North Dakota State University
CROP & PEST REPORT

NDSU EXTENSION

No. 7 June 22, 2023

Inside this Issue...

NDSU FIELD DAYS SET

NDSU Field Days provide an opportunity for farmers, ranchers and others to hear about the latest research and practices in animal science, agronomy and horticulture.

The North Dakota State University Research Extension Centers' annual field days are set. The events take place at the Research Extension Center sites across the state and feature speakers, presentations and tours covering a diverse array of topics. The field days are open to the public.

The dates and locations for the field days are:

July 10 – Central Grasslands Research Extension Center – Streeter (10 a.m.-3 p.m. CDT)

July 11 – Hettinger Research Extension Center (5-7 p.m. MDT followed by supper)

July 12 and 13 – Dickinson Research Extension Center
- July 12 – Livestock tour at Manning Ranch (9 a.m.-noon MDT followed by lunch)
- July 13 – Horticulture tour (9 a.m.-noon MDT followed by lunch), agronomy tour (1:30-5 p.m.)

July 12 and 13 – Williston Research Extension Center
- July 12 – Main site agronomy and horticulture (4-8 p.m. CDT)
- July 13 – Irrigated tour – Nesson Valley Irrigation Research and Development farm, located 23 miles east of Williston on Highway 1804 (8:30 a.m.-Noon CDT)

July 17 – Agronomy Seed Farm – Casselton (5 p.m. CDT agronomy, 7 p.m. supper)

July 18 – Carrington Research Extension Center – Carrington (9:15 a.m.-3:30 p.m. CDT)

July 19 – North Central Research Extension Center – Minot (8:30 a.m.-Noon CDT)

July 20 – Langdon Research Extension Center – Langdon (8:45 a.m.-Noon CDT)

July 25 – Horticulture Research and Demonstration Gardens – Fargo (3-7 p.m. CDT plants, local foods and outdoor spaces)

Aug. 3 – Carrington Research Extension Center's Oakes Irrigation Research Site – Oakes (8:30 a.m.-noon CDT followed by lunch)

Sept. 9 – NDSU Research Arboretum – Amenia (12:30 p.m.)

NDSU Agriculture Communication
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entomology

SCOUT FOR SOYBEAN APHIDS

The IPM Crop Survey found soybean aphid this past Monday, June 19, in Sargent County near Stirum, southeastern North Dakota. The high temperatures over 90°F and severe thunderstorms can slow reproduction of soybean aphids. However, temperatures are forecasted to be moderate in the mid-80° F late week and into next week. Optimal reproduction for soybean aphids is when the temperature is in the low 80° F. Soybean aphid females give birth to nymphs (no wings), and then these nymphs can develop into a reproducing adult in seven to 10 days. So, you can see how soybean aphids can reproduce quickly.

Begin scouting soybean fields at the V3 to V4 stage to determine if soybean aphids are present in fields. Scout for soybean aphids by walking a "W" pattern in the field and check 5 spots throughout the field. Check a minimum of 38 plants for each 50 acres of soybeans. Estimate the number of aphids per plant and then calculate the percent of plants infested and the average number of aphids per plant. Insecticides are not recommended at this time to encourage the natural control of predators and parasitic wasps. When scouting, look for predators (lady beetles or lacewing larvae) as 'indicators' of the presence of soybean aphids. **The critical growth stages for making soybean aphid treatment decisions are from the late vegetative to early reproductive stages (R3) in ND.**

Soybean aphid nymphs found in Sargent County. (Tommy Crompton, NDSU Extension IPM Scout, Fargo)

Economic Threshold (E.T.):

The E.T. has a built-in window of 7 days to apply a foliar insecticide before aphid population will reach 'yield loss' levels. At the E.T., there is no yield loss. If the aphid populations are above the E.T., it indicates the need for a foliar-applied insecticide to prevent yield loss.

Economic Thresholds for Soybean Aphids

Crop Stage	# Aphids per Plant	% of plants Infested
Late vegetative to R1 (beginning of flowering) to R5 (beginning seed)	250	80% and increasing populations
R6 (full seed)	No treatment necessary	

Avoid early insecticide applications for control of soybean aphids. Our research funded by the North Dakota Soybean Council showed that early insecticide application before the E.T. resulted in no significant yield gain from spraying compared to when the E.T. is reached. The residual foliar insecticide activity will not last through the entire aphid season if the insecticide is applied early. So, growers may have to re-spray at an additional cost if soybean aphid populations resurge. Some years soybean aphid populations do not increase to the E.T. level due to climatic conditions and/or beneficial insects keeping aphids in check naturally (growers might not have to spray at all). Regardless of the insecticide used, application timing at the E.T. is the optimal timing for soybean aphid control.

COLLECTING LEAFY SPURGE FLEA BEETLES

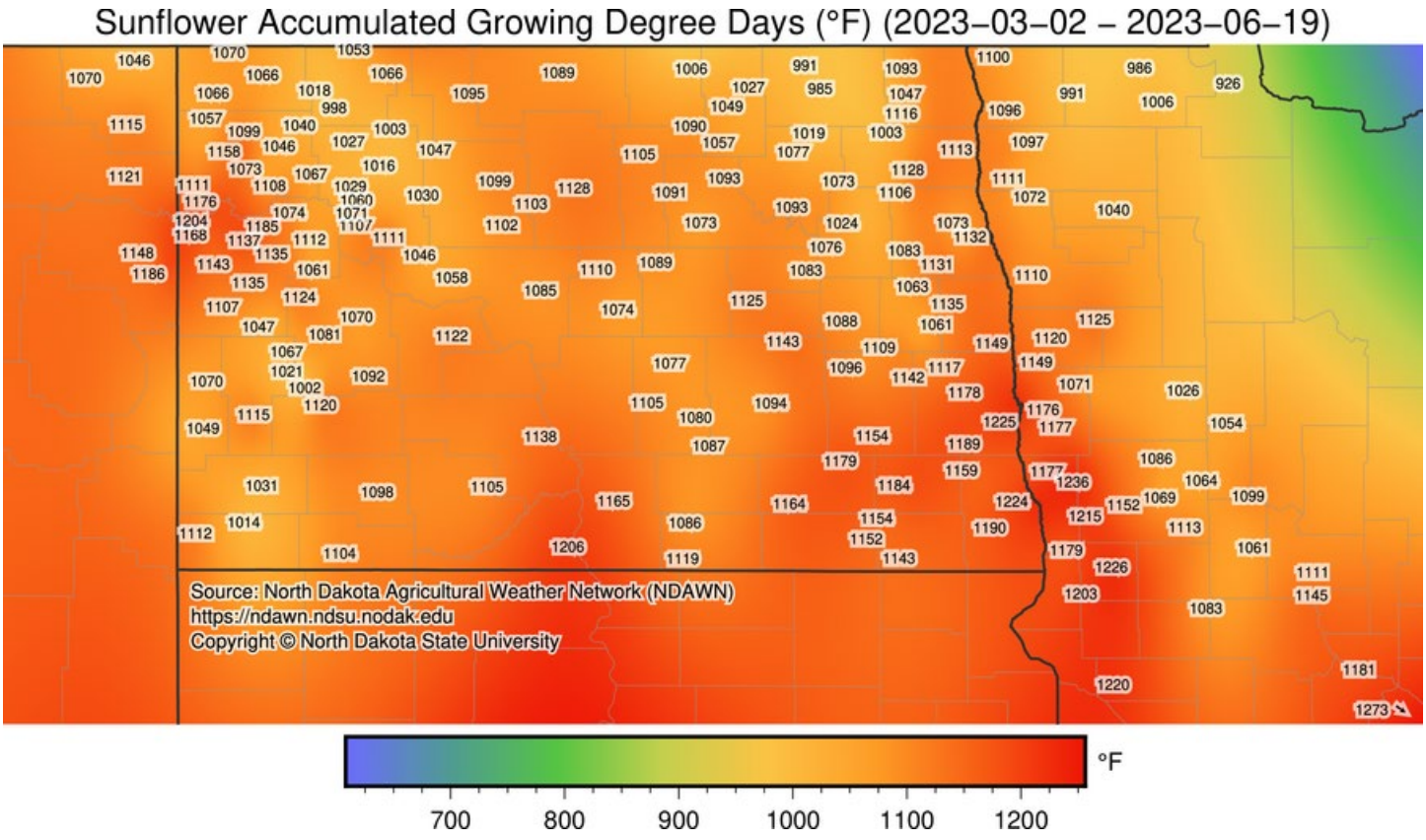
Leafy spurge is flowering and land managers may be interested in obtaining leafy spurge flea beetles (*Aphthona* species) for biocontrol of this noxious weed. Leafy spurge flea beetles are an effective means of controlling leafy spurge in North Dakota. This group of flea beetles is host-specific to the leafy spurge plant, which makes them an ideal biological control choice.

The accumulated growing degree days (AGDD) for sunflower (base of 44° F) can be used as a guide to determine when to begin scouting for adult flea beetles. Begin scouting for adult flea beetles when the AGDD approaches 1,000. **Flea beetles should be collected between 1,200 and 1,600 AGDD using the sunflower GDD model from NDAWN.** Adult flea beetles can be easily collected with a 15-inch sweep net.

Now is a good time to start scouting for leafy spurge flea beetle and good sampling sites as all areas of North Dakota have accumulated 1,000 AGDD. Use the sunflower degree days/growth stage application on NDAWN website. Select 'Map' and then enter "2023-03-01" for the planting date and select "degree day" for map type. See map below.

After late July (or 1,600 AGDD), flea beetles begin to lay eggs and should not be moved or collected. Leafy spurge flea beetles typically take three to five years to establish and impact leafy spurge infestations.

To find collecting sites for leafy spurge flea beetle, contact your local county weed office (number listed in local phone book). Leafy spurge flea beetles also are available commercially for purchase at WeedBusters BioControl in Montana. For more information, see the NDSU Extension publication on Leafy Spurge Control Using Flea Beetles (*Aphthona* spp.) W1183 (Revised).



