PRAIRIELANDS GROUNDWATER CONSERVATION DISTRICT

JOHNSON · ELLIS · HILL · SOMERVELL

2021 ANNUAL REPORT

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Letter from the General Manager

Kathy Turner Jones
General Manager

One of the phrases often heard in 2021 was the term "the new normal". Many times, this was referring to the way COVID-19 has changed the way we live, learn, work, and travel. Instead of thinking of these changes as a disadvantage due to current circumstances, I believe this "new normal" offered a way to adapt and improve upon the tasks we have been assigned to help manage, conserve, and protect groundwater resources. Even in the face of virtual meetings, adjusted procedures, and limited travel, Prairielands GCD was able to have another productive year for groundwater management.

The ripples of the COVID-19 pandemic could certainly still be felt during the 87th Texas Legislature. Add an unexpected, severe winter storm into the mix and it truly was a session like no other. This sessions' primary focus seemed to be on COVID-19 response, redistricting, biennial budget, and the state's electrical power grid issues brought to the forefront following Winter Storm Uri. The Texas Water Conservation Association's Groundwater Committee worked in advance of the session to develop consensus-based legislative proposals. This committee recommended two proposals move forward as part of TWCA's legislative agenda. These proposals, one providing a process to petition a groundwater conservation district for rulemaking and another clarifying which desired future condition (DFC) should be included in a management plan when a DFC is petitioned, were both included in SB 152 (Perry/Harris). That bill became the main vehicle for groundwater discussions during the legislative session but ultimately failed to reach the finish line due to disputes among policy makers and stakeholders related to the provision on attorney's fees. The Texas Alliance of Groundwater Districts identified 10 bills, out of 120 that were tracked, as statewide priority groundwater bills during the legislative session. These bills implicated substantial changes to Chapter 36 of the Texas Water Code, groundwater policy, and GCD operations. Of those ten bills, none of them made it to the finish line. This legislative session marks the first session in many years where no key groundwater-specific bills passed the Legislature. However, just because these bills did not pass during this legislative session does not mean similar bills could not come up for consideration in the next session. The District continues to be actively involved with legislative committees through statewide water associations and organizations to stay ahead of the legislation that impacts the District and its constituents.

One of the major accomplishments the District saw in 2021 was the launch of our new Groundwater Management System (GMS). This application was a much-needed improvement to replace the existing database the District had been using. This new system brings several benefits to our public, including a more streamlined well registration process, more efficient groundwater production reporting, and real-time monitoring of groundwater usage. On the District's end, the ability to access more accurate and advanced data means we can make more efficient assessments for management decisions within the District.

One of the priorities of the District was to task the Planning and Development Committee to collaborate with the District's consulting hydrogeologist to develop a hydrogeological assessment of

Aquifer Storage and Recovery and Aquifer Recharge within the District as required by an objective in the District's Management Plan. In December 2021, the assessment report was presented to the Board and approved as final. This project has resulted in creation of datasets that will help guide siting of ASR and AR projects which have the potential to improve groundwater supplies and quality within the District. Some additional projects on the horizon in 2022 include an assessment of the relationships between drought conditions, increased pumping, and the impacts of both on water levels and shallow wells in the aquifers in the District.

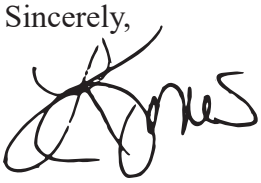
Another task accomplished in 2021 was the submission of adopted Desired Future Conditions to the Texas Water Development Board for Groundwater Management Area 8. The District held a public hearing on February 8, 2021, to receive public comment on the proposed DFCs, and on November 4, 2021, GMA 8 representatives met in a public meeting to adopt the DFCs and authorize the submission of the explanatory report to TWDB. These DFCs are the product of several years' worth of data, planning, and collaboration between neighboring GCDs within GMA 8.

In September 2021, Prairielands GCD Director Kent Smith announced his retirement after eagerly and faithfully serving the District since his appointment to the Board of Directors in 2017. His involvement on the District's Rules and Bylaws Committee helped guide the continued implementation of the District Rules well as identifying necessary amendments to ensure the District Rules allow for the best approach to managing and preserving groundwater resources. Director Smith also served as a member of the Planning and Development Committee, where his contributions and oversight helped to grow the District's well monitoring network and oversee hydrogeologic studies and projects. Director Smith proudly represented the communities and water resources of Hill County during his time on the Board of Directors, and his dedication to the District and its constituents will always be cherished. We want to thank Kent for his many years of service to this Board and wish him the very best in the years to come.

2021 also brought new faces to the Board of Directors and the staff members. Director Barney McClure of Cleburne joined the Board in May 2021 to represent Johnson County, and brings a background in education, legislative affairs, and a deep personal tie to the Cleburne area. Director Brad Daniels was appointed to the Board in September 2021 to represent Hill County. Director Daniels has provided valuable knowledge and insight to the District with his 32 years of experience in the water industry. The District also welcomed two new staff members to the office to fill the role of Comptroller and GIS Specialist. The year also saw continued achievements of the District's education and outreach initiatives, additional planning for growing the District's well monitoring program, and further implementation of the well permitting process.

Although 2021 continued to keep us on our toes, the dedication to managing and protecting our groundwater resources always remains a priority to the District staff, board, and consultants. I look forward to building on the achievements of 2021 and the opportunity to work with our communities, business leaders, and local and state officials on water conservation and supply matters in 2022.

Sincerely,



Kathy Turner Jones
General Manager

Mission Statement

The Mission of the Prairielands Groundwater Conservation District (“District’’) is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, insure that the residents of Ellis, Hill, Johnson, and Somervell Counties maintain local control over their groundwater, and operate the District in a fair and equitable manner for all residents of the District.

Brief District History

Prairielands Groundwater Conservation District was formed in response to a finding by the Texas Commission on Environmental Quality (TCEQ) that groundwater shortages were expected in Ellis, Hill, Johnson, and Somervell counties over the next 25 years. The TCEQ finding required local residents to create a groundwater conservation district, or else the TCEQ would mandate one, enabling legislation for the Prairielands GCD to be created in 2009 by the 81st Texas Legislature.

The Prairielands GCD is located in the north prairies of Texas, encompassing a four-county area. The District spans 2,870 square miles and overlays the Woodbine Aquifer and Trinity Aquifer.

District Creation

The Prairielands Groundwater Conservation District (“District”) was created by the 81st Texas Legislature under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 36 of the Texas Water Code (“Water Code”), by the Act of May 3rd, 2009, 81st Leg., R.S., Ch. 1208, 2009 Tex. Gen. Laws 3859, codified at TEX. SPEC. DIST. LOC. LAWS CODE ANN. Ch. 8855. (“The District Act”). The District is a governmental agency and a body politic and corporate. The District was formed to serve a public use and benefit and is essential to accomplish the objectives set forth in Section 59, Article XVI, of the Texas Constitution.

Board of Directors

The Prairielands Groundwater Conservation District's Board of Directors is composed of two members per county, appointed by the counties' Commissioners' Courts. The 2021 directors are:

President – Charles Beseda
Term Expires August 31, 2023
Represents Hill County

Vice-President – Randel Kirk
Term Expires August 31, 2025
Represents Ellis County

Secretary/Treasurer – Maurice Osborn
Term Expires August 31, 2023
Represents Ellis County

DIrector – Barney McClure
Term Expires August 31, 2023
Represents Johnson County

Director – John Curtis
Term Expires August 31, 2023
Represents Somervell County

Director – Kent Smith
Retired September 30, 2021
Represented Hill County

Director - Brad Daniels
Appointed October 1, 2021
Term Expires August 31, 2025
Represents Hill County

Director – Marty McPherson
Term Expires August 31, 2025
Represents Somervell County

Director – Paul Tischler
Term Expires August 31, 2025
Represents Johnson County

District Staff

Kathy Turner Jones
General Manager

Michael Heath
Field Operations Coordinator

Annette Kinney
Permitting Coordinator

Karol Bowers
Permitting Assistant

Kaylin Garcia
Office Assistant

Sinclaire Newby
Public Relations and Education Director

Brian Watts
Comptroller

Rusty Zent
Field Technician

Robert Spencer
GIS Specialist

Amendments to District Rules

The Board of Directors for Prairielands GCD held a public hearing on December 20, 2021 to adopt amendments to the District Rules regulating water wells within the boundaries of the District effective January 1, 2022. Over the months leading up to the meeting, the District staff and directors worked diligently to identify needed rules improvements in the course of implementing the District Rules that were adopted on December 17, 2018 and previously amended on October 21, 2019 and November 16, 2020. The Board's Rules and Bylaws Committee worked to develop recommended amendments to the District Rules to address such improvements.

Publication of the proposed amendments to the District Rules were made available to the public on November 30, 2021, and a public notice of a hearing on the consideration of adopting the amended rules was published in newspapers across the four-county district no less than 20 days prior to the public hearing. At the public hearing, which was held in person at the meeting room inside the District office in Cleburne, the Board considered any oral and written comments from the public on the proposed amendments to the District Rules, and after taking up and considering the proposed amendments to the District Rules, the Board adopted the amendments as presented.

The adopted amendments to the District Rules included requiring any well equipped with a variable frequency drive capable of being set in a manner that would allow the well to operate at a production capacity higher than authorized by the District to be equipped with a flow restrictor that mechanically restricts the production capacity of the well at the wellhead to the authorized amount. The deadline to drill, equip, complete, or substantially alter a well increased from one hundred twenty (120) days to one hundred eighty (180) days from the date of approval of the well registration or permit. The amendments also allow semiannual meter reading and water production reporting for small well owners that are not public water systems and that produce no more than 10,000,000 gallons annually, as well as eliminated the use of a geographic weighted centroid to calculate the minimum spacing distances from property lines and from existing wells and allows the general manager to approve exceptions to the minimum well spacing requirements in certain instances. Additionally, the amendments establish minimum spacing requirements between new small-capacity wells and existing wells and clarify spacing requirements for new large-capacity wells from existing wells on the same property and increase the required minimum tract size for a single domestic well serving two or more households.

Other amendments included establishing certain requirements for pump installers and well owners relating to equipping a well and clarifying requirements regarding well screening and completion based on the information provided in the approved application for a registration or permit. The amendments also clarify the calculation of contiguous controlled acreage for Operating Permits for retail public utilities based on the type of certificate of convenience and necessity (CCN) held by the retail public utility and amends the provisions in the District Rules relating to compliance orders. The amendments also establish a minimum threshold and other limitations for eligibility for the monthly water use fee payment option, amended the general manager's authority to enter into settlements for rules violations, establishes permitting requirements and increased fees for average system water loss by public water systems above certain percentages to prevent waste and promote water conservation, any temporary transitional rules provisions that have expired were eliminated, and other non-substantive clarifying and conforming changes. The adopted amendments to the District Rules are necessary to support the District's efforts in managing the groundwater resources within the boundaries of the District. Information about the public hearing and copies of the amended District Rules are available on the District's website at www.prairielandsgcd.org, and physical copies can be obtained by visiting the District office at 208 Kimberly Drive in Cleburne.

Management Plan Objectives, Performance Standards, and Annual Activity Report

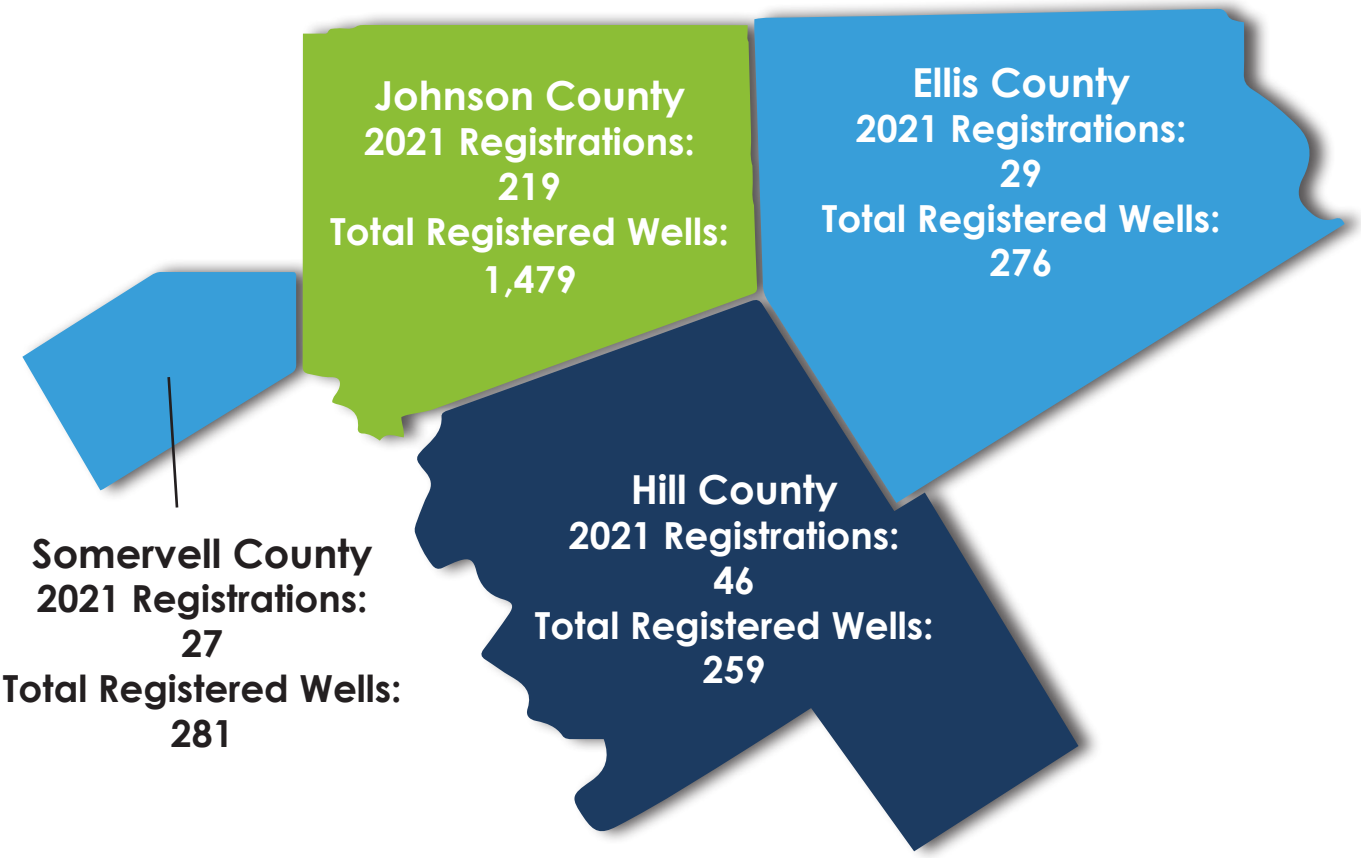
Providing the Most Efficient Use of Groundwater

Well Registration

A.1. Management Objective: *The District will require that all wells be registered in accordance with its rules.*

Performance Standard: *Each year the staff will report well registration statistics. A summary of registration activity by county and aquifer will be included in the District's Annual Report.*

By December 31, 2021, a total of 321 additional wells were registered with the District in 2021, bringing the total number of registered wells to 2,295 at the end of the year. Of the new registrations, there were 250 new wells and 71 existing wells. These 2021 well registrations were comprised of 251 exempt wells, 10 non-exempt wells, 59 inactive wells, and one plugged well.



