http://www.ext.nodak.edu/extnews/spouts/

water spouts

No. 257 July 2011

Upcoming 2011 NDSU Field Days

Casselton Agronomy Seed Farm	July 18	(701) 347-4743
Carrington Research Extension Center	July 19	(701) 652-2951
Minot North Central Research Extension Center	July 20	(701) 857-7677
Langdon Research Extension Center	July 21	(701) 256-2582
Oakes Irrigation Research Site	July 26	(701) 742-2189
Nesson Valley Irrigation Site	July 28	(701) 774-4315

Summer Water Tours – North Dakota Water Education Foundation

These tours provide a firsthand look at North Dakota's critical water issues. Registration is $15 per person and includes tour transportation, meals, refreshments, informational materials and a one-year subscription to North Dakota Water magazine. Here are two tours organized by the North Dakota Water Education Foundation that will be held in the coming month:

Southwest North Dakota – The Thriving Prairie, July 26

This tour begins and ends in Dickinson. The Southwest Pipeline Project began in 1983 in southwestern North Dakota and has made significant progress. This tour will highlight some of the facilities and needs that have been met with a clean supply of good-quality water. The tour will begin at Marathon Oil for an industry overview, then move northeast near the city of Dodge to see a newly constructed water depot. The tour then heads to Zap to look at a new water treatment plant serving the region. In the afternoon, stops will be at the Dakota Gasification Plant in Beulah and the Sacred Heart Monastery in Richardton. The final stop will be the wine cellar at Assumption Abbey.

Northwest Oil Impact Tour – Aug. 16

This tour begins and ends in Watford City and will view oil-impacted areas in McKenzie County. Participants will tour an oil well drilling rig and see a presentation on the process of hydraulic fracturing near an ongoing well fracture site. Participants also will learn about the Western Area Water Supply project that is meeting the critical water needs in the area. The tour will visit Tobacco Garden Bay on Lake Sakakawea to see how increased lake levels affect businesses, irrigation, agricultural research, water use and management.

To register online, go to *www.ndwater.com* or send a check to NDWEF, P.O. Box 2254, Bismarck, ND 58502. Please indicate which tour you want to attend and include the number of people. For more information on the tours, give us a call or send an email.

North Dakota Water Education Foundation
(701) 223-8332, Fax (701) 223-4645
Ndwaterusers@btinet.net

Watch Your Soil Moisture – It Can Change Very Quickly

When describing the growing season so far, the rain appears to have been plentiful all over the state. Rainfall amounts for the last 30 days (June 16 to July 14) recorded by the North Dakota Agricultural Weather Network (NDAWN – *http://ndawn.ndsu.nodak.edu*) show that most places have received 3 inches or more. However, some areas have received very little rain. The Sidney, Brorson and Dickinson NDAWN stations show recorded amounts of an inch or less. At the other end of the spectrum, the Wyndmere, Ekre and Lisbon NDAWN stations have recorded amounts of more than 6 inches. Most locations had multiple significant rainfall events, which means much of the rain infiltrated into the soils.

Check Soil Moisture

We are entering the critical irrigation period when crops are beginning to flower and set fruit, so even with the increased rainfall amounts, the only way to be certain of the level of soil moisture is to check every field and at several locations in the field. When managing water applications with a center pivot, you can get behind very easily if you don't watch your soil moisture levels. Crops are growing quickly and using an increasing amount of water each day.

The best and easiest way to check the soil moisture is with a soil probe, Figure 1 *(page 2)*. The soil probe should be at least 3 feet long to check the soil moisture down to the 3-foot depth.

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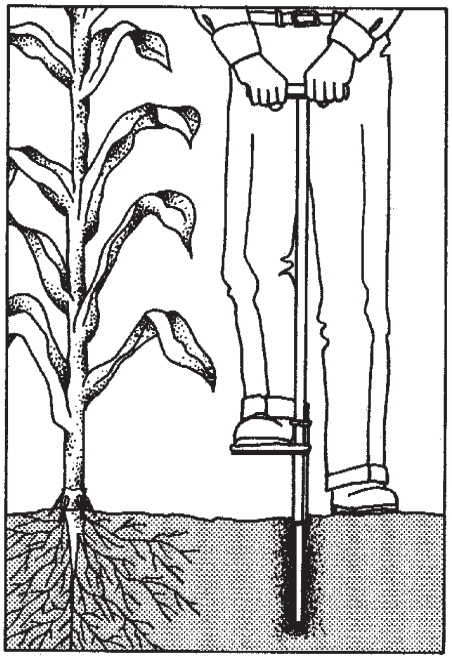

Figure 1. Checking subsoil with a soil probe.

