Answer: These flies are infected with a pathogen. Those light stripes on the dead flies are spores of the Entomophthora fungus. The fungus seems to interfere with the flies' coordination. They land on a plant and crawl out to the edge of a leaf or twig and die. This ensures that the fungal spores can disperse freely and infect more flies or insects. Under humid, warm and moist condition, epizootics can occur and provide excellent natural control of insects.
SCOUT FOR CEREAL APHIDS

Cereal aphids have arrived in ND with the help of the strong southerly winds! IPM Scouts just started to see cereal aphids in wheat last week at one site in Bottineau County, and more fields this week in the southeast area. No reports of cereal aphids were found in barley yet.

Scouting for cereal aphids is easy and should begin at stem elongation. Look on the undersides of leaves and near the base of the plant for the tiny ⅛-inch long, greenish and pear-shaped aphids. Aphids can be winged or wingless. The most common species in ND are the English grain aphid, bird cherry oat aphid and greenbug. When temperatures are in the low to mid-80s F, conditions are favorable for fast reproduction. Cereal aphids usually have several generations in ND before dying off in the fall.

Continue scouting for cereal aphids for the next month in wheat (spring, durum and winter), oat and barley, or until the crop gets past the end of heading stage.

For a scouting protocol, walk a Z or W pattern across the field and inspect 20 randomly selected stems at 5 sites for cereal aphids. Calculate the percent of infested plants (incidence) with one or more aphids. The **economic threshold is 85% of the plants infested and prior to the completion of heading**. Heavy infestations of cereal aphids can reduce grain quality (protein and test weight). In addition, cereal aphids are good vectors of barley yellow dwarf (BYDV), which can stunt plants and reduce yield. A common symptom of BYDV is yellowing of the leaf, often the flag leaf, from the tip back toward the stem. No insecticides are necessary after the onset of flowering, since the negative impacts of cereal aphid feeding are reduced (no yield loss).

Left to right: Greenbugs, bird cherry oat aphids (both photos by James Kalisch, UNE) and English grain aphids (Patrick Beausay, NDSU)
UPDATE ON ALFALFA WEEVIL DEGREE DAYS

The degree day map (below) shows that alfalfa weevil larval feeding is past the peak period based on accumulated degree days (ADD). Peak feeding occurs between 504 - 595 ADD when larvae are mature, 3rd to 4th instars (Table 1). Most of ND is >600 ADD, so no alfalfa weevil control is recommended in those areas. Larvae will start pupating (non-feeding stage) at 814 ADD. The recent, hot temperatures have pushed the rate of insect development. Some alfalfa is being cut this week. Early cutting of alfalfa is one of the best pest management strategies to reduce feeding damage from alfalfa weevil.

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>DD Required to Complete Life Stage</th>
<th>Accumulated DD</th>
<th>Typical Feeding Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg hatch begins</td>
<td>300</td>
<td>300</td>
<td>Light</td>
</tr>
<tr>
<td>1st instar development</td>
<td>71</td>
<td>371</td>
<td>Light</td>
</tr>
<tr>
<td>2nd instar development</td>
<td>67</td>
<td>438</td>
<td>Heavy</td>
</tr>
<tr>
<td>3rd instar development</td>
<td>66</td>
<td>504</td>
<td>Heavy</td>
</tr>
<tr>
<td>4th instar development</td>
<td>91</td>
<td>595</td>
<td>Heavy</td>
</tr>
<tr>
<td>Pupation</td>
<td>219</td>
<td>814</td>
<td></td>
</tr>
<tr>
<td>Adult emergence</td>
<td>—</td>
<td>&gt;814</td>
<td></td>
</tr>
</tbody>
</table>

Janet J. Knodel
Extension Entomologist
SUGARBEET ROOT MAGGOT ACTIVITY: WINDY WEATHER = NO SHARP PEAK, MANY MORE FLIES TO COME

Similar to the past two years, several areas in 2020 experienced substantial surges in sugarbeet root maggot (SBRM) flight activity ahead of “normal”. Fly activity gradually built up to what were considered high to severe levels in many of those fields.

Although flies are present in extremely high levels in many fields throughout the growing area, especially the northern RRV, the persistent windy weather (Fig. 1) during the past week has kept most flies down near/on the ground. As such, fly counts from the past few days are not reflective of the high fly densities present in many fields. Therefore, we can expect many more flies to emerge in the next few days. This will result in a very flat activity curve during peak fly activity which has been occurring during the past 3-4 days.

