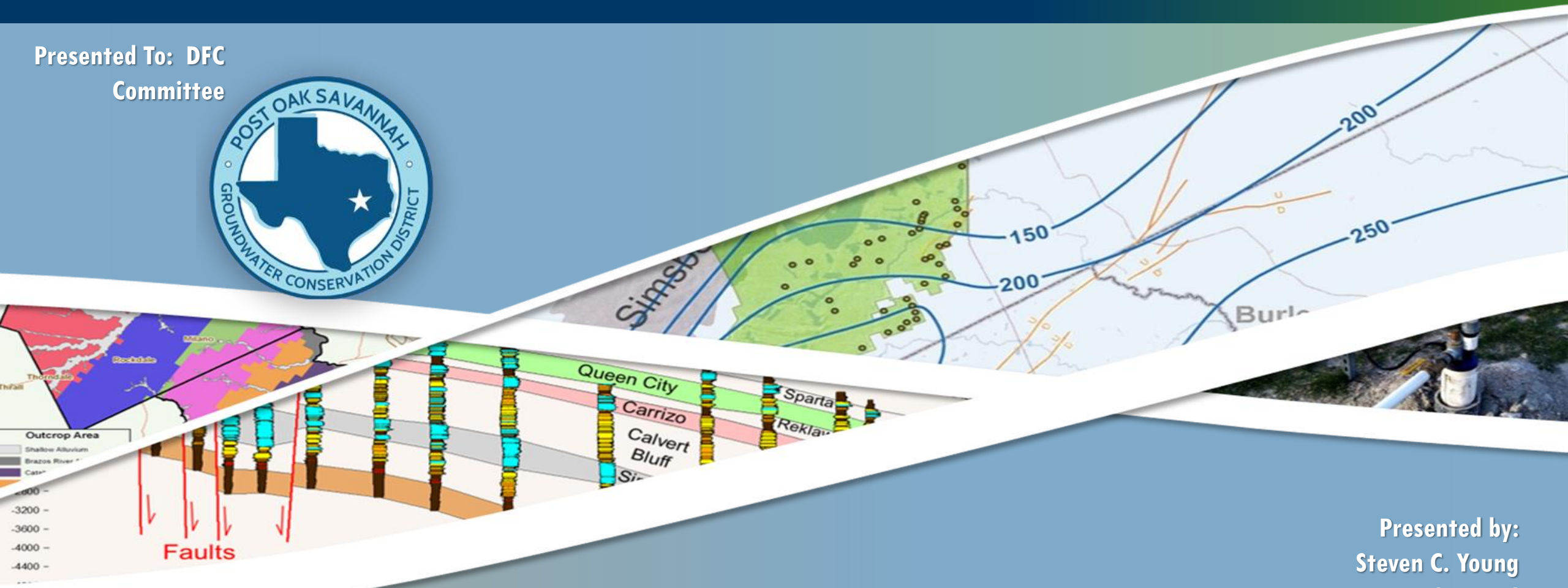
Preliminary Results for 2023 Compliance Report and 2023 GWAP Annual Needs Assessment Report

Presented To: DFC Committee



Presented by:
Steven C. Young
Lakin Beal
Jonathan Quiroz

November 28, 2023

Discussion Topics

- Compliance Report
  - Update Monitoring Network
  - Analysis of Water Level
  - Protective Drawdown Limit and Desired Future Conditions Compliance Evaluation
- GANA Report
  - Pumping Scenario
  - 2023 Compliance with DFCs & PDLs
  - Compliance Since 2011

Monitoring Well Network

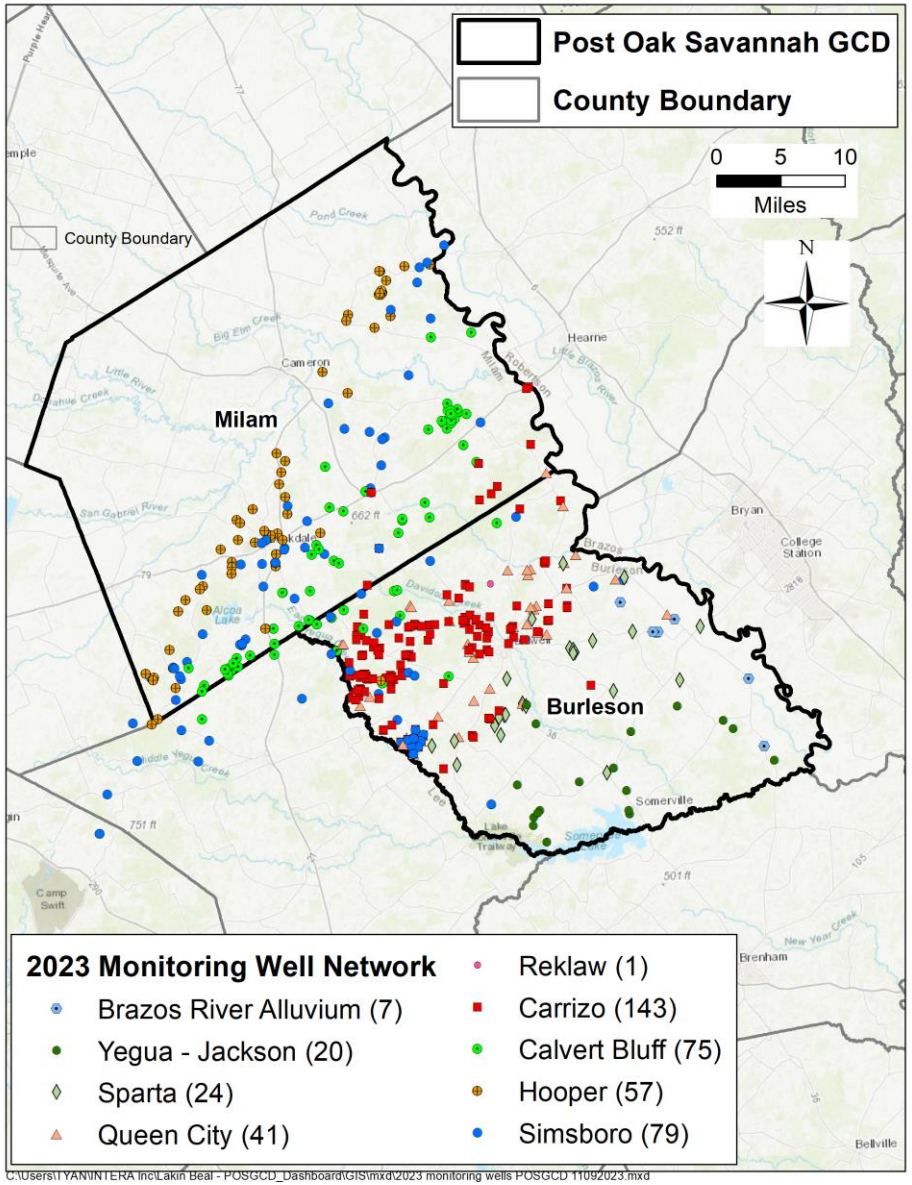
2023 Monitored Water Levels

	BVGCD	LPGCD	POSGCD
Sparta	16	2	22
Queen City	15	5	35
Calvert Bluff	21	0	61
Carrizo	18	23	118
Simsboro	64	10	89
Hooper	17	2	46
Total	151	42	371

2023 Monitoring Well Network

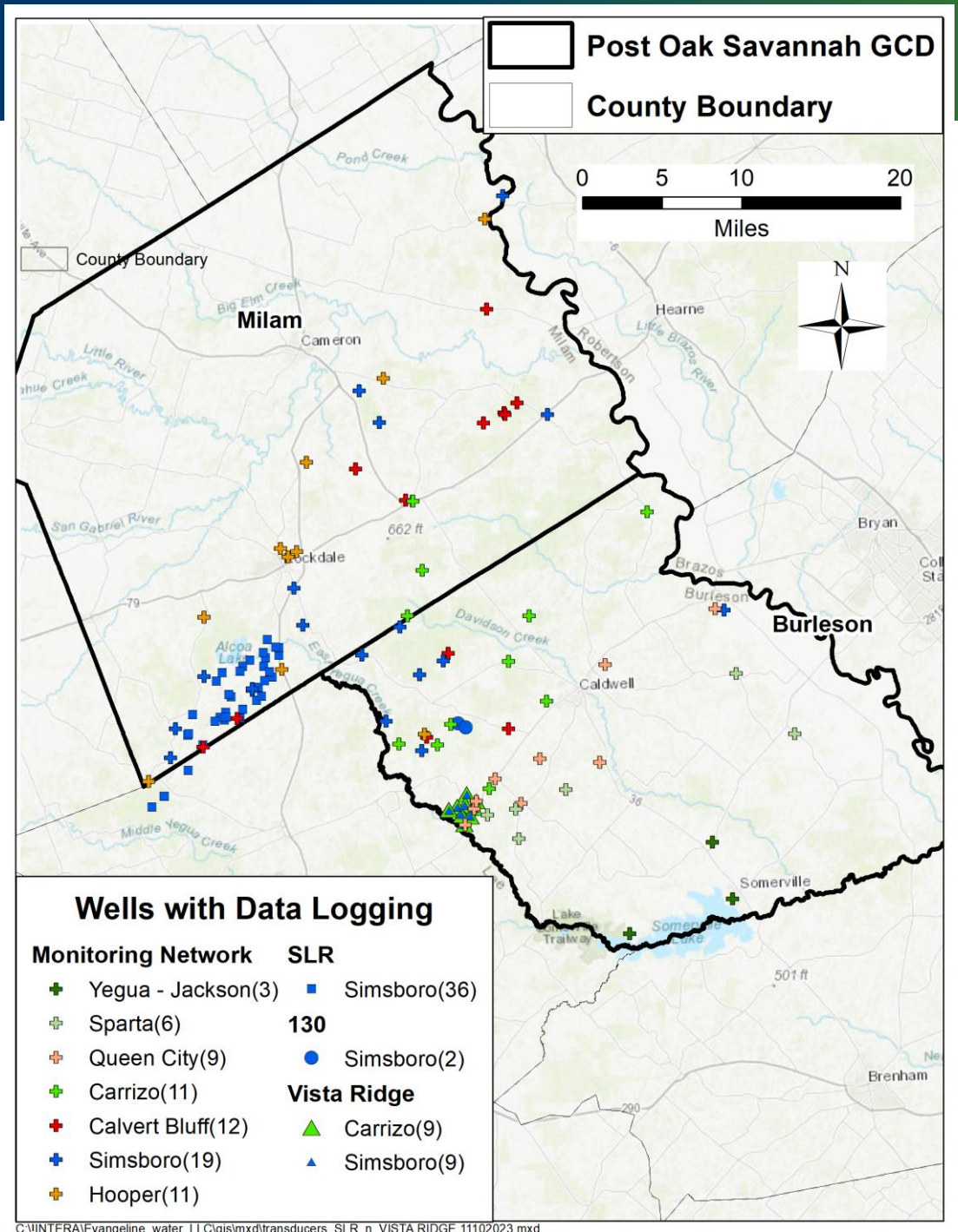
	POSGCD
Sparta	24
Queen City	41
Calvert Bluff	143
Carrizo	75
Simsboro	79
Hooper	57
Yegua-jackson	20
Total	439

2023 Monitoring Network



Wells with Data Logging

- Data Logging
  - Monitoring Program (71 wells)
  - Regulatory (56 wells)

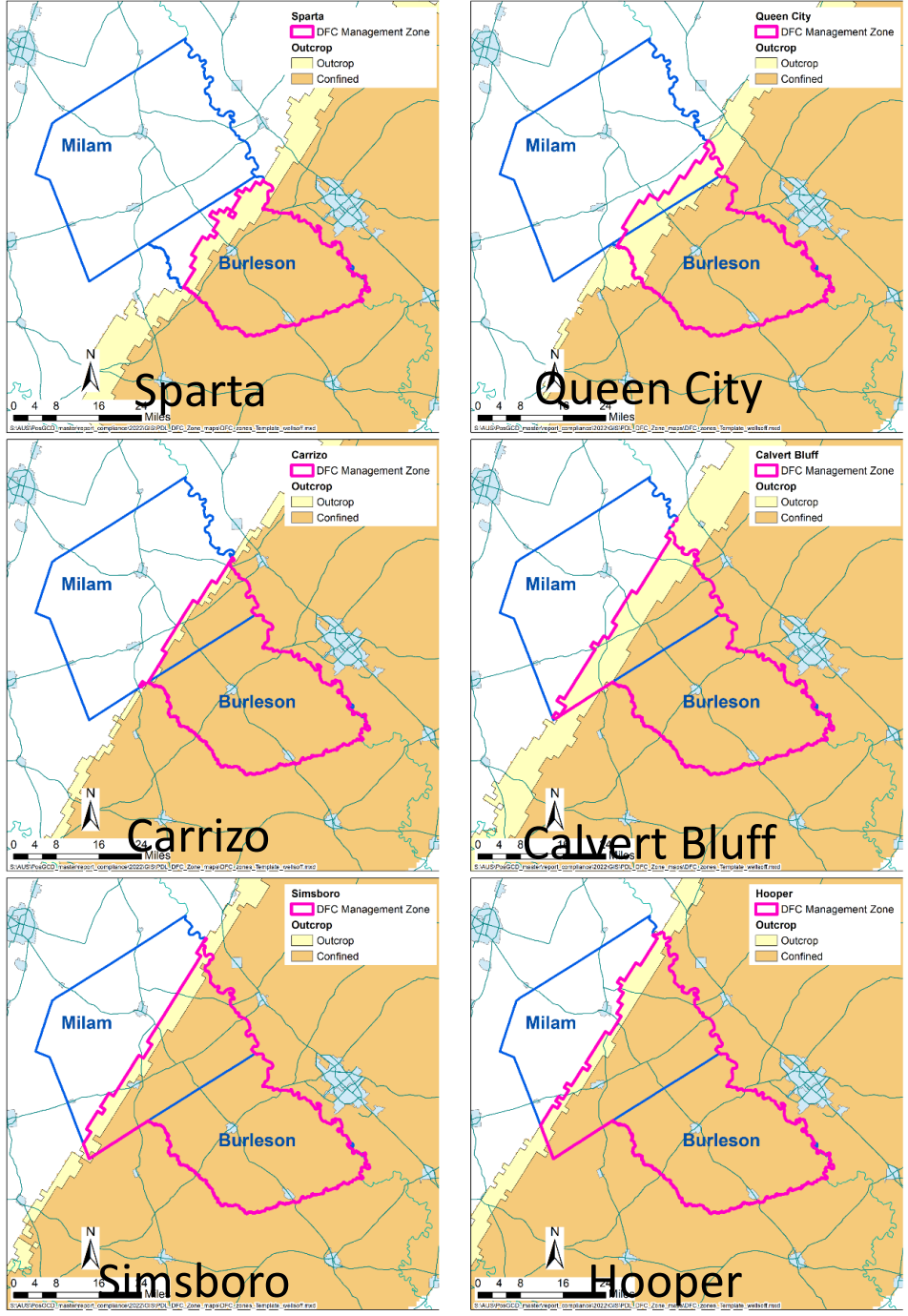


DFC Management Zones

- Spans the aquifer footprint within the District
- Yegua-Jackson and Brazos Valley Alluvium not shown
- Because of concerns with sparse well coverage across some aquifers, PDLs were created

