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

Presented to Little River Basin Master Gardeners

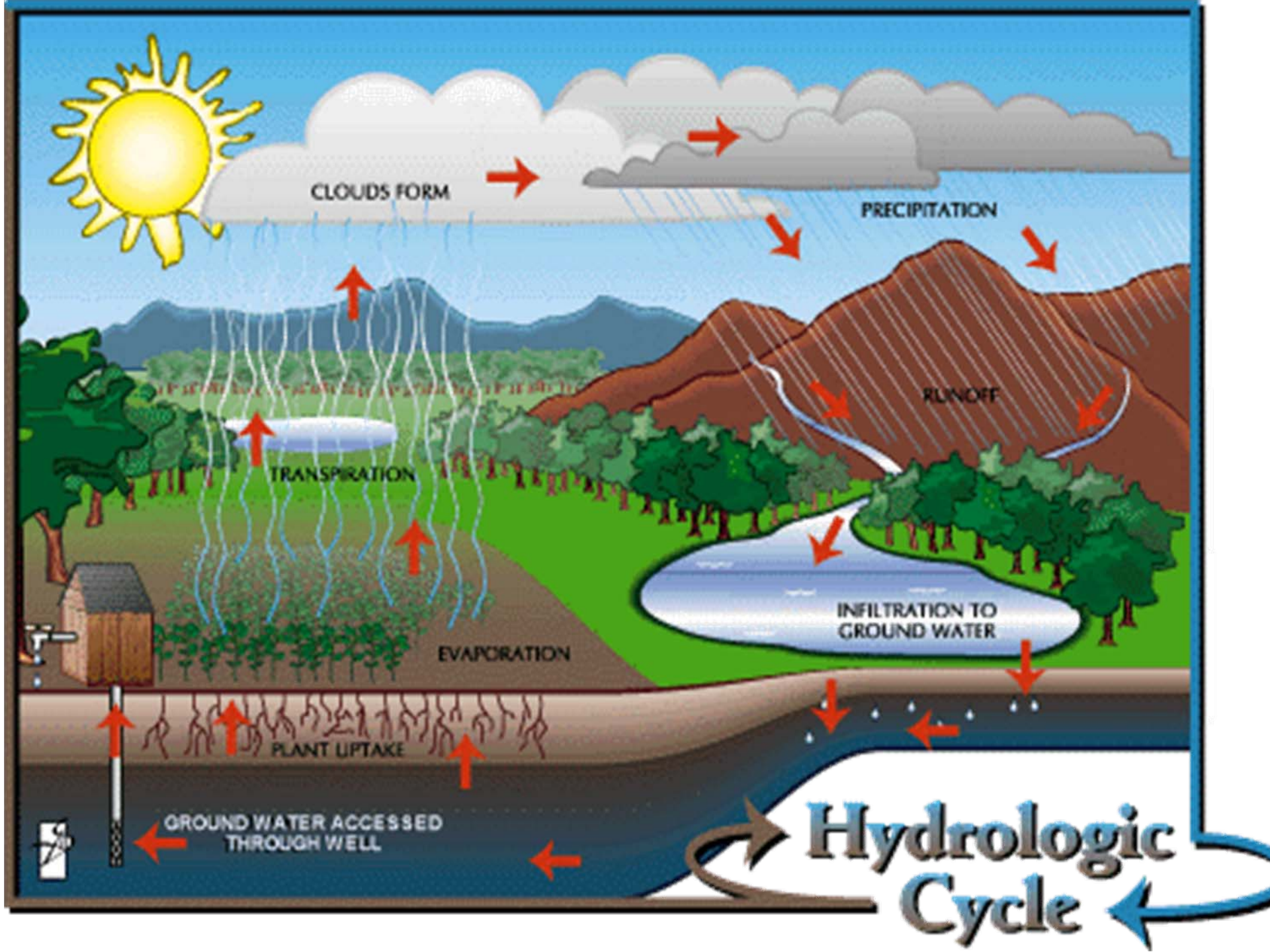
Gary Westbrook, General Manager
Post Oak Savannah GCD
August 17, 2011

Serving the citizens of Milam and Burleson Counties

Agenda

1. Texas Water Resources
2. Texas Water Management
3. GCDs- Powers and purposes
4. Why POSGCD in Burleson and Milam counties
5. Groundwater Resources and Management strategies within POSGCD

Texas Water Resources

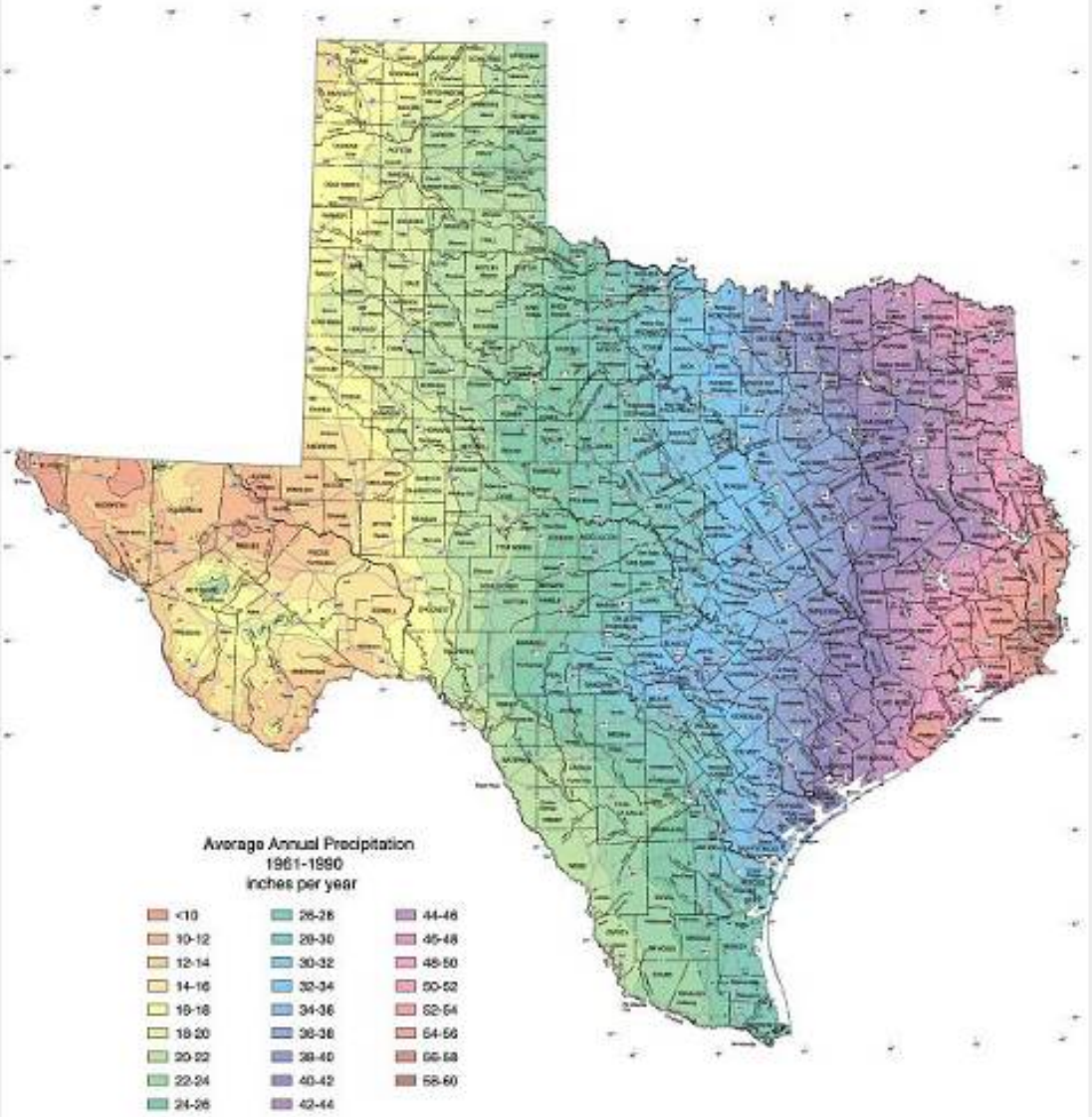

CLOUDS FORM
PRECIPITATION
RUNOFF
TRANSPIRATION
INFILTRATION TO
GROUND WATER
EVAPORATION
PLANT UPTAKE
GROUND WATER ACCESSED
THROUGH WELL
Hydrologic
Cycle

U.S. DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

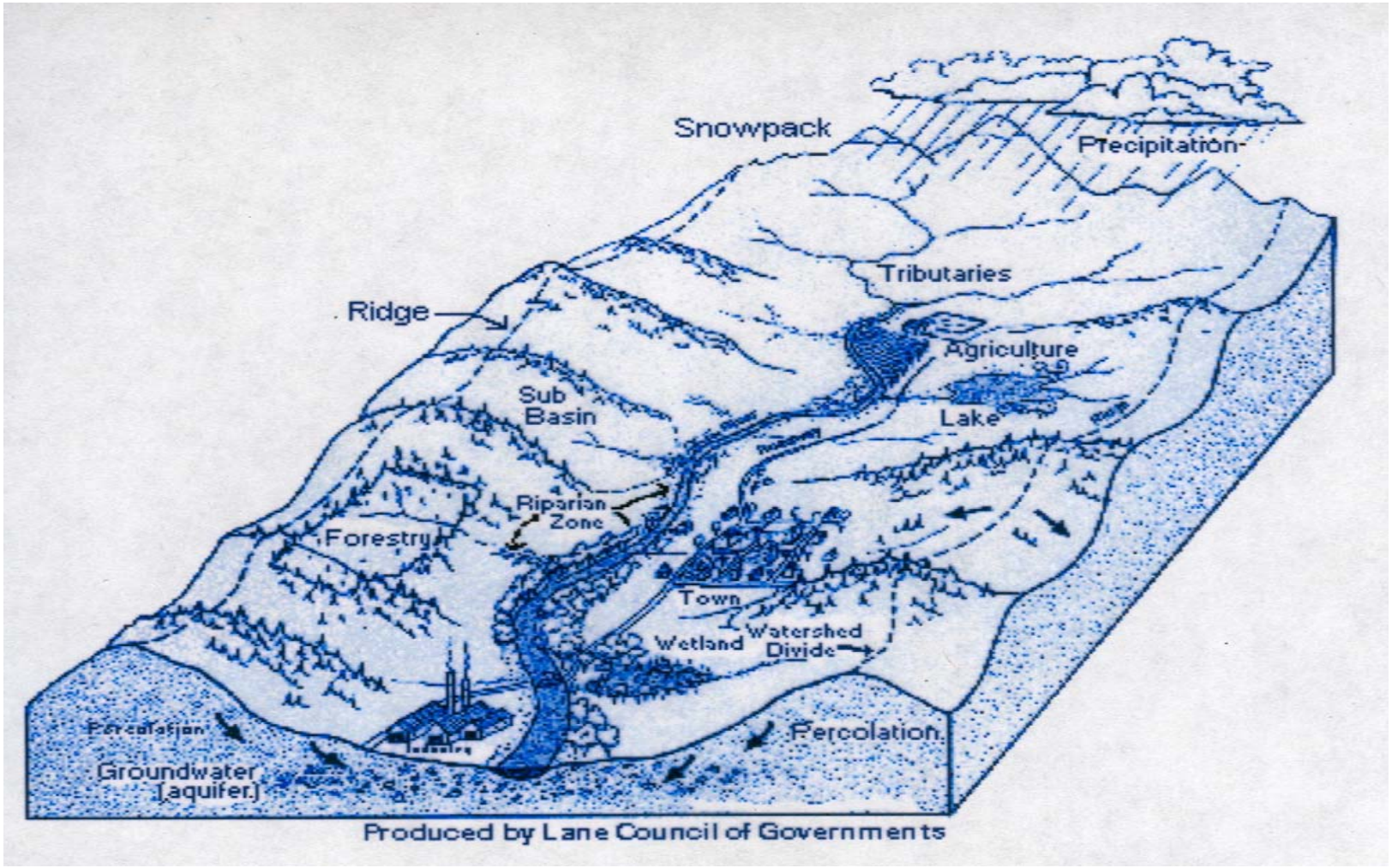
TEXAS

ANNUAL PRECIPITATION



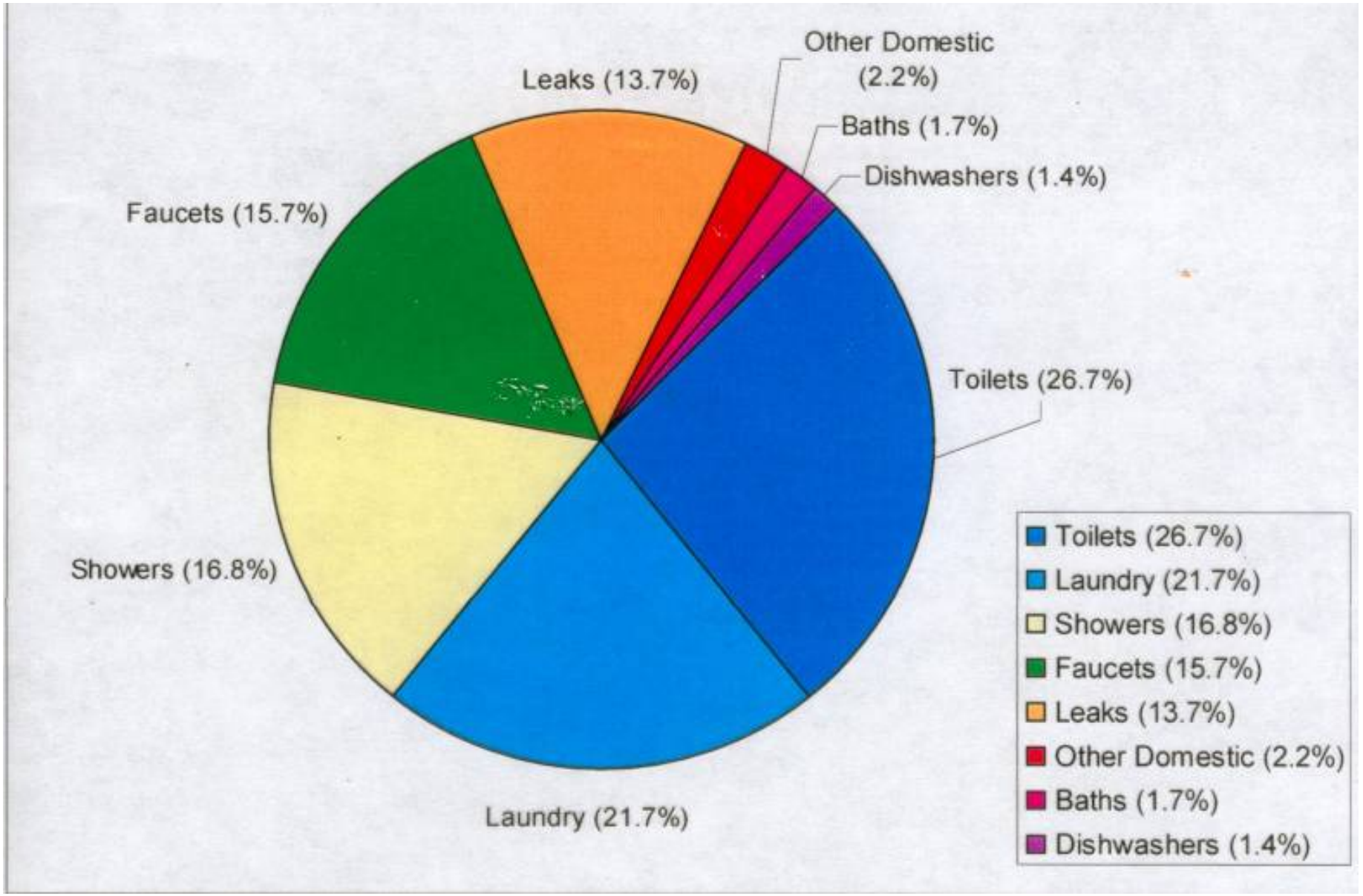
SCALE 1 : 2,500,000

Watershed



Many watersheds make a river basin.

