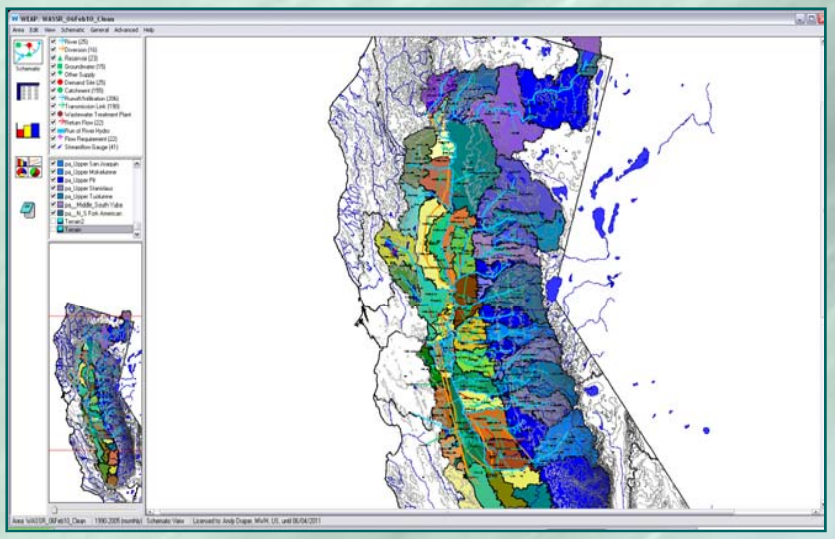
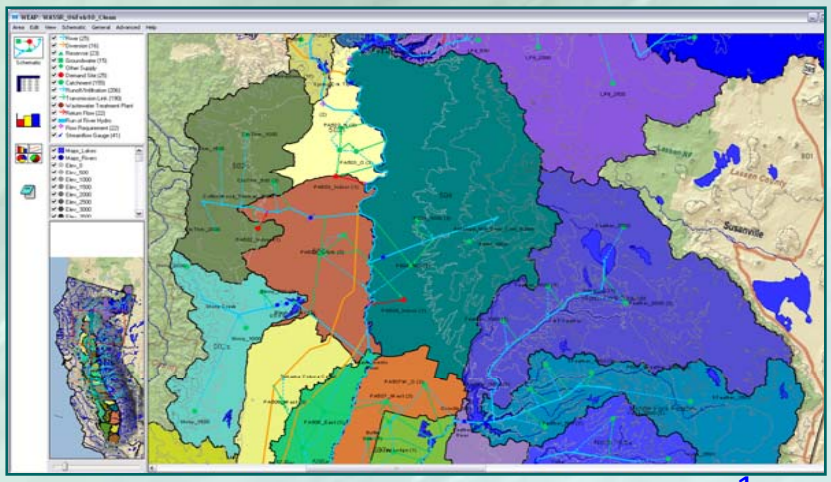
Approach Used for Planning Area Scale Analysis

- Critical Methodological Issues that Arose During Water Plan Update 2009 on the Planning Area Scale Analysis, and How They Were Addressed



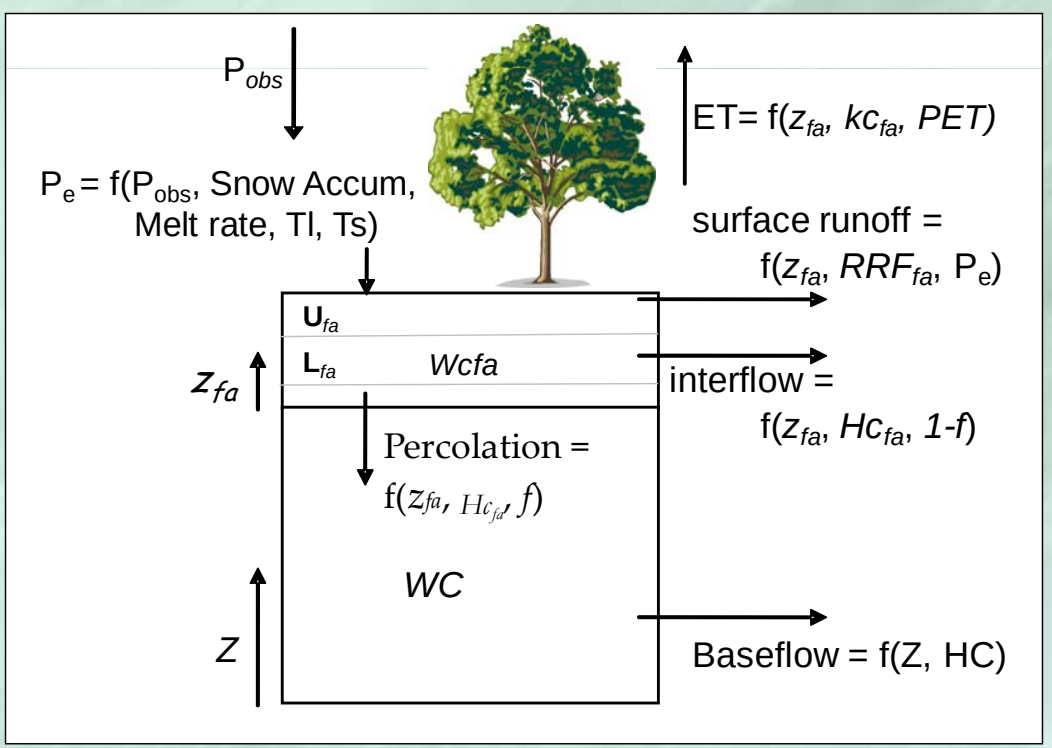


Approach Used for Planning Area Scale Analysis

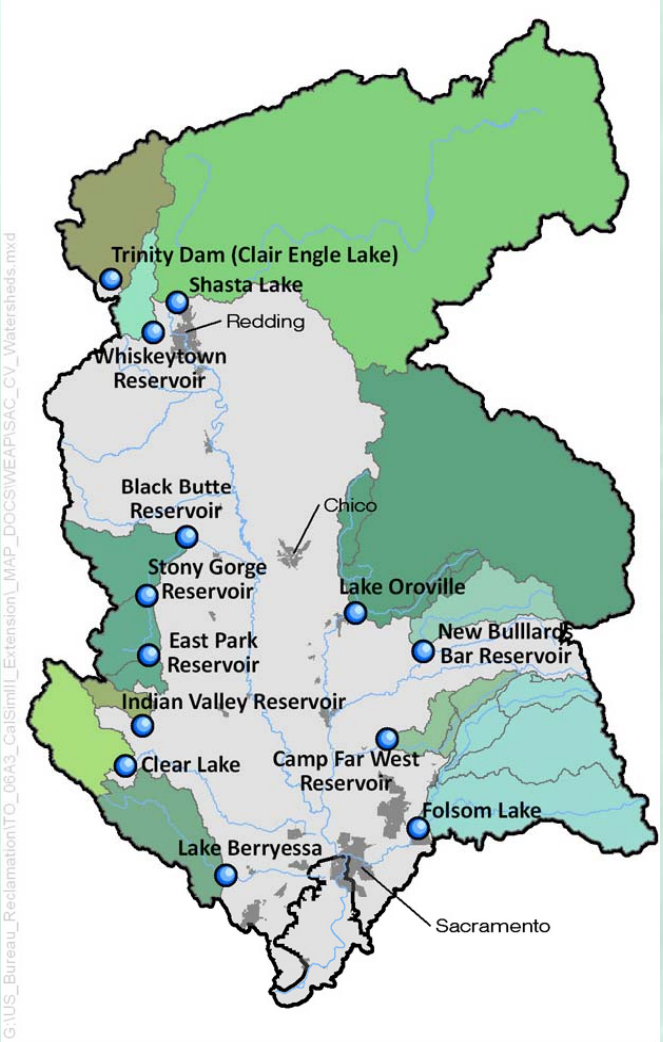
- Brian Joyce (SEI)
- David Yates (NCAR)
- Andy Draper (MWH)

