Refined
Groundwater Availability Model GAM) for the Seymour Aquifer
in Haskell, Knox, and Baylor Counties

Stakeholder Advisory Forum 1

Proposed Modeling Plan

October 23, 2008

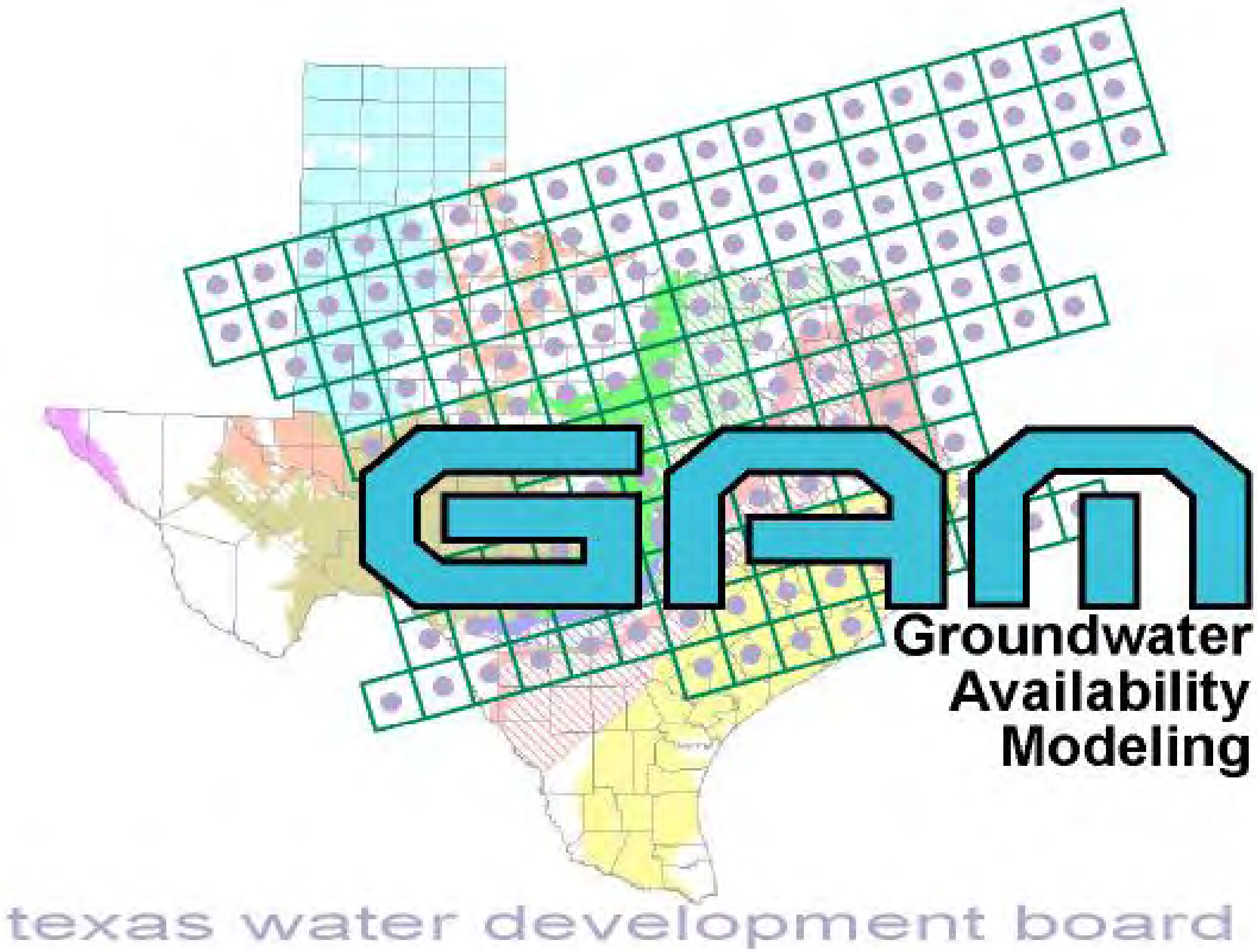
Outline of Presentation

- General Introduction to the TWDB GAM Program
- Refined Seymour GAM Team and Roles
- Objectives of Stakeholder Advisory Forums
- Brief Overview of Seymour Aquifer
- Basics of Groundwater Flow
- Basics of Groundwater Modeling
- Refined Seymour GAM - Overview
- Existing Seymour GAM vs. Refined Seymour GAM
- Refined Seymour GAM – Tools and Inputs
- Additional Data for the Refined Model
- Refined Seymour GAM – Conceptual Model
- Refined Seymour GAM Modeling Process
- Model Limitations
- Refined Seymour GAM Schedule

Refined Seymour GAM Team and Roles

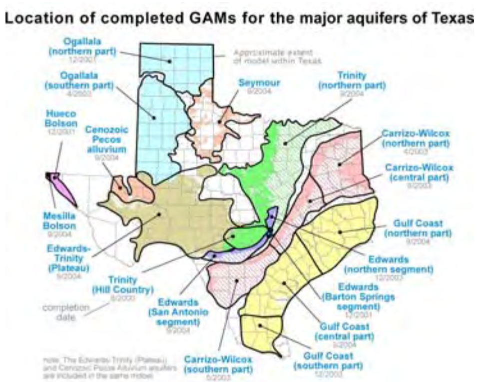
- **INTERA, Inc.**
  - Project management
  - SAF meetings
  - Model development
  - GIS
  - Stakeholder communication
- **Bureau of Economic Geology, The University of Texas at Austin,**
  - Aquifer recharge/discharge data integration
- **Water Prospecting and Resource Consulting**
  - Data gathering
  - Stakeholder communication
- **Dr. Jim Butler, P.G.**
  - Senior technical input
    - Pre-development aquifer conditions
    - Current aquifer conditions
- **Dr. Graham Fogg**
  - Senior technical review
    - Groundwater modeling
    - Surface/groundwater interactions

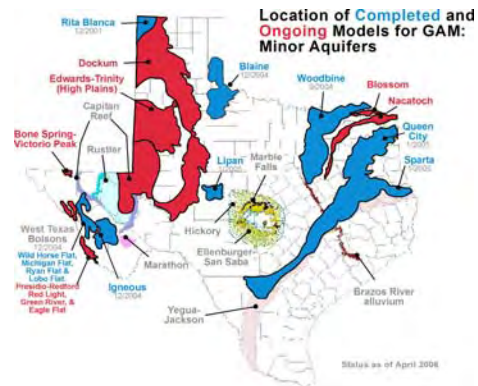
TWDB GAM Program

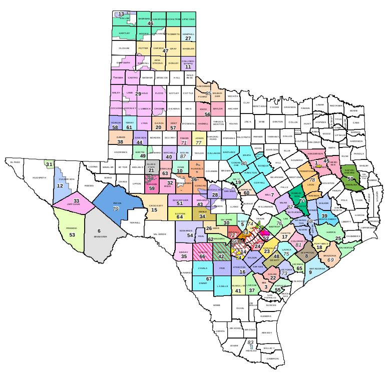


TWDB GAM Program (cont)

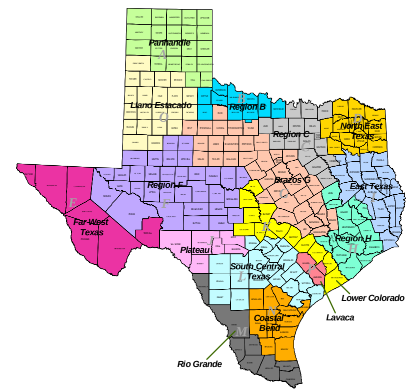
Groundwater Availability Modeling





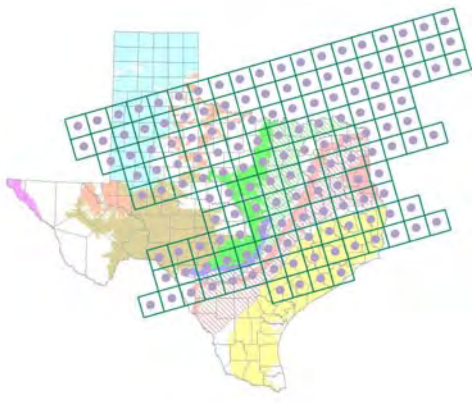


Contract Manager
Shirley Wade



Texas Water Development Board

TWDB GAM Program (cont)

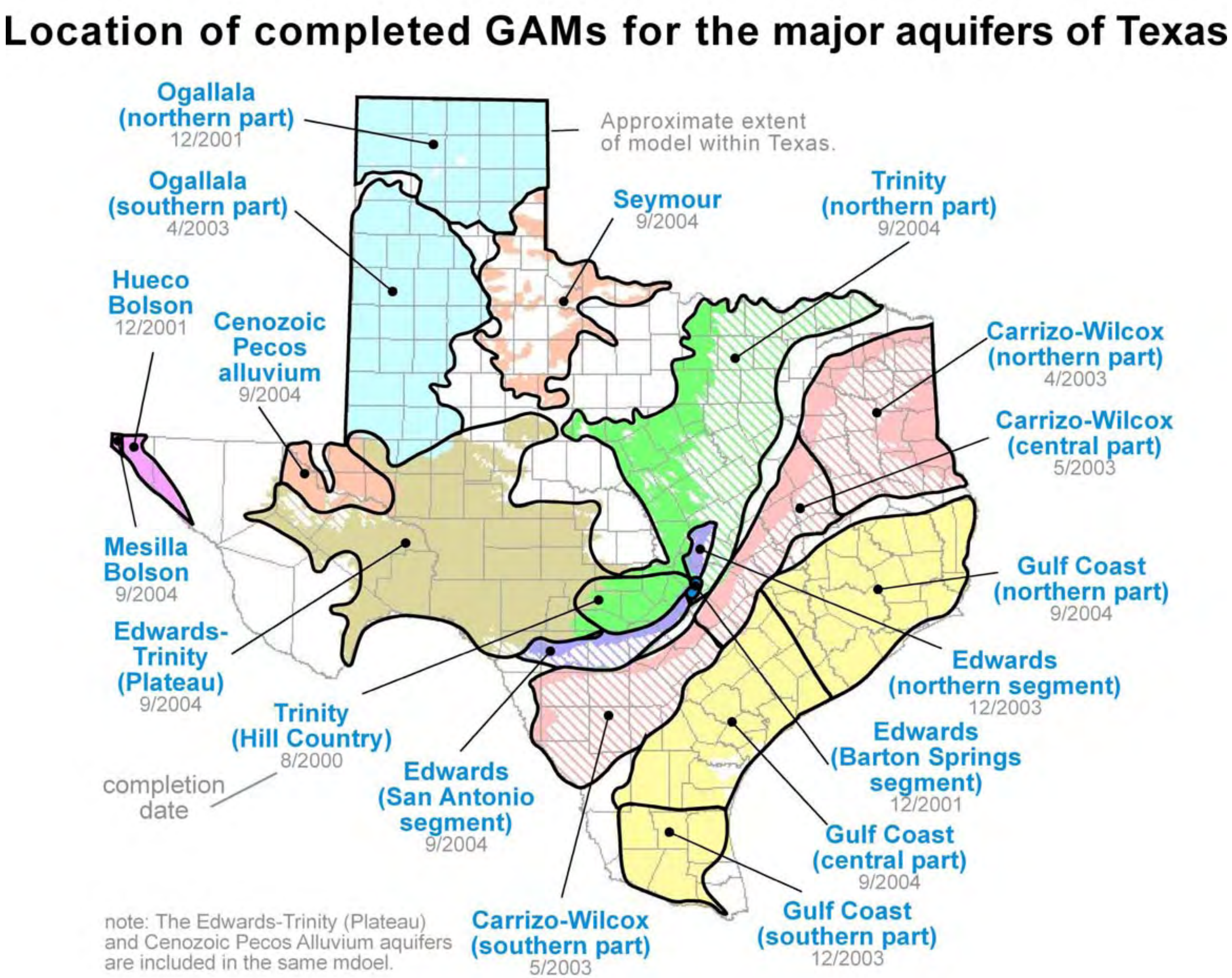


GAM

- **<u>Purpose:</u> To develop tools that can be used to help GCDs, RWPGs, and others assess groundwater availability.**
- **<u>Public Process:</u> You get to see how the model is put together.**
- **<u>Freely Available:</u> Standardized, thoroughly documented, and available upon request.**
- **<u>Living Tools:</u> Periodically updated.**

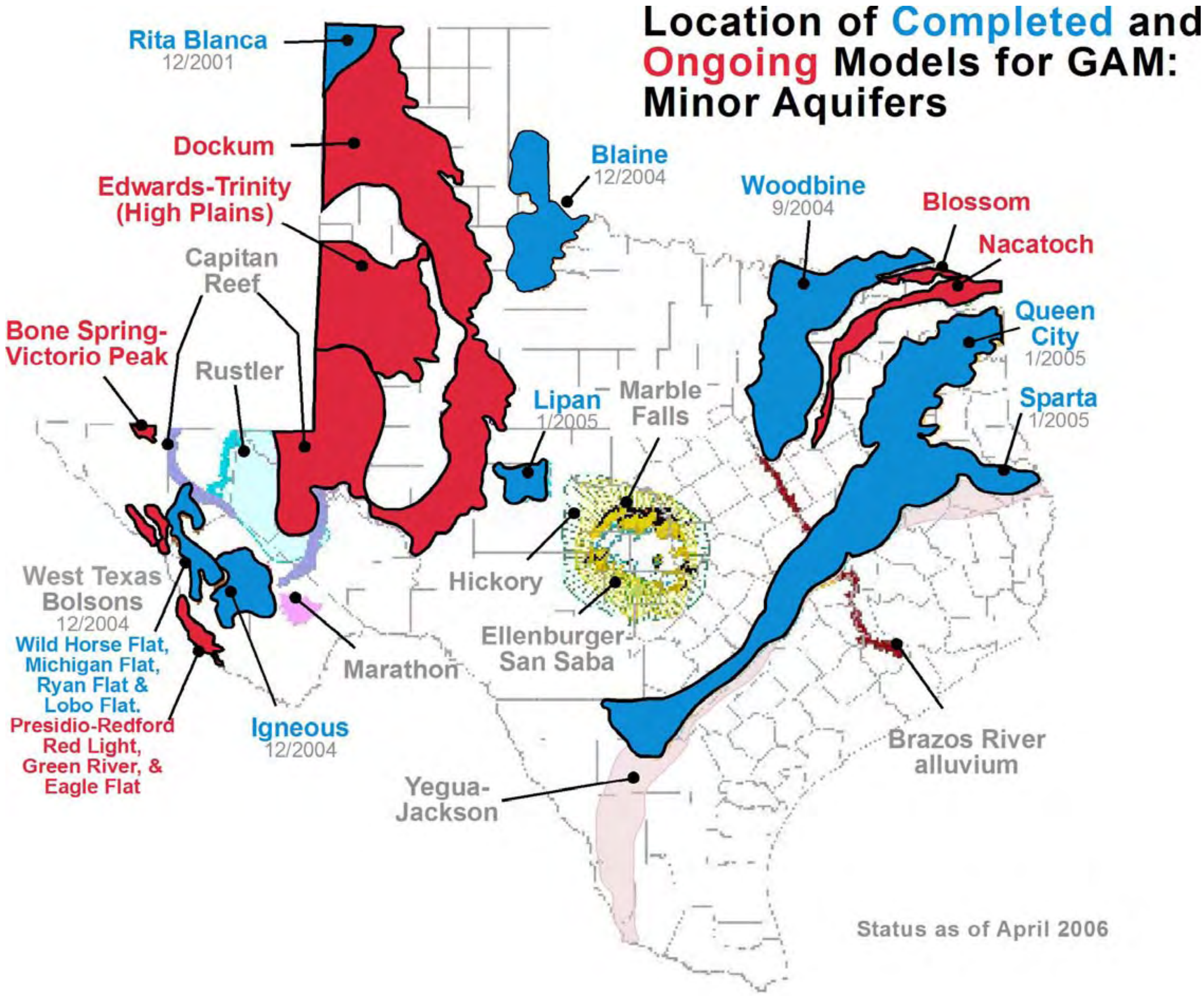
CR1

TWDB GAM Program (cont)

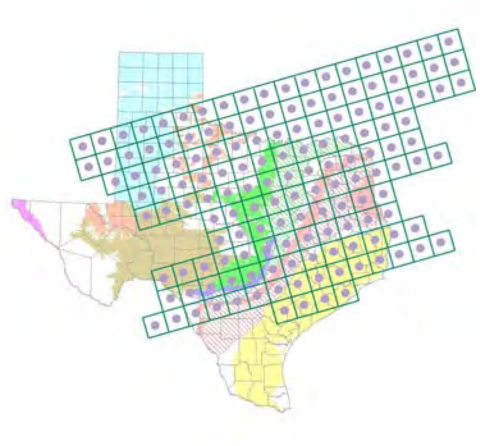


CR2

TWDB GAM Program (cont)



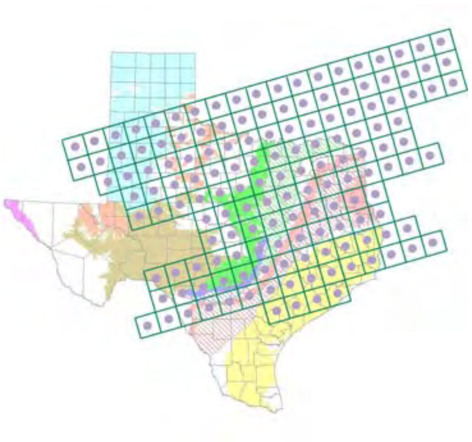
TWDB GAM Program (cont)



What is
Groundwater
Availability or MAG?

