CALIFORNIA DEPARTMENT OF WATER RESOURCES

# CVSOM
# Reservoir Operations

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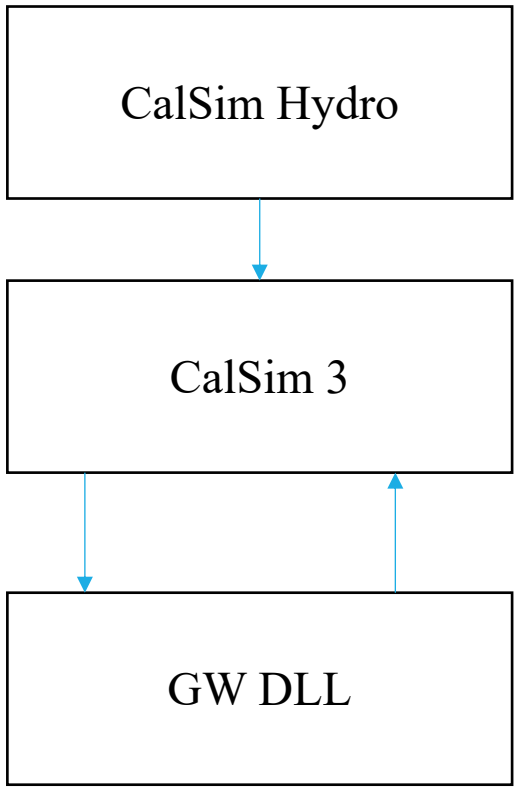
CALIFORNIA DEPARTMENT OF WATER RESOURCES
Modeling Support Office

