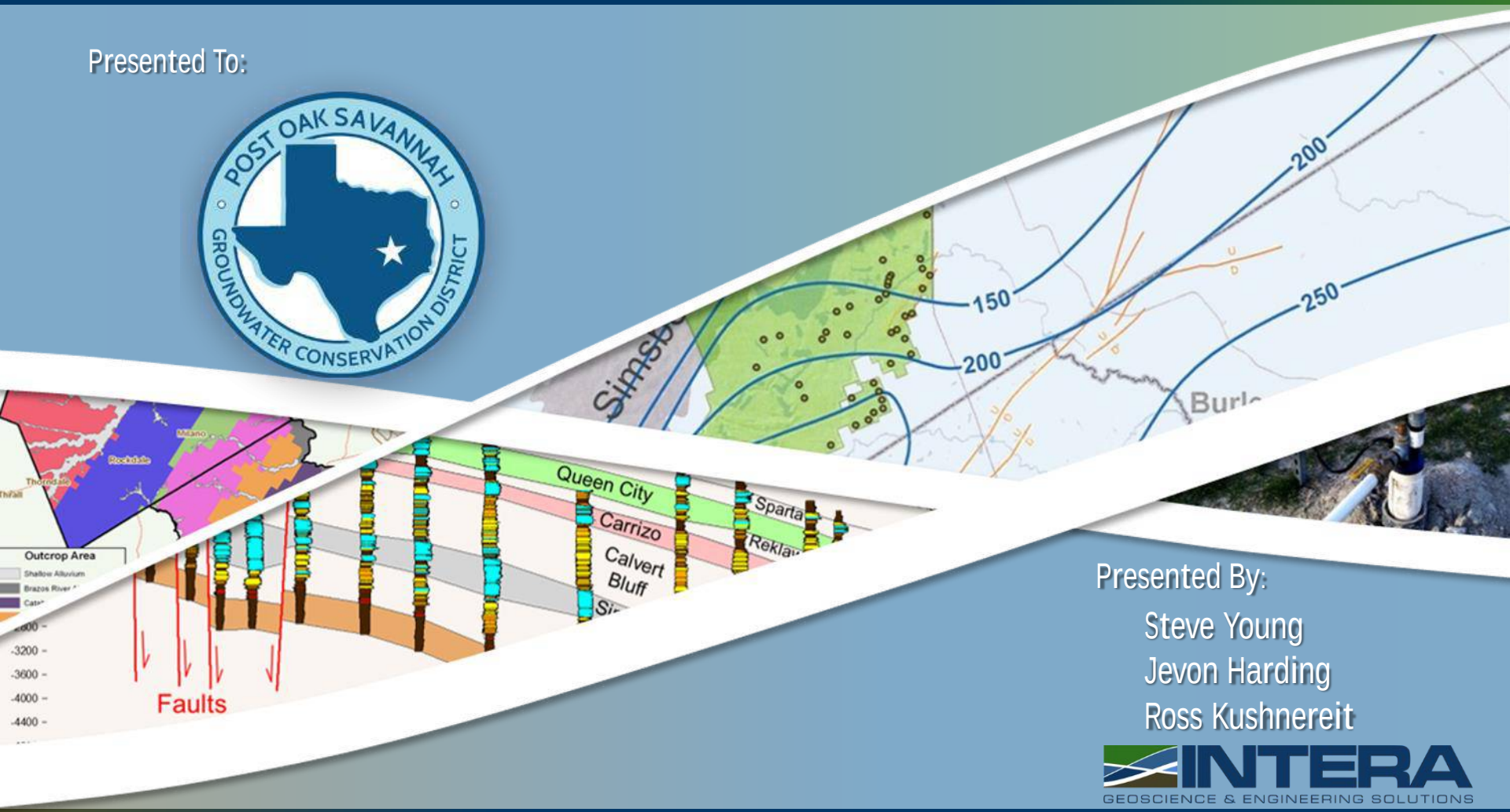
Presentation to DFC Committee: Exploratory DFCs GAM Simulations

Presented To:

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT



Presented By:

Steve Young
Jevon Harding
Ross Kushnereit

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

August 6, 2019

Agenda

- DFC Exploratory Simulation
  - Pumping Assumptions
  - DFC & PDL calculations
  - District-wide Drawdowns
  - Water Budgets
- DFC Sensitivity Analysis
  - Limit non-POSGCD pumping to 2018 rates
  - Limit POSGCD pumping to 2018 rates

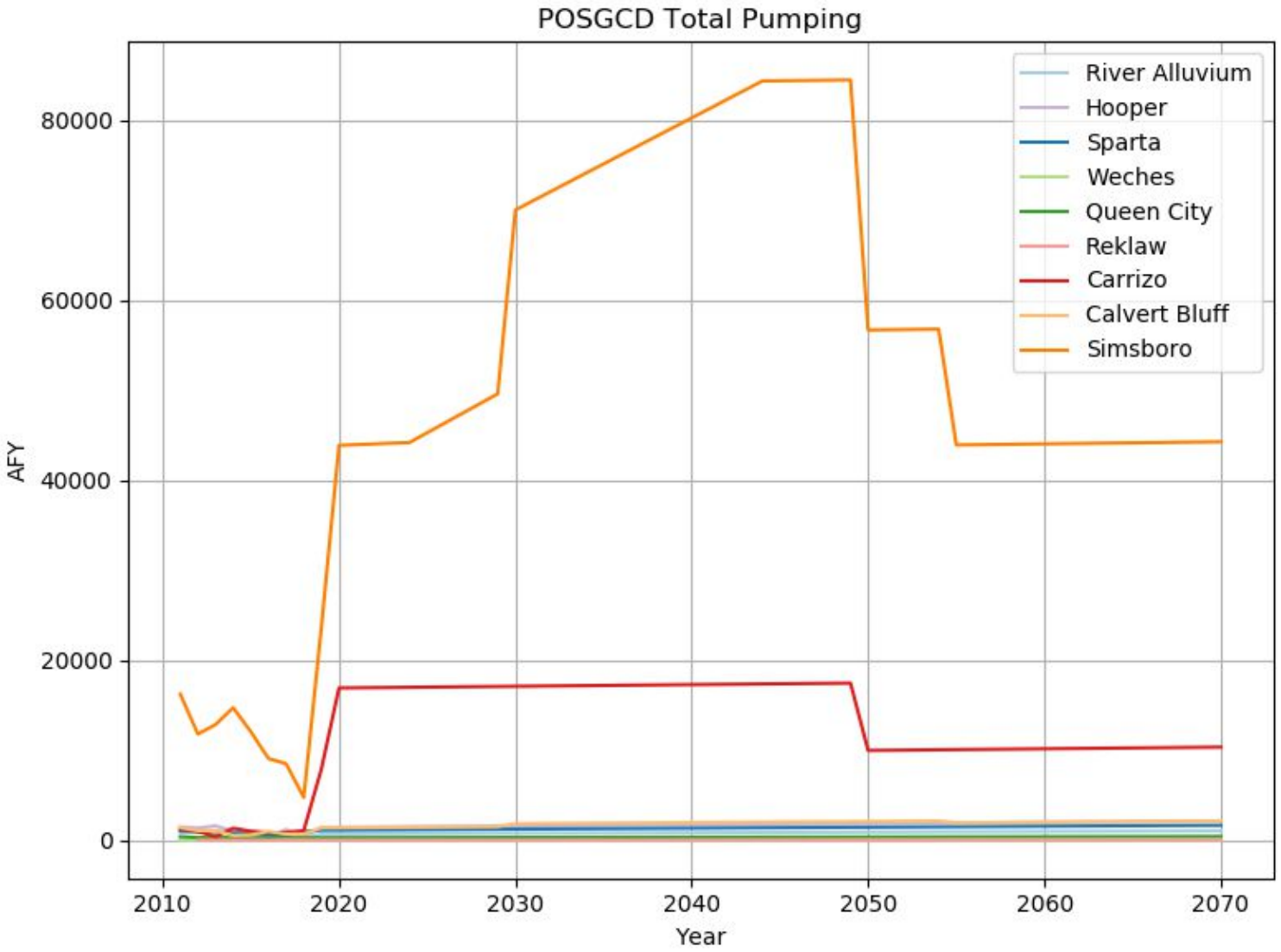
Agenda (con't)

- On-going GAM Evaluation
  - Check with measured water levels
  - Evaluate and updated where appropriate
  - Approach for Developing and Testing Management Strategies
- Initial Investigation on Curtailment Options
  - 2% annual reduction
  - Additional Simulation
- Options for Moving Forward
  - Additional Curtailment investigation
  - Approaches for model improvement
    - Stratigraphy update
    - Local refinement of GAM to POSGCD
    - Integrate with monitoring program

