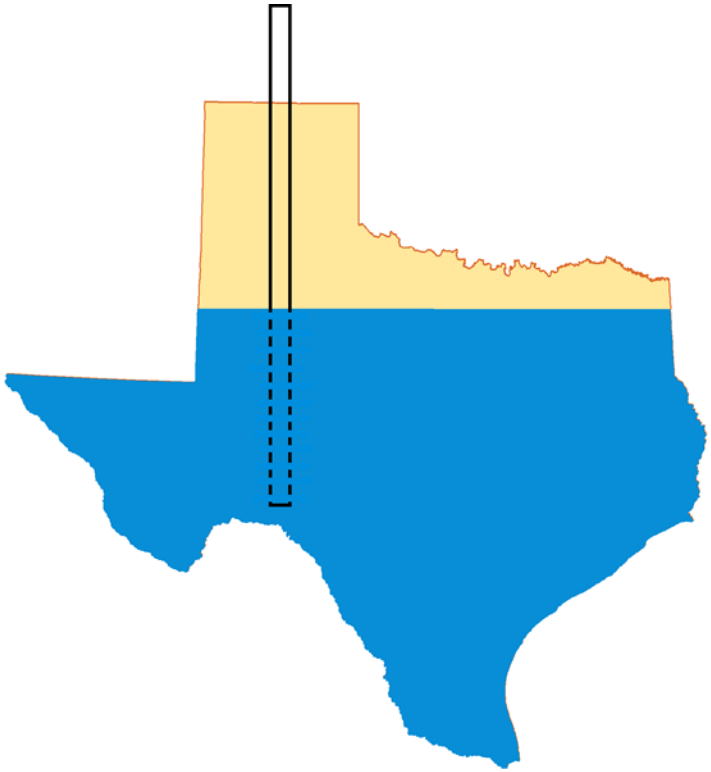
Future of Groundwater Use in Texas



Larry French, P.G.

Groundwater Resources Division

Texas Water Development Board

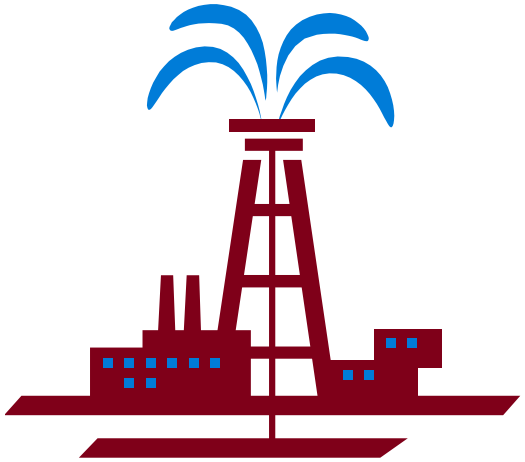
Presented at the "Water is Life" Conference

Texas A&M AgriLife Research Station

April 18, 2013

Topics- Future of Groundwater Use in Texas

- Demands for water
- Survey of availability
- What's trending…
- Case (mini) study



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groundwater and Texas

- ~60 percent of the 16.6 million acre-feet of water used
- ~80 percent of groundwater is used for irrigation
- groundwater provides 39 percent of water to cities

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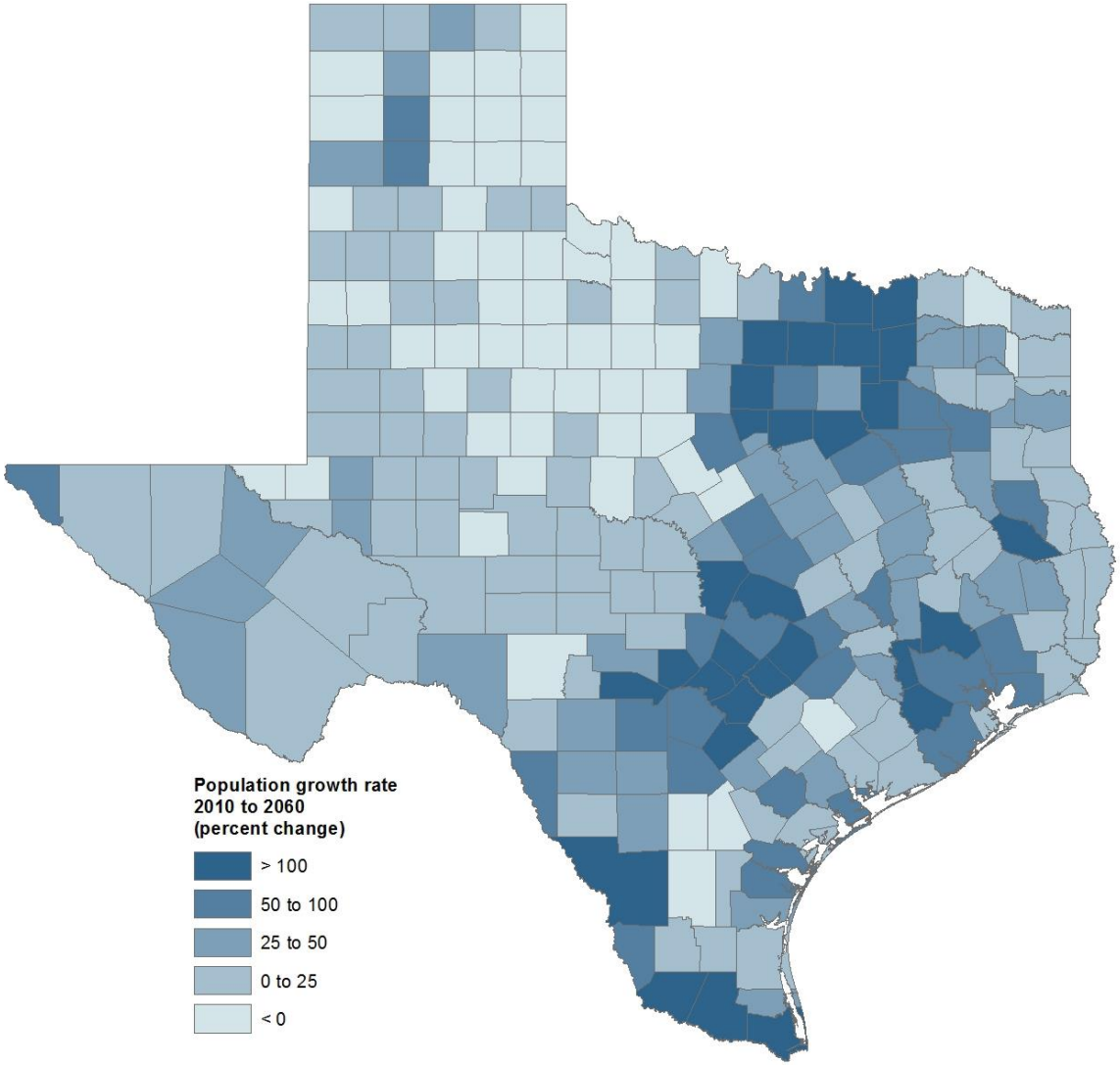
Projected Population Growth in Texas Counties



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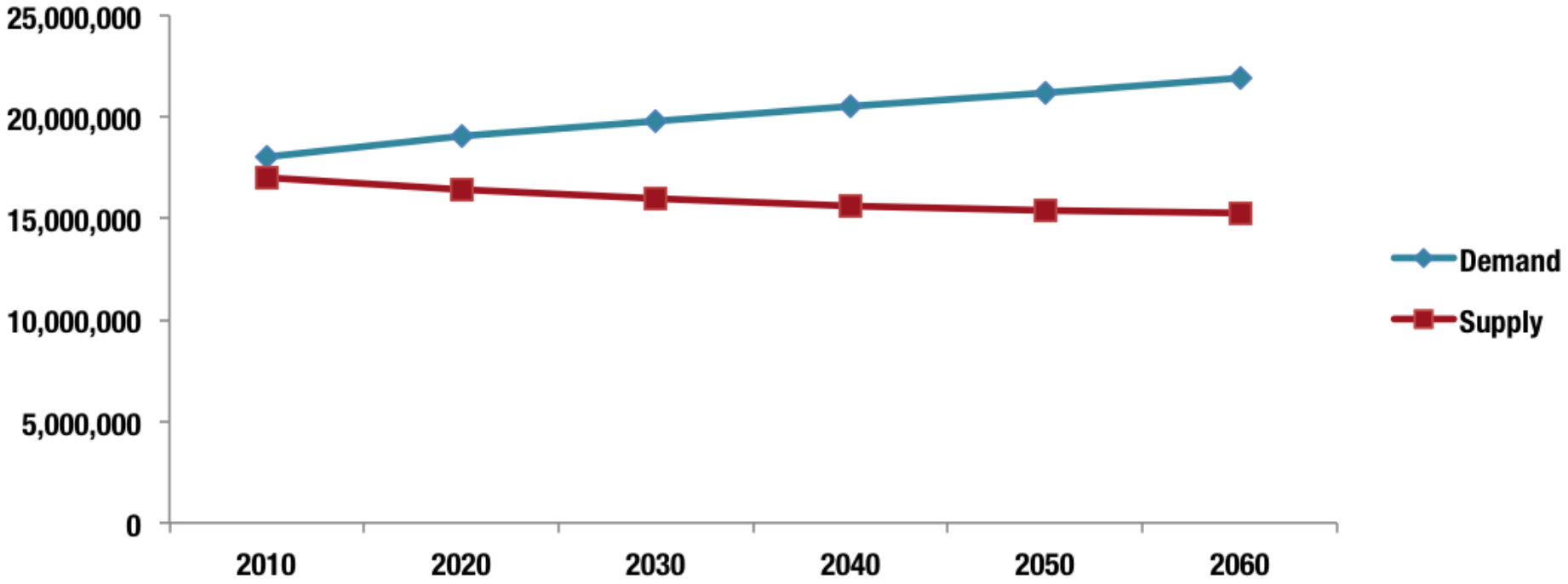
Projected Water Demands and Existing Supplies



