

Groundwater Availability Modeling (GAM) for the Nacatoch Aquifer

Presented to

Stakeholder Advisory Forum
Texas A&M University - Commerce
Commerce, Texas

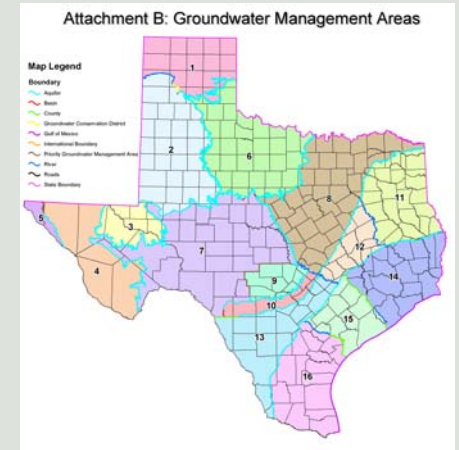
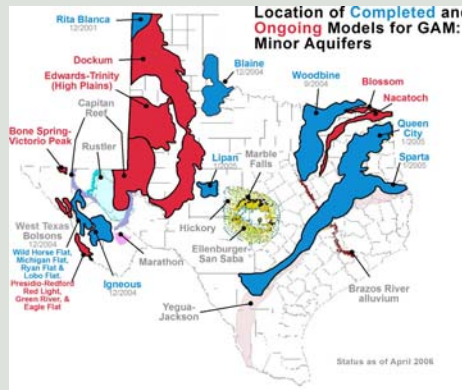
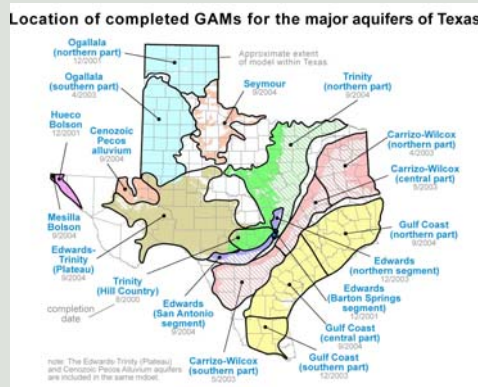
July 14, 2006



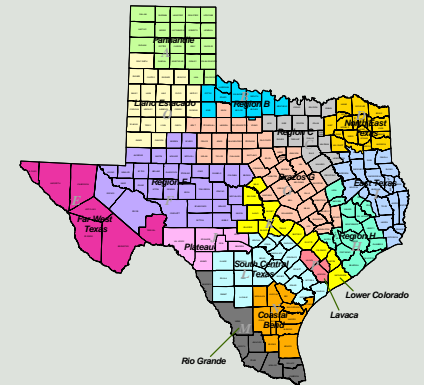
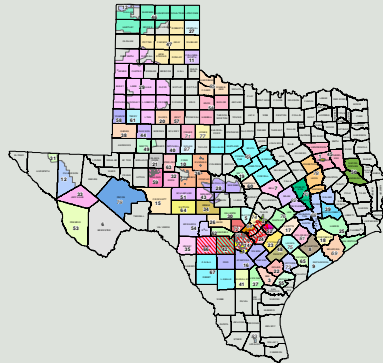


