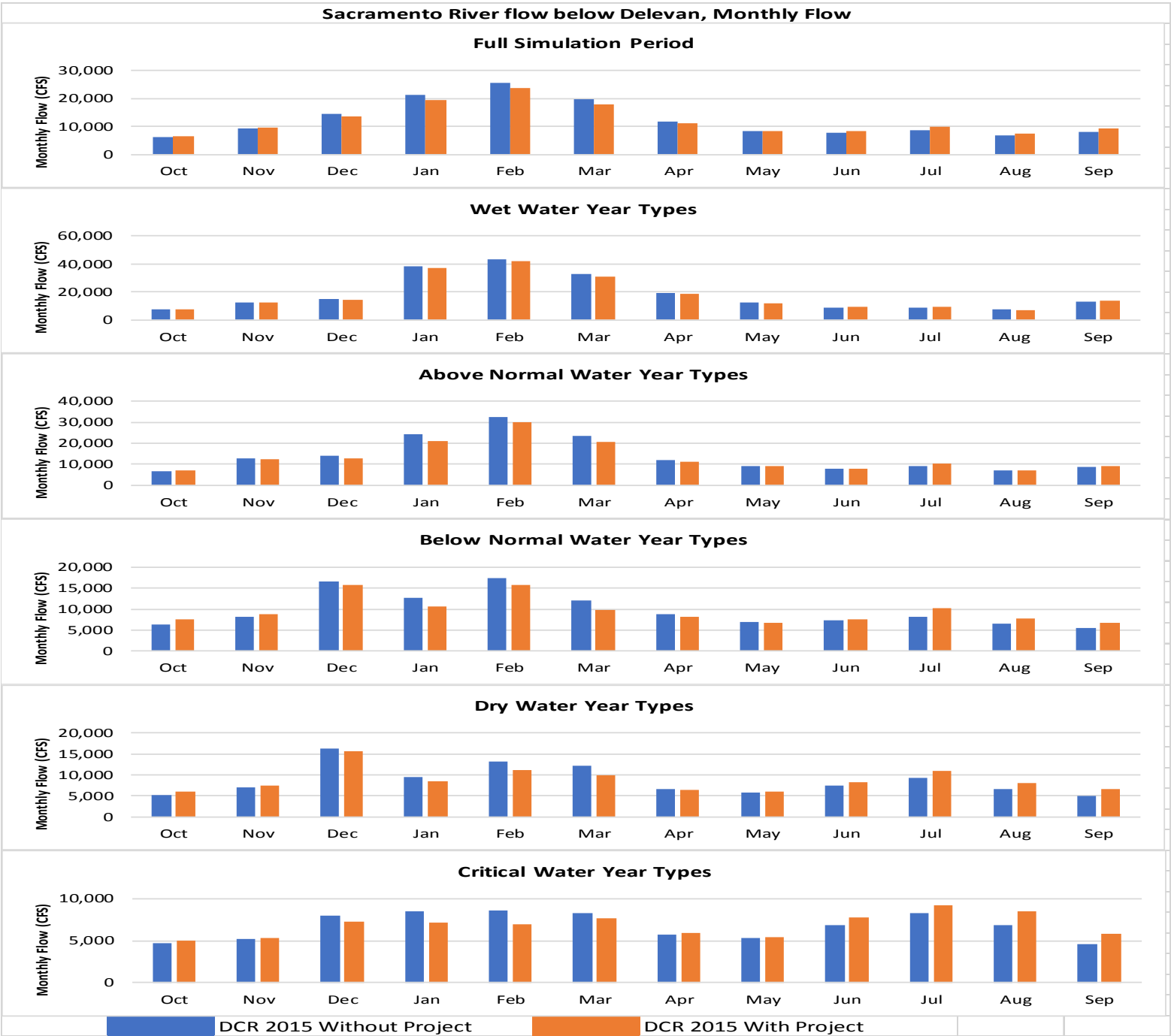
Delevan Pipeline diversion to fill Sites Reservoir Monthly Averages