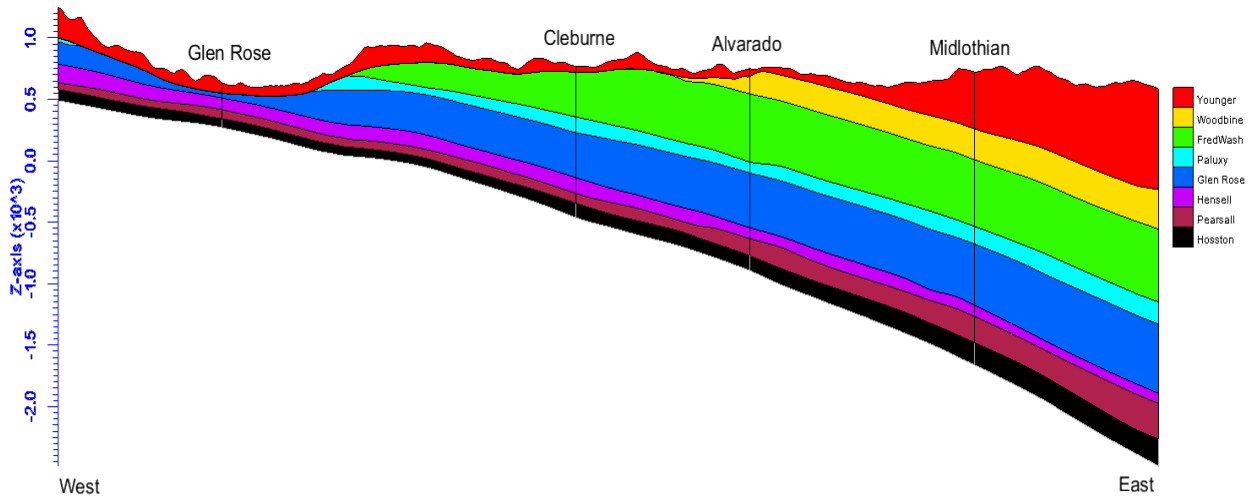


Figure 1. West to East Cross Section Stratigraphy Map of the District

Stratigraphy map provided by Aquaveo, 2018

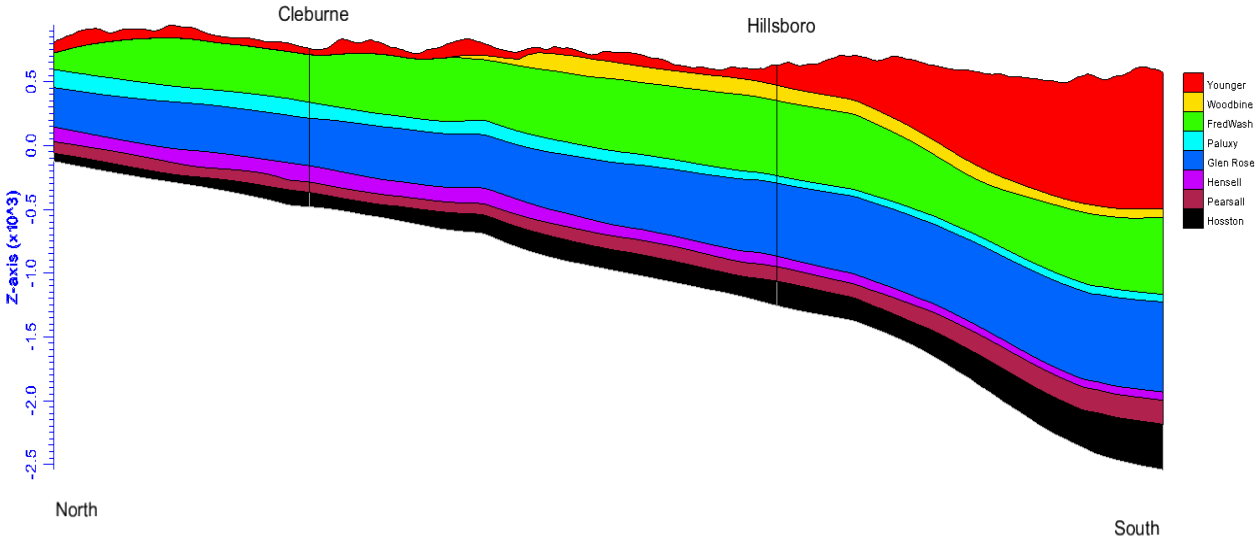


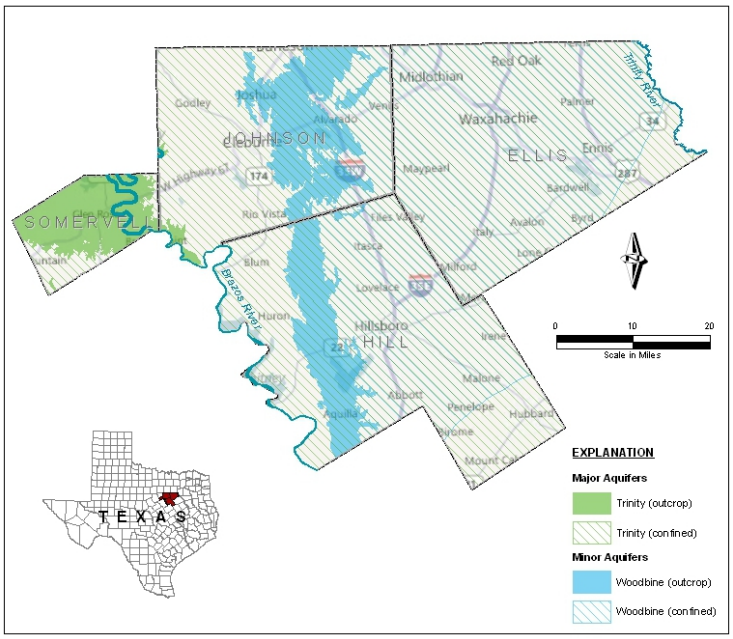
Figure 2. North to South Cross Section Stratigraphy Map of the District

Stratigraphy map provided by Aquaveo, 2018

Well Registrations by Aquifer

To register wells by aquifer formation, the District used data from the update of the Northern Trinity/Woodbine Groundwater Availability Model (NTWGAM). The District uses the data in its online registration and reporting geo-database to apply aquifer formations to registered wells based on location, depth, and screen interval. Many wells, however, are screened across multiple formations in the Trinity aquifer. For this report, the layer with largest percentage of the screened area was chosen for those wells. The breakdown of wells with available screen interval data registered in 2021 by stratigraphy is as follows:

Younger aquifers – 7 · Ellis County – 3 · Johnson County – 2 · Somervell County – 2	**Woodbine Aquifer** – 46 · Ellis County – 16 · Hill County – 5 · Johnson County – 25
Washita/Fredericksburg Group – 64 · Ellis County – 4 · Hill County – 8 · Johnson County – 52	**Paluxy Aquifer** – 53 · Hill County – 13 · Johnson County – 39 · Somervell County – 1
Glen Rose Formation – 38 · Hill County – 2 · Johnson County – 36	**Hensell Aquifer** – 7 · Ellis County – 1 · Johnson County – 5 · Somervell County – 1
Pearsall Formation – 0	**Hosston Formation** – 29 · Ellis County – 1 · Hill County – 1 · Johnson County – 10 · Somervell County – 17



Installation of Meters and Annual Production of Groundwater from Non-Exempt Wells

A.2. - Management Objective: *Each year the District will monitor annual production from all non-exempt wells within the District. The District will compile records and develop a database of non-exempt wells to help assess the aquifer units from which groundwater production occurs.*

Performance Standard: *The District will require installation of meters on all non-exempt wells and reporting of production to the District.*

The District's Rules require all non-exempt well owners to install and maintain accurate water meters on their wells. Based upon the meter readings, the Rules further require well owners to record the amount of groundwater produced from their wells and to report the amount of groundwater production to the District on a monthly basis. Beginning in 2019, the District required all non-exempt wells to either hold an Operating Permit or a Historic Use Permit to help regulate groundwater usage.

A.3. - Management Objective: *The District will compile records and develop a database of non-exempt wells to help assess in which aquifer units groundwater production occurs.*

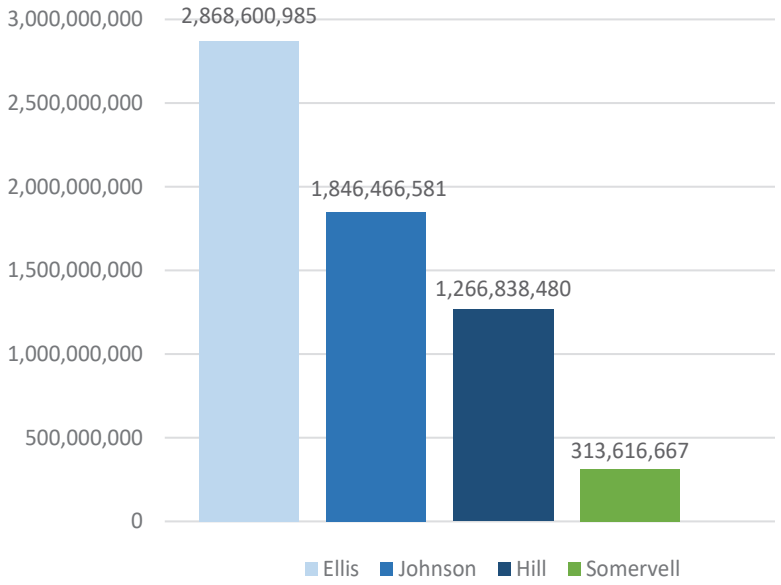
Performance Standard: *The District will require installation of meters on all non-exempt wells and reporting of production to the District. The annual production of groundwater from non-exempt wells will be included in the Annual Report provided to the Board of Directors.*

In 2021, the District launched a new and improved Groundwater Management System that houses all well and water usage information. This extensive database is used by the District to classify wells as exempt/non-exempt, verify coordinates of well locations, input/verify meter readings, easily assess the quantity of water pumped by county, aquifer, well owner, or use, locate wells, and approve new well registration applications. It is also available to well drillers and well owners to apply for new wells or report meter readings, and to pay for their non-exempt water usage. Not only can non-exempt well owners report their meter readings, but they have 24/7 access to their meter readings archive, past water use fee orders, and driller's reports. Furthermore, they have access to a change-meter tool in situations in which their meter is malfunctioning. This improves accuracy of the readings without having to contact the office.

District Non-Exempt Well Production

Non-exempt well owners in the District reported that they pumped a total of 6,295,522,713 gallons of groundwater in 2021. Owners in Ellis County pumped the most of the four counties followed by Johnson, Hill, and Somervell. Compared to 2020 production totals, Ellis County and Johnson County both showed a reduction in groundwater production, while Hill and Somervell Counties indicated an increase in groundwater production.

2021 Water Use by County (Gallons)



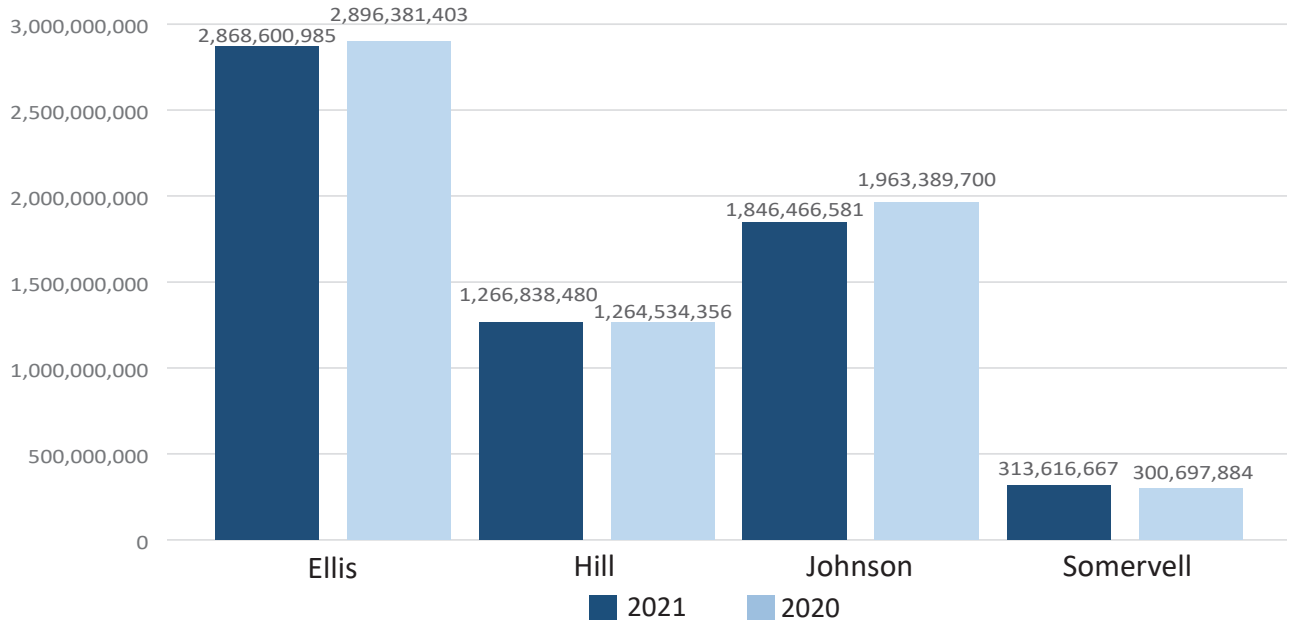
2021 Permitted Amount:

9,171,742,140 gallons

2021 Actual Amount Produced:

6,295,522,713 gallons

2021 vs 2020 Annual Water Usage by County (Gallons)



District Water User Groups

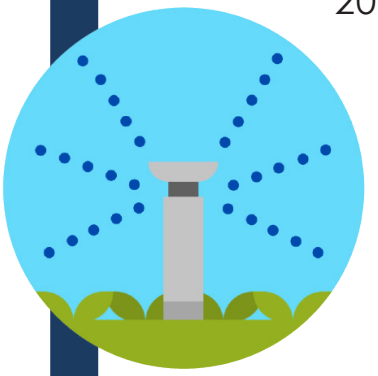
Most of the groundwater used in the District is for municipal/public water supply systems with a reported 5,368,614,712 gallons pumped in 2021. The industrial/manufacturing sector reported the second greatest usage at 761,156,900 gallons. There was a reduction in groundwater production amounts for all user groups except for non-agricultural irrigation.

Municipal/Public Water Supply
2021 Usage: 5,368,614,712 gal
2020 Usage: 5,407,620,809 gal

Industrial/Manufacturing
2021 Usage: 761,156,900 gal
2020 Usage: 844,010,037 gal

Filling a Pond or Surface Impoundment
2021 Usage: 78,034,655 gal
2020 Usage: 81,433,073 gal

Commercial/Small Business
2021 Usage: 47,350,033 gal
2020 Usage: 49,948,627 gal



Non-Agricultural Irrigation
2021 Usage: 38,540,776 gal
2020 Usage: 37,722,600 gal

Oil & Gas Production
2021 Usage: 1,825,637 gal
2020 Usage: 4,268,197 gal

2021 Water User Group Pumping Amounts by County

Ellis County
Commercial/Small Business: 2,634,207 gal
Filling a Pond or Surface Impoundment: 10,649,129 gal
Non-Agricultural Irrigation: 13,039,676 gal
Industrial/Manufacturing: 591,316,660 gal
Municipal/Public Water Supply: 2,250,961,313 gal

Hill County
Filling a Pond or Surface Impoundment: 1,954,200 gal
Municipal/Public Water Supply: 1,264,884,280 gal

Johnson County
Commercial/Small Business: 2,520,200 gal
Filling a Pond or Surface Impoundment: 63,469,640 gal
Non-Agricultural Irrigation: 25,501,100 gal
Industrial/Manufacturing: 34,256,300 gal
Municipal/Public Water Supply: 1,718,970,144 gal
Oil & Gas Production: 1,749,197 gal

Somervell County
Commercial/Small Business: 42,195,626 gal
Filling a Pond or Surface Impoundment: 1,961,686 gal
Industrial/Manufacturing: 135,583,940 gal
Municipal/Public Water Supply: 133,798,575 gal
Oil & Gas Production: 74,440 gal

Methodology to Determine Production from Exempt Wells

A.4. - Management Objective: *The District will develop a methodology to quantify current and projected annual groundwater production from exempt wells.*

Performance Standard: *The District will provide the TWDB with its methodology and estimates of current and projected annual groundwater production from exempt wells. The District will also utilize the information in the future in developing and achieving desired future conditions and in developing and implementing its production allocation and permitting system and rules. Information related to implementation of this objective will be included in the Annual Report to the Board of Directors.*

The District utilizes the same methodology and estimates of current and projected annual groundwater production from District-defined exempt wells as was used in the TWDB-adopted Northern Trinity/ Woodbine Groundwater Availability Model ("NTWGAM"). This methodology is consistent with that used by the TWDB, and based on projected changes in population and the distribution of domestic and livestock wells in the area using census block data to estimate population distribution.

