

# Joint Planning between GCDs in GMAs & affects on Regional and State Water Plan



*Presented at  
Milam and Burleson Counties  
Groundwater Summit*

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Manager*

[Website: www.posgcd.org](http://www.posgcd.org)

*Serving the citizens of Milam and Burleson Counties*

# Purpose of the Texas State Water Plan

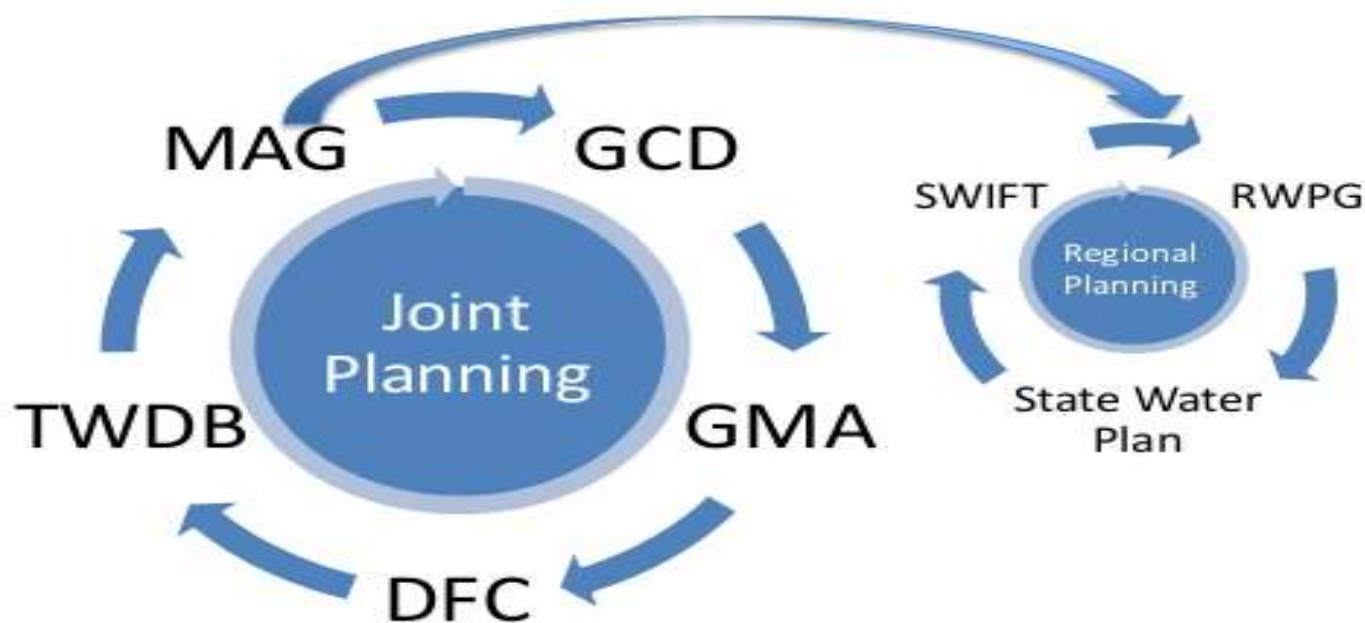
“To ensure the ongoing vitality of our economy, Texas’ citizens, water experts, and government agencies collaborate in a comprehensive water planning process. We plan so that Texans will have enough water in the future to sustain our cities and rural communities, our farms and ranches, and our homes and businesses while also preserving the agricultural and natural resources that have defined Texas for generations.” - *2017 Texas State Water Plan*

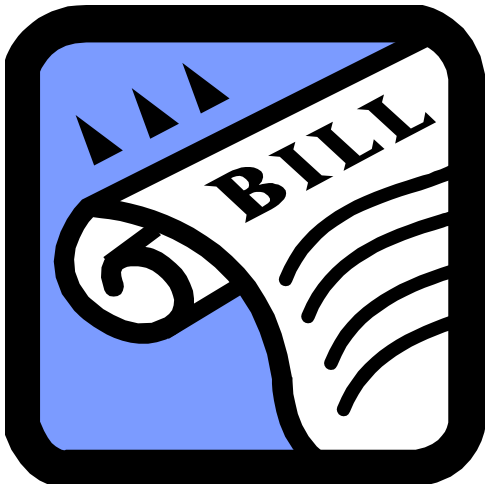
# List of Acronyms

- **GCD- Groundwater Conservation District**
- **GMA- Groundwater Management Area**
- **DFC- Desired Future Condition**
- **TWDB- Texas Water Development Board**
- **MAG- Modeled Available Groundwater**
- **RWPG- Regional Water Planning Group**
- **SWIFT- State Water Implementation Fund for Texas**
- **Acre Foot- water to cover one acre one foot deep (325,851 gallons)**

# Two Separate & Very Different Processes- Regulation of GCDs vs. Planning of the State

## Regional & Joint Planning

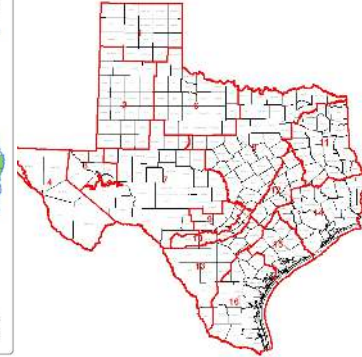
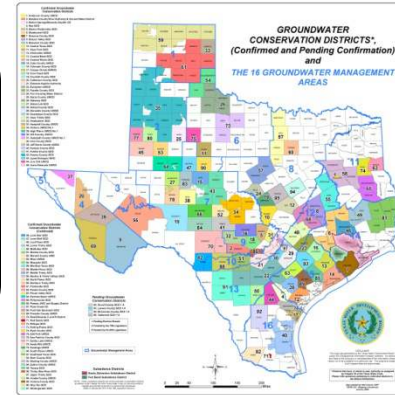




## Texas State Water Planning (think balance sheet)

- State Water Planning through 16 RWPGs
- Water demands determined from water users
- Groundwater Supplies (GW) determined by GCDs in 16 GMAs by adopting DFCs
- Surface Water Supplies (SW) determined by State
- RWPGs use available GW and SW Supply numbers for planning and recommended strategies

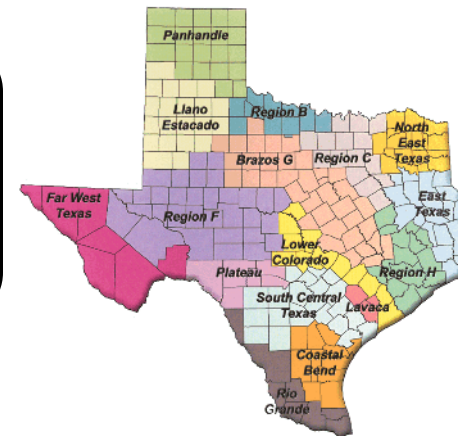
GCDs in GMAs  
decide **Desired Future Conditions**  
In open meetings with comments  
and deliver to TWDB



TWDB provides estimates  
of **Modeled Available Groundwater**  
Using **Groundwater Availability Models**  
to GCDs and RWPGs



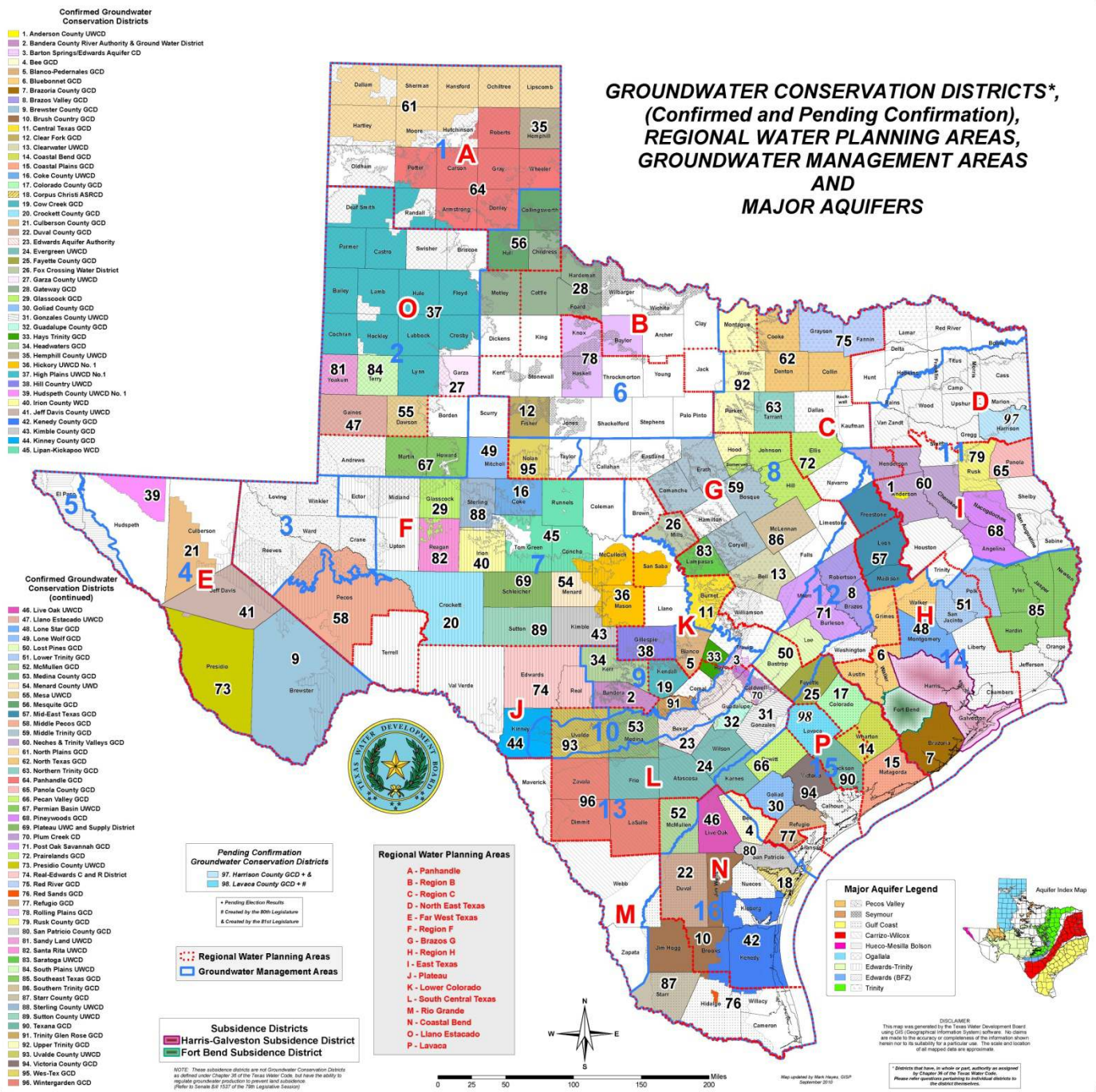
GCDs and RWPGs include  
**Modeled Available Groundwater**  
in plans



