

North Plains Water News



A Publication of the NORTH PLAINS GROUNDWATER CONSERVATION DISTRICT

VOLUME 65, NO. 1

WINTER 2020

Soil Water Balance in a Corn and Cotton Rotation

by Nicholas Kenny, P.E.

The North Plains Water Conservation Center (WCC) is central to the outreach effort of the North Plains Groundwater Conservation District, demonstrating irrigation methods that conserve water while improving farm economics. The farming program at the WCC is directed by the District's board of directors and is executed in cooperation with Stan Spain as part of his farming operation. The WCC has been in a corn and cotton rotation for the past few seasons to address the immediate needs of the producers in the District.

One of the looming concerns with a corn and cotton rotation has been the question, "Does cotton really use less water than corn," with the emphasis being on the belief that cotton extracts significantly more water from the soil profile than corn does. This question was heavily looming following 2018 which was, by all accounts, a very strong cotton year. The discussion even escalated within some circles to question why even grow corn if cotton is this advantageous.

In 2019, we set out to pinpoint a few answers to these questions about soil water extraction by digging 8ft. deep pits prior to planting and following harvest in the corn and cotton circles to measure actual water content at each foot in the soil profile. Since the WCC has been in a corn and cotton rotation, we were able to see the residual effects of coming out of a corn field into a cotton field as well as coming out of a cotton field into a corn field.

The measurements show that over the course of the growing season at the WCC, the cotton field exhibited a 6-inch net water extraction from the soil profile and the corn field measured a net 4-inch gain in soil profile water. These figures



indicate that cotton is responsible for a gross 10-inches more soil water extraction than corn in a comparable production season. This sounds substantial, but what does it really mean? Directly, it means that tap-rooted cotton is indeed more aggressive in extracting water from the soil profile, both from deeper levels in the soil and more vigorously in the first four feet of the profile. It also suggests that cotton extracts some percentage of water that a corn crop leaves behind.

The benefits in the cotton crop are obvious, but this soil water dynamic does provide some enterprise level benefits. First, cotton can successfully be managed on a lower in-season irrigation system capacity which allows a higher capacity to be applied to corn. In 2019, the WCC corn was raised on 91-days of 4 GPM / acre water while the cotton was grown on 57-days of 3 GPM / acre water (19 acre-inches on the corn and 9 acre-inches on the cotton with yields of 240 bushels / acre and 2.5 bales / acre, respectively). Second, cotton and corn both offer higher revenue streams in rotation than other crops, so the dollars per acre-inch of water are more favorable, season to season. Finally, the soil moisture voids (think large cracks in the soil) following a cotton crop allow for maximum off-season precipitation to be captured and stored within the root zone.

Of course, there are a few principles that should be considered when managing water in a corn/cotton rotation. One is that off-season soil water refilling will need to be monitored accurately to ensure sufficient soil moisture is present for the next corn crop, especially by the following June as the critical management point approaches (the time when the corn water need exceeds the irrigation system

(continued on page 2)

2019 Production Reports Due

The 2019 Production Reports were mailed or emailed by December 5, 2019. If you have not received your reports or are missing any reports, please contact our office as soon as possible. All reports are due by March 2, 2020. Any late filed reports are subject to a \$50 per day late filing fee up to \$500 per report filed after March 1, 2020. Please make sure all reports are filled out, signed and applicable documentation attached to the report, such as 12 months of gas bills or Pivo Trac reports, depending on your metering method. Any report not filled out properly, not signed or missing any required documentation will be considered not filed and subject to late filing fees. If you have flow meter readings on your report but are reporting by a different metering method, please fill in the flow meter readings. In most cases, the flow meter is there because it is required by the District to be reported. District staff will be happy to help you over the phone or in the office if you have any questions or have any trouble filling out your reports. 💧

Ready to Lend

Looking to replace inefficient equipment with water-saving technology? Thanks to a \$1,000,000 low-interest loan to the North Plains GCD from the Texas Water Development Board (TWDB), funds are available to growers within the District at 2.59 percent interest for the purchase of certain high-efficiency irrigation equipment.