Indoor Water Use (American Avg. 60 GPD)

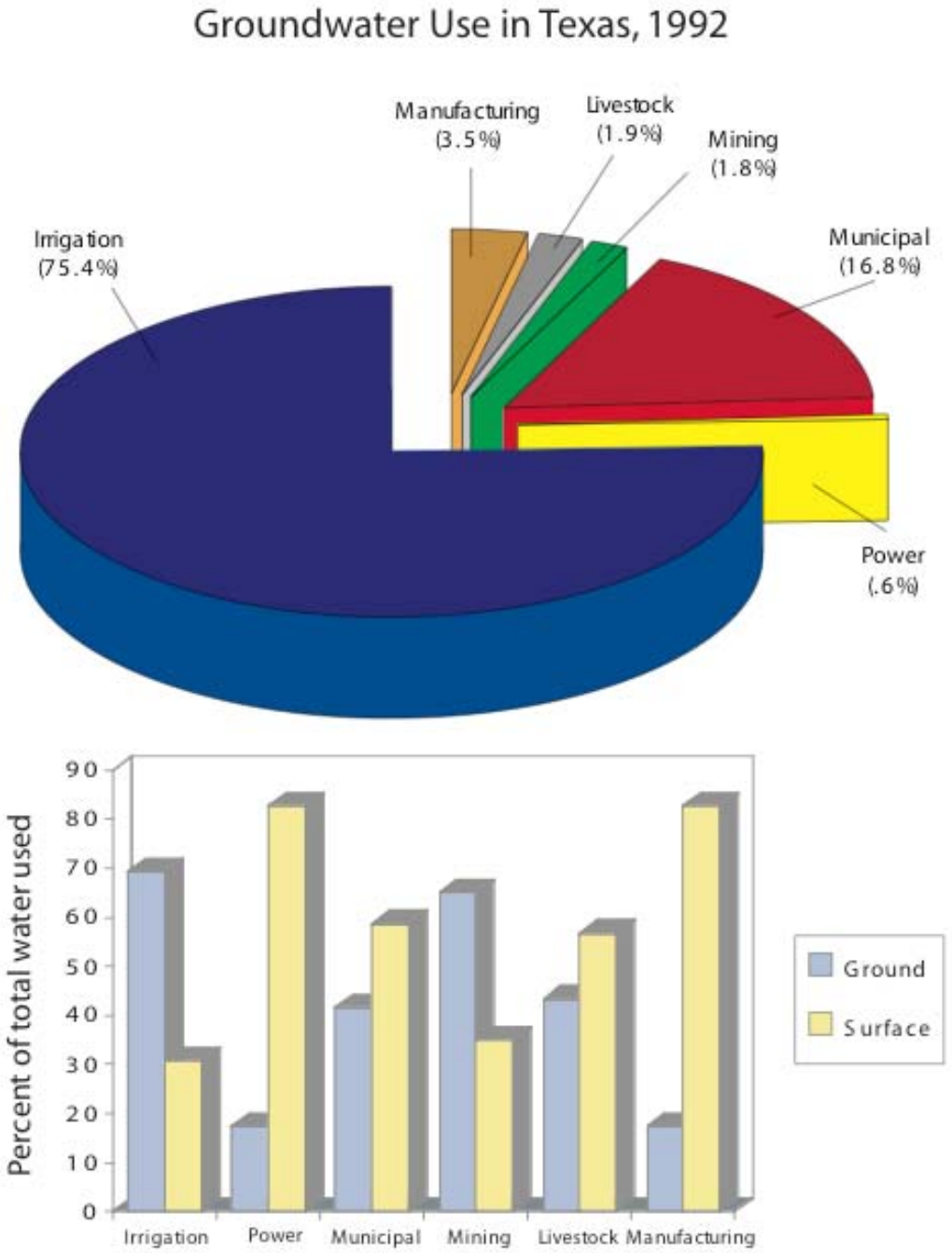


Outdoor Water Use

(American Avg. 120 GPD)

Agriculture Irrigation

Coastal Bermuda hay
Pecans ~ Corn ~ Milo
Soybeans ~ Melons
Turf Grasses ~ Wheat
Cotton



How much water does it take?

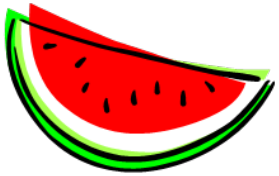
6 gallons

120 gallons

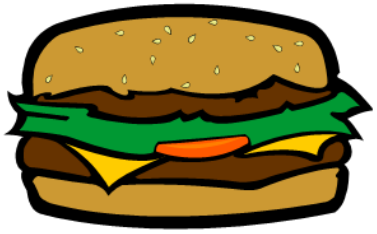
65 gallons

3 gallons

65,000 gallons!!!

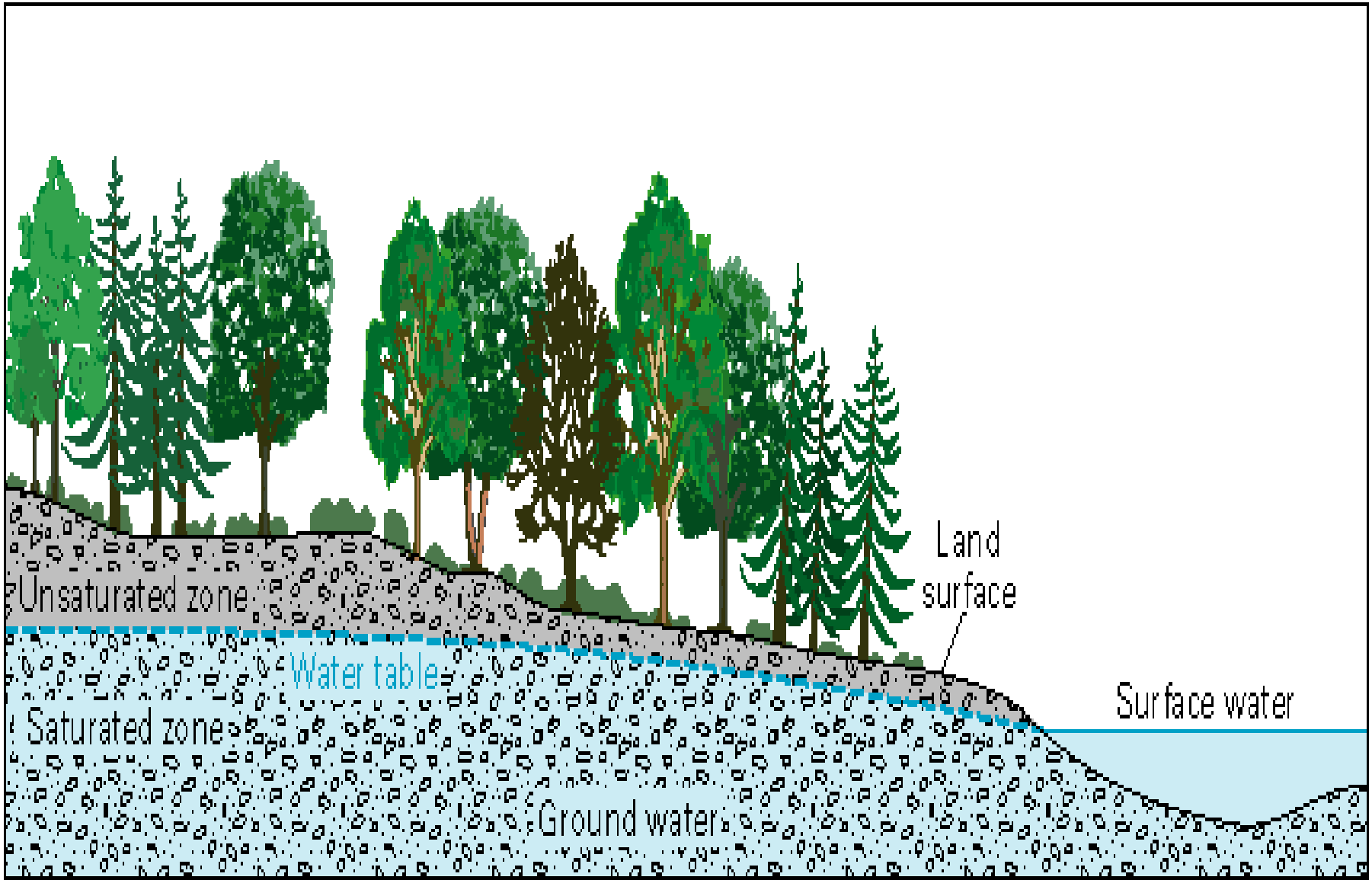


100 gallons



1,300gallons

Groundwater System



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

Why Groundwater?

- 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

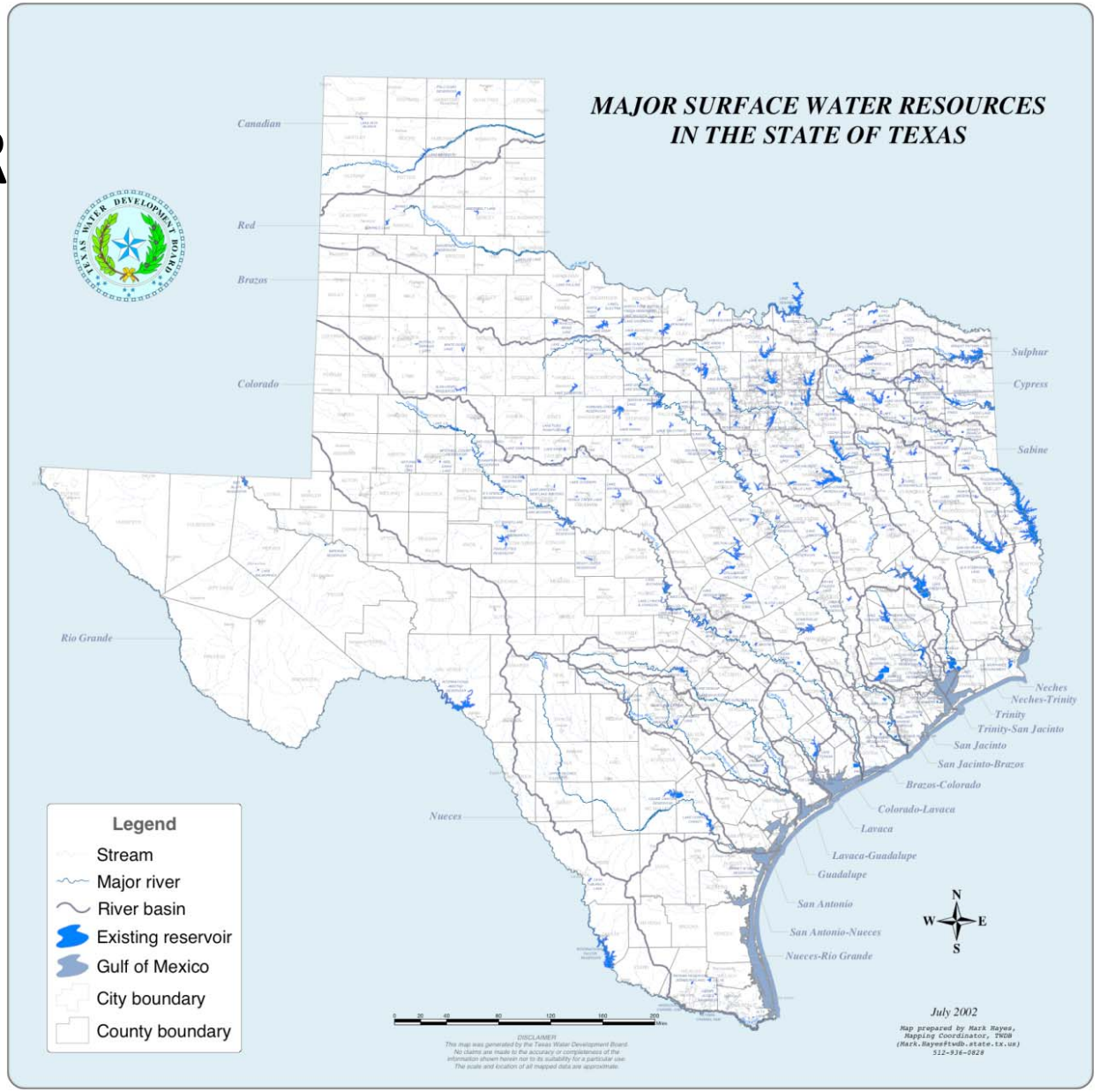
Texas Water Management

Planning- Texas: 2000 vs. 2060

	2000	2060
Population		
Texas	20 M	45.5 M
Region G	1.6 M	3.3 M
GW Demands (A/F)		
Texas	16.9 M	21.6 M
Municipal	4 M	8.2 M

