



Annual Management Plan Progress Report 2021

February 28, 2022

A. Providing for the Most Efficient use of Groundwater [25, 26]

1. Groundwater Reporting

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

Performance Standards: Annually, the District will collect production reports on all properties containing non-exempt wells and calculate annual groundwater withdrawals for the District.

Action Taken: The District received production reports for 2020 from 2902 Groundwater Production Units. Annual groundwater withdrawals were calculated and published in the Hydrologic Report and presented to the Board at the July 2021 board meeting.

Table 1: Groundwater production reported to the District, 2016-2020 (Acre-feet).

County	2016	2017	2018	2019	2020	Average
Dallam	339,200	312,300	349,900	303,200	342,745.65	329,500
Hartley	391,600	376,000	422,600	349,200	402,242.14	388,300
Moore	185,700	173,100	200,600	157,700	199,359.43	183,300
Sherman	285,300	265,100	312,000	255,400	328,409.54	289,200
Hansford	170,400	146,700	190,800	162,300	195,120.62	173,100
Hutchinson	67,700	63,600	75,500	68,400	79,388.98	70,900
Lipscomb	42,300	44,200	44,200	43,400	54,522.30	45,700
Ochiltree	81,400	77,300	95,500	81,800	105,241.27	88,200
West	1,201,800	1,126,500	1,285,100	1,065,500	1,272,756.76	1,190,300
East	361,800	331,800	406,000	355,900	434,273.17	377,900
Totals	1,563,600	1,458,300	1,691,100	1,421,400	1,707,029.93	1,568,200

^[A] 2020 Production data are provisional and subject to minor changes.

^[B] Average is an average of the last five years.

2. Well Registrations and Permitting

Management Objective: All exempt and non-exempt wells constructed within the jurisdiction of the District are required to be registered or permitted in accordance to the District’s Rules.

Performance Standards: District staff will verify all wells within a Groundwater Production Unit(s) are registered or permitted in accordance with the District Rules during any site visits.

Action Taken: In 2021, the District inspected all Groundwater Production Units (GPUs) on which applications were made for new permits for non-exempt wells, new exempt wells were registered, and previously unregistered wells were discovered during inspections. The following table gives the results from permitting and inspecting wells in 2021.

Table 2: Permitting and inspecting wells

Permitting and Inspecting Wells		
Non-exempt Permits	GPUs Inspected	New Exempt Wells Registered
414	1337	160

3. Conservation Demonstration and Education

Management Objective: Provide support through the District’s North Plains Water Conservation Center, demonstrations, and other District education programs to promote groundwater conservation.

Performance Standards: At least annually, conduct field days and/or other events to educate stakeholders regarding water use efficiency technologies and practices. The District will publish reports on the activities at the North Plains Water Conservation Center and other demonstrations and education programs.

Action Taken:

