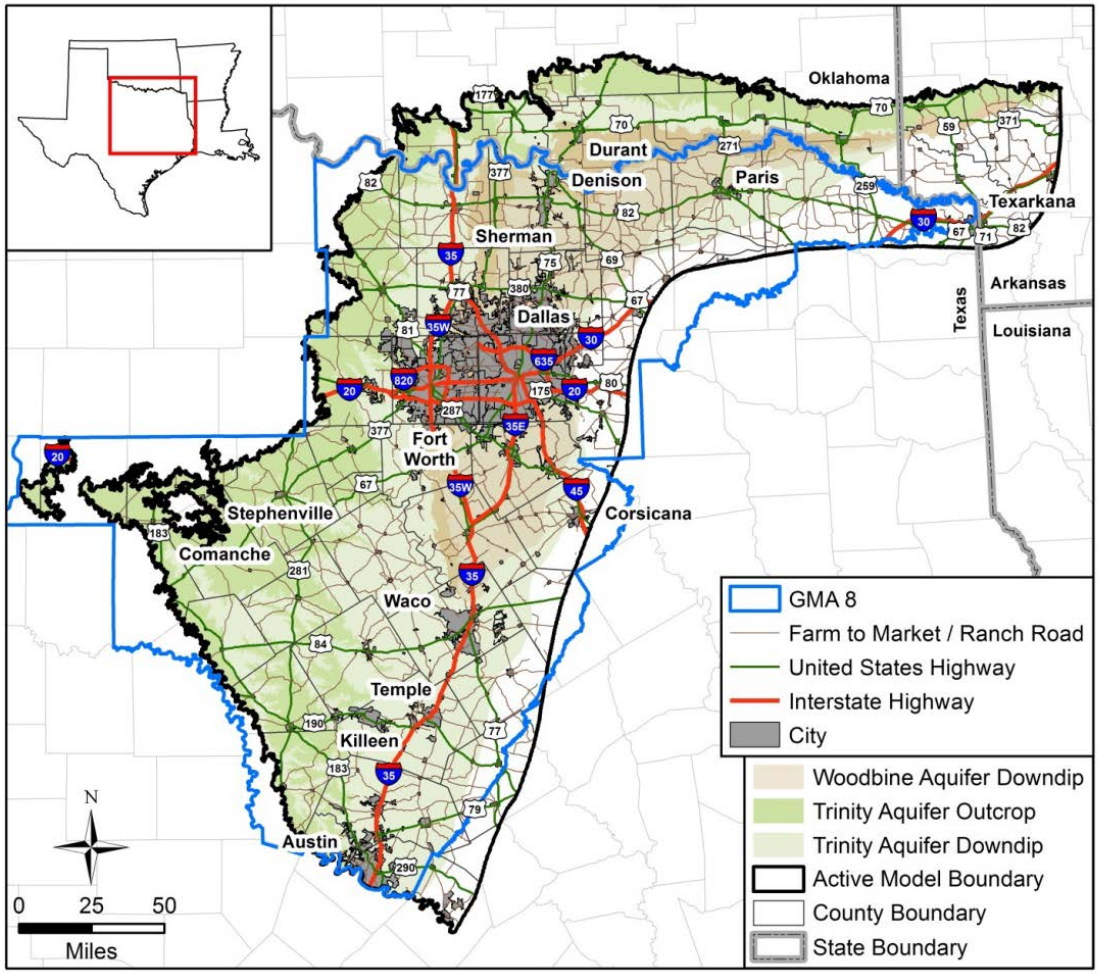
GMA-8 Update



Presented By:
Van Kelley, P.G.

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November 18, 2015

Current UTGCD Trinity DFC & MAG

County	Trinity Sub-Aquifer	Desired Future Condition(1)	Managed Available Groundwater (2) (AFY)
Hood	Paluxy	1	942
	Glen Rose	2	4
	Hensell	16	3,595
	Hosston	56	6,604
Hood County Total		NA	11,145
Parker	Paluxy	5	9,800
	Glen Rose	6	192
	Hensell	16	1,441
	Hosston	40	3,815
Parker County Total		NA	15,248
Wise	Paluxy	4	2,559
	Glen Rose	14	5
	Hensell	23	1,480
	Hosston	53	5,238
Wise County Total		NA	9,282
Montague	Paluxy	0	505
	Glen Rose	1	-
	Hensell	3	362
	Hosston	12	1,807
Montague County Total		NA	2,674
District Total		NA	38,349

(1) Average drawdown in feet after 50 years from the year 2000

(2) from GAM Run 08-84mag (Wade, 2009)

Performance Metrics

- Performance Metrics were discussed in meetings with GMA-8 representatives and were defined in a GMA-8 RFQ
- There are three types:
  - Drawdown - drawdown is equal to the simulated 2010 head (water level expressed as an elevation) minus the 2070 head
    - Contour maps of drawdown (in feet)
    - Average drawdown calculated by County and Aquifer
  - Well Impacts
    - Evaluated as reduction in available drawdown
  - Water Budget – an accounting of inflow, outflows and change in storage by county and aquifer (Trinity – Woodbine).
    - Evaluated at 2011, 2020, 2030, 2040, 2050, 2060, 2070
    - Presented in tables and in time-series plots

