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entomology

IPM CROP SURVEY 2025

The IPM scouts and insect trappers were trained on Monday, June 2. We are pleased to introduce the 2025 NDSU IPM scouts and insect trappers:

- **Shelby Dietz**, central and south-central counties, working out of Carrington REC with Jeff Stachler
- **Ashlyn Williams**, southwest and west central counties, working out of Dickinson REC with Victor Gomes
- **Chris Asmundson (insect trapper, IPM scout position vacant)**, north central counties, working out of NCREC in Minot.
- **Scott Roseth and Samantha Turnquist**, northwest counties, working out of Williston REC
- **Tommy Crompton**, southeast and east central counties, working out of the NDSU campus, Fargo, with Janet Knodel, Patrick Beauzay, Andrew Friskop, Wade Webster and Sam Markell.
- **McKenna Schneider and Kartheek Chapara**, northeast counties, working out of Langdon REC with Anitha Chirumamilla and Scott Knoke (Benson County Extension Office).

The IPM scouts working for the University of Minnesota Extension are:

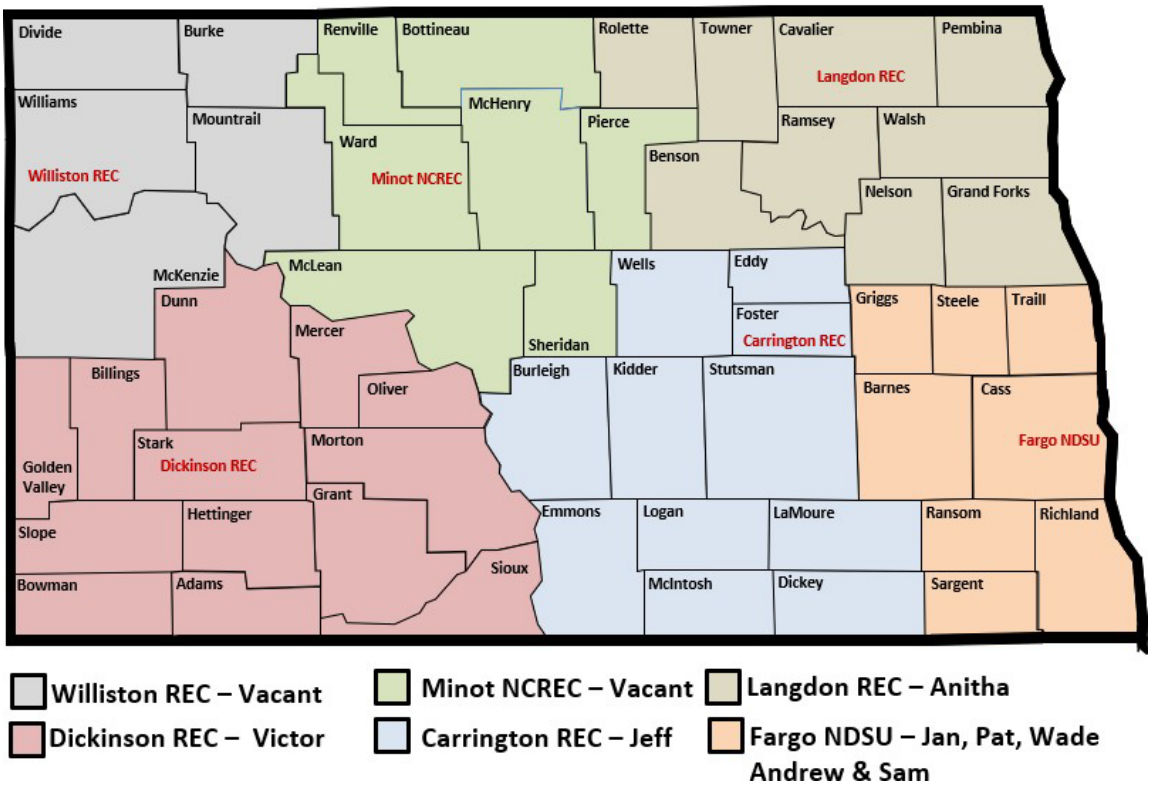
- **Zoe Hoaglund and Jordan Hunnicutt** working out of the Moorhead and Morris areas with Anthony Hanson, Regional Educator, IPM / Extension
- **Stephen McFadzen and Libby Dulmage** working out of the Crookston area with Angie Peltier, Regional Educator, Crops / Extension

If you see scouts out in your fields, please know that they are helping to identify and find economic insect pests and diseases of wheat, barley, soybean and sunflower. Insect trapping is an essential part of the IPM Crop Survey where scouts monitor for banded sunflower moth, wheat midge, armyworm and other insect pests.

We also collaborate with the North Dakota Department of Agriculture on surveying for exotic pests (insects, diseases, nematodes), and negative results support the export of field crops outside of North Dakota, saving farmers markets and money. This work is partly funded by the Crop Protection and Pest Management Program [grant no. 2024-70006-43752] from the USDA National Institute of Food and Agriculture, and the North Dakota Department of Agriculture.

For North Dakota, the scouting areas are shown on the map on the next page.

IPM Scouting Areas by RECs



Janet J. Knodel
Extension Entomologist

Patrick Beauzay
State IPM Coordinator and Research Specialist

Andrew Friskop, Wade Webster and Sam Markell
Extension Plant Pathologists

Victor Gomes
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SCOUT CANOLA FIELDS FOR FLEA BEETLES

Timely scouting and management of flea beetles are essential to protect canola during its most vulnerable stages—emergence through the 4- to 6-leaf stage. Flea beetles can cause significant feeding injury that may reduce plant stands and ultimately lead to economic yield losses if left unchecked.

Start scouting immediately after crop emergence and continue daily for at least 14 days or until the crop reaches the 4- to 6-leaf stage. Although canola becomes more tolerant to feeding damage as it matures, younger seedlings are highly susceptible to injury.

Feeding Injury Symptoms: Flea beetles feed on above-ground plant tissue, primarily cotyledons and young leaves. Key signs of injury include:

- Pitting and shot-holing on cotyledons and true leaves
- Defoliation, often beginning at the field edges
- Reduced plant vigor and, in severe cases, stand loss

Flea beetle causing injury to 3-leaf canola plant (P. Beauzay, NDSU)

To assess flea beetle presence and feeding injury accurately, follow this scouting approach:

- Start at field edges, especially near shelterbelts or grassy areas—common overwintering sites for flea beetles.
- Walk in a "W" pattern through the field to sample edges and interior zones.
- At five locations, spaced evenly along your path, randomly select 10 canola plants at each site (total of 50 plants).
- Estimate the percent defoliation of each plant and record your observations.
- Calculate the field's average percent defoliation to determine the severity of the damage.

Threshold: A foliar insecticide treatment is recommended when both of the following conditions are met:

- **Average defoliation reaches or exceeds 25% on cotyledons or the first true leaves**, and
- Flea beetles are actively feeding in the field.
- Note: Feeding injury escalates rapidly during warm, dry weather. Even a 1–2 day delay in treatment can lead to severe stand loss or complete crop failure under high flea beetle pressure.

Apply foliar insecticide applications during sunny, warm conditions, preferably midday, when flea beetles are most active and exposed on the plant surface. Delaying application or applying under cool, cloudy, or rainy conditions may reduce insecticide efficacy due to reduced beetle activity and coverage.

Foliar Insecticide Efficacy

Trials conducted in Fargo and Langdon, North Dakota, and Roseau, Minnesota, evaluated the effectiveness of several foliar insecticides in the Table below:

Product	Active ingredient	IRAC Group	Rate (fl oz/acre)	Efficacy
Brigade 2EC	bifenthrin	Pyrethroid (3A)	2.6	Good
Warrior II	lambda-cyhalothrin	Pyrethroid (3A)	1.92	Good
Mustang Maxx	zeta-cypermethrin	Pyrethroid (3A)	4.0	Good
Delta Gold	deltamethrin	Pyrethroid (3A)	0.8	Average
Ridgeback	Bifenthrin + sulfoxaflor	Pyrethroid (3A)+ Sulfoximine (4C)	4.3	Average
Exirel	Cyantraniliprole	Diamide (28)	7.0	Excellent

Most pyrethroids provided good control except Delta Gold, which was significantly less effective. Exirel demonstrated excellent control due to its systemic and translaminar activity, which protects both treated and newly emerging leaf tissue. Its performance was comparable to two applications of Brigade 2EC. Ridgeback provided average flea beetle control. The sulfoxaflor component is primarily effective against aphids and contributes little to flea beetle management. Helix Vibrance (insecticidal + fungicidal seed treatment) offers good early-season protection but

diminishes over time. Fungicide-only treatments (untreated for insects) provided minimal protection and allowed for substantial flea beetle injury.

Avoid using Exirel as a foliar spray if Lumiderm (cyantraniliprole) was used as the seed treatment. Repeated exposure to the same active ingredient (Group 28) in a single season increases the risk of insecticide resistance development.