A typical soil probe is made of stainless steel and removes a soil core about 3/4 inch in diameter. A common soil probe is the Oakfield probe. A one piece, 3-foot soil probe sells for about $90 (*www.soilsamplers.com/*). Some fertilizer plants carry 2-foot soil probes to sell to their customers.

Low soil moisture, especially subsoil moisture, can affect the growth and development of deep-rooted crops such as small grains, corn, sugar beets, sunflowers and alfalfa.

By using the "feel method," you can estimate the soil moisture level with reasonable accuracy. The feel method involves taking a soil sample, forming a ball in your hand and squeezing. The response of coarse-textured soils to squeezing at field capacity will leave no free water on the soil ball, but a wet outline of the soil ball will be left on the hand. If the ball of soil breaks easily, then the soil is at less than field capacity.

Managing subsoil moisture is always difficult because it involves determining if enough rain has been received to recharge the soil profile before the high-water-use period begins. Recharging the root zone with irrigation is easy when the crop is young because it is not using much water. Most of the applied water will infiltrate into the soil. This may not be true later in the season when the crop is taller, more mature and using a greater amount of water.

Center pivots with a low capacity of less than 6 gallons per minute per irrigated acre may not be able to keep up with crop demand later in the season. Starting to irrigate early may be wise for irrigators with low-flow capacity irrigation systems.

Scheduling Irrigation

With variable rainfall events, determining when to irrigate and how much water to apply can be difficult. A system for scheduling irrigation events must be followed.

Scheduling using the "checkbook" method requires the irrigator to measure rainfall amounts, record irrigation amounts and obtain an estimate of daily crop water use. Using these data, a soil moisture balance sheet is used to determine the daily soil moisture deficit. This method is called the checkbook method because it is very similar to how you balance your bank checkbook. If you think of rain and irrigation amounts as deposits and crop water use as withdrawals from the "soil water bank," then you have the idea.

The procedure is outlined in NDSU Extension publication AE-792, "Irrigation Scheduling by the Checkbook Method," available from county Extension offices. An Excel spreadsheet version has been developed and can be used in North Dakota and Minnesota. Information on obtaining a copy can be found in the June issue of *Water Spouts* (*www.ext.nodak.edu/extnews/spouts/ws256_june11.pdf*).

The most difficult part of scheduling irrigation is obtaining the daily crop water use values. Fortunately, you have two relatively easy ways to obtain these numbers. AE-792 contains tables that provide estimates of the daily crop water use for the most commonly irrigated crops in North Dakota. All you need is a record of the daily maximum temperature and the number of weeks after emergence.

More accurate estimates of daily crop water can be obtained from the NDAWN website by looking under "Applications." You can obtain daily crop water use in numerical tables or maps for alfalfa, turf grass, corn, pinto beans, wheat, barley, potatoes, sugar beets, sunflowers and soybeans. The crop water use estimates from the website are more accurate than the values in the crop water use tables in AE-792 because local daily weather is used to calculate the crop water use.

You can select crop water use tables for any of the 72 NDAWN weather stations and a particular crop, or you can view maps of North Dakota with crop water use values superimposed at the location of each weather station.

A site-specific irrigation-scheduling program also is available on the NDAWN website. You have to log in to use the program. More information can be found in the June 2009 issue of Water Spouts (*www.ext.nodak.edu/extnews/spouts/spout243.pdf*). This is the most accurate irrigation scheduling method because it uses the soil properties for your specific field and weather data from the nearest NDAWN station.

Knowing crop water use, using an irrigations scheduling method and monitoring soil moisture on a regular basis (every two weeks) will help you optimize your irrigation water management and provide the best yield possible.

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Coping with "Hard" Soils

With all the rain and elevated water tables across the state, salinity on irrigated ground is becoming more of a problem. This article is a reprint from the 2002 issue of Water Spouts *but is very timely.*

Is there anything I can do to amend my "hard" soils? This is a question that is frequently brought up by irrigators. Hard soils are usually soils that have been affected by sodium (Na) naturally or by application with irrigation water containing sodium. Unfortunately, most of the irrigation waters that come from underground aquifers in North Dakota contain varying amounts of sodium.

The first step in dealing with soils that have a tendency to "harden" with irrigation is to have the irrigation water analyzed for salts and sodium and to have a soil-water compatibility determination made. One place to have this done is at the NDSU Soil and Water Environmental Laboratory. This will be the first indication of whether "hardening" problems may be due to the irrigation water or the soils. Soils vary greatly in their ability to tolerate salts and sodium. North Dakota soils with the lowest tolerance can tolerate salt levels up to 1,000 micromhos per centimeter (umhos/cm) and SAR levels up to 6. The SAR is the ratio of sodium to calcium (Ca) and magnesium (Mg) in the irrigation water. Soils with the best tolerance can tolerate salt levels of 3,000 umhos/cm and an SAR of 12.

