North Plains Groundwater Conservation District | **2016 ANNUAL REPORT**

agriculture& WATER

NORTH PLAINS
GROUNDWATER
Conservation District

CONSERVATION. SUSTAINING LIFE

It doesn't take long when you drive the highways and back roads of the North Plains Groundwater Conservation District for you to realize the pivotal role that agriculture plays in the lives of the people of the District. Cattle ranches, dairies, feedlots and farmland stretching out before your eyes make it clear. Irrigated agriculture accounts for approximately $4 billion worth of economic activity in the High Plains region each year. Agribusiness is the either the number one or number two leading economic sector in the District, depending on the state of the oil and gas market, and most of the activity starts with irrigation. Groundwater is the life blood of this region. Without it, this District would be a much different place.

While there are other significant groundwater users in the District including, municipal supply and industrial users, agricultural irrigation accounts for approximately 95-percent of the groundwater that is produced in the District. With the mission of maintaining the quality of life in the District through the conservation, protection, and preservation of the area's groundwater resources, many of the District's activities logically focus on agricultural conservation. The goal of the District's activities is to make sure that, as stewards of the groundwater north of the Canadian River, we are making the most of every drop of the region's precious resource.

While statistics can tell part of the story of the importance of irrigated agriculture to the communities in the District, the evidence can be easily observed by just looking around. If farmers are doing well, then that success can be felt throughout the community. Certainly, support businesses, such as implement dealers, seed dealers and irrigation supply companies will benefit from the farmer's success, but so will car dealers, movie theaters and grocery stores!

Because irrigated agriculture is so important to the people of this District, this report will feature images of agriculture, as it happens. The images stir a sense of pride in the ingenuity and work ethic that produce a bountiful harvest of food and fiber, as well as belonging and community. The images also remind us of the unseen resource that makes it all possible and that must be stewarded to protect this important enterprise and way of life.

MISSION STATEMENT

"Maintaining our way of life through the conservation, protection and preservation of our groundwater resources."

Location and Extent

The District covers approximately 7300 square miles in the northern Texas Panhandle encompassing Dallam, Hansford, Lipscomb, Ochiltree, and Sherman Counties, as well as parts of Hartley, Hutchinson, and Moore Counties. The District is home to approximately one million acres of irrigated agricultural land.

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Aerial photography courtesy Casey McAnally, Crop Production Services

BOARD OF DIRECTORS

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LETTER FROM THE PRESIDENT

Dear Stakeholders,

2016 has been a banner year for the District, despite all the usual challenges and uncertainties. The good news, as always, is that stakeholders continue to conserve water, meet production allocations, and advance economically. This is not only great for our stakeholders but for our communities as well.

The District, because of its bold and sometimes unpopular measures, has become a shining light and example for other water users across the state. Why? Because it works, and because of the positive results.

We continue to challenge ourselves to add value to the tax dollars paid by stakeholders and residents, and to meet the goals of our primary commission - "to conserve water".

The District has moved into a new season, one of conserving through education and demonstration; not just regulation. We continue a relentless effort to find and implement new technologies by partnering with cooperators in water-saving demonstrations and cost sharing. We've also partnered with groups like NRCS and TWDB that offer tools to help farmers track and measure usage. As a result of this new education mindset, the Master Irrigator Program was born with 26 participants in 2016. The new program looks at every aspect of irrigated agriculture and maintains an emphasis on influences that we can control. There are sessions on: soil management, fertility, tillage, irrigation efficiency, pivot monitoring and controls, crop hybrids, planting dates, drip irrigation, and any new advancements in irrigated agriculture. In short, anything that will allow us to produce more for every acre-inch pumped. Experts and experienced producers from across the country teach 4-5 full-day classes for participants who sign up. The goal is to not only to maintain net income, but to advance it. All graduates earn priority access to cost shared funds provided by NRCS.

As you can see, this has been a busy year for the district. Our goal is to continue in our efforts to advance our stakeholders economically and make every effort to conserve our great resource for future generations.

We are thankful for the vision and guidance provided by our staff, present and past managers, and board members--and for our stakeholders. We are successful because it is demanded!

Respectfully,

Harold Grall

Harold Grall, Director Moore County, North Plains Groundwater Conservation District
President 2016-2018
harold@pureelementwater.com

The District's Progress in Achieving Management Goals

With the passing of Senate Bill 1 in 1997, the 75th Texas Legislature required groundwater conservation districts to design management plans to meet specific strategic goals as outlined in the legislation. Senate Bill 1 created a statewide groundwater management and planning process, while preserving local control over the process through the districts. The districts are required to examine and revise their management plan at least every five years. This annual report is intended to give an annual update on North Plains Groundwater Conservation District's progress on each of the strategic goals included in its management plan.

This report will be presented to the District's Board of Directors in a timely manner, and then made available to the public. A copy of the most current annual report will be available for public review on the District website at www.northplainsgcd.org and at the District office.

MANAGEMENT GOALS

Providing for the Most Efficient Use of Groundwater (31TAC §356.5(A)(1))

A.1. Management Objective:

Calculate total annual groundwater withdrawals through water use reporting by all producing water right owners that have a well capable of producing more than 25,000 gallons of groundwater a day.

A.1. Performance Standards:

Annually the District will collect production reports on all properties containing non-exempt wells and calculate annual groundwater withdrawals for the District. A summary will be presented to the Board of Directors each year.

Groundwater Production by County 2012-2016 (Table 1)

County	2012	2013	2014	2015	2016	Average
Dallam	372,000	399,300	393,700	297,000	339,200	360,240
Hartley	458,700	459,000	442,100	332,700	391,600	416,820
Moore	234,700	228,300	210,000	156,700	185,700	203,080
Sherman	348,100	346,700	361,400	251,700	285,300	318,640
Hansford	218,800	202,000	211,700	148,800	170,400	190,340
Hutchinson	72,300	69,800	74,000	57,700	67,600	68,280
Lipscomb	55,600	42,600	48,800	39,400	42,300	45,740
Ochiltree	109,300	98,300	106,300	77,400	81,400	94,540
West	1,413,500	1,433,300	1,407,200	1,038,100	1,201,800	1,298,780
East	456,000	412,700	440,800	323,300	361,700	398,900
Total	**1,869,500**	**1,846,000**	**1,848,000**	**1,361,400**	**1,563,500**	**1,697,680**

**Production volume shown in acre/feet.*

A.2. Management Objective:

Provide support through the District's North Plains Research Field (North Plains Water Conservation Center) to promote research into drought tolerant crops, efficient water management strategies and other research promoting water use efficiencies.

