Trinity-Hill Country Groundwater Availability Model: Update

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Stakeholder Advisory Forum

June 7, 2005

OUTLINE

- Update issues
- Introduction to groundwater modeling
- Overview of Trinity-Hill Country Aquifer
- GAM schedule
  - SAF meetings
  - Project milestones

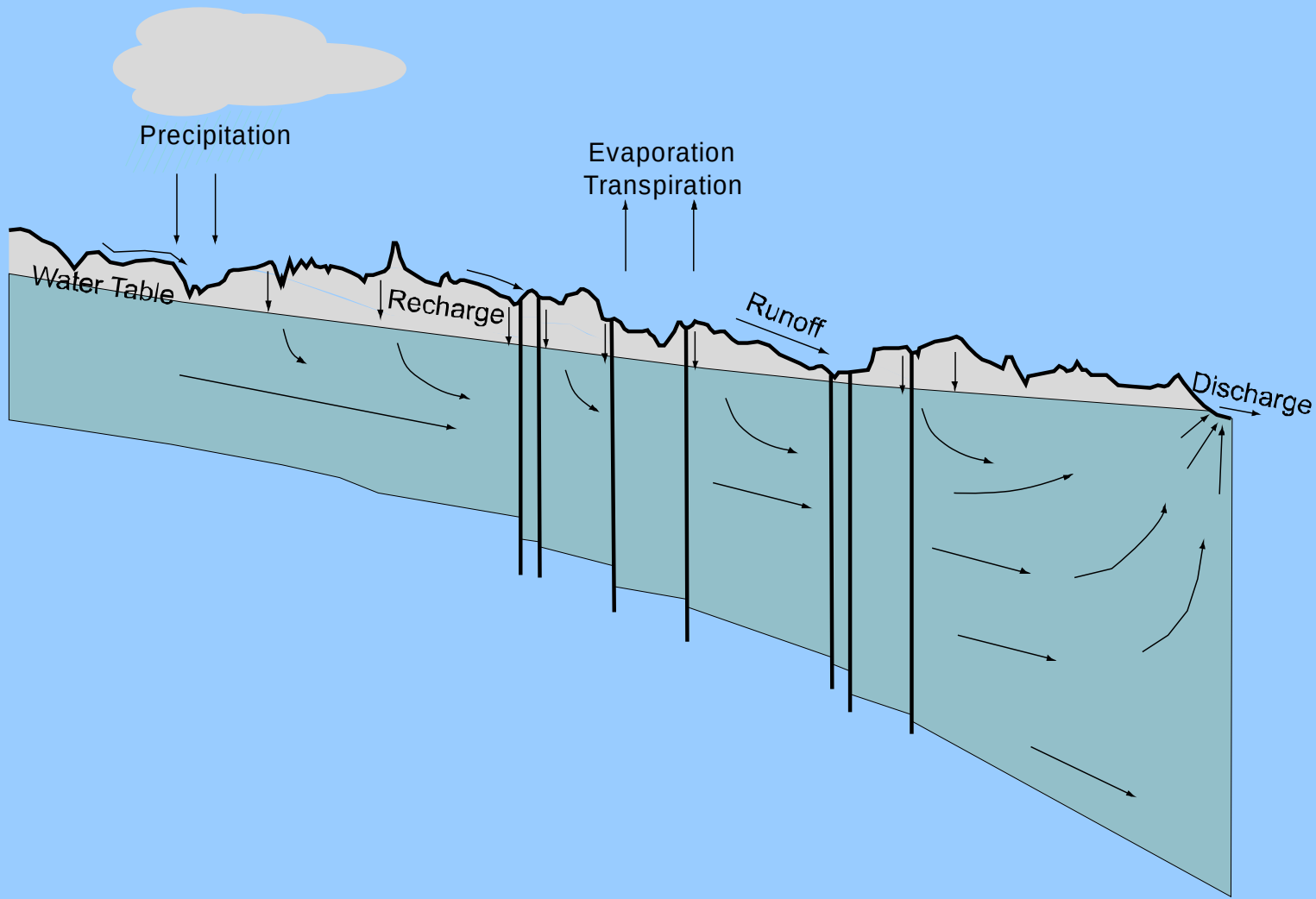
UPDATE ISSUES

- Meeting GAM standards
  - Map projection
  - Stress periods
- Adding Lower Trinity
  - Simulating Hammett Shale
- Adjust structure
- Redistribution of pumping
- Recharge distribution

INTRODUCTION TO GROUNDWATER FLOW MODELING

WHAT IS AN AQUIFER?

- Rock or sediment from which usable amounts of water can be extracted



HYDROLOGIC CYCLE

WHY ARE GROUNDWATER FLOW MODELS NEEDED?

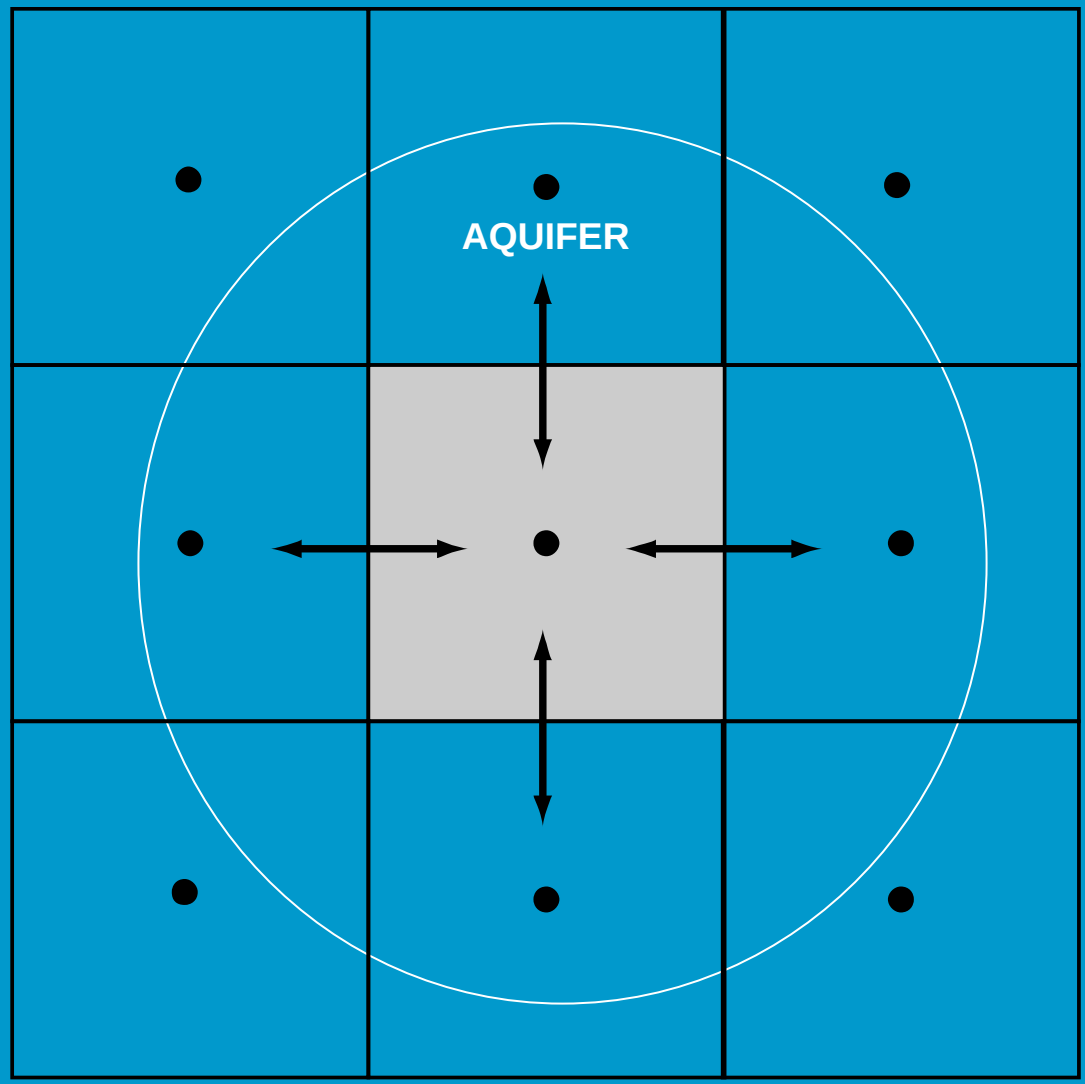
- Groundwater flow is difficult to observe
- Aquifers are typically complex in terms of spatial extent and hydrogeological characteristics
- Means of integrating available data for prediction of groundwater flow

