GRASSHOPPER HOT SPOTS

The NDSU Extension IPM scouts are finding increasing levels of grasshopper nymphs (immatures) in areas of the state that missed the rains (see map). Grasshopper nymphs are easy to observe in the ditches and the field edges now. As ditches are mowed, nymphs are moving into field edges. In these hot spots, treating field edges are recommended when the following action thresholds are reached for grasshopper nymphs:

- 50 - 75 nymphs per square yard in ditches (or adjacent non-crop areas)
- 30 - 45 nymphs per square yard in the field.

Nymphs are generally easier to control than adult grasshoppers. Scout for grasshopper nymphs in ditches and field edges through mid-July, and note any defoliation on crops.
SCOUT FOR WHEAT MIDGE

Wheat midge emergence is underway in the northern tier of North Dakota and will continue for the next 1-2 weeks depending on temperatures. Producers can access the wheat midge degree day model on North Dakota Agricultural Weather Network (NDAWN) to find out if their wheat is at risk (or in a susceptible wheat stage, heading to early flowering) during female wheat midge emergence (just enter your planting date and select the nearest weather station): https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html. Female wheat midge is at 10% emergence with 1,300 accumulated degree days (ADD), 50% emergence with 1,475 ADD and 90% emergence with 1,600 ADD. The North Dakota Crop Progress and Condition News Release indicates that 27% of the spring wheat is headed (USDA NASS, News Release, June 25, 2018).

Since the 2018 Wheat midge forecast is low. Scouting is good insurance and could save you the cost of an insecticide over the field this year. Scout for the orange adult flies 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 IPM trappers (Dan Kraemer at Fargo, Jace Paryzek at Williston REC, Traci Murphy at Langdon REC, and Bree Obergfell at NCREC) are using pheromone traps to monitor for wheat midge mainly in the northern tier of state. Trap catches are entered weekly into the PESTWEB system of Montana State University (see the map). Trap catches do not indicate treatment but do tell growers when wheat midge is present and the relative density of the male wheat midge. Only males are attracted to the pheromone lure in trap.

For more information about wheat midge, 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 collecting leaf spurge flea beetles for biocontrol of the noxious weed leafy spurge. 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.


BLISTER BEETLES IN SOYBEANS

Several calls have come into the office on blister beetles feeding on soybeans causing defoliation on leaves from Crosby in Divide County, and Upham in Bottineau County. Blister beetles are uncommon pests of field crops, but are known to feed on alfalfa, sweet clover, canola, potatoes, dry beans, soybeans, sugar beets and weeds. They are ravenous feeders devouring leaves, stems, flowers, and pods. Use defoliation thresholds in crops; for example, the action threshold for vegetative soybeans is 35% defoliation.

Blister beetles are mobile and gregarious, and often congregate in certain spots in a field due to an aggregation pheromone (insect attractant). In some instances, blister beetles feed for a short time and then move to other areas of field or move out of the field. Alfalfa is a preferred host of blister beetles and they often move into other fields after alfalfa is cut for hay. Blister beetles produce a toxin called cantharidin and any livestock, especially horses, which ingest blister beetles while eating forages can become sick or even die.

There are several species of blister beetle in ND, including Lytta nuttalli, a large purplish green beetle; Epicauta fabricii or the ash-gray blister beetle; and Epicauta ferruginea, a smaller rusty-colored, pubescent beetle.
APHIDS ARE HERE!
Low populations of soybean aphids and cereal aphids are being found in the IPM Survey of ND and MN (soybeans only). This is a good time to start up your scouting program for both aphids!
In North Dakota, soybean aphids are being reported from Grand Forks County (not shown on map) and Pembina County in northeast, and Sargent County in southeast. Watch the YouTube video on Scouting for Soybean Aphids, if you need a refresher:
https://www.youtube.com/watch?v=KQ6K lf12Lg

For cereal aphids, low populations (<4% of plants infested) were observed in Cass, Dickey and Foster Counties. Only English grain aphid was found on spring wheat. Treatment is recommended at 85% of the plants infested. Spring wheat is susceptible to economic populations of cereal aphids through the completion of heading. Since 27% of the spring wheat is headed, it looks like most of the spring wheat will outgrow any risk of economic losses from cereal aphids this year. Good news! However, any late-planted spring wheat will be at a higher risk for cereal aphid infestation, since they arrive on southerly wind flows all summer.
CHICKPEA GROWTH STAGES

Chickpea is classified as ‘kabuli’ or ‘desi’ type, based primarily on seed color. Kabuli chickpea, sometimes called Garbanzo bean, has a white to cream-colored seed coat. Desi chickpea has a pigmented (tan to black) seed coat and small seeds. Kabuli and desi chickpea types can be identified by flower color: kabuli types have white flowers, indicating the absence of pigmentation, while desi types having purple flowers. The pods are oval-shaped (Photo 1) and contain one or two seeds. Plant height ranges from 10 to 22 inches, with kabuli types often slightly taller than desi types. Growth stages for chickpea are divided between vegetative and reproductive phases (Table 1). However, as the plant is indeterminate, new leaves continue to develop after flowering begins.