Woodard & Curran

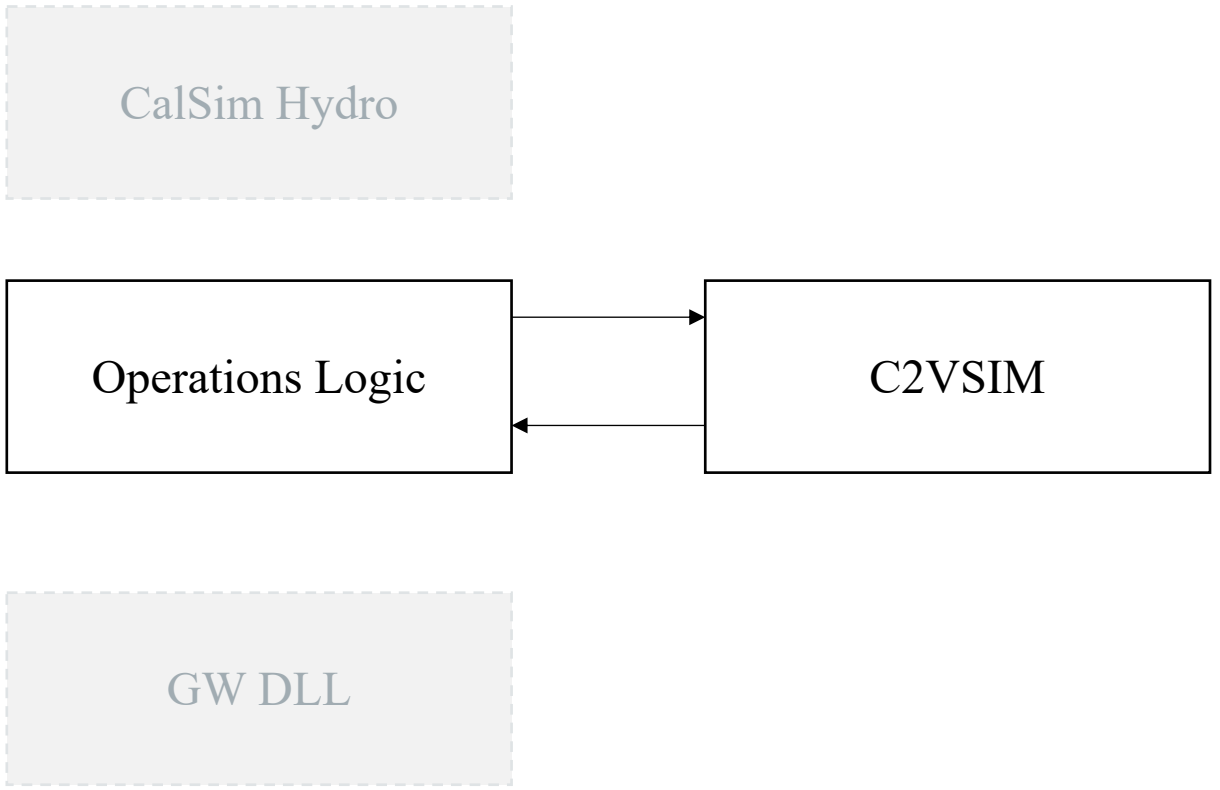
Stantec

# Introduction

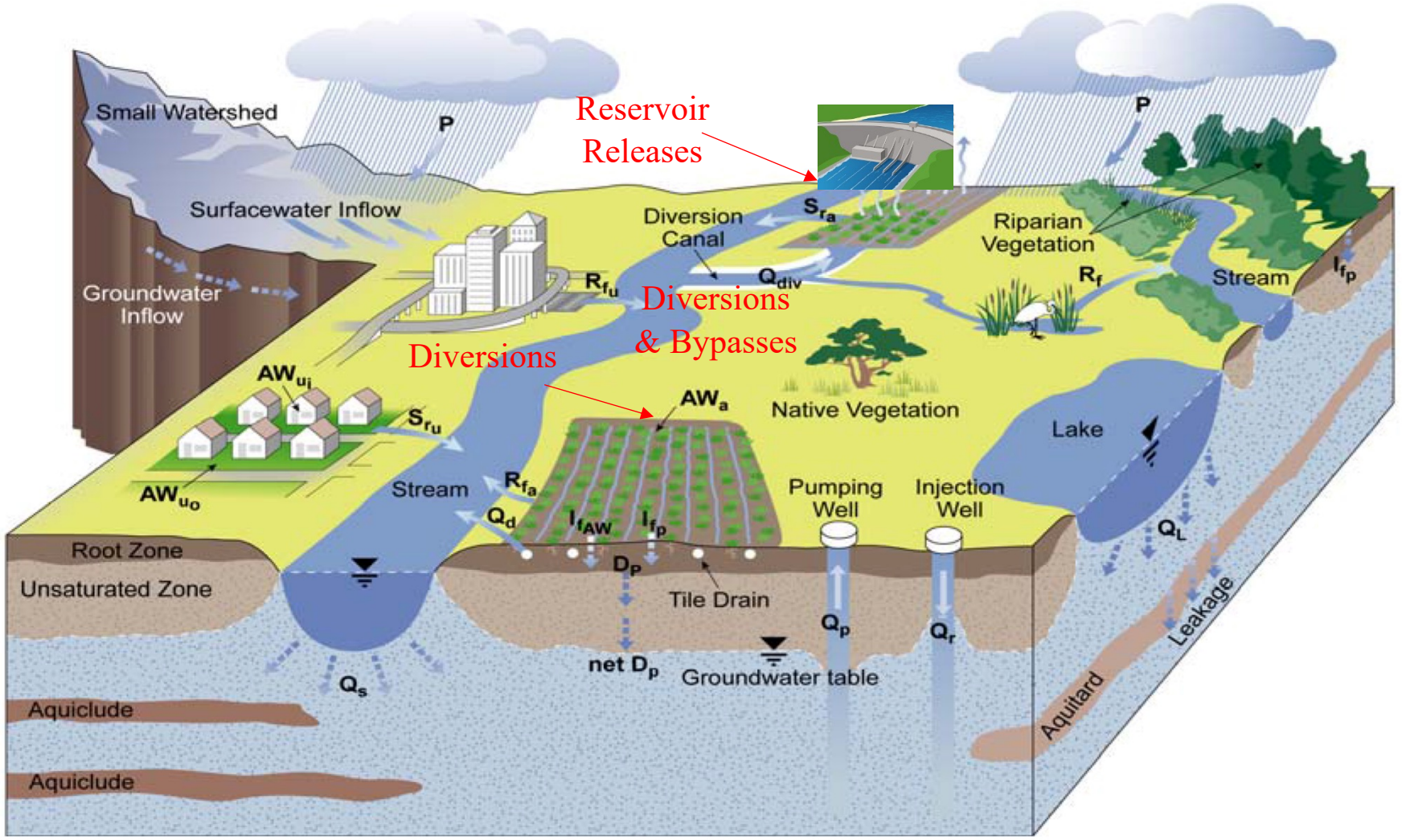
CalSim 3



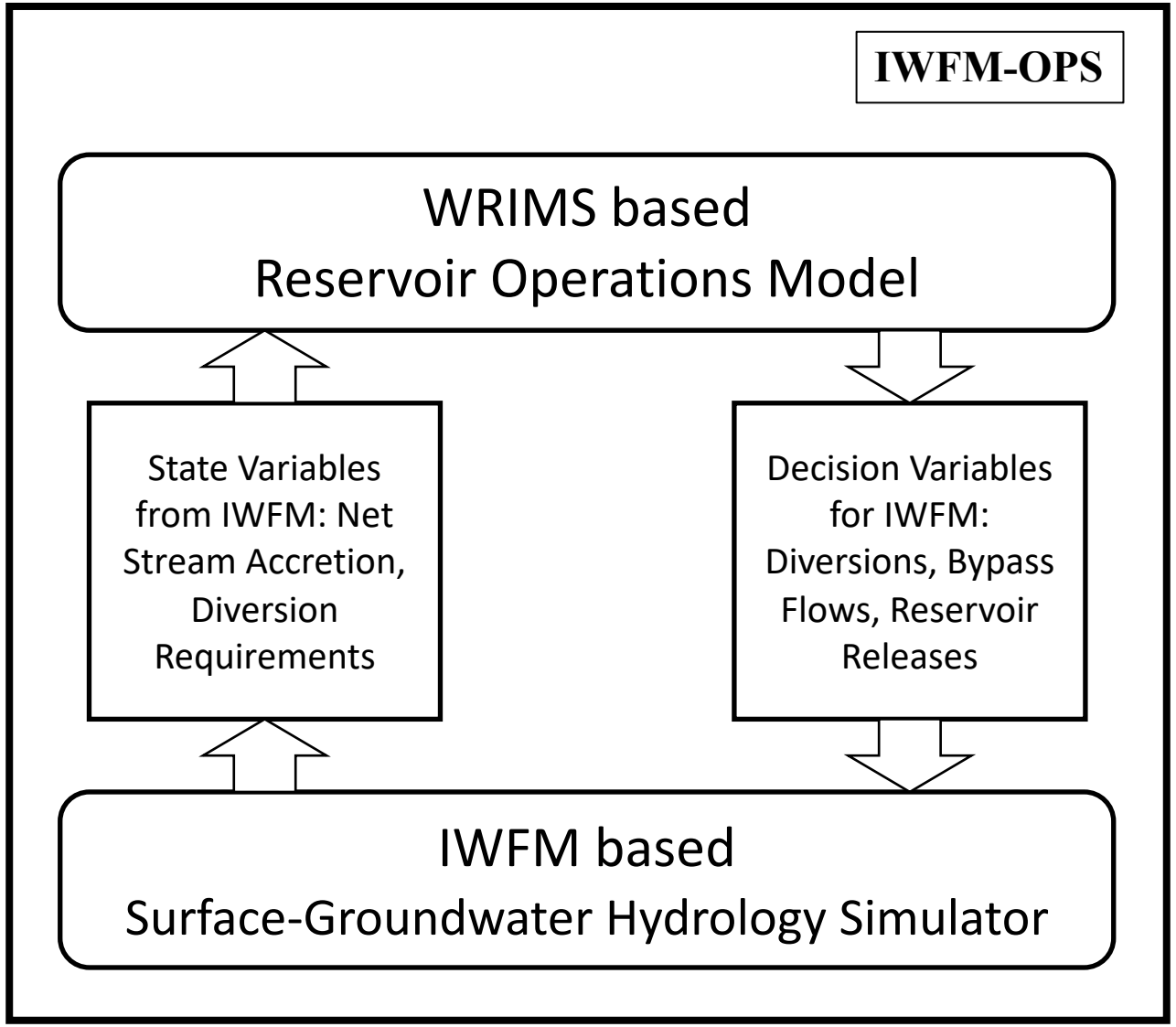

CVSOM Development



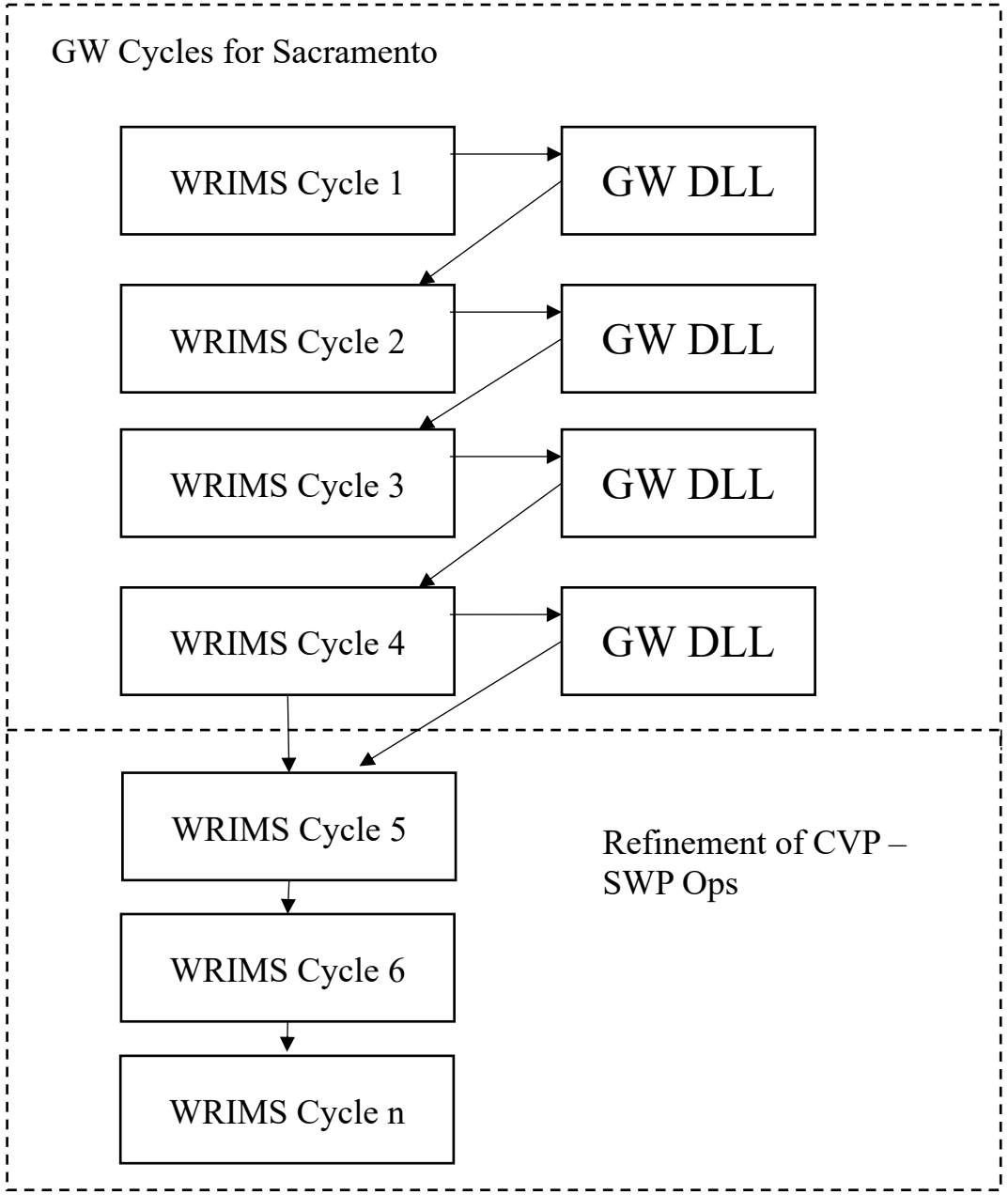
# Modeling in CVSOM



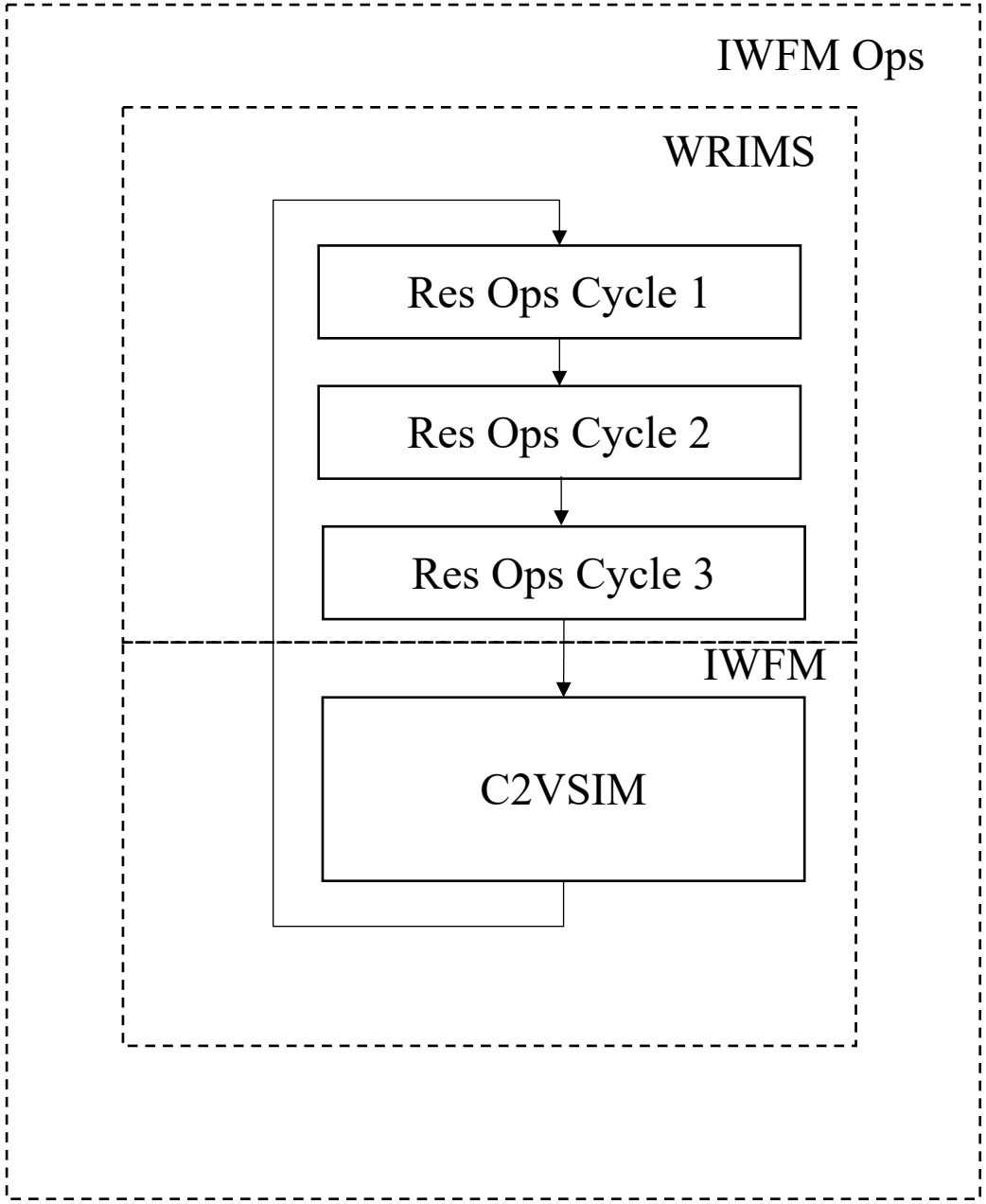
# Modeling Interface



# CalSim 3



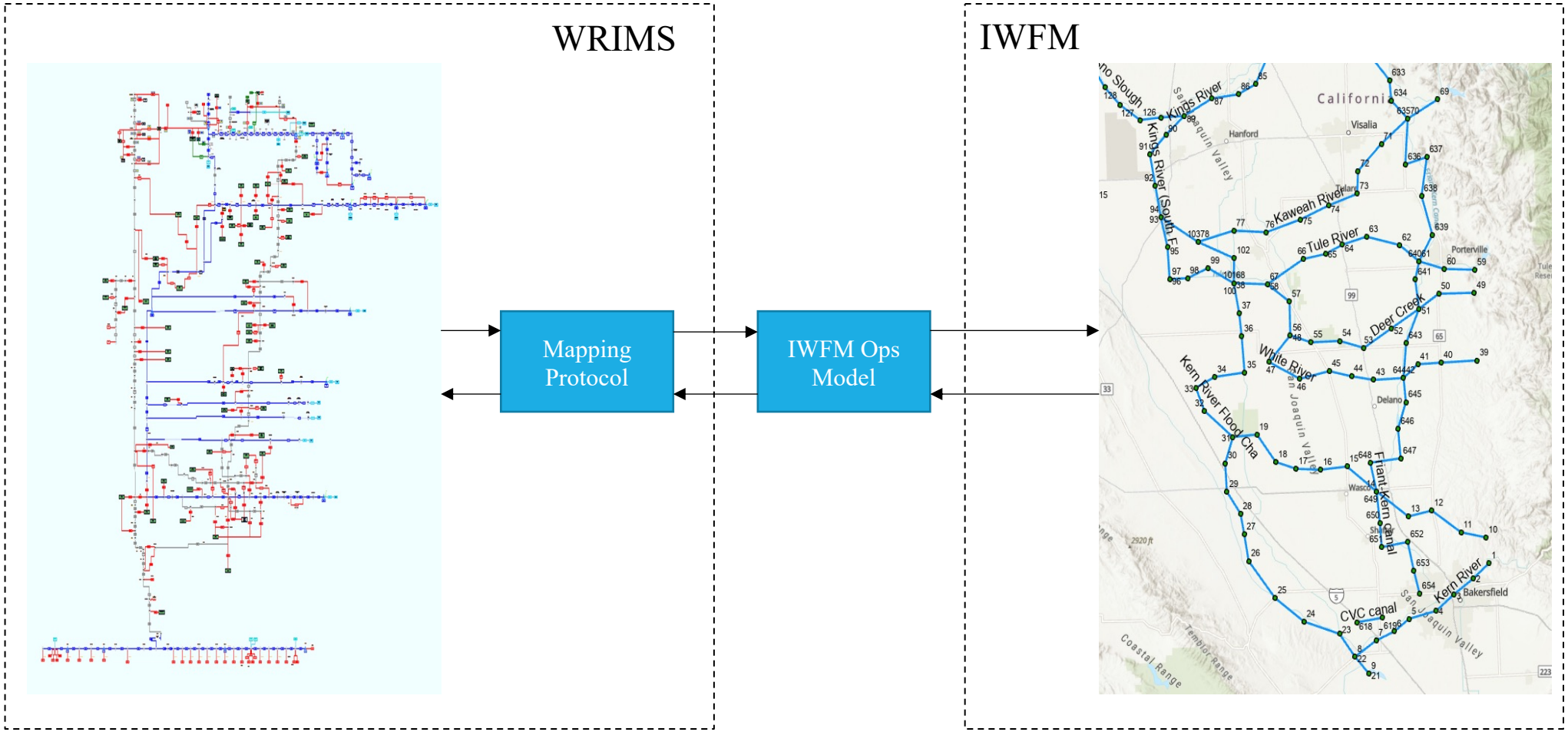