Qu. 1: Snowmelt and Rainfall Runoff Processes

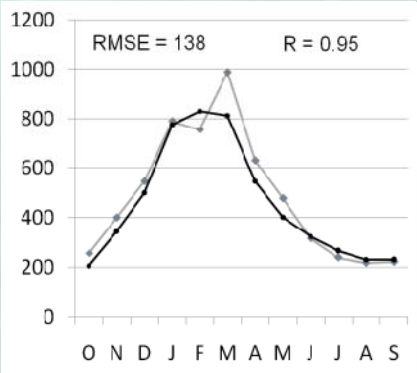
- Two bucket soil moisture model

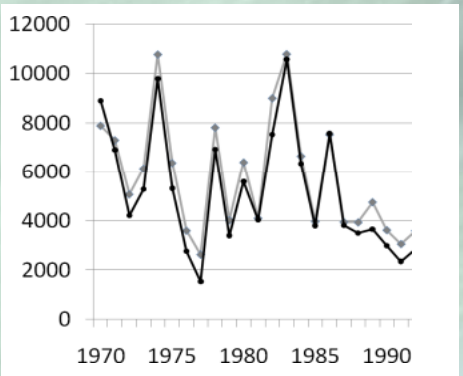


Qu. 1: Snowmelt and Rainfall Runoff Processes

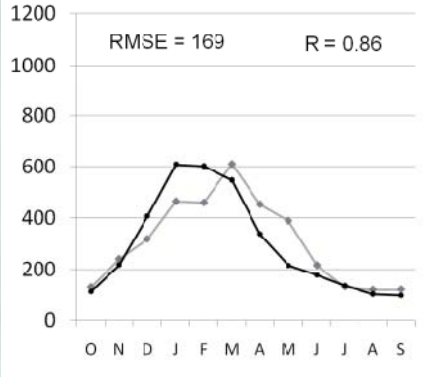


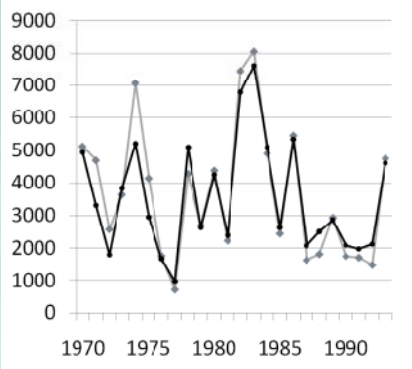
- Shasta Inflows



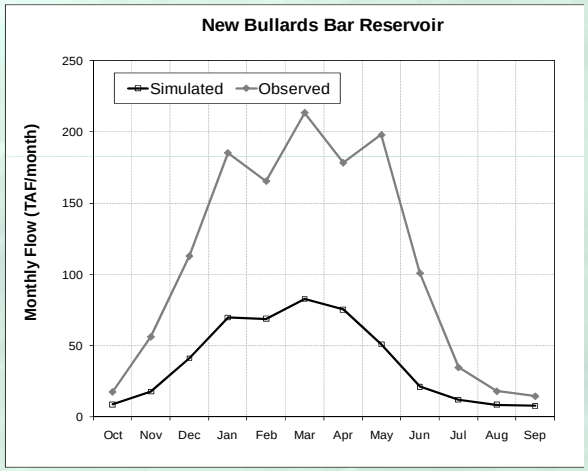


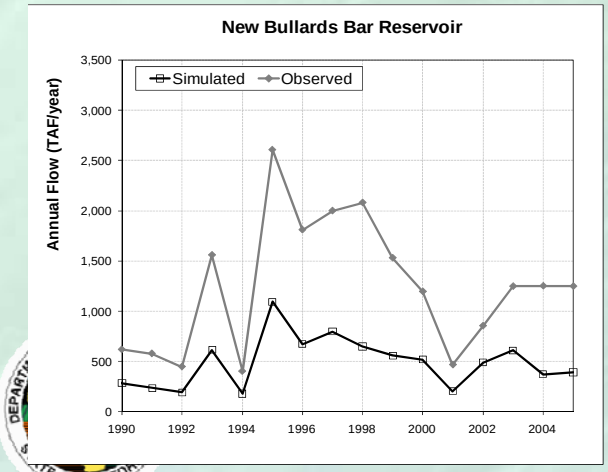
- Oroville Inflows

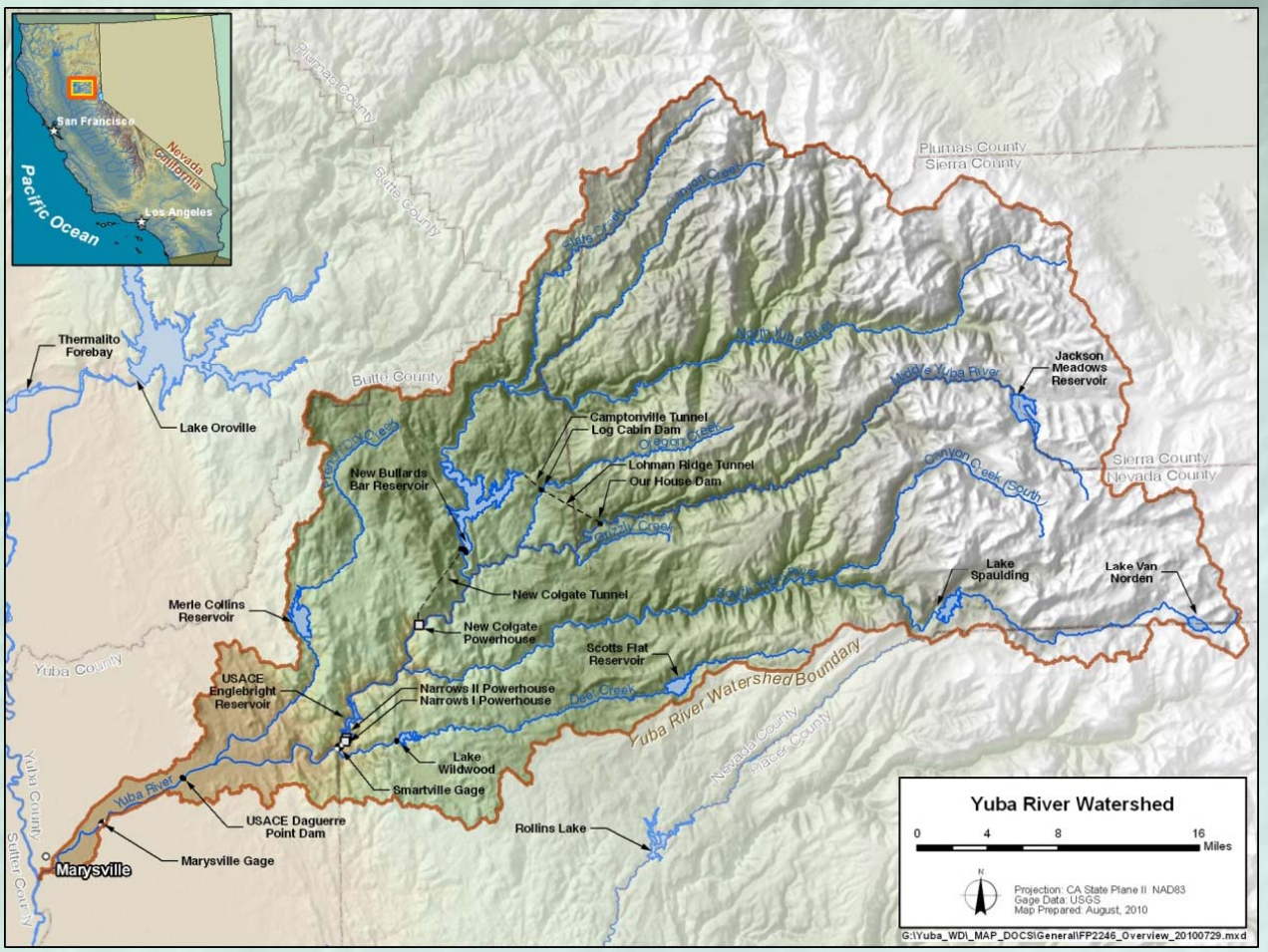




Qu. 1: Snowmelt and Rainfall Runoff Processes – Additional Calibration





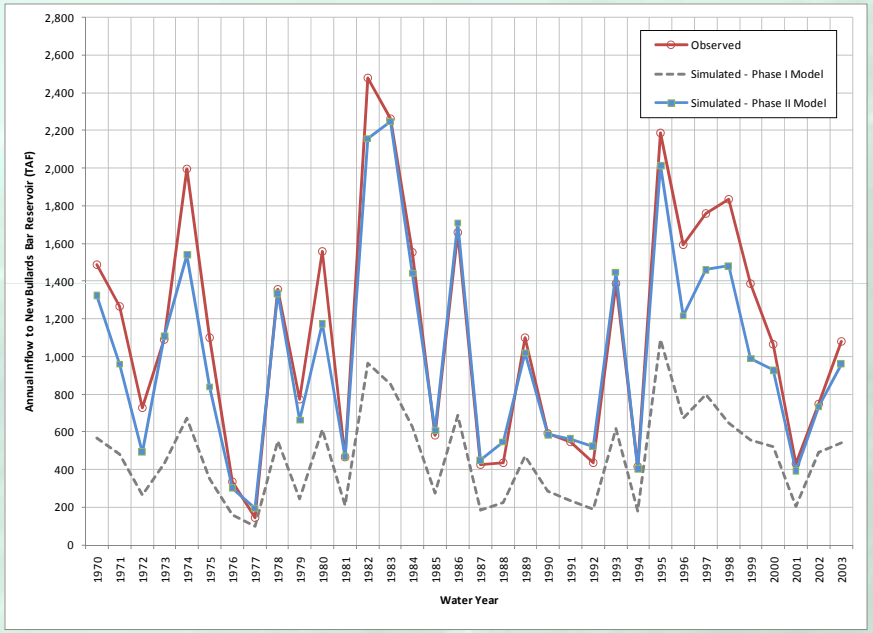


Qu. 1: Snowmelt and Rainfall Runoff Processes – Additional Calibration

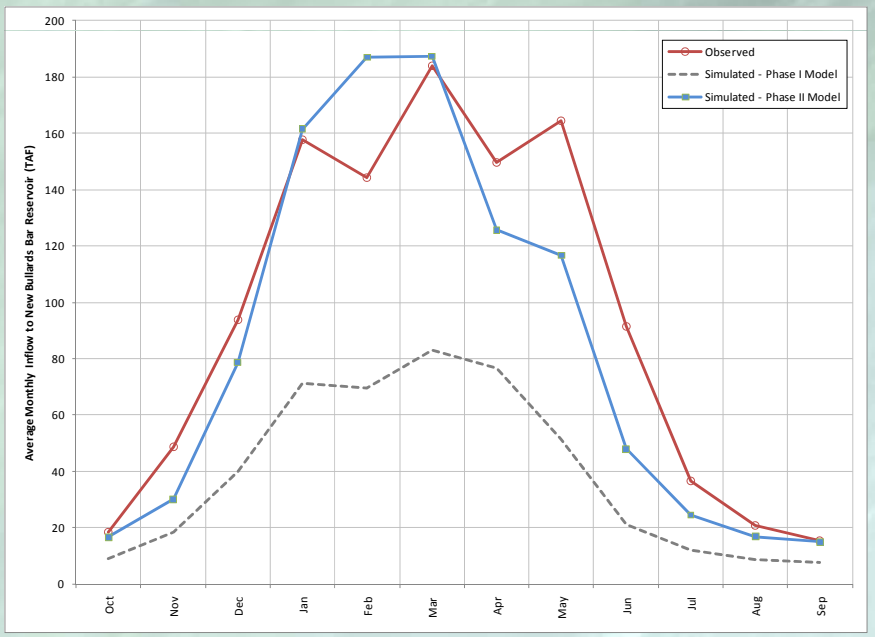
Land Use Type	PA Model Phase I		PA Model Phase II	
