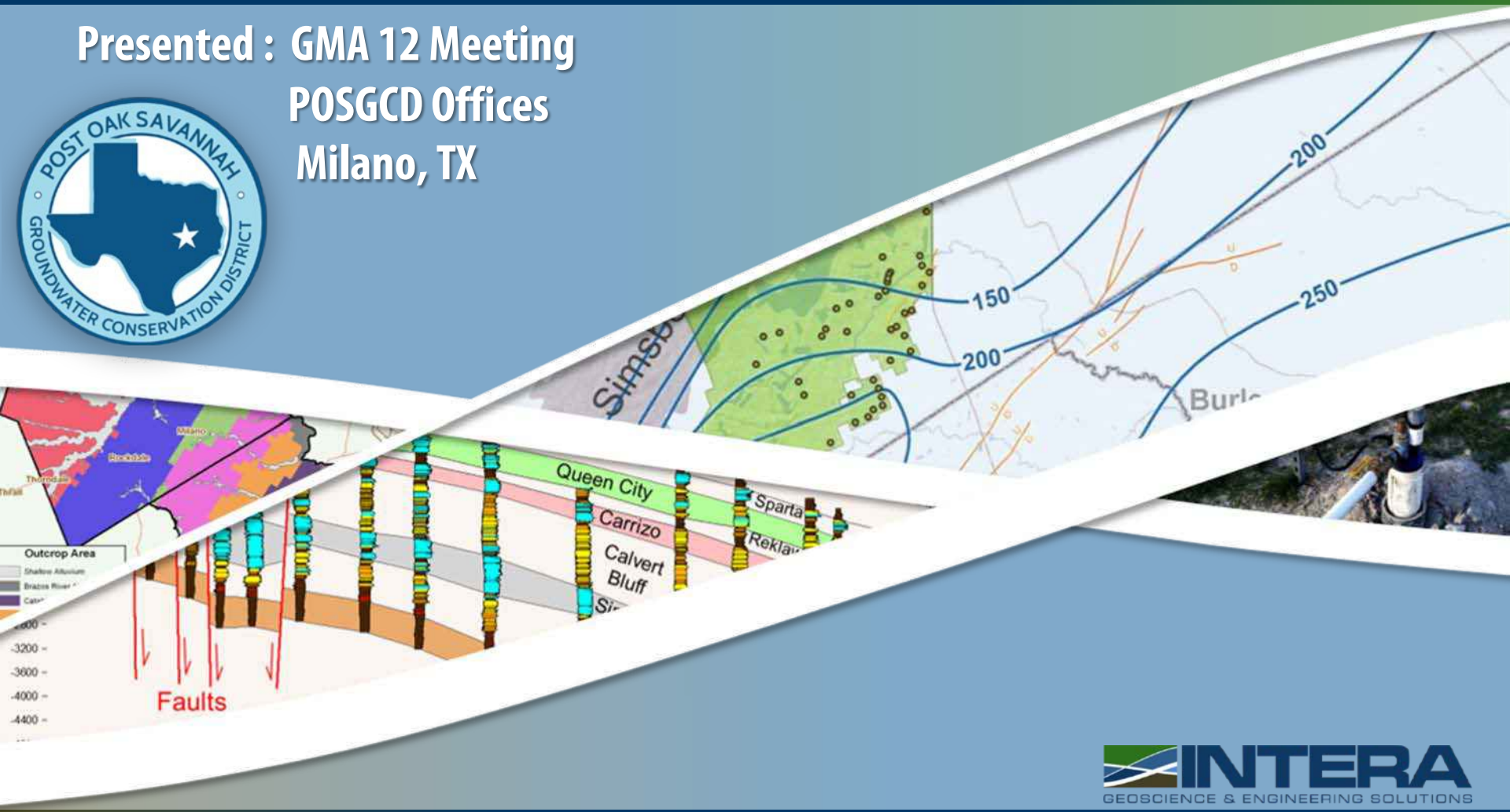
Update to the Carrizo-Wilcox Groundwater Availability Model (GAM)

Presented : GMA 12 Meeting
POSGCD Offices
Milano, TX



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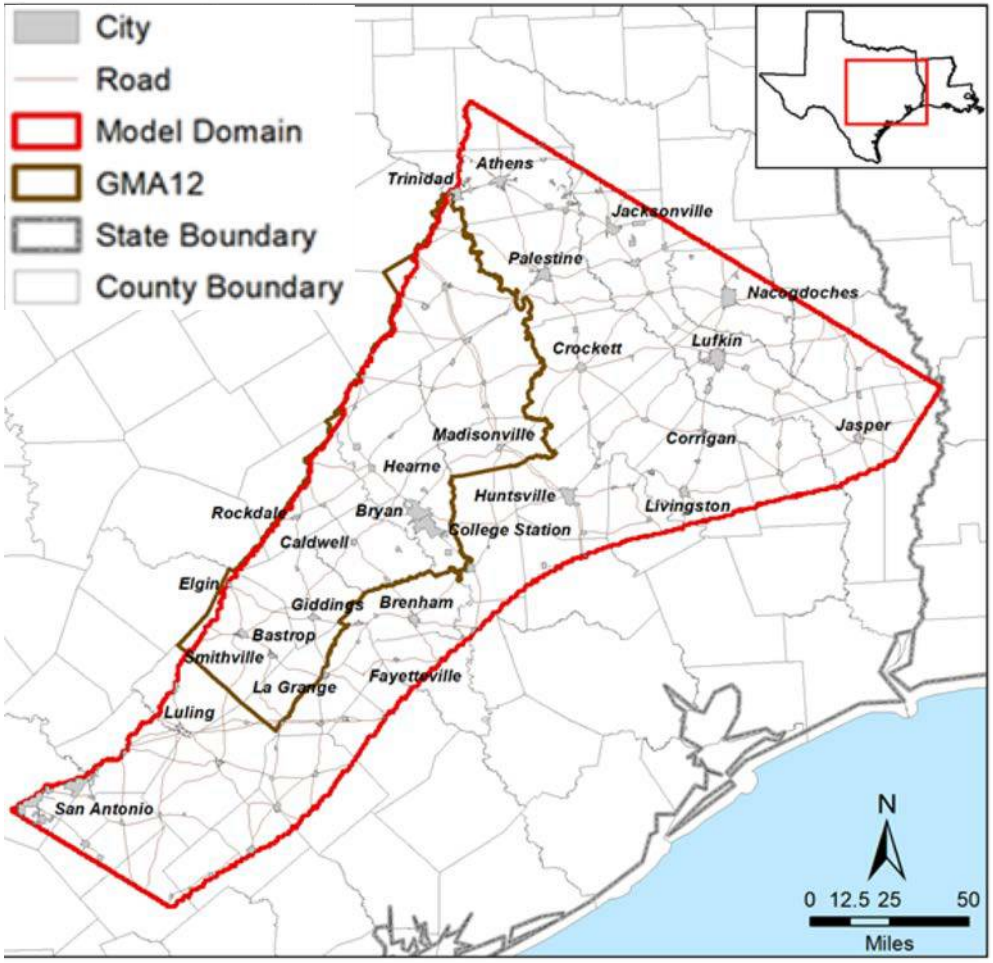
October 9, 2018