Figure 1. High winds, evidenced by soil debris blowing across a sugarbeet field, can significantly reduce SBRM fly captures on sticky-stake traps.

Cumulative fly counts are quite concerning this year, with the most severe counts being recorded in the northern Valley. Representative areas where the highest fly counts have been recorded are presented in Table 1. Daily and cumulative fly counts from all locations can be viewed online here.

Table 1. Cumulative sugarbeet root maggot fly counts per field (2 sticky-stakes/field) in selected Red River Valley locations during the 2020 growing season (as of June 15, 2020)

<table>
<thead>
<tr>
<th>Nearest City</th>
<th>Township</th>
<th>Section</th>
<th>Cumulative Fly Count/2 Stakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thompson, ND</td>
<td>Walle</td>
<td>27</td>
<td>1,130</td>
</tr>
<tr>
<td>Warren, MN</td>
<td>McCrea</td>
<td>29</td>
<td>849</td>
</tr>
<tr>
<td>Bathgate, ND</td>
<td>N. Cavalier</td>
<td>12</td>
<td>846</td>
</tr>
<tr>
<td>St. Thomas, ND</td>
<td>S. St. Thomas</td>
<td>7</td>
<td>814</td>
</tr>
<tr>
<td>St. Thomas, ND</td>
<td>S. St. Thomas</td>
<td>27</td>
<td>701</td>
</tr>
<tr>
<td>East Grand Forks, ND</td>
<td>Huntsville</td>
<td>9</td>
<td>611</td>
</tr>
<tr>
<td>Buxton, ND</td>
<td>Belmont</td>
<td>32</td>
<td>608</td>
</tr>
<tr>
<td>Crookston, MN</td>
<td>Crookston</td>
<td>23</td>
<td>568</td>
</tr>
<tr>
<td>Buxton, ND</td>
<td>Belmont</td>
<td>19</td>
<td>549</td>
</tr>
<tr>
<td>St. Thomas, ND</td>
<td>N. St. Thomas</td>
<td>24</td>
<td>412</td>
</tr>
<tr>
<td>Reynolds, ND</td>
<td>Belmont</td>
<td>6</td>
<td>404</td>
</tr>
</tbody>
</table>
Postemergence SBRM Control. Growers in high-risk areas for damaging SBRM infestations who have not yet made a postemergence insecticide application should do so as soon as possible, as the window for effective performance is closing. This is especially important if an insecticidal seed treatment or a low to moderate rate of a granular insecticide was used at planting. Fields in which heavy rainfalls (> 3 inches) occurred within two to three days after at-plant or postemergence insecticides were applied also may need additional postemergence protection.

The best control option this time is a sprayable liquid insecticide application, which can either be applied by ground-based equipment or aircraft. Postemergence liquid insecticides perform best if applied close to (within 2-3 days of peak fly; either on, before or after peak). Treated fields should be monitored closely for the next few days to determine if fly activity resurges. Some fields could require retreatment if subsequent infestations reach or exceed 0.5 flies per plant.

IMPORTANT: If a chlorpyrifos-containing liquid spray (e.g., Lorsban 4E, Lorsban Advanced, or any generic chlorpyrifos product) is applied, 10 days must pass before another chlorpyrifos liquid can be made to the same field. If retreatment is necessary within 10 days of the initial chlorpyrifos application, an insecticide containing a different active ingredient must be used. For more information, consult the “Insect Control” section of this year’s Sugarbeet Production Guide. Always remember to READ, UNDERSTAND, and FOLLOW the label of your insecticide product – it’s the law.

Mark Boetel
Research & Extension Entomologist

COVER CROPS PLANTED INTO SUNFLOWER

Soil erosion is generally more common with row crops than with close-growing small grains. Sunflower stubble, if cut in the fall below 12 inches, is not effective for trapping snow due to its limited winter surface cover. Recently, agronomists and producers have increased awareness of protecting soil from wind and water erosion. Cover crops, such as legumes, can boost soil fertility, reduce soil erosion and are becoming increasingly important in farming systems. Some potential benefits of intercropping a legume in sunflower are atmospheric nitrogen fixation, soil erosion control, improved snow trapping, improvement of the soil aggregation and organic matter content, and fodder or green manure production.

