



System Reoperation Program

October 2014





Study Authorization

Legislation: Senate Bill X2 1

(Water Quality, Flood Control, Water Storage, and Wildlife Preservation - Perata, 2008)

- Directed DWR to conduct planning and feasibility studies to **identify potential options** for the reoperation of the state's flood protection and water supply systems that will optimize the use of existing facilities and groundwater storage capacity.
- The studies shall incorporate appropriate **climate change scenarios** and be designed to determine the potential to achieve the following objectives...

Study Objectives

Simultaneous Objectives:

- Water supply reliability
- Flood hazard reduction
- Ecosystem protection and restoration



By

- **Integrating** flood protection and water supply systems
- **Reoperating** existing system in conjunction with effective groundwater management
- **Improving** existing water conveyance systems

Schedule

Phase 1 Plan of Study

System Reoperation Program
Phase 1 - Plan of Study



Phase 2 Formulate Reoperation Scenarios

DRAFT
Phase 2 Report
System Reoperation Study
Strategy Formulation and Refinement



Phase 3 Initial Analysis

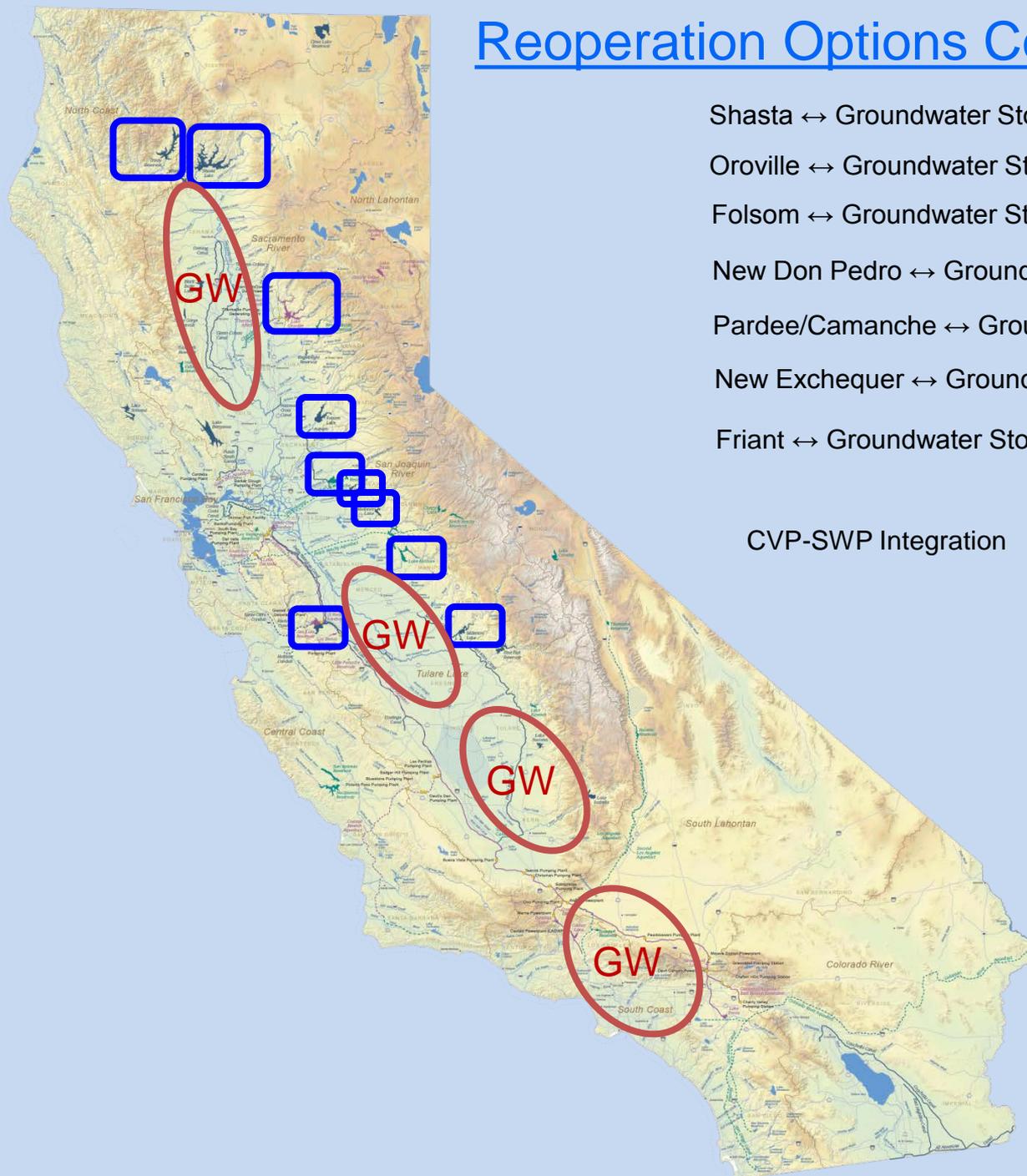
June 2015

Phase 4 Reconnaissance Study

Dec 2016



Reoperation Options Considered



Shasta ↔ Groundwater Storage

Oroville ↔ Groundwater Storage

Folsom ↔ Groundwater Storage

New Don Pedro ↔ Groundwater Storage

Pardee/Camanche ↔ Groundwater Storage

New Exchequer ↔ Groundwater Storage

Friant ↔ Groundwater Storage

CVP-SWP Integration

Agency Coordination - Vetting

Reservoir Owner and Operators

- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- SWP & CVP Operators
- Metropolitan Water District
- Friant Water Authority
- East Bay Municipal Utility District
- Merced Irrigation District
- Modesto Irrigation District
- Turlock Irrigation District

Fish Agency

- National Marine Fisheries Service

Other Stakeholders

- The Nature Conservancy
- California Water Plan – Stakeholder groups
- Water Research Foundation

