

Texas NGWMN Update

December 6, 2016

- TWDB monitoring network & goals
- How TWDB uses our groundwater data
- Trans-boundary issues?
- Specific application in management
- History of our NGWMN participation
- TWDB site selection & classification
- Differences in data collection & protocols
- Current NGWMN projects to enhance the network
- Other data available



Texas Water Development Board

Mission:

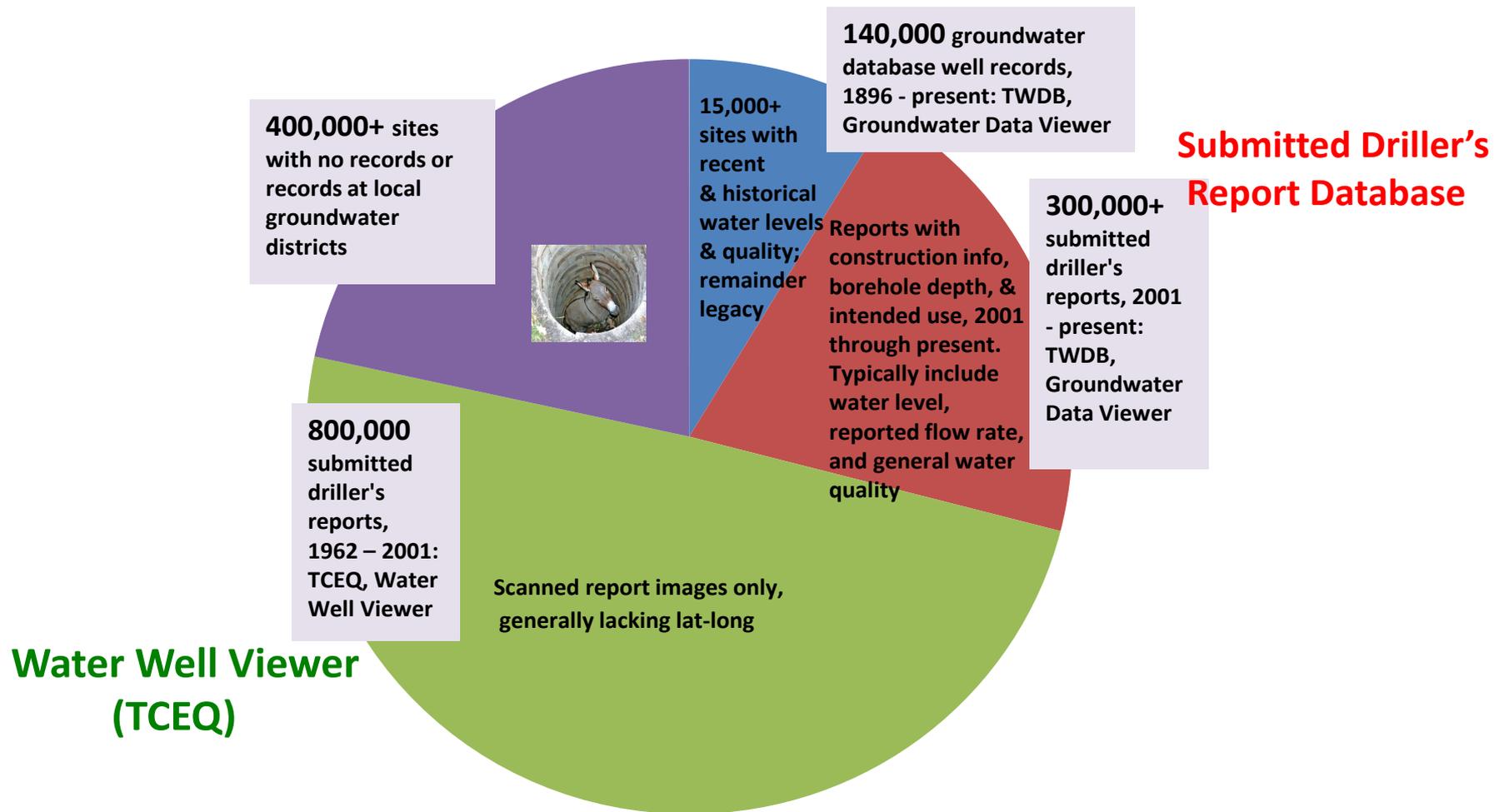
“Sustainable and affordable water for Texas”

- Grants and loans
- Water planning
- Data collection

The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board’s statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

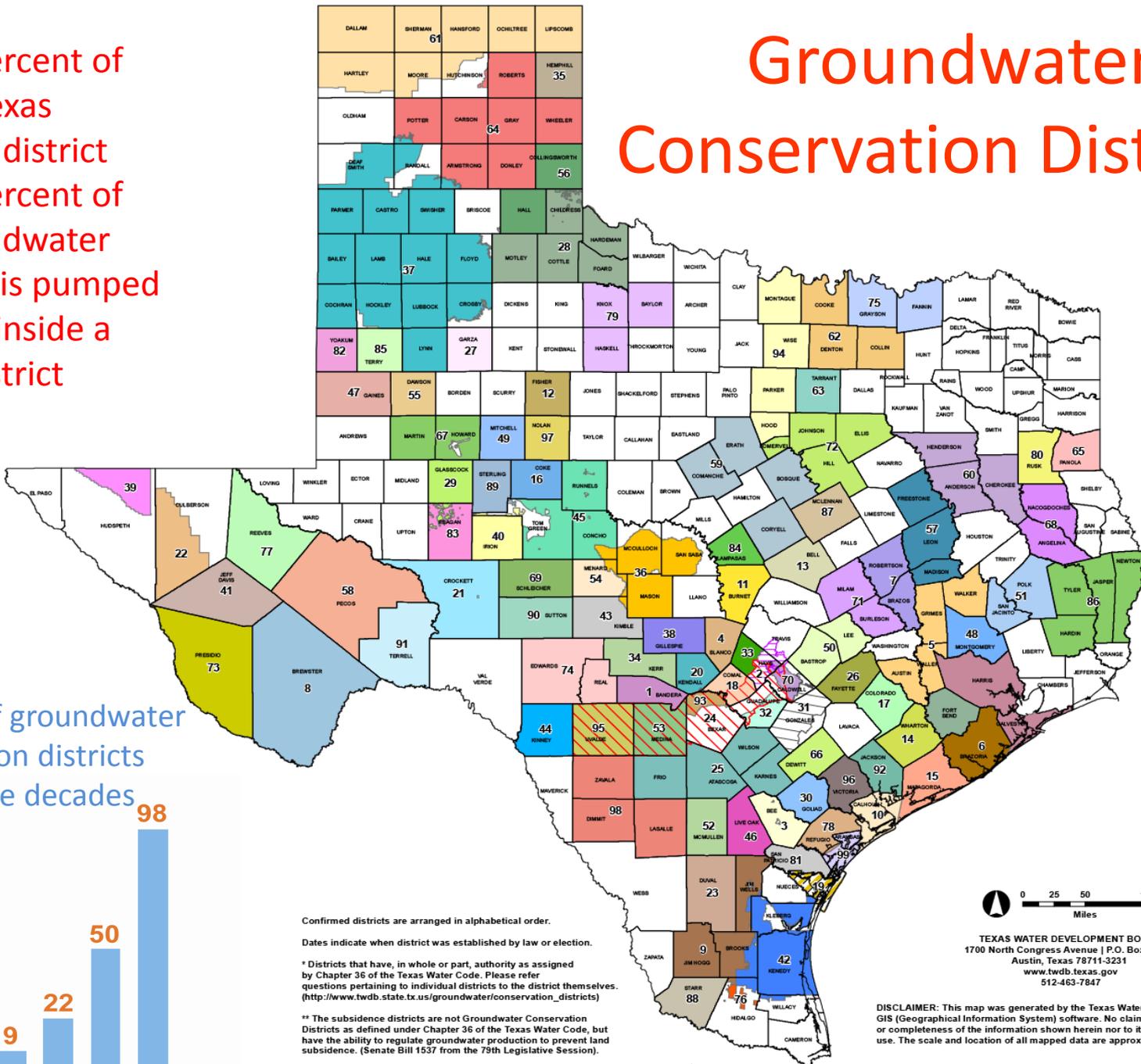
Location of records for 1.5+ million water wells drilled in Texas since the late 1890s

Groundwater Database

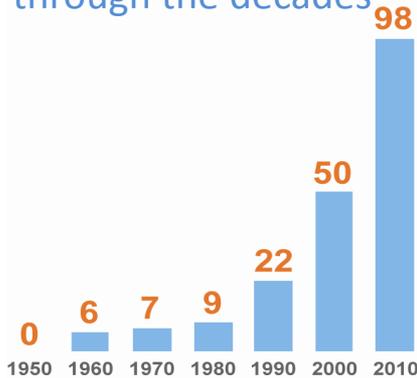


Groundwater Conservation Districts

~60 percent of Texas has a district
 ~90 percent of groundwater pumped is pumped from inside a district



Number of groundwater conservation districts through the decades



Confirmed districts are arranged in alphabetical order.

Dates indicate when district was established by law or election.

* Districts that have, in whole or part, authority as assigned by Chapter 36 of the Texas Water Code. Please refer questions pertaining to individual districts to the district themselves. (http://www.twdb.state.tx.us/groundwater/conservation_districts)

** The subsidence districts are not Groundwater Conservation Districts as defined under Chapter 36 of the Texas Water Code, but have the ability to regulate groundwater production to prevent land subsidence. (Senate Bill 1537 from the 79th Legislative Session)

Groundwater Conservation District GIS Data created by the Texas Commission on Environmental Quality. For more information, please contact TCEQ at 512-239-1000 or wras@tceq.texas.gov.

