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water spouts

No. 228 MAY 2007

Upcoming NDSU Field Days and Other Crop-related Events

Streeter Central Grasslands Research Extension Center	June 27	(701) 424-3606
Minot – Canola Day North Central Research Extension Center	June 27	(701) 857-7677
Williston – Pulse Crops Day Research Extension Center	June 29	(701) 774-4315
Minot – Pulse Crops Day North Central Research Extension Center	July 10	(701) 857-7677
Hettinger Research Extension Center	July 10	(701) 567-4323
Dickinson Research Extension Center	July 11	(701) 483-2348
Williston Research Extension Center	July 12	(701) 774-4315
Carrington Research Extension Center	July 17	(701) 652-2951
Minot North Central Research Extension Center	July 18	(701) 857-7677
Sidney, Mont. USDA/ARS Northern Plains Ag Research Lab	July 18	(406) 482-2208
Langdon Research Extension Center	July 19	(701) 256-2582
Mandan USDA/ARS Northern Great Plains Research Lab	July 19	(701) 663-6445
Kidder County and Oakes area *Tour of commercial onion production and processing*	Aug. 28	(701) 223-8332

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Understanding Crop Water Availability

Knowing the average seasonal water use for a crop is important for both irrigated and dryland production. With water resources becoming more expensive to obtain and pump, water management becomes an important issue. Predicting when and how much precipitation will fall during a growing season can be difficult. With irrigation, you have the capability to supply the difference between what the crop needs and what precipitation will supply.

When considering crop water use, root depth is an important factor. Generally, 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 surface. By the time the crop has reached full height, the roots will not develop downward but will continue to produce fine roots in the interval between the surface and the depth of maximum root penetration.

Figure 1 shows the final average effective root depth for each crop (assuming the soil profile will allow full root penetration). The majority of the moisture is obtained from the top half of the root zone, with decreasing extraction by deeper roots. This is because more root mass generally is at the top of the root zone and the root mass tapers off with depth.

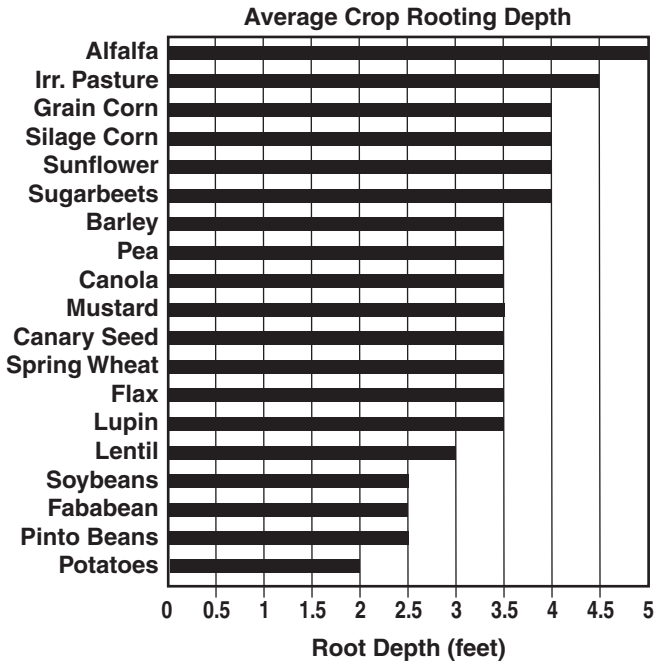

Figure 1. Average root depth for various crops.

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Figure 2 shows the average crop total seasonal water needs (precipitation + irrigation + beginning soil water content). Usually full-season crops, such as alfalfa and corn, need more water than short-season or cool-season crops, such as wheat and legumes. Figure 2 gives irrigators an idea of how much irrigation water they need if they know the average rainfall and beginning soil water content.