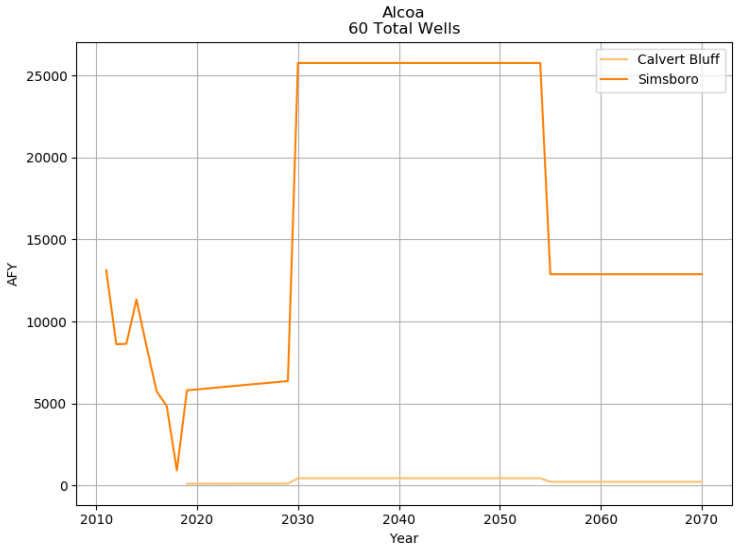
Development of DFC Modeling Scenario

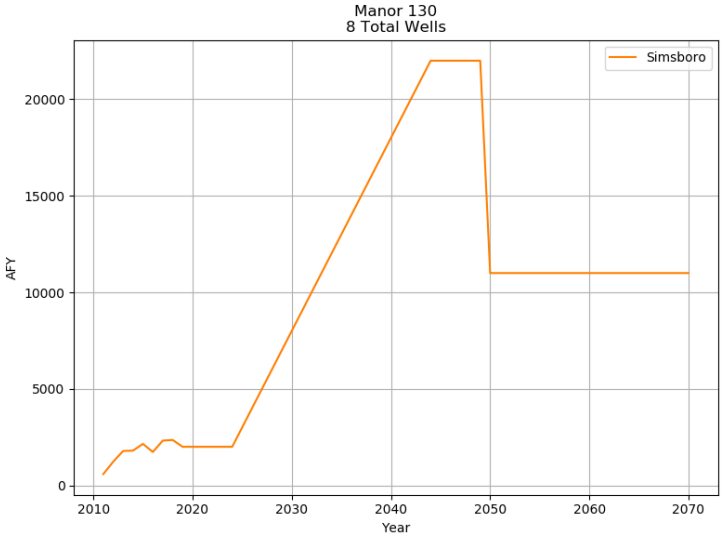
- GMA 12 Pumping Assumptions
  - Pumping Scenario (PS) 2 for all counties except Milam and Burleson
  - Results presented on August 2
- POSGCD Pumping Assumptions
  - All permits keep at 40% useage and increase to 60% useage in 2070
  - Adjust permits separately for
    - Blue Water Vista Ridge
    - Blue Water Manor/I-130
    - ALCOA

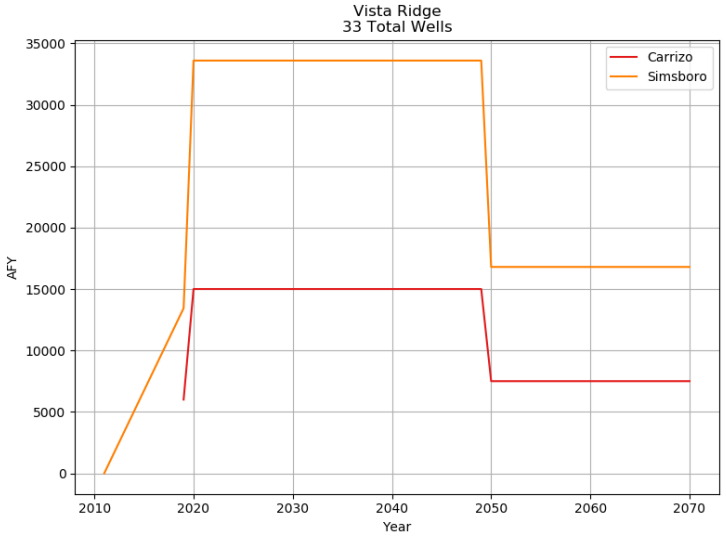
POSGCD Pumping



Blue Water and ALCOA Pumping







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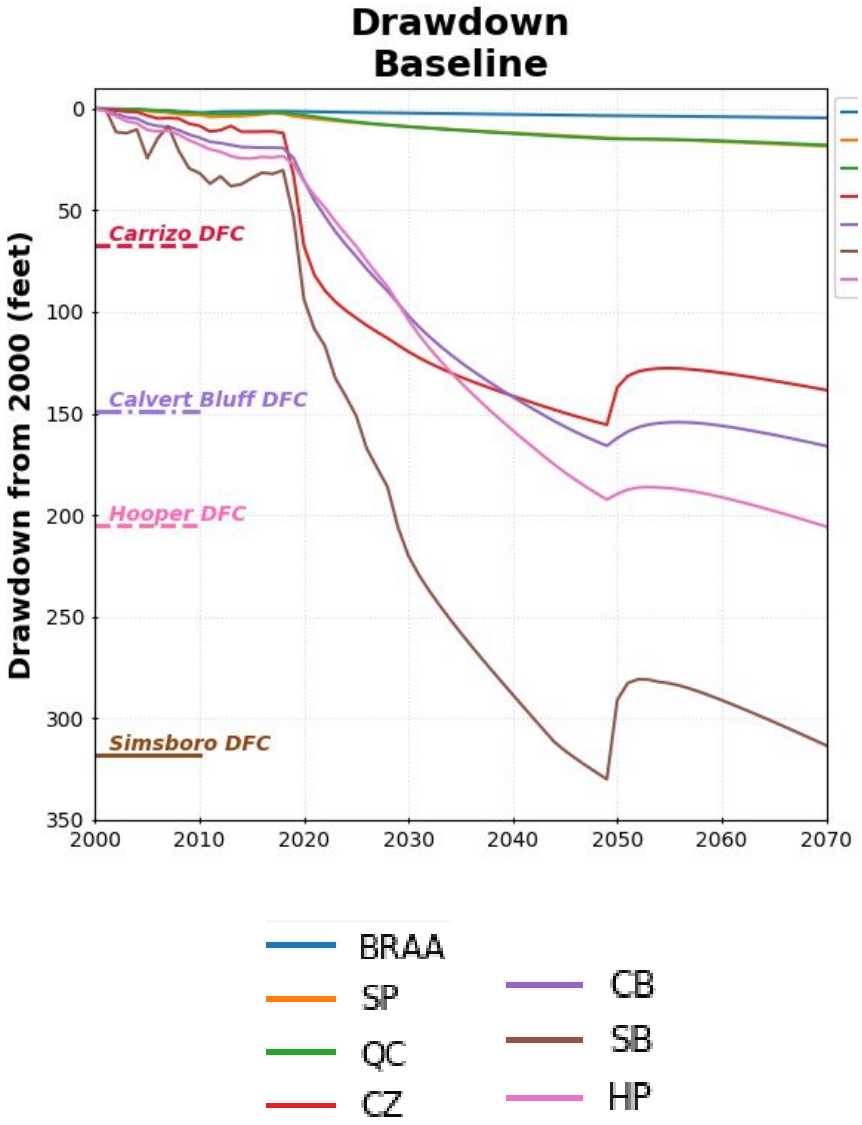
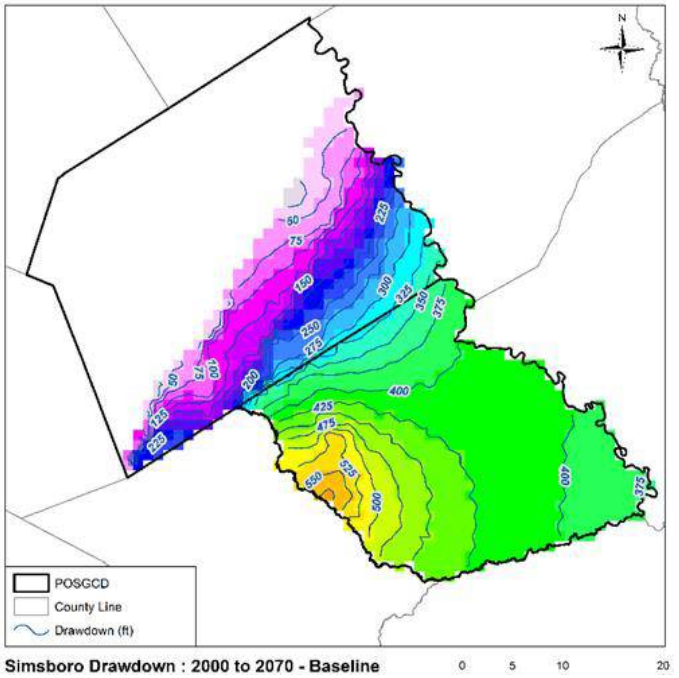
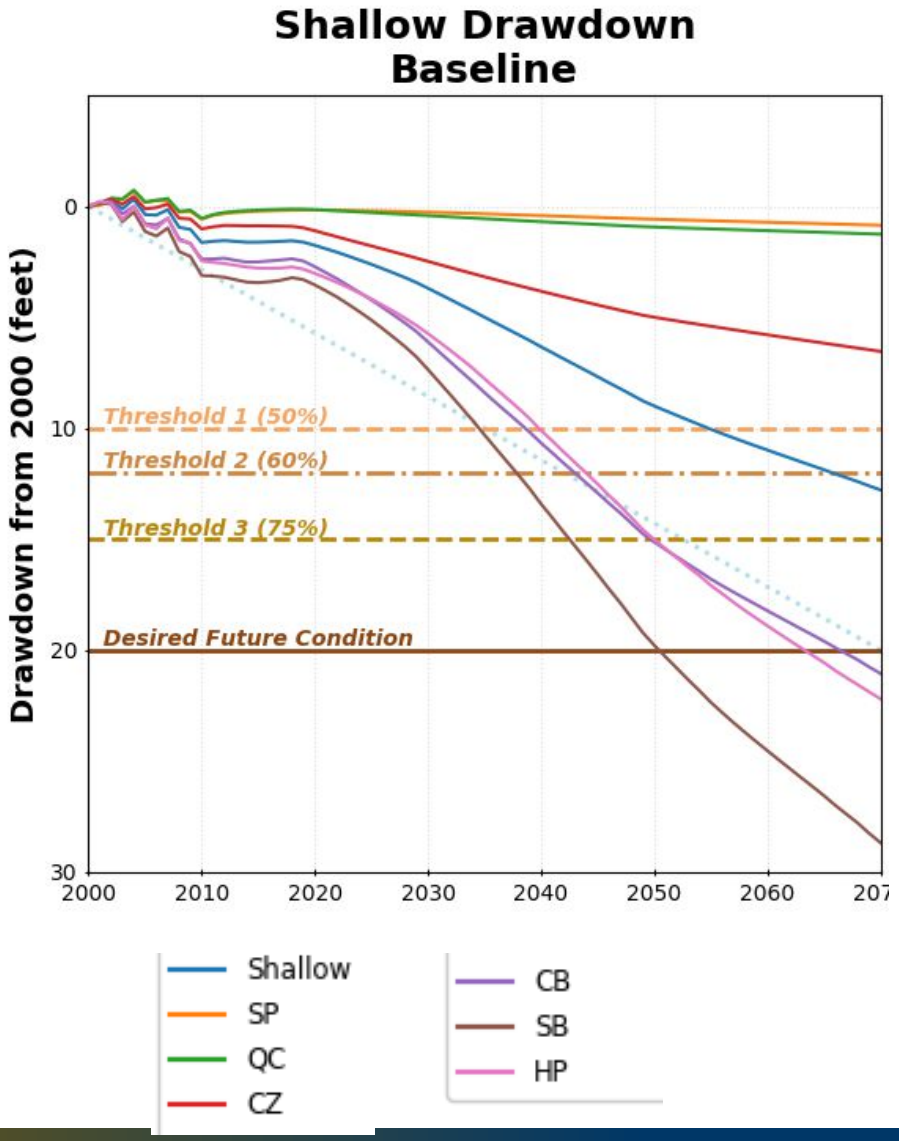
DFC Calculation

