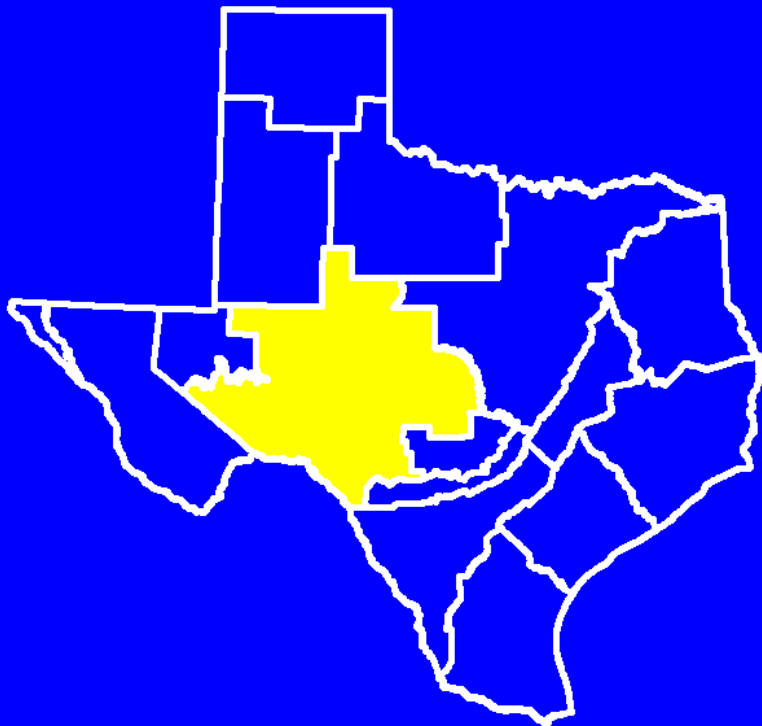


The Use of Groundwater Availability Models in Texas in the Establishment of Desired Future Conditions in GMA 7



Bill Hutchison, Ph.D., P.E., P.G.
Independent Groundwater
Consultant

GMA 7 Conference
April 18, 2015

Topics

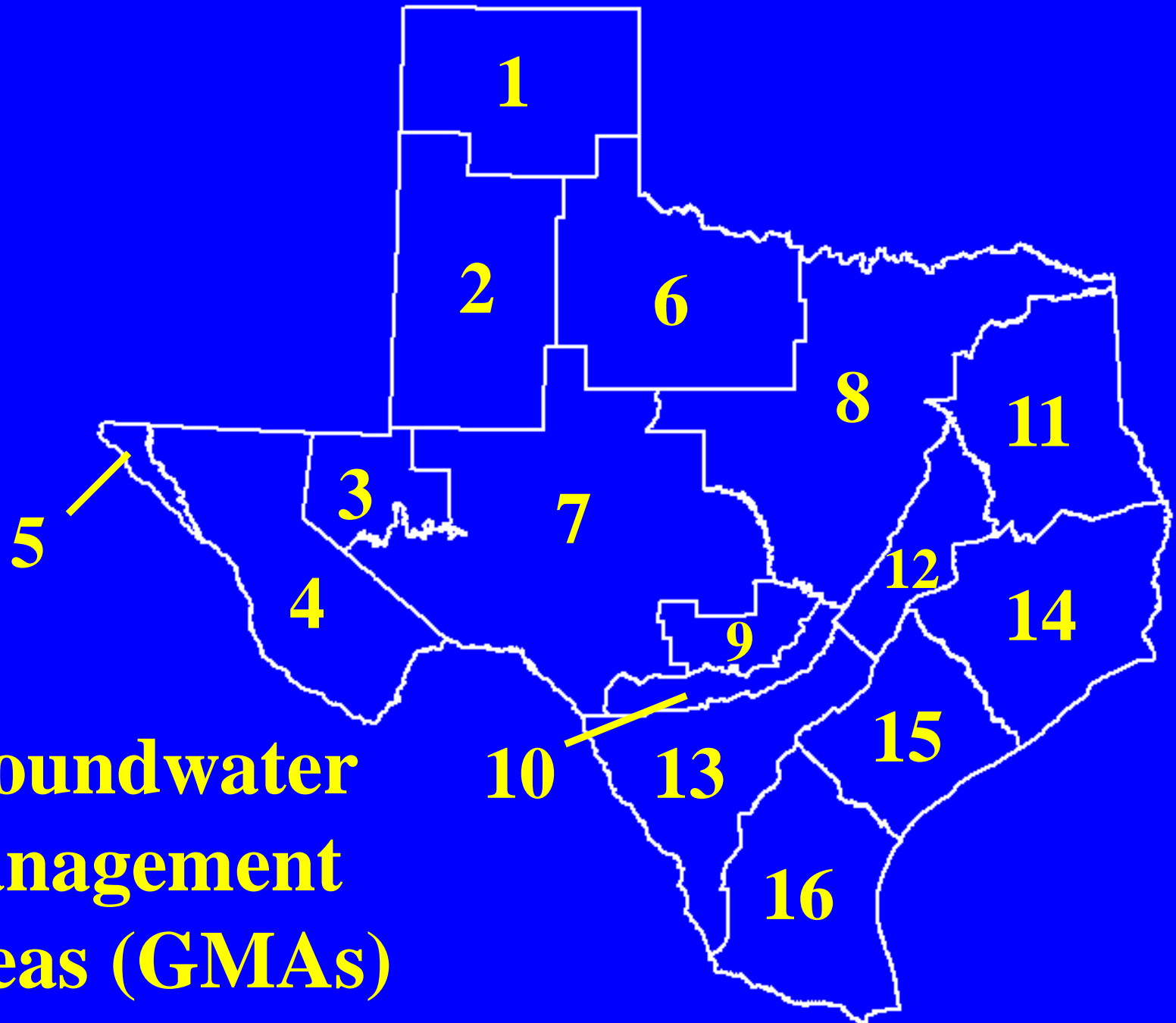
- Background
- Example of DFC Development in 2010
- Changes in DFC Adoption Process
- Status of DFC Updates

Joint Planning

- Formalized the quantification of “Groundwater Availability” (2005 Session)
- Prior to mandatory joint planning, Regional Water Planning Groups established “Groundwater Availability” using various methods

Joint Planning

- Desired Future Condition (DFC)
 - Adopted by Groundwater Conservation Districts (GCD) within a Groundwater Management Area (GMA)
- Managed Available Groundwater (MAG)
 - Calculated by Texas Water Development Board



