GMA 8
Joint Groundwater Planning Meeting

October 27, 2020

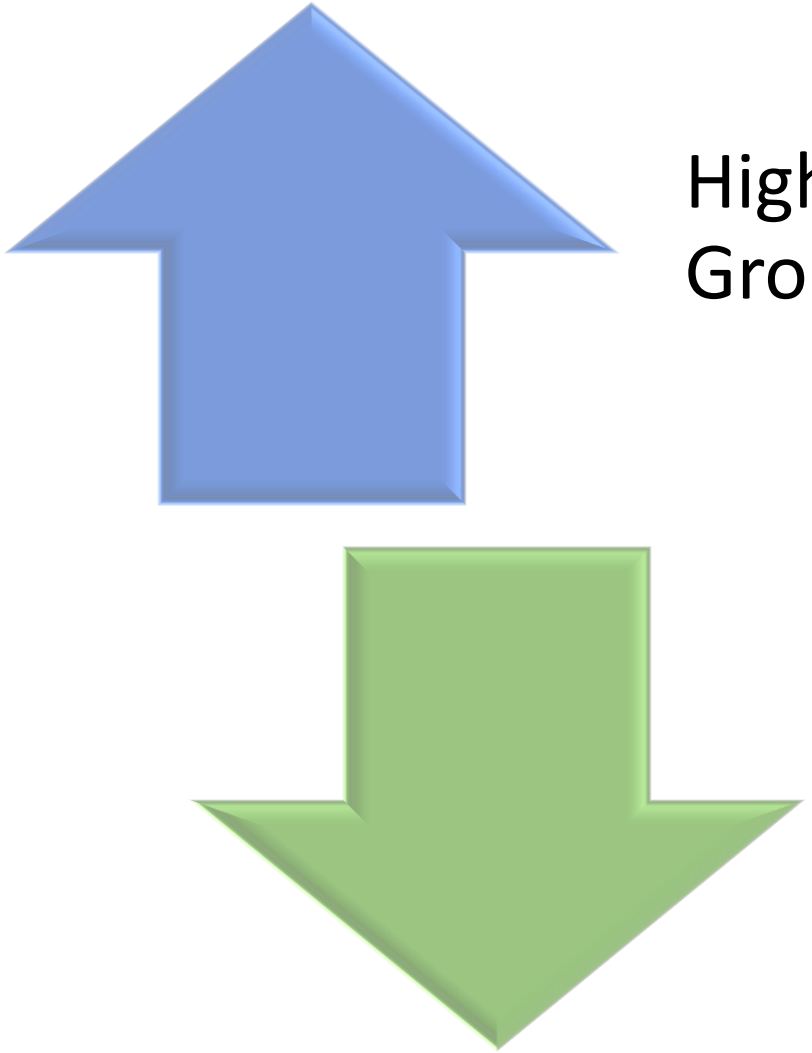
wsp

Blanton & Associates, Inc.
Environmental Consulting • Planning • Project Management

Agenda Item 7
Presentation and discussion of the 9 factors pursuant to Texas Water Code Section 36.108(d).

- WSP Team has discussed 9 factors in three previous meetings
- Minor DFC changes have occurred due to minor changes in GAM runs
- Briefly review 9 factors before considering adoption of proposed DFCs

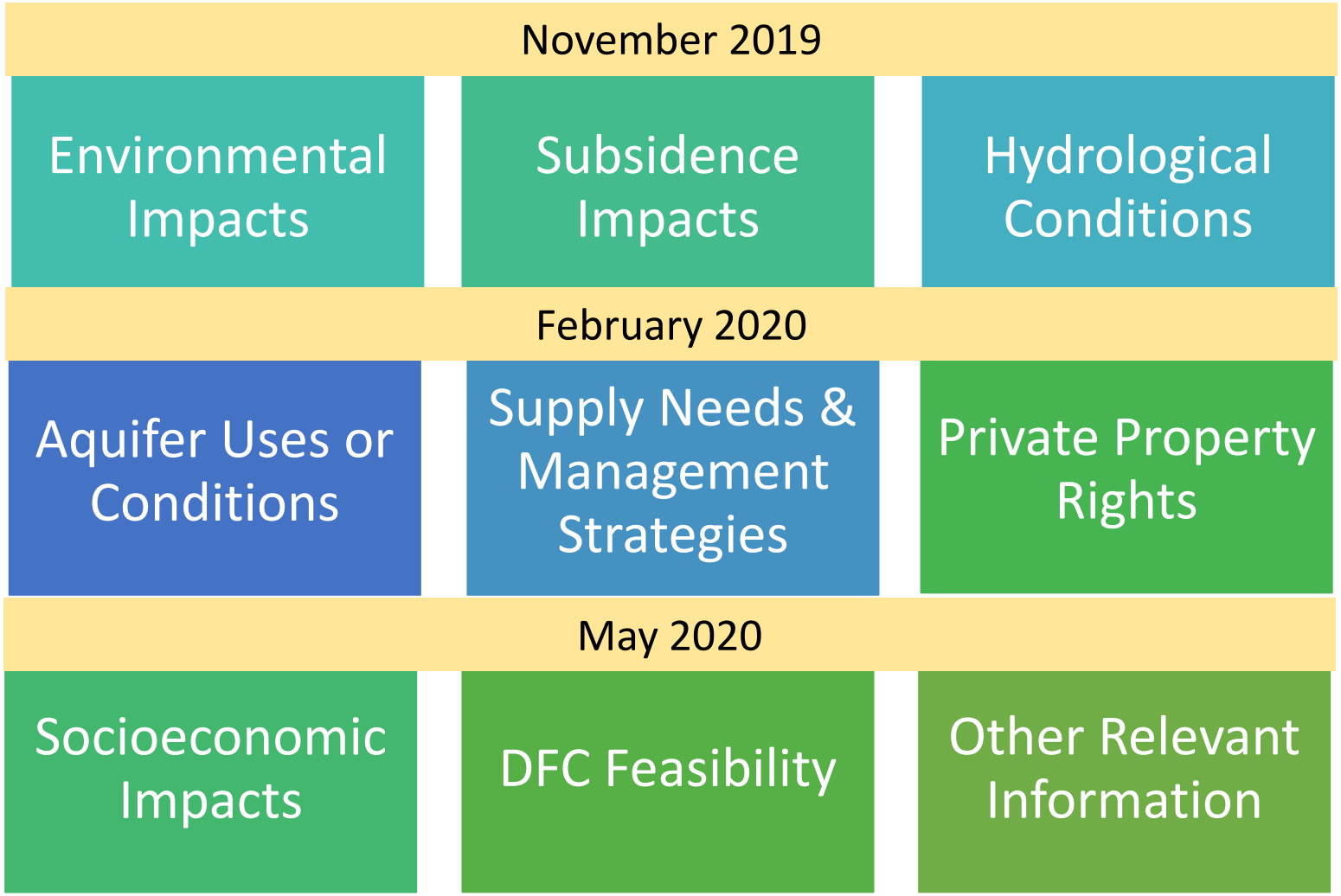
Standard for Desired Future Conditions



Highest Practicable Level of Groundwater Production

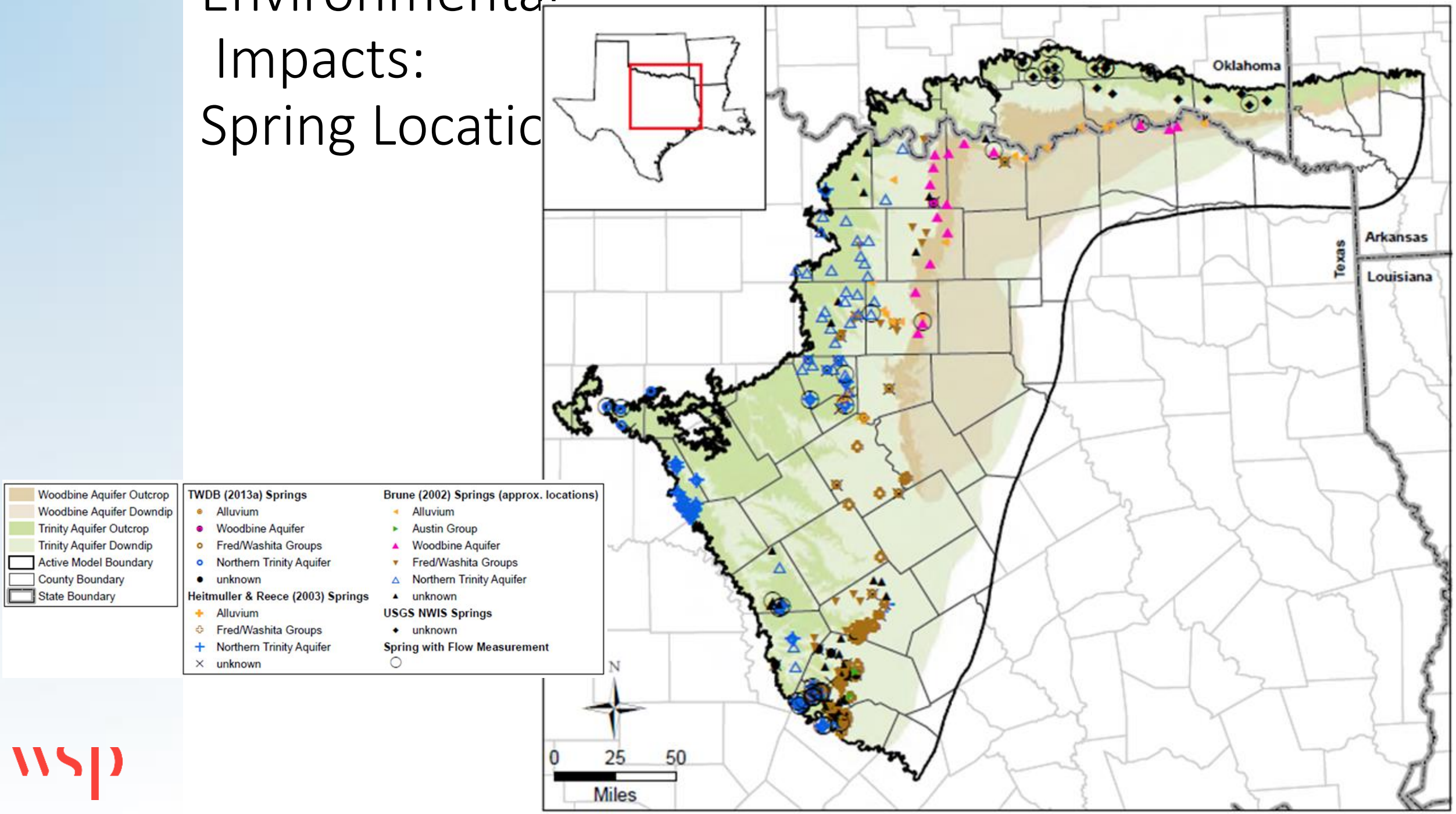
Conservation, Preservation, Protection, Recharging, and Prevention of Waste of Groundwater, and Control of Subsidence