WHEAT MIDGE RISK FORECAST AND EMERGENCE

Wheat midge is an economic insect pest of hard red spring wheat and durum wheat in the northern tier of North Dakota. Soil samples collected in North Dakota wheat fields indicate low levels of overwintering wheat midge larvae (cocoons). A total of 2,040 soil cores were collected from 22 counties in the fall of 2022 to estimate the statewide risk for wheat midge for the 2023 spring wheat growing season. Soil cores were collected by the ANR County Extension Agents and support was from the North Dakota Wheat Commission.

Adult wheat midge (P. Glogoza)

The majority of the soil samples had zero wheat midge cocoons in the soil for the past three years. The percentage was 97.5% with no midge cocoons in 2023, 95% in 2022 and 86% in 2021. This is the record low since the wheat midge larval survey for overwintering cocoons started in 1995.

Only about 2.5 percent of soil samples were positive for wheat midge cocoons, with density ranging from 36 to 143 cocoons per square meter. This is a low risk for wheat midge infestation, which is classified as one to 200 midge cocoons per square meter.

Low risk areas were scattered in eight counties throughout the state, including the northwest area (Burke County), north-central area (Benson, McHenry and Rolette Counties), and the west-central area (McLean County). No soil samples had moderate or high cocoon densities of wheat midge (201 to over 800 midge larvae per square meter). See annual wheat midge risk maps at https://www.ndsu.edu/agriculture/ag-hub/ag-topics/crop-production/diseases-insects-and-weeds/insects/wheat-midge-risk-maps

This dramatic decrease in wheat midge populations since 2019 is probably due to drought in 2020 through 2022. Drought can cause wheat midge to overwinter for two years instead of the typical emergence during the following season. Larvae also are susceptible to dryness and require rain to emerge from the soil in late June through mid-July, and to drop out of the mature wheat heads and dig into the soil to overwinter as cocoons. In some locations, wheat midge larvae remained in the wheat heads during harvest due to the dry environment and ended up in the harvest trucks instead of the soil. Comparing precipitation from May through August with wheat midge cocoon densities for each surveyed county over the past 12 years shows a strong positive correlation between precipitation and wheat midge populations.

Another reason wheat midge infestation risk is so very low could be due to the late spring wheat planting in 2022 due to the cool, wet conditions in early May. Late planting dates reduce the risk of infestation due to the wheat heading after peak emergence of wheat midge.

With the very low populations of wheat midge for the third year in a row, night scouting for adult midges in spring wheat fields is not pressing, unless the field is continuous wheat and/or favorable moist weather in late June to early July occurs during emergence. These two factors can cause rapid increases in the numbers of emerging adult wheat midges, especially in areas that did receive adequate precipitation last year.

Wheat producers should use the wheat midge degree-day model to predict the emergence of wheat midge and to determine when to scout, and if their wheat crop is at risk. Select your nearest NDAWN station and enter your spring wheat planting date. The output indicates the expected growth stage of the wheat and whether the crop is susceptible to midge infestation, as well as the timing and percent of wheat midge emerged.

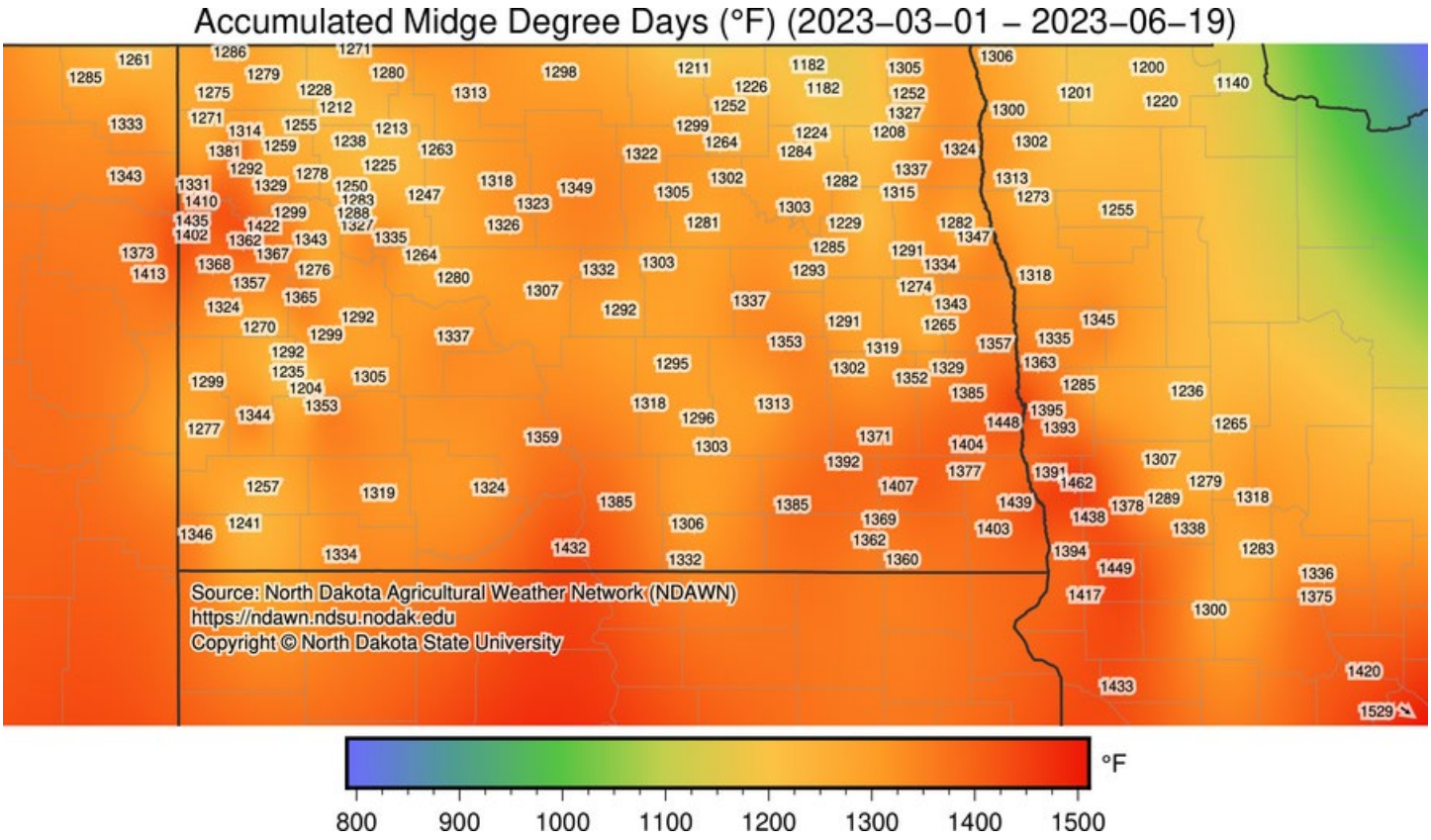
This 2023 forecast is favorable for growers since the risk for yield loss and reduced grain quality from wheat midge is low. Unfortunately, the bad news is that the beneficial parasitic wasp that attacks and kills wheat midge can't survive without its host. No parasitized cocoons were found in 2022 and 2021. This is the second time that no parasitic wasps were observed. Parasitic wasps play an important role in natural control of wheat midge and parasitize the eggs or larvae. In contrast, the parasitism rate was 0% in 2022 and 2021, 15% in 2020, 36% in 2019 and 9% in 2018.

Scouting for the tiny, orange adult flies always is recommended in any areas with moist soils during midge emergence. Some tips for monitoring for wheat midge include scouting during the night, when wheat midge is most active, warm night temperatures about 59° F and winds less than 6 mph. Wheat is most susceptible to midge infestations from heading to early flowering (less than 50% flowering).

Wheat Midge - Economic Thresholds for Foliar applied Insecticides
Hard red spring wheat = one or more midge observed for every four or five heads
Durum wheat = one or more midge observed for every seven or eight heads

Wheat midge emergence is starting for the male in the northern tier and for the female in the southern tier of North Dakota. Since conditions are dry again this year, larvae also could remain in extended diapause for at least one additional year and emerge in 2024. See wheat midge AGDD map below.

Wheat Midge Degree Days (base temperature of 40° F)	
Degree Day Accumulations	**Wheat Midge Emergence**
1,100	Male wheat midge emerging
1,300	10 percent of females emerged
1,475	50 percent of females emerged
1,600	90 percent of females emerged



Janet J. Knodel, Extension Entomologist

plant pathology

BACTERIAL LEAF STREAK – EARLY SYMPTOM DEVELOPMENT

Bacterial leaf streak is considered to be our number one foliar disease of wheat in North Dakota. The disease can cause extensive flag leaf damage resulting in reduced photosynthesis and reduction in yields (up to 60% on the most susceptible varieties). We often notice this disease after the flag leaf has fully expanded and the disease becomes much more noticeable as wheat plants enter the flowering stages of development (Figure 1). We also know this pathogen is seedborne, but rarely see early symptom development (tillering growth stage).

During this past week when visiting some of my research trials, I noticed pockets of yellow and diseased leaves in our large blocks of wheat. Upon further inspection, it became clear the lesions were caused by bacterial leaf streak and confirmed the seedborne nature of the disease. Figures 2 through 4 provide the steps to detecting bacterial leaf streak on tillering to jointing wheat. Regardless of the growth stage bacterial leaf streak is detected, accurate diagnosis is important, especially with regards to fungicide input expectations. Simply put, fungicides do not manage bacterial leaf streak and our best management tool is host resistance (select a variety with a BLS score of 5 or less). We have evaluated several bactericides in wheat over the past three growing seasons and none of the products evaluated managed the disease and did not protect yield.

Figure 1. Wheat flag leaves with bacterial leaf streak symptoms of yellow to brown streaks. Note flag leaf death starting to occur on leaves with the most amount of damage.

Figure 2. Brown to yellow lesions noticed on the bottom leaf of a wheat plant at the tillering growth stage.

Figure 3. Upper side of leaf with brown to yellowish lesions. Note water soaking (grease looking spot) on the edge of the lesions. Water-soaking is a diagnostic symptom of a bacterial disease.

Figure 4. Underside of leaf with brown to yellowish lesions. Note bacterial ooze droplets in the center of some of the lesions. This is a diagnostic sign of a bacterial pathogen.