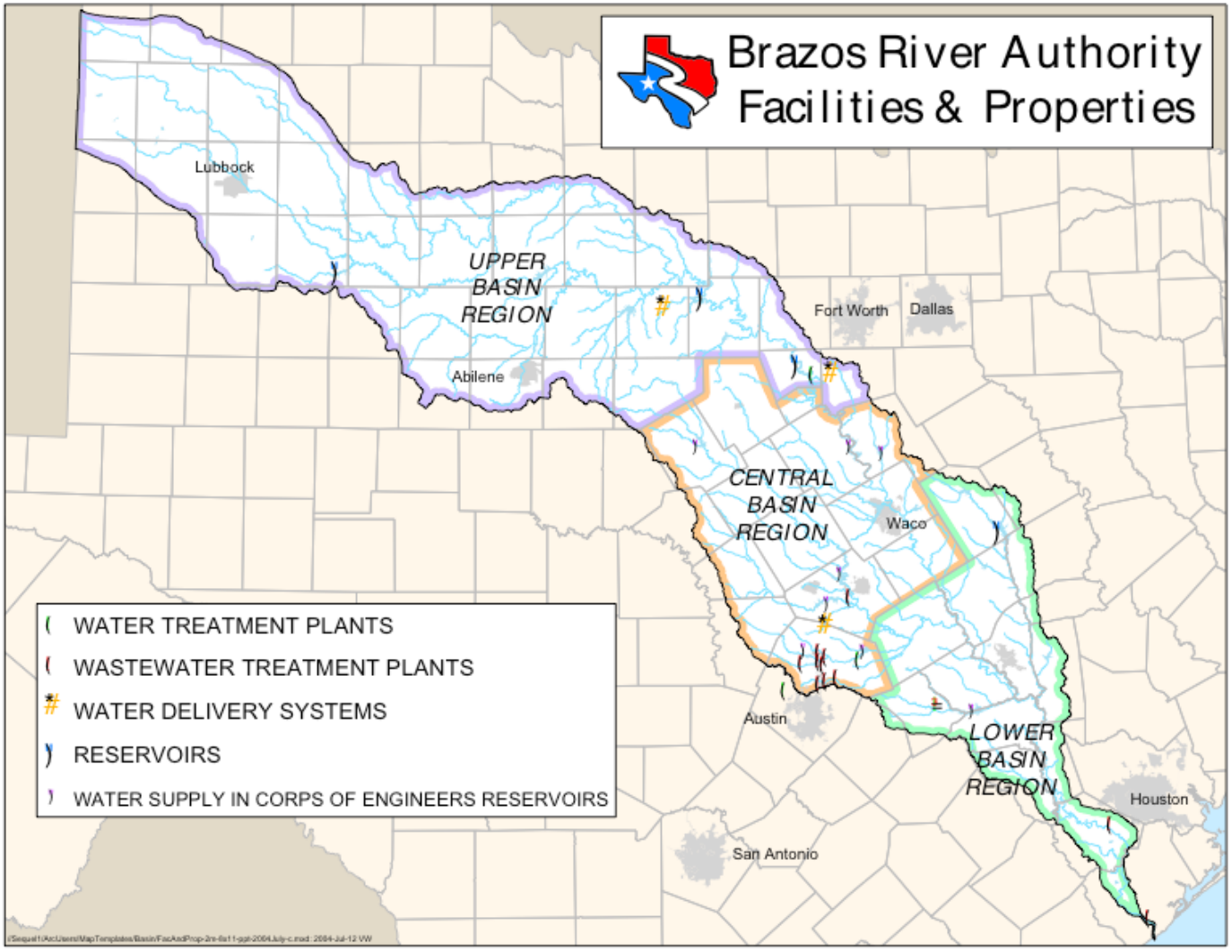
SURFACE WATER

is regulated by River Authorities

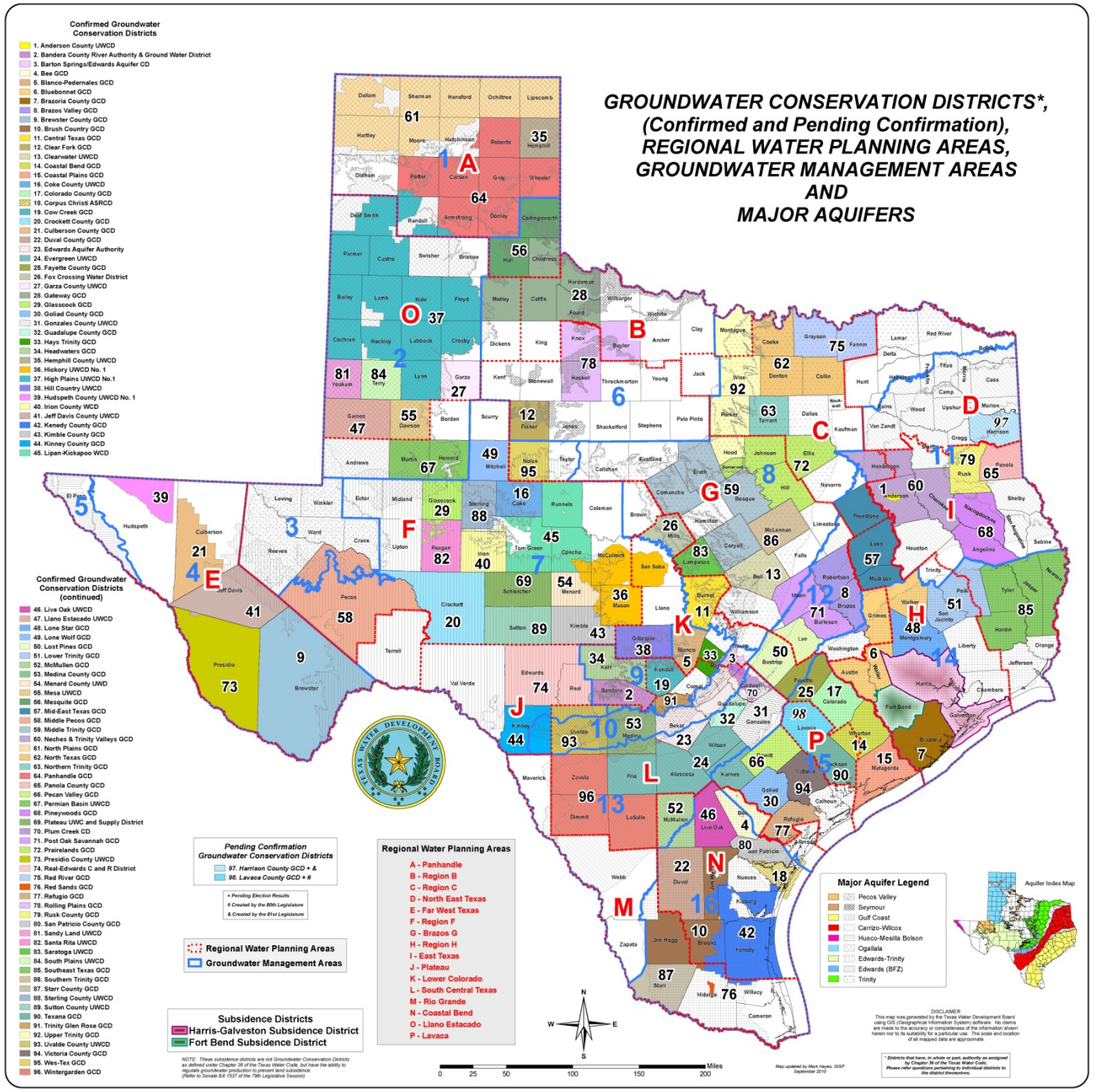


Major River Basins In Texas

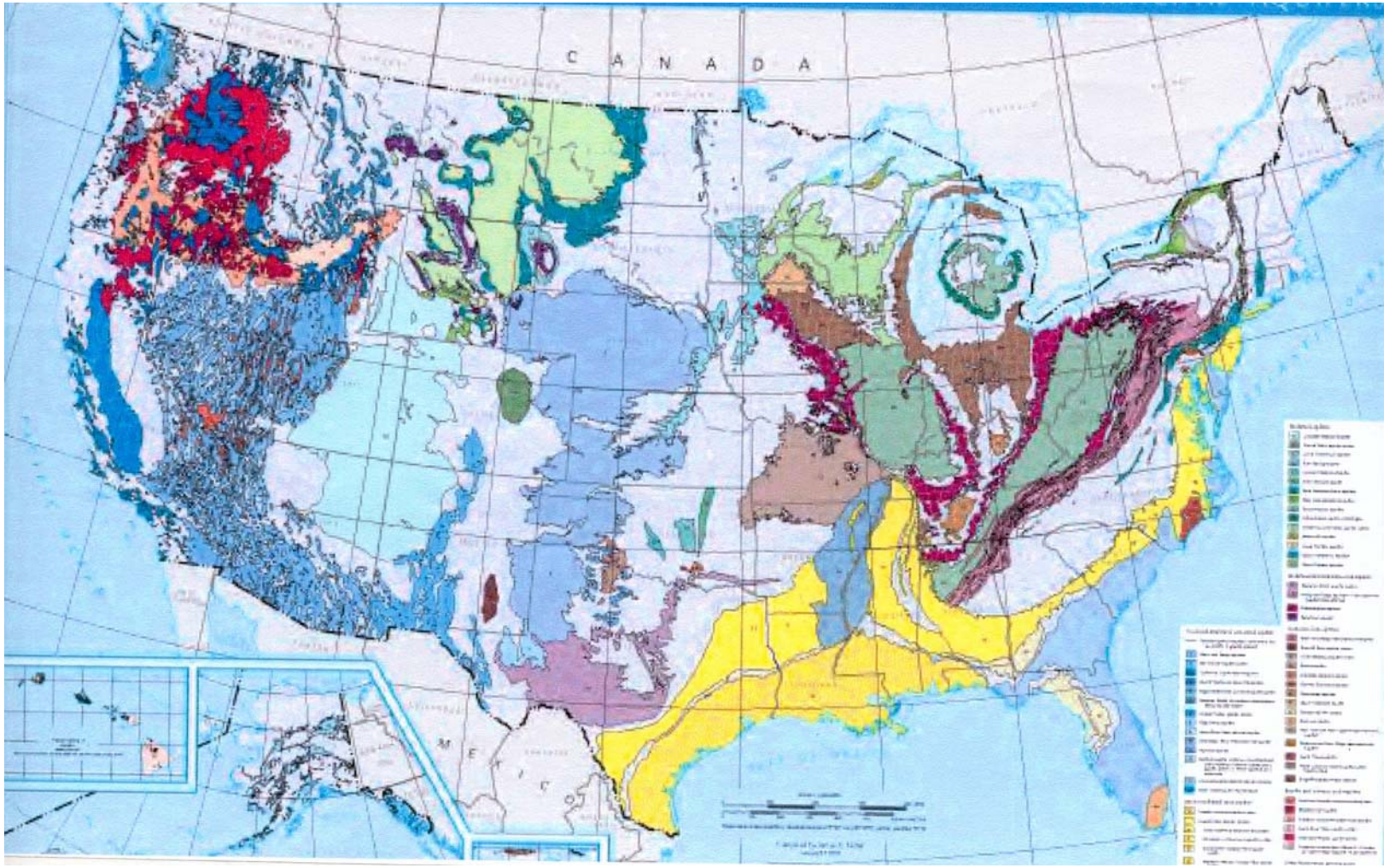
Brazos River Authority



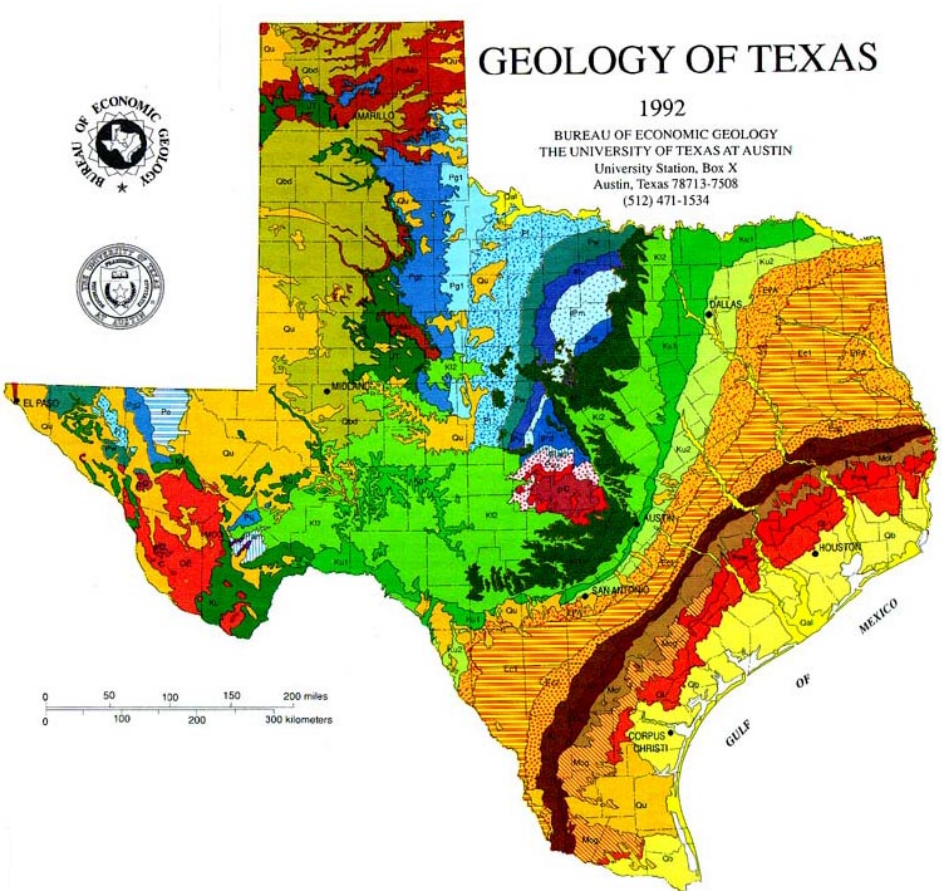
Groundwater in Texas aquifers is regulated by Groundwater Conservation Districts

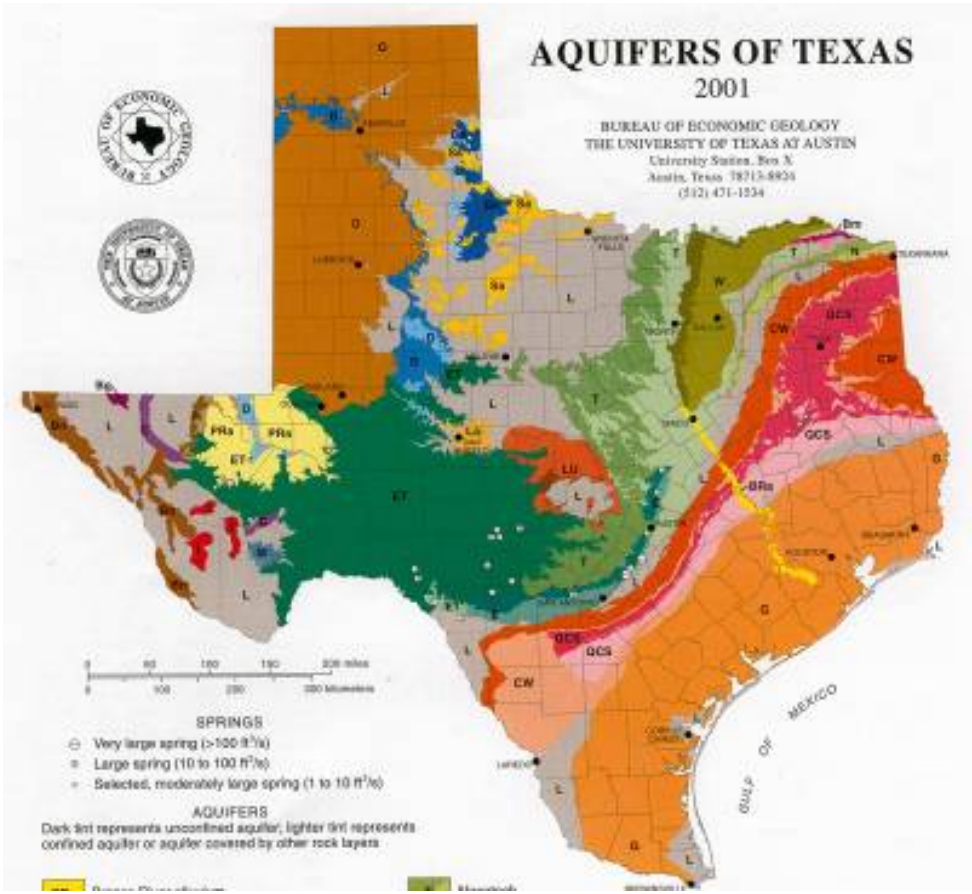


U.S. Aquifers



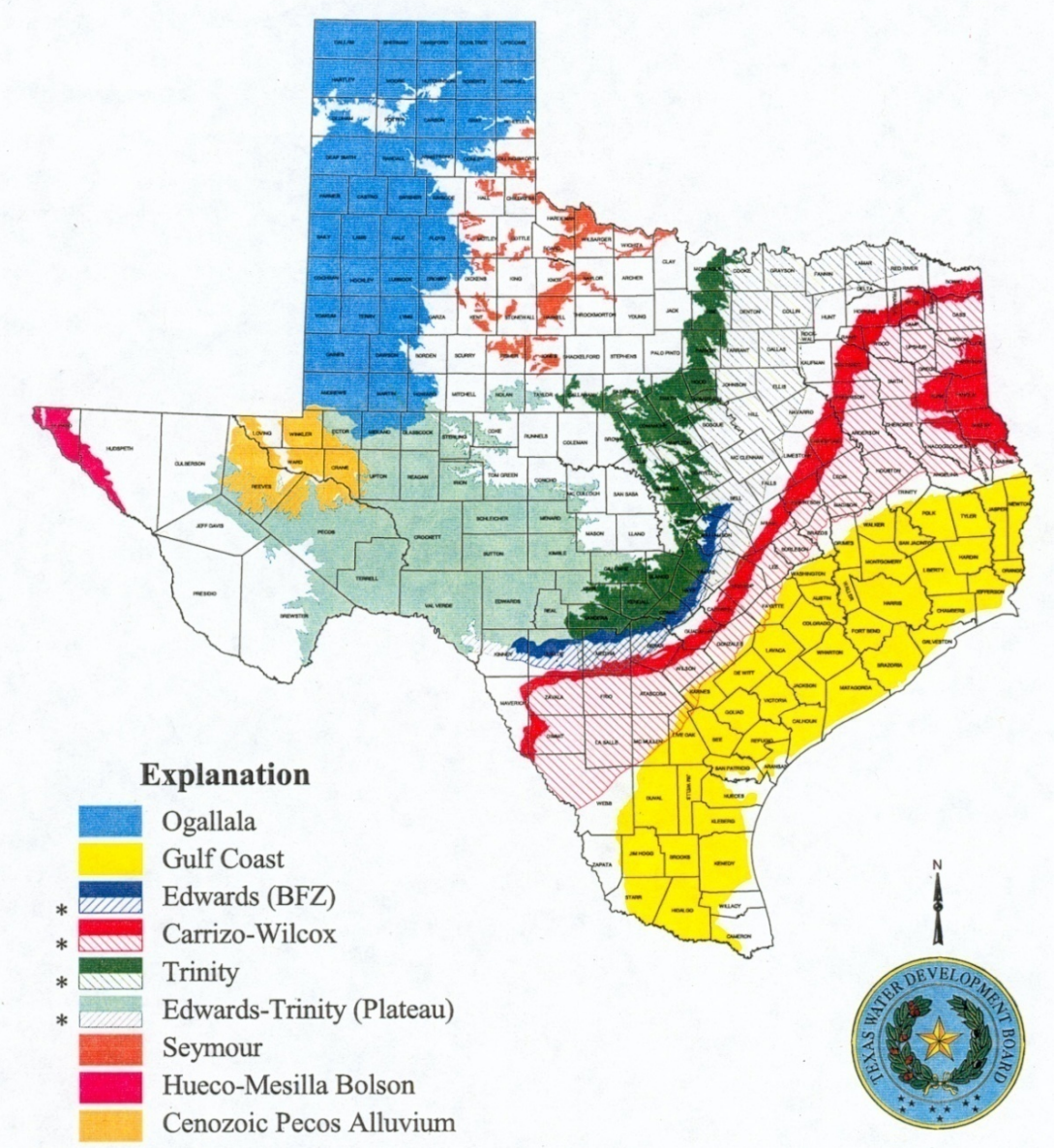
Geology / Aquifers





Major Aquifers of Texas

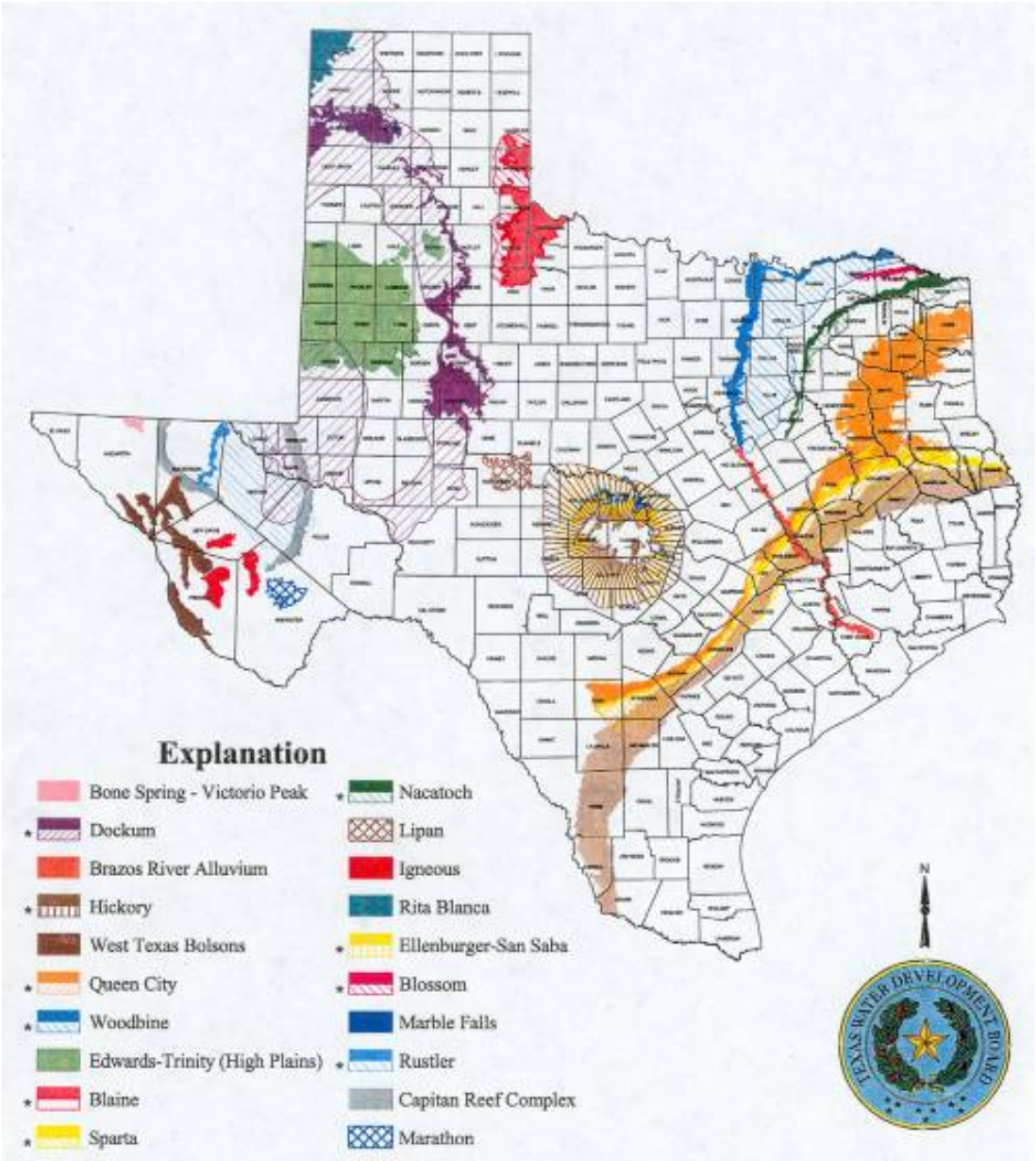
POSGCD
Carrizo-Wilcox



Minor Aquifers of Texas

POSGCD

Queen City
Sparta
Yegua-Jackson
Brazos Alluvium



Groundwater Conservation Districts

Powers and purposes

Rule of Capture

- Old English Rule

- Landowners have the right to pump unlimited groundwater from the land they own, as long as not wasteful, without liability to neighbors

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
  - 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 state's preferred method of groundwater management through rules developed, adopted, and promulgated by a district**

OWNERSHIP OF GROUNDWATER

Section 36.002

The legislature recognizes that a landowner owns the groundwater below the surface of the landowner's land as real property.

