CONSERVATION CONNECT

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A publication of the High Plains Water District

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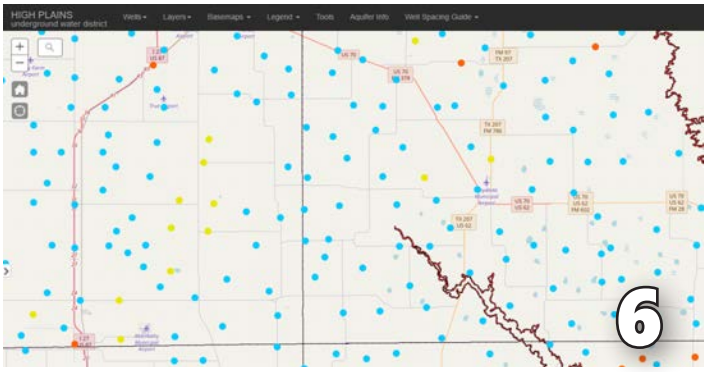

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LETTER FROM THE PRESIDENT

"The more we know about groundwater conservation, the better we will be for years to come."

I shared that thought in the first issue of *Conservation Connect* published in fall 2014. Now, five issues later, this statement remains as relevant as ever.

Our magazine's mission is to highlight water conservation efforts of area businesses, homeowners, producers, researchers, and others within the 16-county HPWD service area.

Here are just a few of the success stories from the past four issues:

- Commercial and residential rainwater harvesting installations
- Exploration of the Dockum Aquifer as an alternative water supply
- New irrigation management technologies
- One town's efforts to save its water wells and its livelihood
- State of the art water treatment technologies
- Use of treated wastewater for crop irrigation and ethanol production
- Water conservation efforts at a beef processing plant
- Water reuse in the car wash industry
- Xeric landscaping in commercial and residential settings

Each article demonstrates how people in the Panhandle-South Plains region have pulled together to find solutions when water-related issues arise. It takes all of us working together to make the best use of groundwater stored in area aquifers. Such collaboration will lead to additional water conservation technologies and tools for future use.

The HPWD Board of Directors and staff continue to promote groundwater conservation by making the best science-based data available to constituents. Much of this information is available through our interactive map feature on the HPWD website (**map.hpwd.org**). Recent updates include the addition of rain gauge network information, new drawing and measurement tools, and a "virtual aquifer bore" to provide groundwater information at any location within the district. Be sure to visit the updated web map, if you have not already done so.

As always, we value your feedback. Feel free to call our office at (806) 762-0181, if you have questions, comments, or need more information about HPWD programs and activities.

Lynn Tate, HPWD Board President

FIVE YEARS IN REVIEW

Article by Jason Coleman, P.E. General Manager

During the past five years, High Plains Underground Water Conservation District (HPWD) has dedicated much time and effort to improving the effectiveness of our mission. We can trace our success back to the five areas of focus:

T

TRANSPARENCY

The HPWD Board of Directors wants the public to know what is happening, and how its financial resources are being used for various programs. As a result, our website includes financial reports, board meeting agendas, and other management reports.

R

RESEARCH AND DEMONSTRATION

The Board's creation of a research/demonstration committee has also improved the evaluation and funding of projects that are beneficial to district residents. Projects have explored agricultural and municipal conservation subjects, as well as funded demonstration projects for organizations wishing to promote good stewardship of groundwater resources.

A

AQUIFER DATA COLLECTION

One of the greatest achievements in the past five years is the development and release of the district's web map. This resource provides constant access to annual and daily water level measurements, drillers logs and pump installers logs, aquifer information, and other data. Read more about the new updates to the web map on Page 6.

C

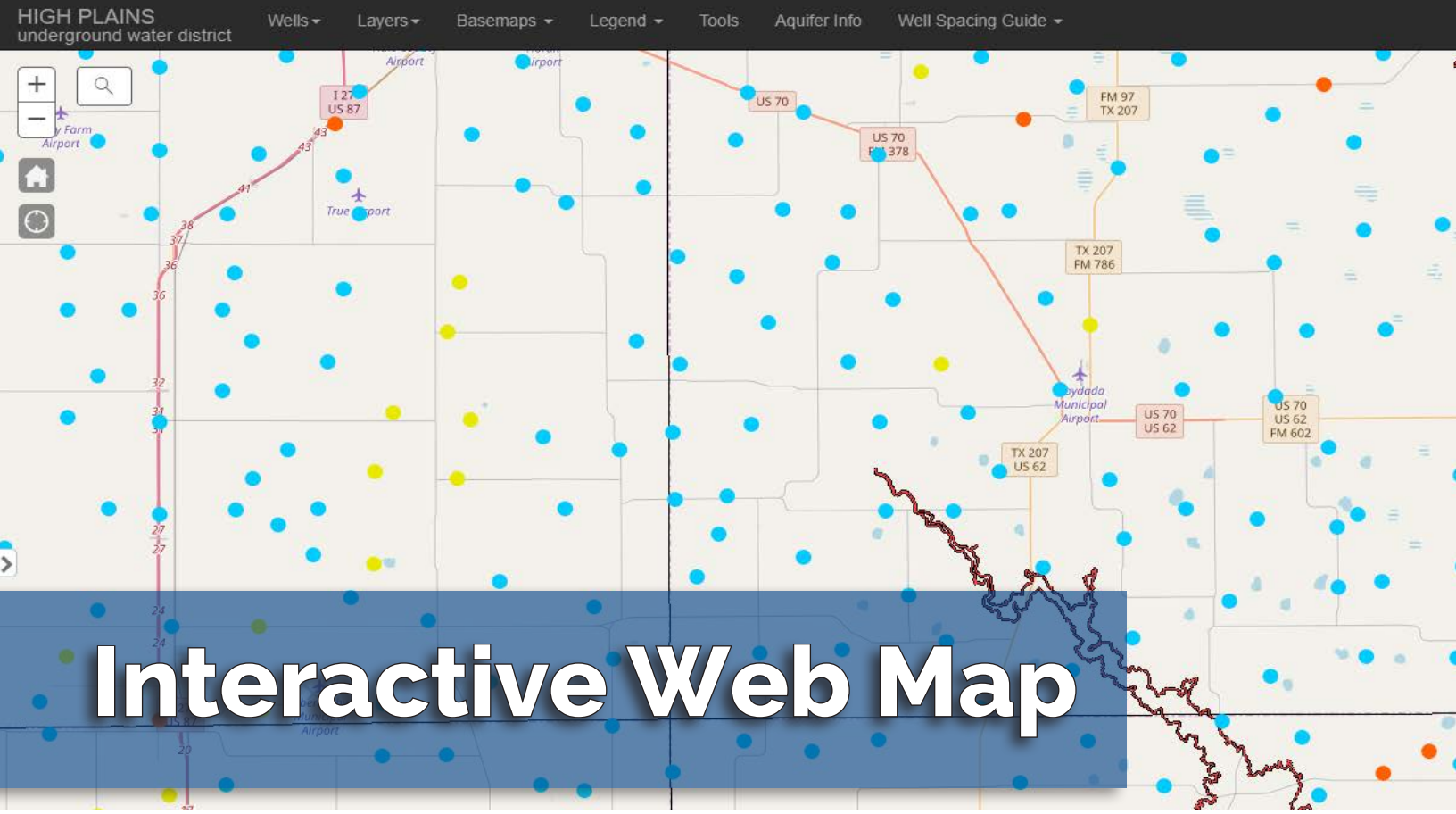
CUSTOMER SERVICE

HPWD values hose we serve. Field staff provide water level measurements and flow tests at individual well sites upon request. Our Irrigation Assessment Program (IAP) offers on-farm analysis of aquifer conditions throughout the growing season.

