



# Assessing Capture from the Truckee River by Pumping Wells with a Predictive Drawdown Model—Tracy Segment Hydrographic Area, NV

In cooperation with the Bureau of Reclamation

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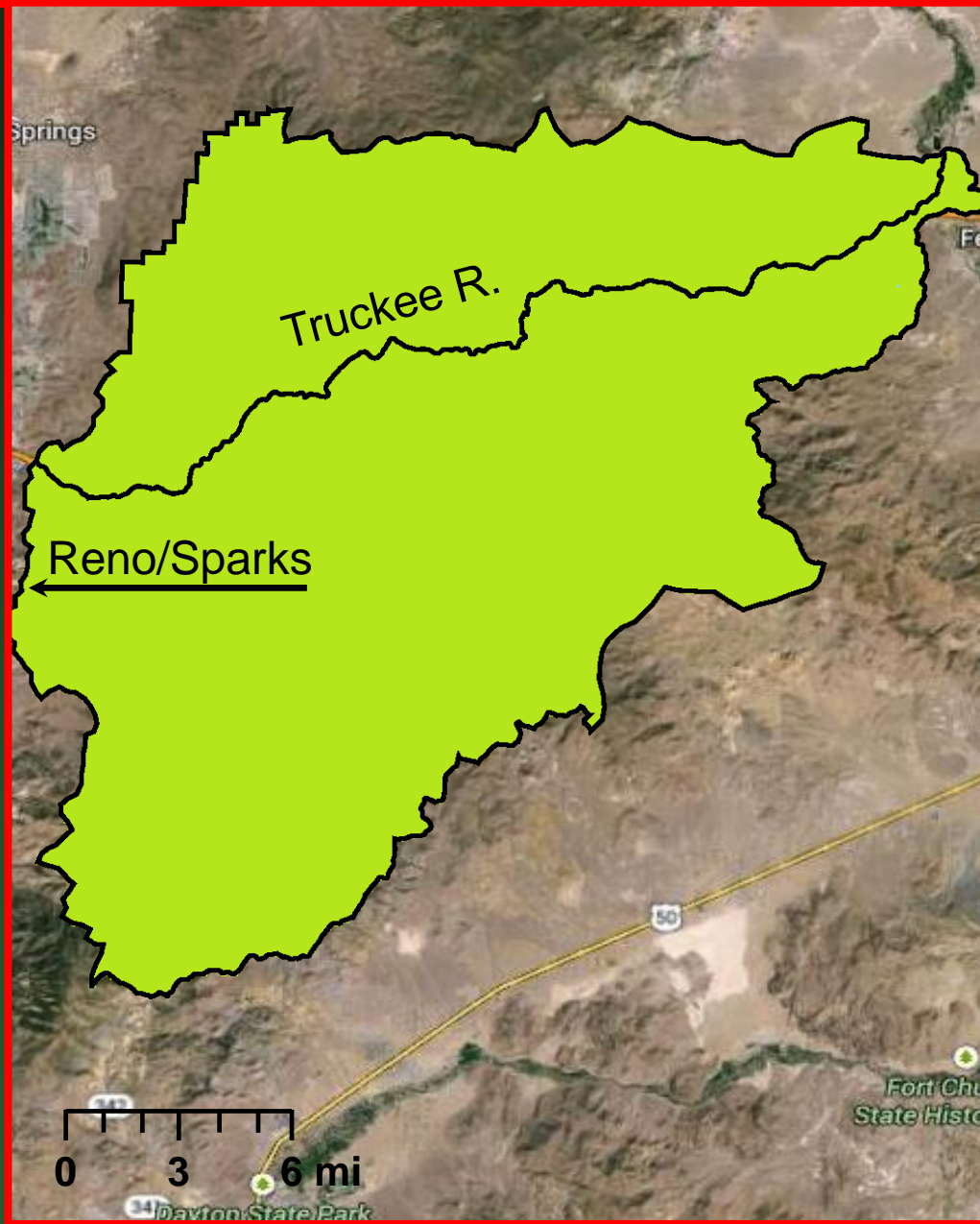
# Objective

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- **Estimate magnitude & timing of pumping effects; Tracy Segment hydrographic area (HA)**
  - Decreased groundwater discharge to Truckee River
  - Groundwater level declines
- **Approach: Direct Drawdown Model**
  - Distribute Transmissivity (T) and Specific yield (Sy)
- **T and Sy distributions estimated with**
  - Aquifer tests
  - Simultaneously calibrate predevelopment & water-level change models