- **Managed available groundwater (MAG)…the amount of groundwater available for use.**
- **The State does not directly decide how much groundwater is available for use: GCDs will through GMA process.**
- **A GAM is a <u>tool</u> that can be used to assess groundwater availability once GCDs and GMAs decide on the desired future condition of the aquifer.**

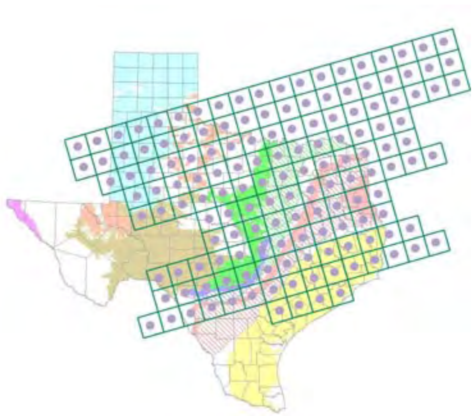
TWDB GAM Program (cont)



Do we have
to use GAM?

- Water Code & TWDB rules require that GCDs use GAM information, if available, for their management plans.
- TWDB rules require that RWPGs use managed available groundwater estimates, if developed in time for the planning cycle

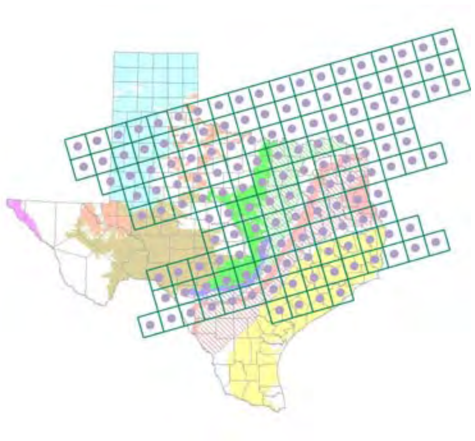
TWDB GAM Program (cont)



How do we use GAM?

- **The Model**
  - Predict water levels and flows in response to pumping and drought
  - Effects of well fields
- **Data in the Model**
  - Water in storage
  - Recharge estimates
  - Hydraulic properties
- **GMAs and RWPGs can request runs**

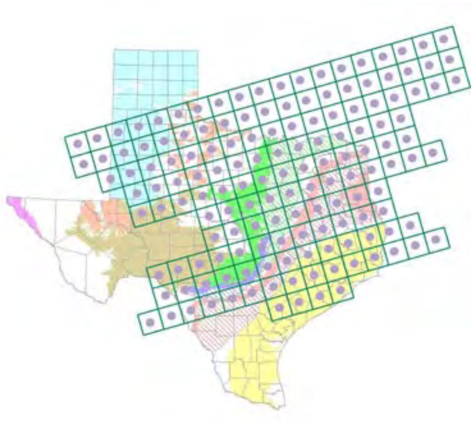
TWDB GAM Program (cont)



Living
Tools

- GCDs, RWPGs, TWDB, and others collect new information on aquifer.
- This information can enhance the current GAMs.
- TWDB plans to update GAMs every five years with new information.
- Please share information and ideas with TWDB on aquifers and GAMs.

TWDB GAM Program (cont)



Participating in the GAM Process

- **SAF meetings**
  - Hear about progress on the model
  - Comment on model assumptions
  - Offer information (timing is important!)
- **Report review**
  - At end of project
- **Contact TWDB**
  - Contract manager

Comments:

Contract Manager
shirley.wade@twdb.state.tx.us
(512) 936-0883
www.twdb.state.tx.us/gam

Refined Seymour GAM Team Contact Information

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      jewing@intera.com
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    - Bureau of Economic Geology
      The University of Texas at Austin
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      Austin, TX 78713-8924
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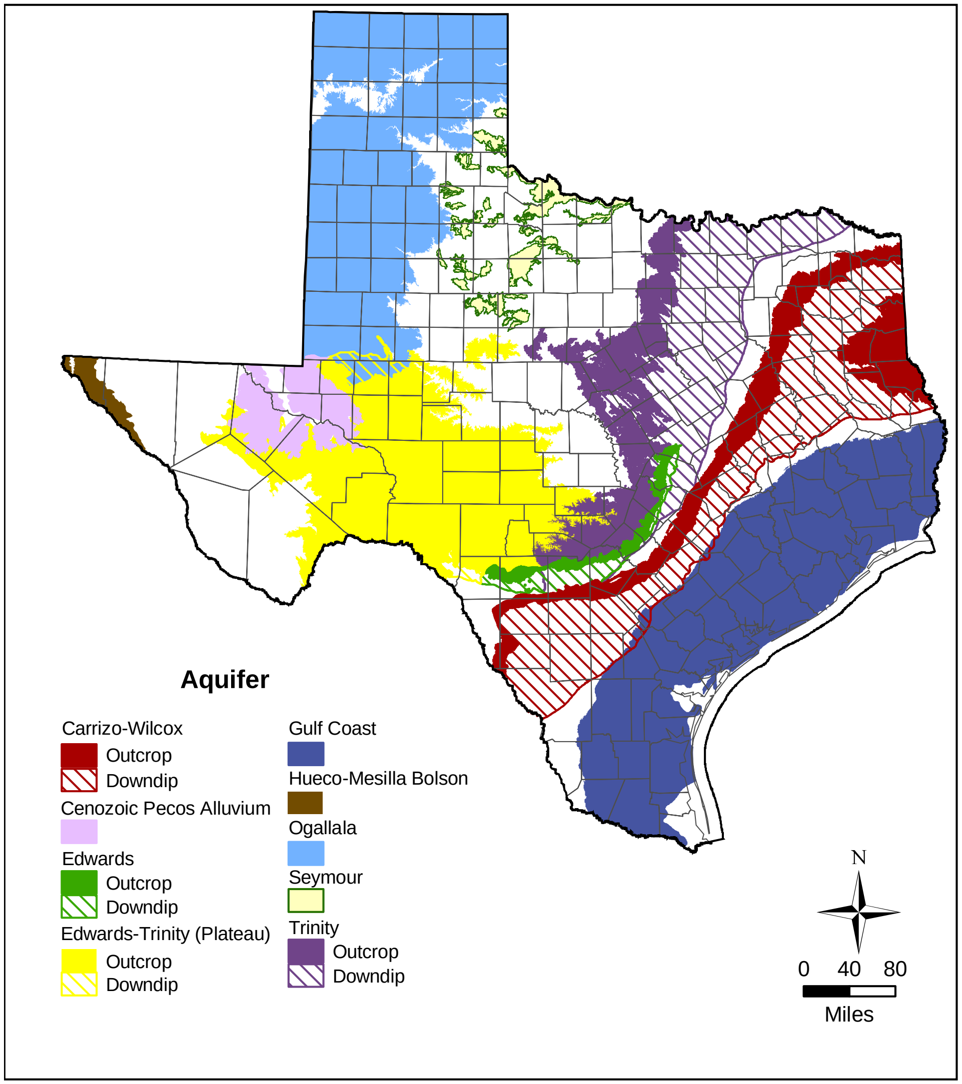
      Fort Worth, TX 76102
      (512) 335-5408
    - ach@wprconsulting.com

Objectives of Stakeholder Advisory Forums

- **Interaction between the GAM team and interested stakeholders**
  - Stakeholder communication and input are critical to the success of the refined Seymour GAM
  - Stakeholders will be relied upon to voice issues and provide information to ensure the model addresses the important water resource questions regarding the Seymour Aquifer
  - SAF meetings will be held periodically to discuss modeling progress and solicit comments
- **Future updates**
  - TWDB website
  - SAFs (as needed)
- **SAF presentations and questions and responses from meetings will be posted at http://www.twdb.state.tx.us/gam/symr/symr.htm**

Brief Overview of Seymour Aquifer

Major aquifers in Texas



Brief Overview of Seymour Aquifer (cont)

- An unconfined (water-table) aquifer
- Composed of clay, silt, sand, and gravel
- Gravel and sands occur primarily at base
- Basal gravel and sand is the predominate water-bearing zone
- Thickness is typically up to 100 feet
- Saturated thickness typically less than 60 feet

Basics of Groundwater Flow

- **Definitions**
  - Aquifer – Water saturated permeable geologic unit that can transmit significant quantities of water.
  - Water table – The level at which water stands in a shallow screened well.
  - Hydraulic head - The water level in a well expressed as an elevation.
  - Hydraulic conductivity – A physical property of the geologic media representing its ability to transmit water.
  - Specific yield – The volume of water that an unconfined aquifer releases from storage per unit surface area of aquifer per unit decline in water table elevation.
  - Storativity – The volume of water that a confined aquifer releases from storage per unit surface area of aquifer per unit decline in head.

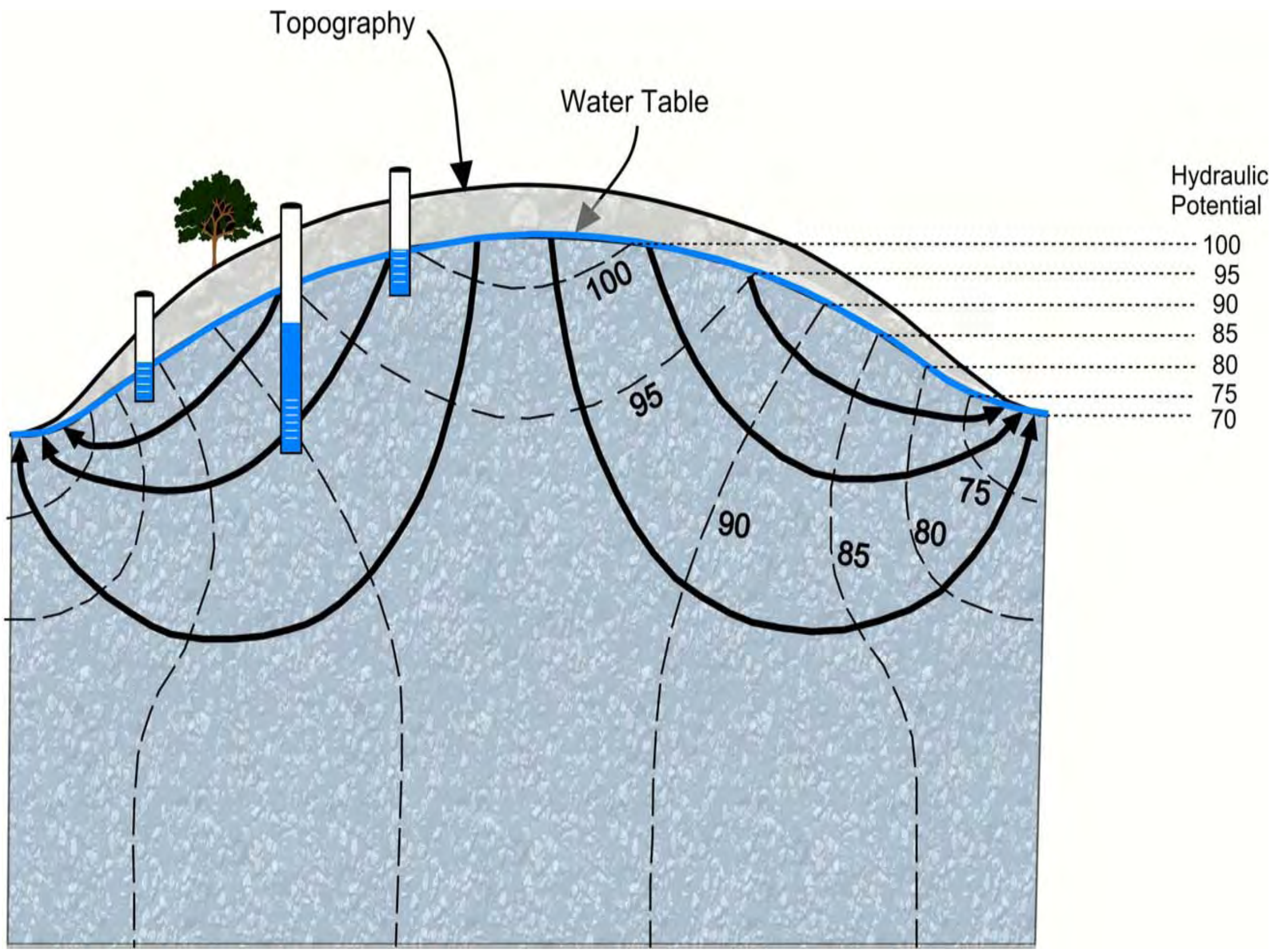
Basics of Groundwater Flow (cont)

- **Definitions (cont)**
  - Recharge – The entry of water to the saturated zone at the water table.
    - Recharge equals water inputs at the ground surface (precipitation + irrigation) minus water losses (runoff + evapotranspiration).
  - Stream losses or gains – The water that is either lost from an aquifer or gained by an aquifer through the base of the stream.
  - Cross-formational flow – Groundwater flow between geologic formations.

Basics of Groundwater Flow (cont)

- **Principles**
  - The primary observable quantity describing groundwater flow is the water level as measured in a well.
  - The water level expressed as elevation is termed the hydraulic head.
  - The difference in hydraulic head between wells defines the direction of groundwater flow.
    - Groundwater flows from high hydraulic head to low hydraulic head.
  - The water table is typically a subdued replica of the topography.
  - The saturated thickness and hydraulic conductivity of the aquifer material define the volumetric flow rates (e.g., pumping).

Schematic Cross Section of Groundwater Flow



Groundwater flows from high hydraulic potential (energy) to low hydraulic potential.

