WHEAT MIDGE EMERGING & 2018 FORECAST

Wheat midge emergence will be starting soon in the northern tier of North Dakota where it has been a major insect pest of hard red spring wheat and durum wheats. The wheat midge degree day model predicts the emergence of wheat midge, and helps producers to determine when to scout and if their wheat crop is at risk (or in a susceptible wheat stage, heading to early flowering, for female wheat midge egg-laying). The degree day model using a base temperature of 40 F to predict the emergence of males at 1,100 accumulated growing degree days (AGDD), 1,300-1,600 AGDD for female wheat midge (see table below). See wheat midge AGDD map on next page.

<table>
<thead>
<tr>
<th>Wheat Midge Degree Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,100</td>
</tr>
<tr>
<td>Male wheat midge emerging.</td>
</tr>
<tr>
<td>1,300</td>
</tr>
<tr>
<td>10 percent of females will have emerged.</td>
</tr>
<tr>
<td>1,475</td>
</tr>
<tr>
<td>50 percent of females will have emerged.</td>
</tr>
<tr>
<td>1,600</td>
</tr>
<tr>
<td>90 percent of females will have emerged.</td>
</tr>
</tbody>
</table>

Producers can access the wheat midge degree day model on North Dakota Agricultural Weather Network (NDAWN) at: https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html

Select your nearest NDAWN station and enter your wheat planting date. The output indicates the expected growth stage of the wheat and whether is susceptible to midge infestation, as well as how far along the wheat midge emergence is, such as, 50% females emerged. Scouting for the orange adult flies is conducted at night when temperatures are greater than 59 F and the winds are less than 6 mph. Use a flash light and slowly scan the heads of wheat plants for wheat midge adults, counting the number of flies per head.

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.
2018 Wheat Midge Forecast: Two thousand and ten soil samples were collected from 21 counties in the fall of 2017 to estimate the regional risk for wheat midge in North Dakota for 2018. Results indicated low levels of overwintering wheat midge larvae (cocoons) (see map on next page). In fact, the 2018 wheat midge risk forecast is one of the lowest on record, since the survey started in 1995.

Less than one percent of the soil samples had economic population densities of wheat midge (greater than 500 midge larvae per square meter) this past year. The hot spot was located in one soil sample in northeast Rolette County in north central North Dakota. The majority of the soil samples, 75 percent, had no wheat midge cocoons. This is good news for North Dakota wheat producers as it will reduce the likelihood that insecticide inputs will be needed for wheat midge control in wheat in 2018.

Wheat midge populations ranged from zero to 1,321 midge larvae per square meter, with an average of 24 larvae per square meter in 2017. In 2016, wheat midge populations were slightly higher than 2017, ranging from zero to 2,071 midge larvae per square meter, with an average of 42 larvae per square meter. Other areas with low wheat midge populations (200 to 500 larvae per square meter) occurred in small, localized areas in northeastern Eddy and Wells, and south central Ramsey counties. These population levels are still considered non-economic and low risk for wheat midge.

The dry weather in the northwest and north central areas of North Dakota was extremely unfavorable for wheat midge in 2017. Larvae are susceptible to dryness and require dew or rain to drop out of the wheat heads and to dig into the soil to overwinter as cocoons. Even with the low risk forecast for wheat midge, it is wise to scout any wheat fields that are at risk from heading to early flowering (<50% flowering) during wheat midge emergence. Remember, scouting for wheat midge is still the best way to determine if you have an economic infestation in your wheat field and ‘good insurance.’

Thanks to the NDSU Extension Agricultural agents who collect the soil samples in their county each year. The North Dakota Wheat Commission provides funding to support the wheat midge survey.

For more information about wheat midge scouting and IPM, please consult the NDSU Extension IPM of the Wheat Midge in North Dakota E1330 (revised) and the Extension Entomology website on wheat midge.
UPDATE ON LEAFY SPURGE FLEA BEETLES DEGREE DAYS

Most of North Dakota has accumulated enough degree days to start scouting for leaf spurge flea beetles for biocontrol of the noxious weed leafy spurge. Begin scouting for adult flea beetles when the sunflower AGDD approaches 1,000. Flea beetles are collected between 1,200 and 1,600 AGDD using the sunflower GDD model. Use the sunflower degree day map on NDAWN and enter “2018-03-01” for planting date and select “growing degree day” for map type.
IPM EXTENSION PUBLICATION

This new extension fact sheet describes the different tools of Integrated Pest Management (IPM) for farmers in agriculture. Examples of different pest management strategies are given including cultural, host plant resistance, mechanical, biological and chemical control. The steps of implementing IPM and its benefits are described. It is available online and as printed copies through your local county extension office.

