

SWRCB Workshop 3 Modeling Tools

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Outline

- Brief Discussion of Selected Models

 CalSim-II
 CalLite
 DSM2
 SELFE
- Case Study (Fall X2 Analysis)
- Unimpaired versus Natural Flow

What is CalSim-II?

- Statewide long-term planning model
- Simulates operations of SWP and CVP facilities on a monthly time-step
- Represents the Sacramento and San Joaquin River system and Delta
- Accounts for system operational objectives, physical constraints, legal and institutional agreements and statutes

California Water Resources System





Salinity Standards

- 1. Emmaton
- 2. Jersey Point
- 3. Rock Slough [CC PP#1]
- 4. Collinsville
- 5. Chipps Island
- 6. Antioch

Representation in CalSim-II



Why use CalSim-II?

- Addresses many SWP and CVP obligations throughout the state (local demands, upstream river minimum flows, delta water quality, delta outflow, exports to contractors, etc.).
- Ability to assess operational objectives over a longterm planning horizon (82 years of simulation).
- Ability to evaluate potential water supply impacts throughout the state using comparative analysis.
- Ability to incorporate Climate Change and Sea Level Rise effects

CalSim-II Limitations

- Monthly time-step
 - mid month, 1 week, 3-day, 1-day, daily variability
- Demands aggregated in relatively large geographic areas (course resolution)
- Assumes existing water rights rules
- Imprecise groundwater representation
- More suitable for comparisons than stand-alone applications

CalLite Model

- Central Valley Water Management Screening Model
- Derived from CalSim-II model
- Simplified Sacramento and San Joaquin Valleys, but Same Delta representation.
- Simulation Period is 82 years (1922-2003)
- Flexible Graphical user interface for Input and output

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CalLite Model

CalLite allows interactive modification of water management actions

- Facilities (Isolated Facility, Storage investigation)
- Delta regulation options (D1641, Biological opinions)
- Demand management (Current and Future level)
- Hydrology (Current, Future, and Climate Change)

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HYDRO Flow, velocity, depth, and water surface elevations

QUAL Fate and transport of conservative and nonconservative constituents PTM Transport of neutrally buoyant particles

DSM2 Boundary Conditions

Martinez

Sacramento River

the second second

Tributaries

Consumptive Use

Stockton 🦯

Exports

San Joaquin River

Tidal Stage

DSM2 (Nutrient Modeling)



SELFE (3-D Model Bay/Delta/Ocean)



CalSim-II links to other models and processes



Case Study – CalSim-II Fall X2 Analysis

Major Assumptions

- No Action Alternative Simulation (With Fall X2)
 - 1922 2003 Simulation Period
 - Future Level of Development Land-Use and Demands (2030)
 - Future Level of Climate Change (2025)
 - Future Level of Sea Level Rise (15 cm)
 - Water Rights Decision 1641 regulations
 - 2008 USFWS Biological Opinion Reasonable and Prudent Actions including Fall X2 requirements which occur only in years following Wet or Above Normal years
 - 2009 NMFS Biological Opinion Reasonable and Prudent Actions
 - Temperature and storage requirements under Action 1.2 not modeled
- No Fall X2 Alternative Simulation
 - Same as No Action with the exception of the removal of the Fall X2 requirement

Case Study – Fall X2 (Export Impacts)

Total SWP + CVP Export (TAF)	With Fall X2	Without Fall X2	Diff
1922 - 2003 Average	4728	4927	199
Average of 1 Year Following W or AN	5040	5374	335
Max Impact of Year Following (1944)	3915	4690	775
Min Impact of Year Following (2000)	4987	4997	10

Different metrics can show different impacts

 Model results need to be evaluated qualitatively and quantitatively

Case Study – Fall X2 (Storage Impacts)



Shasta + Oroville Storage (TAF) 1963 - 2003



Case Study – Fall X2

 Wet years help storage to recover

 Exports still Impacted

1944 shows
 largest export
 impact



Case Study – Fall X2 Analysis Summary of Findings

Storage generally lower when implementing Fall X2

- Storage impacts can be more pronounced in periods following Fall X2 requirements
- Reduced storage is accompanied by a reduced ability to meet temperature requirements for listed species
- Reduced storage is accompanied by reduced exports

Unimpaired versus Natural Flow

- Unimpaired Flow (UF) can be significantly different from Natural Flow (NF)
- UF is a conceptual quantity estimated through various means to approximate "total water available" at a location
- NF is also a conceptual quantity that is the streamflow that would have occurred naturally if the watershed were not altered by "human activity"
- UF and NF quantities are more similar for upper watersheds



Limitations on the use of UF

- No channel flow routing
- Some estimates are based on expert judgment; hence not precise
- Direct field measurement and forecast of the UF is possible but very difficult
- Difficult to implement UF based requirements in real time



Take Home Points

- Models are simplifications of the real physical world and should be used with caution
- There are multiple modeling tools that should be used together to examine the CA water system holistically
- The effects of Climate Change and Sea Level Rise should be considered in all modeling
- System objectives and impacts will likely need to be balanced

