North Dakota State University
# CROP & PEST REPORT
NDSU EXTENSION

No. 9 June 30, 2022

## Inside this Issue...



**AG NDSU FIELD DAYS SET**

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. NDSU's 15th President, David Cook, will be attending this year's field day events.

The dates and locations for the field days are:

July 11 – Central Grasslands Research Extension Center – Streeter
(10 a.m.-3 p.m. CDT)
July 12 – Hettinger Research Extension Center – Hettinger
(5-7 p.m. MDT followed by supper)
July 13 – Dickinson Research Extension Center – Dickinson
(8 a.m.-Noon MDT agronomy with lunch, 1-3 p.m. horticulture, 5 p.m. supper)
July 13 – Williston Research Extension Center main site
(4-8 p.m. CDT agronomy and horticulture)
July 14 – Williston Research Extension Center irrigated tour – Nesson Research and Development farm, located 23 miles E of Williston on Hwy 1804 (8:30 a.m.-Noon CDT)
July 18 – Agronomy Seed Farm – Casselton
(5 p.m. CDT agronomy tour, 7 p.m. supper)
July 19 – Carrington Research Extension Center – Carrington
(9:15 a.m.-3:30 p.m. CDT)
July 20 – North Central Research Extension Center – Minot
(8:30 a.m.-Noon CDT)
July 21 – Langdon Research Extension Center – Langdon
(8:45 a.m.-Noon CDT)
August 4 – CREC Oakes Irrigation Research Site – Oakes
(8:30 a.m.-Noon CDT)
August 9 – NDSU Horticulture Research & Demonstration Gardens – Fargo
(3-7 p.m. CDT plants, local foods and outdoor spaces)
September 10 – NDSU Horticulture Research Farm near Amenia
(10 a.m.-3 p.m. CDT trees and ornamentals) Pre-registration required

# entomology

**CUTTING HAY FOR HORSES – WATCH OUT FOR POISONOUS BLISTER BEETLES!**

***Ash-gray blister beetle (M. Berti, NDSU)***

***Striped blister beetle feeding on sugarbeet (Jordan Sang)***

Several blister beetle species feed on alfalfa, including: ash-gray blister beetle (*Epicauta fabricii*); black blister beetle (*E. pensylvanica*) and striped blister beetle (*E. vittata*). Adult blister beetles are easy to recognize due to their large size (½ to 1½ inch), soft bodies, short wing covers, long legs and a neck-like appearance between head and prothorax.

Most blister beetle species have one generation per year. Adults become active in early to mid-summer and females lay eggs in the soil. Eggs hatch in about two weeks into larvae called triungulins. *Epicauta* larva are beneficial insects and are effective predators of grasshopper eggs. Blister beetles overwinter in soil as larvae. **Field reports indicate that blister beetles are high again in 2022 (like 2021) in most areas of hay production due to high grasshopper populations.** Adult blister beetles are attracted to blooming alfalfa fields and weeds (goldenrods, dandelions). Adults are active June through September and will feed on nectar, pollen, leaves, stems and flowers.

**The most severe threat from blister beetles is their poison called *cantharidin*, which is toxic to people and livestock, especially horses.** Cantharidin oil is released when beetles are crushed and even dead beetles have high levels of the toxin that does not weaken. Cantharidin is highly toxic and irritates the gastrointestinal and urinary tracts, which can lead to death in horses. It is estimated that about 30 to 50 striped blister beetles could be potentially lethal to horses. Fewer beetles cause sores or blisters on tongue and mouth, colic, diarrhea, bloody feces, depression, elevated temperatures, increased heart rate, increased breathing rate and dehydration. Poisoned horses often place their muzzle in water without drinking.

**Hay infested with blister beetles is a big concern for hay producers and livestock owners, especially horse owners. Cattle and sheep can also be poisoned. Levels of toxicity to beef cattle has not been identified. The amount of cantharidin produced by blister beetles varies by species (see Table), and male blister beetles produce higher amounts than female blister beetles.** So, it is hard to predict how many blister beetles are needed to kill an animal. If you suspect cantharidin poisoning, contact your veterinarian immediately. Unfortunately, cantharidin poisoning has no cure except supportive care including mineral oil, intravenous fluid therapy, activated charcoal, and anesthetics.

**Relative toxicity to horses of three common blister beetle species. Number of blister beetles expected to kill a horse weighing:**

| Blister Beetle species | 275 lbs | 550 lbs | 825 lbs |
|---|---|---|---|
| Black blister beetle | 550 | 1100 | 1700 |
| Spotted blister beetle | 175 | 345 | 520 |
| Three-striped blister beetle | 40 | 80 | 120 |

*Source: Capinera et al. 1985. J. Econ. Entomol. 75: 1052-55.*

**Scouting:** Blister beetles are difficult to scout for since they are mobile and gregarious, and often congregate in field edges or certain spots in a field with flowering weeds. In some instances, blister beetles feed for a short period of time and then migrate to other areas of the field or to new fields. After the alfalfa is cut, they often move out into blooming canola and other blooming field crops.

***Ash-gray blister beetle in hay field, Slope County (S. Hewson, NDSU Ext. Agent, Slope County)***

**Integrated Pest Management:**

**Prior to harvest:**

- Scout closely for blister beetles, swarms or defoliation immediately prior to harvest. If large populations of blister beetles are observed, producers should not harvest until beetles have moved out of field or an insecticide may be applied. There is no treatment threshold for blister beetles in alfalfa hay. If insecticides are used, read label directions for rates, pre-harvest intervals, restrictions and precautions. Fields should not be treated at peak bloom to avoid bee kill. Insecticides approved for blister beetle in alfalfa are listed in the ***2022 North Dakota Field Crop Insect Management Guide E1143***.
- Hay fields adjacent to rangeland pastures are at higher risk for blister beetle infestations due to typically higher grasshopper populations in rangeland pastures.
- Control blooming weed hosts near or in alfalfa fields.
- Cut alfalfa early at 10% bloom. Blooming alfalfa attracts blister beetles into the field.

**At harvest:**

- Fields should be rechecked 24 hours prior to cutting to ensure that new swarms of blister beetles have not re-infested the fields.
- Use equipment without hay conditioners or crimpers that may crush blister beetles, thus contaminating hay, or may increase the numbers of blister beetles located underneath the windrow. Even tractor tires can crush blister beetles in hay when turning equipment around. Cut hay with a sickle bar or rotary mower that allows blister beetles to move out of hay after cutting. If large numbers of blister beetles are observed in spots during harvesting, stop tractor and allow blister beetles to move out of the way or go around them.
- Raking may dislodge dead beetles from hay.
- Scout harvested hay and underneath windrows closely for blister beetles and allow blister beetles to move out of drying hay before baling. Turning the windrow may be helpful to get blister beetles to move out.
- If blister beetles are suspected in harvested hay, either don't feed the hay or provide alternative feeds/hay for livestock. Don't force livestock to eat hay contaminated with blister beetles.
- Chemical control is generally not recommended at harvest, because dead beetles could be incorporated into cured hay instead of falling onto the ground. Remember, dead blister beetles still have a level of cantharidin toxic to livestock.
- Grinding hay only dilutes the cantharidin toxin when the hay is mixed into a final ration.
- Cantharidin concentration for blister beetle toxin in equine or ruminants can now be measured by the **NDSU Veterinary Diagnostic Lab**: https://www.vdl.ndsu.edu/tests/blister-beetle-toxin-cantharidin/

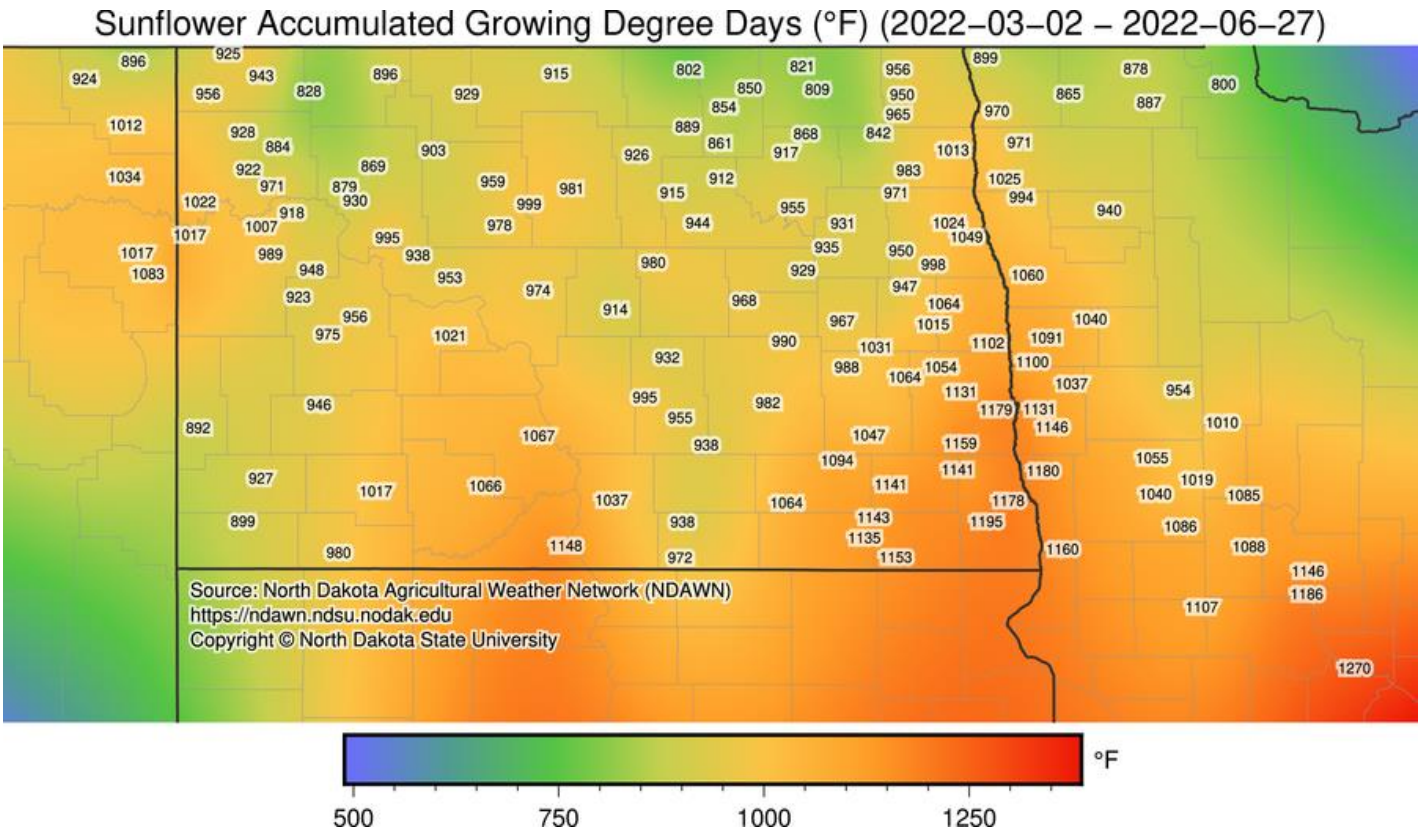
For more information, consult the 2021 NDSU Extension publication on ***Blister Beetle Management in Forages and Field Crops E1002 (revised)***.