Previous GMA 8 Meetings Discussing Nine Factors



Environmental Impacts

Environmental Impacts: Spring Locatic

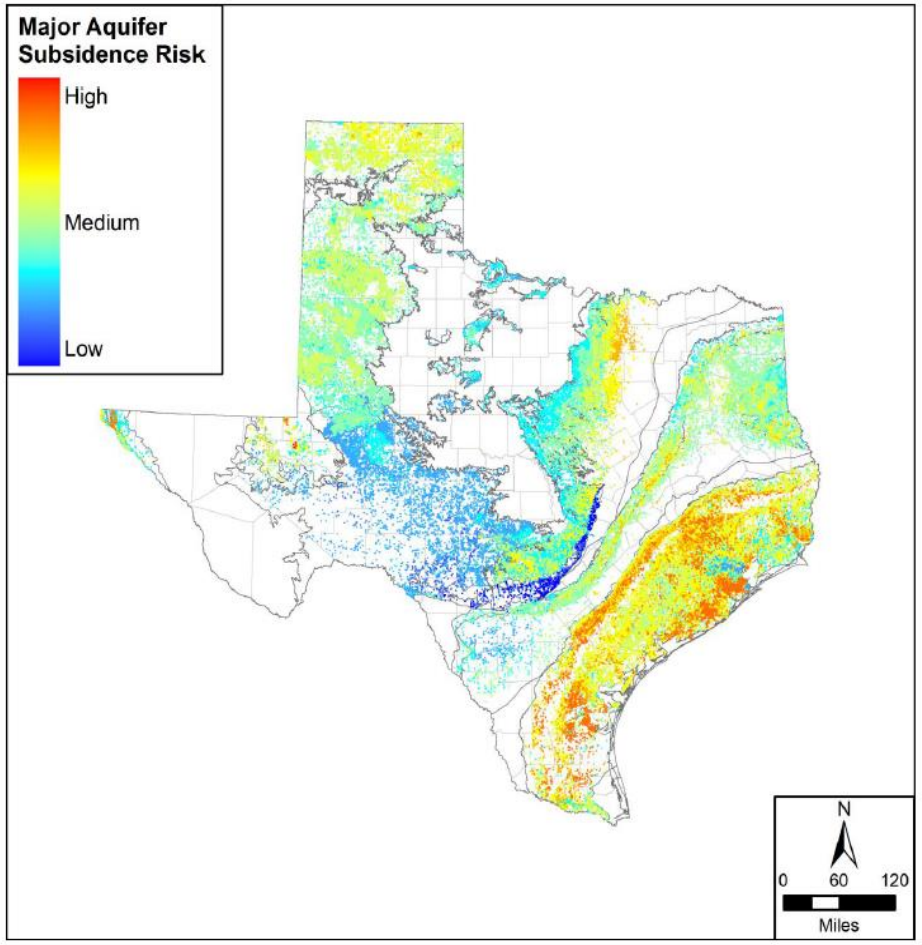


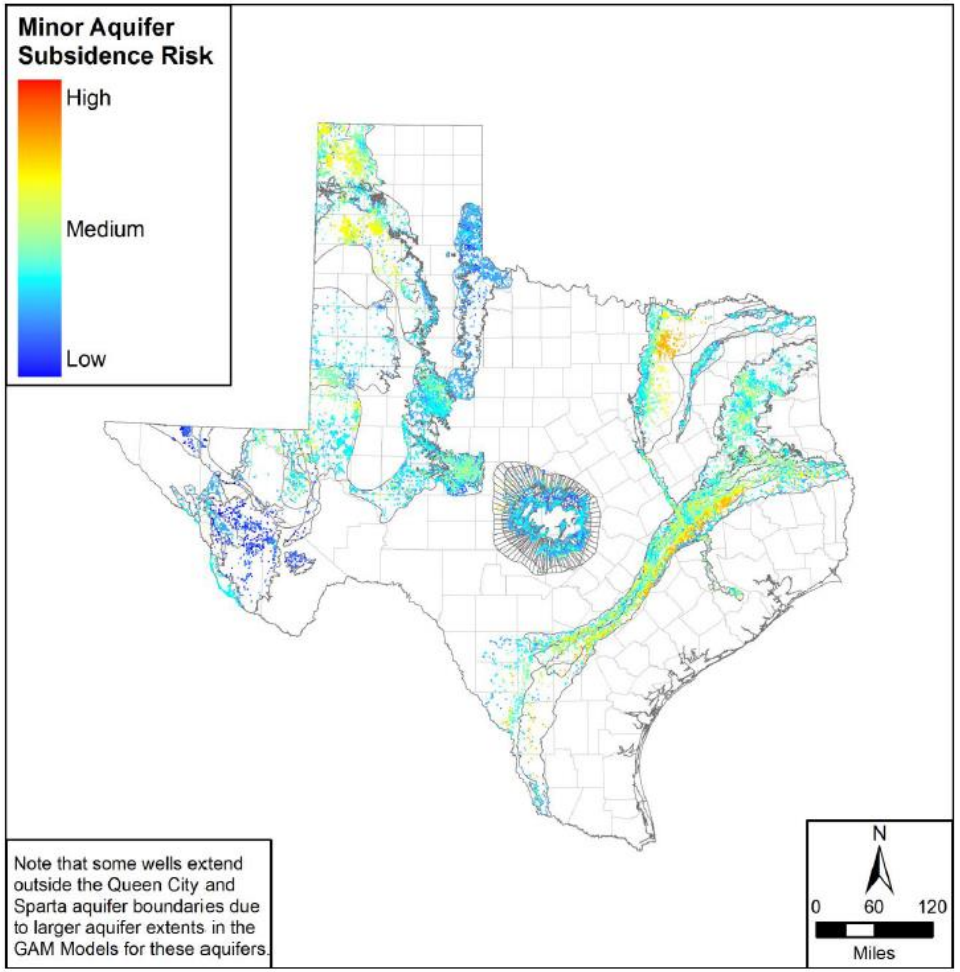
Environmental Impacts: Spring Discharge and Streamflow

- Southern portion of GMA 8 has the greatest density of springs.
- Most are in the Washita/Fredericksburg, which includes Edwards BFZ.
- Many located in far western extent of GMA 8.
- Springs flow when the water level elevation of the aquifer is higher than the spring elevation.
- Run 11 impacts to springs and streams is very similar to Run 10 in previous round of planning

