

TURLOCK AND MODESTO SUBBASIN GSPs

INTERBASIN COORDINATION MEETING

Presented on May 20, 2020



AGENDA

- Status of GSP process
 - Turlock Subbasin
 - Modesto Subbasin
- Summary of the C2VSim™ model along the Tuolumne River boundary
 - Model features and calibration
 - Stream-aquifer interaction
- Status and update of the DRAFT Groundwater Budgets
 - Turlock Subbasin
 - Modesto Subbasin
- Future cooperation between the two subbasins
- Additional coordination Items
 - Grant funded monitoring wells
 - Future communication and messaging
- Schedule and next steps



MODEL SUMMARY

TUOLUMNE RIVER BOUNDARY



MODEL FEATURES

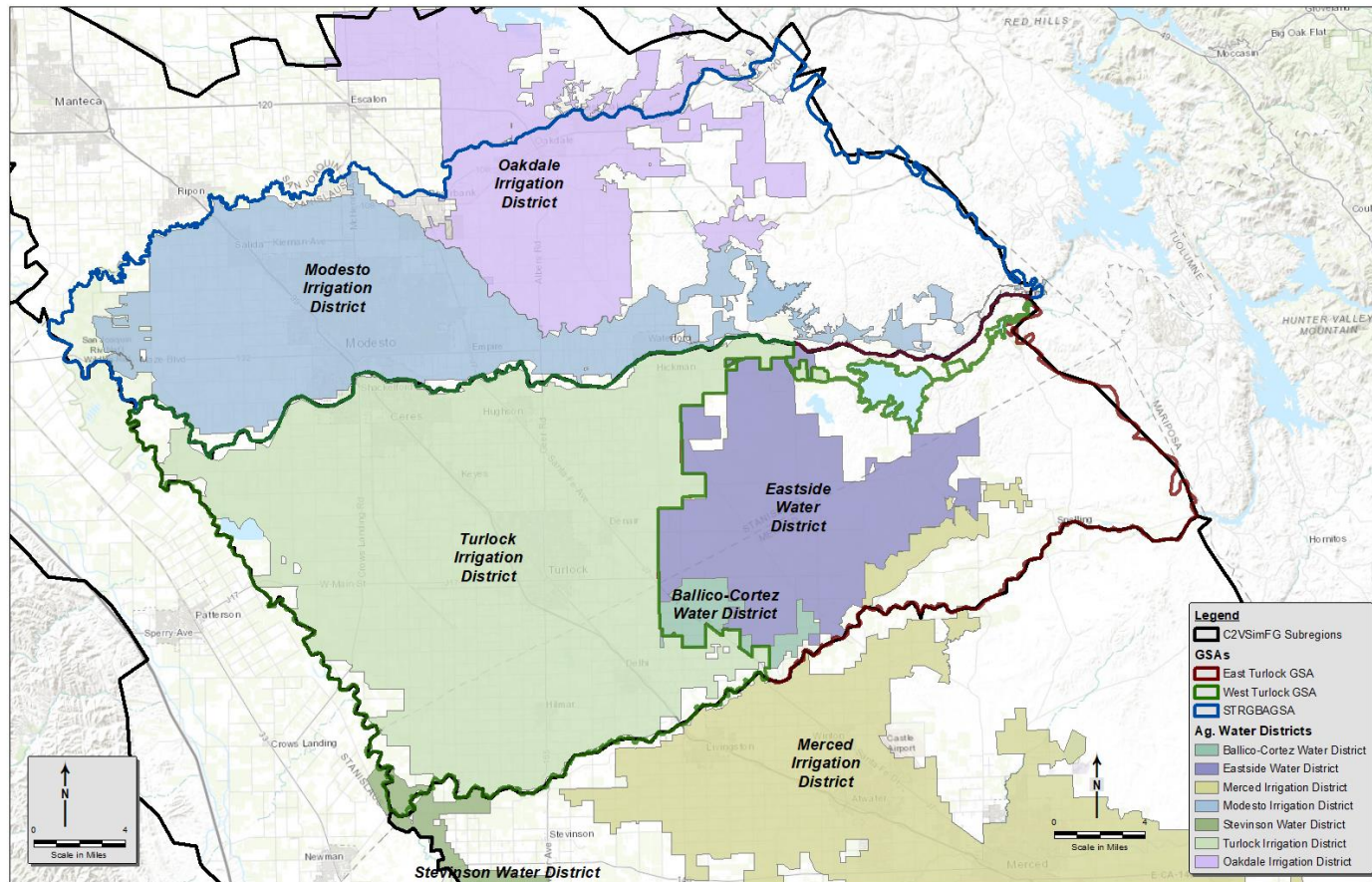
IWFM Fundamentals

- Surface Features
 - Precipitation
 - Evapotranspiration
 - Land Use and Cropping Patterns
 - Soil and Root-Zone Parameters
- Hydrogeological Features
 - USGS Texture Data
 - Corcoran Clay Analysis and Refinement
- Same Calibration Approach
 - Land, Stream, and Aquifer Systems

Turlock-Modesto Features

- Surface Water Deliveries
 - Reservoir Recharge
 - Canal Recharge
- Agency Well Pumping
 - Municipal Wells
 - Agricultural Agency
- Private Element Pumping

LOCAL WATER AGENCIES



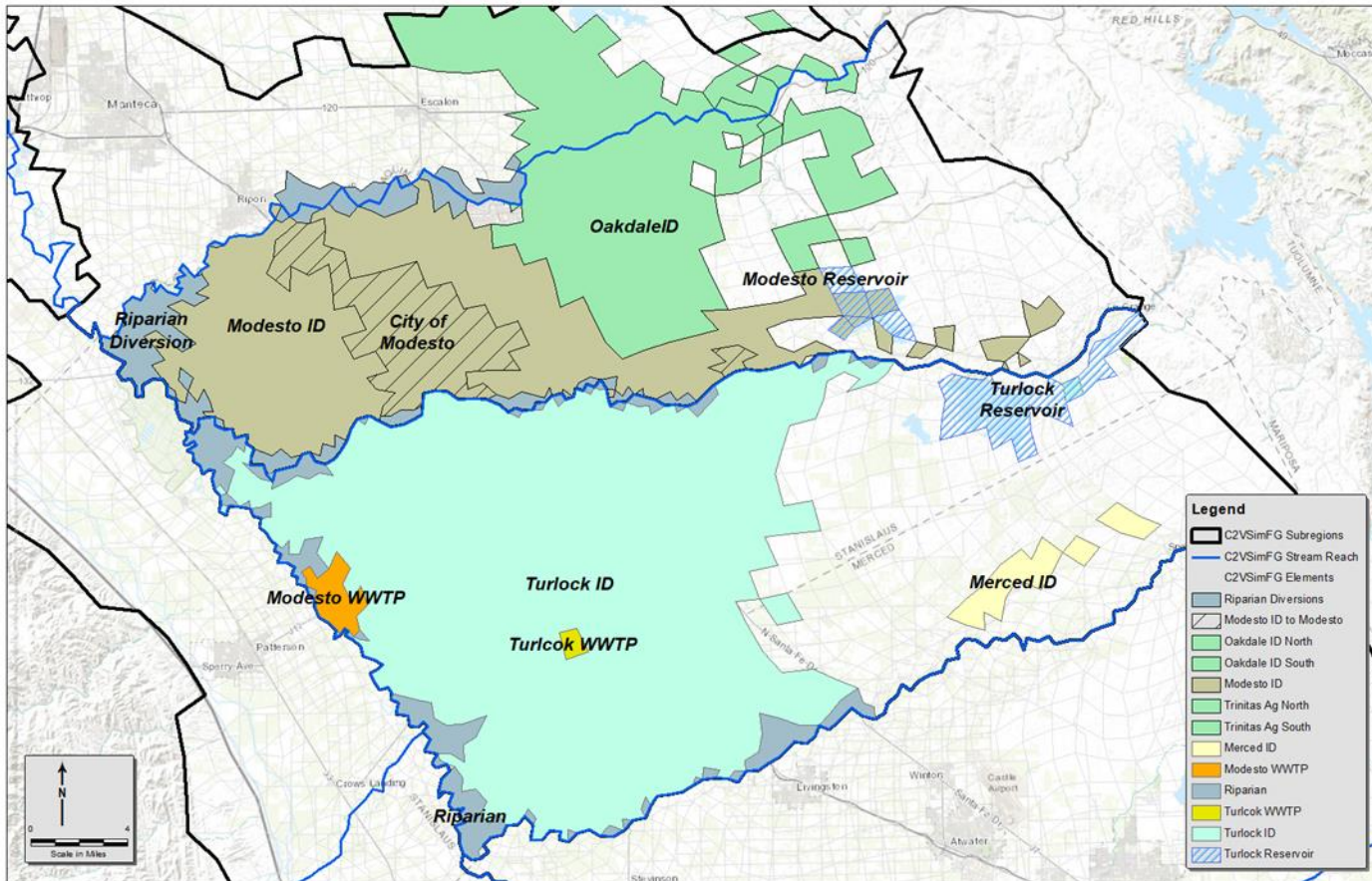
Agricultural Agencies

- Modesto ID
- Oakdale ID
- Turlock ID
- Eastside WD
- Ballico-Cortez WD
- Merced ID
- Stevinson WD

Urban Municipalities

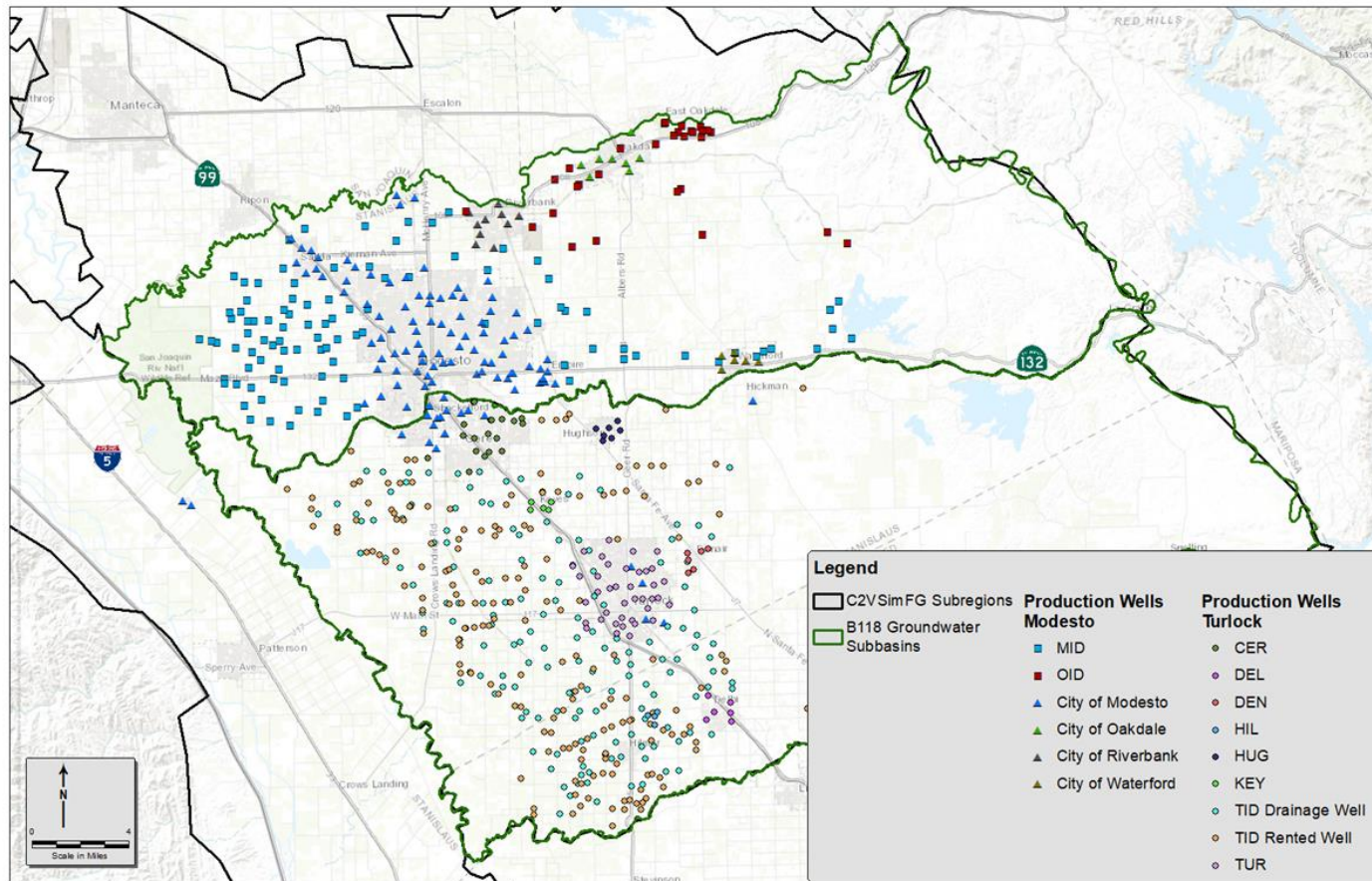
- Modesto
- Turlock
- Ceres
- Oakdale
- Riverbank
- Waterford
- Hughson
- Keyes
- Hickman
- Denair
- Delhi
- Hilmar

SURFACE WATER SUPPLY



- Agricultural
 - Modesto Irrigation District
 - Oakdale Irrigation District
 - Turlock Irrigation District
 - Merced Irrigation District
- Riparian Surface Water
 - Stanislaus
 - Tuolumne
 - Merced
 - San Joaquin
- Municipal Surface Water
 - Modesto, City of

GROUNDWATER SUPPLY: AGENCY



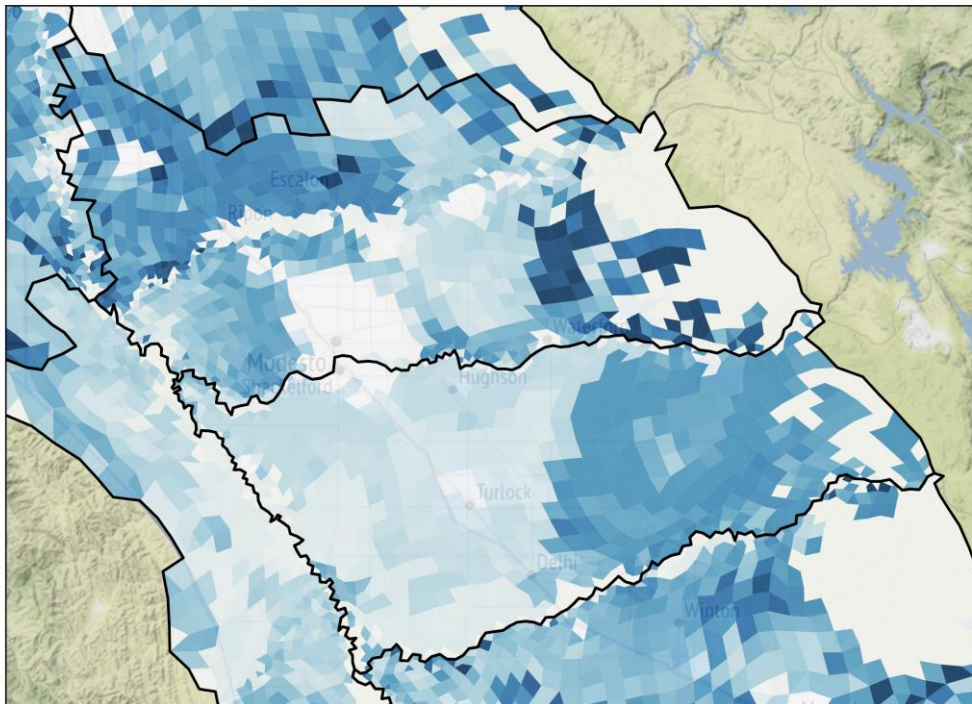
812 Simulated Wells

- 576 Ag Wells
 - TID: 403
 - MID: 141
 - OID: 32
- 236 Urban Wells
 - Modesto: 120
 - Turlock: 40
 - Ceres: 20
 - Riverbank: 11
 - Oakdale: 10
 - Hughson: 8
 - Waterford: 6
 - Delhi: 6
 - Denair: 6
 - Keys: 5
 - Hilmar: 4

Note: This map only includes agency pumping; private agricultural and domestic groundwater production is simulated at each element.