Sacramento Valley

- Glenn-Colusa Irrigation District
- RD 108

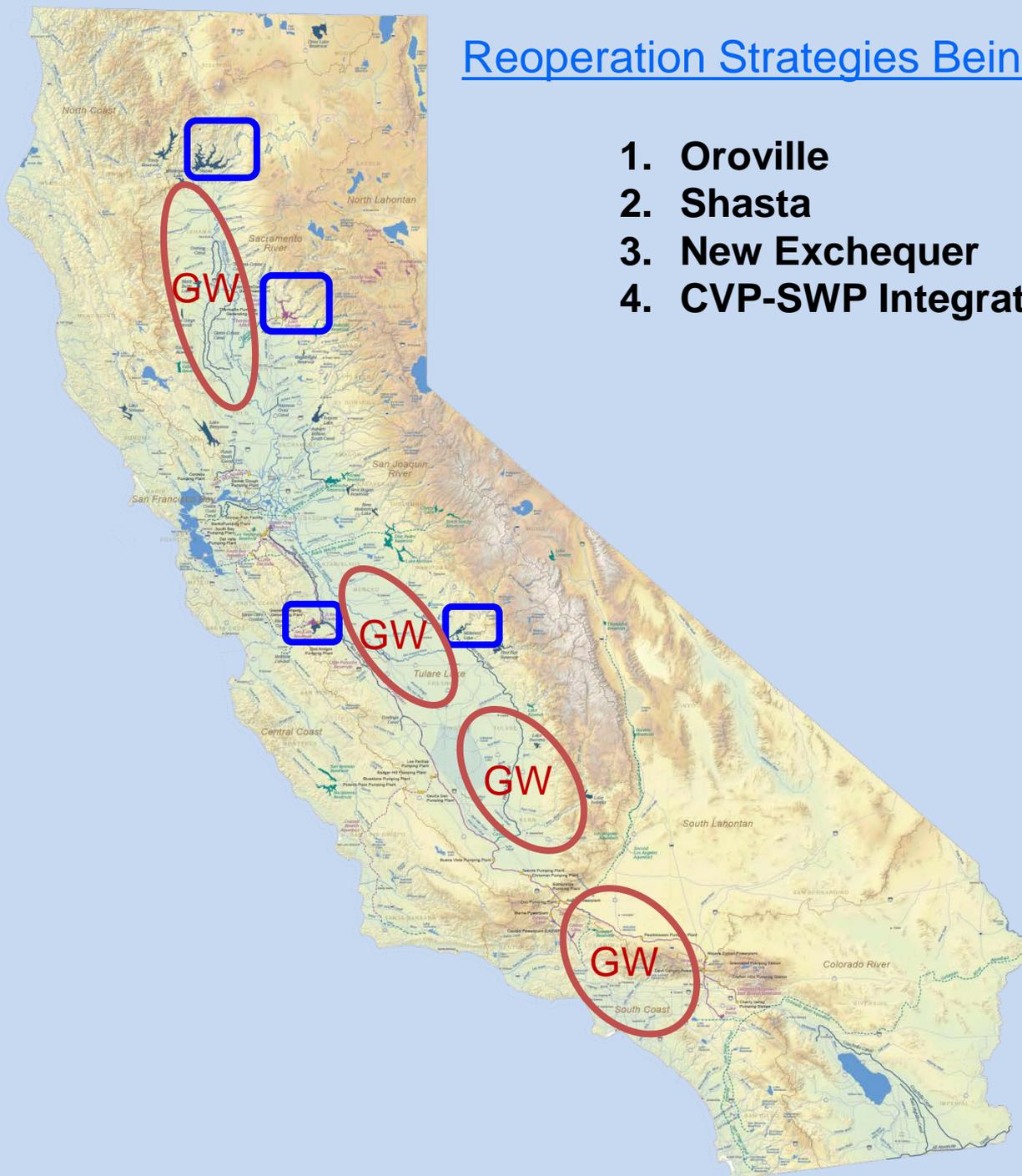
Ground Water Districts

- Madera Irrigation District
- Merced Irrigation District
- Modesto Irrigation District
- Turlock Irrigation District
- North San Joaquin Water Conserv. Dist.
- Kern Water Bank Authority
- Arvin-Edison Waters Storage District
- Semitropic-Rosamond Water Bank Authority
- Metropolitan Water District
- Orange Co. Water District
- Water Replenishment District
- Three Valleys Municipal Water District
- Calleguas Municipal Water District
- Raymond Basin Management Board
- San Gabriel Basin Water Qual. Authority
- Inland Empire Utilities Agency



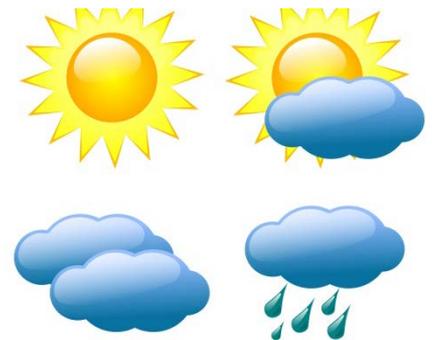
Reoperation Strategies Being Evaluated

1. Oroville
2. Shasta
3. New Exchequer
4. CVP-SWP Integration



Reoperation Components

- Supplemental Ecosystem Flows
- Conjunctive Management
- Forecast Based Operations (FBO)



Supplemental Ecosystem Flows

- Salmonids: spawning, rearing, predation risk, thermal stress.
- Non-salmonid: delta smelt, splittail
- Geomorphic
- Riparian