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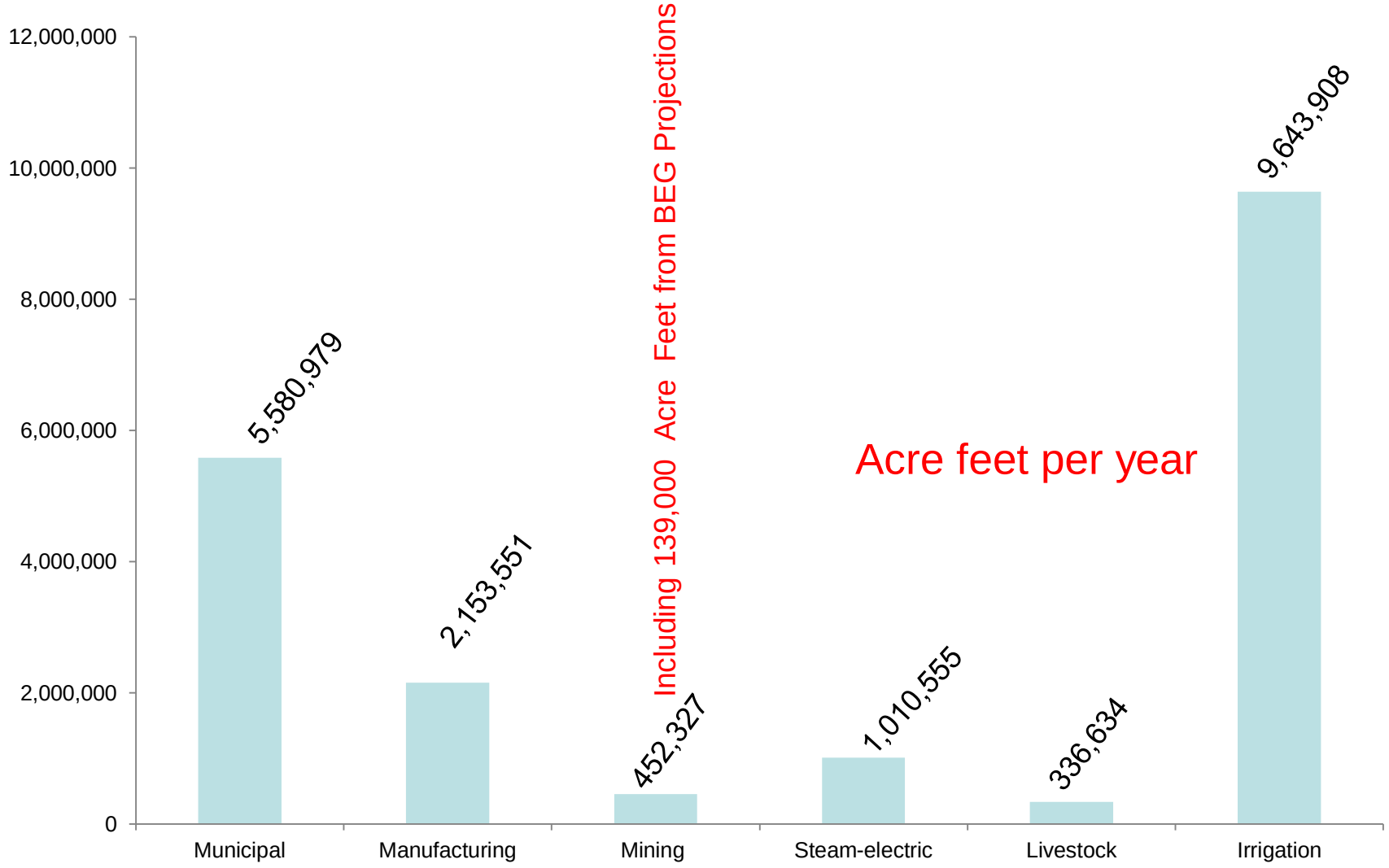
State Water Demand Projections
2020 Decade



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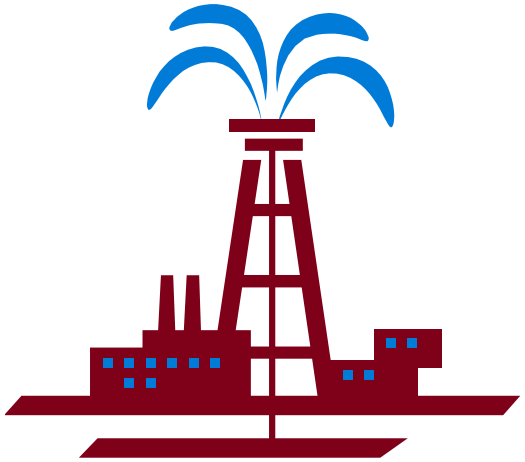

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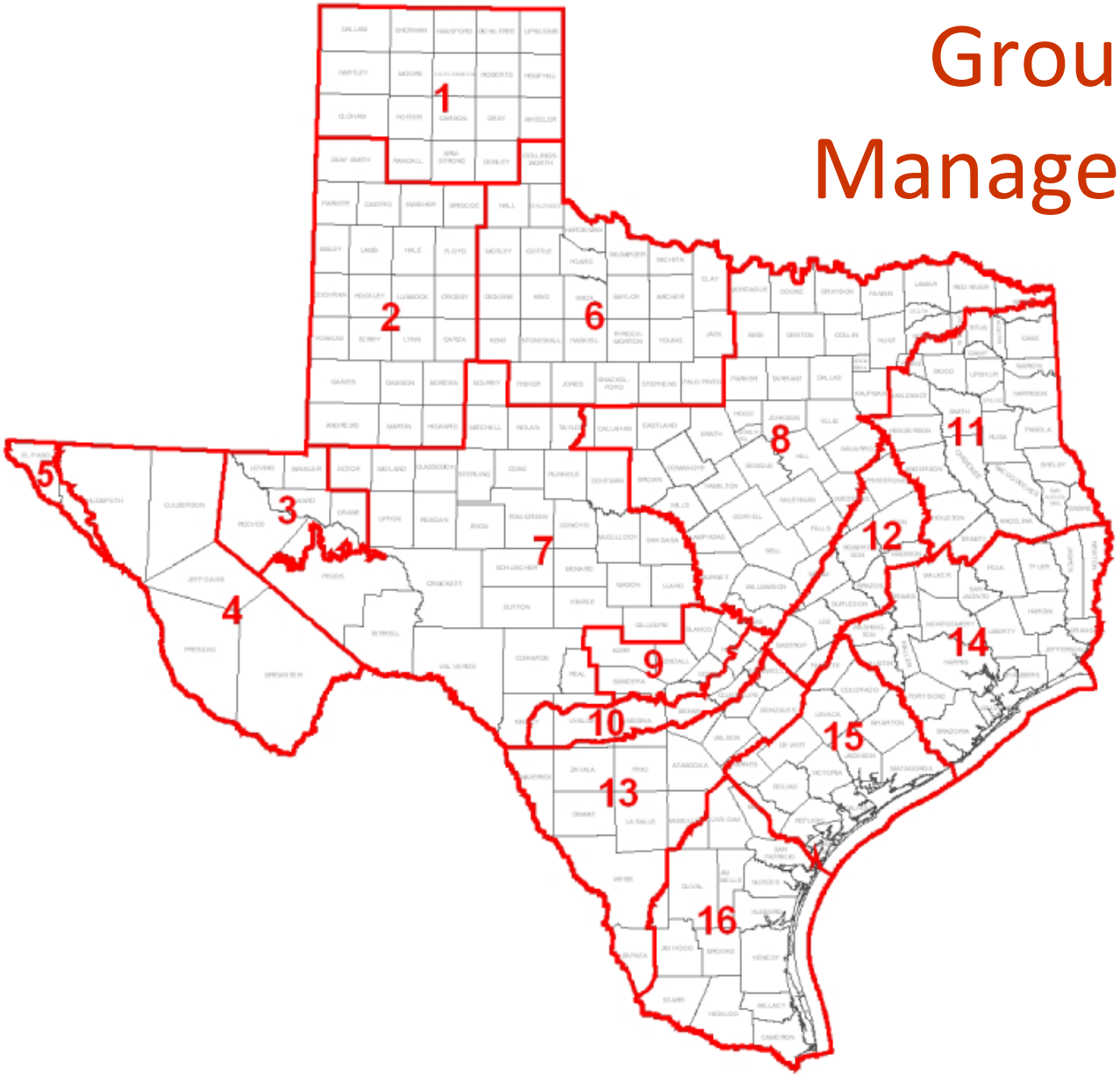
Groundwater Management Areas