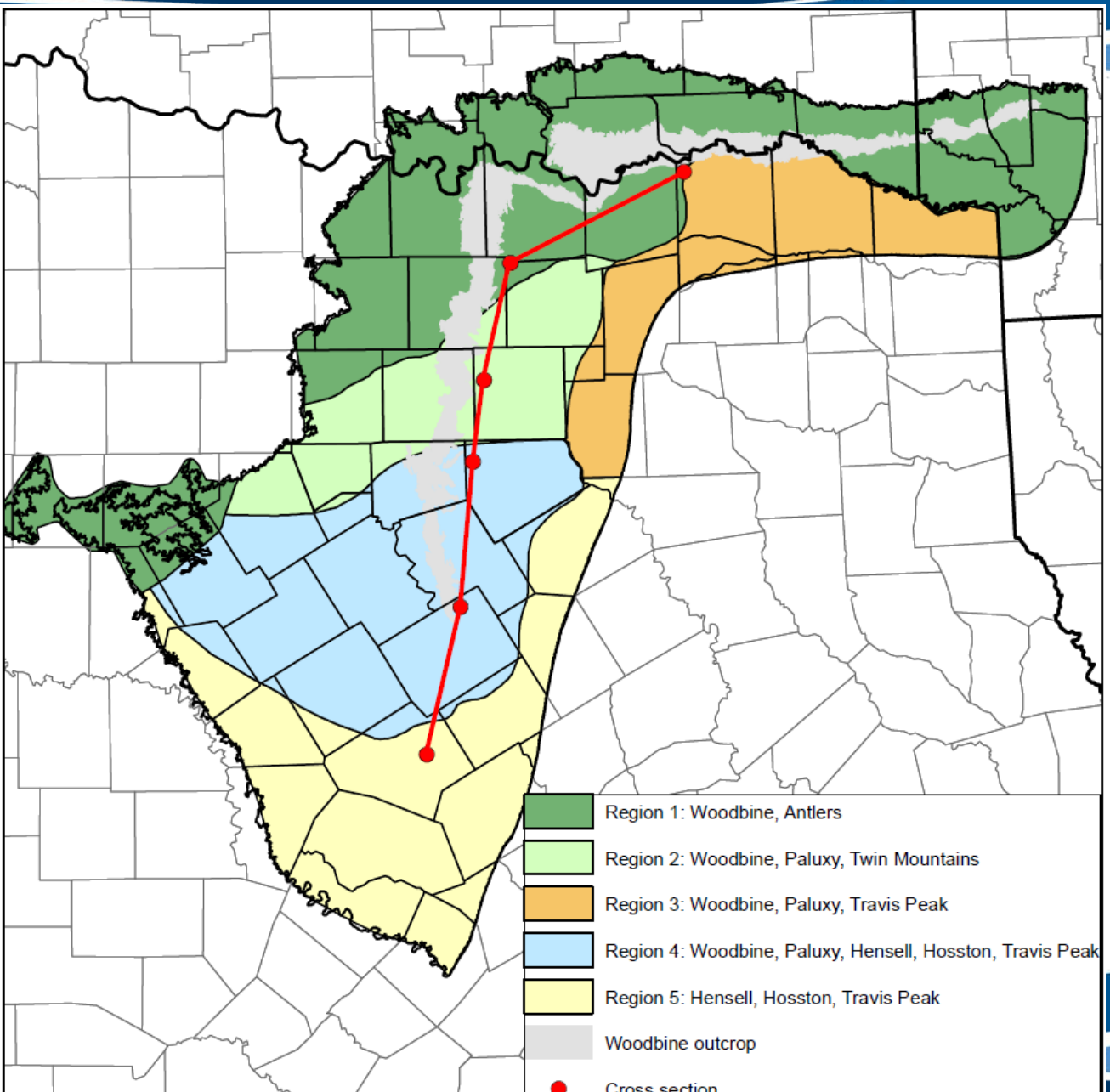
County Average Drawdown by Aquifer/Formation (Layer)

Average Water Level Declines Between 2010 and 2070 for Wise County (Feet)						Wells Impacted
	Paluxy	Glen Rose	Hensell	Pearsall	Hosston	# of "dry wells" of the 3,700 wells
Current Level of Pumping (5)	3	2	4	9	4	133
30% Reduction in Pumping (6.1)	-4	-8	-14	-32	-45	114
10% Increase in Pumping (6.5)	6	6	10	22	21	
20% Increase in Pumping (6.6)	8	9	16	36	37	
30% Increase in Pumping (6.2)	11	13	21	50	54	177
60% Increase in Pumping (6.3)	19	23	39	90	*103*	249
90% Increase in Pumping (6.4)	29	34	57	*132*	*153*	372

Negative values indicate an increase in water levels

values in Red indicate that the water level would fall below the bottom of the aquifer

