

An Update on the Calibration of United's Groundwater Flow Model and Next Steps

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Model Expansion

Extend the numerical groundwater flow model into Santa Paula, Fillmore and Piru Basins

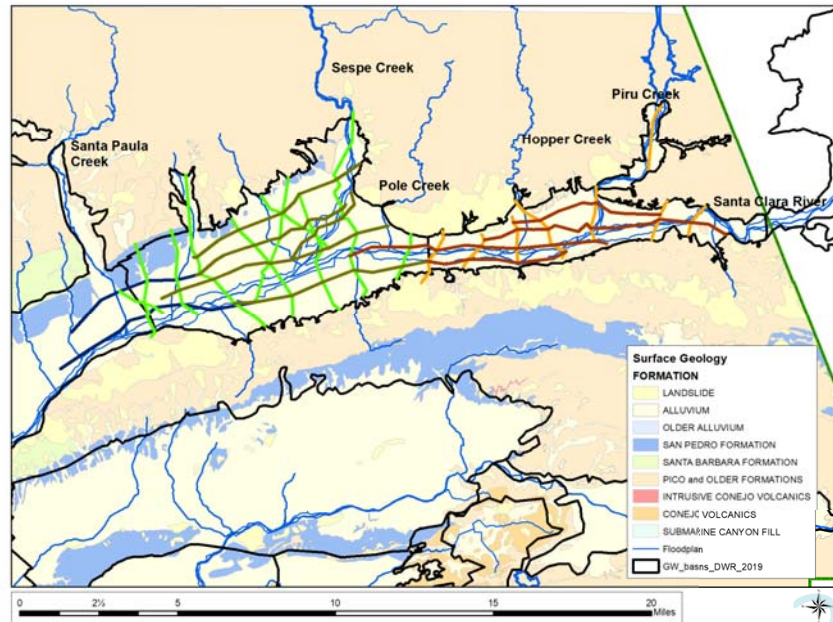
The model was extended in Mound basin to the DWR basin boundary

Now simulating surface water/groundwater interactions



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Section lines in the Piru and Fillmore basins