Janet J. Knodel
Extension Entomologist

WIREWORM PRESSURE HIGH

Wireworm damage is being observed in sunflower in the Mohall area, especially in sunflower following small grain or corn. Wireworms tunnel through seedling plants causing death of the seedlings, and often kill the seedling right at germination. Stand loss from high wireworm populations can be significant. For example, a field in which we are running insecticide efficacy trials for wireworms was seeded at 25,000 plant per acre. However, the established stand was only 18,000 plants per acre after wireworm feeding, a 28% stand reduction! Producers are having to over seed to compensate for wireworm loss, and that’s an added expense.

In our 2018 insecticide trials for wireworm control in sunflower, we are testing in-furrow pyrethroids alone, thiamethoxam seed treatment alone and combinations of in-furrow pyrethroids and thiamethoxam seed treatment. However, stand count data shows that we are still losing plant stand from wireworm feeding injury even with the combination treatments. Fortunately, we also are testing experimental seed treatments in wheat and sunflower with new modes of action that should kill the wireworms. Syngenta and BASF plan to release these new insecticides for wireworm control in wheat and corn by 2019.

Wireworm damaged sunflower seedling and stand loss in sunflower field near Mohall, northcentral ND. (P. Beauzay, NDSU Extension Entomology)

Janet J. Knodel
Extension Entomologist

Patrick Beauzay
State IPM Coordinator
Research Specialist, Extension Entomology
CHECKING LEGUMES FOR NODULATION

This spring, North Dakota growers have planted several annual legume crops, including field pea, chickpea, lentil, soybean and dry bean. Legumes form visible nodules on the root hairs of the primary and lateral roots, two to three weeks after plant emergence (see photo). Legume species specific bacteria form a symbiotic relationship with the legume roots. The resulting nodules contain the bacteria. These bacteria can biologically fix nitrogen (N) from the air, making it available to the plant. If there is abundant N already available in the soil, the plant will not nodulate properly. It is important to dig up some roots and check a field to see if nodules are present. To check roots, use a small spade or gardening tool to dig up the plants. Do not pull the plants out of the ground as this will cause nodules to be ripped off the roots and therefore the nodule observation will be misleading. Bring a small bucket of water into the field and wash off the soil from the roots. Check roots in several locations within the field and examine roots of a few plants per location.

Healthy and actively N fixing nodules have a pink or reddish inside color. Nodules that are white, brown or green inside do not fix N. If the legume plant does not have nodules or the nodules are not healthy and discolored inside, the plant may show yellowing due to a lack of N, assuming there was limited residual plant available N. Under normal conditions, N fertilization is not recommended for most legumes, but if the yellowing is indeed due to lack of N, a rescue top-dress application with N may be warranted.

At the time of digging roots, it is also suggested to check the health of the root system and evaluate if there are root diseases present. Diseased roots will have lower nodule numbers. In addition, in saline areas of fields, or in soybean fields with iron deficiency chlorosis (IDC) lower root nodules per plant is expected.

Although seed may have been inoculated with the right bacteria species, satisfactory nodulation is not a guarantee. Environmental conditions such as drought or excess moisture after planting may result in poor nodulation. In fields where poor nodulation is observed, it is important to inoculate the seed the next time the same type of legume is planted in the same field.

Hans Kandel
Extension Agronomist Broadleaf Crops
WARMER THAN NORMAL TEMPERATURES HASTEN CROP DEVELOPMENT

A quick look at the weather data for this season reveals that corn and wheat growing degree days are running well ahead of normal (100 to more than 200 for a May 1st planting date). This warmer weather is pushing corn and wheat development about 5 to 10 days ahead of normal depending on the location in the state.

Corn is a warm season crop, with optimum growth occurring with cool nights and daytime temperatures near 85 degrees. Recent weather has been nearly ideal for corn growth. In a few fields, yellow flagging has been observed. This occurs when new leaves have difficulty emerging from the whorl because of being slightly crinkled usually during the V5-V7 stages. Buggy whipping is followed by the “yellow flagging” of the restricted leaves once they emerge from the whorl. This phenomenon can occur when there have been cycles of cool and warm temperatures with hybrids differing in their likelihood to show a response. The incidence of buggy whipping/yellow flagging is much less than last year. Generally, the tightly twisted leaves in affected plants will unfurl and the plants will resume normal development after several days.