A.2. Performance Standards:

Annually the District will summarize its activities at the North Plains Research Field (North Plains Water Conservation Center) to be presented to the Board of Directors.

In 2016, the District installed approximately 40 acres of subsurface drip irrigation at the North Plains Water Conservation Center (WCC) in the area between the WCC's two pivots. The project was a joint effort of the District, farmer/operator Stan Spain, the District's corporate partner Crop Production Services Inc. (CPS) of Loveland, CO and Professional Water Management Associates. Drip irrigation is relatively new to the northern Texas Panhandle. The District installed the drip system to further water conservation demonstration and to educate producers about the advantages and disadvantages of drip irrigation compared to the low energy precision application (LEPA) above ground systems at the WCC. As part of the drip system installation, the District set aside some previously irrigated acres for development as a cover crop based on USDA-NRCS guidelines. The project was funded through the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and the Texas Water Development Board conservation loan.

The District planted a portion of the subsurface drip irrigation system, as well as part of the east pivot, as part of the District's 3-4-5 on-farm conservation demonstration program. CPS planted the remainder of the WCC using various plant populations and multiple crops and crop rotations in their demonstrations. Crops included corn, dry land cotton and wheat. The CPS demonstrations are in line with the water conservation focus the Board desires for the WCC.

On June 14, 2016, the District Board of Directors dedicated the District's classroom and meeting facility at the WCC to Richard S. Bowers. More than 100 of Bowers' friends and family attended the ceremony announcing the official naming of the Richard S. Bowers Conservation Learning Center. The Board voted unanimously in March to honor Bowers for his 35 years of working to steward the groundwater of the region for the present and for future generations.

Mr. Bowers passed away on November 14, 2015, after a distinguished career dedicated to public service and leadership in water conservation. Mr. Bowers became the general manager of the Panhandle Groundwater Conservation District, located in White Deer in 1979, serving there until he accepted the general manager's position at North Plains Groundwater Conservation District in 1987. That same year the District purchased the property where the current WCC operates today. Mr. Bowers worked, lived and raised his family in the District for twenty years before moving to Burnet to assume the general manager position at the Central Texas Groundwater Conservation District in 2007. In August 2011, he officially retired. Even after his retirement, he served as interim general manager for the Upper Trinity Groundwater Conservation District in Springtown, Texas in 2014. "The District is honored to dedicate the conservation learning center at the North Plains Water Conservation Center to the memory of Richard Bowers. Mr. Bowers was keenly interested in and led the District in establishing its groundwater conservation education programs," said Bob Zimmer, Board President.

The WCC also hosted the first year of the Master Irrigator Program in 2016. Sessions were held in June and July with 23 participants completing the course and qualifying for a share of the North Plains GCD EQIP funding. Over $400,000 from the special fund was distributed to the first-year graduates to off-set the cost of water conservation practices implemented in their respective operations. The purpose of the program is to provide training to local producers in best irrigation practices and technology to increase adoption of these conservation strategies.

On August 16th, the District assisted CPS with a field day at the WCC. The District's presentation focused on the process and objectives of the "3-4-5 GPM Project" and also highlighted the side-by-side comparison of subsurface drip irrigation and LEPA center pivot irrigation, using the newly installed drip field at the WCC.

The WCC attracted some international visitors interested in the demonstrations in 2016. Irrigation equipment dealer, Farris Hightower, brought a group of farmers from Australia to the WCC to discuss the subsurface drip system in mid-September. Later, a group, including crop nutrition consultant David Reinart; Jourdan Bell, Ph.D., assistant professor and agronomist at Texas A&M AgriLife Research and Extension in Amarillo; Robert Schwartz, Ph.D., USDA Soil and Water Management Research; and visitors from Western Africa and Ukraine visited the WCC to discuss farm operations.

Controlling and Preventing the Waste of Groundwater (31TAC §356.5(A)(1)(B))

B.1. Management Objective:

Control and prevent the waste of groundwater as defined by the Texas Water Code through the enforcement of District "Waste" rules.

B.1. Performance Standards:

Annually the District will summarize enforcement of "Waste" rule violations and report to the Board of Directors.

Waste rule violations in 2016 (Table 2)

Waste Violation Report	Description	Action	Resolution
1	Salt Water disposal well was found leaking water onto an access road.	Owner of well was contacted by District to resolve.	Owner cleaned up area of excessive water and fixed leak.

Controlling And Preventing Subsidence (31TAC §356.5(A)(1)(C))

Due to the depth of water and the nature of the geology of the aquifer within the District, subsidence is unlikely and the District's Board of Directors, upon recommendation from the staff, has determined that this goal is not applicable to the District.

Conjunctive Surface Water Management Issues (31TAC §356.5(A)(1)(D))

Following notice and hearing, the District coordinates the development of the management plan with surface water management entities as required by 31 TAC §356.6(a)(4). Documentation regarding this coordination effort is located in Appendix K of the District's management plan. The District also coordinates the development of the plan with the Panhandle Regional Water Planning Group.

D. 1. Management Objective:

Each year, the District will participate in the regional planning process by attending at least 75 percent of the Region A – Panhandle Regional Water Planning Group meetings to encourage the development of surface water supplies to meet the needs of water user groups in the District.

D. 1. Performance Standard:

The summary of attendance of a District representative at Region A - Panhandle Regional Water Planning Group meetings will be reported to the District Board of Directors.

2016 Panhandle Regional Water Planning Group Meetings

May 17, 2016 – (Public Input Hearing) - General Manager, Steve Walthour and Director, Gene Born attended on behalf of the District, and Director, Danny Krienke, attended as Groundwater Management Area – 1 representative.