E

EDUCATION AND OUTREACH

Throughout the year, HPWD staff use many avenues of communication to share water conservation information with thousands of people from all water user groups. This includes *The Cross Section* newsletter, *Conservation Connect* magazine, social media and presentations to civic clubs and school groups.



Article by Katherine Drury

Since its launch in 2013, our interactive web map has made the District's annual water level measurements accessible any time from your computer, tablet or smart phone. As technology and online capabilities have advanced in the last five years, HPWD continues to add extra features to the map. The latest features include an Aquifer Info tool, the Permit Portal, Bookmarks, new Layers, and other mapping tools.

Aquifer Info

The Aquifer Info tool allows users to drill virtual test wells at any location in the High Plains Water District service area. This tool compiles data from HPWD research and water level measurements, as well as Groundwater Availability Models (GAMs). This tool provides an approximate view of the strata of the aquifers in a given area. When the tool is turned on, click anywhere in the district to gather data about the saturated thickness of the Ogallala Aquifer and depth of the aquifers in that area. Be sure to allow pop-ups from the website, and a new window will display the results of the virtual bore.

Permit Portal

Applying for a permit is now easier than ever with our new Permit Portal. Create your account, and click "Request a Permit". Fill in the information requested, and select the location of the new or replacement well. Submit the application, and our permit field staff will be in touch to schedule a time to confirm the location of the well.

Bookmarks and Layers

Visitors can bookmark frequently visited locations on the map for quick navigation while they are logged in. Open the "Tools" bar and click "Bookmarks". Zoom to a property that you would like to save. Click "Add Bookmark" and name it. These bookmarks can be accessed through the map tool, as well as the Permit Portal.

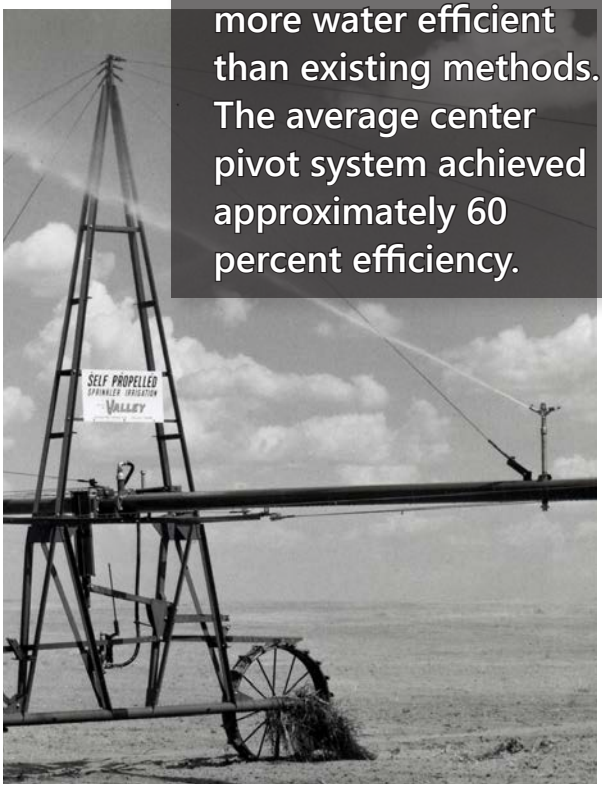
Layers depicting rainfall data from the National Weather Service and outlines of the three aquifers found in our district may be toggled on and off as desired. The interactive map and permit portal can be accessed at **map.hpwd.org** on a computer, tablet and smart phone. For a full tutorial of these features, find the High Plains Water District on YouTube.

EVOLUTION OF THE CENTER PIVOT

As you fly over the High Plains of Texas, a patchwork quilt of circles overlays much of the land. These are the traces of center pivot systems that producers use to irrigate their crops. These systems have made irrigated agriculture a more water efficient and cost effective practice. We celebrate the invention and evolution of this iconic piece of American agriculture.

1948

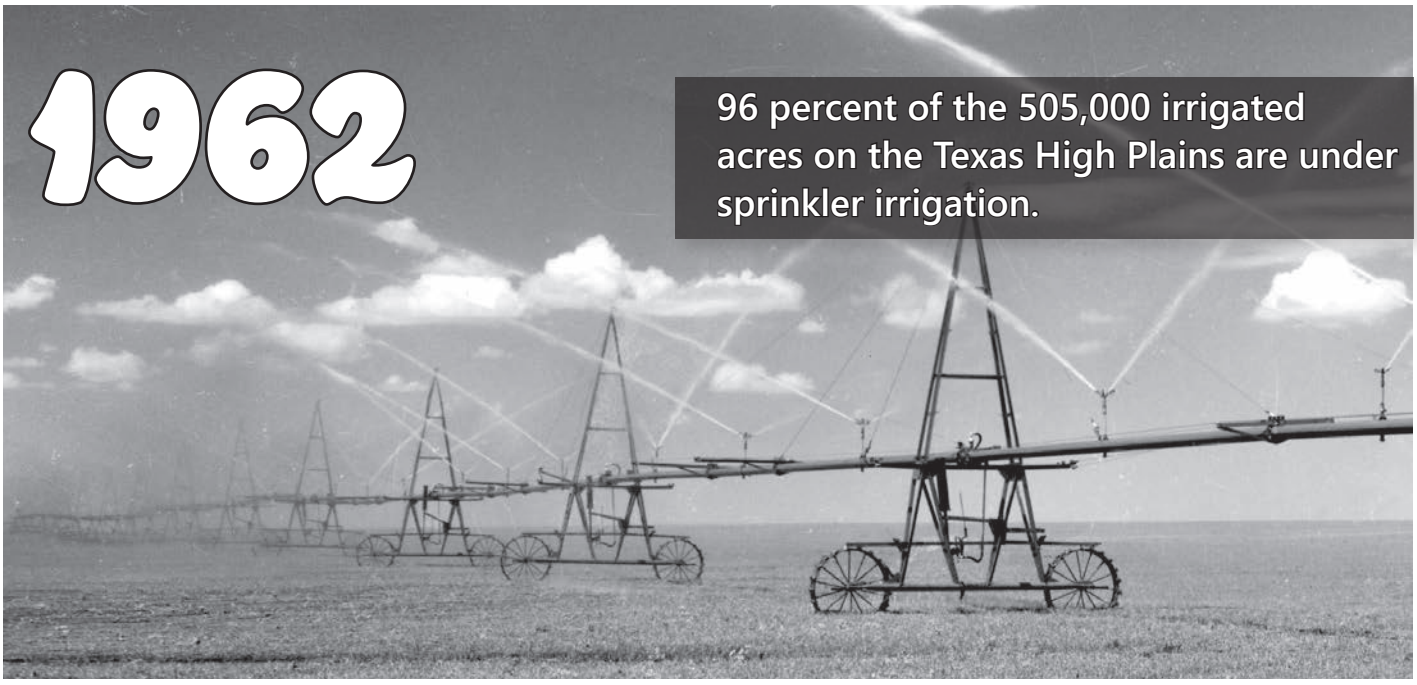
Colorado dryland farmer Frank Zybach invented an automatic, self-propelled sprinkler irrigation system. He received a patent for his invention in 1952.



These early pivot systems saved producers time and labor costs, but they were not much more water efficient than existing methods. The average center pivot system achieved approximately 60 percent efficiency.

1951

High Plains Underground Water Conservation District was created by voters to ensure local governance over area water supplies.