**Groundwater
Management
Areas (GMAs)**

Desired Future Condition (DFC)

- Quantified conditions of groundwater resources
- Specified time or times in the future
- Broad Policy Goal
 - Drawdown
 - Spring flow
 - Storage volumes
- Updated at least every 5 years

Managed Available Groundwater (MAG)

- TWDB calculates based on DFC
 - Models
 - Water budget calculations
 - District provided data and information
- Will be included in GCD Management Plans
- To be used in permitting decisions

Groundwater
Availability = DFC + MAG

Groundwater
Availability = Policy + Science

Groundwater
Availability = DFC + MAG

Desired Future Condition (DFC)

- *Quantified* conditions of groundwater resources
- Specified time or times in the future
- Broad *Policy* Goal
 - Drawdown
 - Spring flow
 - Storage volumes
- Updated at least every 5 years

TWDB Rules after 2005 Session

- No statutory definition of DFC
- TWDB Added definition of DFC (quantified conditions)
 - Resulted in the use of models
- Legislature later adopted TWDB's definition in 2011 legislation

Groundwater Availability Models (GAMs)

- Program started in 2000 to model all aquifers in Texas
- Stakeholder involvement
- Continuous improvement of the models
- Objective of models: define groundwater availability
 - Groundwater district management plans
 - Regional water planning group plans

Model Runs

- Simulations of changes in:
 - Groundwater pumping and/or
 - Drought conditions
- Output examples:
 - Drawdown
 - Spring Flows
 - Storage Volumes

Model Runs

- Simulations of changes in:
 - Groundwater pumping and/or
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DFC

Model Runs

- Simulations of changes in:
 - Groundwater pumping and/or
 - Drought conditions
- Output examples:
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MAG

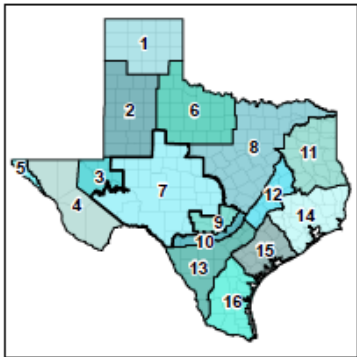
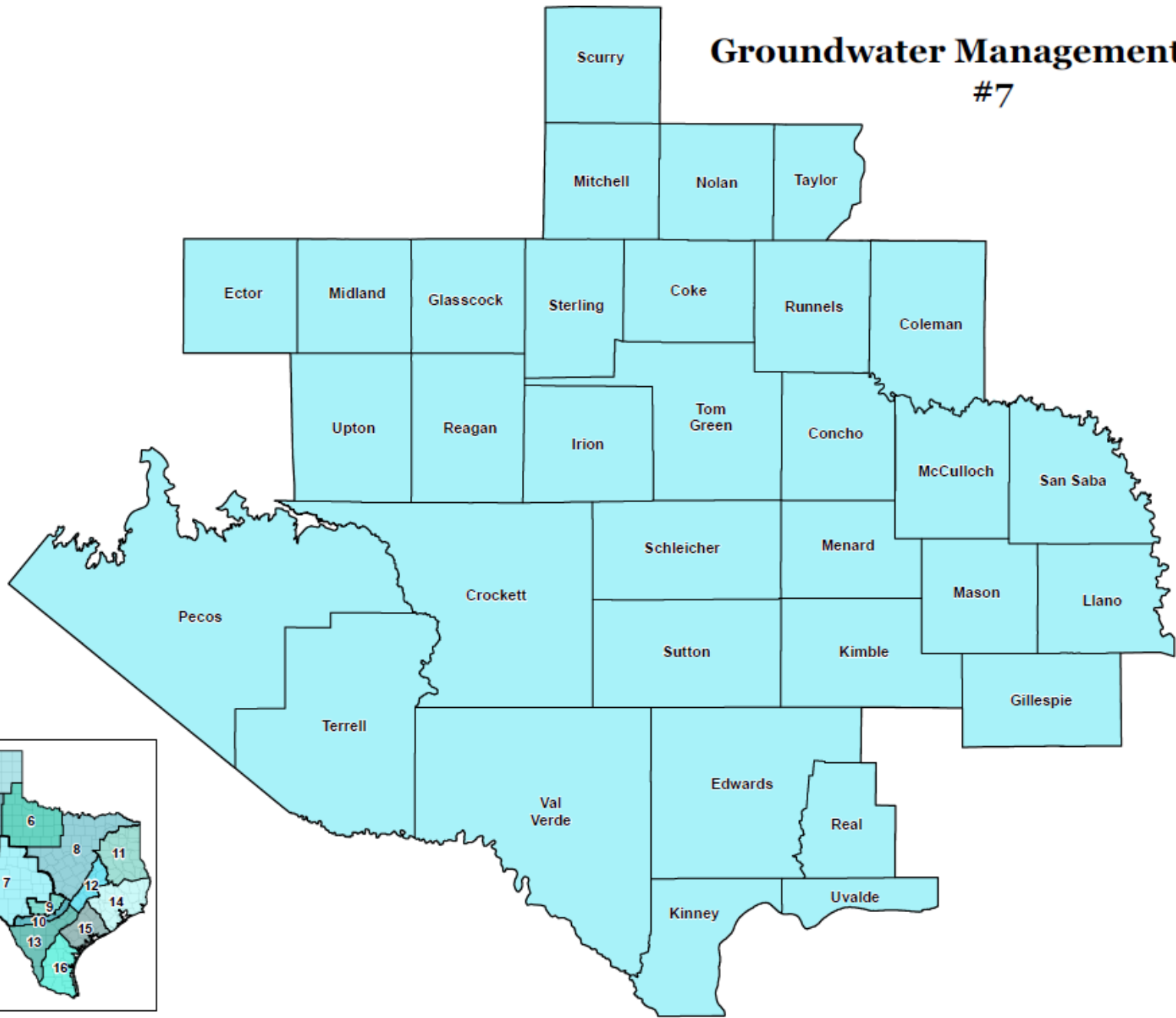
Topics

- Background
- Example of DFC Development in 2010
- Changes in DFC Adoption Process
- Status of DFC Updates

Example of DFC Development in GMA 7

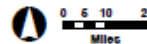
- Edwards-Trinity (Plateau), Pecos Valley, Trinity Aquifers
- 7 feet of drawdown in 2060 (GMA 7 Average)
- Summary of how DFC was established


Groundwater Management Area #7



DISCLAIMER: This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map date: JAN-2014

TEXAS WATER DEVELOPMENT BOARD
1700 North Congress Avenue | P.O. Box 15231
Austin, Texas 78711-3231
www.twdb.texas.gov



MISSION: The Texas Water Development Board's (TWDB) mission is to provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas. 