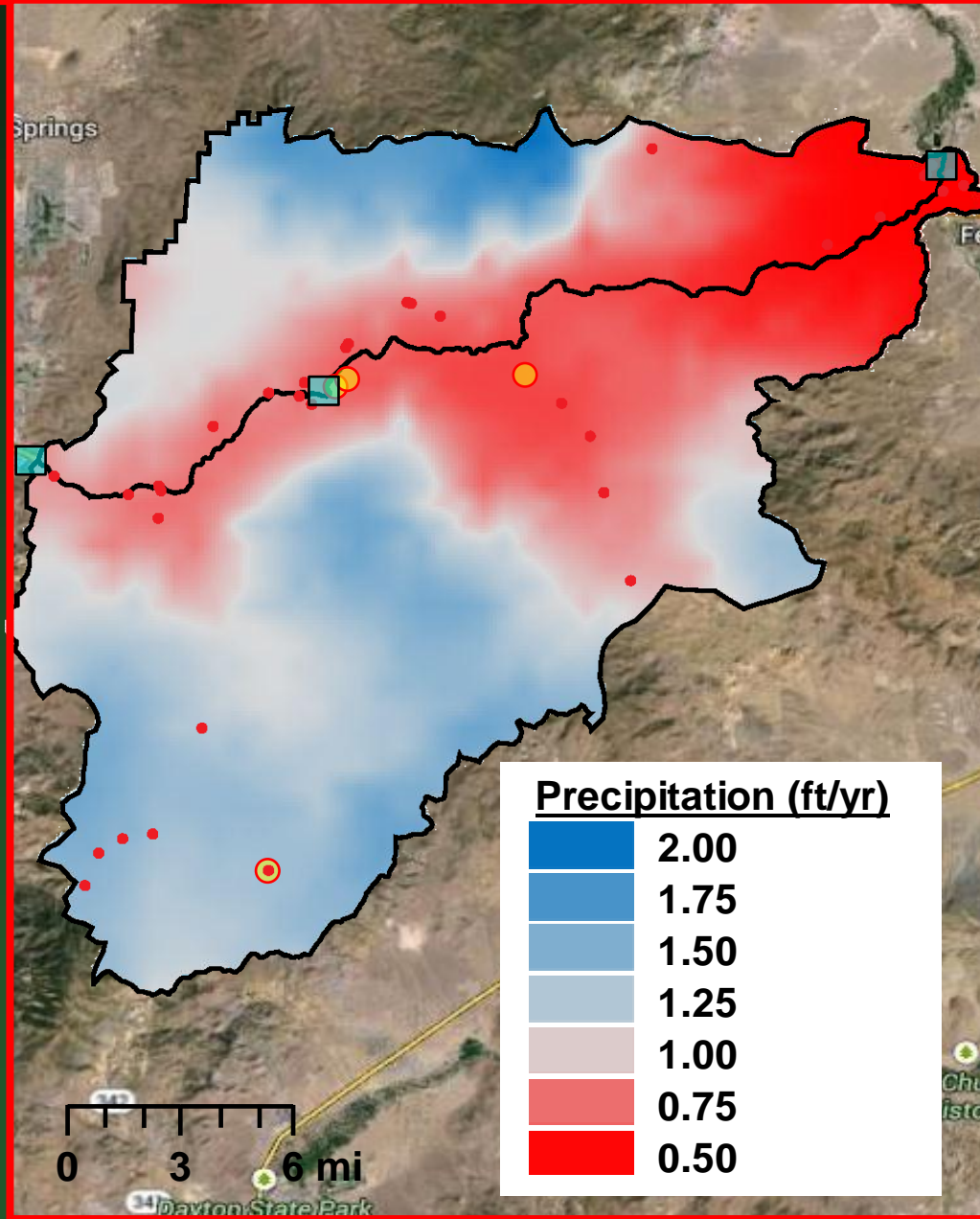
# Tracy Segment HA

- East of Reno/Sparks
- Precipitation:
  - ~150,000 acre-ft/yr
- Truckee discharge at Vista gage:
  - ~780,000 acre-ft/yr
- Recharge range:
  - 6,000 acre-ft/yr
  - 11,500 acre-ft/yr



# Steady-State Model Observations

- **Geology**
  - Mostly volcanic rock
  - Thin basin fill
- **Groundwater levels**
- **Aquifer test data**
  - Investigates volcanics
- **Discharge & Stage;**  
3 Truckee R. gages
- **PRISM precipitation model**
- **Recharge equals discharge**



# Groundwater Model Discretization

- 256 x 233 cells

  - 150 m x 150m

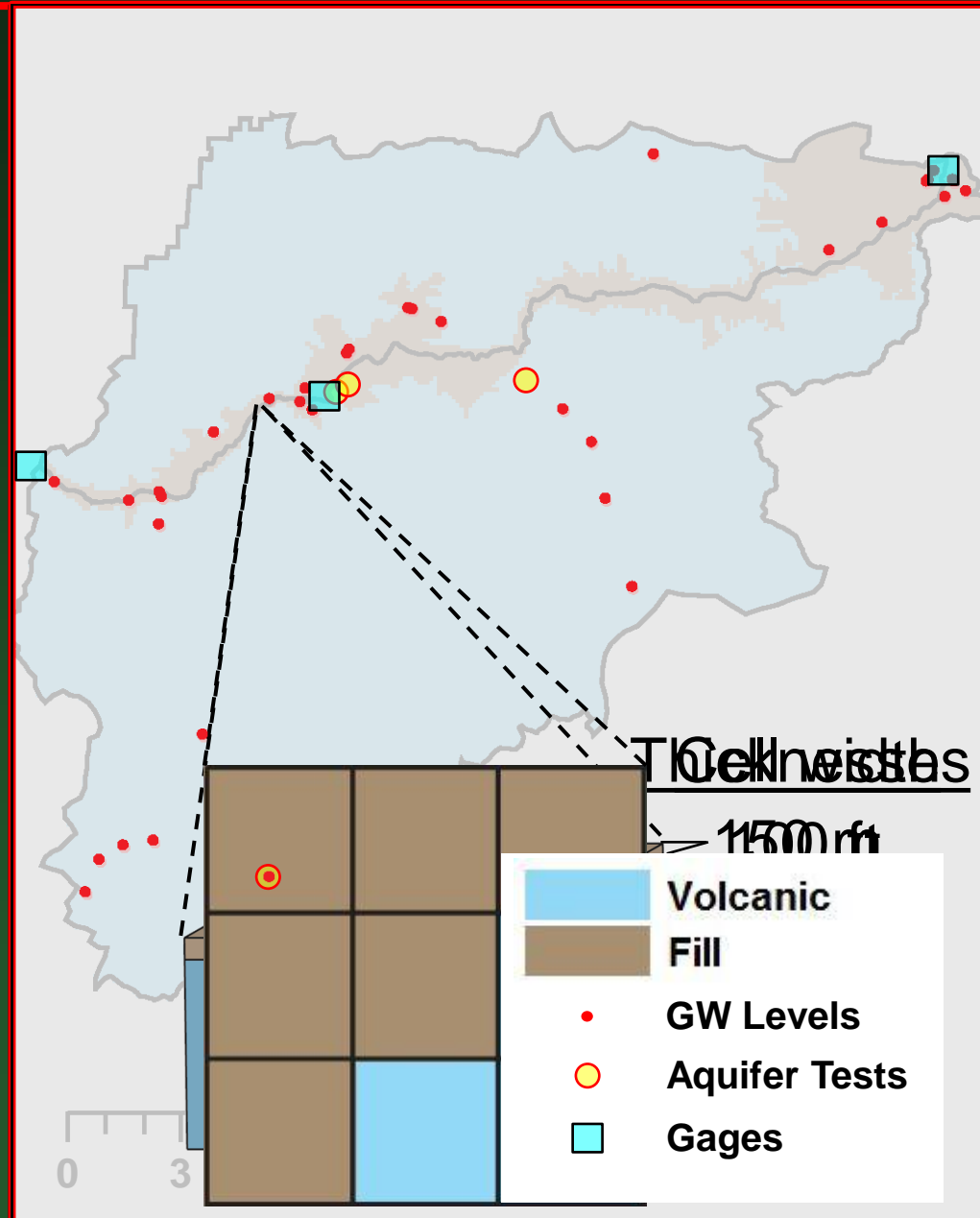
- Two Layers

  - Layer 1 (upper)

    - Volcanic or Fill
    - 100 ft thick

  - Layer 2 (lower)

