GMA 12 Socioeconomic Impacts, Hydrologic Impacts, and State Water Plan

Presented to GMA 12

April 2, 2026

INTERA

Outline

- Method for Calculating of DFCs for SP/QC/CW GAM
- DFCs Calculated for PS4-2mod2
- Hydrogeological Conditions: Sustainable Production and TERS
- 500 Year simulations

INTERA

Method for Calculating Desired Future Conditions

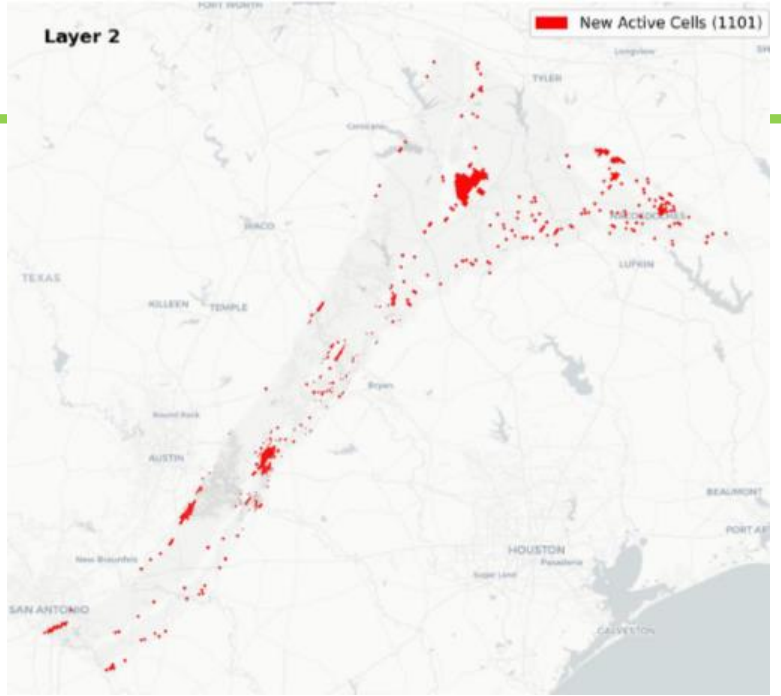
INTERA

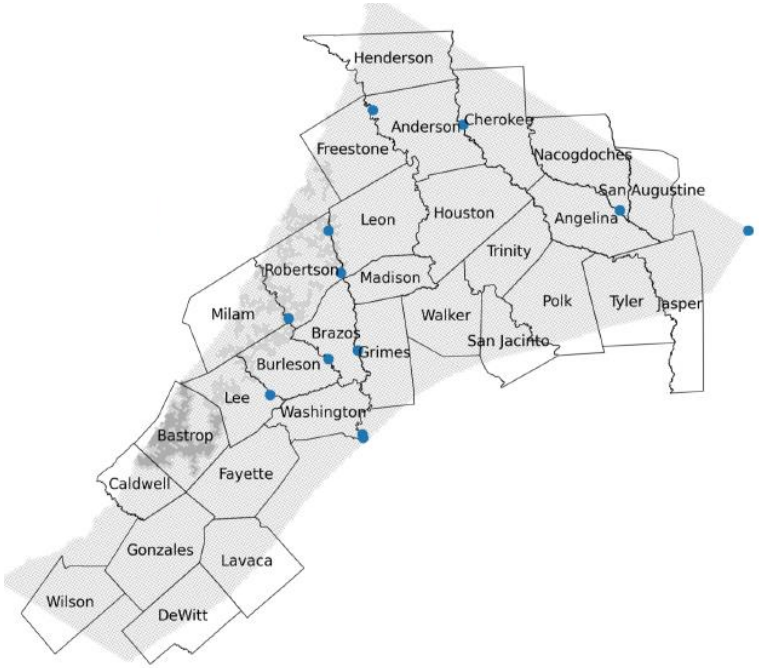
Excel Application (Jan 22, 2026)

	A	B	C
1	# nodes	767	
2	# Outcrop Cells	215	
3	# Paired Outcrop Cells	65	
4	# Aquifer Cells w/o Paired	637	
5	# Dry Paired Outcrop Cells - head start	0	
6	# Dry Paired Outcrop Cells - head end	0	
7	# Dry Aquifer w/o Paired Cells - head start	0	
8	# Dry Aquifer w/o Paired Cells - head end	0	
9	Average Head Start	258.3321	feet
10	Average Head End	213.5409	feet
11	Average Drawdown	44.7912	feet
12			
13			
14			
15			
16			
17			
18			

readme | data | main | OutcropCells | AquiferCells | Results | +

- **Readme**: Information and Instructions
- **Data:** all data associated to the model grid
- **Main:** main sheet, core for calculations
- **OutcropCells:** Calculations for outcrop grid cells “paired” with an aquifer cell.
- **AquiferCells:** Calculations for aquifer cells without paired nodes
- **Results:** Summary of results for Outcrop grid cells, aquifer cells, paired cells, dry cells, average heads *weighted by transmissivity* and drawdown.





Excel Application Verification: (con't) (Jan 2011 – Dec 2079)

GCD	Aquifer	GAM2020 Script Outputs	GAM2020 Spreadsheet Outputs	AGS (transmissivity weighted)	AGS - INTERA	INTERA Spreadsheet Tool used by AGS	AGS - INTERA
		PS4-2	PS4-2	PS4-2	PS4-2	PS4-2	PS4-2
POSGCD	3	46.0	46.0	46.0	0.0	46.0	0.0
POSGCD	5	29.9	29.9	30.0	0.0	29.9	0.0
POSGCD	7	168.9	168.9	168.9	0.0	168.9	0.0
POSGCD	8	188.1	188.1	187.9	-0.2	188.1	0.0
POSGCD	9	367.7	367.7	367.1	-0.6	367.7	0.0
POSGCD	10	234.7	234.7	234.7	0.0	234.7	0.0
METGCD	3	30.7	30.7	30.8	0.0	30.7	0.0
METGCD	5	24.4	24.4	24.5	0.1	24.4	0.0
METGCD	7	50.3	50.3	50.3	0.0	50.3	0.0
METGCD	8	65.4	65.4	65.4	0.0	65.4	0.0
METGCD	9	91.4	91.4	91.4	0.0	91.4	0.0
METGCD	10	83.1	83.1	83.1	0.0	83.1	0.0
BVGCD	3	57.9	57.9	58.0	0.0	57.9	0.0
BVGCD	5	47.3	47.3	47.3	0.0	47.3	0.0
BVGCD	7	84.0	84.0	84.0	0.0	84.0	0.0
BVGCD	8	119.2	119.1	119.3	0.1	119.2	0.1
BVGCD	9	283.3	283.4	283.1	-0.2	283.4	0.0
BVGCD	10	191.0	191.0	191.0	0.0	191.0	0.0
LPGCD	3	20.6	20.6	20.7	0.0	20.6	0.0
LPGCD	5	27.3	27.3	27.1	-0.2	27.3	0.0
LPGCD	7	128.0	128.0	127.9	-0.1	128.0	0.0
LPGCD	8	134.2	134.2	134.0	-0.2	134.2	0.0
LPGCD	9	253.2	253.2	253.1	-0.1	253.2	0.0
LPGCD	10	145.9	145.9	145.9	0.0	145.9	0.0
FAYETTE	3	46.7	46.7	46.7	0.0	46.7	0.0
FAYETTE	5	73.8	73.8	73.8	0.0	73.8	0.0
FAYETTE	7	140.3	140.3	140.3	0.0	140.3	0.0
FAYETTE	8	154.7	154.7	154.7	0.0	154.7	0.0
FAYETTE	9	240.5	240.5	240.5	0.0	240.5	0.0
FAYETTE	10	136.6	136.6	136.6	0.0	136.6	0.0

Excel Application Verification: (con't) (Jan 2011 – Dec 2079)

gcd	aquifer	GAM2020 Script Outputs	GAM2020 Spreadsheet Outputs	Spheros	Spheros-INTERA
		PS4-2	PS4-2	PS4-2	PS4-2
POSGCD	3	46.0	46.0	45.5	-0.5
POSGCD	5	29.9	29.9	28.4	-1.5
POSGCD	7	168.9	168.9	168.3	-0.6
POSGCD	8	188.1	188.1	183.4	-4.7
POSGCD	9	367.7	367.7	364	-3.7
POSGCD	10	234.7	234.7	232.6	-2.1
METGCD	3	30.7	30.7	31	0.3
METGCD	5	24.4	24.4	24.5	0.1
METGCD	7	50.3	50.3	50.6	0.3
METGCD	8	65.4	65.4	65.4	0.0
METGCD	9	91.4	91.4	91.4	0.0
METGCD	10	83.1	83.1	83.6	0.5
BVGCD	3	57.9	57.9	57.4	-0.5
BVGCD	5	47.3	47.3	46.1	-1.2
BVGCD	7	84.0	84.0	84.3	0.3
BVGCD	8	119.2	119.1	114.4	-4.8
BVGCD	9	283.3	283.4	281.4	-1.9
BVGCD	10	191.0	191.0	191.8	0.8
LPGCD	3	20.6	20.6	19.7	-0.9
LPGCD	5	27.3	27.3	27.1	-0.2
LPGCD	7	128.0	128.0	126.1	-1.9
LPGCD	8	134.2	134.2	125.3	-8.9
LPGCD	9	253.2	253.2	248.5	-4.7
LPGCD	10	145.9	145.9	139.5	-6.4
FAYETTE	3	46.7	46.7	44.3	-2.4
FAYETTE	5	73.8	73.8	73.9	0.1
FAYETTE	7	140.3	140.3	139.3	-1.0
FAYETTE	8	154.7	154.7	153.2	-1.5
FAYETTE	9	240.5	240.5	239.4	-1.1
FAYETTE	10	136.6	136.6	135	-1.6

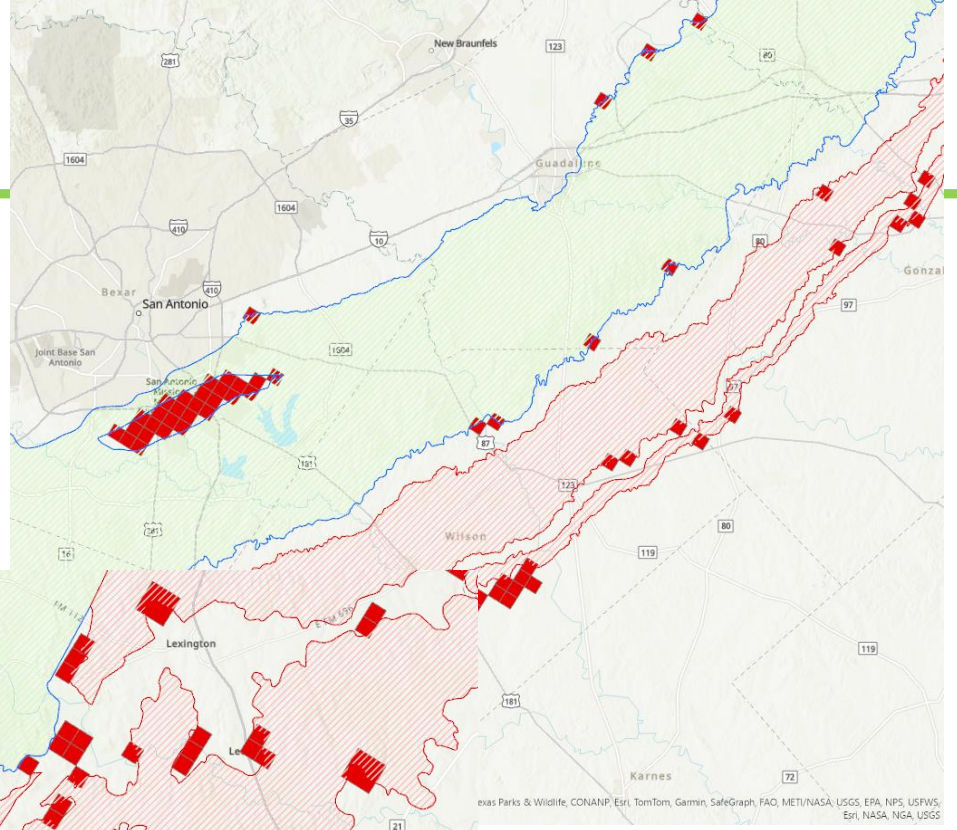
Active/Non Active Cell Designation

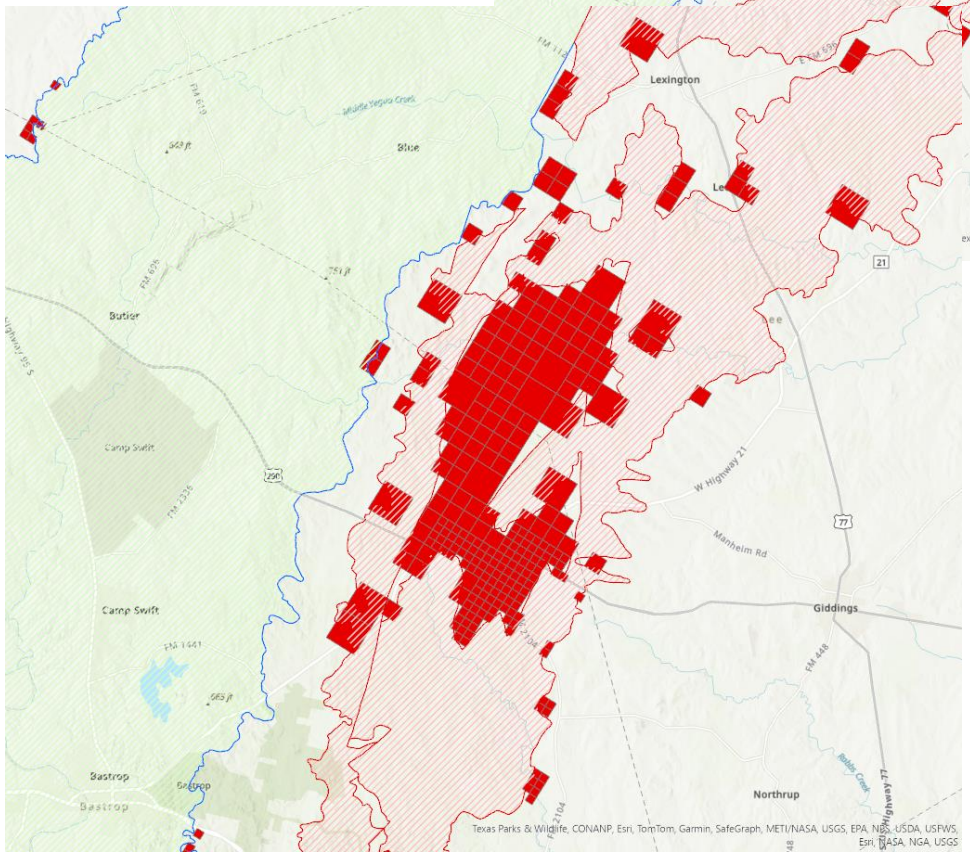
Hi Steve,

Yes, we did look at that map. I've attached maps that show the layer 2 grid cells in red where INTERA suggests changing AQ_active from 0 to 1.

In the zoomed maps the Carrizo-Wilcox outcrop boundary is shown in light green hatches. The Queen City and Sparta outcrop boundary is shown in red hatches.

The zoomed maps show that the switched cell centroids fall in gaps between the outcrop boundaries or gaps within the outcrops ("windows"), so by our convention they should be AQ_active = 0.





