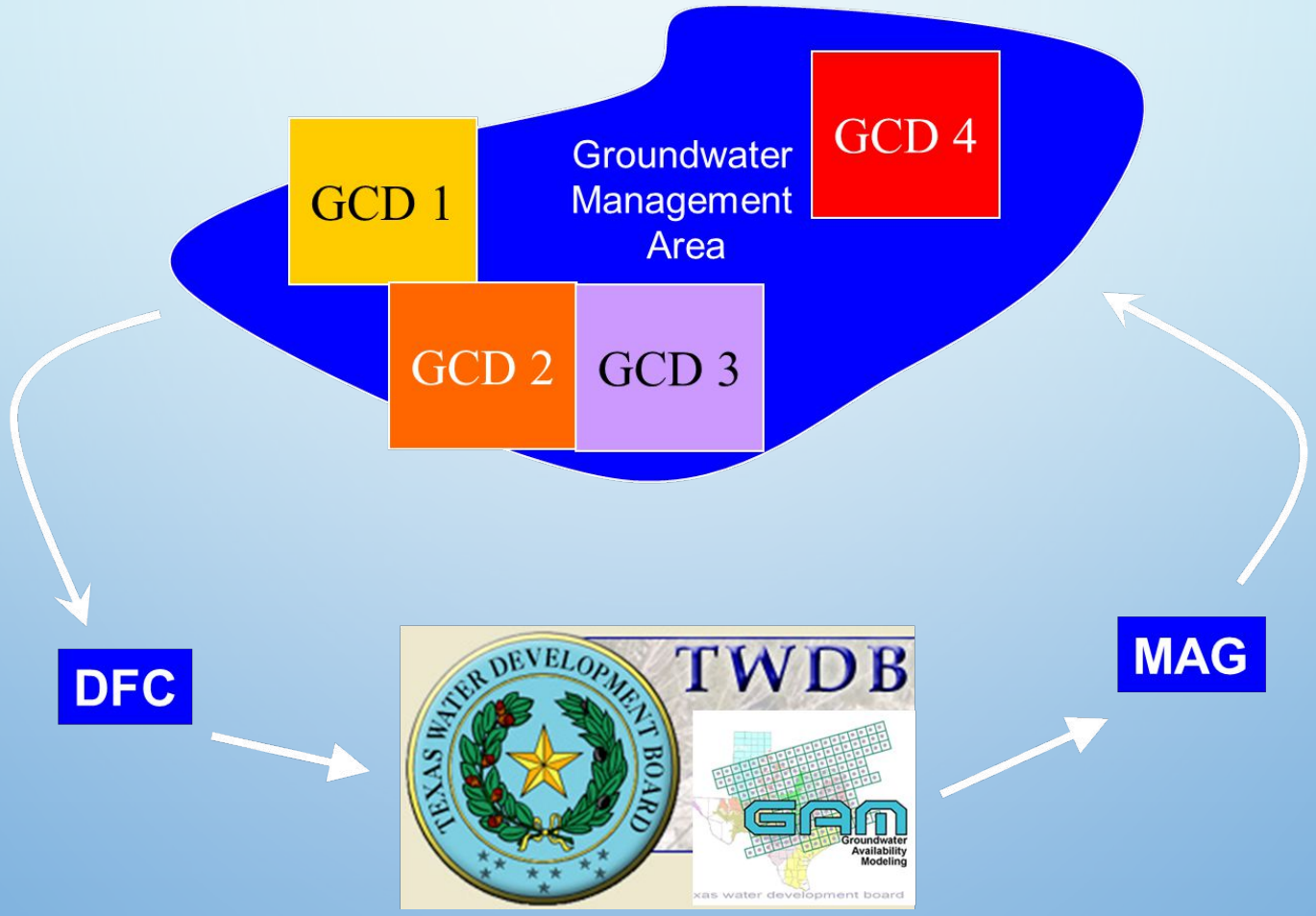
GMA 12
DFC DEVELOPMENT

JUNE 6, 2014

DEFINITIONS

- **GCD**- GROUNDWATER CONSERVATION DISTRICTS
- **GAM** – GROUNDWATER AVAILABILITY MODEL
- **RWPG** – REGIONAL WATER PLANNING GROUPS
- **GMA** – GROUNDWATER MANAGEMENT AREA
- **DFC** – DESIRED FUTURE CONDITION
- **MAG** – MODELED AVAILABLE GROUNDWATER
- **TERS** – TOTAL ESTIMATED RECOVERABLE STORAGE