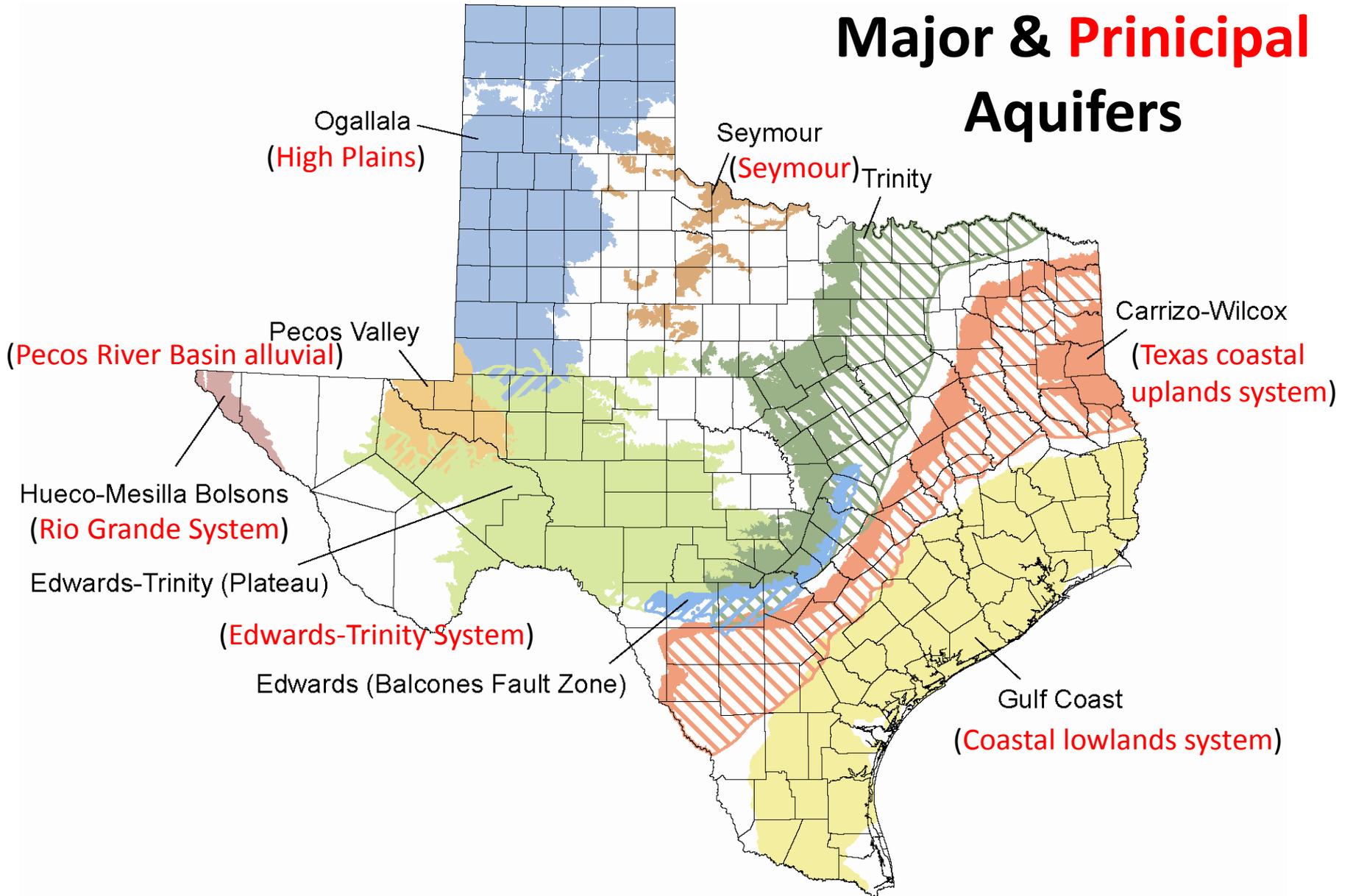


TEXAS WATER DEVELOPMENT BOARD
 1700 North Congress Avenue | P.O. Box 13231
 Austin, Texas 78711-3231
www.twdb.texas.gov
 512-463-7847

DISCLAIMER: This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map date: NOV-2015

MISSION: The Texas Water Development Board's (TWDB) mission is to provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas.

Major & Principal Aquifers



TWDB monitoring networks & goals

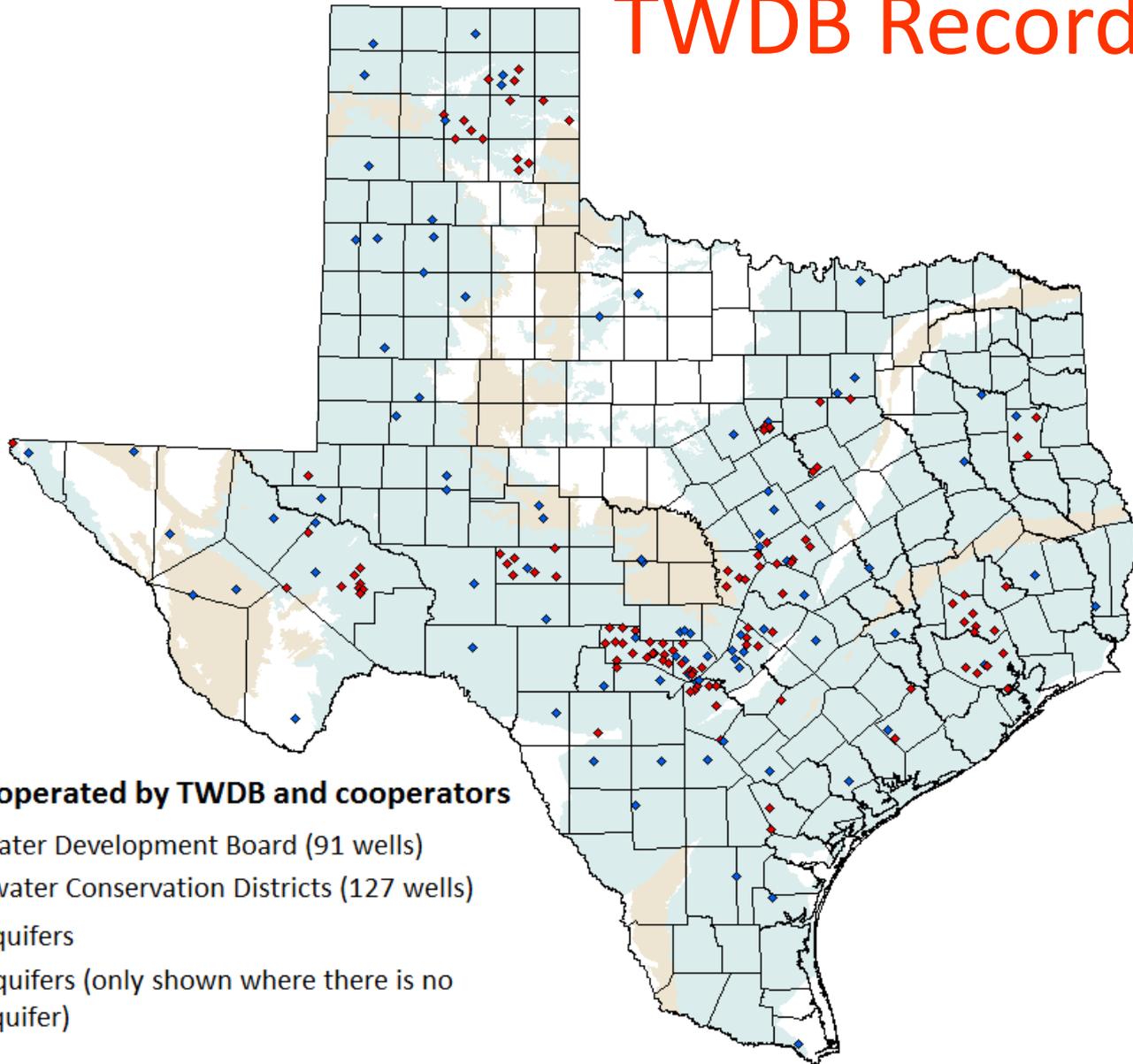


- 200 automatic water-level recorder wells
- 7,500 water-level network wells
- 1,200 – 1,600 water-quality network
 - wells & springs (4-year cycle)



- Wells (& springs) are completed in 9 major, 21 minor, and several undesignated or local aquifers
- Representative number of wells monitored per county, per aquifer determined by amount pumped
- Sites monitored to determine groundwater-level trends, publish real-time levels on-line, characterize/establish baseline of naturally occurring groundwater quality and any changes that may have occurred over time

