Item 9 – Discussion of DFC Factors 1-3 (Current Planning Period)

GMA 12 member districts met August 24, 2023 for purposes of planning the Desired Future Conditions (DFCs) for adoption in 2026. The members agreed to begin this planning round using the adopted 2021 DFCs as the starting point. This item will be placed on the October 26, 2023 agenda to formally adopt the position.

GMA 12 is now in the position to begin considering the nine statutorily required factors related to the adopted DFCs. Each district was asked to visit with their board members and determine how factors 1-3 will be applied during the current planning round Those factors are:

> *(1) aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;*
> *(2) the water supply needs and water management strategies included in the state water plan;*
> *(3) hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge;*

James Beach, Advanced Groundwater Solutions, will provide background information related to the consideration of the three above-listed factors in past planning rounds and how he suggests they be applied during the current round of planning.

Brazos Valley Groundwater Conservation District

4th Round
Joint Groundwater Planning

Discussion of Desired Future Condition (DFC) Factors 1, 2, 3

October 12, 2023

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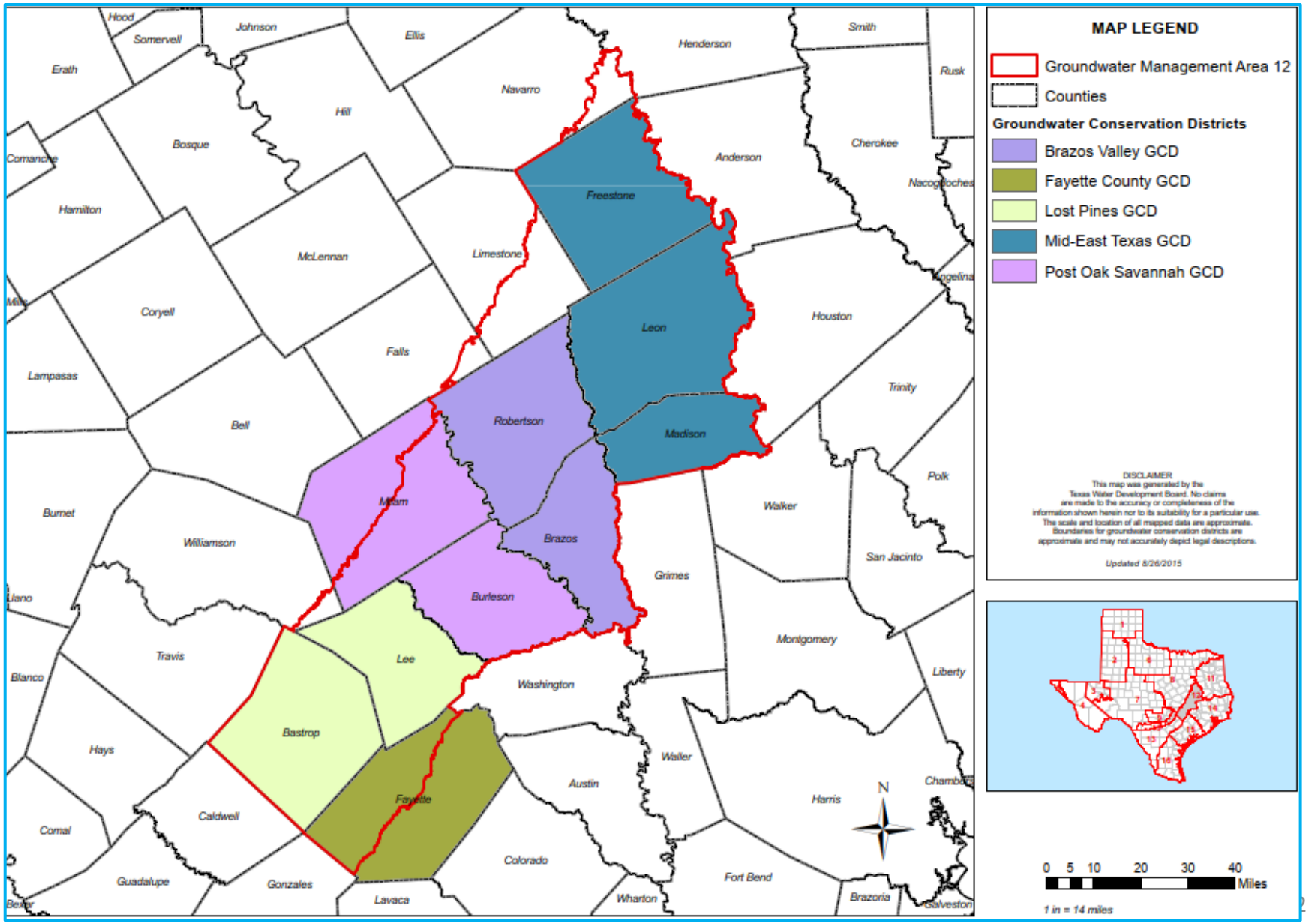
GMA-12



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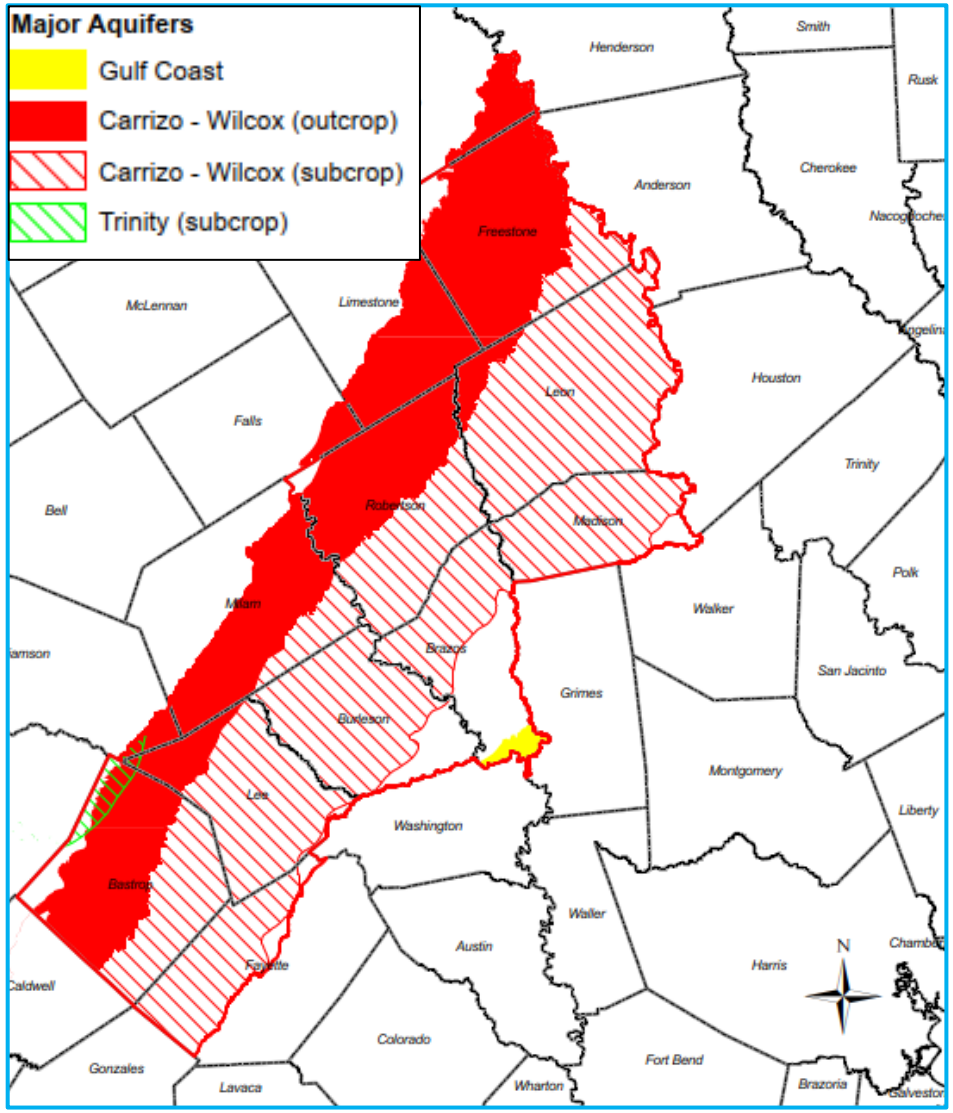
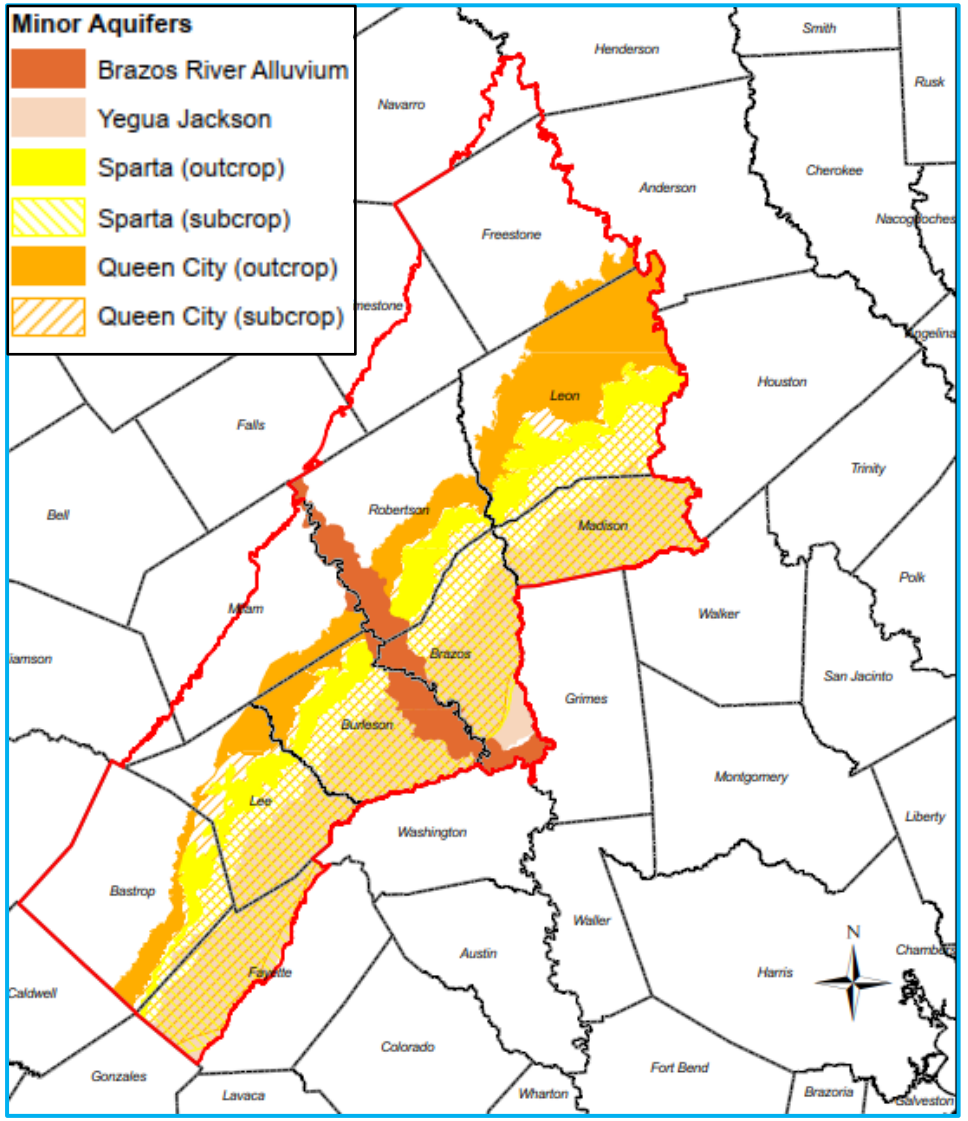
GMA-12 Major and Minor Aquifers





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Desired Future condition
Modeled Available groundwater

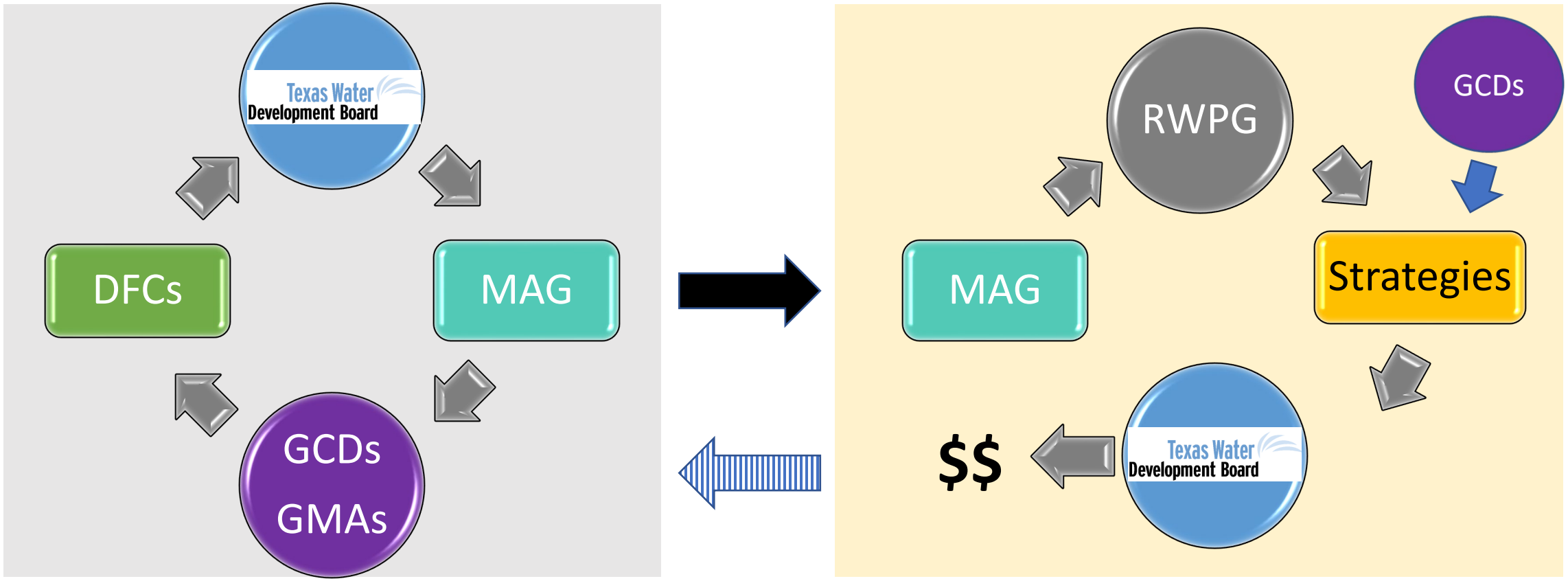
"Desired future condition" means a quantitative description, adopted in accordance with Section 36.108, of the desired condition of the groundwater resources in a management area at one or more specified future times.

