CONSERVATION CONNECT

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A publication of the High Plains Water District

Learning Landscape:

A school garden provides conservation education for students of all ages

IN THIS ISSUE:

On the Cover:
Bushland Elementary School garden organizers Jessica Patterson, Michael Hall, and Neal Hinders stand in the new waterwise landscape in front of the school.

Editors: Katherine Drury/Carmon McCain

Contributor:
Keni Reese- HPWD intern

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LETTER FROM THE PRESIDENT

For several years, High Plains Underground Water Conservation District (HPWD) has had an unofficial motto that "water conservation is best accomplished through public education."

It is our pleasure to showcase the water conservation efforts of several individuals in this issue of *Conservation Connect*. Each plays a vital role – whether it is adoption of new technologies for water treatment, installing a xeric landscape demonstration garden at a local school, or conducting research for a better understanding of geology/hydrology of aquifers in our district.

With our motto in mind, the HPWD Board of Directors and Staff continue exploring ways to provide the best groundwater information to the public.

Many have provided favorable comments about the interactive map feature on the HPWD website (**map.hpwd.org**). They've commented about the ease of finding information about permitted water wells in the district, daily and annual water level data from the observation well network, Dockum Aquifer data, and the ability to view copies of drillers' logs and geophysical logs.

We're constantly looking for ways to improve this feature. Rain gauge data has recently been added to the site. For example, there are now bar charts depicting 2017 rainfall by month. Clicking on each bar chart brings up an expanded view of rainfall by day for that respective month.

The Board of Directors and Staff realize none of this could be accomplished without the support of constituents within our 16-county service area.

As always, we want to hear from you. Comments and suggestions relating to HPWD programs and activities are always appreciated. Feel free to call our office at (806) 762-0181 if you have questions, comments, or need more information about the district. ■

Lynn Tate

Lynn Tate, HPWD Board President

AIMING FOR IRRIGATION EFFICIENCY

Article by Carmon McCain

Agricultural producers within the HPWD service area have always been responsive to new advances in irrigation technology—especially those which can help improve water use efficiency and conservation.

Following the successes of LEPA, drip irrigation, and other technologies, irrigation industry leaders and manufacturers began focusing on ways to improve irrigation management.

As weather, crop and other production variables change daily, so do irrigation management decisions. Telemetry systems and mobile apps allow producers to remotely start or stop a system, adjust the amount of water/chemical applied, and troubleshoot issues without having to actually visit a site. These monitoring systems offer other features, too, which are configured by the user.

In order to help producers access this technology, HPWD applied for a grant with the Texas Water Development Board's (TWDB) Agricultural Water Conservation Grant Program. TWDB awarded $225,000 for the HPWD Assistance in Irrigation Management (AIM) Program in August 2017.

"More than 150 applications for cost-share funding were received in the 14 days following our program announcement. Of these, approximately 143 qualified for funding. The HPWD Board of Directors and Staff are very pleased by our producers' interest in implementing this technology," said Victoria Messer Whitehead, HPWD Governmental Affairs Director.

Some equipment funded by the program includes center pivot monitoring and controllers, subsurface drip irrigation controllers, and center pivot rain monitors. All devices have capabilities of transmitting data to mobile devices, such as tablets and cell phones.

Qualified applicants are reimbursed up to 50 percent of the purchase price of telemetry-based irrigation monitoring systems typically used with a center pivot system or subsurface drip system. Funds were handled on a first-come, first-served basis until depleted.

HPWD will continue to seek grant-funding opportunities with the TWDB, but no additional funding for the AIM Program is available at this time.

"We greatly appreciate the TWDB's efforts to share these funds with producers to improve irrigation management. It is a significant investment in groundwater conservation," she said. ■

HEALTHY SOILS HELP CONSERVE WATER

Article & Photos by Carmon McCain

During a recent crop residue field day in Hale County, USDA-NRCS Zone Agronomist Brandt Underwood placed two soil samples onto pieces of mesh and then submerged them in individual cylinders filled with water.

As the Slake Test progressed, people watched as most of the conventionally tilled soil fragments quickly dissipated within a five-minute period. The minimum tillage soil fragments, containing higher organic matter, remained intact for an extended time.

"As this demonstrates, the minimum tillage soil has greater structure (tilth) which provides greater stability. This improves soil aeration and water retention while reducing erosion and nutrient leaching," said Underwood.

Many High Plains agricultural producers are working to improve their soil health to increase crop yields and better utilize their groundwater resources.

Conservation tillage and no-till operations are one way to accomplish this.

"This is a way to put the soil back in balance and return it to a natural state. Most of the soil activity is currently bacterial, which burns up organic material and nutrients. Bringing the fungal level back to a natural state will be beneficial in the long run." said Jeff Miller with ForeFront Agronomy.

He said soil contains 45 percent minerals, 25 percent water, 25 percent air, and five percent organic matter. Of the organic matter, 80 percent is humus, 10 percent are roots, and 10 percent are organisms, such as bacteria and fungi.

"Water must displace air to enter the soil. The higher the bulk density, the greater the soil compaction. Soils with high compaction are likely to have poor water infiltration rates and slower root growth. No-till can increase water infiltration rates in the soil by as much as 10 percent. There is also a 10 percent increase in rooting depth," said Miller.

He noted that test plots with lower crop residue required an additional 1.5 to 2.5 inches of irrigation water to achieve the same crop yield as compared to plots with residue on the surface. At the end of the growing season, plots with more residue contained an additional 1.5 inches of water in the top four feet of the soil profile as compared to those plots with no residue cover. Plots with residue on the soil surface would save three to four inches of irrigation water as compared to bare soil.

No-till operations have been fairly common in Kansas for many years. However, Miller said the practice is in its infancy here on the Panhandle-South Plains.

"It got a bad rap because some folks were doing it incorrectly. You can't have a monoculture crop, such as cotton only. There must be multiple crops grown during multiple years for it to work properly. With that in mind, some producers are taking a second look at no-till. They are adding cover crops to their farming operations. Some are considering nutrient recapture to increase soil organic matter and reduce compaction," he said.

Miller believes no-till farming can be beneficial to the region.