SCAB RISK REMAINS LOW FOR WHEAT AND BARLEY

Spring wheat and barley growth stages vary considerably in the state and some of the crop has headed. Most reports of heading spring wheat and barley coincides with areas experiencing heat and extreme water stress. Currently, small grains at the heading and/or flowering growth stages are at low risk for scab development. We may see a statewide rain event this week that could increase scab risk, but we may not see this increase in scab risk until the end of next week. There are still a lot of unknowns with rainfall amounts and expected increases in relative humidity, so I will continue to provide updates once the system passes through the state.

As a reminder, we have about a seven-day window to make an effective application in wheat and barley. The best time to apply a fungicide in wheat is at early-flowering and up to seven days after (Figure 1). For barley, the best time to apply is at full-head and up to seven days later (Figure 2). With regards to selecting a fungicide, Caramba®, Miravis Ace ®, Proline ®, Prosaro®, Prosaro Pro®, and Sphaerex® all are rated “good”. This means they will provide 50-60% scab suppression (on average). Folicur and generic formulations are rated “fair” and will provide around 20% suppression (on average).

Figure 1. The best time to make a fungicide application for scab suppression in wheat is at early-flowering (yellow anthers observed in center of wheat spike – stage depicted in center spike) and up to seven days later.

Figure 2. The best time to make a fungicide application for scab suppression in barley is at full head (fourth head from the left) and up to seven days later.

Andrew Friskop
Extension Plant Pathology, Cereal Crops

INTERACTIVE SCLEROTINIA RISK MAP AVAILABLE STARTING ON JUNE 20, 2023

The Sclerotinia risk map will be available through the **NDSU Canola Pathology Program**, the **Northern Canola Growers Association**, and the **Minnesota Canola Council** websites starting on June 20, 2023. The maps, which are refreshed daily, can be observed by clicking on the "Risk Map" button. The maps represent areas with low, intermediate and high risk in green, yellow and red, respectively; clicking on any NDAWN station in the map will show the estimated percentage of risk of disease development for that station (Fig. 1). This information will help growers make a more informed spraying decision.

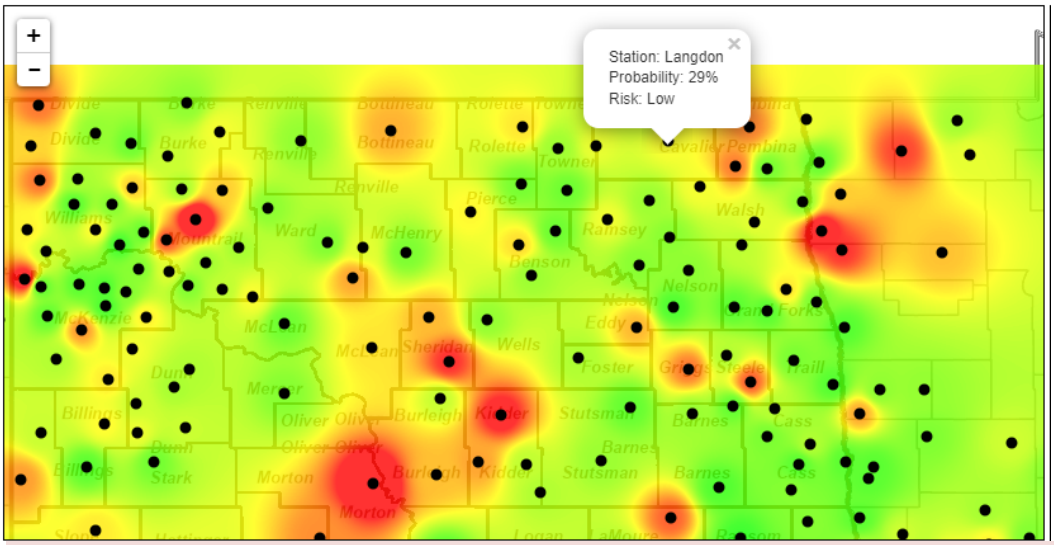


Figure 1. Sclerotinia stem rot risk map for June 20, 2023. Areas in red are at high risk, in yellow at intermediate risk, and in green at low risk of disease development.

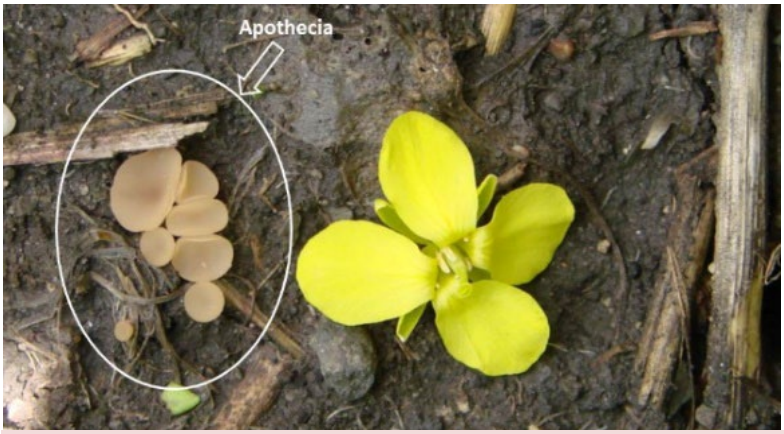


Figure 2. Apothecia of Sclerotinia sclerotiorum in a wheat field. A canola flower is to its side for size comparison.

To tailor the risk to a field, growers are encouraged to use the risk calculator on the same website.

Growers should remember two important things when they look at the risk map. First, the risk only applies to fields where canola is flowering. Second, the risk map is only as accurate as the weather information we have. Rainfall can be sporadic; if your fields have had more/less rain than the general area, then you may have a relative higher/lower risk, respectively. Checking your fields for presence of apothecia (Figure 2) will provide confirmation of increased risk.

Luis del Rio Mendoza
Plant Pathology

plant science

IRON DEFICIENCY CHLOROSIS SHOWING UP

At this time of the year, yellowing of soybean leaves due to Iron Deficiency Chlorosis (IDC) is starting to show up. There is genetic difference between soybean varieties in their tolerance to IDC conditions.

Seed from soybean varieties entered in NDSU variety trials are annually tested for IDC tolerance in a site with severe IDC expression. The varieties are scored on a scale of 1 to 5 (Figure 1). The average rating on this IDC stress site for 2022 was 3.5, showing severe IDC (Figure 2). As indicated in the Figure 2, there are varieties with higher levels of tolerance to IDC.

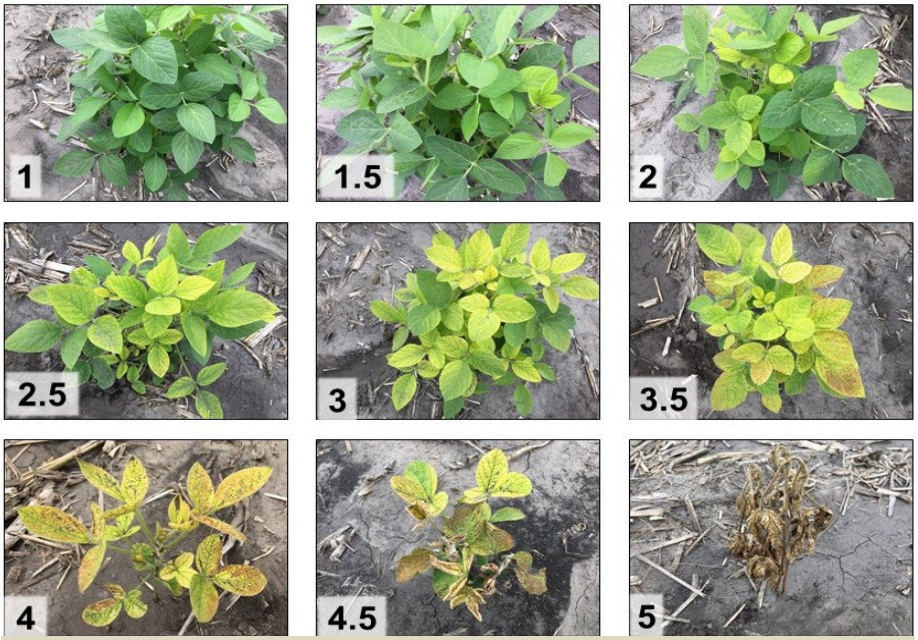


Figure 1. IDC sating scale 1 plant completely green (no IDC) to 5 where plant is dead.

Figure 2. IDC ratings for 240 soybean varieties tested by NDSU in 2022.