	Hydraulic Conductivity (mm/month)	Soil Water Capacity (mm)	Hydraulic Conductivity (mm/month)	Soil Water Capacity (mm)
Forest	128	473	128	525
Non Forest	255	810	255	900
Barren	170	257	170	285
Impervious	255	101	255	113
Pervious	115	506	115	563

Watershed Parameter	PA Model Phase I	PA Model Phase II
Freezing Temperature (2,000-2,500 meters)	-4.00	0.00
Freezing Temperature (0-2,000 meters)	-8.00	-7.71
Melting Temperature (2,000-2,500 meters)	4.00	7.99
Melting Temperature (0-2,000 meters)	3.00	5.13

Qu. 1: Snowmelt and Rainfall Runoff Processes – Additional Calibration



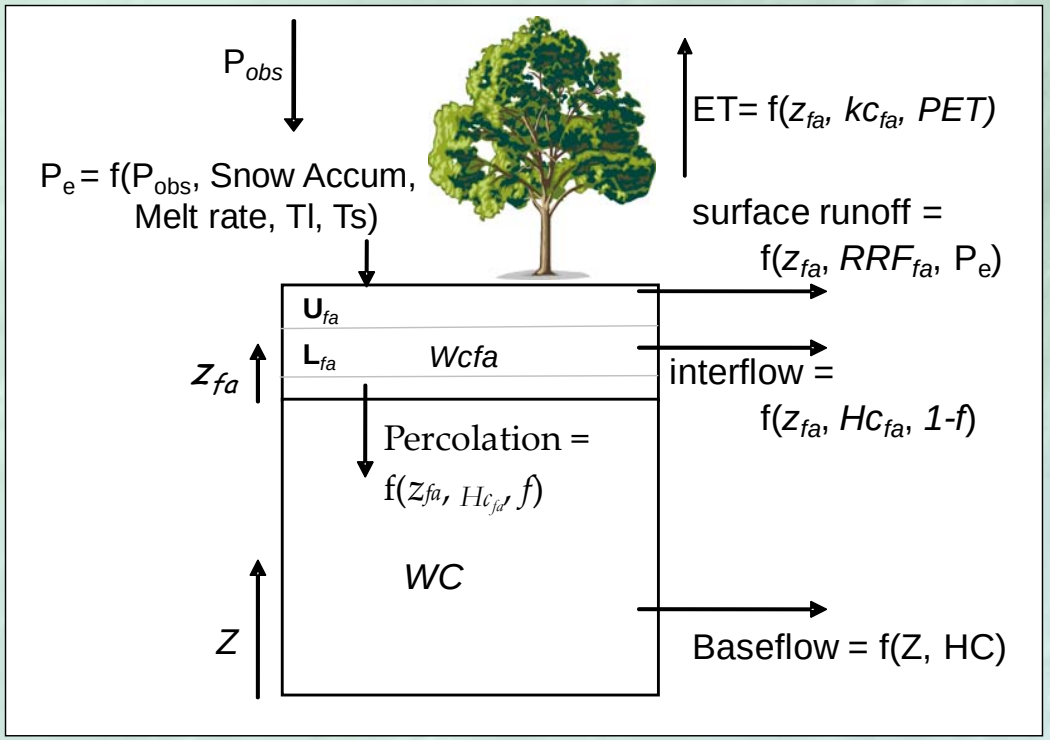
Simulated and Observed Annual Unimpaired Inflows to New Bullards Bar Reservoir