Small grains are progressing through growth stages quickly. Much of these earlier planted crops are in the boot stage or just beginning to head. I have received a few questions about whether the crop will be shorter than normal due to this accelerated development. It is common for small grain crops that are stressed during vegetative development (in this case average temperatures above optimum is the stress) to be shorter than normal. As I recall, the small grain crop was found to be much shorter than normal last year about this stage of development. However, in the in the areas of the state where there was no serious water stress, small grain crops ended up being about as tall as normal at harvest last season. Small grains have the potential of compensating when conditions turn favorable. So even though it seems likely that the small grain crops will be slightly shorter than normal this year due to their hastened development, the weather during the next week or two can still have an impact on the ultimate height of the crop.

Joel Ransom
Extension Agronomist for Cereal Crops

FUSARIUM YELLOWS IN SUGARBEET FIELDS

Fusarium yellows/decline symptoms were observed in research plots and a commercial sugarbeet field. The fungi Fusarium oxysporum and Fusarium securum cause Fusarium yellows and Fusarium decline, respectively, on sugarbeet. Fusarium yellows/Fusarium decline may cause significant reduction in plant stand, root yield and extractable sucrose.

Infection typically starts early in the growing season. Under severe disease conditions, young plants at the 4- to 6-leaf stage may initially display leaf yellowing (Figure 1) followed by wilting and death. Cross sections of roots typically will show darkening of vascular system. On older plants (4-leaves and older), symptoms include interveinal yellowing, leaf scorch and death of older leaves (Figure 2). Symptoms may include distinct yellowing of half the leaf on one side of the midrib (Figure 3) which then spreads over to the other side of the mid-rib; necrosis and death of older leaves followed by death of the younger leaves. Under severe disease conditions, older infected plants may die. In many instances where disease is not severe, plants may display typical foliar symptoms but survive. Roots of seedlings and older plants with distinct foliar symptoms appear healthy on the outside, but when these roots are cut in a cross or transverse section, there is a distinct darkening and damage of the vascular system (Figure 3 & 4). Roots of infected plants will not store well in piles and have very high respiration rates and low sugar concentration. The best and only way to manage Fusarium yellows/decline is to plant tolerant varieties, many of which are available. Growers should consult their agriculturists or seed sales representatives for Fusarium tolerant varieties appropriate for their specific growing area.

(See following pages for figures)
Figure 1. Symptom of Fusarium yellows/decline on 4-leaf stage sugarbeet – yellowing first on oldest true leaves

Figure 2. Typical symptoms of Fusarium yellows/decline on an older plant – interveinal chlorosis and necrosis starting on oldest leaves followed by similar symptoms on younger inner leaves
Figure 3. Distinct necrosis of half-leaf along one side of the mid-rib of Fusarium yellows/decline sugarbeet and darkening of vascular system.

Figure 4. Outside of root of Fusarium yellows/decline plant appears healthy but cross-section shows vascular system is severely damaged.
CONFIRMED REPORT OF FUNGICIDE RESISTANCE IN THE FIELD PEA ASCOCHYTA/MYCOSPHAERELLA BLIGHT PATHOGEN

Resistance to the QoI fungicides (FRAC group 11) has been confirmed in the pathogen that causes Ascochyta / Mycosphaerella blight in FIELD PEA. To be clear, this should be considered only a first report of resistance. We currently do not know how widespread this resistance is. However, if growers apply any FRAC 11 fungicides on field pea this growing season for Ascochyta/Mycosphaerella blight (such as Headline, Quadris) or premixes containing FRAC 11 fungicides, it is important to monitor fields for management of the disease.

The identification of the fungicide resistant pathogen was confirmed several ways. First, reduced control of FRAC 11 fungicides was observed in a fungicide trial on field’s peas at the Carrington Research Extension Center. Isolates of the suspicious pathogen were sent to Dr. Pasche’s pulse crop and dry bean laboratory at NDSU. The pathogen isolates were grown in petri plates on agar (growth media) that contained different levels of FRAC 11 fungicides. The fungicide resistant isolates were able to grow on agar that contained levels of fungicide 50 to >1,000 higher than the control isolates. Thus, confirming a sensitivity shift (thus, ‘resistance’) in the laboratory.