In the NTWGAM, estimates of rural domestic pumping were developed using census block data from 1990, 2000, and 2010, total population data for 1980 to 2010, and an assumed per capita water use. Historically, the TWDB has provided this data in support of estimating rural domestic pumping for GAM models. This coverage includes an identifier in each census block that indicates whether the population in the block represents an urban or rural population. The rural domestic pumping for each county was then calculated as the rural population times an assumed per capita use of 110 gallons per day. The calculations of rural domestic pumping for 1980 through 2010 assumed that all water used for rural domestic purposes was supplied by shallow groundwater wells located in the outcrop of the northern Trinity, Woodbine, or Edwards BFZ aquifers or the combined outcrop of the Washita/Fredericksburg groups (excluding the Edwards BFZ Aquifer) that lies between the northern Trinity and Woodbine aquifer outcrops. In addition, TWDB and Texas Department of Licensing and Regulation ("TDLR") well and geospatial land use databases are utilized in determining spatial distribution of exempt water use.

Controlling and Preventing Waste of Groundwater

Metering, Reporting, Usage Fees, and Compliance Monitoring

B.1. - Management Objective: *Each year the District will monitor annual production from all non-exempt wells within the District.*

Performance Standard: *The District will require installation of meters on all non-exempt wells and reporting of production to the District. The annual production of groundwater from non-exempt wells will be included in the Annual Report provided to the Board of Directors.*

The District requires all non-exempt wells to have meters installed and maintained on each wellhead. The District Rules require well owners to record the amount of groundwater produced from their wells and to report the amount of groundwater production to the District on a monthly basis. In accordance with Resolution No #21-001, and later as adopted in the District Rule amendments, a non-exempt well owner or operator who is not a public water system and does not exceed ten million gallons of groundwater per year may apply and receive approval from the District to take meter readings and submit Water Production Reports to the District semiannually. As of the end of 2021, there were only two of these small volume non-exempt users who reported semiannually.

B.2. - Management Objective: *The District will encourage the elimination and reduction of groundwater waste through the collection of a water use fee for non-exempt wells within the District.*

Performance Standard: *Annual reporting of total groundwater used and total water use fees paid by non-exempt wells will be included in the Annual Report provided to the Board of Directors.*

In 2021, Prairielands GCD encouraged elimination and reduction of groundwater waste by collecting water use fees for non-exempt wells, identifying and investigating compliance issues, and looking for instances of potential waste of groundwater. The District charges a water use fee rate of $0.20 per 1,000 gallons for non-exempt usage. There is an additional $0.10 per 1,000 gallons for transporting groundwater out of the District. The District collected an estimated pre-audit total of $1,929,335 in water use fees in 2021.

Groundwater produced from non-exempt wells in 2021:

6,295,522,713 gallons

B.3. - Management Objective: *The District will identify well owners that are not in compliance with District well registration, reporting, and fee payment requirements and bring them into compliance.*

Performance Standard: *The District will compare existing state records and field staff observations with the well registration database to identify noncompliant well owners.*

There were twelve compliance issues encountered in 2021, five of which were for failure to pay water use fees on time. There was one instance of a non-exempt well which was required to register and obtain a permit. Six cases were related to exceeding authorized production amounts for 2021. All cases of compliance issues related to fee payment and registrations were resolved amicably, and the cases of overpumpage for 2021 aim to be resolved by the end of the first quarter of 2022.

B.4. - Management Objective: *The District will investigate instances of potential waste of groundwater.*

Performance Standard: *Report to the Board as needed and include the number of investigations in the Annual Report.*

During 2021, the District did not encounter any instances of needing to investigate potential groundwater waste.

Addressing Conjunctive Surface Water Management Issues

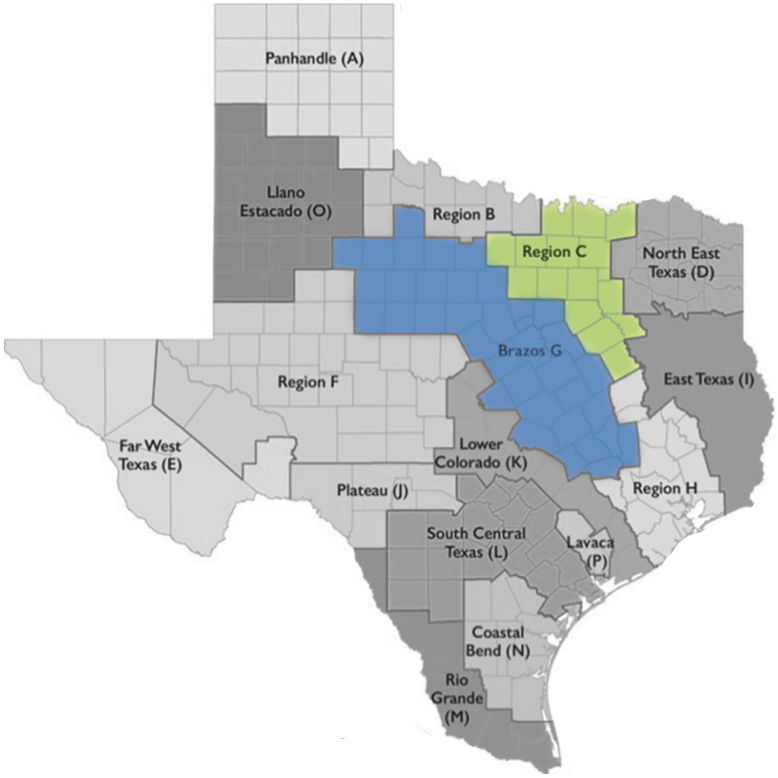
State and Regional Water Planning Review and Participation

C.1. - Management Objective: *The District will actively participate in the Region C and Region G regional water planning processes to stay abreast of water demand projects and supply strategies in the District and to coordinate the District's groundwater management strategies with the regional water planning groups and foster an understanding of regional management practices.*

Performance Standard: *The District will review the most recently approved State Water Plan to gain an understanding of water demand projections and supply strategies in the District. The District will monitor future proposed amendments to the Region C and Region G regional water plans as they pertain to the District and ensure that supply strategies impacting groundwater resources in the District are identified in the appropriate regional water plan. The District's General Manager or designated representative will attend meetings of the Region C and Region G regional water planning groups when feasible. A summary of the District's interactions with the regional water planning groups will be included in the Annual Report provided to the Board of Directors.*

The Board of Directors, General Manager, and District staff strive to stay informed on any matters related to groundwater supply in Ellis, Hill, Somervell and Johnson counties. Critical sources of pertinent information include familiarity and understanding of regional and state water plans. The Board President and General Manager continued to stay abreast of proposed amendments to the Region C and G regional water plans so that supply strategies impacting groundwater resources in the District were properly identified.

The General Manager participated in Brazos G Regional Water Planning Group meetings on March 3, June 23, and September 29. During the March 3, 2021 meeting, the District's General Manager, Kathy Turner Jones, was also appointed appointed by the Executive Committee of the Brazos G Regional Water Planning Group to represent Water District Interests. The District's Board President participated in the Brazos G meeting on September 29. Region C held a meeting on August 2, 2021.



In July 2021, the Texas Water Development Board adopted the 2022 State Water Plan. The regional water plans serve as the cornerstone of the State Water Plan and address the needs of all water user groups in the state. The 2022 State Water Plan is the 11th state water plan and the fifth plan based on the regional water planning process. Regional water planning groups develop plans that serve the entire region, taking into consideration all the water needs of area communities.

C.2. - Management Objective: *The District will: 1) seek to better understand groundwater and surface water interactions, including groundwater base flow discharges to surface water courses and aquifer recharge from surface water flows; 2) identify existing and planned surface water and other alternative supplies to meet anticipated demand growth; 3) explore possible groundwater to surface water conversions in the District and facilitate the process, and 4) understand current and planned surface water supplies and how they affect groundwater demands.*

Performance Standard: *A summary of the progress and interaction with RWPGs will be included in each Annual Report.*

The District's interactions with the RWPGs not only included participation in meetings but coordination with the groups to keep them up-to-date on groundwater-related activities in Ellis, Johnson, Hill and Somervell counties as well. The District's groundwater regulations directly impact the planning activities of the RWPGs, so the District works collaboratively with the RWPGs and it's consultant team to incorporate the District's groundwater management goals into the regional water planning process.

Injection Wells and Oil and Gas Compliance

D.1. - Management Objective: *The District will develop a program to monitor and assess injection well activities in the District.*

Performance Standard: *The District will monitor and review injection well applications filed with the Railroad Commission of Texas and the Texas Commission on Environmental Quality that propose injection wells to be located within the boundaries of the District to identify contamination threats to groundwater resources in the District. The General Manager will bring to the attention of the Board any applications that the General Manager determines in their discretion threaten the groundwater resources in the District, and any outcomes of actions taken by the District will be included in each Annual Report.*

In 2021, Prairielands GCD addressed natural resource issues that impacted the use and availability of groundwater and which are impacted using groundwater. District activities fell into three categories:

1. Monitoring and assessing injection well activities in the District;
2. Monitoring compliance by oil and gas companies with District registration, metering, production
   reporting, and fee payment requirements; and
3. Participating in interim activities prior to the 87th Session of the Texas Legislature.

The District utilizes an effective Underground Injection Control ("UIC") monitoring program that included the review of all applications for injection wells proposed to be located within the District's boundaries to ensure injection well activities do not endanger groundwater resources. In June the District received notice from TCEQ regarding their receipt of an UIC permit application filed by Republic Industrial and Energy Solutions, LLC for a new Class I Injection well to be located in Hill County to dispose/inject municipal landfill leachate and Class 1 and 2 industrial wastewaters. The application was forwarded to District's legal counsel and submitted to the District's UIC technical consultant to perform an in-depth technical review of the application to determine whether the proposed injection well is a possible source of contamination of protected groundwater resources.

The District received notice on September 2, 2021 from the TCEQ stating the application had been deemed administratively complete by the TCEQ Executive Director and that a technical review of the application would be conducted. After the technical review is completed, notice will be sent back to the District, and there will be a 30-day window to provide comment. In the event the District does want to provide comment, the District's legal counsel will seek authorization from the District to submit comment(s) on behalf of the District. The District seeks to work with injection well applicants to modify or abandon the application in a manner that ensures that groundwater resources are adequately protected.

D.2. - Management Objective: *The District will monitor compliance by oil and gas companies of the well registration, metering, production reporting, and fee payment requirements of the District's rules.*

Performance Standard: *As with other types of wells, instances of non-compliance by owners and operators of water wells for oil and gas activities will be reported to the Board of Directors as appropriate for enforcement action. A summary of such enforcement activities will be included in the Annual Report.*

The oil and gas companies have continued to comply with the well registration, metering, production reporting, and fee payment requirements of the District's rules. In 2021, with the contiuation of the District's new permitting program, the oil and gas companies have generally complied with the requirements of the District Rules to the best of the District's knowledge. Only three enforcement actions were initatied in 2021 for three seperate oil and gas companies who had either failed to report and/or pay water use fees. All three enforcement cases were resolved amicably and were closed prior to the end of 2021.

Addressing Drought Conditions

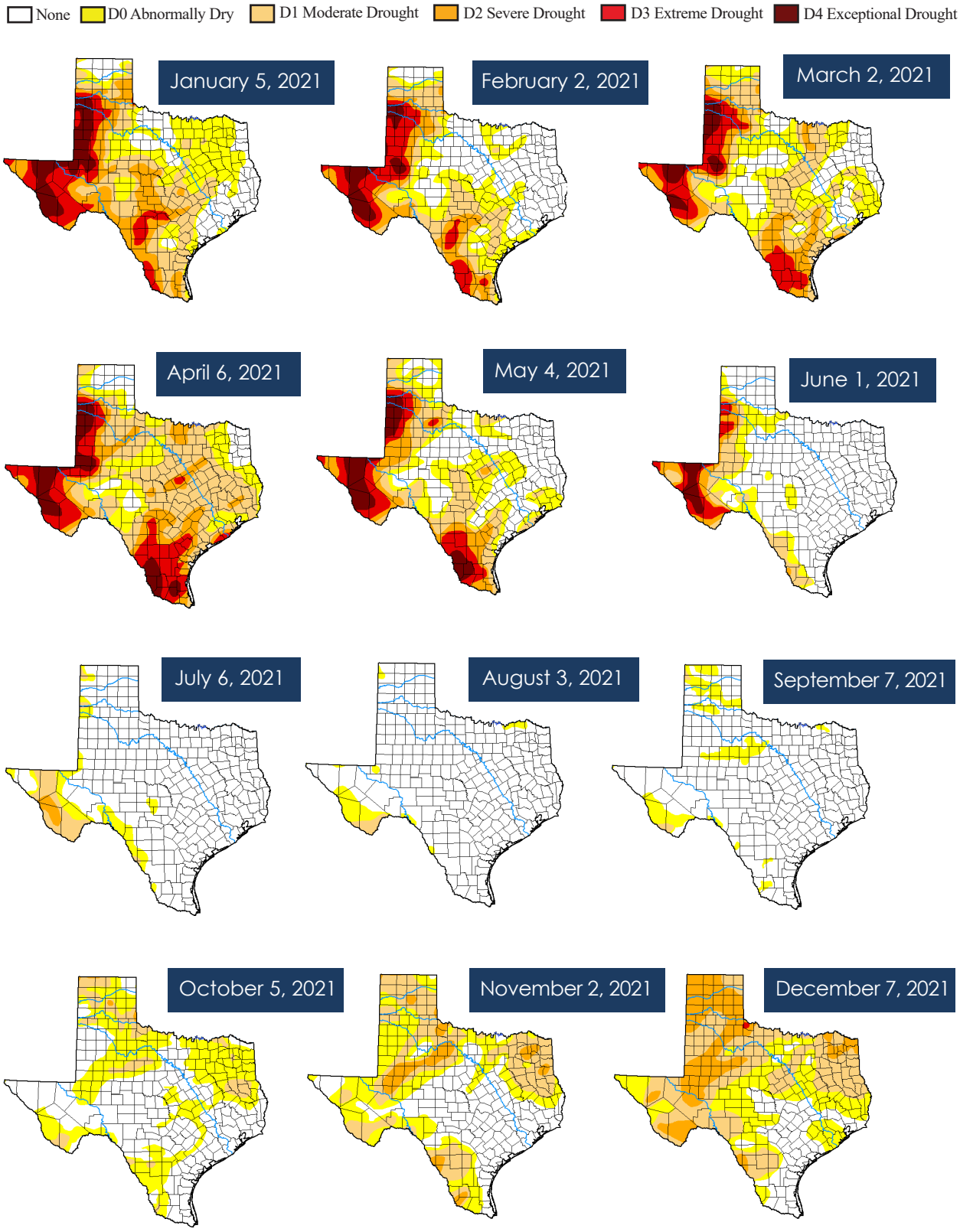
Drought Conditions and Monitors

E.1. - Management Objective: *Monthly review of drought conditions within the District using the Texas Water Development Board's Monthly Drought Conditions.*