GMA 7 “Vision”

- Minimize drawdown in east (headwaters area)
- Provide for irrigation demands in west (significant drawdown)

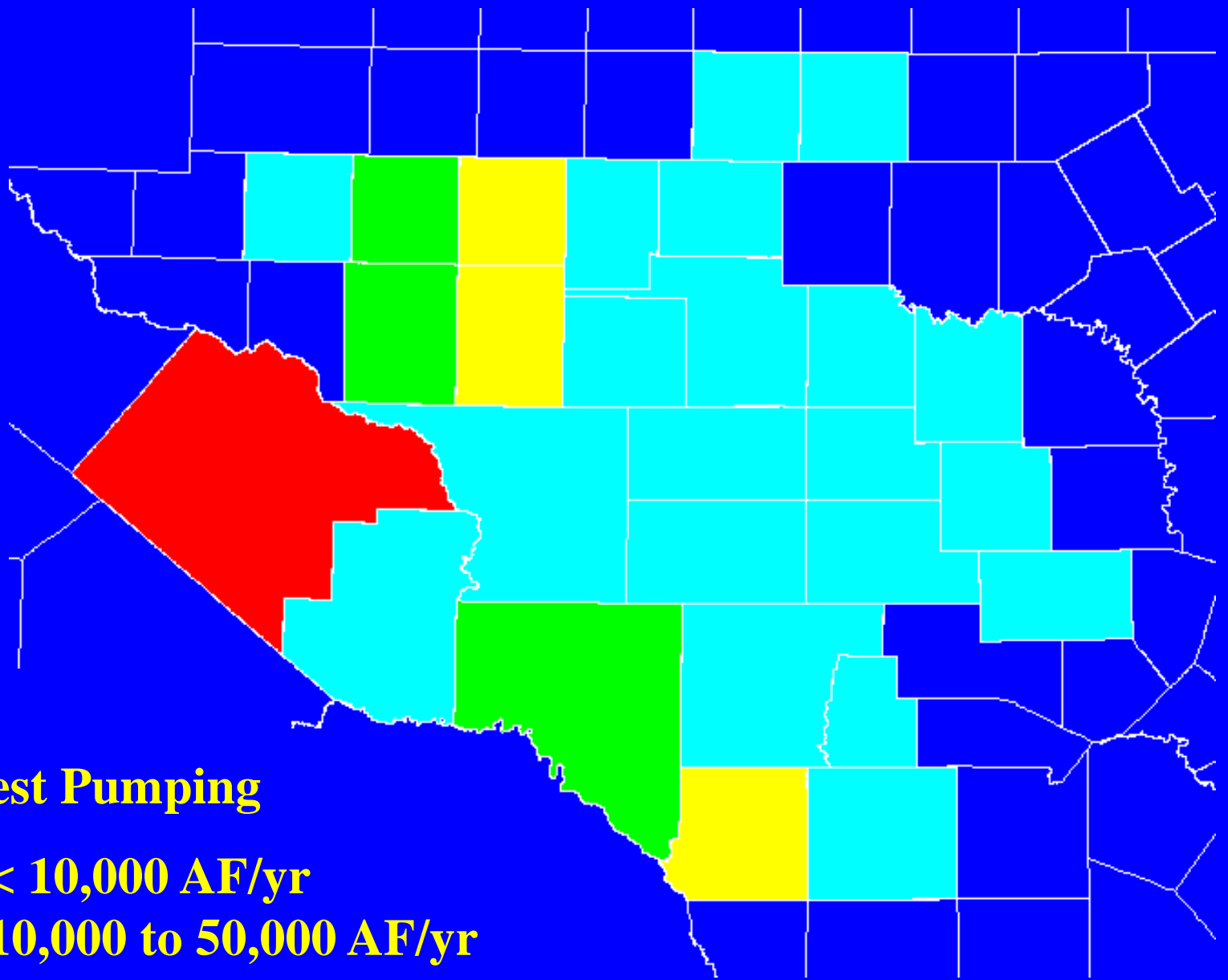
GMA 7 “Vision”

- Minimize drawdown in east (headwaters area)
- Provide for irrigation demands in west (significant drawdown)

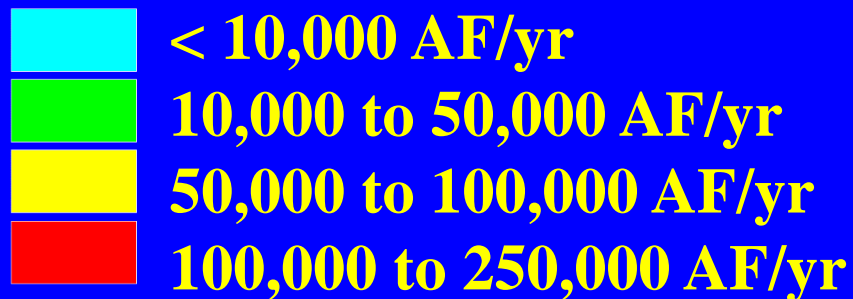
Is this compatible?

“Request” Pumping

- County-by-county pumping (27 counties)
- Total GMA 7 “request” = 530,000 AF/yr
 - 2005 GMA 7 pumping = 400,000 AF/yr
- Assumed average recharge
- Estimate drawdown in 2060