For irrigation scheduling and allocations of limited water supplies, knowing the crop growth periods that are most sensitive to water stress is an important factor. Figure 3 shows the approximate time frame for North Dakota and growth stage in which moisture stress probably will reduce yield potential. Usually the short-season crops or cool-season legumes will not tolerate stress early in the season, compared with full-season crops that need adequate moisture later in the season.

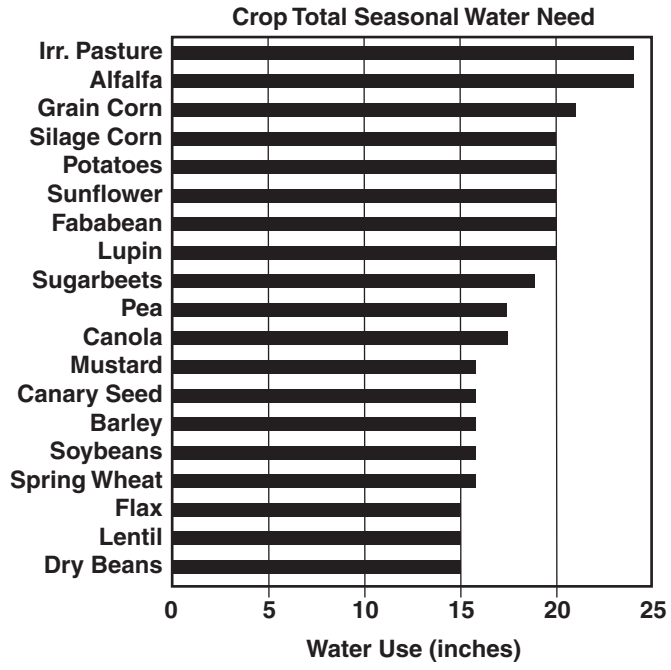

Figure 2. Total seasonal water use for various crops.

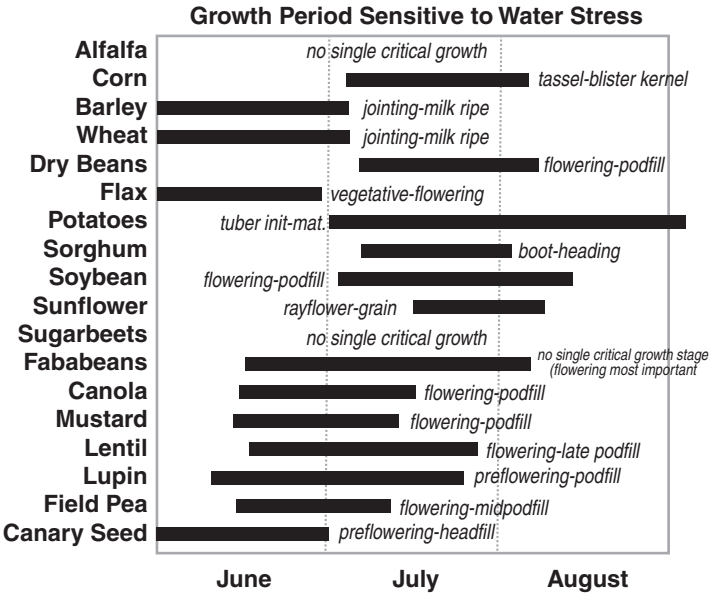

Figure 3. Growth period when crops are sensitive to water stress.

This information is to be used only as a general guideline or comparison among the different crops. More detailed crop water curves and irrigation scheduling criteria have been developed for many of these crops. Irrigation scheduling information is available in Extension publication AE-792, "Irrigation Scheduling by the Checkbook Method," or by accessing the North Dakota Agricultural Weather Network (NDAWN) Web site *(http://ndawn.ndsu.nodak.edu/)* to find estimated daily crop water use values for each weather station on the network.