Basics of Groundwater Modeling

- **Definition of a model**
  - A representation of reality that attempts to explain the behavior of some aspect of reality and is always less complex than the real system it represents (Domenico, 1972)
  - A tool designed to represent a simplified version of reality (Wang and Anderson, 1982)
- **Why do we model groundwater flow**
  - Groundwater, unlike surface water, is difficult to directly observe
  - Aquifers are typically complex in terms of spatial extent and hydrogeologic characteristics
  - Groundwater models provide the only means for integrating available data and predicting groundwater flow at the scale of interest

Basics of Groundwater Modeling (cont)

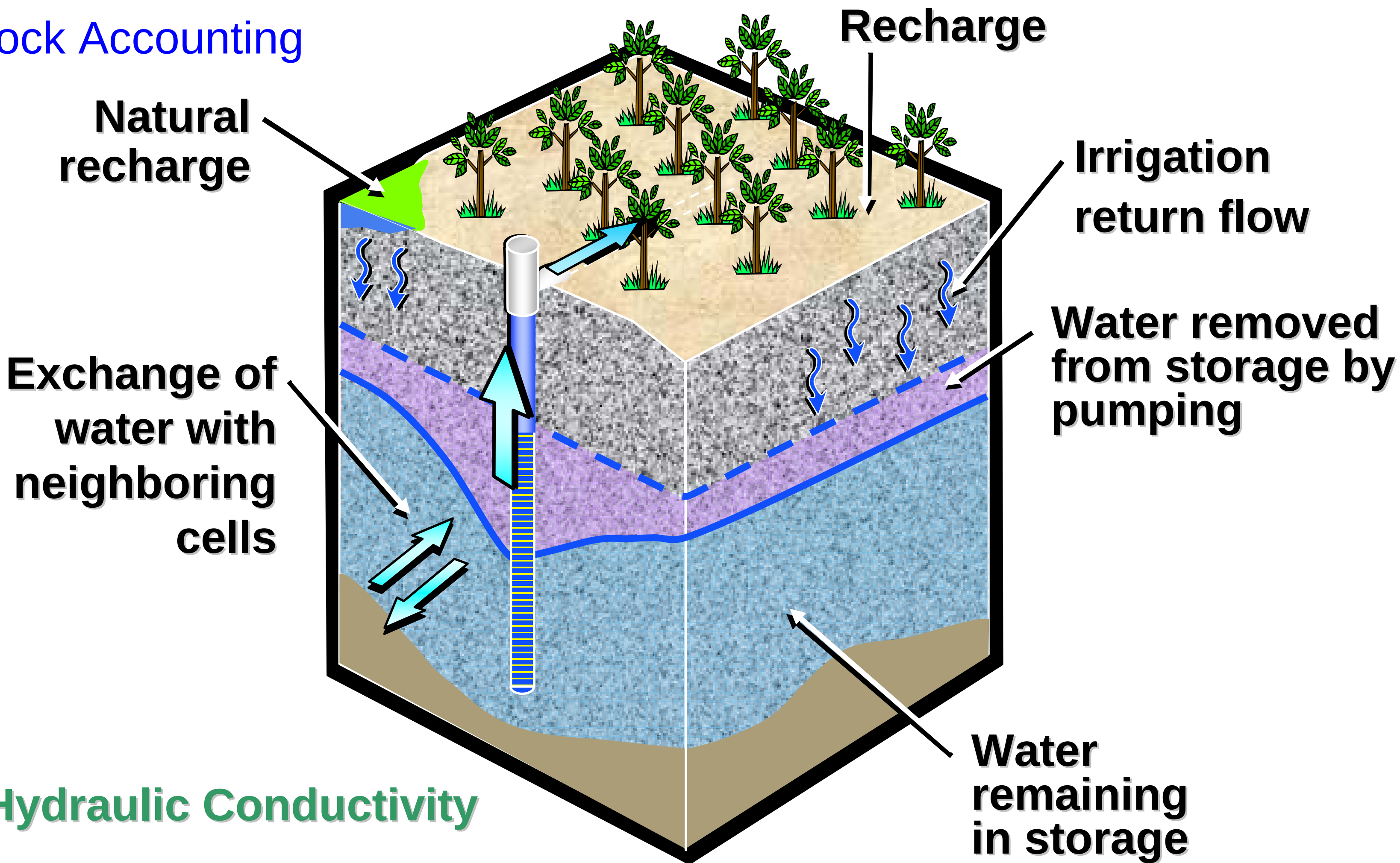
- **Numerical Groundwater Flow Model**
  - Is a mathematical representation of a physical aquifer
  - Uses the basic laws of physics that govern groundwater flow
  - Represents the aquifer using discrete parameters
  - Calculates hydraulic heads at discrete locations determined by the model grid
  - Values from the model parameters can be modified until the model calculated hydraulic heads match observed hydraulic heads (i.e., model calibration)
  - The calibrated model can be used as a tool to calculate future hydraulic heads in the aquifer

Basics of Groundwater Modeling (cont)

- **Modeling protocol (steps)**
  - Define the model objectives and select the modeling tools best able to meet the objectives
  - Gather and analyze the data
    - Model input parameters
    - Calibration targets
  - Develop a conceptual model of the physical system
  - Design the mathematical model
  - Calibrate the model to observed conditions
  - Analyze the sensitivity of the model to input values
  - Document all aspects of the modeling process in a report
  - Use the model to predict future conditions
    - Evaluate water management strategies
    - Evaluate GMA groundwater availability

Basics of Groundwater Modeling (cont)

Gridblock Accounting

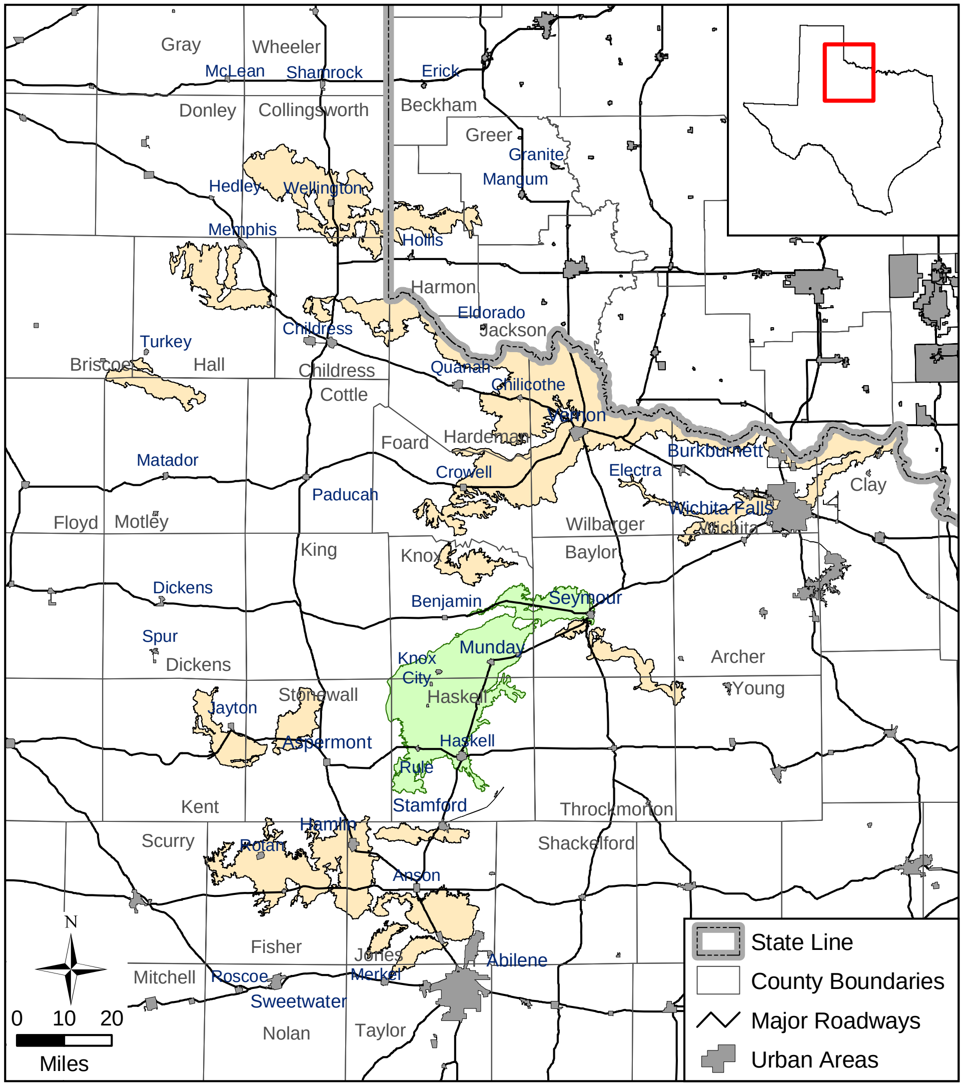


- Hydraulic Conductivity
- Storage value
- Thickness

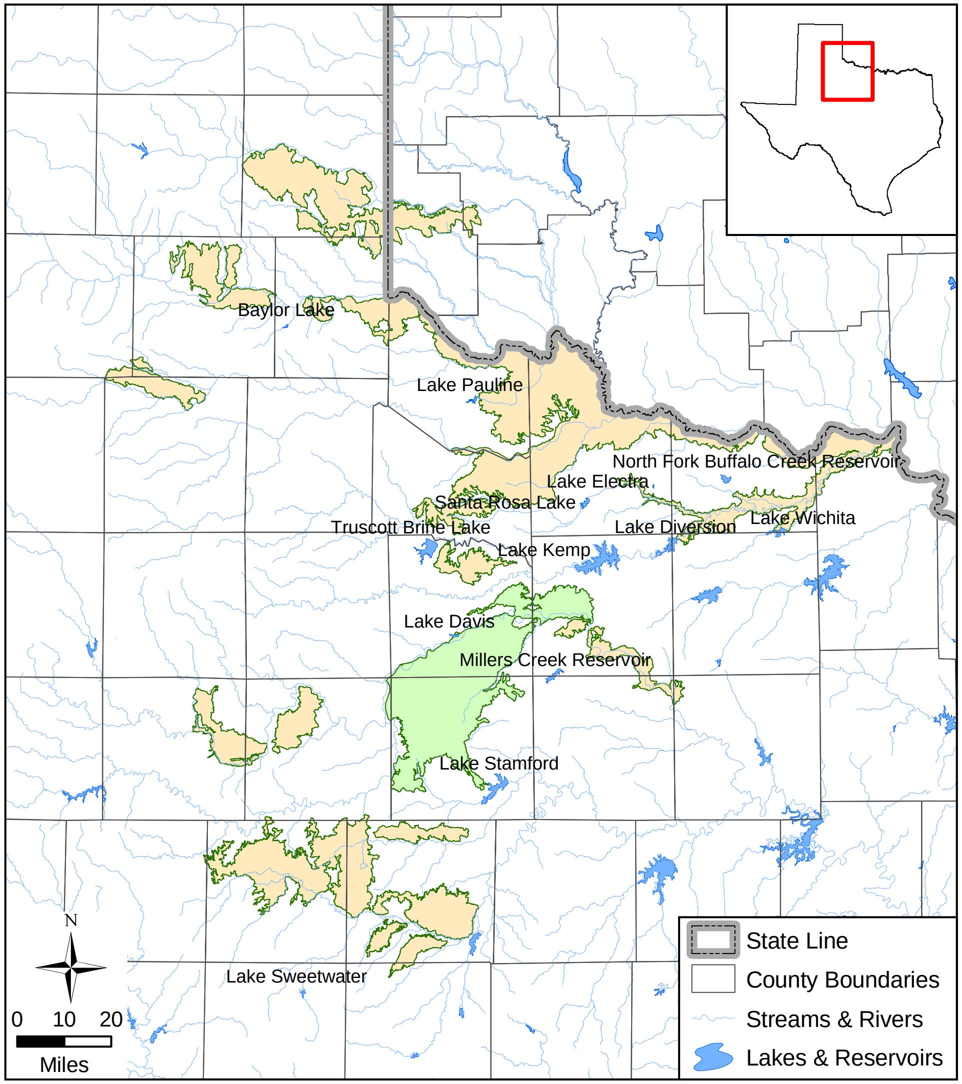
Refined Seymour GAM

- **Model objectives**
  - Develop a three-dimensional realistic and scientifically accurate groundwater flow model that represents the physical characteristics and relevant processes of the Seymour aquifer in Haskell, Knox, and Baylor counties and is suitable for use by stakeholders (e.g., the Rolling Plains GCD)

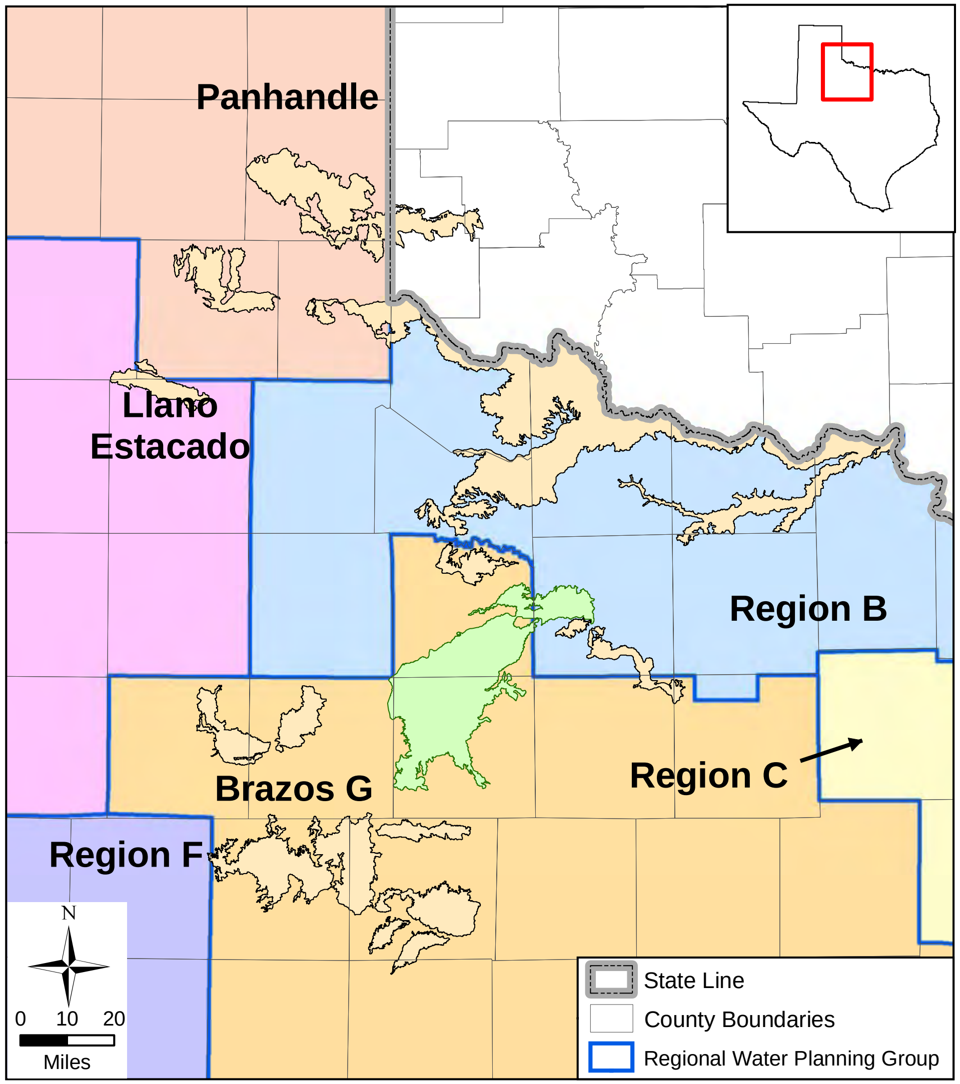
Refined Seymour Study Area



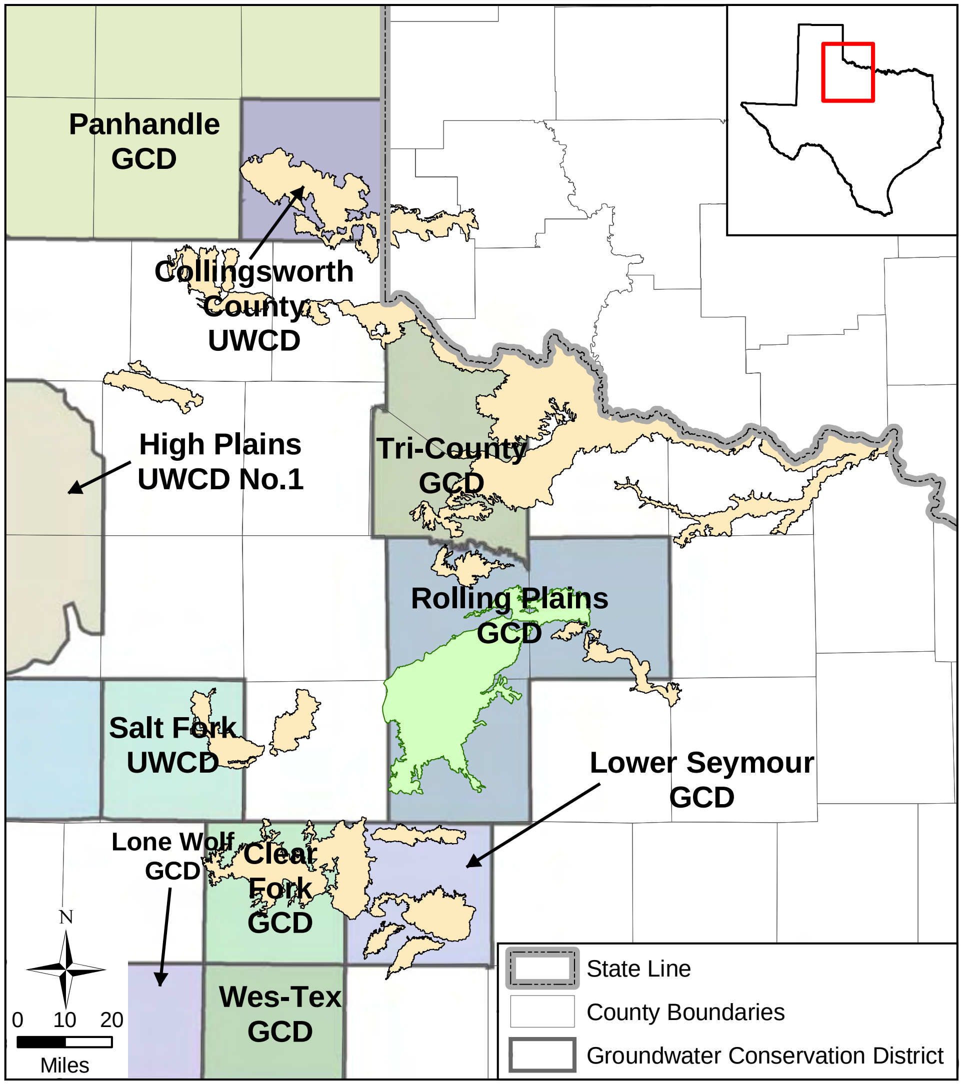
Refined Seymour Study Area (cont)