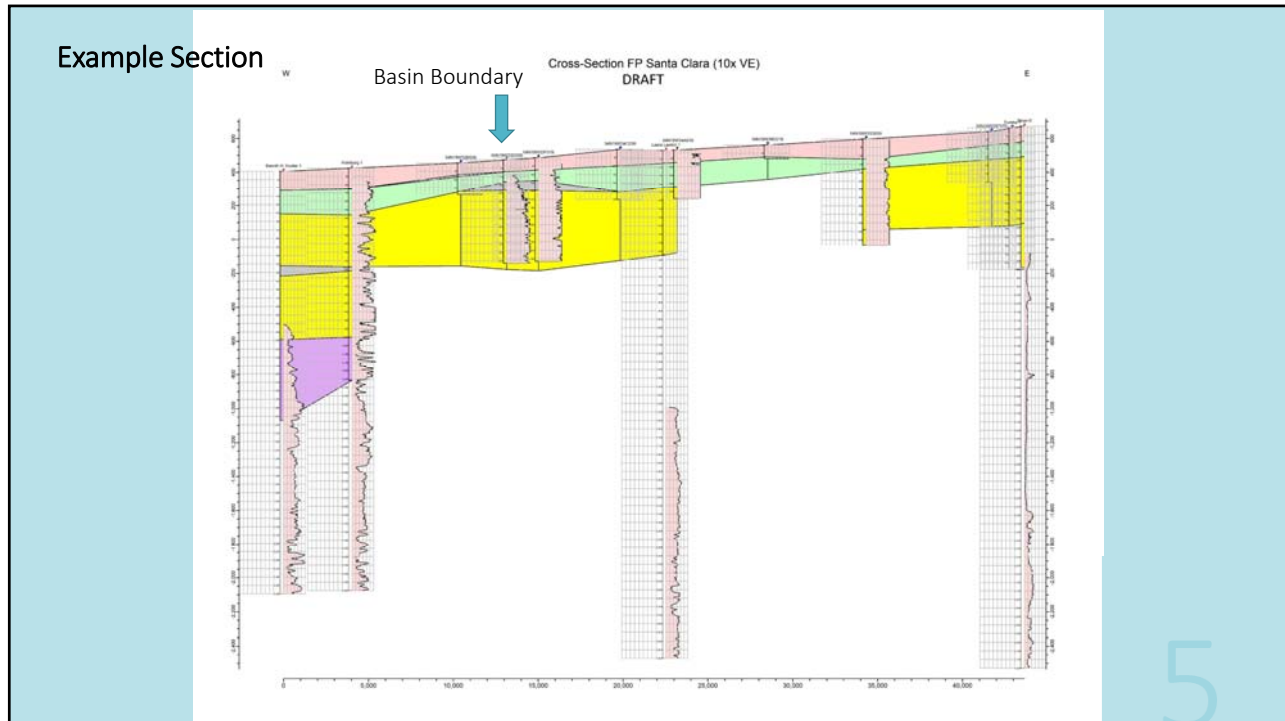


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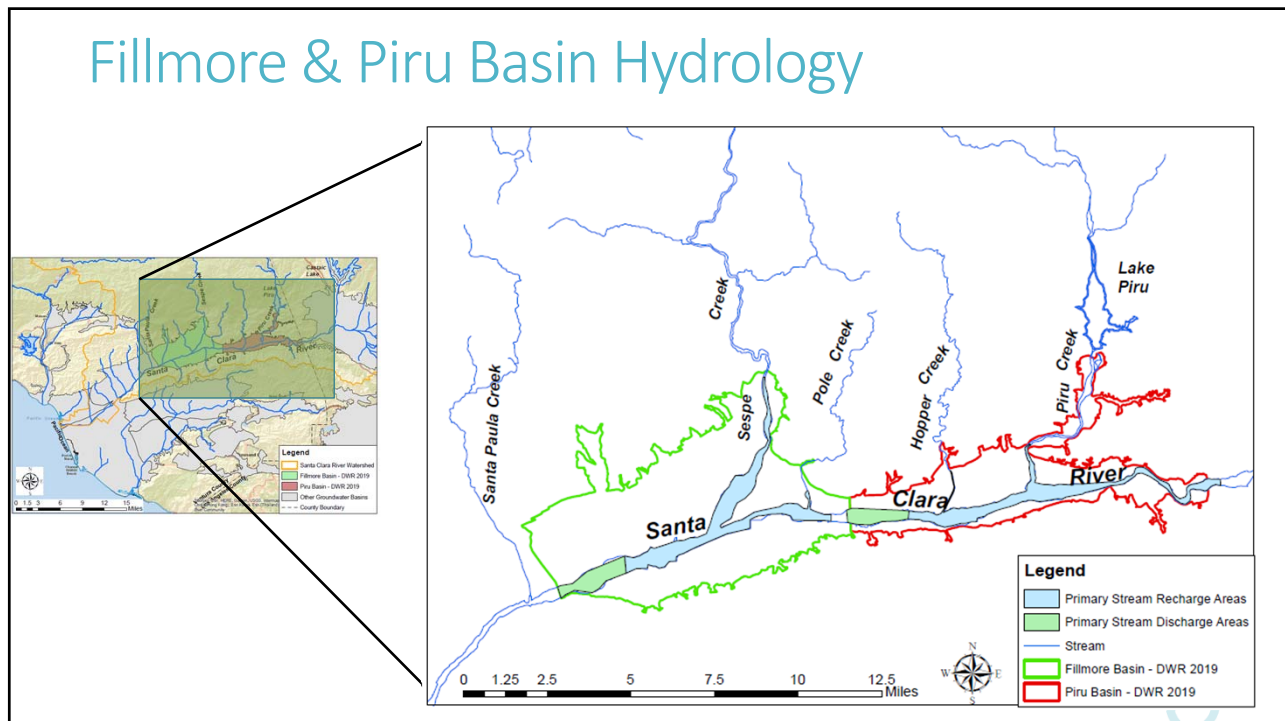
Mapping of hydrostratigraphic units (aquifers)