TWDB Recorders

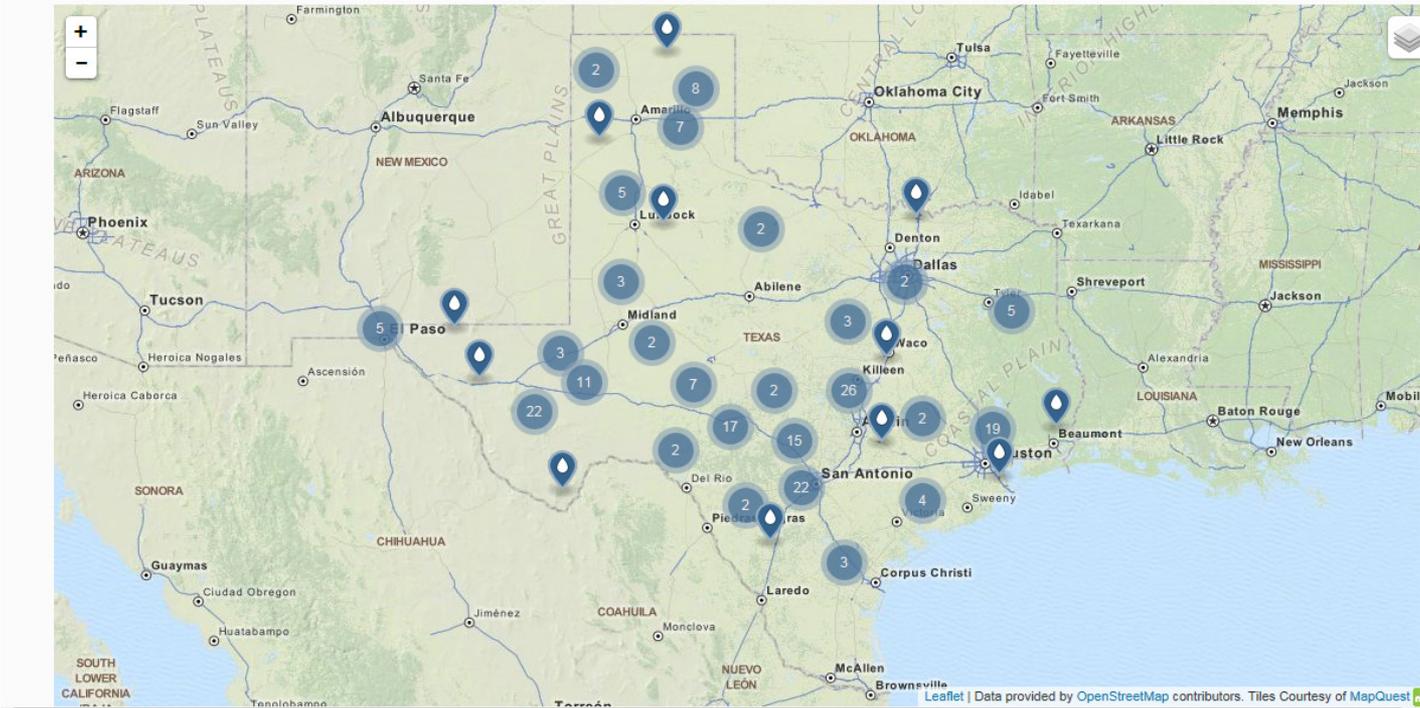


Recorder sites operated by TWDB and cooperators

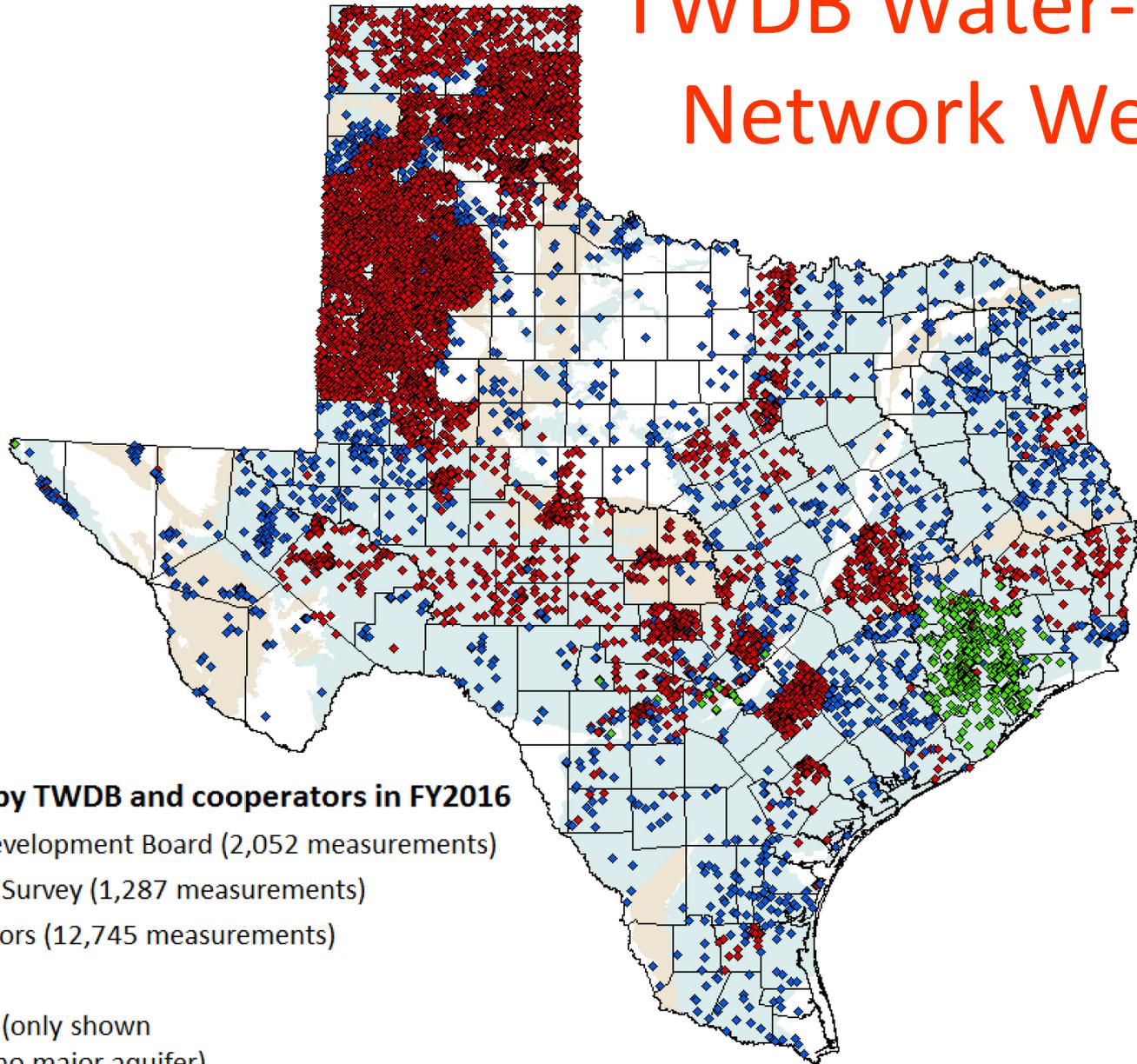
- ◆ Texas Water Development Board (91 wells)
- ◆ Groundwater Conservation Districts (127 wells)
- Major aquifers
- Minor aquifers (only shown where there is no major aquifer)

<http://www.waterdatafortexas.org/groundwater/>

Automated Groundwater Level Wells



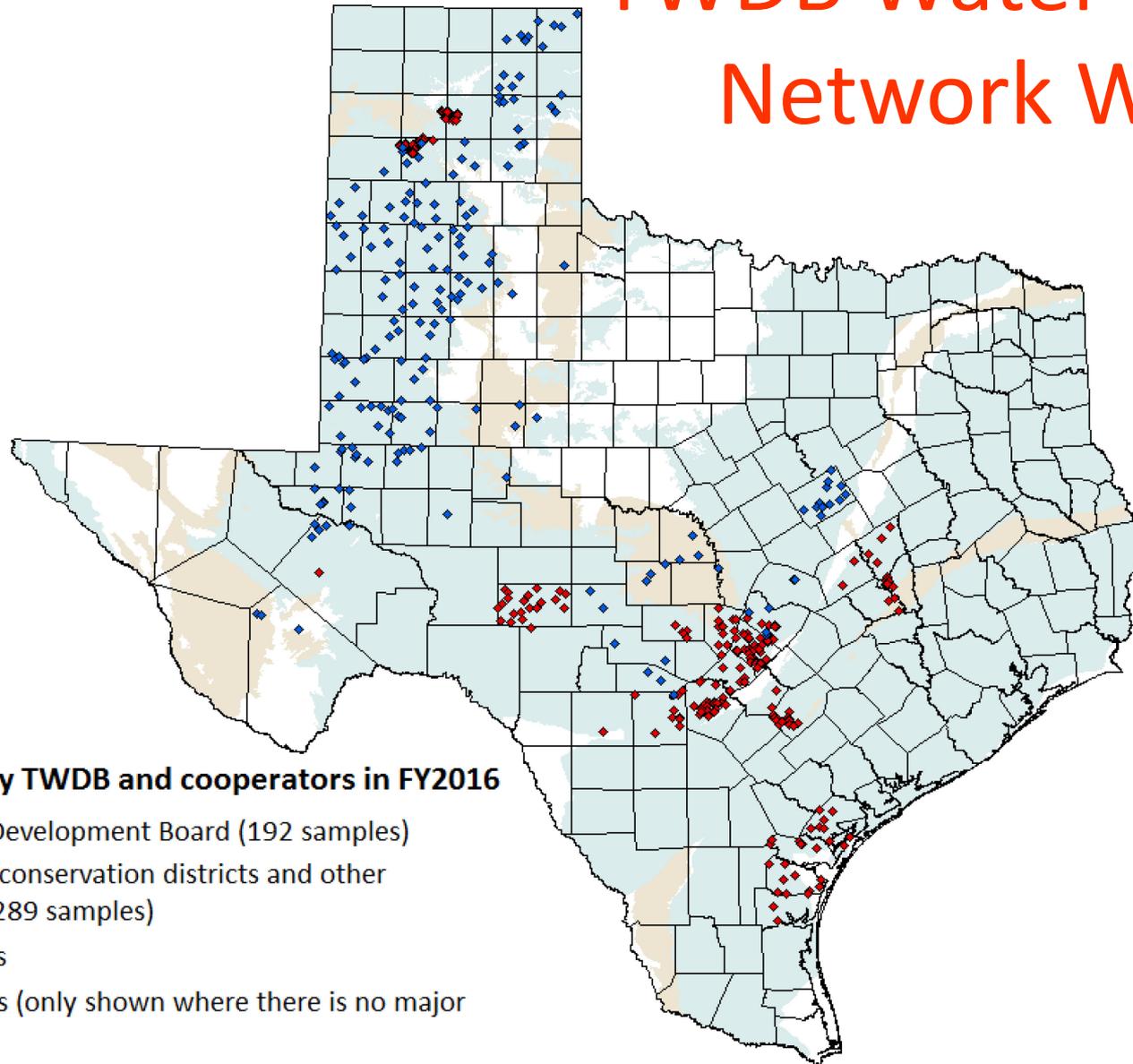
TWDB Water-level Network Wells



Wells measured by TWDB and cooperators in FY2016

- ◆ Texas Water Development Board (2,052 measurements)
 - ◆ U.S. Geological Survey (1,287 measurements)
 - ◆ Other cooperators (12,745 measurements)
 - Major Aquifers
 - Minor Aquifers (only shown where there is no major aquifer)
- Total wells (6,983)

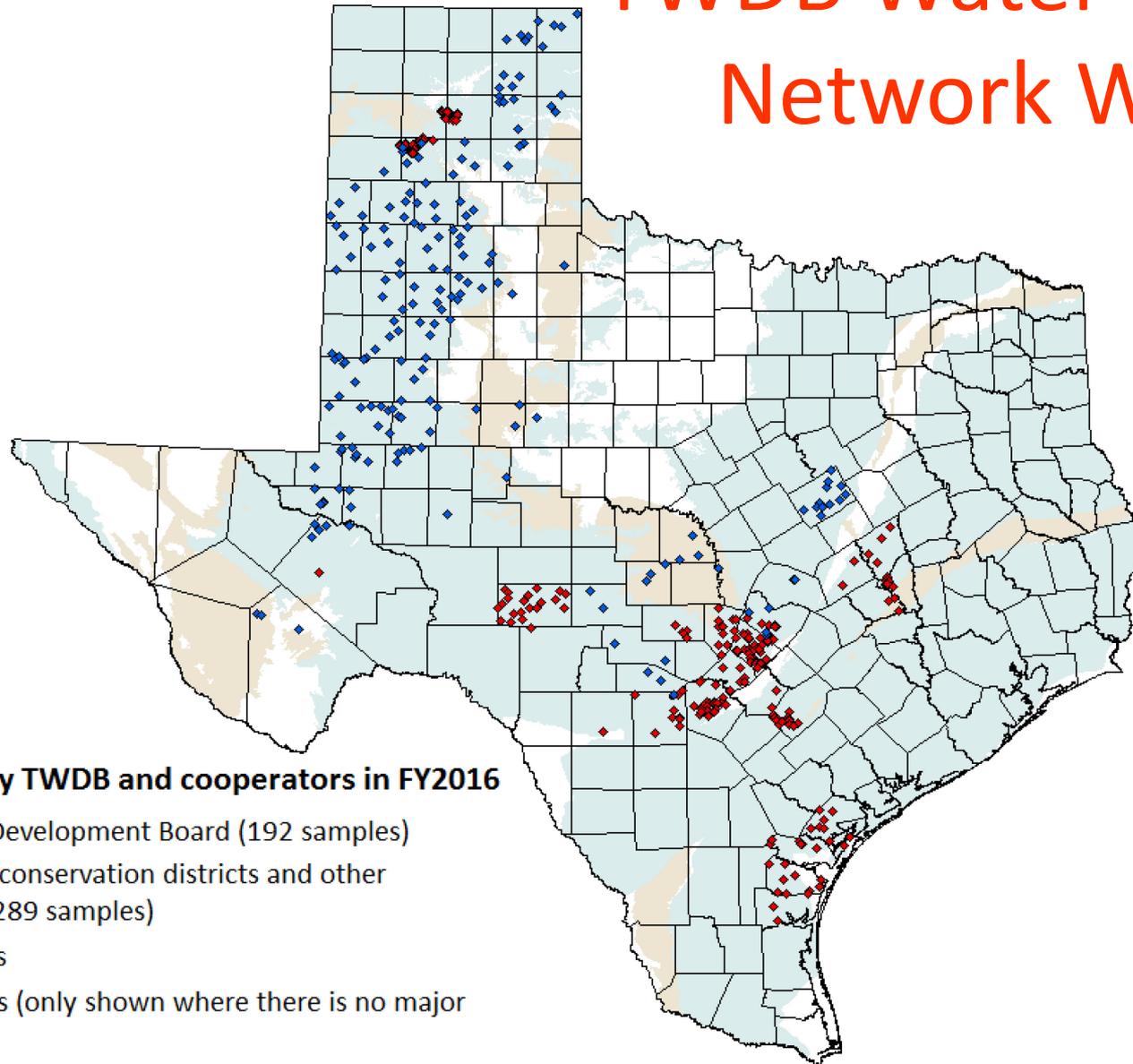
TWDB Water-quality Network Wells



Sites sampled by TWDB and cooperators in FY2016

- ◆ Texas Water Development Board (192 samples)
 - ◆ Groundwater conservation districts and other cooperators (289 samples)
 - Major aquifers
 - Minor aquifers (only shown where there is no major aquifer)
- Total sites (481)

TWDB Water-quality Network Wells



Sites sampled by TWDB and cooperators in FY2016

- ◆ Texas Water Development Board (192 samples)
 - ◆ Groundwater conservation districts and other cooperators (289 samples)
 - Major aquifers
 - Minor aquifers (only shown where there is no major aquifer)
- Total sites (481)

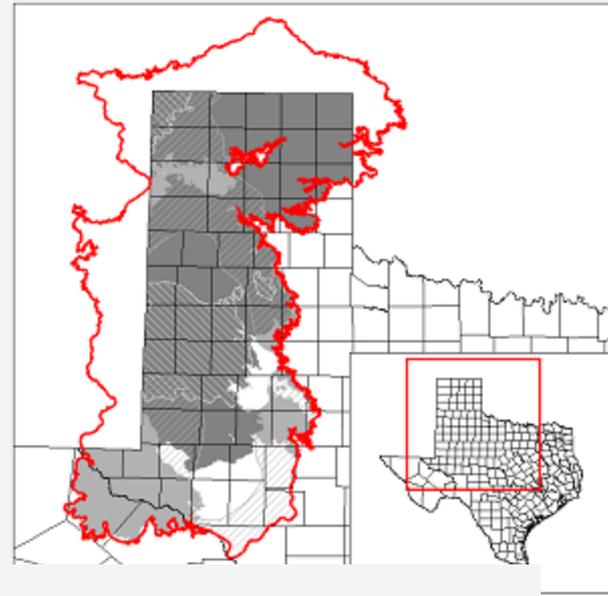
Data Use, Trans-boundary Issues?, Application

Groundwater Availability Models

High Plains Aquifer System

Groundwater Availability Model (GAM)

In July 2012, the Texas Water Development Board (TWDB) contracted with INTERA, Inc. to develop a groundwater availability model (GAM) for the High Plains Aquifer System ([Ogallala Aquifer](#), [Dockum Aquifer](#), [Edwards-Trinity \(High Plains\) Aquifer](#), and [Rita Blanca Aquifer](#)). The project was completed and delivered in 2015.