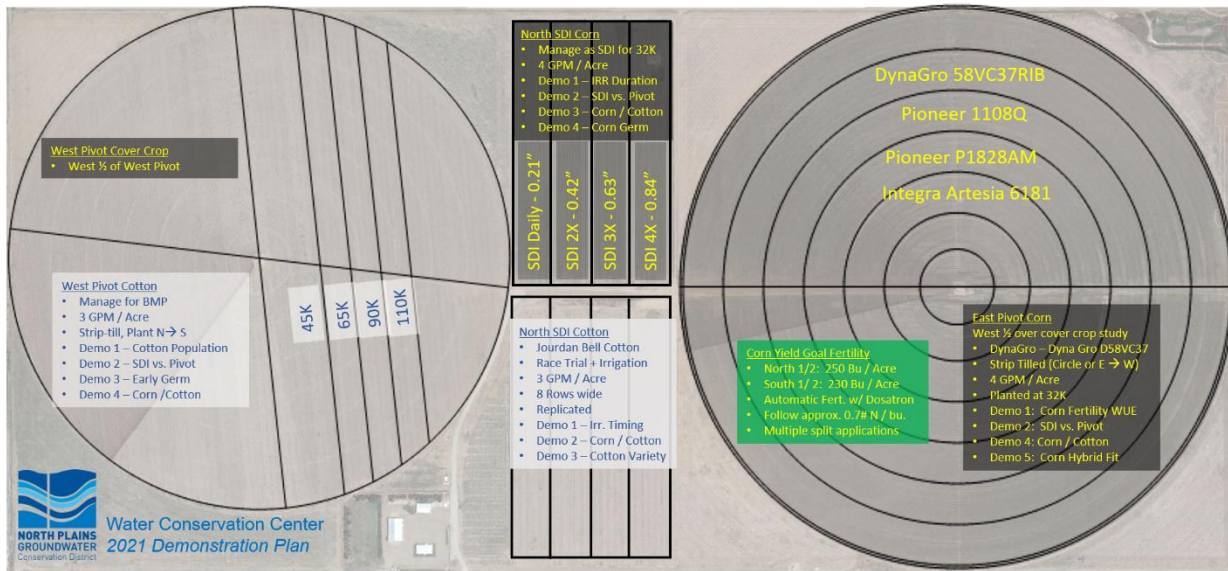
The Master Irrigator Program

The Master Irrigator is a 4-day interactive training program combining lecture and producer panel interaction to provide a fast track to adoption of irrigation conservation practices, tools and technologies. Ultimately the program helps growers be more efficient stewards of the area’s groundwater resources.

The Master Irrigator Program was held in the spring 2021 after being cancelled in 2020 due to health and safety considerations relating to the pandemic. The 2021 class graduated 19 participants, increasing the number of acres influenced by the Master Irrigator Program to approximately 350,000.

WCC Demonstrations for 2021

Figure 1: 2021 WCC Field plan for Corn and Cotton Rotation



2021 Irrigation Summary

Cotton - 2021	Plant Date	Rainfall	Pre-Water	Irrigation: Acre-Inches		Total Irr.	Last Irr.
				In-season	Post Sept 1		
West Pivot	12-May	12.1	1.9	5.9	2.3	10.1	23-Sep
South Drip: Zone 9-10	25-May	10.2	2.3	2.8	1.7	6.8	22-Sep
South Drip: Zone 11-12	25-May	10.2	2.4	2.8	1.7	6.8	22-Sep
South Drip: Zone 13-14	25-May	10.2	2.0	2.9	1.4	6.3	22-Sep
South Drip: Zone 15-16	25-May	10.2	1.9	2.8	1.4	6.1	22-Sep

Corn - 2021	Plant Date	Rainfall	Pre-Water	Irrigation: Acre-Inches		
				In-Season	Total Irr.	Last Irr.
East Pivot	24-May	10.2	4.4	17.8	22.1	19-Sep
North Drip - Corn - Zones 1-2 (1X)	24-May	10.2	2.4	17.3	19.7	16-Sep
North Drip - Corn - Zones 3-4 (2X)	24-May	10.2	1.9	15.5	17.4	16-Sep
North Drip - Corn - Zones 5-6 (3X)	24-May	10.2	1.9	19.5	21.3	16-Sep
North Drip - Corn - Zones 7-8 (4X)	24-May	10.2	1.9	18.2	20.1	16-Sep

Corn Harvest Results

The North SDI blocks at the WCC were harvested on 12 October. The SDI demonstrations were managed by varying irrigation frequency; yield and total irrigation are as follows.

<i>North SDI - DG58VC37RIB</i>	Yield (Bu / Acre)	Irrigation (in.)
SDI Daily - 0.21"	234.9	19.6
SDI 2x - 0.42"	230.6	17.4
SDI 3x - 0.63"	228.9	21.3
SDI 4x - 0.84"	225.7	20.1

The SDI plots matured and dried 9 days earlier than the pivot plots and yielded substantially less. The summary of the irrigation differences indicates that we did not have excellent control on our irrigation applications. The differences in applied irrigation and higher yields where less water was applied indicate that even further reductions in irrigation volumes and capacity should be evaluated for the SDI treatments. The soil moisture across all four drip blocks was easily maintained with 4 GPM / Acre and multiple shut-downs. The irrigation figure includes approximately 2 inches of pre-water.

The East Pivot was primarily harvested on 21 October. 6 truck loads were harvested on 12 October following the SDI blocks. Early harvest was delayed due to high grain moisture. The East Pivot layout had 5 hybrids planted east to west in 24-row blocks, repeated on the North and the South side of the pivot. The North average yield is 254.4 bushels / acre and the South average is 233 bushels / acre. The nominal irrigation on the East Pivot is 22.1 inches. Hybrid results are as follows.

<i>East Pivot</i>	North	South	AVG
Pioneer 1108Q	250.7	254.6	252.6
Pioneer 1828AML	257.9	264.3	261.1
Pioneer 1366AML	238.9	248.0	243.5
Pioneer P0908AML	270.4	248.1	259.2
DynaGro DG58VC37RIB	253.0	243.8	248.4

Cotton Harvest Results

Cotton was harvested across the WCC during the week of 8-12 November. All cotton was harvested utilizing Stan Spain's stripper baler. Each bale was weighed using Texas A&M AgriLife's scales. The District's primary cotton effort was the population demonstration on the West Pivot which had 2 replications of planting populations at 45K, 65K, 95K, 110K, and 75K for the field, all planted on 12 May. Dr. Jourdan Bell's RACE Trial was in the South SDI blocks and was planted at 75K on 25 May.