Natural Resource Issues That Impact the Use and Availability of Groundwater and Which Are Impacted by the Use of Groundwater (31TAC §356.5(A)(1)(E))

The District has determined that the current natural resource issues that may impact the use and availability of groundwater within the District are water quality issues and declining water tables.

E.1. Management Objective:

Monitor aquifer characteristics that impact the use and availability of groundwater and which are impacted by the use of groundwater through District programs by maintaining a network of water quality and water level monitor wells.

E.1. Performance Standards:

A. District staff will collect and analyze water samples from appropriate monitor wells periodically but not less often than once every five years.

Mineral Analyses from Wells within the District (Table 3)

Parameter	Units	2014 Number of Analyses	2014 Average Analysis	2015 Number of Analyses	2015 Average Analysis	2016 Number of Analyses	2016 Average Analysis
Sulfate	mg/l	56	55	6	24.3	22	49.2
Nitrate	mg/l	52	9.6	6	7	22	12.3
Total Iron	mg/l	56	0.05	6	0.069	22	.16
Chlorides	mg/l	56	37	6	19.1	22	23.95
Fluoride	mg/l	56	1.7	6	0.96	22	.55
Total Hardness	mg/l	56	222	6	204	16	213.82

**Note 2016 test results samples from area homeowners.*

B. District staff will perform water quality analyses for select constituents for District well owners upon request. Results for the 2016 testing by request are included in Table 3 above, which is published in the 2016 Hydrology and Groundwater Resources Report.

C. District staff will summarize their water quality activities and make the information available to the Board of Directors and the public annually. Results for 2016 water quality testing are summarized in the 2016 Hydrology and Groundwater Resources Report and reflected here in Table 3 above.

D. District staff will collect aquifer water level measurements annually.

Average Depth to Water and Comparisons of Average Declines in Select District Water Level Monitor Wells (Table 4)

County	Avg. Depth to Water (ft.)	2016 Avg. Well Decline (ft.)	2015 Avg. Well Decline (ft.)	Current 5-Year Avg. Well Decline (ft.)	Previous 5-Year Avg. Well Decline (ft.)	Current 10-Year Avg. Well Decline (ft.)	Previous 10-Year Avg. Well Decline (ft.)
Dallam	284	3.85	3.75	3.73	3.48	3.95	3.05
Hansford	304	2.42	2.37	2.32	2.01	2.19	1.58
Hartley	363	4.62	4.48	4.38	4.20	4.27	3.33
Hutchinson	349	2.12	2.09	2.06	1.95	2.05	1.72
Lipscomb	162	.89	.86	.88	.79	.89	.58
Moore	354	3.07	3.00	2.93	2.30	2.59	1.71
Ochiltree	332	1.56	1.54	1.4	1.26	1.38	1.00
Sherman	303	3.11	3.06	2.99	2.71	2.94	2.71
District-wide	**306**	**2.71**	**2.64**	**2.59**	**2.34**	**2.53**	**1.96**

**The information in Table 4 was derived from an analysis of monitor well hydrographs created from the data in the District's water level database. The analysis data from some monitor wells, indicating both rises and declines, are not sufficiently consistent to ensure accuracy and reliability in their use. Such data may be excluded during the calculations of declines, depth to water or saturated aquifer formation.*

E. District staff will summarize groundwater level declines and average depth to water and make the information available to the Board of Directors and the public annually. Groundwater level declines and average depth to water are summarized in the 2016 Hydrology and Groundwater Resources Report and reflected here in Table 4 above.

F. District staff will summarize or update aquifer saturated material information and make the information available to the Board of Directors and the public at least every two years.

Estimated Saturated Thickness by County for 2016 (Table 5)

Dallam	Hartley	Sherman	Moore	Hansford	Hutchinson	Ochiltree	Lipscomb
154 ft.	141 ft.	152 ft.	146 ft.	175 ft.	147 ft.	196 ft.	203 ft.

The saturated thickness of the Ogallala aquifer ranges from less than 10 feet to over 300 feet and has an estimated average thickness of 164 feet across the District (Table 5).

The 2016-2017 Hydrology and Groundwater Resources Report was presented to the Board of Directors on June 20, 2017 as recorded in the minutes of the board meeting.

E.2. Management Objective:

Investigate and address deteriorated wells that may cause a threat to water quality.

E.2. Performance Standard:

A. District staff will pursue repair or plugging of deteriorated wells. (See Table 6 below)

B. District staff will summarize the deteriorated well activities and make the information available to the Board of Directors and the public annually.

Deteriorated Wells (Table 6)

Reported/Discovered	Investigated	Plugged	Capped
0	N/A	N/A	N/A

Addressing Drought Conditions (31TAC §356.5(A)(1)(F))

North Plains Groundwater Conservation District lies in an area of the State of Texas that has a semi-arid climate. Semi-drought conditions are experienced year round, and the District works to educate the public about methods to conserve water all year, but particularly during dry periods.

F.1. Management Objective:

Provide residential stakeholders with information and tools to conserve during dry and peak use periods.

F.1. Performance Standards:

Annually, the District will conduct water conservation communications and education activities. These activities will be summarized annually and presented to the Board of Directors.

Summer Municipal Cooperative Conservation Project

The summer municipal cooperative conservation project is a program specifically designed to address domestic conservation at the time of year with the highest home water usage. The project is scheduled each year for the summer, when outdoor use spikes, due mostly to lawn and garden irrigation. 2016 marked the fifth year for the project, also known as Operation: Summer Showers. Through cooperation with local city halls, the District distributes summer water conservation kits that include: a low-flow showerhead, a sprinkler gauge, a faucet leak gauge and leak detector tablets. By including the low-flow showerhead and other water-saving tools, the kit helps homeowners save water inside, as well as outside. The city halls partner with the District by acting as distribution points for the kits, sharing the expenses and by helping get the word out that the kits are available. Local radio stations and newspapers also join in the effort by offering free or discounted public service announcements about Operation: Summer Showers. The District also features the campaign on all social media platforms. Seven area city halls partnered with the District for the project in 2016.

For other District conservation outreach activities see Item G.1b. Performance Standards.

Water Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, or Brush Control, Where Appropriate And Cost-Effective (31TAC §356.5(A)(1)(G))

G.1. Water Conservation

G.1a. Management Objective:

Support research and field demonstrations to foster adoption of agriculture water conservation technologies and practices.