    - Volcanic only
    - 900 ft thick



# Steady-State Model Calibration

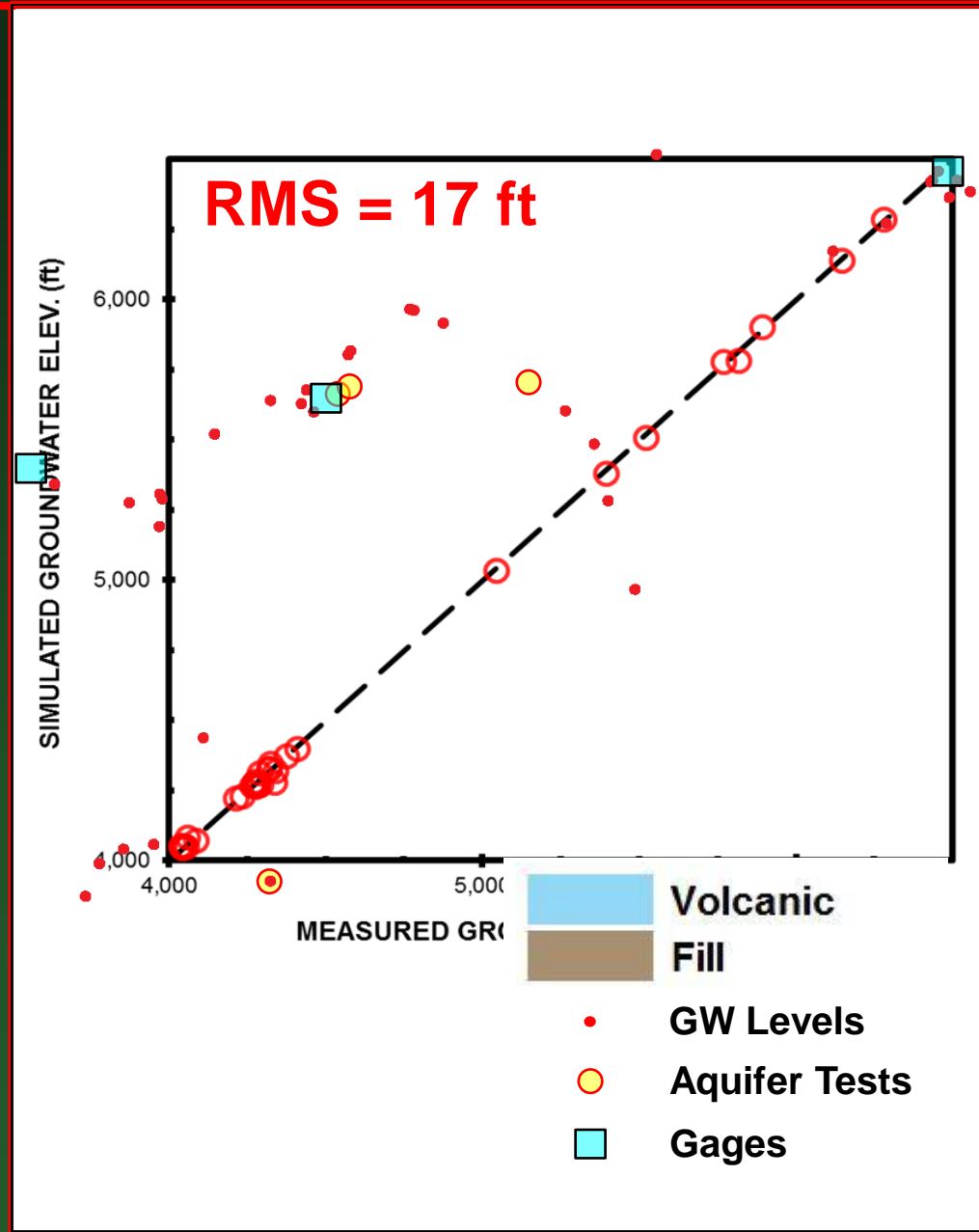
## ○ Observations

- Transmissivity—  
Aquifer-test results
- Groundwater levels
- Discharge = 6,000 ac-ft/yr