Request Pumping



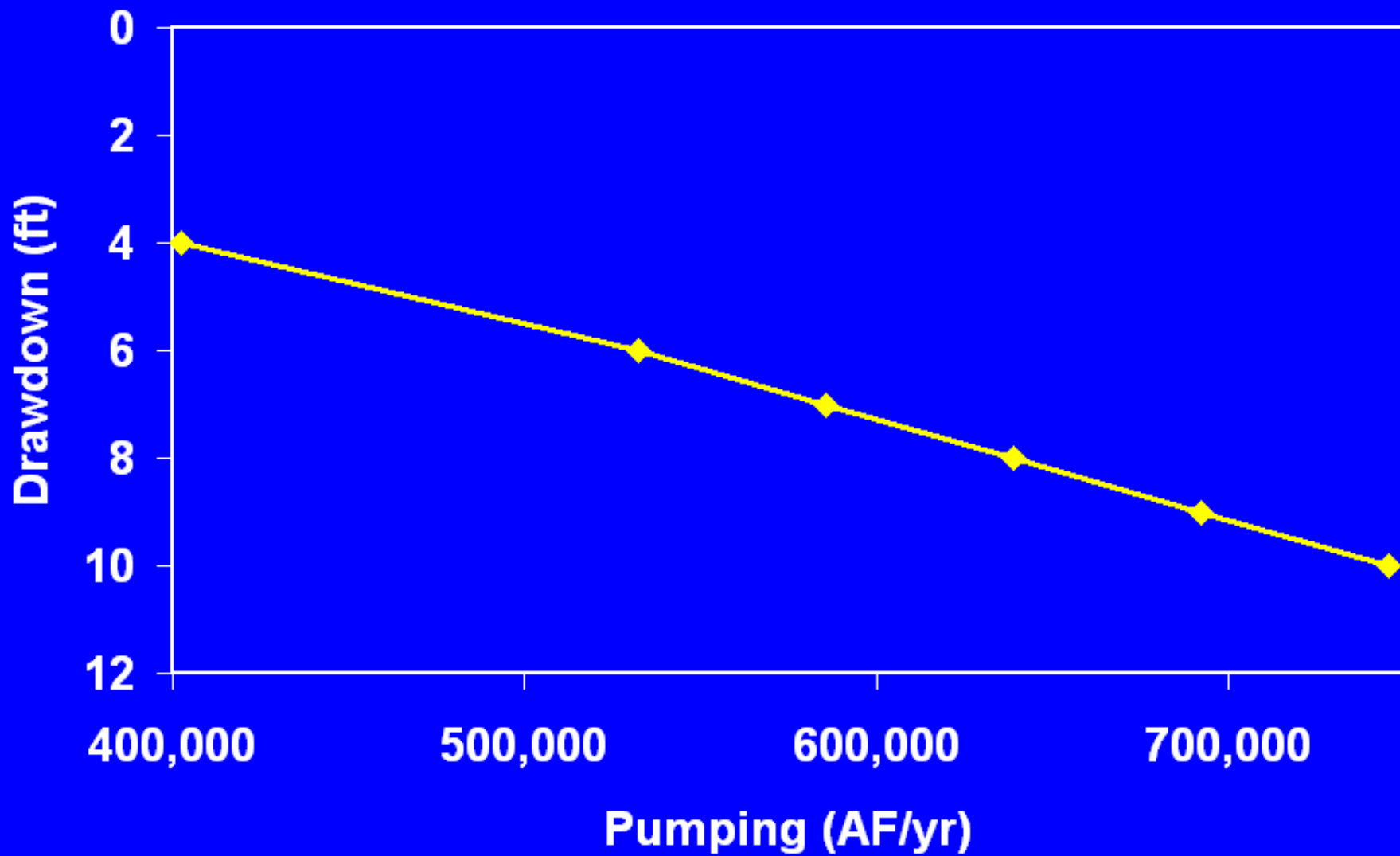
Six Initial Scenarios

- Scenario 0 (2005 Pumping)
- Scenario 1 (“Request” Pumping)
- Scenario 2 (110% of Request Pumping)
- Scenario 3 (120% of Request Pumping)
- Scenario 4 (130% of Request Pumping)
- Scenario 5 (140% of Request Pumping)

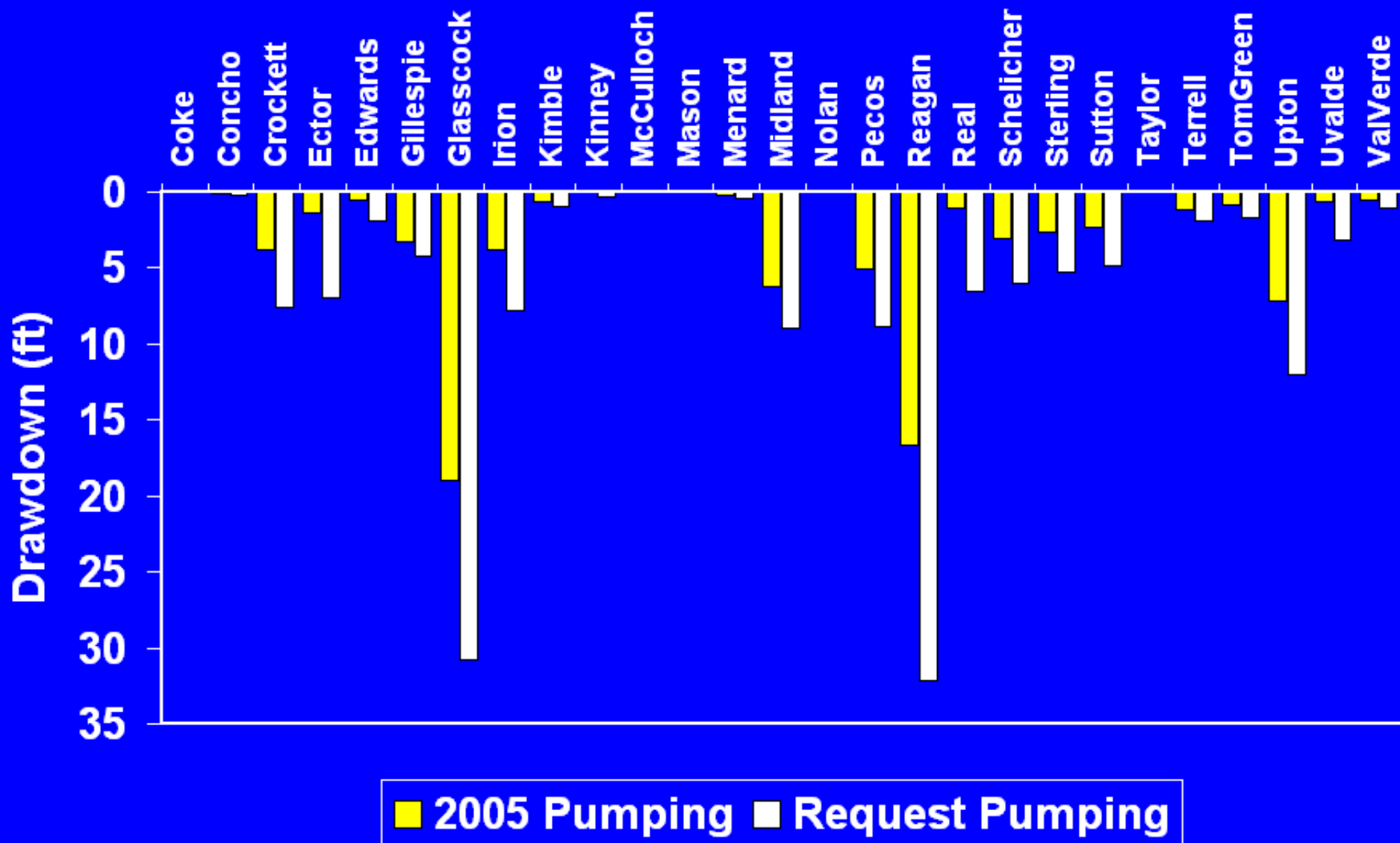
Pumping and Drawdown Summary

- Scenario 0 400,000 AF/yr 4 feet
- Scenario 1 530,000 AF/yr 6 feet
- Scenario 2 586,000 AF/yr 7 feet
- Scenario 3 639,000 AF/yr 8 feet
- Scenario 4 692,000 AF/yr 9 feet
- Scenario 5 746,000 AF/yr 10 feet