Figure 1: West Pivot cotton harvest details. The variety is Fiber Max 1621 (early maturity, disease tolerant, semi-hairy). Base loan value is \$0.52 and sale price is adjusted to \$1.00 for the sake of this table.

	Lint Yield (lbs / acre)	Turnout (%)	Lint Yield (bales / acre)	Loan Value (\$0.52) (cents/lb)	Base Adjusted (\$1.00) (USD/lb)	Lint Revenue per Acre (USD/Acre)	Seed Value (USD/Acre)	Total Revenue (USD/Acre)	Revenue / Irrigation (USD / Acre-inch)
EP1 - 110K	1540	37.7%	3.079	56.30	\$1.08	\$1,667	\$182	\$1,849	\$183
EP2 - 95K	1490	36.3%	2.981	57.00	\$1.10	\$1,634	\$177	\$1,810	\$179
EP3 - 65K	1518	37.5%	3.036	56.50	\$1.09	\$1,649	\$180	\$1,829	\$181
EP4 - 45K	1498	37.8%	2.996	56.55	\$1.09	\$1,629	\$177	\$1,807	\$179
EP Field - 75K	1624	37.7%	3.248	55.35	\$1.06	\$1,729	\$192	\$1,921	\$190
WP Field - 75K	1573	36.1%	3.146	55.25	\$1.06	\$1,671	\$186	\$1,858	\$184
WP-1 - 110K	1227	31.3%	2.453	48.60	\$0.93	\$1,146	\$145	\$1,292	\$128
WP-2 - 95K	1345	32.6%	2.689	48.40	\$0.93	\$1,251	\$159	\$1,411	\$140
WP-3 - 65K	1337	32.7%	2.675	50.35	\$0.97	\$1,295	\$158	\$1,453	\$144
WP-4 - 45K	1280	33.0%	2.560	48.40	\$0.93	\$1,191	\$152	\$1,343	\$133

Figure 4: 2021 Cotton RACE Trial yield results. The RACE work was performed by Dr. Jourdan Bell and located in the South SDI blocks at WCC. The planting date was 25 May due to May rainfall events.

	Lint Yield (lbs / acre)	Turnout (%)	Lint Yield (bales / acre)	Loan Value (\$0.52) (cents/lb)	Base Adjusted (\$1.00) (USD/lb)	Lint Revenue per Acre (USD/Acre)	Seed Value (USD/Acre)	Total Revenue (USD/Acre)	Revenue / Irrigation (USD / Acre-inch)
ST 4993 B3XF	1195	36%	2.39	57.6	\$1.11	\$1,324	\$156	\$1,480	\$218
FM 2398 GLTP	1171	35%	2.34	57.2	\$1.10	\$1,288	\$153	\$1,441	\$212
FM 1621 GL	1157	35%	2.31	54.52	\$1.05	\$1,213	\$151	\$1,364	\$201
DP 1820 B3XF	1148	36%	2.30	57.28	\$1.10	\$1,265	\$150	\$1,414	\$208
Arm 9442 XF	1115	33%	2.23	55.28	\$1.06	\$1,185	\$145	\$1,331	\$196
NG 3729 B2xf	1106	32%	2.21	56.63	\$1.09	\$1,204	\$144	\$1,349	\$198
NG 3195 B3XF	1081	34%	2.16	57.65	\$1.11	\$1,198	\$141	\$1,339	\$197
NG 3956 B3XF	1048	32%	2.10	53.78	\$1.03	\$1,084	\$137	\$1,221	\$179
DP 2012 B3XF	1035	34%	2.07	57.03	\$1.10	\$1,135	\$135	\$1,270	\$187
NG 3930 B3XF	955	32%	1.91	55.1	\$1.06	\$1,012	\$125	\$1,136	\$167
FM 1730 GLTP	944	32%	1.89	56.53	\$1.09	\$1,026	\$123	\$1,149	\$169

Irrigation observations being considered from the 2021 season include:

1. **Over-Irrigation with 4 GPM / Acre** - There were multiple periods during July when the East pivot corn showed signs of saturation and over-irrigation, following a cotton crop that completely depleted the soil moisture. It is likely that management could have been more aggressive on withholding in-season irrigation water. Ceres imaging and soil moisture probes combined to indicate these events that otherwise would be difficult to identify.