In general, the rate of sunflower development is mainly influenced by temperature. Therefore, cumulative growing degree-days are a valuable means to show differences among growing seasons (See current estimated sunflower growth stages). Water is the major limiting production factor for sunflower in the northern Great Plains. Intercropping is not a new concept, as it is a common practice in tropical countries. Clearly, from the producer's perspective, the primary crop component (sunflower) should yield near its potential when planted at its optimum plant density. The legume, or secondary crop, planted at lower than optimum plant density, is expected to yield below a legume or other cover crop planted as a sole crop. The primary crop (sunflower) should be planted first to have competitive advantage. The primary crop will receive full sunlight at the top of the canopy. The secondary crop, farther down the canopy, will have long periods of dim light, with short exposure to near full sunlight caused by holes in

Photo 1. Lentil interseeded into sunflower at the same date as sunflower was planted.
the canopy when upper leaves move. Different areas of the cover crop leaves will be exposed to solar radiation, due to the change in sun's angle during the day and over the season. Shading by sunflower influences the photosynthesis and atmospheric nitrogen fixing ability of the intercropped legume. For most cover crops grown in shaded conditions, growth is reduced. Some legume species, however, continue to fix atmospheric N while shaded. Nitrogen applied to legume-based intercrops will usually favor the growth of the non-legume crop and reduce N-fixation by the legume. Results from intercropping experiments are often field specific and seasonal variation is high.

Intercropping naturally causes plant competition between primary and secondary component crops for water, nutrients, light and carbon dioxide. Production of total biomass produced in an intercrop system compared with their sole crops can be increased if more solar radiation is intercepted. This can be achieved by minimizing the proportion of radiant energy that reaches the soil (greater radiation-use efficiency) or by use of solar energy by the component crop when the primary crop is senescing (yellowing of the leaves in the fall). Cultural practices, like time of planting of the respective component crops, planting pattern, fertilizer application and pest control strongly influence the relative competitiveness of the primary and secondary crops.

In my experiment, legumes were interseeded into sunflower on the day of sunflower planting, at the V4, and V10 growth stages of sunflower. Legumes included, and their seeding rate were: hairy vetch (28.8 lb/a), sweetclover (9.5 lb), alfalfa (16 lb), black lentil (22.3 lb) and snail medic (22.3 lb). The sunflower yield was reduced when legumes were interseeded at the same time as sunflower planting, except for black lentil (which produced 1237 lb of legume biomass). The sunflower yield, head diameter, achenes per head, and 100-kernel weight were not significantly lower when legumes were interseeded at the V4 or V10 growth stages. The amount of legume biomass produced is indicated in Figure 1. Legume biomass was lower when the legume was interseeded at the later (V10) growth stage.

Hairy vetch produced the most biomass but the crop is difficult to kill and may become a ‘weed’ during a subsequent season. Better results of cover crop establishment are achieved when the seed is covered with soil. At the drier environments, legume biomass produced was low, indicating the need for sufficient moisture for the intercrop. Although in this experiment only legumes were tried as an intercrop, it is anticipated that other adapted species can also work as a cover crop. More research is needed to identify these opportunities. This research focused on interseeding at the vegetative stage of sunflower. Experiments with corn and soybean have shown that there might be opportunities to aerially seed winter hardy cover crops at the end of the growing season. Near maturity, the sunflower canopy is opening and light will be available for a cover crop to establish. Establishment will depend on available moisture at the time of sowing.
MONITORING CROP WATER USE

The recent hot and windy weather has had me thinking about crop water use and the potential for drought stress in the state if we don’t get some rain. One way to monitor crop water status is to use the crop water use app in NDAWN. Daily water use by a crop is dependent on the crop, its stage (greater leaf area means greater water use), temperature, relative humidity and wind speed. Figure 1 charts the daily water use with this app at the Hettinger Research Extension center. Because of its greater leaf area, wheat is currently using more than twice the water of corn. Additionally, from these data one can see the impact of daily weather on water use. For example, the water use by wheat on June 13th was more than twice that recorded on June 9th.

![Figure 1. Estimated daily water use by wheat (top line) and corn (bottom line) in Hettinger, ND in 2020. These data assumed a May 1st emergence date for wheat and a May 20th emergence date for corn.](image)

This app also can be used to monitor the relationship between water use and the amount of rainfall received. Currently, the crop water deficits (transpiration minus rainfall) for wheat are large with the greatest deficits (the larger the number the larger the deficit) in the southwest (Figure 2). For corn the scenario is more positive (Figure 3), with many stations reporting slight surpluses of water (more rainfall than crop use resulting in negative deficits).

