

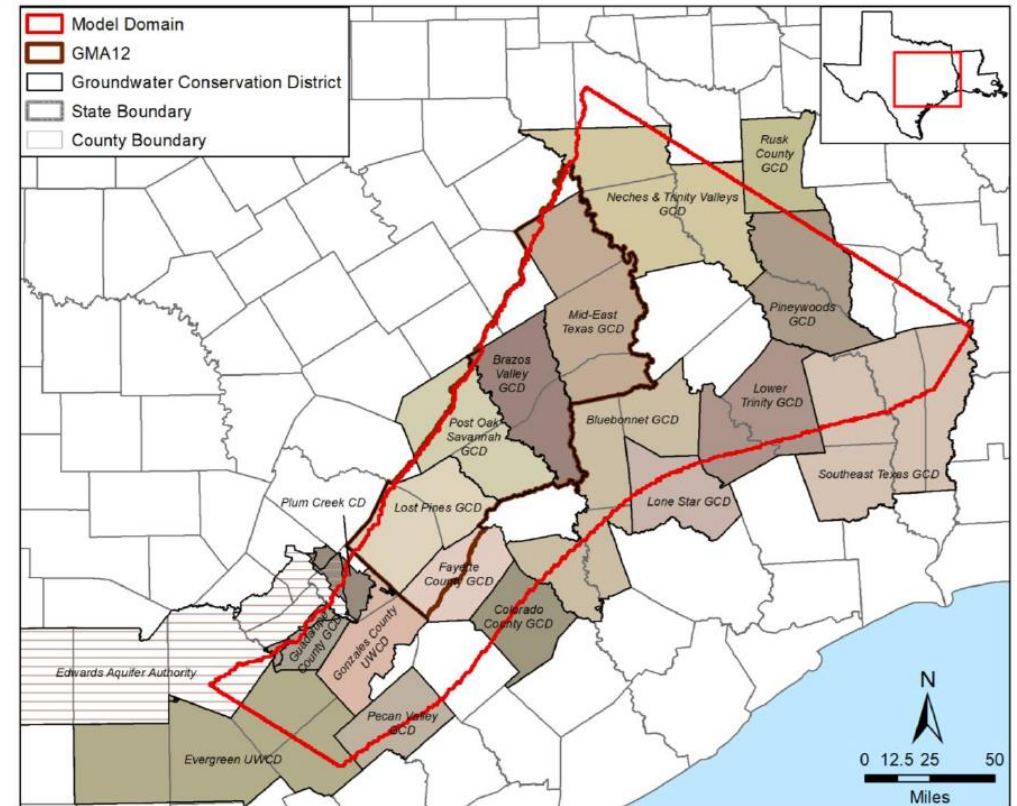
PS4-2mod: Draft Final Results

Presented to GMA-12
April 2, 2026

Gretchen Miller, Ph.D., P.E., P.G.

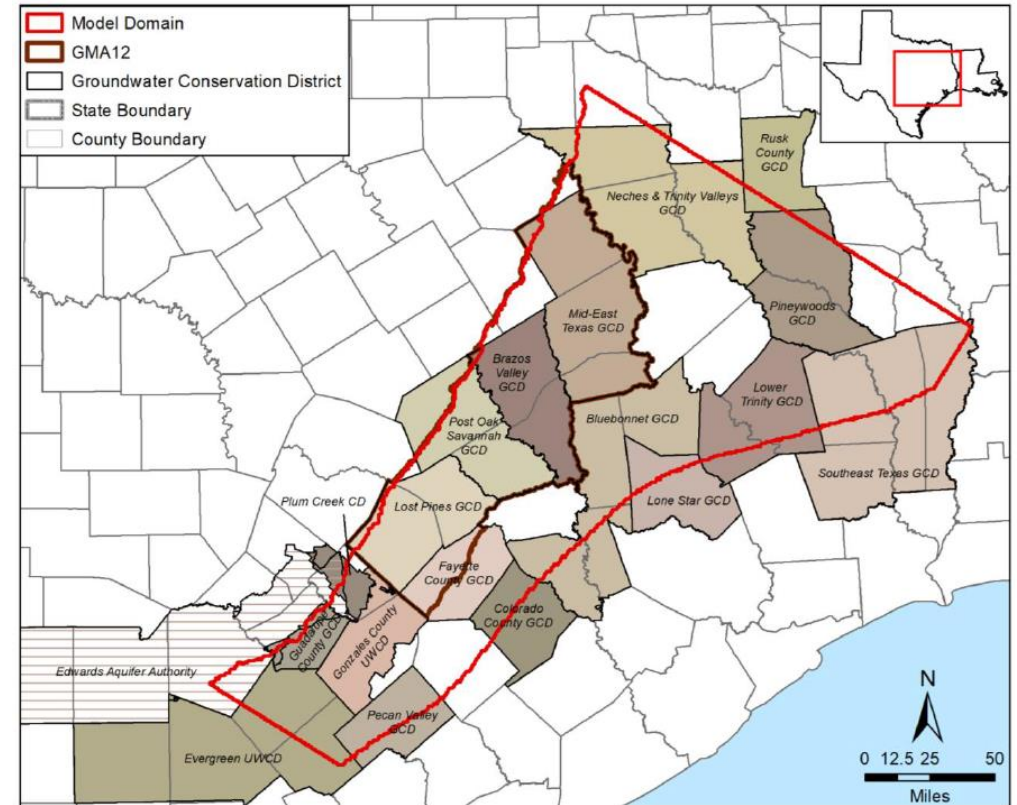
GMA-12 Modeling

- PS4-2: Realistic Scenario
 - Districts provide best estimates as to future pumping based on existing permits
 - BVGCD, LPGCD, POSGCD, provided major updates
 - FCGCD maintained PS3-19
 - METGCD provided minor updates
 - Updates



GMA-12 Modeling

- **PS4-2 and PS4-2 File Versions:**
 - V2 – Presented in April 2025
 - V3 to V6 – Internal tests and compilations, not presented
 - V7 – Presented March 17, 2026
 - V8 – This version (April 2, 2025)
 - Corrects issue with distribution of GMA-13 pumping between Calvert Bluff and Carrizo layers
- **Recommend PS4-2_v8.wel as final well file for PS4-2mod simulations**



Total pumping same as March 17 presentation

Pumping (afy) in 2079

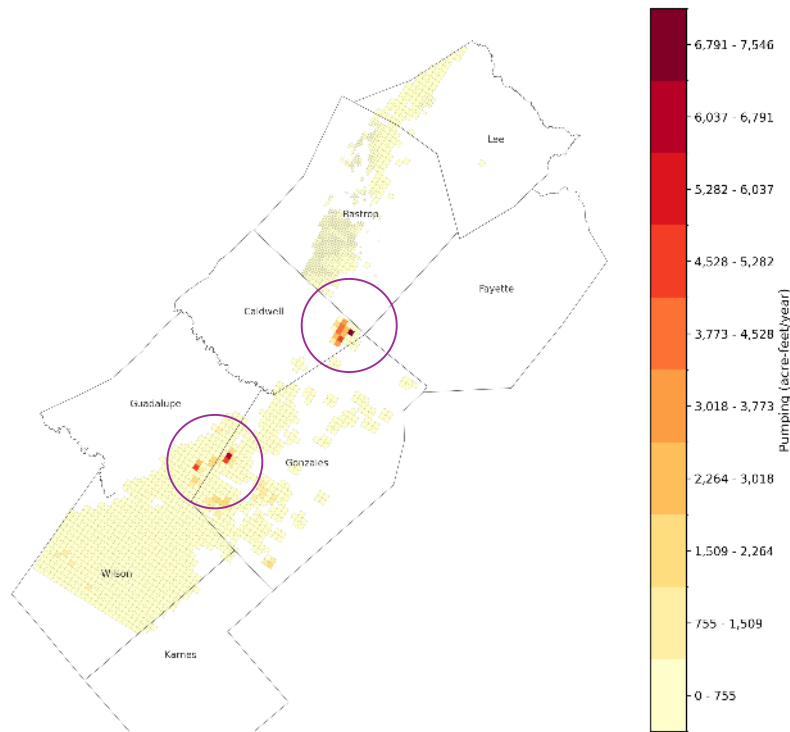
	Aquifer	Alluvium	Sparta	Queen City	Carrizo	Calvert Bluff	Simsboro	Hooper
BVGCD	PS3-19	60,059	13,152	1,268	5,495	1,724	147,145	2,137
	PS4-2	60,059	13,151	1,268	5,495	1,724	190,150	2,137
	PS4-2 Modified	60,059	13,152	1,268	5,495	1,724	190,150	2,137
LPGCD	PS3-19	200	2,764	1,773	12,973	5,560	81,815	3,275
	PS4-2	932	3,200	1,841	12,358	3,780	53,194	2,255
	PS4-2 Modified	932	3,200	1,841	12,358	3,780	53,194	2,251
METGCD	PS3-19	-	3,380	1,615	10,522	4,218	6,865	5,248
	PS4-2	-	3,380	1,615	10,522	4,218	6,865	5,248
	PS4-2 Modified	-	4,302	2,133	4,243	6,436	4,297	4,950
POSGCD	PS3-19	35,806	4,102	7,833	18,194	4,758	79,379	3,124
	PS4-2	35,806	5,474	1,241	15,169	2,337	95,166	1,763
	PS4-2 Modified	35,806	5,474	1,241	15,169	2,337	95,166	1,763
FCGCD	PS3-19	-	2,851	2,811	5,152	-	-	-
	PS4-2	-	2,851	2,811	5,152	-	-	-
	PS4-2 Modified	-	2,851	2,811	5,152	-	-	-