"We've seen advances in irrigation technology that allow water to be applied more efficiently. Now, we're seeing new ways to improve irrigation management and scheduling. This allows producers to make better decisions, which we hope will help slow groundwater decline in our area," he said.

Kelly Kettner, who operates a 4,000 acre farm in Lamb and Parmer Counties, has used no-till farming practices since 2004. His main crops include cotton, corn, sorghum, wheat, and barley.

Initially, he stopped plowing in an attempt to halt soil erosion. "I was frustrated by having to go out and run a sand fighter."

However, attendance at the 2009 No-Till On The Plains conference in Kansas gave Kettner an understanding that no-till farming is much more than simply choosing not to plow fields.

"Essentially, all life depends upon the soil ... There can be no life without soil and no soil without life; they have evolved together."

- Charles E. Kellogg,

USDA Yearbook of Agriculture, 1938

"It showed me the importance of noticing your native ecosystem and trying to mimic it through farming practices using summer and winter cover crops," he said. It was then that he starting using a true no-till system with cover crops and strategic crop rotations.

The Muleshoe producer has seen many benefits from converting to no-till farming.

"My soils are definitely healthier. I have many earthworms now—and after rain events, I see mushrooms and white fungi growing on the old crop residue. Fungus is the 'glue' that holds organic matter in place. This allows water and nutrients to be readily available for growing crops," Kettner said. He added that his soil has a soft, sponge-

Healthy no-till soils (left) are darker and have more organic matter than conventionally tilled soil (right).

The wheat harvest has long passed, but the stubble remains in the fields throughout the next cotton crop.

like texture when he plants his summer cash crop following the winter cover crop.

He has also observed an increase in crop water use efficiency.

"Water use efficiency has greatly increased since adopting no-till practices. Very seldom do I irrigate cotton before bloom and I can usually delay watering corn until the v6 stage. The only exception is if we have a dry spring and the cover crop has depleted moisture stored in the soil profile," he said.

Input costs, such as fuel for plowing, have also reduced. "I'm no longer making multiple trips across the field to plow. The cover crops provide plant competition to control weeds. Residual weed control is important because you don't have any mechanical options other than a hoe."

Kettner said patience is a virtue when converting from conventional tillage to no-till. During his 13 year experience, there were many times when he was ready to just give up and go back to conventional farming methods. Yet, through it all, he has remained focused on improving the health of his soil.

"There is no textbook about how to farm with a no-till system. Be patient and figure out how to make no-till fit your farm management style and mix of crops. It requires more management and planning than conventional farming. The first few years of no-till can be challenging because your soils are making the transition from a bacterial dominated system to a fungal dominated system. You may not see the full benefits at first," he said.

The primary disadvantage to high residue no-till farming is having cool soils at planting time. This is not an issue with corn, but it could result in a delayed cotton crop. Miller said test plot observations showed soil temperatures at planting were 8 percent cooler with no-till as compared to conventional tillage. However, they were about the same once crop canopy closure was achieved.

Kettner is among a group of farmers that attend the No-Till On The Plains conference in Kansas each year. "Call us a support group, if you will, but we have developed a relationship that allows us to bounce ideas off each other and offer suggestions to one another. Although our operations are very different, we each have a common goal in mind regarding soil health and structure," he said.

"It takes a while to get over the idea that the cover crop is going to use some of our precious water. You have to be able to see that the cover crop is actually going to help you capture more water for your cash crop," he said. ■

A DIFFERENT SLANT:
XCEL ENERGY'S INNOVATIVE WATER WELL

Article by Jason Coleman, P.E., HPWD General Manager
Photos by Katherine Drury

Innovative water supply strategies are constantly emerging in Texas. One particularly interesting project is located in Lamb County, where Xcel Energy recently completed a horizontal water supply well.

Lower well yields are the result of water level declines in Xcel Energy's existing well field. These reductions are estimated to be 10 percent each year, and significantly threaten the continued operations of the Tolk and Plant X generating stations.

Use of horizontal drilling technology in oil exploration, development and production operations has increased rapidly in recent years. However it has not been widely used for water production in Texas. The technical objective of horizontal water well drilling is to expose significantly more aquifer sands to the surface of the well screen than can be achieved via drilling of a conventional vertical well. This presents the opportunity for increased production of groundwater due to the greater surface area in the well that is able to transmit water to the pump. Thus, an economic benefit of horizontal drilling is increased productivity of the aquifer from a single well extraction point.

The horizontal well is located within Xcel's existing water well field near its Tolk and Plant X generating stations, where the company owns more than 50,000 contiguous acres of water rights. Xcel Energy worked with HPWD to find a viable location for the horizontal water well project. Leveraging the size of its existing well field, Xcel was able to purposefully locate the horizontal groundwater well in the center of the property.

Modeling performed by Xcel Energy consultant LBG-Guyton Associates shows that a horizontal groundwater well has the potential to yield more consistent groundwater production than traditional vertical groundwater wells. Using HPWD well spacing rules, LBG Guyton's groundwater modeling also demonstrates that this location has little or no additional impact to other water users in the area than would be expected from an equivalent number of vertical wells. The well site is permitted for up to 1000 gallons per minute (gpm), and conforms to HPWD well spacing rules and property line rules. One of Xcel's existing water supply wells was abandoned to meet the well spacing rules of HPWD.

Having a stable, consistent supply of water can equate to lower costs to Xcel Energy customers in the long run. In addition, it eliminates the need to drill additional vertical wells to serve as

The casing is laid out before being pulled into the hole.

replacements; reduces the likelihood to expand current well field infrastructure; and avoids the cost of acquiring additional groundwater rights.

Xcel Energy recognizes that possible benefits of a horizontal well do not come without potential risks. Even though horizontal wells have been used for many years in numerous applications, Xcel Energy nor its consultants are aware of a horizontal water well application at the depths present in Xcel Energy's existing well field. At the horizontal well location, the base of the Ogallala aquifer is about 200 feet below land surface.

Directed Technologies Drilling began horizontal drilling of the well in April 2017. A 48-hour pump test was conducted in late June. During that time, the flow rate generally held constant at 670 gpm.

During the pump test, water levels were observed in three locations:

1) In the horizontal screen section on the west end of the well.
2) 150 yards west of the screened section.
3) 350 yards south of the screened section, and about the midpoint of the 500 foot long screen.