The fact that water deficits are positive, does not necessarily mean that the crop has suffered from drought stress, as these calculations do not consider the amount of water available in the soil. The plentiful rainfall last fall and the snow melt this spring filled the soil profile in many regions of the state. Soils can provide 1 to 2 inches of water per foot of depth (depending on its texture), meeting the water use requirements of the crop for many days before the crop experiences drought stress. When soil moisture is depleted and the plant becomes “stressed”, it will reduce transpiration by closing the stomata. While this reduces water loss from the plant, it also reduces the amount of CO₂ available to the plant for photosynthesis. Reduced photosynthesis means reduced plant growth which in turn translates into reduced plant size and reduced yield potential. Leaves soon wilt especially during the heat of the day. with severe moisture stress, plant tissues desiccate and eventually die when the stress is significant enough.

(continued on next page)
Figure 2. Crop water deficit for wheat, assuming a May 1 emergence date.

Figure 3. Crop water deficit in corn, assuming a May 20 emergence date.

Joel Ransom
Extension Agronomist, Cereal Crops
Rhizoctonia damping-off and root rot, caused by *Rhizoctonia solani*, are common soil borne diseases of sugarbeet and a major problem for growers in Minnesota and North Dakota. The pathogen may cause death of seedlings and older plants. Growers at some cooperatives have had to destroy fields with more than 50% incidence of Rhizoctonia root rot since infected roots do not store well in long term storage. Crop rotation with non-hosts such as wheat and barley, use of resistant varieties, and fungicides used on seed and applied so that they target the pathogen in the soil are strategies used to manage the disease. **Disease symptoms:** In infected seedlings, there is wilting followed by death because of infection of the hypocotyl at the soil line (Figure 1). In older plants, the most common symptom is wilting of the leaves, starting with the oldest leaves (Figure 2). Leaves may or may not become yellow. Severely infected plants typically become desiccated and withered before harvest (Figure 3). Some infected plants may survive but damaged roots will be of lower quality. Root rot infections typically start at or just below the soil line (Fig. 4), and sometimes lower on the tap root. **Disease management:** Rotations with crops, such as wheat and barley, which are not host of *R. solani* AG 2-2 IIIB or AG 2-2 IV, will help to reduce the inoculum pressure. Since the pathogen is more severe in wet conditions, draining and leveling of fields with help in disease management. Fields with a history of Rhizoctonia crown and root rot should be planted to a variety with good disease resistance. The fungicides azoxystrobin (Quadris) at 9.2 to 16 fluid ounces per acre, or Priaxor at 6.7 fluid ounces per acre, applied in a 7-inch band before infection takes place provide effective disease control. It is best to apply fungicides when plants are at the 4-6 leaf stage and before they close rows so that the fungicide gets into the soil and close to the roots to prevent infection. Timing application just before a rain event, or before a scheduled irrigation where this is available, will help to get the fungicide in a position to protect the roots.

(continued on next page)
Figure 3. Foliage of infected plants become dry and withered in August and September.

Figure 4. Roots of infected plants in early July showing symptoms below the soil line.

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Extension Sugarbeet Specialist
NDSU & U of MN
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LOW OCCURRENCES OF DISEASE IN WHEAT AND BARLEY

The IPM scouts visited over 100 wheat fields last week and reported very few diseases. Tan spot was the most frequently found disease but was only reported in approximately 10% of the fields. The highest levels of tan spot severity were found in wheat on wheat production systems. Similarly, fungal leaf spots (net blotch and spot blotch) were reported in approximately 10% of the barley fields surveyed. Sporadic rain, high temperatures and strong winds have prevented morning dews, which are key for fungal growth and infection, leading to the development of fungal leaf spots. Most photos I have received of damaged small grain leaves indicate that the leaf spots have been caused by wind damage, heat stress, and other abiotic (non-living) stressors (Figure 1).

Figure 1. Brown discolorations on the oldest leaves of wheat not caused by disease. Discolorations likely caused by a combination of abiotic stressors such as temperature changes and high winds. (Photo by Marc Michaelson, IPM Scout)
TOP-DRESSING/SIDE-DRESSING N

There are always farmers who top-dress or side-dress as part of their normal growing season plan. These are usually farmers who have learned that high-clay soils and sandier soils, particularly in the wetter eastern regions of ND, are prone to early-season N loss through leaching and/or denitrification. This year, there are many more farmers who wisely planted rather than wait for N fertilizer delivery and application.

For small grains and other solid-seeded crops, sooner is better than later, with broadcast NBPT treated urea or streamed UAN. For row crops, particularly corn, but also sunflower, the side-dress could go on at any time this year. Usually, it would be wise to wait until V5 to begin application, but with the late planting the calendar is already on the tail end of the traditional wet season, so the risk of leaching and denitrification with early side-dress is less than normal.