Note: GAM outcrop not change from 3rd joint planning cycle

DFC Comparison Among Runs (Intera Application of Excel File)

GCD	Aquifer	PS3-19	PS4-2	PS4-2 Modified	PS4-2 Modified_V2
BVGCD	Sparta	50.5	57.9	56.8	56.9
	Queen City	42.3	47.3	46.2	46.3
	Carrizo	75.8	84	83	83.3
	Calvert Bluff	94	119.2	118.6	118.5
	Simsboro	202.2	283.3	283.2	282.6
	Hooper	145.9	191	190.7	190.2
FAYETTE	Sparta	47	46.7	52.4	56.5
	Queen City	76.2	73.8	84.2	95.8
	Carrizo	148.2	140.3	141.9	173.3
	Calvert Bluff	153.8	154.7	232.1	184.4
	Simsboro	219.3	240.5	312.2	275.5
	Hooper	132.6	136.6	215.8	181.6
LPGCD	Sparta	21.9	20.6	20.9	21.5
	Queen City	29.5	27.3	29.9	31.4
	Carrizo	140.5	128	130.1	138.7
	Calvert Bluff	139.3	134.2	151.2	141.2
	Simsboro	249.5	253.2	269.4	261.3
	Hooper	146.7	145.9	166.4	157.2
METGCD	Sparta	26.1	30.7	22.2	22.2
	Queen City	21.5	24.4	18.9	18.9
	Carrizo	49.8	50.3	45.1	45.1
	Calvert Bluff	59.6	65.4	58.3	58.2
	Simsboro	79.3	91.4	84.8	84.7
	Hooper	73.7	83.1	76.3	76.1
POSGCD	Sparta	33.5	46	45.9	46
	Queen City	32	29.9	29.8	30
	Carrizo	168.8	168.9	169.2	170.3
	Calvert Bluff	163.6	188.1	189.1	188.9
	Simsboro	287.8	367.7	370.5	369
	Hooper	189.5	234.7	237.8	236.4

Notable change from PS3-19

Decisions Need to Finalize for DFC Calculations

- How to assign "active" attribute in outcrop and other formation
- Resolve differences among consultants on DFC calculations
- Send file to TWDB for their check
- Variance Option

INTERA

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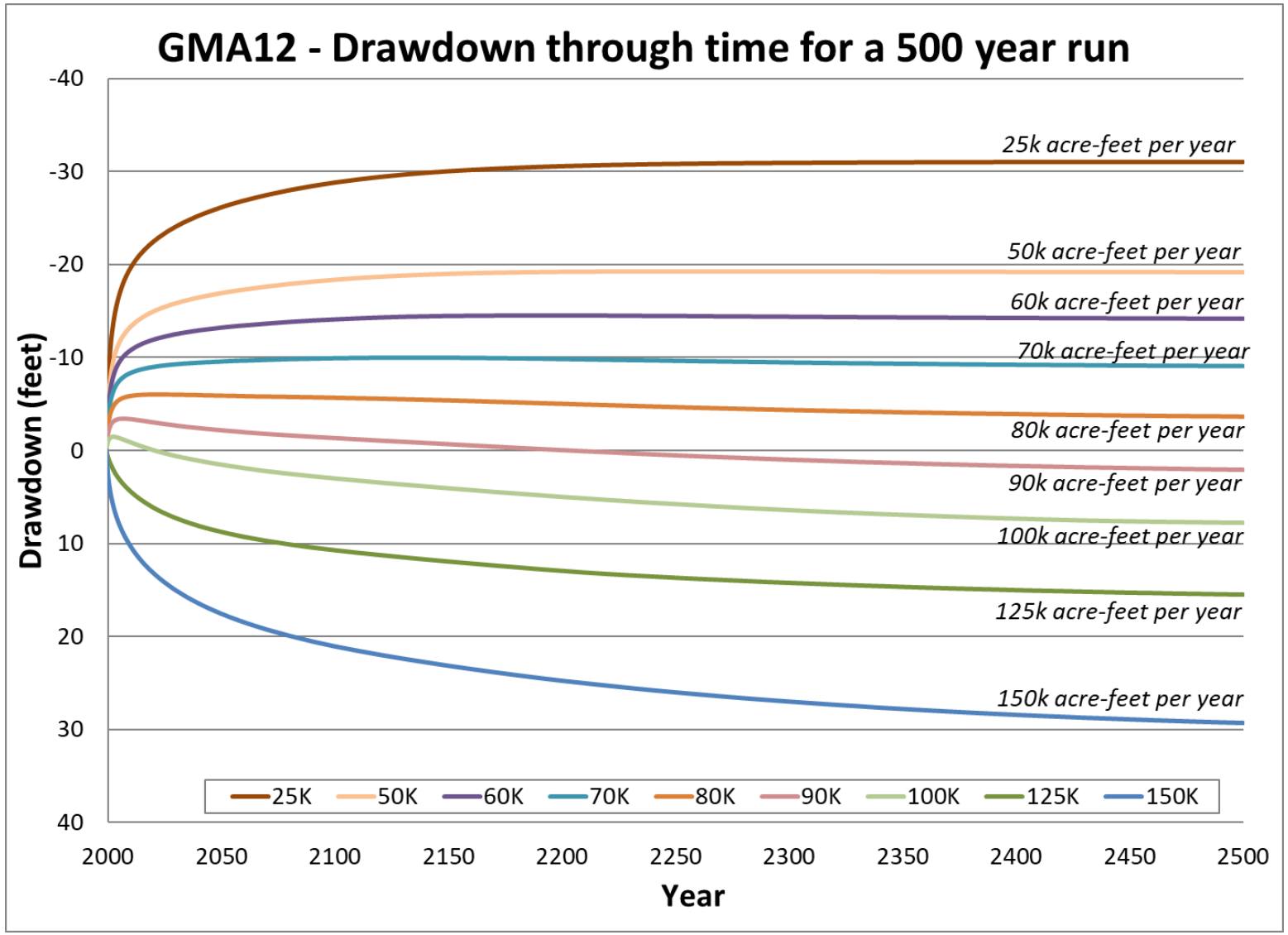
INTERA

Hydrogeological Conditions

Sustainable Pumping

INTERA

Sustainable Pumping for GMA 12 (TWDB, 2012)*



Used 2004 GAM for GMA 12

Preliminary – Work in Progress

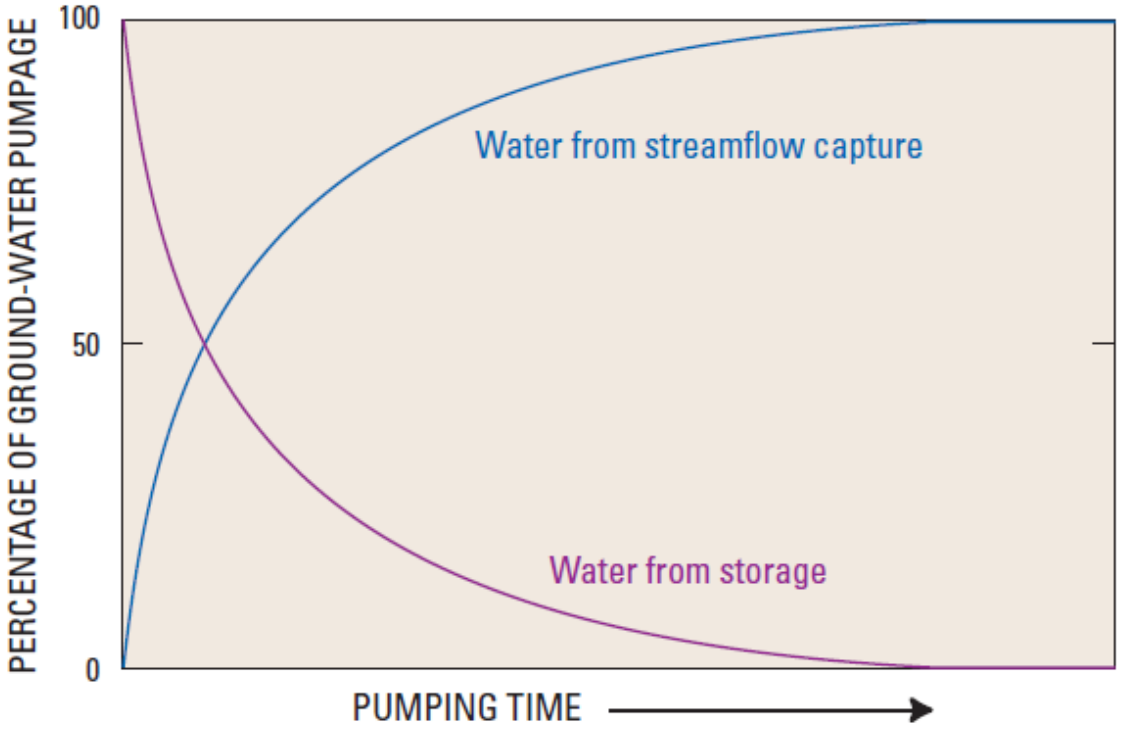
INTERA

Sustainable Pumping for GMA 12 (TWDB, 2012)

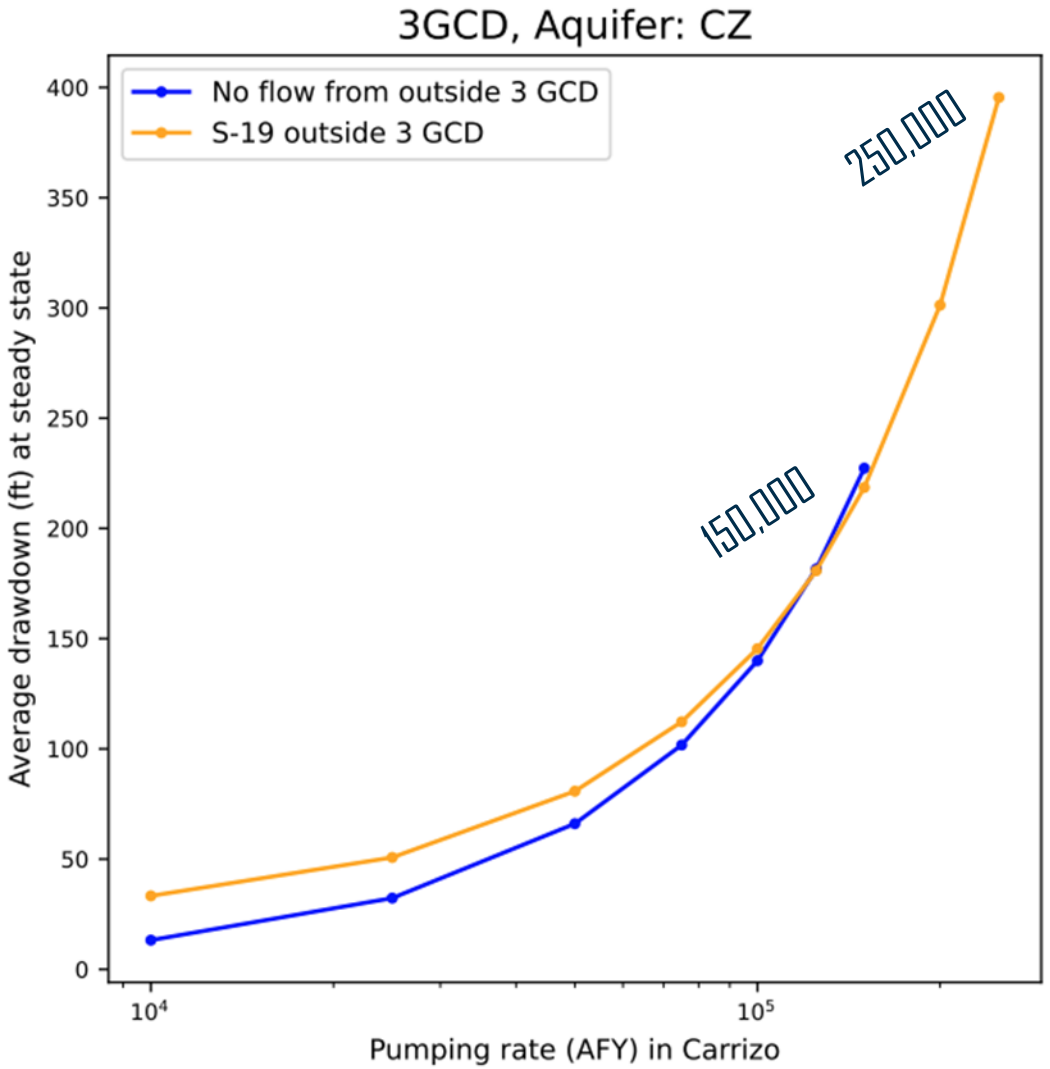
County	Modeled Available Groundwater (2060)	2007 State Water Plan Groundwater Availability (2060)	2011 Regional Water Plan (2060)	Current Use (2008 Water Use Survey)	Recharge	Storage	25 percent	75 percent	Maximum Sustainable Pumping Level
BASTROP	28,498	28,000	28,000	12,395	21,783	98,429,578	24,607,394	73,822,183	5,951
BRAZOS	57,169	53,000	57,156	31,044	0	136,726,259	34,181,565	102,544,694	9,591
BURLESON	38,701	44,000	35,482	931	142	153,184,778	38,296,194	114,888,583	1,283
FALLS	895	1,000	910	15	2,390	822,161	205,540	616,621	83
FAYETTE	1,000	400	400	6	0	104,383,421	26,095,855	78,287,565	342
FREESTONE	5,259	6,653	6,653	3,475	41,502	45,870,392	11,467,598	34,402,794	2,811
LEE	27,380	45,000	27,533	1,613	7,604	129,532,459	32,383,115	97,149,344	8,326
LEON	15,196	5,558	5,558	2,889	5,933	178,933,891	44,733,473	134,200,418	4,129
LIMESTONE	11,918	20,000	12,162	3,118	21,061	11,692,040	2,923,010	8,769,030	856
MADISON	2,542	1,518	1,518	62	0	121,343,009	30,335,752	91,007,257	219
MILAM	22,319	45,000	20,090	5,429	25,691	46,350,226	11,587,556	34,762,669	4,737
NAVARRO	15	180	180	18	1,883	1,046,211	261,553	784,658	1
ROBERTSON	46,583	38,000	46,016	17,872	27,043	108,094,335	27,023,584	81,070,751	6,377
WILLIAMSON	7	0	0	32	2,146	500,081	125,020	375,061	0
Total	257,482	288,309	241,658	78,899	157,178	1,136,908,838	284,227,210	852,681,629	44,707