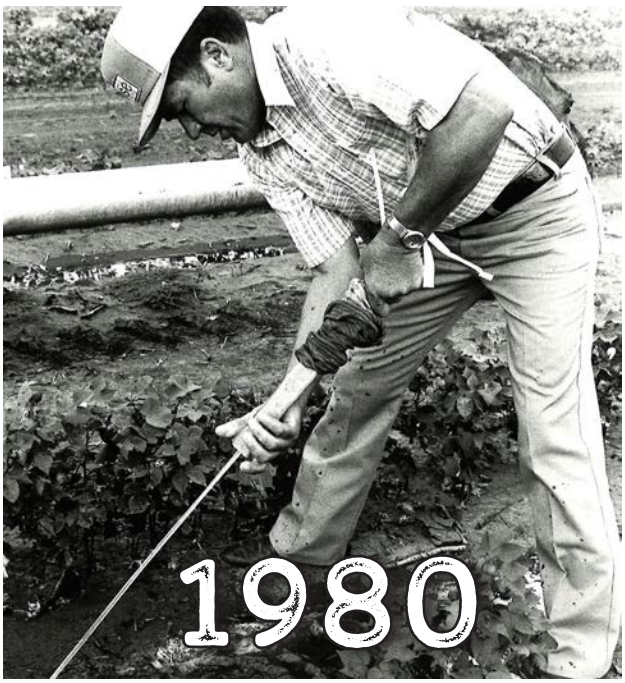


1962

96 percent of the 505,000 irrigated acres on the Texas High Plains are under sprinkler irrigation.

1971-1977

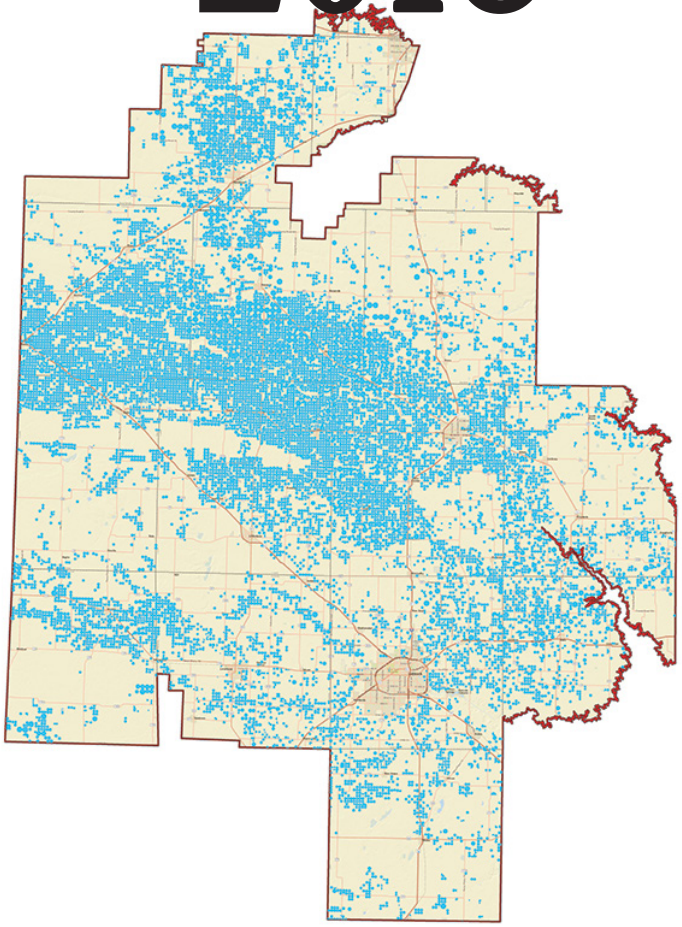
The number of center pivots in operation on the Texas High Plains jumped 400 percent from 885 to 3,645.



Carl Butler of Hockley County achieves **99.6 percent** efficiency using modified sprinkler system with low pressure drop lines and canvas socks.

Texas Agricultural Experiment Station Agriculture Engineer Dr. Bill Lyle of Lubbock explains his design of a dropline nozzle which reduces erosion in the furrow under a low pressure sprinkler. This evolved to become Low Energy Precision Application (LEPA) irrigation.

2018



There are approximately 14,300 center pivot systems and 5,800 subsurface drip irrigation systems in the High Plains Water District service area. This map depicts the location of each center pivot system.

> "Research data shows such a tremendous advantage that LEPA has over the traditional pivot system. We can achieve better crop yields, improved water use efficiency and energy savings."

-Dr. Bill Lyle , May 1988 issue of *The Cross Section*

WATCHING WATER:

IMPROVING IRRIGATION EFFICIENCY WITH TELEMETRY

Producer Jonathan James controls his center pivot through an application on his phone.

Article by Katherine Drury

There have been many advances in irrigation technology during the past century. Low Energy Precision Application (LEPA) center pivot systems and subsurface drip irrigation have taken the place of furrow irrigation with open, unlined ditches. With irrigation application efficiencies nearing 100 percent, researchers and irrigation equipment manufacturers are turning their attention to improved system monitoring and scheduling.

Telemetry technology, allowing remote monitoring and control of center pivot and subsurface drip irrigation systems, is an emerging trend among producers. The most basic systems allow the producer to remotely monitor an irrigation system and turn it on or off by clicking a button on his phone or computer. The more advanced telemetry systems can incorporate soil moisture information and weather data to help a producer schedule irrigation.

Jonathan James, a cotton and wheat producer in Floyd and Crosby Counties, utilizes monitoring technology on his irrigation systems. He said this equipment has been a valuable addition to his operation. "Mrs. FieldNet," as James' wife calls it, frequently sends him text messages about the status of his irrigation systems. This keeps him in the loop, if a system fails.

Earlier this summer, he and his family were about to take a day trip out of town. As always, he checked his irrigation systems that morning before leaving.

"I drove by a system with one of the monitors on it," James said. "Everything was fine. The monitor said it was fine. Visually, it was running."

He drove to check on the final center pivot. After ensuring that it was working properly, he turned around to go home before leaving town.

"That one pivot that I had driven by ten minutes earlier texted me that it had shut off," he said. "I

stopped by and had it fixed in about 30 minutes. If I had been without the monitoring system, the pivot would've sat there for 24 hours before I made it back again."

He estimates that he could have lost upwards of half a million gallons of water down the turn row had he not been immediately notified of the irrigation system malfunction.

James manages 19 center pivots. He drives about three hours every day to check on each of his fields and irrigation systems. He said this telemetry equipment helps him prioritize his route.

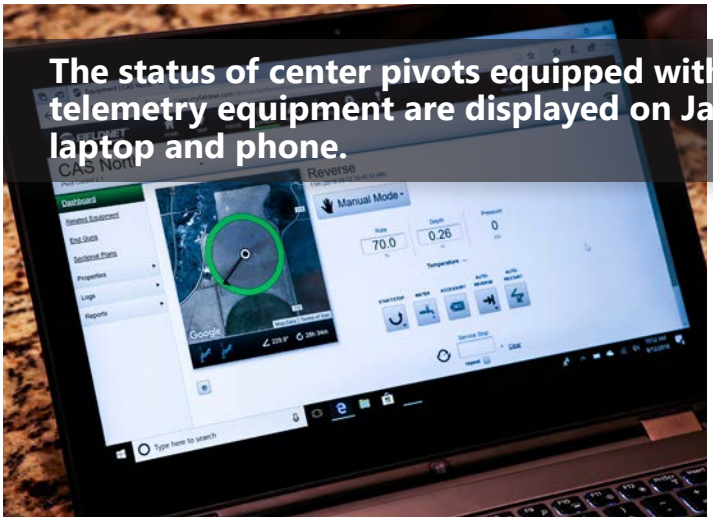
"I farm from north of Lorenzo to south of Dougherty. It takes me about three hours to make a circle to see every one of them. I still go to every one every day, but if I get up and see that one is off, I know I'm going there first and then make my circle rather than going around and showing up there at 11 o'clock. That's another four or five hours it might have saved me."