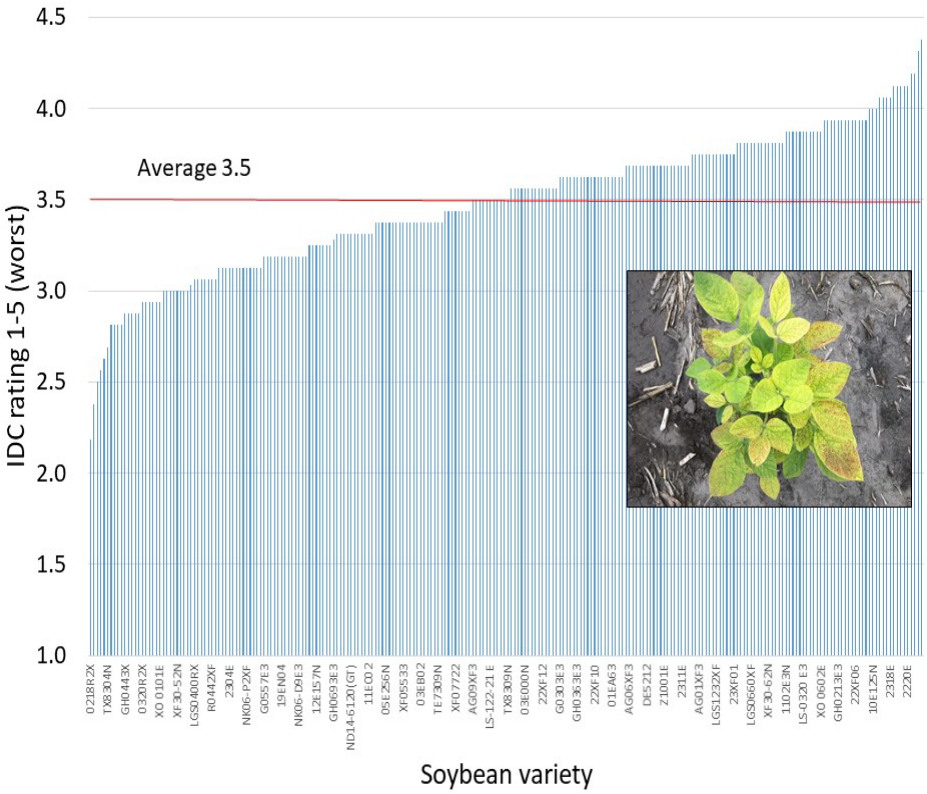
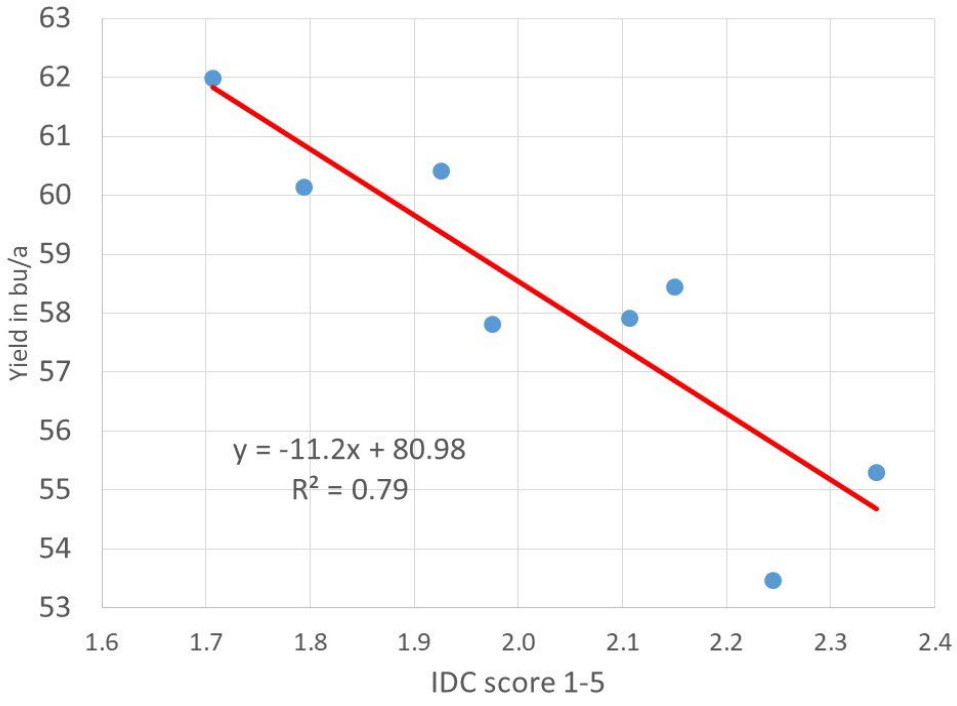


Figure 3. IDC ratings and soybean yield at Fargo 2022. As IDC severity increased the corresponding soybean yield decreased.



No soybean variety is immune to chlorosis. There are large differences in yellowing, plant stunting, and subsequent yield reduction between the most tolerant and most susceptible varieties (Figure 3). Field choice and selecting a variety with tolerance to IDC are important management decisions that producers should make in avoiding or reducing the negative yield effect of chlorosis. The data for variety response for 2022 can be found at https://www.ndsu.edu/agriculture/extension/publications/north-dakota-soybean-variety-trial-results-2022-and-selection-guide. Later in the summer, when the 2023 data is collected, data will be available at https://www.ag.ndsu.edu/varietytrials/soybean.

CHECK FOR NODULES ON SOYBEAN ROOTS

Soybeans are legumes and have the ability, through a beneficial relationship with specific bacteria, to fix atmospheric nitrogen (N) and make it available to the soybean plant. Legumes normally do not require N fertilizer because of this relationship with beneficial bacteria. The N-fixing bacteria colonize host roots and form nodules (small swellings) on the root system. Nodules that are fixing N are pink or red inside. High N content in the soil reduces the ability of the bacteria to form nodules and fix N. Most agricultural fields will have some residual N at the beginning of the growing season and soybean plants will use this N. We do not recommend the application of N fertilizer if the plant is able to normally nodulate and provide the needed N to the plant from the symbiotic relationship with the beneficial bacteria.

Limited nodulation may occur in fields where there is no previous soybean cropping history. Other factors that may reduce nodulation are wet conditions early in the season or dry soil conditions. The presence of root rots or severe IDC may also inhibit the ability of the bacteria to form nodules. We recommended to check roots for nodules. Carefully dig up plants to avoid sloughing off the nodules and wash them in a bucket of water. Check a number of locations in each field. Adequate nodulation at the V4-V6 is in the range of 7 - 14 nodules per plant. The number of nodules will still increase as the plant continues to develop.

Hans Kandel
Extension Agronomist Broadleaf Crop

Dave Franzen
Extension Soil Specialist
701-799-2565

HEAT STRESS ON SMALL GRAINS

I have been getting a number of questions related to heat stress in small grains. It has been much hotter than ideal for small grain growth and development so far this season. Spring wheat, barley, oats, and other small grains benefit tremendously from long, cool springs with adequate moisture. While much of the state was able to seed into good moisture after snow melt and get off to a decent start, rain has been short to very short the past 6 weeks. We've also experienced daytime temperatures well above normal for this time of year with many days reaching 90°F and above. Spring wheat maintains its highest yield potential with daytime high temperatures from approximately 50-75°F. When temperatures exceed 75°F during late tillering, the number of spikelets per spike can be reduced. If the heat occurs even earlier during wheat vegetative growth, i.e., emergence through early tillering, the number of tillers can be reduced. Fewer tillers mean fewer heads and fewer heads mean lower yield.

When temperatures are above 85°F, photorespiration begins to occur. Photorespiration happens when C3 plants, like wheat and other cool-season cereals, close their stomata (pores or openings in the leaf) on sunny, hot, and dry days to conserve moisture. If the stomata stay closed for a long period of time and it remains sunny and dry, the plant uses up all the CO_2 in its leaves because photosynthesis continues. The plant can't shut off its photosynthesis. The plant can't get more CO_2 because its stomata are closed to prevent water loss. After CO_2 levels drop, the plant starts fixing oxygen (O_2) because there is more of it around than the CO_2 the plant needs. This wastes energy and decreases photosynthetic output, also called efficiency. All C3 plants like wheat have this problem in hot and dry environments. C4 grasses like corn and sorghum that evolved in warmer climates have solved this problem. Corn and other C4 species have a special enzyme called PEP (phosphoenolypyruvate carboxylase) that has a higher affinity, aka stronger attraction, to CO_2 than Rubisco, the enzyme C3 plants use to fix CO_2.

16" tall wheat heading out in Cass County NW22 research site near Fargo airport on 6/19/2023.

Deep crack in the Fargo-Ryan silty clay loam at the NW22 research site in Cass Co on 6/19/2023.

So in short, the high temperatures of the past 6 weeks have not been kind to our small grains. I have wheat 14-16" tall heading out in Cass County. I've heard of even shorter cereals to the north and west and farmers making the decision now to not spend any more money on inputs for the crop. It is still a little too soon to say what yields might look like as good rains and some cooler temperatures can still help the 2023 wheat crop. However, we have already lost a chunk of our yield potential in the places that felt like August in May and June. The photos included are of 16" tall wheat heading out in Cass County, taken 6/19/23. Deep cracks are opening up in the Fargo clay soils. Don't drop your car keys!

Clair Keene
Extension Agronomist Small Grains and Corn

DRY, HOT WEATHER AND FERTILIZER ISSUES

The number one question from farmers and ag-practitioners is whether the N applied as urea over the past few weeks after seeding is still there. After the urea was applied, there was a week or more of humid nights/days during which the urea 'slaked' for a better term, so you couldn't see the pellets anymore. That made the urea come in contact with the soil enzyme urease, which splits the urea into its component parts of CO_2 and NH_3, both of them gases, or at least the ammonia having a gas phase. If the farmer was savvy enough to have the urea treated with the proper rate of NBPT (a spectacular urease inhibitor), then the first 10 days after slaking the urea was completely protected. After that, the 'tail' of the NBPT is chewed away by some organism and urea can be split by the enzyme. This 'end' and 'beginning' is not instantaneous and it takes some time to reach the end of inhibitor life. This is what I would estimate would happen- if the application is 15 days old, subtract 10 days for the beginning of urease splitting to begin. Then, if soil pH is greater than 7 and/or there is considerable residue on the soil surface, I would estimate a 10% loss of N after that. If it continues to be really dry, the losses experienced after that would probably remain at about 10% per week. In my studies of urease inhibitors about a decade ago, in a perfect loss environment, moist conditions in the experimental field cylinder continuously, very humid under the plastic cover, with pH slightly greater than 7 and about 30% residue cover, loss was 30% in a week with no NBPT. Losses during the same time under those ideal loss conditions with inhibitor were only a few percent.

IN-SEASON NITRATE SAMPLING?

The pre-sidedress soil nitrate test was developed to help farmers in the corn belt determine corn N need. Although North Dakota/regional farmers can successfully utilize a fall 2foot nitrate sampling/analysis to determine N rate for the coming year, sampling in the fall in areas to our east and south would almost always be a fruitless effort. Too much water, only frosty soil, tile lines run most of the year when there is moisture, there is only slowing, no stopping nitrification. If a North Dakota farmer was not able or neglected to sample in fall 2022, then a PSNT sampling may be helpful. Agvise Laboratories maintains a nice description of sampling and use at https://www.agvise.com/sidedress-corn-using-the-pre-sidedress-soil-nitrate-test-psnt/ . Note that the Iowa State recommendations on the site only cover manured fields, corn after alfalfa, and after excessive rainfall.

My experience with the PSNT has not been overwhelmingly successful. Our N recommendations in the NDSU calculator are far more predictive in our area. I was part of an 8 state project that looked at several methods to predict N rate, and PSNT was useful only when other factors were considered
https://www.ndsu.edu/fileadmin/snrs/Files/Adjusting_Corn_Nitrogen.pdf

IDC IN SOYBEAN WORSE THAN LAST YEAR?