GMA-13 pumping total unchanged, distribution altered

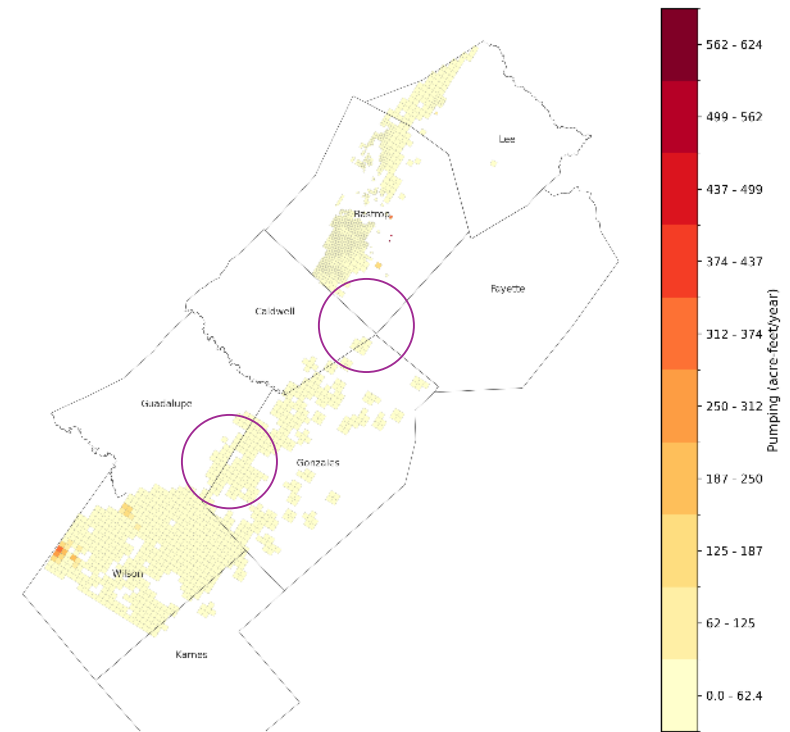
PS4-2_v7.wel (March 17)

PS4-2_v8.wel (April 2)

8 - Calvert Bluff Pumping in 2080



8 - Calvert Bluff Pumping in 2080

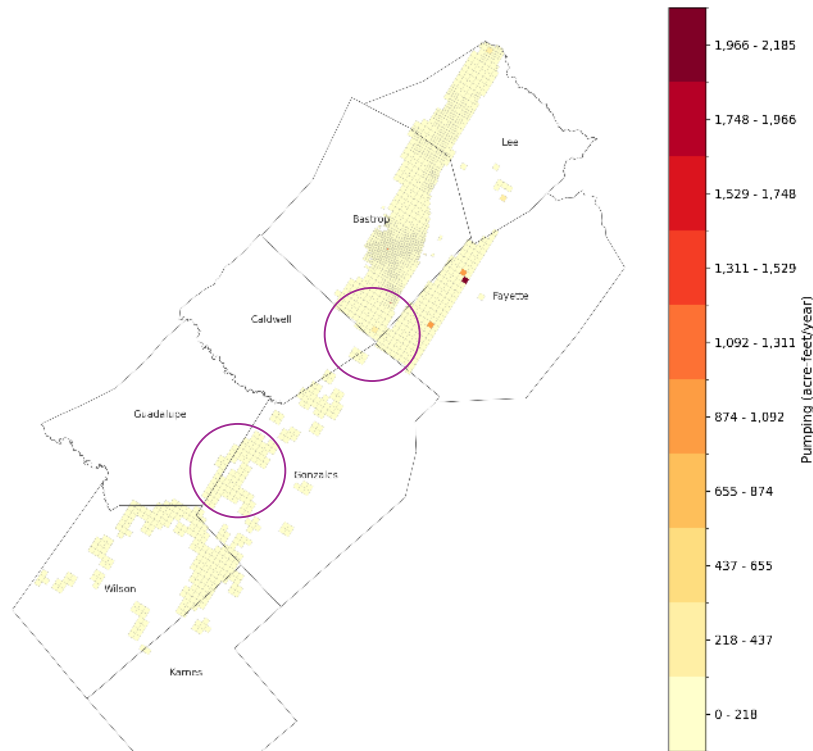


GMA-13 pumping total unchanged, distribution altered

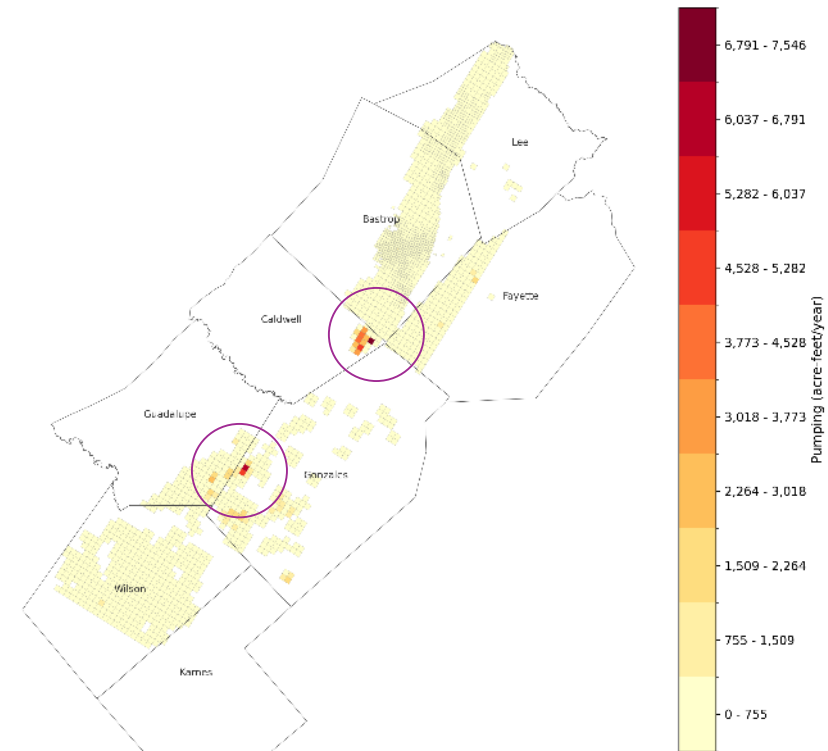
PS4-2_v7 (March 17)

PS4-2_v8 (April 2)

7 - Carrizo Pumping in 2080



7 - Carrizo Pumping in 2080



Drawdown based on PS4-2_v7.wel

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	55	50	20	23	45
5	Queen City	44	84	30	19	28
7	Carrizo	83	141	128	46	168
8	Calvert Bluff	114	233	141	59	184
9	Simsboro	281	316	265	85	367
10	Hooper	192	220	159	77	236

Drawdown based on PS4-2_v8.wel

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	56	54	21	22	46
5	Queen City	45	96	31	19	29
7	Carrizo	84	173	137	45	170
8	Calvert Bluff	114	184	132	58	184
9	Simsboro	281	277	257	85	365
10	Hooper	191	185	150	77	234

Difference between v7 and v8 .wel files

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	1.1	4.0	0.5	-0.1	0.4
5	Queen City	1.4	11.7	1.6	-0.1	0.4
7	Carrizo	0.8	32.0	8.5	-0.2	1.5
8	Calvert Bluff	0.0	-48.4	-9.4	-0.3	0.0
9	Simsboro	-0.6	-38.3	-7.9	-0.4	-1.4
10	Hooper	-0.6	-36.0	-8.8	-0.4	-1.4