Table 1. Growth stages of chickpea.

<table>
<thead>
<tr>
<th>Chickpea Growth Stages</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetative Growth Stages</strong></td>
<td></td>
</tr>
<tr>
<td>VE</td>
<td>Seedling emergence</td>
</tr>
<tr>
<td>V1</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; multifoliolate leaf fully expanded</td>
</tr>
<tr>
<td>V2</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; multifoliolate leaf fully expanded</td>
</tr>
<tr>
<td>V3</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; multifoliolate leaf fully expanded</td>
</tr>
<tr>
<td>V4</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; multifoliolate leaf fully expanded</td>
</tr>
<tr>
<td>Vn</td>
<td>n&lt;sup&gt;th&lt;/sup&gt; multifoliolate leaf fully expanded</td>
</tr>
<tr>
<td><strong>Reproductive Growth Stages</strong></td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>Early bloom, one open flower</td>
</tr>
<tr>
<td>R2</td>
<td>Full bloom, most flowers on the plant open</td>
</tr>
<tr>
<td>R3</td>
<td>Early pod, pods visible on lower portions of the plant</td>
</tr>
<tr>
<td>R4</td>
<td>Pods have reached their full size but are still flat</td>
</tr>
<tr>
<td>R5</td>
<td>Early seed, seed in any single pod fills the pod cavity</td>
</tr>
<tr>
<td>R6</td>
<td>Full seed, seeds fill the pod cavity</td>
</tr>
<tr>
<td><strong>Physiological Maturity</strong></td>
<td></td>
</tr>
<tr>
<td>R7</td>
<td>Leaves start to yellow and 50 percent of the pods are yellow</td>
</tr>
<tr>
<td>R8</td>
<td>90 percent of the pods are mature color (gold to brown)</td>
</tr>
</tbody>
</table>

(Continued on next page)
Chickpea matures later than dry pea or lentil and prefers a longer, warmer growing season. Desi chickpea typically flowers one day to one week earlier than kabuli types, depending on the variety. Large-seeded kabuli varieties generally mature one to two weeks later than desi types. Average maturity will depend on the variety and climatic conditions, and ranges from 100 to 130 days. If chickpea was seeded in early May, plan to harvest by mid-September. Under cool, wet late summer conditions, maturity can be delayed substantially due to chickpea’s indeterminate growth habit.

DECISION SUPPORT FOR A FOLIAR APPLICATION OF NITROGEN

In last week’s Crop and Pest Report, Franzen and Endres published the recipe for a foliar application of N that can increase grain protein by 0.5 to 1.0% in spring wheat. The cost of this treatment can vary from $20 to $30 per acre depending on the price of the fertilizer used and its application cost. The profitability of this treatment is dependent on the actual increase in protein achieved, the protein premium in the market and the yield of the treated crop. Predicting what the market premium (or discount) for protein will be at harvest is not easy but is influenced by the quality of other wheat classes both in the USA and elsewhere. Additionally, and sometimes most importantly, the premium is influenced by the quality of the spring wheat crop produced in North Dakota. It is, therefore, not uncommon for the premium to be high in years when yields are high and protein is low. Conversely, when the state’s average yield is low due to drought or higher than average temperatures, protein will tend to be high and the protein premium will decline or disappear. Last year the premium was relatively low most of the year since there was enough good quality wheat around.

As mentioned above another factor that impacts the profitability of the application of this N treatment is the crop’s yield. For wheat that is fully headed, it is now possible to estimate yield based on the visible components of yield. The following is a method used by the Wheat Quality Council’s spring wheat tours. The three components that contribute to yield are the number of spikes per area, the number of kernels per spike and the kernel weight. Kernel weight can vary by variety and the environment, and cannot be precisely determined until maturity. This is one of the reasons that estimating yield is just that, an estimate with some level of variance from the actual. The formula described below uses a historic average for kernel weight to allow for an estimation prior to maturity and harvest. That value and other conversion factors are incorporated into the value “0.142” included in the numerator. Since small differences in the numbers used in this formula can result in large differences in the estimated yield, multiple samples taken from representative areas of the field will help improve the accuracy of the estimate.

\[
\text{Bushels/acre} = \frac{\text{spikes per 3 ft of row} \times \text{spikelets per spike} \times \text{kernels per spikelet} \times 0.142}{\text{Row spacing in inches}}
\]