Next, field pea plants were grown in the greenhouse and infected with the pathogen. When the control pathogen was used, the FRAC 11 fungicides controlled the disease. However, when the fungicide resistant isolates were used, the disease was not controlled. In the photo below, the fungicide resistant isolate was used to infect the field peas. From Left to Right, the plants were the control treatment (sprayed with only water), sprayed with headline (a FRAC 11 fungicide), and sprayed with Proline (a FRAC 3 fungicide).

*Field peas infected with an Ascochyta/Mycosphaerella blight isolate resistant to strobilurin (FRAC 11) fungicides. Plant on left is the control treatment (sprayed with water), plant in center is a Headline (FRAC 11 fungicide) treatment, and plant on right is a Proline (FRAC 3 fungicide) treatment.*
To determine how widespread the resistance is, we will actively be conducting a pathogen survey this summer. This will be critical knowledge for the development of management recommendations in the future. Without this knowledge, it is premature to make widespread changes to management recommendations. However, as stated before, it is very important that growers closely monitor fields for Ascochyta / Mycosphaerella blight after applying FRAC 11 fungicides to field peas.

To be clear, this information only applies to FRAC 11 fungicides, and only to the pathogen that causes ascochyta blight on field peas. The pathogen that causes ascochyta blight on chickpeas has been known to be resistant to FRAC 11 fungicides for over a decade. To the best of our knowledge, the pathogen that causes ascochyta blight on lentils is still sensitive to FRAC 11 fungicides (thus, Headline, Quadris, etc... are still effective).

Sam Markell  
Extension Plant Pathologist,  
Broad-leaf Crops

Julie Pasche  
Research Plant Pathologist  
NDSU Dept. of Plant Pathology

Michael Wunsch  
Research and Extension Pathologist  
NDSU Carrington REC

FUSARIUM HEAD BLIGHT RISK IN NORTH DAKOTA

Winter wheat is in the flowering stages of development and some of the spring wheat has headed. Now is a good time to assess Fusarium head blight (scab) risk. Presently, a few pockets of moderate scab risk exist for susceptible varieties in northeast and southeast ND (Figure 1). For moderately susceptible (Figure 2) or moderately resistant spring wheat varieties, scab risk is low for the entire state. Conditions that favor scab development include prolonged periods (2-3 days) of high humidity, frequent rain events and warm temperatures. Therefore, continue to monitor the growth stage in small grain fields, take note of field conditions (i.e.: dew periods, rain, etc.) and pay attention to upcoming weather events that may elevate scab risk.

(Continued on next page)
The best time to apply a fungicide for scab in wheat is when a majority (>50%) of the main stems are at early flowering (Figure 3). For barley, the best time for a fungicide application is when a majority (>50%) of the main stems are at full head (Figure 4). Research conducted at NDSU and throughout the United States (funded by United States Wheat and Barley Scab Initiative) suggest that applying a fungicide to wheat 4-7 days after early flowering (late) provides more disease suppression than applications made prior to early flowering (early). The same trend is observed in barley where fungicides applied after full-head (late) provide more suppression than fungicides applied prior to full-head (early). Currently, triazoles/DMI/FRAC 3 are the only state labeled fungicides that provide suppression of scab and deoxynivalenol (vomitoxin). Also, there are efficacy differences among triazoles with prothioconazole+tebuconazole (Prosaro) or metconazole (Caramba) providing 45-60% suppression and tebuconazole (Folicur and generics) providing 20-30% suppression. For more information on scab fungicide efficacy and timing, please read CPN-3001 Optimizing Fungicide Use for Fusarium Head Blight (Scab) and Associated Mycotoxins and NDSU Extension Publication Deoxynivalenol (DON) in Small Grains.

(See figures 3 and 4 on next pages)
Figure 3. The best time to make a scab fungicide application in wheat is at early flowering defined as yellow anthers (flowers) extruding from the center portion of the head.
FALL AMMONIA DAMAGE TO SOYBEAN

