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water spouts

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2020 NDSU Field Days

The NDSU Research Extension Center (REC) field days were held virtually this year. To view the short videos prerecorded at each location, use the links below to go to the REC you desire and click on the large yellow and green field day announcement at the top.

- July 7 Hettinger Research Extension Center
- July 8 Dickinson Research Extension Center
- July 8-9 Williston Research Extension Center and Nesson Valley Irrigation Research Site
- 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
- July 28 Central Grasslands Research Extension Center (near Streeter)
- Aug. 4 Oakes Irrigation Research Site: Robert Titus Research Farm

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Northern Plains Potato Growers Virtual Field Day – Aug. 27

The regular potato field day and tour has been canceled due to COVID-19. A virtual event will be held instead. Check the NPPGA website at *www.nppga.org* for more details.

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Minnesota Virtual Irrigation Field Days at Becker and Rosholt in August

The University of Minnesota has scheduled virtual field days at its irrigation research sites.

For more information and to register for the field days at Rosholt and the Sand Plains Research Farm in Becker, go to *https://blog-crop-news.extension.umn.edu/2020/08/register-now-for-two-virtual-field-days.html.*

Examining 20 Years of Corn Water Use

In the July issue of *Water Spouts*, I had a chart that showed the average water use in July and August for the top five irrigated crops grown in North Dakota. These values were developed more than 40 years ago from research performed by Earl Stegman. They are a composite of irrigation research he conducted for many years at the Carrington Research Extension Center and the Oakes irrigation research site.

I decided to check if these values were still valid by using the crop water use app on the NDAWN website (*http://ndawn.ndsu.nodak.edu*) for four locations: Oakes, Carrington, Nesson Valley (Hofflund on NDAWN) and Tappen in Kidder County. I chose corn as the indicator crop because it is grown every year at the four sites.

I obtained the seasonal corn water use from 1998 to 2019 for Oakes and Carrington, from 1999 to 2019 for Nesson Valley and from 2002 to 2019 for the Tappen site. I picked an emergence date of May 15 and an ending date of Sept. 30 to be consistent for each site from year to year. The calculated water use for each site assumes proper irrigation was practiced so the corn did not experience any water stress.

The results are shown in **Figure 1**. The variation in water use appears to follow a five-year cycle, and 2019 was a down year. So far, the 2020 growing season is way ahead of 2019.

Below is a table showing the mean corn water use at each location, along with the high and low values. **Figure 1** shows that three of the sites had their lowest seasonal corn water use in 2004 and all were very low in 2014. The mean corn water use is significantly different at Carrington, compared with the other sites.

	Mean Corn Water Use	High	Low
	inches		
Oakes	19.95	22.16	18.12
Nesson Valley	19.16	22.46	16.00
Tappen	19.15	20.97	16.26
Carrington	18.07	19.67	15.56

I then looked at the corn water use for Oakes, Carrington and Nesson Valley during July and August. Below is a table showing the average for each site. Note that the water use in these two months is about 70% of the growing season total from emergence to harvest.

Mean Corn Water Use	July	August	Total
		inches	
Oakes	7.9	5.9	13.8
Nesson Valley	7.8	5.7	13.5
Carrington	7.2	5.3	12.5

The corn water use patterns obviously have changed, when compared with Stegman's data. His data showed a difference of about 0.5 inch of corn water use between July and August, whereas 20 years of data show that variation is closer to 2 inches. Changes in corn genetics, combined with better fertility management, plus generally earlier planting dates all may have contributed.

To look at the variability of the corn water use estimates for the three sites, I calculated the coefficient of variation. The higher the coefficient of variation, the greater the variability of the water use estimates.

For the combined two months, Nesson Valley had the greatest coefficient of variation at about 9%, Carrington the lowest at 6.2% and Oakes was at 7.5%. However, for just August, the coefficient of variation for all three sites was about 12%. As we know, the weather during August in North Dakota can be highly variable and that is reflected in the higher variability of the corn water use estimates.

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Tracking Corn Water Use Deficit

In the June issue, Joel Ransom's article included a map showing the corn water deficit (rainfall minus estimated corn water use) and I included an update in the July issue. **Figure 2** (following page) is an update of that graphic showing the corn deficit from July 22 to Aug. 18, assuming a May 20 emergence date.