GAM Updates

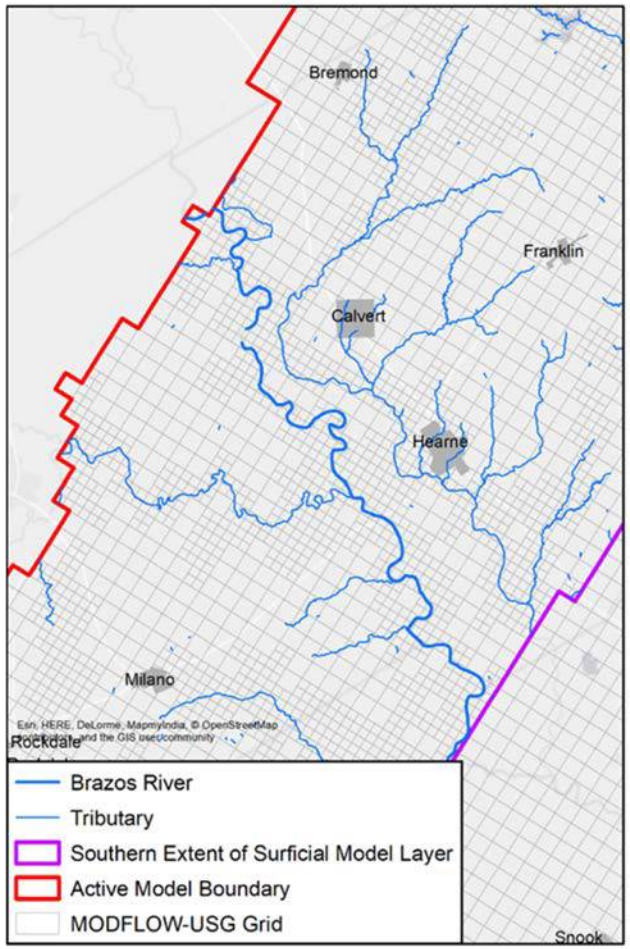
- Increased resolution near Colorado and Brazos River
- Addition of shallow groundwater flow zone
- Enhanced representation of recharge
- Enhanced model predictive capabilities near streams
- Updated aquifer properties using recent aquifer pumping tests
- Update fault locations and properties
- Increased calibration period for simulation of historical water levels

Model Construction

Areal Extent – no change



Grid cell Sizes – Smaller and refined around rivers



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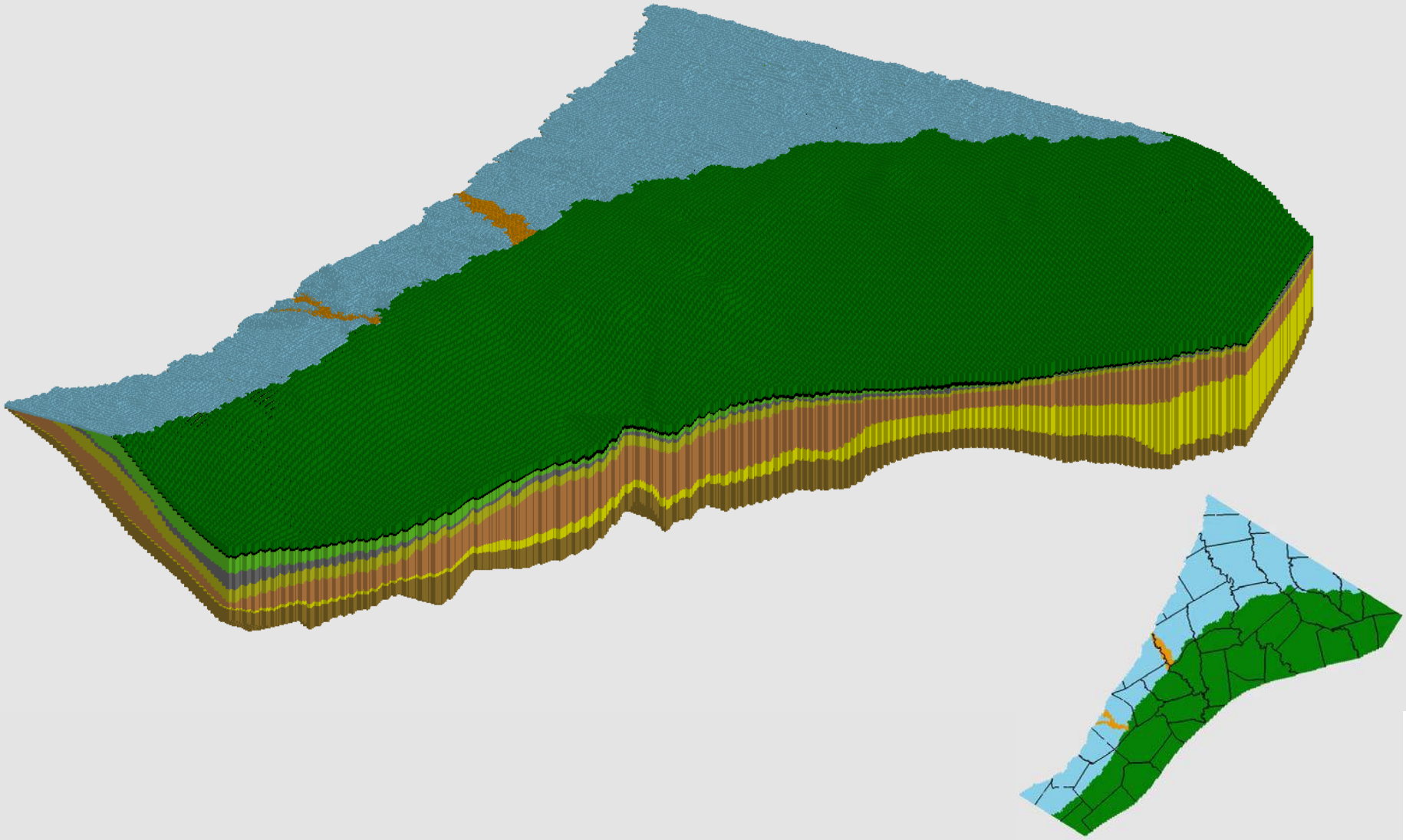
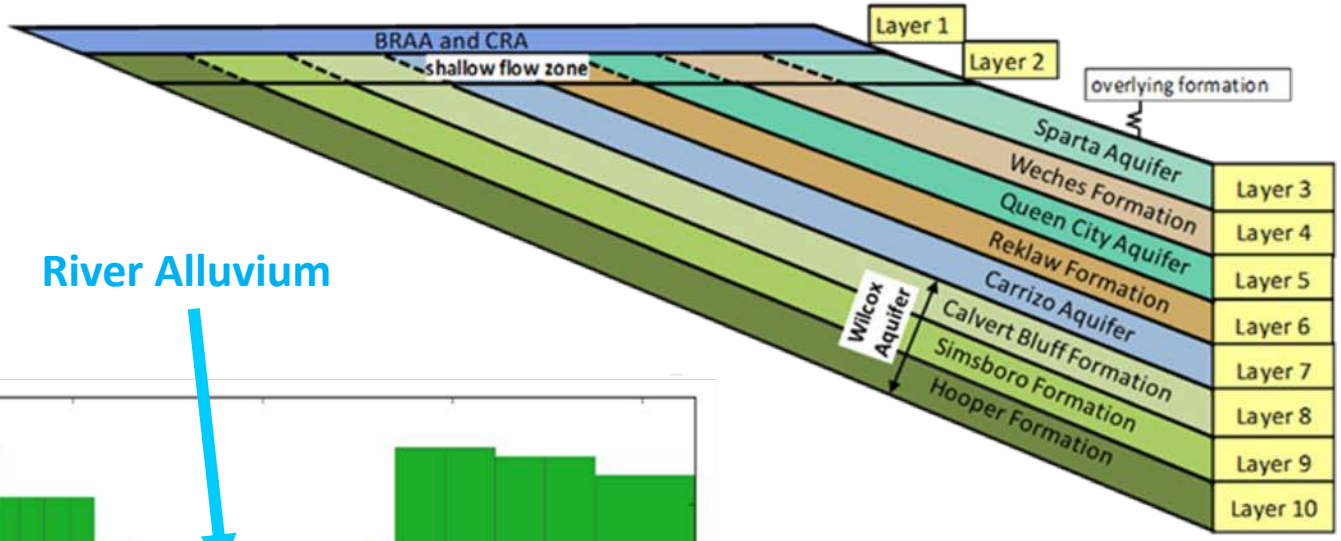
Three-Dimensional View of Updated GAM with Ten Model Layers



