Proposed PS4-5 Simulations

Presented to GMA-12
November 9, 2026

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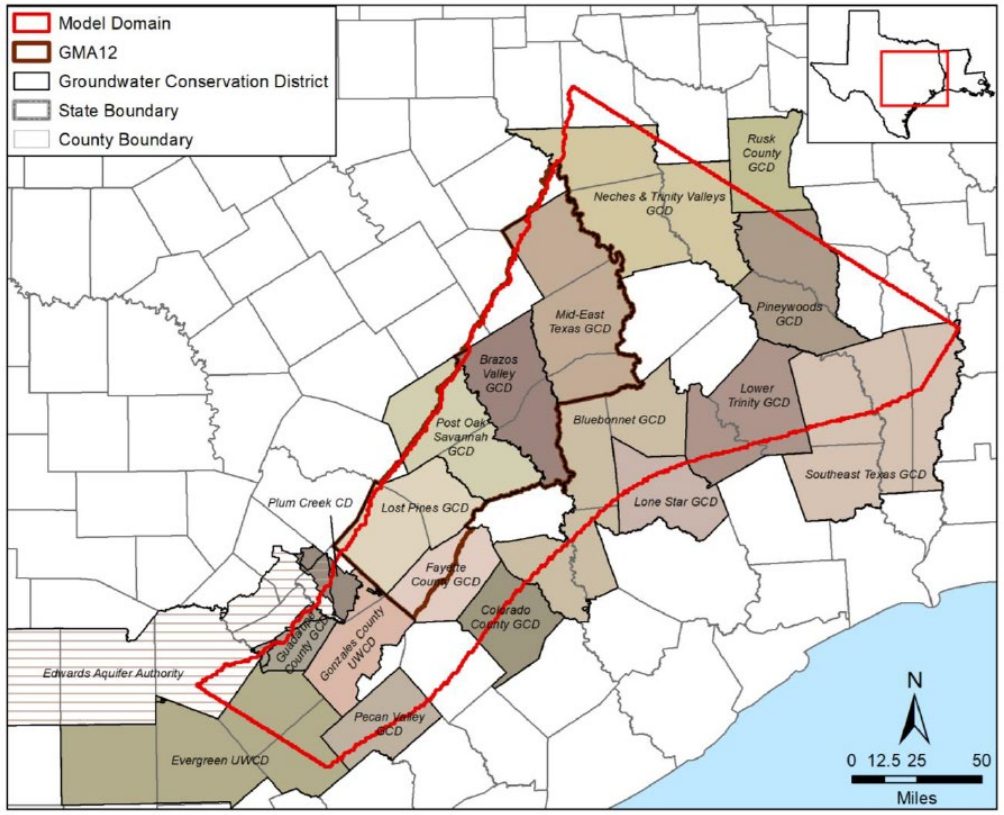
SPHEROS ENVIRONMENTAL

LOST PINES GROUNDWATER CONSERVATION DISTRICT

GMA-12 Modeling

- **GMA-12**
  - PS4-1: All Permit Scenario
  - PS4-2mod: Keep DFCs the same or similar; LPGCD Reductions
- **Proposed**
  - PPS4-3: BVGCD "Best Estimate"
  - PPS4-4: POSGCD, BVGCD Reductions
  - PPS4-5: LPGCD Reductions, Revised



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New PS4-5 Scenario (PPS4-5) - Summary

- **Changes to PS4-4 pumping for Lost Pines and Brazos Valley**
  - Consistent with stated intents of other districts
    - PS4-2mod for Brazos Valley and others, PS4-4 for Post Oak Savannah
  - Lost Pines pumping increased to replicate PS4-2mod values
    - Ultimately returns GMA-12 wide pumping to around 550,000 afy
    - Reclaims cuts made to LPGCD pumping that were not paralleled by other districts
- **POSGCD and LPGCD have nearly identical pumping rates in 2080 – around 118,500 afy**

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Development of PPS4-5

- **Method for increasing Lost Pines pumping to replicate PS4-2mod values**
  - Starts with 2020-2025 average actual rates which increase by 1% per year
  - Adds Phase 2 for Recharge Water LP in 2030 (25,000 afy)
  - Begins curtailment in 2030 for Carrizo-Wilcox formations, later for others
  - Curtailment only happens if a user's predicted rate is higher than their curtailment rate (i.e., permit rate x curtailment factor)
  - Curtailment factor: 8% in Simsboro, 12% in all others

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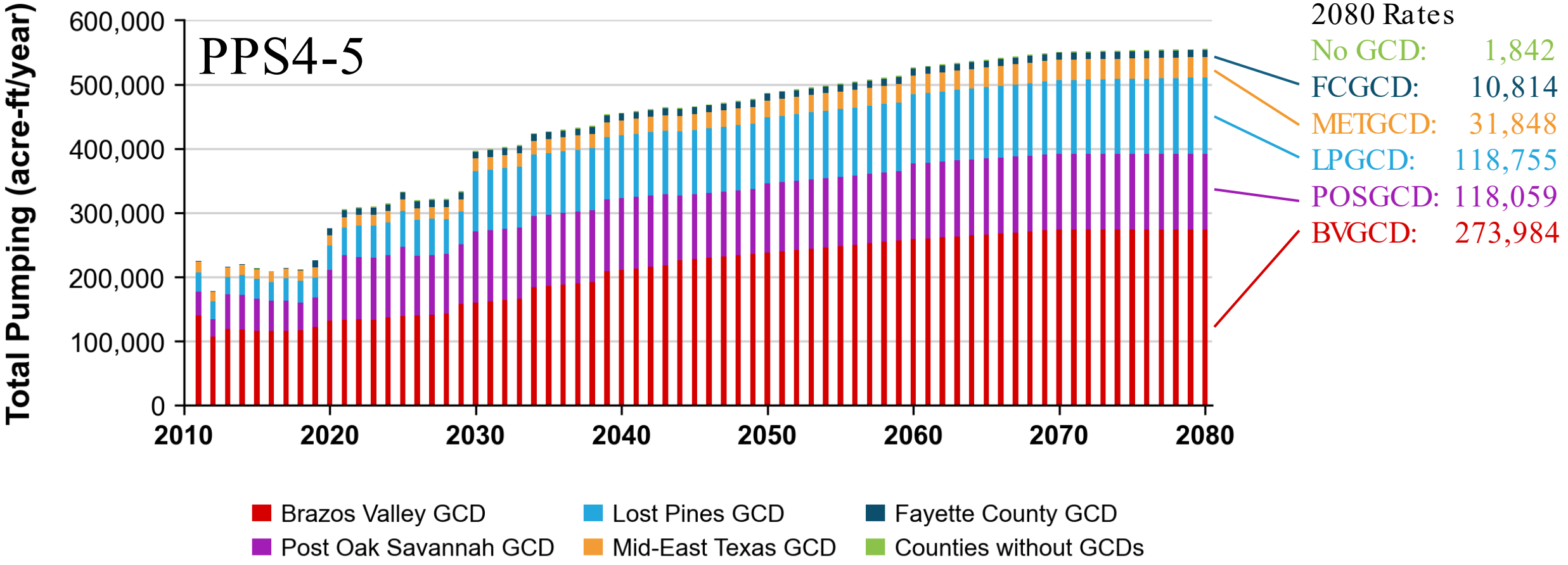
Total pumping rates return to around 555,000 afy by 2080 in PPS4-5



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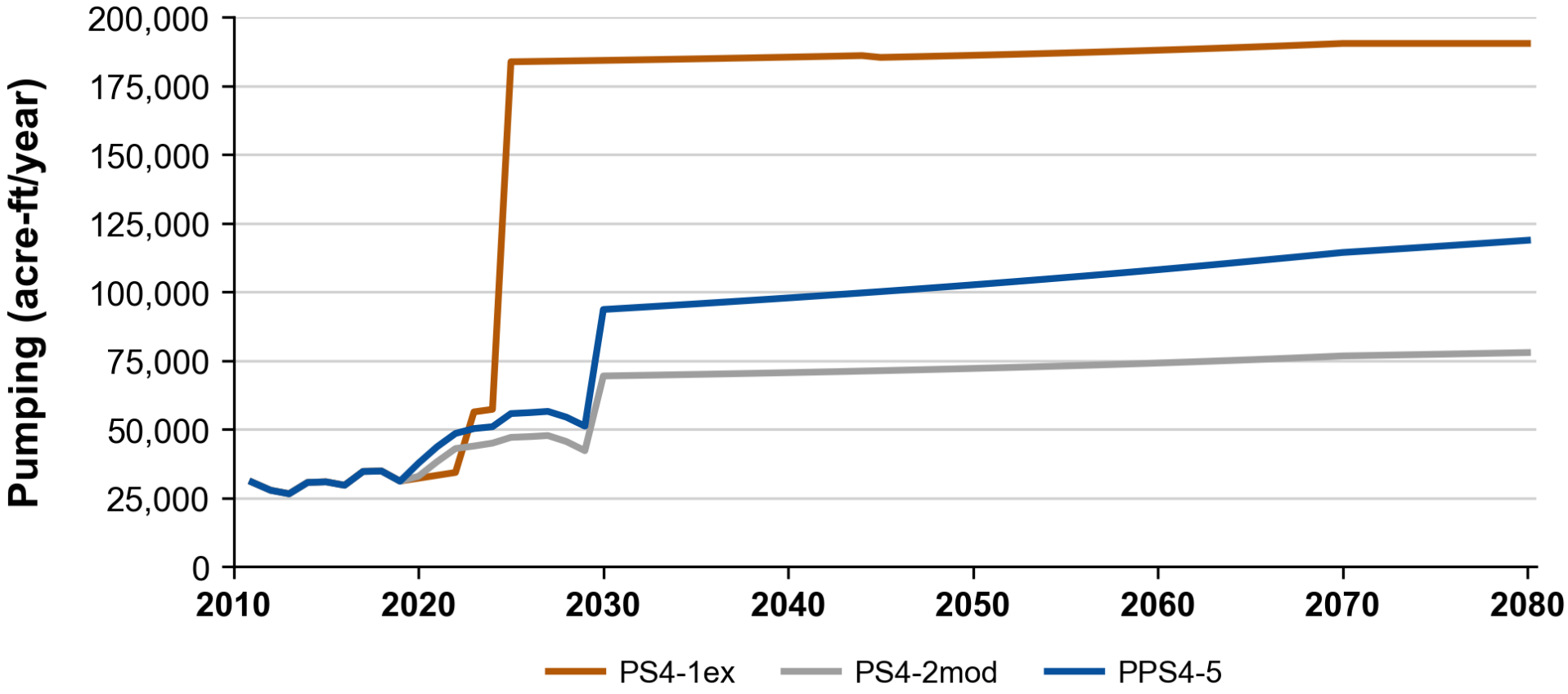
Lost Pines GCD pumping by scenario



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Drawdown based on PPS4-5

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	56	58	23	22	46
5	Queen City	45	99	33	18	29
7	Carrizo	78	179	141	44	152
8	Calvert Bluff	112	NR	143	56	170
9	Simsboro	268	NR	261	81	326
10	Hooper	179	NR	159	73	214

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Drawdown = $WL_{31Dec79} - WL_{01Jan11}$ (ft)

Grid file: czwx_v3_02_MFUSG_ModelGrid121823.intera.csv

DD Calculation Code: Spheros Python Script

Existing DFCs in 2070 compared to *PPS4-5 drawdowns in 2080*

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	53 | 56	43 | 58	22 | 23	25 | 22	32 | 46
5	Queen City	44 | 45	73 | 99	28 | 33	20 | 18	30 | 29
7	Carrizo	84 | 78	140 | 179	134 | 141	48 | 44	146 | 152
8	Calvert Bluff	111 | 112	NR	132 | 143	57 | 56	156 | 170
9	Simsboro	262 | 268	NR	240 | 261	76 | 81	278 | 326
10	Hooper	167 | 179	NR	138 | 159	69 | 73	178 | 214

SPHEROS ENVIRONMENTAL

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

Drawdown = $WL_{31Dec79} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

Difference between PS4-2mod and PPS4-5 wel files

Layer		BVGCD	FCGCD	LPGCD	METGCD	POSGCD
3	Sparta	-1.3	1.2	1.1	-0.6	-0.4
5	Queen City	-1.5	2.8	1.4	-0.6	-0.8
7	Carrizo	-5	6	2.5	-1.5	-18
8	Calvert Bluff	-7	NR	1.4	-2.3	-18
9	Simsboro	-15	NR	-0.8	-3.9	-43
10	Hooper	-11	NR	1.6	-3.1	-22

SPHEROS ENVIRONMENTAL

Difference = PS4-2mod – PPS4-5

Drawdown = $WL_{31Dec79} - WL_{01Jan11}$ (ft)

Grid file: czwx_v3_02_MFUSG_ModelGrid121823.intera.csv

DD Calculation Code: Spheros Python Script

Table 1. Comparison of Current DFCs and DFCs simulated by the GAM for Run PS4-2v8, proposed Run 4-4, and PPS4-5. All values are calculated by Spheros' Python scripts.