GMA 7 Drawdown in 2060



GMA 7 Drawdown by County



July 29, 2010 GMA 7 Meeting

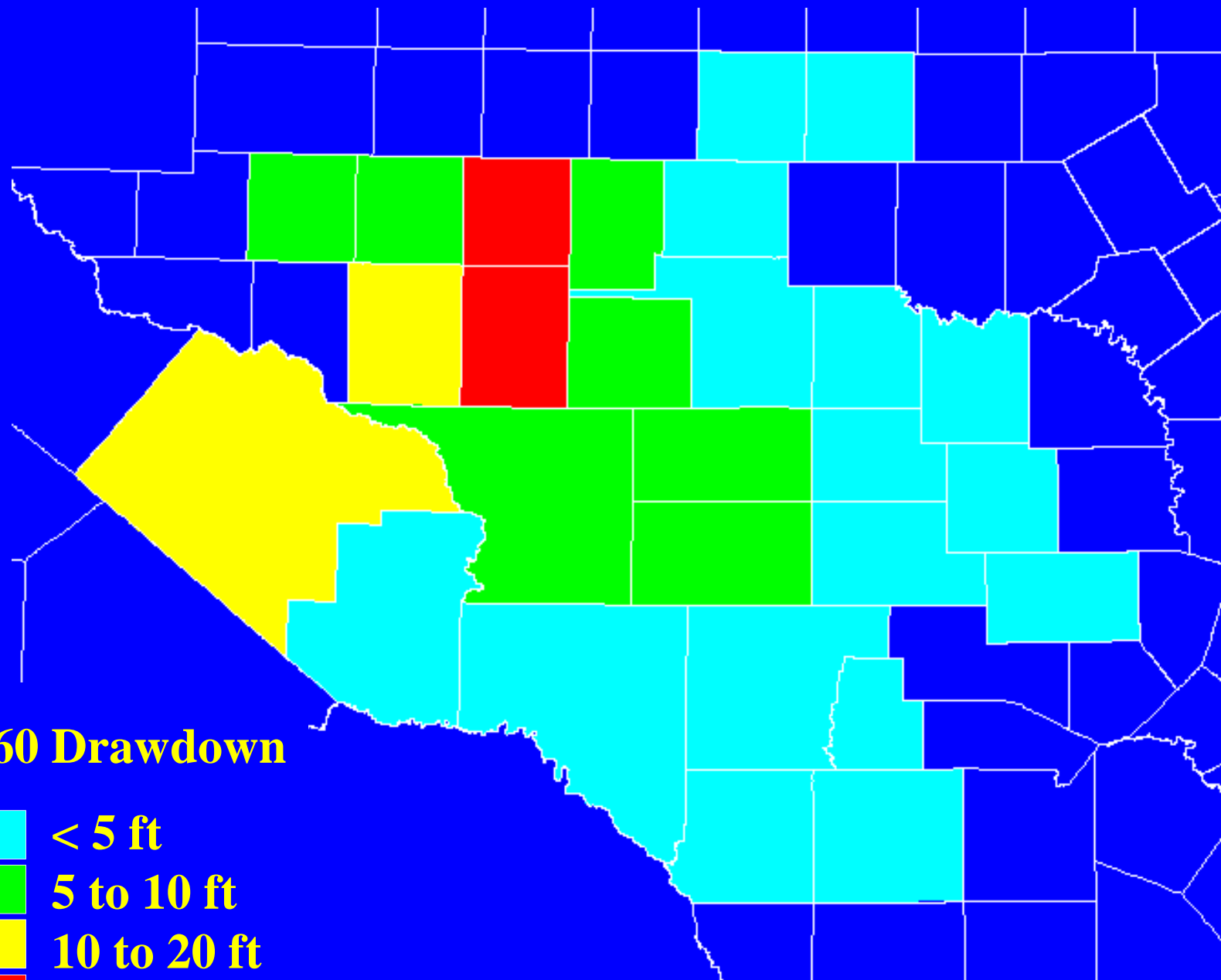
- Discussed “request pumping” scenario
- Compare and contrast with continuation of 2005 pumping
- Compare and contrast with incremental increases
- GCD representatives developed 5 new scenarios (individual county adjustments)
 - Model runs completed at meeting

Pumping and Drawdown Summary

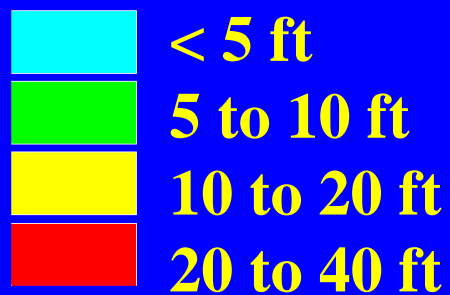
- Scenario 6 548,000 AF/yr 7 feet
- Scenario 7 550,000 AF/yr 7 feet
- Scenario 8 566,000 AF/yr 7 feet
- Scenario 9 571,000 AF/yr 7 feet
- Scenario 10 571,000 AF/yr 7 feet

GMA 7 Adopted Scenario 10

- 7 feet of drawdown in 2060 (GMA Average)
- Pumping = 571,000 AF/yr
 - “Request pumping” of 530,000 AF/yr
- Met predefined “vision”



2060 Drawdown



Topics

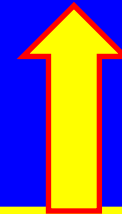
- Background
- Example of DFC Development in 2010
- Changes in DFC Adoption Process
- Status of DFC Updates