This TWDB funding will be used to help producers get the most out of every drop of irrigation applied and ultimately keep thousands of acre-feet of water in the Ogallala aquifer. Full program guidelines and loan applications are available on our website, www.northplainsgcd.org, or by contacting Kirk Welch at 806-935-6401, or by e-mailing kwelch@northplainsgcd.org. All loans are subject to credit approval. 💧

Texas Legislature begins its interim studies for the 2021 Legislative session

The Texas Legislature has a system for conducting Interim Studies of legislation and issues which may require legislation. The Speaker of the House and Lt. Governor “charge” House and Senate committees respectively with studying named issues and reporting their findings prior to the convening of the next legislature. These studies can and often do lead to legislation to solve a challenge identified by the Senate and House Committees.

The Interim Charges issued by the Speak of the House, which deal with water or water related policy, are as follows:

Energy Resources Committee

Water recycling and water re-use in the oil and gas industry. This is a joint charge with the House Ways and Means Committee.

Environmental Regulation Committee

Regulation of commercial (and residential) irrigation backflow devices to determine the incidence of pollutant backflow into drinking water sources.

Natural Resources Committee

This committee’s charges have the most impact on NPGCD. Its study topics include:

- a.) appropriations of water for recharge of aquifers and use in aquifer storage and recovery projects
- b.) rulemaking regarding permitting unappropriated flows
- c.) monitor implementation of HB 720 regarding appropriations of water, aquifer recharge, storage and recovery and HB 721 regarding reports by the TWDB of aquifer storage and recovery and recharge projects, including a statewide study
- d.) monitor TWDB activity regarding HB 722 on brackish groundwater, and HB 807 relating to the statewide water planning process.
- e.) The committee is also charged with studying the efforts of the TCEQ, TWDB and Public Utility Commission to promote and preserve regional water projects to meet water needs and encourage investment in water infrastructure.
- f.) Monitor implementation of HB 807 regarding the water planning process, appointment of the Interregional Planning Council (by the TWDB) and increasing coordination and Regional Water Planning Groups.

- g.) identify impediments or threats to regionalization, barriers to private investment, prioritizing planning and implementation of the State Water Plan, needed water supply projects, and addressing the state’s growth challenges, supply issues, processes for sale, transfer or merger of systems and state authority to regulate regional water supply pricing.
- h.) monitor the joint planning process for groundwater and achievement of the desired future conditions by GCDs.

A full copy of the House of Representatives 2019 interim charges can be found at the following link: https://house.texas.gov/_media/pdf/interim-charges-86th.pdf

The Interim Charges issued by the Lt. Governor for the Senate, which deal with water or water related policy, are as follows:

The water related interim charges are included in a Joint Charge to the Natural Resources, Economic Development and Water and Rural Affairs Committees.

The topics under study are:

- a.) Future water supply: study and make recommendations promoting the state’s water supply, storage, availability, valuation movement, and development of new sources
- b.) Groundwater regulatory framework: study the groundwater regulatory framework and recommend improvements in regulation, management and permitting
- c.) Monitoring implementation of legislation: SB 2272 regarding amendment and revocation procedures of certificates of convenience and necessity used by certain water utilities.

A full copy of the Senate’s 2019 interim charges can be found at the following link: <https://senate.texas.gov/assets/pdf/Senate-Interim-Charges-86.pdf>

North Plains GCD monitors the interim studies that affect water policy in the north Texas Panhandle and provides information to the various committees during the interim session to assist the Legislature’s studies. 💧

Soil Water Balance

(continued from page 1)

capacity). In some years, this may require initiating pre-watering. Another is that a cotton on cotton rotation will not provide near as favorable cotton production as cotton in a corn/cotton rotation, simply based on the understanding that some volume of the water that cotton makes use of is being applied (and paid for) during the preceding corn crop.