October-September Delevan Pipeline diversion to fill Sites Reservoir

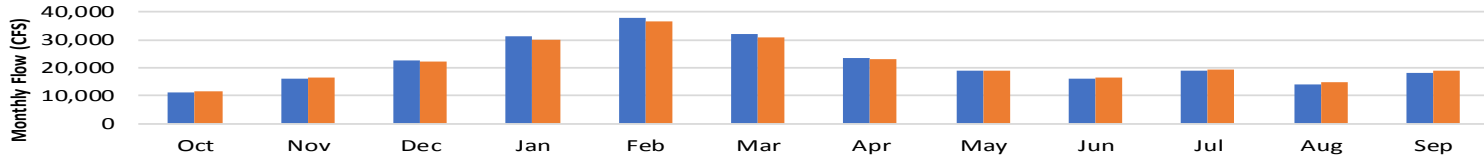




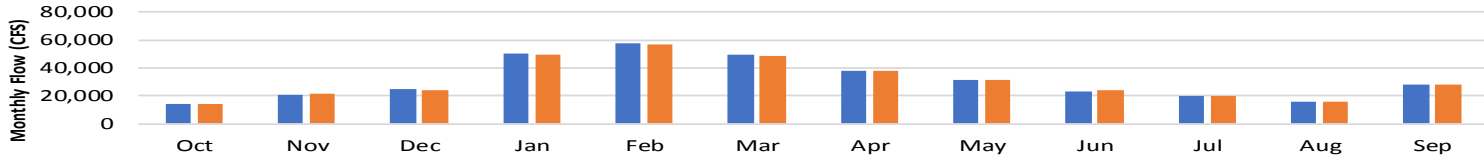


**Sacramento River flow at Freeport, Monthly Flow**

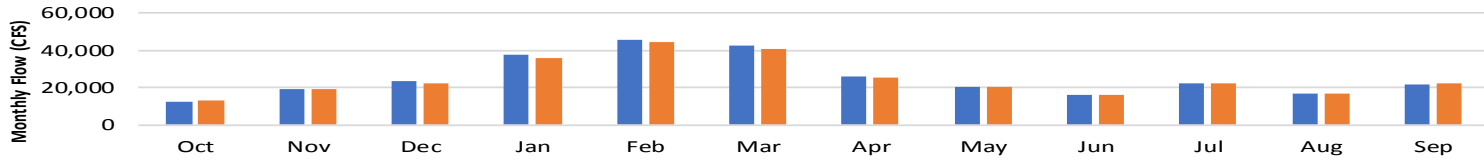
**Full Simulation Period**



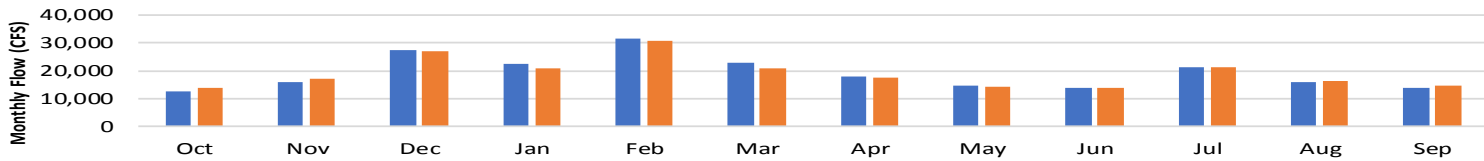