In North Dakota, some canola fields are being planted later in the season. Late planting generally reduces the risk of flea beetle injury because the crop may emerge after peak beetle activity. However, this approach has trade-offs:

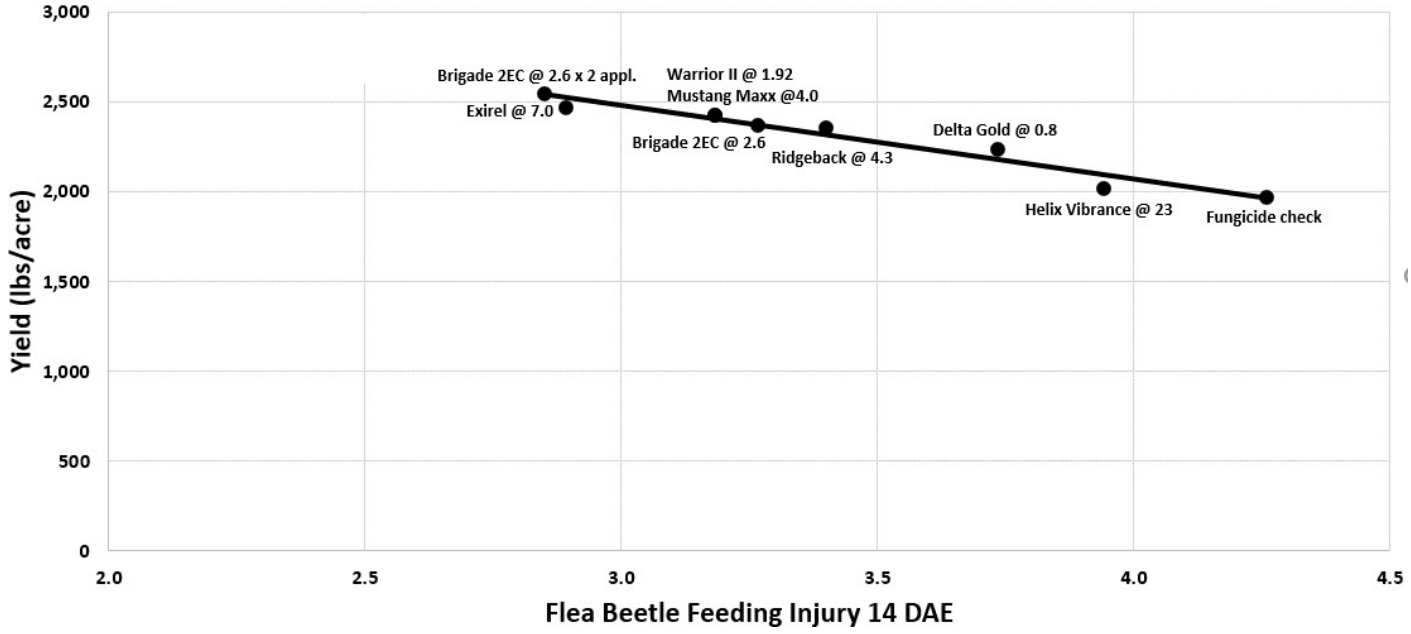
- Pros: Reduced flea beetle pressure due to mismatched timing with peak emergence
- Cons: Increased risk of heat stress during flowering, which can negatively impact yield

Effective flea beetle management in canola depends on:

- Timely and accurate scouting
- Understanding insect behavior
- Using economic thresholds for foliar sprays
- Applying insecticides under ideal weather conditions
- Avoiding resistance through diversified insecticide use

While seed treatments offer a first line of defense, they are not always sufficient. Be prepared to follow up with foliar insecticides if threshold levels are met, especially in years with persistent or high beetle populations.

Figure 1. Foliar Insecticide Trial: Relationship between Flea Beetle Feeding Injury at 14 Days after Emergence (DAE) and Yield across locations, 2023.



Janet J. Knodel
Extension Entomologist

Patrick Beauzay
State IPM Coordinator and Research Specialist

SUGARBEET ROOT MAGGOT: FLY ACTIVITY PEAK NEARING!

Adult fly activity of the sugarbeet root maggot (SBRM; Fig. 1) fly activity has increased considerably this past Monday (June 2), and it is expected to rise sharply and peak throughout most of the Red River Valley (RRV) by Friday or Saturday of this week. If that prediction holds true, fly activity will have occurred about one week earlier than the 15-year average for the area.

Fig 1. SBRM Adult on seedling (Photo: M. Boetel, NDSU)

In most years, latitude plays a role in the timing of peak fly activity timing throughout the region, with peaks in the southern RRV usually occurring two to four days earlier than those in the central and northern RRV, respectively. However, the unseasonably warm weather that occurred in the central and northern Valley a couple of weeks ago appears to have provided somewhat of an equalizing effect on SBRM growing degree-day accumulations. As a result, activity peaks are expected to occur on about the same day or within a day of each other throughout the production area. Although this is rare, it has occurred before and, in the most recent case, it was during a similar growing season in which fly activity peaked earlier than typical.

Although the forecasts presented in Table 1 suggest that SBRM fly activity will peak in most areas between June 6 and 7, the extended weather forecast indicates that temperatures will cool down by Sunday, June 8 and then warm back up to the high 70s on Tuesday, June 10. This suggests the distinct possibility of a resurgence of fly activity during the early part of next week.

Table 1. Degree-day (DD) based predictions for timing of high SBRM fly activity periods and peak fly activity in the Red River Valley

Location	Total DD (as of June 2)	High Fly Activity Period	Maximum Likelihood Peak Fly Date*
Sabin/Glyndon, MN	584	June 6-7 (+80°F, dry, and low winds)	June 7
Ada, MN/Hillsboro, ND	578	June 6-7 (+80°F, dry, and low winds)	June 7
Grand Forks, ND	598	June 6-7 (+80°F, dry, and low winds)	June 6
St. Thomas, ND	594	June 6-7 (+80°F, dry, and low winds)	June 6

*Maximum likelihood for peak fly activity is based on extended weather forecasts for wind speed, air temperature, and precipitation. Peak fly in current-year beets usually coincides with the first rain-free, calm/low-wind day to reach 80°F after 650 DD are accumulated.

Fly count monitoring network. As has been the case for several years, NDSU is partnering with American Crystal Sugar Cooperative and the Minn-Dak Farmers Cooperative to monitor SBRM fly activity in producers' sugarbeet fields throughout the insect's range in both North Dakota and Minnesota. Current hotspots include Auburn, Buxton, Cashel, Cavalier, Crystal, Reynolds, St. Thomas, and Veseleyville, ND, and also near Ada, Borup, and Eldred, MN.

Moderately high activity has also been observed in fields near Bathgate, Hoople, Nash, and Oakwood, ND, as well as Crookston, Hallock, Oslo, Lockhart, and Stephen, MN. Other areas could also develop relatively high infestations in the next few days. As such, growers in SBRM risk areas should be ready to apply additive postemergence insecticide applications if fly activity in their areas increases to at least 45 flies per sticky stake or 0.5 flies per plant within a field. Fly counts from the NDSU trapping network can be viewed online at: http://www.ndsu.edu/entomology/people/faculty/boetel/flycounts/.

Postemergence SBRM Control. Growers in high-risk areas for damaging SBRM infestations should apply a postemergence insecticide as soon as possible for additive protection, especially if an insecticidal seed treatment or a low to moderate rate of a granular insecticide was used at planting. Replanted fields also may need additional postemergence insecticide protection. The best control option at 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 after a postemergence application to determine if fly activity resurges. Some fields could require retreatment if subsequent infestations reach or exceed 0.5 flies per plant. For more guidance on postemergence control strategies, 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

plant pathology

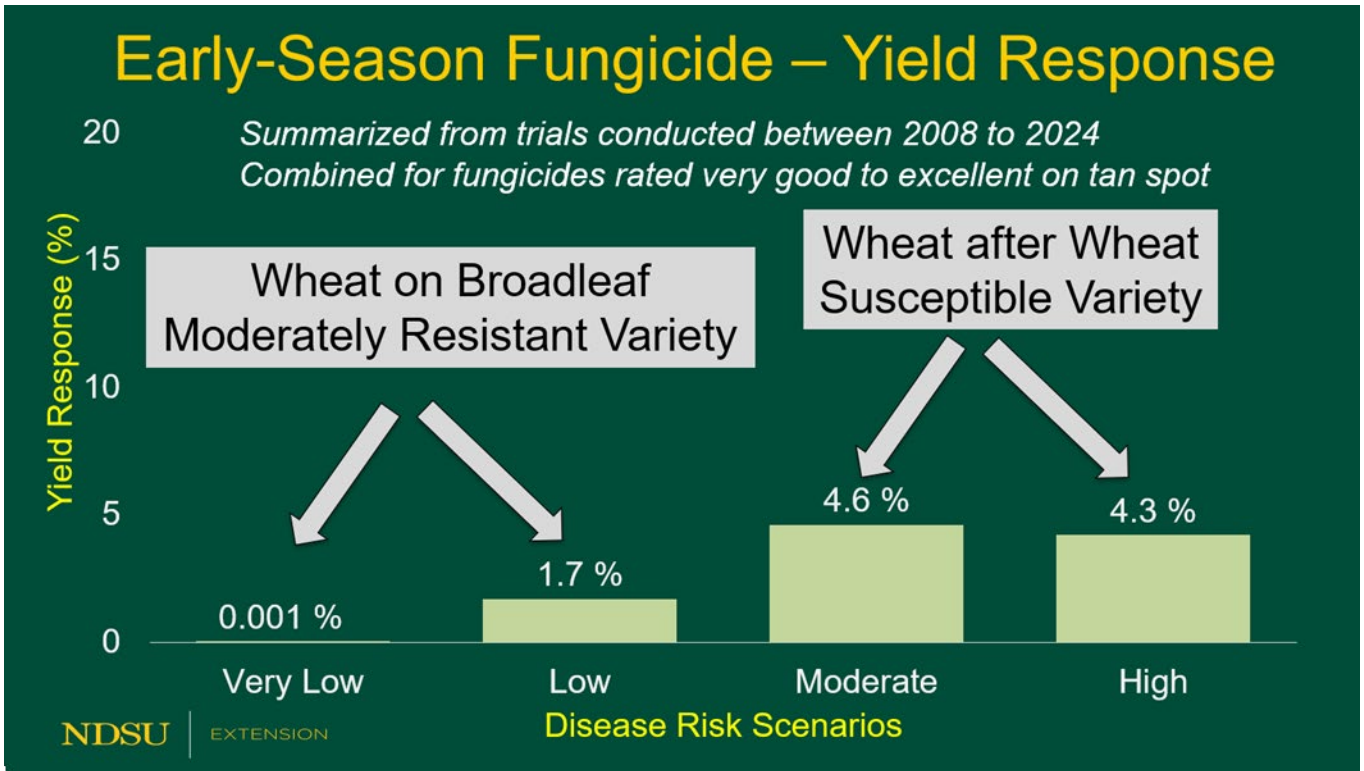
SPRAY EARLY AND OFTEN….IS THAT REALLY TRUE?

