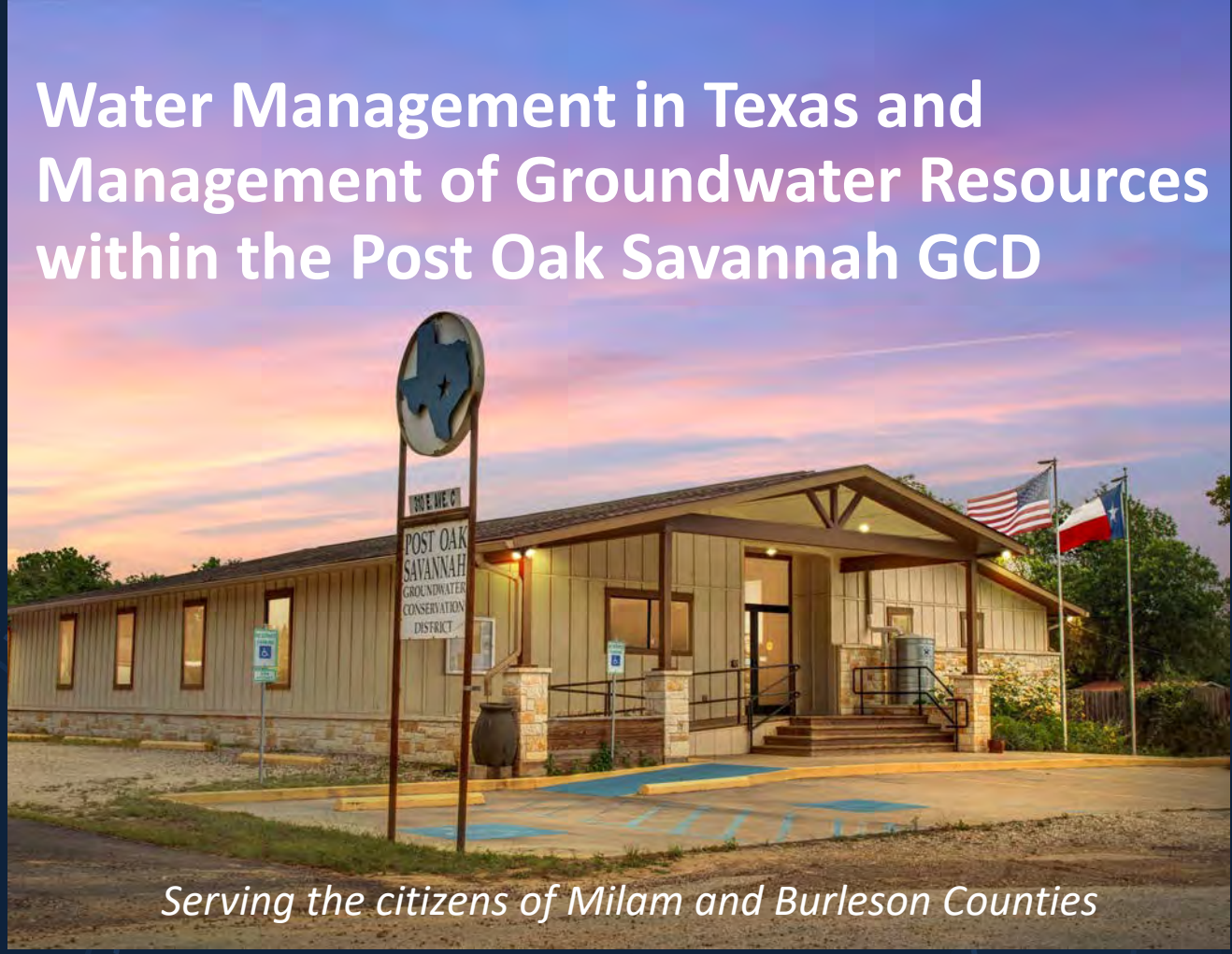
Water Management in Texas and Management of Groundwater Resources within the Post Oak Savannah GCD



Serving the citizens of Milam and Burleson Counties

By: Gary Westbrook,
General Manager
Doug Box,
Education Coordinator

Post Oak Savannah GCD

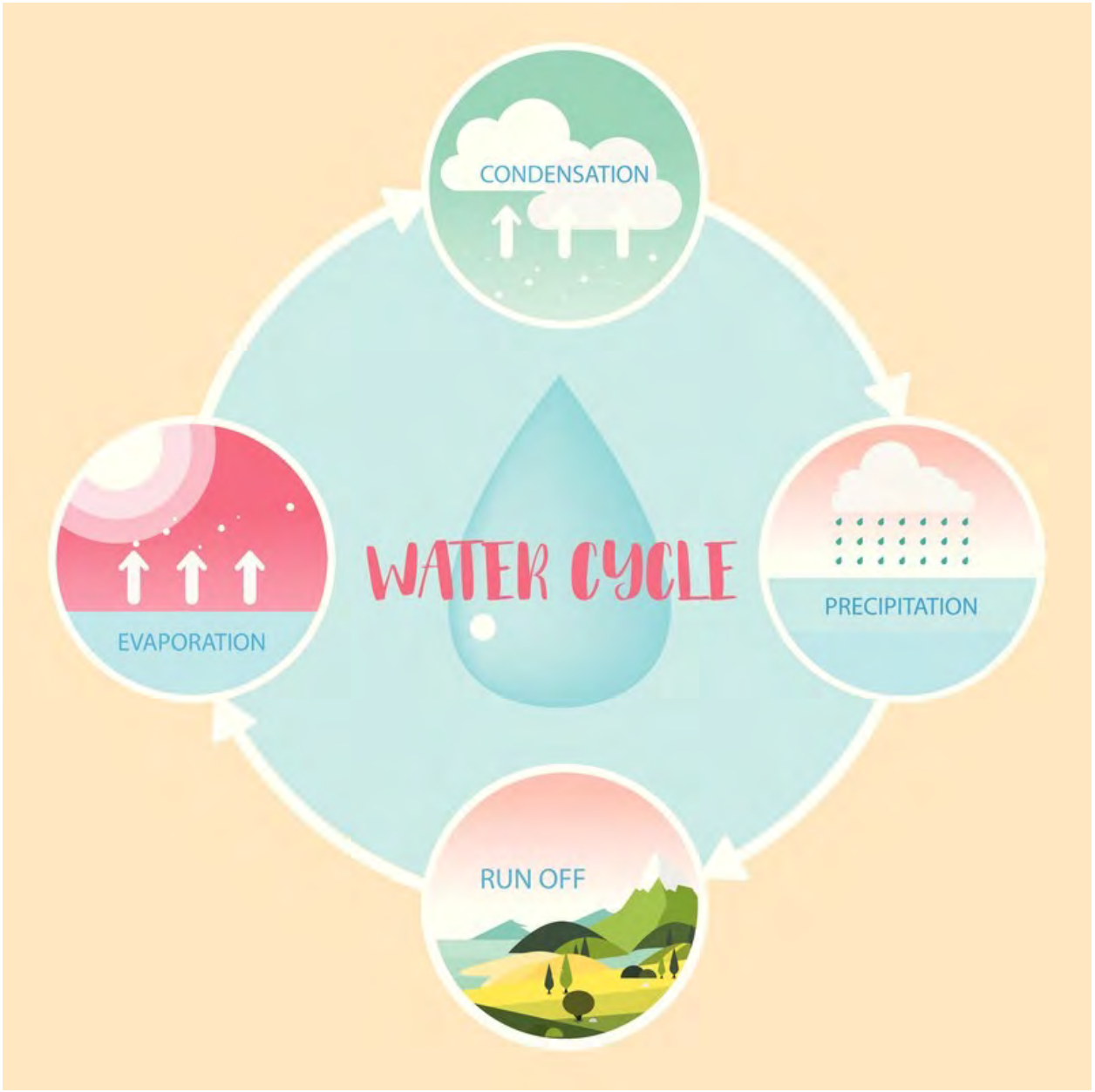
El Camino Real Master Naturalist

Agenda

1. The Basics: The Water Cycle
2. Texas Water Resources and Management
3. GCDs- Powers and purposes
4. Why POSGCD in Burleson and Milam counties
5. Groundwater Resources within POSGCD
6. GMA Joint Planning and State Water Planning
7. Management strategies of POSGCD
8. POSGCD Programs

The Basics:

The Water Cycle



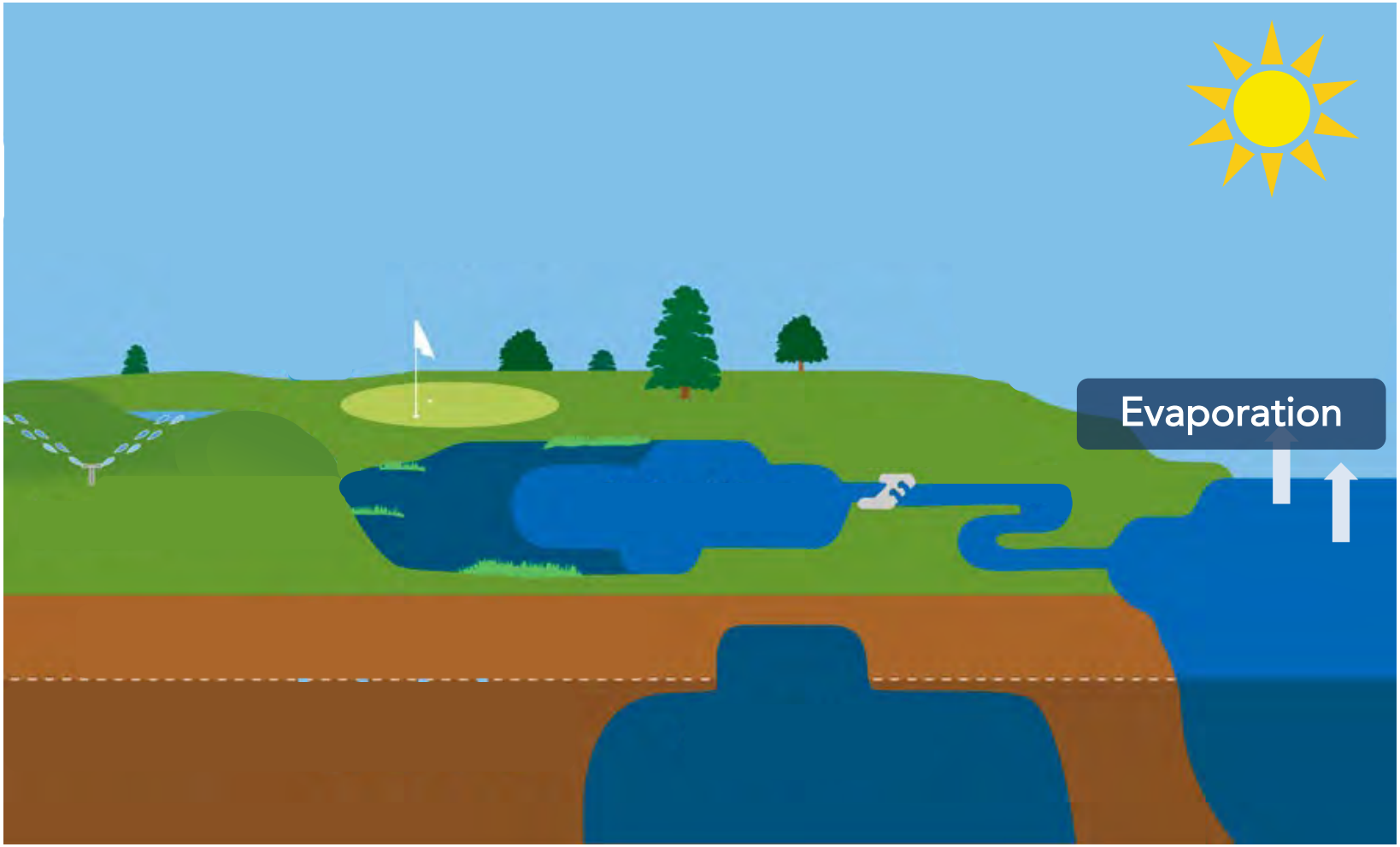
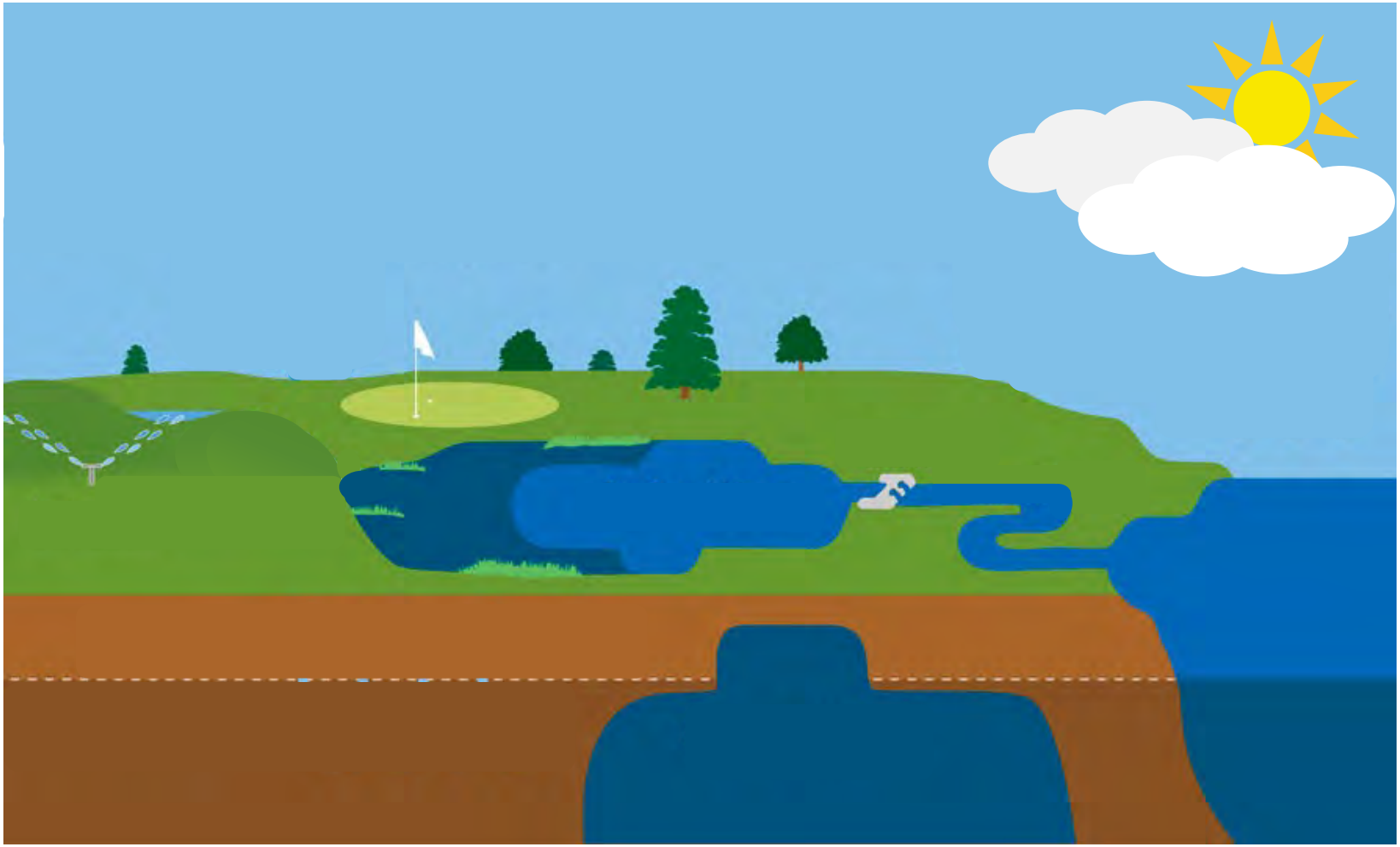
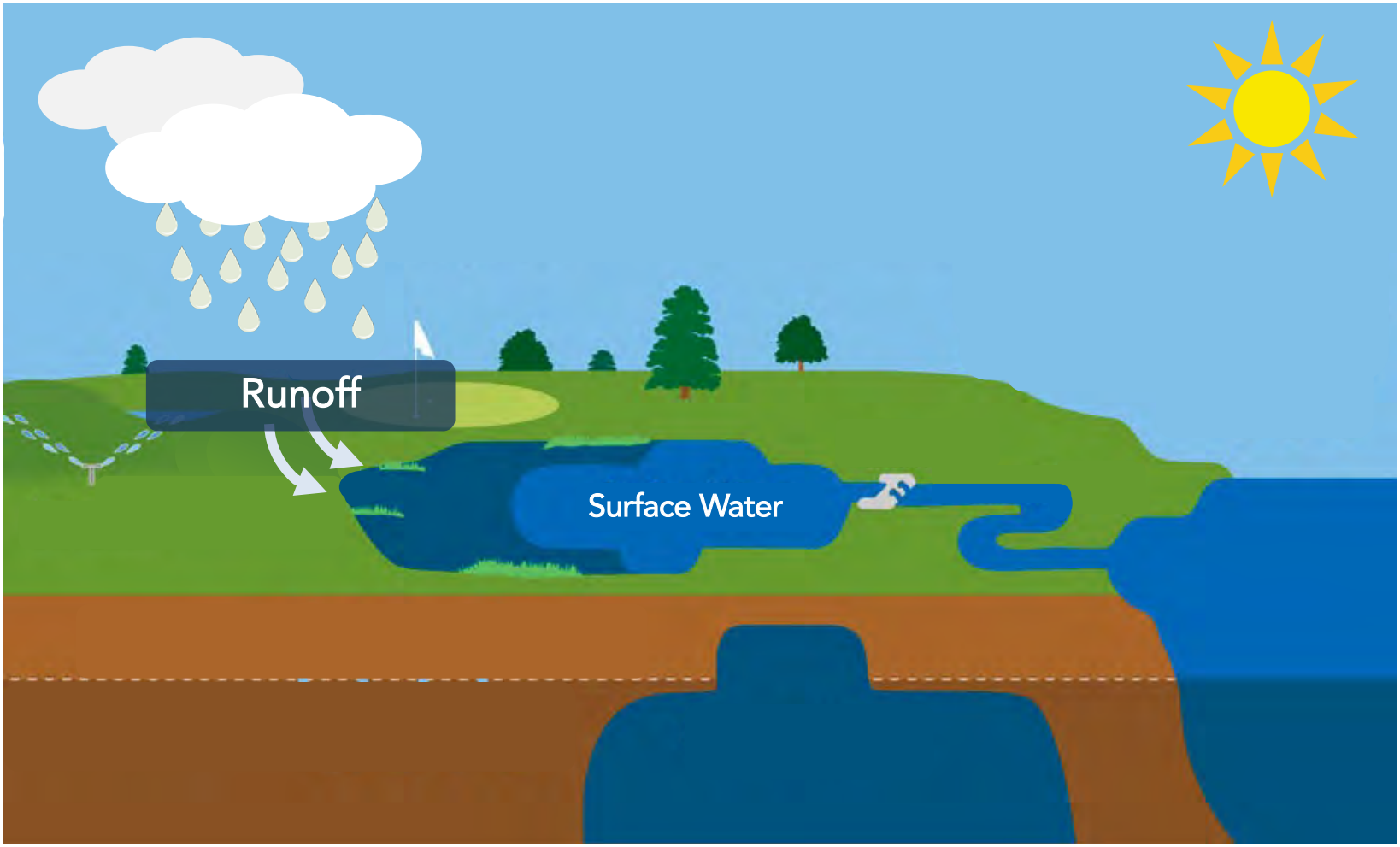


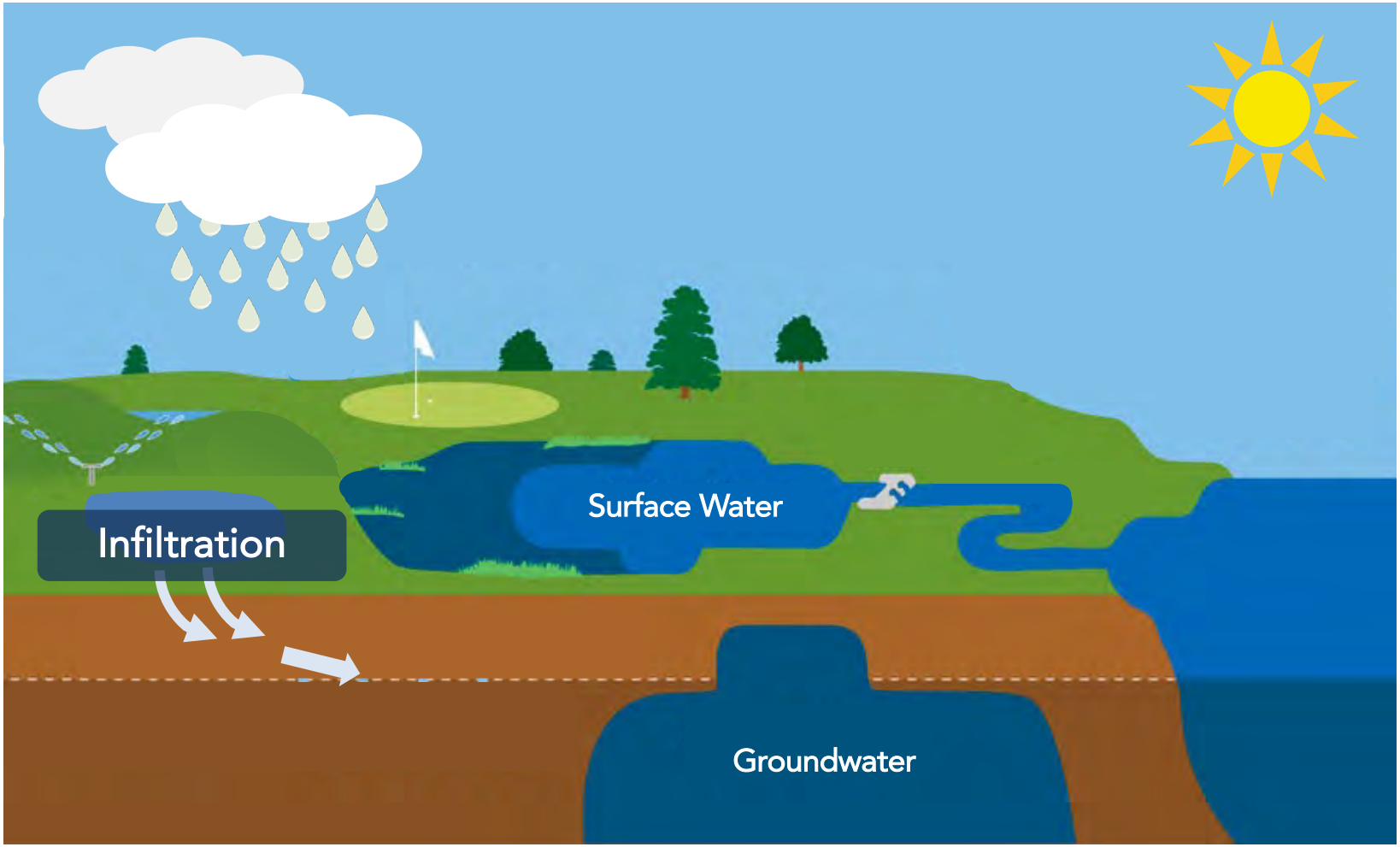
Photo Credits: nysgolfbmp.cals.comell

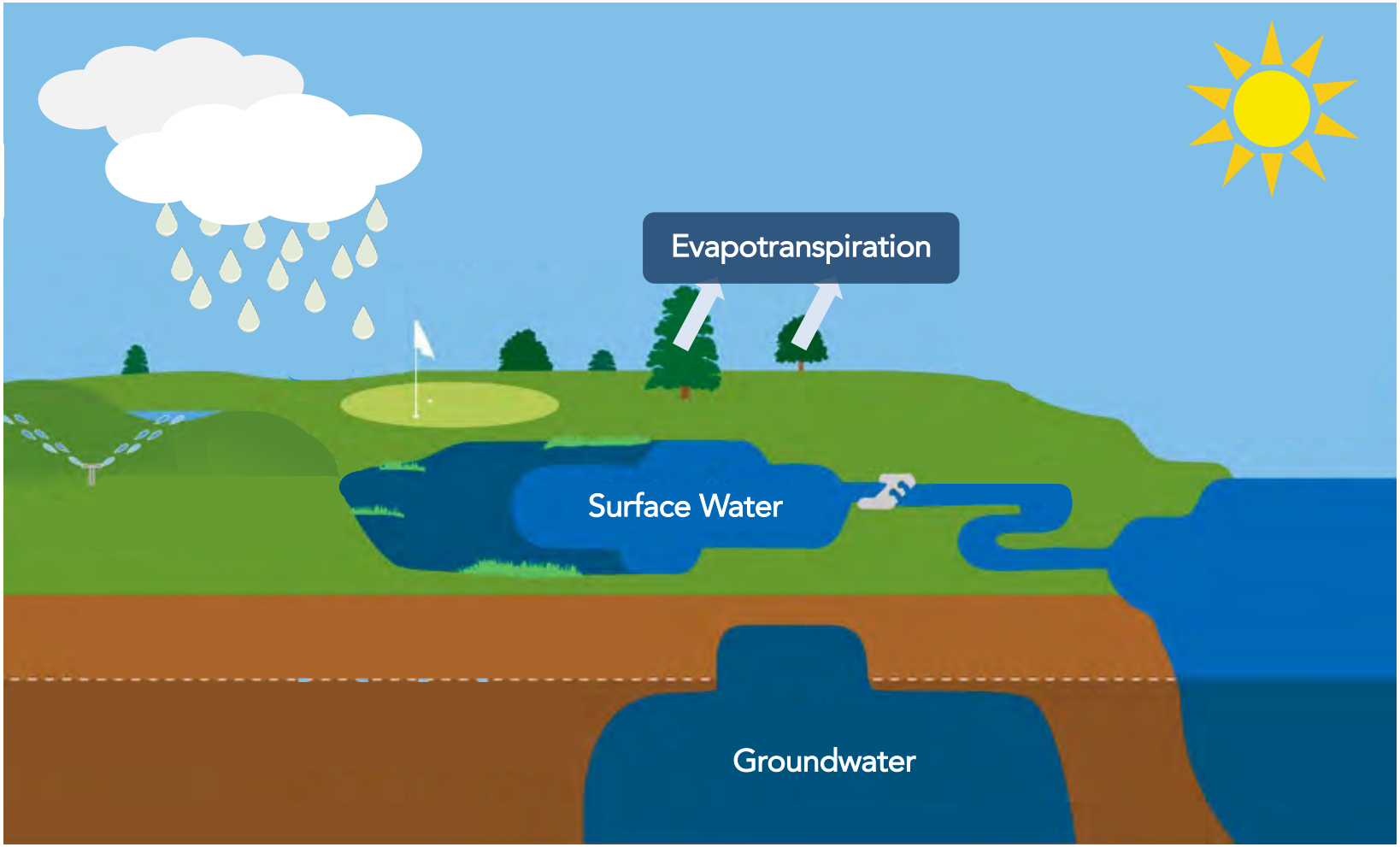

Condensation

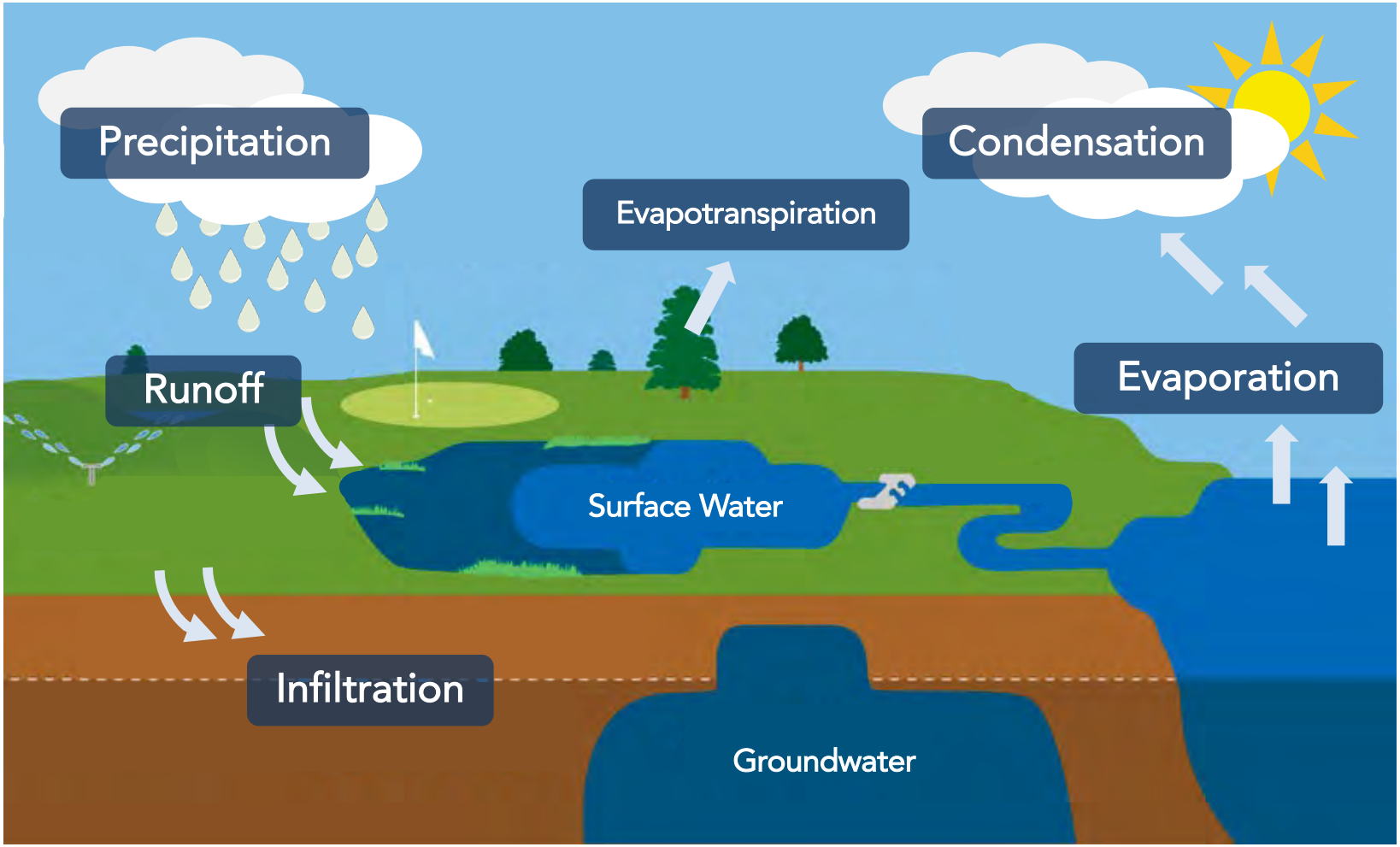



Precipitation


Runoff
Surface Water


Infiltration
Surface Water
Groundwater

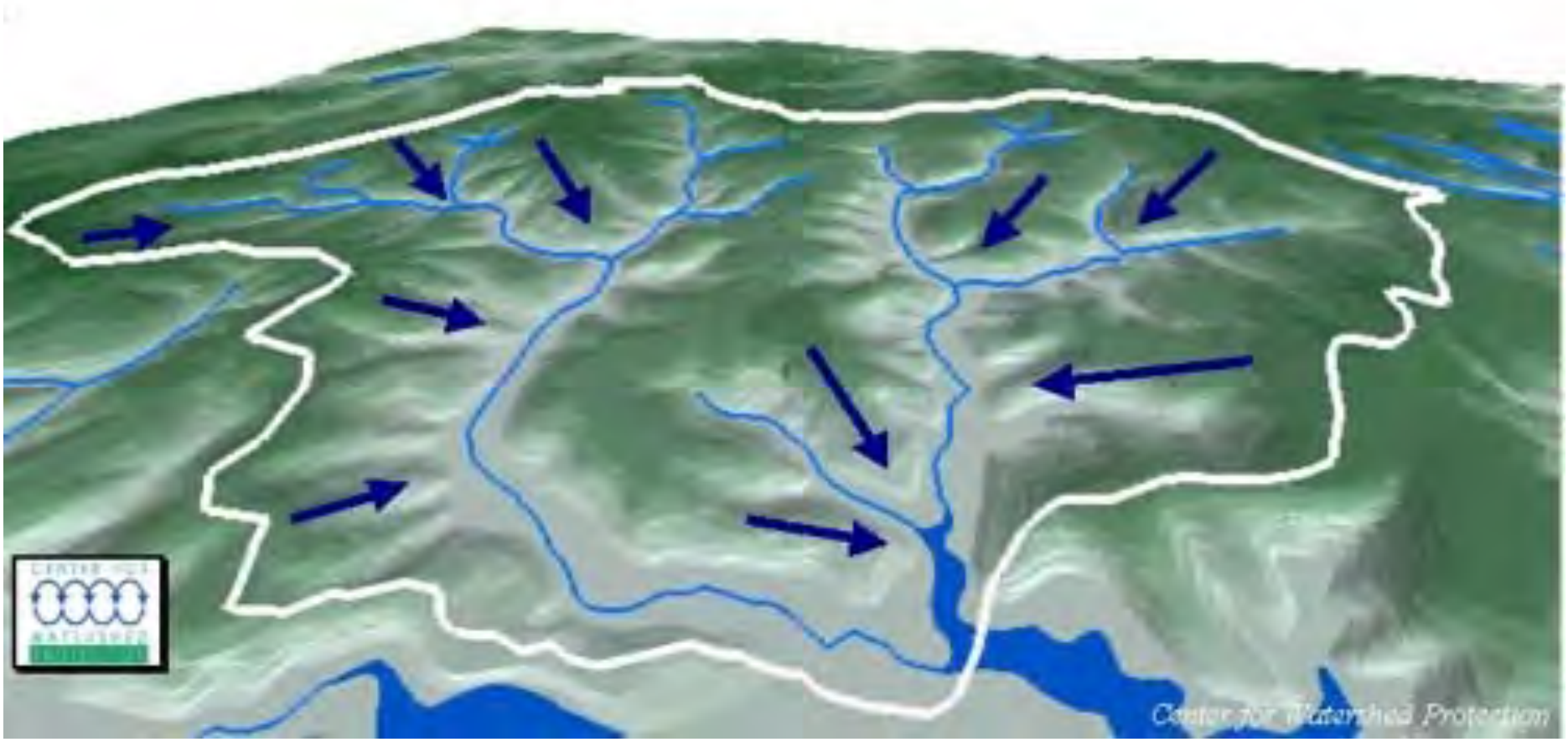

Evapotranspiration
Surface Water
Groundwater


Precipitation
Condensation
Evapotranspiration
Runoff
Evaporation
Surface Water
Infiltration
Groundwater

