Fillmore and Piru Basins Groundwater Sustainability Agency

FPBGSA Stakeholder Workshop Groundwater Model Overview

Senior Groundwater Modeler
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June 25, 2020

United Water CONSERVATION DISTRICT

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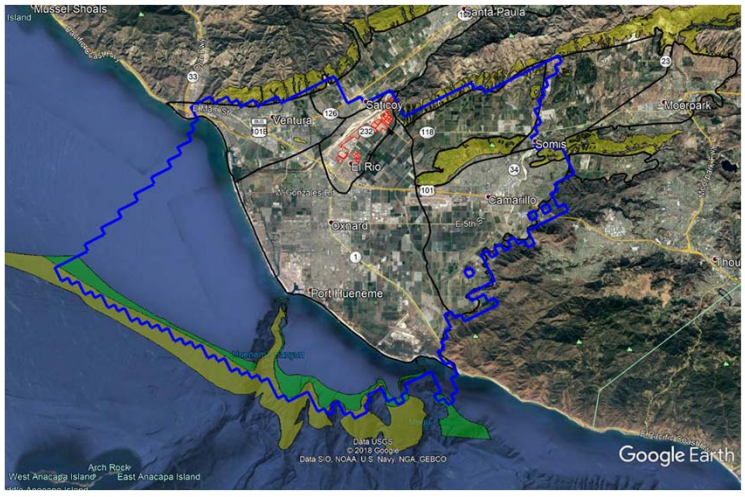
The UWCD Groundwater Model in 2018

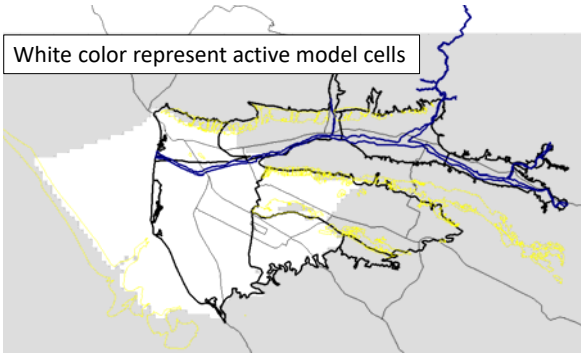


- Started in 2013 for UWCD groundwater management
- After SGMA was passed in 2014, the UWCD Model was considered an ideal tool to support local GSAs
- UWCD released the GW model in 2018 and was used to simulate FCGMA's GSPs
- The 2018 model domain is shown in **BLUE**.

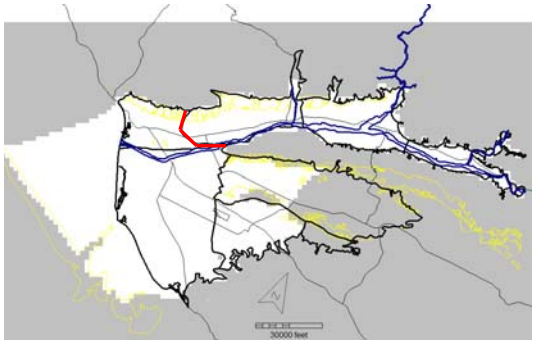
2

Model Expansion

- The 2018 GW model is expanded into **Santa Paula, Fillmore and Piru** Basins
- The 2018 GW model also extends in **Mound** basin to the DWR basin boundary
- The geology changes from Forebay to Santa Paula along Country Club Fault and Oak Ridge Fault (in RED line)



2018



2020

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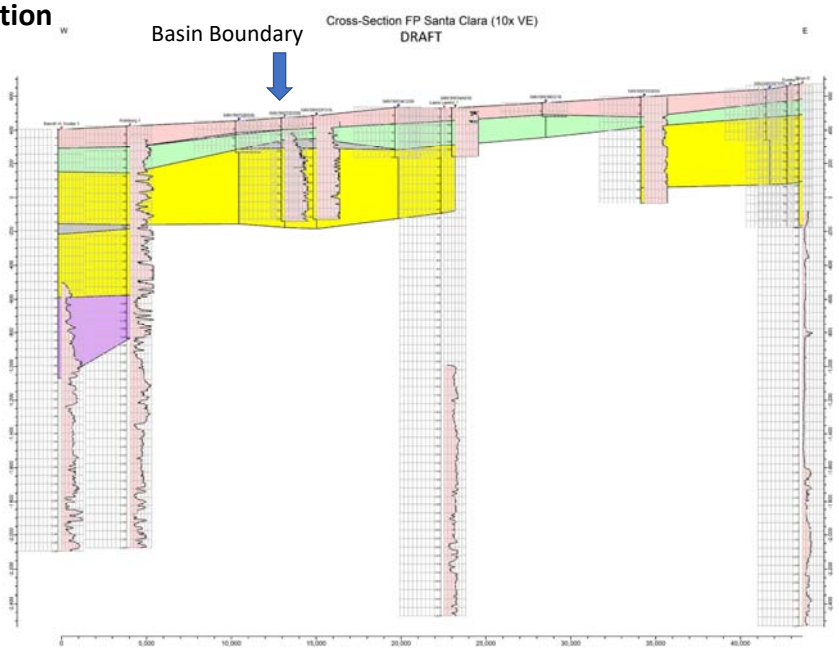
Example Section