Aquifer	2070 Drawdown
Sparta	32
Queen City	30
Carrizo	146
Upper Wilcox (Calvert Bluff Fm)	156
Middle Wilcox (Simsboro Fm)	278
Lower Wilcox (Hooper Fm)	178

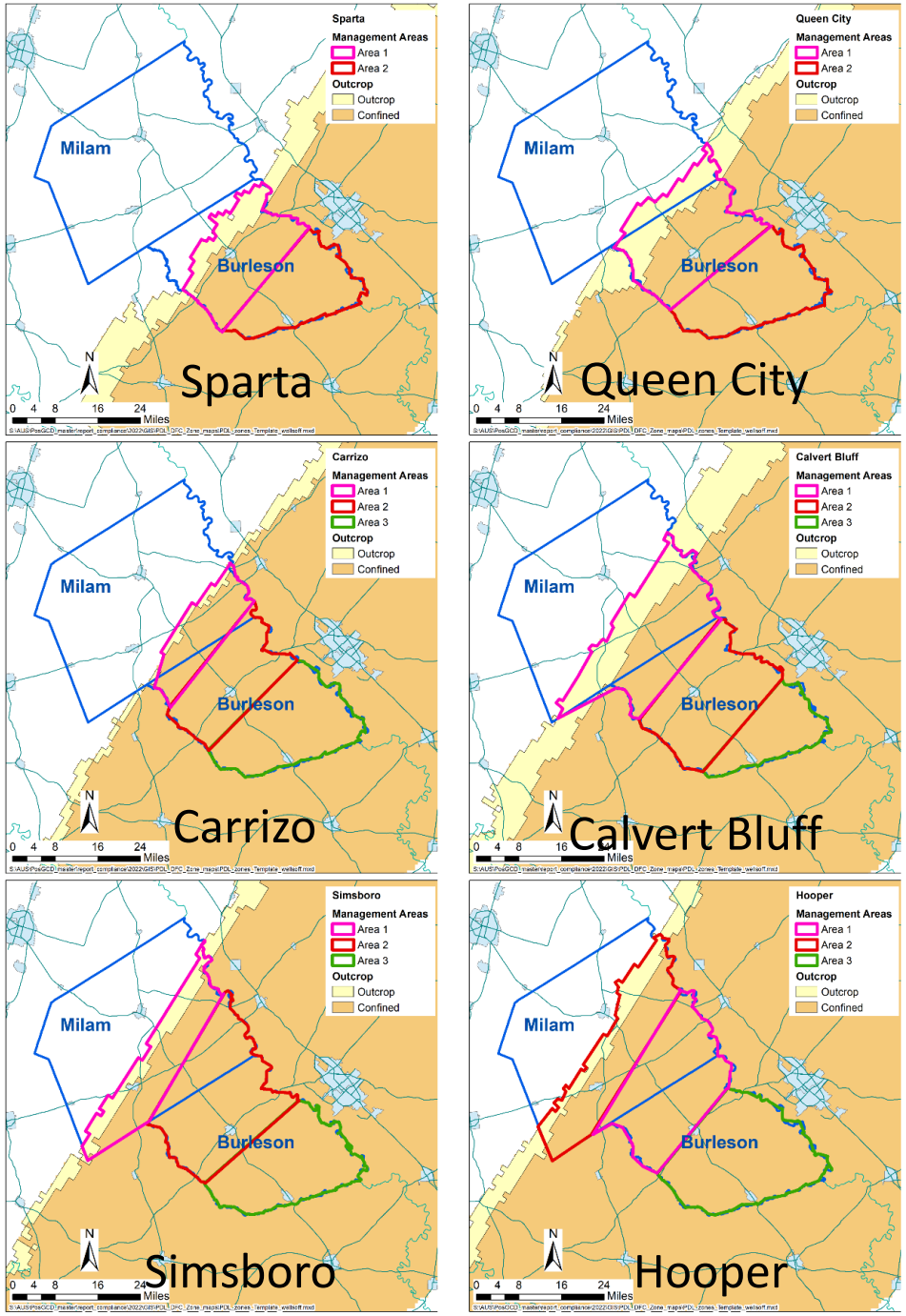
Note: Yegau-Jackson DFC = 61 ft, drawdown 2011-2023 = -25 ft



PDL Management Areas

- Management Zones has been partitioned into Management Areas
- Only Management Areas with sufficient monitoring wells are have PDLs

Management Area		2070 Drawdown
Sparta	Area 1	28
Queen City	Area 1	75
Carrizo	Area 1	75
	Area 2	175
Calvert Bluff (Upper Wilcox)	Area 1	88
	Area 2	223
Simsboro (Middle Wilcox)	Area 1	91
	Area 2	335
Hooper (Lower Wilcox)	Area 1	210

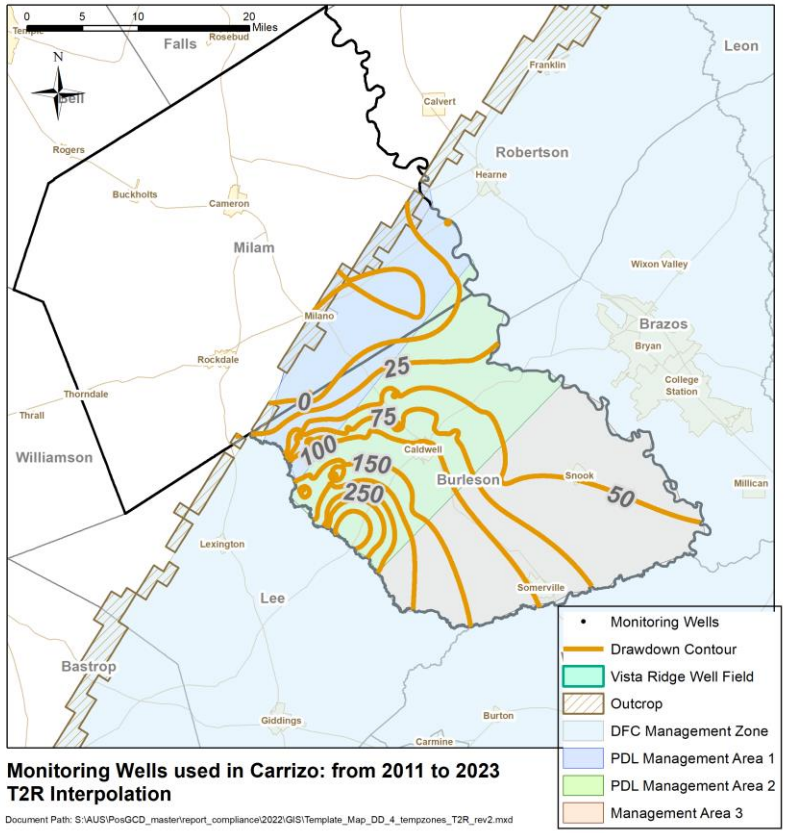


Workflow for Evaluating DFC and PDL Compliance

- Measured Water Levels
  - manual measurements
  - transducer/welintel (data logging equipment)
- Filter and Average Values for 1st Quarter
  - period of interest (January 1 – April 31st)
  - Outlier measurements investigated or removed
- Generate Water Level Contours
  - Topo to Raster (T2R) – developed for land surfaces
  - Kriging (KWL) – developed for hydrogeologic data
  - Kriging Combined with Modeling (KRS) - tailored for data with trends
- Determine Spatial Averages for 2023 Water Levels
  - management zones (DFCs' area of concern)
  - management area (PDLs' area of concern)
- Calculate Average Drawdown from 2011 to 2023
  - management zones (DFCs' area of concern)
  - management area (PDLs' area of concern)

2023 Water Levels for Carrizo

Topo to Raster



Monitoring Wells used in Carrizo: from 2011 to 2023
T2R Interpolation

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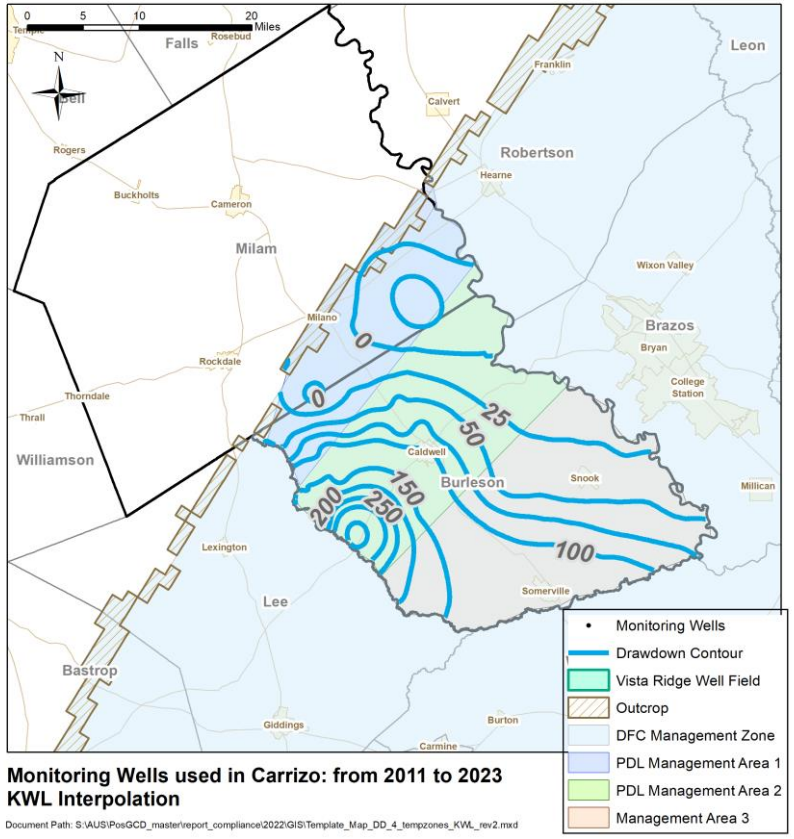
Kriging