If rainfall has been normal to drier than normal, using the N recommendations in place, less soil nitrate-N test, previous crop credits, and less any N applied to date would be a reasonable rate to use. If rainfall has been above normal, then some loss of N has already happened, so the question is what rate to use? There are two methods that might be considered beyond a guess. The first would be a pre-sidedress soil test. This test was developed in Iowa and probably performs the best in Iowa. The test involves taking soil samples 1-foot deep in a transect across the corn rows and analyzing for nitrate. The Iowa testing protocols do not account for spatial variability, which I spent the first 10 years of my NDSU career studying. There will be spatial variability within the field, so taking one sample in a small area to characterize an entire field is unreasonable (this is also a major problem with the y-drop nitrate test box protocol). To characterize the field, the field should be zone sampled similarly to what should be done for a preplant N application. The reason I haven’t spent more time than necessary on the pre-sidedress soil test calibration is that I make it a habit not to research anything I don’t think a farmer/consultant would do. But if one took the time to sample correctly, the pre-sidedress N test might have some value, although the 4 years of work I conducted were not very supportive of the results.

The second method, and one I prefer to recommend, is the use of an N-sufficient strip in the field that will show differences between an area with sufficient N and any areas that may have N shortages. The preferred time to make the strips (~ 100-200 feet long, width of an application, an extra 150-200 lb/acre N) would be at preplant base-N application time. However, that time is now past, so what to do? The small grains are up, but the row crops are mostly not up. In the small grains, stream the normal N rate or 50 lb/acre more with an ATV sprayer or any sprayer as soon as possible in a strip about 100 feet long in an area generally typical of the field soil and in an area that can easily be revisited. Then either watch the greenness of the strip and compare it to the field, or use an active-optical sensor to provide a number of reflectance that would be better than the eye to provide an indication whether topdress would be of value. For corn, again with an ATV dry spreader or any spreader, apply 150-200 lb/acre N, or whatever the original difference in preplant and side-dress might be plus about 100 lb N/acre to a strip about 100 feet long, then watch the strip compared to the rest of the field. Ideally, an active-optical sensor, such as the GreenSeeker or the Holland Scientific Crop Circle sensor would be used, and NDSU has published corn algorithms available to direct rates in different parts of the field either by active site-specific N application, or by mapping zones, then applying the N in separate operations. https://www.ndsu.edu/fileadmin/soils/pdfs/sf1176-5.pdf

Another benefit of the N sufficient strip is that if the strip is more yellow or less green than the rest of the field, that indicates S deficiency, and S should be applied immediately; then the N needs should be assessed about a week later after a rain.

Dave Franzen
Extension Soil Specialist
701-799-2565
TANK-MIXES WITH ENLIST ONE

Postemergence herbicide applications are currently underway or about to be applied on many of our soybean acres. Our spray season has been difficult due to the relentless winds over the past couple of weeks. We may finally be catching a bit of a break in winds over the coming days, and it is important to take our time and make good decisions during the rush to get our fields sprayed. One important part of this process is the proper mixing of herbicides and tank-mix partners to ensure every component properly goes into solution. This will be especially critical for anyone who is spraying Enlist One herbicide on Enlist soybeans. Tank-mixing either AMS or a potassium (K) salt of glyphosate (such as Roundup Powermax) with Enlist One is a popular choice for these postemergence applications, but there can be mixing compatibility issues if the process is rushed. When mixing these products with Enlist One we have to start with plenty of water (at least half the tank), take our time to allow each component to mix into solution, and follow the proper mixing order to avoid compatibility issues with these product combinations.

Enlist One + Roundup Powermax added to a tank at the same time causes the products to salt out.

Enlist One + Roundup Powermax + ammonium sulfate in 5 gallon (left) and 10 gallon (right) carrier volume when following the proper mixing order and allowing for each product to mix into solution. Note that Enlist One must be applied with a minimum carrier volume of 10 GPA.

Enlist One added to water + ammonium sulfate when the ammonium sulfate was not given proper time to mix into solution.