G.1a. Performance Standards:

Annually, the District will summarize the project results to be presented to the Board of Directors.

“3-4-5 Gallon Production Maximization (GPM) Corn Demonstration Project”

2016 marked the second year of the District’s “3-4-5 Gallon Production Maximization (GPM) Corn Demonstration Project”. The “3-4-5 GPM Project” uses the latest water conservation technologies and practices to grow corn based on the availability of water. Groundwater availability within the District varies from less than 3 gallons per minute (gpm) to over 5 gpm. Factors affecting groundwater availability include well pumping plant efficiency and aquifer capacity for the amount of land irrigated. Most irrigation farmers within the District use between 3 gpm and 5 gpm to grow crops. To address these local conditions, the “3-4-5 GPM Project” demonstrates best management practices and technologies to grow crops using 3 gpm, 4 gpm and 5 gpm of irrigation water, as needed. More specifically, the project is based on applying 1.10 inches of irrigation weekly, using an irrigation capacity of 3 gpm, 1.49 inches using 4 gpm, and 1.85 inches using 5 gpm. The District partners with the TWDB, CPS and growers to make the project possible.

The second year of the “3-4-5 GPM Project” was a year of further confirmation that pouring more water on a corn crop is not the best business decision for irrigated corn producers in the District. A highlight of the program was one cooperator who produced a 200-plus bushel per acre (bpa) corn crop with only 2.5 gpm of irrigation available for the season. This demonstration topped both his 4 and 5 gpm plots by 12-18 bpa.

“This cooperator applied a management strategy including planting dates, seeding rates, and hybrid selection, in addition to soil health benefits from historical crop residue, that was specifically intended to increase yield potential at his lower irrigation capacity,” said Leon New, Project Lead for the “3-4-5 GPM Project”. While project coordinators recommend certain practices, many of the variables are at the discretion of the individual cooperating producers. Consequently, results vary from one demonstration site to another. However, even the varying practices and results provide valuable insight into best practices for maximizing the net return from the grower’s groundwater, based on his or her specific production and management goals.

The overview of the 2016 “3-4-5 GPM Project” shows that, with adequate rainfall, it is possible to grow 200+ bushel corn crops with limited irrigation. With rainfall ranging from 6.41 to 13.86 inches, all but one of the 3 gpm demonstrations were within +/- 5-percent of a 200 bpa yield. In fact, only 3 out of 10 of the 3 gpm plots fell below 200 bpa, with one site reaching 216 on only 13.57 inches of rrigation and a total of 22.35 inches of irrigation and rainfall. Soil moisture totals were not available at the time of this writing. One of the 3 gpm fields that did not reach 200 bpa experienced significant hail damage and other mitigating circumstances that negatively impacted yield.

The three year “3-4-5 GPM Project” builds on the District’s award winning “200-12 Project” that ended in 2014. Participants in the “3-4-5 GPM Project” are using variable rate irrigation (VRI) to simulate 3, 4, and 5 gallons per minute, per acre irrigation conditions in side-by-side, production-scale demonstrations. The “3-4-5 GPM Project” also uses a comprehensive resource management approach, including irrigation scheduling and management technologies, maximized delivery systems, conservation tillage practices, hybrid technology, and pest and nutrient management to optimize conditions for water savings and maximum yield.

“We learned from the various levels of irrigation used during the ‘200-12 Project’ that we were normally over-irrigating with 5 gpm, and the yields at 3 and 4 were not that much less,” said New. “The idea is that irrigators can strategically use less water, improve their irrigation efficiency and

maintain profitable yields." Producers with higher irrigation capacity can reduce the amount of irrigation applied through nozzle package adjustments or by use of VRI speed control.

TWDB Chair, Bech Bruun presented at the 3-4-5 field day in Perryton.

Year two of this three-year project saw an even greater level of management through a variety of planting dates, seeding rates, hybrid selections and irrigation application methods, all aimed at increasing yield potential at lower irrigation capacities. Planting dates ranged from April 25 to June 12, with most of the fields planted in the last week of May 2016. One of the highest yielding demonstrations was the corn planted the earliest. The 3 gpm field yielded 231 bpa with only 14 inches of irrigation; however, this plot benefitted from the highest rainfall total of any in the project with almost 14 inches of in-season rain. This cooperator utilized an early-late planting combination with 3-4 weeks between plantings and an irrigation capacity of 3.14 gpm per acre on 180 acres of corn. He learned the technique during the "200-12 Project".

Seeding rates ranged from 26-38,000 seeds per acre, but yields did not increase proportionately without the application of a disproportionate volume of irrigation water for the highest seeding rates. The resulting increase in input costs from seed, irrigation, fertilizer and harvest will reduce any increase in revenue and cause a reduction in overall efficiency.

Hybrid selection strategies ranged from using high yielding, drought tolerant varieties, to focusing on high ear-flex varieties. Varieties with enhanced ear-flex can grow larger ears, and therefore, increase yields if additional water is available. On the other hand, many of the higher yield, drought tolerant varieties tend to have more of a fixed ear size. Ear-flex allows the grower to reduce seeding rates, and therefore, the water requirement, while allowing the opportunity to take advantage of any additional rainfall.

Year two also marked the first year of the side-by-side comparison between subsurface drip irrigation (SDI) and Low Energy Precision Application (LEPA) center pivot irrigation. LEPA applies the irrigation water in a bubble or similar pattern no more than 18 inches above the soil using drop hoses. It is reported to reach application efficiency levels of 95 percent. SDI uses drip lines buried in the ground delivering water directly to the crop root zone. This demonstration was located at the North Plains Water Conservation Center (WCC). The WCC provides the opportunity to compare the two high-efficiency systems side-by-side. In the 2016 side-by-side comparison, the LEPA system out-performed the SDI by an average of about 8 bushels per acre. "In only the first year of the comparison and operation of the SDI system at the WCC, these numbers are not conclusive," said New. "More data is necessary, but this is valuable information for beginning to understand these systems better in terms of water efficiency, yield performance and cost feasibility." These demonstrations are made possible by the District's corporate partner, Crop Production Services in cooperation with WCC farm operator and demonstration cooperator, Stan Spain.