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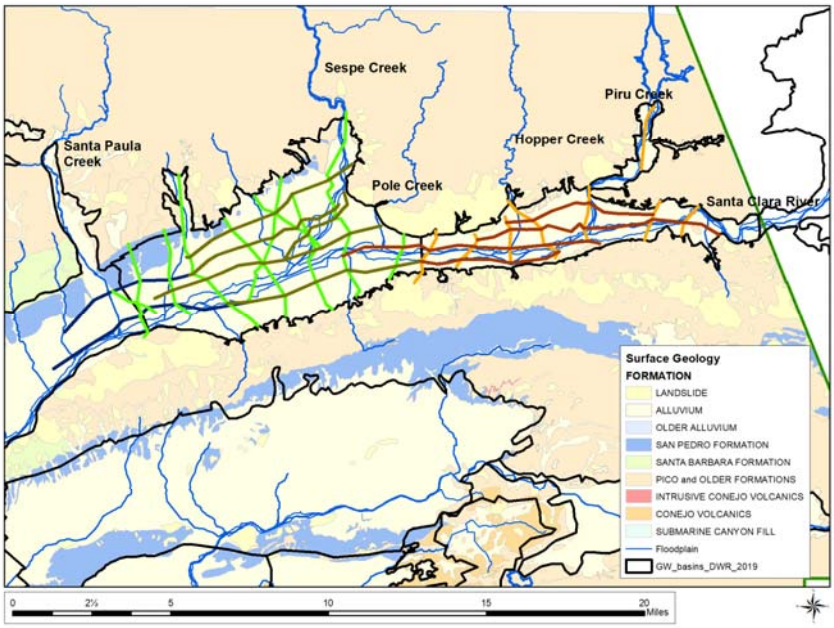
Section lines in the Piru and Fillmore basins



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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
	Upper Saugus	7
C	Aquitard	8
	Lower Saugus	9
	Undifferentiated Sedimentary Deposits	10

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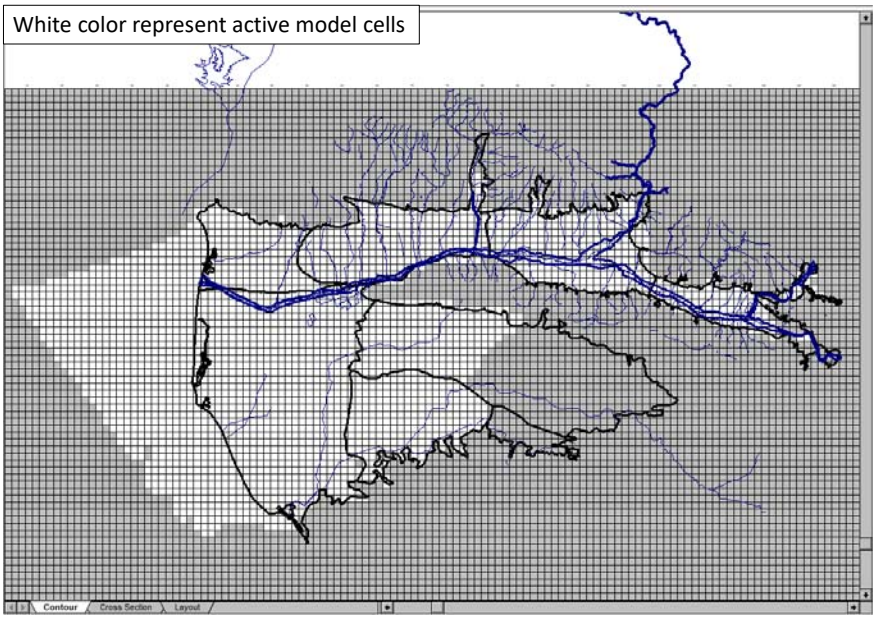
UWCD Groundwater Model

- **MODFLOW-NWT** Version 1.2.0 – a well documented and reviewed software developed by U.S.G.S.
- Grid size: 2000 ft by 2000 ft. The CPU time is about 25 minutes. For finer grids (1000 ft or 500 ft), the CPU time (about 8 or 16 hours) is too long
- Simulation time: 1985 to 2015 with monthly time step
- Pumping: Ag and M&I usages
- Streams: Santa Clara River, Piru Creek, Hopper Creek, Pole Creek, Sespe Creek, Santa Paula Creek, UWCD conservation releases
- Diversions: Various diversions along Santa Clara River, Piru Creek, and Santa Paula Creek
- Surface water: Recharge from precipitation, Ag/M&I usages
- Validation period: 2016 to 2019 (future task)

7

The figure below is for illustration purpose.