Directions for obtaining the values for this formula:
1. Count the number of spikes in a three-foot length of row (taking an average of several counts improves the estimate). Do not count small heads that will not significantly contribute to yield. If the crop was planted with an air seeder in bands or as paired rows, count the spikes from the entire width of the band or both rows in the pair.
2. Count the number of spikelets in six or more randomly selected spikes. Omit the top and bottom spikelets as they contribute little to the overall yield.
3. For the number of kernels per spikelet use 2.3 unless the crop has been stressed, then 2.1 kernels per spikelet.
4. If not known, determine the row spacing by measuring the distance between several rows or bands of wheat. Most double disc drills are set at 6, 7, or 8 inch row spacings. The width of air seeded bands can vary. To determine the row spacing of the bands, measure the distance between the edge of one band to the same edge of the adjacent band. (Continued on next page)
Examples from research plots in Prosper this year (both spike numbers and spikelets per spike are lower this year than for those reported last year):

Winter wheat  
(95 spikes in three foot row X 15.2 spikelets per spike X 2.3 kernels per spike X 0.142)/(7 inch row spacing) = 67 bu/acre

Spring wheat  
(85 spikes in three foot row X 12.8 spikelets per spike X 2.3 kernels per spike X 0.142)/(7 inch row spacing) = 50 bu/acre

Durum wheat  
(85 spikes in three foot row X 14.2 spikelets per spike X 2.3 kernels per spike X 0.142)/(7 inch row spacing) = 56 bu/acre

Assuming that the above estimate for spring wheat is accurate, and that the protein premium will be similar to current levels of about $0.25 per point (5 cents per fifth), and that we are able to increase the protein contain of the grain by 1% with the foliar N treatment, the foliar N treatment would result in an increased return of $12.5 per acre (50 bu per acre x 0.25 extra income per bushel). In this scenario, the increase in grain value would not cover the cost of the application. At the premium assumed in this example a yield of 120 bu per acre would be required to produce the extra income needed to pay for the treatment cost if assumed to be $30 (80 bu per acre if the treatment cost was $20 per acre).

Joel Ransom  
Extension Agronomist for Cereal Crops

SUGARBEET CROP PROGRESS

Overall, the sugarbeet crop in most areas in North Dakota and Minnesota is showing good leaf growth and canopy will be closed in most areas within the next 10 days. There are some areas affected by dry conditions after planting where the plant stand may be lower than our ideal 175 to 200 plants per 100 ft. of 22-inch rows and these fields may have beets at different leaf stages because of different times of emergence. However, these fields with uneven growth and somewhat lower populations will still have good yields with good pest management and will require some more care and patience at harvesting. The Southern Minnesota factory district, which has a good sugarbeet crop, is experiencing much more rain than other production areas.

Fields that have been under water stress are likely to become more susceptible to diseases such as Rhizoctonia and Aphanomyces root rot. Most growers have been using more Rhizoctonia and Aphanomyces tolerant varieties, fungicidal seed treatments as well as incorporating precipitated calcium carbonate, which is the limestone from the sugarbeet production process, into their fields – these practices will help to reduce and manage soil borne diseases including Rhizoctonia and Aphanomyces.

In July, agriculturists will start to sample fields for root weight and sugar concentration which will, at that time, start to give an indication of the potential crop size. I hope that growers using our research-based recommendations will have a phenomenal crop that is produced economically.

The biggest constraint between a high quality and high yielding crop and one that can be of poor sugar quality is the foliar disease, Cercospora leaf spot. We have a high population of overwintering Cercospora spores that have
developed resistance to QoI or strobilurin fungicides including Headline, Priaxor and Gem, and have reduced sensitivity to all our other commonly used fungicides.

To effectively control Cercospora leaf spot, growers must mix two different modes of action in each of their applications and start control at first symptoms or at disease onset. Triphenyltin hydroxide (Tin) and triazoles, the mainstay of our program, should always be mixed with other chemistries including Topsin, EBDCs such as mancozeb, copper, or Mankocide, which is a mixture of mancozeb and copper, for effective disease control and managing fungicide resistance.

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WHITE MOLD OF CANOLA RISK

Recent rains and canola entering bloom have prompted questions about white mold and fungicide applications on canola. Below we try to answer some questions about white mold on canola.

Why is canola susceptible at bloom?

Unlike many other pathogens, Sclerotinia (the white mold pathogen) needs flower petals to cause infection. The ascospores can easily digest flower petals, and once the process starts, the disease will quickly spread into branches and stems and can result in yield losses and lodging. Recommendations for fungicide applications begin at early bloom (usually 20-50%) because the earliest infections have the longest time to develop. Consequently, they tend to be lower on the plant and cause greater yield loss.