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Rewritten from a Water Spouts article by David Klinkebiel in 1994

Irrigation System Maintenance and Recordkeeping

Irrigation equipment is no different than other crop production equipment. If not properly cared for, it may fail at the time it is most needed. Fixing small problems is less expensive than fixing a major breakdown during July or August. Repairs should be made early in the season when the crop water demands are low (before June 15). If maintenance was performed on the irrigation system last fall, then early season maintenance should require only checking to see that no damage occurred during the winter.

Spring maintenance should include checking the operation of your well (if you have one), pump, motor, electrical control boxes, piping and distribution system (sprinkler system, gated pipe, etc.) Rodents, dirt and water do the most damage to electrical components. If you don't feel confident performing routine irrigation system maintenance or you don't have the time, most irrigation dealers offer an annual service contract.

Maintaining an efficient well

Most water in the state contains enough iron to provide a source of energy for the growth and development of "iron bacteria." These bacteria are not the cause of high iron concentrations, but grow very well in the constant water temperature in the well. Iron bacteria accumulate on the screen, casing, pump and piping in the form of a slimy, red-brown to pink mass. The accumulation of iron bacteria will plug the open area of the screen and formation, thus reducing the rate at which water can flow into the well. **Chlorination of the well should be done both in the spring and fall; however, if this is not possible, then it should be done in the fall.**

Keeping a well near its original productivity is possible with semiannual chlorination. However, if your well's production last year was low, it may need

to be rehabilitated by swabbing and using acid to dissolve encrusted minerals on the screen. Instructions for chlorination and well rehabilitation can be found in NDSU Extension publication AE-97, "Care and Maintenance of Irrigation Wells." If your well needs to be rehabilitated, do it early in the growing season (before the end of June).

Before you turn the pump on for the first time, measure and record the depth to the static water level in the production well and any nearby observation wells. The depth to the static water level and the date of measurement should be recorded in a convenient place, such as the inside of the pump control panel or pivot panel. Compare this year's reading with past readings. This will tell you what is happening in the aquifer.

Check electrical motors, phase converters and control panels

Before starting your irrigation system, check the control panels and equipment condition. To begin, make sure the electrical power to your equipment is **locked in the OFF position** at the main disconnection point. You always should use extreme caution when working around electrical power boxes and machinery. If you are not sure the power is off, use a voltmeter to determine it truly is disconnected.

Electric motors and phase converters are especially susceptible to dust and moisture accumulations, particularly if a severe storm occurred during the winter. High winds can deposit snow and fine dust inside presumably sealed boxes.

If possible, open the motor for better access to the windings. Using compressed air, remove any dirt and dust. While the motor is open, check for rodent entry and damage. If you see evidence of rodent damage, find the entry hole and plug it. Check the motor shaft to see that it turns freely.

Phase converters, especially the static type, should be cleaned thoroughly. If your power supplier furnishes the phase converter, contact the company about servicing it. If you own the phase converter, treat it like other electrical equipment, thoroughly cleaning it with compressed air and cleaning relay contacts with a high-quality electrical contact cleaner.

Open all the electrical panel covers and examine for dirt, rodent damage, leaking door seals, and loose or damaged wires, and ensure that the bare copper grounding wire is properly connected to the panel box and the grounding rod. Examine any relays with exposed contacts. Moisture condensation may have caused corrosion that will make the contacts remain open or be stuck together. Be sure all switches operate freely. If moisture is present, remove it and leave the box open until it dries.

Check the piping and sprinkler systems

Visually inspect the piping between the pump and the distribution system (center pivots, lateral moves, big guns or gated pipe). Check all the air release valves to make sure they are working. Replace broken pressure gauges. Check all valves to make sure they open and close properly.

Check the operators manual for specific maintenance items to look for on your equipment. If for some reason you do not have an operators manual, get one from a dealer or the manufacturer. If the sprinkler system is relatively new, determine what service is required to keep the warranty in effect. Also, determine any other service the manufacturer suggests before the system is put into operation each year.