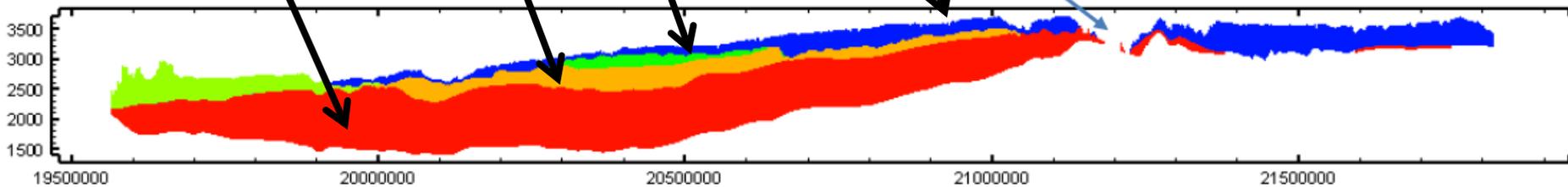
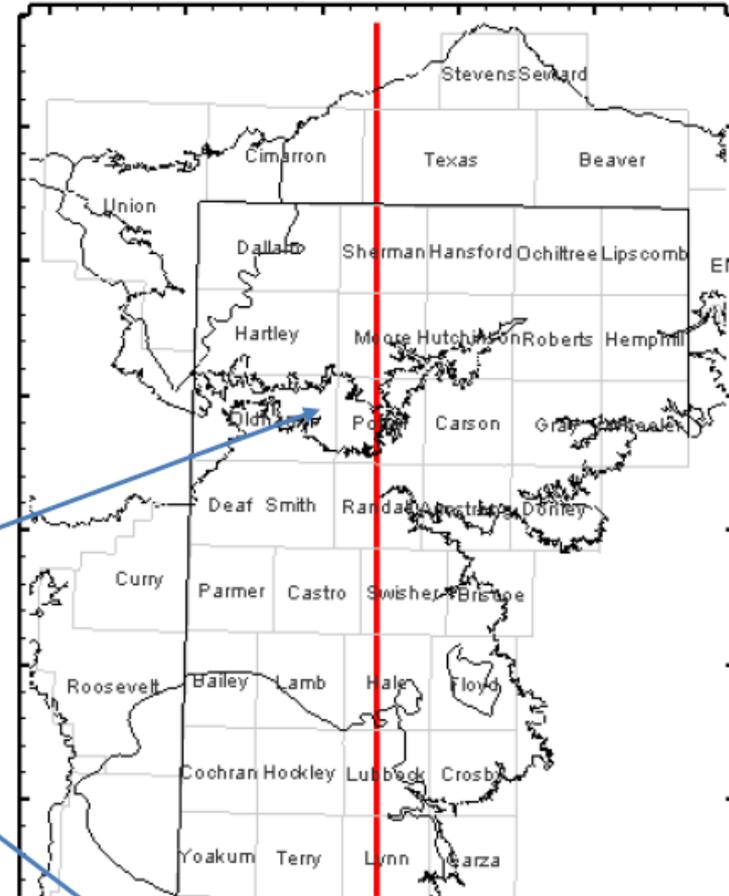
Model Reports

 ["Conceptual Model for the High Plains Aquifer System Groundwater Availability Model."](#)

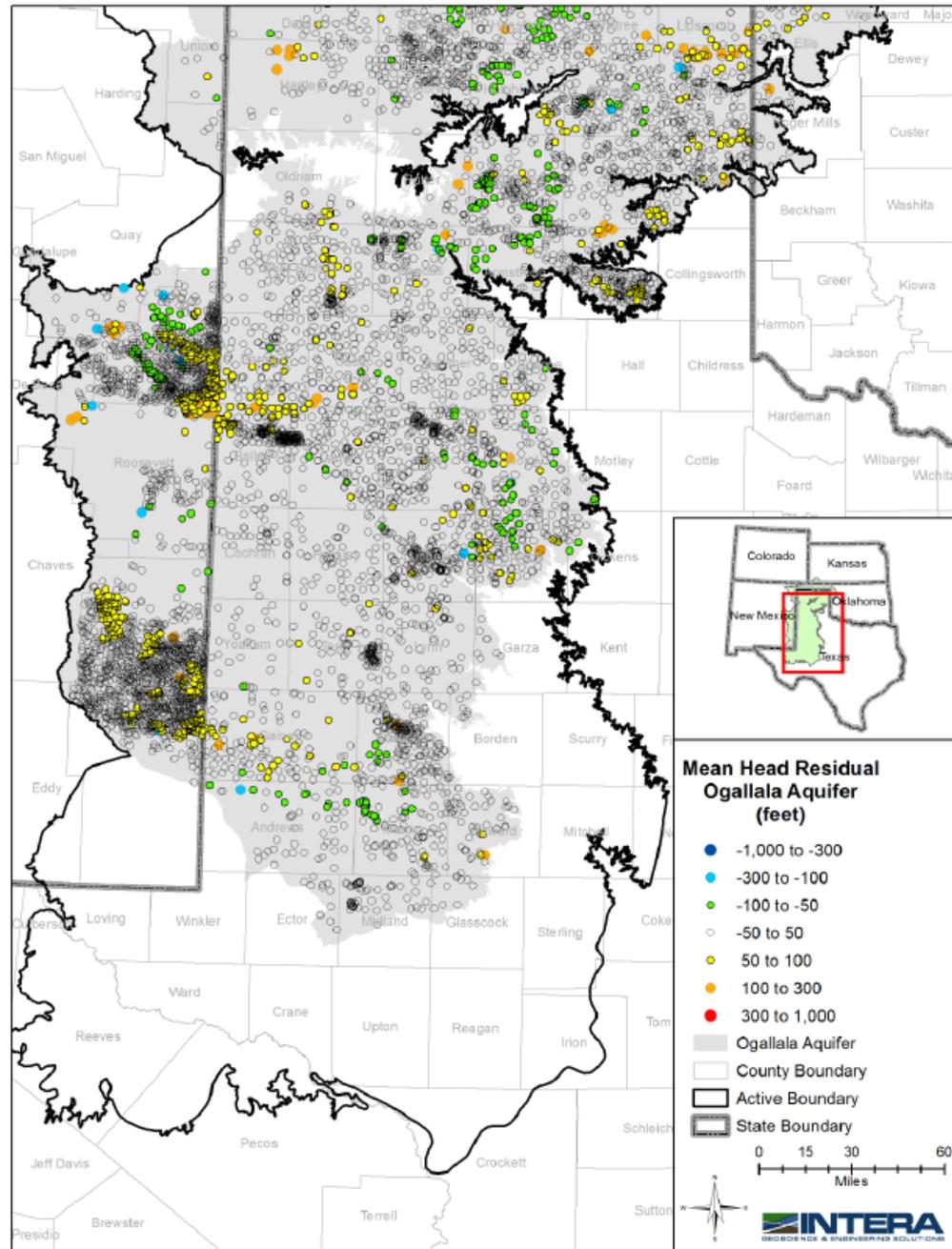
 ["Numerical Model for the High Plains Aquifer System Groundwater Availability Model."](#)