# CVSOM Development



# Comparison between CalSim and CVSOM

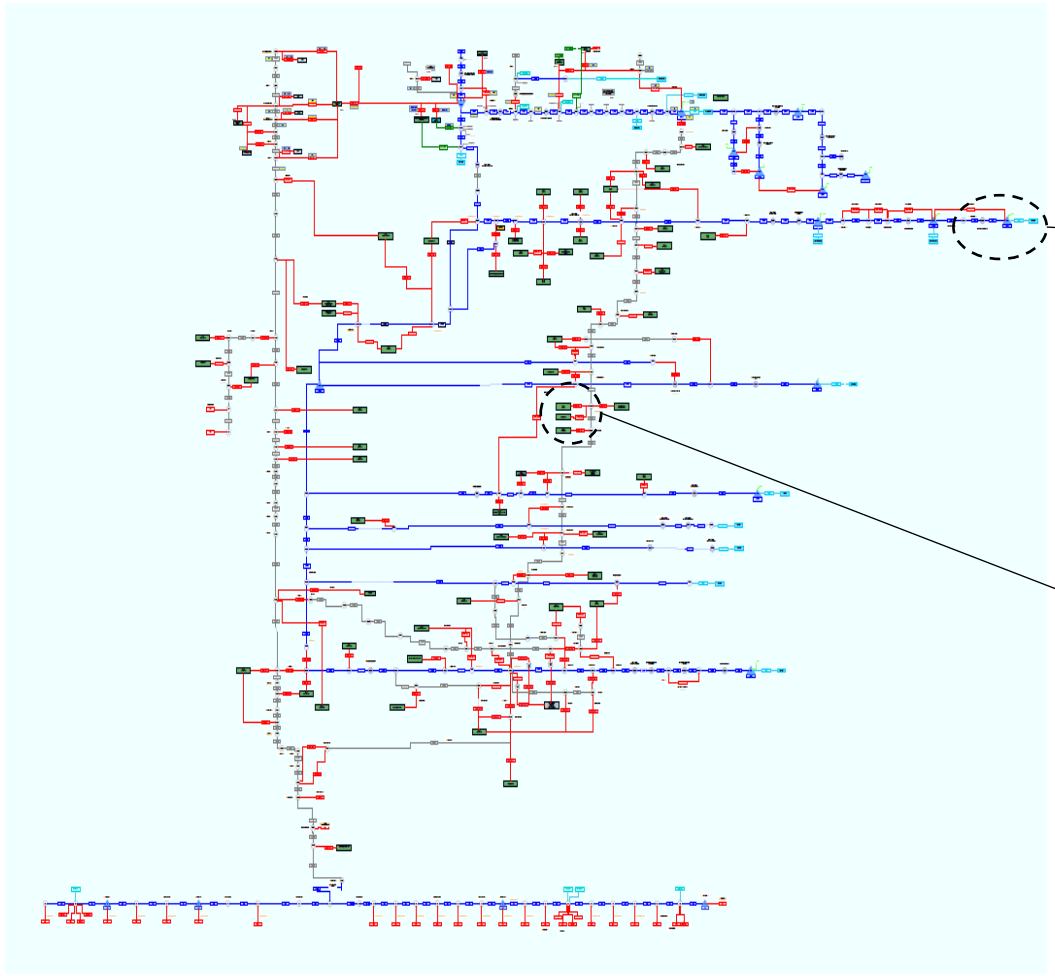
| | CALSIM | CVSOM |
|---|---|---|
| Level of Development | 2020 (i.e. Not Historical) | 2020 (i.e. Not Historical) |
| Period of Simulation | 1922-2015 | 1922-2015 |
| Time Step | Monthly | Monthly |
| Model Domain | Sacramento, San Joaquin Valleys | Sacramento, San Joaquin Valleys and Tulare Basin |
| Surface Water Hydrology | Preprocessed | Dynamic – C2VSIM |
| Groundwater Hydrology | Finite-Element based GW DLL | C2VSIM GW |
| Stream Routing | Dynamic - WRESL | Dynamic – C2VSIM |
| Water Demands | Preprocessed | Dynamic – C2VSIM |
| Regulations | Wheeling, Transfers, Joint Point, refined COA and ITP included | Simplified CVP-SWP-Delta operations |

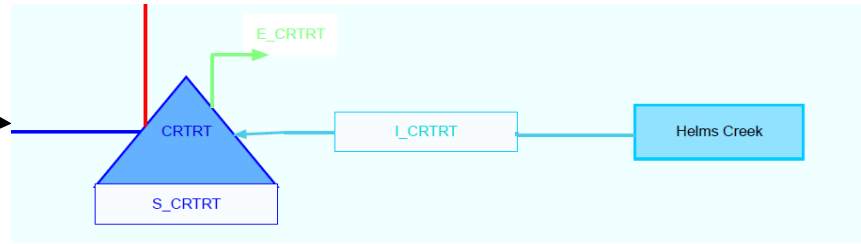
# Mapping of Variables between WRIMS and IWFM