New DFC Process

- Consider 9 specific factors
- “Proposed” DFC
- Public comments and public hearings
- District summary reports
- “Final” DFC
- “Explanatory Report”

New DFC Process

Before 5/1/2016



- Consider 9 specific factors
- “Proposed” DFC

- Public comments and public hearings
- District summary reports
- “Final” DFC
- “Explanatory Report”

New DFC Process

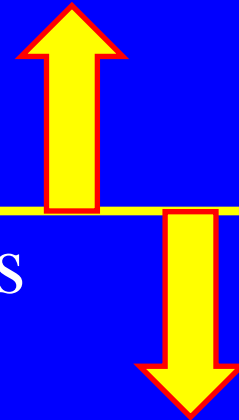
Before 5/1/2016

- Consider 9 specific factors
- “Proposed” DFC

-
- Public comments and public hearings
 - District summary reports

- “Final” DFC
- “Explanatory Report”

*After “Proposed”
DFC*



First Round of Joint Planning

- GMA 7 Action on July 29, 2010
 - Adopted 11 Desired Future Conditions in Nine Resolutions
 - Declared 3 Aquifers Not Relevant for Purposes of Joint Planning

Aquifers Considered Not Relevant for Purposes of Joint Planning

- Blaine
- Igneous
- Seymour

Current Desired Future Conditions

- Capitan Reef
- Dockum
- Edwards-Trinity
(Plateau)
- Ellenburger-San Saba
- Hickory
- Lipan
- Marble Falls
- Ogallala
- Pecos Valley
- Rustler
- Trinity

2010 DFC Aquifer Assessments and Model Runs

Aquifer	Aquifer Assessment	Model Run
Capitan Reef Complex	X	
Dockum		X
Edwards-Trinity (Plateau), Pecos Valley, Trinity		X
Ellenburger-San Saba	X	
Hickory	X	
Lipan		X
Marble Falls	X	
Ogallala		X
Rustler	X	

Anticipated Model Runs

- Replace Aquifer Assessments
 - Capitan Reef Model
 - Llano Uplift Model (Ellenburger-San Saba, Hickory, Marble Falls)
 - Rustler Model

Topics

- Background
- Example of DFC Development in 2010
- Changes in DFC Adoption Process
- Status of DFC Updates

Status of DFC Updates

- December 18, 2014 GMA 7 Meeting
 - Reviewed current DFCs
 - Compared historic use to current modeled available groundwater
 - Discussed GAMs
 - Established overall schedule

Upcoming Meetings

- April 23, 2015 GMA 7 Meeting
 - Blaine, Igneous, Lipan, and Seymour Aquifers (not relevant)
 - Edwards-Trinity (Plateau), Pecos Valley, Trinity, and Rustler Aquifers
- September 2015 GMA 7 Meeting
 - Capitan Reef, Dockum, Ellenburger-San Saba, Hickory, Marble Falls, and Ogallala Aquifers

For Each Aquifer

- Assess Current DFCs
- Consider Nine Factors and Balancing
- Complete Model Runs
- Complete Preliminary Explanatory Report

Planned Model Runs

- One Layer Model (Edwards Trinity (Plateau), Pecos Valley, Trinity)
 - *Kinney County Model*
 - *Val Verde Model*
- *Capitan Reef*
- *High Plains Aquifer System (Dockum and Ogallala)*
- *Llano Uplift (Ellenburger-San Saba, Hickory, Marble Falls)*
- *Rustler*

Models used in 2010
New Models

One Layer Model

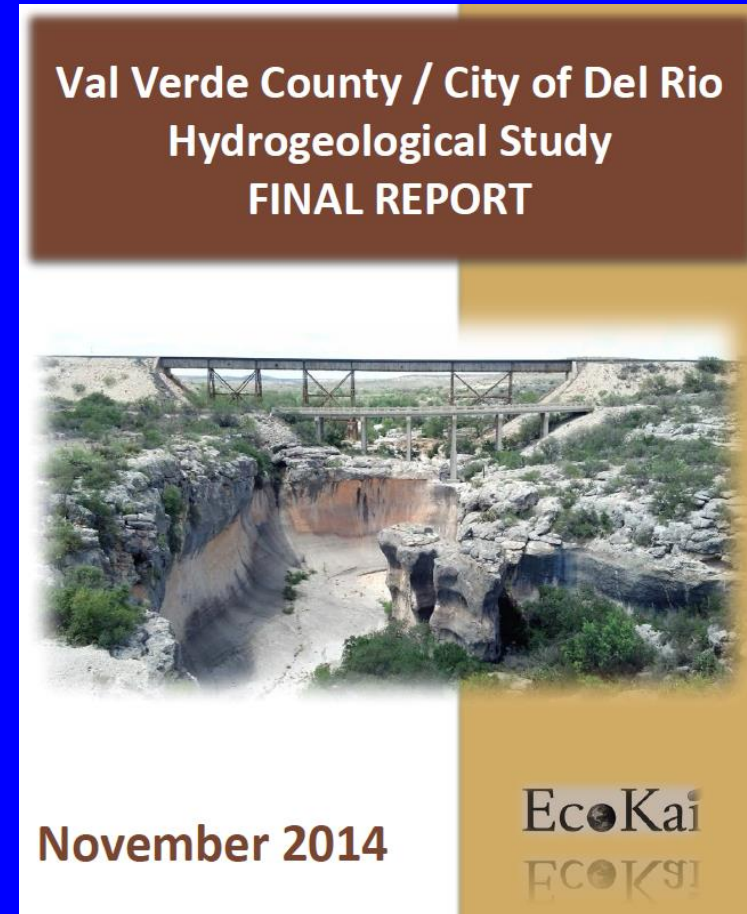
- Completed as an alternative to the GAM in 2010
- Used in development of current DFC for Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers
- Completed new run using current MAG to 2070 (covered in technical memorandum)
- To be discussed at April 23, 2105 GMA 7 meeting