Subsidence Impacts

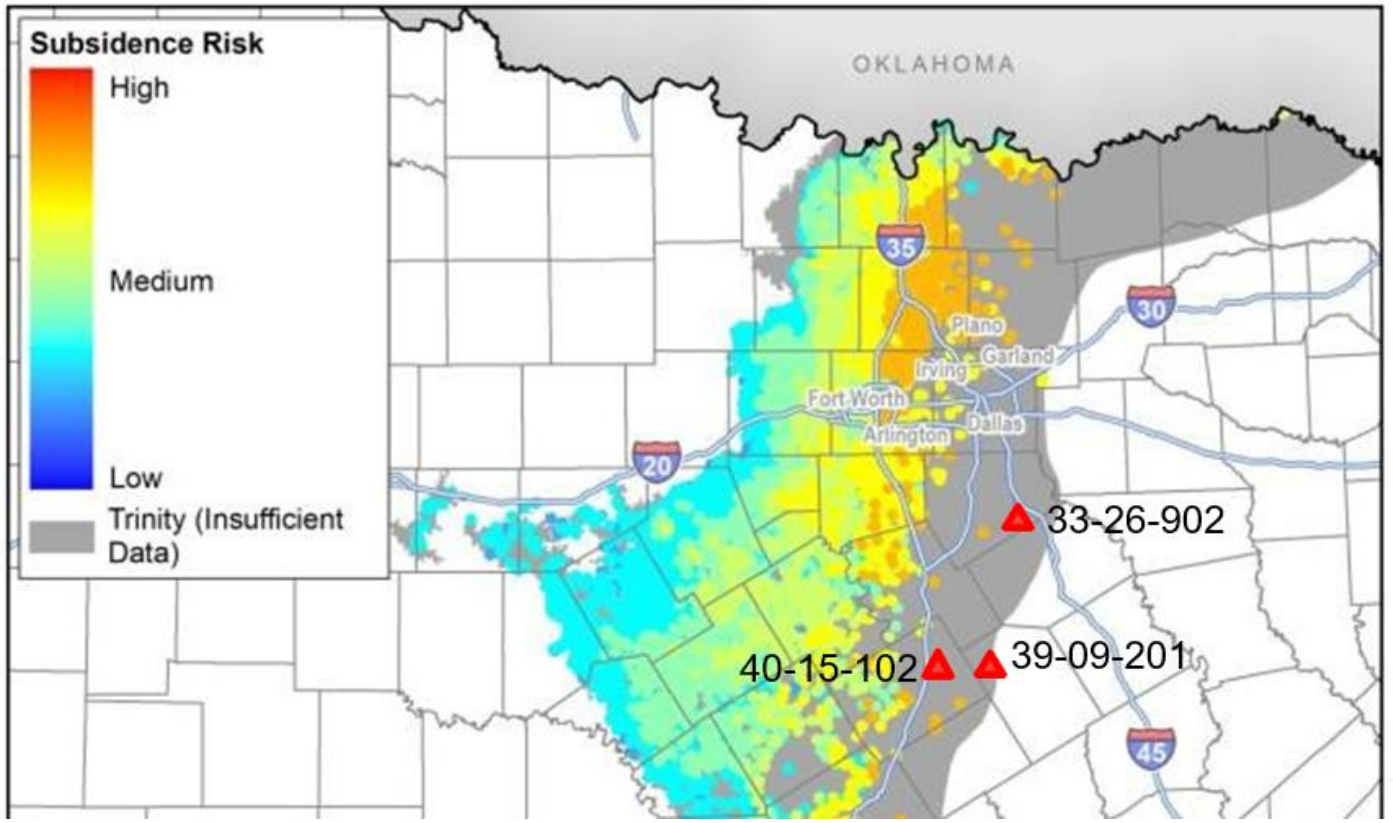
Visualizing the Subsidence Risk





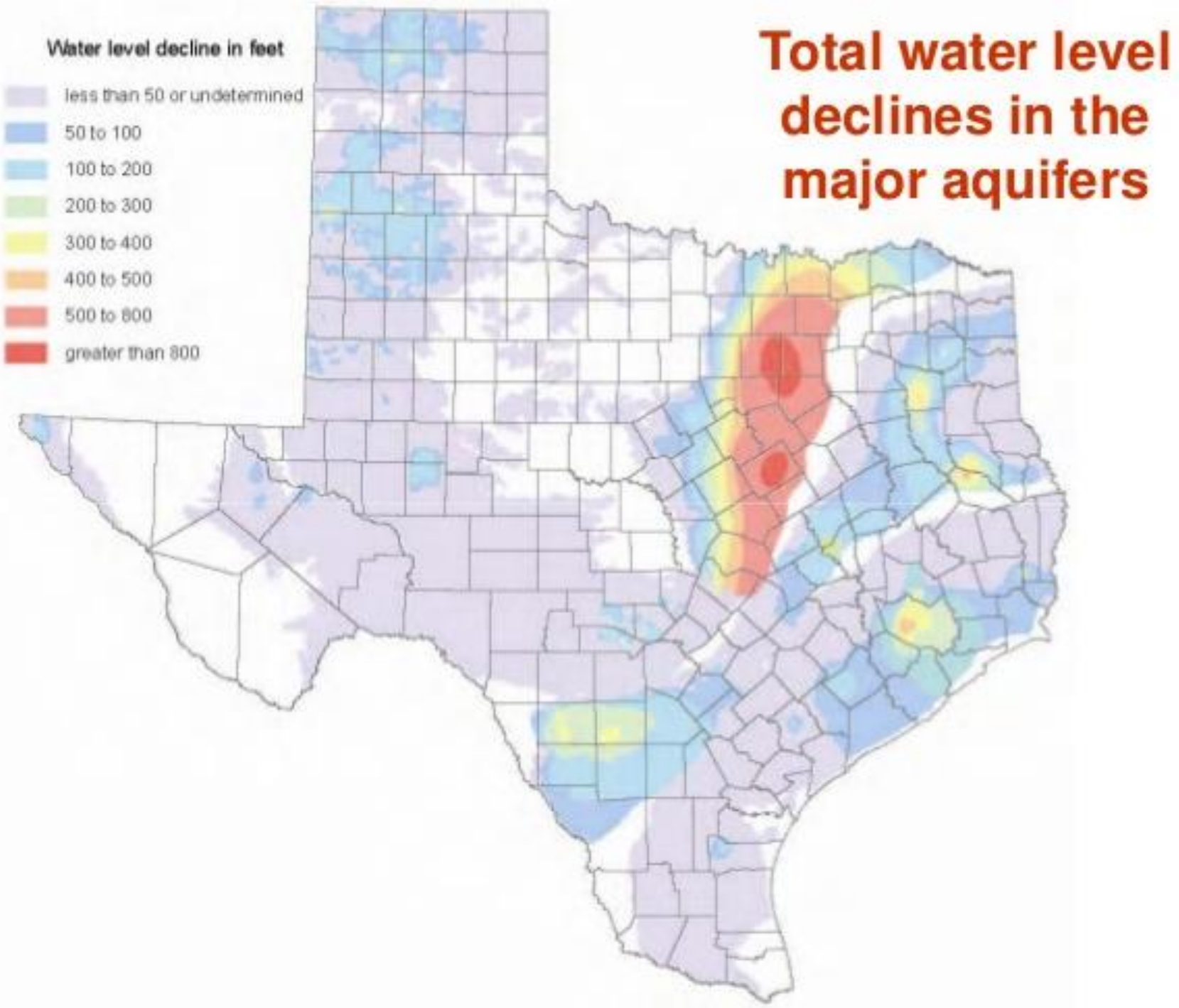
Examples of Subsidence Estimates

Well Owner	State Well ID	Aquifer Thickness (feet)	Clay Thickness (feet)	**Subsidence Risk Score**	Minimum Subsidence (feet)	Maximum Subsidence (feet)
Rockett SUD	33-26-902	1,140	668	**7.66**	0.6	1.2
Penelope WSC	39-09-201	1,440	299	**8.59**	3.0	6.0
Aquilla	40-15-102	835	294	**7.66**	2.5	4.5



Hydrological Conditions

Total water level declines in the major aquifers



Hydrological Conditions

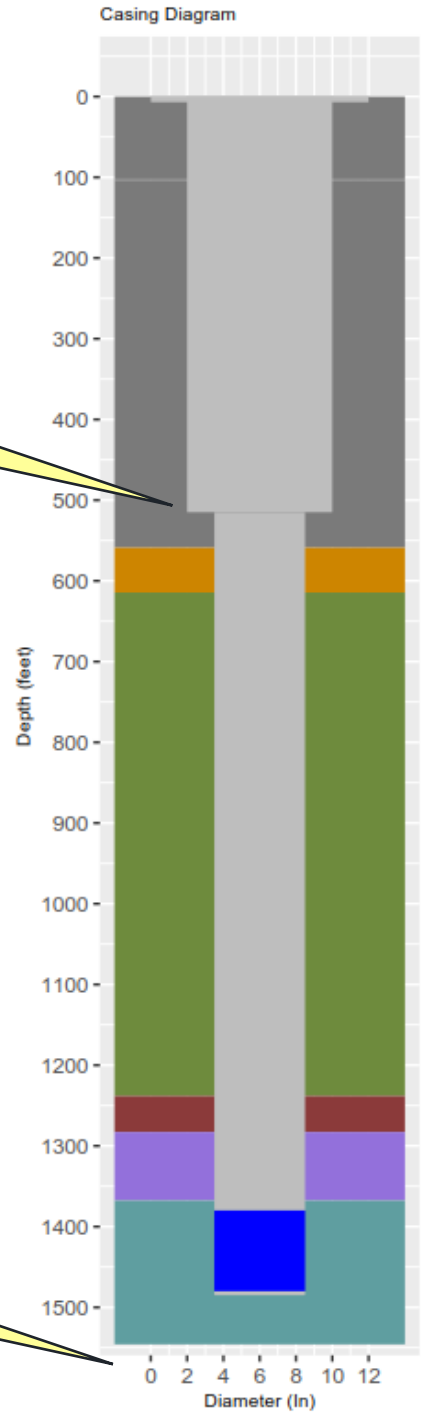
- TWDB GWDB water level data
- Define relevant **TWDB** aquifer codes
- Count measurements and throw out null values.
  - Wells with less than 3 measurements; and
  - Wells that do not have a measurement since 2000
- Selection criteria reduced well locations with water levels from 8,461 to 677 wells used for mapping/hydrographs