2. **Lower soil moisture percentage in SDI** - Despite periods of withheld irrigation, the North SDI corn spent the entire season in a high-moisture condition. Zones 3-4 had a slightly shorter relative run-time and applied less water than the other 6 Zones. During the season, this zone appeared more ideal according to multiple indicators. Consideration will be given to indicate whether an even lower irrigation threshold would be beneficial on SDI. The thought would be to irrigate at a 80% of plant available water level or manage it as if the capacity is 3 GPM / acre instead of 4 GPM / acre.
3. **Late Irrigation in Cotton** – The strategy in cotton was to terminate irrigation by September 1, with the understanding that ideal conditions could cause incremental irrigation events in September. Instead of having a full soil moisture profile at 1 Sept, the water levels were maintained at a lower level. As September and October remained warmer, the cotton was irrigated with multiple, smaller irrigation events through 23 September. Cotton run-away was never an issue and stature was maintained to the end of the season.

New Irrigation Well at WCC

In the wake of declining production from the WCC's East Well, management and the District contract engineer recommended drilling a new well at the WCC. That process was initiated after the 2021 growing season. Hydro Resources drilled four total test holes at the Water Conservation Center in August and October.

1. Test Hole #1, 20 Aug, (SW Corner of East Pivot) – Poor formation and expected low production
2. Test Hole #2, 24 Aug, (Pivot Point of East Pivot) – Lost circulation
3. Test Hole #3, 25 Aug, (SE Corner of north SDI) – Good formation, >400 GPM, non-ideal location
4. Test Hole #4, 2 Oct, (NE Corner of West Pivot) – Good formation, 400 GPM, preferred location

The first three test holes were in pursuit of a Class-C well that would produce greater than 500 GPM. After observing the test holes in the radius restricted locations, a fourth test hole was ordered in a more preferred location, reducing the expectation to that of a 400 GPM well. The fourth test hole was drilled in the NE corner of the West Pivot, near the weather stations. The fourth test hole location was selected for the well and the drilling process was completed by the end of the calendar year. Above ground infrastructure remains to be completed for the well to be operational.

The District published reports on activities at the WCC and other demonstrations in the winter, spring and fall issues of the North Plains Water News as well as on social media and the District website.

4. *Financial Assistance*

Management Objective: The District will encourage the adoption of technologies that promote efficient use of groundwater and conserve water by providing the means to purchase the technology.

Performance Standards: At least annually, the District will seek financial assistance for stakeholders regarding conservation equipment and practices.

Action Taken: The District applied for and received \$250,000 from the Texas Water Development Board to fund the Master Irrigator Program through the 2022 program year. The District continued to provide the following financial assistance programs through 2021:

- TWDB Irrigation Meter Reimbursement – reimbursed eligible irrigators up to half the cost of flow meters.
- TWDB Master Irrigator – funds were available to reimburse up to half the cost of certain approved conservation equipment for graduates of the Master Irrigator Program.

5. *Technical Assistance*

Management Objective: The District will assist stakeholders in collecting information and knowledge about practices and technologies that promote efficient use of groundwater.

Performance Standards: The District will provide technical assistance to stakeholders when requested, and the information is beneficial for the efficient use of groundwater.

Action Taken: In 2021, District contract agriculture engineer, Nich Kenny, assisted graduates of the Master Irrigator program and others with the proper installation and operation of irrigation equipment to maximize performance and efficiency of the practices. In addition, the District received inquiries for groundwater-related technical assistance and provided information to help users conserve water. Technical services performed by the District included flow tests and water quality testing. The District also partnered with the United States Department of Agriculture – Natural Resources Conservation Service to inspect Variable Frequency Drives which allow for more control over electric irrigation motors. Finally, the District worked with the United States Geological Survey on a water quality investigation to provide a water quality base line of information and that information is available to the public upon request.

B. Controlling and Preventing the Waste of Groundwater [27, 28]

Management Objective: Control and prevent the waste of groundwater as defined by state law.

Performance Standards: The District will pursue any reported violations of the District's rules concerning groundwater waste.

Action Taken: The District received five water waste reports in 2020. All instances were investigated with corrective measures taken by the property owner or lessee. No issues were taken before the board of directors.

C. Controlling and Preventing Subsidence [29, 30]

Controlling and preventing subsidence has historically not been considered as challenging in the High Plains Aquifer System compared to other aquifer systems in Texas.

Action Taken: District staff reviewed the TWDB report on subsidence; "Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with regard to Groundwater Pumping, TWDB Contract Number 1648302062. The report lists the Ogallala aquifer with a high risk of subsidence and states, "Subsidence Risk is high with high subsidence risk in large areas of the aquifer".

The report lists the Dockum, Rita Blanca and Ogallala aquifers with a medium risk of subsidence and states, "subsidence potential exists but is not generally significant outside of hotspots within each aquifer".

Considering the extent of the study and due to the depth of the water and the nature of the geology within the District, extensive subsidence is unlikely and the District's Board of Directors, upon recommendation from qualified staff, have determined that this goal is not applicable to the District.

