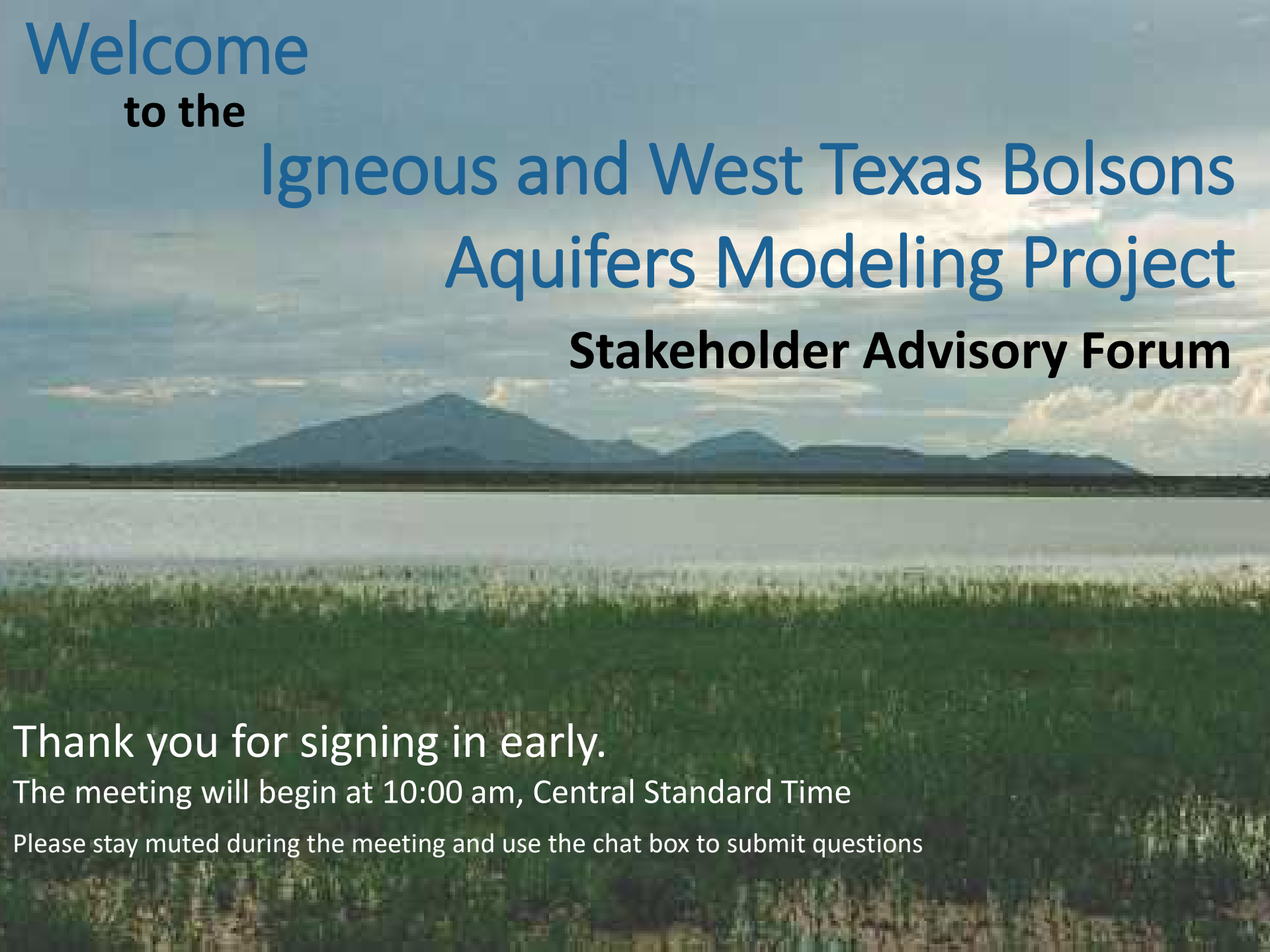


Welcome
to the
Igneous and West Texas Bolsons Aquifers Modeling Project
Stakeholder Advisory Forum

Thank you for signing in early.

The meeting will begin at 10:00 am, Central Standard Time

Please stay muted during the meeting and use the chat box to submit questions

Meeting Information

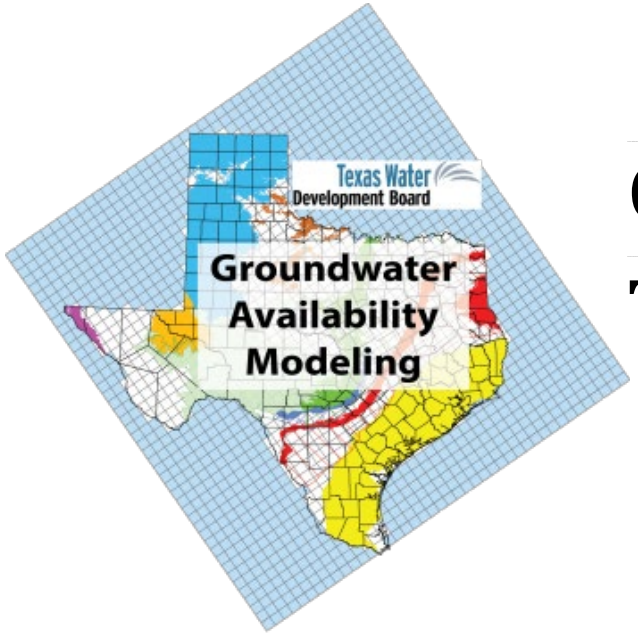
- An audio and video recording of the meeting, presentation, and the report summarizing the meeting will be made available on the project's TWDB website

- https://www.twdb.texas.gov/groundwater/models/gam/wtbi/wtbi.asp

Outline

- Groundwater Availability Modeling program
- Basic terminology of groundwater flow
- Igneous and West Texas Bolsons aquifers
- Groundwater modeling process
- Data collection
- Project schedule

Texas Water Development Board (TWDB) Groundwater Modeling (GAM) Program



Groundwater Modeling Program

Texas Water Development Board

What is the Texas Water Development Board?

Not regulatory agency like Texas Commission on Environmental Quality.

Science: Groundwater, surface water, innovative water technology, conservation, education, flooding.

Planning: Assist with regional planning and state planning (drought and flood plans)

Funding: We assist with implementing water projects with funding

Groundwater Modeling (GAM) Program

Aim: Develop groundwater flow models for the major and minor aquifers of Texas.

