

Delta Flow Approach Concepts

Presentation for
BDCP HOTT & Conveyance Workgroup
April 14, 2009

Background

- December 19, 2008, Overview Document
 - Left the issue of Delta outflow unresolved;
 - Recognized that appropriate targets for Delta outflow have been vigorously debated;
 - Used D-1641 for DRERIP purposes;
 - Committed to evaluate a range of targets.

Delta Flow Complexities

- Changes to Delta flow affect to varying degrees:
 - Upstream coldwater management
 - Outflow and X2 location
 - Water supply volumes and reliability
- Tradeoffs are unavoidable
- Delta flow can be achieved through changes in:
 - Outflow
 - Inflow
 - Reservoir Releases
- Small fraction of the Delta flow is manageable by Projects.

Delta Flow

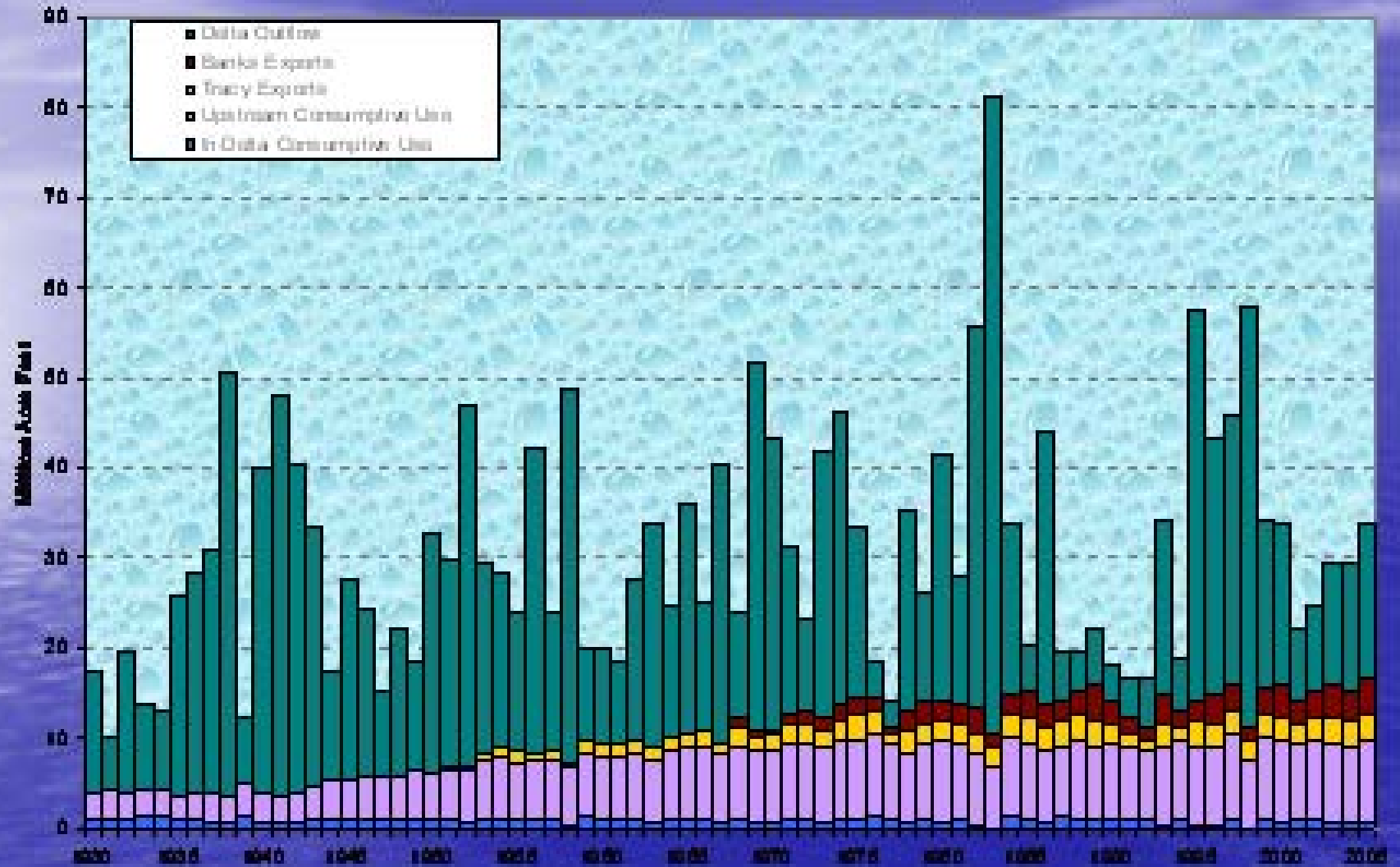
Approaches Concepts

- Explore a range of inflow/outflow approaches for consideration in BDCP planning
- Consider improved, simplified methods for providing Delta inflows/outflows that better balance competing needs

Delta Flow Planning Principles

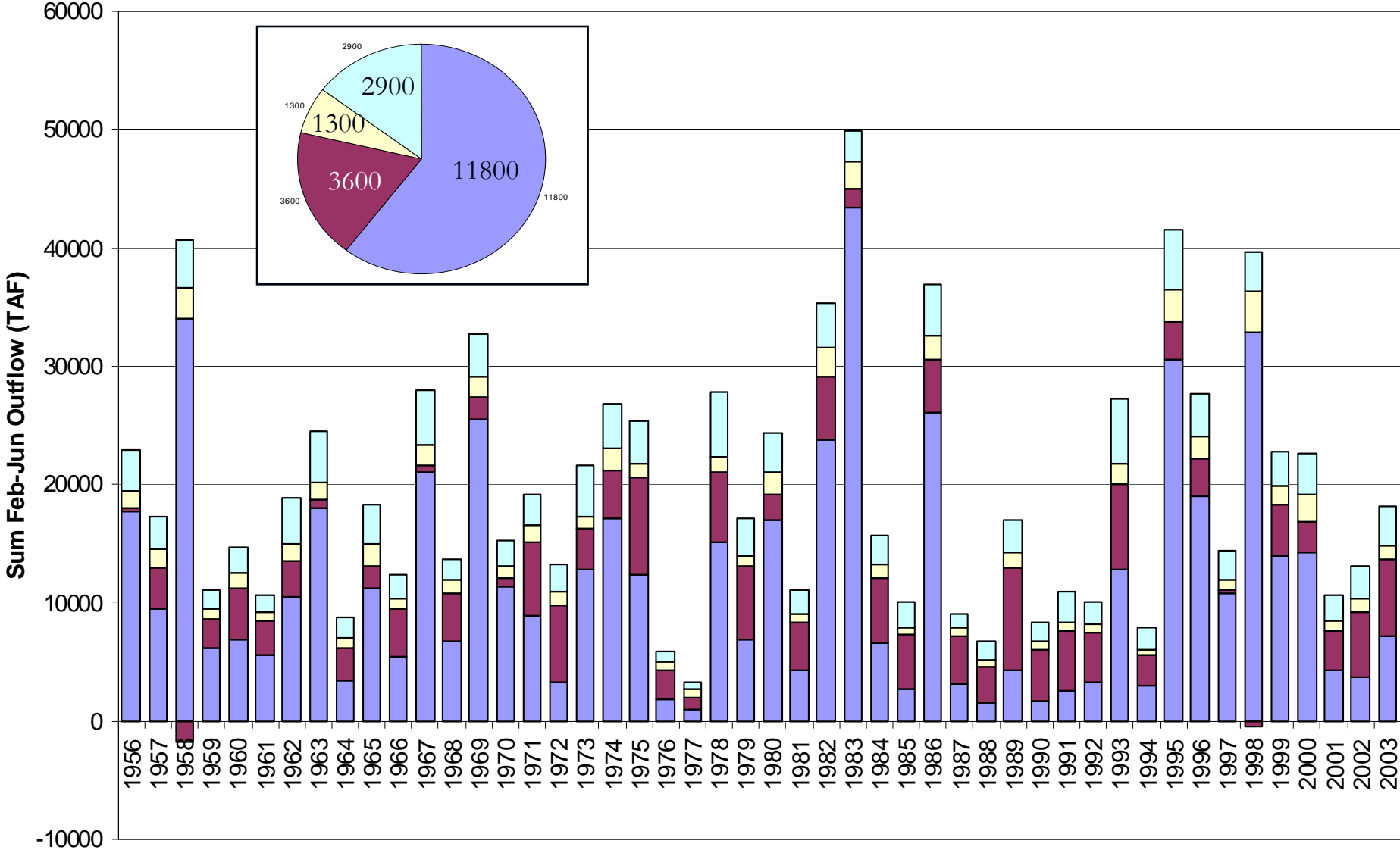
- Work with water volumes manageable by SWP and CVP in the Sacramento Valley;
- Improve synchrony with natural flows;
- Protect upstream conditions and X2 location;
- Consider biological mechanisms and risk principles;
- Utilize best scientific and forecasting information.