GROUNDWATER FLOW MODELING

- Mathematical representation of an aquifer
- Uses basic laws of physics that govern groundwater flow
- Calculates the hydraulic head at discrete locations (grid)
- Calculated model heads can be compared to hydraulic heads measured in wells

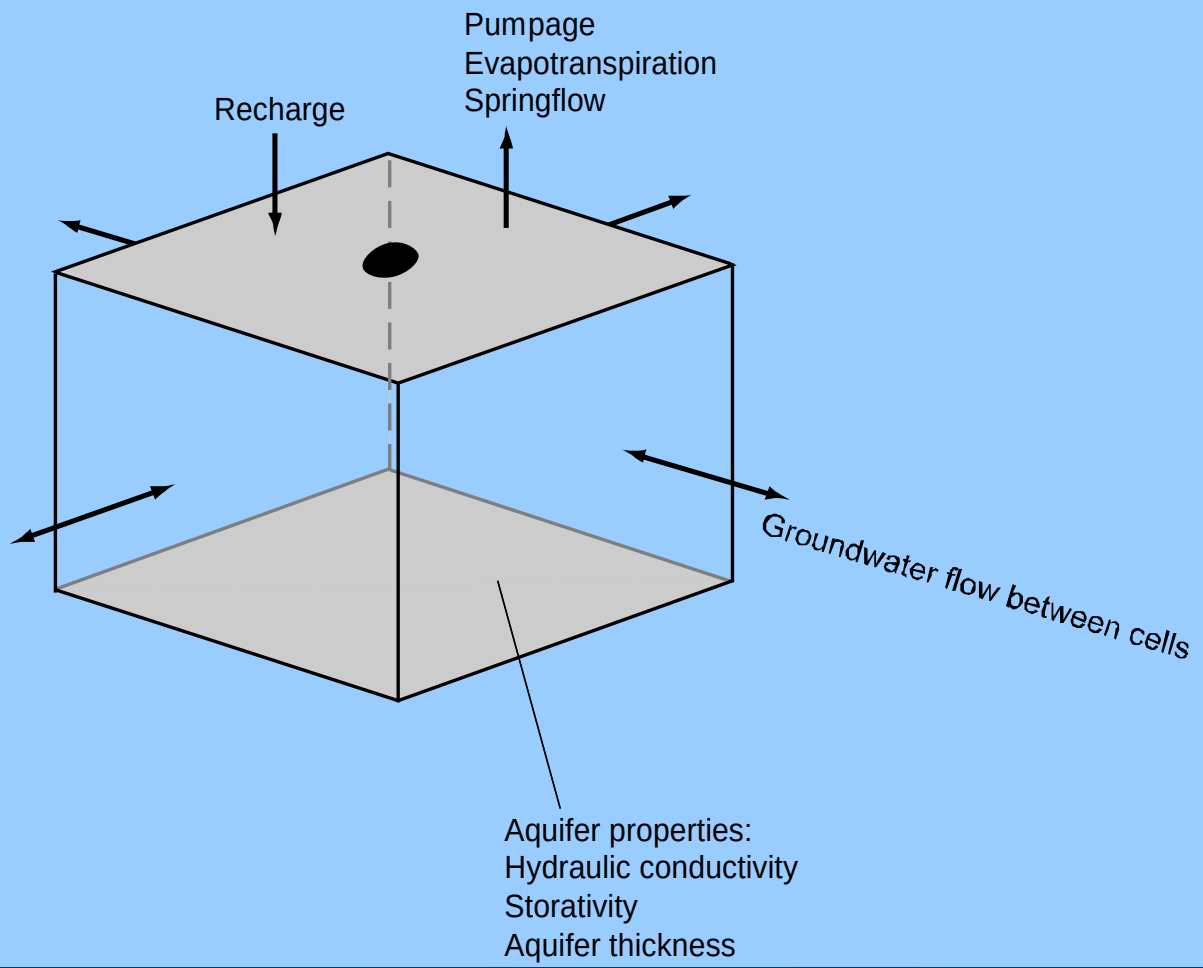
MODEL INPUT DATA

- Geology
  - Stratigraphy
  - Structure
- Water levels
- Surface water
  - Spring discharge
  - Stream discharge
- Aquifer properties
- Water use



MODEL CELL

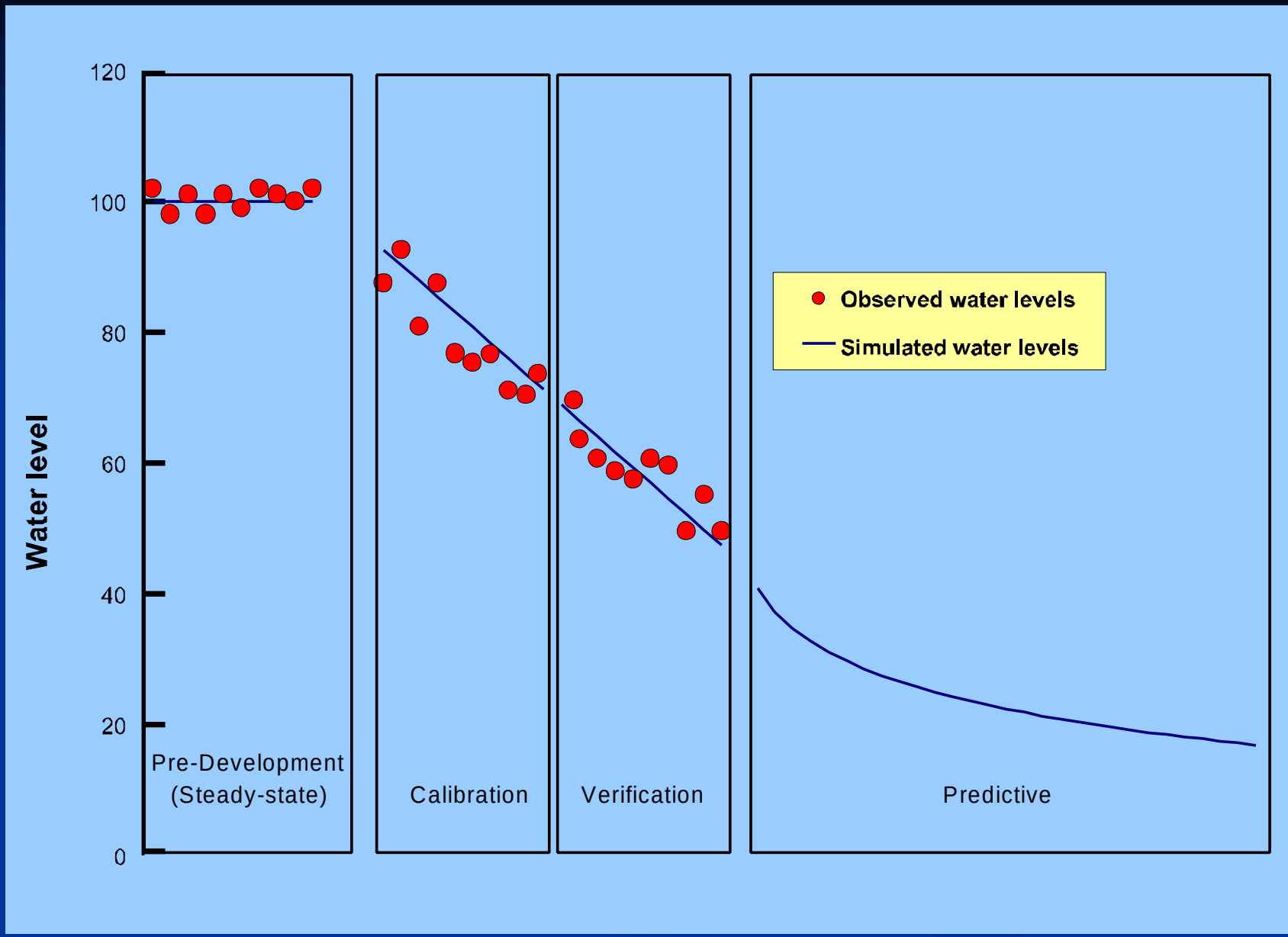
Hydraulic head calculated by balancing water inflows and outflows