GROUNDWATER SUPPLY: PRIVATE

Non-ponded Ag. Pumping (ft.)
2015-09



Private Groundwater Production

Private agricultural and domestic groundwater production is estimated at each element to meet demand

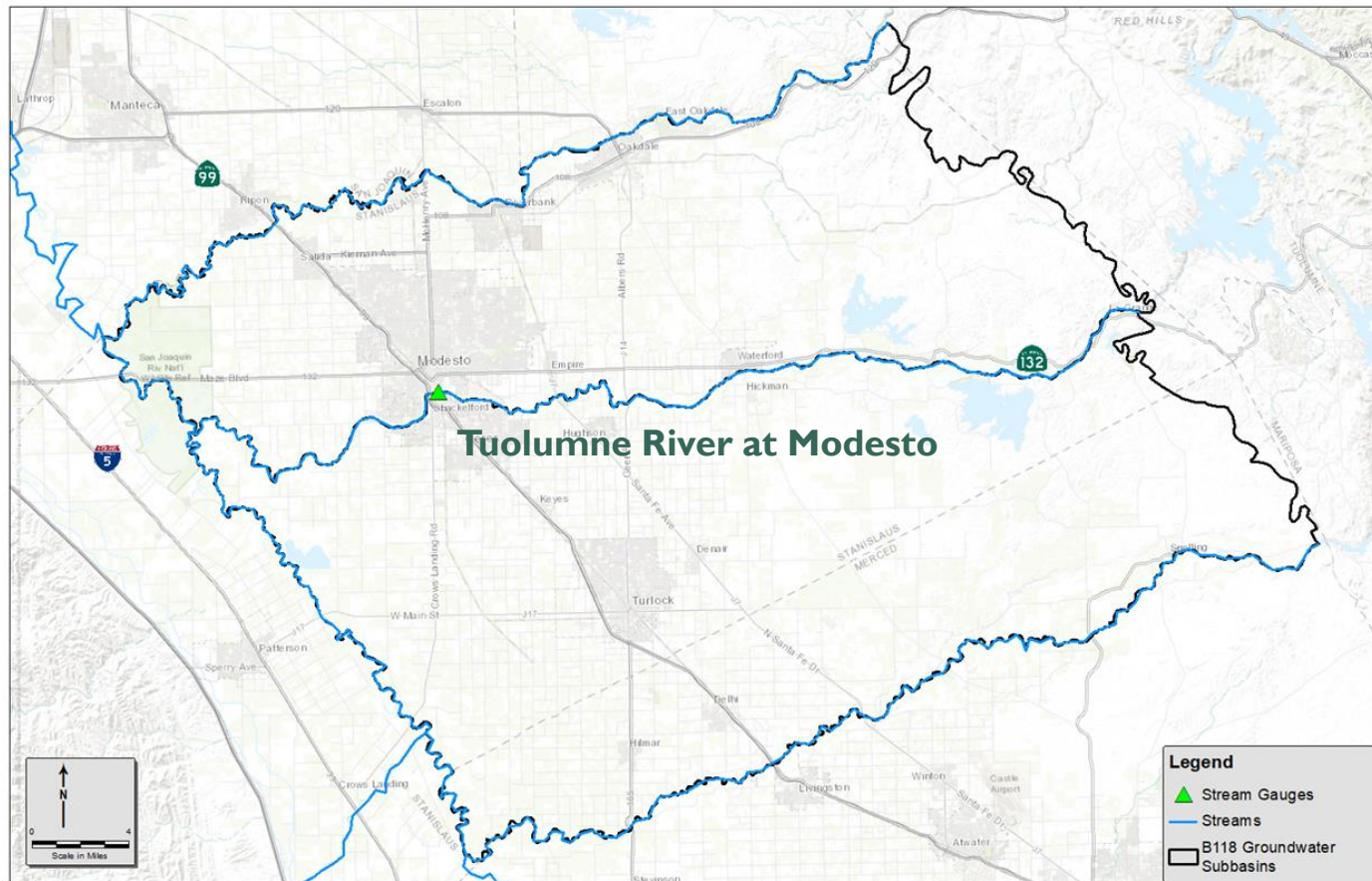


STREAM CALIBRATION

MODESTO-TURLOCK BOUNDARY ALONG THE TUOLUMNE RIVER



TUOLUMNE RIVER CALIBRATION

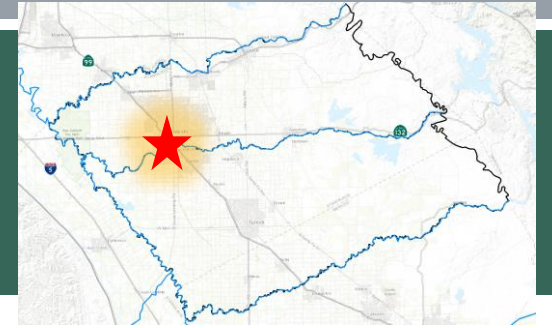


Calibration Criteria

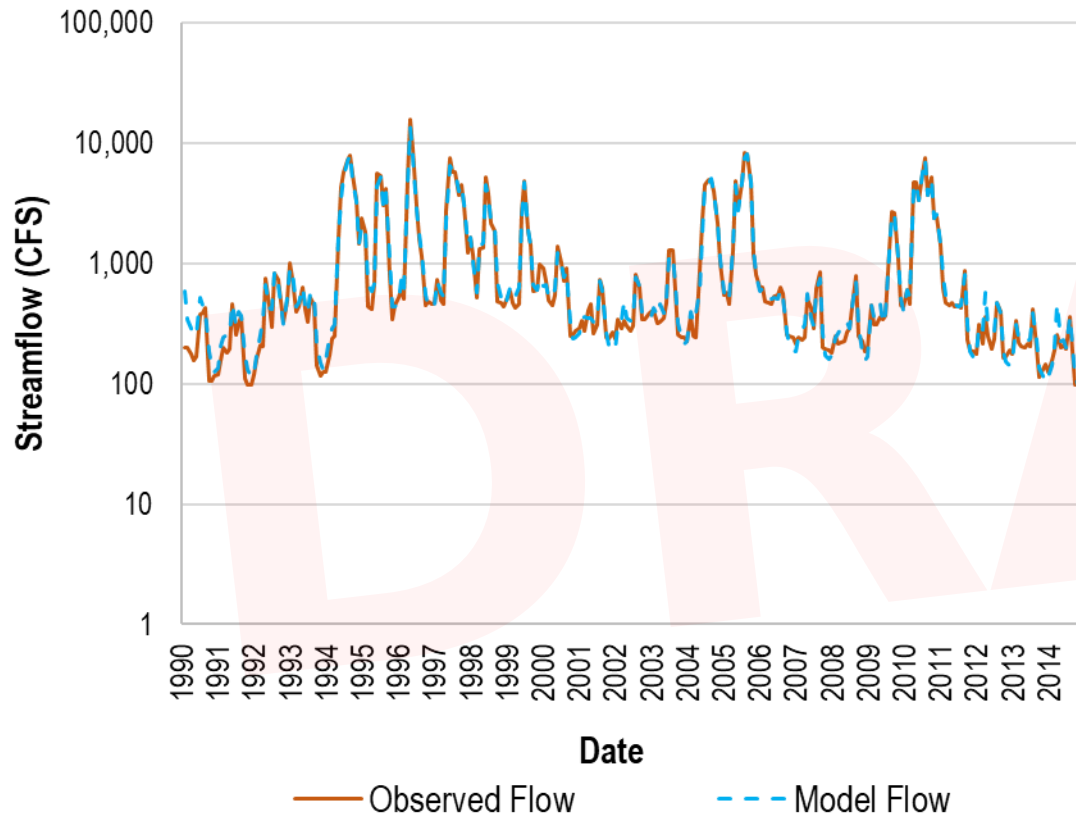
- Match observed streamflow at gauging stations
- Refine hydrologic parameters for calibration of stream/aquifer systems
- Produce reasonable and defensible water budgets

STREAM HYDROGRAPHS

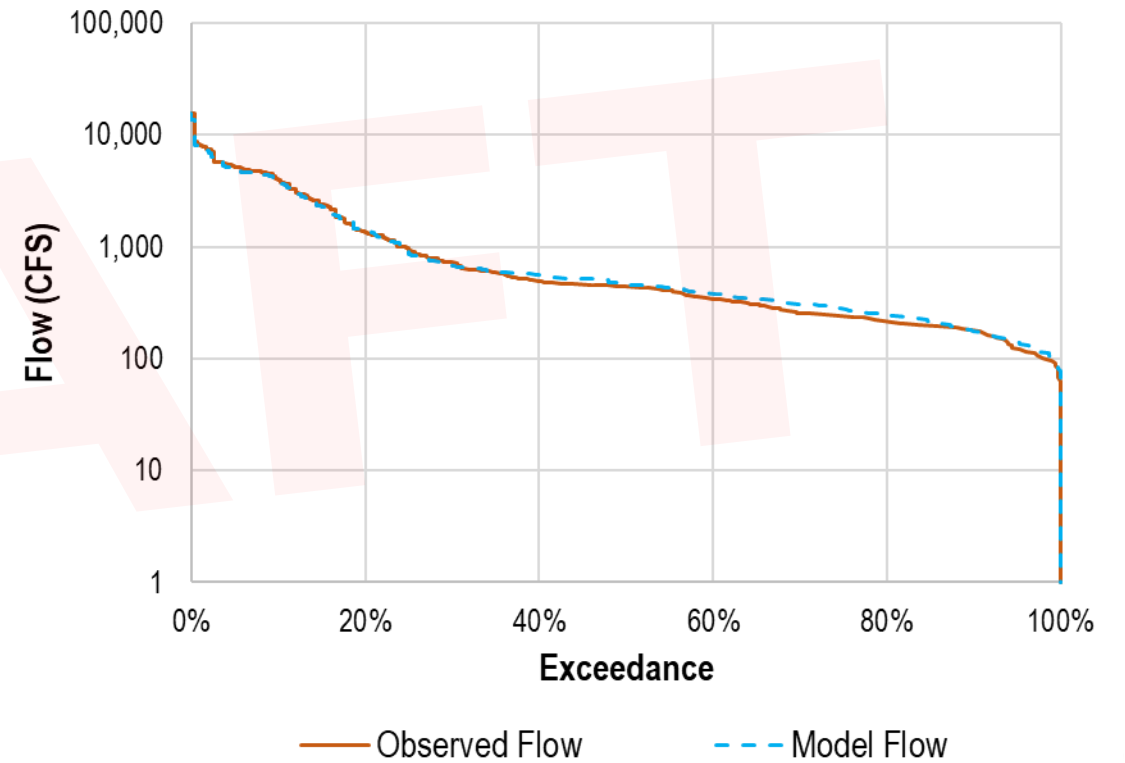
Tuolumne
river at
Modesto



USGS:11290000_and_CDEC:MOD

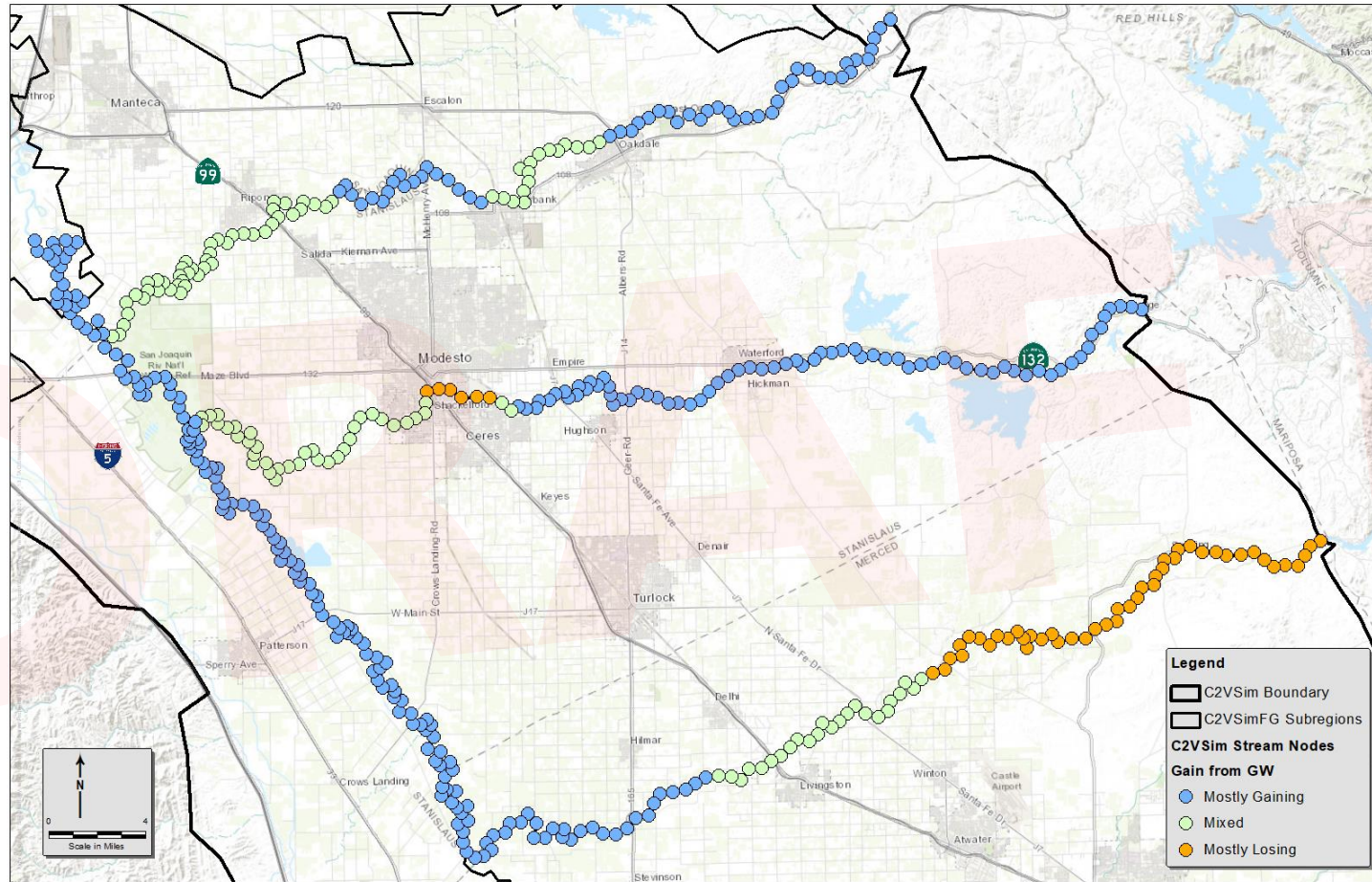


Exceedance Chart
(Observed and Simulated)