Texas Water Resources and Management

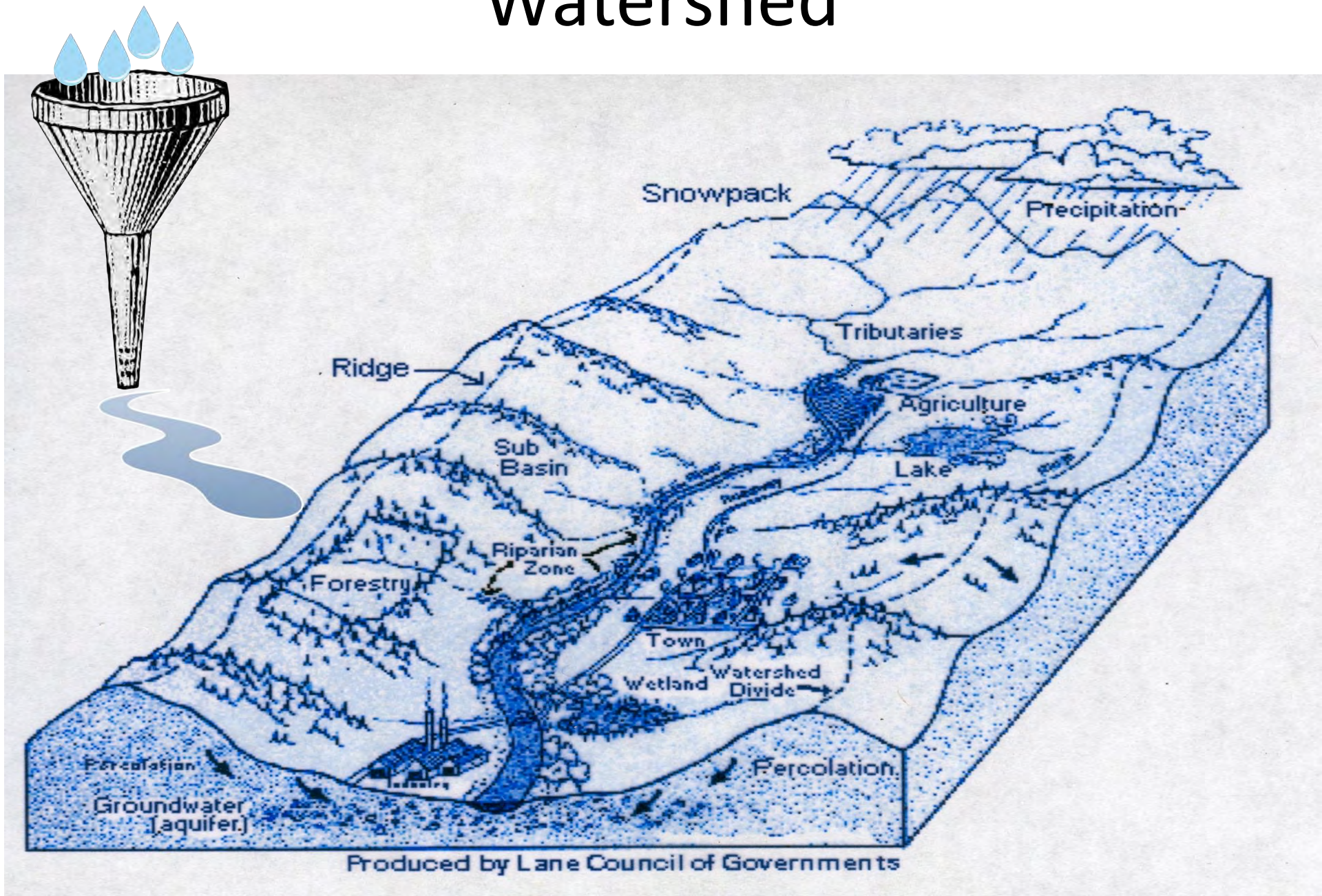
What is a Watershed?

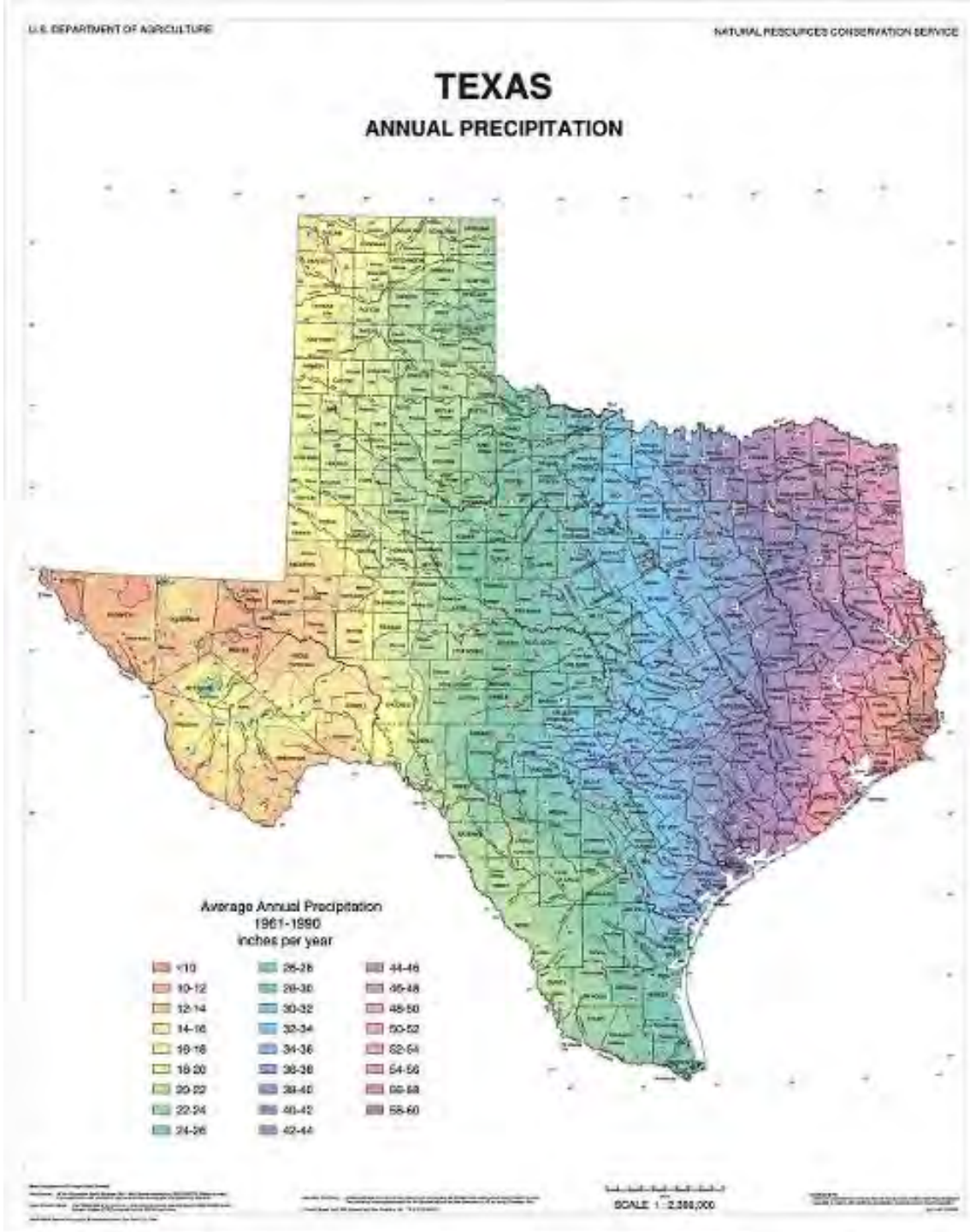
A watershed is an area or ridge of land that separates waters flowing to different rivers, basins or seas.



Many watersheds make a river basin.

Watershed

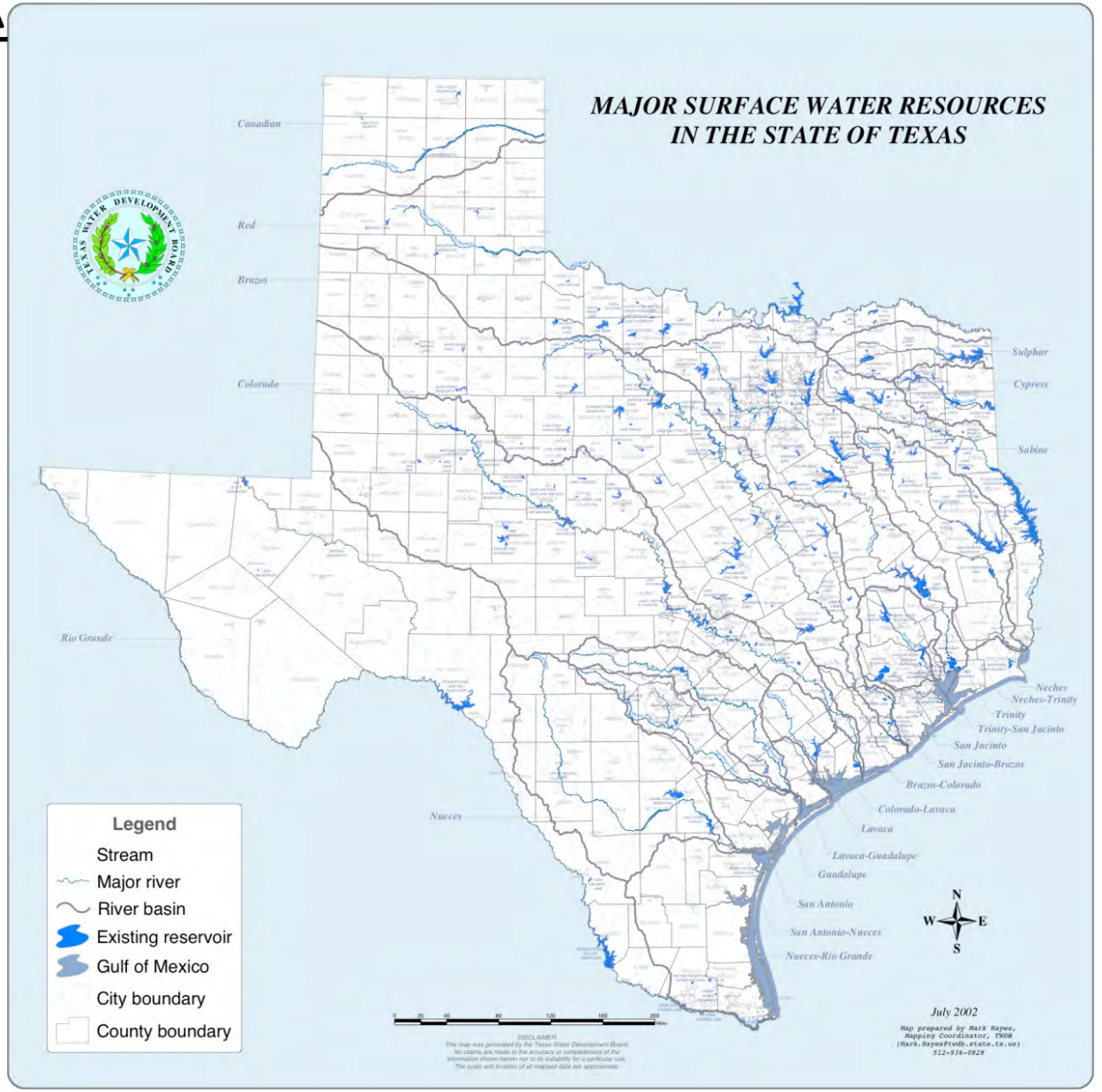

Snowpack
Precipitation
Tributaries
Ridge
Agriculture
Sub Basin
Lake
Riparian Zone
Forestry
Town
Wetland
Watershed Divide
Percolation
Groundwater (aquifer)
Produced by Lane Council of Governments



POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

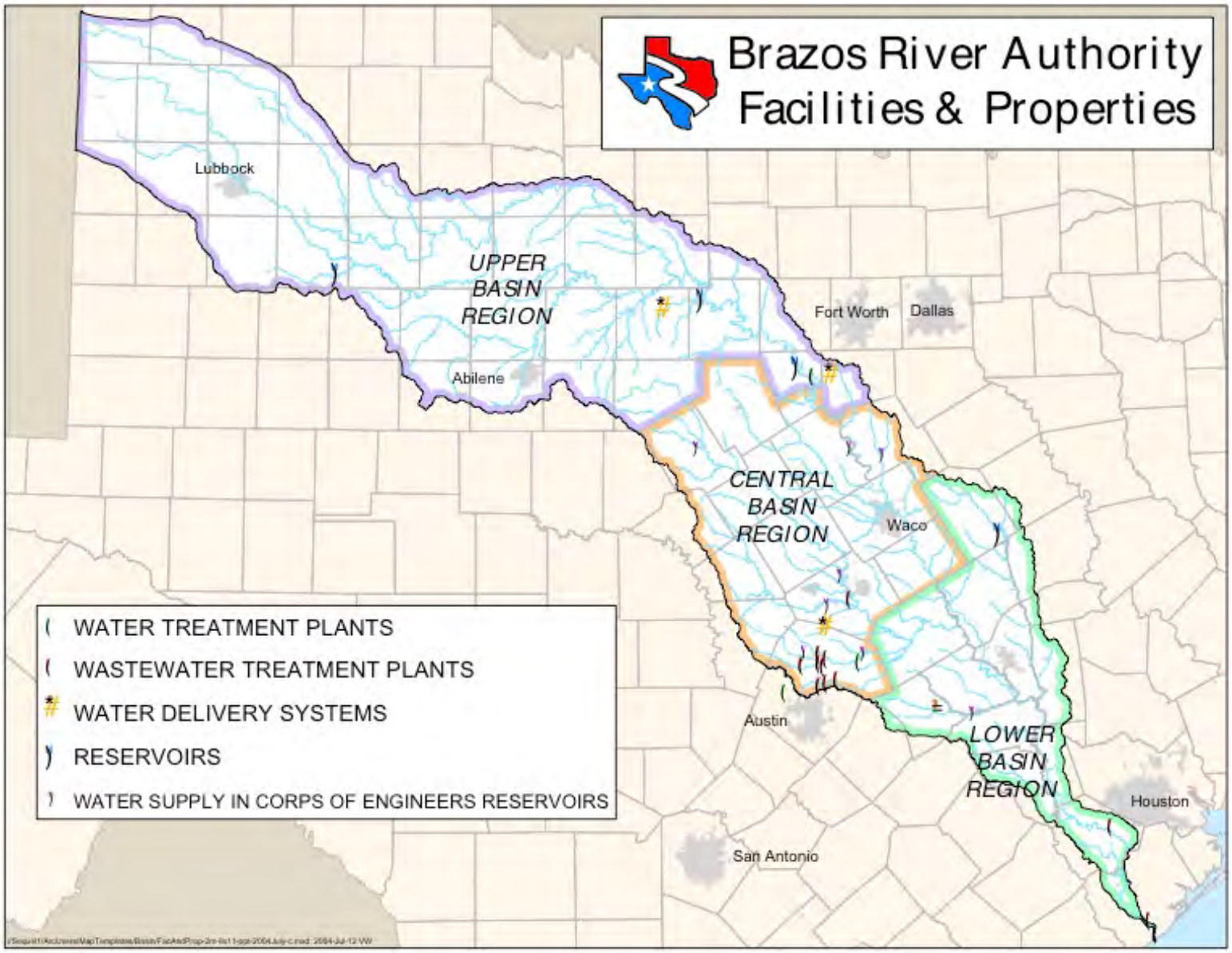
SURFACE WATER

Owned by the State, Regulated by Texas Commission on Environmental Quality (TCEQ), & managed by River Authorities

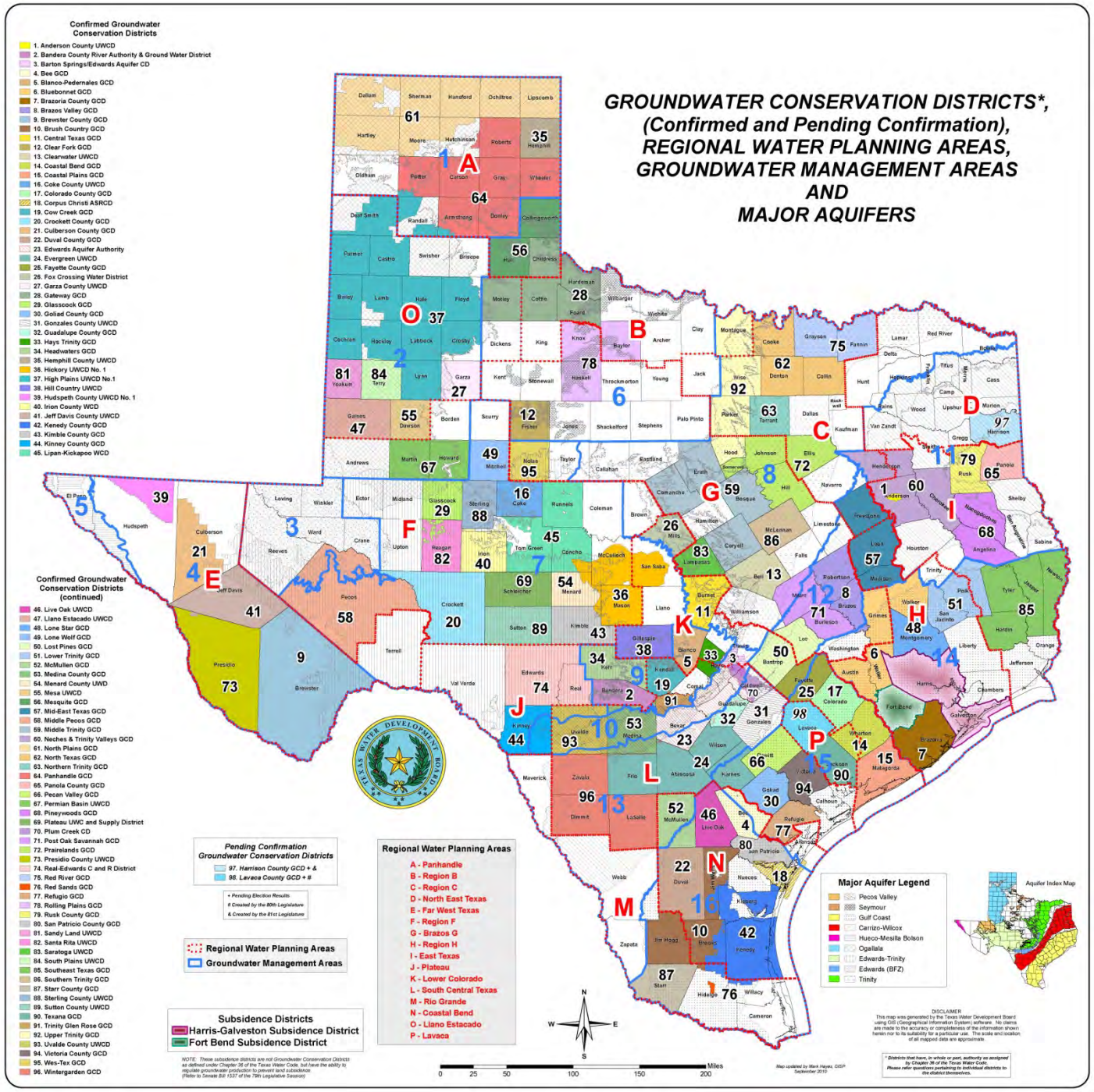


POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Brazos River Authority



Groundwater in Texas aquifers is privately owned & regulated by 100 Groundwater Conservation Districts (GCDs)

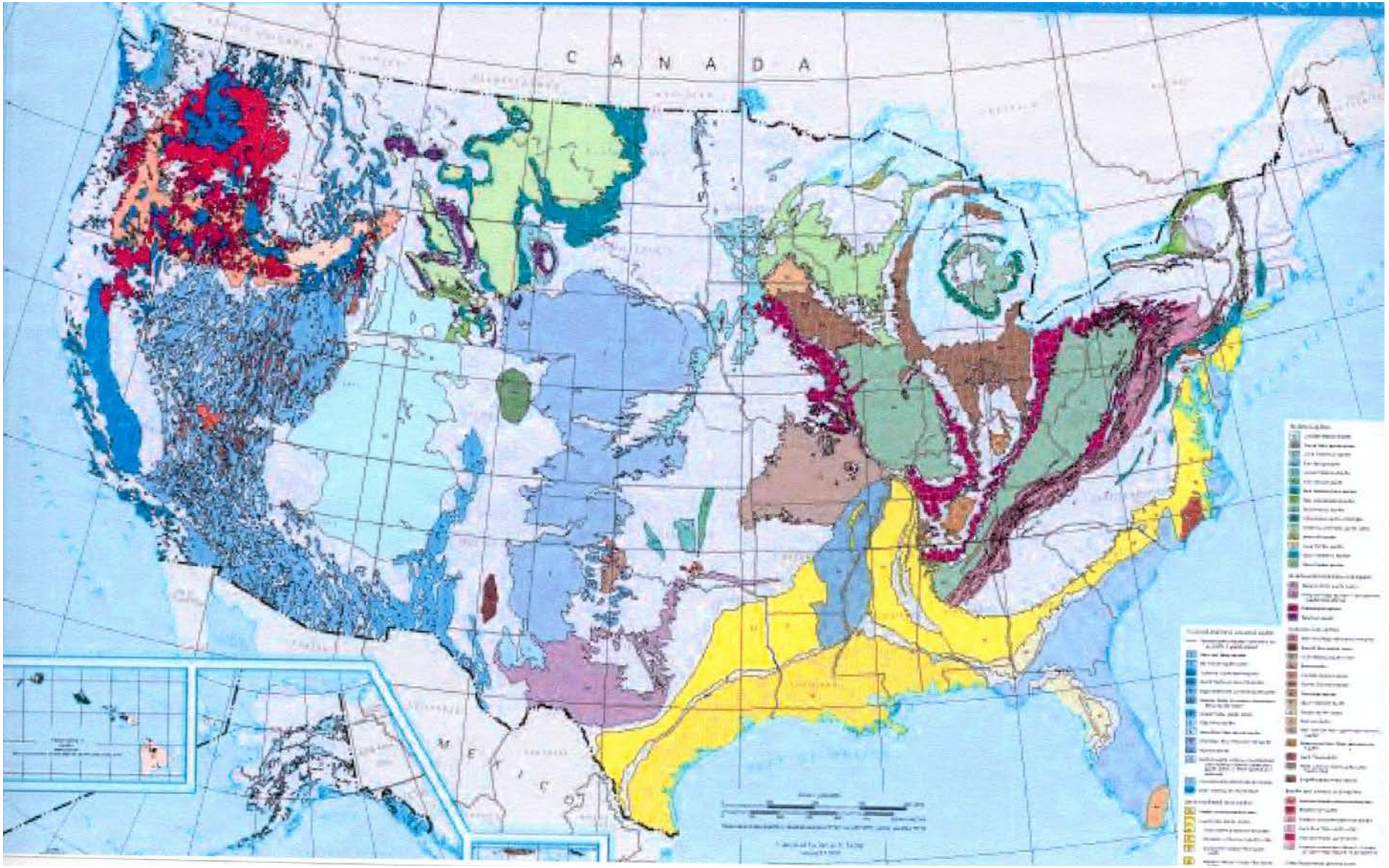


What is an aquifer?

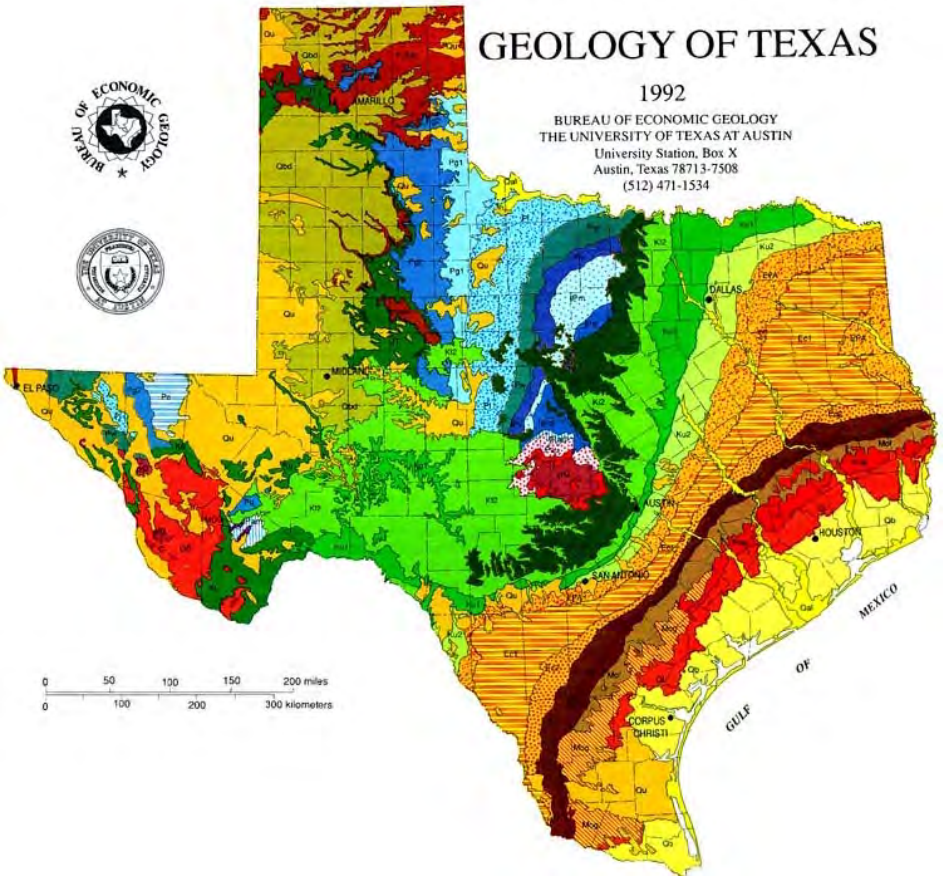
Merriam-Webster: An aquifer is a water bearing stratum of permeable rock, sand, or gravel.

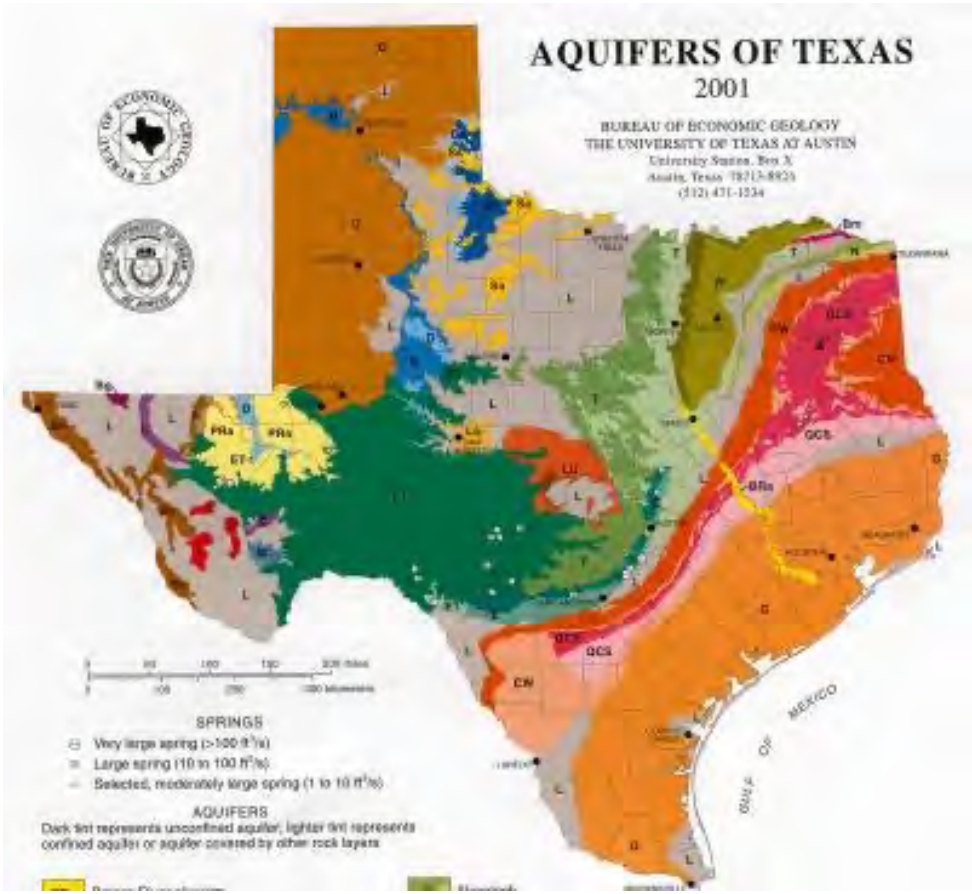
From TWDB (Mace and others): An aquifer is geologic media (rock, sand, gravel, silts, clays) that can yield economically usable amounts (depends on location and needs) of water.