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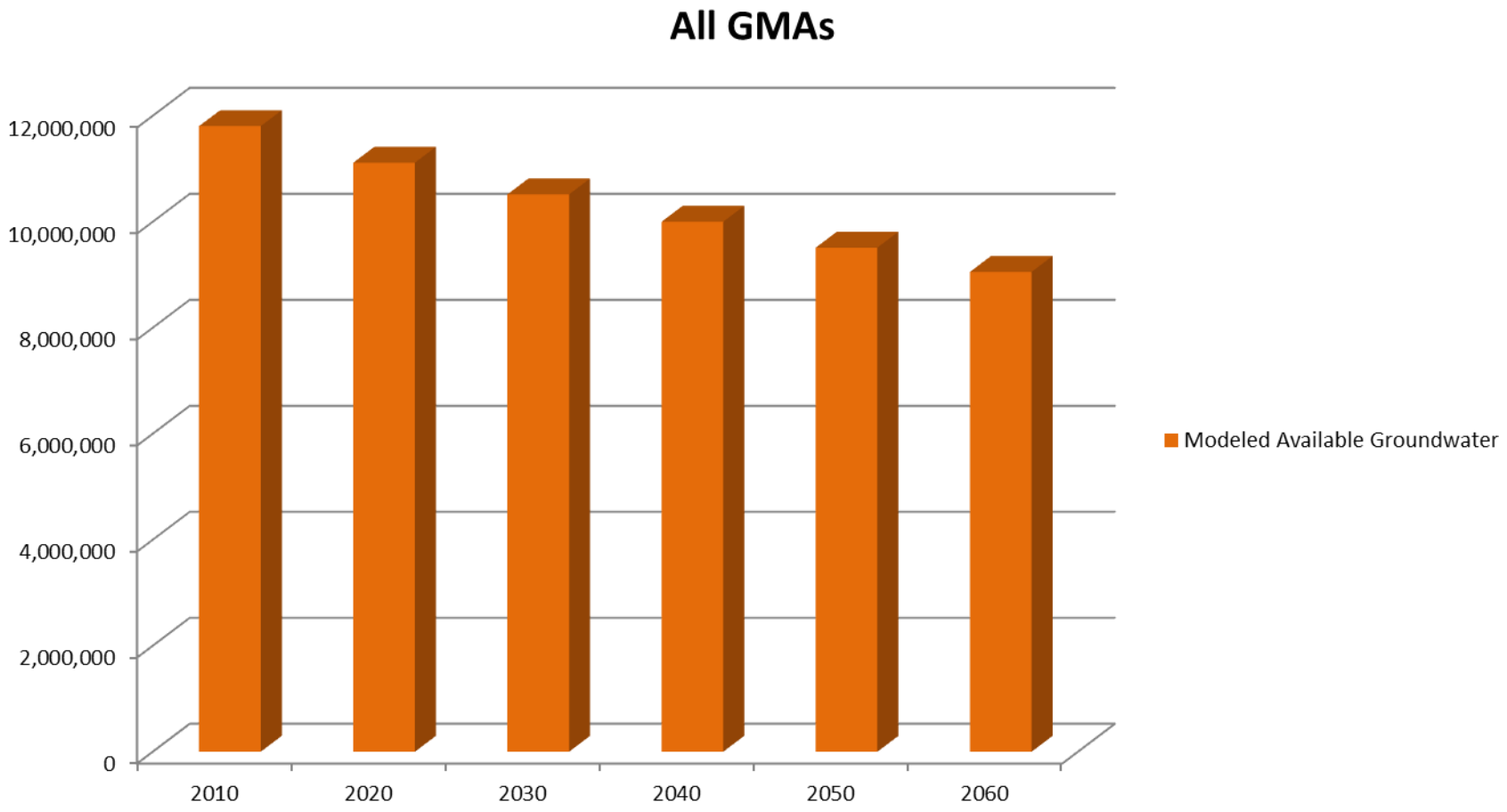
Statewide Modeled Available Groundwater through 2060



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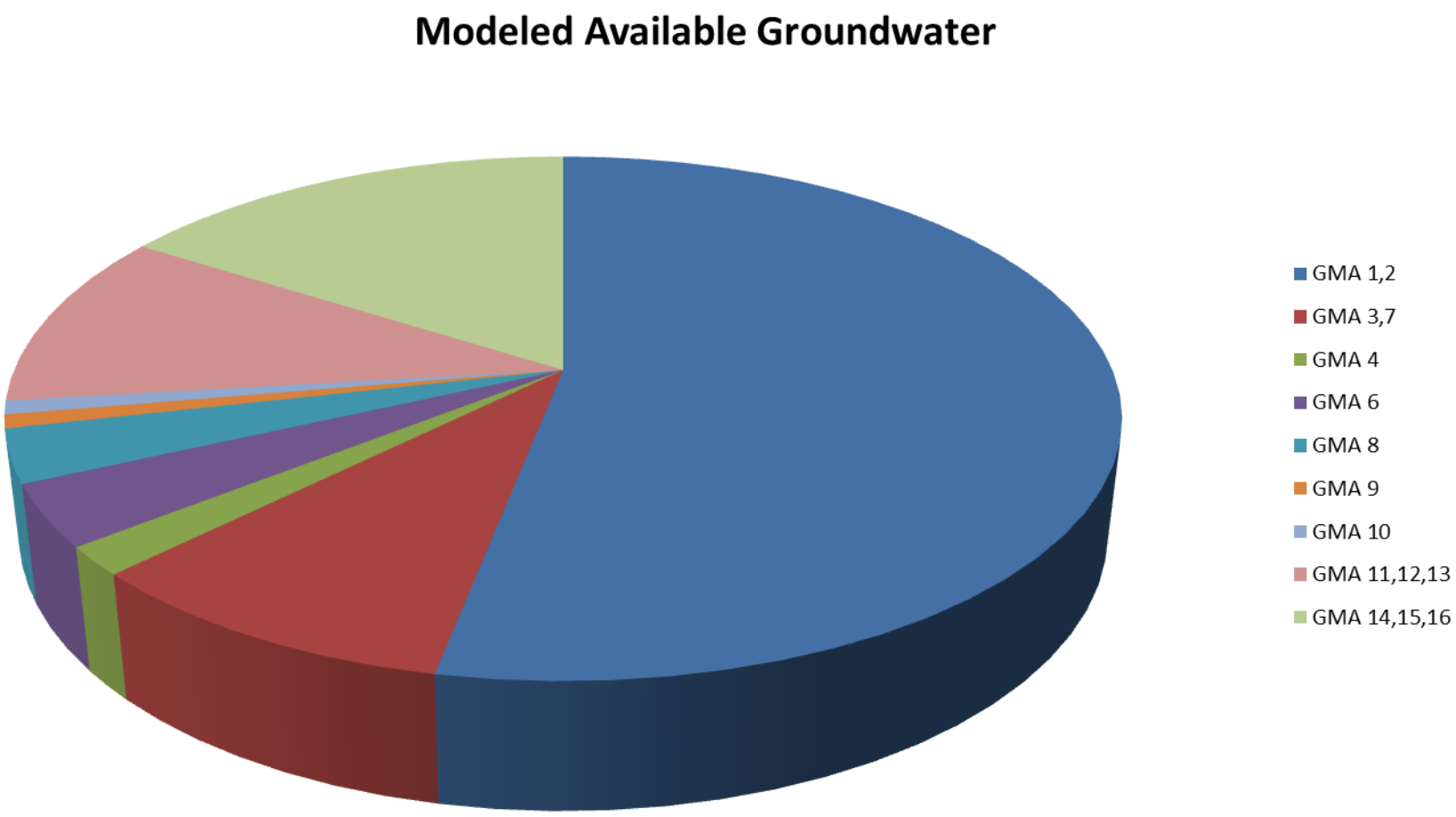
MAGs in GMAs



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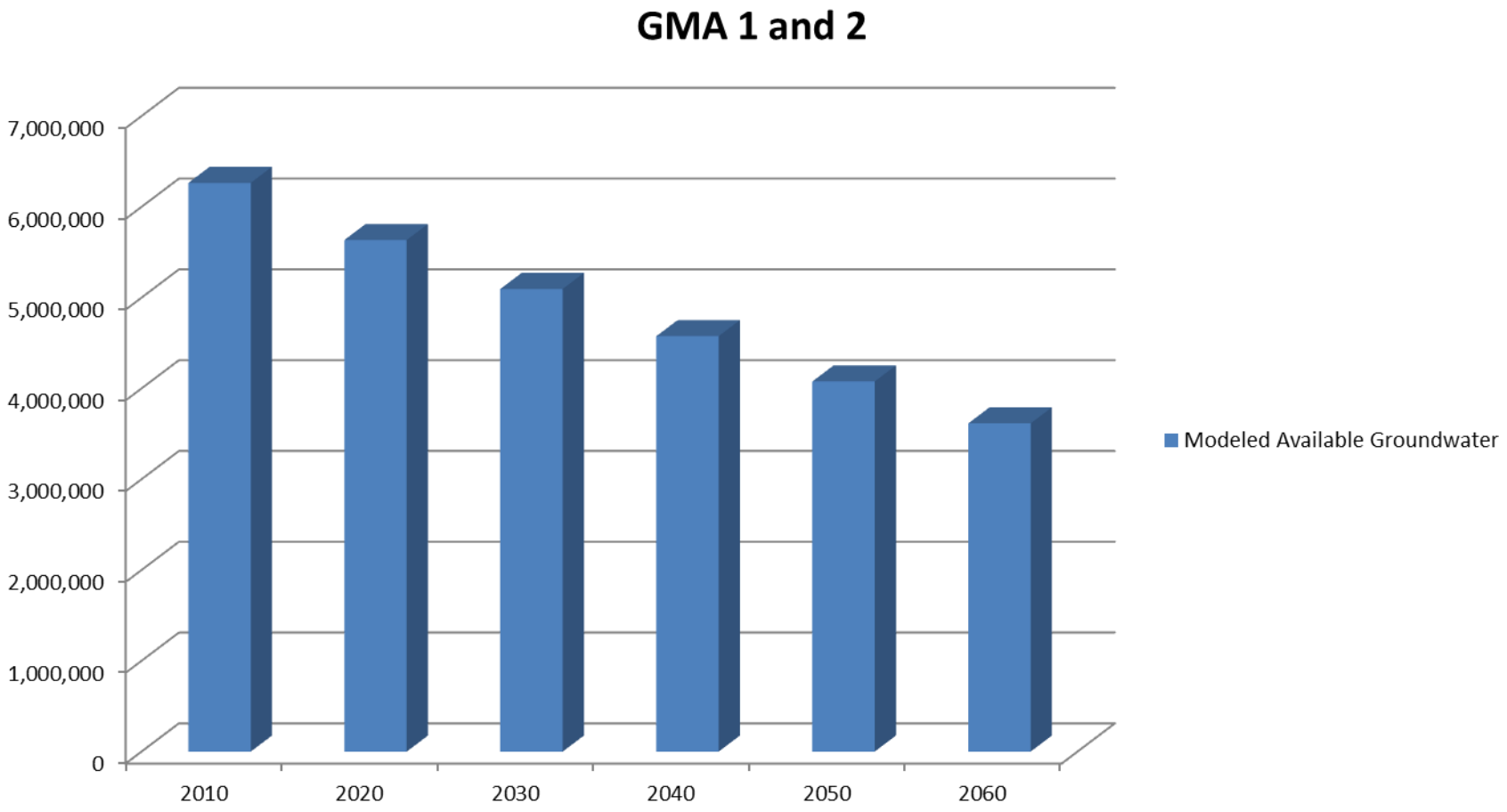
High Plains Aquifers