He said irrigation systems can shut down for a variety of reasons, which range from getting stuck in the mud to power surges. He estimates that on average, one of his systems malfunctions every day during the irrigation season. The ability to remotely communicate with his irrigation systems has been invaluable.

"The amount of time that it saves you and the information you collect from it is such a useful tool."

Telemetry allows producers to track when their systems were turned on or off and how long they are in operation. This data can be exported and evaluated with each data point serving as an opportunity to learn and refine the process for next season.

"Efficiency is the name of the game in farming. Every year, we're trying to squeeze just a little more and a little more, and this increases my efficiency of keeping machines running."



The status of center pivots equipped with telemetry equipment are displayed on James' laptop and phone.

AIM-ING FOR EFFICIENCY

HPWD has received a total of $375,000 from the Texas Water Development Board for cost share funding for the Assistance in Irrigation Management (AIM) program since 2017. The first round of funding was claimed in less than two weeks. The second round of funding was gone within three days.

"Based on past producer interest, we knew that these funds would be claimed very quickly," said HPWD General Manager Jason Coleman. "The HPWD Board of Directors commends these producers for their interest in this equipment. Purchasing and installing these devices can help conserve groundwater."

AIM is a voluntary cost share program that helps producers with the purchase price of telemetry-based irrigation monitoring systems used with either a center pivot system or subsurface drip irrigation system. This equipment allows remote monitoring of irrigation systems in order to detect problems or make adjustments during rainfall events.

WEATHERING THE

Article by Hope Henderson

Although not as severe as the 2011 drought, dry conditions plagued Texas throughout much of the 2018 growing season, making it very difficult to establish a crop.

Most of the Panhandle-South Plains region experienced severe to extreme drought conditions throughout the first eight months of 2018. Rain totals ranged from seven to nine inches across the High Plains Water District service area, well below average. A dry winter forced many producers to apply pre-plant irrigation in order to have adequate soil moisture for seed germination. As the growing season progressed, high temperatures coupled with very limited rainfall made this a difficult year for producers.

"Weather has such a major economic impact upon the economy of this region and this state. It is all heavily rooted in agricultural production," said Rick Kellison, project director for the Texas Alliance for Water Conservation (TAWC).

The TAWC project uses on-farm demonstrations of cropping and livestock systems to compare production practices, technologies, and systems that maintain farm profitability while extending the life of the Ogallala Aquifer. High Plains Water District has been involved with TAWC since the project's inception.

"It is a difficult scenario. You never go into a growing season thinking that you will have a drought similar to the one in 2011. That drought was a major learning experience for producers," said Kellison.

According to the Texas Water Development Board, the 2011 drought was the worst one-year drought since record keeping began in 1895. It also saw the hottest temperatures recorded up

E DROUGHT

to that time. All of Texas experienced drought conditions in 2011. Approximately 75 percent of the state was classified as being in exceptional drought—the most severe category.

Despite the dry conditions in 2018, Kellison said most producers are doing a good job evaluating how much water they have available for irrigation.

"Each producer has a different farm management philosophy. It is not a one size fits all. Our growers are doing a good job of picking strategies that work well for them while conserving the most water possible," he said.

Some of these include skip row planting, use of soil moisture probes and other telemetry-based irrigation management applications, conservation tillage, and use of more water-efficient crop varieties.

Kellison shared a story about one producer who reduced the seeding rate in his field since he knew there would be a limited amount of water for the crop. This also helps reduce cost since seeds are among the major inputs for producers.

"I'm optimistic that our producers will be even better prepared for future droughts as our irrigation management technology and crop genetics improves," said Kellison.

No one knows what weather is in store for the 2019 growing season. However, State Climatologist John Nielsen-Gammon said long-term forecasts call for El Niño weather patterns through winter and spring, according to a news release. This typically means above-average rainfall, especially in South Texas.

"September is already off to a good start. It's not good for cotton producers, but much of the state has received moisture in the last few weeks," said Nielsen-Gammon. ■

Minor Aquifer *Major* Potential?

Article by Jason Coleman, P.E.

Over the last several years, the High Plains Water District has partnered with several municipalities in order to explore the minor aquifers below the Ogallala as potential alternative water sources.

In 2017, the HPWD board voted to cost share a test well project with the City of Wolfforth. The objectives of this test well were to investigate the characteristics of the Dockum Aquifer in Southwest Lubbock County, log the entire borehole depth to study the strata of the formations at this location, and to complete a temporary production well in the Edwards-Trinity (High Plains) Aquifer (ETHP).

Crews from Layne Water Management began drilling the seven inch diameter test hole on March 6, 2018. In order to investigate the entire thickness of the Dockum Aquifer, crews drilled to 1,730 feet below the land surface. The USGS logging crew began their work on March 11, 2018 and gathered valuable data from the formations.

Here is a general description of the aquifer units at the test hole location:

- 0 to 200 feet -- Ogallala
- 200-285 feet -- ETHP
- 285-1,730 feet -- Dockum

After the geophysical logs were obtained, the test hole was plugged from 1,730 feet to 290 feet. The small diameter test hole was then reamed to twelve inches from land surface to 290 feet, where the temporary test well was installed for further analysis of the ETHP.

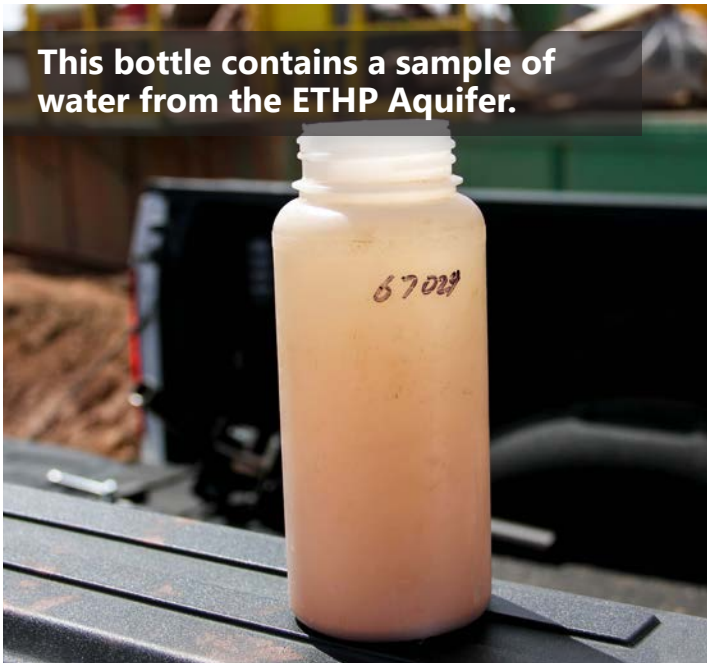
The sediments in this aquifer that may yield significant quantities of water include limestone and sand. Due to erosional processes, however, the existence and thickness of these units varies.

At this site, the geophysical log indicated the presence of limestone and sand in the 200-280 foot interval below land surface. Where limestone rocks are fractured or contain significant void spaces, water is transmitted to a well bore in greater quantities than where the rocks are completely consolidated.