texas water development board

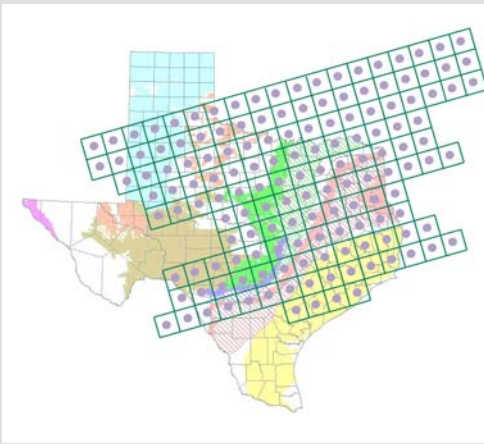
Groundwater Availability Modeling



Contract Manager
Andrew Donnelly



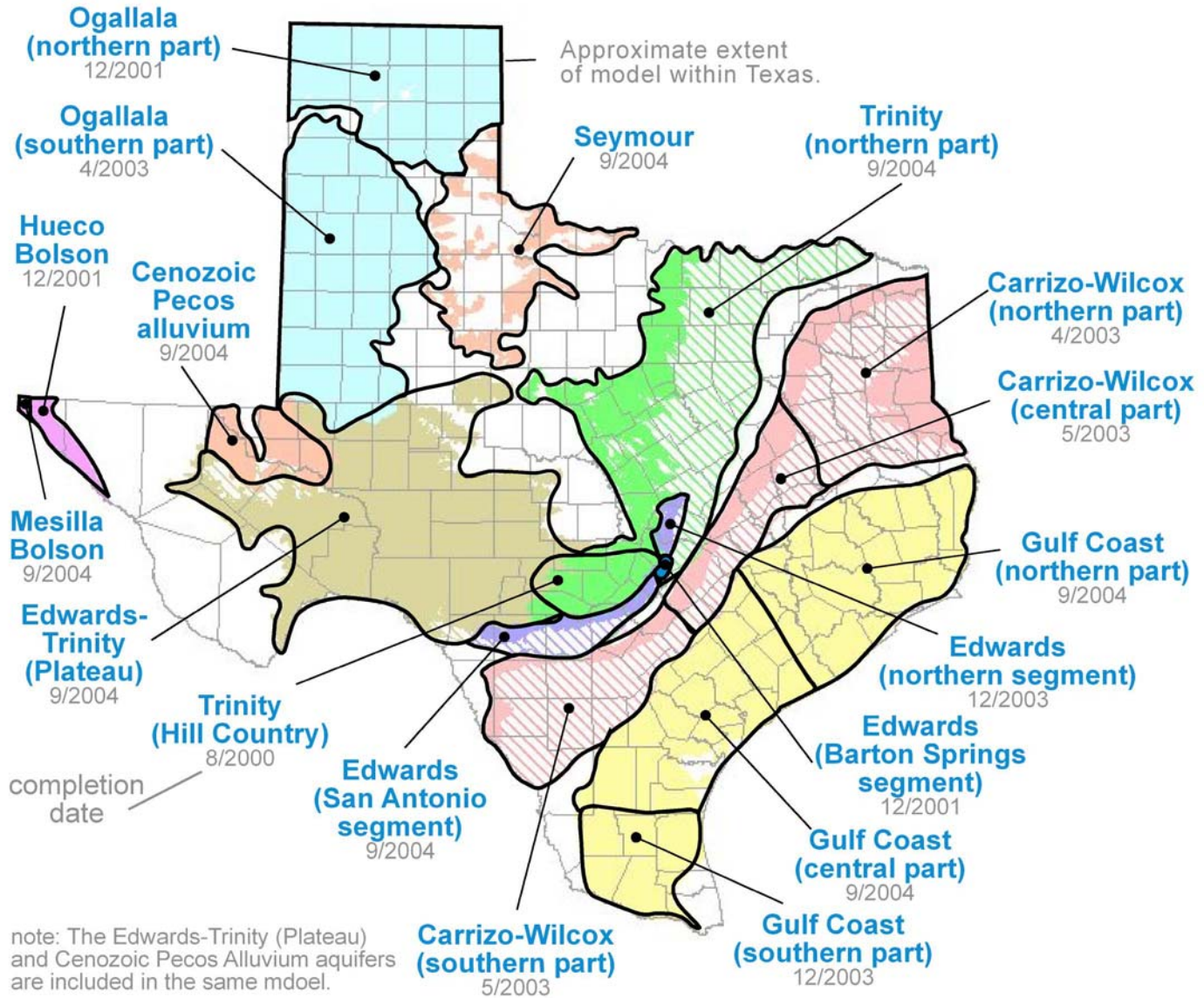
Texas Water Development Board



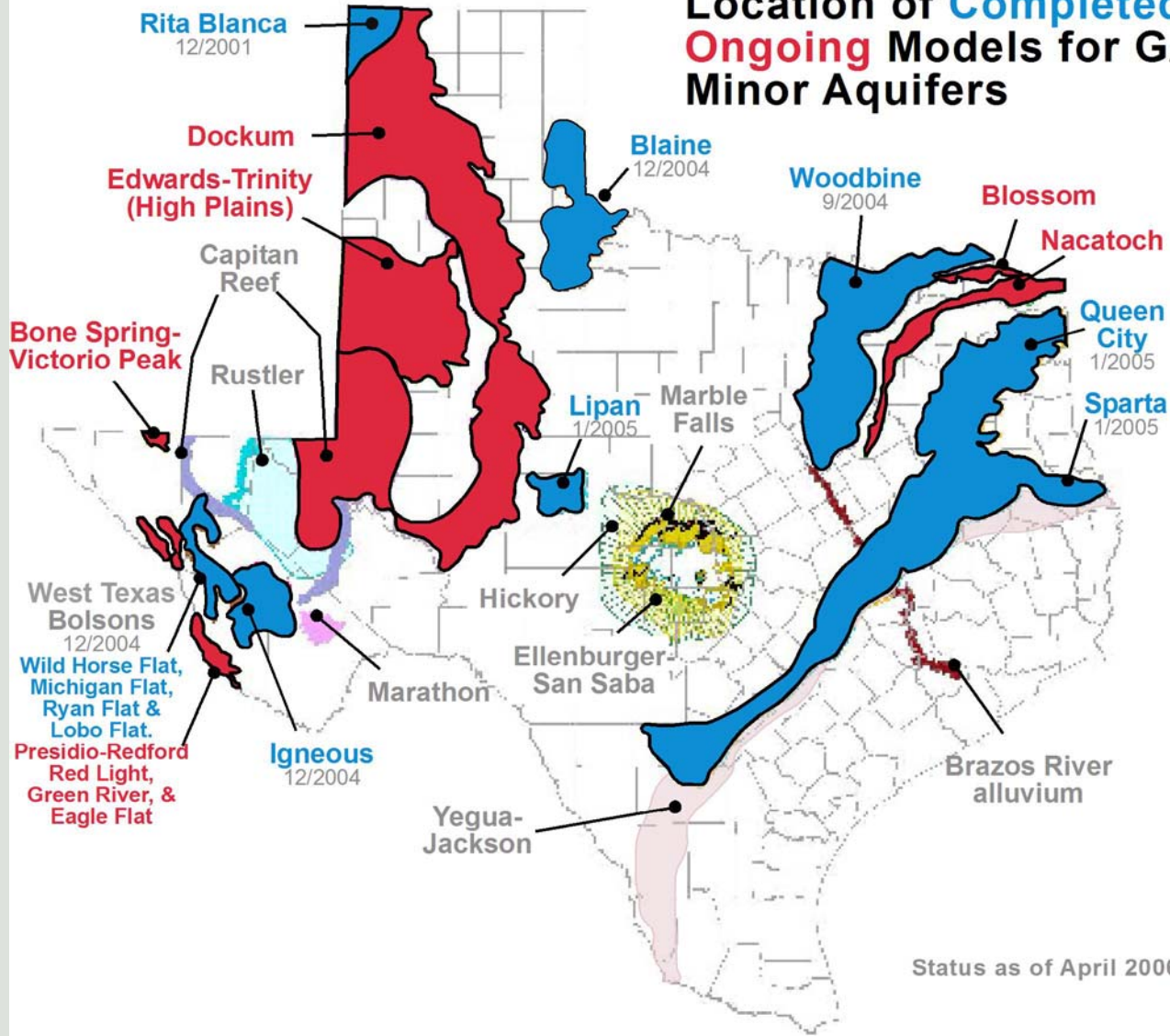
GAM

- Purpose: to develop tools that can be used to help GCDs, RWPGs, and others assess groundwater availability.
- Public process: you get to see how the model is put together.
- Freely available: standardized, thoroughly documented, and available over the internet.
- Living tools: periodically updated.