Almost all of North Dakota is showing a substantial corn water use deficit (water use minus rain). Availability of adequate soil water during the last month of the growing season has a big impact on corn quality, weight and yield. Research has shown that water stress during the three weeks before the formation of the black layer can reduce yields from 10 to 15 bushels per acre.

Irrigation management is highly dependent on the texture and depth of soil. Generally, sandy loams and loamy sands (the two most common irrigated soil

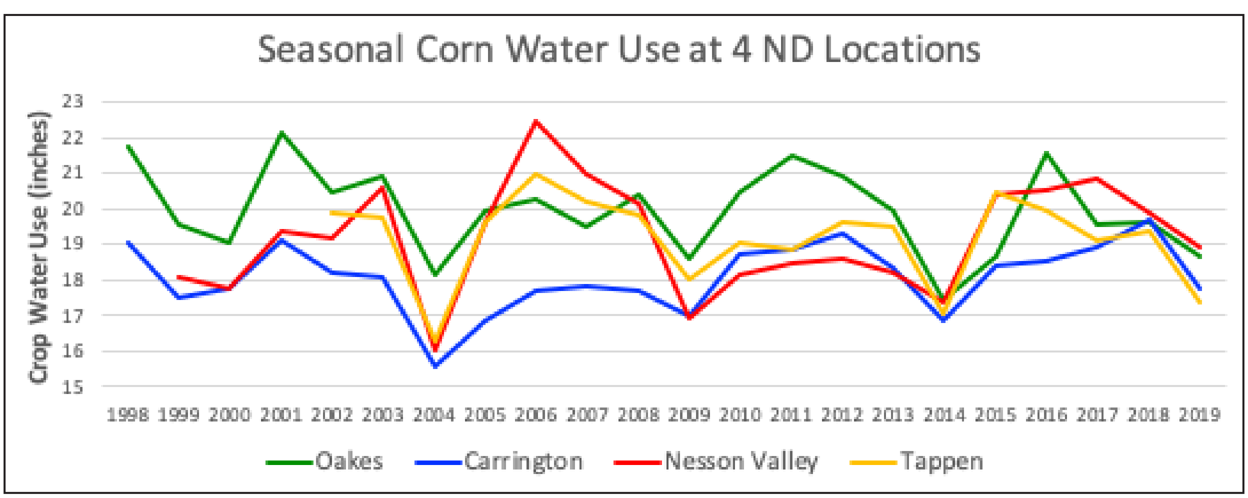

Figure 1. Season corn water use for four locations in North Dakota.