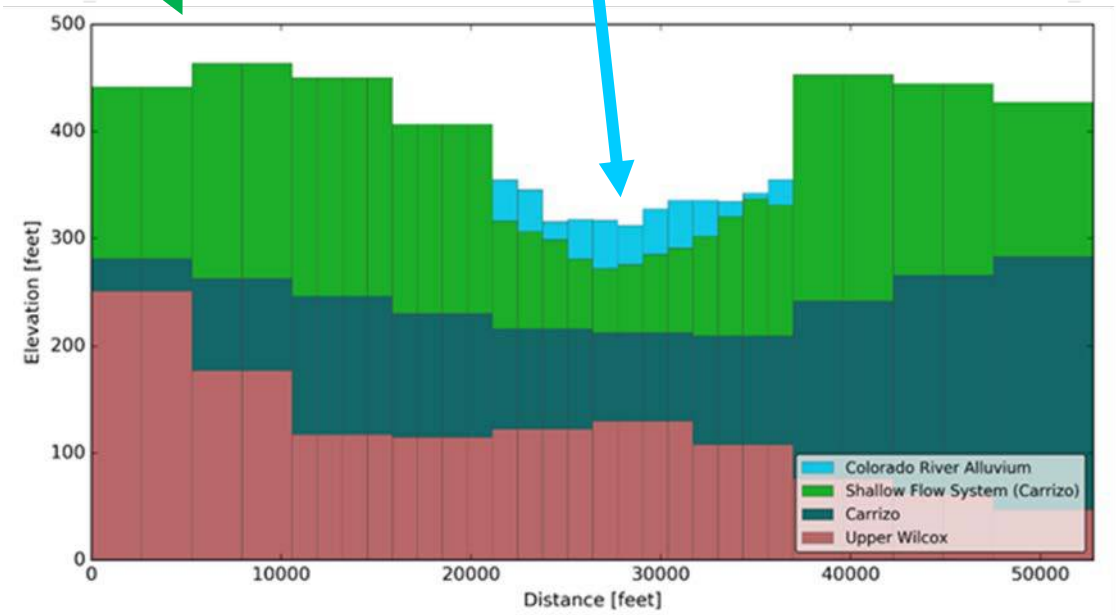
Cross-Sections of Model Layers in Updated GAM

Vertical Layering– added two layers – river alluvium and a shallow groundwater flow zone



Shallow Flow Zone

River Alluvium



Additional model layers prevents deep pumping and stream flow from occurring in same grid cell

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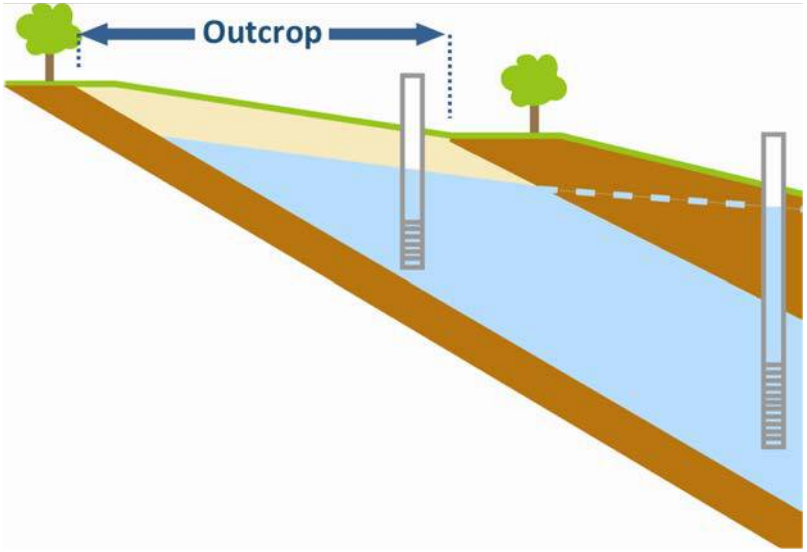
Changes to Recharge & Shallow Groundwater Flow

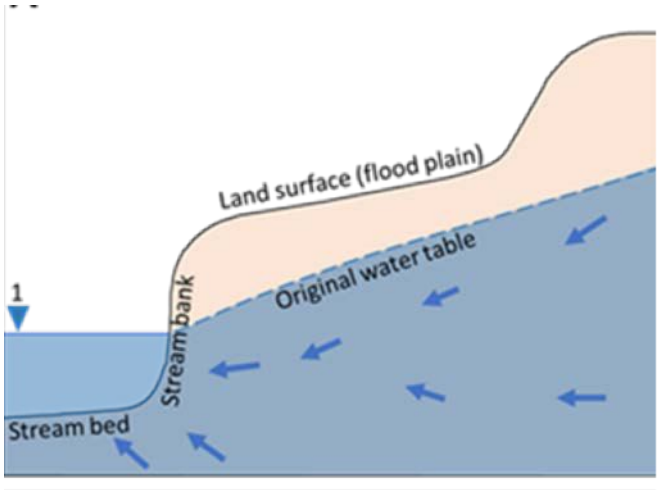
Recharge Rate about Doubled

- Recharge only occurs on outcrops
- Recharge Rate Increases with:
  - increased annual precipitation
  - decreased annual ET
  - Increased permeability (or percent sand) of formation

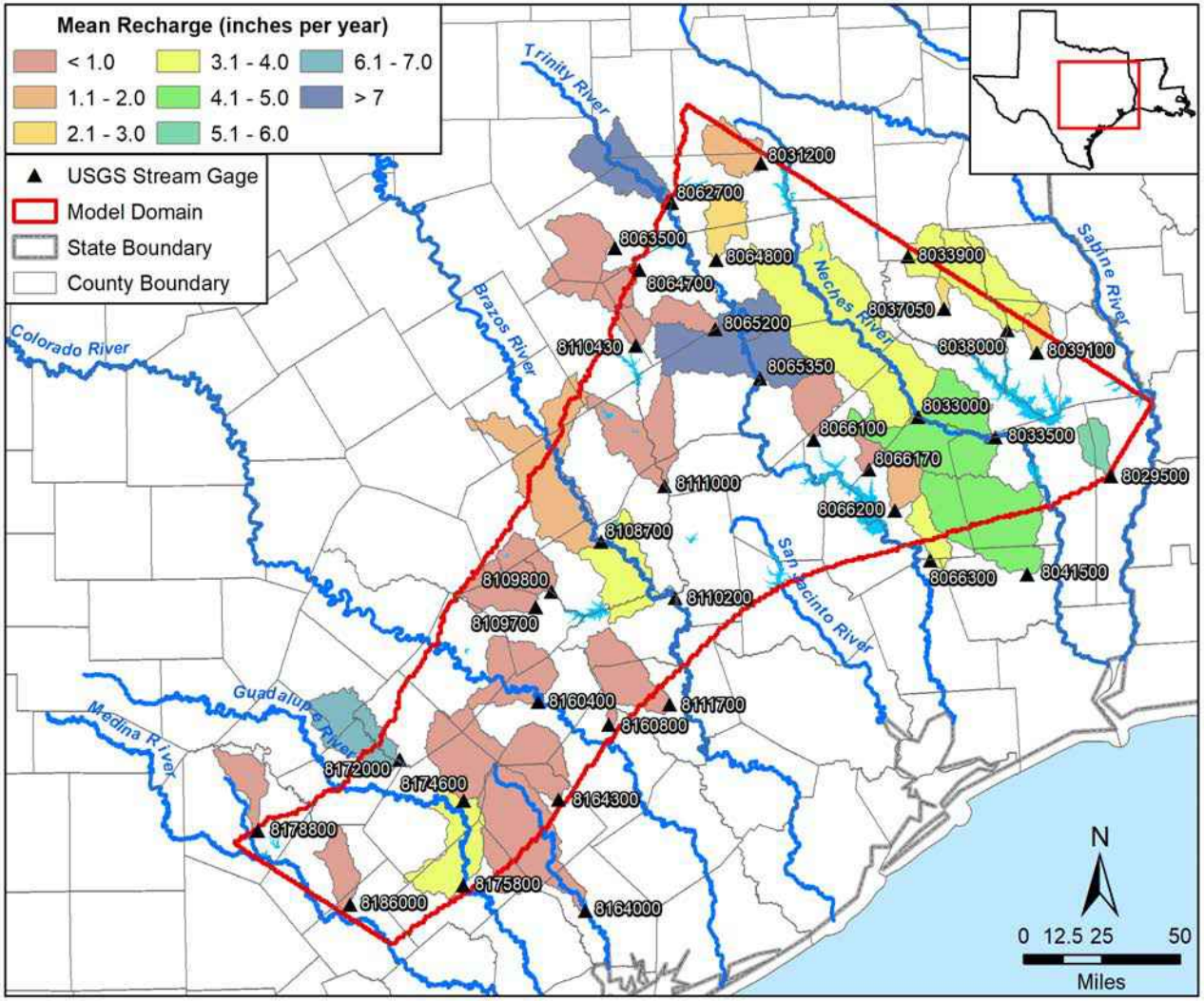


Groundwater Flux to Streams About Tripled

- When aquifer is full, primary outlet for groundwater discharge is surface water
- Addition of Shallow Model Layers allows two Flow Zones to Coexist:
  - Shallow groundwater flow strongly affected by SW-GW interaction
  - Deep groundwater flow is strongly affected by pumping