Performance Standard: *An annual review of drought conditions within the District will be included in the Annual Report provided to the Board of Directors. Reports will be provided more frequently to the Board as deemed appropriate by the General Manager to timely respond to drought conditions as they occur.*

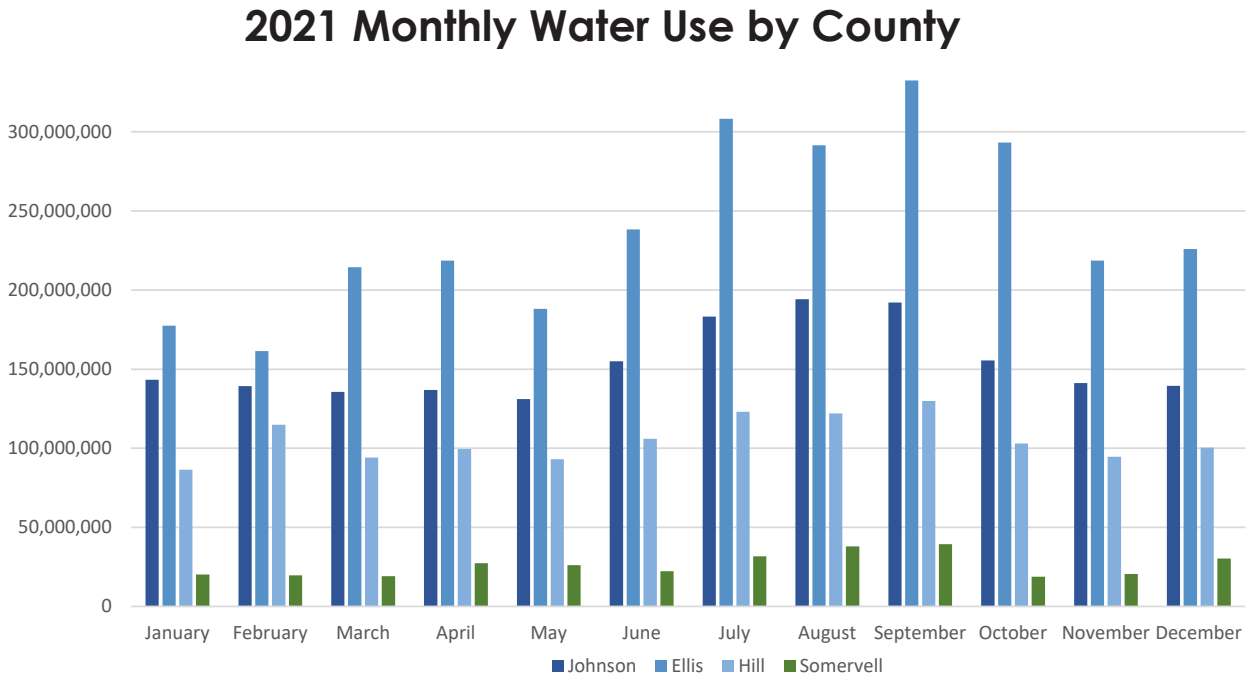
Throughout 2021, Prairielands staff provided U.S. Drought Monitors for Texas and water usage reports to the Board of Directors during each month's Regular Board Meeting. The Board and staff are kept up to date on drought conditions not only in the District, but also in the state of Texas and southern region of the United States. The following page includes examples of the monthly Texas Drought Monitor Maps that are used by the District for addressing drought conditions.

2021 Monthly Texas Drought Monitor Maps



https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

The monitors and usage reports were compared periodically to look for any correlation between the drought conditions and pumping amounts within the District. In the monthly drought maps shown on the previous page, the significant periods of drought within the District were indicated during the first five months of 2021 and then again in October through December. In the graph of monthly water use by each county below, pumping amounts follow seasonal trends in water demand, with less water being pumped in the first and fourth five months of the year and more withdrawn in the summer months where there were not drought conditions present within the District. The District will continue to study the correlation between drought conditions, pumping, and aquifer levels and develop appropriate drought pumping restrictions or over-pumping allowables by the end of calendar year 2022.



E.2. - Management Objective: *The District will develop information to understand the relationships between drought conditions, increased pumping, and the impacts of both on water levels and shallow wells in the outcrops and subcrops of the aquifer subdivisions in the District. The District will also determine areas where it may be suitable for the District to implement pumping restrictions during drought times in order to protect public safety and welfare, as well as areas in which the District may wish to allow overpumping during drought periods to promote conjunctive management when surface water supplies become unavailable to water user groups due to drought conditions.*

Performance Standard: *The District will monitor and assess drought impacts on aquifer outcrops and subcrops, including effects of increased pumping. By 2022, the District will complete studies and rules and regulatory plan development for drought pumping restrictions or over-pumping allowables.*

In 2021, the District began planning for the drought evaluation to be completed by the end of 2022. The first step in the plan is to review the impacts of the 2011 drought in order: (1) to better understand how the drought impacted groundwater levels within the District, and (2) to determine what specific challenges water user groups faced during the drought. The appropriate drought management strategy will be the approach that balances the two competing priorities during drought, that is to meet water needs and to protect the aquifer. The results from the 2011 drought review will help find the balance between these priorities and help inform the District's strategy during future droughts.

Conservation and Public Awareness Articles

F.1. - Management Objective: *The District will annually submit at least one article regarding water conservation, rainwater harvesting, or brush control for publication to at least one newspaper of general circulation in the District counties.*

Performance Standard: *Each year, a copy of each conservation article will be included in the District's Annual Report to be given to the District's Board of Directors.*

Press releases of various District activities were sent to newspapers in all four counties throughout the year: Cleburne Times-Review, Glen Rose Reporter, Hillsboro Reporter, Ellis County Press and the Waxahachie Daily Light. A copy of conservation-related articles are included in the following pages.

Press Release #1: An overview of the Texas Water Development Board's Water Loss, Use and Conservation workshop program and free leak detection equipment available to water utility providers. This article aimed to promote awareness of resources available to non-exempt well owners that would allow for positive stewardship of water resources while sustaining revenues.

Press Release #2: An educational article promoting water conservation and efficiency for springtime in Texas. Outdoor water can constitute a large portion of overall residential water use, so wise landscape watering is an important area to promote conservation. The key to watering the Texas landscape wisely is threefold: 1) Choose plants adaptive to conditions in your area of the state; 2) Measure the amount of water needed to irrigate your landscape; 3) Use the right tools and methods to deliver the optimal amount of water.

Press Release #3: An article promoting the celebration of Smart Irrigation Month by helping local residents identify ways they can conserve water, save money and see better irrigation results during the peak of summer. Smart Irrigation Month is a public awareness campaign led by the Irrigation Association, a nonprofit industry organization dedicated to promoting efficient irrigation. Focused on July, traditionally the month of peak demand for outdoor water use, the campaign highlights simple practices and innovative technologies to make maintaining green spaces easy and convenient and minimizing overwatering while keeping lawns, gardens and landscapes beautiful and healthy.

In additon to submitting the following articles, the District also continued with its digital and social media initiative in 2021 with the the District's Facebook, Twitter, and LinkedIn profiles and utilizing email campaign software to distribute e-blasts to non-exempt and exempt well owners, elected officials, business owners, educators, and media contacts and anyone in the public who had requested to receive them. The content in these social and digital media posts include conservation tips, groundwater awareness, important meetings or events in the District, education event information, and general information about the District. These approaches provide an excellent resource for distributing educational materials, sharing important news and information, and building identity and recognition among the public.

Press Release #1

PGCD
PRAIRIELANDS GROUNDWATER CONSERVATION DISTRICT
JOHNSON • ELLIS • HILL • SOMERVELL

Navigating Losses and Leaks: Resources to Help Maximize Revenue and Minimize Water Loss

March 19, 2021 – For Immediate Release

Did you know the Texas Water Development Board provides resources for public retail water systems to help make the most of their water loss audit, reduce and repair leaks, and conserve water? Even with the warmer weather we have experienced lately, many of us are still feeling the aftershock of Winter Storm Uri a month later. We at Prairielands GCD know the public retail water systems have been working diligently since the "snowpocalypse" to continue providing safe and reliable water to their customers, all while potentially dealing with damages incurred due to the unprecedented freeze. The good news is there are resources available for these kinds of situations, and we wanted to ensure you were aware of these opportunities provided by TWDB to help mitigate water loss and sustain revenues.

Water Loss, Use and Conservation Workshops
The word "audit" can bring with it many different feelings, but when it comes to your water loss audit, here are some upcoming resources to help make sure those feelings are of preparedness rather than panic. TWDB will be conducting two training webinars based on the water use survey, water loss audit, and water conservation reports as part of their Water Loss, Use and Conservation (WLUC) workshop program from 8:00 a.m. to 12:00 p.m. (noon), Thursday, April 8 and Thursday, April 22. The WLUC workshops will look at water loss from a water stewardship perspective, and review topics such as public utility revenue loss, collecting and reporting accurate data, assessing, auditing, and data validation.

Free Leak Detection Equipment
Knowing there is a leak is one thing, but locating it can sometimes be tricky, especially with large systems. As a conservation initiative, TWDB loans acoustical leak detection and ultrasonic flow meter testing equipment to help assist utilities identify leaks and determine flow rates. This program is designed to aid utilities in reducing water loss by locating leaks within the distribution system and verifying flow rates from production meters. The equipment ranks among the industry's best current technology and can filter out unwanted sound frequencies that would otherwise prevent you from pinpointing the leaks. This equipment can be borrowed for 30-days and as many times as necessary throughout the year. The equipment is free to borrow, the utilities only cost is to prepay for return shipping. For more information on the resources listed above, please visit www.twdb.texas.gov/conservation/resources/waterloss-resources.asp.

Press Release #2

PGCD
PRAIRIELANDS GROUNDWATER CONSERVATION DISTRICT
JOHNSON • ELLIS • HILL • SOMERVELL

The Top Three Outdoor Water Conservation Tips You Need to Know This Spring

April 26, 2021 - For Immediate Release

Because Texas enjoys a vibrant economy and continued population growth, ensuring we have enough water for current and future Texans remains a top priority in the state. Fortunately, all Texans can play a role in conserving water. Outdoor water can constitute a large portion of overall residential water use, so wise landscape watering is an important place to start. The key to watering the Texas landscape wisely is threefold: 1) Choose plants adaptive to conditions in your area of the state; 2) Measure the amount of water needed to irrigate your landscape; 3) Use the right tools and methods to deliver the optimal amount of water. The Prairielands Groundwater Conservation District is pleased to provide these important tips for watering your yard and plants to get them green, healthy, and thriving while conserving water this spring and summer.

Choose Native Plants

Native and adapted plants are the ideal choice for an aesthetically pleasing and water efficient landscapes in Texas. Whether you are interested in well-manicured looks or a more naturalistic landscape design, there are several native and adapted plants with various structures, textures and colors to meet your needs and to help save time and money. Some of the characteristics that lead Texans to incorporate native or adapted plants include their tolerance for drought and heat, water efficiency, and low pesticide and fertilizer requirements. Vitex, lantana, and red yucca are just a few of the native plants that have low water demands and also provide a gorgeous pop of color to your landscaping. An added bonus is they can also attract bees and butterflies as well.

Calculate Your Watering Needs

Once you've chosen plants well suited to your area, how do you know when and how much to water your landscape? Healthy, properly irrigated lawns rarely need more than one inch of water per week during the summer months. The best time to water all landscape plant material is early morning or late evening when winds are calmer and temperatures are lower, resulting in less water loss to evaporation. A good rule is to wet the soil to a depth of 4 to 6 inches to reach the root system of the plants. Deep, infrequent watering helps

plants thrive by promoting deep roots, which helps plants to absorb water from the deeper soil over a longer period of time. Use a soil moisture probe or screwdriver to determine the depth the water reaches. Soil type, amount of rainfall, and season of the year all affect the amount of water you need to apply.

Irrigate Efficiently

After you've made your selection of plants and determined the schedule for watering based on their needs, the next important decision is to select the appropriate way to water your landscaping. One of the most important ways you can help conserve water outdoors is to know the most efficient approaches to applying water to your lawn, flowerbeds, trees and shrubs. Here are three of the most common lawn and garden irrigation methods:

• Sprinklers

These systems are popular because they are convenient and supply large areas of a landscape with plenty of water. With careful timing of zone watering and proper selection of spray nozzles, these systems can be adjusted to water in a reasonably efficient manner. Monitor the zone settings and adjust throughout the year to meet changing weather conditions and landscape needs. If settings are not monitored and changed, at some time during the growth season a landscape will be either under or over watered.

• Drip Irrigation

Drip irrigation systems are very efficient (use up to 60% less water) at supplying water to smaller areas of a landscape. Drip irrigation places a small amount of water (and, as an option, nutrients) close to the roots. The simplest and least expensive example of drip irrigation is the use of soaker hoses. These are especially useful in flower beds and around trees. They can also be placed next to the house to stabilize soil next to the foundation.

• Hand Watering

Hand watering means using a combination of hose-end yard sprinklers that have to be moved and the use of a handheld hose, or even using a watering can. For most applications, the first thing to consider is using a sprinkler or spray nozzle that does not produce a fine mist. Fine mist evaporates more quickly and is easily blown out of the area you want to water. Hand watering plants allows you to precisely apply water where it is needed, and control how much is being applied. This is a good option for outdoor potted plants and hanging baskets.

Choosing native plants, assessing water needs, and applying water efficiently will have you on the right path to setting your lawn and garden up for success this spring. If we cultivate good watering habits just as we cultivate our gardens, we can use water to sustain our plants and promote healthy growth while conserving supplies for future use. To learn about more ways to conserve water, please visit www.prairielandsgcd.org.

Press Release #3

Save Money and Water During Smart Irrigation Month

June 28, 2021 – For Immediate Release

Prairielands Groundwater Conservation District (PGCD) is celebrating Smart Irrigation Month by helping local residents identify ways they can conserve water, save money and see better irrigation results during the peak of summer.

Smart Irrigation Month is a public awareness campaign led by the Irrigation Association, a nonprofit industry organization dedicated to promoting efficient irrigation. Focused on July, traditionally the month of peak demand for outdoor water use, the campaign highlights simple practices and innovative technologies to make maintaining green spaces easy and convenient and minimizing overwatering while keeping lawns, gardens and landscapes beautiful and healthy. These approaches will also allow you to save money on utility bills and help protect community water supplies for today and the future.

To conserve water and utilize more efficient watering practices, PGCD recommends residents plant and maintain landscapes using native and adapted plants that will thrive in the Texas climate and require less water. It is also recommended to water early in the morning or later in the evening when the likelihood of losing water to evaporation is lower. Take the time to inspect your sprinkler systems and hoses for any repairs that may need to be made to fix and prevent leaks. You can also install new irrigation systems that use real-time weather data and soil moisture sensors to automatically adjust watering to meet plant needs, as well as retrofitting existing systems with rain sensors that prevent watering in rainy weather. PGCD also encourages the use of rainwater harvesting systems to capture and store rainwater for outdoor use on lawns, landscaping, and gardens.