MODEL CELL

MODELING PROCESS

- Define model objectives
- Develop conceptual model
- Design model
- Calibration and verification modeling
  - Comparison with observed data
- Predictive modeling
  - Predict impacts of projected pumping
    - 2000 - 2050



MODEL PERIODS

MODEL LIMITATIONS

- Approximation of the real system
  - Regional scale
- Uncertainty in the input data
  - Grid resolution
  - Incomplete data

PURPOSE OF THE TRINITY MODEL

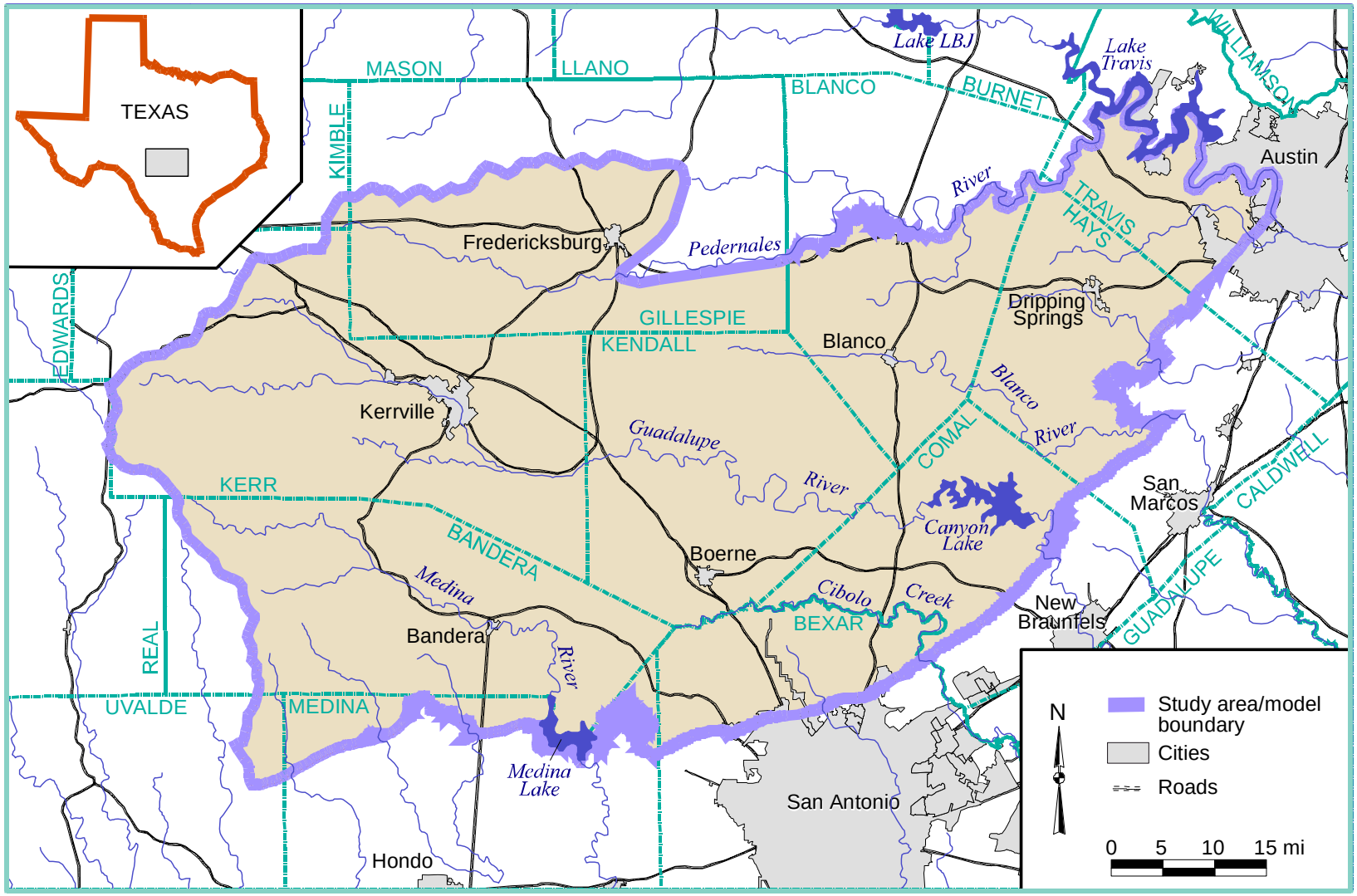
- **A tool to evaluate water-management strategies.**
- **Predict water-level declines under drought-of-record conditions.**

INTRODUCTION TO THE TRINITY-HILL COUNTRY GROUNDWATER AVAILABILITY MODEL

THE MODEL AT A GLANCE

- Hill Country area.
- Includes: (1) Edwards Group in plateau,
  (2) Upper Trinity aquifer,
  (3) Middle Trinity aquifer.
  (4) Lower Trinity aquifer.
- Considers geology, recharge, rivers, and pumping.