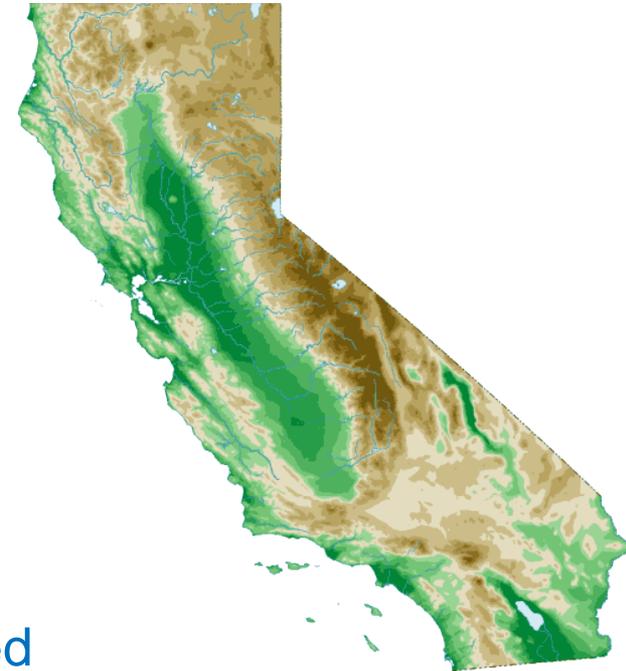


Conjunctive Management

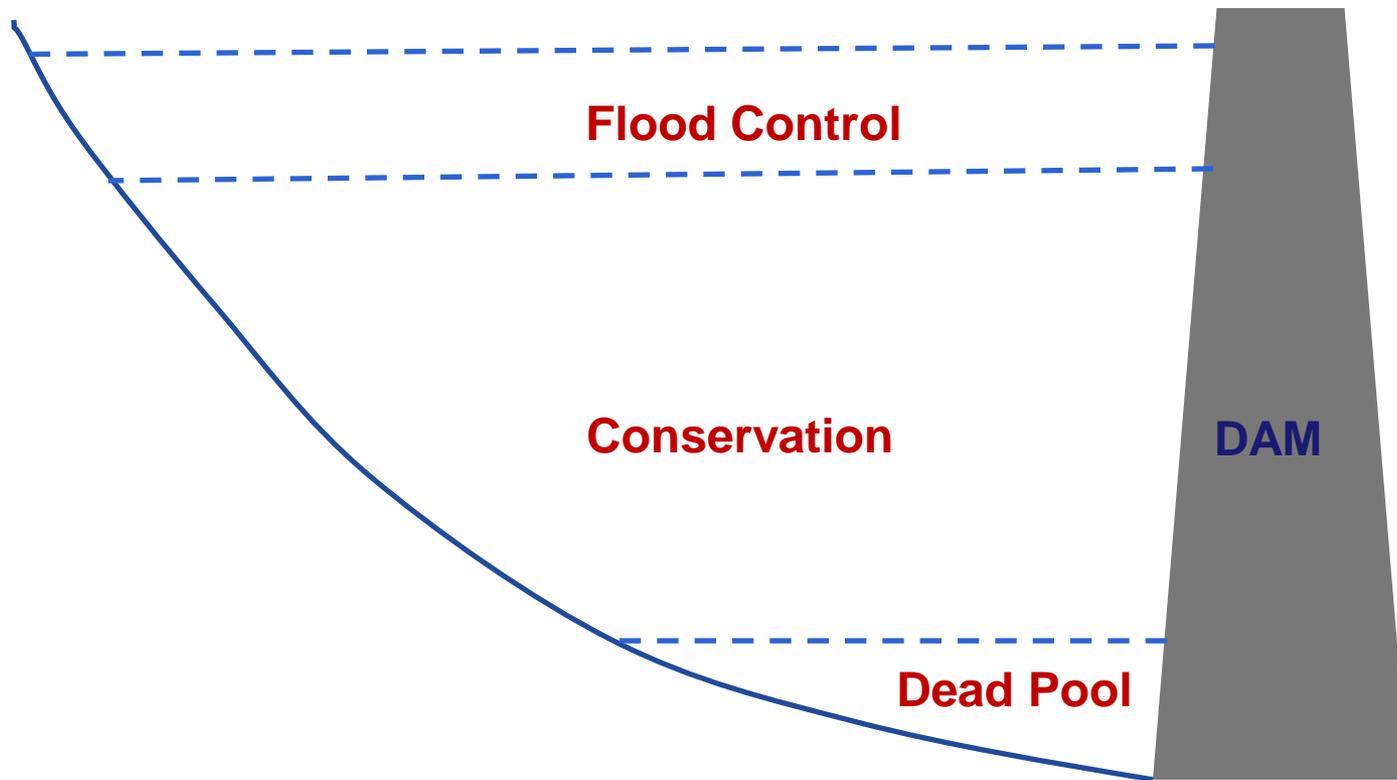
Opportunities geographically specific

Northern California: groundwater substitution appears most feasible due to relatively full groundwater basins