Nothing in this code shall be construed as granting the authority to deprive or divest a landowner… of the groundwater ownership and rights described by this section.

This section does not:

(1) 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;

(2) affect the ability of a district to regulate groundwater production as authorized under Section 36.113, 36.116, or 36.122 or otherwise under this chapter or a special law governing a district; or

(3) require that a rule adopted by a district allocate to each landowner a proportionate share of available groundwater for production from the aquifer based on the number of acres owned by the landowner

Old law- The ownership and rights of the owners of the land and their lessees and assigns in groundwater are hereby recognized, and nothing in this code shall be construed as depriving or divesting the owners or their lessees and assigns of the ownership or rights, **except as those rights may be limited or altered by rules promulgated by a district.**

ADMINISTRATION

Section 36.051

The governing body of a district is the board of directors . . .
***may be appointed or elected- please reference enabling legislation.

POSGCD Directors
(appointed by Commissioner's Courts)

Milam County	Interest	Burleson County
Carroll Glaser	At Large	Nathan Ausley
Jay Tumlinson	Agriculture	Jay Wilder
Kerry Starnes	Municipal	Andy Hovarak
Jim Hodson	Industrial	Lee Alford, III
Dwayne Jekel	Rural Water	Robert Ware

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.

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, County Clerk's Office, one or more newspapers in counties of District
- 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
- 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.

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

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

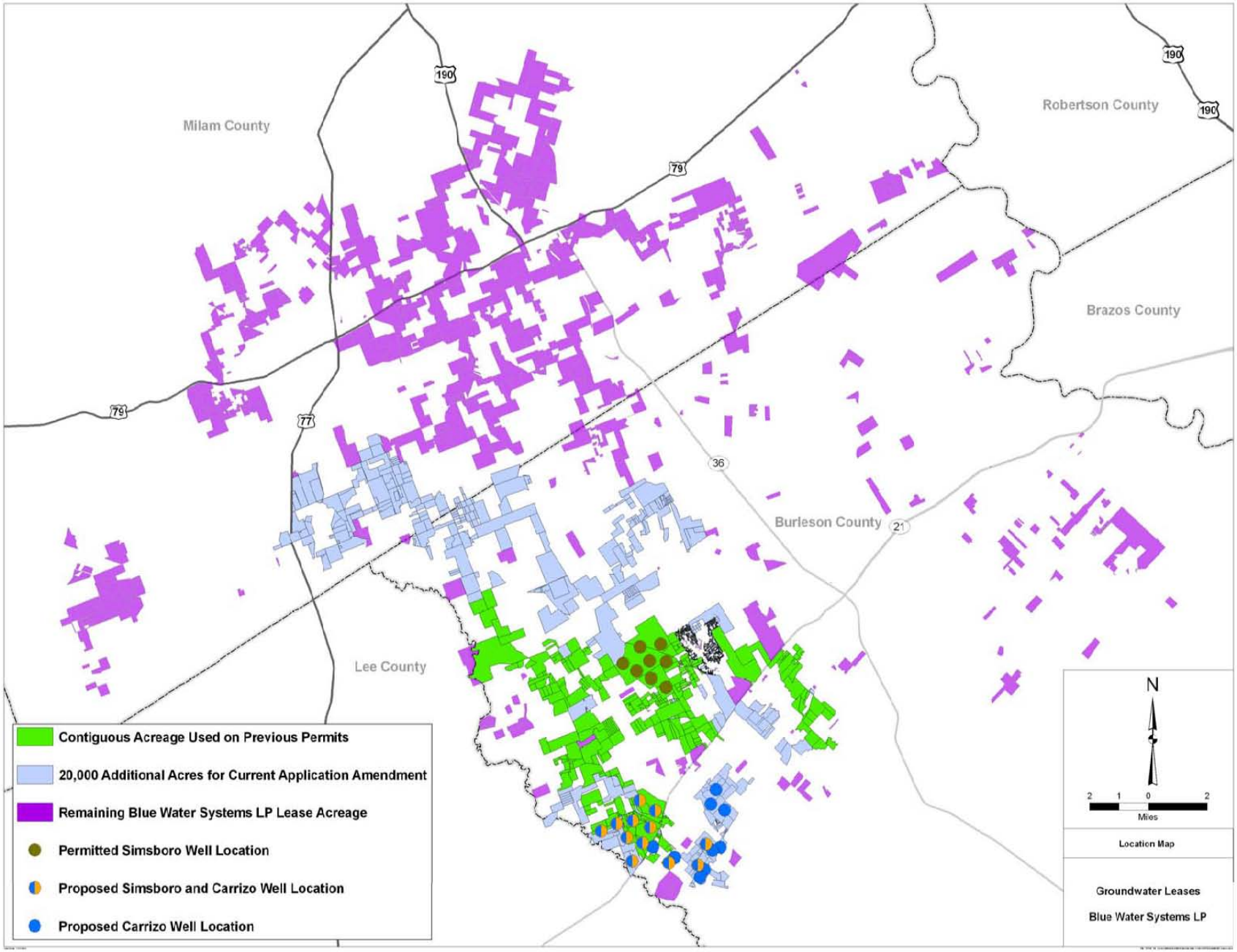
b. Future Growth

c. Reasonableness of Management Strategies

d. Insufficient Science

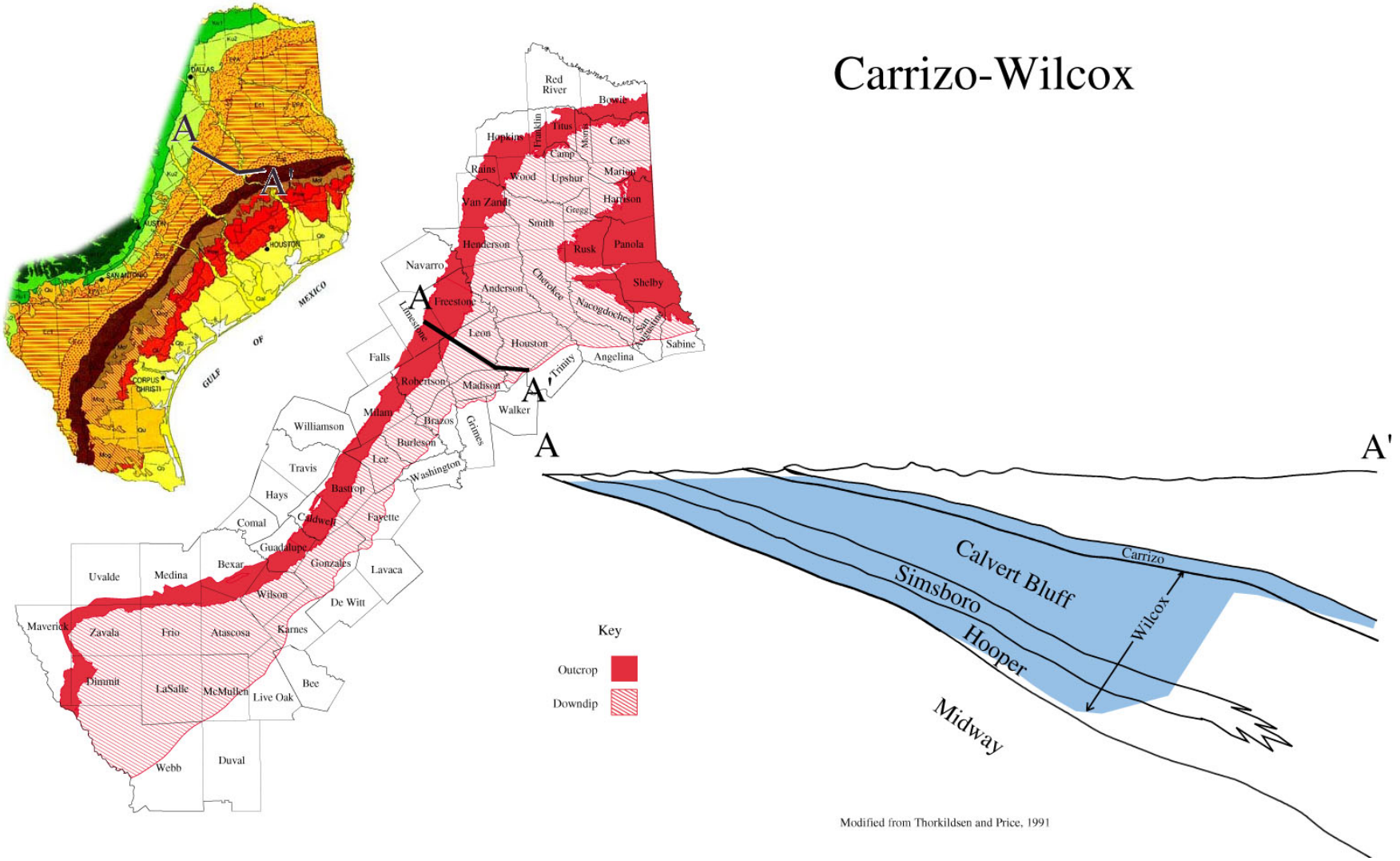
e. Unknown area future projects (in and out of District)

f. Property Rights

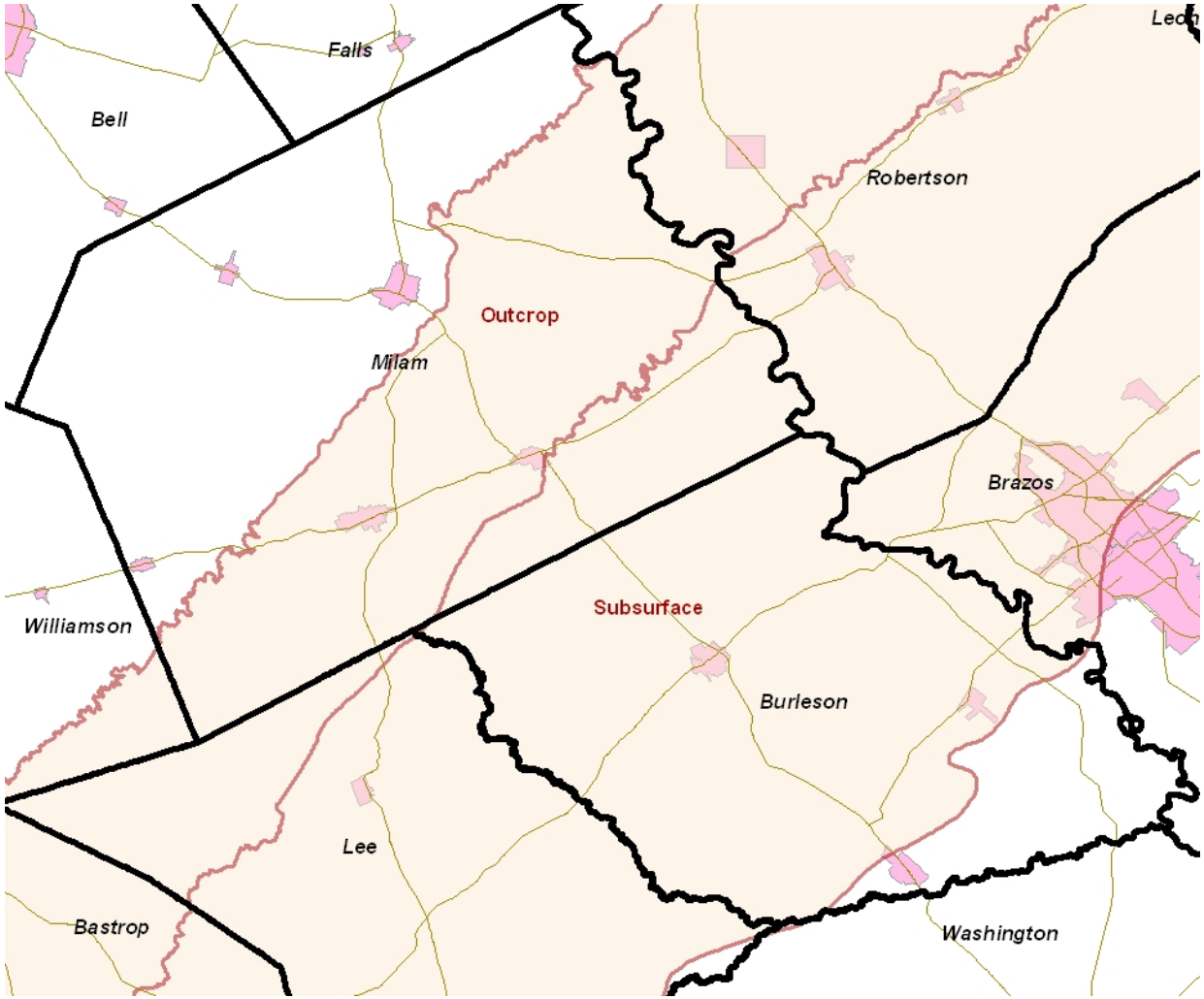

Milam County
Robertson County
Brazos County
Burleson County
Lee County
190
79
77
36
21
Contiguous Acreage Used on Previous Permits
20,000 Additional Acres for Current Application Amendment
Remaining Blue Water Systems LP Lease Acreage
Permitted Simsboro Well Location
Proposed Simsboro and Carrizo Well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