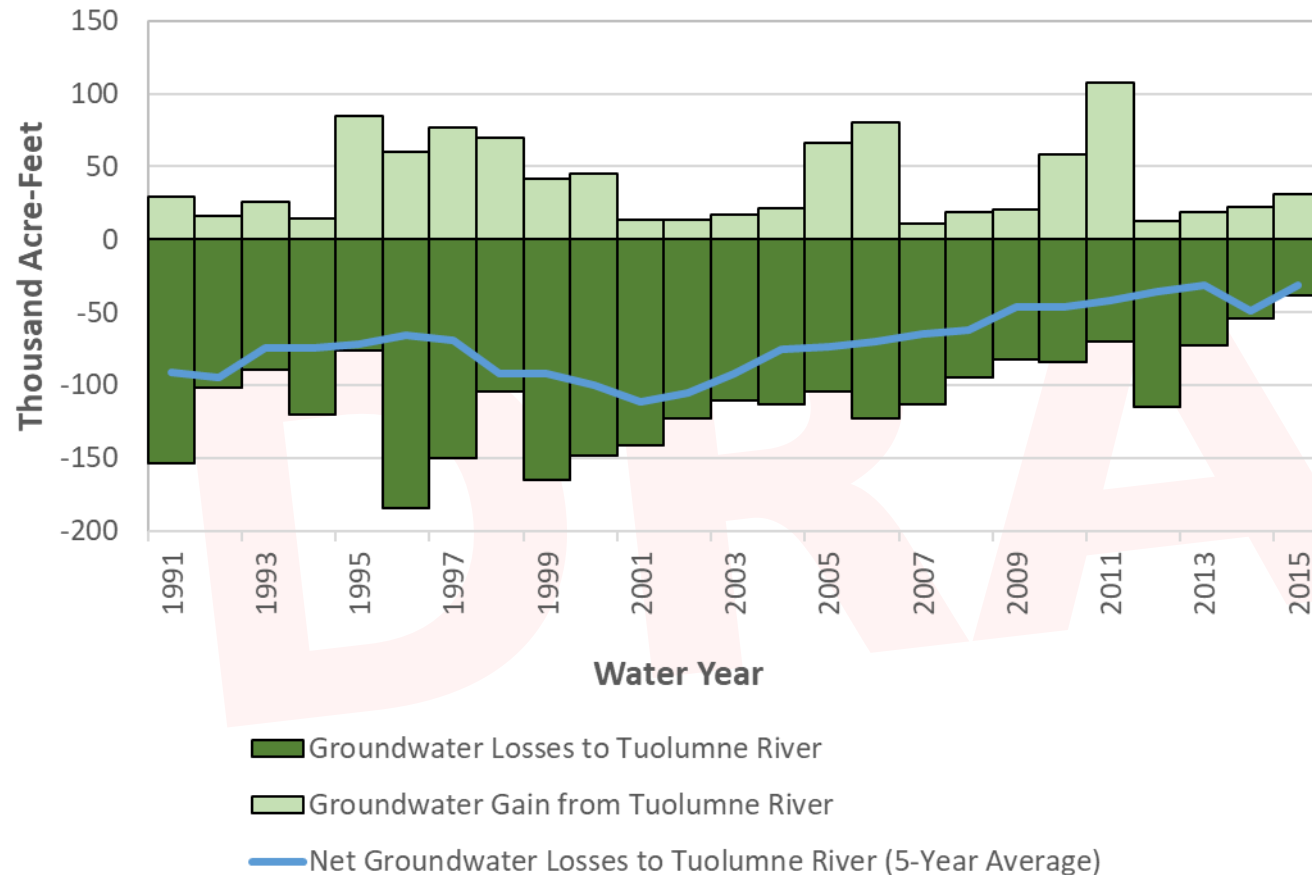


STREAM-AQUIFER INTERACTION

Average Annual Gain from Groundwater (AFY)



STREAM-GROUNDWATER INTERACTION



As seen from the aquifer

- 20,000 AFY of water seeps into the aquifer system each year.
- 56,000 AFY of groundwater is lost to the stream each year.
- **The Tuolumne River gains a net of 36,000 AFY each year from the groundwater system**

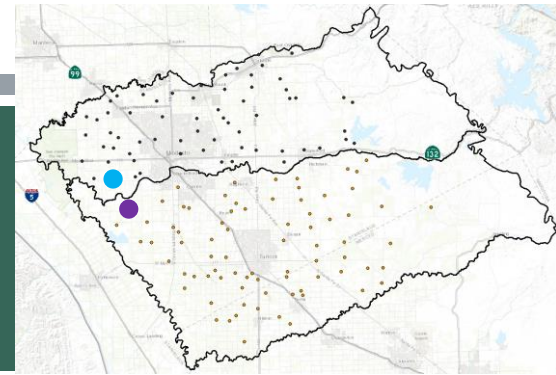


AQUIFER CALIBRATION

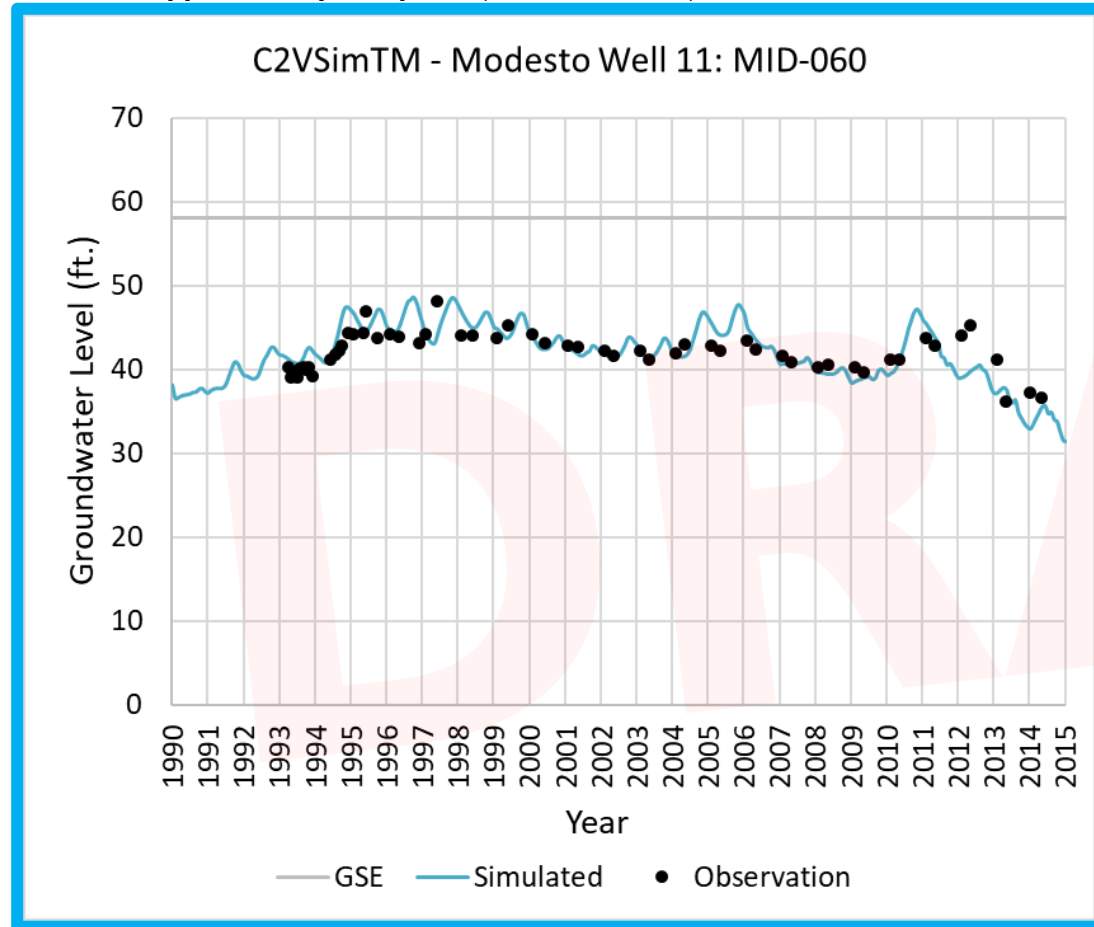
GROUNDWATER LEVELS NEAR THE TUOLUMNE RIVER



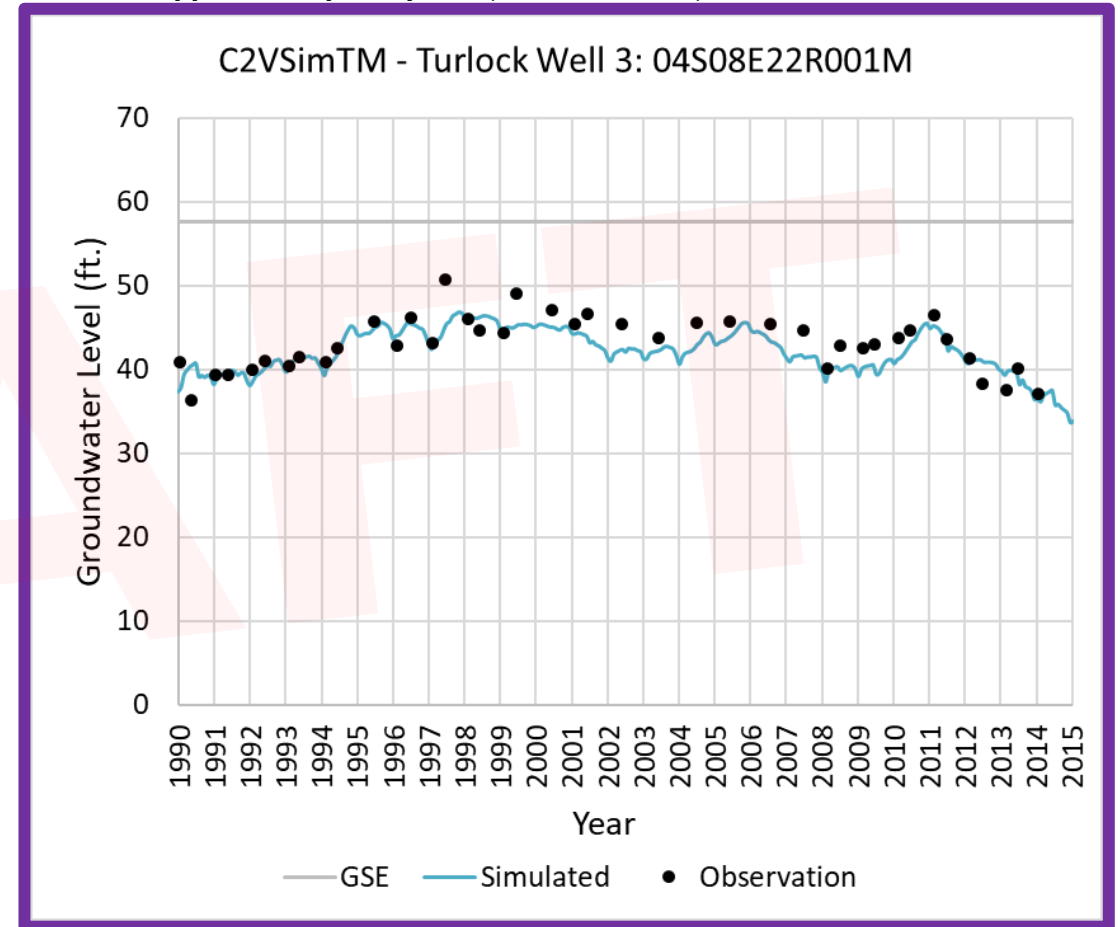
GROUNDWATER HYDROGRAPHS



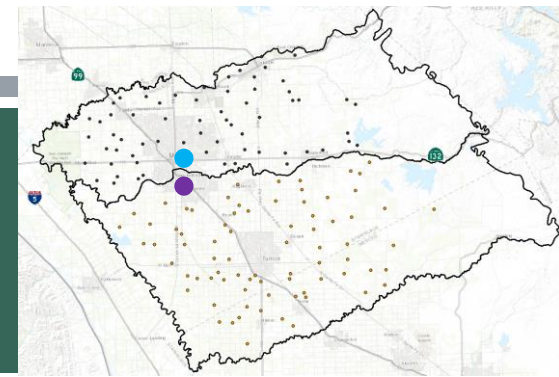
Western Upper Principal Aquifer (Above Corcoran)