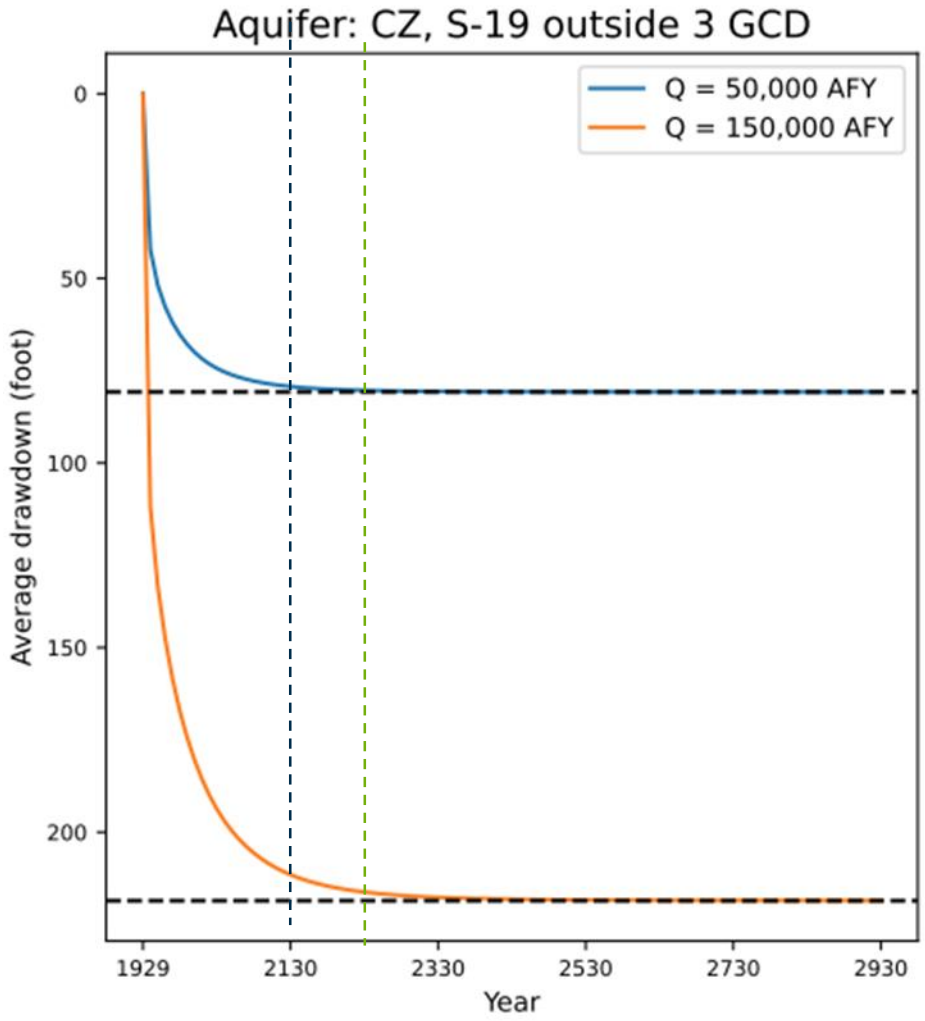
Sustainable Production

- Water that can be physically be pumped from an aquifer is only about 10% of TERS
- Desaturation of aquifers limits the among of water that can be provided to pumps
- Previous sustainability by TWDB underestimates sustainable production
- TERS significantly overestimates available production



OPMAN Sustainability Investigations: Maximum Production & Minimum Drawdown

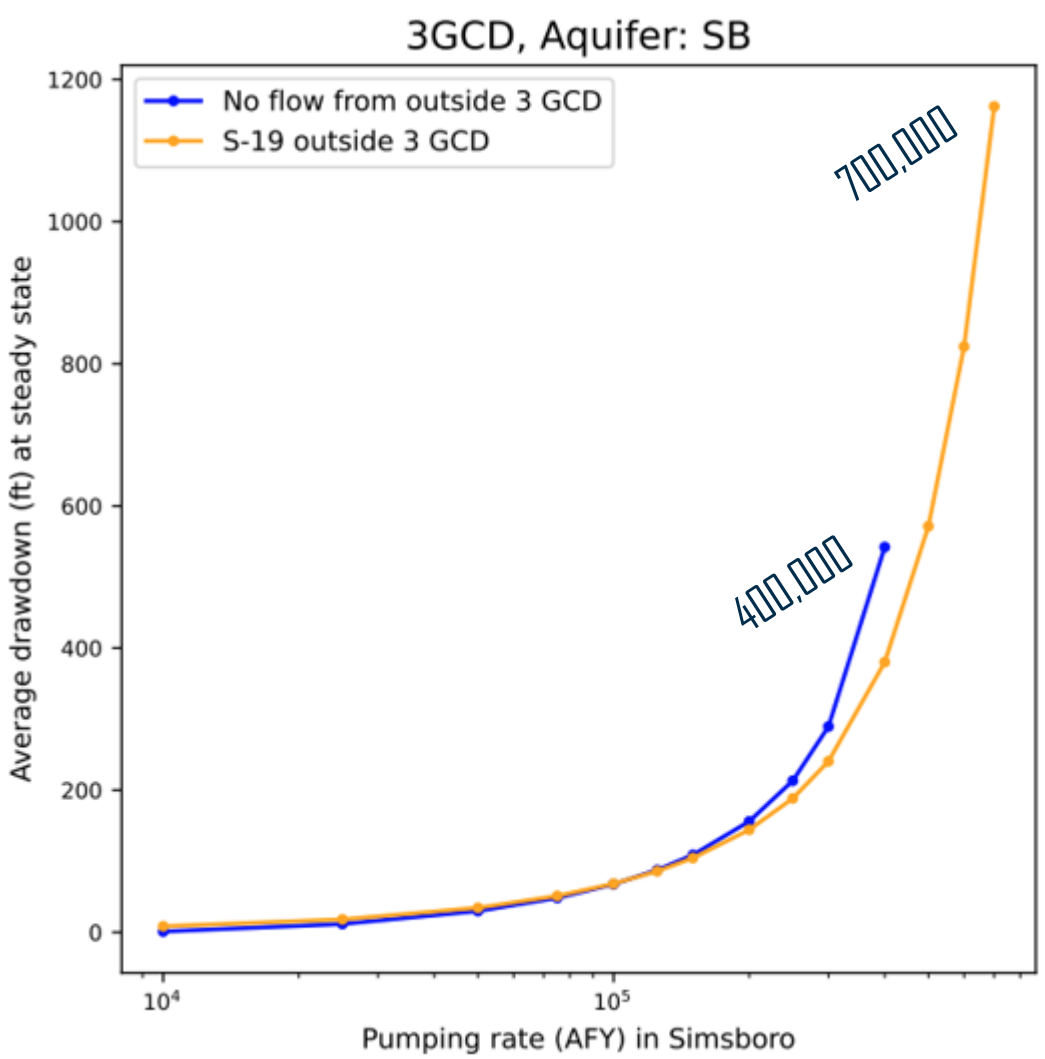


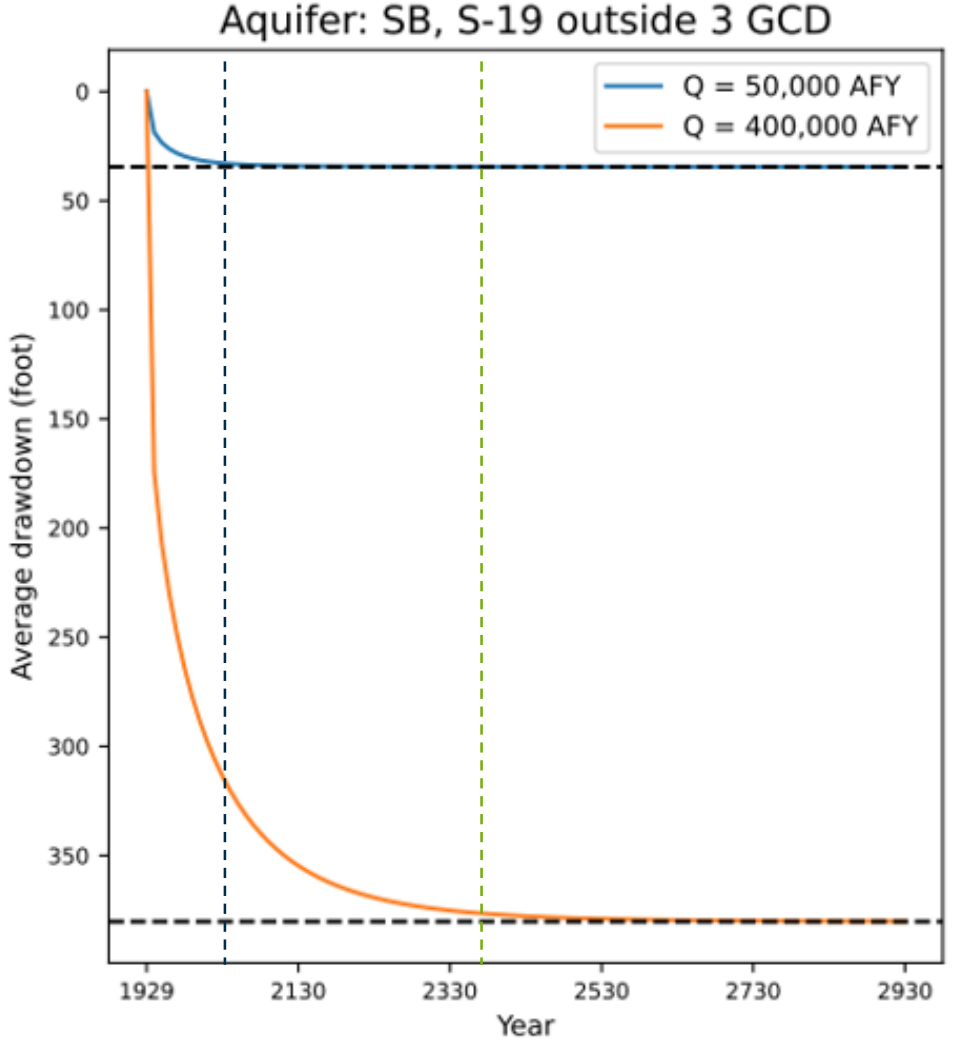


Preliminary – Work in Progress

INTERA

OPMAN Sustainability Investigations: Maximum Production/Minimum Drawdown

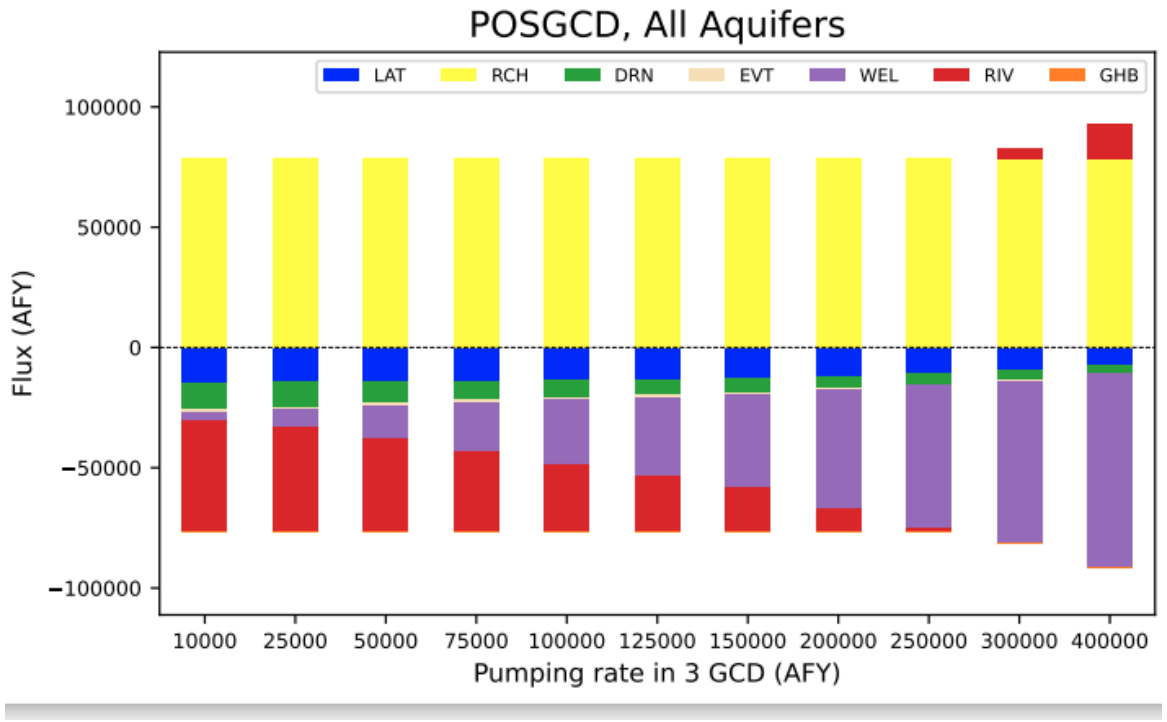


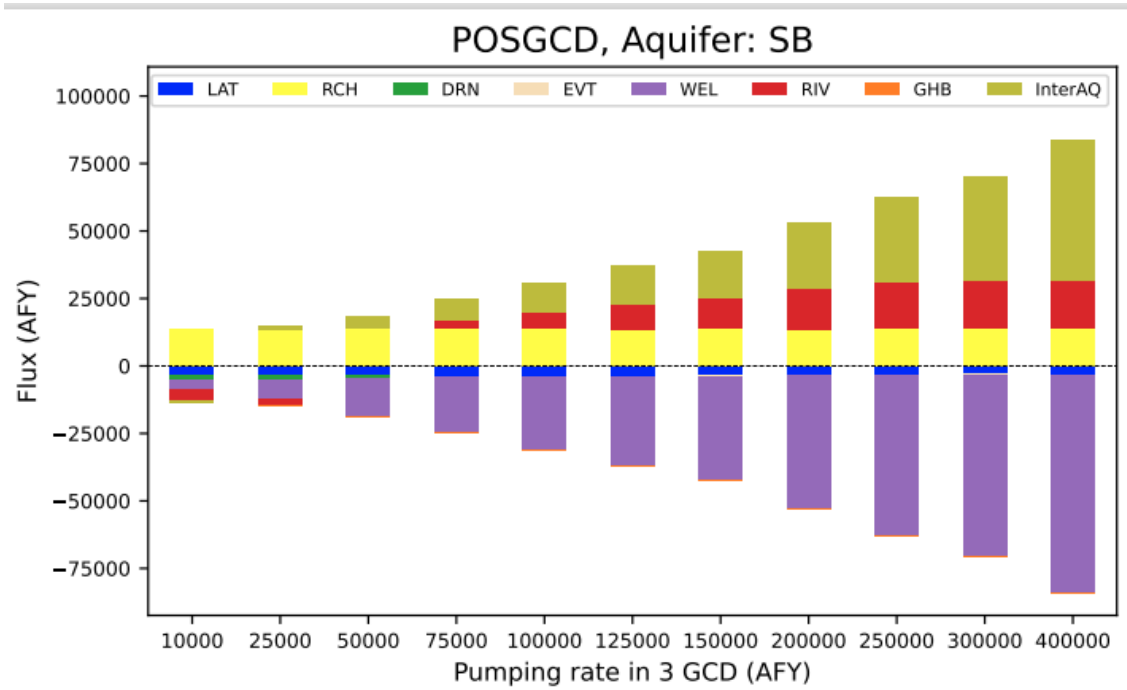


Preliminary – Work in Progress

INTERA

Simsboro Water Budgets at Increasing Pumping Rates: (flow allowed from outside 3 GCDs)