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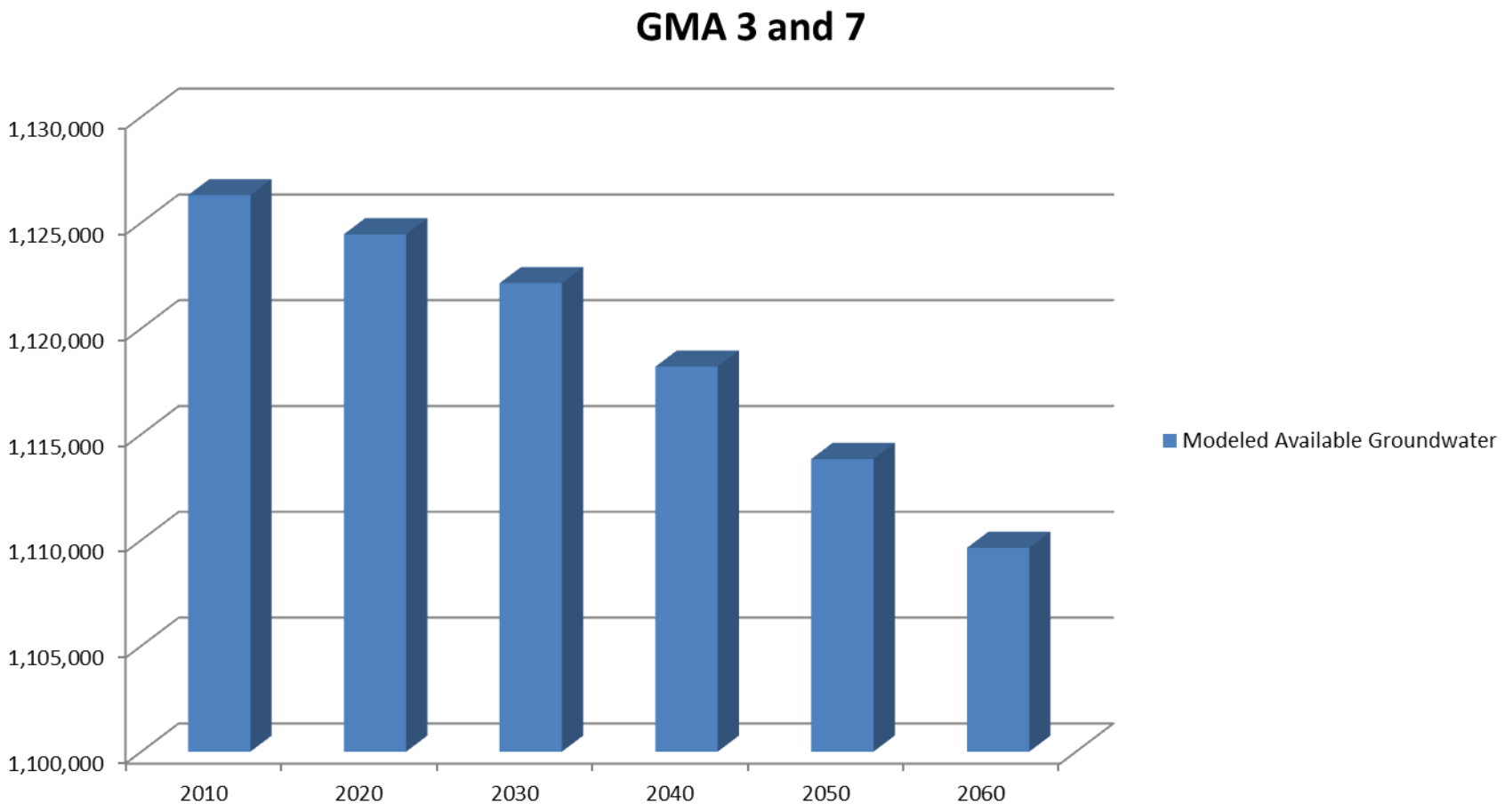
West Texas Aquifers



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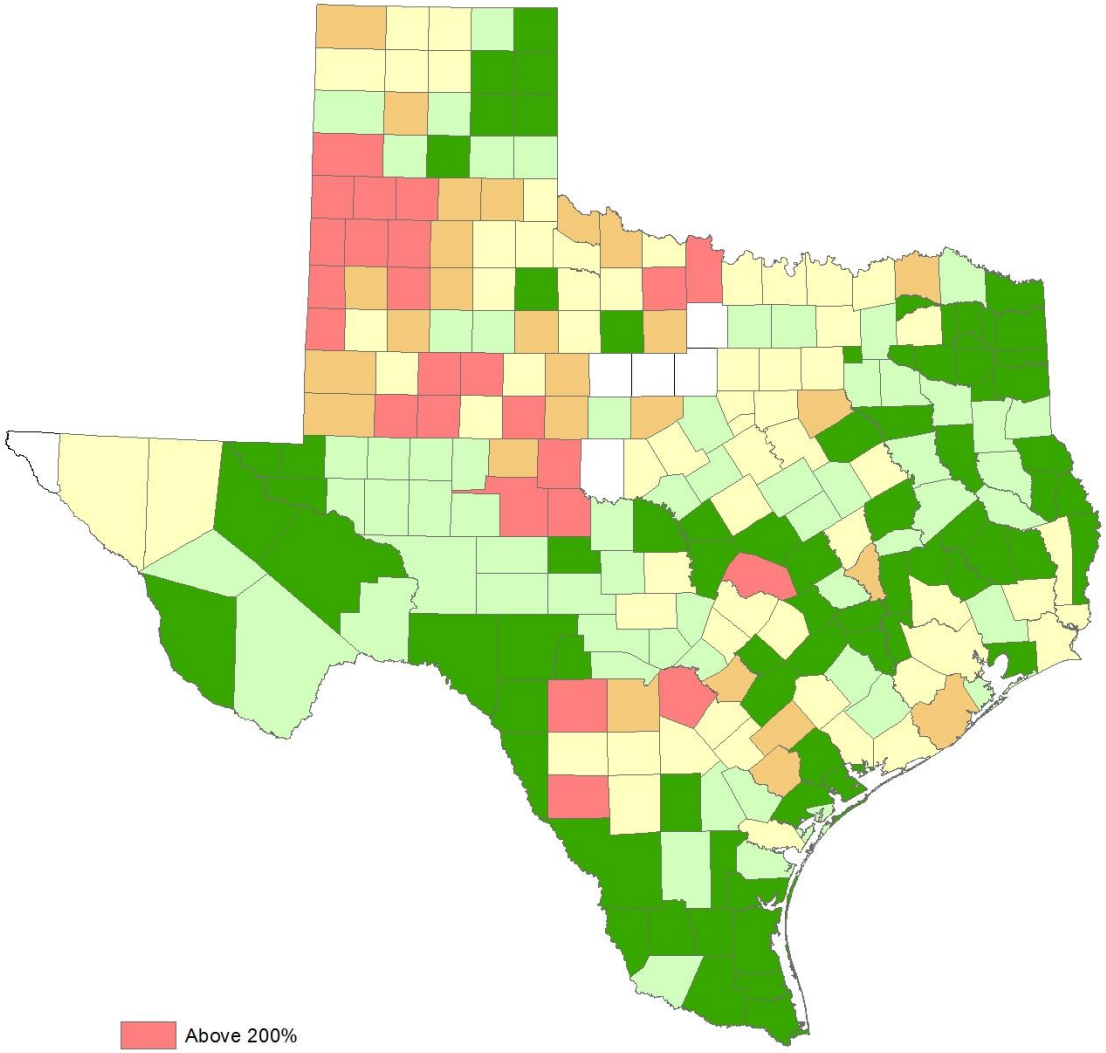
Comparison of Current Groundwater Withdrawls versus Modeled Available Groundwater (MAG) Volumes by Percentage



Map prepared by Blake Neffendorf, TWDB
October 23, 2012

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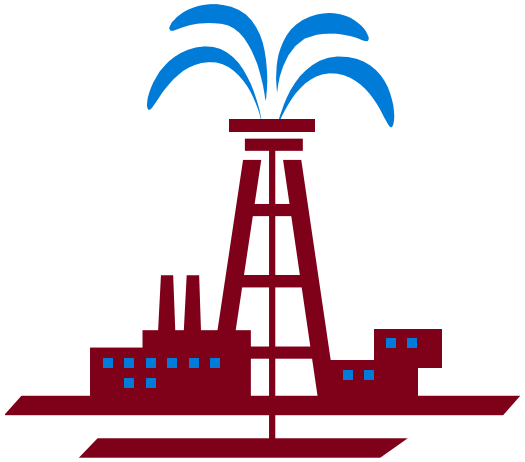
Topics- Future of Groundwater Use in Texas