U.S. Aquifers



Geology / Aquifers

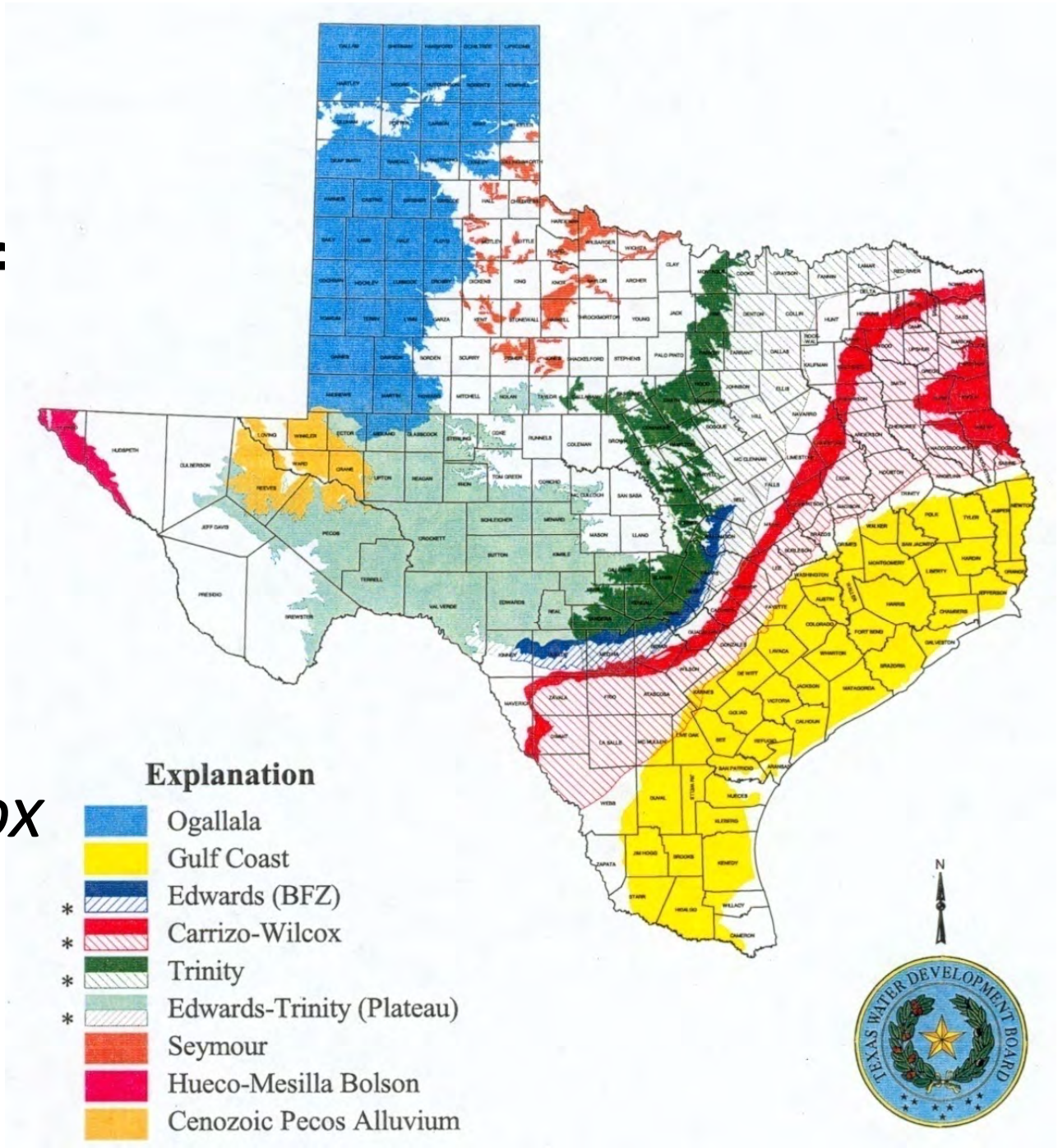




Major Aquifers of Texas

POSGCD

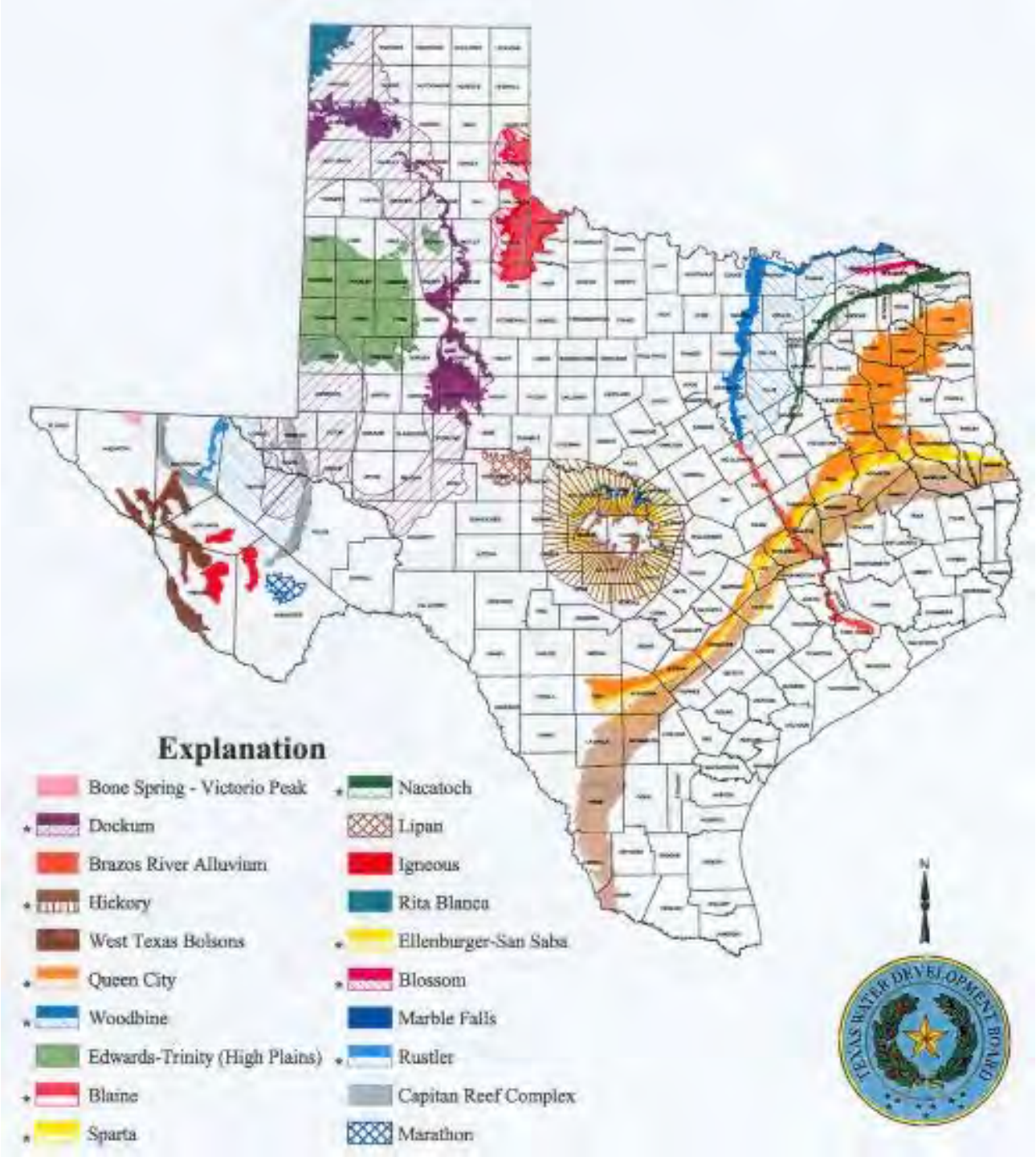
Carrizo-Wilcox



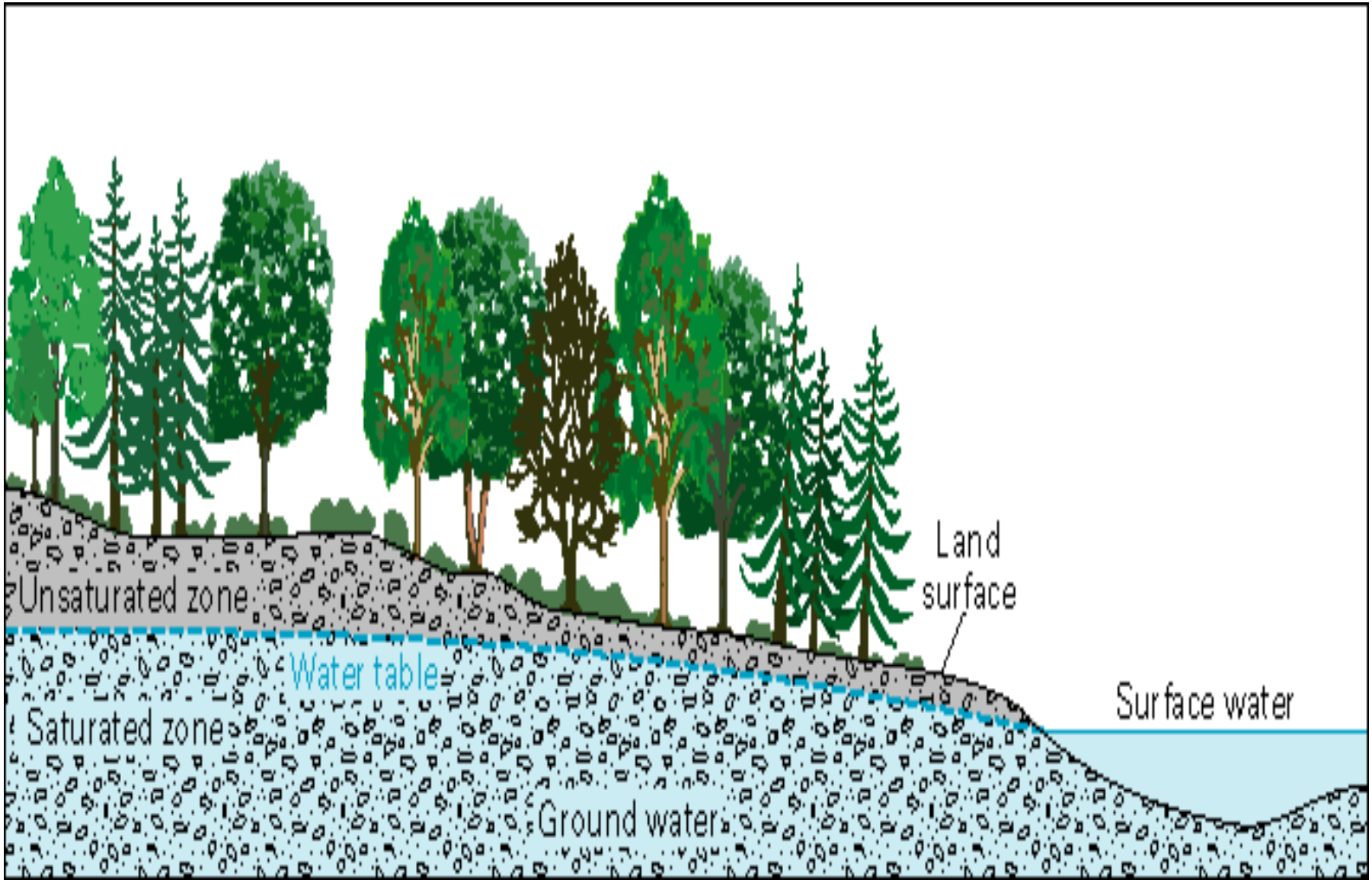
Minor Aquifers of Texas

POSGCD

Queen City
Sparta
Yegua-Jackson
Brazos Alluvium



Groundwater System



Why Groundwater?

More than **half** of all Texans (54.9%) depend on **groundwater** for their drinking water. Where does your drinking water come from?

- Comparatively inexpensive - drilling wells
- costs much less than building water
- treatment plants required to FILTER, PURIFY, and DISINFECT surface water
- Natural FILTRATION occurs as water percolates through layers of sand & gravel
- Groundwater is generally pure, clear and clean

Planning- Texas Population: 2020 vs. 2070

	2020	2070
Population		
Texas	29.6 M	46.7 M
Region G	2.37 M	3.9 M
GW Demands (A/F)		
Texas	17.6 M	18.6 M
Municipal	5.2M	7.78 M

Groundwater Conservation Districts

Powers and Purposes

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

History of Groundwater Management in Texas

- 1904 – Rule of Capture
- 1917- Conservation Amendment - Texas Constitution
- 1949 – Legislature- Groundwater Conservation Districts
  - Can alter or modify Rule of Capture
  - Preferred method of groundwater management
- 2001 (SB 2) – Groundwater Management Areas
  - TWDB designates 16 GMAs
  - GCDs within GMA share GWMPs
  - Joint Planning within a GMA available if called for by one of the GCDs
- 2005 (HB1763) Requires GMA Joint Planning
  - GCDs within GMA must set DFCs for aquifers by 2/3 vote by 9-1-10
  - Each GCD gets one vote
  - Must complete process every 5 years, or as needed, annual reviews
  - TWDB evaluates DFCs using GAM to derive MAGs by GCD, RWPG, and River Basin for planning purposes

Political Subdivisions

- GCDs are Political Subdivisions of State
  (Specific authority and responsibilities in a defined geographic area)
- "Political subdivision" means a county, municipality, or other body politic or corporate of the state, including a **district or authority** created under Section 52, Article III, or Section 59, Article XVI, Texas Constitution, a state agency, or a nonprofit water supply corporation created under Chapter 67. (*Ch. 36.001)*
- Empowered by Chapter 36, Texas Water Code

PURPOSE

Chapter 36.0015

- **Provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater** (Also must provide for most efficient use of the groundwater resources)
- **Groundwater Conservation Districts are the <u>state's preferred method of groundwater management</u> through rules developed, adopted, and promulgated by a district**

Ownership of Groundwater

- 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**.

Ownership of Groundwater

- 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…

ADMINISTRATION

Section 36.051

Appointed by County Commissioners

BOARD OF DIRECTORS

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Sidney Youngblood
Board President
Milam Co Industrial

Ward Roddam
Board Vice President
Milam Co Municipal

Jay Wilder
Board Secretary
Burleson Co Agriculture

Lee Alford
Director
Burleson Co Industrial

Becky Goetsch
Director
Burleson Co At Large

Dana McClaren
Director
Milam Co Agriculture

Steven Wise
Director
Milam Co At Large

Tommy Tietjen
Director
Burleson Co Municipal

Bob Wilson
Director
Milam Co Rural Water

Ed Savage
Director
Burleson Co Rural Water

STAFF

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Gary Westbrook
General Manager

Gary began work for the District in

Bobby Bazan
Water Resources Specialist

Elaine Gerren
Office Manager

Craig Andrews
Field Technician

Craig Andrews, POSGCD

Doug Box
Education Coordinator

Jeff Fisher
Field Technician

Courtney Gentry
Administrative Assistant

RULEMAKING POWER

Sec. 36.101

- A district may make and enforce rules, including rules limiting groundwater production **based on tract size or the spacing of wells,** to provide for conserving, preserving, protecting, and recharging of the groundwater or of a groundwater reservoir or its subdivisions in order to control subsidence, prevent degradation of water quality, or prevent waste of groundwater and to carry out the powers and duties provided by this chapter.

During the rulemaking process the board shall consider **all groundwater uses and needs** and shall develop rules which are fair and impartial.

After notice and hearing, the board **shall** adopt and enforce rules to implement this chapter….

PROTECTION OF HISTORIC OR EXISTING USE
Sec. 36.116

- In promulgating any rules limiting groundwater production, the district may preserve historic or existing use before the effective date of the rules to the maximum extent practicable consistent with the district's comprehensive management plan under Section 36.1071 and as provided by Section 36.113. (**Historic Use, Resolution of 2003**)

Source of the struggle for Property Rights: Historic or Existing users vs. Future users

Existing Users: "Protect my investment/livelihood"

Future Users: "Protect my property rights"

.

NOTICE REQUIREMENTS

Section 36.101

- 20 days notice required for **rulemaking** hearings
- Posted at District Office and website, County Clerk's Office, one or more newspapers in counties of District (Office and website only for regular meetings)
- Provide notice by mail, fax, or email to persons requesting notice (lasts one year)
- Make available copy of proposed rules on website and at office location during normal business hours

ENFORCEMENT OF RULES

Section 36.102

- A district may enforce this chapter and its rules by injunction, mandatory injunction, or other appropriate remedy in a court of competent jurisdiction ($100K settlement)
- The board **by rule may set** reasonable civil penalties for breach of any rule of the district not to exceed $10,000 per day per violation, and each day of a continuing violation constitutes a separate violation
- If the district prevails in any suit to enforce its rules, the district **may** seek and the court **shall** grant, in the same action, recovery for attorney's fees, costs for expert witnesses, and other costs incurred by the district before the court. Also applies to defense to suit)

RIGHT TO ENTER PROPERTY
Section 36.123

- District employees and agents are entitled to enter any public or private property within the boundaries of the district … at any reasonable time for the purpose of inspecting and investigating conditions relating to the quality of water in the state or the compliance with any rule, regulation, permit, or other order of the district

- … shall observe the establishment's rules and regulations concerning safety … and notify any occupant or management of their presence and shall exhibit proper credentials

MISCELLANEOUS

- Section 36.107 - A district may carry out any research projects deemed necessary by the board
- Section 36.109 - A district may collect any information the board deems necessary
- Section 36.158 - A district may make or accept **grants**, gratuities, advances, or loans in any form to or from any source approved by the board, including any governmental entity, and may enter into contracts, agreements, and covenants in connection with grants, gratuities, advances, or loans that the board considers appropriate

AUTHORITY TO SET FEES

Section 36.205

- A district may set fees for administrative acts of the district, such as filing applications (Fee schedule)
- A district shall set and collect fees for all services provided outside the boundaries of the district
- A district may assess production fees based on the amount of water authorized by permit
- A district may assess the fees in lieu of, or in conjunction with, any taxes otherwise levied by the district
- A district may use revenues generated by the fees for any lawful purpose in accomplishing its purposes

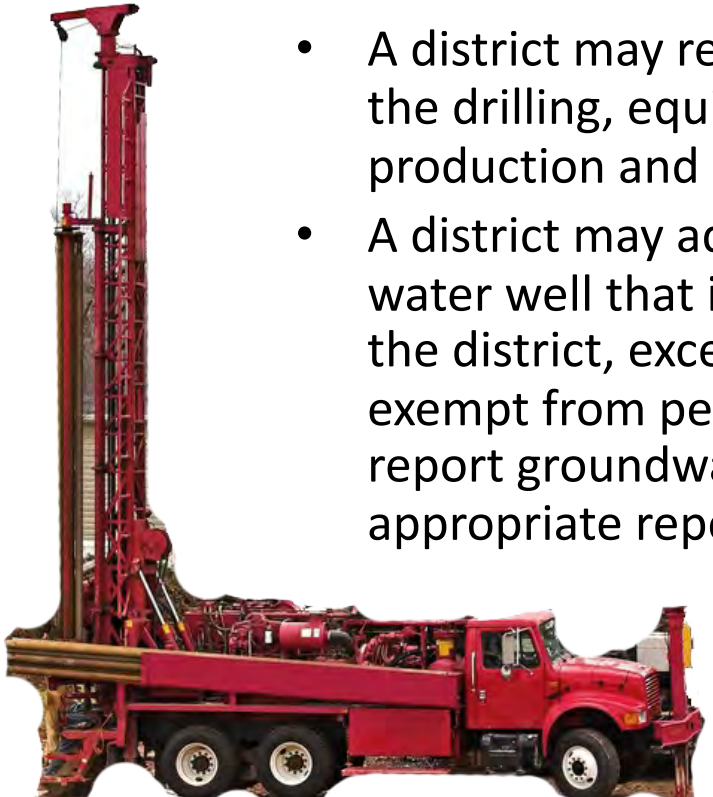
DRILLERS' LOGS

Section 36.112

A district shall require that accurate drillers' logs be kept of water wells and that copies of drillers' logs and electric logs be filed with the district

RECORDS AND REPORTS

Section 36.111



- A district may require that records be kept and reports be made of the drilling, equipping, and completing of water wells and of the production and use of groundwater
- A district may adopt rules that require an owner or operator of a water well that is required to be registered with or permitted by the district, except for the owner or operator of a well that is exempt from permit requirements under Section 36.117(b)(1), to report groundwater withdrawals using reasonable and appropriate reporting methods and frequency.

EXEMPTIONS

Section 36.117

A district may exempt wells from the requirement of obtaining a drilling permit, an operating permit, or any other permit required by this chapter or the district's rules

A district may not require any permit issued by the district for:

- a well used solely for domestic use or for providing water for livestock or poultry on a tract of land larger than 10 acres that is either drilled, completed, or equipped so that it is incapable of producing more than 25,000 gallons of groundwater a day

- the drilling of a water well used solely to supply water for a **rig** that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the Railroad Commission of Texas provided that the person holding the permit is responsible for drilling and operating the water well and the well is located on the same lease or field associated with the **drilling rig** (Does not include secondary exploration such as frac water)

EXEMPTIONS

Section 36.117

A district may not require any permit issued by the district for:

- the drilling of a water well authorized under a permit issued by the Railroad Commission of Texas under Chapter 134, Natural Resources Code, or for production from such a well to the extent the withdrawals are required for mining activities regardless of any subsequent use of the water
- A water well exempted under (36.117) shall be registered in accordance with rules promulgated by the district

PERMITS FOR WELLS

Section 36.113

A district **shall** require a permit for the drilling, equipping, operating, or completing of wells or for substantially altering the size of wells or well pumps, except as provided by Section 36.117 (Exemptions)

DRILLING OR ALTERING WELL

Section 36.115

No person, firm, or corporation may:

- drill or operate a well without first obtaining a permit from the district
- alter the size of a well or well pump such that it would bring that well under the jurisdiction of the district without first obtaining a permit from the district
- By definition “person” is all inclusive

REGULATION OF SPACING AND PRODUCTION

Section 36.116

A district by rule may:

- Regulate spacing of new wells from existing wells and property lines based on production capacity or other characteristics
- Regulate production of groundwater by setting production limits on wells based on acreage or tract size, acreage assigned to an authorized well site, acre feet per acre, or gallons per minute per well site acre, managed depletion, or any combination of these

- In promulgating any rules limiting groundwater production, the district may preserve historic or existing use… to the maximum extent practicable consistent with the district's comprehensive management plan

MANAGEMENT PLAN

Section 36.1071

- Must be adopted within 3 years of creation or confirmation
- Must be approved by Texas Water Development Board
- Must contain estimates of groundwater resources, availabilities, demands, and uses
- Must contain District management strategies including Desired Future Conditions
- Must be developed by using the District's best available data
- Must be compatible with other GCD Management Plans in same Groundwater Management Area
- The district shall adopt rules necessary to implement the management plan

Other

- GCDs may be Created by:
  - TCEQ- Priority Groundwater Management Area
  - Legislation- Locally filed
- Confirmation Election
  - Temporary Directors prior
  - Permanent Directors after
- Revenues
  - Tax Based
  - Fee Based
  - Both
- Powers and Authorities from 2 sources
  - Chapter 36
  - Enabling or Special Legislation of District- takes precedent over Chapter 36
    - Add or amend powers (fee structure)
    - Remove Powers (eminent domain)

Why Post Oak Savannah Groundwater Conservation District in Burleson and Milam Counties?

POSGCD created by 77th Legislature, HB1784, 2001

Who is Post Oak Savannah GCD

- Approved in Confirmation Election by Citizens of Burleson and Milam Counties

POSGCD History

- 2001- Created by 77th Legislature (HB1784)
- 2002- Confirmed by election both counties
- 2003- Resolution for Local Water Utilities
- 2004- Adopt Rules and Management Plan
- 2005- Adopt strategies to protect shallow aquifers
- 2010- Adopt Desired Future Conditions
- 2013- Codified by 83rd Legislature

POSGCD Background
and Reasons for creation (2001)

I. Resources + Location + Growth =

>35,000 acres water rights leased by 2000

II. Local Concerns

a. Existing Area Users (100% Burl. Co., 90% Milam Co.- use groundwater)

Municipal, Industrial, Agricultural

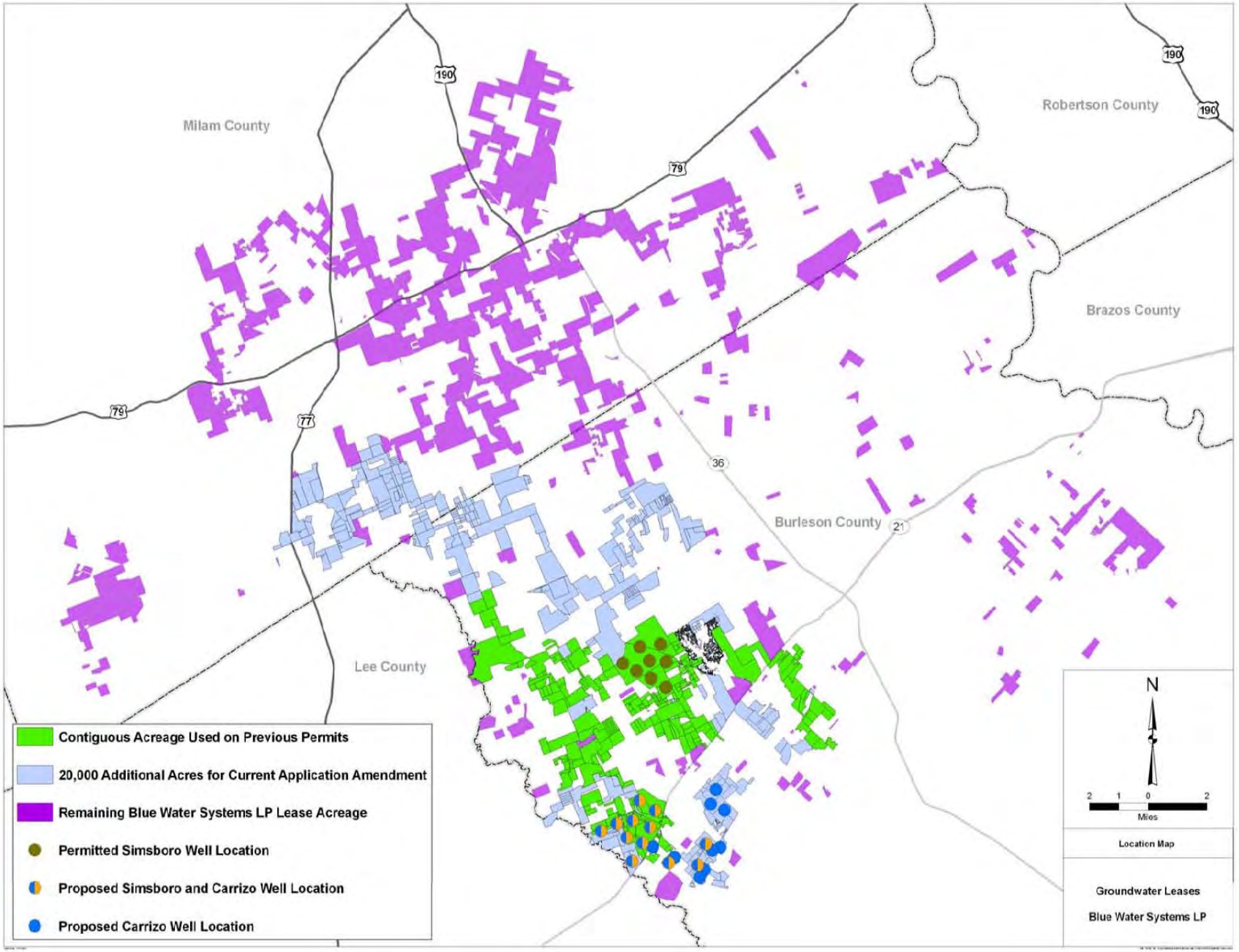
b. Future Growth

c. Reasonableness of Management Strategies

d. Insufficient Science

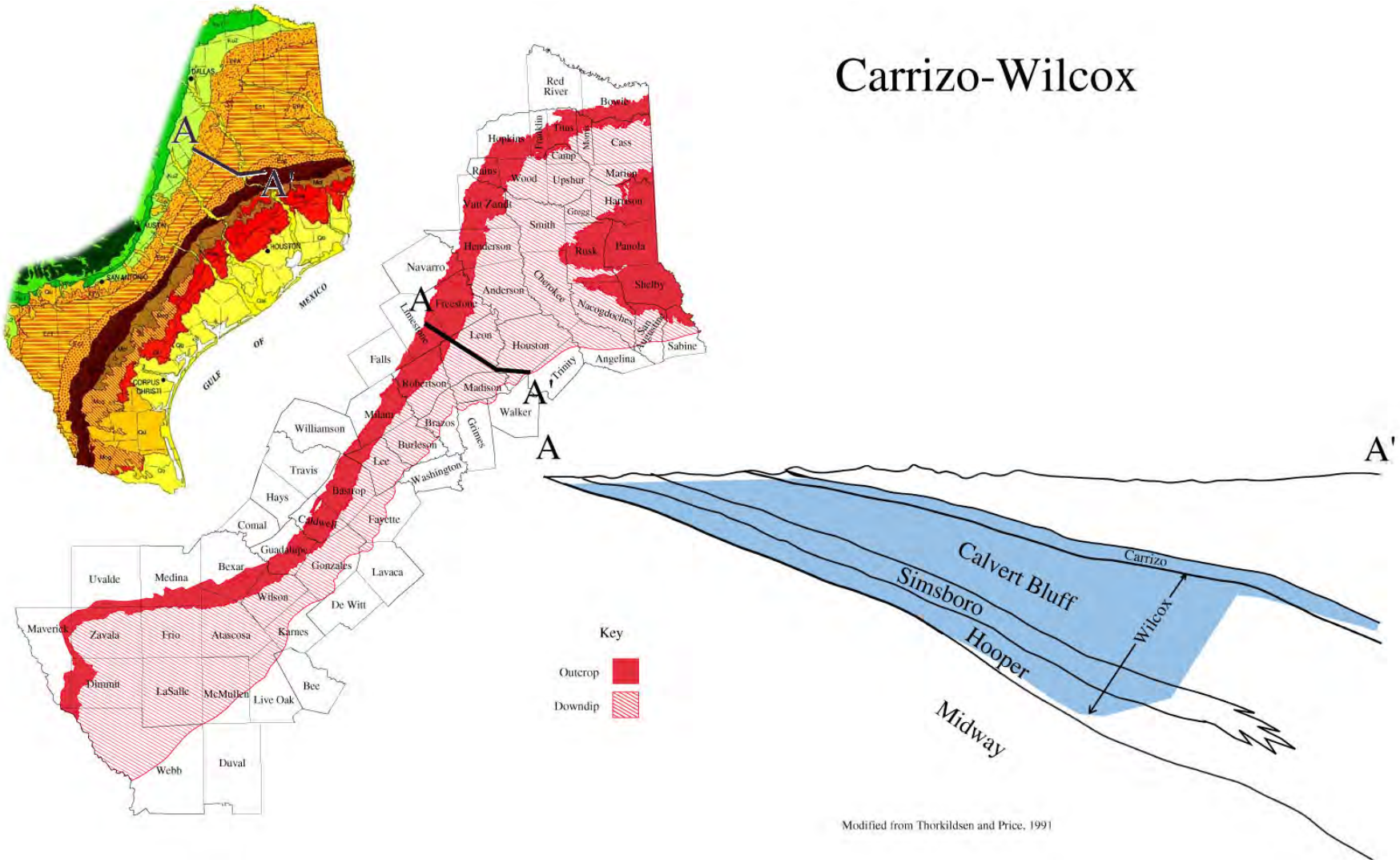
e. Unknown area future projects (in and out of District)

