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water spouts

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2020 NDSU Field Days

Short prerecorded videos of the presentations given at the Research Extension Centers' virtual field days can be viewed on their websites.

- July 7 Hettinger Research Extension Center
- July 8 Dickinson Research Extension Center
- July 8-9 Williston Research Extension Center
Nesson Valley irrigated field day (July 9)
- July 13 Agronomy Seed Farm, Casselton
- July 14 Carrington Research Extension Center
- July 15 North Central Research Extension Center,
Minot (includes pulse crops and canola)
- July 16 Langdon Research Extension Center

Video presentations for the following virtual field days will be available for viewing on the date shown and posted to their websites for future viewing.

- July 28 Central Grasslands Research Extension
Center (near Streeter)
- Aug. 4 Oakes Irrigation Research Site –
Robert Titus Research Farm

Summer Water Tours – Canceled

The board of the North Dakota Water Education Foundation has decided to cancel all summer water tours for 2020. We hope the tours will resume next summer.

North Dakota Water Education Foundation,
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Irrigation Scheduling and Small Rainfall Events

The rain gauge reads 0.12 from yesterday's light rain, you received no rain the day before and you do not expect rain today. Should you enter this amount in your irrigation scheduling program or worksheet? The purpose of this article is to simplify your irrigation scheduling practices by discussing small rainfall events and their impact on the soil water balance used for irrigation scheduling.

Irrigation scheduling – determining when and how much water to apply – is discussed here in the context of irrigation scheduling tools (three methods available online at www.ag.ndsu.edu/irrigation/irrigation-scheduling). These tools contain worksheets in which the user records rainfall and net irrigation, and crop water use is computed by the program or entered by the user. The models then compute an estimate of the amount or balance of water available to the crop.

The rainfall that enters the soil is net rainfall. The crop canopy intercepts and holds some rainfall, where it evaporates before it enters the soil. Because this rain does not reach the root zone, it does not contribute to the soil water balance and should not be entered into the worksheet.

As the first water droplets hit dry foliage, they splatter, with most of the water dropping off. However, some water adheres to the plant and forms a film. Based on computer modeling and lysimeter studies, Allen Thompson, agricultural engineer at the University of Missouri, estimated that a fully developed corn crop can hold between 0.05 and 0.10 inch of water on the leaves and stalks.

The amount depends on wind speed, air turbulence and other atmospheric conditions. He suggests neglecting

rainfall events smaller than 0.10 inch for irrigation scheduling purposes. This does not mean you should subtract 0.10 from larger rainfall events because you would gain little accuracy by doing so.

To put this amount in perspective, suppose a sprinkler irrigation system applies enough water to supply the irrigated area with 1 inch of water. An efficiency of 85% translates into a loss of 0.15 inch. For applications of 0.50 to 0.75 inch, the efficiency may drop to 80%, which translates into losses of 0.10 to 0.15 inch.

In addition to canopy evaporation, irrigation system inefficiencies include losses from drift and evaporation as water droplets travel through the air. Other factors influence the contribution of small rainfall events to the soil water balance. Even if the top inch of soil is wet from a small rain, evaporation from the soil surface may make this additional water unavailable to the crop.

The rate of evaporation from the soil surface increases when the surface is wet because the ability of water to move through soil increases with the wetness of the soil. Common experience tells us that rainfall is variable with location, even within a single field. When small amounts are measured in a rain gauge, some areas within a field may have received no rain.

Thus, you simply may want to neglect amounts less than 0.10 inch to avoid the risk of under-irrigating parts of a field. Another way to address this problem is to install more than one rain gauge in each field and schedule irrigations accordingly.

In summary, a general guide is that rainfall amounts smaller than 0.10 inch can be ignored for irrigation scheduling purposes. These small rainfall amounts do not need to be entered into soil water balance calculations.

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Maintaining Air/Vacuum Release Valves

Through the years, I have noticed that the valves on many irrigation systems, installed to protect the pipeline and pump, are often in poor shape. When the irrigation system was new, the irrigation dealer installed the combination air and vacuum release valve(s) to protect the pump and pipeline from water hammer and air restrictions. Their purpose was to let air into or out of the pipeline at key locations.

They often are located at the pump, in front of the check valve, and on the high points of the pipeline between the

pump and irrigation system. If the pipeline goes over a hill, they are installed at the highest point of the pipeline.

They can be mounted on standpipes that extend from the pipeline to about 3 to 4 feet above the field surface, but some are buried in a vault. A common design of irrigation air/vacuum release valves has a plastic ball enclosed in an aluminum head with a rectangular outlet on the top.