Simulated and Observed Monthly Unimpaired Inflows to New Bullards Bar Reservoir

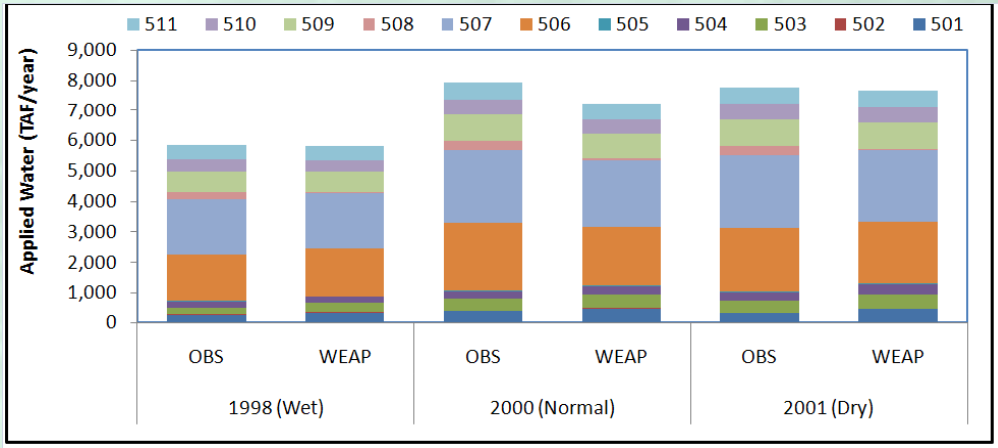
Qu. 2: Water Use

- Crop Water Demand
  - Based on crop and soil characteristics and climate

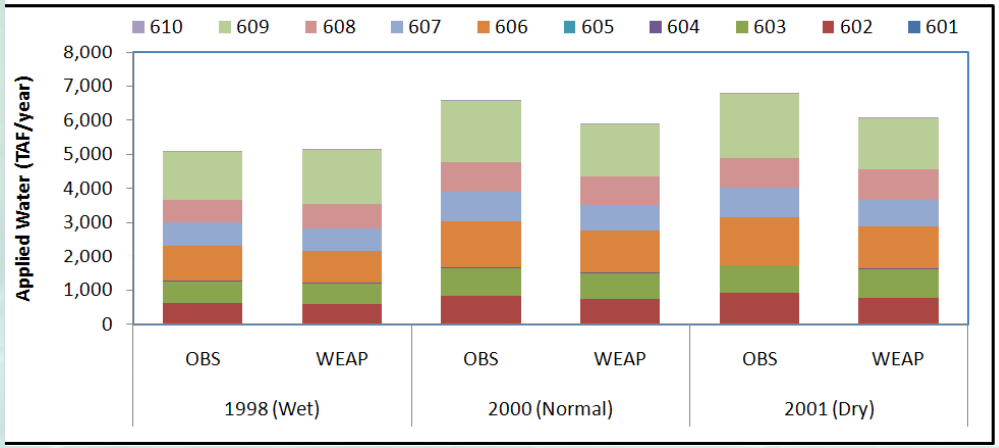


Qu. 2: Water Use
Agricultural Applied Water

- Calibrated to DWR Water Portfolio Data



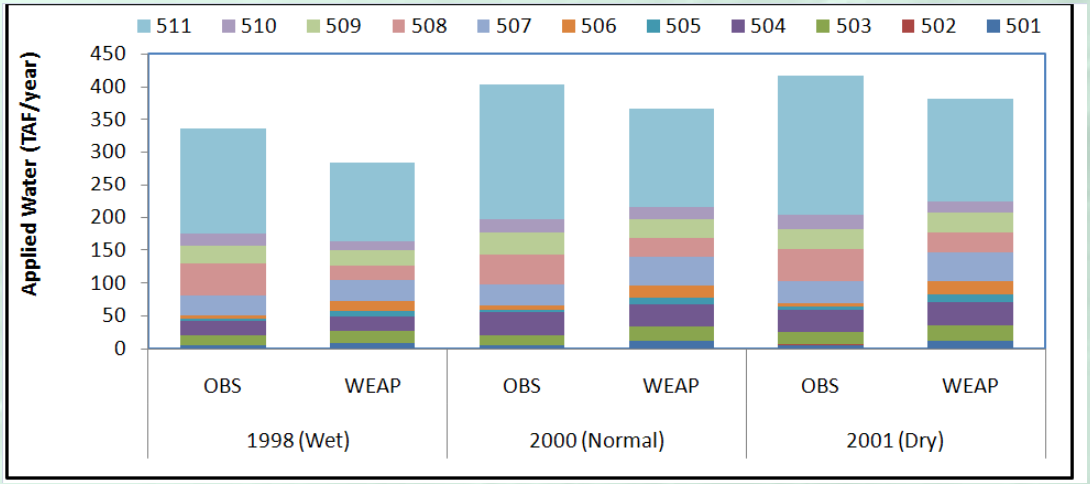
- Sacramento Valley



- San Joaquin Valley

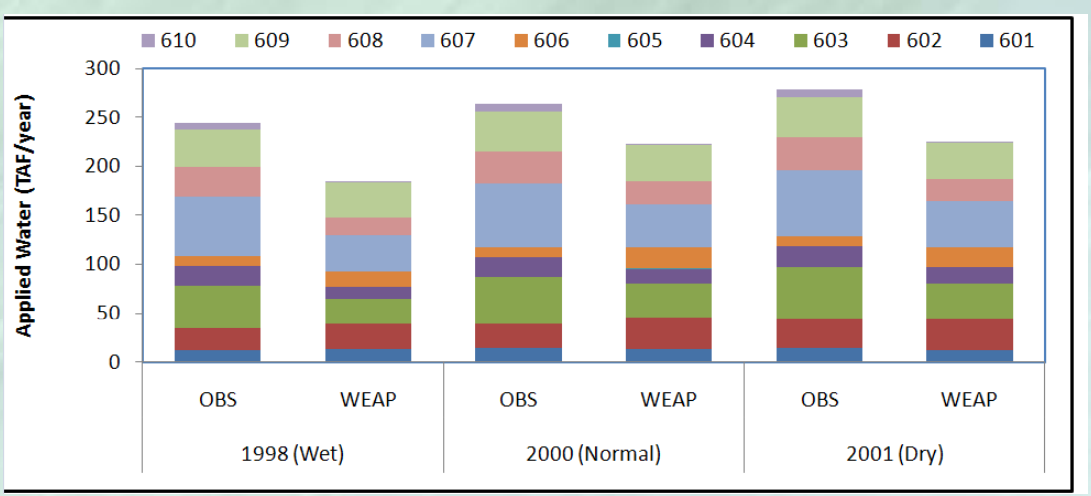
Qu. 2: Water Use
Urban Outdoor Applied Water