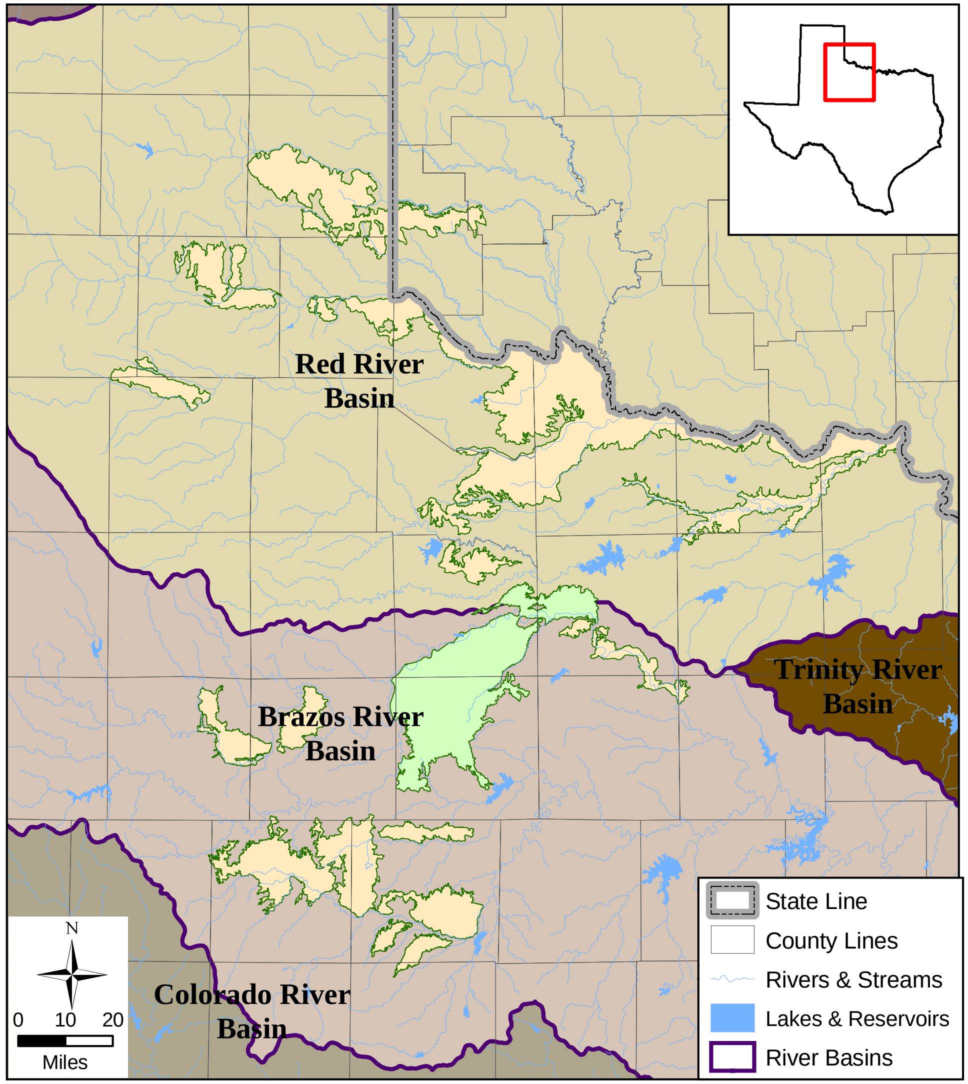
Refined Seymour Study Area (cont)



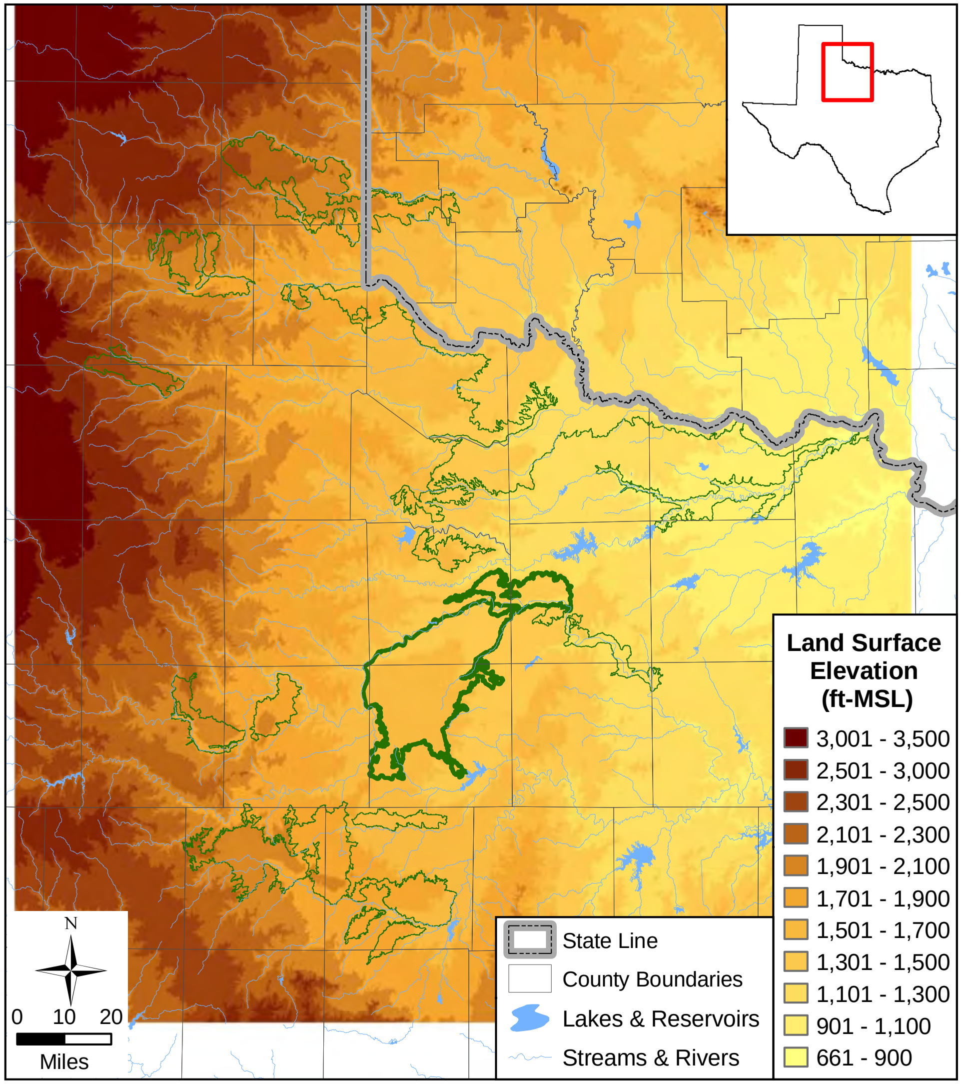
Refined Seymour Study Area (cont)



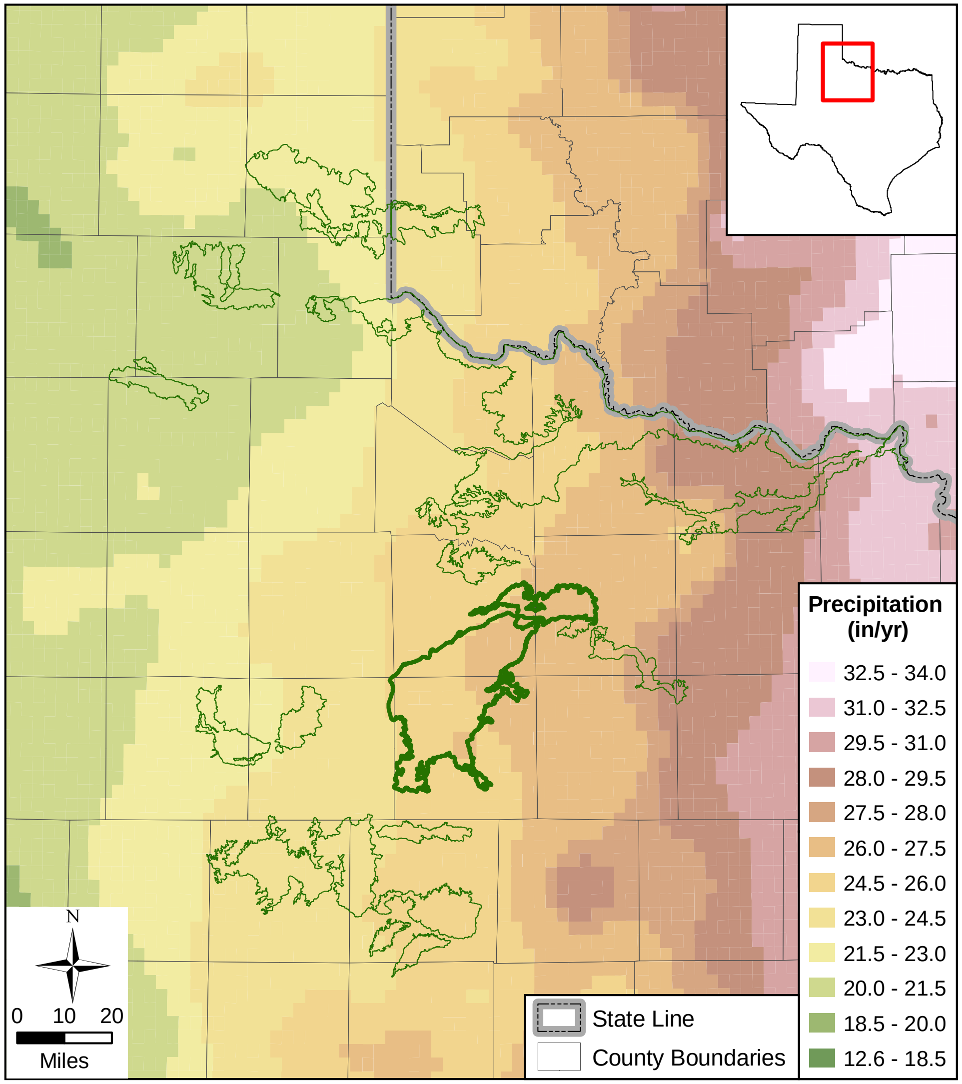
Refined Seymour Study Area (cont)



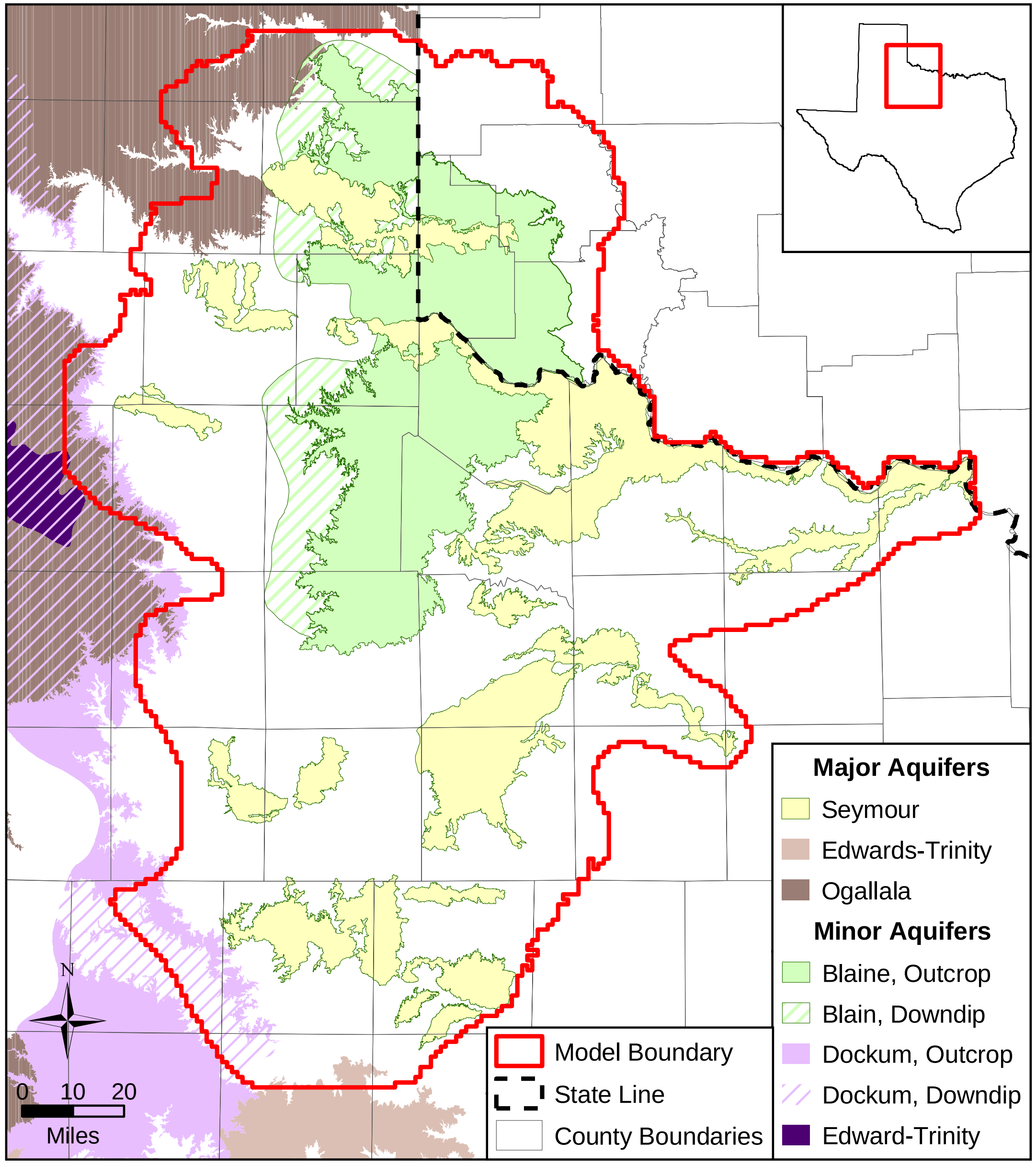
Refined Seymour Study Area (cont)