Growers are surprised when dry seasons exhibit greater IDC than wet years. In wet years, although the water table (distance from soil surface to the depth of saturated soil) is more shallow, the direction of water movement is usually downward, forcing surface soluble salts deeper and making surface EC values lower. Although soluble salts do not cause IDC, the carbonates in the soil do that, soluble salt levels are the reason that ND region IDC is so severe compared to soils in Iowa and other states where there is similar carbonate content, but no salt. In a dry season such as this year, capillary water is pulled to the surface along with the soluble salts in the ground water, increasing the salts near the surface and increasing the severity of IDC. The IDC we see is evidence that capillary water has risen to near the soil surface, supplying sufficient water around soybean roots for the solubility product of calcium and or magnesium carbonate 'bicarbonate (HCO_3^-)' to inhibit the activity of root exudates of soybean from being able to transform soil iron (Fe) into a much more soluble form for uptake.

FLASHBACK ON PRE-GLYPHOSATE ERA WEED CONTROL

Yes, I know this is the Soils section, but the conversation around the Extension table in our weekly conference call with agents and specialists made me flashback to my experiences as an agronomist in my previous career (before 1994). It was the pre-glyphosate era at the time, and when there was a spring filled with environmental stress, dry, hot, two things happened; first, herbicides didn't kill the weeds nearly as well. Secondly, the crops were injured more frequently and more severely. I can't begin to count the number of field visited, where I had to talk with concerned to angry clients who wondered how the soybeans could be so injured and the weeds so healthy. I had no consoling answer then, nor do I have one now. I just know that it's the way pre- and post-glyphosate era herbicide applications work. No wonder farmers leaped at glyphosate when it was introduced. Were those the 'good-old-days'?

Dave Franzen
Extension Soil Specialist
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diagnostic lab

SPURGE HAWKMOTH CATERPILLARS

NDSU Extension Entomology received several identification requests for spurge hawkmoth caterpillars in just the past few days. Spurge hawkmoth (*Hyles euphorbiae*) is native to Europe and western Asia and was introduced to the United States in 1965 as the first classical biological control agent of leafy spurge. In North America, spurge hawkmoth is most abundant in the northern United States and adjacent Canadian provinces. Caterpillars are variable in color depending on age, ranging from green to orange to black (Figures 1). While not a very effective biocontrol agent, they are magnificent caterpillars and it's gratifying to see them happily munching on leafy spurge!

Figure 1. Spurge hawkmoth caterpillars. Photos by Patrick Beauzay, NDSU Extension.

Patrick Beauzay
NDSU Extension Entomology

stored grain

NDSU EXTENSION OFFERS SUMMER GRAIN STORAGE TIPS

Keep grain as cool as possible during the summer to extend the storage life and limit insect activity. Summer temperatures will warm grain, which could lead to insect infestations and mold growth. The goal for summer storage should be to keep the grain as cool as possible to extend the storage life and limit insect activity. Insect reproduction is reduced at temperatures below about 60 F.

Ventilate the top of the bin to remove the solar heat gain, which will warm the grain. Hot air under the bin roof will heat several feet of grain at the top of the bin to temperatures conducive to mold growth and insect infestations. Provide air inlets near the bin roof eave and an outlet near the peak to exhaust the hot air at the top of the bin. It's much like venting an attic; the heated air rises and is exhausted at the peak. A ventilation fan to exhaust the hot air is another option. Provide air inlets because the fan cannot exhaust air if an air inlet does not exist.

Periodically run grain aeration fans to keep the grain temperature cool as possible. Night air temperatures on average are near or below 60° F during the summer. Running the aeration fan for a few hours to push air up through the cool stored grain will cool grain near the top. Pick a cool early morning about every three weeks when temperatures are below 60° F to run the aeration fan, and only run the fan a few hours to minimize heating grain at the bottom of the bin.

Cover the fan when it is not operating to prevent warm air from blowing into the bin and heating the stored grain. If the wind blows primarily during the daytime, the grain will be warmed to the daily maximum temperature. Also, warm air is drawn into the bin due to a chimney effect if the fan opening is not covered. The chimney effect occurs when heated air exits the top of the bin pulling air into the bin through the fan opening.

Producers are encouraged to monitor the grain temperature. Temperature sensors on cables are an excellent tool, but they only measure the temperature of the grain next to the sensors. Because grain is an excellent insulator, the grain temperature may be much different just a few feet from the sensor and not affect the measured temperature.

Common locations to place a temperature cable are near the middle and a few feet from the south wall of a bin.

Grain Summer Storage Moisture Content: Having grain at an appropriate warm-season storage moisture content is very important to store grain safely during the summer. The maximum moisture content for warm-season storage is 13% to 14% for corn, 11% to 12% for soybeans, 13.5% for wheat, 12% for barley and 7% to 8% for oil sunflowers.

Mold growth will occur at summer temperatures if the grain exceeds the recommended moisture content. The allowable storage time for 15% moisture corn, for example, is only about four months at 70° F and two months at 80° F degrees.

Checking the grain moisture content is important because moisture measurements at harvest may have been in error due to moisture gradients in the kernel, grain temperature and other factors. In addition, the moisture may have changed while the grain was in storage due to moisture migration or moisture entering the bin.

Check Stored Grain: Stored grain should be monitored closely to detect any storage problems early. Check stored grain at least every two weeks. While checking on the grain, measure and record the grain temperature and moisture content. Rising grain temperatures may indicate insect or mold problems. Insect infestations can increase from being barely noticeable to major infestations in three to four weeks when the grain is warm.

Grain temperature cables are a wonderful tool, but do not rely on them to replace inspecting for insects or crusting and detecting odors or other indicators of storage problems. Another option for monitoring grain that is beginning to be used is to measure the carbon dioxide level. Mold growth and insect activity produce carbon dioxide.

Work Safely: Make sure everyone, including family and employees, working around stored grain understand the hazards and proper safety procedures. Too many people ignore safety practices and suffer severe injury or death while working around grain. Never enter a bin while unloading grain or to break up a grain bridge or chunks that may plug grain flow. Flowing grain will pull you into the grain mass, burying you within seconds. Use “lock-out/tag-out” procedures to assure equipment will not start before entering the bin.

Bridging occurs when grain is moldy or in poor condition. The kernels stick together and form a crust. A cavity will form under the crust when grain is removed from the bin. The crust isn’t strong enough to support a person’s weight, so anyone who walks on it will fall into the cavity and be buried under several feet of grain. Determine if the grain has a crust before any grain has been removed. If work needs to be done with a crust, it must be done before any grain is removed.

To determine if the grain is bridged after unloading has started, look for a funnel shape on the surface of the grain mass. If the grain surface appears undisturbed, the grain has bridged and a cavity has formed under the surface. Stay outside the bin and use a pole or other object to break the bridge loose.

If the grain flow stops when you’re removing it from the bin, a chunk of spoiled grain probably is blocking the flow. Entering the bin to break up the blockage will expose you to being buried in grain and tangled in the auger.

If grain has formed a vertical wall, try to break it up from the top of the bin with a long pole on a rope or through a door with a long pole. A wall of grain can collapse, or avalanche, without warning, knocking you over and burying you.

Never enter a grain bin alone. Have at least two people at the bin to assist in case of problems. Use a safety harness and rope that prevents you from descending rapidly more than a couple of feet when entering a bin.

Take time to think of all options before entering a bin.

Kenneth Hellevang
Extension Agricultural Engineer & Professor

around the state

NORTHEAST ND

The entire region is going through dry conditions with no significant amount of rain for the past 7-10 days. Crops such as small grains are showing signs of drought stress with leaf rolling and brown leaf margins. The added burden of high temperatures is pushing the crops to grow faster towards head development and flowering. Many wheat and barley fields are 12-19" tall, at boot stage with very few tillers. Considering the hot and dry conditions, the risk of scab disease in small grains continues to remain low. Canola is growing fast and covering the ground with the decreasing flea beetles. However, late planted canola is struggling with dry conditions. Corn is growing rapidly reaching nearly 6-8 leaf stage in some areas. Soybeans and sunflower stands are looking good. However, rain is much needed for these crops to survive and yield going forward. Grasshopper hot spots are increasing and several farmers are spraying to protect their crops from the nymph damage.

Drought stressed spring wheat in Griggs County (left) and Cavalier County (right)
Photo: Jeff Stachler, ANR Extension Agent, Griggs County and Anitha Chirumamilla

Soybeans in Towner County
Photo: Anitha Chirumamilla

Canola at 4-6 leaf stage in Cavalier County
Photo: Anitha Chirumamilla

Drought stressed corn in Ramsey County
Photo: Lindsay Overmyer, ANR Extension Agent, Ramsey County

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NORTHWEST ND

Most of the northwest have been abnormally dry this past week. As per NDAWN weather data from June 11 to 18, only very few areas in the northwest received scattered rain showers amounting from 0.01 inches in Ross last Thursday to 0.19 in Buford last Saturday. Almost all of the northwest received 0.00 inches of rain in this time frame. As of June 19, less than one percent of Mountrail County, more than half of Williams, McKenzie, and Burke Counties, and all of Divide County are in abnormally dry conditions as per U.S. and North Dakota drought monitor.

Crops like canola, mustard, and field pea are flowering. Lentil are up to 15-leaf node. Corn is up to V9; soybean are up to 5th trifoliate; and sunflowers around at V9-11. Chickpeas are starting to produce flowers. Although not a whole lot of field planted to flax this year, but flax is starting to produce flowers. For the most part crops were in drought and heat stress in the past week. Thankfully the severe thunderstorms in the early mornings of Monday and Tuesday (June 19 & 20) brought in the much-needed rain and now the crops look a little bit better compared to how they were prior to the thunderstorms. It is possible some fields may have wind-damaged crops. Winds speeds of up to 51 mph have been recorded in some areas. The severe thunderstorms brought in of up to 0.97 inches rain in some areas like in Pioneer in Williams county. Still the northwest counties need more precipitation if the 80 to 90° F dry weather will continue in the coming weeks especially now that the crops are blooming.