STUDY AREA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San Marcos
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BANDERA
Boerne
Medina
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Creek
BEXAR
New Braunfels
GUADALUPE
Bandera
River
REAL
UVALDE
MEDINA
Medina Lake
San Antonio
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Study area/model boundary
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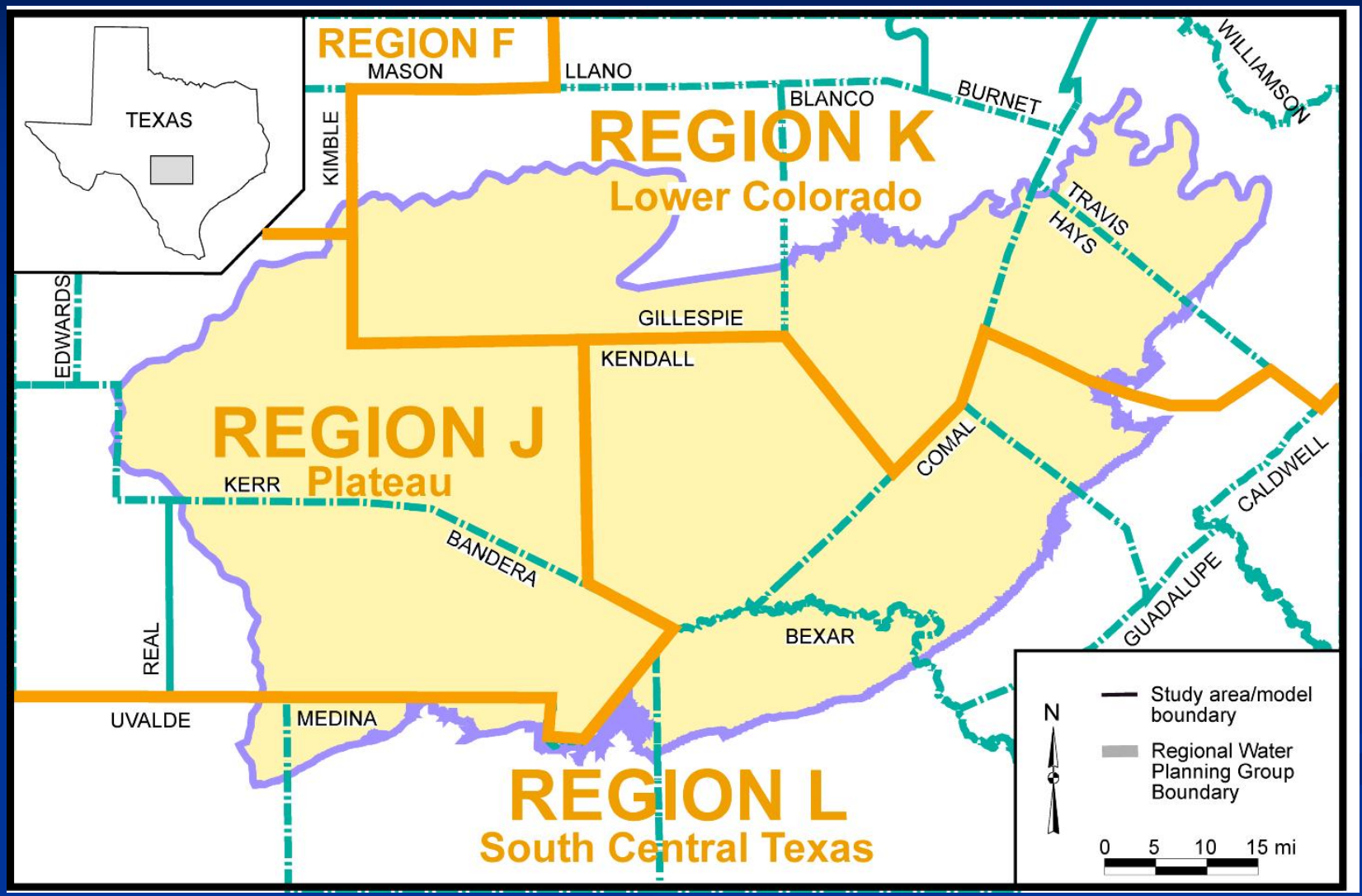
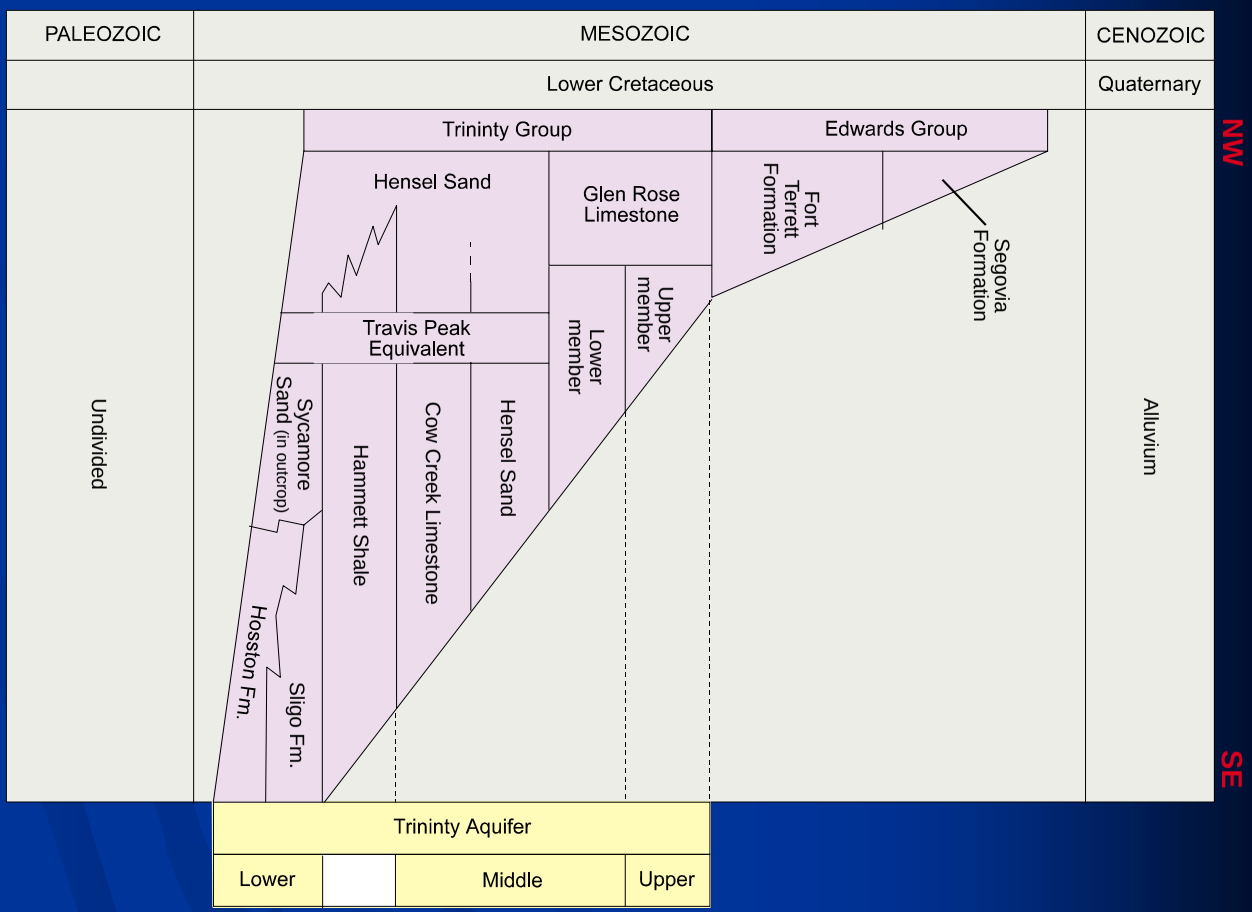
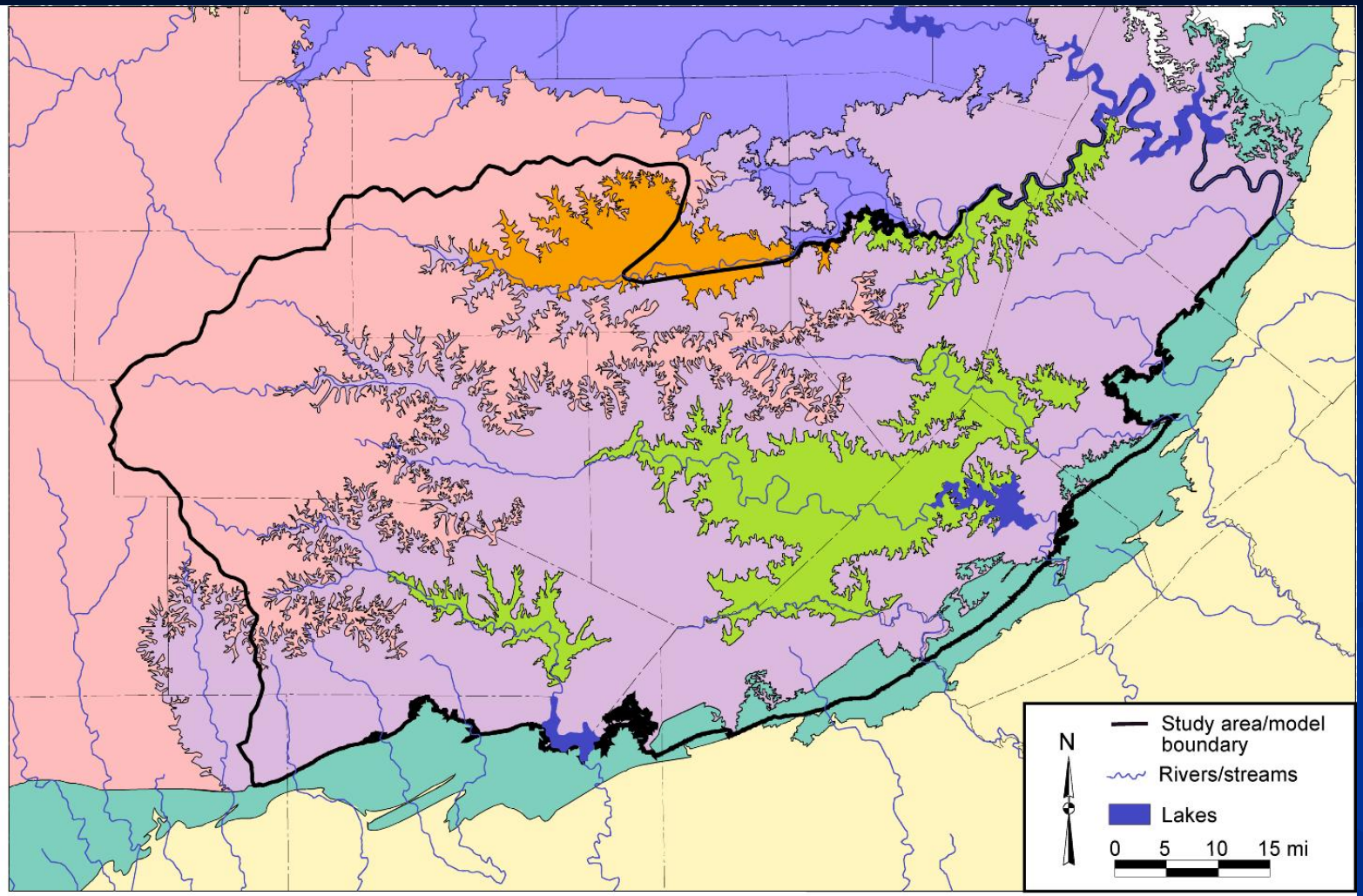
REGIONAL WATER PLANNING GROUPS