"Modeled available groundwater" means the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108.

The Groundwater Planning Cycle

Joint Groundwater Planning

Regional Water Planning



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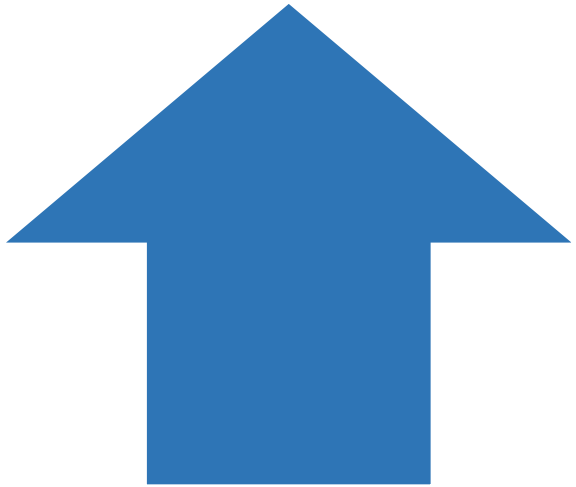
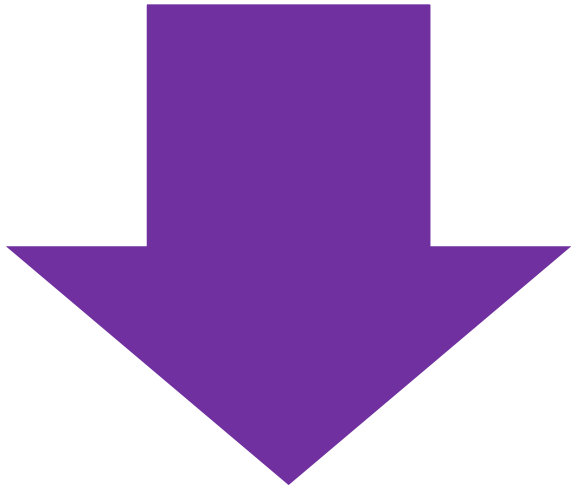
Chapter 36 Balancing Test –
DFC must provide a balance between



highest practicable level of groundwater production



conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence

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9 Factors to Consider in Developing Desired Future Conditions

Aquifer Uses or Conditions	Supply Needs and Management Strategies	Hydrological Conditions
Environmental Impacts	Subsidence Impacts	Socioeconomic Impacts
Private Property Rights	DFC Feasibility	Other Relevant Information

Current GMA 12 DFCs

Carrizo-Wilcox, Queen City, Sparta

Adopted Desired Future Conditions for Relevant Aquifers (Sparta, Queen City, and Carrizo-Wilcox aquifers)							
Groundwater Conservation District (GCD)	Desired Future Condition (DFC) 2011 through 2070 Average Drawdown (ft) by Aquifer						Date DFC Adopted
	Sparta	Queen City	Carrizo	Calvert Bluff	Simsboro	Hooper	
Brazos Valley GCD *	53	44	84	111	262	167	11/30/2021
Fayette County GCD **	43	73	140	--	--	--	11/30/2021
Lost Pines GCD	22	28	134	132	240	138	11/30/2021
Mid-East Texas GCD	25	20	48	57	76	69	11/30/2021
Post Oak Savannah GCD	32	30	146	156	278	178	11/30/2021
Falls County (no district)	--	--	--	--	7	3	11/30/2021
Limestone County (no district)	--	--	--	2	3	3	11/30/2021
Navarro County (no district)	--	--	--	0	1	0	11/30/2021
Williamson County (no district)	--	--	--	-- ***	31	24	11/30/2021

"--" indicates an aquifer is not present or was declared non-relevant for the purposes of joint planning

* DFCs are average drawdown from 2000 through 2070 for Brazos Valley GCD

** DFCs for Fayette County GCD include Fayette County in both GMA 12 and GMA 15

*** District representatives in GMA 12 declared the Calvert Bluff in Williamson County non-relevant for the purposes of joint planning on 5/6/2022

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Current GMA 12 DFCs

Yegua-Jackson

Adopted Desired Future Conditions for Relevant Aquifers (Yegua-Jackson Aquifer)		
Groundwater Conservation District (GCD)	**Desired Future Condition (DFC) 2010 through 2069 Average Drawdown (ft)**	**Date DFC Adopted**
Brazos Valley GCD	67	11/30/2021
Fayette County GCD	81	11/30/2021
Lost Pines GCD	--	11/30/2021
Mid-East Texas GCD	8	11/30/2021
Post Oak Savannah GCD	61	11/30/2021
"--" indicates aquifer was declared non-relevant for the purposes of joint planning		

Brazos River Alluvium

Adopted Desired Future Conditions for Relevant Aquifers (Brazos River Alluvium Aquifer)		
Groundwater Conservation District (GCD)	**Desired Future Condition (DFC)**	**Date DFC Adopted**
Brazos Valley GCD (Brazos and Robertson counties)	North of State Highway 21: Percent saturation shall average at least 30 percent of total well depth from 2013 to 2069 South of State Highway 21: Percent saturation shall average at least 40 percent of total well depth from 2013 to 2069	11/30/2021
Post Oak Savannah GCD (Burleson County)	A decrease of 6 feet in the average saturated thickness from 2010 to 2069	11/30/2021
Post Oak Savannah GCD (Milam County)	A decrease of 5 feet in average saturated thickness from 2010 to 2069	11/30/2021

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Current GMA 12 DFCs

Non-Relevant for Joint Planning Purposes

Gulf Coast

Non-Relevant Aquifers *		
Aquifer	**Location**	**Justification**
Trinity	Bastrop, Lee (Lost Pines GCD), and Williamson counties	Very limited areal extent; extreme depth; no known use
Yegua-Jackson	Bastrop and Lee counties (Lost Pines GCD)	Very low use; lack of permitted production; no anticipated permitted production in the future
Carrizo-Wilcox (Calvert Bluff, Simsboro, and Hooper formations; Wilcox portion)	Fayette County (Fayette County GCD)	Extreme depth; poor water quality; lack of use; zero anticipated use in the future
Carrizo-Wilcox (Calvert Bluff Formation)	Williamson County	Extremely limited areal extent
Gulf Coast	Brazos County (Brazos Valley GCD)	Very limited areal extent; shallow depth; low use
Brazos River Alluvium	Falls County	Very limited areal extent (less than one square mile)

BVGCD MAGs

Brazos Valley GCD								
GCD	Aquifer	County	Modeled Available Groundwater (acre-feet per year)					
			2020	2030	2040	2050	2060	2070
Brazos Valley GCD	Brazos River Alluvium	Brazos	77,816	76,978	76,393	76,195	76,100	76,039
Brazos Valley GCD	Brazos River Alluvium	Robertson	55,907	55,424	55,157	54,839	54,723	54,618
Brazos Valley GCD	Carrizo-Wilcox (Calvert Bluff)	Brazos	0	0	0	0	0	0
Brazos Valley GCD	Carrizo-Wilcox (Calvert Bluff)	Robertson	252	546	841	1,136	1,430	1,725
Brazos Valley GCD	Carrizo-Wilcox (Carrizo)	Brazos	864	1,444	2,023	2,603	3,183	3,763
Brazos Valley GCD	Carrizo-Wilcox (Carrizo)	Robertson	81	412	743	1,074	1,405	1,736
Brazos Valley GCD	Carrizo-Wilcox (Hooper)	Brazos	0	0	0	0	0	0
Brazos Valley GCD	Carrizo-Wilcox (Hooper)	Robertson	798	1,066	1,334	1,603	1,871	2,139
Brazos Valley GCD	Carrizo-Wilcox (Simsboro)	Brazos	37,282	42,709	48,137	53,565	58,993	64,421
Brazos Valley GCD	Carrizo-Wilcox (Simsboro)	Robertson	38,219	47,140	56,061	64,982	73,903	82,824
Brazos Valley GCD	Queen City	Brazos	133	245	357	469	582	694
Brazos Valley GCD	Queen City	Robertson	36	144	252	359	467	575
Brazos Valley GCD	Sparta	Brazos	4,483	6,014	7,545	9,076	10,607	12,138
Brazos Valley GCD	Sparta	Robertson	167	338	509	680	851	1,022
Brazos Valley GCD	Yegua-Jackson	Brazos	4,207	6,270	7,092	7,091	7,091	7,091
Brazos Valley GCD Totals								
	Brazos River Alluvium Aquifer		**133,723**	**132,402**	**131,550**	**131,034**	**130,823**	**130,657**
	Carrizo-Wilcox (Calvert Bluff)		**252**	**546**	**841**	**1,136**	**1,430**	**1,725**
	Carrizo-Wilcox (Carrizo)		**945**	**1,856**	**2,766**	**3,677**	**4,588**	**5,499**
	Carrizo-Wilcox (Hooper)		**798**	**1,066**	**1,334**	**1,603**	**1,871**	**2,139**
	Carrizo-Wilcox (Simsboro)		**75,501**	**89,849**	**104,198**	**118,547**	**132,896**	**147,245**
	Queen City Aquifer		**169**	**389**	**609**	**828**	**1,049**	**1,269**
	Sparta Aquifer		**4,650**	**6,352**	**8,054**	**9,756**	**11,458**	**13,160**
	Yegua-Jackson Aquifer		**4,207**	**6,270**	**7,092**	**7,091**	**7,091**	**7,091**