Aquifer Regions



- **5 Regions with different aquifer characteristics**

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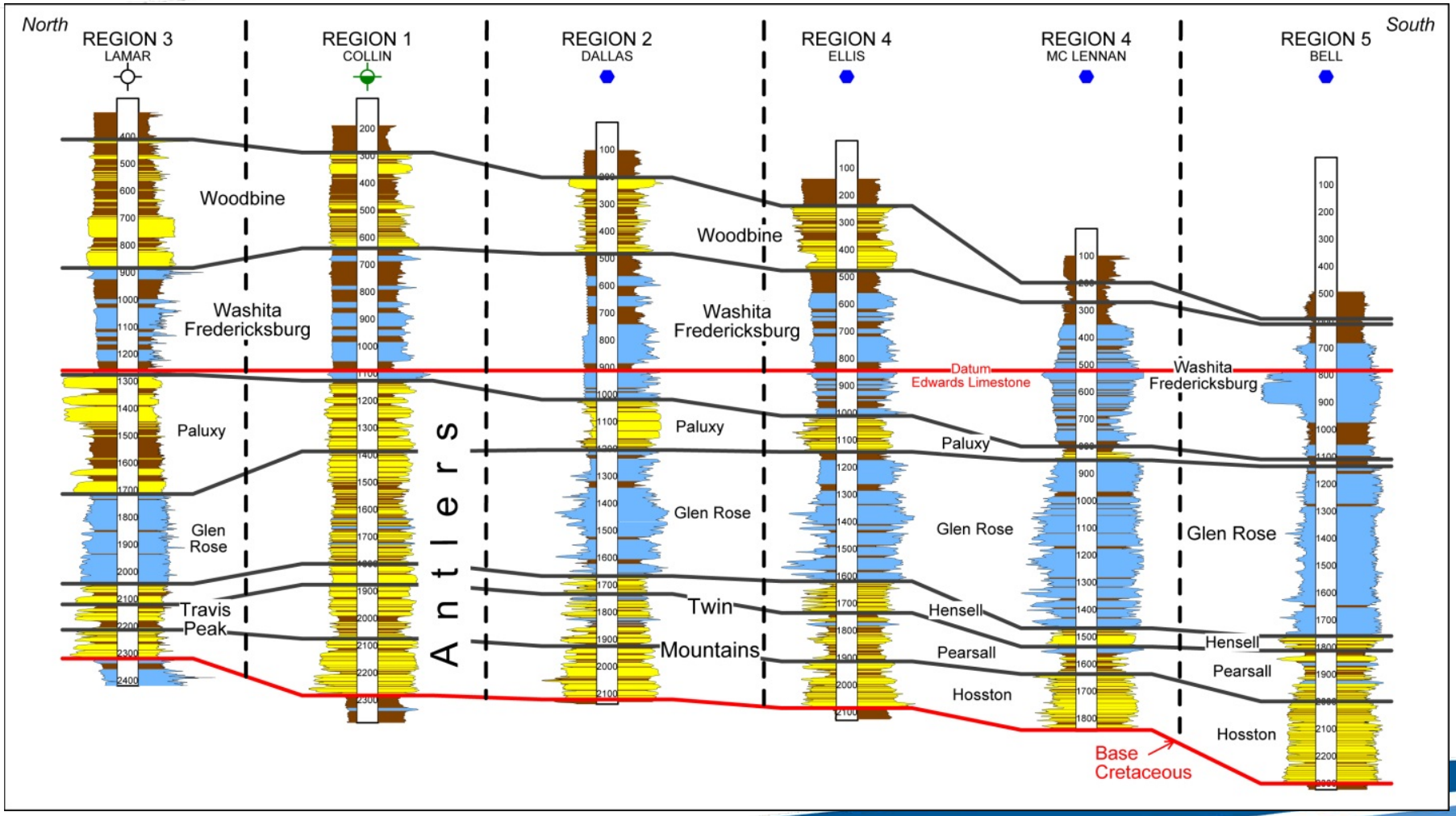
North-South Cross Section