hydrostratigraphy

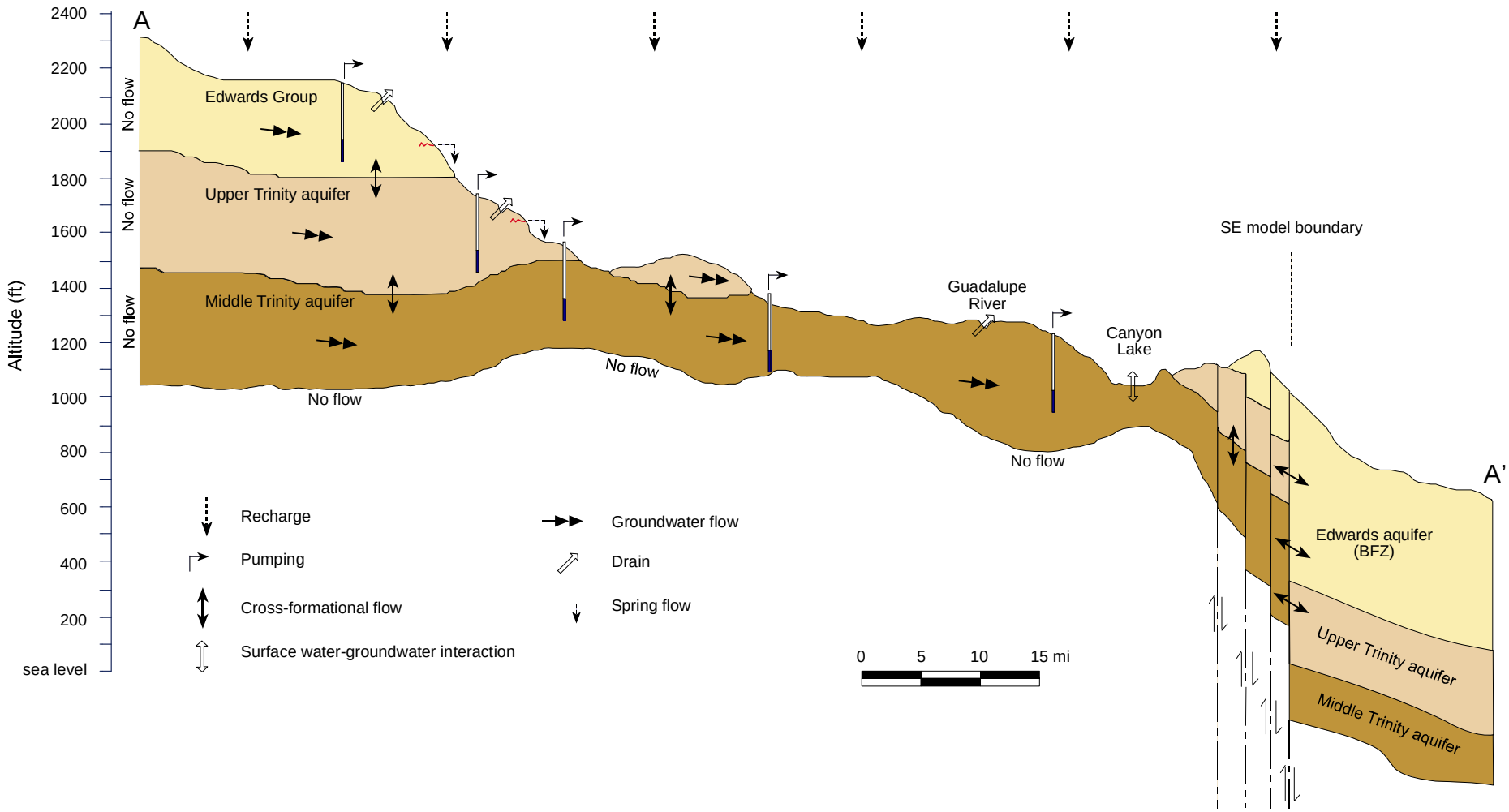


surface geology

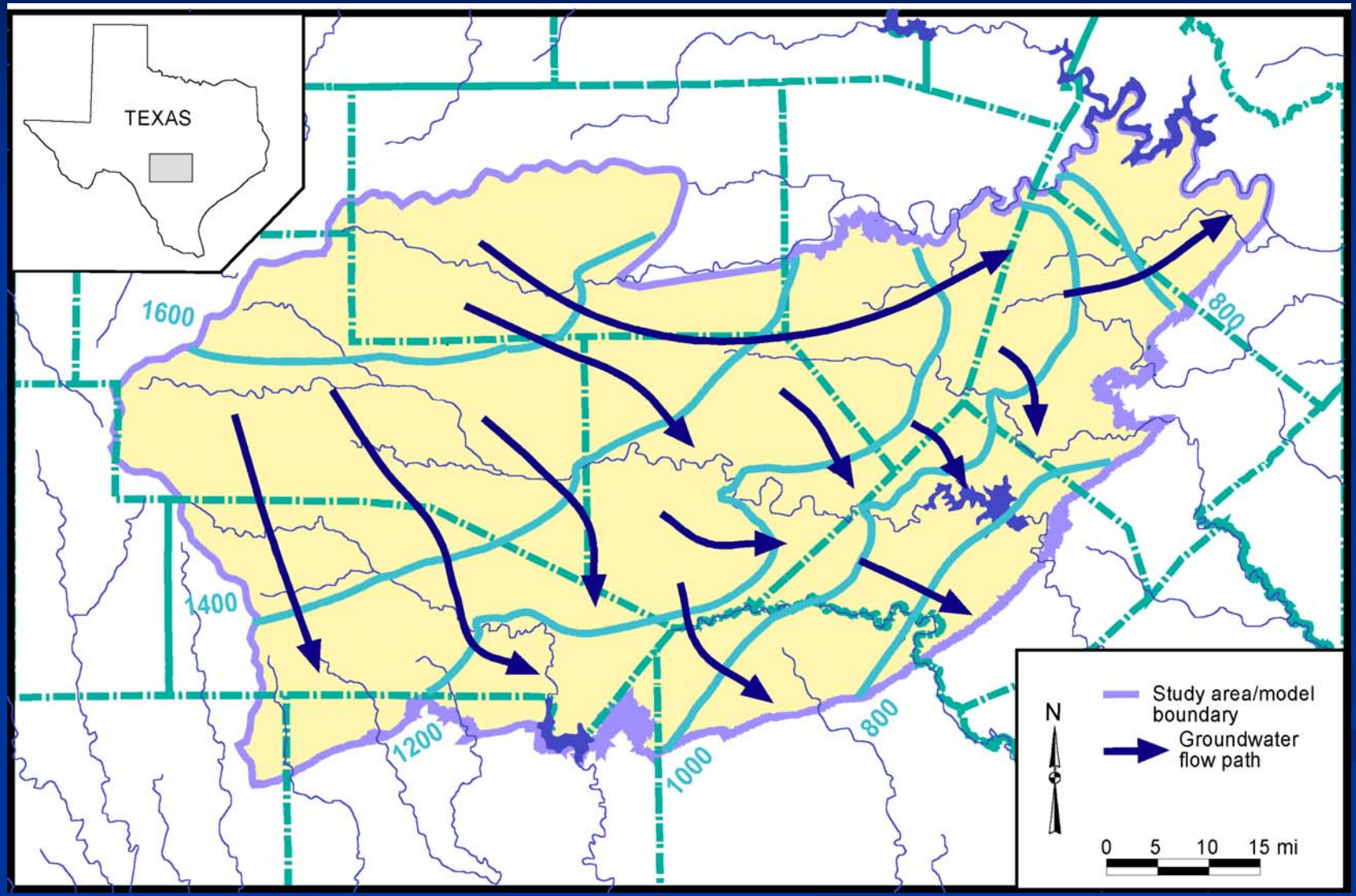


- Sediments younger than Edwards Group
- Edwards Group (BFZ)
- Edwards Group (Plateau)
- Upper member of the Glen Rose Limestone
- Lower member of the Glen Rose Limestone
- Hensel Sand
- Sediments older than the Hensel Sand