INNOVATIVE REUSE

Xcel Energy has implemented industry leading water conservation practices at both Plant X and Tolk Station for many years.

The combined plants' water consumption has been reduced by about 180 million gallons per year by construction of a pipeline linking the two facilities. Blowdown water from Plant X (used water from plant operations) is sent for recycling and is blended with fresh water for use at the Tolk station.

This allows the source water to be used for more than 20 cycles through its circulating water system.

Large machinery helps guide the casing into the hole.

Several observations were noted during the 48-hour test:

- Location 1 showed about 23 feet of drawdown.
- Location 2 showed about 0.94 feet of drawdown.
- Location 3 showed about 0.40 feet of drawdown.

There are four permanent monitoring wells situated near the horizontal water well.

The wells are located:

- 150 yards from the west end of the screened section.
- 250 yards from the east end of the screened section.
- 350 yards south of the screened section, and about the midpoint of the 500 foot long well screen.
- 450 yards south of the screened section, and about the midpoint of the 500 foot long well screen.

The wells were constructed at Xcel's expense and are equipped with HPWD pressure transducers. Water level data from these wells are received by HPWD staff each day via telemetry. This provides vital information about water level changes near this unique water well system.

FAST FACTS

- **Distance from entry point to exit point of the well: 2,241 feet**
- **Length of screened horizontal section: 500 feet**
- **Casing diameter: 12 inch (nominal)**
- **Depth below land surface of screened interval: about 192 feet**
- **Depth below land surface to red bed: about 200 feet**
- **Well development techniques: air lift, water jetting, pumping with 6 inch submersible**
- **Permitted maximum production rate: 1,000 gpm**
- **Current production rate: about 660 gpm**
- **Saturated thickness of the Ogallala Aquifer at the well site: about 42 feet**
- **Pumping equipment: 60 HP submersible**

Future groundwater requirements at Tolk and Plant X will not increase over historical usage, which is about 12,000-15,000 acre-feet per year for both facilities. This total is approximately 3-4 inches per acre, which is well below the HPWD limit of 18 inches per contiguous acre.

As more information is compiled, and certain trends are discernable, HPWD will report this in future electronic/print issues of *The Cross Section* newsletter. ■

The drill is directed from this control room. The dial on the window indicates the drill bit's depth and pitch.

Searching for Solutions

In order to conserve the region's groundwater resources, it is essential that both policymakers and members of the public have the best scientific information upon which to base their water management decisions.

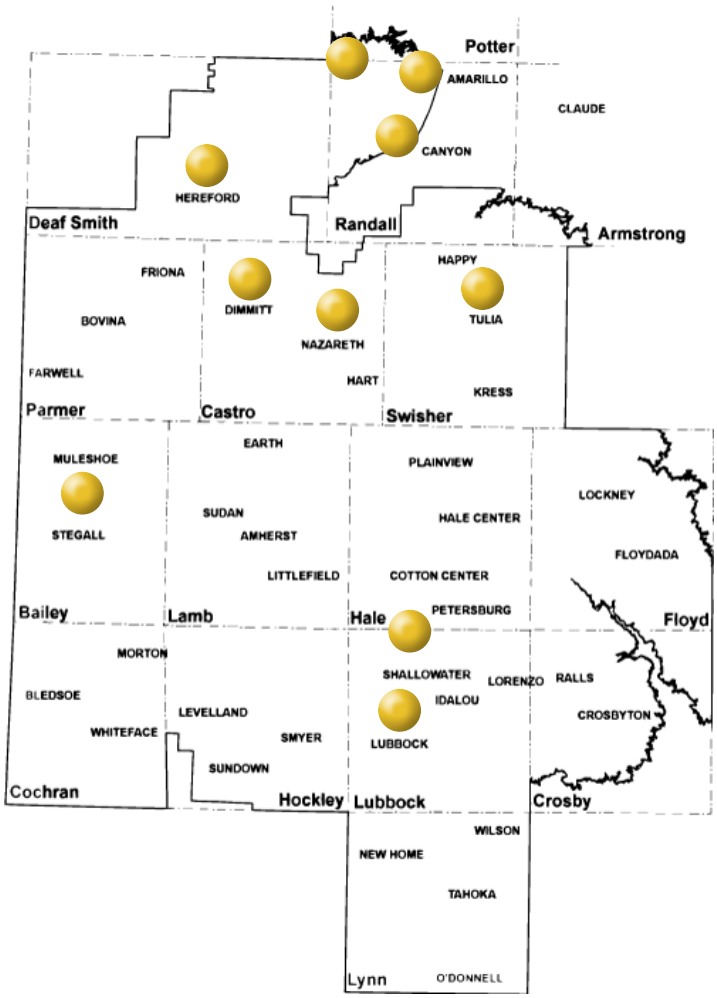
Researchers within the HPWD service area have been busy with a wide range of water-related demonstrations and studies during the past three years. Here is an overview of those projects.

To view a full list of research projects and detailed reports, visit hpwd.org/research.

"The HPWD Board of Directors is pleased to provide grant funding to support these educators & researchers as they work to improve crop production methods, educational efforts, & irrigation technologies. All are designed to help conserve groundwater resources."

HPWD Board President
Lynn Tate of Amarillo

Research Project Locations



Not Pictured:

Texas 4-H: Texas 4-H2O Water Ambassadors (2017-2018)

Tarleton State University: Plant-based polymers as effective treatment agents in removal of dissolved solids and radioactive materials from Dockum Aquifer (2016-2017)