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KWL Interpolation

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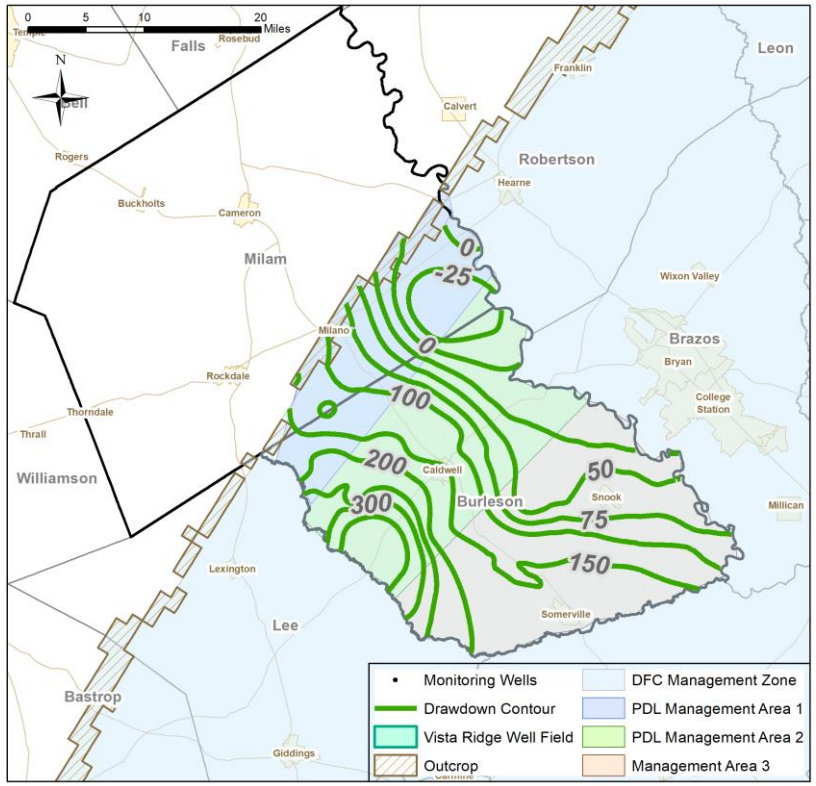
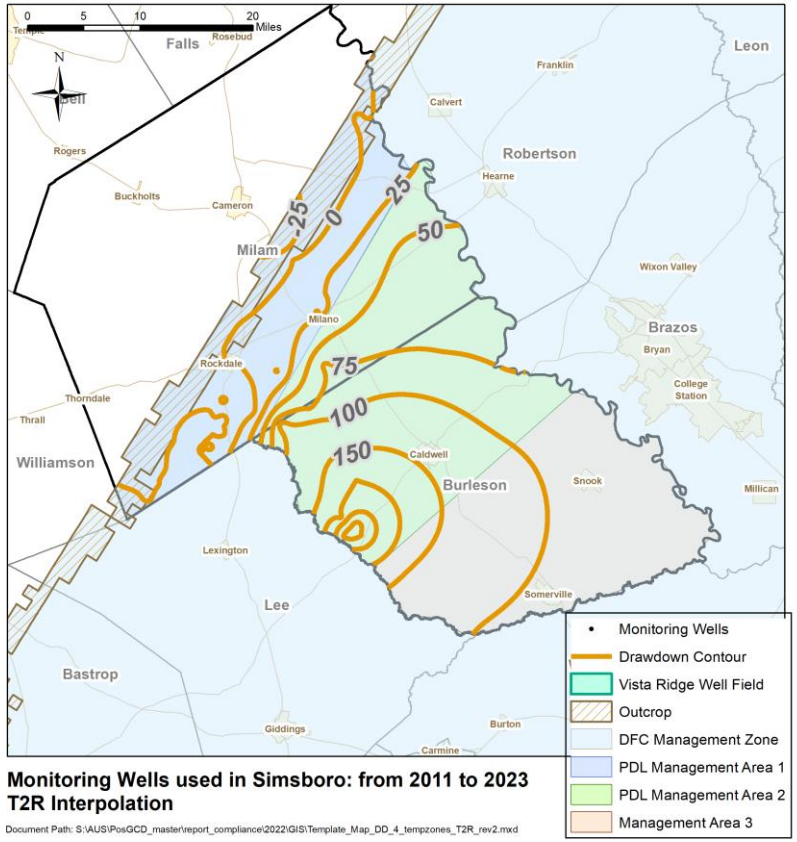
Kriging/Modeling



Monitoring Wells used in Carrizo: from 2011 to 2023
KRS Interpolation

2023 Water Levels for Simsboro

Topo to Raster



Monitoring Wells used in Simsboro: from 2011 to 2023
T2R Interpolation

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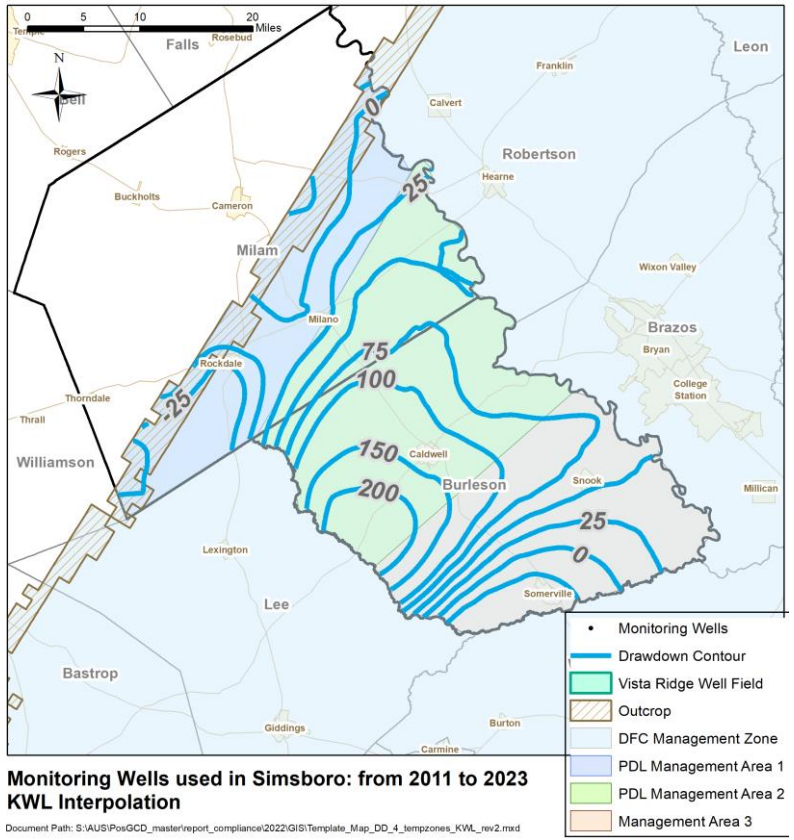
Kriging



Monitoring Wells used in Simsboro: from 2011 to 2023
KWL Interpolation

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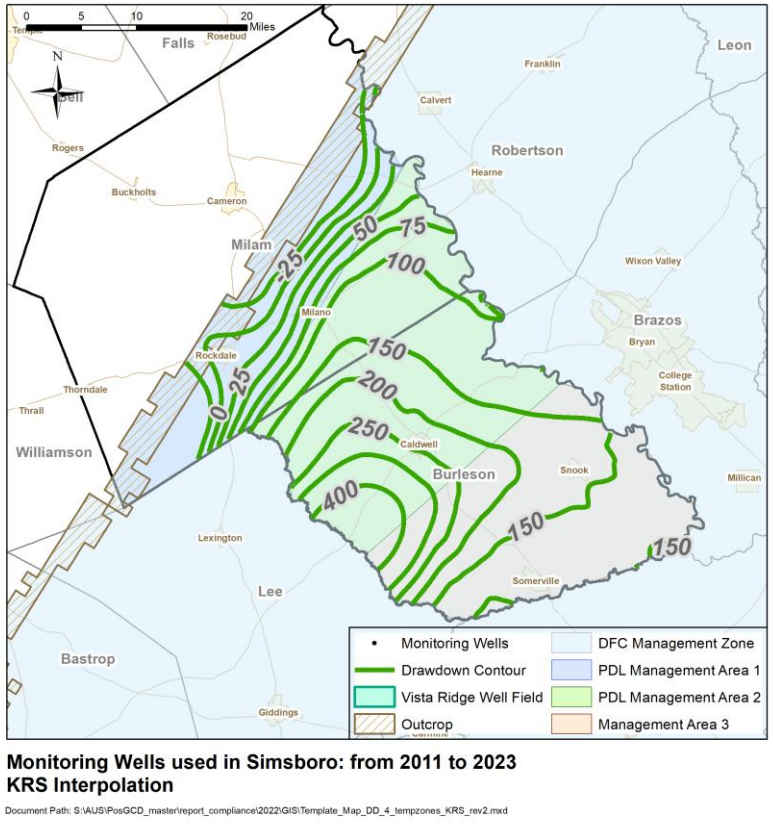
Kriging/Modeling



Monitoring Wells used in Simsboro: from 2011 to 2023
KRS Interpolation

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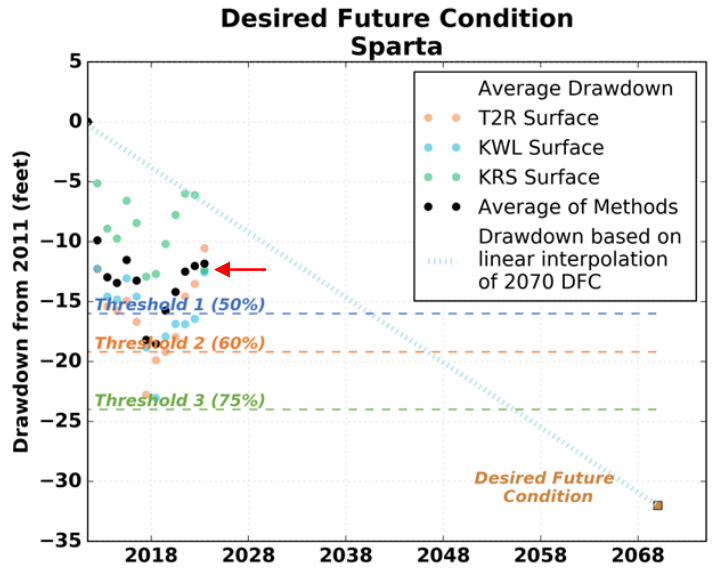
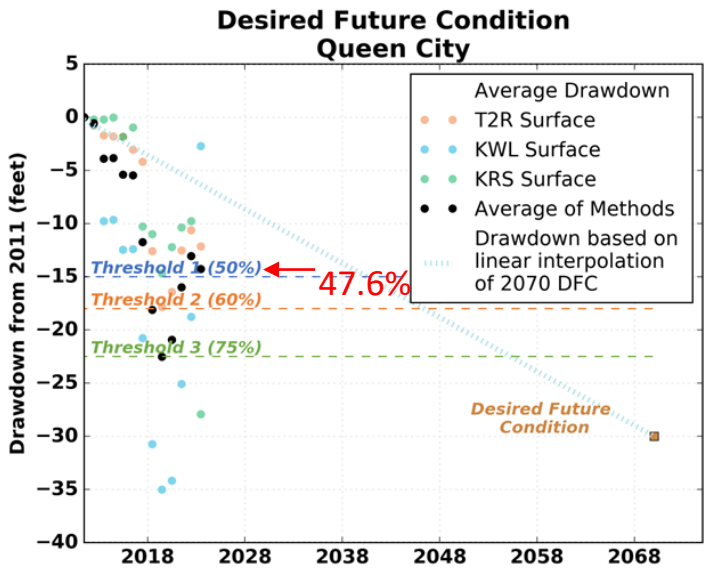
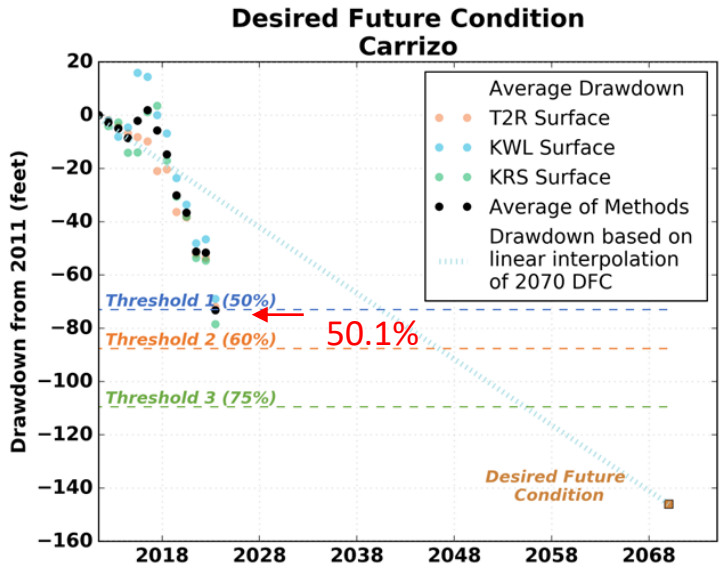
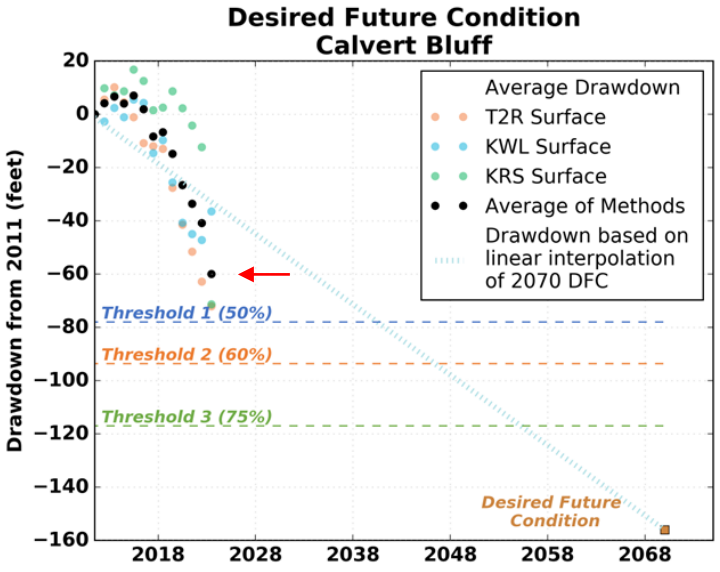
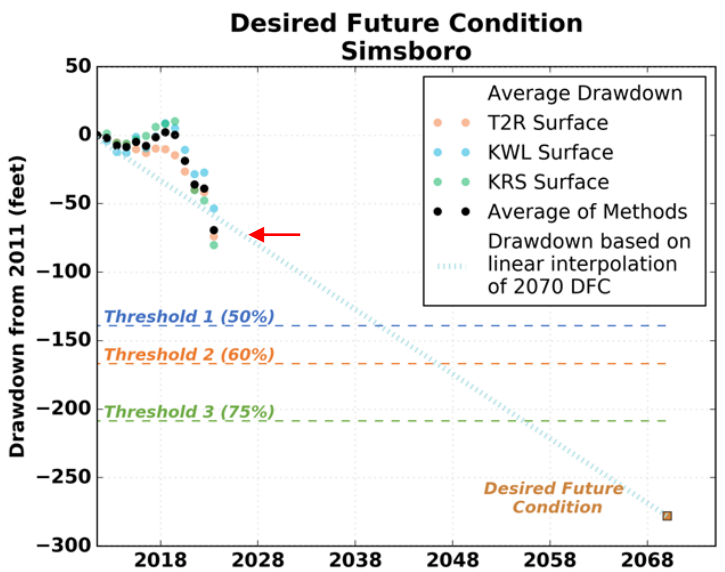
Preliminary Compliance Evaluation for DFCs: 1 Exceedance