**Wet Water Year Types**



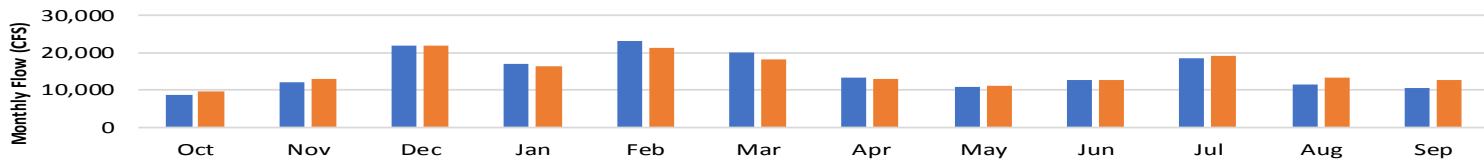
**Above Normal Water Year Types**



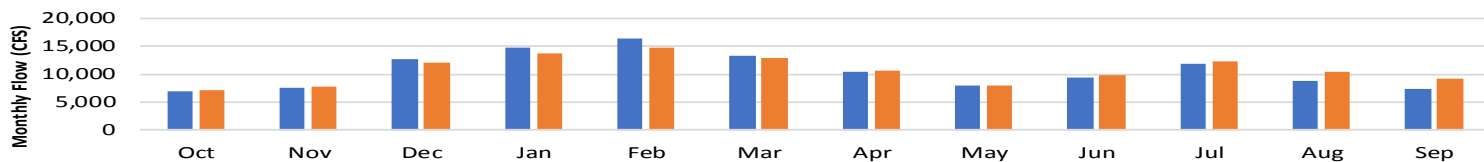
**Below Normal Water Year Types**



**Dry Water Year Types**



**Critical Water Year Types**

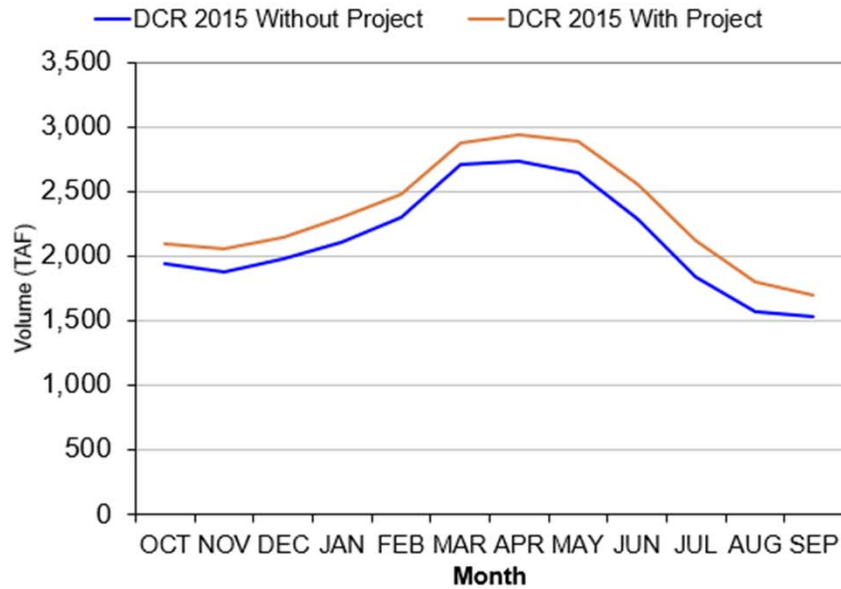


DCR 2015 Without Project