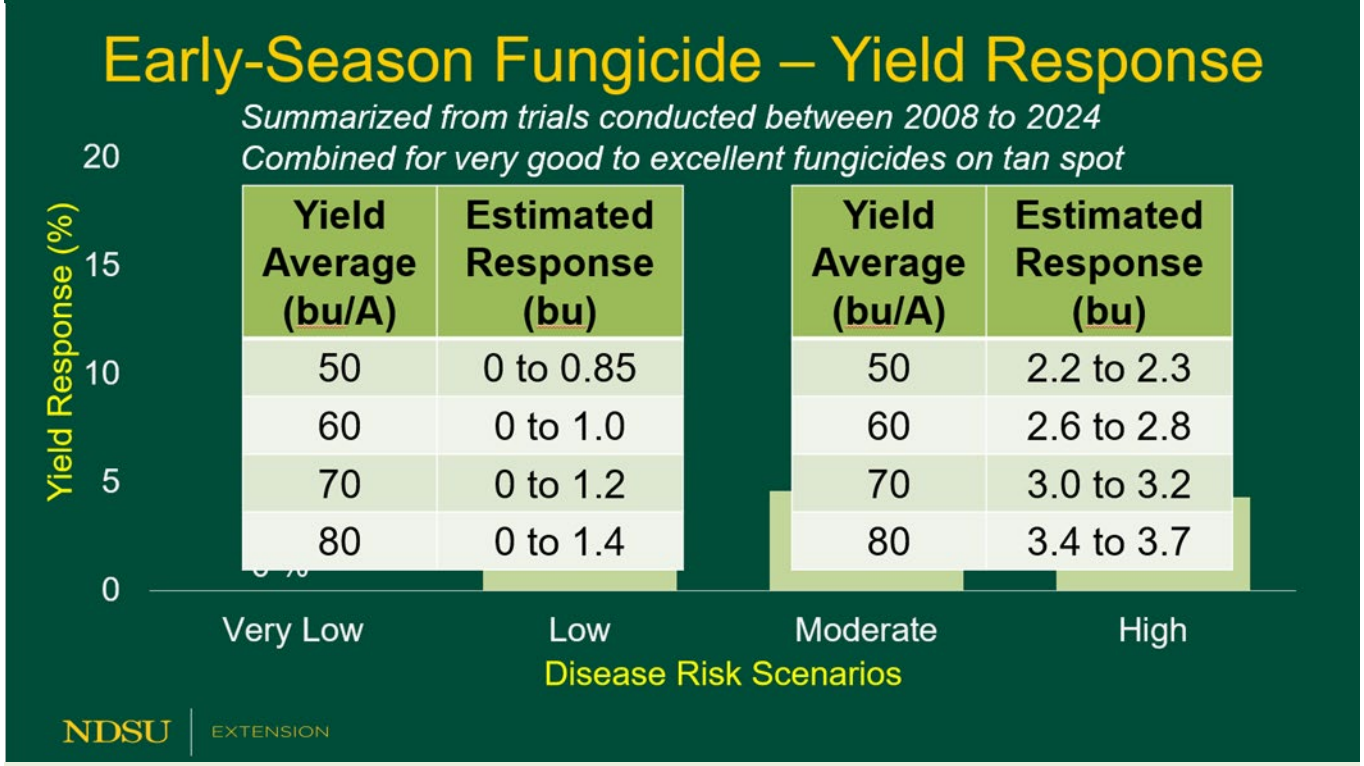
While the first part of that title may have been true when trying to control powdery and downy mildew with Bordeaux mixture in wine grapes, it is no longer the case when controlling small grains diseases with fungicides.
When does it make sense to add a fungicide to your herbicide program in small grains?

The simplest answer is "**Only when you have found disease in your field or have insufferable early season disease risk**". Adding fungicides in the absence of a disease does not buy you anything other than risking crop injury as certain fungicide formulation may 'heat up' specific herbicide(s). It is therefore important to read the label restrictions on the herbicides and fungicides you are planning to use.

What about yield?

This past winter Dr. Andrew Friskop, NDSU Extension Plant Pathologist, summarized 16 years of fungicide timing trials across North Dakota (Figure 1). One of the questions that was addressed was when it made sense to make an early season fungicide application. In order to answer this question, the data was first divided into four risk scenarios – very low risk, low risk, moderate risk, and high risk. The very low and low risk scenarios included varieties that were moderately resistant to the leaf spotting diseases (tan spot and/or Septoria spp.), seeded after a broadleaf crop, in years with below average rainfall and either infrequent or sporadic dews. The moderate and high-risk scenarios included varieties susceptible to leaf spotting leaf diseases (tan spot and/or Septoria spp.), following wheat, in years with average or above rainfall and frequent dews. The final disease severities at the end of the grain fill period averaged less 1%, between 1 and 10%, between 10 and 20%, and more than 20% for very low, low, moderate, and high-risk scenarios, respectively. The corresponding yield responses averaged 0.0%, 1.7%, 4.6%, and 4.3% for the very low, low, moderate, and high-risk scenarios. Disease could only be found at the time of herbicide application in the high-risk scenario.





Yield Average (bu/A)	Estimated Response (bu)
50	0 to 0.85
60	0 to 1.0
70	0 to 1.2
80	0 to 1.4

Yield Average (bu/A)	Estimated Response (bu)
50	2.2 to 2.3
60	2.6 to 2.8
70	3.0 to 3.2
80	3.4 to 3.7

Figure 1. Yield response (%) and estimated bushel response for fungicides rated very good to excellent on tan spot across four disease risk environments in hard red spring wheat.

What has changed?

Tan spot epidemics were frequent throughout the mid-90's into the early 2000's. Recent disease survey data has shown a sharp decrease in tan spot prevalence over the past 10 years in both MN and ND. Aside from Mother Nature influencing epidemics, host resistance has gotten better; crop diversity has increased; longer rotations away from wheat are common; and fungicide applications have become a routine crop input. The impact of crop rotation on tan spot cannot be understated as that single management tool can provide up to 63-70% suppression in no-till environments. To reiterate (and maybe slightly more nuanced): **Yield response of adding a fungicide to your herbicide program is highest if you are following wheat, grow a variety that is rated (moderately) susceptible to tan spot, and disease is already present in the field**.

**Article also appears in the University of Minnesota Extension – Minnesota Crop News.*

Andrew Friskop
Extension Plant Pathology, Cereal Crops

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Extension Professor
Small Grains Specialist

POST-EMERGENT OPTIONS FOR MANAGEMENT OF RHIZOCTONIA DISEASES

Sugarbeet seedlings in North Dakota and Minnesota are approaching the 4-8 leaf stage, which is a critical time for post-emergent fungicide applications to manage Rhizoctonia root rot. Following the 2024 season, 38% of respondents at winter growers' seminars indicated use of post-emergent fungicides for Rhizoctonia control. In fields with a history of Rhizoctonia in either sugarbeet, soybeans, or dry beans, post-emergent applications may be necessary to protect plants. Specialty varieties tolerant to Rhizoctonia provide the most benefit later in the growing season. Seed treatments and in-furrow applications can protect seedlings early on, but their efficacy decreases over time. Several conventional fungicides are labeled for post-emergent applications, and typically will have similar activity against disease (Table 1). There are likely other options available. Also noted in Table 1 is information about active ingredients, application method, and application rates.

For post-emergent fungicide applications in sugarbeet, the products listed in may be applied either banded or broadcast. The rates are equivalent EXECPT for Excalia rates, which differ between banded or broadcast applications. Research from Dr. Ashok Chanda at the University of Minnesota – Crookston has demonstrated that both banded and broadcast applications have similar efficacy among these products. Please note that these applications, while are intended to target soilborne diseases, are counted as a foliar application for the purposes of fungicide resistance management.

Tank mixing fungicides with herbicides or insecticides is still not recommended. Data regarding crop injury is sparse, but NDSU sugarbeet Extension has multiple field trials this season to address this research need. Oftentimes, fungicide application windows for effective Rhizoctonia control are wider than those for herbicide applications, or for post-emergent sprays for root maggot control. It is important to prioritize pests which pose the most significant economic problem, in order to optimize spray timing, nozzles, adjuvants, etc.

Table 1. Conventional fungicide options for management of Rhizoctonia in sugarbeet in ND and MN. Other products may be available.

Trade Name	Active ingredient	Mode of action	Application method	Rate
Quadris	Azoxystrobin	QoI (FRAC 11)	Band or broadcast	9.2-16.6 fl oz/A
Excalia	Inpyrfluxam	SDHI (FRAC 7)	Band	0.64 fl oz/A
			Broadcast	2.0 fl oz/A
Proline	Prothioconazole	DMI (FRAC 3)	Band or broadcast	5.7 fl oz/A
Elatus	Azoxystrobin + Benzovindiflupyr	QoI (FRAC 11) + SDHI (FRAC 7)	Band or broadcast	7.1 fl oz/A
Azterknot	Azoxystrobin + *Reynoutria sachalinenis*	QoI (FRAC 11)	Band or broadcast	9.2 fl oz/A
Azteroid	Azoxystrobin	QoI (FRAC 11)	Band or broadcast	5.7. fl oz/A

Eric Branch
Extension Plant Pathology, Sugarbeets

plant science

WHAT WILDFIRE SMOKE MEANS FOR OUR CROP

The frequency and intensity of wildfires in the western United States and Canada have increased significantly over the past decade (Figure 1). While these fires have had devastating effects in the areas they directly impact, their reach extends much farther. Smoke from these wildfires drifts across the continent, significantly degrading air quality hundreds- even thousands- of miles from the source. The thick plumes of smoke from Canadian wildfires are covering large portions of the country (Figure 2), prompting many farmers to ask: How will this poor air quality affect my crop?