Future activity in the ongoing corn and cotton rotation at WCC will include a follow-up 2020 pre-plant soil dig to give a more accurate measure of the full annual soil moisture balance. Another is to investigate the coincidence that a 10 acre-inch gross soil extraction from cotton compared to corn matches nearly perfectly with the 10 acre-inch difference in irrigation between the two. The hope is more details will help categorize the water balance of the corn and cotton rotation to create accurate enterprise and water budgets for the North Plains. Our goal is to provide real solutions to fulfill the mission of the District--*maintaining our way of life through conservation, protection, and preservation of our groundwater resources.*💧

Winter Water Level Measurements and Monitor Wells

Beginning in early January District personnel start annual water level measurements. Currently the District measures 434 wells. Monitor well measurements are typically complete by early to mid-March. For various logistical reasons staff are usually able to successfully measure about 80% of the wells. The information collected is analyzed, used to create hydrographs, maps and the information plays an important role in making reasonable long-term management decisions based on the best scientific data available.

Changes in the water table, calculated from monitor well measurements vary from rises in the water level to declines that may locally exceed 8-12 feet per year. Each county in the District has areas experiencing little or no decline as well as areas of much greater decline. Declines are caused predominately by pumping and are influenced primarily by surface recharge of the aquifer and lateral flows into and out of the aquifer. Recharge is affected by rainfall, surface runoff, evaporation and plant uptake, depth to water, soil porosity and the geologic substrata present. An aquifer characteristic that affects the speed an aquifer refills and consequently how much water a well can produce is intra-formational flow. Intra-formational flow is the flow of water from one part of an aquifer into another part of the same aquifer.

The District also drills or rehabilitates monitor wells or installs water level monitoring equipment in up to ten monitor wells annually when available. The wells are non-production wells dedicated solely to data collection which provide information of more accuracy, reliability and consistency than other types of wells the District monitors. They are also readily available, if needed, for conducting aquifer tests that cannot be conducted using other types of wells. 💧

Save Paper and Water by Choosing our E-Newsletter

North Plains GCD now offers our district newsletters by email. If you would like us to send you a digital copy of the newsletter, you can go online at www.northplainsgcd.org/sign-e-news/ and fill out the form, or just email info@northplainsgcd.org. You can also go online to download previous newsletters, and find us on Facebook, Twitter and Instagram.



2019 Cotton Irrigation Demonstration: Evaluation of Irrigation Initiation

In 2019, Jourdan Bell (Texas A&M AgriLife Research and Extension Agronomist) and colleagues conducted a cotton variety by irrigation trial at the North Plains Groundwater Conservation District's (NPGCD) Water Conservation Center (WCC) as part of the Panhandle Replicated Agronomic Cotton Evaluations (RACE trials). The RACE trials are conducted across Texas by regional AgriLife Agronomists to provide Texas producers unbiased data on variety performance in their respective production regions. Trials are repeated across each region to provide agronomist and producers the ability to evaluate variety performance and stability under diverse production environments. While cotton production has expanded in recent years, there has not been a side-by-side evaluation of the effect of irrigation initiation on lint production and quality of newer, earlier maturing cotton varieties grown across the District.

The ability to conduct a trial at the WCC provided Bell a unique opportunity to evaluate the effect of irrigation initiation on variety performance as well as collaborate with NPGCD and collaborating County Extension Agents (Mike Bragg, Kristy Slough, and Matt Whitely) on the Cotton and Conservation Video series. The Cotton and Conservation videos provided producers weekly video updates from the WCC and/or other AgriLife RACE trials across the District.