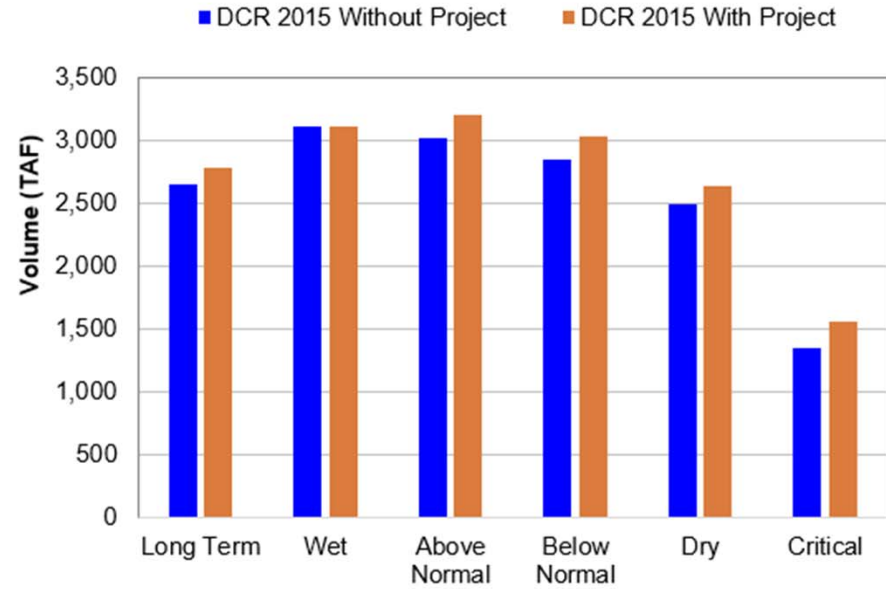
DCR 2015 With Project

# Lake Shasta Storage

**Shasta Lake Storage Driest Periods (29-34,76-77,87-92)**



**September Shasta Lake Storage**



# Sacramento River Temperature

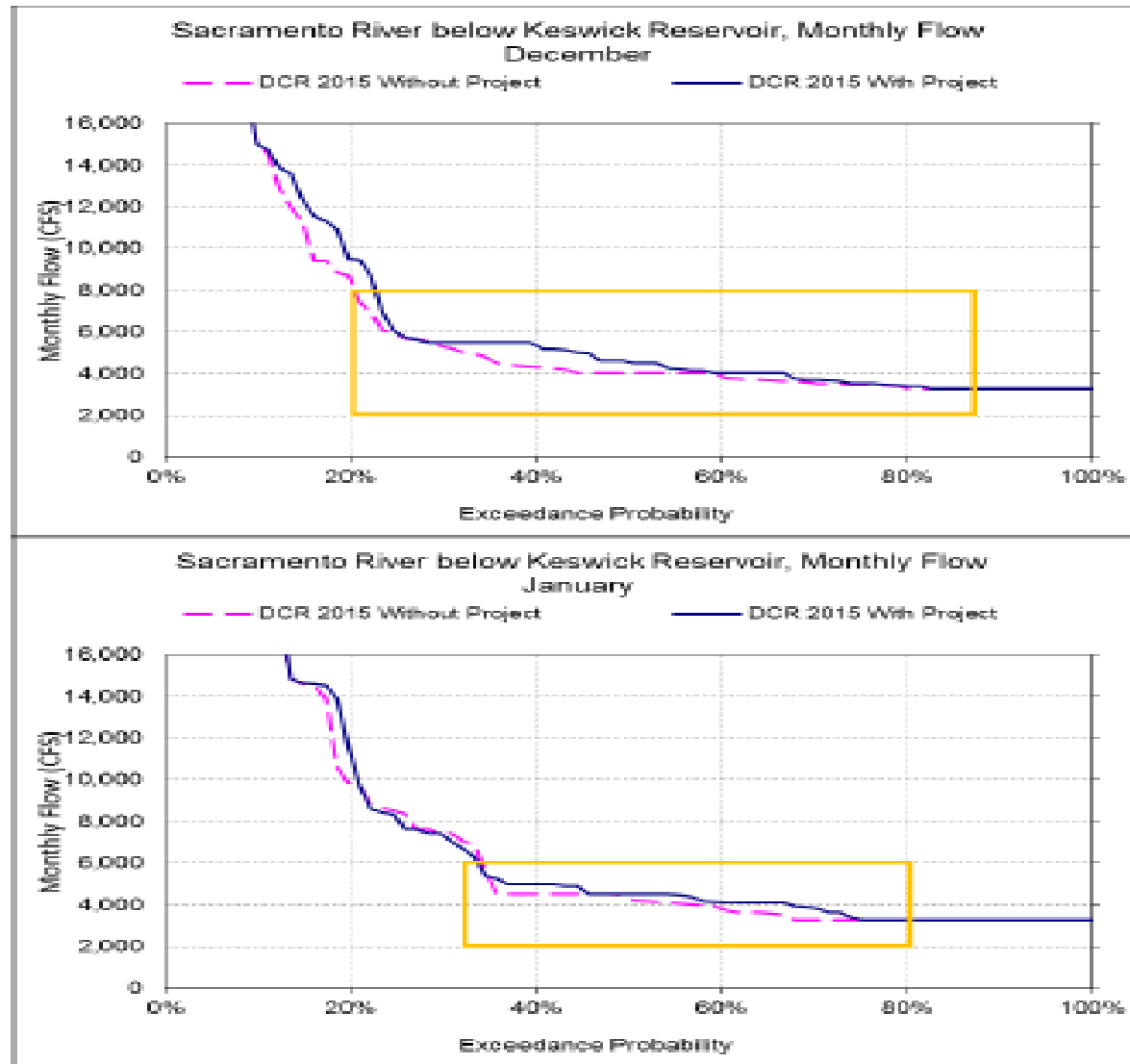
Table D.6-1: 2015 Average July to September Sacramento River Temperatures