The Prairielands Groundwater Conservation District was created in 2009 by the 81st Texas Legislature with a directive to conserve, protect and enhance the groundwater resources of Ellis, Johnson, Hill and Somervell Counties in Texas. For more information and resources about how you can conserve water indoors and outdoors, visit www.prairielandsgcd.org.

F.2. – Management Objective: *Each year, the District will include at least one informative flier on water conservation, rain water harvesting, or brush control within at least one mail out to groundwater non-exempt users distributed in the normal course of business for the District. The District will also consider additional fliers or initiating other public awareness campaigns and outreach efforts on water conservation during drought conditions.*

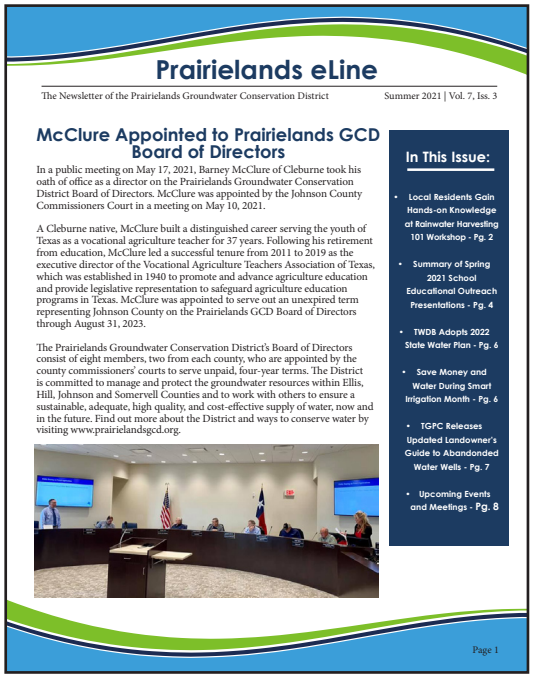
Performance Standard: *Each year, a copy of each mail-out flier and a summary of all other public awareness water conservation campaigns and outreach efforts will be included in the District's Annual Report to be given to the District's Board of Directors.*

A flier detailing the Texas Water Development Board's free leak detection equipment program and their water loss, use, and conservation workshops was mailed to non-exempt well owners on March 19, 2021. Not only was this information generally important for water utility providers to help identify leaks and conserve water, but this information was distributed approximately a month following the severe Winter Storm Uri which caused damage and leaks for many systems. The District wanted to ensure that these well owners were aware of these resources to help mitigate water loss and conserve water. The District also develops and produces its own quarterly newsletter, the Prairielands eLine, that is distributed in print and electronically and made available to the public in the District's office. Water conservation topics and other items covered in the Prairielands eLine issues in 2021 included the following:

Winter 2021
- Winter Weather Watering Tips
- PGCD Recognized as 4-H Water Ambassador Sponsor
- TWDB Water Loss Audit Allows Utility Providers to Conserve Water and Increase Revenues

Spring 2021
- Tips to Conserve Water Outdoors This Spring
- Six Simple Steps to Report Meter Readings
- PGCD Launches TexMesonet Data Page on Website
- Resources to Help Maximize Revenue and Minimize Water Loss
- Texas Well Owner Network "Well Educated" Workshop Scheduled for June 8, 2021

Summer 2021
- Local Residents Gain Hands-on Knowledge at Rainwater Harvesting 101 Workshop
- Summary of Spring 2021 School Presentations
- TWDB Adopts 2022 State Water Plan
- Save Money and Water During Smart Irrigation Month
- Texas Groundwater Protection Committee Releases Updated Landowner's Guide to Abandoned Water Wells



Prairielands eLine

The Newsletter of the Prairielands Groundwater Conservation District — Summer 2021 | Vol. 7, Iss. 3

McClure Appointed to Prairielands GCD Board of Directors

In a public meeting on May 17, 2021, Barney McClure of Cleburne took his oath of office as a director on the Prairielands Groundwater Conservation District Board of Directors. McClure was appointed by the Johnson County Commissioners Court in a meeting on May 10, 2021.

A Cleburne native, McClure built a distinguished career serving the youth of Texas as a vocational agriculture teacher for 37 years. Following his retirement from education, McClure led a successful tenure from 2011 to 2019 as the executive director of the Vocational Agriculture Teachers Association of Texas, which was established in 1940 to promote and advance agriculture education and provide legislative representation to safeguard agriculture education programs in Texas. McClure was appointed to serve out an unexpired term representing Johnson County on the Prairielands GCD Board of Directors through August 31, 2023.

The Prairielands Groundwater Conservation District's Board of Directors consist of eight members, two from each county, who are appointed by the county commissioners' courts to serve unpaid, four-year terms. The District is committed to manage and protect the groundwater resources within Ellis, Hill, Johnson and Somervell Counties and to work with others to ensure a sustainable, adequate, high quality, and cost-effective supply of water, now and in the future. Find out more about the District and ways to conserve water by visiting www.prairielandsgcd.org.

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- Local Residents Gain Hands-on Knowledge at Rainwater Harvesting 101 Workshop - Pg. 2
- Summary of Spring 2021 School Educational Outreach Presentations - Pg. 4
- TWDB Adopts 2022 State Water Plan - Pg. 6
- Save Money and Water During Smart Irrigation Month - Pg. 6
- TGPC Releases Updated Landowner's Guide to Abandonded Water Wells - Pg. 7
- Upcoming Events and Meetings - Pg. 8

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Fall 2021
- Maximize Irrigation Efficiency by Avoiding Mistakes
- Winterizing Water Wells: Southern Style
- Now Scheduling the Water Education Trailer for Fall 2021 and Spring 2022
- Understanding Surface Water vs Groundwater

District staff also made several presentations to community and civic groups, as well as making appearances at public events. These outreach initiatives with public organizations and events are a productive way to educate individuals about water conservation, promote awareness, and build relationships and recognition within the four counties of the District. A summary of public events and presentations is listed below:

Date	Event	Location	County	Participants
1/19/21	After Hours Business Social	Cleburne	Johnson	30
3/2/21	Johnson County SUD Board Workshop	Joshua	Johnson	17
3/10/21	Leadership Cleburne State Government Day	Cleburne	Johnson	13
6/5/21	Prairielands GCD Rainwater Harvesting 101 Workshop	Cleburne	Johnson	30
6/16/21	Natural Resources Camp	Whitney	Hill	40
6/18/21	Texas Well Owner Network "Well Educated" Workshop	Cleburne	Johnson	41
7/14/21	Cleburne Lions Club	Cleburne	Johnson	30
8/12/21	Johnson County Association of Realtors Luncheon	Cleburne	Johnson	35
8/18/21	Texas A&M AgriLife Healthy Lawns and Waters Workshop	Grand Prairie	Dallas*	18
9/10/201	Water Efficiency Network of North Texas	(Virtual)	Johnson	13
9/18/21	Prairielands GCD Rainwater Harvesting 101 Workshop	Cleburne	Johnson	15
9/30/21	Cleburne Chamber of Commerce Business Expo	Cleburne	Johnson	100
10/12/21	Grandview Lions Club	Grandview	Johnson	12
10/19/21	Glen Rose 4-H Club	Glen Rose	Somervell	36
11/6/21	Burleson Family Camp Out	Burleson	Johnson	43
12/8/21	Leadership Cleburne County Government Day	Cleburne	Johnson	17
			Total	490

**Event for residents of Ellis, Johnson, Tarrant and Dallas counties.*

F.3. - Management Objective: *The District will investigate the feasibility of recharge enhancement and aquifer storage and recovery projects in the District.*

Performance Standard: *By 2022, the District will complete studies and an initial assessment regarding the feasibility of recharge enhancement and aquifer storage and recovery projects in the District.*

During the past decade in Texas there have been multiple years of extreme drought and extended periods of above normal temperatures, which has decreased inflows to, and increased evaporative losses from surface water reservoirs. This increased water stress has driven a need for more water storage in many areas of Texas, but it often takes decades to plan, permit, design, and construct new surface water reservoirs. Given the near-term water supply demands there has been increased interest in managed aquifer recharge (MAR) techniques that can increase the quantity and quality of groundwater available in the near-term. There are two general types of MAR, aquifer storage and recovery (ASR) and aquifer recharge (AR) sometimes referred to as artificial recharge.

The Texas Water Development Board (TWDB, 2018) defines aquifer storage and recovery (ASR) as "the storage of water in a suitable aquifer through a well during times when water is available, and the recovery of water from the same aquifer during times when it is needed." ASR facilities have been increasingly recognized as a viable option to help communities and industries in Texas address water supply needs. When comparing ASR systems to surface water reservoirs, there are several key benefits:

- No water loss to evaporation
- No surface inundation with its associated condemnation, environmental impacts, and years of permitting/regulatory issues
- No loss of storage capacity due to sedimentation
- Scalability: capital costs start at $1-2 million, rather than $10s to $100s of millions.

Aquifer recharge, as defined by HB 721 and amended Section 11.155 of the Texas Water Code, "involves the intentional recharge of an aquifer by means of an injection well authorized under Chapter 27 of the Texas Water Code or other means of infiltration, including actions designed to (a) reduce declines in the water level of the aquifer; (b) supplement the quantity of groundwater available; (c) improve water quality in an aquifer; (d) improve spring flows and other interactions between groundwater and surface water; and (e) mitigate subsidence. The key difference between ASR and AR as defined in the Texas Water Code is in ASR there is intent to recover recharged water, while in AR there is no specific intent to recover recharged water.

The potential benefits that ASR and AR may provide have prompted several bills in the last two legislative sessions. In 2018, the Texas 86th Legislature passed three bills aimed at encouraging further development and use of ASR and AR projects. HB 721 directs TWDB to conduct studies on ASR and AR projects in the State Water Plan and required TWDB to conduct a survey to identify the relative suitability to various aquifer for use in ASR and AR projects (Shaw and Others, 2020). The statewide study suggests there are large swaths of the District that are considered "most suitable" for both ASR and AR. However, these suitability rankings were evaluated on a grid with a resolution of 50,000 feet x 50,000 feet (or 89.5 square miles), which is too coarse to evaluate the feasibility of ASR/AR strategies at the District level. The District initiated a study focused on refining the techniques used in the statewide TWDB study so that ASR and AR suitability could be evaluated over a better geographic resolution.

The method used to evaluate the relative suitability of ASR and AR within the District largely followed the methods used in the statewide ASR and AR study (Shaw and Others, 2020), but was modified to use the higher resolution data available at the District scale. All suitability metrics were evaluated on the NTGAM grid, which consists of quarter-mile by quarter-mile grid cells. The refined study applied a scoring methodology that scaled each suitability parameter important for a successful ASR and AR project (e.g., hydraulic conductivity, sand thickness, aquifer storativity, etc.) onto a zero to one scale where the most suitable parameter score is set to one and the least suitable parameter score is set to zero. All suitability parameters were then summed giving the total for ASR and for AR suitability for each aquifer. For display and discussion purposes the total suitability scores were normalized again onto a zero to one scale.

The results from this refined analysis indicate that ASR suitability scores of the five aquifer units studied (i.e., the Woodbine, Paluxy, Hensell, Pearsall, and Hosston) show the Paluxy, Hensell, and Pearsall fell completely within the medium suitability category (Figure 2, Figure 3, Figure 4). The Woodbine and Hosston also fell mostly within the medium suitability category, but there are large portions within Ellis County, which are considered highly suited for ASR (Figure 1 and Figure 5). These highly suited regions coincide with the areas where sand thickness is greatest in the Woodbine and Hosston. There are no areas within the District that are considered to be of low suitability for ASR.