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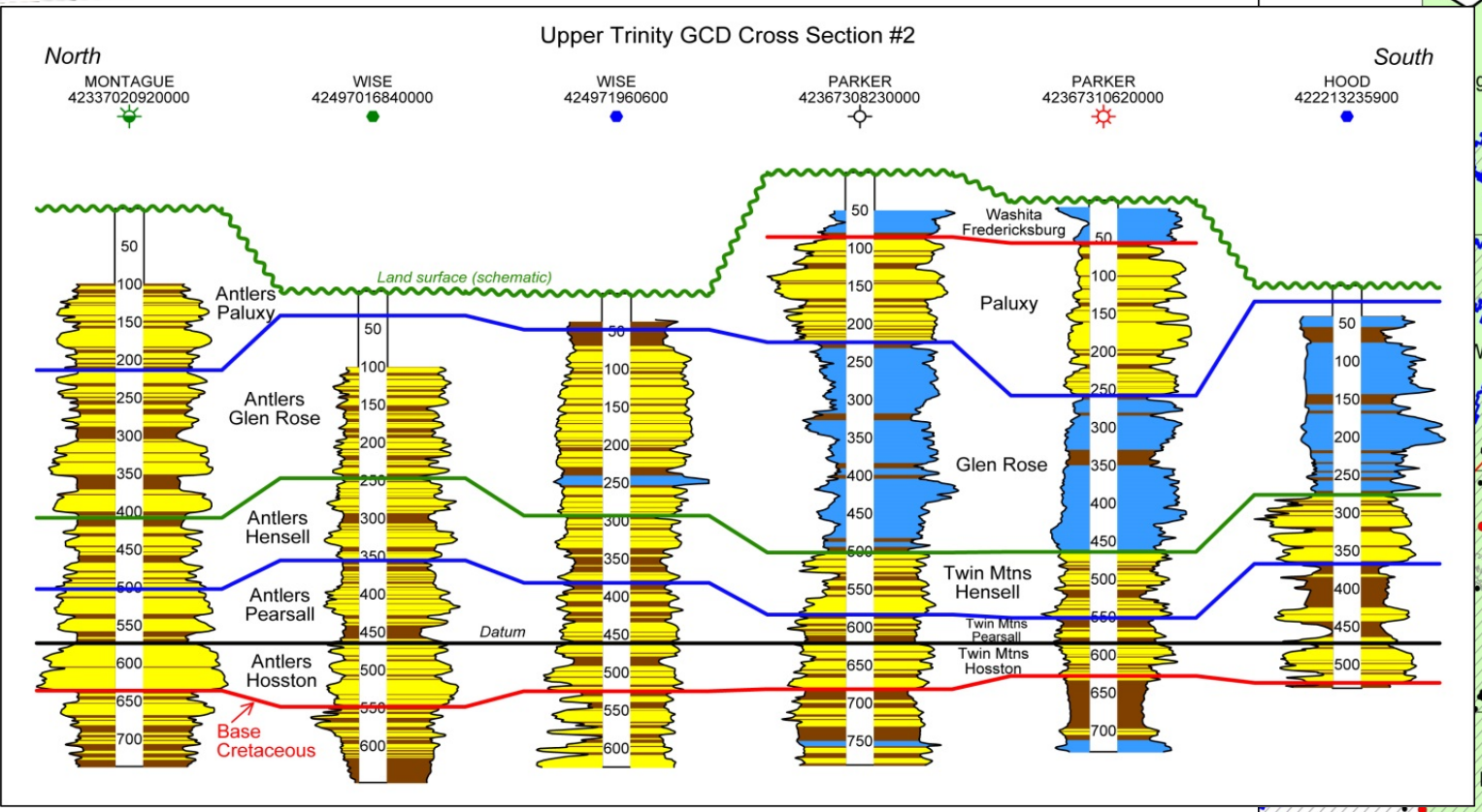
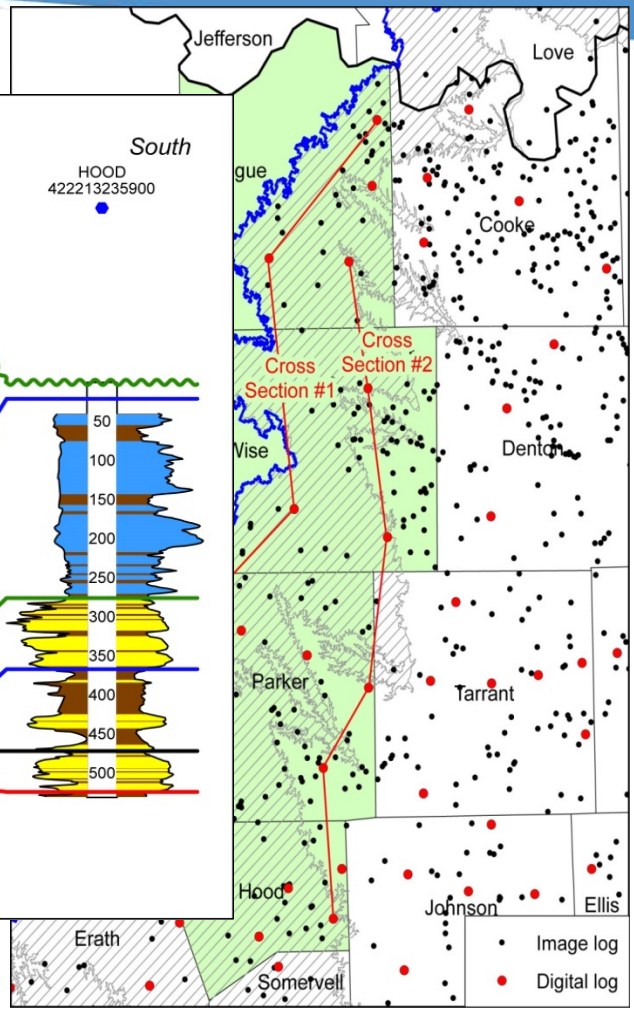
District Hydrogeology