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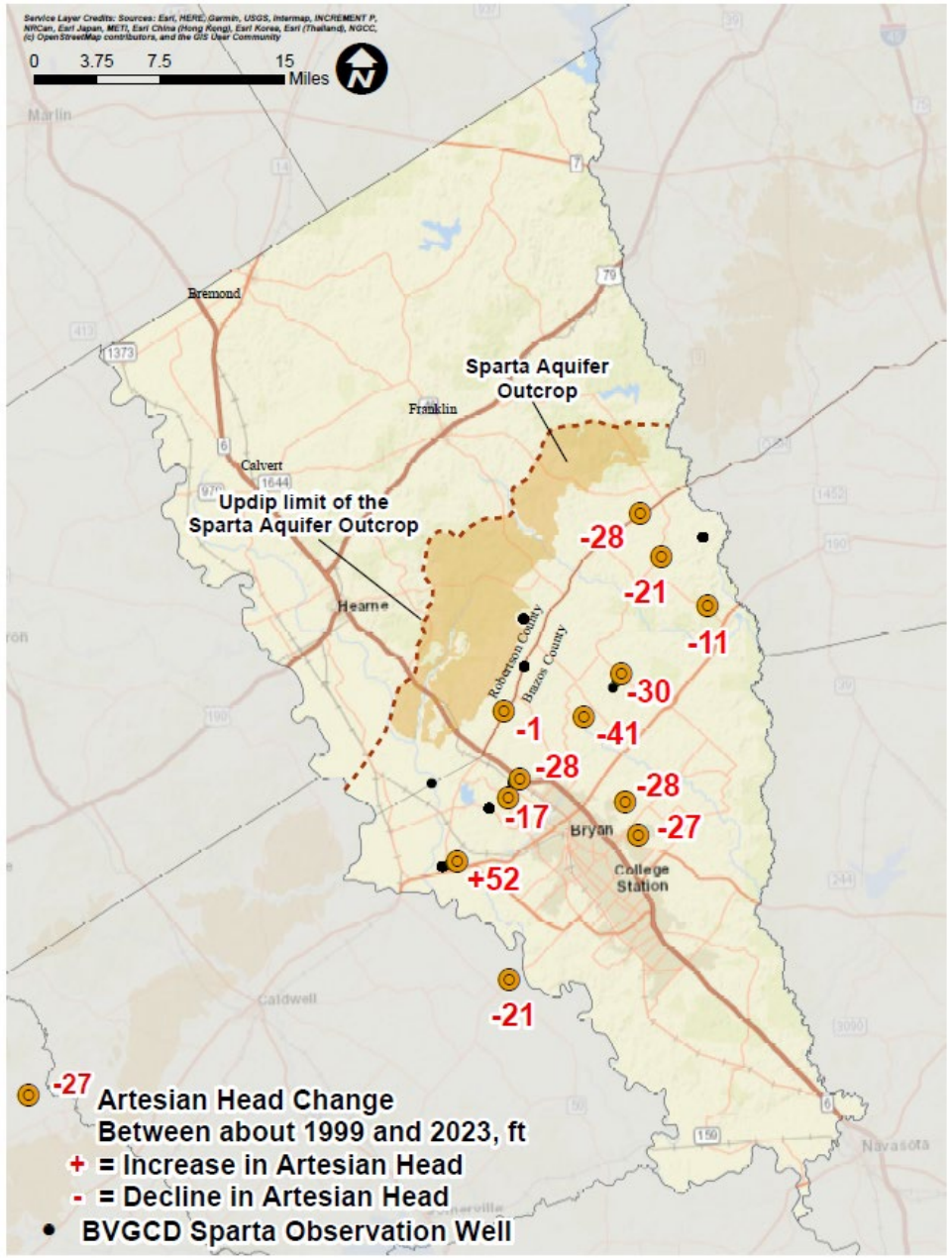
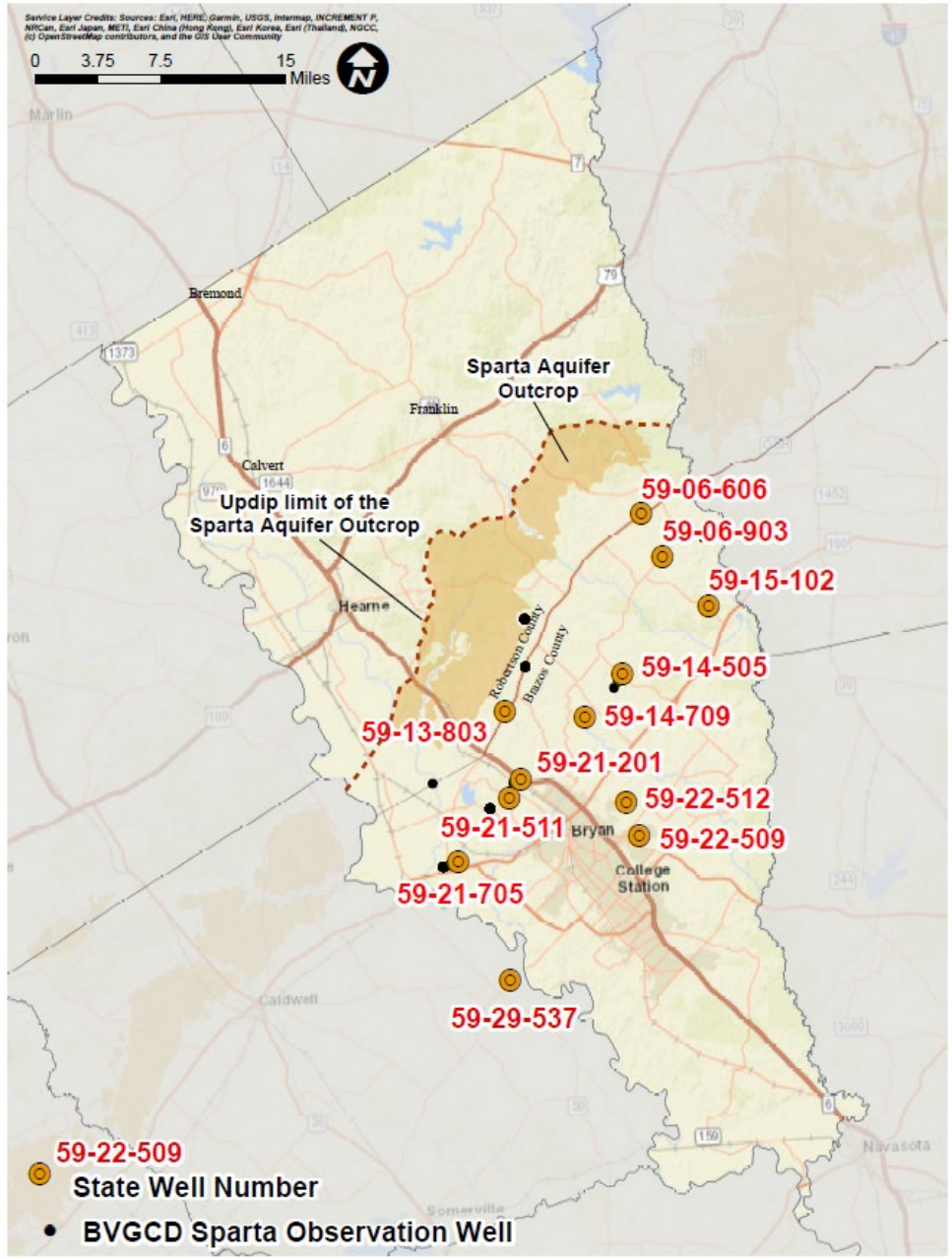
Aquifer uses or conditions

- aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;

Sparta Aquifer





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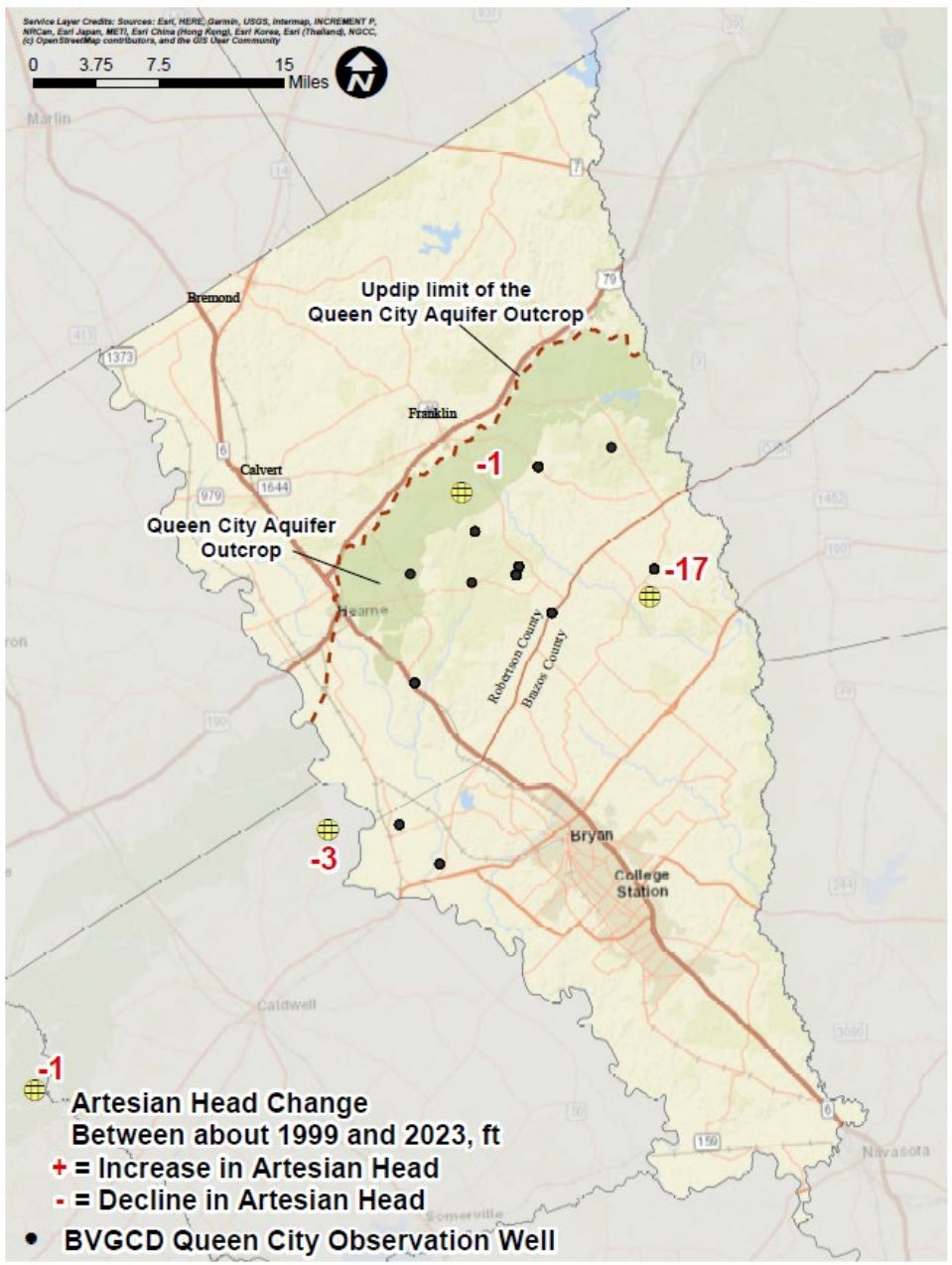
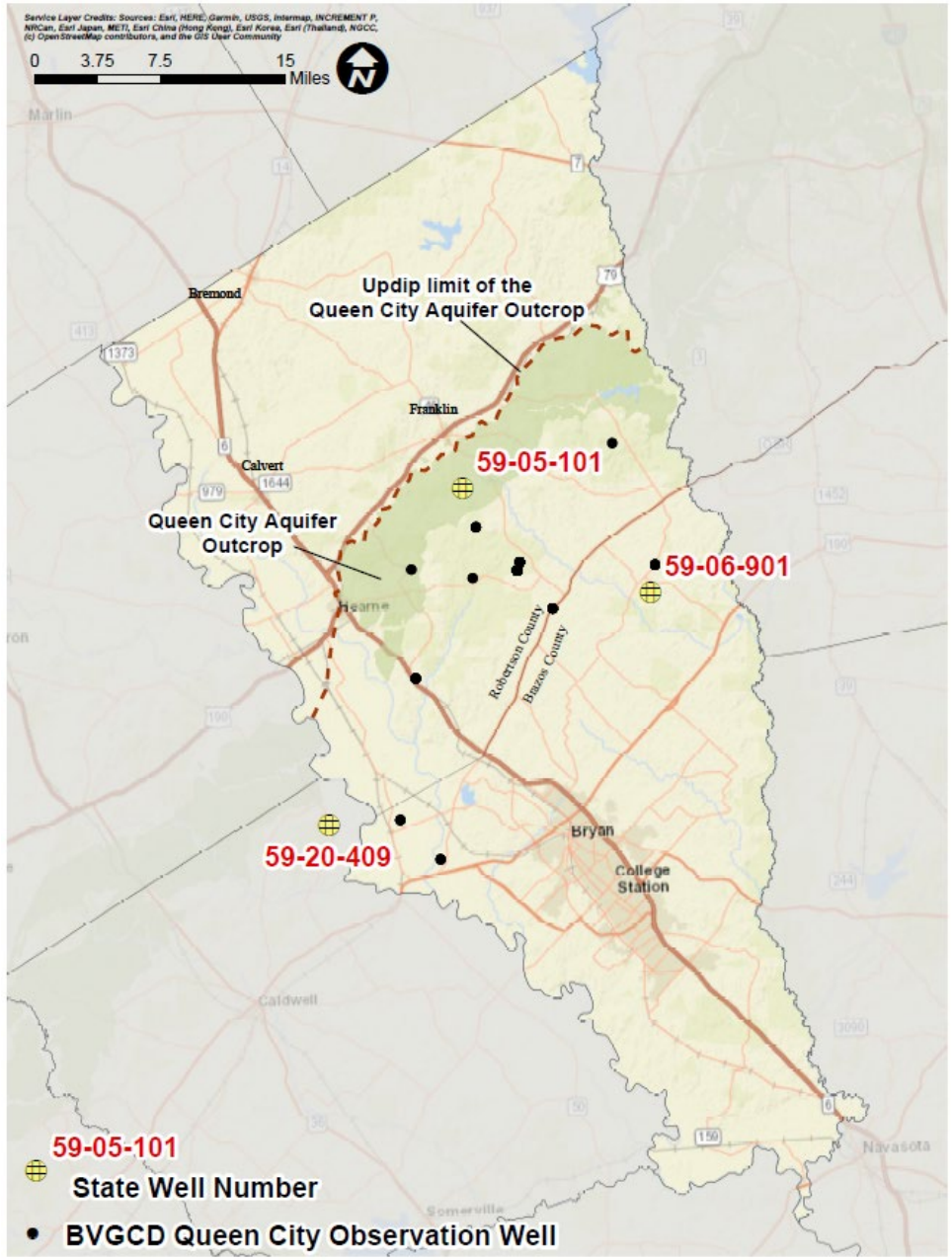
Queen City Aquifer