- Model rotated 26°
- 26505 active cells
- 384.7 mile^2

Basin	Monitoring Wells	Pumping Wells
All Basins	888	1607
Oxnard Plain + Forebay	442	642
Fillmore	104	363
Piru	51	125

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Why Use the Groundwater Model?

- Available data like water level are points over a vast area. A groundwater model can connect the dots based on good science
- Predict the water level due to
  - Climate changes, future conditions, and rain fall patterns
  - Projects: imported water, conservation releases
  - Management decisions
- Support the analysis of GSPs including
  - Groundwater level at key areas for MT, MO
  - Environmental effects

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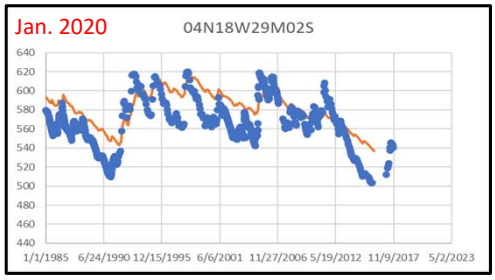
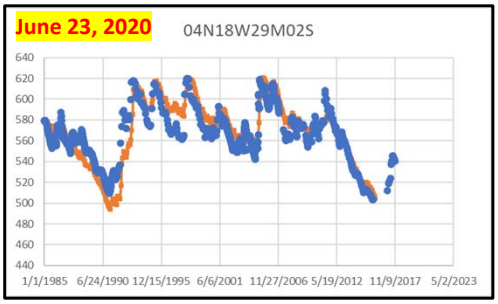
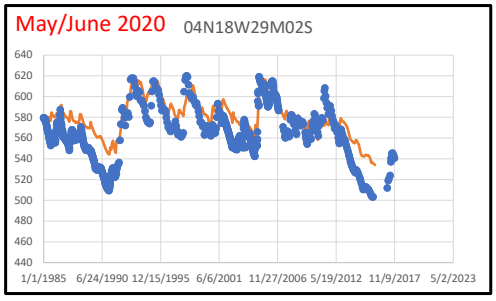
Model Calibration

- The closer the simulated values (in **orange**) are to the data (in **blue**), the better the model.
- Adjust aquifer properties, stream bed properties,… so that the model replicates the data



A sample well in Piru Basin





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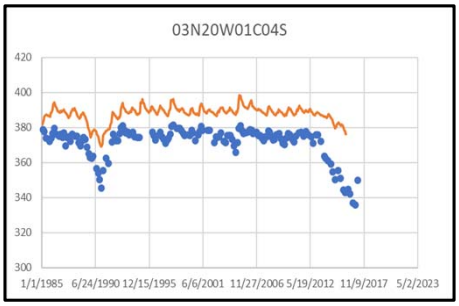
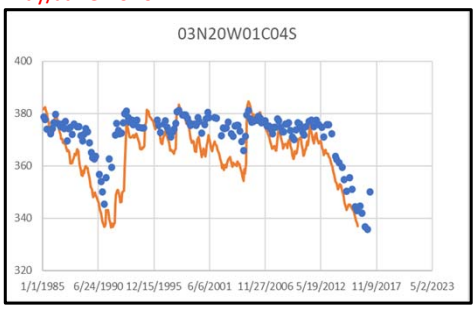
A sample well in Fillmore Basin

Jan. 2020

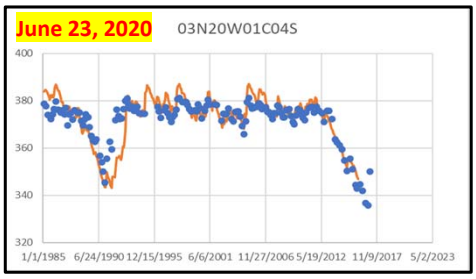


May/June 2020



- Hundreds of wells with hundreds of water level measurements are evaluated in the model calibration
- The GW model can mimic most of the water level data