Refined Seymour Study Area (cont)

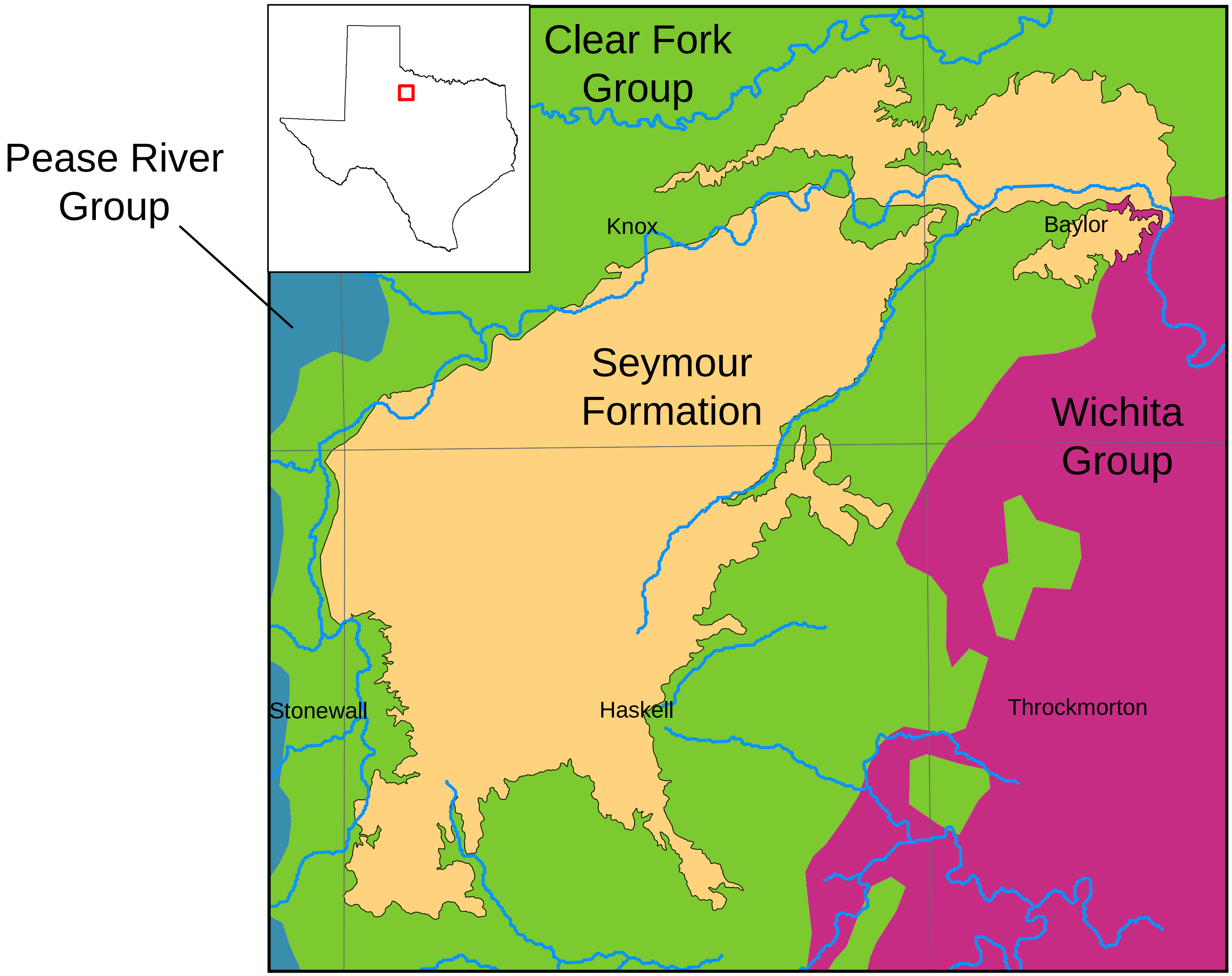


Existing Seymour GAM Model Domain



Source: Online: Texas Water Development Board, August 2003

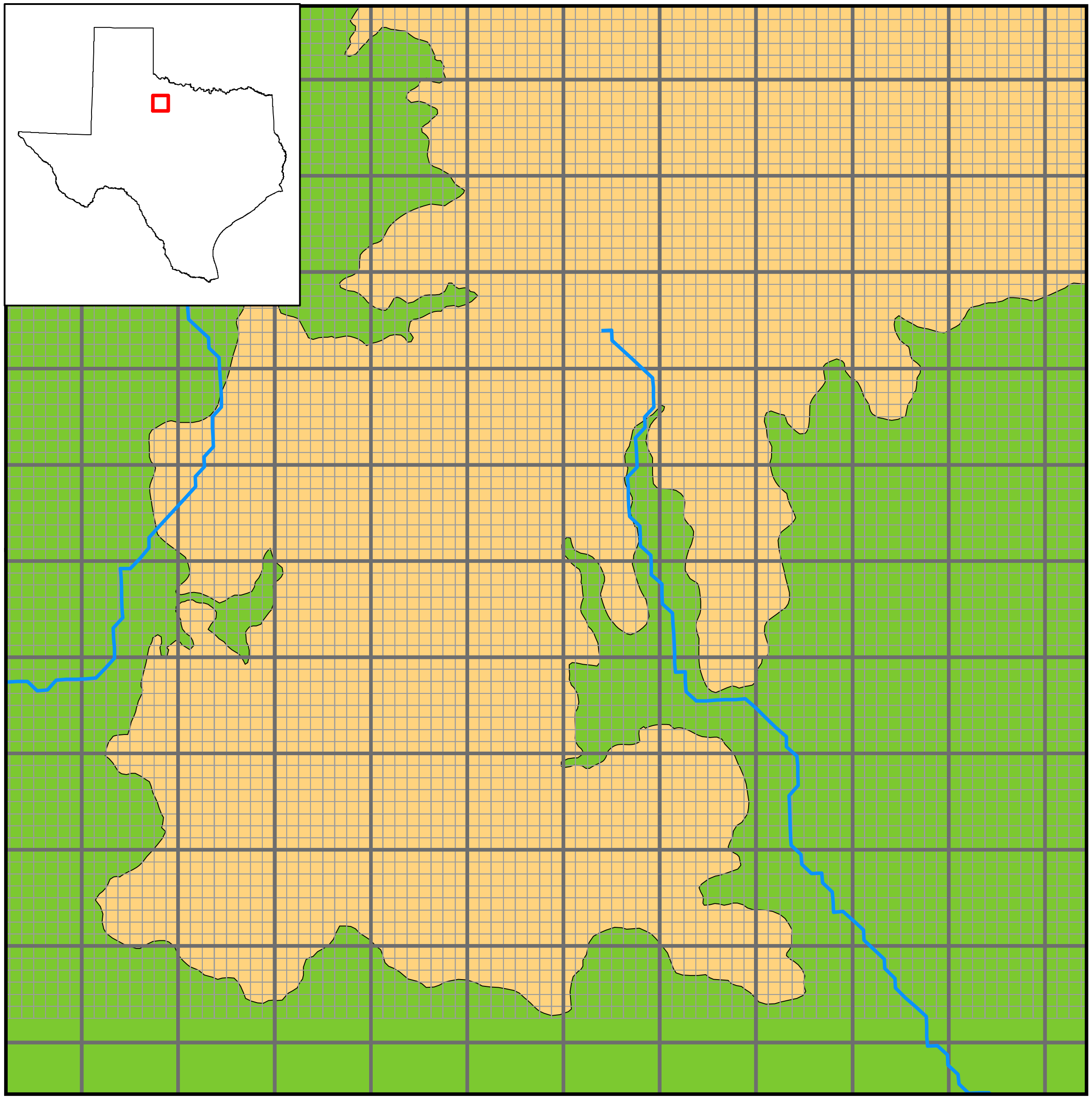
Refined Seymour GAM Model Domain



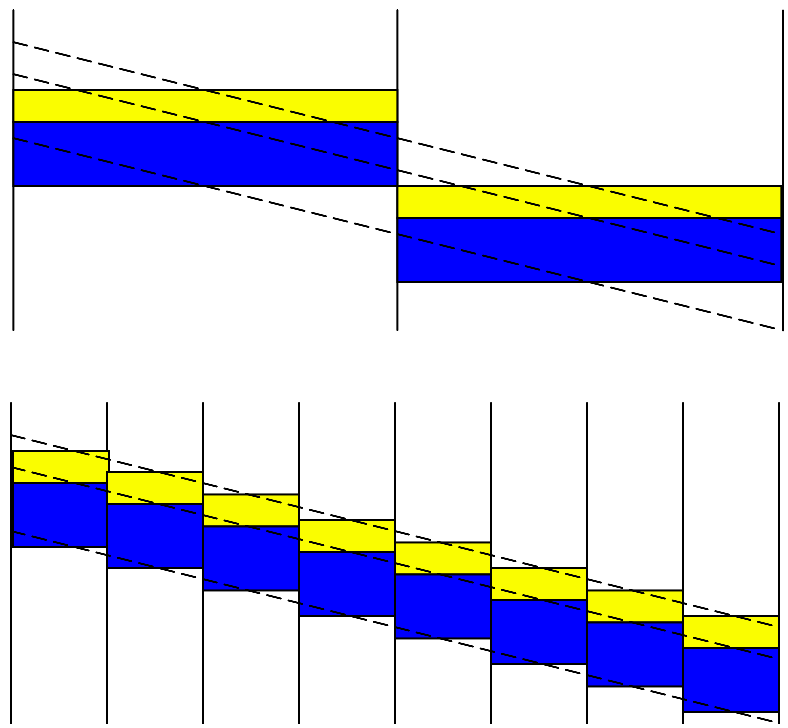
Existing versus Refined Model

Model Input	Existing Model	Refined Model
Grid	1-mile by 1-mile	1/8-mile by 1/8-mile
Structure	used DEM, point data from TWDB & TCEQ, contour maps, and Seymour outline	will apply same data at refined scale will include data from GCD well records may include Brazos alluvium if data allows
Hydraulic Conductivity	interpolation of measurements and inferred values from specific capacity tests	add any new (>2003) data to interpolation add zones to differentiate between older and younger deposits (TDWR, 1978) add data from GCD well records
Recharge	temporal variability (monthly) and average recharge from SWAT simuations spatial variability from elevation model calibrated	Use data (Cl, H3/He3, matric potential) in rangland and dryland and irrigated farmland to describe predevelopment and land use/ recharge relationships and historical land use relationships will investigate irrigation return flow
Streams	locations and geometry from RF1 monthly streamflows from gauge data	no new information; repeat method under refined conditions
Pumping	annual data from TWDB monthly factors from Borrelli et al., 1998	no new information; repeat method under refined conditions
ET	temporal (monthly) and spatial variability from SWAT modeling	follow methods in BEG & INTERA, 2005 and data from Borrelli et al. 1998
Springs	used spring locations from Brune, TWDB county reports, USGS database	either use fine scale USGS NHD coverage with DEM, place drains in all boundary cells, or both