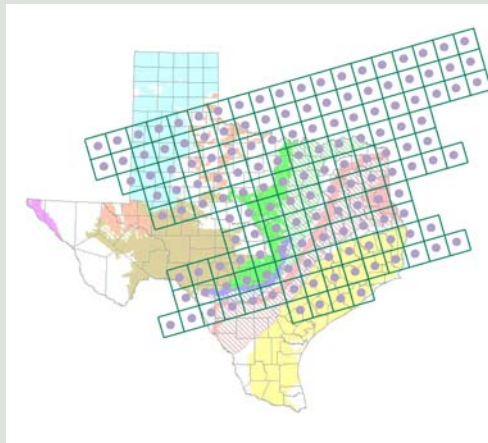
Location of completed GAMs for the major aquifers of Texas



Location of Completed and Ongoing Models for GAM: Minor Aquifers



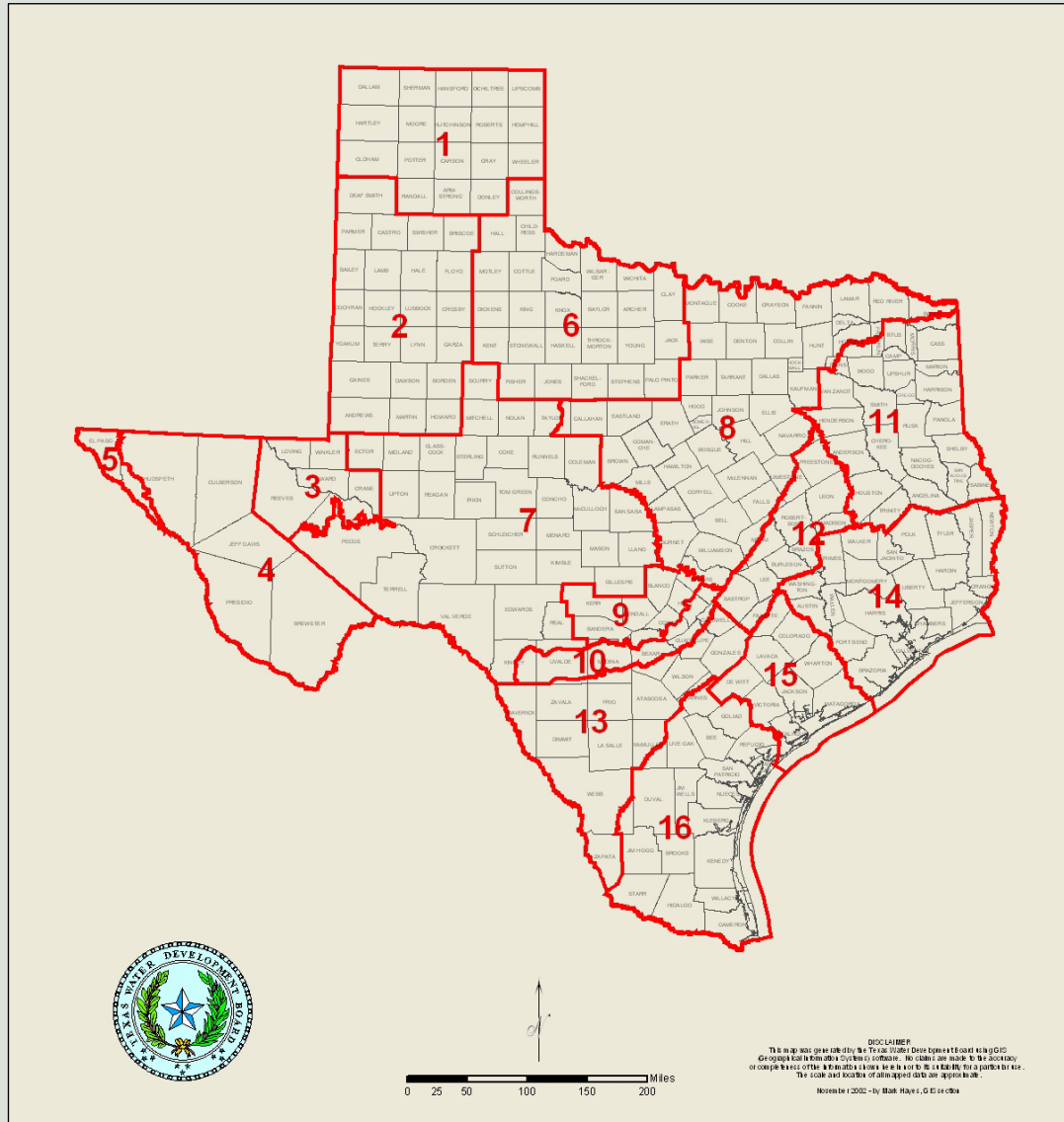
Status as of April 2006



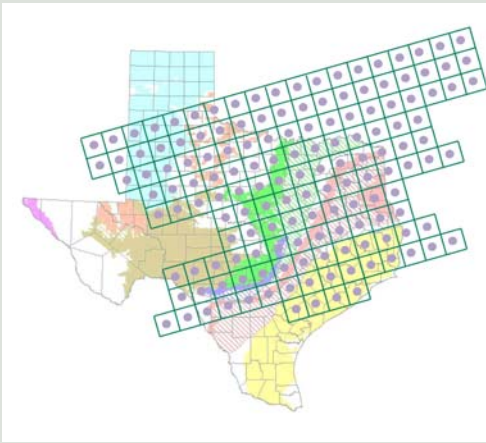
What is groundwater availability or MAG?