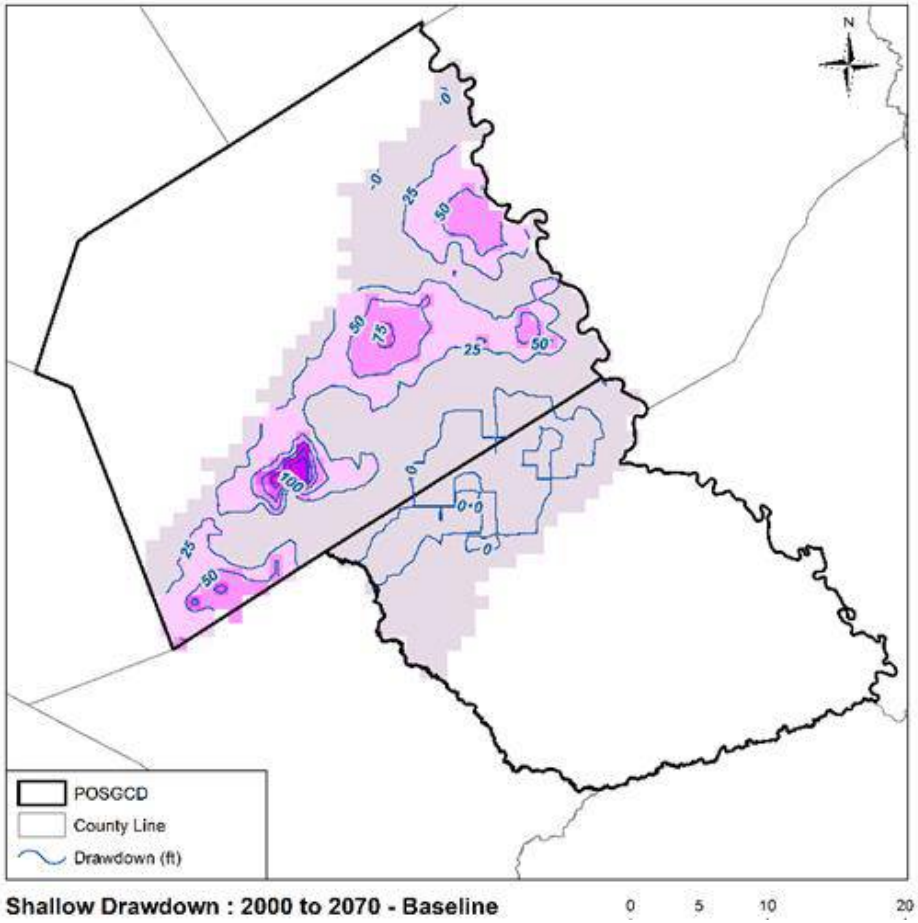




Aquifer	Current DFC	Baseline
Sparta	28	18
Queen City	30	18
Carrizo	67	138
Calvert Bluff	149	166
Simsboro	318	313
Hooper	205	206

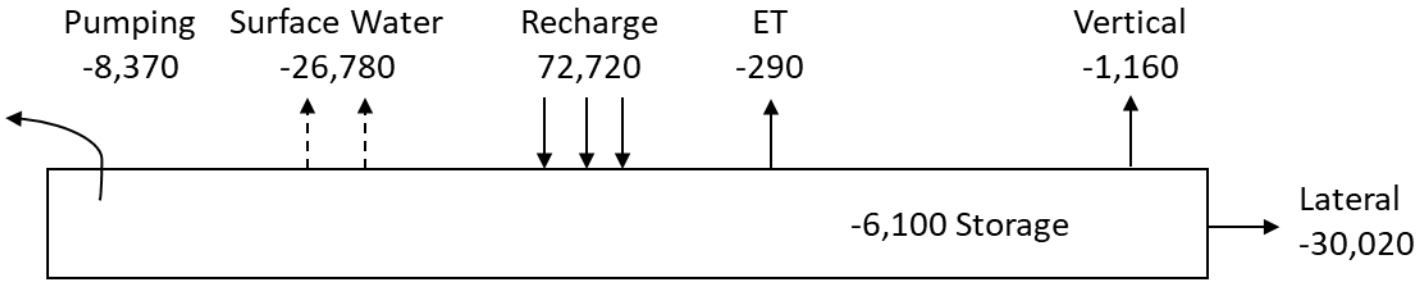
Shallow Drawdown Results



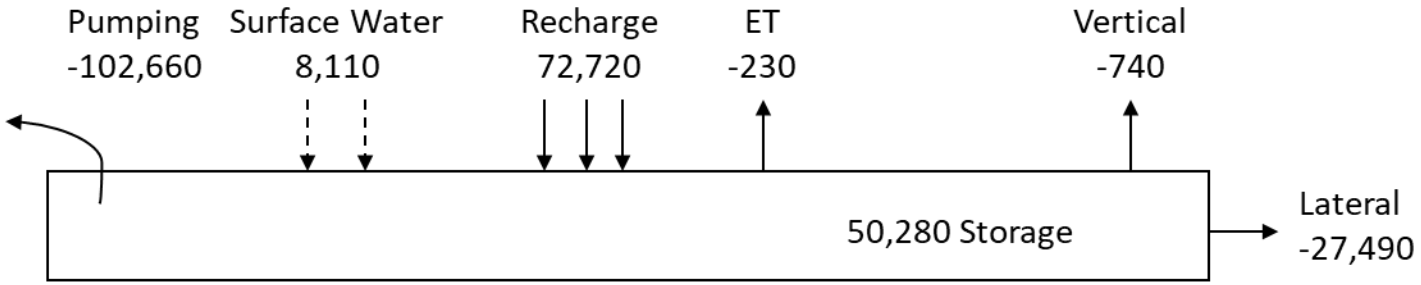


Water Budget (acre-ft/year)