Exploring the Dockum

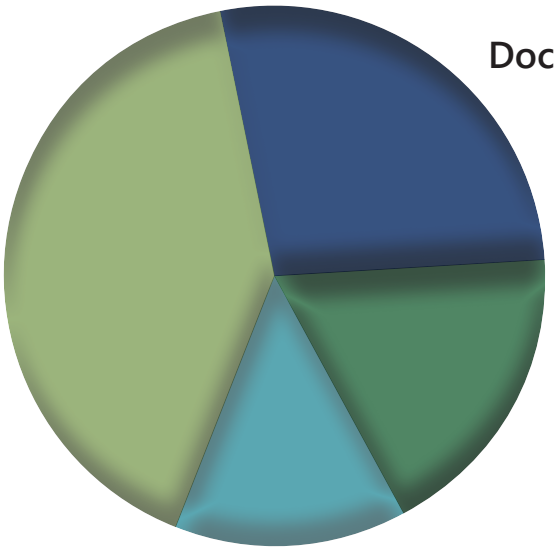
249 active wells

3 continuous water level monitoring sites

2 test wells in Lubbock and Abernathy

20 well sites with detailed geologic data

Number of Projects By Category



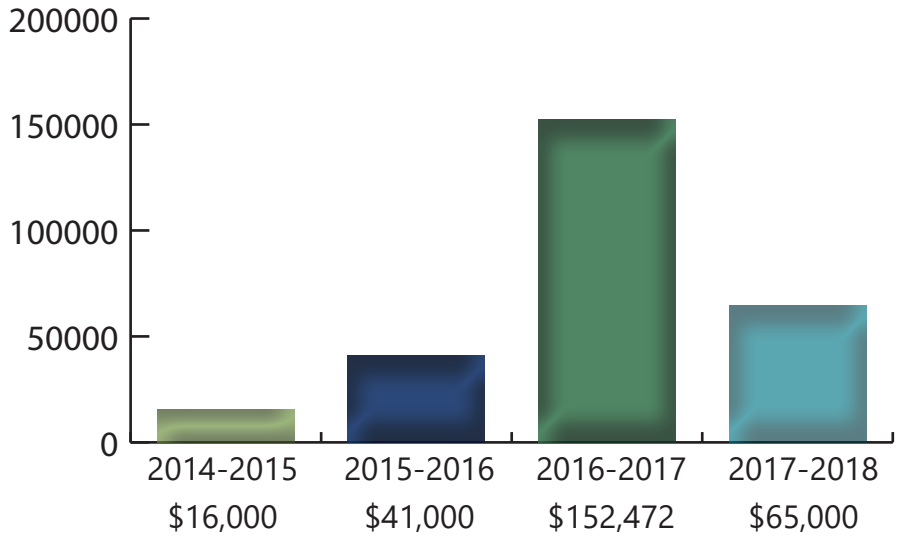
Dockum Aquifer (6)

Agricultural Water Conservation (9)

Public Education (4)

Residential Water Conservation (3)

Funds Allocated to Research



Average Amount Spent Per Project

$12,476

LIONS' LEGACY PROJECT CELEBRATES CONSERVATION

Article by Carmon McCain

For more than 65 years, the Lubbock South Plains Lions Club has had a soft spot in its heart for young people.

Vance Gipson, a retired college president, knows that all too well. He currently serves as the 2017-2018 Lions' District 2-T2 Governor. The district covers 22 counties in the Panhandle-South Plains region.

"Chartered in April 1951, the South Plains Lions Club has served many persons, including children. We have recruited blind, physically challenged, and diabetic children to attend free camping sessions at the Texas Lions Camp at Kerrville. Our club has also provided Christmas toys to those in need. However, our longest running service project has been associated with the Boys Club," Gipson said.

The Boys Club provides a safe place to learn, play, and grow; nurture essential skills with mentors, and experience enriching programs and activities, according to its national website.

Retired architect Bill Cox, a Lion since 1955, recalls the club's early involvement with the Boys Club.

"South Plains Lions Club established the local Boys Club chapter in the early 1950s. The original building was an old barracks from Reese Air Force Base, which was later replaced by the current building in 1957. Theodore (Ted) Phea served as unit director of the Boys Club from 1954 until his death in October 1987. A year later, the organization was renamed the Ted Phea Boys Club in his honor," said Cox. The name later changed to Ted Phea Boys and Girls Club, when the national organization allowed girls to join in 1990.

Throughout the years, the Lions have made many improvements to the facility, including painting, general upkeep, and construction of a new pavilion. Other organizations including Downtown American Business Club (ABC) and Lubbock United Way assist the Boys and Girls Club.

"After addition of the pavilion, we felt this was the perfect opportunity to do some additional landscaping. The Boys and Girls Club Board of Directors and staff shared their concerns about the high cost of irrigating the landscape and turf – so it seemed a natural choice to choose xeric landscaping for this project," said Gipson.

Club members formed a planning committee, who selected Smart Lawn and Landscaping in Lubbock as contractor for the project. Additional assistance for the design was provided by Lynn Cox, Bill's daughter-in-law. She is a Master Gardener in the Texas Hill Country.

Plant and trees selected for the xeric landscape included: Mexican Feather Grass; Red Yucca; Pale Leaf Yucca; Texas Sage; Dwarf Yaupon Holly; Desert Willow; and Hot Lips Salvia. Each was selected for its minimum water requirements and drought resistance.

"The Boys and Girls Club staff provided valuable insight into the project design. They kept the safety of the children in mind the whole time. We agreed that we did not want to have cactus or other thorny plants, rocks that could be picked up and thrown, or hedges that children could hide in. We appreciated them bringing their unique perspective to discussion of the landscape design," said Gipson.

He added that the committee decided not to remove the entire turf area because the children need an area where they can play football or have

The Xeric landscape was formally dedicated with a July 2017 ribbon cutting ceremony sponsored by the Lubbock Chamber of Commerce.

other activities.

The landscapers excavated the selected turf area, put in a drip irrigation system, and added the new plant materials.

"We installed a Netafim hose bibb drip irrigation system which has emitters spaced every 12 inches. The system applies 0.9 gallons of water per minute," said Buckie Dobson with Smart Lawn and Landscaping.

Cox said the subsurface drip irrigation system will be used regularly during the first two years to help the plants become established. After that, it will be used only as needed for supplemental irrigation.

With the drip system in place, the area was covered with "Trail Mix," a sand, rock, and clay mixture from R. E. Janes Gravel Company in Slaton.

"This is a local product, which is more cost-effective to use than decomposed granite. Most of the decomposed granite comes from the Marble Falls area and there are freight costs associated with it," he said.

Cox said the project took about a week to complete. "The landscapers had quite a crew working on this." The total cost of the project was $11,600.

Because of the club's long-time involvement with the Phea Branch, Gipson thought the landscape renovation would also make an excellent Lions' Centennial Community Legacy Project.