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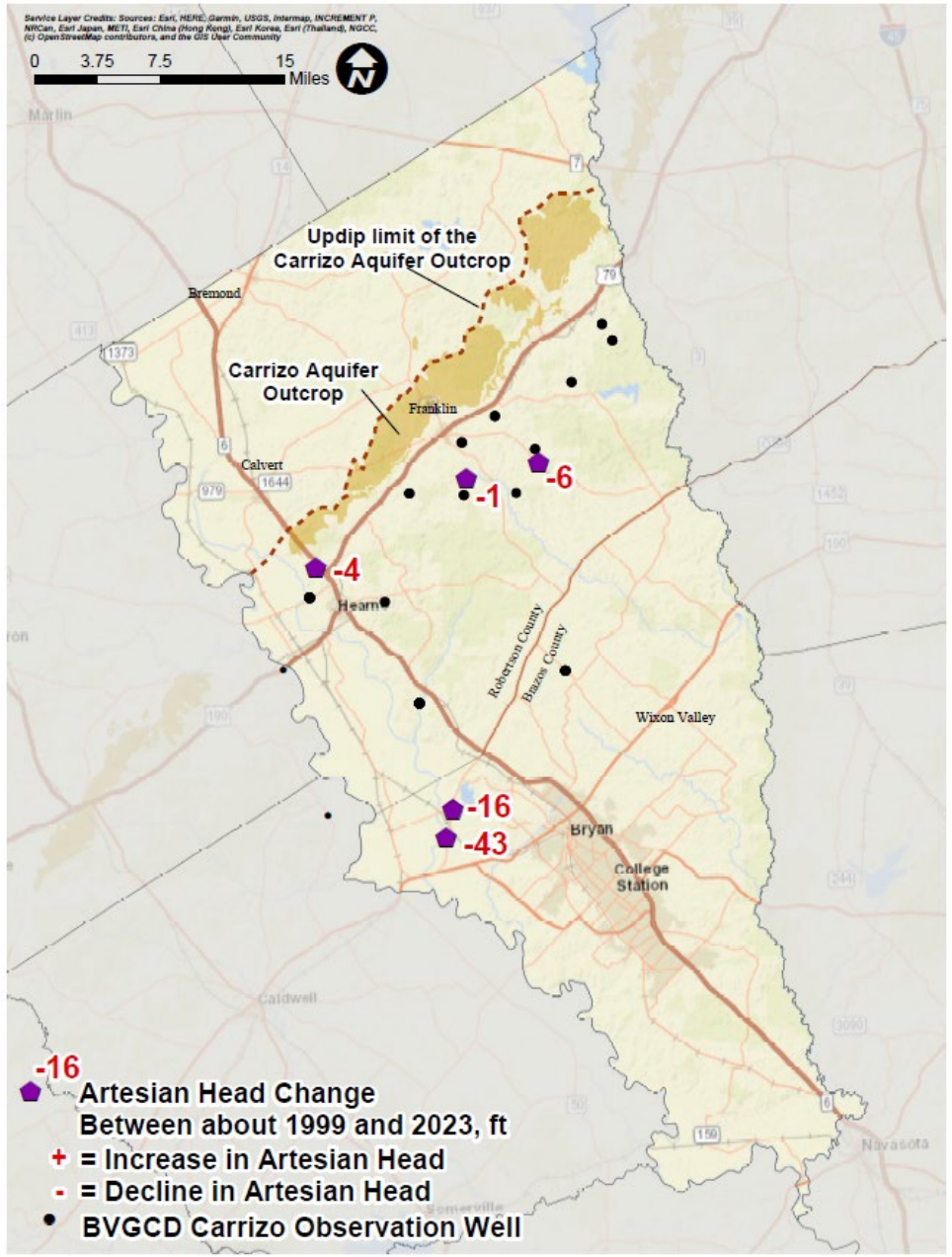
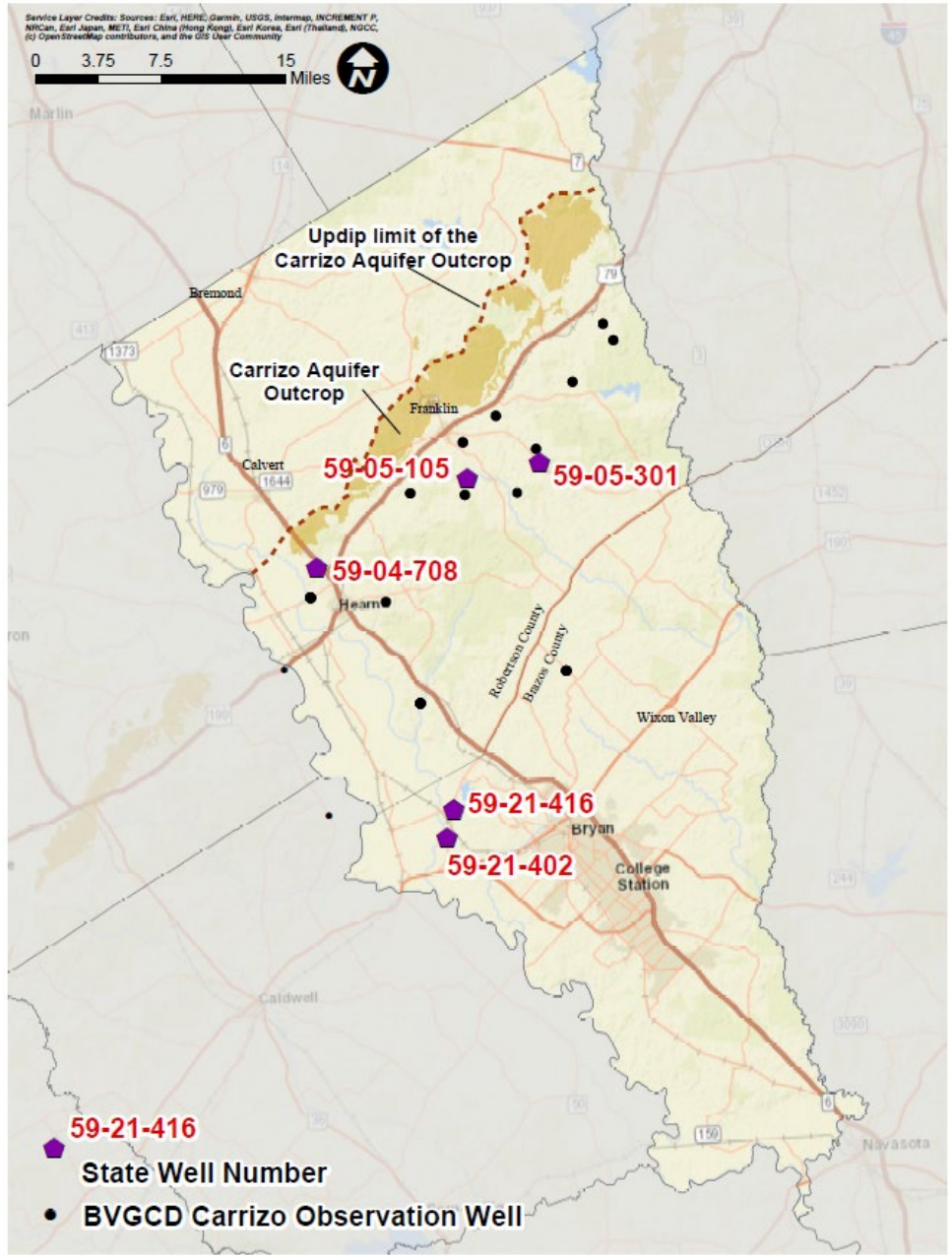
Carrizo Aquifer





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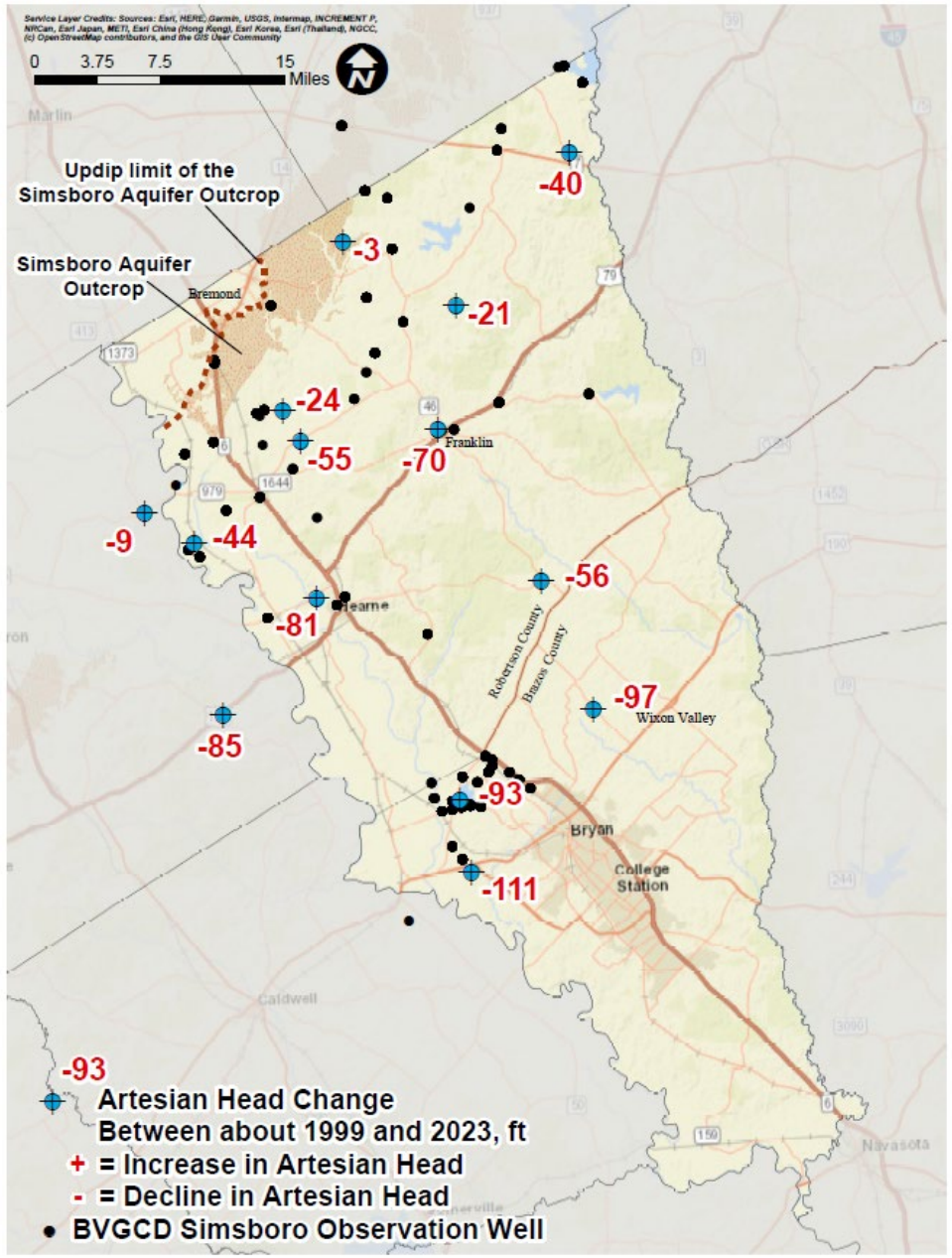
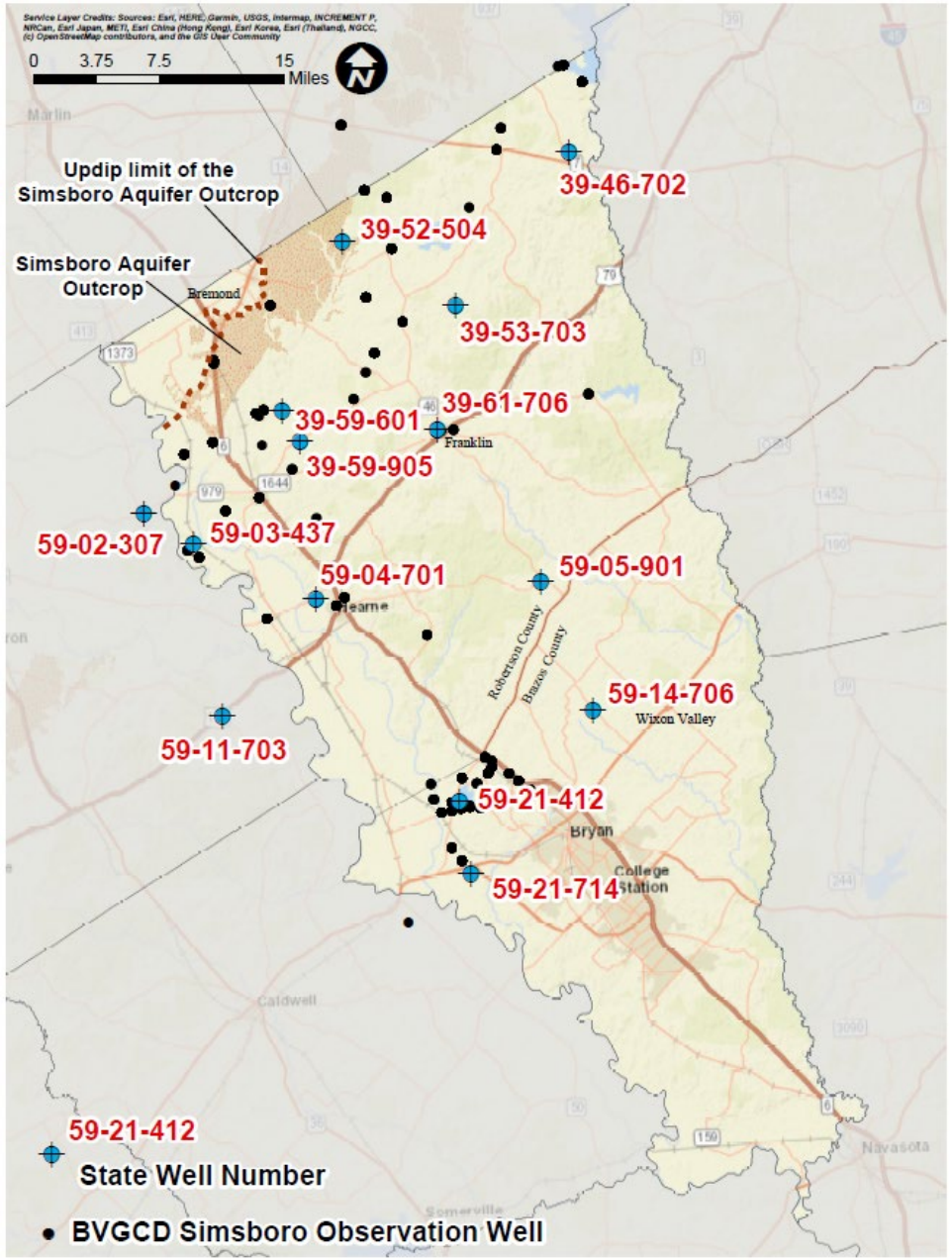
Simsboro Aquifer





