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water spouts

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In this issue:

Water Tours – North Dakota Water Education Foundation

Northwest Oil Impact – Aug. 6

This tour begins and ends in Williston and will take participants through areas around the northwestern region to look at oil-impacted areas of McKenzie and Williams counties. This tour will show some of the infrastructure impacts that come with oil development. Learn how water supply projects are working together with industrial, rural and municipal customers to meet the critical water needs of the area.

Missouri River Expedition – Aug. 20

This tour begins and ends in Bismarck. Explore the incredible Missouri River and learn about critical Missouri River issues, including bank stabilization, fishing, recreation, water use and management, endangered species, natural resources and water quality. The expedition also includes visits to recreational and historic sites in the region, including Garrison Dam and Fish Hatchery, and the Knife River Indian Villages, and ends with an hourlong cruise of the Missouri River aboard the Lewis and Clark Riverboat.

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.

To register for one or more of these tours, go to *www.ndwater.com/programs* and click on "Summer Water Tours" on the left-hand menu or send a check to NDWEF, P.O. Box 2254, Bismarck, ND 58502. Please indicate which tour or tours you want to attend and include the number of people who will attend. For more information, give us a call or send an email.

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Water Use of Commonly Irrigated Crops

During most growing seasons, the lack of water available to plants in July and August can have detrimental effects on yield. 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 of these crops, the water use is about 70 percent 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

So far this growing season, rain amounts received throughout most of the state have kept up with crop water use. This is shown in the following map of water deficit for corn from the North Dakota Agricultural Weather Network (NDAWN). A negative value indicates that more rain has been received at that site than the corn has used to date.

With the exception of Williams, McKenzie and parts of Wells counties, most of the state has a negative value. However, even if an NDAWN location shows a positive

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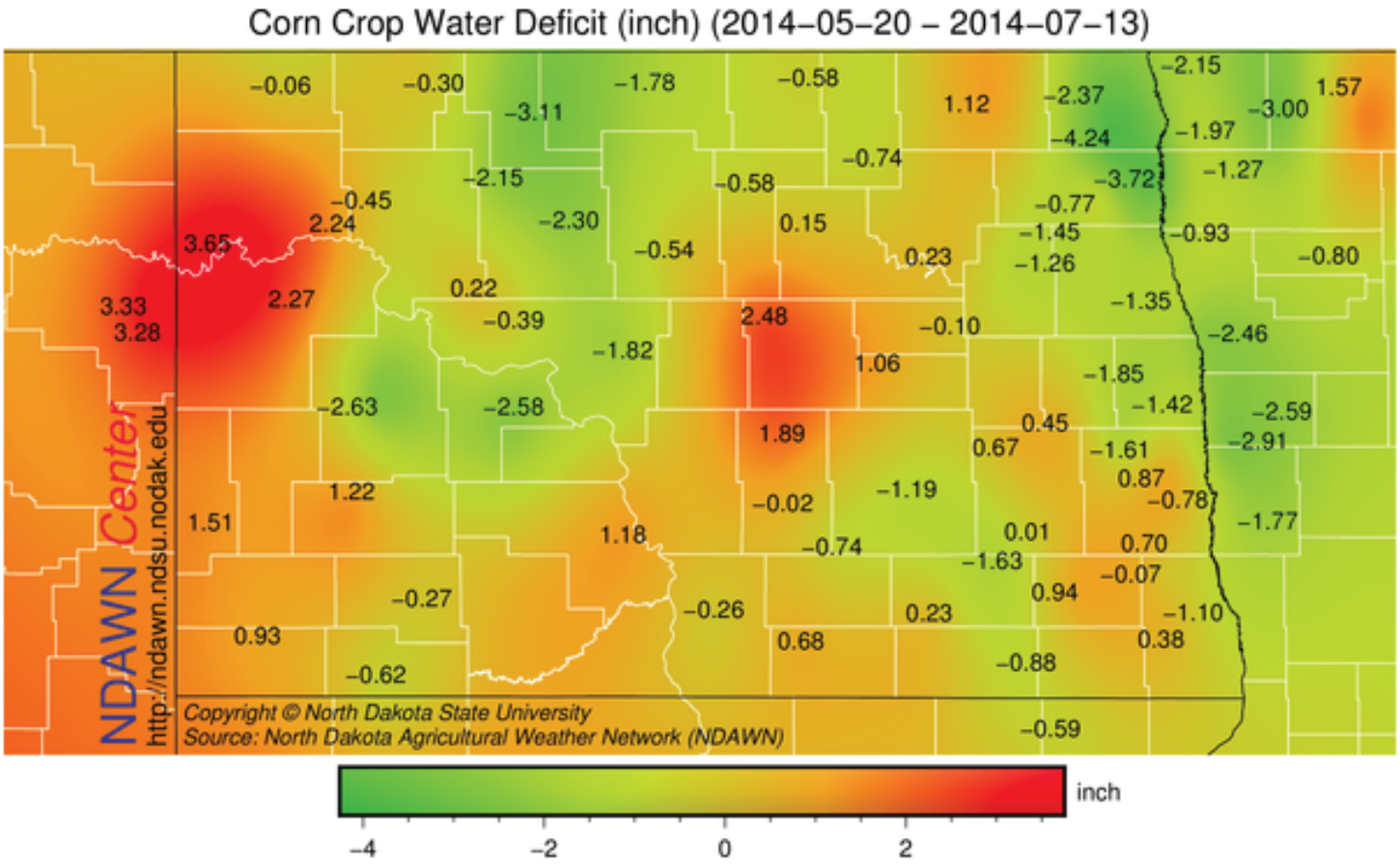