Aquifer System	Hydrostratigraphic Unit	Model Layers
A	Surficial Deposits and Colluvium	1
	Aquitard	2
	Recent River Alluvium	3
B	Aquitard	4
	Older Alluvium	5
	Aquitard	6
C	Upper Saugus	7
	Aquitard	8
	Lower Saugus	9
	Undifferentiated Sedimentary Deposits	10

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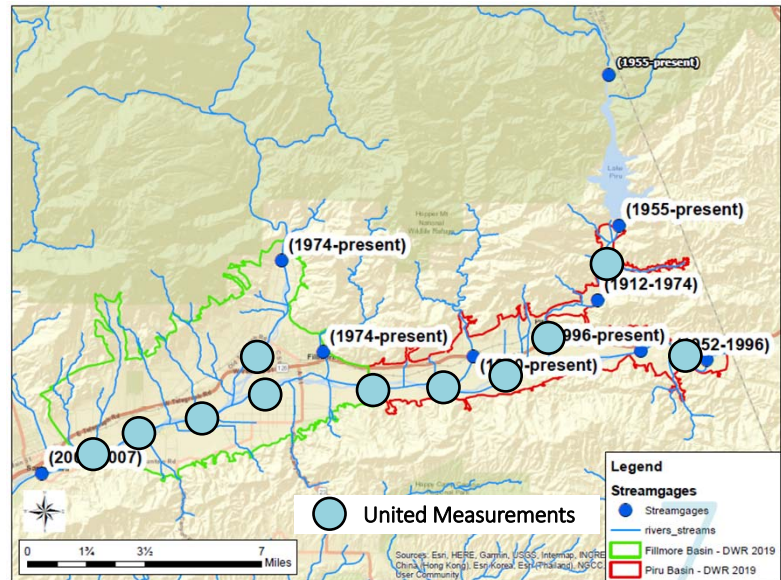
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Model Development - Streamflow

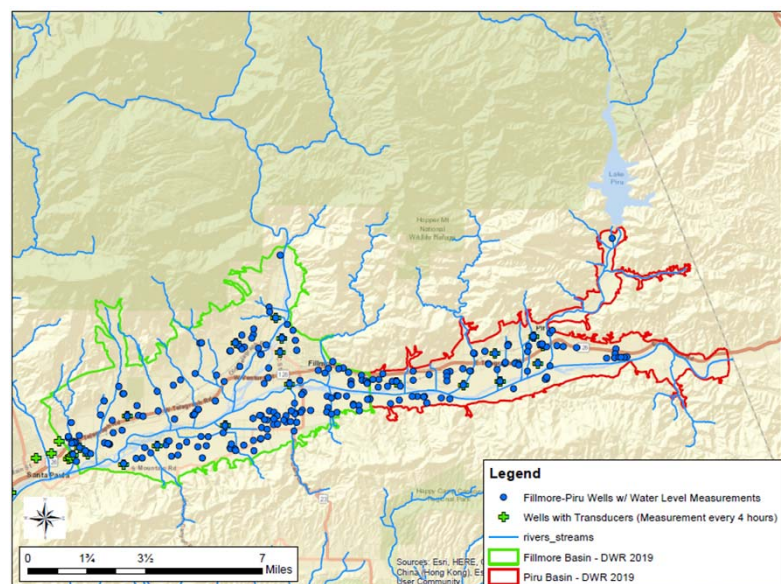
Streamflow gaging sites
 Percolation rates within
 stream channel
 United hand measurements
 500 + along Santa Clara
 River and tributaries
 Majority 1999 - present



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Model Development – Groundwater Levels

