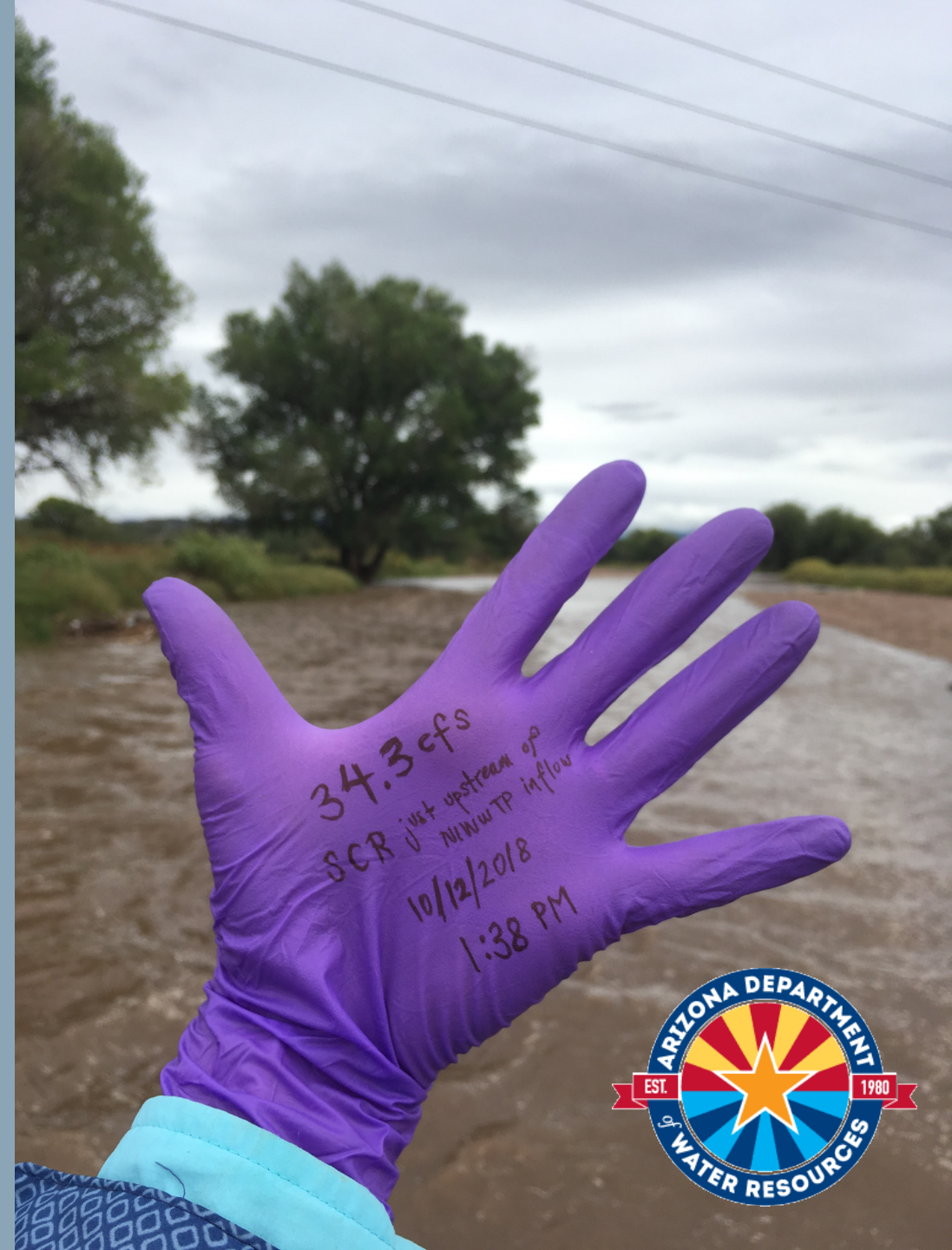


Olga Hart and Keith Nelson  
Arizona Department of Water  
Resources

## Recent, Ongoing, and Upcoming Field & Modeling Activities in the Santa Cruz AMA

*Santa Cruz Active Management Area  
Groundwater Users Advisory Council  
Meeting*

November 6, 2018 | Nogales, AZ



# ADWR Hydrology Division Activity in SCAMA

## FIELD

### NEW

- 72-hour aquifer test
- Installation of 2 new transducers

### ONGOING

- Quarterly index well measurements
- Quarterly SCR discharge measurements
- High-resolution WL monitoring (7 total sites)

### UPCOMING

- Basin sweep (spring 2020)

## MODELING

### NEW

- Preliminary Potrero model developed

### ONGOING

- ACM testing and calibration of Potrero and combined SCAMA models
- Additional sample collection for model development / calibration

### UPCOMING

- Combined Santa Cruz AMA model and report (circa 2019)



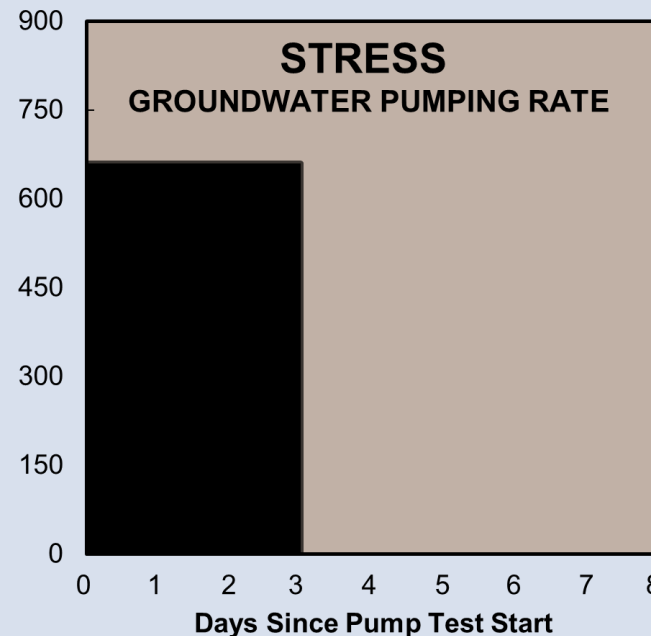
# 72-hour Meadow Hills Aquifer Test

## DETAILS:

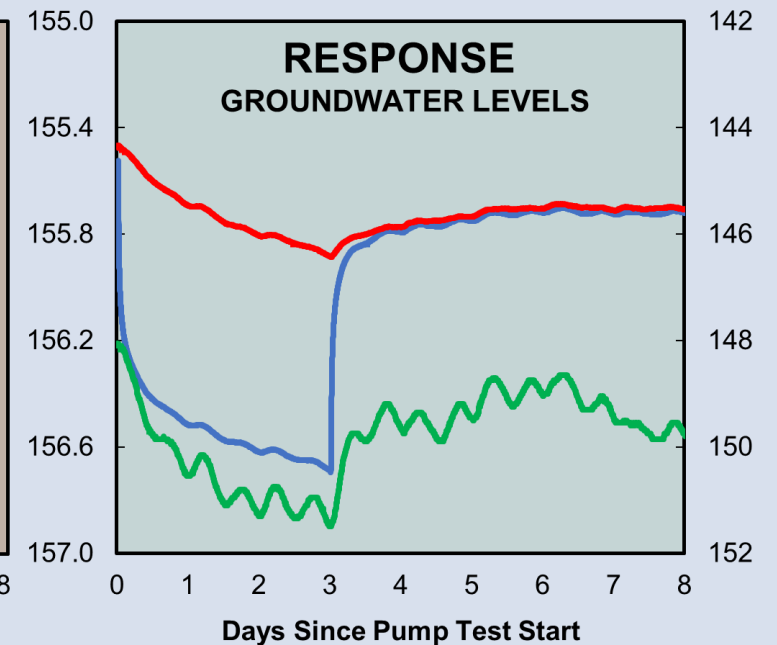
- Meadow Hills #2, pumping 660 gpm over 72 hours
- Drawdown measured @ pump well + 3 observation wells instrumented with transducers

## RESULTS:

- Clear differential b/w shallow and deep systems
- **Confining layer present** b/w 160 and 300 feet bls
- $K_H$  calculated ~27 ft/d



■ Pump Rate - Meadow Hills #2



— UMW-3D, screen 300-320 ft  
 — UMW-3, screen 130-160 ft  
 — DTW\_Nogales\_MH#3 well depth 310' (Note Y-Axis scale)

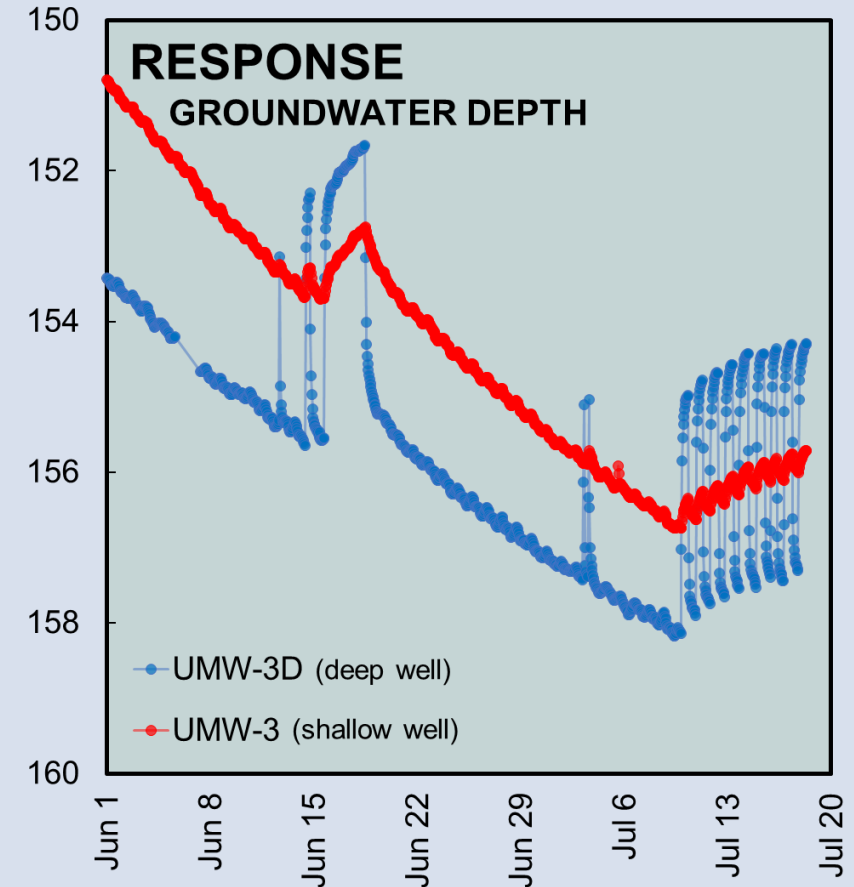
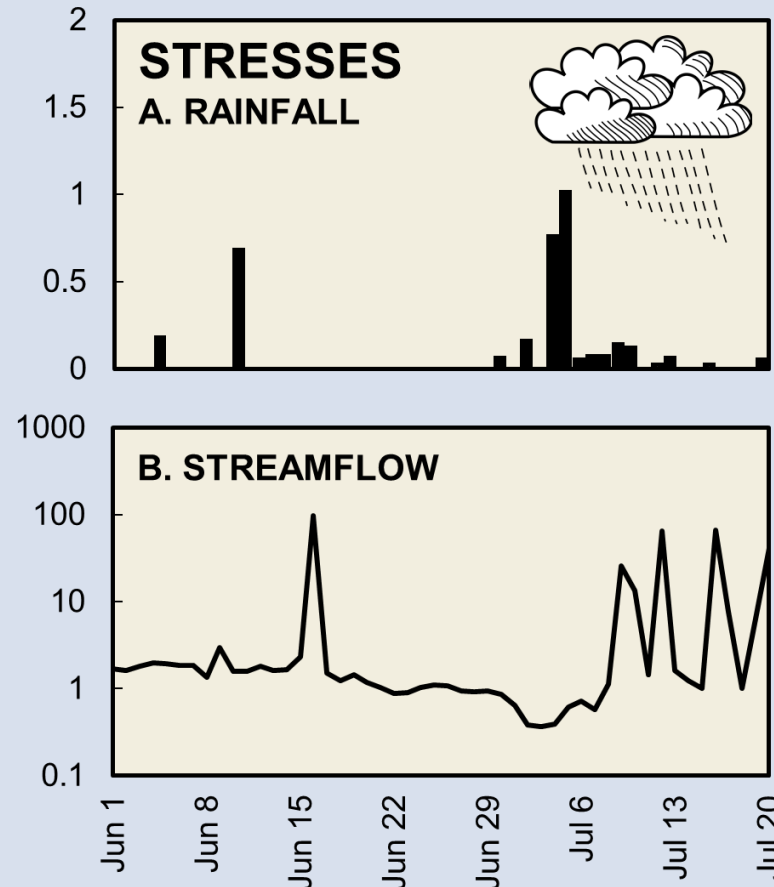
# New Transducer Installation and High-Resolution Water Level Monitoring

