NDSU Field Days: July-August 2019

Plan to attend a nearby NDSU Field Days to learn the latest in new crop varieties, agronomy, soil science, pest issues and more!

July 11: Nesson Valley Irrigation Field Day – Williston, N.D. 8:30 AM
July 15: Agronomy Seed Farm – Casselton, N.D. 5 PM
July 16: Carrington Research Extension Center – Carrington, N.D.
   9 AM - noon and 1 - 3 PM
July 17: North Central Research Extension Center – Minot, N.D.
   9 AM - noon
July 18: Langdon Research Extension Center – Langdon, N.D.
   8 AM - noon
Aug 15: Oaks Irrigation Field Tour – Oakes, N.D 9 AM - noon
**CEREAL APHIDS AND BYDV PRESENT IN ND**

Southerly wind events have facilitated the movement of migratory cereal aphids into ND. In addition to causing feeding injury, cereal aphids are vectors for the viruses (*Barley yellow dwarf virus* and *cereal yellow dwarf virus*) responsible for barley yellow dwarf (BYD). Cereal aphids (mostly English grain aphids and bird cherry oat aphids) have been reported from small grains in southwest, north central and southeast ND (Sources: IPM Scouts for NDSU). Plants submitted last week to the NDSU Plant Diagnostic Laboratory from Cass County, ND were confirmed to have BYD. Cereal aphid populations in northern ND are lower and BYD has not been reported or confirmed. Minnesota and South Dakota also has reported increasing populations of cereal aphids.

Aphids damage plants by sucking sap and depriving the plant of nutrients. Generally, the greatest potential for yield loss is when the plant is between the boot and heading stage. After heading, the interval when aphid feeding can potentially rob small grains of yield decreases quickly. Scout for aphids by examining the whole plant and underside of leaves. **Thresholds for aphids on small grains are generally when 85% of plants are infested (have 1 or more aphids on them).** Field scouting should be conducted from stem elongation until end of heading. If the risk of BYD is high (*i.e.*: wheat is at early vegetative stages with high levels of aphids and BYD symptoms are present), more aggressive pest management may be required.

Both the bird cherry oat aphid and English grain aphids are effective vectors of BYDV and CYDV, and when aphid populations are high, both viruses can spread quickly through small grain fields. The earlier a plant is infected, the greater the potential for yield loss. Although several fields are heading into the flowering growth stages, **pay particular attention to late-planted small grain fields and scout for aphids and BYD symptoms.** Insecticide applications targeted against aphids cannot cure infected plants but may prevent further spread of the disease. Most of the small grain varieties are susceptible to BYD. Please consult NDSU Extension E-1143, *North Dakota Field Crop Insect Management Guide*, for insecticide information.

Visible symptoms of BYD include leaf discoloration, stunting and disruption of normal plant development. Leaf discoloration includes shades of yellow, red (more common in oats), and purple (sometimes) often starting from the tip and progressing along the leaf margins towards the stem. If plants are infected with BYD in the 4- to 5-leaf stage, growth will be slowed, stunted, and maturity may be delayed. Later infected plants may not have obvious symptoms and are less likely to have significant yield loss. Infection sites within a field can appear as stunted yellow single plants or clusters of yellow plants among healthy plants. **Because growth stages of small grains vary across the state (tillering to late flowering), producers/crop consultants should actively scout for cereal aphids and decide if an insecticide application is needed.** The recent heavy thunderstorms across ND may wash cereal aphids off plants or drown them. Natural controls from parasitic fungal diseases should also help decrease aphid populations due to the high humidity.
Aphids in Wheat
June 21 - July 5, 2019

Percentage of Infested Stems

- 0
- 1-25
- 26-50
- 51-75
- > 75

Wheat Growth Stages
June 21 - July 5, 2019

- 0-9 Germination stages
- 10-19 Early Leaf Stages
- 20-29 Tiller Stages
- 30-39 Jointing Stages
- 40-49 Boot Stages
- 50-59 Inflorescence Stages
- 60-69 Anthesis Stages
- 70-79 Milk Development Stages
- 80-89 Dough Development Stages
- 90-99 Ripening Stages

Janet J. Knodel
Extension Entomologist

Andrew Friskop
Extension Plant Pathology, Cereal Crops
WHEAT MIDGE UPDATE

Recent hot temperatures have increased the Accumulated Degree Days (ADD) for emergence of the female wheat midge. For most of the northern tier of ND, we are over 50% emerged (1475 ADD) and approaching 90% emerged (1600 ADD) by the end of the week (see wheat midge NDAWN map on right). Scout if crop is susceptible to wheat midge egg laying (heading to early flowering).