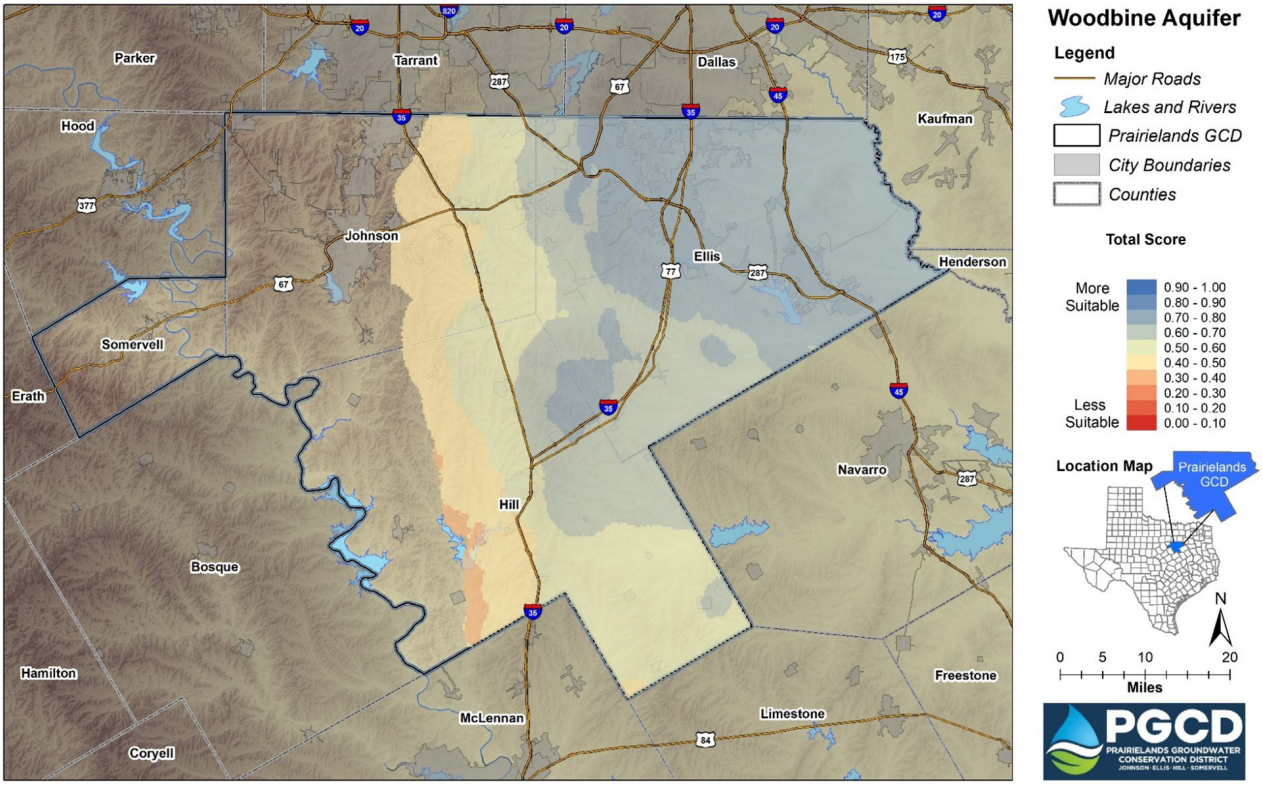


Figure 1. *ASR suitability score for the Woodbine aquifer.*

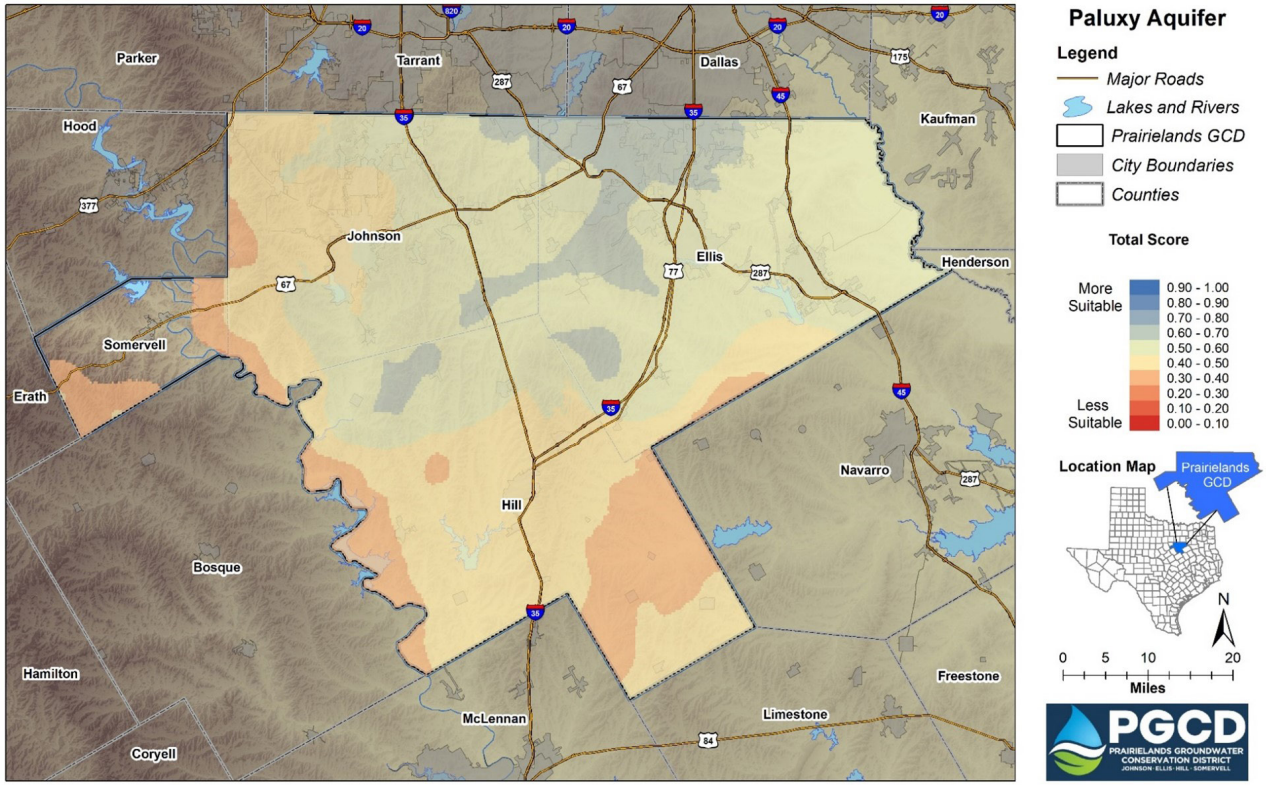


Figure 2. *ASR suitability score for the Paluxy aquifer.*

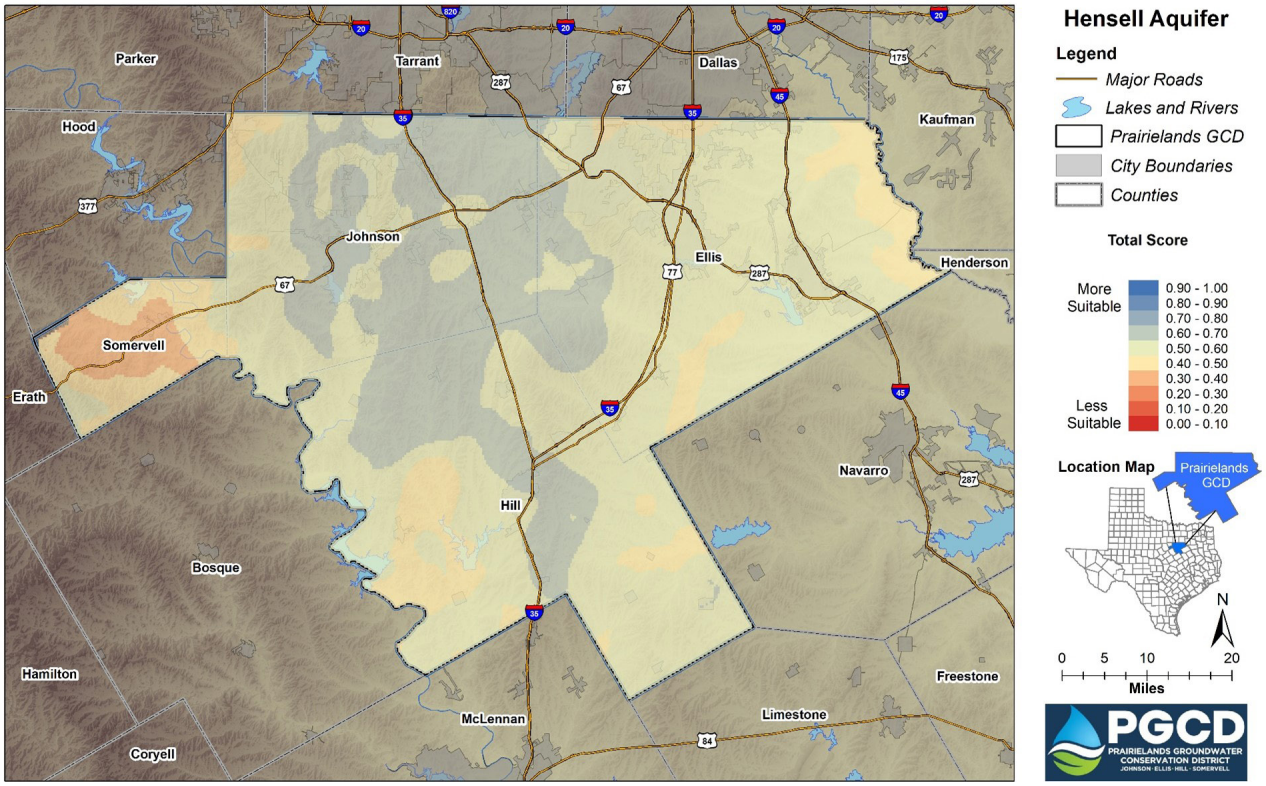


Figure 3. *ASR suitability score for the Hensell aquifer.*

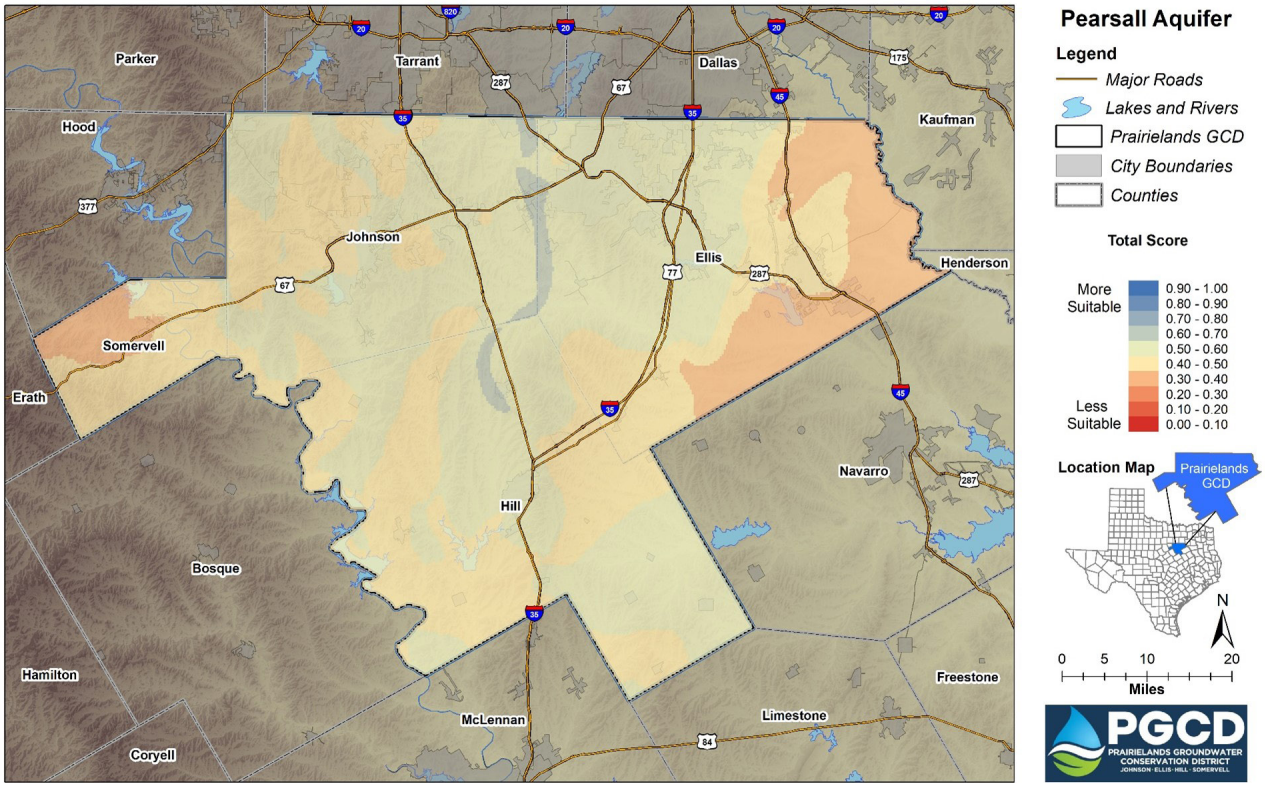


Figure 4. *ASR suitability score for the Pearsall aquifer.*

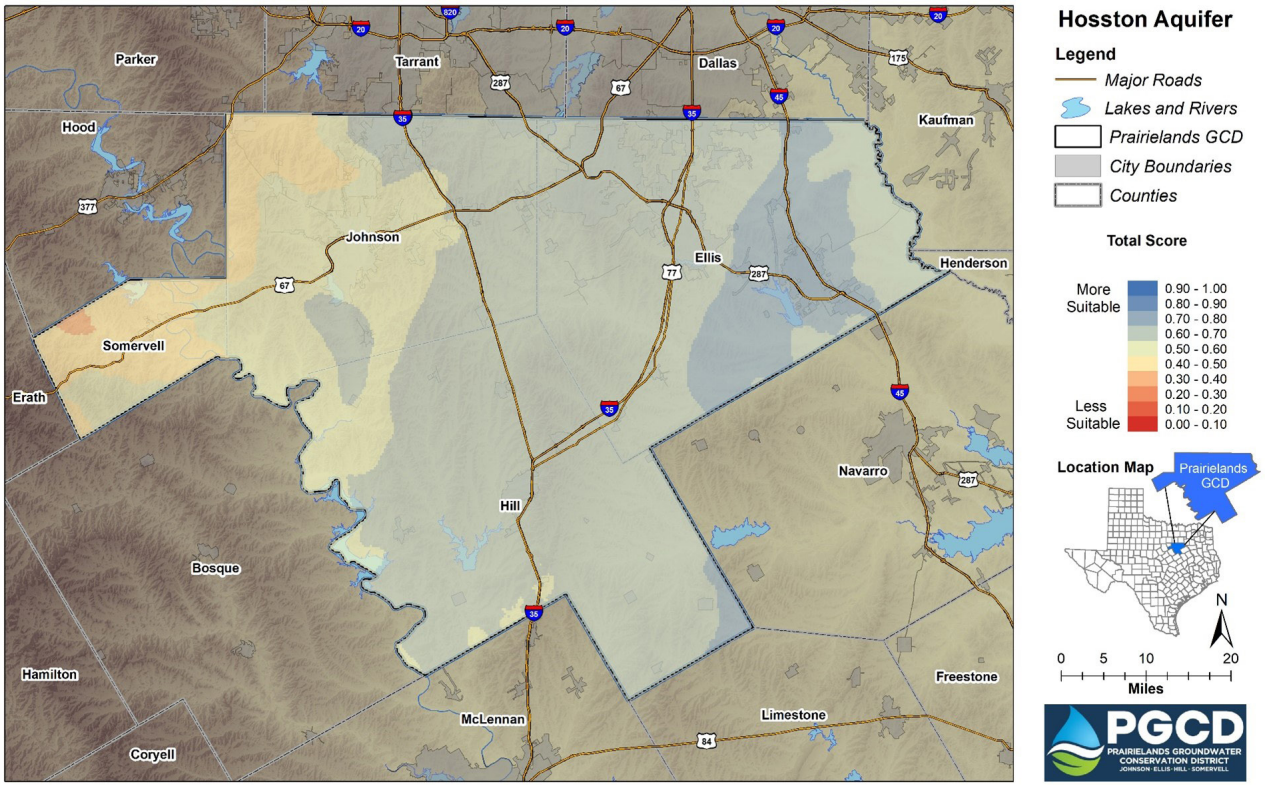


Figure 5. *ASR suitability score for the Hosston aquifer.*

All aquifers, except for the Pearsall, have large areas that fell just below highly suitable (i.e., within 0.6-0.7). The Pearsall aquifer generally has the lowest relative ASR suitability, which is expected given the hydrogeologic characteristics of the unit. While this study focused on evaluating ASR suitability individually for each aquifer, in practice one could install an ASR well that that targets multiple aquifers. For example, if a stakeholder wanted to site an ASR well in the Lower Trinity aquifer system, the ASR suitability maps for the Hensell, Pearsall, and Hosston could be summed. The areas with the highest sum would have the greatest potential for a successful ASR operation.

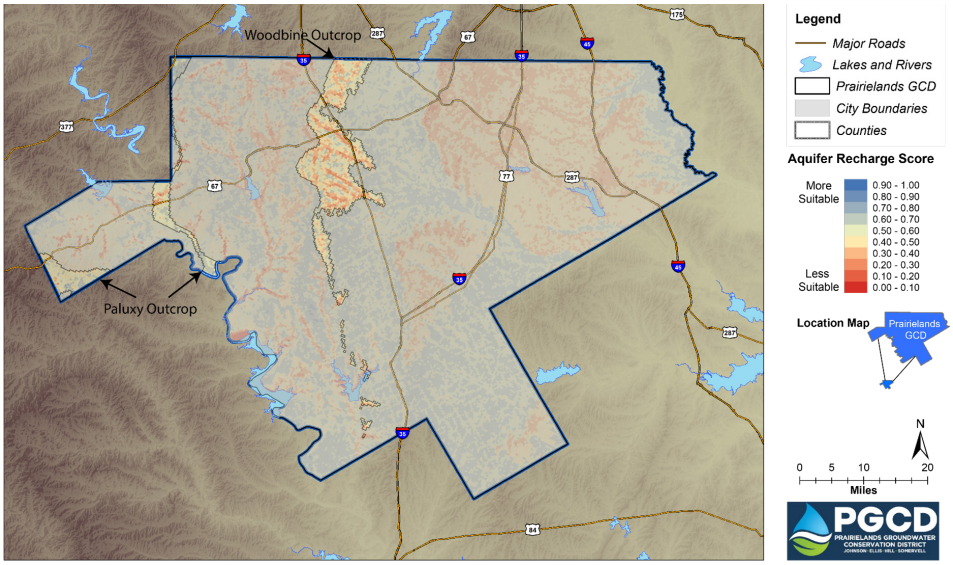


Figure 6. *AR suitability score.*

The final AR suitability scores are shown in Figure 6. The shaded vs. unshaded areas in Figure 5-6 distinguish areas where the primary aquifer units are in subcrop from areas where they are in outcrop. The Woodbine and Paluxy are the only two aquifers that outcrop within the District. If the primary goal of an AR project is to offset groundwater pumping by increasing recharge to an aquifer, then it is important that these projects be located in areas where the aquifer units' outcrop. Areas where the primary aquifers are in subcrop can still benefit from an AR project, but the recharge potential will depend on the hydraulic connectivity between the shallow subsurface and the underlying aquifer units. In areas where the shallow subsurface is comprised of homogeneous, uncompacted coarse-grained sediments, which tend to have the greatest vertical hydraulic conductivity, the recharge potential would be greater than areas with dense fine-grained units or intact limestone (i.e., units with much lower vertical hydraulic conductivity values). The site-specific hydrogeology of the area between the top of the shallowest aquifer and ground surface is key to applicability of AR projects.