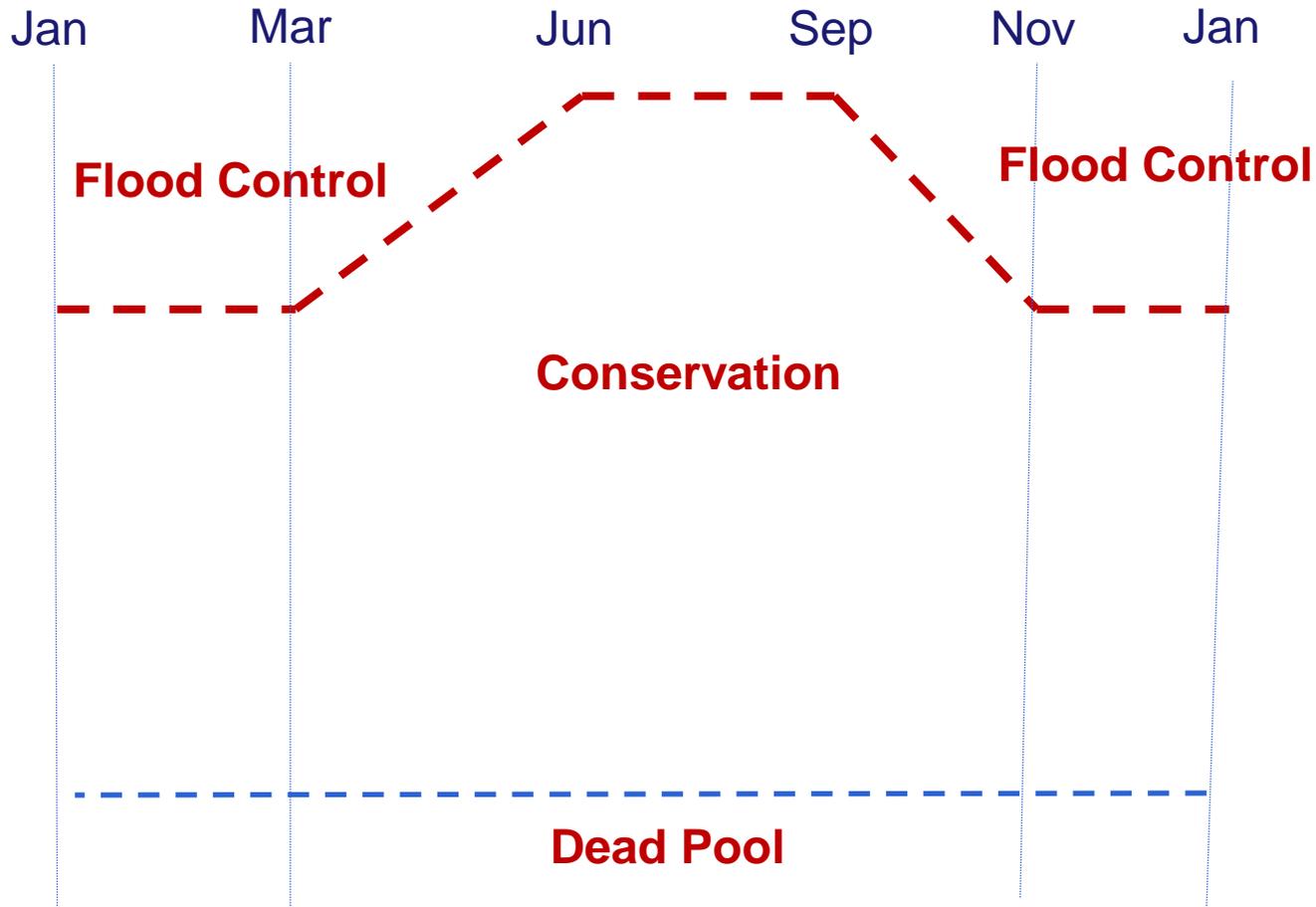
South-of-the-Delta: groundwater banks are already used extensively due to relatively depleted basins, but their use is limited by access to surface water.