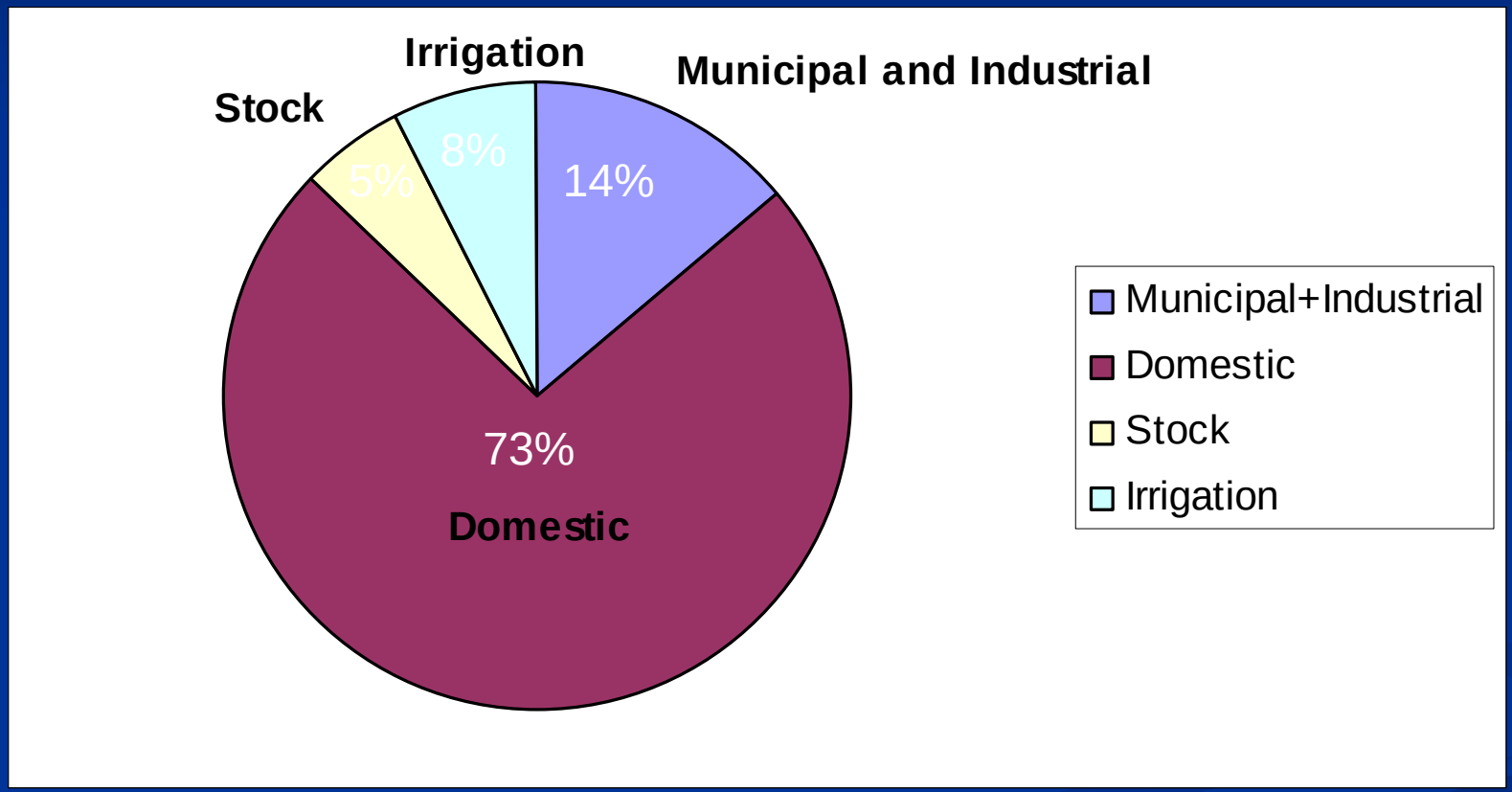
CROSS-SECTION



GROUNDWATER FLOW PATHS

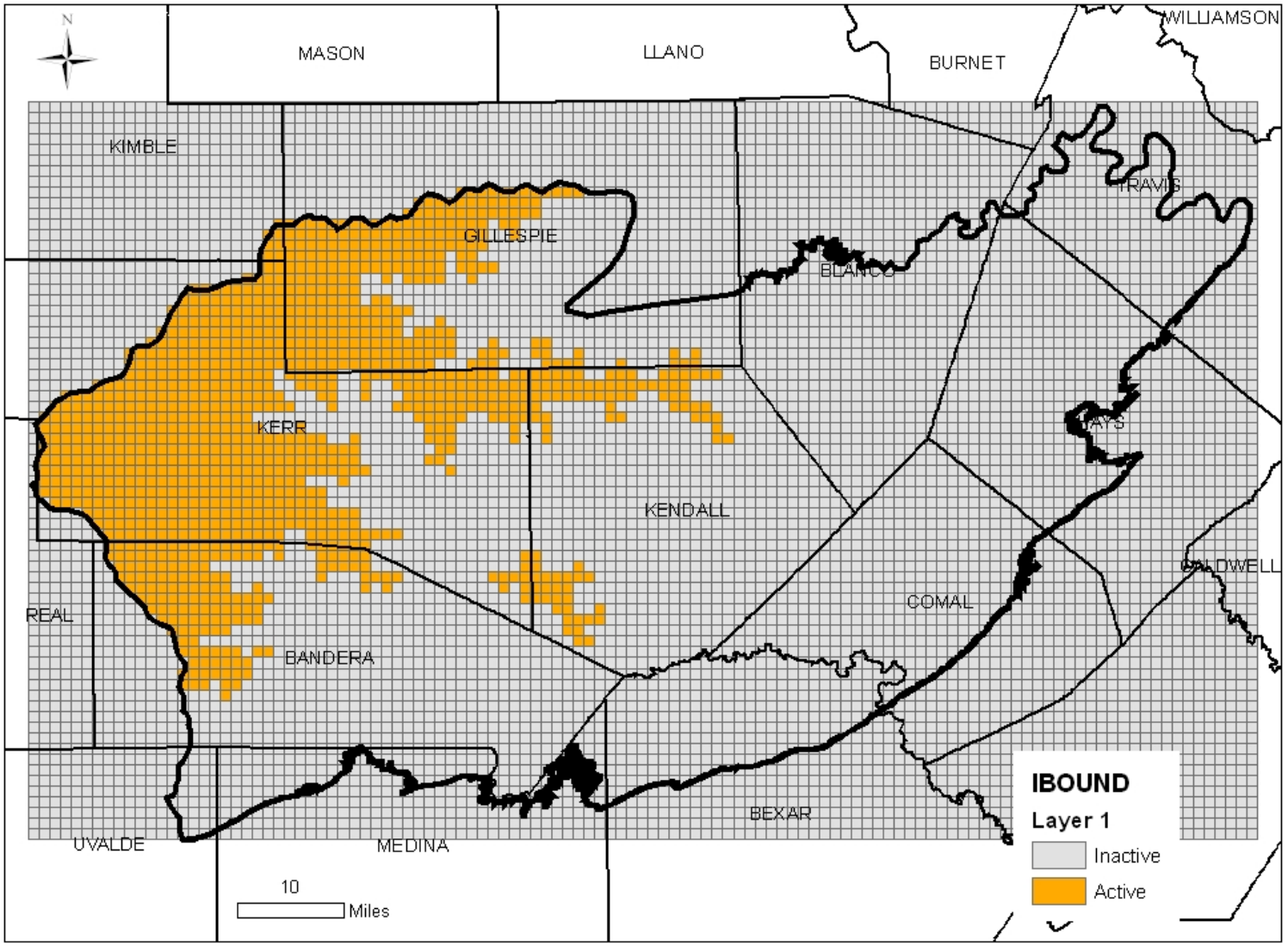


1997 PUMPING BY USE CATEGORIES



EXISTING MODEL

MODEL GRID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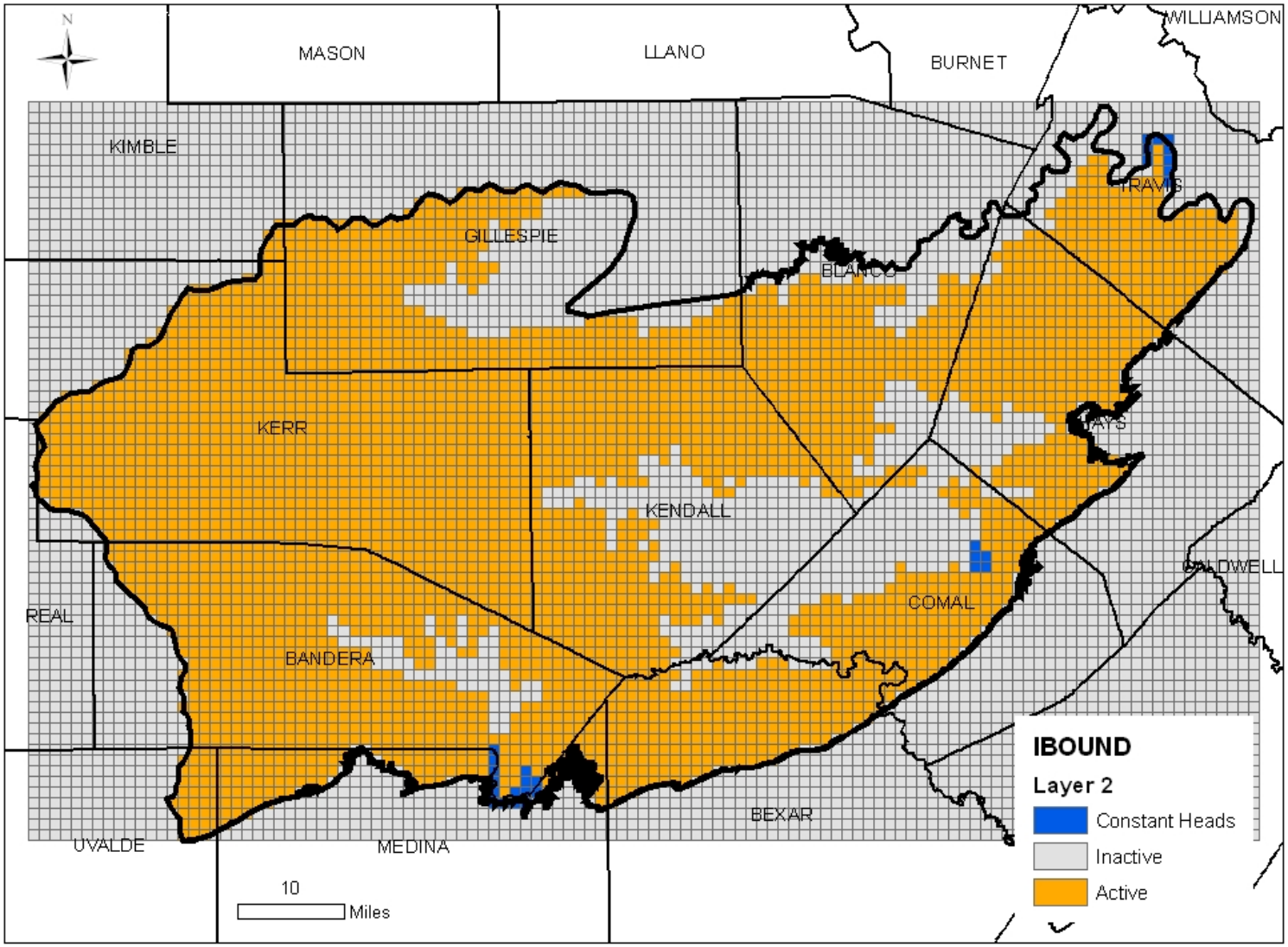