Karl Hoppe
Extension Livestock Specialist, Carrington Research Extension Center

Janet J. Knodel
Extension Entomologist

**DEGREE DAY UPDATE - LEAFY SPURGE FLEA BEETLES**

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. **Only southeast North Dakota has accumulated enough growing degree days (GDD) for scouting or sweeping for adult leafy spurge flea beetles to assess collecting sites**. Use the sunflower degree days/growth stage application on NDAWN website. Enter "2022-03-01" for the planting date and select "degree day" for map type.




**LOW RISK FOR WHEAT MIDGE IN 2022**

Soil samples in North Dakota indicated lower levels of overwintering wheat midge larvae (cocoons) in the fall of 2021. A total of 2,070 soil samples were collected from 22 counties in the fall of 2021 to estimate the statewide risk for wheat midge in the 2022 wheat growing season. The distribution of wheat midge is based on unparasitized cocoons found in the soil samples.

The majority of the soil samples had zero wheat midge cocoons in the soil for the past two years - 95% with no midge cocoons in 2021 and 86% in 2020. This is the lowest number of overwintering cocoons since the wheat midge larval soil survey started in 1995. In 2018, we had another low year with 84% of the soil samples with no cocoons.

Only about 5% of soil samples were positive for wheat midge cocoons, with densities ranging from 36 to 71 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 (Divide,

Mountrail and Renville Counties), north-central area (Bottineau, Benson and Pierce Counties), the west-central area (McLean County) and the northeast area (Ramsey County). No soil samples had moderate or high cocoon densities of wheat midge (201 to over 800 midge larvae per square meter).

This dramatic decrease in wheat midge populations since 2019 is probably due to drought in 2020 and 2021. 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. They 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. Comparing precipitation from May through August with wheat midge cocoon densities for each surveyed county over the past 11 years shows a strong positive correlation between precipitation and wheat midge populations.

With the very low populations of wheat midge for two years in a row, producers may not have to scout for adult midges this year 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.

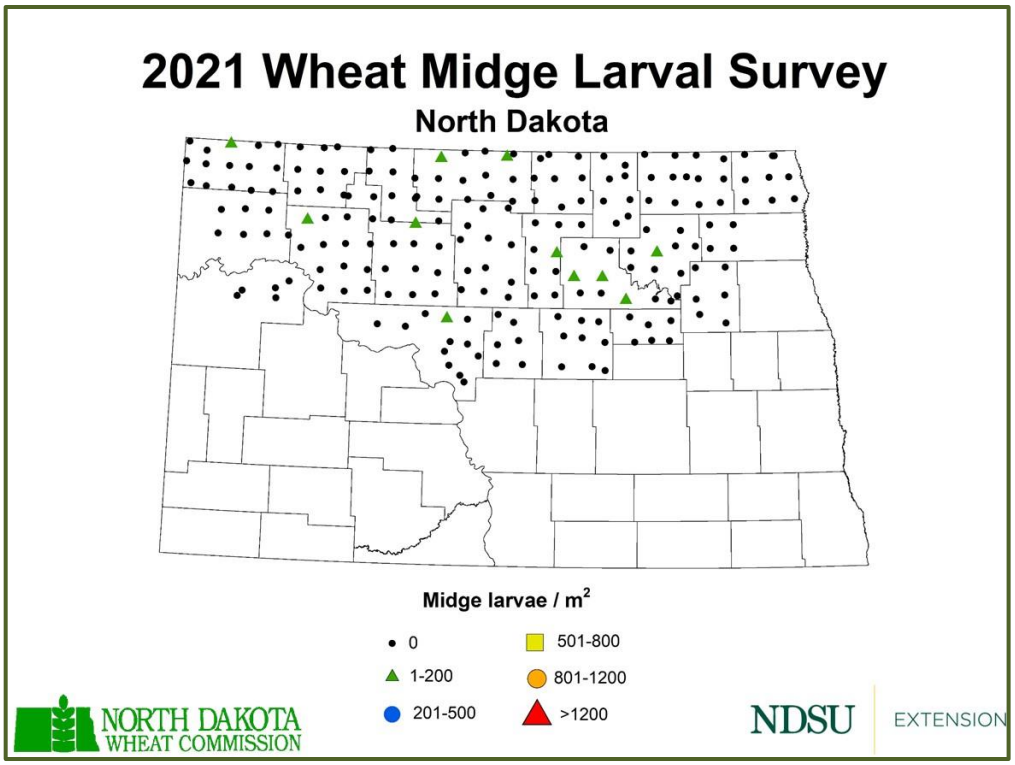
We recommend that producers use the wheat midge degree-day model to predict the emergence of wheat midge and to determine when to scout, and if their wheat crop is at risk. Producers can access the ***wheat midge degree-day model*** on the North Dakota Agricultural Weather Network (NDAWN) website

Select your nearest NDAWN station and enter your 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 of wheat midge emergence.

If wheat midge is detected, the **economic thresholds for wheat midge are one or more midge observed for every four or five heads on hard red spring wheat, or one or more midge observed for every seven or eight heads on durum wheat.**

This forecast is good news for wheat growers since the risk for yield loss and reduced grain quality from wheat midge is very low. Unfortunately, the bad news is that the beneficial parasitic wasp can't survive without its host, wheat midge. To my surprise, no parasitized cocoons were found in 2021. This is the first 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 15% in 2020, 36% in 2019 and 9% in 2018.

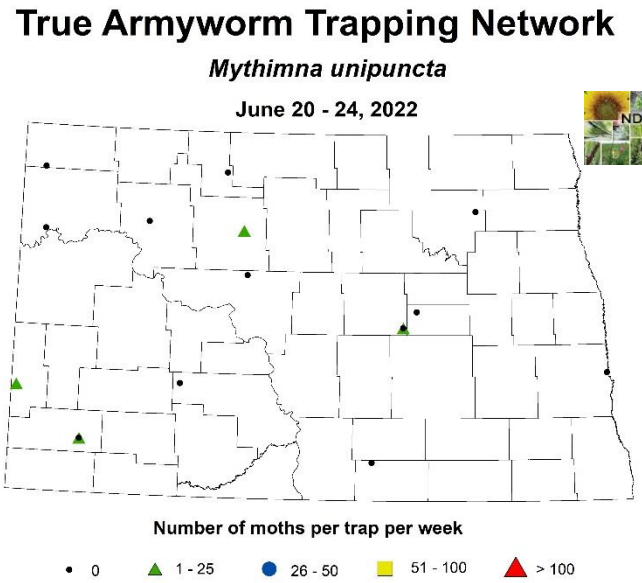
NDSU Extension agents collected the soil samples. The North Dakota Wheat Commission provided funding for conducting the wheat midge larval soil survey.

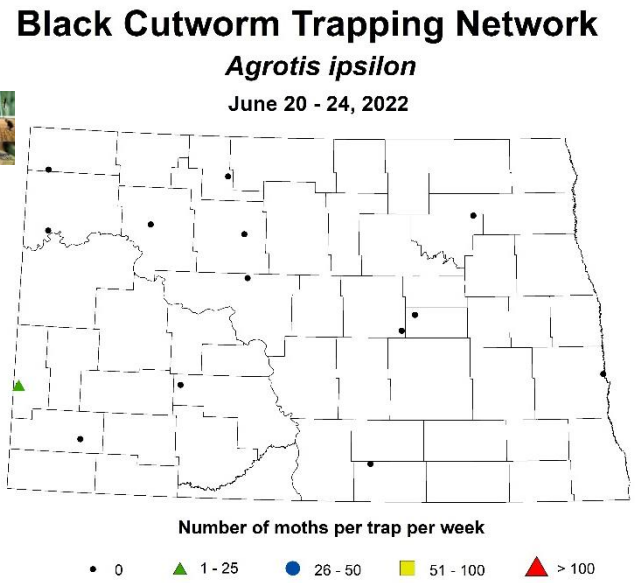


**IPM INSECT TRAPPING**

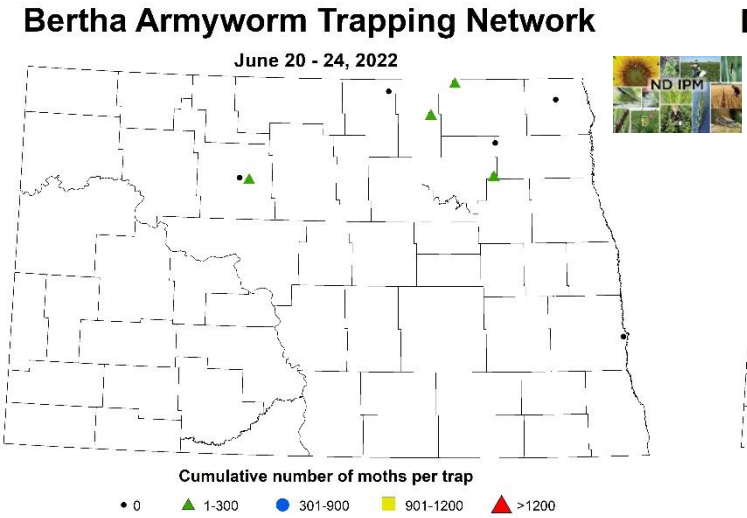
We will be posting and reporting weekly trapping results for insect pests of wheat and canola on the NDSU Extension ***IPM website*** and in the ***Crop & Pest Report***.