I have had two calls within the past few days on a rare phenomenon. An ag-consultant and a farmer from the central part of ND have seen soybean damage over last fall’s anhydrous ammonia bands. The last time I have seen damage from a fall ammonia application was in 1997 outside of St. Thomas, ND. The farmer had applied ammonia in late October 1996, seeded spring wheat in spring 1997, and the wheat did not emerge over every ammonia band track in the field. People think that nitrification happens immediately following ammonia application, but this is not what happens. (Continued on next page)
Ammonia remains ammonia for at least a week following application regardless of when it is applied. North Dakota farmers can successfully apply fall ammonia on most soils close to freeze up because we have real winter; not the namby-pamby post-fall season commonly referred to as ‘winter’ in Indiana. Ammonia application is essentially ‘in the freezer’ until this year almost May (hard to remember it was that cold in April, but check out the NDAWN archives). As soon as it was fit to plant, everything went into the ground, including soybean. When there is concentrated ammonia in a band, a portion of it will partition (my physical chemistry class experiences recalled) into free ammonia. Any free ammonia is toxic to seeds and harmful to seedlings. If we had experienced some earlier spring weather and a little moisture than actually occurred, the ammonia toxicity to seedlings would not be apparent. With the evidence that ammonia is still active after 6 months, it serves as an object lesson that ‘there is no safe time after ammonia application to seed’, at least in a practical sense. Fortunately, these fields so far have been solid-seeded soybean, so the natural ability of soybean to fill in gaps and yield similarly at lower populations will make these observations informative, but not economically important.

Dave Franzen
Extension Soil Specialist
701-799-2565

PROTEIN ENHANCEMENT RECIPE

Early seeded spring wheat fields are beginning to head, so one of the upcoming questions many of you will have will concern strategies for increased protein. It is unknown what protein premiums might be offered at harvest for the 2018 crop. The premium usually is based on what the protein level of the USA wheat crop might be. If the protein is anticipated to be lower, a higher dockage for less than 14% protein will be imposed and a higher premium for greater protein will be offered.

**IF** the decision is made to try to increase protein, the most efficient way to accomplish this is to apply 30 pounds N per acre (10 gallon of UAN + 10 gallon water) immediately after flowering is completed on the main stem head (post anthesis and before the wheat seed starts to become milky). Apply with flat fan nozzles broadcast over the plants during the cool of the day, usually from just before daybreak until it becomes hot or ideally near dusk. If the day is cloudy, and temperatures are in the 50’s to 60’s degrees F, the sprayer could run all day. Expect some leaf burning, but at this growth stage the burning does not contribute to yield loss, but don’t push it. Spraying all day in heat/drought stressed wheat when temps are 90 degrees is not a wise practice.

Reduced burning (again not an issue, but some growers don’t like the attention burning receives from neighbors) can be accomplished if the local supplier ‘melts’ urea to make a urea solution. In most cases, low burning or no burning results from using straight urea compared to UAN. However, on rare occasions fields have been severely burned from urea solution application. This was probably the result of biuret contamination of the urea used to make the solution. Biuret is a byproduct of the urea manufacturing process when it is poorly controlled. Urea is a worldwide commodity. Although US and Canadian manufacturers do a good job of keeping biuret content of urea low (less than 0.2%), the same might not be true from offshore sources. There are few laboratories in the region that test fertilizer for biuret. [A publication from the International Plant Nutrition Institute](#) states that urea with less than 1% biuret should be acceptable as a foliar source for most crops. However, very sensitive crops may require less than 0.3% biuret.

The contact information for the one laboratory that we know tests for biuret follows below. This is not an endorsement for the lab. If anyone has information from other regional labs that test for biuret, we would be interested to know and we can distribute the information through the Ag-Dakota list-serve. The turn-around time for a urea sample is 3-5 business days.

Midwest Laboratories
13611 B Street
Omaha, NE 68144
402-334-7770

(Continued on next page)
It is also important to explain that there are a number of products that are slow-release urea liquid fertilizers that claim great efficiency over UAN or urea solution. Instead of 30 pounds N per acre, which is required for ½ to 1% protein gain, they claim that 1-3 gallons per acre (2.5 to 7.5 pounds N per acre) of their product will accomplish the same task. This is untrue. For data on several of these products in NDSU trials, please see https://www.ndsu.edu/fileadmin/soils/pdfs/foliarNreport.pdf. These slow release products have no greater foliar N efficiency compared to UAN.

Dave Franzen
Extension Soil Specialist
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Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center

ARE INVERSIONS REALLY THAT COMMON?

Pesticide applicators have long been obliged and directed by pesticide labeling to understand, identify, and NOT apply during air temperature inversions. This has become acutely important because of the off-target movement of dicamba over the last couple of years. But a similar statement is also found on many other pesticide labels.

EPA and pesticide manufacturers have made it abundantly clear they do not want pesticides applied during an inversion. But that is easier said than done. Until recently, very few people actually monitored inversions. That is fast changing. North Dakota and NW Minnesota via NDAWN now have 31 stations monitoring this in real time with alerts being posted to smart phones. Missouri has 11 stations. Pesticide manufacturers have also spent a fortune on predictive modeling and distribution of their estimates via mobile apps. Finally, handheld sensors developed by Innoquest are also widely available. Now that we can measure and monitor for inversions, an applicator has to assess this information and make a decision to spray or NOT spray. That is the hard part.