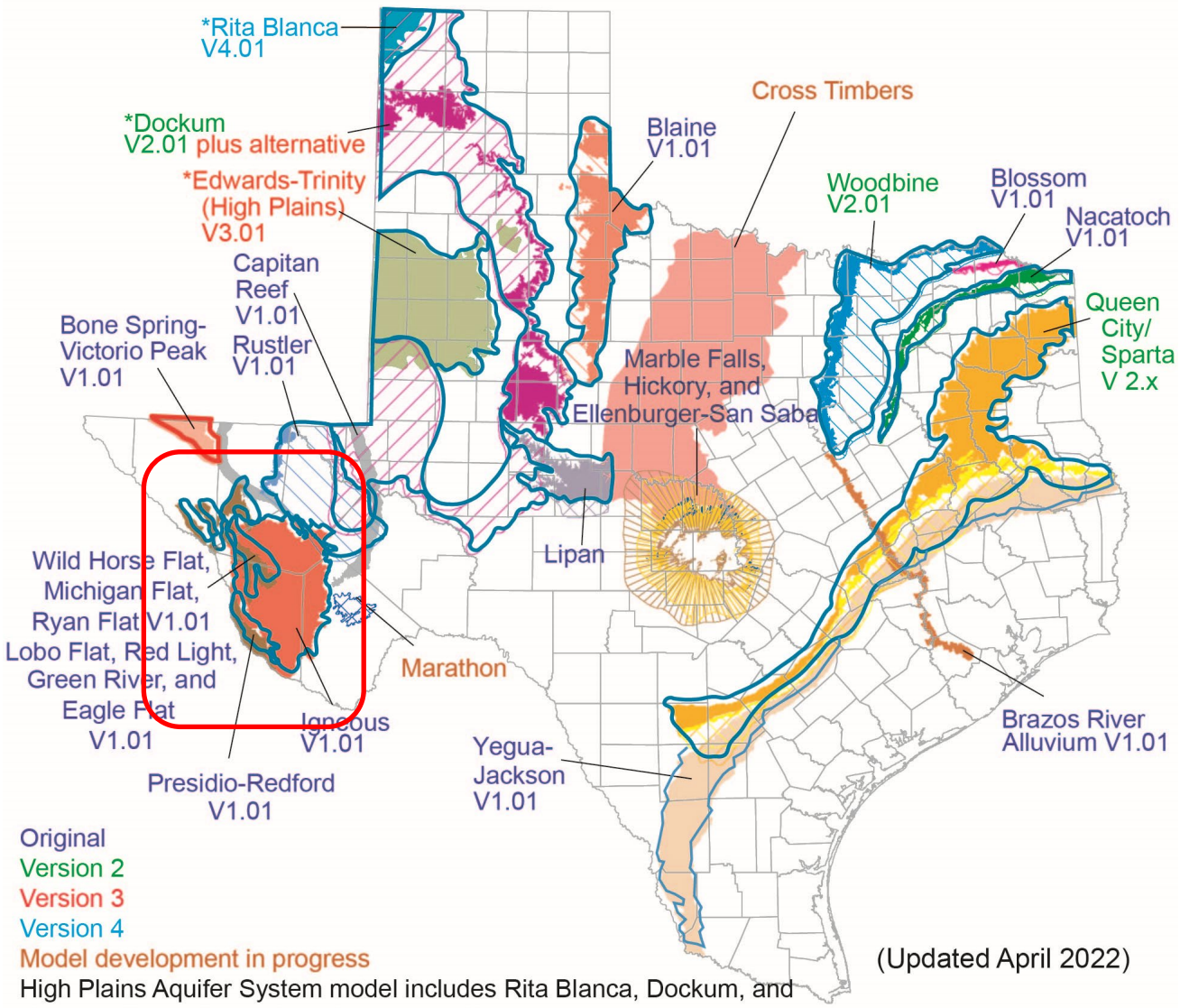
Purpose: Tools that can be used to aid in groundwater resources management by stakeholders.

Public process: Stakeholder involvement during model development process.

Models: Freely available, standardized, thoroughly documented. Reports, data, models are available for download from TWDB download page for models.

Living tools: Periodically updated.

GAMs for Minor Aquifers



High Plains Aquifer System model includes Rita Blanca, Dockum, and Edwards-Trinity (High Plains) minor aquifers

Why Stakeholder Advisory Forums?

Keep stakeholders updated about progress of the modeling project

Inform how the groundwater model can, should, and should not be used

Provide stakeholders with the opportunity to provide input and data to assist with model development

Contact Information

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Daryn Hardwick, Ph.D.

Manager of Groundwater Modeling Department

512-475-0470

daryn.hardwick@twdb.texas.gov

Texas Water Development Board

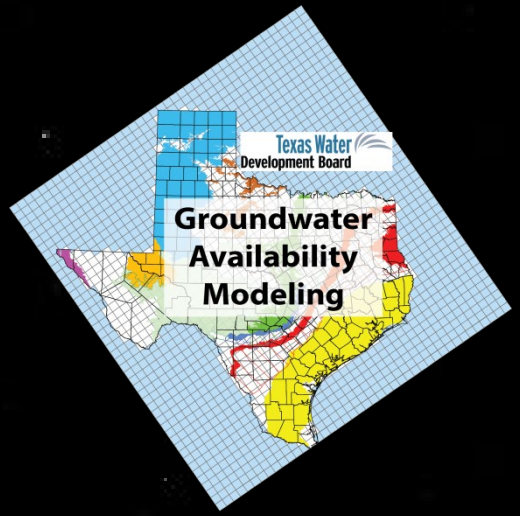
P.O. Box 13231

Austin, Texas 78711-3231

Web information:

https://www.twdb.texas.gov/groundwater/models/gam/wtbi/wtbi.asp

Igneous and West Texas Bolsons Aquifers



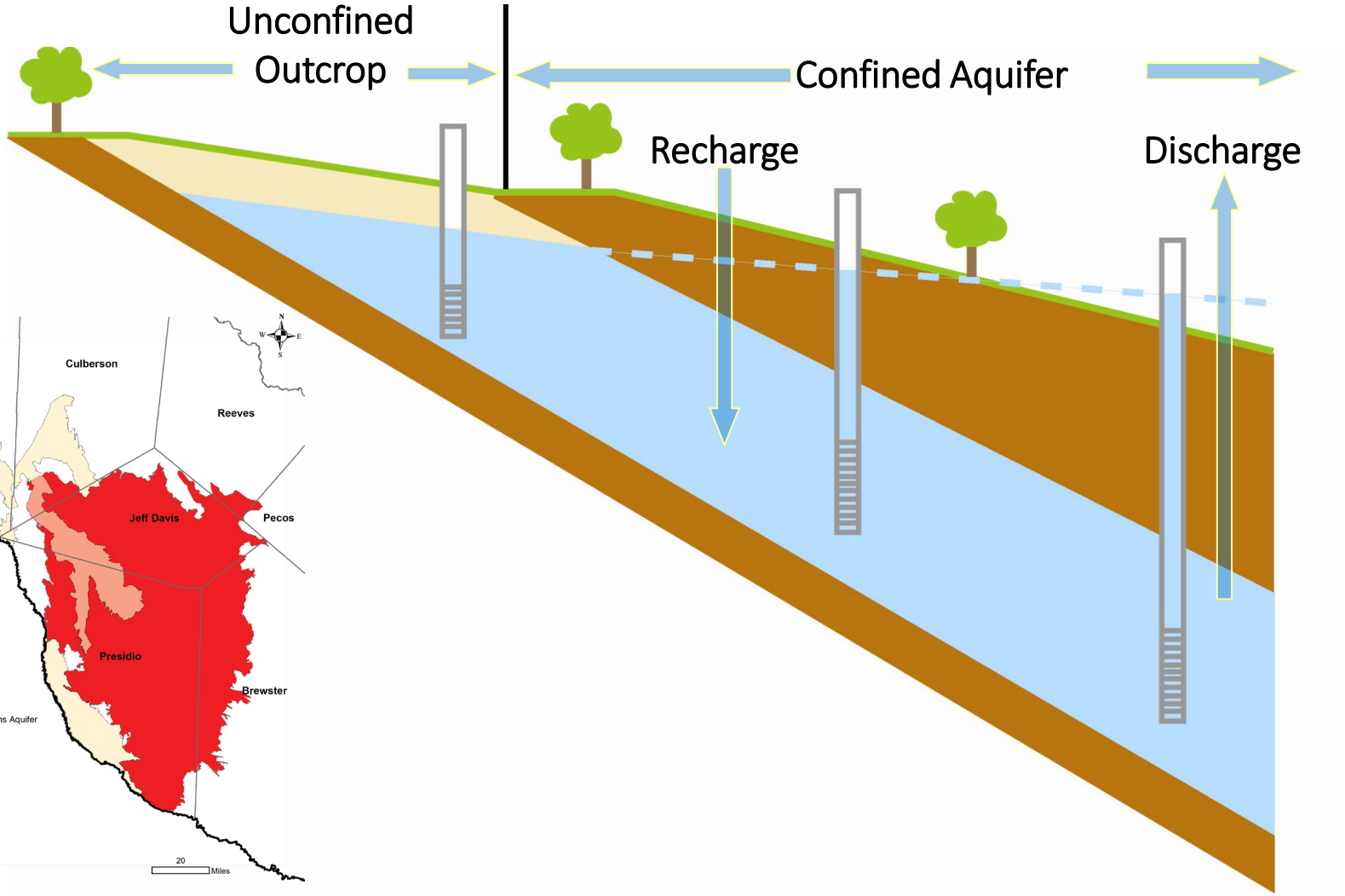
Ian Jones, Ph.D., P.G.