All Aquifers 2019

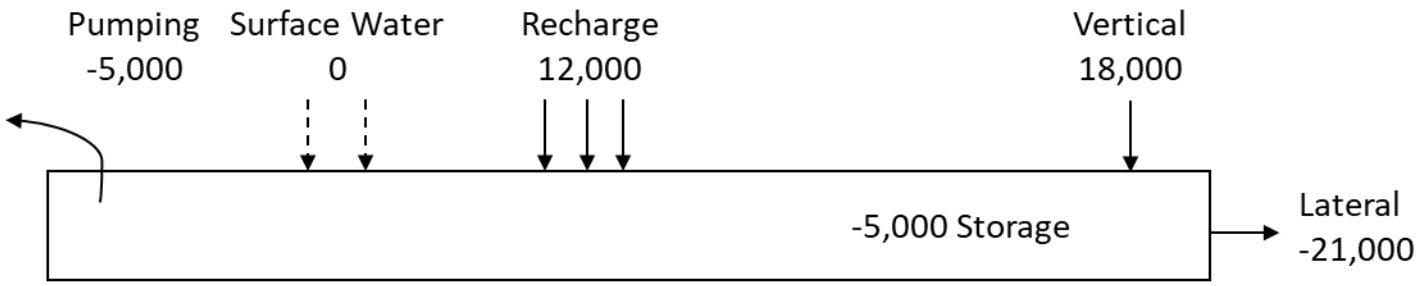


All Aquifers 2040

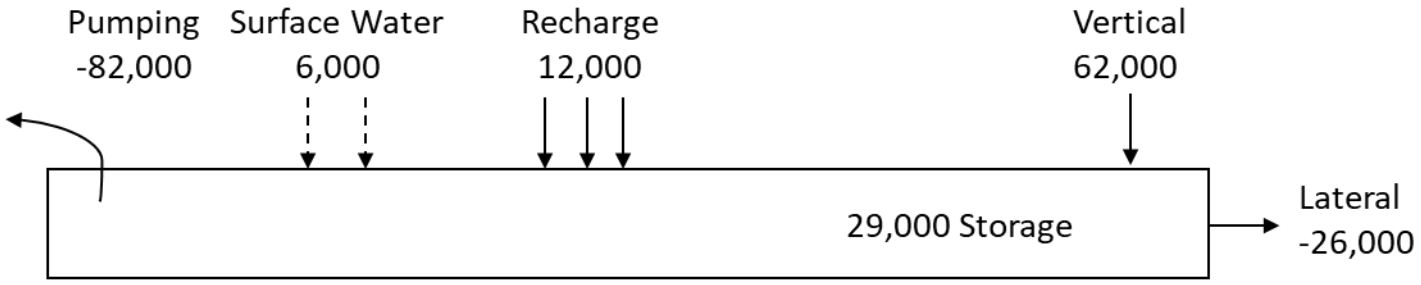


Water Budget (acre-ft/year)

Simsboro 2019

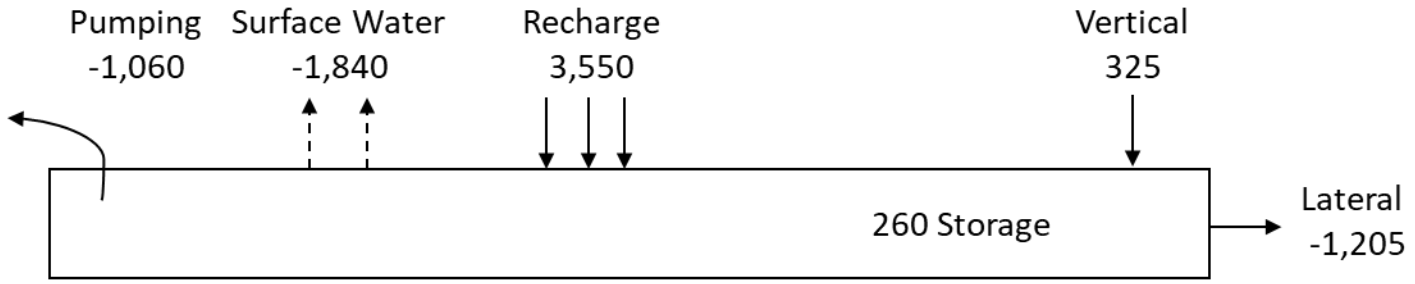


Simsboro 2040

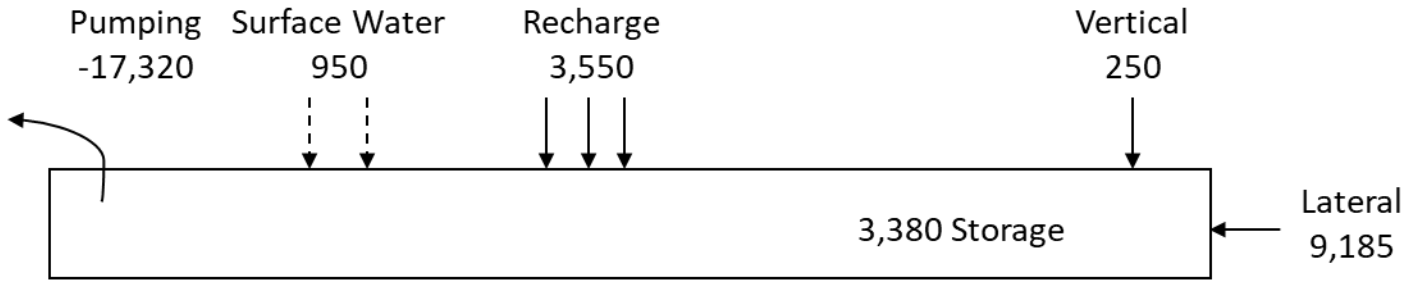


Water Budget (acre-ft/year)

Carrizo 2019



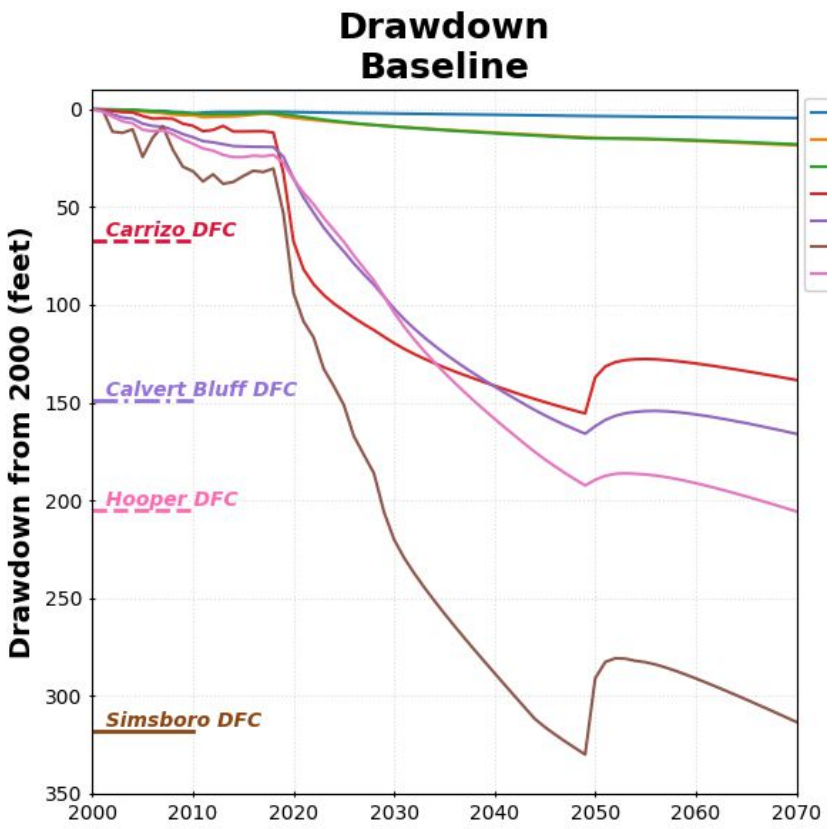
Carrizo 2040

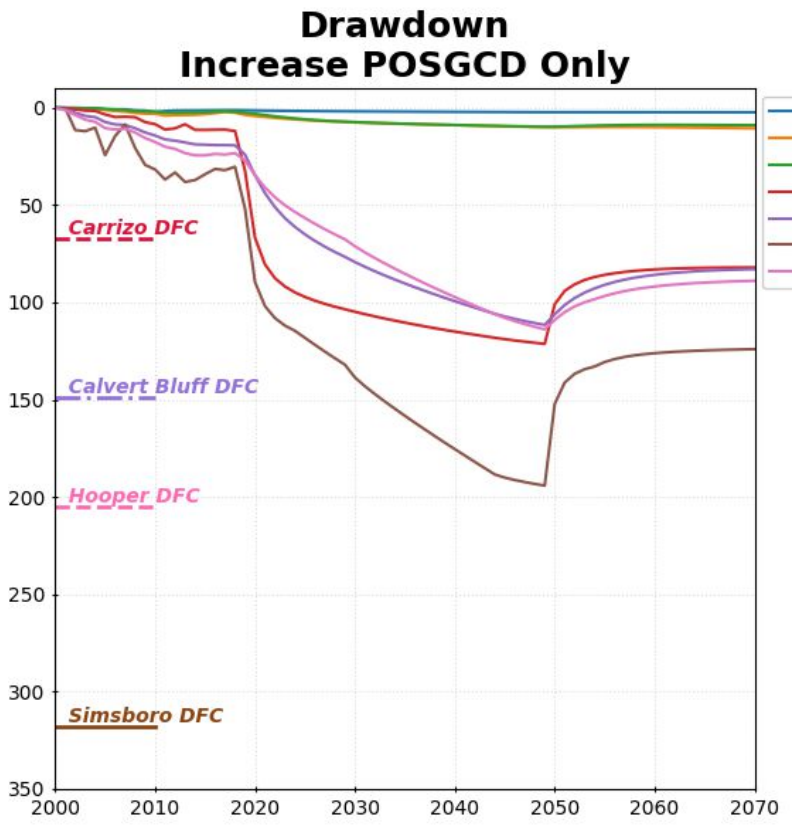


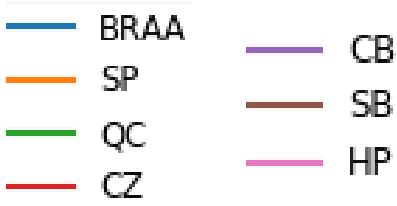
Sensitivity Analysis

- POSGCD Pumping
  - POSGCD pumping remains the same
  - Non-POSGCD pumping is fixed at 2018 pumping rates
- Non-POSGCD Puming
  - POSGCD pumping is fixed at 2018 pumping rates
  - Non-POSGCD pumping remains the same