This season started out hot with very little rain. The grasshoppers have picked up where they left off last season. In some fields there is an overabundance and in other fields there seems to be hardly any. In areas that do, grasshoppers are within threshold for insecticide application (35-45 nymphs per square yard, 8-14 for adults). Grasshoppers are in much greater numbers in deep ditches. So far, no wheat midge has been detected through insect trapping. Crop diseases have yet to be seen, although we've seen crops that have some sun damage on them. These are mostly Williams and McKenzie counties. With the rain that has been forecasted for later this week, some diseases are expected to be seen in our IPM (Integrated Pest Management) crop scouting efforts in the coming weeks. At the Williston REC, we're seeing Ascochyta blight in our chickpea plots.

Drought and heat stressed canola producing flowers with considerably less vegetative biomass. Hot and dry weather can cause chemical weed control to be less effective even when applied at label weed size. Kochia in this field has shown regrowth.

Less than a foot-tall wheat at boot stage. The sudden high temperatures coupled with drought stress in the past two weeks have caused the most grass crops to start heading much earlier than expected.

Among the first hay bales for the year in the northwest. Forage crops are harvested much earlier than expected.

Heat damage on wheat leaves.

Small circular black dots on Chickpea leaves showing early signs and symptoms of Ascochyta blight.

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SOUTH-CENTRAL/SOUTHEAST ND

According to NDAWN, rain received in this region during June 1-19 ranges from 0.1 inch (Edgeley) to 2.7 inches (Lisbon), with the Carrington Research Extension Center (CREC) receiving 1 inch. During June 13-19, average daily water use (date of plant emergence in parenthesis): spring wheat (May 15) was 0.2 inch; and corn (May 25) and soybean (June 1) was about 0.1 inch. The entire region would welcome rainfall that would rewet topsoil! Center pivots are operating at the CREC for research trials and seed production fields.

CREC irrigated spring wheat variety trial seeded on May 5 (picture taken June 19).

Crop growth stages at the CREC: winter cereals are flowering to early seed development; early May planted barley and spring wheat are heading (see picture); canola and flax are flowering; mid-May planted corn has 8 leaves; and soybean and dry bean are rapidly adding vegetation.

How productive are late-emerging corn plants compared to normal plant emergence for a field? A multi-year NDSU study conducted across the state indicates relative ear weight reduction of 35% and 41% of individual plants emerging 5-10 days and 11-17 days, respectively, after normal emergence date. Also, estimated yield loss was 1-2% or 2-6% if a field had 10% or 30%, respectively, of plants emerging 5-17 days after normal emergence.

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weather

WEATHER FORECAST

The Week in Review

Once again, average air temperatures were above normal for the past week (Figure 1). Tuesday, June 20, was particularly hot with many NDAWN stations east of the Missouri River recording high temperatures in the upper 90°s F (Figure 2). Note the sharp temperature contrast through central ND - thunderstorms, some severe with hail and strong winds, formed along this boundary Tuesday evening. One inch hail was reported from McLean, Pierce, and Wells Counties, and 1.75 inch (golf ball) hail was reported near Carbury and Kramer in Bottineau County. 65 MPH winds were reported near Rugby in Pierce County.

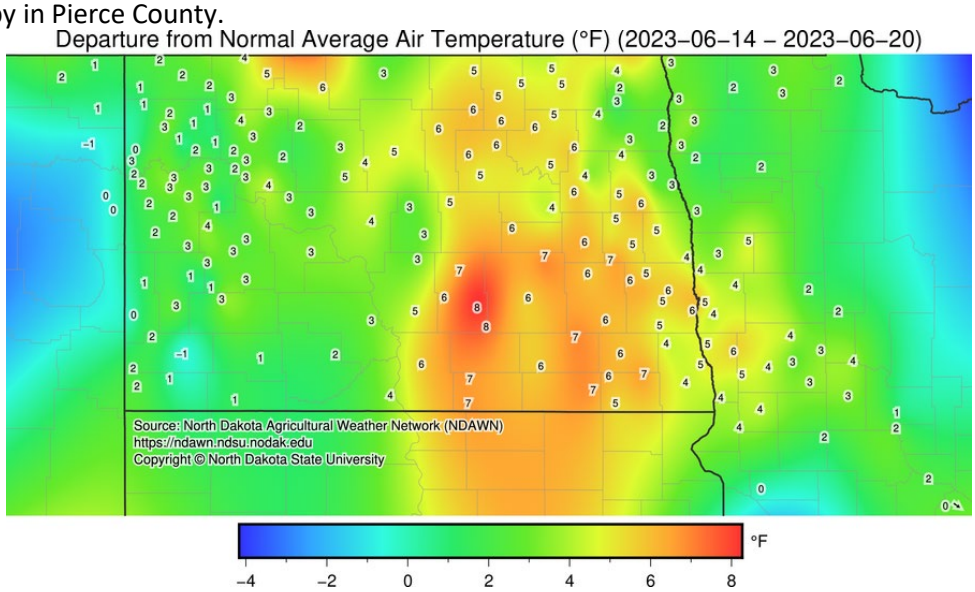

Figure 1. Average air temperature departure from normal from June 14 through June 20.

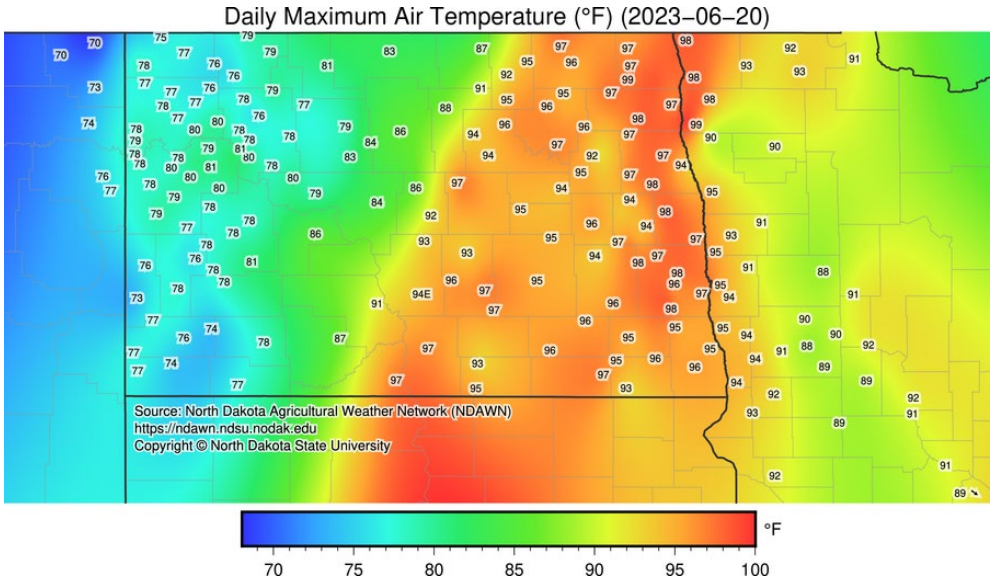

Figure 2. Maximum air temperatures for June 20 at reporting NDAWN stations.

There also was a sharp contrast between west and east for rainfall this past week (Figure 3). Most areas of ND were below normal for rainfall (Figure 4), except areas along a line from western Sioux County northeast through eastern McLean and western Sheridan Counties.

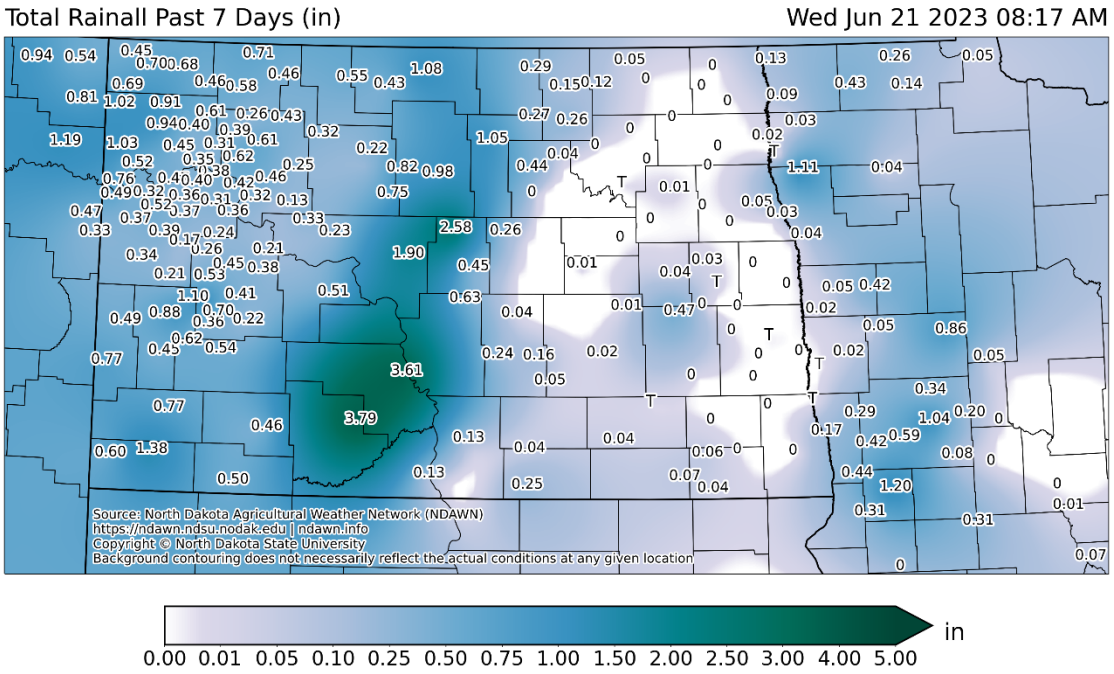

Figure 3. Total rainfall from June 15 through June 21.

