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water spouts

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Upcoming 2022 Events

Sept. 15	Fruit, Hemp and Vegetable Field Day
Oct. 17-18	Upper Missouri Water Association Meeting
Dec. 6-9	North Dakota Water Convention and Irrigation Workshop

Upper Missouri Water Association Meeting

The Upper Missouri Water Association (UMWA) Conference is scheduled for **Oct. 17-18** at Cadillac Jack's Gaming Resort in Deadwood, South Dakota.

In addition to other presentations, the conference will include a presentation from Dan Keppen, executive director of Family Farm Alliance, and a tour of the Belle Fourche Irrigation District. The tour stops will include the Diversion Dam, the North and South Gate Houses, and the Indian Creek check and siphon with lunch at High Plains Restaurant and Bar. Both of these may be of interest to irrigators.

A block of rooms has been reserved at the SpringHill Suites by Marriott. To reserve your room(s), call 1-605-559-1600 and reference Code UMCO or mention the Upper Missouri Water Association ($79 plus tax per night), **by Sept. 26.**

The registration fee is $190 per person before Oct. 3 and $215 after. The registration fee covers all meals, the meeting and the tour. Online information can be found at **https://ndwater.org/ndw-events/**. If you have questions, please call.

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North Dakota Irrigation Statistics: 2021 Growing Season

Sources: *Farm Service Agency (FSA), National Agricultural Statistics Service (NASS) and the North Dakota state engineer's office (State Water Commission)*

Total harvested cropland acres (NASS)	28,479,200
Number of acres irrigated (FSA)	332,750
Percentage of cropland irrigated	1.16%

Acres of Major Irrigated Crops (FSA):

Corn	132,700
Soybeans	68,064
Potatoes	28,770
Wheat	19,618
Alfalfa	14,366
Barley (malt and feed)	4,087
Dry edible beans	16,576
Sugar beets	12,290
Subtotal	**296,471**

Miscellaneous Irrigated Crops: mixed forages, oats, field peas, onions, grass, rye, sorghum, flax, safflower, canola, carrots, millet, lentils and triticale. Total of **36,280 acres**

Total major irrigated crop receipts (NASS)	$8.53 billion
Total receipts from major irrigated crops	$344 million
Irrigation revenue as percent of total	4.4%
Gross return per irrigated acre (major crops)	$1,161
Gross return per dryland acre	$300
Dryland acres needed to equal an irrigated acre	3.88

Irrigation Systems: Center pivots are used on about 90% of irrigated land; surface irrigation methods are used on 10%.

Water Use for Irrigation (SWC): In 2020, permitted irrigation systems diverted about 194,000 acre-feet of water, for a statewide average of 7.0 inches of pumped water applied to each acre. For volume comparison, the maximum storage capacity of Lake Sakakawea is 23.8 million acre-feet of water.

Water Sources (SWC): about 60% of water permitted for irrigation came from groundwater (wells) and about 40% came from surface water.

Estimating the Amount of Pumped Water

If you have an irrigation water permit, sometime this winter you will receive a notice from the North Dakota State Department of Water Resources requesting a report of the amount of water you pumped for irrigation this past growing season. Here are three methods you can use to determine the volume of water pumped for irrigation depending on your equipment.

1. Do you have a working flow meter?

   A working flow meter with a volume totalizer makes it easy to report water usage. The volume totalizer is a counter similar to the odometer in a car. Some meters record the volume in either hundreds or thousands of gallons. It is usually easy to determine which one because the manufacturer will show zeros to the right of the counter. If hundreds of gallons are recorded then there will be two extra zeros, and there will be three zeros if it records thousands of gallons. Some record the volume in cubic feet of water (1 cubic foot equals 7.5 gallons) and some record in acre-inches or acre-feet. Usually, the measurement unit for volume is shown on the face plate of the flow meter.

   If you wrote down the numbers on the volume totalizer at the start of the season, then all you need do is read the meter again and subtract the numbers to obtain the volume pumped. You can report water use in either gallons or acre-feet. Just remember an acre-foot of water covers an acre one foot deep in water and is equal to 325,800 gallons. An acre-inch is equal to 27,150 gallons.