JOINT PLANNING



APPROACHES FOR DEFINING MAG

- SUSTAINABILITY
  - DFC: LONG-TERM INFLOW = LONG-TERM OUTFLOW
- WATER BUDGET
  - DFC: PREDEFINED DECLINE IN WATER LEVEL OR VOLUME
- SPRINGFLOW OR STREAM IMPACT
  - DFC: MAINTAIN SPRINGS AND STREAMS DURING DROUGHT
- WATER QUALITY
  - DFC: LIMITED OR NO DEGRADATION
- COMBINATION
  - DFC: AGENCY/STAKEHOLDER DEFINED

A COOKING LESSON

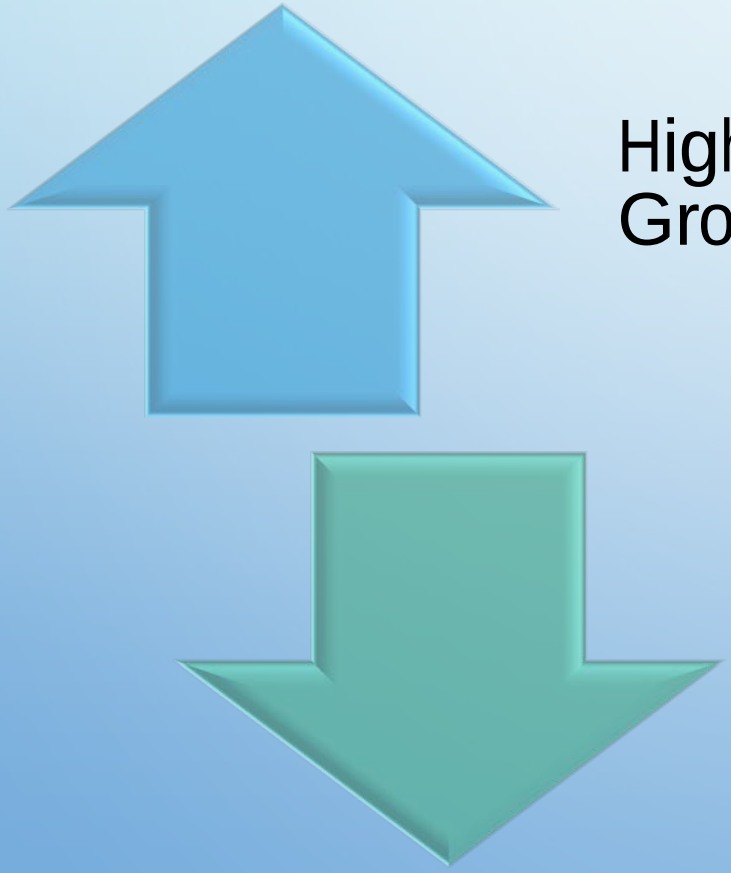
- MANY INGREDIENTS
- MULTIPLE WAYS TO COOK
- DIFFERENT TASTES OF REVIEWERS

CURRENT MAGS
FROM 2010 PLANNING

Year 2060 Managed Available Groundwater in Acre-Feet

District	Brazos River Alluvium	Carrizo	Calvert Bluff	Simsboro	Hooper	Queen City	Sparta	Yegua-Jackson	Total
Brazos Valley	-	5,496	1,755	96,185	316	529	7,923	7,071	**119,275**
Fayette County	-	1,000	-	-	-	570	3,729	5,762	**11,061**
Lost Pines	-	12,052	3,985	37,249	2,592	1,133	1,877	-	**58,888**
Mid-East Texas	-	11,088	3,912	7,170	827	974	3,334	1,122	**28,427**
Post Oak Savannah	25,138	7,059	1,038	48,501	4,422	502	6,734	12,923	**106,377**
GMA 12	**-**	**36,695**	**10,690**	**189,105**	**8,157**	**3,708**	**23,597**	**26,878**	**323,968**