f. Property Rights

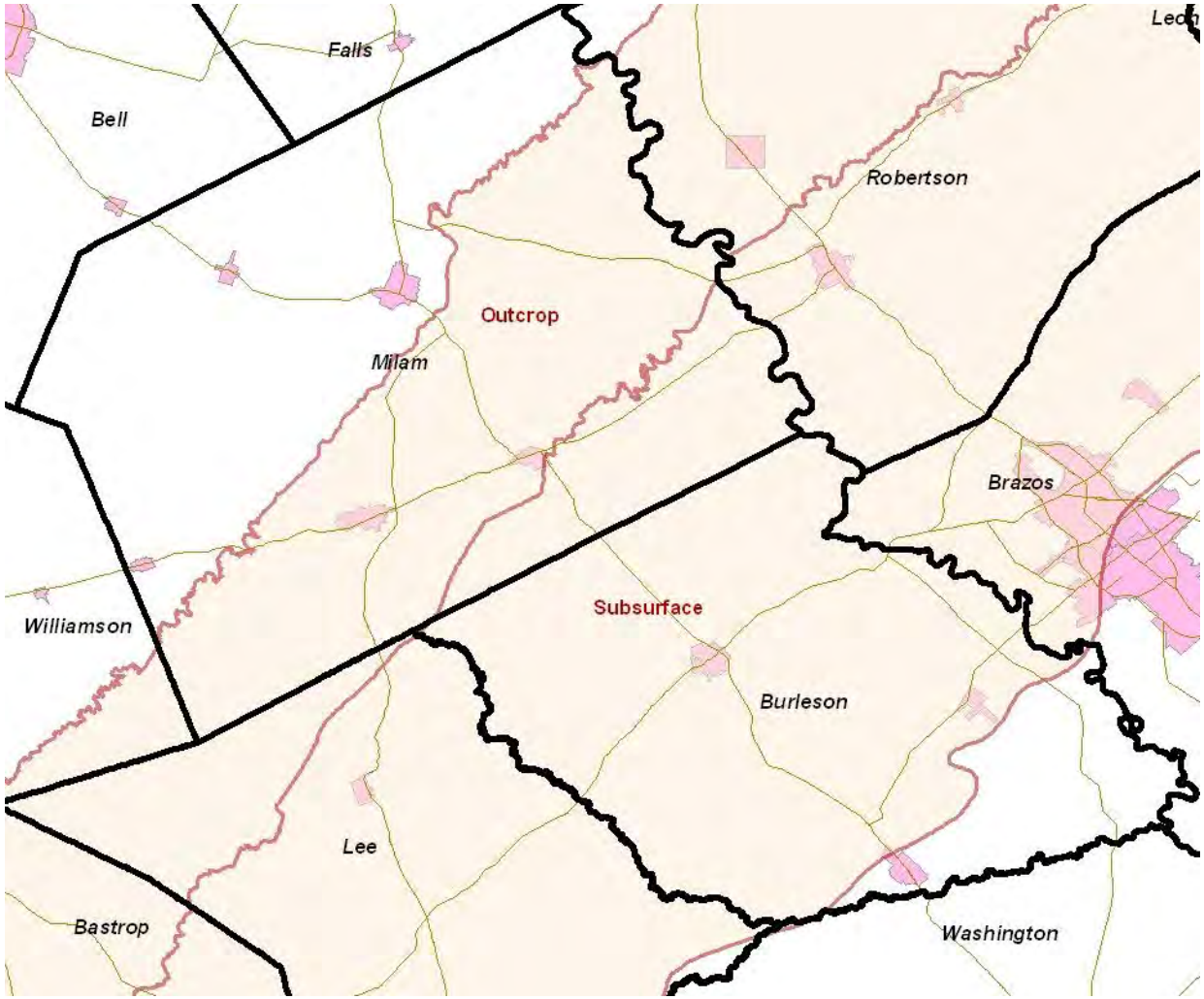

Milam County
Robertson County
Brazos County
Burleson County
Lee County
190
79
77
36
21
Contiguous Acreage Used on Previous Permits
20,000 Additional Acres for Current Application Amendment
Remaining Blue Water Systems LP Lease Acreage
Permitted Simsboro Well Location
Proposed Simsboro and Carrizo Well Location
Proposed Carrizo Well Location
N
2 1 0 2
Miles
Location Map
Groundwater Leases
Blue Water Systems LP

Groundwater resources within POSGCD

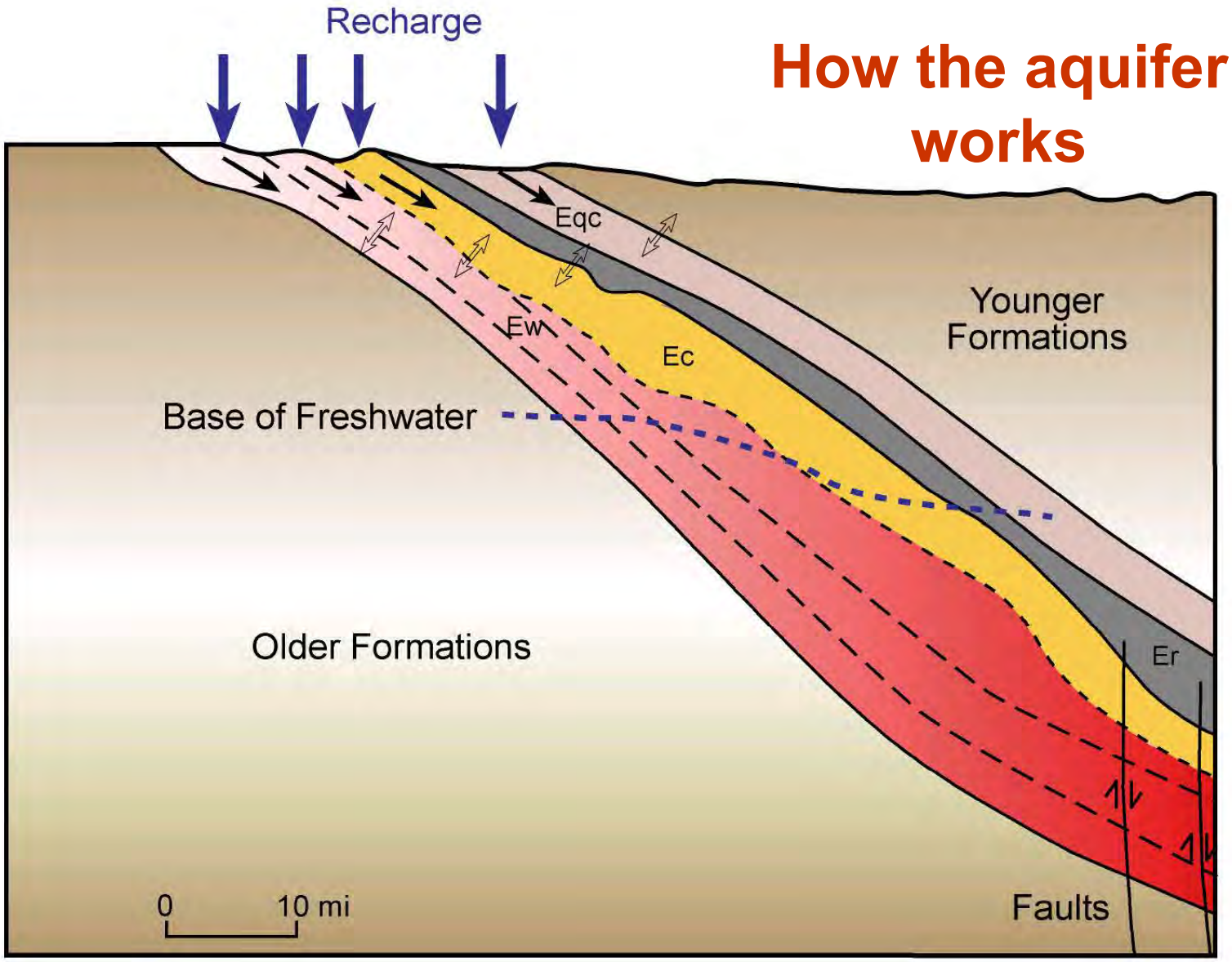
Carrizo-Wilcox Aquifer



Outcrop and Subsurface Extent of Carrizo-Wilcox Aquifer



How the aquifer works

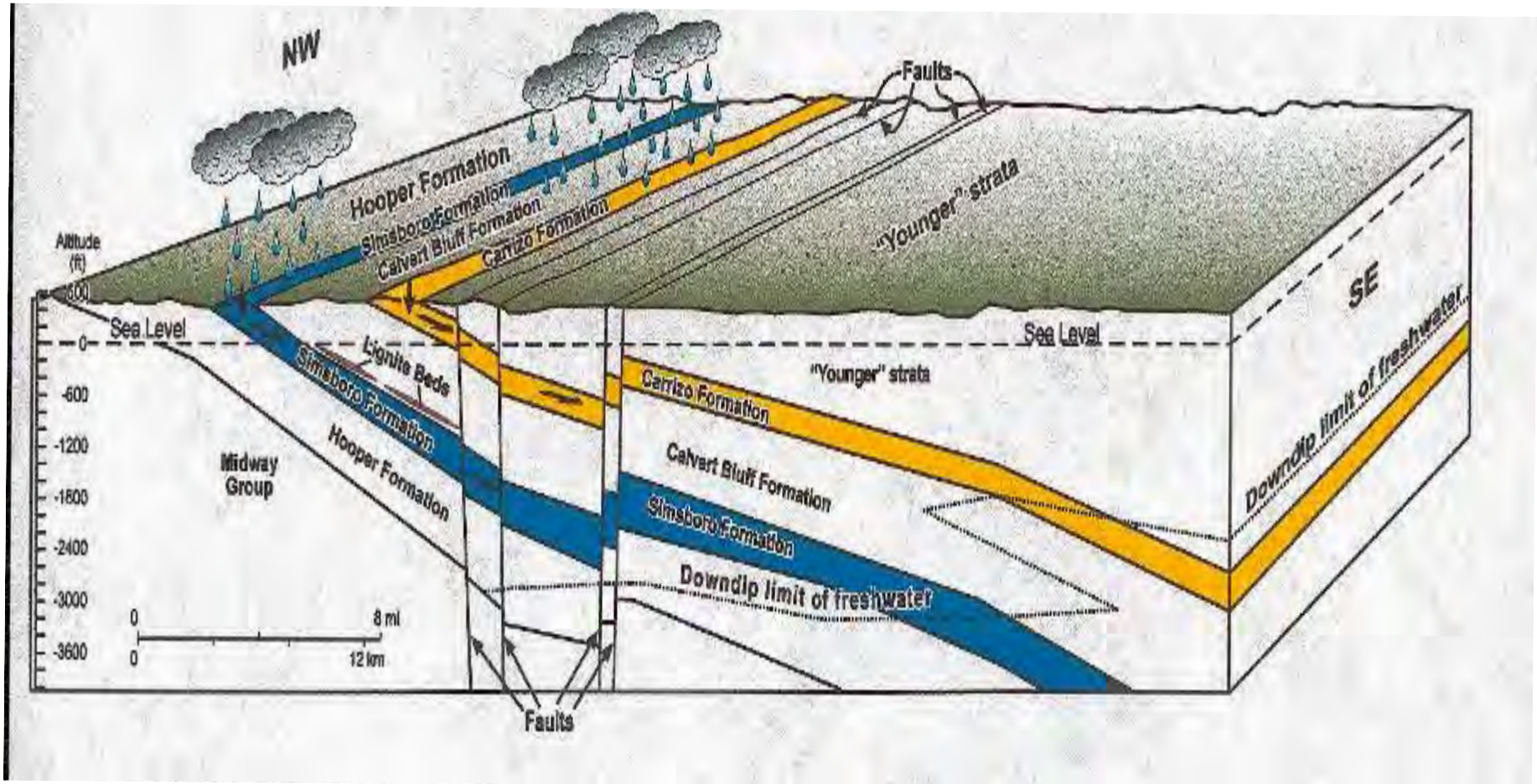


Ew = Wilcox; Ec = Carrizo; Er = Reklaw; Eqc = Queen City

Carrizo-Wilcox Formations (layers)

- **CARRIZO** = primarily sand
- **CALVERT BLUFF** = up to 1000 feet thick, mixture of sand & clays; layer of **lignite**
- **SIMSBORO** = 100 to 700 feet thick, sand
- **HOOPER** = oldest; mud, clay & silt

Geologic Cross Section
Carrizo-Wilcox Aquifer
Fault Zones



GMA Joint Planning
And
State Water Planning

History of Groundwater Management in Texas

- 1904 – Rule of Capture
- 1949 – Groundwater Conservation Districts
  - Can alter, modify or discard Rule of Capture
  - Preferred method of groundwater management
- 2001 (SB 2) – Groundwater Management Areas
  - TWDB designates 16 GMAs
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- 2005 (HB1763) Requires GMA Joint Planning
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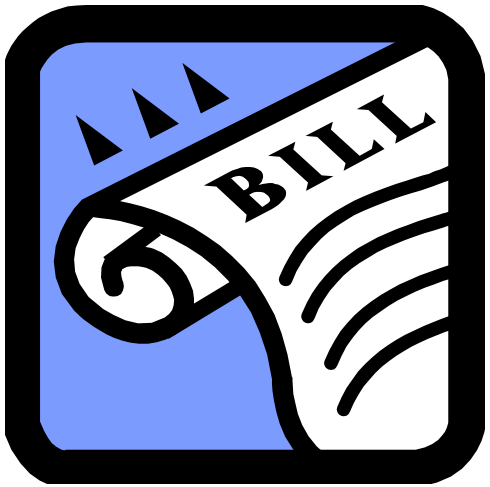
  - Must complete process every 5 years, or as needed, annual reviews
  - TWDB evaluates DFCs using GAM to derive MAGs by GCD, RWPG, and River Basin for planning purposes

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*

Joint Planning and Acronyms

-Texas Water Development Board (TWDB)
-Groundwater Conservation Districts (GCDs)
-Groundwater Management Areas (GMAs)
-Regional Water Planning Groups (RWPGs)
-Groundwater Availability Models (GAMs)
-Water Availability Models (WAMs)
-Desired Future Conditions (DFCs)
-Modeled Available Groundwater (MAGs)
-GCD Groundwater Management Plan (GWMP)
****GCD Management Plans and Rules within a GMA



Texas State Water Planning (think balance sheet)

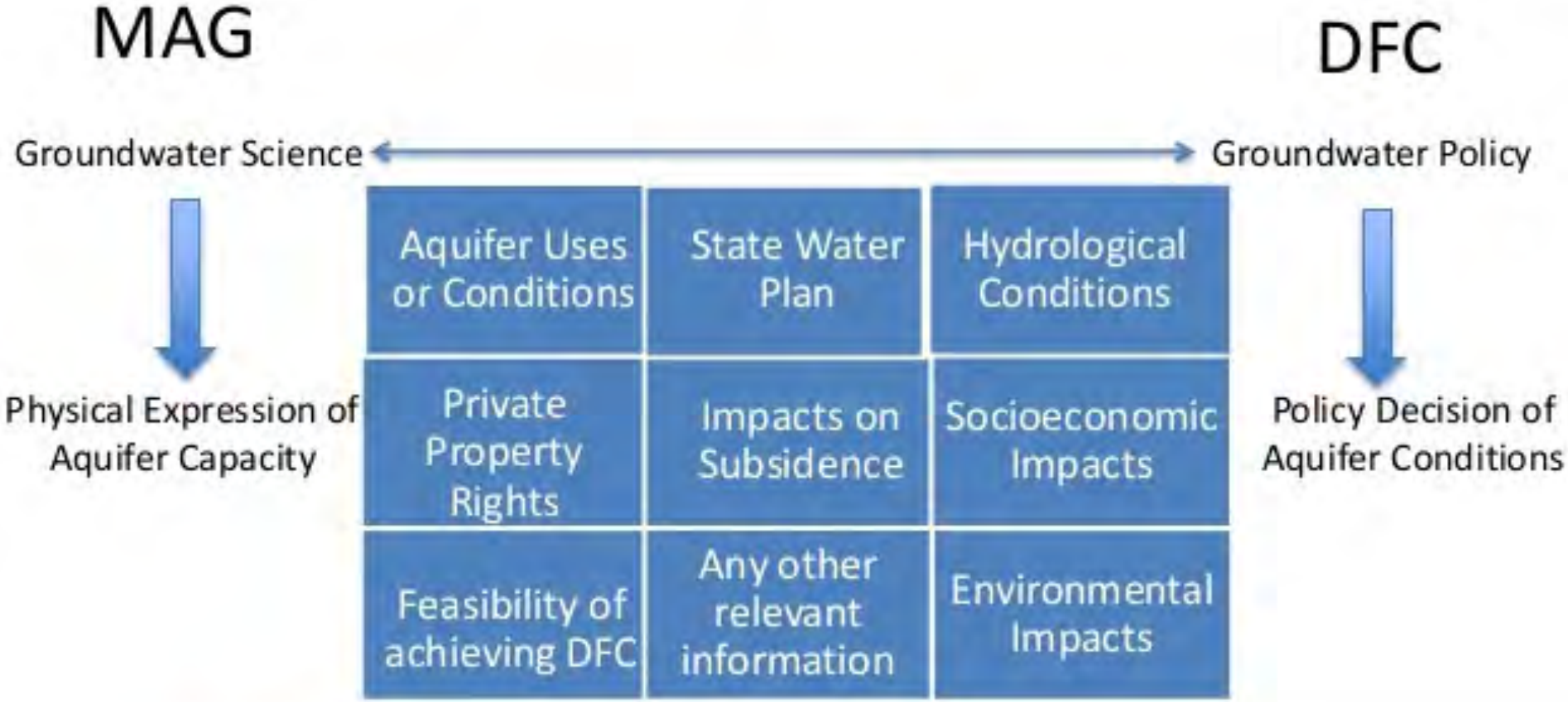
- State Water Planning through 16 RWPGs
- Water demands determined from water users
- Groundwater Supplies (GW) determined by GCDs in 16 GMAs by adopting DFCs
- Surface Water Supplies (SW) determined by State
- RWPGs use available GW and SW Supply numbers for planning and recommended strategies

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

Desired Future Condition

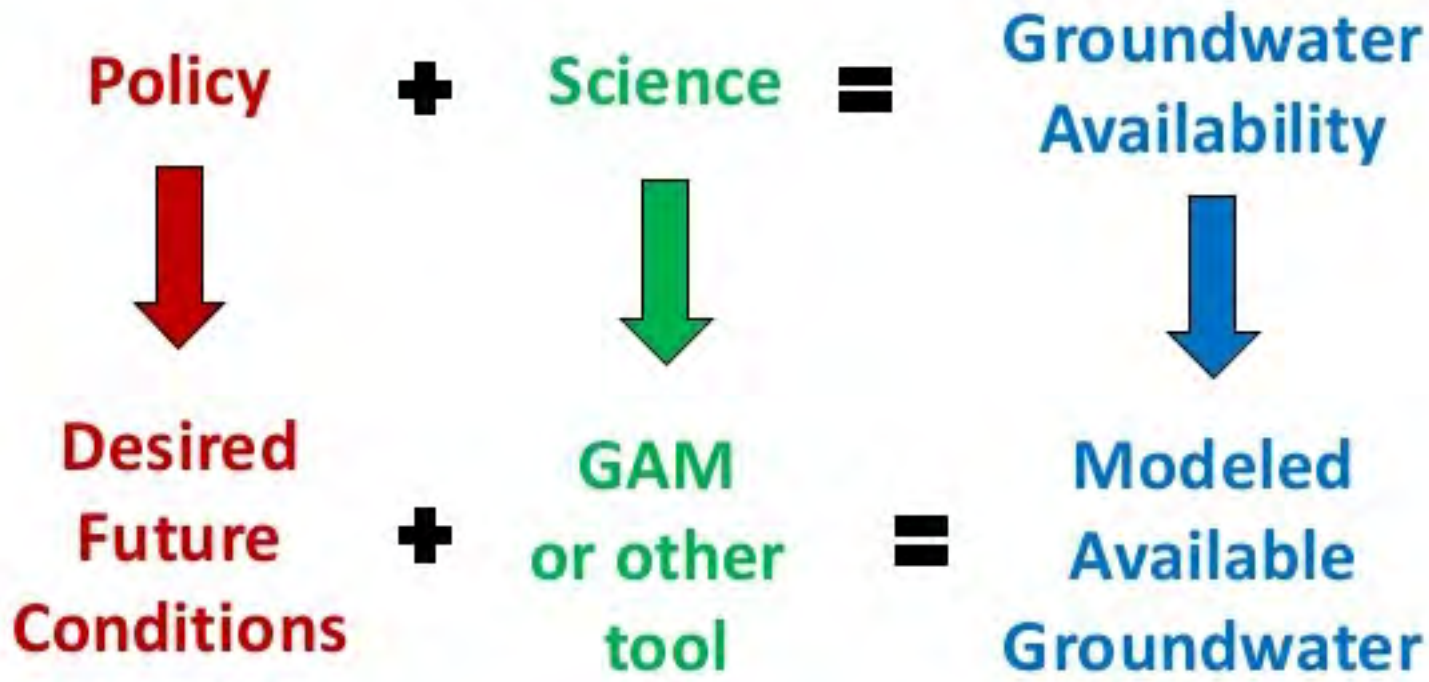
- The **desired**, **quantified** condition of **groundwater resources**
  - water levels, water quality, spring flows, or volumes)
  - at a specified time or times in the future or in perpetuity.
- For "**relevant**" aquifers (Major and Minor aquifers)
- Broad Policy Goal
  - Drawdown (most)
  - Spring 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



TAGD
TEXAS ALLIANCE OF GROUNDWATER DISTRICTS

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)

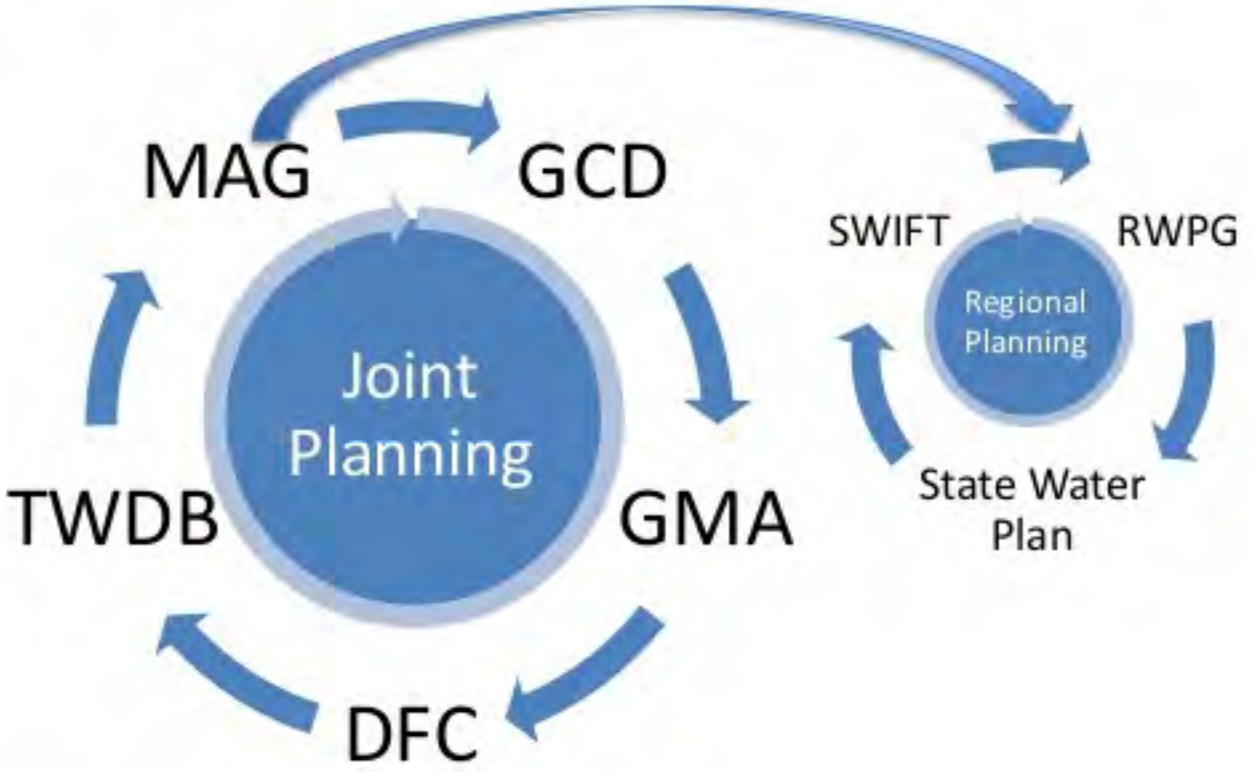
Modeled Available Groundwater and Permits (2 of 2)

- 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

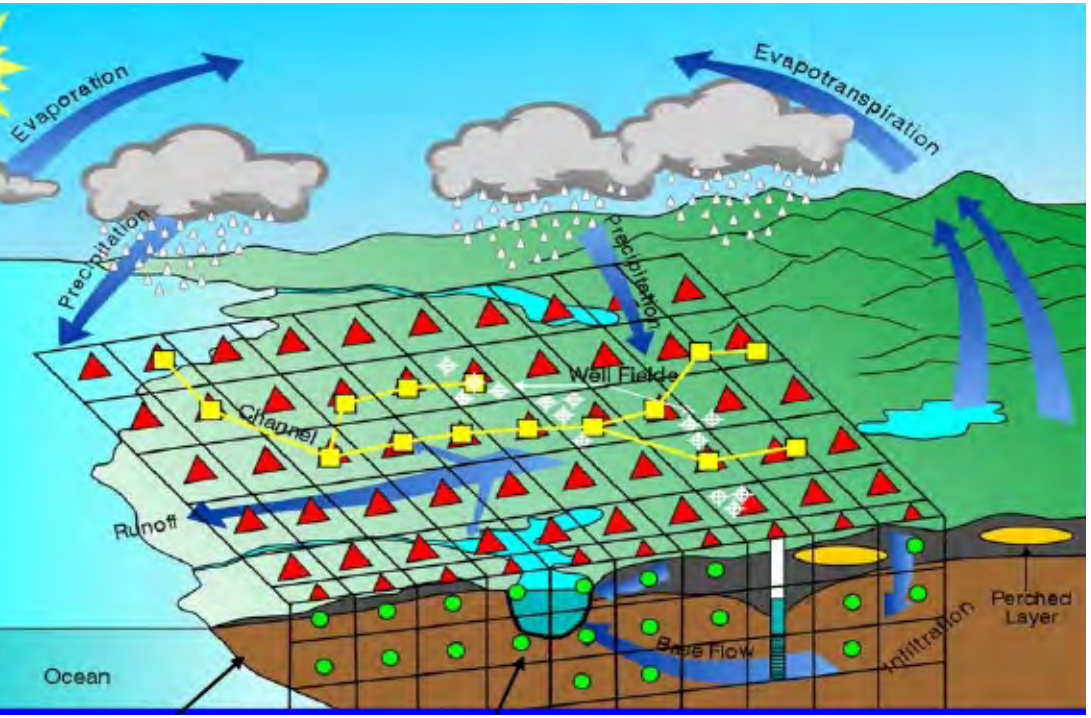
Regional & Joint Planning

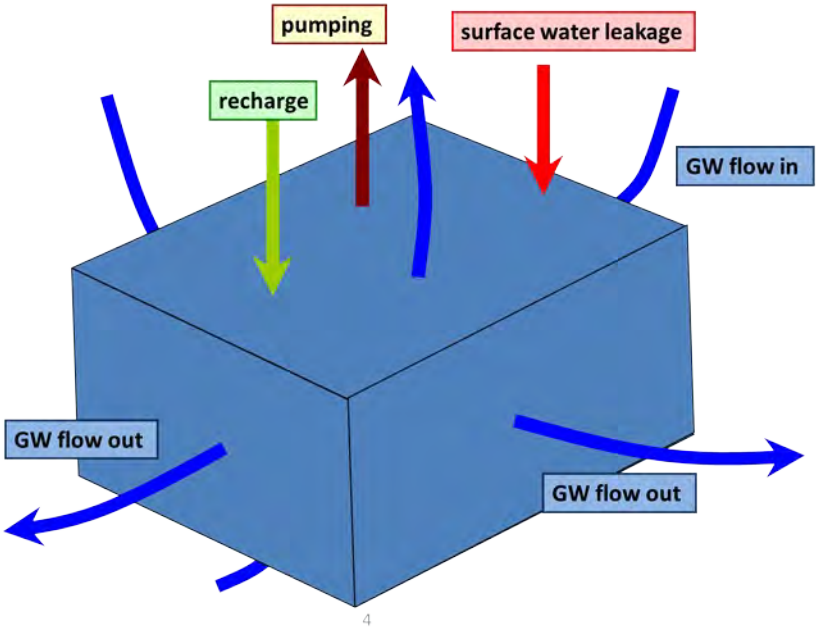


TAGD
TEXAS ALLIANCE OF GROUNDWATER DISTRICTS

Description of Groundwater Model

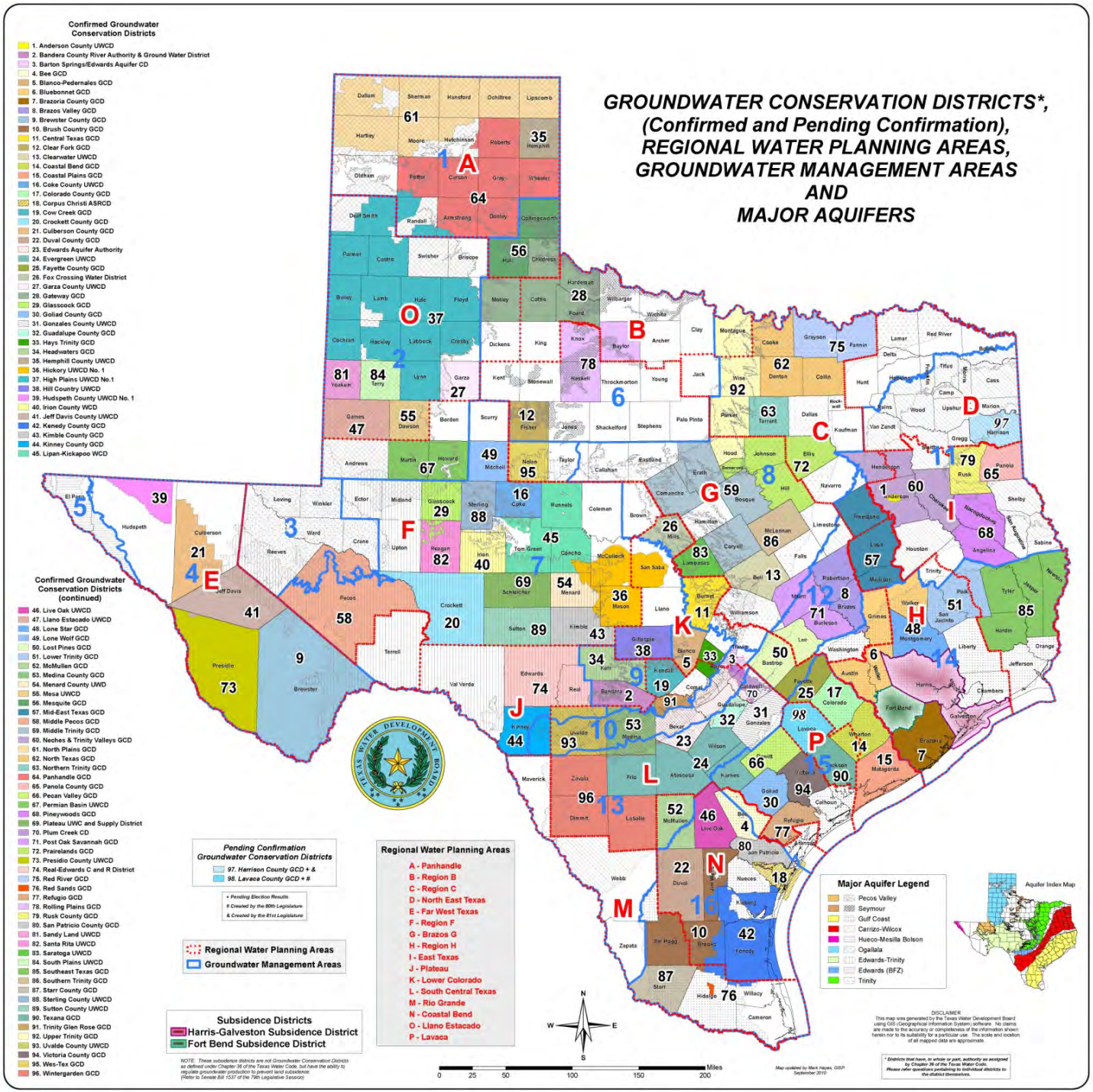
- a tool that integrates data and hydrology to predict groundwater flow
- the tool acts like a big Excel spreadsheet where grid cells physically represent "blocks" of aquifer material
- water levels are predicted by solving for a water balance at each block using equations describing groundwater flow