Figure 1. Corn water deficit map for the period from emergence on May 20 to July 13. A negative deficit indicates that rain amounts exceed corn water use for that time period.

deficit, remember that in addition to the rain, water stored in the root zone also is available to plants.

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. Of course, the deficits can change to positive values very quickly with hot, dry weather, so be watchful and have your irrigation system ready.

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 on the pull-down menu.

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Mobile Device Apps for Irrigation

Mobile devices such as smartphones and tablets are becoming important tools for farming. Now you can control irrigation pumps and center pivots with these devices. Many people are developing applications (apps) to run on these devices, and the University of Nebraska Extension Service has just released two apps that may benefit irrigators.

Irrigation Pumping Plant Efficiency Calculator App

IrrigatePump, the irrigation pumping plant efficiency calculator mobile app, can help you identify irrigation pumping plants that are underperforming and need to be adjusted, repaired or replaced with a better design. This app uses existing records to help determine when pumping plants should be tested by a professional.

An easy-to-use design guides the user to input six numbers: pumping lift, pressure at the discharge, acre-inches of water pumped, fuel price and total fuel used. The app then calculates a pumping plant performance rating. It also provides an estimated cost to bring the pumping plant up to standards and the number of years necessary to pay back the investment at various interest rates.

This calculator compares the fuel used for your pumping plant with the Nebraska pumping plant performance criteria (NPC). A pumping plant meeting the criteria is delivering the expected amount of useful work, measured as water horsepower hours (whp-h), for the amount of energy consumed. The NPC is based on field tests of pumping plants, lab tests of engines and manufacturer data on three-phase electric motors.

Survey results in the past have shown many pumping plants used 30 to 50 percent more energy than expected by the NPC. Surveys of relatively new pumping plants

indicate they're operating at 82 to 92 percent of the NPC. Results are anonymous but can be captured and emailed to yourself.

The developers of the app are Thomas Dorn, University of Nebraska-Lincoln Extension educator emeritus; Derrel Martin, UNL water and irrigation resources specialist; and William Kranz, UNL Extension irrigation specialist.