Groundwater resources and Management Strategies within POSGCD

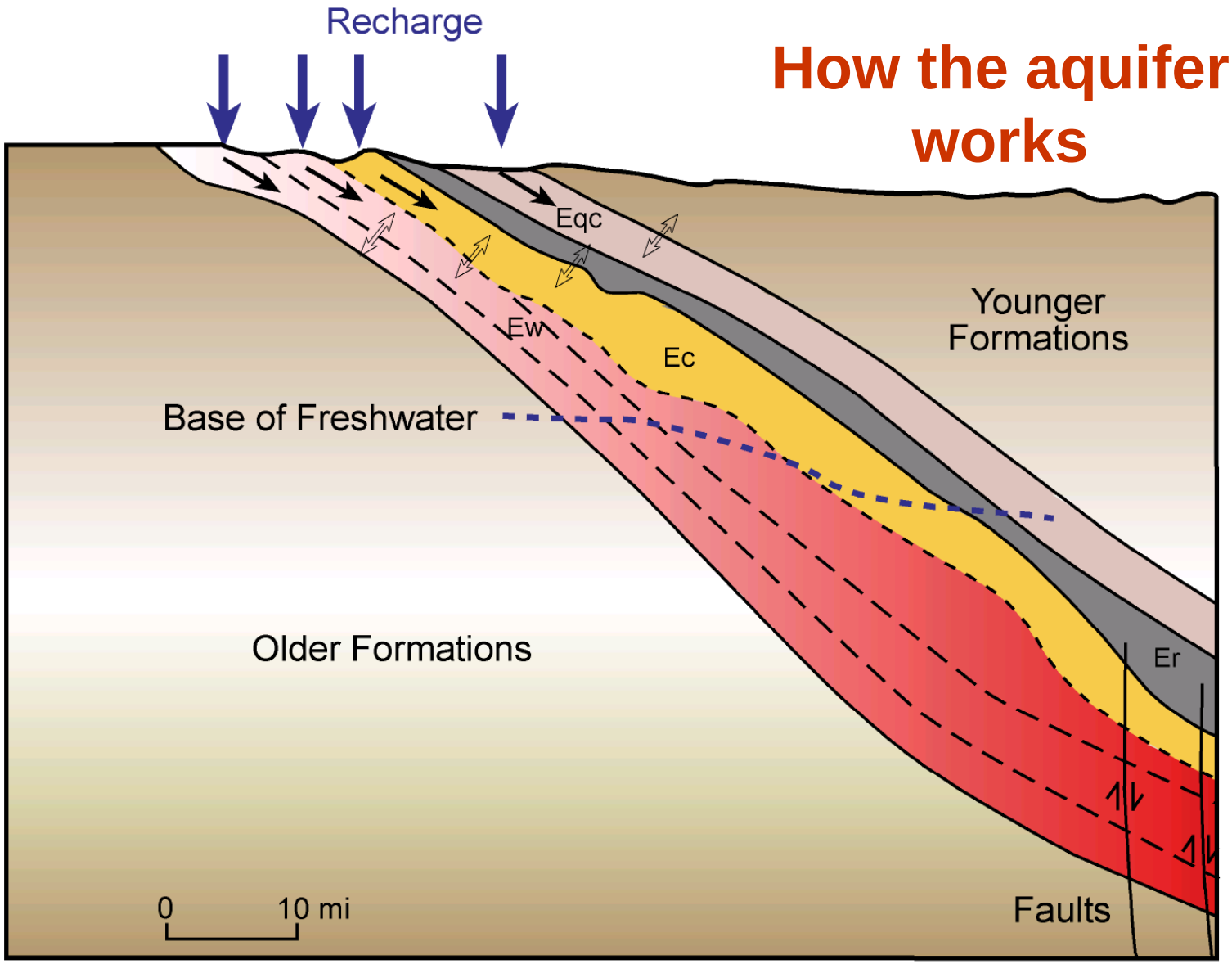
Carrizo-Wilcox Aquifer



Outcrop and Subsurface Extent of Carrizo-Wilcox Aquifer



How the aquifer works

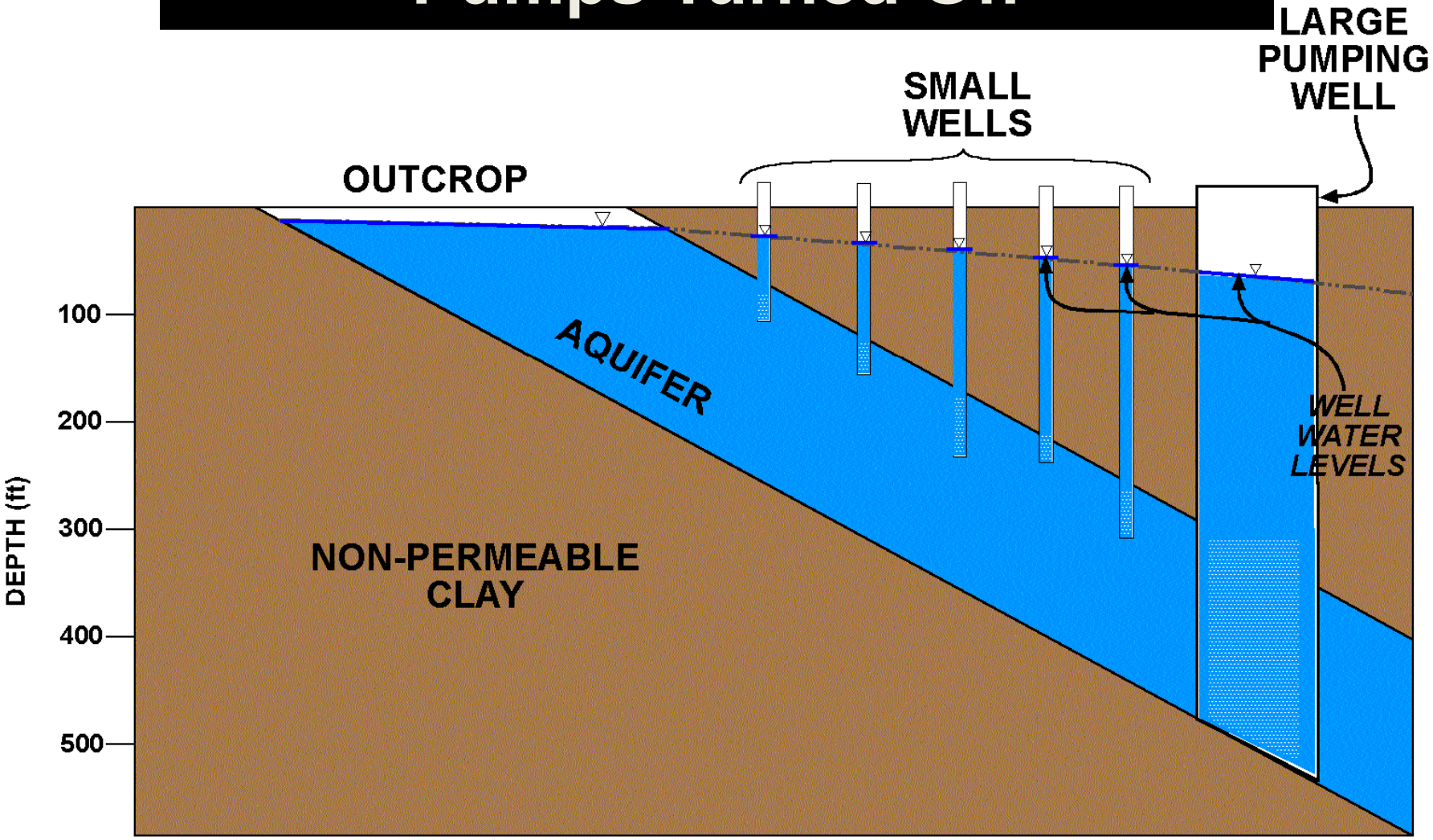


Ew = Wilcox; Ec = Carrizo; Er = Reklaw; Eqc = Queen City

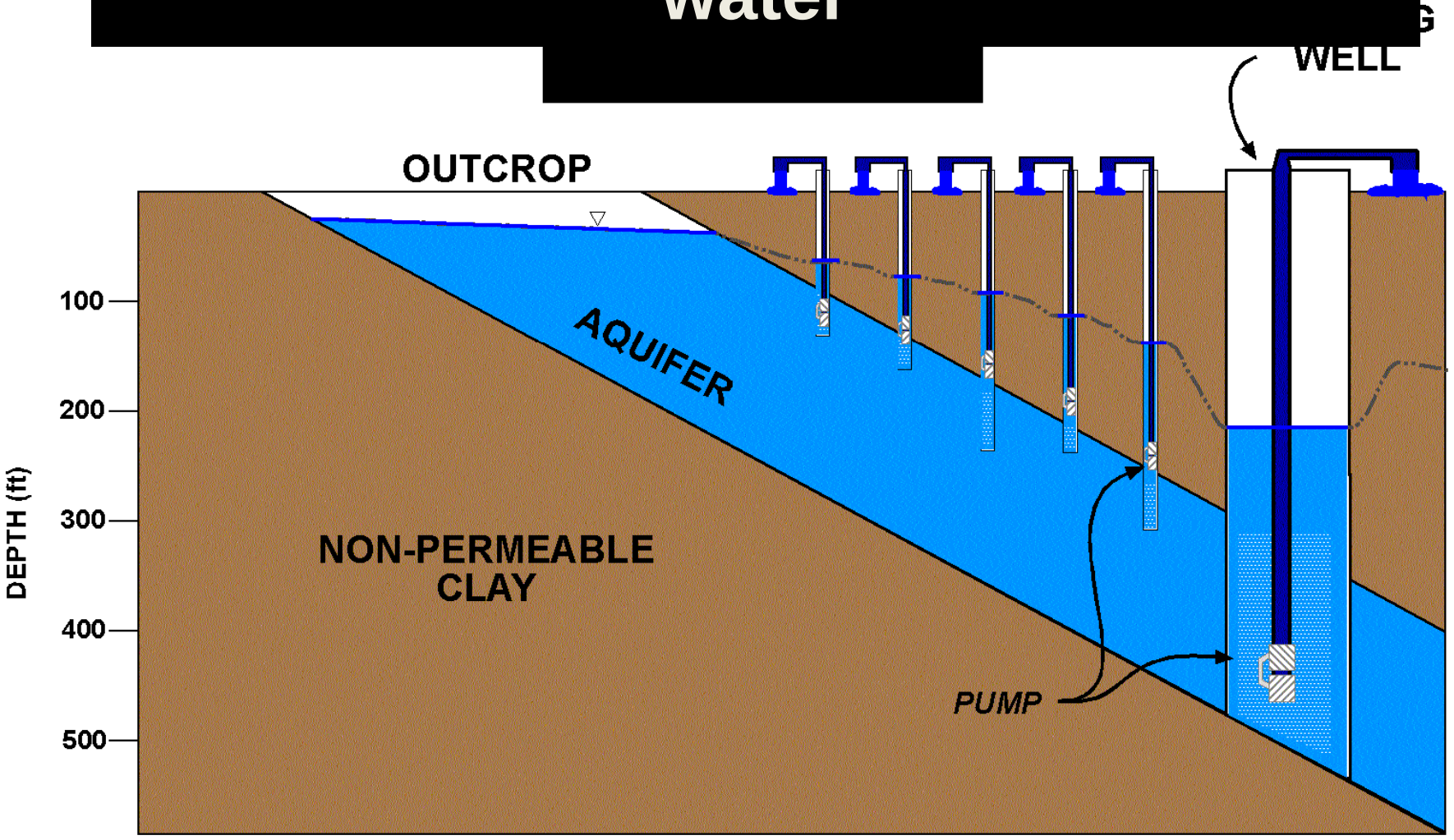
Carrizo-Wilcox Formations (layers)

- **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

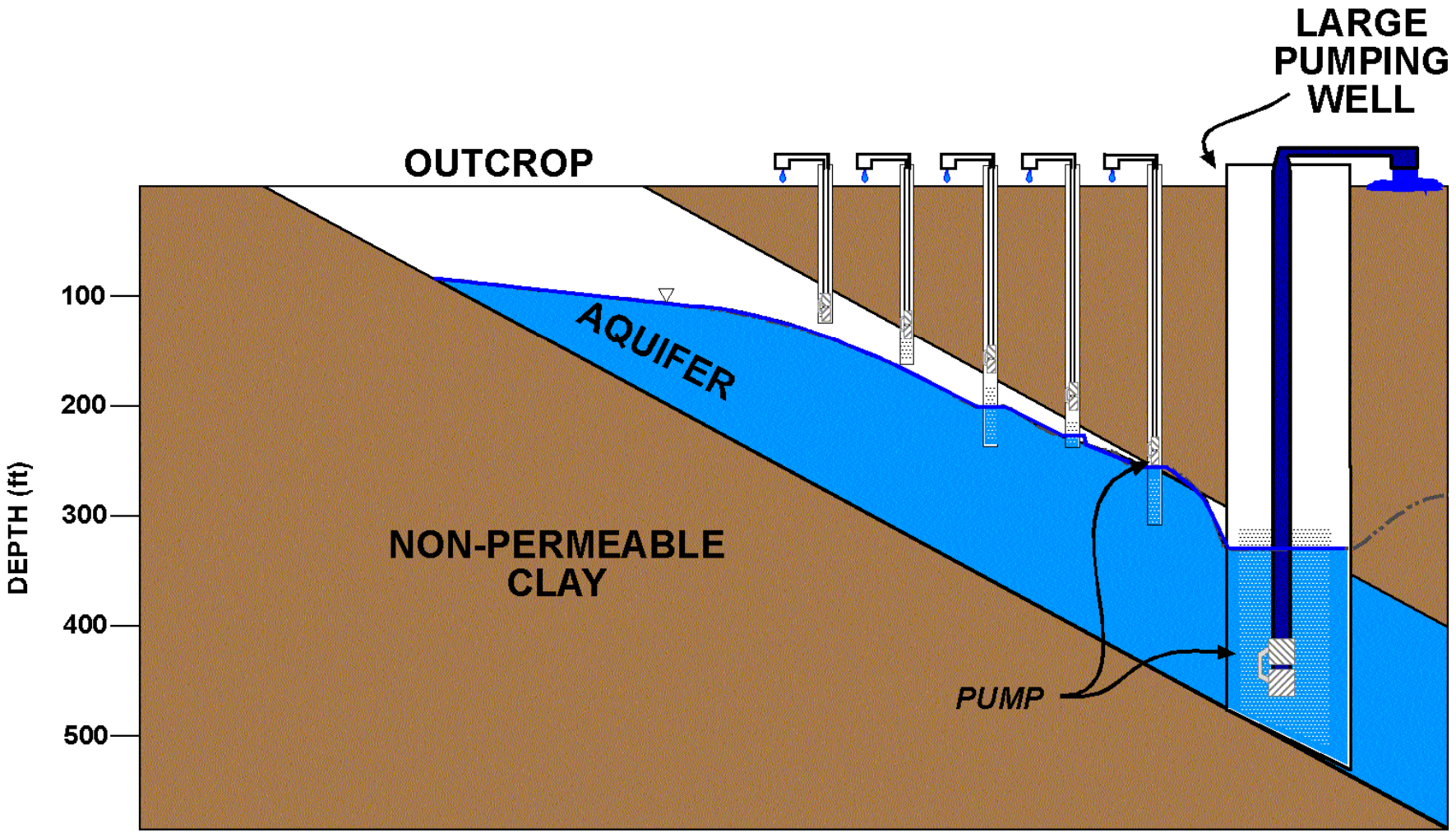
Cross Section of Aquifer
Pumps Turned Off



