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water spouts

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Upcoming 2021 NDSU Field Days

Details for the field day at each location listed below will be posted to their websites sometime in late June.

July 13	Hettinger Research Extension Center
July 14	Dickinson Research Extension Center
July 14-15	Williston Research Extension Center
July 19	Agronomy Seed Farm, Casselton
July 20	Carrington Research Extension Center
July 21	North Central Research Extension Center
July 22	Langdon Research Extension Center
July 27	Central Grasslands Research Extension Center (10 a.m. - 3 p.m.)
Aug. 4	Oakes Irrigation Research Site

Links to the website for each Research Extension Center can be found at www.ag.ndsu.edu/research/field-days.

Tom Scherer, 701-231-7239
NDSU Extension Agricultural Engineer
Thomas.Scherer@ndsu.edu

The Importance of Pressure Gauges and a Working Flow Meter

The day-to-day indicators of irrigation system performance are an accurate flow meter and pressure gauges.

The performance of irrigation systems that use wells for their water supply can vary during the growing season due to lower water levels in aquifers. Recording the pressure and flow readings will indicate how much the performance may change.

An accurate, working flow meter provides very valuable irrigation management information. Accurate flow measurement is important for chemigation, selection and modification of sprinkler nozzles, calculating the application rate of the pivot, checking the production of the well and tracking the performance of the pump.

However, the most important reason for an accurate flow meter is that it records the amount of water pumped during the growing season. This is necessary for reporting to the North Dakota State Water Commission.

However, flow meters appear to be equipment that many irrigators don't use, don't repair and constantly overlook when managing their irrigation systems. Through the years, I've conducted pumping plant efficiency tests on many irrigation systems, and finding some systems where the flow meter was installed but not working or never had one installed is common.

North Dakota winters are hard on flow meters, and the freeze/thaw cycles quickly cause the bearings and other moving parts on propeller meters to wear out. This is also true for the other parts of the irrigation system. Now probably is the time to repair the old flow meter (if that's possible) or purchase a new flow meter.

Some irrigation wells are valved back due to seasonal changes in aquifer levels. When the well is valved back, without a flow meter, you have no way to measure how much water is being applied to the crop.

If your flow meter doesn't work, have it repaired or buy a new meter. If your flow meter is working properly, consider removing it this fall and storing it in a warm place for the winter. During fall maintenance, an extra 15 minutes to remove the flow meter and cover the hole in the pipe is worthwhile.

Pressure Gauges

The pressure gauge is an often overlooked and neglected instrument on many irrigation systems. Yet it is probably the most important indicator of irrigation pump operation readily available to you.

Every time you turn the pump on, the pressure gauge receives a “shot” due to pressure fluctuations from filling the pipeline. In addition to the bounce at turn on, while the pump is operating, you often have pressure fluctuations and vibrations. Because of these conditions, pressure gauges (even liquid-filled types) lose their accuracy after a couple of growing seasons.

If your pressure gauges are old and you question their accuracy, now would be a good time to replace them. Many center pivots have a pressure transducer connected to the control box. The pressure is displayed in the panel, along with other operations parameters. Having an accurate pressure gauge at the pivot point provides a check on the accuracy of the pressure transducer.

Because a pressure gauge only conveys useful information when you are looking at it, why not install a shut-off valve between the gauge and the pipeline? When you want to check the pressure, just open the valve. This will extend the life of the pressure gauge and ensure you are getting accurate readings. Plus, this makes removing the pressure gauge at the end of the season easy to do.

Tom Scherer, 701-231-7239
NDSU Extension Agricultural Engineer
Thomas.Scherer@ndsu.edu

Seasonal Crop Water Use

As we enter the critical irrigation season, knowing the average seasonal water use of a crop is important for irrigated and dryland production. With the demand for water resources increasing, water management becomes an issue, especially during a drought.

Knowing or predicting how much and when precipitation will fall during the growing season can be difficult. With irrigation, you have the capability to supply the difference between what the crop needs and what precipitation and stored soil water will provide.

When considering crop water use, the potential root depth is an important factor. With deep soils, during the fast-growing vegetative stage, the root depth for most annual crops will be approximately the same distance below the soil surface as the crop is above the soil. As the crop approaches the reproductive stage, the root depth will slow and eventually stabilize at some depth.