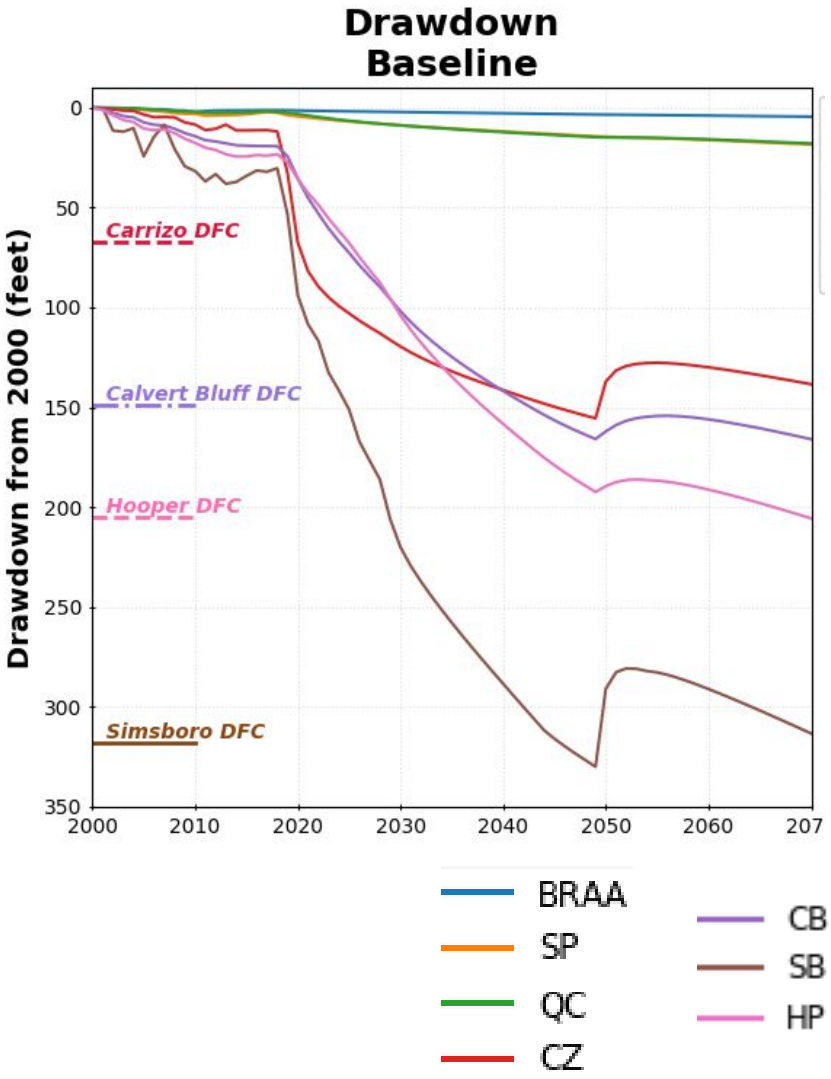
POSGCD Pumping

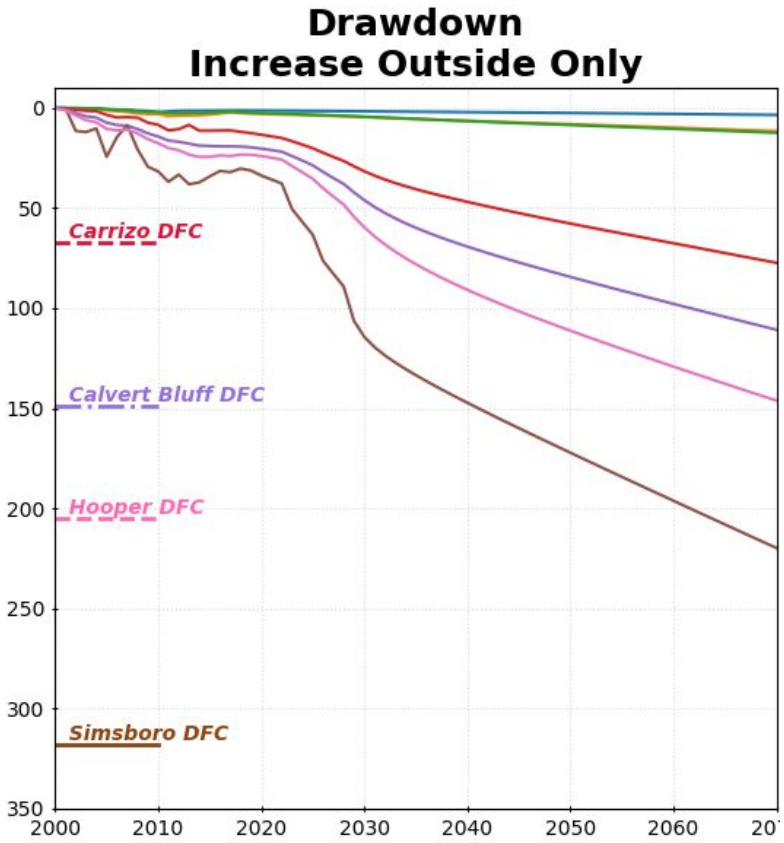






Non-POSGCD Pumping





Drawdown Results

Drawdown from 2000 to 2070 (ft)

Aquifer	Current DFC	Baseline	Increase POSGCD Only	Increase Outside Only
Sparta	28	18	11	12
Queen City	30	18	9	12
Carrizo	67	138	82	77
Calvert Bluff	149	166	83	111
Simsboro	318	313	124	220
Hooper	205	206	89	146

On-going GAM Evaluations

- GAM used to predict DFC based on anticipated pumping
- GAM used to identify the probably causes for water level changes
- GAM used to investigate management strategies
- GAM not thoroughly vetted under heavy pumping conditions in Burleson County

On-going GAM Evaluation

Drawdown from 2000 to 2070 (ft)

Aquifer	Current DFC	Baseline	Increase POSGCD Only	Increase Outside Only
Sparta	28	18	11	12
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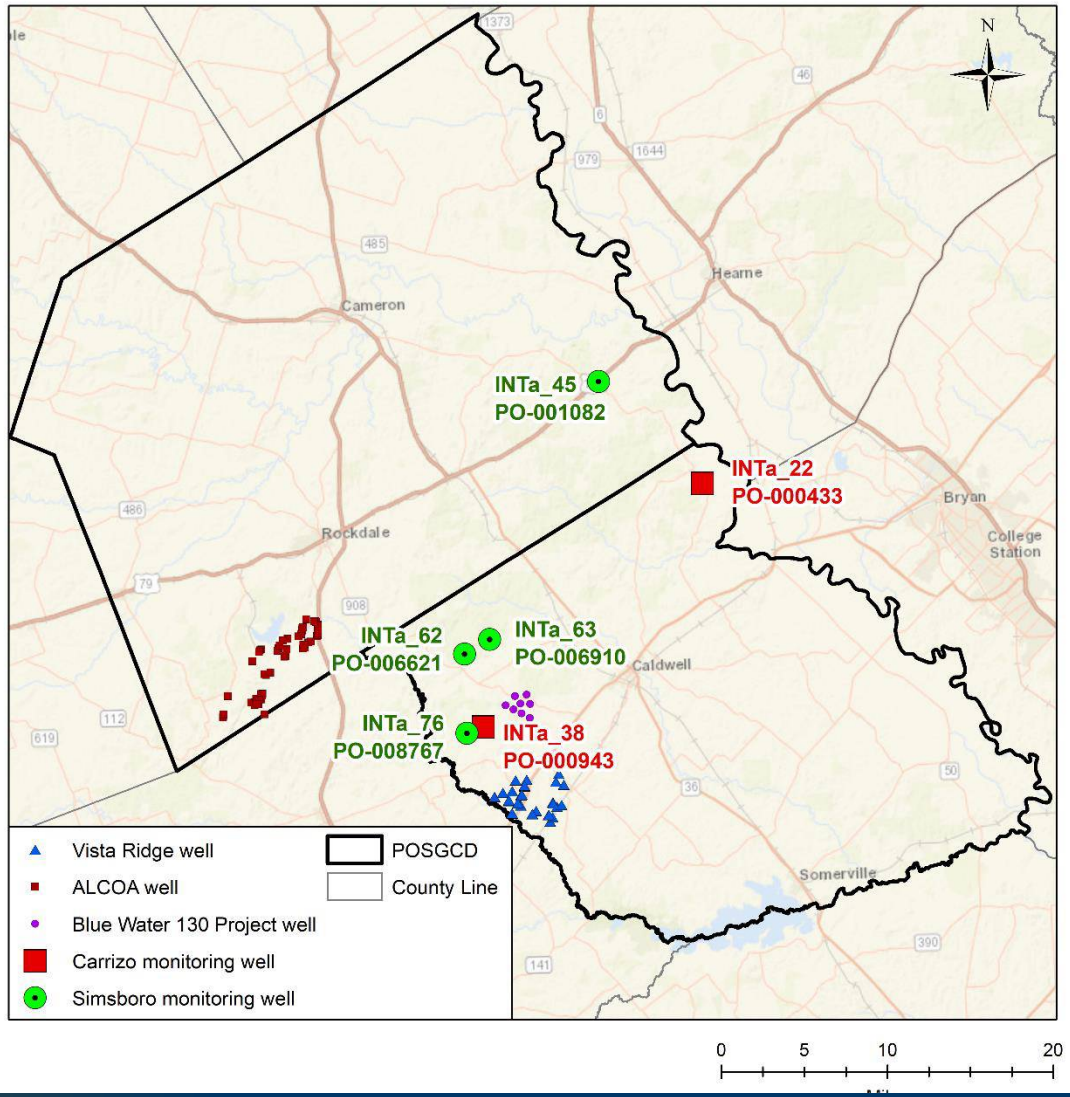
Monitoring Options: Simsboro & Carrizo