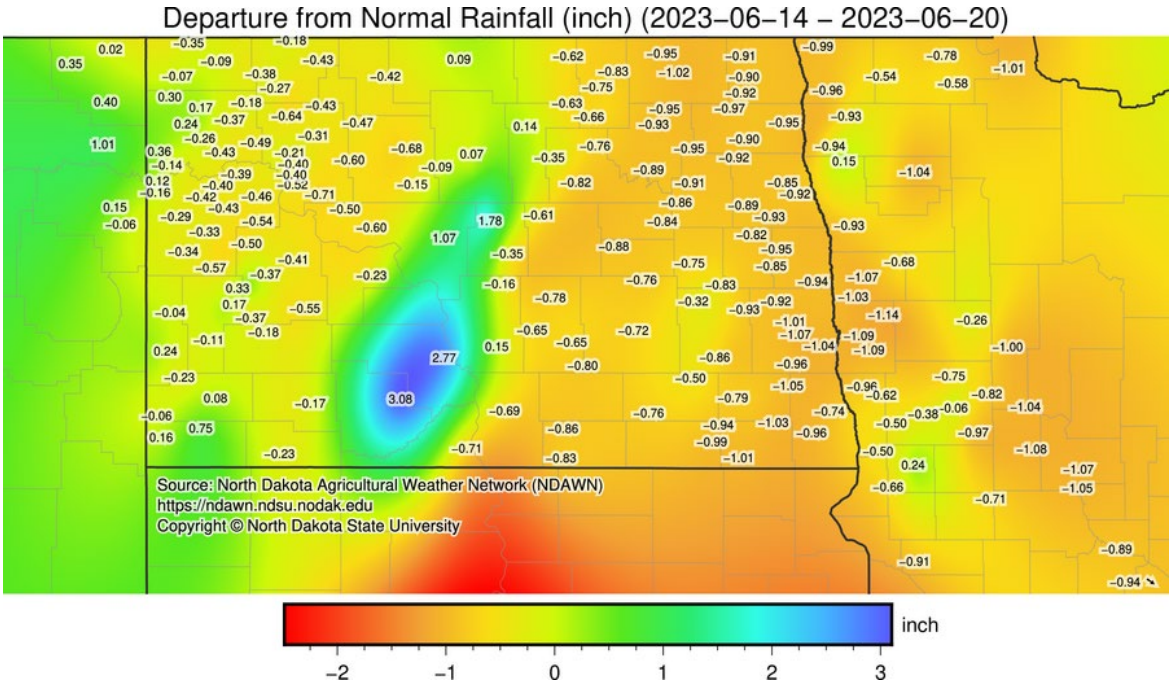

Figure 4. Rainfall departure from normal from June 14 through June 20.

Soil moisture at the 4-inch depth is largely deficient across most of the state (Figure 5), while soil moisture at the 8-inch depth looks a bit better, but still with many stations reporting a deficit (Figure 6).

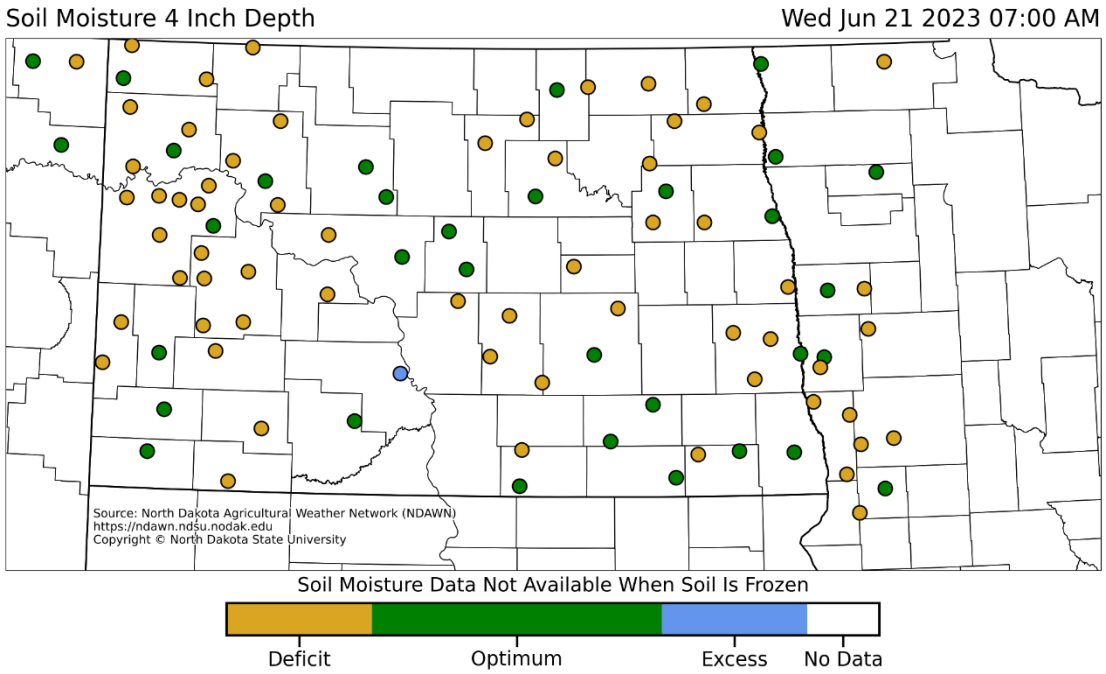

Figure 5. Soil moisture at the 4-inch depth as of 7:00 AM on June 21.

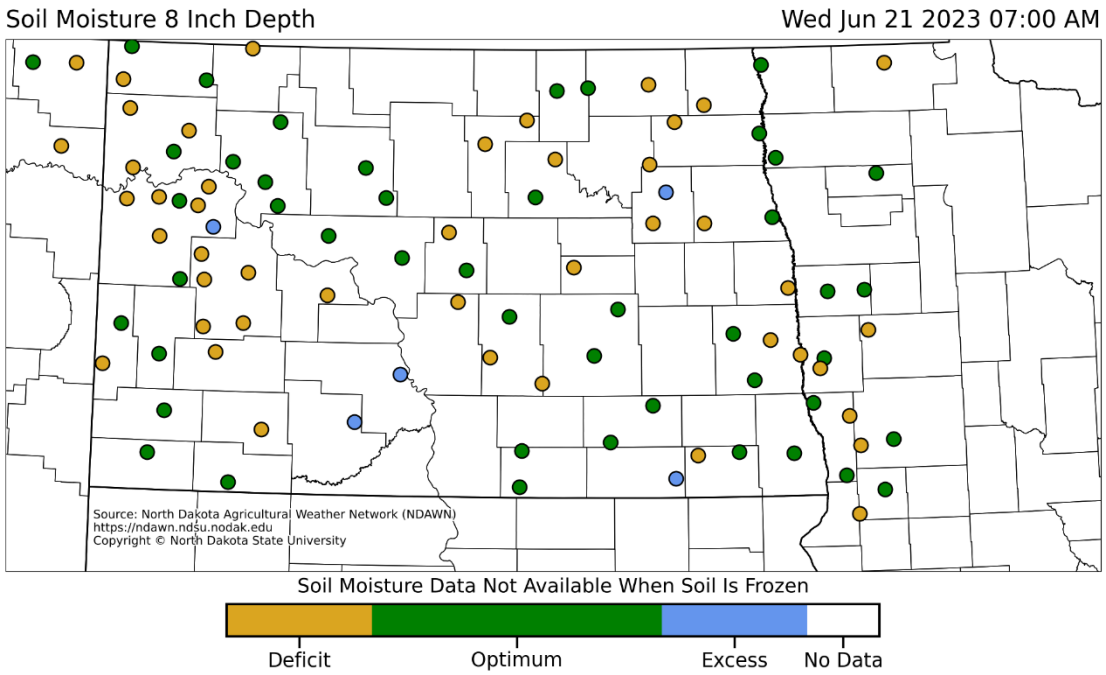

Figure 6. Soil moisture at the 8-inch depth as of 7:00 AM on June 21.

Growing degree days (GDD) have, of course, progressed at a faster than normal pace due to the above normal temperatures. Accumulated GDD for corn and soybean (base 50°F) since May 1, and for wheat (base 32°F) since April 20, are depicted in Figures 7 and 8. For other crops, please check out the Growing Degree Days pages at the NDAWN.INFO website. For the most accurate degree day accumulations for your crops at your locations, please visit the Applications pages at the main NDAWN website. There you can select the nearest NDAWN station, select your crop, enter your planting date, and generate GDD tables. Another useful feature is the NDAWN Ag Tools webpages, where you can select other tools for specific crops.

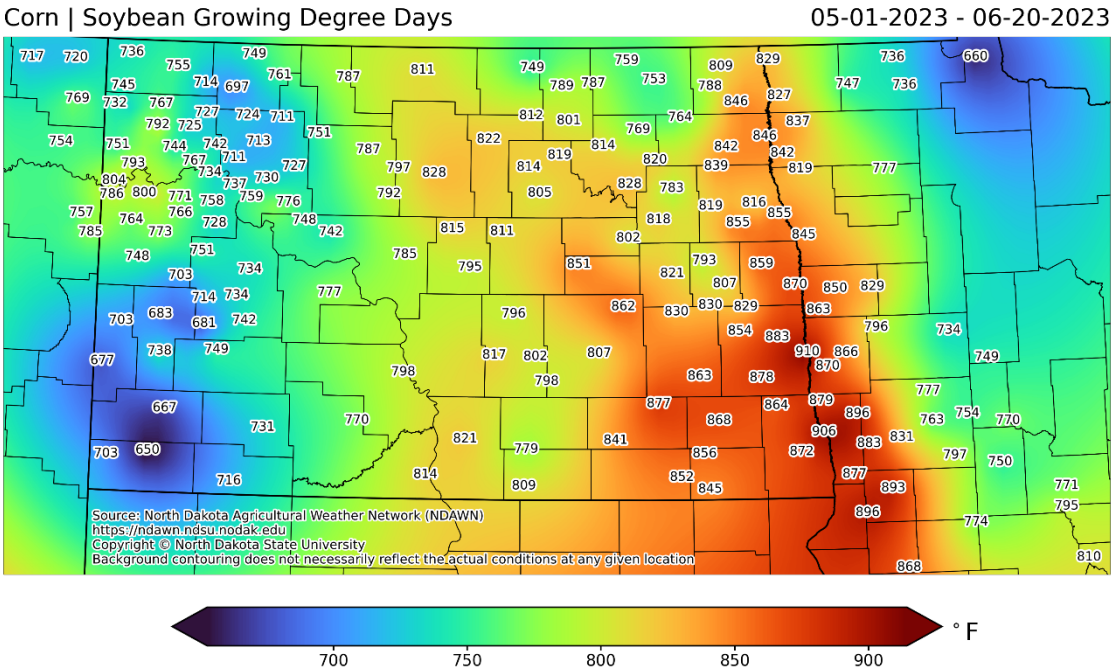

Figure 7. Accumulated growing degree days for corn and soybean since May 1.