Location	Without Project (°F)	With Project (°F)	Change (°F)
<b>Long-term Average</b>			
Bonnyview	53.0	52.5	-0.5
Balls Ferry	54.5	54.1	-0.5
Jellys Ferry	55.9	55.4	-0.5
Bend Bridge	56.9	56.5	-0.5
<b>Dry Years</b>			
Bonnyview	53.5	52.9	-0.6
Balls Ferry	55.1	54.5	-0.7
Jellys Ferry	56.4	55.8	-0.6
Bend Bridge	57.5	56.9	-0.6
<b>Critical Years</b>			
Bonnyview	56.5	55.1	-1.4
Balls Ferry	58.0	56.6	-1.4
Jellys Ferry	59.2	57.9	-1.3
Bend Bridge	60.1	58.9	-1.2



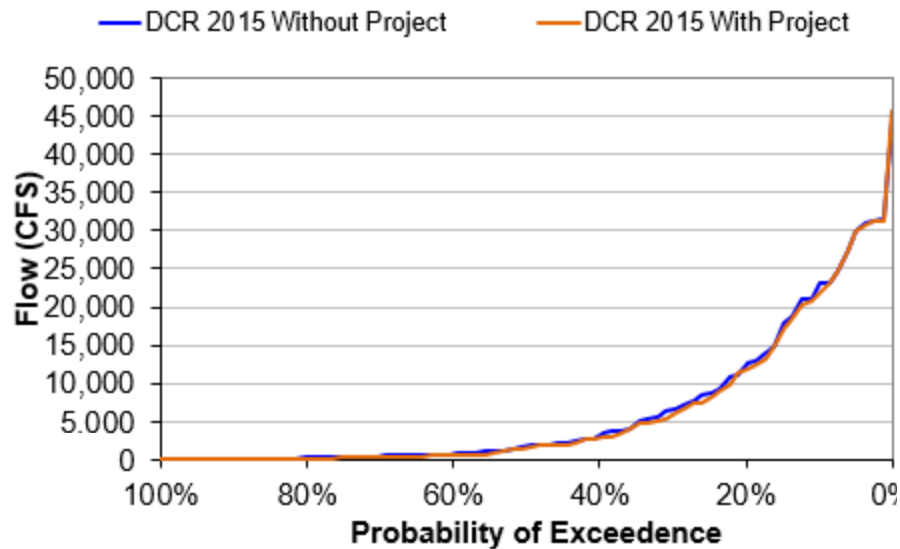
# Sacramento River Below Keswick

## Current Conditions



# Yolo Bypass Flow

### November-March Yolo Bypass Flow



### August-October Delivery to Yolo Bypass

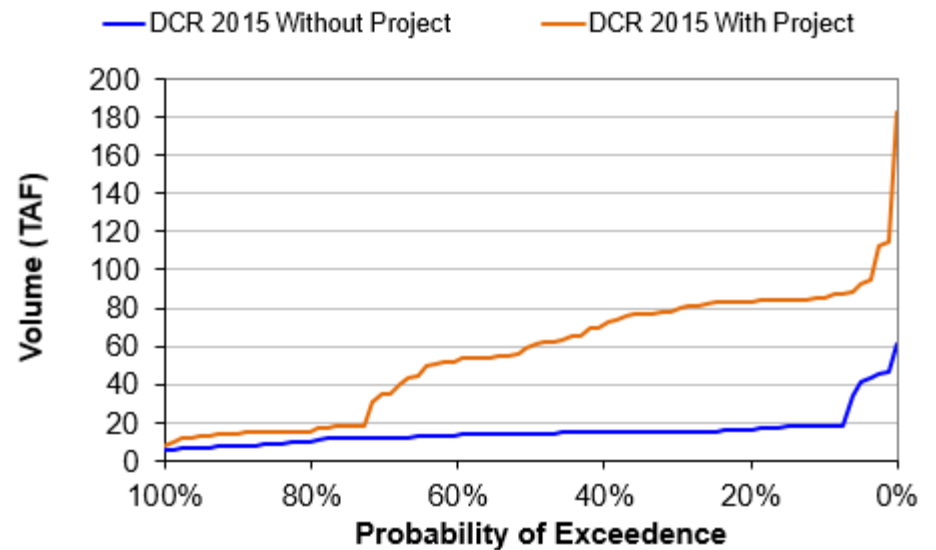


Table ADF-2. Description of Proposed Sites Project Authority Seasonal Operations  
 Sites Reservoir Project Operations Plan

Objective	Detail of Operation	Priority of Operation <sup>a</sup>	Year Type Most Suitable for Operation <sup>b</sup>	Months Most Suitable for Operation <sup>c</sup>											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>General Operation</b>															
Diversions to storage	Conduct diversions through the T-C Canal, GCID Canal, and the proposed Delevan Pipeline (diversions could occur in any month). Diversions would only occur once the D-1641, CVPIA 3406(b)(2), 2008 USFWS BiOp, and 2009 NMFS BiOp requirements have been met and existing authorized Delta diversions (e.g., Freeport Regional Water Project, Los Vaqueros Reservoir, cities of Fairfield, Vacaville, and Benicia) have been satisfied. Diversions to Sites Reservoir would be restricted by Sacramento River bypass criteria at Red Bluff, Hamilton City, Wilkins Slough, and Freeport, and mitigation restrictions for protecting fish outmigration pulse flows. Shading indicates the period in which diversion operations would occur, with the highest diversions during November through March. Diversions could also be limited by future regulatory requirements which may be placed on California and the United States.	n/a	n/a	Orange	Orange	Orange	Light Orange	Light Orange	Light Orange	Light Orange	Light Orange	Light Orange	Light Orange	Orange	Orange
Seasonal Reservoir Operations	Fill Sites Reservoir by pumping water diverted and stored pursuant to Water Right Application A025517 throughout the winter and spring and drain during peak release periods throughout the summer and fall.	n/a	n/a	Fill Cycle High Point						Drain Cycle Low Point				Fill Cycle	
<b>Water Supply Operations</b>															