DRAFT: Delta Outflow, Upstream Consumptive Use, In-Delta Consumptive Use, and Exports



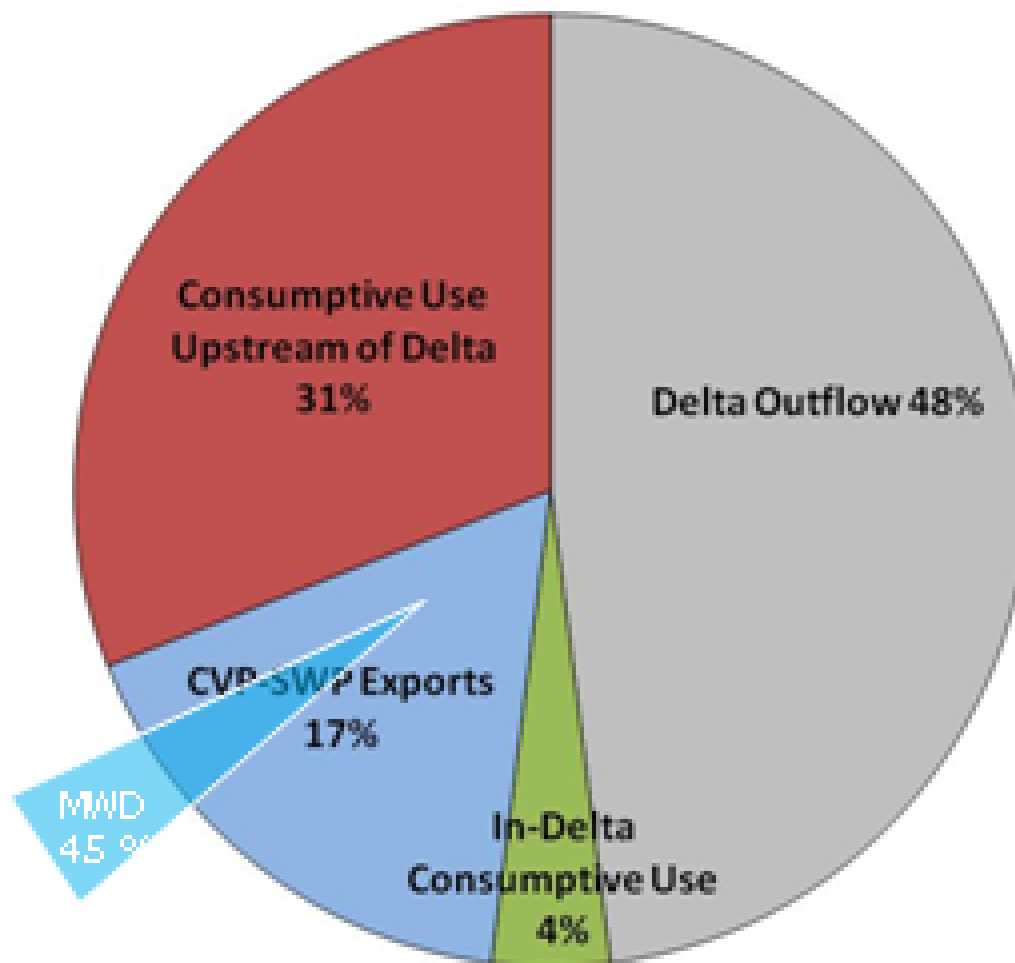
Comparison of Delta Outflow under Different Levels of Impairment Sum Feb-Jun (1956-2003)

■ Historic
 ■ Project (SAC Valley + Delta)
 ■ SAC Valley Non-Project
 ■ San Joaquin



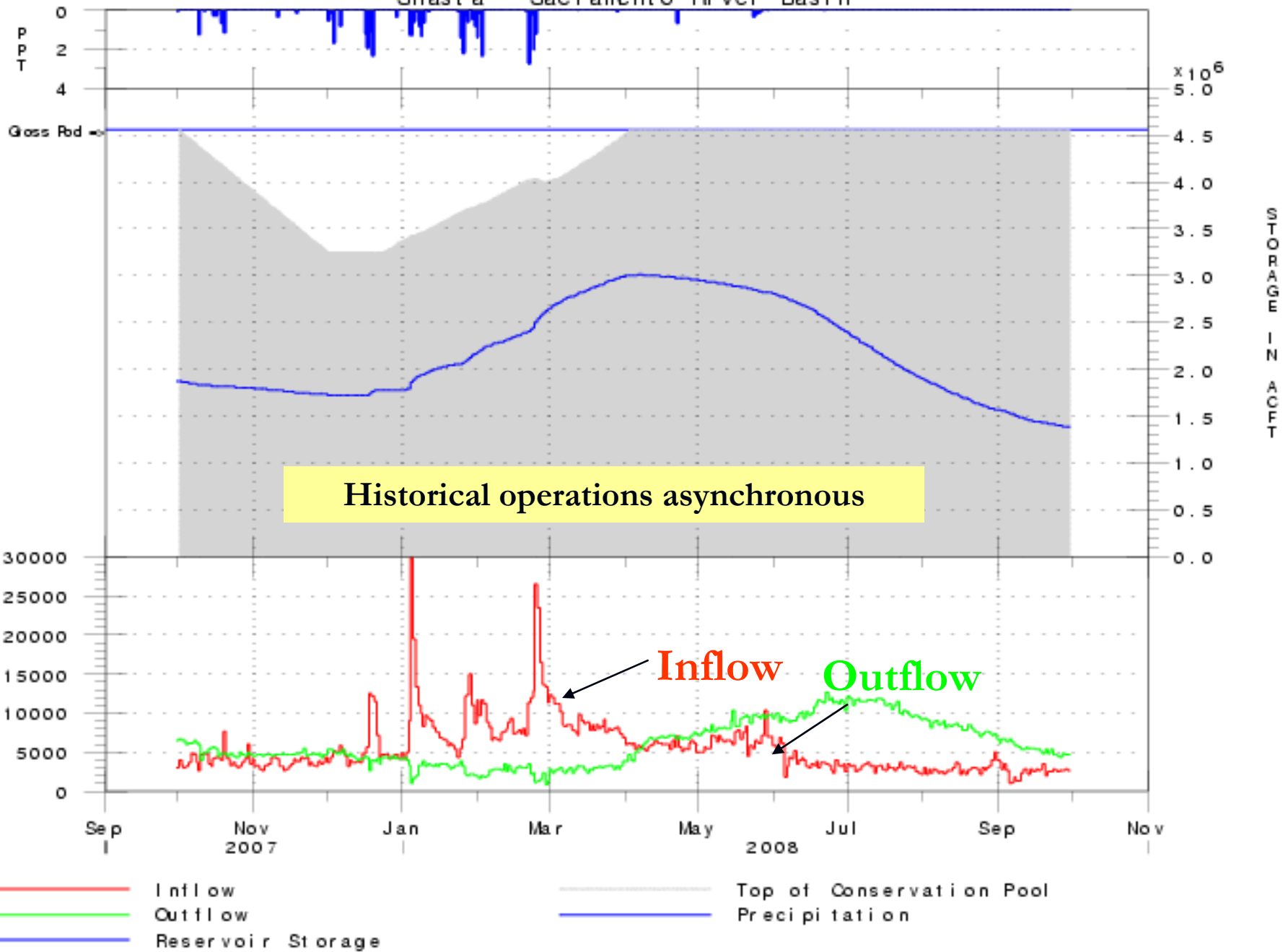
Historical Diversions Within the Delta Watershed