Over the past couple of months, NDSU and UM extension professionals have been closely observing real time inversion data using fixed stations and the Innoquest hand held device. So far in our work we have some interesting finding we would like to share.

Table 1. Percentage of days with a temperature inversion for at least 10 min per day by inversion intensity level from May 17 to June 12, 2018. Inversion intensity at each location was calculated as the difference in temperature between 1m and 3m heights (i.e., Temperature at 3m minus the temperature at 1m). Temperature was logged at 1-minute intervals with the HOBO MX2303 temperature data logger.

<table>
<thead>
<tr>
<th>Location</th>
<th>Inversion Intensity (Temperature difference between 1m and 3m)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 0.1 F</td>
<td>&gt; 0.5 F</td>
</tr>
<tr>
<td>Benson</td>
<td>100.0</td>
<td>92.6</td>
</tr>
<tr>
<td>Rosemount</td>
<td>100.0</td>
<td>96.0</td>
</tr>
<tr>
<td>Rochester</td>
<td>96.2</td>
<td>96.2</td>
</tr>
</tbody>
</table>

(Continued on next page)
1. Inversions happen in every 24 hour day EXCEPT when it is raining, there is severe weather, or when the wind speeds are very high and sustained in the night time hours (Table 1).

2. Inversions have been observed even when winds have been in the teens and gusting up to 25 mph!

3. Inversions begin to break apart in the morning hours quickly after sunrise. Temperatures start moving towards neutral (no inversion) within 15 to 30 minutes of sunrise and they are usually neutral within 90 to 120 minutes after sunrise.

4. Fog is not always associated with inversions. During an Advection fog you can have neutral or higher temperatures near the ground. Ground/Radiation fog is often associated with an inversion. Telling the difference can be a challenge. You can read more on the types of fogs here: http://glossary.ametsoc.org/wiki/Fog

5. Inversions start to build in the late afternoon. We have observed a 0.1 °F inversion four to five hours before sunset. However, when an inversion is starting to build that early, it happens very slowly. NDAWN, fixed stations in Minnesota, and hand held devices do not begin to show consistent readings (roughly 0.5°F of inverted temperatures) until about 120 to 180 minutes before sunset.

From a practical perspective, what is an applicator to do when making a decision to spray or not?

- In the morning, the sun is your friend. Regardless of cloud cover or wind speeds, an inversion will be quickly neutralized after sunrise by radiant energy striking the earth and heating the air near it. This process is complete in 90 to 120 minutes.

- In the afternoon and evening, it is more challenging to determine when to stop spray applications for the day. Especially since we do not know when an inverted temperature begins to seriously impact a pesticide application. At this time, our BEST IDEAS ARE:
  a. When skies are clear, wind speeds are very calm (0 to 3mph), and shifting direction, an applicator should exercise extreme caution and shut down earlier in the afternoon.
  b. When skies are clear, winds are above 3, to 6mph, and an inversion of 0.5°F or more is observed, the inversion intensity will likely move to 1.0°F or more by the evening hours. We believe this threshold merits curtailing further applications.
  c. With clear or broken skies, and winds above 6 to 10 mph, there is sufficient mixing in the atmosphere to keep an inversion from forming as quickly or as intensely. In these conditions, one may consider spraying longer into the evening, but would still be wise to finish applications within an hour of sunset.
  d. Finally, local conditions will often influence the timing and intensity of inversions. For example, official sunset times do not take into consideration rolling topography or the shading/wind influences from shelterbelts. Further, the site of application may have varying ground cover or canopy formation relative to a fixed tower site. Thus it is important to not rely exclusively on remote sensing.

In summary, pesticide applicators, like never before, are under intense pressure to make the right decision every time to avoid off-target pesticide movement. The good news is, we are amassing a massive repository of data to help applicators judge when to spray or not. The bad news is we have much to learn, in academia, industry, and in the regulator community. Until more answers are available, we will do the best we can sharing what we know and WHAT WE DO NOT KNOW about this critical environmental phenomenon.