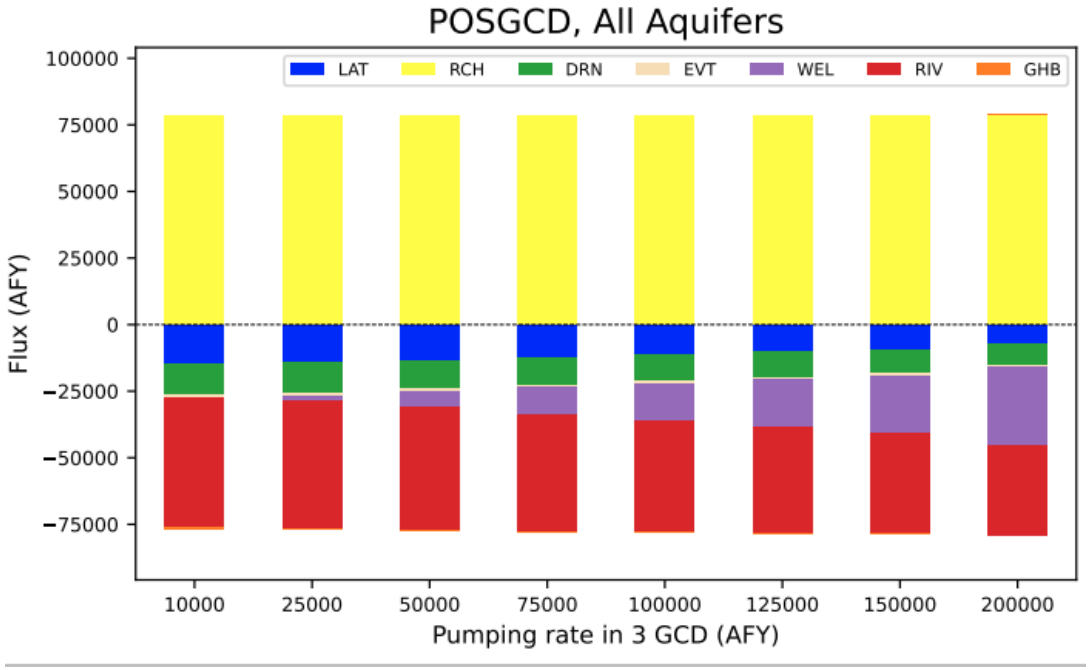


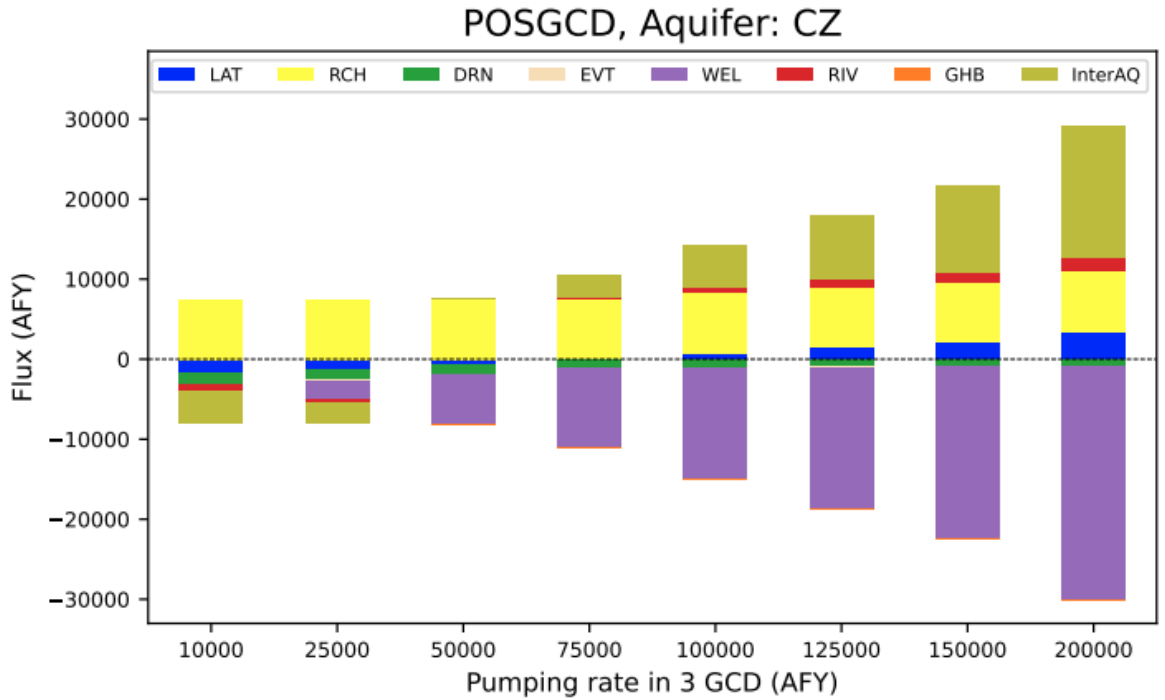


Source for Production water is almost exclusively source by capture of water flowing to the river

Source for Production in Simboro made possible by
Increase capture or water flowing to river and increase vertical flow int
Simsboro

Carrizo Water Budgets at Increasing Pumping Rates: (flow allowed from outside 3 GCDs)





Source for Production water is almost exclusively source by capture of water flowing to the river

Source for Production in Simboro made possible by
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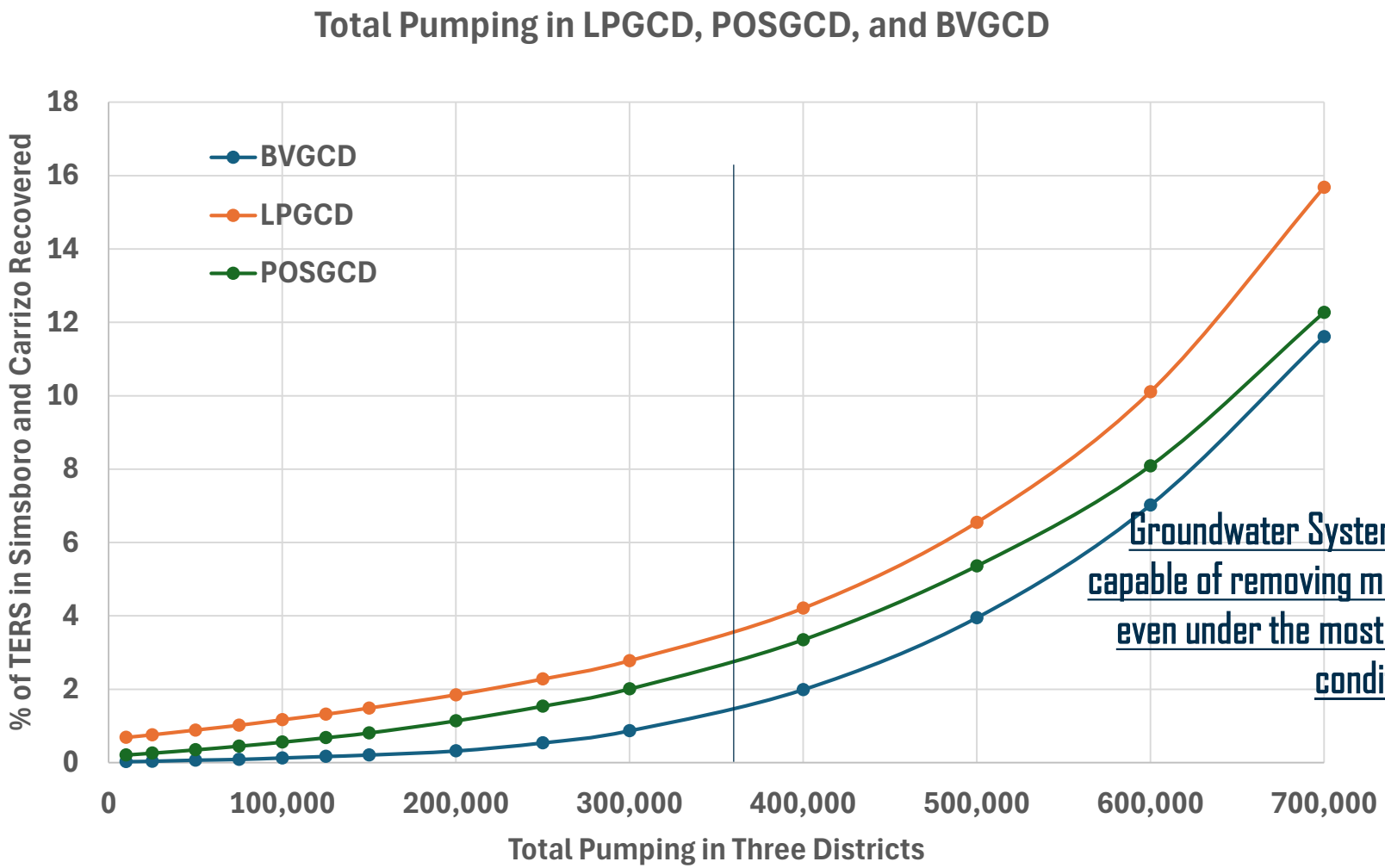
Total Estimated Recoverable Storage Removed at Different Production Rate

Carrizo & Simsboro Production in PS4-2mod2

BVGCD – 195,645
POSGCD – 110,335
LPGCD – 65,552
Total – 371,351



Groundwater System is not physically capable of removing more than 15% of TERS even under the most extreme favorable condition

INTERA

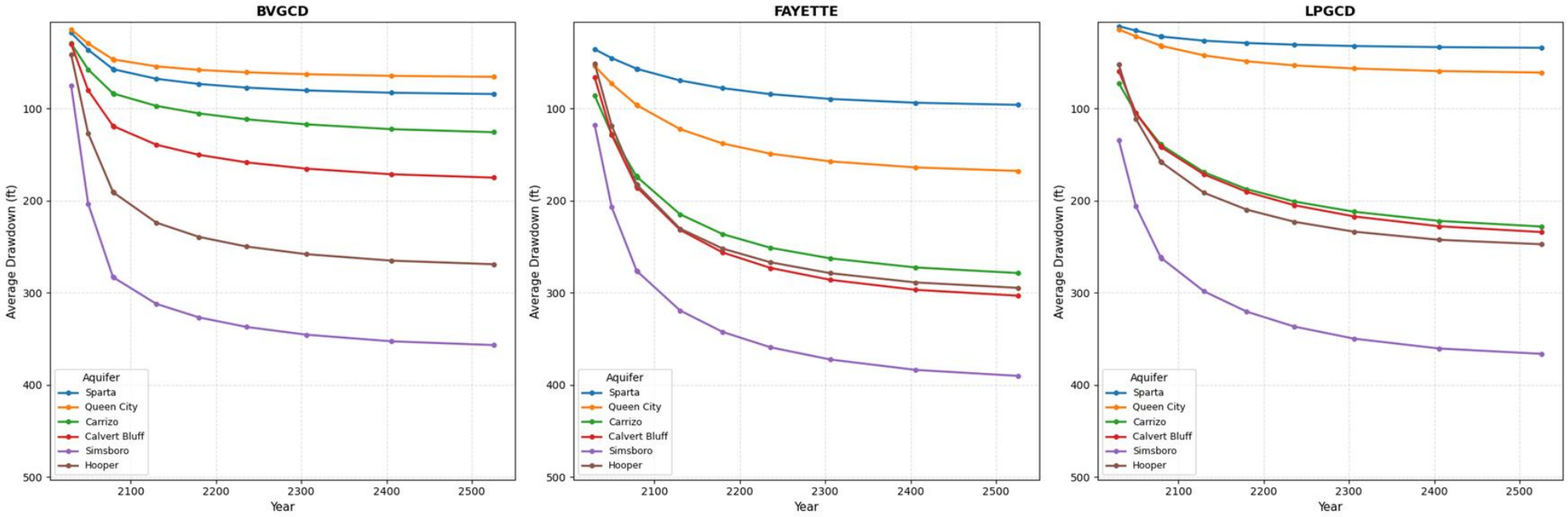
500 yr Simulations:

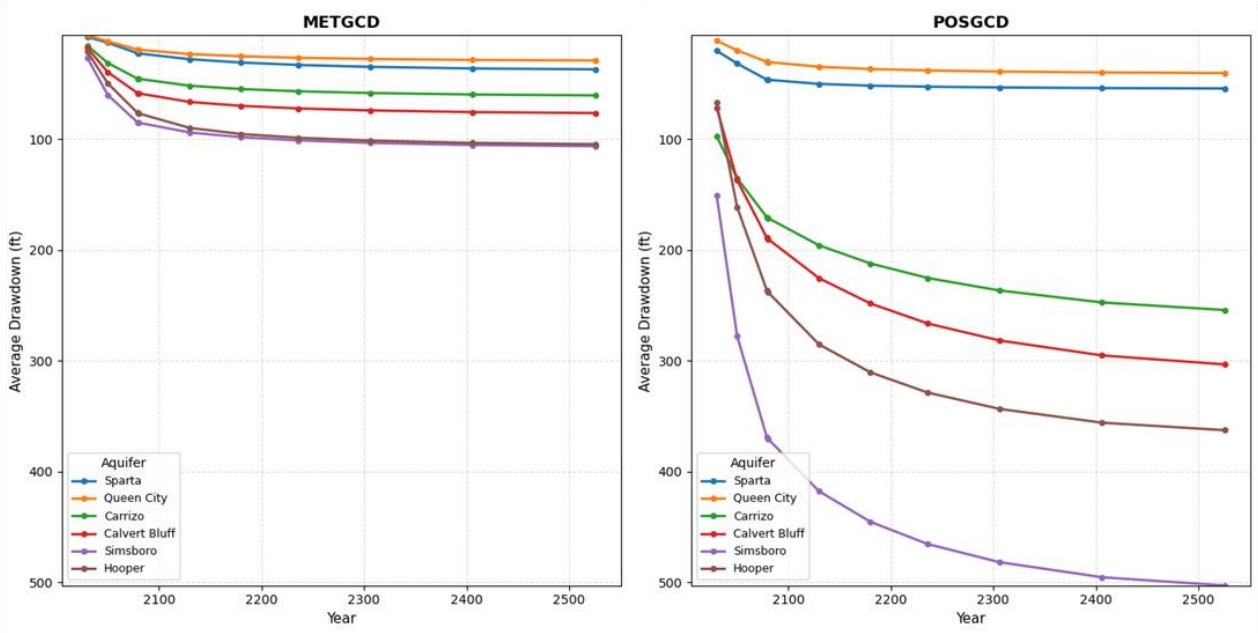
Hydrogeological Conditions

Social-economic Considerations for Limiting Production

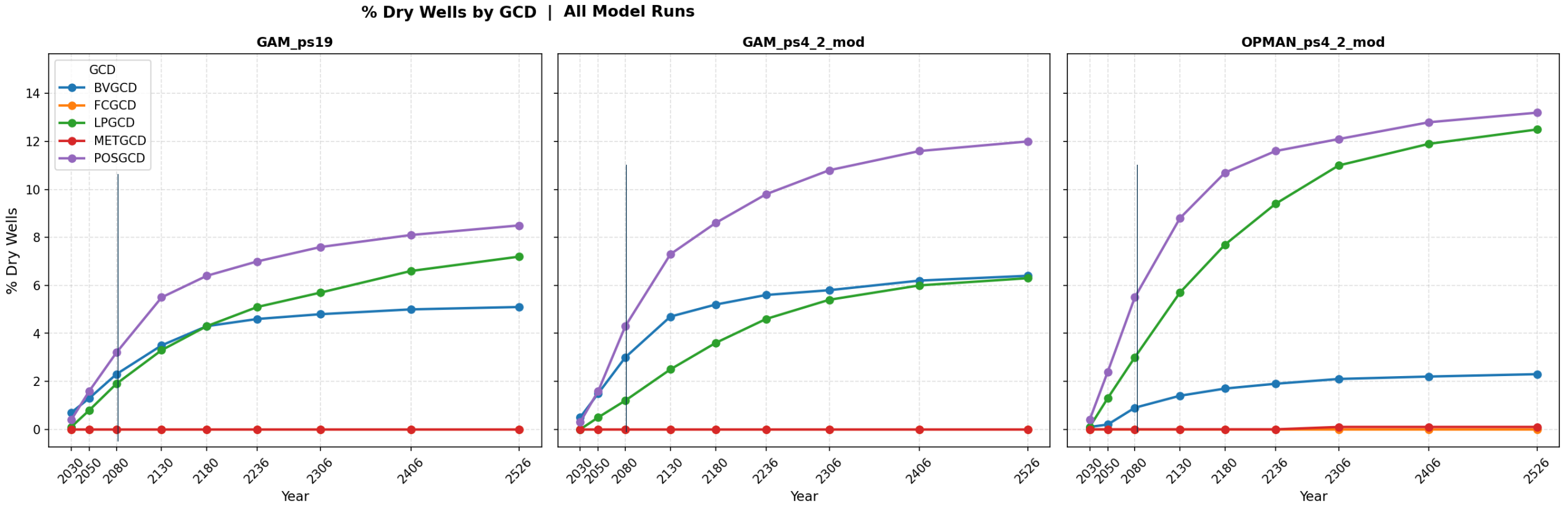
INTERA

DFCs for 500-year Simulation For PS4-2mod2





GCD Dry Well Comparison: % of Total Wells



GCD	Aquifer	Eligible Wells
BVGCD	Sparta	642
	Queen City	615
	Carrizo	170
	Calvert Bluff	856
	Simsboro	367
	Hooper	171
	TOTAL	**2821**