The app costs $1.99 and is available for iPhones, iPads and Android devices in the:

- Apple iTunes Store for iPhone and iPad at *https://itunes.apple.com/us/app/irrigation-pumping-plant-efficiency/id834448125?mt=8*
- Google App Store for Android at *https://play.google.com/store/apps/details?id=com.movecreative.pumpingplant*

Agricultural Irrigation Costs App

IrrigateCost, an agricultural irrigation costs mobile app, can calculate ownership and operating costs for your irrigation system. The app models center-pivot and gated-pipe irrigation systems and the most commonly used energy sources.

The user inputs information such as acres irrigated, pumping lift, system pounds per square inch, pump and pivot life, and inches of water applied, as well as related costs such as for the well and engine, labor, energy, district fees and taxes. The app then calculates total irrigation cost as well as total ownership and total operating costs. It also breaks down costs by irrigation well, pump, gear head, pump base, diesel engine and tank and system, and calculates the per-acre annual cost and per-acre-inch annual cost.

Results for different energy sources are displayed on separate tabs, allowing you to make side-by-side comparisons among energy options.

The calculator also is helpful when computing a fair crop-share rental agreement. Parties often will list all the contributions required for crop production (land, irrigation system, machinery, labor, crop inputs, etc.) in a table. By using two columns (one for the landowner and one for the tenant), costs can be determined for each on the inputs. The columns are totaled and a percentage is determined for the landowner's and tenant's contributions. The "fair" rental arrangement would be to divide the crop on the same percentage as the contributions that each party has made.

The costs of owning and operating the irrigation system are some of the most difficult to identify when analyzing irrigated crop-share arrangements. Much of the total cost of irrigation results from ownership costs, and a large percentage of ownership costs are not annual out-of-pocket costs but, rather, hidden costs, such as return on capital investment, depreciation, taxes and insurance. This app calculates ownership costs for each irrigation system component, such as the well, pump, gear head, power unit and the irrigation distribution system.

Additional uses for the app include:

- Determining what to charge for watering a portion of a neighbor's field. This app can help you determine the ownership costs the neighbor should pay in addition to the operating costs for each acre-inch of water pumped.
- Estimating costs to pump an acre-inch of water to help you determine how many additional bushels of a crop are needed by applying 1 more inch of water at the end of the irrigation season.

Results are anonymous but can be captured and emailed to yourself.

Thomas Dorn, UNL Extension educator emeritus, developed this app.

- The app costs $1.99 and is available for iPods, iPads and Android devices in the: Apple iTunes Store for iPod and iPad at *https://itunes.apple.com/us/app/agriculture-irrigation-costs/id700329336?mt=8*
- Google App Store for Android at *https://play.google.com/store/apps/details?id=com.movecreative.irrigatecost*

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Have You Looked at the Pressure Gauge Lately?

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

If the pressure at the pump decreases, you may have problems with the pump or the water levels have changed in the well, resulting in an increase in the pumping water level. The pressure gauge on a center pivot will indicate if you have sufficient pressure to operate the sprinkler package for uniform distribution of water.

However, through time, pressure gauges lose their accuracy. 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, pressure fluctuations and vibrations often occur while the pump is operating. 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. For center-pivot irrigation systems, the one at the pivot

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point probably is the most important and should be the first one replaced.

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, a shut-off valve makes replacing the pressure gauge easy when the system is in operation.

Spraying on the Road is Against the Law

In 1989, the North Dakota Legislature passed a law concerning irrigation systems and roads. Section 61-14-16 of the North Dakota Century Code states:

> "No person may place, erect, or operate a sprinkler irrigation system, center pivot irrigation system, or other irrigation works or equipment upon or across any highway, street, or road or in such a manner as to willfully allow water from the irrigation works or equipment to flow or fall upon any highway, street, or road."

A person violating this section is guilty of an infraction. If you notice that the roads near your pivot are wet after irrigation, the end gun on/off settings need adjusting. In the past, wet roads or a motorist driving into water from the end gun have caused accidents.

This law does not apply to the transportation of irrigation works or equipment on a highway, street or road. This means a moving irrigation system can be run across a road as long as it isn't spraying water.

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