GCD	Aquifer	Current DFCs (2070)	GAM Simulations		
			DFCs (Jan 2011 to Dec 2079)		
			PS4-2v8	PPS4-4	PPS4-5
POSGCD	Sparta	32	46	45	46
	Queen City	30	30	29	29
	Carrizo	146	170	146	152
	Calvert Bluff	156	189	155	170
	Simsboro	278	369	288	326
	Hooper	178	236	189	214
BVGCD	Sparta	53	57	56	56
	Queen City	44	46	45	45
	Carrizo	84	83	79	78
	Calvert Bluff	111	119	103	112
	Simsboro	262	283	238	268
	Hooper	167	190	160	179
LPGCD	Sparta	22	22	21	23
	Queen City	28	31	30	33
	Carrizo	134	139	124	141
	Calvert Bluff	132	141	120	143
	Simsboro	240	261	212	261
	Hooper	138	157	131	159

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LPGCD Remaining Artesian Head Percent (Average by Registered LPGCD Wells)

Layer		PS4-2mod	PPS4-5
3	Sparta	76%	75%
5	Queen City	74%	73%
7	Carrizo	44%	42%
8	Calvert Bluff	41%	33%
9	Simsboro	66%	55%
10	Hooper	69%	63%

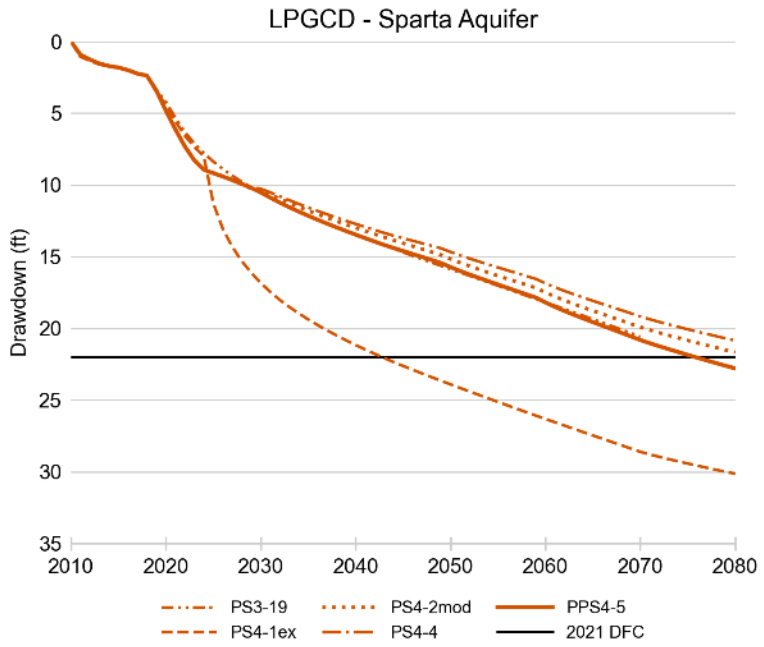
SPHEROS ENVIRONMENTAL

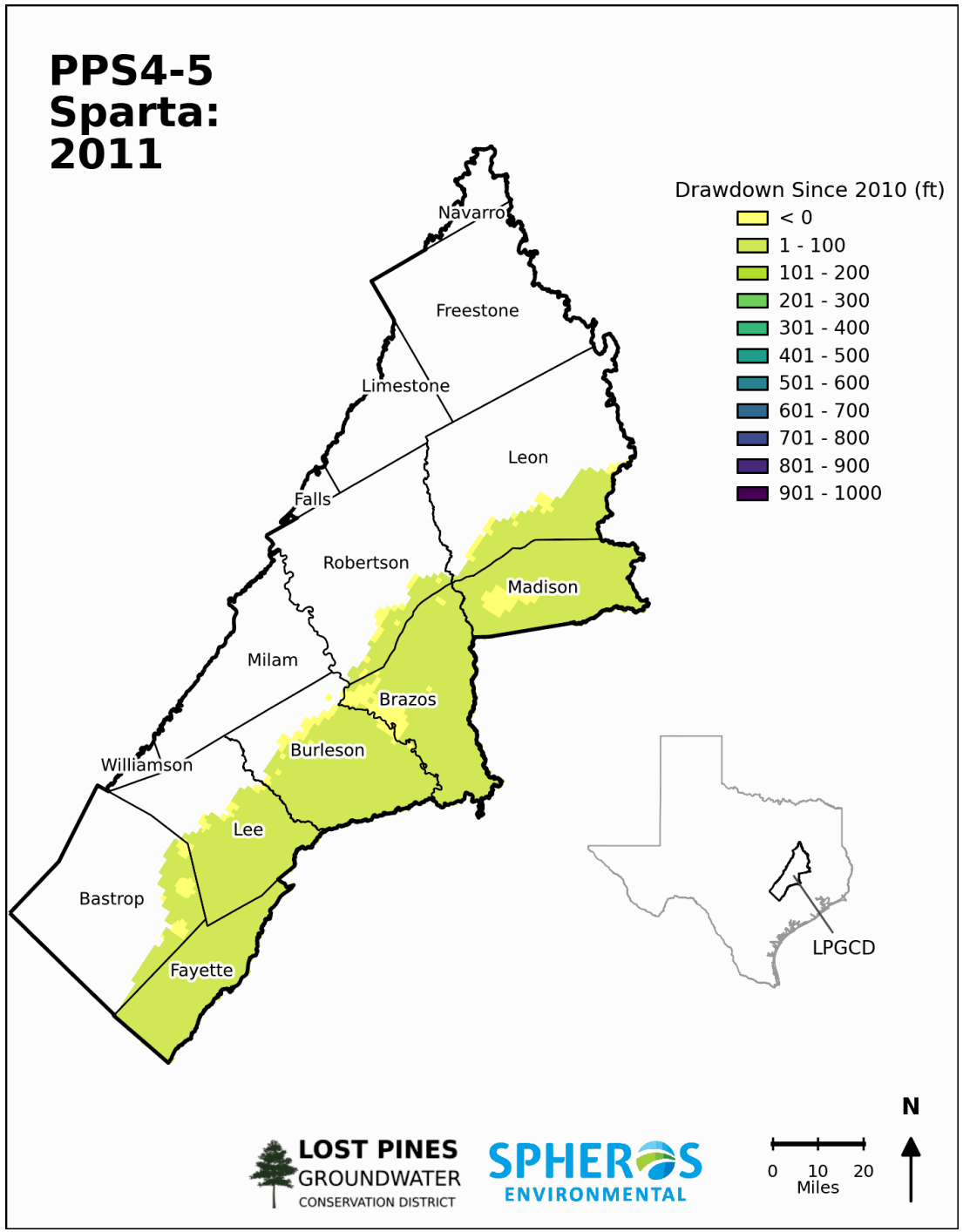
Model: Central SP-QC-CW GAM v.3.02

Drawdown = $WL_{31Dec79} - WL_{01Jan11}$ (ft)