GCD	Aquifer	Eligible Wells
FCGCD	Sparta	2
	Queen City	1
	Calvert Bluff	1
	TOTAL	**4**

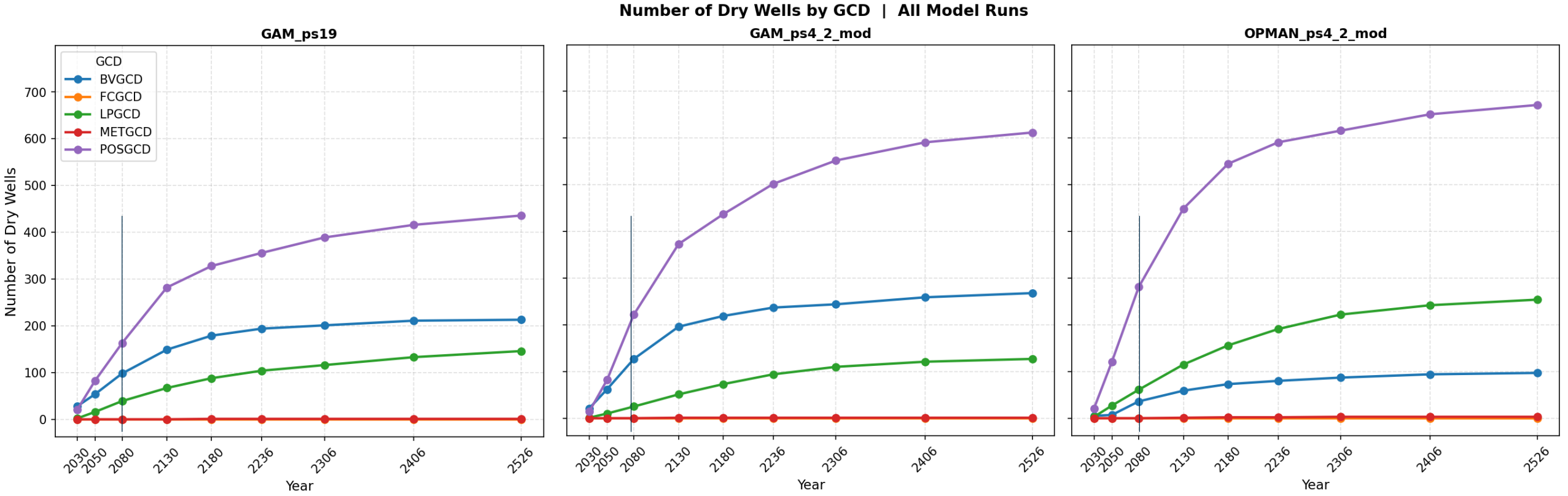
GCD	Aquifer	Eligible Wells
LPGCD	Sparta	146
	Queen City	331
	Carrizo	190
	Calvert Bluff	513
	Simsboro	286
	Hooper	310
	TOTAL	**1776**

GCD	Aquifer	Eligible Wells
METGCD	Sparta	441
	Queen City	632
	Carrizo	300
	Calvert Bluff	1423
	Simsboro	724
	Hooper	564
	TOTAL	**4084**

GCD	Aquifer	Eligible Wells
POSGCD	Sparta	1172
	Queen City	1081
	Carrizo	461
	Calvert Bluff	725
	Simsboro	653
	Hooper	797
	TOTAL	**4889**

INTERA

GCD Dry Well Comparison: Total Number of Wells



INTERA

All Districts

2011-2080 Carrizo – GAM PS3-19

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	12	12	0	0	2	0	0	0	0	0	0	0	10
20-40	13	6	2	0	2	1	0	0	0	0	3	0	5
40-60	14	3	1	0	1	1	0	0	0	4	3	4	0
60-80	16	10	3	2	2	1	2	1	0	1	1	1	2
80-100	17	8	5	0	4	2	3	1	1	0	1	0	0
100-150	73	11	7	17	20	13	10	3	2	1	0	0	0
150-200	78	3	7	35	7	11	8	8	2	0	0	0	0
200-250	92	1	10	44	8	13	9	4	2	2	0	0	0
250-500	468	0	67	202	56	52	60	24	6	1	0	0	0
500+	334	0	48	114	112	45	15	0	0	0	0	0	0
TOTAL	1117	54	150	414	214	139	107	41	13	9	8	5	17

Well Impact
Dry – 17
>50% - 93

2011-2080 Carrizo – GAM PS4-2-modv2

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	12	12				2							10
20-40	13	6	2		1	2							8
40-60	16	4	1			3		1				1	10
60-80	15	9	3	2		3	1			1	3		2
80-100	18	8	3	3	3	4	2	1		2			
100-150	74	11	7	20	12	17	6	7	1	1	2		1
150-200	75	3	12	25	10	8	7	7	4	1			1
200-250	94	1	16	33	13	12	6	5	6	1	1	1	
250-500	469		108	159	52	52	72	15	7	2	2		
500+	331		51	101	128	41	9	1					
TOTAL	1117	54	203	343	219	144	103	37	18	8	8	2	32

Well Impact
Dry – 32
>50% - 105

INTERA

All Districts

2011-2080 Carrizo – GAM PS4-2-modv2

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	12	12				2							10
20-40	13	6	2		1	2							8
40-60	16	4	1			3		1				1	10
60-80	15	9	3	2		3	1			1	3		2
80-100	18	8	3	3	3	4	2	1		2			
100-150	74	11	7	20	12	17	6	7	1	1	2		1
150-200	75	3	12	25	10	8	7	7	4	1			1
200-250	94	1	16	33	13	12	6	5	6	1	1	1	
250-500	469		108	159	52	52	72	15	7	2	2		
500+	331		51	101	128	41	9	1					
TOTAL	1117	54	203	343	219	144	103	37	18	8	8	2	32

Well Impact
Dry – 32
>50% - 105

2011-2080 Carrizo – OPMAN PS4-2-modv2

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	8	8	1			1			2				4
20-40	16	4	14										2
40-60	12	6	10	1								1	
60-80	12	11	9		1			1		1			
80-100	18	7	7	1	3		1	3	1	1		1	
100-150	70	11	11	17	7	14	4	13	2	2			
150-200	78	6	10	28	14	4	7	3	1	4	2	1	4
200-250	99	1	43	10	12	7	8	6	2	2		1	8
250-500	479	0	132	100	62	32	19	31	17	33	25	15	13
500+	329	0	28	64	50	72	58	19	25	7	3	3	0
TOTAL	1121	54	265	221	149	130	97	76	50	50	30	22	31

Well Impact
Dry – 31
>50% - 356

INTERA

All Districts

2011-2080 Simsboro – GAM PS3-19

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	25	18	3	0	0	0	0	1	0	0	0	0	21
20-40	37	21	4	0	0	1	0	0	1	0	2	1	28
40-60	61	36	7	0	1	6	2	1	5	2	3	3	31
60-80	60	32	4	1	2	3	7	4	3	1	4	7	24
80-100	54	26	3	4	6	4	7	2	2	2	3	5	16
100-150	135	19	23	13	17	10	13	9	5	5	16	9	15
150-200	164	4	77	19	12	14	7	7	12	8	2	2	4
200-250	228	1	118	46	17	10	12	11	6	3	3	0	2
250-500	917	2	446	195	76	75	56	31	24	8	4	2	0
500+	329	1	81	97	97	33	12	9	0	0	0	0	0
TOTAL	2010	160	766	375	228	156	116	75	58	29	37	29	141

Well Impact
Dry – 141
>50% - 340

2011-2080 Simsboro – GAM PS4-2-modv2

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	25	18	3			1							21
20-40	37	21	4								3	1	29
40-60	60	36	6	1		1	3	6	3	3	3		34
60-80	63	32	5		1	2	5	6	7	3	1	2	31
80-100	50	26	6	1	5	4	6	1	5	2	3	2	15
100-150	133	19	23	12	11	15	8	10	10	3	4	4	33
150-200	166	4	78	15	15	16	6	3	3	1	4	12	13
200-250	226	1	131	32	18	10	9	7	2	8	6	1	2
250-500	913	2	483	120	85	53	45	57	27	17	16	4	6
500+	337	1	80	50	93	71	23	18	2				
TOTAL	2010	160	819	231	228	173	105	108	59	37	40	26	184

Well Impact
Dry – 184
>50% - 454

INTERA

All Districts

2011-2080 Simsboro – GAM PS4-2-modv2

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	25	18	3			1							21
20-40	37	21	4								3	1	29
40-60	60	36	6	1		1	3	6	3	3	3		34
60-80	63	32	5		1	2	5	6	7	3	1	2	31
80-100	50	26	6	1	5	4	6	1	5	2	3	2	15
100-150	133	19	23	12	11	15	8	10	10	3	4	4	33
150-200	166	4	78	15	15	16	6	3	3	1	4	12	13
200-250	226	1	131	32	18	10	9	7	2	8	6	1	2
250-500	913	2	483	120	85	53	45	57	27	17	16	4	6
500+	337	1	80	50	93	71	23	18	2				
TOTAL	2010	160	819	231	228	173	105	108	59	37	40	26	184

Well Impact
Dry – 184
>50% - 454

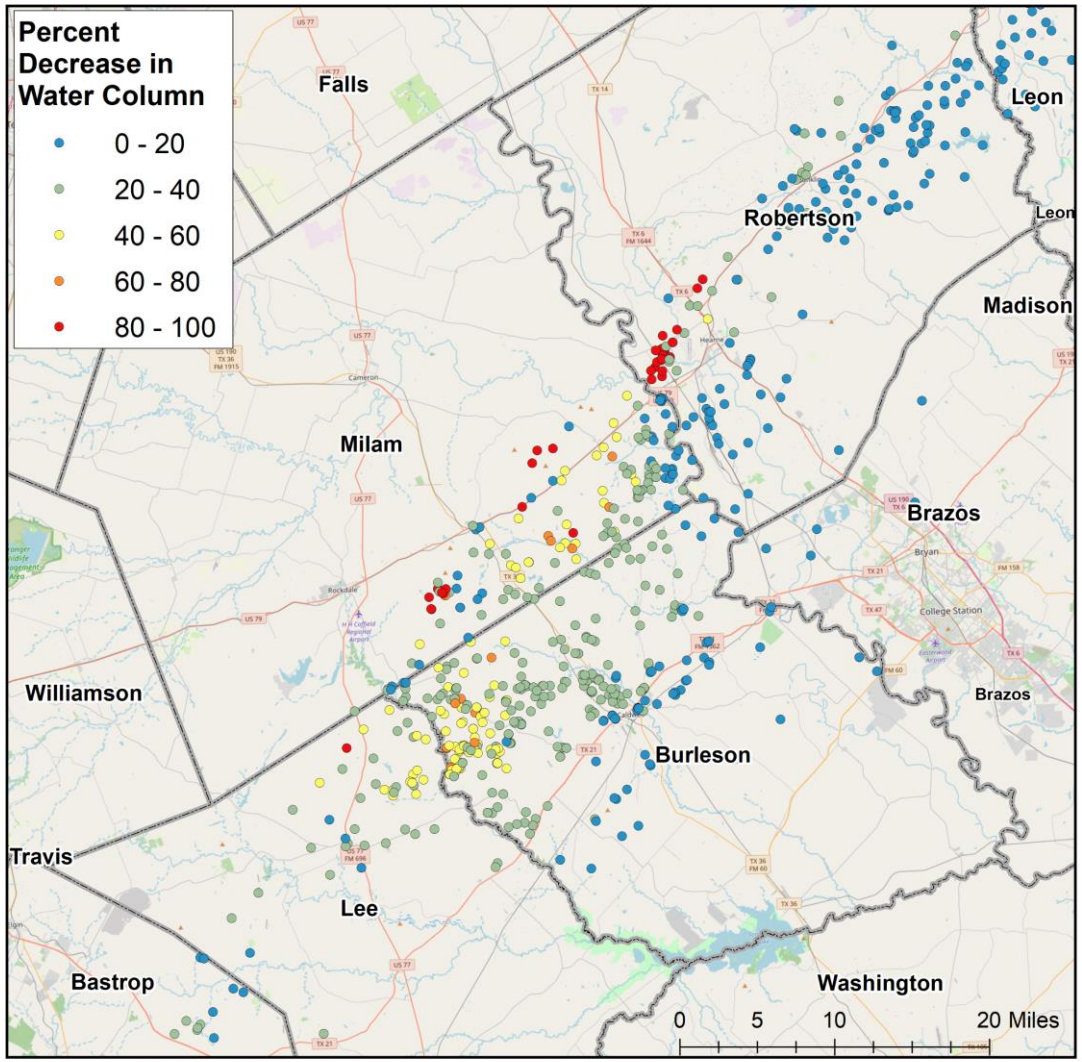
2011-2080 Simsboro – OPMAN PS4-2-modv2

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	23	17	3				1	1	1	1	1		15
20-40	42	28	5			1		1	1				34
40-60	61	30	10		3	3	2		1			1	41
60-80	58	25	5	4	3	1		4	2	2		1	36
80-100	61	17	2	8	1		3	3		2	1	1	40
100-150	141	21	17	14	16	7	11	7	6	3	8	10	42
150-200	173	4	49	19	25	7	16	13	6	8	6	5	19
200-250	238	0	121	23	14	13	12	15	13	9	2	3	13
250-500	902	3	514	134	59	49	40	38	23	15	13	6	11
500+	318	0	161	67	45	13	16	7	4	5			
TOTAL	2017	145	887	269	166	94	101	89	57	45	31	27	251