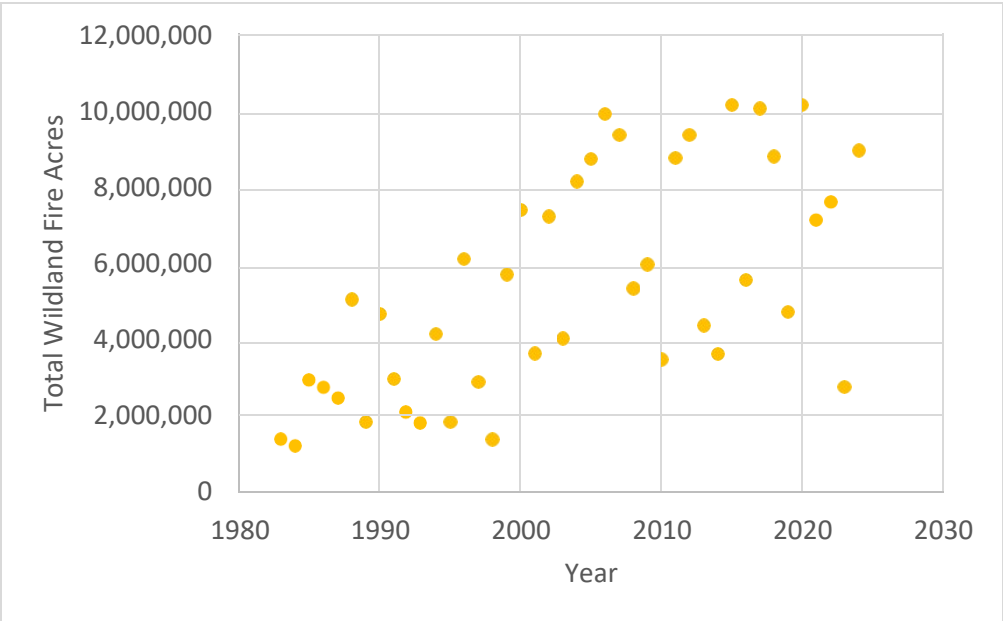

Figure 1: Total acres affected by wildfires in the US across time. Data from Wildfires and Acres \| National Interagency Fire Center

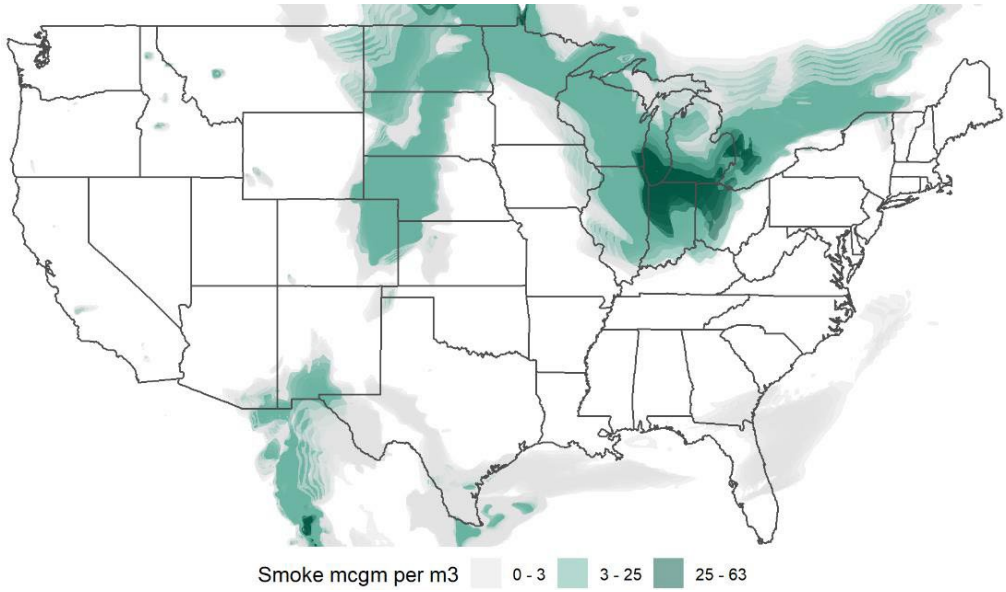

Figure 2. Smoke concentration. Data from National Weather Service Smoke Forecast | US Energy Atlas, retrieved on June 2, 2025.

One of the primary agricultural concerns with wildfire smoke is its effect on sunlight. During smoky periods, the thick haze reduces the intensity of direct sunlight, limiting the energy available to plants for photosynthesis (less energy to grow). However, this light becomes more diffuse, which can actually improve light-use efficiency.
When evaluating the impact on yield, the severity of light reduction is an important factor. Studies examining varying degrees of shading have found, unsurprisingly, that greater reductions in solar radiation led to larger declines in yield. That said, it's difficult to quantify how much wildfire smoke will reduce solar radiation in any given year. For example, a 2018 study in California's Central Valley estimated a reduction in photosynthetically active radiation (PAR) of just 3.6% during a prolonged wildfire event (Hemes et al., 2020).

Crop type also plays an important role. Summer grasses such as corn (C4 crops) are typically more sensitive to reduced light than soybeans and wheat (C3 crops). Timing matters as well: the impact on yield depends on the crop stage when solar radiation is limited and the duration of the smoky conditions. In soybeans, low solar radiation has the greatest effect during the grain-filling period.

Fortunately, smoke-related reductions in light have been temporary and relatively minor so far. If the smoky conditions only occur early in the growing season, before grain filling, they are unlikely to have much impact.

One aspect that would be of particular interest in our region is how wildfire smoke may impact temperatures. By reducing solar radiation, smoke can lower surface temperatures. Depending on the situation, this cooling can be beneficial or harmful. If a crop is under drought stress, moderated daytime temperatures may help reduce additional stress. However, this might not be the case in your field, and if your crops are already behind in accumulating growing degree units (GDU), smoke-related cooling could worsen the delay and limit yield potential.

Finally, wildfire smoke contains a mix of harmful pollutants, including particulate matter, ozone, nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). Of these, ozone is of particular concern for plants. Unlike the protective ozone layer high in the atmosphere, ground-level ozone is a strong oxidant that damages (burns) leaf tissues by entering plant stomata and

disrupting normal respiration. That said, current evidence suggests that the levels and duration of ozone exposure from wildfire smoke in agricultural areas are generally too low to cause significant additional harm beyond existing sources of air pollution.

Determining the exact impact of wildfire smoke on crop yields is challenging due to the complex and overlapping factors involved. While there are several ways wildfire smoke could influence crop productivity—through light, temperature, and air quality—so far, it appears unlikely that the smoky conditions experienced in most areas will cause significant yield losses.

Ana Carcedo
Broadleaf Agronomist

EARLY SEASON CORN ISSUES AND WHAT TO MAKE OF THEM

The temperature swings and precipitation patterns of May have set us up for some potential early season corn issues. If a corn field did not experience stand loss due to saturated soils or standing water after the mid-month rains, they could experience emergence issues due to crusting or, after emergence, "buggy whipping," also known as twisted whorl syndrome.

Regarding soil crusting, the good news is, corn is one of the most resistant crops we have to soil crusting. In many cases, germinating corn seedlings are able to break through soil crusts better than more delicate broadleaf crops like soybean or small-seeded crops like canola. However, a thick, dry crust can slow down or even prevent emergence when the coleoptile cannot break through. If more than 100-120 GDDs have passed since planting and the corn has not emerged, it is time to get out and walk the field to dig up seeds. Seeds with coleoptiles that have bent over rather than continuing up through the soil surface are an indication that a soil crust is the problem. Soils crusts may also cause uneven corn emergence, just like cloddy soils. If emergence is uneven, keep in mind that a corn plant that is 1 leaf stage behind a neighbor can lose 10-20% yield. If it is 2 leaf stages behind, yield loss increases to 30-50%. If soil crusting is a problem, using a rotary hoe to break up the crust before the crop emerges is the best option. A spring-tine harrow can also be used if a rotary hoe is not available. Make sure that the rotary hoe only runs as deep as the crust is thick. The goal is to break up the crust and improve crop emergence while minimizing disturbance of the seedling roots. Crusts are best dealt with as soon as possible after they form, so do not delay crust-busting if it is needed.

We may be a little early to discuss twisted whorls, but it seems timely given the temperature changes we have experienced over the past 10 days. Twisted whorls, also called buggy whipping, happens when the newest leaf or leaves of a corn plant remain twisted up as they emerge from the whorl (top of the plant). This is most frequently observed in V6-V9 plants when the corn is growing rapidly. But, it can occur in younger corn, V4-V5. No one knows exactly why twisted whorls happen, but there are likely a variety of factors at play. When temperatures change quickly between hot and cold or cold then hot, the rate of cell elongation and growth in the developing leaves also changes and may lead to cells on one side of a leaf growing more rapidly than on the other, causing the twist. Some have also hypothesized that secretions on corn leaf edges may cause "stickiness" that prevents the leaves from unfurling as normal. Herbicide injury can also be a cause, especially Group 15 (Harness, Dual, Outlook) or Group 4 (dicamba, 2,4-D), but I encourage anyone observing twisted whorls to go over herbicide application records of the affected and, if applicable, nearest adjacent field(s) before blaming an herbicide. Twisted whorls, whether early or later in the growing season, have not been shown to reduce corn yield. It may look strange, but rest assured, the plants will grow out of it.

The first photo shows a twisted leaf emerging from the whorl of V4 stage corn. (photo credit: Robert Nielsen, Purdue).

The second photo shows a normally developing V4 corn plant with its 5th leaf opening up (unfurling) as it emerges from the whorl. (photo credit: Robert Nielsen, Purdue).

Clair Keene
Extension Agronomist Small Grains and Corn

soils

BAND APPLIED NITROGEN IN-SEASON SOIL TESTING

As the season progresses and after some parts of the state got more than double the normal average precipitation in May, we start to hear some reports from farmers about their crop looking yellowish and concerns about nitrogen deficiency. Yellowing of the older plant leaves could be a sign of either nitrogen or sulfur deficiency, and in some cases both. The best way to really narrow it down is to soil test. If your nitrogen was band applied and you are considering sampling your field due to concerns about nitrogen losses, how should you do an in-season soil to assess your nutrient levels accurately?