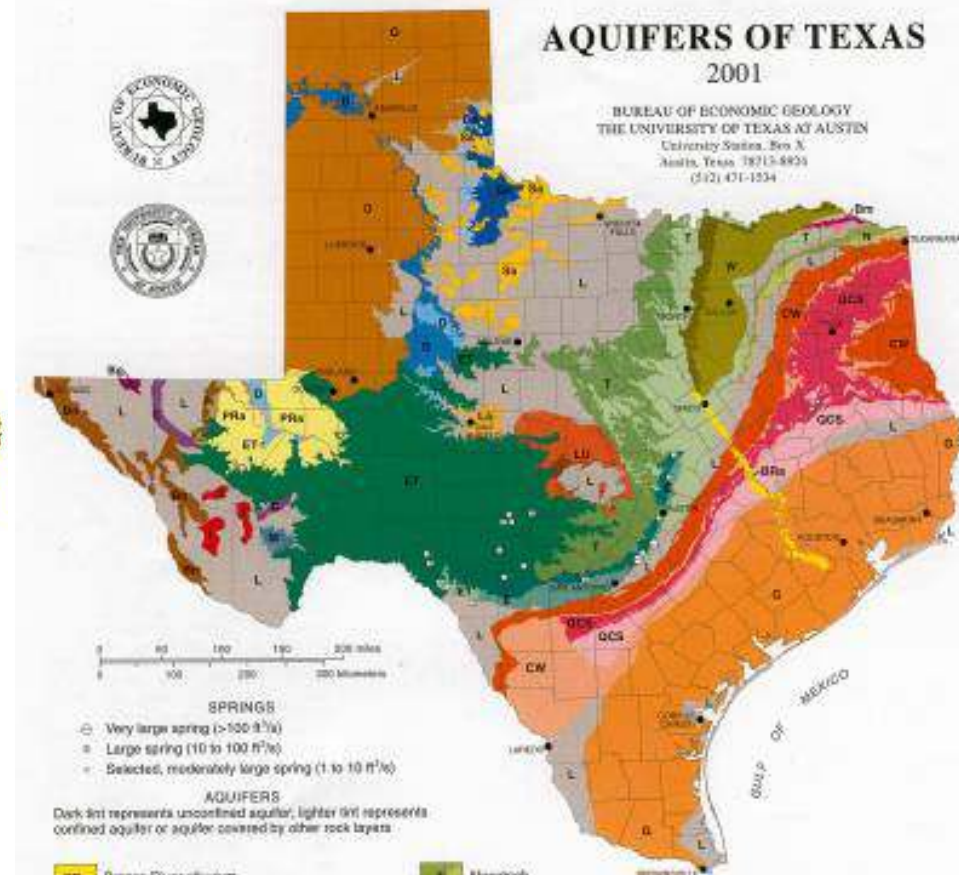
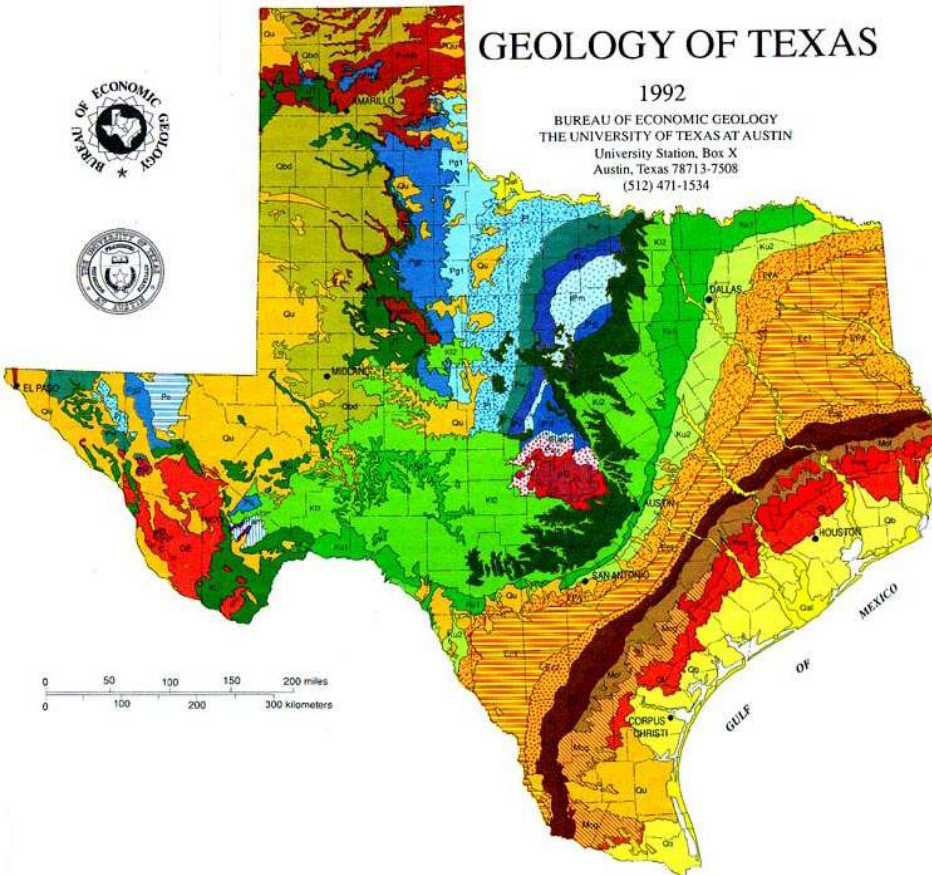
**Groundwater in Texas is owned by landowners.**

**Aquifers are regulated by Groundwater Conservation Districts (GCDs).**

**GCDs are empowered by Texas Water Code, Chapter 36**

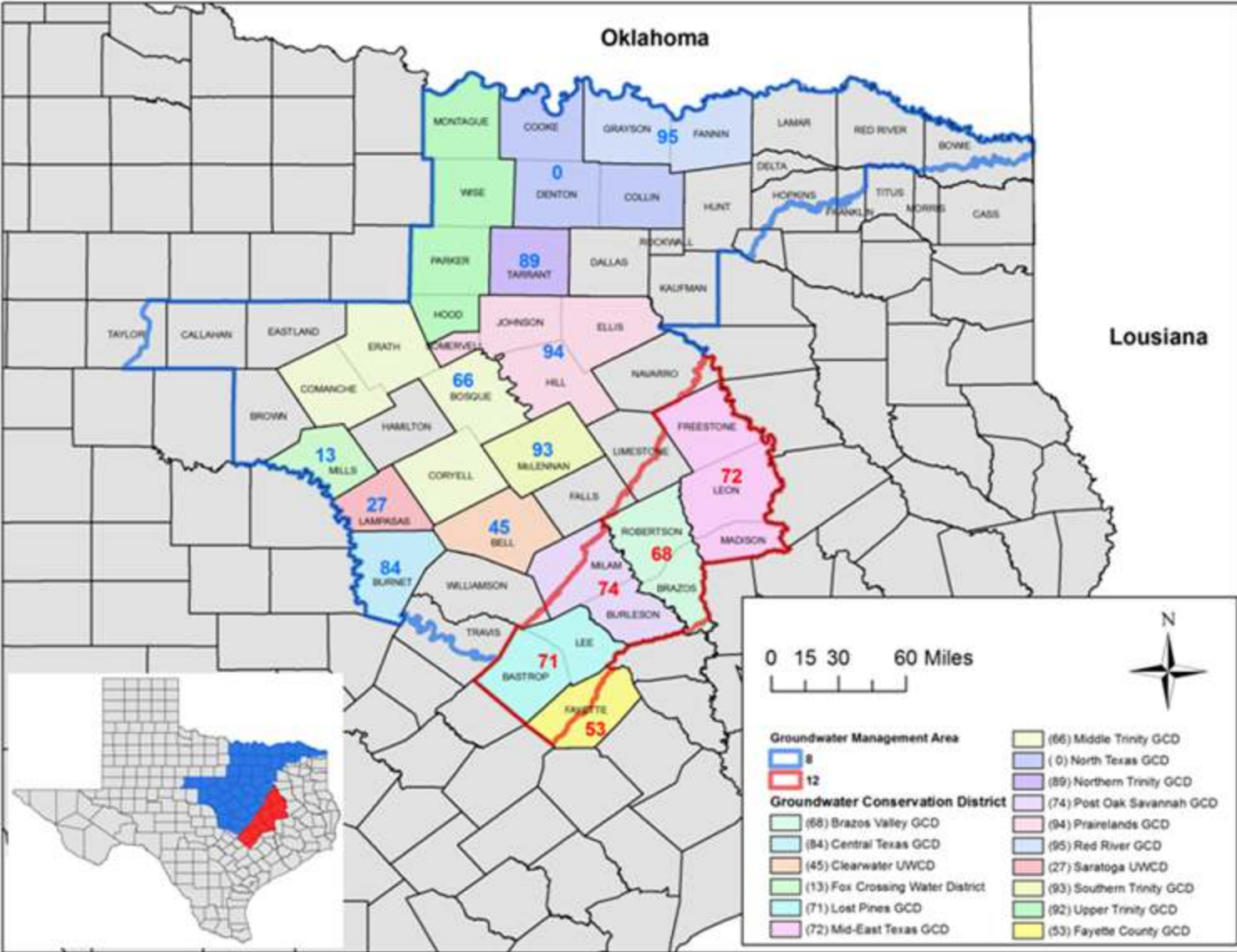


# Geology / Aquifers

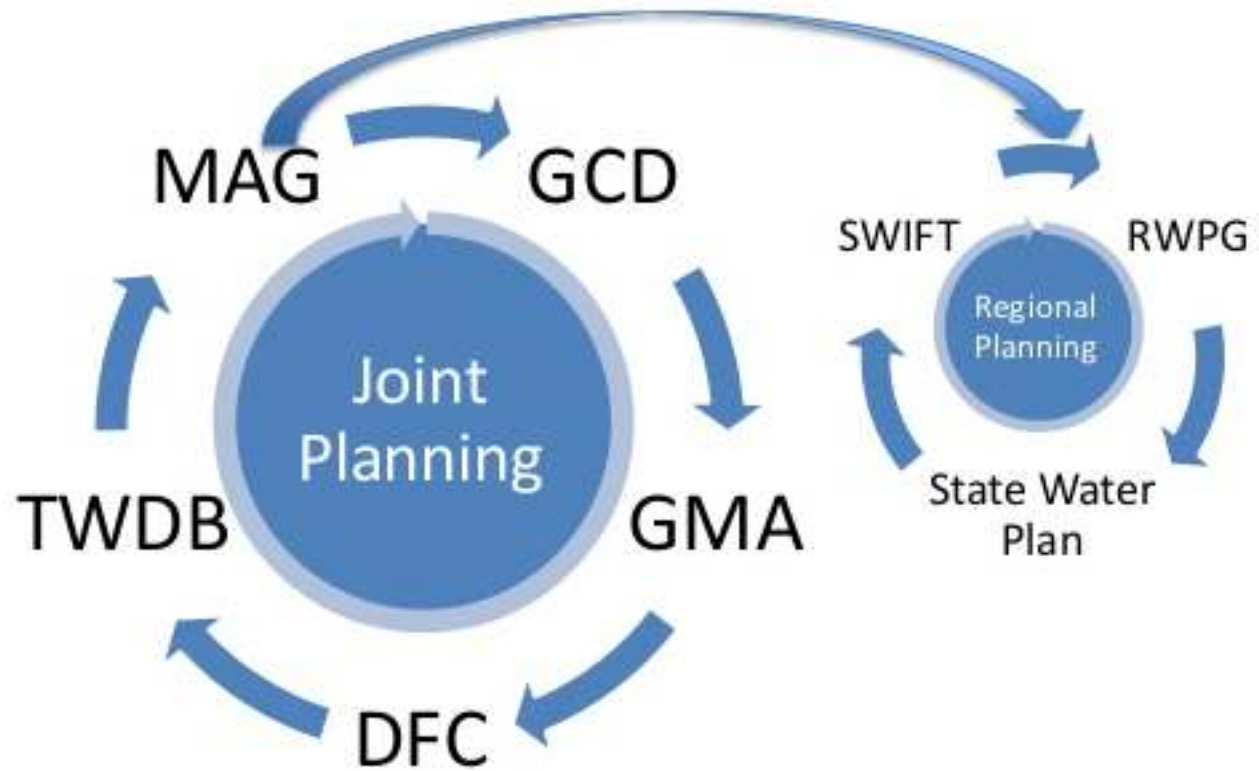




# Groundwater Management Areas 8 and 12



# Regional & Joint Planning



**TAGD**

TEXAS ALLIANCE OF  
GROUNDWATER DISTRICTS

# Desired Future Condition

- The desired, quantified condition of groundwater resources
  - water levels, water quality, spring flows, or volumes)
  - at a specified time or times in the future or in perpetuity.
- For “relevant” aquifers (Major and Minor aquifers)
- Broad Policy Goal
  - Drawdown (most)
  - Spring flow (a few)
  - Storage volumes (High Plains, Llano Uplift)
- Updated at least every 5 years (propose by May 1, 2021, final adoption by January 5, 2022)

# Science & Policy

## MAG

## DFC

Groundwater Science

Groundwater Policy



Aquifer Uses or Conditions	State Water Plan	Hydrological Conditions
Private Property Rights	Impacts on Subsidence	Socioeconomic Impacts
Feasibility of achieving DFC	Any other relevant information	Environmental Impacts