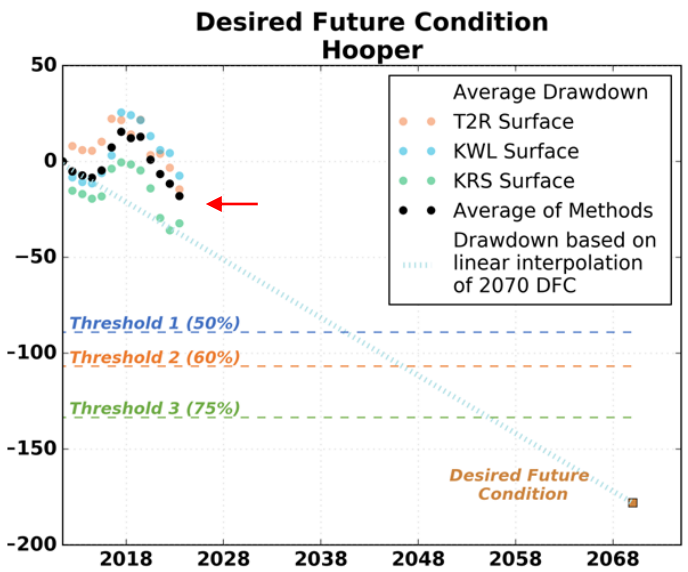




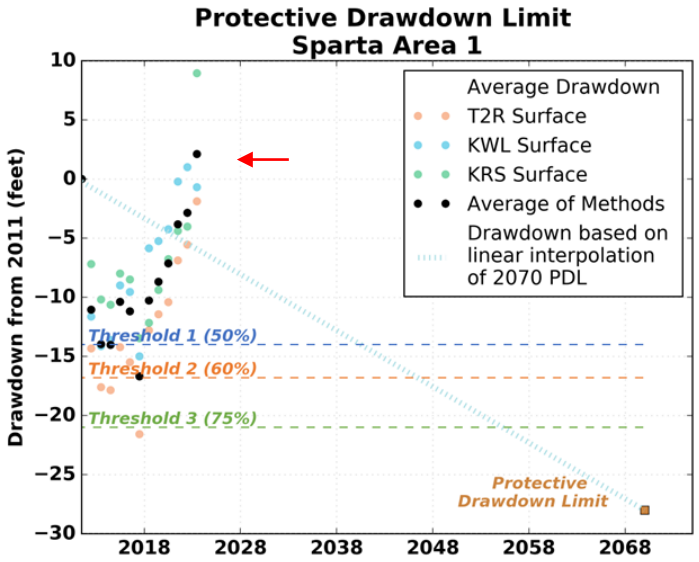


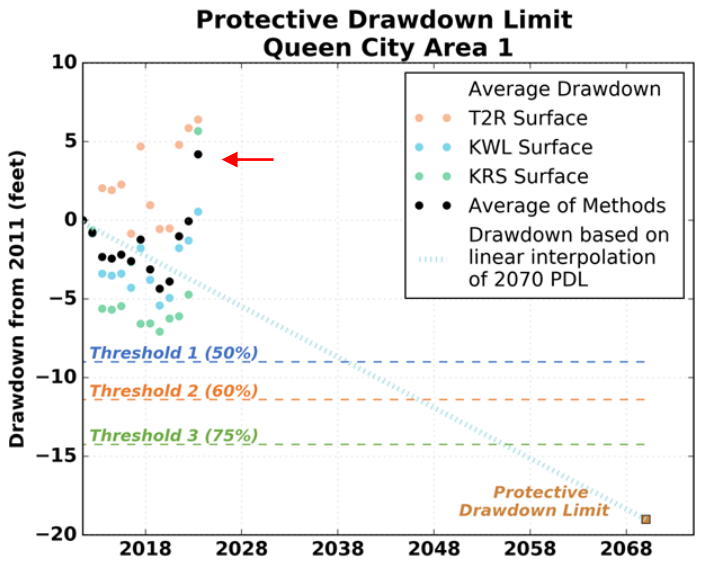


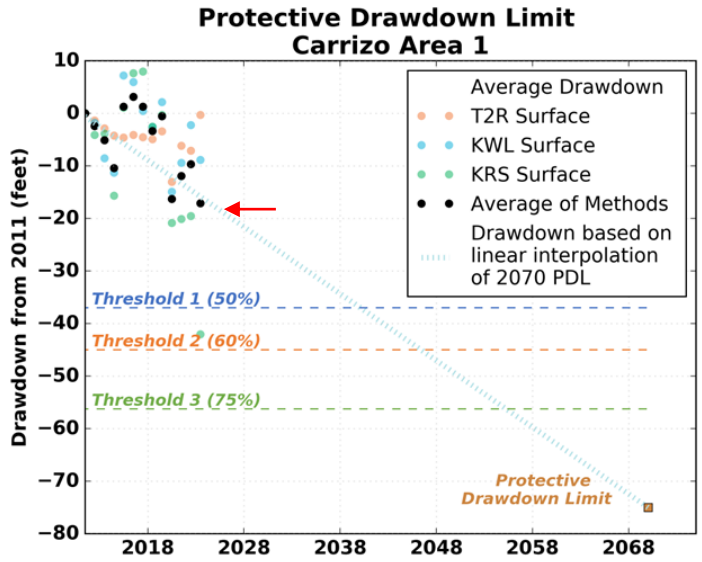


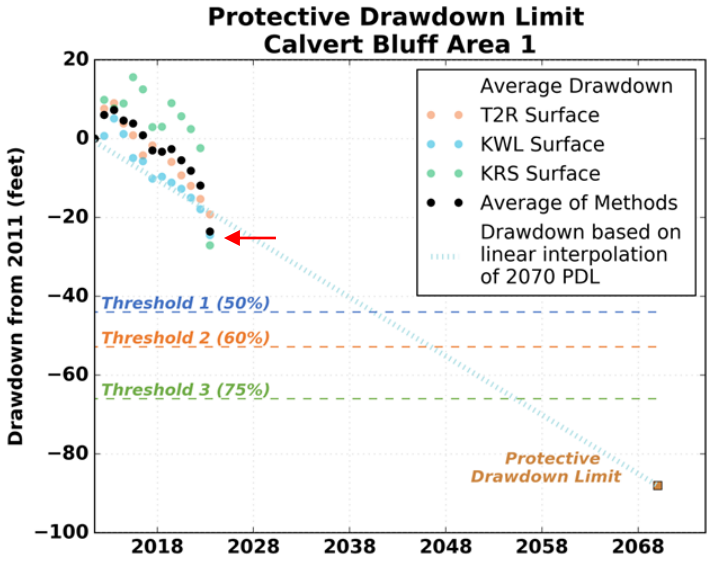


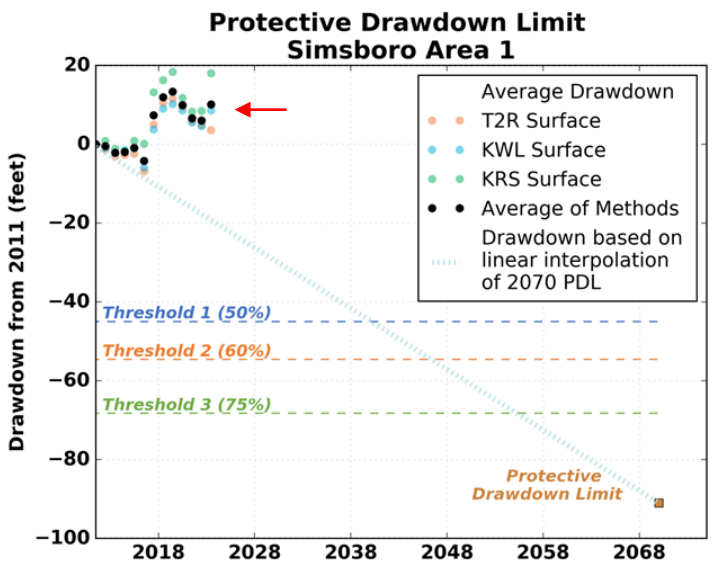
Preliminary Compliance Evaluation for PDLs for Zone 1: 0 Exceedance

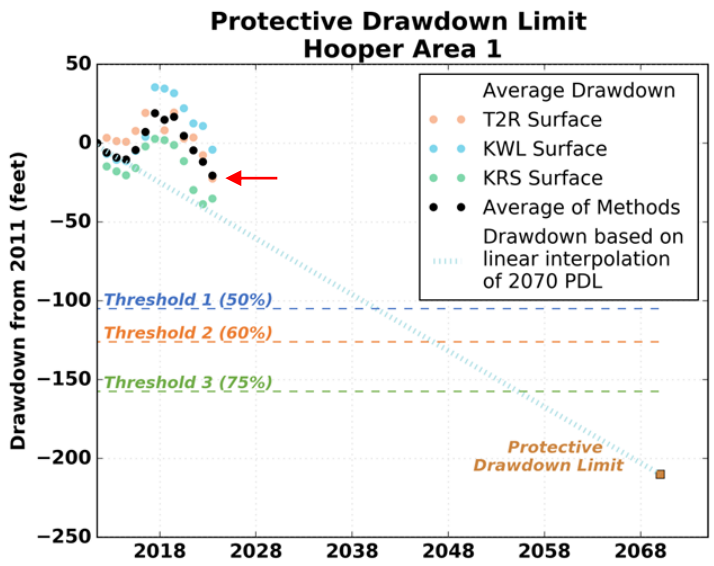




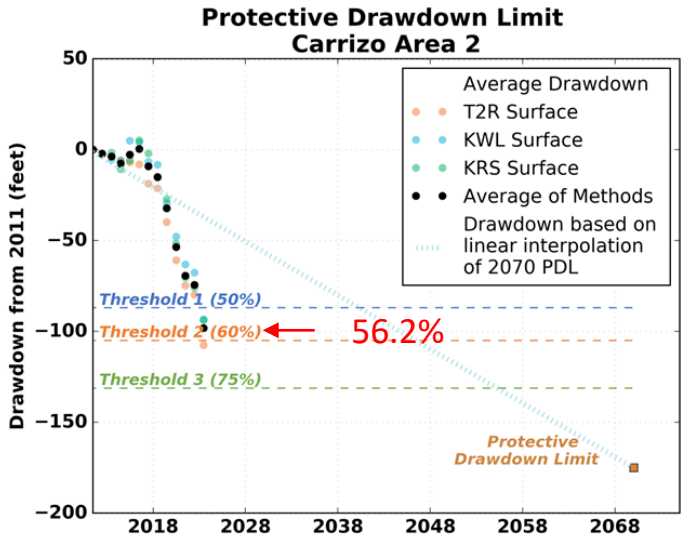


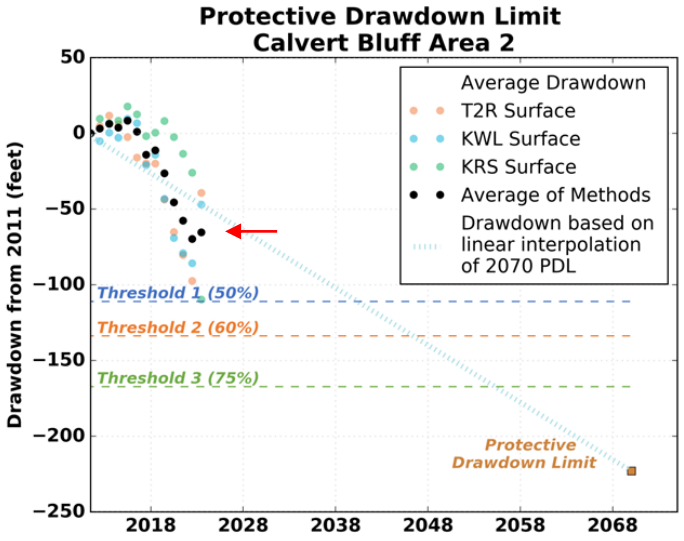


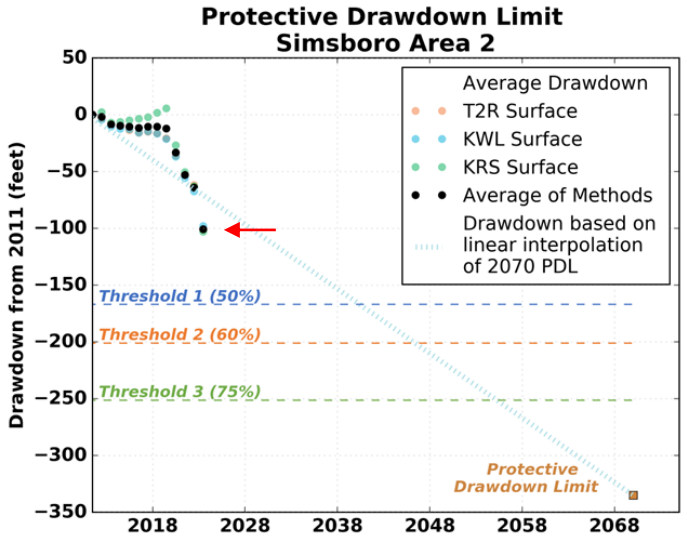




Preliminary Compliance Evaluation for PDLs Zone 2: 1 Exceedance







Summary

- DFCs Summary
  - Exceedance of Threshold 1 (50%)
    1- Carrizo (50.1%)
  - Exceedance of Threshold 2 (60%)
    or Threshold 3 (75%)
    0 – No aquifers