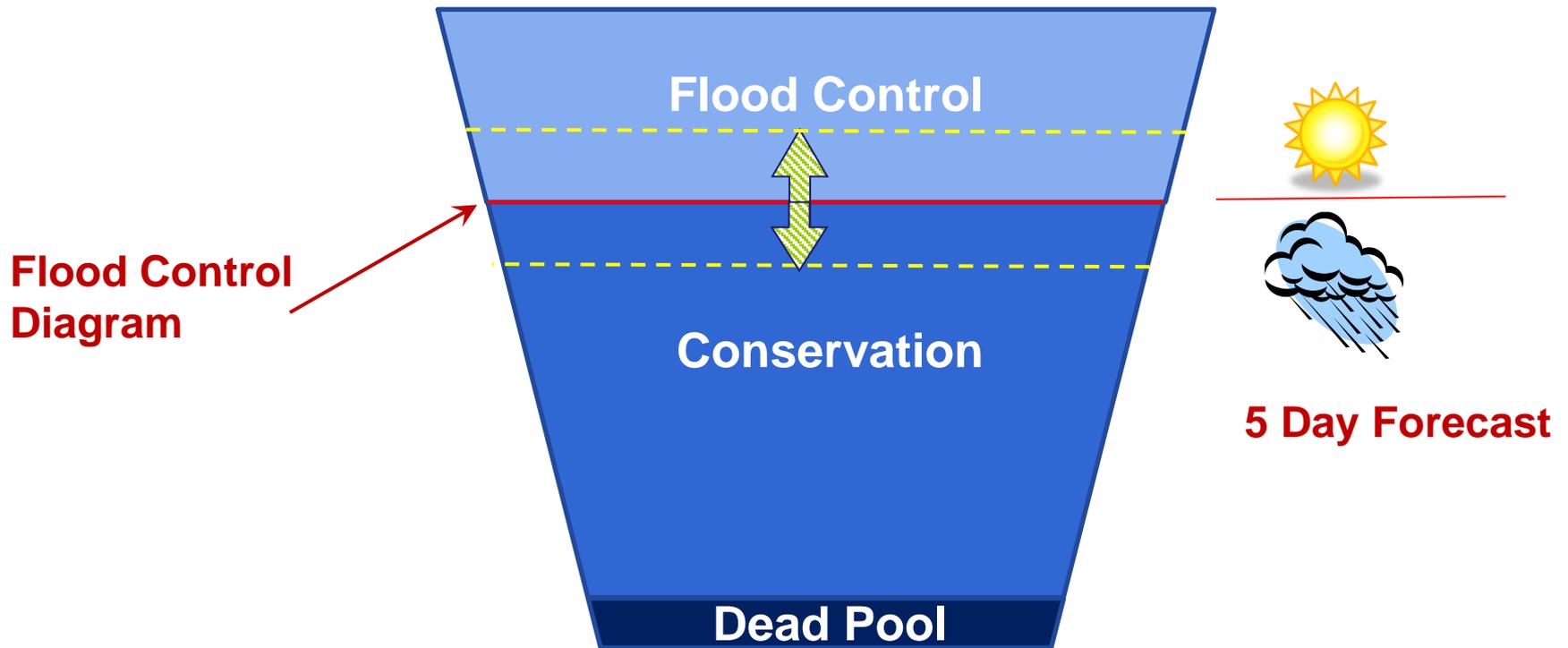
FBO: Reservoir Storage Space



FBO: Typical Flood Control Diagram



Forecast Based Operations



Phase 2 - Tradeoff Analysis

Reoperation of Oroville



Reoperation of Shasta



Components

- Supplemental Eco Flows: 25 to 500 TAF
- Conjunctive Management: 25 to 100 TAF
- Eco Flows + Conjunctive Management

Tradeoff Analysis - Findings



Supplemental Eco Flows

- **Cold water pool**
- **Water supply**
- **Hydropower**

Reoperation - Oroville

Supplemental Ecosystem Flows 100 TAF/yr (*target*)
Conjunctive Management 100 TAF/yr (*limit*)
Forecast Based Operations 5 days or 25% encroachment

Change in Storage (September) TAF

Reservoir	Eco Flows
Oroville	- 25
Shasta	+ 1
Trinity	+ 3
Folsom	+ 1
CVP/SWP exports (TAF/yr)	- 7
Eco Flows (TAF/yr)	+27

Reoperation - Oroville

Supplemental Ecosystem Flows 100 TAF/yr (*target*)
Conjunctive Management 100 TAF/yr (*limit*)
Forecast Based Operations 5 days or 25% encroachment

Change in Storage (September) TAF

Reservoir	Eco Flows	Eco Flows + Conjunctive Mgmt
Oroville	- 25	- 3
Shasta	+ 1	0