Pheromone traps are being monitored for wheat midge again this year by the IPM trappers. See PestWeb map of cumulative midge counts below. Remember, trap catches do not indicate the need for a treatment but do tell growers when wheat midge is present and the relative density of male wheat midges. Wheat midge counts are updated weekly on the PESTWEB System of Montana State University during July.

See past Crop & Pest Report articles on wheat midge for more information on scouting:
START COLLECTING LEAFY SPURGE FLEA BEETLES

The degree day map indicates that most of ND is in the period between 1,200 and 1,600 ADD (sunflower GDD model NDAWN) when leafy spurge flea beetles should be collected. Adult flea beetles can be collected with sweep nets. After late July (or 1,600 AGDD), flea beetles begin to lay eggs and should not be moved or collected.

See past Crop & Pest Report article on leafy spurge flea beetle for more information.

https://www.ag.ndsu.edu/cpr/entomology/degree-days-for-collecting-leafy-spurge-flea-beetles-07-04-19

EUROPEAN CORN BORER EMERGING

A pheromone trap network is being ran for monitoring flights of European corn borer (ECB) in conventional, non-Bt corn fields. We have 14 trap sites in 7 counties of ND including Barnes, Cass, Cavalier, Richland, Steele, Traill and Ward Counties. Last week, the Z-pheromone and the E-pheromone traps each captured only one moth in Cass County. This is the univoltine flight (one flight per year), which is the predominate ECB ecotype in ND, and typically emerges in mid-July. The damage from the univoltine ECB includes eardrop, stalk lodging and reduced corn yields when economic populations of ECB larvae tunnel inside stalks of corn. We will be posting weekly maps of the trapping results for European corn borer moths on the IPM website. Thanks for support from the North Dakota Corn Council.
The current degree day model for the univoltine ECB ecotype (base of 50°F) indicates that the flight is starting in SE ND (see table at right). As with other degree day models, it helps identify priority times for field scouting since the models pinpoint the occurrence of key biological events. In this case, the model is indicating the proportion of moths that have emerged. Use the Insect Degree Day application on NDAWN, select map, select 50°F for the base temperature and select ‘Degree Days’ for the map type. See NDAWN map below.

 Accumulated Base 50 Insect Degree Days (°F) (2019–03–01 – 2019–07–08)

BLISTER BEETLES IN FIELD CROPS
Ash gray blister beetles, Epicauta fabricii, have been reported in canola, soybean and alfalfa fields in central, northwest and north central areas of ND. Adult blister beetles can be an occasional pest causing defoliation to the leaves and clipping flowers or pods. In canola, they are attracted to blooming canola fields for its nectar and pollen, but they also devour leaves, flowers and pods. Blister beetles are a major problem in alfalfa / hay fields or in bales, since they produce a toxic chemical (cantharidin), which is toxic to livestock, especially horses. Larvae of Epicauta species actively prey on grasshopper egg pods.

Blister beetles are mobile and gregarious, and often congregate in certain spots in a field (edges). In some instances, blister beetles only feed for a short period and then migrate to other fields. Alfalfa and forage are preferred hosts of blister beetles and they often move into canola or other field crops after the alfalfa is cut. If treatment is necessary to avoid yield loss, producers can ‘spot treat’ with a foliar insecticide. Please avoid spraying flowering crops for bee/pollinator safety.

Janet J. Knodel
Extension Entomologist

Accumulated Growing Degree Days for forecasting flight of univoltine ECB ecotype as of 07-08-2019, NDAWN.
North Dakota growers continue to be the number one producers of dry field pea in the U.S., harvesting 365,000 acres of the crop in 2018. In 2018, North Dakota farmers harvested 175,000 acres of lentil, the second largest acreage in the nation after Montana, where producers harvested 450,000 acres.