- Demands for water
- Survey of availability
- What's trending…
- Case (mini) study



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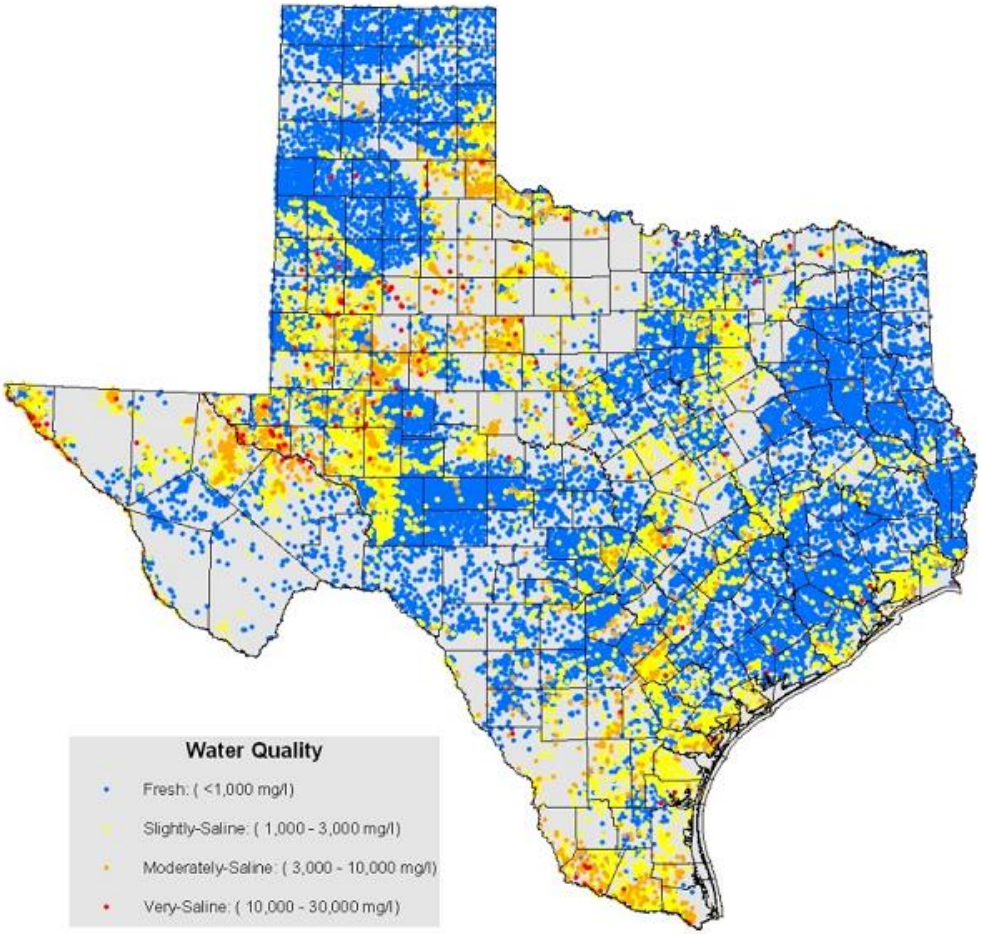
TDS

- < 1,000 mg/l
- 1,000 to 3,000 mg/l
- 3,000 to 10,000 mg/l
- > 10,000 mg/l



~ 2.7 billion acre-feet of brackish groundwater

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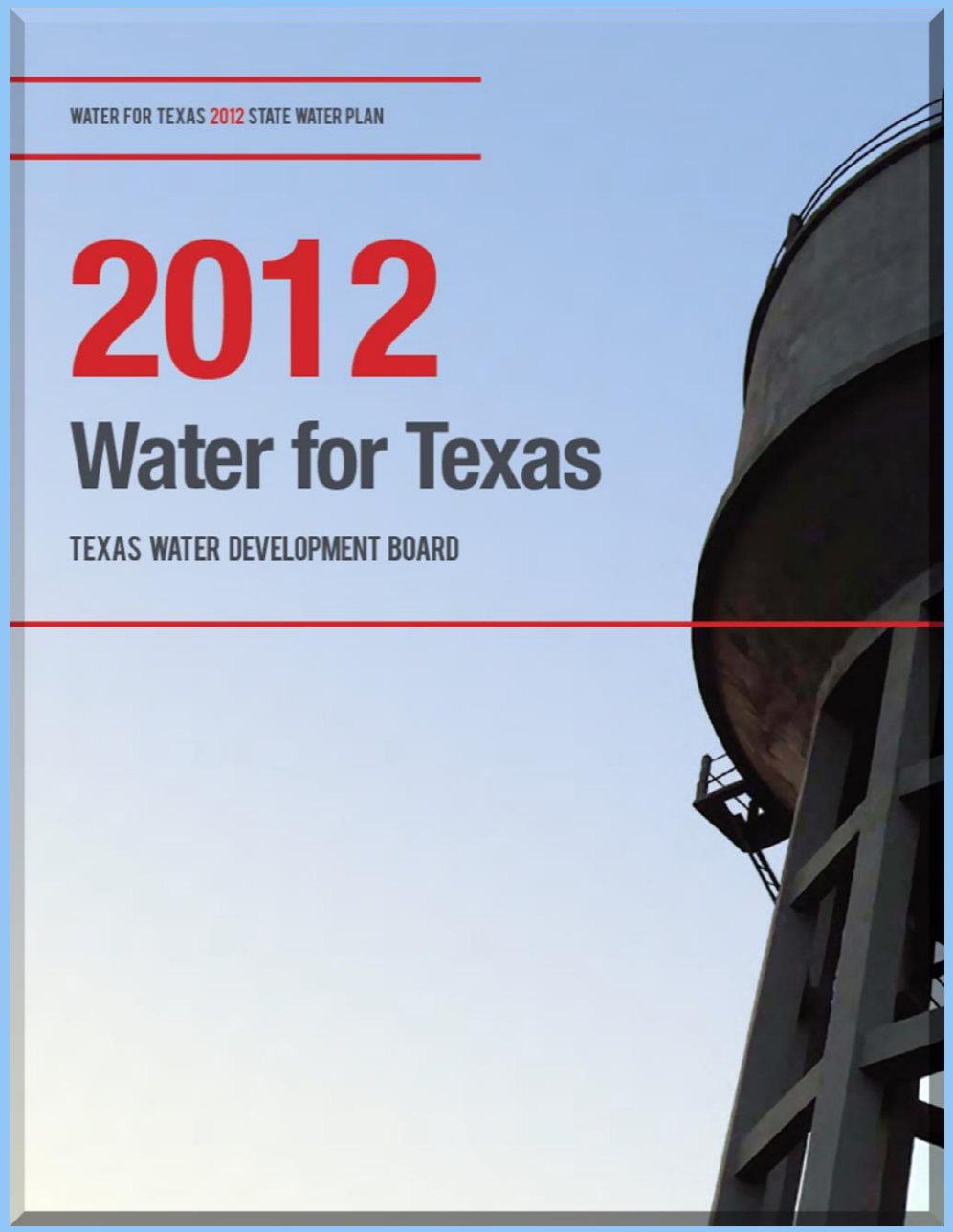
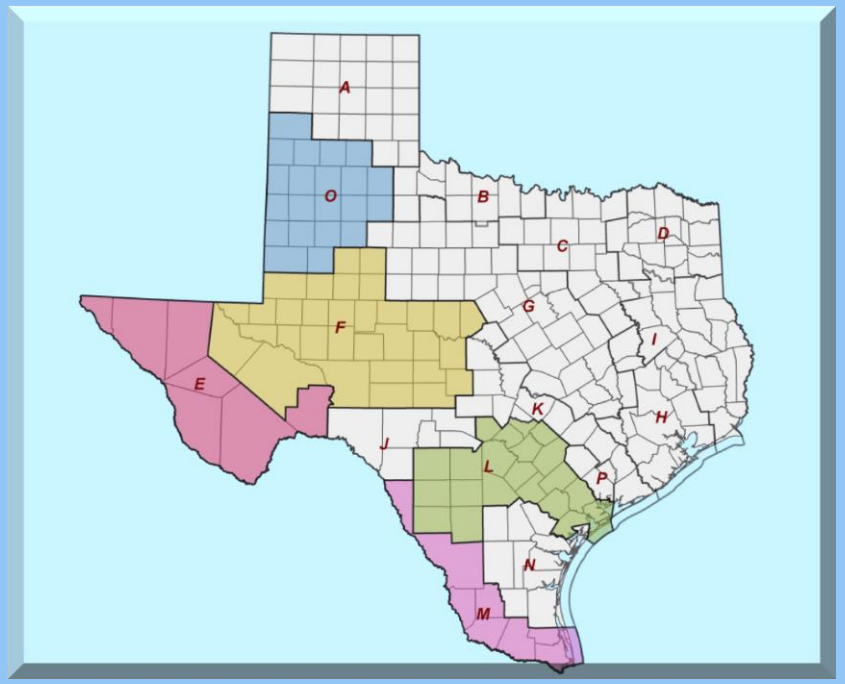
State and regional water planning