## DETAILS:

- Paired transducers installed during aquifer test remain in place
- Continue to monitor water levels in shallow and deep aquifers @ 15-minute resolution ([ongoing](#))

## RESULTS:

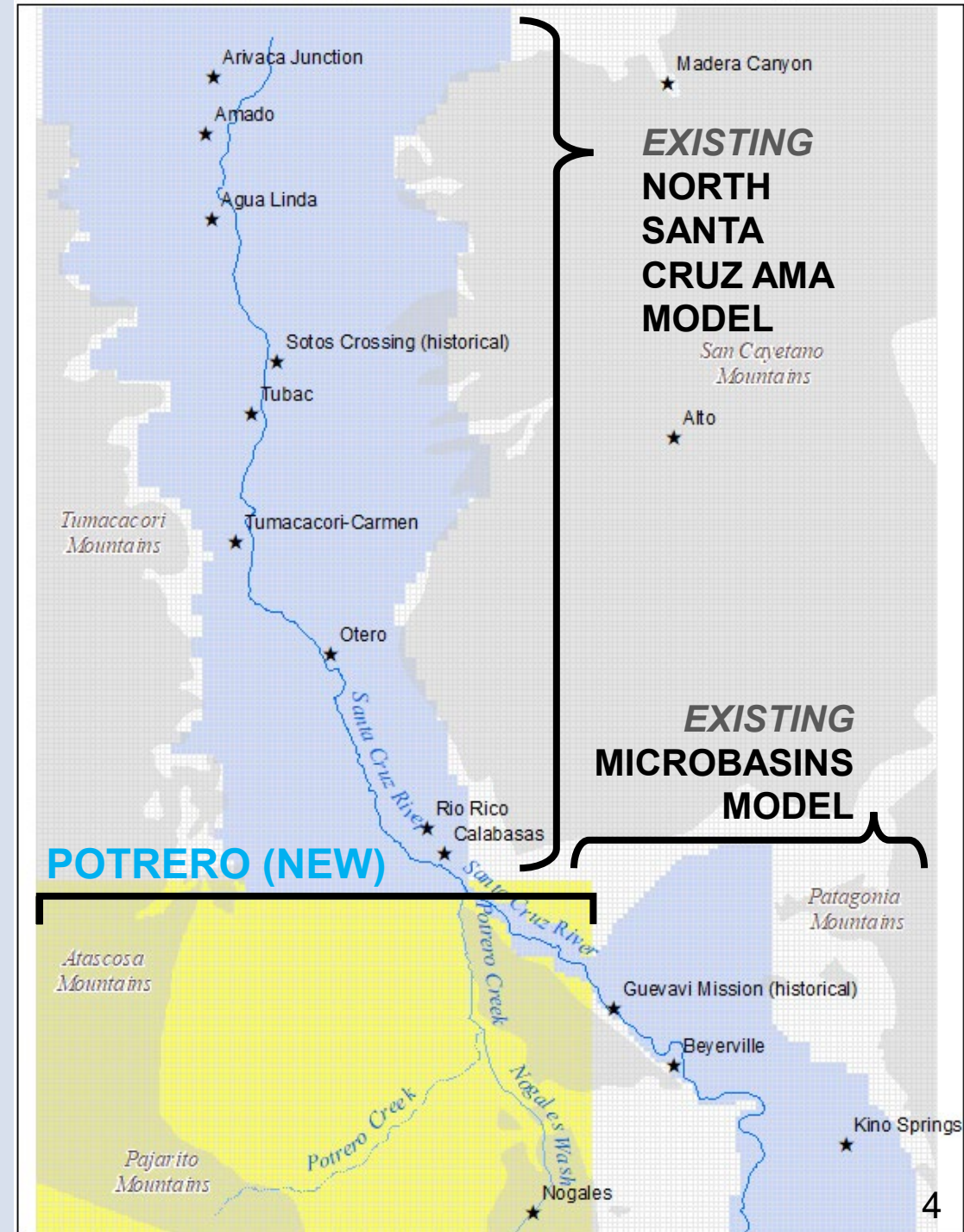
- **Deeper system responds more quickly** than shallow both to stresses from below (deep pumping) **AND** from above (precipitation-based recharge)



# Development of Potrero Groundwater Model

## THE INTERIM MODEL

- Simulates 1997-2016 at sub-monthly resolution
- 1/8 mile x 1/8 mile grid, covering over 100 square miles (65 mi<sup>2</sup> active)
- 3 model layers
  - Younger Alluvium, Older Alluvium, Nogales Formation
- Incorporates latest USGS fault mapping and all available head and flow targets
  - ADWR, ADEQ, UMI/Clear Creek
- Calibrated using PEST



# Development of Potrero Groundwater Model

## WHAT WE KNEW

- Relatively **stable water levels** since (at least) 1930s, despite groundwater pumping, ET, and groundwater outflow
- A set of 3 (or more) **distinct water level regimes** pointing at possibly 3 (or more) local aquifer systems

## WHAT WE DIDN'T KNOW

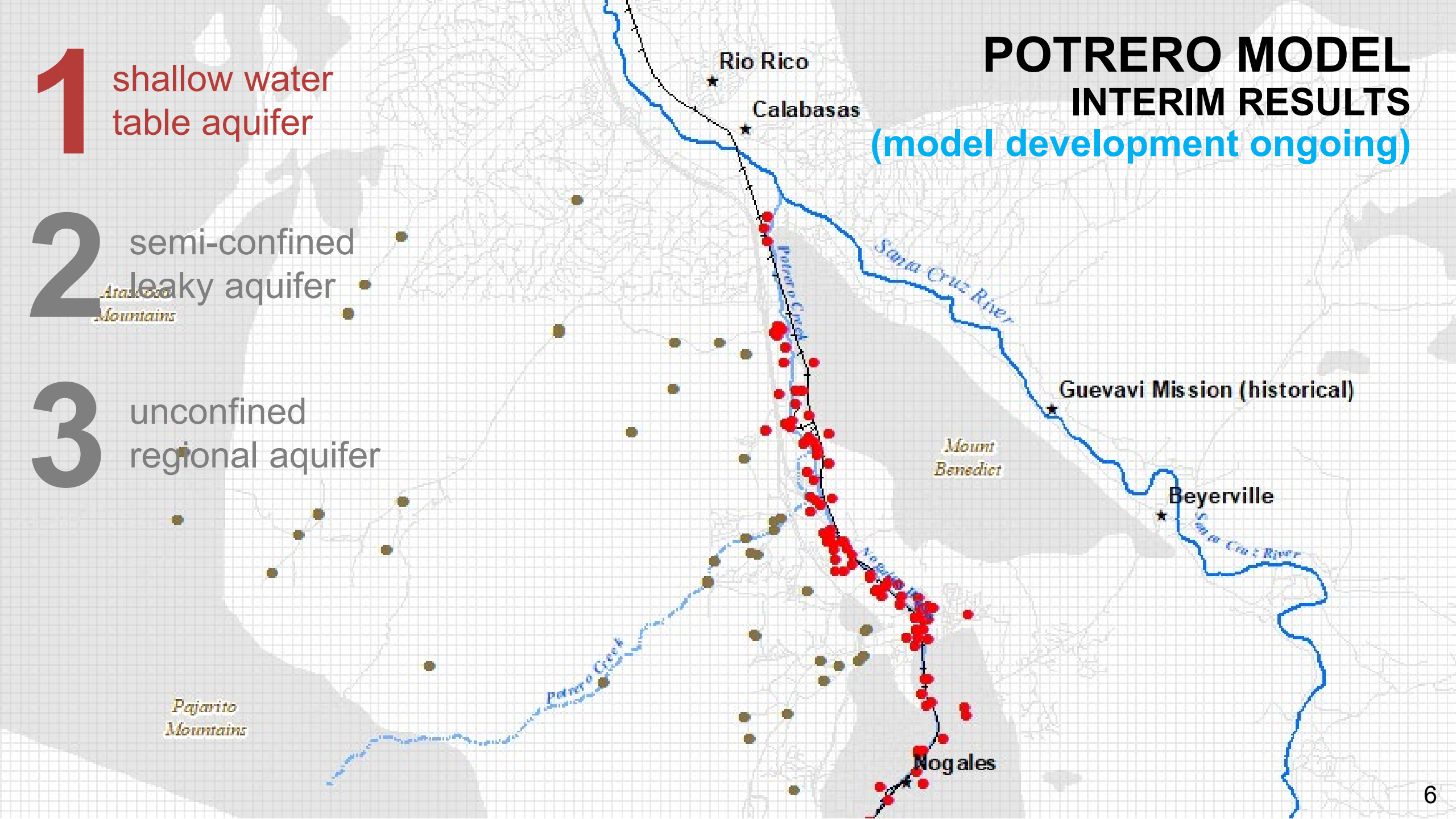
- **Source of aboveground water** near the confluence of Potrero Creek and Nogales Wash at the wetlands
- **Location, depth, and impact of confining layers** on groundwater flow throughout the sub-basin
- **Overall “piping” of the sub-basin;** its principal water sinks and sources

