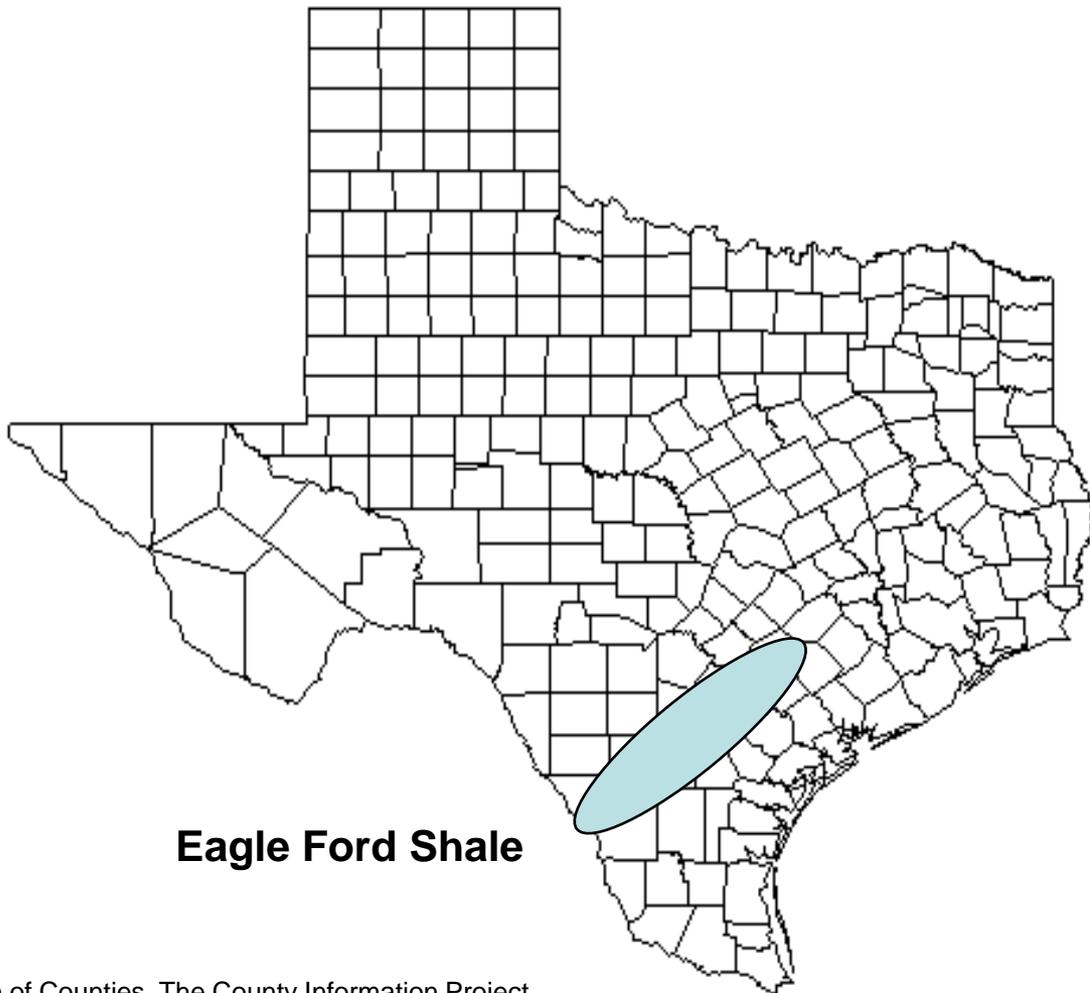


Eagle Ford Shale Water Supply and Demand

Stephen Jester, P.E.

