



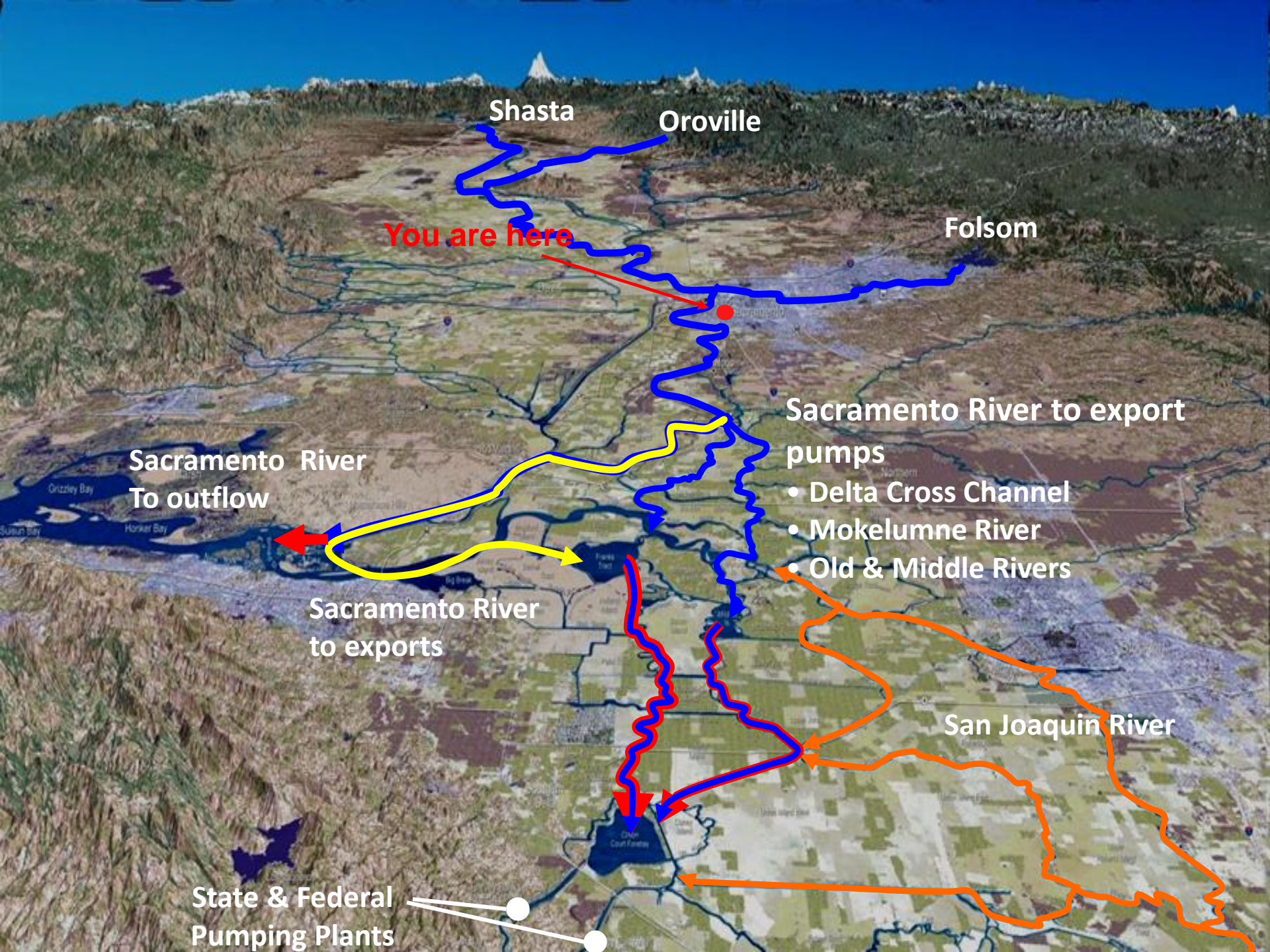
# Operational Changes Due to the Salmon & Smelt BO's

Walter Bourez

September 7, 2011

# Topics

- Review of basic CVP/SWP operations
  - CVP/SWP key facilities
  - CVP/SWP characteristics
  - Operational requirements
  
- Major operational changes due to BO's
  - Review of historical data
  
- Major operational changes due to BO's
  - Modeling analysis
  
- Other effects



Shasta

Oroville

Folsom

You are here

Sacramento River  
To outflow

Sacramento River to export  
pumps

- Delta Cross Channel
- Mokelumne River
- Old & Middle Rivers

Sacramento River  
to exports

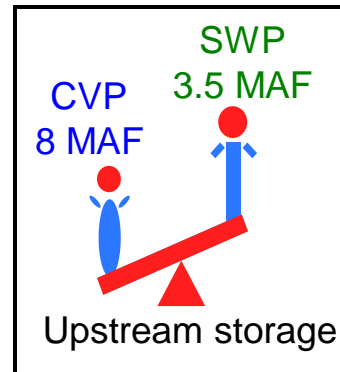
San Joaquin River

State & Federal  
Pumping Plants

# Key Features of CVP/SWP

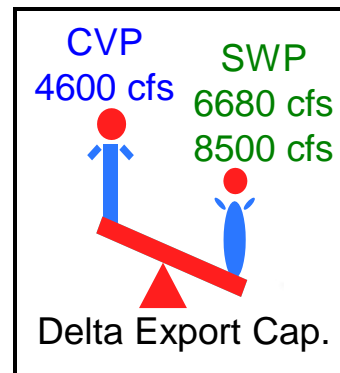
## CVP

- Upstream storage
  - Total about 8 MAF
- Export
  - 4,600 cfs capacity



## SWP

- Upstream storage
  - Total about 3.5 MAF
- Export
  - 6,680 cfs March 16 – December 14
  - 8,500 cfs December 15 – March 15