- PDLs Summary
  - No exceedance of Threshold 1 (50%)
    1 – Carrizo (56.2%)
  - No exceedance of Threshold 2 (60%)
    or Threshold 3 (75%)
    0 – No aquifers

Rule 16.4.1 Threshold 1

If Threshold Level 1 is exceeded, the District will perform studies to provide information on aquifer properties, aquifer recharge, aquifer and surface water interactions, and aquifer pumping. To the extent possible, the studies shall distinguish between the causes and effects of pumping occurring within the District and outside of the District. The results may be used to improve the models, tools, and methodologies used to analyze data and predict future groundwater levels and availability. The District will contract with a professional hydrogeologist to (i) conduct studies and/or (ii) establish the parameters for the studies and review the results of studies. The results of the studies shall be made available to the public in a reasonable manner during one or more public meetings within ninety (90) calendar days after the completion of the studies. [Amended July 2, 2019] [Amended May

Discussion Topics

- Additional checks on measured water levels
- Identify areas where additional measurements would be beneficial
- Investigate grouping of wells
- Incorporate use of Reclamation Model into Kriging with Modeling
- Improve methods to account for differences in methods and uncertainty
- Prepare a letter report on monitoring data and compliance evaluation in June 2024
- Update protocols in Guidance Document Protocols in August 2024 to incorporate findings

GWAP Annual Needs Assessment Report

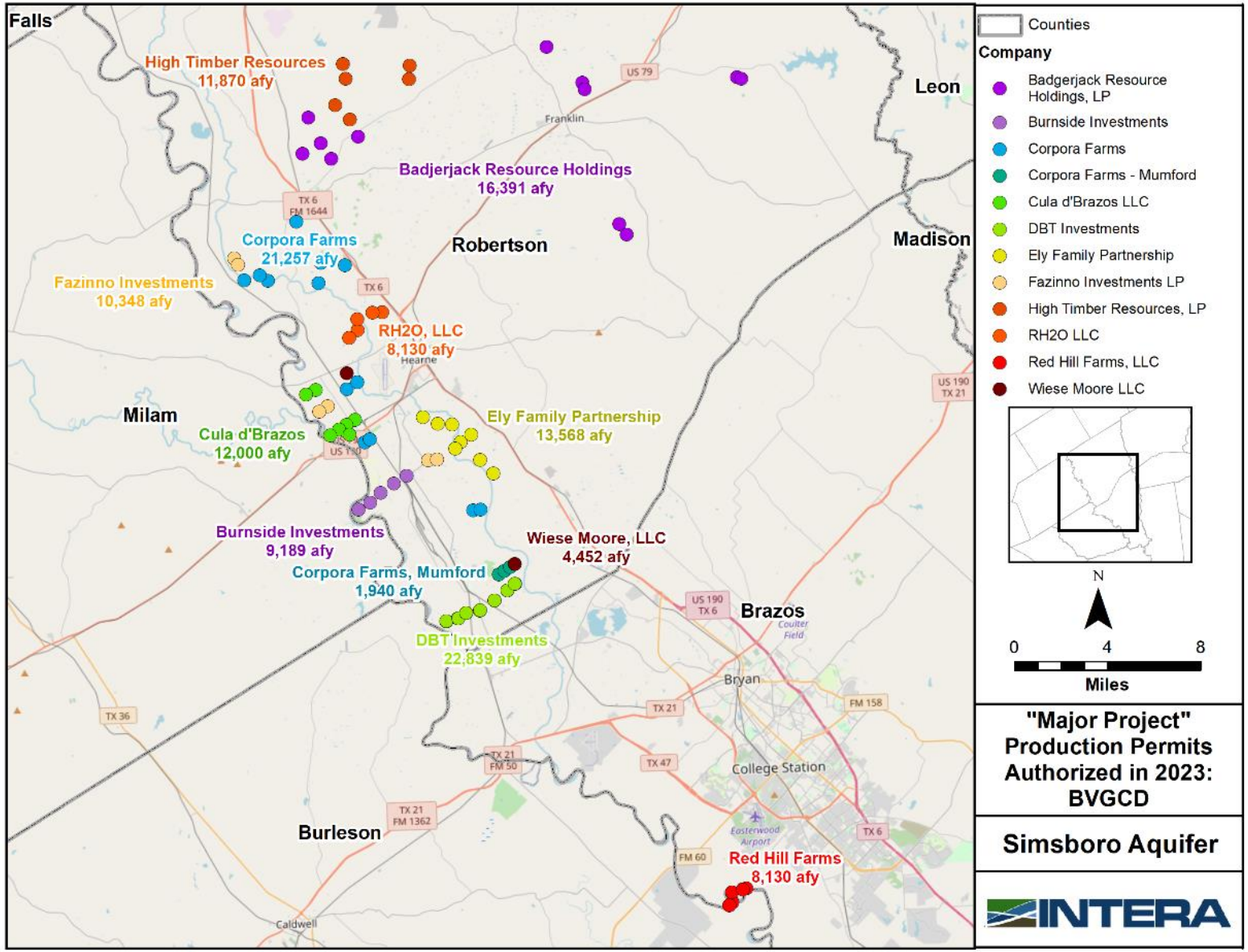
Overview of GANA

Objective: identify eligible wells where water levels are likely to decline below the elevation of the pump setting as a result of regional groundwater production in GMA 12 within the next 10 years.

High-Priority wells: number of wells with pump elevation data that the GW model predicts will have water level in 2033 that are less than 15 feet above the elevation of its pump settings recorded in the POSGCD database

Moderate-Priority well: number of wells without pump elevation data that the GW model predicts will have water level in 2033 that are less than 15 feet above the elevation of if pump setting elevation were recorded

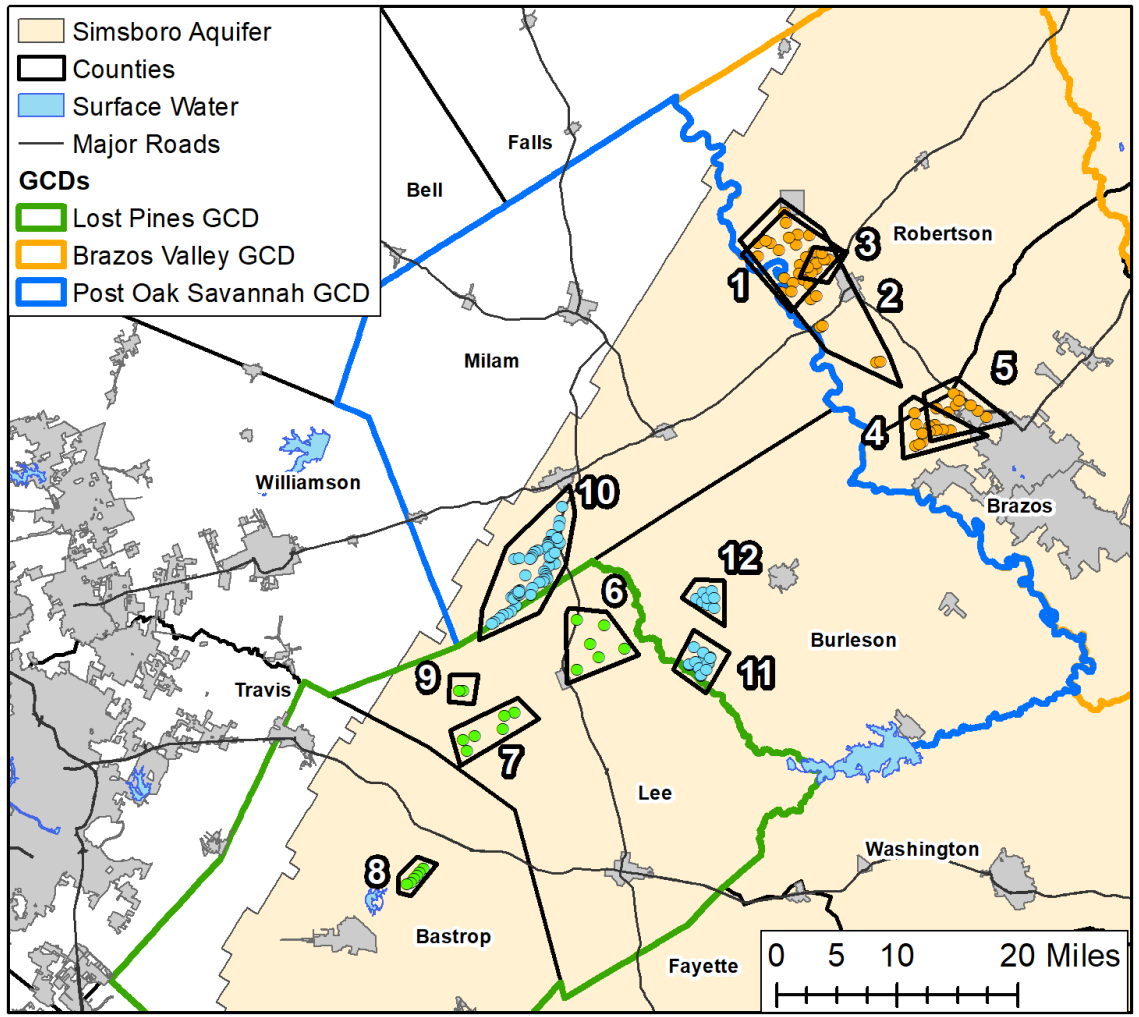
Major 2023 Simsboro Permits in BVGCD



2023 Simsboro Variable Permits	Permit (AFY)
Badgerjack Resource Holdings, LP	16,391
High Timber Resources, LP	11,870
Corpora Farms	21,257
Corpora Farms - Mumford	1,940
Fazzino Investments	9,161
Wiese Moore LLC	4,452
Burnside Investments	9,189
Cula d'Brazos LLC	12,000
Red Hill Farms	8,130
RH2O LLC	8,130
Ely Family Partnership	13,568
DBT Investments	22,839
2023 Variable Total	**138,927**

Vast majority of these permits are viewed as speculative by BVGCD. This amount of pumping cannot occur without BVGCD exceeding DFCs in 2070.

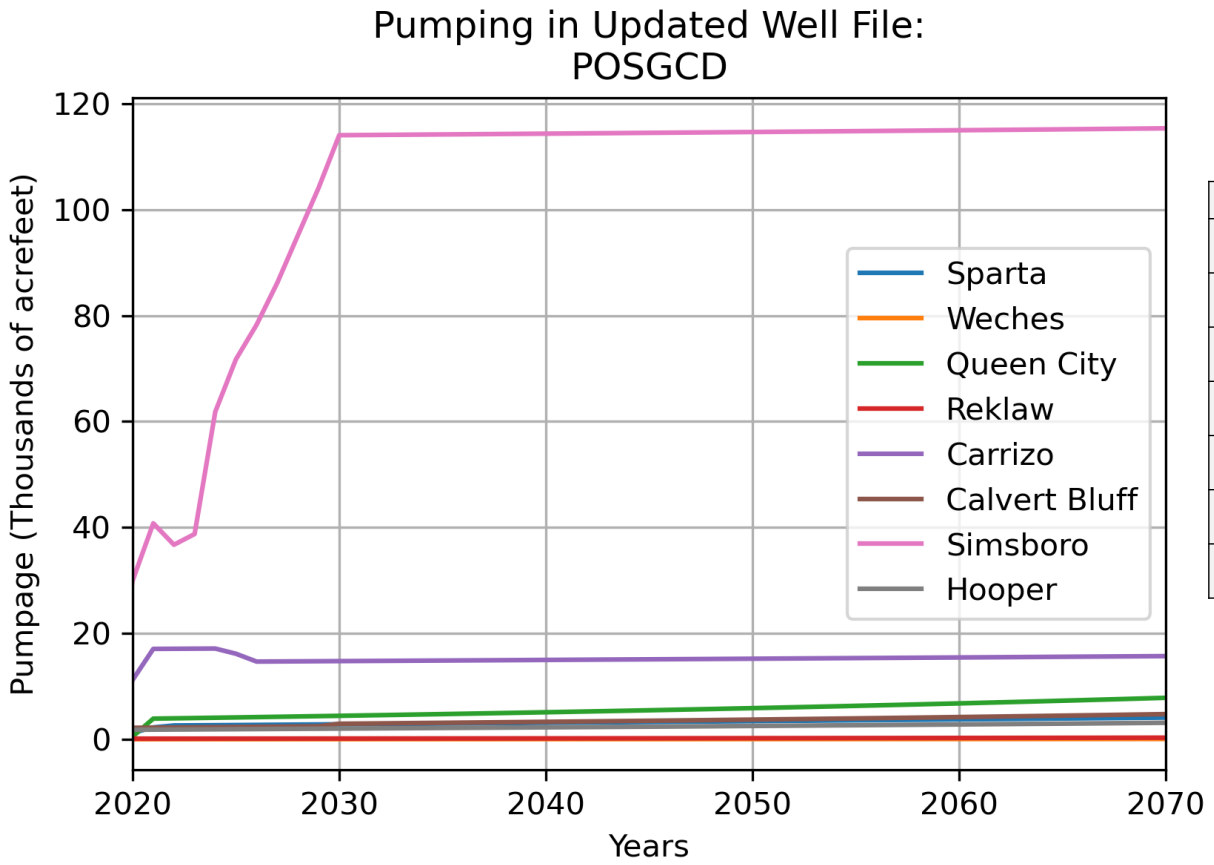
Location of Notable Simsboro Well Fields



GANA concerned with drawdown only through 2033. No curtailment considered to have occurred before 2033.