Water Level Elevations
 Single measurements
 254 wells
 23,000+ records



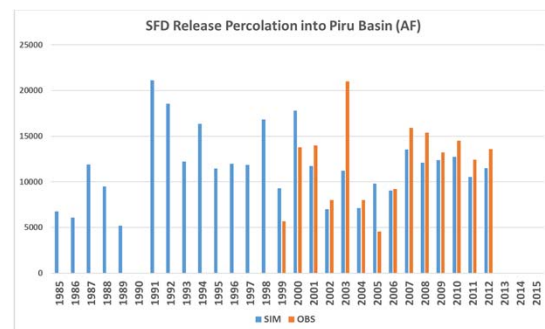
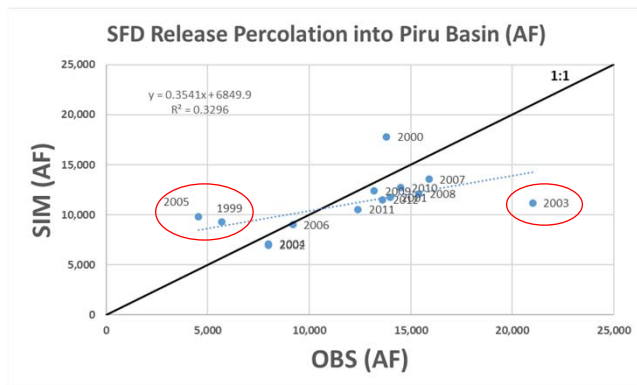
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Percolation of Streamflow

- Very important for model calibration
- Monthly “stress periods” for recharge and pumping
- Using STR package, started with SFR
- Storm flows vs. conservation releases
 - *Conservation releases well documented, relatively constant*
 - *For flashy storm flows, monthly average flow results in too much channel recharge*
 - *Algorithm designed to adjust channel widths and timing of high flows*
 - Stream bed conductivity = default conductivity * HHK_Factor
 - Stream channel width = default width * Width_Factor

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Releases – Percolation to Piru Basin

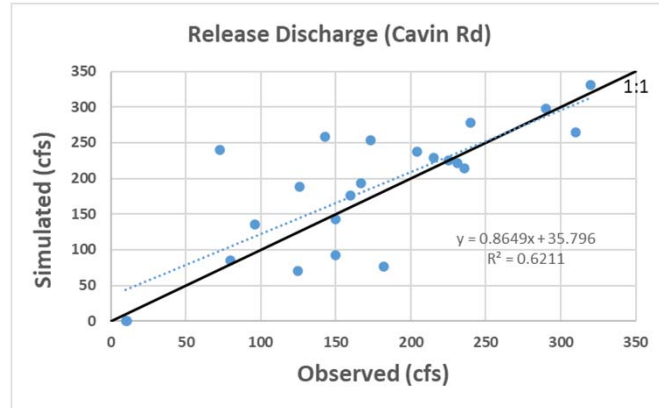


Model best captures releases with medium percolation to Piru
Low/high extremes are over/under predicted

DRAFT RESULTS

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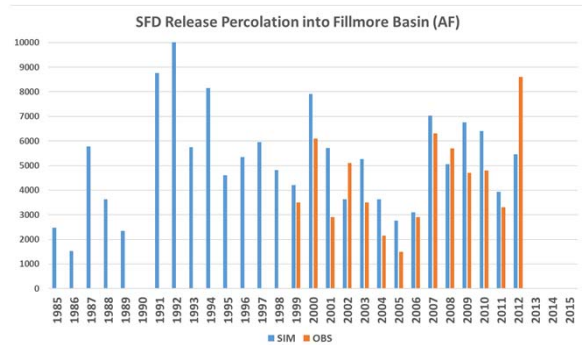
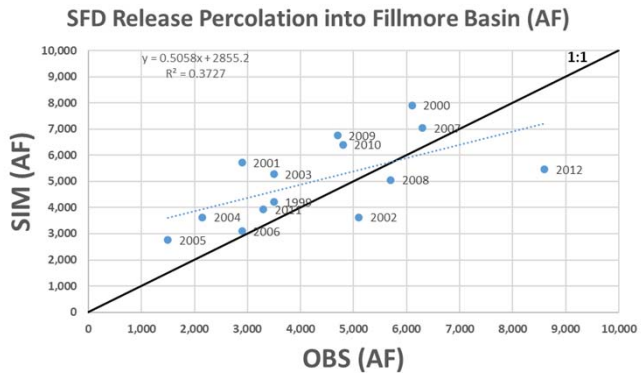
Release – Piru basin streamflow