2. Do you have an hour meter on the center pivot or pump?

   For a center pivot system, you can calculate an estimate of the amount of water pumped using the hour meter in the pivot control panel. However, you need to have written down the hour-meter reading at the beginning of the growing season. Subtract the current reading from the previous reading to get the number of hours the pivot operated this year. You then need to know the approximate flow rate to your center pivot. This can be obtained from the center pivot sprinkler chart. Now that you know the flow rate use the following formula to calculate the acre-feet of water that were pumped:

   Volume pumped = (Hours of operation) x (gallons per minute) / 5,430

   For example, say your center pivot ran for 895 hours and the sprinkler flow rate is 800 gallons per minute then the volume pumped is approximately:

   (895 x 800) / 5,430 = 131.9 acre-feet.

   You can also use this method if you have a diesel or gasoline engine with an hour meter or have an hour meter in the pump electrical control panel and know the average flow rate being pumped.

3. No water meter or hour meter?

   If this is the case, estimating the volume pumped will be difficult. However, for electrically driven water pumps, you can obtain an estimate of the number of hours of operation using the electric meter. Modern electric meters not only record the total energy use in kilowatt-hours (kwh) but also other parameters such as peak kwh and average kwh use. You can estimate total hours the pump was operated by dividing the total kwh used during the growing season by the average kwh. The seasonal total and average electric draw for each meter can be obtained from your electrical supplier. For instance, say your pumping plant used a total of 43,937 kwh and the average pumping load was 43 kw. Dividing 43,937 kwh by 43 kw shows that the pump operated for 1,021.8 hours. Again, you need an estimate of the flow rate which can be obtained from the sprinkler chart.

   The calculated hours will be correct even if the meter is recording the electricity used by both the pump and center pivot or if it is recording electrical use of just the pump. The extra electrical load of the center pivot is recorded in both the average draw and the total so it doesn't affect the calculated hours of operation.

Estimating the volume of pumped water becomes very difficult where irrigation systems have one pump that supplies multiple pivots or multiple wells that supply a single or multiple center pivots. If you have difficulty estimating pumped water volume, consider installing a flow meter, or if you have a center pivot, write down the reading on the hour meter. There are other ways of estimating the volume of pumped water from electrical use but it involves a few more calculations. Contact me if you have questions.

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Irrigation Excellence Award Nominations

Do you know of anyone that has been instrumental in developing and/or influencing the practice of irrigation in North Dakota? Consider nominating them for the Irrigation Excellence award to be presented at the 59th annual Joint North Dakota Water Convention and Irrigation Workshop to be held Dec. 6-9 in Bismarck.

The award nomination form can be found online at **https://ndwater.org/events/joint-north-dakota-water-convention-irrigation-workshop/**. Nominations will be accepted until Thursday, Oct.13.

If you don't have online access, contact me to obtain a form. To submit nominations, send me the form via email or by regular mail (ND Water, PO Box 2254, Bismarck ND 58502).

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Centrifugal Pumps: Reducing Cavitation and Impeller Wear

If you are pumping from an open water source and your pump sounds like it is pumping gravel, chances are it is due to cavitation. Cavitation is caused by water going from a liquid to a vapor state. A centrifugal pump operates by creating a partial vacuum (pressure less than atmospheric) at the inlet or "eye" of the impeller. When the vacuum at the eye of the impeller reaches the vapor pressure of water, vapor bubbles form. As the vapor bubbles pass through the vanes of the impeller the pressure increases and the bubbles implode. Usually, the implosions occur near the vanes of the impeller and knock off bits of metal. Over time cavitation will cause the impeller to look like it is riddled with pockmarks and holes, similar to Swiss cheese.

Cavitation will cause the following to occur:

1. The pump will sound like it is pumping gravel.
2. The pump may vibrate excessively.
3. Vibration can cause bearings to fail and affect the motor or engine.
4. The packing gland leaks excessively and require constant adjustment.
5. The flow rate and pressure will decrease.

There are two main reasons cavitation occurs in a pump. The first is that the inlet to the pump is too high above the water source and the pump can't provide enough suction to lift the water. The second is that the pump can't provide enough pressure to supply the irrigation system, often resulting in reduced flow through the pump and causing cavitation. Typically, this will occur on pipelines where several pumps are supplying water to the irrigation systems.

Reduced flow rate can cause irrigation set times to be longer resulting in more time to complete an irrigation cycle. It will certainly result in more energy consumption and reduced pumping plant efficiency along with lower irrigation application efficiency.