A NEW STANDARD FOR DESIRED FUTURE CONDITIONS



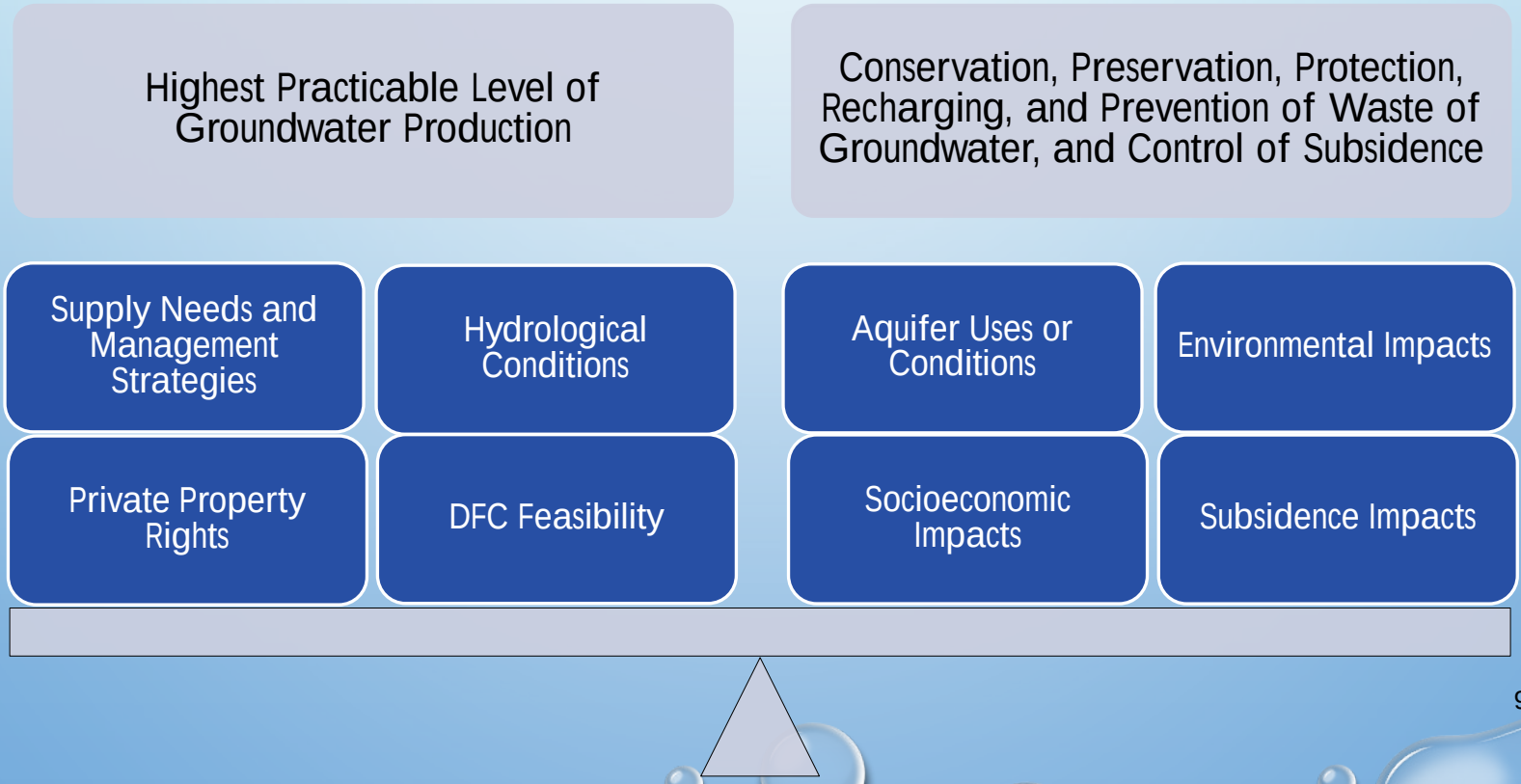
Highest Practicable Level of Groundwater Production

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

DFC CONSIDERATIONS

- 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

FINDING A BALANCE



TOTAL ESTIMATED RECOVERABLE STORAGE (TRINITY)