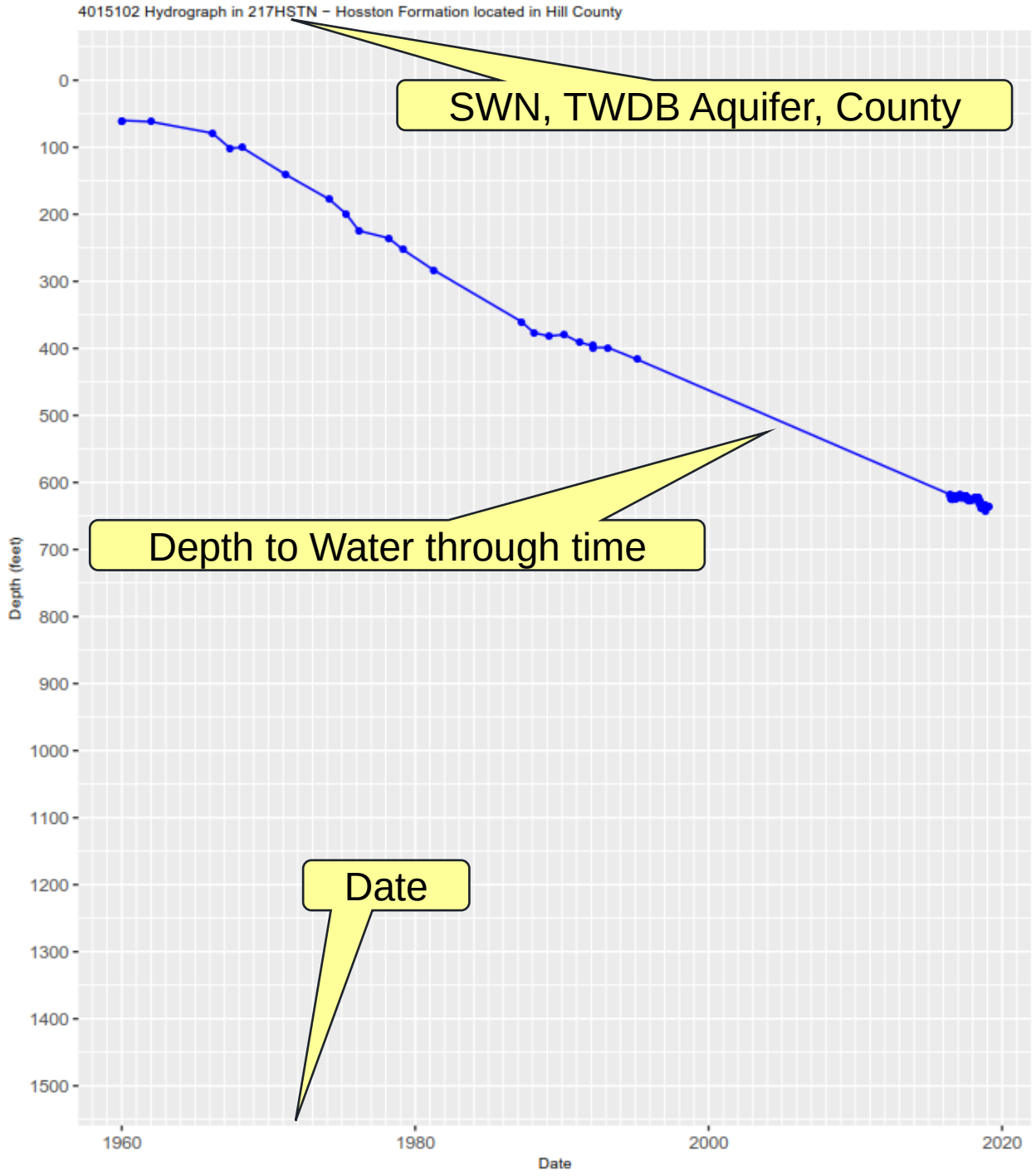
HOSSTON AQUIFER HYDROGRAPH

Change in Casing Size

NTGAM Aquifer Designation

Well and Screen Diameter





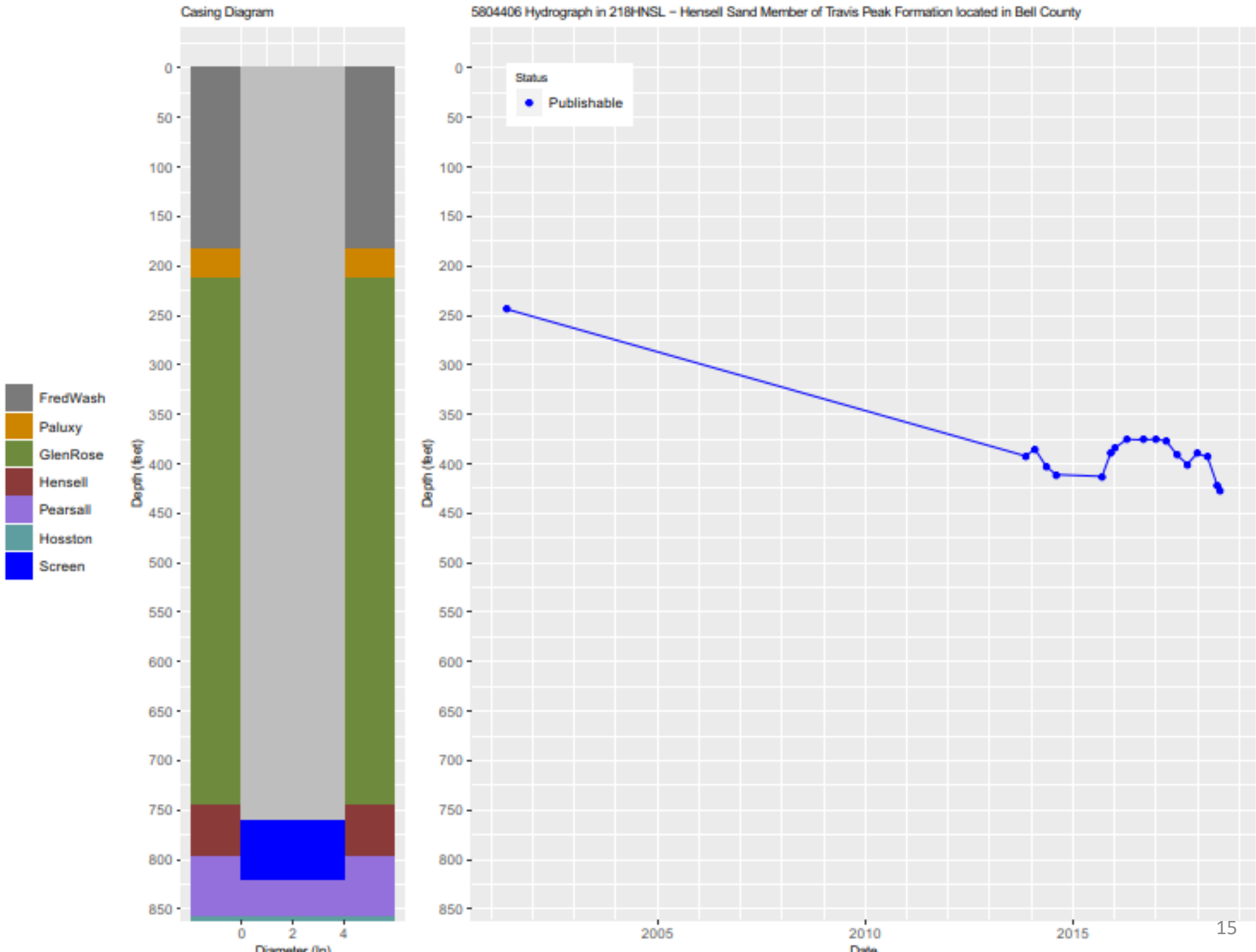
SWN, TWDB Aquifer, County

Depth to Water through time

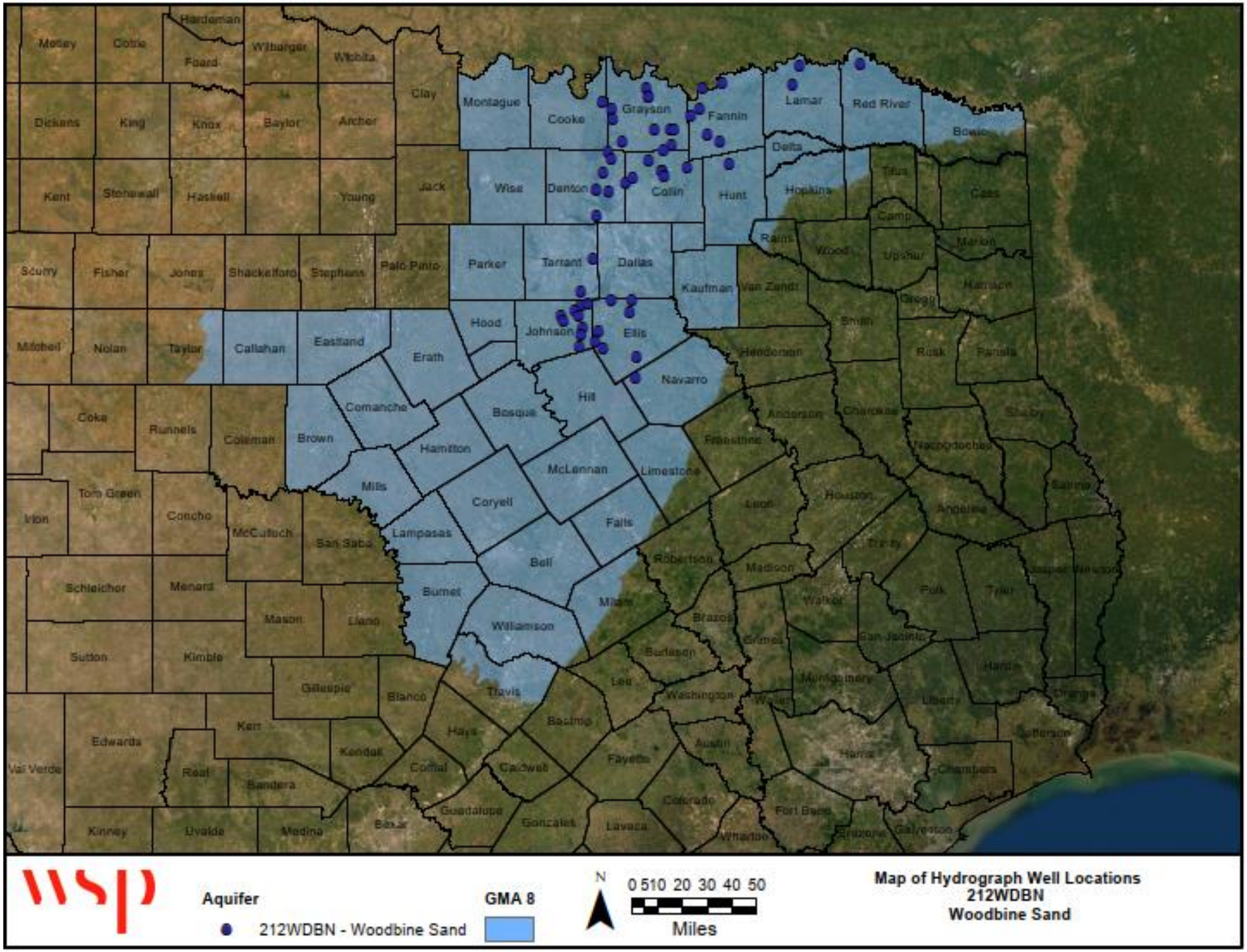
Date

The Aquifer layers shown in the casing diagram were developed using the NTWGAM. In certain cases, assumptions used to develop the NTWGAM can cause well casing and screen intervals to not align well with modeled aquifer layers.

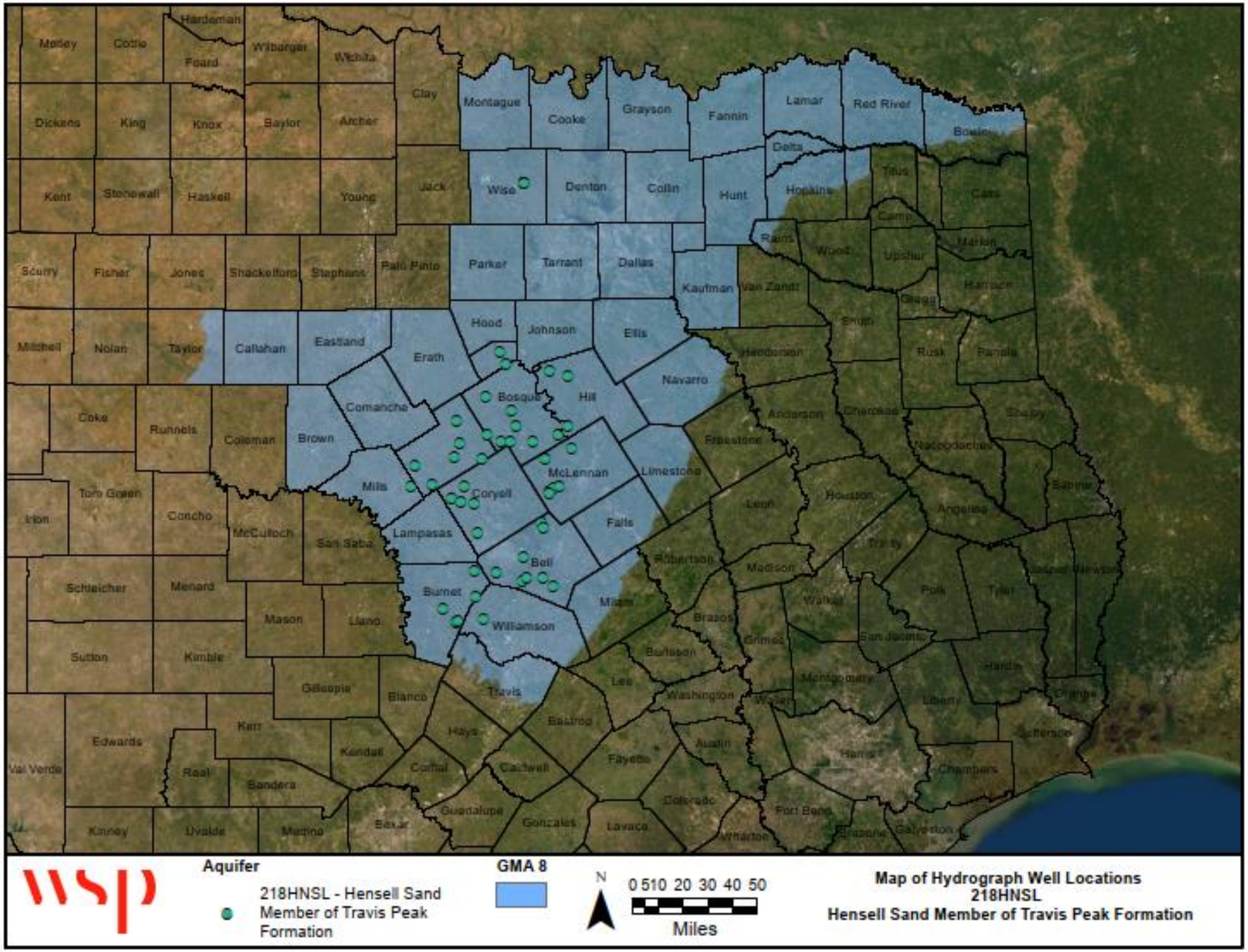
HENSELL AQUIFER HYDROGRAPH IN BELL COUNTY