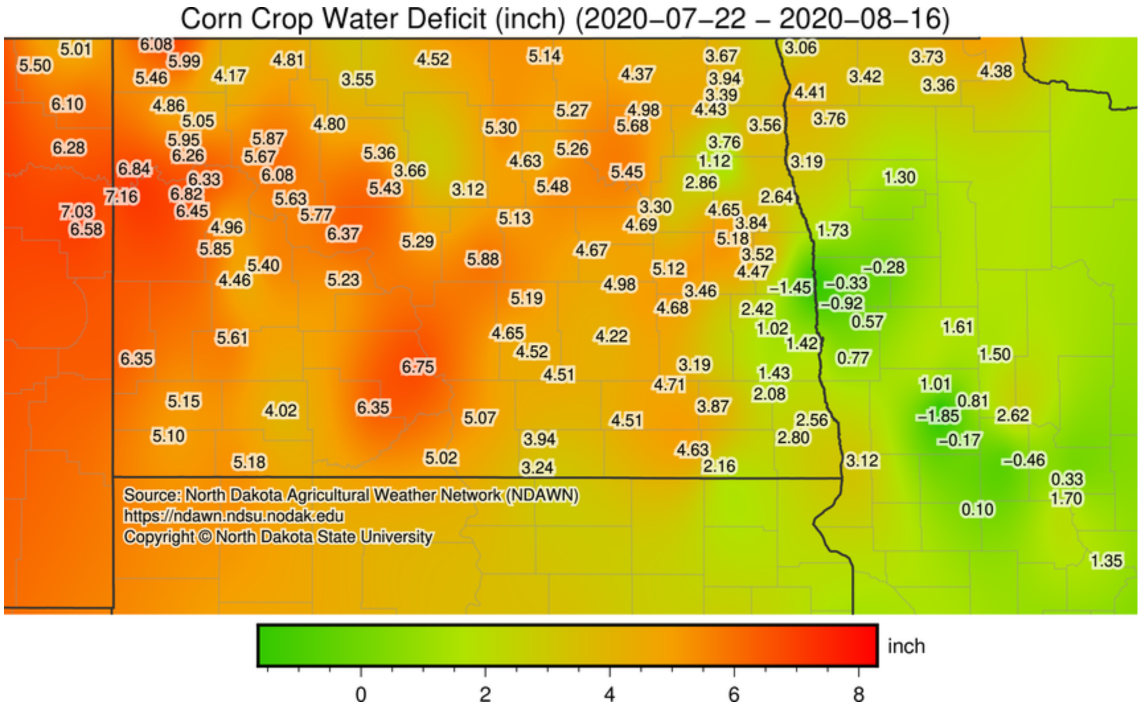

Figure 2.
Corn water deficit map. A negative value means that rainfall has exceeded the crop water use so far. A positive value indicates that corn water use has exceeded rainfall at that location.

textures) have about 1.5 inches of plant-available water per foot of soil depth.

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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Estimating the Yield of Irrigated Corn and Soybeans

Several techniques are available for estimating **corn grain** yield prior to harvest. This version was developed by the Agricultural Engineering Department at the University of Illinois and is the one most commonly used.

A numerical constant for kernel weight is figured into the equation to calculate grain yield. Because weight per kernel will vary depending on hybrid and environment, the yield equation only should be used to **estimate relative grain yield**. For example, yield will be overestimated in a year with poor grain fill conditions, while it will be underestimated in a year with good grain fill conditions.

Step 1

Count the number of harvestable ears per 1/1,000th acre **(Table 1)** from several representative locations in the field. Don't pick the best or worst areas. Pick every fifth ear in the sample row.

Step 2

Count the number of kernel rows per ear. Calculate the average of all the ears.

Step 3

Count the number of kernels per row on each of the same ears, but do not count kernels on the butt or tip that are less than half size. Calculate the average.

$$\text{Estimated Yield} = \frac{\text{Results from Step 1 x Step 2 x Step 3 (above)}}{90}$$

The most accurate estimates of soybean yield are taken within three weeks of maturity. Assume 2.5 beans per pod. However, look at several locations in the field. Your beans may be higher or lower. Use your estimate in step 5.

Step 1

Use Table 1 for the number of feet of row needed to make 1/1,000 of an acre.

Step 2

Count the number of plants in 10 different randomly selected sample areas. Calculate the average.
Avg. = __________ plants per 1/1,000 of an acre

Step 3

Count the number of pods per plant on 10 randomly selected plants from each sample area. Calculate the average. Avg. = __________ number of pods plant

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Step 4

Calculate the number of pods per acre by multiplying the plant population by the number of pods per plant. Results from Step 2 x Step 3 x 1,000 = __________ pods per acre.

Step 5

Calculate the number of seeds per acre by multiplying pods per acre by 2.5 seeds per pod. Result from Step 4 x 2.5 = __________ seeds per acre

Step 6

Calculate the number of pounds per acre by dividing seeds per acre by an estimate of 2,500 seeds per pound. Result from Step 5 ÷ 2,500 = __________ pounds per acre.

Step 7

Estimate yield by dividing pounds per acre by 60 pounds per bushel. Result from Step 6 ÷ 60 = __________ estimated yield in bushels per acre.

Example: Soybeans are planted on 15-inch rows (34.9 feet equals 1/1,000 of an acre from Table 1). The average number of plants per 34.9 feet is 122, with an average of 21 pods per plant. The estimated yield is: (122 x 21 x 1,000 x 2.5) / (2,500 x 60) = 42.7 bushels per acre

Table 1. Length of row that represents 1/1,000th acre

An accurate estimate of plant population per acre can be obtained by counting the number of plants in a length of row equal to 1/1,000 of an acre. Make at least three counts in separate sections of the field; calculate the average of these samples, then multiply this number by 1,000.

Row width	Length of single row to equal 1/1,000th of an acre	
(inches)	Feet	Inches
6	87	1
7	74	8
8	65	4
10	52	3
15	34	10
20	26	2
22	23	9
24	21	9
28	18	8
30	17	5
32	16	4
36	14	6