Well Impact
Dry – 251
>50% - 500

INTERA

Carrizo – GAM – PS4-2modv2



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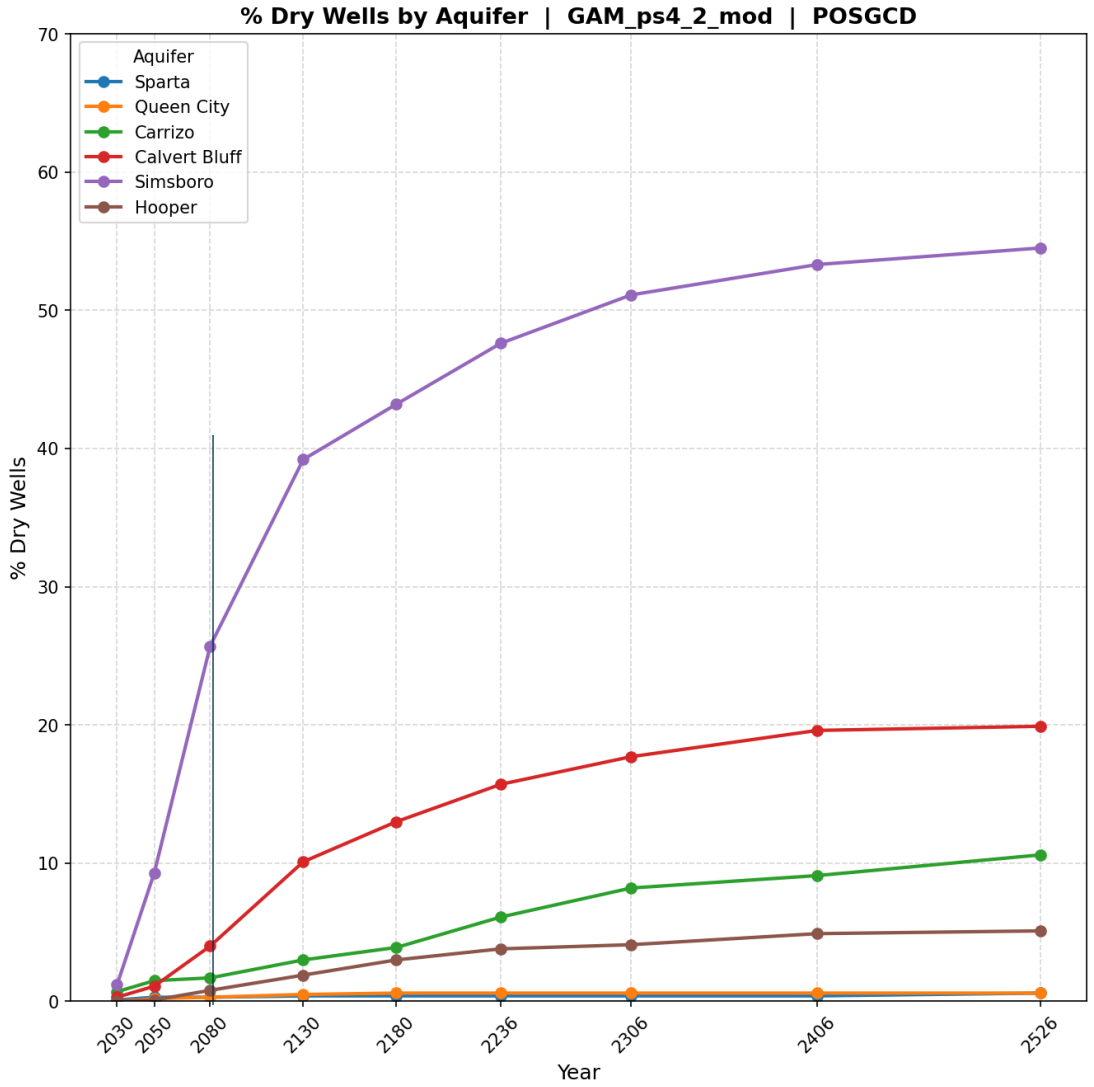
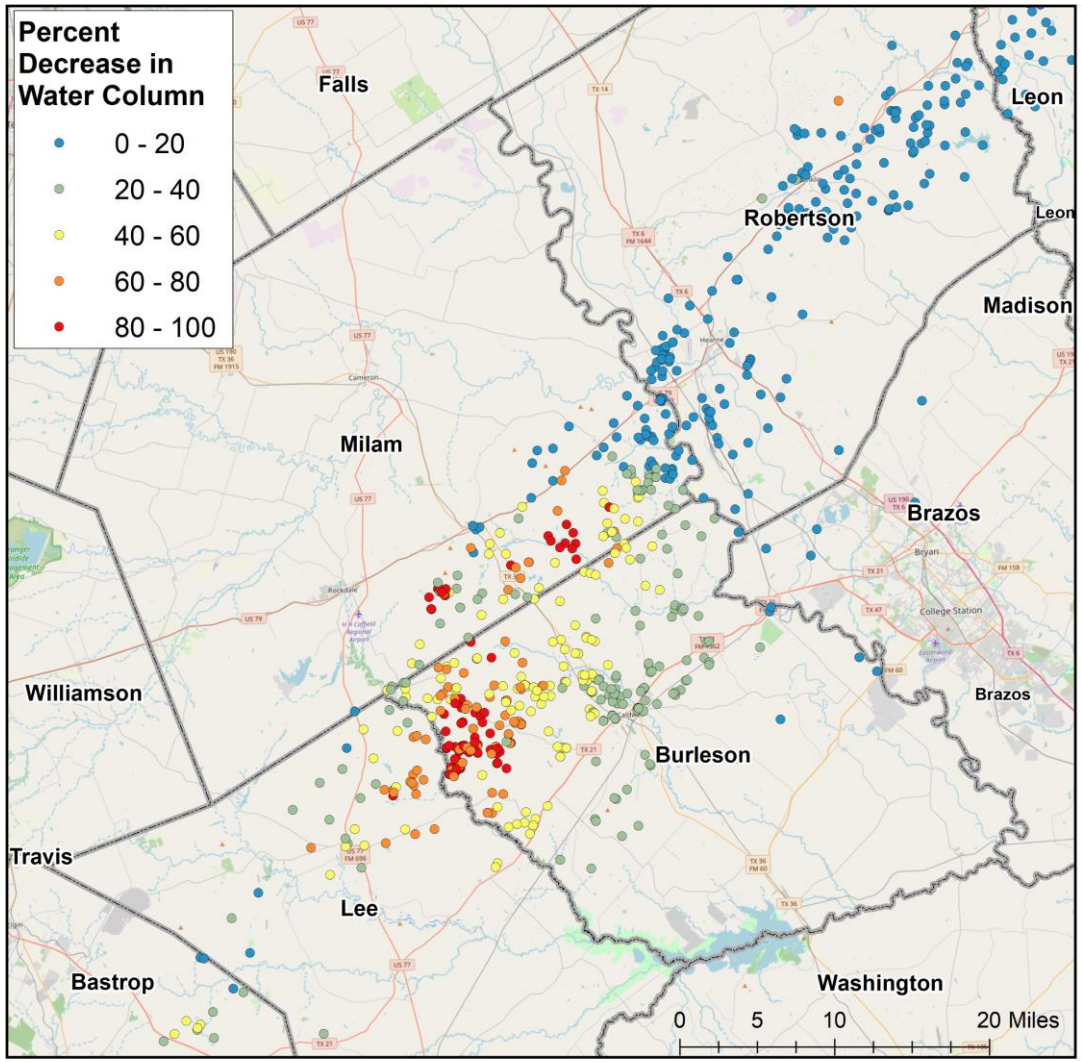


2011-2080: Carrizo – OPMAN – PS4-2mod2



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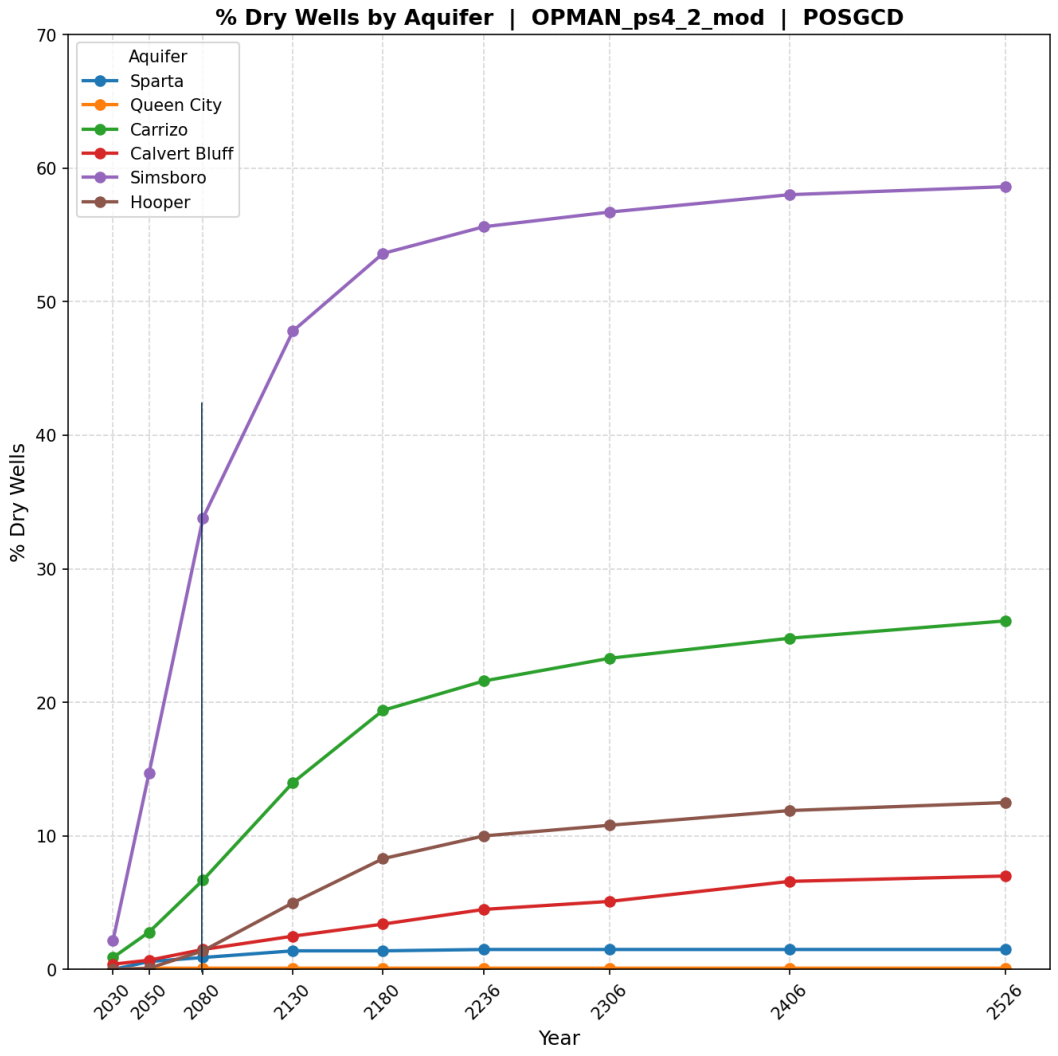


2011-2080 GAM PS4-2-MODv2: Carrizo

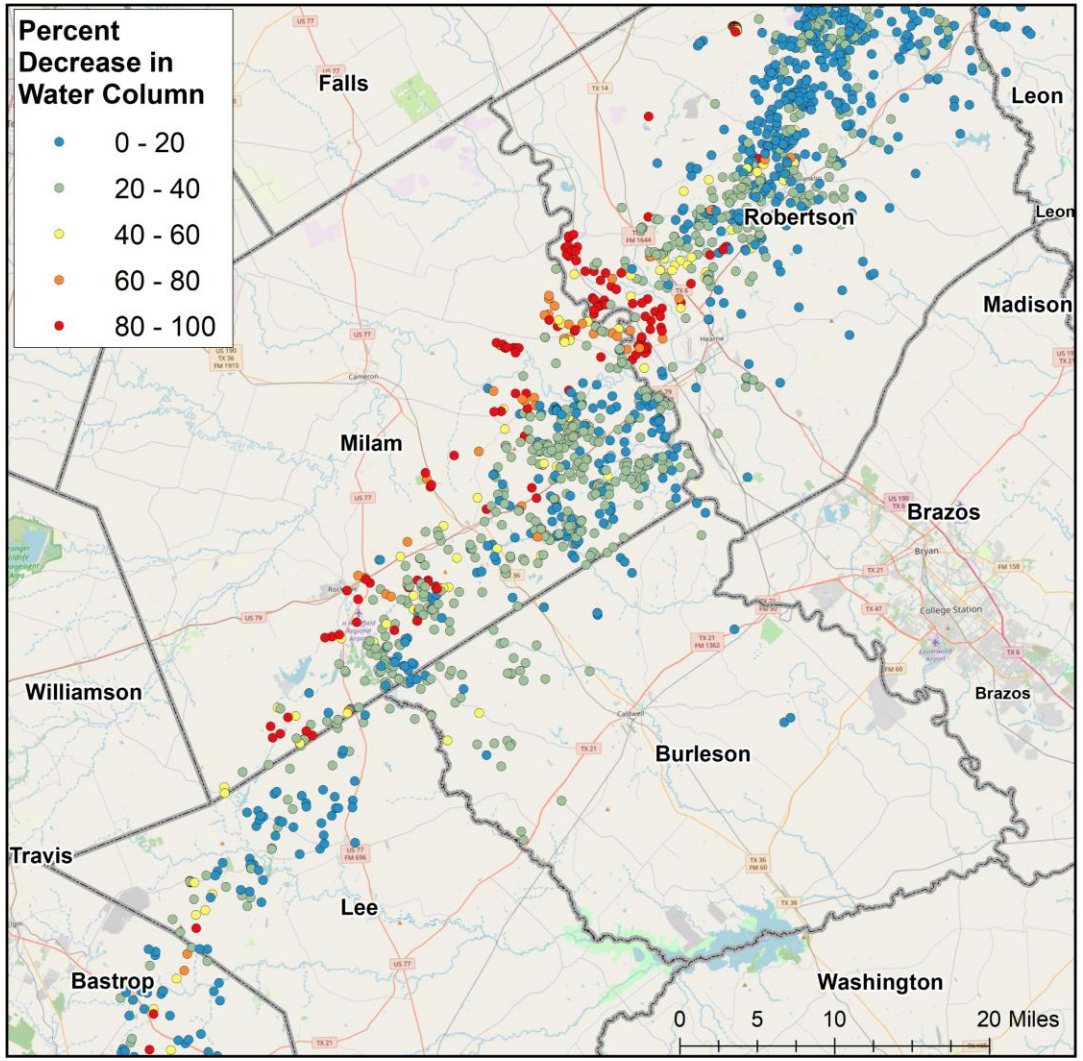
GAM

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	7	7											7
20-40	1	1											1
40-60	2	2				2							
60-80	5	2				1				1	3		
80-100	2	1				1				1	0		
100-150	20	7	1	3	2	1	5	5	1	1	1		
150-200	13				1	1	4	5	2				
200-250	32	1	1	8	4	9	3	4	2	1			
250-500	159			24	26	38	54	11	5	1			
500+	219		3	58	115	35	8						
TOTAL	460	21	5	93	148	88	74	25	10	5	4		8

OPMAN

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	5	5							1				4
20-40	2	2											2
40-60	1	1										1	
60-80	5	5	5										
80-100	4	2	2							1		1	
100-150	14	4	4		2	2	1	5					
150-200	18	3	2	3		1	2			3	2	1	4
200-250	32	1	12		3	2	3	1		2		1	8
250-500	165		11	12	9	12	11	23	14	22	23	15	13
500+	217			7	39	62	55	18	24	6	3	3	
TOTAL	463	23	36	22	53	79	72	47	39	34	28	22	31