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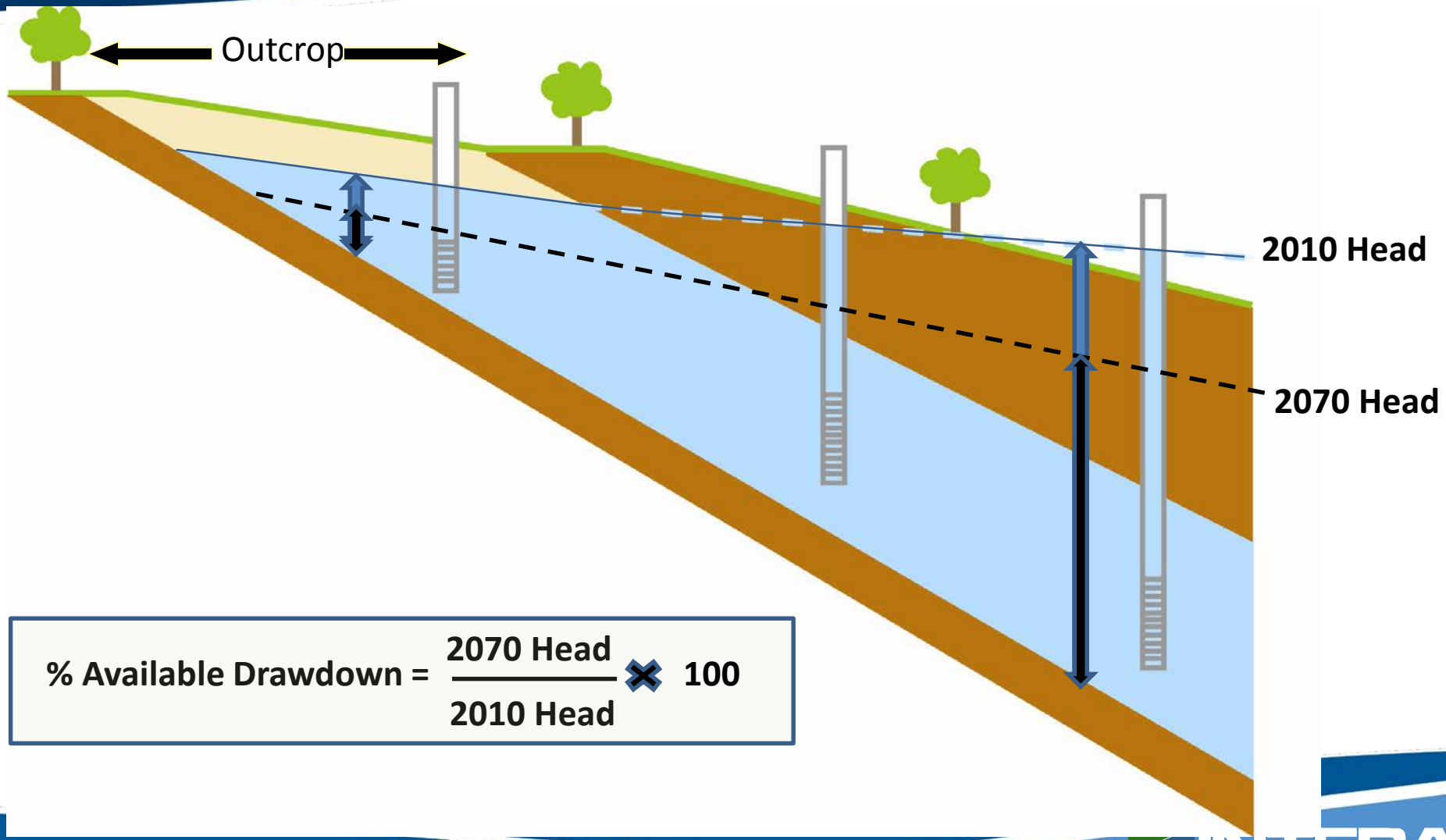
DFC Framework Option - Hydrogeologic Regions

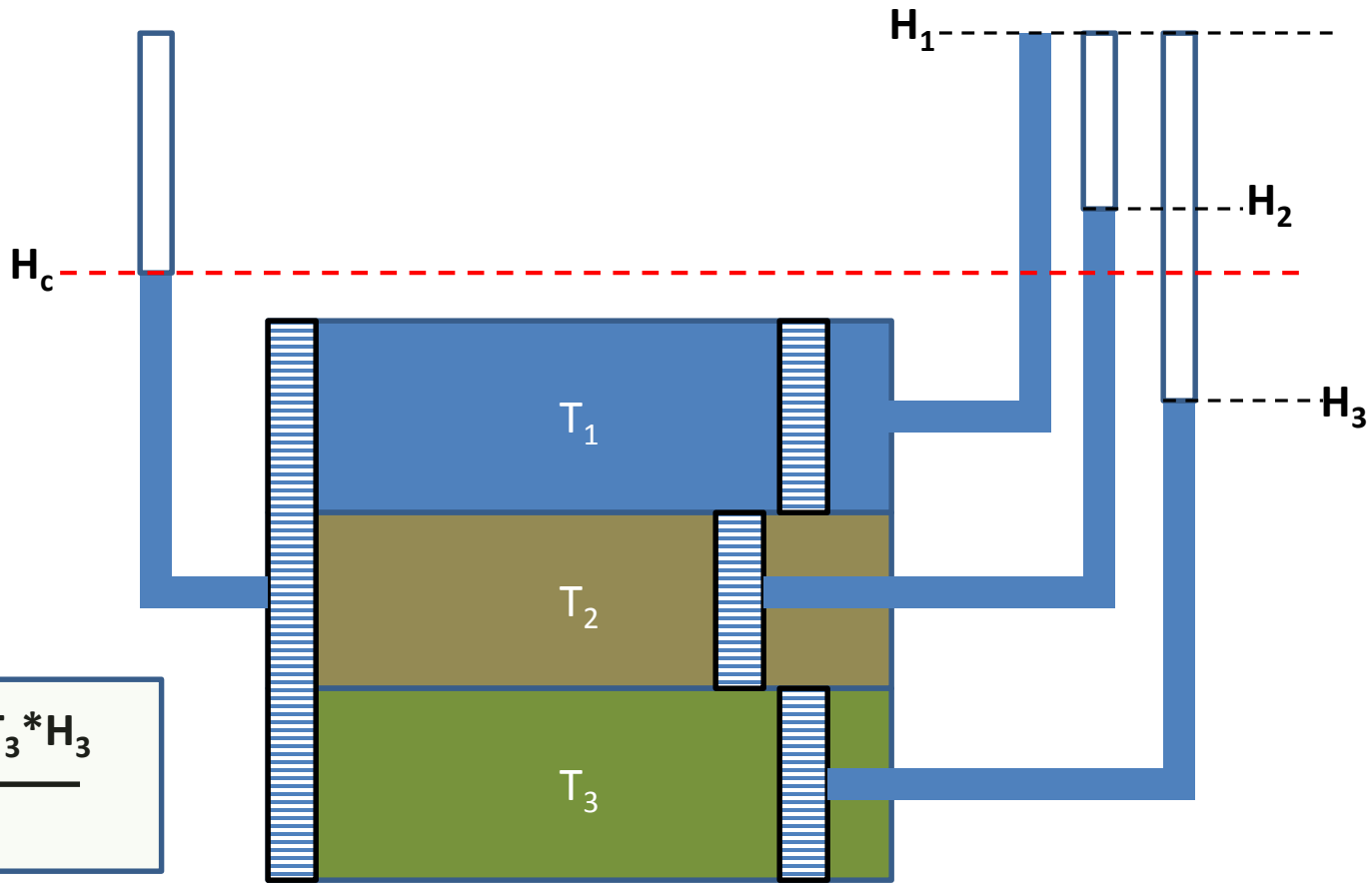
Model Terminology	Region 1	Region 2	Region 3	Region 4	Region 5
Woodbine Aquifer	Woodbine	Woodbine	Woodbine	Woodbine	Woodbine (no sand)
Washita/ Fredericksburg Groups	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg
Paluxy Aquifer	Antlers	Paluxy	Paluxy	Paluxy	Paluxy (no sand)
Glen Rose Formation	Antlers	Glen Rose	Glen Rose	Glen Rose	Glen Rose
Hensell Aquifer	Antlers	Twin Mountains	Travis Peak	Hensell/ Travis Peak	Hensell/ Travis Peak
Pearsall Formation	Antlers	Twin Mountains	Travis Peak	Pearsall/ Sligo	Pearsall/ Sligo
Hosston Aquifer	Antlers	Twin Mountains	Travis Peak	Hosston/ Travis Peak	Hosston/ Travis Peak