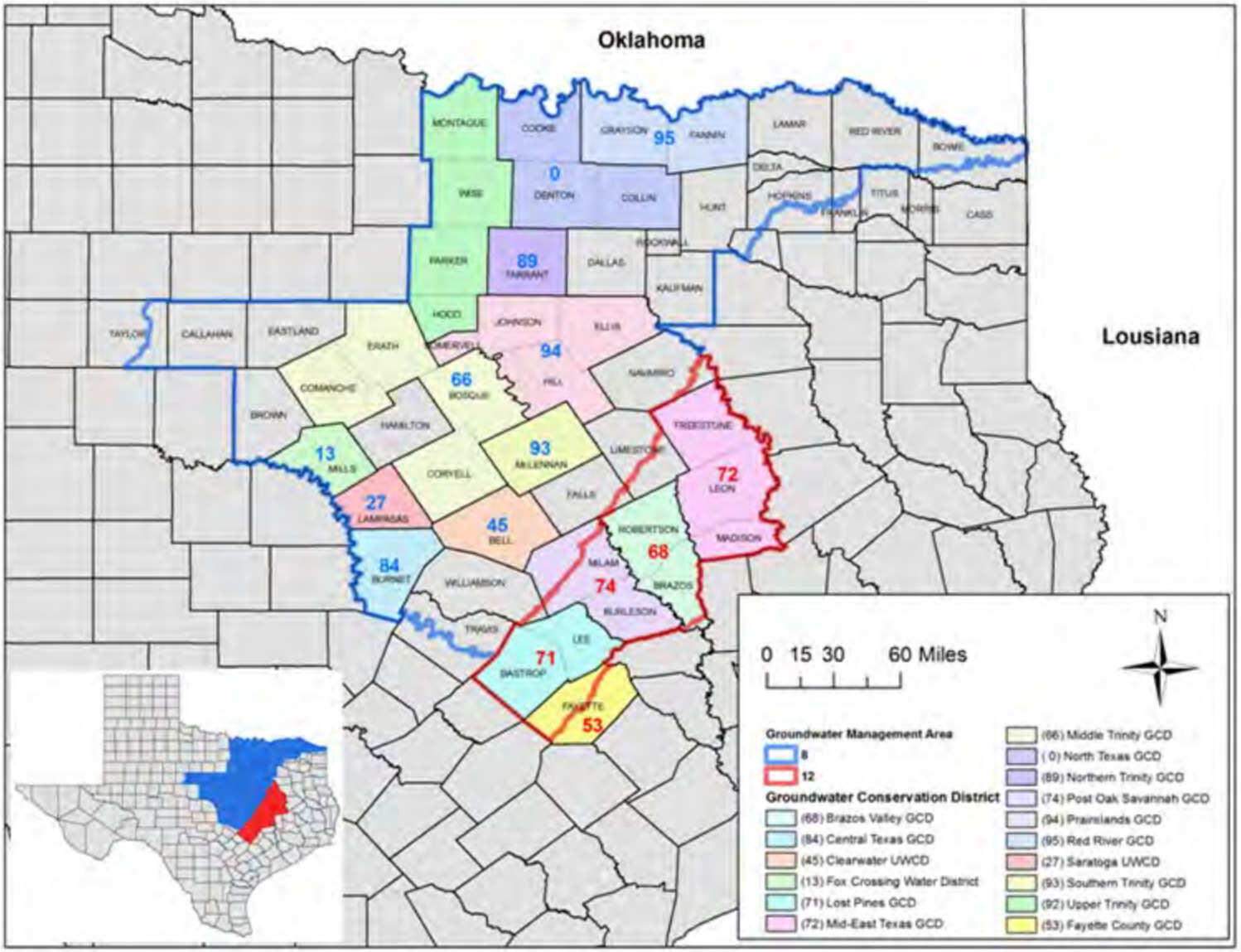


Note: Schematic from MODHMS MODFLOW Manual

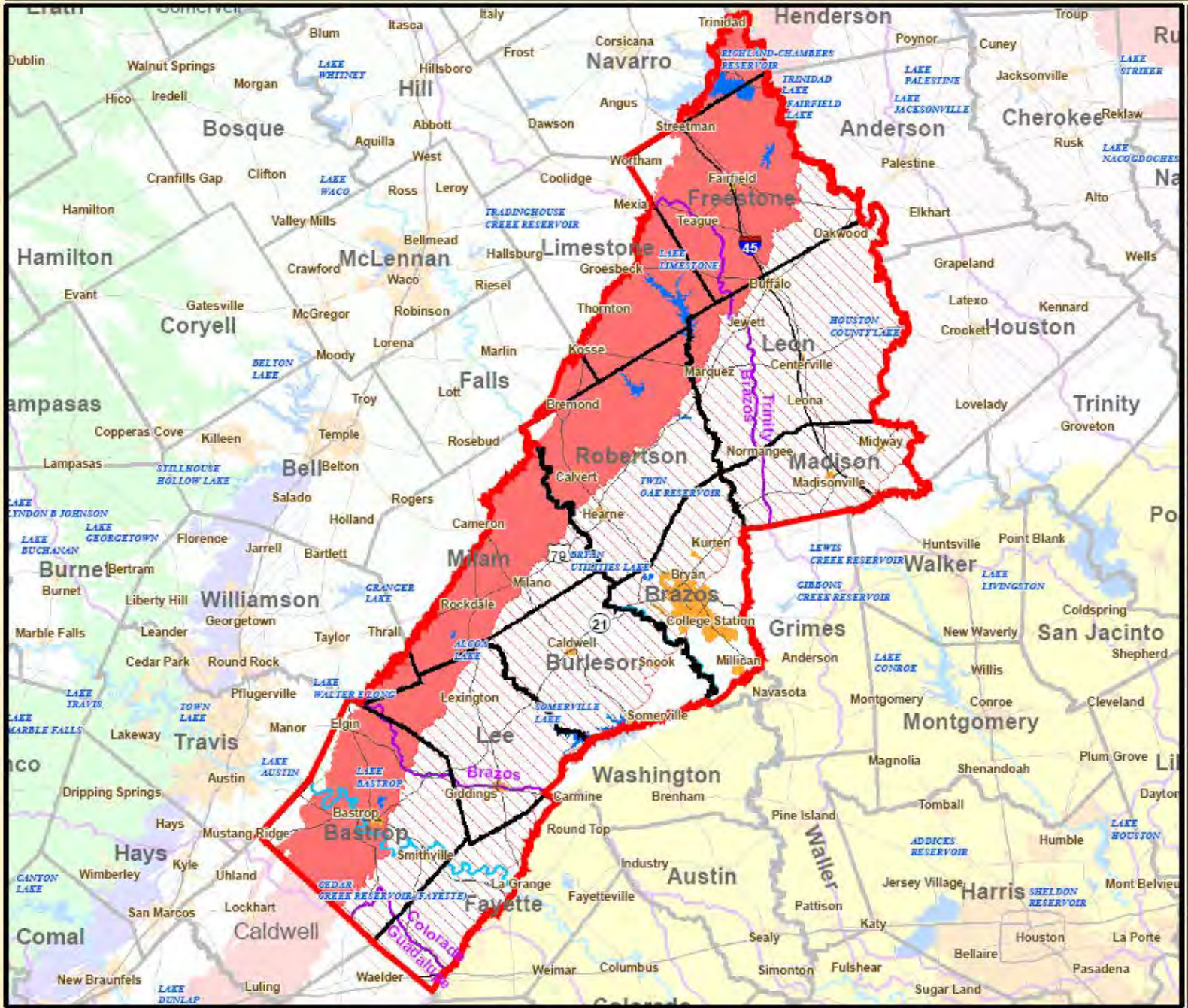
The Joint Planning Process of Groundwater Management Areas



Groundwater Management Areas 8 and 12



Groundwater Management Area #12



MAP LEGEND

- GMA #12
- River
- River Basin
- Reservoir
- Cities
- Counties

Major Aquifers

- Cenozoic Pecos Alluvium
- Seymour
- Gulf Coast
- Carrizo - Wilcox (outcrop)
- Carrizo - Wilcox (downdip)
- Hueco - Mesilla Bolson
- Ogallala
- Edwards - Trinity Plateau (outcrop)
- Edwards - Trinity Plateau (downdip)
- Edwards BFZ (outcrop)
- Edwards BFZ (downdip)
- Trinity (outcrop)
- Trinity (downdip)

Map prepared by Mark Hayes
Texas Water Development Board
GIS Section
12/21/2005

0 7 14 21 28 Miles

1 inch equals 26 miles

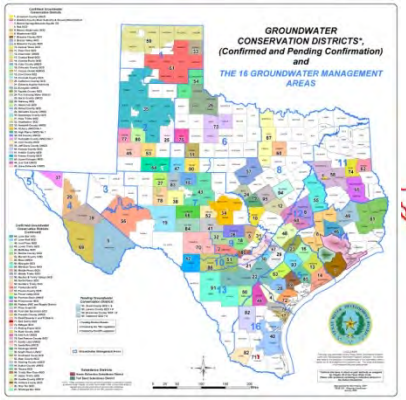
Groundwater Management Areas (GCD Joint Planning)

When considering the adoption of Desired Future Conditions it is important to remember Section 36.108(d-2) of Chapter 36, which states:

The desired future conditions … must provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence …

GCDs can protect existing wells

GCDs in GMAs
decide Desired Future Conditions
and deliver to TWDB

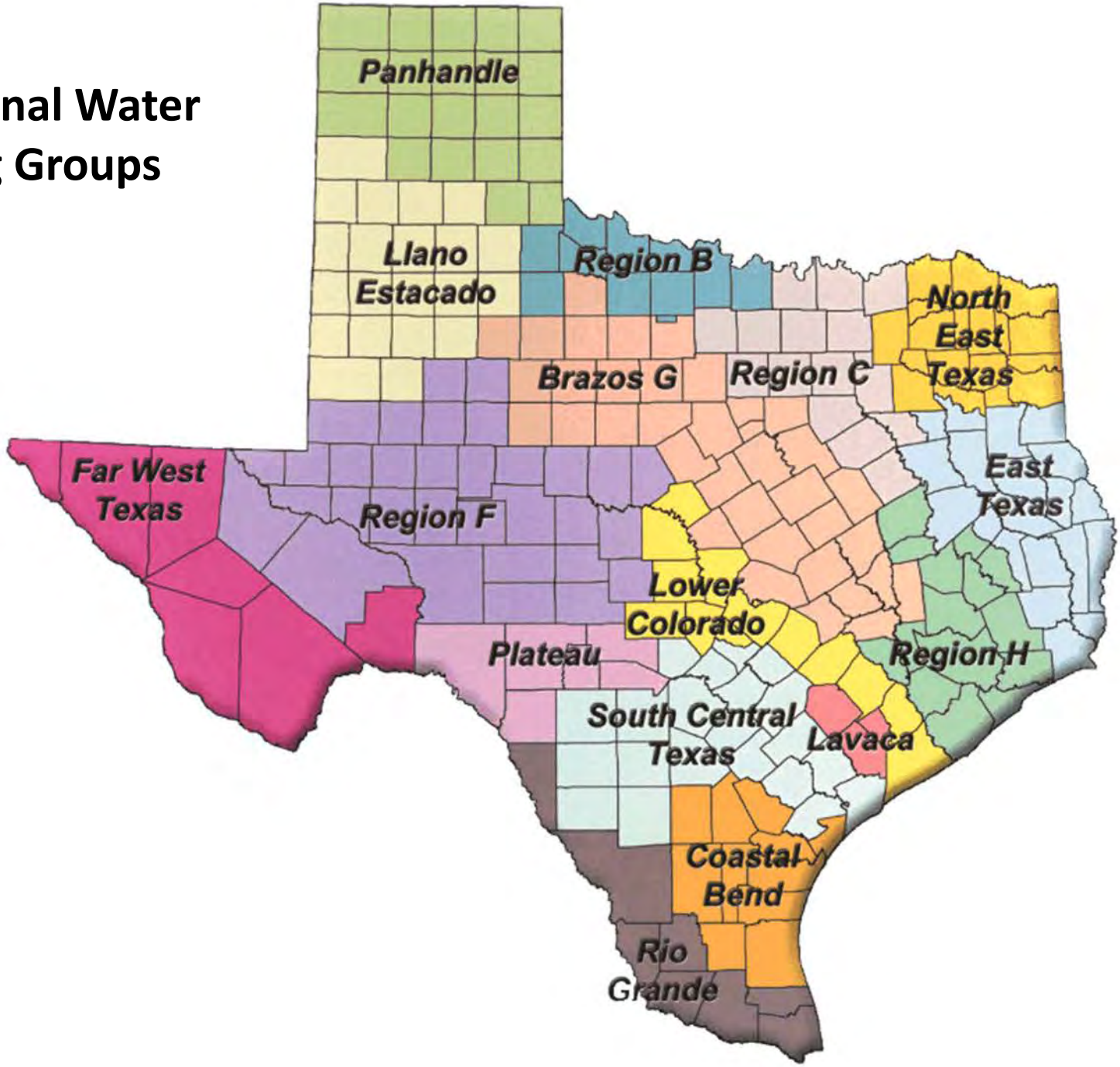


TWDB provides estimates
of Modeled Available Groundwater
to districts and regions

TEXAS WATER DEVELOPMENT BOARD

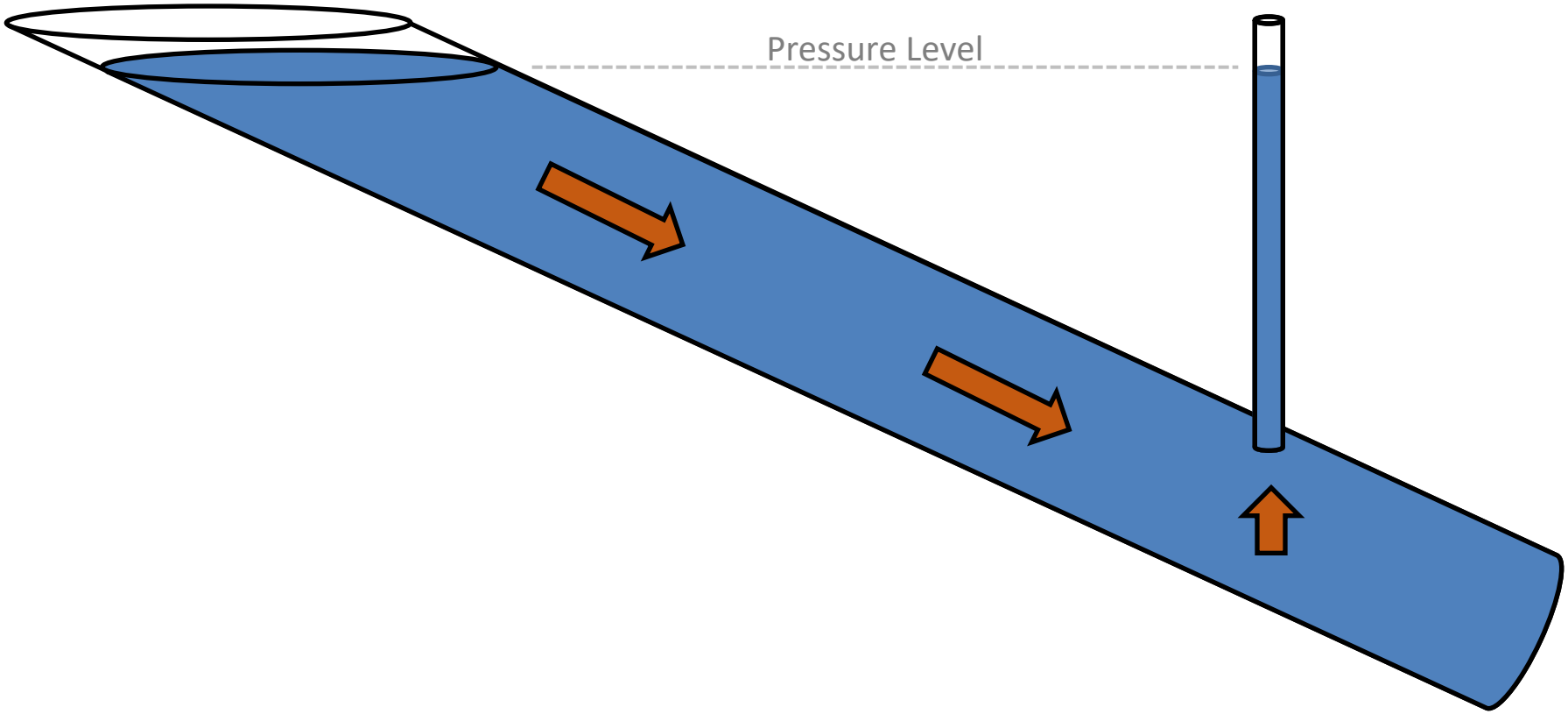
GCDs and RWPGs include
Managed Available Groundwater
in plans

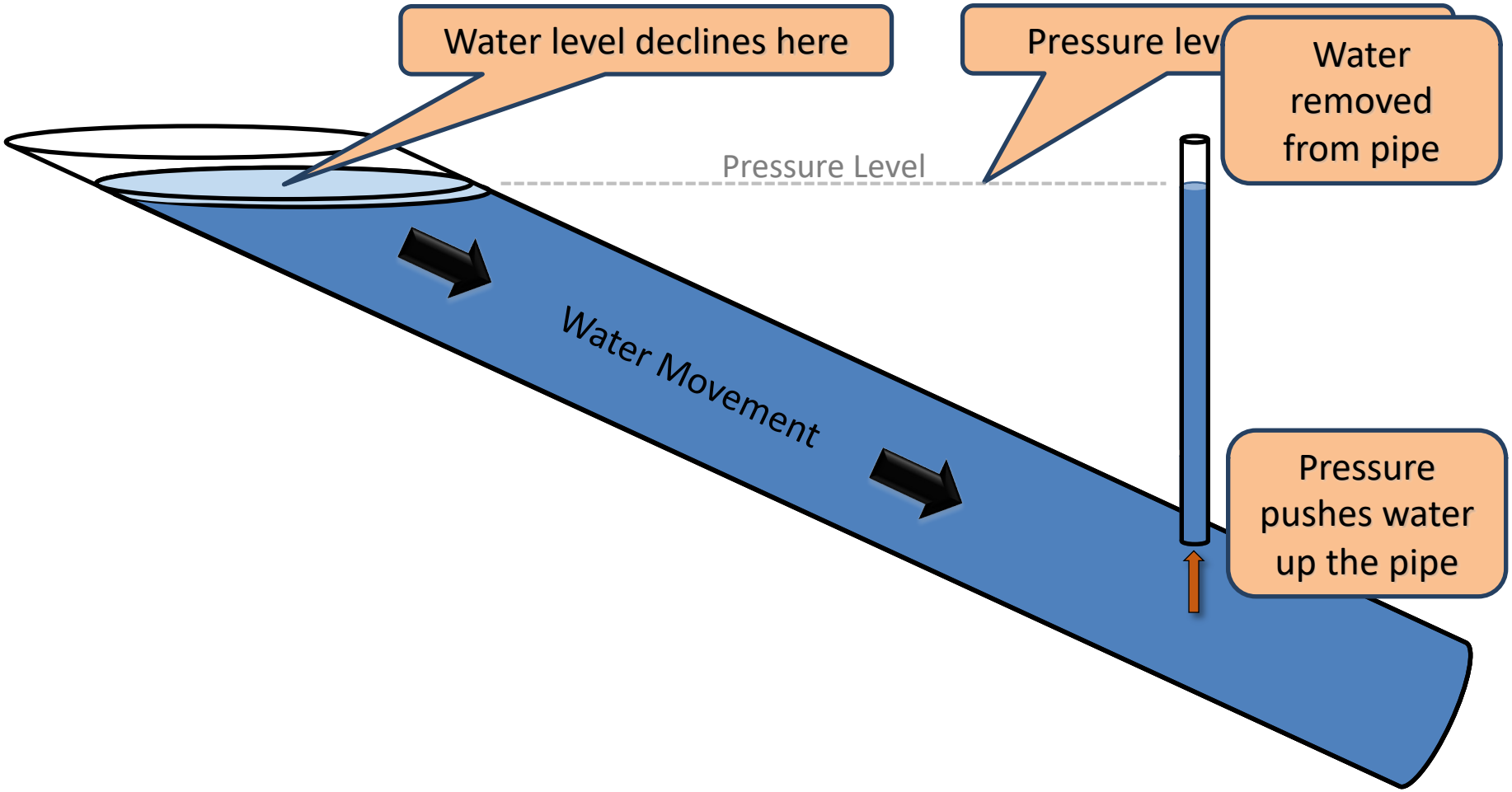
16 Regional Water Planning Groups



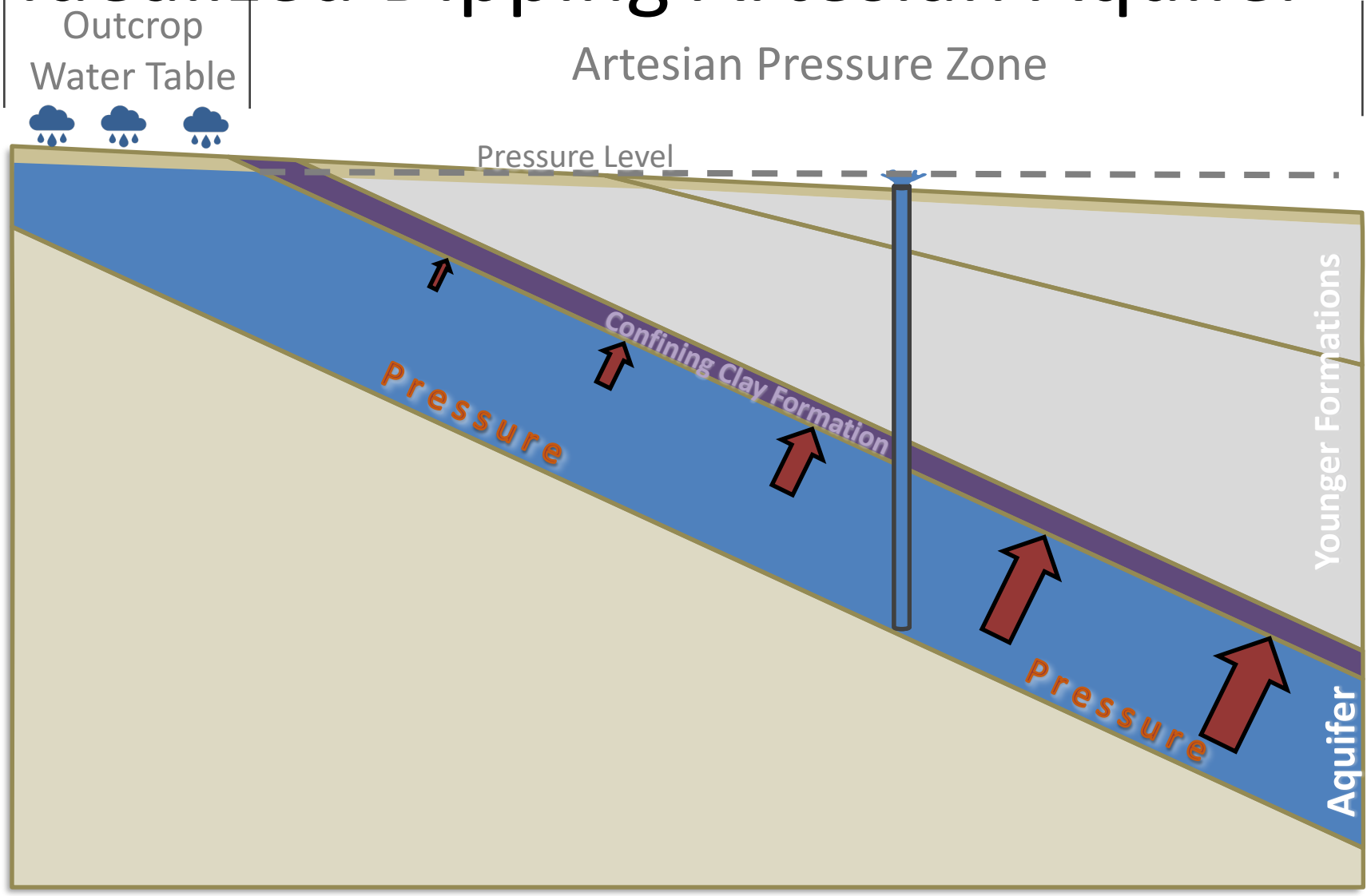
Challenges of balancing development with protection of aquifers

Pressure Example

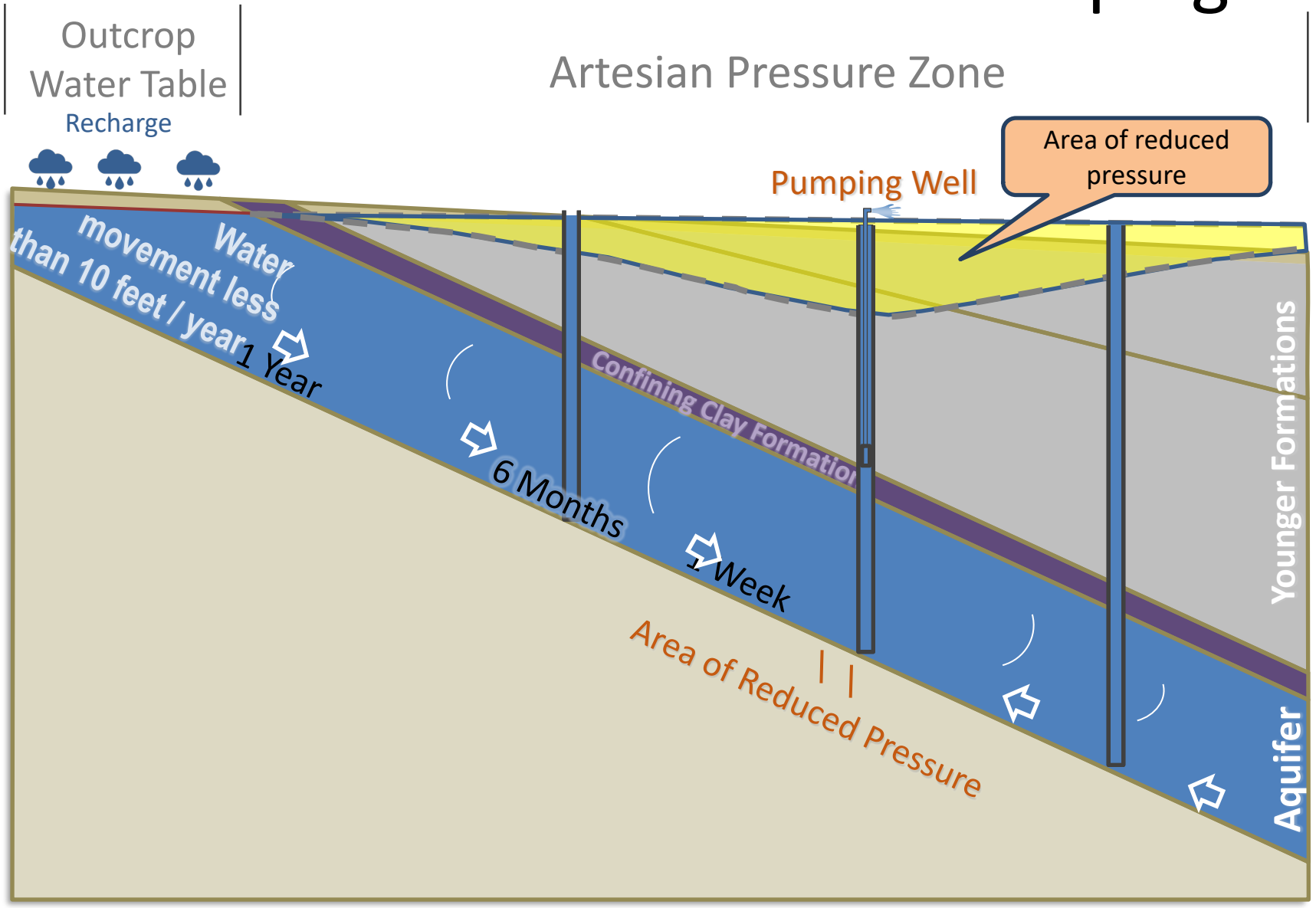



Water level declines here
Pressure lev
Water removed from pipe
Pressure Level
Water Movement
Pressure pushes water up the pipe