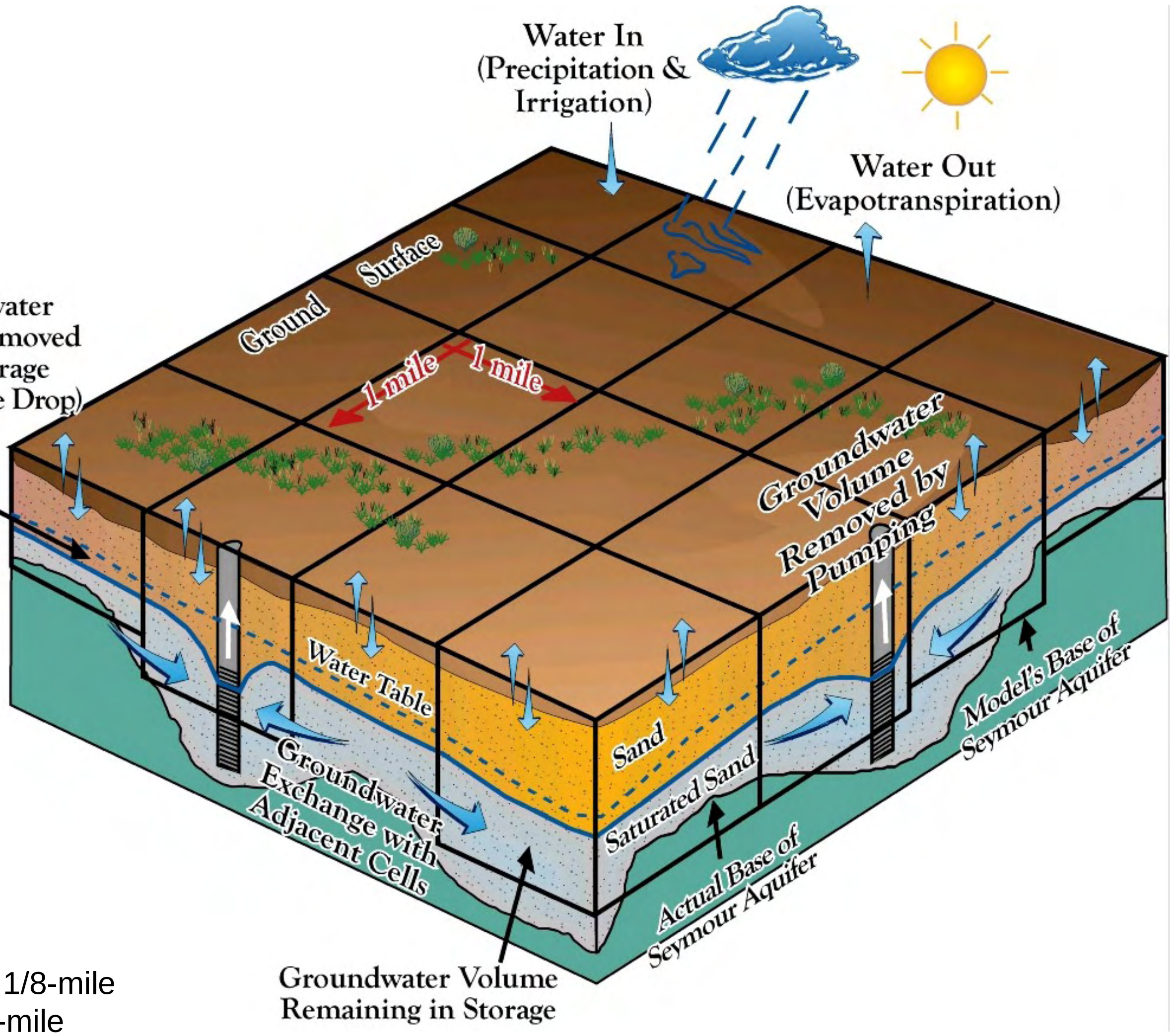
Refined Grid



Refined Grid – X-section Schematic



Interactions Between Model Grid Cells



NOTE: Grid blocks will be 1/8-mile
by 1/8-mile not 1-mile by 1-mile

Refined Seymour GAM – Model Tool

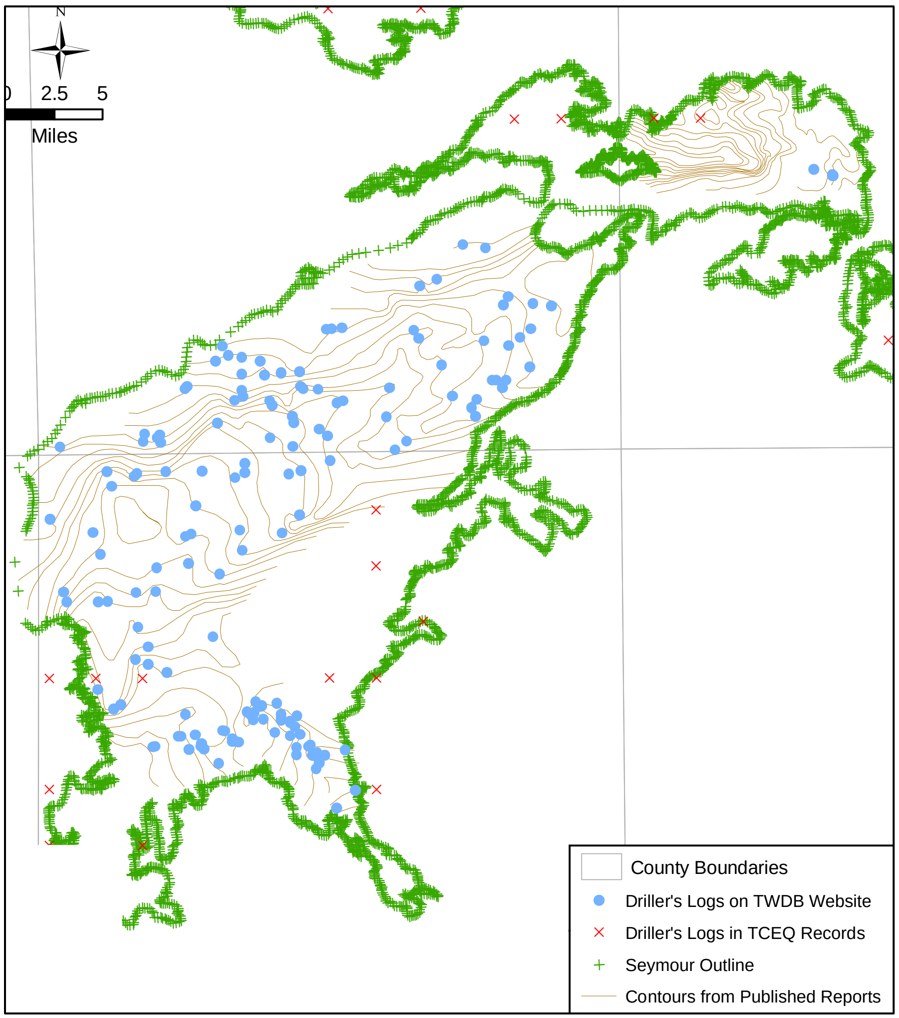
- **MODFLOW-2000**
  - Three-dimensional finite-difference groundwater flow code
  - Most widely accepted groundwater flow code in use today
  - Written and supported by the U.S. Geological Survey
  - Public domain
  - Well documented
  - Large user group
  - Supported by enhanced boundary condition packages to handle recharge, evapotranspiration, streams, springs, and reservoirs
- **Groundwater Vistas for Windows Version 4**
  - Graphical user interface for MODFLOW

Refined Seymour GAM - Input

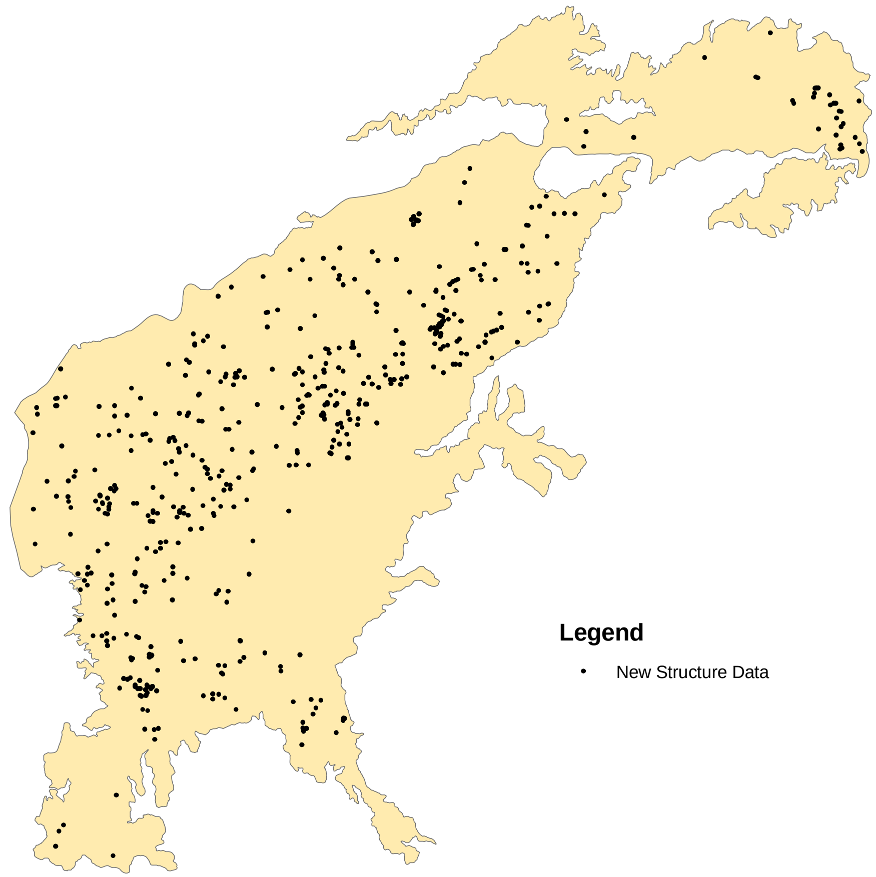
- **Ground surface elevation**
  - *Digital elevation model (DEM)*
- **Top and bottom elevations of the Seymour aquifer**
  - *TWDB Report 226 (Harden and Associates, 1978)*
  - *Driller's logs from TWDB website, the Rolling Plains GCD, and TCEQ well records*

Structure Data Sources

Existing GAM



Additional Data from Rolling Plains GCD

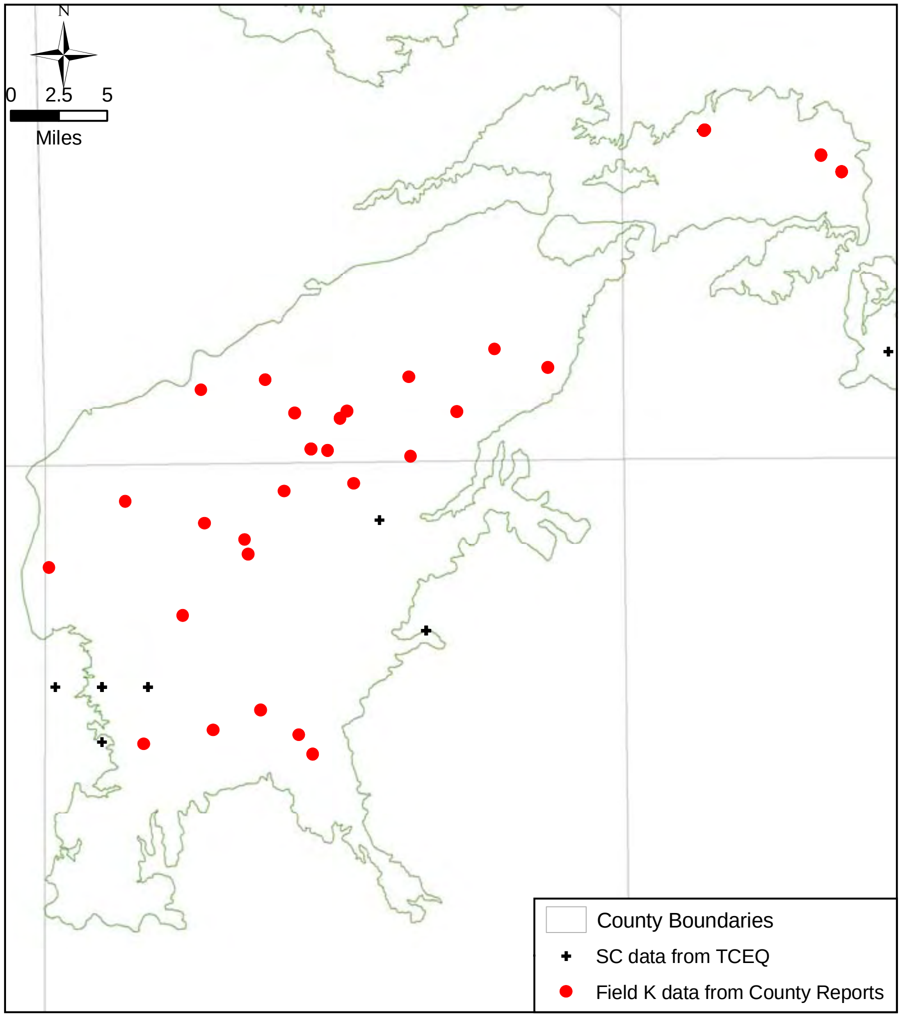


Refined Seymour GAM - Input (cont)

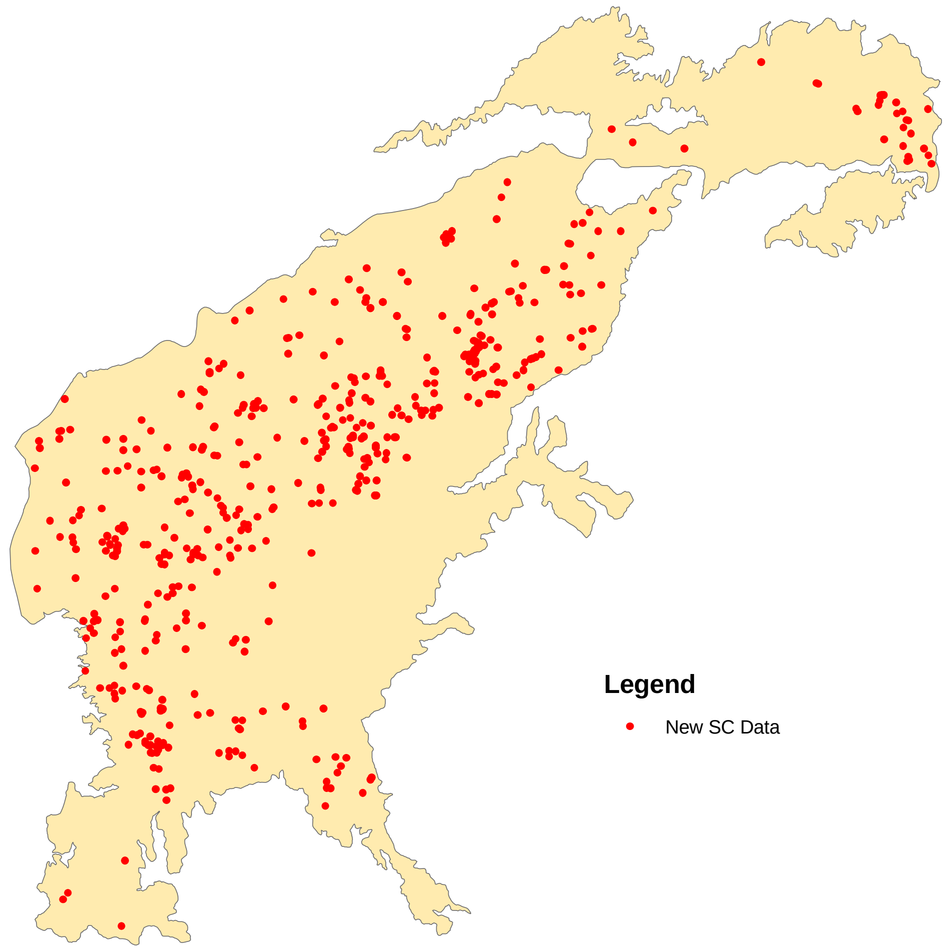
- **Aquifer properties**
  - Hydraulic conductivity
    - *TWDB Report 226 (Harden and Associates, 1978)*
    - *TWDB Bulletin 6209 (Ogilbee and Osborne, 1962) – Haskell and Knox County report*
    - *TWDB Report 218 (Preston, 1978) – Baylor County report*
    - *Driller’s logs from TWDB website, the Rolling Plains GCD, and TCEQ well records*
  - Specific yield
    - *TWDB Report 218 (Preston, 1978) – Baylor County report*

Hydraulic Conductivity Data Sources

Existing GAM



Additional Data from Rolling Plains GCD



Older and Younger Deposits

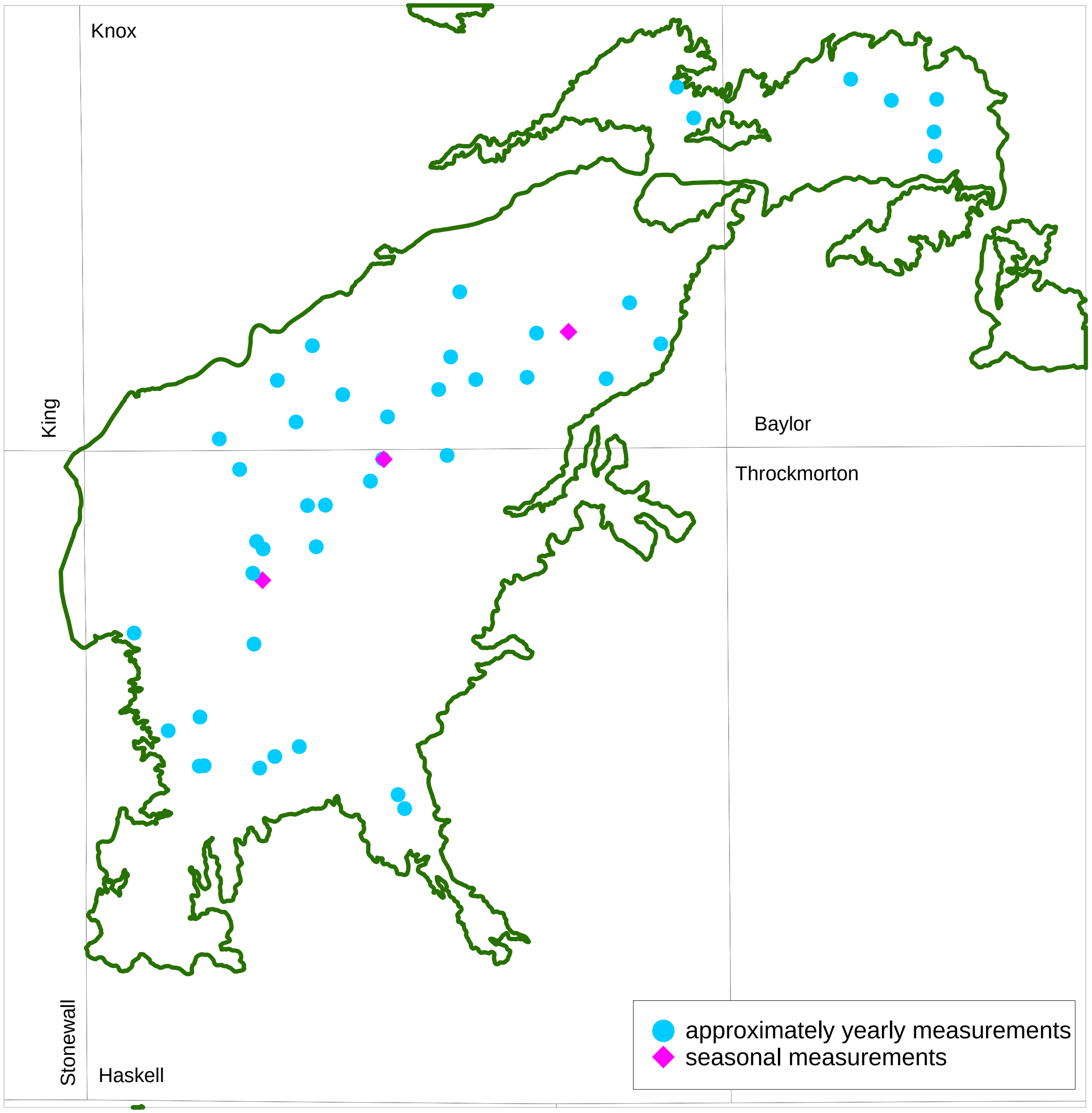
from R.W. Harden & Associates (1978)