Potential DFC Approach
% of 2010 Available Drawdown Remaining in 2070



$$\% \text{ Available Drawdown} = \frac{\text{2070 Head}}{\text{2010 Head}} \times 100$$

Calculation of Composite Head for Multiple Aquifers



$$H_c = \frac{T_1*H_1 + T_2*H_2 + T_3*H_3}{T_1 + T_2 + T_3}$$

Wise County

Wise County Drawdown							
			Pumping Factor				
Region	Aquifer	Zone	0.7	1	1.3	1.6	1.9
Region 1	Antlers	Outcrop	-12	3	17	29	39
		Confined	-56	11	77	136	180

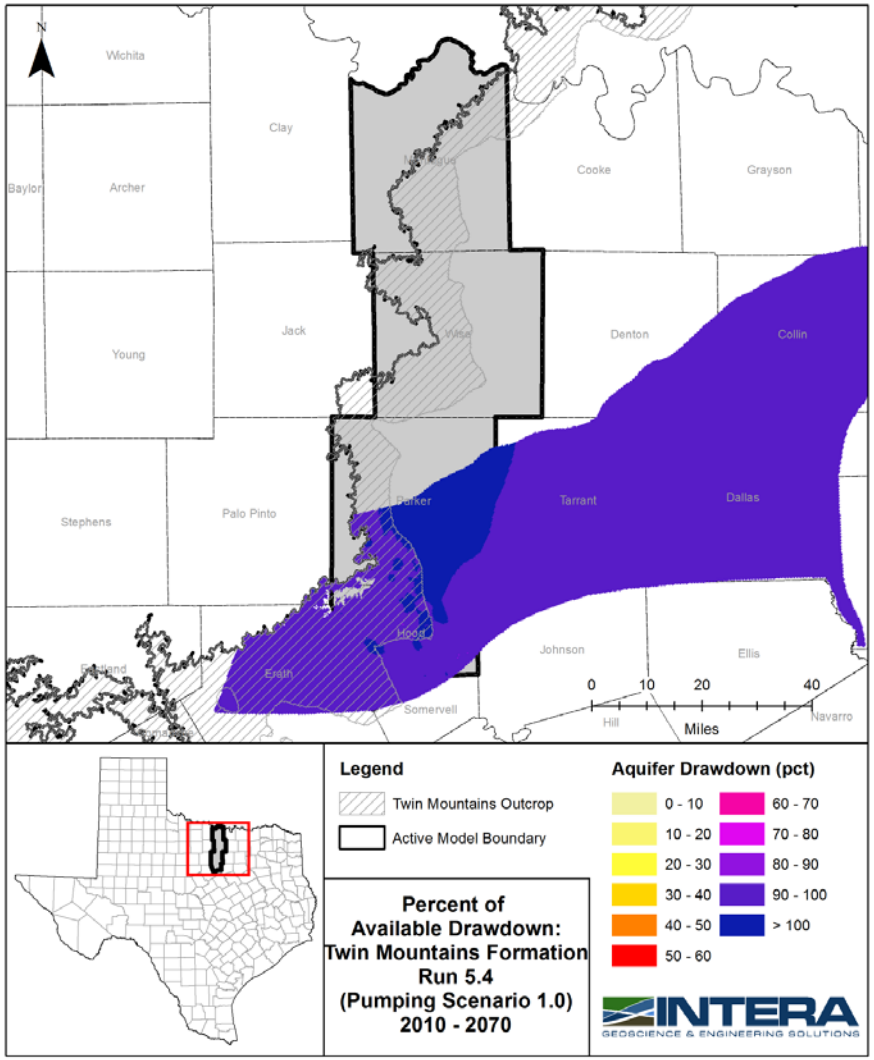
Wise County % Available 2010 Drawdown Remaining in 2070							
			Pumping Factor				
Region	Aquifer	Zone	0.7	1	1.3	1.6	1.9
Region 1	Antlers	Outcrop	104%	99%	95%	91%	88%
		Confined	111%	98%	85%	**73%**	**65%**