## ○ T and R distributed with pilot points

- T—Geologic constraints
- R—PRISM guides

## ○ Match T, water levels, and total discharge

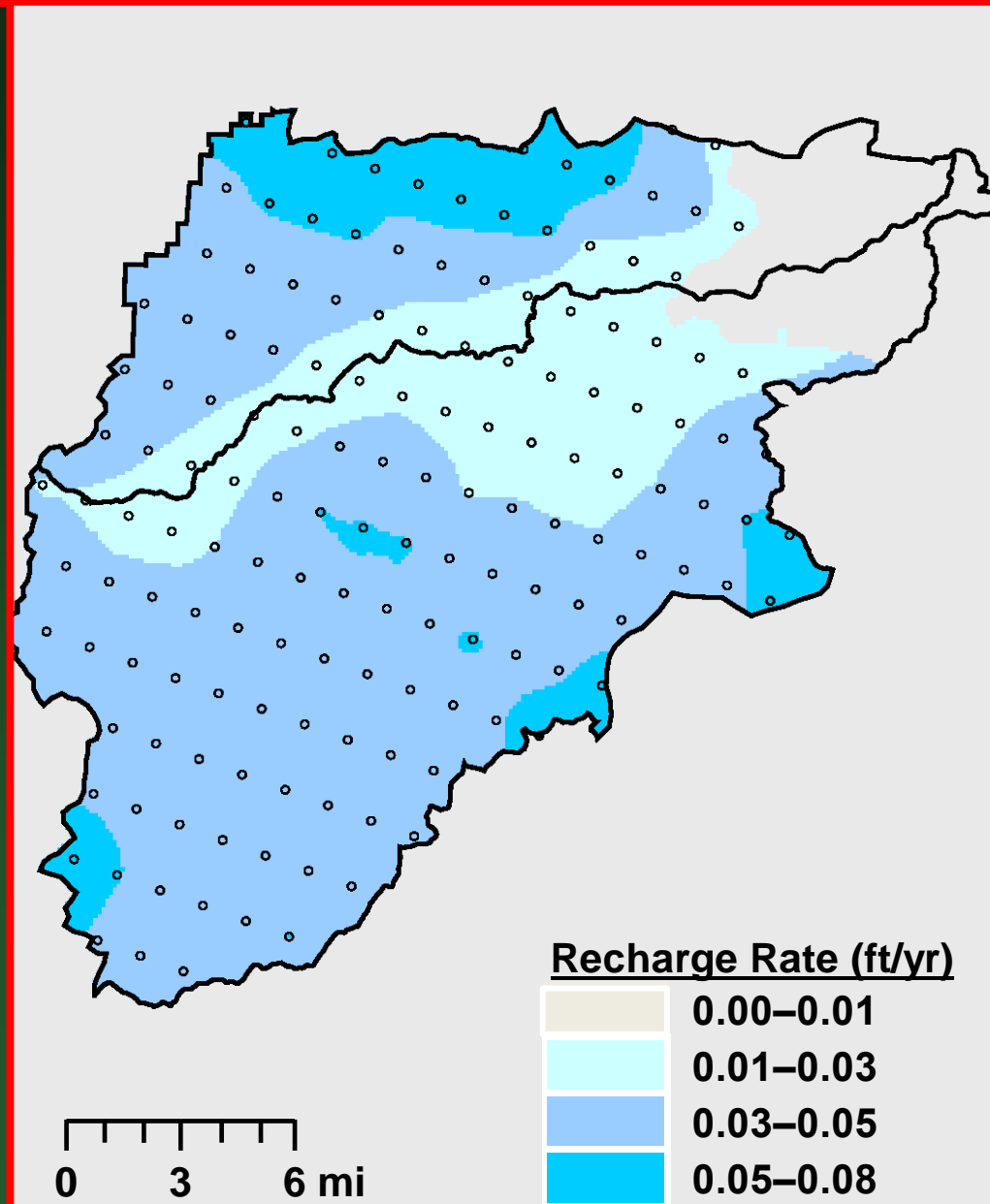


# Steady-State Model Calibration

## ○ Recharge Estimates

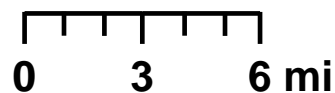
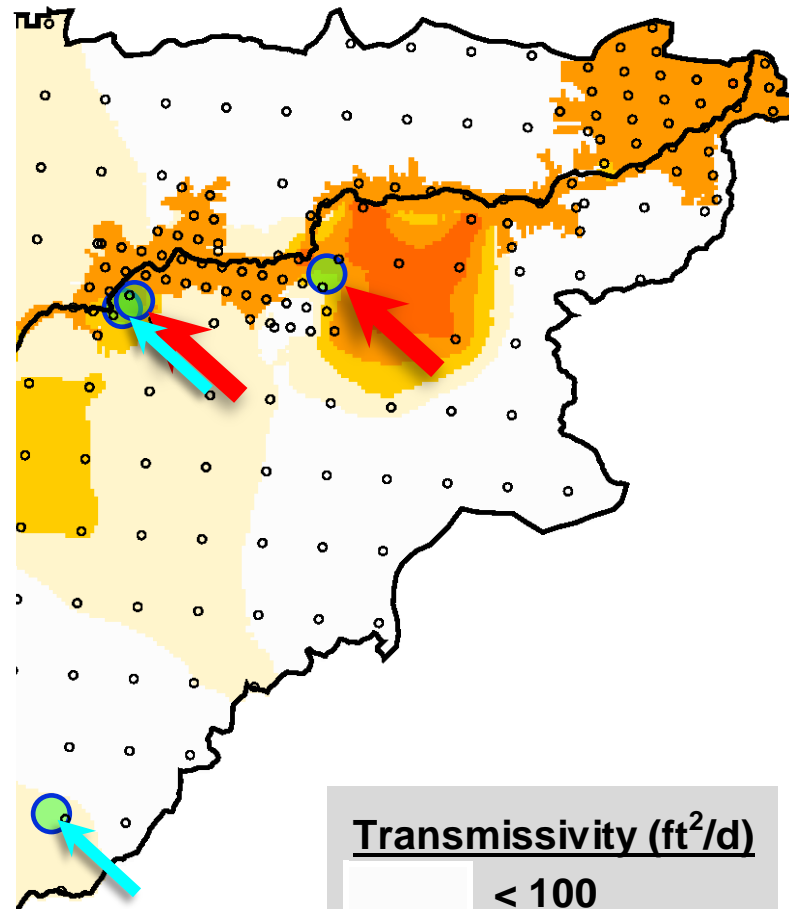
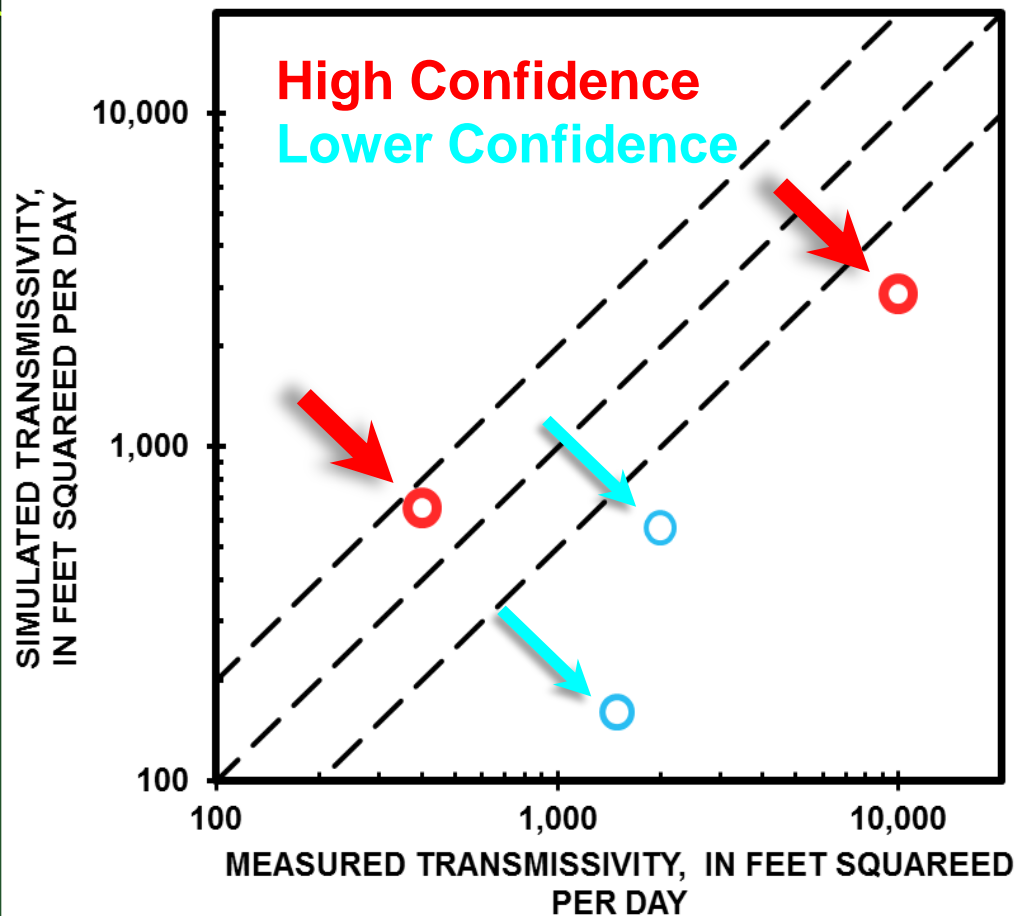
- Recharge = GW discharge  
Total = 6,000 acre-ft/yr
- Recharge distributed  
by kriging from pilot points
- More precipitation—PRISM;  
More recharge
- Maximum = 0.08 ft/yr