DD Calculation Code: Spheros Python Script

PPS4-5 Drawdown Sparta Aquifer





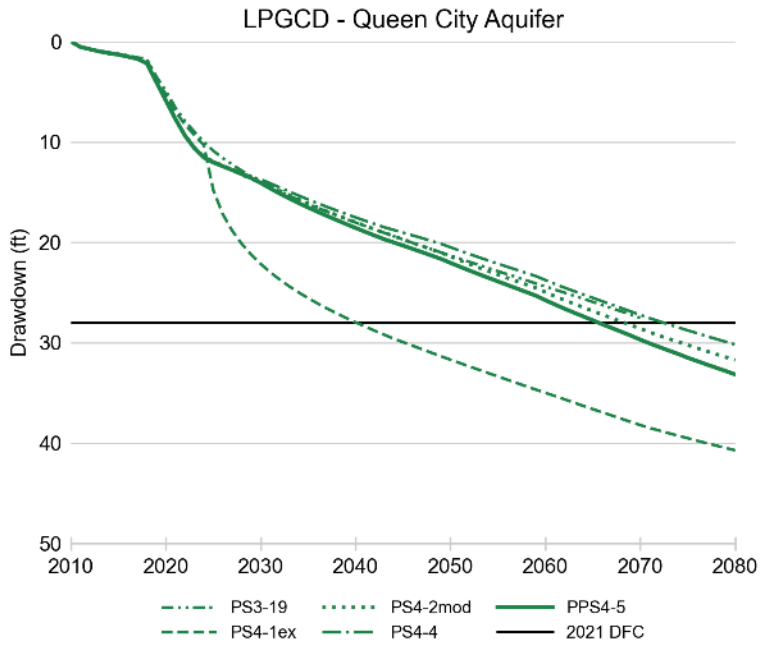
SPHEROS ENVIRONMENTAL

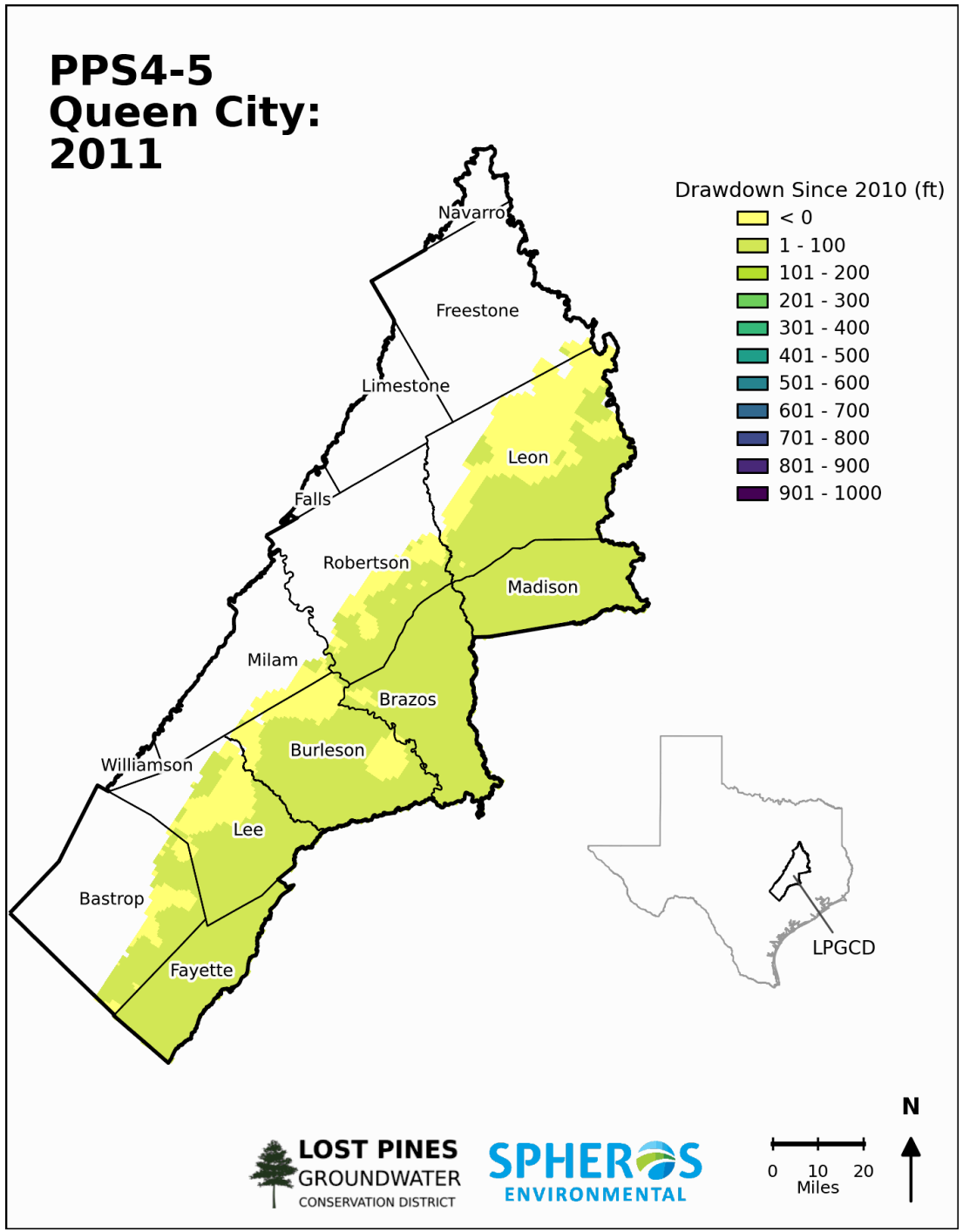
Model: Central SP-QC-CW GAM v.3.02

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

DD Calculation Code: Spheros Python Script

PPS4-5 Drawdown Queen City Aquifer





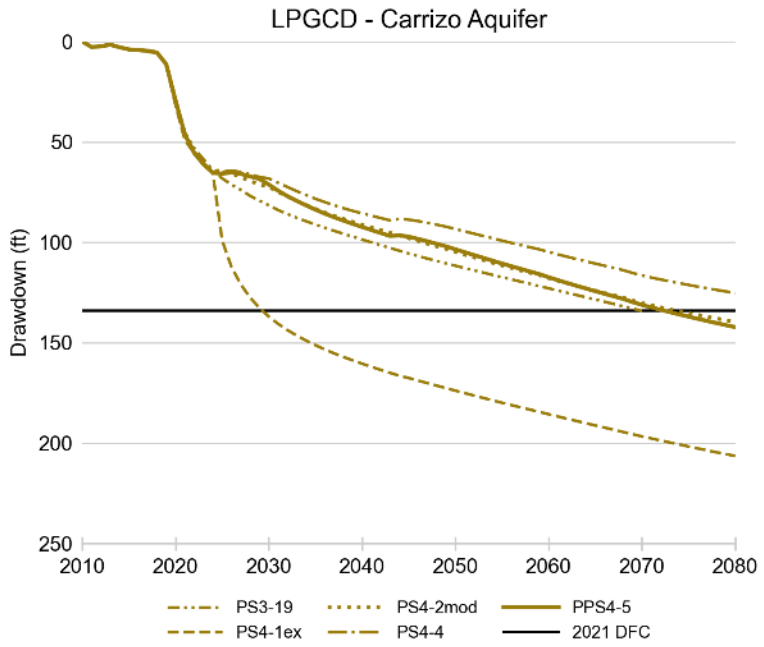
SPHEROS ENVIRONMENTAL

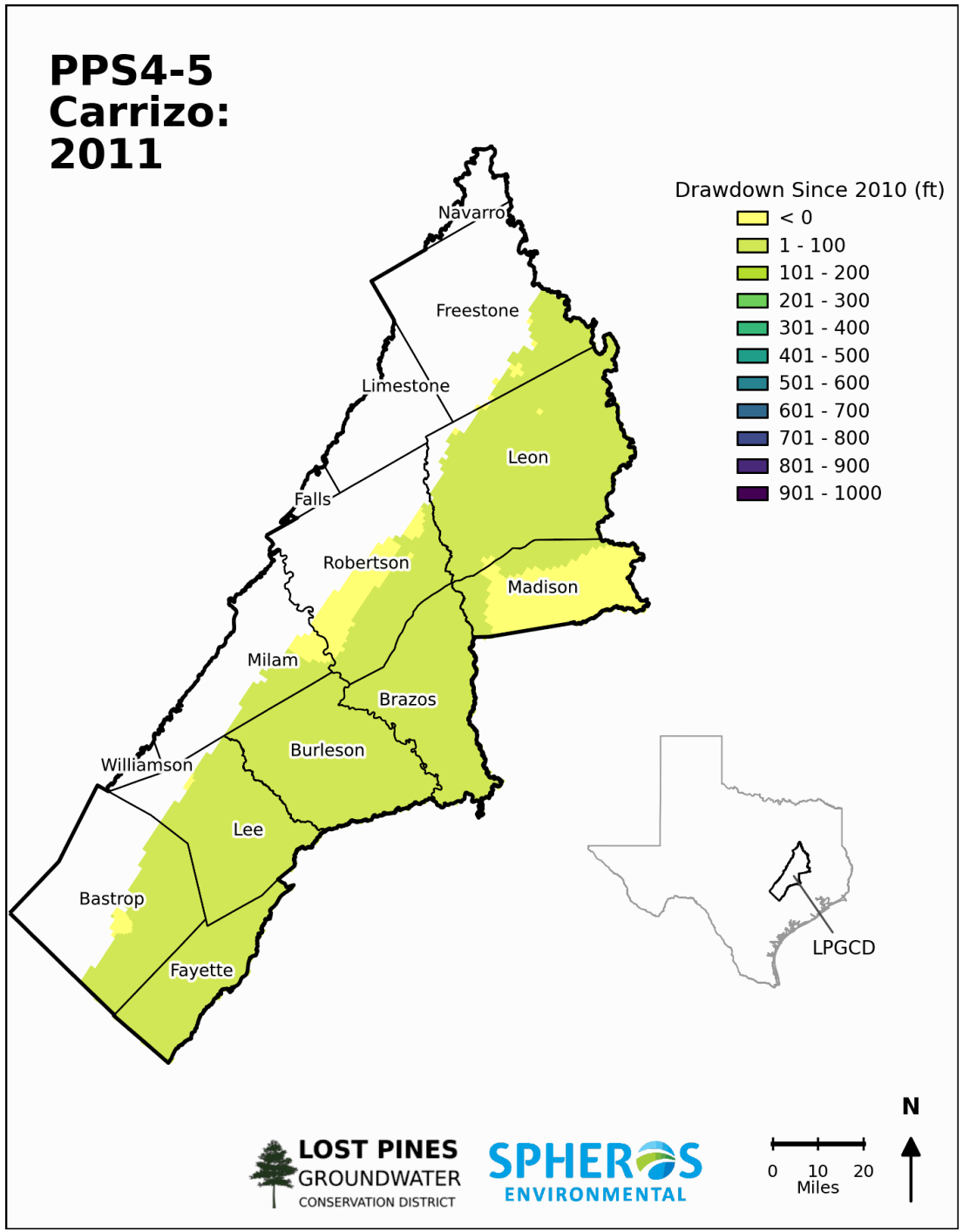
Model: Central SP-QC-CW GAM v.3.02

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

DD Calculation Code: Spheros Python Script

PPS4-5 Drawdown Carrizo Aquifer





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

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

DD Calculation Code: Spheros Python Script

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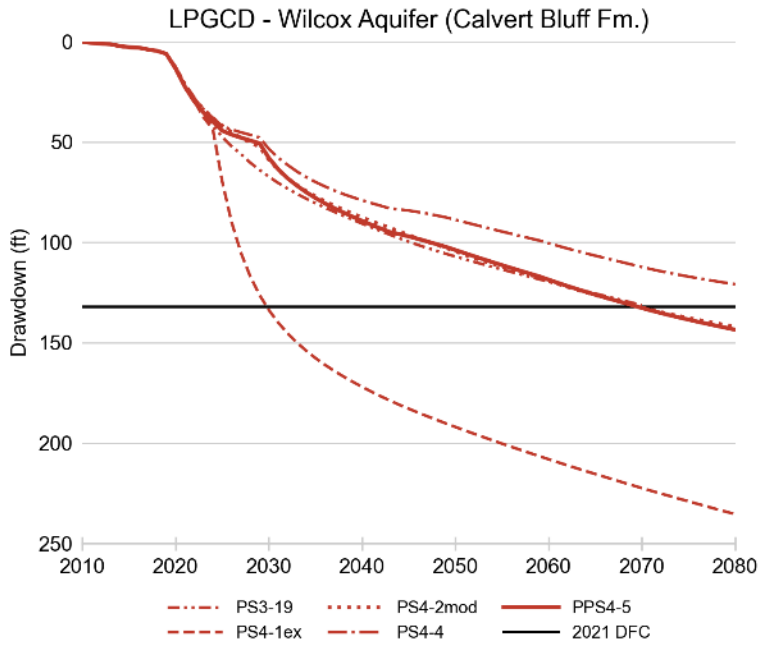
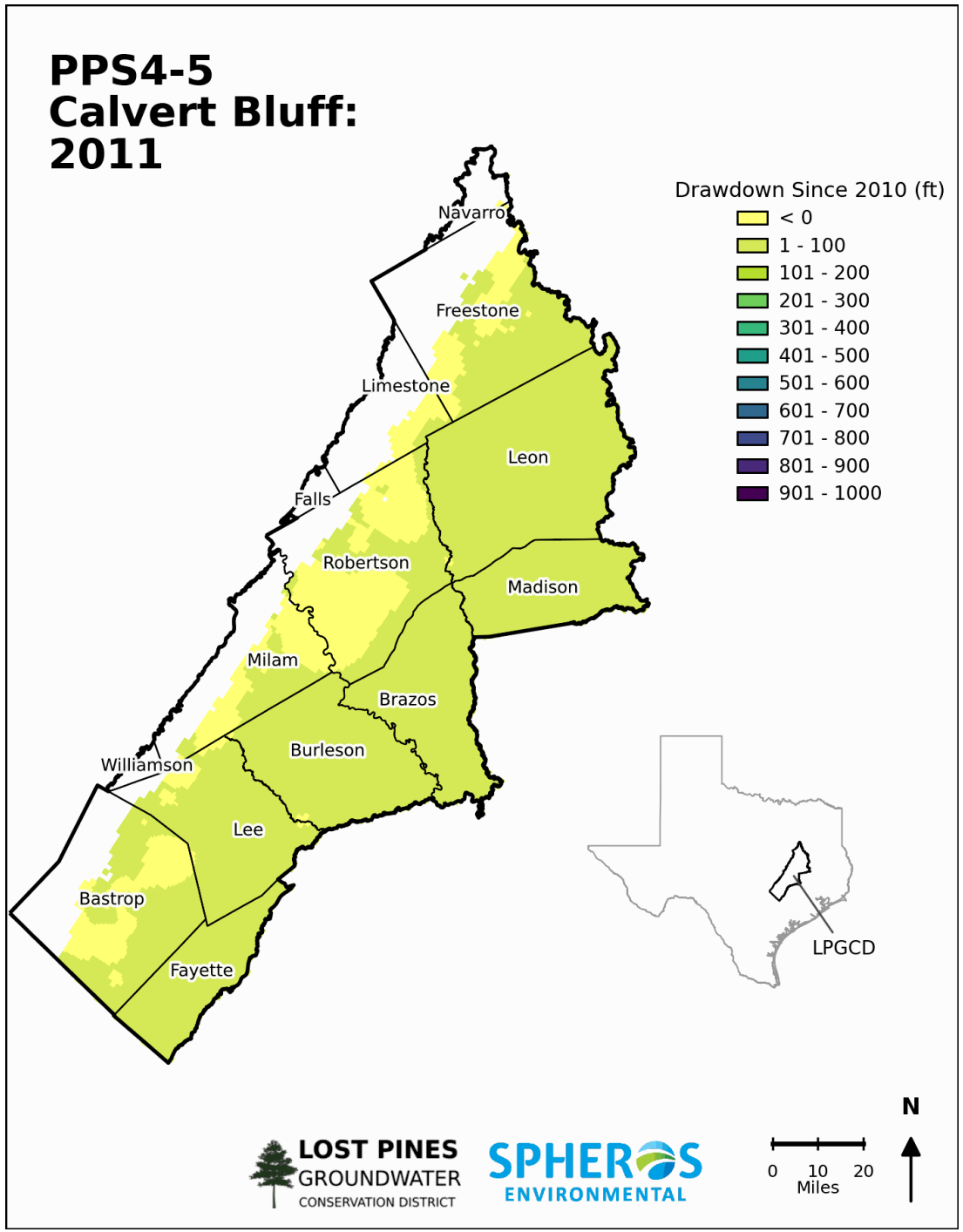
PPS4-5 Drawdown Calvert Bluff Aquifer