Structure on Grid

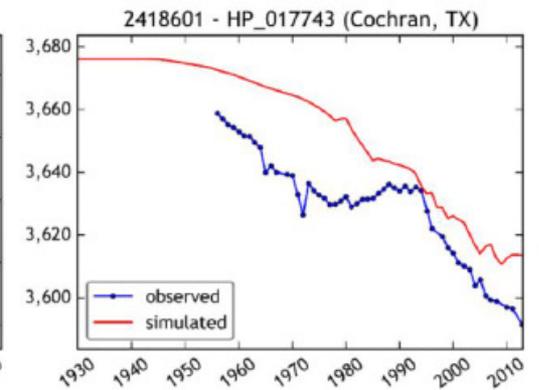
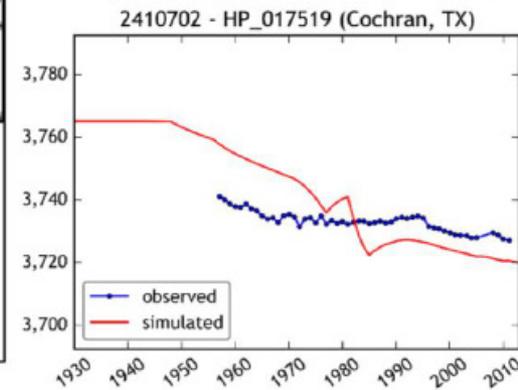
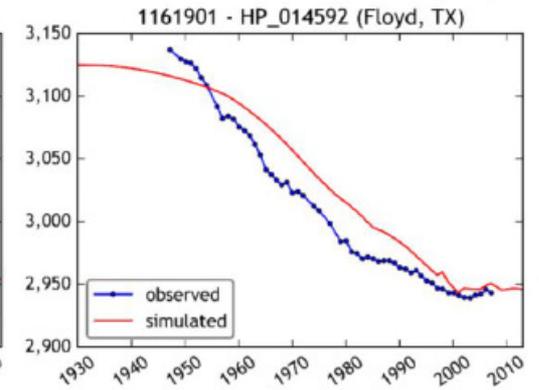
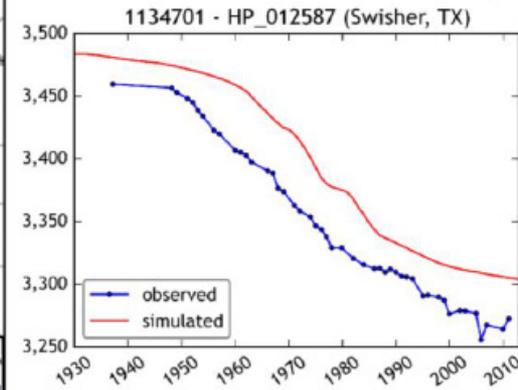
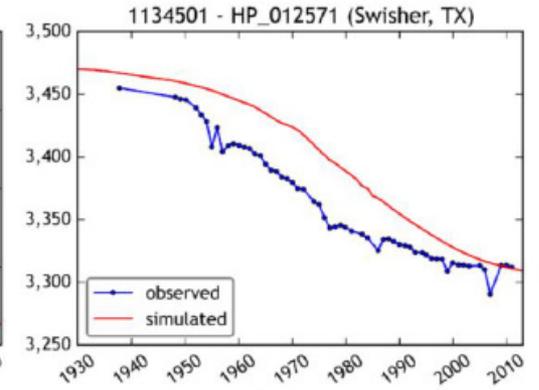
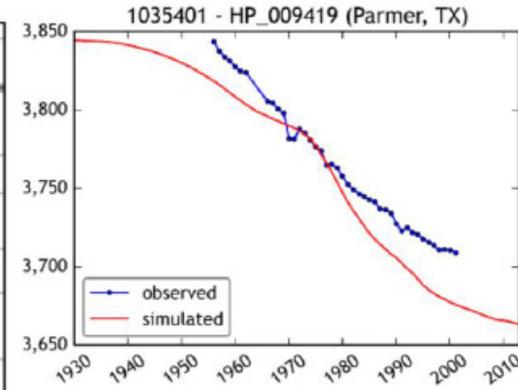
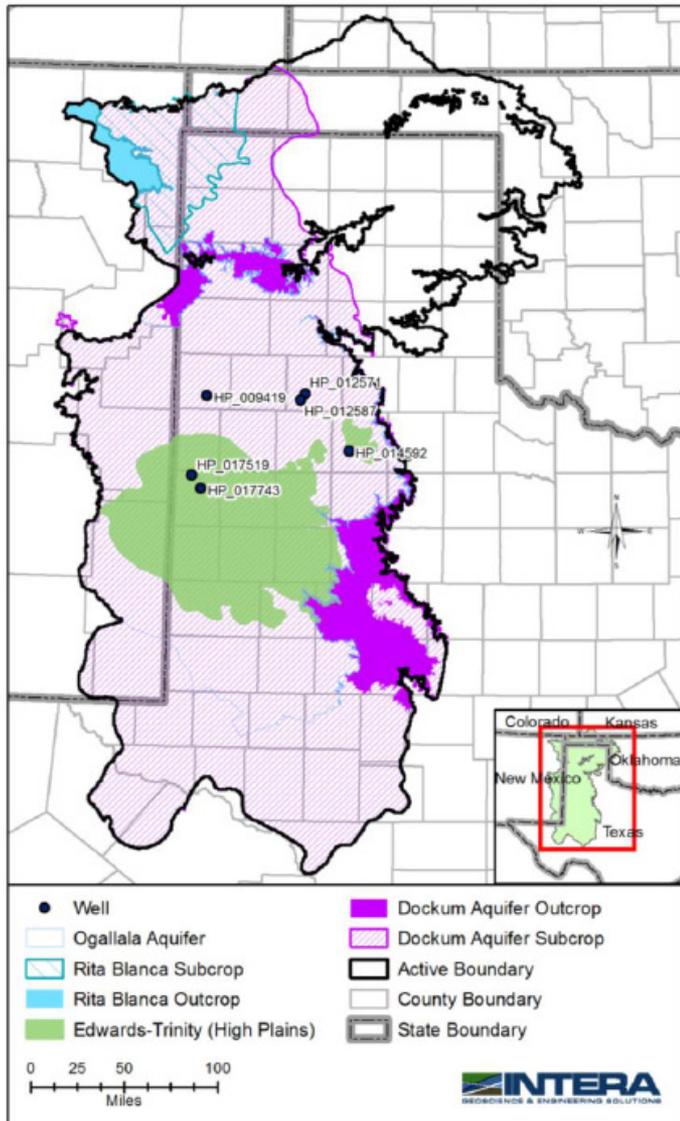
High Plains
Edwards-Trinity
Upper Dockum
Lower Dockum



Transient Calibration

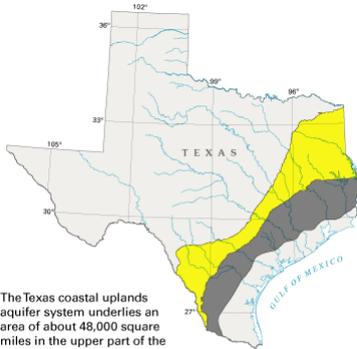


Ogallala Aquifer



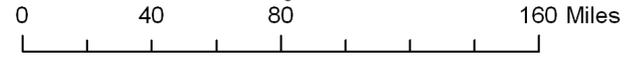
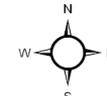
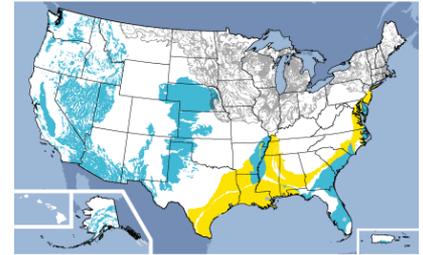
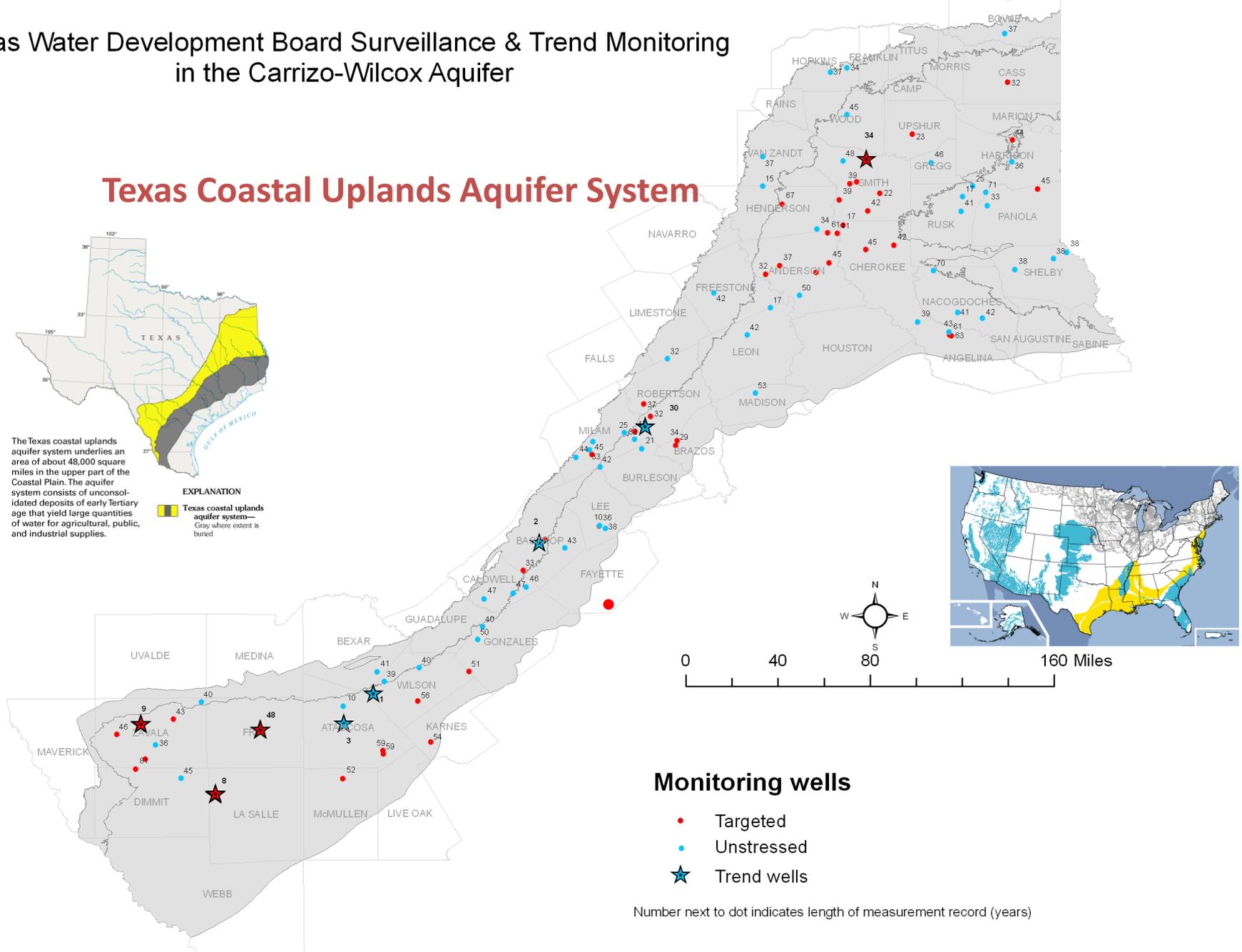
Texas Water Development Board Surveillance & Trend Monitoring in the Carrizo-Wilcox Aquifer

Texas Coastal Uplands Aquifer System



The Texas coastal uplands aquifer system underlies an area of about 48,000 square miles in the upper part of the Coastal Plain. The aquifer system consists of unconsolidated deposits of early Tertiary age that yield large quantities of water for agricultural, public, and industrial supplies.

EXPLANATION
 Texas coastal uplands aquifer system—
 Gray where extent is buried



Monitoring wells

- Targeted
- Unstressed
- ★ Trend wells

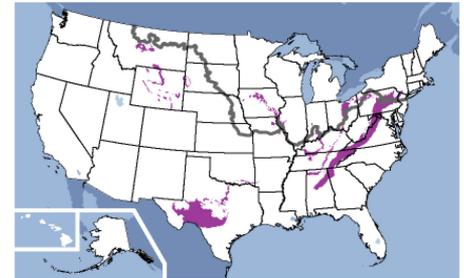
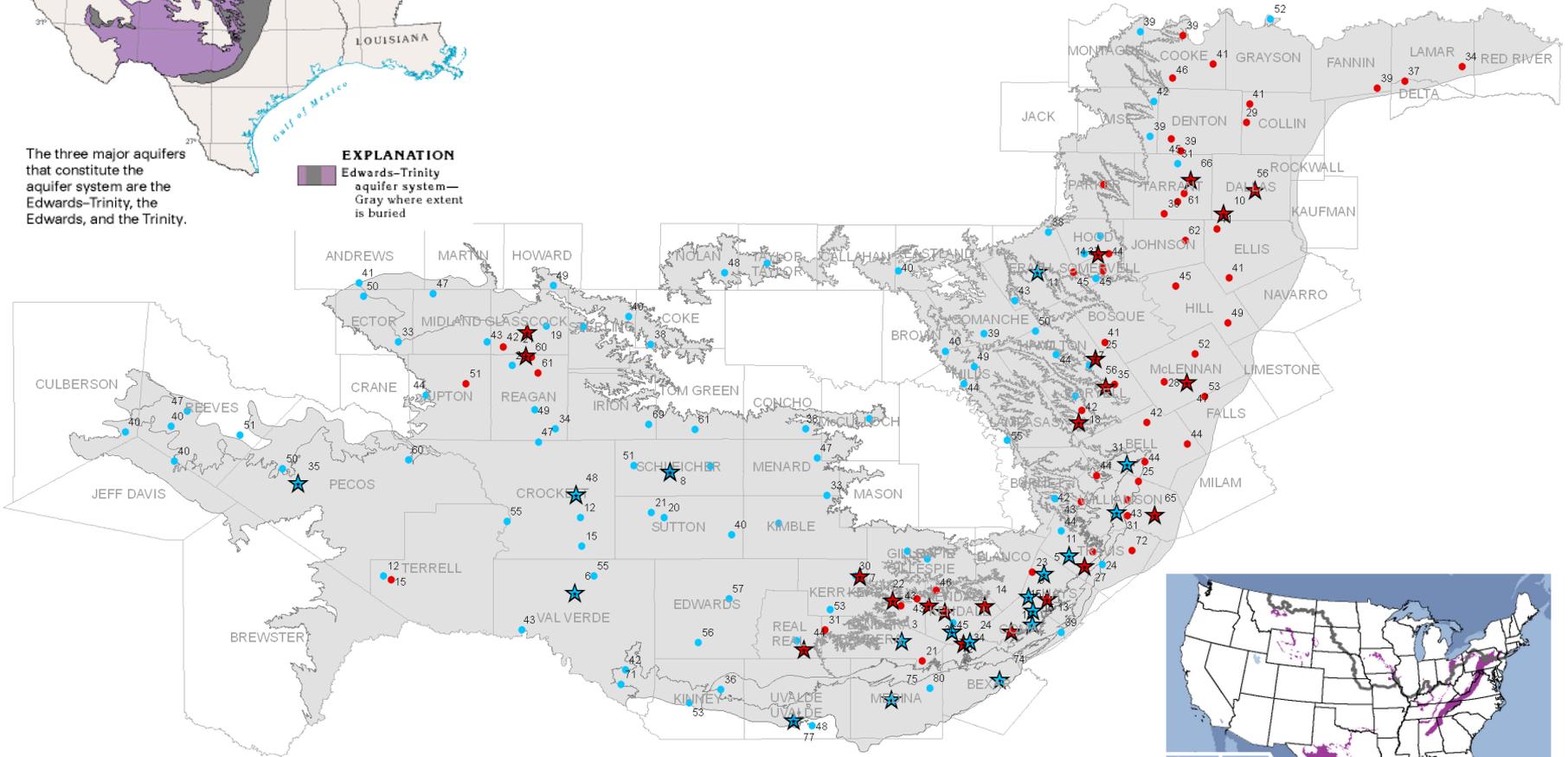
Number next to dot indicates length of measurement record (years)