June 23, 2020



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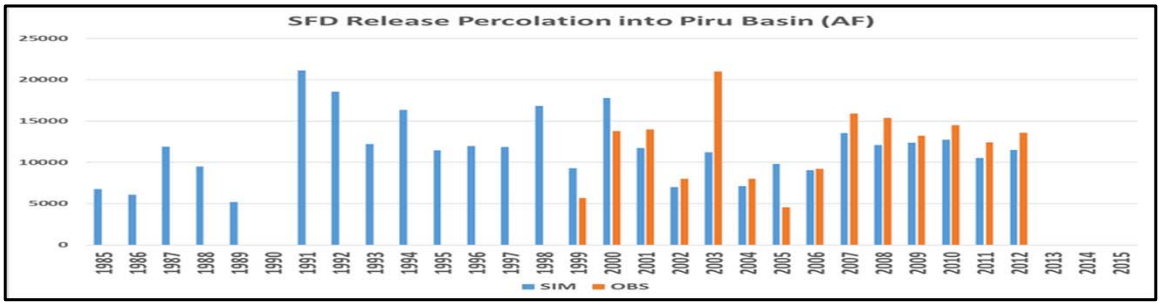
Stream Flow Interactions in Piru Basin

May/ June 2020



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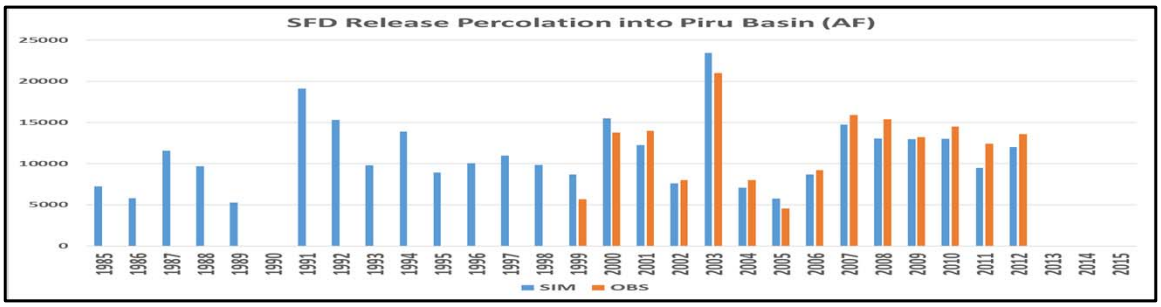

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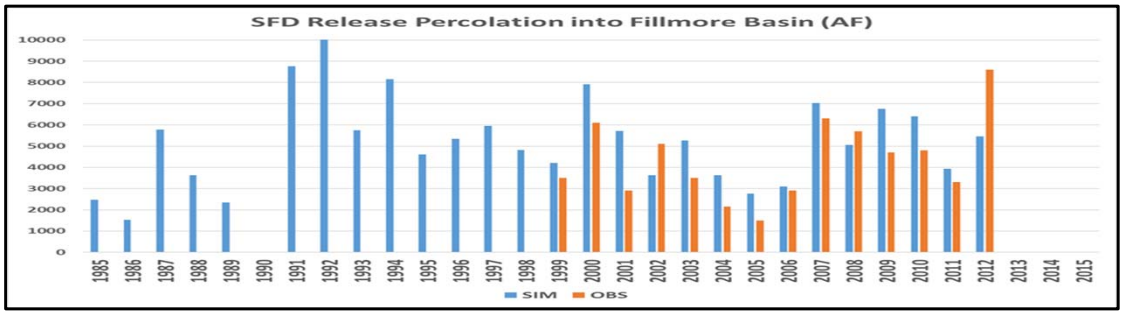
Stream Flow Interactions in Fillmore Basin

May/ June 2020



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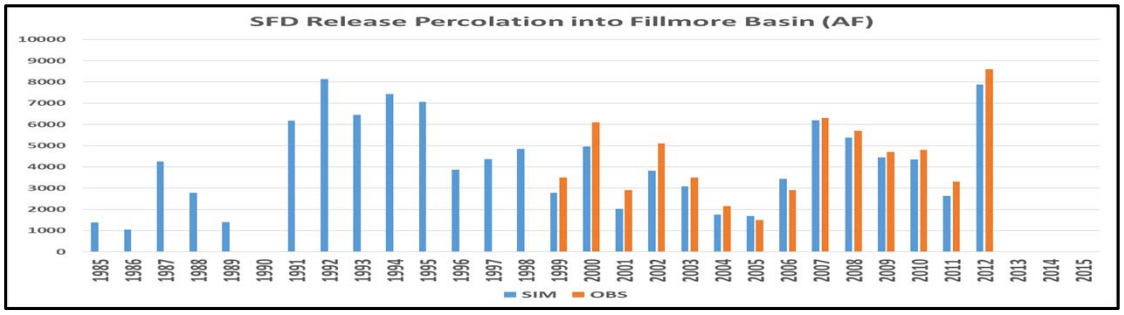