The results discussed above are part of an ASR and AR feasibility assessment report that was presented to the Board and approved as final on December 21, 2021. This analysis has resulted in creation of datasets that will help guide siting of ASR and AR projects which have the potential to improve groundwater supplies and quality within the District.

Results from the ASR and AR suitability analysis can be used for preliminary screening of potential ASR and AR sites, but should be considered in a relative context. The siting and design of ASR and AR projects is very site-specific and considers many factors in addition to the factors considered in this study (geology, hydrogeology and geography). Other factors that may need to be taken into account when considering development of new ASR and AR projects, including: source water, access to land, interest of landowners and tenants, possible ancillary benefits (e.g., improvements to streamflow or wetland conditions), and engineering and operations costs. The ASR and AR suitability analysis is a precursor to the typical phased ASR and AR design and implementation process which is adaptive in nature and is driven by collection of site-specific data and information.

F.4. Management Objective: *The District will peridocially support or sponsor an education seminar addressing conservation, recharge enhancement, rainwater harvesting, precipiation enhancement, or brush control.*

Performance Standard: *The District will support or sponsor such a seminar at least once every other year. A summary of such educational acitivites will be included in the District's Annual Report.*

The District was a Signature Sponsor for the Texas 4-H Youth Water Ambassador program in 2021. This is a program for high school students to encourage their interest in the water industry. The program seeks to bring students of varying backgrounds together to gain advanced knowledge and practice leadership skills related to the science, technology, and management of water in Texas. Through an application process, up to 30 high school youth are selected each spring to participate in a summer 4-H2O Leadership Academy and commit service hours annually in a variety of ways. Ambassadors gain insight into water law, policy, planning, and management as they interact with representatives from state water agencies, educators, policy-makers, and water resource managers. Water Ambassadors commit a minimum 40 hours of service over a 12-month period following the Academy. Service hours include delivering water education at local 4-H clubs, schools, fairs, and community events. The District had five students serve as Water Ambassadors in 2021.

The District also hosted two rainwater harvesting workshops for residents of Ellis, Hill, Johnson, Somervell, and surrounding counties on June 5 and September 18, 2021. There were thirty attendees for the June event and fifteen at the September event. Participants received a presentation from District staff about the basic components of rainwater harvesting systems, benefits and uses of rainwater harvesting, and how to maximize efficiency of a rainwater harvesting system. Attendees then assembled their own 55-gallon rain barrel to take home and implement. Following the events, several participants emailed photos showcasing their use of their new rain barrels. The District also hosted a Texas Well Owner Network "Well Educated" half-day training for domestic well owners to learn about water well basics and maintanence, water quality, and pollution prevention. The District sees to continue this educational workshop program in 2022 and onward.

In 2021, The District was also a sponsor for the Texas Alliance of Groundwater District's 10th annual Texas Groundwater Summit on August 31 through September 2, 2021. The Texas Alliance of Groundwater Districts was established in 1988 to provide groundwater conservation districts the opportunity to exchange ideas and develop or influence programs for the management, conservation, protection, and development of groundwater within Texas. The Texas Groundwater Summit is the premier groundwater event in the state, bringing together a diverse group of groundwater professionals over three days to discuss emerging trends and new research.

F.5. - Management Objective: *Each year, the District will seek to provide an educational outreach regarding water conservation to at least one elementary school in each county of the District.*

Performance Standard: *Each year, a list of schools that participate in the educational outreach will be included in the District's Annual Report to be given to the District's Board of Directors.*

Increasing public awareness about groundwater conservation through education and outreach is one of the main goals of the District. The WET, or Water Education Trailer, is a mobile classroom that features exhibits that provide demonstrations about rainwater harvesting, indoor water conservation tips, pollution prevention, how a water well works, and features a working aquifer model. The presentations included in the WET meet TEKS standards and provide STEM-based learning activities.

Date	School	County	Grade	Participants
1/25/21	Keene Elementary	Johnson	5th	74
4/8/21	Cleburne Christian Academy	Johnson	K-12th	85
4/12/21	Hughes Middle School	Johnson	6th and 7th	297
4/22/21	Venus Elementary	Johnson	5th	170
4/27/21	Hillsboro Intermediate	Hill	4th	154
4/28/21	Hillsboro Intermediate	Hill	5th	132
4/30/21	Hill County Water Day (Various Schools)	Hill	5th	179
5/4/21	Ag Day at Venus ISD	Johnson	5th,8th and 9th	123
5/21/21	Advantage Academy Charter School	Ellis	3rd - 5th	61
5/24/21	Glen Rose Junior High	Somervell	8th	171
6/29/21	Rio Vista Elementary (Summer Classes)	Johnson	5th – 10th	104
7/28/21	David Walker Elementary (Summer Classes)	Tarrant*	3rd – 5th	84
11/17/21	Grandview Junior High	Johnson	7th	91
11/18/21	Grandview Junior High	Johnson	8th	104
			Total	1,952

**School district includes students from Johnson County. Held in partnership with Northern Trinity GCD.*

Groundwater Monitoring Program and Desired Future Conditions

G.1. - Management Objective: *The District will develop a Groundwater Monitoring Program within the District to monitor water well levels (and baseline water quality) in wells in each aquifer and subdivision thereof in the District. The District will review the geographic and vertical distribution of existing monitoring wells in the District with historical data from the TWDB, USGS, TCEQ, and other agencies and develop a plan to partner with those agencies as appropriate to ensure continued availability of the monitoring wells and data from them to the District. The District will also develop a plan to acquire or install new monitoring wells to fill in gaps in geographic or vertical distribution. The District will then develop an annual goal of how many monitoring wells it will add each year and a priority system for their installation based upon data deficiencies and needs for the geo-database. The District will take periodic readings from the monitoring wells and input the data into the District's geo-database. The District will utilize the information to help implement its regulatory and permitting program and monitor water level trends and actual achievements of DFCs.*

Performance Standard: *Upon development, a summary of the District Groundwater Monitoring Program will be included in the District's Annual Report to be given to the District's Board of Directors.*

To help manage groundwater resources prudently, the District monitors groundwater conditions via groundwater wells distributed throughout the District. As of December 2021, there are 178 monitoring wells within the District. A fundamental requirement of any monitoring program is that it must be able to monitor the aquifer resources within the District at a scale consistent with the management objectives of the District. Two of the Districts' key management objectives are: (1) the ability quantitively track progress towards DFCs, and (2) the ability to generate accurate annual District-wide water level change maps for each aquifer. In early 2021, the District asked INTERA Inc. to perform a review of the existing monitoring network and provide recommendations on how the monitoring network could be expanded to meet the District's management objectives.

When developing a water level monitoring program there are many technical characteristics that must be considered in tandem with practical and policy considerations. Some of the characteristics include the number of wells that are monitored, how frequently water levels are measured, and how to spatially distribute wells across the county. The concepts that generally guide the practical and policy considerations are: the value of simplicity, flexibility, and the law of diminishing returns. Simplicity, is both a benefit for the District staff, who must implement the monitoring approach, and also for the public, who may want to understand the monitoring approach. The monitoring approach must also be flexible enough to easily handle situations that are inevitable when monitoring over several decades. Wells will be added to, and removed from, the network periodically. The concept of diminishing returns generally refers to getting less incremental benefit from each additional item added. For well monitoring, more wells results in a higher confidence in calculated District- and county-wide average drawdowns, but beyond a certain point the cost and effort of adding more wells to the network and regularly monitoring their water levels outweigh the benefit.

Over the latter half of 2021, the District and INTERA developed a strategy to expand the current monitoring network into a comprehensive monitoring program. To ensure that the wells in the monitoring network are distributed approximately evenly throughout the county, the U.S. Geological

Survey 7.5-minute quadrangles were used as a standard grid. These quadrangles (hereafter referred to as "quads") are shown in grey in Figure 7. TWDB also uses these quads to guide water well numbering (e.g., the first four digits of a State Well Number correspond to the quad in which the well lies).

One of the primary challenges of expanding a monitoring program is the shear amount of data that must be analyzed and then organized in a manner that allows for strategic and efficient monitoring network expansion. Using data from the District's well registration database, the TWDB groundwater database (GWDB), and the TWDB Submitted Drillers Reports (SDR), Figure 7 shows the distribution of groundwater wells colored by aquifer in the District and within a 3-mile buffer of the District boundaries. Wells within the 3-mile buffer were included because they inform regional groundwater trends at no cost to the District. In total there were 1,164 identified wells with screen information. Screen information is critical because aquifer specific water levels can only be measured in wells that are screened solely within a single aquifer. Of the 1,164 identified wells, 632 were screened over a single aquifer (Table 1). The remaining 532 wells were screened over multiple aquifers

The results from analysis were incorporated into a master spreadsheet intended to help the District:

1. Identify gaps in the monitoring network that must be filled by an existing well or by installation of a monitoring well
2. Prioritize incorporation of existing wells using a spatial ranking system
3. Readily access all relevant well information made available by the TWDB in the GWDB and the SDR

Because of the costs and large amount of coordination and logistics associated with developing a well monitoring network, INTERA recommended that District consider developing the monitoring network over a period of several years. The expansion strategy focuses on prioritizing additions of existing wells into the monitoring program because it is more cost-effective and a quick way to expand the monitoring network over the near term. However, INTERA also recommends installing observation wells strategically throughout the District in order to increase the overall reliability of the network through time. Over the next decade, the proposed expansion strategy suggests that the District install two new observation wells each year and identify ten existing wells per year to add to the network. Monitoring well additions will initially be focused in aquifers that produce most of the water supply within the District. The Hosston aquifer currently provides the majority of groundwater used throughout the District, so under the proposed expansion strategy it will be first aquifer to have a complete monitoring network (estimated completion is 2028). The Woodbine and Paluxy aquifers will reach 80% completion by 2030 and 2035. The proposed expansion strategy timeline considers the significant resources the District must put forth each year to make progress towards completing the monitoring program.

Aquifer	Total Single Aquifer Wells	Actively Monitored
Woodbine	141	6
Paluxy	198	12
Glen Rose	135	2
Hensell	22	5
Hosston	114	39
Twin Mountains	22	1
Totals	**632**	**65**

Table 1. *Identified wells screened in a single aquifer.*

G.2. - Management Objective: *Upon approval of the District Monitoring Program, conduct water level measurements within the District as specified in the Monitoring Program.*

Performance Standard: *Annual evaluation of the water-level trends and the adequacy of the*

monitoring network to monitor aquifer conditions within the District and to monitor achievement of applicable desired future conditions. The evaluation will be included in the District's Annual Report to be given to the District's Board of Directors.

After review of all water level measurements recorded using the current monitoring well network, the District's consulting hydrogeologist firm, INTERA, concluded that due to sparsity of data, regional groundwater changes cannot be accurately determined with interpolation methods. In areas between wells interpolation methods are needed to produce estimates of the water levels. As an alternative to District-wide groundwater level change maps, water level changes were evaluated on a well-by-well basis for each aquifer (Figures 1-6).

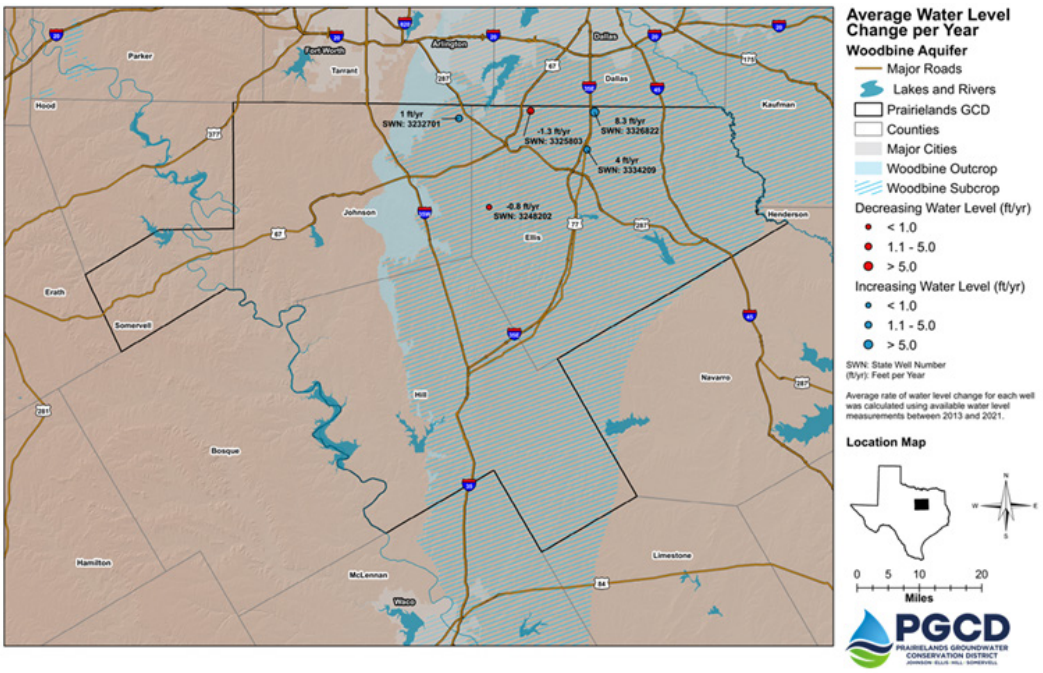


Figure 1. *Average water level change in Woodbine aquifer between 2013 and 2021.*