## ○ Recharge unnecessary for prediction



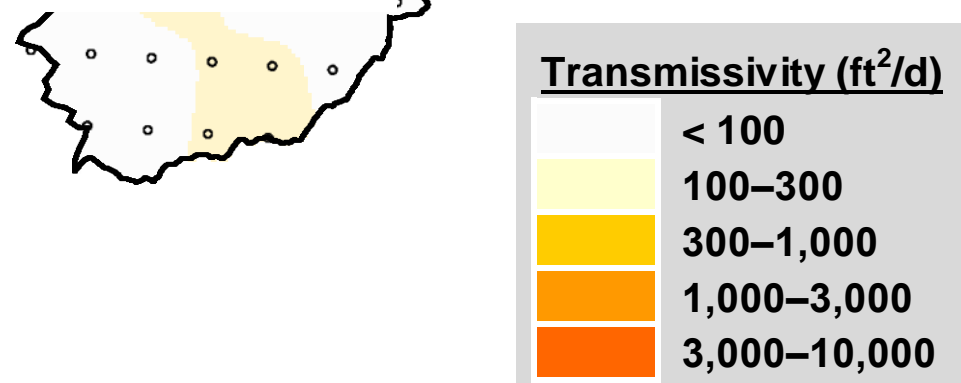
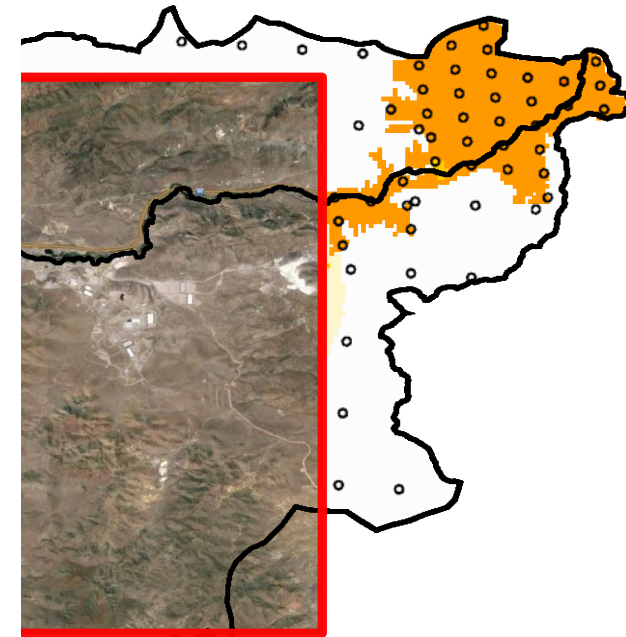
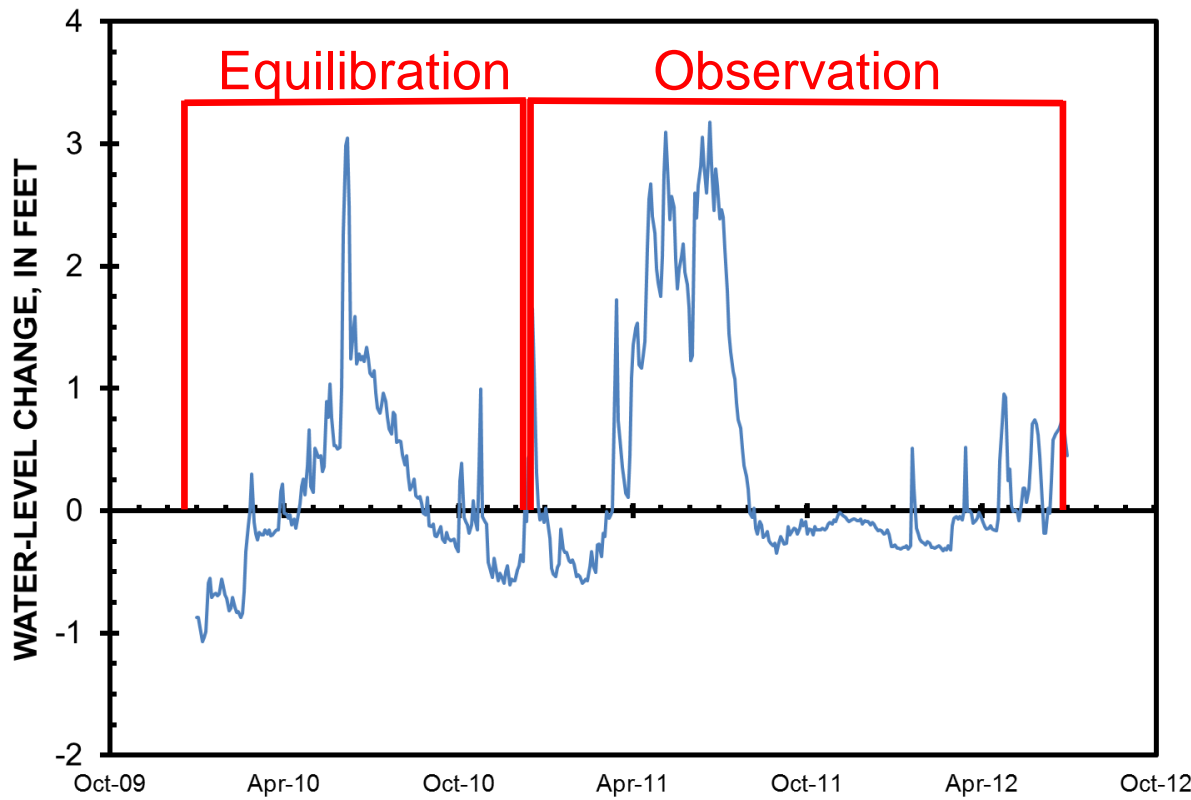
# Steady-State Model Calibration