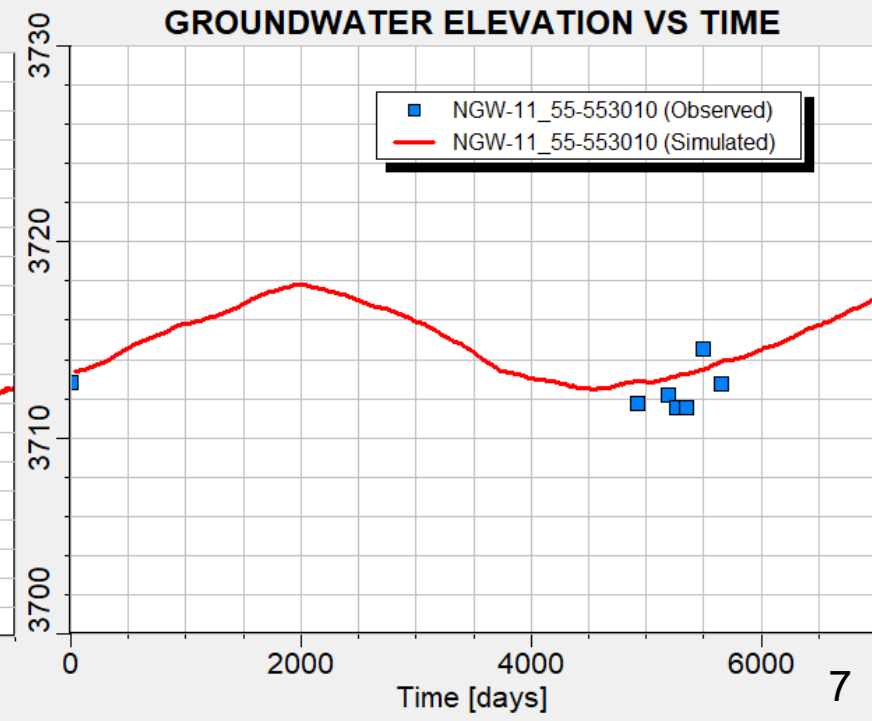
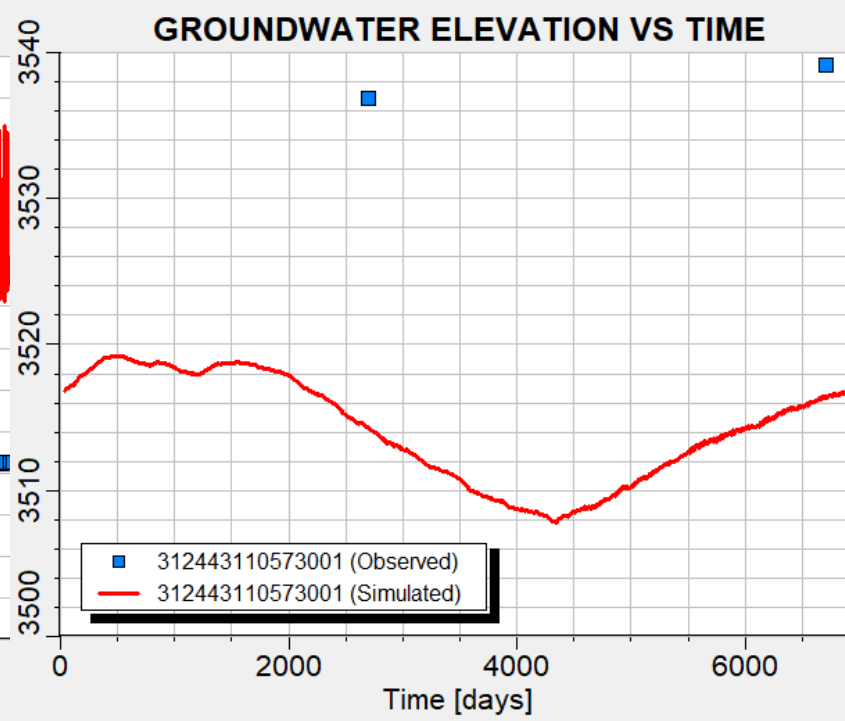
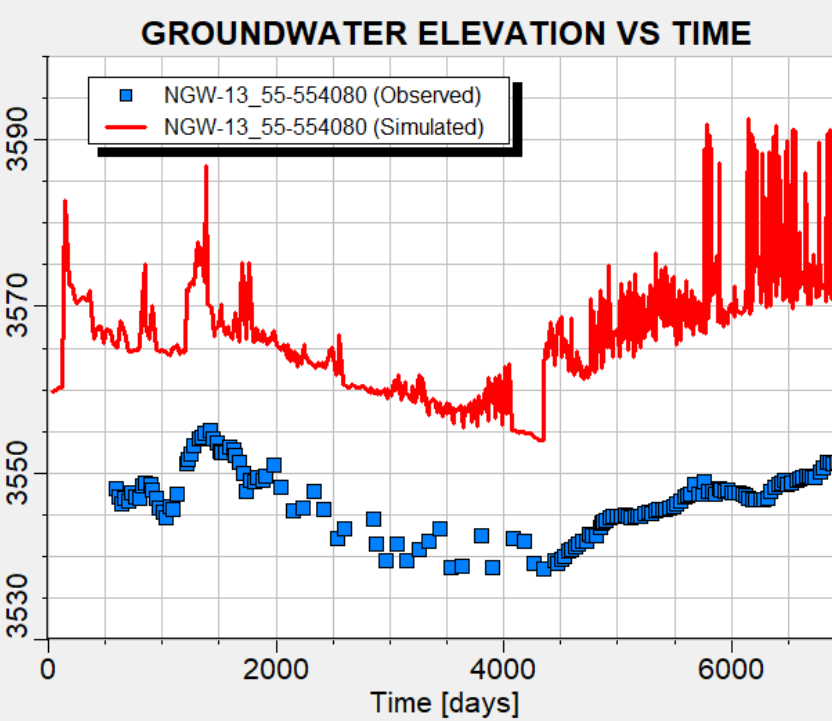
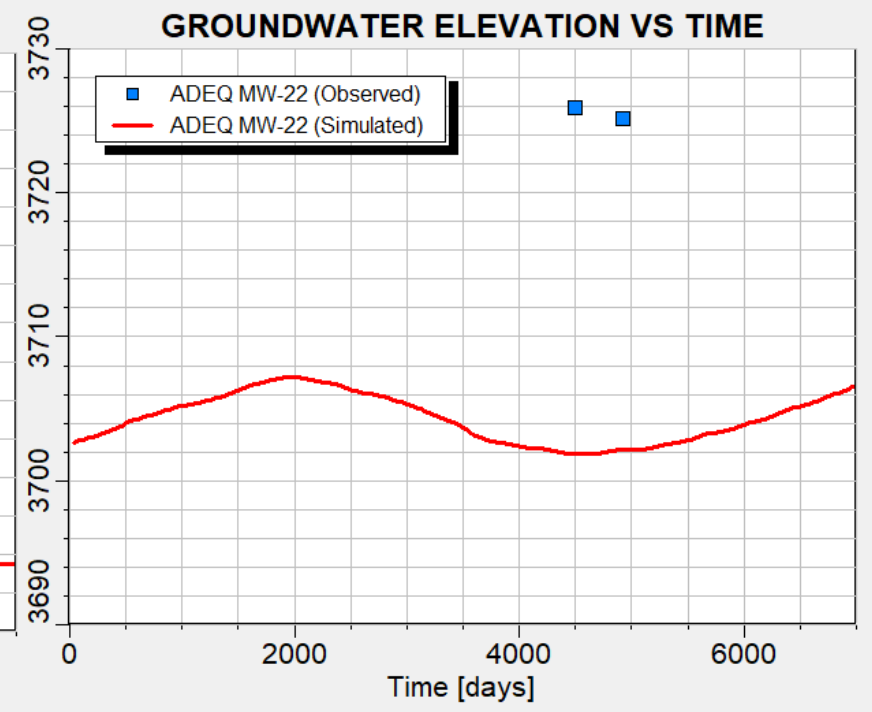
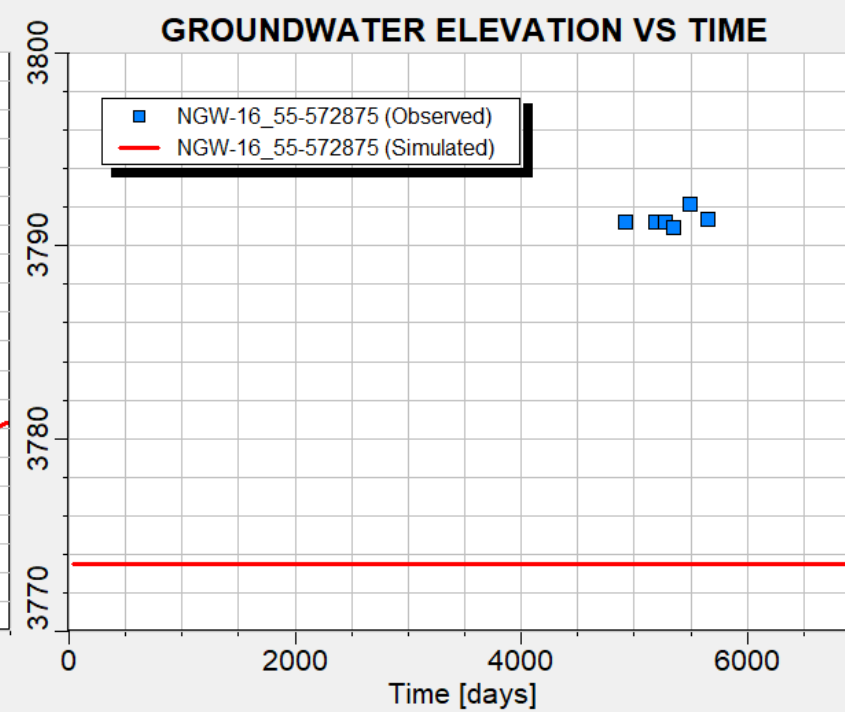
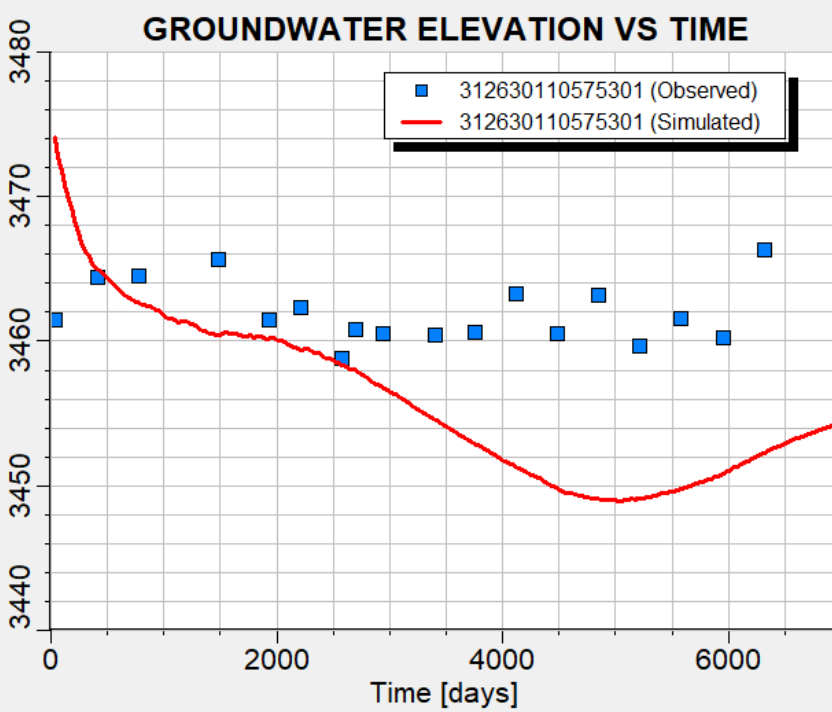
**1** shallow water table aquifer