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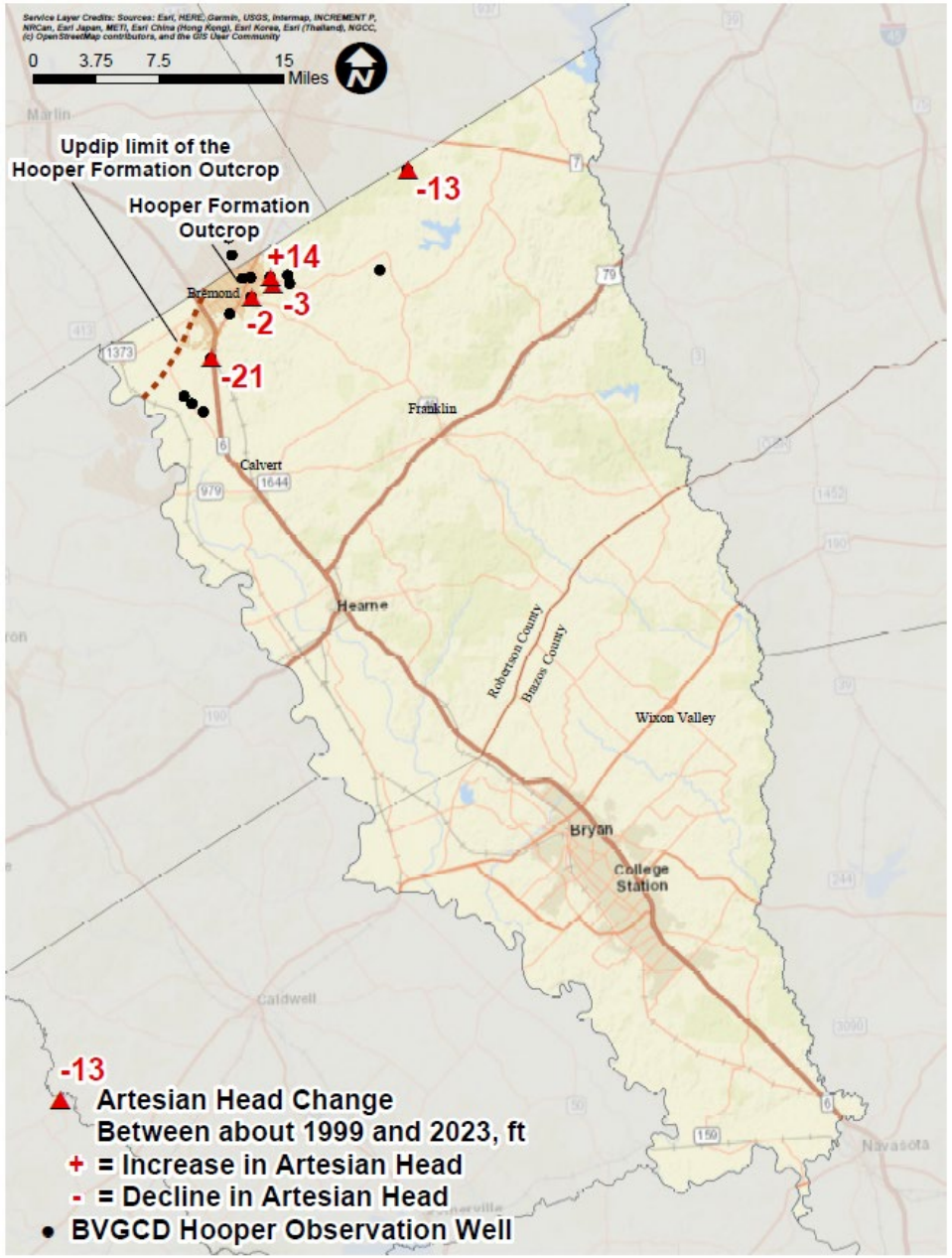
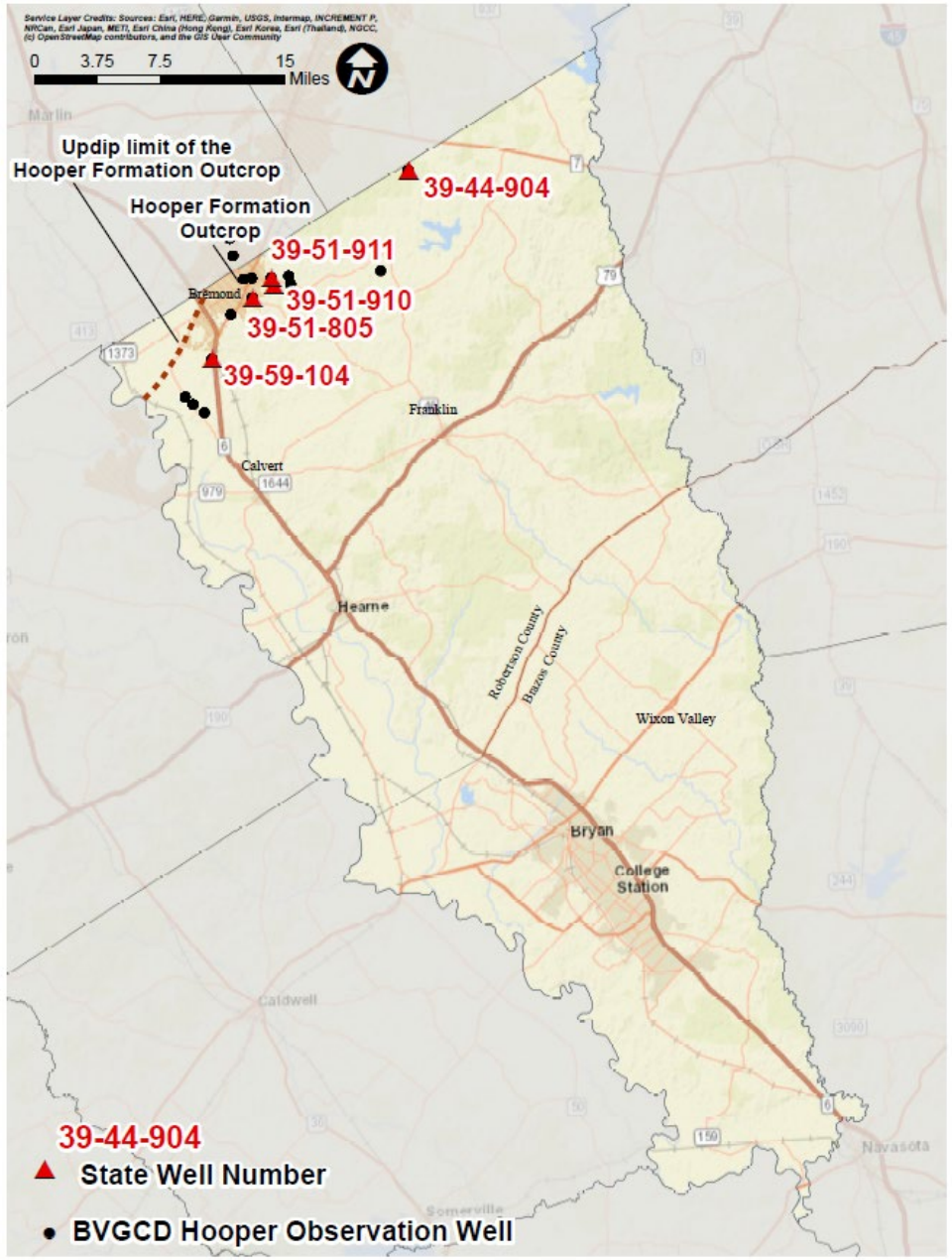
Hooper Formation





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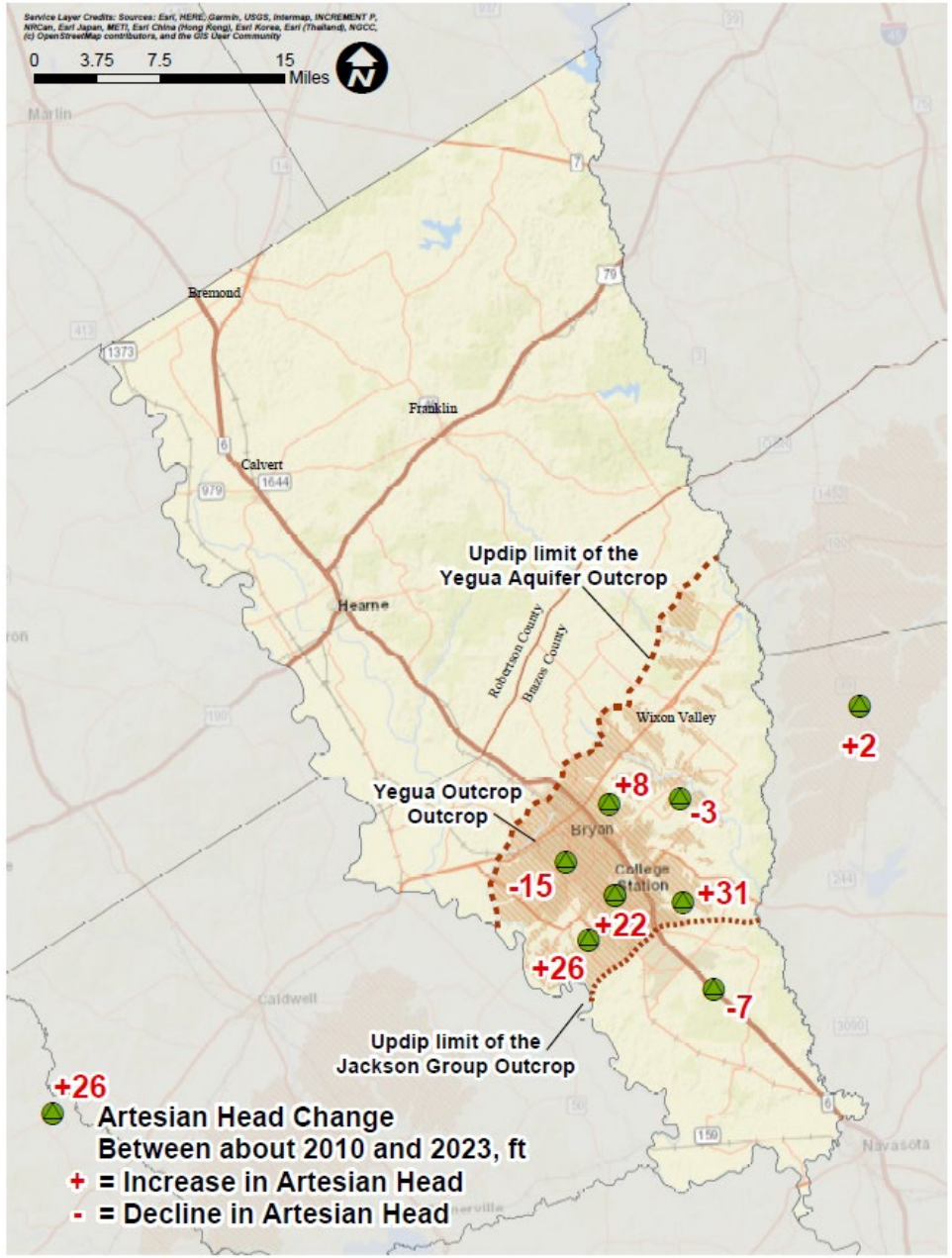
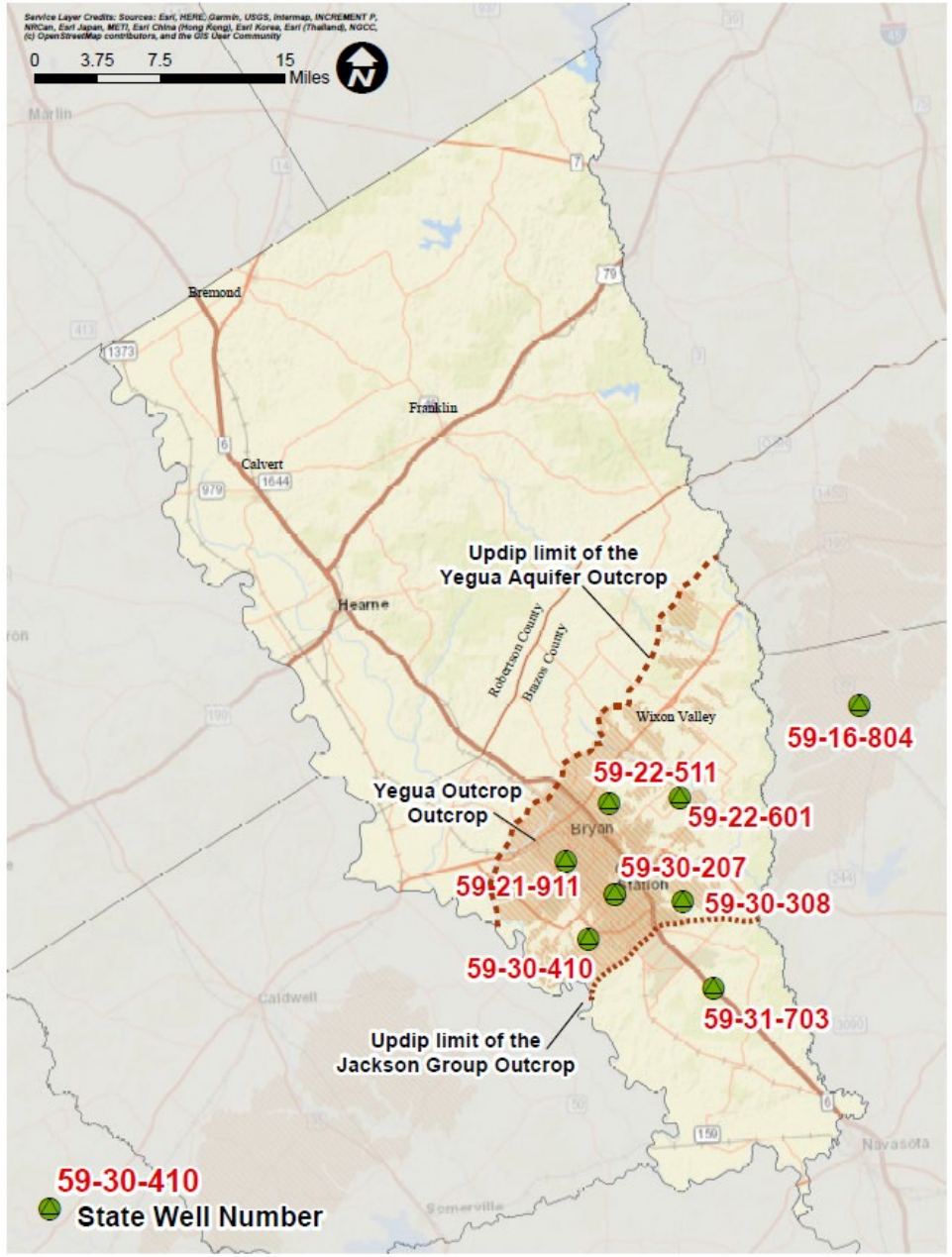
Yegua-Jackson Aquifer