Unfortunately, there is no certain way of predicting where these fractures and voids exist. Hence, a drilling and test well project is currently the most reliable method of determining the nature of the limestone rocks.

Quantifying the thickness and productivity of the sand units is also quite difficult, since we have few records of wells in this area as a reference.

For the temporary ETHP well, the contractor used seven inch diameter casing and screen. The screened section of the well was 220-285 feet below land surface. Using a tremie, the driller installed a bentonite plug in the annular borehole space from 170-210 feet below land surface in order to isolate the overlying Ogallala sediments from the ETHP



This bottle contains a sample of water from the ETHP Aquifer.

screened section.

When the temporary well was installed, the depth to water was 130.40 feet below land surface. This water level is about 15 feet higher than the Ogallala water table, indicating a confined aquifer system at this location.

After the temporary well was constructed in the ETHP aquifer, the contractor used an airlift procedure to help remove the drilling mud and develop the well. It is necessary to remove the cake of mud in the borehole wall so that the formation water is transmitted to the well casing. The contractor then installed a submersible pump for test pumping the well. Over a twelve hour period of test pumping, the well did not produce much more than ten gallons per minute. As a result, the test pump was removed in favor of additional well development techniques. These processes involved more air lifting, as well as a chemical treatment to help remove any remaining drilling mud. Despite these efforts, little improvement in the well productivity was realized. Our conclusion is that the limestone rocks at this location do not contain significant cracks or void spaces.

The water quality was also tested. The results of this analysis show very high dissolved mineral content. The water was tested by a hand sampler in the field, at a certified laboratory, and with a continuous monitoring probe. All three methods produced very similar results. Public drinking water systems must have total dissolved solids (TDS) of less than five hundred milligrams per liter. A TDS of 500 mg/L is roughly the same as conductivity of 810 microsiemens per centimeter (uS/cm).

The test well conductivity ranges from 8,000-16,000 uS/cm, much higher than the allowable for public drinking water.

Scientific publications indicate that water quality in the ETHP Aquifer is generally a bit higher in TDS than Ogallala. However at this location, the ETHP results are more than ten times higher in TDS than the Ogallala. This leads us to question whether the sampled water is truly indicative of the ETHP, or if there is a Dockum Aquifer influence in the sampled water. HPWD studies show that water quality of this same TDS level is present in the Dockum Aquifer. We also know that "upconing" may occur in the Dockum, which could result in the high TDS results from these samples. More work should be performed in the ETHP water quality sampling before we may conclusively resolve this question and consider this as a viable alternative to the Ogallala Aquifer. ■

HPWD Field Supervisor Keith Whitworth reels up the AquaTroll, a device that provides real-time water quality data.

DIGGING DEEPER:

A STUDY OF THE DOCKUM AQUIFER

Article by Carmon McCain

A devastating 2011 drought prompted many landowners and municipalities to look at brackish groundwater as a possible alternative water supply.

The Texas Water Development Board (TWDB) classifies the Dockum Aquifer as a minor aquifer. It underlies the entire High Plains Underground Water Conservation District (HPWD) service area—buried far below the Ogallala and Edwards-Trinity (High Plains) Aquifers.

For many years, there was little information about the quality and quantity of groundwater stored in the Dockum Aquifer. Many had to refer to TWDB Report # 345, *Aquifers of Texas*, published in Nov. 1995.

With that in mind, the HPWD Board of Directors adopted a multi-faceted Dockum Aquifer study in April 2015.

Here is what HPWD staff have accomplished since April 2015:

- Approximately 292 active wells identified in the Dockum Aquifer.
- The U.S. Geological Survey (USGS) has conducted geophysical logging of 23 Dockum wells since 2015.
- HPWD staff has completed upwards of 34 water quality well logs using an Aqua Troll. HPWD also has deployed two daily logging tools in Dockum wells in Deaf Smith and Swisher Counties.
- HPWD Board of Directors approved funding of four Dockum Aquifer research projects. Of these, three projects involved drilling of test wells at Abernathy, Lubbock, and Wolfforth.
- HPWD staff performed over 100 flow tests—with water production ranging from 56 to 1,010 gallons of water per minute.
- HPWD staff established a network of 32 annual water level observation wells for the Dockum Aquifer. The 2018 water level measurements showed an average change of +1.18 feet in water levels during 2017. Swisher County had a maximum water level rise of 12.38 feet while Hockley County had a maximum water level decline of 3.44 feet.
- HPWD staff collected 117 water quality grab samples from pumping Dockum Aquifer wells in the District.
- HPWD staff modified the TWDB Dockum Aquifer map to show areas where total dissolved solids (TDS) are greater than 5,000 milligrams per liter (mg/L). These areas, previously shown in white, could lead people to believe that the Dockum Aquifer does not exist in those areas.

Legislators are gathering information about brackish groundwater issues during the interim session hearings. For example, the House Committee on Natural Resources is evaluating the status of groundwater policy in Texas, including "the designation of brackish groundwater production zones and related research."

"HPWD staff members are proud of the knowledge being acquired through these studies", said General Manager Jason Coleman. Visit **hpwd.org** for infographic summaries of the Dockum Aquifer study program. ■

ON THE HORIZON

Article by Katherine Drury

Cutting-edge agricultural research is being conducted throughout the High Plains Water District. Many of these projects are aimed at improving irrigation scheduling recommendations and crop water use. Here is a sample of what researchers are working on.

IRRIGATION CONTROLS

A user-friendly irrigation control system was created at the Bushland USDA-Agriculture Research Service (USDA-ARS) facility by a team of agricultural researchers and computer scientists from Texas A&M University, Texas A&M AgriLife Research and Extension in Lubbock and Bushland, and USDA-ARS Bushland.

This technology improves irrigation timing recommendations using variable speed center pivot system. The system controller integrates soil moisture probes, real-time and forecasted weather data, crop models, and machine learning techniques. They want the end product to be practical and economical for producers to implement. Though this system automates much of the decision-making process, producers may also use a manual operating feature. This system is designed to be independent of the irrigation system manufacturer's control platform, making it compatible with all brands.

Through the development of this pivot control system, the researchers have also addressed concerns many producers have with current technologies. Specifically, the location of a pivot in a field can now be tracked within one meter of accuracy using GPS technology. They have also developed a methodology for optimizing the number and placement of soil moisture sensors.

Though there is limited field data available at this time, modeled crop yields are promising with the newly-developed system. Simulations indicate a 20 percent reduction of water use can be achieved without affecting corn yield.

COTTON

Much of the cotton research conducted at the Lubbock USDA-ARS Cropping Systems Research Laboratory (CSRL) is focused on increasing yield and improving water use efficiency. In one trial, researchers are studying the effects of inserting tomato genes into cotton. A small scale trial shows a yield increase of 80 percent. A larger field trial is being conducted to confirm these preliminary findings.

Dr. James Mahan and Dr. Paxton Payton are evaluating cotton performance under eight water and thermal environments in a single growing season. They planted a plot every two weeks from March 15 to July 6, with three inches of soil moisture available at planting. Though this is a dryland experiment, researchers had to add supplemental irrigation to simulate average rainfall events due to the 2018 precipitation deficit. After three years of this experiment, preliminary results show that earlier cotton planting may have an apparent advantage. However, planting in March is too early.

GRAINS

Many of the corn and sorghum trials at the CSRL in Lubbock are focused on improving temperature and drought tolerance. Dr. Yves Emendack is examining the impact earlier planting has on different varieties of sorghum. Improving cold tolerance allows producers to plant their crop earlier in the year and take advantage of spring rains and better soil moisture. Dr. Emendack is not only studying germination rates, but also final yields. He said final crop yield is more important than just germination rates.