Revised Recharge Function based on Analysis of River Gages



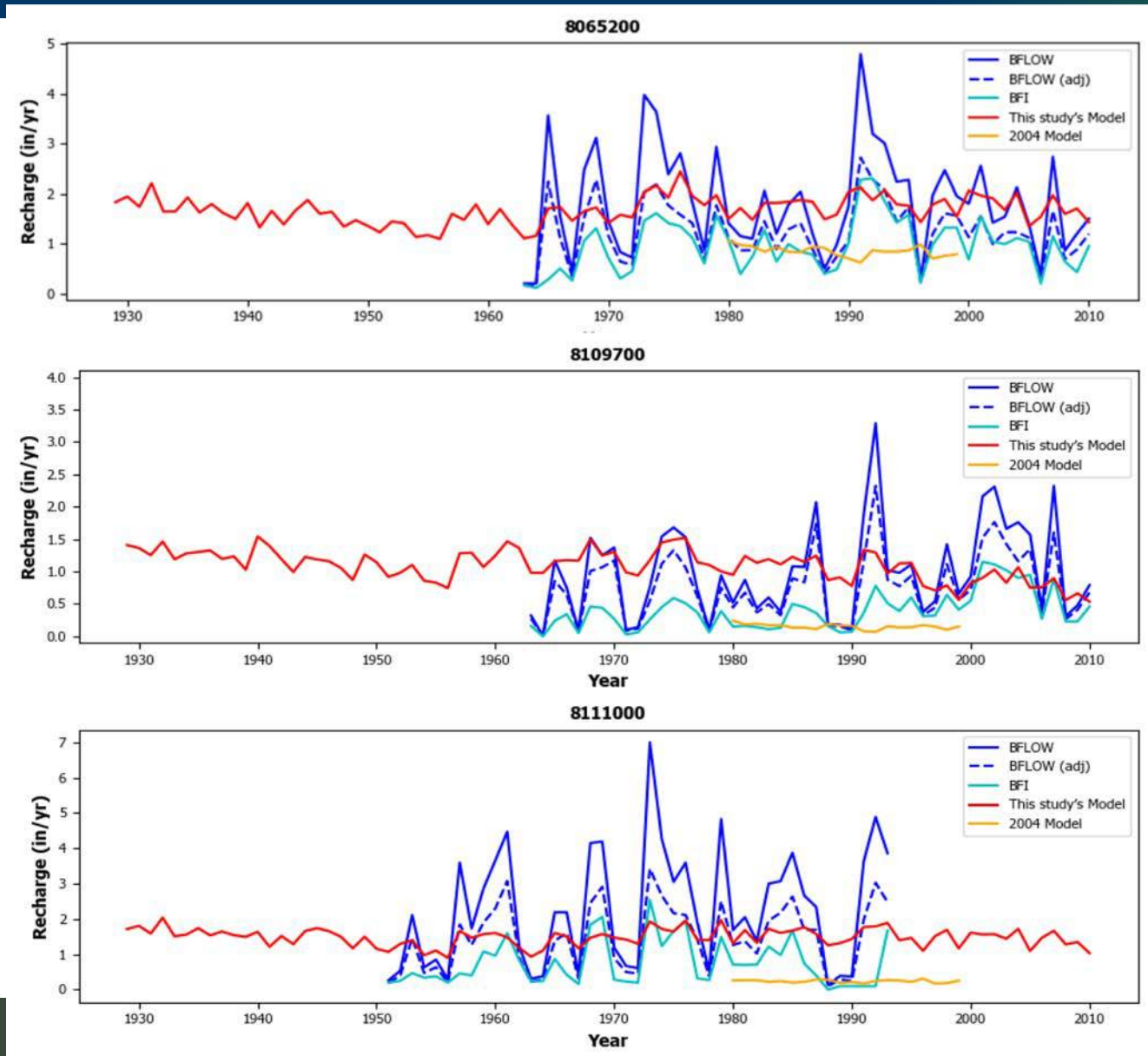
Revised Recharge Function

Precipitation-Recharge Relationship for GMA 12

Precipitation Percentile	Average Precipitation (in/yr)	Recharge (in/yr)	Recharge divided by Precipitation
0.1	26.3	0.8	0.03
0.2	29.2	1.2	0.04
0.3	32.2	1.6	0.05
0.4	34.3	1.8	0.05
0.5	36.9	2.0	0.05
0.6	38.9	2.1	0.05
0.7	42.3	2.3	0.05
0.8	44.9	2.3	0.05
0.9	48.2	2.3	0.05