January 19, 2023

BASICS OF GROUNDWATER FLOW

Ryan Flat

Confined/Unconfined Aquifer



Hydrogeology Terminology

Aquifer: Geologic unit capable of transmitting useable amounts of groundwater to a well. **Unconfined** – water table is upper boundary. **Confined** – overlain by non-aquifer material, groundwater under pressure.

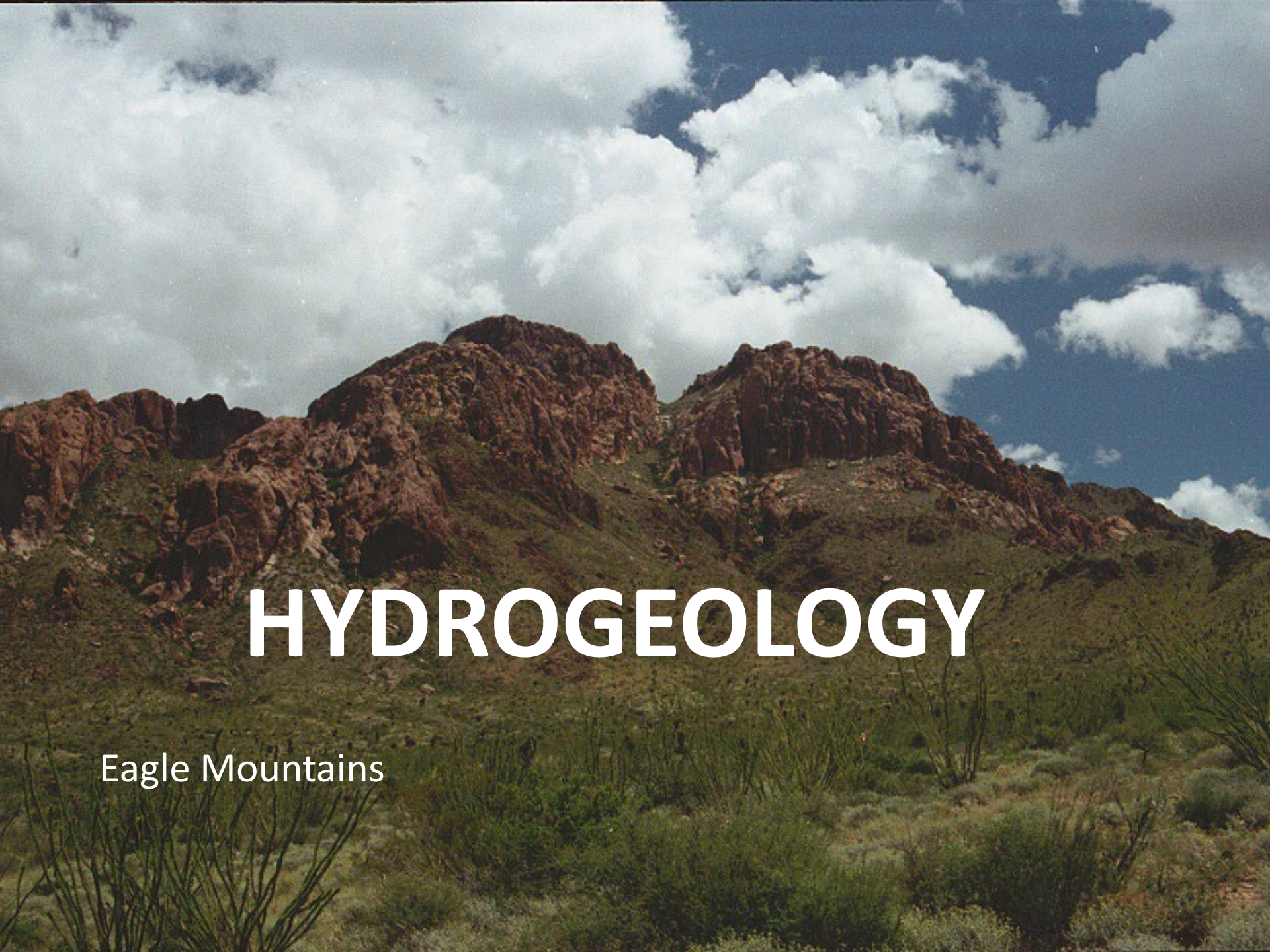
Water Table: Boundary between saturated (filled with water) and unsaturated zones (filled with air).

Hydraulic head: Water level in well expressed as an elevation

Hydraulic conductivity: A measure of the ability of material to transmit groundwater.

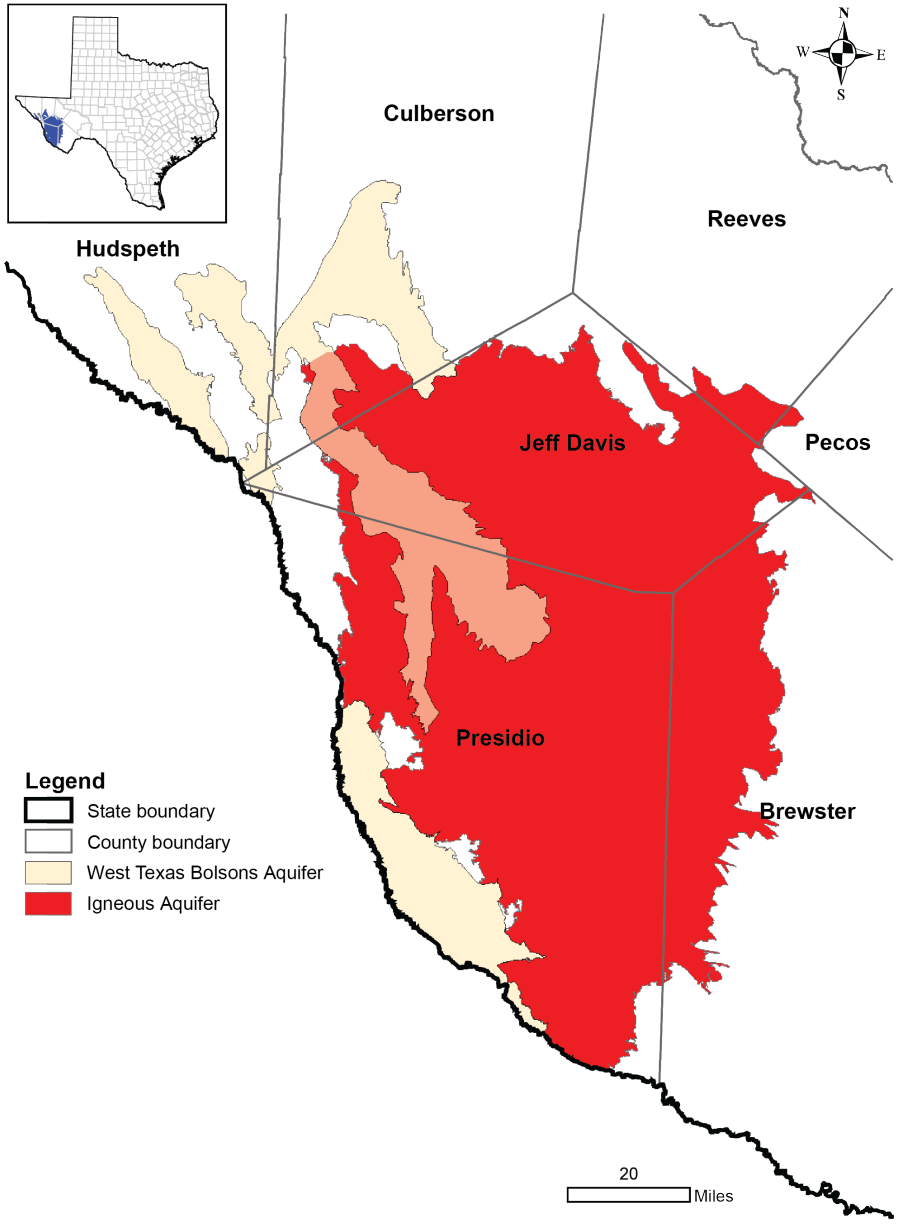
Recharge: The processes involved in water entering an aquifer. Examples, infiltration through the soil or from streams

Discharge: The processes involved in water leaving an aquifer. Examples, discharge from springs, pumping wells, discharge to streams.