One of Dr. Junping Chen's projects examines heat and drought tolerance of corn and sorghum varieties. Her goal is to incorporate stress tolerant genetic traits in breeding for resilience in these crops. She is screening for heat and drought tolerant germplasm in water-limited fields under high temperatures. Some of these varieties are showing high heat and drought stress tolerance.

HIGH TUNNELS

There are several high tunnels at the Bushland experiment station for vegetable production research. Preliminary results from one of the studies shows water use in vegetable crops is lower in high tunnels than in open fields. Growers in the Lubbock region have had great success using high tunnels in recent years to grow high value crops, such as strawberries. Texas A&M AgriLife Extension Researcher Dr. Russ Wallace in Lubbock has also been evaluating blackberries, cut flowers, and other crops grown in high tunnels. These structures are a valuable tool for market farmers who sell their products directly to consumers.

These projects show much promise in helping producers improve crop yields and optimize water use. Many of these projects are still under investigation, and more work is needed before final recommendations can be made and these technologies are market-ready. HPWD will keep you apprised of the findings of these and other research projects conducted in our region.

WEST TEXAS AGRO-CLIMATE MONITOR

Dr. Steve Mauget at the USDA-ARS CSRL in Lubbock created the High Plains Agro-Climate Monitor, which examines precipitation and temperature patterns. This Agro-Climate Monitor helps users compare current conditions to previous years. It displays continuously updated information on soil temperature, cumulative growing degree days, cumulative precipitation and first freeze dates. It averages ten years of data from the five West Texas Mesonet sites nearest you to create a summary of these variables.

Check out the tool by searching online for "West Texas Agro-Climate" or typing in: csrl.ars.usda.gov/wewc/WestTXClimMonitor/index.php

Create a Waterwise Landscape

Article by Katherine Drury

Outdoor watering can account for 50 to 80 percent of home water use in the spring and summer. This may be wasted through poor choice of plant materials and inefficient landscape watering practices, including runoff. By transitioning to a waterwise landscape, you can cut down on your daily water use and lower your monthly water bill while creating an outdoor oasis. Here are some steps to help you transform your lawn into a waterwise landscape.

Planning

Create a master landscape plan for reference. Consider your site's daily sun exposure and soil drainage. Group plants based on water and sunlight requirements.

Soil Health

Get your soil tested, and amend it accordingly. All soils will benefit from the addition of organic matter. This will increase your soil's aeration and ability to absorb and store water. Till in four to six inches of fully composted organic material each time you replant annual beds.

Turf Grass

Choose a low water use variety of grass. Consider reducing the amount of turf grass in your landscape. Most turf grasses require about one inch of water per week to survive. Maintain your turf to increase its water efficiency. Mow at the correct height, fertilize and extract weeds.

Efficient Irrigation

Water in the morning or evening to avoid evaporation and wind drift. Check your system often to ensure all spray heads are working and that your system is not creating runoff. Turn your system off during wet weather or freezing temperatures. For flower beds, use drip irrigation or soaker hoses where appropriate. Consider collecting rainwater for use in your flower beds.

Plant Selection

Consult your landscape plan, and choose plants based on the area where they will be planted. Native or adaptive plants usually require less water and maintenance. Check the cold hardiness of the plants you are considering. Not all Texas native plants will withstand our cold winters. Check out the next page for our plant suggestions.

Mulch

Mulch helps reduce the amount of moisture evaporated from the soil, reduces annual weed populations, prevents soil compaction and moderates soil temperatures. Maintain a three to four inch layer of mulch year round. Use organic mulches like compost, straw or wood chips. As these deteriorate, they will add organic matter to the soil.

Maintenance

Keep weed populations at bay; they compete for water and sunlight. Take care of diseases and pests, as they can inhibit a plant's ability to intake water. Healthy plants use water more efficiently, so fertilize turf grass and other plants. Water your plants deeply and less frequently to encourage healthy root systems. Replenish mulch in the fall and spring.

Rainwater Harvesting

Collecting rainwater is a great way to offset your reliance on municipal and groundwater supplies. A catchment system can be as simple as a bucket under the eaves of a roof, or as complex as gutters that channel rainwater into tanks. Tanks range in capacity from 50 to 5,000 gallons or more. Passive rainwater collection can also be accomplished by adding bioswales, rain gardens or other depressions to collect water in your landscape. Check out rainwater.tamu.edu for more information!

Calculate how many gallons you can catch on your home or barn during a one inch rain event!

_____ sq ft roof x .623 =

____ potential gallons

Waterwise Plants

Be sure you read the label before buying a plant. Make sure it is a drought tolerant or low water use variety. Check the plant's sunlight and soil drainage requirements. If you're purchasing a perennial, shrub or tree, ensure that it will withstand our freezing temperatures.

The plants listed below are not the only waterwise plants that can be grown in our area, these are just some of our favorites!

Perennials

- Agastache (Hyssopp)
- Artemisia
- Blackfoot Daisy
- Catmint
- Delosperma
- Dianthus
- Evening Primrose
- Flame Acanthus
- Gallardia
- Gaura
- Jupiter's Beard
- Lavender
- Mexican Bush Sage
- Red Yucca
- Rosemary
- Saliva Greggii
- Texas Sage
- Turks Cap
- Yarrow
- Zexmenia

Wildflowers

- American Basketflower
- Chocolate Daisy
- Copper Globe Mallow
- Indian Blanket
- Plains Fleabane
- Prairie Coneflower
- Prairie Verbena
- Purple Prairie Clover
- Tahoka Daisy
- White Prickly Poppy

Grasses

Ornamental:

- Feather Reed Grass
- Northern Sea Oats
- Pampas Grass
- Purple Fountain Grass
- Sand Lovegrass
- Switch Grass

Turf Grass:

- Bermuda Grass (certain varieties)
- Buffalo Grass

Range Land:

- Grama
- Blue stem

Groundcovers

- Bishop's Weed
- Hardy Plumbago
- Purple Heart
- Santolina
- Sedums

Trees

- American Smoketree
- Austrian Pine
- Chinese Pistache
- Hackberry
- Hawthorn
- Lacebark Elm
- Prairie Flameleaf Sumac
- Southern Catalpa
- Texas Red Oak
- Texas Redbud
- Thornless Honeylocust
- Vitex
- Western Soapberry

Vines

- Honeysuckle
- Passion Vine
- Silver Lace Vine
- Sweet Autumn Clemantis

Banking on a Rainy Day

Article by Carmon McCain

Persons traveling through the busy intersection of Southwest 45th Avenue and Teckla Boulevard in Amarillo may take a moment to notice the banking center built there about seven years ago. However, few realize that it is home to one of the city's larger commercial rainwater harvesting installations.

Construction of the FirstBank Southwest (FBSW) Western Banking Center begin in 2012. Bank officials and landscape architects agreed that they could do more to conserve water — even though xeric landscaping was a major component in the original landscape plan.

Before construction, the 36,252 square foot site allowed 100 percent of rainwater runoff to enter the City of Amarillo's storm water system. Addition of an on-site rainwater harvesting system helps reduce the amount of water used for landscape purposes and lessens storm water runoff in this flood-prone area.

"Residents of our area are Texas tough and Panhandle proud. When you think about it, we are doing the same thing that our early predecessors did. They had to capture water (in cisterns) in order to maintain a viable lifestyle," said Smith Ellis, FBSW Chairman of the Board.

It was hot and dry when I visited the bank in late August. David Pace stood in a doorway and pointed toward the tan-colored pavers around the building. He has served as FBSW properties manager since 2009.