Eagle Ford Shale Play



Eagle Ford Shale

Eagle Ford Shale Water Demand

- Total Water demand estimate based on:
 - Forecasted number of future wells
 - Estimated water demand per well

- 823 wells drilled, 394 completions in 2010
 - Number of rigs ramping up

Eagle Ford Shale Water Demand

- ❑ Potential 20,000 wells at full development*
- ❑ Water demand per well
 - ❑ 90,000 to 115,000 bbls
 - 11.5 to 15 acre-feet
- ❑ Primary source of water - groundwater

*"Eagle Ford Shale Play and the Carrizo Aquifer", Darrell Brownlow, PhD, Fountainhead 4th qtr 2010

Eagle Ford Shale Water Demand

- ❑ EF Shale development assume over 10-15 years
- ❑ Rate of 1300 to 2000 wells/yr
- ❑ At 11.5 -15 acre-ft/well,
 - 15,000 to 30,000 acre-feet water demand/yr

Other Water Demands in EF

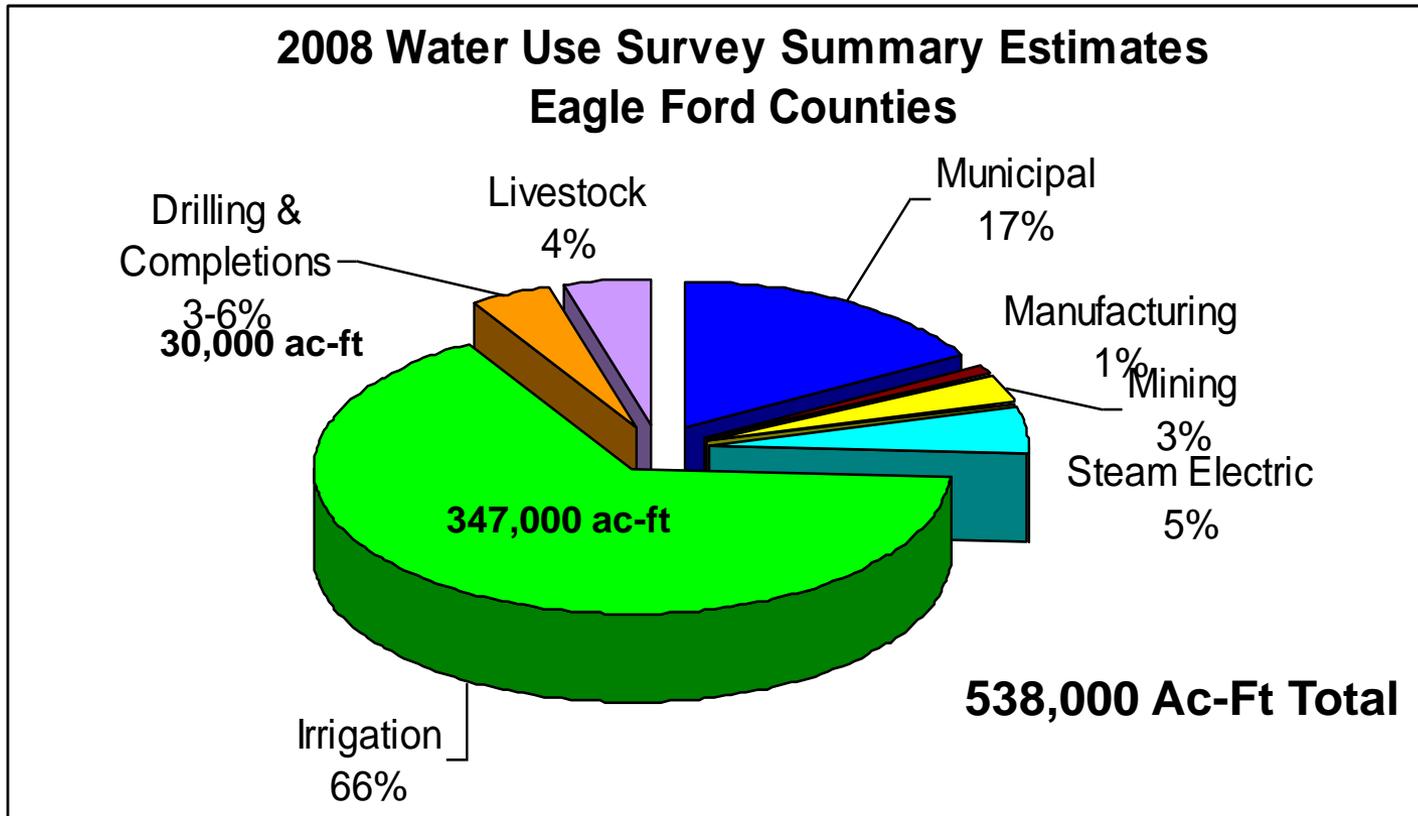
2008 Water Use Survey Summary Estimates in Acre-Feet¹⁾