**2** semi-confined leaky aquifer

**3** unconfined regional aquifer

# POTRERO MODEL INTERIM RESULTS (model development ongoing)





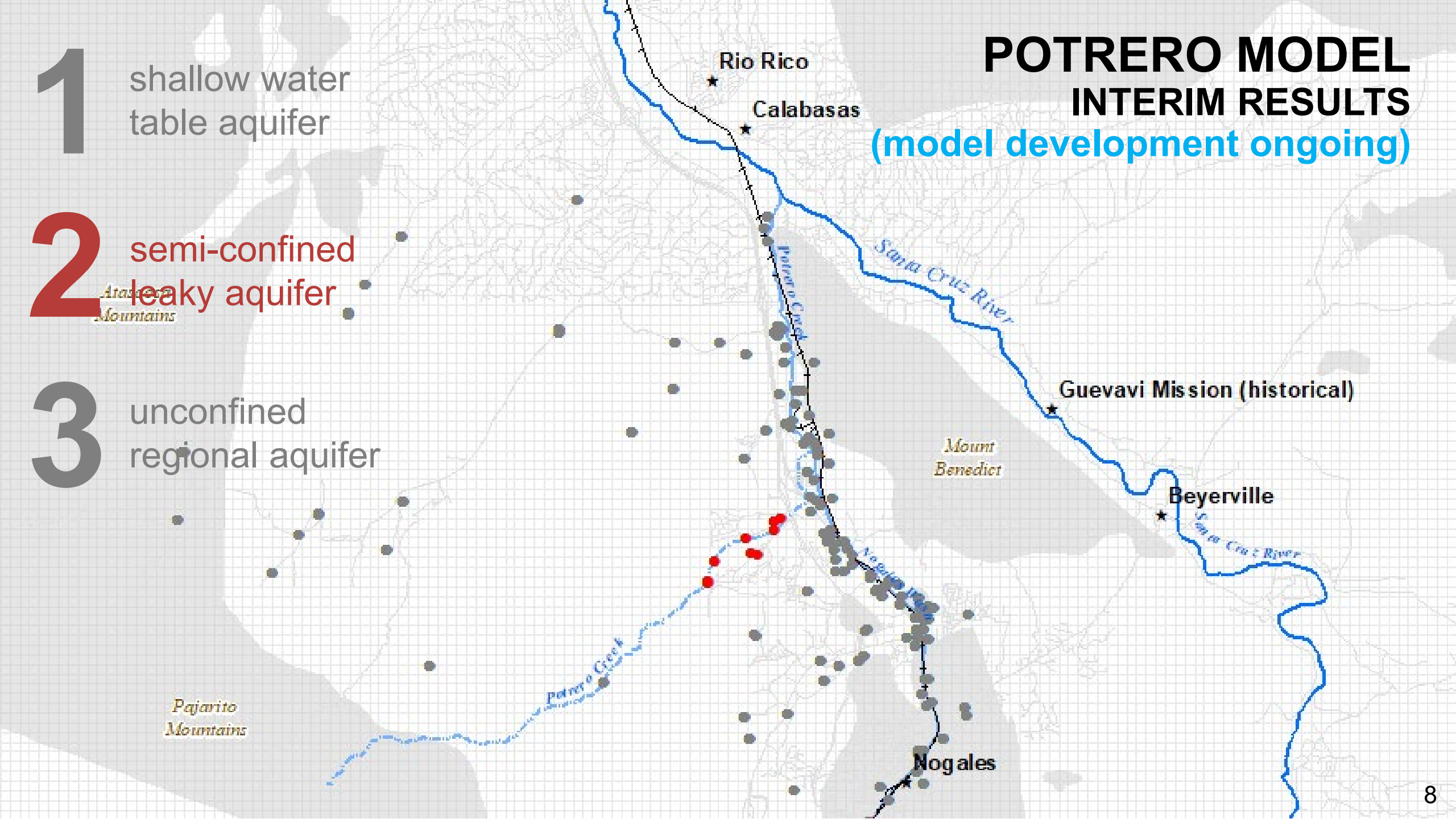
# POTRERO MODEL INTERIM RESULTS

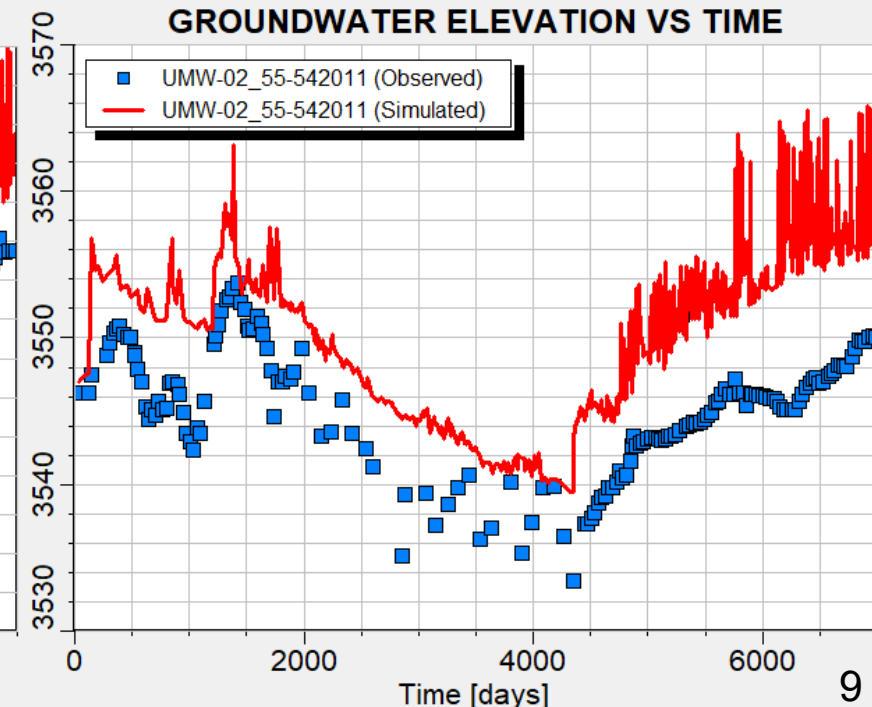
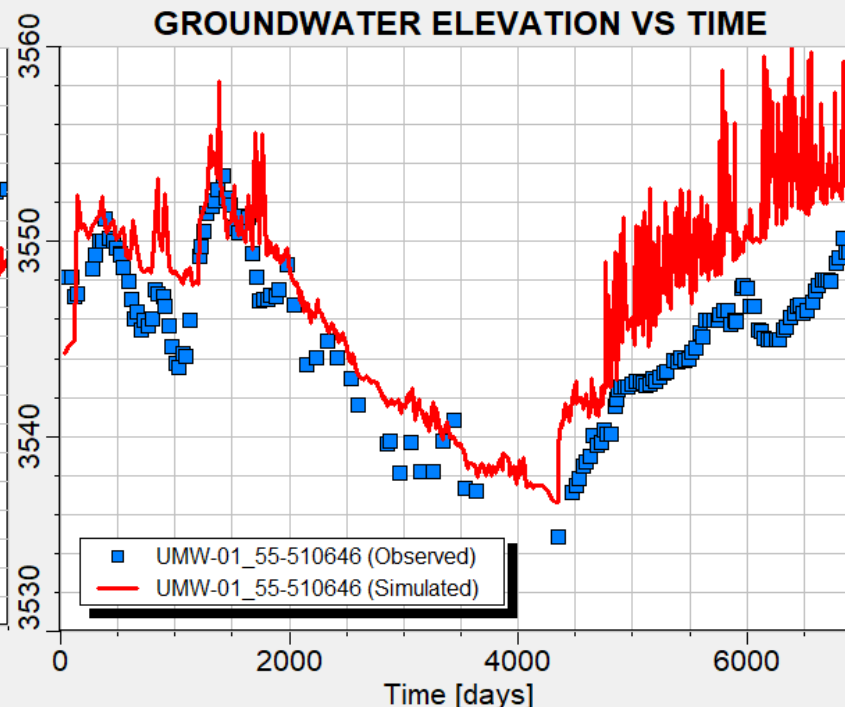
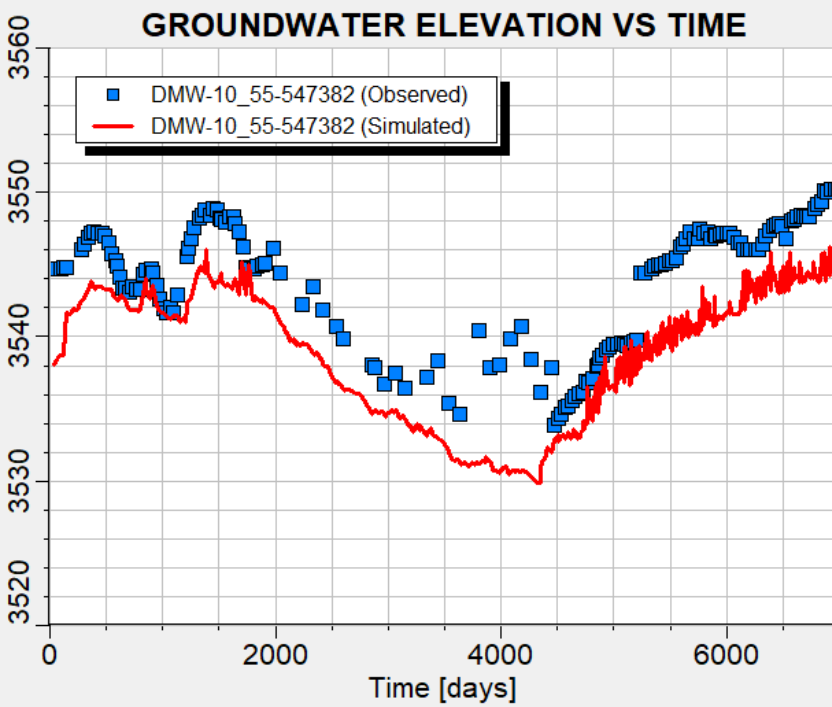
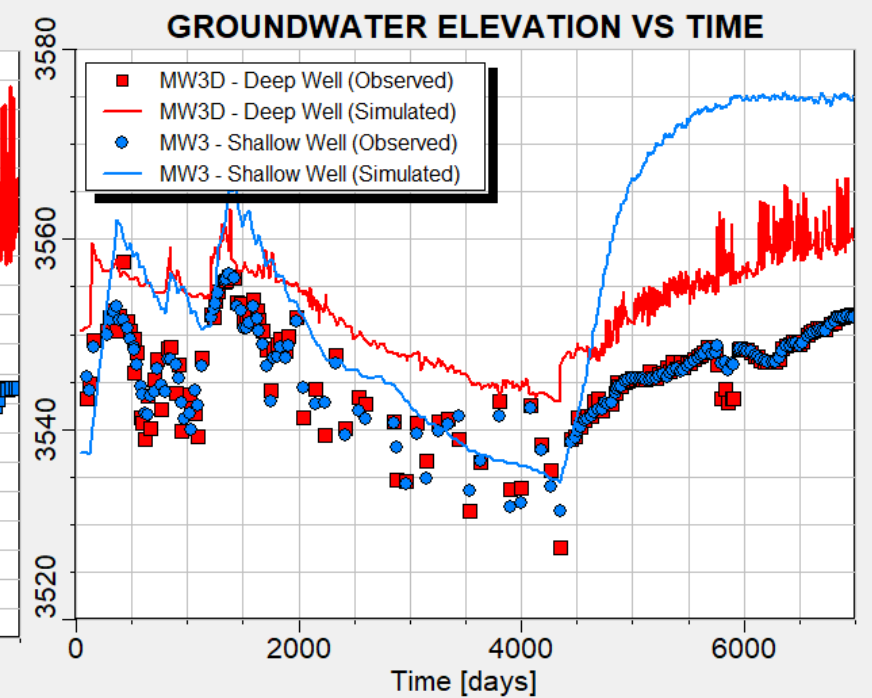
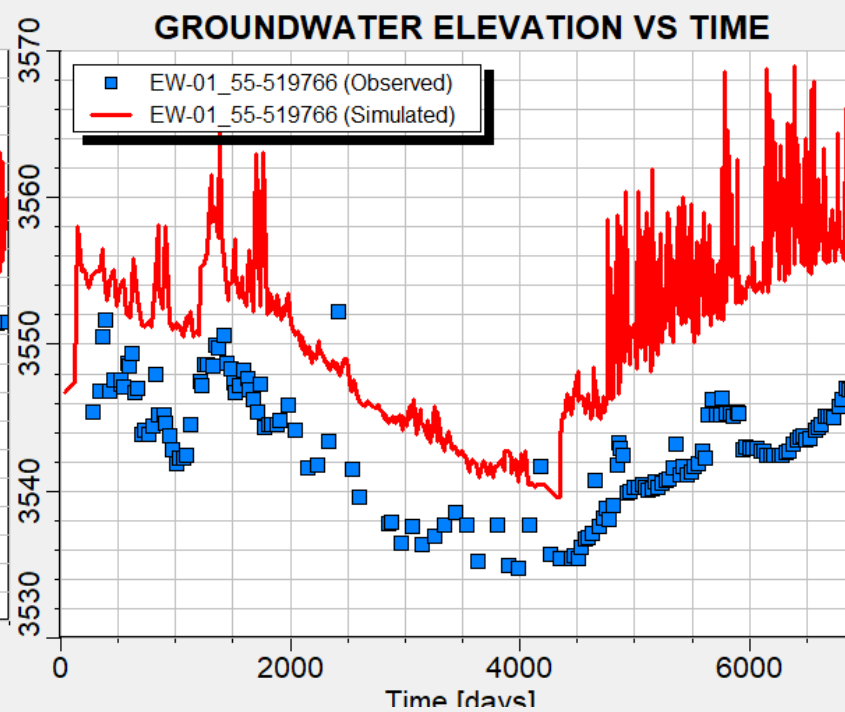
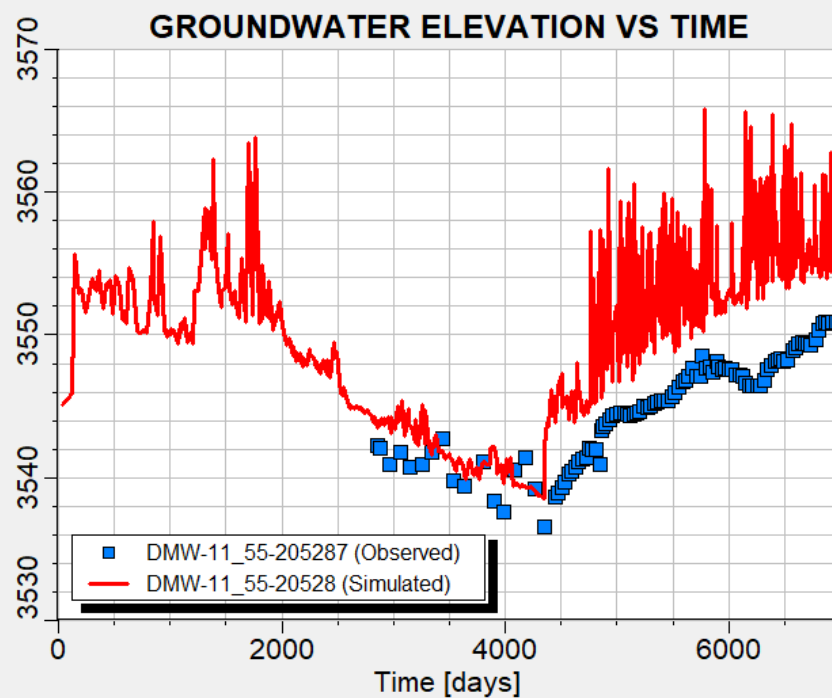
(model development ongoing)