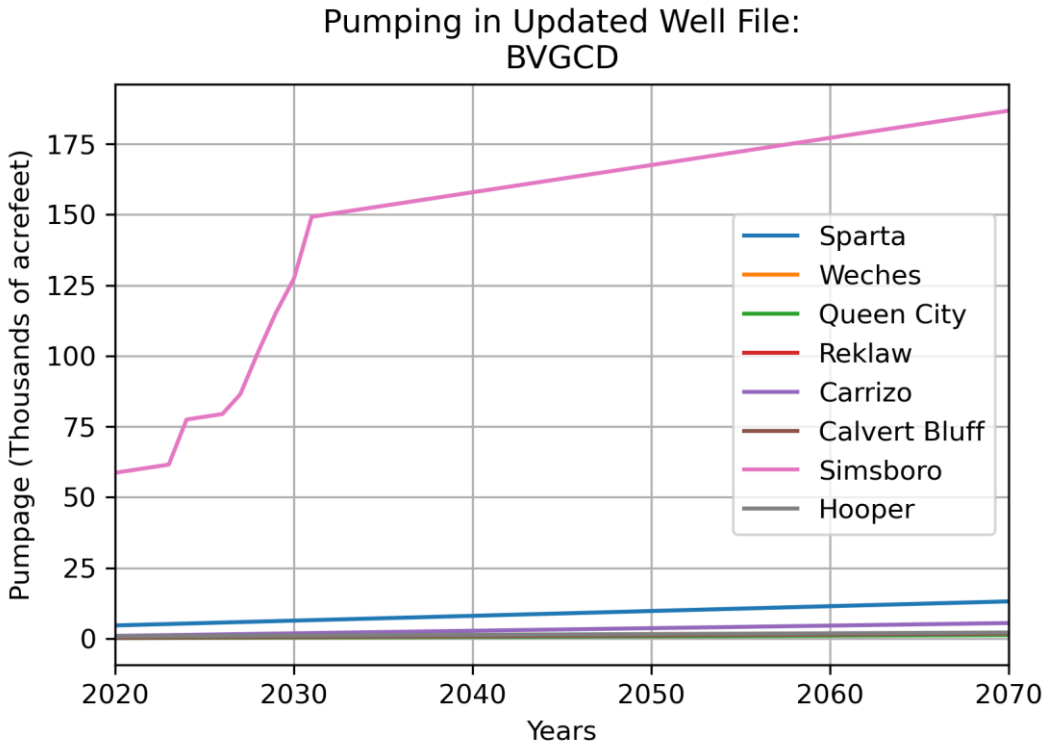
Owner/Permit Amount		Amount in DFC Run S-19	Production Pre- 2024
Brazos Valley GCD			
1	UW Brazos Farms - 70,480	40,000	12 - 21,000 afy
2	Corporal Farms - 15,000 afy (est)	0 afy	0 afy
3	RH2O LLC- 15,000 (est)	0 afy	0 afy
4	Texas A&M - 7,645 afy (historic)	7,645 afy	5,700 afy
4	City of College Station - 27,857 afy	22,800 afy	12,100 afy
5	City of Bryan - 46,300 afy	32,135 afy	18,700 afy
Lost Pines GCD			
6	Gateway – 18,500 afy	0 afy	0 afy
7	Recharge – 46,000 afy	13,500 afy	0 afy
8	LCRA – 8,000 afy	0 afy	0 afy
9	Manville - 3,150 afy	0 afy	0 afy
Post Oak Savannah GCD			
10	SLR – 40,000 afy	40,000 afy	1,000 afy
10	SLR – 9,000 afy (pending)	0 afy	0 afy
11	Vista Ridge – 40,835 afy	32,000 afy	40,000 afy
12	130 Project – 20,000 afy	20,000 afy	1,800 afy
TOTAL	367,767 afy	208,080 afy	94,300 afy
BVGCD	182,282 afy	102,850 afy	51,500 afy
LPGCD	74,650 afy	13,500 afy	0 afy
POSGCD	109,835 afy	92,000 afy	42,800 afy

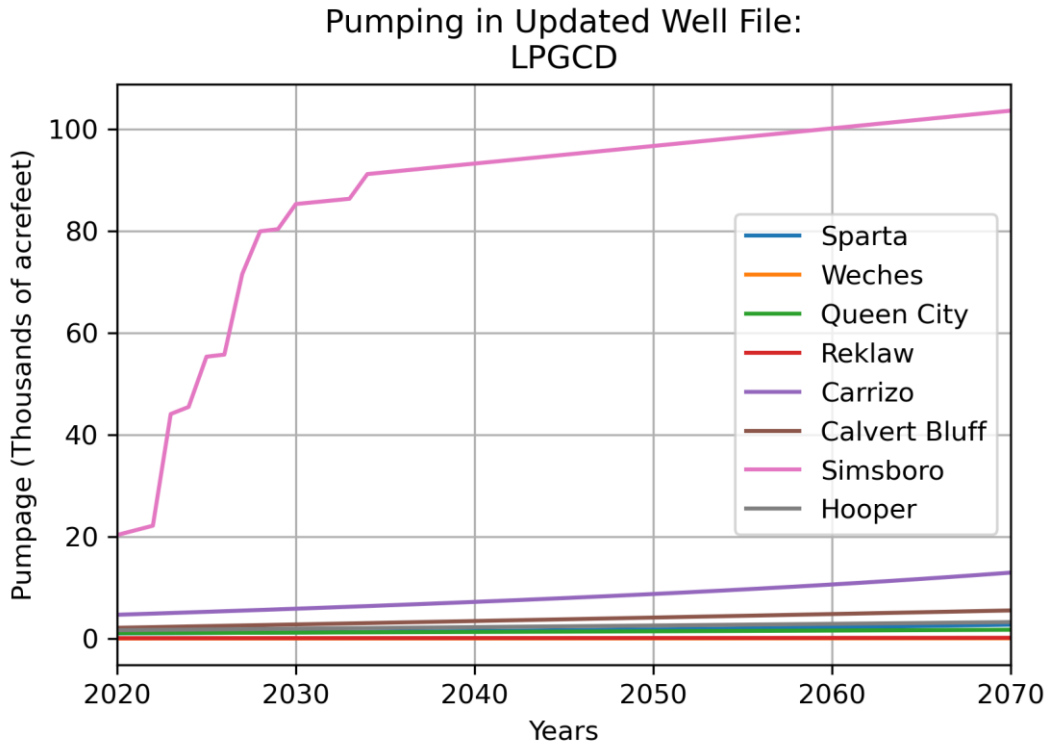
GANA Pumping Rates for POSGCD



Year	2023	2025	2026	2033	2043	2053	2063
Sparta	2,644	2,699	2,727	2,926	3,221	3,532	3,861
Queen City	4,018	4,134	4,194	4,630	5,331	6,141	7,084
Carrizo	17,112	16,155	14,677	14,830	15,054	15,286	15,529
Calvert Bluff	2,272	2,335	2,368	3,044	3,423	3,858	4,361
Simsboro	38,751	71,729	78,257	114,117	114,415	114,731	115,071
Hooper	1,871	1,915	1,937	2,096	2,340	2,606	2,900
Total	66,668	98,968	104,159	141,643	143,783	146,154	148,806

Pumping Rates for POSGCD, LPGCD, and BVGCD





Wells Eligible for GWAP

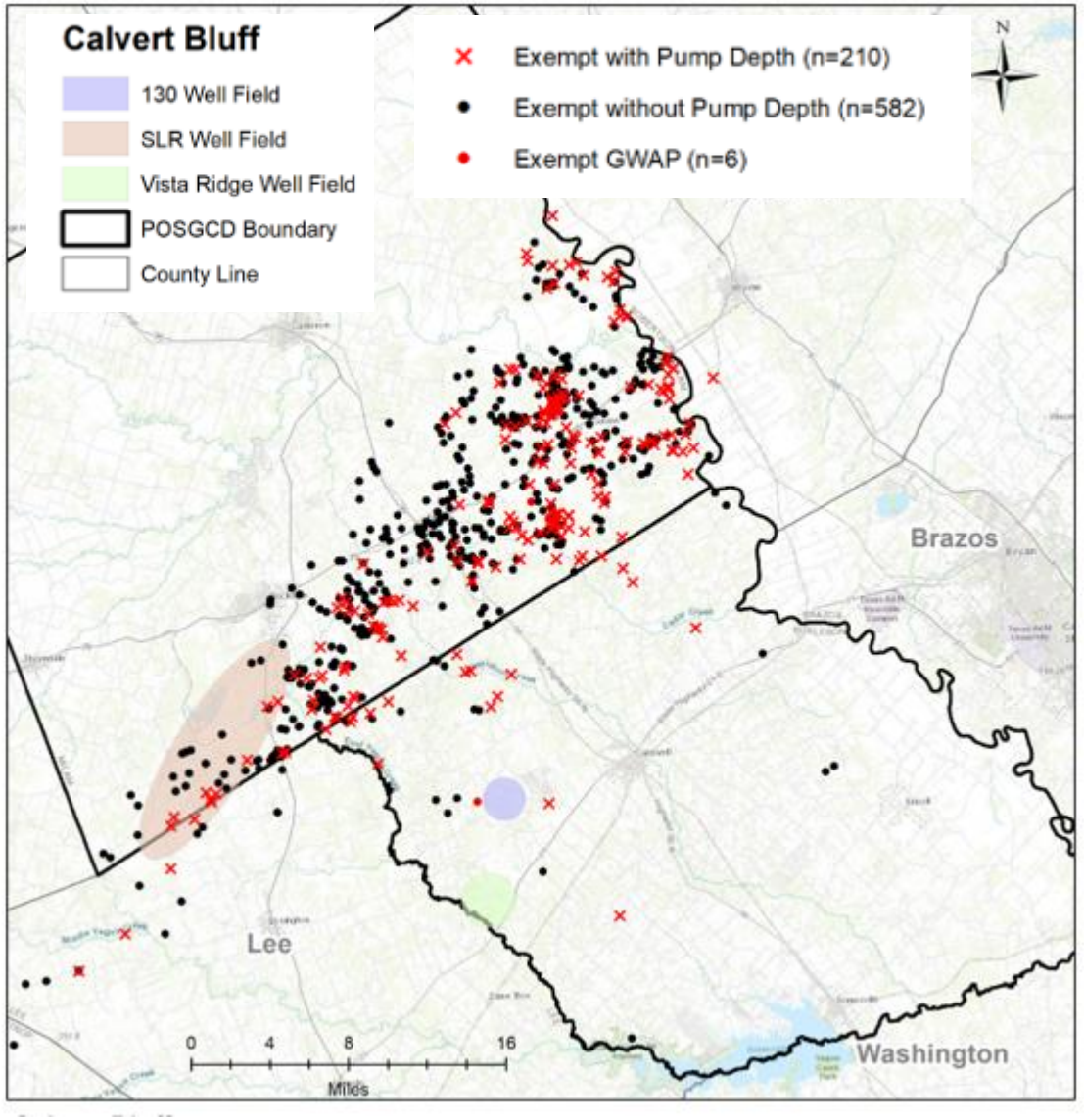
Exempt Wells

Aquifer	Has Pump Depth Information	No Pump Information	Total Eligible Exempt Wells
Sparta	161	1030	1191
Queen City	192	1035	1227
Carrizo	174	417	591
Calvert Bluff	216	582	798
Simsboro	78	381	459
Hooper	197	543	740
TOTAL	**1018**	**3988**	**5006**

******80% of exempt wells lack pump information ******

Low-capacity Permitted Wells

Aquifer	Has Pump Depth Information	No Pump Depth Information	Total Eligible Permitted (Low Capacity) Wells
Sparta	18	33	51
Queen City	15	28	43
Carrizo	19	11	30
Calvert Bluff	38	22	60
Simsboro	13	15	28
Hooper	16	18	34
TOTAL	**119**	**127**	**246**