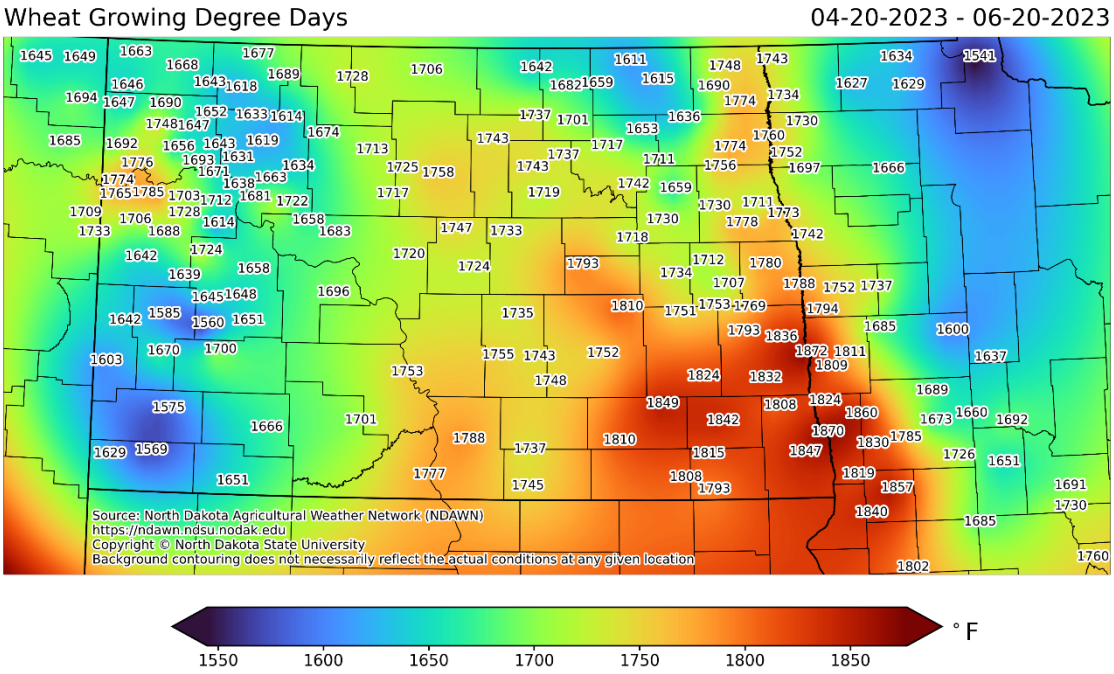

Figure 8. Accumulated growing degree days for wheat since April 20.

The Week Ahead

It looks like the omega high that has dominated our weather for the past few weeks is finally ending. Good news! As I write this on Wednesday morning, June 21, the forecast is for widespread 1+ inch rainfall across most of the state tonight, with lesser amounts in northwestern and southeastern ND. An upper level low is forecast to progress through our region this weekend. This will bring widespread chances for showers and thunderstorms. At this time, there is some disagreement among forecast models as to the exact track of the upper level low - the further north the track, the greater the potential for severe weather, including a slight risk of flash flooding, especially in eastern ND. A clipper system is then forecast to move in early next week. Dewpoints will generally be in the 50s to low 60s, although transpiration from growing crops and surface evaporation from recent rains could boost dewpoint temperatures. The 7-day precipitation forecast shows the potential for widespread rainfall totals of 2 to 3 inches for ND (Figure 9). Temperatures will moderate, with seasonable highs in the 80s east, and 70s and even some upper 60s west. The 6 to 10 day temperature and precipitation outlooks call for near normal temperatures and a decent chance for above normal precipitation (Figures 10 and 11).

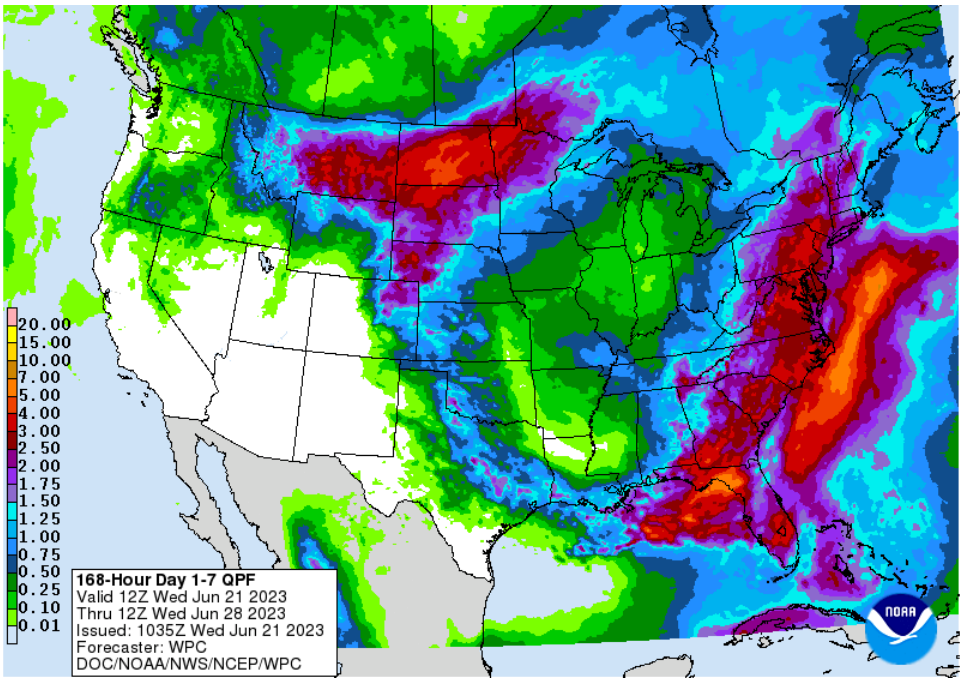

Figure 9. Precipitation forecast for the continental United States from 7:00 a.m. June 21 through 7:00 a.m. June 28.

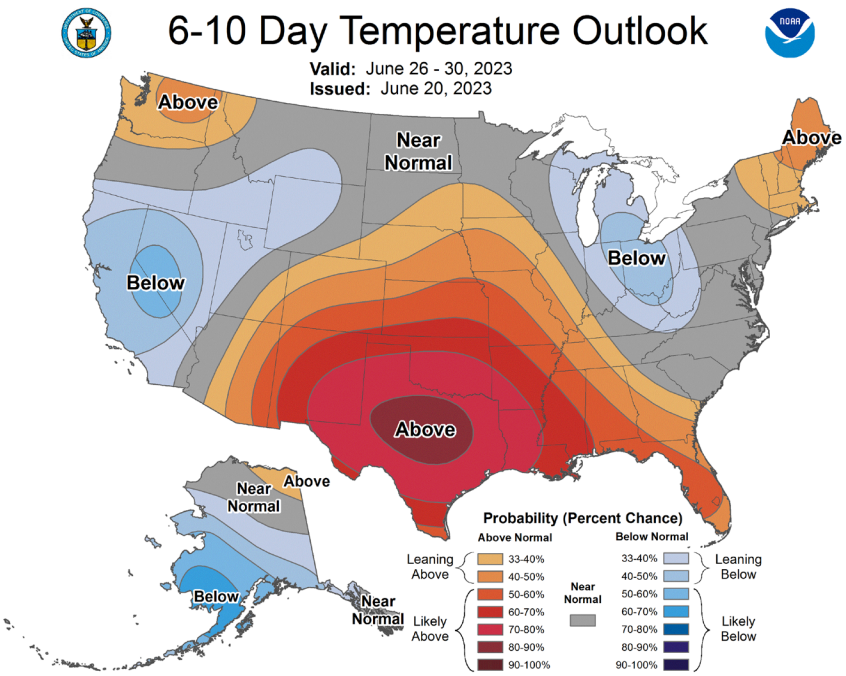

Figure 10. Temperature outlook for the continental United States and Alaska from June 26 through June 30.

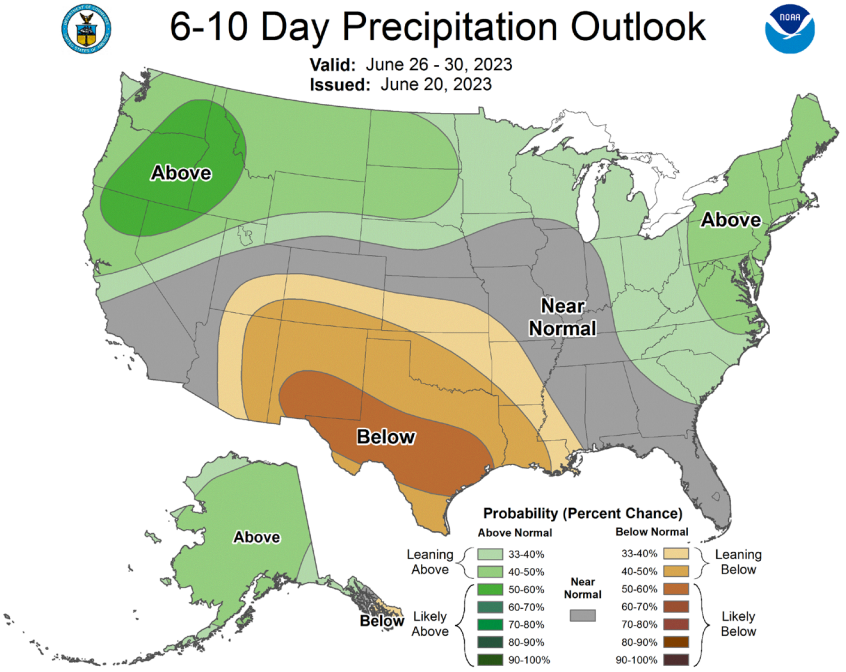

Figure 10. Precipitation outlook for the continental United States and Alaska from June 26 t

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