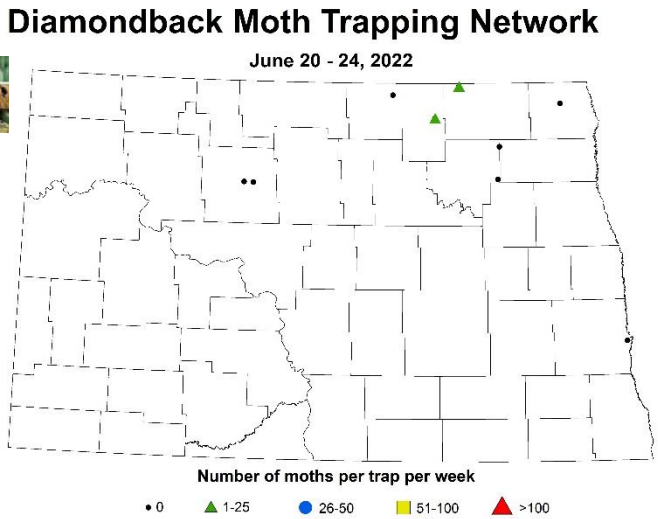
**Wheat:** IPM Scouts have placed pheromone traps out for true armyworm and black cutworm at 16 trap sites in 16 counties. Trap catches for true armyworm were detected at low numbers, <10 moths per trap per week, at 25% of the trap sites. True armyworm is causing problems in rye crops and crops with rye cover crop in other states like southern MN. We've had one report of young armyworm larvae in rye near Fairmount in Richland County. Black cutworm was observed at one of the 16 trap sites (only 1 moth captured) in Golden Valley County in the southwest.




**Canola:** IPM Scouts have placed pheromone traps out for bertha armyworm and diamondback moth at 8 traps site in 7 counties, mainly northern canola growing areas. Trap catches for bertha armyworm were detected at low numbers, <10 moths per trap per week, at 50% of the trap sites. Diamondback moths were observed at two of the 8 trap sites at low numbers in Cavalier and Towner Counties in the northeast.




Janet J. Knodel
Extension Entomologist

## EUROPEAN CORN BORER EMERGING, BEGIN SCOUTING

***European corn borer moth (Veronica Calles-Torrez)***

Thanks to support from the North Dakota Corn Council, we are monitoring a trapping network for flights of European corn borer (ECB) in conventional non-Bt and Bt corn fields again this year. A modified Hartstack trap is being used for trapping ECB moths in grassy field ditches of corn fields. We have 13 trap sites in 8 counties of North Dakota including Barnes, Cass, Griggs, Ransom, Richland, Sargent, Steele and Ward.

The E-race ECB just started to emerge last week, near Sheldon, Ransom County. This is the first generation of the bivoltine flight of ECB. This week the Z-race ECB, the generation of the univoltine, has started to emerge near Shenford and Sheldon in Ransom County. We will be posting and reporting weekly trapping results for European corn borer moths on the NDSU Extension ***IPM website*** and in the ***Crop & Pest Report***.

| Area | County | Nearest town | Race | June 20-26 | June 27-July 3 | July 4-10 | July 11-17 |
|---|---|---|---|---|---|---|---|
| EC | Barnes | Cuba | Z | 0 | 0 | | |
| EC | Barnes | Cuba | E | 0 | 0 | | |
| EC | Cass | Casselton | Z | 0 | 0 | | |
| EC | Cass | Casselton | E | 0 | 0 | | |
| EC | Cass | Rush River | Z | 0 | 0 | | |
| EC | Cass | Rush River | E | 0 | 0 | | |
| EC | Cass | Grandin | Z | …. | …. | | |
| EC | Cass | Grandin | E | …. | …. | | |
| EC | Griggs | Cooperstown | Z | 0 | 0 | | |
| EC | Griggs | Cooperstown | E | 0 | 0 | | |
| EC | Steele | Finley | Z | 0 | 0 | | |
| EC | Steele | Finley | E | 0 | 0 | | |
| EC | Steele | Luverne | Z | 0 | 0 | | |
| EC | Steele | Luverne | E | 0 | 0 | | |
| NC | Ward | Minot | Z | 0 | 0 | | |
| NC | Ward | Minot | E | 0 | 0 | | |
| SE | Sargent | Gwinner | Z | 0 | 0 | | |
| SE | Sargent | Gwinner | E | 0 | 0 | | |
| SE | Ransom | Shenford | Z | 0 | 6 | | |
| SE | Ransom | Shenford | E | 0 | 0 | | |
| SE | Ransom | Sheldon | Z | 0 | 8 | | |
| SE | Ransom | Sheldon | E | 3 | 0 | | |
| SE | Richland | Lidgerwood | Z | 0 | 0 | | |
| SE | Richland | Lidgerwood | E | 0 | 0 | | |
| SE | Richland | Antelope | Z | 0 | 0 | | |
| SE | Richland | Antelope | E | 0 | 0 | | |
| | | | **Total # of Z =** | **0** | **14** | | |
| | | | **Total # of E =** | **3** | **0** | | |

**How to scout for ECB:** corn should be monitored weekly for corn borers for *at least eight weeks* (from mid-June to mid-August) once plants exceed an extended leaf height of 17 inches. Inspect plants for the presence of egg masses, whorl feeding, and active larvae.

Scouting for univoltine ECB: scout corn fields from mid-June through late July.

Scouting for bivoltine ECB:

- 1st generation of bivoltine ECB: scout when plants are at whorl stage (V6), and inspect plants for shot-holing in the whorl and for active larvae.
- 2nd generation of bivoltine ECB: scout when plants are tasseling to silking (VT-R1 stages) and older stages, and inspect plants for the presence of egg masses and larvae in ears.

Additionally, a degree day model has been developed to forecast the emergence of the univoltine ECB moths (Table 1). Go to the NDAWN, select Applications, and then select 'Insect DD' and the nearest town; or select 'map' for the whole state North Dakota and the base temperature of '50 F'.

**Table 1. Degree Day Model for Univoltine ECB Ecotype (base temperatures of 50 F)**

| Accumulated Degree | Proportion of Emerged Moths |
|---|---|
| 911 | 10 % |
| 986 | 25 % |
| 1078 | 50 % |
| 1177 | 75 % |
| 1274 | 90 % |

Veronica Calles-Torrez
Post-doctoral Scientist

T.J. Prochaska
Extension Crop Protection Specialist
NDSU North Central Research Extension Center

Janet J. Knodel
Extension Entomologist

# plant pathology

**SMALL GRAIN DISEASE OBSERVATIONS AND FUNGICIDE QUESTIONS**

Growth stages for spring small grains range from early leaf stages to early heading stages. This has presented a diversity of questions pertaining to disease risk, flag leaf fungicides, and fungicide use for Fusarium head blight. This article will address some of the most commonly asked questions.

Disease Observations

The IPM scouts visited 98 small grain fields last week and reported disease in 2% of the wheat fields. One disease that has been reported in Hettinger County and Grand Forks County is bacterial leaf streak (BLS) in wheat (Figure 1). The high winds, hail, and severe thunderstorms will damage wheat tissue allowing the bacterium to gain entry into the plant. This disease is most noticeable in wheat at flag leaf stage or beyond. As a reminder, in-season plant protection products are inconsistent for management of BLS, however, disease identification is extremely important.

Bacterial leaf streak (BLS) can be confused with other fungal leaf diseases, and misidentification could lead to an ineffective fungicide decision. To help identify BLS in wheat, here are a few tips. First, identify the variety and look up the BLS resistance score (NDSU Extension Publication A574-21). Second, BLS affected plants will often appear in patches and on edges of field (Figure 1A). Third, BLS will have irregular lesions that are both chlorotic (yellow) and necrotic (brown) and often run parallel (streaking) on the wheat leaves (Figure 1B). Fourth, look for water-soaking on the leading edges of lesions and for the presence of bacterial ooze within lesions, especially visible in the morning (Figure 1C).

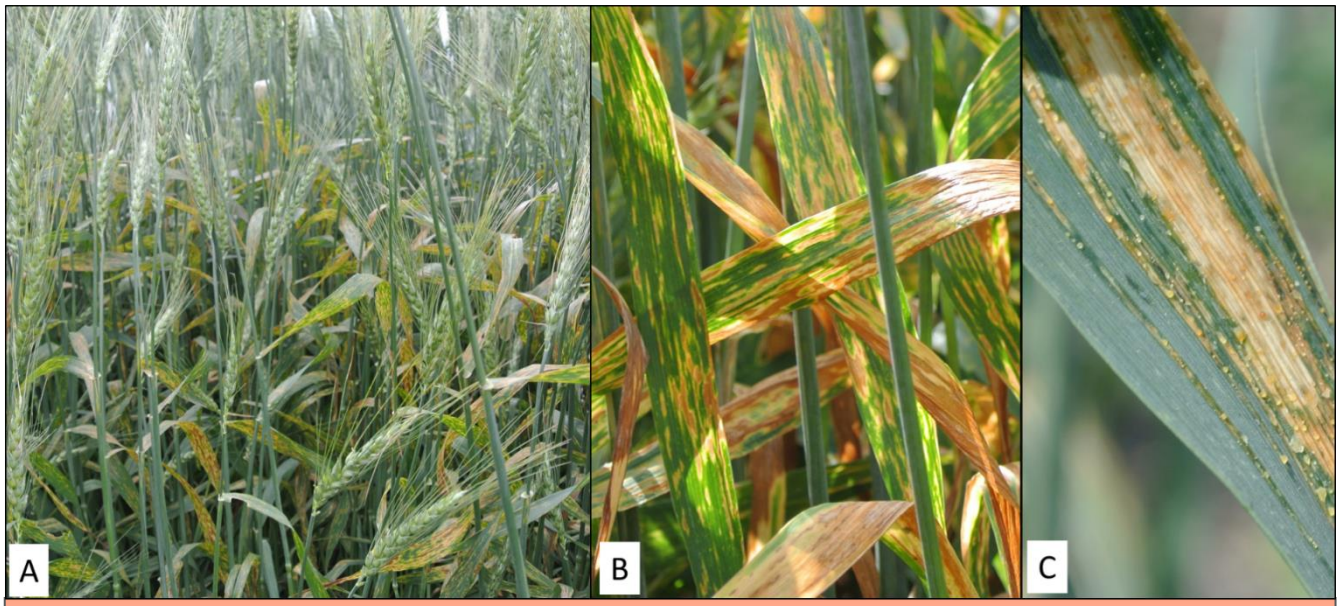



***Figure 1. (A) – A patch of wheat plants with moderate to severe BLS. (B) Wheat leaves with typical BLS symptoms including chlorotic and necrotic streaking. (C) Presence of water-soaking and bacterial ooze caused by the BLS pathogen.***

Fusarium Head Blight Risk

Most of the state is in low to moderate scab risk. There are a few pockets of elevated scab risk for very susceptible varieties as indicated in both the NDSU FHB model and National FHB model. However, scab risk for moderately susceptible and moderately resistant varieties remains low across the entire state. Risk estimates can quickly change, so make sure to use the models to help gauge scab risk in your fields. The primary driving factor for FHB risk is relatively humidity (associated with rain and prolonged morning dews) as that will stimulate spore production and infection of wheat and barley heads.