LPGCD Water Balance 2080 (PS4-2_v7.wel)

Layer		Lateral Flow			Recharge	Surface Water	Pumping	Storage	GHB	Vertical Flow
		POSGCD	FCGCD	BVGCD/ METGCD						
3	Sparta	-4	-2,721	0	12,364	-1,142	-3,153	1,606	-2,272	-4,870
5	Queen City	834	-4,872	0	11,597	-1,049	-1,837	5,283	0	-6,931
7	Carrizo	-7,013	-4,448	0	9,235	4,827	-12,356	9,473	0	-3,164
8	Calvert Bluff	-662	-378	0	22,596	2,850	-3,780	12,393	0	-27,321
9	Simsboro	-17,837	-2,456	0	6,394	7,749	-53,194	5,747	0	54,011
10	Hooper	745	-989	0	7,248	162	-2,255	873	0	-7,760

Values in acre-feet per year
 Positive = Into Aquifer
 Negative = Out of Aquifer

LPGCD Water Balance 2080 (PS4-2_v8.wel)

Layer		Lateral Flow			Recharge	Surface Water	Pumping	Storage	GHB	Vertical Flow
		POSGCD	FCGCD	BVGCD/ METGCD						
3	Sparta	-3	-2,799	0	12,364	-1,014	-3,153	1,720	-2,230	-5,192
5	Queen City	836	-5,464	0	11,597	-1,018	-1,837	6,140	0	-7,389
7	Carrizo	-6,958	-4,498	0	9,235	4,798	-12,356	11,598	0	4,112
8	Calvert Bluff	-656	-647	0	22,596	1,843	-3,780	10,617	0	-32,701
9	Simsboro	-18,055	-1,951	0	6,394	7,448	-53,194	5,700	0	53,628
10	Hooper	711	-824	0	7,248	95	-2,255	833	0	-8,159

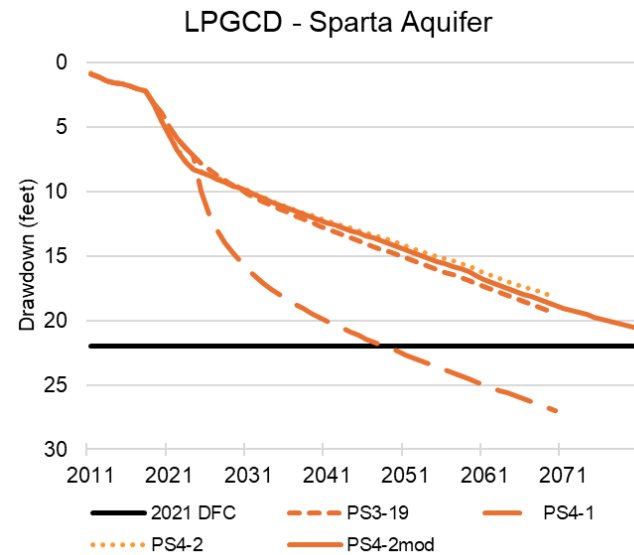
Values in acre-feet per year
 Positive = Into Aquifer
 Negative = Out of Aquifer

Difference between v8 and v7 .wel files

Layer		Lateral Flow			Recharge	Surface Water	Pumping	Storage	GHB	Vertical Flow
		POSGCD	FCGCD	BVGCD/ METGCD						
3	Sparta	1	-79	0	0	128	0	113	42	-323
5	Queen City	2	-592	0	0	31	0	857	0	-458
7	Carrizo	55	-50	0	0	-30	0	2,125	0	7,275
8	Calvert Bluff	6	-269	0	0	-1,007	0	-1,776	0	-5,380
9	Simsboro	-218	505	0	0	-301	0	-48	0	-383
10	Hooper	-34	166	0	0	-67	0	-40	0	-399

Values in acre-feet per year
 Positive = Into Aquifer
 Negative = Out of Aquifer

PS4-2mod Drawdown Sparta Aquifer

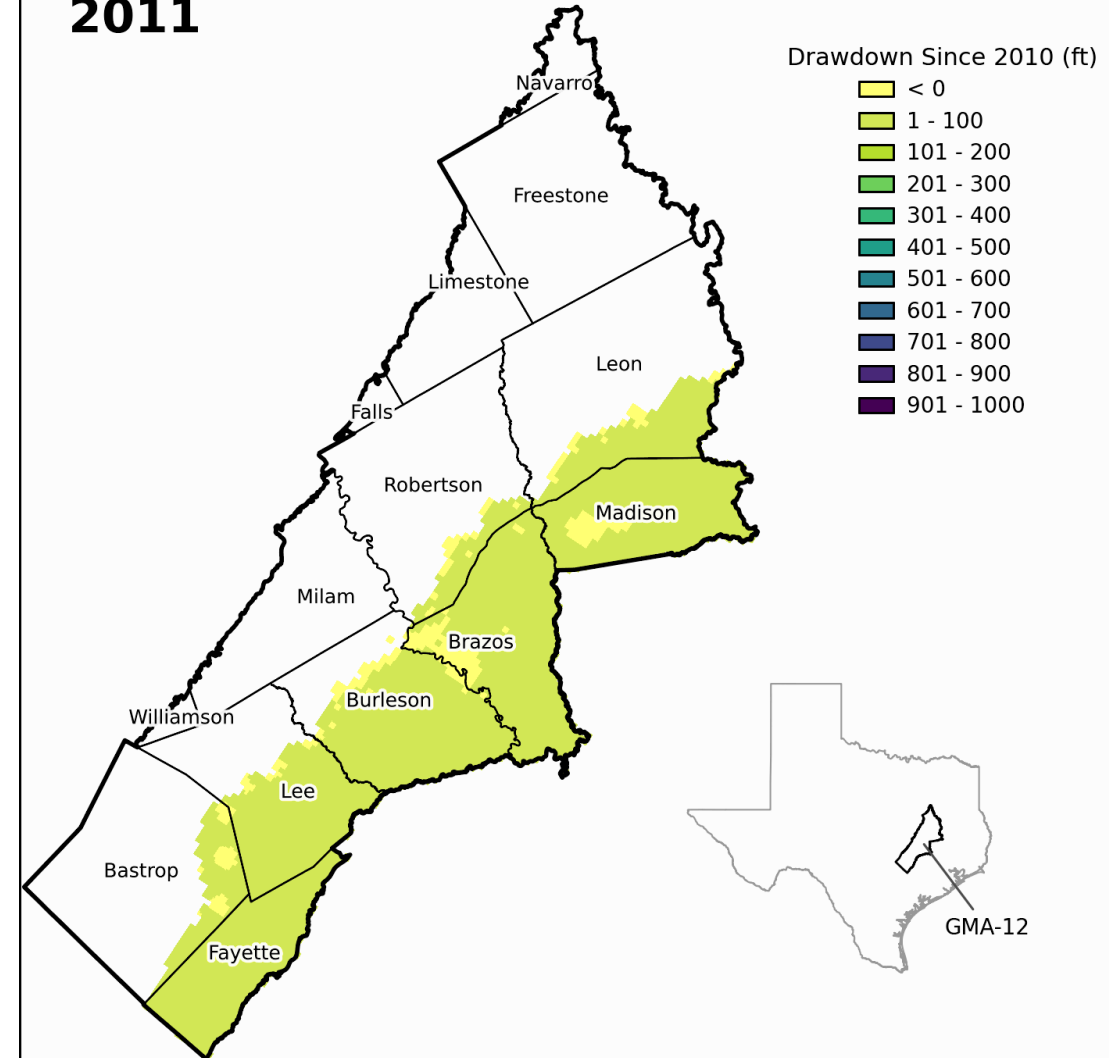


Model: Central SP-QC-CW GAM v.3.02

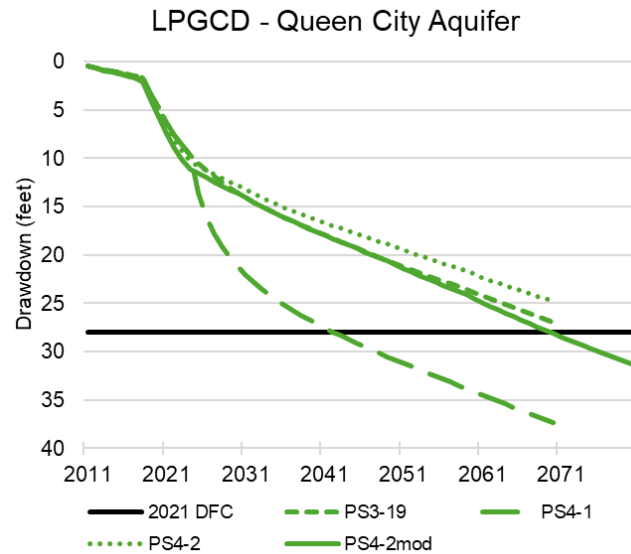
Drawdown = $WL_{31Dec80} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