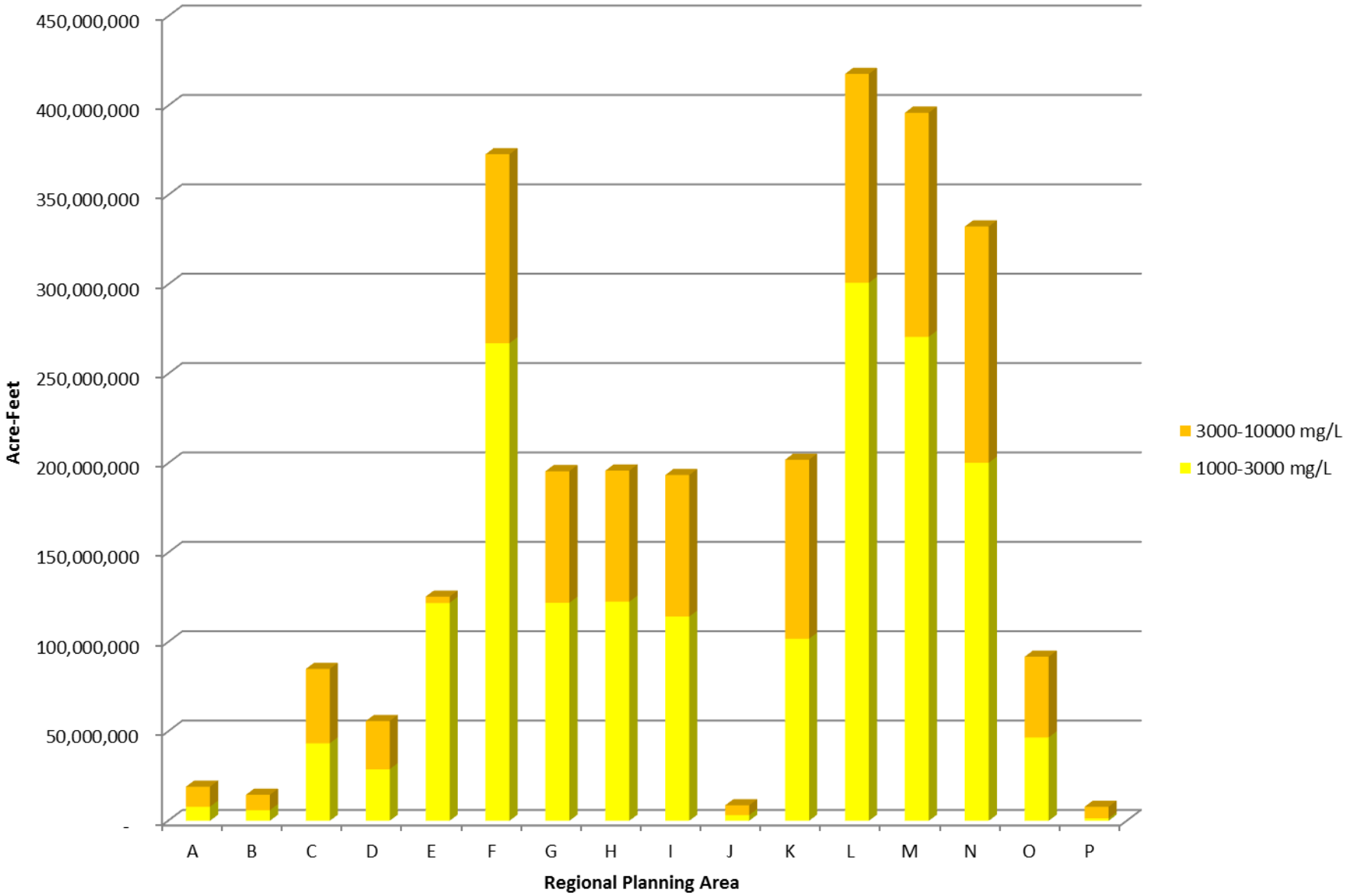
Recommended Water Management Strategies include:

Brackish Groundwater

- Develop 181,568 acre-feet/year by 2060
- 5 regions recommended strategy (E, F, L, M, O)



Estimated Brackish Groundwater Volume



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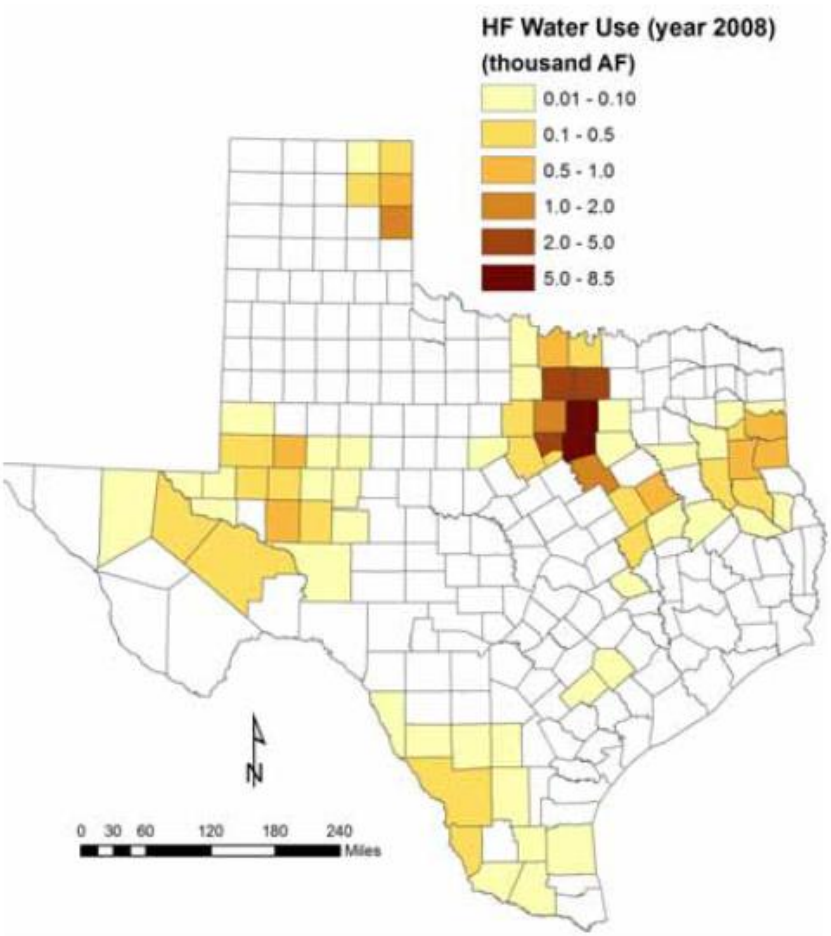
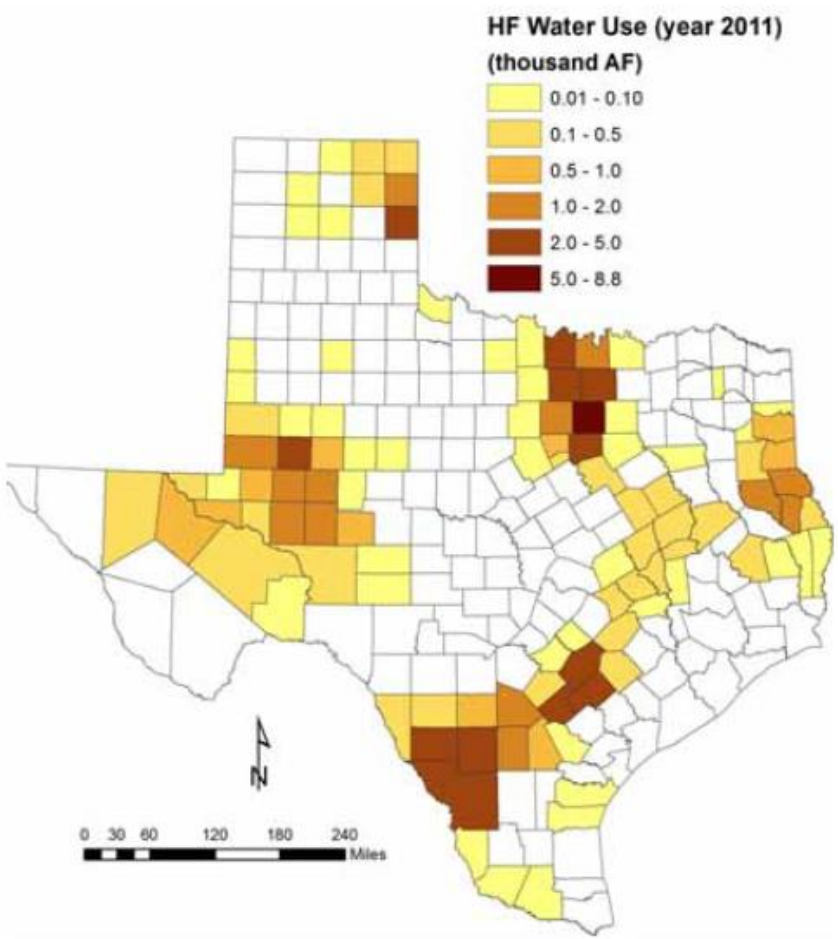
Increase in Hydrofrack Water Use



~36,000 ac ft



~81,500 ac ft
Incl. ~17,000 ac ft of recycling/reuse and use of brackish water

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Estimated Groundwater Usage in Oil and Gas Industry in West Texas Counties

(data from Bureau of Economic Geology, 2012)