It is important to keep in mind that under natural conditions, about one out of 10 acres of land in North Dakota is affected with salts or sodium. This means that the salts and sodium are naturally a part of the geological materials that soils have formed from and that "hard" soils do occur in nature without human intervention.

Soil "hardening" is due to a dispersion of the soil particles by sodium when it displaces calcium and magnesium ions that normally saturate the soil and help maintain its structure. Calcium and magnesium are both soil nutrients that carry two positive (+) electrical charges. The soil particles are predominantly negatively (-) charged. Consequently, the opposite charges are attracted and the calcium and magnesium can form "bridges" between soil particles that help maintain soil structure. Sodium, on the other hand, has only one positive (+) charge. It is unable to form the bridges between soil particles and, consequently, the soil structure disappears.

To regain the soil structure, calcium must be added to the soil to displace the sodium and bring back the structure. This sounds like a simple solution but difficulties exist in doing this effectively. First, a soluble source of calcium must be used in large enough quantities to displace the excess sodium from the soil particles. Once the sodium is displaced, then it must be removed by leaching the soil with excess water. Here two problems exist.

Many North Dakota soils have a water table within 6 feet of the soil surface. Under these conditions, salts and sodium are carried up to the soil surface by capillary rise of water from the water table. As water evaporates form the soil surface or is utilized by crops, the salts and sodium are left behind in the crop root zone. Attempting to leach salts and sodium under these conditions is often futile unless the soils are mechanically drained. In undrained soils, the salts can be leached to the water table but again rise to the soil surface after the irrigation is ended and the soils begin to dry and crops begin using the water.

The second problem is that often the "hardness" is due to a high sodium content of the irrigation water. As additional irrigation water is used, more and more salts and sodium are added to the soil, and the problem may become worse.

Amending soils with calcium-containing materials can be successfully accomplished only if adequate subsurface drainage exists to substantially lower the water table and remove the excess irrigation water containing the leached salts and sodium.

Often products are sold that purport to "soften" hardened soils. Most of these are ineffective because proper subsurface drainage in not available for problem soils, and the quality of the irrigation water is such that the salts and sodium in the water nullify any beneficial effects of these products.

The best ways to deal with soils that have a tendency to "harden" are:

- Avoid irrigating soils that have inherently high levels of sodium.
- Do not use waters with high levels of sodium for irrigation.
- Irrigate the most tolerant soils with the best quality water available.

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Oakes Irrigation Research Site Field Day on July 26

Energy beets for biofuel production and a demonstration using a light meter to determine nitrogen status of crops will be the highlights of the annual Oakes Irrigation Research Site field day.

The field day will be held on July 26 starting at 9 a.m. The irrigation research site is 4.5 miles south of Oakes on the west side of North Dakota Highway 1.

The Green Vision Group, Heartland Renewable Energy and NDSU are cooperating on a multifaceted project to develop energy sugar beet production for biofuel in North Dakota. Presentations will be given at the sugar beet hybrid yield trial plots. In addition, yield results from other locations, both irrigated and dryland, in North Dakota will be discussed.

Significant interest has developed in using active light sensors for immediate detection of the nitrogen status in crops. The tour will include an in-field demonstration of a

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For more information on this and other topics, see: www.ag.ndsu.edu

Crop Circle 430 multispectral light sensor to determine nitrogen sufficiency in potatoes, corn and hard red spring wheat.

The field day also will include variety trials of corn, soybeans, small grains, dry edible beans and potatoes, along with stops at the research plots used to determine the optimum amount of corn stover removal for biofuel and the environment.

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Nesson Valley Irrigation Research Field Day on July 28

The Nesson Valley Irrigation Research and Development Project (NVIRDP) field day will be held on July 28 starting at 9 a.m. The NVIRDP is 25 miles east of Williston on North Dakota Highway 1804 (one mile east of Lund's Landing marina).

This 160-acre project was developed in 2004 to function as an irrigated research and development program for the MonDak region using the best irrigation equipment.

Our vision is that this irrigation project will provide an opportunity to identify and advance irrigated cropping systems for the MonDak region. Irrigation is a critical component needed to promote the production and processing of high-value crops in this region.

Some of the topics for this year's field tour are the new energy beet bioenergy project that has garnered great interest from around the state and a water infiltration demonstration comparing tillage systems (conventional, minimum and no-till). University of Minnesota and NDSU scientists will be on hand to give an update on their current projects. Also, the USDA-Northern Plains Ag Research Laboratory, Sidney, Mont., will be giving an update on its current research projects.

Come and join us for an exciting morning. After the tour, a lunch that includes fresh fries from a recently released potato, MonDak Gold, will be provided.

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