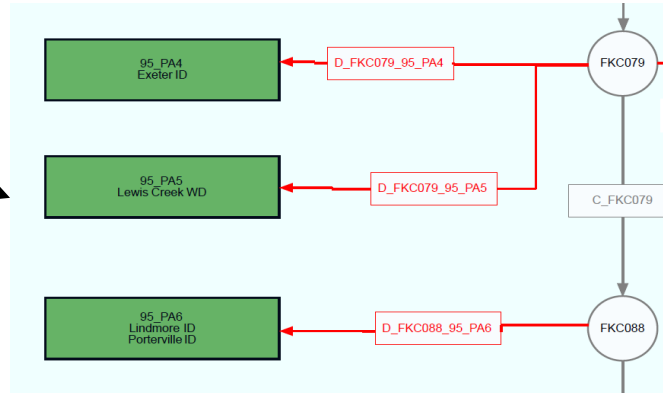


# Tulare Watershed Modeling

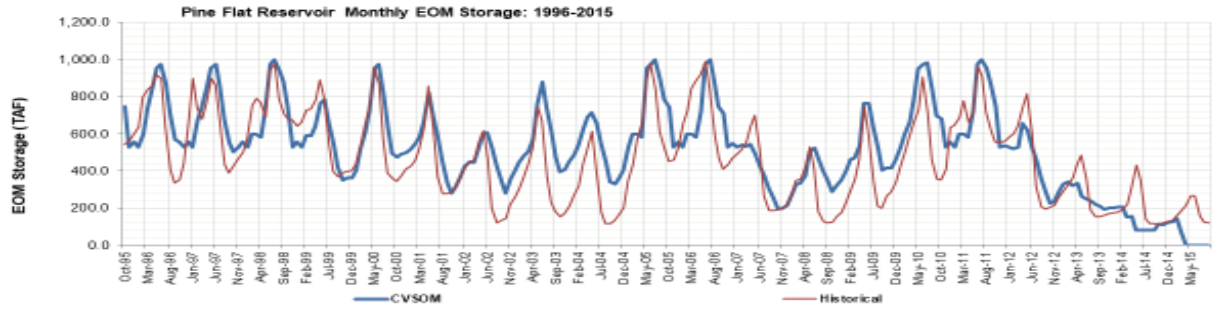
# XML – Based Schematic

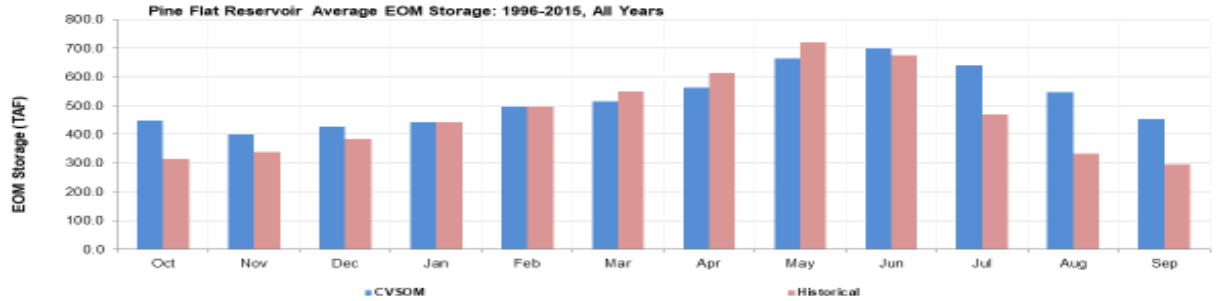




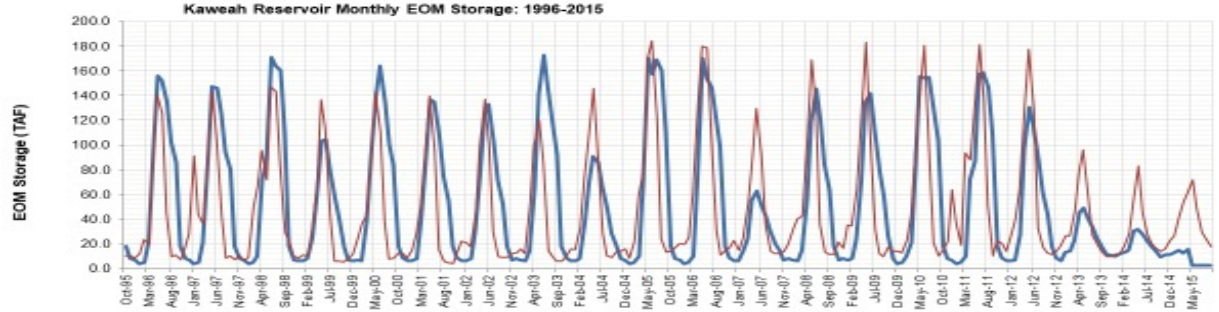



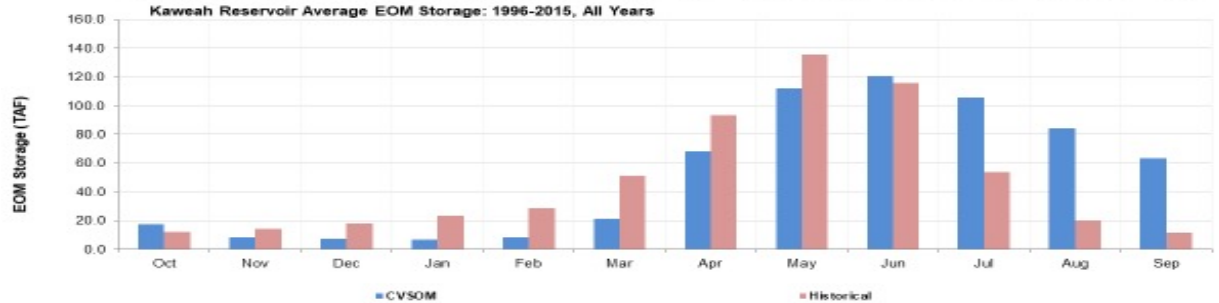
# Pine Flat Reservoir



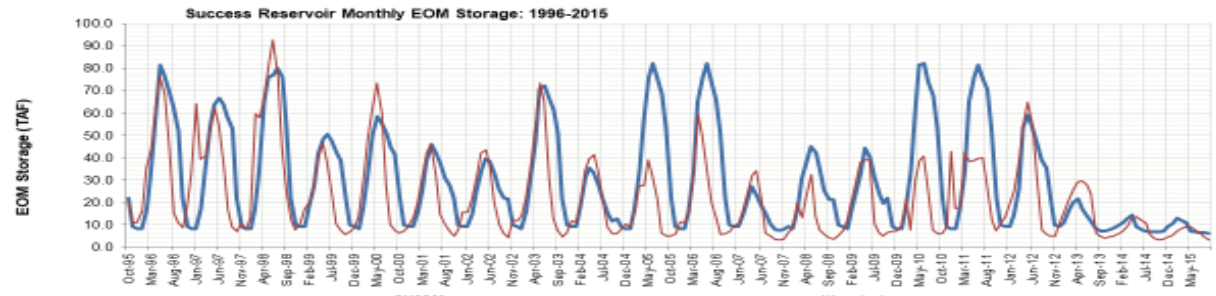



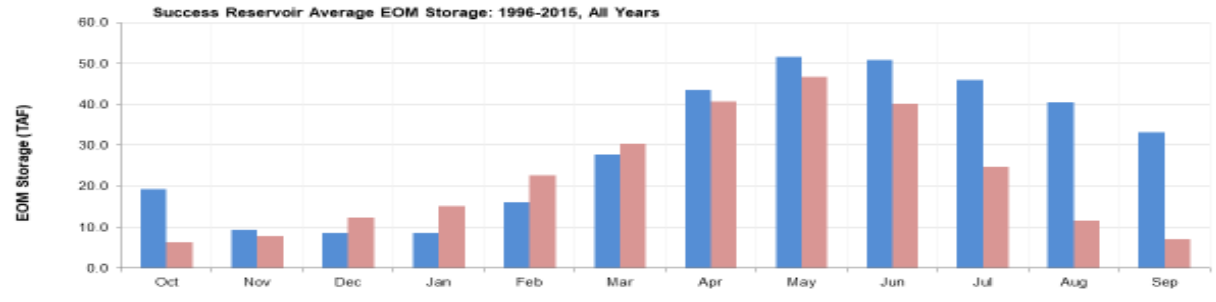