## Transmissivity



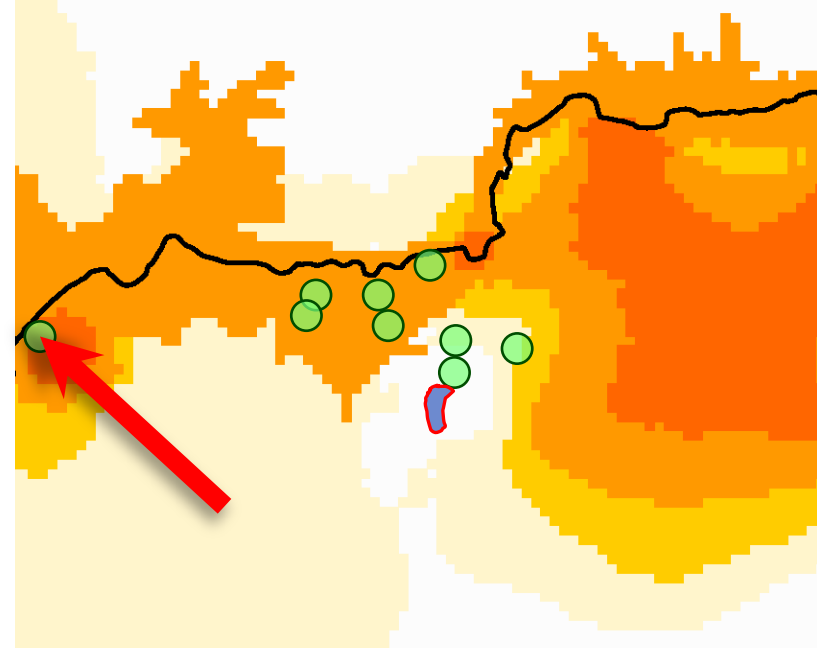
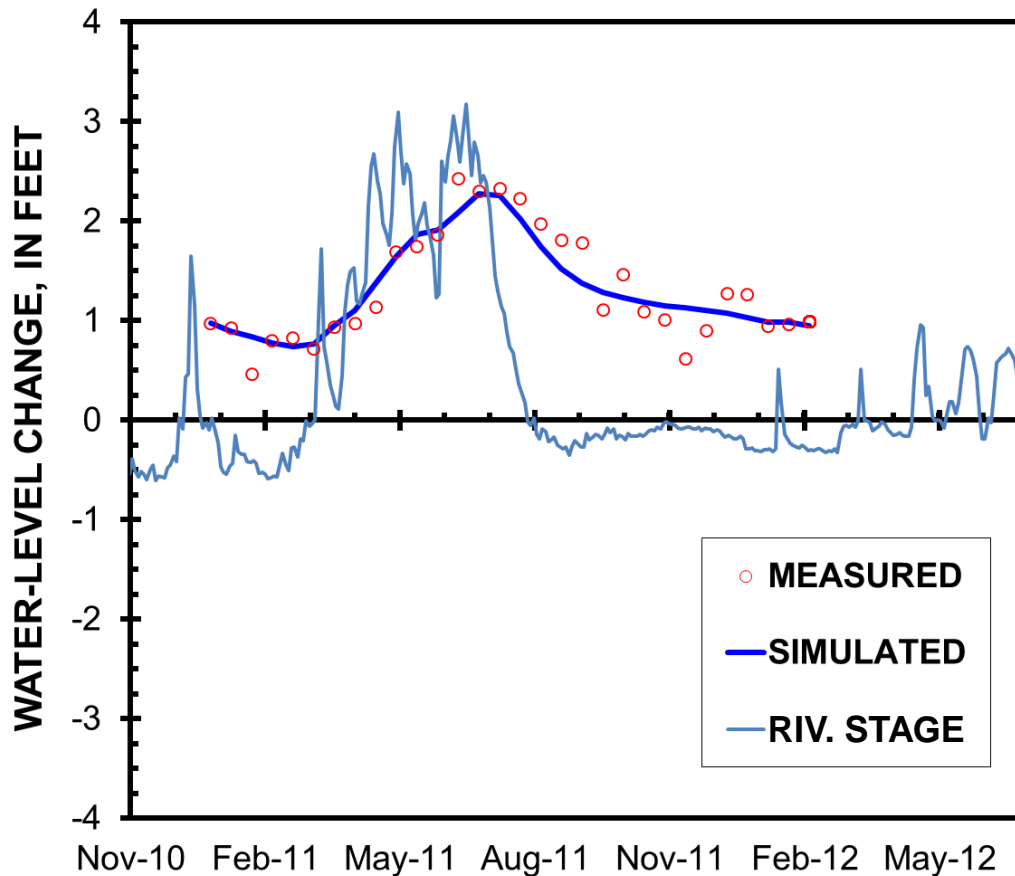


# Transient Model Calibration

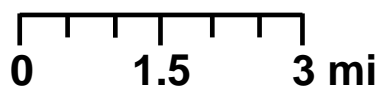


- Modeling period
  - Jan. 2010–July 2012
  - 48 h timesteps (n = 398)