North Dakota harvested 13% of the nation’s chickpea acres and had the fourth largest number of acres harvested in U.S. in 2018.

The new “Pulse Crop Production Field Guide,” a spiral-bound pocket-sized publication, has information about field pea, chickpea, and lentil production. Chapters are divided in subsections covering variety considerations, growth and development of the three species, crop rotations, field selection and preparation, planting date guidelines, seeding rates, frost tolerance and damage, soil fertility requirements, weed control, insect pest and disease management, harvest management, drying, storage and marketing. The publication lists websites and other resources with additional information, and has several photos of agronomy issues, insects, and diseases.

The online version of the guide is available at: https://www.ag.ndsu.edu/publications/crops/pulse-crop-production-field-guide-for-north-dakota

The Pulse Grower Association partially funded publication of “Pulse Crop Production Field Guide for North Dakota.”

Resources
- NDSU Extension publication A1469, “North Dakota Dry Pea Variety Trial Results and Selection Guide”
- NDSU Extension publication E1143, “North Dakota Field Crop Insect Management Guide”
- NDSU Extension publication E1877, “Pulse Crop Insect Diagnostic Series: Field Pea, Lentil and Chickpea.”
- NDSU Extension publication E1879, “Integrated Pest Management of Pea Leaf Weevil in North Dakota”
- NDSU Extension publication PP622, “North Dakota Field Crop Plant Disease Management Guide”
- NDSU Extension publication PP1362, “Ascochyta Blight of Chickpea”
- NDSU Extension publication PP1704, “Pea Seed-borne Mosaic Virus (PSbMV) in Field Peas and Lentils”
- NDSU Extension publication PP1790, “Pea Disease Diagnostic Series”
- NDSU Extension publication PP1913, “Lentil Disease Diagnostic Series”
- NDSU Extension publication SF725, “Soil Fertility Recommendations for Field Pea, Lentil and Chickpea in ND.”
- NDSU Extension publication W253, “North Dakota Weed Control Guide”

Hans Kandel
Extension Agronomist Broadleaf Crops
IS CORN DEVELOPMENT CATCHING UP?

In the most recent NASS Crop Progress report, about 80% of the corn crop was rated good to excellent. However, much of the corn was planted late this year and that, coupled with abnormally cold temperatures in May, has caused some concern about how the crop might finish the year. Since we are about a third of the way through the season (as far as GDDs are concerned) I thought it was a good time to assess when the crop might mature this fall.

In Table 1, I have summarized GDD accumulations for this season (and normal GDDs) assuming May 1st and May 22nd planting dates. The latter date was used as it was when about 50% of the corn was planted in North Dakota this year. As expected, planting date has had a significant effect on the number of GDD available with about 115 more GDD available to the earlier planted crop. However, due to the cold temperatures in May in this year, that difference was much less would be normal for the same period (~190 GDDs are the normal difference compared to 115 this year).

GDD accumulation since May 22 have been very similar to the long-term average, which suggests that we are not falling behind the normal, nor are we catching up. Simulations from in the U2U Decision Support tool for GDDs, predict that the maturity of early planted corn will be behind normal (due to the cold May), but depending on the RM of the hybrid grown, there is a reasonable chance that it will mature early enough for reasonable dry down before normal harvest.

For the later planting date, maturity is likely to occur in October, later than is considered optimum as far as field drying is concerned. This is particularly the case if a full season hybrid was used, even though planting was delayed. Data on the attached table are averages and should be viewed as such. The GDD tool, does produce a range of dates around the average and illustrate what is possible, given the variability in weather between years. The recent warmer weather has not been sufficient to catch the crop up to an more ideal stage; warmer than average temperatures for the remaining two thirds of the season are needed to ensure a good finish to the corn crop this year and given the variability of past weather, there is still a reasonably good chance that could occur.