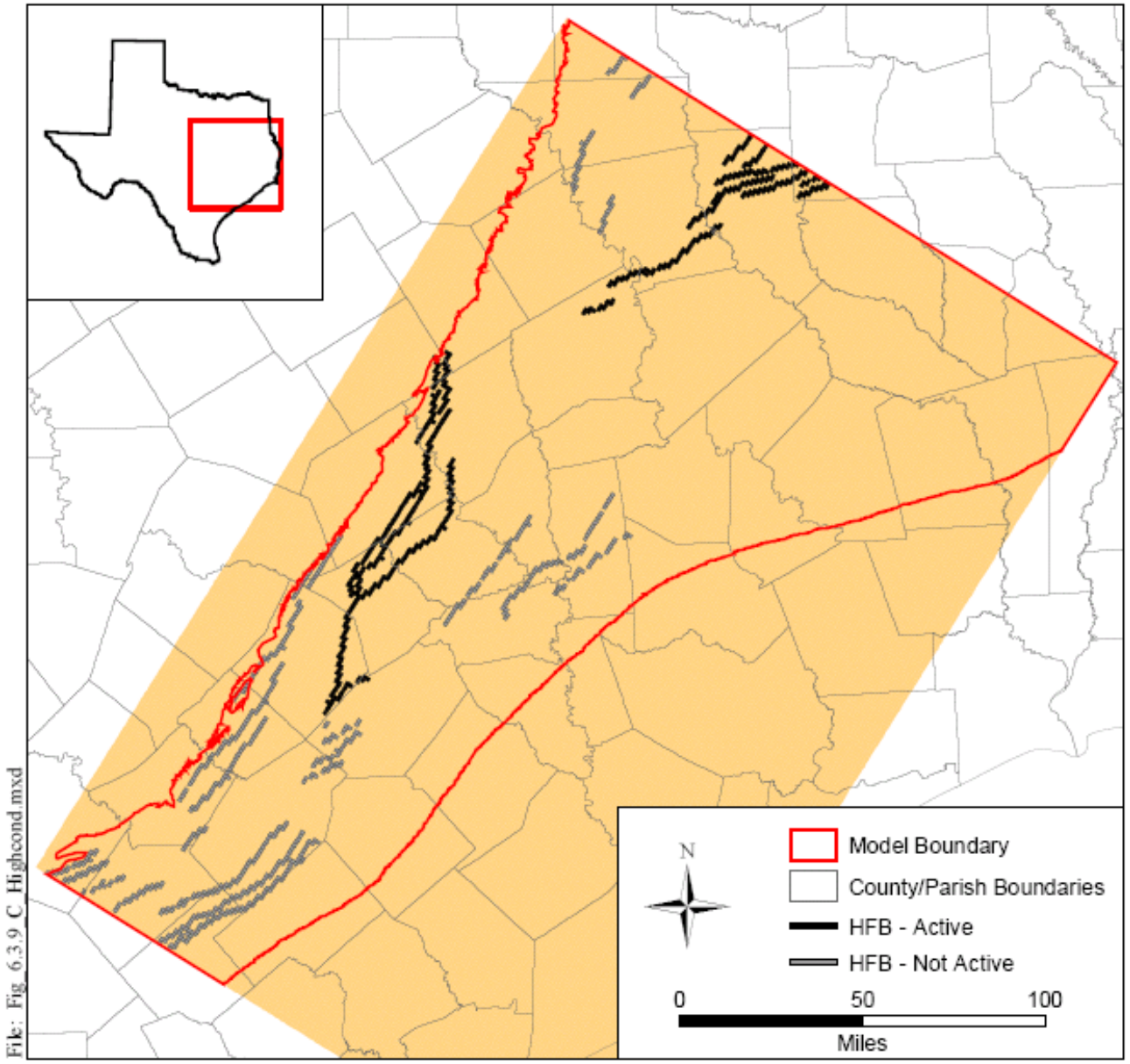
Normal Pumping – All wells have water



Continued Overpumping – Aquifer may take decades to recover

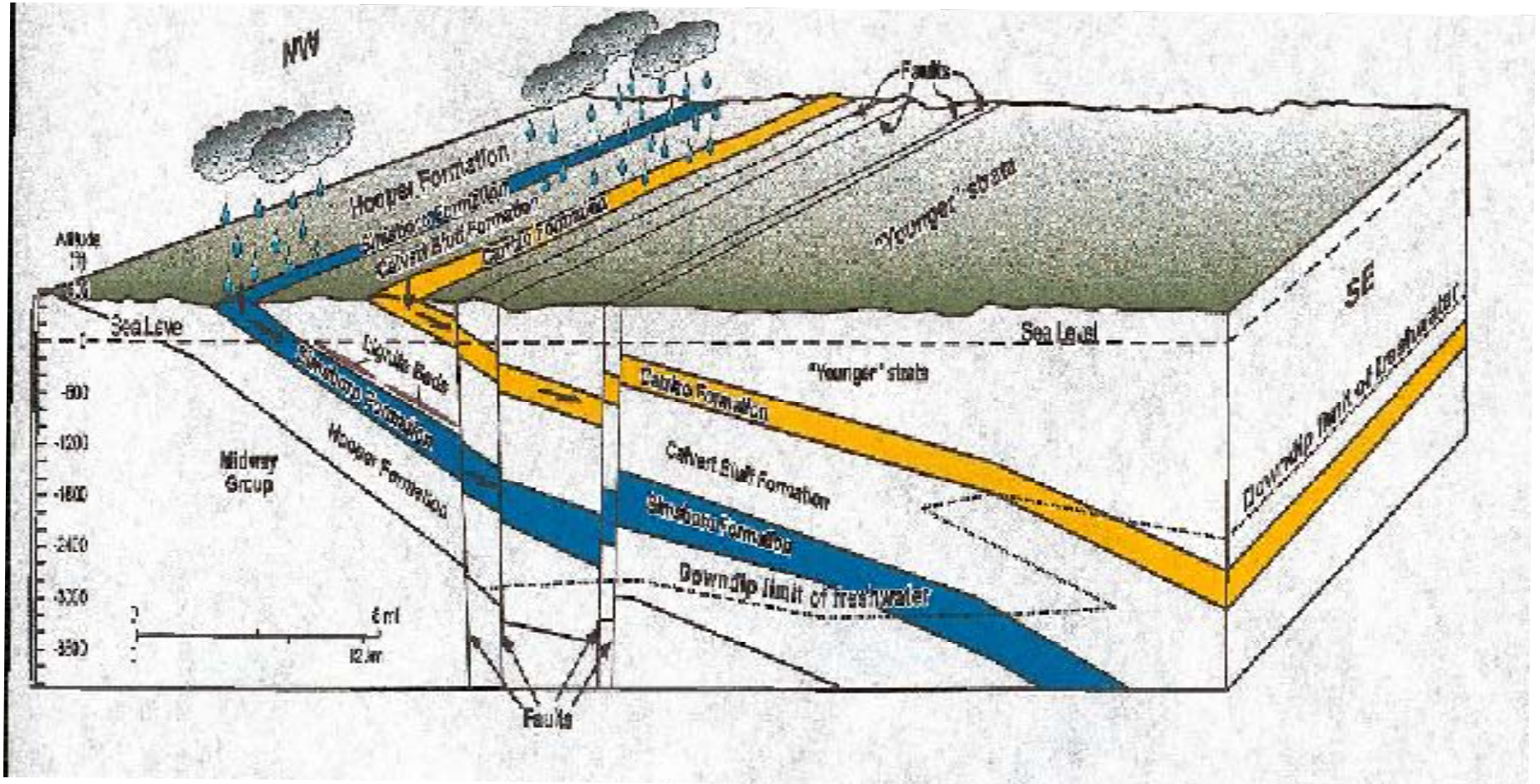


Representation of Faults in Central QSCW GAMs

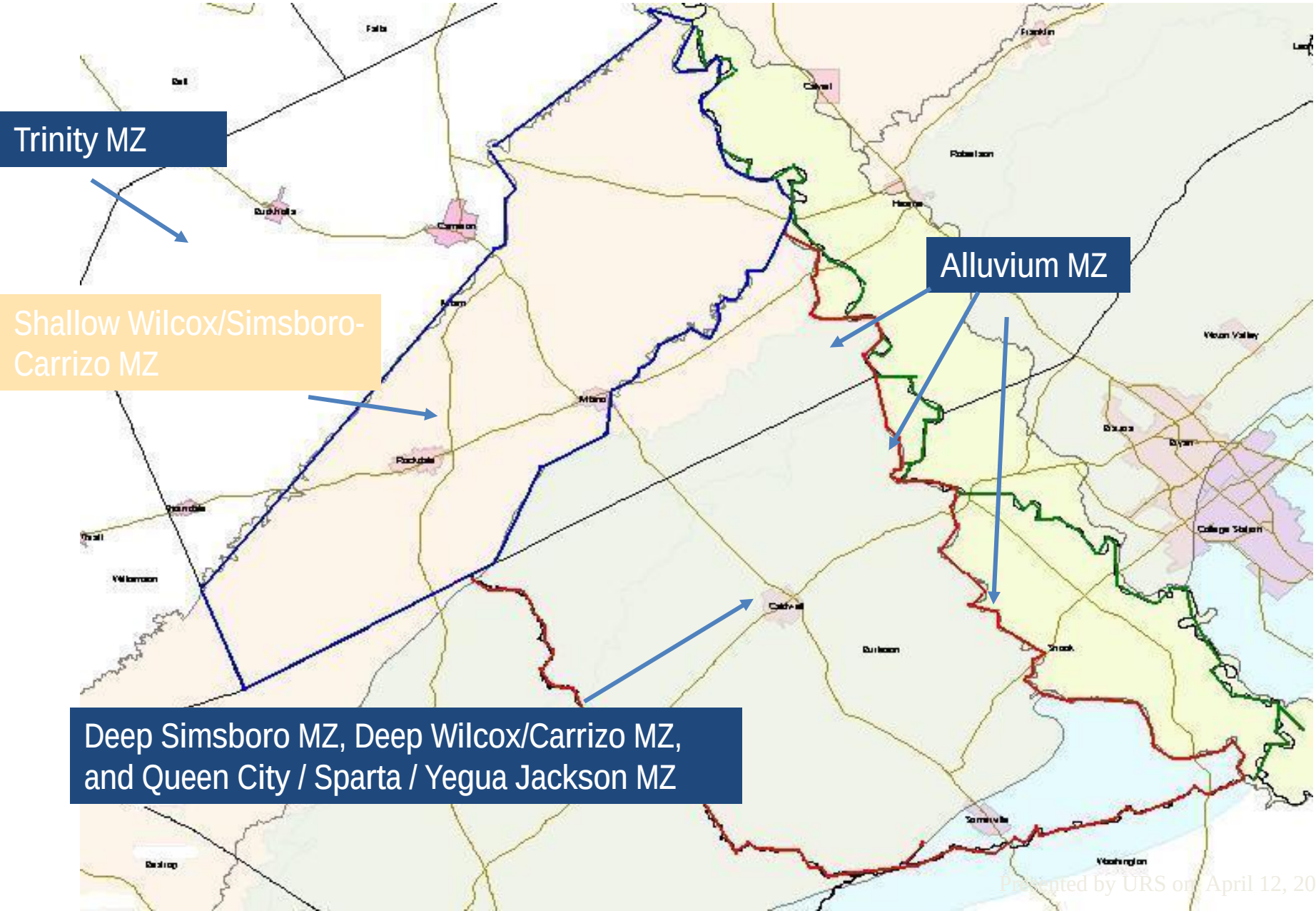


Draft – for discussion purposes only

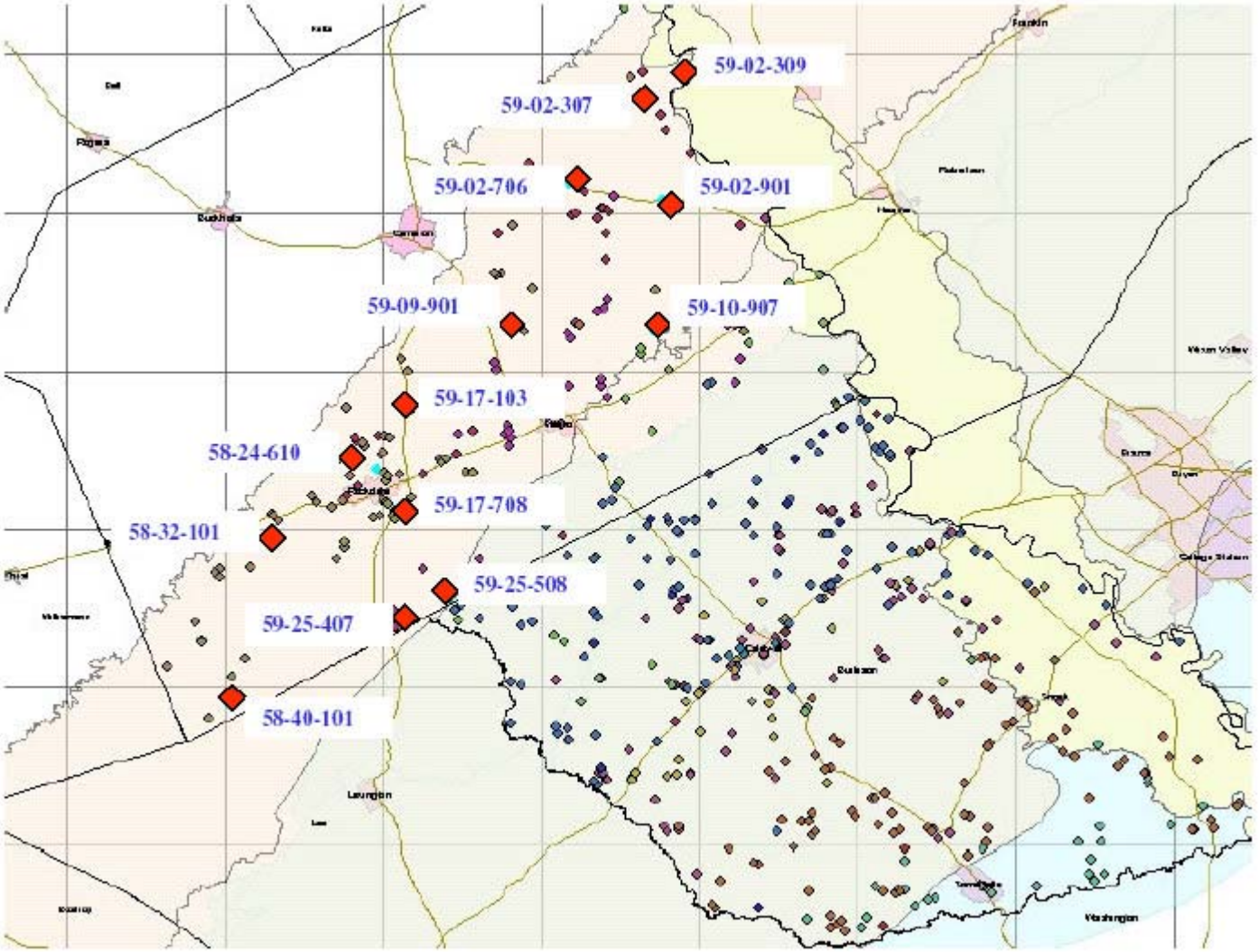
Geologic Cross Section
Carrizo-Wilcox Aquifer
Fault Zones



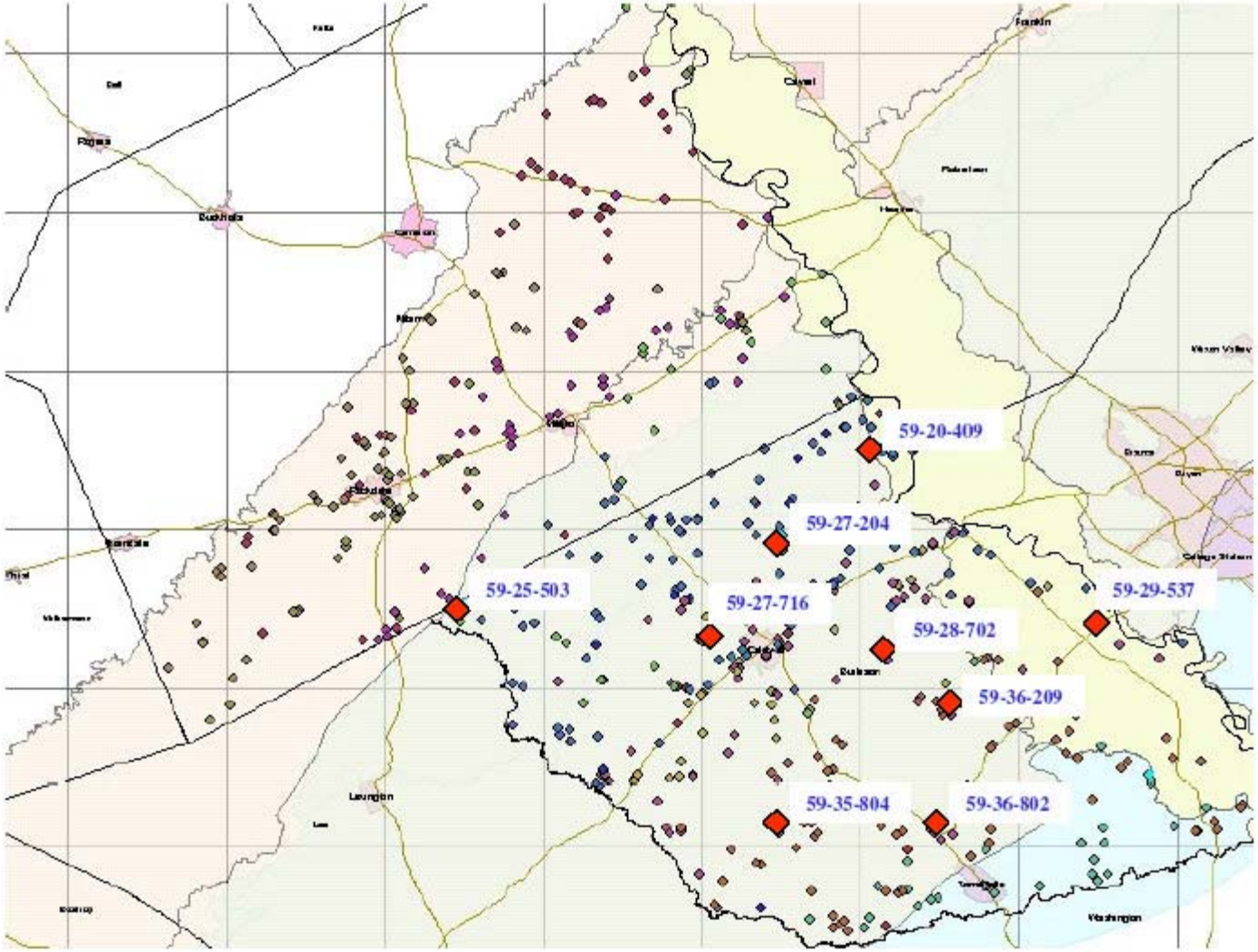
Management Zone Boundaries



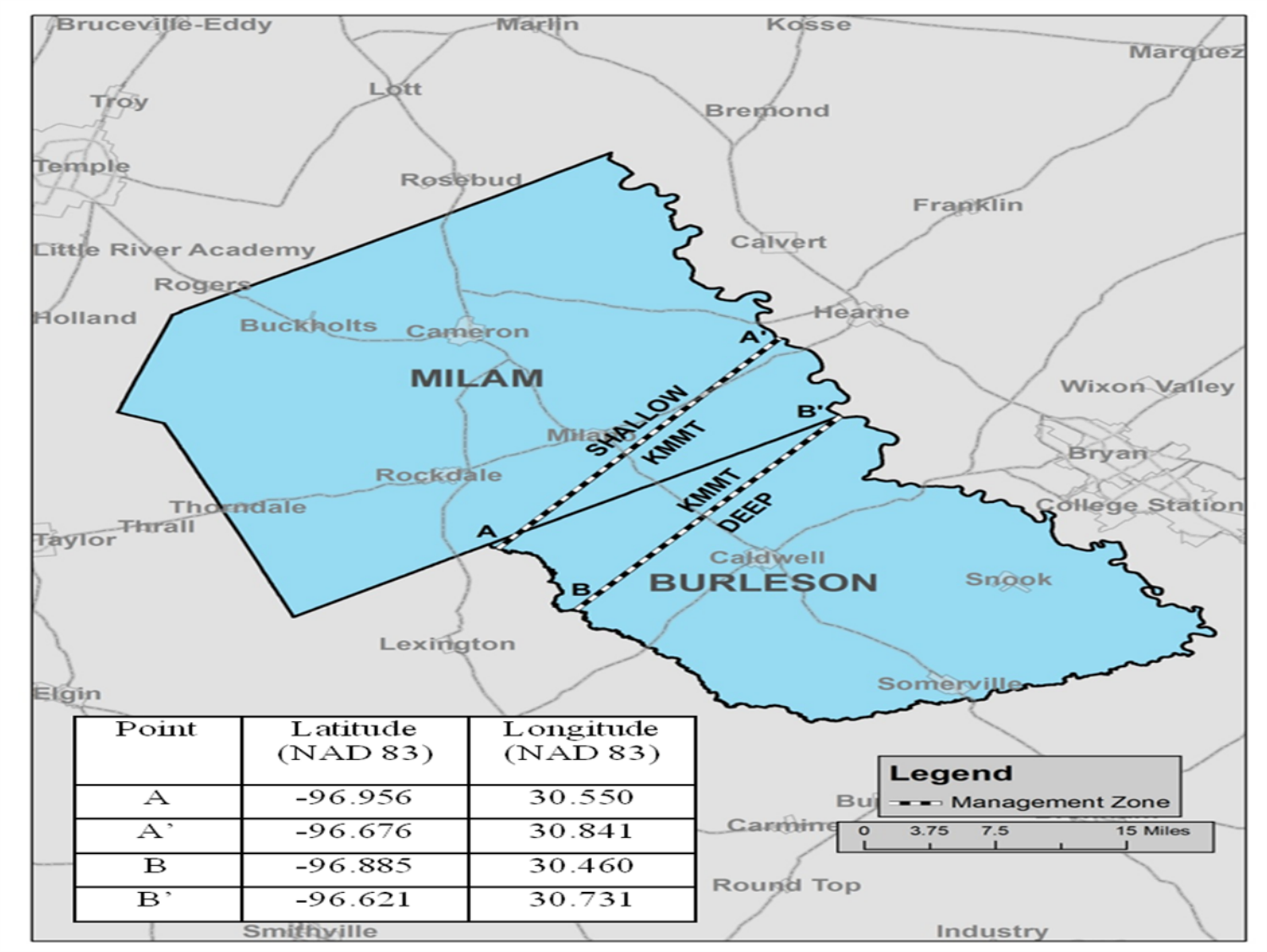
Shallow Carrizo-Wilcox Monitoring Wells



Deep Carrizo-Wilcox Monitoring Wells



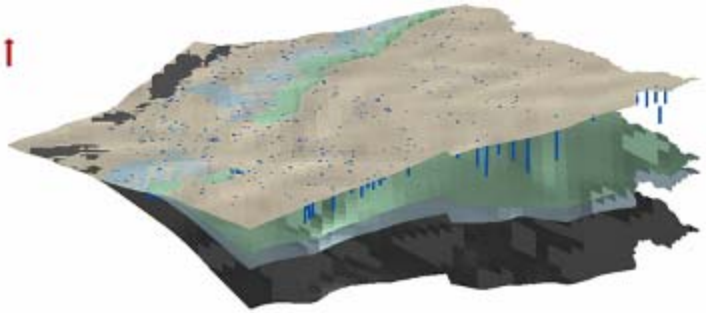
POSGCD- New Management Zone Added: Karnes-Milano-Mexia-Talco (KMMT) Carrizo-Wilcox MZ for flexibility and safety