* Revised GAM has about twice the amount of recharge than current GAM

Simulation of SW-GW Interactions



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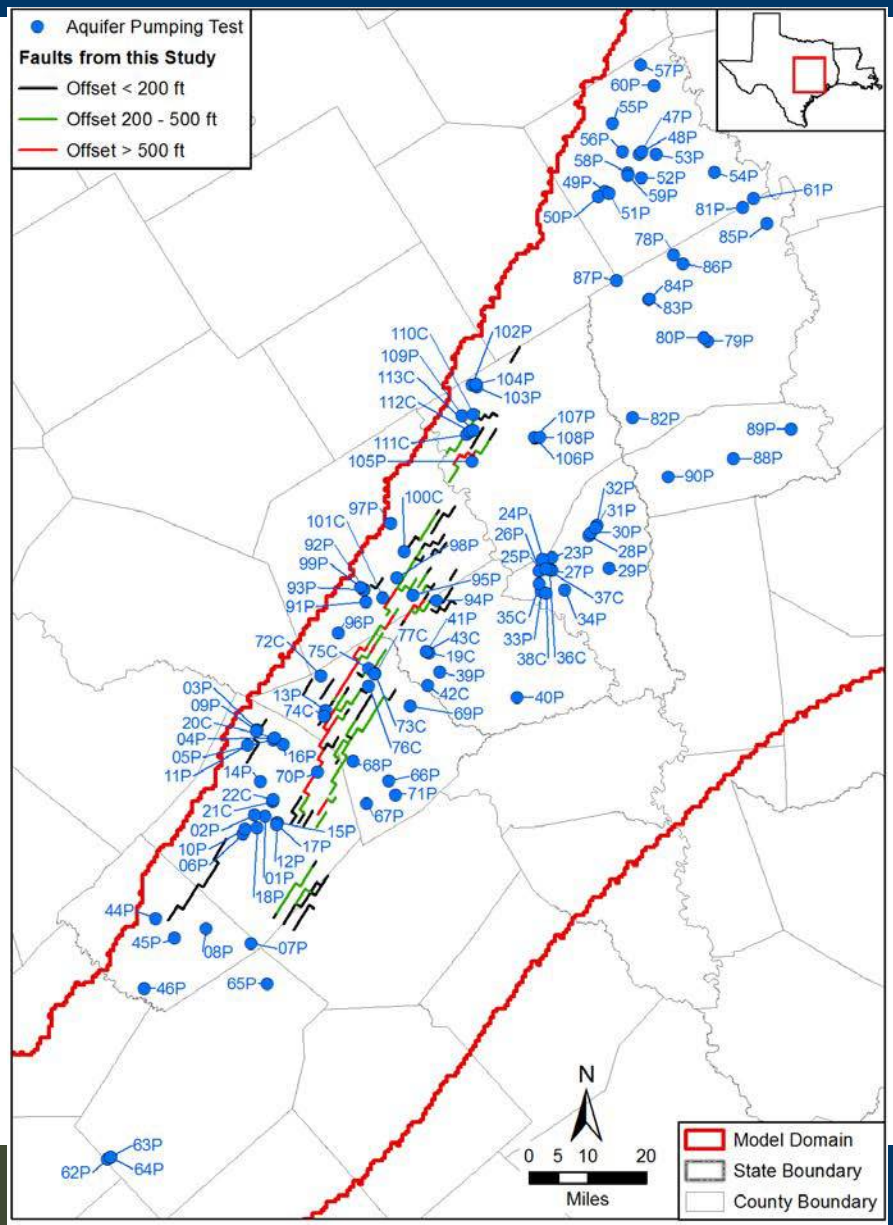
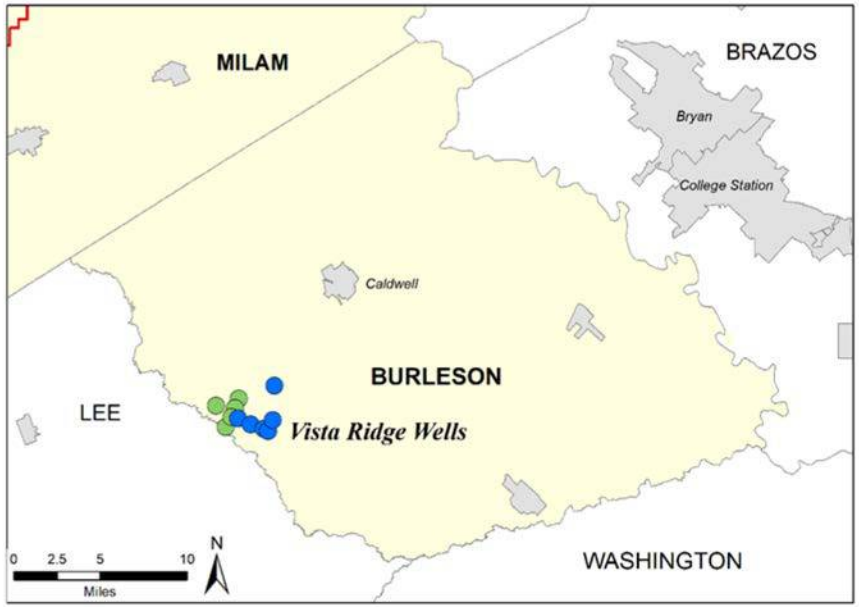
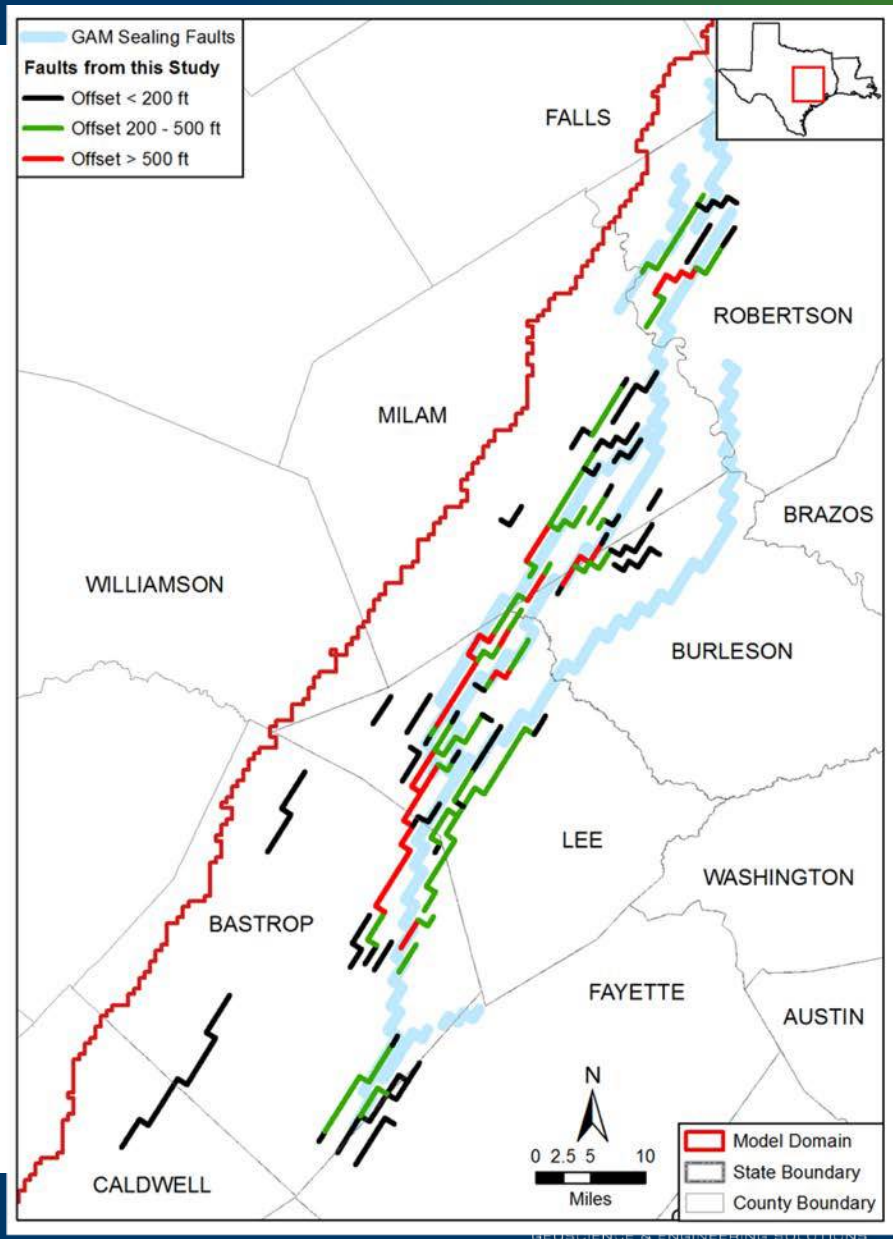
Aquifer Pumping Tests





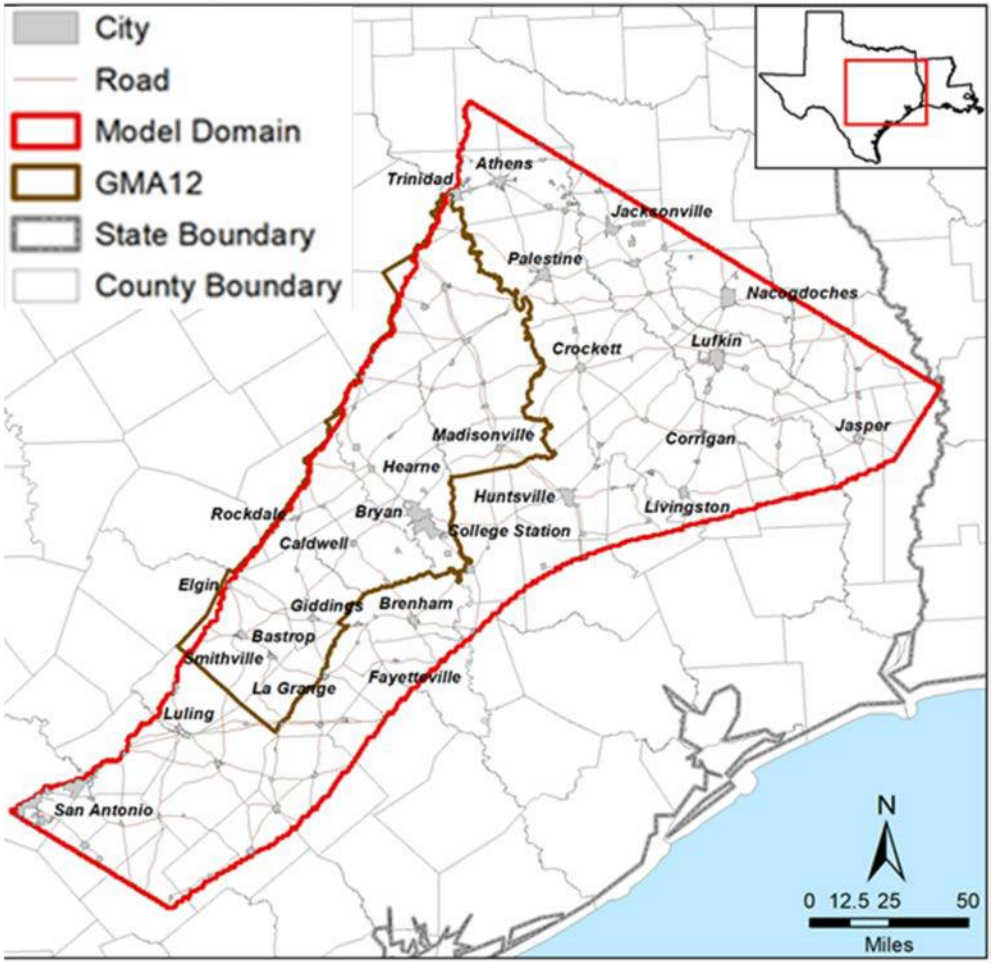
Updated Fault Representation: Smaller Footprint and Faults with Varying Properties