Physical Expression of Aquifer Capacity

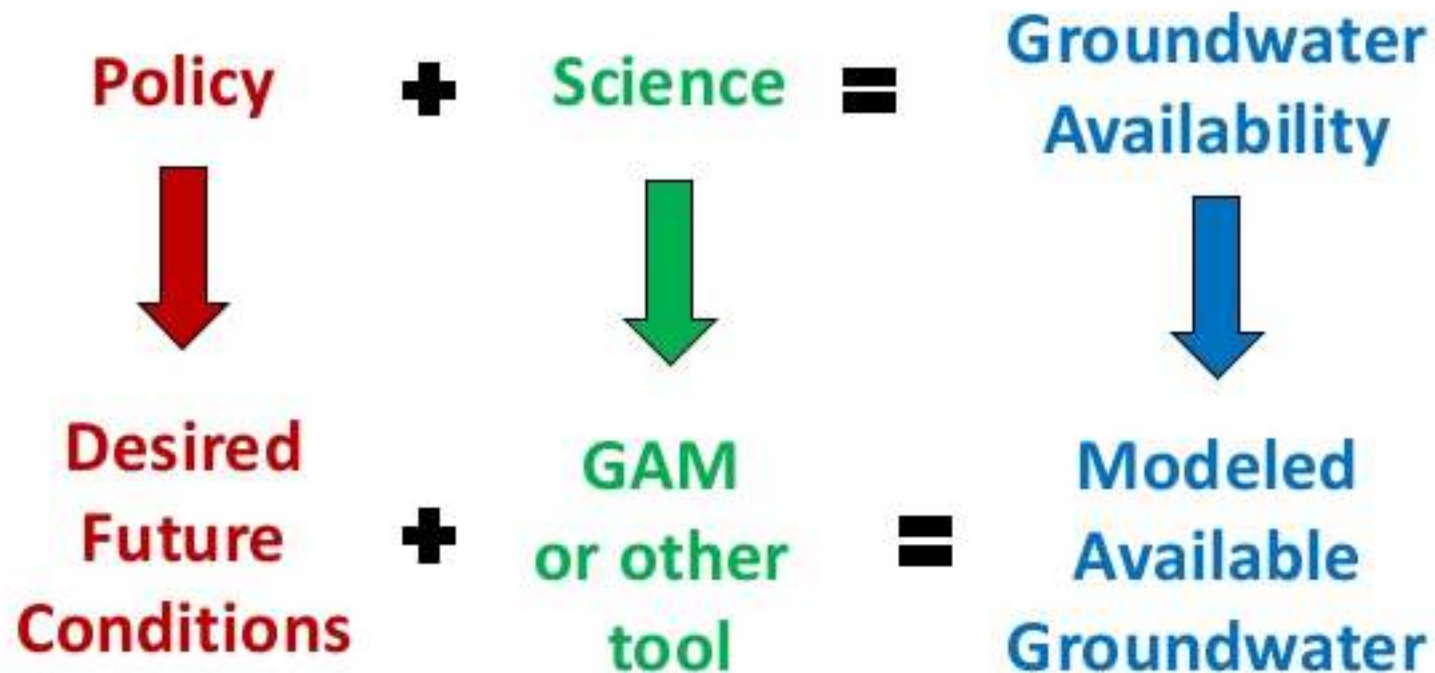
Policy Decision of Aquifer Conditions



# TAGD

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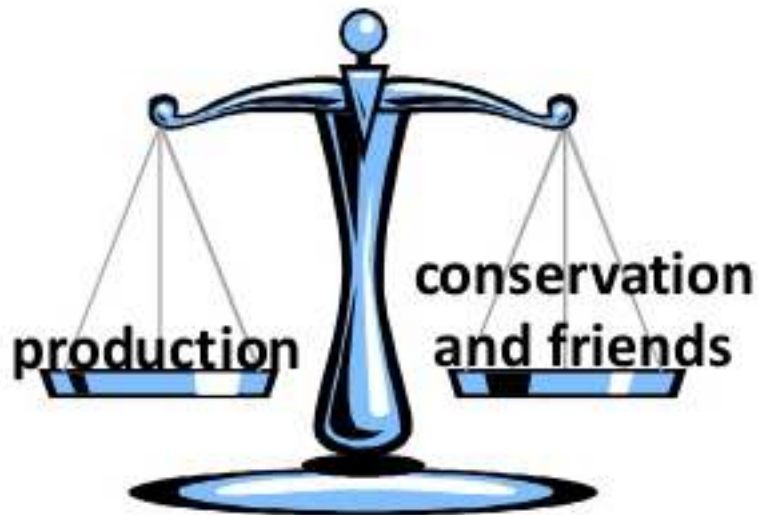
# What is Groundwater Availability?



**Goal: informed decision-making**

# A balancing act

- Highest practicable level of groundwater production
- Conservation
- Preservation
- Protection
- Recharging
- Prevention of waste
- Control of subsidence



# Modeled Available Groundwater

- **Modeled available groundwater** represents the **total** amount of groundwater, including both **permitted** and **exempt** uses, that can be produced from the aquifer in an average year, that achieves a “**desired future condition.**”
- It is expressed as a rate – generally in acre-feet per year.

# Modeled Available Groundwater and Permits (1 of 2)

- The amount of water may be produced on an average annual basis to achieve a desired future condition.
- Districts, to the extent possible, shall issue permits up to the point that the total volume of exempt and permitted groundwater production will achieve an applicable desired future condition.
- But also....not so simple! (next page)



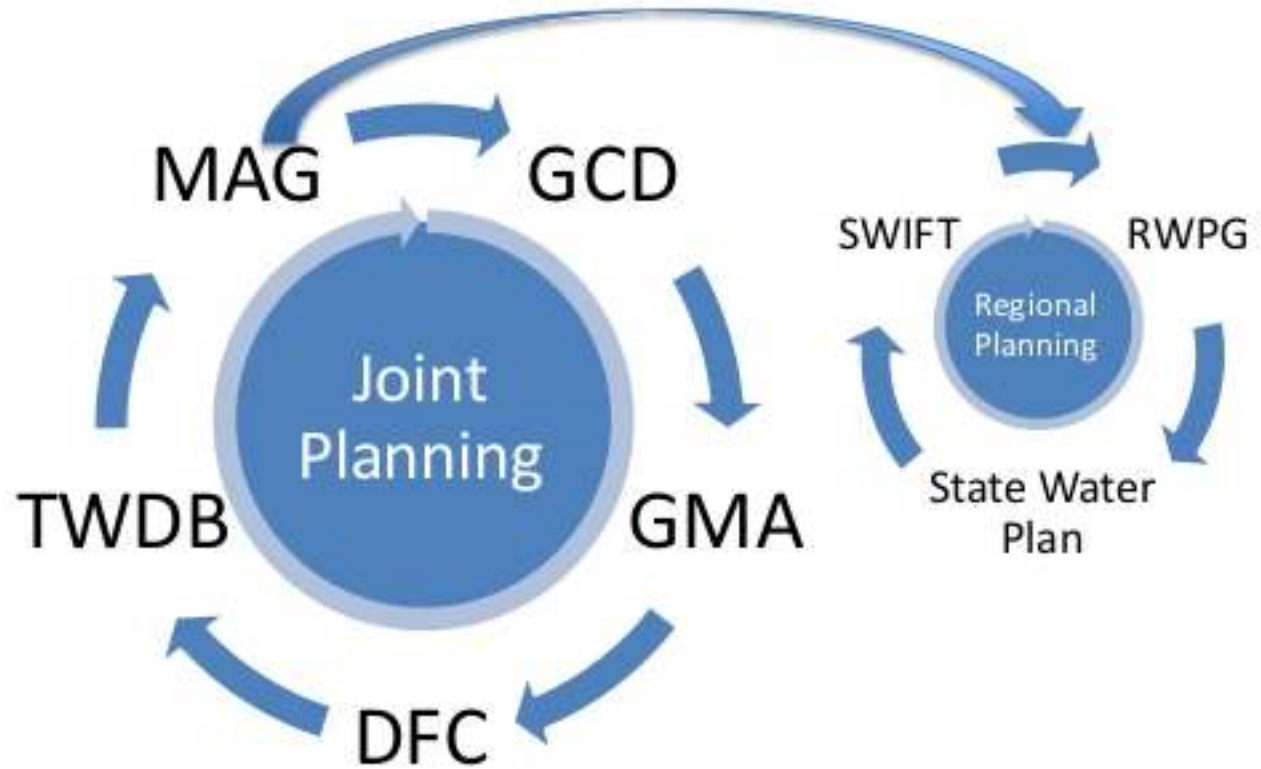
# Modeled Available Groundwater and Permits (2 of 2)

- The district shall manage total groundwater production on a long-term basis to achieve an applicable desired future condition and consider:
  - Modeled available groundwater
  - Groundwater produced under exempt uses
  - Amount of groundwater previously permitted
  - Estimate of permitted groundwater that is actually produced
  - Yearly rainfall and groundwater production patterns.

## Three points to consider:

1. Desired future conditions are an expression of local groundwater management.
2. Desired future conditions can be modified by districts to address improvements in data/science/technology and changing groundwater usage.
3. Districts are responsible for managing the groundwater resource to achieve the desired future condition

# Regional & Joint Planning



**TAGD**

TEXAS ALLIANCE OF  
GROUNDWATER DISTRICTS



Challenges of governing **Private**  
**Property Rights** in groundwater

# Common Law/Rule of Capture

- Common Law- Historically developed
- Rule of Capture- Old English Rule
- Under Rule of Capture Landowners have the right to pump unlimited groundwater from the land they own, as long as not malicious or wasteful, without liability to neighbors
- GCDs modify the Rule of Capture based on science to mitigate impacts of production from one property owner to another and upon the resource, subject to Chapter 36, TWC

## Ownership of Groundwater in Texas

TWC 36.002 states: The groundwater ownership and rights described by this section: (1) entitle the landowner,... to drill for and produce the groundwater below the surface of real property, subject to Subsection (d), without causing waste or malicious drainage of other property or negligently causing subsidence, but does not entitle a landowner,... to the right to capture a specific amount of groundwater below the surface of that landowner's land; and (2) do not affect the existence of common law defenses or other defenses to liability under the rule of capture.

Subsection (d), mentioned above, states:

This section does not... prohibit a district from limiting or prohibiting the drilling of a well by a landowner for failure or inability to comply with minimum well spacing or tract size requirements adopted by the district,... (or) affect the ability of a district to regulate groundwater production as authorized... under this chapter...



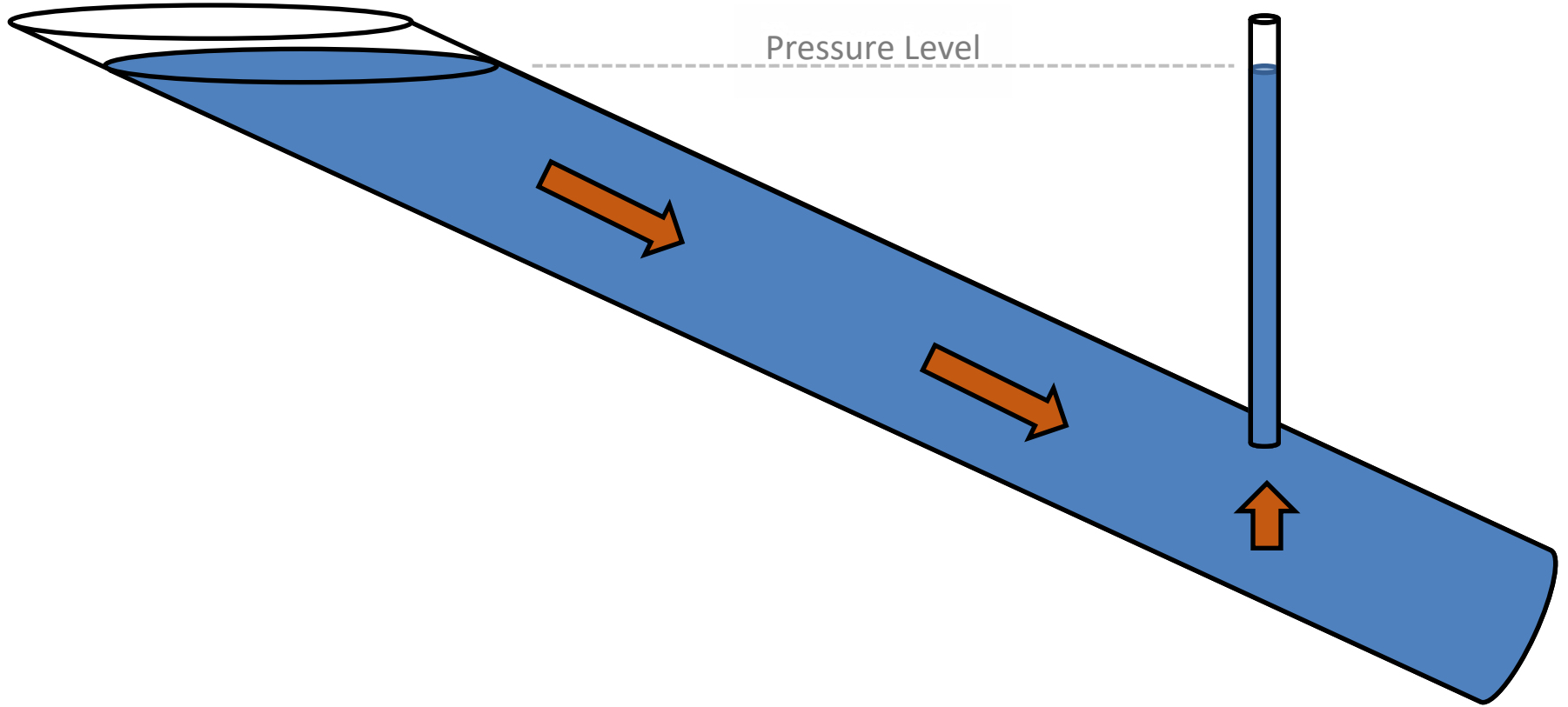
Challenges of balancing development  
with protection of aquifers-