What conditions are favorable for infection?

Essentially, the answer is cool and wet. Prior to bloom that pathogen needs water in the soil. Wet soil will allow the sclerotia (the hard black overwintering structure) to germinate, form small mushroom (apothecia) and release ascospores. A minimum of 1-2 inches of rain 1-2 weeks before bloom can initiate germination.

During bloom, anything that keeps the canopy wet for prolonged periods of time will facilitate infection. Multiple days of rainfall, very heavy dews, fog, etc... will provide enough water for infection to start. The wild card here is temperature. We rarely see much white mold when daytime highs are 85 F or higher, but the disease can run rampant when high temperatures are in the 60’s and low 70’s F.

What’s the risk now?

Often, it is a mixed bag across the region. Fields that have had more rainfall, a history of disease, and cooler conditions are at greatest risk. The NDSU Sclerotinia stem rot (SSR) Risk Map and Risk Calculator for Canola, operated by NDSU Canola Pathologist Dr. Luis del Rio and funded by the Northern Canola Growers Association, are useful tools that can be used to help producers determine risk. However, please remember that this map is only relevant when canola is in bloom and that the map is only as good as the weather data used to generate it. NDAWN (North Dakota Agriculture Weather Network) is a fantastic resource, and the envy of most other states, but rainfall can be extremely variable even at a field level.

The most recent risk map (6/26/18) indicates that risk is highly variable throughout the state, and that can change quickly. The risk map and risk calculator can be found online at http://www.ag.ndsu.edu/sclerotinia and through the Northern Canola Growers Association website, http://www.northerncanola.com/. The map and calculator are also available through the Canola Doctor application for Android and iOS-based devices. The application is free and can be downloaded from Google Play Store and the iTunes App Store. The risk maps are updated daily between June 16 and July 31.

(Continued on next page)
Fungicides. If growers determine that a fungicide application is warranted, application timing is very important. Targeting the early bloom stages is ideal (commonly 20%). Pictures and descriptions of bloom stages can be found in the NDSU Extension Publication Sclerotinia of Canola PP-1410 http://www.northerncanola.com/wp-content/uploads/2014/05/Sclerotinia-Control-in-Canola.pdf. Our data demonstrates that multiple fungicides can be effective.

Figure 1. June 26th, 2018 Sclerotinia risk map

Figure 2. 20% bloom (reproduced from NDSU Extension Publication PP-1410)

Sam Markell
Extension Plant Pathologist, Broad-leaf Crops

Luis del Río Mendoza
Canola Pathologist
MANAGEMENT RECOMMENDATIONS FOR ASCOCHYTA BLIGHT ON CHICKPEA

We have had many questions about Ascochyta blight on chickpea in the last couple weeks. The disease is, by far, the most damaging disease to chickpeas. The information below is a summary of management recommendations for the disease. Ascochyta blight can cause complete crop loss in chickpeas even on fields with no prior history of the disease. Simply, every chickpea field is at risk for Ascochyta blight.

What is Ascochyta blight?
The disease is caused by the fungus *Ascochyta rabiei*, and is specific to chickpeas. Critically, a different *Ascochyta* species cause disease on each of the pulse crops. Consequently, this pathogen is not the causal agent of Ascochyta blight on either lentils or field peas. Similarly, the pathogens that cause Ascochyta blight on lentils and field peas do not cause disease on chickpeas.

Why is my field at risk?
The disease is seed-borne and is transmitted from seeds to the emerging seedlings. It is also introduced to new fields through atmospheric movement of spores. The causal pathogen produces infective spores on overwintered diseased chickpea residues, and the wind-dispersed spores can move miles away from their original source.

The use of chickpea seed that has tested negative for seed-borne Ascochyta combined with seed treatment with fungicides that suppress the transmission of Ascochyta from seeds to seedlings reduces the risk of Ascochyta development from diseased seed but does not eliminate that risk. When seed is tested for seed-borne Ascochyta, testing is conducted on small samples of seed, and the tests can fail to detect low levels of seed-borne disease. Seed treatment fungicides reduce, but do not eliminate, seed-to-seedling transmission of the disease. Even when seed testing negative for seed-borne Ascochyta is planted and that seed is treated with a fungicide seed treatment that suppresses seed-to-seedling transmission of Ascochyta, the introduction of Ascochyta blight into a field from diseased seed is possible.

What are the symptoms and signs?
Ascochyta blight initially develops as a few small scattered disease lesions within the canopy during mid- to late vegetative growth or early bloom, often at low incidence. These lesions begin as small gray specs that quickly turn into brown lesions with dark borders. Small, circular black dots (pycnidia) appear in the lesions, and are arranged in concentric circles, often resembling a bull’s eye. Lesions can occur on any above ground plant part; leaves, stems, flowers, etc. (Figures 1-4).