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Model Review

- The 2020 groundwater model has been reviewed by the expert panel (Dr. Sorab Panday, Mr. John Porcello, and Mr. Jim Rumbaugh) on a continuous basis. The same panel had reviewed the 2018 model
- The model is under internal review by surface water hydrologists and hydrogeologists
- UWCD is addressing the review comments and finalizing the 2020 groundwater model

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Questions/Comments

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Fillmore and Piru Basins Groundwater Sustainability Agency

FPBGSA Stakeholder Workshop

Technical Session: Groundwater Model

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United Water Conservation District

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Model Layers

The hydrogeologists completed the mapping of hydrostratigraphic units (aquifers) in 2019

Coastal Basins (Oxnard Basin, PV, Mound, and West LP)

Aquifer System	Hydrostratigraphic Unit	Model Layer
Shallow	Ground Surface to the bottom of Semi-Perched Aquifer	1
UAS	Semi Perched-Oxnard Aquitard	2
	Oxnard Aquifer	3
	Oxnard-Mugu Aquitard	4
	Mugu Aquifer	5
LAS	Mugu-Hueneme Aquitard	6
	Hueneme Aquifer	7
	Hueneme-Fox Canyon Aquitard	8
	Fox Canyon Aquifer - upper	9
	Fox Canyon upper - basal Aquitard	10
	Fox Canyon Aquifer - basal	11
	Santa Barbara and/or other Formation - upper	12
	Grimes Canyon Aquifer	13
Deep	Older sedimentary rocks and Conejo Volcanics	Boundary

River Basins (Santa Paula, Fillmore, and Piru)

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

Fox Canyon Aquifer and Grimes do not extend into the River basins (Santa Paula, Fimmore and Piru)

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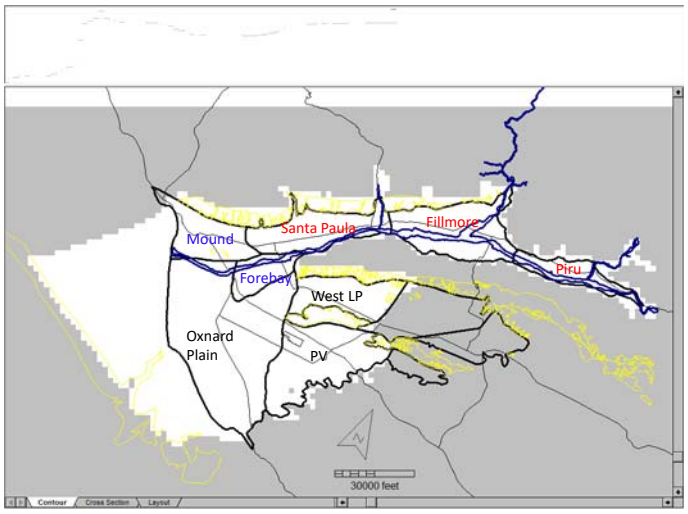
Model Calibration

- Forebay, Mound, Oxnard Plain, PV, and West LP were calibrated in the 2018 UWCD Model
- Piru, Fillmore, and Santa Paula basins are new
- The interaction between surface water and groundwater is critical for model calibration



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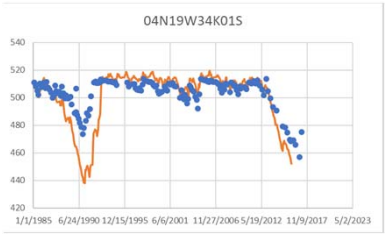
Piru Basin

- The residuals are acceptable
- The interaction between groundwater and Santa Clara River is critical



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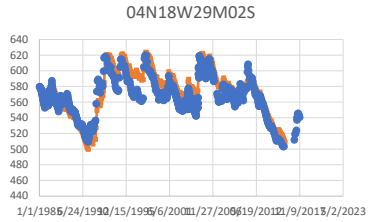

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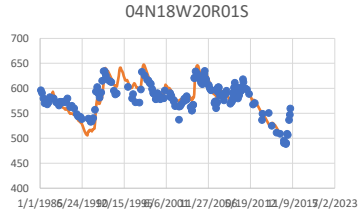

