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water spouts

No. 318 August 2021

In this issue:

Potato Field Day – Aug. 26

North Dakota State University and University of Minnesota potato research will be highlighted during the Northern Plains Potato Growers Association (NPPGA) field day on Thursday, Aug. 26.

The field day tour will travel to three locations. The day will begin at 7 a.m. with breakfast at Hoverson Farms near Larimore, N.D. Research presentations will begin at 8:15.

Lunch and research presentations will be at the Forest River Colony near Inkster, N.D., at noon. Also scheduled is a field tour of the irrigated research trials.

The last stop will be at Oberg Farms near Hoople, N.D., starting at 5 p.m. The final stop will include research poster presentations and an evening meal.

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Irrigation Cost-share Request for Information

The North Dakota Irrigation Association has learned of the potential for funding available from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) for updates or improvement to existing irrigation systems to maximize utilization of water. A similar project was funded this spring. It provided assistance to 16 North Dakota irrigators. During the most recent round of funding, the NRCS received more applications than it had available funding.

To assemble a strong application and request an appropriate amount of funding, the Irrigation Association is gathering information from irrigators who may be interested in applying for funding this fall.

Examples of potentially eligible projects include:

- Improving water use efficiency by converting from flood to pivot irrigation
- Installing variable-rate irrigation on an existing low-pressure system
- Converting a high-pressure center pivot to a low-pressure system

Given the extreme drought the state is experiencing, this program may make updating their system(s) more economically feasible for irrigators to ensure maximum utilization of this precious resource.

If you are interested in learning more about this potential funding opportunity, please contact me. Additional information also can be found by contacting your local NRCS office.

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Will This Drought Affect Your Irrigation Well?

The drought that started last year and continued into this growing season has greatly increased the need for irrigation and may begin to affect well water production.

For the past few years, irrigation pumping has been relatively low in many parts of the state due to timely rains. However, during these years, the screens in many wells may have been plugging slowly. Because of high water levels in most aquifers, the impact of this plugging was not so noticeable. But if the drought continues into next year's growing season, partially plugged wells will start to cause water production problems.

If your well is old and hasn't been chlorinated or cleaned in several years, this fall would be a good time to have it checked by a well driller. If it's an old well, it may need some redevelopment.

A well provides access to the aquifer where the water is located. During pumping, if a well is functioning properly, the water from the aquifer will enter the well screen with the lowest possible amount of restriction.

As water flows into a well, it carries minerals with it. Through time, these minerals can build up on the formation materials near the well screen because that is where the water velocity is the greatest. It may sound counter-intuitive, but some minerals will precipitate at the high velocities. Through time, the deposition of minerals can encrust the screen and formation, which increases the resistance to flow of water into the well.

Anything that restricts the flow of water into the well can increase the drawdown. The drawdown is the difference between the static water level and the pumping water level. Water flows into the well from all directions but a cross-sectional view is shown in **Figure 1**.

From a hydraulic point of view, drawdown is the head (pressure) required for water to flow into the well. The greatest amount of drawdown occurs within a few feet of the well, where the velocity is the greatest. During droughts, the static water level in the aquifer will drop, and even with a normal drawdown, the pumping water level can drop to the point where the pump will start sucking air, especially if the screen is partially plugged.

I often hear irrigators say they don't want to pay for the cost of redevelopment because it doesn't help with well performance. This may be a true statement if the well was poorly developed at the time of construction. However, if the well was constructed and developed properly, it will have less drawdown, save on pumping costs and have less trouble supplying water during high water use periods.

You have several methods for cleaning and rehabilitating a well. Cleaning a well screen can be done using chemicals to dissolve minerals on the screen, along with mechanically swabbing. After the screen has been cleaned on the inside, the well should be redeveloped. The methods of development, in order of effectiveness and cost, are airlift pumping with agitation, surging and jetting.