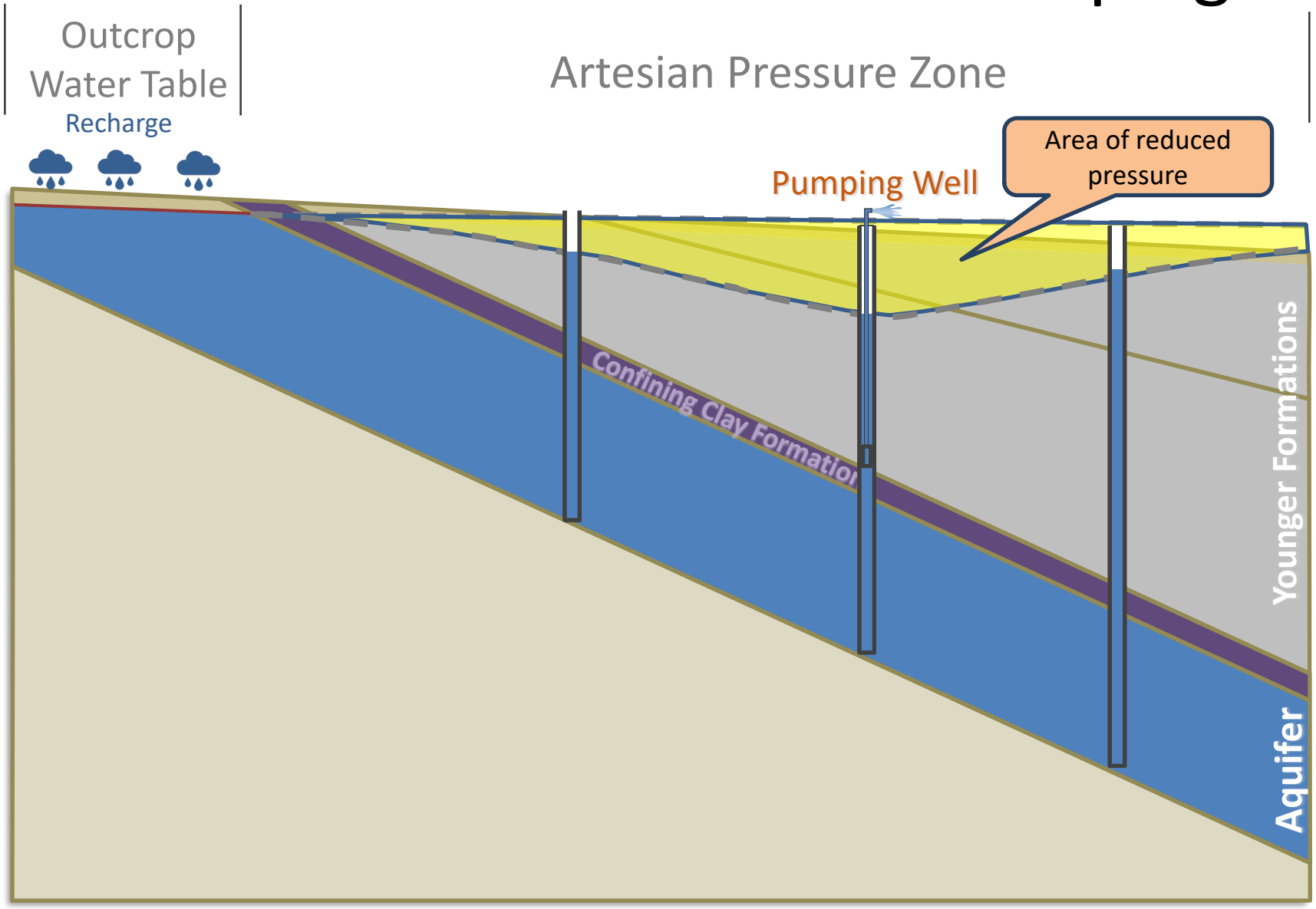
Idealized Dipping Artesian Aquifer



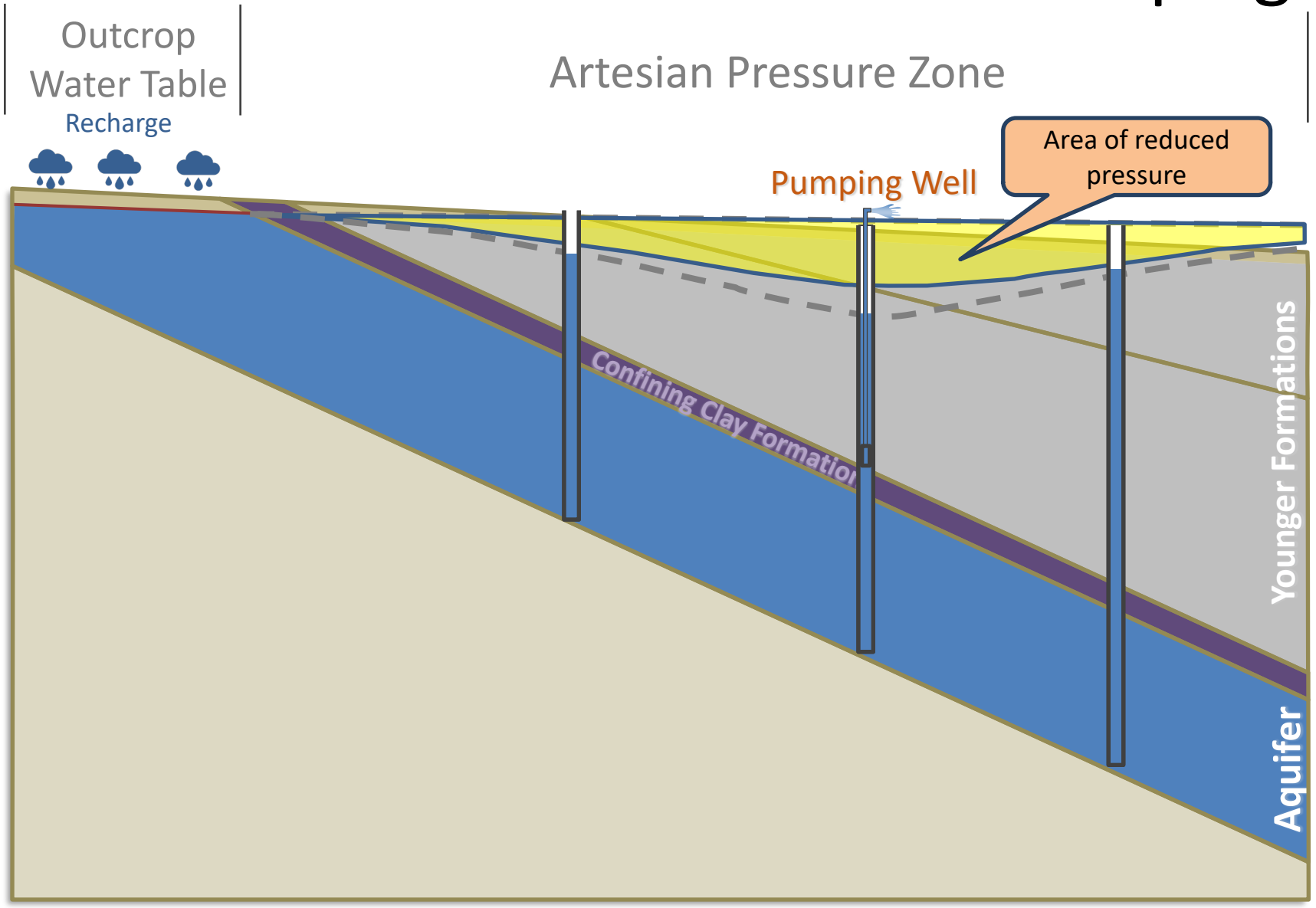
Pressure Reduction due to Pumping



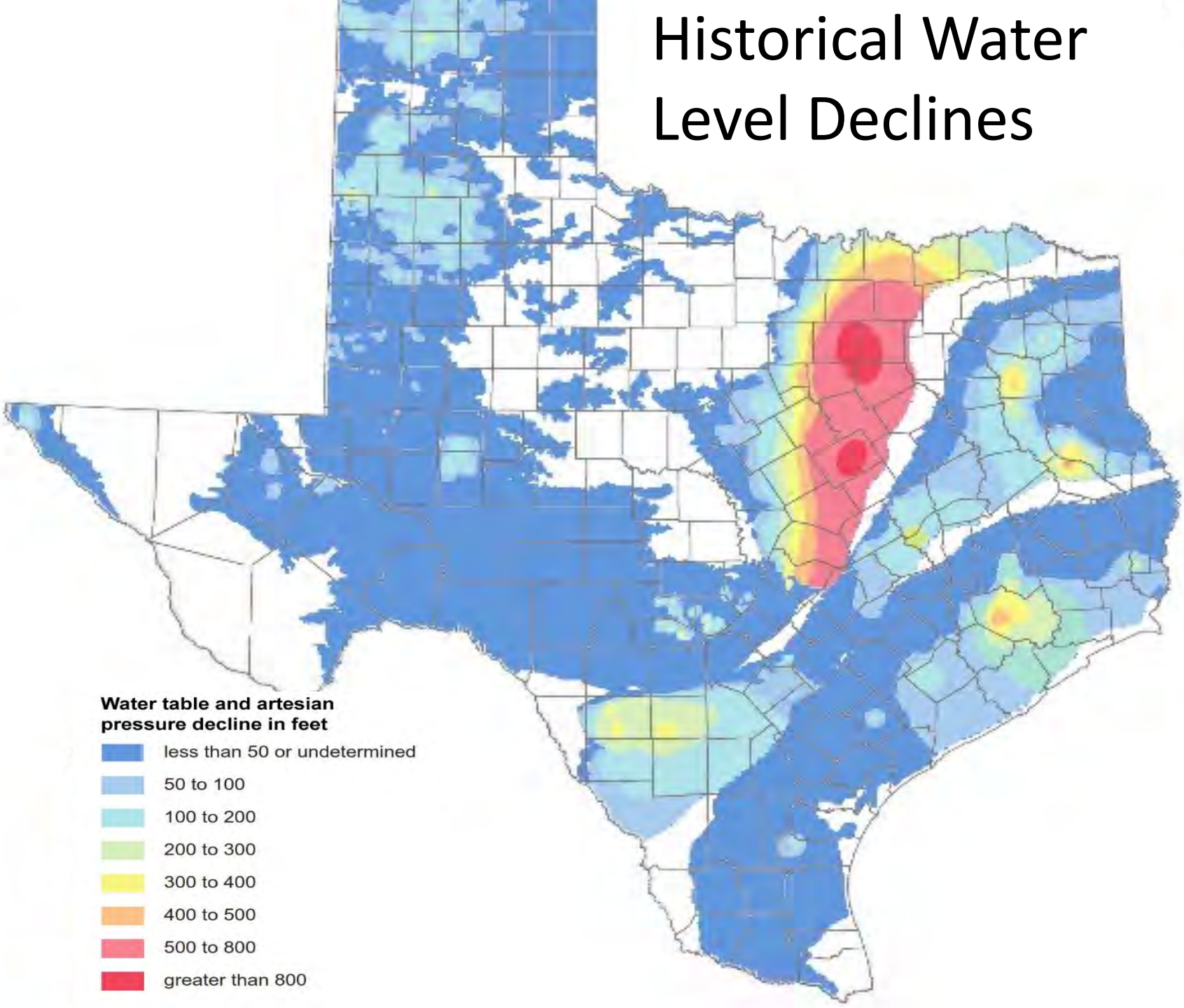
Pressure Reduction due to Pumping



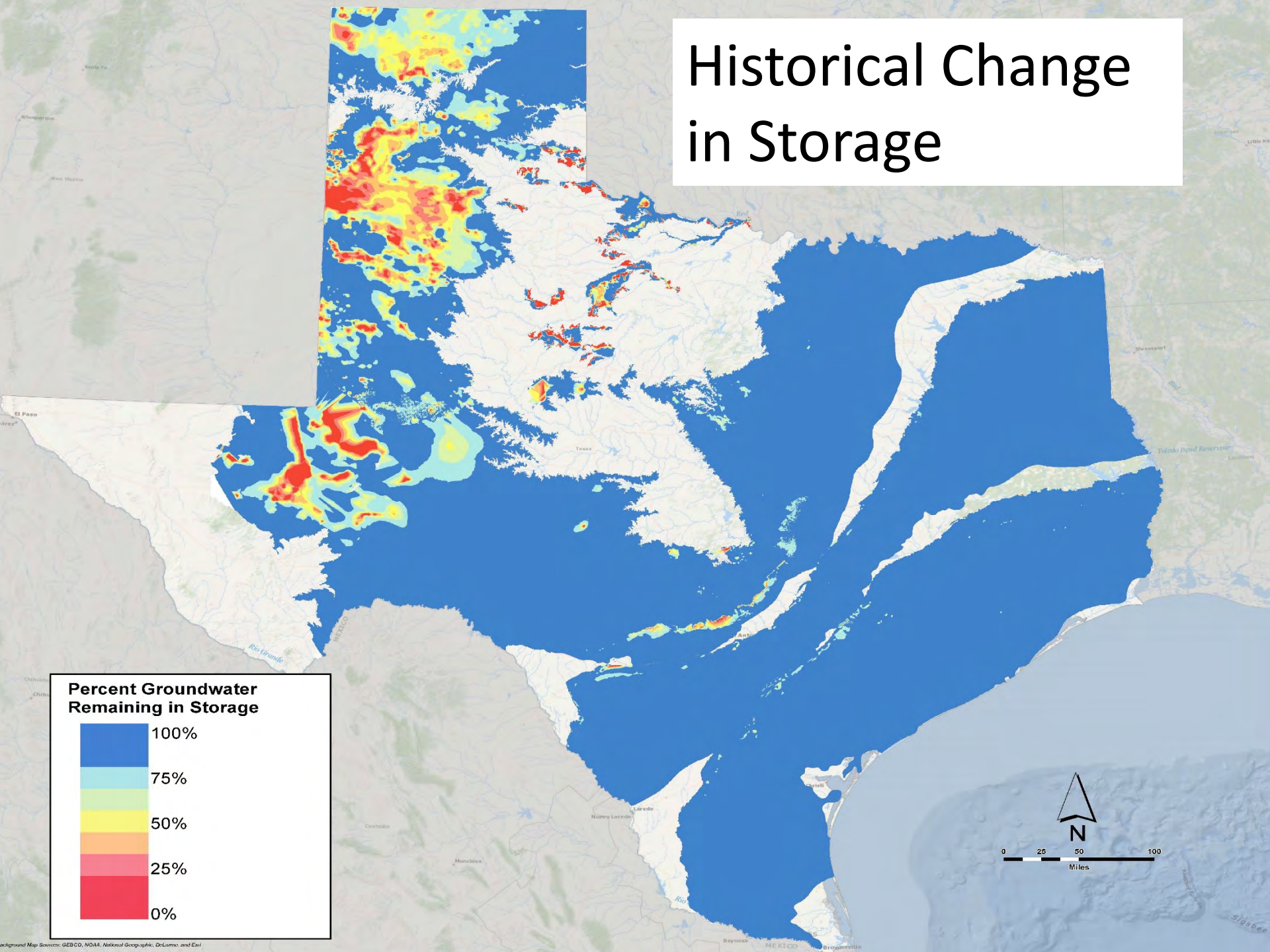
Pressure Rise with Decrease in Pumping



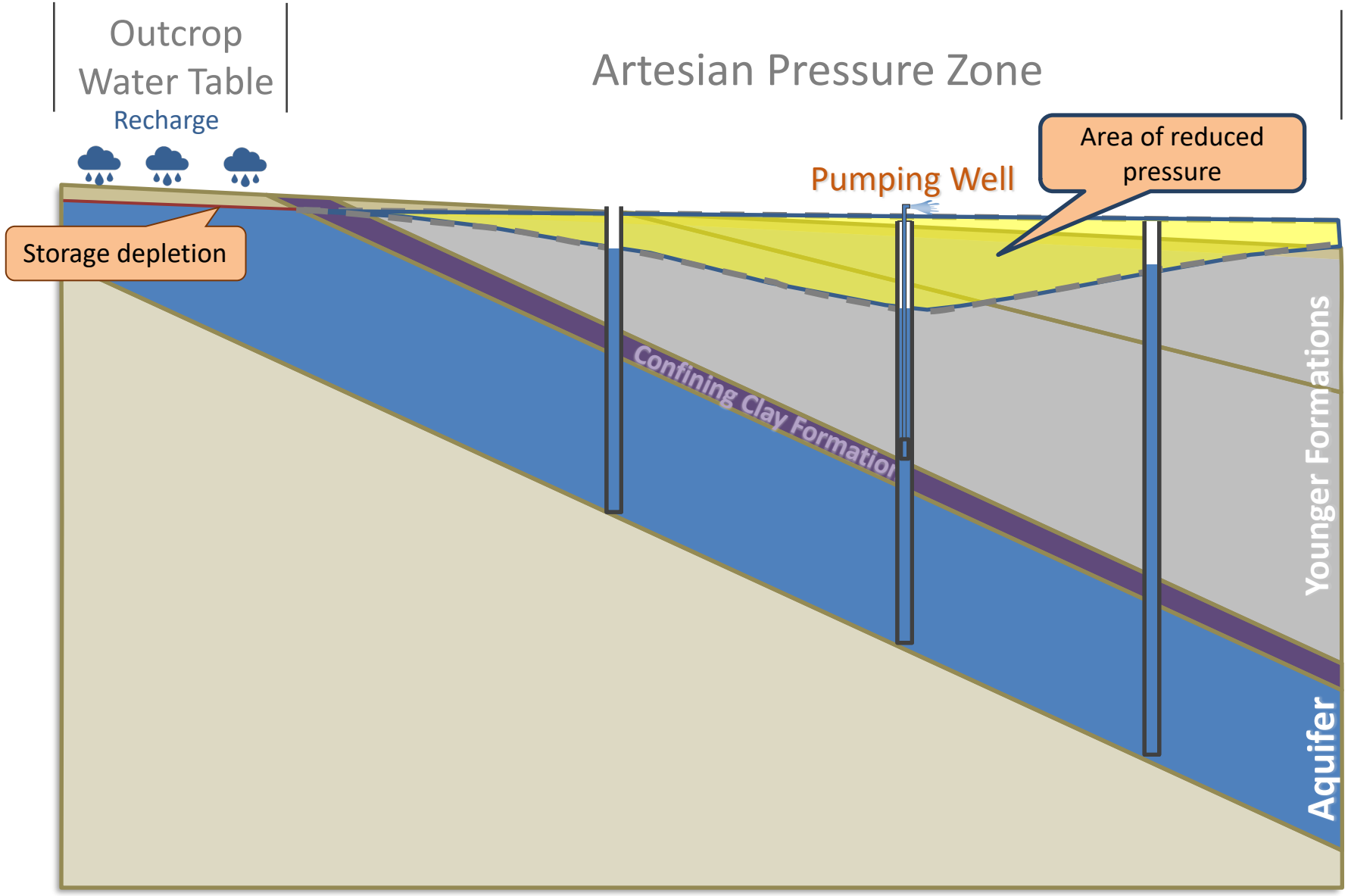
Historical Water Level Declines



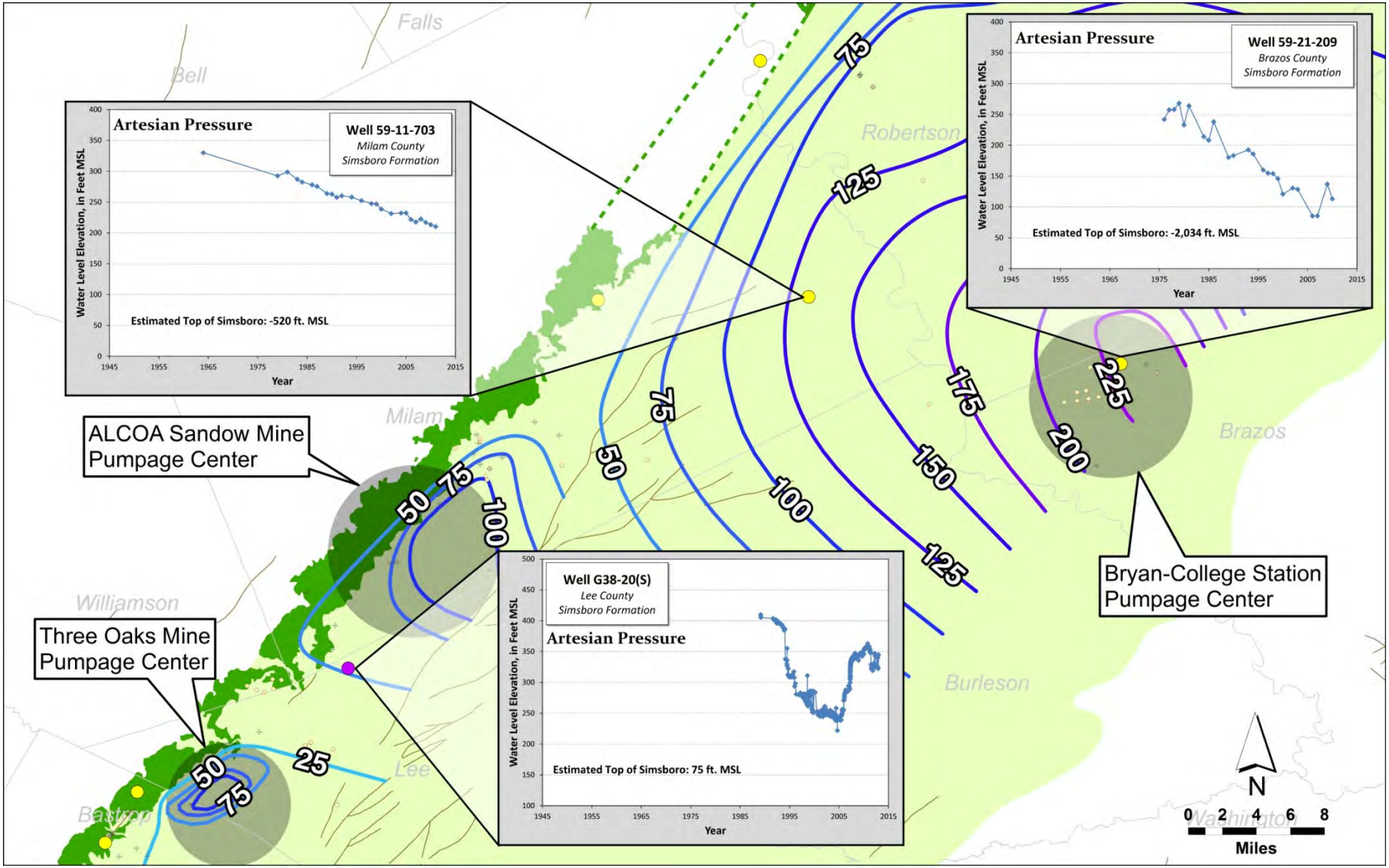
Historical Change in Storage



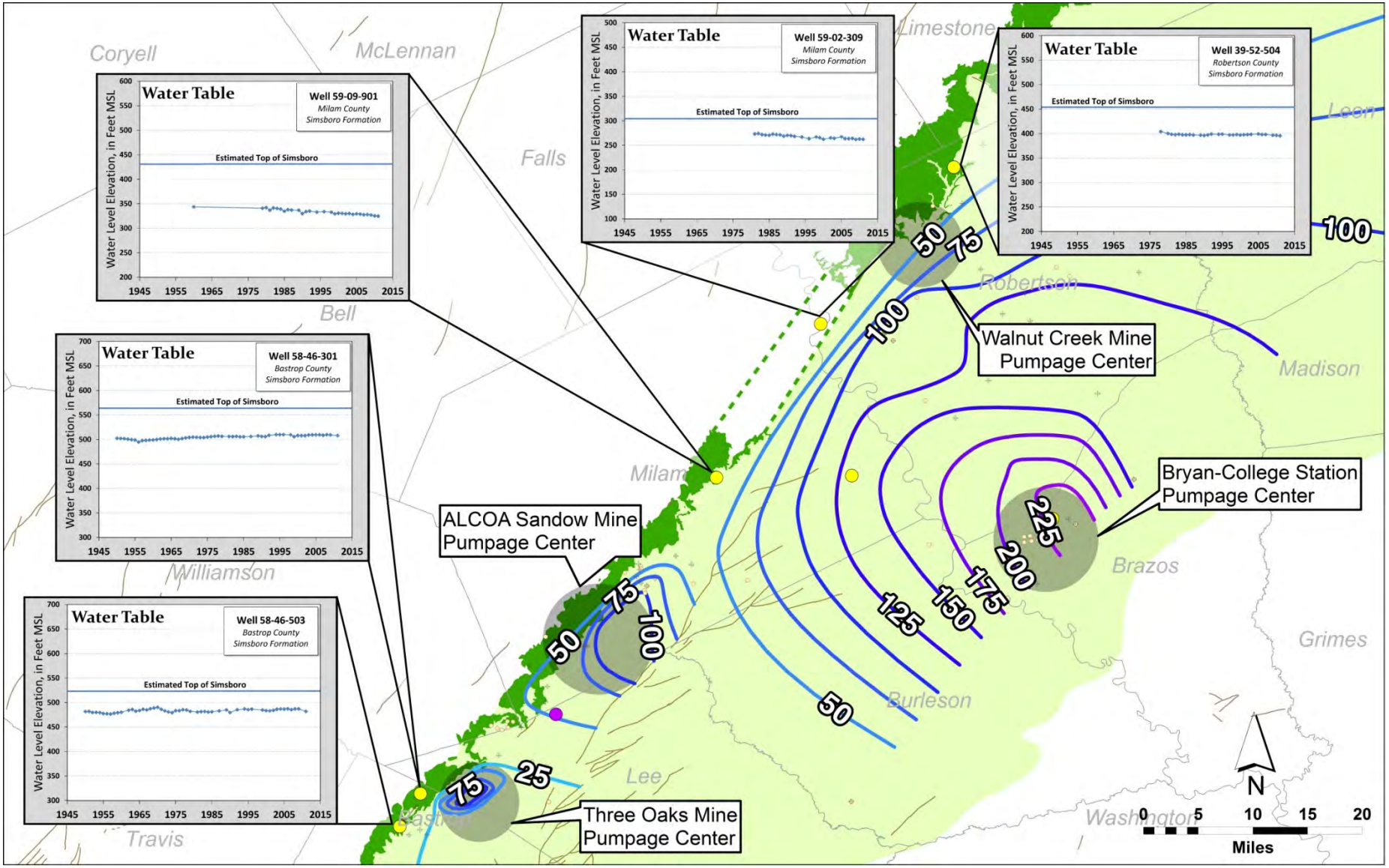
Pressure vs. Storage



Artesian Pressure Drawdown

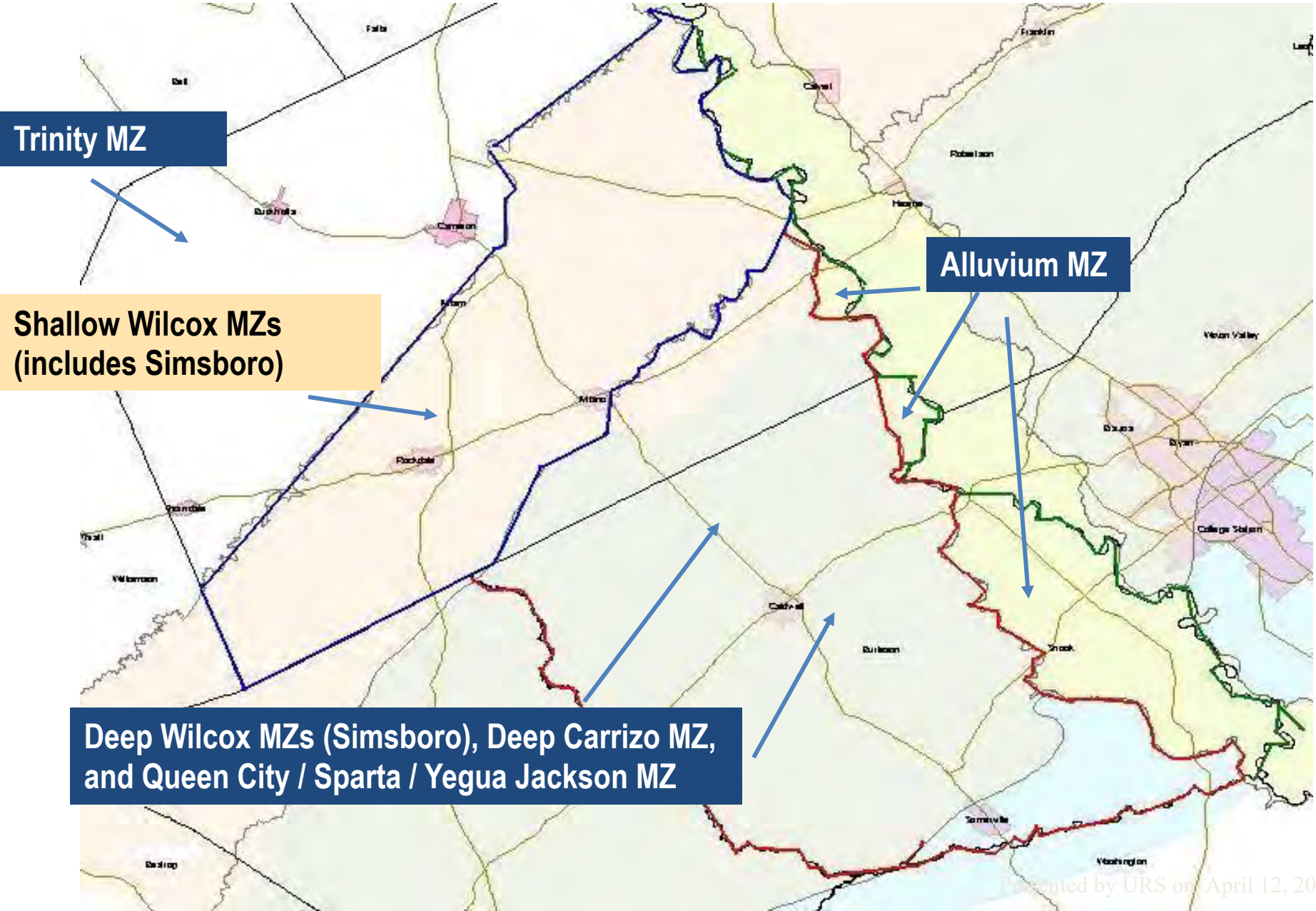


Water Table Drawdown



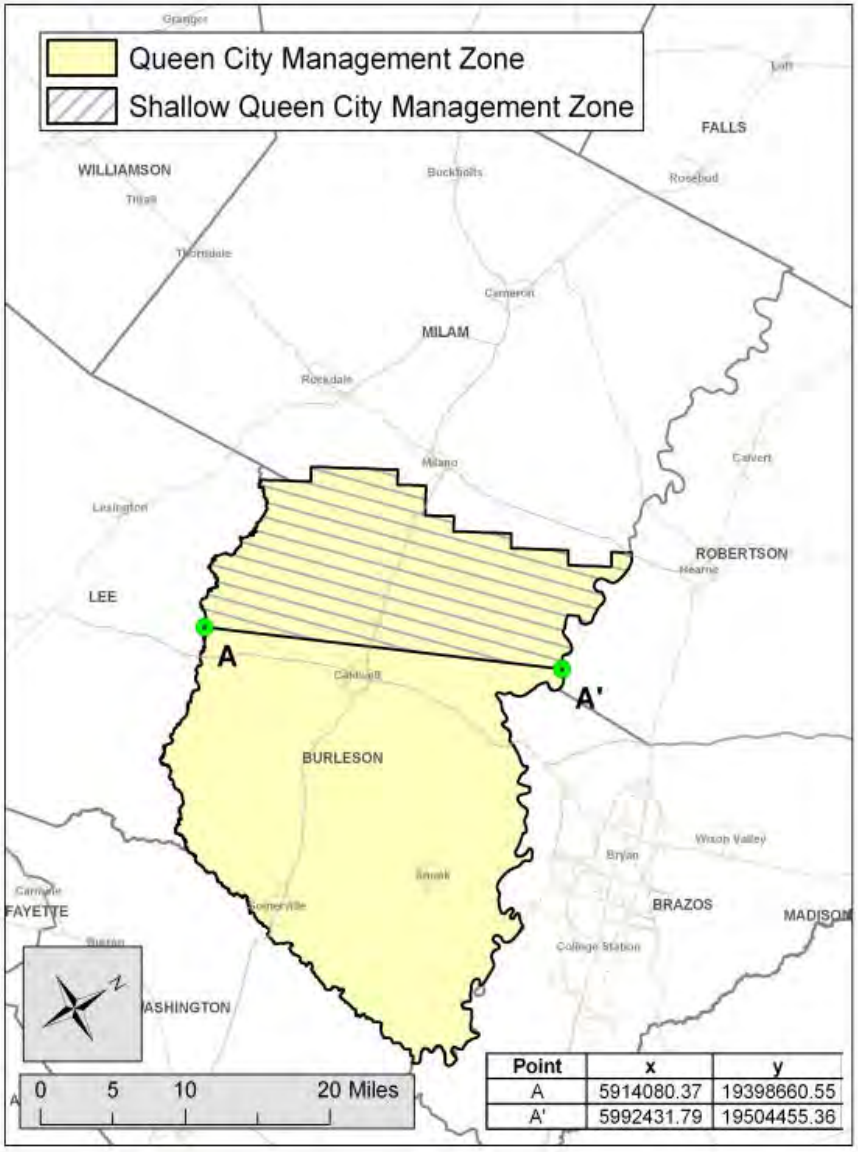
Management Strategies of POSGCD

Management Zone Boundaries

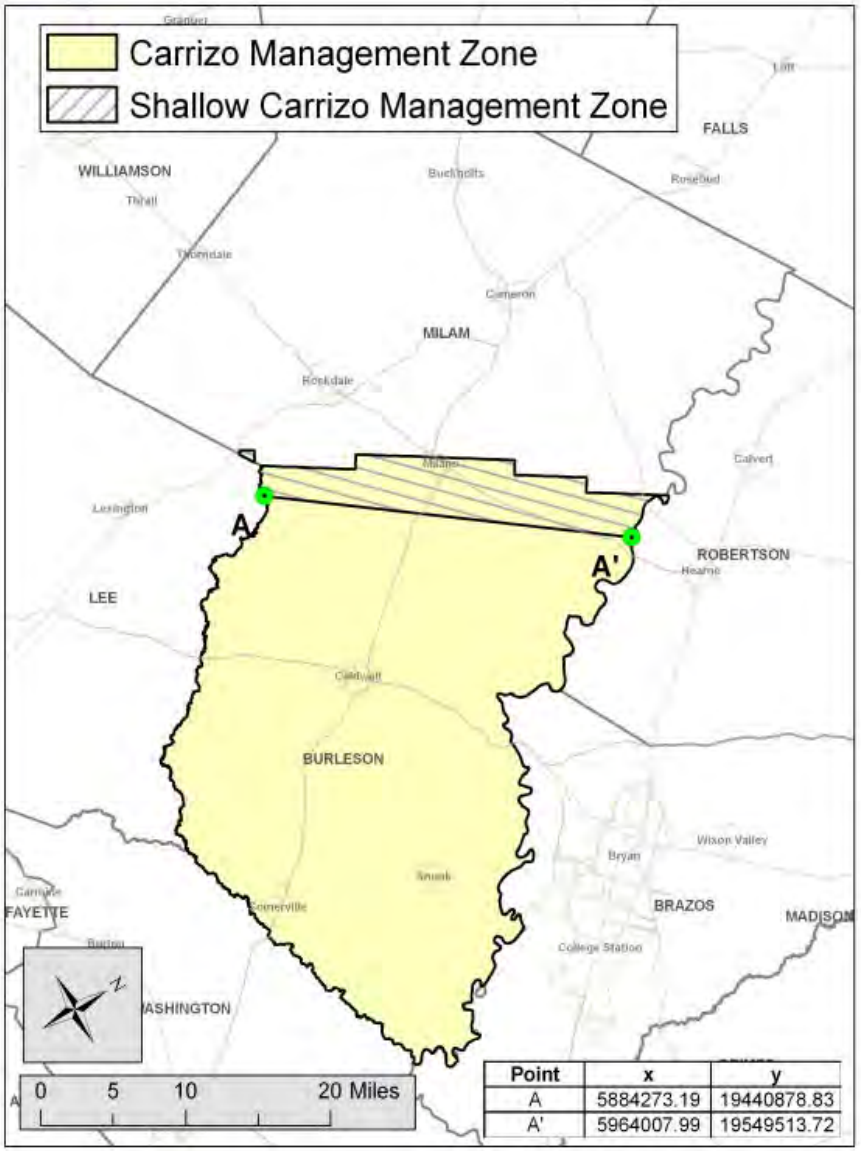



Trinity Management Zone
WILLIAMSON
FALLS
MILAM
LEE
ROBERTSON
BURLESON
BRAZOS
FAYETTE
GRIMES
0 5 10 20 Miles

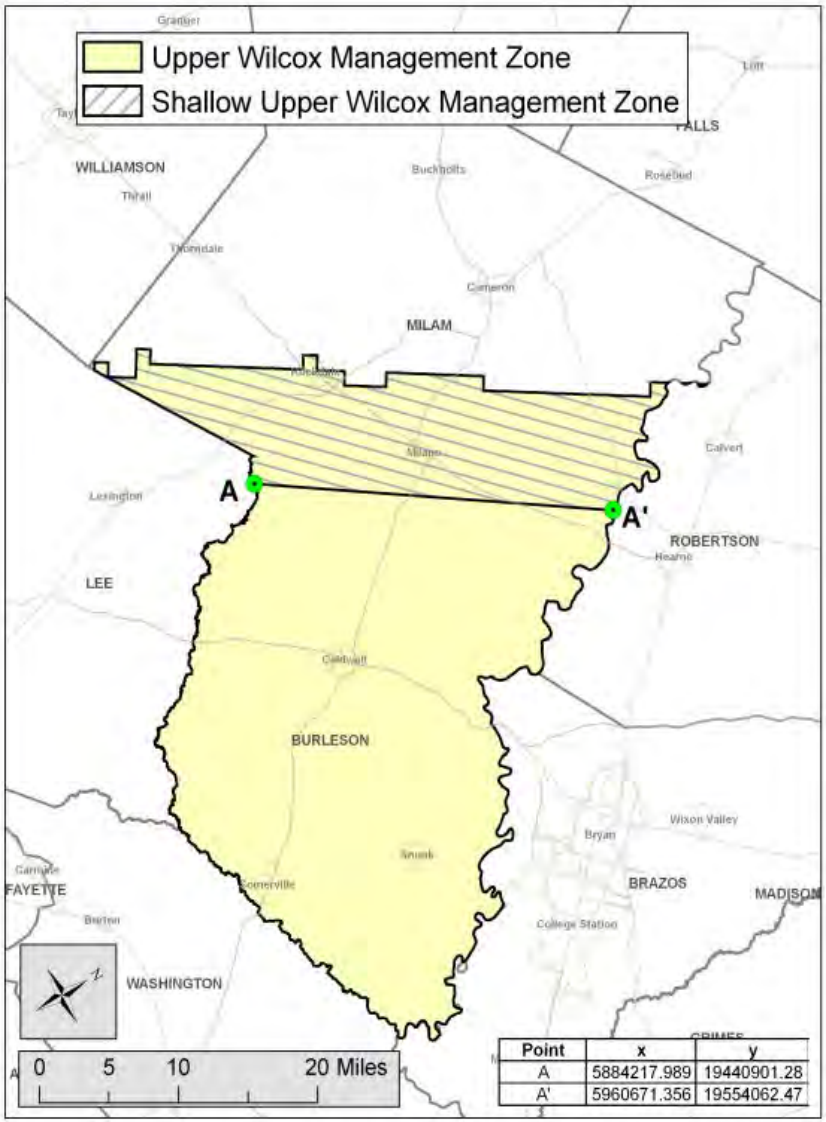

Sparta Management Zone
Shallow Sparta Management Zone
WILLIAMSON
FALLS
MILAM
LEE
ROBERTSON
BURLESON
BRAZOS
A
A'
0 5 10 20 Miles
Point X Y
A 5925582.02 19388263.59
A' 6006562.49 19475254.71



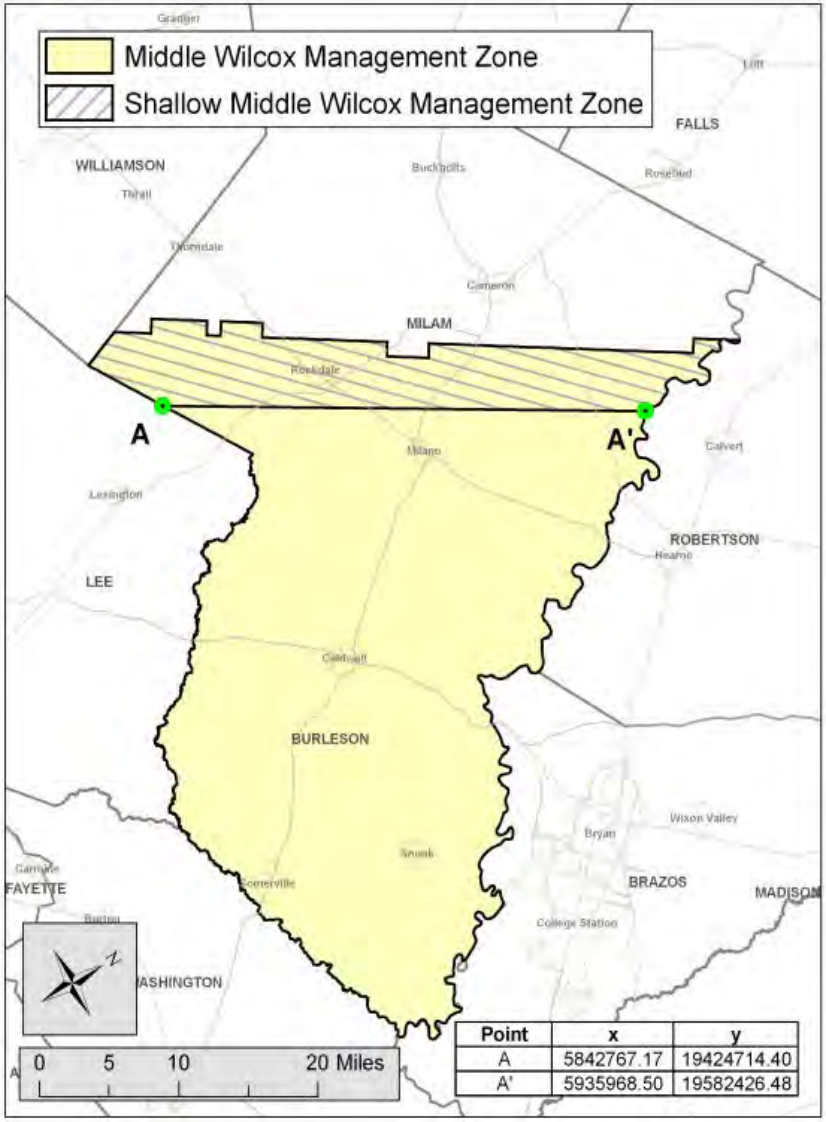
Point	x	y
A	5914080.37	19398660.55
A'	5992431.79	19504455.36



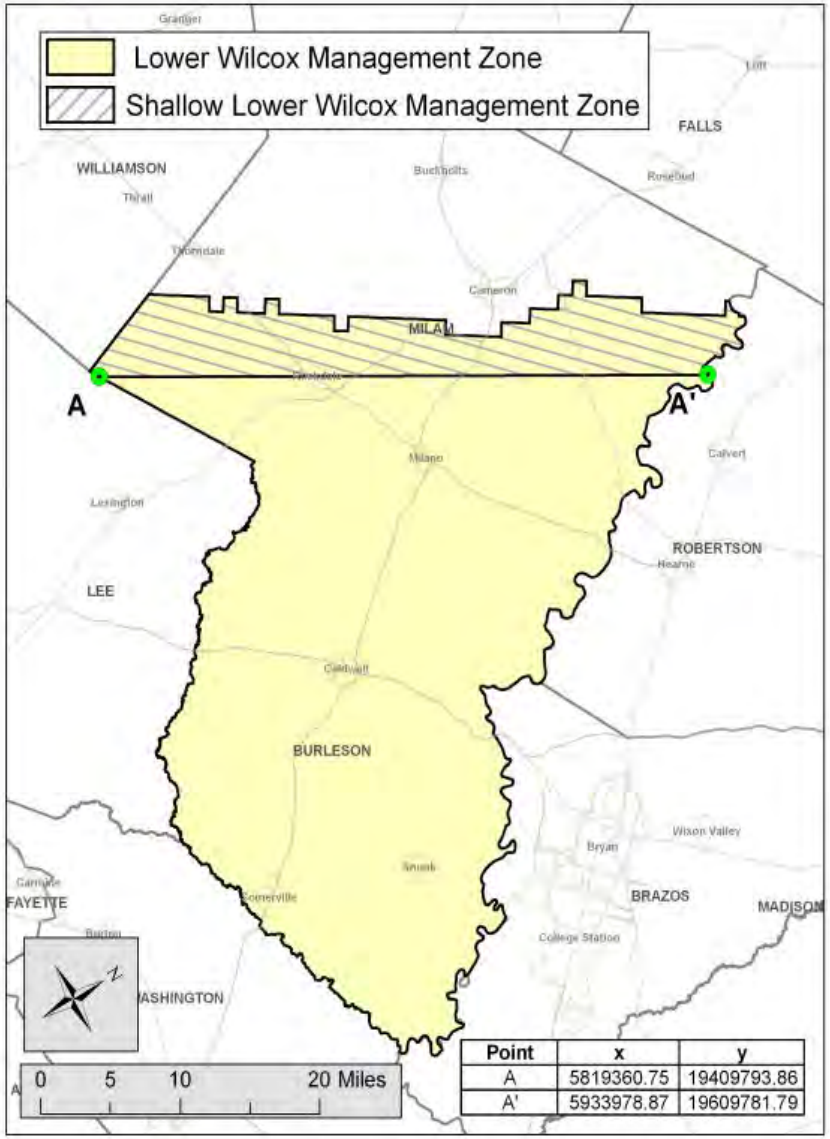
Point	x	y
A	5884273.19	19440878.83
A'	5964007.99	19549513.72



Point	x	y
A	5884217.989	19440901.28
A'	5960671.356	19554062.47



Point	x	y
A	5842767.17	19424714.40
A'	5935968.50	19582426.48



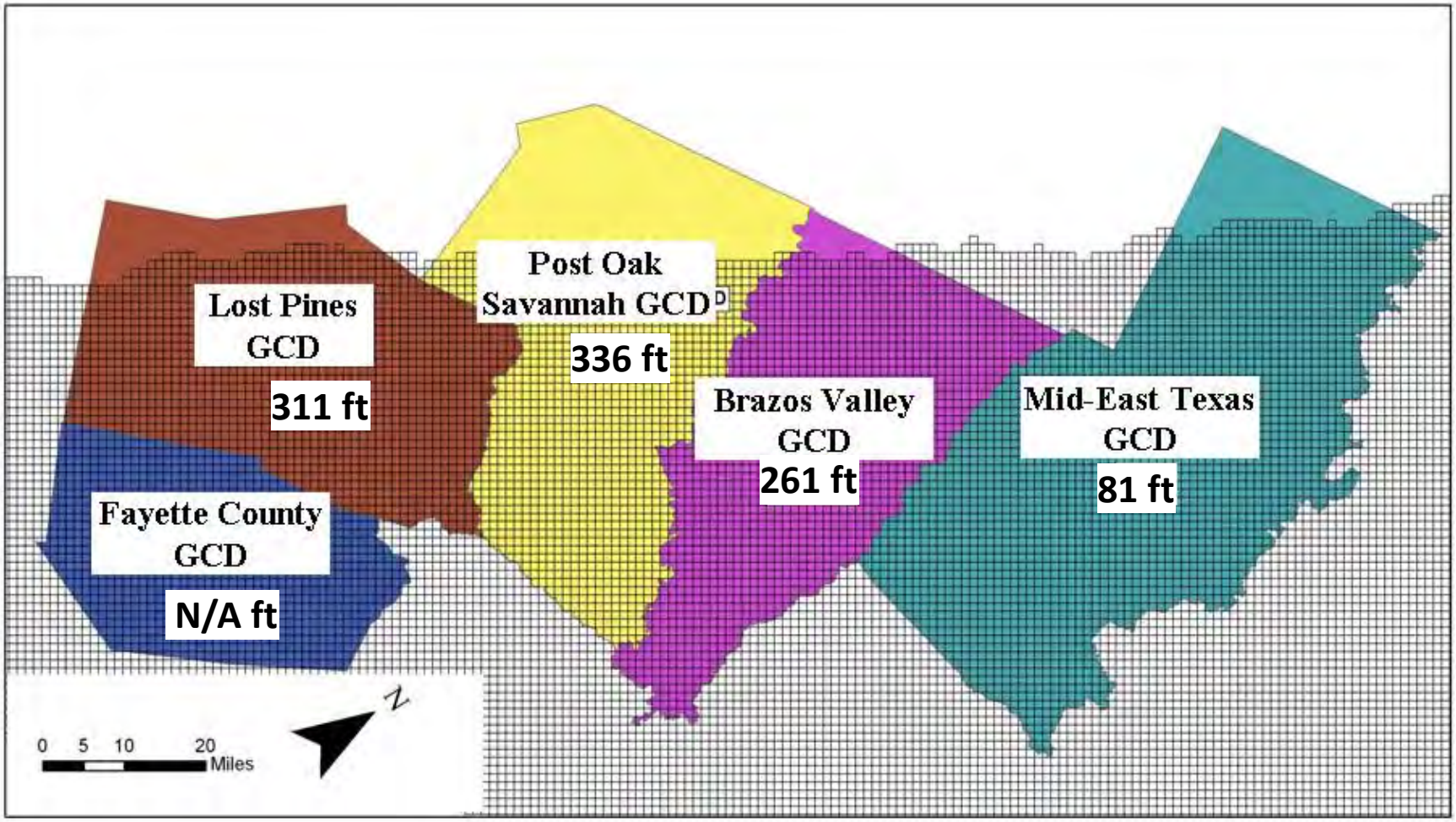
Point	x	y
A	5819360.75	19409793.86
A'	5933978.87	19609781.79

Summary of POSGCD Management Strategies

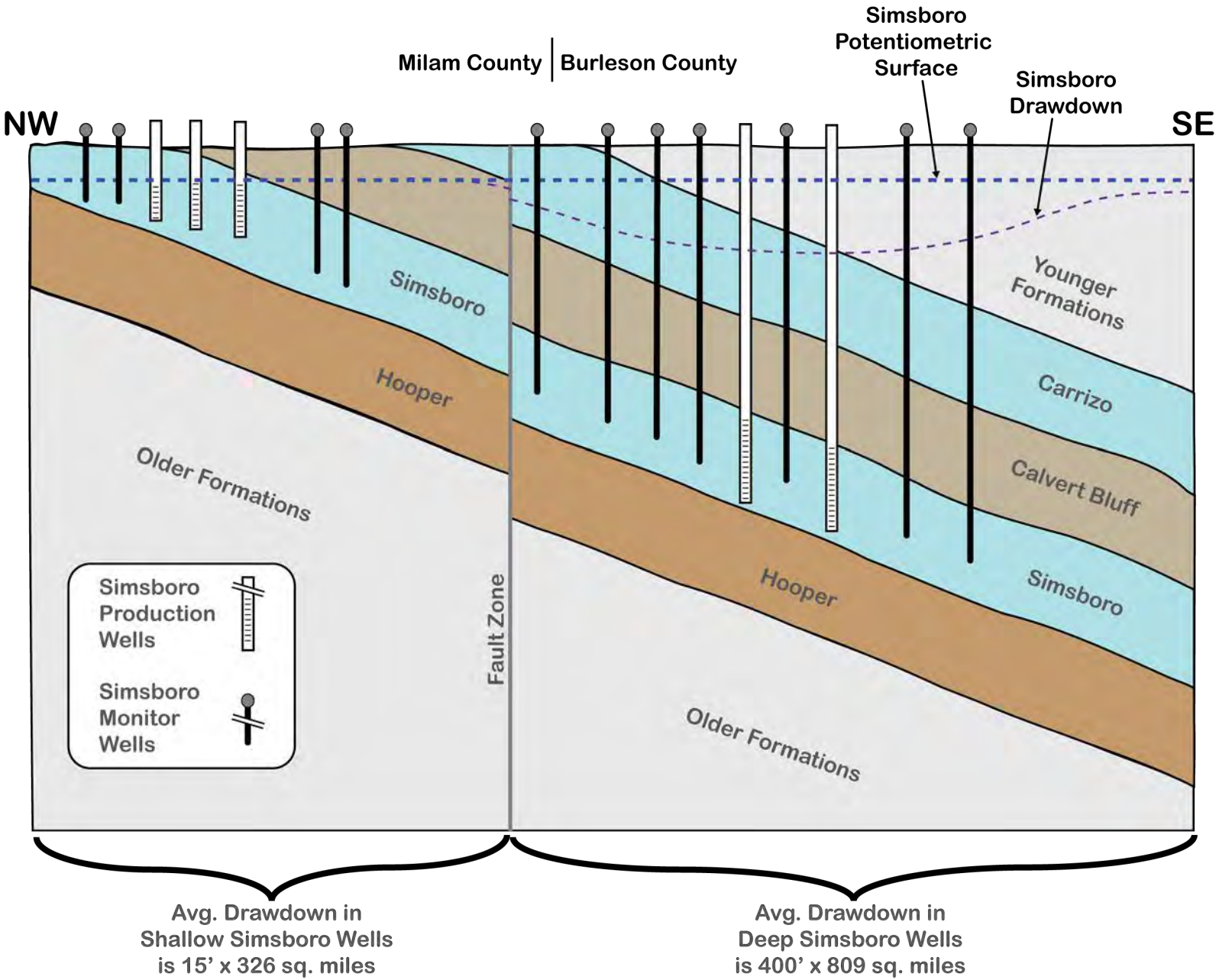
Aquifer/Formation	Over all DFC	DFC- Unconfined Area
Sparta	32	10
Queen City	31	10
Carrizo	172	20
Calvert Bluff (Upper Wilcox)	179	20
Simsboro (Middle Wilcox)	336	20
Hooper (Lower Wilcox)	214	20
Yegua/Jackson	61	15

(These DFCs are expressed as average drawdowns for a 60-year period beginning January 2010 and ending December 2069, for the area covered by each aquifer in Milam and Burleson Counties.)

GMA 12 Adopted DFCs: Expressed in Average across District for Simsboro (2010 to 2070)