Finally, the District continued demonstrations initiated in 2015 to compare Precision Mobile Drip Irrigation (PMDI) to LEPA. PMDI involves drip hoses being pulled around the field by the center

pivot system and applying the irrigation directly to the soil. While there were some technical problems with the PMDI comparison in 2015 that negatively impacted results, in 2016 the PMDI out-performed LEPA by an average of 10 bpa. More data is still needed to develop any definitive conclusions, but 2016's PMDI results are promising.

Overall, New says the increased efficiency that is possible by reducing the amount of water used to grow corn creates options and opportunities for growers. "On one hand, by managing production cost through irrigation, seeding rates, hybrids, and fertility, in combination with strategic crop residue and soil practices, growers may put more money in the bank, while leaving water in the ground and some profit on the table for later," said New. "On the other hand, a grower with adequate capacity may seize the opportunity to operate more efficiently, but over more acres, putting more money in the bank now." New summarized by saying this demonstration project presents District growers, and all who see these results, with the question, "Where, how and when will I use my water?"

Master Irrigator Program and Agriculture Water Conservation Outreach

In 2016, the District worked with the USDA-NRCS and Texas A&M University to present the first-ever Master Irrigator Program to promote widespread adoption of technologies and practices to achieve agricultural water conservation in the Panhandle. The District worked with USDA-NRCS to establish the North Plains GCD EQIP Fund as an incentive for irrigators who completed the training. NRCS allocated $1.6 million to the fund to be distributed over 4 years. In the first year, the program attracted 26 initial participants, with 23 completing the course. Graduates from the 2016 class benefitted from $444,186.32 from the fund to assist with new conservation practices on their farms. In addition to the EQIP Fund, the NRCS agreed to match up to $45,000 to promote the Master Irrigator Program and other agriculture water conservation outreach programs. Table 7 outlines the funding and practices.

Practice and amount (Table 7)

Practice	Amount
Flow Meters	$2,895.00
Irrigation Pipeline	$18,990.00
Pivot Conversions	$110,132.94
New Pivots	$191,742.38
Soil Probes	$27,780.00
Variable Frequency Drive	$92,646.00
Total	**$444,186.32**

Master Irrigator training is an irrigation management curriculum made up of 4-5 days of intensive, interactive irrigation education. The program is focused on increasing understanding and proficiency with the latest irrigation management tools, technologies and practices. Armed with this knowledge, irrigators select tools and strategies that fit their operation and can be implemented to maximize return on investment for every drop of water used.

A producer advisory panel continues to work with Dr. Steve Amosson of Texas A&M Agri-Life to develop the curriculum for the course.

District Assists with Pump Tests for Variable Frequency Drives

Variable Frequency Drives (VFDs) allow electric pump motors on irrigation wells to speed up or slow down to adjust pump performance and to match operating conditions. Used correctly, VFDs can save energy, while maintaining pumping plant efficiency.

In 2016, the District continued working with the USDA-NRCS and local growers to assist with the NRCS pump testing requirements and application process for installing VFDs on irrigation wells. The pump tests consisted of two tests, one before and one after the installation of the VFD. The tests determined the efficiency and cost savings for the pumping systems. The District performed 10 pumping tests for growers that were approved for funding through NRCS EQIP for VFDs.

G.1b. Management Objective:

Conduct conservation education activities to encourage water conservation (prevention of waste) and create informed and educated citizens who will be dedicated stewards of their resources.

G.1b. Performance Standards:

Annually the District will disseminate groundwater conservation and waste prevention information through a variety of media, activities and events. Activities will target agricultural, residential and young stakeholders. A summary of educational activities will be presented to the Board of Directors each year.

Conservation Outreach Activities

Annual Water Festivals

2016 was the 11th annual children's water festival sponsored by the District. The event, currently dubbed the "Save the Planet's Water Festival," welcomed 969 fourth grade students and 72 teachers for a grand total of 1,041 participants over the three days of festivals. In 2016, the events were held May 17 in Perryton, May 18 in Dalhart and May 19 in Dumas. The "Save the Planet's Water Festival" leads potential Water Rangers on a full day of training and fun to ultimately prepare them to "protect and conserve groundwater wherever they find it." Throughout the day the new recruits visit seven stations featuring activities, presentations and games with water conservation and natural resource themes. Once they've completed their Water Ranger "basic training," they've earned the right to be called a Water Ranger.

During the festivals, the students learn about topics including, the Ogallala aquifer, watershed protection, the history of water in the region and much more. For the fourth year in 2016, the festivals featured a finale presentation from Kevin Barnes, the Green Magician. Barnes has presented his Green Earth Magic Show to young people all over the country, including 19 years at the Orange County Children's Water Education Festival in Irvine, CA, the largest children's water festival in the country.

In-Class Groundwater Conservation Presentations

District personnel provided in-class groundwater conservation education for 4th grade classes in Moore County reaching more than 350 students. Staff also made presentations to about 75 kindergarten through sixth grade students as

part of the Gruver Farm Scholarship Foundation Ag day in October. The District provides in-class presentations by request on a first come, first served basis to any classes in the District, grades K-12.

Groundwater Conservation Presentations

The District provides presentations to community and civic organizations and stakeholders within the District, and to industry groups locally, state-wide and beyond. Presentations in 2016 included:

January 11	Leon New/Steve Walthour, Pioneer Crop Production Clinic – Dalhart
January 12	Leon New/Kirk Welch, Pioneer Crop Production Clinic - Stratford
January 13	Leon New/Steve Walthour, Pioneer Crop Production Clinic – Stratford
January 14	Leon New/Steve Walthour, Pioneer Crop Production Clinic – Spearman
March 24	Leon New/Danny Krienke/Harold Grall - NRCS CIG Webinar
May 17	4th Grade Water Festival – Perrytor
May 18	4th Grade Water Festival – Dalhart
May 19	4th Grade Water Festival – Dumas
June 14	Bob Zimmer/Steve Walthour – Richard S. Bowers Water Conservation Education Center Dedication
June 20	Steve Walthour, Senate Agriculture, Water and Rural Affairs Committee - Austin
June 30	Steve Walthour, Groundwater Management Districts Association – Yakima, WA
August 16	Leon New/Harold Grall, 3-4-5 Demonstration Field Tour – WCC, Etter
August 23	Bob Zimmer, TAGD Summit – San Marcos
August 23	Kirk Welch, TAGD Summit – San Marcos
August 31	Leon New/Steve Walthour/Danny Krienke, 3-4-5 Demonstration Field Tour – Perryton
September 1	Leon New/Steve Walthour/Zac Yoder, 3-4-5 Demonstration Field Tour – Dalhart
October 20	Gruver Farm Scholarship Foundation – Gruver
October 27	Steve Walthour, American Geophysical Water Forum – Golden, CO
November 19	Alyssa Holguin, Moore County Farm Bureau Ag Day – Dumas