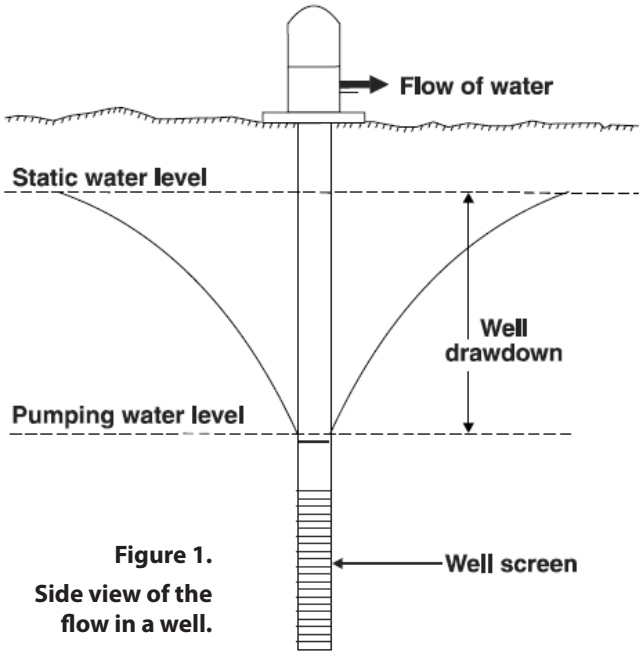

Figure 1.
Side view of the flow in a well.

Air Lift Pumping and Agitation

Airlift pumping forces compressed air through an airline to the bottom of the well, **Figure 2**. As air bubbles rise, they create a surging effect that carries water and fines out of the well. Airlift pumping is alternated with short periods of no pumping, which forces water out into the formation to help break up sand bridging around the screen. Well development is effective only if the water is deep enough in the well to get the surging action.

Mechanical Surging

Surging alternately forces water into and out of the formation through the well screen openings, **Figure 3**. A pistonlike tool moves up and down in the well to create the surging action. The surging of the water through the well screen loosens the mud and fines in the borehole and draws them into the well to be removed by pumping or bailing.

Surging is especially suited to cable tool drilling. While common for bridge or louvered well screens, surging is not very effective with very deep wells (more than 200 feet) or those with multiple screens.

Jetting

The most effective and most expensive well development method is high-pressure water jetting with simultaneous pumping, **Figure 4**. High-velocity water jets through the screen and gravel pack into the formation to loosen and break down the fine materials and encrusted minerals.

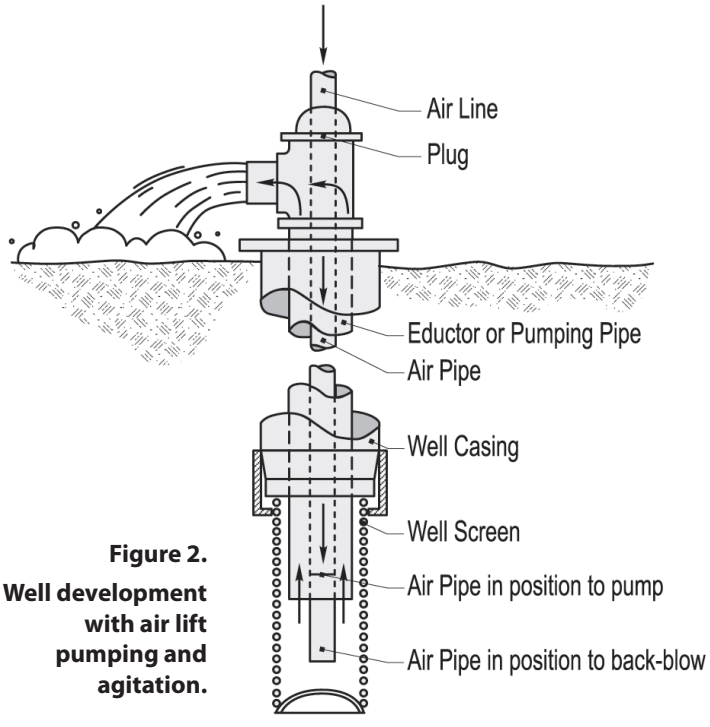

Figure 2.
Well development with air lift pumping and agitation.