Lions Clubs International is celebrating its 100th anniversary in 2017. As a way to commemorate this milestone, more than 1.4 million members in 46,000 clubs worldwide were asked to have a Centennial Community Legacy Project.

One suggestion was for Lions to provide a community gift, such as refurbishing a playground.

The South Plains Lions Club's 55 members agreed that converting the conventional turf to a xeric landscape would make an outstanding legacy project.

"It is our hope that this project will instill pride for the Boys and Girls Club facility. In addition, we want to share the importance of water conservation with Boys and Girls Club members and their families. To us, that's a great legacy with an impact throughout the years to come," Gipson said. ■

Boys and Girls Club President David Sanchez presents a Certificate of Appreciation to District Governor Vance Gipson of the South Plains Lions Club.

This state-of-the-art water treatment facility is now online, providing high quality water to the citizens of Wolfforth.

NEW WATER TREATMENT FACILITY ONLINE IN WOLFFORTH

Article & Photos by Katherine Drury

A long-awaited water treatment project is complete and serving the residents of Wolfforth. The city, located in Lubbock County, is now equipped with updated water storage tanks and a state-of-the-art water treatment facility.

Wolfforth City Manager Darrell Newsom said the project started nearly 15 years ago when the city's wells became noncompliant as a result of revised Texas Commission on Environmental Quality (TCEQ) standards. The agency lowered the acceptable limits of fluoride and arsenic in public water supply systems. The standard for arsenic decreased from 50 parts per billion to 10 parts per billion.

"We didn't get any more arsenic in our water," Newsom said. "We just became non-compliant because the standard was lowered."

The city's initial action was to tie existing wells together in order to blend the water. This lowered the levels of arsenic to 0.008 parts per billion, which met TCEQ's standards.

"By blending, we immediately got better water quality because some wells were very low in arsenic and some wells were a little higher," he said.

Once the wells were tied together, the elevated storage tanks were refurbished and refinished. The water towers were also put under a long-term maintenance program with specialists inspecting the tanks a couple of times each year and updating as needed. In addition, the city built a large above-ground storage tank that holds 1.5 million gallons of water. This effectively doubles their storage capacity.

"That has really helped our wells tremendously because they don't have to work as hard," Newsom said. "We fluctuate against the ground storage tank, not against the wells, so that makes a big difference."

With the arsenic in check and the storage tanks in top shape, the city looked to solutions to lower the amount of fluoride in its water supply.

High levels of fluoride in well water are not new in West Texas. It is a naturally occurring element found in rocks and soils in our region. When groundwater is present, fluoride and other elements bind to water molecules and are carried into water supply systems. While some fluoride is recommended by the American Dental Association, too much can lead to fluorosis, a deficiency of minerals which causes brown mottling of teeth.

After many hours of research and touring similar

facilities, city officials decided that an electrodialysis reversal (EDR) plant best fit the needs of their citizens and their water supply. Newsom said EDR was the best option available because a minimal amount of water is lost to the brine stream.

"When we piloted this system, we showed only a five to six percent loss to the brine stream, whereas reverse osmosis can lose 30 to 40 percent depending on your input water," he said.

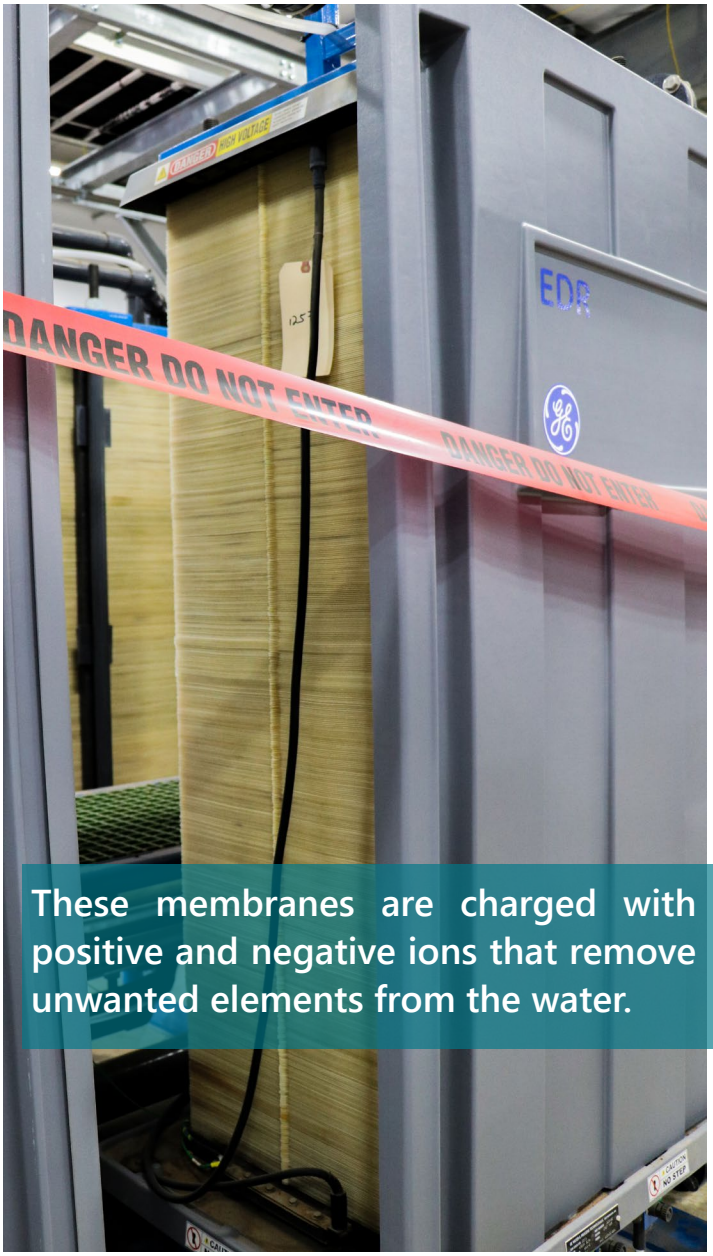
EDR technology is a membrane-based water treatment system that utilizes electricity to remove solids, salts, and other elements, leaving the water free from contaminants.

The final product delivered to taps in Wolfforth is 75 percent water treated at the EDR plant and 25 percent raw well water. This water is softer and lower in pH than the previous supply.