County	*Total Storage (acre-feet)*	*25 percent of Total Storage (acre-feet)*	*75 percent of Total Storage (acre-feet)*
Bastrop	9,000,000	2,250,000	6,750,000
Lee	500,000	125,000	375,000
Williamson	1,600,000	400,000	1,200,000
Total	**11,100,000**	**2,775,000**	**8,325,000**

TOTAL ESTIMATED RECOVERABLE STORAGE (CARRIZO-WILCOX)

Groundwater Conservation District (GCD)	*Total Storage (acre-feet)*	*25 percent of Total Storage (acre-feet)*	*75 percent of Total Storage (acre-feet)*
No District	14,000,000	3,500,000	10,500,000
Brazos Valley GCD	180,000,000	45,000,000	135,000,000
Fayette County GCD	95,000,000	23,750,000	71,250,000
Lost Pines GCD	220,000,000	55,000,000	165,000,000
Mid-East Texas GCD	340,000,000	85,000,000	255,000,000
Post Oak Savannah GCD	170,000,000	42,500,000	127,500,000
Total	1,019,000,000	254,750,000	764,250,000

TOTAL ESTIMATED RECOVERABLE STORAGE (QUEEN CITY)

Groundwater Conservation District (GCD)	*Total Storage (acre-feet)*	*25 percent of Total Storage (acre-feet)*	*75 percent of Total Storage (acre-feet)*
Brazos Valley GCD	34,000,000	8,500,000	25,500,000
Fayette County GCD	19,000,000	4,750,000	14,250,000
Lost Pines GCD	32,000,000	8,000,000	24,000,000
Mid-East Texas GCD	45,000,000	11,250,000	33,750,000
Post Oak Savannah GCD	30,000,000	7,500,000	22,500,000
Total	160,000,000	40,000,000	120,000,000

TOTAL ESTIMATED RECOVERABLE STORAGE (SPARTA)

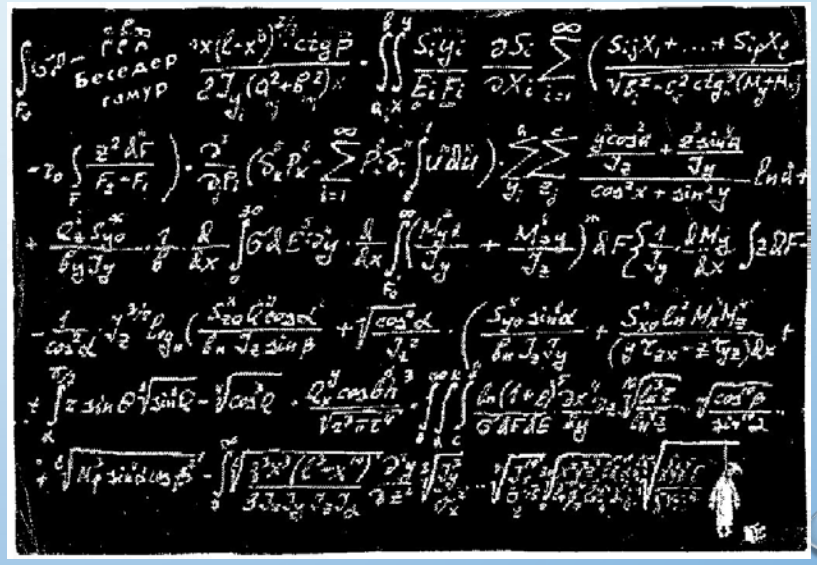
Groundwater Conservation District (GCD)	*Total Storage (acre-feet)*	*25 percent of Total Storage (acre-feet)*	*75 percent of Total Storage (acre-feet)*
Brazos Valley GCD	18,000,000	4,500,000	13,500,000
Fayette County GCD	12,000,000	3,000,000	9,000,000
Lost Pines GCD	13,000,000	3,250,000	9,750,000
Mid-East Texas GCD	21,000,000	5,250,000	15,750,000
Post Oak Savannah GCD	16,000,000	4,000,000	12,000,000
Total	80,000,000	20,000,000	60,000,000

TOTAL ESTIMATED RECOVERABLE STORAGE (YEGUA-JACKSON)