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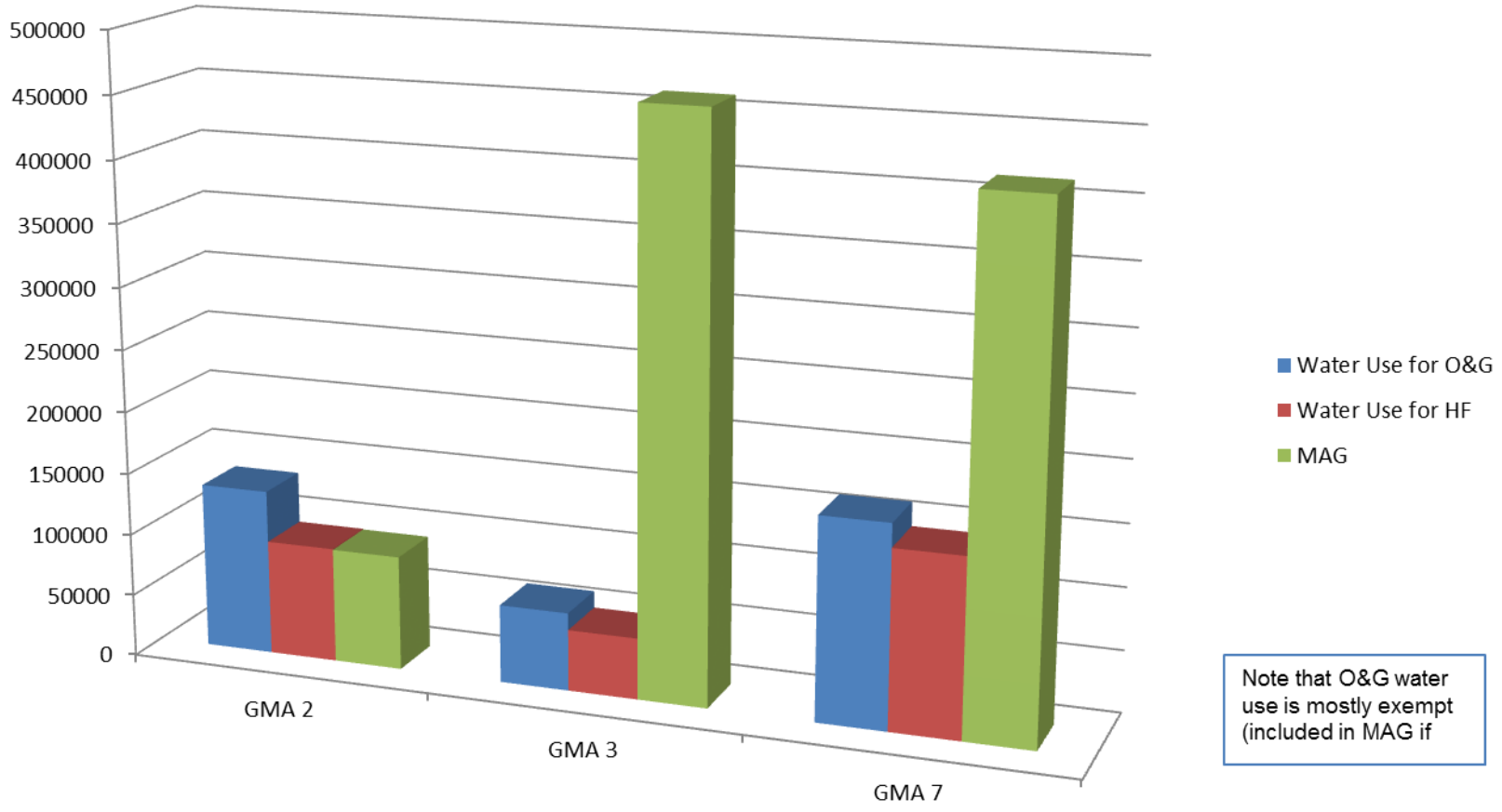
Comparing MAGs to Water Use



Note that O&G water use is mostly exempt (included in MAG if

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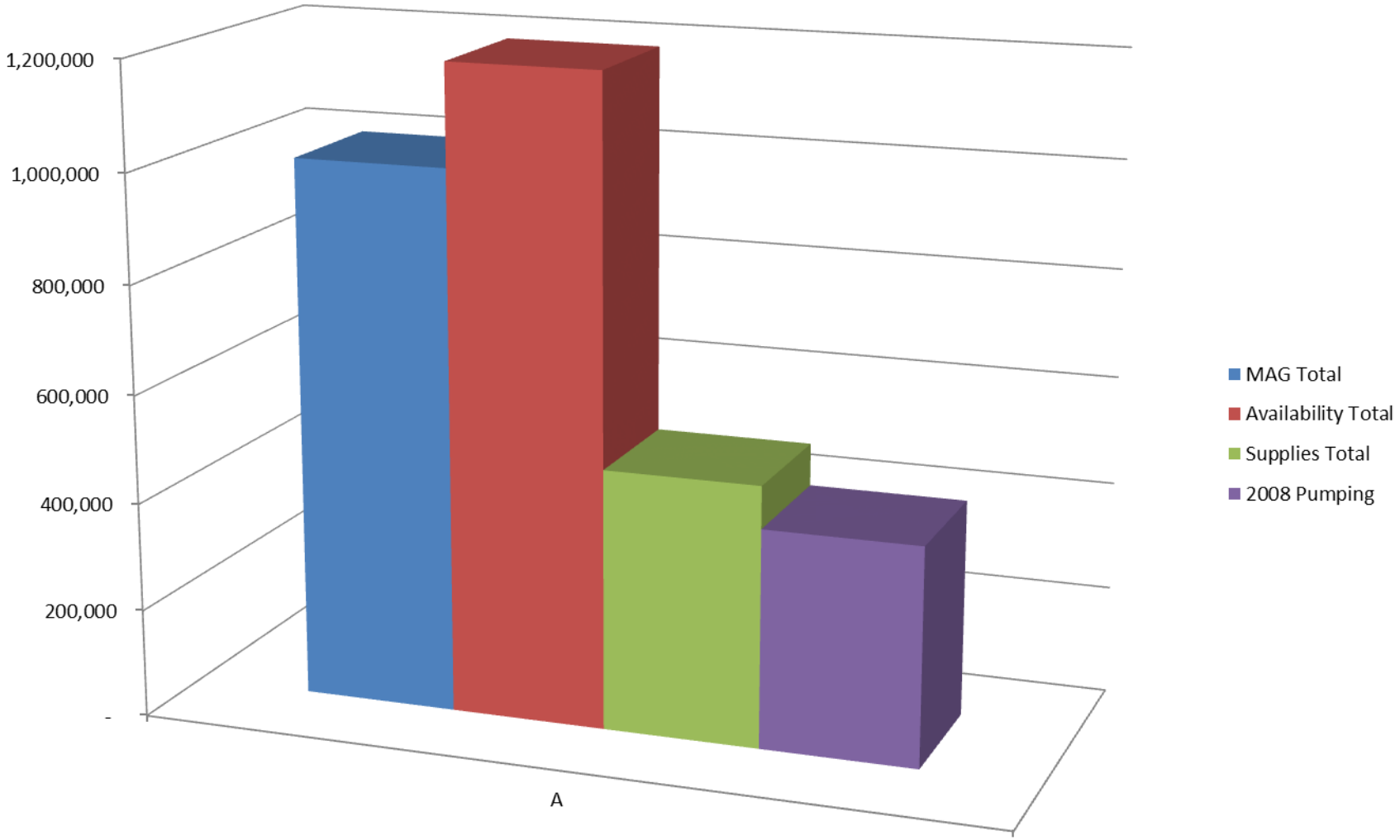
Groundwater MAGs, Availability, Supply, and 2008 Pumping for Region F



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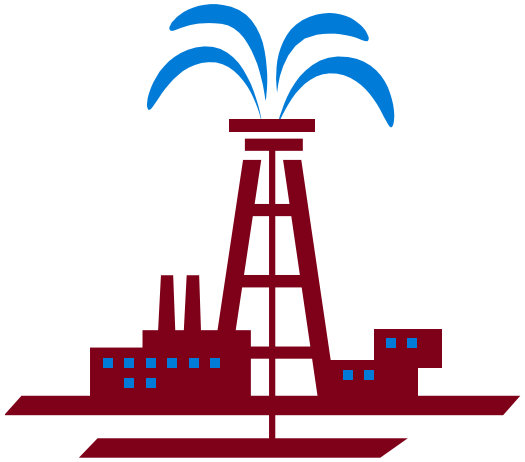

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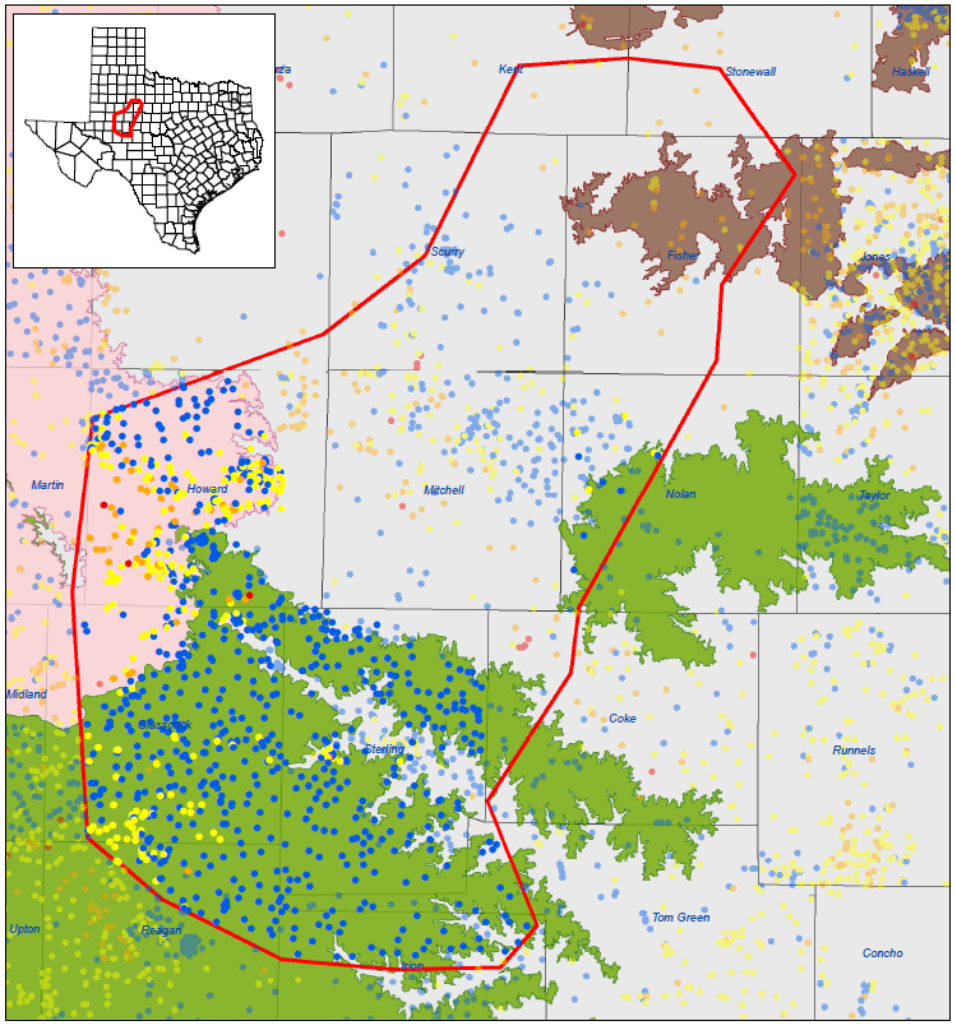
Groundwater Quality in Major Aquifers within the Cline Shale Extent