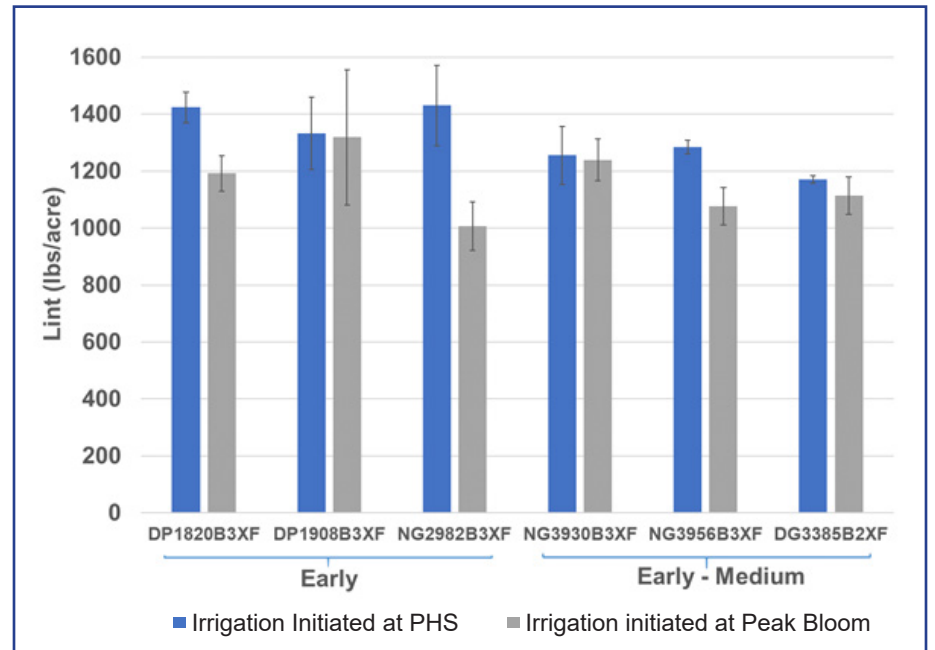
The RACE trial conducted at the WCC was duplicated to evaluate the timing of irrigation initiation on variety performance. Irrigation timing simulated two common irrigation scenarios: 1) early irrigation initiated at pinhead square simulating where irrigation water might be dedicated to a cotton crop and 2) late irrigation initiated at full bloom simulating where irrigation might be shared with a corn crop. Initiating irrigation at full bloom may allow the producer to concentrate irrigation resources on the corn crop during tasseling then move irrigation to the cotton crop. In 2019, plots were planted on May 14 with Stan Spain. Crop development was delayed in May and June as a result of cool conditions. All plots received 0.65 inches on June 27 when cotton was approximately 2-4 nodes. The irrigation treatment at pinhead square was initiated on July 9, and the irrigation treatment at peak bloom was initiated on August 6. Seasonal irrigation totals were 8 and 4.7 inches for irrigating the pinhead and peak bloom treatments, respectively. Soil moisture was monitored with gypsum blocks. Soil moisture remained greater than 90% of field capacity in June during early vegetative development. Across all varieties, the lint yield averaged 158 lbs/acre less when initiating irrigation later in the season at peak bloom, but yield data revealed significant variety responses by maturity. First year data suggests that the evaluated early maturing varieties are more susceptible to yield losses from water stress at pinhead square than the evaluated early-medium varieties. Overall, there was a 222 lb/acre yield loss when initiating irrigation at peak bloom for the early varieties. Conversely, the overall yield loss when delaying irrigation was only 93 lbs/acre less for the early-medium maturing varieties. Because earlier varieties are often more determinant, they may not have the ability to flex with favorable growing conditions later in the growing season like the early-medium varieties.

However, under declining well capacities, producers are beginning to consider the production per unit of water applied. While initiating irrigation at pinhead square resulted in greater lint production, the greatest irrigation use efficiency (pounds of lint per acre-inch irrigation water applied) was greatest when irrigation was initiated at peak bloom. The peak bloom strategy resulted in an additional 82 lbs/acre of lint per inch of irrigation applied.