- 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 tool that can be used to assess groundwater availability once GCDs and GMAs decide on the desired future condition of the aquifer.

Groundwater Management Areas

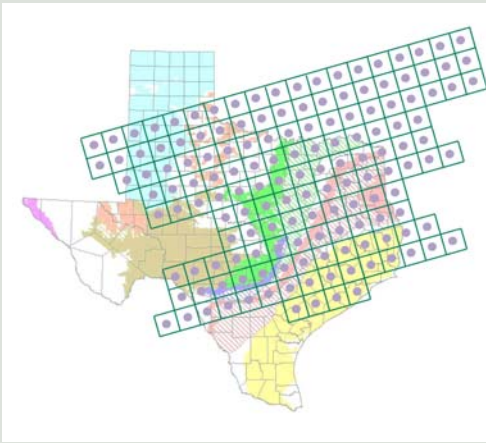


Do we have to use GAM?

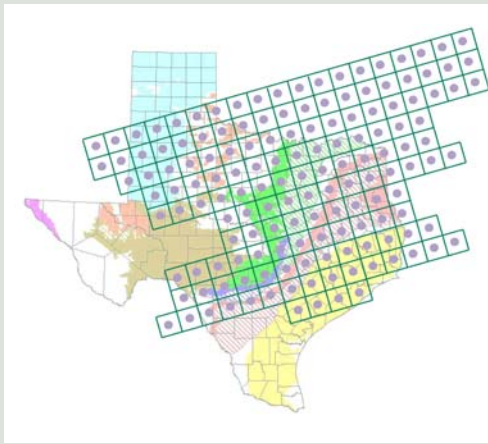


- Water Code & TWDB rules require that GCDs use GAM information, if available, for their management plans.
- TWDB rules require that RWPGs use managed available groundwater estimates, if developed in time for the planning cycle

How do we use GAM?

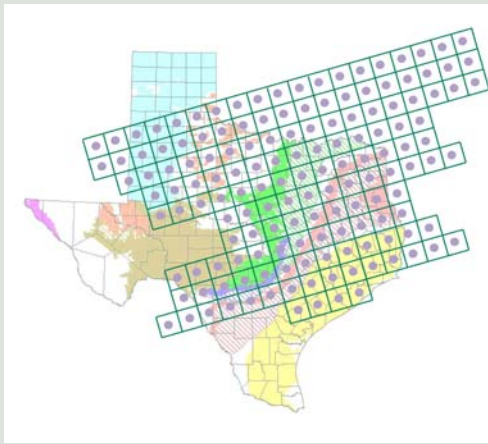


- The model
 - predict water levels and flows in response to pumping and drought
 - effects of well fields
- Data in the model
 - water in storage
 - recharge estimates
 - hydraulic properties
- GCDs and RWPGs can request runs



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.



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:

Andrew Donnelly

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www.twdb.state.tx.us/gam



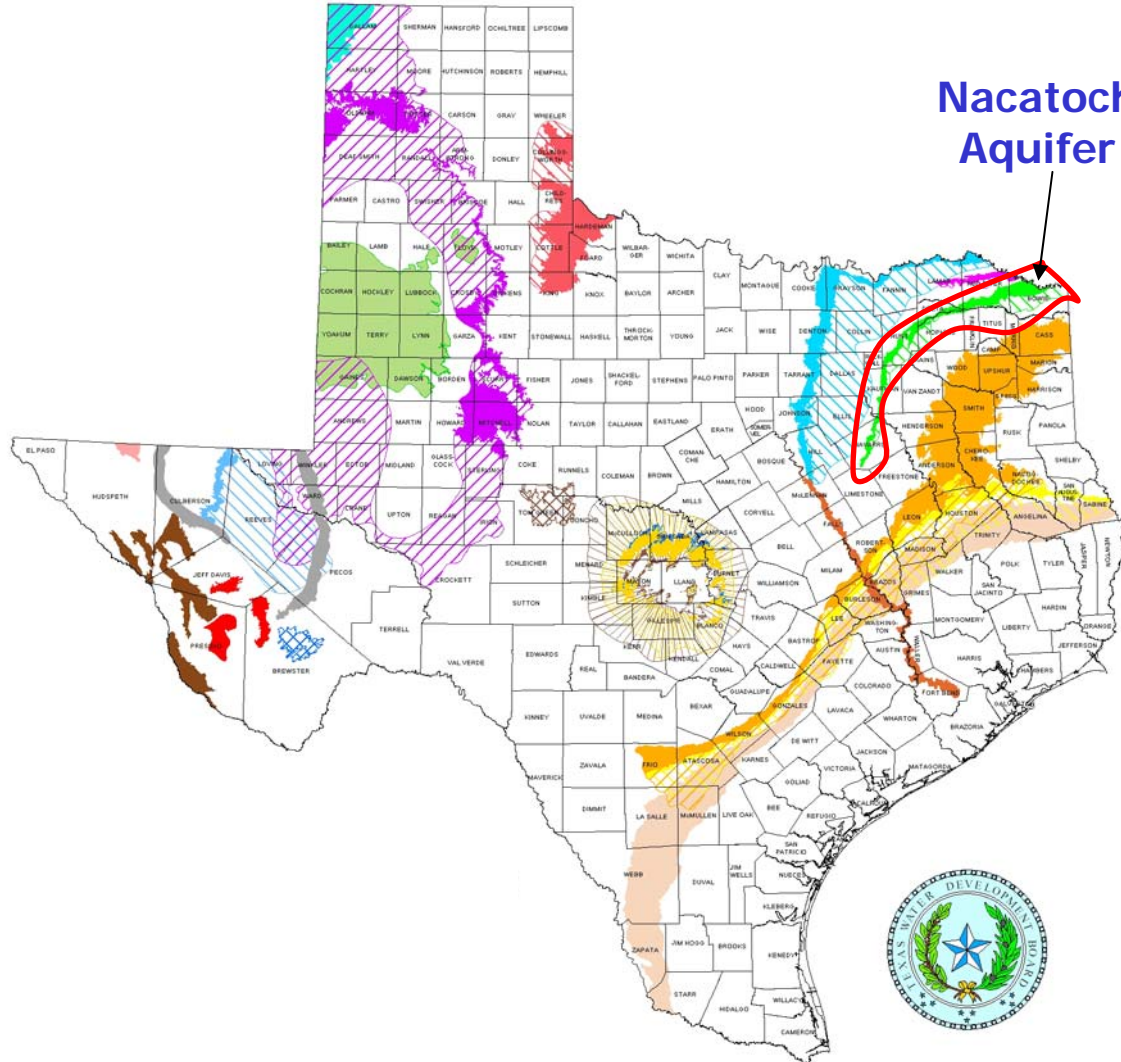
Nacatoch GAM Team

- LBG-Guyton Associates
- INTERA, Inc.
- Dr. Graham Fogg
- TWDB

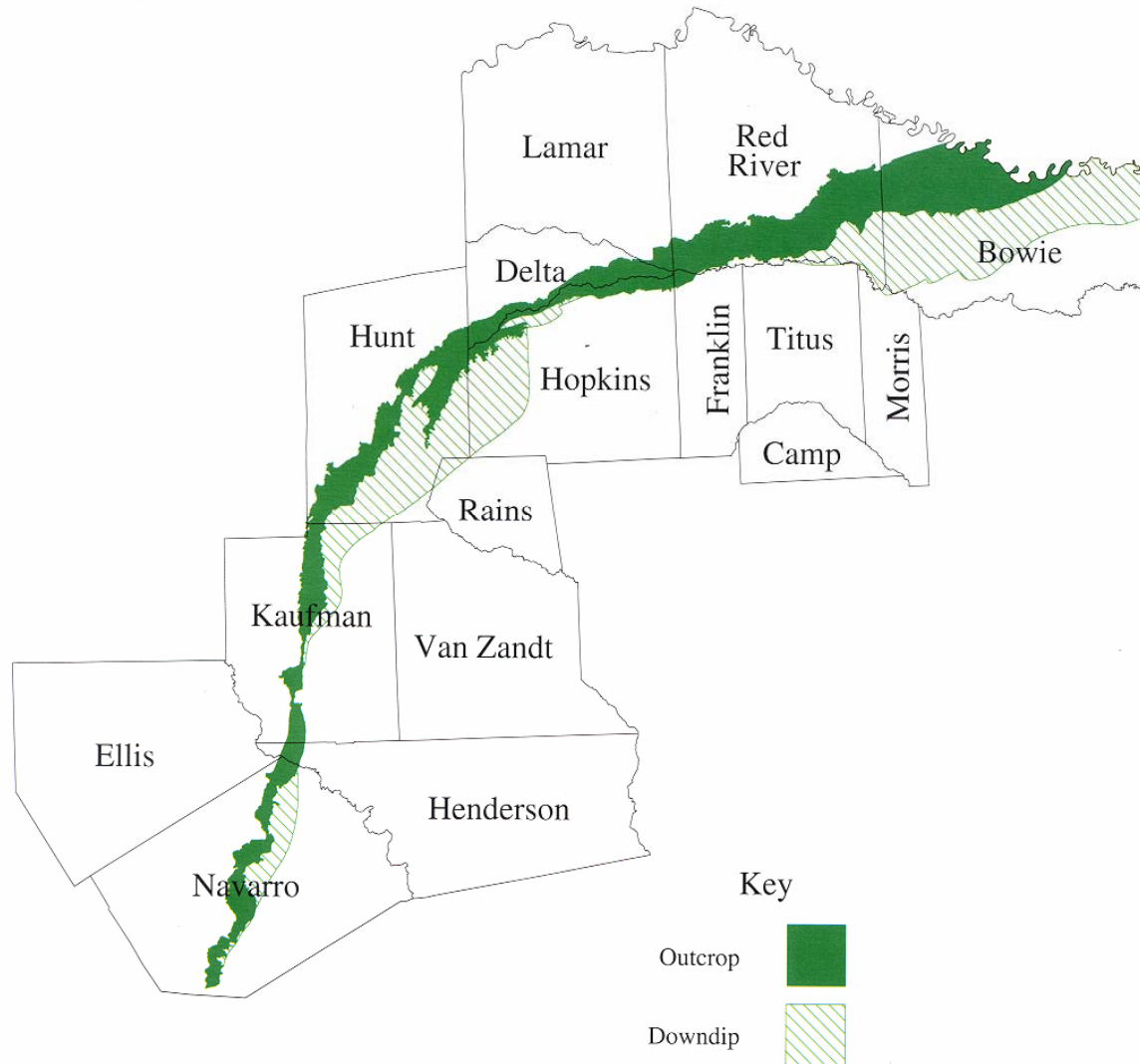
Nacatoch GAM Team - Roles

- **LBG-Guyton – Primary roles:**
 - Project management
 - SAF meetings
 - Geology
 - Hydrostratigraphy
 - Structure
 - Water quality
 - Model calibration
 - Reporting
 - Project deliverables
- **G. Fogg – Primary Role:**
 - Geohydrologic characterization
 - Reporting
- **INTERA – Primary roles:**
 - Physiography and climate
 - Water levels and regional groundwater flow
 - Recharge
 - Rivers, streams, lakes, and springs
 - Hydraulic properties
 - Discharge and pumping
- **INTERA – Support role:**
 - SAF meetings
 - Model calibration
 - Reporting