Here is a link to a webinar sponsored by the United Soybean Board and Take Action that addresses this issue in further detail. Corteva, who manufactures Enlist One, has a factsheet for proper mixing order of different products with Enlist One.
GROWTH STAGE CUTOFFS FOR HERBICIDE APPLICATIONS IN CORN

The recent warm weather has led to rapid growth and development of many of our crops, including corn. We have not had many good spray days due to windy conditions, but many corn fields are rapidly approaching the growth stage and height-restriction cutoffs for postemergence corn herbicides. Some of the earliest cutoff timings are 8-inch corn for broadcast applications of 2,4-D, and any atrazine must be applied before corn reaches 12-inches in height. If corn is 12 inches or taller, the atrazine must be left out of the tank. See the “When to Apply” column on pages 24 through 26 in the 2020 NDSU Weed Control guide for height and growth stage restrictions of postemergence herbicides in corn.

Joe Ikley
Extension Weed Specialist

DRIFTING IN THE WIND

Each year applicators are placed in a near impossible task of meeting the expectations of the pesticide label and being able to control pests in a timely way. 2020 has been another extraordinary year from a planting perspective, but in recent weeks wind conditions have been far from ideal.

I have had several calls from anxious applicators over the past week asking, what if I spray when winds are gusting well above 15 mph? It depends on a whole range of factors. But ultimately it comes down to droplet size and the length of time it takes to reach the target. Fine spray drops fall very slowly as compared to coarse drops. Fine drops have very little mass and so they cannot overcome the friction of the air as well as coarse ones. That means the fine drops are subjected to the wind for a relatively long period of time. The following illustration compares different droplets sizes for lateral movement at various wind speeds:

![Calculated Lateral Movement of Different Size Droplets, 24 Inches to the Target](image)

Figure 1 illustrates how far various sized drops will carry downwind.

The chart was derived from EPA’s National Aerial Applicator’s Manual published in 2009. Generally, 150 micron or less drops are considered highly driftable. They fall slowly and therefore move much farther down range in the wind. In theory, a 20-micron drop will move 1100 feet before it hits the target. But in most situations, they never make it that...
far, especially on a warm day because they simply evaporate. What follows is the evaporation rate for various-sized spray drops on a relatively hot and dry day.

<table>
<thead>
<tr>
<th>Droplet diameter (microns)</th>
<th>Terminal velocity (feet per second)</th>
<th>Droplet diameter after water evaporates (microns)</th>
<th>Time to evaporate (seconds)</th>
<th>Distance traveled from nozzle (inches)</th>
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</thead>
<tbody>
<tr>
<td>20</td>
<td>0.04</td>
<td>7</td>
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<td>67</td>
<td>29.0</td>
<td>25</td>
</tr>
</tbody>
</table>

*Table 1 assumes 90 degrees F temperature along with 36% humidity. The table was derived from a 1990’s era NDSU Extension Circular, AE-1210, Reducing Spray Drift.*

In sum, making an application in high wind conditions will result in significant down range movement of fine spray drops. Applications higher than 24 inches above the target will exacerbate fine droplet movement. Sprayers operating at pressures well above manufacturer recommendations will result in substantial generation of fine spray drops. Flat Fan nozzles produce a high percentage of fine spray drops and should be avoided in high wind conditions. Even nozzles that generate a high percentage of coarse or greater droplets will still produce a sufficient number of fine drops that can move down range. North Dakota Administrative Rule makes it clear:

“Applications must not occur when the atmospheric conditions favor the off-target drift of pesticides or prevent the proper deposition of pesticides to the target area.”

If you apply in high wind conditions, you are likely risking violation of the law and angering a neighbor. Plus, it is a public relation black eye. We are living in an environment that tolerance for off-target movement is moving towards zero. As a pesticide specialist, and as a veteran of applying pesticides commercially, I fully realize the pressures you are all under. I want you to know that I wish you the best on the very important and difficult work you all do.

Andrew A. Thostenson
Pesticide Program Specialist

**TANK CLEANOUT PROCEDURES**

June is the month when crops and weeds are actively growing. For private and commercial applicators, the month of June involves controlling weeds in multiple crops, often at the same time. Furthermore, applicators accomplish their task while juggling applications around weather events including rainfall, high temperatures and wind events that may compromise the spray job and /or violate the pesticide label. In recent years, weed control treatments are mixtures of multiple herbicides for broad spectrum weed control and herbicides delivering multiple sites of action for effective weed control to manage weed resistance.

Herbicides are crop and weed species selective. Thus, it is highly likely herbicides used in a crop in the first spray job are toxic to the crop in the second spray job. And application may likely be accomplished with the same equipment. What is the proper procedure to clean spray equipment between spray jobs? I recommend developing best
management practices for cleanout that are firmly adhered to by all operators. The goal of tank cleanout is to dilute and remove the previous chemical formulation completely to prevent carryover of residues which can damage the crop in the next job.