This winter, take the pump apart and look at the impeller. If it is pocked marked and there is damage, replace it for next season. Cavitation is serious enough to spend some time preventing it before it happens. Here are some rules to follow:

1. Use a suction pipe that is at least one nominal diameter larger than the pump inlet. Larger suction pipe diameters mean lower water velocity and less friction loss.
2. Place the pump as near to the water source as possible.
3. Use an eccentric reducer on the pump inlet so no air is trapped at the pump inlet.
4. Do not obstruct the suction pipe with valves or constrictions. However, a foot valve in the water at the end of the suction pipe does not create problems.
5. The suction pipe should take the most direct route to the water. A straight length of pipe from the water to the pump inlet is best.
6. Use a screened inlet of sufficient area to allow water to enter freely. A small screen area will result in higher entrance velocity that can cause vortexing, entrain air and pull more debris to the screen.

Silt, sand and rocks can cause impeller wear. If you have to pump dirty water, make a sump as long as possible to allow silt and sand to settle out before the pump intake. Screen the sump to exclude rocks and debris

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When Handling Anhydrous Ammonia, Don't Hurry

There is always a feeling of "hurry, hurry" with fall fieldwork. Fall tillage, moving bales, harvesting the last of the crop, getting machinery moved home and applying anhydrous ammonia for next year's crops; it all has to be done – yesterday. Often enough, hurry is usually a major factor with farm accidents. Handling and applying anhydrous ammonia cannot be rushed.

Before stopping in the field to replace an empty nurse tank, line up the equipment so you can always work on it while upwind of all connections to be made. Check to see where the closest water is for an emergency dip if something really goes wrong. Have an escape route from the scene planned ahead of time.

Always be sure to have your squirt bottle of water in your shirt pocket before you leave the tractor cab or the pickup truck cab. If you should need it and it isn't there, you will painfully use valuable time in looking for it – if you can see at all. Replace the water daily. Keep it fresh.

Put on all of the basic protective equipment first, before starting work on the equipment. The gloves must be long cuff rubber gloves approved for handling anhydrous ammonia. The goggles must be snug fitting and non-vented to keep the ammonia from getting to your eyes. If the gloves and goggles are left in the kit or your cab, they can't help you.

Be sure to always place your body upwind from the connection you are working on. This helps to move any escaping ammonia away from you. Disconnecting the empty nurse tank in the field is a job that should not be rushed. Be sure to completely close the liquid withdrawal valve on the nurse tank first. If it is not completely closed before disconnecting, the nurse tank hose will remain pressurized – a dangerous condition.

When connecting the fresh nurse tank to the applicator, always be certain the hose end bleeder valve is closed and the hose end is securely plugged into the applicator before opening the liquid withdrawal valve on the tank. Otherwise, an uncontrolled

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When Handling Anhydrous Ammonia, Don't Hurry

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release of anhydrous ammonia will probably occur, placing you at risk.

Do not remove any of the protective equipment, gloves or goggles, until all connections are made and found to be safe. Then, place the protective equipment back in the nurse tank kit, unless you are wearing your own. Be sure of what you are doing, following all the disconnection and reconnection steps in their proper order, and stay safe in your anhydrous ammonia application.

More information on safe handling of anhydrous ammonia can be found in AE-1149 Anhydrous Ammonia: Managing the Risks available at all county Extension offices or online at **www.ndsu.edu/agriculture/ag-hub/publications/anhydrous-ammonia-managing-risks**.

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Fruit, Hemp and Vegetable Field Day on Sept. 15

The NDSU Department of Plant Sciences will host a fruit, hemp and vegetable field day on Sept. 15 at the NDSU Horticulture Research Farm and Arboretum near Absaraka, North Dakota. The field day will begin at 4 p.m.

The field day will include presentations on:

- Caterpillar tunnel research
- **High tunnel with automated sensor-controlled irrigation**
- Renovation of old/unproductive apple trees
- Hydro-mulching for weed control
- Evaluating new brassica cultivars for yield and stress tolerance
- Evaluating black currant, cantaloupe and haskap cultivars, and their health attributes
- Evaluating allium species and their cultivars for health attributes
- Floral hemp research, grape breeding research, juneberry research
- Raspberry research

Registration is needed for the boxed dinner available at 6 p.m. For more information or to register for the event, visit **www.ndsu.edu/agriculture/academics/events/ndsu-sets-fruit-hemp-and-vegetable-field-day**.

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