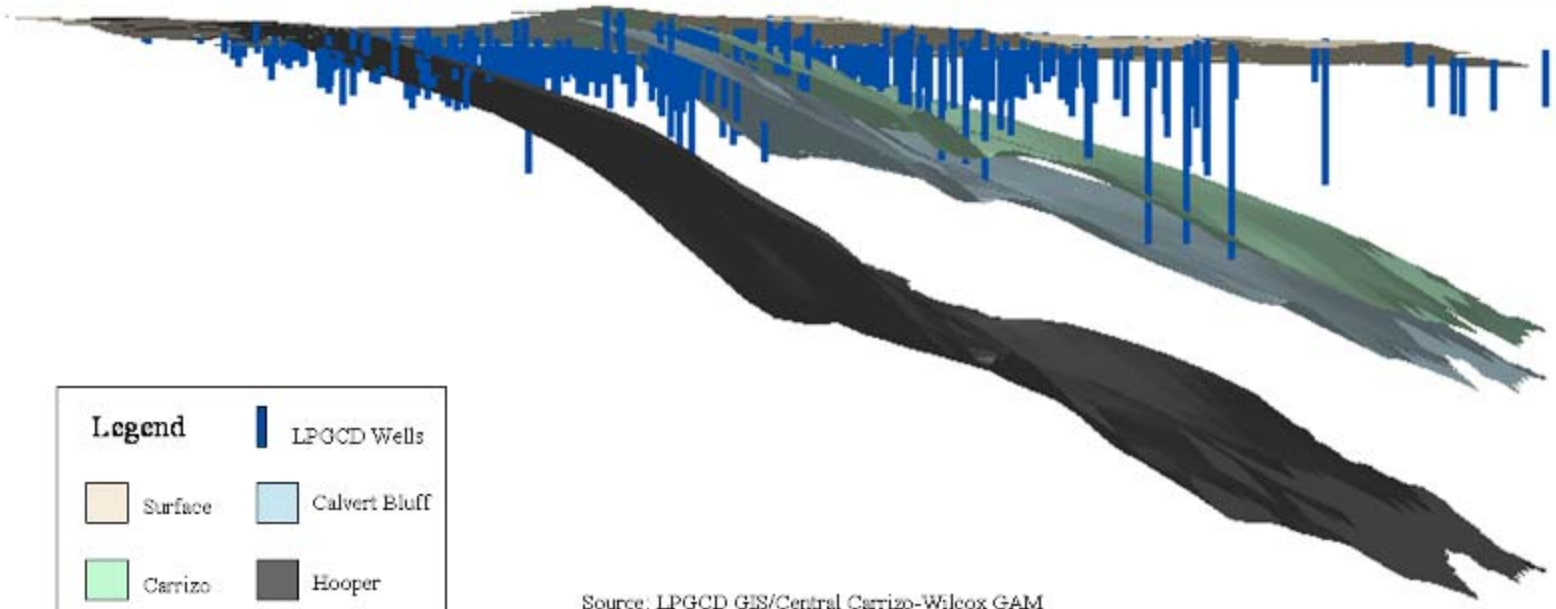


Point	Latitude (NAD 83)	Longitude (NAD 83)
A	-96.956	30.550
A'	-96.676	30.841
B	-96.885	30.460
B'	-96.621	30.731

Measuring Water Depth

LPGCD Aquifers





Source: LPGCD GIS/Central Carrizo-Wilcox GAM

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

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 Managed Available Groundwater Values; and
- The Management Goals, Objectives, and Performance Standards

Summary of POSGCD Management Strategies

Management Zone	Estimated Groundwater Availability (ac-ft/yr)	Groundwater Drawdown Trigger Level
Trinity	300	N/A
Brazos/LR Alluviums	9400	N/A
Shallow Carrizo-Wilcox	33,750	50 feet
Deep Simsboro	60,000	300 feet
Deep Carrizo-Wilcox	30,750	190 feet
Queen City-Sparta-Yegua	14,500	N/A

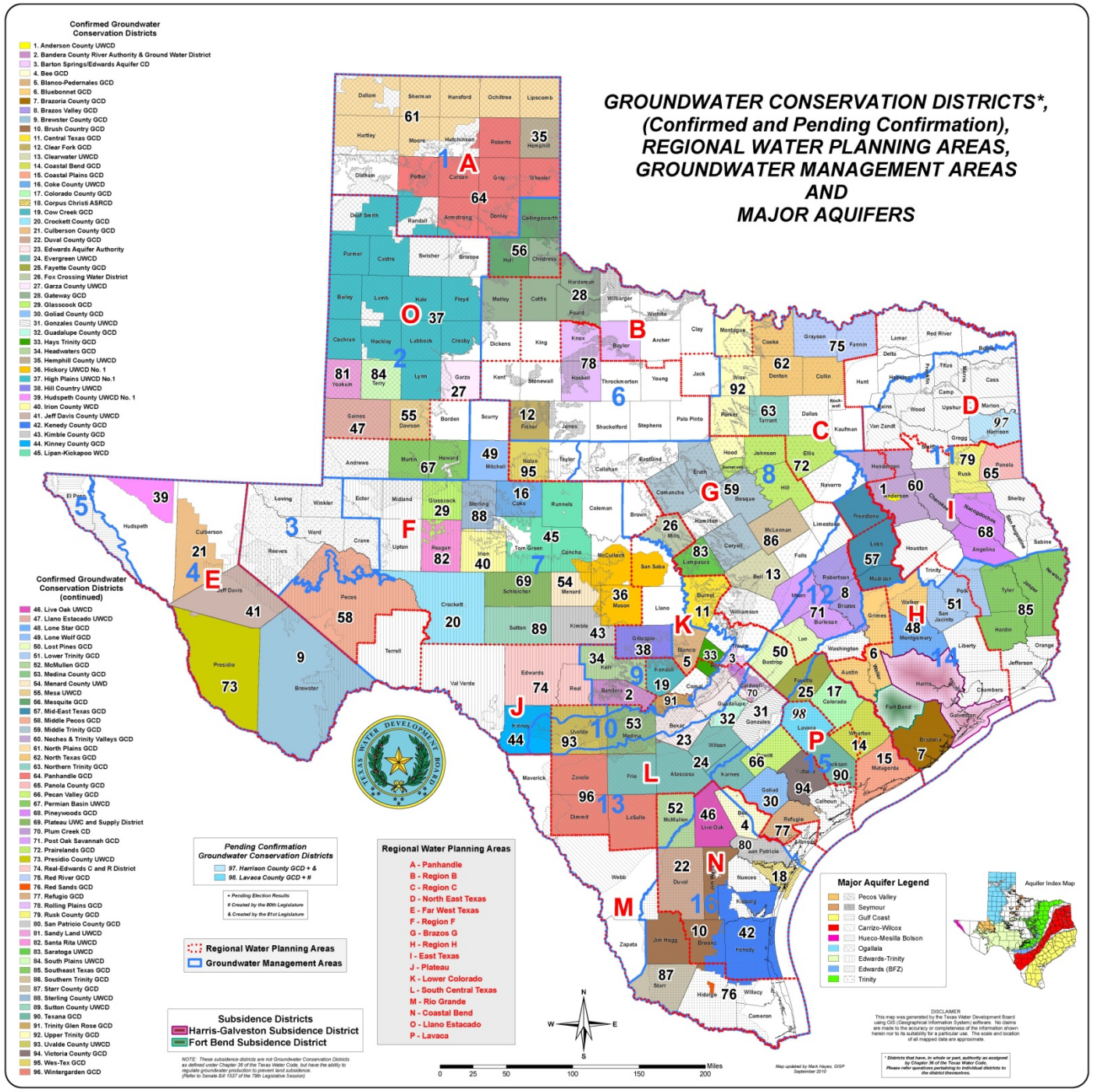
History of Groundwater Management in Texas

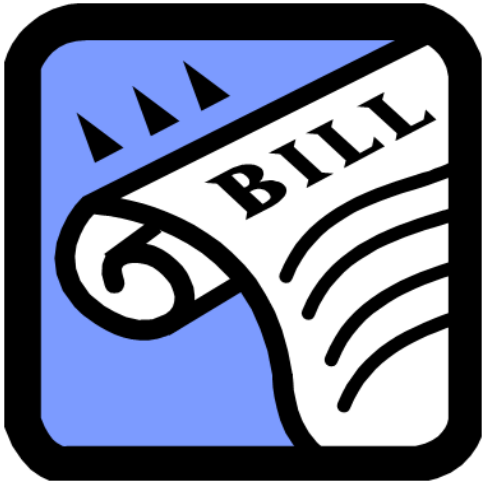
- 1904 – Rule of Capture
- 1949 – Groundwater Conservation Districts
  - Can alter, modify or discard Rule of Capture
  - Preferred method of groundwater management
- 2001 (SB 2) – Groundwater Management Areas
  - TWDB designates 16 GMAs
  - GCDs within GMA share GWMPs
  - Joint Planning within a GMA 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

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)
-Managed Available Groundwater (MAGs)
-GCD Groundwater Management Plan (GWMP)
****GCD Management Plans and Rules within a GMA

The Joint Planning Process of Groundwater Management Areas

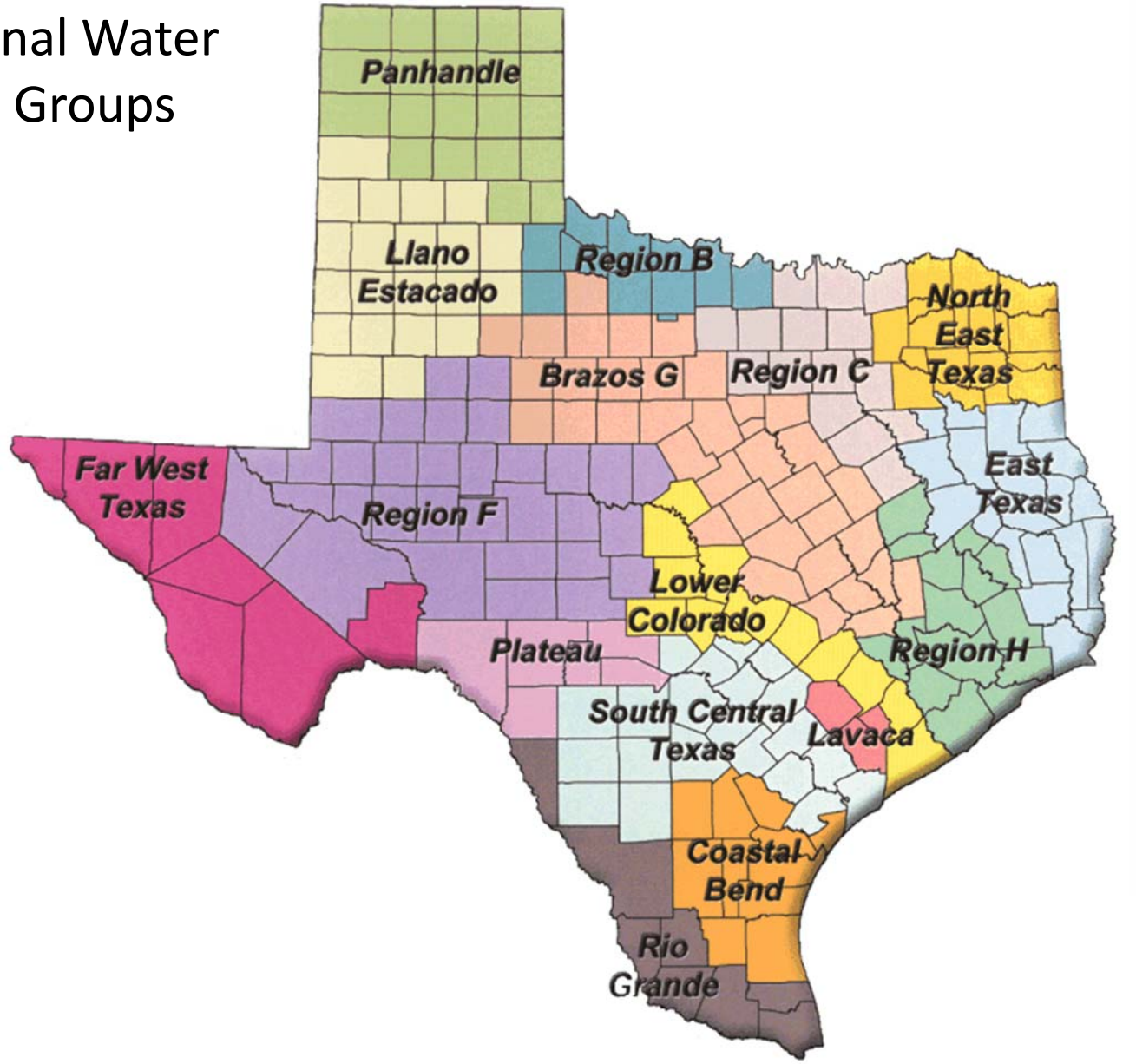




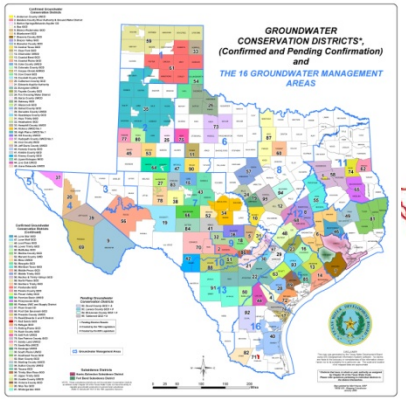
Texas State Water Planning

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

16 Regional Water Planning Groups

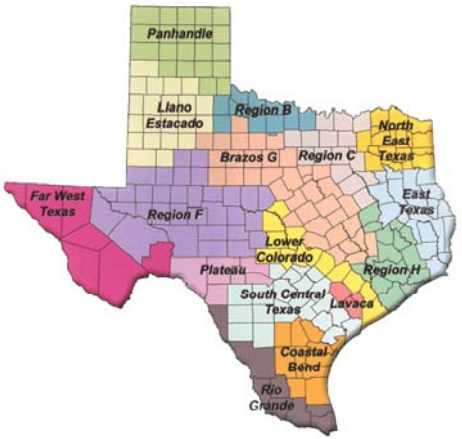


GCDs in GMAs
decide Desired Future Conditions
and deliver to TWDB

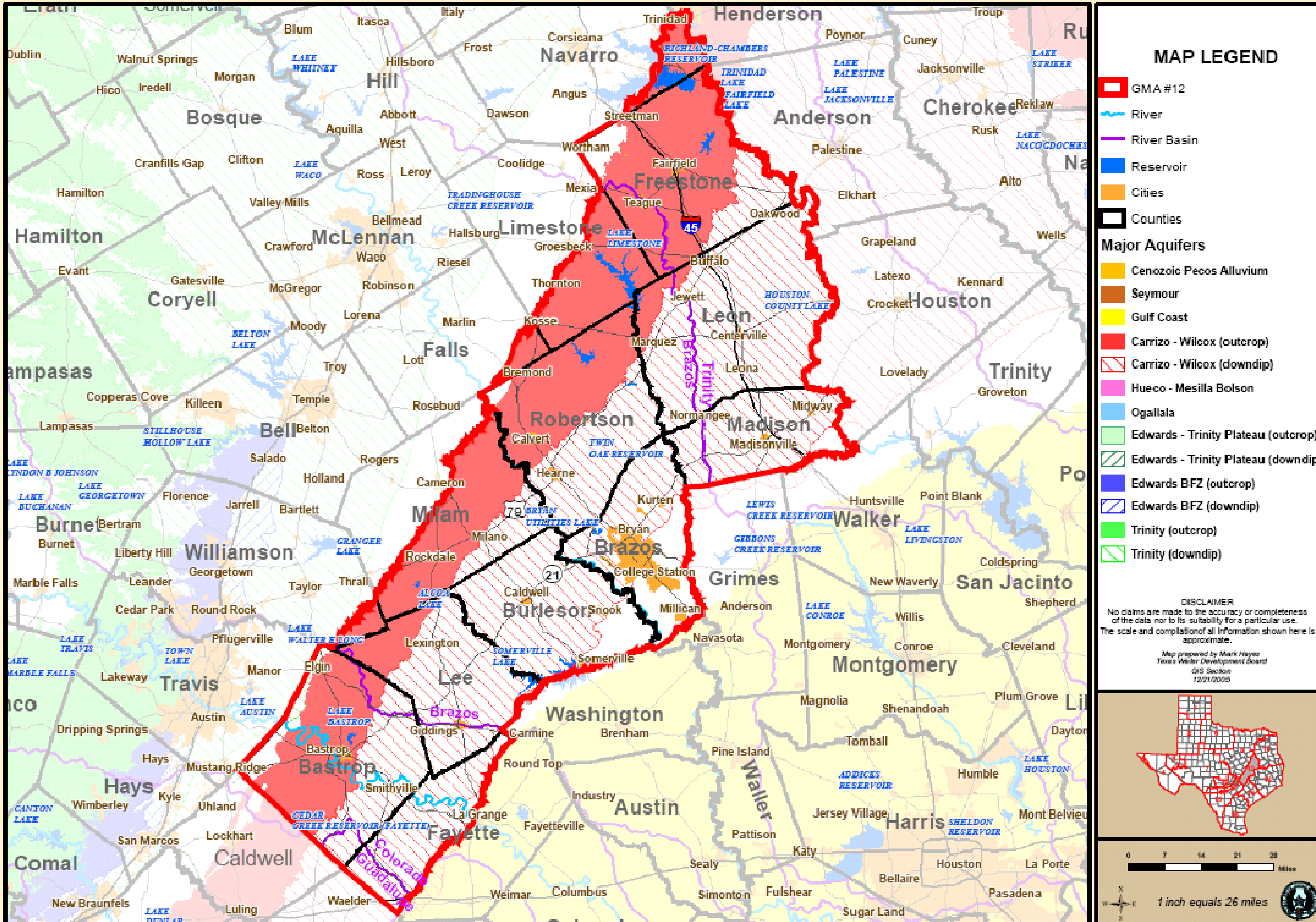


TWDB provides estimates
of Managed Available Groundwater
to districts and regions