DRAFT RESULTS

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Releases – Fillmore

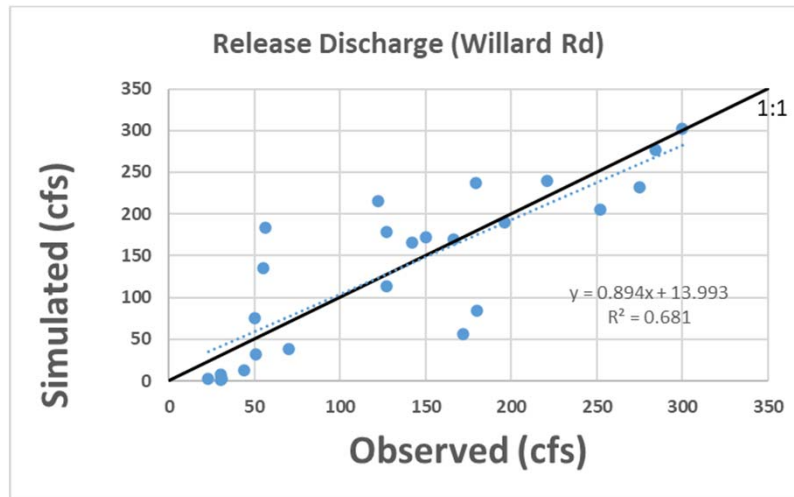


- Generally good calibration of percolation to Fillmore during release
- Year with largest recharge under predicted (2012)

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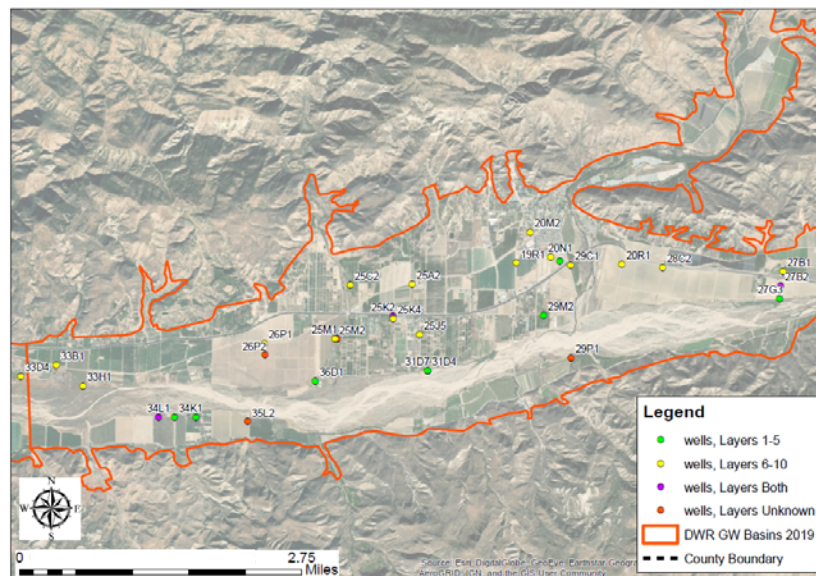
Release – Fillmore basin boundary streamflow



DRAFT RESULTS

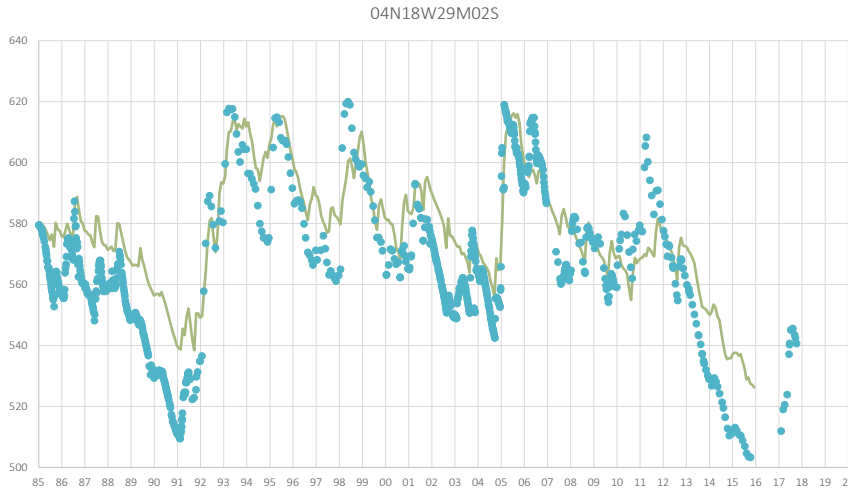
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Piru Basin Primary Calibration Well Locations