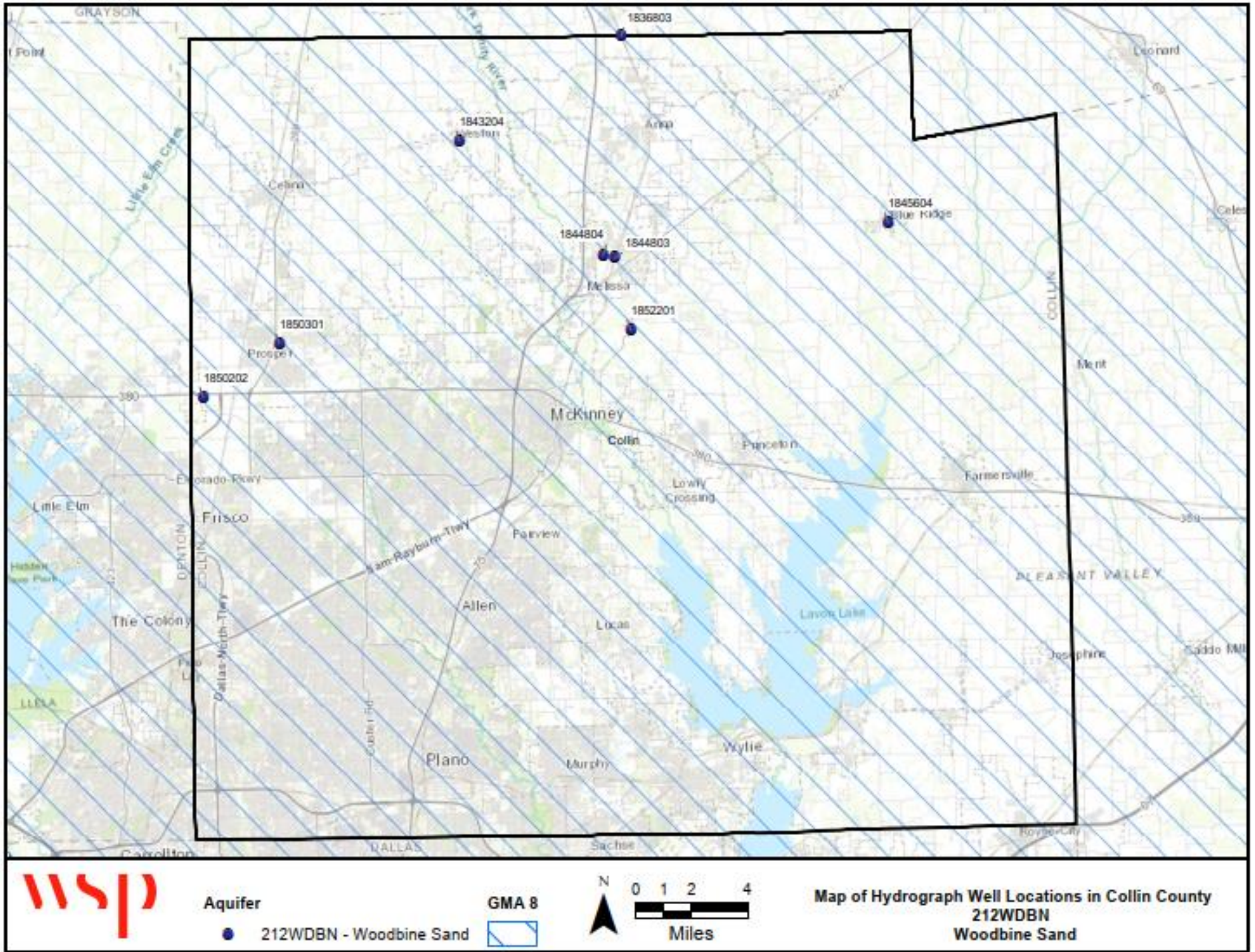
WOODBINE AQUIFER WELLS WITH HYDROGRAPHS



HENSELL AQUIFER WELLS WITH HYDROGRAPHS



WOODBINE AQUIFER WELLS WITH HYDROGRAPHS IN COLLIN COUNTY



Total Estimated Recoverable Storage (TERS)

Hickory Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Brown	55,000	165,000
Burnet	1,650,000	4,950,000
Lampasas	700,000	2,100,000
Mills	157,500	472,500
Travis	8,250	24,750
Williamson	4,250	12,750
Total	2,575,000	7,725,000

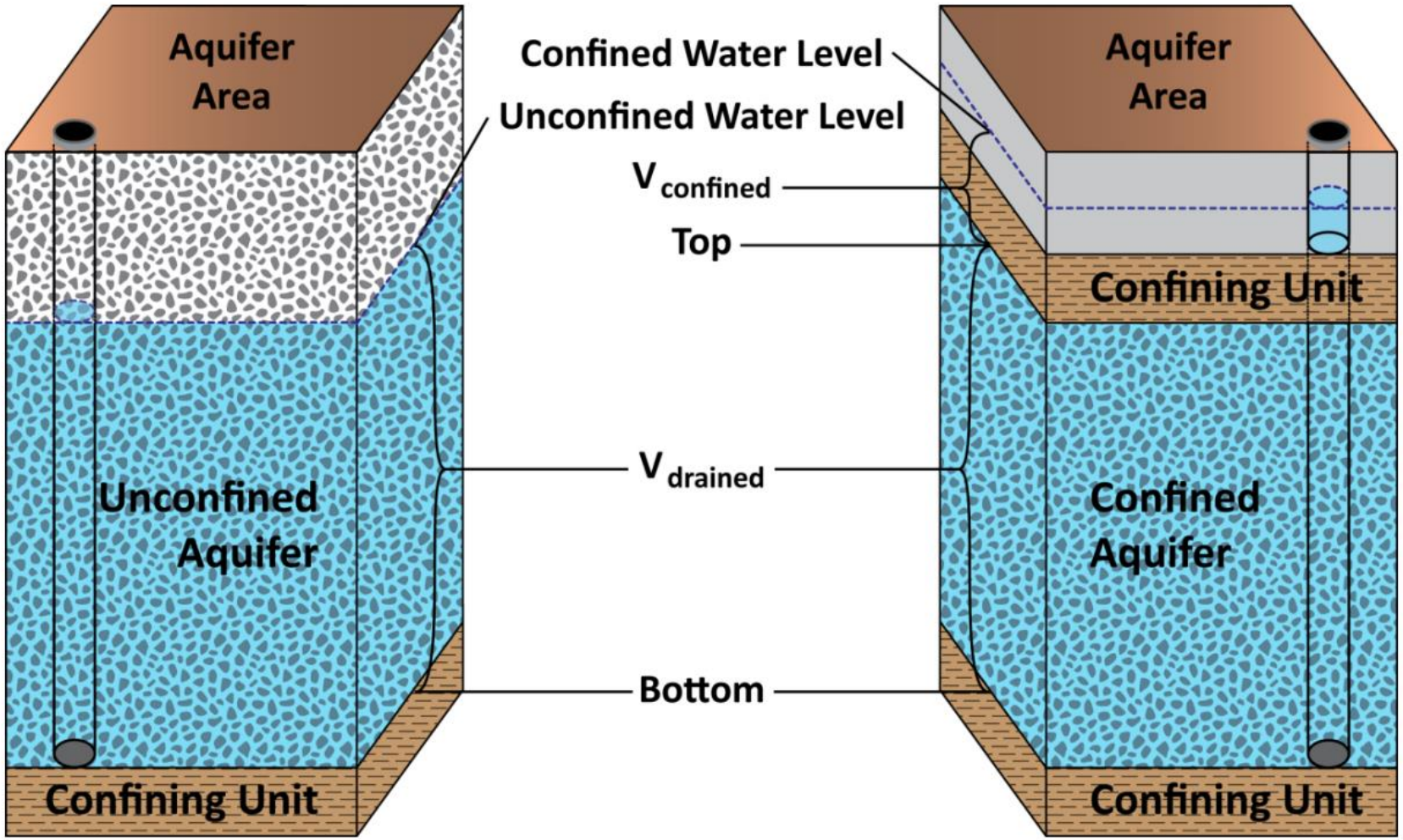
Ellenburger – San Saba Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Brown	55,000	165,000
Burnet	1,650,000	4,950,000
Lampasas	700,000	2,100,000
Mills	157,500	472,500
Travis	8,250	24,750
Williamson	4,250	12,750
Total	2,575,000	7,725,000

Marble Falls Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Burnet	9,500	28,500
Lampasas	9,750	29,250
Total	19,250	57,750

Total Estimated Recoverable Storage (TERS)



Total Estimated Recoverable Storage (TERS)

Trinity Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Bell	14,750,000	44,250,000
Bosque	10,000,000	30,000,000
Brow	650,000	1,950,000
Burnet	2,750,000	8,250,000
Callahan	450,000	1,350,000
Collin	22,000,000	66,000,000
Comanche	2,075,000	6,225,000
Cooke	11,250,000	33,750,000
Coryell	8,500,000	25,500,000
Eastland	400,000	1,200,000
Ellis	19,500,000	58,500,000
Erath	5,000,000	15,000,000
Falls	9,000,000	27,000,000
Fannin	19,750,000	59,250,000
Grayson	15,750,000	47,250,000
Hamilton	5,500,000	16,500,000
Hill	13,000,000	39,000,000
Hood	2,750,000	8,250,000
Hunt	3,000,000	9,000,000
Johnson	8,750,000	26,250,000
Kaufman	2,350,000	7,050,000
Lamar	19,250,000	57,750,000
Lampasas	3,000,000	9,000,000
Limestone	2,750,000	8,250,000
McLennan	14,750,000	44,250,000
Milam	5,500,000	16,500,000
Mills	2,125,000	6,375,000
Montague	1,950,000	5,850,000
Navarro	9,750,000	29,250,000
Parker	5,500,000	16,500,000
Red River	11,000,000	33,000,000
Rockwall	1,225,000	3,675,000
Somervell	1,500,000	4,500,000
Tarrant	12,250,000	36,750,000
Taylor	157,500	472,500
Travis	9,750,000	29,250,000
Williamson	19,250,000	57,750,000
Wise	5,000,000	15,000,000
Total	339,882,500	1,019,647,500

Total Estimated Recoverable Storage (TERS)

Edwards (Balcones Fault Zone) Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Bell	2,750	8,250
Travis	1,475	4,425
Williamson	19,500	58,500
Total	23,725	71,175

Woodbine Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Collin	8,000,000	24,000,000
Cooke	300,000	900,000
Dallas	7,500,000	22,500,000
Denton	2,225,000	6,675,000
Ellis	6,250,000	18,750,000
Fannin	9,750,000	29,250,000
Grayson	8,000,000	24,000,000
Hill	1,675,000	5,025,000
Hunt	2,050,000	6,150,000
Johnson	1,125,000	3,375,000
Kaufman	1,175,000	3,525,000
Lamar	5,250,000	15,750,000
McLennan	225,000	675,000
Navarro	850,000	2,550,000
Red River	1,125,000	3,375,000
Rockwall	11,500	34,500
Tarrant	1,325,000	3,975,000
Total	56,836,500	170,509,500

Total Estimated Recoverable Storage (TERS)

Nacatoch Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Bowie	525,000	1,575,000
Delta	25,000	75,000
Ellis	17	50
Franklin	1,825	5,475
Hopkins	82,500	247,500
Hunt	137,500	412,500
Kaufman	30,000	90,000
Lamar	3,000	9,000
Navarro	23,750	71,250
Rains	4,500	73,500
Red River	145,000	435,000
Rockwall	70	210
Total	978,162	2,934,485