PS4-2mod
Sparta:
2011



PS4-2mod Drawdown Queen City Aquifer

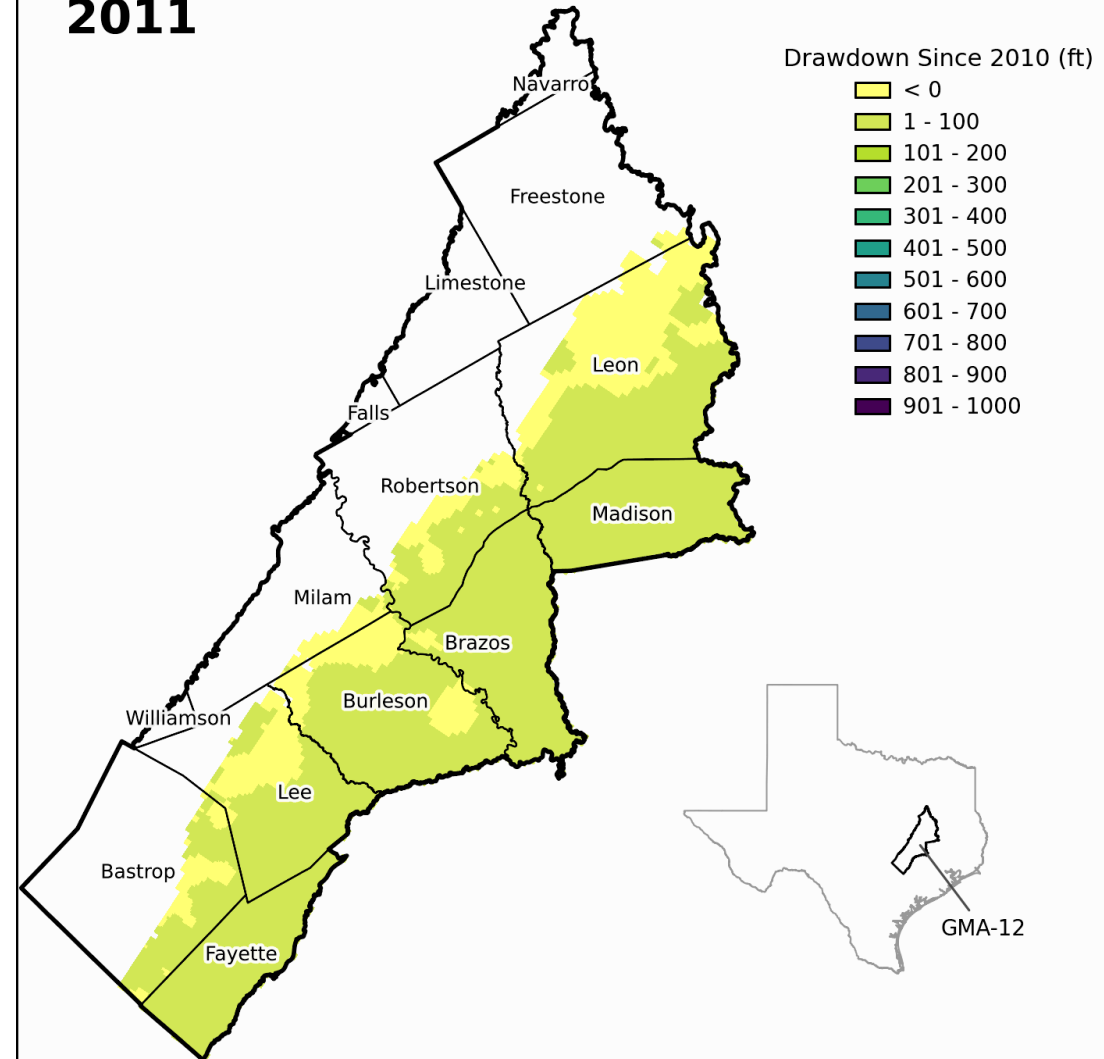


Model: Central SP-QC-CW GAM v.3.02

Drawdown = $WL_{31Dec80} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

**PS4-2mod
Queen City:
2011**



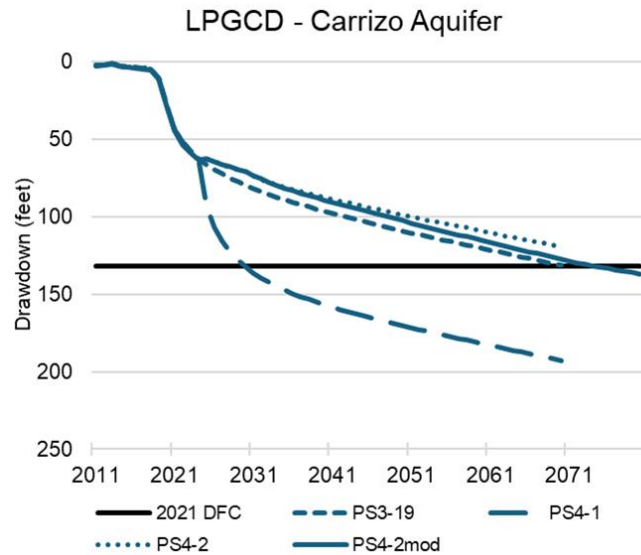
LOST PINES
GROUNDWATER
CONSERVATION DISTRICT