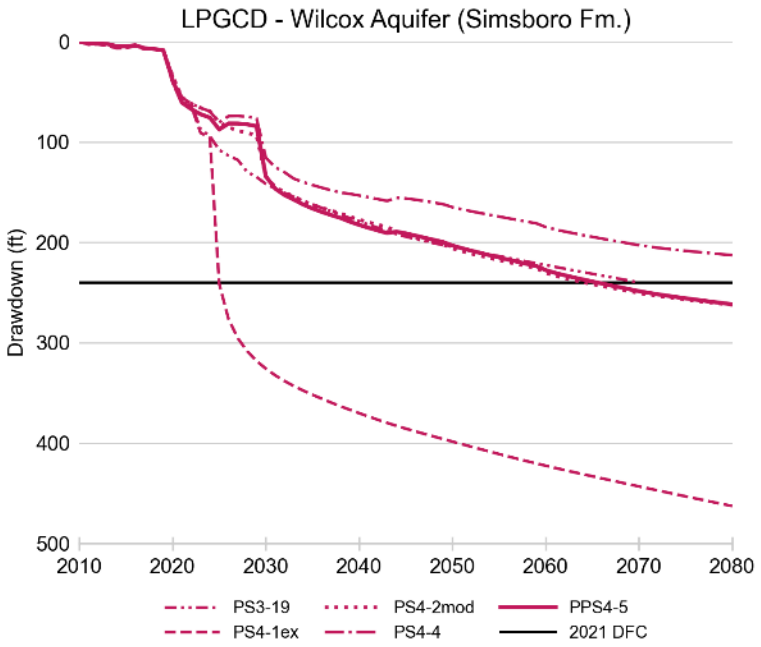
SPHEROS ENVIRONMENTAL

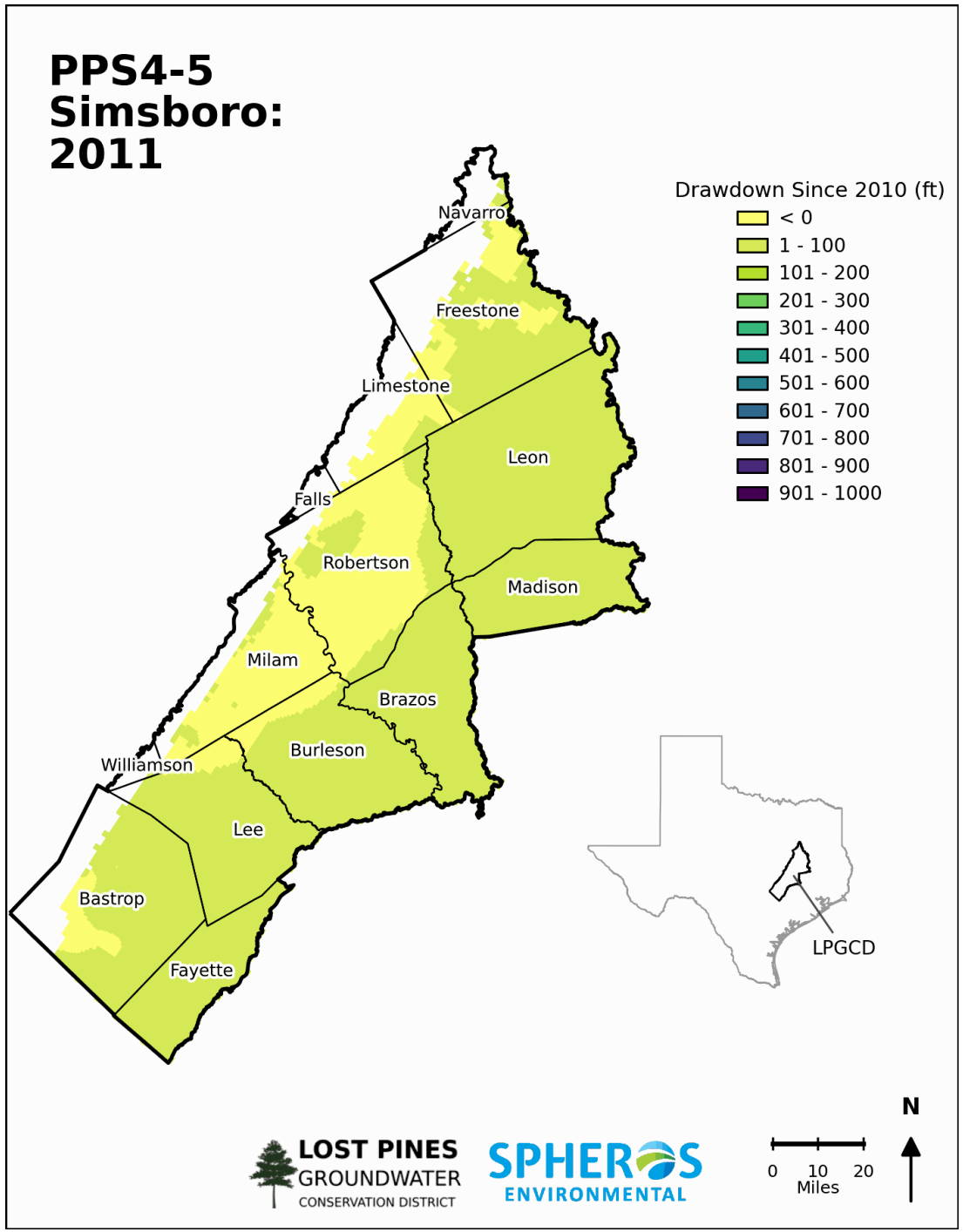
Model: Central SP-QC-CW GAM v.3.02

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

DD Calculation Code: Spheros Python Script

PPS4-5 Drawdown Simsboro Aquifer





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

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

DD Calculation Code: Spheros Python Script

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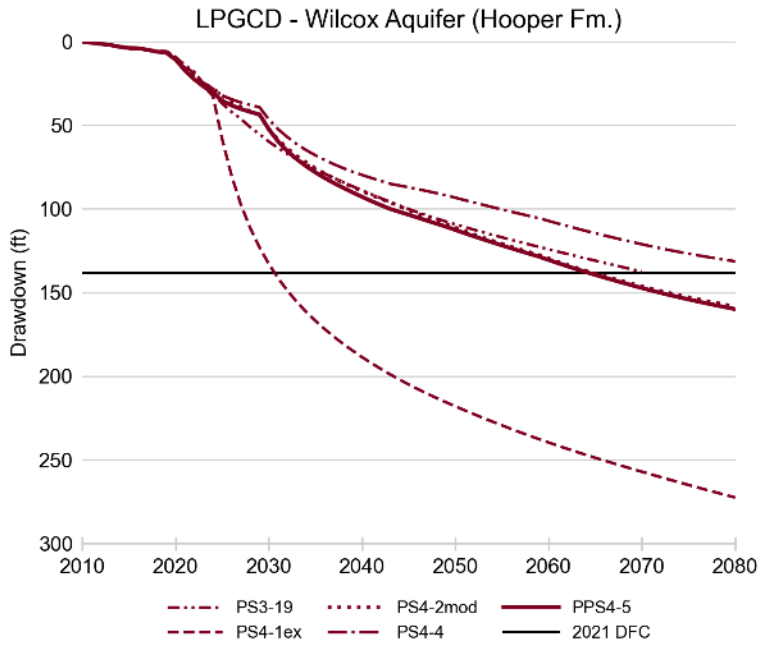
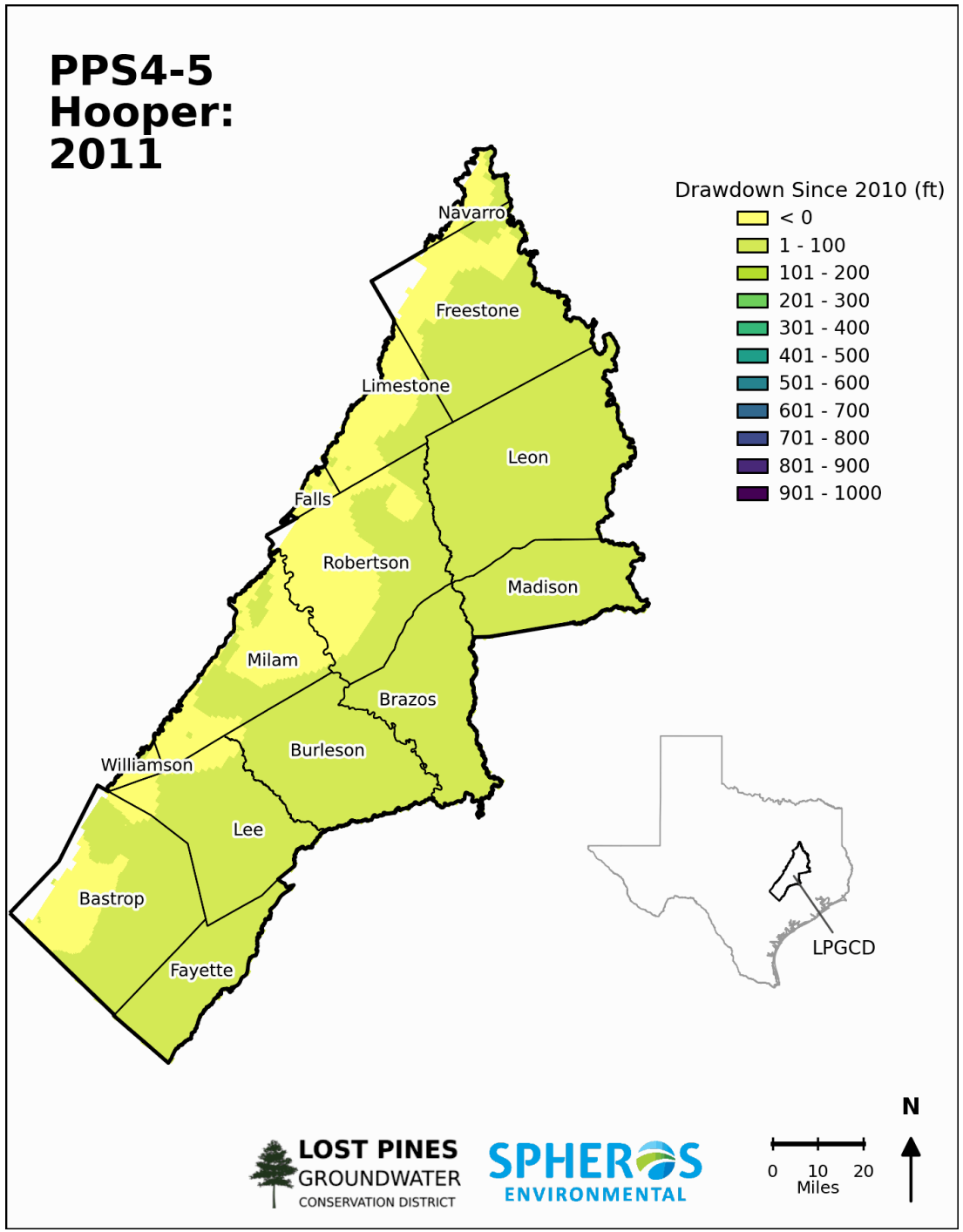
PPS4-5 Drawdown Hooper Aquifer





SPHEROS ENVIRONMENTAL

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

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

DD Calculation Code: Spheros Python Script

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

18,000 AF/Y of groundwater flows from LPGCD into POSGCD in PS4-2v8.