Trinity  
2.4 MAF

Shasta  
4.5 MAF

Black Butte

Oroville  
3.5 MAF

New Bullards Bar

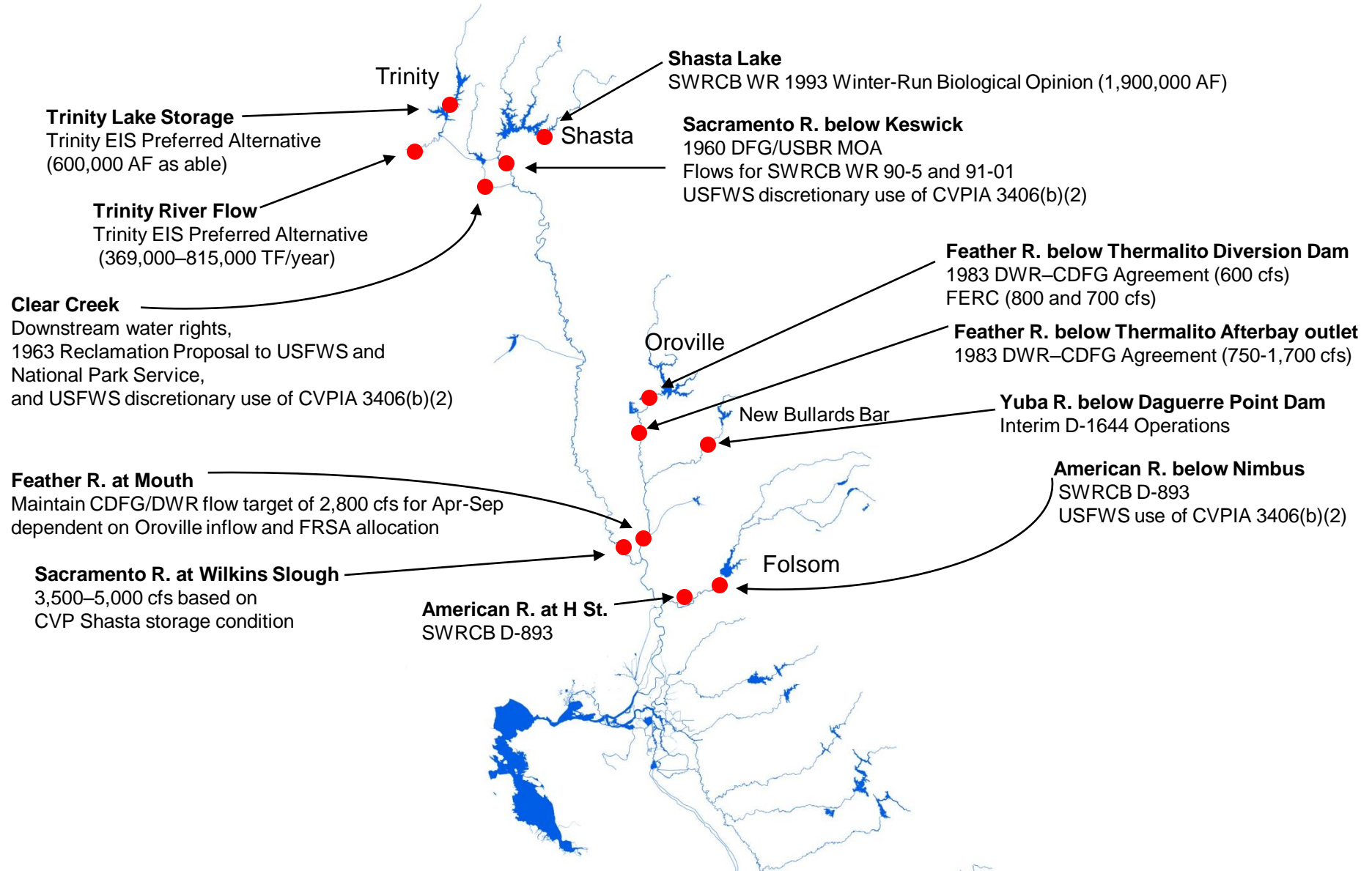
Folsom  
1.0 MAF

Most of you  
are still here

Banks PP  
10,300 cfs

Jones PP  
4,600 cfs

# North of Delta Flow Criteria



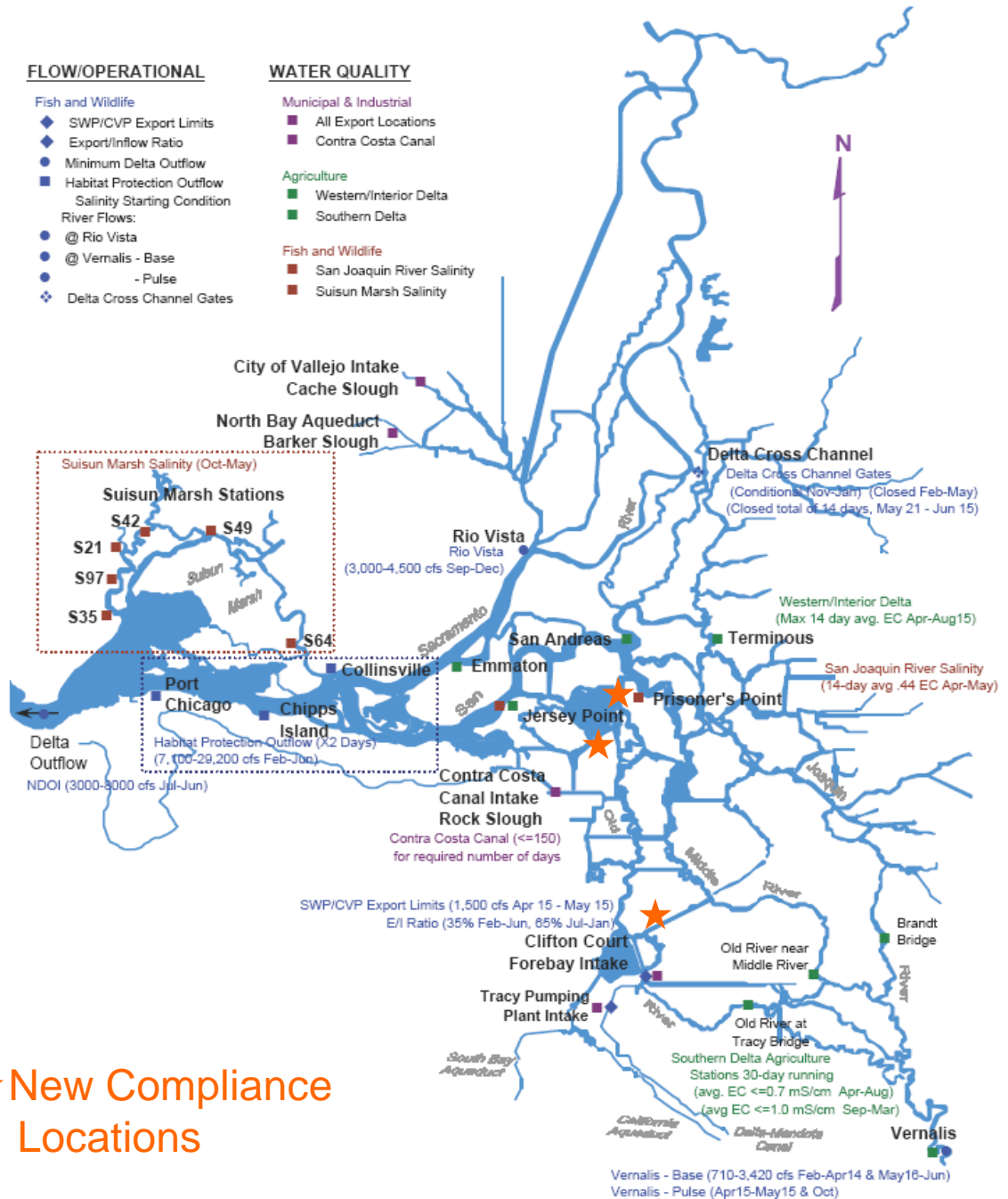
# D-1641 Bay-Delta Standards Stations

## FLOW/OPERATIONAL

- Fish and Wildlife**
- ◆ SWP/CVP Export Limits
- ◆ Export/Inflow Ratio
- Minimum Delta Outflow
- Habitat Protection Outflow
- Salinity Starting Condition
- River Flows:
- @ Rio Vista
- @ Vernalis - Base
- - Pulse
- ◇ Delta Cross Channel Gates

## WATER QUALITY

- Municipal & Industrial**
- All Export Locations
- Contra Costa Canal
- Agriculture**
- Western/Interior Delta
- Southern Delta
- Fish and Wildlife**
- San Joaquin River Salinity
- Suisun Marsh Salinity



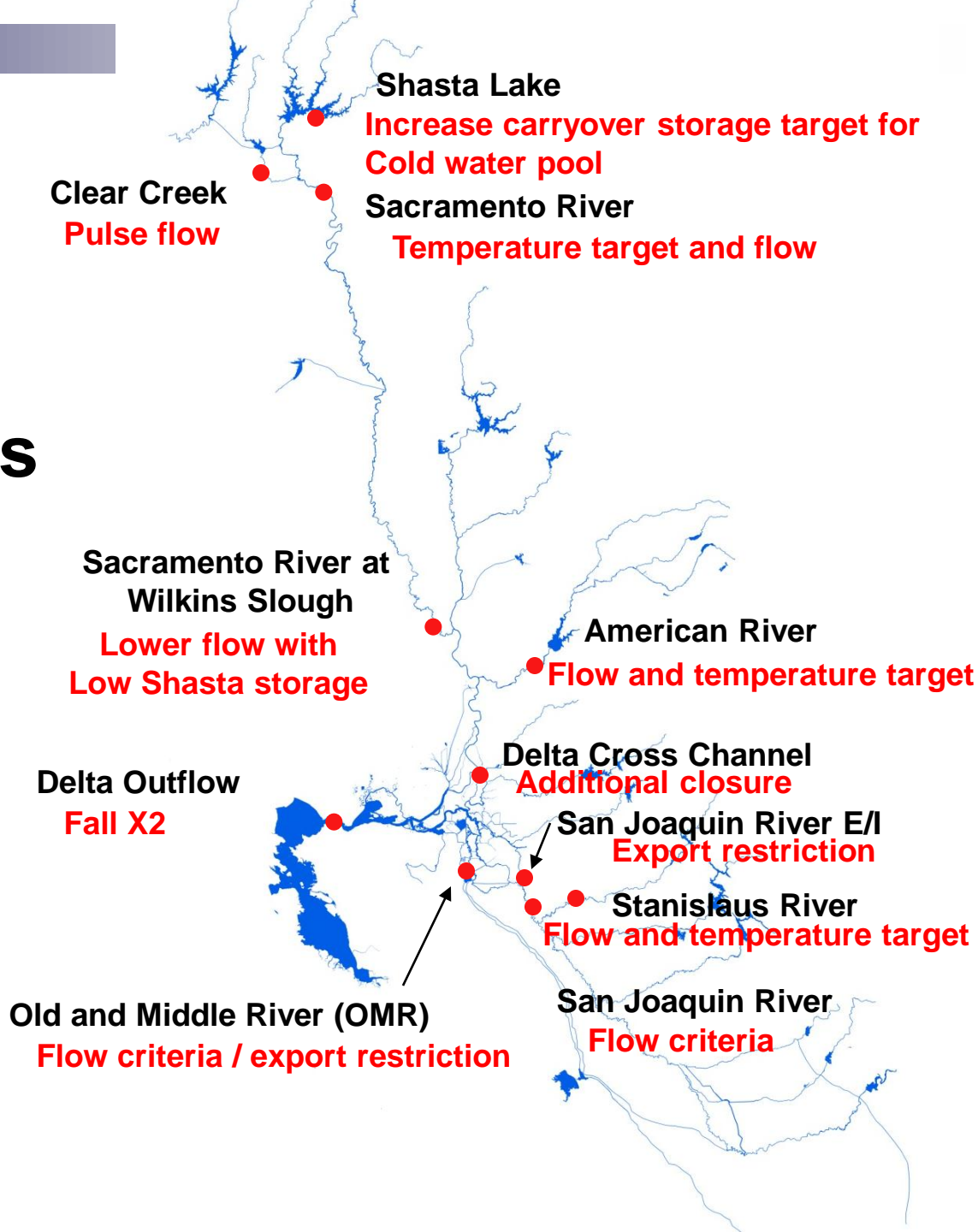
★ New Compliance Locations

Vernalis - Base (710-3,420 cfs Feb-Apr14 & May16-Jun)  
Vernalis - Pulse (Apr15-May15 & Oct)