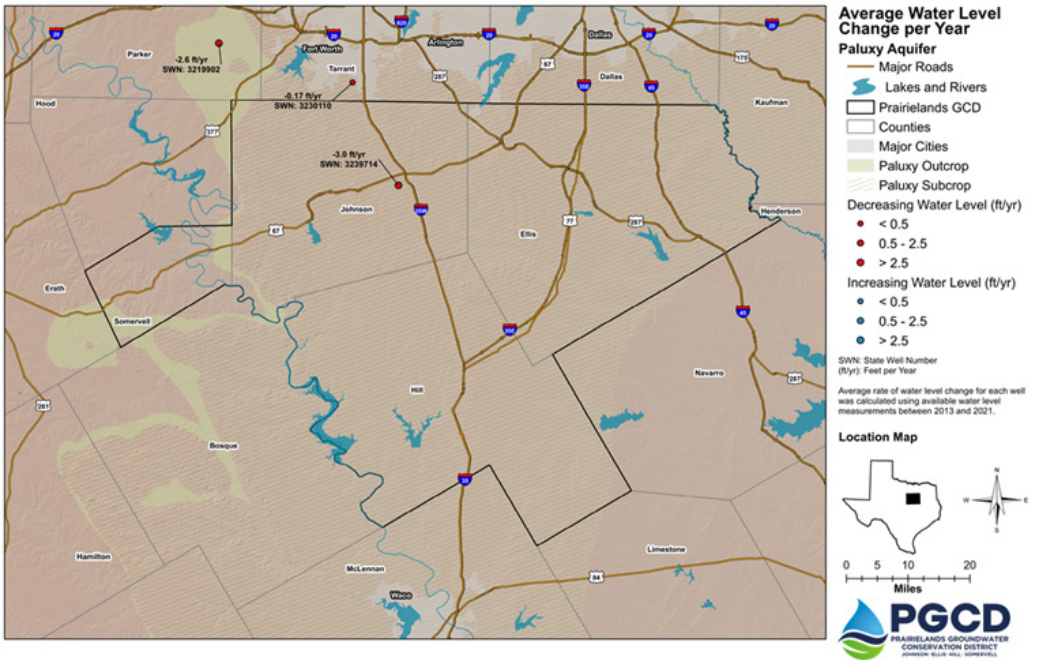


Figure 2. *Average water level change in Paluxy aquifer between 2013 and 2021.*

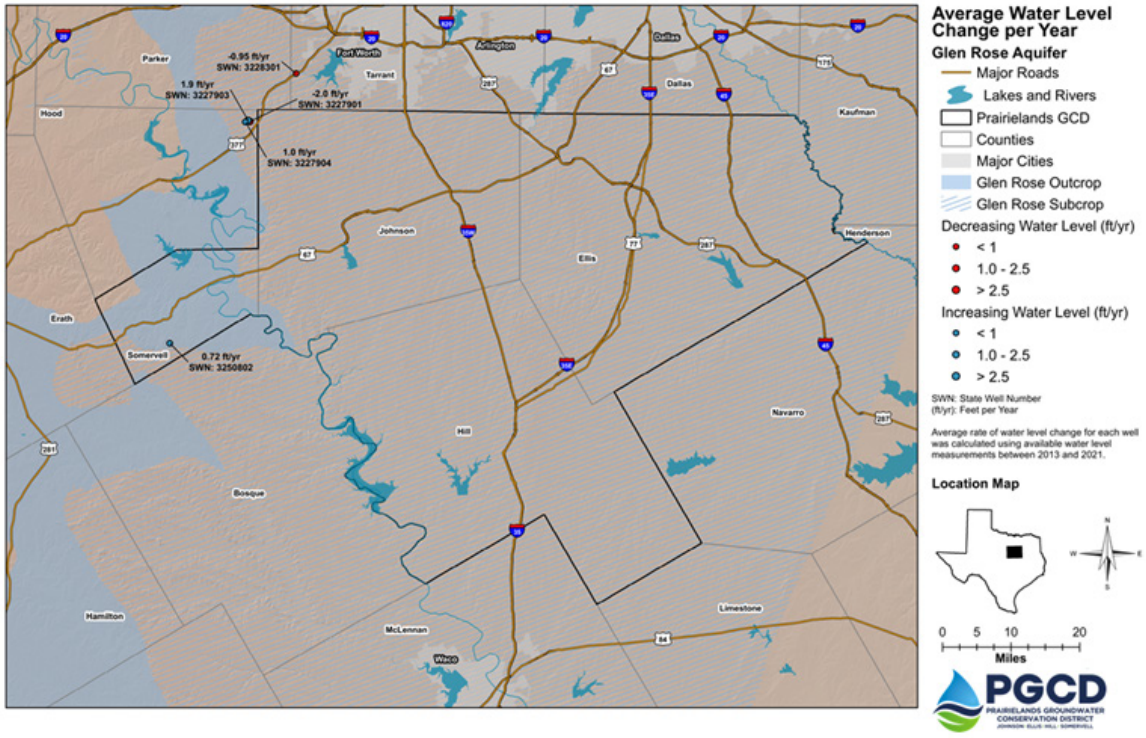


Figure 3. *Average water level change in Glen Rose aquifer between 2013 and 2021.*

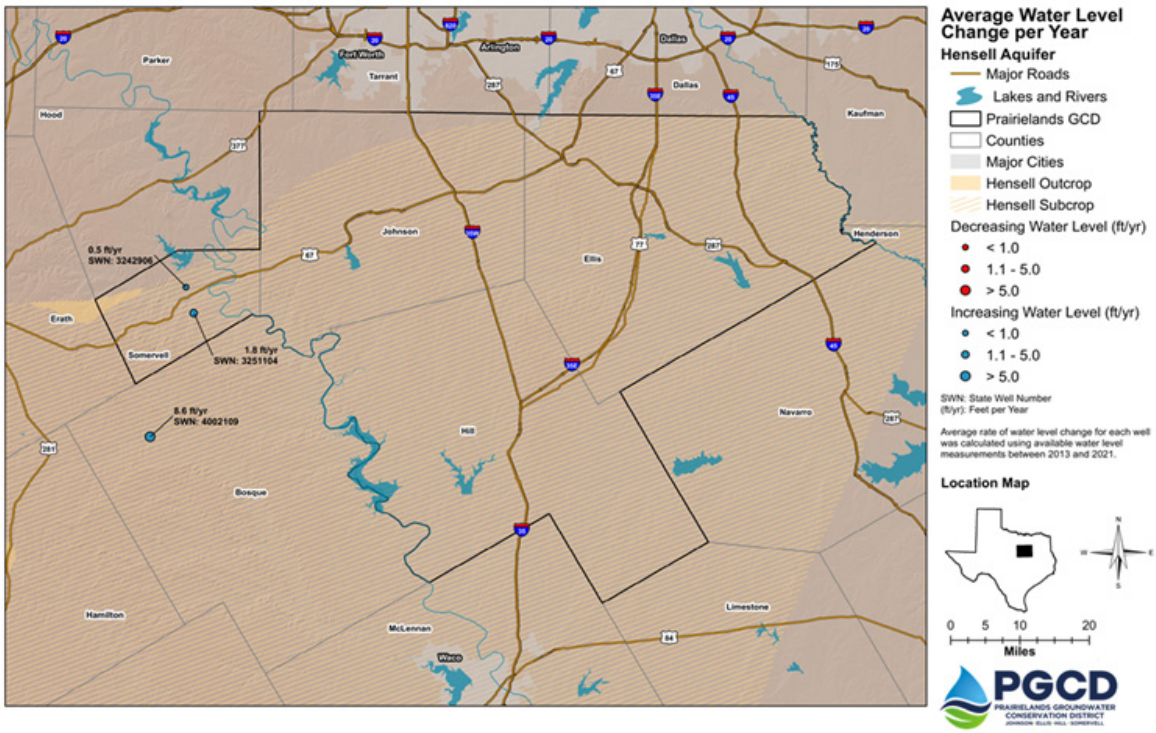


Figure 4. *Average water level change in Hensell aquifer between 2013 and 2021.*

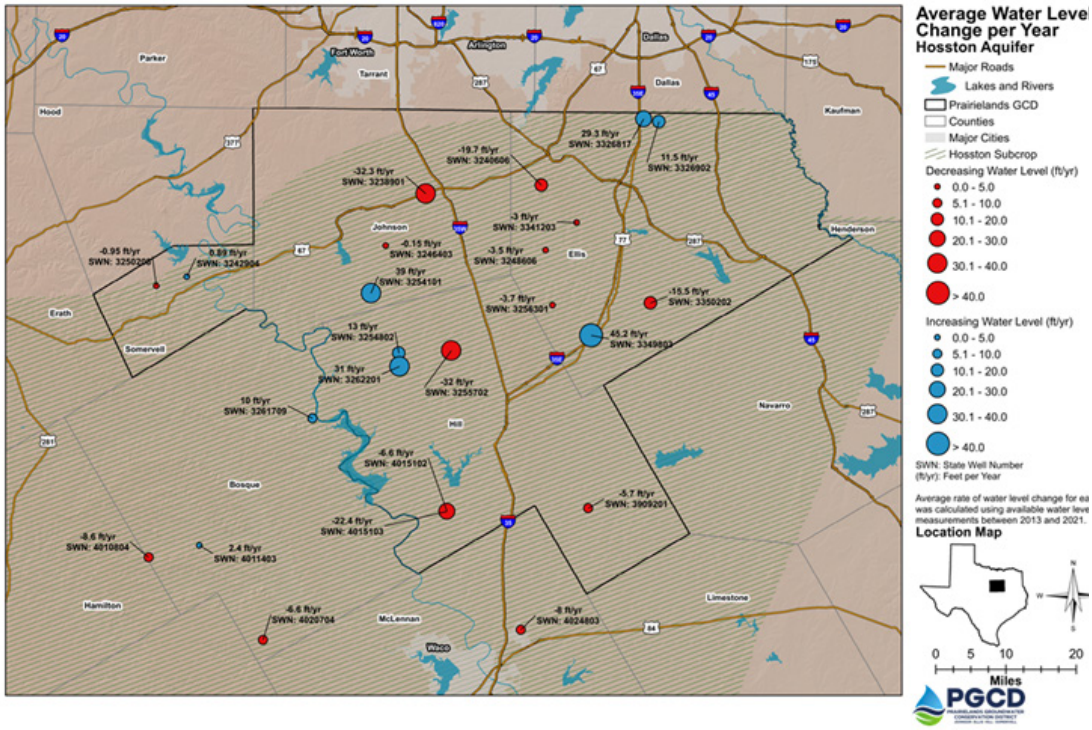


Figure 5. *Average water level change in Hosston aquifer between 2013 and 2021.*

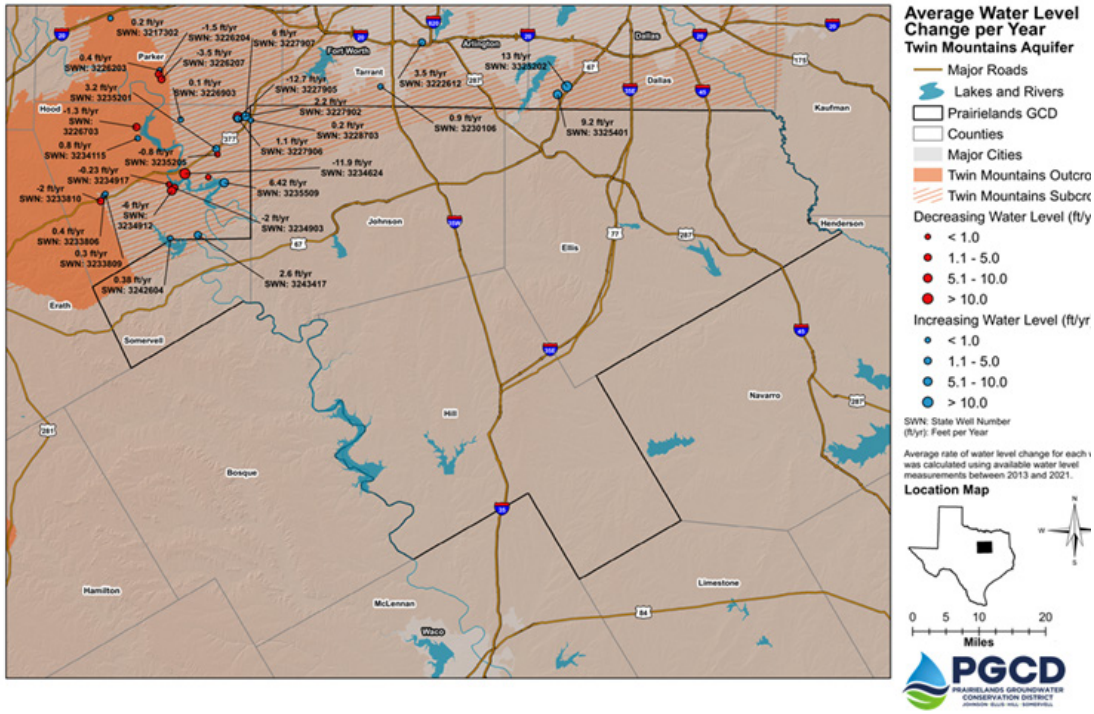


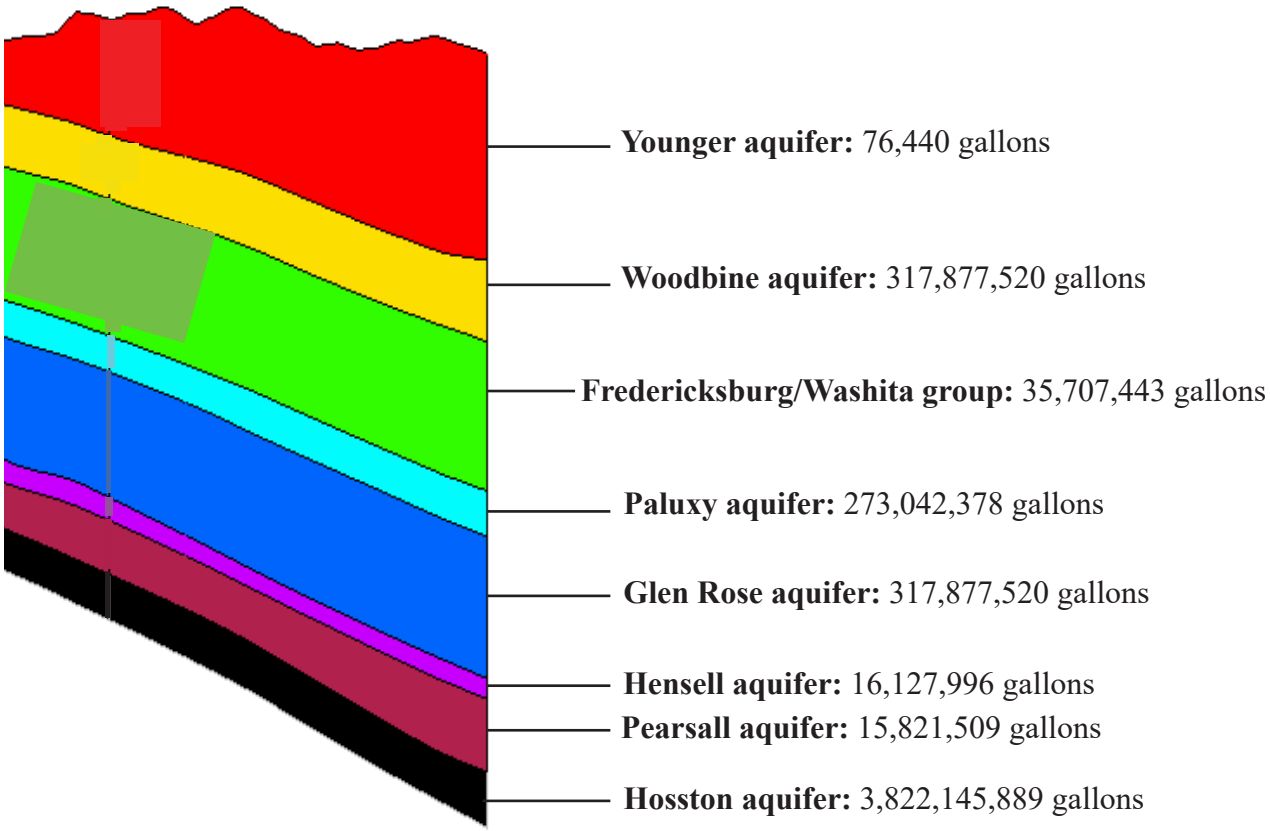
Figure 6. *Average water level change in Twin Mountains aquifer between 2013 and 2021.*

2021 Water Usage by Aquifer

G.3. - Management Objective: *The District will monitor non-exempt pumping within the District for use in evaluating the District's compliance with aquifer desired future conditions.*

Performance Standard: *Annual reporting of groundwater used by non-exempt wells will be included in the Annual Report provided to the District's Board of Directors.*

In 2021, non-exempt wells in the District reported groundwater use of 6,295,522,713 gallons. With the district's Groundwater Management System, groundwater production can be tracked to specific aquifers and aquifer groups. Gallons produced by formation are listed below:



Stratigraphy map provided by Aquaveo

Production by Aquifer Groups:

Woodbine/Fredericksburg: 97,126,909 gallons
Fredericksburg/Washita/Paluxy: 67,606,334 gallons
Paluxy/Glen Rose: 126, 291, 359 gallons
Hensell/Pearsall: 14,797,600 gallons
Hensell/Hosston: 17,923,631 gallons
Hensell/Pearsall/Hosston: 511,816,614 gallons
Pearsall/Hosston: 934,192,271 gallons

PGCD

PRAIRIELANDS GROUNDWATER CONSERVATION DISTRICT

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