Flag Leaf Fungicide

A fungicide applied at the flag leaf growth stage is used to protect wheat from fungal leaf diseases such as tan spot, leaf rust and stripe rust. The application can also be used in barley to manage net blotch and spot blotch. There are several effective fungicides labeled for management of foliar diseases and their use is extremely important under high disease risk situations such as when using a susceptible variety, grown in a monoculture system (wheat on wheat or barley on barley), when disease is observed in the lower canopy, and when conducive weather conditions are present. The yield response from this fungicide application is directly related to the amount of disease. Referencing a large foliar fungicide data summary I have compiled on wheat, the suggested yield response from a flag leaf fungicide application is 2.8% (very low disease risk), 3.1% (low disease risk), 7.3% (moderate disease risk) and 19% (high disease risk). Currently, we have a very low occurrence of tan spot in the state, and leaf rust and stripe rust have not been observed in ND. Given these observations, I would consider the current wheat crop at flag leaf or beyond to be at very low to low risk for fungal leaf diseases. If we were to identify rust in the coming days (or week), make sure to scout the latest planted wheat crop as it may be under a higher level of flag leaf disease risk.

Quick Review of Fungicides for Fusarium head blight

The best time to apply a fungicide in hard red spring wheat, hard red winter wheat, and durum is when a majority of the main stem heads are at early-flowering and up to 7 days after (Figure 2). In other words, when the yellow anthers start protruding from the center of the head, you have about 7 days to make an effective fungicide application to manage FHB and deoxynivalenol (DON; VOM), and to protect yield. In spring barley (both two-row and six-row), the best time to apply a fungicide is at full-head emergence and up to 7 days later (Figure 3). It is important to know that applying a fungicide prior to full-head emergence (i.e.: awns just showing) in barley can lead to poor fungicide coverage and unsatisfactory control of FHB and DON. The fungicides that provide the greatest amount of scab suppression and rated "good" are Caramba®, Proline®, Prosaro®, Prosaro Pro®, Miravis Ace®, and Sphaerex®. The tebuconazole generics on the market are categorized as "fair" for FHB and DON. In the coming weeks, I will be discussing more topics revolved around FHB management, so stay tuned!


***Figure 2. The smaller yellow arrow is highlighting a wheat head at early-flowering and pointing to the small yellow anthers. The longer yellow arrow is demonstrating the most effective growth stages to suppress FHB and DON in wheat.***

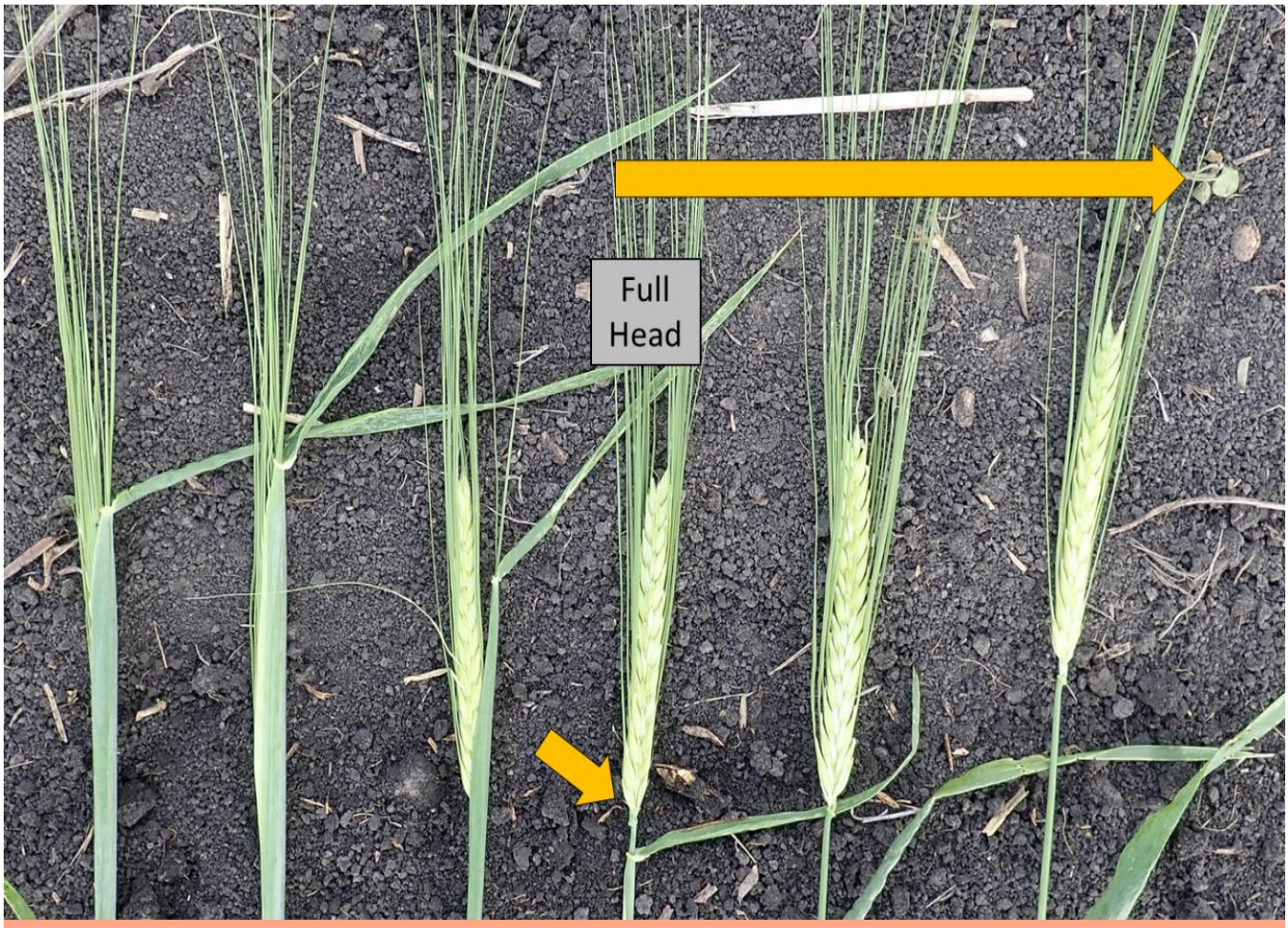



***Figure 3. The smaller yellow arrow is highlighting a barley head at full-head. The longer yellow arrow is demonstrating the most effective growth stages to suppress FHB and DON in barley.***

Andrew Friskop
Extension Plant Pathology, Cereal Crops

# plant science

**IRON DEFICIENCY CHLOROSIS SHOWING UP**

In some fields yellowing of plant leaves due to Iron Deficiency Chlorosis (IDC) is starting to be visible. Soybean varieties have genetic differences for the expression of symptoms, and some have tolerance to IDC. No soybean variety is immune to chlorosis, but large differences in yellowing, plant stunting, and subsequent yield reduction occur between the most tolerant and most susceptible varieties. Field choice and selecting a variety with tolerance to IDC are important management decisions producers make in avoiding or reducing the negative yield effect of chlorosis. Most soils in North Dakota have sufficient iron. However, the presence of soil carbonates, which manifests itself most commonly in a pH greater than 7, can result in IDC. Soil and environmental conditions of elevated salt concentrations, excess moisture, cool temperatures, and high soil nitrate, tend to increase IDC. Plant leaves with IDC symptoms are yellow with green veins (Figure 1). Yellowing, browning and stunting of the plants during the early vegetative stages will result in less photosynthesis in these plants, compared with healthy green plants, thus causing reduced soybean yields.

*Figure 1. IDC on the first trifoliate leaves near Fargo*

The yellowing of the leaves usually becomes pronounced when the plants reach the two- to seven-trifoliolate leaf stages. Soybean plants may grow out of IDC and turn green at the end of the vegetative growth stages, but due to the early season IDC, yields still will be reduced (Figure 2). Data in Figure 2 was generated in fields with known IDC symptoms, to evaluate the yield reduction with increased IDC severity. In most fields IDC is occurring is certain areas of the field and typically some parts of the field may not show any symptoms at all. The variability is mainly due to the distribution of soil carbonates throughout the field. The rating scale used by NDSU scientists is shown in Figure 3.