What conditions favor disease?
Ascochyta blight will develop rapidly in cool/moderate temperatures (59 – 77 F is optimal) and wet environments. Once infection begins in a field, frequent rainfalls will spread the disease very rapidly because spores released by pycnidia are splash dispersed. Periods of hot dry weather will slow or stop the spread of the disease, but spread will resume as soon as conditions become favorable again.

(Figures 1-4 and more on next page)
How do we manage the Ascochyta blight?

**Fungicide timing:**
In very susceptible varieties such as ‘Sierra’ or ‘CDC Xena’, the disease can spread significantly even prior to bloom initiation when the canopy is completely open, and use of these varieties is not recommended in the Northern Plains. In more resistant varieties such as ‘CDC Frontier’ or ‘CDC Orion’, significant spread of disease generally does not occur until bloom when the canopy begins to close, trapping humidity. Ascochyta blight can be difficult to control once significant disease development has occurred, and a foliar fungicide application during early bloom is advised. Subsequent fungicide applications should be made at 10- to 14-day intervals as needed on the basis of rainfall patterns.

**Fungicide efficacy:**
- The pathogen causing Ascochyta blight has developed resistance to the QoI (FRAC 11) fungicides, and the fungicides Headline (pyraclostrobin), Quadris (azoxystrobin), and Aproach (picoxystrobin) have no efficacy against the disease.
- DMI (FRAC 3) fungicides differ in effectiveness against Ascochyta blight. Proline (prothioconazole) is more effective than Quash (metconazole), and older DMI fungicides such as propiconazole (sold in the premix product ‘Quilt’) have little or no efficacy against Ascochyta blight.

(Continued on next page)
• SDHI (FRAC 7) fungicides have shown equivalent efficacy to Proline when disease pressure is low to moderate but are less effective than Proline when conditions are highly favorable for disease.

• Tank-mixing Proline or SDHI fungicides with chlorothalonil (Bravo WeatherStik, Echo 720, and other brands) improves Ascochyta disease control and can significantly improve chickpea yield and quality under disease pressure. Tank-mixing with chlorothalonil is advised for all fungicide applications, even those made after the canopy is closed. When tank-mixing, apply chlorothalonil at the low end of the labeled rate (generally 1.38 pt/ac) and maintain the full labeled rate of tank-mix partner.

• Two or more fungicide applications are often needed, and DMI (FRAC 3) and SDHI (FRAC 7) fungicides should be rotated in order to reduce the risk of the development of fungicide resistance.

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NDSU Carrington REC

Julie Pasche
Research Plant Pathologist
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Sam Markell
Extension Plant Pathologist, Broad-leaf Crops

FUSARIUM HEAD BLIGHT (SCAB) RISK

Scab risk has increased for susceptible varieties that are headed or are in the flowering stages of development. Currently, there are several areas of moderate to high risk across much of the state (Figure 1). Scab risk for moderately susceptible varieties is lower; however, a pocket of moderate risk exists in southwest North Dakota. I am expecting scab risk in the state to maintain or even get higher in the next few days. Several factors that will contribute to a higher risk include wheat planted on corn residue, rain, prolonged dew periods (into the afternoon hours), and fog. Continue to monitor the growth stage in the field, record field conditions, and apply a fungicide when needed. Please refer to last week’s article for more information pertaining to fungicides.

Figure 1. Scab risk for susceptible varieties on June 27.

(Continued on next page)
BACTERIAL LEAF STREAK IN WHEAT

Bacterial leaf streak (BLS) has been observed on flag leaves in several areas across North Dakota. This disease can look like several other foliar diseases such as stripe rust, tan spot or Septoria blotch. Therefore, I will review the key field diagnostic features that separate BLS from other fungal leaf spots. Early lesions caused by the BLS pathogen will be irregular, water soaked and run lengthwise along the leaf (Figure 1). At this stage, lesions will often harbor cream to orange colored crystalline structures (bacterial ooze). As the lesions mature, tan to brown necrotic lesions will replace the water-soaked areas (Figure 2).

Figure 1. Early lesions of bacterial leaf streak. Notice bacterial ooze.

Figure 2. Scab risk for moderately susceptible varieties on June 27.
Fields that were exposed to a thunderstorm with high winds at flag leaf are more likely to see BLS. This is explained by bacteria usually requiring a wounding event to gain access into leaf tissue. Unfortunately, once you have identified BLS in a field, there are no viable in-season management options. Commonly used fungicides at flag leaf or at early-flowering will not have an effect on BLS, and the use of cupric hydroxides to suppress BLS has been inconsistent. Varietal susceptibility information can be found in the North Dakota Hard Red Spring Wheat Selection Guide (A574-17).