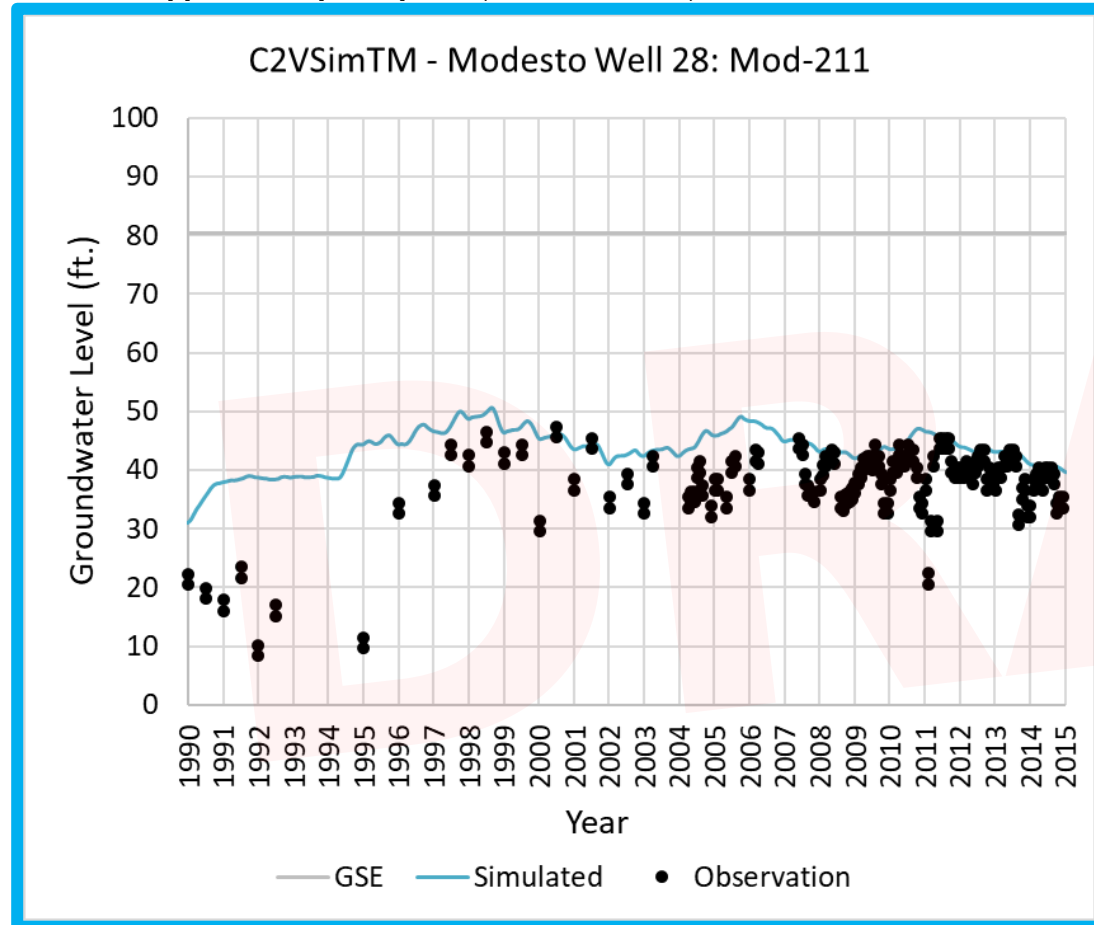
Western Upper Principal Aquifer (Above Corcoran)



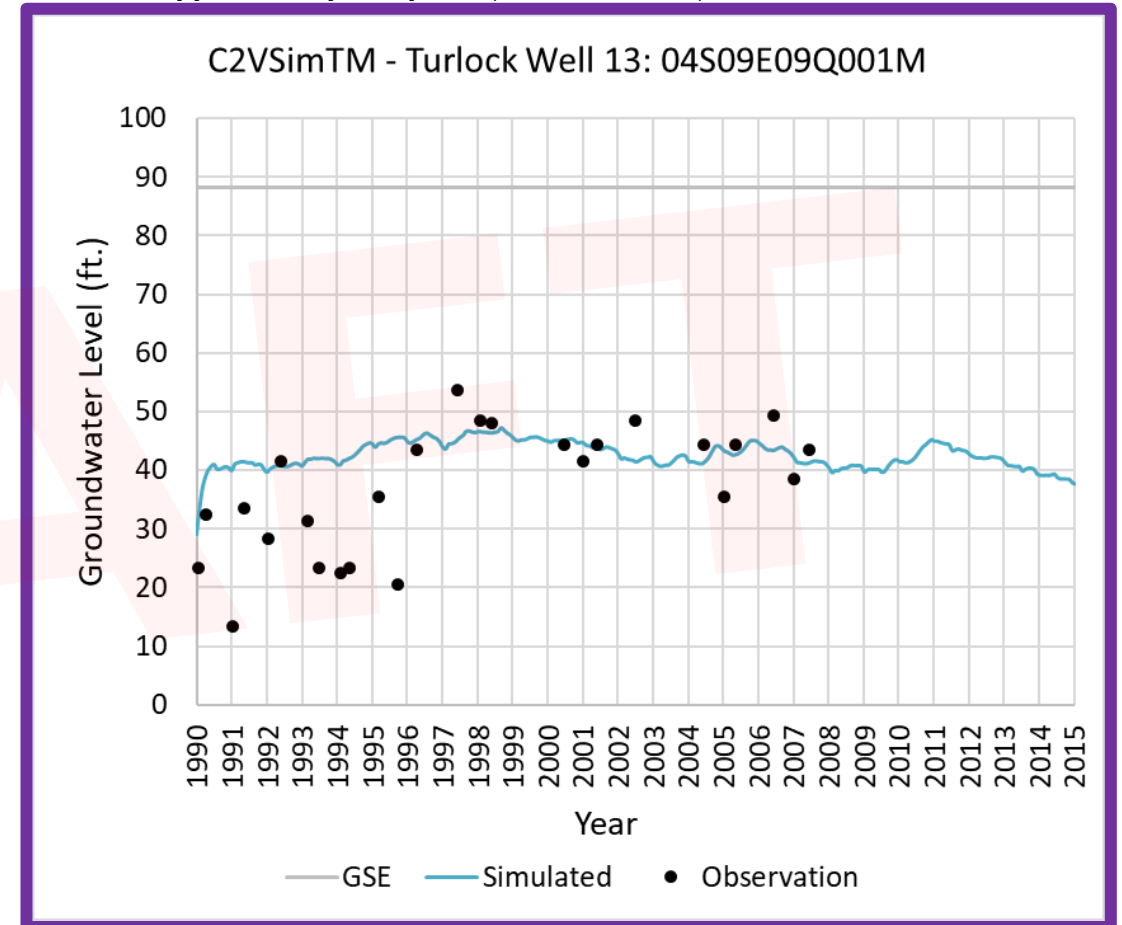
GROUNDWATER HYDROGRAPHS



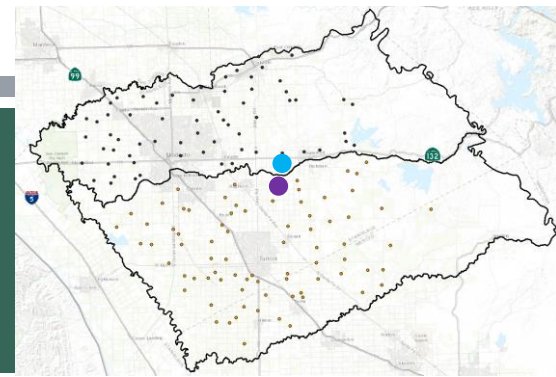
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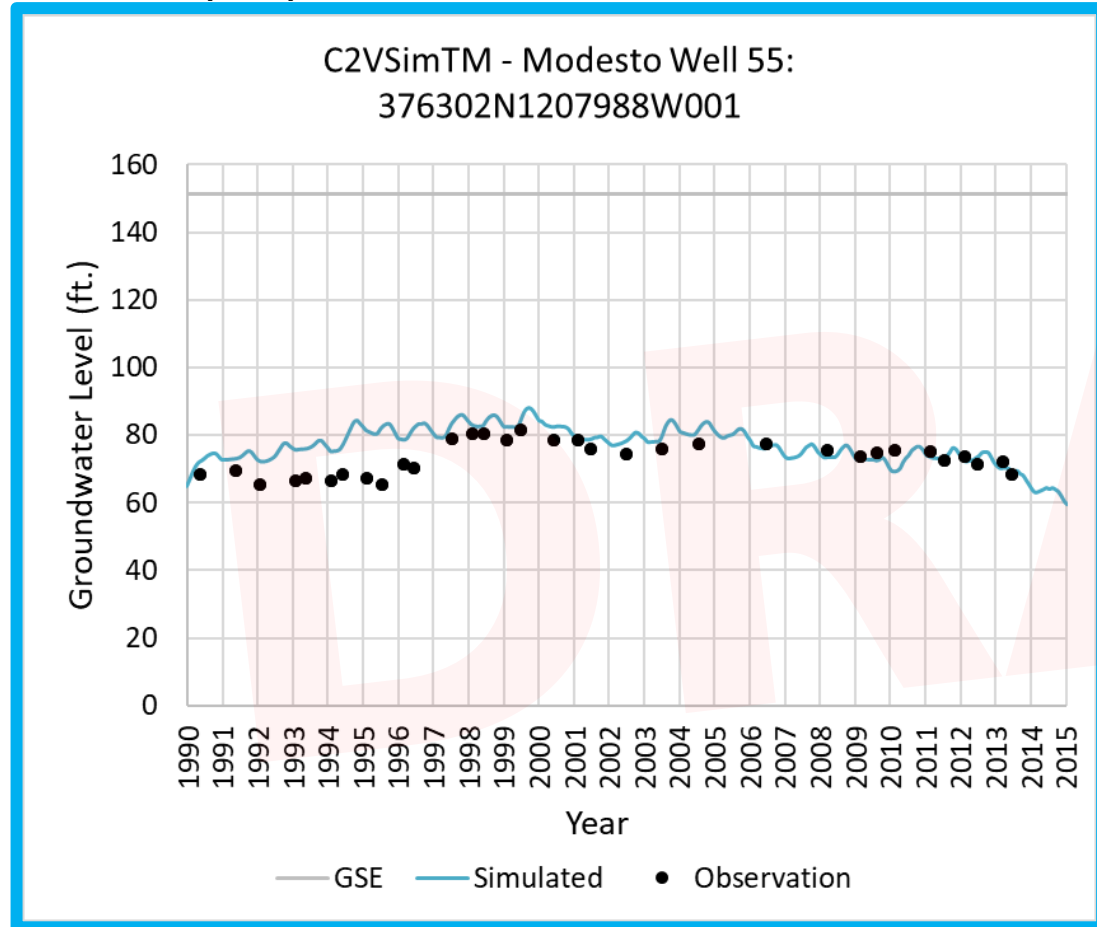
Western Upper Principal Aquifer (Above Corcoran)