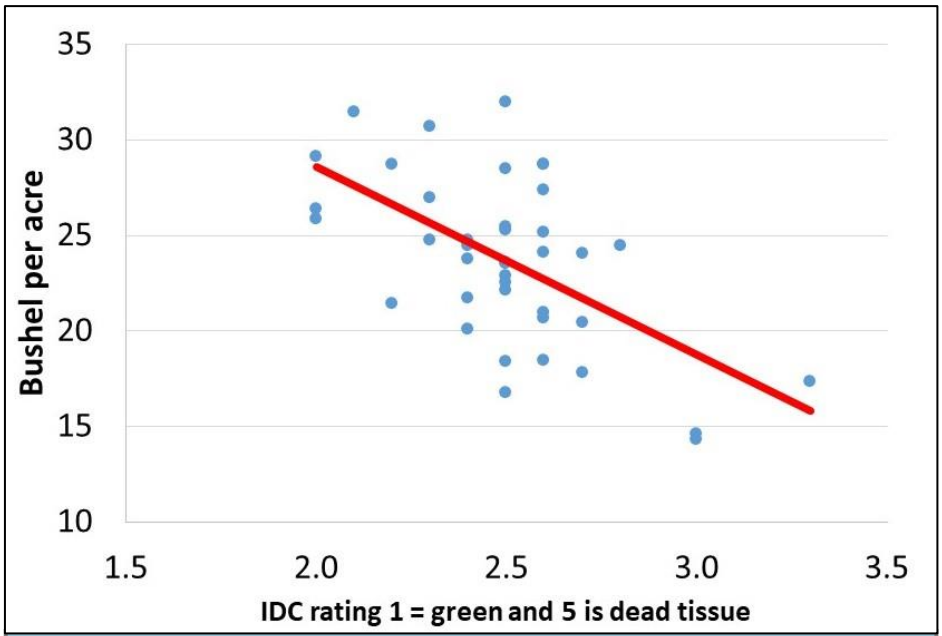



*Figure 2. IDC rating vs soybean yield, from a NDSU soybean variety trials, using the combined data from Hunter, Leonard, and Colfax locations.*

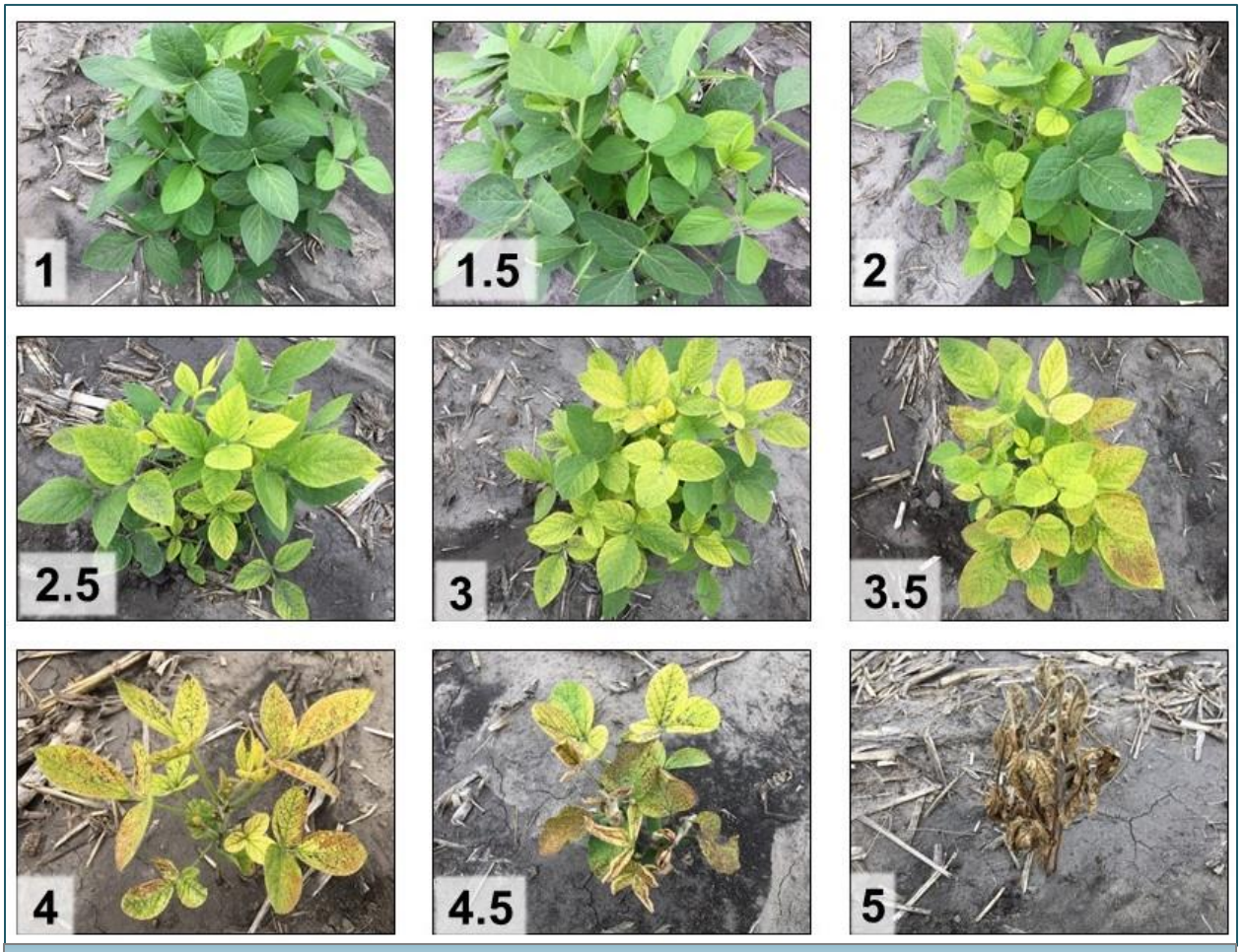



***Figure 3. Rating scale used by NDSU scientists to score soybean IDC severity.***

The number one management strategy in the region to reduce IDC is field selection. Fields that have a pH of 7 and below are preferred. The lower the salt (EC) values, the better.

The second most important strategy is variety selection. NDSU reports relative IDC scores of all varieties tested. The variety trial IDC rating data from the 2021 season are available in the soybean variety trial results. The results for varieties tested in 2022 will be available later this summer. It is important to note the IDC severity in current soybean fields and select, if needed, more tolerant varieties for the 2023 season.

Hans Kandel
Extension Agronomist Broadleaf Crops

Dave Franzen
Extension Soil Specialist

**WIND DAMAGE TO CORN**

Reports of corn growth stages vary widely throughout the region. Most corn planted by mid to late May is now V3-V6 with some early planted fields as advanced as V8. But, with the hot temperatures of the past two weeks, the corn is growing quickly and advancing through early growth stages.

Strong winds and thunderstorms moving through late last week and over the weekend caused damage to corn such as tattered leaves and root lodging. The most important thing a grower can do at this point is to be patient and wait 3-4 days to see if the crop recovers. Even though we are nearing the end of June, most corn is still in its early vegetative stages and has the ability to recover from wind damage. New leaves will come out of the whorl and replace those shredded by the wind. Plants blown down will show signs of righting themselves by resuming upward growth if they are recovering. And fortunately, they will also re-establish roots as long as adequate moisture is available. The most likely factor to reduce yield at this point is actual stand loss which cannot be accurately assessed until corn has had a few days to right itself and grow out of the injury. As difficult as it is to be patient, wait and see if corn that looks blown down recovers, as yield loss from wind flattened corn is often not as bad as it looks immediately after the storm.

**DR. CLAIR KEENE IS THE NEW NDSU SMALL GRAIN AND CORN EXTENSION AGRONOMIST**

***Dr. Clair Keene, NDSU Extension Agronomist***

You may have noticed a change in the Crop and Pest Report small grain and corn section during the 2021 growing season: Dr. Clair Keene was hired as the new NDSU Extension Agronomist for Small Grains and Corn following the retirement of Dr. Joel Ransom.

Prior to joining the Plant Sciences Department, Dr. Keene was the Extension Specialist in Cropping Systems at the Williston Research Extension Center from 2016-2021. While at the WREC, she gained experience working with spring wheat, durum, oats, pulse crops, and many of the diverse crops of western North Dakota.

Clair earned her Ph.D. in Agronomy from Penn State University and a B.S. in Biology from Iowa State University. She grew up in Bellevue, Nebraska and enjoys gardening and hiking. Clair can be reached at clair.keene@ndsu.edu. She looks forward to serving the farmers of North Dakota in her new role.

Clair Keene
Extension Agronomist Small Grains and Corn

# soils

**CORN WITH YELLOW TOPS**

The past week, the upper leaves of corn in some fields have turned yellow. Yellow upper leaves might be a symptom of S deficiency or Zn deficiency, but maybe not. The region has had several very windy events within the past couple weeks, and yellow tops might be the result of the trauma of the wind whipping the leaves violently during one of more of these events. There are also fields where S was applied last fall, which is never a good idea, and 10 inches or more of spring rains may have moved some S out of the root zone. To determine whether the corn S status is adequate, a plant analysis is the best diagnostic tool. A soil sample is not diagnostic, because there is no soil S test in the world that is diagnostic. For most regional corn plants, which are smaller than 12 inches tall, cutting plants about ½ inch above the soil surface

and submitting 20-25 plants from the area of interest in one sample is recommended. I would strongly recommend a plant sample from the area of possible deficiency and a sample of the same hybrid from an area that looks normal whenever possible; a paired plant sampling. The plant analysis result table is only a guess. Comparing 'good' and 'not-so-good' areas of the field is far more instructive. AgVise Labs has a good 'guide for taking plant samples of regional crops'. Other commercial laboratories may have similar information. The NDSU Soil Laboratory does not perform commercial plant analysis.

**ALFALFA FERTILIZATION AT FIRST CUTTING OR AT ESTABLISHMENT IN AN UNUSUAL YEAR**

Alfalfa fertilization recommendations for North Dakota are provided in a recently updated NDSU circular https://www.ndsu.edu/fileadmin/soils.del/pdfs/Alfalfa_soil_fertility_requirements_in_North_Dakota_Soils_SF1863.pdf . However, fertilizer P and K costs are greater than normal and one might hope that costs will decrease in the future. There is no guarantee of a cost decrease, and, as in all fertilizer inputs, the profitable rate of fertilizer depends on the cost of fertilizer and the price obtained from the value of the crop.

The best time for fertilization of established alfalfa is after 1st cutting, which is about now. The general recommendations are for application of about 50 pounds per acre 11-52-0 for the P requirements. For K requirements, application of 80 pounds per acre of 0-0-60 per ton of removal over the course of the past 12 months is recommended. However, due to the high price of K fertilizer presently and because most alfalfa in North Dakota is used for beef cattle in a blend, application of about 40 pounds per acre of 0-0-60 per ton alfalfa removed would be a more profitable option. If alfalfa is intended to be sold in a premium hay market, then maintaining the 80 pounds per acre 0-0-60 per ton alfalfa removed over the past year would be profitable even at today's fertilizer pricing structure.