Schematic Cross Section
Simsboro Drawdown



Rockdale Wells and Water Levels**

Well Name	Screen Depth	Pump Depth	Water Level	Well Buffer	Total Buffer
New Texas	370	273	128	145	242
Airport	443	235	134	101	309
Tracy	346	224	137	87	209
Runway	450	285	154	131	154
Praesel	225	225	N/A	N/A	N/A
Belton (m)	390	N/A	134	N/A	N/A

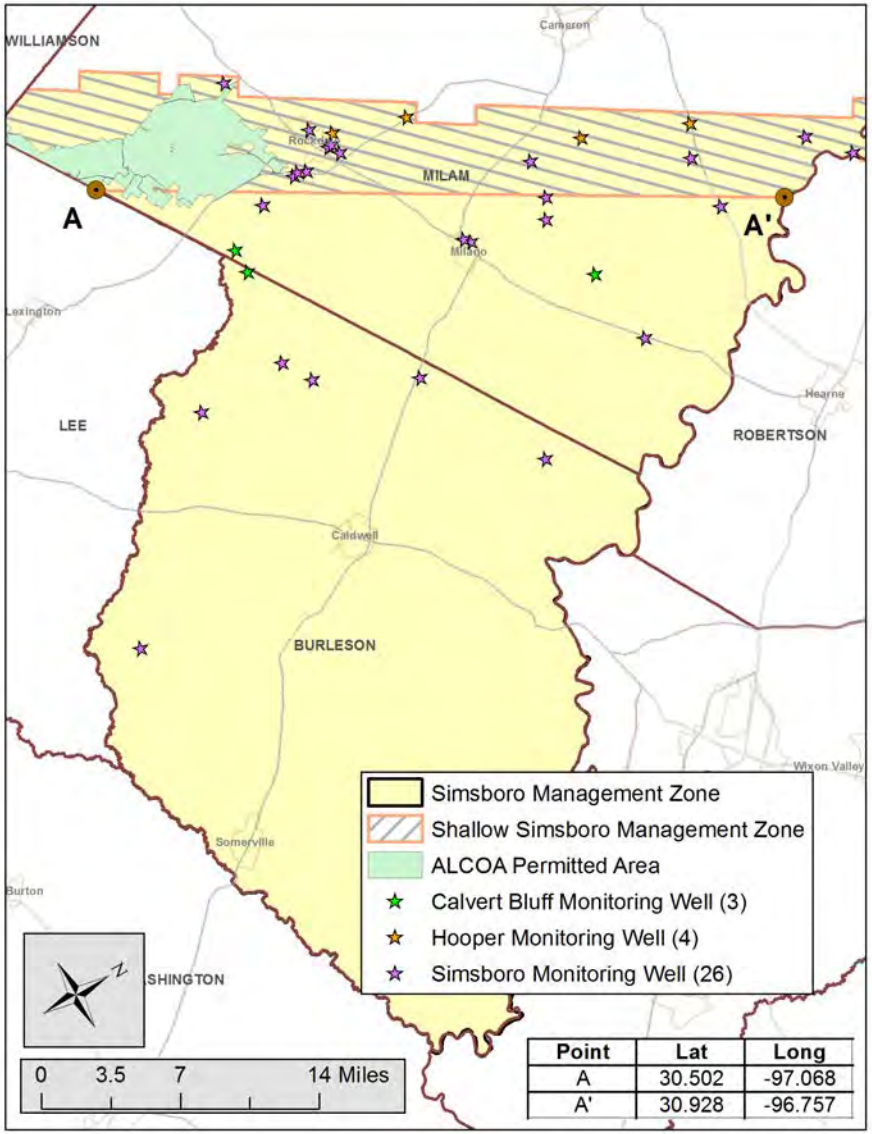
**Rockdale wells are located in the shallow portion of the Carrizo-Wilcox formations

Well Buffer = difference between Water Level and Pump Depth

Total Buffer= difference between Screen Depth and Water Level (if able to drop pumps)

(m) = monitor well only

POSGCD Monitoring Locations for Wilcox Aquifer



Relevant Factors for Consideration in Management of Groundwater Resources

- Chapter 36
- The purpose of the rules of the District;
- The equitable distribution of the resource;
- The economic hardship resulting from grant or denial of a permit, or the terms prescribed by the permit;
- The potential effect the permit may have on the aquifer, sustainability of the recharge on the aquifer as a whole, and groundwater users;
- The Desired Future Conditions and the estimated Modeled Available Groundwater Values; and
- The Management Goals, Objectives, and Performance Standards

Current Info in District Well Database

Formation	# wells
• Yegua/Jackson	2091
• Sparta	644
• Queen City	592
• Simsboro	397
• Carrizo	186
• Hooper	422
• Other	>3200
• Total	>7500

MONITORING WELLS
15% Increase
for 2021

ADDING MORE NEXT GENERATION MONITORING ACOUSTIC MEASUREMENT TECHNOLOGY

Well Monitoring is one of the most important tools Post Oak Savannah Groundwater Conservation District has to track the health of the aquifers. At the present time, the District has over 359 Monitor Wells across the two counties which include Rural Water Suppliers, landowner exempt wells, and wells the District has drilled for the sole purpose of monitoring.

Monitor wells give us a snapshot of the water levels in the aquifers. They also give us a tool for making better decisions on installation of new wells and the amounts of water available for pumping.