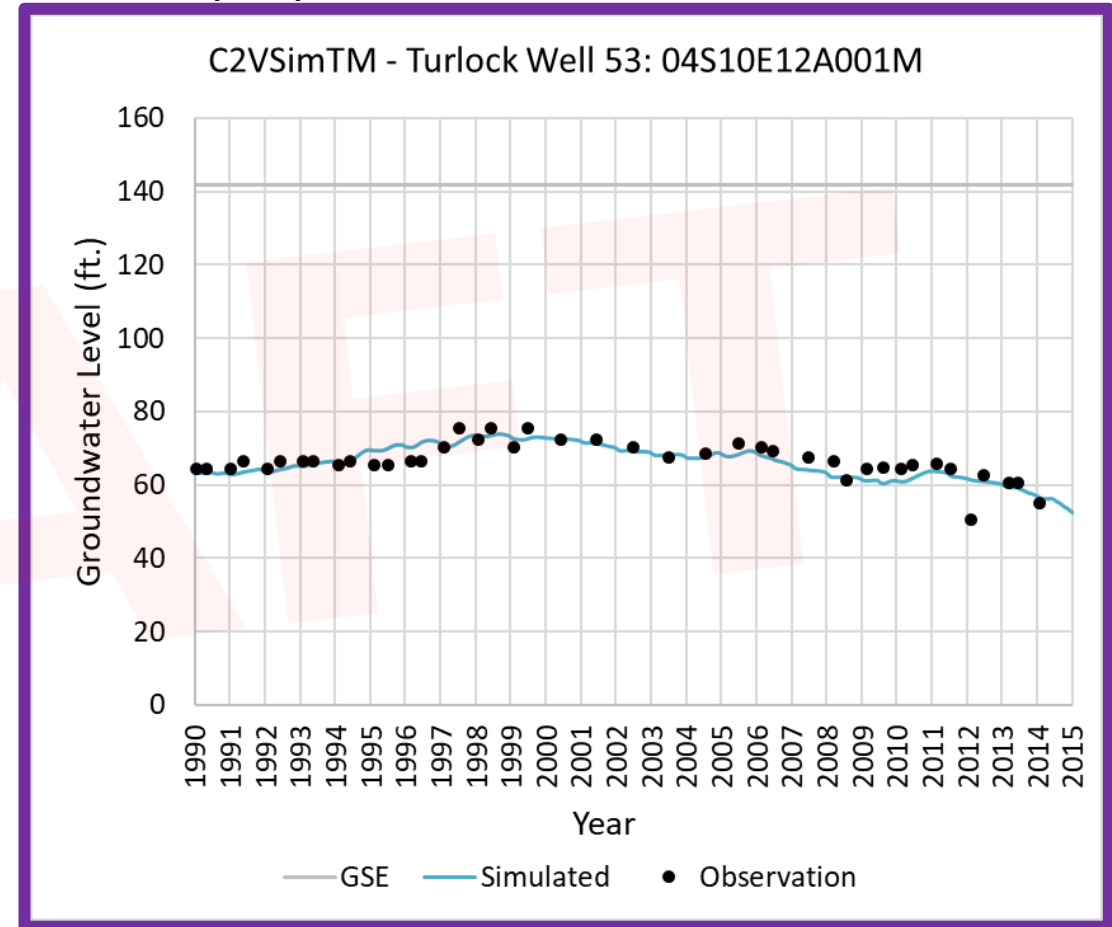
GROUNDWATER HYDROGRAPHS



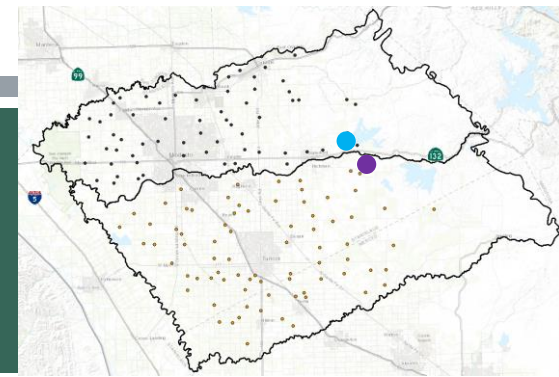
Eastern Principal Aquifer



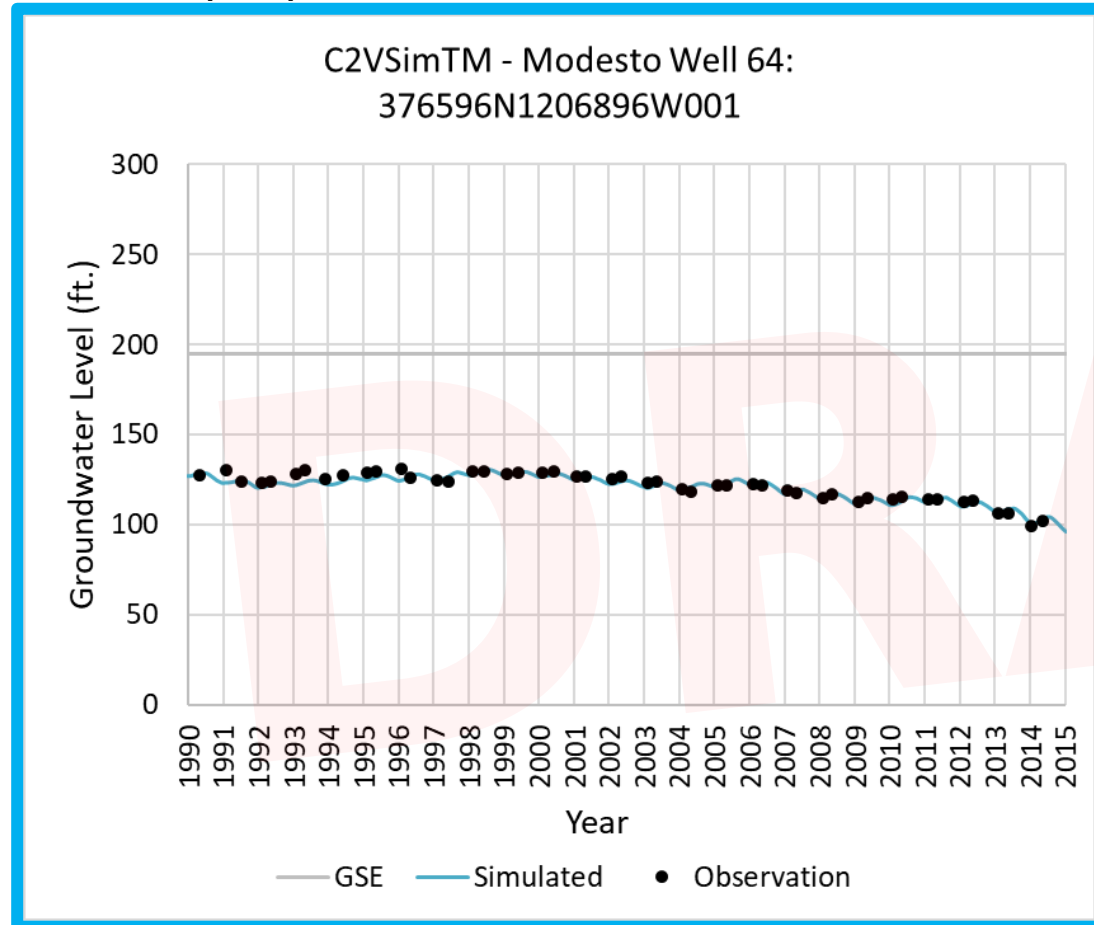
Eastern Principal Aquifer



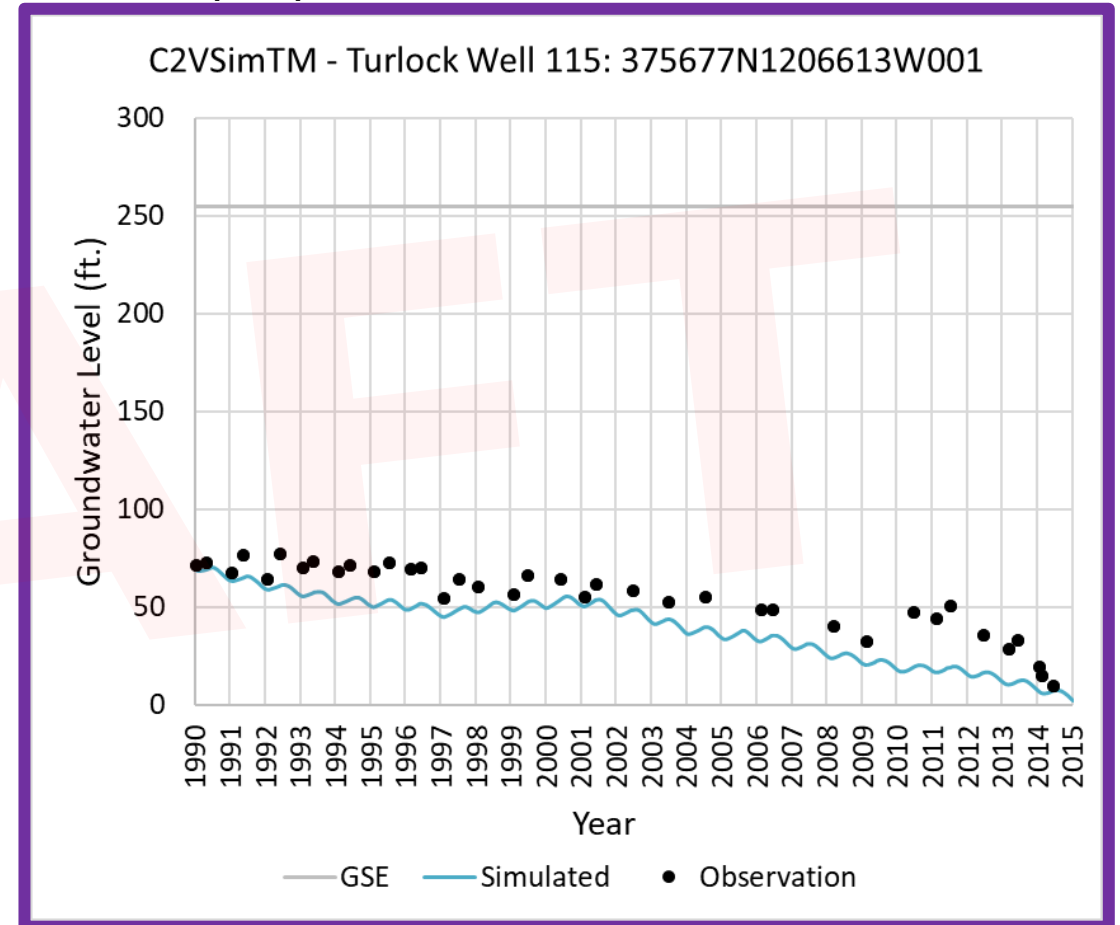
GROUNDWATER HYDROGRAPHS



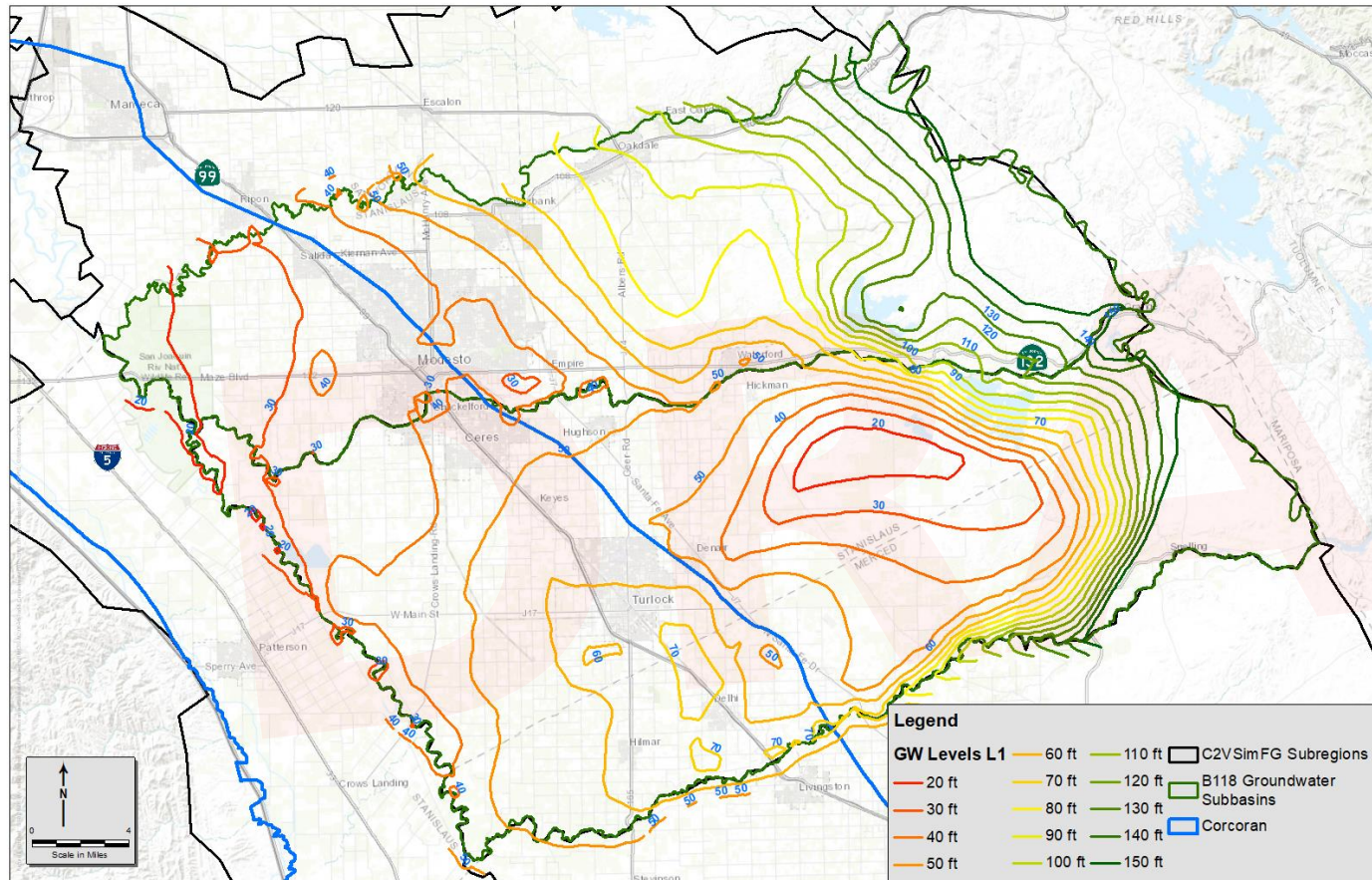
Eastern Principal Aquifer



Eastern Principal Aquifer

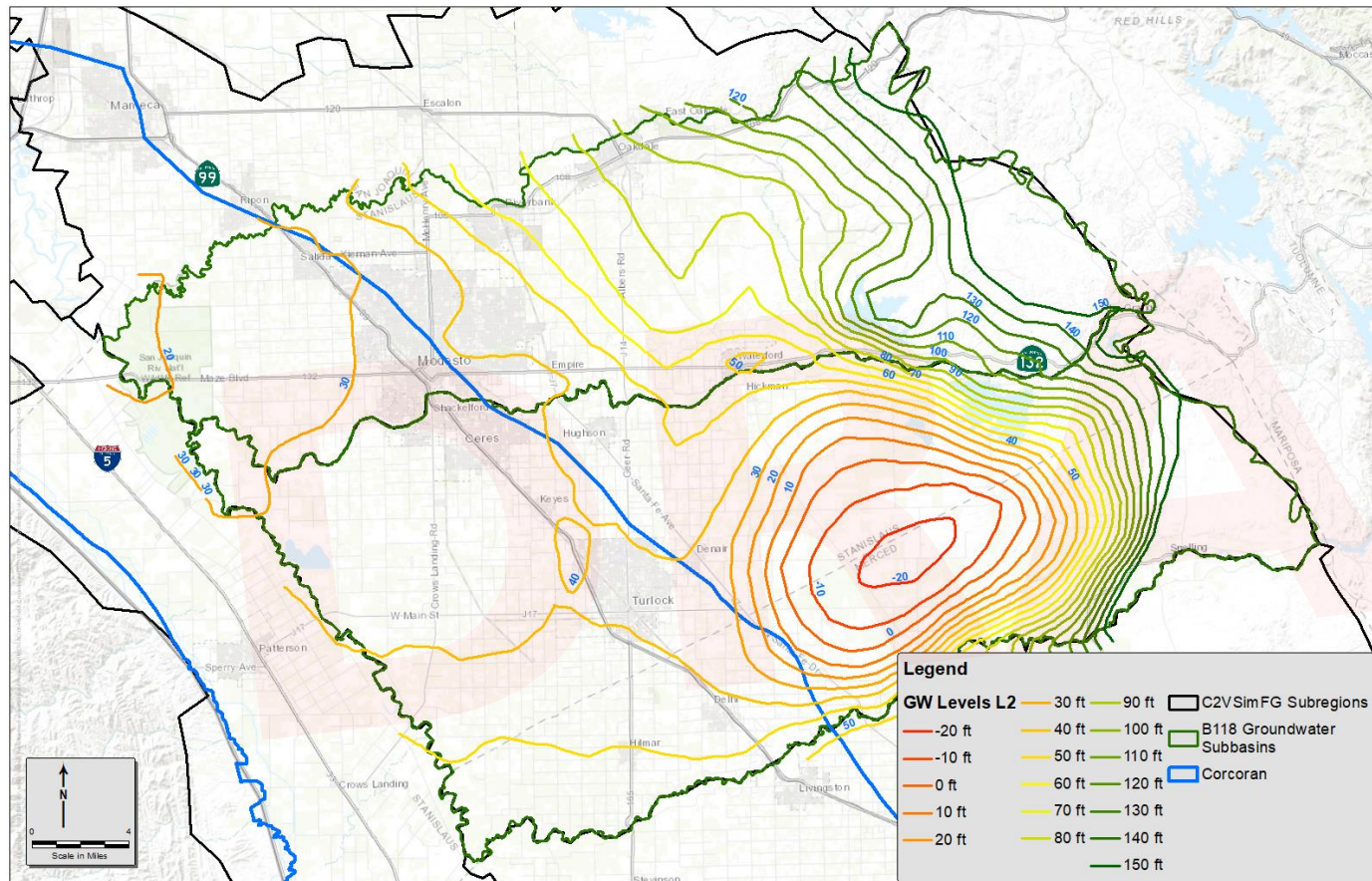


MODEL GROUNDWATER LEVEL CONTOURS



- Period: Sep 2015
- Principal Aquifers:
Western Upper
(Above Corcoran)
and
Eastern
(Shallow Zones)
- San Joaquin Valley Water
Year Index:
Critical