"Every so often, people will ask to see the system during a rainfall event. I like to watch the expression on their faces as rain flows across the parking area and eventually disappears into the permeable paving system," he said.

Rain falls upon the parking lot and the building's metal roof. Downspouts channel water from the roof to the pavers. Once below the pavers, it flows through gravel backfill into 530 linear feet of perforated pipe. The pipe conveys water into an underground tank.

"The tank is basically a rigid 'milk crate' with a non-permeable envelope around it," says Jason Habeger with Turner LandArchitecture in Amarillo. The company designed the rainwater harvesting system.

These permeable pavers allow rainwater to pass through and collect in the tank below the surface.

"This type of tank doubles the storage capacity at a lesser cost. The system, as a whole, is not from one company. It is a combination of multiple rainwater collection methods available from different sources. Each can be used independently – it just depends upon what the customer wants to accomplish with their design."

The paver system base can hold up to 12,000 gallons of harvested rainwater. An additional 14,600 gallons of rainwater can be stored in the underground tank. This gives a potential storage capacity of 26,600 gallons. That is the equivalent of 99.6 percent of the rainfall collected from a two-year storm event.

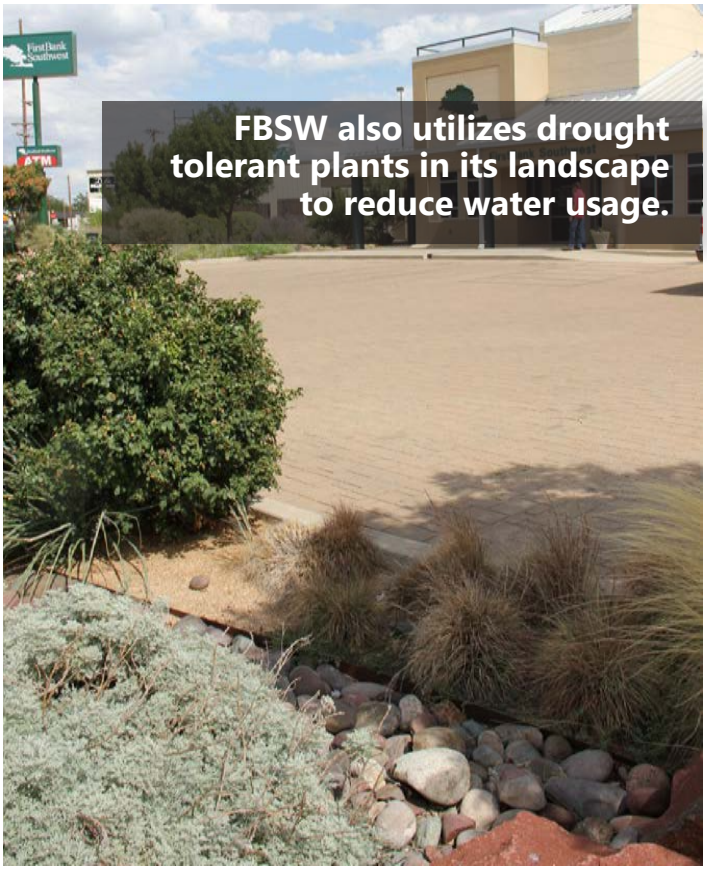
"This is not a self-sustaining system — even though we have the potential to collect a large amount of water. For example, our last major rainfall was in September and we were out of water by February. There are backup connections to use city water for the landscape, if needed. This still saves water because of the xeric landscape. We are equipped to handle the ebbs and flows of rainfall events," said Pace.

The banking center contains 7,720 square feet of designed landscape area. The perimeter includes a rain garden/swale with boulders from Marble Falls, decomposed granite mulch, and river cobble. This allows rainwater to percolate into the soil.

Planting the area in tall fescue would require an application of approximately 171,661 gallons of water with an automatic landscape sprinkler system during the growing season.

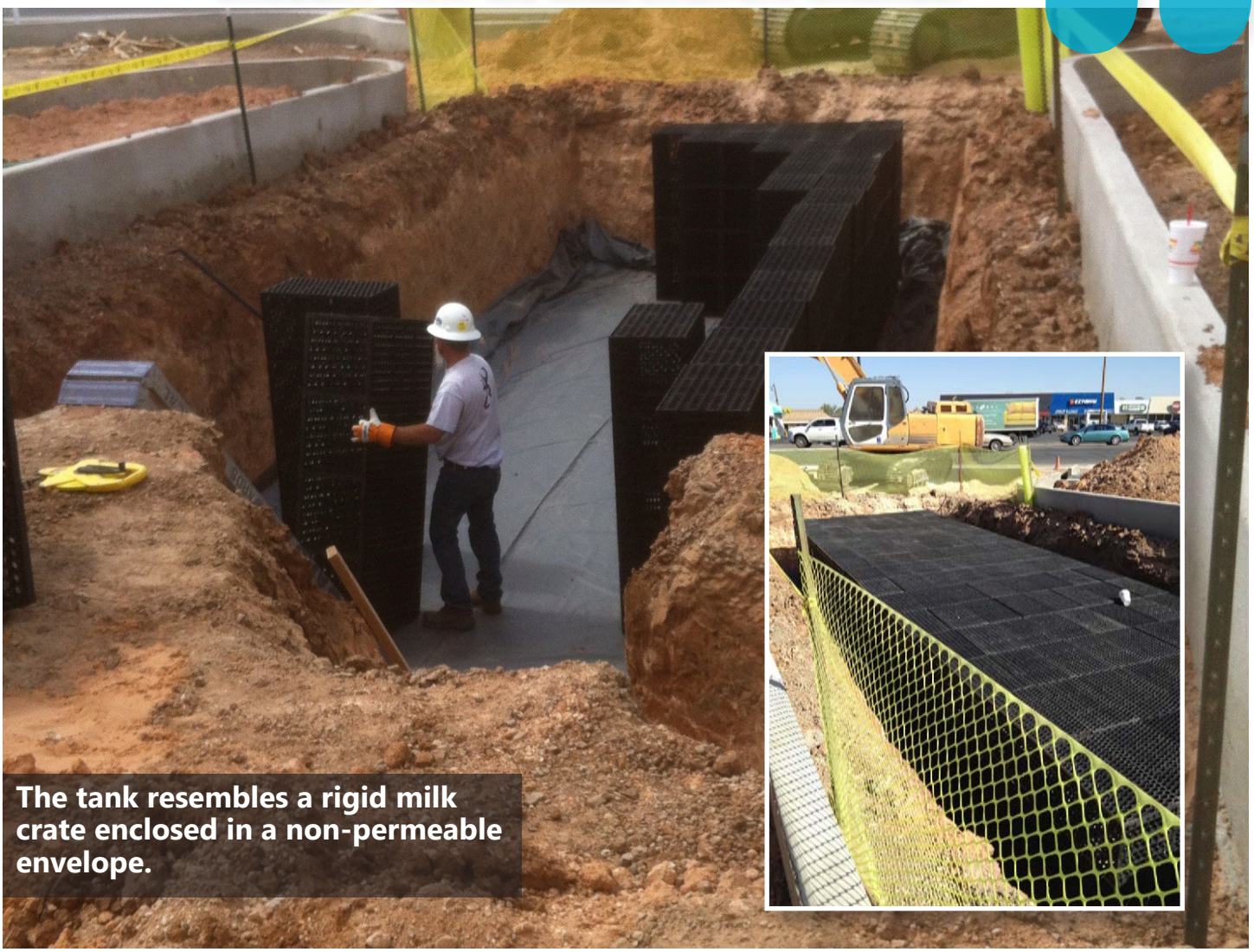
Designers incorporated a point source drip irrigation system for efficiency and flexibility. Each bedded plant receives about one gallon of water per hour through one to five strategically placed emitters. Trees receive one gallon of water per hour through two bubblers.