D. Addressing Conjunctive Surface Water Management Issues [31, 32]

Management Objective: Address conjunctive water use issues with organizations that have relevant authority or jurisdiction.

Performance Standard: Annually, the District's representatives will attend at least 75% of Region A: Panhandle Regional Water Planning Group's meetings. To further address conjunctive water use issues, the District will submit a copy of its management plan to The Canadian River Municipal Water Authority, Palo Duro Water District, and Red River Authority for their consideration and review.

Action Taken: The Panhandle Water Planning Group (PWPG) Executive Committee met on Wednesday June 2, 2021 at 10:00 AM via video conferencing. Steve Walthour, General Manager participated in the meeting. The Executive committee reviewed the

Prioritization Subcommittee meeting minutes from August 19, 2020 and discussed the solicitation process for the next round of water planning. The committee proposed that Freese and Nichols be selected for Technical Consulting Services. The committee recommended that Steve Walthour be added to the executive committee.

The PWPG (Region A) held a scheduled public meeting on Tuesday, June 29, 2021 at 9:30 am at the Panhandle Regional Planning Commission, 415 SW 8th Ave., Amarillo, Texas. The meeting was also attended virtually. Steve Walthour, General Manager participated in the meeting. The PWPG approved Freese and Nichols for Technical Consulting Services and approved Steve Walthour be added to the executive committee. Walthour presented “Missouri River Transfer Project to Mitigate Flooding and Protect the Six-State Ogallala-High Plains Regional Socio-Economic Viability.”

The Groundwater Management Districts Association Board of Directors held their meeting on Tuesday, October 26, 2021, at 3:00 pm CST via video conferencing. Steve Walthour, General Manager and GMDA Vice President attended. The Board amended its Federal Priorities for the NWRA Groundwater Caucus to include interbasin surface water transfers for recharge purposes into the Ogallala – High Plains states.

National Water Resources Association held their Fall Conference in Chandler Arizona from November 8 through November 10, 2021. Walthour presented “Missouri River Transfer Project to Mitigate Flooding and Protect the Six-State Ogallala-High Plains Regional Socio-Economic Viability” to the Groundwater Caucus at the conference.

Region O held a scheduled public meeting on Wednesday, November 17, 2021, at the South Plains Association of Governments, 1323 58th Street Lubbock, TX. Walthour presented “Missouri River Transfer Project to Mitigate Flooding and Protect the Six-State Ogallala-High Plains Regional Socio-Economic Viability.”

E. Addressing Natural Resource Issues that Impact the Use and Availability of Groundwater and which are Impacted by the Use of Groundwater [33, 34]

1. Aquifer Monitoring

Management Objective: Monitor aquifer characteristics that affect utilization and availability of groundwater and which are affected by the use of groundwater through District programs by maintaining a network of monitor wells.

Performance Standards:

- i. District staff will periodically collect and analyze water samples from appropriate monitor wells.

Action Taken: United States Geological Survey collected the last water samples from 16 monitor wells across the District in 2020. Results have yet to be reported to the District. Additional samples will be analyzed once the USGS sample results are reported.

- ii. District staff will perform water quality analyses for select constituents for well owners upon request.

Action Taken: In 2021, water samples were analyzed from 37 private wells upon request, compared to 13 in 2020. Water quality results were reported in aggregate in the 2021 Hydrologic Report.

- iii. Annually, District staff will summarize their water quality activities and make the information available to the Board of Directors and the public.

Action Taken: Water quality activities are published in the annual Hydrologic Report and presented to Board of Directors for approval. The information is available in the District office and on the District website.

Table 4: Mineral analyses from wells within the District

Parameter	Units	2018 Number of Analyses	2018 Average Analysis Result	2019 Number of Analyses	2019 Average Analysis Result	2020 Number of Analyses	2020 Average Analysis Result
Sulfate	mg/l	32	50.8	29	44.68	USGS Samples	Due 2021
Nitrate	mg/l	22	11.14	29	1.653	USGS Samples	Due 2021
Total Iron	mg/l	22	0.234	29	.0433	USGS Samples	Due 2021
Chlorides	mg/l	22	60.77	29	30.57	USGS Samples	Due 2021
Fluoride	mg/l	22	.0466	29	.661	USGS Samples	Due 2021
Total Hardness	mg/l	22	217	29	208	USGS Samples	Due 2021

- iv. District staff will collect aquifer water level measurements annually.

Action Taken: Water levels for select District wells were measured in January and February of each year and reported in the annual Hydrologic Report.