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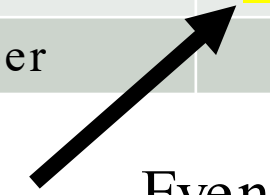
Values in acre-feet per year
Positive = Into Aquifer
Negative = Out of Aquifer

LPGCD Water Balance in 2080 (PS4-4.wel)

Layer		Lateral Flow			Recharge	Surface Water	Pumping	Storage	GHB	Vertical Flow
		POSGCD	FCGCD	BVGCD/ METGCD						
3	Sparta	-3	-2,794	0	12,364	-1,298	-3,153	1,640	-2,283	-4682
5	Queen City	828	-5,385	0	11,597	-1,331	-1,837	5,829	0	-6,728
7	Carrizo	-6,134	-4,583	0	9,235	4,628	-12,355	10,551	0	5,203
8	Calvert Bluff	-416	-598	0	22,596	1,080	-3,780	8,732	0	-30,000
9	Simsboro	-9,664	-1,777	0	6,394	7,269	-53,194	4,393	0	47,792
10	Hooper	647	-771	0	7,248	7	-2,255	679	0	-7,615



Even with cutbacks to Vista Ridge in Run 4-4, groundwater still flows from LPGCD into POSGCD

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

LPGCD Water Balance 2080 (PPS4-5.wel)

Layer		Lateral Flow			Recharge	Surface Water	Pumping	Storage	GHB	Vertical Flow
		POSGCD	FCGCD	BVGCD/ METGCD						
3	Sparta	19	-2,780	0	12,364	-918	-3,350	1,872	-2,165	-5.475
5	Queen City	856	-5,501	0	11,597	-1,049	-1,960	6,476	0	-7,690
7	Carrizo	-5,738	-3,676	0	9,235	5,041	-16,836	13,256	0	2,872
8	Calvert Bluff	-374	-548	0	22,596	4,434	-5,246	14,794	0	-40,945
9	Simsboro	-3,705	-1,445	0	6,394	8,304	-85.638	8,607	0	64,944
10	Hooper	975	-702	0	7,248	358	-2,831	1,349	0	-9,050

Similar pumping in both LPGCD and POSGCD. LPGCD lateral flow into POSGCD is greatly reduced compared with PS4-2v8.

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

Summary of PPS4-5

- Considers LPGCD stakeholder feedback
- Makes 2080 pumping roughly equal for POSGCD and LPGCD
- Keeps desired DFCs for LPGCD – maintain currently adopted DFCs
- Keeps desired pumping for POSGCD, FCGCD, METGCD, and BVGCD

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Stills from Animations

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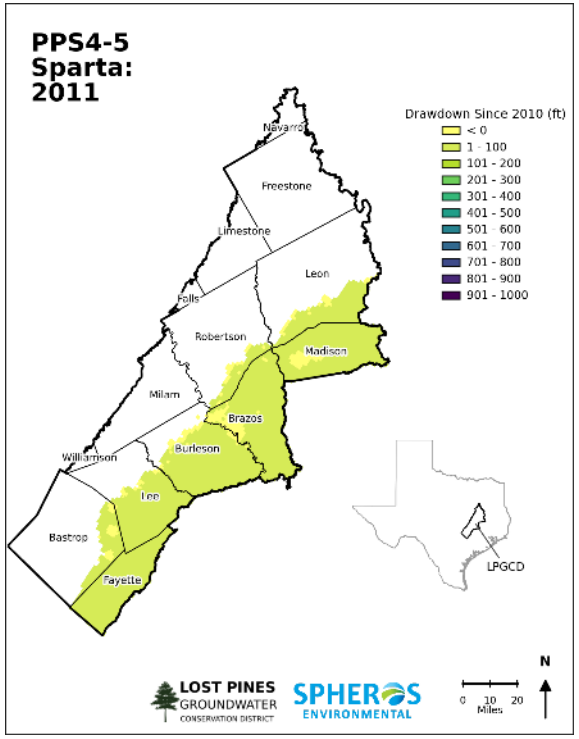
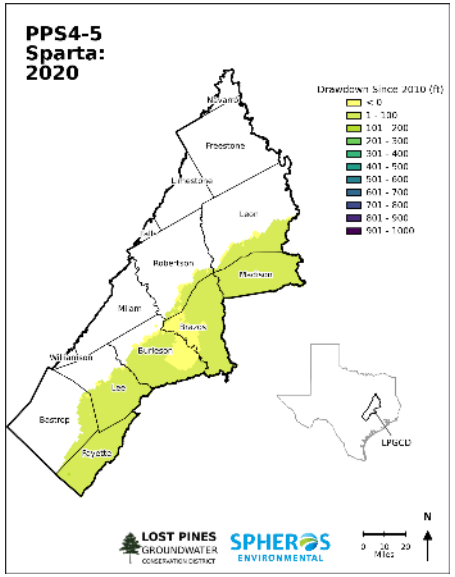
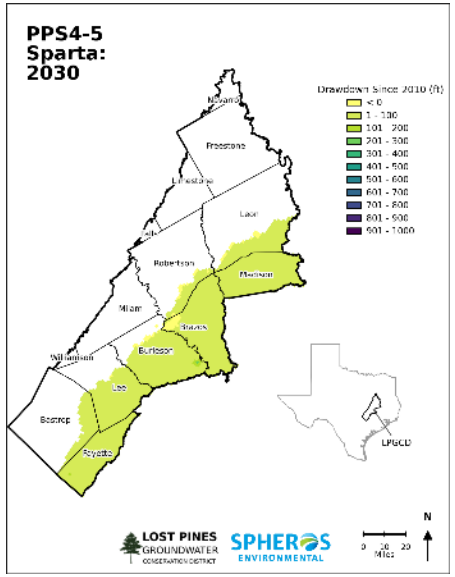
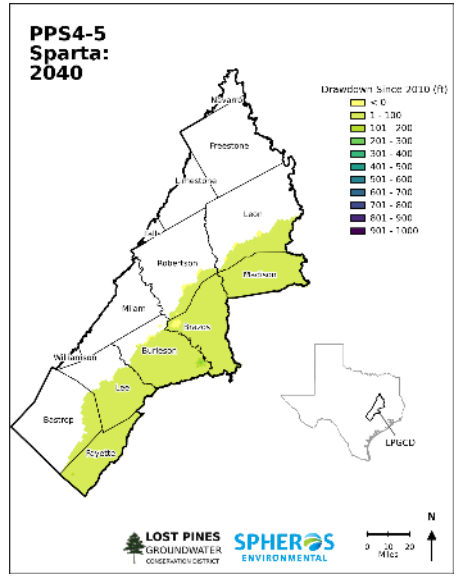
PPS4-5 Drawdown
Sparta Aquifer

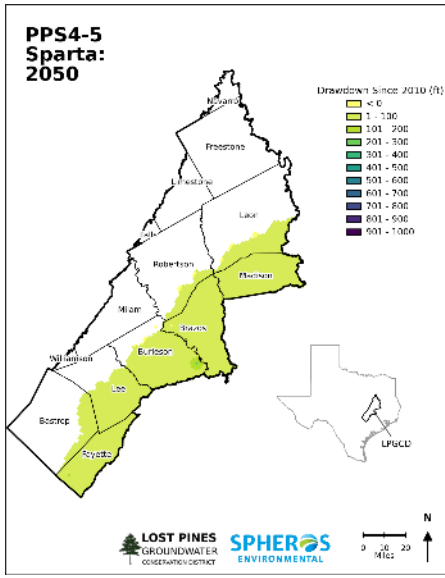
Central SP-QC-CW GAM v.3.02
Layer 3

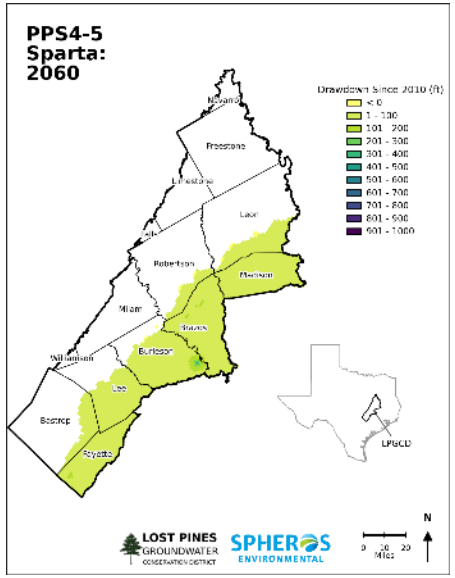


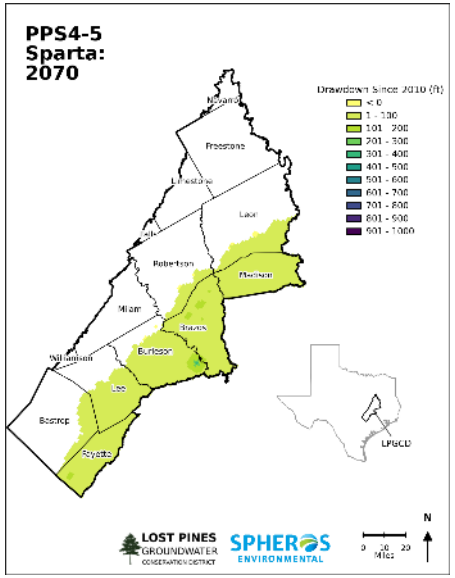


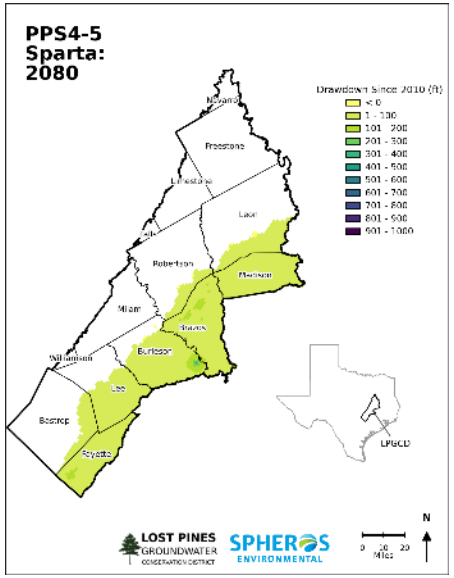












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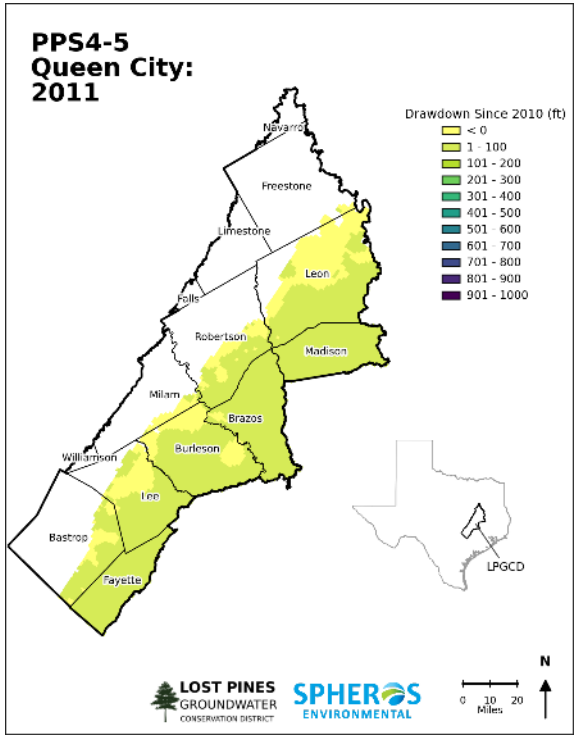
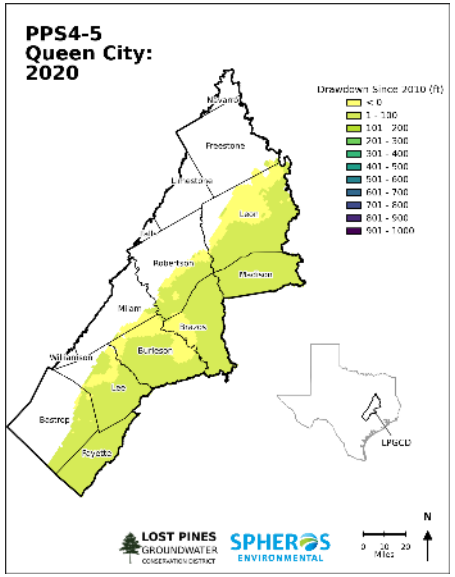
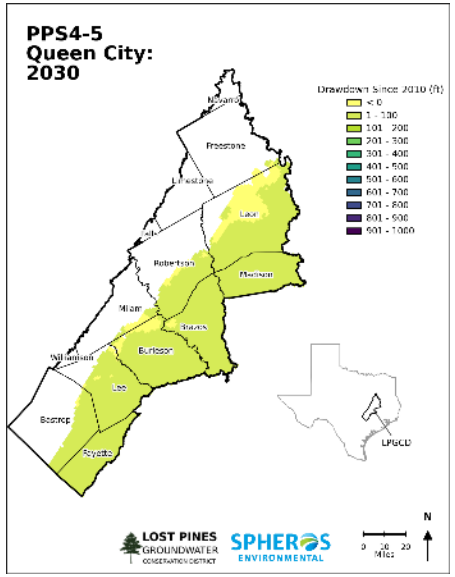
LOST PINES GROUNDWATER CONSERVATION DISTRICT