- Calibrated to DWR Water Portfolio Data

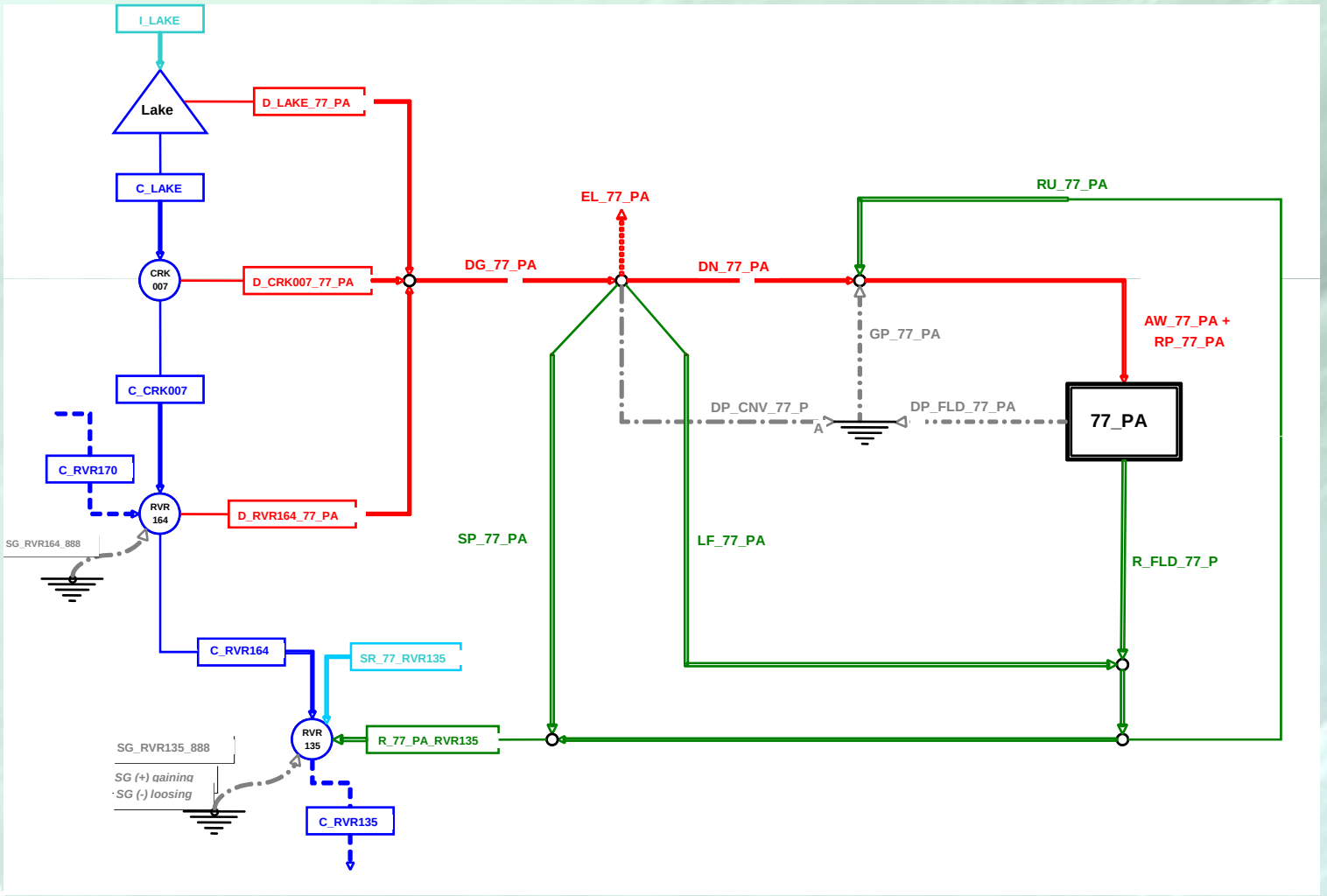


- Sacramento Valley

- San Joaquin Valley



Qu. 2: Water Use



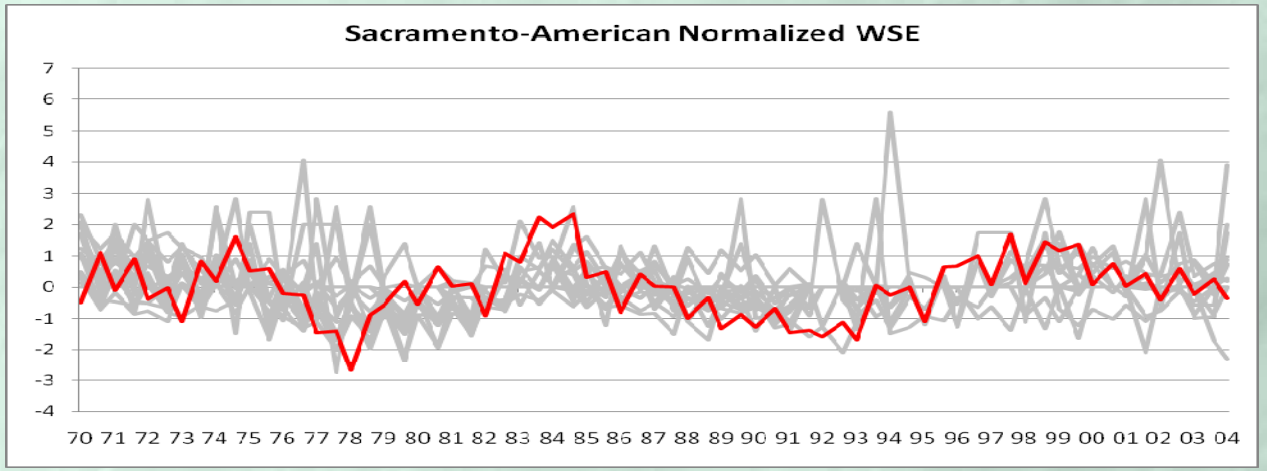
Qu. 3: Groundwater

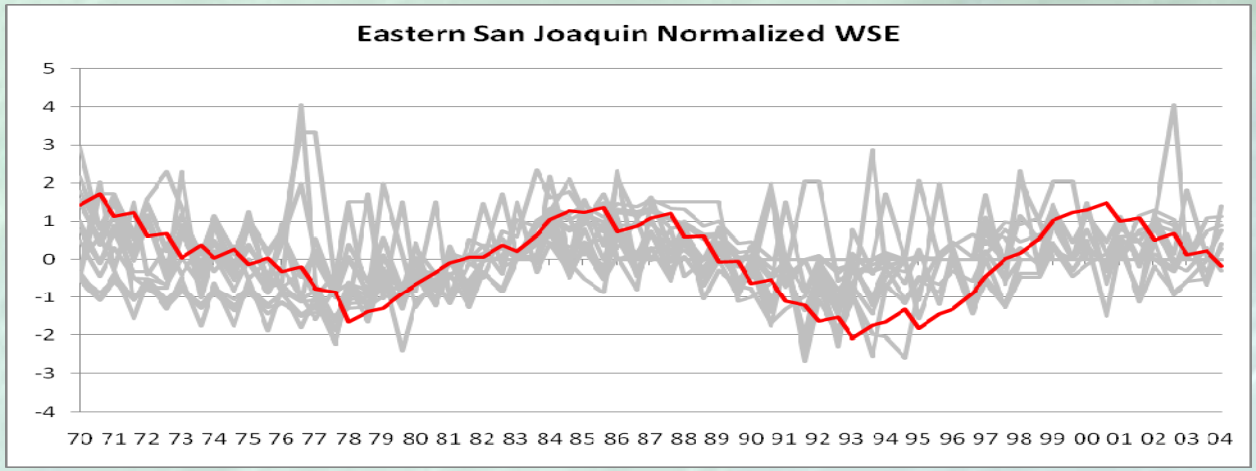
- 15 Groundwater Basins based on B-118

- Basin Parameters Include:
  - Hydraulic Conductivity
  - Specific Yield
  - Geometric Factors: Distance to river, Length of hydraulic connection

Qu. 3: Groundwater

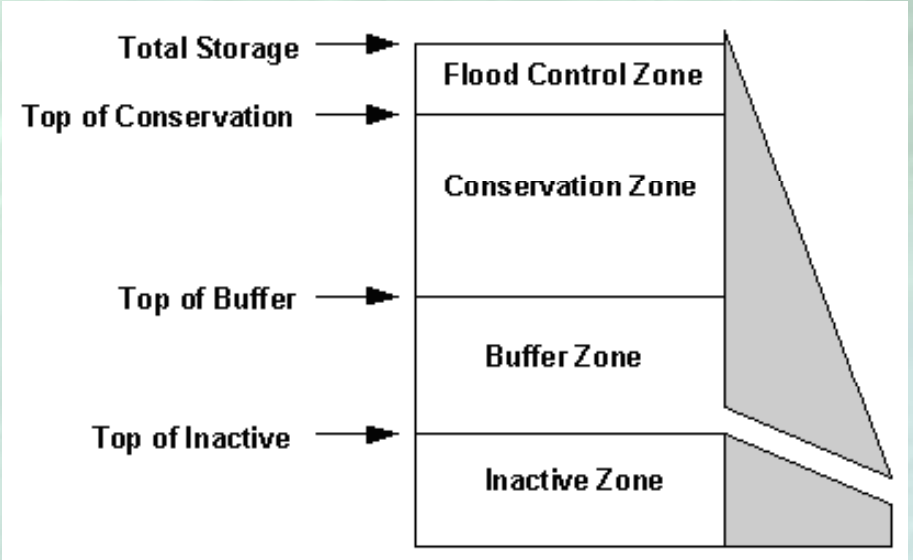
- Calibrated to DWR Water Data Library





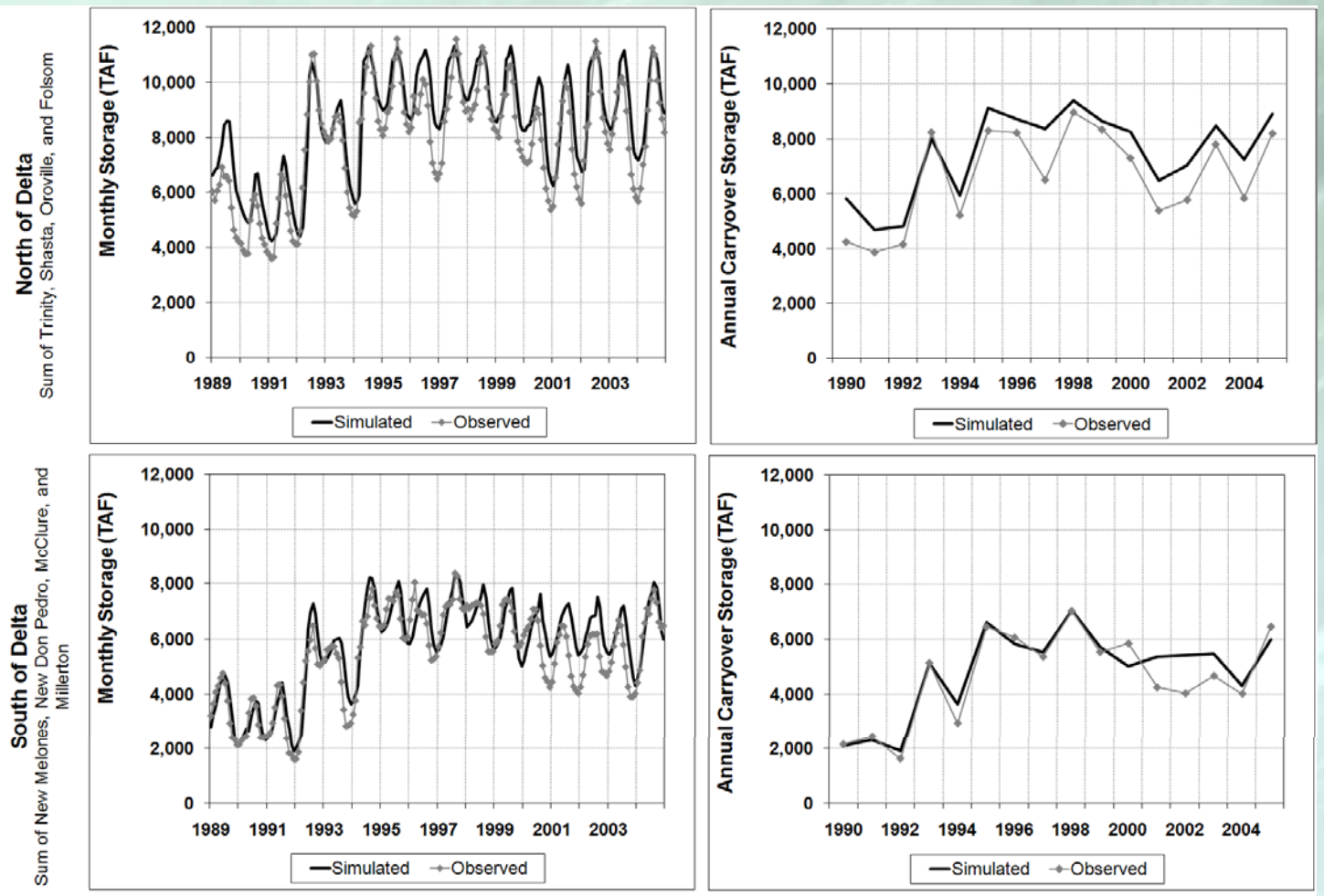
Qu. 4: Reservoir Operations

- Release to meet all downstream demands
  - Dependent upon:
    - Storage priorities (relative to other reservoirs)
    - Unrestricted releases from Conservation Zone
    - Limited releases from Buffer Zone