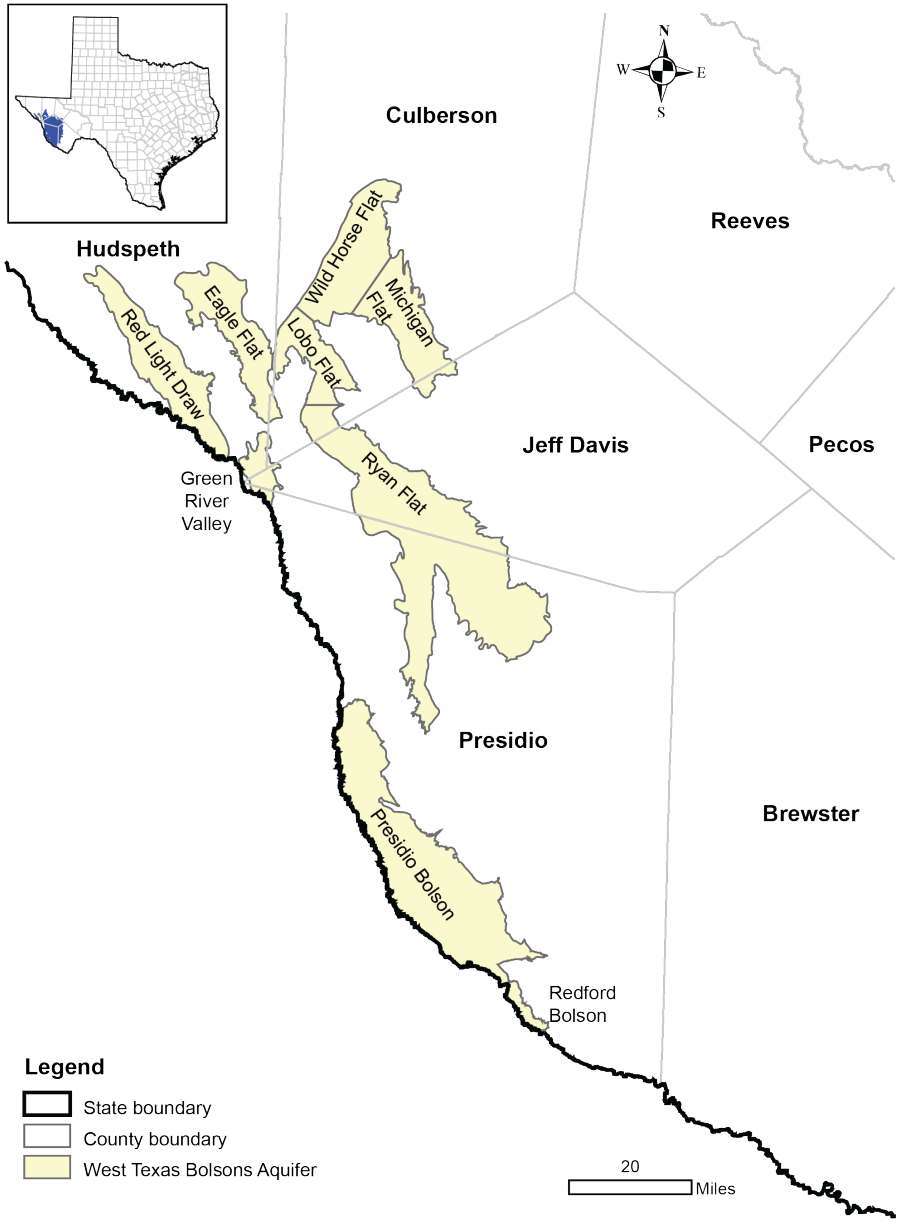


HYDROGEOLOGY

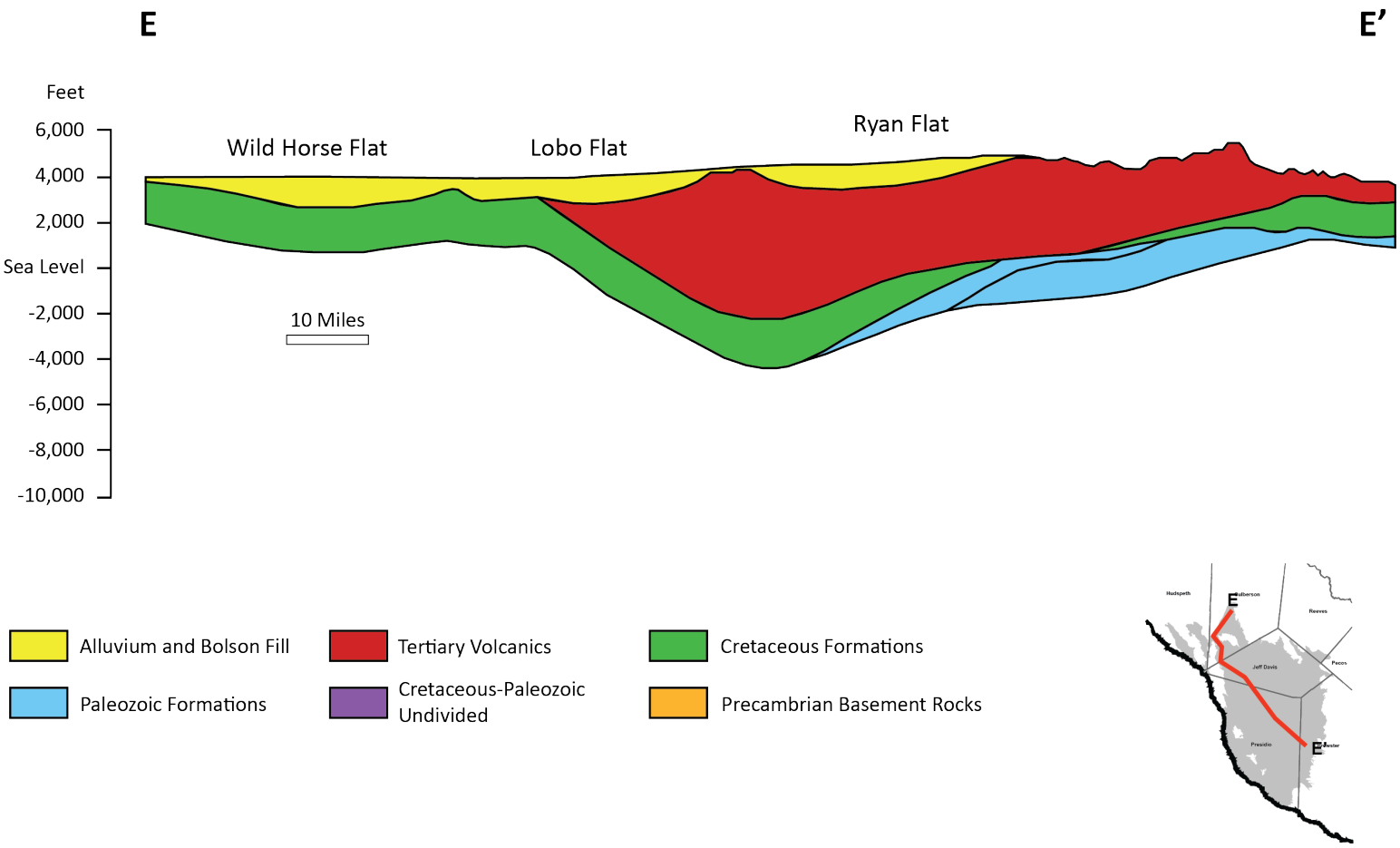
Eagle Mountains


N
W
E
S
Culberson
Reeves
Hudspeth
Jeff Davis
Pecos
Presidio
Brewster
Legend
State boundary
County boundary
West Texas Bolsons Aquifer
Igneous Aquifer
20
Miles