| Table 1. Accumulated growing degree days (GDDs) for 2019 and normal for two planting dates of corn at Carrington and Prosper, and predicted* dates of maturity using two hybrid maturities. |
| Carrington | Prosper |
| 1-May       | 22-May  | 1-May       | 22-May  |
| 2019 Accumulated GDDs† | 813 | 699 | 868 | 752 |
| Normal Accumulated GDDs | 881 | 696 | 931 | 736 |
| Predicted date of maturity 85 RM | 28-Sep | 24-Oct | 14-Sep | 28-Sep |
| Average date of maturity 85 RM‡ | 19-Sep | 27-Sep | 10-Sep | 20-Sep |
| Predicted date of maturity 90 RM | 22-Oct | No | 6-Oct | 21-Oct |
| Average date of maturity 90 RM | 30-Sep | No | 18-Sep | 3-Oct |

*Predicted dates to maturity were simulated using U2U Decision Support Tool - GDD, [https://hprcc.unl.edu/gdd.php#](https://hprcc.unl.edu/gdd.php#)
† Accumulated GDDs are from date of planting through 7/8/2019
‡ Average date over the past 30 years that corn reached black layer for the specified hybrid RM and planting date. The predicted date for 2019 used future “normal” weather data whereas the average date of maturity is the average of the calendar dates that corn reached maturity, given the weather in each of the past 30 years.

Joel Ransom
Extension Agronomist, Small Grains and Corn
FUSARIUM HEAD BLIGHT (SCAB) RISK AND FACTORS TO CONSIDER

There are several areas across the state in moderate to high risk for Fusarium head blight (FHB) on susceptible varieties that are flowering (Figures 1 and 2). If a moderately resistant variety is being used, moderate to high FHB risk still exists for southeast and southwest North Dakota (Figure 3). All of these statements are based off maps generated by the Fusarium Head Blight Prediction Center (national model) and the NDSU Small Grains Disease Forecasting Website (state model). Risk will increase in the coming days for most areas of the state. Currently, the state and national model have similar trends, but also have noticeable differences prompting several questions on how to gauge FHB risk and what model should I use? This article will review both models and provide some insight on commonly asked questions.

Differences between the national and state model
Weather Data Source: The national model uses weather obtained by the National Weather Service that adjusts for topography and vegetation. The state model is solely dependent on the NDAWN station data. Regardless, the most important weather data variable being used is relative humidity as this drives FHB epidemics.

Time periods: The national model retrieves relative humidity data information for 15 days prior to the flowering date selected. The state model uses relative humidity for 7 days prior to the flowering date. The importance of using relative humidity data prior to flowering growth stages is that the Fusarium fungus needs several days of conducive conditions to start releasing spores that small grain spikes.

Figure 1. National model Fusarium head blight risk for SUSCEPTIBLE varieties for July 10, 2019. Red = high risk, yellow = moderate risk, and green = low risk.

Figure 2. North Dakota state model Fusarium head blight risk for SUSCEPTIBLE varieties for July 9, 2019. Red = high risk, yellow = moderate risk, and green = low risk.

Figure 3. National model Fusarium head blight risk for MODERATELY RESISTANT varieties for July 10, 2019. Red = high risk, yellow = moderate risk, and green = low risk.
Host Susceptibility Selection: The national model currently has a selection tool to select market class (spring vs winter wheat) and host susceptibility (susceptible, moderately susceptible and moderately resistant). The state model does not have the market class criteria and has four classes of susceptibility: very susceptible, susceptible, moderately susceptible and moderately resistant. Having a moderately resistant variety can drastically reduce risk in spring wheat.

Remember...These are prediction models

As with every model, predictive models should not be used as a sole source of information and decision making. Rather it should be used to help alert you to conditions that are conducive for FHB. We have seen the models perform remarkably well and also fail to predict epidemics. When I get asked about the risk for FHB in an area, I first consider the level of resistance of the variety used and then think about other factors that may give an indication of high humidity. For example, if dews are extending into the afternoon hours for consecutive days (pant legs are soaked when scouting), this paints a picture of an environment that will be at higher risk for scab.

Final thoughts

Currently, I believe the national model is doing a better job predicting potential FHB epidemics in the state. The national model has responded well to rain events, fog, long dew points, etc. The state model appears to be more conservative this year, but the model has been trending towards higher risk for several areas of the state over the past couple days.