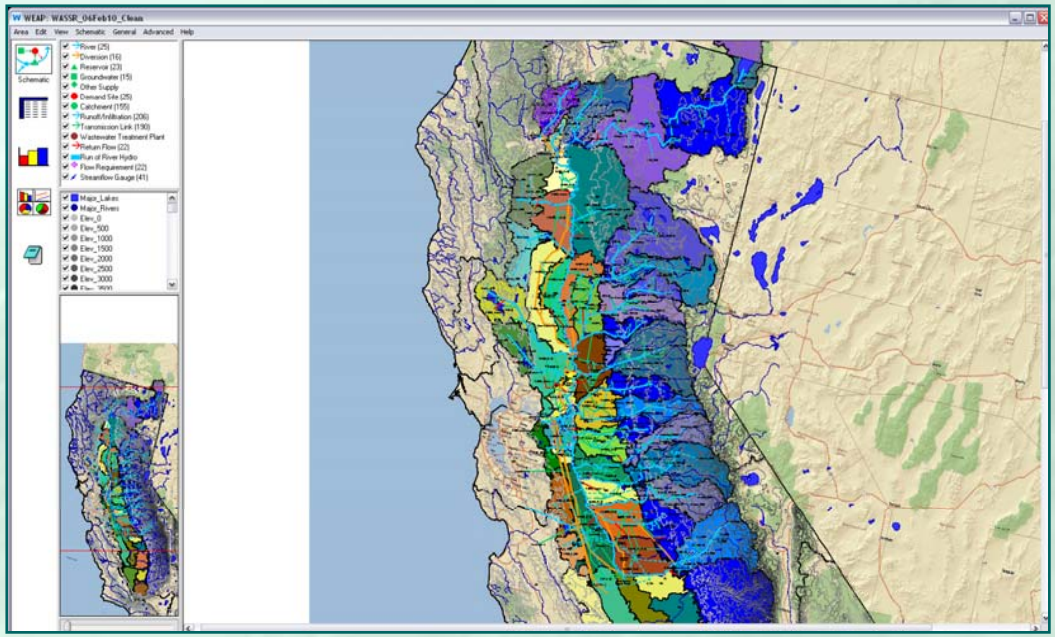


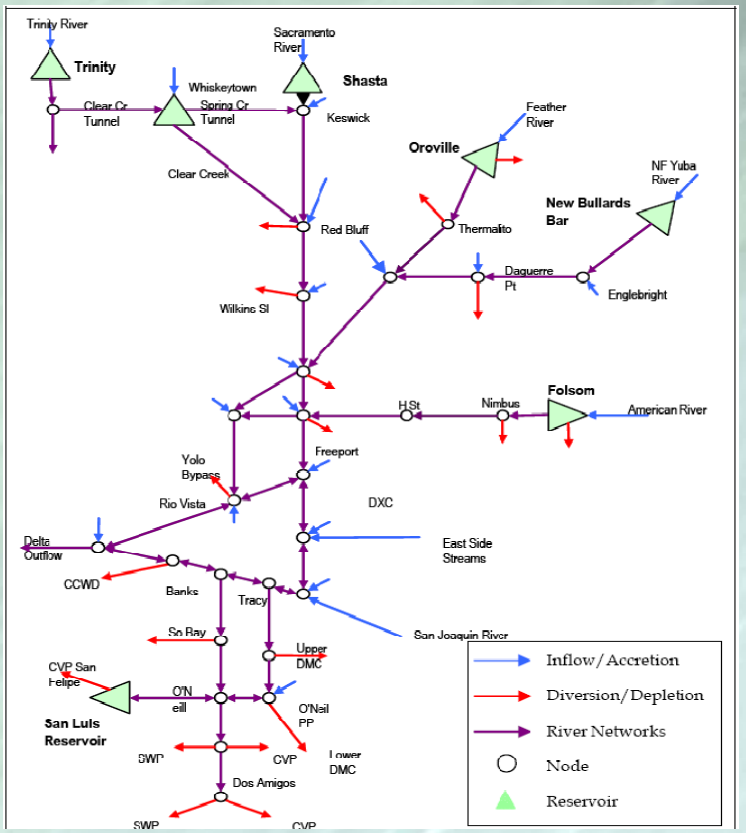
Qu 4: Reservoir Operations

- Combined Monthly and Carryover Storage

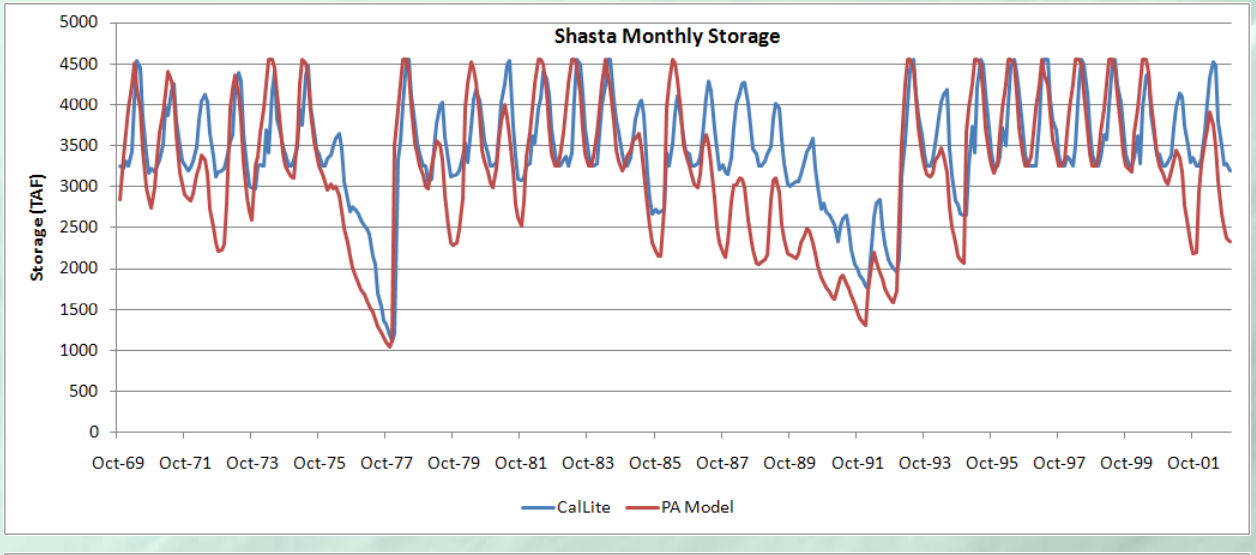


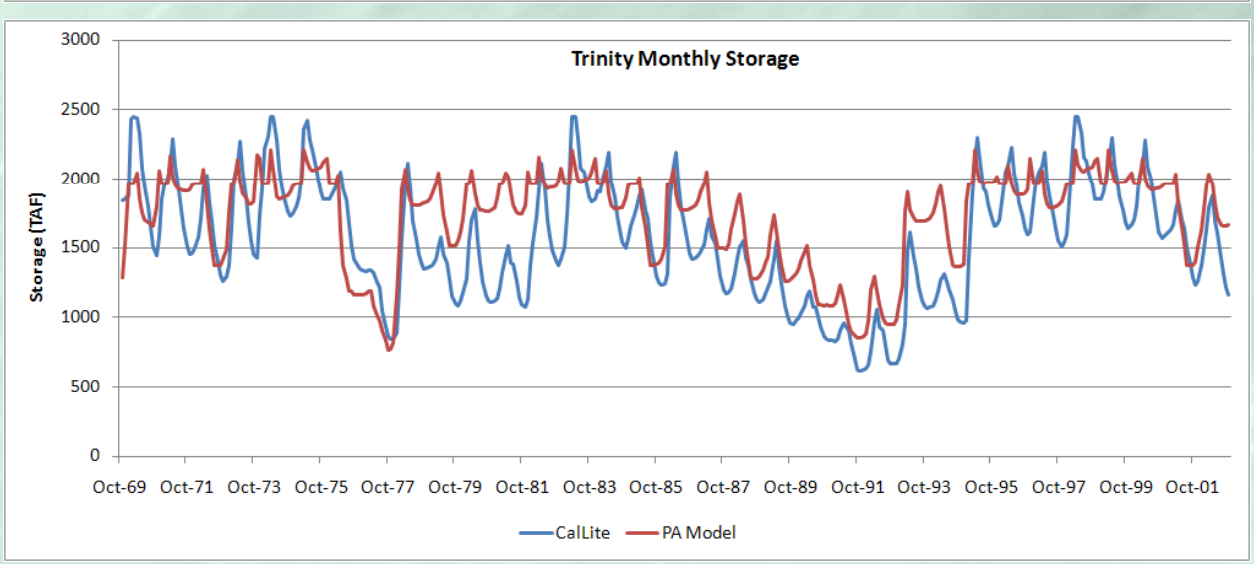
Qu. 4: Reservoir Operations
PA Model and CalLite Comparison