**Hydrological Conditions,**

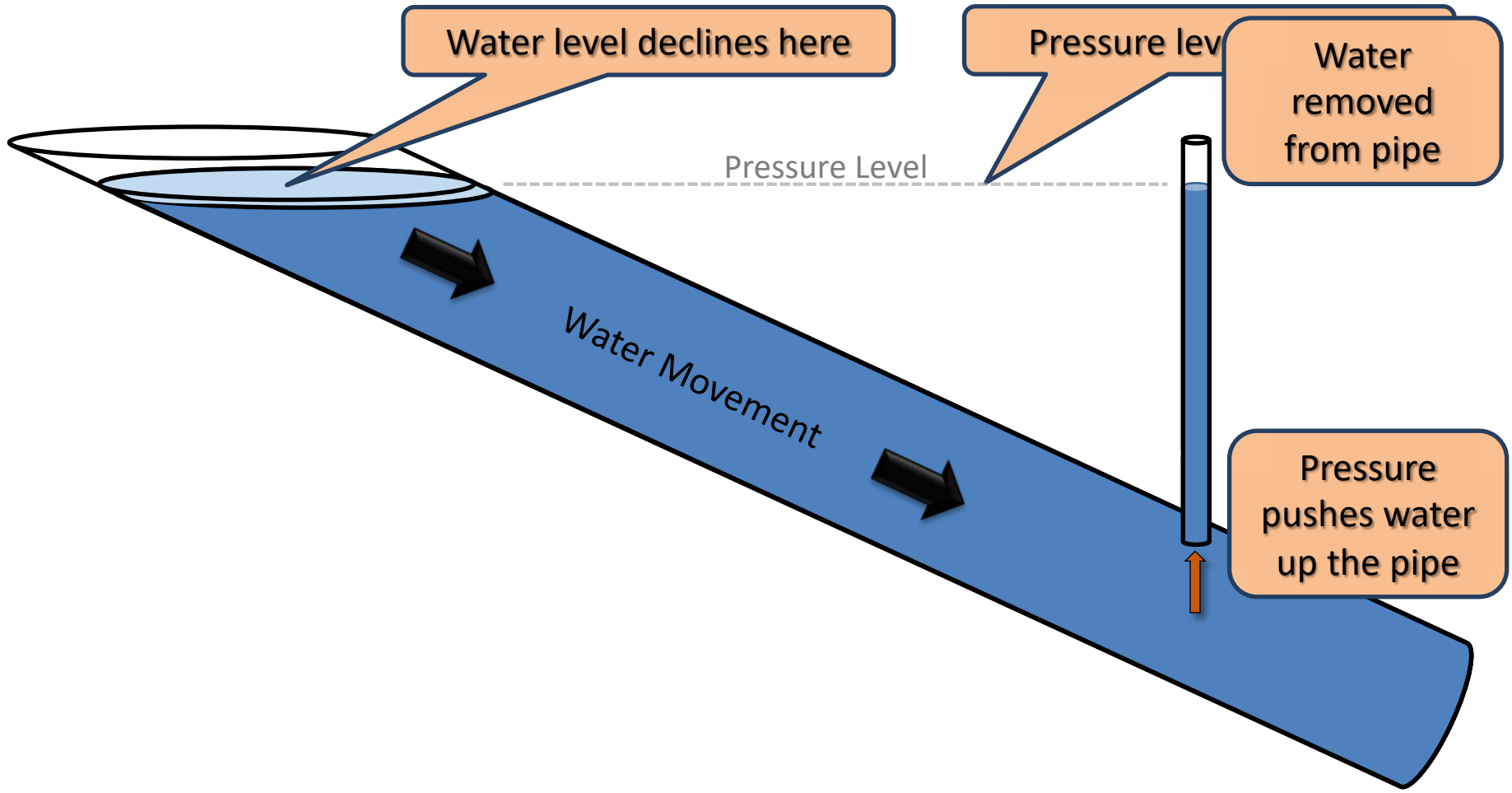
**Environmental Impacts,**

**Socioeconomic Impacts**

# Pressure Example







Water level declines here

Pressure level

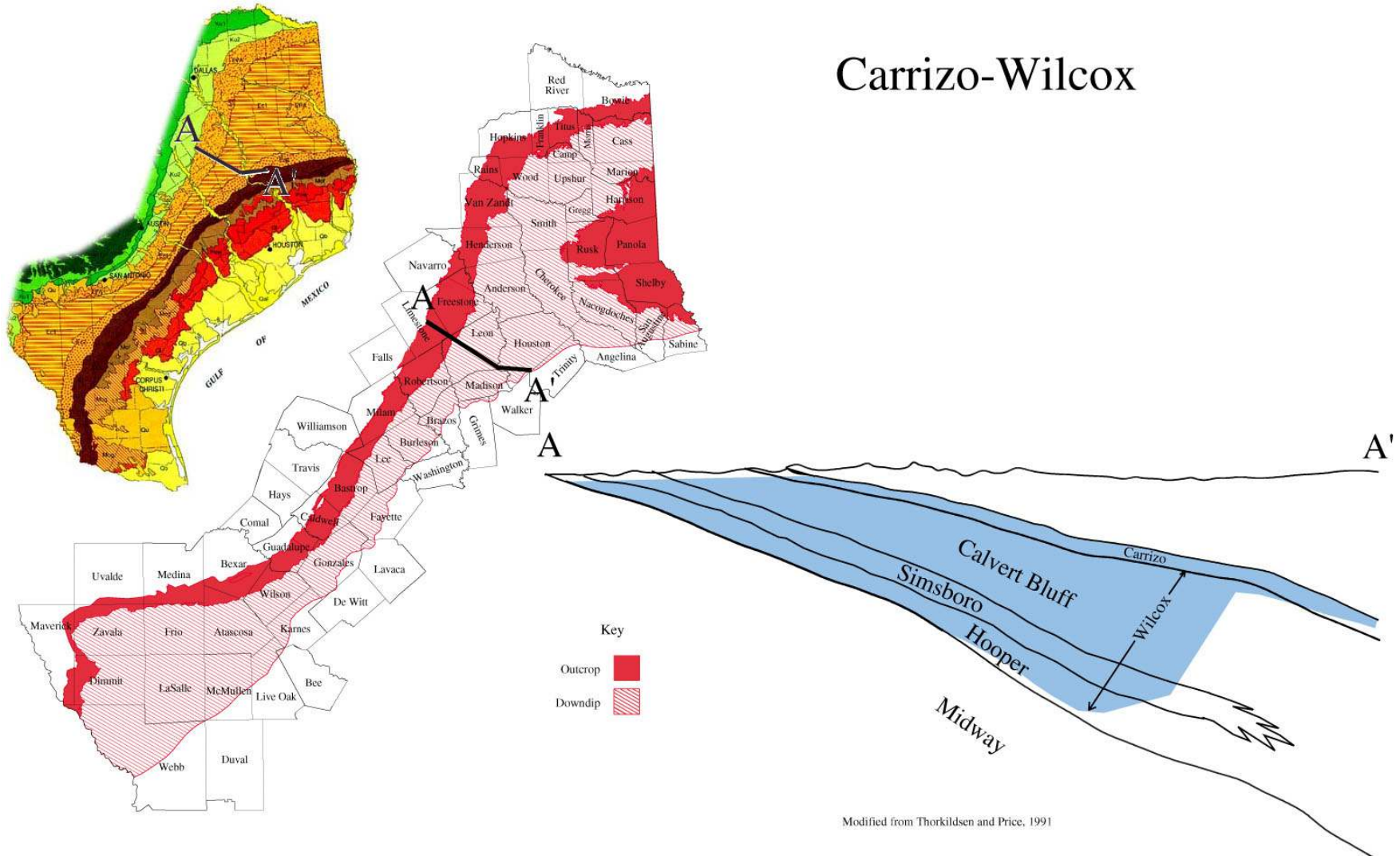
Water removed from pipe

Pressure Level

Water Movement

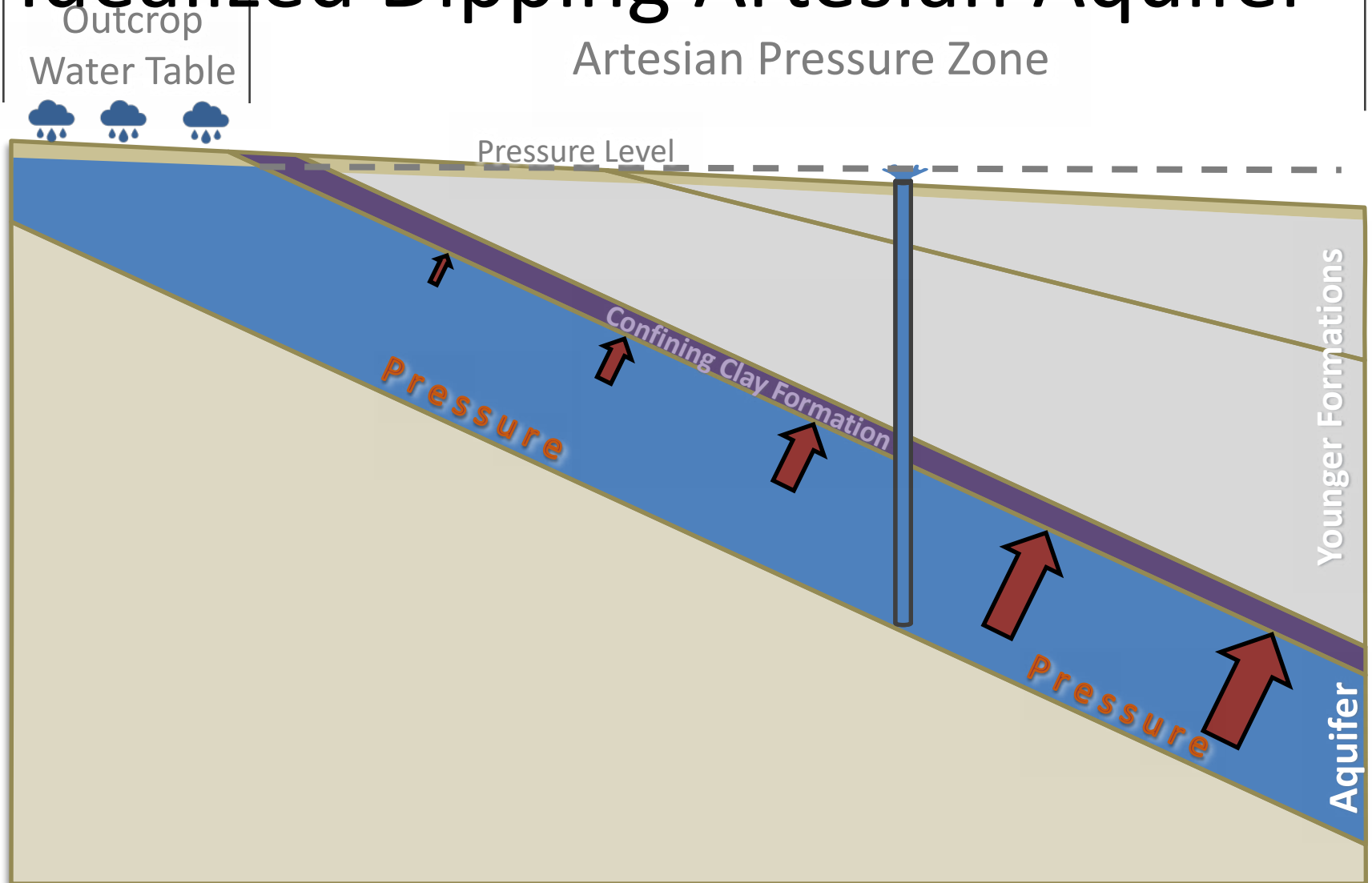
Pressure pushes water up the pipe