Calvert Bluff – GAM – PS4-2mod2



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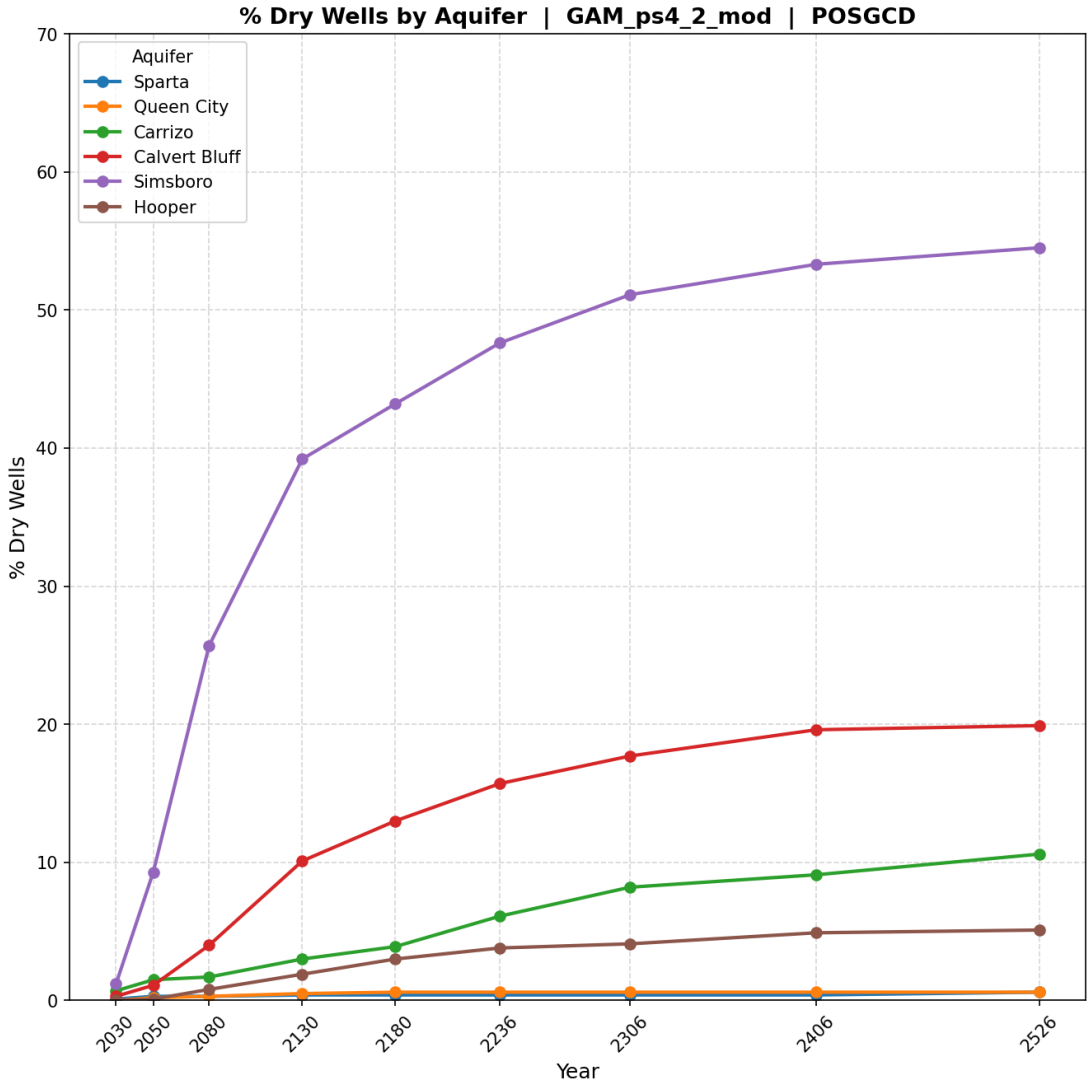
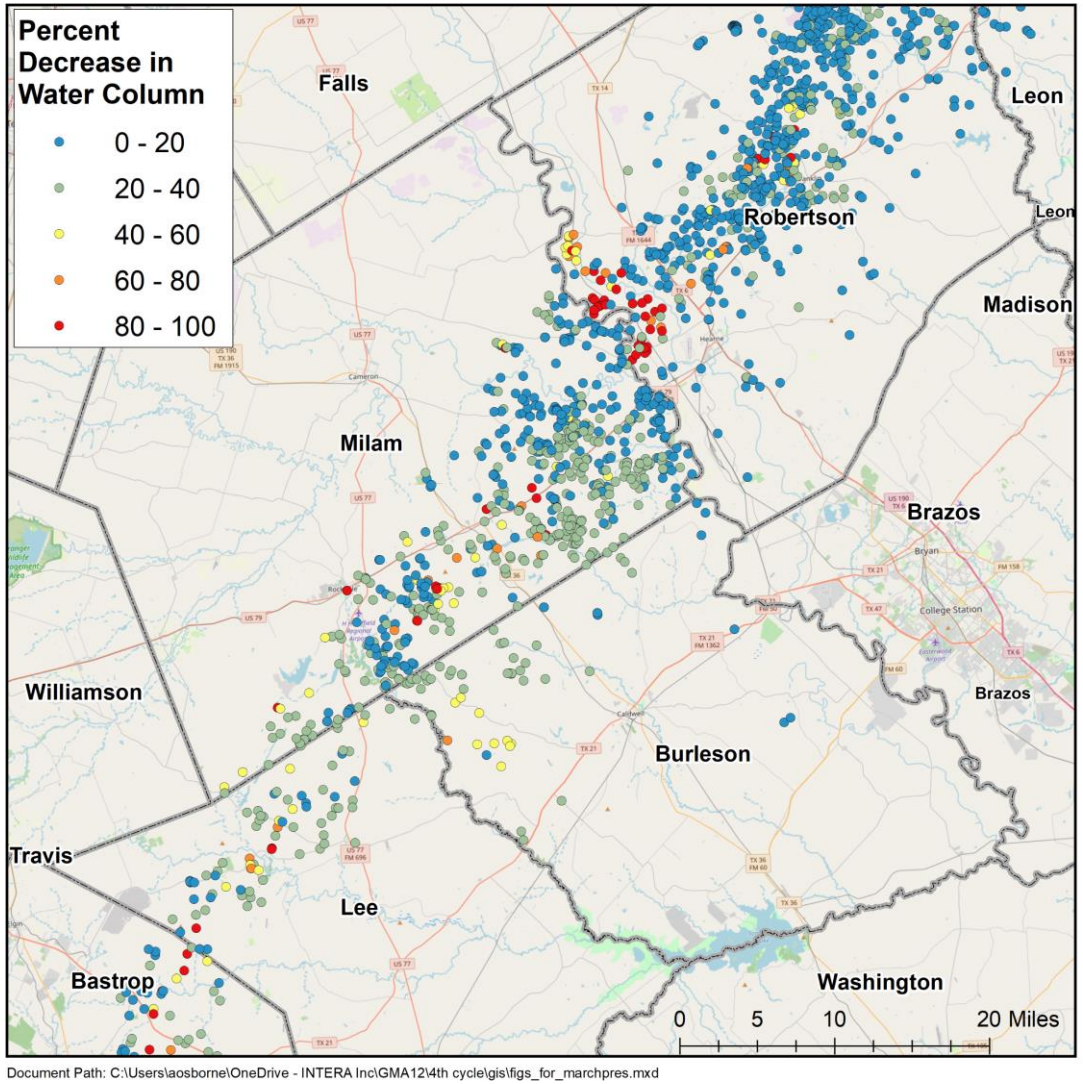


Calvert Bluff – OPMAN – PS4-2modv2



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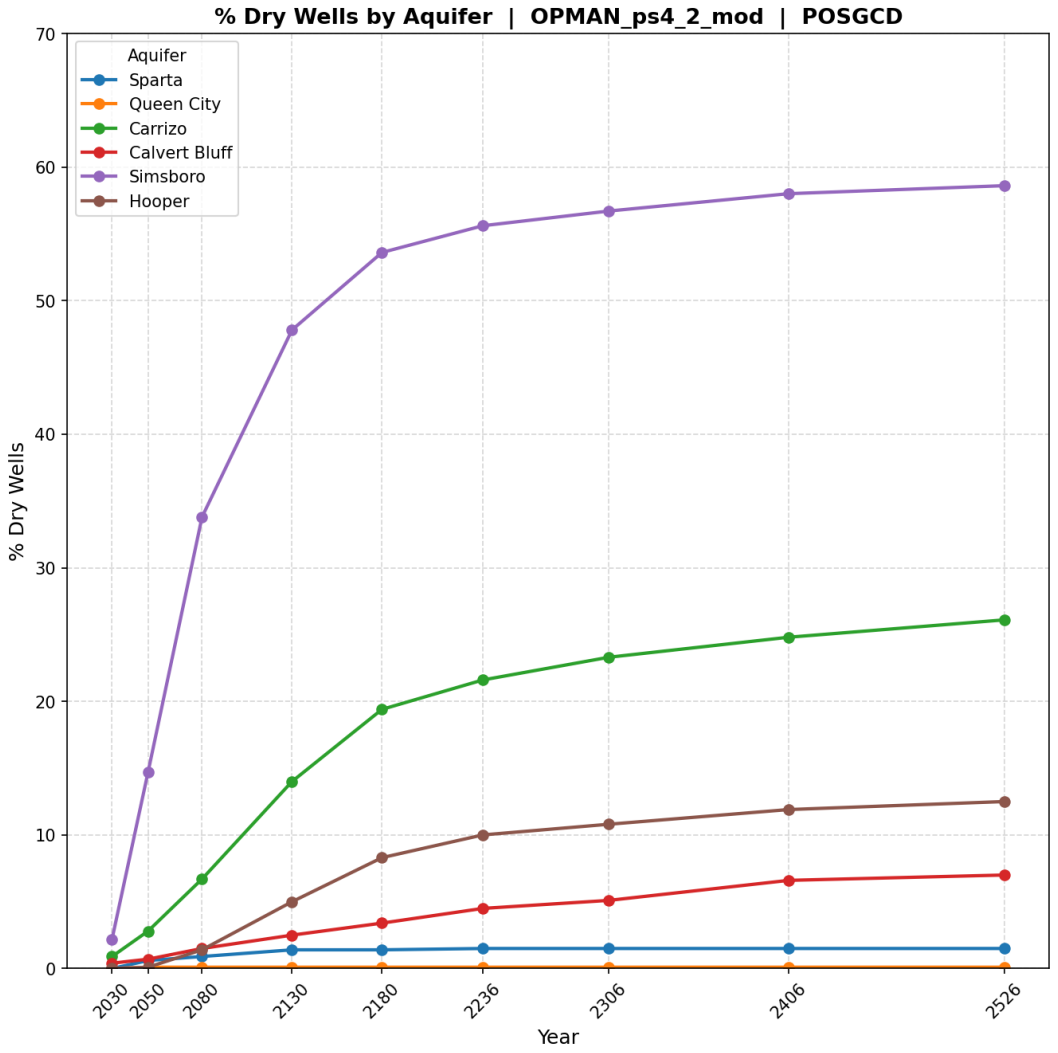


2011-2080 GAM PS4-2-MODv2: Calvert Bluff

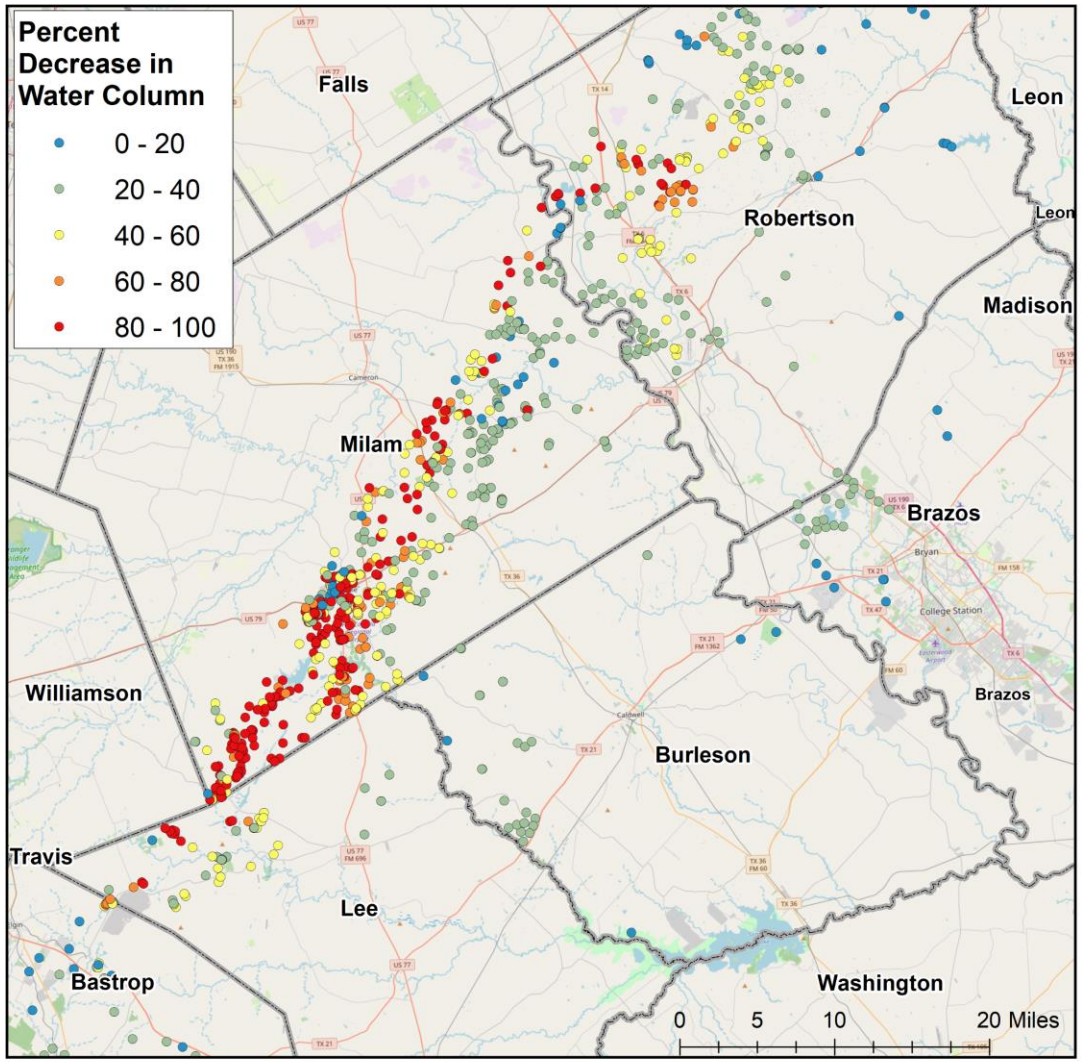
GAM

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	4	4											4
20-40	15	13		1			1			1	1	1	10
40-60	23	23	1		1		1	1	3	3	3	1	9
60-80	18	18	1		2	4	1	1	2			2	5
80-100	18	12			3			2	1	1	8	2	1
100-150	31	9		2	1	3	2	6	6	5	4	2	
150-200	38				1	4	10	16	7				
200-250	45				8	28	9						
250-500	278	1		37	205	34	1	1					
500+	248			126	113	7	2						
TOTAL	718	80	2	166	334	80	27	27	19	10	16	8	29

OPMAN

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	7	5		2									5
20-40	10	10	5		3			1					1
40-60	22	22	11	4	1	3		2	1				
60-80	19	15	2	3	5	4	1	1					3
80-100	18	12	2	4	2	5	1	2	1				1
100-150	51	21	11	14	9	6	3	2	2	1	1	1	1
150-200	40			13	8	13	1	1	1	2	1		
200-250	54		2	9	29	5	5	3	1				
250-500	284		4	128	115	29	6	1	1				
500+	226	1	2	87	101	27	5	4					
TOTAL	731	86	39	264	273	92	22	17	7	3	2	1	11