The EDR plant went online in May 2017. Overall, the project cost approximately $8 million, and each customer's water bill increased by $26. Newsom said EDR technology has been around for about 30 years, but it is continually changing due to upgrades in technology. The treatment systems are computerized and allow for extensive monitoring and controlling. The City is utilizing a Supervisory Control and Data Acquisition (SCADA) system that acts as the plant's brain. It controls the flow from the wells into the storage tanks and monitors the water supply system.

Wolfforth is also transitioning to smart "radio-read" meters for their water customers. The meter readings are transmitted to telemetry equipment located on water towers. This direct feed from customers' water meters can be read in real time.

City officials are also looking for future water supplies. A current partnership with the High Plains Water District could lead to a new water source for the city. Together, they will fund an exploratory well drilled into the Edwards-Trinity (High Plains) and Dockum aquifers as a possible water source for a new municipal well sometime in the future.



These membranes are charged with positive and negative ions that remove unwanted elements from the water.


The brine stream is discharged into the city's sewer system.

Conservation education is also important to Wolfforth officials as they work to ensure the longevity of their groundwater supply.

"Education is a big part of it," Newsom said. "We do a lot of social media. We've used different stages of restrictions to encourage conservation. There's a certain part of the population that is conservation-minded and education-minded and they do it. Then, there are some that will only do it if you raise their water bill. To them, it's really a function of trying to save money rather than trying to conserve. There's different people. You're going to have to approach it from different directions to get everybody on board." ■

Texas Business Uses Reclaimed Water in Offices

Article & Photos by Katherine Drury

Atmos Energy Corporation is incorporating a wide array of water conservation technologies in its offices across Texas.

Approximately seven buildings, including the Lubbock and Levelland offices, utilize large water catchment systems. The capacities of these systems range from 10,000 to 30,000 gallons. The office in Levelland, completed late 2016, can hold approximately 20,000 gallons.

The Lubbock cistern has a capacity of 30,000 gallons and captures rainwater and air conditioning condensation. Up to 3,400 gallons of condensate is reclaimed each month! The entire 25,000 square foot warehouse is guttered, as well as a portion of the office building. Timely rains have kept the cistern full throughout most of 2017.

Despite the large capacity of this cistern, there is little maintenance involved. This water is not being used as a potable source, therefore no treatment is necessary. The system is equipped with one debris filter and lined with a black plastic bladder.

This reclaimed water is used to irrigate the xeric landscape that surrounds the building, located off 66th Street and Milwaukee Avenue in Lubbock. The flower beds are full of water-wise plants, like Knock Out Roses, yuccas, and native grasses. The only turf area is filled with tall blue grama grass that needs little irrigation and is mown once or twice per year.

The reclaimed water is also being used for nonpotable indoor purposes, such as water for toilets and urinals. Rainwater and air conditioning condensation is the primary source of water for nonpotable use in these offices, with a backup well or municipal water supply for times of drought.

In addition to rainwater harvesting, Atmos highlights other water conservation tools and techniques in their office. They utilize low flow toilets and faucets. There is also signage around the building detailing their water conservation efforts as well as recycled materials used during construction.

In their endeavor for each new office building to be LEED certified, reclaimed water catchment systems are included as a component of the new construction projects. Atmos Energy plans to continue installing water reclamation systems and other conservation technologies in future office constructions. ■

Atmos Energy utilizes reclaimed water and water conservation technologies in seven of its office buildings across the state:

- Abilene
- Arlington
- Kerrville
- Killeen
- Levelland
- Lubbock
- Waxahachie

Growing with Rain:

Rain Gardens on the High Plains

Article & Photos by Keni Reese

When thinking about gardens, most people associate them with either fruit or vegetable harvests. However, rain gardens "harvest" rainwater and keep it on landscapes where it can be used by plants and trees. This water conservation practice reduces runoff while maximizing the benefits of rainfall.

Although they are not a new technology, rain gardens have gained in popularity in the High Plains area during the past few years, according to Vikram Baliga, Lubbock County Extension Horticulture Agent.

"Typically, we think of rainwater harvesting as capturing water falling on the roof of a home or building and using gutters to convey it into storage tanks. But, we often forget that soil is also great for holding water. You can design a landscape to collect water and store it in the soil," Baliga said.

What is a Rain Garden?

Most landscapes are designed to be higher near a home and then gradually slope away toward the street. This allows water to be shed quickly so that it does not collect near the home's foundation, which can cause damage and/or flooding.

Rain gardens take the opposite approach. These depressions in a landscape collect rainwater from a roof, driveway, or street and hold it in place until it can soak into the soil. These gardens are usually planted with grasses and flowering perennials. Not only does this provide an attractive landscape, rain gardens are often beneficial for butterflies, song birds, and other wildlife.

Rain Garden Benefits

Baliga said there are several benefits to adding rain gardens to the landscape. One of these is the reduction of storm water runoff.

"Adding extra impervious areas ("hardscapes") decreases the amount of water that can soak into the soil following rainfall events. This water has to go somewhere, so it typically flows off landscapes and parking lots, down street curbs, and into storm drains or playa lakes," he said.

The runoff can pick up a wide range of pollutants, including litter, traces of motor oil and antifreeze, fertilizers, sediments, and yard waste as it flows along. "Reducing storm water runoff can be beneficial by keeping these items out of urban playa lakes," he said. Other benefits include improved visual appeal of a landscape while using less money for supplemental irrigation.

"You can get a really nice landscape with relatively low maintenance and achieve any look you want," Baliga said.

It's Not All Concrete and Cactus!!

Mention drought-tolerant landscapes and most people immediately visualize cactus, rocks, and cow skulls. However, there are a wide variety of lush and colorful water-efficient plants that can be used in a rain garden.

"People don't know they can get a nice full, colorful landscape and still have a rain garden," Baliga said. "It's important that they use care in selecting the

The National Ranching Heritage Center has a large rain garden in front of the museum.

The High Plains Water District has a thriving rain garden next to its parking lot.

proper plant variety to achieve their goal.

Rain gardens can be made up of a variety of different plants. Ornamental grasses, native perennials, Artemisia, Blackfoot Daisies, perennial wildflowers, trees, and shrubs are just a few plants used in rain gardens across the High Plains.