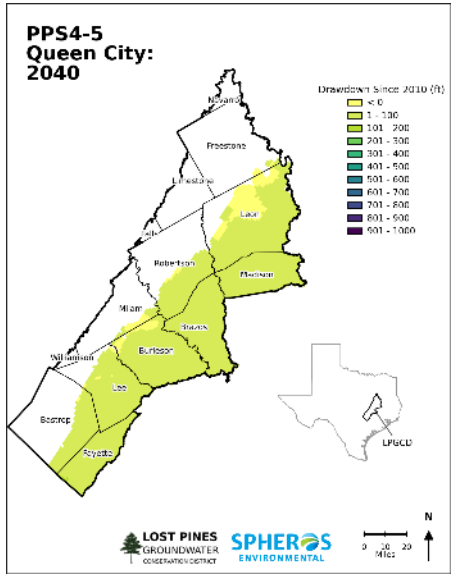
PPS4-5 Drawdown
Queen City Aquifer

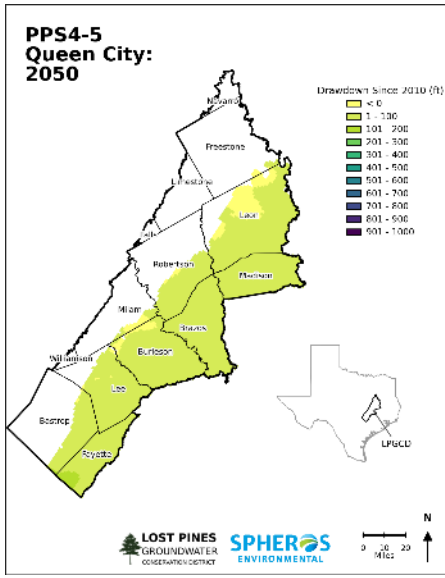
Central SP-QC-CW GAM v.3.02
Layer 5

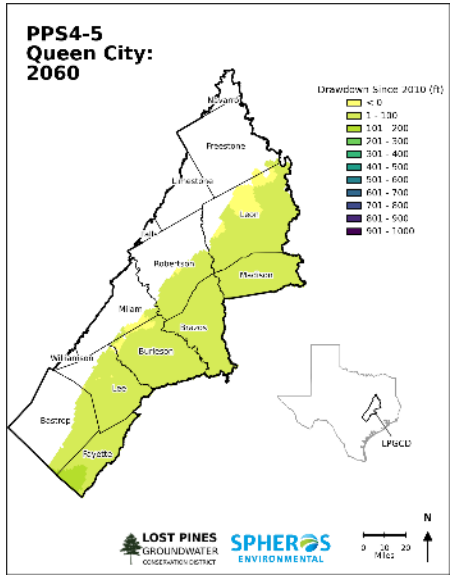


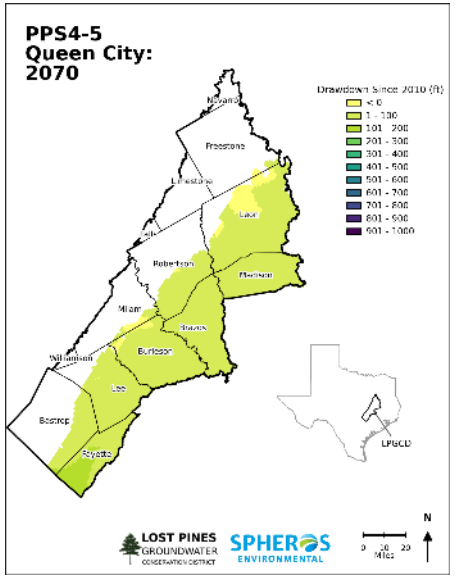


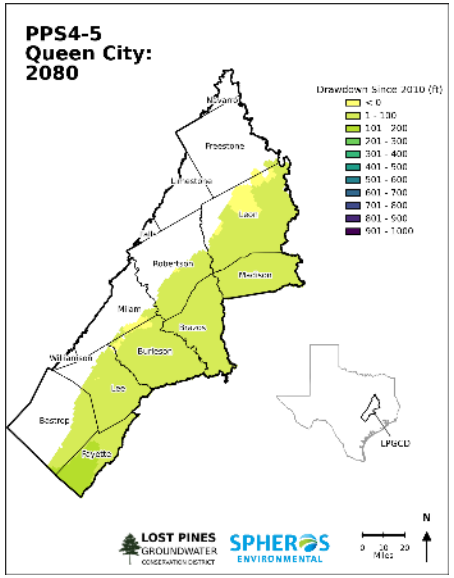












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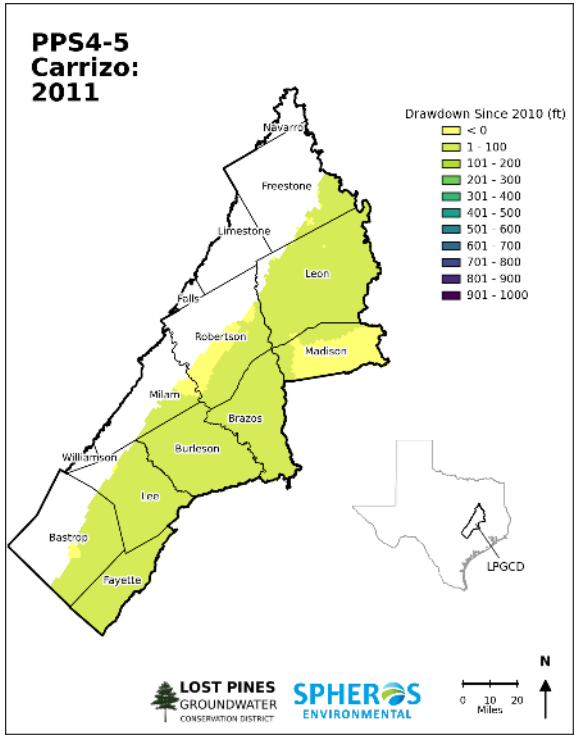
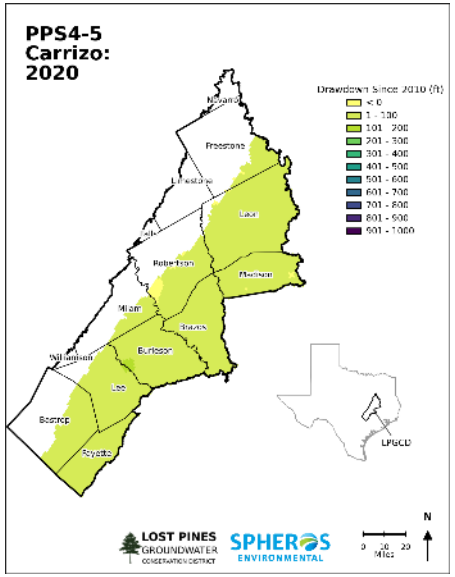
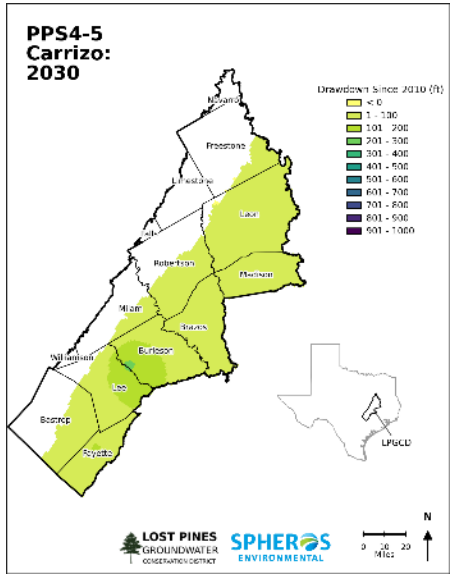
LOST PINES GROUNDWATER CONSERVATION DISTRICT