# Carrizo-Wilcox Aquifer



Carrizo-Wilcox

# Idealized Dipping Artesian Aquifer



# Pressure Reduction due to Pumping

Water Table

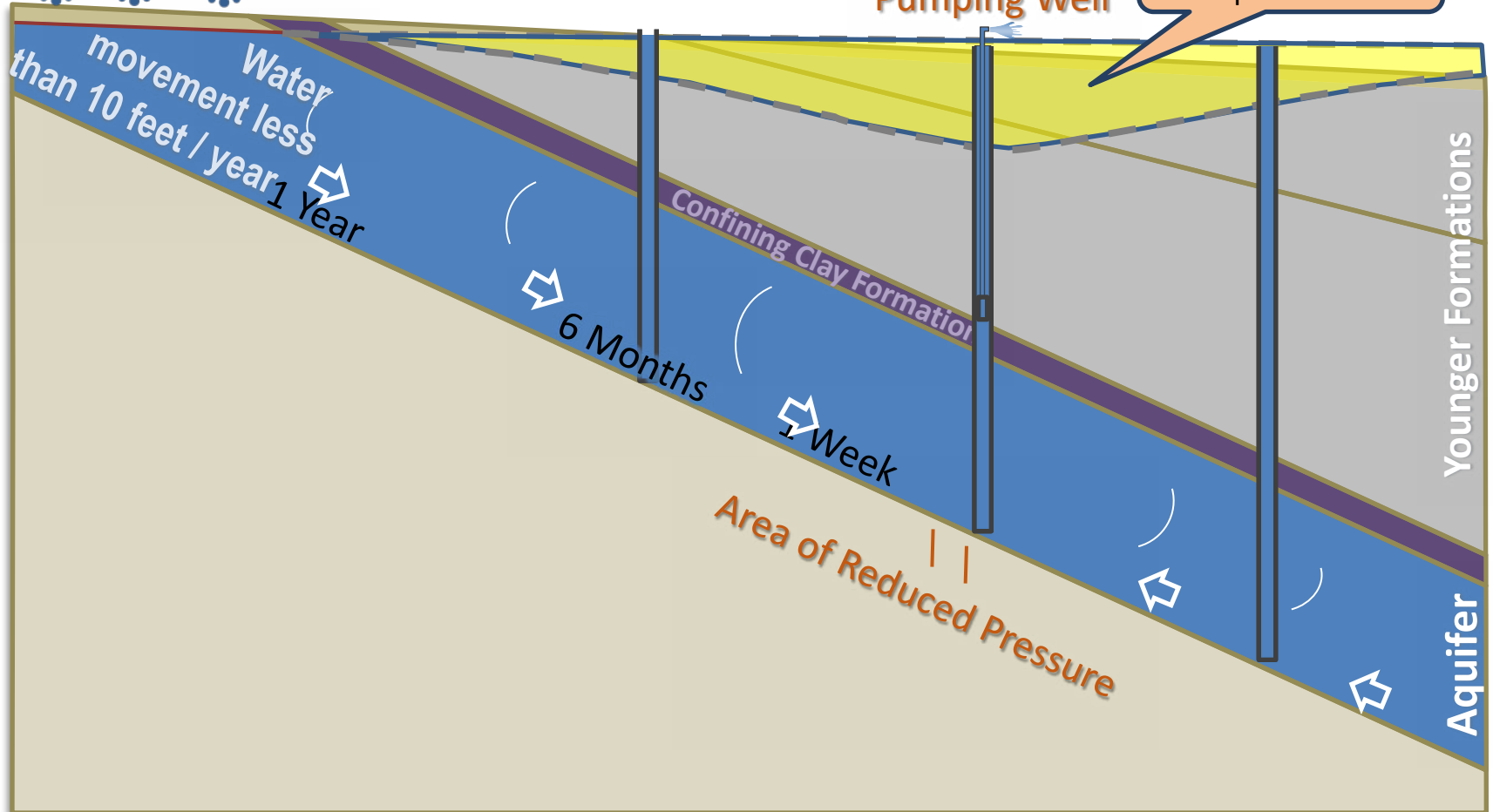
Artesian Pressure Zone

Recharge



Pumping Well

Area of reduced pressure



# Pressure Reduction due to Pumping

Water Table

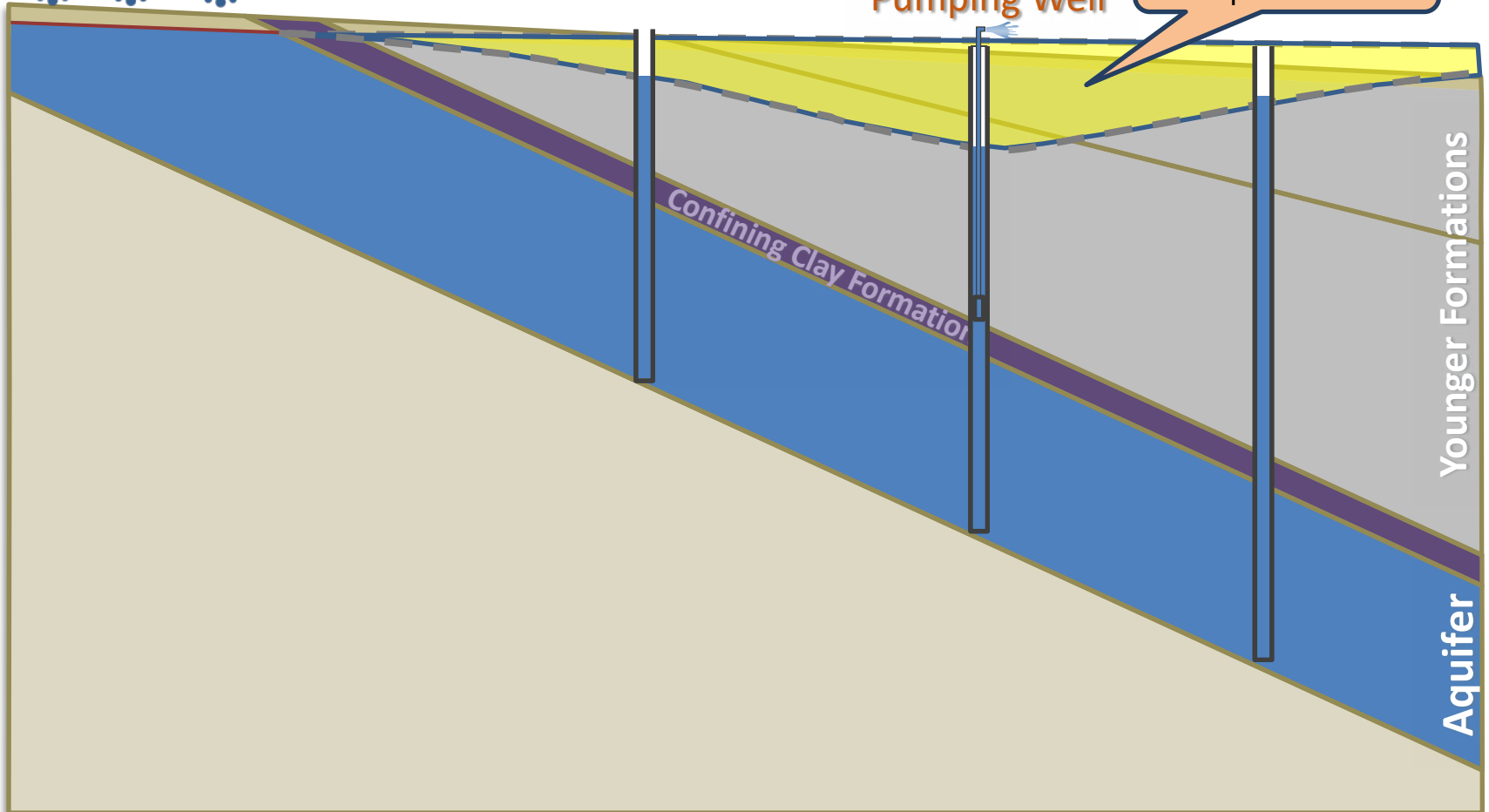
Artesian Pressure Zone

Recharge

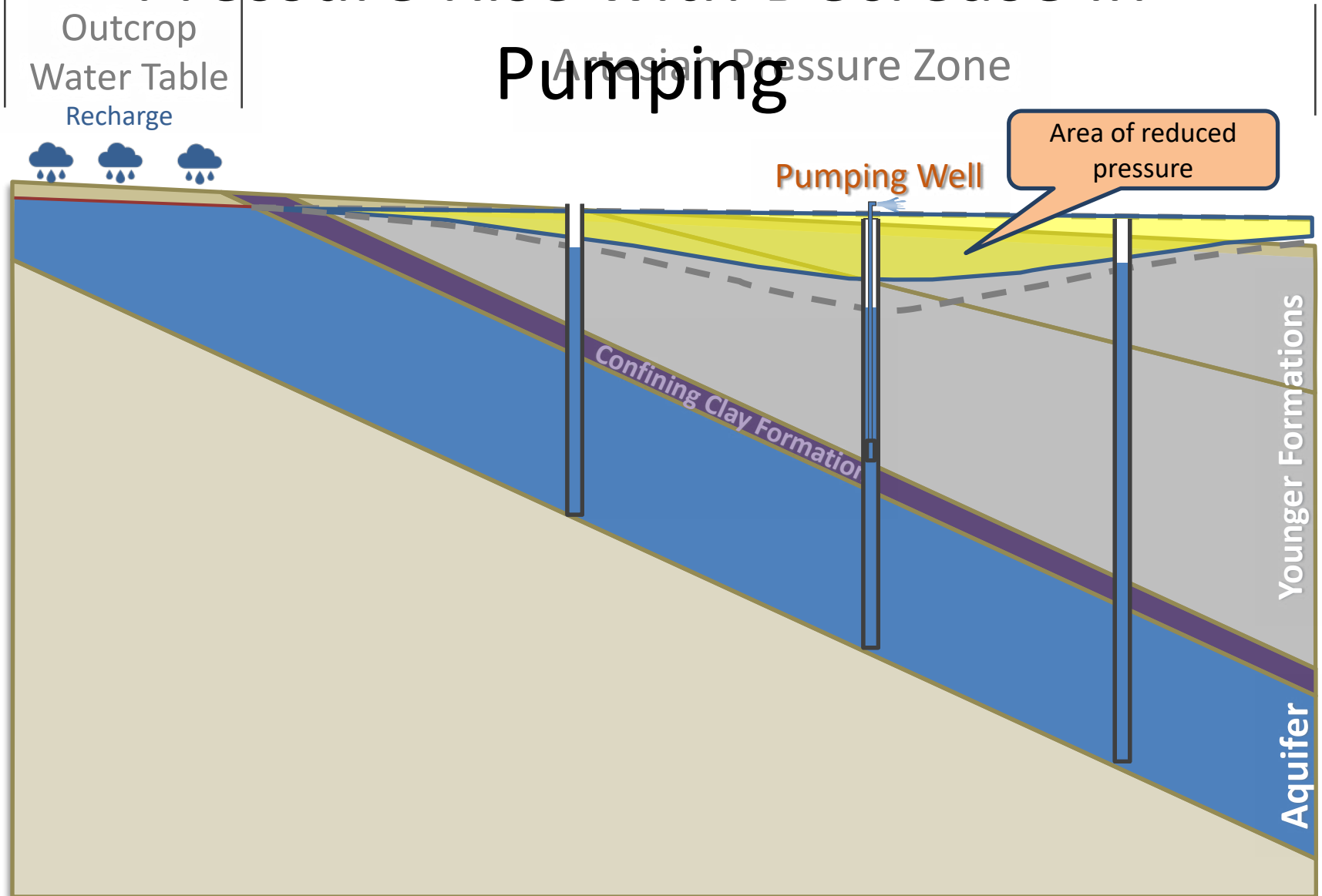