Kinney County Model

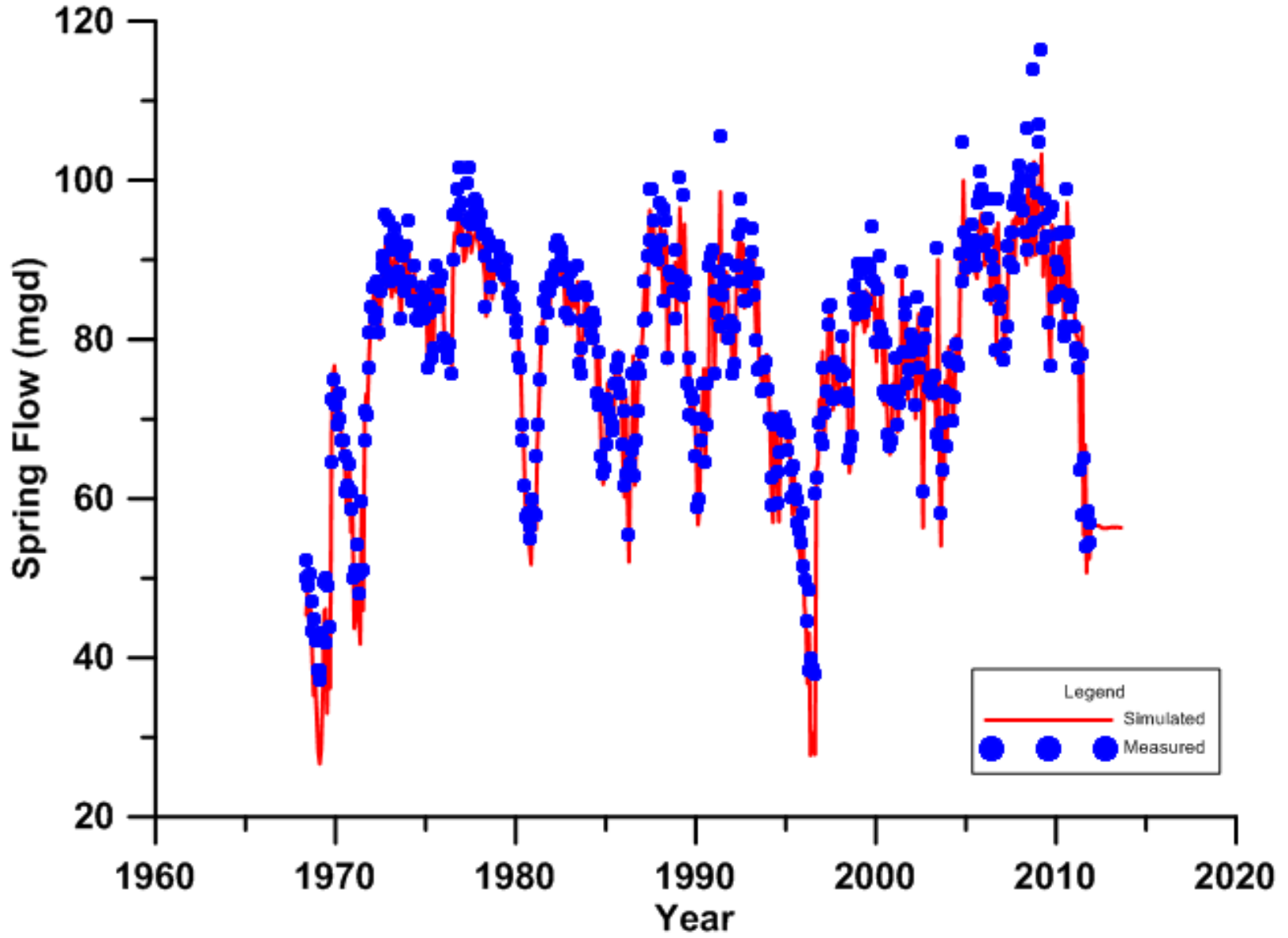
- 2010 Version was used in DFC development
- Currently being updated and upgraded (monthly model)
- Plan to use for DFC development for Kinney County portions of GMA 7 and GMA 10

Val Verde Model

- Developed as part of a study for City of Del Rio and Val Verde County
- Monthly San Felipe spring flow
- Could be used for DFC development in Val Verde County (spring flow based DFC)



San Felipe Spring



Capitan Reef

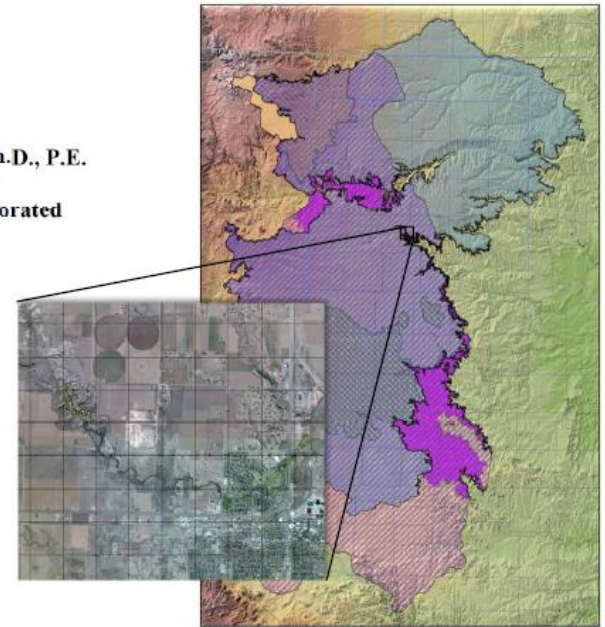
- Draft Conceptual Model Report has been published by TWDB
- Expected completion is summer 2015

High Plains Aquifer System

- Ogallala and Dockum aquifers
- Draft model report and files available
(Comments due May 6)
- Expected completion is August 31, 2015

Draft Numerical Model Report for the High Plains Aquifer System Groundwater Availability Model

Prepared by
Neil E. Deeds, Ph.D., P.E.
Marius Jigmond
INTERA Incorporated



Prepared for:
Texas Water Development Board
P.O. Box 13231, Capitol Station
Austin, Texas 78711-3231

Texas Water
Development Board

March 2015

Llano Uplift Model

- Covers Marble Falls, Ellenburger-San Saba, and Hickory aquifers
- Draft Conceptual Model report completed
- Expected completion is summer 2015

Draft Conceptual Model Report: Minor Aquifers in Llano Uplift Region of Texas



Report By:
Jianyou (Jerry) Shi, Ph.D., P.G.
Radu Boghici, P.G.
William Kohlrenken

and

William Hutchison, Ph.D., P.E., P. G.
Independent Groundwater Consultant

Texas Water Development Board
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November 10, 2014

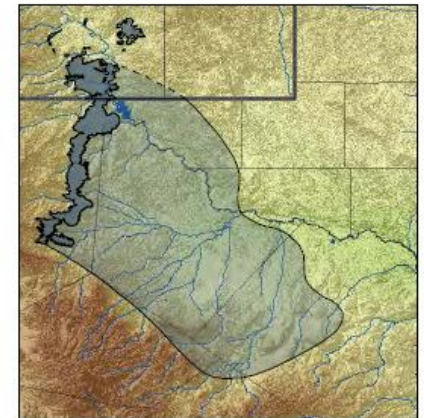
Rustler

- New GAM completed in 2012
- Model runs completed for discussion at April 23, 2015 GMA 7 meeting

Final Groundwater Availability Model Report for the Rustler Aquifer

Prepared by

John E. Ewing, P.E.
Van A. Kelley, P.G.
Toya L. Jones, P.G.
Tingting Yan, EIT
Abhishek Singh, Ph.D., EIT
Dennis W. Powers, Ph.D., P.G., L.P.G.
Robert M. Holt, Ph.D.
John M. Sharp, Ph.D., PH.G., P.G.