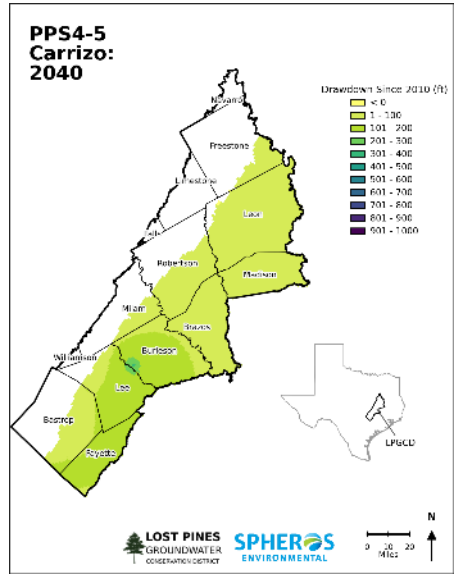
PPS4-5 Drawdown
Carrizo Aquifer

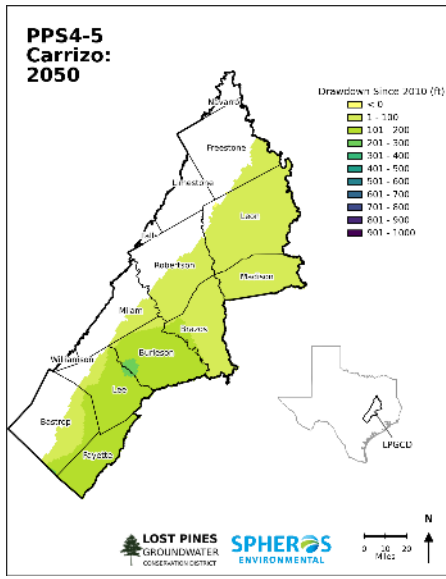
Central SP-QC-CW GAM v.3.02
Layer 7

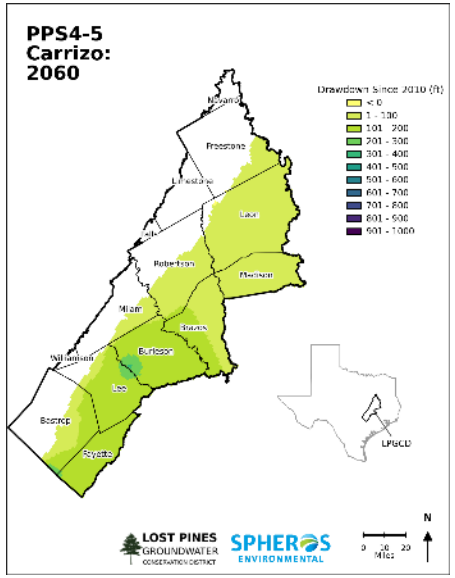


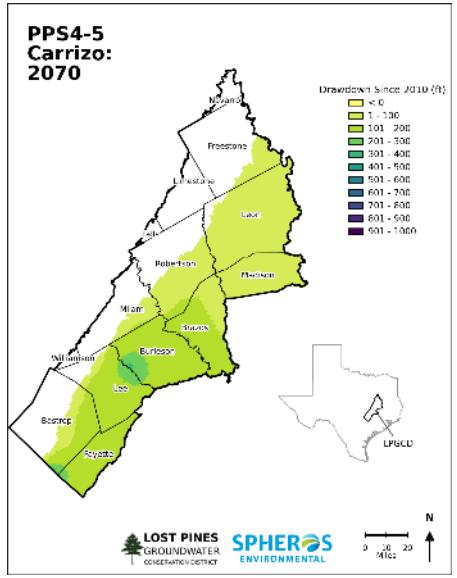


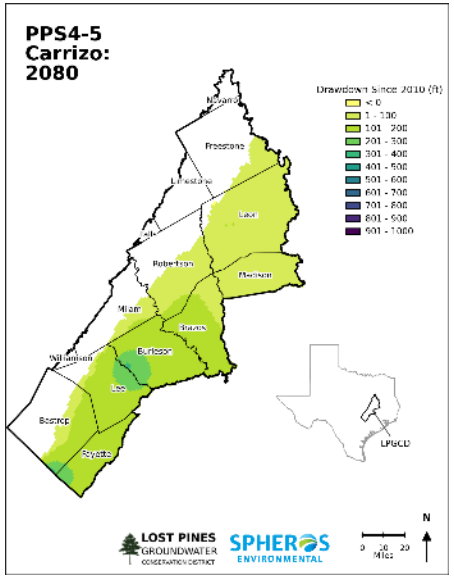










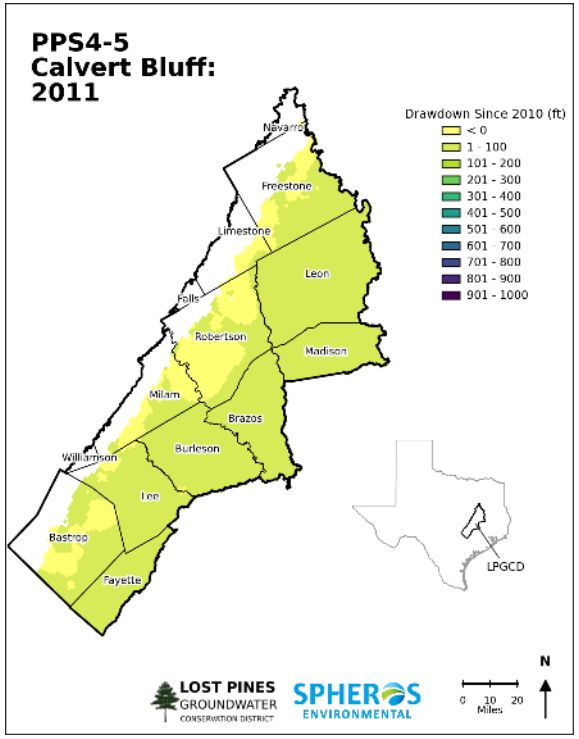


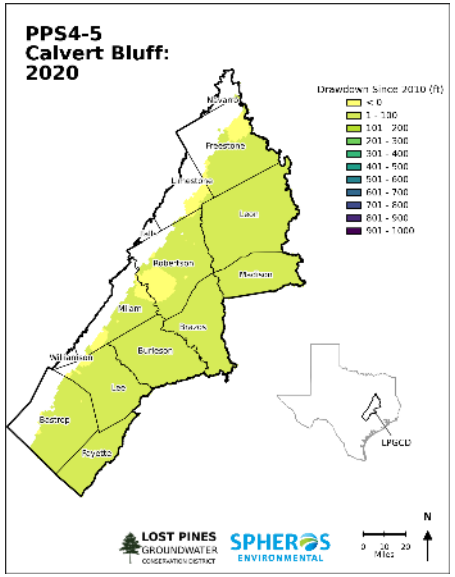
SPHEROS ENVIRONMENTAL

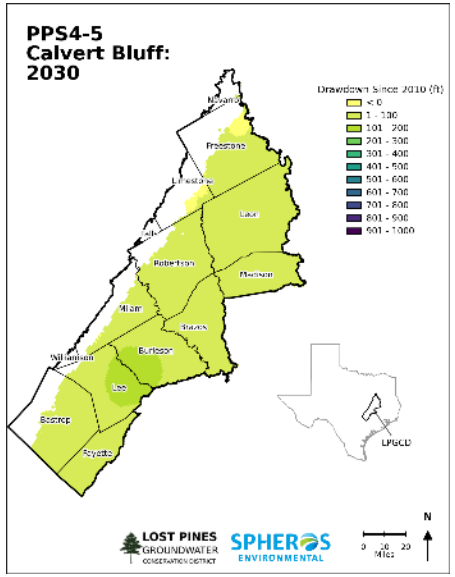
LOST PINES GROUNDWATER CONSERVATION DISTRICT

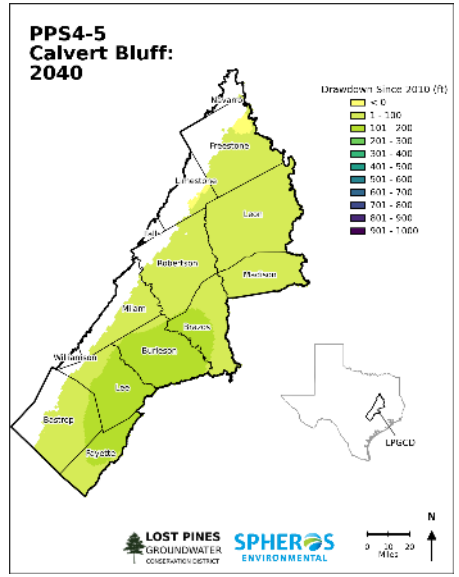
PPS4-5 Drawdown
Calvert Bluff Aquifer

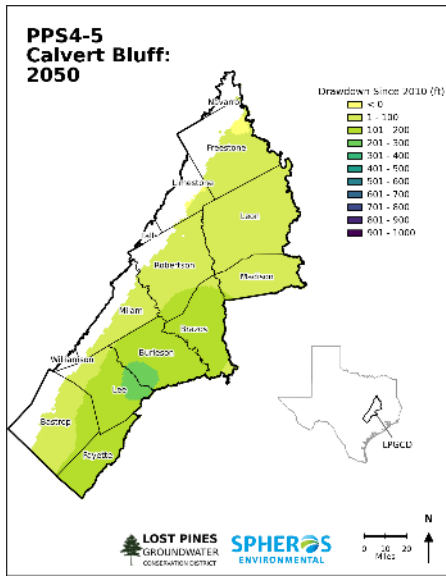
Central SP-QC-CW GAM v.3.02
Layer 8

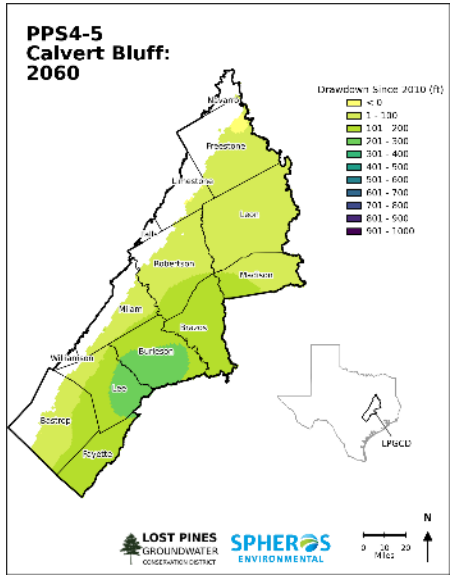


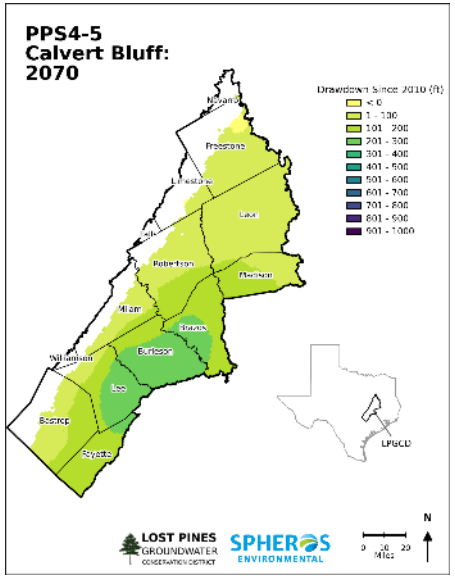


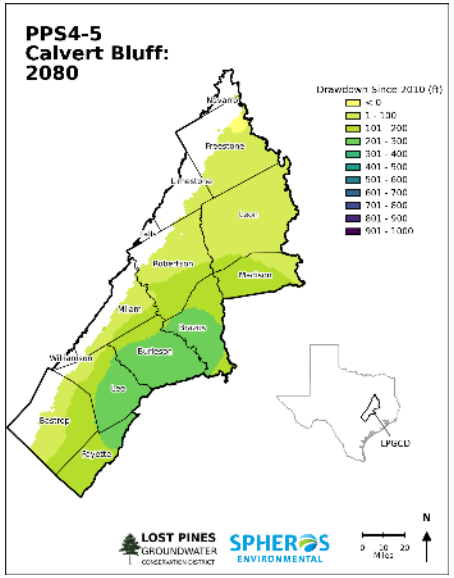










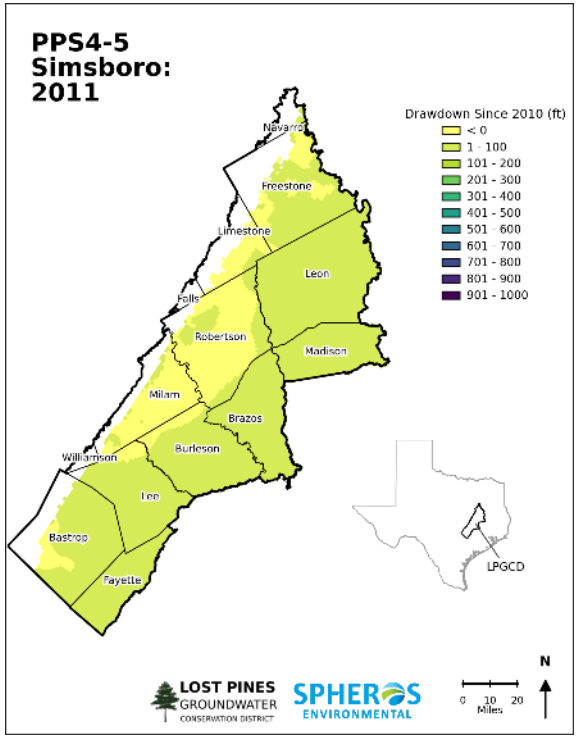


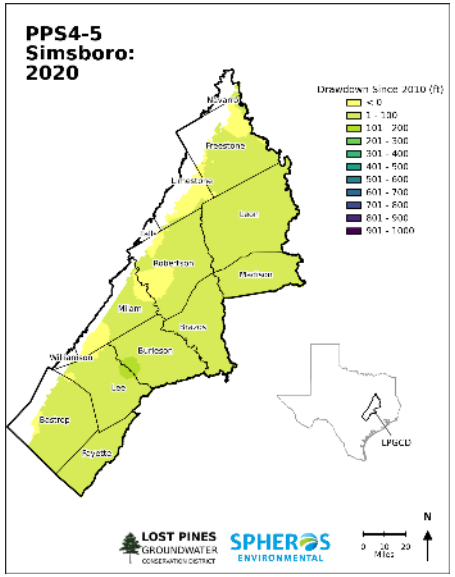
SPHEROS ENVIRONMENTAL

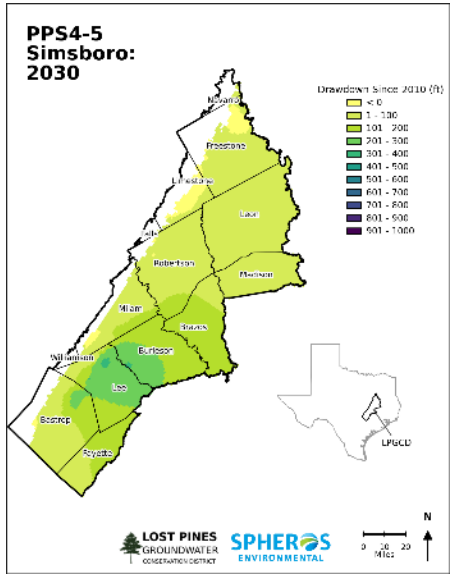
LOST PINES GROUNDWATER CONSERVATION DISTRICT