# New Criteria From BO's

- Salmon BO RPA's

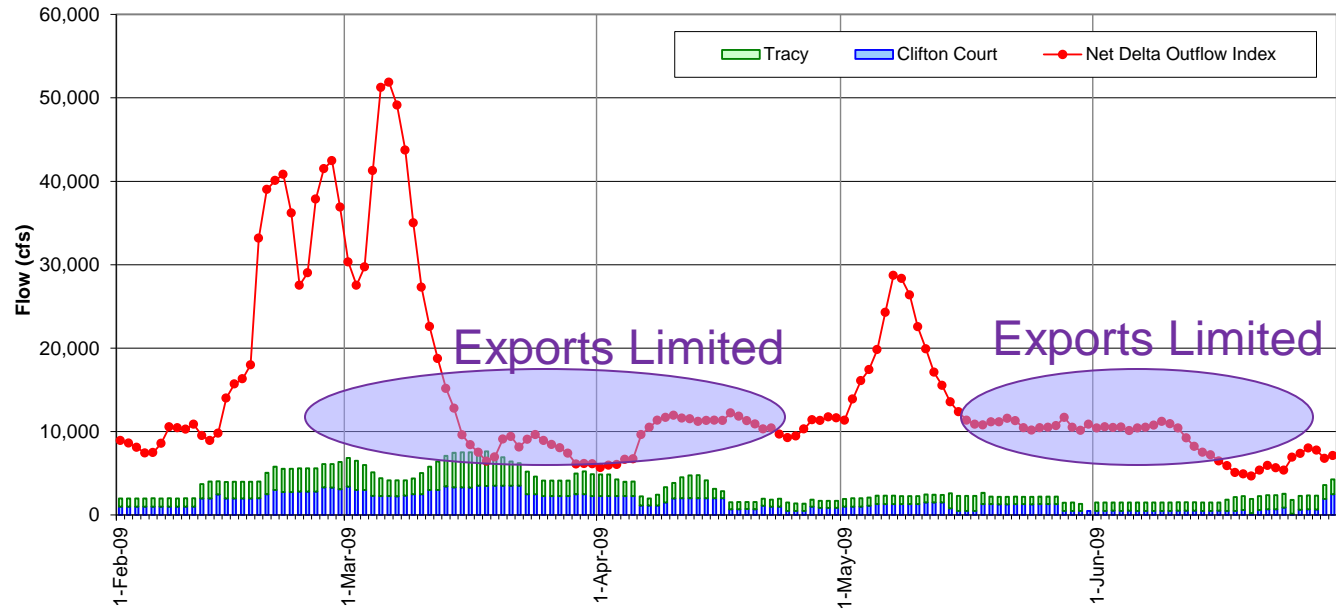
- Smelt BO RPA's



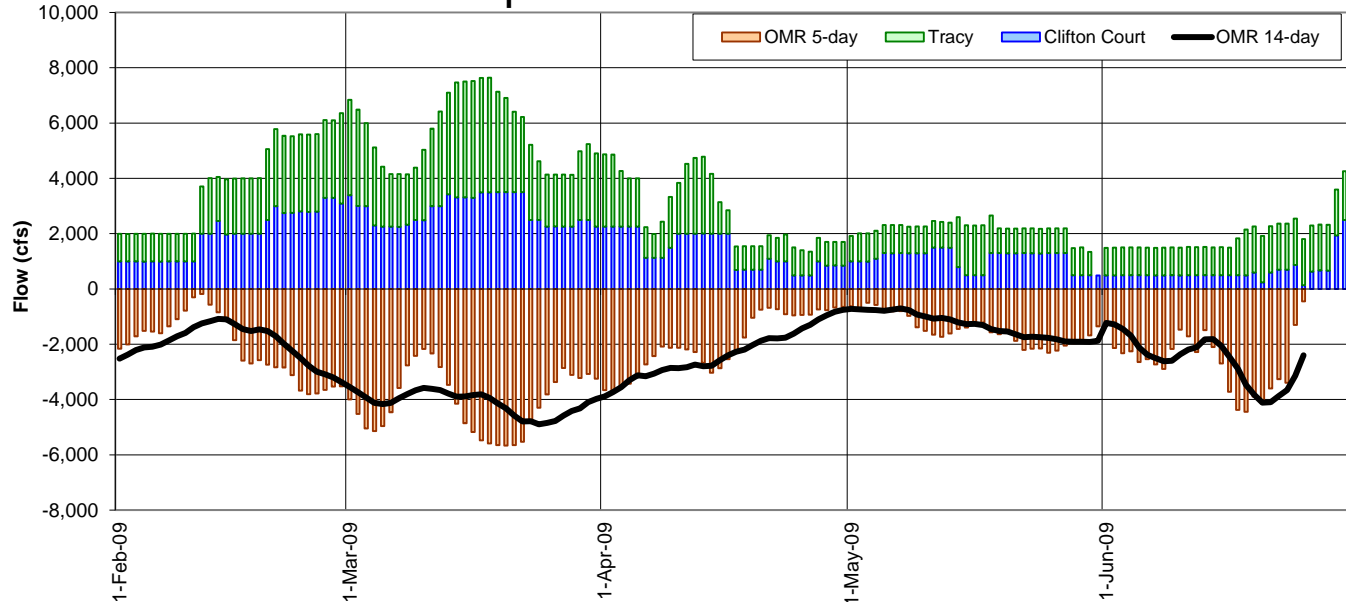
# Recent Operations With Court Ordered OMR Requirements

Daily from February 1, 2009 To June 28, 2009

### Delta Outflow and Exports



### Delta Exports and OMR Flows

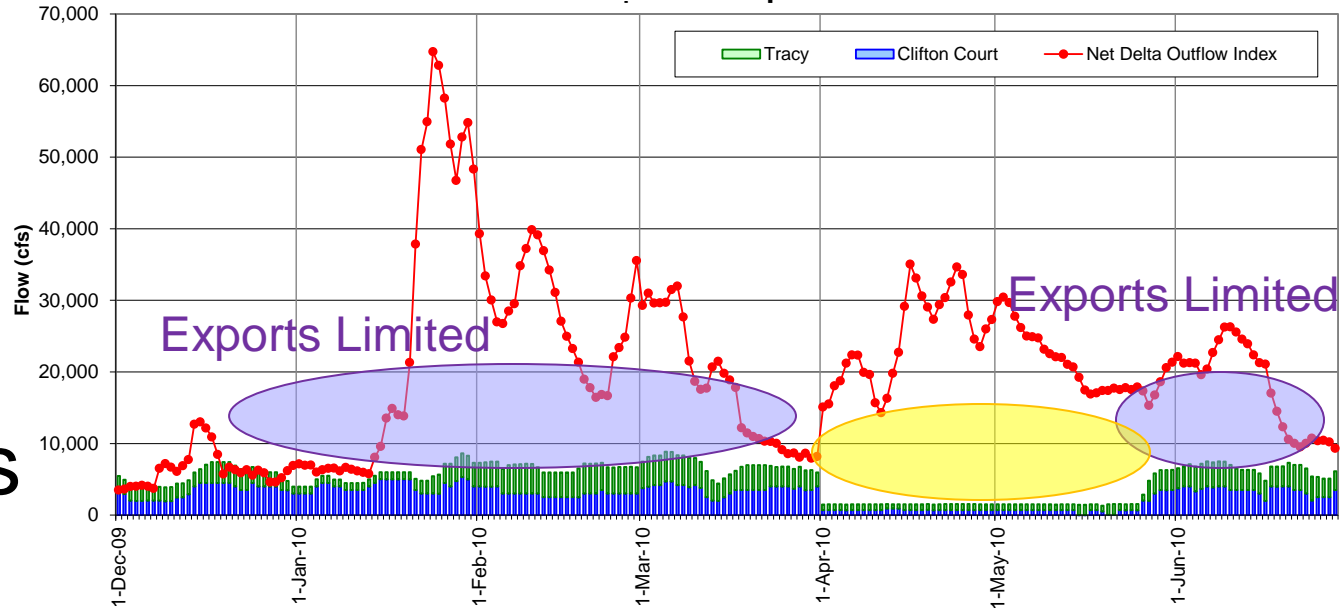




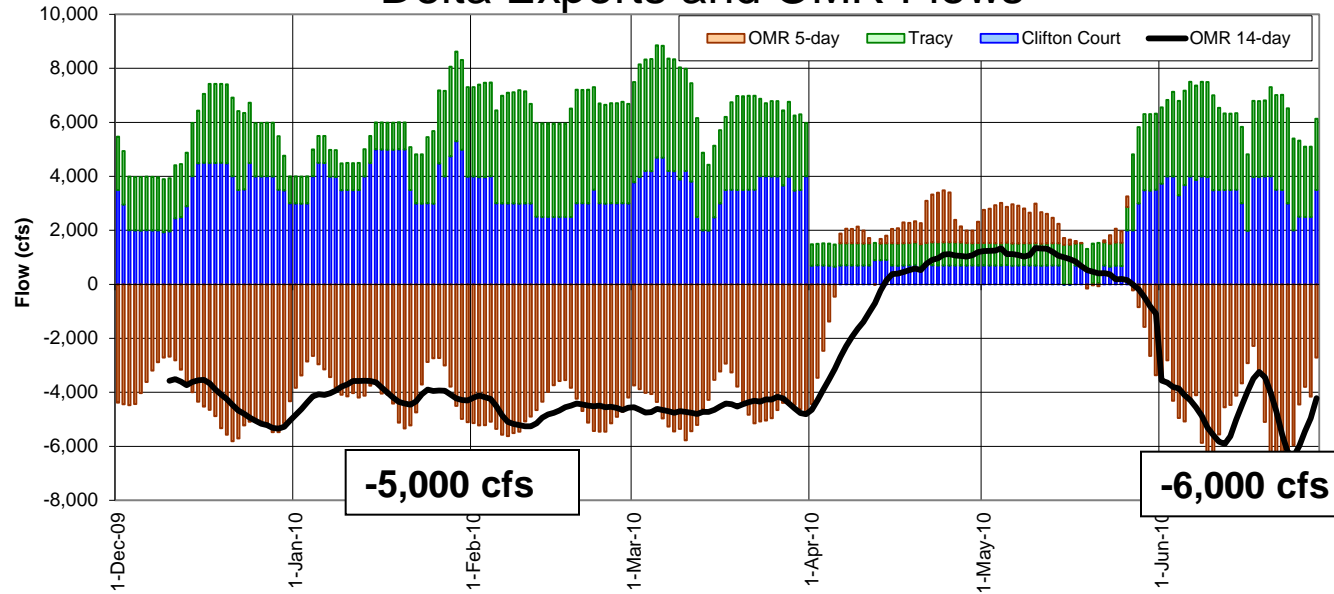
# Recent Operations With OMR Requirements