Andrew Friskop
Extension Plant Pathology, Cereal Crops
POTASSIUM DEFICIENCY IN-SEASON DIAGNOSIS AND CORRECTION IN CORN

Potassium deficiency in corn is a relatively new problem for most of North Dakota outside of the highly eroded, deep sandy soils on the western edge of the Red River Valley where K deficiency has been common for decades. Potassium deficiency symptoms at V6 to V8 growth stages look similar to the image below.

A full diagnosis to confirm the K deficiency can be made using a paired plant sample analysis from a ‘good’ area compared with a ‘not-so-good’ area. There is an NDSU Extension circular available explaining the updated K recommendations for North Dakota, which are related to clay chemistry.

Link to SF 1881, North Dakota Clay Mineralogy Impacts Crop Potassium Nutrition and Tillage Systems

The corn in the field shown is in an area of the state where the critical level defined by the clay chemistry map in the circular is 150 ppm, but the area where the deficiency is located tested 170 ppm. Obviously, the corn is telling the farmer that the critical value should be 200 ppm, not 150 ppm. Although 145 soil samples were taken within the state to develop the clay chemistry maps, including at least 2-3 in each county, there are probably areas of some size not represented in the survey that require the higher critical K value. If a field is in a condition as shown, and the field was not fertilized with K because the field was in the lower critical K area and the soil test was between 150 and 200 ppm,
then for the future, please note that the field should be fertilized based on the 200 ppm critical value, and not the lower value indicated in the general clay chemistry map.

A field, or a part of a field, showing K deficiency at this stage of growth, or even a few leaves more mature, can be rescued by applying a broadcast application of 0-0-60 at 100 pounds per acre. With a little rain shower following application, the corn should come back to normal. If left to nature, the yield reduction in our research was generally 20-30 bushels per acre less than corn adequately fertilized with K. A row-type applicator mounted with a dry fertilizer box would be the preferred application, since 100 pounds per acre is a lot for an airplane to deal with. Potassium thiosulfate liquid would also be a possibility if dribbled between the rows, but the rate of K would need to be similar to the dry K recommendation and would likely be more expensive.

Dave Franzen
Extension Soil Specialist
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MIXING ISSUES WITH ENLIST ONE AND GLYPHOSATE

I have received a few questions about compatibility issues with Enlist One and some formulations of glyphosate for use in Enlist Soybean. Specifically, the questions have concerned the potassium salts of glyphosate. When some potassium salts of glyphosate are mixed with Enlist One in inductor tanks, then the products quickly separate, and a white chalky residue is left behind. In order to evaluate this ourselves, we did a simple jar test to mix 1 pint of Enlist One with 1 pint of a potassium salt of glyphosate (Roundup Powermax) or 1 pint of a dimethylamine salt of glyphosate (Durango DMA) at 3 different carrier volumes: 1, 3, and 15 gallons per acre. We then shook the bottles, and let them sit for 1 hour. Images 1-3 show the different mixtures at 1 minute after mixing, and image 4 shows all the mixtures 1 hour after mixing.
At the lower carrier volumes, Enlist One + Roundup Powermax left white chalky residue on the container walls, and separated quickly. However, the mixture in 15 gallons per acre carrier volume stayed in solution and did not leave the residue behind. I should also note that we added most of the water to the 15 GPA bottles prior to adding the herbicides. The extra water in those bottles helped the products go into and stay in solution. Roundup Powermax and Durango DMA were the only two glyphosate formulations we tested, and we did not test any isopropylamine salts of glyphosate. I recommend a quick jar test if anyone wants to mix other glyphosate formulations with Enlist One in an inductor tank to test for these compatibility issues.

Joe Ikley
Extension Weed Specialist
**AROUND THE STATE**

**NORTH CENTRAL ND**

The North Central region continued to receive hit and miss storms over the last 7 days - NDAWN observations at several stations are as follows: Minot 0.05”; Rugby 0.14”; Bottineau 0.49”; Rolla 0.50”; Plaza 0.34”; Mohall 0.48”; and Garrison 1.83”. Overall, several growers continue to apply fungicides in the North Central region for possible disease as they continue scouting efforts. The IPM scout for the region continues to observe tan spot in some small grain fields.