At pump startup, the air in the pipeline will be pushed out through the valve until water pushes the ball up to the top and seals the opening. When the pump shuts off, water flows back into the pipeline and the ball drops, letting air in. On older irrigation pipelines, I often have noticed broken or missing standpipes or valves where the ball is stuck.

Why is making sure these valves are working so important? Air always is in a pressurized pipeline.

Air gets in a pressurized irrigation pipeline three ways: when the pump is started, through valves, pump packing glands and under vacuum conditions, and finally, water naturally contains about 2% air by volume. Because water always contains some air, it will continually replenish the air that is trapped at high points in the pipeline.

No matter how air gets into the pressurized pipeline, it will collect in the high points where it can restrict the flow by effectively forming an air bubble that reduces the available flow diameter of the pipe. People often are surprised to learn that an air bubble will stay in a pipeline with flowing water and under pressure.

Problems often occur when parts of that air bubble “slough” off to be carried down the pipe, where they can cause explosive water hammer. Water hammer can cause all types of problems such as collapsed pipes, damaged water fittings and broken pump volutes.

If the air/vacuum release valves are broken or not working at the high points of the pipeline, a different type of problem occurs. When the pump shuts off, a vacuum condition occurs in the pipeline at these points that could damage the pipeline fittings and cause leaks.

On center pivots, hearing air periodically being expelled by the first few sprinkler heads is not uncommon. The pump could be sucking air due to too much drawdown in the well or the air could be collecting at a high point of the pipeline. Either way, this is not a good situation.

The next time you're working with the irrigation system, check the condition of the air/vacuum release valves. Make sure they are working properly.

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Water Use of Commonly Irrigated Crops

During most growing seasons, lack of water in July and August can have detrimental effects on crop yields. Irrigation can overcome those effects to ensure that you harvest the best yield possible.

In general, you could say that July is for vegetative growth and August is for developing the “fruit” of the crop. In other words, good irrigation water management is very important during these two months.

Below is a chart showing the average water use for many of the commonly irrigated crops in North Dakota. Note that for all these crops, the water use is about 70% of the growing season total from emergence to harvest.

| Average Water Use | July | August | Total |
|-------------------------|--------|--------|-------|
| | inches | | |
| Corn (grain and silage) | 6.6 | 6.3 | 12.9 |
| Pinto beans | 7.0 | 5.8 | 12.8 |
| Potatoes | 7.0 | 5.5 | 12.5 |
| Soybeans | 6.5 | 5.9 | 12.4 |
| Sunflowers | 6.6 | 6.0 | 12.6 |

Last month, Joel Ransom’s article included a map showing the corn water deficit (rainfall minus estimated

corn water use). **Figure 1** is an update of that graphic showing the corn deficit from June 16 to July 21, assuming a May 20 emergence date.

Note that generally the eastern part of North Dakota is wet, whereas the west is getting very dry. As we enter the most important irrigation month, August, you must make sure you are checking soil moisture in the field. A few hot, dry days can change the deficit quickly.

Irrigation management is highly dependent on the texture and depth of soil. Generally, sandy loams and loamy sands (the two most common irrigated soil textures) have about 1.5 inches of plant-available water per foot of soil depth. The storms that have passed through the state the last couple of weeks have provided some very timely rain amounts, but with hot weather, crop water use will be greater than average.

More site-specific crop water use estimates can be obtained from the NDAWN website: <http://ndawn.ndsu.nodak.edu>. Click on Applications on the left side of the page and select crop water use in the pull-down menu.