North Plains Water News

The North Plains Water News was published three times in 2016. The NPWN is a four-page newsletter that features articles highlighting the District's regulatory, scientific and education outreach activities, as well as other relevant news relating to water. In addition to mailing the print version to over 1200 recipients, the newsletter is also available on the District website at www.northplainsgcd.org. In 2016, the District distributed the newsletter via email to more than 1000 e-mail addresses.

Conservation News Releases

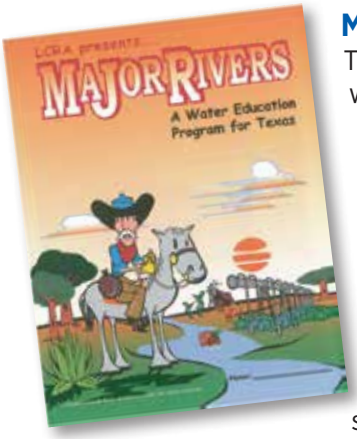
The District employs a consistent media relations and public relations strategy featuring news releases highlighting the activity of the Board of Directors and updates on the District's conservation outreach programs. The District also responds to media requests for information and assists television, radio, print and online news agencies in the coordination of coverage that will extend the conservation message.

Rainwater Harvesting

The District maintains rainwater harvesting information available upon request at the District office.

Xeriscaping Class

The District has information regarding xeriscaping and low water-use plants available upon request at the District office.



Major Rivers Curriculum

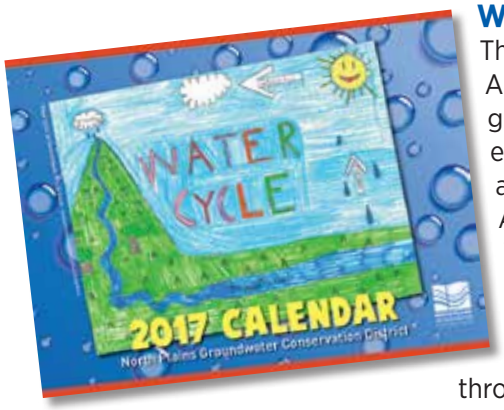
The Major Rivers Curriculum was made available by request to any class within the District.

Fifth Grade WaterWise Education Curriculum

The WaterWise Conservation Education Program was made available to fifth graders in the District. 2016 is the sixth straight year of the program and 620 fifth grade students and their teachers participated. Through an in-class, teacher-led conservation curriculum and a take-home kit filled with conservation tools, students and their families learn and save water. Numbers shown are for 2016-2017.

Total Projected Program Savings:

ANNUAL	LIFETIME
3,838,202	23,340,690 gallons of water
14,982	93,993 therms of gas
127,204	800,102 kWh of electricity



Water Conservation Calendar Art Contest

The District sponsored the 12th Annual Water Conservation Calendar Artwork Contest in 2016. The contest was open to 4th, 5th and 6th grade students throughout the District. Students submitted their entries to the District office where staff selected 12 monthly winners and one grand prize, cover winner.

All winners were featured in the 2016 Water Conservation Calendar. The grand prize winner received a $50 gift card, and the entry was displayed on the cover of the calendar. The other winners received $25 gift cards. The District produced 400 calendars and distributed them to the winners, other individuals by request and through the District office and city offices throughout the District.

Groundwater Presentation at Farm Bureau Ag Fairs

Approximately 350 students participated in the "Edible Aquifer" activity presented in cooperation with the Moore County Farm Bureau. The "Edible Aquifer" teaches students about the composition of aquifers in a unique and memorable way. By leading the students through the process of constructing an aquifer out of a variety of tasty materials, the idea is reinforced that our aquifer is formed by layers of geologic material. After the ice, soda, ice cream, and chocolate milk mix are all combined to form the "Edible Aquifer," the message is driven home when the students lower a straw in to the concoction and

"pump" the mixture out, dirt and all. The activity uses the powerful sense of taste to reinforce the concept of the aquifer and where our water comes from.

Meter Reimbursement Program

The North Plains Groundwater Conservation District neared the end of the first contract in the meter reimbursement program in 2016. From the beginning of the contract in October of 2014 through the end of 2016, the District reimbursed 624 meters for a total of $529,089.40. The meter reimbursement program is designed to help offset the cost to area ag producers who put flow meters on irrigation wells. Under the second contract the District has $800,400 available for meter reimbursement which allows the District to operate the program through December 2019.

The funds for the meter reimbursement program come from a grant made available from the Texas Water Development Board (TWDB). The TWDB funds are awarded to groundwater districts across the state with the understanding that meters are an accepted and effective management tool for producers and groundwater conservation districts.

The TWDB awarded the District an additional $295,050 in August 2015 (third contract), bringing the grand total for the program to almost $1.7 million dollars. The additional funds should allow the District to operate the meter reimbursement program through December 2021. As a condition of receiving the funds, the District requires participants to report their various crops and crop acres (but not bushels or crop amounts) annually for five years. This allows the District to more accurately estimate, by county, inches of water each crop uses. This information is used in regional planning and eventually incorporated into the State Water Plan.

The funds from grants two and three will be available to continue to cost share the purchase of irrigation well meters after the first round of funding is expended. The TWDB funds will allow the District to assist in the purchase of approximately 2,300 meters.