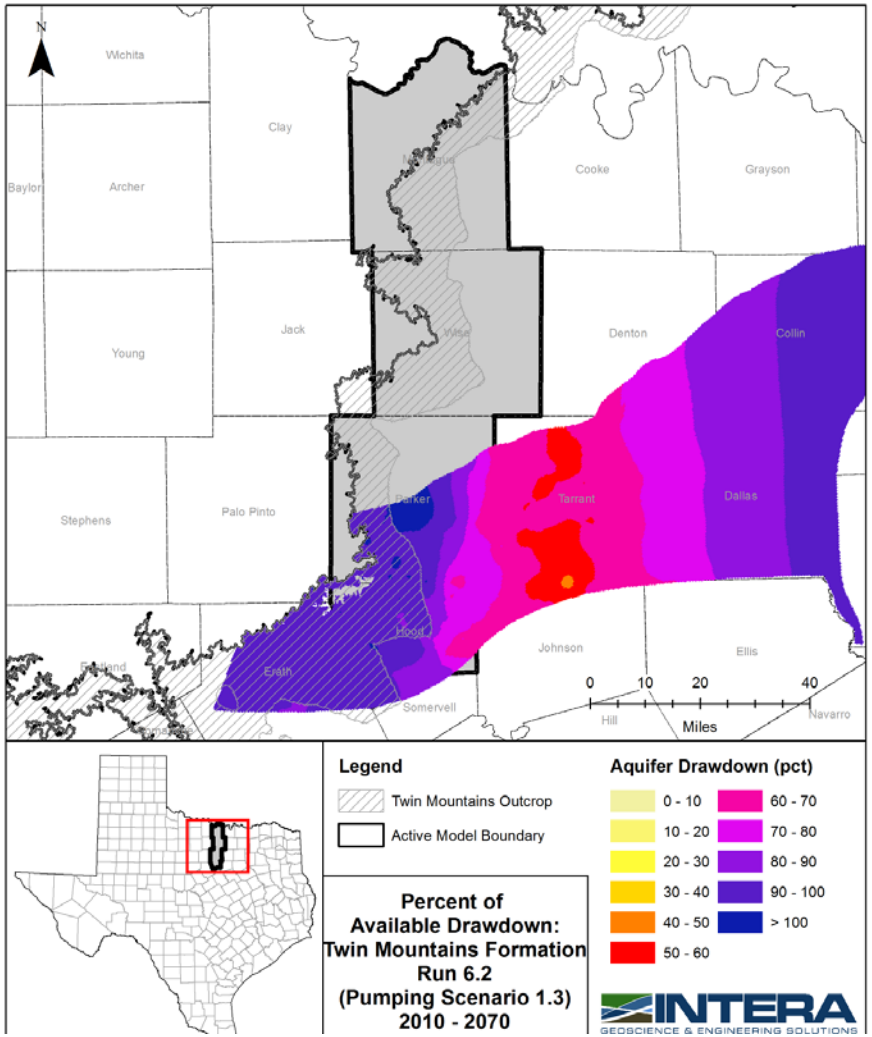
Parker County

Parker County Drawdown							
			Pumping Factor				
Region	**Aquifer**	**Zone**	**0.7**	**1**	**1.3**	**1.6**	**1.9**
Region 1	**Antlers**	Outcrop	-14	-4	6	15	22
Region 2	**Paluxy**	Outcrop	2	3	4	5	6
		Confined	-7	-2	4	9	15
	Glen Rose	Outcrop	3	6	8	12	16
		Confined	-29	-2	25	54	84
	Twin Mountains	Outcrop	-1	0	1	2	3
		Confined	-58	-9	40	88	124

Parker County % Available 2010 Drawdown Remaining in 2070							
			Pumping Factor				
Region	**Aquifer**	**Zone**	**0.7**	**1**	**1.3**	**1.6**	**1.9**
Region 1	**Antlers**	Outcrop	105%	101%	98%	94%	91%
Region 2	**Paluxy**	Outcrop	98%	97%	96%	95%	94%
		Confined	105%	101%	98%	94%	90%
	Glen Rose	Outcrop	98%	97%	96%	94%	92%
		Confined	112%	101%	90%	**78%**	**65%**
	Twin Mountains	Outcrop	100%	100%	99%	98%	98%
		Confined	123%	104%	85%	**67%**	**53%**