MODEL GROUNDWATER LEVEL CONTOURS



- Period: Sep 2015
- Principal Aquifers:
Western Lower
(Below Corcoran)
and
Eastern
(Deeper Zones)
- San Joaquin Valley Water
Year Index:
Critical

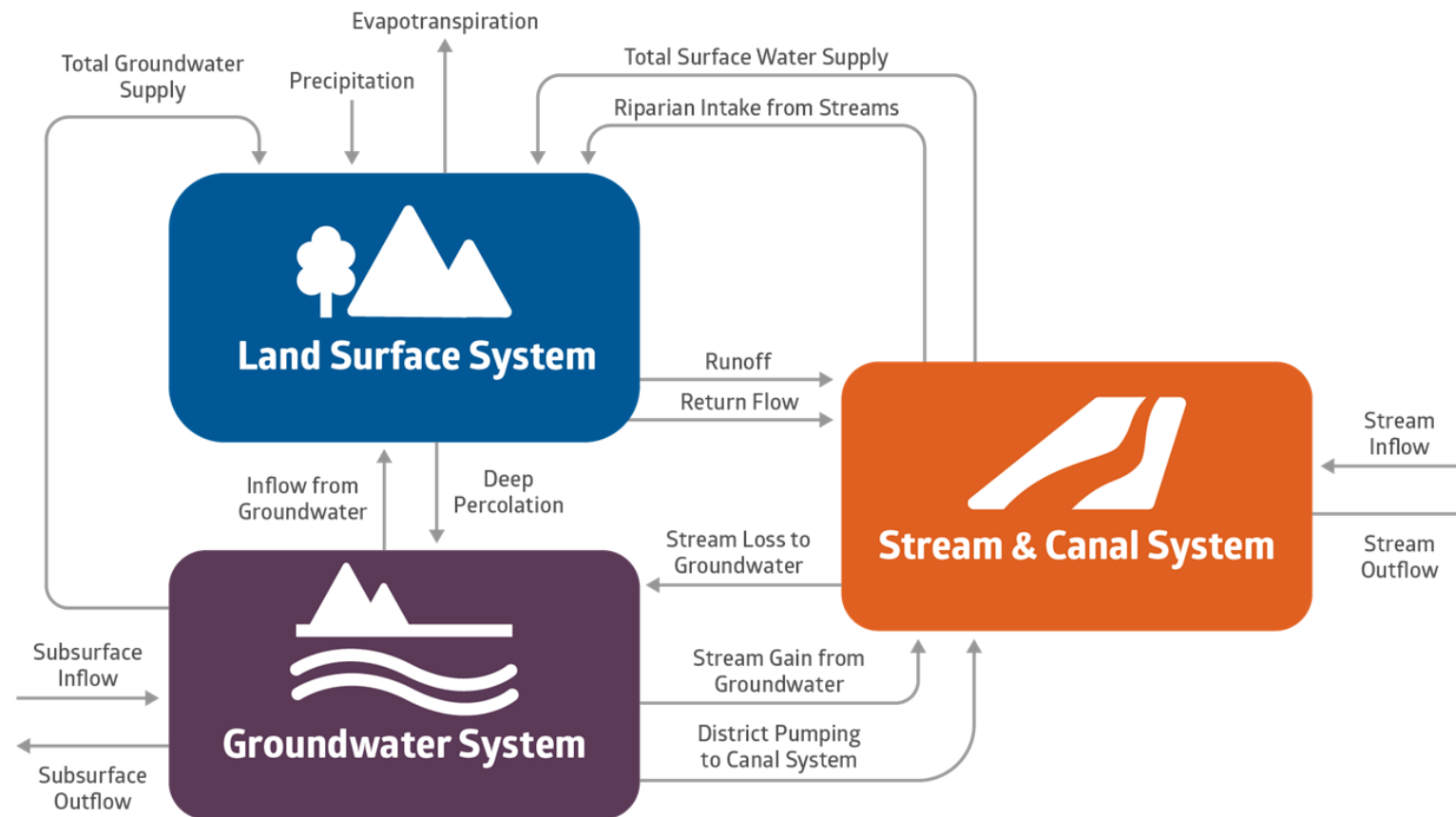
Model: C2VSimTM_v0.2.6 || Date Produced: 05/18/2020



WATER BUDGETS

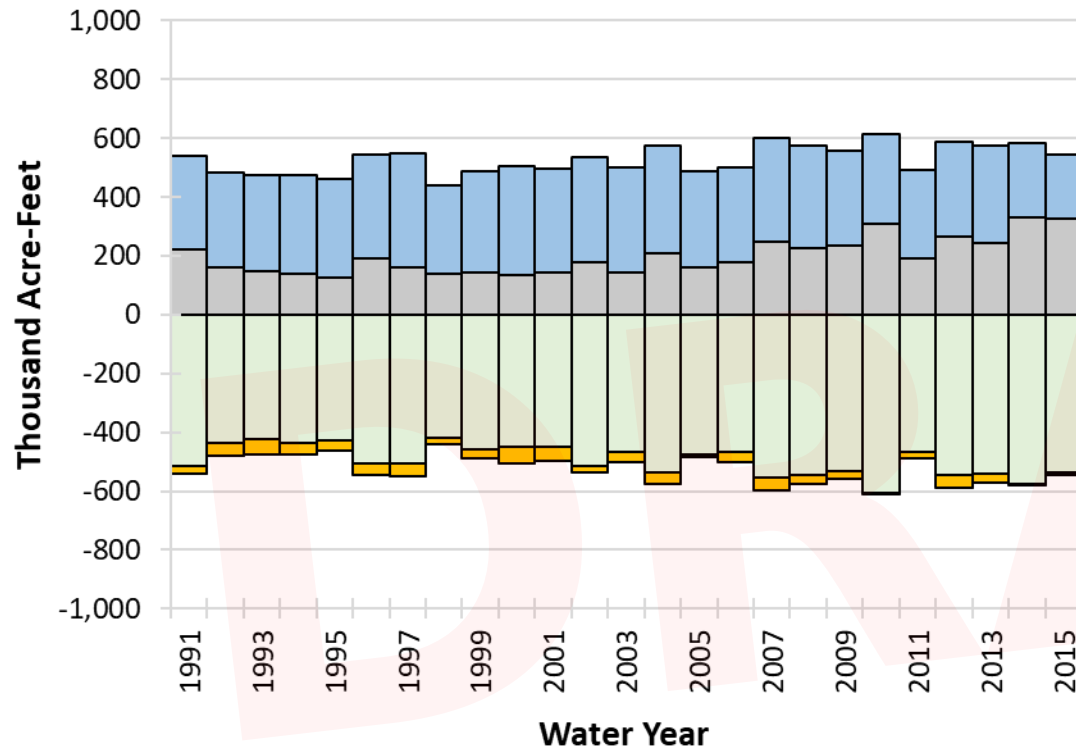


MODEL MODULES INTER-RELATIONSHIP



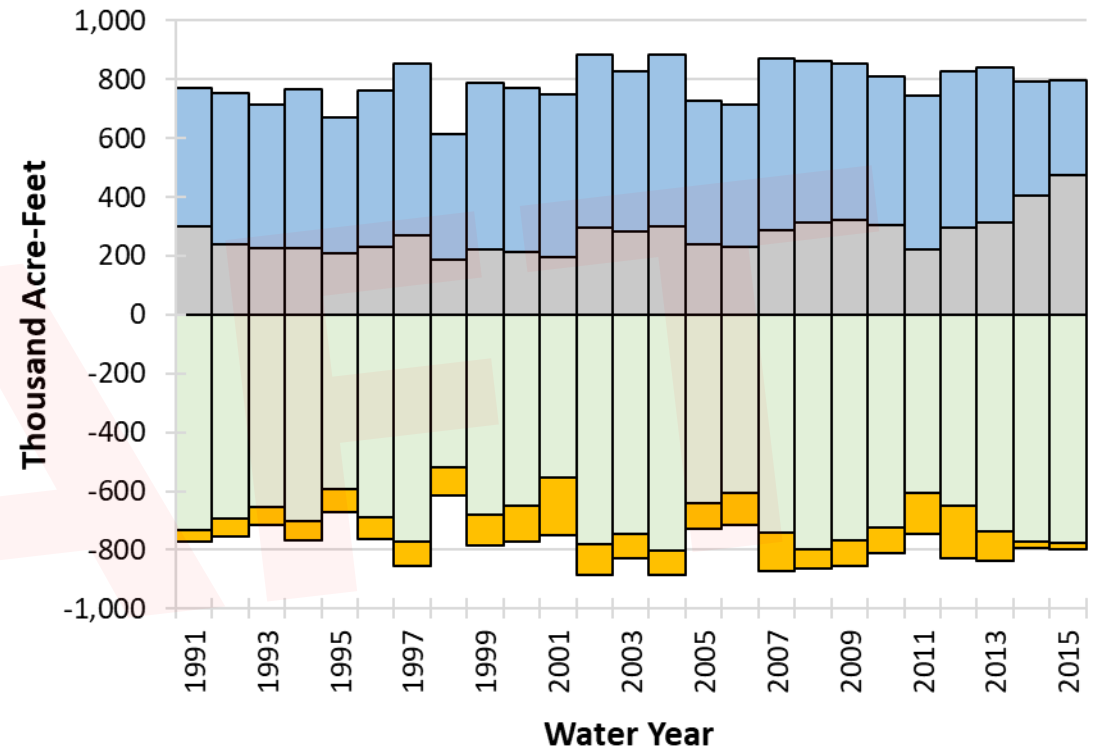
LAND & WATER USE BUDGET: AGRICULTURAL

Modesto Subbasin



- Ag. Demand
- Ag. SW Deliveries
- Ag. Pumping
- Ag. Shortage(+)/ Surplus (-)

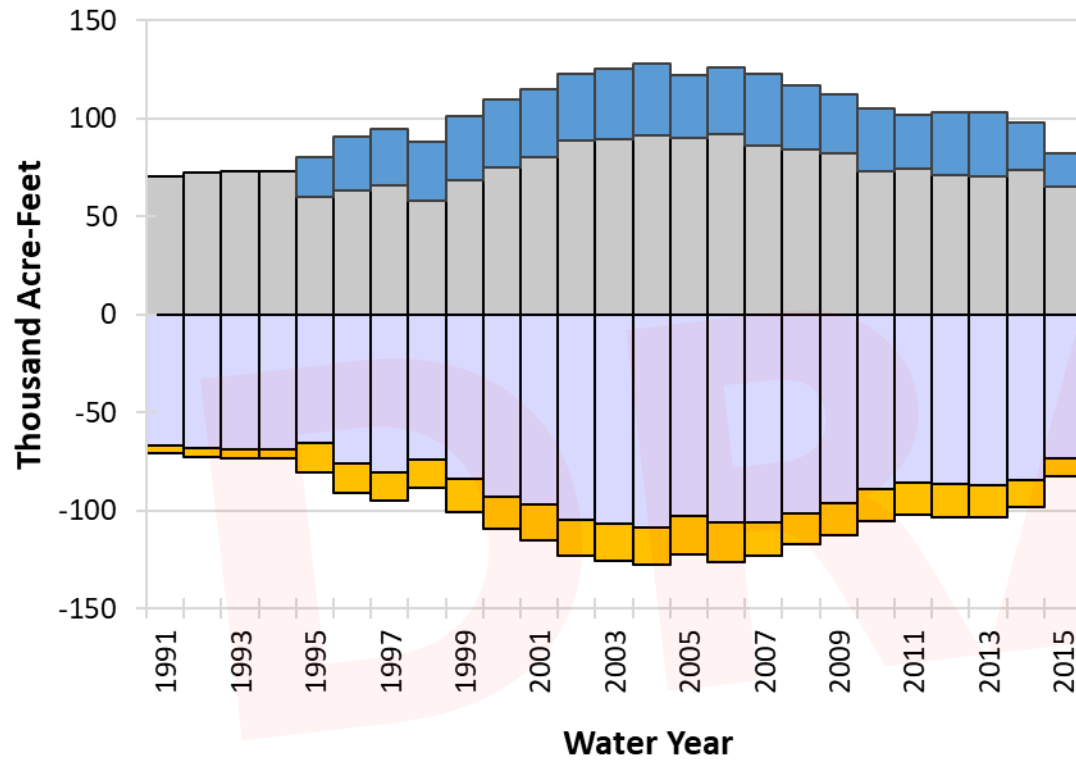
Turlock Subbasin



- Ag. Demand
- Ag. SW Deliveries
- Ag. Pumping
- Ag. Shortage(+)/ Surplus (-)