Groundwater Quality

Fresh Groundwater:	Less than 1,000 mg/L TDS*
Slightly Brackish Groundwater:	1,000 - 2,999 mg/L TDS*
Moderately Brackish Groundwater:	3,000 - 9,999 mg/L TDS*
Saline Groundwater:	10,000 mg/L or Greater TDS*

Approximate Cline Shale Extent

Major Aquifers

- Edwards-Trinity Plateau Aquifer Outcrop (Exposed at the Surface)
- Ogallala Aquifer Outcrop
- Seymour Aquifer Outcrop

TDS - Total Dissolved Solids concentration (mg/L)

LanceChristian, P.G., Texas Water Development Board

0 5 10 20 30 Miles

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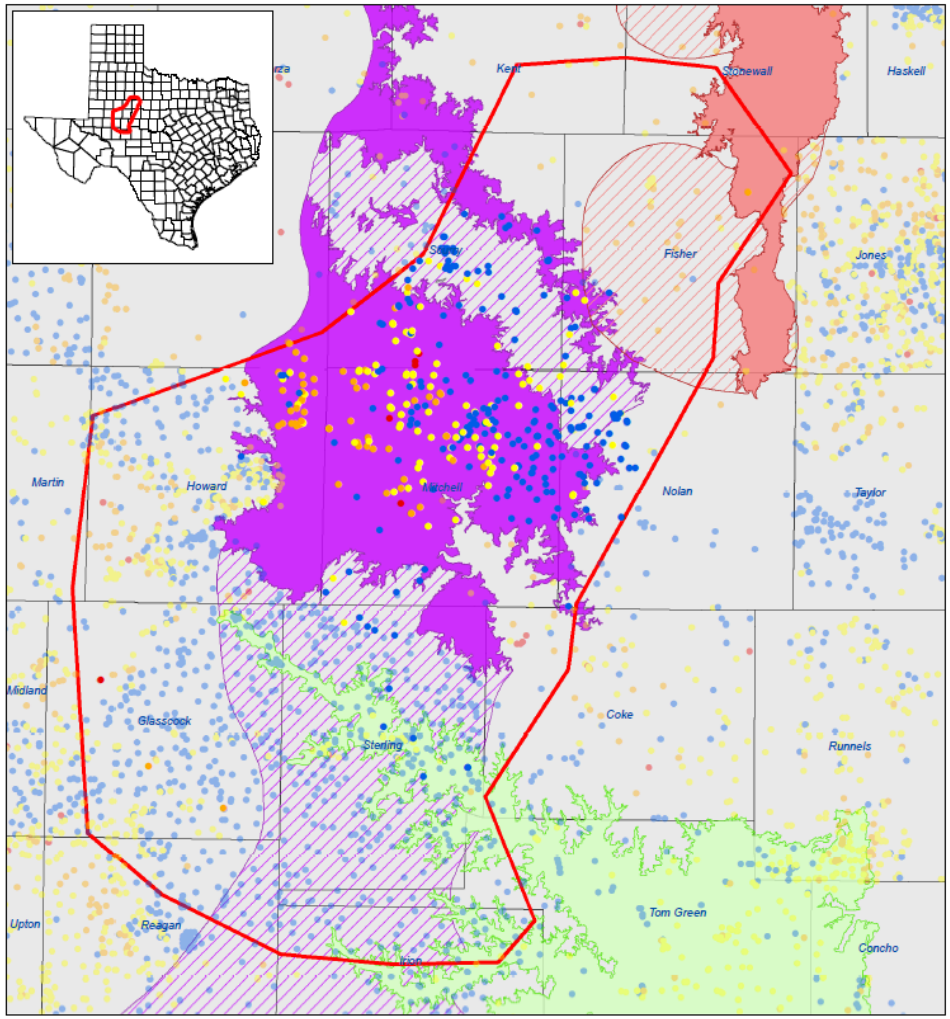
Groundwater Quality in Minor Aquifers within the Cline Shale Extent



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Approximate Cline Shale Extent

Minor Aquifers

- Blaine Aquifer Outcrop (Exposed at the Surface)
- Blaine Aquifer Subcrop (Occurs only in subsurface)
- Dockum Aquifer Outcrop
- Dockum Aquifer Subcrop
- Lipan Aquifer Outcrop

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0 5 10 20 30 Miles

TDS - Total Dissolved Solids concentration (mg/L)

Lance Christian, P.G., Texas Water Development Board

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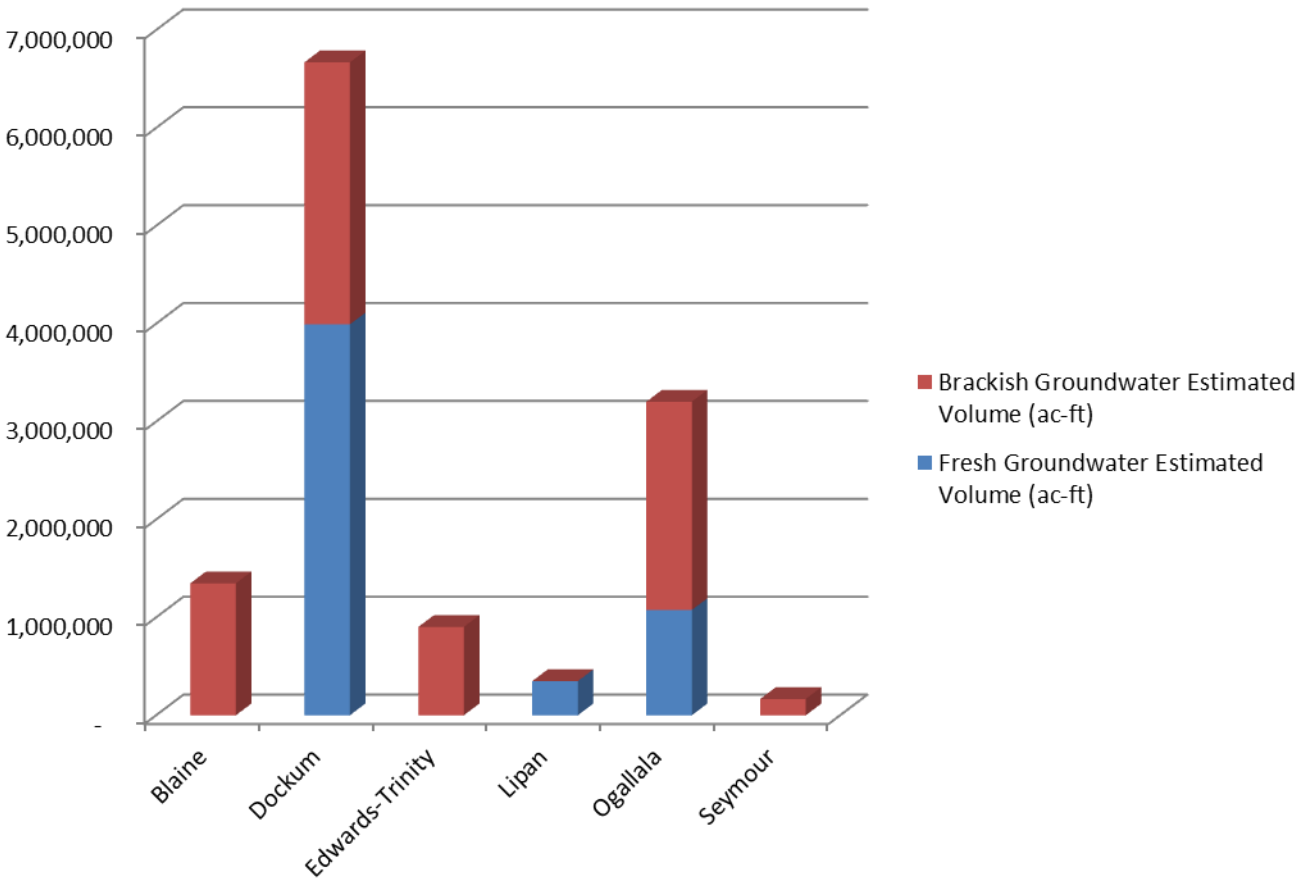
Groundwater Volumes in Cline Shale Play



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To conclude:

- With respect to future groundwater use in Texas:
  - Agriculture 
  - Municipal 
  - Energy 
- Innovative approaches
  - Brackish groundwater
  - Aquifer Storage and Recovery
- Challenges: drought, legal/regulatory

Texas Water Development Board

Contact:

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Texas Water Development Board

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512-463-5067