# Lake Kaweah



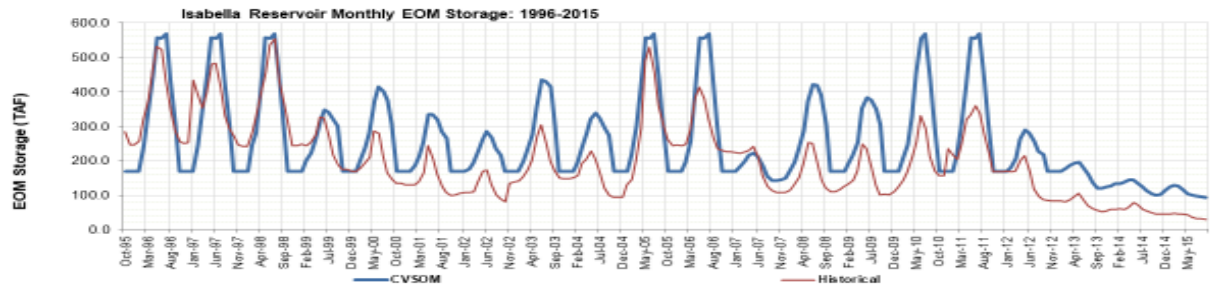



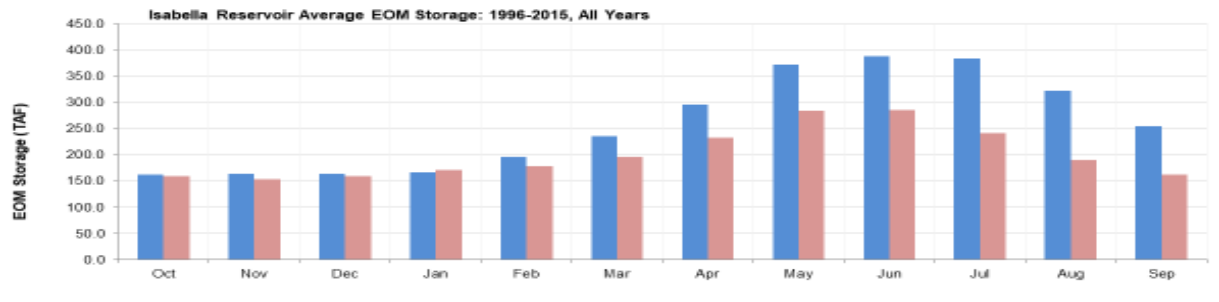

# Lake Success



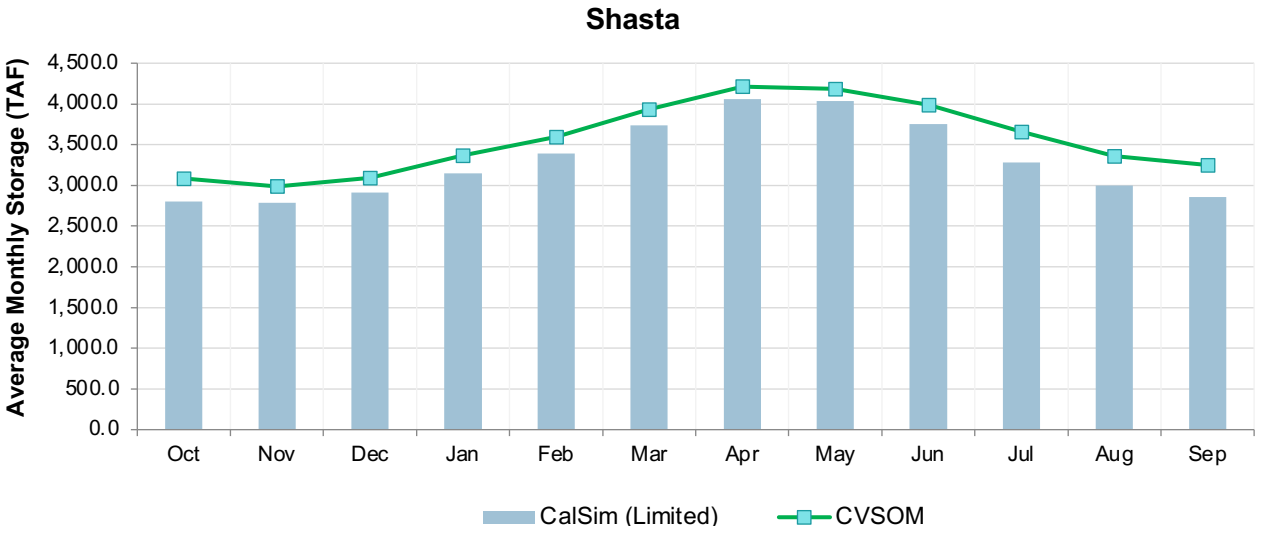

# Lake Isabella

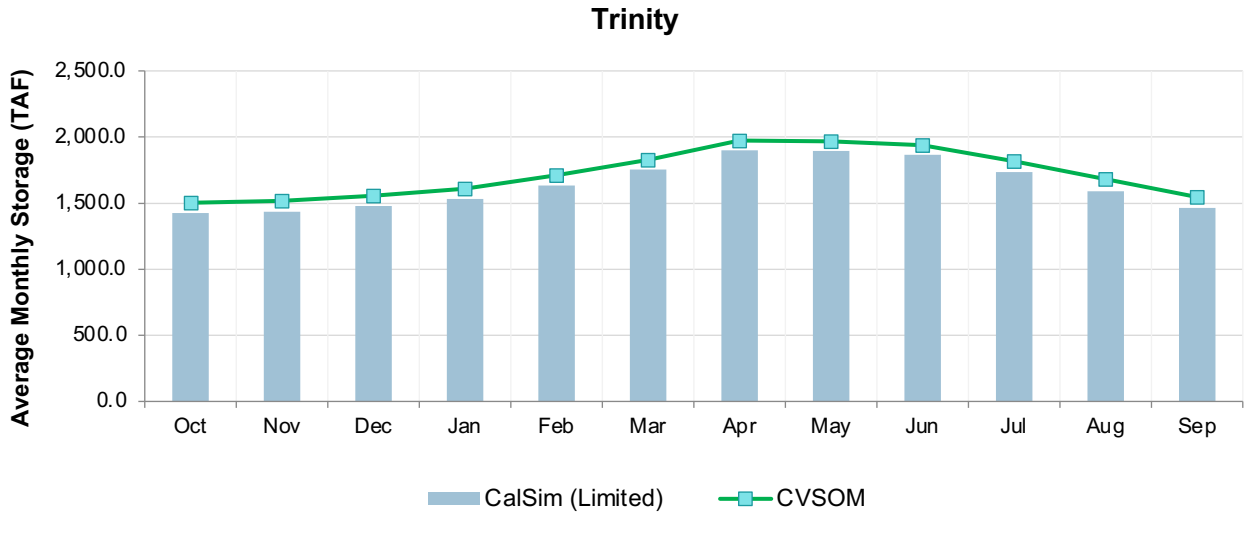


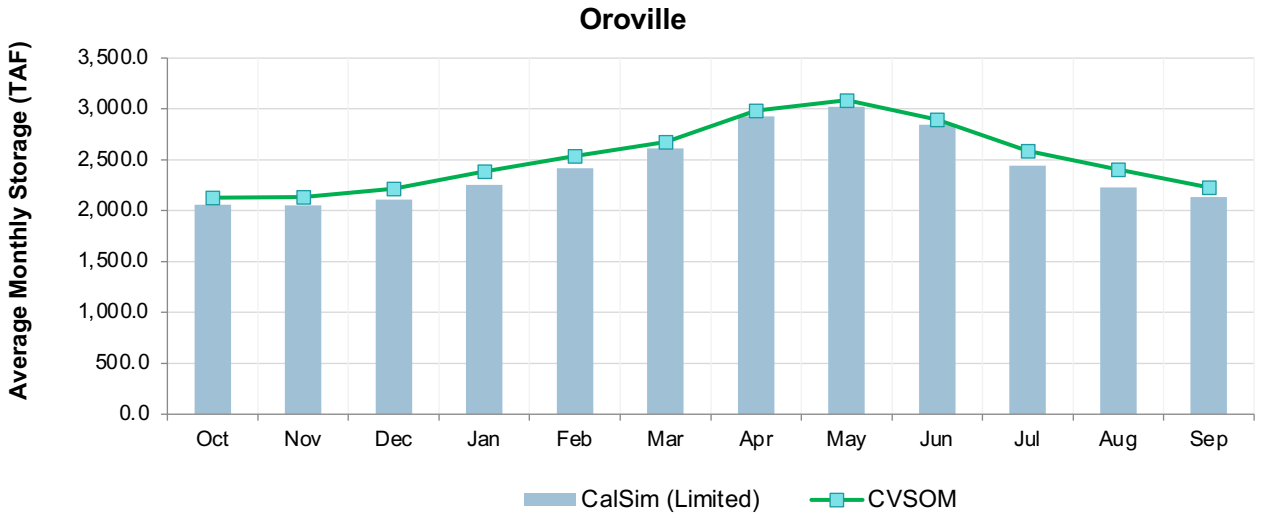



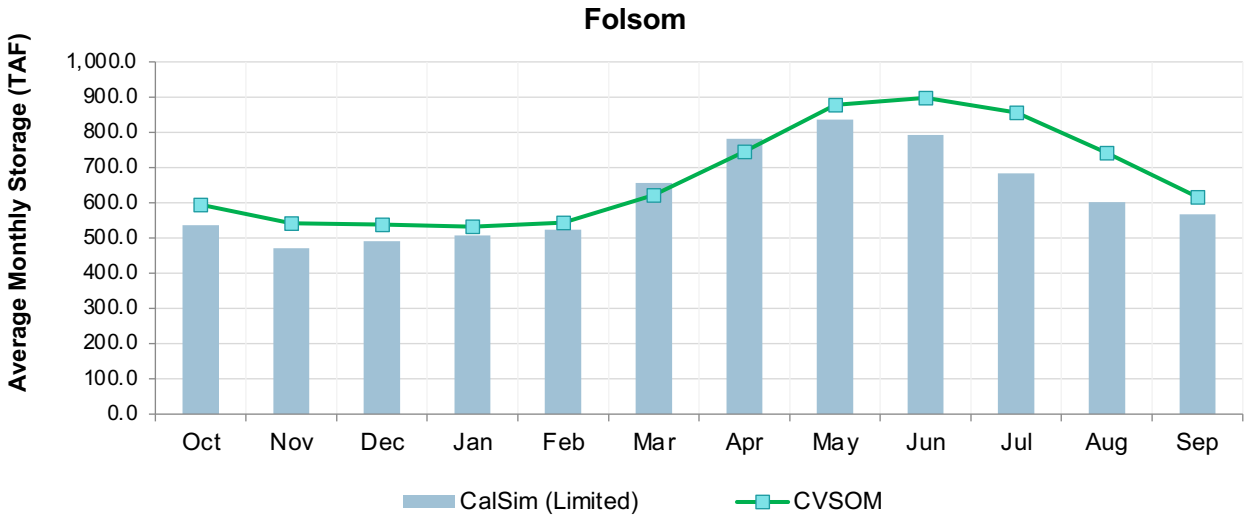