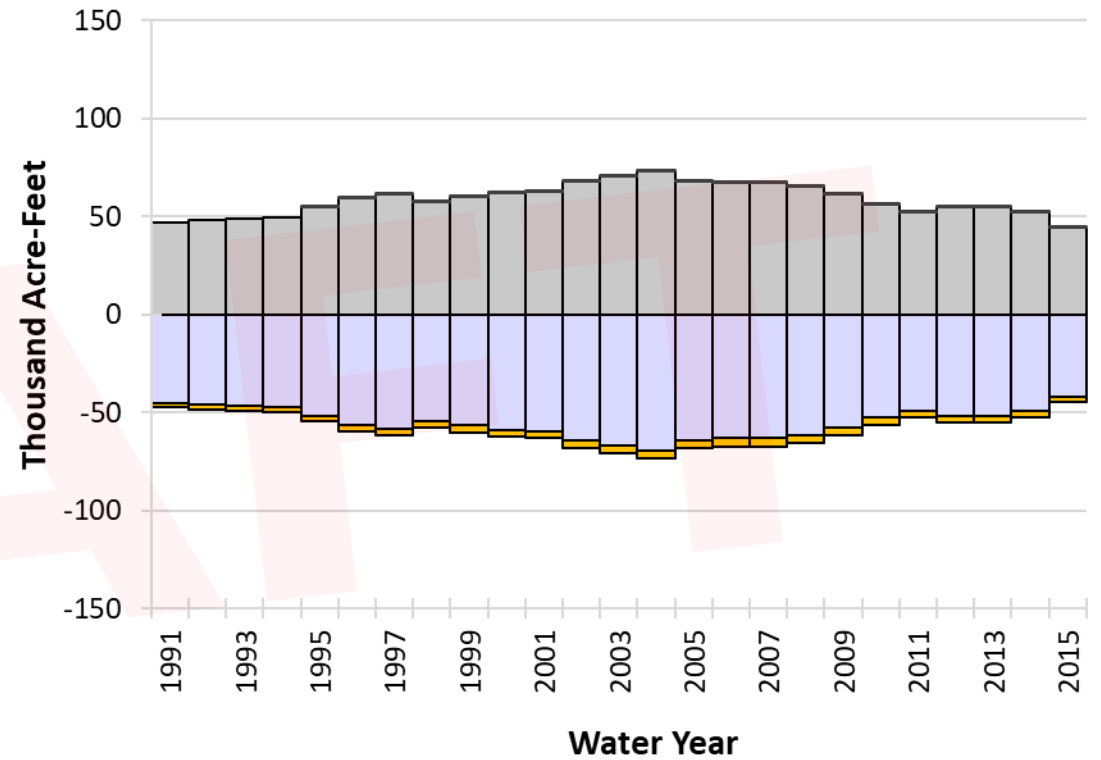
LAND & WATER USE BUDGET: URBAN

Modesto Subbasin



- Urban Demand
- Urban Pumping
- Urban SW Deliveries
- Urban Shortage(+)/ Surplus (-)

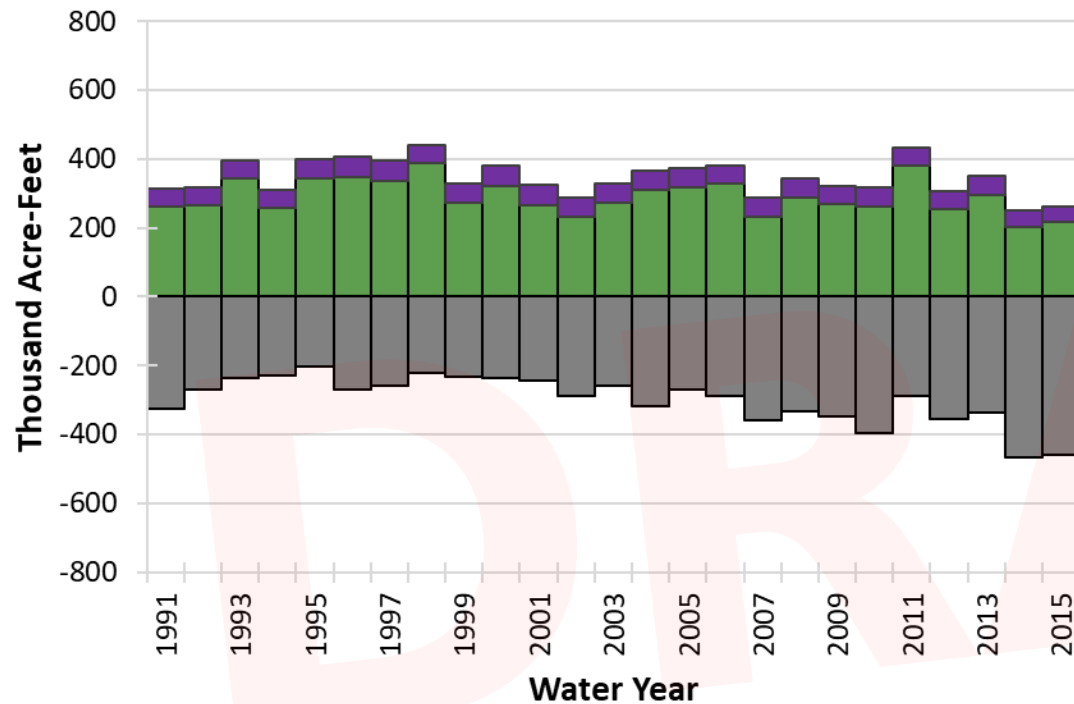
Turlock Subbasin



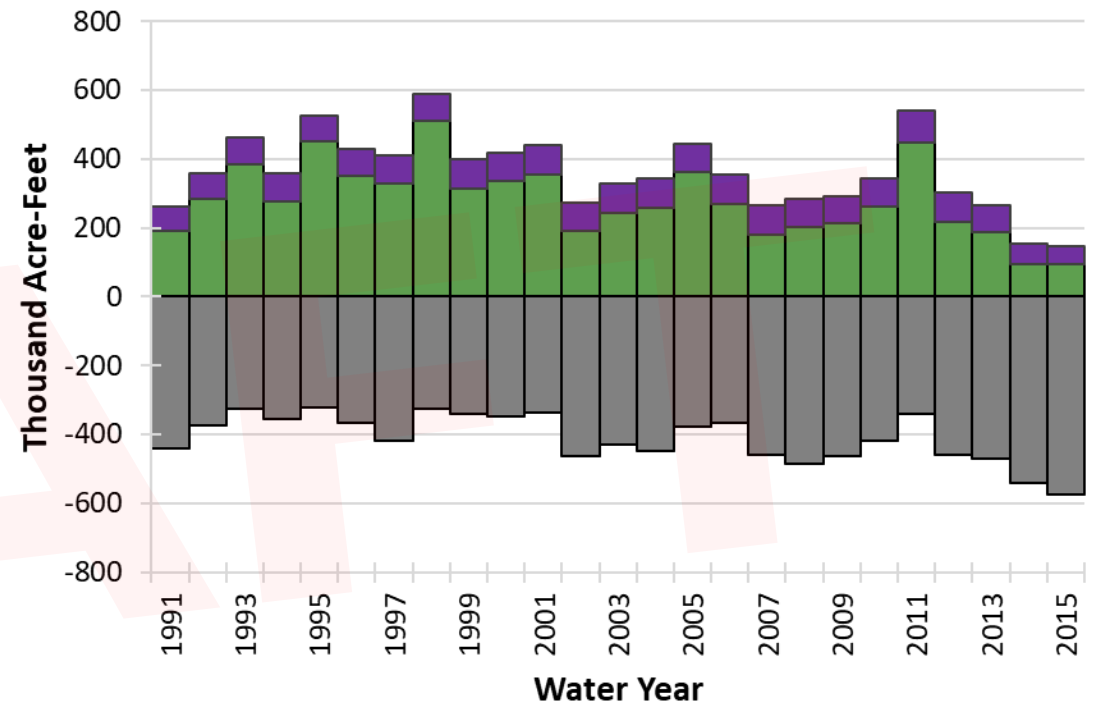
- Urban Demand
- Urban Pumping
- Urban SW Deliveries
- Urban Shortage(+)/ Surplus (-)