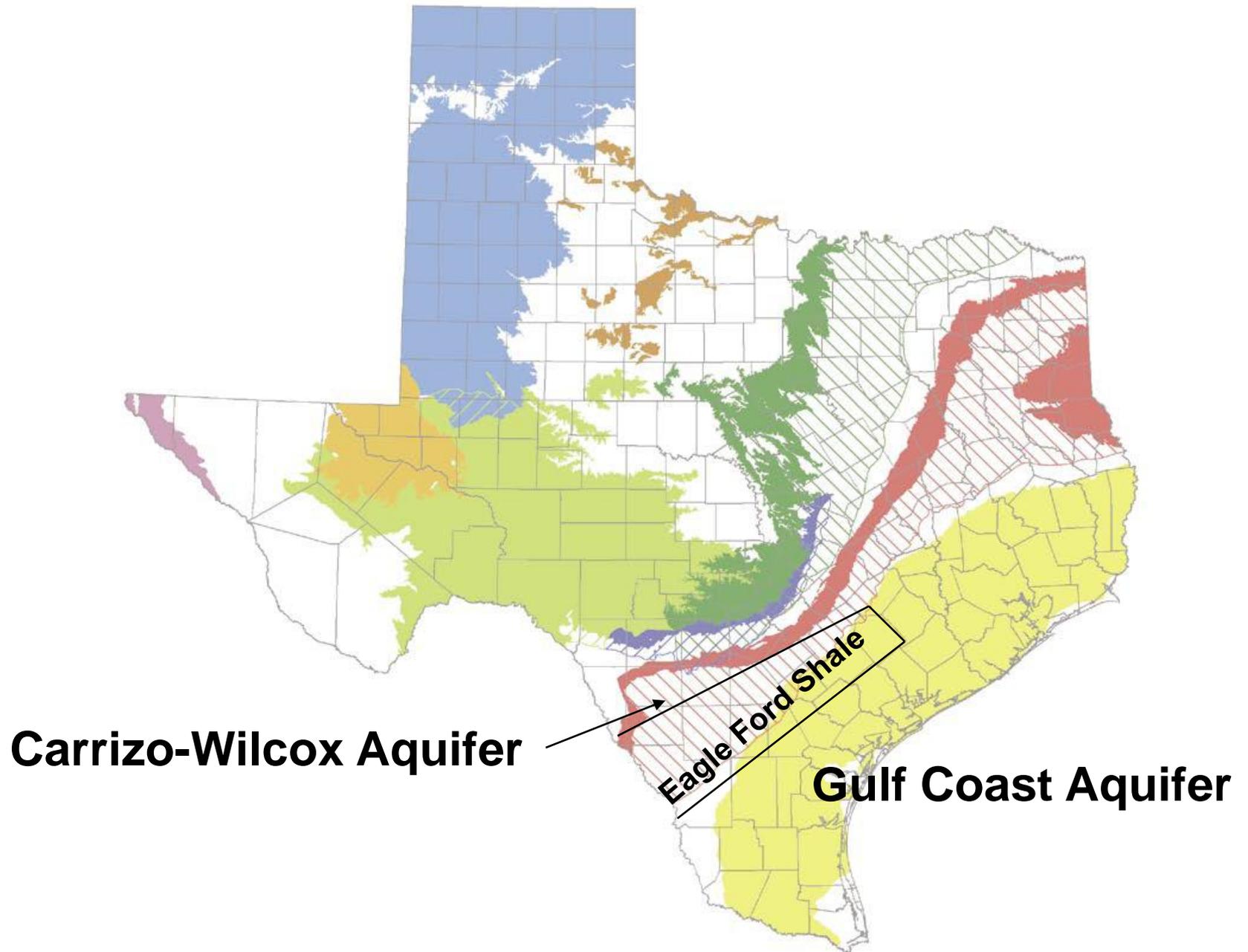
Eagle Ford Counties

Source: TX Water Development Board (<http://www.twdb.state.tx.us/wrpi/wus/2008est/2008wus.asp>)