SPHEROS
ENVIRONMENTAL

0 10 20
Miles

N
↑

PS4-2mod Drawdown Carrizo Aquifer

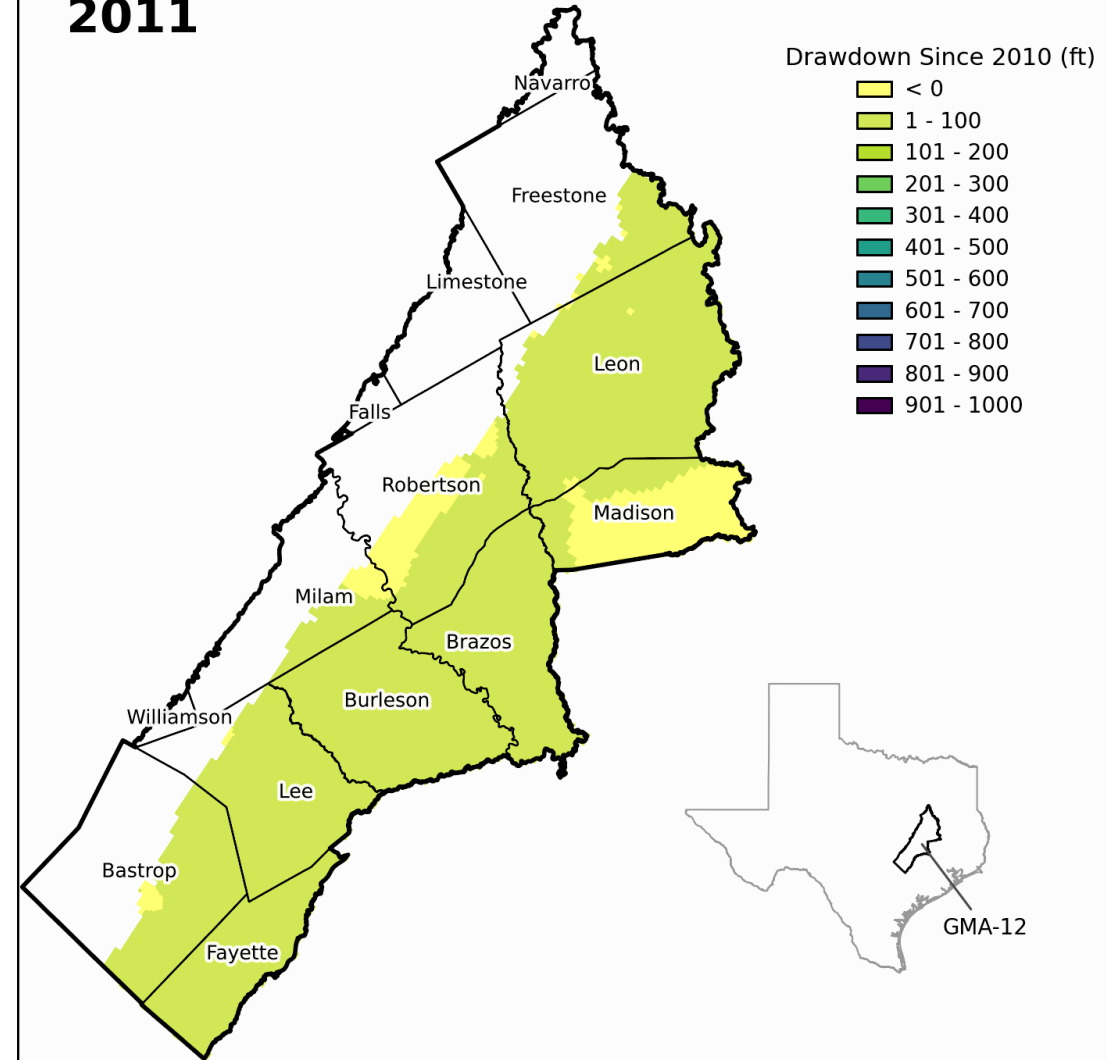


Model: Central SP-QC-CW GAM v.3.02

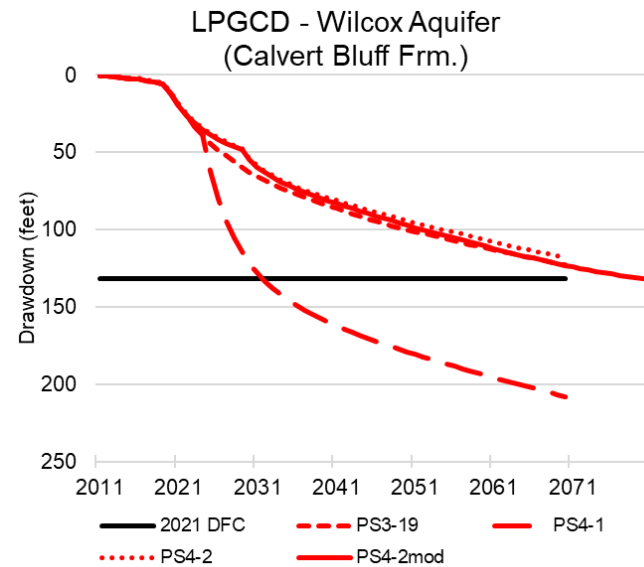
Drawdown = $WL_{31Dec80} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

PS4-2mod
Carrizo:
2011



PS4-2mod Drawdown Calvert Bluff Aquifer

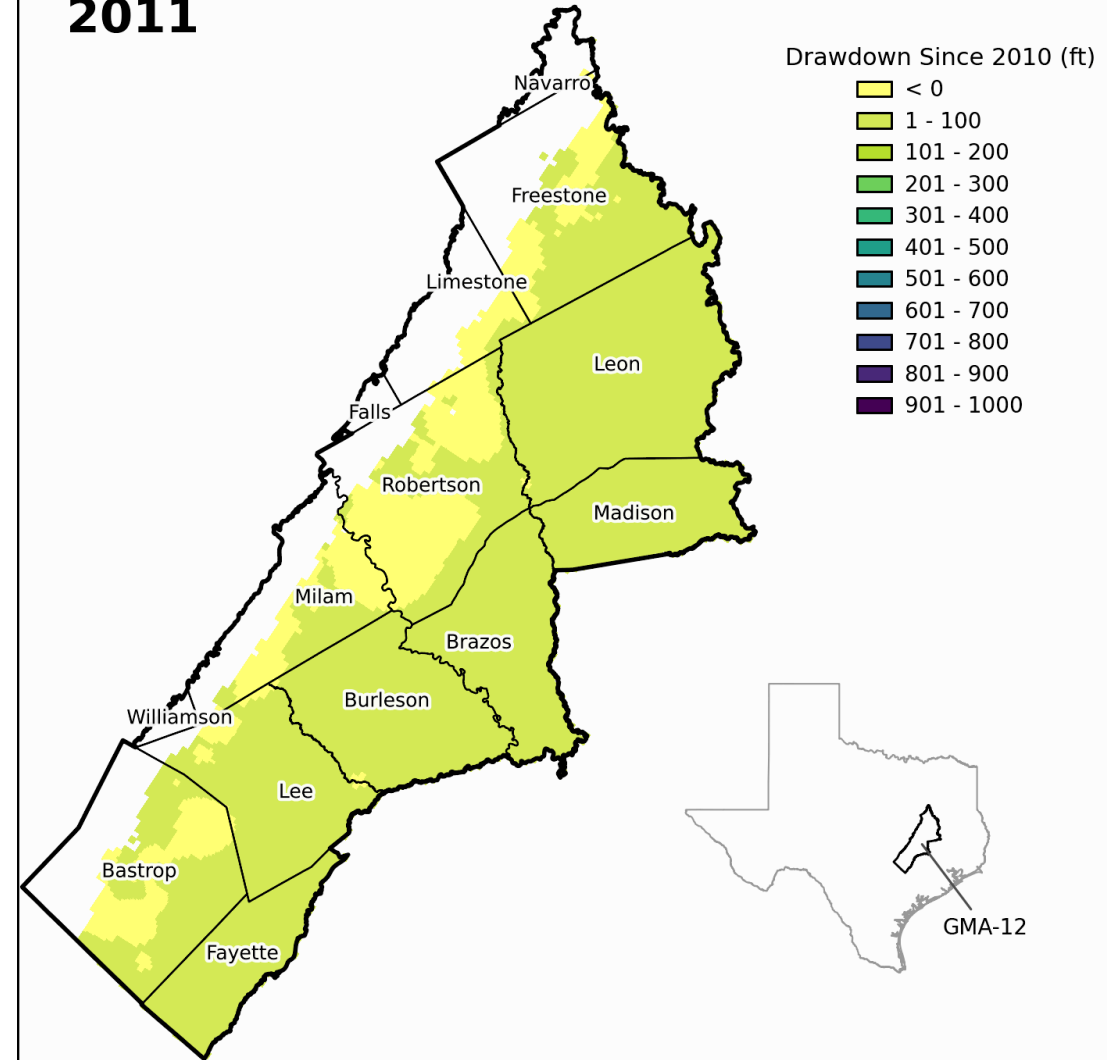


Model: Central SP-QC-CW GAM v.3.02

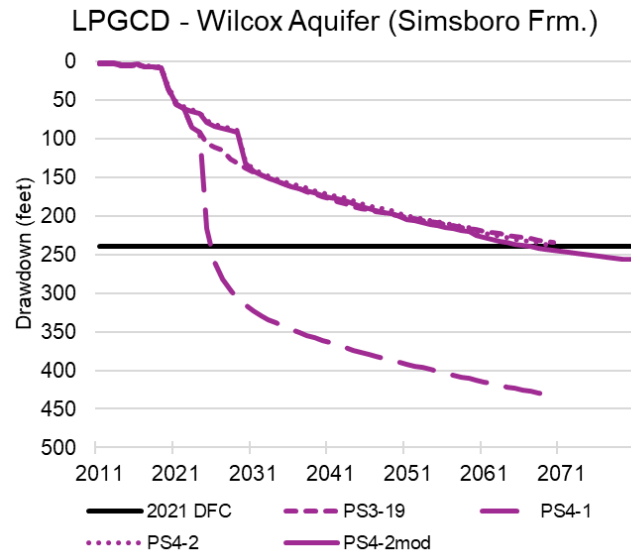
Drawdown = $WL_{31Dec80} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