The average effective root depth for many crops is shown in **Figure 1**. This is the depth from which the majority of

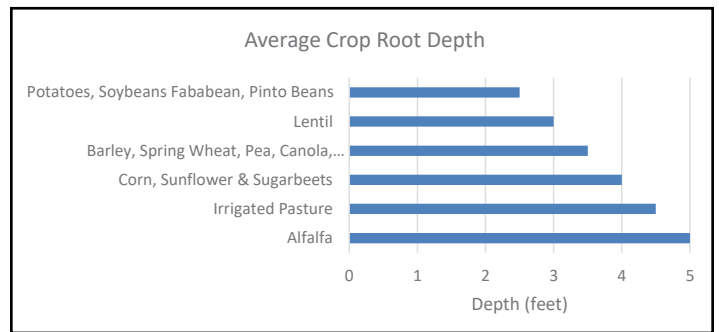


Figure 1. Effective root depth where most water is extracted for selected crops.

the crops water is obtained. But research has shown that about 70% of the crop water use comes from the top half of the root depth and decreased extraction occurs at deeper depths in the soil. This is because, on average more, root mass is at the top of the root zone, then it tapers off with depth.

However, the root depth can vary within fields due to the depth of soil. The crop root depth on many irrigated soils in North Dakota is limited due to an underlayment of gravel, fractured bedrock or clay. Irrigation of these soils and areas of the field with shallow soil must be managed very carefully.

The average crop total seasonal water use (effective precipitation + irrigation + stored soil water) is shown in **Figure 2**. Full-season crops such as corn and alfalfa obviously need more water than short-season crops such as barley, wheat and short-season legumes. This graph gives a rough idea of the amount of irrigation required if the soil water at the beginning of the season is known and rain amounts are recorded during the season.

To optimize irrigation water application, knowing the critical crop growth periods that are most sensitive to water stress is an important part of management. The important growth periods and relative time frames for several irrigated crops are shown in **Table 1**. Usually, the short-season crops will not tolerate stress earlier in the season, when compared with full-season crops, which need adequate soil water later in the season.

An example of water stress on corn yields is shown in **Figure 3**. This figure is based on research performed by Earl Stegman across three growing seasons, where he intentionally water stressed corn in replicated plots at different growth stages. Water stress was defined where the available soil water in the root zone was less than 50%.

Note that maximum yield loss occurred between tasseling and after blister kernel development. For contrast, the superimposed average corn water use curve is for a well-watered (no stress) field. Note that the maximum average daily corn water use coincides with the maximum potential yield loss due to water stress.

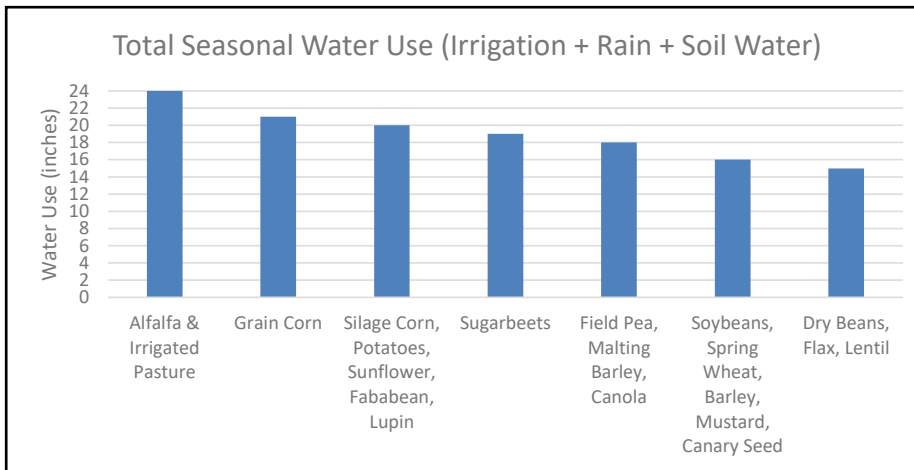


Figure 2.
Total seasonal crop water use for maximum yield potential.