G.2. Recharge Enhancement

The District has limited surface water resources to enhance recharge through diversion or infiltration of surface water. The District explored recharge enhancement through its precipitation enhancement program. The District discontinued its funding for the precipitation enhancement program in 2006. The District could not quantify if, and to what extent, the program positively affected precipitation and subsequent recharge. Therefore, recharge enhancement through surface water diversion or infiltration, or through precipitation enhancement could not be proven to be effective. The District has determined that this objective is not applicable at this time.

G.3. Rainwater Harvesting

G.3. Management Objective:

Provide public information regarding rainwater harvesting.

G.3. Performance Standards:

The District's activities in rainwater harvesting education will be summarized annually and presented to the Board of Directors.

The rainwater harvesting education and outreach activities conducted by the District are described under the Performance Standards for Item G.1b.

G.4. Precipitation Enhancement

The District has determined that this objective is not applicable at this time.

G.5. Brush Control

G.5. Management Objective:

Provide public information regarding brush control.

G.5. Performance Standards:
Maintain brush control literature in the District office. The District's activities in addressing brush control education will be summarized annually and presented to the Board of Directors.

Brush control information is available in the District office at 603 E. 1st Street, Dumas, TX.

Desired Future Conditions (DFC) of the Groundwater Resources (31TAC §356.5(A)(1)(H))

H.1. Management Objective:
Revise District Rules to achieve Desired Future Conditions of the Ogallala, Rita Blanca and Dockum aquifers.

H.1. Performance Standards:
The District will update its rules within one year of adoption of the management plan. Annually the District will review its rules and conservation programs to determine if they are achieving the DFCs.

The current District Management Plan was adopted by the Board of Directors in May of 2013 and approved by the TWDB in July of 2013. The acceptance by the TWDB began the 1-year window for adoption of rules to achieve the DFC's. In July of 2014, the District passed new rules designed to make adjustments in the Annual Allowable Production, if necessary, to meet the DFCs. In April 2015, the Board repealed the existing rules and approved newly proposed and revised rules for the District. The decision was the culmination of three years of review by the board. The rules regarding the DFCs were moved, unchanged, from Chapter 4 in the previous rules to Chapter 8 in the current rules. On July 19, 2016, the Board of Directors reviewed the rules and programs and determined they were sufficient to meet the DFC and no action was taken regarding Annual Allowable Production.

H.2. Management Objective:
Monitor the condition of the aquifers and status of groundwater production compared to the adopted DFCs.

H.2. Performance Standards:
Annually review groundwater production information, (Groundwater Availability Models) GAMs, and water level measurements to characterize aquifer conditions compared to the DFCs and report findings to the Board of Directors.

District Engineer, Paul Sigle, compiled the following information showing the status of the aquifer in relation to Modeled Available Groundwater (MAG) based on the District's DFCs.

Table 8 provides a comparison of the 5-year average groundwater production and the 2016 groundwater production to the MAG. The MAG is a calculation provided by the TWDB that estimates the amount of groundwater available for pumping, while maintaining the District's approved DFCs. Based on the 5-year average, the remaining MAG across the District is 29-percent. The average remaining MAG for the four eastern counties is 53-percent, and 15.7-percent for the western counties. For the 2016 production, the total remaining MAG across the District is 34.6-percent. The remaining MAG for the four eastern counties is 57.4-percent, and 22-percent for the western counties. If the District continued to pump at 2016 rates, no pumping reduction would be required to achieve the DFC for the western counties until 2028, and the eastern counties would not require a reduction in pumping during the observed period of the MAG, through 2062. At the 2016 pumping rate, the pumping would need to be reduced by 90.9 thousand acre-feet by 2030 to achieve the DFC. At the 5-year average rate, pumping would need to be reduced by 188.9 thousand acre-feet by 2030.

District Production Trend Compared to Ogallala Modeled Available Groundwater (Table 8)

County	2016 MAG	2016 Production	2016 Difference	Average Production	Average Difference
Dallam	435,583	339,200	22.1%	360,240	17.3%
Hartley	440,083	391,600	11.0%	416,820	5.3%
Moore	242,451	185,700	23.4%	203,080	16.2%
Sherman	422,960	285,300	32.5%	318,640	24.7%
Hansford	275,929	170,400	38.2%	190,340	31.0%
Hutchinson	61,964	67,600	-9.1%	68,280	-10.2%
Lipscomb	243,725	42,300	82.6%	45,740	81.2%
Ochiltree	266,852	81,400	69.5%	94,540	64.6%
West	1,541,077	1,201,800	22.0%	1,298,780	15.7%
East	848,469	361,700	57.4%	398,900	53.0%
Total	**2,389,546**	**1,563,500**	**34.6%**	**1,697,680**	**29.0%**

H.3. Management Objective:

Joint plan with other groundwater conservation districts to achieve DFCs.

H.3. Performance Standards:

At least annually report the joint planning committee activities to the Board of Directors.

February 25, 2016 – Bob Zimmer, GMA 1 Board Member and North Plains GCD Board Secretary, attended the GMA 1 meeting as did North Plains GCD Board Member, Gene Born, North Plains GCD Vice President, Danny Krienke and General Manager, Steve Walthour. Additional District attendees included, Keith Good and Dale Hallmark.

March 17, 2016 – Bob Zimmer, GMA 1 Board President and North Plains GCD Board Secretary, attended the GMA 1 meeting as did North Plains GCD Board Member, Gene Born and General Manager, Steve Walthour. Additional District attendees included, Keith Good and Dale Hallmark.

April 20, 2016 – Bob Zimmer, GMA 1 Board President and North Plains GCD Board Secretary, attended the GMA 1 meeting as did North Plains GCD Board Member, Gene Born and General Manager, Steve Walthour. Additional District attendees included, Keith Good and Dale Hallmark.

October 5, 2016 – Bob Zimmer, GMA 1 Board President and North Plains GCD Board Secretary, attended the GMA 1 meeting as did North Plains GCD Board Member, Gene Born, North Plains GCD Vice President, Danny Krienke and General Manager, Steve Walthour. Additional District attendees included, Keith Good and Dale Hallmark.

November 2, 2016 – Bob Zimmer, GMA 1 Board President and North Plains GCD Board Secretary, attended the GMA 1 meeting as did North Plains GCD Board Member, Gene Born and General Manager, Steve Walthour. Additional District attendees included, Keith Good and Dale Hallmark.