TWDB Surveillance and Trend Wells in the Edwards (Balcones Fault Zone), Trinity, and Edwards-Trinity (Plateau) Aquifers



The three major aquifers that constitute the aquifer system are the Edwards-Trinity, the Edwards, and the Trinity.

EXPLANATION
 ■ Edwards-Trinity aquifer system—
 Gray where extent is buried



Monitoring Wells

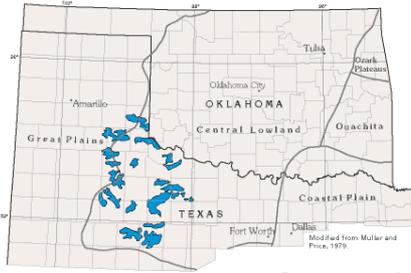
- Targeted
- Unstressed
- ★ Trend wells

Number next to dot indicates length of measurement record (years)



TWDB Surveillance and Trend Wells in the Seymour Aquifer

Seymour Aquifer



EXPLANATION
 Seymour aquifer
 Physiographic province boundary and name

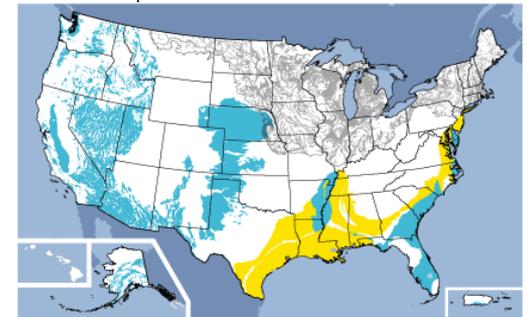
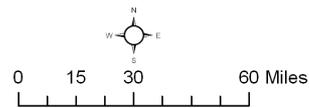
Figure 32. Isolated patches of alluvial deposits in 20 counties in north-central Texas form the Seymour aquifer. The deposits are erosional remnants of the Seymour Formation.



Monitoring wells

- Targeted
- Unstressed
- Trend wells

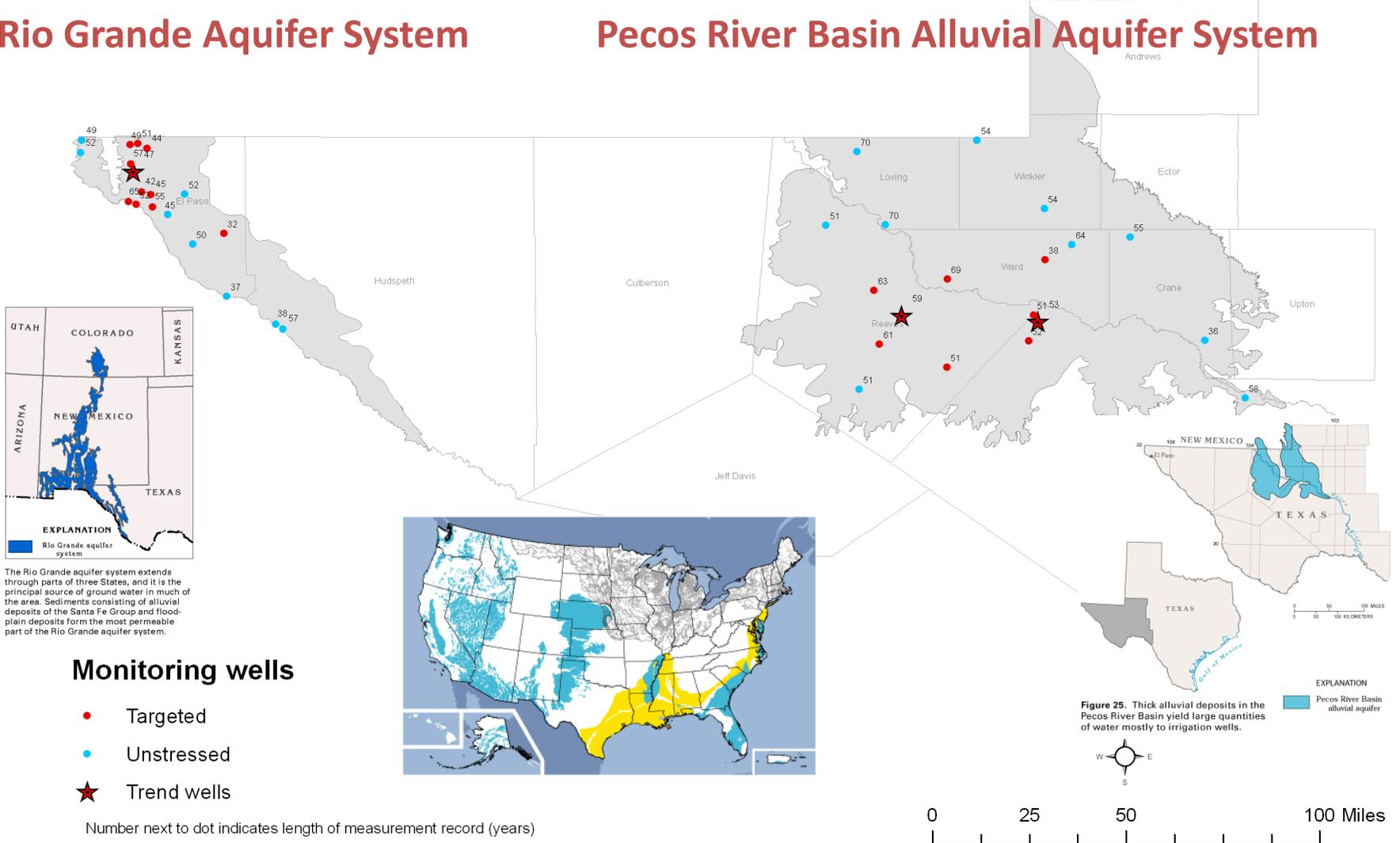
Number next to dot indicates length of measurement record (years)



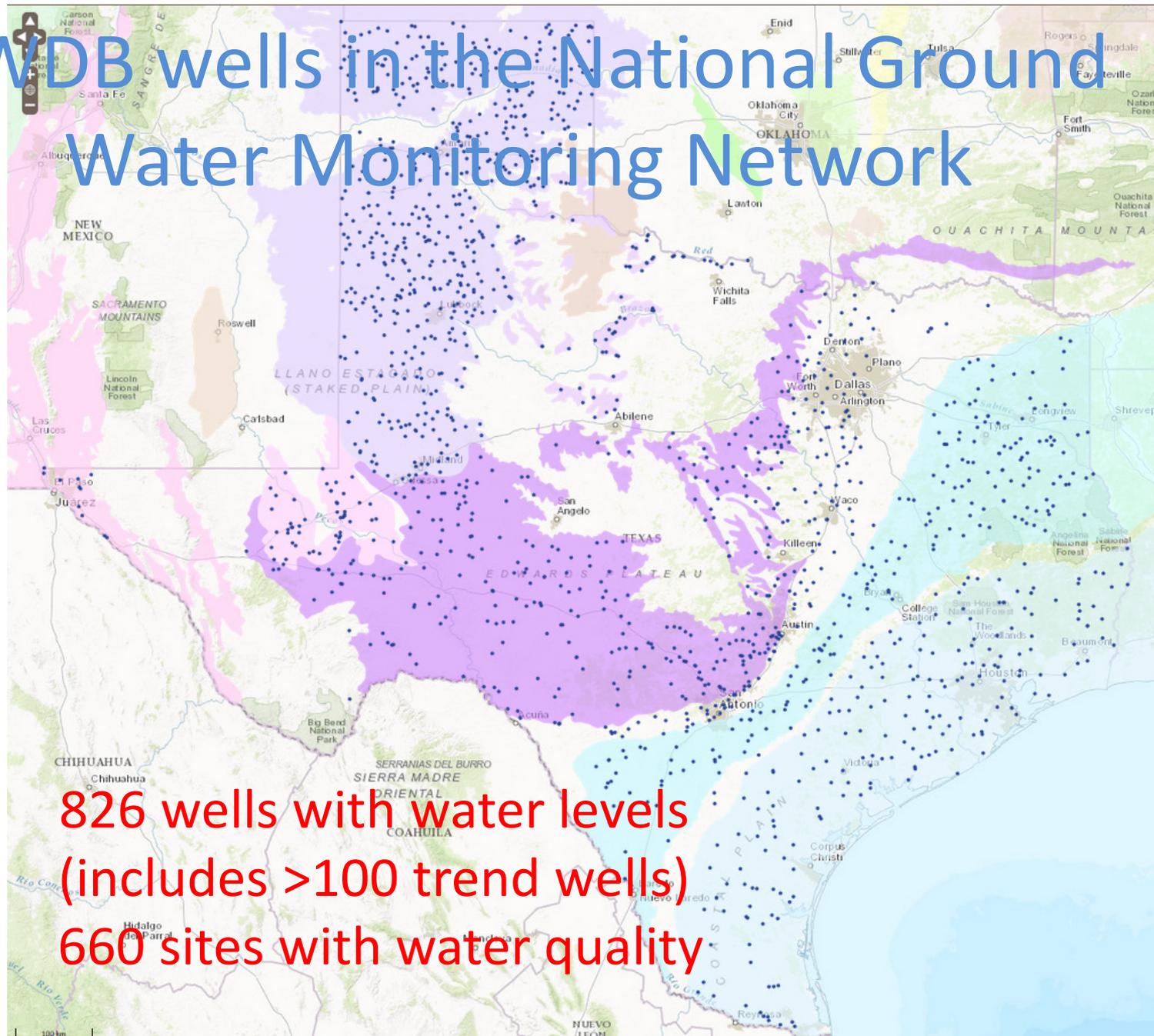
TWDB Surveillance and Trend Wells in the Hueco-Mesilla Bolsons and Pecos Valley Aquifer

Rio Grande Aquifer System

Pecos River Basin Alluvial Aquifer System



TWDB wells in the National Ground Water Monitoring Network





Site selection & classification

- Minimum data elements
- Period of record (recently measured/sampled; longest records)
- Likelihood of continued data collection
- Water-level classification usually straightforward; is distribution and density of selected sites with known and suspected changes vs background sites adequately representative?