Daily from  
December 1, 2009  
To  
June 28, 2010

## Delta Outflow and Exports



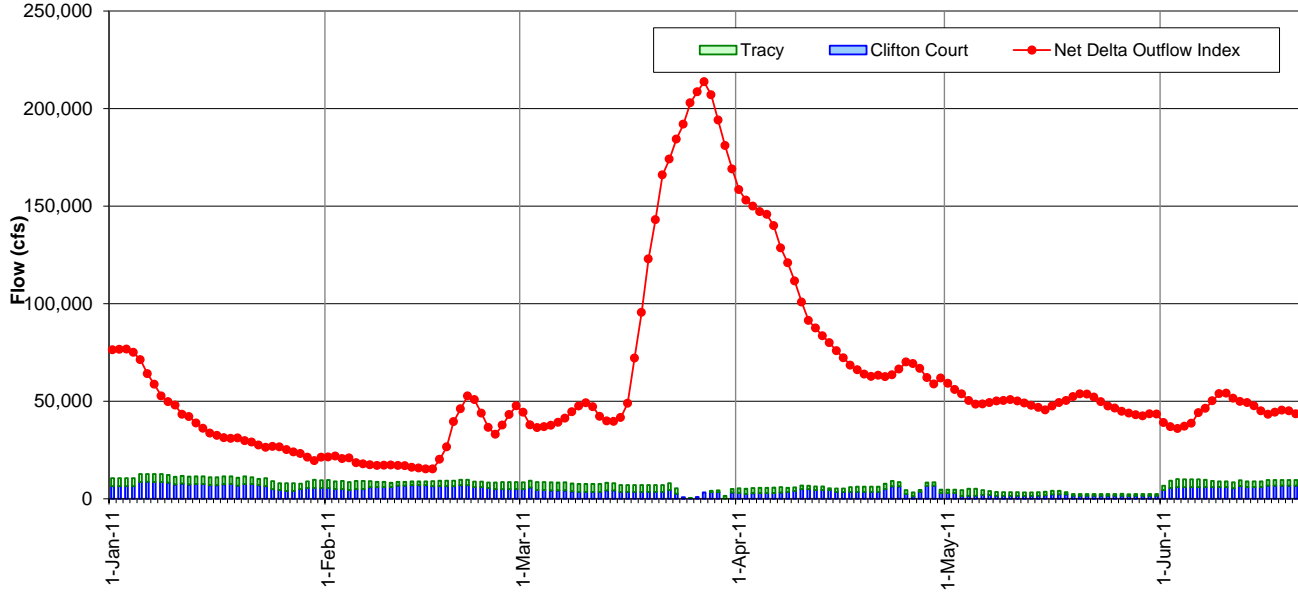
## Delta Exports and OMR Flows



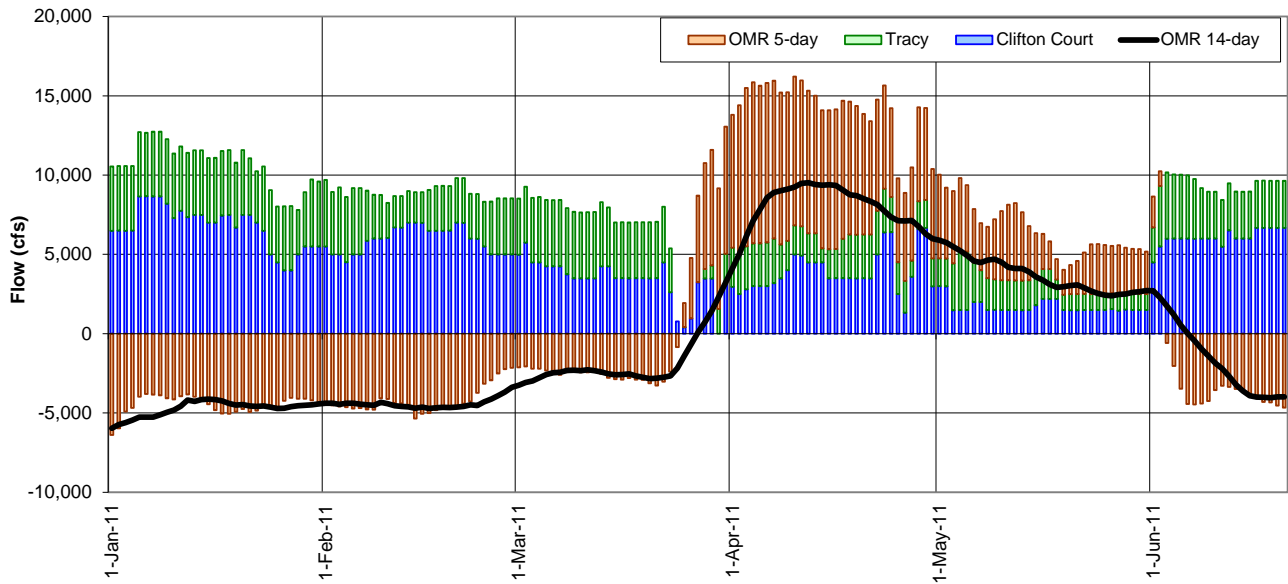
# Recent Operations With Court Ordered OMR Requirements