Table 5: Depth to water by county

Dallam	Hartley	Sherman	Moore	Hansford	Hutchinson	Ochiltree	Lipscomb
290 ft.	365 ft.	321 ft.	358 ft.	303 ft.	350 ft.	341 ft.	164 ft.

- v. Annually, 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.

Action Taken: Groundwater level declines and average depth to water are calculated and published in the annual Hydrologic Report.

Table 6: 2020 Average depth to water and comparisons of average decline in select District water level monitor wells

County	Avg. Depth to Water (Feet)	2020 Avg. Well Decline (Feet)	2019 Avg. Well Decline (Feet)	Current 5-Year Avg. Well Decline (Feet)	Previous 5-Year Avg. Well Decline (Feet)	Current 10-Year Avg. Well Decline (Feet)	Previous 10-Year Avg. Well Decline (Feet)
Dallam	282	2.58	2.61	2.63	2.82	2.74	3.19
Hansford	302	1.71	1.70	1.69	1.68	1.70	1.64
Hartley	364	3.05	3.08	3.12	3.24	3.19	3.56
Hutchinson	350	1.47	1.47	1.46	1.45	1.46	1.41
Lipscomb	162	0.49	0.49	0.49	0.44	0.44	0.43
Moore	358	2.34	2.34	2.33	2.31	2.32	2.08
Ochiltree	333	1.18	1.14	1.11	0.97	1.03	0.78
Sherman	313	2.48	2.45	2.43	2.37	2.37	2.32

District-wide	308	1.91	1.91	1.91	1.91	1.91	1.93

- vi. At least on a two-year cycle, District staff will summarize or update aquifer saturated material information and make the information available to the Board and the public.

Action Taken: The District calculates saturated thicknesses every other year and using District monitor well data. The next scheduled update will be published in 2023.

Table 7: 2020-2021 Estimated average aquifer thickness by county (District area only).

Dallam	Hartley	Sherman	Moore	Hansford	Hutchinson	Ochiltree	Lipscomb
164 ft.	132 ft.	140 ft.	118 ft.	163 ft.	128 ft.	137 ft.	218 ft.

2. Deteriorated Wells

Management Objective: Investigate and address deteriorated wells that may pose a threat to water quality.

Performance Standard: District staff will pursue repair or plugging of deteriorated wells.

Action Taken: In 2021, District staff inspected 911 wells. District staff observed zero (0) deteriorated wells as defined by the Chapter 4 of the District Rules. District staff observed 173 wells that contained casing in good condition but did not meet the following conditions: 1) The well has been capped with a covering that is not easily removed. 2) If a cap is present it must be capable of sustaining weight of at least 400 pounds. 3) The well is sealed to prevent the pollution of groundwater.

Of the 173 wells observed not properly capped, the District staff installed 62 temporary caps that met the District’s requirements and also instructed the owners in writing as to how to bring these wells into full permanent compliance. Well owners have permanently capped 111 of these wells according to District rules.

3. Aquifer Information

Management Objective: The District will provide easy access to public information available about the aquifers and wells within the District’s jurisdiction.

Performance Standards: The District will maintain a web-based application for providing information about the groundwater resources in the region.

Action Taken: The public can view a variety of maps and publications related to District groundwater resources on the District’s website at www.northplainsgcd.org. The subpage for Aquifer Data & Maps had the highest number of visitors in 2021, with 2,010 page views.

F. Addressing Drought Conditions [35, 36]

North Plains Groundwater Conservation District lies in an area of the State of Texas that has a year-round, semi-arid climate. The area experiences generally dry conditions year-round compared to other areas of the state. The District works to educate the public about methods to conserve water all year, but particularly during dry periods.

1. Current Drought Conditions

Management Objective: Provide information about the current drought conditions in the area.

Performance Standards: Maintain information about the current drought conditions on the District’s website.

Action Taken: The District links the weekly drought monitor published by the National Drought Mitigation Center at University of Nebraska – Lincoln on the website at www.northplainsgcd.org.

2. Conservation Education

Management Objective: Provide stakeholders with information and tools to conserve during dry and peak use periods.

Performance Standards: Annually, the District will conduct water conservation communications and education activities.

Action Taken: Drought conditions and water conservation tips were communicated through the District’s social media accounts, newsletters and website during 2021.

G. Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control, Where Appropriate and Cost-Effective [37, 38]

1. Conservation

a) Groundwater Conservation Reserve Program

Management Objective: Provide program allowing permitted well owners that timely report their groundwater production to retain any unused allowable annual production for future years, promoting the conservation of groundwater.

Performance Standards: Annually, District staff will report to permitted well owners the well owner's conservation reserve.

