Tri-Basin Irrigator

Volume 17, Issue 5 *July 20, 2017*

Program Information

EQIP & CSP:

EQIP – Projected sign-up deadline for 2018 funds will be mid-October 2017.

CSP – We are currently contracting 2017 pre-approved applications.

NSWCP: NSWCP funds are ONLY available for flow meters and soil moisture sensors at this time.

ENERGY EFFICIENCY GRANT: Signup deadline for 2018 funds will be October 31, 2017. For more information contact Kelley at Rural Development at the Kearney USDA Service Center at 308-237-3118, Ext. 4 or at 308-455-9837.

Calendar of Events

July 18: TBNRD Board Meeting - 1:30 PM
July 22-27: Phelps County Fair
July 27-29: Gosper County Fair
Aug 7: CNPPID Board of Directors Meeting - 9 AM
Aug 8: TBNRD Board Meeting at Kearney County Fairgrounds -1:30 PM

Turn On Irrigation Today or Tomorrow?

Some of you have received some nice rain lately. So when does one need to turn on the irrigation system again? To schedule irrigations, follow example below:

- Holdrege Silt Loam soil holds about 2.3 inches per foot
- Corn (silking) = 3 ft. root depth
- ET estimate = 0.36 inches per day
- Producer set goal to irrigate at 65% moisture
- In field, current moisture is 80%

2.3 in./ft. x 3.0 ft. depth x 80% = 5.52 in. available water
2.3 in./ft. x 3.0 ft. depth x 65% = 4.49 in. minimum to irrigate

5.52 in. – 4.49 in. = 1.03 in. water left in soil

1.03 in. / 0.36 in. ET = 2.86 days of water left.

A factor you must take into account is the number of days it takes to get across the field to the point of where the current soil moisture levels were taken. In this example, if you can get to this point in 1 day, you can start irrigating in 2 days. Hopefully catch a rain and you won't have to. If it takes more than 1 day to get to this point in the field, then you need to take that into account.

Maximizing soil moisture can save dollars. Especially with crop prices the way they are.

If you have any questions about scheduling irrigations or would like to set up an appointment to go over this, call Curtis Scheele at 308-995-6121, Ext. 3.

Curtis's Column

USDA United States Department of Agriculture
Natural Resources Conservation Service

Ultrasonic Flow Meter Measurements Are Available!!!

Are you wondering how much water is flowing through your irrigation system? If so, you can request an ultrasonic flow meter measurement. This portable flow meter clamps onto the outside of the pipe and can measure the water flow.

The ultrasonic flow meter can be used to determine how much water your well is pumping. It can tell you how much water is going into your pivot system. It can be used to determine how much water you are losing from leaky gates and gaskets. It can be used to determine the amount of water you are applying to your field. It can also be used as a check against your permanently installed flow meter.

If you wish to request an ultrasonic flow meter measurement, you can contact Curtis Scheele at 308-995-6121, Ext. 3 OR Nolan Little at 308-995-6688 to schedule an appointment.

Soil Health Series: Infiltration

Infiltration is key in capturing FREE moisture for your crops. I mentioned Aggregate Stability and Soil Structure in the last two issues. When these two soil properties are in good to excellent condition, your soil will have excellent infiltration rates. Infiltration is the downward entry of water into the soil. The rate is how fast the soil can take in the water.

Tillage can damage the two soil properties listed above. The result is compaction and crusting, basically the destruction of pore space. Without pore space there is no room for the soil to take in the water.

The two photos below show this rather well. These photos were taken right after a significant rain event. You will notice that the tilled field did not infiltrate much water due to lack of pore space. However, the no-till field infiltrated the entire rain event. The no-till field now has more moisture in the profile for the crops. This is more money in the pocket.

Conventional Till
Runoff filled ditch

No Till
Not a runoff filled ditch

Photos taken within 10 minutes no more than a mile apart. No rain totals but rainfall similar on both fields.

Attached is a Soil Quality Indicator sheet for more info.
See also the attached Infiltration and Runoff sheet for another example.