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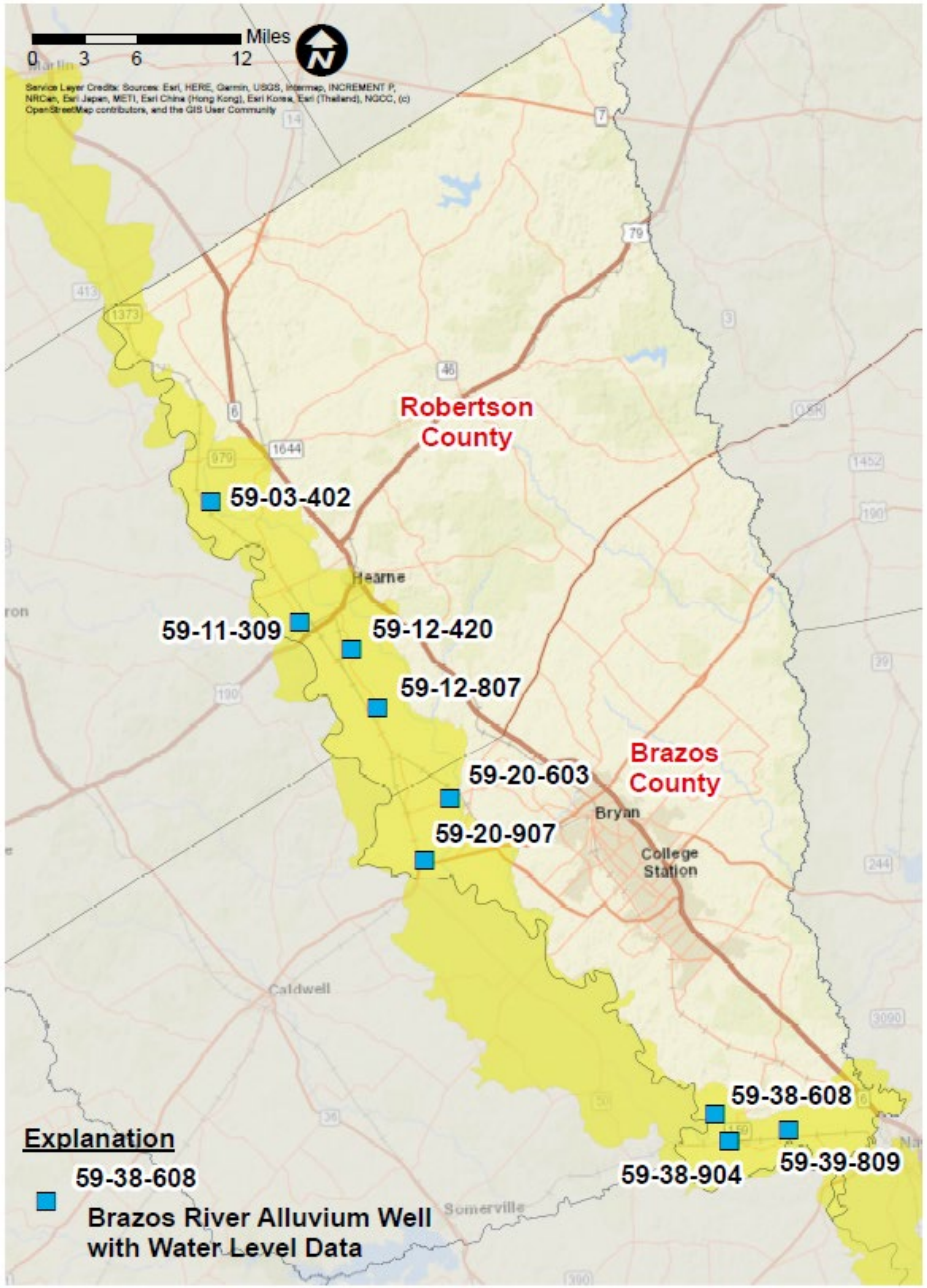
Location of Brazos River Alluvium Wells with Water Level Hydrographs



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Water supply needs and management strategies

- the water supply needs and water management strategies included in the state water plan

Brazos County - Water Supply Needs

BRAZOS COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
G	Bryan	Brazos	215	-1,896	-4,578	-8,034	-12,323	-19,650
G	College Station	Brazos	413	-3,492	-8,874	-13,436	-13,379	-13,360
G	County-Other, Brazos	Brazos	37	38	40	43	45	46
G	Irrigation, Brazos	Brazos	6,258	6,328	6,336	6,336	6,336	6,336
G	Livestock, Brazos	Brazos	0	0	0	0	0	0
G	Manufacturing, Brazos	Brazos	697	1,036	1,078	1,078	1,078	1,078
G	Mining, Brazos	Brazos	552	30	207	496	717	826
G	Steam-Electric Power, Brazos	Brazos	-1	18	20	20	20	20
G	Texas A&M University	Brazos	-99	43	104	120	124	124
G	Wellborn SUD	Brazos	3,030	1,969	1,513	962	310	-379
G	Wickson Creek SUD	Brazos	1,138	1,071	845	586	326	42
	Sum of Projected Water Supply Needs (acre-feet)		**-100**	**-5,388**	**-13,452**	**-21,470**	**-25,702**	**-33,389**

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Robertson County - Water Supply Needs

ROBERTSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
G	Bethany Hearne WSC	Brazos	0	0	0	0	0	0
G	Bremond	Brazos	210	198	186	171	156	141
G	Calvert	Brazos	339	346	349	349	350	350
G	County-Other, Robertson	Brazos	3	9	10	11	11	11
G	Franklin	Brazos	973	956	917	868	808	738
G	Hearne	Brazos	2,040	1,899	1,729	1,729	1,728	1,724
G	Irrigation, Robertson	Brazos	-12,851	-16,181	-17,100	-17,718	-17,829	-17,921
G	Livestock, Robertson	Brazos	0	0	0	0	0	0
G	Manufacturing, Robertson	Brazos	4,566	4,566	4,566	4,566	4,566	4,566
G	Mining, Robertson	Brazos	5,774	3,934	3,687	3,687	3,687	3,687
G	Robertson County WSC	Brazos	-81	-157	-235	-332	-433	-526
G	Steam-Electric Power, Robertson	Brazos	0	0	0	0	0	0
G	Twin Creek WSC	Brazos	427	408	390	368	347	325
G	Wellborn SUD	Brazos	853	382	272	159	48	-55
G	Wickson Creek SUD	Brazos	43	41	32	23	13	3
	Sum of Projected Water Supply Needs (acre-feet)		**-12,932**	**-16,338**	**-17,335**	**-18,050**	**-18,262**	**-18,502**

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2022 State Water Plan Water Management Strategies

Brazos County

BRAZOS COUNTY

WUG, Basin (RWPG) — All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Bryan, Brazos (G)							
Bryan ASR (Carrizo-Wilcox)	Simsboro Aquifer ASR [Brazos]	0	6,000	6,000	6,000	8,500	10,500
Carrizo GW Development for Bryan in Brazos County	Carrizo-Wilcox Aquifer [Brazos]	0	7,501	7,501	7,501	7,501	7,501
Municipal Water Conservation - Bryan	DEMAND REDUCTION [Brazos]	0	1,311	1,606	1,719	1,988	2,489
		0	**14,812**	**15,107**	**15,220**	**17,989**	**20,490**
College Station, Brazos (G)							
Carrizo GW Development for College Station in Brazos County	Carrizo-Wilcox Aquifer [Brazos]	0	0	5,234	9,695	9,796	9,796
Municipal Water Conservation - College Station	DEMAND REDUCTION [Brazos]	0	234	0	0	0	0
Reuse DPR- College Station	Direct Reuse [Brazos]	0	8,232	8,232	8,232	8,232	8,232
		0	**8,466**	**13,466**	**17,927**	**18,028**	**18,028**
Irrigation, Brazos, Brazos (G)							
BRA System Operation--Surplus	BRA System Operations Permit Supply [Reservoir]	348	348	348	348	348	348
		348	**348**	**348**	**348**	**348**	**348**
Steam-Electric Power, Brazos, Brazos (G)							
Reuse- Bryan (Option 1)	Direct Reuse [Brazos]	605	605	605	605	605	605
		605	**605**	**605**	**605**	**605**	**605**
Texas A&M University, Brazos (G)							
Municipal Water Conservation - Texas A&M University	DEMAND REDUCTION [Brazos]	0	560	1,072	1,557	2,006	2,415
Texas A&M Sparta Aquifer Development	Sparta Aquifer [Brazos]	0	0	638	638	638	638
		0	**560**	**1,710**	**2,195**	**2,644**	**3,053**
Wellborn SUD, Brazos (G)							
Municipal Water Conservation - Wellborn SUD	DEMAND REDUCTION [Brazos]	0	355	501	533	591	655
		0	**355**	**501**	**533**	**591**	**655**
Sum of Projected Water Management Strategies (acre-feet)		**953**	**25,146**	**31,737**	**36,828**	**40,205**	**43,179**

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2022 State Water Plan Water Management Strategies

Robertson County

ROBERTSON COUNTY

WUG, Basin (RWPG) — All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Bremond, Brazos (G)							
Municipal Water Conservation - Bremond	DEMAND REDUCTION [Robertson]	0	13	21	21	23	24
		0	**13**	**21**	**21**	**23**	**24**
Hearne, Brazos (G)							
Municipal Water Conservation - Hearne	DEMAND REDUCTION [Robertson]	0	43	22	19	17	17
		0	**43**	**22**	**19**	**17**	**17**
Irrigation, Robertson, Brazos (G)							
Irrigation Water Conservation	DEMAND REDUCTION [Robertson]	2,375	3,959	5,579	5,612	5,612	5,612
		2,375	**3,959**	**5,579**	**5,612**	**5,612**	**5,612**
Robertson County WSC, Brazos (G)							
Carrizo Aquifer Development - Robertson County WSC	Carrizo-Wilcox Aquifer [Robertson]	550	550	550	550	550	550
		550	**550**	**550**	**550**	**550**	**550**
Steam-Electric Power, Robertson, Brazos (G)							
Purchase from Walnut Creek Mine-Reuse	Brazos Other Local Supply [Robertson]	0	0	0	9,000	9,000	9,000
		0	**0**	**0**	**9,000**	**9,000**	**9,000**
Twin Creek WSC, Brazos (G)							
Municipal Water Conservation - Twin Creek WSC	DEMAND REDUCTION [Robertson]	0	21	23	23	23	25
		0	**21**	**23**	**23**	**23**	**25**
Wellborn SUD, Brazos (G)							
Municipal Water Conservation - Wellborn SUD	DEMAND REDUCTION [Robertson]	0	69	90	89	92	96
		0	**69**	**90**	**89**	**92**	**96**
Sum of Projected Water Management Strategies (acre-feet)		**2,925**	**4,655**	**6,285**	**15,314**	**15,317**	**15,324**