High Priority and GWAP Wells

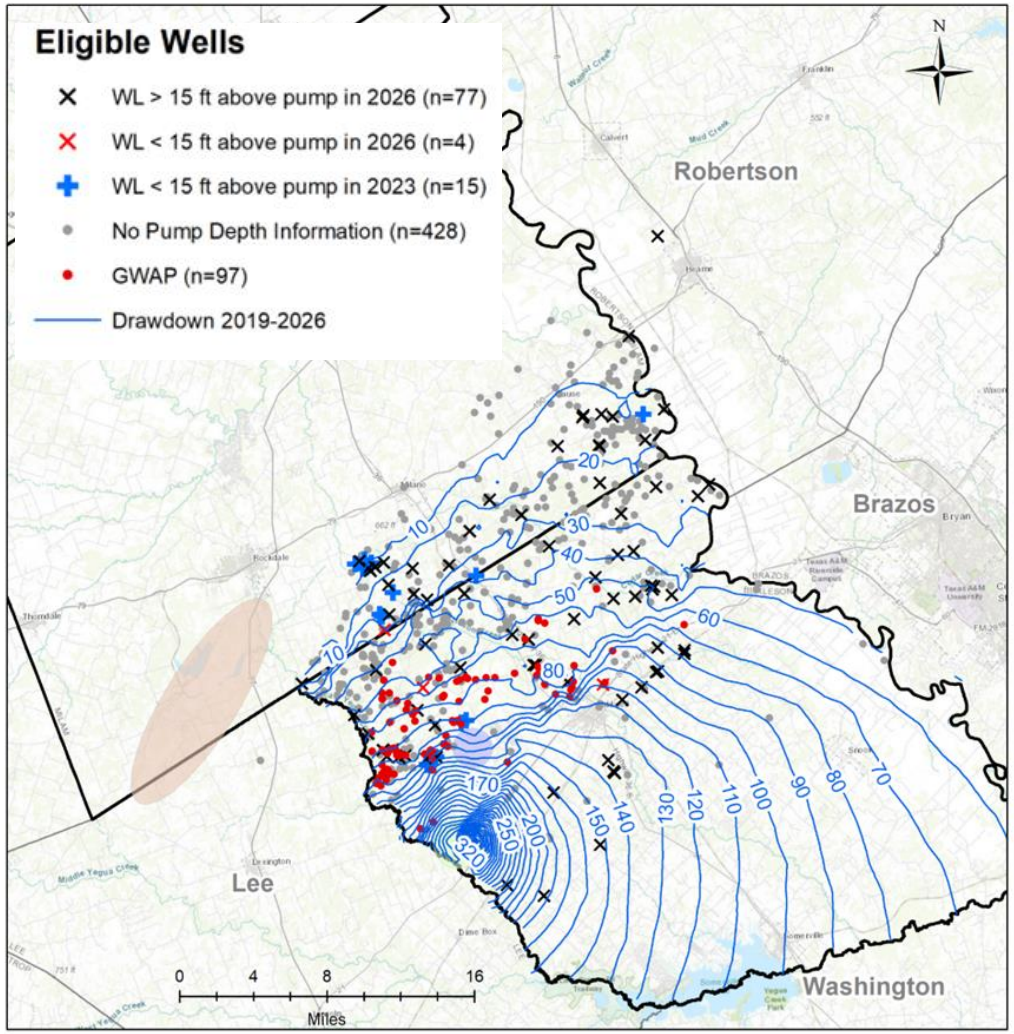
- High Priority
  - Defined elevation of pump setting
  - In 2023, water level is > 15 ft above the pump setting
  - In 2033, water level is < 15 ft above the pump setting
- Wells of Concern
  - Define elevation of pump setting
  - In 2023, water level is < 15 ft above the pump setting
  - Presume that simulated water level or well specs are not accurate
- GWAP Wells
  - Well replace or pumped lower by POSGCD
  - Pump lowered by at least 100 ft

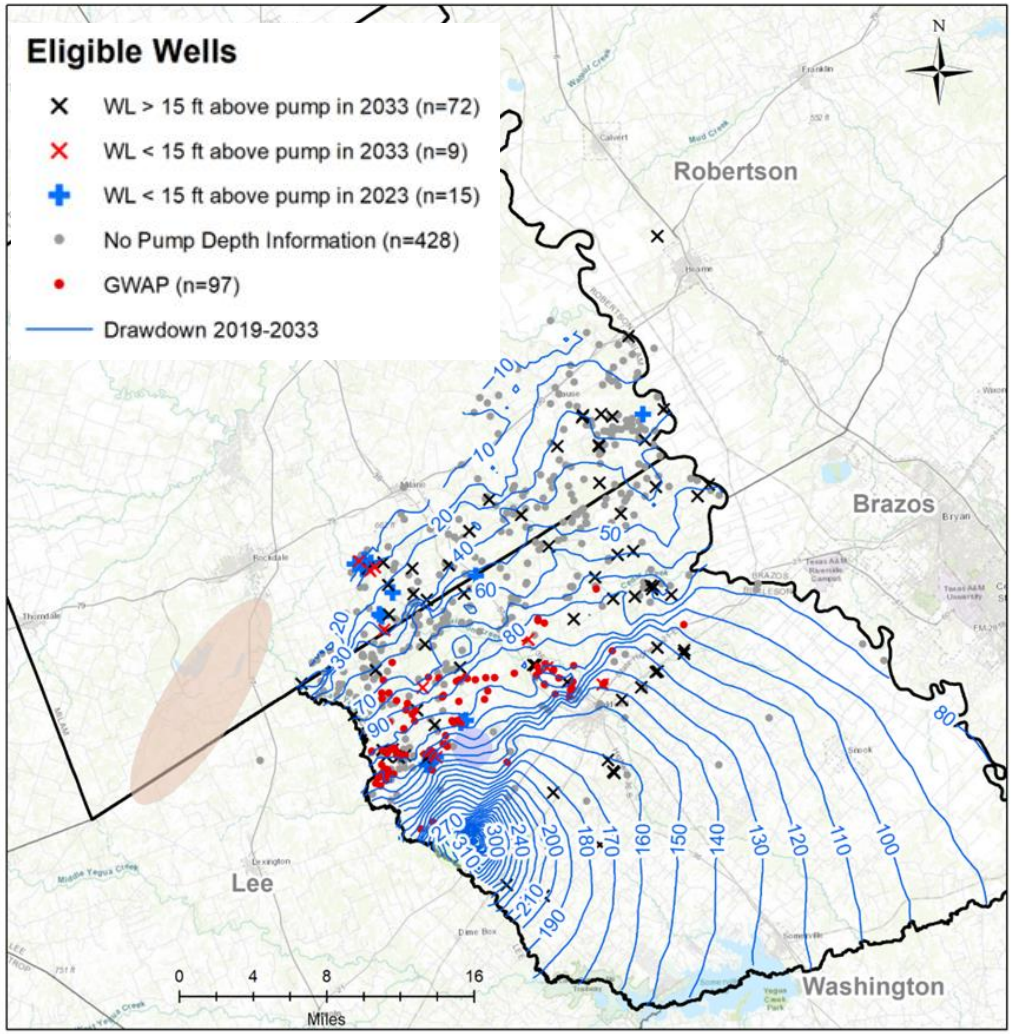
Aquifer	High-Priority wells (simulated water level is < 15 ft above pump setting)		Wells of Concern (simulated water level is < 15 ft above pump setting in 2023)	GWAP Wells
	2026	2036		
Sparta	1	3	4	0
Queen City	1	1	6	6
Carrizo	4	10	15	97
Calvert Bluff	1	11	6	7
Simsboro	1	8	11	3
Hooper	1	3	7	1
Total	9	36	49	114

Simulated Drawdown: Carrizo

Carrizo

- 130 Well Field
- ALCOA Well Field
- Vista Ridge Well Field
- POSGCD Boundary
- County Line