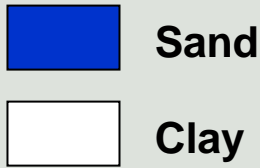
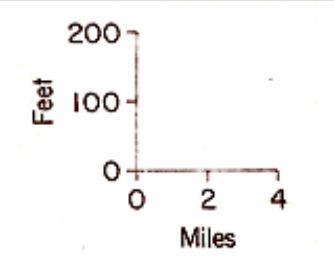
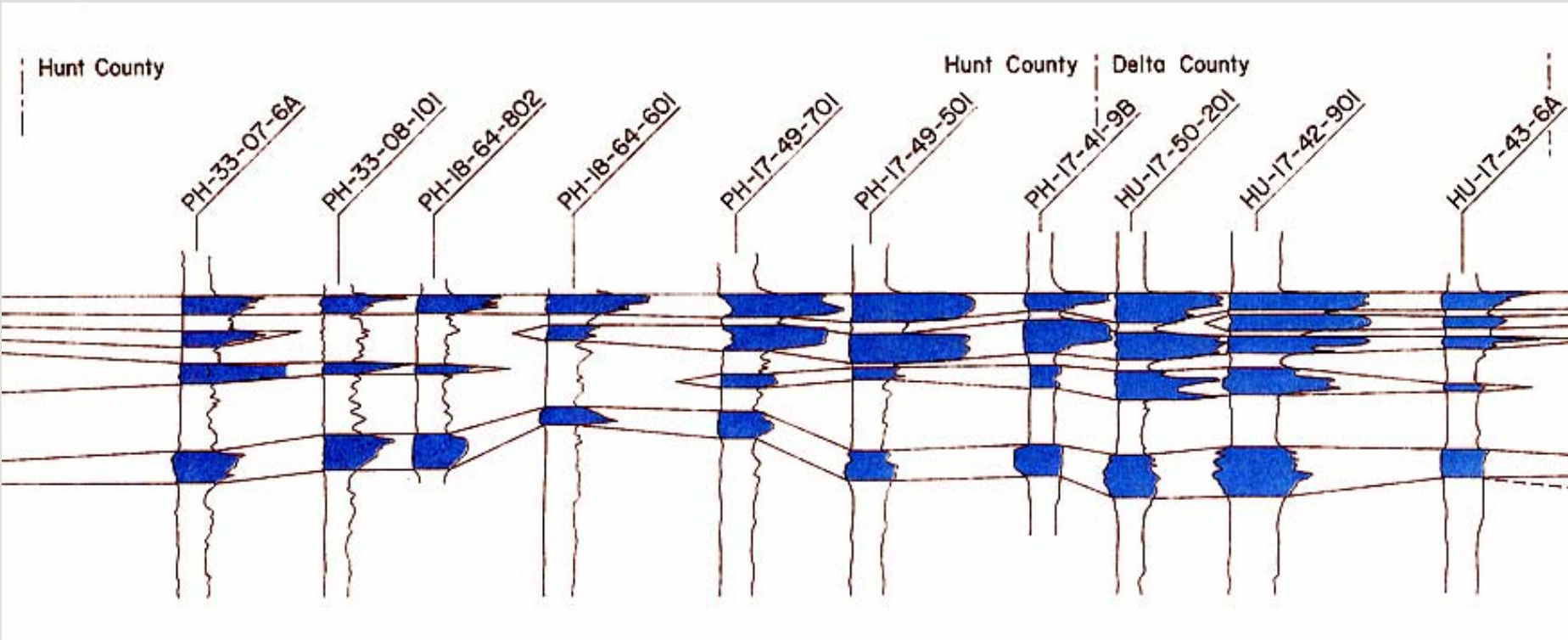
Minor Aquifers



Nacatoch Aquifer



Geologic Cross-Section



Numerical Groundwater Flow Modeling

- A numerical groundwater flow model is a mathematical representation of the physical aquifer
- A numerical model is calibrated to match actual measured water levels in wells
- A numerical model can then be used as a tool to calculate the water level at specific locations based on aquifer characteristics, and varying pumping and recharge scenarios

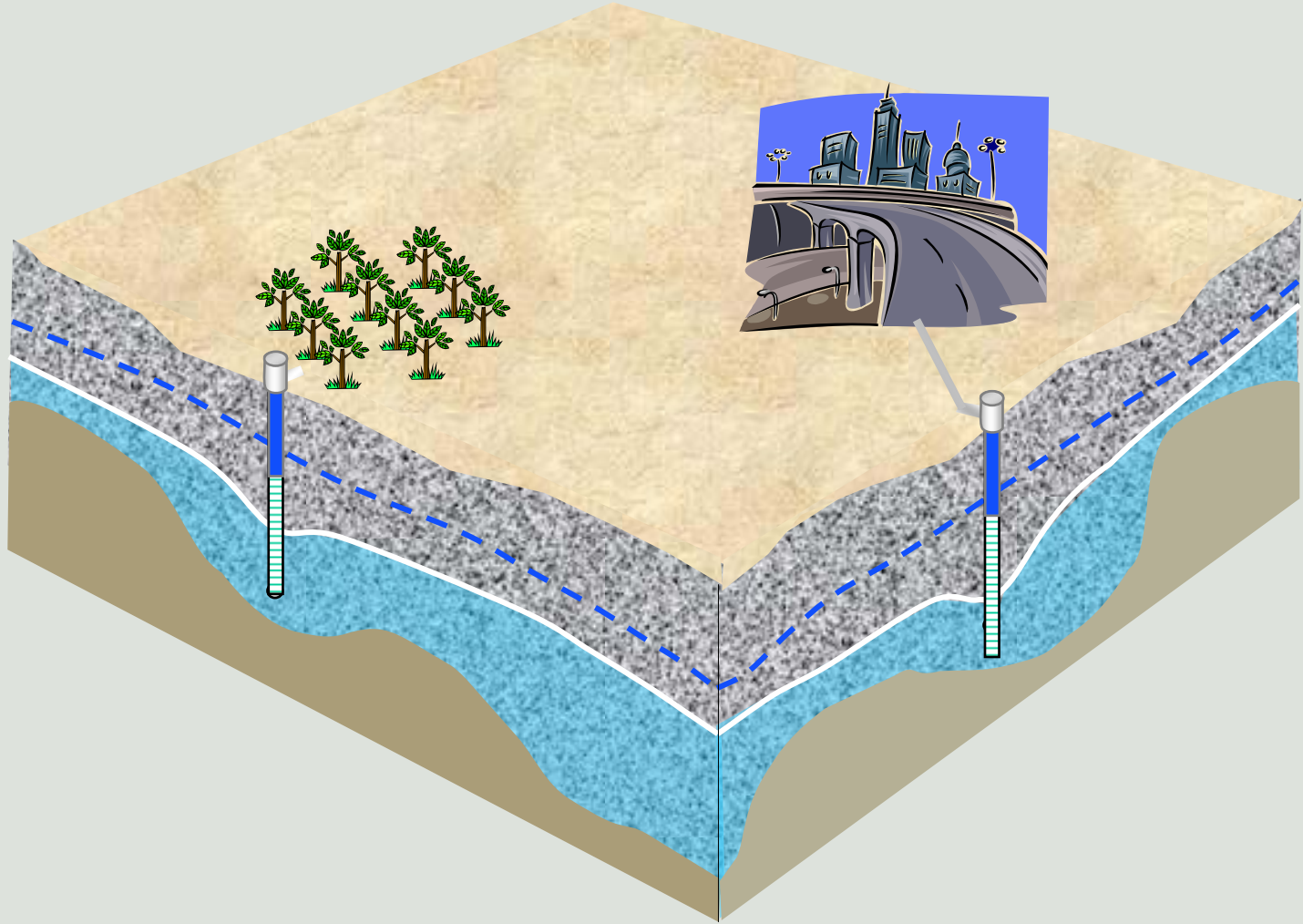
Modeling Protocol (steps)