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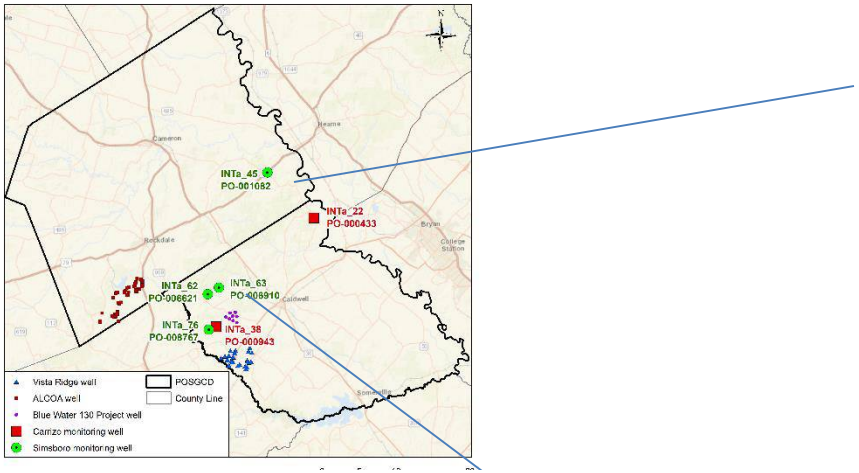
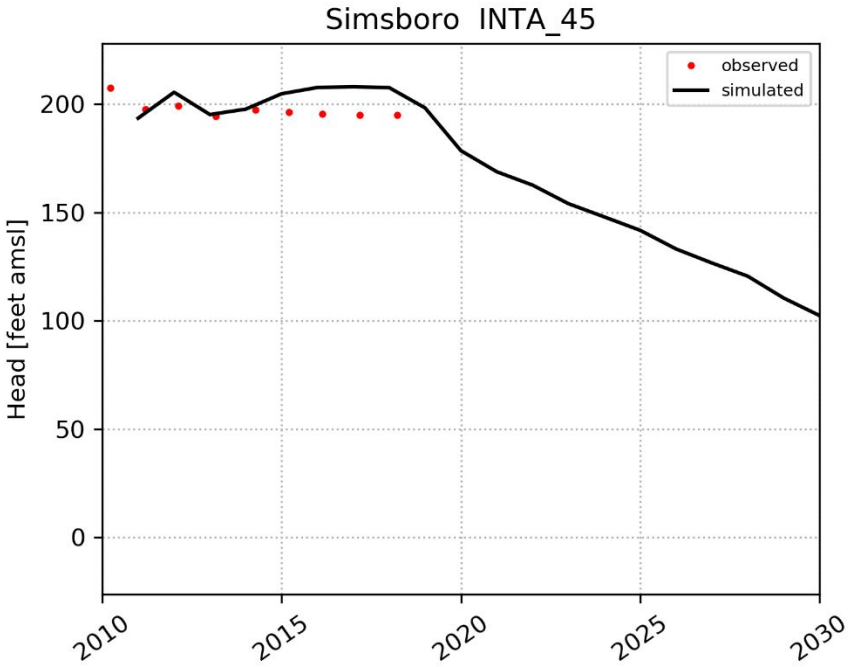
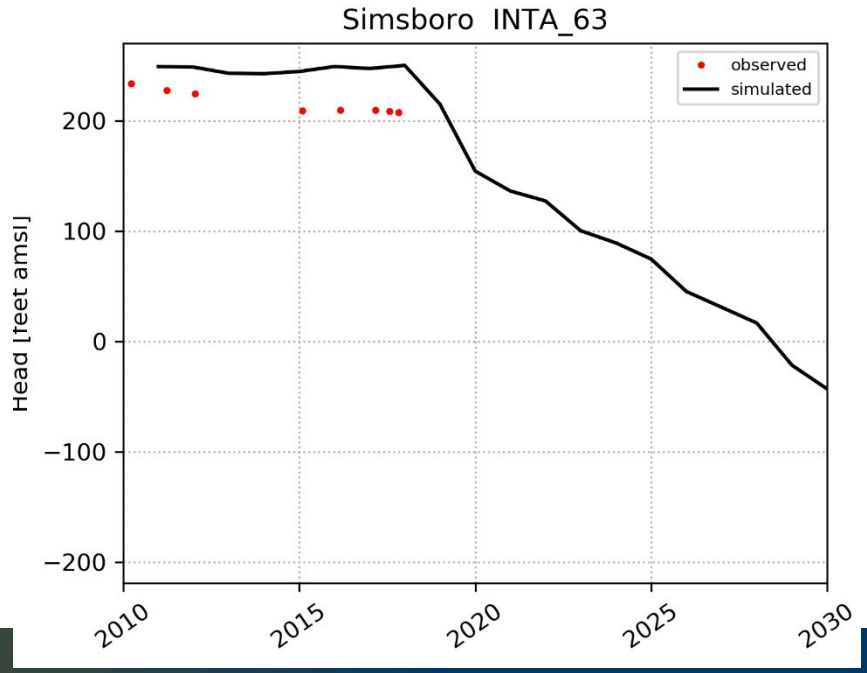
Monitoring Options: Simsboro Wells







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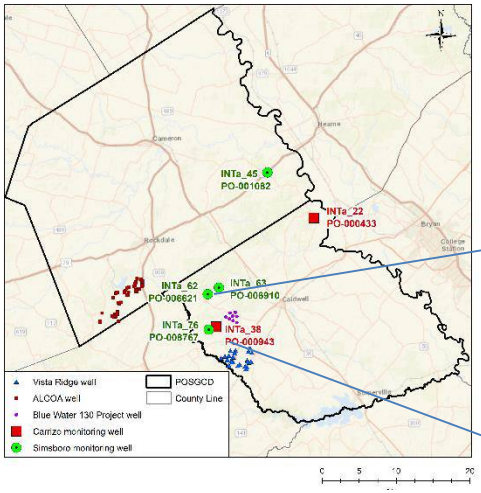
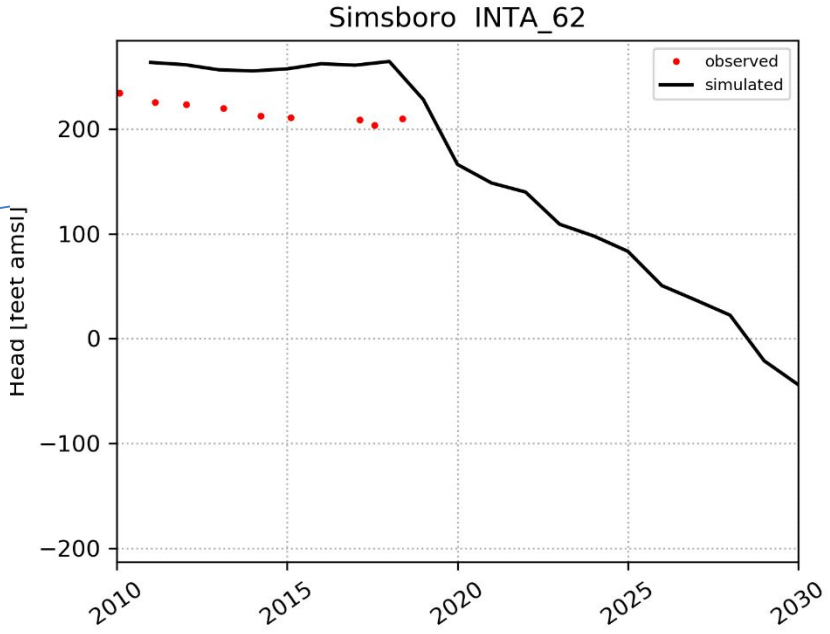
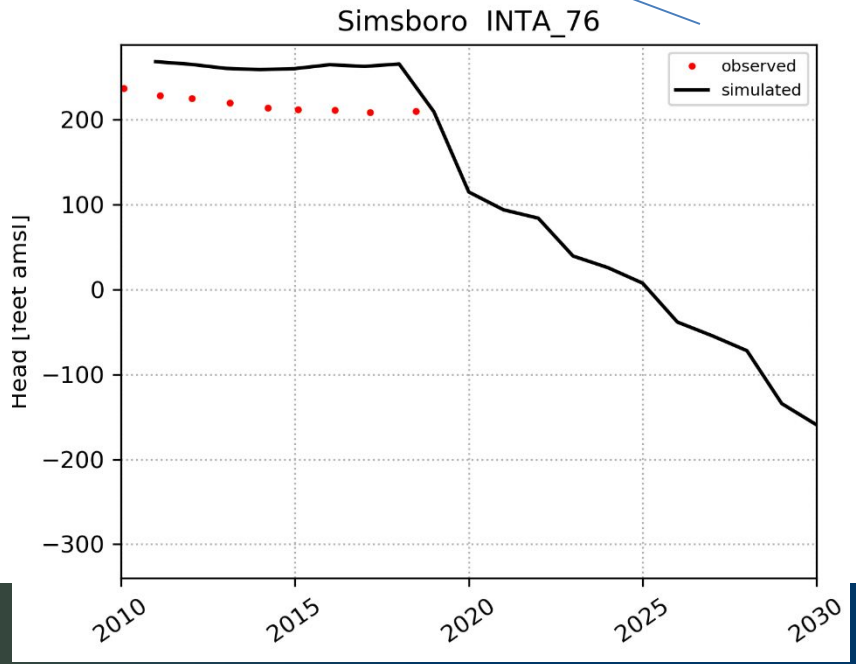
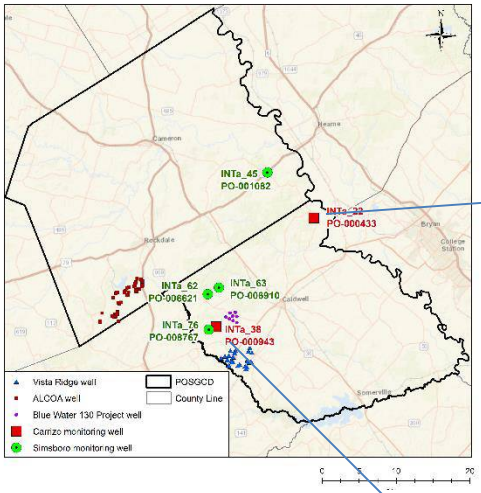
Monitoring Options: Simsboro Wells