Repair or replace damaged electrical cables and controls, tighten nuts and bolts. inspect welds and stress points for cracks, and inspect tires and makes sure they are properly inflated. On center pivots, check gearbox lubricant levels, drain off moisture and refill with approved lubricant or change the lubricant if discolored. Inspect seals and gearbox for cracks. Lubricate all fittings, joints, bearings and the pivot point.

The sprinkler system should be checked thoroughly for vandalism and any other winter damage. Many machine manufacturers require that the grease in all gearboxes be drained and replaced. If this is not the case, check all gearboxes for moisture accumulation from condensation. Drain off any moisture and check that the proper amount of grease is in each. All fittings should be greased to replace grease that may have hardened during the winter. Check inflation pressure on all tires. Improper inflation can cause tire breakdown and also may place stress on the drive system. Finally, remove the end cap from the sprinkler boom and leave off until the system has been flushed.

For electric and oil drive center pivots and lateral moves, start the machine and run dry. Listen to each gearbox and motor for abnormal noise, and inspect and repair or replace as needed. On pivots, open the collector ring cover and inspect the brushes and contacts. For the individual tower boxes, do the following:

a) Using compressed air or a good-quality electrical contact cleaner, clean all of the contacts in each box. Do a visual check and clean any corrosion with high-quality sandpaper or emery cloth and apply cleaner.
b) Freeze/thaw cycles cause electrical contacts to loosen. Check and tighten all connection screws. Repair or replace any damaged or broken wires.

Now that you have completed the dry walk-through of the irrigation system, start the pump and put some water through the system. **However, don't stand in front of the main electrical panel when starting the system for the first time. Stand to the side of the panel.**

Check the pump and well performance

Assuming you have performed a "dry walk-through" of the irrigation system, turn on the pump. Listen for any unusual sounds. When the system comes up to pressure, if your flowmeter works, record the flow rate. Compare this with the pump design rate and past recordings. If the flow rate and pressure are the same as in previous years, you can assume the pump and well are in good condition.

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Flush out the piping system. On pivots and lateral moves, flush out the main line by removing the end cap or emptying the sand trap. Replace the end cap. When the system is filled with water, check the sprinklers to see if any are plugged or not operating properly.

After irrigating for a day, if you have a well, record the pumping water level. You can calculate the drawdown by subtracting the static water level from the pumping water level. Record this reading with the flow rate measurement. This will help determine if your well screen is starting to plug. Use a steel tape or electric sounder for measurement readings. Compare these readings to previous years' readings. Divide the flow rate (GPM) by the drawdown to determine the specific capacity of the well (GPM/ft drawdown). If the specific capacity has dropped to 80 percent of original, the well should be acidized. A well should be acidized in the off-season; during the fall is best. If the specific capacity of a well drops to less than 70 percent of its original value, restoring it to the original value is practically impossible.

If the flow rate is less than last year's recorded flow rate, but the drawdown is about the same or less, you may have a problem with the pump. Submersible pumps cannot be adjusted and, if the flow rate has dropped significantly, the pump needs to be pulled and inspected.

Deep-well turbine pumps have an adjustment nut on top of the motor or right-angle gear drive that is used to adjust impeller clearance. Frequently going through this adjustment procedure can improve the flow rate and pressure. Unless you are familiar with making pump adjustments, contact the pump supplier or a well driller for help in determining the problem and making adjustments. A publication on pump adjustment is available from the NDSU Extension Service.

If the flow rate is less than past recordings and the drawdown is more than in the past, the problem is in the well. This indicates water cannot move through the screen into the well as it did in previous years. The cause may be iron bacteria or mineral incrustation plugging the screen openings. Acidizing is needed to remove mineral incrustation. Either one or both processes may be needed to restore a well to its original productivity. Chlorination should precede acidizing. Acidizing is a corrective measure and should be undertaken only after consultation with your well driller to determine its effect on screen and gravel pack.

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