Groundwater Conservation District (GCD)	*Total Storage (acre-feet)*	*25percent of Total Storage (acre-feet)*	*75percent of Total Storage (acre-feet)*
Brazos Valley GCD	30,000,000	7,500,000	22,500,000
Fayette County GCD	27,000,000	6,750,000	20,250,000
Lost Pines GCD	10,000,000	2,500,000	7,500,000
Mid-East Texas GCD	15,000,000	3,750,000	11,250,000
Post Oak Savannah GCD	27,000,000	6,750,000	20,250,000
Total	109,000,000	27,250,000	81,750,000

EVALUATION OF INPUT

- ANALYTIC MODELING
- HYDRO-ECONOMIC CONSIDERATIONS
- SUBSIDENCE CONSIDERATIONS
- SURFACE WATER AVAILABILITY
- OTHER SUPPLY STRATEGIES
- GAMS



APPLICATION THE GAMS

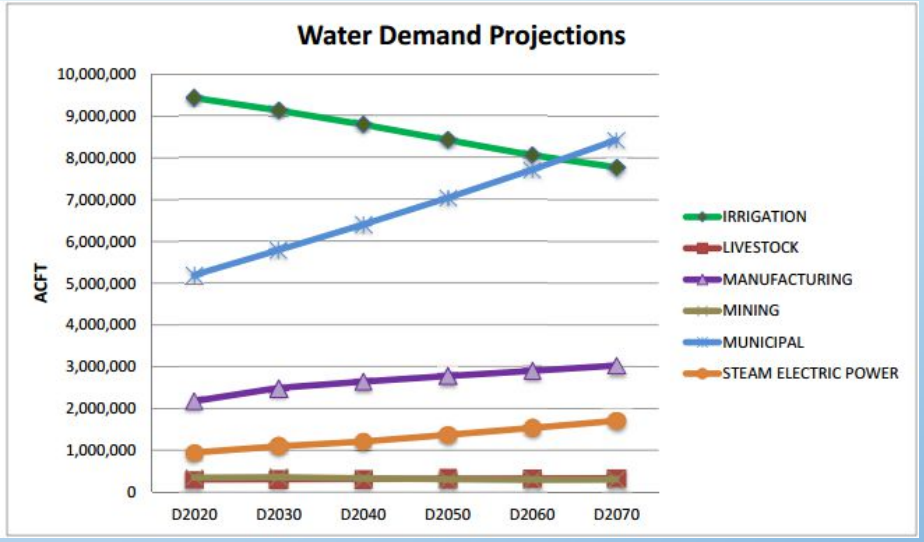
- PURPOSE: ESTIMATE GROUNDWATER AVAILABILITY
  - PLANNING TOOLS
  - INPUT PUMPING
  - EVALUATE SIMULATED EFFECTS FROM PUMPING
- DEMANDS WILL DICTATE APPLICATION
- GAMS CAN BE IMPROVED

GAM MODIFICATIONS

- EXTEND THE MODEL CALIBRATION FROM 2000 → 2010
- DEVELOP PUMPING ESTIMATES FROM 2000 → 2010
- POTENTIAL FUTURE MODIFICATIONS
  - IMPROVE AQUIFER AND GEOLOGIC REPRESENTATION
  - MODEL UPDATE/RECALIBRATION

INITIAL DFC DEVELOPMENT

- DEVELOP A DEMAND BASED MODEL RUN
- POSSIBLE NEXT STEPS
  - ASSESSMENT OF HIGHEST PRACTICABLE LEVEL OF PRODUCTION
  - ASSESSMENT OF MAXIMUM CONSERVATION



INITIAL ESTIMATES OF GROUNDWATER DEMANDS, AC-FT/YR

	2020	2030	2040	2050	2060	2070
Brazos Valley GCD	**94,177**	**102,442**	**107,012**	**115,225**	**124,529**	**134,724**
Brazos	**52,825**	**60,194**	**63,866**	**71,149**	**79,490**	**88,684**
Carrizo-Wilcox	42,739	49,113	52,497	59,587	67,557	76,268
Queen City	653	966	860	686	554	488
Sparta	6,226	6,878	7,244	7,580	8,048	8,560
Yegua-Jackson	3,208	3,238	3,265	3,296	3,330	3,368
Robertson	**41,352**	**42,248**	**43,146**	**44,076**	**45,040**	**46,040**
Carrizo-Wilcox	40,381	41,268	42,157	43,078	44,033	45,023
Queen City	971	980	989	998	1,007	1,017