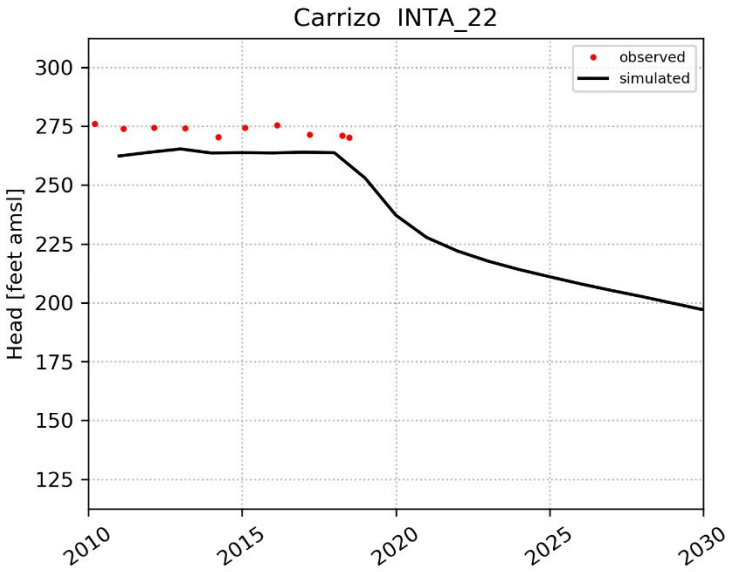


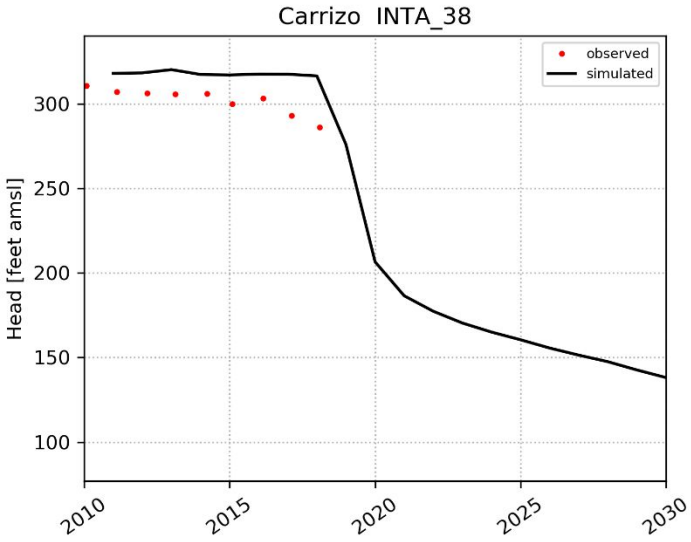




Monitoring Options: Carrizo Wells



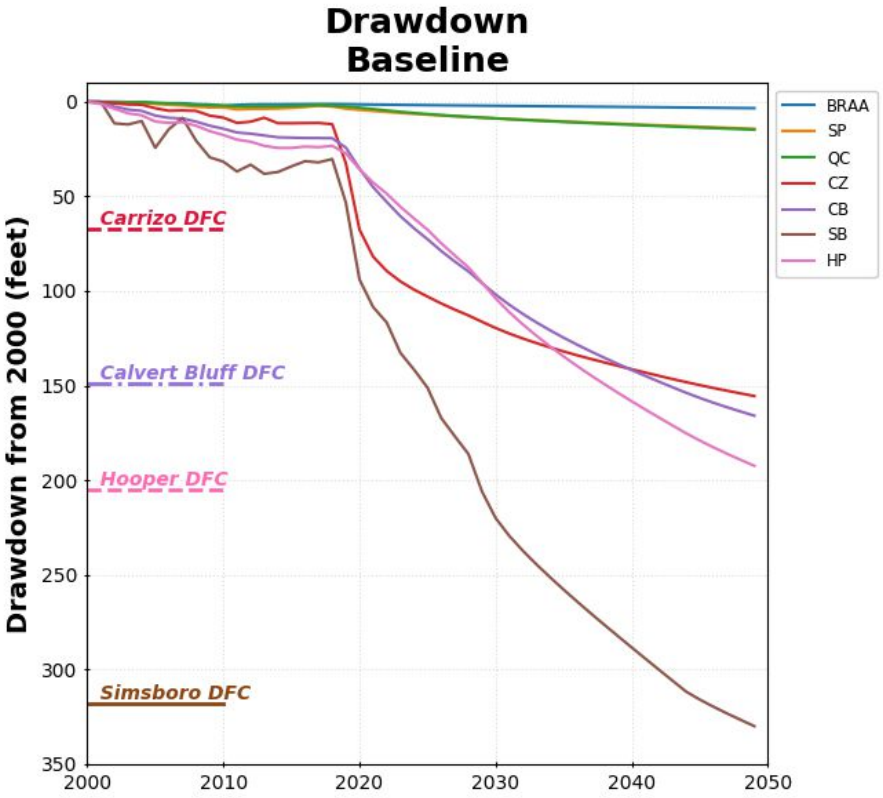


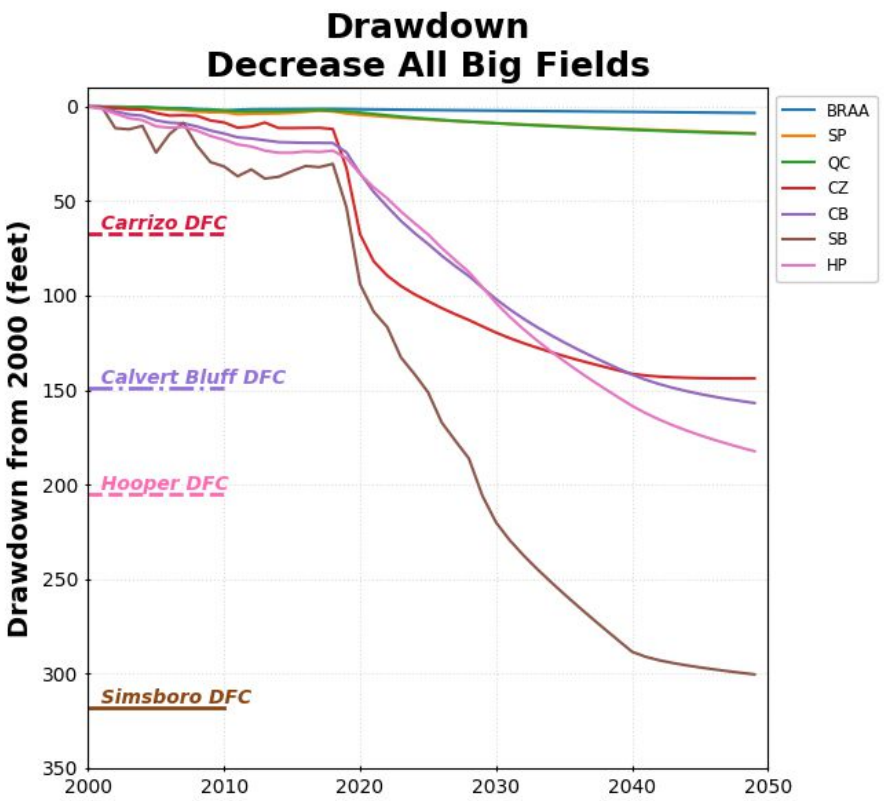


Initial Investigation on Curtailment Options: Approach

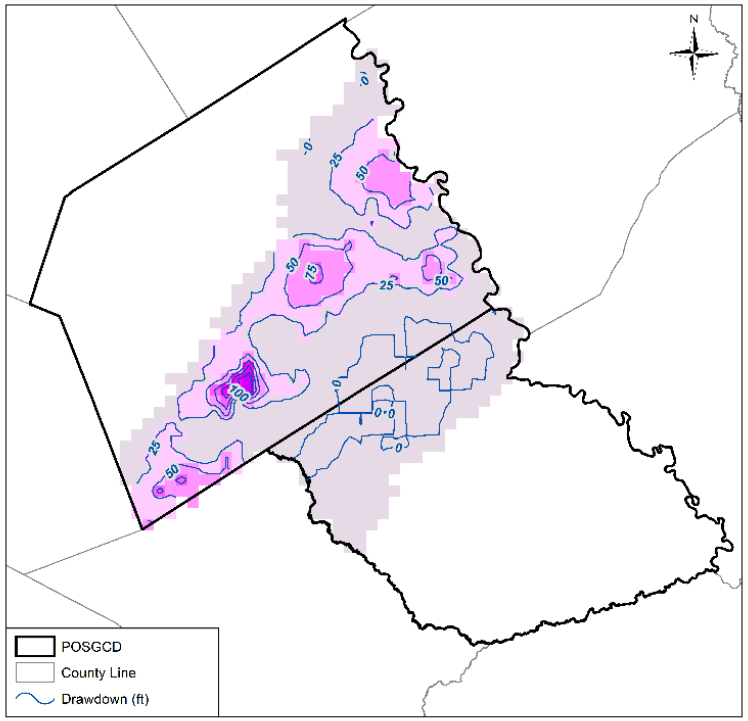
- Major Simboro Users
  - ALCOA
  - Blue Water – Vista Ridge
  - Blue Water – Manor/I-130
- Curtailment Options
  - Begin 2040
  - Annual 2% annual
- Investigation
  - all three separately
  - all three together

Drawdown Results

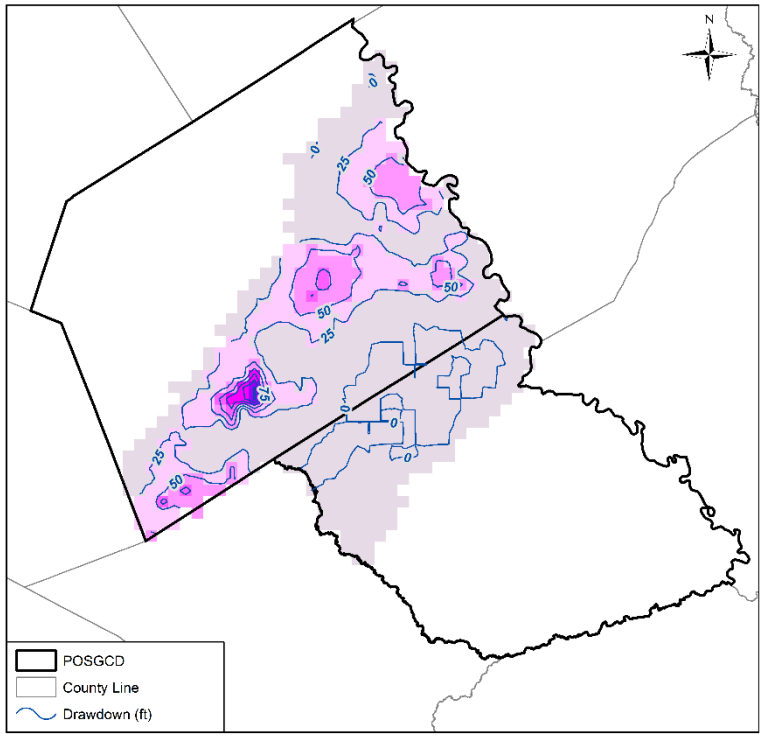




Shallow Drawdown Results



Shallow Drawdown : 2000 to 2070 - Baseline



Shallow Drawdown : 2000 to 2070 - Decrease ALCOA & Blue Water 130 & Vista Ridge

Shallow Drawdown : 2000 to 2070 - Baseline

0

< 25	151 - 175	301 - 325	451 - 475	601 - 625
26 - 50	176 - 200	326 - 350	476 - 500	626 - 650