# Transient Model Calibration

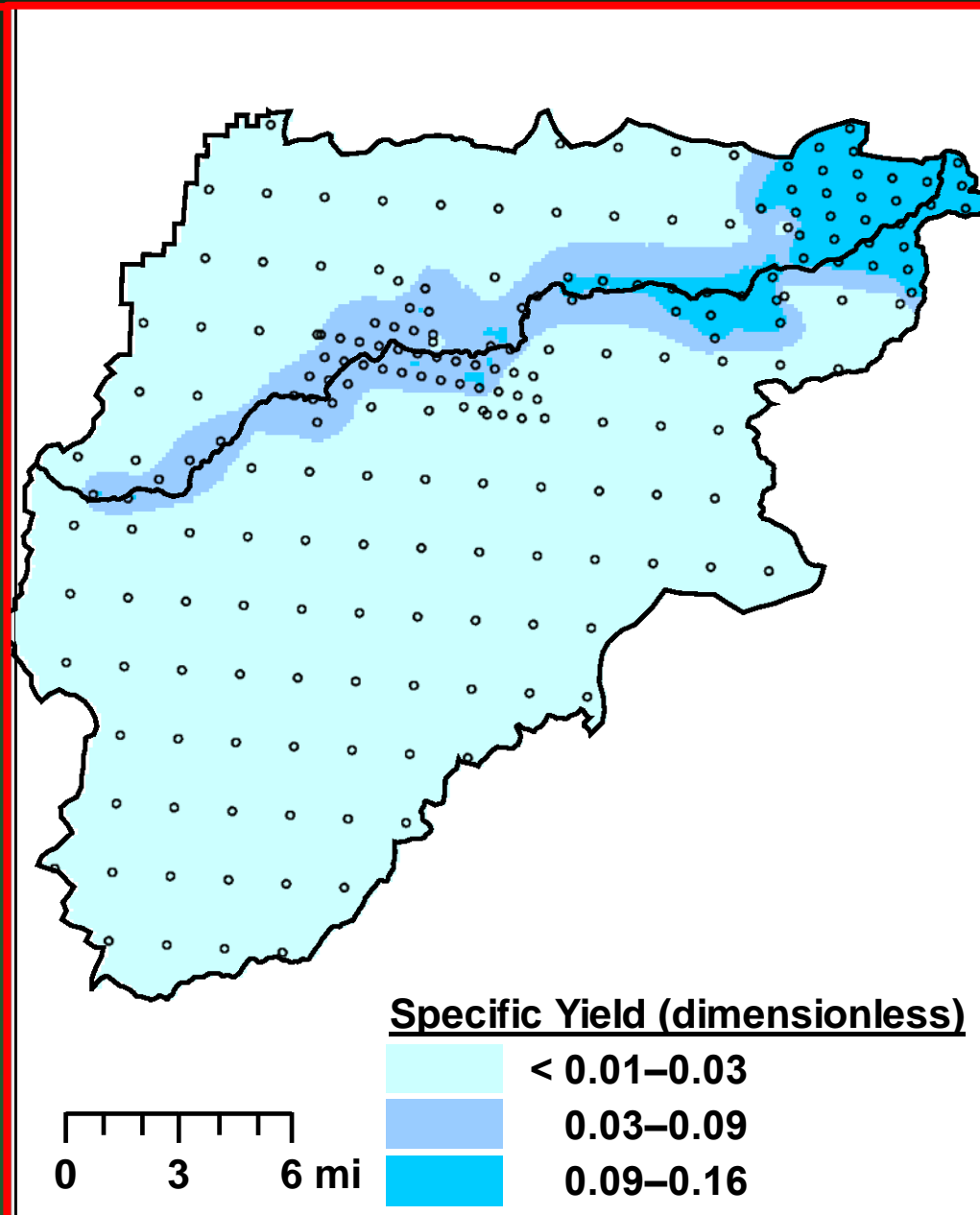


**Transmissivity (ft<sup>2</sup>/d)**



# Transient Model Calibration

- Specific yield constrained by geology
  - Fill = 1–16%  
avg. = 10%
  - Volcanics = <1–15%  
avg. = 1%
- Transient calibration also refines transmissivity distribution in area of interest



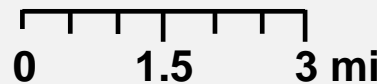
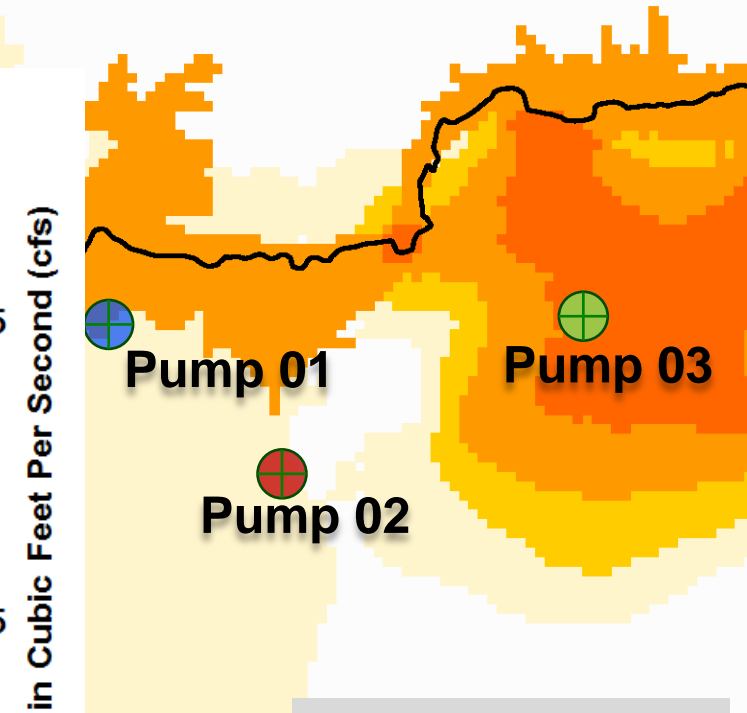
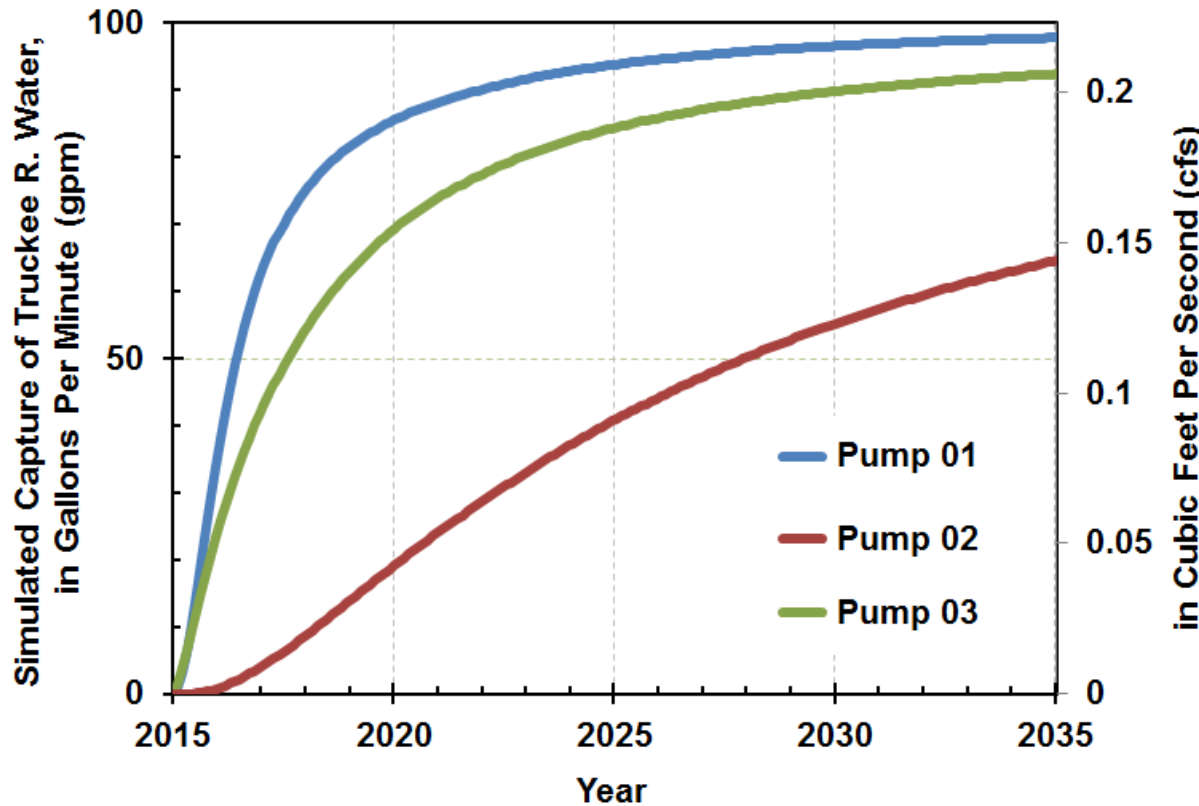
# Direct Drawdown Approach