Era	System	Stratigraphic Units	
Cenozoic	Quaternary	Quaternary deposits	
		Windblown sand	
		Bolson deposits	
	Tertiary	Volcanic rocks undivided	Merrill Formation
		Intrusive Igneous rocks	Duff Formation/Decie Member
		Chambers Tuff	Sheep Pasture Formation
		Garren Group	Sleeping Lion Formation
		Tarantula Gravel	Frazier Canyon Formation
		Hogeye Tuff	Cottonwood Spring Basalt
		Trachyte Porphery	Bracks Rhyolite
		Upper Rhyolite	Adobe Canyon Formation
		Pantera Trachyte	Chambers Tuff
		Perdiz Conglomerate	Limpia Formation
		Petan Basalt	Potato Hill Andesite
		Tascotal Formation	Gomez Tuff
		Mitchell Mesa Welded Tuff	Star Mountain Rhyolite
		Brooks Mountain Formation	Crossen Trachyte
		Goat Canyon Formation	Sheep Canyon Basalt
		Medley Formation	Pruett Formation
		Wild Cherry Formation	Huelster Formation
		Eppenauer Ranch Formation	Buckshot Ignimbrite
		Mount Locke Formation	Colmena Tuff
		Barrel Springs Formation	Gill Breccia
		Capote Mountain Tuff	
Mesozoic	Cretaceous	Cretaceous undivided	Benevides Formation
		Buda Limestone	Finlay Limestone
		Boracho Formation	Cox Sandstone
		San Martine Limestone Member	Bluff Mesa Formation
		Levinson Limestone Member	Yucca Formation
		Eagle Mountain Sandstone	Etholean Conglomerate
		Espy Limestone	Torcer Formation
	Jurassic	Malone Formation	
Paleozoic	Permian	Hueco Limestone	
Precambrian	Precambrian	Carrizo Mountain Group	
		Precambrian bedrock undivided	