INITIAL ESTIMATES OF GROUNDWATER DEMANDS, AC-FT/YR

	2020	2030	2040	2050	2060	2070
Fayette Co GCD	**6,595**	**6,880**	**6,998**	**7,096**	**7,170**	**7,339**
Fayette	**6,595**	**6,880**	**6,998**	**7,096**	**7,170**	**7,339**
Carrizo-Wilcox	757	833	881	924	963	995
Gulf Coast	2,317	2,402	2,440	2,471	2,497	2,546
Other	1,130	1,221	1,277	1,328	1,372	1,413
Queen City	309	338	356	372	386	399
Sparta	111	109	106	102	99	100
Yegua-Jackson	1,971	1,977	1,938	1,898	1,852	1,887

INITIAL ESTIMATES OF GROUNDWATER DEMANDS, AC-FT/YR

	2020	2030	2040	2050	2060	2070
Lost Pines GCD	**36,122**	**48,478**	**55,069**	**63,563**	**75,480**	**91,070**
Bastrop	**28,066**	**36,034**	**41,993**	**49,902**	**61,177**	**76,014**
Carrizo-Wilcox	24,572	32,324	38,099	45,878	56,264	69,918
Other	1,573	1,612	1,562	1,367	1,811	2,402
Queen City	960	1,049	1,166	1,329	1,551	1,847
Sparta	960	1,049	1,166	1,329	1,551	1,847
Lee	**8,056**	**12,445**	**13,075**	**13,661**	**14,303**	**15,057**
Carrizo-Wilcox	6,758	11,119	11,734	12,315	12,953	13,704
Other	-	-	-	-	-	-
Queen City	677	691	699	701	703	705
Sparta	621	635	642	45	647	648

INITIAL ESTIMATES OF GROUNDWATER DEMANDS, AC-FT/YR

	2020	2030	2040	2050	2060	2070
MidEast Texas GCD	**16,833**	**17,718**	**18,390**	**21,925**	**28,550**	**28,550**
Freestone	**6,177**	**6,673**	**7,214**	**10,615**	**16,994**	**16,994**
Carrizo-Wilcox	6,177	6,673	7,214	10,615	16,994	16,994
Leon	**6,142**	**6,414**	**6,461**	**6,478**	**6,585**	**6,585**
Carrizo-Wilcox	5,403	5,650	5,703	5,727	5,830	5,830
Queen City	648	673	668	661	665	665
Sparta	88	88	88	88	88	88
Yegua-Jackson	2	2	2	2	2	2
Madison	**4,515**	**4,631**	**4,715**	**4,833**	**4,971**	**4,971**
Carrizo-Wilcox	1,468	1,505	1,522	1,558	1,602	1,602
Queen City	271	278	283	290	299	299
Sparta	1,839	1,889	1,930	1,984	2,043	2,043
Yegua-Jackson	937	960	979	1,000	1,027	1,027

INITIAL ESTIMATES OF GROUNDWATER DEMANDS, AC-FT/YR

	2020	2030	2040	2050	2060	2070
Post Oak Savannah	**45,506**	**46,448**	**76,177**	**87,005**	**88,183**	**86,073**
Burleson	**19,796**	**20,785**	**50,739**	**61,342**	**60,139**	**57,951**
Brazos River All	12,536	12,902	12,689	12,470	12,225	11,780
Carrizo-Wilcox	5,431	6,001	36,199	47,053	46,131	44,452
Queen City	391	402	396	389	381	367
Sparta	1,399	1,440	1,416	1,392	1,364	1,315
Yegua-Jackson	39	40	39	38	38	36
Milam	**25,711**	**25,663**	**25,438**	**25,663**	**28,045**	**28,122**
Carrizo-Wilcox	25,711	25,663	25,438	25,663	28,045	28,122

QUESTIONS? COMMENTS?