1970-89



Reference: Delta Vision Task Force

Shasta - Sacramento River Basin

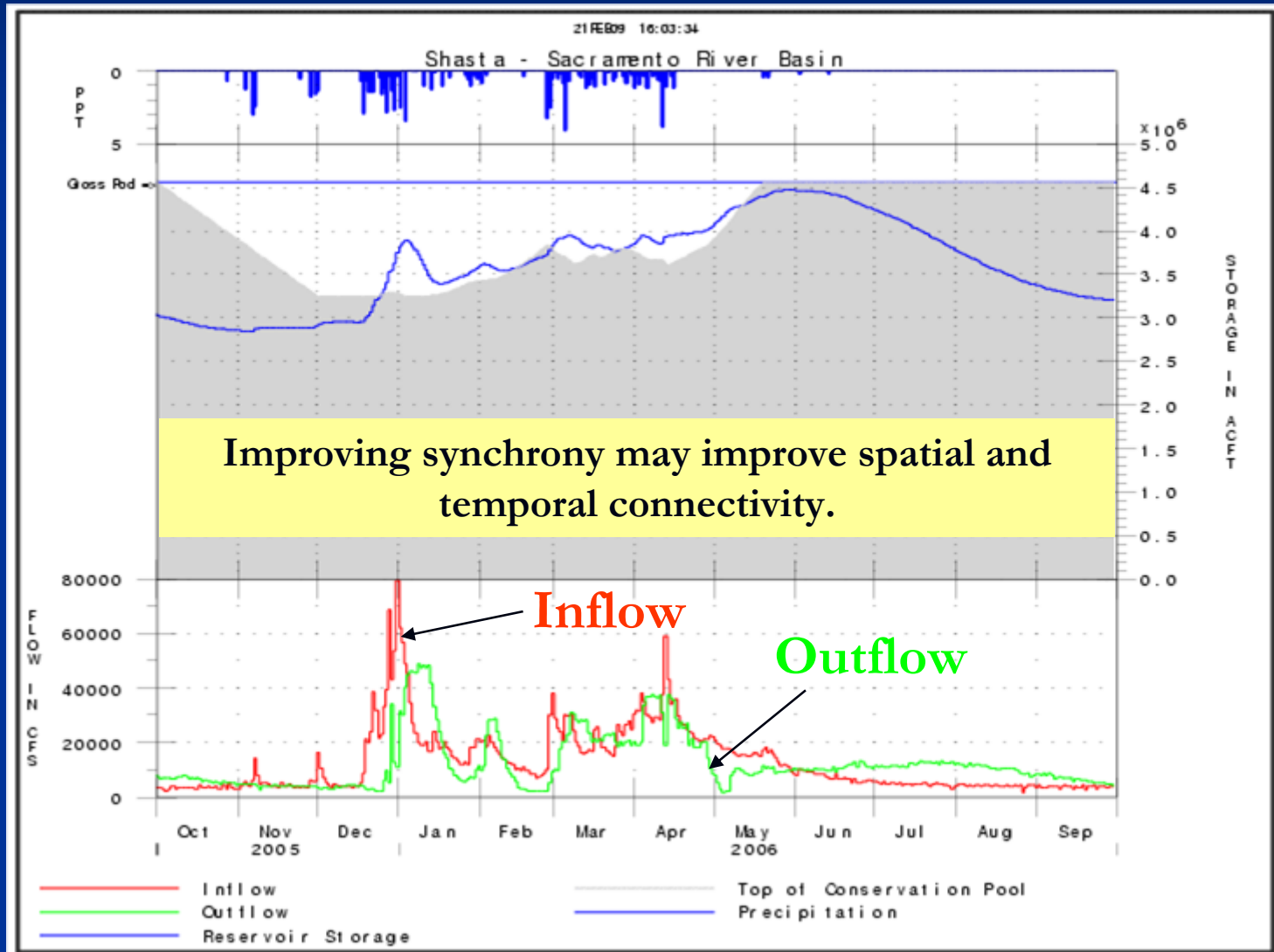


Historical operations asynchronous

Inflow Outflow

- Inflow
- Outflow
- Reservoir Storage
- Top of Conservation Pool
- Precipitation

3b. Maintain Synchrony with Natural Hydrology



2 Step Analytical Approach

- Necessary considerations:
 - (1) Delta flows, (2) coldwater management, (3) water supply
- Pass 1
 - Evaluate operations of upstream reservoirs under the assumptions that releases would only occur for upstream requirements, Delta requirements, and water rights and exchange contractors.
 - Illustrates the capability of the system to satisfy a given Delta flow objective.
- Pass 2
 - Includes allocation decisions to evaluate the operations of the projects for both water supply and environmental purposes.
 - Trade-offs between these deliveries, storage, and outflow can be ascertained.

CalLite Model Modifications

SWP and CVP Operations

Central Valley Water Management Screening Model

MAIN MENU

MAIN HOME

CONTROL

Run Settings

Hydroclimat

Demands

Facilities

Regulations

Operations

SCHEMATIC

RESULTS

INSTRUCTIONS

Delta Outflow Options

Set minimum flows at select locations based on a fraction of forecasted unimpaired flow at each location

		Months											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Keswick	<input type="checkbox"/>	0	0	0	0	0	0	0	0	0	0	0	0
Thermalito	<input type="checkbox"/>	0	0	0	0	0	0	0	0	0	0	0	0
Nimbus	<input type="checkbox"/>	0	0	0	0	0	0	0	0	0	0	0	0
Verona	<input type="checkbox"/>	0.6	0.6	0.6	0.5	0	0	0	0	0	0	0	0
Freeport	<input checked="" type="checkbox"/>	0	0.5	0.5	0.5	0.5	0.5	0	0	0	0	0	0
Delta Outflow*	<input type="checkbox"/>	0	0.5	0.5	0.5	0.5	0.5	0	0	0	0	0	0

*Delta Outflow is set to a percent of forecasted unimpaired SACR flows plus 100% of SJR flows.