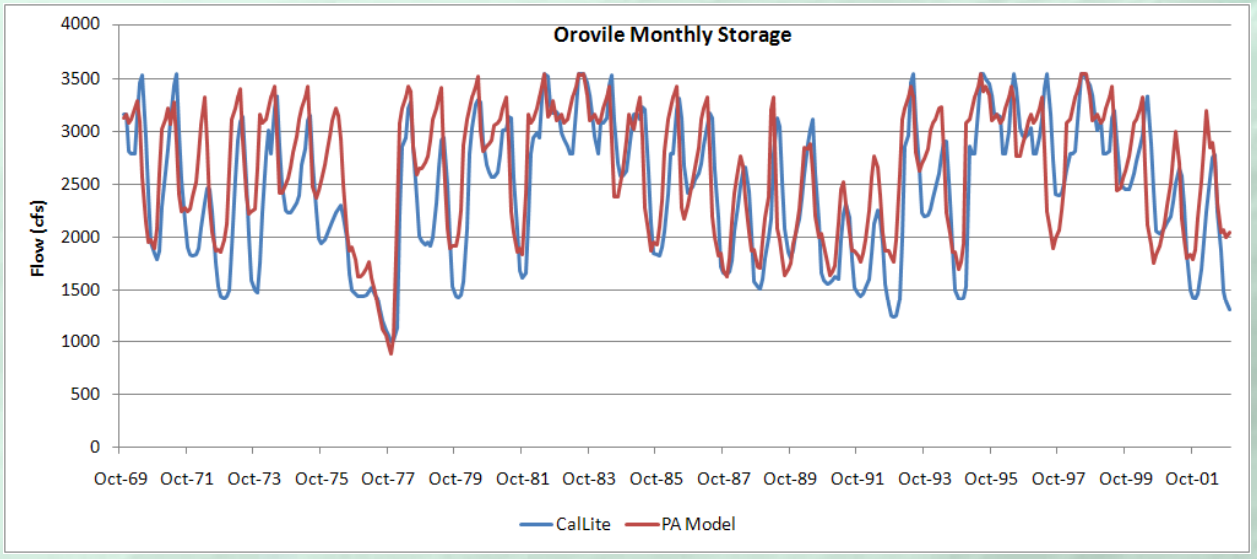


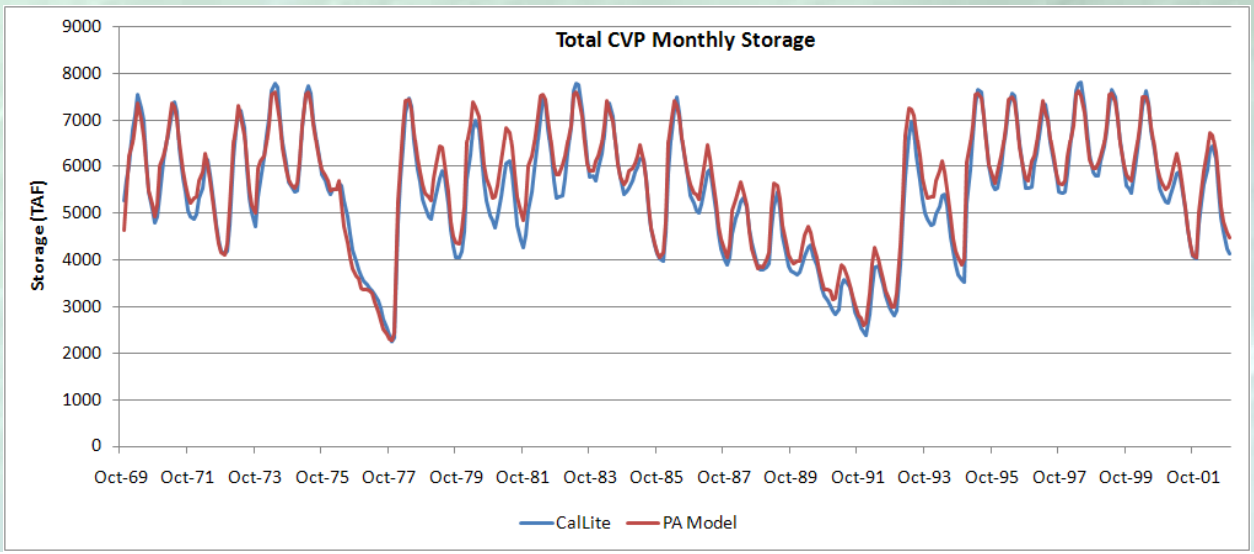
Qu 4: Reservoir Operations
PA Model and CalLite Comparison



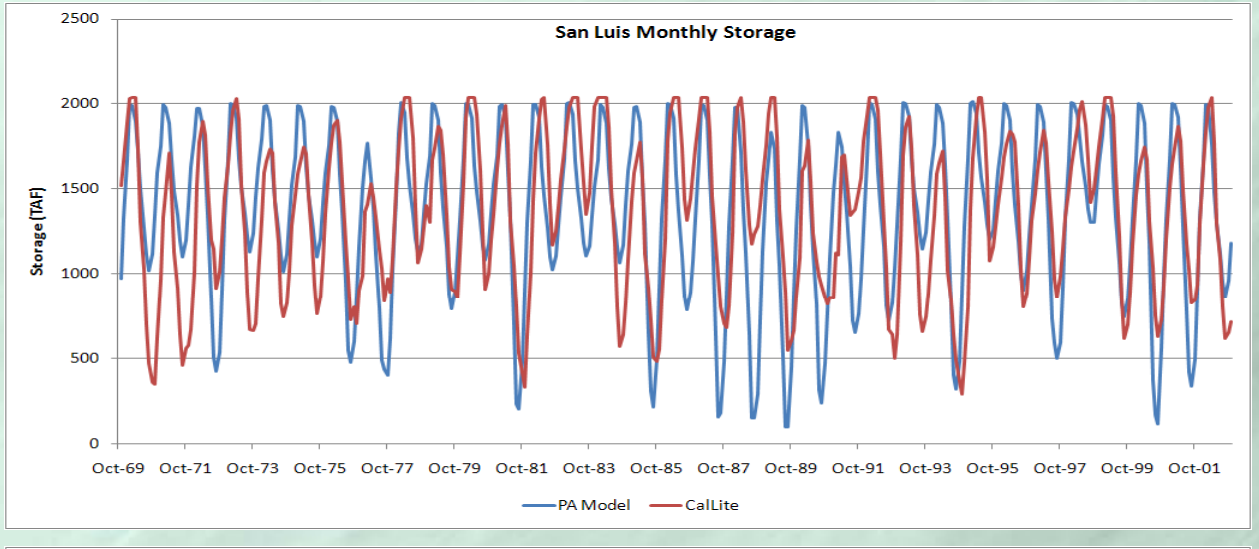


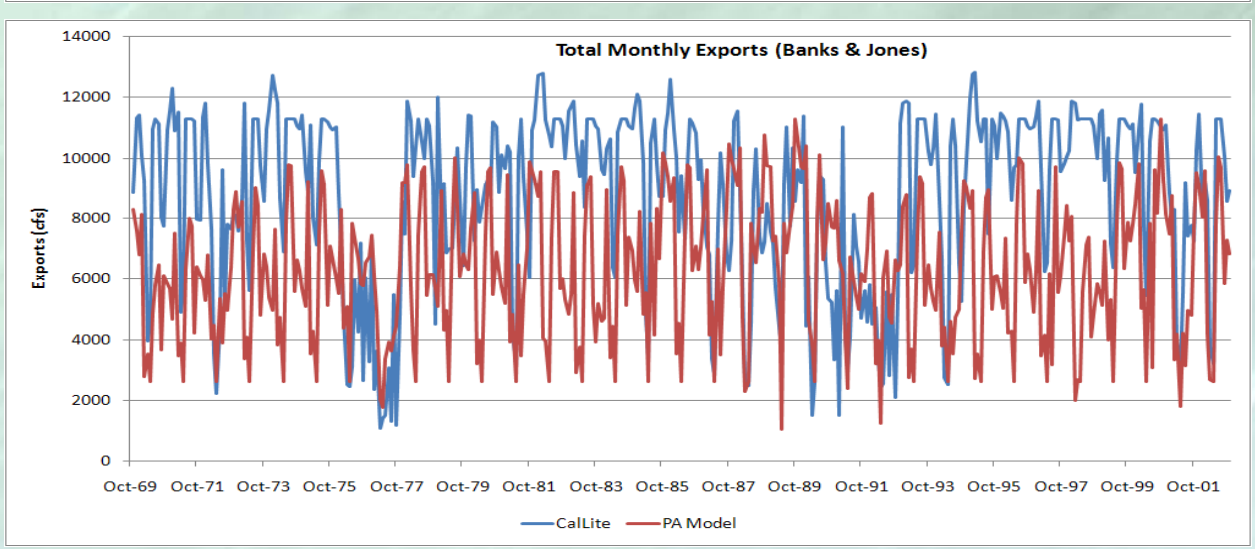
Qu. 4: Reservoir Operations
PA Model and CalLite Comparison





Qu. 4: Reservoir Operations
PA Model and CalLite Comparison





Qu. 5: Delta Operations

- Regulatory Considerations within PA Model
  - X2
  - Salinity (G-Model)
  - MRDO
  - VAMP Export Limits
  - Export/Inflow Limits
- Does not Consider
  - COA
  - DXC