PS4-2mod
Calvert Bluff:
2011



PS4-2mod Drawdown Simsboro Aquifer

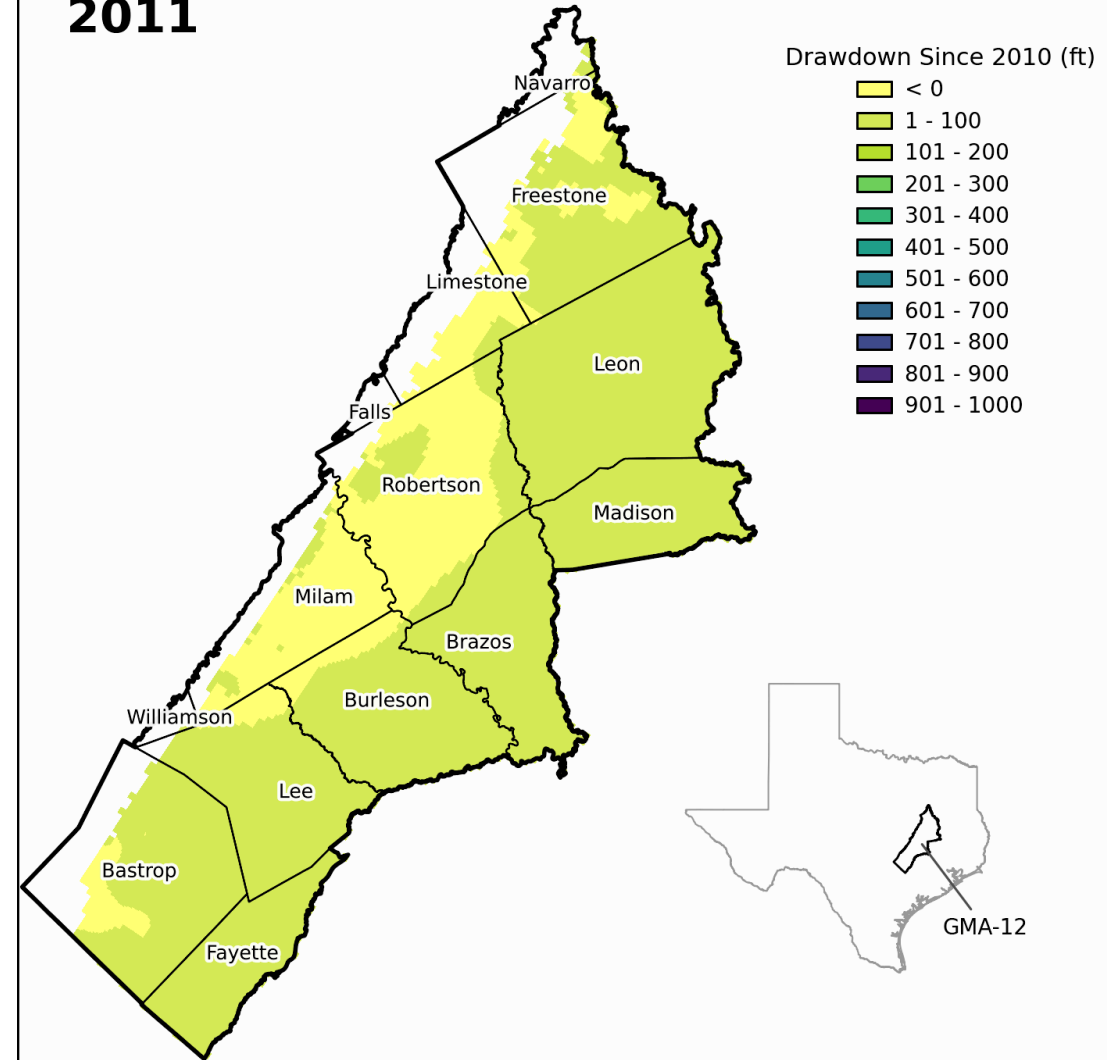


Model: Central SP-QC-CW GAM v.3.02

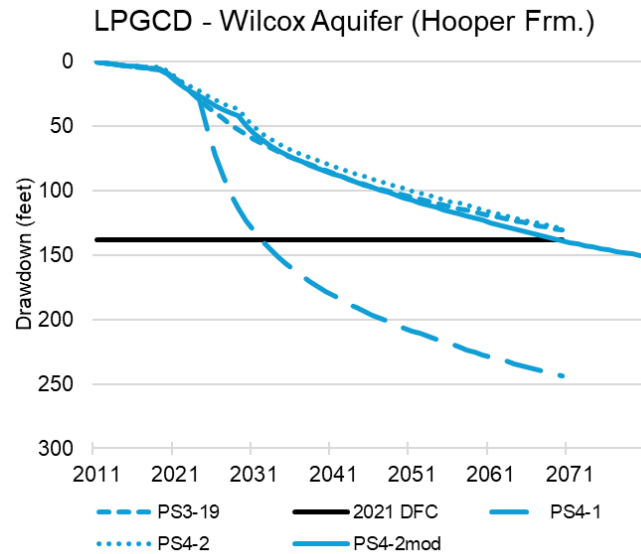
Drawdown = $WL_{31Dec80} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