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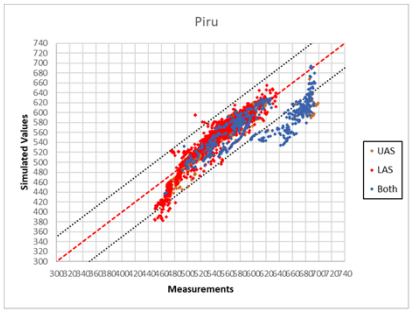
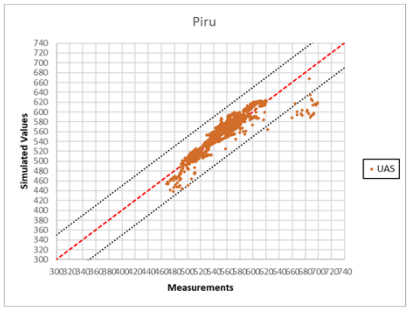
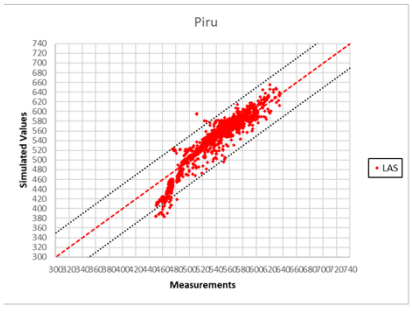
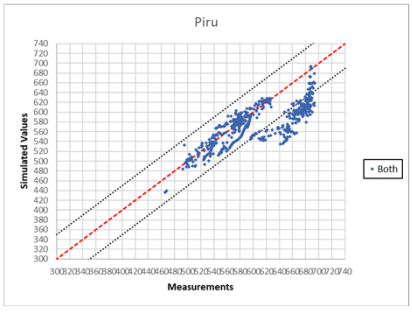
Scatter Plot for Piru Basin









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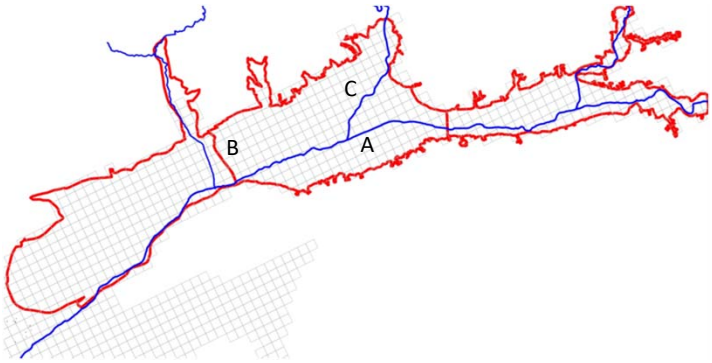
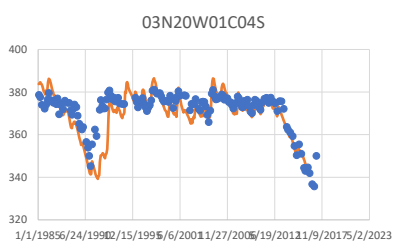
Fillmore Basin

- The residuals are acceptable in the shallower layers
- There are a limited number wells in the deep layers. The calibration may need improvement





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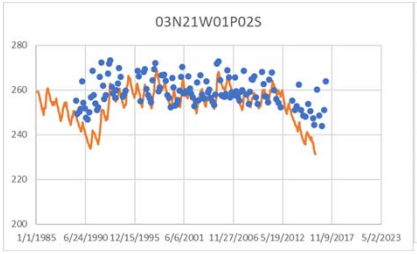

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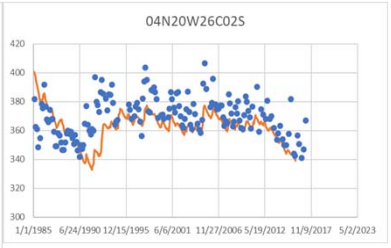

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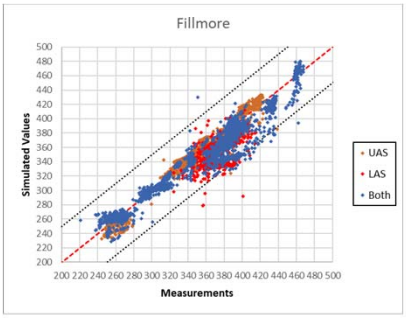
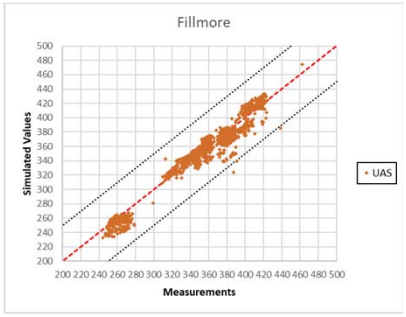
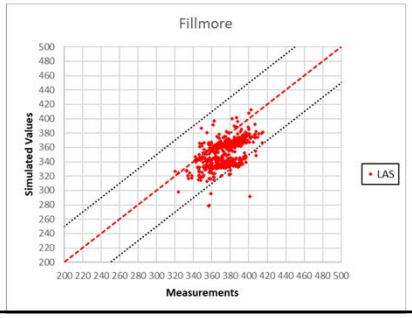
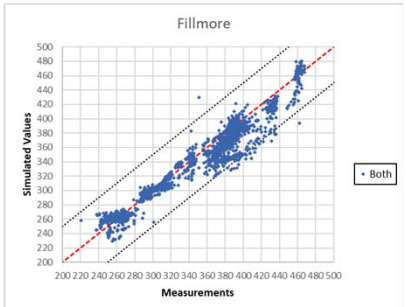
Scatter Plot for Fillmore Basin