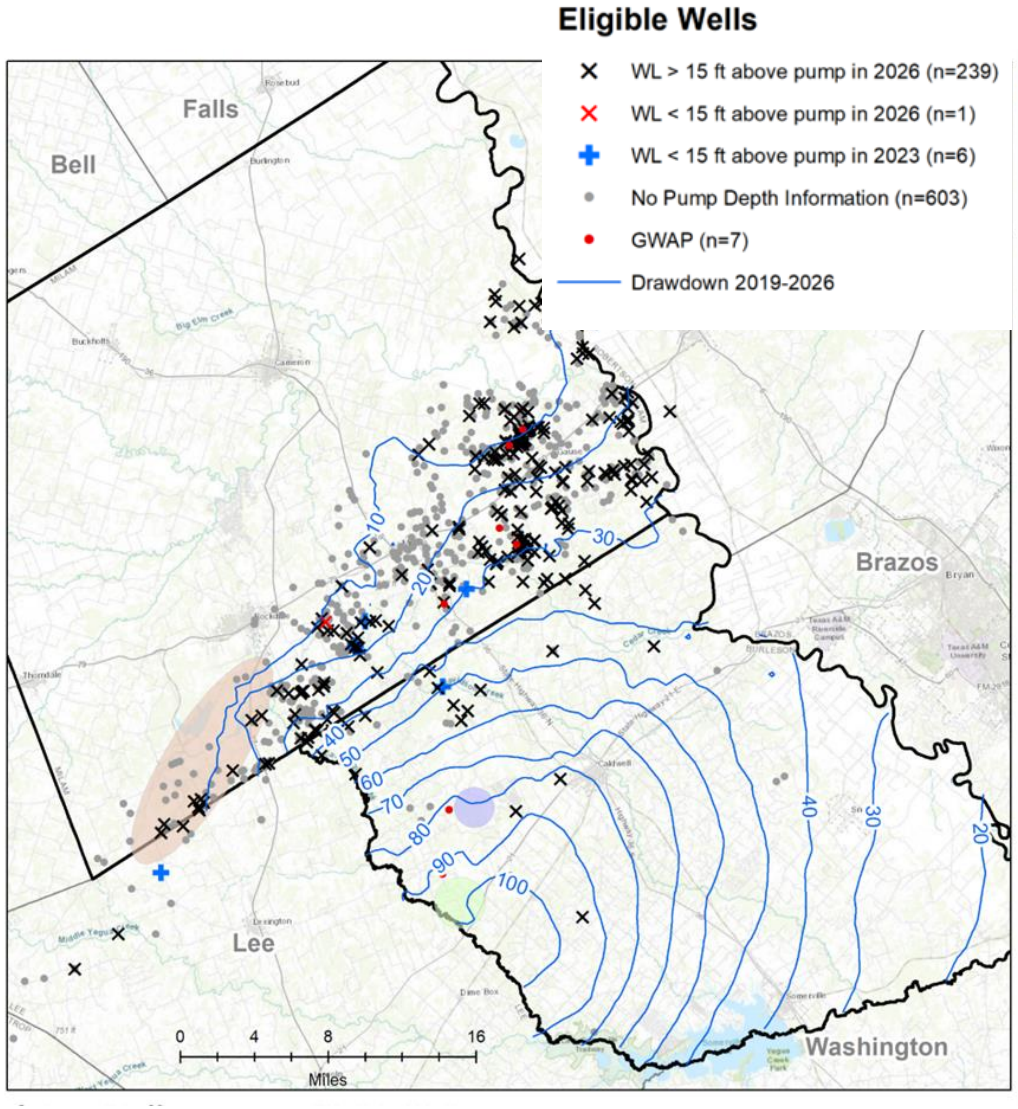


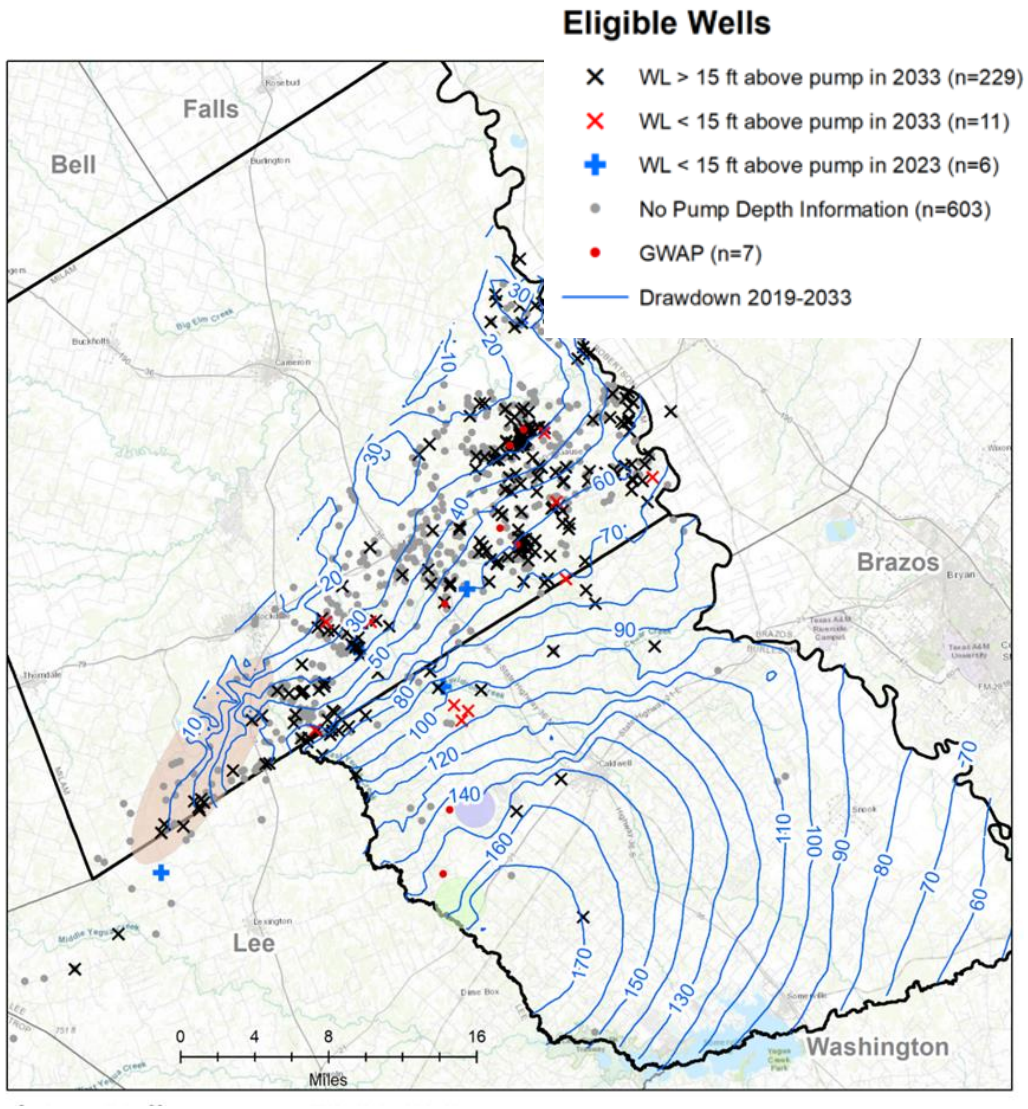


Simulated Drawdown: Calvert Bluff

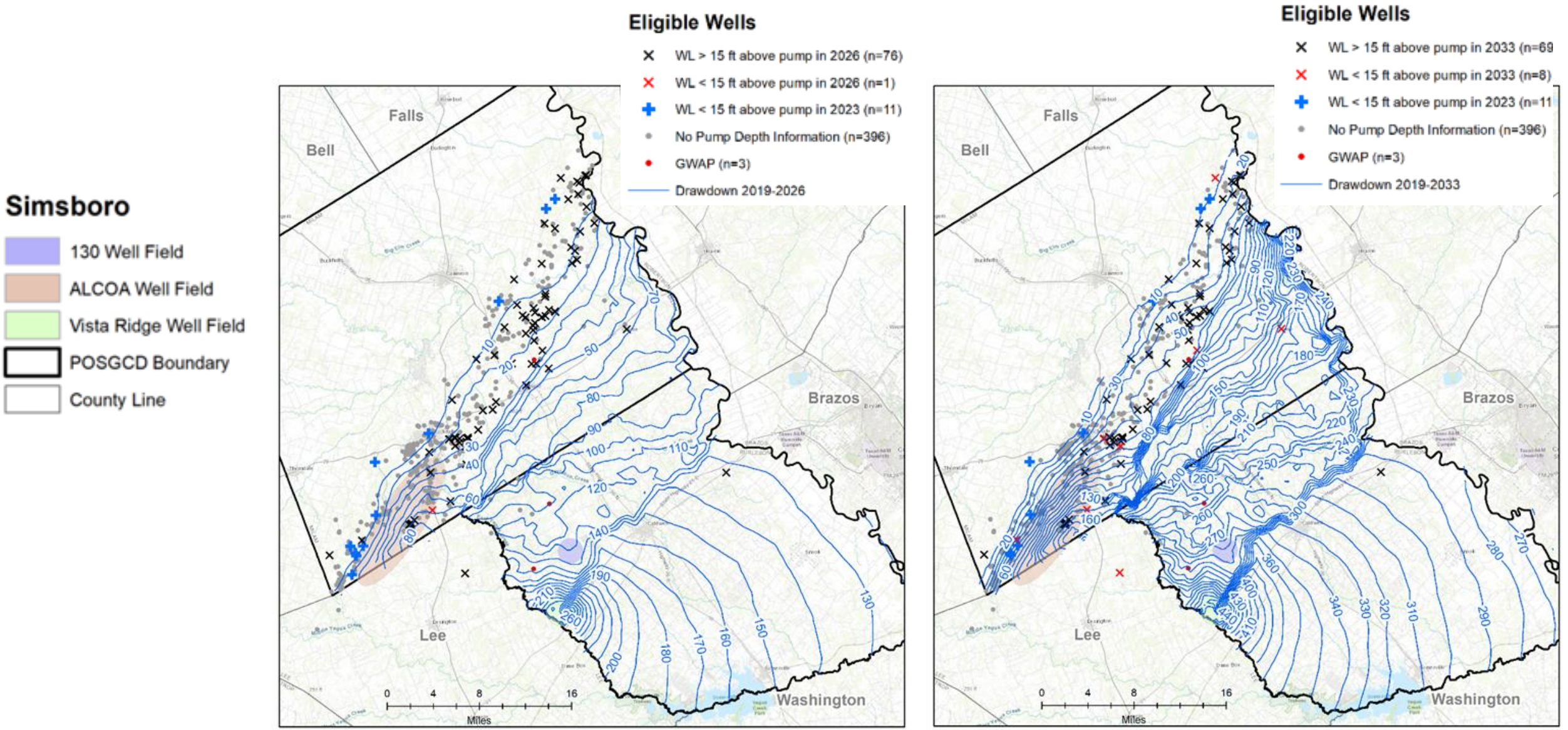
Calvert Bluff

- 130 Well Field
- ALCOA Well Field
- Vista Ridge Well Field
- POSGCD Boundary
- County Line



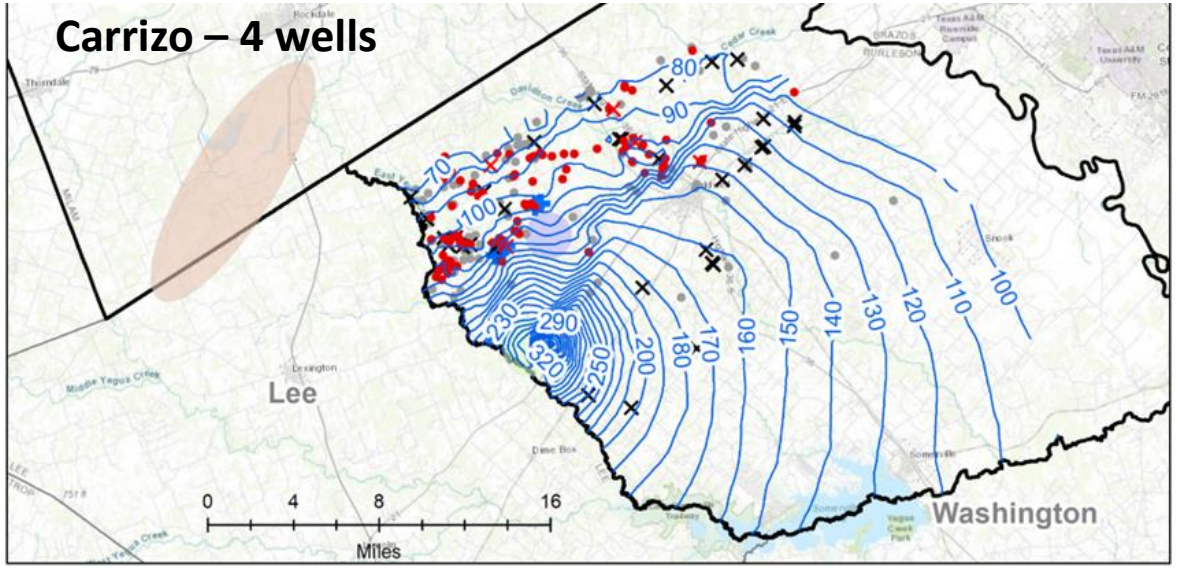


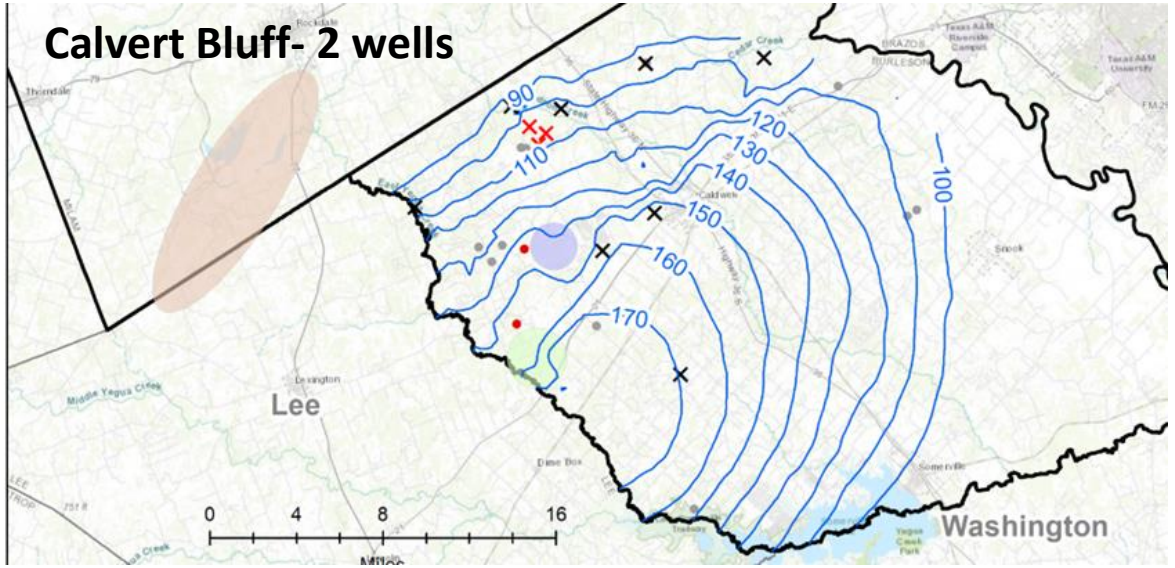
Simulated Drawdown: Simsboro



Moderate Priority Wells

- Estimated number of wells with no pump information that likely would have been high priority wells if we had pump information
- Determine percentage (%) of wells with information on pump elevation information
- Apply percentage(%) to the number of wells with no information on pump elevation information





Estimated Number of Impacted Wells

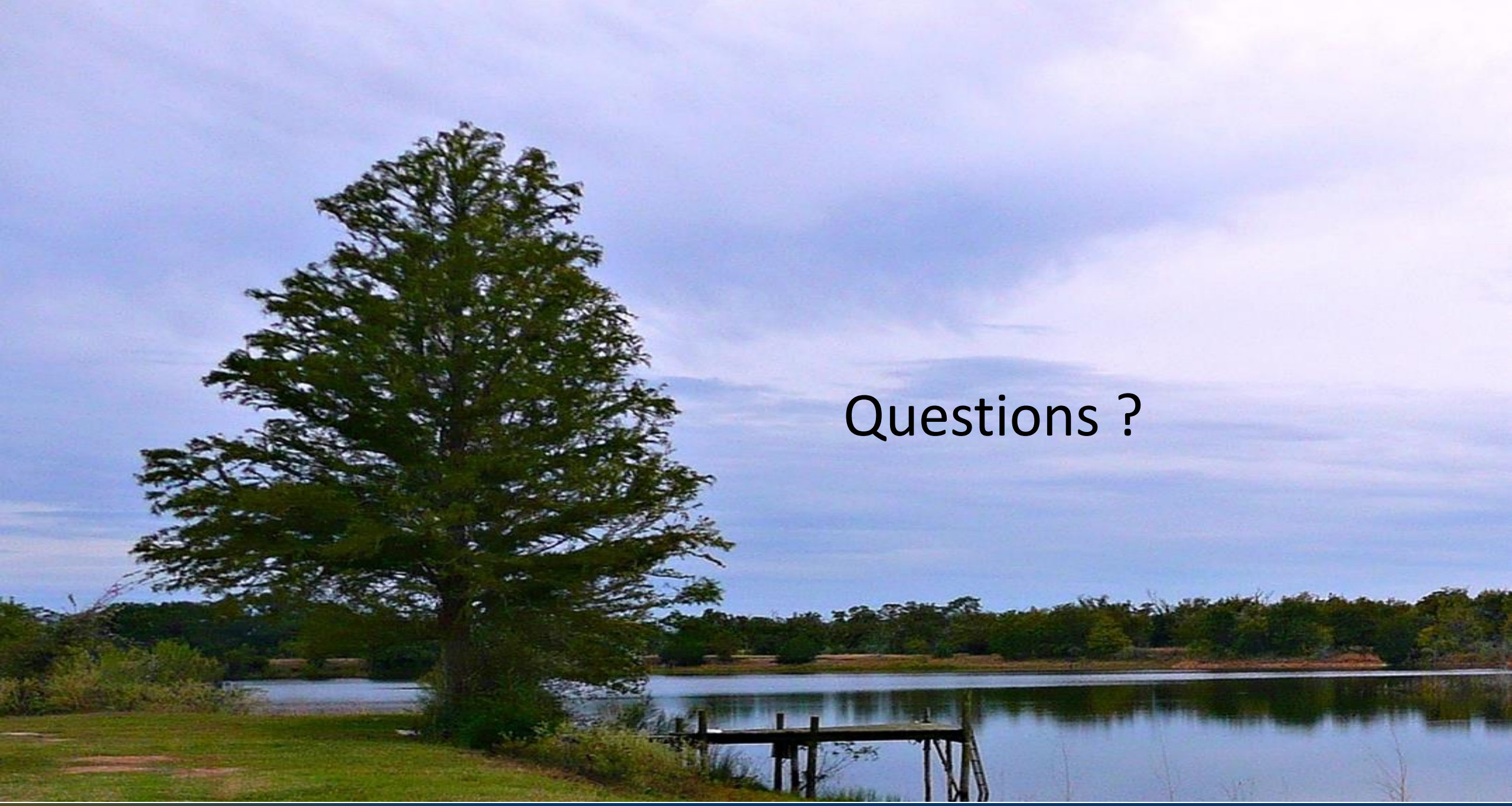
Aquifer	Number of Wells			
	High-Priority	Moderate-Priority	Of Concern	Total
Sparta	3	0	4	7
Queen City	1	0	6	7
Carrizo	10	4	15	29
Calvert Bluff	11	2	6	19
Simsboro	8	0	11	19
Hooper	3	0	7	10
TOTAL	36	6	49	91

Discussion Topics

- Use of GAM and GMA 12 simulation
  - PS-19 calibration to 2011 to 2022 water levels
  - PS-19 annual production compared to TWDB and GCD annual production
  - In 2024, Reclamation groundwater model will be available as an option

- GMA 12
  - Impacts are localized near pumping centers
  - Assess drawdown impacts at existing wells
  - Considerations regarding socio-economic issues at local scale
  - Considerations regarding development of a mitigation policy

- Mitigation
  - Sharing report well impacts among GCDs
  - Coordinating a mitigation policy with adjacent GCDs


Questions ?