PS4-2mod
Simsboro:
2011



PS4-2mod Drawdown Hooper Aquifer

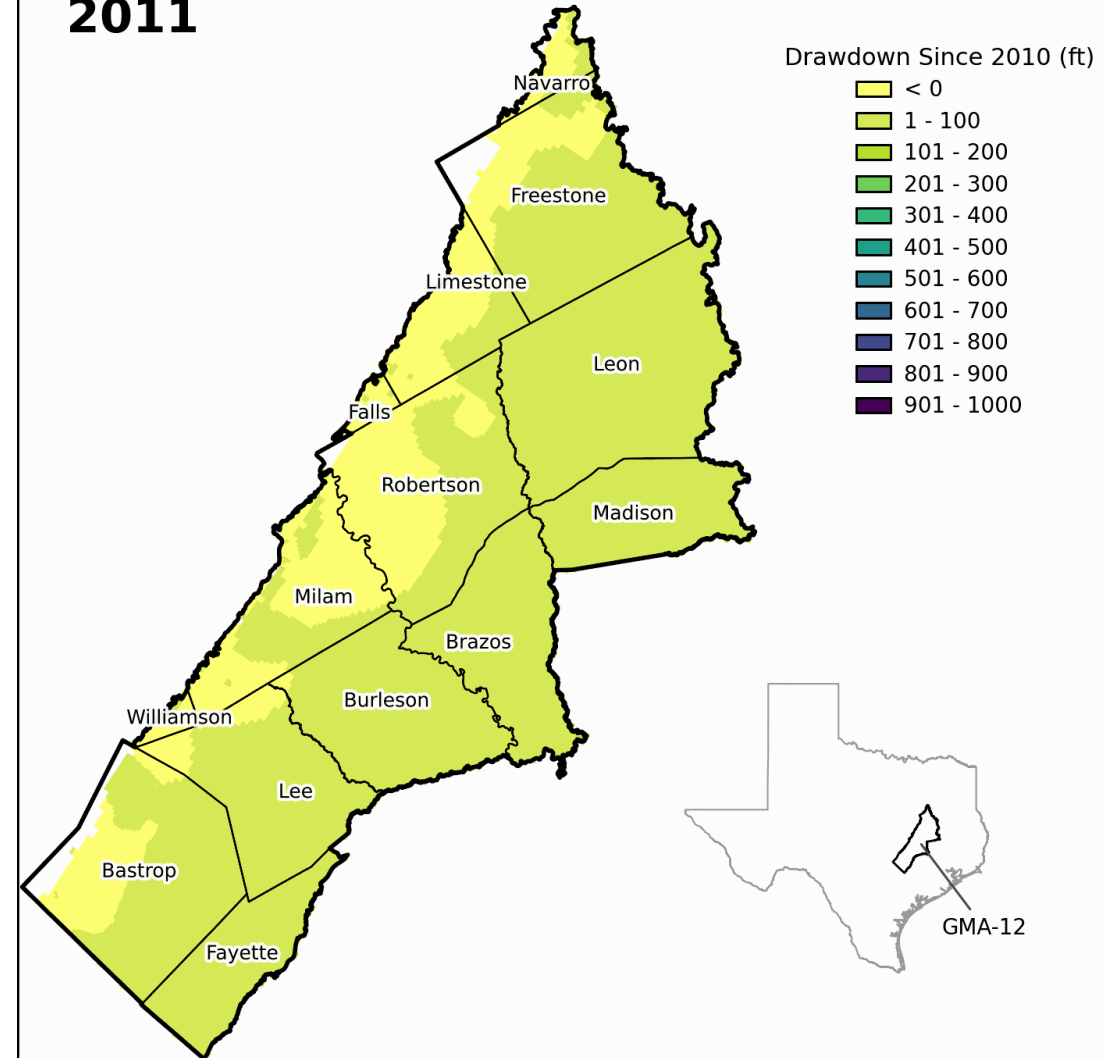


Model: Central SP-QC-CW GAM v.3.02

Drawdown = $WL_{31Dec80} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

PS4-2mod
Hooper:
2011



PS4-2mod Artesian Head Sparta Aquifer

Model: Central SP-QC-CW GAM v.3.02

$$H_{a,\text{remain}} = H_{a,31\text{Dec}80} / H_{a,01\text{Jan}11} * 100\%$$

Artesian Head Code: Spheros Python Script

PS4-2mod Artesian Head Queen City Aquifer

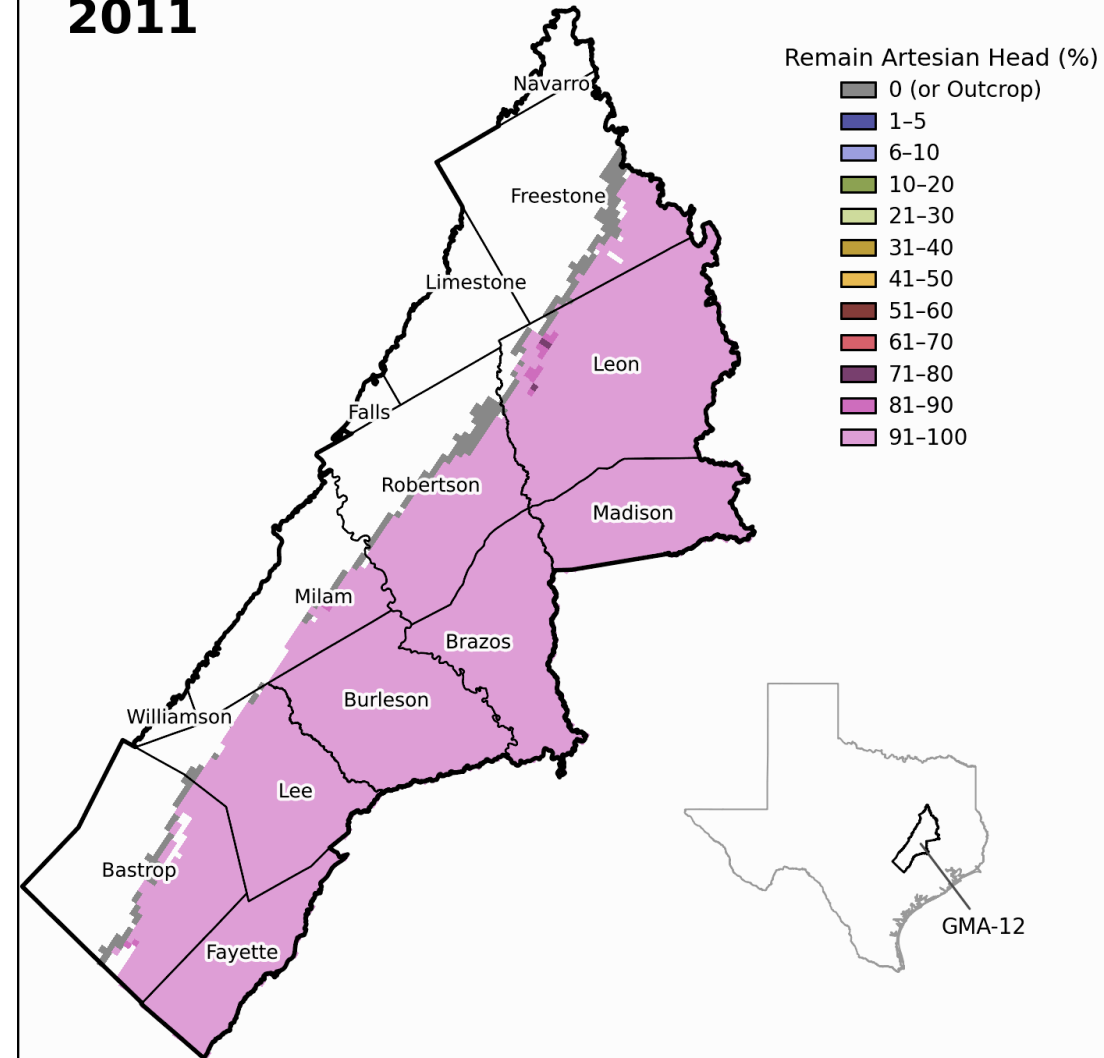
Model: Central SP-QC-CW GAM v.3.02

$$H_{a,\text{remain}} = H_{a,31\text{Dec}80} / H_{a,01\text{Jan}11} * 100\%$$

Artesian Head Code: Spheros Python Script

PS4-2mod Artesian Head Carrizo Aquifer

PS4-2mod
Carrizo:
2011



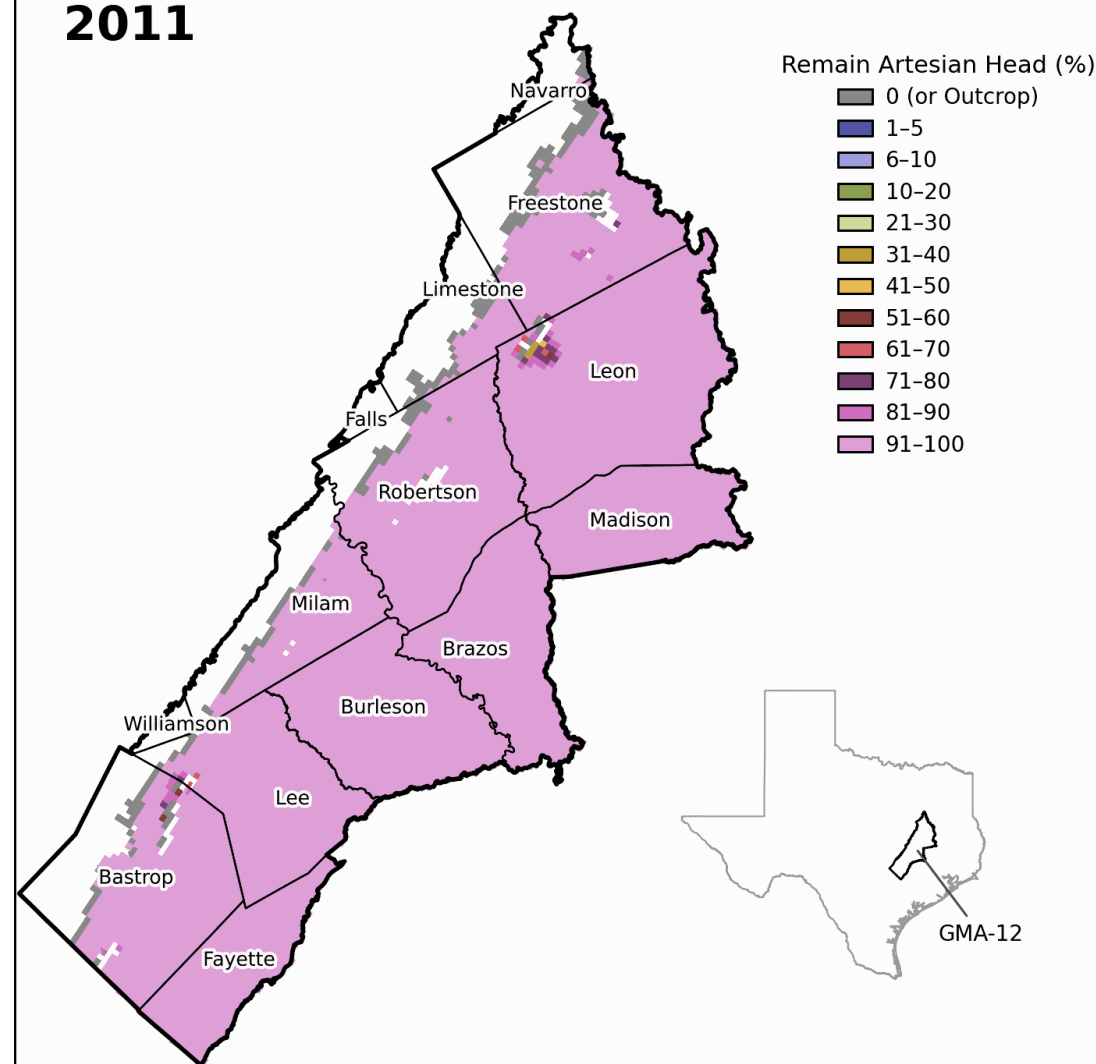
Model: Central SP-QC-CW GAM v.3.02

$$H_{a,remain} = H_{a,31Dec80} / H_{a,01Jan11} * 100\%$$

Artesian Head Code: Spheros Python Script

PS4-2mod Artesian Head Calvert Bluff Aquifer

PS4-2mod
Calvert Bluff:
2011



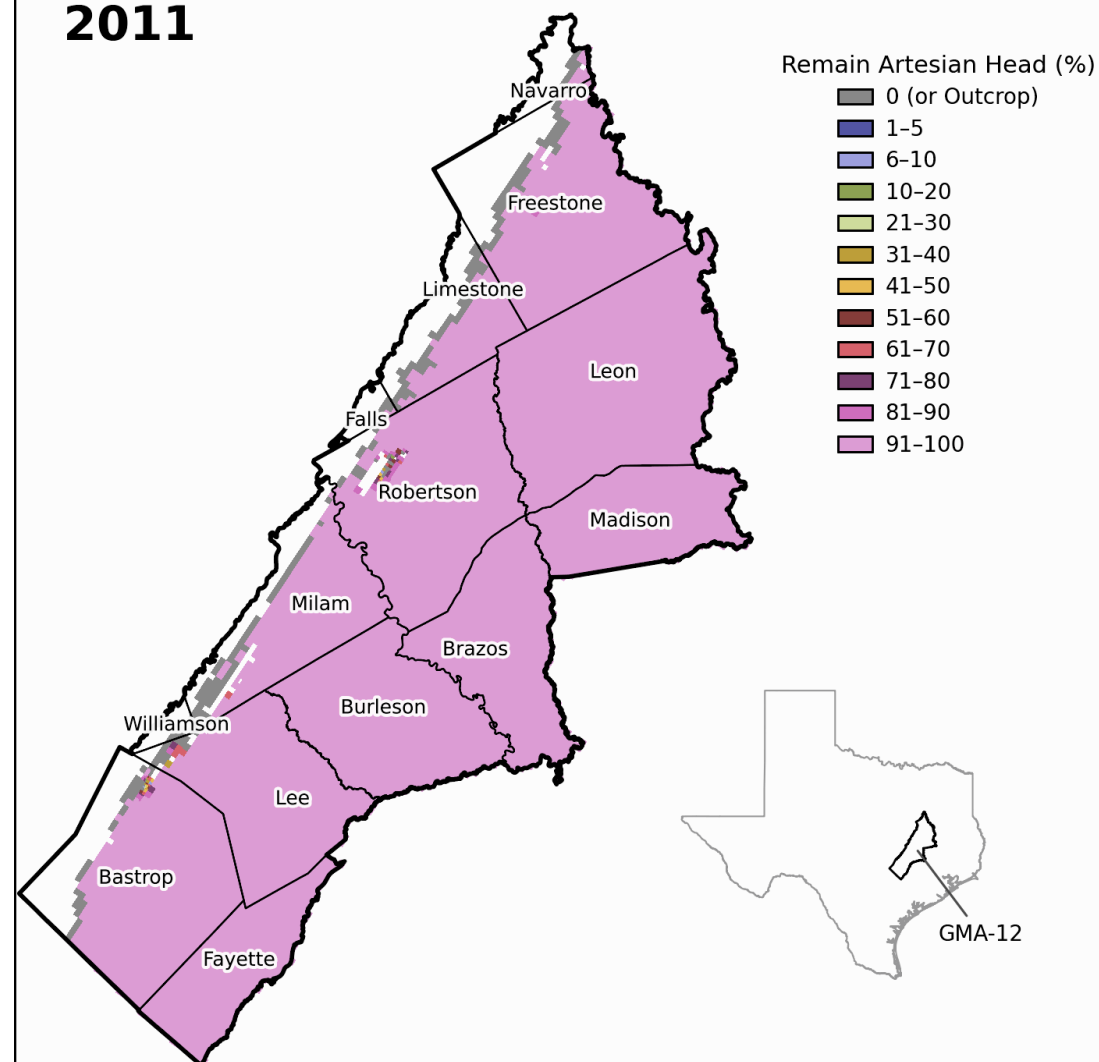
Model: Central SP-QC-CW GAM v.3.02

$$H_{a,remain} = H_{a,31Dec80} / H_{a,01Jan11} * 100\%$$

Artesian Head Code: Spheros Python Script