Unselect this check box to turn off any X2 requirements

OR

Set minimum Delta outflow based on MONTH x WYT:

Specifications

Delta Flow Gaming Scenarios

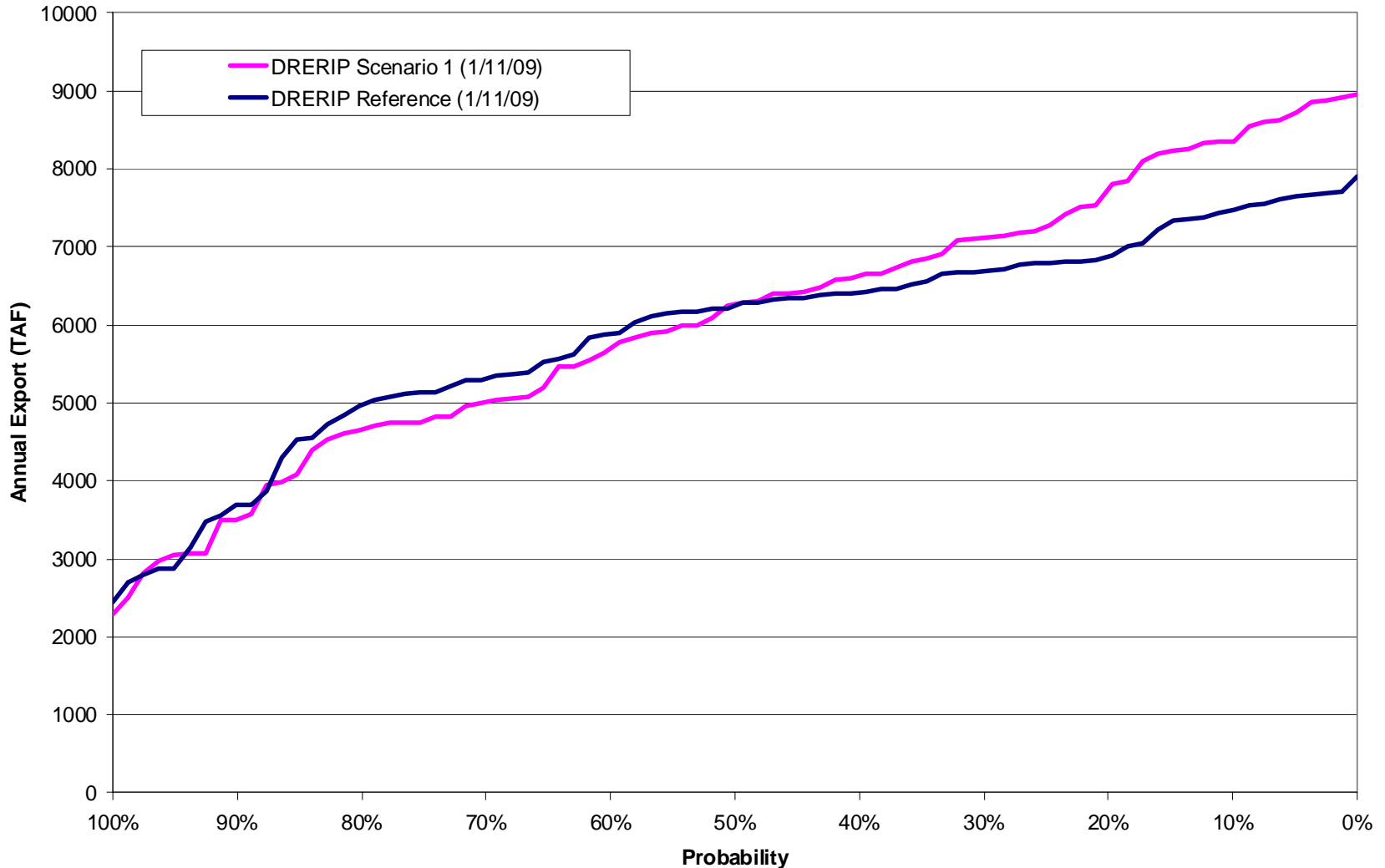
- TBI-NGO X2 proposal
X2 as function of 8 River Index
- PRE X2 proposal
D-1641 without Roe Island trigger
- Proportionate Outflow proposal
XX% of manageable unimpaired Sac Valley runoff *and*
YY% of impaired San Joaquin Valley runoff
- Proportionate Inflow proposal
XX% of manageable unimpaired Sac Valley runoff

Key Performance Metrics

- Outflow volume and X2 location
- Cold water management
- Water supply volume and reliability
- Synchrony
- Hood Diversion constraints (Bypass Flows)
- SOD Diversion constraints (OMR)