CNPPID NOTES

The million dollar rain and other updates:

It is not often we get a reprieve from dry conditions in mid-July; for many Central producers it was the million-dollar rain that puts a new pickup in the garage. Significant volume, no hail and arriving just prior to the corn silking; a welcome anomaly to normal conditions. The sunshine and heat that are following make conditions greenhouse perfect for a corn plant.

Nebraska is the hot spot of the nation this Wednesday afternoon. It is also near perfect conditions for an algaecide treatment for the canals. The high heat will bring on fast growth and with most of the irrigation shut down for a few days and the canal water fairly still, our patrolmen should get good plant uptake on the pesticide treatment they are putting down.

Central began its 4th 2-week run or 7th 1-week run on Monday. There are five full weeks left in the regular season; and there should be water available for late planted crops unless more rain makes that option unnecessary.

Lake McConaughy water surface is at elevation 3,253.4' above MSL or 81% of capacity. Inflows are low, 317cfs this Wednesday afternoon. The South Platte River at the CO/NE state line is also low, running at 63 cfs.

The large Reclamation reservoirs in Wyoming are nearly full. Beginning with the furthest unit upstream, inflows to Seminoe Reservoir are 704 cfs and it is storing 881,642 AF or at 87% of capacity. Pathfinder Reservoir is storing 968,198 AF or at 90% of capacity and Glendo Reservoir is storing 405,144 AF or at 82% of capacity. Those volumes at this time of the year are good indicators Reclamation will need to release water to NE in the spring to make room for the next snowpack. The 2018 water season is looking good.

TRI-BASIN NRD NEWS

Irrigation Season Reminders:

Chemigation: Our staff has been busy with routine chemigation inspections, as well as a record number of new inspections because of low nitrogen levels in plant samples and a cutworm invasion. If your systems are due for a routine inspection, you'll receive a call from our office to schedule those.

Water Samples: Staff and our summer interns have also been busy taking samples from irrigation wells for our Water Quality testing program. If you have crop reports due each year, don't forget to take water samples from your irrigation wells for those reports.

Irrigation Meters: You should periodically check your irrigation flowmeters to make sure they are working correctly. If you don't think your meter is working correctly, our staff or Curtis Scheele at the NRCS office can check flow rates using an ultrasonic flowmeter. If you have a meter repaired during the irrigation season, note the meter reading before operating that irrigation equipment. Doing so will make it easier to reconcile any movement of the propeller while the meter was being repaired. If you have questions about reinstalling your flowmeter or about your meter readings, contact our office at 1-877-995-6688.

NEBRASKA EXTENSION EXTRAS

Soybean Stem Borers:

Soybean stem borer, *Dectus texanus,* adults are long-horned grey-colored beetles with ½ long antennae (see photo 1 below) native to the central U.S. causing soybean damage in central Nebraska since 2000. In 2016, stem borer lodging occurred in scattered Phelps county soybean fields moving west from Hamilton, Clay and Kearney counties. Females lay eggs singly from late June to August on cocklebur, ragweed, sunflowers, and soybeans. Eggs are primarily laid in soybean leaf petioles.

Generally, stem borer beetle eggs (curved like small bananas) are laid in the mid-canopy of soybean plants; so when the eggs hatch, the legless, creamy yellow larvae tunnel into the stalks (see right photo above) and feed on the pith. If eggs were laid in leaf petioles, the larvae feed in the petioles for several days and then tunnel up and down the main stems until September; later moving to the base of the plant. As soybeans mature and ready for harvest; plants then may lodge, since the larvae girdled stems an inch or two about ground level. Larvae overwinter in the base of these detached stems.

Usually during this time, stem borer detection is based on observing wilted or dying soybean leaves in the mid-canopy of affected plants. Dectus produce only one generation per year; but adults emerge at different times. Therefore, control is difficult due to these insects spending most of their life inside plant stems with the adults hiding under leaves within the plant canopy. Seed treatments are also ineffective due to the length of time between planting and emergence of the adult beetles. Further, insecticide treatments targeting adults are difficult, since the adults are active for several weeks in the summer being the only exposed stage.

No resistant Group 3 or 4 soybean varieties are currently available although research in Kansas has discovered very good resistance in a Group VI soybean maturity group; but more genetic breeding is needed. So, cultural controls are the only recommended ways to reduce *Dectus* losses.