Grasshoppers, aphids, and sawfly have also been detected. For some growers, grasshoppers have been a big deal along field edges. Grasshoppers have also been reported in sunflower over the last week. For the first time in 2019, wheat midge was detected in several traps last week. Wheat midge numbers were moderate in the Ward and McHenry County traps with low detections across the remainder of the area. Please keep in mind, these numbers are not considered an economic threshold, but rather suggest growers should be scouting. At this time, no sunflower moths have been detected in traps.

The NDSU North Central Research and Extension Center field day has been set for July 17th. The program begins at 8:30 am with a pest clinic. The tour begins at 9 am. Field day topics include hemp production strategies, weed control research, clubroot management and ID in canola, Omega-3 canola, Pulse production and potential pea release, and managing soils with beet lime. At 1 pm, the NCREC will host a wheat preharvest marketing seminar sponsored by the North Dakota Wheat Commission. Topics include marketing strategies for harvest and beyond (Mike Krueger of The Money Farm), challenges and opportunities for North Dakota wheat producers in 2019, and a demand outlook for hard red spring and durum wheats. A meal will be served for attendees at 12 noon. Both events can be attended free of charge.

**NORTHWEST ND**

The Williston Research Extension Center dryland field day is Wednesday, July 10th and everyone is welcome. Attendees can pick either the dryland agronomy or horticulture tour. Featured topics on the dryland tour include soil acidification in no-till, a plant pathology research update, and dryland soybean management. The dryland tour will conclude with the ground breaking for a new seed cleaning facility on site. The horticulture tour will include a walking tour of the All-American Selections garden and a discussion of house plant care. Both tours start at 3:45 pm followed by a steak and lamb supper at 7:00 pm. The Nesson Valley irrigated tour is on Thursday, July 11th 9:00 am to noon followed by a hamburger lunch. Tour highlights include weed management, demonstrations of herbicide injury on crops, and high tunnel research. The Nesson Valley site is 23 miles east of Williston on Highway 1804.

With scattered rain showers moving through the area over the past week and periods of higher humidity, growers have started spraying chickpea for ascochyta blight. Growers with durum or spring wheat varieties susceptible to scab (Fusarium head blight) are advised to keep an eye on their fields and spray for scab if needed. Remember, spraying a little late (3-7 days after flowering has started) is more effective than spraying too early (prior to flowering).
NORTHEAST ND

Soybeans are starting to blossom in the northeast. Overall, soybean growth and development is slow this year. Last week, my IPM scout observed plants at the V2 to V4 stage. We are not close to canopy closer yet. Iron chlorosis is present in scattered fields.

We received variable rainfall across the region. We needed the rain, but not the violent winds that came with it. Bacterial leaf streak has been found in Ramsey County wheat, which likely was kickstarted from June 29th storms. With Monday’s rainstorm, more patches of bacterial leaf streak may develop. No fungicide or chemical application can prevent or stop bacterial leaf streak.

Spraying for scab in wheat and white mold in canola continues. Sclerotinia risk is high across the north east. Scab risk is highest in Towner and parts of Rolette counties. Remember, early flowering is best timing for scab. This stage occurs when the middle of the head has cast out the yellow florets. Wheat fields are uneven for flowering and it can be hard to decide when to apply fungicide, especially when rainstorms are forecasted. My advice is aim to spray to provide coverage for your best crop. NDSU Plant Pathology has also said that applications applied a little on early side produce less scab infection than applications applied at a later-than-ideal timing. Post flowering, protein enhancement for wheat can be applied soon. Liquid 28% mixed with water or a urea solution can be used. See Extension publication, SF712.

We found grain aphids in Walsh County. Grasshoppers were increasing in numbers. However, this week’s rain has probably aided in reducing their numbers.

Lesley Lubenow
Area Extension Specialist/Agronomy
NDSU Langdon Research Extension Center

SOUTHWEST ND

According to NDawn from June 25th to July 8th, Dickinson received 0.33 inch of rain, however reports from the surrounding area show that some received over an inch. Rainfall and scattered storms have brought moisture to most of the region; however, some areas are still in need of more. There were pockets that were impacted by hail over the past week, and there is a wide range in crop maturities with the hectic spring we’ve had. While there are some fields a bit behind, a majority of the fields I’ve seen look great. With moist conditions and most small grains heading and flowering, be sure to apply fungicides in a timely manner. If you weren’t able to make it for our field day on July 10th, feel free to contact me or stop by the NDSU Dickinson Research Extension Center and we can visit about some of the work being done here.