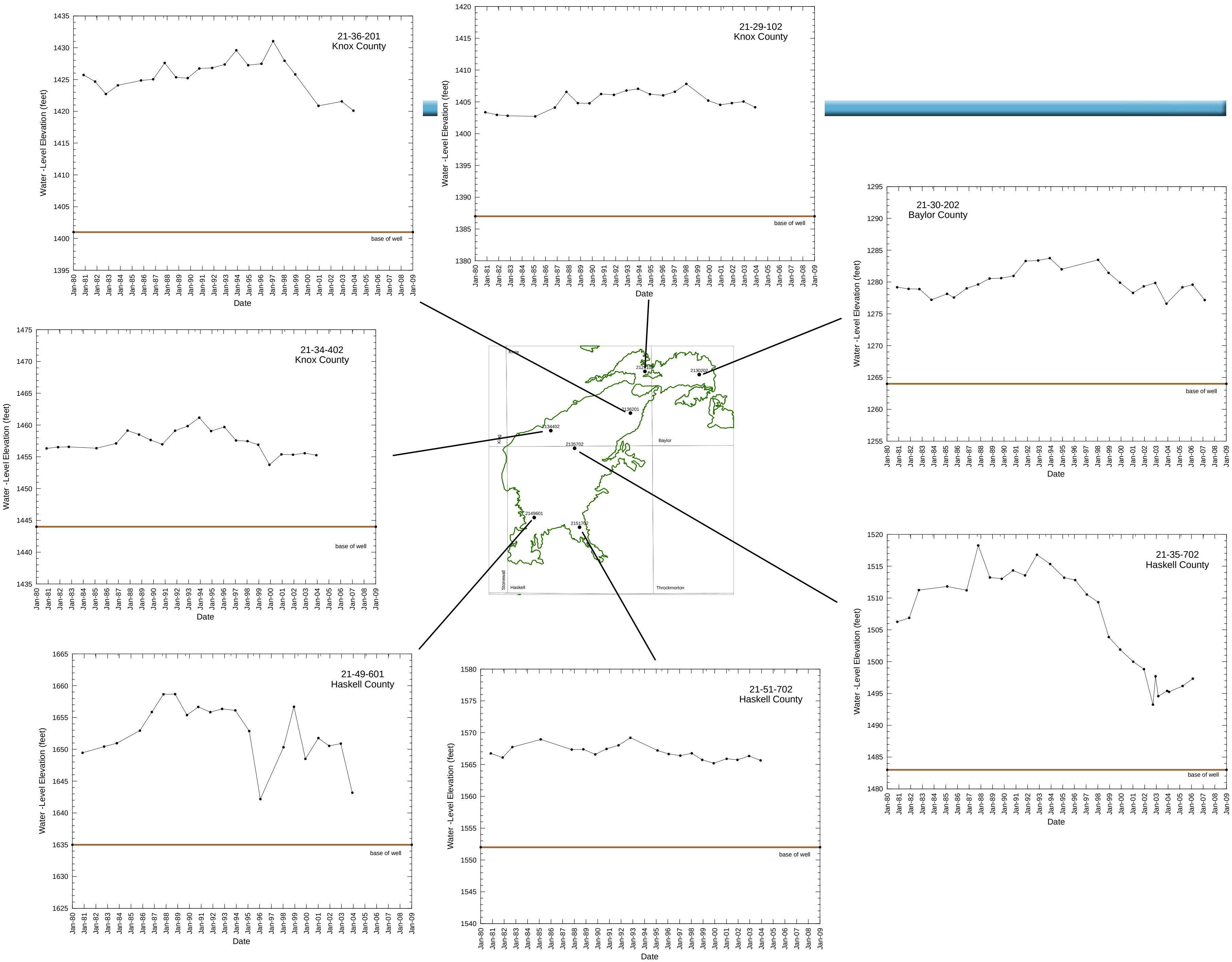
Refined Seymour GAM - Input (cont)

- **Initial elevation of the water table**
  - *TWDB website*
  - *TWDB Report 226 (Harden and Associates, 1978)*
  - *TWDB Bulletin 6209 (Ogilbee and Osborne, 1962) – Haskell and Knox County report*
  - *TWDB Report 218 (Preston, 1978) – Baylor County report*
- **Hydraulic head data for the calibration period (1980 through 1997)**
  - *TWDB website*
  - *TWDB website*
  - *TWDB Report 226 (Harden and Associates, 1978)*
  - *TWDB Bulletin 6209 (Ogilbee and Osborne, 1962) – Haskell and Knox County report*
  - *TWDB Report 218 (Preston, 1978) – Baylor County report*

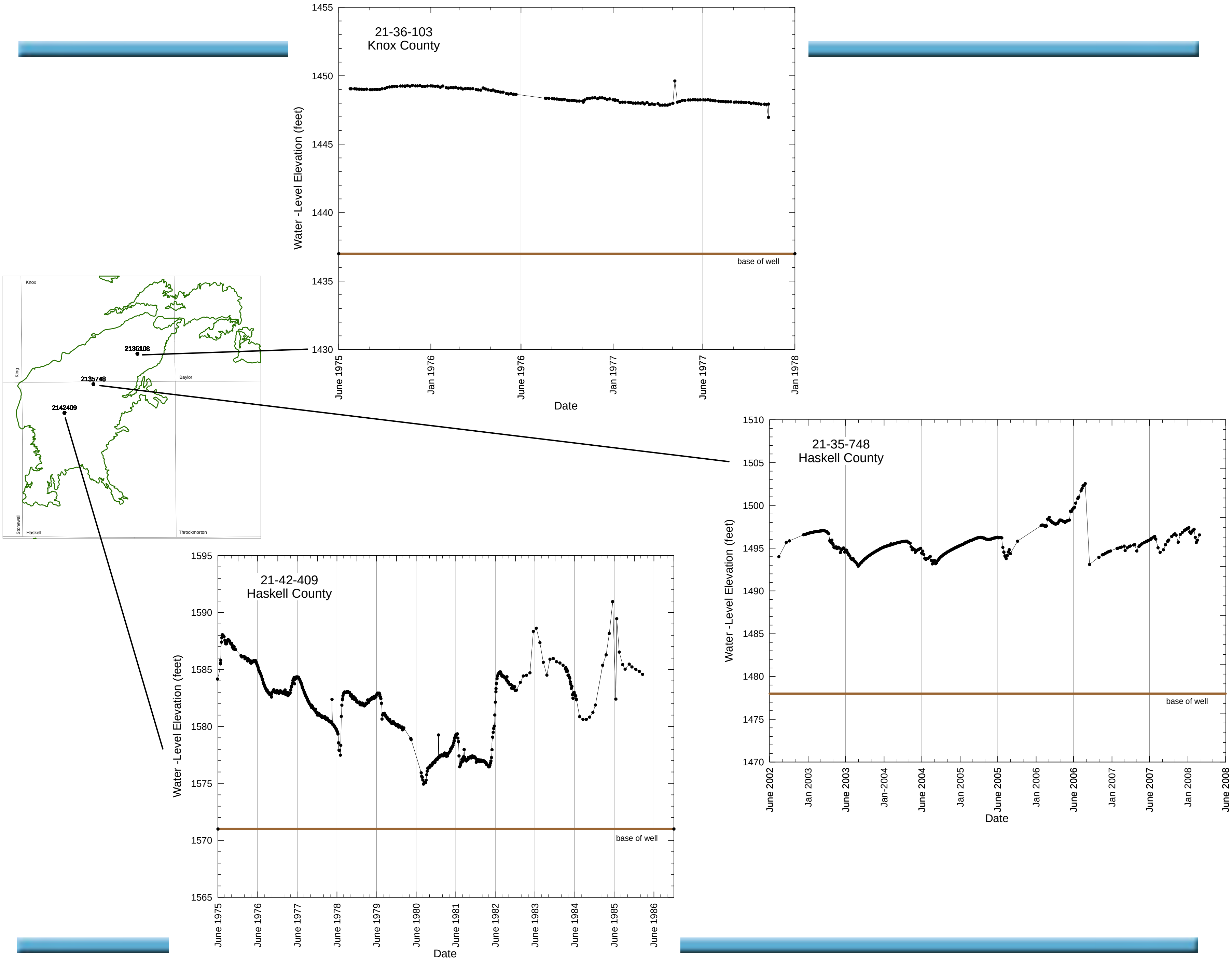
Water Level Data

Locations with Transient Water-Level Data





21-36-201
Knox County
Water -Level Elevation (feet)
Date
base of well
21-29-102
Knox County
Water -Level Elevation (feet)
Date
base of well
21-30-202
Baylor County
Water -Level Elevation (feet)
Date
base of well
21-34-402
Knox County
Water -Level Elevation (feet)
Date
base of well
21-35-702
Haskell County
Water -Level Elevation (feet)
Date
base of well
21-49-601
Haskell County
Water -Level Elevation (feet)
Date
base of well
21-51-702
Haskell County
Water -Level Elevation (feet)
Date
base of well
Knox
Baylor
King
Haskell
Stonewall
Throckmorton
2136201
2134402
2135702
2130202
2149601
2151702


21-36-103
Knox County
Water -Level Elevation (feet)
1455
1450
1445
1440
1435
1430
base of well
June 1975
Jan 1976
June 1976
Jan 1977
June 1977
Jan 1978
Date
Knox
King
Baylor
Stonewall
Haskell
Throckmorton
2136103
2135748
2142409
21-35-748
Haskell County
Water -Level Elevation (feet)
1510
1505
1500
1495
1490
1485
1480
1475
1470
base of well
June 2002
Jan 2003
June 2003
Jan-2004
June 2004
Jan 2005
June 2005
Jan 2006
June 2006
Jan 2007
June 2007
Jan 2008
June 2008
Date
21-42-409
Haskell County
Water -Level Elevation (feet)
1595
1590
1585
1580
1575
1570
1565
base of well
June 1975
June 1976
June 1977
June 1978
June 1979
June 1980
June 1981
June 1982
June 1983
June 1984
June 1985
June 1986
Date

Refined Seymour GAM - Input (cont)

- **Cross-formational flow**
  - *Water-Level data on the TWDB website*
- **Recharge**
  - *TWDB Bulletin 6209 (Ogilbee and Osborne, 1962) – Haskell and Knox County report*
  - *Chloride concentrations in the unsaturated zone for various land cover (current work by the BEG)*

Recharge Estimates

Recharge estimates from water-level rises reported in Ogilbee and Osborne (1962)

Location	Rise in Water Level (ft)	Starting Year	Ending Year	Total Time	Specific Yield	Estimated Reharge (in/yr)
nr	60	1900	1933	33	0.15	3.27
Rochester	4			2	0.15	3.60
west of Rochester	25			25	0.15	1.80
west of Rochester	30			25	0.15	2.16
nr	>16	1906	1918	12	0.15	>2.40
west of Rochester	61			nr		
west of Rochester	28			nr		
west of Rochester	63			nr		
Rochester	30	1900	1930	30	0.15	1.80
nr = not reported						

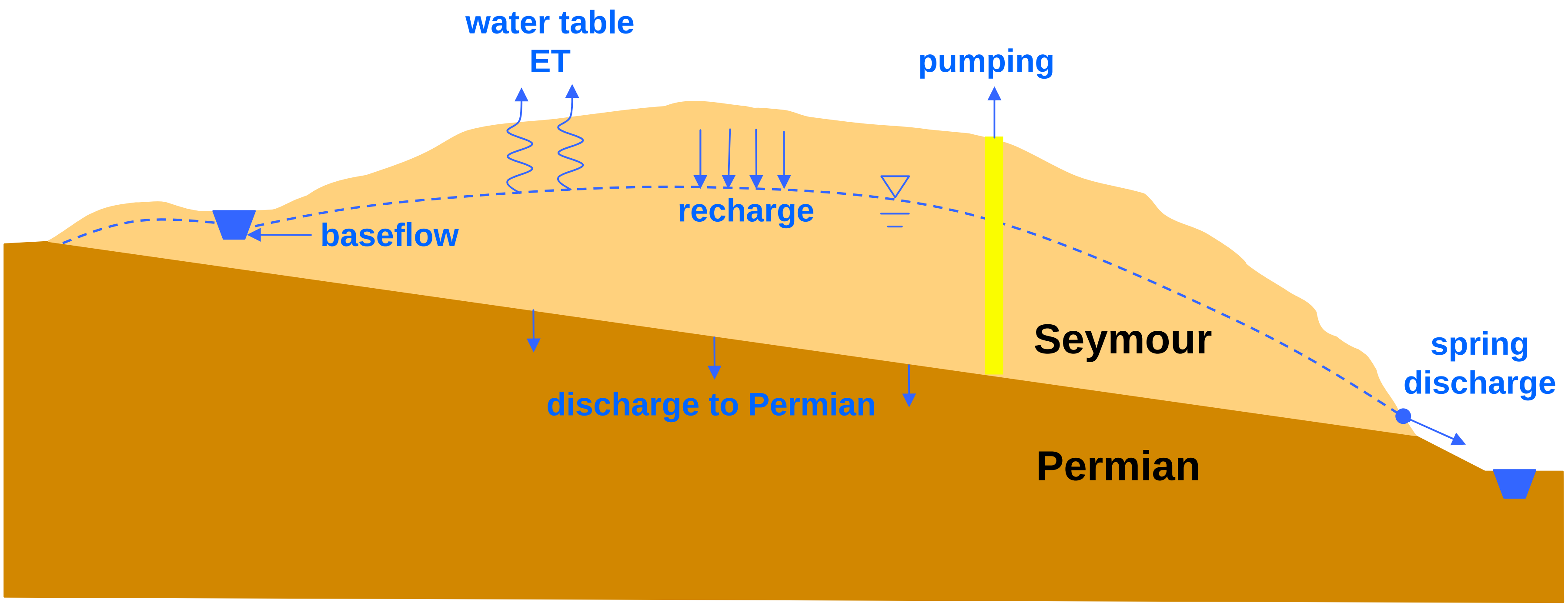
Ogilbee and Osborne (1962) suggest that “the development of the land for cultivation appears to have increased the opportunities for recharge and probably has decreased the amount of water lost by evapotranspiration.

Recharge Estimates (cont)

Preliminary estimates based on chloride concentrations in the unsaturated zone – ongoing work by the BEG

Setting Borehole	Precipitation		Cl(P)	Depth		Depth to Water		Flushed Depth		Mean	Minimum	Maximum	Estimated Recharge	
	mm/yr	in/yr	mg/L	m	ft	m		m	ft	mg/L	mg/L	mg/L	mm/yr	in/yr
"Natural" Land Cover														
HAS03-07	626	24.6	0.401	5.79	19.00	15	49	4.0	13.0	10.7	6.1	17.2	26.8	1.1
HAS04-27	629	24.8	0.401	5.94	19.49	15	49	3.7	12.2	47.4	23.0	71.9	6.4	0.3
Rain-Fed Agriculture Partly Flushed														
HAS03-07	657	25.9	0.408	2.9	9.51	15	49	3.5	11.5	33.8	13.8	60.6	10.0	0.4
HAS04-27	633	24.9	0.409	9.14	29.99	15	49	5.6	18.2	17.2	6.2	49.6	22.0	0.9
Rain-Fed Agriculture Completely Flushed														
HAS03-01	627	24.7	0.404	6.1	20.01	15	49	6.1	20.0	15.5	3.1	27.5	21.0	0.8
HAS03-02	627	24.7	0.404	2.51	8.23	15	49	2.5	8.2	12.9	5.9	28.6	25.6	1.0
HAS03-03	630	24.8	0.404	6.1	20.01	15	49	6.1	20.0	21.2	5.9	74.3	19.4	0.8
HAS03-04	627	24.7	0.403	3.66	12.01	15	49	3.7	12.0	8.1	3.4	21.9	41.6	1.6
HAS04-30	633	24.9	0.411	4.57	14.99	15	49	4.6	15.0	7.2	6.4	9.3	36.6	1.4
HAS04-31	633	24.9	0.41	3.66	12.01	15	49	3.7	12.0	6.1	5.1	7.7	43.9	1.7
HAS04-32	635	25.0	0.408	9.75	31.99	15	49	9.8	32.0	15.0	5.5	30.5	22.5	0.9
HAS04-25	632	24.9	0.409	12.19	39.99	15	49	12.2	40.0	18.7	4.1	65.6	27.1	1.1
HAS04-28	628	24.7	0.403	10.36	33.99	15	49	10.4	34.0	19.9	5.8	58.6	20.6	0.8
HAS04-24	632	24.9	0.409	9.6	31.50	15	49	9.6	31.5	10.0	3.6	41.5	38.6	1.5
Irrigated Agriculture			**Cl(P + Irr)**											
HAS03-06	928	36.5	2.20	6.1	20.01	15	49	6.1	20.0	93.5	29.5	201.6	30.4	1.2
HAS04-23	930	36.6	12.20	33.5	109.91	15	49	3.4	11.0	291.9	82.6	537.9	63.0	2.5
HAS04-29	837	33.0	3.00	10.67	35.01	15	49	10.7	35.0	23.4	4.8	35.8	148.0	5.8
HAS07-01	964	38.0	36.00	6.92	22.70	15	49	6.9	22.7	764.8	475.2	1268.4	70.8	2.8
HAS07-02	968	38.1	103.00	6.4	21.00	15	49	6.4	21.0	2586.5	1917.9	3956.0	41.2	1.6
HAS07-03	964	38.0	22.70	12.8	41.99	15	49	12.8	42.0	186.0	47.4	372.1	118.6	4.7

Where does recharge go?