Since these *Dectus* prefer domestic sunflowers over soybeans, sunflowers may be used as a trap crop when planted adjacent to or around soybean fields. Research at North Carolina reinforces that burying borer-infested stubble after harvest can reduce soybean stem borer populations the next year; but this may contribute to erosion concerns. Weed control is also recommended for cocklebur, giant ragweeds, and wild sunflowers alternative *Dectus* borer hosts.

Field observations suggest that early planted, short-season soybean varieties may be more likely to have harvest lodging losses. Longer season varieties mature later; allowing more time to harvest before lodging. Otherwise, prompt harvesting at low speeds is the best strategy for avoiding lodging losses in infested fields.

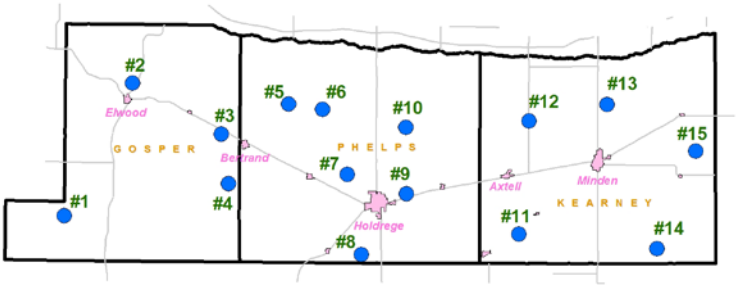
More information is available in our Nebraska Extension "Soybean Stem Borers in Nebraska" NebGuide G2082 http://extensionpublications.unl.edu/assets/html/g2082/build/g2082.htm.

NAWMN Crop ET Information

Additional Information and other ET resources can be found at websites listed under "ET Information Sites" below.

Inches of Crop Water Use (ET) = Evaporation x Kc

	July 3 – July 9		July 10 – July 16	
Site	Evaporation	Rain	Evaporation	Rain
1	2.10	0.00	1.85	0.90
2	2.20	0.02	1.60	0.62
3	1.90	0.12	1.30	2.47
4	2.10	0.07	1.50	1.25
5	1.90	0.00	1.60	1.60
6	1.90	0.00	1.10	1.70
7	2.00	0.00	1.50	0.99
8	2.10	0.40	1.80	0.48
9	1.80	0.00	1.60	0.80
10	1.80	0.00	2.10	0.85
11	1.70	0.00	1.70	0.70
12	1.80	0.00	1.20	1.28
13	1.80	0.00	1.60	0.84
14	2.40	0.00	1.50	0.28
15	1.60	0.00	1.70	0.40



2017 Map of NAWMN Sites across the Tri-Basin NRD.

Crop Coefficients (Kc)

Corn Stage	Kc	Soybeans Stage	Kc
2 leaf	0.10	Cotyledon (VC)	0.10
4 leaf	0.18	1st Node (V1)	0.20
6 leaf	0.35	2nd Node (V2)	0.40
8 leaf	0.51	3rd Node (V3)	0.60
10 leaf	0.69	Beg. Bloom (R1)	0.90
12 leaf	0.88	Full Bloom (R2)	1.00
14 leaf	1.01	Beg. Pod (R3)	1.10
16 leaf	1.10	Full Pod (R4)	1.10
Silk – Beg. Dent	1.10	Beg. Seed (R5)	1.10
¼ Milk Line	1.04	Full Seed (R6)	1.10
Full Dent (½ Milk)	0.98	Yellow Leaf (R6.5)	1.00
¾ Milk Line	0.79	Beg. Mat. (R7)	0.90
Black Layer	0.60	Full Mat. (R8)	0.20
Full Maturity	0.10	Mature	0.10

Crop Stage Information

Corn (V16-16 Leaf to R2-Blister stage): Silking is the peak water use period for corn. Moisture stress at this time causes poor pollination and seed set. The result will usually be a nubbin.

Avg. daily water use from July 10 – July 16 was 0.17"-0.33".

Soybeans (R1-Beg Bloom to R3-Beg Pod stage): Environmental stress from R3 through R6 (Full Seed) will reduce yield more than any other time. R4 (Full Pod) is the most crucial period.