POSGCD Field Technicians Craig Andrews and Jeff Fisher measure the monitor wells at least once a year. We take the date and water level he records and enter everything into our database. We are then able to use our hydrological models to make better decisions about managing these aquifers. **The more monitoring wells we have help us better understand the Aquifers and how pumping impacts water levels in specific areas.**

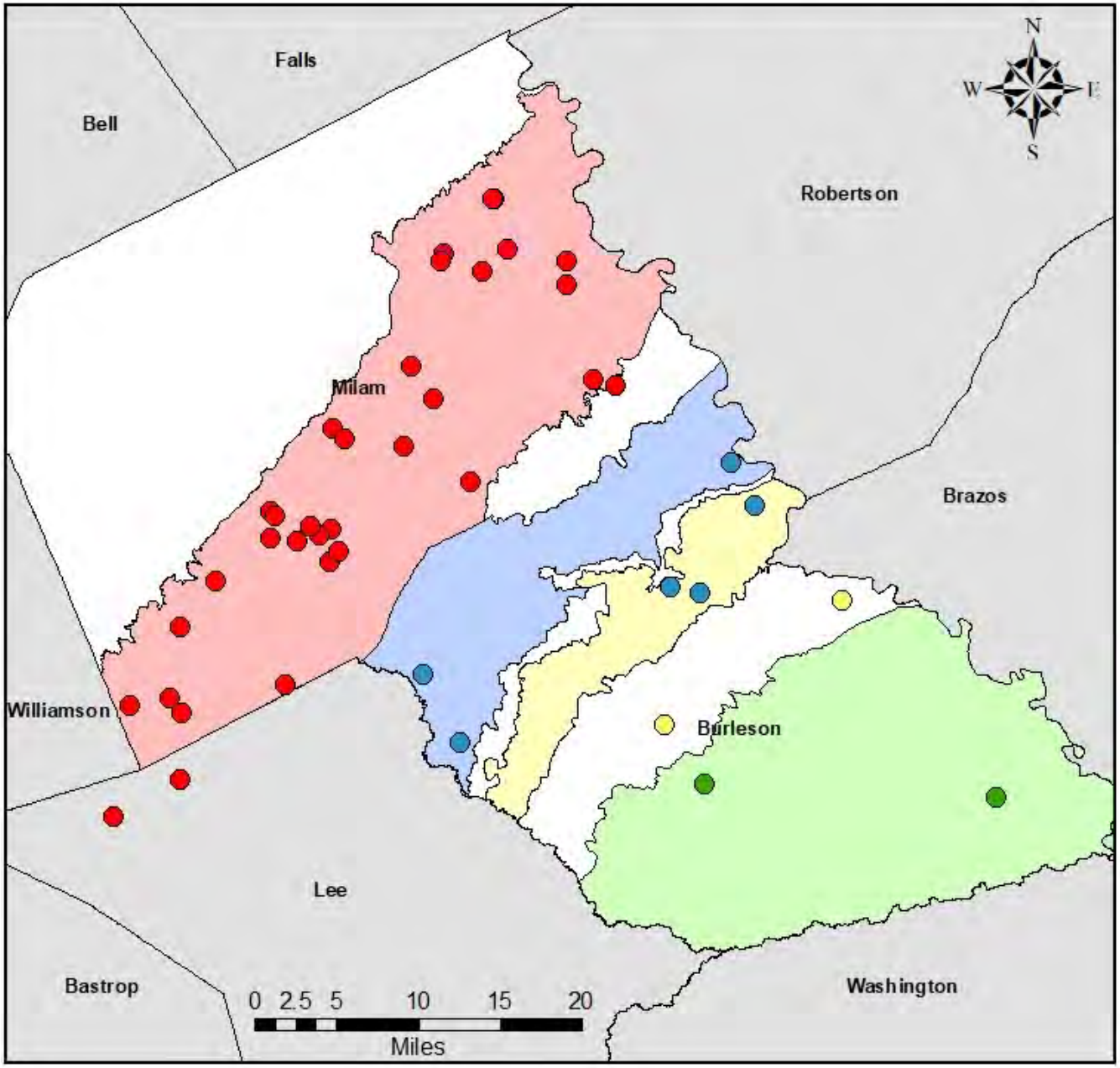
We continued adding the patented, next-generation, acoustic measurement technology. These include remote telemetry, and a cloud platform to collect accurate and reliable groundwater level measurements.

Monitoring Wells

Groundwater Management

- Protection of water levels
  - Overall Desired Future Conditions
  - Shallow zones restrictions
  - District Monitor well network
- Respect for Property Rights
  - To produce
  - When not producing**

District Monitoring Wells - Shallow (<400) Management Zone



This map illustrates the wells in the District's Monitoring Network that are identified to be in the shallow management zone set for 400 feet. The District makes an effort to make management decisions that are supported through best available science, In an effort to improve this science, more wells are needed to increase the quantity and quality of data. While the Carrizo-Wilcox has been prioritized, there is a strong need for some shift towards the minor aquifers in regards to number of shallow monitoring wells. This document is for DRAFT ONLY.

Legend

Monitor Wells <400

- Carrizo-Wilcox
- Queen City
- Sparta
- Yegua - Jackson

- Carrizo-Wilcox Outcrop
- Queen City Outcrop
- Sparta Outcrop
- Yegua-Jackson Outcrop

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Monitoring Summary

- 370 monitoring wells (adding more)
  - 311 incidental wells (manual measurements)
  - 59 continual wells (hourly measurements)
- Monitoring results available on website
- Continuous evaluations and reports to Board
- Water Level trends are stable
- Changed Shallow Management Zone to be top 400 feet of each formation.

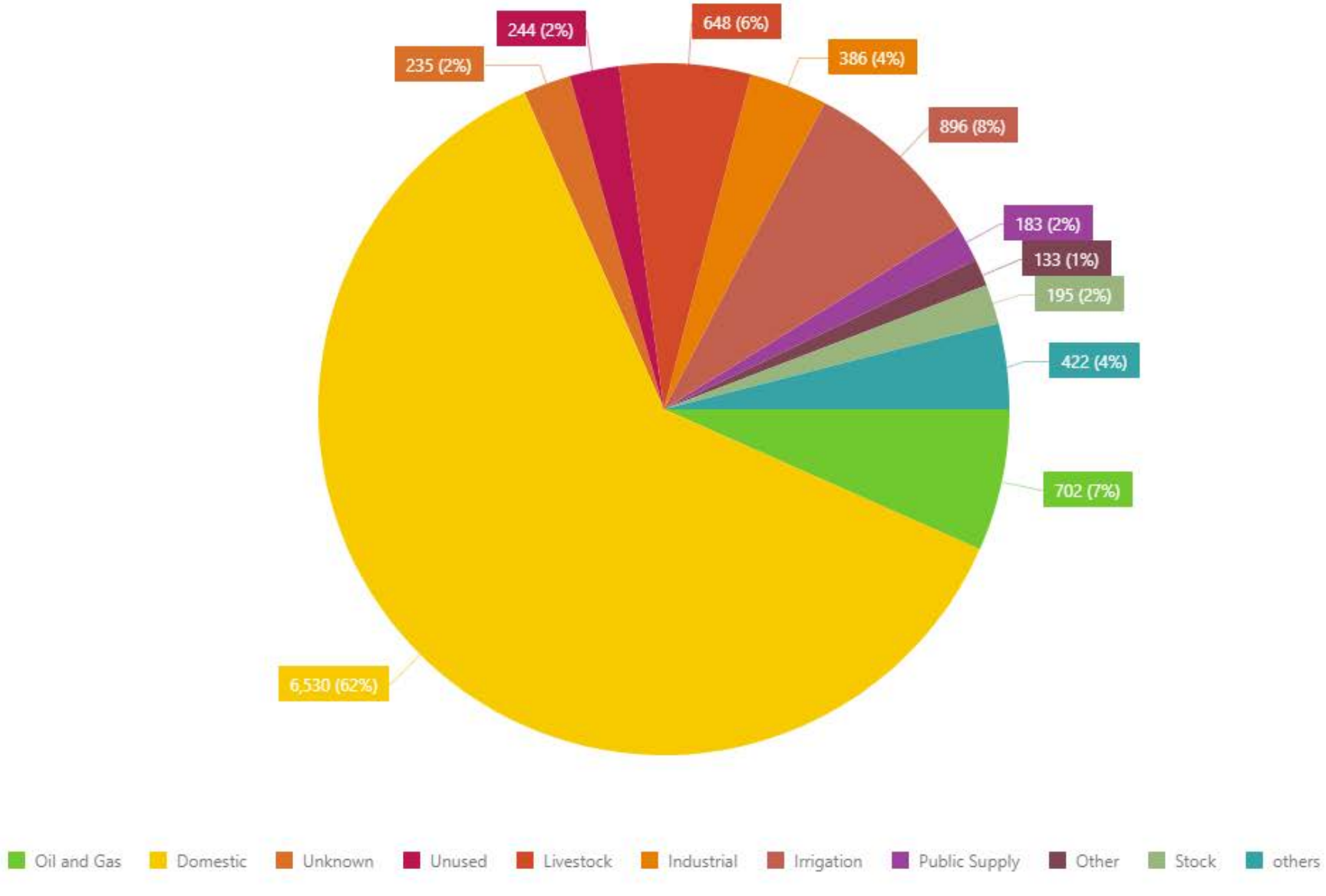
Water Level Trends

- Carrizo showed significant changes/drawdown and significant impacts in NW Burleson county. The District implemented GWAP as a corrective measure that assists with impacted wells and provides additional data.
- Simsboro showed significant changes/drawdown but no significant impacts.
- None of the others showed any significant changes or impacts.

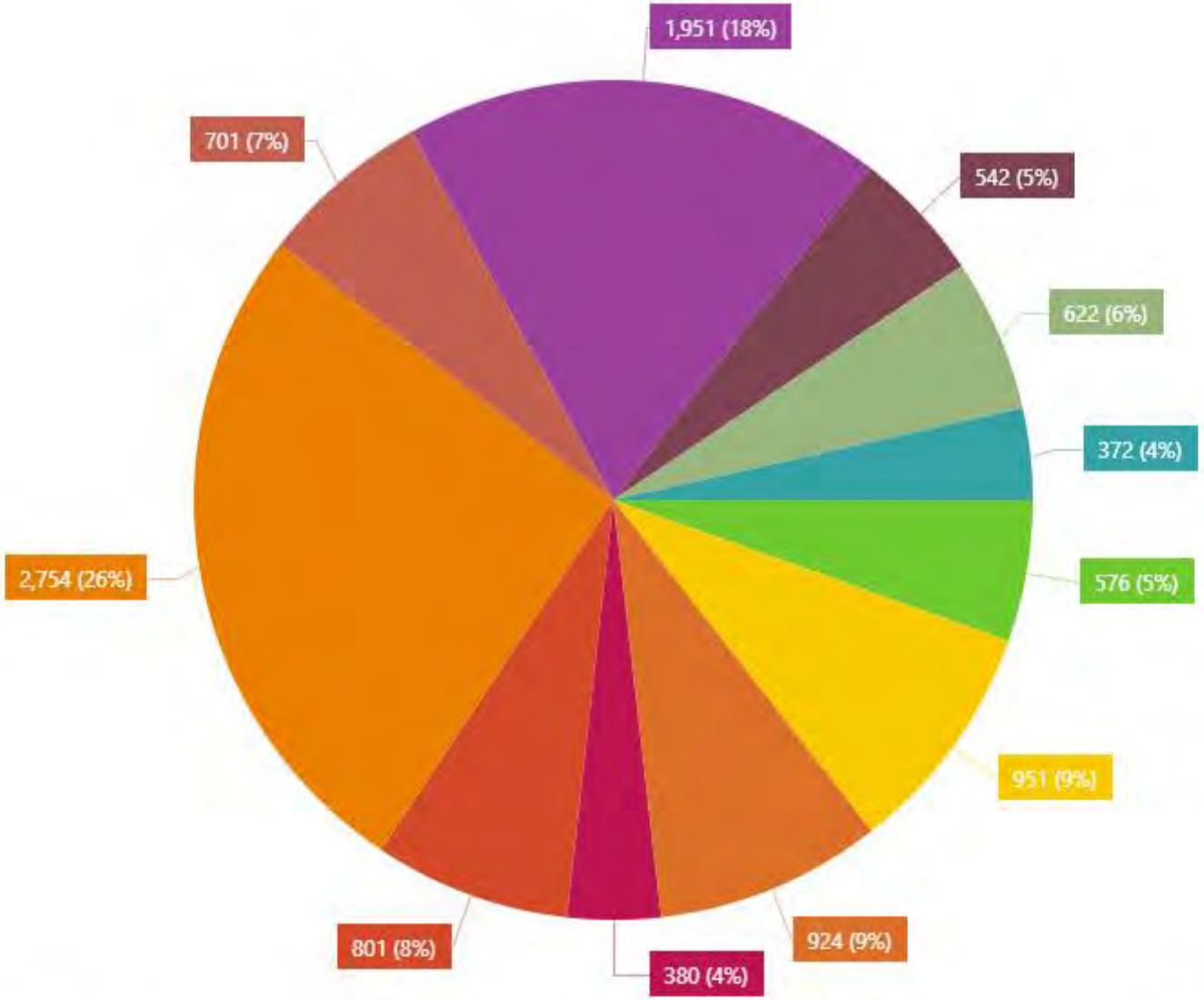
Monitoring Summary

Aquifer	# of Monitoring Wells
Hooper	51
Simsboro	63
Calvert Bluff	64
Carrizo	102
Queen City	38
Sparta	24
Yegua-Jackson	21
Brazos River Alluvium	7

Wells by Use


244 (2%)
648 (6%)
235 (2%)
386 (4%)
896 (8%)
183 (2%)
133 (1%)
195 (2%)
422 (4%)
702 (7%)
6,530 (62%)
Oil and Gas
Domestic
Unknown
Unused
Livestock
Industrial
Irrigation
Public Supply
Other
Stock
others

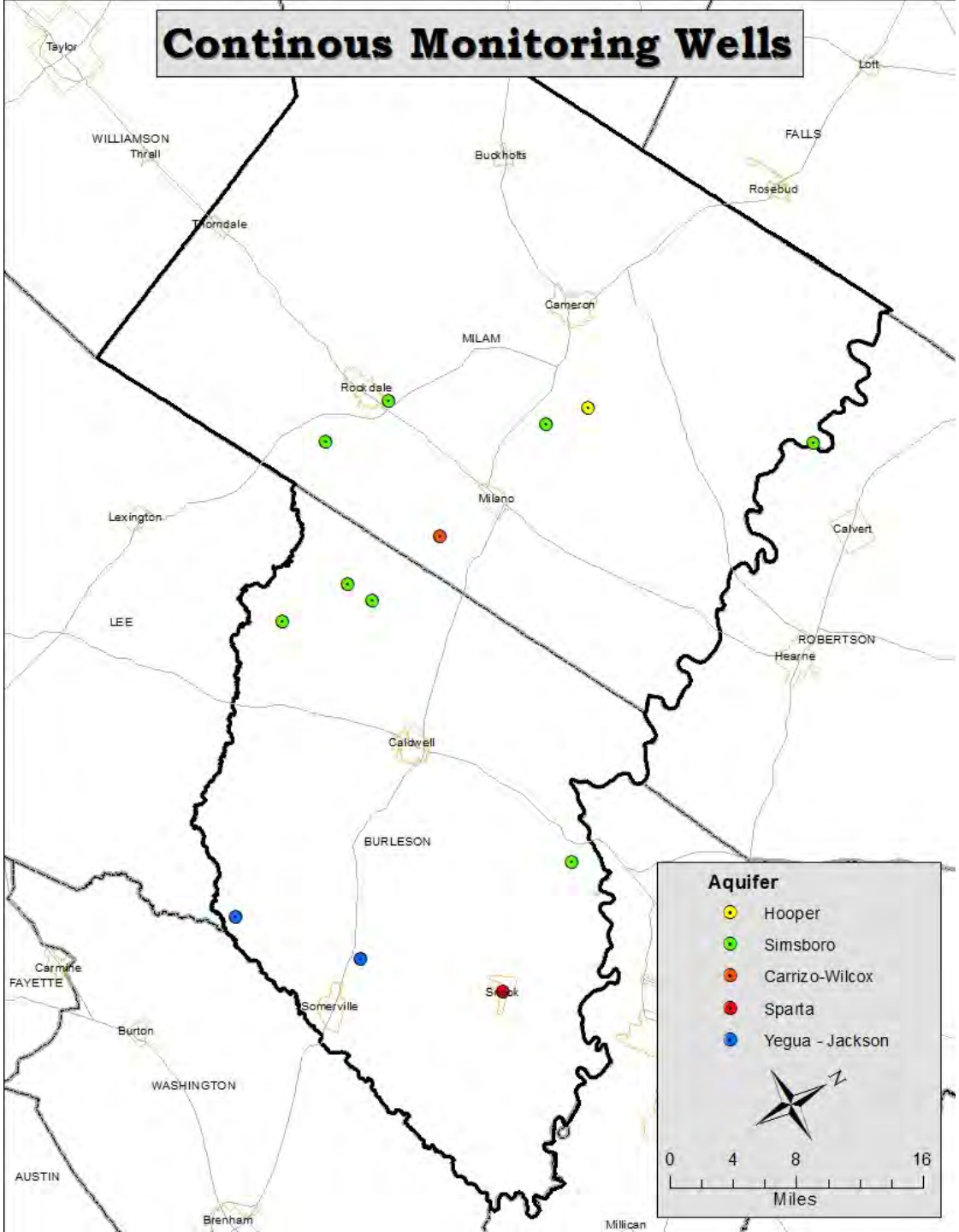
Wells by Aquifer



Water Level Monitoring

Aquifer	Management Zone	
	Shallow	Deep
Hooper	6	0
Simsboro	12	16
Calvert Bluff	5	0
Carrizo	4	4
Queen City	5	3
Sparta	0	8
Yegua-Jackson	N/A	3
Brazos River Alluvium	7	N/A

Continous Monitoring Wells



POSGCD Programs

District Education Program

- Public presentations (Master Gardeners, groups, service clubs, Co. Extension events, Big Spring Clean, etc.)
- Milam and Burleson Counties Groundwater Summit
- Commissioners Court Annual Updates
- Website- *www.posgcd.org*
- Newspapers
- Newsletters
  - Quarterly Paper
  - Monthly Email
- Schools- Public and private
  - Water Wise- 4th and 5th grades
  - In person presentations- 6th & 7th grade science
  - Additional resources- Water IQ for all levels
  - Extension Service

Working with County Extension Offices

TEXAS A&M AGRILIFE EXTENSION

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Ag in the Classroom

Other Ways to Work with Texas AgriLife

AgriLife Specialists

- Other Workshops
  - Earth Kind Workshop, Landscape and Irrigation, and Rainwater Harvesting
  - Social Media Outreach -
    - Facebook, Twitter and more

  - Publish Print or E Newsletters

Earth-Kind Workshop

POSGCD Office
310 East Avenue C
Milano, TX 76556


ONE WAY


AANA2017

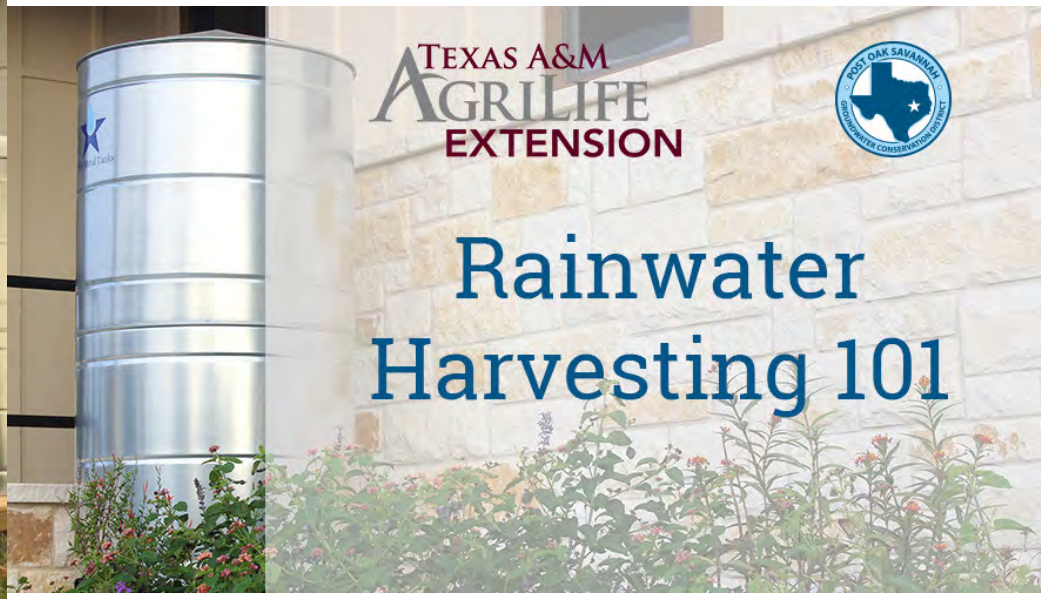

Titleist

TEXAS A&M AGRILIFE EXTENSION

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

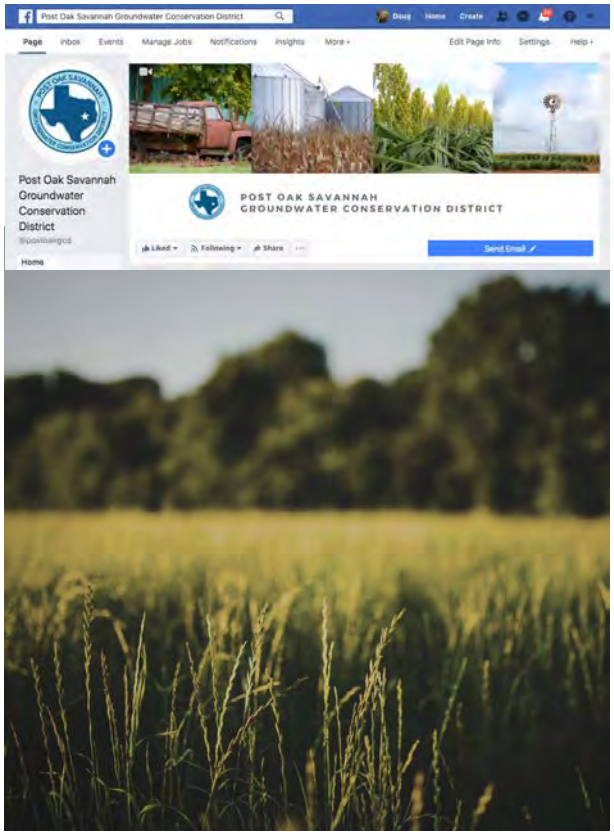
Landscape & Irrigation:
Selection and Installation Workshop

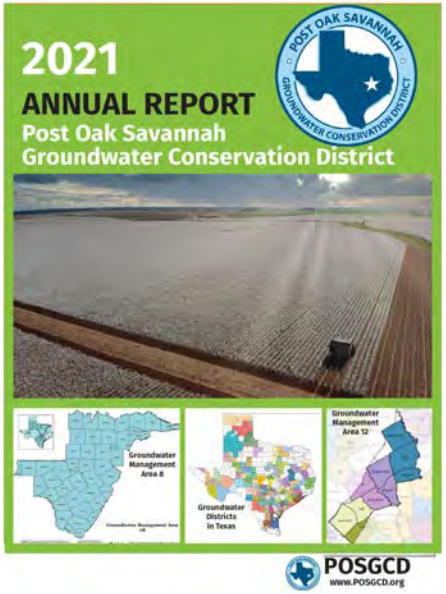
310 East Avenue C
Milano, TX 76556



Rainwater Harvesting

Twitter, Facebook, & Newsletter





Newsletter
Print or E-Newsletter

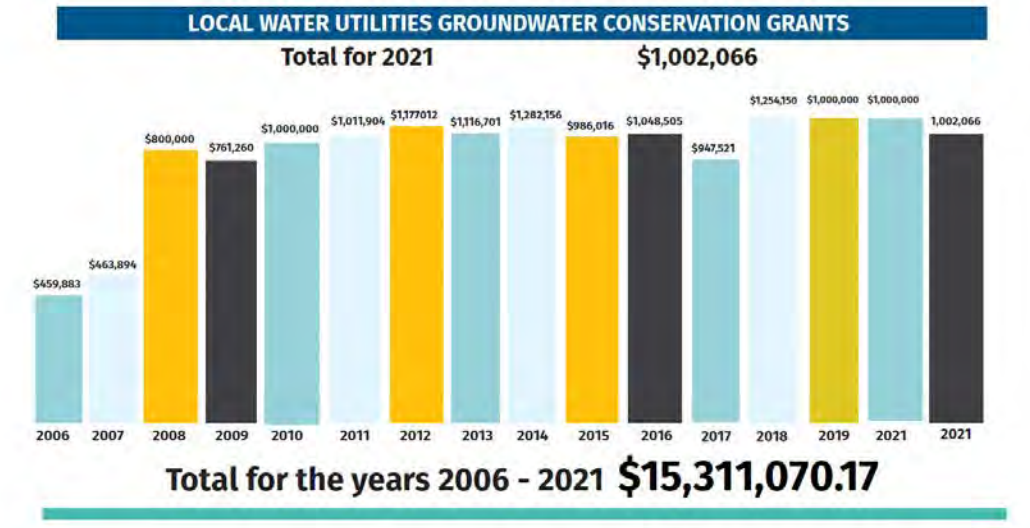
District Groundwater Conservation Grants

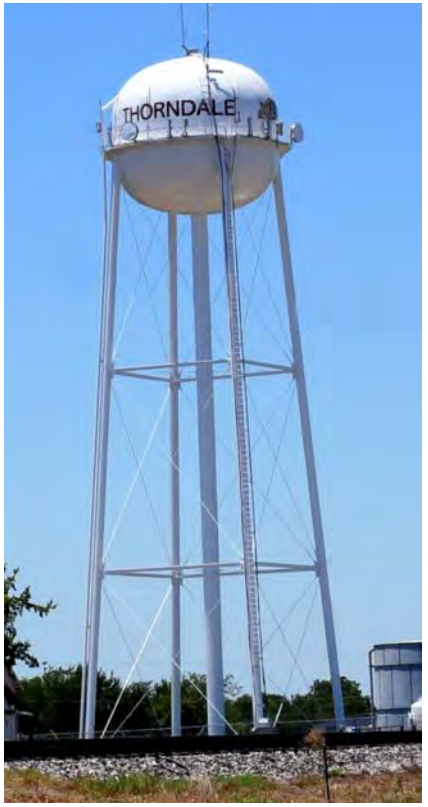
>>Local Water Utilities in District

Must be used for conservation of groundwater or recharge of aquifer(s)

History (since 2006)

- Awarded 85 grants
- 23 different Local Water Utilities
- Approximately $15.31 Million
- 2021 Four Recipients totaling $1,002,066





District Groundwater Conservation Grants (continued)

>> Fire Departments in the District ($25,000 per year)

Available for water conservation materials and equipment

-Absorbent materials

-Foam

-Foam dispersing nozzles

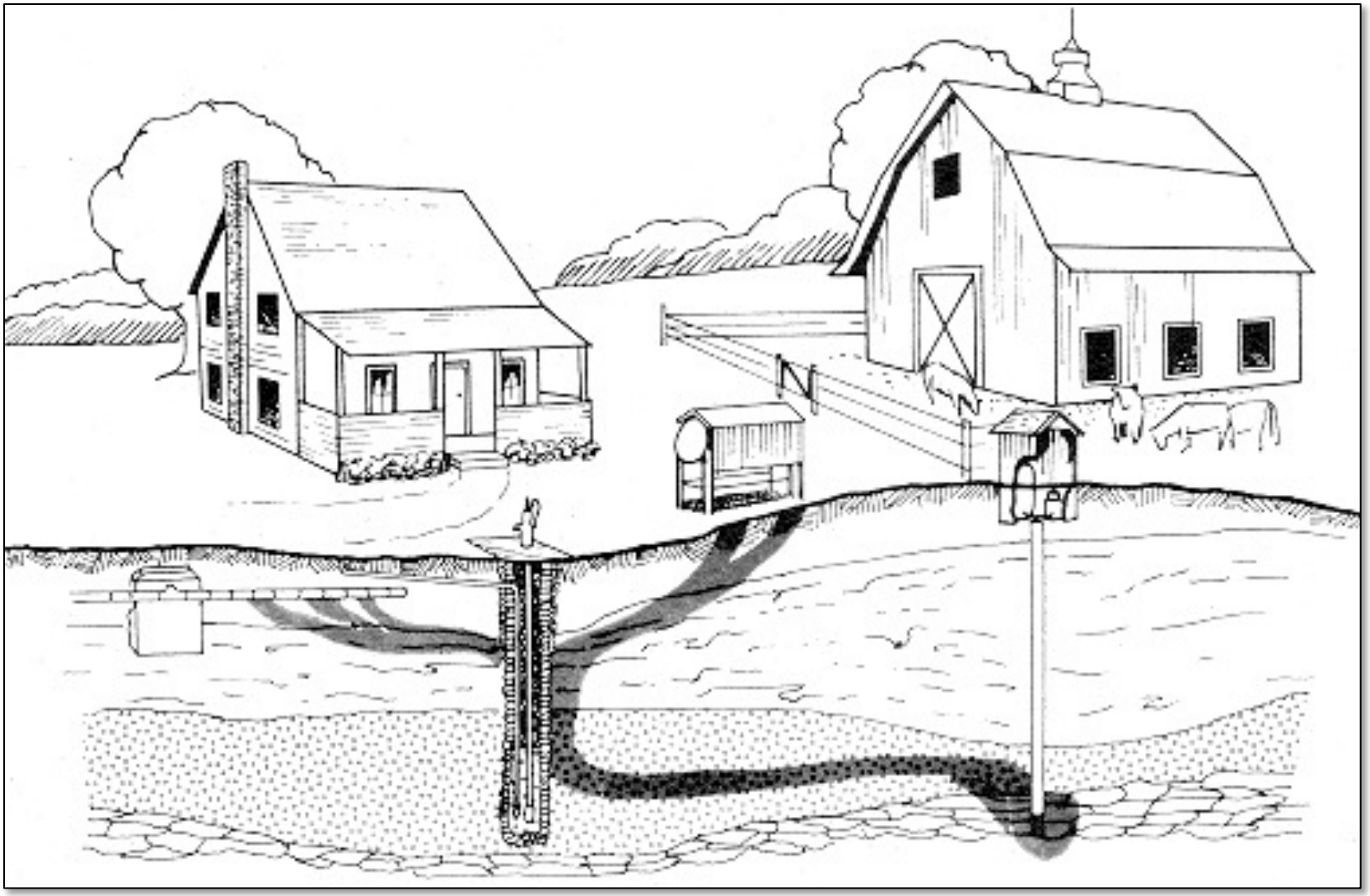
-ProPaks

>>Well Plugging ($25,000 per year)

District reimburses 100% of expense up to $2500

Abandoned Wells

- What is it?
  - Unused for six consecutive months
  - Or a non-deteriorated well with casing, pump or has been capped
- Why a problem?
  - Safety
  - Nuisance
  - Environmental
  - Legal
- Who can plug the well?
  - Licensed well driller
  - Licensed pump installer
  - Landowner



Abandoned wells can be pathways for pollutants

Abandoned Wells

Groundwater Well Assistance Program (GWAP)

Purposes-Increase # of monitoring wells, Predict and correct issues with water supply

	2020	2021 to Date	December 2021
Wells Inspected	47	39	1
Wells Serviced	24	36	0
Total POSGCD Spent	$76,161	$233,954	$0
Total Reimbursed to POSGCD From Vista Ridge & I-130 Projects	$17,653	$95,025	$0

GROUNDWATER
WELL ASSISTANCE PROGRAM

POST OAK SAVANNAH
GROUNDWATER CONSERVATION
DISTRICT

POSGCD Aquifer conservancy Program (ACP)

Would you like to conserve
your water for future generations by placing
all or part of your water rights
into a conservancy stewardship?

Join the Post Oak Savannah Aquifer Conservancy Program by placing your land in the Conservancy

You do not give up any of your water rights?

You simply agree not to lease or permit that water during the term of commitment.

You will receive payment for not leasing or pumping your water.
Of course, you can still have an Exempt Well for personal and livestock use.

You choose the length of commitment
five years, ten years twenty years,
thirty years or fifty years.

You will be able to cancel the agreement at the end of the term, if you sell your property, transfer it to your heirs or at the time of death of the landowner.

You can commitment all of your water rights or keep part for row crops, pecan grove, irrigate a hay patch, etc.

Why would you want to commit your water rights into the ACP?

As Texas continues to grow,
demands will increase on all resources.
The ACP allows landowners to work with
the District to help
Conserve water for future generations.

The purpose of ACP

- Empower landowners through stewardship
- Establish a legacy of conservation
- Compliment current sustainable practices
- Conserve groundwater
- Add a long-term tool to the current Toolbox of management strategies

Questions?

Contact info:

Gary Westbrook

General Manager

Post Oak Savannah GCD

Phone: 512-455-9900

Fax: 512-455-9909

Email: gwestbrook@posgcd.org

Website: www.posgcd.org

Serving the Citizens of Milam and Burleson Counties