When considering plants, he said it is important to select varieties that can handle both wet and dry conditions. "It is good to have plants that thrive when the rain garden is full of water. These plants should also be able to withstand periods of drought as well," he said.

A drip line or sprinkler head may be incorporated into the rain garden design for use during periods of extreme drought.

"Supplemental irrigation for any landscape in West Texas is probably necessary at some point. If it doesn't rain for six months, even the most drought tolerant plants are going to need some water," Baliga said.

Rain Garden Costs

Adding a rain garden and renovating a typical front yard in an average city lot may cost from $5,000 to $10,000. However, Baliga says not every rain garden costs that much. In its simplest form, adding a rain garden entails "turning the mountains in a landscape into valleys that hold water."

How Do I Start?

Baliga advises homeowners to "start small" when considering installation of a rain garden. They can begin by contouring the soil to catch water. Later, rocks or mulch can be added. Finally, the desired plants will go into the rain garden.

"I recommend breaking this type of project into small pieces. It's less expensive, it's less overwhelming, and you can make good progress and eventually end up with something that you really like," Baliga said.

He added that local Master Gardener Associations are a good resource when starting a rain garden.

"These groups have a good understanding of plant selection and rainwater harvesting techniques. They are always willing to help those wanting to build a rain garden," he said. Other helpful resources include irrigation supply houses and local nurseries.

"We are seeing more and more rain gardens in our area. I like them as a concept and as a tool for water conservation. They are a great way to drive us culturally toward water conservation in our landscapes," he said. ■

LEARNING LANDSCAPE

Article & Photos by Katherine Drury

A landscape can do more than beautify an outdoor space. It can be a pit stop for pollinators or a meeting place for PTA. It can educate visitors and demonstrate the importance of native plants. It can foster the values of volunteerism and community involvement.

A new landscape at Bushland Elementary School was planted with the hope of meeting these goals.

Garden organizer and elementary school mom Jessica Patterson headed up the project, initiating the construction of the garden. With grant funding from the High Plains Water District, the school was able to transform part of their turf grass to a learning garden. (Learn more about the other research projects HPWD has funded on page 12).

Patterson said this new garden reduces the amount of water they were using on their landscape. Maintaining the existing grass was expensive, time consuming and required a lot of irrigation.

"We were drawing a lot of well water out to water this grass," she said. "If we are going to water with our drinking water, we might as well have something pretty to look at that we can enjoy."

The first step in transforming the turf into a water wise landscape was to remove the grass. Volunteers took several weekends to complete this initial task. Landscape designer and Texas Tech University Masters student Michael Hall said the next step was to amend the soil.

"The big thing was to amend the soil first so it'll hold more water," Hall said. "So we brought in about three inches of cotton burr compost that we tilled in the soil. The long term goal is that this will be watered once a month once everything is established."

Throughout the process, the landscape design was altered to accommodate problems as they arose.

"When I started digging and excavating, I came out here after about an inch and a half of rain, and there was water all over the pathway area," Hall said. "It was up past the concrete, and I just knew something had to be done about that."

Bioswales were added to divert the flood waters away from walkways and the school building. Bioswales are depressions in a landscape that are used to catch rainwater. Plants utilize this water for days and weeks to come, reducing the need for supplemental irrigation. These depressions not only irrigate the landscape, but they also help reduce the amount of rain that would flood the inside of the school.

> **"When people know that you care for the outside, they know how much you care for the inside."**
>
> **- Bobbye Morgan, Bushland Elementary School Principal**

"We have so many places where we have problems with the water damaging the school," Patterson said. "We really need to look at different drains and how to use that water in a better way and take it to a place that it needs to go rather than letting it flood the classrooms."

Great care and consideration was given to the construction of the garden, from the focal point of the flag pole to the placement of certain plants.

"The chocolate flower is just in the right spot for the smell to drift up at them as they're walking in the door in the mornings," said Neal Hinders, owner of Canyon's Edge Plants.

The fun part of planning any new landscape is picking the plants. Hinders grew all of the plants found in the garden. He also helped pick some of the plants, focusing on those native to the area.

"Native plants will grow fairly easily," Hinders said. "There's some use for them. You can see the butterflies coming on, and the bees and other pollinators will be out here."

Hinders said he focused on perennials and encouraged the addition of native grasses.

"They're a little unique because they are the native grasses used as ornamentals," he said. "They'll look really good in the winter time."

Hall chose 12 or 13 plants and repeated them throughout the landscape in randomized patterns. He also wanted to ensure that the plants would have multiple blooming seasons, particularly during spring and fall when the kids are in school. Organizers paid careful attention to the types of plants in the landscape, picking safe, soft plants for this kid-friendly area.

Bushland Elementary students have been hard at work in the garden. Not only did some help with the installation of the landscape, they are continuing to maintain it during and after school.

Principal Bobbye Morgan reads to a group of students in the garden.

"The students love it," Patterson said. "They go back to their teachers and talk about how much fun they had pulling weeds."

Whether pulling weeds is actually fun or not, the students enjoy stepping out of their classrooms to explore and learn in this new space. Science classes, the Einstein Lab and Garden Club have already made use of the garden in Fall 2017.

Another purpose of the garden is to provide a sensory experience to all children, especially those with special needs. Bushland Elementary School Principal Bobbye Morgan said the special needs students are getting a lot out of their experience in the garden.

"We wanted these students to be able to use this as a sensory garden for the smells and the touch," she said. "With our speech kids, it's hard for them sometimes to talk about different things. When they see the beauty of the flowers, then it brings out some of those words they haven't used before. When they're looking for the butterflies, they're following and trying to figure out where they're going. They identify the flowers, they smell the flowers and touch them. It's really good for those sensory needs."

This garden is also an opportunity to teach all students about the environment and foster a sense of volunteerism at a young age.

"All of it was a dream because we wanted to show kids that we need to take care of our world, and our world is this world right here, right in front of us," Morgan said. "We want to be able to conserve water. We want to be able to show people that there's beauty in all kinds of plants. We wanted the students to be responsible for this area and to really know that our school is important. We want people to know how much we love the community. The kids got involved. They've helped us weed it and do all of that. That was kind of our dream. If you build a garden, then you're preparing kids for the future"

Constructing the garden, especially extracting the existing grass, was a full community effort. From elementary school students and their parents to community partners and even high school football players, Patterson said they always had the right number of hardworking volunteers.