Pumping Well

Area of reduced pressure

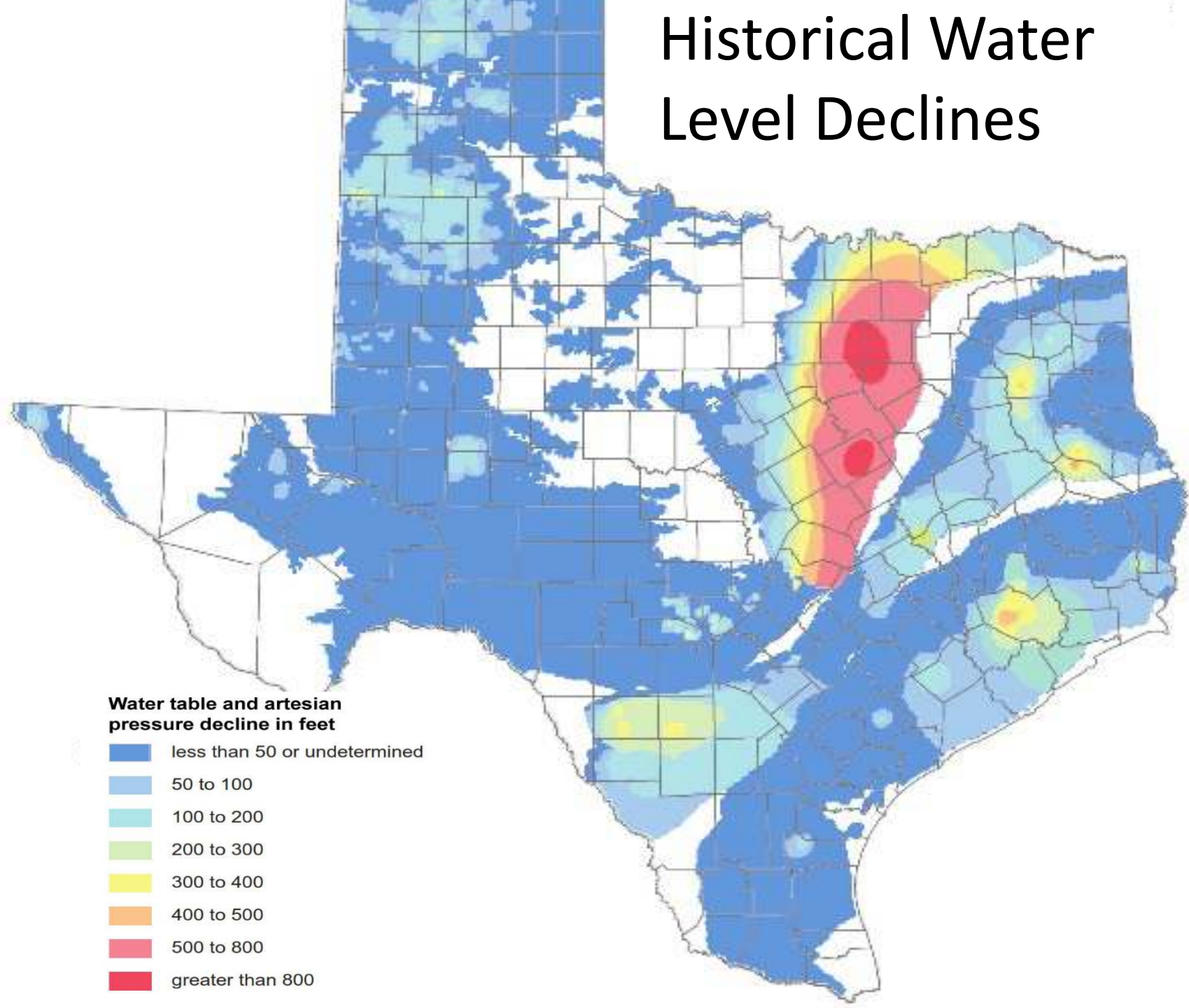
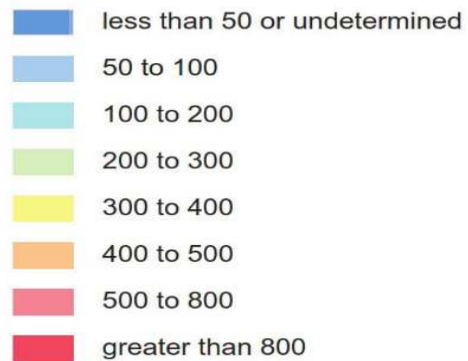


# Pressure Rise with Decrease in Pumping

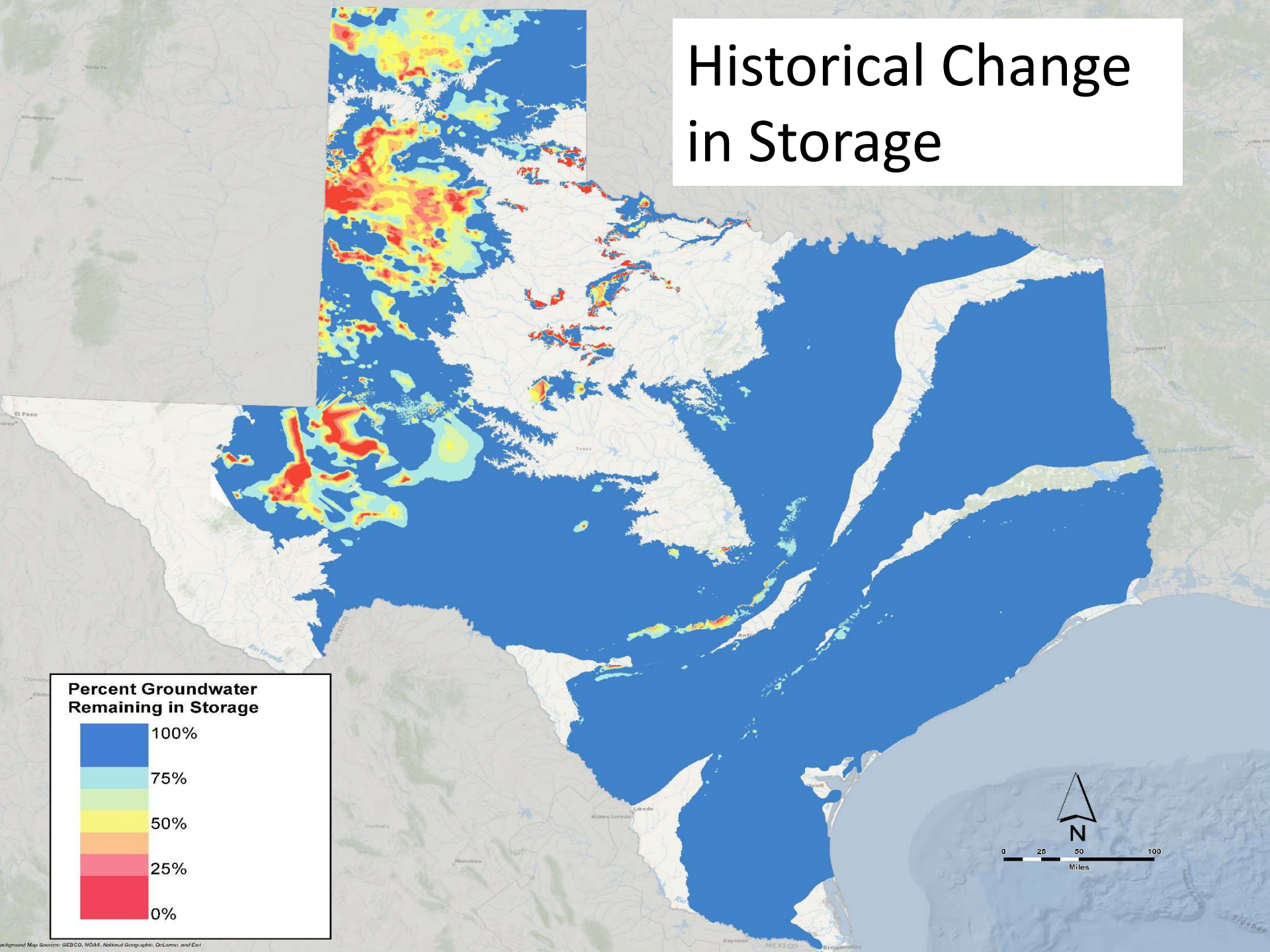


# Historical Water Level Declines

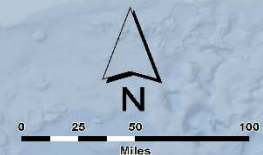
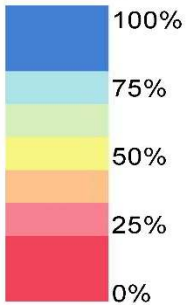
## Water table and artesian pressure decline in feet