Simsboro – GAM – PS4-2mod2



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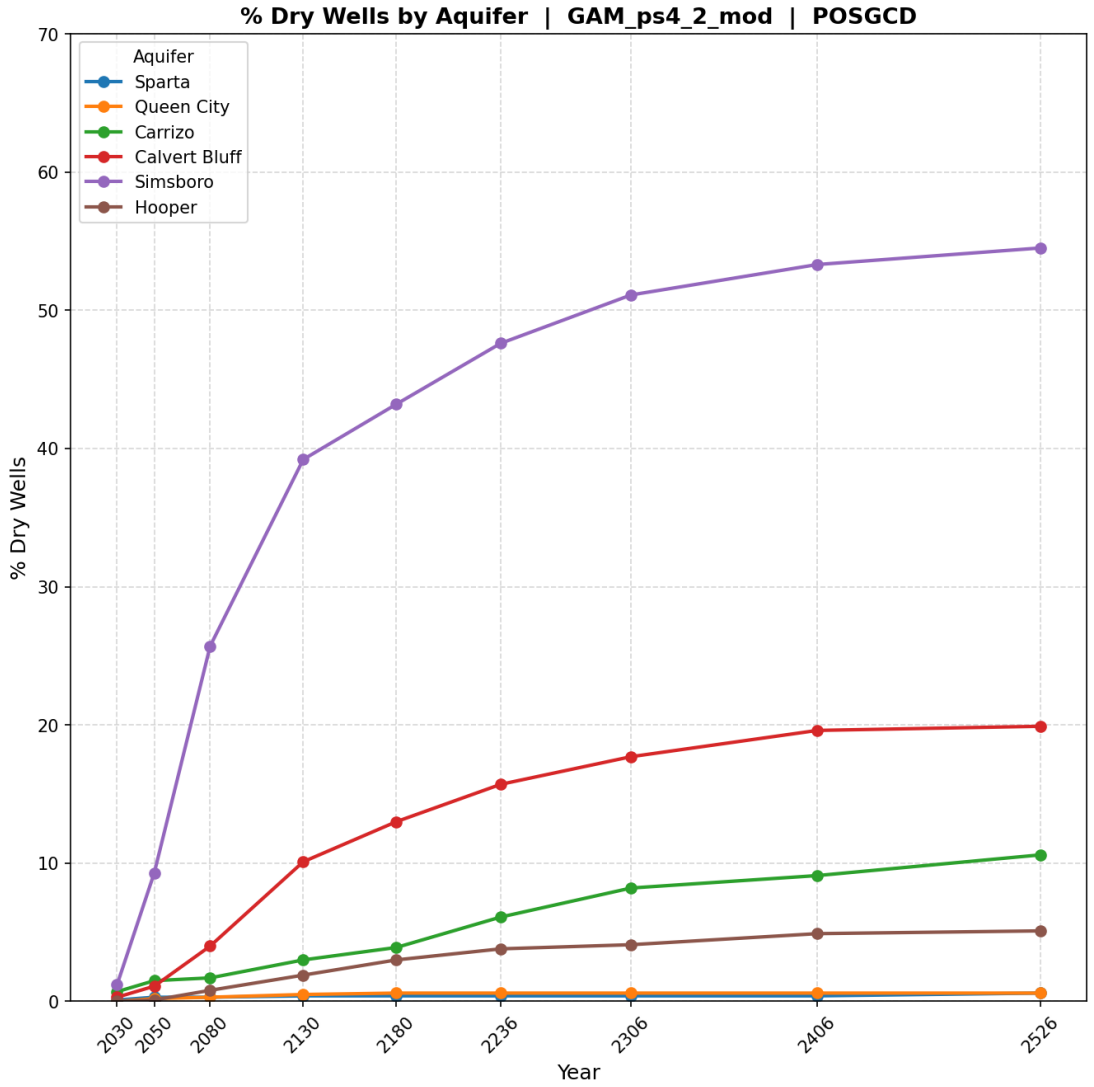
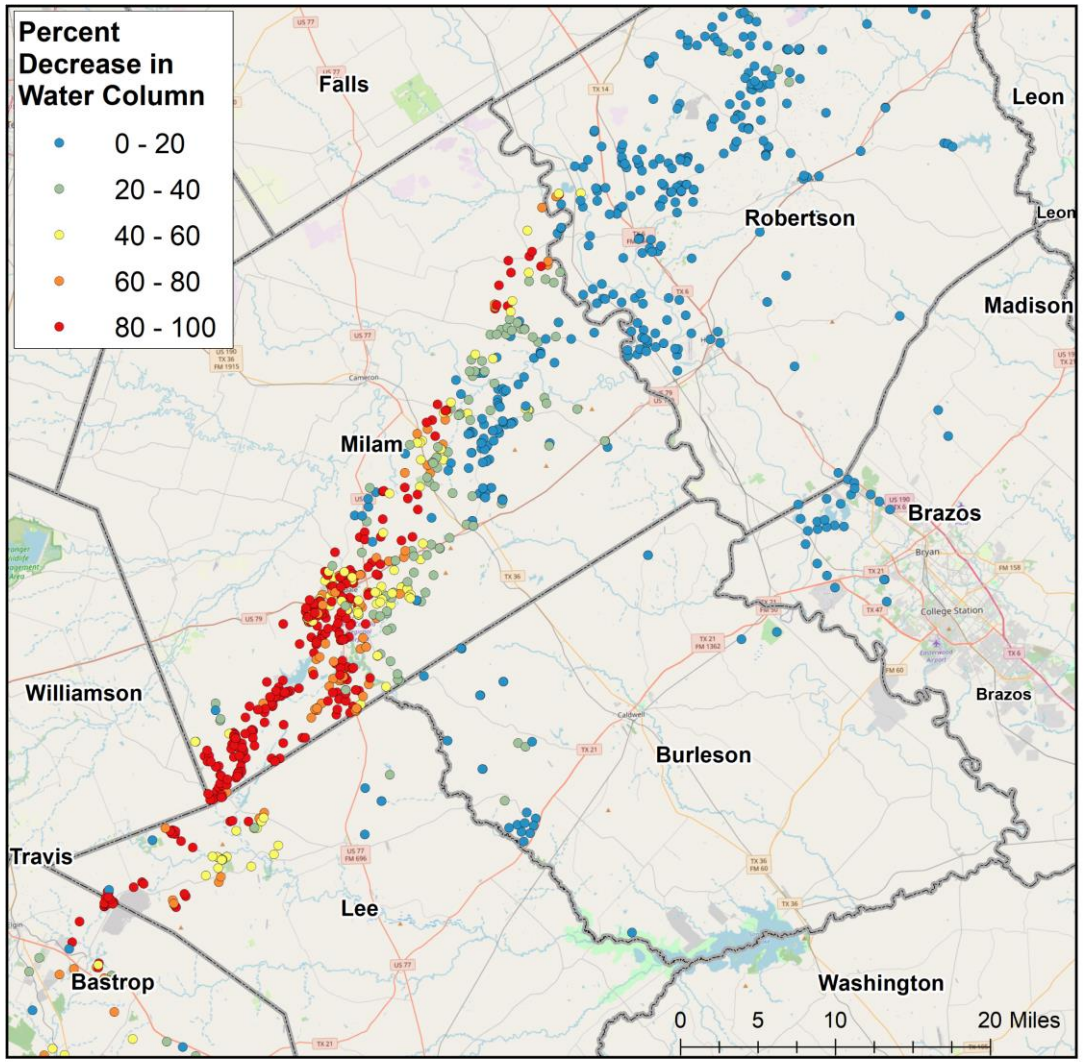


Simsboro – OPMAN – PS4-2modv2



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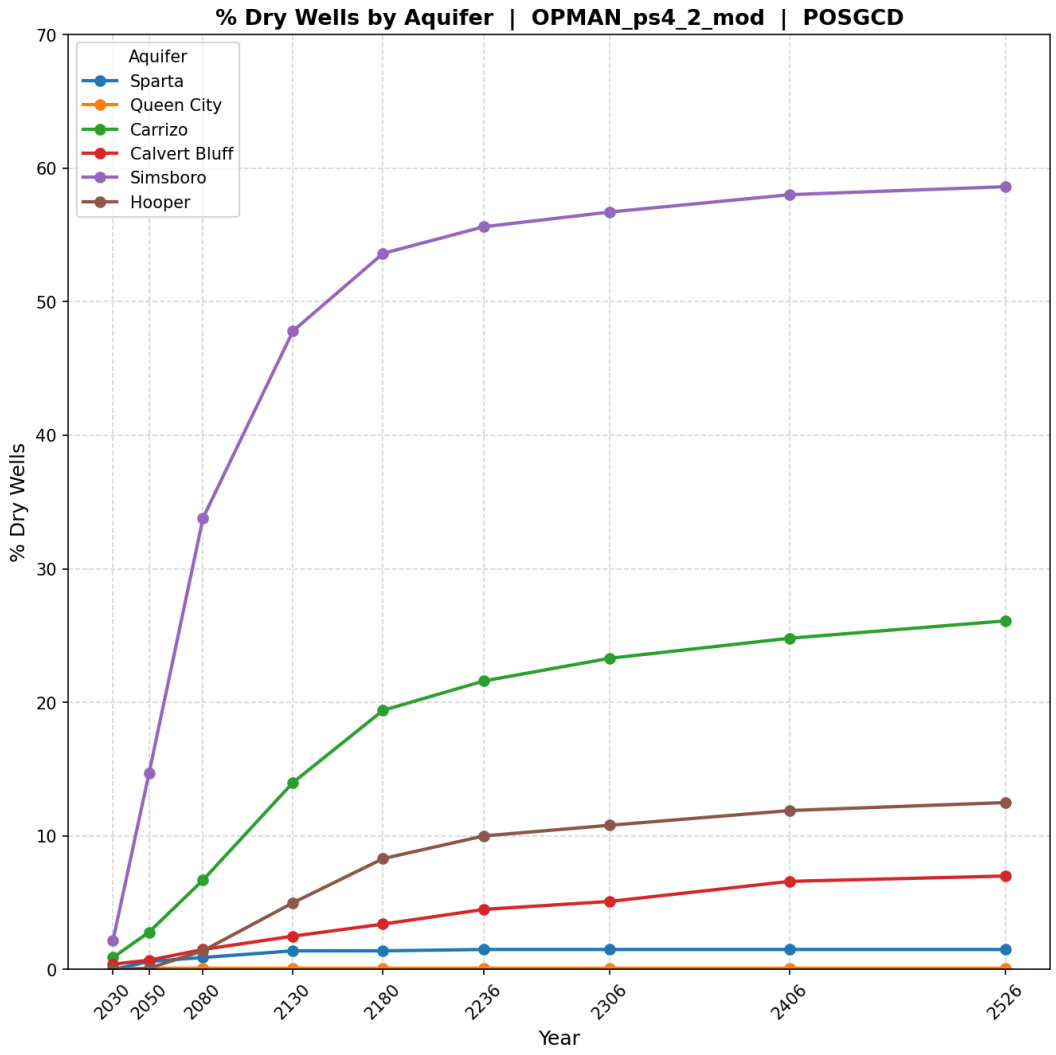

2011-2080 Simsboro – GAM PS4-2-modv2

GAM

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	21	14											21
20-40	28	17									3	1	24
40-60	50	29		1		1	2	6	3	3	3		31
60-80	50	26				2	5	6	6	1		2	28
80-100	36	21			4	4	6	1	2	1	2	2	14
100-150	70	6		1	2	8	3	6	8	2	4	4	32
150-200	51	1	4	3	2	6	4	2	3	1	4	11	11
200-250	36	1	2	3	6	6	4	5	1	6	2	0	1
250-500	197	1	1	13	52	27	21	32	19	10	12	4	6
500+	106			10	43	29	6	16	2				
TOTAL	645	116	7	31	109	83	51	74	44	24	30	24	168

OPMAN

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	15	13											15
20-40	34	24				1		1	1				31
40-60	43	23	1		3	3	2		1			1	32
60-80	44	20		3	3	1		4	1	2		1	29
80-100	47	12		2	1		3	3		2	1	1	34
100-150	69	6		4	4	1	6	3	3		4	7	37
150-200	48	2			3	3	2	5	5	6	4	5	15
200-250	51				4	4	3	12	8	6	1	1	12
250-500	191	1	2	55	20	19	25	17	14	13	10	5	11
500+	98		5	44	30	6	4		4	5			
TOTAL	640	101	8	108	68	38	45	45	37	34	20	21	216

INTERA

Summary – GAM PS4-2-modv2

GCD	Aquifer	Eligible Wells	2080 N Dry	2080 % Dry
BVGCD	Sparta	642	14	2.2
	Queen City	615	2	0.3
	Carrizo	170	19	11.2
	Calvert Bluff	856	62	7.2
	Simsboro	367	7	1.9
	Hooper	171	1	0.6
	TOTAL	**2821**	**105**	**3.7**
FCGCD	Sparta	2	0	0
	Queen City	1	0	0
	Calvert Bluff	1	0	0
	TOTAL	**4**	**0**	**0**
LPGCD	Sparta	146	0	0
	Queen City	331	1	0.3
	Carrizo	190	5	2.6
	Calvert Bluff	513	10	1.9
	Simsboro	286	9	3.1
	Hooper	310	0	0
	TOTAL	**1776**	**25**	**1.4**

GCD	Aquifer	Eligible Wells	2080 N Dry	2080 % Dry
METGCD	Sparta	441	0	0
	Queen City	632	0	0
	Carrizo	300	0	0
	Calvert Bluff	1423	0	0
	Simsboro	724	0	0
	Hooper	564	0	0
	TOTAL	**4084**	**0**	**0**
POSGCD	Sparta	1172	4	0.3
	Queen City	1081	3	0.3
	Carrizo	461	8	1.7
	Calvert Bluff	725	29	4
	Simsboro	653	168	25.7
	Hooper	797	6	0.8
	TOTAL	**4889**	**218**	**4.5**
ALL	**TOTAL**	**13574**	**348**	**2.6**

INTERA

Summary – GAM PS4-2-modv2

GAM PS3-19				
GCD	**Aquifer**	**Eligible Wells**	**2080 N Dry**	**2080 % Dry**
POSGCD	Sparta	1172	4	0.3
	Queen City	1081	7	0.6
	Carrizo	461	8	1.7
	Calvert Bluff	725	19	2.6
	Simsboro	653	120	18.4
	Hooper	797	4	0.5
	TOTAL	**4889**	**162**	**3.3**
ALL	**TOTAL**	**13574**	**284**	**2.1**

GAM PS4-2-modv2				
GCD	**Aquifer**	**Eligible Wells**	**2080 N Dry**	**2080 % Dry**
POSGCD	Sparta	1172	4	0.3
	Queen City	1081	3	0.3
	Carrizo	461	8	1.7
	Calvert Bluff	725	29	4
	Simsboro	653	168	25.7
	Hooper	797	6	0.8
	TOTAL	**4889**	**218**	**4.5**
ALL	**TOTAL**	**13574**	**348**	**2.6**

OPMAN PS4-2-modv2				
GCD	**Aquifer**	**Eligible Wells**	**2080 N Dry**	**2080 % Dry**
POSGCD	Sparta	1172	11	0.9
	Queen City	1080	1	0.1
	Carrizo	463	31	6.7
	Calvert Bluff	731	11	1.5
	Simsboro	640	216	33.8
	Hooper	797	11	1.4
	TOTAL	**4883**	**281**	**5.8**
ALL	**TOTAL**	**13577**	**375**	**2.8**

INTERA

State Planning

Comparison of Productions

INTERA

Summary – GAM PS4-2-modv2

GCD	Scenario	Production Rate (AFY)							
		Alluvium	SP	QC	CZ	CB	SB	HP	CZ-WX
BVGCD	PS3-19	60,059	13,152	1,268	5,495	1,724	147,145	2,137	156,501
BVGCD	PS4-2 Modified_v2	60,059	13,152	1,268	5,495	1,724	190,150	2,137	199,506
BVGCD	Strategy Source		638						28,347
BVGCD	Supply	96,916	6,300	709					80,121
BVGCD	Permitted Volume	96,048	12,549	1,653	10,537	1,619	335,500	1,921	349,576
FCGCD	PS3-19		2,851	2,811	5,152				5,152
FCGCD	PS4-2 Modified_v2		2,851	2,811	5,152				5,152
FCGCD	Strategy Source		604						-
FCGCD	Supply		235	122					1,034
FCGCD	Permitted Volume		299	830	3,362				3,362
LPGCD	PS3-19	200	2,764	1,773	12,973	5,560	81,815	3,275	103,623
LPGCD	PS4-2 Modified_v2	932	3,200	1,841	12,358	3,780	53,194	2,255	71,587
LPGCD	Strategy Source								862
LPGCD	Supply		962	1,192					35,439
LPGCD	Permitted Volume	6,000	1,159	885	24,126	5,905	135,363	2,864	168,258
METGCD	PS3-19		3,380	1,615	10,522	4,218	6,865	5,248	26,853
METGCD	PS4-2 Modified_v2		3,380	1,615	10,522	4,218	6,865	5,248	26,853
METGCD	Strategy Source			144					-
METGCD	Supply		2,484	798					9,248
METGCD	Permitted Volume		3,768	660	1,536	5,071	1,886	2,312	10,805
POSGCD	PS3-19	35,806	4,102	7,833	18,194	4,758	79,379	3,124	105,455
POSGCD	PS4-2 Modified_v2	35,806	5,474	1,241	15,169	2,337	95,166	1,763	114,435
POSGCD	Strategy Source		25						782
POSGCD	Supply	46,880	5,767	456					60,258
POSGCD	Permitted Volume	-	7,161	1,597	18,444	7,114	115,532	2,177	143,266

Note: Data in 2070 are used for Strategy.

SP: Sparta; QC:Queen City; CZ: Carrizo; CB: Calvert Bluff; SB: Simsboro; HP: Hooper; CZ-WX: Carrizo-Wilcox

INTERA