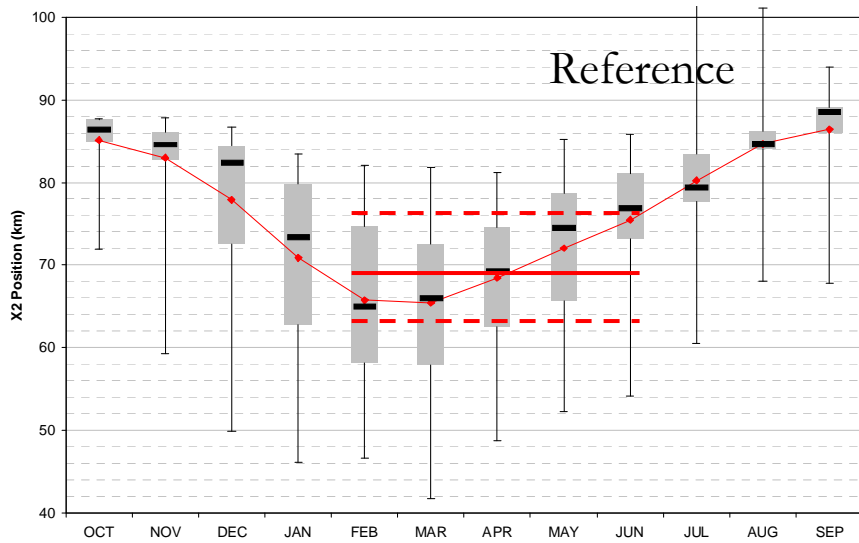
Export Reliability Example

Annual Total Export Exceedance Probability

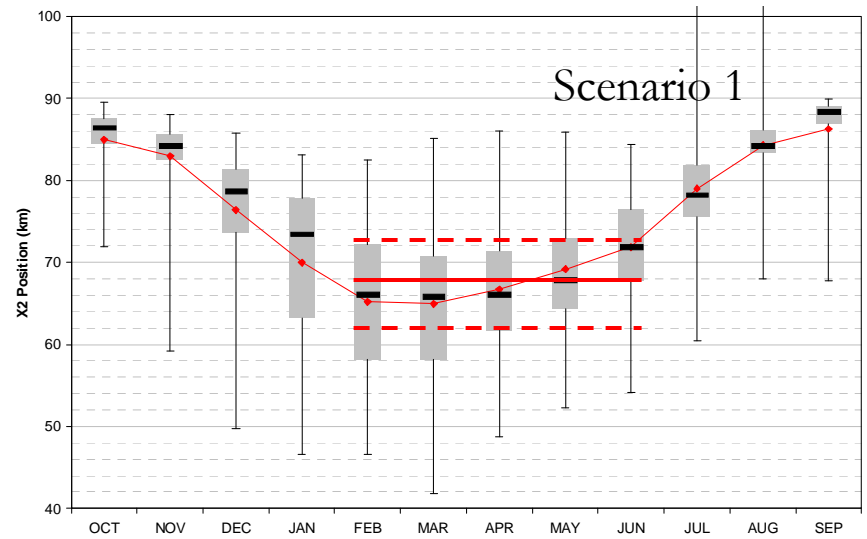


X2 Changes Example

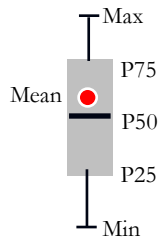
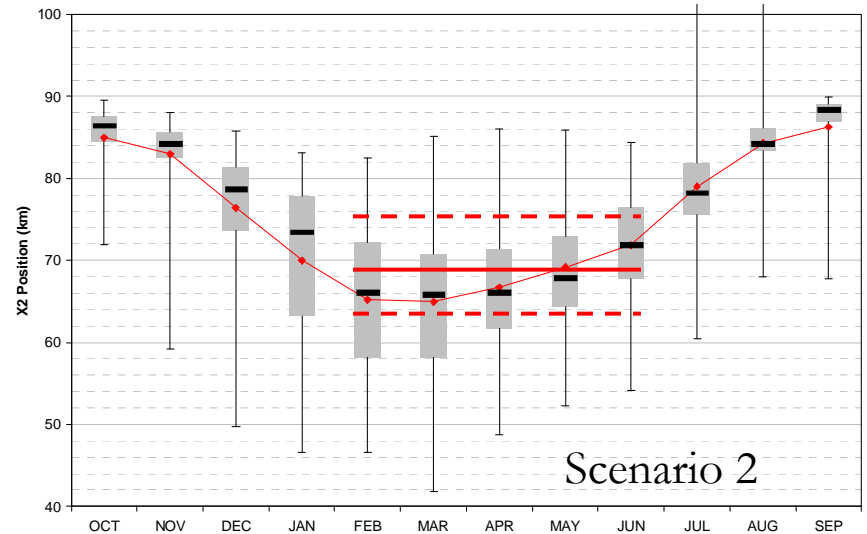
Simulated X2 Position
Reference (DRERIP Scenario 1)



Simulated X2 Position
Outflow Scenario 1

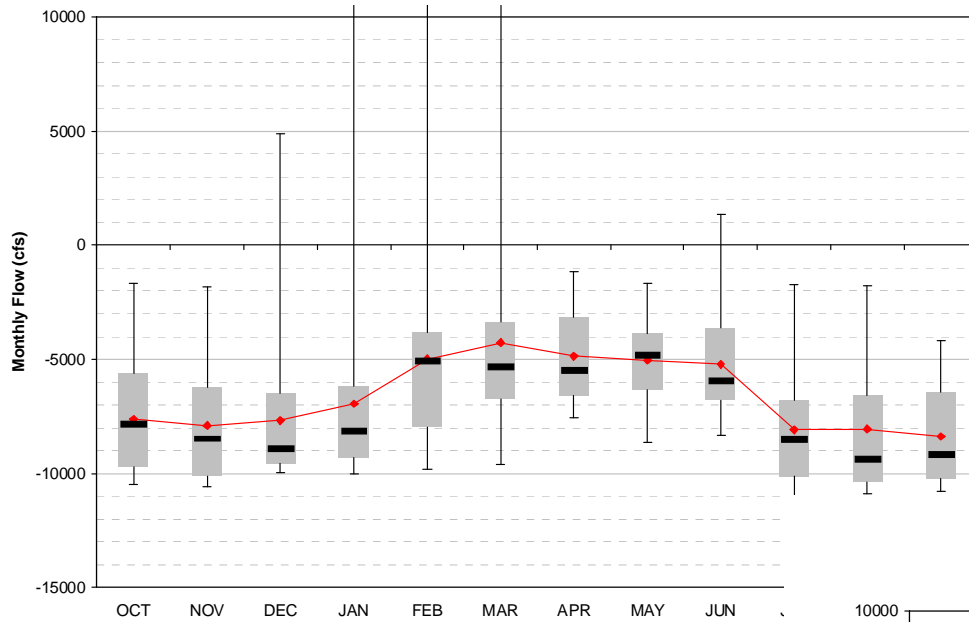


Simulated X2 Position
Outflow Scenario 2



Combined Old and Middle River Flows

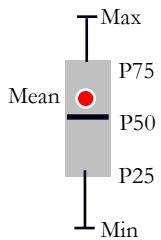
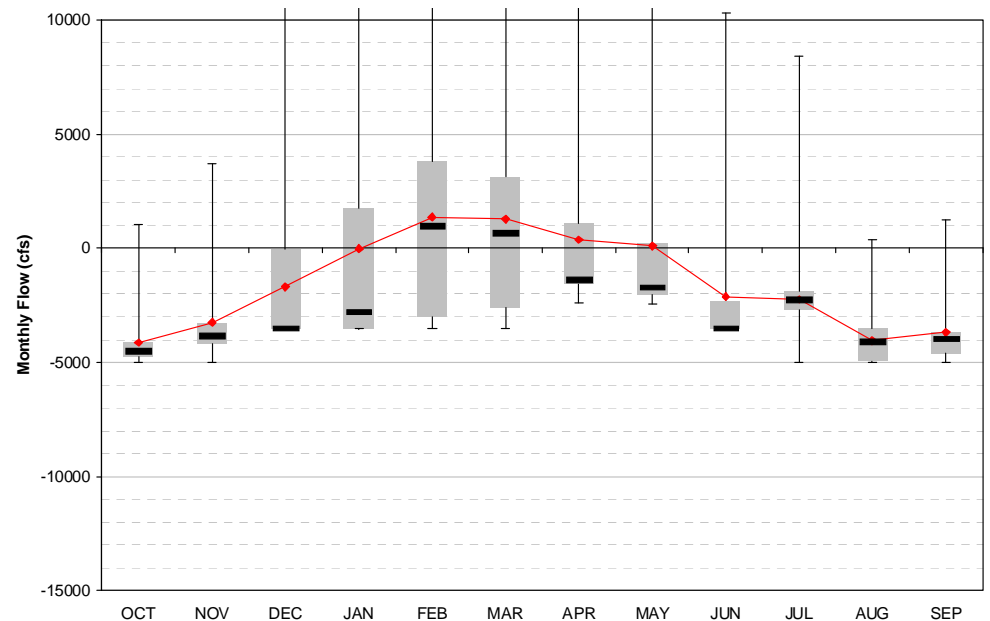
DRERIP Reference (1/11/09)