Avg. daily water use from July 10 – July 16 was 0.14"-0.33".

July 10-July 16 (15 of 15 NAWMN sites reporting): Average weekly rainfall was 0.52 (range 0.28 to 2.47). Average weekly ET for corn was 1.76 and for soybeans was 1.42.

ET Information Sites

NAWMN Sites:
- http://www.cnppid.com/news-info/weatheret-data/nebraska-agricultural-water-management-network/
- https://nawmn.unl.edu/ETdata/DataMap

CropWatch: http://cropwatch.unl.edu/gdd-etdata
CNPPID: http://www.cnppid.com/news-info/weatheret-data/
Water Use Hotline: 1-800-993-2507

Corn Stage		DESCRIPTION
R1	Silking	Begins when any silks are visible outside the husks.
R2	Blister	The kernels are white on the outside and resemble a blister in shape. The cob should be close to, if not, at full size by R2. The silks are beginning to dry out and darken in color.

Soybean Stage		DESCRIPTION
R2	Full Bloom	At least one open flower is present at any one of the two uppermost main stem nodes that have fully developed leaves.
R3	Beginning Pod	At least one pod of 3/16" length is present at any one of the four upper most main stem nodes. It is not uncommon to seee pods of greater length at the lower nodes.

Lake and River Levels

CNPPID Reservoir Elevation and Platte River Flow data listed below and other locations can be found on CNPPID's website at *http://cnppid.com/wp-content/uploads/2016/06/lakeRiverData.html*.

	July 20, 2017, 8:00 AM	*1 Year Ago*
Capacity of Lake McConaughy	**80.8%**	**NA**
Inflows to Lake McConaughy	**446 cfs**	**1313 cfs**
Flows on the North Platte at North Platte	**918 cfs**	**1870 cfs**
Flows on the South Platte at North Platte	**136 cfs**	**364 cfs**
Flows on the Platte at Overton	**1524 cfs**	**2139 cfs**

I have always grown from my problems and challenges, from things that don't work out; that's when I've really learned.

- Carol Burnett

Websites of Interest

Soil Health:
www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Climate	*agclimatenebraska.weebly.com*
SAM Registration	*www.sam.gov*
NRCS Nebraska	*www.ne.nrcs.usda.gov*
Central Irrigation District	*www.cnppid.com*
TBNRD Home Page	*www.tribasinnrd.org/*
Farm Service Agency	*www.fsa.usda.gov*
UNL Cropwatch	*cropwatch.unl.edu*
UNL Extension	*extensionpubs.unl.edu/*
K-State SDI Website	*www.ksre.ksu.edu/sdi*
No-till On The Plains	*www.notill.org*

Rainfall

Rainfall amounts listed below and other locations come from NeRAIN which can be found at website *https://nednr.nebraska.gov/NeRain/Maps/maps*.

Location:	July 6 – July 19	May 1 – July 19
Arapahoe 6.9 NW:	**0.88**	**9.71**
Bertrand 6.1 mi. SE:	**1.71**	**8.20**
Funk 4.1 mi. NNE:	**3.87**	**11.16**
Minden 0.855 mi. W:	**3.32**	**13.25**
Minden 8.8 mi. ESE:	**3.27**	**12.13**

Average Rain for May-July in Holdrege = 11.32 Inches

****** If you wish to receive this newsletter via e-mail, or have any questions, comments or ideas, feel free to contact Curtis Scheele at the NRCS office in Holdrege or you can email him at curtis.scheele@ne.usda.gov. ******

USDA - Natural Resources Conservation Service

USDA United States Department of Agriculture Natural Resources Conservation Service

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Holdrege, NE 68949-0798
308-995-6121, Ext. 3