51 - 75	201 - 225	351 - 375	501 - 525	651 - 675
76 - 100	226 - 250	376 - 400	526 - 550	676 - 700
101 - 125	251 - 275	401 - 425	551 - 575	701 - 725
126 - 150	276 - 300	426 - 450	576 - 600	

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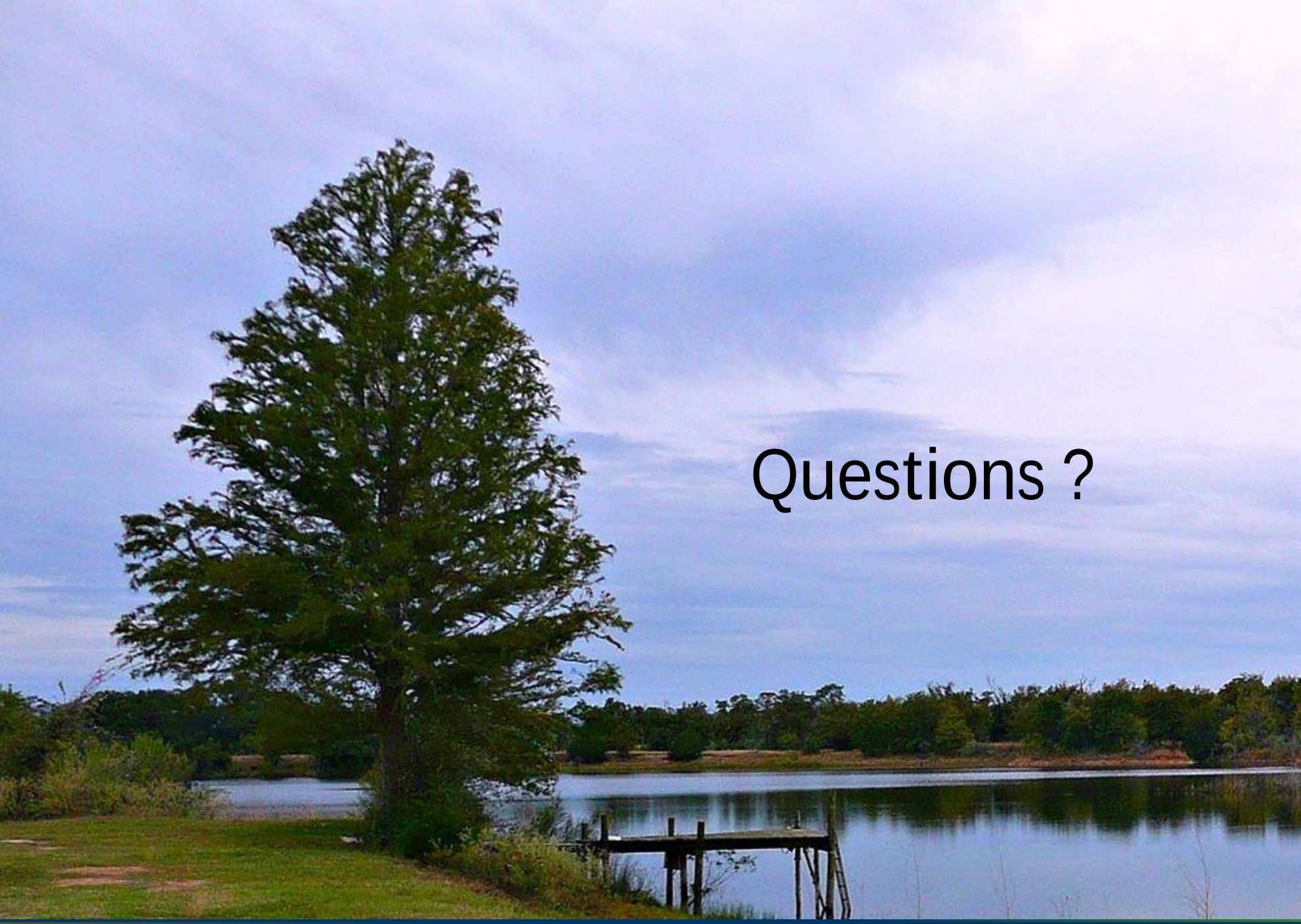
Observations Regarding Initial Curtailment DFC Simulation

- Aquifer is Less Sensitive to Curtailment Changes Than Previous Simulations
  - Change in Model?
  - Change in GMA 12 Pumping?
- Water Balance Analysis
- Hydrogeologic Studies

Options for Moving Forward

- Curtailment investigation
  - Quantify importance of non-POSGCD pumping on each DFC and PDL
  - Evaluate monitoring network (wells)
  - Evaluate data analysis (co-kriging)
- Model Testing, Evaluations, Improvements
    - Stratigraphy update
    - Integrate with monitoring program
    - Local refinement of GAM to POSGCD Data


Questions ?