# Sacramento Watershed Simulation

# Results: Proof of Concept

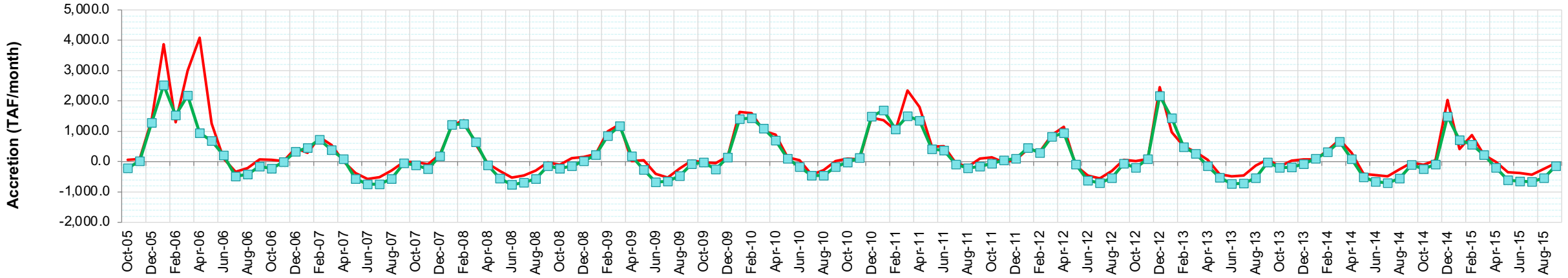


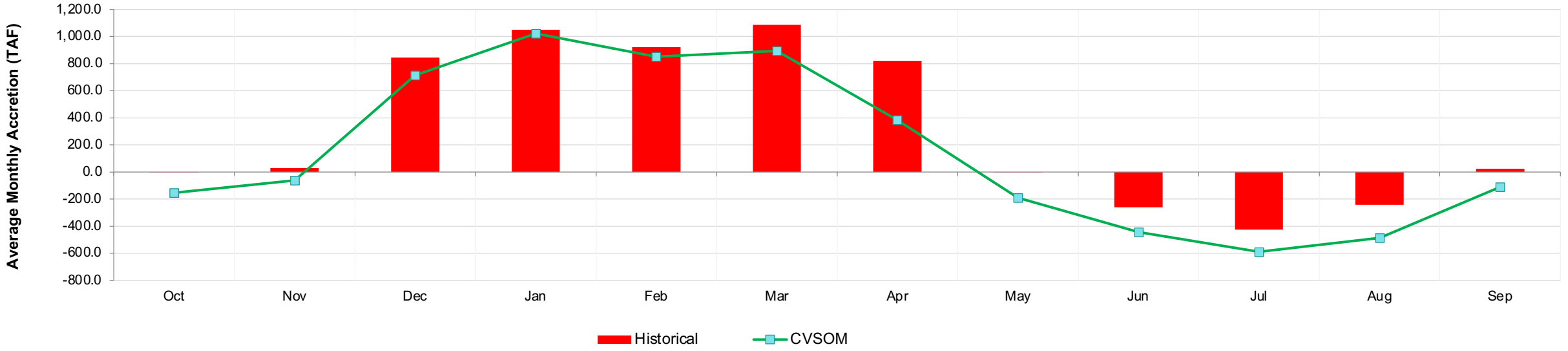



# Sacramento Valley Accretions

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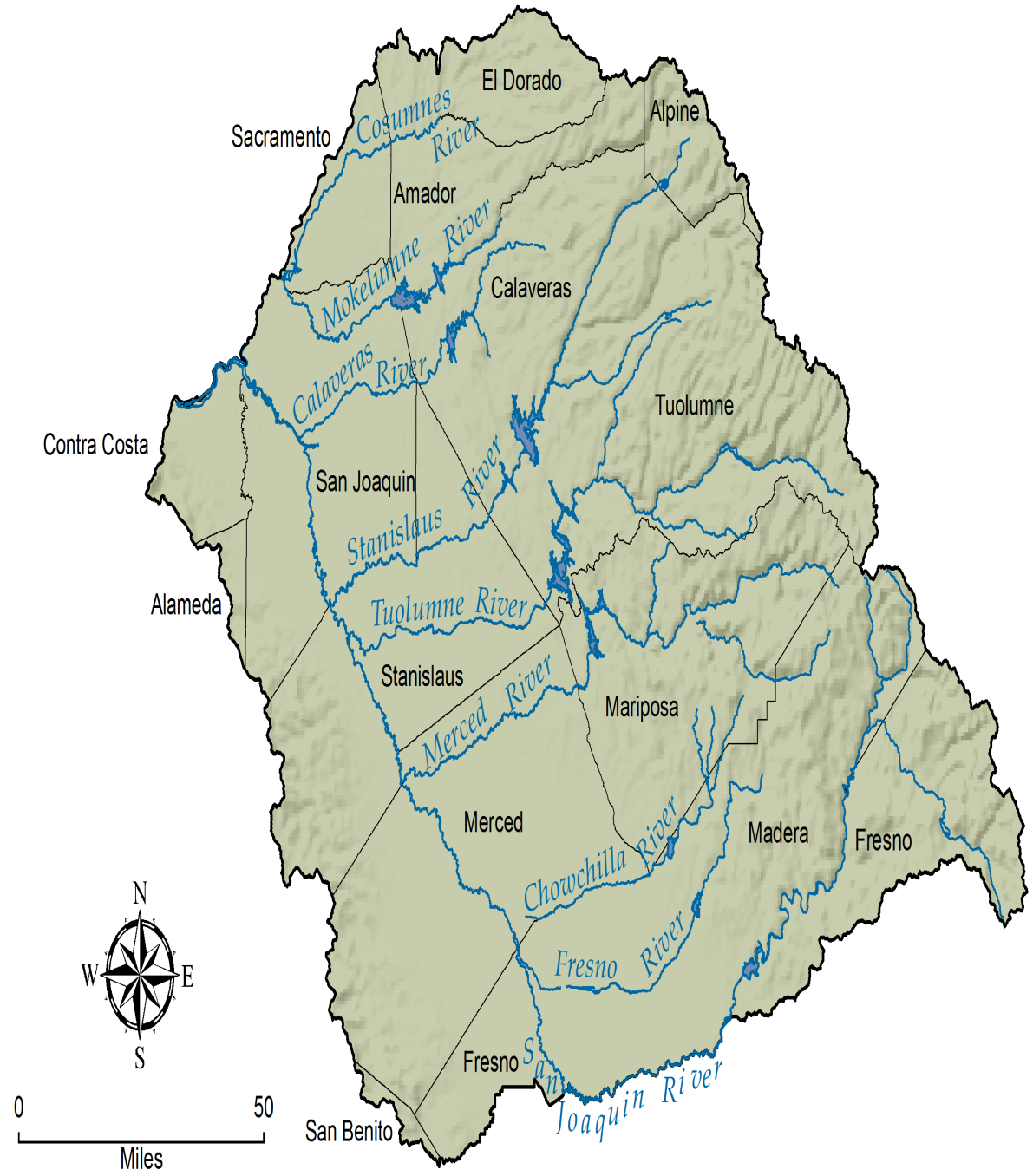
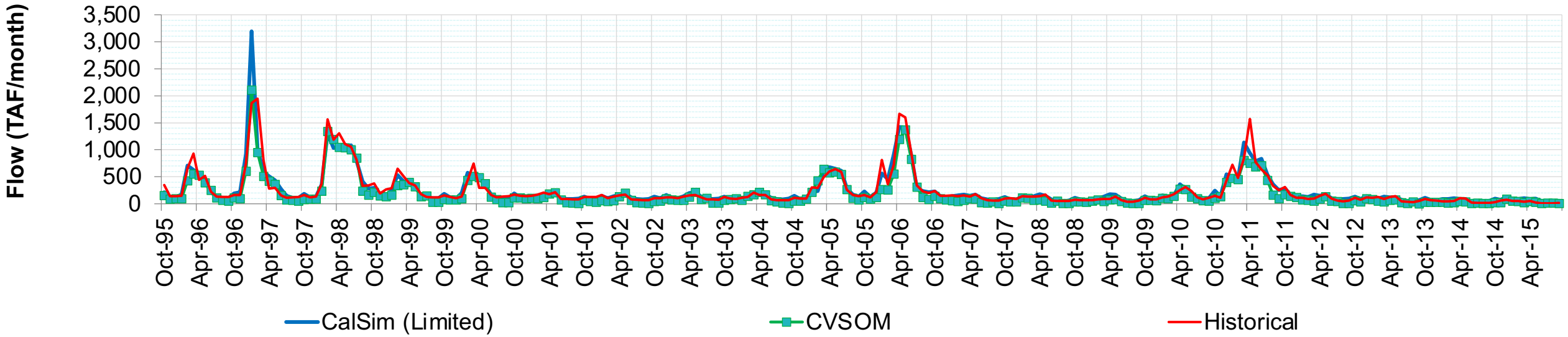
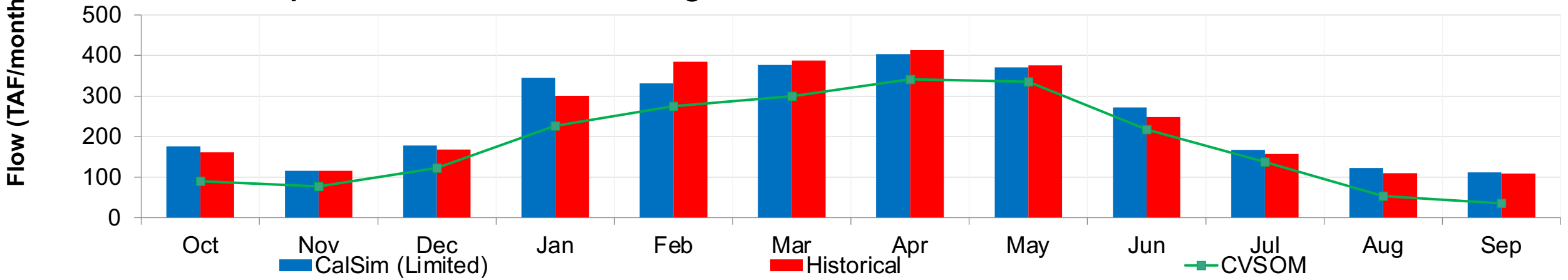
# San Joaquin Watershed Simulation