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- **Separate from calibration models**
- **Truckee R. = no drawdown boundary**
  - Effectively an infinite source of water
- **Recharge not needed**
- **Initial drawdown in MODFLOW**
  - Zero, – 0 –, specified
  - No simulated drawdown
- **Spatially distributed properties**
  - Specific yield
  - Transmissivity

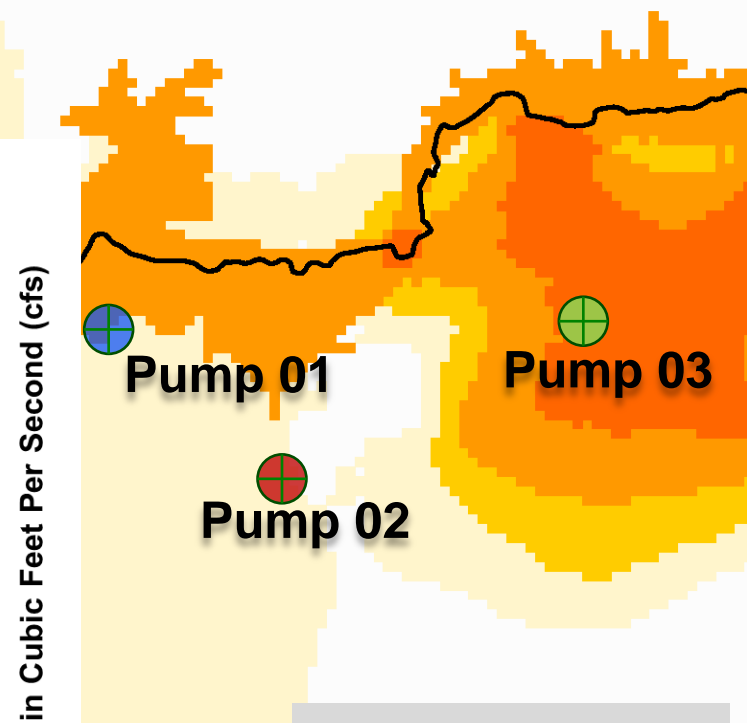
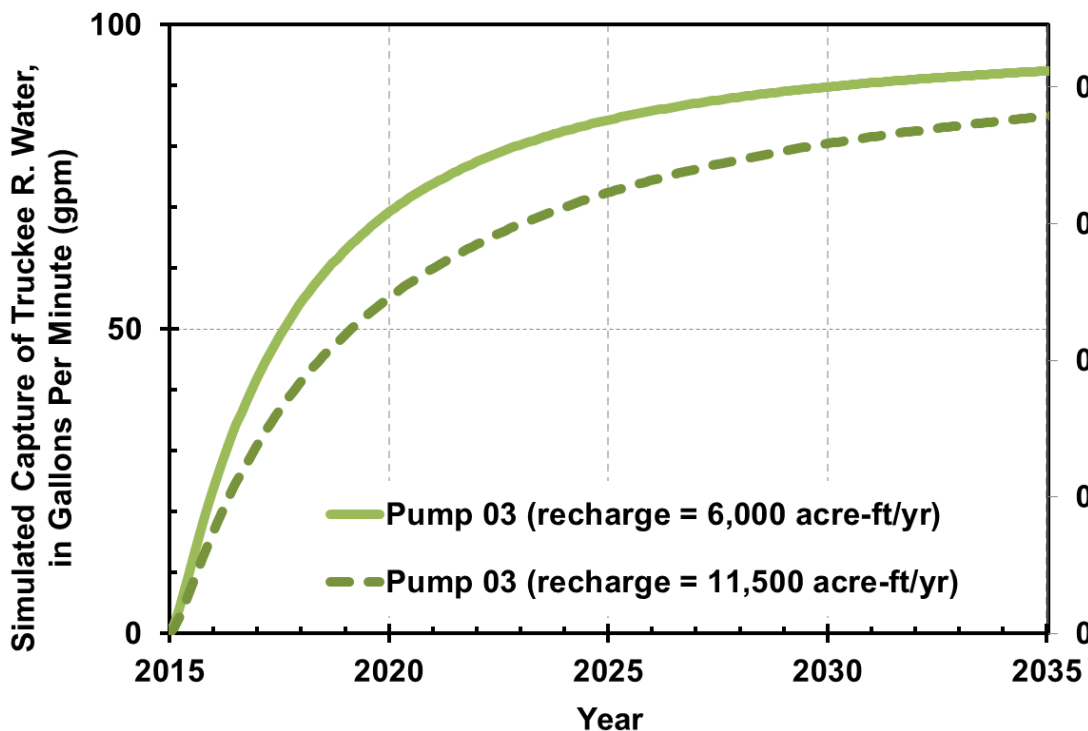
# Direct Drawdown Approach

- Hypothetical pumping wells (n = 3)

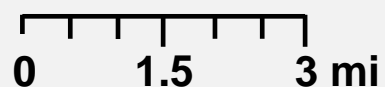
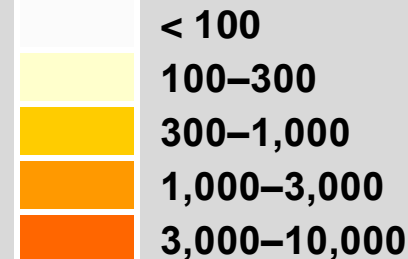


# Alternative Hydraulic Properties

- Change GW discharge observation
- Recharge = Discharge



Transmissivity (ft<sup>2</sup>/d)



# Summary

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- Direct-drawdown simulation is a simple, useful tool for estimating the magnitude and timing of pumping effects on groundwater discharge
- Preliminary results indicate ...
  - Magnitude & timing of groundwater capture tied to proximity to Truckee River
  - Differences in assumed recharge volumes minimally affect magnitude & timing of groundwater capture