# Historical Change in Storage



**Percent Groundwater  
Remaining in Storage**





# Pressure vs. Storage

Artesian Pressure Zone

Outcrop  
Water Table  
Recharge



Storage depletion

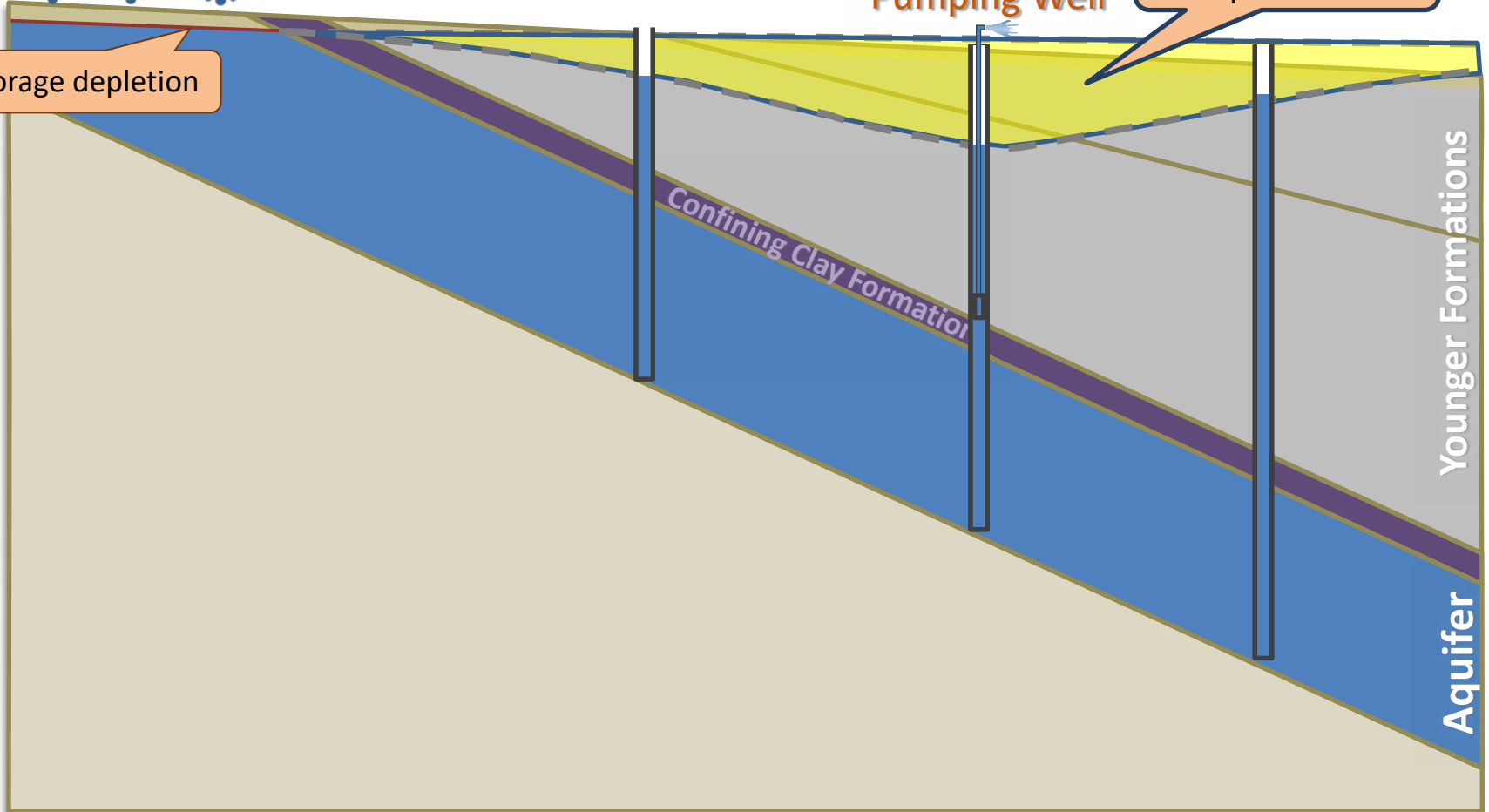
Pumping Well

Area of reduced pressure

Confining Clay Formation

Younger Formations

Aquifer

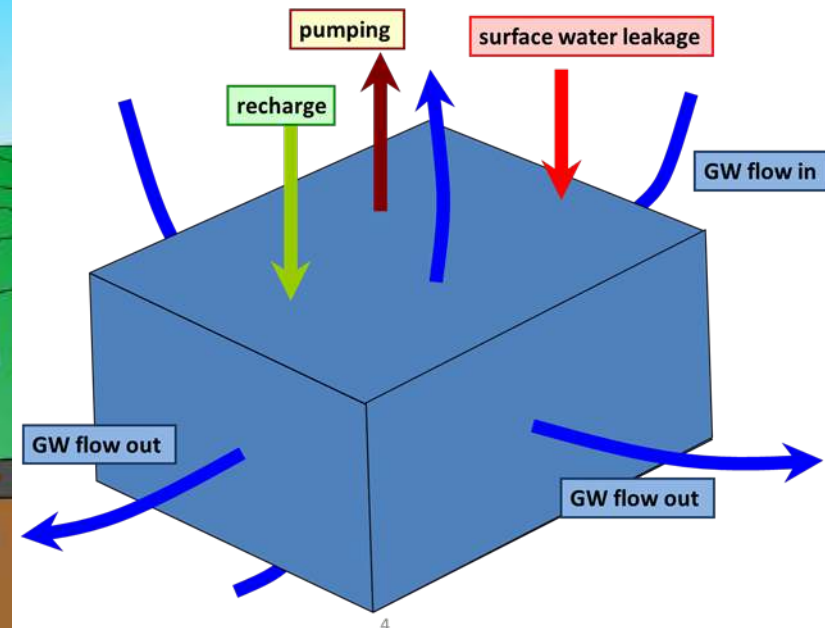
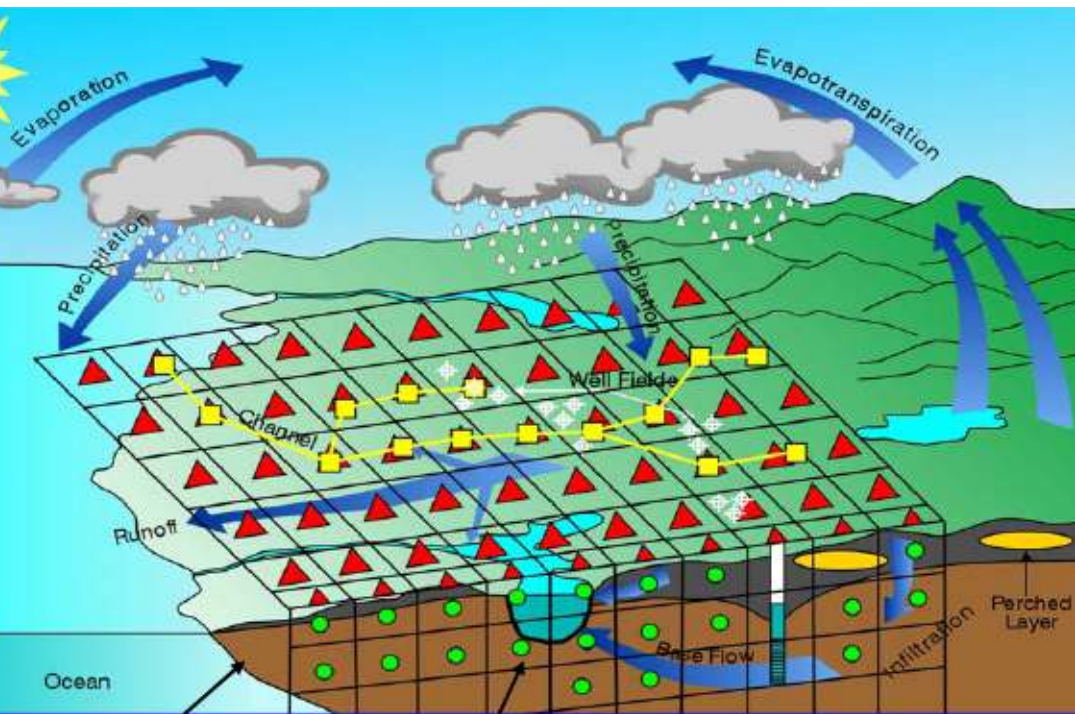




Groundwater Availability Models (GAMs)-  
***The science supporting the decisions***

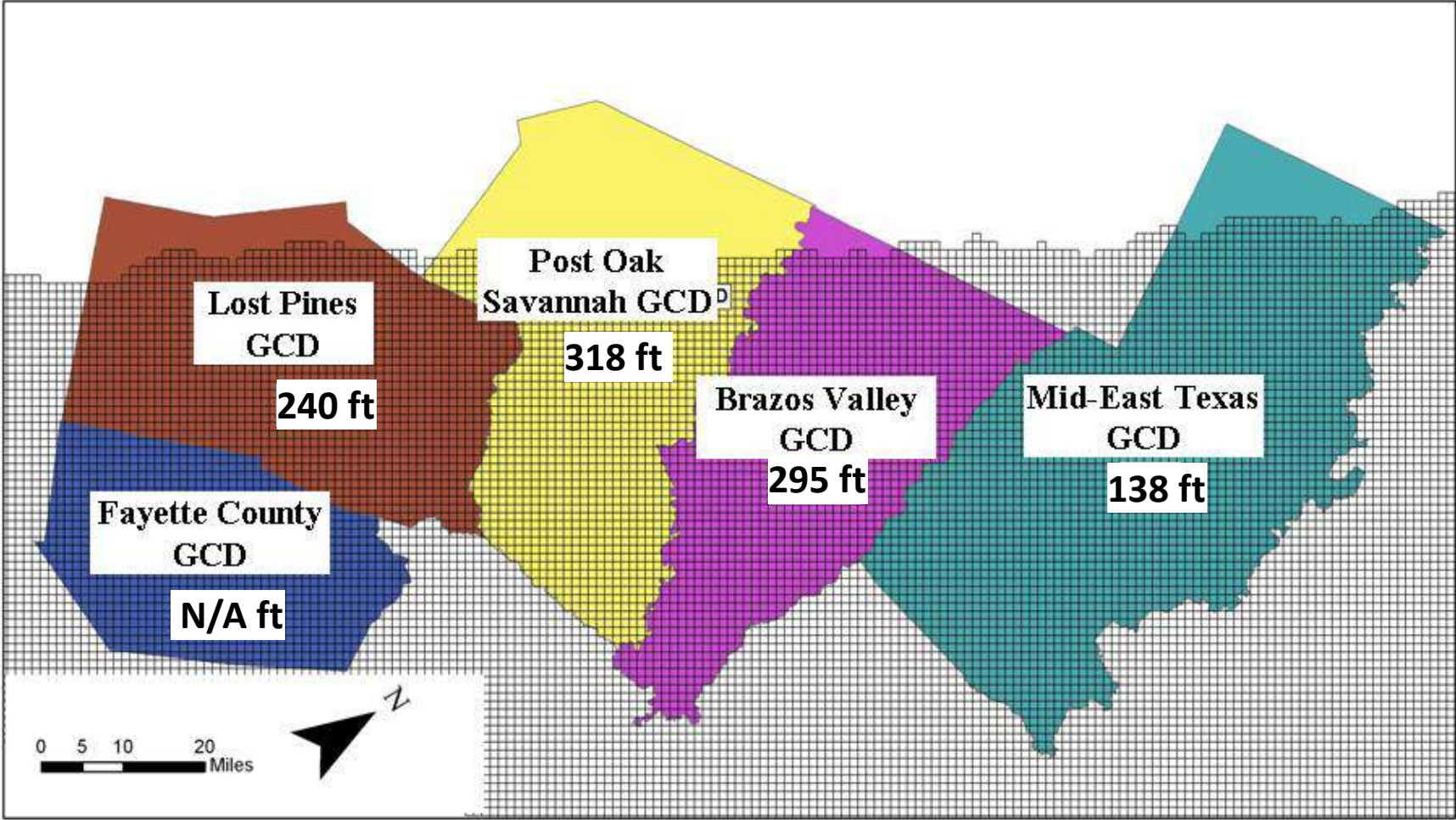
# Description of Groundwater Model

- a tool that integrates data and hydrology to predict groundwater flow
- the tool acts like a big Excel spreadsheet where grid cells physically represent “blocks” of aquifer material
- water levels are predicted by solving for a water balance at each block using equations describing groundwater flow
- Originally created for use in regional water planning