Twin Mountains





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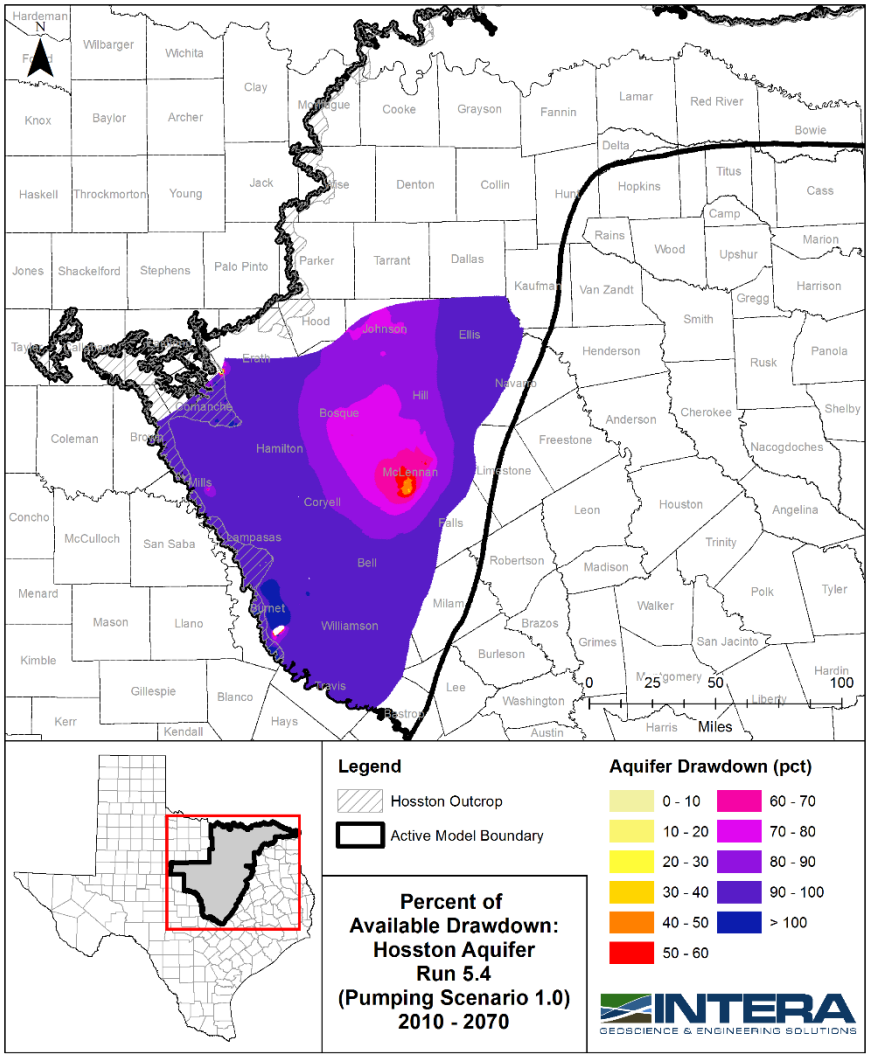
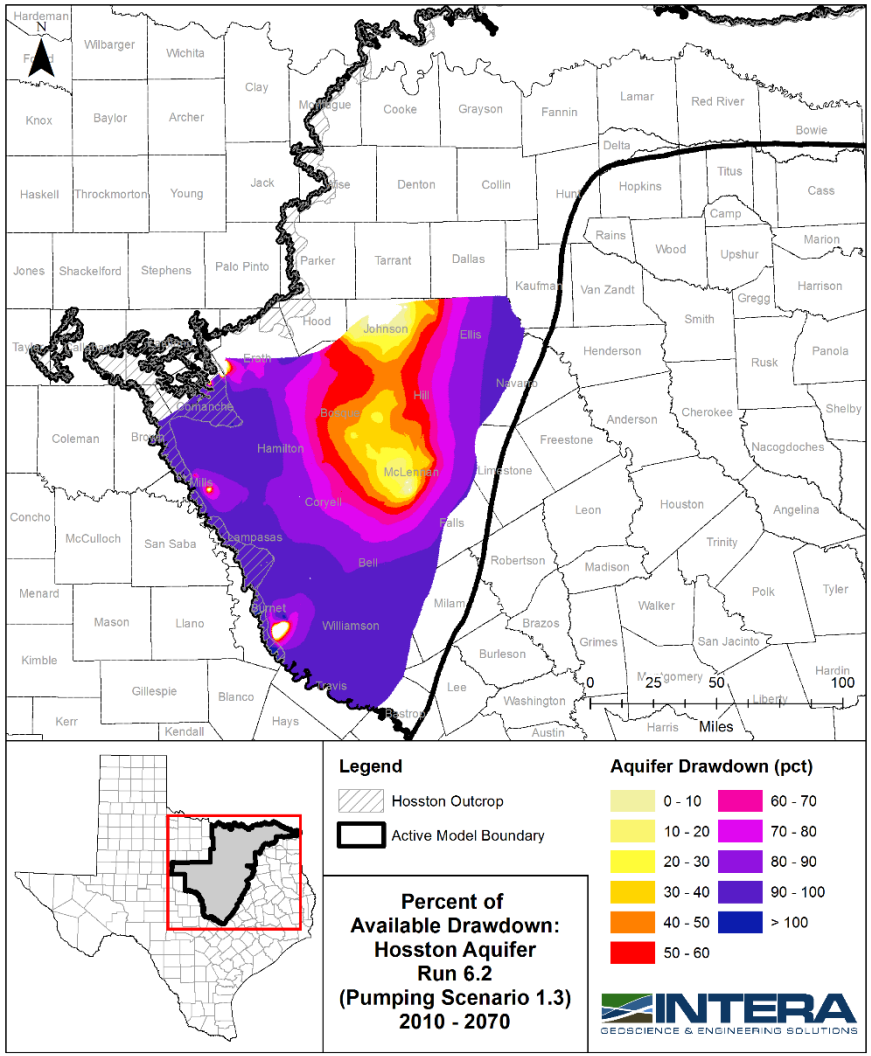
Hosston / Travis Peak





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