**1** shallow water table aquifer

**2** semi-confined leaky aquifer

**3** unconfined regional aquifer





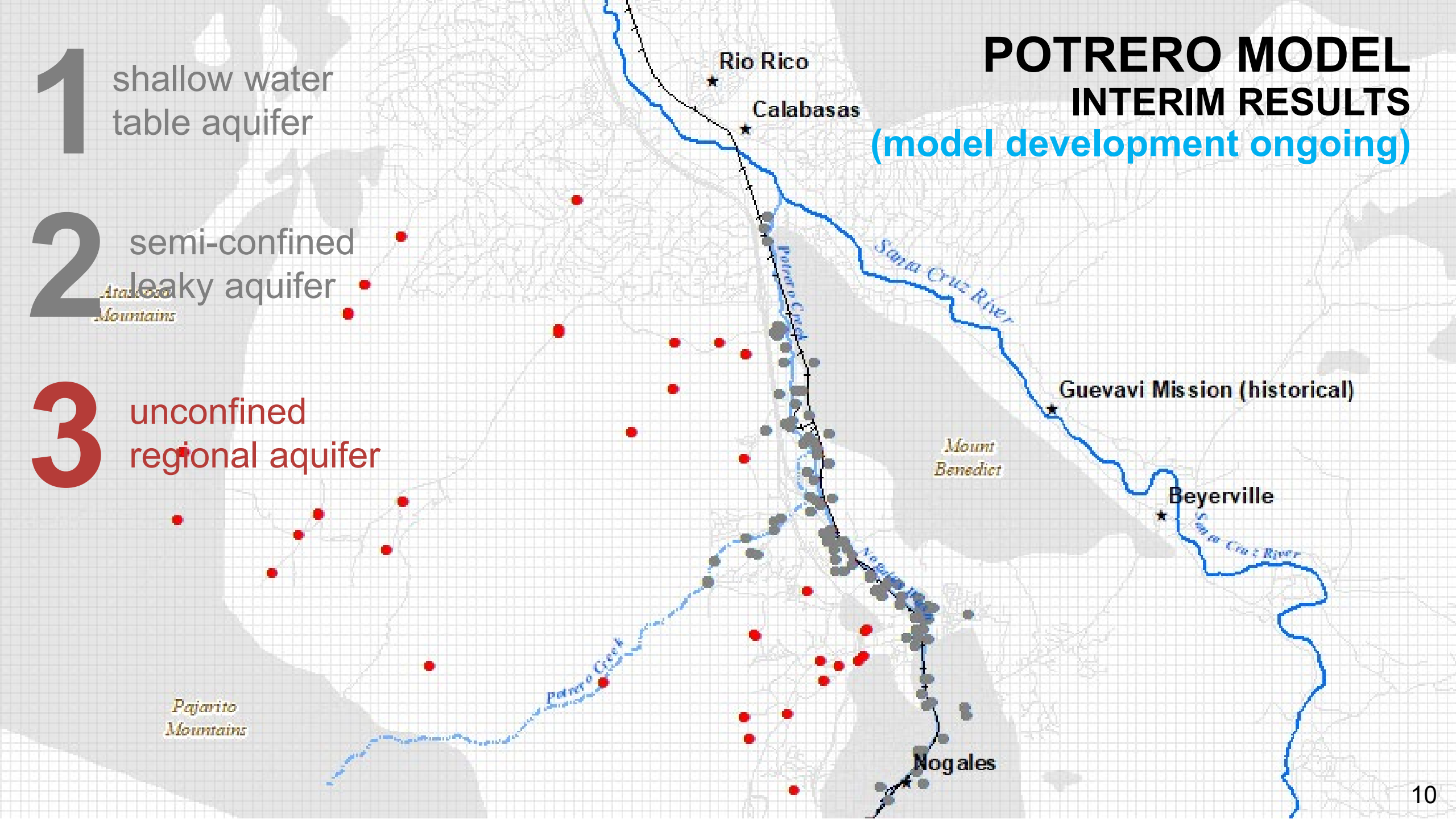
# POTRERO MODEL INTERIM RESULTS

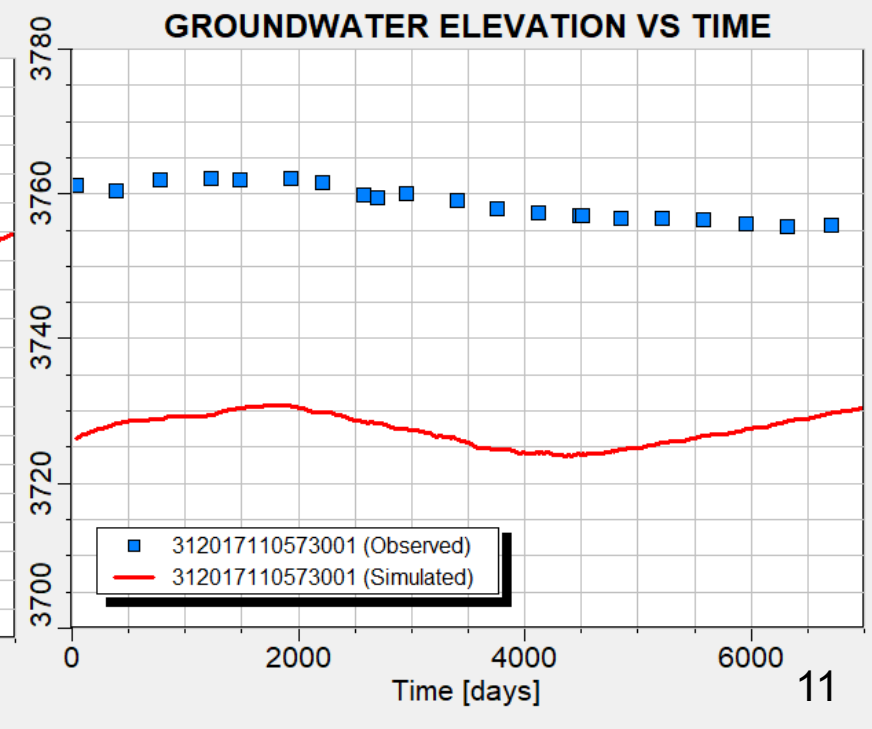
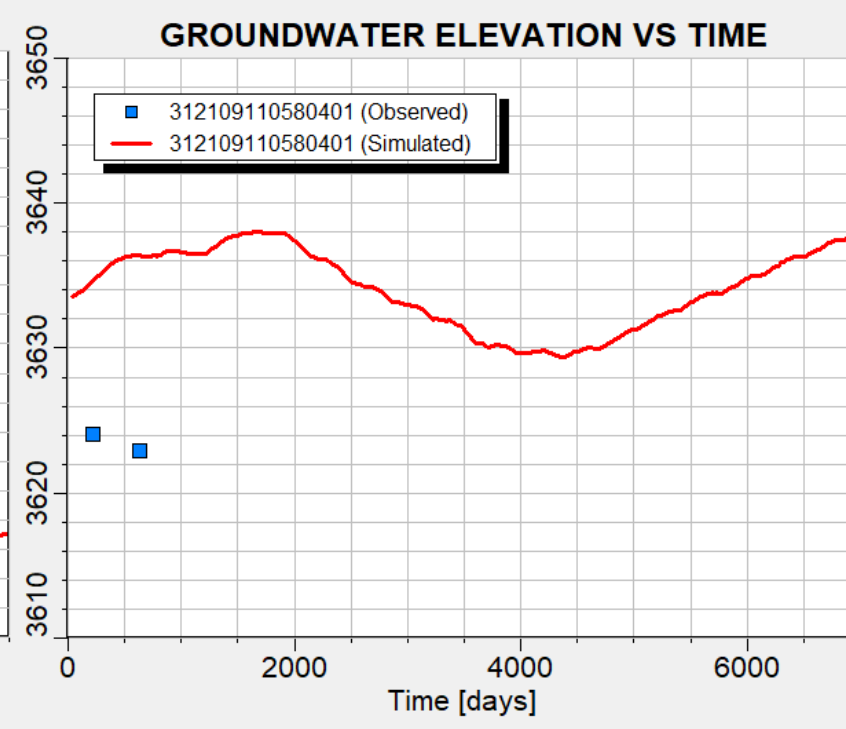
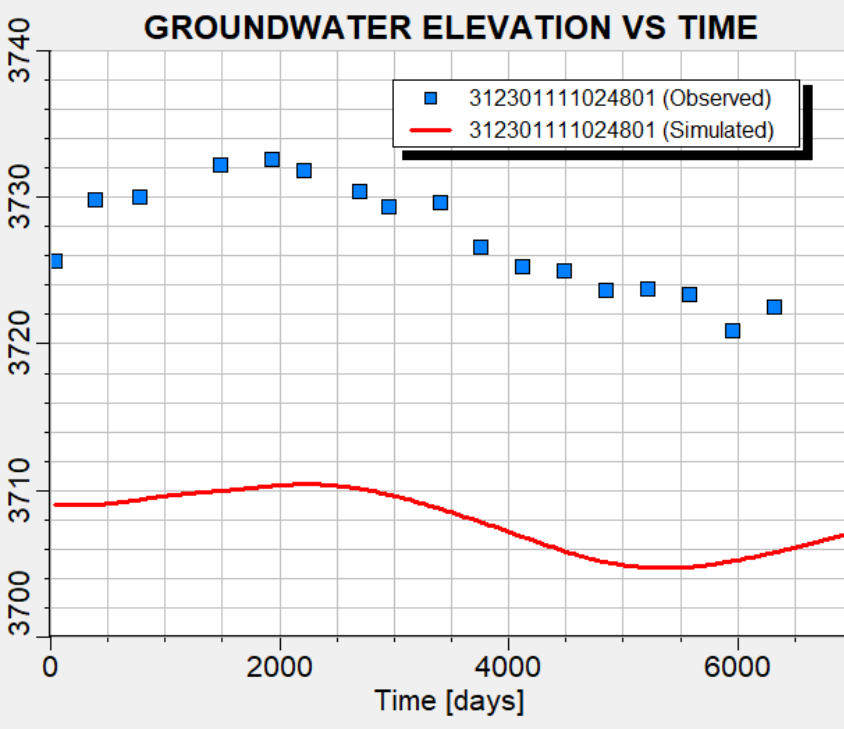
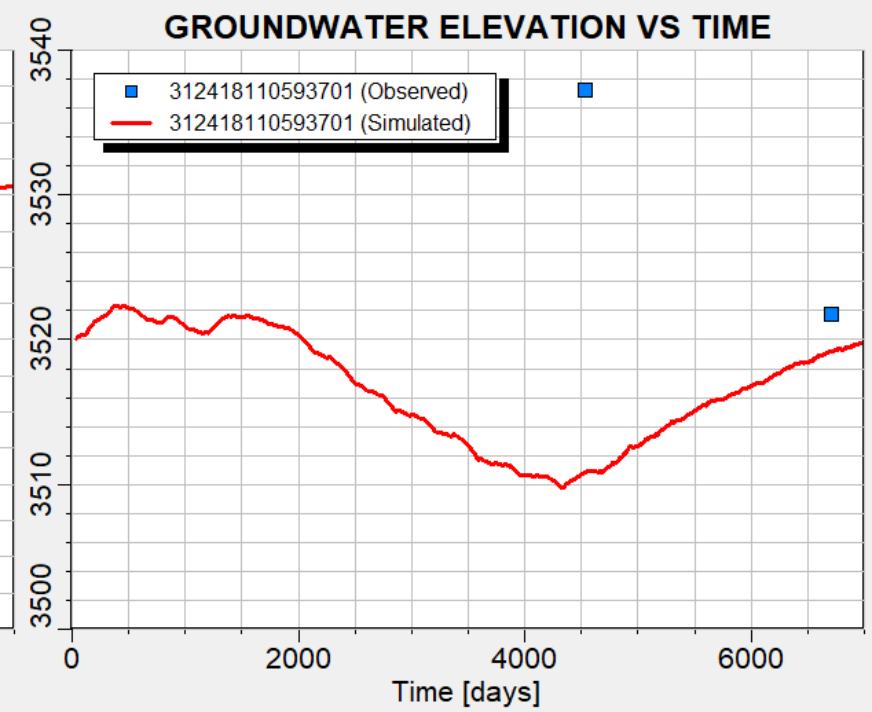