OMR Flows Example

Combined Old and Middle River Flows

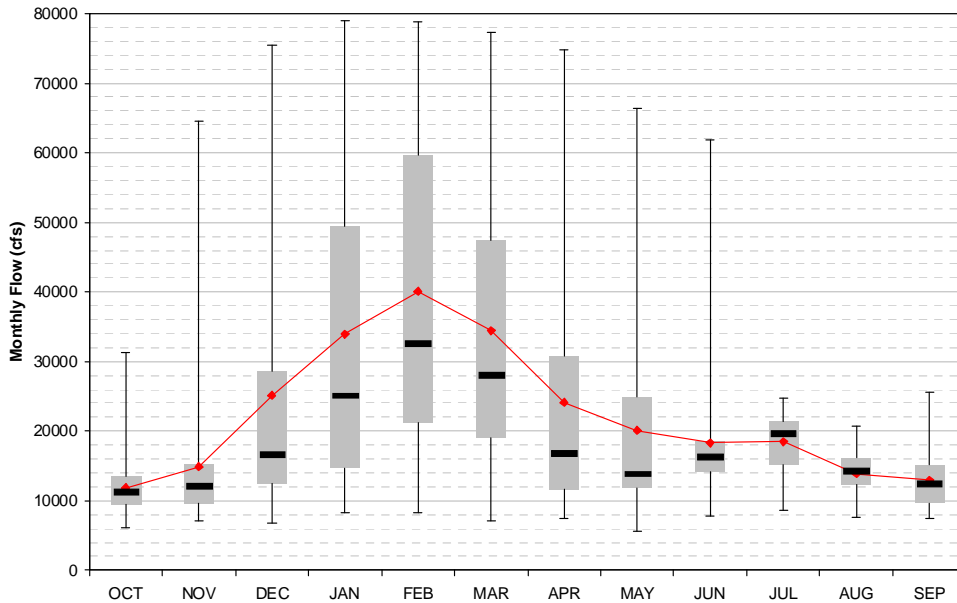
DRERIP Scenario 1 (1/11/09)



Sac River Flows Example

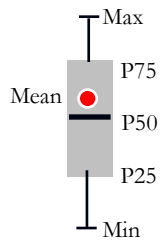
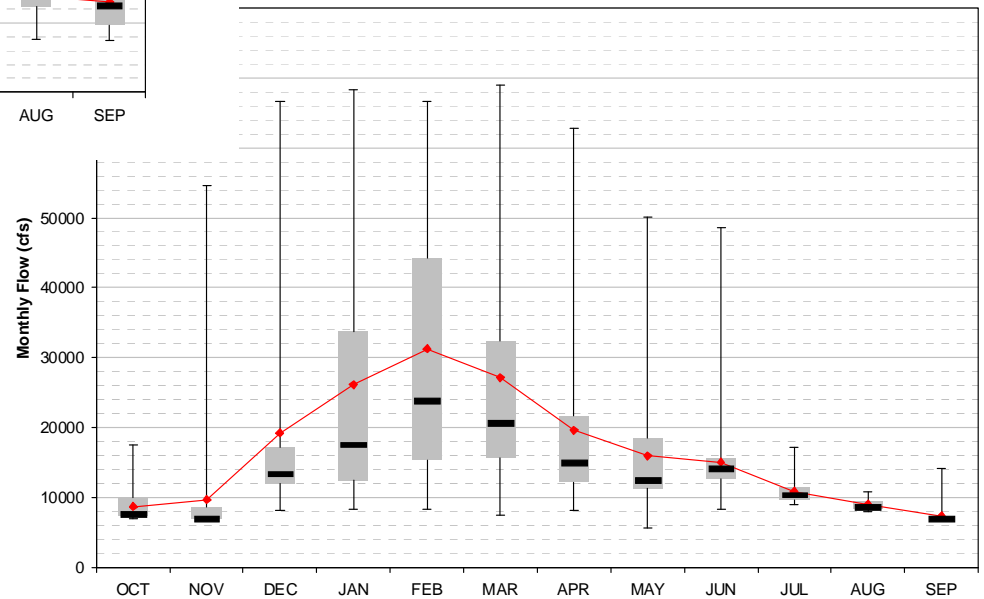
Sacramento River Flow downstream of Hood

DRERIP Reference (1/11/09)



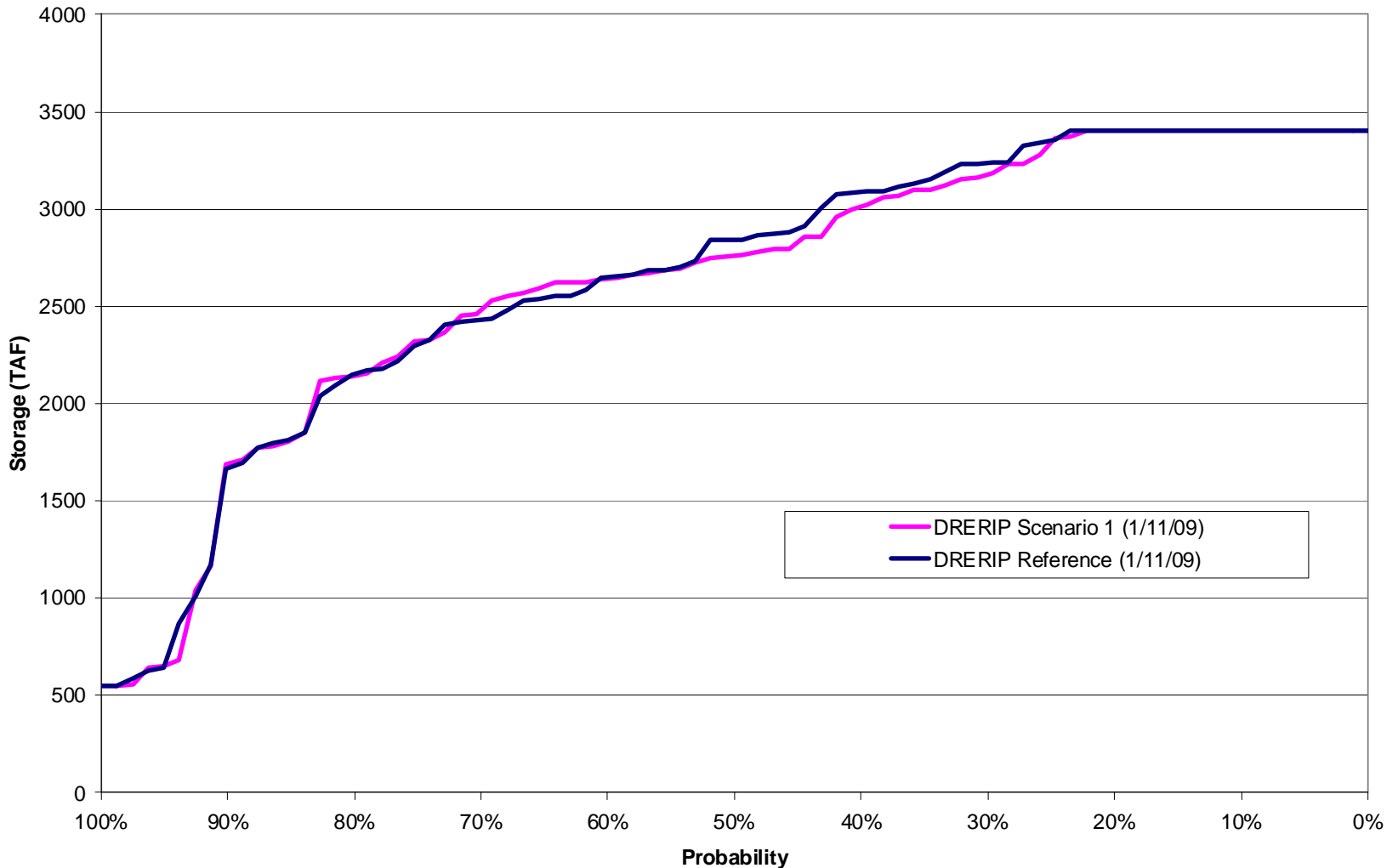
Sacramento River Flow downstream of Hood

DRERIP Scenario 1 (1/11/09)



Upstream Storage Example

Shasta Storage Exceedance Probability (end of September)