309 Smith Street
PO Box 41
Elwood, NE 68937-0041
308-785-3307, Ext. 3

1005 South Brown Street
Minden, NE 68959-2601
308-832-1895, Ext. 3

Central Nebraska Public Power & Irrigation District

CENTRAL Nebraska Public Power and Irrigation District

415 Lincoln Street
PO Box 740
Holdrege, NE 68949
308-995-8601

Tri-Basin Natural Resources District

Tri Basin Natural Resources District

1723 Burlington Street
Holdrege, NE 68949
308-955-6688

Nebraska Extension

N EXTENSION

1308 2nd Street
Holdrege, NE 68949

308-995-4222

PO Box 146
Elwood, NE 68937

308-785-2390

424 North Colorado
PO Box 31
Minden, NE 68959
308-832-0645

Soil Quality Indicators

Infiltration

Infiltration is the downward entry of water into the soil. The velocity at which water enters the soil is infiltration rate. Infiltration rate is typically expressed in inches per hour. Water from rainfall or irrigation must first enter the soil for it to be of value.

Factors Affecting

Inherent - Infiltration rate is dependent on soil texture (percentage of sand, silt, and clay) and clay mineralogy. Water moves more quickly through the large pore spaces in a sandy soil than it does through the small pores of a clayey soil, especially if the clay is compacted and has little or no structure or aggregation (see Table 1).

Depending on the amount and type of clay minerals, many clayey soils develop shrinkage cracks as they dry, creating a direct conduit for water to enter the soil. These clay soils have high infiltration capacities as water moves into the shrinkage cracks, although at other times, when cracks are not present, their infiltration rate is characteristically slow.

Dynamic - A reflection of climate and landscape position, as well as management practices and crop demand, existing soil water content affects the ability of the soil to pull additional water into it. Pores and cracks are generally open in a dry soil. Many of them are filled in by water or swelled shut as the soil becomes wet, so infiltration rate is generally highest when the soil is dry. As the soil becomes wet, the infiltration rate slows to the rate at which water moves through the most restrictive layer, such as a compacted layer or a layer of dense clay.

Infiltration is affected by crop and land management practices that affect surface crusting, compaction, and soil organic matter. Without the protective benefits of vegetative or residue cover, bare soil is subjected to the direct impact and erosive forces of raindrops that dislodge soil particles. Dislodged soil particles fill in and block surface pores, contributing to the development of surface crusts that restrict water movement into the soil.

Compaction results from livestock and equipment traffic, especially on wet soils, and continuous plowing to the same depth, e.g. the creation of a plow pan below the tillage depth. Compacted or impervious soil layers have reduced pore space and restricted water movement through the soil profile.

A one inch layer of water is added to a six inch diameter ring to measure infiltration rate.

Soil organic matter affects infiltration through its positive affect on the development of stable soil aggregates, or crumbs. Highly aggregated soil has increased pore space and infiltration. Soils high in organic matter also provide good habitat for soil biota, such as earthworms, that through their burrowing activities, increase pore space and create continuous pores linking surface to subsurface soil layers.

Management that reduces soil cover, disrupts continuous poor space, compacts soil, or reduces soil organic matter negatively impacts infiltration. Since tillage negatively affects all of these properties, it plays an important role in a soil's infiltration rate.

Table 1. Steady infiltration rates for general soil texture groups in very deeply wetted soil. (Hillel, D. 1982. Introduction to soil physics. Academic Press, San Diego, CA)

Soil Type	Steady Infiltration Rate (in/hr)
Sands	> 0.8
Loams	0.2 - 0.4
Clays	0.04 - 0.2

Relationship to Soil Function

Infiltration is an indicator of the soil's ability to allow water movement into and through the soil profile. Soil temporarily stores water, making it available for root uptake, plant growth and habitat for soil organisms.

Problems with Poor Function

When water is supplied at a rate that exceeds the soil's infiltration capacity, it moves downslope as runoff on sloping land or ponds on the surface of level land. When runoff occurs on bare or poorly vegetated soil, erosion takes place. Runoff carries nutrients, chemicals, and soil with it, resulting in decreased soil productivity, off-site sedimentation of water bodies and diminished water quality. Sedimentation decreases storage capacity of reservoirs and streams and can lead to flooding.

Restricted infiltration and ponding of water on the soil surface results in poor soil aeration, which leads to poor root function and plant growth, as well as reduced nutrient availability and cycling by soil organisms. Ponding and soil saturation decreases soil strength, destroys soil structure, increases detachment of soil particles, and makes soil more erodible. On the soil surface rather than in the soil profile, ponded water is subject to increased evaporation, which leads to decreased water available for plant growth.