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Hydrological conditions

- hydrological conditions, including for each aquifer in the management area the **total estimated recoverable storage** as provided by the executive administrator, and the **average annual recharge, inflows, and discharge;**

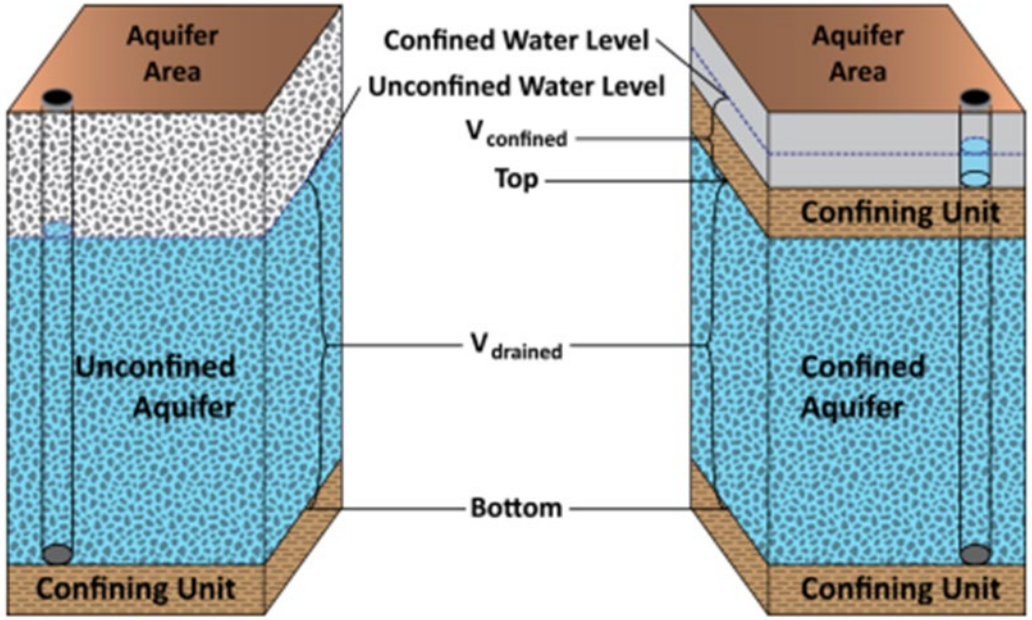

FIGURE 1. SCHEMATIC GRAPH SHOWING THE DIFFERENCE BETWEEN UNCONFINED AND CONFINED AQUIFERS.

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TERS Carrizo-Wilcox

TABLE 3. TOTAL ESTIMATED RECOVERABLE STORAGE BY COUNTY FOR THE CARRIZO-WILCOX AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 12. COUNTY TOTAL ESTIMATES ARE ROUNDED TO TWO SIGNIFICANT DIGITS.

County	*Total Storage (acre-feet)*	*25 percent of Total Storage (acre-feet)*	*75 percent of Total Storage (acre-feet)*
Bastrop	98,000,000	24,500,000	73,500,000
Brazos	69,000,000	17,250,000	51,750,000
Burleson	120,000,000	30,000,000	90,000,000
Falls	820,000	205,000	615,000
Fayette	95,000,000	23,750,000	71,250,000
Freestone	46,000,000	11,500,000	34,500,000
Lee	130,000,000	32,500,000	97,500,000
Leon	180,000,000	45,000,000	135,000,000
Limestone	12,000,000	3,000,000	9,000,000
Madison	110,000,000	27,500,000	82,500,000
Milam	47,000,000	11,750,000	35,250,000
Navarro	1,000,000	250,000	750,000
Robertson	110,000,000	27,500,000	82,500,000
Williamson	500,000	125,000	375,000
Total	1,019,320,000	254,830,000	764,490,000

Brazos Valley GCD	180,000,000	45,000,000	135,000,000

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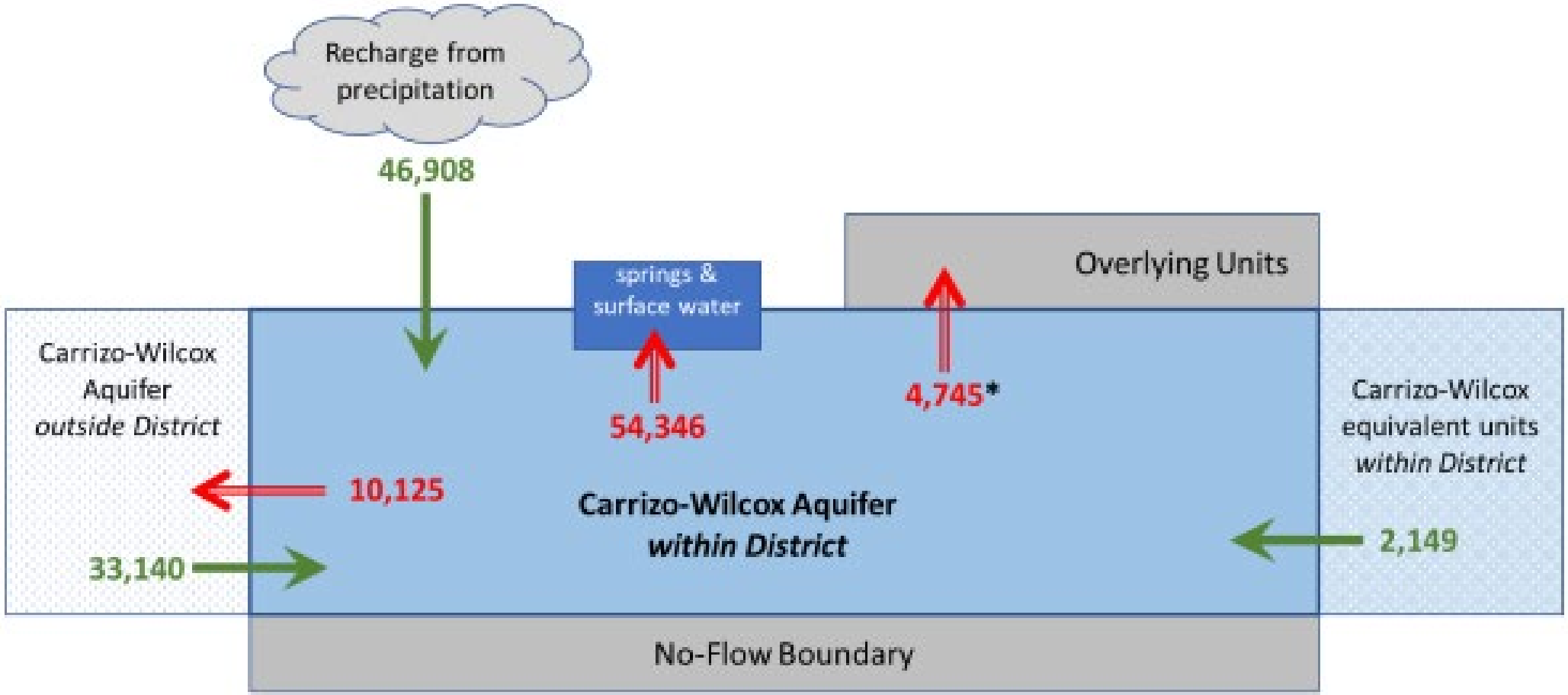
TERS : Other Aquifers

	Groundwater Conservation District (GCD)	Total Storage (acre-feet)	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Queen City	Brazos Valley GCD	34,000,000	8,500,000	25,500,000
Sparta	Brazos Valley GCD	18,000,000	4,500,000	13,500,000
Yegua-Jackson	Brazos Valley GCD	30,000,000	7,500,000	22,500,000
Brazos River Alluvium	Brazos Valley GCD	560,000	140,000	420,000
Gulf Coast	Brazos Valley GCD	450,000	112,500	337,500

Carrizo-Wilcox Recharge, Inflows, Discharges



From GAM Run 23-009

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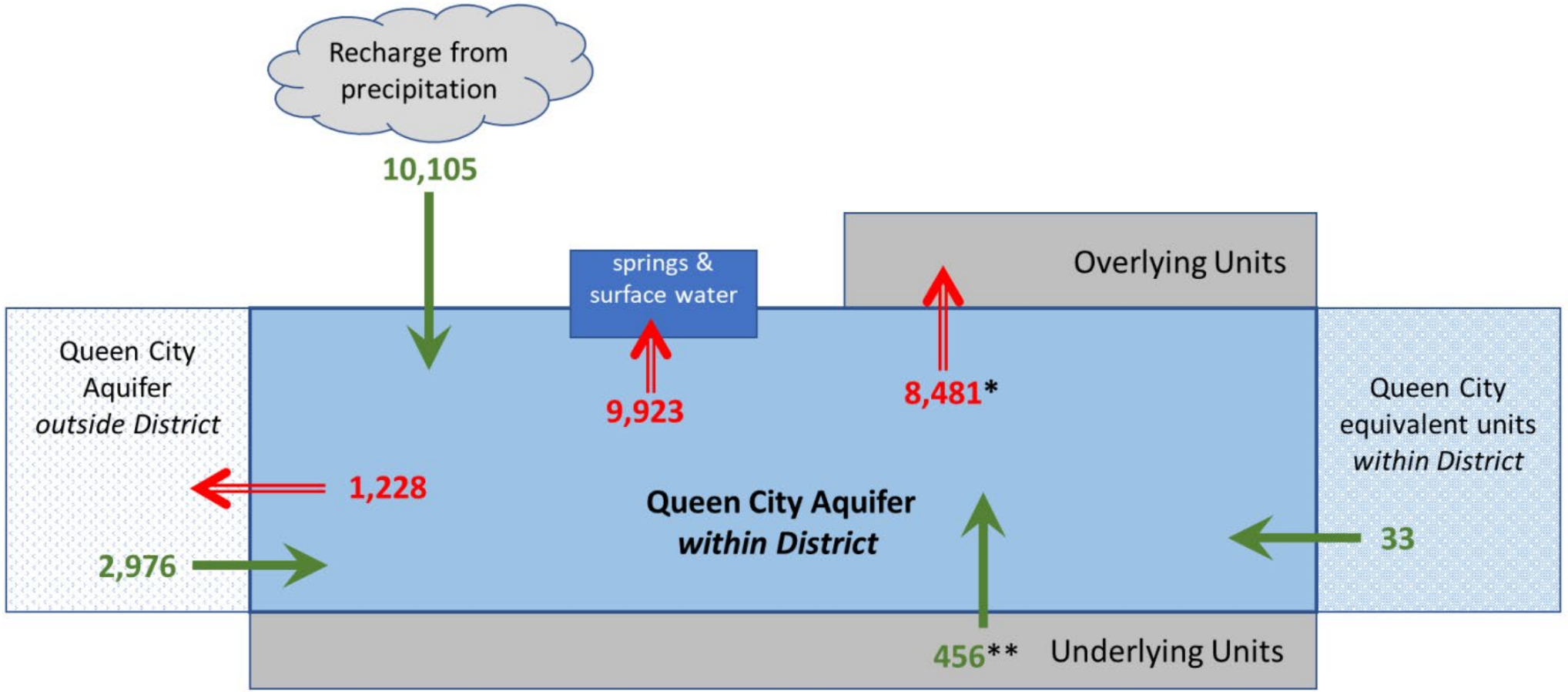
Queen City Recharge, Inflows, Discharges