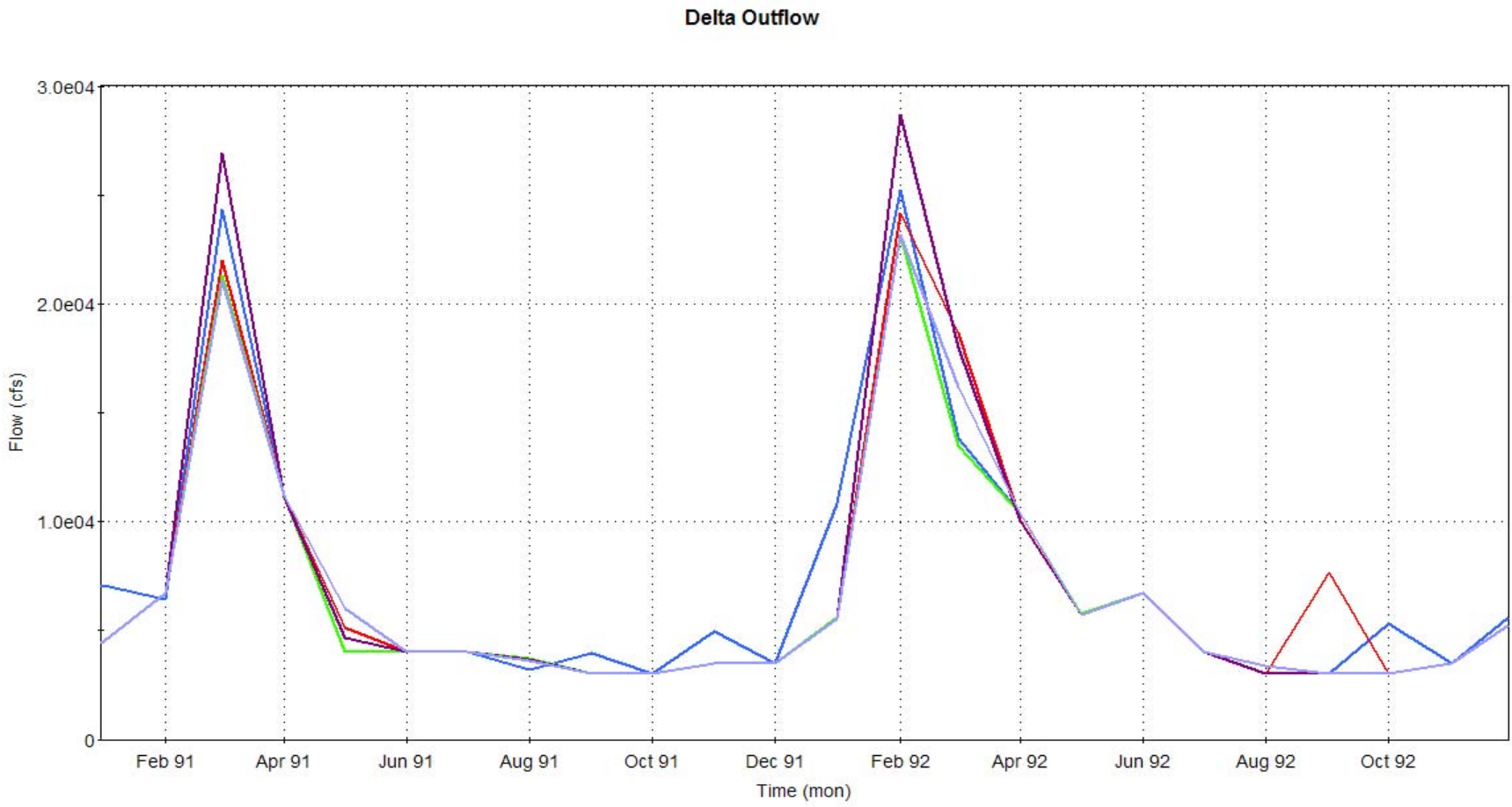


VERY Initial Findings

- Outflow magnitude and synchrony largely unaffected under varying gaming scenarios;
- X2 location largely unaffected under varying gaming scenarios;
- Upstream flow synchrony can be improved;
- Considering outflow only (i.e. in isolation) can significantly impact other performance metrics.

Outflow Magnitude and Synchrony

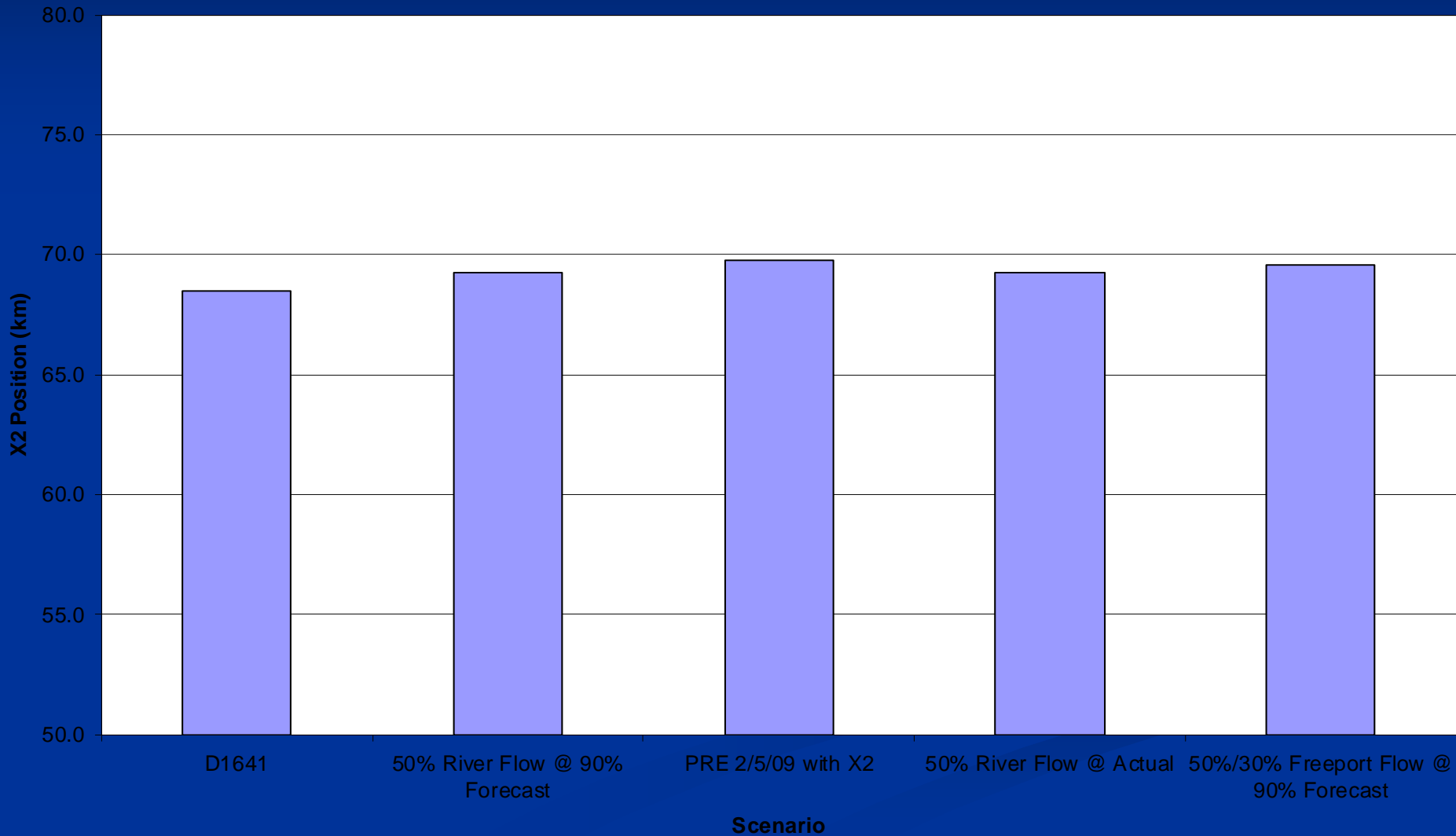
Time History



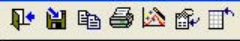
[Delta_Outflow,1] [Delta_Outflow,2] [Delta_Outflow,3] [Delta_Outflow,4] [Delta_Outflow,5]