## San Joaquin River near Vernalis Monthly Flows: 1996-2015




## San Joaquin River near Vernalis Average Flows: 1996-2015, All Years

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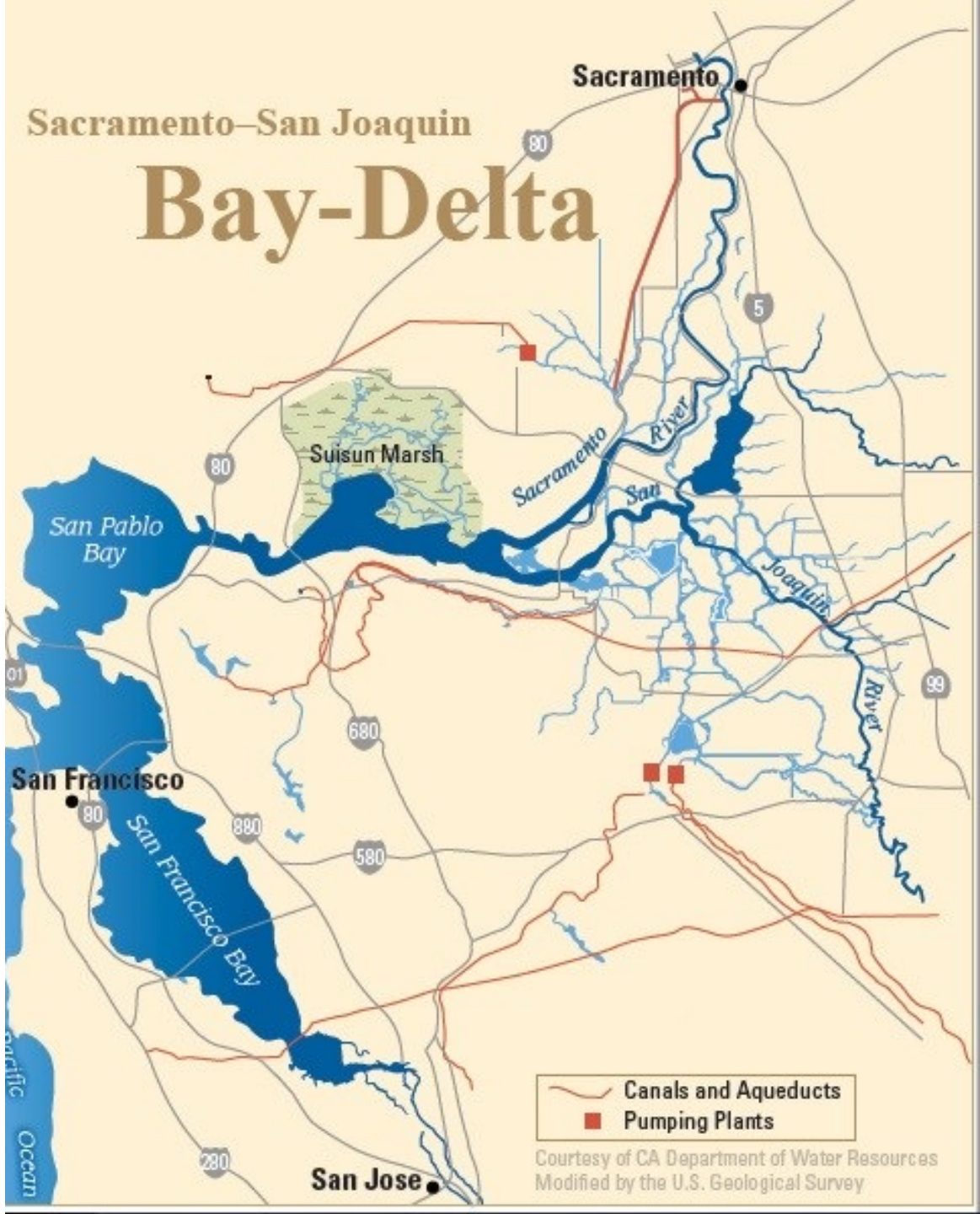
# Sacramento-San Joaquin Delta Region

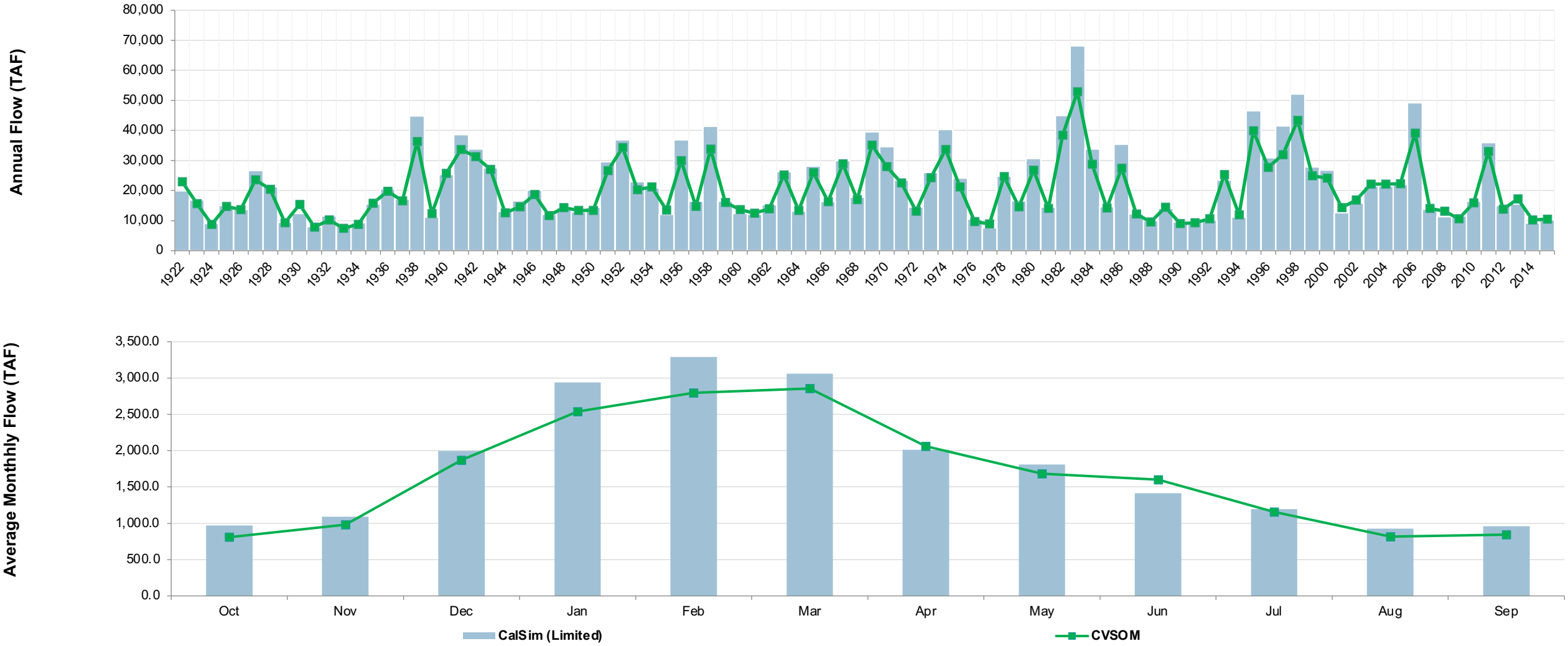


# Delta Region

- Delta Region is currently modeled in WRIMS section of CVSOM because of
  - C2VSimCG's simplified representation of Delta Channels and the need to represent Old and Middle River flow criteria.*
  - Need for consistency with ANN and real-time calculation of Delta Depletion and NDOI.
- Flow routing in C2VSimCG is currently being refined and would be included in future versions of CVSOM.

*Representation of Delta was refined in the latest C2VSimCG version and will be incorporated into CVSOM in the future.

# Results: Proof of Concept: Net Delta Outflow Index (NDOI)

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# Run Time

| Max Number of Iterations | Water Years | Run Time (HH:MM:SS) |
|---|---|---|
| 5 | 1922-2015 | 03:14:30 |
| 10 | 1922-2015 | 05:17:32 |
| 20 | 1922-2015 | 07:33:49 |
| 30 | 1922-2015 | 10:07:23 |
| 40 | 1922-2015 | 10:58:48 |
| 50 | 1922-2015 | 11:47:44 |
| 100 | 1922-2015 | 12:41:46 |
| 200 | 1922-2015 | 14:17:58 |

# Conclusion

- CVSOM provides a new platform for modeling California reservoir operations and dynamically simulating all aspects of valley floor surface water hydrology and groundwater hydrology
- The iterative methodology used in CVSOM provides an advantage of refining reservoir operations and water allocations progressively during each iteration
- Results of current version of CVSOM (Phase I) depict a robust proof of concept.
- A preliminary simulation of Tulare region combined with Sacramento, San Joaquin and Delta regions was conducted as a part of CVSOM development

# Collaboration

Tariq Kadir, Ph.D., P.E.

Can Dogrul, Ph.D., P.E.

Steven Jepsen, Ph.D.

Norman Johns, Ph.D.

Ali Taghavi, Ph.D., P.E.

Sercan Ceyhan, Ph.D.

Andy Draper, Ph.D., P.E.

Puneet Khatavkar Ph.D., P.E. ENV SP

CALIFORNIA DEPARTMENT OF WATER RESOURCES
Modeling Support Office

This study was conducted under contract with the Department of Water Resources, Modeling Support Office.

# Thank You

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