The final product evokes pride in the organizers, the students and even the school parents. Patterson said that the parents love the area as much as the students do.

"It's added much more of a relaxing feel to our pick up times," Patterson said. "Pick up can be so stressful, and everybody just comes out and they sit and relax and enjoy, and the kids play with the butterflies. So it's really given the school a different feel, that we're more of a community." ■

Investigating Possibilities

H2You Contest 2016-2017

Article by Carmon McCain

Crosbyton High School students Timothy Appling, Briana Garcia, Kenley Henn, and Rose Williams were winners of the 2016-2017 H2You water conservation campaign contest.

The annual competition is designed to increase water conservation awareness and encourage sharing of innovative ways to reduce water use in either agriculture, municipalities, or among local residents.

This year's winning campaign began with fictional "breaking news" stating that Crosbyton was without water as a result of drought and poor water conservation practices. "Something has to be done in order to avoid this news release," the students wrote.

Using the theme, "Investigating Possibilities," the students examined the City of Crosbyton's current water resources and explored potential water conservation strategies. These included: 1) a possible retrofit of the existing water treatment plant at White River Lake for greater efficiency; and 2) non-potable reuse of treated wastewater by the City of Crosbyton.

Being proactive and finding solutions to water problems before they are needed is essential. "Working together is the hope of many more than just this team. We hope to combine all aspects of water conservation and make both the problem and the solutions a united effort," the team concluded.

The winners were in Austin March 5-7 to present their campaign to area legislators and state agency representatives, including Senator Charles Perry of Lubbock, Representative Drew Springer of Muenster, Texas Water Development Board Members, and staff at Texas Department of Agriculture.

H2You Team (Left to Right): Timothy Appling, Kenley Henn, Rose Williams, and Briana Garcia

During their trip, the students toured the State Capitol, participated in a special guided Capitol Dome tour, and watched the House of Representatives from the gallery. They also visited the Bullock Texas State History Museum and had an opportunity to dine/shop at The Domain.

Elementary Principal Sharon West and Ag Science Teacher Ben Stokes of Crosbyton were the team sponsors. They praised their team and HPWD's efforts to engage high school students.

"Crosbyton students have had the good fortune to win the contest for the past three years. This is such a wonderful opportunity for students to learn about water conservation and management on the local and state level. Experiencing such a trip and having access to the resources provided is so important," West said. ■

The H2You team presented their campaign to Rep. Drew Springer and Sen. Charles Perry at the Capitol.

TWDB Chairman Bech Bruun (left) and his Chief of Staff Lauren Graber (right) discussed municipal water supply solutions with the team.

THE 85th TEXAS LEGISLATURE

Article by Victoria Messer Whitehead

The 85th Texas Legislature was one for the books. It was a session that featured a roller coaster of emotions on all sides in an attempt to solve the big issues facing the State of Texas. Because of this there was very little progress in groundwater policy.

The emotional toll of the session truly hit the legislature like never before. Approximately 6,615 bills were introduced and a little over 1,208 bills were sent to the Governor's desk. This represents an 18 percent chamber pass rate, the lowest in ten years. Overall, the 85th Legislature saw a historical low 15.23 percent pass rate after the Governor's veto period.

The large number of bills filed also included many pieces of legislation affecting groundwater rights and regulation. High Plains Water District (HPWD) tracked a little more than 125 bills this session, which covered topics such as groundwater permitting, management, and regional water planning.

HPWD played an active role as an interested stakeholder in groundwater legislation. We also served as a resource to the legislature, helping educate members on groundwater production in West Texas as well as geological differences between the Ogallala aquifer and other aquifers in the state. HPWD offered testimony before the House Natural Resources Subcommittee on Special Water Districts and the Senate Committee on Ag, Water, and Rural Affairs.

The regular session saw a limited number of groundwater bills pass. Many of these were ultimately vetoed by Governor Greg Abbott. The groundwater legislation that did make it past the finish line included: HB 2215 by Rep. Four Price (R-Amarillo) relating to syncing up the Desired Future Conditions adoption process with the regional water planning group process; SB 865 by Sen. Charles Perry (R-Lubbock) authorizing groundwater conservation districts to use electronic banking; and SB 1009 by Sen Perry (R-Lubbock) relating to determinations of "administrative completeness" in the permitting process.

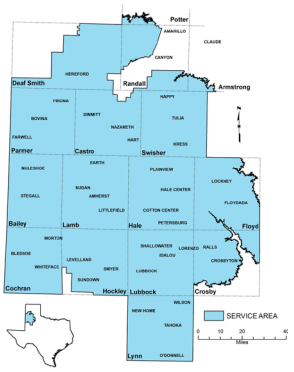
The special session saw eight groundwater bills filed in the House. Many of these were vetoed by the Governor or stalled in the last month of the regular session. All special session groundwater bills fell victim to the short session time frame, which was consumed with other statewide matters.

High Plains Water District expects a busy interim session discussing some of the major policy topics that arose during the regular session. We will continue to play an active role in the interim hearings and development of legislation leading up to the 86th Texas Legislature in 2019. ■

FAST FACTS

HIGH PLAINS WATER DISTRICT

HPWD was created in 1951 and is the first groundwater conservation district in the State of Texas.



The service area now includes all or portions of 16 counties, approximately 7.5 million acres. HPWD is the largest groundwater conservation district in Texas.

District residents are represented by five elected directors and a group of appointed County Advisory Committee members.

A professional staff conducts the day-to-day operations.

Funding

The Board of Directors sets the annual ad valorem tax rate. The current rate is $0.0069 per $100 valuation.

Water User Groups

Groundwater is the primary water supply for many HPWD municipalities, businesses, farms, ranches and rural residents. Agricultural irrigation is reliant on groundwater, primarily the Ogallala Aquifer.

Services

- Water level measurements
- Hydrologic data
- Water well permits
- Rainwater harvesting information
- Information/Education services
- Irrigation application efficiency
- Open wells and cave-ins
- Research funding (details on page 12)

High Plains Underground Water Conservation District