Daily from January 1, 2011 To June 20, 2011

### Delta Outflow and Exports

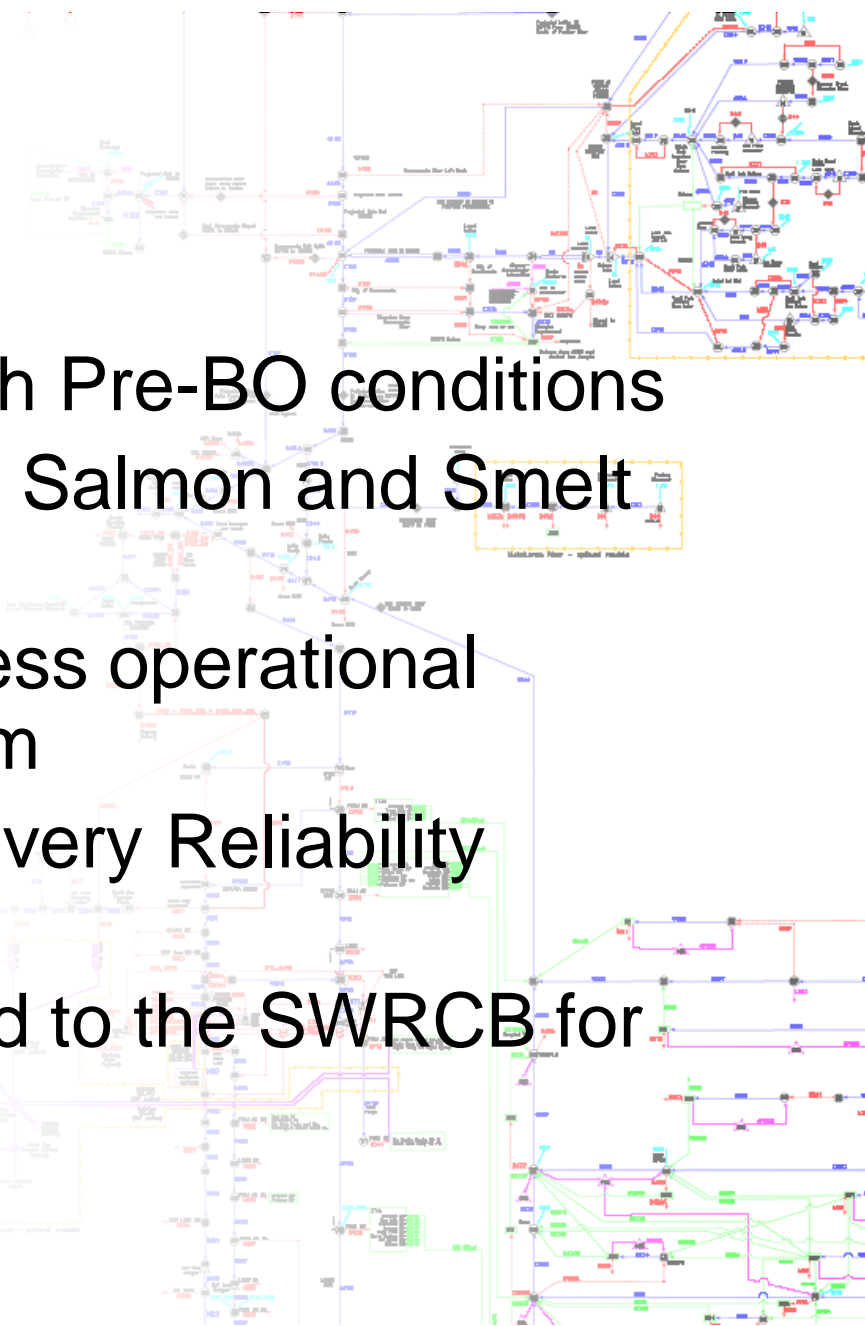


### Delta Exports and OMR Flows



# Modeling

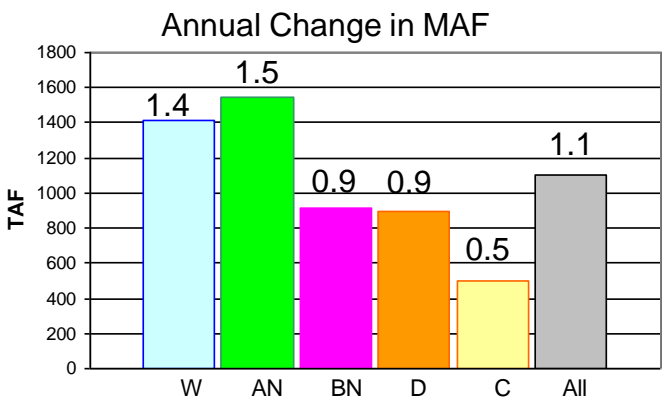
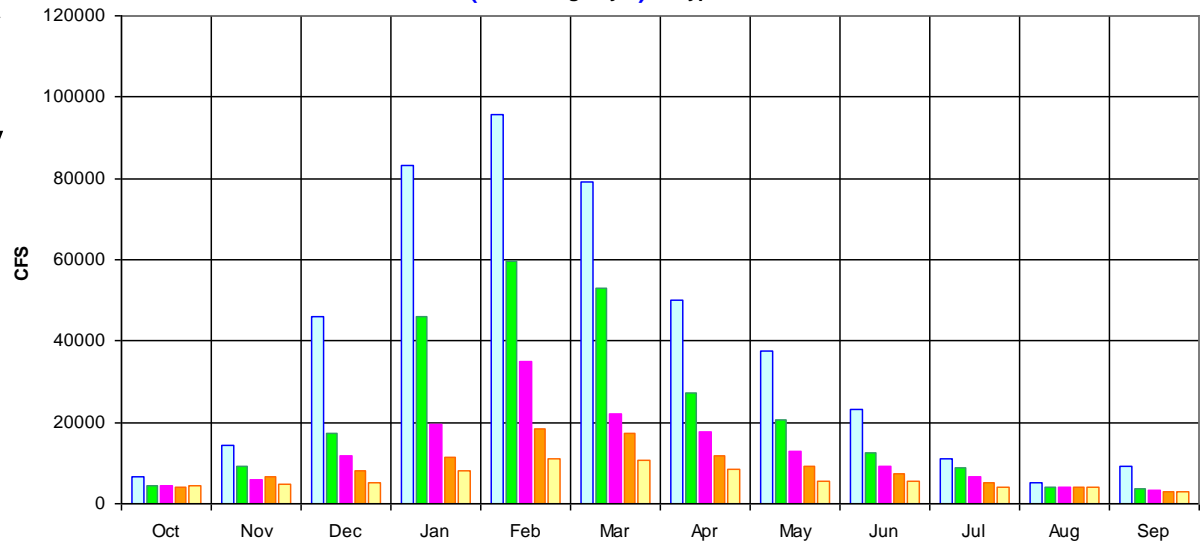
- Model system operations with Pre-BO conditions
- Model system operation with Salmon and Smelt BO's
- Compare model runs to assess operational changes to CVP/SWP system
- Use State Water Project Delivery Reliability Report CalSim II modeling
- These results were submitted to the SWRCB for the Delta outflow proceeding



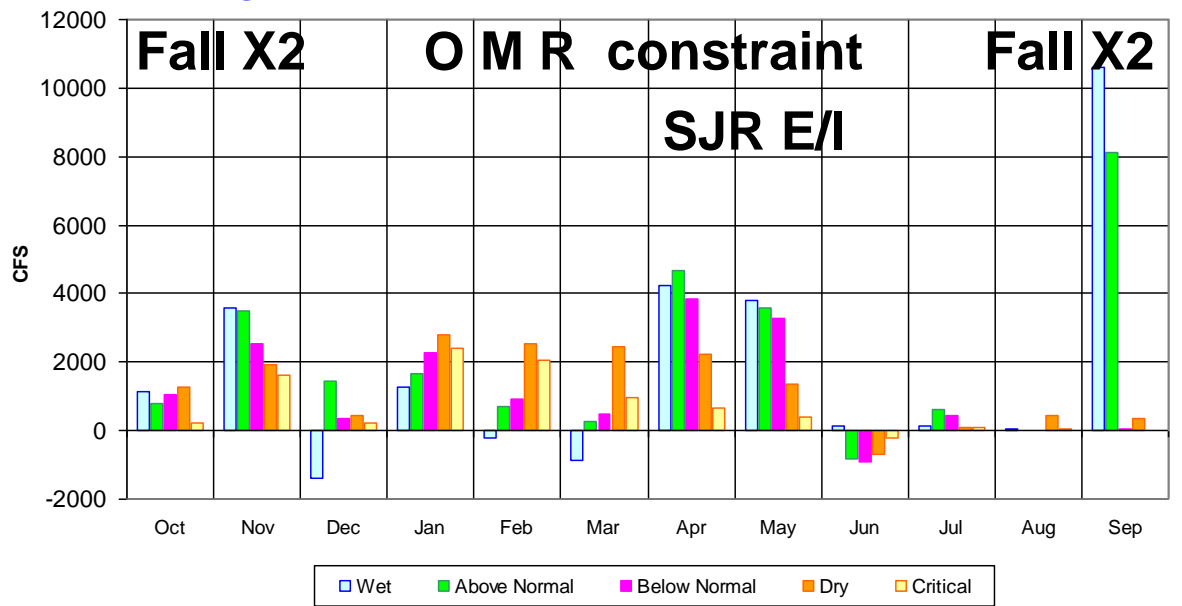
# Delta Outflow

- Based on SWP Reliability Study models
- Increase due to BO's
  - Additional exports restrictions
  - Additional required outflow

Delta Outflow (D-1641)



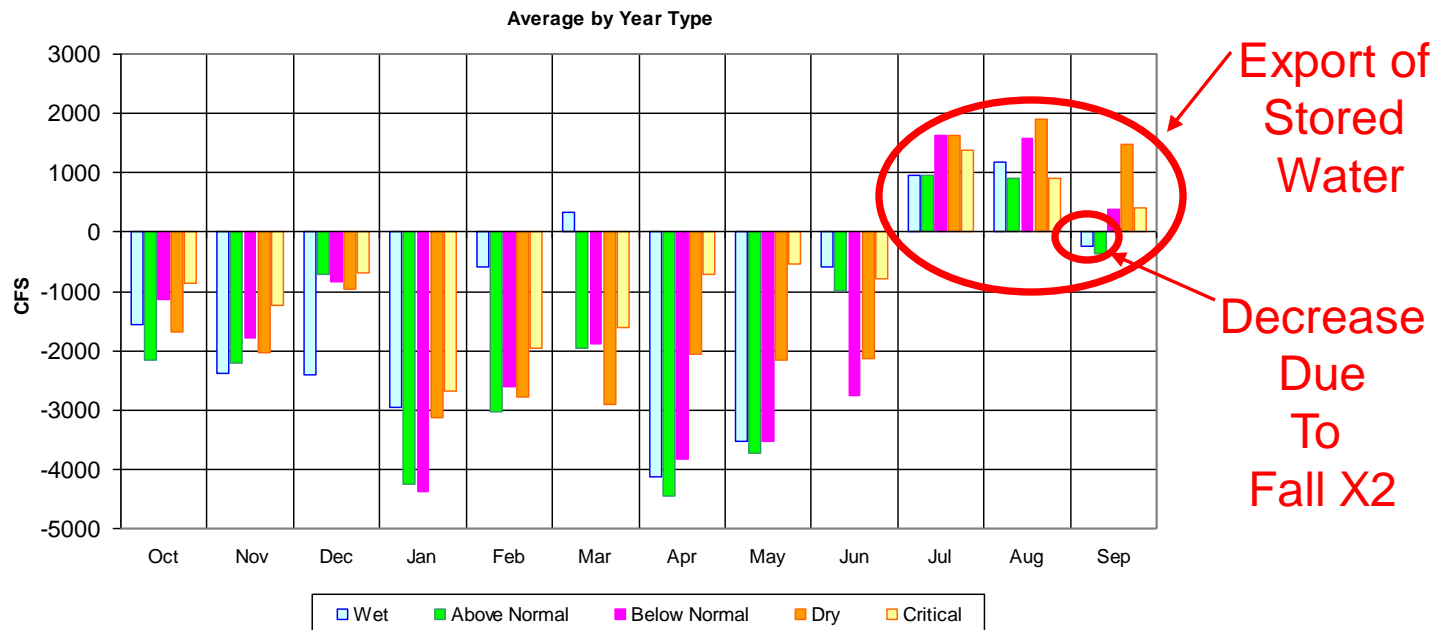
Change in Delta Outflow Due to RPA's



# Delta Exports

- Exports restricted most when outflow is generally higher (December – June)
- Exports increase during summer months (July – September)