The report for joint planning was presented to the Board of Directors at multiple board meetings including the March 8, 2016 meeting as reflected in the District's official minutes.

The representatives of the member districts retained the Panhandle Regional Planning Commission for administrative services. assisted in the planning process by providing technical services and coordinating the groundwater availability modeling of proposed Desired Future Conditions, as needed. The member districts considered various presentations and information to address Texas Water Code Chapter 35 and Chapter 36 requirements.

Voting members of the GMA 1 Board of Directors are shown here (l to r) Chairman Bob Zimmer-North Plains Groundwater Conservation District, Danny Hardcastle - Panhandle Groundwater Conservation District, Lynn Tate- High Plains Underground Water Conservation District, and Jim Haley - Hemphill County Underground Water Conservation District.

H.4. Management Objective:

Manage groundwater withdrawal amounts based on an allowable production limitation in order to achieve DFCs.

H.4. Performance Standards:

Annually the District will summarize the previous year's allowable production compliance. Each year the compliance results will be presented to the Board of Directors.

Other Management Goals Included In the Plan by the District

No other management goals are listed at this time.

2016 Compliance Statistics (Table 9)

In Compliance	Exceeded Production Limit	Administratively Resolved	Fine Paid/Meters Installed	Pending 7/12/17
2836	18	14	3	1

DISTRICT FINANCIALS

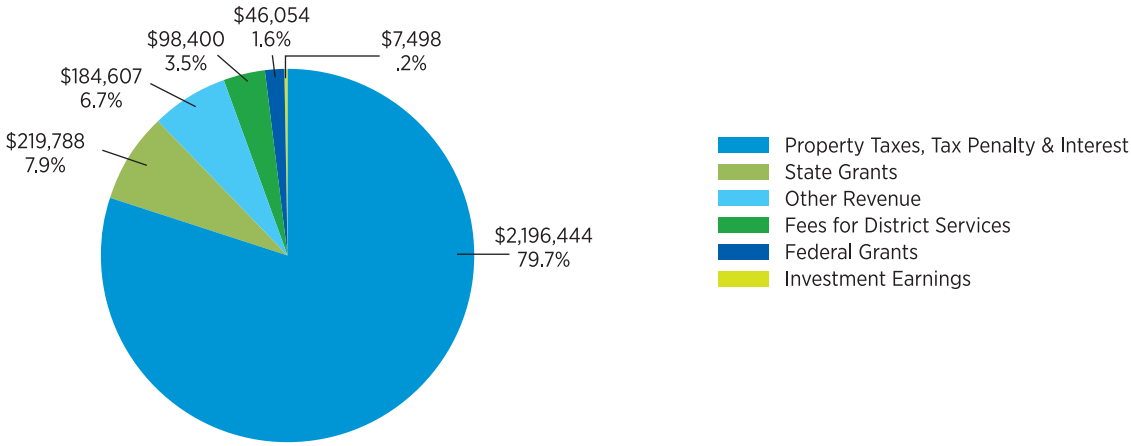
For the fiscal year ending September 30, 2016, the District's net financial position increased by $0.14 million, or nearly 3.87%, because of 2016 District operations. During the year, the District had expenditures that were $0.14 million less than the $2.77 million generated in tax and other revenues for District programs. The total cost of all the District's programs and activities was $2.63 million.

However, our taxpayers ultimately paid only $2.15 million because some of the costs were paid by those who directly benefited from the programs ($0.22 million) or by grants the District acquired at the direction of the Board ($0.27 million) that subsidized certain conservation programs.

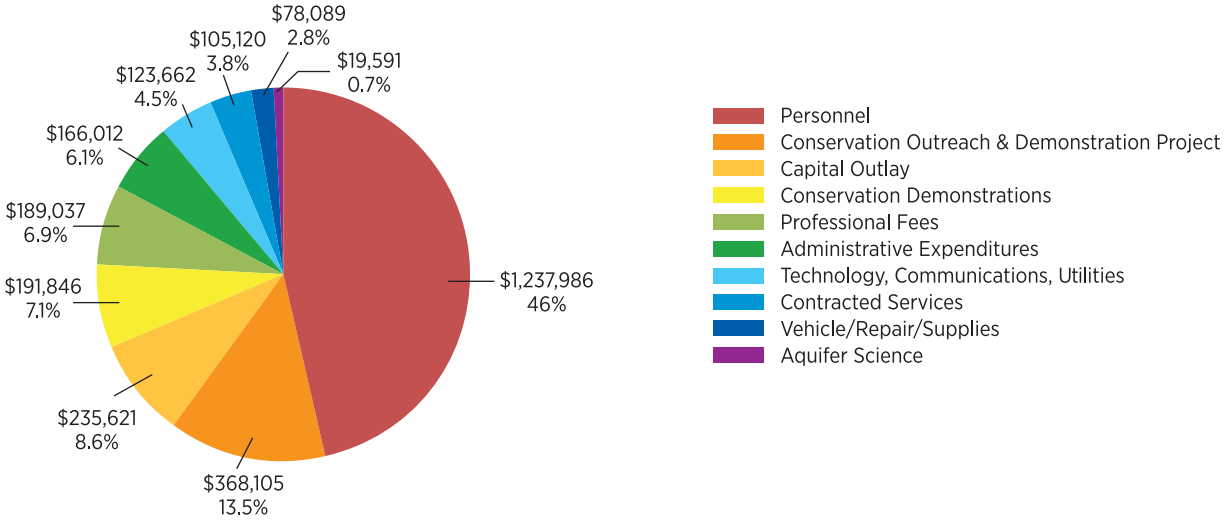
The general fund balance ended the year with a fund of $1.38 million, which is less than the previous year's balance of $1.39 million.

At the end of the fiscal year the District had $2.67 million invested in a broad range of capital assets, including facilities and equipment for water conservation. The amount represents a net increase of just over $0.03 million or 1.31% more than last year. The following charts show the District's revenues and other financing sources as well as the District's expenditures for the fiscal year ending September 30, 2016.

Revenues and Other Financing Sources



Total Expenditures



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