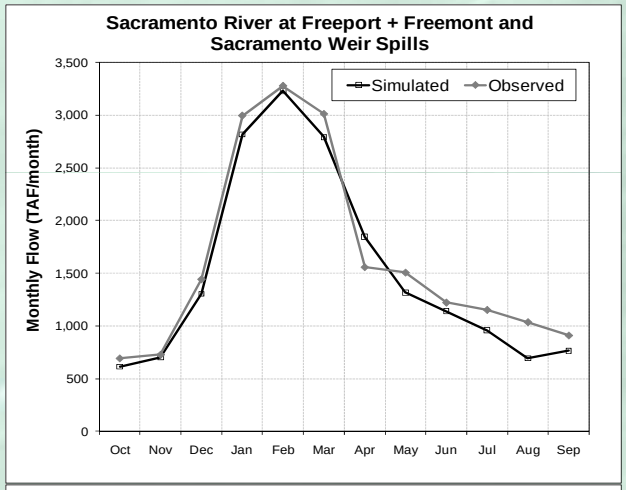
Qu. 5: Delta Operations
Delta Inflows

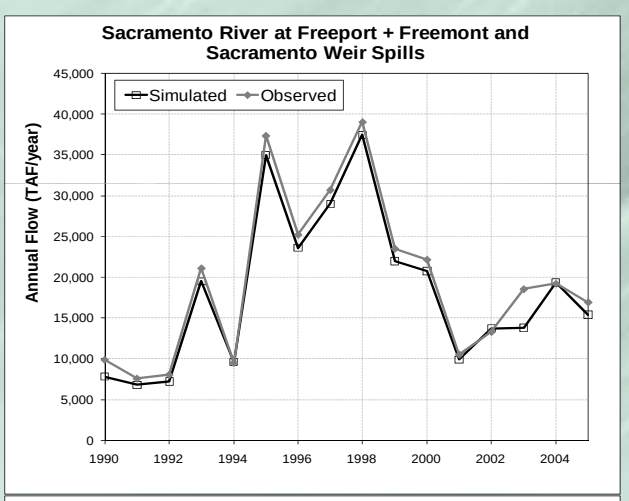
Average Monthly Flows

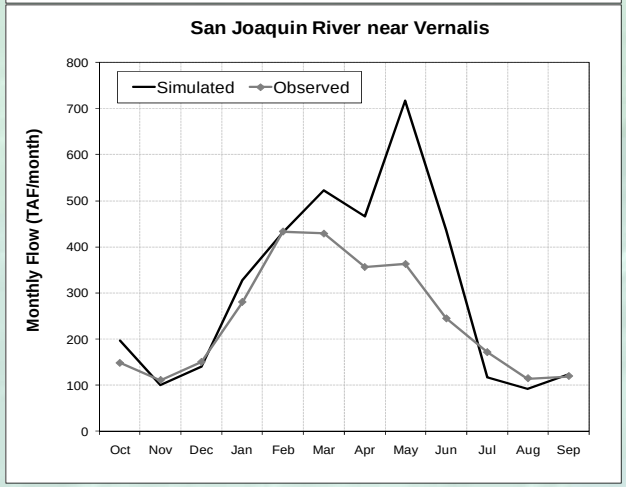
Total Annual Flows

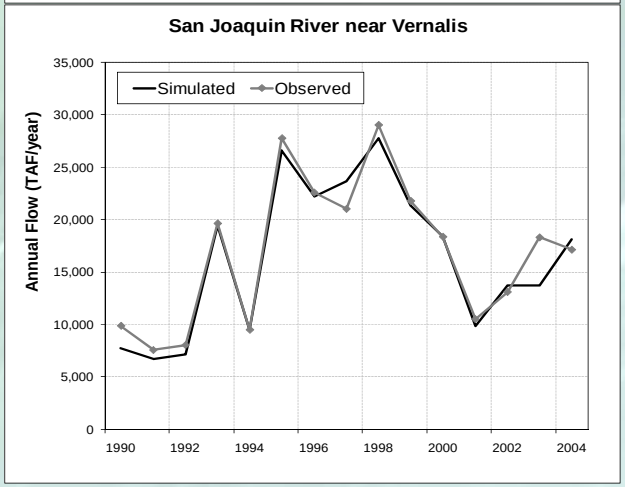
Sacramento River at Freeport

San Joaquin River at Vernalis





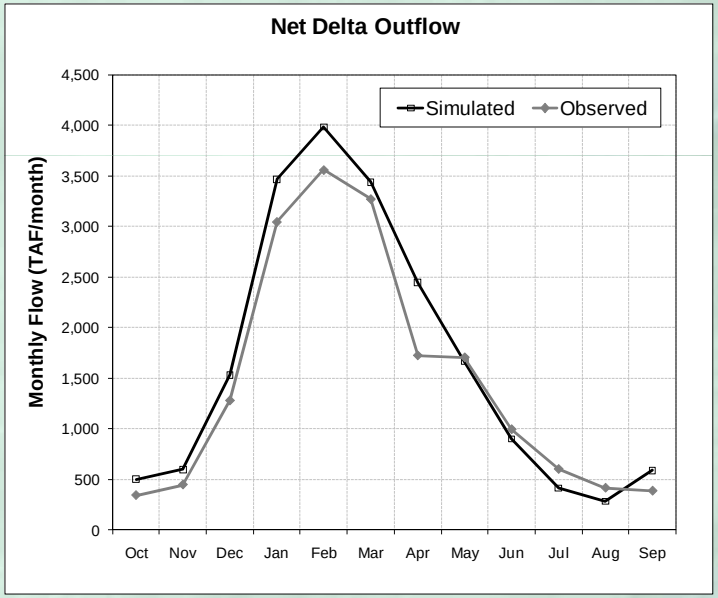




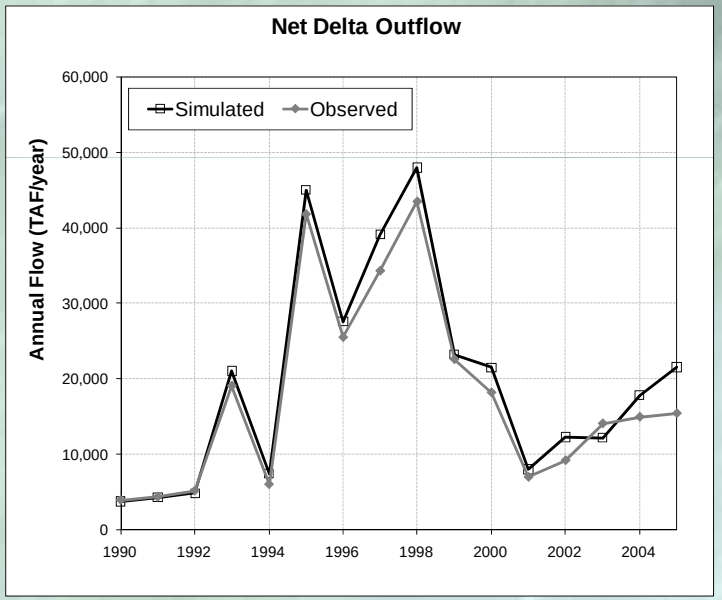
Qu. 5: Delta Operations
Delta Outflows

Net Delta Outflow

Average Monthly Flows



Total Annual Flows



Qu. 5: Delta Operations

Comparison of PA model and CalLite no limits on surface water diversion

Description	Average Annual Flow/Storage (TAF) Water Years 1971-2005		
	CalLite	PA model	Difference
Sacramento River at Hood + Yolo Bypass at Lisbon Weir	20,356	20,125	231
Trinity River at Lewiston	796	542	254
Sacramento River diversions Shasta Dam to Wilkins Slough	2,334	3,145	-810
Diversion Yuba/Feather	1,181	1,151	30
Diversion Sac/American	387	603	-215
Total Diversions	3,903	4,899	-996
Change in North of Delta Reservoir Storage	-14	2	-17
North of Delta Reservoirs Evaporation	298	-168	466
Delta Diversions and Exports[7]	6,382	4,528	1,854
Net Delta Outflow	18,534	20,067	-1,532
Exports + Outflow (Includes CCWD)	24,916	24,594	322

Comparison of PA model and CalLite with limits on surface water diversion

Units in TAF	CalLite	PA model	Difference
Sacramento River at Hood + Yolo Bypass at Lisbon Weir	19,315	20,241	-926
Trinity River at Lewiston	792	627	165
Sacramento River diversions Shasta Dam to Wilkins Slough	2,138	1,766	372
Diversion Yuba/Feather	1,178	1,239	-61
Diversion Sac/American	387	462	-75
Total Diversions	3,703	3,466	237
Change in North of Delta Reservoir Storage	-23	9	-32
North of Delta Reservoirs Evaporation	298	-173	471
Delta Diversions and Exports	6,191	4,540	1651
Net Delta Outflow	17,558	20,168	-2610
Exports + Outflow (Includes CCWD)	23,749	24,708	-959