For More Information

- The basics and importance of Air Temperature Inversions in NDSU’s comprehensive fact sheet.
- 11 minute video clip by Daryl Ritchison, NDSU’s North Dakota Ag Weather Network Director on observations from North Dakota during the 2017 season here: https://tinyurl.com/NDSU-Ritchison
AROUND THE STATE

NORTH CENTRAL ND

Over the past week, the north-central region rain has been variable. Minot has received about 1¼ inches, Garrison and Bottineau have received about ¾ inch, and rainfall near Bowbells was a touch over a tenth. A line of severe thunderstorms went across the northern portion of the state with damaging hail as big as 3 inches with Lignite, being the epicenter. Drown out is becoming an issue in some areas around Columbus. There have been reports of root rots in the extremely wet areas.

Due to the recent dry period, many producers cut back on spring fertilizer. With the recent precipitation, many of those producers have been side-dressing nitrogen. Nitrogen is an extremely leaky nutrient. A good portion of nitrogen applied to fields (usually more than 50%) does not make it into the plant. Split applying nitrogen is a great strategy. However, it requires time and equipment to complete this practice, but it can greatly improve nitrogen efficiency.

Chris Augustin
Extension Soil Health Specialist
NDSU North Central Research Extension Center

NORTHWEST ND

Much of Northwest ND received rain last week starting either Thursday or Friday and lasting through Saturday. The rain fell steadily and was able to soak into the ground in most places. Rainfall totals were generally between 0.5” and 1.0” across the region. There were isolated incidents of hail and strong winds causing some injury to crop leaves. Temperatures were cool over the weekend and are predicted to remain in the upper 70’s and low 80’s through the weekend of June 23 and 24. The next chance for rain is over the weekend with thunderstorms possible Friday through Sunday. Crop development is progressing with early-planted spring wheat in the boot stage and later planted fields jointing. If you have early-planted durum or spring wheat that is starting to head out, keep an eye on the relative humidity (RH) in your area and be prepared to spray a fungicide if scab/ head blight risk is high as your crop begins to flower. Early planted peas and lentils are just starting to flower while later planted pulses are 4”-6” tall and not yet flowering. As pulses begin to flower, the window for grass weed control closes, so make sure to take advantage of the light winds this week and get spraying done. If you experienced hail, check crops for diseases as bacterial infections may begin to show up on damaged crops. The pulse crop scout is seeing root rot in many pulse crop fields, especially where water collects or runs.

Clair Keene
Extension Cropping Systems Specialist
NDSU Williston Research Extension Center
PULSE CROP DISEASE UPDATE

Ascochyta blight has been found by an NDSU pulse crop scout (Shawn Postovit) in chickpea fields in Williams and Burke Counties at up to 50% incidence. Ascochyta first appears as scattered disease lesions on plants (Fig 1) but this disease can progress very quickly and thus foliar fungicides must be applied in a timely manner. Applications of systemic fungicides are advised as soon as trace levels of disease is detected. If weather remains cool and wet, applications of fungicides should continue every 10 to 14 days during bloom and early pod fill. Note that Strobilurin (FRAC 11) fungicides are not effective on Ascochyta blight on chickpeas as the pathogen, Ascochyta rabiei, has developed resistance. Further management recommendations can be found in the publication Management of Ascochyta Blight of Chickpea found on the Pulses: Tools for Growers webpage. Refer to the 2018 North Dakota Field Crop Plant Disease Management Guide for products currently registered on chickpea in ND.

NORTHEAST ND

It’s been a great week for plant growth and development in the northeast unless your fields were in the hail associated-storm areas. The earliest wheat is at heading stage and the later seeded wheat is at stem elongation. Soybeans are up to V3 stage. Sunflowers are between V4 and V6. Canola is at the end of its vegetative stages and starting to bolt.
At the LREC station, blister beetles have been observed in faba beans. There is no economic threshold for blister beetles. According to Saskatchewan Pulse Growers literature, blister beetles can move into faba beans, feed in swarms, and leave the fields. The biggest concern would be if faba beans were cut for livestock feed and the adult beetles were present as they contain an irritating and toxic chemical, cantharidin. These beetles can also be found in alfalfa, soybean and canola.

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

SOUTH-CENTRAL

The region’s NDAWN station data indicate rain during June 1-19 ranged from 1.3 inches (Cooperstown) to 4.6 inches (Jamestown), with the Carrington REC receiving 2.8 inches. This is a generally good week for crops and farmers with adequate soil moisture, moderate temps, sunshine, and low wind!