West Texas Bolsons Aquifer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Feet
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4,000
2,000
Sea Level
-2,000
-4,000
-6,000
-8,000
-10,000
Wild Horse Flat
Lobo Flat
Ryan Flat
10 Miles
Alluvium and Bolson Fill
Tertiary Volcanics
Cretaceous Formations
Paleozoic Formations
Cretaceous-Paleozoic Undivided
Precambrian Basement Rocks
Hudspeth
Culberson
Reeves
Jeff Davis
Pecos
Presidio
Brewster
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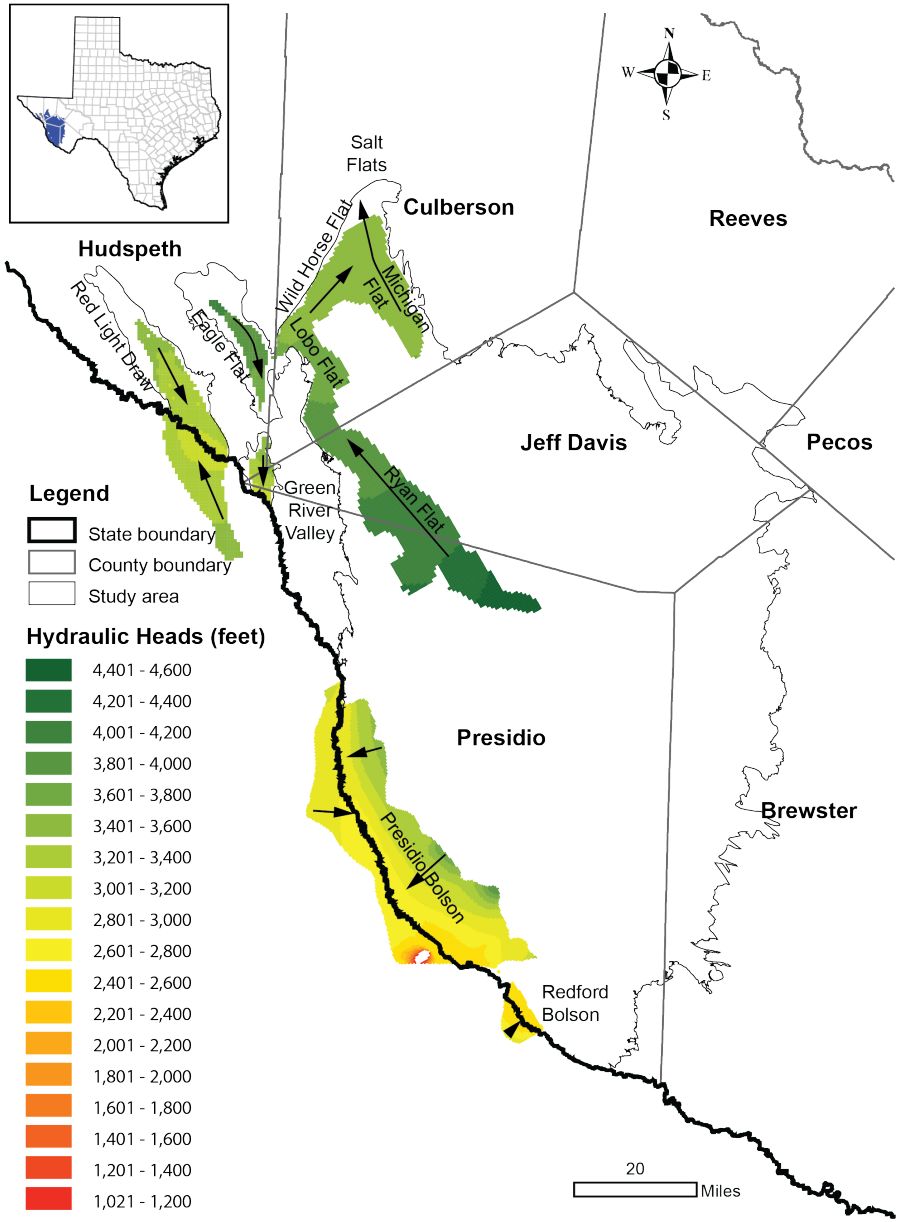
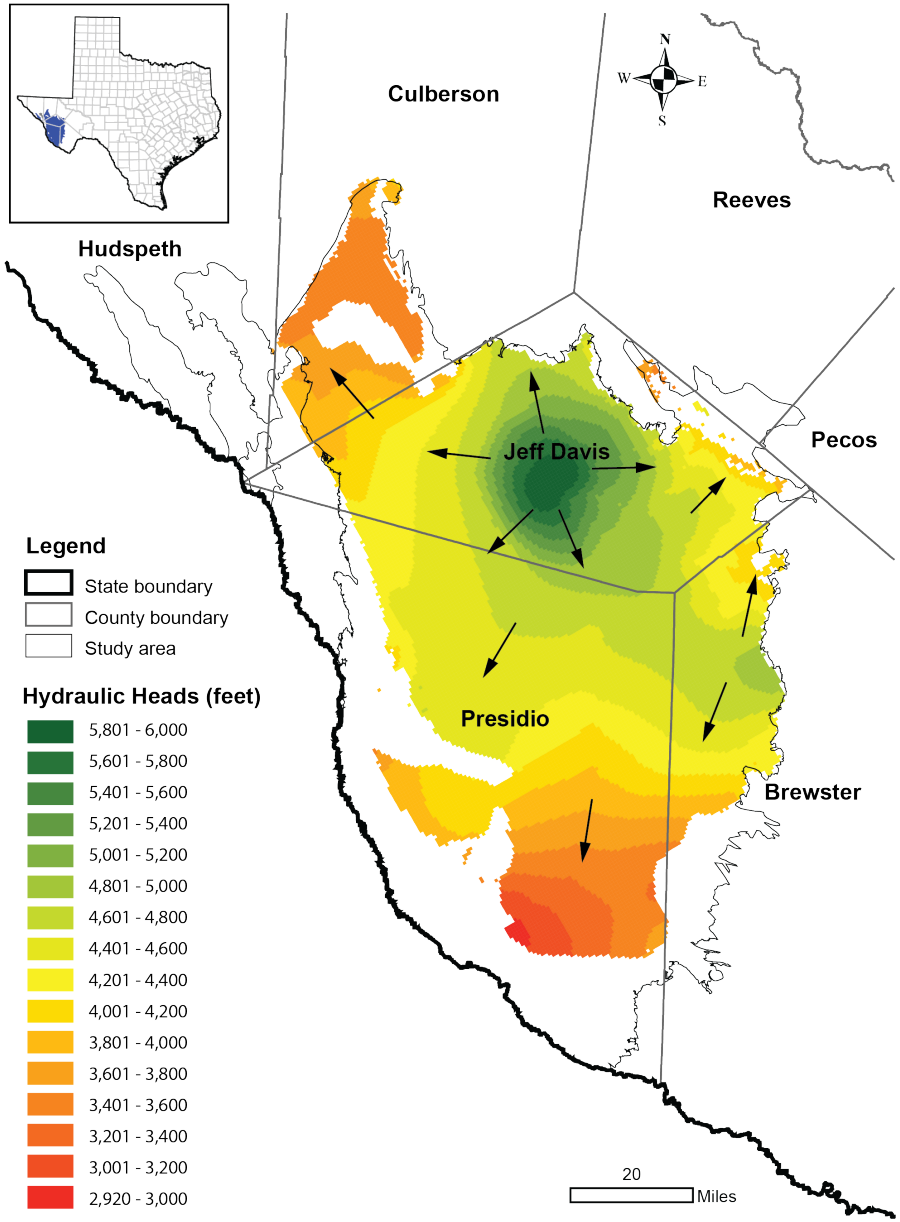
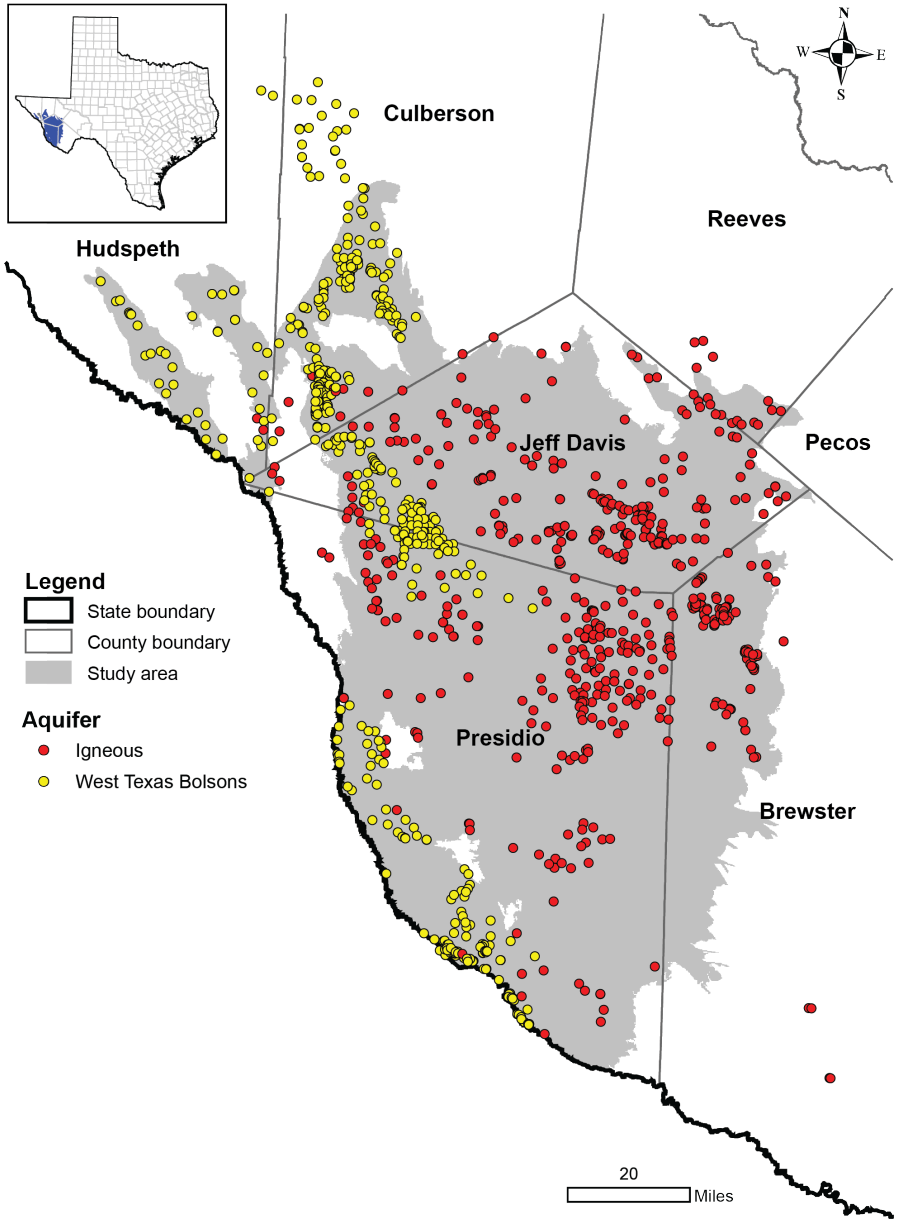