Blossom Aquifer in GMA 8

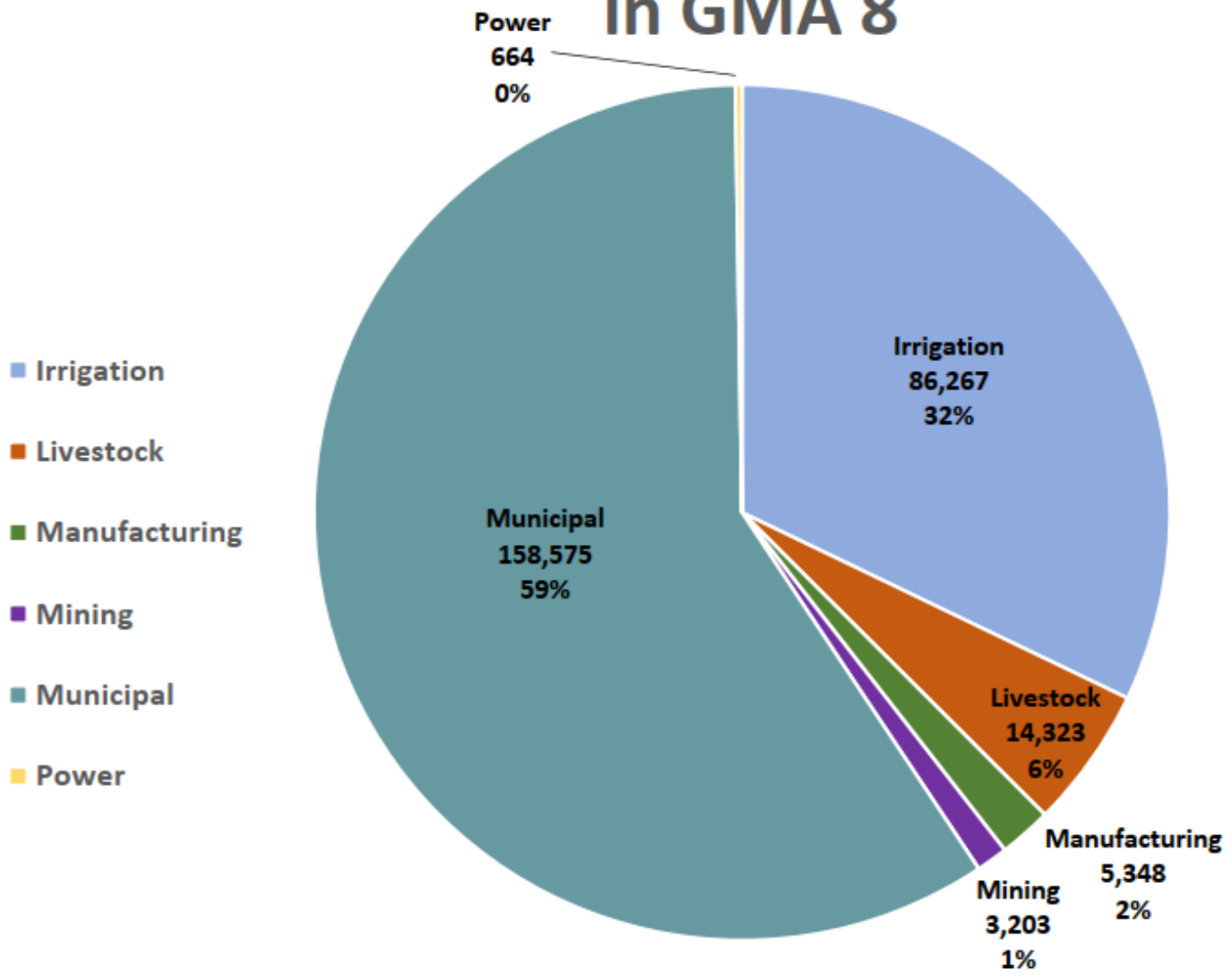
County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Bowie	227,500	682,500
Lamar	242,500	727,500
Red River	1,300,000	3,900,000
Total	1,770,000	5,310,000

Brazos River Alluvium Aquifer in GMA 8

County	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Bosque	2,400	7,200
Falls	40,000	120,000
Hill	1,650	4,950
McLennan	22,500	67,500
Milam	2,175	6,525
Total	68,725	206,175