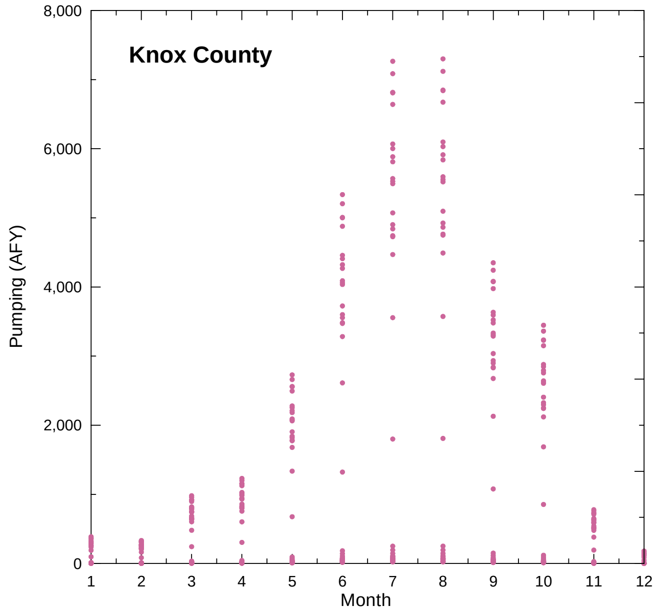
Refined Seymour GAM - Input (cont)

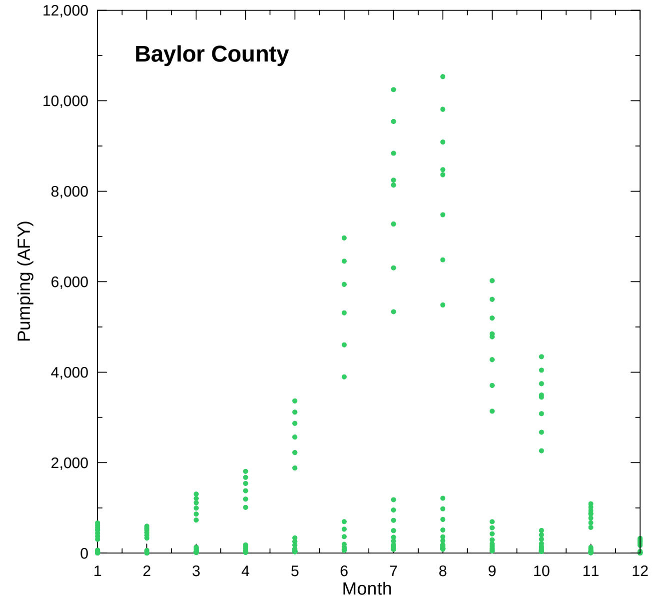
- **Natural discharge**
  - Streams
    - Locations
      - *TWDB website (major river GIS coverage)*
    - Gain-loss
      - *TWDB Report 218 (Preston, 1978) – Baylor County report*
  - Springs
    - Locations and Discharge Rates
      - *TWDB website*
      - *Brune (2002) – Springs of Texas, 2nd Edition*
      - *USGS (Heitmuller and Reece , 2003) – Database of Historical Documented Springs and Spring Flow Measurements in Texas*

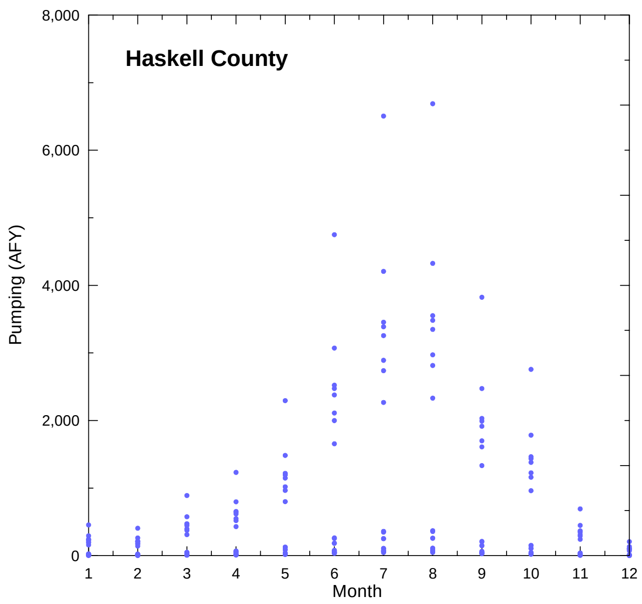
Refined Seymour GAM - Input (cont)

- **Artificial discharge via pumping**
  - Locations and Rates
    - *TWDB pumping database*

Monthly Variation in Irrigation Pumping





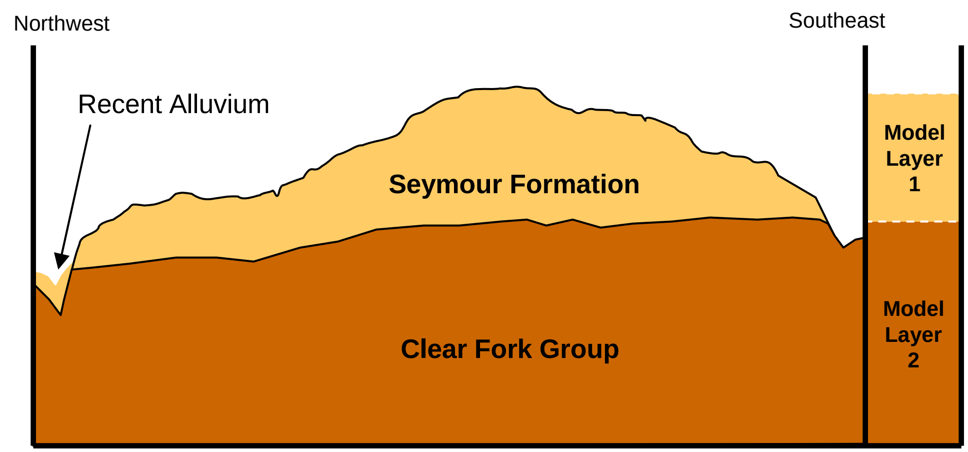


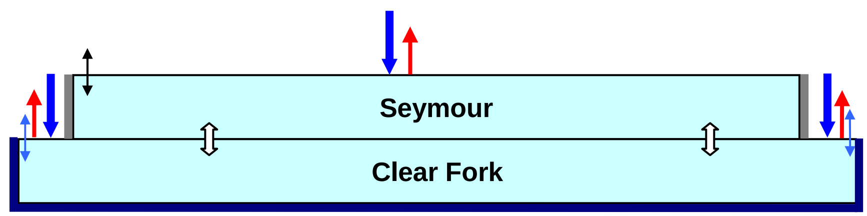
Additional Data for Refined Model

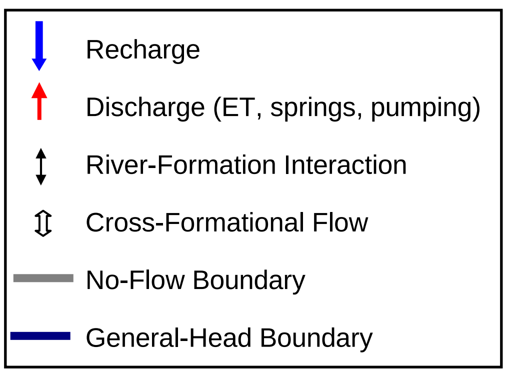
- **Recharge studies by the BEG**
  - Soil physics
  - Environmental tracers
  - Groundwater age dating
- **Historic development of the saturated interval in the Seymour**
  - Filling up of the Seymour resulting from changes in land use
- **Data not previously publicly available (stakeholder, etc.)**
  - Hydraulic properties
    - Additional data received from the Rolling Plains GCD
  - Water levels
    - Ability to use data since 1997 is limited due to required transient calibration period of 1980 through 1997
  - Soft data
    - Where is the Seymour Aquifer more productive and less productive?
    - Where is recharge into the Seymour Aquifer higher and where is it lower?
    - What is the interaction between the Seymour and underlying Permian-age rocks?
    - Where do the Seymour and Permian-age rocks interact?

Refined Seymour GAM – Conceptual Model

- **A simplified representation of the hydrogeological features that govern groundwater flow in the Seymour**
  – Hydrostratigraphy
  – Hydraulic properties
  – Recharge
  – Pumping
  – Boundaries







Groundwater Flow Direction

from R.W. Harden & Associates (1978)

Refined Seymour GAM Modeling Process

- Collection and analysis of data
- Development of a conceptual model
- Construction of the mathematical model
- Simulate development of the Seymour Aquifer (i.e., filling up of the aquifer)
- Calibrate the model to transient conditions from 1980 through 1997 using monthly time steps
- Conduct a sensitivity analysis on major parameters
- Document all aspects of the model

Model Limitations

- The Seymour aquifer is heterogeneous vertically (sand, gravel, silt, clay), but is represented as one layer with average properties.
- Processes and timing related to the historical development of the Seymour Aquifer are largely unknown.
- Data available (e.g., water levels, pumping) is limited in some regions.
- The GAM is a tool for making groundwater availability assessments on a regional basis only.
- The GAM is not capable of predicting aquifer responses at small scales (e.g., individual wells).

Advantages of the Refined Model

- **Additional data**
  - Well log data from the Rolling Plains GCD
    - Structure
    - Hydraulic conductivity
  - Recharge
    - Work being conducted by the BEG
- **Refined Grid**
  - Improves horizontal to vertical aspect ratio and thus communication between gridblocks
  - Should reduce the number of dry cells
  - Provides ability to incorporate more heterogeneity in structure and hydraulic properties
  - Provides increased resolution of drawdown
- **Considers only one pod of the aquifer**
  - Improves model accuracy
  - Improves model performance

Additional Data to Support Model.

- **Additional data is welcomed**
- **Additional data must be received by November 13, 2008**
- **All data used in the refined model will become publically available at the end of the project**
- **Forward data to**
  - Toya Jones
    INTERA, Inc.
    1812 Centre Creek Dr., Suite 300
    Austin, Texas 78754
    (512) 425-2000
    tjones@intera.com

Refined Seymour GAM Schedule

Date	Description
March, 2008	Project Start
January, 2009	Completion of Conceptual Model Development
February 12, 2009	Draft Conceptual Model Report to TWDB
June, 2009	Completion of Steady-State Model Calibration
July, 2009	Completion of Transient Model Calibration
September 10, 2009	Draft Model Report to TWDB
November, 2009	TWDB Feedback on Draft Model Report
December, 2009	Model Training Seminar
January 7, 2010	Final Model Report to TWDB

Seymour Aquifer Refined GAM
Stakeholders Advisory Forum #1
Munday, Texas
October 23, 2008
Attendance List, Questions and Answers, Discussion

ATTENDANCE LIST

Name	Affiliation
Toya Jones	INTERA, Inc.
Shirley Wade	Texas Water Development Board
Wade Oliver	Texas Water Development Board
Andrew Chastain-Howley	Water Prospecting and Resource Consulting
Ray Brady	RMBJ Geo, Inc.
Mendy Shugart	Texas Department of Agriculture
Joe Shephard	City of Seymour
Mike McGuire	Rolling Plains Groundwater Conservation District
Sam Fare	West Central Texas Municipal Water District

PRESENTATION

The Stakeholder Advisory Forum was held on Thursday, October 23, 2008 at 6:30 p.m. at the Perry Patton Community Center located at 131 West Cisco Street in Munday, Texas.

The presentation topics for this form included:

- Groundwater availability modeling overview
- Basics of groundwater flow
- Basics of groundwater modeling
- Comparison of existing Seymour Aquifer groundwater availability model and refined groundwater availability modeling for the Seymour Aquifer in Baylor, Haskell, and Knox counties
- Review of data needed for groundwater modeling
- New well data from Rolling Plains Groundwater Conservation District
- Timelines and request for additional information
- Schedule for the refined groundwater availability model for the Seymour Aquifer in Baylor, Haskell, and Knox counties.

The meeting concluded at 8.45 p.m.

A summary of questions, answers and other discussion is listed below.

QUESTIONS AND ANSWERS

Question: Toya Jones: Where are the springs within the model area?
Answer: Mike McGuire: There are a few springs along the Brazos River, probably more in Baylor County.

Question: Toya Jones: There are data gaps in the southeastern and northwestern parts of the model. Are these areas dry?
Answer: Mike McGuire: These areas are generally weak producers. There is some water production in the southern Baylor County pod. In the western Knox/Baylor pod, there is only windmill water and in southeastern Knox and eastern Haskell county much of this area is dry.

Question: Sam Fare: Why is the model only using pumping data from the period of 1980 to 1997?
Answer: Toya Jones and Shirley Wade: The TWDB has detailed pumping from this period which has been validated.

Question: Andrew Chastain-Howley: Were there ever any pumping tests conducted on the United States Geological Survey monitoring well near Munday?
Answer: Mike McGuire: No. However, the production well (21-35-702) close to this site has a long history of data and it may be possible to use those data for estimation of specific yield.

Question: Toya Jones: Is there any feel for communication between the Seymour Aquifer and the underlying Permian strata?
Answer: Mike McGuire: Little communication is suspected.

Question: Toya Jones: What are the irrigation amounts in each of the counties?
Answer: Numerous: 2,100 acres-feet in Baylor County, 39,000 acre-feet in Haskell and Knox counties.

Question: Andrew Chastain-Howley: Are there any flowing creeks within the aquifer area?
Answer: Mike McGuire: There is no year round surface flow over the Seymour.

Question: Ray Brady: Are there similar modeling plans for any of the other pods (such as Collingsworth County)?
Answer: Shirley Wade: There are no plans for modeling other pods at this time. If stakeholders wish these other areas to be reviewed then the local Groundwater Conservation Districts should vocalize this need to the TWDB.

DISCUSSION

Mike McGuire: Well yields are not generally as strong in the younger sediments to the west of the main pod in Knox and Haskell counties.

Numerous: The native vegetation predating human development was tall grass prairie. There was also some skepticism that the aquifer was completely dry at the beginning of the 20th Century.

Toya Jones: The intention is to simulate the Seymour Aquifer filling up with water. The reports suggest that the aquifer filled up between 1900 and 1930.
Note: No other suggested scenarios or methods were put forward at this time.

Mike McGuire: With respect to recharge, the active area is between the cities of Rochester and Rule, where the Altus sandy loam soils are at the surface. The Natural Resources Conservation Service has completed soil surveys which may be of use for the recharge analysis.

Sam Fare: In addition, the best soils for recharge are generally the best soils for agriculture and irrigation. Therefore, these areas will get return flows in addition to high natural recharge rates. The dry land farming is conducted mainly on the black clay soils (which have lower recharge potential).

Toya Jones: Suggested that the consultant estimates recharge and then send it to stakeholders for review.

Mike McGuire: Municipal pumping from the aquifer is only for the city of Seymour today. All other municipalities are supplied by surface water from Miller Creek Reservoir, which filled up in 1978.