Trinity	+ 3	0
Folsom	+ 1	+ 2
CVP/SWP exports (TAF/yr)	- 7	+ 22
Eco Flows (TAF/yr)	+27	+27

Reoperation - Oroville

**Supplemental Ecosystem Flows
Conjunctive Management
Forecast Based Operations**

100 TAF/yr (*target*)

100 TAF/yr (*limit*)

5 days or 25% encroachment

Change in Storage (September) TAF

Reservoir	Eco Flows	Eco Flows + Conjunctive Mgmt	Eco Flows + Conjunctive Mgmt + FBO
Oroville	- 25	- 3	+24
Shasta	+ 1	0	-1
Trinity	+ 3	0	+3
Folsom	+ 1	+ 2	+2
CVP/SWP exports (TAF/yr)	- 7	+ 22	+28
Eco Flows (TAF/yr)	+27	+27	+27

Observations

- Existing surface reservoirs have limited flexibility
- Releasing eco flows impacts cold water pool, and water supply
- FBO improves system flexibility
- FBO + Conjunctive management could facilitate enhancement of ecosystem, water supply, and flood protection
- Analytical framework for integrated analysis of surface water and groundwater.



Next Steps

- Evaluate the scenarios with climate change and BDCP
- Evaluate flood management and ecosystem benefits
- Refine conjunctive management opportunities



Questions & Comments