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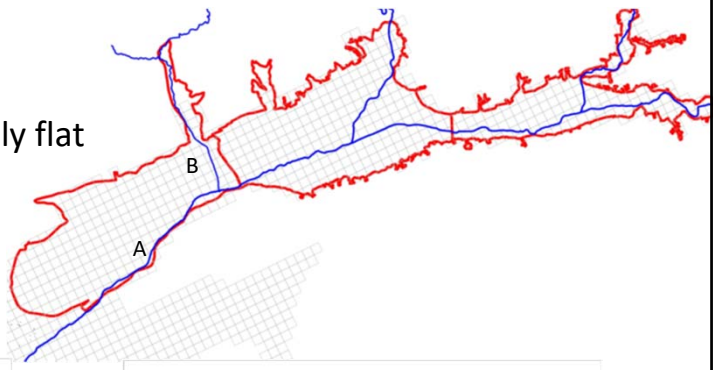
Santa Paula Basin

- The water level data is generally flat
- The residuals are accetpable



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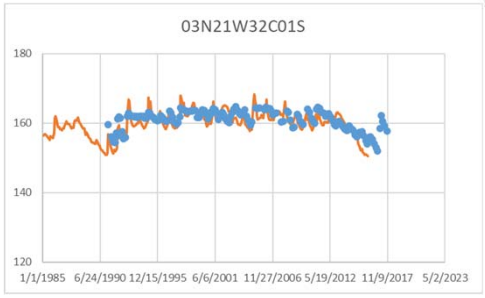

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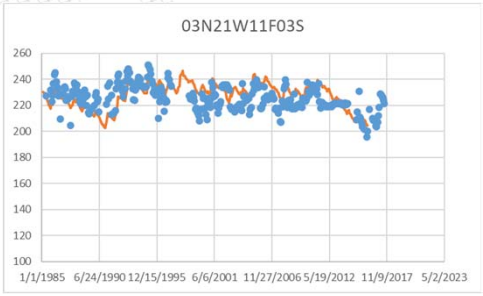

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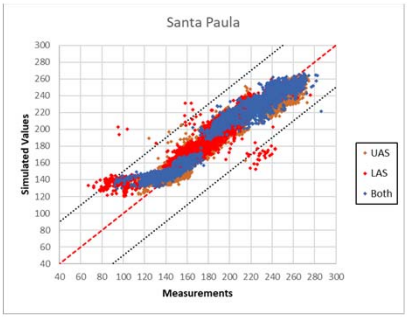
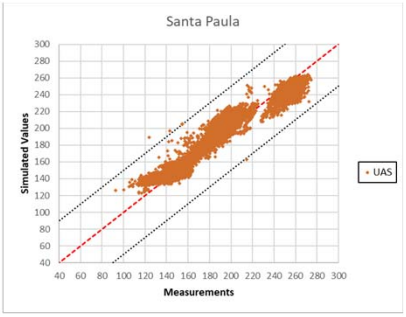
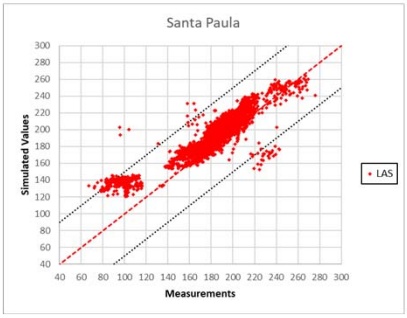
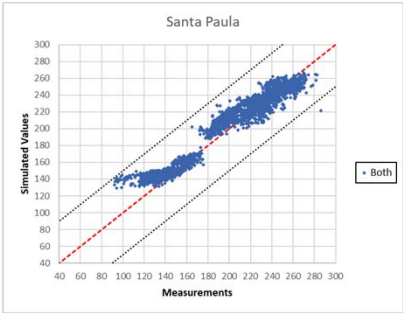
Scatter Plot for Santa Paula Basin