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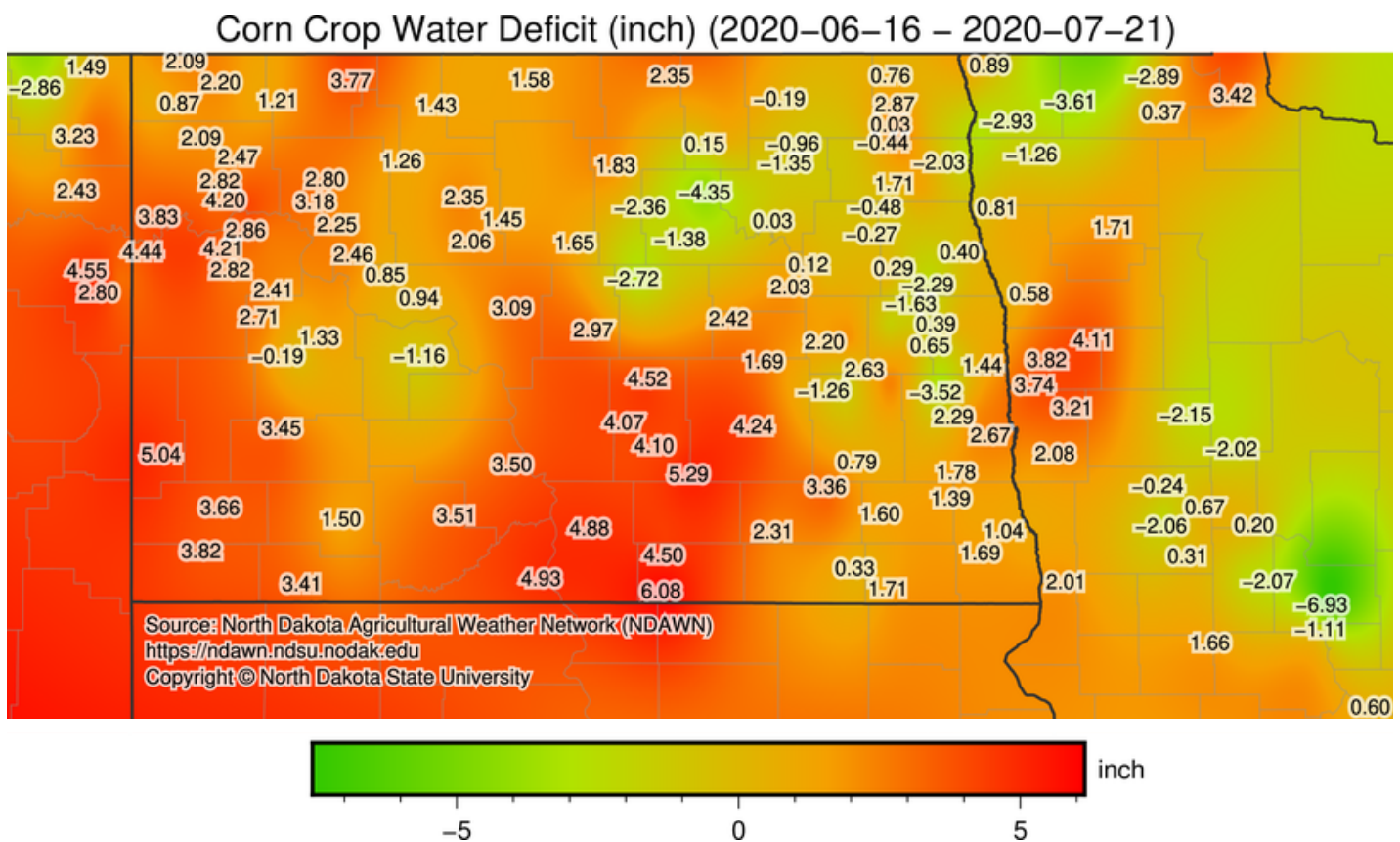
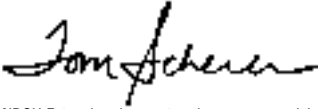


Figure 1. Corn water deficit map. A negative value means that rainfall has exceeded the crop water use so far. A positive value indicates that corn water use has exceeded rainfall at that location.



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County commissions, North Dakota State University and U.S. Department of Agriculture cooperating.

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This publication will be made available in alternative formats for people with disabilities upon request, 701-231-7881.

Oakes Irrigation Research Site – Virtual Field Day on Aug. 4

The field day for the NDSU Oakes Irrigation Research Site - Robert Titus Research Farm will be held on Tuesday, Aug. 4, and will consist entirely of virtual presentations. The approximately 40-acre site 4.5 miles south of Oakes on North Dakota Highway 1 is a substation of the NDSU Carrington Research Extension Center.

Topics and presenters are:

- **White Mold in Soybeans and Dry Beans**
Michael Wunsch, plant pathologist, Carrington Research Extension Center
- **Droplet Size and Fungicides for Control of White Mold**
Wunsch
- **60-inch Corn Row Spacing and Cover Crops at the Oakes Research Site**
Kelly Cooper, agronomist, Oakes Irrigation Research Site
- **60-inch Corn Row Spacing and Cover Crops, Farmer Trials**
Joe Breker, producer
- **Cover Crops – What is Trending**
Abbey Wick, NDSU Extension soil health specialist

- **Potato Variety Trials**
Susie Thompson, NDSU potato breeder
- **Prevent Plant – Fertility Concerns Before and After Cover Crops**
David Franzen, NDSU Extension soil science specialist
- **Carbon Storage in Soil**
Larry Cihacek, professor, NDSU Soil Science
- **Tile Drainage – Some Surprise Situations**
Thomas Scherer, NDSU Extension agricultural engineer

For more information, contact the Carrington Research Extension Center at 701-652-2951 or visit its website at <https://www.ag.ndsu.edu/CarringtonREC>.

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