NGWMN vs TWDB protocols

USER MANUAL 52



- Field techniques
- Meta data collection

A Field Manual for Groundwater-level Monitoring at the Texas Water Development Board

Janie Hopkins, P.G.
&
Bryan Anderson

September 2016



Current projects

- Maintain existing 1,470 sites with replacements and additional sites as necessary
 - 58 High Plains aquifer wells in registry without depths (not displayed); do records exist?
 - Review well characterization and classification
 - Contact El Paso Water Board for historical & current water-level data
- Document NGWMN well maintenance activities for TWDB staff
- Link/promote NGWMN and TWDB contributions on TWDB web site
- Apply for funding to fill data gaps (lithology, depths)

Other Data/Info Available

Water Data Interactive



WATER DATA Interactive



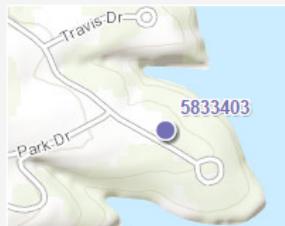
TexMesonet

An interactive mapping application for viewing a network of selected weather stations and rain gages throughout the state of Texas. The application displays current weather conditions, radar and 24 hour time series graphs.



Texas FLOOD Viewer

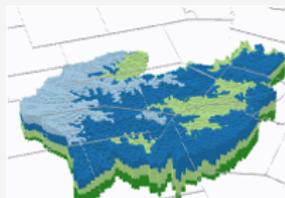
An interactive mapping application for viewing current conditions and up-to-date information for flooding in your area.



Groundwater Data Viewer

This interactive mapping application provides access to water-related data for Texas. The viewer contains several GIS datasets relating to water resources, including TWDB groundwater data, brackish groundwater data, and data

[click to show more](#)



Major Aquifer 3D Viewer

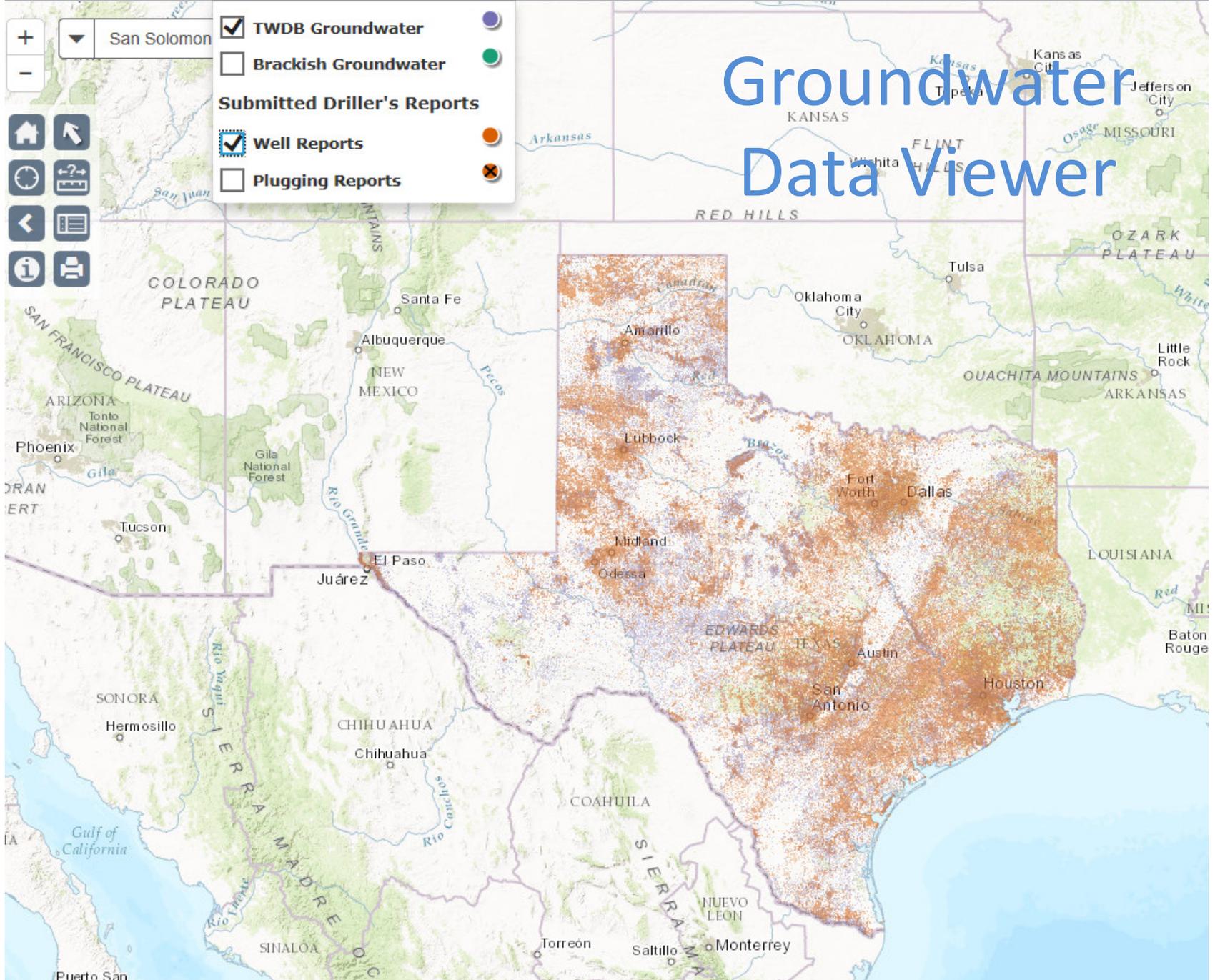
A three dimensional interactive viewer for exploring the major aquifers of Texas. After choosing an aquifer, users can choose to be re-directed to a 3D viewer that allows visual manipulation of the subsurface model. The

+
-
Home
Previous View
Next View
Previous Layer
Next Layer
Info
Full Screen

San Solomon

- TWDB Groundwater
- Brackish Groundwater
- Submitted Driller's Reports**
 - Well Reports
 - Plugging Reports

Groundwater Data Viewer



Groundwater Database (GWDB) Reports

The Texas Water Development Board (TWDB) Groundwater Database (GWDB) contains information on selected water wells, springs, oil/gas tests (that were originally intended to be or were converted to water wells), water levels, and water quality to gain representative information about aquifers in Texas to support water planning from a local to a more regional perspective.

Except where noted, all of the information provided in the GWDB is believed to be accurate and reliable; however, the TWDB assumes no responsibility for any errors appearing in rules or otherwise. Further, TWDB assumes no responsibility for the use of the information provided. PLEASE NOTE that users of these data are responsible for checking the accuracy, completeness, currency and/or suitability of all information themselves. TWDB makes no guarantees or warranties as to the accuracy, completeness, currency, or suitability of the information provided via the GWDB. TWDB specifically disclaims any and all liability for any claims or damages that may result from providing GWDB data or the information it contains. Check out the [Explanation of TWDB Groundwater Database](#) for more information.

Reports and Downloads

Reports are designed to view a select set of information in the GWDB, not for viewing all records in the database. Reports allow the user to select or enter certain information to obtain records for that specific criteria. There is an option to export the reports to several different formats; although the reports are optimized for viewing as PDF and CSV formats. To get the entire GWDB, go to the Downloads section below.

Reports

[Well Search by Map](#)

Use the TWDB Water Data Interactive (WDI) Groundwater Data Viewer to search for well records. Click "Groundwater" at the top of the page to view other groundwater data, including well and plugging reports. Several base maps and layers, along with interactive tools, allow for viewing and downloading Texas groundwater data.

Record of Wells

[Record of Wells by Aquifer](#)

Select one aquifer and then one or multiple counties from the lists at the top of the page, then click the View Report button in the upper right. In the report, click the state well number for all available information on the well. Exported PDF page size is 11" x 8.5".

Aquifers
Groundwater Management Areas
Groundwater Conservation Districts
Groundwater Data
<ul style="list-style-type: none">Numbered ReportsBulletinsHistorical Groundwater ReportsAutomated Groundwater Level WellsGroundwater Database (GWDB)Submitted Drillers Reports (SDR) DatabaseWater Data Interactive (WDI) Groundwater Data Viewer
Groundwater Models
Groundwater Educational Videos
Regional Water Planning Areas
Special Projects
Rules and Statutes
Frequently Asked Questions
External Resources
Groundwater Staff
State Water Implementation Fund for Texas (SWIFT)

Groundwater Data Reports

Water Data Interactive



[2017 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

[click to show more](#)



[Water Data for Texas](#)



This website is a product of the Texas Water Development Board (TWDB) Water Science Conservation Division and is made possible by the support of management and staff at TWDB. This project is part of our ongoing efforts to

[click to show more](#)



[GEMSS/2](#)

The Geospatial Emergency Management Support System (GEMSS) was developed by the Texas Natural Resources Information System (TNRIS), a part of the Texas Water Development Board, using the Hazard Mitigation Grant

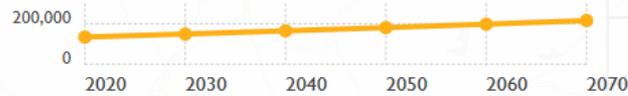
[click to show more](#)

View data for Select County

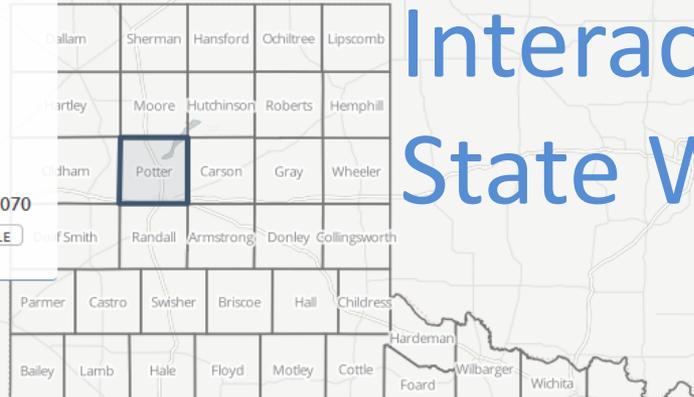
Potter County

County in Region A

Population

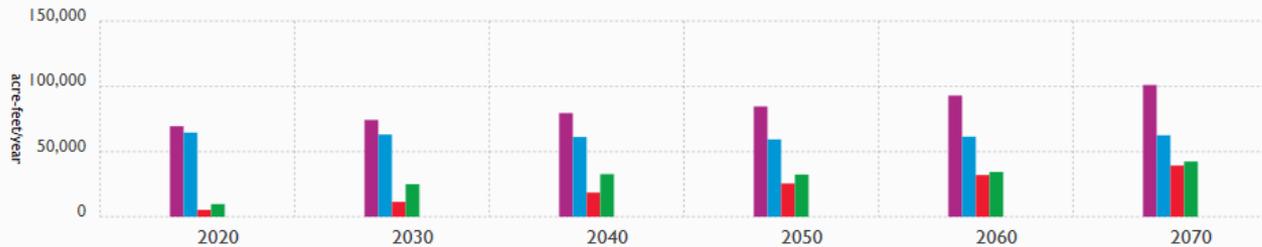


[SHOW DATA TABLE](#)



Interactive 2017 State Water Plan

POTTER COUNTY Totals by Decade (acre-feet/year)