Sites Project Authority	Provide storage releases to participating TCCA districts on an as-needed basis to supplement CVP Agricultural Water Service Contract deliveries. Provide storage releases to GCID and RD 108 to supplement CVP Settlement Contract deliveries. Provide supplemental water supplies to project participants in the Sacramento Valley and south-of-the-Delta to improve water supply reliability. Export would require new contracts for conveyance with Reclamation and DWR.	SPA-1	AN,BN,D,C				Blue	Blue	Blue	Blue	Blue	Light Blue	Light Blue		
<b>Hydropower Operation</b>															
Dispatchable Hydropower Generation	Provide more than 30 hours per week of uninterrupted operation, with dedicated afterbay/forebay (Holthouse Reservoir) with 6,500-acre-foot capacity.	n/a	ALL					Red	Red	Red	Red	Red	Red	Red	Red
<b>Ecosystem Enhancement Storage Account (EESA) Actions/Operation</b>															
EESA-1: Shasta Coldwater Pool	Increase Shasta Lake storage levels to preserve additional coldwater pool storage. This action would have particular emphasis in Below Normal, Dry, and Critical water-year types. This benefit would be achieved by (1) exchanging environmental water from Sites Reservoir for environmental water storage in Shasta, and then releasing water from Sites Reservoir to meet CVP contract requirements for GCID, Reclamation District 108, and the Member Units of the TCCA; (2) releasing water from Sites Reservoir to meet CVP south-of-the-Delta needs instead of releasing water from Shasta; and (3) releasing water from Sites Reservoir to meet a portion of the CVP commitment for Delta outflow.	DP-1	BN, D, C					Green	Green	Green	Green	Green			
EESA-2: Sacramento River Flows for Temperature Control	Maintain water temperatures year-round at levels suitable for all species and life stages of anadromous salmonids in the Sacramento River between Keswick Dam and Bend Bridge, and during the July through September period for Below Normal, Dry, and Critical water-year types. This objective would be achieved by releasing water from increased storage in Shasta.	DP-2	BN, D, C					Green	Green	Green	Green	Green			
EESA-3: Folsom Lake Coldwater Pool	Increase Folsom Lake storage levels to preserve additional coldwater pool to achieve temperatures that are more suitable for juvenile steelhead summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during dry and critical water-year types. The additional storage would be achieved by releasing Sites Reservoir water to assist with meeting Delta objectives that are currently met through releases from Folsom, particularly from January through August.	DP-2	D, C					Green	Green	Green	Green	Green	Green	Green	Green