Growers should follow recommendations for alfalfa establishment, paying particular attention to zone sample pH values and a possible need to apply lime if the pH is less than 6.5. Considering subsoil pH would also be helpful to understand if the field would support long-term alfalfa production. Alfalfa does not perform well in acidic soils.

**FERTILIZER N FOR SORGHUM-SUDAN AND MILLET SEEDED FOR HAY/FORAGE**

Sorghum-sudan and millet are always seeded to some farms in North Dakota; however, interest in these two crops is greater this year due to the late planting season and the continued need for hay and forage. Soil sampling to 2 feet in depth for residual nitrate-N is always an excellent idea before planting either crop, due to waste of resources if N is not required, and the possibility of toxicity to livestock from sorghum-sudan if soil nitrate is high or it is over-fertilized with N. Sorgham-sudan should be fertilized to a maximum of 100 pounds N per acre of residual soil nitrate-N + fertilizer N supplement. Amounts over 100 pounds must be avoided due to toxic compounds that could be produced in the forage with excessive N. Millet should be fertilized as follows:

Soil test 21-35 lb Nitrate-N per acre: 55 pounds N per acre
Soil test 36-50 lb Nitrate-N per acre: 35 pounds N per acre
Soil test 51 to 80 lb Nitrate-N per acre: 20 pounds N per acre

Whatever the soil test P and K values are, they will have to be sufficient given this late date.

Dave Franzen
Extension Soil Specialist
701-799-2565

# weeds

**WEED DAY AT PROSPER AND NW22**

NDSU Weed Science will be hosting an open tour of weed control research at our Prosper and NW22 locations in Cass County on Thursday, July 7. Several trials funded by commodity groups and industry will be on display. We also have a herbicide site of action demonstration at the Prosper location.

Registration is free, and will start at 8 AM at Prosper, complete with coffee and donuts. We will caravan to the NW22 location at around 10 AM and tour that site until noon. We have received approval for 3 Pest Management CEU credits for the event.

Please see the attached advertisement for additional details. Contact Joe Ikley (joseph.ikley@ndsu.edu) for additional questions. Pre-registration is not required.

Joe Ikley
Extension Weed Specialist

# diagnostic lab

**PLANT DIAGNOSTIC LAB UPDATE**

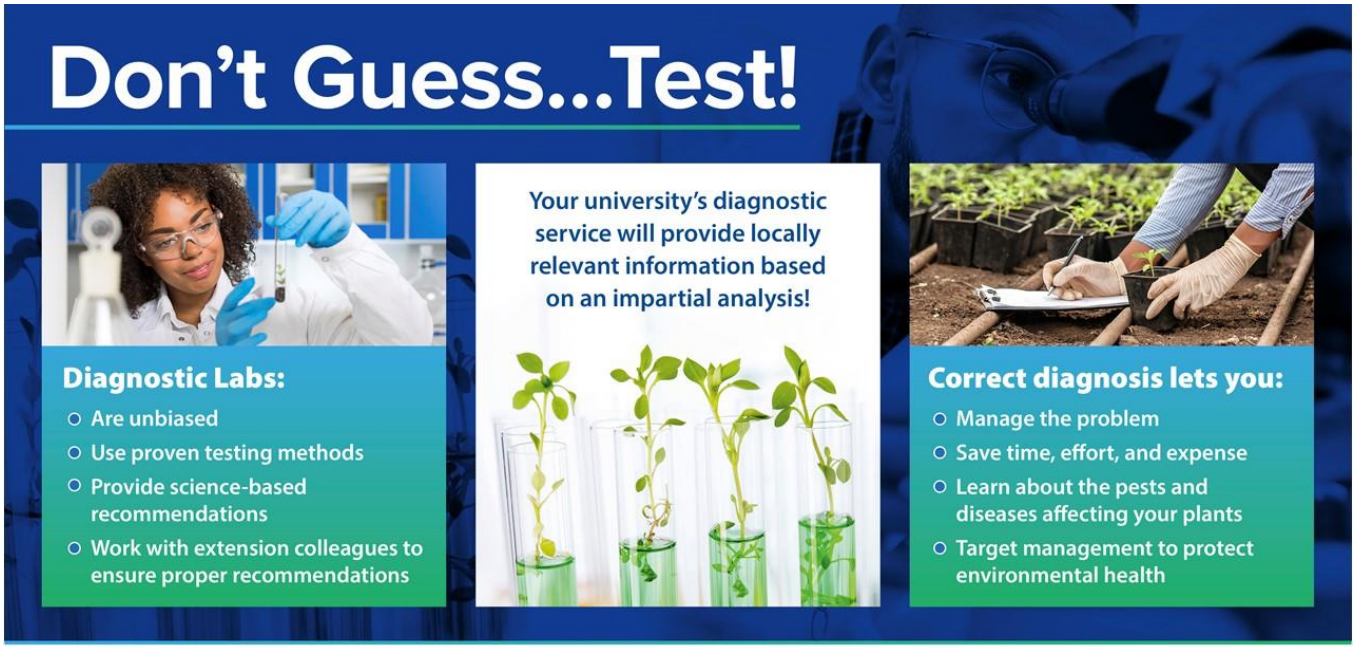
New Personnel

The Plant Diagnostic Lab is led by **Suzette Arcibal Baldwin,** Extension Plant Diagnostician since August 2021. Suzette is also a PhD candidate in Plant Science at the University of Idaho, and her dissertation focuses on screening for resistance and managing Fusarium head blight of wheat and barley. Two new Associate Plant Diagnosticians recently joined the lab in the spring of 2022. **Dorah Mkabili Mwangola** obtained her PhD in Entomology from the University of Minnesota. Dora recently completed her dissertation on managing emerald ash borer in urban ash populations with the use of insecticide treatments. **Sandesh Dangi** obtained his PhD in Plant Science from the University of Idaho. Sandesh recently completed his dissertation on characterizing isolates of the potato late blight pathogen and managing other potato storage diseases.

Services and fees

We are here to help you with your plant and pest problems. We offer a range of services including: plant disease diagnosis and management recommendations; insect, plant/weed, fungal (mushroom/mold) identification, seed health and phytosanitary testing, and more. To see our common services and associated fees, please visit our new website. Detailed instructions and tips on sample submission and request forms can also be found on our website. When submitting a sample to the lab, please enclose the lab form with your contact and sample information. To facilitate accurate diagnosis, please provide as many details about the sample as possible. Walk-ins are always welcome! Our physical location is 203 Waldron Hall at the NDSU campus. We can also fill out the form with you in person or by phone.

Depending on the sample, turnaround time can be from 1 to 14 days. Oftentimes, we can process samples sooner than the maximum estimated turnaround time. Once we finish processing your sample, we will send the report to your preferred contact method.




NDSU NORTH DAKOTA STATE UNIVERSITY **Plant Diagnostic Lab** NPDN National Plant Diagnostic Network

If you have any questions, please contact us by phone at 701-231-7854 or by email.

Suzette Arcibal Baldwin
Extension Plant Diagnostician

Sandesh Dangi
Associate Plant Diagnostician

Dorah Mwangola
Associate Plant Diagnostician

# around the state

**AROUND THE STATE**

**NORTH CENTRAL ND**

Hit and miss storm chances brought localized severe weather to some portions of central and north central North Dakota. Even some pea to marble sized hail impacted the Minot area. Moderate temperatures and small chances of precipitation appear to be part of next week's forecast. At the NCREC, 0.61" of rain was observed since last Monday (June 20th). The following are precipitation observations across the area, as noted by local NDAWN stations from June 20th through June 27th: Bottineau: 0.50"; Garrison: 0.38"; Karlsruhe: 0.42"; Mohall: 0.20"; Plaza: 0.43"; and Rugby: 0.29".

As noted in previous editions of the Crop & Pest Report, some crop samples have arrived showing signs of abiotic stress due to environmental factors of the past few weeks. Canola flea beetle calls have begun to slow down as crop staging passes the 6th leaf stage. Grasshopper calls continue to be the dominant topic at the NCREC for our growers. As reported previously, continue to scout, and make applications should economic thresholds be met; this could be as simple as a border treatment.

Additionally, blister beetle calls are now coming into the office. They are being observed in flowering alfalfa and other host plants. Scouting is going to be key. **Adjustment of harvest dates and maintaining weed-free field sites can help reduce numbers.** Blister beetles often feed for a short period of time and then disperse to other areas of the field or other field sites. After alfalfa is cut, they often move out into blooming field crops nearby.

TJ Prochaska
Extension Crop Protection Specialist
NDSU North Central Research Extension Center

Leo Bortolon
Extension Cropping Systems Specialist
NDSU North Central Research Extension Center

**NORTHEAST ND**

The storms during last week accounted to rainfall amounts ranging from 0.26 to 2.73 inches in the NE region. The storm rainfalls have provided enough moisture for plants to germinate and sustain growth in most areas. However, there are still waterlogged ground in the heavier soils. High winds have dried up surface soil moisture in many locations. Heavy winds combined with rainfall caused washout in some areas and winds also caused damaged to dry bean, soybean and corn fields. Small grains are highly variable in growth stages anywhere between 3-leaf to tillering and jointing stages. Some early seeded fields are nearing the flag leaf stage. In Griggs County, certain wheat and corn fields have been reported declining a bit due to nitrogen deficiency, maybe sulfur deficiency, wet soils, and wind damage. Soybeans are emerging/unifoliate with others reaching the 1st trifoliate stage, corn is about 3-5 leaf, and the canola is about 6 leaf stage.

***Figure: Grasshopper nymph feeding on soybean leaf (Anitha Chirumamilla, LREC)***

Weed control is in full speed in many crops. Dicamba spraying is happening on soybeans before the June 30th deadline. Humidity is creating ideal conditions for bacterial and fungal diseases which are starting to become apparent. Hot spots of bacterial leaf streak (BLS) are showing up in wheat in Grand Forks County. Grasshopper nymph populations continue to increase in many areas. Alfalfa and hay are being cut. Blister beetle infestations have been reported in alfalfa stands (Pembina County) just as cutting has started.