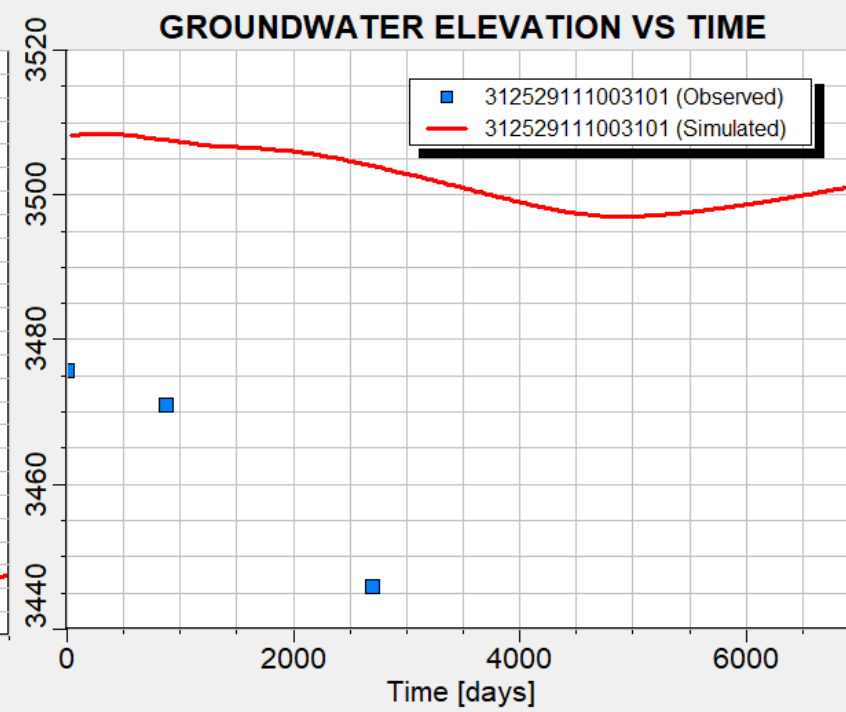
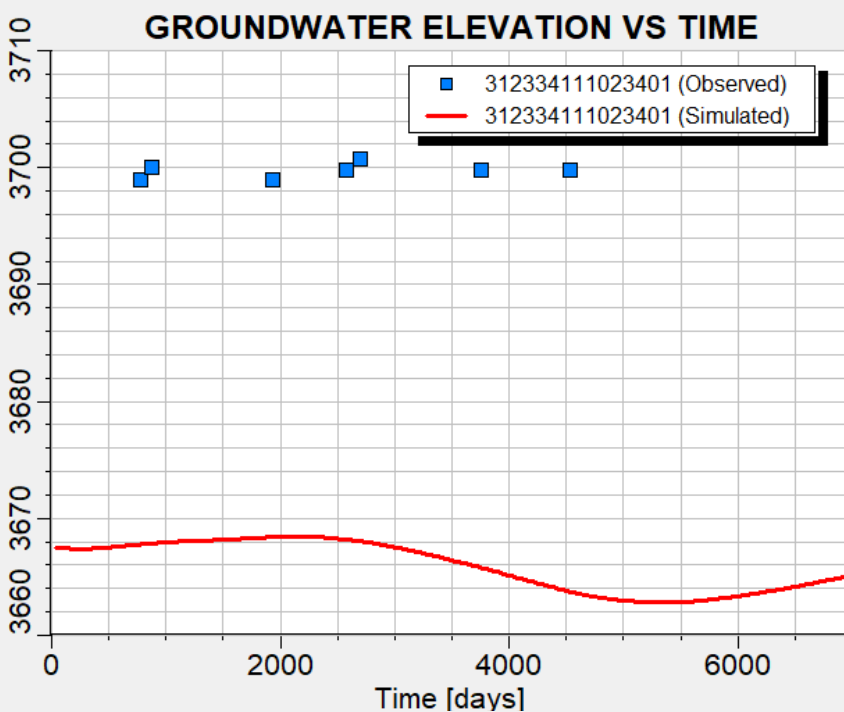
(model development ongoing)

**1** shallow water table aquifer

**2** semi-confined leaky aquifer

**3** unconfined regional aquifer





# POTRERO MODEL INTERIM RESULTS

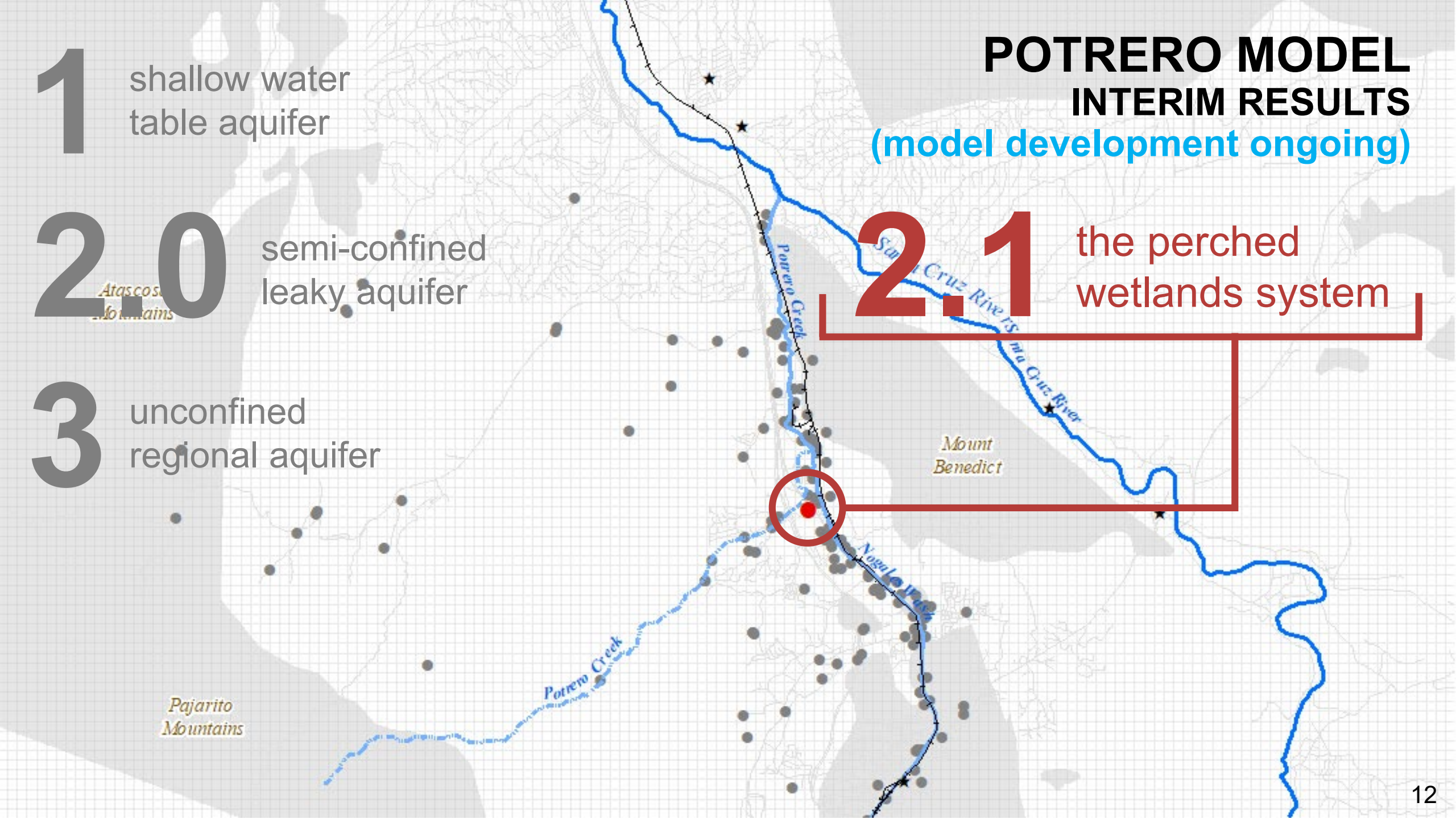
(model development ongoing)