Ryan Buetow
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center
SOUTH-CENTRAL/SOUTHEAST ND

Based on NDAWN, the region’s total rainfall May 1 through July 8 ranged from 5.8 inches (Carrington) to 9.8 inches (Oakes). During the past week (July 2-8), rainfall ranged from 0.4 inch (Harvey) to 5.3 inches (Linton). On July 9, significant rain was received.

The region’s corn growing degree day units accumulated from May 15 to July 8 range from 670 to 790. This range is about the equivalent of one leaf or less plant development compared to the long-term average for the period. We should have lots of summer left to catch up; a delayed fall frost would also be good!

Winter cereals are in the soft- to hard-dough seed stages. Spring small grain seeded during late April are in the watery-ripe to soft-dough stages. First-half of May planted corn is at V7-9 and soybean is flowering (R1 stage). Canola is advancing through bloom with pod/seed development; dry bean are nearing the flowering stage; field pea is developing seed; flax is forming bolls; and sunflower has reached the reproductive stage (R1).

POST herbicide application in soybean and dry bean, foliar fungicide application in spring wheat, and haying have all been recent, challenging farm activities due to frequent and significant rain. Lodged grain and increase in crop disease risk are present.

Lodged two-row barley at Carrington REC on July 9

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center
WEATHER FORECAST

The July 11 through July 17, 2019 Weather Summary and Outlook

Almost all the rain that was recorded in the past week fell on Monday, July 8 and Tuesday, July 9. Rain totals from North Dakota Agricultural Weather Network (NDAWN) stations each of those two days is presented in Figure 1 and Figure 2.

![Figure 1. Total Rainfall on Monday, July 8, 2019 at NDAWN stations](image1)

![Figure 2. Total Rainfall on Tuesday, July 9, 2019 at NDAWN stations](image2)
Several NDAWN stations recorded over 3 inches those two days with a few stations even exceeding 5 inches. Although much of the region recorded beneficial, or even excessive rainfall, the northeastern part of North Dakota was a noticeable exception.

The rain and cloudiness associated with the rain, attributed to temperatures being near or even below average for the past week (Figure 3). These next 7 days should bring in much warmer temperatures with many days recording highs in the 80s and even a day or two at or above 90 degrees.

![Departure from Normal Average Air Temperature (°F) (2019–07–03 – 2019–07–09)](image-url)

**Figure 3. Temperature departures from average from July 3 to July 9, 2019 at selected NDAWN stations**

There will be a subtle shift of the weather patterns over North America this week. This will allow warmer temperatures to surge northward. Temperatures are expected to be slightly above average through the middle of next week. There will be a couple of weaker disturbances with most locations not recording much rain through the weekend. Next week temperatures may exceed 90 degrees over parts of the region ahead of a cold front that looks to be moving through next Tuesday or Wednesday. That transition may in turn bring in another widespread rain across North Dakota and northwestern Minnesota. Until then, in the short term, any thunderstorms look to be more hit and miss.

My projected growing degree days (GDDs) for the next seven days for Base 32°, 44° and 50° is presented in Figure 4. With warmer temperatures expected to move into the northern plains, most locations are expected to record 10% to 20% more GDDs this week than the past 7 days.
Although less rainfall is expected than what was recorded during the past week, the rain from earlier this week will add moisture to the lower atmosphere. This will mean high humidity most nights and mornings during this upcoming forecasted period that will keep the hours with relative humidity (RH) above 85%, above seasonal averages. This will keep the risk of plant diseases at higher levels than average for the time of year. My projected hours with high RH through July 17 are presented in Figure 5.

Using May 5 as a planting date, accumulated growing degree days for wheat (base temperature 32°) are 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. Accumulated Growing Degree Days for Wheat since May 5, 2019

Using May 15 as a planting date, accumulated growing degree days for corn (base temperature 50°F) are 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. Accumulated Growing Degree Days for Corn since May 15, 2019

Soybeans also use base 50°F 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 your 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
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