Action Taken: The District reported cumulative and available groundwater conservation reserve to each non-exempt well owner, or the well owner's agent, as part of 2021 Annual Allowable Production reporting forms emailed or mailed by November 30, 2021 for production year 2021.

b) Conservation Education

Management Objective: Conduct conservation education activities to encourage water conservation and create informed and educated citizens who will be dedicated stewards of their resources.

Performance Standards: Annually, the District will disseminate groundwater conservation and waste prevention information through a variety of media, activities, and events.

Action Taken: The District used traditional and social media to communicate conservation messages in 2021.

-The district newsletter was distributed to approximately 2000 people via email and another 1000 through traditional mail.

-The Ag Water Update radio series continued in 2021, bringing timely water management and conservation information to listeners to four radio stations across the district.

-The Cotton and Conservation educational video series marked its third year of bringing cotton production best practices to the growers of the North Plains and beyond. Texas A&M AgriLife/Research personnel provide the content for the videos clips that are made available on the District website and on Youtube.

-Live grower education returned in 2021 with a Grower Day presentation at the Moore County Community Building. The event, featuring district agricultural engineer, Nich Kenny and Texas A&M AgriLife agronomist, Jourdan Bell, Ph.D., covered the demonstrations conducted at the North Plains Water Conservation Center.

District conservation outreach activities

Date	Event	Attendance
January 6	Dumas Rotary – “How Groundwater Shaped Texas”	15
January 29	Soil Lab – Hillcrest Elementary	75
March-April	Master Irrigator – intensive irrigation conservation class for agricultural producers, taught by experts	19
March 15	WCC Grower Day – Moore County Community Bldg. – Nicholas Kenny, Jourdan Bell, Ph.d.	15
June 30	4H2O Ambassador Tour – WCC – Jourdan Bell, Ph.D., Stan Spain, Justin Garrett	25
August 5-7	XIT Rodeo and Reunion - Staff volunteered to run drinks stands and distributed Conservation Kits	N/A
August 19	Staff gave away free tea and distributed Conservation Kits	N/A
September 1	TAGD Texas Groundwater Summit – Steve Walthour	80
September 9	Perryton Rotary Club – Steve Walthour	15
September 16	Dumas Noon Lions – Steve Walthour	60
September 23	Dalhart Rotary – Steve Walthour	15
November 16	Farm Bureau Ag Days – Dumas, edible aquifer presentation to fourth graders	340
November 17	Texas A&M AgriLife Extension – taught 8 th graders by playing the Wateria trivia/Bingo game	300
November 30	Boy Scout Troop 199 – Dumas – Steve Walthour	12
December 1-2	Amarillo Farm and Ranch Show – Amarillo Civic Center – Staff outreach and Master Irrigator promo	N/A
December 7	Boy Scout Troop 199 – Dumas – Steve Walthour	12
December	In-class presentations for fourth graders	75

c) **Conservation Rule Compliance**

Management Objective: Monitor and enforce compliance to District Rules

Performance Standards: The District staff will report the enforcement to the Board as needed.

Action Taken: In 2021, District well owners filed 2901 Annual Groundwater Production Reports for 2020. 2883 Groundwater Production Units reported groundwater use within the Annual Allowable Production limit in a timely manner. Of the 16 who exceeded groundwater withdrawal limits, one was administratively resolved.

Table 9: 2020 Annual Production Reporting Compliance

2020 Annual Production Reporting Compliance			
Complied with District Rules	Exceeded Groundwater Production Limits	Admin. Resolved	Completed Mitigation Action
2883	16	1	0

A compliance matter is only considered an enforcement action if administrative remedies have been exhausted and the person is required to appear before the Board of Directors.

d) **Recharge Enhancement**

The District has limited surface water resources to achieve enhanced recharge through diversion or infiltration of surface water. The District explored recharge enhancement through its precipitation enhancement program, and the District discontinued funding for the program in 2006. The District could not quantify if, or to what extent, the program positively affected recharge or groundwater use in the District. The Board of Directors determined recharge enhancement through surface water diversion, infiltration, or precipitation enhancement is not currently viable or practical. For this management plan, this goal is not applicable to the District.

2. **Rainwater Harvesting**

Management Objective: The District promotes rainwater harvesting by maintaining rainwater harvesting information at the District Office and provides literature about its benefits at a public meeting held at least once annually.

Performance Standards: Annually District staff will report to the Board of Directors the number of people who attended the rainwater harvesting meetings.

Action Taken: No rainwater harvesting meeting was held in 2021.

3. *Precipitation Enhancement*

The District discontinued its funding for the precipitation enhancement program in 2006. The District could not quantify if, or to what extent, the program positively affected recharge or groundwater use. The Board of Directors determined that precipitation enhancement is not currently viable or practical. For this management plan, this goal is not applicable to the District.