Prepared for:

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Austin, Texas 78711-3231



August 2012

April 23, 2015 GMA 7 Meeting

- Six Technical Memoranda
 - Documents four aquifers not relevant for joint planning
 - Documents some of the nine factors and initial model runs for Edwards-Trinity (Plateau), Pecos Valley, Trinity, and Rustler aquifers

Technical Memoranda

- 15-01 (March 30, 2015) – Blaine
- 15-02 (March 30, 2015) – Igneous
- 15-03 (March 30, 2015) – Lipan
- 15-04 (March 30, 2015) – Seymour
- 15-05 (April 7, 2015) – Rustler
- 15-06 (April 8, 2015) – Edwards-Trinity
(Plateau), Pecos Valley, Trinity

Not Relevant for Purposes of Joint Planning

- Blaine Aquifer (TM 15-01)
- Igneous Aquifer (TM 15-02)
- Lipan Aquifer (TM 15-03)
- Seymour Aquifer (TM 15-04)

Not Relevant for Purposes of Joint Planning

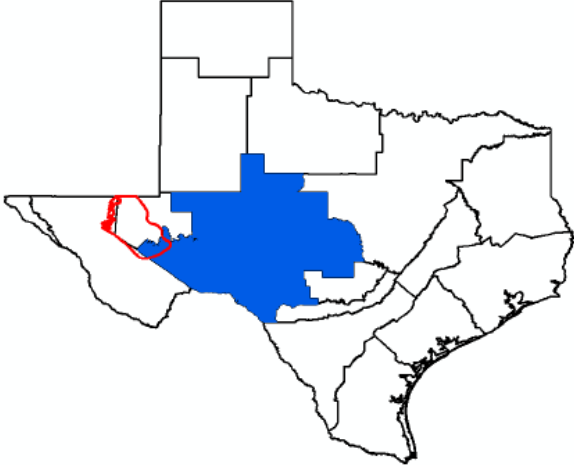
- Specific requirements from TWDB:
 1. Aquifer description and location
 2. Aquifer characteristics
 3. Groundwater demands and current groundwater use
 4. Total Estimated Recoverable Storage
 5. Explanation of non-relevance

Rustler Aquifer (TM 15-05)

- Aquifer Description
- Nine Factor Information
- GAM Background
- Initial Simulations with GAM

*GMA 7 Technical Memorandum 15-05
Draft 1*

Rustler Aquifer: Nine Factor Documentation and Predictive Simulations with Rustler GAM



Prepared for:
Groundwater Management Area 7

Prepared by:
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512-745-0599
billhutch@texasgw.com

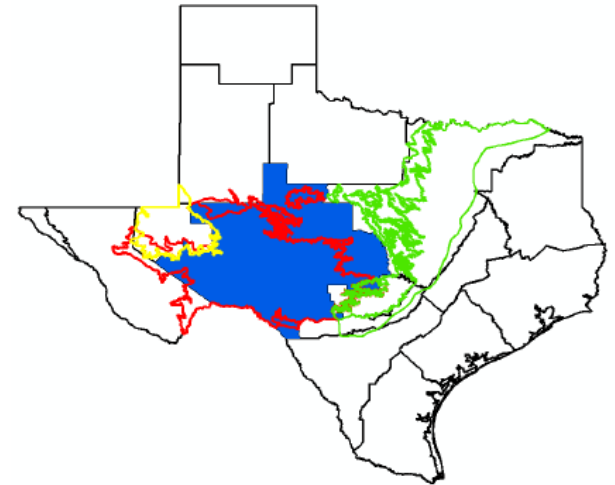
April 7, 2015

Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers (TM 15-06)

- Aquifer Descriptions
- Nine Factor Information
- Predictive Simulation Results

*GMA 7 Technical Memorandum 15-06
Draft 1*

**Edward-Trinity (Plateau), Pecos Valley and Trinity Aquifers:
Nine Factor Documentation and Predictive Simulations**

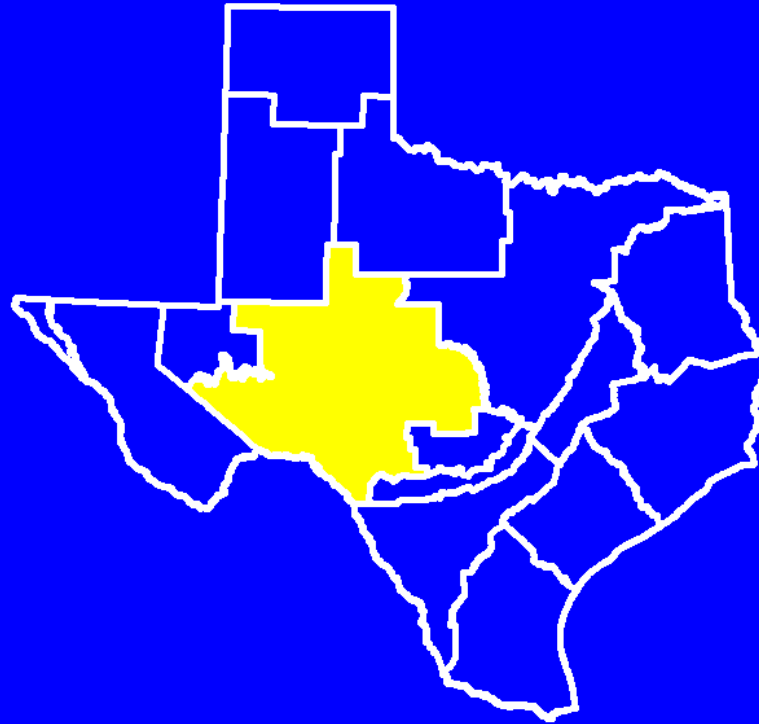


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April 8, 2015

Questions?



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