Aquifer Uses and Conditions

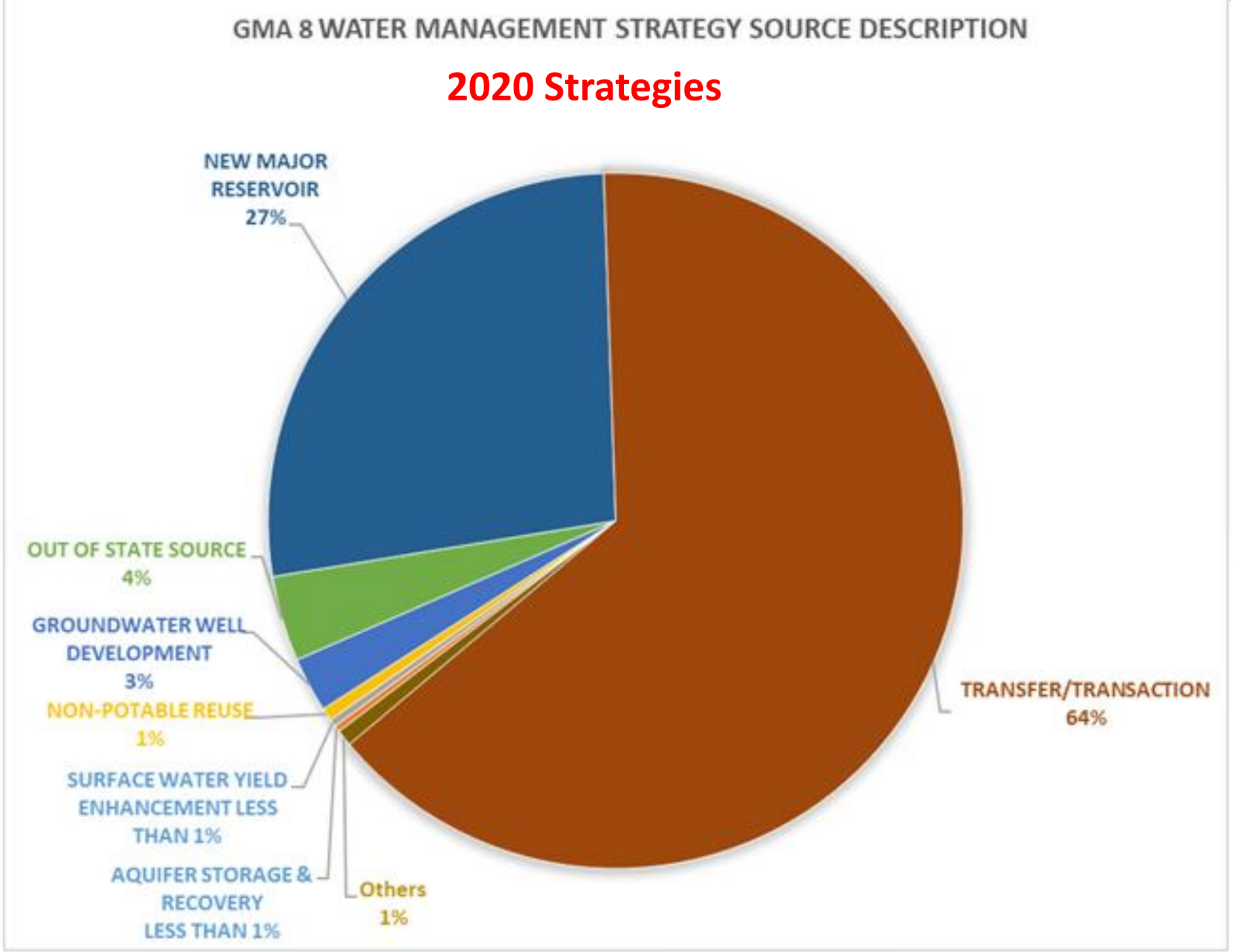
Groundwater Pumping by Type in GMA 8



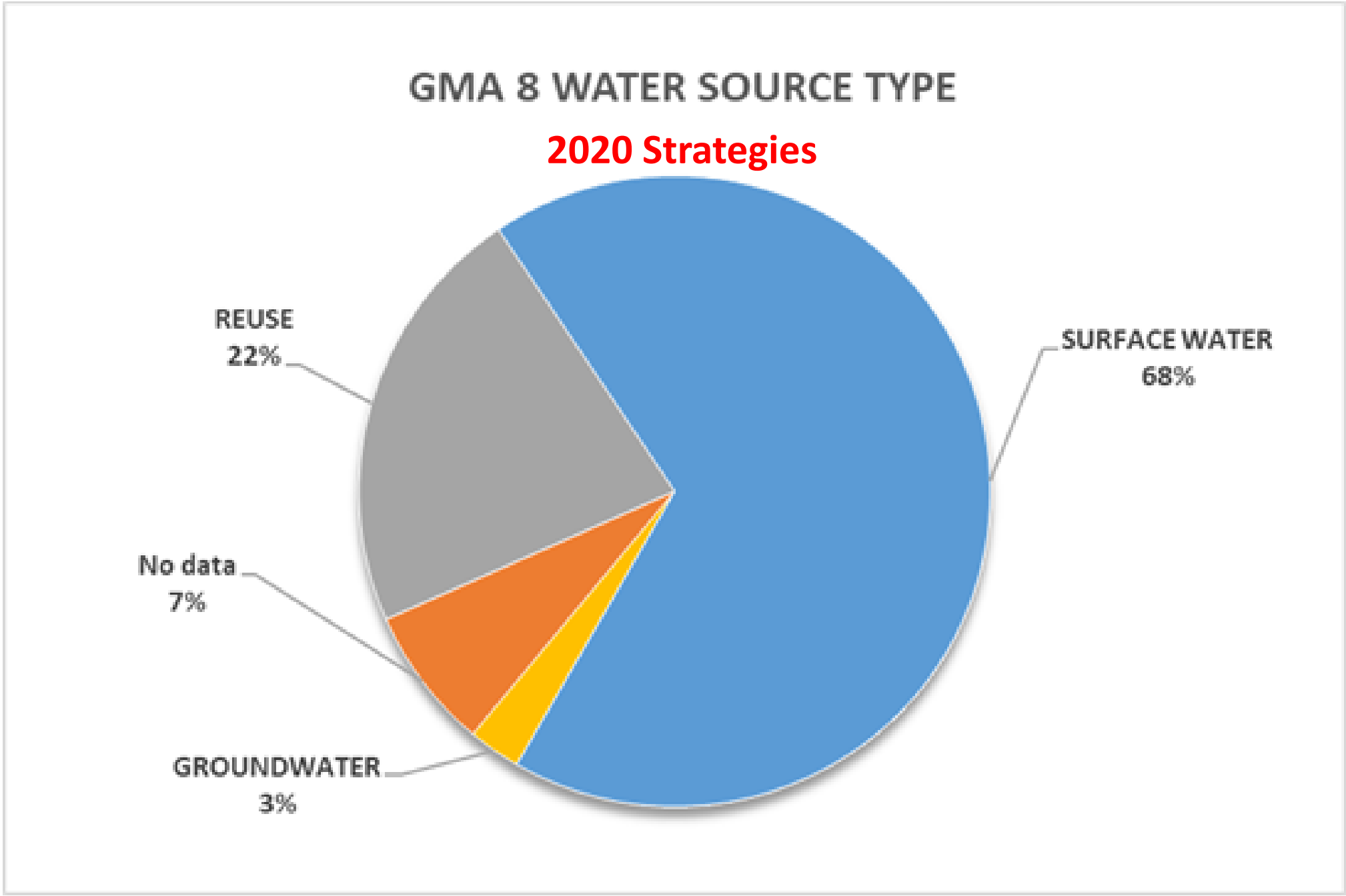
5-year average for years 2014-2018

Supply Needs & Management Strategies

Sources for New Strategies in GMA 8



Water Sources for New Strategies in GMA 8

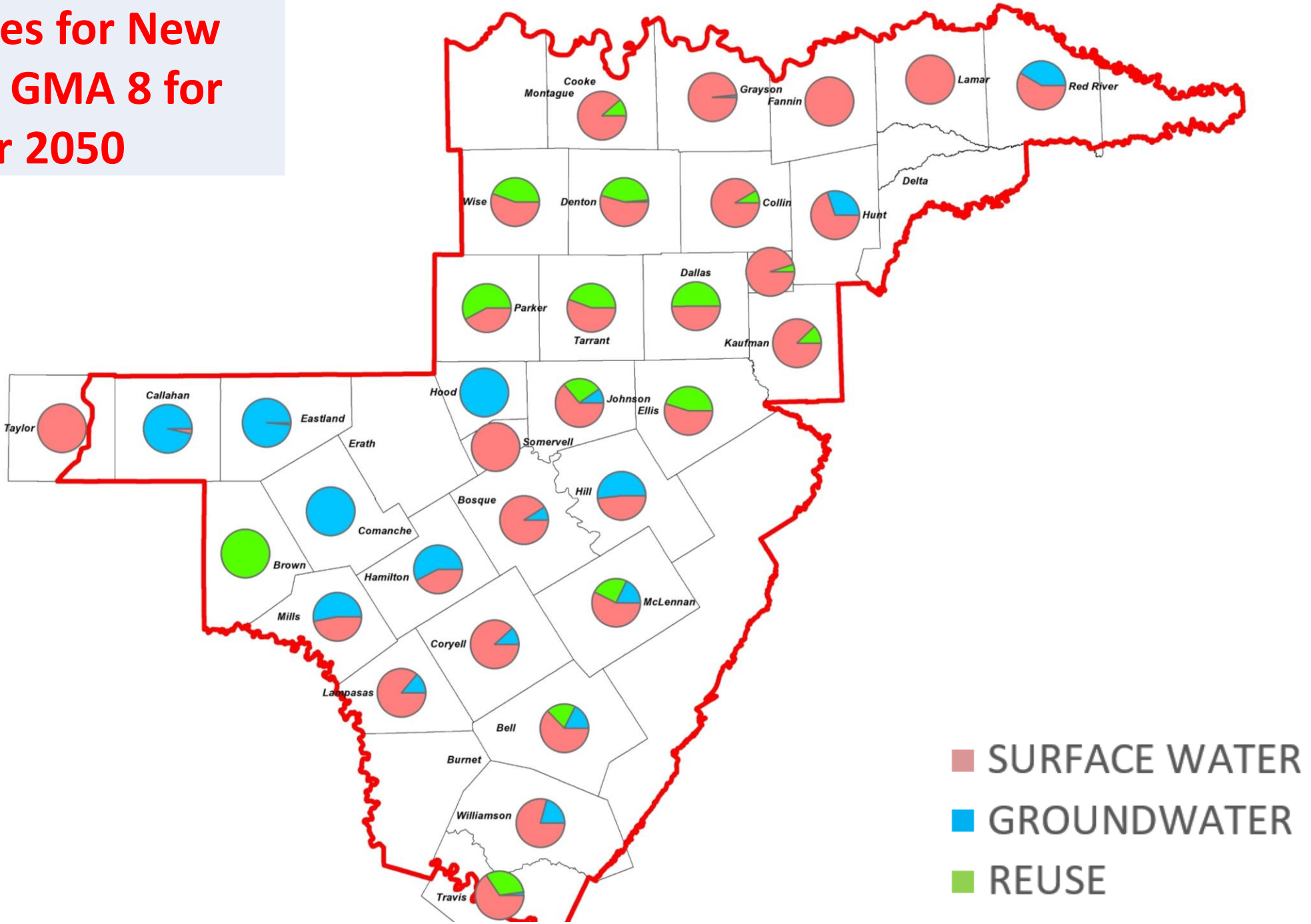


Supply Needs & Management Strategies

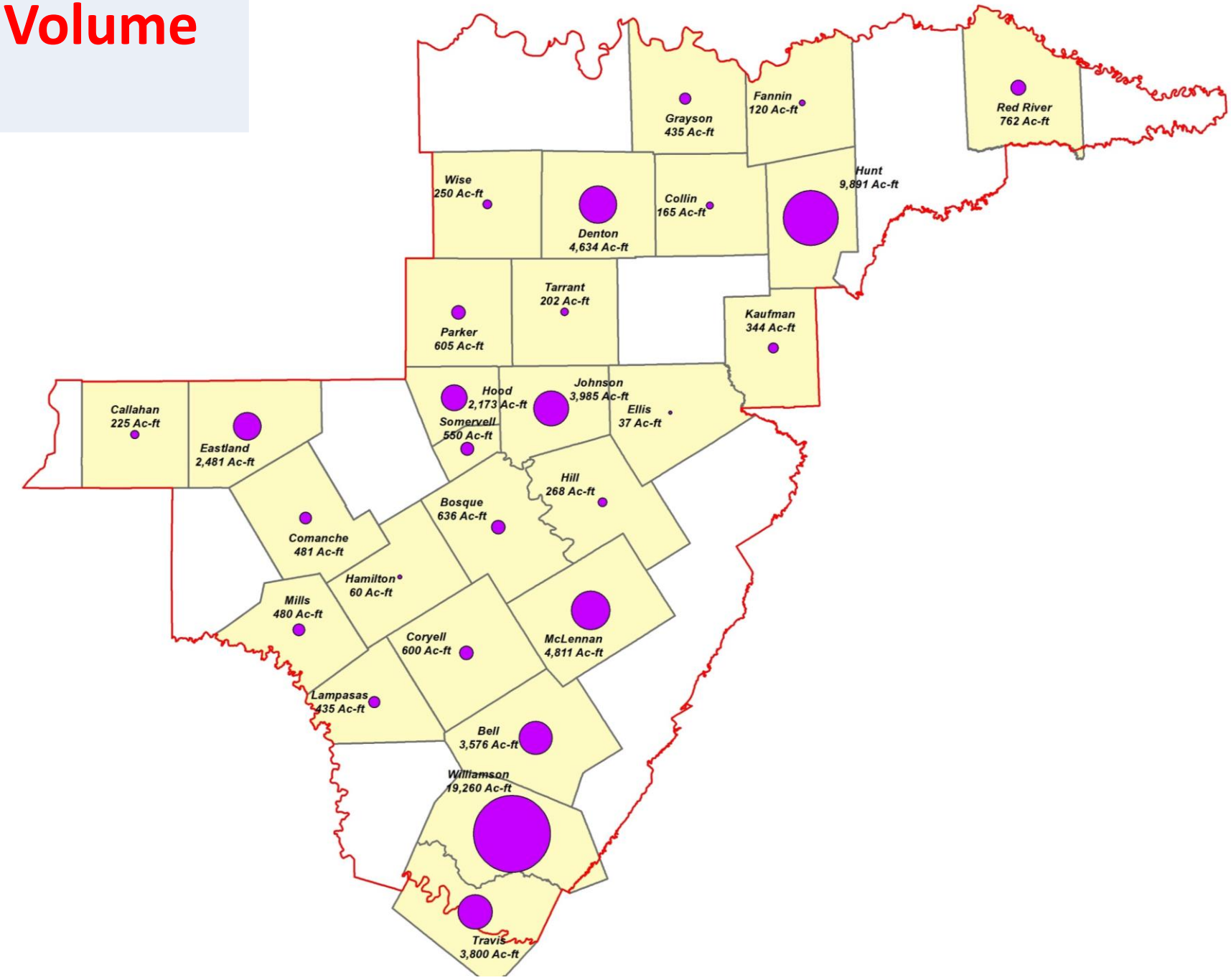
- Supply Needs
  - Need = Supply is less than Future Demand
  - Need = Current Supply - Future Demand

- Management Strategies
  - Infrastructure strategies to meet needs
  - 2020 and 2050 strategies

Water Sources for New Strategies in GMA 8 for the year 2050



Groundwater Volume 2050



Socioeconomic Impacts

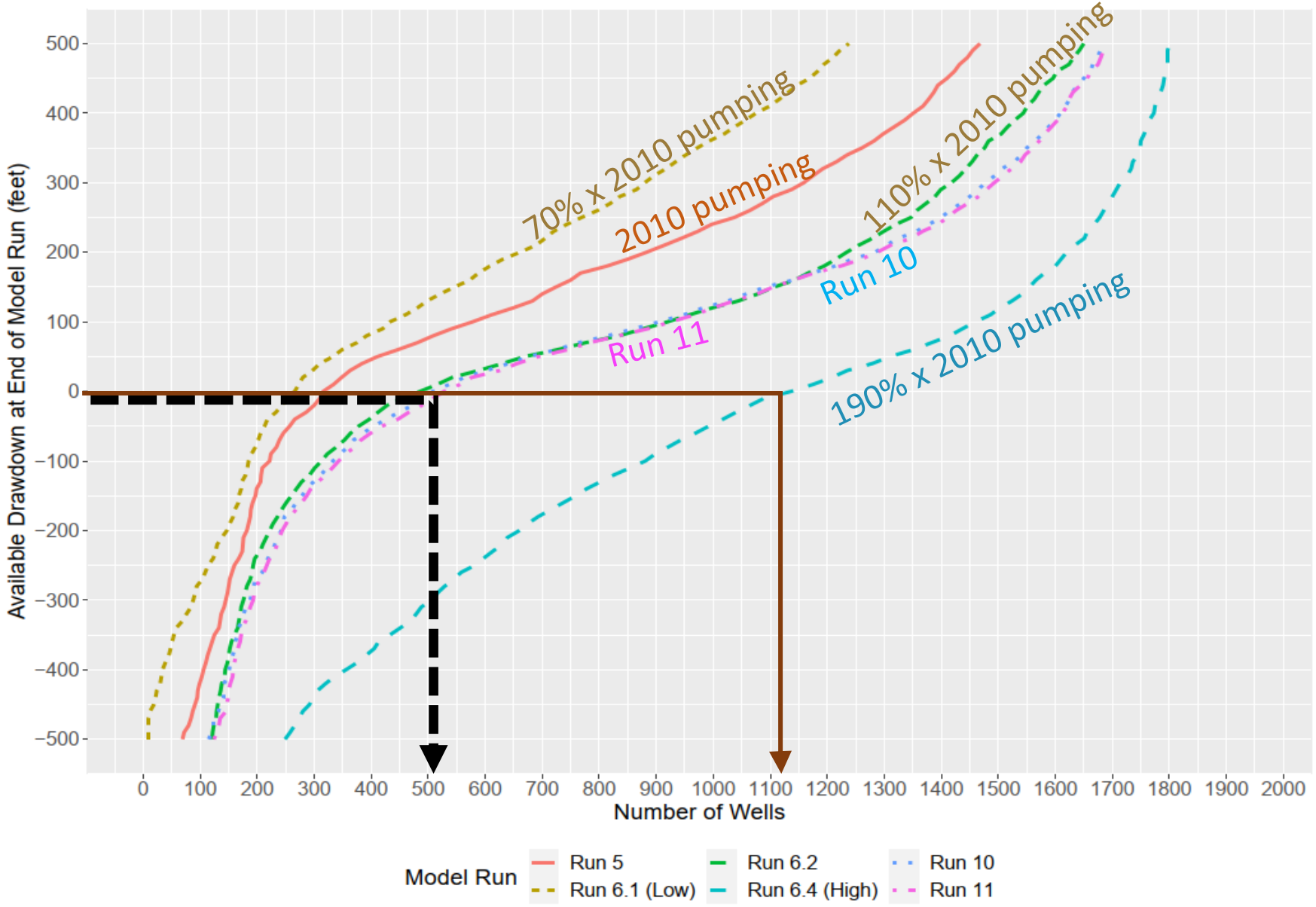
Socioeconomic Impacts

- Socioeconomic impacts considered:
  - Impacts of lowering water levels on costs of production.
  - Decreasing well yields and potential need for additional wells.
  - Potential for and additional costs of developing alternative supplies.
  - Need to meet water supply needs to avoid impacts of water shortages.