A standard composite soil sample taken in a field which received band applied fertilizer, when not done correctly, can result in hitting only the banded or non-banded locations, leading to inaccurate soil test results. The "hot zones" located

in the band have a much higher fertilizer concentration than those between the bands. When trying to get a comprehensive picture of nitrogen levels in the field, having more samples in or out of the band can significantly impact your soil test results and nitrogen needs. Results from a demonstration project carried out by AGVISE Laboratories on soil sampling after banded nitrogen application show the variability in soil N concentration across banded rows, with samples taken directly in the band containing over 800 lb N/ac in a field with a 150 lb N/ac application rate (Figure 1).

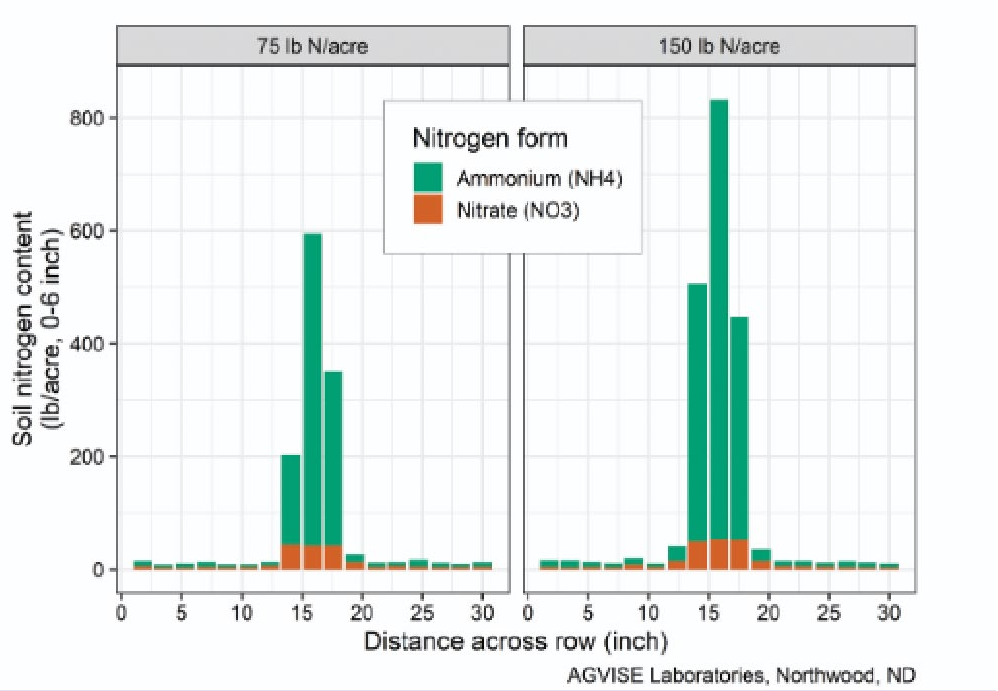

Figure 1: Soil nitrogen distribution after banded urea fertilizer application. Figure created by J. Breker, AGVISE Labs, used with permission.

In order to collect a representative soil sample across a field which has band-applied fertilizer, there are two main sampling approaches—using a shovel or soil probe. Both sampling approaches have positive and negative aspects relating to accuracy and the amount of labor needed:

Shovel: The most accurate sampling technique would be to use a shovel to collect a continuous soil slice 2-3 inches wide spanning across the band, mixing the soil well, and taking a sub-sample to submit for analysis. The benefit of this method is the error of missing the fertilizer band is removed, however it is *very* time and labor-intensive.

Soil probe: Using push probes, is more practical in terms of time and labor, but can result in lower accuracy if not done properly (and still has inherent error if done properly). The push probe method involves collecting evenly spaced soil cores perpendicularly across the bands, from the same area as mentioned in the shovel method. The number of soil cores taken in each transect depends on the width between the bands of fertilizer, with each core being spaced 2-3 inches apart. This method requires careful consideration, as it has a high chance of not balancing correctly. For instance, if you think one sample is not in the band, it may actually be a banded sample, which can throw the whole test off in terms of accuracy for the average soil nutrient concentration.

The commonality between the two is the area from which the sample is collected. In order to be representative of both the banded and the inter-band area follow these simple steps (Figure 2):

1. Start by collecting the soil between two bands,
2. Continue sampling perpendicular across the band, and
3. End in the next inter-band area

Both sampling methods described are simple approaches, sample across the banded area, and still need to be replicated across the field, as is done with typical composite sampling. Both methods discussed will provide information, but with varying levels of accuracy and sampling feasibility. Higher odds of an accurate sampling take time. Remember, this is just an estimate, replicated soil sampling and proper sample handling increases the accuracy of the results, regardless of the method used to sample the soil.

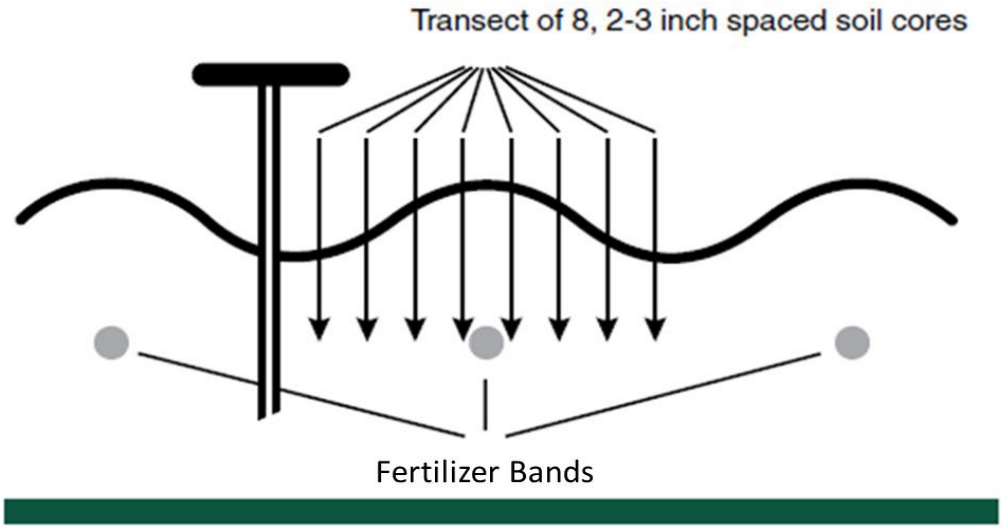

Figure 2: Sampling strategy for banded fertilizer in a transect perpendicular to row direction spanning at least one complete row. NDSU Image.

For more information on soil sampling and sample handling, please refer to D.W. Franzen's article on Soil Sampling as a Basis for Fertilizer Application.

Chandler Gruener
Extension Soil Health Specialist

Victor Gomes
Extension Cropping Systems Specialist

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weeds

GROWTH STAGE CUTOFF IN SMALL GRAINS AND CORN

Small grains growing conditions are good for many folks across the state, and the crop is progressing through growth stages with several fields tillering and approaching jointing. It is important to pay attention to growth stages this time of year, as several herbicide labels contain growth stage cutoffs during the tillering and stem elongation periods. **Figure 1** (also found on page 16 of the 2025 Weed Guide) lists many popular products and their window of application based on small grain growth stage.

Most corn fields are still in the early vegetative stages, but there have been several reports of variable emergence and parts of some fields being replanted. This can lead to several growth stages being present in the same field at the same time. **Figure 2** (also found on page 31 of the 2025 Weed Guide) lists many popular products and their window of application based on corn growth stage. It is important to note that several products have a cutoff based on height, rather than growth stage. These products have an asterisk after their name in Figure 2, and the growth stage listed is an approximate growth stage corn typically reaches that height. For example, atrazine should be applied before corn