Table ADF-2. Description of Proposed Sites Project Authority Seasonal Operations

Objective	Detail of Operation	Priority of Operation <sup>a</sup>	Year Type Most Suitable for Operation <sup>b</sup>	Months Most Suitable for Operation <sup>c</sup>													
EESA-4: Augment American River Flows	Augment flows in the lower American River to reduce dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May). This action would also reduce juvenile anadromous salmonid isolation events (through avoiding extreme fluctuations in flow), particularly from October through June. This objective would be accomplished by releasing a portion of the additional water stored at Folsom Reservoir resulting from Sites Reservoir releases to meet Delta objectives.	DP-2	ALL	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EESA-5: Yolo Bypass Flow Enhancement	Release flow through the Colusa Basin Drain and Knights Landing Ridge cut during summer and fall months (i.e., August through October) to help increase productivity in the Yolo Bypass in the lower Cache Slough and lower Sacramento River areas to increase desirable food sources for Delta smelt and other key fish species in the late summer and early fall.	AVG-1	AN,BN,D	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EESA-6: Lake Oroville Coldwater Pool	Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River from May through November during all water-year types. Additional storage would be accomplished through releases from Sites Reservoir to meet Lake Oroville compliance obligations. Provide releases from Oroville Dam to maintain water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River. Augment flows in the lower Feather River to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.	DP-2	BN,D,C	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EESA-7: Incremental Level 4 Water Supply for Wildlife Refuges	Provide water toward meeting incremental Level 4 wildlife refuge water needs north-of-the-Delta and south-of-the-Delta to supplement refuges supplies up to Level 4 criteria (CVPIA).	AVG-2	AN,BN,D	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EESA-8: Augment Sacramento River Fall Flows	Augment flows in the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation life-stage periods extending from October through March), particularly during fall months. Avoid abrupt changes. Operations would avoid adverse impacts to coldwater pool operations in Dry and Critical water-year types.	AVG-3	AN,BN,D	■	■	■	■	■	■	■	■	■	■	■	■	■	■