4. *Brush Control*

The District has a semi-arid climate, has very little surface water, experiences low annual rainfall and has a depth to groundwater exceeding 300 feet. Considering the District's low rainfall, depth to groundwater and lack of surface water resources; brush control as a form of recharge enhancement or groundwater conservation is not practicable or effective. The District has determined that brush control is not a viable groundwater conservation goal for this area and is therefore not applicable.

H. Addressing the Desired Future Conditions [39, 40]

1. *Compare DFCs to Aquifers' Conditions*

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

Performance Standards: Annually review groundwater production information, GAMs, and water level measurements to characterize aquifer conditions compared to the DFCs.

Action Taken: The Board reviewed groundwater production information, GAMs, and water level measurements to characterize aquifer conditions compared to the DFCs on Tuesday, June 1, 2021 at the North Plains Water Conservation Center.

Table 10: 2020 Production Compared to Modeled Available Groundwater

County	2020 MAG	2020 Production	2020 Percent Difference between MAG and Production	Average Production 2016-2020	Average Percent Difference between MAG and Production 2016-2020
Dallam	401,663	342,746	-14.67%	329,500	-17.97%
Hartley	409,187	402,242	-1.70%	388,300	-5.10%
Moore	219,654	199,359	-9.24%	183,300	-16.55%
Sherman	398,183	328,410	-17.52%	289,200	-27.37%
Hansford	275,016	195,121	-29.05%	173,100	-37.06%
Hutchinson	62,803	79,389	26.41%	70,900	12.89%
Lipscomb	266,809	54,522	-79.57%	45,700	-82.87%
Ochiltree	243,778	105,241	-56.83%	88,200	-63.82%
West	1,428,687	1,272,757	-10.91%	1,190,300	-16.69%
East	848,406	434,273	-48.81%	377,900	-55.46%
Total	2,277,093	1,707,030	-25.03%	1,568,200	-31.13%

2. *Joint Planning*

Management Objective: The District will participate in the joint planning process of the Groundwater Management Area 1 with other groundwater conservation districts.

Performance Standards: A District representative will participate in each GMA-1 joint planning meeting.

Action Taken: The Groundwater Management Area Number 1 (GMA #1) met on Thursday, January 21, 2021, at 10:00 am by video conference. The following North Plains GCD representatives were in attendance: Bob Zimmer, Joint Planning Committee

Chairman; Danny Krienke, Representative to Region A, and Steve Walthour, General Manager. The Joint Planning Committee reviewed the nine factors related to establishing Desired Future Conditions.

GMA #1 met on Thursday, February 18, 2021, at 10:00 am by video conference with the following North Plains GCD representatives in attendance: Bob Zimmer, Joint Planning Committee Chairman; and Steve Walthour, General Manager. The Joint Planning Committee reviewed the explanatory report and discussed potential changes to their management plans, if any, that would be necessary to implement the proposed Desired Future Conditions.

GMA #1 met on Thursday, March 18, 2021, at 10:00 am by video conference with the following North Plains GCD representatives in attendance: Bob Zimmer, Joint Planning Committee Chairman; and Steve Walthour, General Manager. The Joint Planning Committee proposed Desired Future Conditions for adoption for aquifers in GMA #1.

On June 1, 2021, The Board of Directors conducted a public hearing to accept public comment on the proposed Desired Future Conditions (DFCs) for the relevant aquifers within the Groundwater Management Area 1 (GMA 1) Joint Planning Area. The purpose of this Hearing was to provide interested members of the public the opportunity to appear and provide comments to the District related to the proposed DFCs. The public did not provide written or oral input.

GMA #1 met on Thursday, August 26, 2021, at 10:00 am by video conference with the following North Plains GCD representatives in attendance: Bob Zimmer, Joint Planning Committee Chairman; and Steve Walthour, General Manager. The Joint Planning Committee approved a resolution to adopt Desired Future Conditions for aquifers in GMA#1. Each groundwater conservation district provided an update on the process to amend and implement plans and rules necessary to achieve the various adopted Desired Future Conditions.

3. Allowable Production Limitation

Management Objective: Manage groundwater withdrawal amounts based on allowable production limits to achieve DFCs.

Performance Standards: The Board of Directors will review groundwater withdrawal amounts annually, and may modify annual allowable groundwater production limits consistent with its Rules to achieve the DFCs and preservation of the groundwater resources in the region.

Action Taken: The Board of Directors reviewed annual groundwater withdrawal on Tuesday, June 1, 2021. The Board meeting was conducted via video conference and teleconference. The Board determined it was not necessary to modify production limits.

I. Other Management Goals Included in The Plan by The District

No other management goals are listed at this time.