- Define model objectives & tools
- Data compilation & analysis
- Conceptual model development
- Model design
- Model calibration
 - Predevelopment (steady-state)
 - 1980 to 1997 (transient)
- Model sensitivity analyses
- Reporting
- Future use:
 - Evaluation of regional-scale water management strategies
 - Evaluation of GMA groundwater availability

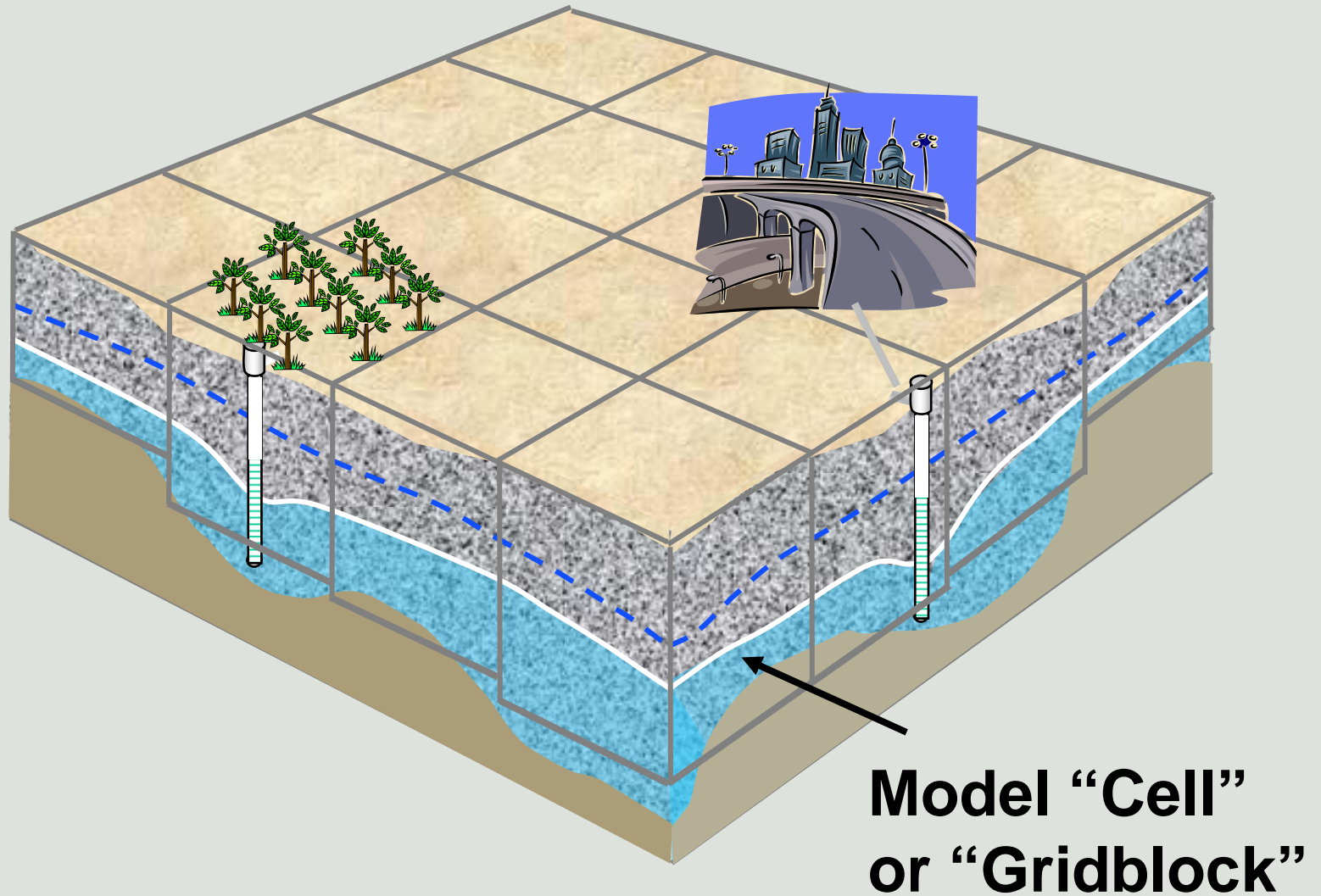
Conceptual Model Issues

- Aquifer Characteristics
- Hydrostratigraphic layers
- Lateral boundaries
- Recharge