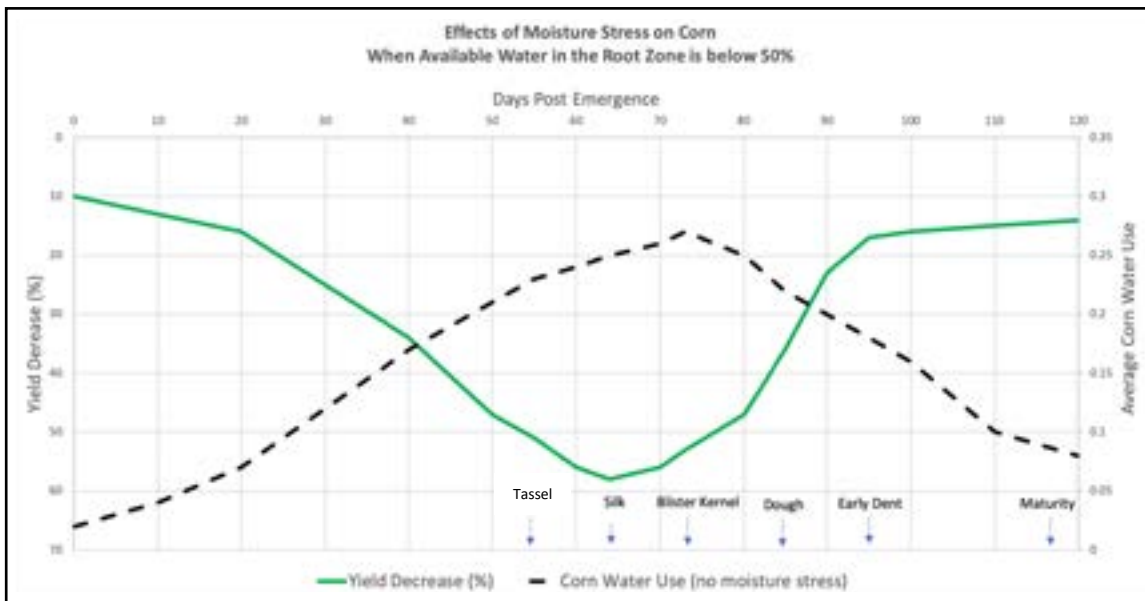


Figure 3.
The effects of water stress on corn yield at different stages of growth, along with the water use curve for corn with no water stress.

Table 1. Growth periods during which crops are most sensitive to water stress that affects yields.

Crop	Period Sensitive to Water Stress	General Dates
Alfalfa	After cutting and baling	
Sugarbeets	Throughout growth	
Corn	Tassel to blister kernel	Early July to late August
Potatoes	Tuber initiation to maturity	Early July to early September
Soybeans	Flowering to pod fill	Early July to late August
Wheat and Barley	Jointing to milk ripe	Early June to early July
Dry beans	Flowering to pod fill	Early July to mid-August
Sunflowers	Ray flower to grain	Mid-July to late August

This information is provided as a general guideline and comparison for different crops.

More detailed crop water use information and irrigation scheduling methods are available in Extension publication AE792, "Irrigation Scheduling by the Checkbook Method" (www.ag.ndsu.edu/publications/crops/irrigation-scheduling-by-the-checkbook-method-1) or by using the crop water use application on the North Dakota Agricultural Weather Network (NDAWN) website, <https://ndawn.ndsu.nodak.edu>.

Tom Scherer, 701-231-7239
NDSU Extension Agricultural Engineer
Thomas.Scherer@ndsu.edu



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

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North Dakota Water Education Foundation – Summer Water Tours

Access to substantial quantities of clean water is important for the developments within North Dakota, and the best way to learn about water projects is to see them in person via a tour.

These tours provide a firsthand look at North Dakota's critical water issues. Registration is \$20 per person and includes tour transportation, meals, refreshments, informational materials and a one-year subscription to *North Dakota Water* magazine.

Tours offered are:

- **June 24 – Managing Water in Agriculture and Industry**
(Tour begins and ends in West Fargo and includes stops for tile drainage)
- **June 29 – Missouri River Expedition**
(Tour begins and ends in Mandan and includes stops at irrigation facilities)

- **July 15 – Red River of the North: “Simply Grand”**
(Tour begins and ends in Grand Forks)
- **July 20 – Fargo-Moorhead Area Diversion Project**
(Tour begins and ends in Fargo)
- **July 27 – Managing Water Through Garrison Diversion**
- **Aug. 10 – Managing the Mighty Mouse**
(Tour begins and ends in Minot)

For more information about each tour online, go to <https://ndwater.org/events/summer-water-tours/> or send a check made out to NDWEF and mail to PO Box 2254, Bismarck, ND 58502. Please indicate which tour or tours you want to attend and include the number of people. For more information, give us a call or send an email.

North Dakota Water Education Foundation

701-223-8332

Fax: 701-223-4645

jellingson@ndwater.net