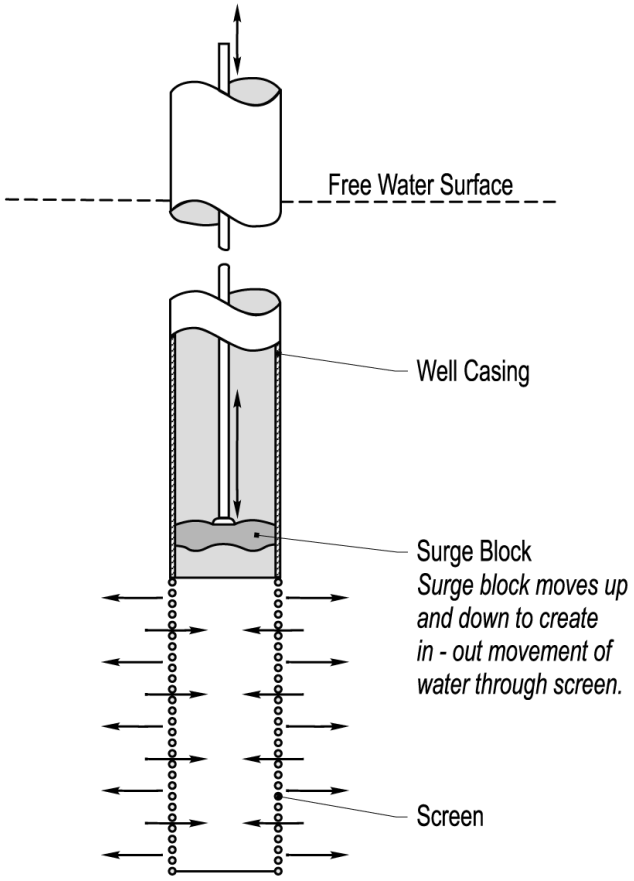

Figure 3. Well development by mechanical surging with a surge block.

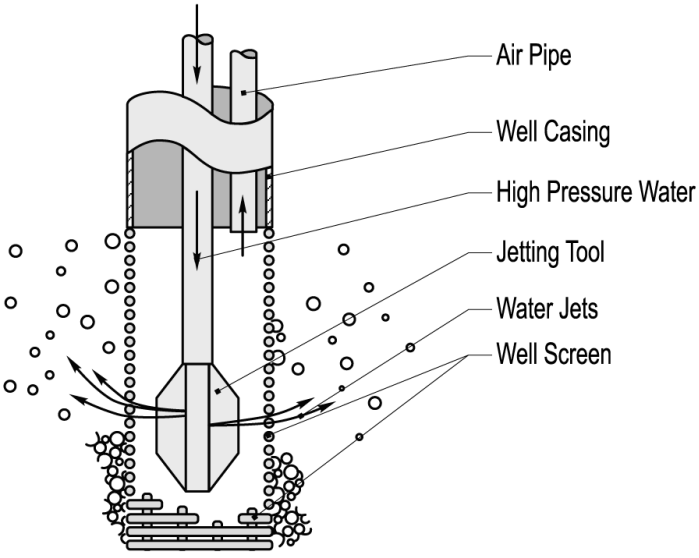

Figure 4. Well development using high-velocity water jetting.

By adding a weak acid to the well, combined with agitation, these mineral deposits can be dissolved and removed.

The jetting tool rotates slowly as it is moved up and down inside the well screen. Pumping at the same time removes the loosened sand and mud that enters the well screen. The jet stream can be directed at any part of the formation around the well for selective development.