Conceptual Model



Data Distributed into Cells



Key Data Sources

- TWDB & predecessors reports
- U.S. Geological Survey reports
- UT Bureau of Economic Geology reports
- TCEQ - drillers logs & specific capacity
- National Climatic Data Center website
 - precipitation
- Brune (1975) - spring locations & flows

Key Data Sources (cont'd)

- TWDB website
 - Well locations
 - Water levels
 - Pumping
 - Water quality
 - Aquifer boundary in Texas
- U.S. Geological Survey website
 - Topography
 - Stream locations and flows
 - Land use / land cover

Current Data Needs

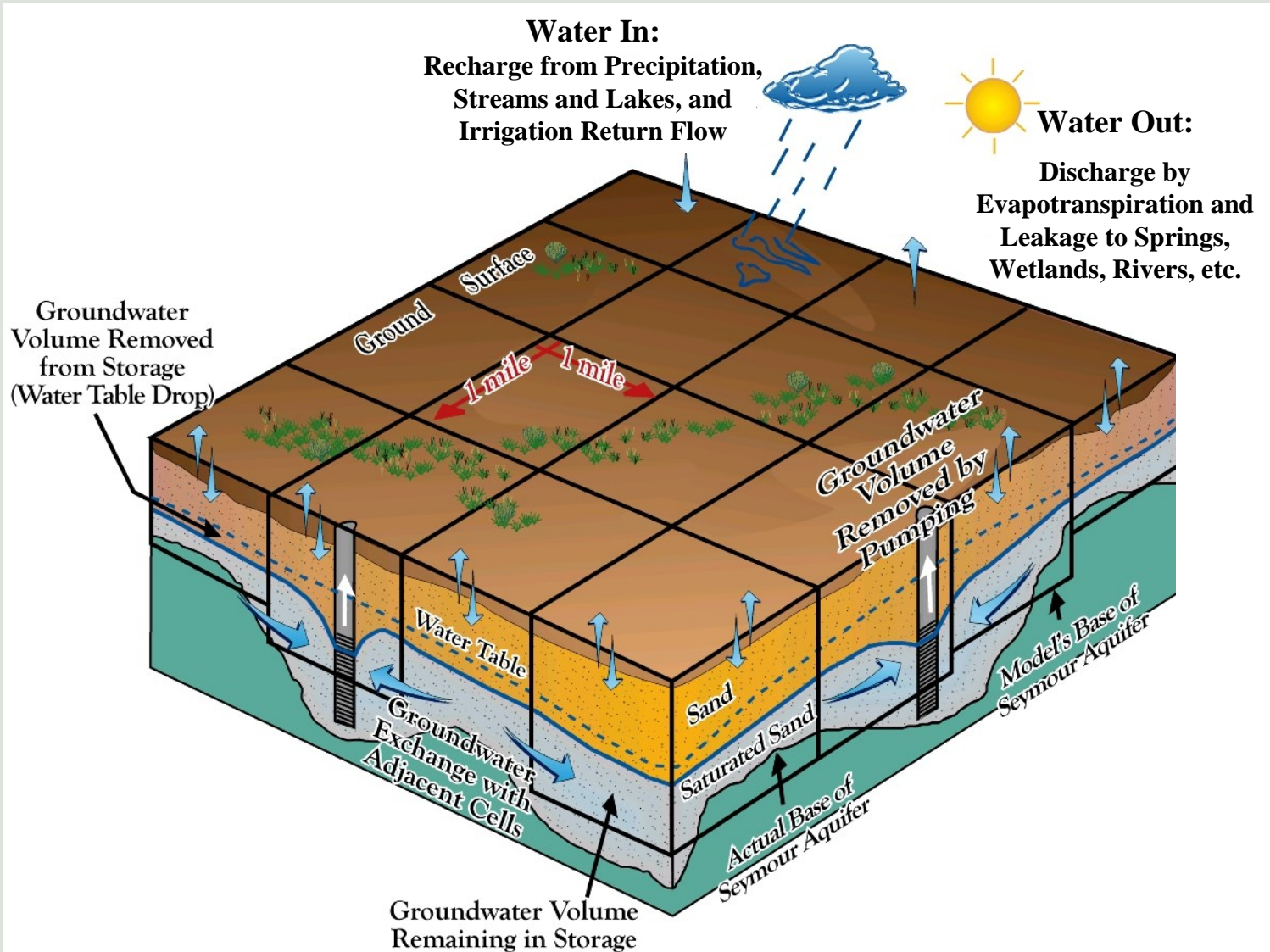
- Nacatoch data for areas with sparse information
 - Geologic logs
 - Major pumping centers
 - Water levels (elevations)
 - Aquifer hydraulic properties
- Relevant data not in the TWDB database. Data provided must be documented and publicly available.
- Data needed by October 31, 2006.

Who to Contact

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Numerical Groundwater Model - Model Grid Cells & Their Interactions



Model Limitations

- The Nacatoch aquifer is heterogeneous vertically and laterally.
- Data available (e.g., geology, wells, pumping) may be limited in some areas.
- 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 or well fields). Such evaluations would require a refined model.

SAF Schedule

SAF Meeting	Date	Topics
1	July 14, 2006	Introduction & Modeling Approach
2	April, 2007	Data Evaluation & Conceptual Model
3	July, 2008	Model Architecture & Steady-State Calibration
4	March, 2008	Predictions and Final Presentation
Model Training	June, 2008	Hands-on Stakeholder Training Seminar
Final Report	July 31, 2008	Final Report Due to TWDB