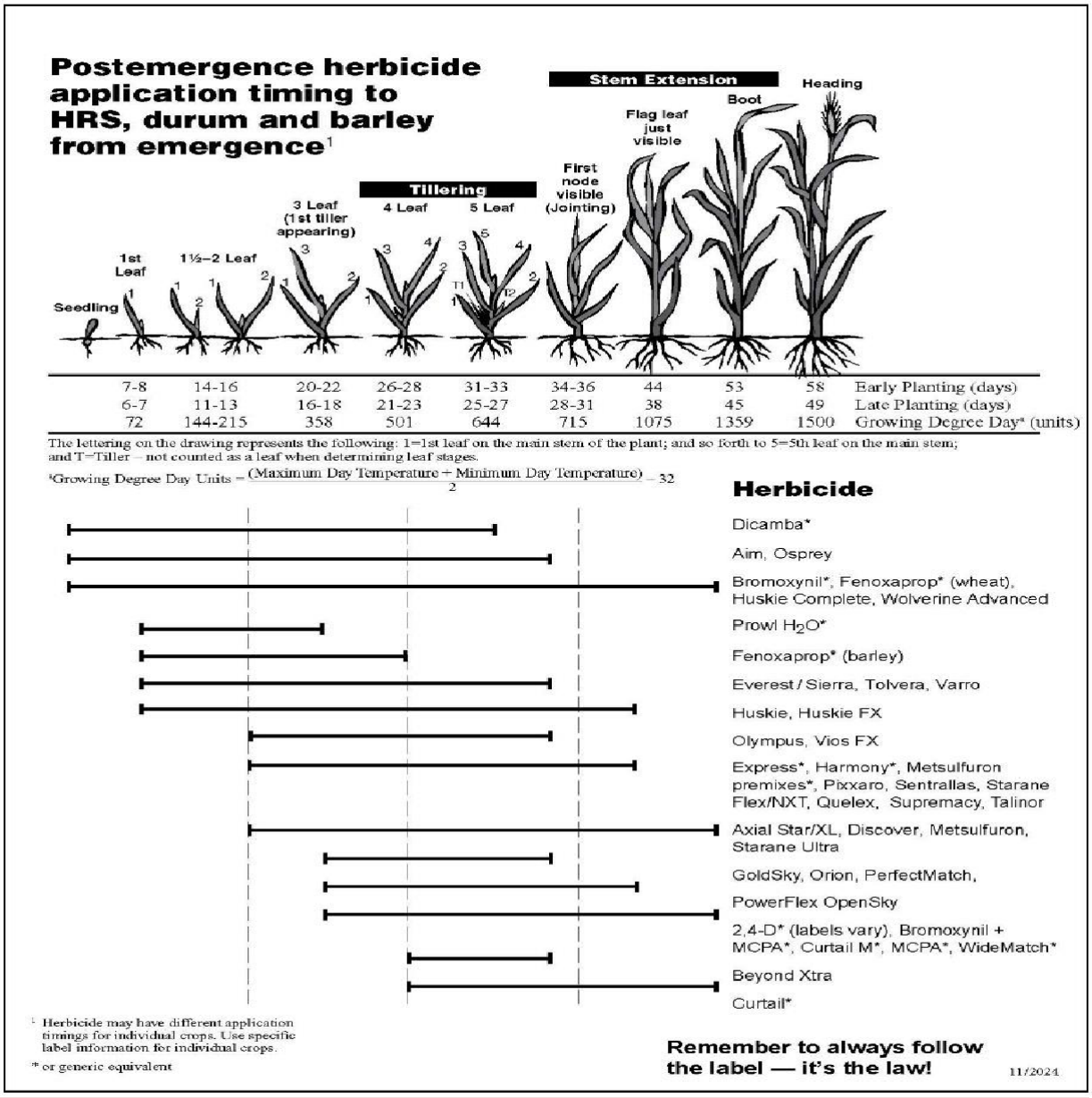

Figure 1 Caption: Postemergence herbicide application timing for small grains.

exceeds 12 inches in height, which is often around the V6 growth stage. Always be sure to check the label for exact details, as this chart is meant as a quick reference guide.

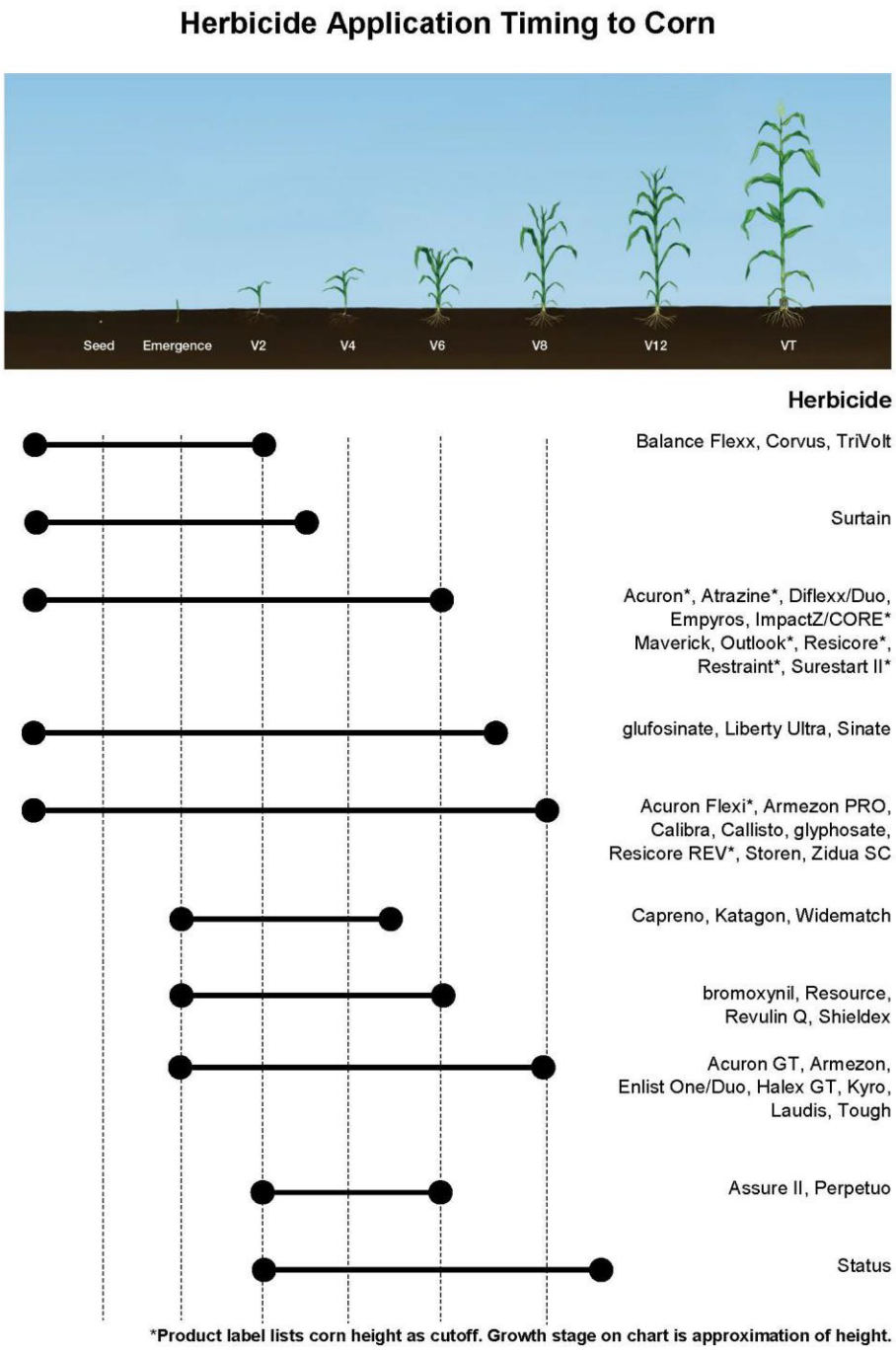

Figure 2 Caption: Postemergence herbicide application timing for corn.

Joe Ikley
Extension Weed Specialist

NEW DELTA T WEBSITE

I've written several articles in this space regarding Delta T (most recently Jun 27, 2024, 'Watch Delta T Values for spraying'). Briefly:

- Delta T describes the evaporative capacity of the ambient air
- when Delta T values exceed 14 °F, excessive spray droplet desiccation and spray deposit evaporation may result in reduced herbicide efficacy
- impacts will be most noticeable when using FINE or MEDIUM spray qualities
- glufosinate (Liberty) is the active ingredient most likely to be impacted

I am happy to announce a new website to assist applicators as they prepare for and respond to elevated Delta T conditions. The **ND Delta T** website, hosted at bit.ly/nddeltat, displays:

- a map of current Delta T (from NDAWN)
- maps of forecasted maximum Delta T for the current day and the next 5 days thereafter
- maps of historical maximum Delta T dating back to May 1
- a table of hourly forecasted Delta T from 6 am to 6 pm on the current day

The About page provides additional background information and explains my reasoning for the site. Briefly, I intend for the website to assist applicators in:

a) planning for days when Delta T is forecasted to reach the caution or unsuitable ranges, so they can appropriately schedule sensitive sprays
b) fostering a mindset where they (i) think proactively about spray weather conditions, so they (ii) check NDAWN repeatedly when spraying, and (iii) adjust operations according to changing conditions
c) using historical Delta T maps as a resource when troubleshooting instances of poor pesticide efficacy

This is an experimental site for summer 2025. Please use it, critique it, and provide me with any feedback or suggested improvements.

Rob Proulx
Agriculture Technology Systems Specialist

forestry

ASH ANTHRACNOSE IN WESTERN NORTH DAKOTA

While large weather systems brought some much-needed moisture to parts of western North Dakota, they also provided conditions that were perfect for ash anthracnose, a fungal disease that affects the leaves of ash trees. Defoliation of ash trees is the most commonly observed symptom, with green leaves littering the ground under infected trees. Additional symptoms of ash anthracnose leaf infections include brown-to-black blotches on leaf margins, causing leaf distortion, and small purple-to-brown spots in the middle of leaves (see photo). Droughts in recent years have resulted in almost no ash anthracnose, but this year defoliation is heavy in some areas but almost nonexistent in other areas.

Trees that were otherwise healthy before being defoliated should recover on their own. Deciduous trees usually have enough energy reserves to grow new leaves. Re-foliated leaves are often smaller and the crowns of affected trees may appear thin. Several years of repeated defoliation may cause twig and branch dieback, especially in the lowest part of the crown.

Treatment with fungicides is usually not warranted. Fungicides are effective only as a preventative treatment and should be applied as leaves begin expanding. Treating trees now can prevent mid-season infections, but infection is more common in a wet, cool spring, rather than the drier, warm summer. For most large trees, fungicide applications aren't very practical. A light application of fertilizer (up to about 1 pound of nitrogen per 1000 square feet of soil surface around the tree) may help reduce stress on highly susceptible ash trees.

The fungus that causes ash anthracnose overwinters in the upper parts of trees in seed samaras, on twig cankers, and on any other infected plant part that remains attached to twigs, so raking and destroying fallen leaves and twigs will help reduce inoculum, though it won't completely eliminate it. As a result, ash anthracnose is a recurring problem on ash trees as long as we have wet, cool weather during budbreak. Disease severity, and therefore the extent of spring defoliation, varies from one year to the next, and among individual trees.

Ash leaves showing symptoms of ash anthracnose. Note the dead leaf margins and distorted growth in the first photo. The second photo shows a dead leaf margin plus small dots where the fungus has entered the leaves through natural openings or wounds created by summer feeding by the ash plant bug.

Joe Zeleznik
Extension Forester

around the state

AROUND THE STATE

NORTHEAST ND

Field Conditions and Crop Progress Update

Field activities were in full swing last week under ideal weather conditions, allowing for significant progress in the planting of corn, canola, and soybeans. A timely rain on Monday, following a 12-day dry spell, provided much-needed moisture to boost crop growth across the region.

Small grains are nearing full emergence, with crop stands rated from good to excellent. Some of the more advanced wheat fields have reached the jointing stage, with row closure observed. Herbicide applications are underway as farmers aim to manage early weed pressure. Field peas emergence is complete with good and uniform stands. Early planted peas are at tendril stage.