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Piru Basin Key Well

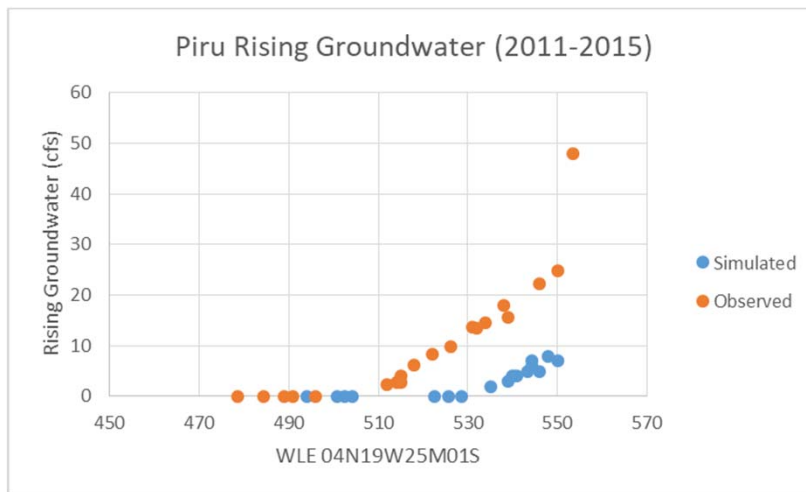


Patterns captured well
 Drought decline should be steeper
 Winter storms should increase more

DRAFT RESULTS

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Piru Gaining Reach

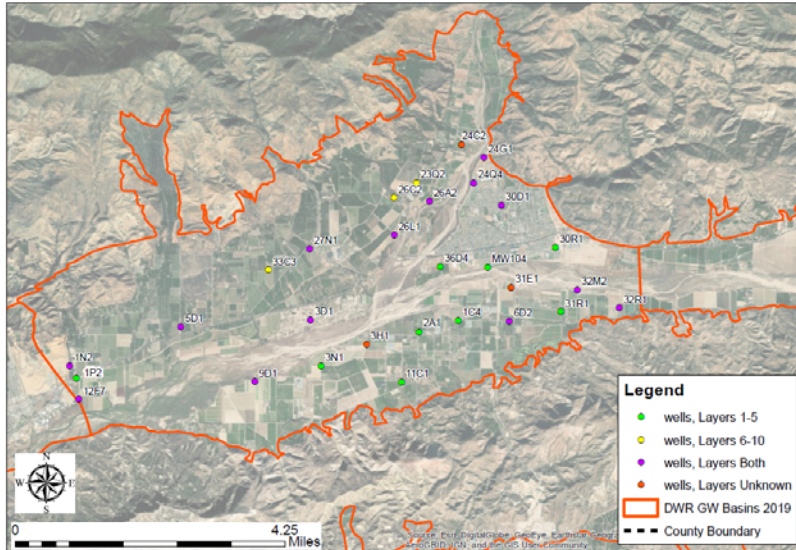


Rising groundwater flow under predicted
 Implications for GDE
 Streambed elevations very important