The trial will be duplicated in 2020. It is hoped that data from this research will provide producers in the Texas Panhandle and NPGCD information about variety response to irrigation timing. Full RACE trial results are available at: <https://amarillo.tamu.edu/files/2020/01/2019-Texas-Panhandle-RACE-Report.pdf>

2019 Cotton and Conservation Videos are available at: <http://northplainsgcd.org/conservationprograms/agricultural-conservation/cotton/> ♦

Courtesy of, Jourdan Bell, Texas A&M AgriLife Research and Extension Agronomist - Amarillo



Maturity	Variety	Pinhead Square (Total Seasonal Irrigation 8 in)		Peak Bloom (Total Seasonal Irrigation 4.7 in)	
		Lint Yield (lbs/ac)	Irrigation Use Efficiency (lbs lint/ac-in)	Lint Yield (lbs/ac)	Irrigation Use Efficiency (lbs lint/ac-in)
Early	DG3385B2XF	1424	178	1192	254
Early	DP1908B3XF	1333	167	1319	281
Early	NG2982B3XF	1430	179	1007	214
Early-Med	DP1820B3XF	1256	157	1240	264
Early-Med	NG3930B3XF	1284	161	1077	229
Early-Med	NG3956B3XF	1171	146	1115	237
Average		1316	165	1158	246



Image on July 31, 2019 reflecting plots (left) where irrigation was initiated at pinhead square and plots where irrigation was not initiated until August 6.

Education Program Offerings

The District is thrilled to offer 3 educational presentations this school year to students within North Plains Groundwater Conservation District:

- **Soil Sleuth Lab (Grades 3-8)** Learn about the components of soils, how they are formed, and their permeability. Students will participate in a hands-on investigation to observe how water moves through different soils, and then discuss the real-world implications of a soil's water retention or drainage. 45-75 minutes, <30 students at a time, must have tables and chairs for all students.
- **EnviroScape Adventure (Grades K-8)** Explore the water resources of a realistic model town and learn how the water cycle and watersheds can be impacted by human activities. Please keep in mind that a short version of this activity is

presented at the 4th grade water festivals each year. 30-45 minutes, <30 students at a time, must have large table for presentation setup and space for students to gather around.

- **Friends of the Farm (Grades K-8)** What did you wear, eat, and do today? Discover all the ways that local agriculture impacts your life and see how farmers use and save water. 30-60 minutes, <30 students at a time.

To schedule an in-class presentation, please call Krista Markham at 806-935-6401 or e-mail kmarkham@northplainsgcd.org with your desired date (please give 2-3 weeks notice), number of classes, grade level, and the presentation requested. Due to staff availability, presentation dates are limited and available on a first-come, first-served basis. ♦

2020 Water Festivals Dates

North Plains Groundwater Conservation District holds three Water Festivals each year. Festivals are held in Dalhart, Perryton and Dumas. The festivals reach over 800 fourth grade students each year with critical information about their role in protecting one of the planet’s most precious resources! The 2020 festival dates are. . .

Friday, April 17th, 2020	Perryton Water Festival, Frank Phillips College Allen Campus
Tuesday, April 28th, 2020	Dumas Water Festival, Moore County Community Building
Wednesday, April 29th, 2020	Dumas Water Festival, Moore County Community Building
Thursday, April 30th, 2020	Dalhart Water Festival, Rita Blanca Coliseum

The North Plains Groundwater Conservation District’s “Save the Planet’s Water” festivals have evolved from Project WET’s National Day of Water Education. This nationally recognized day is celebrated across the United States

(continued below)

NORTH PLAINS GROUNDWATER CONSERVATION DISTRICT
BOX 795
DUMAS, TEXAS 79029



PRESORTED
STANDARD
U.S. POSTAGE PAID
LUBBOCK, TX
PERMIT NO. 324

RETURN SERVICE REQUESTED