Changes in X2 Position

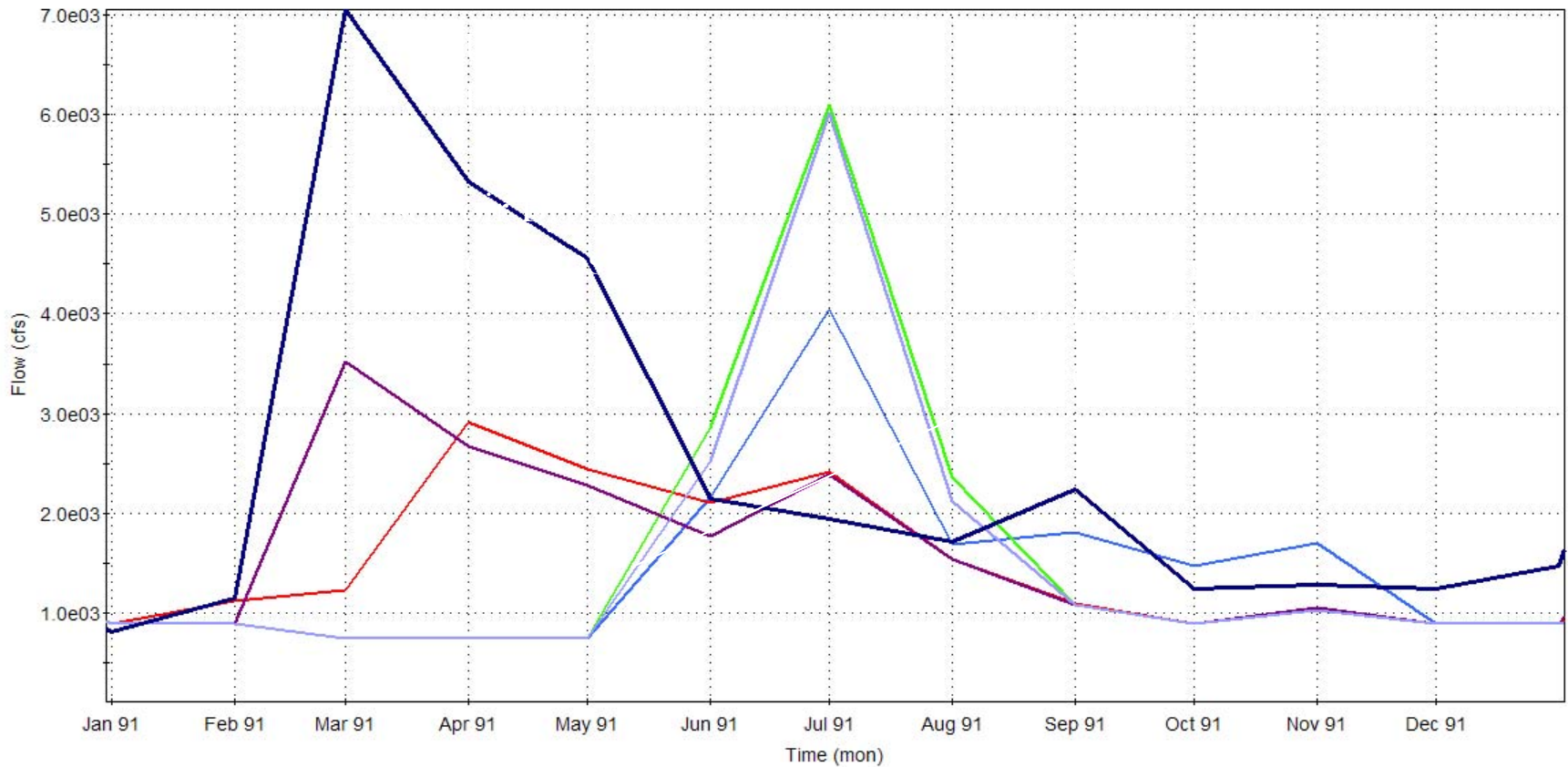
Feb-Jun Average X2 for Scenarios Analyzed



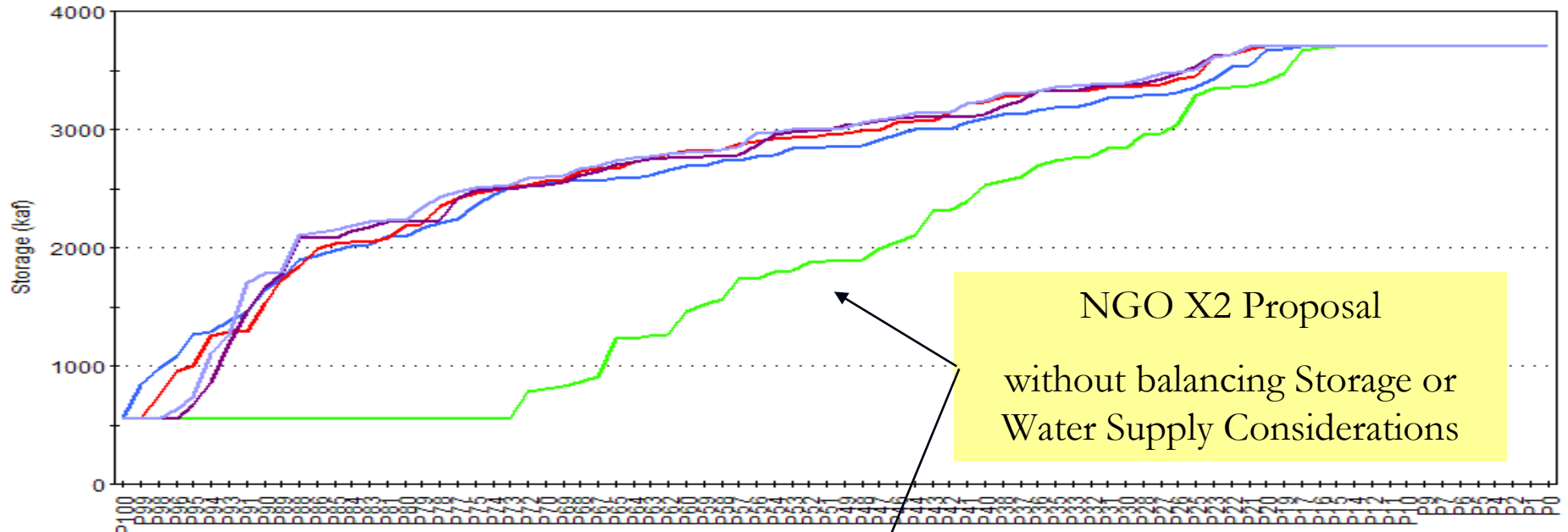
Upstream Flow Synchrony



Feather River Flow near Thermalito



Shasta (End of September) Storage



Oroville (End of September) Storage