Dry bean and sunflower plantings are approaching the halfway mark, with emergence beginning in some of the earlier seeded fields. While corn stands are looking variable, fields previously impacted by frost damage are showing signs of recovery and greening up.

In the Red River Valley, sugarbeet fields damaged by wind and sandblasting have been replanted. Advanced sugarbeet crops are at the 5–6 leaf stage, and most fields have received their herbicide treatments.

Field pea at tendril stage in Cavalier County. Photo: Lahni Stachler, ANR Extension Agent, Cavalier County.

Wheat field in Cavalier County. Photo: Lahni Stachler, ANR Extension Agent, Cavalier County.

Canola planting is 80% complete, with some fields beginning to emerge. Early-emerged canola is experiencing flea beetle pressure. Despite seed treatments with insecticides, some growers are considering foliar applications to prevent injury and protect plant stands.

Poor emergence in a wheat field in Towner County. Photo: Hayden Anderson, ANR Extension Agent, Towner County.

Sunflowers in Cavalier County. Photo: Lahni Stachler, ANR Extension Agent, Cavalier County.

Flea beetles on a canola seedling. Photo: Venkat Chapara, LREC.

Soybean field in Pembina County. Photo: Anitha Chirumamilla, LREC.

Anitha Chirumamilla
Extension Cropping Systems Specialist
Langdon Research Extension Center

SOUTH-CENTRAL AND SOUTHEAST NORTH DAKOTA

The stories of the week are non-uniform and poor emergence of corn and soybean planted prior to May 15th, recovery of completely frosted corn emerged before May 15th, most soybeans and some corn planted prior to May 15th are struggling to emerge through a thick crust and compacted soils and resumption of planting across the region.

Winter rye is heading in most of the region and is shorter than normal and stands are not very good.

Most small grains, canola, dry peas, corn and soybeans have been planted and most are emerged except corn at about 85% for the region, with Eddy County having the least emerged and soybean at about 50%, with Burleigh, Eddy, and Wells Counties having the least emerged soybean. About 60% of dry beans have been planted in the region, with less than 2% of dry beans emerged in the region. About 55% of sunflowers have been planted and about 5% emerged.

Photo 1: Most advanced stage of hard red spring wheat in the region at two nodes (photo by Nancy Deis, NDSU Extension Emmons County ANR Agent.

The maximum stage of hard red spring wheat is already at the two-node stage (**Photo 1**). The average stage of most hard red spring wheat in the region is at the two to three-tiller stage (**Photo 2**). Spring small grain crops condition are mostly good to excellent, but some areas of the region have poorer stands of wheat and areas of some fields are yellow for several reasons, including nitrogen and sulfur deficiencies (**Photo 3**). Some young wheat emerging through the cold spell has some frosted leaf tips in some areas such as in McIntosh County (**Photo 4**).

Photo 2: The average stage of most wheat in the region at two to three tillers.

Photo 3: Patches of yellow hard red spring wheat in a field in Emmons County and can be seen across the region (photo by Nancy Deis).

Photo 4: Frost damaged leaf tips of hard red spring wheat west of Wishek.

Corn stage in the region varies from just emerging to V5 (5 collars) down in Sargent and likely Richland Counties, but most corn in the region is at the V2 stage. Most of the corn emerged prior to the cold rains in mid-May shows at least lower leaf death and leaf tip frost injury as seen in **Photo 5**, but some corn was completely frosted off in Sargent, about 50%, and in Logan County and likely in a few other low-lying areas in other counties. As of late last week, most corn in the region was reported as fair to poor for many reasons, but is finally recovering now after the heat from this past weekend. Corn stands are emerging poorly in some fields as indicated by **Photo 6**. Most of the corn planted prior to the mid-May rains have been crusted in as shown by **Photo 7**. Crusting is causing buggy-whipping and non-uniform emergence, with plants at V2 and others just emerging, as seen in **Photo 8**.

Photo 5: Frost damaged corn in Emmons County and similar to most of the region, with the lowest leaves killed (photo by Nancy Deis).

Photo 6: Poor stand of corn in Wells County, but also present in most counties in the region, especially west of Cooperstown.

Photo 7: Buggy-whipped corn trying to emerge through a thick soil crust which is common, at least west of Cooperstown in the region, but likely in most of the region to some degree (photo by Nancy Deis).

Photo 8: Non-uniform emergence of corn and buggy-whipped corn due to the presence of a soil crust in Sheridan County, but can be seen across the region, at least on corn planted before the cold weather.

Soybean stage in the region varies from being planted to first trifoliate, with most emerging to early unifoliate stage (VC). As of late last week, most soybean fields planted prior to the cold weather had a fair to very poor condition, mostly due to thick crusted and compacted soils. **Photo 9** shows the thick crust in soybean fields and **Photo 10** shows how poor soybean stands were late last week. We really need some good steady rain to get all of the soybeans emerged in the region that were planted in mid-May. Some individual soybean plants in some fields across the region were completely frozen off, as shown in **Photo 11**. Due to the wet, crusted, and cold soils, seedling blights, most often pythium at this time is killing some soybean seeds and seedlings, as shown in **Photos 12 and 13**. I'm guessing most soybeans planted after the cold weather this past week will have no problems emerging well as long as the seed bed was prepared without lots of clods and in muddy conditions. For early planted soybean, start scouting fields for stand counts to determine if replanting is necessary. Some soybeans and corn have been replanted, particularly in Sargent County. According to NDSU research, uniform soybean populations of 75,000 plants per acre can provide near normal yields and replanting is not recommended at this population, however, populations closer to 80,000 or 90,000 may be more beneficial. However, farmers need to weigh the cost of more soybean seed and the price for selling soybeans at the moment.

Photo 9: Poor soybean emergence in Wells County and across the region from a thick soil crust.

Photo 10: Poor soybean stand of mid-May planted soybeans in Wells County and across the region.

Photo 11: Soybean killed by frost in Wells County

Photo 12: Soybean seedling disease, likely pythium killed the soybean seed.

Photo 13: Soybean seedling disease evidenced by the brown lesion on the lower part of the hypocotyl near the nodal roots. This plant likely will die.

Canola in the region either looks good to excellent or fair to poor. **Photo 14** shows a fair to poor stand of canola.

Photo 14: Fair to poor canola stand in Emmons County, but can be found in other parts of the region (photo by Nancy Deis).

Weeds are still a big issue throughout the region. **Photo 15** shows a patch of large wild oat in hard red spring wheat or durum that may be difficult to control. Green foxtail is present in some fields and not others, but is shorter than normal in most cases. I found another example of weeds, this time common lambsquarters in **Photo 16**, surviving vertical tillage with the weeds being quite large already, but most of the soybeans not yet emerged. Remember, weeds surviving tillage are more difficult to control with herbicides and these weeds should be sprayed before they reach two to three inches tall for herbicides to provide the best weed control. At this point in time, please spray weeds based upon weed size and not crop stage, unless the crop is not large enough based upon the crop stage listed on the herbicide label.

Photo 15: A patch of large wild oat in hard red spring wheat that may be difficult to control due to its size.

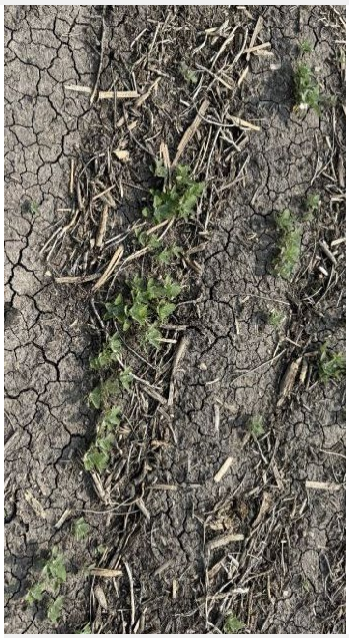

Photo 16: Common Lambsquarters surviving tillage

Of the 27 NDAWN stations chosen this season for this region, the average maximum daily air temperature from May 27 to June 2, 2025 ranged from 72 degrees Fahrenheit near Pickardville and Stirum, to 80 degrees Fahrenheit near Gardner

and Hillsboro, with an average for the region this past week of 76 degrees Fahrenheit, 14 degrees Fahrenheit above last week. The average daily minimum air temperature for the past week at the 27 NDAWN stations across the region ranged from 44 degrees Fahrenheit near Brampton and Zeeland to 52 degrees Fahrenheit near Hurdsfield, Mooreton, Sonora, and Wahpeton. The daily average minimum air for the region for the week was 48 degrees Fahrenheit, 8 degrees Fahrenheit warmer than last week.

For the month of May in the region daily maximum air temperatures ranged from 67 degrees Fahrenheit near Wishek to 73 degrees Fahrenheit near Gardner and Hillsboro, with a regional daily average high temperature of 70 degrees Fahrenheit. Gardner recorded the highest temperature in May at 97 degrees Fahrenheit. The lowest daily average high air temperature for May was 40 degrees in Carrington, McHenry, Pickardville, and Wishek.

Rainfall for these stations across the region for last week ranged from 0 inch near Casselton to 0.52 inch near McKenzie, with an average for the week of 0.11 inch, way below the weekly daily average! As of June 2nd, the Skogmo NDAWN station again had the lowest four-inch depth of soil moisture at 7% with the greatest soil moisture at Mooreton, at 47%. The average four-inch soil moisture over the region decreased 6% again compared to last week at 21%. As of June 2nd, the Pickardville and Stirum NDAWN stations had the lowest 39-inch depth of soil moisture content at 7%, with the Cooperstown and Leonard NDAWN stations having the greatest at 51%, with an average for the region of 29%, only 1% lower than last week.

The May rainfall for the region ranged from 1.39 inch near Pillsbury to 6.14 inches near Livona, with an average for the region of 2.8 inches.

Winds were fairly calm again this week across the region with the average daily wind speed for the week in the region being 6.7 mph compared to 6.0 mph the week before! Average daily windspeeds for May ranged from 7.7 mph near Casselton to 11.3 mph near McHenry and Wishek, with an average for the region of 9.8 miles per hour, which is slightly above normal.