Changes in Exports Due to BO's

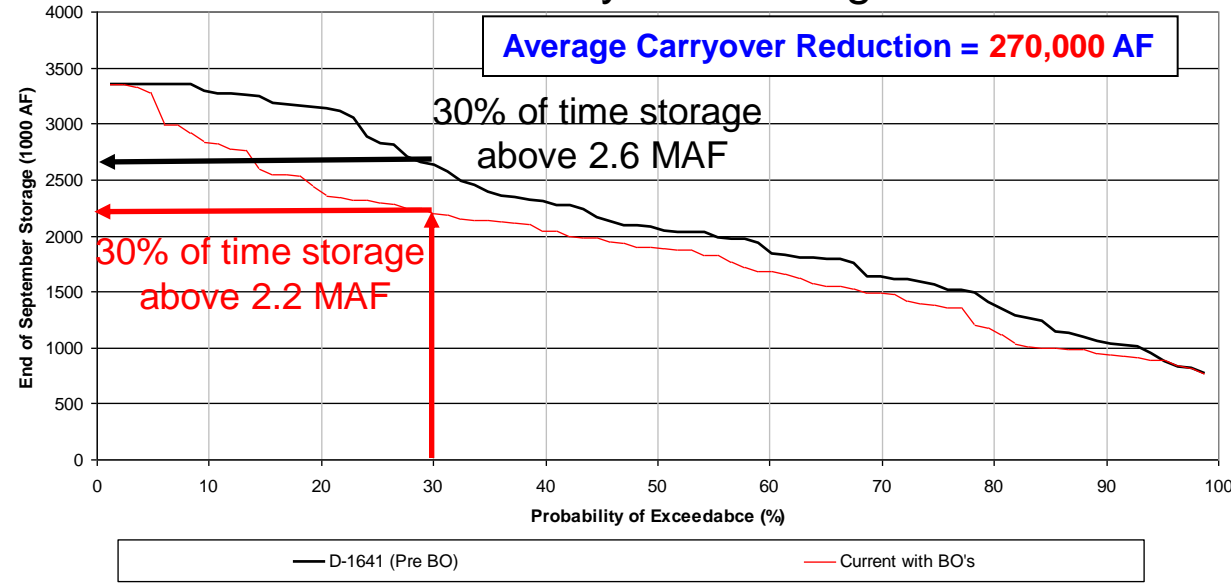


# SWP Changes Due to BO's

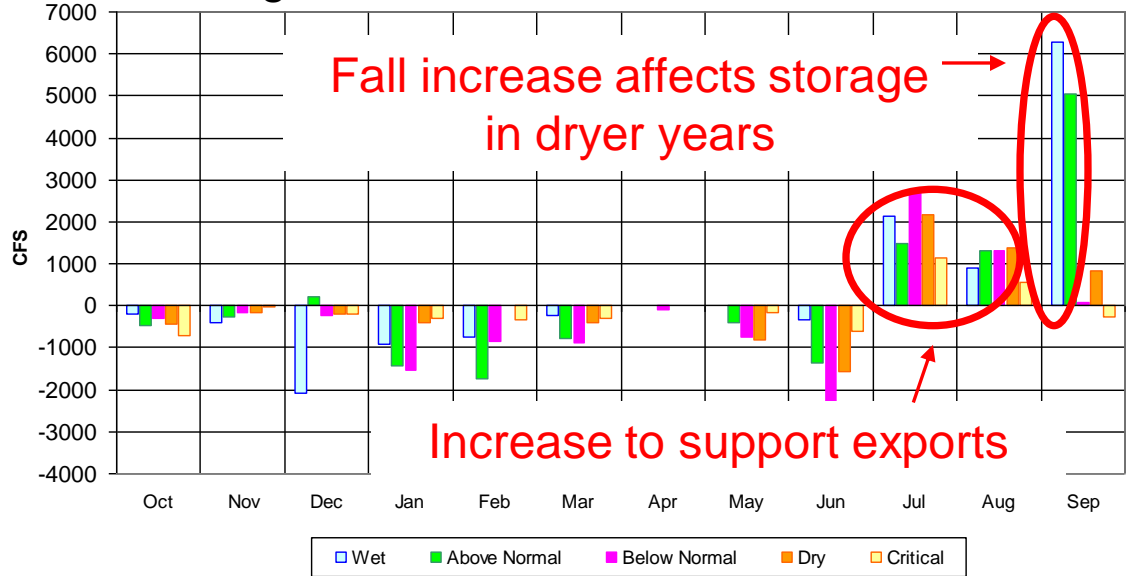
Change in SWP  
South of Delta deliveries  
Conservative estimate  
(1000 AF)

Table A = -260,000  
Article 21 = -380,000  
Article 56 = -50,000  
**Total = -690,000**

## Oroville Carryover Storage



## Change in Feather River below Thermalito



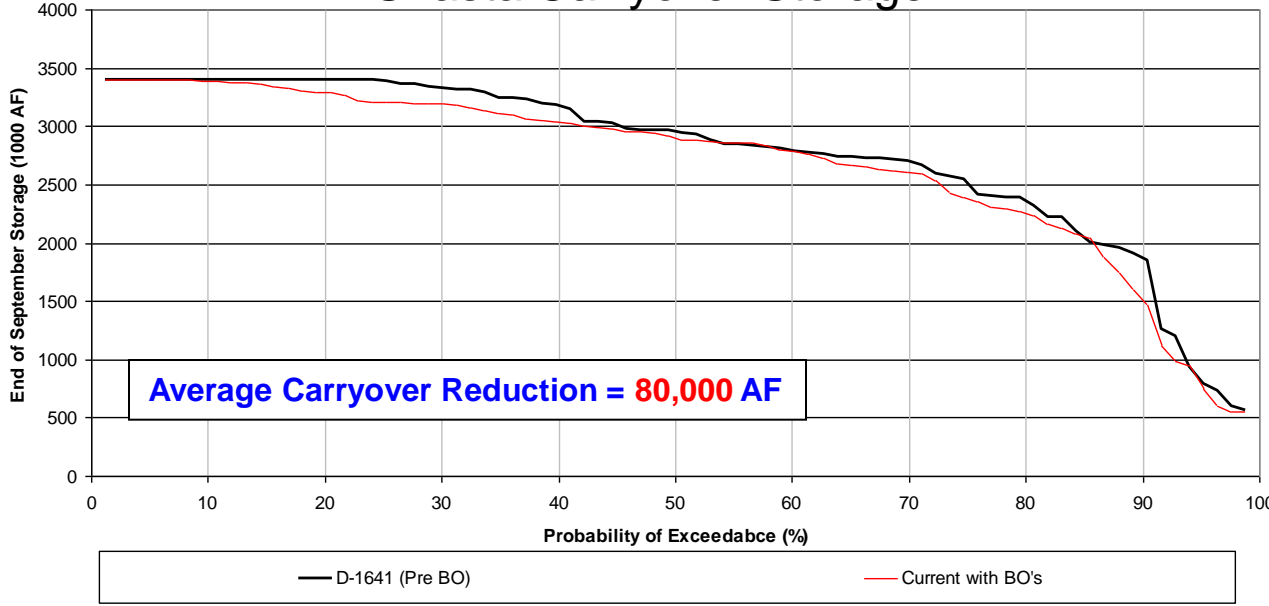


# SWP operational changes

- **Pre BO:** SWP relied on exporting surplus flows and used Oroville Reservoir for dry year reliability
- **Post BO:** SWP ability to divert surplus is limited, therefore the SWP relies on Oroville storage release to support exports during July – September
- Increase Fall release causing lower carryover and dryer year impacts