**Empty the sprayer in the field.** Spray all the product on the field and return from the field with an empty sprayer. I recommend ‘picture-framing’ the perimeter of the field if there is extra product since field edges usually have the most weeds. Spraying the edges is a sequential application of labeled sprays that will not damage the crop. Never, NEVER, allow product to remain in the tank overnight before beginning cleanout procedure as time allows the product to solidify and/or adhere to the tank and plumbing components in your spray equipment. Open valve ends to remove product from the tank and boom. Remove the in-line strainers, endcaps and nozzle screens and tips for thorough cleaning.

**Rinsing is key to successful cleaning.** Rinsing is a process that is more complicated than simply pushing high volumes of clean water through the sprayer. I often learn about thousands of gallons water used to clean the sprayer when I am investigating crop damage attributed to tank cleanout. I recommend multiple aliquots (I prefer four) of smaller water amounts as compared to one or two aliquots of high-water volumes. For example, use four aliquots of 300 G water instead of a single aliquot of 1200 G. The first aliquot is to dilute the spray solution in the bottom of the tank or in the lines. I recommend tank-cleaner for the second and third rinse. If possible, allow the cleaning solution to remain in the tank overnight or for multiple hours.

**Use the correct tank cleaner.** Cleaning products need to be pesticide specific (check the label) and usually are a combination of detergents and either bleach or ammonia. Reassemble the sprayer with strainers, end caps and screen and tips before your fourth and final rinse. Check the plumbing for leaks and make sure the spray pattern is acceptable.

**Learn how physical properties of the pesticides interact with your equipment.** EC formulation often leave a slime on the tank walls or hoses that must be removed by pressure washing or tank cleaners. Dry formulations often accumulate in sprayer crevices, strainers, ends of booms or in screens. Glyphosate and glufosinate are well known ‘tank-cleaners’ with a reputation of dissolving or desorbing pesticide residues from herbicides used in the previous load.
NORTHWEST ND

Last week finished out with high temperatures in the 80’s followed by 30-40 mph winds and a high of 90 degrees on Saturday, June 13th. Winds were somewhat less on Sunday and scattered thunderstorms moved through during the afternoon overnight into early Monday morning. Most areas of western Divide, Williams, and McKenzie Counties saw less than 0.1” from the storms. Far eastern Divide and south east Williams saw two-day totals between 0.5 and 1.0”. The high winds and hot temperatures are continuing to dry out the ground and stress crops. Some relief should be felt where rainfall exceeded 0.5”, but since most of us didn’t get that much, I expect to see more signs of drought stress in crops. Looking at the 7-day forecast, highs are expected to be in the 60’s and 70’s through the weekend. There’s a small chance of showers mid-week but unfortunately no strong chances of rain.

Here at the Williston REC, winter wheat is flowering. The stands seem a bit sparse with not very many tillers per plant and lower leaves drying up (see photo). I observed a pea field starting to flower, no doubt being pushed by the dry conditions. Green foxtail is emerged and growing, so hopefully we’ll get enough breaks from the wind to control summer annual grassy weeds.

Clair Keene
Extension Cropping Systems Specialist
NDSU Williston Research Extension Center

NORTHEAST ND

Most of the spring planting is finished, with a few stragglers. Rain last week greatly improved emergence with seed that was muddled in. Crops in general look very good. With the rain just over a week ago, crop growth has sped up immensely; however, rain would be helpful presently, with the warmer temperatures and high winds drying out the topsoil. The main activity to date is pesticide applications on developing Canola flea beetle activity and weed control, primarily in small grains and some early corn. Baling of first cut alfalfa is beginning in the area. However, yields appear less than usual with the early frosts this spring, and grass growth appears less than usual, so additional forage planting will likely be needed. Prevent Plant will be anywhere from 20-30 percent of the acreage not planted. Hard decisions will have to be made to decide whether to plant a cover crop or desiccate weeds, as needed, for cover. A few might use the hay decision and retain a much smaller amount of insurance coverage. The research center activities have moved along very nicely. Research using barley and oats as cover on saline areas is being done at the research center, to determine productivity and soil healthy issues.

Bill Hodous
Ext Agent/Ramsey County
NDSU Ext County Programs
SOUTH-CENTRAL/SOUTHEAST ND

According to NDAWN, rainfall during June 1-15 ranged from 0.2 inch (Jamestown) to 3.8 inches (Oakes), with the Carrington Research Extension Center (CREC) receiving 0.3 inch. While subsoil moisture is adequate, most of this region, except the southeast, would welcome rain to rewet the topsoil. This would provide soil conditions to help adequately establish late-planted row crops and activate PRE herbicides. High wind, along with warm temperatures, has contributed to the dry topsoil and hampered timely application of POST herbicides. For example, during June 13-15, the region's daily average wind speed ranged from 7-24 mph with maximum wind speed ranging from 22-47 mph.