Figure 2. Advanced lesions of bacterial leaf streak in wheat.
NEW OR UPDATED SULFUR SOIL TEST, SITE-SPECIFIC FARMING AND SOIL SAMPLING PUBLICATIONS

Several of NDSU crop-specific fertility recommendation circulars state that the sulfur soil test is near useless to predict whether a crop will respond to S or not. A one-of-a-kind publication, ‘Limitations of the Sulfate-sulfur Soil Test as a Predictor of Sulfur Response (SF1880), is now available. This publication was developed under the USDA-NCERA13 Soil Testing Committee and it will be linked to their website at University of Missouri.

A recently updated SF990, ‘Soil Sampling as a Basis for Fertility Recommendations’ is also available. This circular contains information on sampling depth, grid/zone sampling strategies for North Dakota, and recent results from our potassium soil testing work.

Finally, SF1176-3 and SF1176-4, in the soils-related site-specific series of the use of yield monitor data and the economic and environmental benefits of site-specific field management have also been completely revised and are available. It will be interesting for readers to see that North Dakota farmers have gained the most from site-specific management based on a recent survey by USDA. This is probably due to the irregular boundaries of many fields west of the Valley (use of auto-steer and automatic boom/seeder shutoffs), the use of site-specific fertilizer management in crops where quality (oil content, sugar concentration, grain protein content) is considered in crop marketing, and because site-specific based fertility recommendations have a deeper research foundation in North Dakota compared to those in most states.

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HORSEWEED CONTROL IN SOYBEAN

Horseweed (some call it marestail) is an annual broadleaf weed native to North America. Horseweed is unique in that it may follow a winter or summer annual life cycle. The winter annual version forms a basal rosette after emergence in the fall for winter survival. The rosette ‘bolts’ in April and grows to a height of 2 to 6 feet by early summer. Horseweed leaves are alternate, linear, and simple with entirely or slightly toothed margins. Horseweed flowers in late July and may produce 200,000 seed per plant.

Horseweed seed has a pappus like dandelion seed that enables it to be carried several miles by wind. Horseweed contains volatile oils, and acids that may cause skin irritation in livestock (especially horses) and humans. Early settlers used horseweed to treat diarrhea and dysentery and Native Americans used it as a coagulant to stop bleeding.

The summer annual version germinates in the spring and completes its lifecycle in one calendar year. The summer annual version is increasing in frequency in North Dakota.

(Continued on next page)
Tillage practices and herbicide resistance have contributed to increased horseweed prevalence in the landscape. Horseweed thrives in no-till; tillage can reduce horseweed prevalence by 50%. Herbicide resistance to paraquat (SOA 22) was first reported in 1980 in Mississippi. Since then, resistance to triazine (SOA 5), ALS inhibitors (SOA 2) and glyphosate (SOA 9) has been reported in various states.

There are very limited in-crop options for effective horseweed control, especially if there are glyphosate resistant biotypes. Control is best when horseweed is six-inches tall or less. FirstRate is effective but only on susceptible biotypes (SOA 2). Liberty (SOA 10) will also provide effective control of small horseweed in LibertyLink soybean.

**HERBICIDE TOLERANT KOCHIA**

Kochia has been a weed control challenge for North Dakota growers for decades. Kochia is extremely competitive, creating significant yield losses when only a few weed escapes occur in crop fields. In North Dakota, kochia is resistant to 2,4-D, MCPA and the ALS inhibitor herbicides (SOA 2). Consider all biotypes resistant to these herbicides or herbicide families when planning a weed management program.
We are hearing about more biotypes resistant to glyphosate. In hindsight, glyphosate-resistant kochia populations in North Dakota should not have come as a surprise. Glyphosate (group 9) is often used as a burndown treatment before planting and / or applied POST in Roundup Ready® crops. Finally, there are reports of kochia surviving dicamba and Starane (fluoxypyr).

Growers with kochia will need to implement weed management plans across the crop sequence on their farms. However, what about plants that ‘roll-in’ from other areas? Dr. Zollinger often spoke of creating a “living fence” or one planter pass of corn or sunflower around the perimeter of field to trap kochia plants on the outside of fields. A critical weakness in kochia biology is most seed remains viable for only one year. Thus, two or three years of excellent season-long weed control can reduce kochia population in the seed bank.