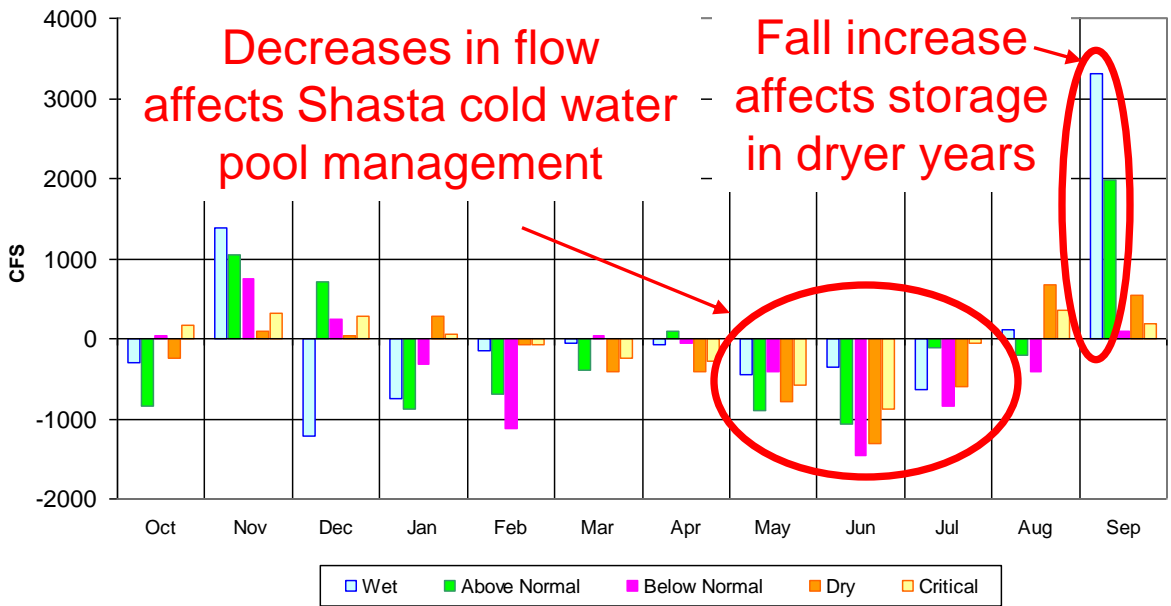
# CVP Changes Due to BO's

## Shasta Carryover Storage



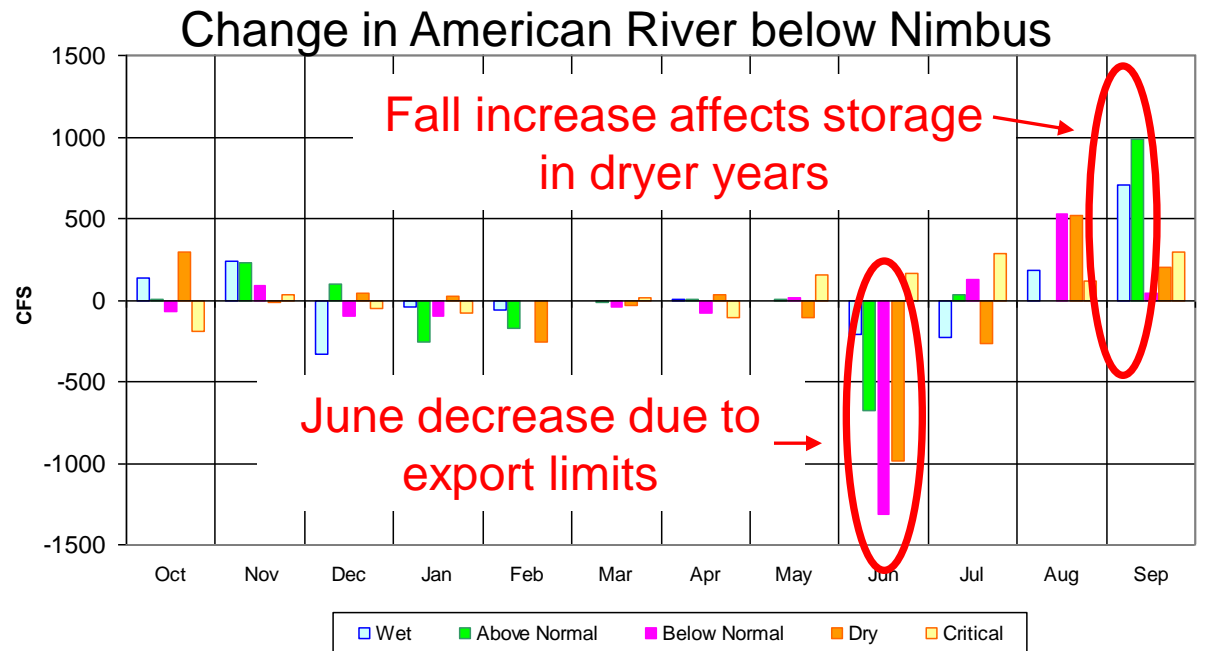
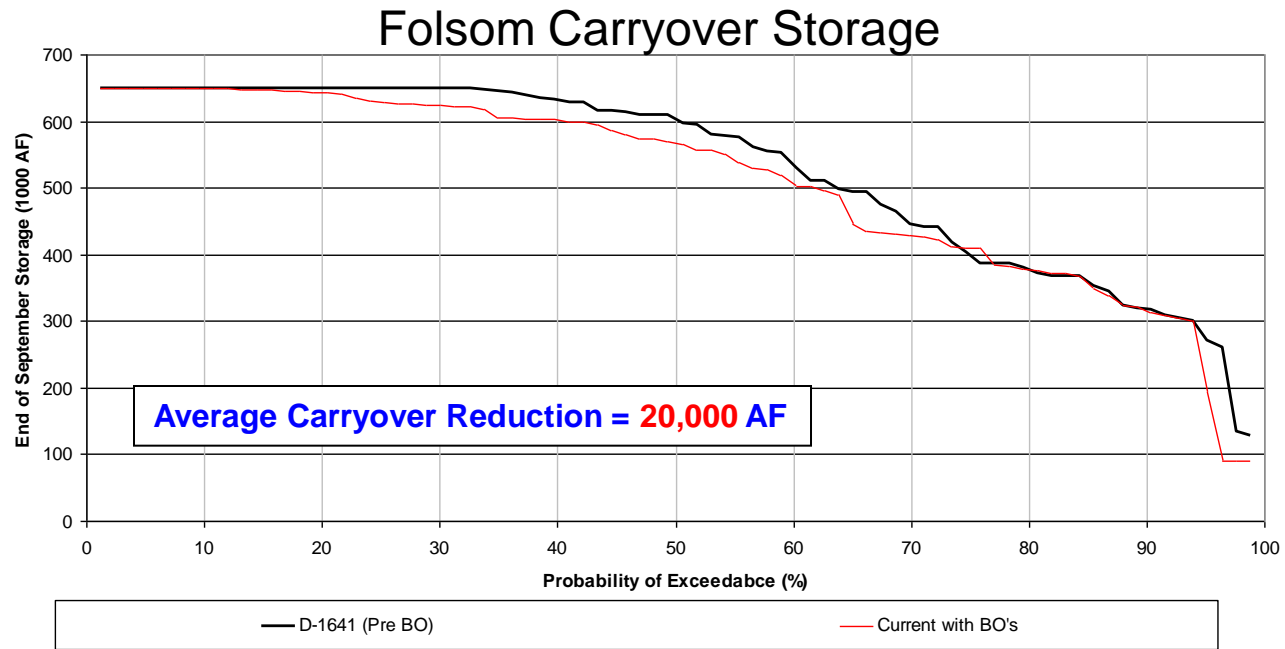
**Change in CVP Deliveries (1000 AF)**  
 North of Delta = -20,000  
 South of Delta = -225,000  
**Total = -245,000**

## Change in Sacramento River below Keswick





# CVP Changes Due to BO's



# CVP operational changes

- **Pre BO:** CVP relied on exporting surplus flows and less on upstream storage releases
- **Post BO:** increased released from Folsom and sometimes Shasta Reservoirs to support exports during July – September
  - Not as extreme as SWP changes
- Increase Fall release causing lower carryover and dryer year impacts