RECHARGE/EXTRACTION

Modesto Subbasin



Turlock Subbasin

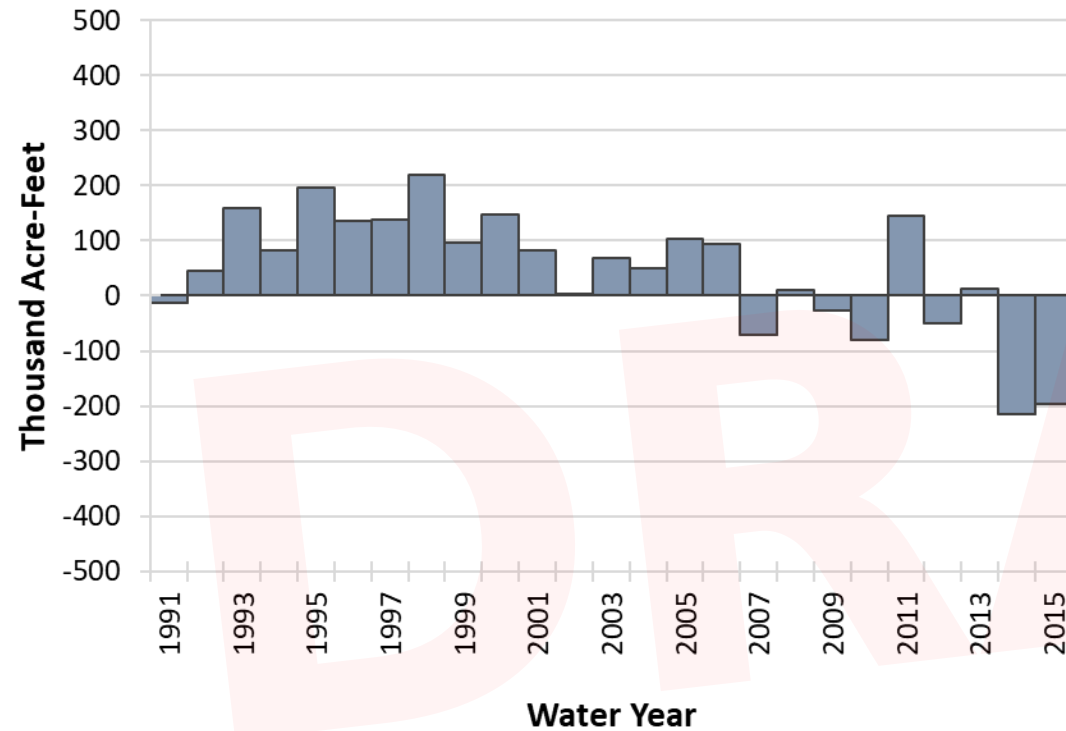


Groundwater Pumping
 Deep Percolation
 Canal and Reservoir Recharge

Groundwater Pumping
 Deep Percolation
 Canal and Reservoir Recharge

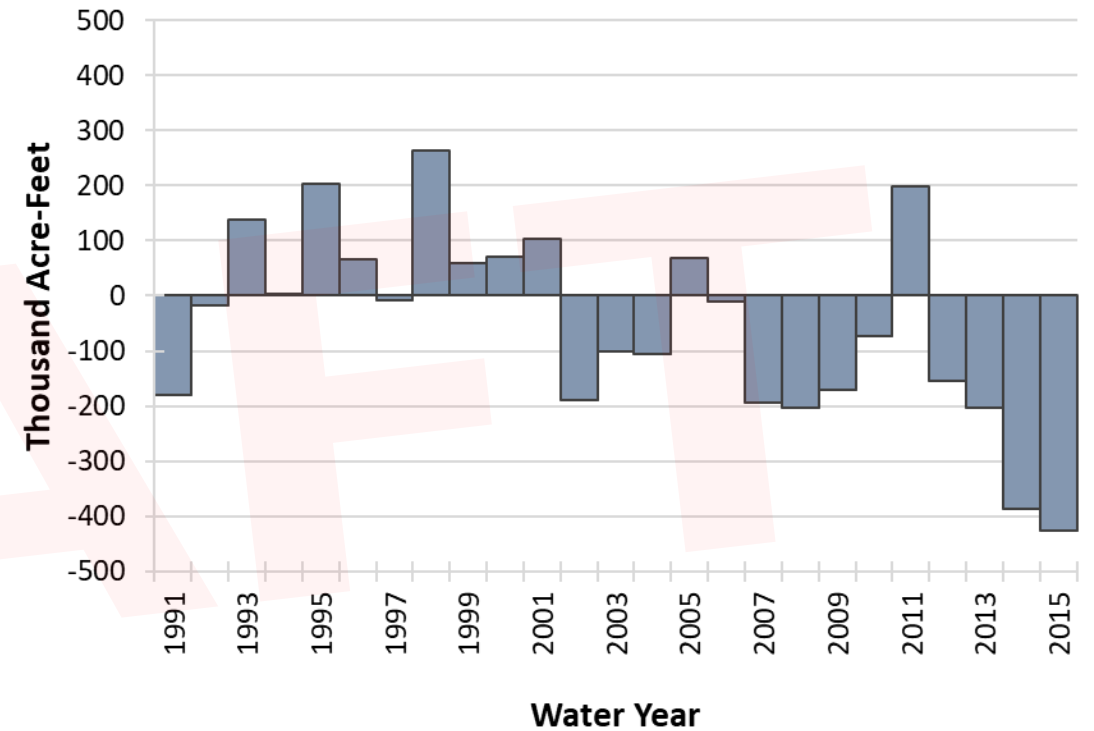
NET RECHARGE

Modesto Subbasin



■ Net Recharge

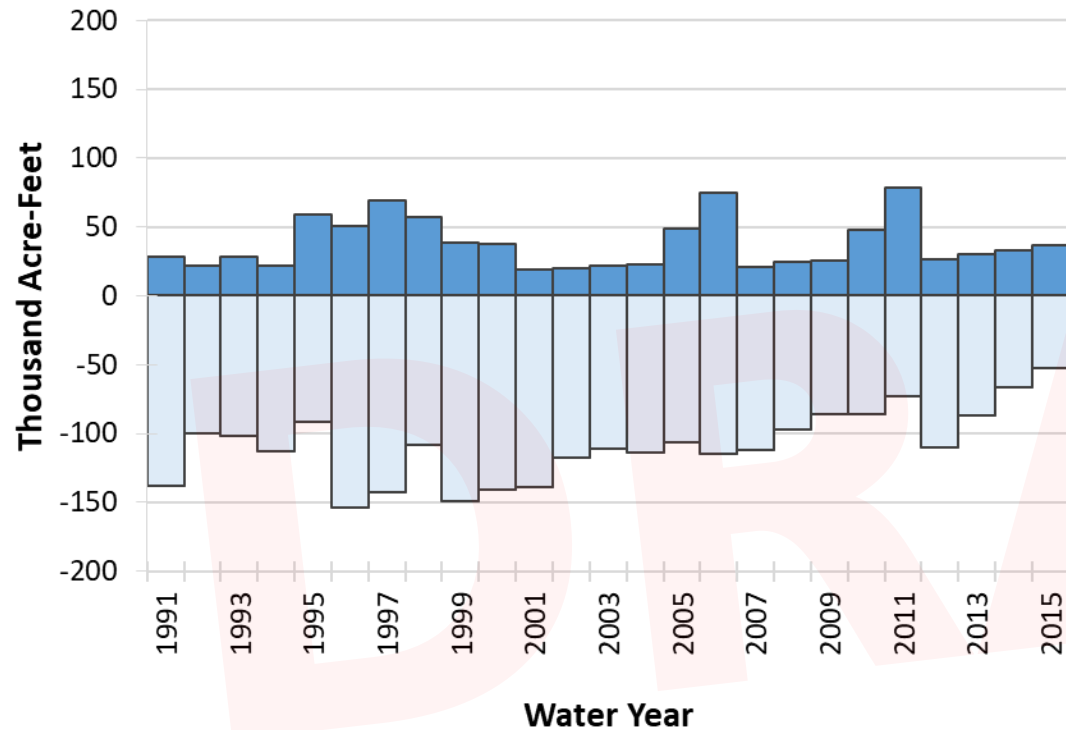
Turlock Subbasin



■ Net Recharge

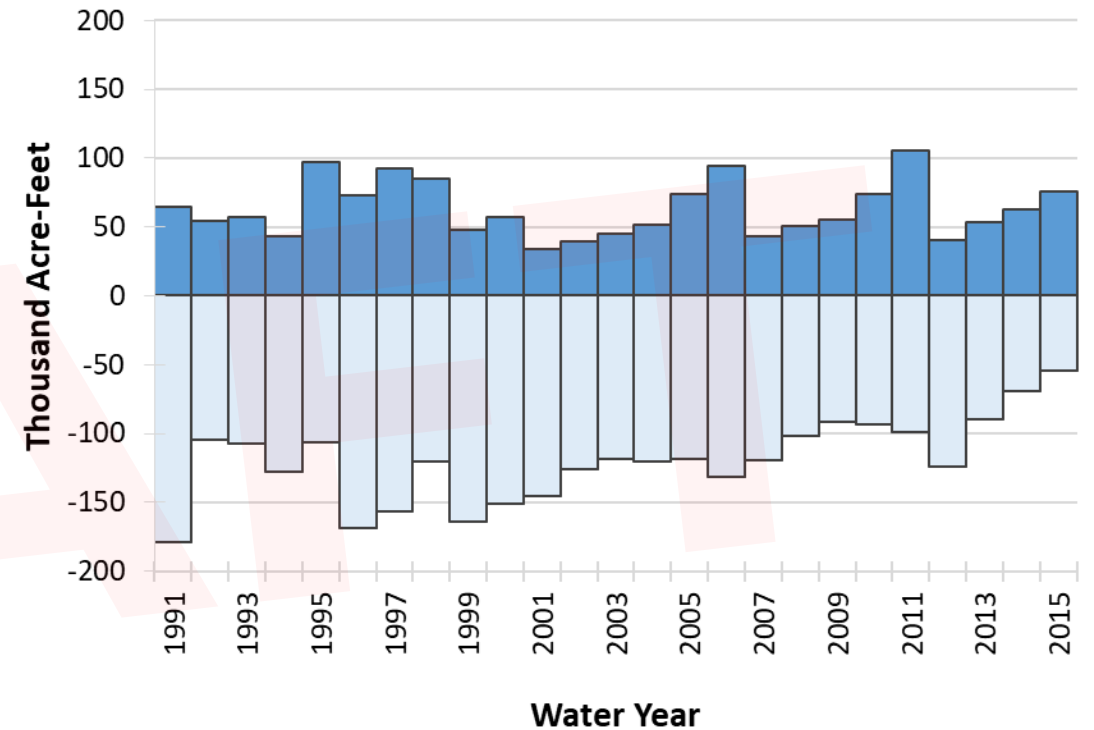
STREAM-GROUNDWATER INTERACTION

Modesto Subbasin



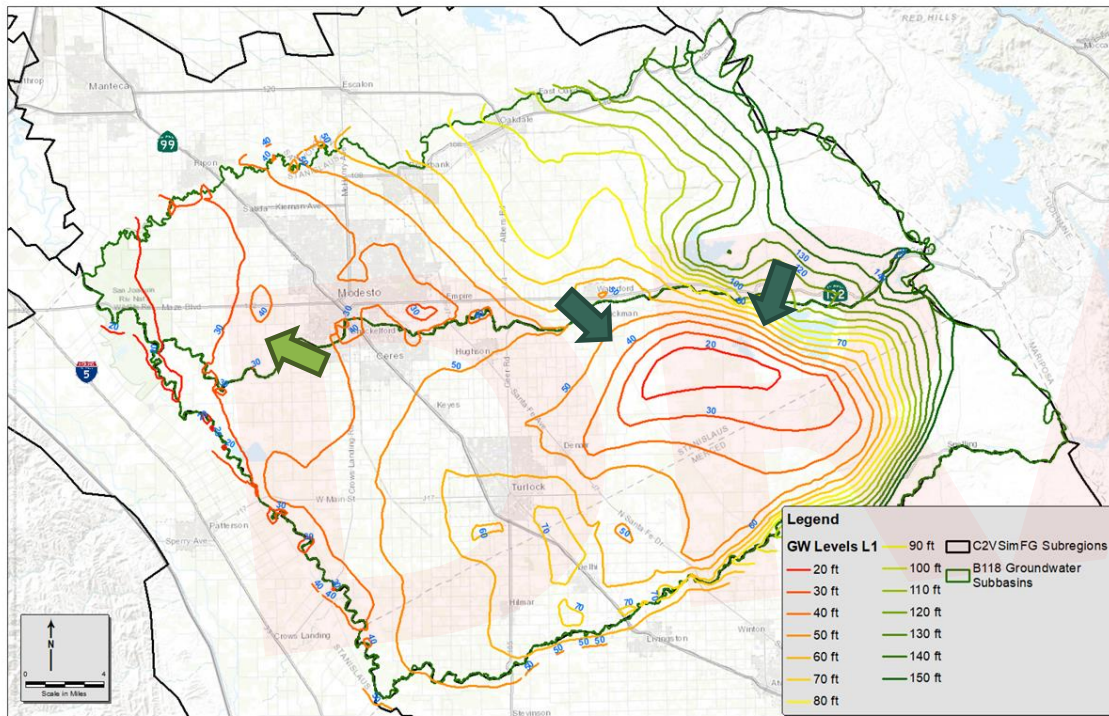
Losses to Stream Gain from Stream

Turlock Subbasin

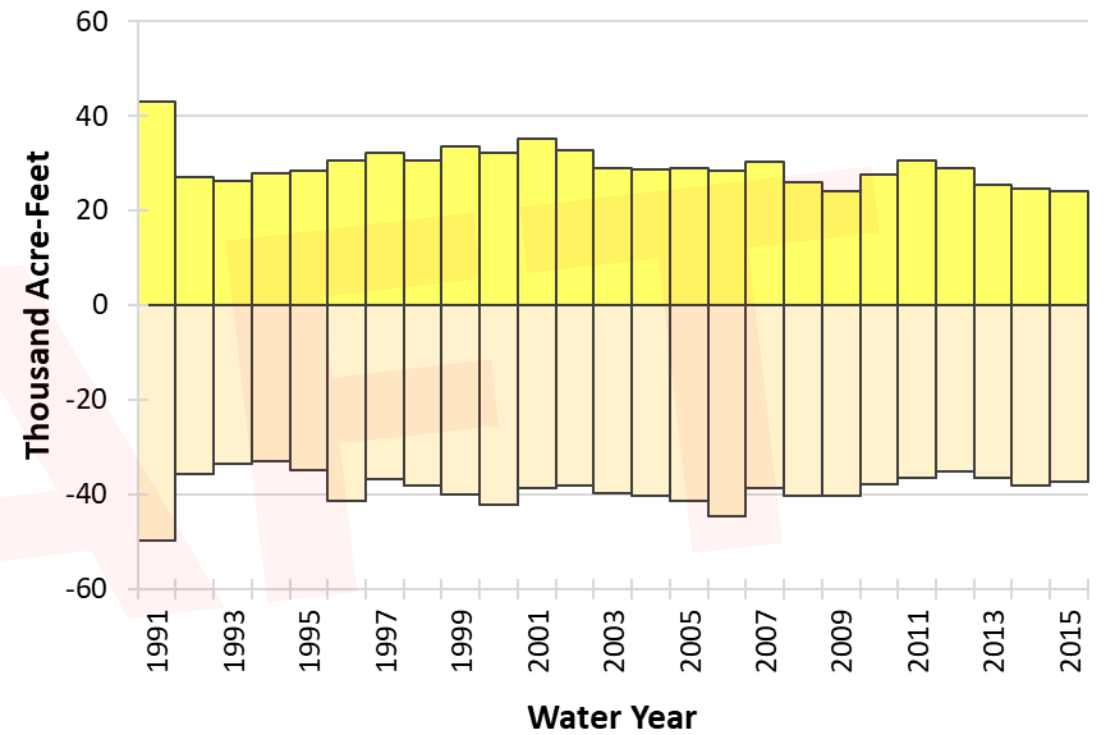


Losses to Stream Gain from Stream

INTER-SUBBASIN FLOW



Note: Figure depicts shallow aquifer system, similar trends observed in deeper aquifer

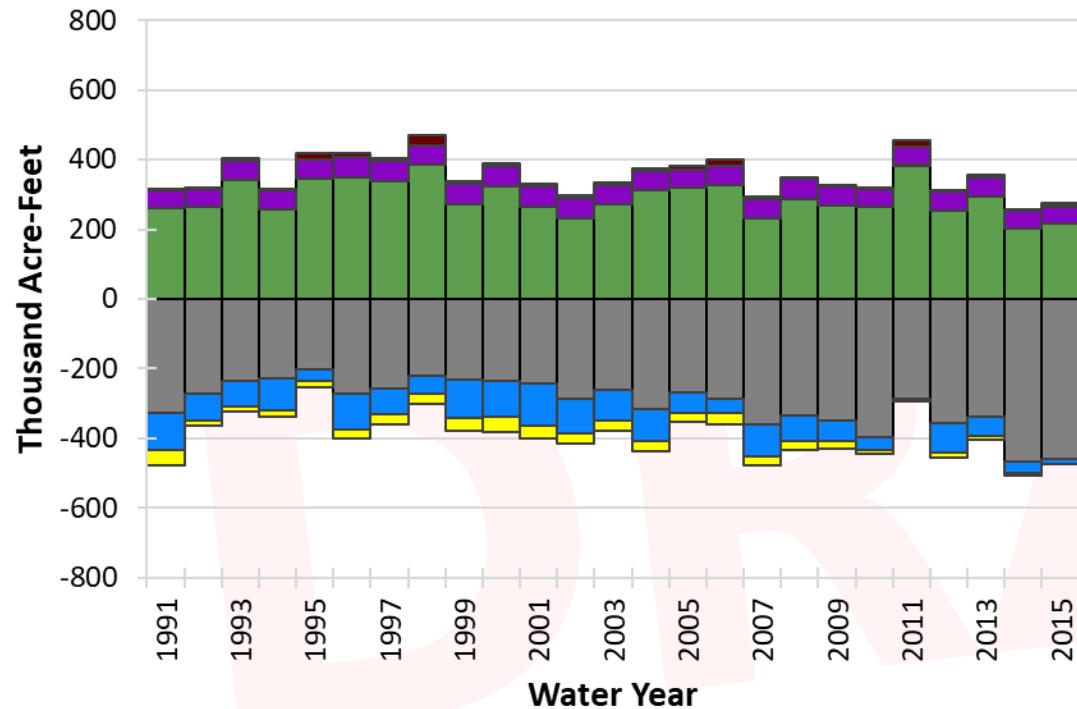


■ Subsurface Flow from Turlock to Modesto

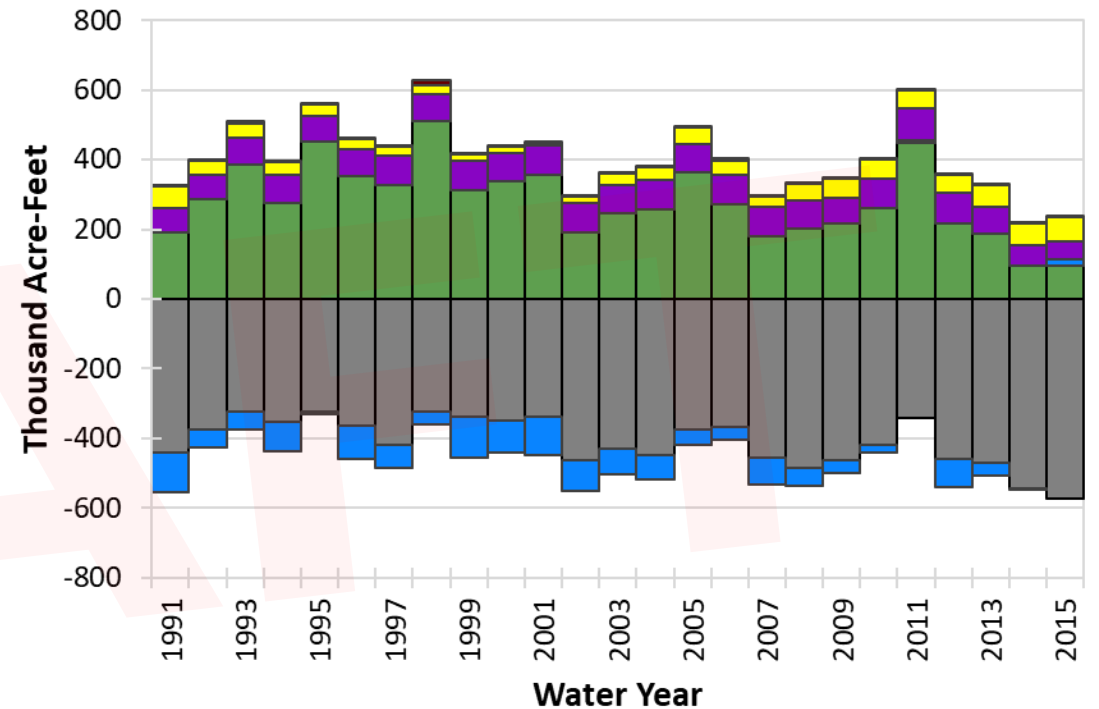
■ Subsurface Flow from Modesto to Turlock

GROUNDWATER BUDGET

Modesto Subbasin



Turlock Subbasin



- Inflow from Foothills
- Canal and Reservoir Recharge
- Deep Percolation
- Subsurface Flow from Adjacent Areas
- Stream/Aquifer Interaction
- Groundwater Pumping

- Inflow from Foothills
- Canal and Reservoir Recharge
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QUESTIONS?