MODEL GRID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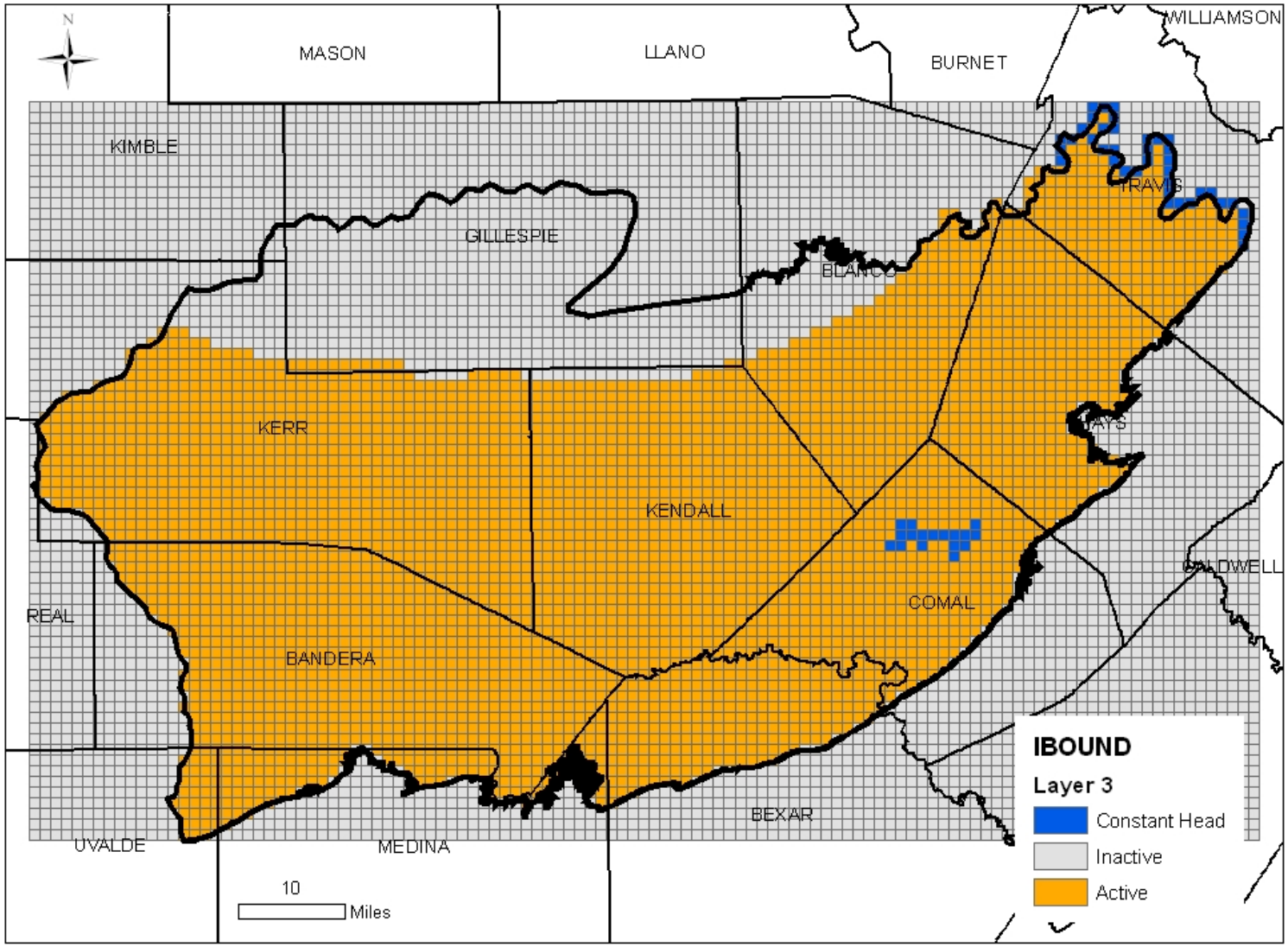
MODEL GRID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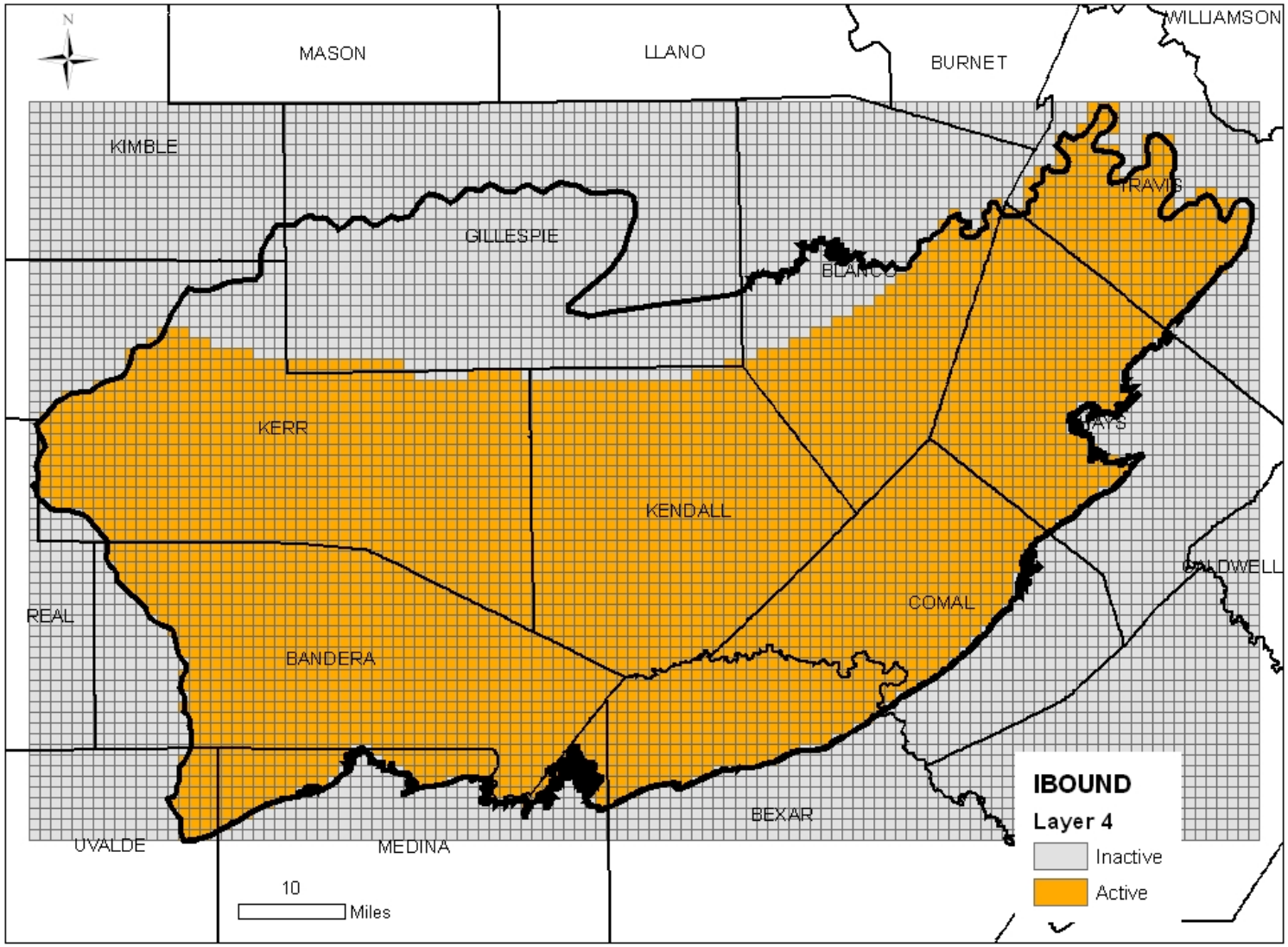
MODEL GRID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ADDITIONAL PARAMETERS