PS4-2mod Artesian Head Simsboro Aquifer

PS4-2mod
Simsboro:
2011



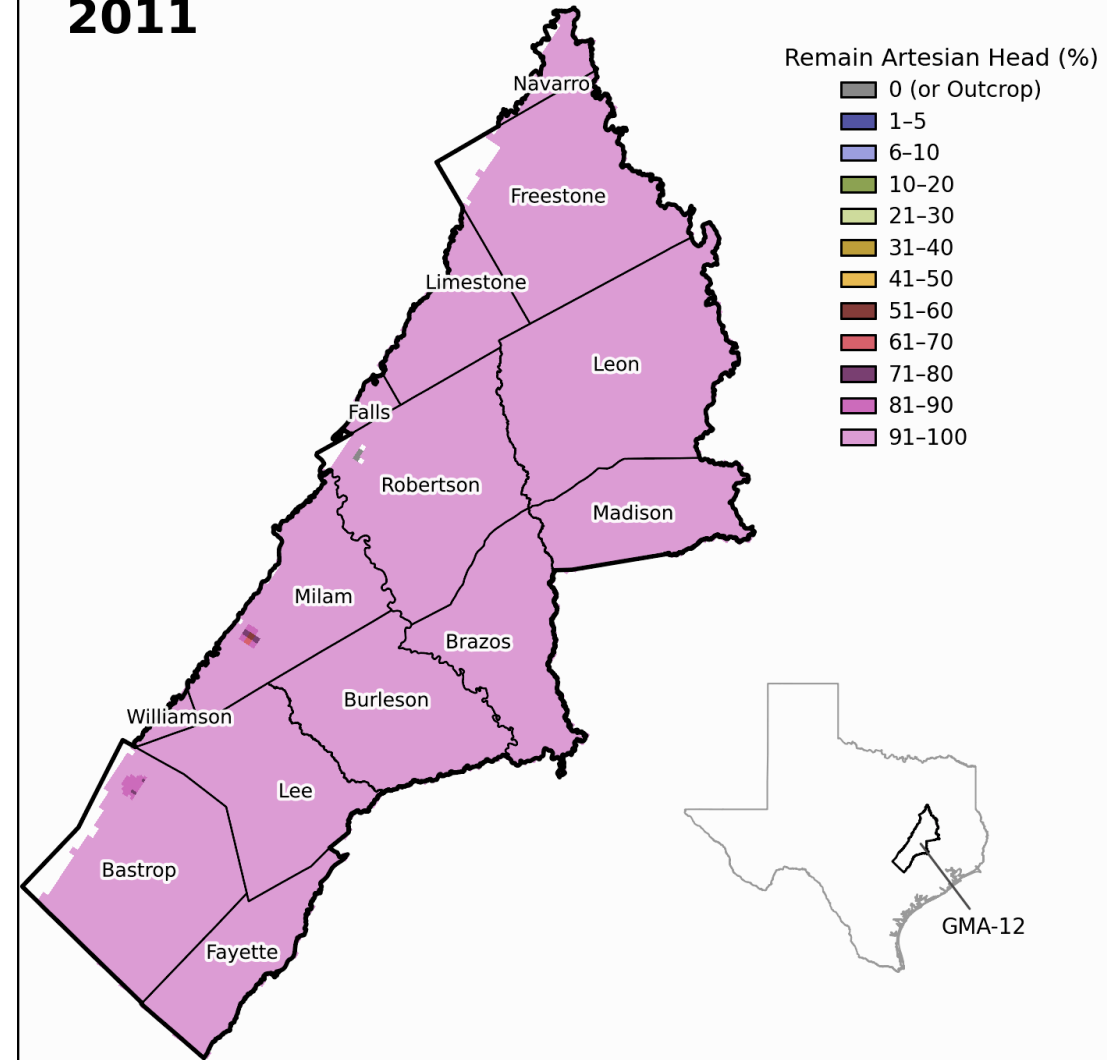
Model: Central SP-QC-CW GAM v.3.02

$$H_{a,remain} = H_{a,31Dec80} / H_{a,01Jan11} * 100\%$$

Artesian Head Code: Spheros Python Script

PS4-2mod Artesian Head Hooper Aquifer

PS4-2mod
Hooper:
2011



Model: Central SP-QC-CW GAM v.3.02

$$H_{a,remain} = H_{a,31Dec80} / H_{a,01Jan11} * 100\%$$

Artesian Head Code: Spheros Python Script

Existing DFCs in 2070 compared to *PS4-2mod drawdowns in 2080*

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	53 56	43 54	22 21	25 22	32 46
5	Queen City	44 45	73 96	28 31	20 19	30 29
7	Carrizo	84 84	140 173	134 137	48 45	146 170
8	Calvert Bluff	111 114	NR	132 132	57 58	156 184
9	Simsboro	262 281	NR	240 257	76 85	278 365
10	Hooper	167 191	NR	138 150	69 77	178 234

Summary

- **Addition of GMA-13 increases drawdown in LPGCD and FCGCD**
 - Noticeable as cone of depression in later timesteps
- **Recommend PS4-2_v8.wel as final well file for PS4-2mod simulations**
 - Incorporates GMA-11, GMA-13, and Williamson County as best as currently possible
 - In LPGCD, remains on same trajectory at PS3-19