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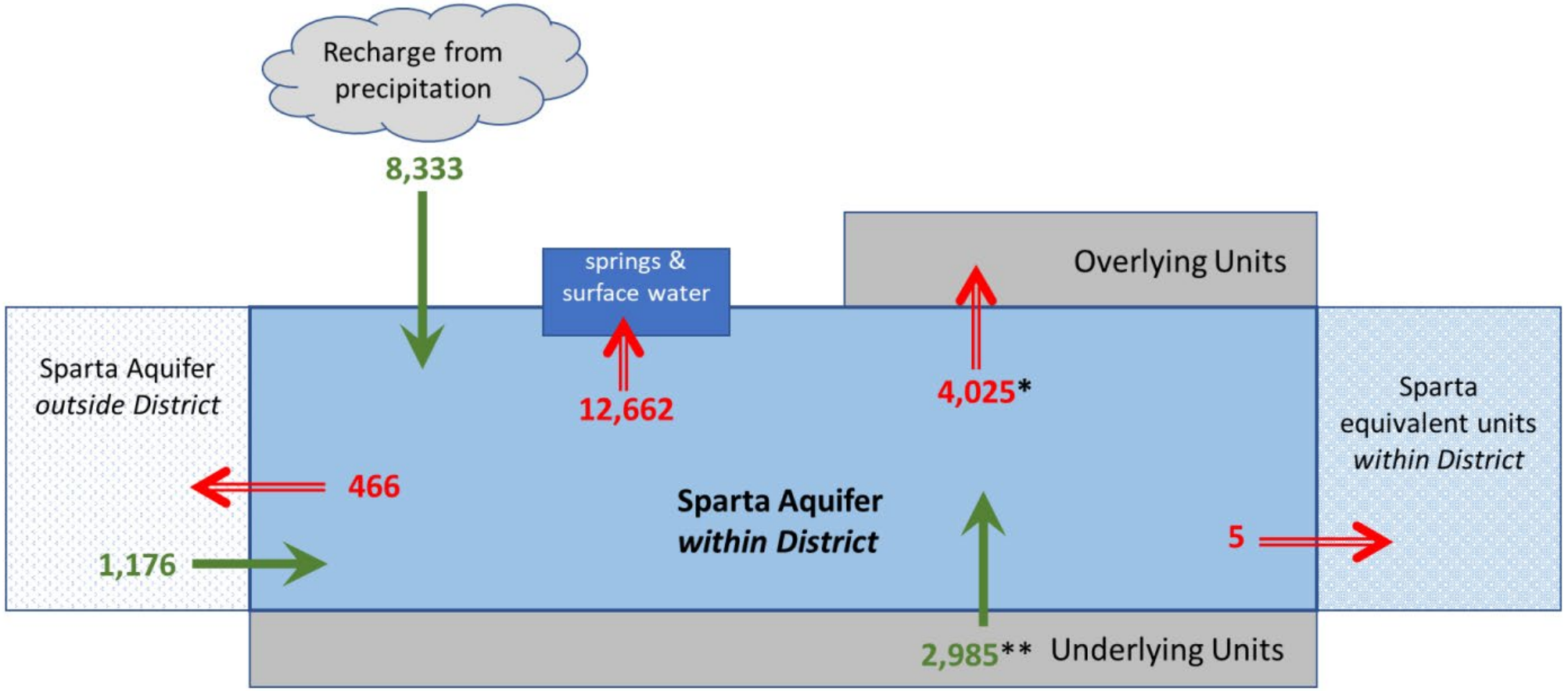
Sparta Recharge, Inflows, Discharges



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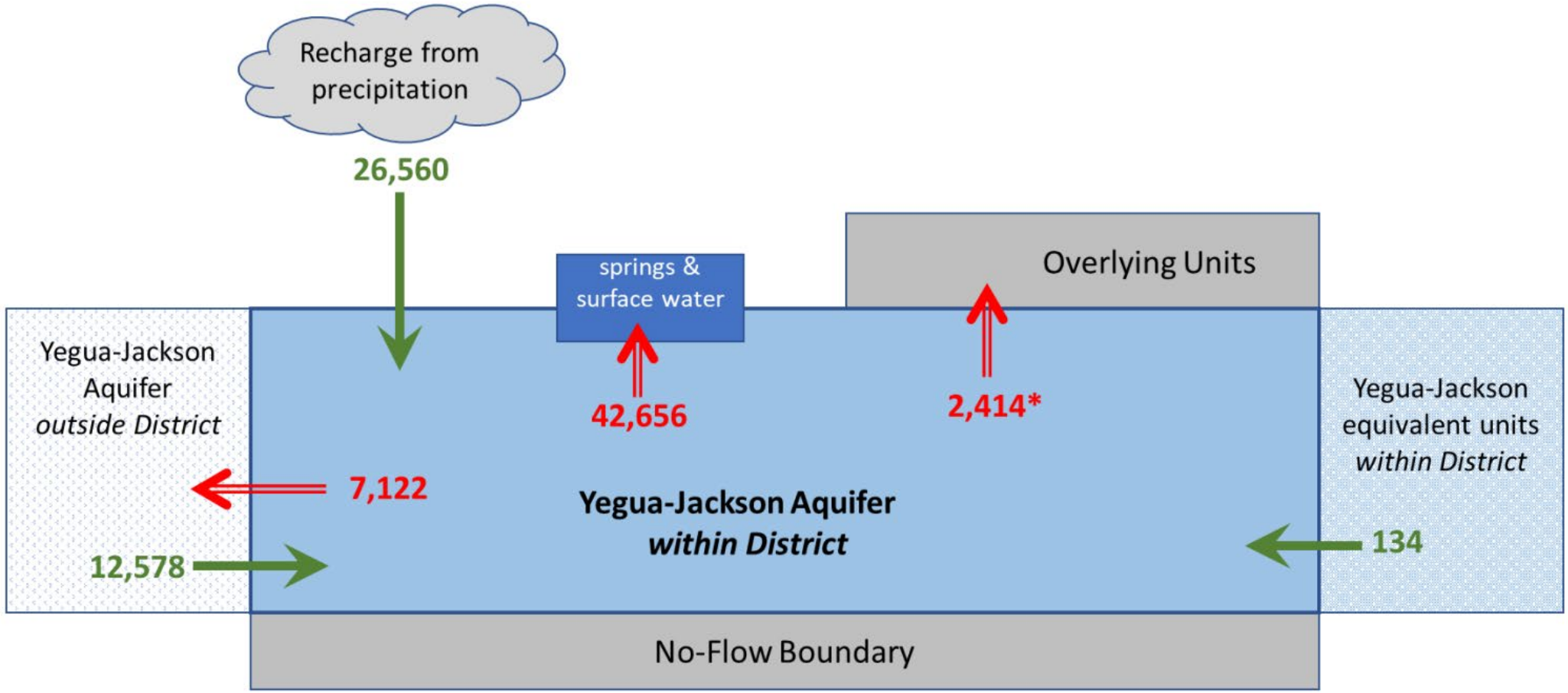
Yegua-Jackson Recharge, Inflows, Discharges



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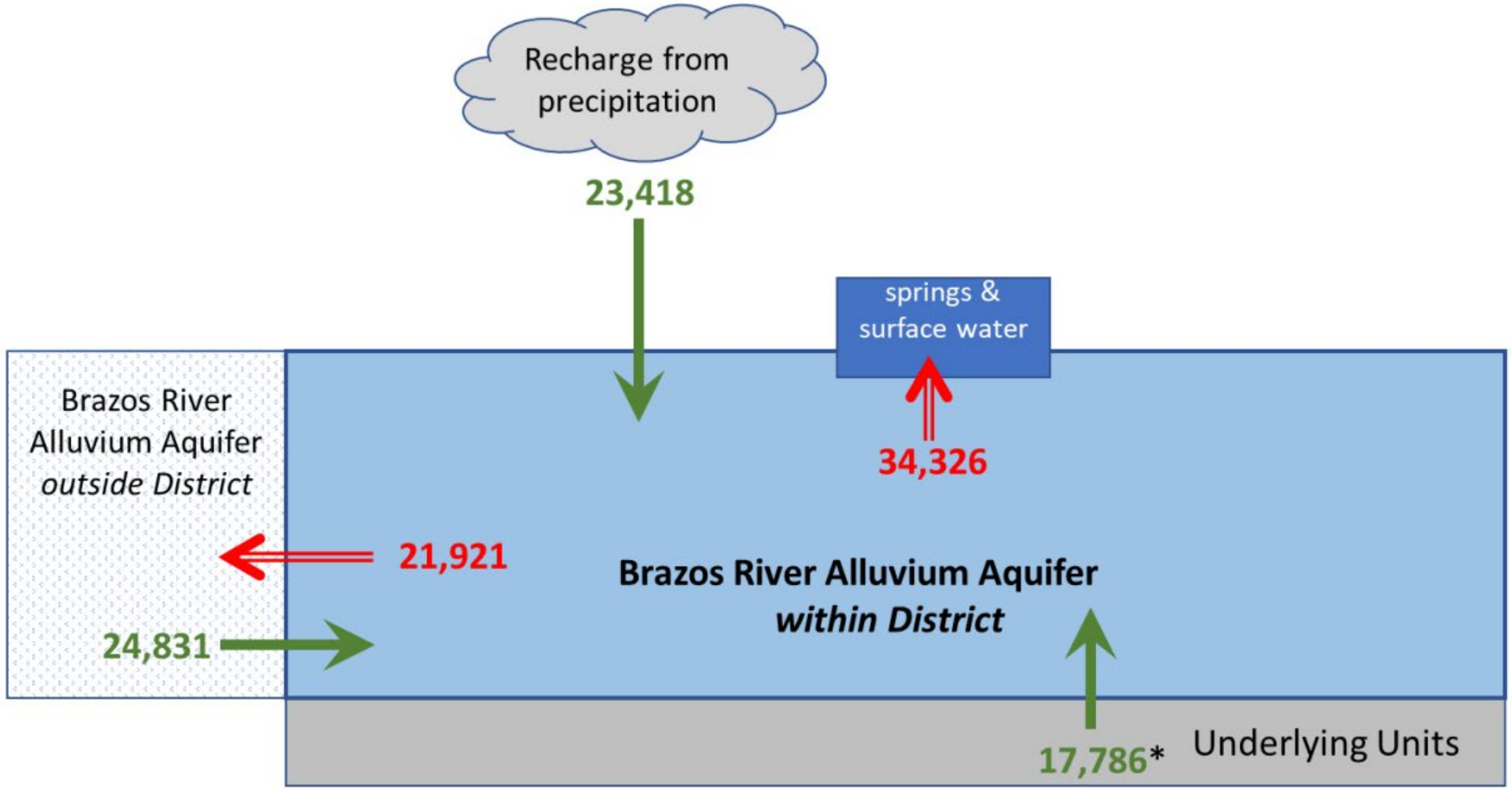
Brazos River Alluvium Recharge, Inflows, Discharges



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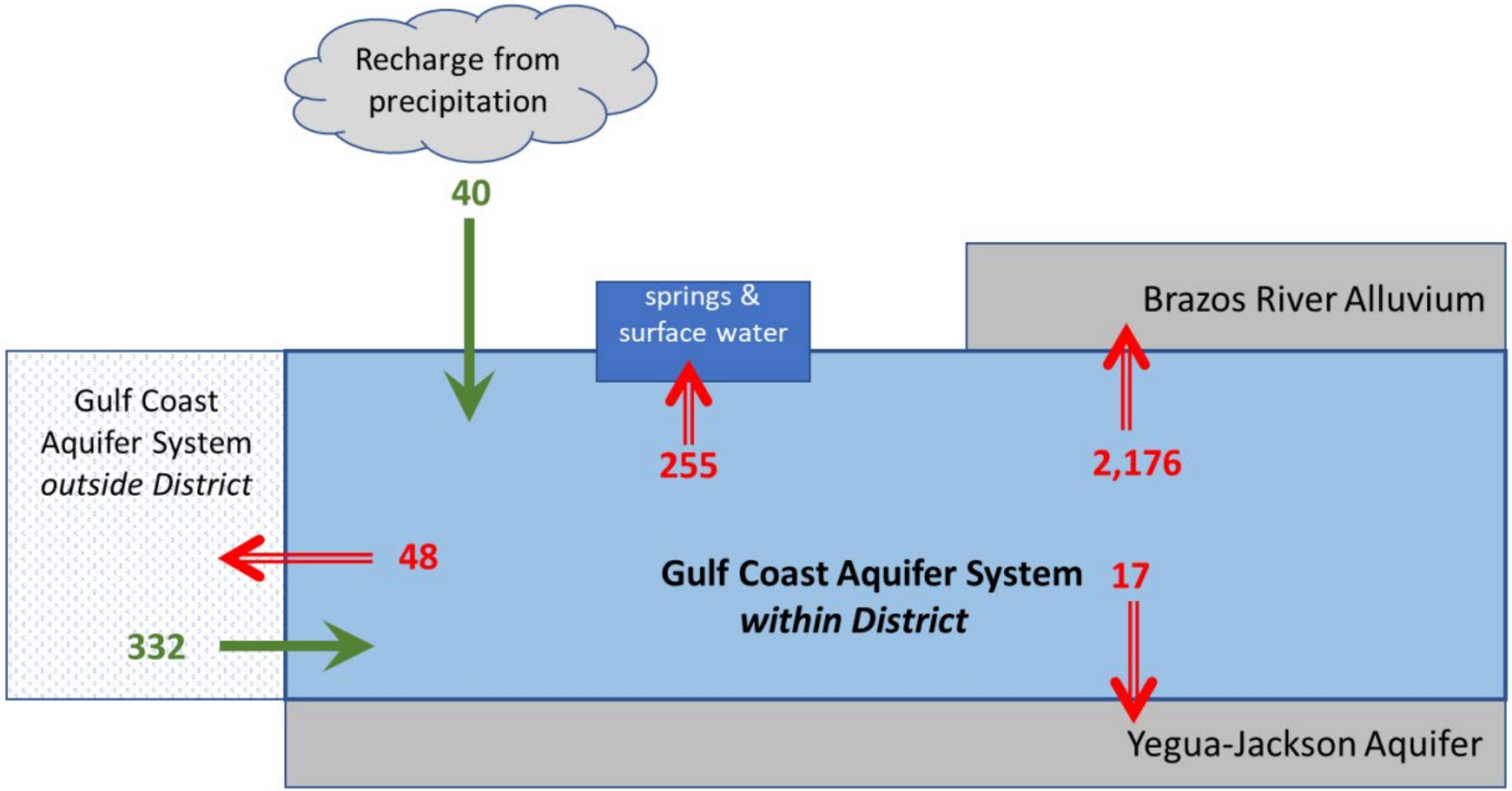
Gulf Coast Recharge, Inflows, Discharges



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Consideration of Factors

1. Aquifer uses or conditions
2. Water supply needs and management strategies
3. Hydrological conditions
4. Other environmental impacts
5. Impact on subsidence
6. Socioeconomic impacts
7. Impact on private property rights
8. Feasibility of achieving the DFC
9. Any other relevant information