Alfalfa harvest is in progress. Winter cereals generally are in the flowering to early seed formation stages. Barley and spring wheat crops seeded late April are near or at heading. Small grain in areas with limited topsoil moisture, such as the CREC, have short plants and reduced yield potential. Late-April planted corn has 6 leaves (V6 stage) and soybean is in the third trifoliate (V3) stage. Late-season row crop planting is essentially complete.

Weed control is the most challenging crop protection problem, while minimal disease or insect problems have been reported or observed.

SOUTHWEST ND

From June 1st to June 15th according to NDAWN Dickinson received 0.24 inch of rain. While the NDAWN station didn’t receive much rain, there were some scattered storms that brought as much as a half inch rain to some, but also hail to others. Over the same period, Hettinger is at 0.41 inch, Mott 0.46 inch, Beach 0.80 inch, and Bowman at 0.27 inch. The dry weather along with high winds have really dried out the top soil and stressed many of the crops throughout the region. Some small grains are beginning to head out early. It looks like there is a chance of rain later this week, we could really use anything we can get. From May 1st to June 15th Dickinson is at 1.52 inch of rain, Hettinger is at 0.88 inch, and Mott is at 0.73 inch. If you are seeing the impacts of drought be sure to contact your county Extension agent so that we can keep the drought monitor map as accurate as possible.
WEATHER FORECAST

The June 18 to June 24, 2020 Weather Summary and Outlook

Many parts of the North Dakota Agricultural Weather Network (NDAWN) experienced little or no rain from June 10 through June 16, 2020 (Figure 1). There were scattered thunderstorm in western North Dakota that hit some of the NDAWN stations in northwestern North Dakota and northeastern Montana Sunday night into Monday morning. During that same period there were some storms in southwestern North Dakota, but the storms generally missed the NDAWN stations, but there was some localized one inch totals as well as large hail in western Adams and Hettinger Counties.

![Total Rainfall (inch) (2020-06-10 – 2020-06-16)](image)

*Figure 1. Total rain from June 10 through June 16 at NDAWN stations (Pillsbury station had 0 not 0.53” as shown).*

Although some NDAWN stations recorded rain yesterday (Wednesday and not included in Figure 1), a vast majority of the region has recorded around or less than 70% of normal rainfall since May 1, with many parts of western North Dakota recording less than 50% of normal in the past six weeks. This next week continues to not look promising for rain in western North Dakota. It only takes one thunderstorm for a particular area, but overall, most locations look to be continuing to record below average precipitation for the next week to ten days, especially in western North Dakota.
The end of last week was cool, but that changed with temperatures well above average for the past several days, especially in southeastern North Dakota where some locations recorded three straight 90° or warmer days. Temperatures from June 10 through June 16 were mostly above average overall with a few exceptions (Figure 3). Today (Thursday) will be the start of a cooler period with highs mostly in the 70s for the next few days with some locations even staying in the 60s on at least one of the days. In turn, there will be fewer Growing Degree Days (GDDs) this week than what was experienced these past seven days.
The projected growing degree days (GDDs) base 32°, 44° and 50° for the period of June 11 through June 17, 2020 can be found in Figure 4.

Figure 4. Projected Growing Degree Days for the period of June 18 to June 24, 2020

Using May 1 as a planting date, accumulated growing degree days for wheat (base temperature 32°) are given in Figure 4. 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 4. Accumulated Growing Degree Days for Wheat (Base 32°) since May 1, 2019
Using May 20 as a planting date, accumulated growing degree days for corn (base temperature 50°) are given in Figure 5. 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.

![Corn Accumulated Growing Degree Days (°F) (2020–05–21 – 2020–06–16)](image)

*Figure 5. Accumulated Growing Degree Days for Corn (Base 50°) since May 20, 2019*

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

You may notice that my graphics this week include stations that were on the NDAWN current page, but not available for historical, Growing Degree Days or crop disease analysis. These additional features will be released to the public soon and may be available on our main website, https://ndawn.ndsu.nodak.edu as you’re reading this, or in the next few days. We appreciate everyone’s patience as the NDAWN programmer slowly catches up from rapid growth of the Mesonet during the past couple of years. More stations will be coming online through the summer.

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