Alfalfa harvest continues with our current sunny days. Winter wheat is in early seed formation and winter rye is in late-seed formation stages. Early seeded (late April) barley is headed and spring wheat is in boot to early heading stages. Plans should be made for foliar fungicide application for scab suppression and flag leaf protection from leaf disease in spring wheat. Field pea and canola are flowering. Corn planted during the first week of May has 6-8 leaves (V6-V8 growth stages). Based on NDAWN growing degree day units accumulated from a May 1 planting date to June 19, the region’s corn ranges from 190 (Jamestown) to 280 (Oakes) units or 2-3 leaves ahead of the long-term average for the same period. Twisted (’buggy-whip’) new leaves in corn have been reported. This may likely be caused by rapid growth from our recent excellent growing conditions and would expect plants to be normal in near future. Mid-May planted soybean and dry bean are in the 2- to 4-trifoliate leaf stages. This is a good time to check the soybean root system for nodules (see picture).

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center
SOUTHWEST ND

Crops appear to be maturing more quickly than average this year. Most canola began to flower in the past week. Early planted small grains are anywhere from booting to early heading. According to NDAWN total rainfall in the past week from June 13th to June 19th in Dickinson is at 0.98 inch, 1.52 inch in Beach, 0.89 inch in Mott, 0.55 inch in Hettinger, 0.37 inch in Carson, and 0.48 inch in Hazen. For producers who may have went short on nitrogen fertilizer this spring with concerns for drought, now may be a good time for an application to collect some of the yield potential that comes with the recent rains. When it comes down to it though, you can’t know how much fertilizer is needed without soil test results. Last year around this time, the region was receiving many samples for wheat streak mosaic virus, with the winter we had this past year I wouldn’t expect it to be much of an issue, but if you suspect a virus issue be sure to send a sample into the Plant Diagnostic Lab.

Ryan Buetow
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center

WEATHER FORECAST

The June 21 through June 27, 2018 Weather Summary and Outlook

Every week we are reminded that rain never falls evenly across the area this time of year. One inch or more rain fell across far southeastern North Dakota and from southwestern to northcentral North Dakota into the northern Red River Valley in the past week. All North Dakota Agricultural Weather Network (NDAWN) stations recorded rain in the past seven days, but the range was from very little to over three inches (see Figure 1). The past three weeks have recorded widespread significant rains, but these next seven days look to be noticeably drier for much of the region.

Figure 1: Total Rainfall (inch) for the period of June 13 through June 19, 2018
Temperatures were cooler than they have been during the week ending on Tuesday, June 19, yet temperatures in eastern North Dakota and northwestern Minnesota still finished above average. Central and western North Dakota into far eastern Montana recorded temperatures right at the average for the middle of June or slightly below (see Figure 2).

The main storm track for the next week, and perhaps even the rest of the month looks to be to the south of North Dakota. Much of South Dakota, Nebraska, southern Minnesota, and Iowa into Illinois should record above average precipitation over the next several days. Plus, with the frequent cloudiness associated with that extra rain and the corresponding wetter soils, temperatures in those areas probably being below normal. But to the north of that main storm track, temperatures should be at least near the average if not above. Western North Dakota and far southern North Dakota will get grazed by some of these storms moving to our west and south and therefore, those areas are expected to record the most precipitation in the next week or more. Other areas look to be recording very little rainfall outside of isolated areas that may get a direct hit from a thunderstorm. Therefore, at the moment it appears the rest of the month will be a drier than average period with the exceptions of those areas mentioned above. Temperatures will be near normal to slightly above in southern North Dakota and in the drier areas in north central and northeastern North Dakota and far northwestern Minnesota will be more likely to record temperatures above average during the next 6 to 10 days. The projected growing degree days (GDDs) base 50°, 44° and 32° for the period of June 21 through June 27, 2018 is presented below in Figure 3.
Using May 5 as a planting date, the accumulated wheat growing degree days (Based 32°) through June 19, 2018 is presented in Figure 4. You can find your exact GDDs for your planting date(s) at:
https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html

Figure 3 Projected Growing Degree Days for the next 7 days

Figure 4 Accumulated Wheat Growing Degree Days from May 5 through June 19, 2018
Using May 10 as a planting date, the corn accumulated growing degree days (Base 50°) through June 19, 2018 is presented in Figure 5. You can find your exact GDDs for your planting date(s) at: https://ndawn.ndsu.nodak.edu/corn-growing-degree-days.html

**Figure 5 Accumulated Corn Growing Degree Days from May 10 through June 19, 2018**

Daryl Ritchison
Meteorologist
Interim Director of the North Dakota Agricultural Weather Network