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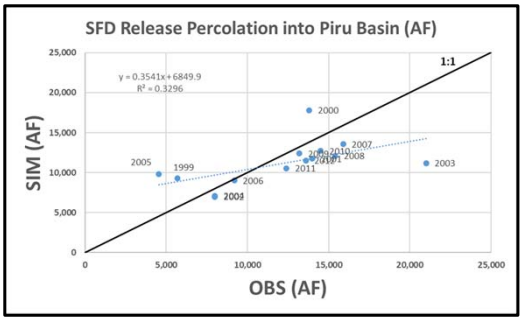
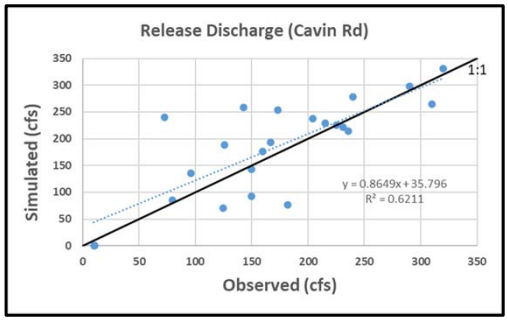
Stream Flow Interactions in Piru Basin

May/ June 2020





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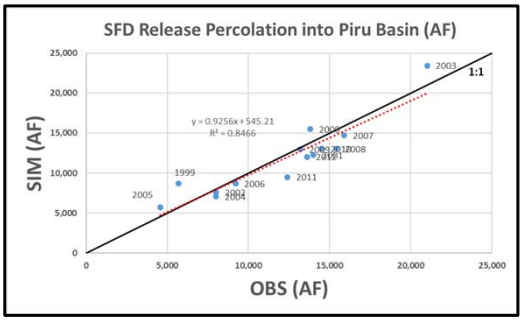

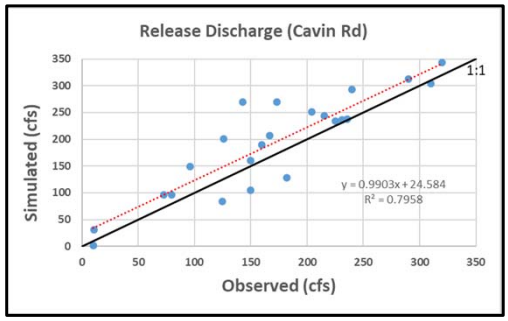

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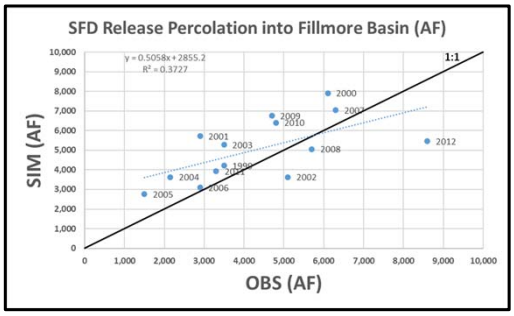
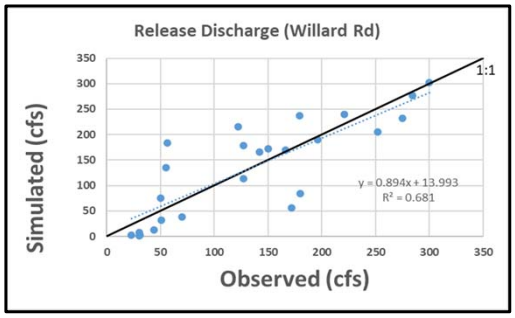
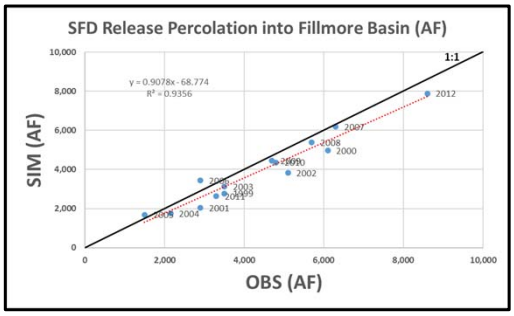
Stream Flow Interactions in Fillmore Basin

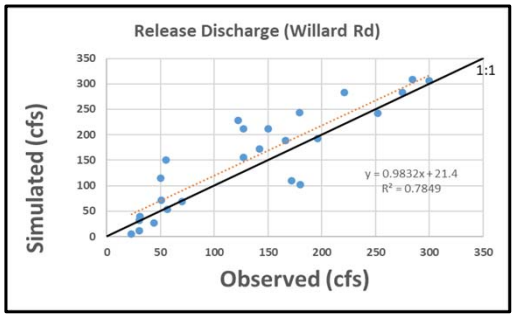
May/ June 2020





June 23, 2020





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Questions/Comments

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