***Wheat at jointing stage in Griggs County***
***(Jeff Stachler, ANR Extension Agent, Griggs County)***

***Wind and hail damaged corn in Griggs County***
***(Jeff Stachler, ANR Extension Agent, Griggs County)***

Anitha Chirumamilla
Extension Cropping Systems Specialist
Langdon Research Extension Center

**SOUTH-CENTRAL/SOUTHEAST ND**

According to NDAWN, the region's rainfall during June 1-27 ranged from 1.1 inch (Robinson; Kidder County) to 4.1 inches (McHenry; Eddy County), with the Carrington REC receiving 2.8 inches and Oakes research site at 1.6 inches. Generally, rain is received multiple times each week, with high amounts and wind plus hail in some counties, including Wells, Eddy, Foster, and Barnes.

Row crop planting and replanting (primarily soybean and dry bean) continued last week, along with warm-season annual forages. Winter cereals are in seed-development stages. Spring-seeded crop growth stages are quite variable among fields, ranging from emerging plants (soybean, dry bean and sunflower) to flowering (canola, flax and soybean [see picture]) and heading (barley and wheat). Herbicide application and haying continue when weather conditions permit.

If zinc deficiency is discovered in corn, a foliar application of a zinc chelate may be beneficial. However, averaged across four trial years at the Carrington REC, in-furrow application of 1 qt/A of zinc chelate provided 3% (4.3 bu/A) greater yield compared to foliar application at the V4-6 growth stage of corn grown in low zinc-testing soils.

***Soybean planted May 6 at Carrington REC at R1 stage on June 27.***

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center

**SOUTHWEST ND**

This past week there have still been a few fields of sunflowers being planted. It also appeared that a few fields that were hailed out were sprayed and replanted to either sunflowers or cover crop/forage mixes. Crops in the region continue to be in excellent condition for the most part. There are pockets of insect issues. A lot of sprayer activity, both for weeds and insects. Hay in the region continues to be cut and baled. There have been reports of blister beetle as well as alfalfa weevil, however cutting should manage the issue.

Now is a good time for noticing soil acidity issues. We are seeing areas with more susceptible crops such as durum or canola with reduced, stressed, or stunted stands in some no-till fields with surface acidity issues. When we have these visible cues, it is much easier to create zones for soil sampling and fall lime application. When the pH drops below 5.5, aluminum becomes more soluble and this can tie up phosphorus, resulting in symptoms of P deficiency in some cases. Find more in our publication 'What is soil acidity?'.

Ryan Buetow
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center

# weather

## WEATHER FORECAST

**The June 30 to July 6, 2022 Weather Summary and Outlook**

Taken as a whole, this past week finished pretty close to average. Western North Dakota was a bit below average and eastern North Dakota into northwestern Minnesota was a bit above average (Figure 1). These next 7 days look to be similar with an overall temperature near average, but this time it looks like southern North Dakota may finish a bit above average with northern portions of the state into northwestern Minnesota finishing a bit below average.

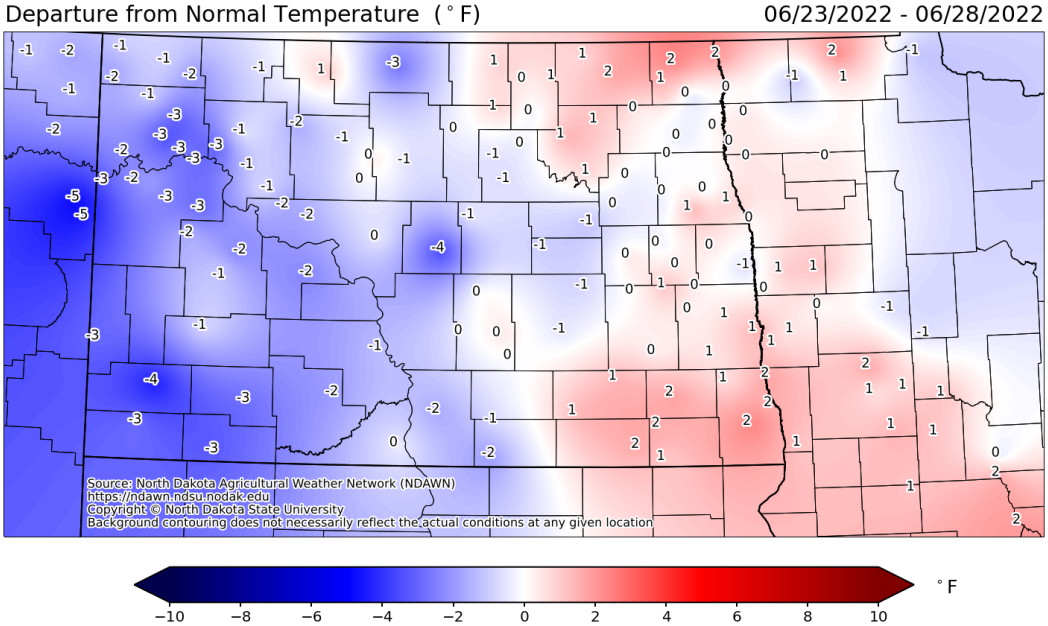



**Figure 1. Departure from Normal temperature at NDAWN stations for the period of June 23 through June 28, 2022**

Most of the rain in the past week occurred last Friday, June 24. Some severe weather was reported as well as localized heavy rain (Figure 2), typical for the month of June. June is by far the wettest month of the year in most areas, plus tends to be the most prone for severe weather. There will be several disturbances passing through during this forecast period but none of them look widespread. Yet, a high percentage of the area should record some rainfall and there is always a threat of localized heavy downpours or severe weather this time of year.

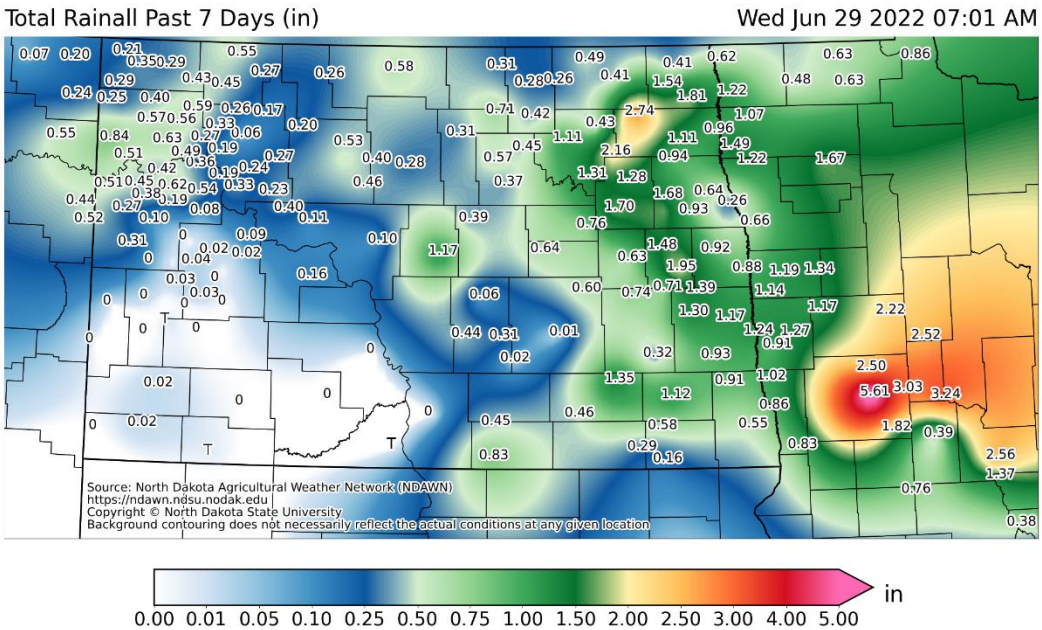



**Figure 2. Total rainfall for the 168-hour period ending at 7:00 AM on June 29, 2022 at NDAWN stations**

The rain from this past week did eliminate the monthly rain deficit in some locations, yet, a high percentage of the NDAWN network will finish the month of June with below or well below average precipitation (Figure 3). The graphic below does not include the rain from yesterday, but amounts were not expected to be high enough to alter the percent of average too much.

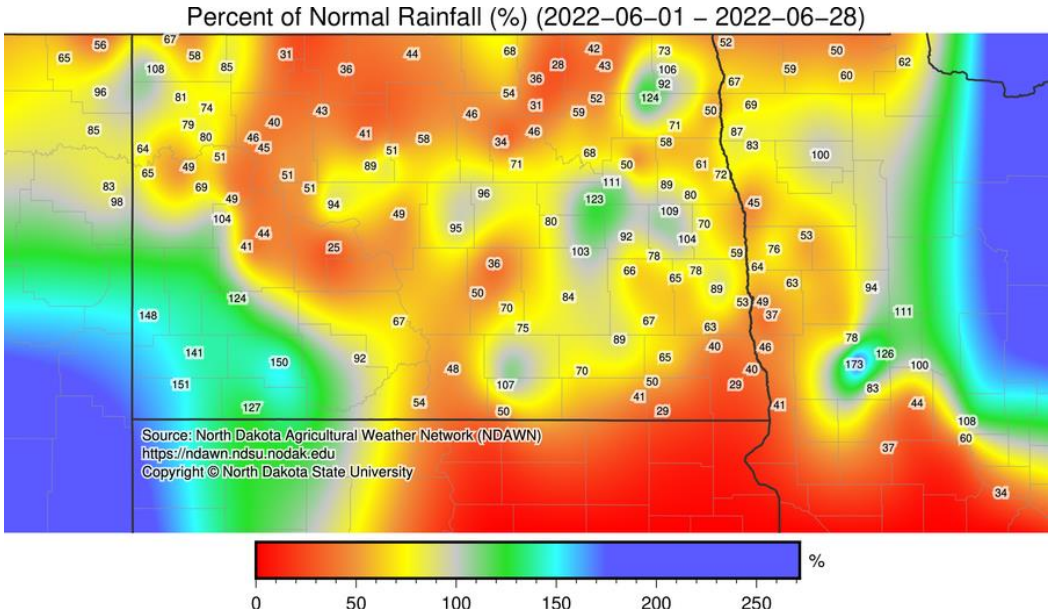



**Figure 3. Percent of Average Rain for the period of June 1 through June 28 at selected NDAWN Stations.**

Figures 4 and 5 below are forecasted Growing Degree Days (GDDs) base 32° (wheat and small grains) and 50° (Corn and Soybeans) for this forecast period.