West Texas Bolsons Aquifer



Igneous Aquifer


Culberson
Hudspeth
Reeves
Jeff Davis
Pecos
Presidio
Brewster
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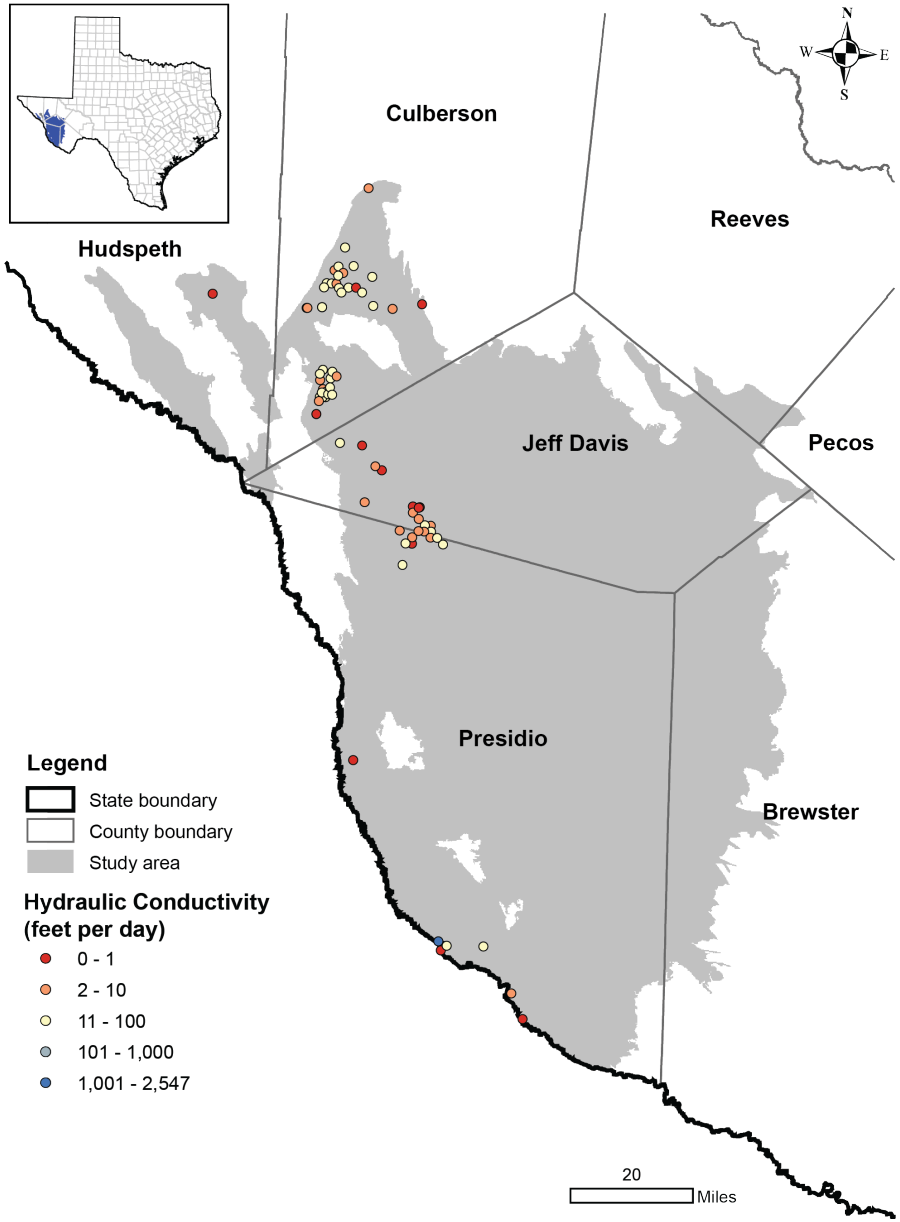
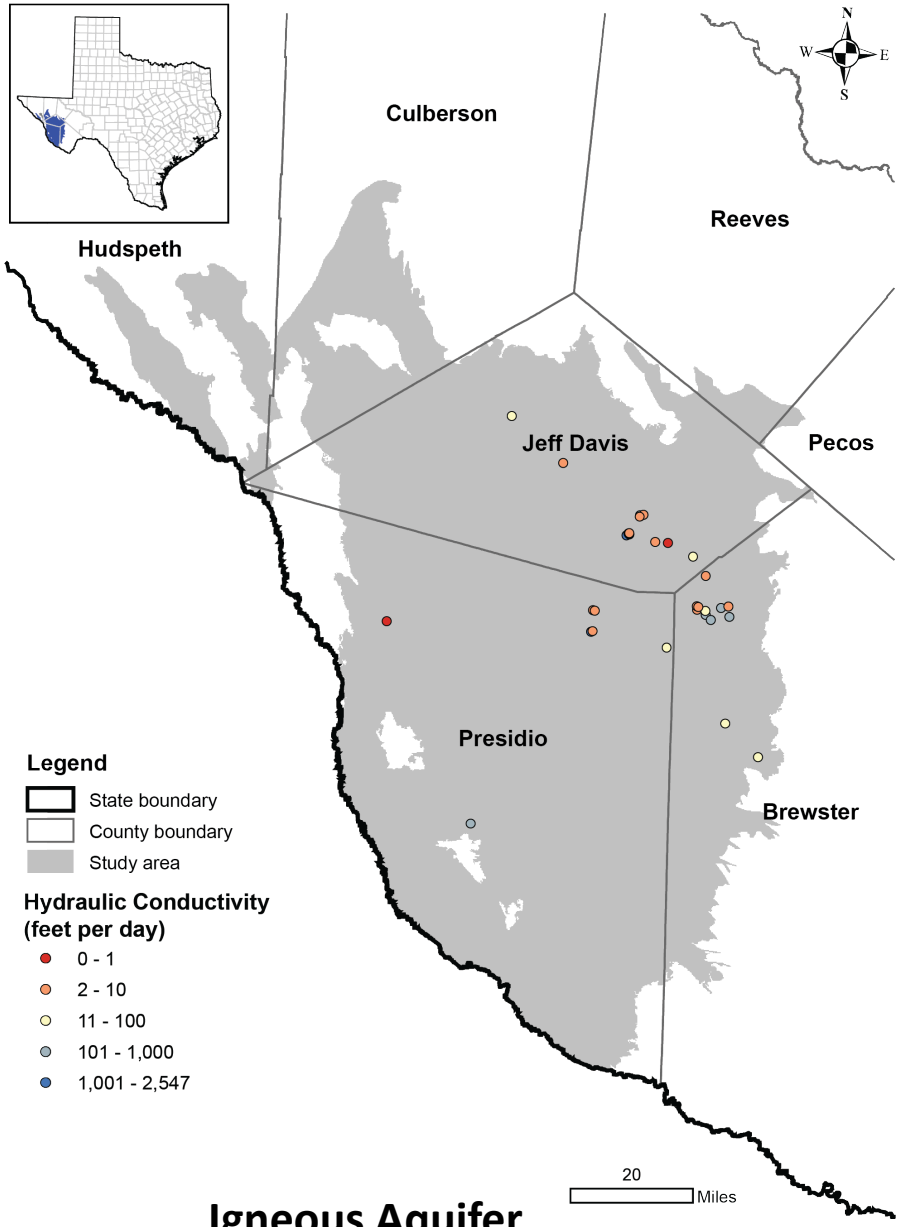
Legend
State boundary
County boundary
Study area
Aquifer
Igneous
West Texas Bolsons
20
Miles



West Texas Bolsons Aquifer



Igneous Aquifer

GROUNDWATER MODELING

Eagle Flat

Definition

- A mathematical device that represents an approximation of an aquifer *(The Compendium of Hydrogeology)*
- Simulation of groundwater flow by means of a governing equation used to represent the physical processes that occur in the aquifer, together with equations that describe heads or flows along the boundaries of the model *(Anderson and Woessner, 2002)*

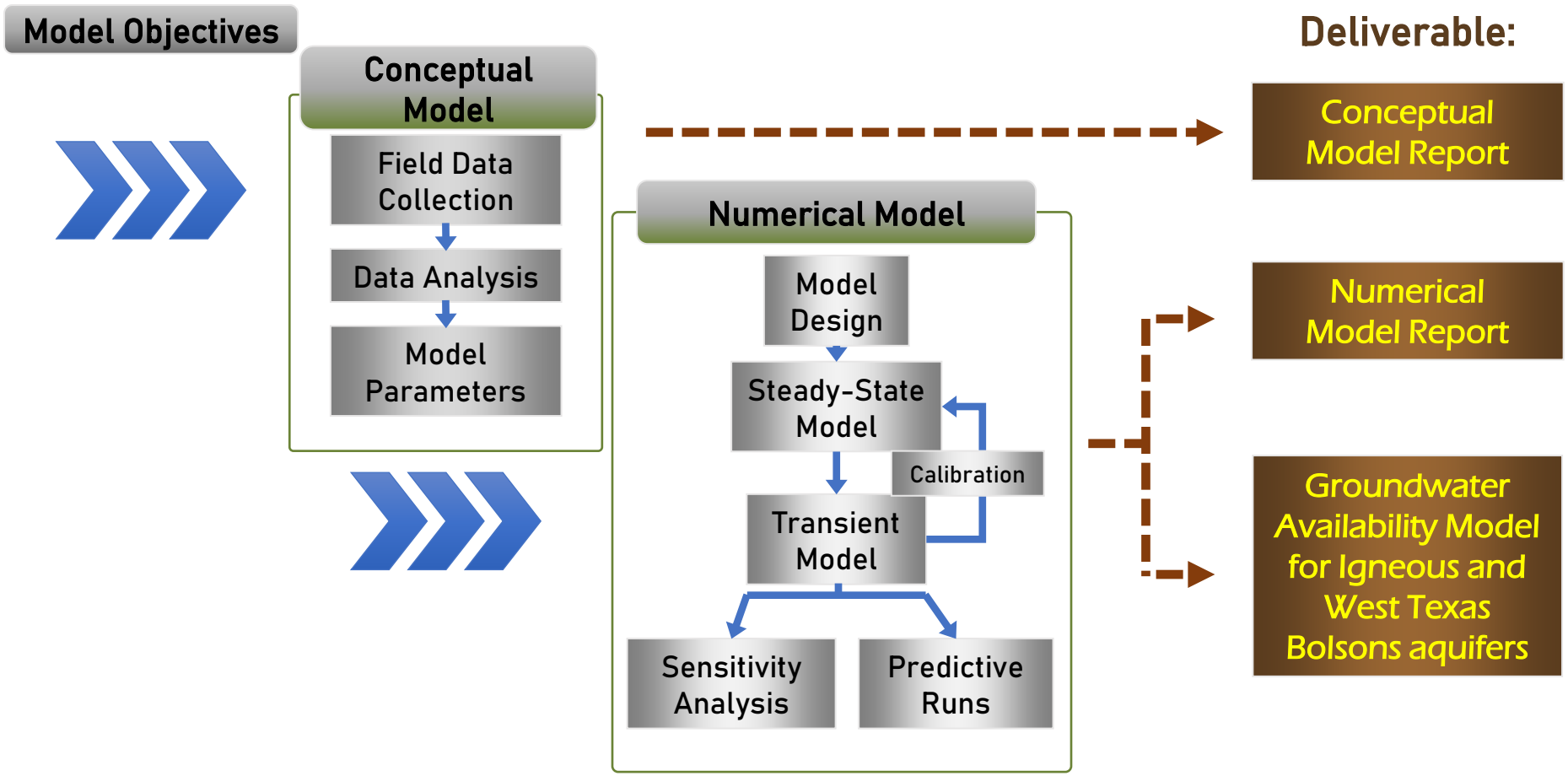
Why Groundwater Flow Models?