- Structural geology
- Hydraulic conductivity
- Specific storage/Specific yield
- Streams (Drains)
- General Head Boundary
- Stress periods
- Recharge distribution

GAM SCHEDULE

TENTATIVE SCHEDULE

2005

- SAF Meeting 1 — Jun. — Conceptual model
- Jul. — Model design
- SAF Meeting 2 — Aug. — Calibrate steady-state model
- SAF Meeting 3 — Sep. — Calibrate transient model
- SAF Meeting 4 — Oct. — Complete model predictions
- Nov. — Prepare draft report
- Dec. — Present SAF Model Seminar
- Deliver Final Product

SAF INPUT NEEDED

- Data
  - Pump test results
  - Water-level
  - Spring flow
  - Structural
- Insights
  - How the aquifer works
  - Model assumptions


TEXAS WATER DEVELOPMENT BOARD

Trinity Hill Country Aquifer
Groundwater Availability Model
Stakeholder Advisory Forum 1
June 7, 2005 - Boerne, Texas
List of Attendees

	Name	Affiliation
1	John C. Kight	Region K
2	Jack Hollon	Hays Trinity Groundwater Conservation District
3	Joe C. Day	Hays Trinity Groundwater Conservation District
4	Jerry Day	San Geronimo Watershed Alliance
5	Richard Connors	Bandera County River Authority and Groundwater District
6	Wayne Tschirhart	Guadalupe-Blanco River Authority
7	David Jeffery	Bandera County River Authority and Groundwater District
8	Mary Sahs	Sahs & Associates
9	Liz Ferrer	Sahs & Associates
10	George Ozuna	U.S. Geological Survey
11	John Waugh	San Antonio Water System
12	Fred Bartel	Kendall County Water Council
13	Abiy Berehe	Texas Commission on Environmental Quality
14	Paul Siemers	Kerr County
15	Jim Hannah	Bandera County River Authority and Groundwater District
16	Micah Voulgaris	Cow Creek Groundwater Conservation District
17	Ron Fieseler	Blanco-Perdernales Groundwater Conservation District
18	Paul Tybor	Hill Country Underground Water Conservation District
19	W. Feathergail Wilson	Strata Geol. Service
20	Gene Williams	Headwaters Groundwater Conservation District
21	Marshall Reeder	Trinity Glen Rose Groundwater Conservation District
22	Robert Mace	Texas Water Development Board
23	Ian Jones	Texas Water Development Board

Groundwater Resources Division

1. **Purpose of meeting**: Trinity-Hill Country Groundwater Availability Model Stakeholder Advisory Forum
2. **Date and location of meeting**: June 7, 2005
3. **TWDB staff in attendance**: Ian Jones, Robert Mace
4. **Senators/Representatives/other VIPs in attendance**: None
5. **Who was in attendance (non-TWDB staff):** See below
6. **Meeting report filed by:** Ian Jones
7. **Date of meeting report filing:** June 9, 2005
8. **Meeting report location and filename:** S:\PLANNING\Meeting Report\GwR_meeting_reports\2005\060705 Jones THC SAF1.doc
9. **Agenda/Outcomes/Comments:**

The first Stakeholder Advisory Forum (SAF) for the updated Trinity-Hill Country Groundwater Availability Model (GAM) was held at the Kendall County Historic Courthouse in Boerne, Texas, on June 7, 2005. Topics covered during the meeting were the work to be done to update the model, an overview of groundwater modeling, the hydrogeology of the Trinity-Hill Country aquifer, and the tentative work schedule. We plan to update the model to meet GAM standards, add the Lower Trinity aquifer to the model, make adjustments to the structure of the existing layers, and redistribute recharge and pumping. According to the present tentative work schedule, work to update the model, including the report, may be completed by the end of 2005.

During the meeting, stakeholders asked several questions pertaining to various aspects of the model. The following is a synopsis of stakeholder questions and comments (**bold**) and our responses (*italics*).

- **How will the Hammett Shale be simulated?** *We will simulate the Hammett Shale using the vertical hydraulic conductivity for groundwater flow between the Middle and Lower Trinity aquifers. Vertical hydraulic conductivity values will be determined through the model calibration process.*
- **Would model efforts by groundwater conservation districts (GCDs) duplicate work done on GAM?** *Modeling efforts by GCDs will likely supplement work done on GAM. The GAMs developed by the TWDB are regional-scale models designed to give a "big picture" view of aquifer responses to projected pumping and drought. Sometimes GCDs need to address local-scale issues within their boundaries that would be better addressed using local-scale models.*
- **How well does the model simulate Jacob's well spring?** *We will check on that.*

- **A stakeholder noted that Bexar Met Water District is looking at pumping 15,000 acre-feet per year in northern Bexar County.** *We will check to see whether that pumping is included in the projected pumping in the model.*
- **A stakeholder has observed groundwater flow to the north near the Haby Crossing Fault.** *When we run the model we will try to simulate this but there is the possibility that northward groundwater flow in that part of the aquifer may be a local-scale issue that can not be replicated in a regional-scale model.*
- **New pumping test information.** *We are interested in incorporating into the model any pumping test data that GCDs or other entities have collected.*
- **Stakeholder had questions related to how well the model predicted future aquifer responses.** *Model uncertainty is related to uncertainty in input parameters, pumping projections, and climate assumptions. The uncertainties increase into the future. We plan to study model uncertainty in the future.*
- **LBG-Guyton Associates did a Lower Trinity aquifer study for regional water planning groups in the model area.** *We will review these study reports and incorporate applicable data.*
- **Need to look for recharge data related to Cibolo Creek in the Trinity Glen Rose GCD groundwater management plan.** *We will attempt to acquire a copy of this report and incorporate the applicable data.*
- **What are the sources of structural geology data.** We obtain structural geology data from different sources including previous studies, geophysical logs, and drillers' logs.

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2	Ian Jones	TWDB
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