The xeric landscape, combined with the drip irrigation system, will reduce landscape water use by 60 percent as compared to a traditional tall fescue lawn.



FBSW also utilizes drought tolerant plants in its landscape to reduce water usage.

> IT IS THE RIGHT THING TO DO – EVEN THOUGH IT IS THE PINNACLE OF A SMALL EFFORT TOWARD WATER CONSERVATION. BELIEVE ME, THIS ISN'T THE LAST DROUGHT THAT WE WILL EVER EXPERIENCE.



The tank resembles a rigid milk crate enclosed in a non-permeable envelope.

Both Habeger and Pace agree that this project has increased awareness of the use of xeric landscaping. It also prompted a change in the City of Amarillo's landscape ordinance with the addition of a recommended plant list.

"People in Amarillo are starting to understand that they can have an attractive landscape with native drought-tolerant plants, rather than relying on traditional turf and trees. This project has inspired them to ask how they can accomplish similar results and be a good steward of our natural resources," said Habeger.

Ellis agrees that it is important to lead by example.

"This rainwater harvesting project has exceeded our expectations. It was a costly project – but it is worth it for several reasons. It enhances the community in which we are a corporate partner. Even more importantly, it highlights some of our water issues and provides a way to combat those problems. It is the right thing to do – even though it is the pinnacle of a small effort toward water conservation. Believe me, this isn't the last drought that we will ever experience," he said. ■

The 86th Texas Legislative Session

Article by Victoria Whitehead

The 86th Texas Legislature faces a diverse set of water policy issues when it convenes Jan. 8, 2019 in Austin. These include groundwater management, use of brackish groundwater resources, and surface water issues in the aftermath of Hurricane Harvey.

During the interim session, High Plains Water District (HPWD) shared information with legislative stakeholders relating to charges issued by Lt. Governor Dan Patrick and House Speaker Joe Straus. In addition, HPWD staff reviewed legislative topics likely to emerge during the upcoming session.

Interim Activities

Groundwater policy continued to be a topic of discussion at several interim committee hearings across the state. Legislators discussed unsolved issues from the 85th session as well as emerging issues in groundwater law/regulation. HPWD provided invited testimony about its water well permit process, efforts to balance water conservation and private property rights, and brackish groundwater production.

In June, HPWD offered testimony before the Senate Committee on Agriculture, Water, & Rural Affairs in Austin. Governmental Affairs Director Victoria Whitehead gave an overview of HPWD water well spacing and production rules, which have been in place for more than 60 years. In addition, the committee learned how HPWD approaches management of aquifers through groundwater monitoring, public education efforts, and research/demonstration projects.

Also in June, HPWD Board President Lynn Tate of Amarillo offered invited testimony about use of brackish groundwater during the House Committee on Natural Resources hearing at Palo Duro State Park in Canyon. He discussed use of the Dockum Aquifer as a water supply for beef cattle operations and municipalities in the northern portion of the HPWD service area.

However, he noted that HPWD research shows usable groundwater is not prevalent in all portions of the Dockum Aquifer. A large portion of the aquifer is extremely brackish with total dissolved solids (TDS) exceeding 5,000 milligrams per liter (mg/L) in the central and southwestern portions of the HPWD service area. As an example, a Dockum Aquifer test well drilled by the City of Lubbock, with cost sharing from HPWD, produced extremely brackish groundwater with TDS greater than that of seawater.

Since the salinity of Dockum Aquifer water varies so much across the District, Tate said it is important to continue sound policy discussions about the definition of "brackish" groundwater and the need for additional research and local management of this resource.

What We Expect at the 86th Legislature

As noted earlier, legislation relating to Hurricane Harvey will keep lawmakers busy this session. However, lawmakers will address some groundwater-related topics, based upon discussion and comments made during the interim session.

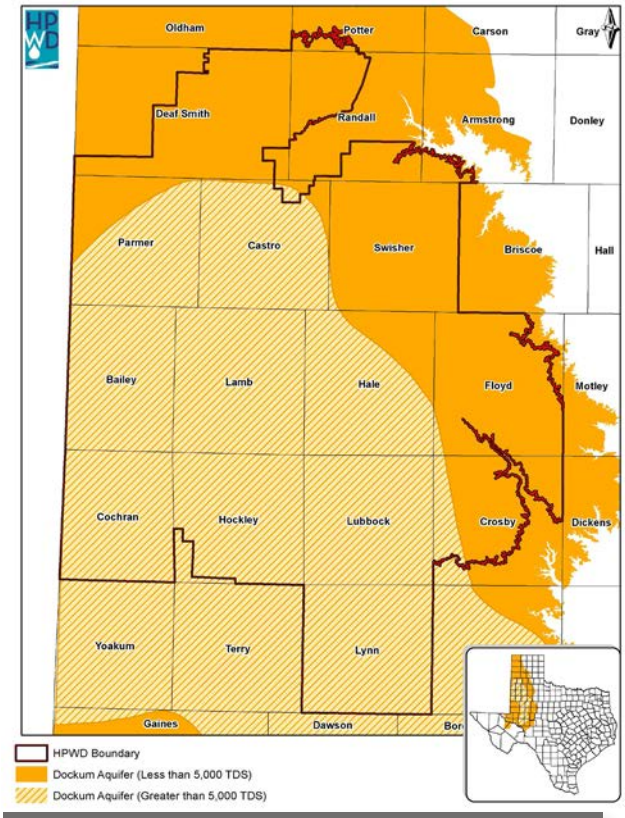
Groundwater Litigation

Some appellate court cases may prompt questions for further review by the Texas Legislature. This could include:

- Who has a standing in a lawsuit relating to a groundwater permit?
- Will landowners be able to recover attorney fees if they take groundwater conservation districts to court and prevail?

Groundwater Permitting

Groundwater districts across the state have the authority under Chapter 36 (Texas Water Code) to issue permits for water wells based upon a number of various methods. This can include water well spacing, production-based permitting, historic use, and beneficial use.



The Dockum is a minor aquifer in the HPWD service area that has areas of extremely brackish water.

Many districts use a combination of these methods to meet the needs of their constituents, while protecting groundwater stored in aquifers within their jurisdiction.

In previous sessions, the Texas Legislature has examined the various methods to see if groundwater conservation districts truly balance water conservation and private property rights. We expect the Legislature to monitor this issue and address problems as needed.

Brackish Groundwater Development

It is important for the State of Texas to plan accordingly for future water needs. This includes investigating use of new or unused groundwater resources, including brackish groundwater.

Brackish groundwater quality and quantity varies drastically across the State and within the HPWD service area. HPWD will monitor proposed brackish groundwater legislation and education legislators about our successful management of this resource.

Victoria Whitehead addresses the Senate Committee on Ag, Water and Rural Affairs on June 4 in Austin.

"HPWD is dedicated to being a resource for the Texas Legislature," said Governmental Affairs Director Victoria Whitehead. "We are busy working with elected officials to encourage, develop, and maintain sound policies for the High Plains region. This includes providing an understanding of the importance of groundwater for economic development," she said.

Follow our legislative updates by subscribing to *The Cross Section*, the district's free newsletter. It is available as a bi-weekly email version or a monthly print edition. Visit hpwd.org/signup to be added to the mailing list.

High Plains Underground Water Conservation District