**1** shallow water  
table aquifer

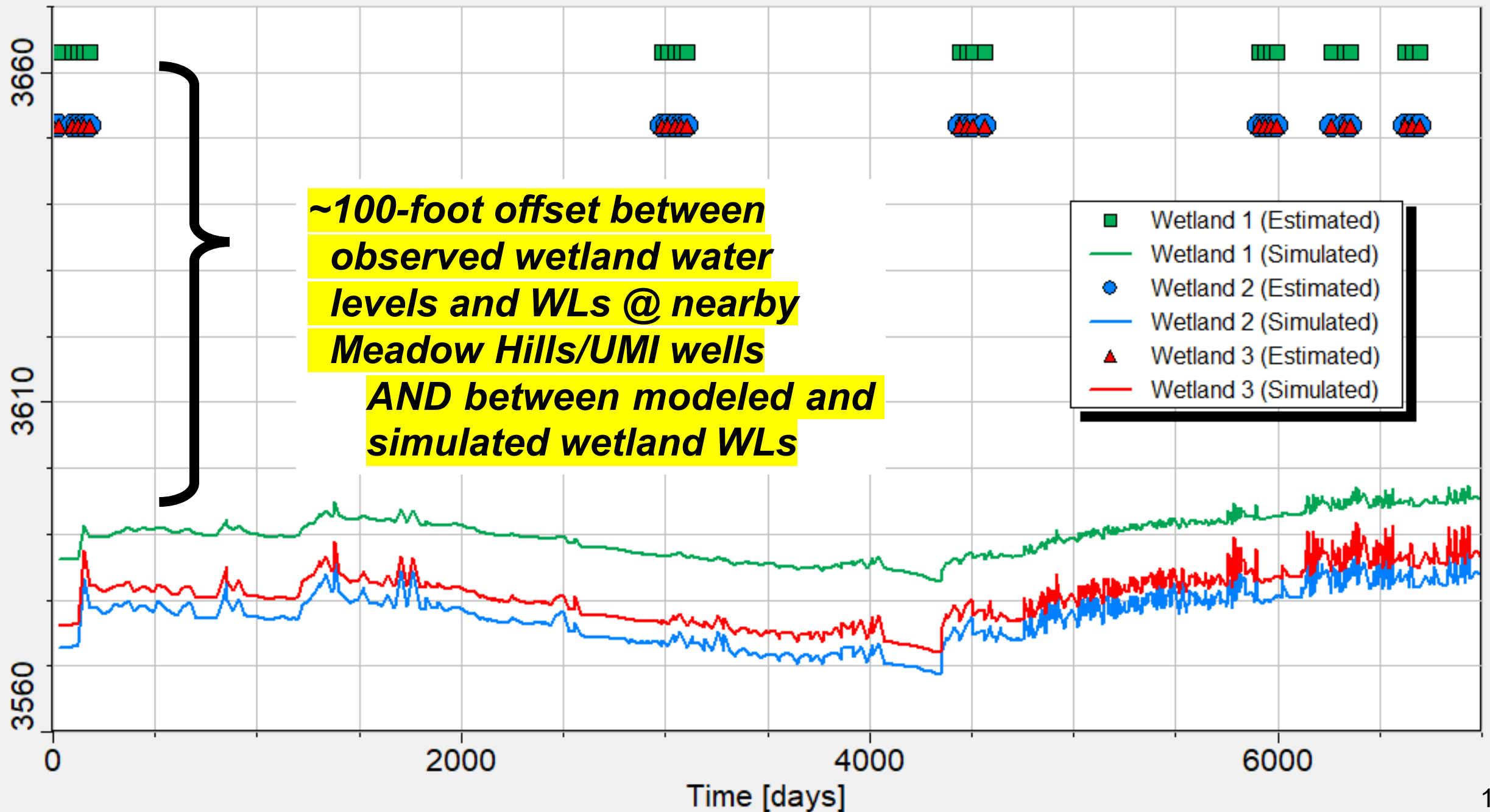
**2.0** semi-confined  
leaky aquifer

**3** unconfined  
regional aquifer

**2.1** the perched  
wetlands system



# GROUNDWATER ELEVATION VS TIME



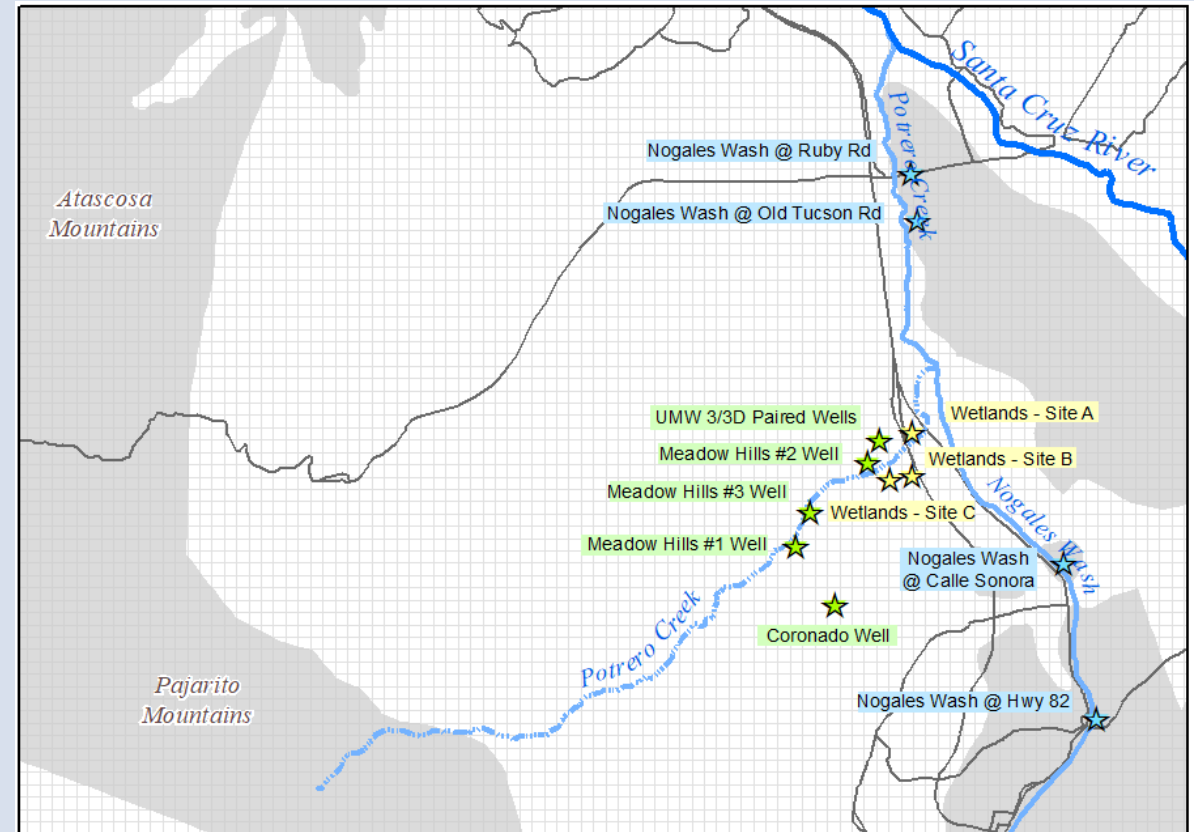
# Additional Sampling to Better Characterize Stream-Aquifer Interaction and Wetlands Source(s)