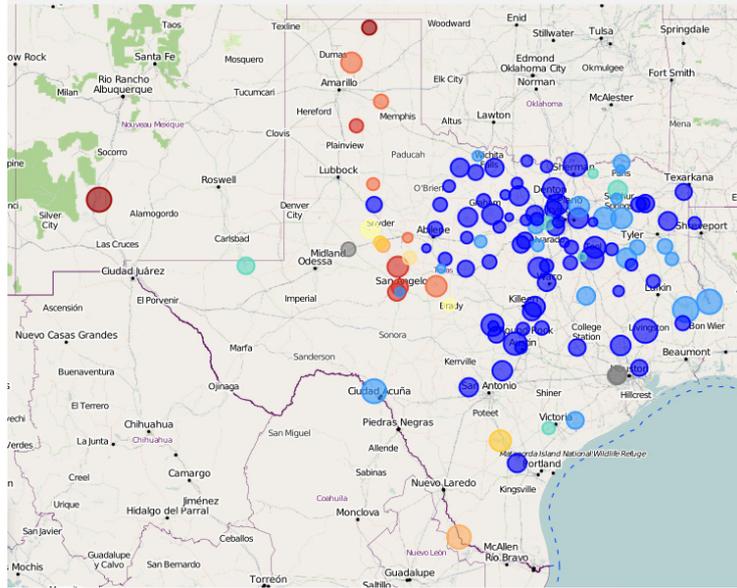


	2020	2030	2040	2050	2060	2070
Demands	69,374	74,224	79,447	84,518	92,870	100,990
Existing Supplies	64,479	63,039	61,130	59,302	61,379	62,462
Needs (Potential Shortages)	5,270	11,415	18,509	25,526	32,001	39,238
Strategy Supplies	9,713	24,948	32,701	32,369	34,383	42,360

POTTER COUNTY Demands by Usage Type (acre-feet/year)



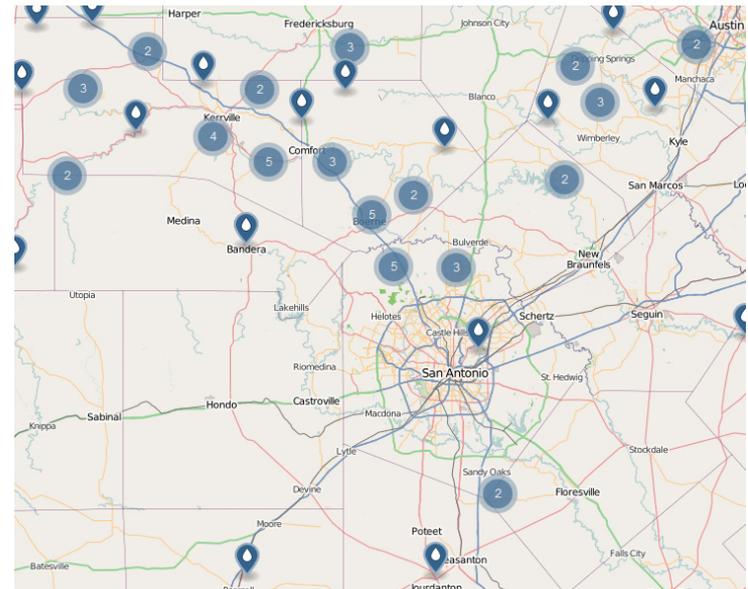
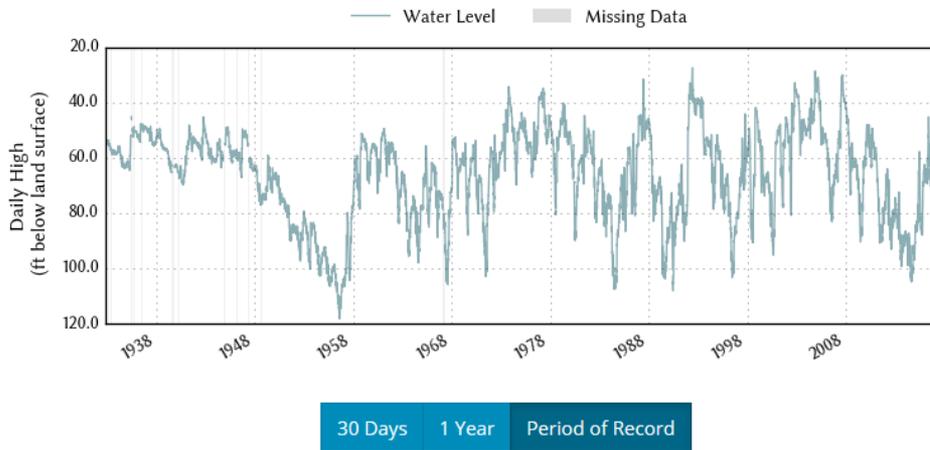
Water Supply Reservoirs are 83.5% full on 2016-11-29



Water Data for Texas

- *reservoirs
- *recorder wells
- *drought resources
- *coastal gauges

State Well Number 6837203 is 50.71 feet below land surface on 2016-11-29



Groundwater Availability Models

Major & Minor Aquifers

- [Carrizo-Wilcox Aquifer \(northern portion\) GAM](#)
- [Carrizo-Wilcox Aquifer \(central portion\) GAM](#)
- [Carrizo-Wilcox Aquifer \(southern portion\) GAM](#)
- [Edwards BFZ Aquifer \(northern segment\) GAM](#)
- [Edwards BFZ Aquifer \(Barton Springs segment\) GAM](#)
- [Edwards BFZ Aquifer \(San Antonio segment\) GAM](#)
- [Edwards-Trinity \(Plateau\) and Pecos Valley Aquifers GAM](#)
- [Gulf Coast Aquifer System GAM for GMAs 15 and 16](#)
- [Gulf Coast Aquifer System \(northern portion\) GAM](#)
- [Gulf Coast Aquifer System \(central portion\) GAM](#)
- [Gulf Coast Aquifer System \(southern portion\) GAM](#)
- [High Plains Aquifer System GAM](#)
- [Hueco-Mesilla Bolsons Aquifer GAM](#)
- [Ogallala Aquifer \(northern portion\) GAM](#)
- [Ogallala Aquifer \(southern portion\) GAM](#)
- [Seymour and Blaine Aquifers GAM](#)
- [Seymour Aquifer in Haskell, Knox, and Baylor Counties GAM](#)
- [Trinity \(northern portion\) and Woodbine Aquifers GAM](#)
- [Trinity \(Hill Country\) Aquifer GAM](#)

Minor Aquifers

- [Blossom Aquifer GAM](#)
- [Bone Spring-Victorio Peak Aquifer GAM](#)
- [Brazos River Alluvium Aquifer GAM](#)
- [Capitan Reef Complex Aquifer GAM](#)
- [Edwards-Trinity \(High Plains\) and Ogallala \(southern portion\) Aquifers GAM](#)
- [Dockum Aquifer GAM](#)
- [Lipan Aquifer GAM](#)
- [Llano Uplift Aquifer System GAM](#)
- [Nacatoch Aquifer GAM](#)
- [Queen City and Sparta Aquifers GAM](#)
- [Rustler Aquifer GAM](#)
- [West Texas Bolsons \(Wild Horse Flat, Michigan Flat, Ryan Flat, and Lobo Flat\) and Igneous Aquifers GAM](#)
- [West Texas Bolsons \(Red Light, Green River, and Eagle Flat\) Aquifer GAM](#)
- [West Texas Bolsons \(Presidio and Redford Bolsons\) Aquifer GAM](#)
- [Yegua-Jackson Aquifer GAM](#)

Aquifers
Groundwater Management Areas
Groundwater Conservation Districts
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▪ Groundwater Availability Models
▪ Alternative Models
▪ Research Projects
▪ Analytical Methods
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Regional Water Planning Areas
Special Projects
Rules and Statutes
Frequently Asked Questions
External Resources
Groundwater Staff

State Water Implementation Fund for Texas (SWIFT)

Historical Pumpage



Year 2014

1 of 2 ? 100% Find | Next



WATER USE SURVEY GROUNDWATER PUMPAGE ESTIMATES
(All volumes are in acre feet unless otherwise noted. 1 Acre-Foot = 325,851 gallons)
 As of 11/28/2016 4:59:16 PM
 Revised as Additional or More Accurate Data Becomes Available Through Survey Responses
 Report Filename: sumfinal_groundwater_pumpage

Year	County	Aquifer	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock
2014	ANDERSON	CARRIZO-WILCOX AQUIFER	7,966	0	0	0	312	24
2014	ANDERSON	OTHER AQUIFER	134	0	0	0	0	7
2014	ANDERSON	QUEEN CITY AQUIFER	576	0	0	0	313	20
2014	ANDERSON	SPARTA AQUIFER	186	0	0	0	0	0
2014	ANDERSON	UNKNOWN	0	0	27	0	0	0
2014	ANDREWS	DOCKUM AQUIFER	0	0	6	0	0	2
2014	ANDREWS	EDWARDS-TRINITY-PLATEAU AQUIFER	0	0	0	0	0	2
2014	ANDREWS	OGALLALA AQUIFER	3,792	0	262	0	14,441	152
2014	ANDREWS	OTHER AQUIFER	0	0	0	0	0	2
2014	ANDREWS	PECOS AQUIFER	108	0	0	0	0	28
2014	ANDREWS	UNKNOWN	0	0	1,503	0	0	0
2014	ANGELINA	CARRIZO-WILCOX AQUIFER	10,640	36	0	0	0	16
2014	ANGELINA	OTHER AQUIFER	306	85	0	0	0	0
2014	ANGELINA	SPARTA AQUIFER	18	0	0	0	0	16
2014	ANGELINA	YEGUA-JACKSON AQUIFER	1,262	874	0	0	0	63
2014	ARANSAS	GULF COAST AQUIFER	408	25	0	0	0	18
2014	ARANSAS	OTHER AQUIFER	11	0	0	0	0	18
2014	ARANSAS	UNKNOWN	0	0	1	0	0	0
2014	ARCHER	OTHER AQUIFER	94	0	0	0	0	355
2014	ARCHER	UNKNOWN	0	0	1	0	0	0
2014	ARMSTRONG	DOCKUM AQUIFER	10	0	0	0	37	29
2014	ARMSTRONG	OGALLALA AQUIFER	335	0	0	0	5,385	217
2014	ARMSTRONG	OTHER AQUIFER	1	0	0	0	0	8

Publications

Historic TWDB Groundwater Reports

This historic Texas Board of Water Engineers report series ran from 1936 to 1961. As of September, 2011, all available hard copies have been scanned. Hard copies are unavailable for any of these reports. Unscanned, unlinked report titles are shown on this page for reference purposes only. Many of these reports contain records of wells, driller's logs, water analyses, and accurate maps showing location of wells. To compare these historical records with current groundwater information, visit our [Water Data Interactive \(WDI\)](#). Note that a few of these historic reports include large fold out maps showing the locations of wells, but in some cases these oversize maps were too large or fragile to be scanned.

To find a specific report on this Web page, click inside the Search Table box below and enter a keyword or phrase. Reports with hyperlinked numbers have been scanned & are available online.

Researchers and Texas water history buffs may be interested in the online [USGS water supply paper series](#). This collection of 75 scanned reports includes papers from 1898 to 1988.

Accessibility note: Many of the report pdf's below were scanned from hard copy and may not be fully accessible for users of certain assistive technologies; however, if you need help please contact the webmaster and we will provide a text-based copy or otherwise make every effort to assist you.

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M143A	General and Special Irrigation Laws of the State of Texas		1920
 M164	Duty of Water on the Lower Rio Grande	By R. G.	1920

State Water Plan

Brochures

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State Water Implementation Fund for Texas (SWIFT)

Financial Assistance Programs

Administrative Rules

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