- Both positive and negative socioeconomic impacts may result.

- Socioeconomic impacts considered in management plan and rule updates.

Public Water Supply Well Impacts



Impacts on Private Property

Impact on Interests/Rights in Private Property

- Private property rights impacts considered:
  - Impacts on property rights of landowners and their lessees.
  - Expectations of existing and future well owners to recover reasonable investments in their water wells and properties.
  - Availability of affordable water of sufficient yield to all properties overlying the aquifer.
  - Availability of affordable water from alternative water supplies.
- Both positive and negative impacts to private property rights may result.
- Private property rights impacts considered in management plan, rule updates, and permit decisions.

DFC Feasibility

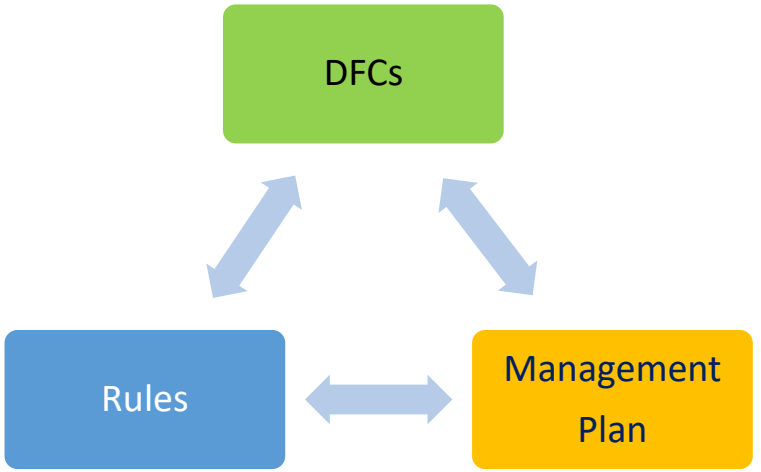
Feasibility of Achieving the DFC

- Physical Achievability
  - Is the DFC physically possible within the aquifer?

  ➢ Groundwater Availability Models help ensure that DFCs are generally physically achievable in the aquifer

- Regulatory Achievability
  - Can the DFC be achieved via GCD management plan and rules?
  - Does the regulated community and stakeholders agree with the management approach required to achieve the DFC?

  ➢ Have GCDs implemented Rules and have an approved Management Plan?



Agenda Item 8
Discussion and possible action on margin of error language for the Desired Future Conditions Statement.

- Due to the nature of the drawdown calculations, TWDB suggests that the GMA provide “variance assumptions”
- Proposed language for DFC Model Run submittal to TWDB:
  - *GMA 8 assumes the model results are consistent with the proposed DFCs if the average drawdowns calculated by the TWDB are within 5 percent or 5 feet (whichever is larger) of the proposed DFCs drawdown values.*

Agenda Item 9
Discussion and possible action on a resolution to adopt proposed Desired Future Conditions.

- *Resolution was included in GMA 8 Packet*
- *Version 1 of Attachment B of the Resolution was sent to GCDs on 10/16/2020*
- *Only comments received were from Central Texas GCD regarding Table 7*
- *Those comments were integrated into Table 7 as shown below:*

Table 7 - GMA 8 DFCs adopted at a county scale for the Llano Uplift Aquifers based on total average feet of drawdown. Planning period from January 1, 2010 through December 31, 2080.

County	Ellenburger-San Saba Aquifer	Hickory Aquifer	Marble Falls Aquifer
Brown	3	3	3
Burnet	12	11	11
Lampasas	16	16	16
Mills	9	9	9

Agenda Item 9 Attachment B

Attachment B: Desired Future Conditions (DFCs) adopted by District Representatives in GMA 8 for all relevant aquifers.

Table 1 – GMA 8 DFCs adopted at an aquifer-wide scale for Northern Trinity and Woodbine aquifers based on total average feet of drawdown (both unconfined and confined drawdown). Planning period from January 1, 2010 through December 31, 2080

GMA 8 Adopted DFCs -Aquifer-Wide Scale	
Woodbine	146
Paluxy	193
Glen Rose	148
Twin Mountain	345
Travis Peak	207
Hensell	148
Hosston	262
Antlers	193

Table 2 - GMA 8 DFCs adopted at a GCD scale for Northern Trinity and Woodbine aquifers (except for Upper Trinity GCD, see Table 3 below for Upper Trinity GCD) based on total average feet of drawdown (both unconfined and confined drawdown). Planning period from January 1, 2010 through December 31, 2080.

GMA 8 Adopted DFCs - GCD Scale								
GCD	Wood-bine	Paluxy	Glen Rose	Twin Mtn	Travis Peak	Hensell	Hosston	Antlers
Central Texas GCD	—	—	2	—	19	7	21	—
Clearwater UWCD	—	17	83	—	333	145	375	—
Middle Trinity GCD	—	5	20	8	98	58	108	12
North Texas GCD	123	465	300	485	—	—	—	305
Northern Trinity GCD	6	105	163	348	—	—	—	177
Post Oak Savannah GCD	—	—	241	—	412	261	412	—
Prairielands GCD	35	44	142	170	323	201	364	—

GMA 8 Adopted DFCs - GCD Scale								
GCD	Wood-bine	Paluxy	Glen Rose	Twin Mtn	Travis Peak	Hensell	Hosston	Antlers
Red River GCD	209	830	335	405	291	—	—	321
Saratoga UWCD	—	2—	1	—	6	1	11	—
Southern Trinity GCD	6	41	148	—	504	242	582	—

Table 3 - GMA 8 DFCs adopted for Upper Trinity GCD for Northern Trinity and Woodbine aquifers based on total average feet of drawdown, discretized based on outcrop and downdip extent. Planning period from January 1, 2010 through December 31, 2080.

GMA 8 Adopted DFCs - Upper Trinity GCD		
Antlers	Outcrop	47
	Downdip	154
Paluxy	Outcrop	6
	Downdip	2
Glen Rose	Outcrop	15
	Downdip	45
Twin Mtn	Outcrop	10
	Downdip	70

Table 4 - GMA 8 DFCs adopted at a county scale for Northern Trinity and Woodbine aquifers (except for Upper Trinity GCD counties, see Table 5 below for these counties) based on total average feet of drawdown (both unconfined and confined drawdown). Planning period from January 1, 2010 through December 31, 2080.

GMA 8 Adopted DFCs - County Scale								
County	Wood-bine	Paluxy	Glen Rose	Twin Mtn	Travis Peak	Hensell	Hosston	Antlers
Bell	—	17	83	—	333	145	375	—
Bosque	—	6	53	—	189	139	232	—
Bowie	—	—	—	—	—	—	—	—
Brown	—	2	1	—	2	1	1	2
Burnet	—	—	2	—	19	7	21	—
Callahan	—	—	—	—	—	—	—	1
Collin	482	729	366	560	—	—	—	596
Comanche	—	—	2	—	4	2	3	12

Agenda Item 9 Attachment B

GMA 8 Adopted DFCs - County Scale								
County	Wood-bine	Paluxy	Glen Rose	Twin Mtn	Travis Peak	Hensell	Hosston	Antlers
Cooke	2	—	—	—	—	—	—	191
Coryell	—	5	15	—	107	70	141	—
Dallas	137	346	288	515	415	362	419	—
Delta	—	279	198	—	202	—	—	—
Denton	22	558	367	752	—	—	—	416
Eastland	—	—	—	—	—	—	—	4
Ellis	76	128	220	413	380	290	390	—
Erath	—	6	6	8	25	12	35	14
Falls	—	159	238	—	505	296	511	—
Fannin	259	709	305	400	291			269
Franklin	—	—	—	—	—	—	—	—
Grayson	163	943	364	445				364
Hamilton	—	2	4	—	26	14	38	—
Hill	20	45	149	—	365	211	413	—
Hopkins	—	—	—	—	—	—	—	—
Hunt	631	610	326	399	35	—	—	—
Johnson	4	-57	66	184	235	120	329	—
Kaufman	242	311	305	427	372	349	345	—
Lamar	42	100	107	—	125	—	—	132
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	199	301	—	433	214	445	—
McLennan	6	41	148	—	504	242	582	—
Milam	—	—	241	—	412	261	412	—
Mills	—	1	1	—	9	2	13	—
Navarro	110	139	266	—	343	2995	343	—
Rains	—	—	—	—	—	—	—	—
Red River	2	24	40	—	57	—	—	15
Rockwall	275	433	343	466	—	—	—	—
Somervell	—	4	4	50	64	17	120	—
Tarrant	6	105	163	348	—	—	—	177
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	83	—	219	68	226	—
Williamson	—	—	78	—	220	89	225	—

Table 5 - GMA 8 DFCs adopted at a county scale for Upper Trinity GCD counties for Northern Trinity and Woodbine aquifers based on total average feet of drawdown for outcrop and downdip areas. Planning period from January 1, 2010 through December 31, 2080.

GMA 8 Adopted DFCs - Upper Trinity GCD by county (O-Outcrop, D-Downdip)				
County	Antlers	Paluxy	Glen Rose	Twin Mtn
Hood -O	—	6	9	13
Hood-D	—	—	39	72
Montague-O	40	—	—	—
Montague-D	—	—	—	—
Parker-O	42	6	20	7
Parker-D	—	2	50	68
Wise-O	60	—	—	—
Wise-D	154	—	—	—

Table 6 - GMA 8 DFCs adopted the Edwards (BFZ) Aquifer. Planning period from January 1, 2010 through December 31, 2080. DFCs are in cubic feet per month spring/stream flow in Bell, Travis, and Williamson counties.

County	DFC
Bell	Maintain at least 100 acre-feet per month of stream/spring flow in Salado Creek during a repeat of the drought of record
Travis	Maintain at least 42 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record
Williamson	Maintain at least 60 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record

Agenda Item 9 Attachment B

Table 7 - GMA 8 DFCs adopted at a county scale for the Llano Uplift Aquifers based on total average feet of drawdown. Planning period from January 1, 2010 through December 31, 2080.

County	Ellenburger-San Saba Aquifer	Hickory Aquifer	Marble Falls Aquifer
Brown	3	3	3
Burnet	12	11	11
Lampasas	16	16	16
Mills	9	9	9

Thank you!

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