A high infiltration rate is generally desirable for plant growth and the environment. In some cases, soils that have unrestricted water movement through their profile can contribute to environmental concerns if misapplied nutrients and chemicals reach groundwater and surface water resources via subsurface flow.

Conservation practices that lead to poor infiltration include:

- Incorporating, burning, or harvesting crop residues leaving soil bare and susceptible to erosion,
- Tillage methods and soil disturbance activities that disrupt surface connected pores and prevent accumulation of soil organic matter, and
- Equipment and livestock traffic, especially on wet soils, that cause compaction and reduced porosity.

Improving Infiltration

Several conservation practices help maintain or improve water infiltration into soil by increasing vegetative cover, managing crop residues, and increasing soil organic matter. Generally, these practices minimize soil disturbance and compaction, protect soil from erosion, and encourage the development of good soil structure and continuous pore space. As a short-term solution to poor infiltration, surface crusts can be disrupted with a rotary hoe or row cultivator and plow plans or other compacted layers can be broken using deep tillage.

Long-term solutions for maintaining or improving infiltration include practices that increase soil organic matter and aggregation, and reduce soil disturbance and compaction. High residue crops, such as corn and small grains, perennial sod, and cover crops protect the soil surface from erosion and increase soil organic matter when reduced tillage methods that maintain surface cover are used to plant the following crop. Application of animal manure also helps to increase soil organic matter. Increased organic matter results in increased aggregation and improved soil structure leading to improved infiltration rates. Conservation tillage, reduced soil disturbance, and reducing the number of trips across a field necessary to produce a crop help leave continuous pore spaces intact and minimize the opportunity for soil compaction.

Conservation practices resulting in infiltration rates favorable to soil function include:

- Conservation Crop Rotation
- Cover Crop
- Prescribed Grazing
- Residue and Tillage Management
- Waste Utilization

Measuring Infiltration

The Single Ring (Flooded/Ponded) Infiltrometer Method is described in the Soil Quality Test Kit Guide, Section I, Chapter 3, pp. 7 - 8. See Section II, Chapter 2, pp. 55 - 56 for interpretation of results.

Reference: Lowery B, Hickey WJ, Arshad MA, and Lal R. 1996. Soil water parameters and soil quality. In: Doran JW, Jones AJ, editors. Methods for assessing soil quality. Madison, WI. p 143-55.

Specialized equipment, shortcuts, tips:

To accurately assess infiltration and compare rates for different soils, the soils should be at similar moisture content when taking the measurement. It is recommended that measurements be taken at field capacity, defined as the water content of the soil root zone at which drainage (by gravity) becomes negligible. If the soil is already saturated, infiltration will not occur; wait for one or two days to allow for drying to measure infiltration rate.

Time needed: 60 minutes or more depending on soil conditions

Infiltration and Runoff

A rainfall simulator demonstrates infiltration and runoff. See photos below to see how a Holdrege Silt Loam soil fared with different tillage and residues.

Rain applied was 1 inch in 5 minutes. The front jars caught runoff while the back jars caught infiltration. Note when the soils were flipped what the 2-3 inch depth below the soil surface demonstrated. Wet soil due to better infiltration.

1. Bare Tilled Soil – Crusting quickly occurred producing lots of runoff and very little infiltration. Note the dry soil at the 2-3 inch depth.

2. Tilled Soil w/ 30% Cover – A little less runoff and a little more infiltration than #1.

3. Tilled Soil w/ 100% Cover – Less runoff and more infiltration than 1 & 2. Infiltrated through the soil on the down slope side of the soil pan.

4. Bare No-Tilled Soil – Very little runoff. Water infiltrated throughout the pan. What if residue was left on this sample as the case in a no-tilled field?

5. No-Till Grass – Pan wasn't flipped but look at all the infiltration (finger pointing to) and how very little runoff there was.

Looking at the white board behind the soils, note the raindrop splash on the bare soils versus the covered soils. Also note the little splash on the bare no-till versus the bare tilled.