Tom Peters  
Extension Sugarbeet Agronomist

Sam Haugen  
Grand Forks County ANR Extension Agent

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**AROUND THE STATE**

**NORTH CENTRAL ND**

Over the last week, the North Central region continued to receive a decent amount of precipitation, however, on a hit-and-miss basis. Minot received about 1.04”, Bottineau 0.02”, Crosby 1.14”, Garrison 0.02”, and Rugby 0.89” of precipitation. Soil temperatures (bare) appear to be holding steady at most NDAWN stations in the North Central region (NCREC/Minot - 71˚F, Bottineau - 67˚F; Garrison - 72˚F; Rugby - 69˚F).

Crops continue to advance fairly rapidly, especially with the aid of the precipitation the past couple weeks. Small grains are beginning to head and some canola is shifting into the budding stage. About 10% of the canola plants have begun to flower. Pulse crops continue to advance, but are about a week behind the pulse crops in the Northwest part of the state – likely due to precipitation that fell in mid to late May that the North Central region didn’t receive.

Continue to scout for minor populations of grasshoppers in the area. Scouting for grasshopper nymphs should continue through the month of June. Always inspect ditches and field edges for nymphs. The ‘threatening’ rating is considered the action threshold and is advised whenever 50-75 nymphs per square yard are being observed in adjacent non-crop areas or 30-45 nymphs per square yard within the field. Growers can use a 15 inch diameter sweep net, taking four 180 degree sweeps to equal a square yard estimate. Flea beetle and cutworm populations are subsiding as we move deeper into June.

Often times, wet weather can lead to some disease issues. Some ascochyta infected field peas have been identified in the area, continued scouting in the north central region is suggested. Some soybean diseases are being observed in McLean and Ward Counties – however, testing results have not been returned to confirm which diseases are present – we hope to have those back soon.

Don’t forget, grape field day - **Basics of Viticulture** - will occur the evening of June 28th at 6 pm. The event will take place at the North Central REC just south of Minot. Please visit the North Central REC Facebook page for more information.

TJ Prochaska  
Extension Cropping Systems Specialist  
NDSU North Central Research Extension Center
NORTHWEST ND

Scattered thunderstorms moved through Northwest ND Friday and Saturday June 22-23. Rainfall totals varied a lot by location with most places receiving between 0.5” and 1.5”. In southern Williams County, a strong downpour Saturday afternoon dumped 1.5-2.0” in less than 2 hours. There were small patches of hail reported from eastern MT to Minot, but no widespread damage has been reported. At the Williston Research Extension Center, the downpour caused residue washing in fields where this year’s crop is still small. Early-planted small grains are flowering and later planted small grains are anywhere from jointing to heading. Peas, lentils, chickpea, flax, and canola are all flowering and the rain and warm temperatures will push crop development this week. Growers are advised to keep an eye on their local weather conditions and be prepared to spray fungicide to control scab in their small grains. Rain, persistent morning fog, relative humidity >85%, and warm (75-85°F) temperatures are ideal conditions for scab infection when wheat and durum are flowering. Ascochyta has been observed in chickpea fields in Williams County and growers are advised to stay ahead of this disease with fungicide applications as soon as the crop is flowering and as long as weather conditions favor disease development.

Save the date!

The Williston REC Annual Dryland Field Tour is July 11th at 4:00 pm and everyone is invited to attend! The dryland and horticulture tours run 4:00-7:00 pm and a free steak supper will be served after the tours.

The Nesson Valley Irrigated Farm Tour is July 12th 9:00 am- 12:00 pm with a free hamburger lunch after the tour.

Clair Keene
Extension Cropping Systems Specialist
NDSU Williston Research Extension Center
NORTHEAST ND
Wheat midge is present across the region. At the station, cereal leaf beetle larvae have been found eating on barley. Larvae leave behind picture window damage where they have eaten a section of the leaf down to the waxy cuticle. Grasshoppers have been found in high numbers in hot spots in the region. Moisture-wise at this point, the region is a mixture of too little, too much and just right (for now) depending on where isolated thunderstorms developed. Sections of Pembina and Cavalier Counties are at approximately 50% of normal rainfall currently. Iron chlorosis deficiency can still be observed in a few fields of soybeans. Very little to no disease is being reported in small grains. As wheat is heading, check the scab risk in your area by visiting NDSU’s Small Grains Forecasting website. Similarly, sclerotinia risk map in canola is being updated. Rollete County is showing high risk potential.

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

SOUTH-CENTRAL
The region’s NDAWN station data indicate rain during June 1-25 ranged from 1.7 inches (Marion) to 5.3 inches (Jamestown), with the Carrington REC receiving 3.8 inches. Our environment has been quite favorable in June and our crops have responded well with good plant densities and rapid growth.