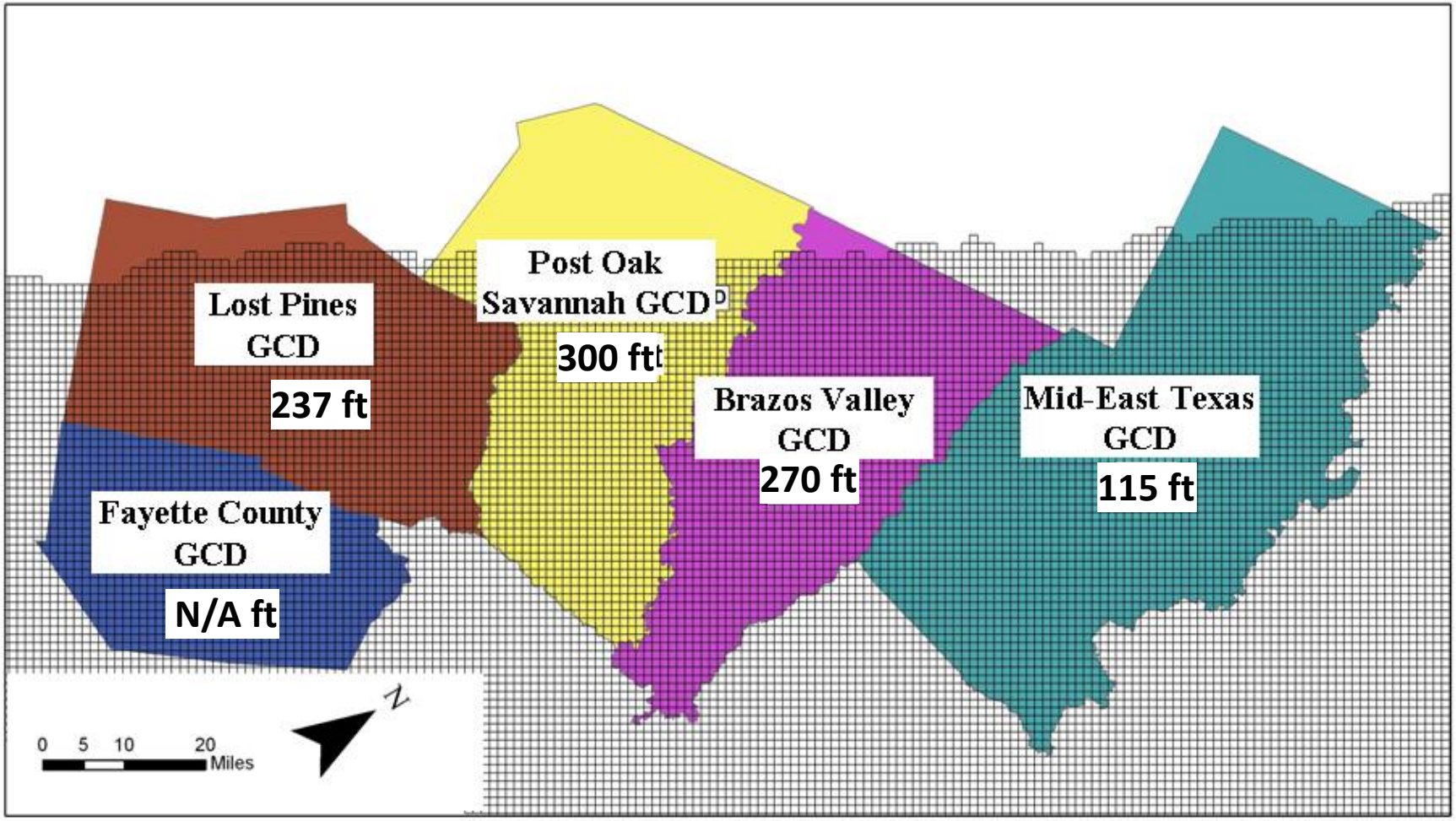
GCDs and RWPGs include
Managed Available Groundwater
in plans



Groundwater Management Area #12



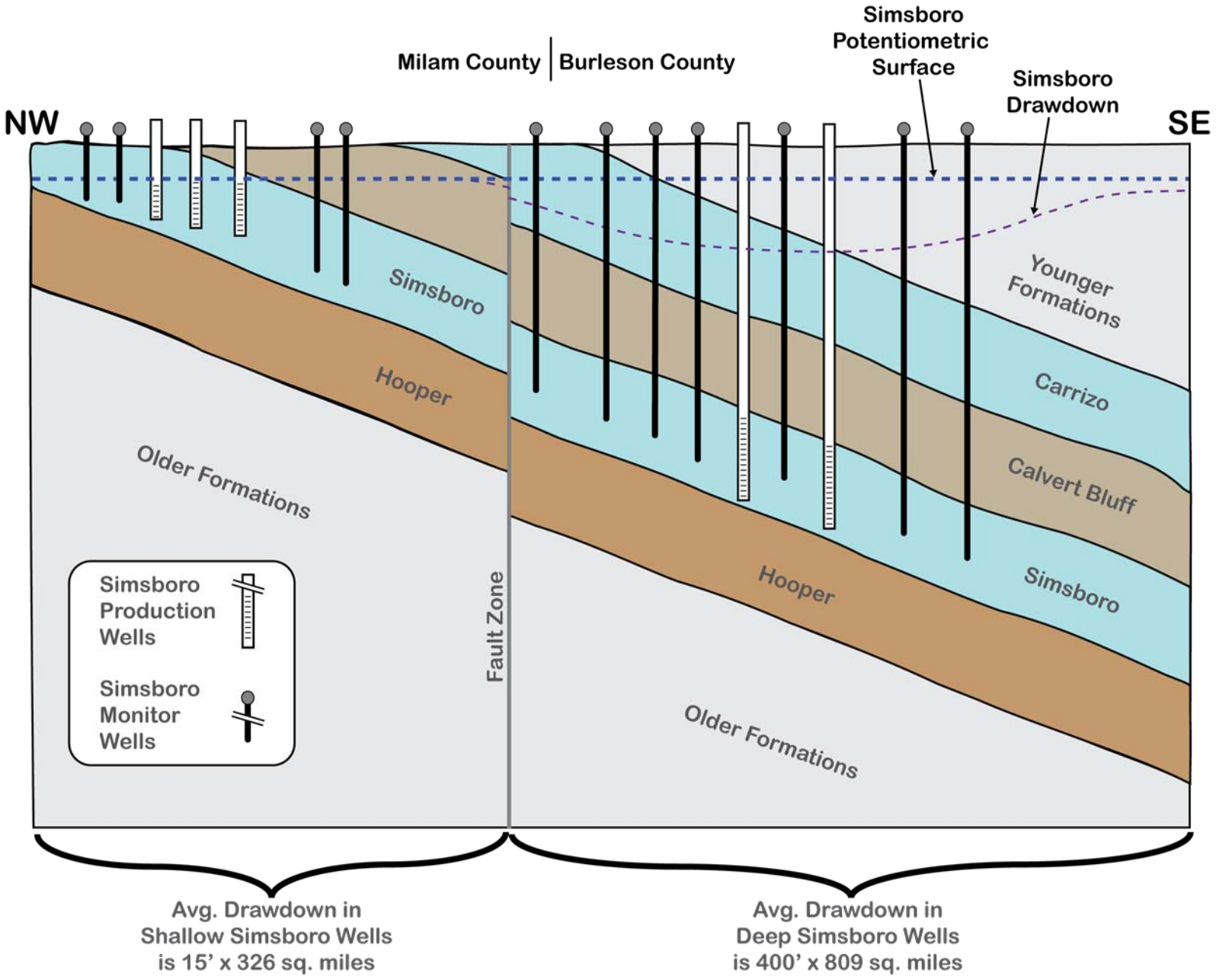
Adopted DFCs: Expressed in Average across District Simsboro (2010 to 2060)



Example DFC Calculations: Simsboro

Conditions			Desired Future Conditions - Drawdown
			Aquifer
DD in Unconfined Area	% Decline in artesian pressure	Max DD in Confined Area	Simsboro
10	0.25	450	312
15	0.25	450	313
20	0.25	450	313
25	0.25	450	314

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

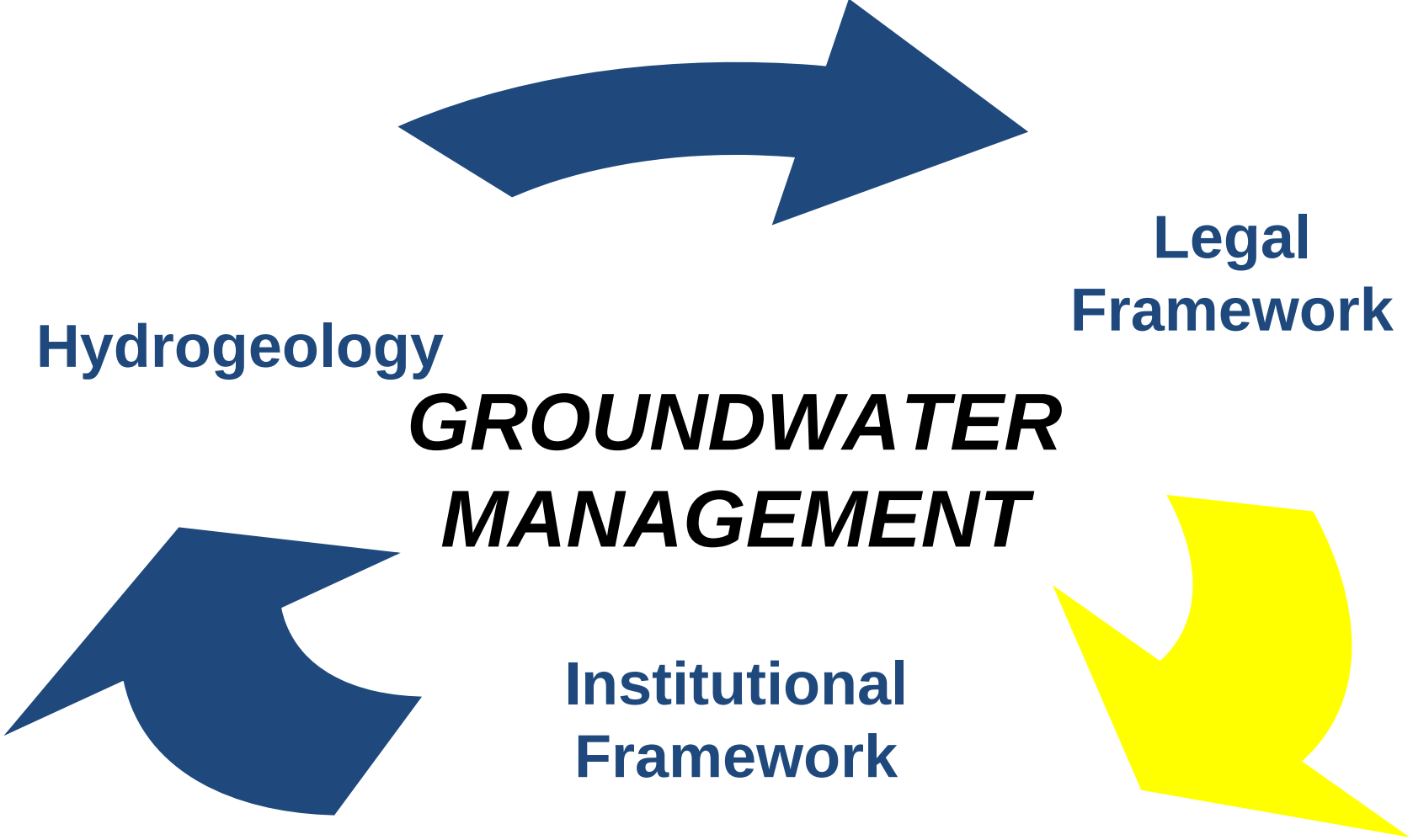
Management utilizing DFCs

- **<u>Adjusting based on Threshold Levels</u>**
  - Examples of Thresholds
    - Percentage of DFC drawdown
      - DFC is avg. 300 feet
        - 1st Threshold is at 70% of DFC or 210 feet- notice and evaluations
        - 2nd Threshold is at 80% of DFC or 240 feet- begin curtailment of permits
        - 3rd Threshold is at 90% of DFC or 270 feet- continue curtailment of permits, considering other triggers

Predicted Drawdown Over Time

Zone/Aquifer		Sparta	Queen City	Carrizo	Calvert Bluff	Simsboro	Hooper
Post Oak GCD	2020	19	28	89	96	196	108
	2040	24	37	109	128	254	147
	2060	27	42	122	154	306	184
Lost Pines GCD	2020	4	10	33	57	151	74
	2040	6	15	49	79	191	105
	2060	6	18	63	102	238	135
Brazos Valley GCD	2020	7	8	35	66	161	104
	2040	11	12	51	94	222	144
	2060	12	13	61	117	273	178
Mid-East Texas GCD	2020	-1	-2	34	40	68	56
	2040	-2	-3	46	57	93	78
	2060	-3	-5	55	70	115	97
Fayette County	2020	30	27	26	73	139	99
	2040	48	46	47	105	182	138
	2060	60	60	63	133	226	174

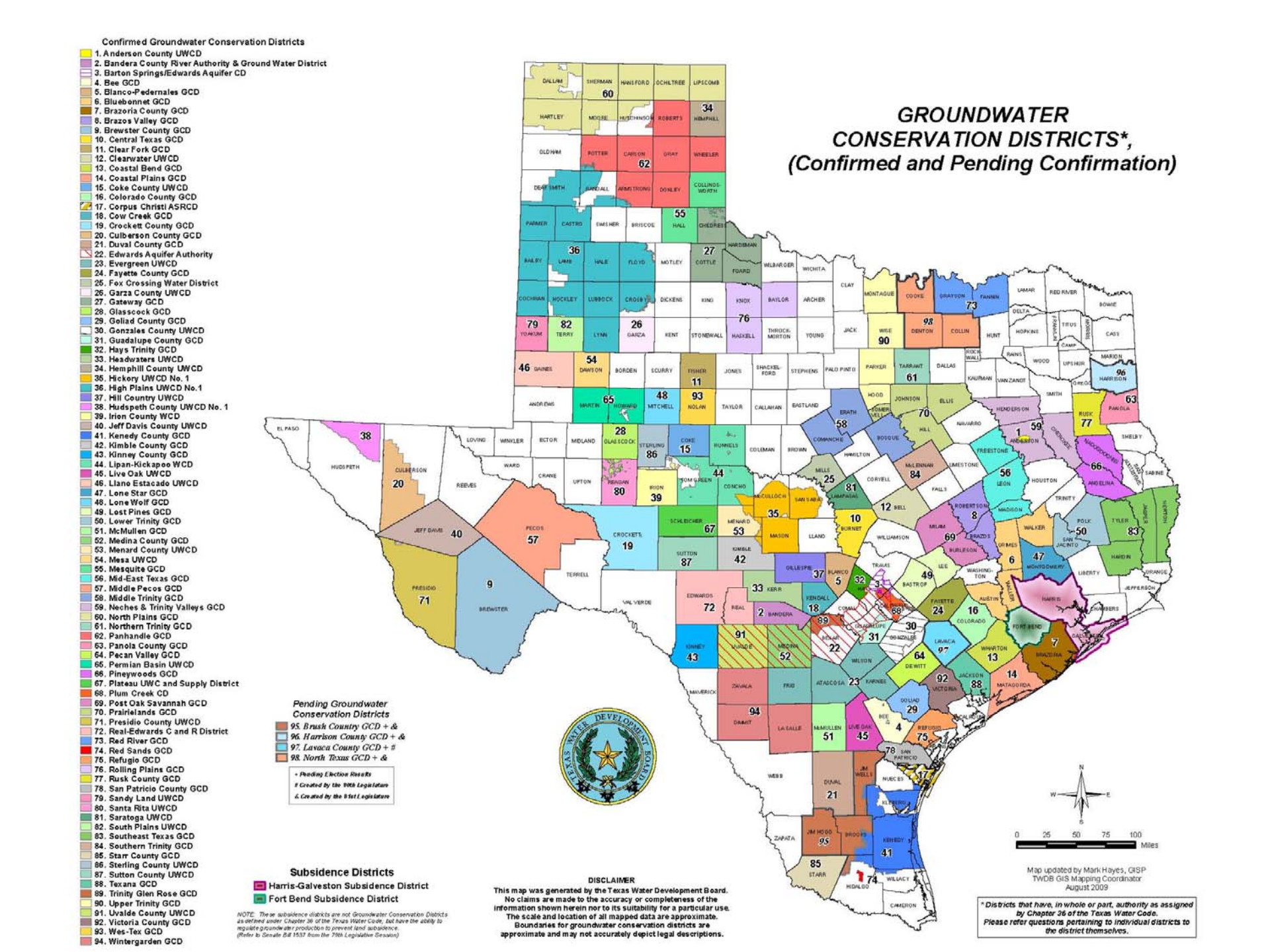
Note: Work in progress, all results are preliminary



Groundwater Availability = DFC + MAG

(Policy) + (Science)

GROUNDWATER CONSERVATION DISTRICTS*, (Confirmed and Pending Confirmation)



Questions?

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