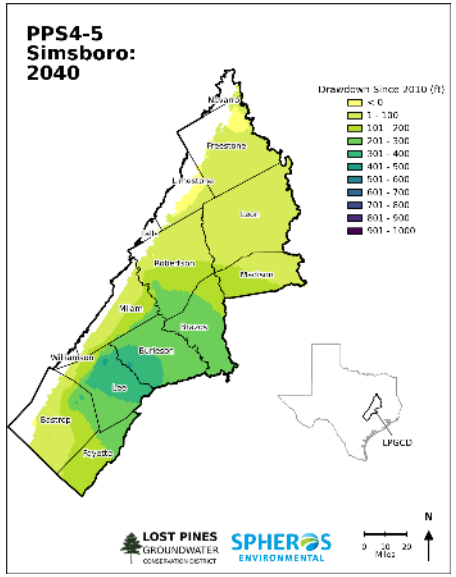
PPS4-5 Drawdown
Simsboro Aquifer

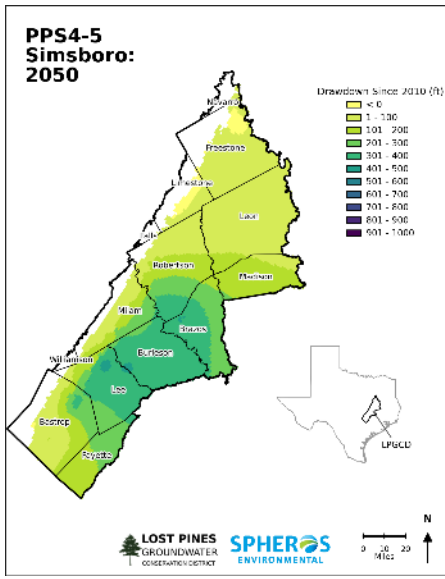
Central SP-QC-CW GAM v.3.02
Layer 9

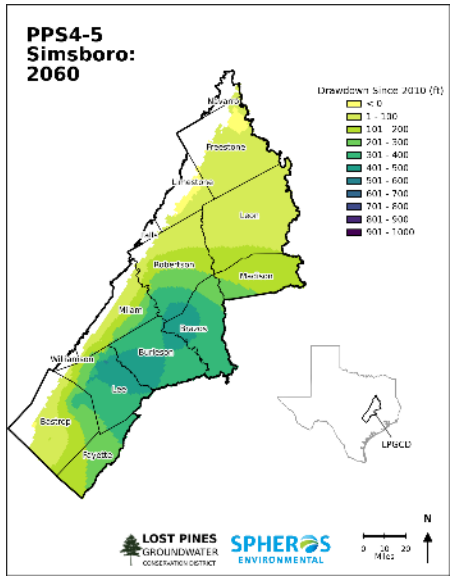


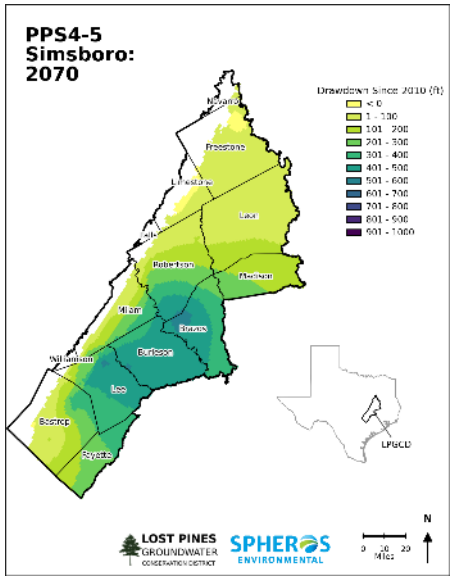


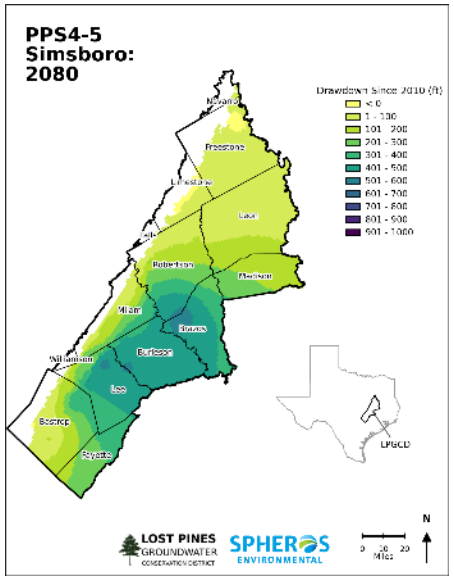










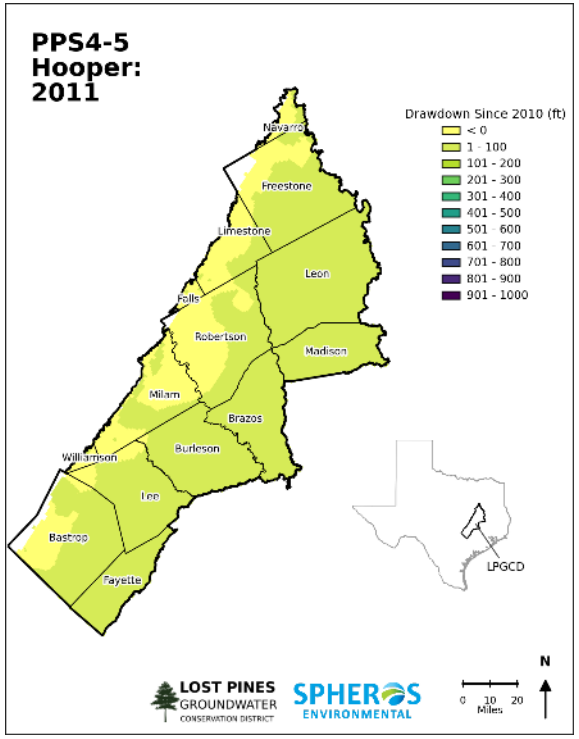


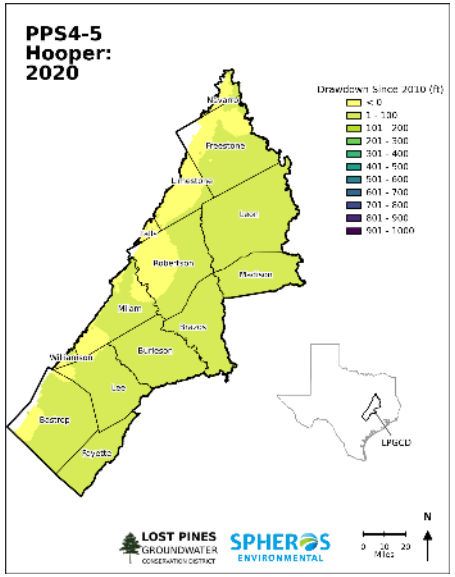
SPHEROS ENVIRONMENTAL

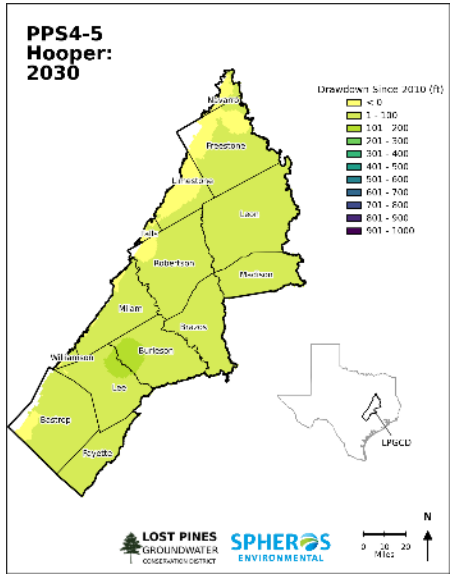
LOST PINES GROUNDWATER CONSERVATION DISTRICT

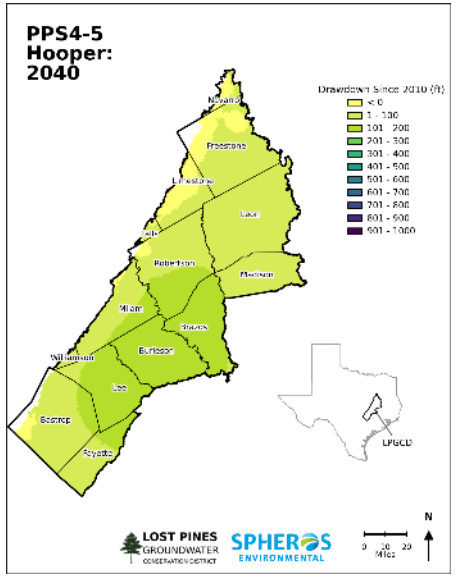
PPS4-5 Drawdown
Hooper Aquifer

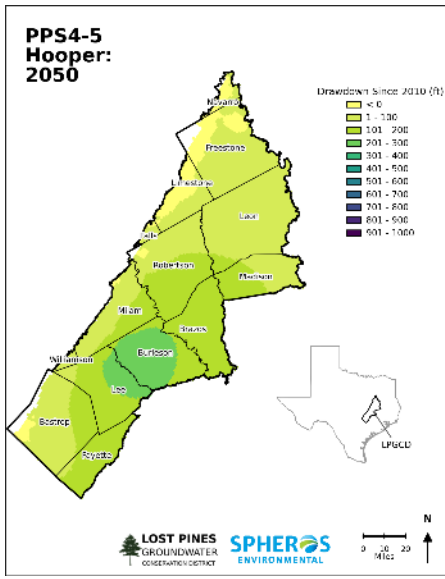
Central SP-QC-CW GAM v.3.02
Layer 10

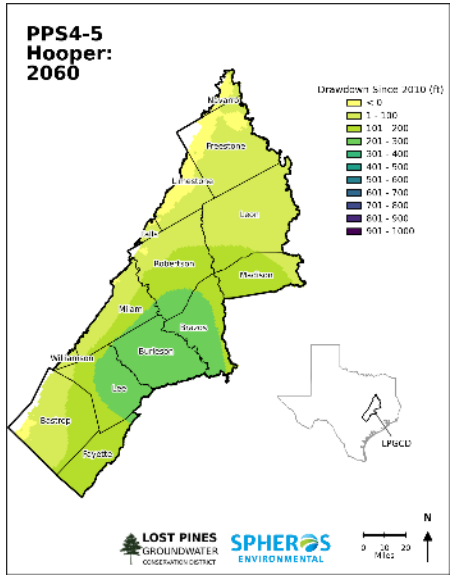


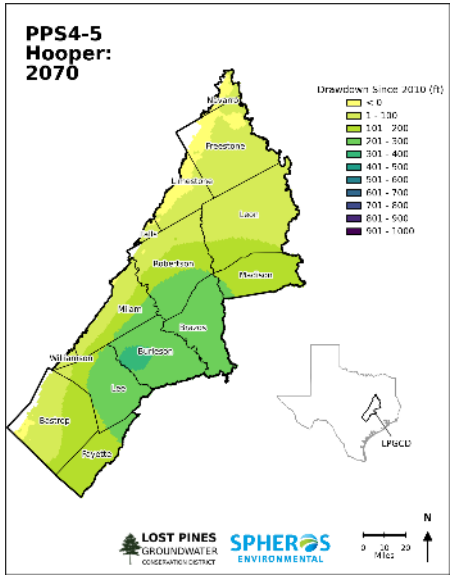


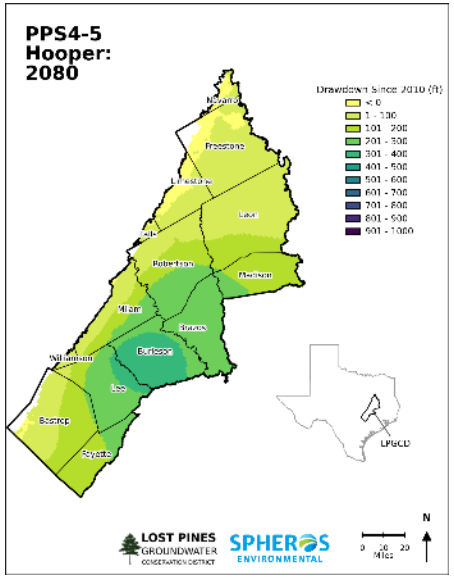












SPHEROS ENVIRONMENTAL

LOST PINES GROUNDWATER CONSERVATION DISTRICT