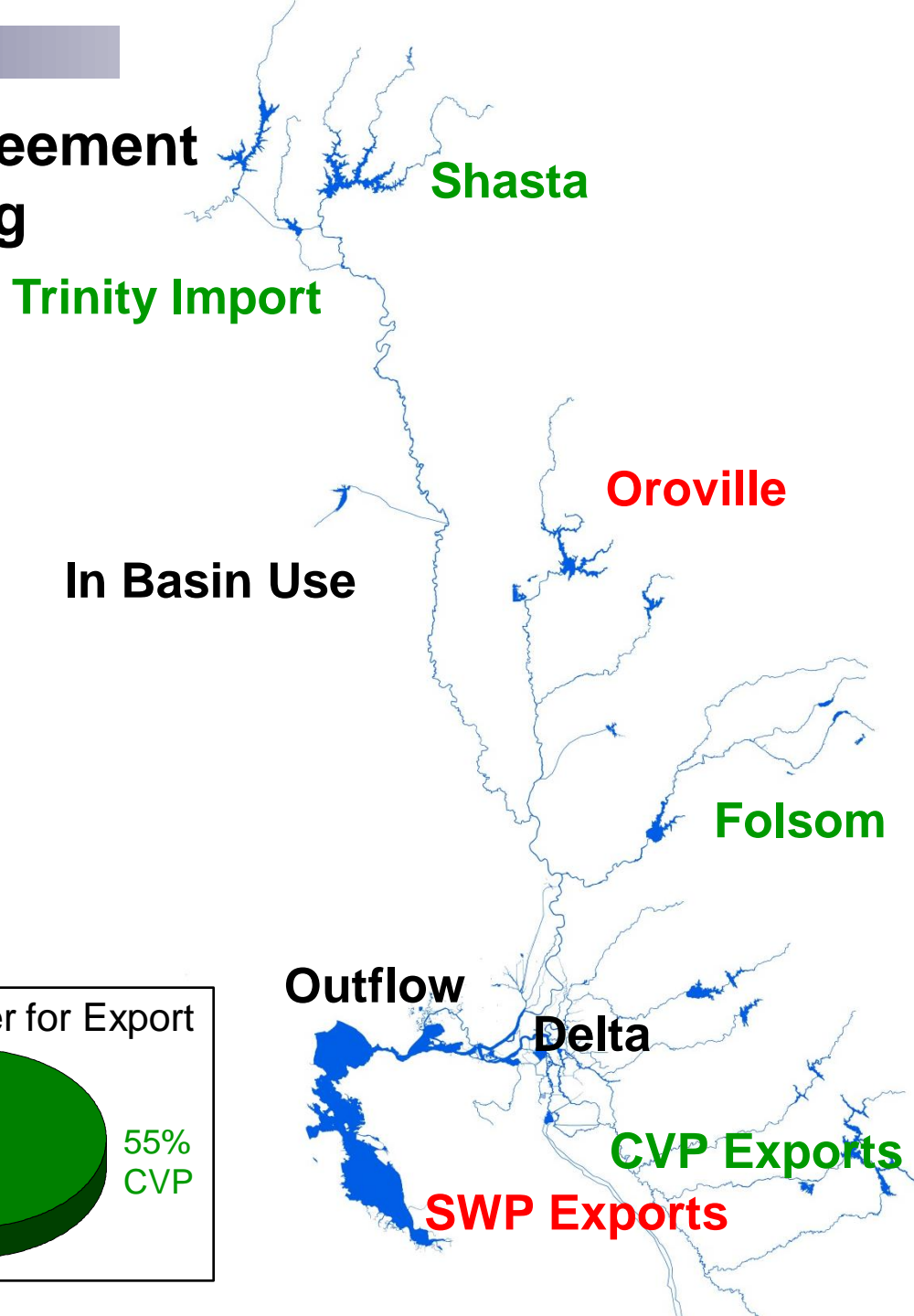
# Other Effects

- Water management planning
  - Decrease in water supply reliability
- Groundwater use and levels
- Institutional agreements
  - Coordinated Operation Agreement
- Decrease in ability to transfer water
- Economic

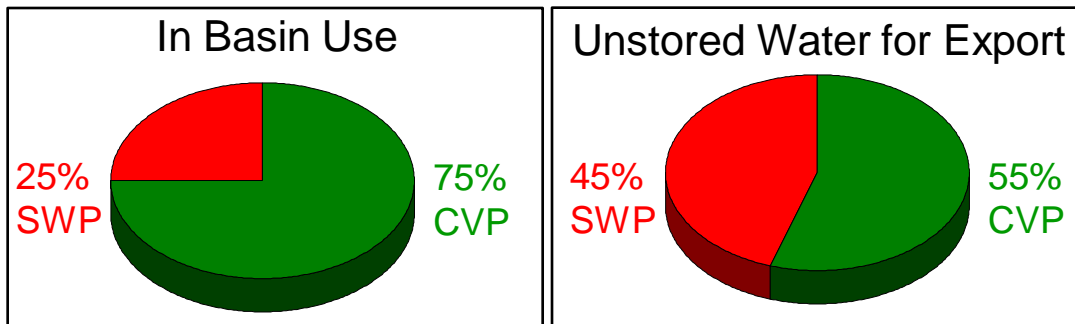
# Coordinated Operation Agreement Facilities And Sharing

COA does not describe sharing associated with:

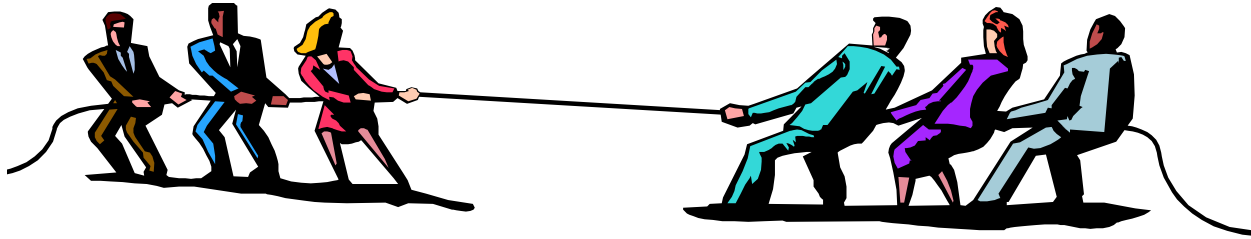
- D-1641 export restrictions (EI ratio)
- OMR export restrictions
- SJR inflow/export restriction
- Responsibility for meeting increased outflow



**In Basin Use**



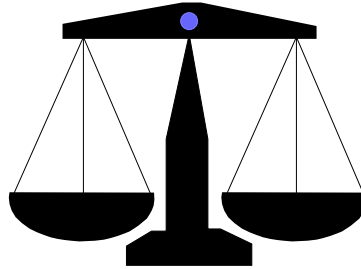
# Smelt RPA's and Salmon RPA's Compete For Same Water



Upstream habitat vs. Delta outflow

- The challenge is developing criteria to balance the system
  - One criterion does not fit all hydrologic conditions

# Tradeoffs

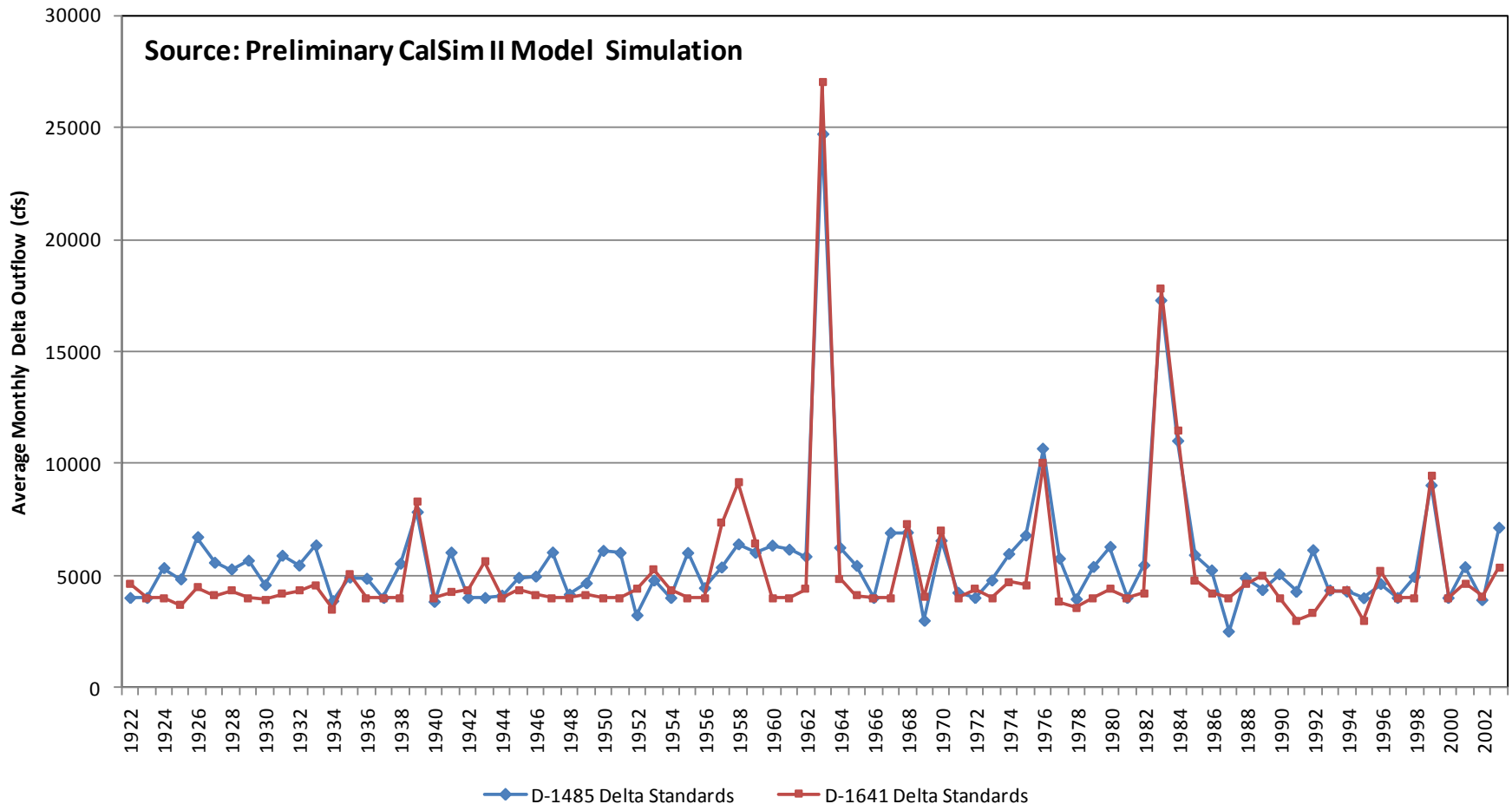


<b>Water Deliveries</b>	■ <b>Delta Outflow</b>
<b>Delta Flow Requirements</b>	■ <b>Upstream Environmental Benefit</b>
<b>CVP North of Delta Delivery</b>	■ <b>CVP South of Delta Delivery</b>
<b>Shasta Storage</b>	■ <b>Folsom Storage</b>
<b>Oroville Storage</b>	■ <b>SWP SOD Storage</b>
<b>American River Fisheries</b>	■ <b>Sacramento River Fisheries</b>
<b>North of Delta Storage</b>	■ <b>South of Delta Storage</b>
<b>Stream Temperature</b>	■ <b>Stream Habitat</b>
<b>Power</b>	■ <b>Water Supply</b>
<b>Species A</b>	■ <b>Species B</b>

# Example of Tradeoffs

## Fall Delta Outflow Variation is Affected by Spring Flow Requirements

Average Monthly Delta Outflow for October





# Summary

- RPA's cause change in operational strategy for SWP and CVP
- Operation of the entire Delta watershed is affected when one component is changed
- Very difficult to develop criteria to protect individual species without impacting others