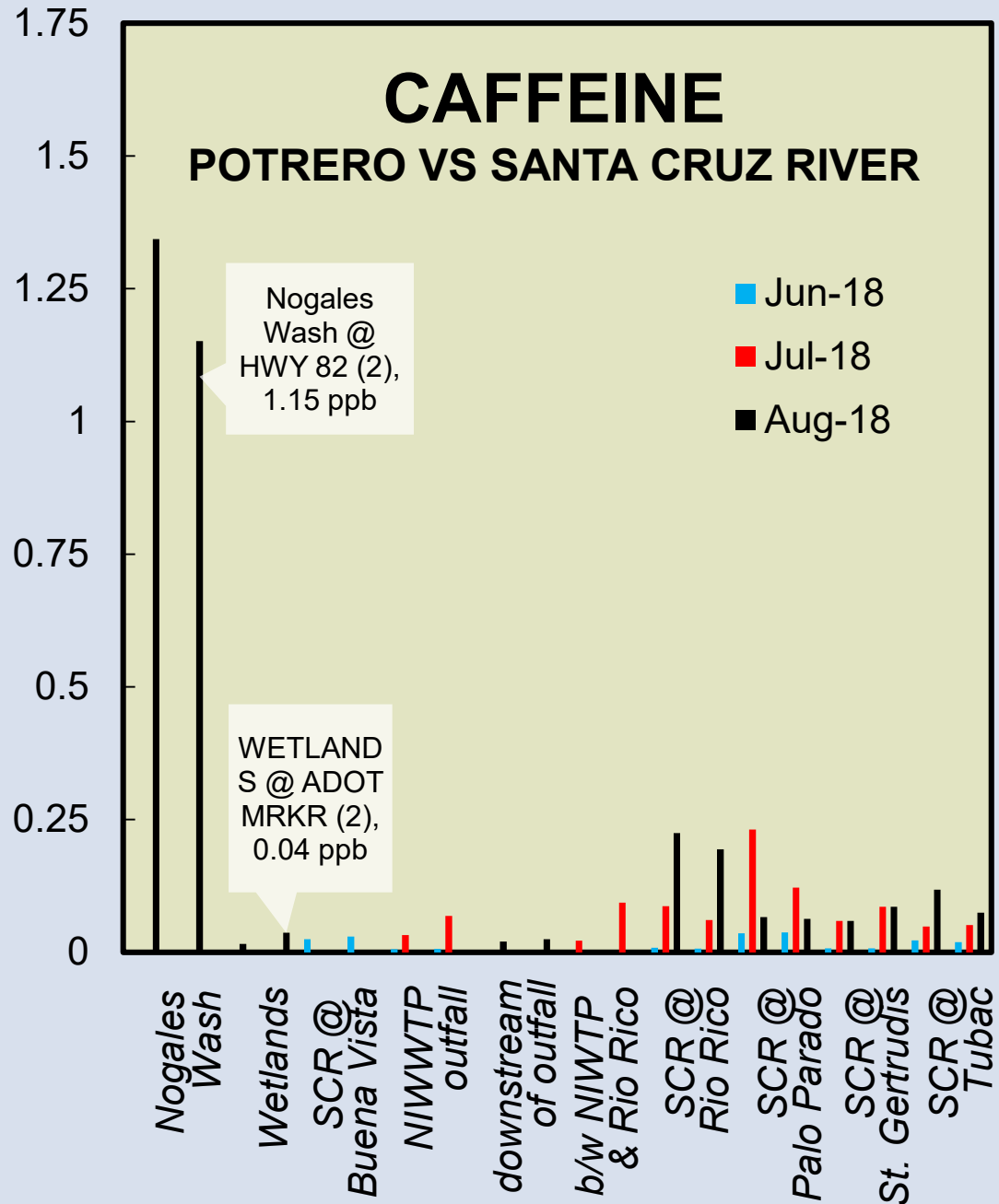
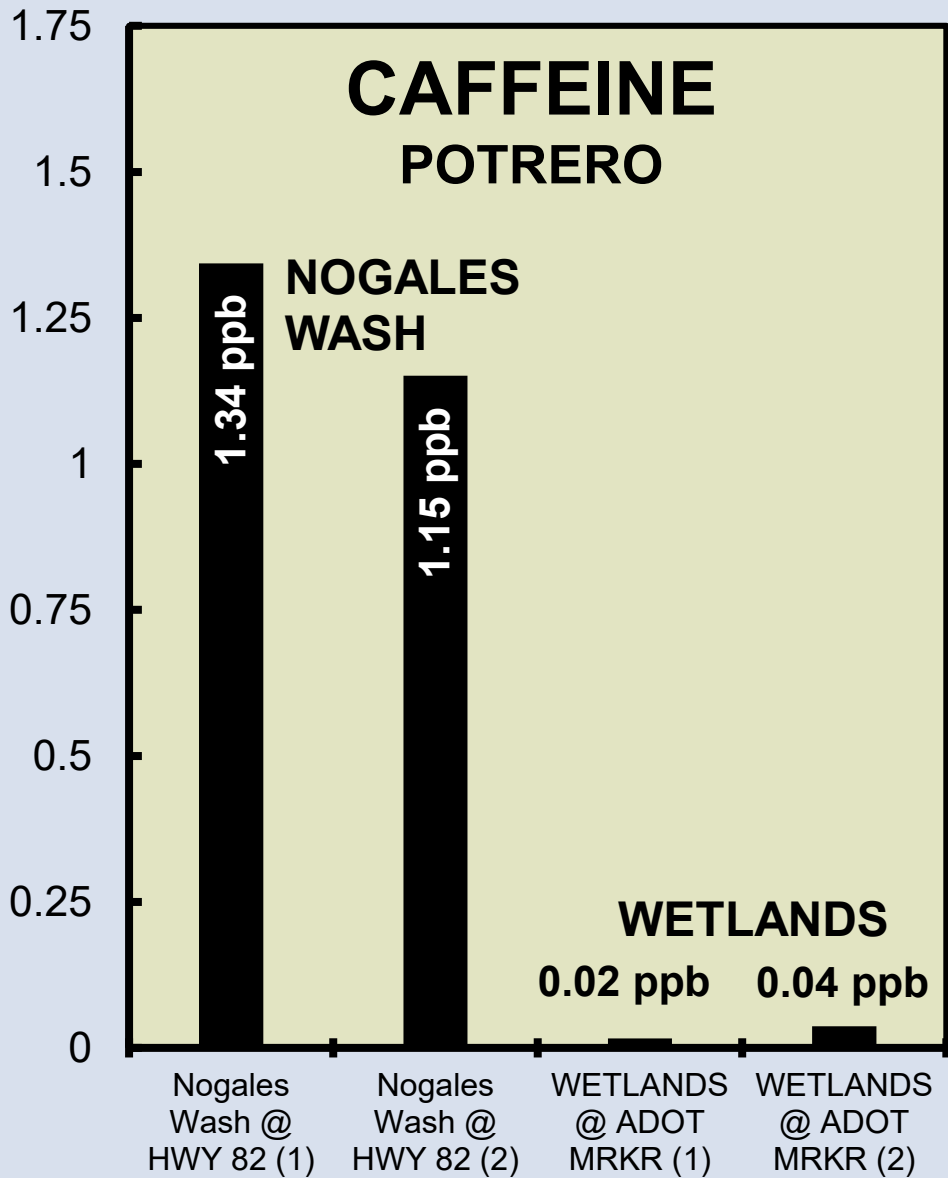
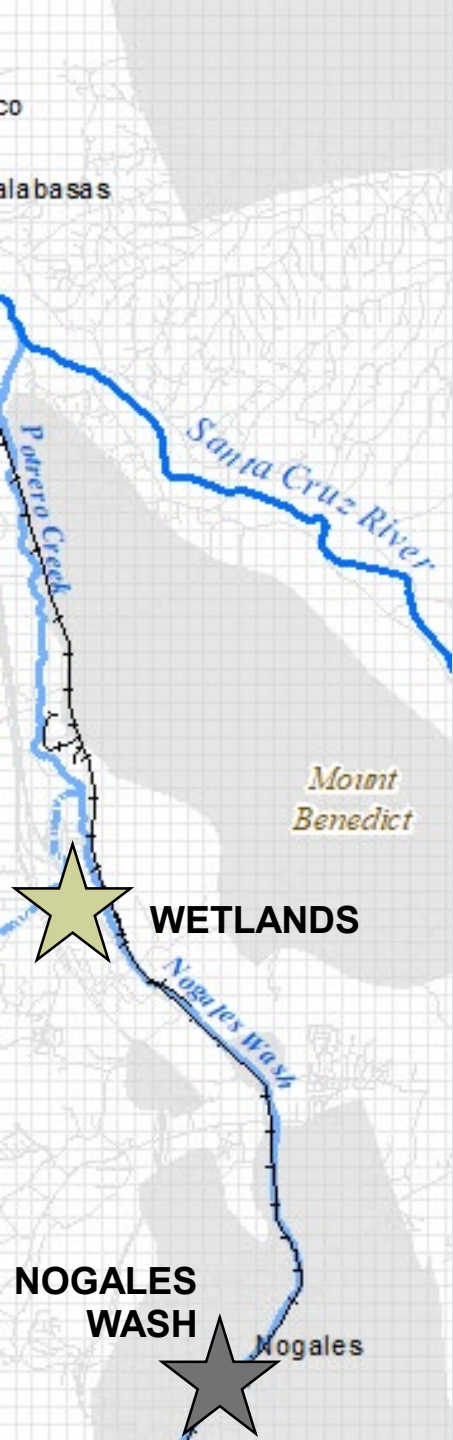
## USGS – Sr/U stable isotope analysis (ongoing)

- Identify similarities & differences b/w different surface and groundwater sources in the sub-basin

## ADWR – Caffeine as urban stream tracer (ongoing)

- Provide additional data regarding similarity / connection of Nogales Wash recharge and wetlands





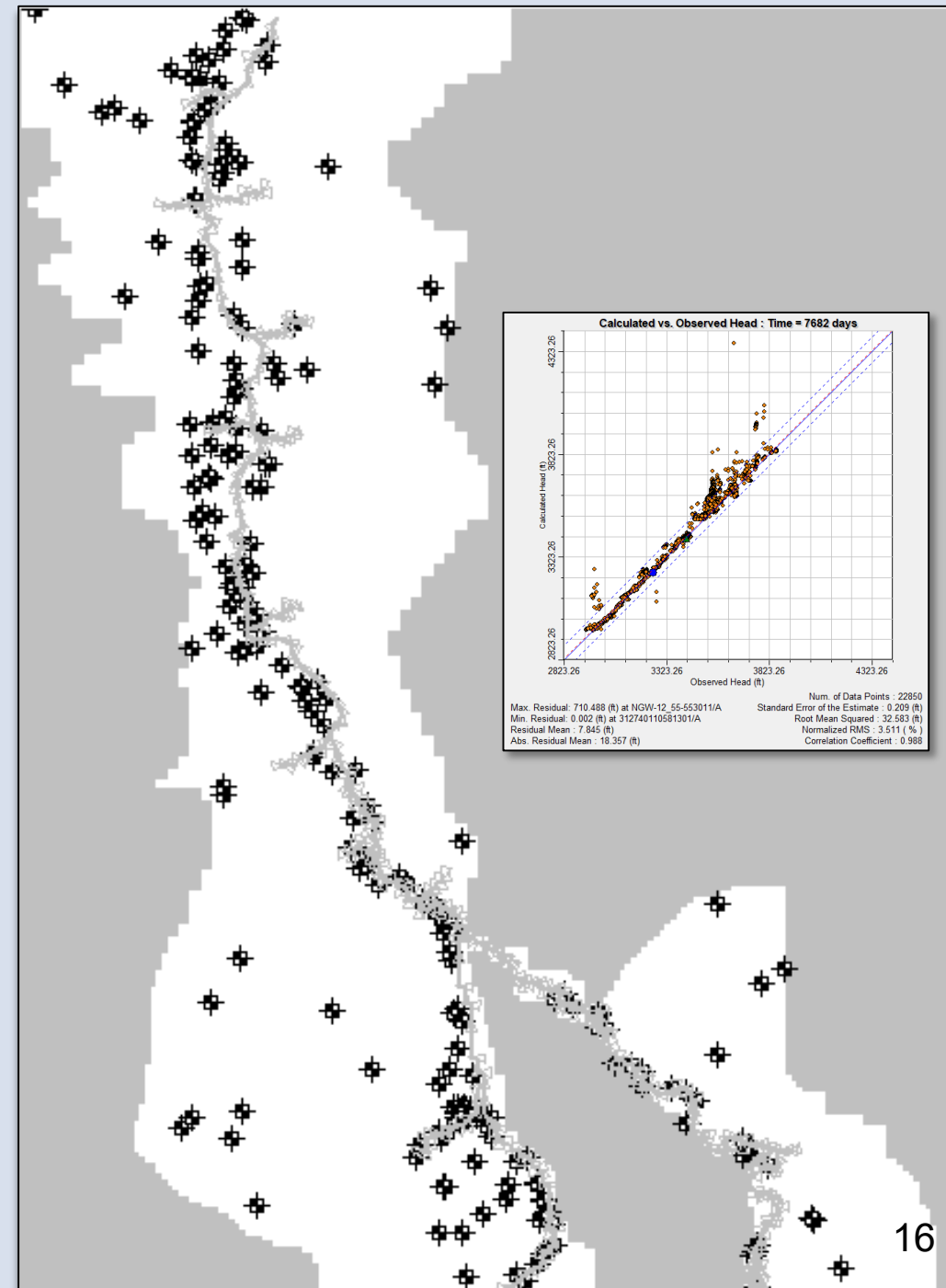
# Combined Santa Cruz AMA model

## DETAILS:

- Last SCAMA models released to public in 2007-2010 (microbasins, NSCAMA)
- New combined model will include:
  - Microbasins, North SCAMA model, Potrero Canyon (**new**) covering time period 1997 through 2017/8
- Will undergo automated calibration, ACM testing, sensitivity and uncertainty testing via inverse regression (**ongoing**)

## TIMELINE (TENTATIVE):

- Preliminary completion: late 2019
- Peer review and public release: thereafter



## For efforts discussed today, a particular thanks to:

- Nick Valverde, Paul Ivanich, and Mark Perez (ADWR)
- Alejandro Barcenas and Ruben Artana (City of Nogales)
- Ric Page, Jim Paces, Chris Menges, and Floyd Gray (USGS)

**Questions?**

Olga Hart | [ohart@azwater.gov](mailto:ohart@azwater.gov)