Region	County	Population Estimates ²⁾	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock
L	ATASCOSA	43,829	6,483	15	64	6,448	29,661	1,696
L	DEWITT	20,166	3,573	129	63	0	13,094	1,849
L	DIMMIT	9,964	2,267	0	0	0	7,069	517
L	FRIO	16,333	2,583	0	0	189	83,725	889
L	GONZALES	19,223	4,635	1,892	0	0	4,143	4,735
L	KARNES	15,348	2,907	48	0	0	1,038	1,064
L	LA SALLE	5,962	1,404	0	0	0	4,491	585
L	WILSON	40,979	6,049	9	0	0	14,332	1,730
L	ZAVALA	11,844	2,812	566	0	0	37,692	1,146
N	BEE	33,117	5,221	0	0	0	6,270	856
N	LIVE OAK	12,082	2,017	2,056	0	0	1,934	838
N	MCMULLEN	859	173	0	219	0	0	395
P	LAVACA	19,435	2,991	414	2	0	5,368	2,088
M	WEBB	238,269	39,301	17	160	1,092	3,738	1,056
K	COLORADO	21,774	3,131	151	15,741	0	134,720	1,634
K	FAYETTE	24,116	3,262	224	2	19,146	76	2,130
Total			88,809	5,521	16,251	26,875	347,351	23,208

EF Water Demand Comparison





Source- Texas Water Development Board

Groundwater Supply Availability

□ TWDB 2007 State Water Plan*

- Gulf Coast Aquifer – 1,800,000 ac-ft availability
 - Vs 1,200,000 ac-ft demand
- Carrizo-Wilcox Aquifer – 1,000,000 Ac-ft availability
 - Vs 450,000 ac-ft demand

□ Groundwater Supply in Eagle Ford Area

- Northern portion (Karnes County and north/east) – Gulf Coast Aquifer
- Southern portion (Karnes County and south/west) – Carrizo-Wilcox Aquifer

*http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/Chapter7.pdf

Water Supply - North

□ Northern Area of Eagle Ford Shale

- Supplied mainly by Gulf Coast Aquifer
 - Central Gulf Coast Aquifer overlaps northern EF in Karnes County and to North and East
- Central Gulf Coast Groundwater Availability Model*:
 - About 620,000 ac-ft annual flow through
 - 30 percent rainfall
 - 70 percent stream seepage
 - Annual Pumping in 1999 was 420,000 ac-ft

*http://www.twdb.state.tx.us/gam/glfc_c/glfc_c_TWDB_SummaryReport.pdf Pp 26, 88

Water Supply - South

□ Southern Area of Eagle Ford Shale

- Supplied mainly by Carrizo-Wilcox Aquifer
 - Southern region of C-W Aquifer overlaps Eagle Ford from Karnes County to Zavala and Dimmit Counties
- Southern Carrizo-Wilcox Groundwater Availability Model*
 - About 370,000 ac-ft annual flow through
 - 87 percent recharge
 - 12 percent streams
 - Annual pumping estimated at 190,000 ac-ft/yr

*Source: GAM for Southern Carrizo-Wilcox Aquifer, TWDB pp 8-20, 4-89
(http://www.twdb.state.tx.us/gam/czwx_s/CZWX_S_Full_Report.pdf)

Summary

- ❑ Projected Oil & Gas Industry Water Demand in Eagle Ford:
 - approximately 3-6% of Total Demand
- ❑ Texas Water Development Board data show sufficient aquifer supply to meet demand over this area.
- ❑ Local conditions should be monitored to avoid impacts