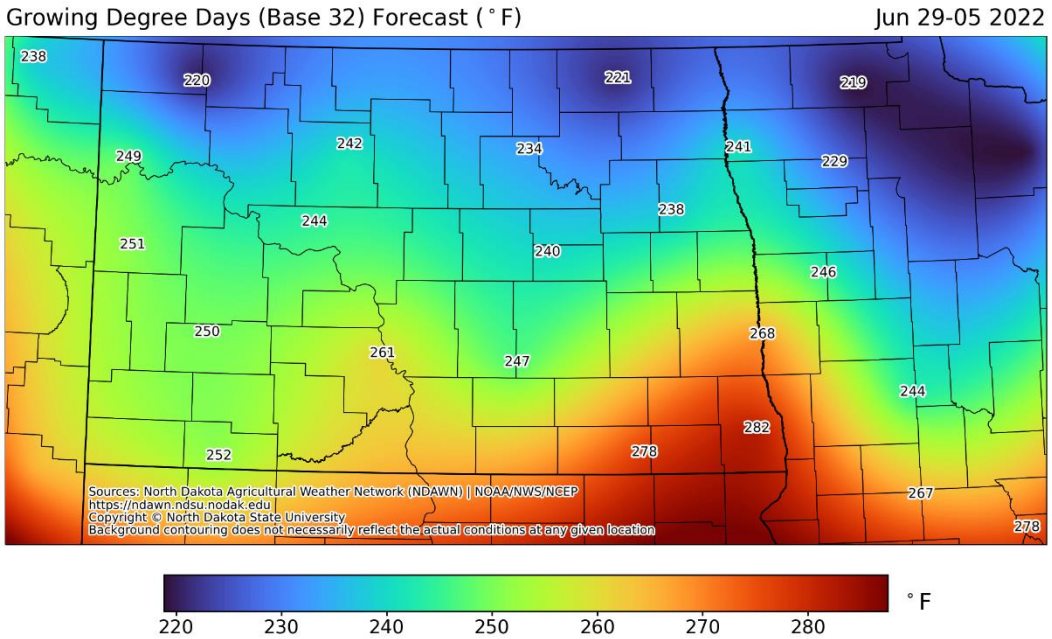



**Figure 4. Estimated growing degree days base 32° for the period of June 30 to July 6, 2022.**

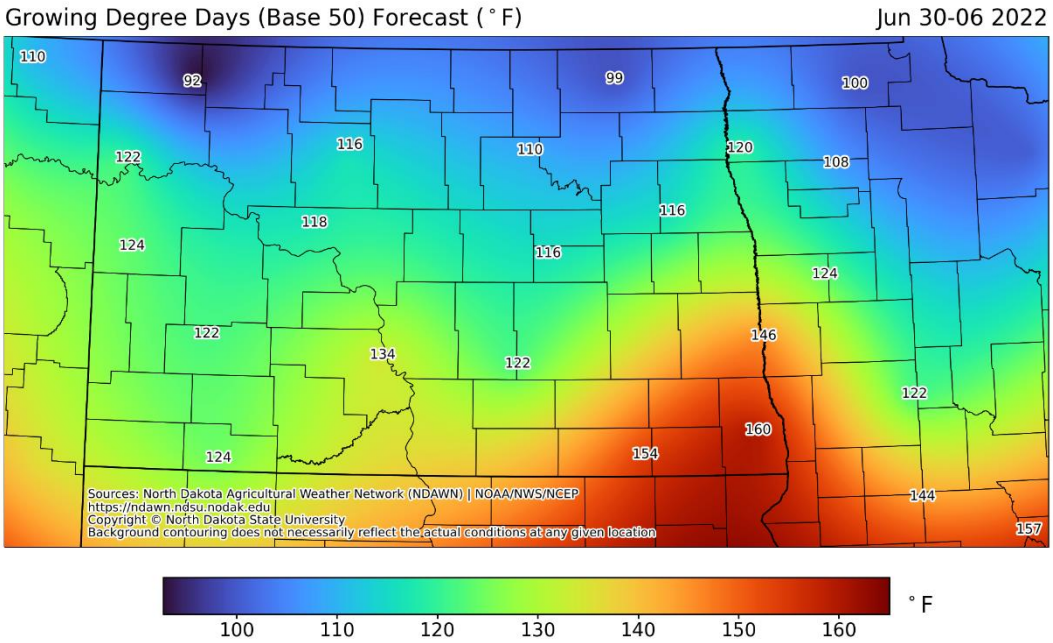



**Figure 5. Estimated growing degree days base 50° for the period of June 30 to July 6, 2022.**

Using May 15 as a planting date, the accumulated growing degree days for wheat (base temperature 32°) is given in Figure 6. You can calculate wheat growing degree days based on your exact planting date(s) here: https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html

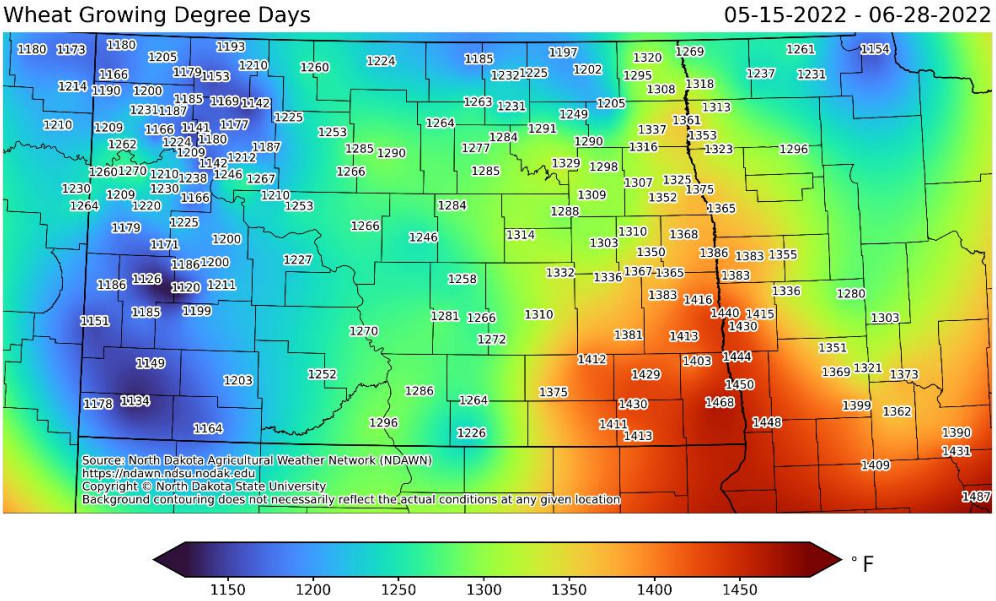



**Figure 6. Wheat Growing Degree Days (Base 32°) for the period of May 15 through June 28, 2022.**

Using May 20 as a planting date, the accumulated growing degree days for corn (base temperature 50°) is given in Figure 7. You can calculate corn growing degree days based on your exact planting date(s) here: https://ndawn.ndsu.nodak.edu/corn-growing-degree-days.html.

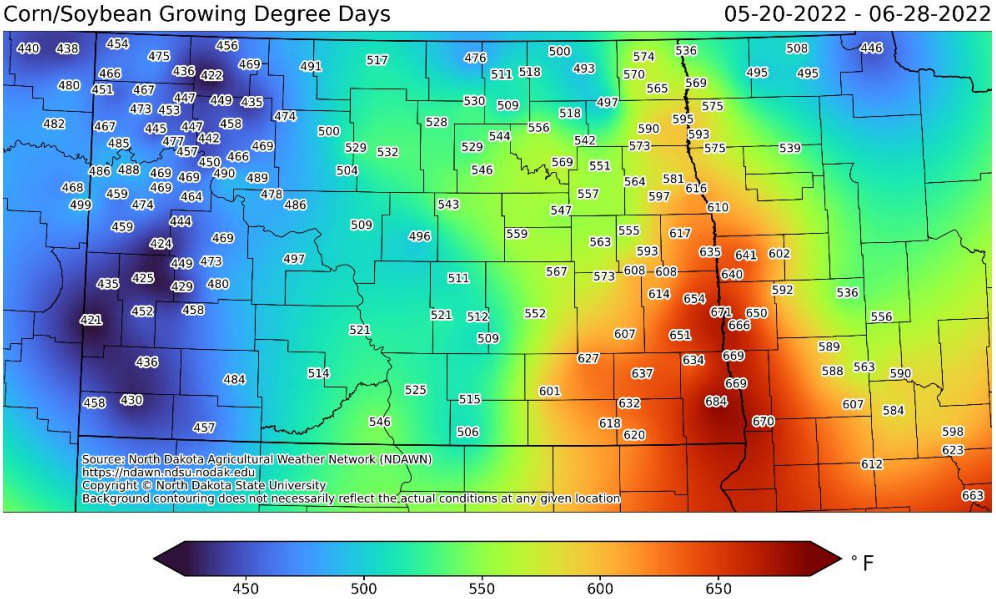



**Figure 7. Corn Growing Degree Days (Base 50°) for the period of May 20 through June 28, 2022.**

Soybeans also use base 50° like corn, but NDAWN has a special tool for soybeans that, based on your planting date and cultivar, can estimate maturity dates based on average temperatures, as well as give you GDDs based on the planting date(s) you set. That tool can be found here: https://ndawn.ndsu.nodak.edu/soybean-growing-degree-days.html

Daryl Ritchison
Meteorologist
Director of the North Dakota Agricultural Weather Network (NDAWN)

North Dakota State University
**CROP & PEST REPORT**
NDSU Dept. 7660; PO Box 6050
Fargo, ND 58108-6050

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*Janet Knodel*
*Co-Editor*

**Entomology**
701-231-7915

**Plant Sciences**
701-231-7971

**Soils**
701-231-8881

*Sam Markell*
*Marcia McMullen*
*Co-Editors*

**Plant Pathology**
701-231-7056

**Weeds**
701-231-7972

**Ag Engineering**
701-231-7261

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