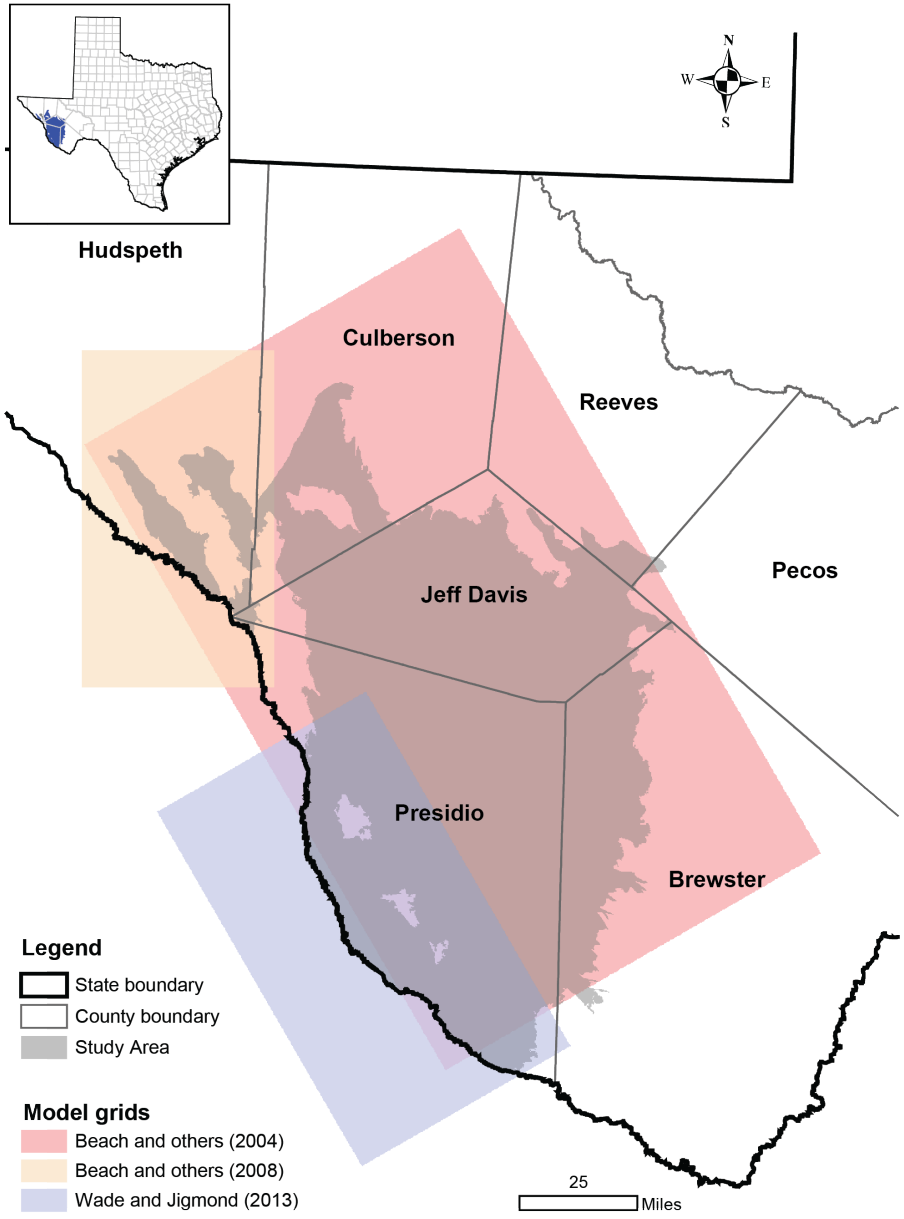
- In contrast to surface water, groundwater flow is difficult to observe
- Aquifers are typically complex in terms of spatial extent and hydrogeological characteristics
- A groundwater model provides the only means for integrating available data for the prediction of groundwater flow at the scale of interest

Objectives/Goals

Update the MODFLOW code	**Original Models developed in older MODFLOW code**
Better understand Intraformational Flow	**Important for updates to local models**
Explore better ways to model surface water/groundwater interactions	
Provide updates on local models	**Newer MODFLOW is more robust, easier to link models or refine areas of interest.**

Flow Chart


Model Objectives
Conceptual Model
Field Data Collection
Data Analysis
Model Parameters
Numerical Model
Model Design
Steady-State Model
Calibration
Transient Model
Sensitivity Analysis
Predictive Runs
Deliverable:
Conceptual Model Report
Numerical Model Report
Groundwater Availability Model for Igneous and West Texas Bolsons aquifers


Hudspeth
N
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S
Culberson
Reeves
Pecos
Jeff Davis
Presidio
Brewster
Legend
State boundary
County boundary
Study Area
Model grids
Beach and others (2004)
Beach and others (2008)
Wade and Jigmond (2013)
25
Miles


DATA COLLECTION

Data Collection

- Heads, discharge, hydraulic properties, water quality data
  - County Reports (predevelopment)
    - Evidence of artesian wells
    - Evidence of flowing springs
  - TWDB groundwater database
  - Railroad Commission Surface Casing Database
  - GCDs
  - Thesis work
  - Other literature
  - Stakeholders

Data Request

Well information - log/location/construction

Groundwater data - level/pumping/water quality

Aquifer data - testing/study

Surface water information – Groundwater Diversion/Interaction

Not currently publicly available/
May be a great study we need to consider.

When do we need the data?

- No later than March 2023


PROJECT SCHEDULE

Project Schedule*

Project Start

(Aug. 2022)

SAF Meeting
Jan. 2023

Conceptual Model

(Aug. 2022 ~ Apr. 2023)

Conceptual Model Report
Jun. 2023

SAF Meeting
Jul. 2023

Numerical Model

(Jun. 2023 ~ Sep. 2024)

Steady-State Model
Jun. 2023 ~ Jun. 2024

Numerical Model Report (Draft)
Aug. 2024

SAF Meeting
Sep. 2024

Completion

(Dec. 2024)

Numerical Model Report (Final)
~Dec. 2024

Groundwater Model For Igneous and West Texas Bolsons Aquifers
~Dec. 2024

***Schedule is Tentative**

Additional Information

Web information:

https://www.twdb.texas.gov/groundwater/models/gam/wtbi/wtbi.asp

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QUESTIONS?
Wild Horse Flat