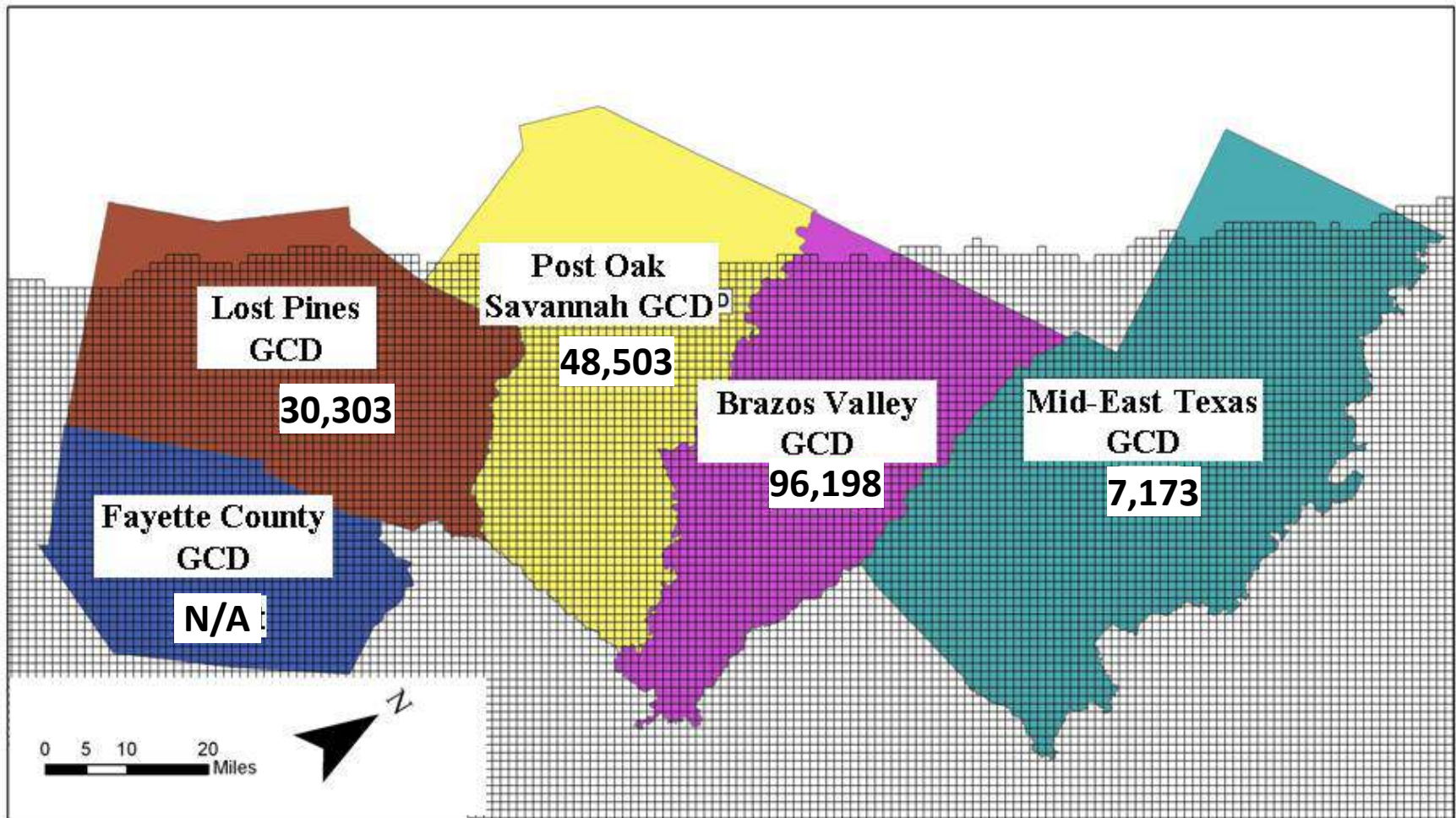


Note: Schematic from MODHMS MODFLOW Manual

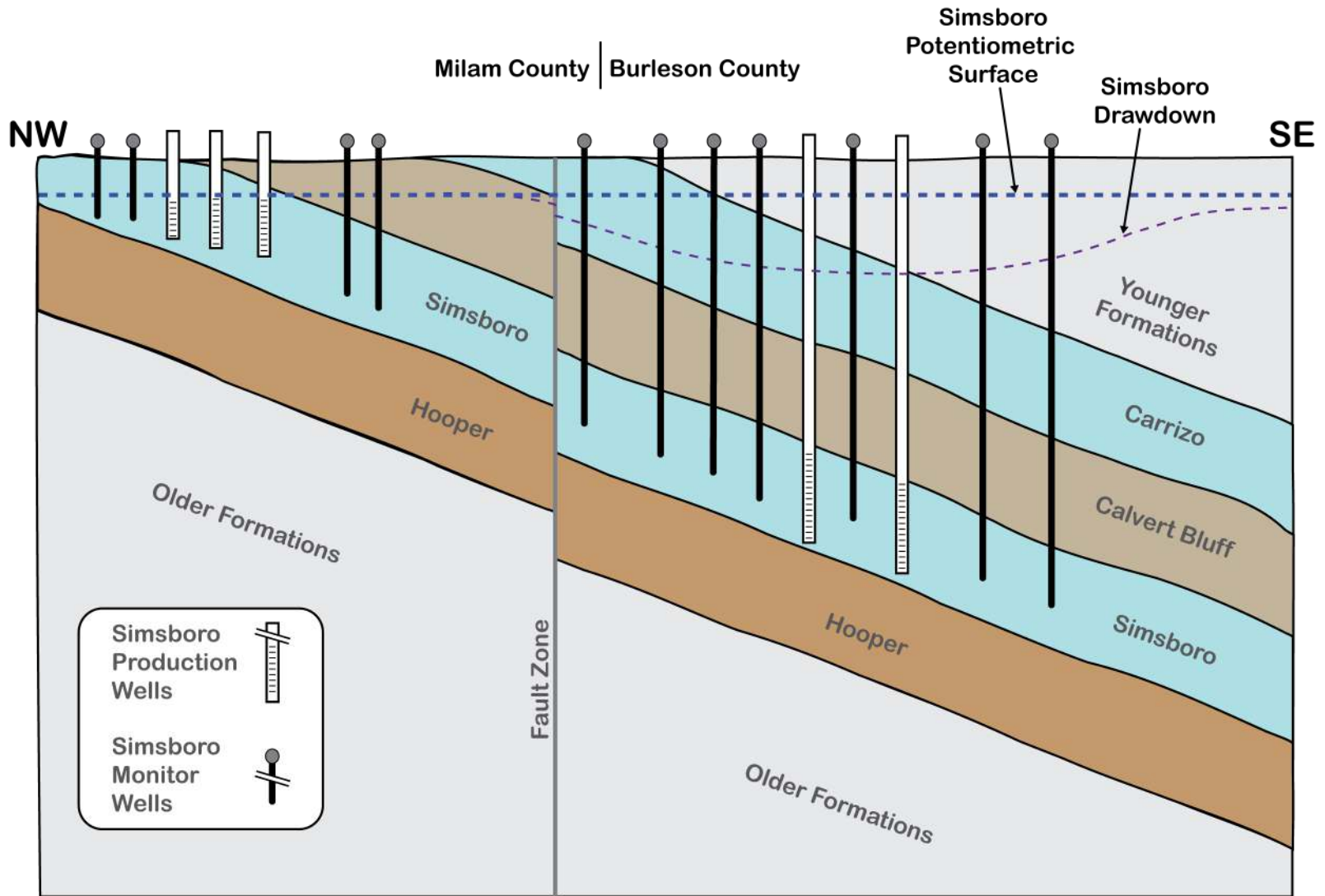
# GMA 12 Current Adopted DFCs: Drawdown Expressed in Average across Districts for Simsboro (2010 to 2060)



# GMA 12 Current Modeled Available Groundwater expressed in Acre Feet for each District in Simsboro (2010 to 2060)



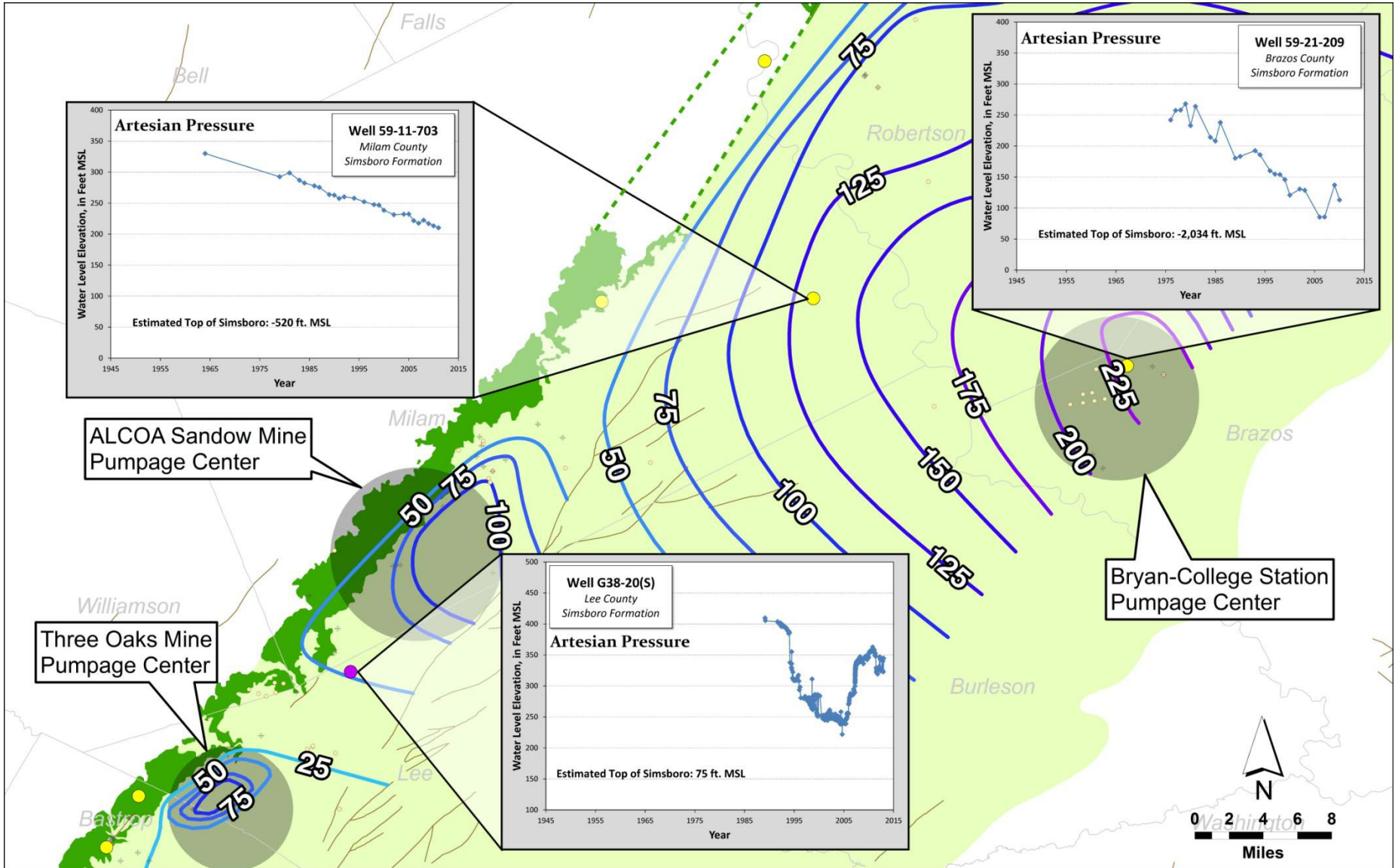
# Schematic Cross Section Simsboro Drawdown



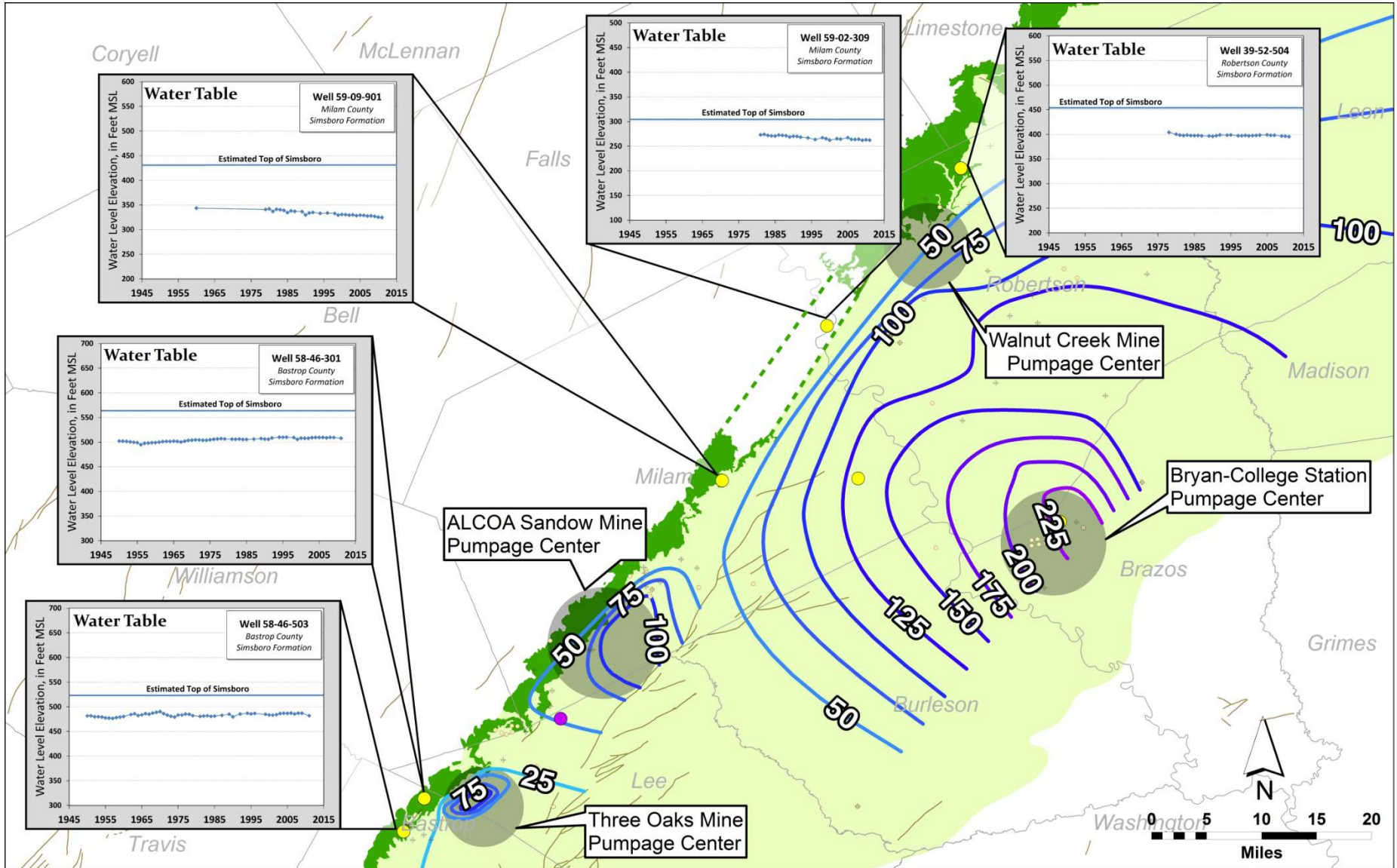
Avg. Drawdown in  
Shallow Simsboro Wells  
is 15' x 326 sq. miles

Avg. Drawdown in  
Deep Simsboro Wells  
is 400' x 809 sq. miles

# Artesian Pressure Drawdown



# Water Table Drawdown





# Questions?

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Serving the Citizens of Milam and Burleson Counties

*What's an Acre-foot?*



## *What's an Acre-foot?*



0.9 feet of  
water