- Faults mapped using geophysical logs
- Properties of faults determined by analysis of pumping tests
- Less obstruction to groundwater flow



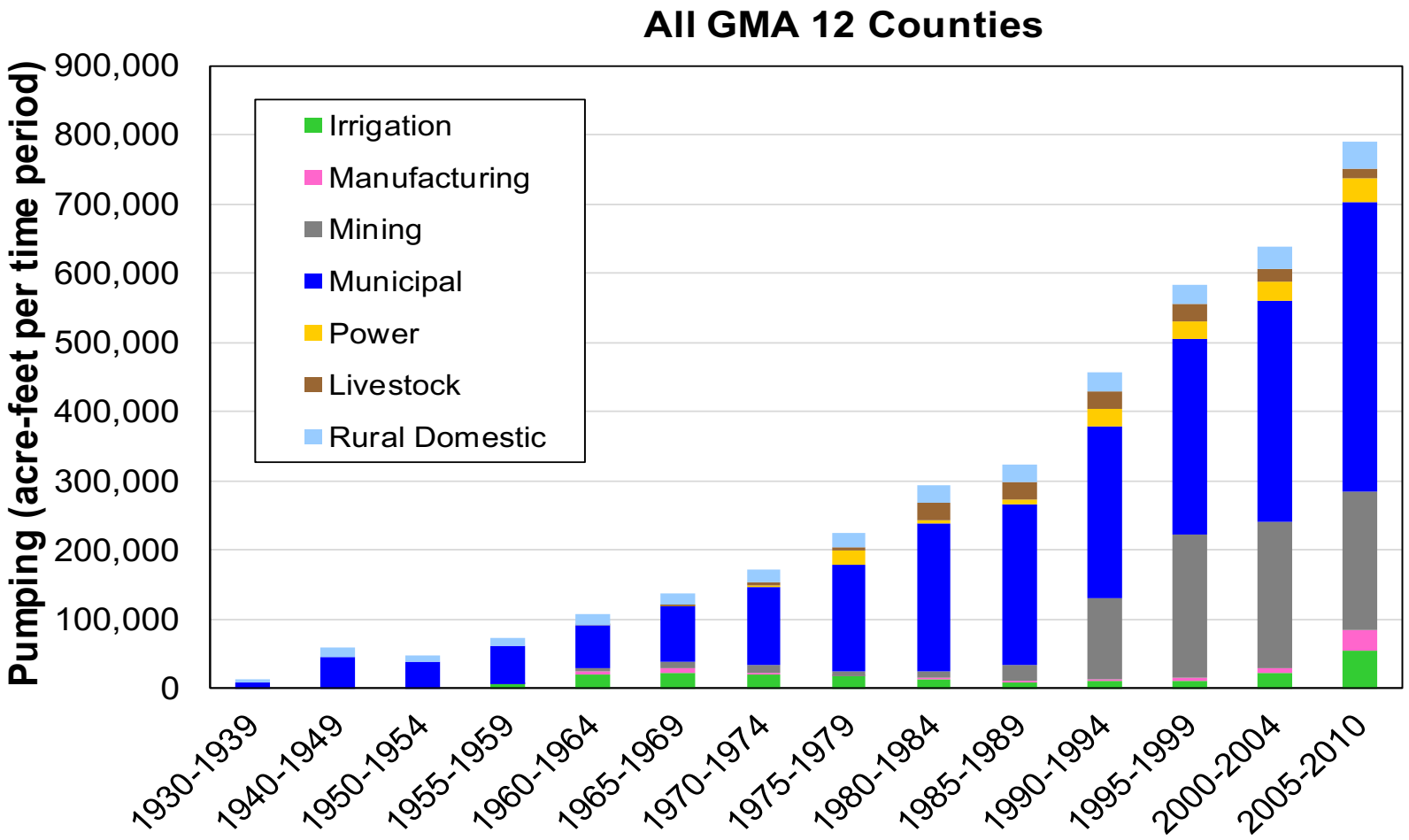
Lengthen Historical Calibration Period

- Previous model simulated 20 years
  - 1980 through 1999
- Updated model simulates 80 years
  - 1930 through 2010