Well screens that use louvered or bridge openings, concrete screens and galvanized irrigator screen do not respond to this type of development because the opening design interferes with the jet of water. Caution: This method should be used only on stainless steel and plastic screen. Some older, iron screens are susceptible to acid and may collapse.

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When to Stop Irrigating

This year is about as far from a normal weather year as we have seen in a long time. The high temperatures and lack of rain have resulted in accelerated growth due to greater heat units, thus most irrigated crops are maturing earlier.

That means that recognizing when a crop has matured is important. Knowing the indicators of physiological maturity of the crops being irrigated and checking soil moisture levels will help you determine when irrigation no longer is needed.

Corn should be irrigated until sufficient soil moisture is available to ensure that the milk layer of the kernel moves down to the tip of the kernel, or black layer formation (physiological maturity). To check the milk line, break an ear of corn in half. The milk line is clearly visible on the kernels as the border between the yellow and the dull milky color.

When the line is half way down the kernel, the last irrigation should be applied through a sprinkler system. For flood irrigation, the last irrigation should occur when the milk line is about a quarter of the way down the kernels.

The location of the milk line should be checked at several points in the field. You can find many examples on the internet showing the progression of the milk line in field corn.

With normal heat unit accumulation, physiological maturity often is reached about 55 days after 75% of the plants have visible silks. The grain moisture may range from 32% to 40% at the time, depending on the hybrid. Yellow dent corn usually is well dented at physiological maturity.

Dry edible beans: The last irrigation should be when the first pods are filling, or irrigation should be stopped when 50% of the leaves are yellowing on the plants. When overwatered, indeterminate varieties (pinto) may continue to vine and set flower with delayed maturity.

For navy beans, physiological maturity is reached when at least 80% of the pods show yellowing and are mostly ripe, with 40% of the leaves still green. Pinto beans are physiologically mature when 80% of the pods show yellowing and are mostly ripe and only 30% of the leaves are still green.

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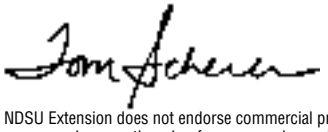

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County commissions, North Dakota State University and U.S. Department of Agriculture cooperating.

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Beans within pods should not show evidence of any green. If the beans have begun to dry, irrigation will not be needed because the beans no longer are removing much water from the soil profile.

Soybeans should be irrigated until sufficient moisture is available to allow full bean development and pod fill. This stage is when leaves are yellowing (75% to 80%) and all pods are filled, with the lower pods just starting to turn brown. At physiological maturity, pods are all yellow and more than 65% of the lower pods have turned brown. Beans within pods should have little evidence of green and should be shrinking.

Studies show that yellow pods sprinkled with brown are the best clue of physiological maturity. Usually if one or two pods show this on the upper two or more nodes of the plant, it has reached physiological maturity. Also, soybeans should be tolerant of a killing frost at this time.

Sunflowers should be irrigated until sufficient moisture is available for the sunflower achenes (seeds) to fill. This is when the backs of the heads turn from lime green to yellow green and ray petals are completely dried.

Potatoes will utilize soil moisture until harvest. The maturation stage begins with canopy senescence as older leaves gradually turn brown and die. Research has shown final irrigation can be used to reduce bruising during the harvesting process.

On sandy soils, soil moisture content between 60% and 80% of field capacity (40% to 20% moisture depletion) provides conditions for a desirable soil load into the harvester, with optimum separation of potatoes and soil and a minimum of physical tuber damage. If soil is dry before harvest, a final irrigation should be applied at least one week prior to harvest to raise the soil moisture level and also raise the tuber hydration level.

Alfalfa should be irrigated to maintain active growth until growth is stopped by a hard frost. Alfalfa going into the winter with adequate soil moisture has a much better chance of little or no winterkill.

Sugarbeets will utilize moisture until harvest time. Irrigation usually is terminated seven to 14 days before harvest to allow the soil to dry.

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