Winter wheat and rye are in the dough stages. Early seeded (late April) barley and wheat are in the early seed development stages. Corn planted during the first week of May has 8-10 leaves. Based on NDAWN growing degree day units accumulated from a May 1 planting date to June 25, the region’s corn ranges from 175 (Robinson) to 300 (Oakes) units or 2-3 leaves ahead of the long-term average for the same period. Seed formation has begun in early planted field pea (see picture) and flax. Flowering is beginning in soybean and early planted dry bean.

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

In the past week, more rain has fallen across southwest ND. According to NDAWN between June 20th and June 26th, Dickinson received 0.25 inch, 0.17 inch in Mott, 1.17 inch in Beach, 1.84 inch in Bowman, and 2.19 inches in Hettinger. With many acres of small grains beginning to head out in the past week coinciding with moist conditions, a fungicide application may be necessary for management of Fusarium Head Blight, especially if a susceptible variety was planted. Our IPM scout Marc found a sunflower field this past week with a very high incidence of downy mildew, be sure to look at the underside of the leaf if this disease is suspected. Dr. Markell and others have put together a very useful sunflower disease diagnostic tool called Sunflower Disease Diagnostic Series PP1727.

Ryan Buetow
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center

WEATHER FORECAST
The June 28 through July 4, 2018 Weather Summary and Outlook

The past seven days were quite warm across the northern portion of North Dakota into northwestern Minnesota with temperature four to six degrees above average. Southern North Dakota the temperatures were closer to the current 30 year average with temperature at or only one to two degrees above average. It is likely that these next seven days will finish above average as well.

(Continued on next page)
The rain was expected to be spottier this past week with western and southern portions of the North Dakota Agricultural Weather Network (NDAWN) having the highest probabilities for rain. The rain was spotty, but even northeastern North Dakota had some pockets of one inch for more rain amounts. Although our station near Dunn Center in Dunn County was missed by the thunderstorms Tuesday evening, many other locations in Dunn, southern Mercer into western Morton County where there is currently no NDAWN station did record significant rains with 1” or more reported in several locations in those counties.
There has certainly been some severe weather in the region this year. Mid-May to mid-July tends to be the most active period of severe weather in North Dakota and northern Minnesota. However; the severe weather has fortunately been spotty and so far, we have yet to experience a widespread severe weather event in 2018. That may change today. Tornadoes, of course, are never widespread events, but localized, and even hail tends to create damage in narrow, sometimes long corridors. Therefore, widespread severe weather in our area mostly occurs because of wind damage associated with long duration bow echoes. Today (Thursday) is a day when all three elements will come into play and it is certainly possible that a bow echo or two may develop this afternoon and evening and in turn bring with it the possibility of widespread severe weather damage in the next 24 hours. Plus, any time you have a threat of severe weather you also have the possibilities of localized heavy rainfall, which will also be a potential factor in the weather over the next 24 hours. Today is one of those days to keep an eye on the weather for possible watches and warnings that may be issued. After today and tonight, there will be some isolated to scattered storms on other days, but anything widespread looks to be holding off until next week. The storms in the next 24 hours will likely bring cooler air into the region Friday into Saturday, but the above average temperatures are expected to return quickly, so the odds favor the next 7 days finishing with above average temperatures in most of the region once again. My projected growing degree days (GDDs) base 50°, 44° and 32° for the next seven days is presented in Figure 3 for the period of June 28 through July 4, 2018.

![Figure 3. Projected Growing Degree Days for the next 7 days](image)

Because of the rain possibility today and other days in the next week, the number of hours with relative humidity above 85% is projected to be fairly high in the next week (see Figure 4). As a reminder, these estimates are for sensor height (about 5 feet above the ground) and therefore, the plants nearer to the surface will likely have more hours than shown with these higher humidity values, plus there should be a few mornings with moderate to heavy dew in the locations that record the most rains from the thunderstorms.
Using May 5 as a planting date, the accumulated wheat growing degree days (Based 32°) through June 26, 2018 is presented in Figure 5. Most location in northern to eastern North Dakota (and stations in Minnesota) are running about 200 to 250 more GDDs than last year (southwestern ND similar to last year) based on that May 5 planting date. You can find your exact GDDs for your planting date(s) at: https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html

Figure 4. Projected Hours with Relative Humidity (RH) above 85% for the period of June 28 through July 4, 2018

Figure 5. 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 26, 2018 is presented in Figure 6. Most locations in northern to eastern North Dakota (and stations in Minnesota) are running about 180 to 220 more GDDs than last year (southwestern ND similar to last year) based on that May 10 planting date. You can find your exact GDDs for your planting date(s) at: https://ndawn.ndsu.nodak.edu/corn-growing-degree-days.html

![Figure 6. Accumulated Corn Growing Degree Days from May 10 through June 19, 2018](image)

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