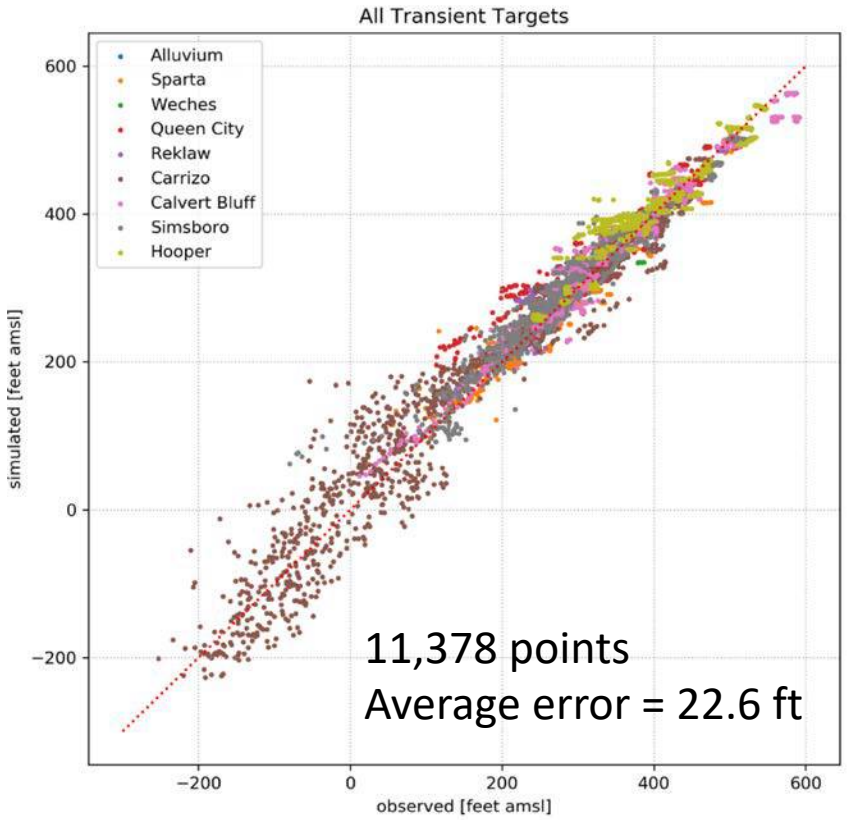


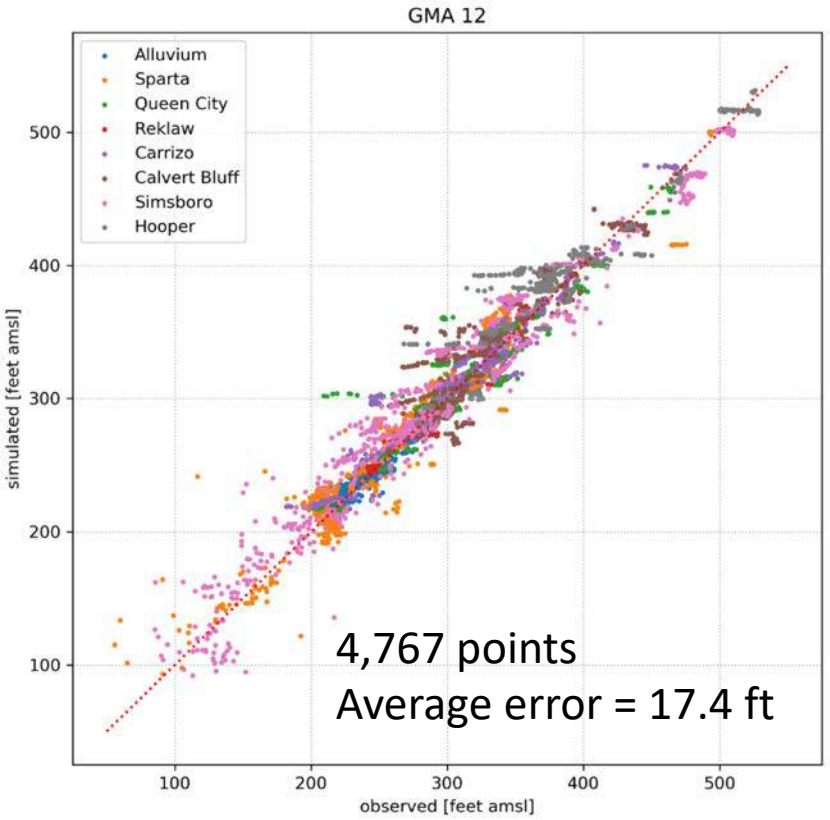
* 2016 Region C Water Plan

Historical Pumping from GMA 12



Simulated versus Observed Water Levels from 1930 to 2010





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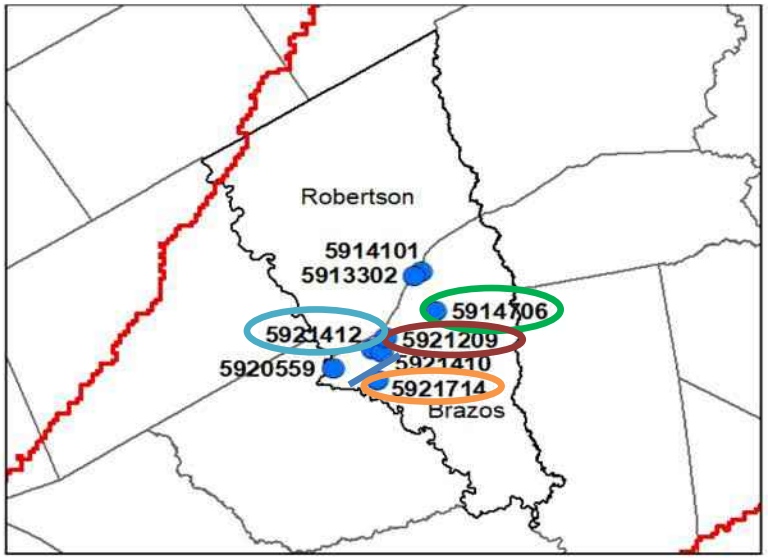
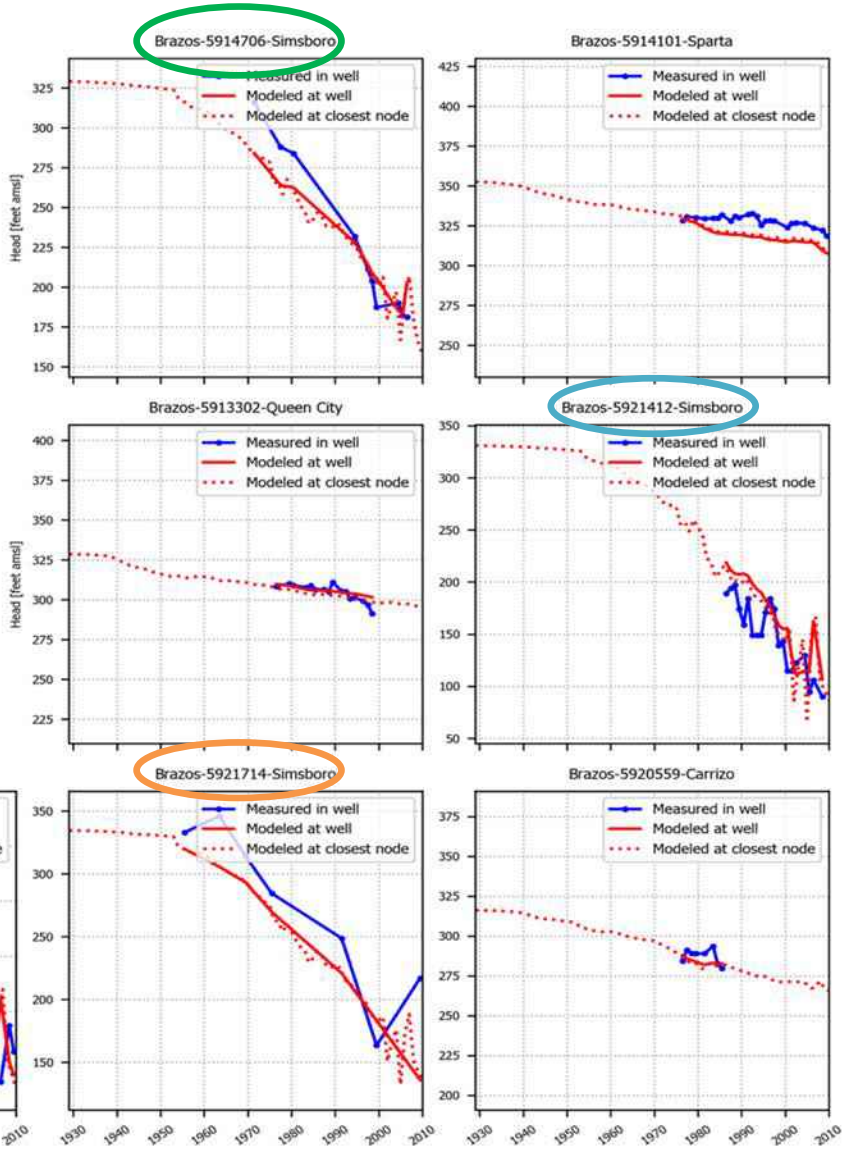
Historical Simsboro Water Levels in in Brazos County

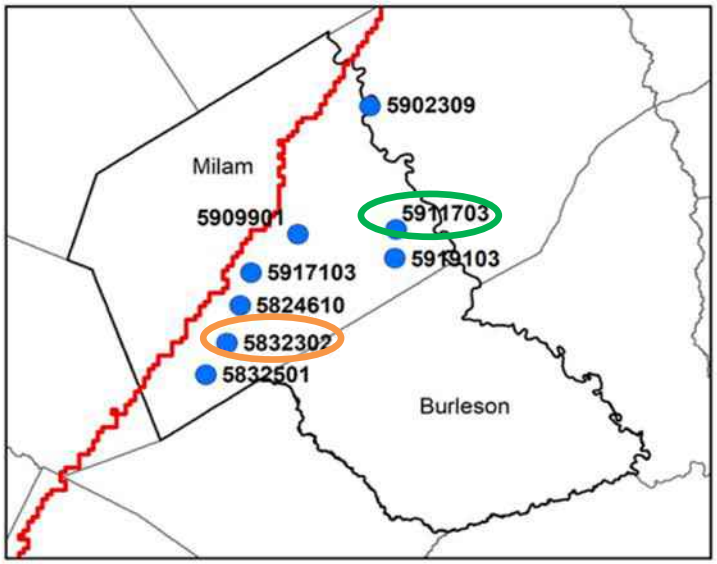
Brazos County

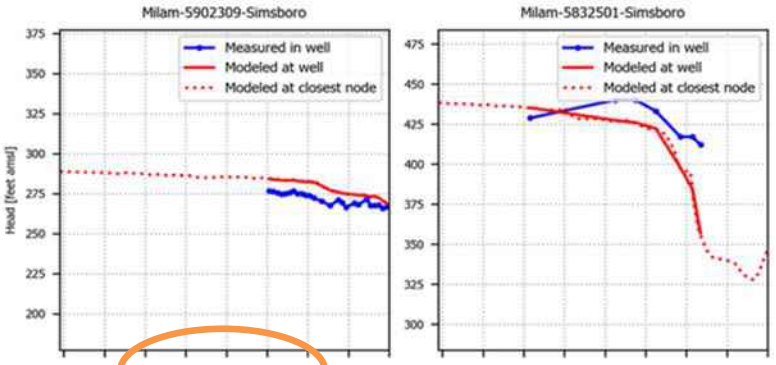


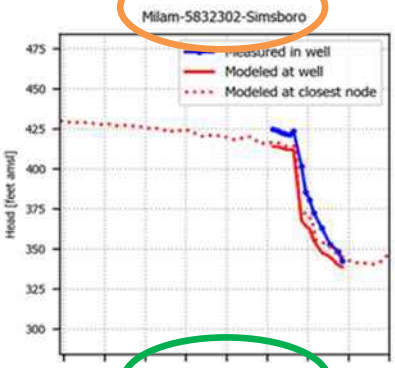


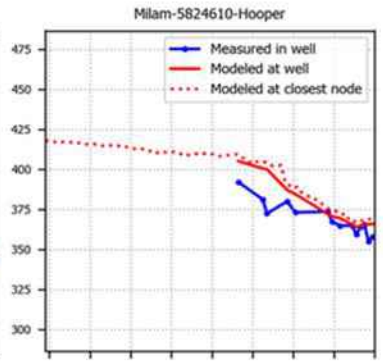
Historical Simsboro Water Levels in Milam County