DRAFT RESULTS

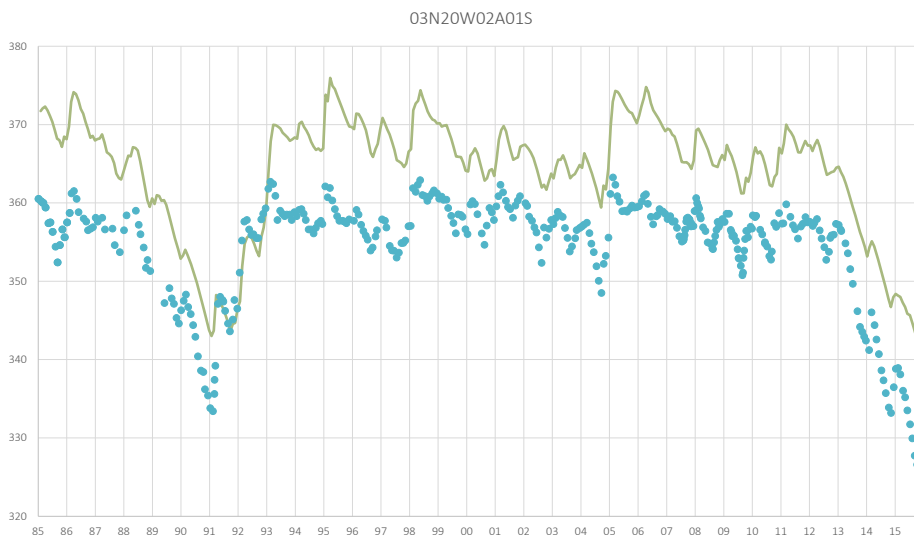
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Fillmore Basin Primary Calibration Well Locations



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Fillmore Basin Key Well



Simulates basin response well
Consistently overpredicts groundwater elevation

DRAFT RESULTS

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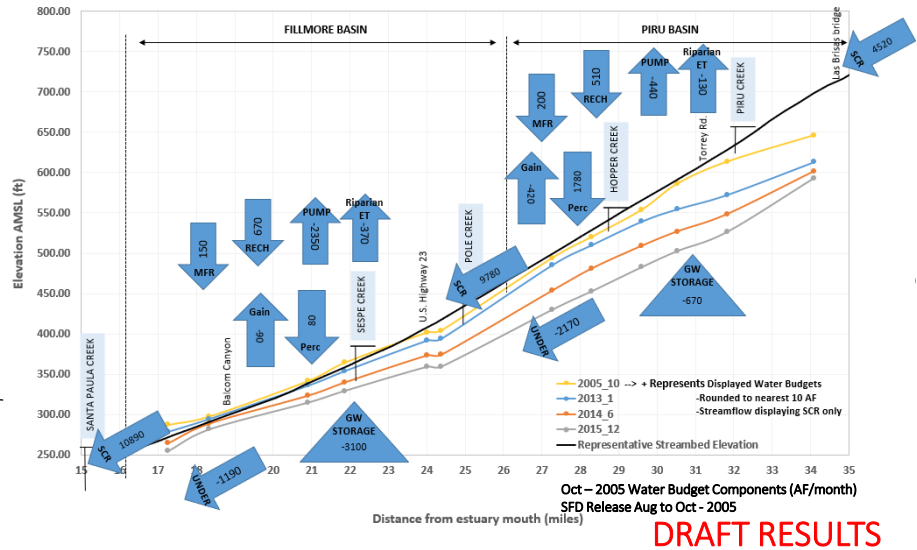
Preliminary Water Levels and Water Budgets

Transect of estimated water levels along Santa Clara River corridor

Oct-2005
(wet year, fall release)

2013-2015 snapshots
(capture draining basins)

Estimated monthly water budget components (AF/month)



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Continuing to work on model calibrations

- Streambed elevations not constant over time, important near boundaries where depth to water is shallow
- Still incorporating some information on releases from Castaic Lake
- When satisfied with channel infiltration, more attention to aquifer properties to improve simulated groundwater elevations

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Still to come, summer and fall 2020

- When model is calibrated for 1985-2015 base period, a validation analysis will be performed
- Validation period of 2016-2019 will be used for the entire model domain (including the Oxnard coastal plain)
- Opportunity for recalibration, as needed
- A sensitivity analysis will be performed for the new 35-year base period

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Future Predictions

- Model calibration is based on based past events (recorded measurements of streamflow, pumping, water levels, etc.)
- Future predictions rely on imagined future climate conditions and basin operations (pumping patterns, reservoir releases, projects, etc.)
- Model runs for varied but plausible future conditions used to assess specific sustainability criteria (groundwater elevations, change in storage)
- Coordination with upstream and downstream basins is recommended

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Questions?