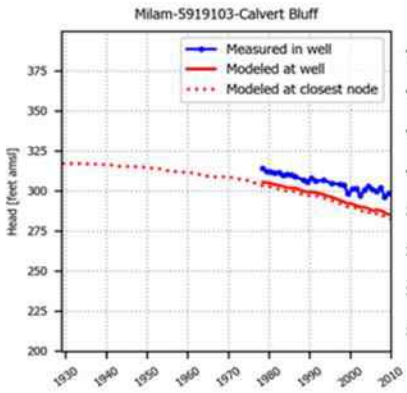
Milam County

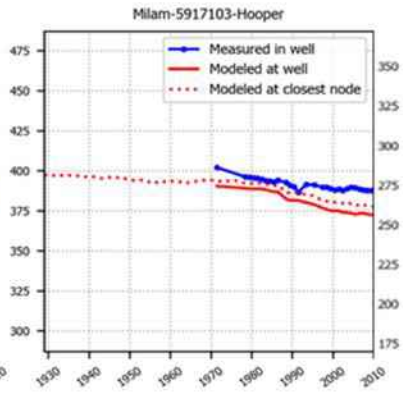


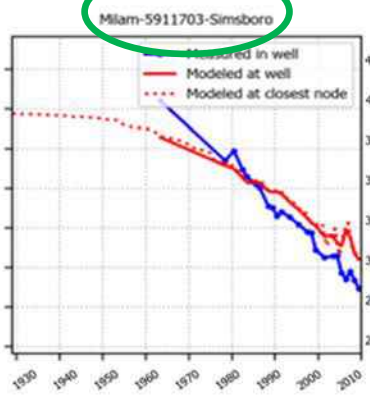


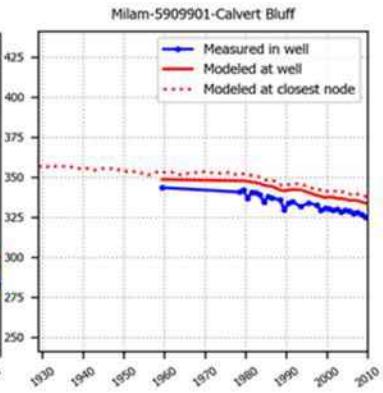






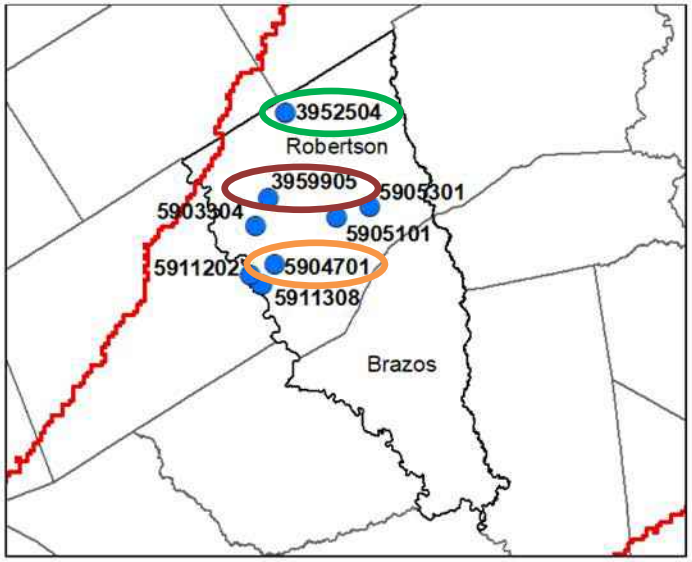


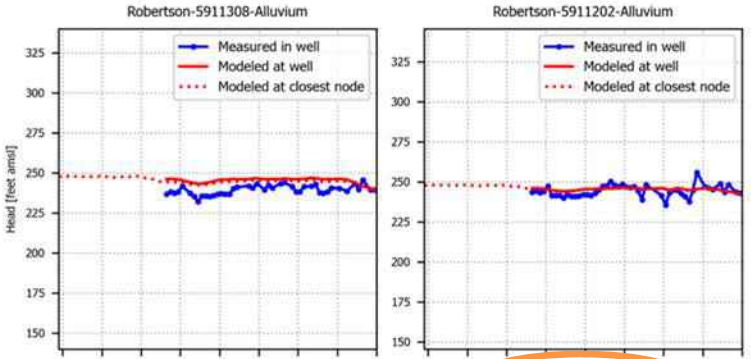


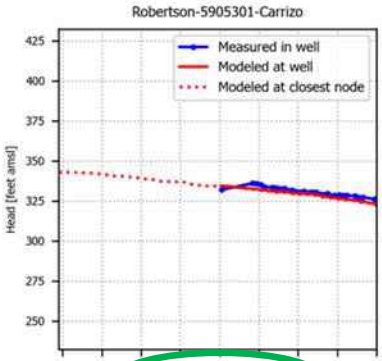


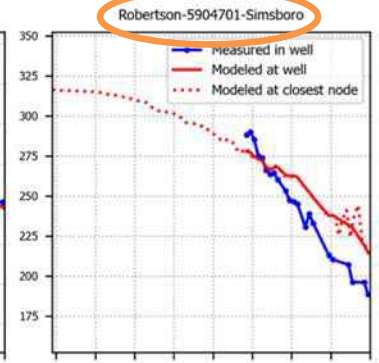
Historical Simsboro Water Levels in Robertson County

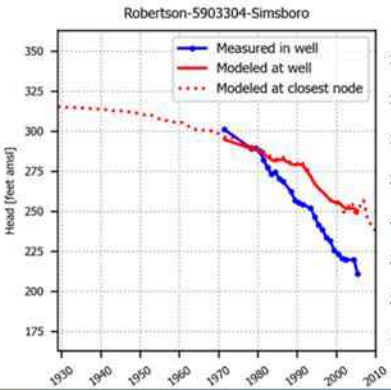
Robertson County

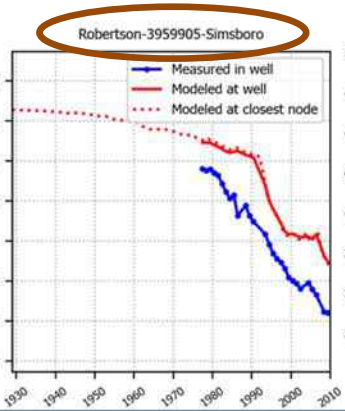


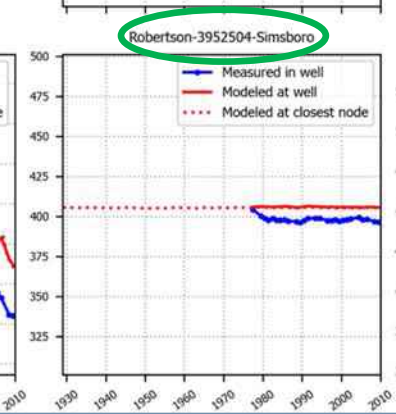


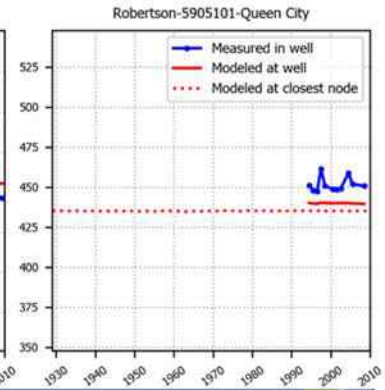













Questions ?