Jeff Stachler
NDSU Extension Cropping Systems Specialist at Carrington Research Extension Center

weather

WEATHER FORECAST

The June 5 to June 11, 2025 Weather Summary and Outlook

Although rain amounts in the past week were mostly on the light side, since May 1, it has been a mix of heavy rains in much of western North Dakota, to adequate rain in the eastern part of the state (Figure 1). Eastern North Dakota, especially east of Highway 281 has been below average for rainfall in the past 5 weeks, which may surprise some people. There will be scattered precipitation in the next week, but widespread heavier rain seems unlikely. We are moving quickly into thunderstorm season when precipitation amounts will be highly variable from spot to spot. The best time period for rain/thunderstorms this forecast period looks to be this weekend.

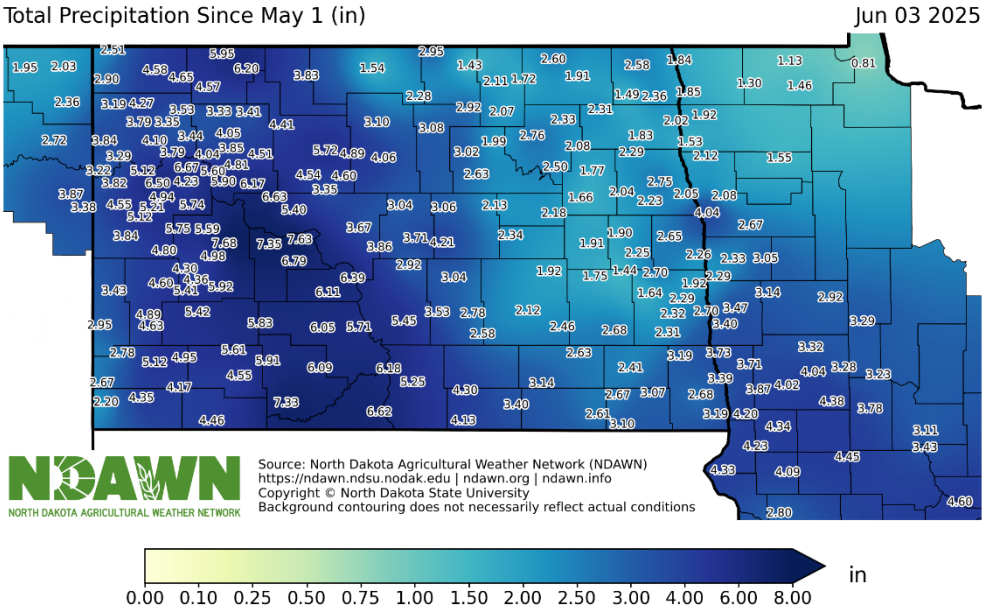

Figure 1. Total Rainfall for the period of May 1 through June 3, 2025.

The cool weather in the middle of May was not enough to offset the very warm start of May we had, plus the last few days of May were also above average. Since May first most of North Dakota has averaged 1 to 3 degrees above average (Figure 2). In the short term, the next several days look to be cooler than average as a cold front moves through with some rain this weekend, but warmer air should be returning toward the middle to end of next week.

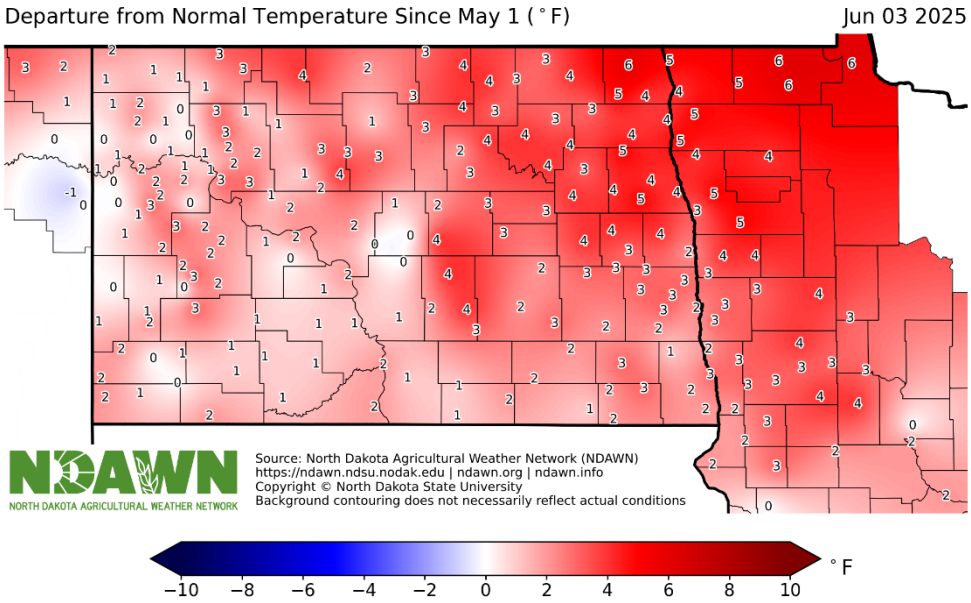

Figure 2. Departure from Average Air Temperature for the Period of May 1 through June 3, 2025

Figures 3 and 4 show forecasted Growing Degree Days (GDDs) for base 32°F (wheat and small grains) and 50°F (corn and soybeans) during this forecast period. With below average temperatures will come fewer than average GDDs in the next week.

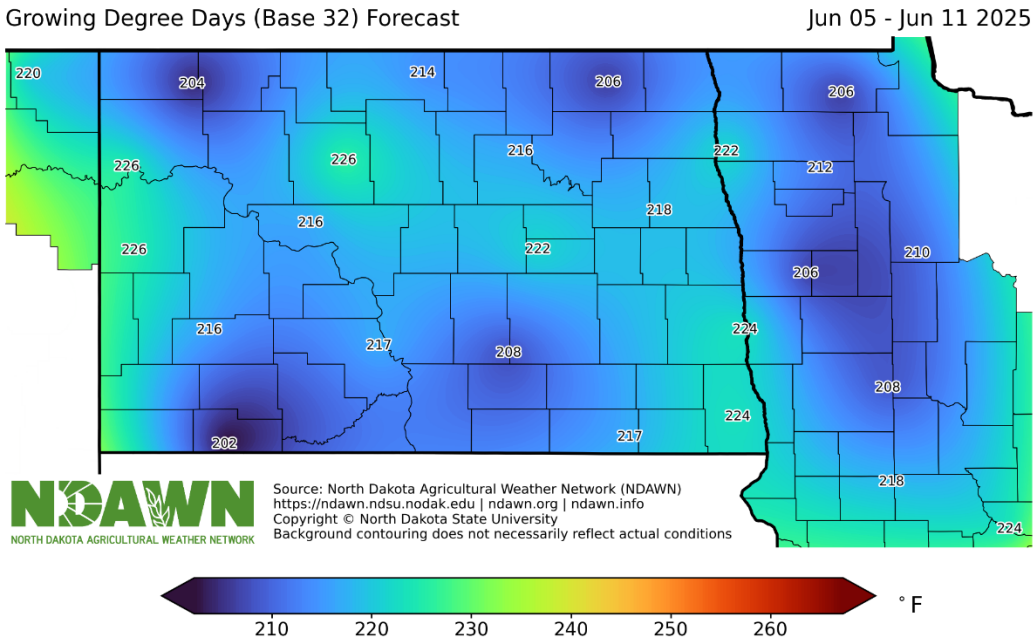

Figure 3. Estimated growing degree days base 32° for the period of June 5 to June 11, 2025.

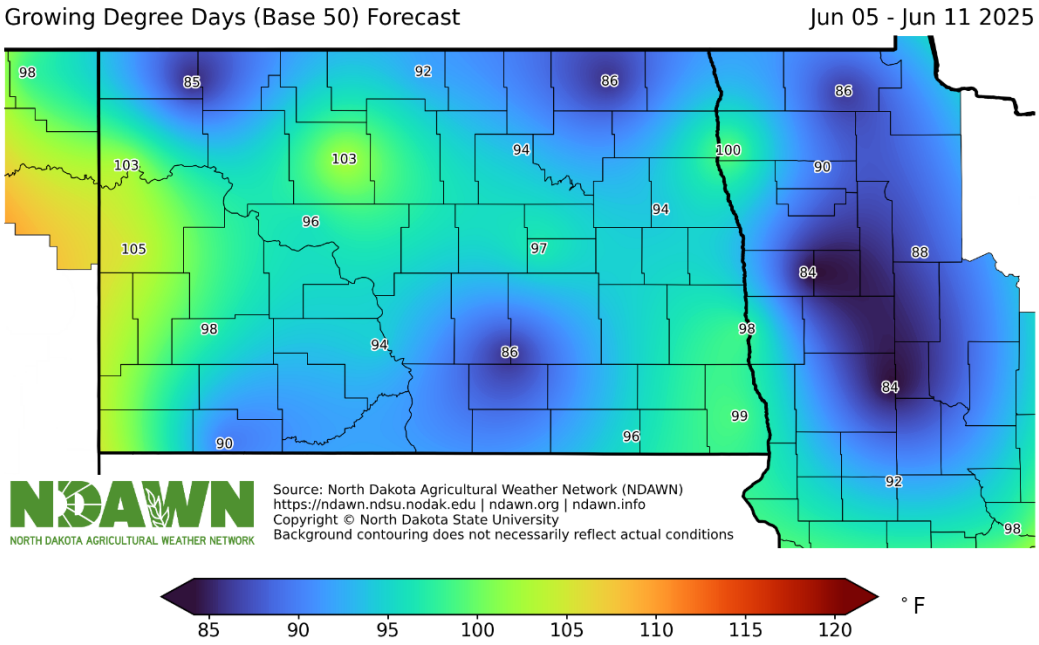

Figure 4. Estimated growing degree days base 50° for the period of June 5 to June 11, 2025.

Using May 1 as a planting date, the accumulated growing degree days for wheat (base temperature 32°) is given in Figure 5. 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

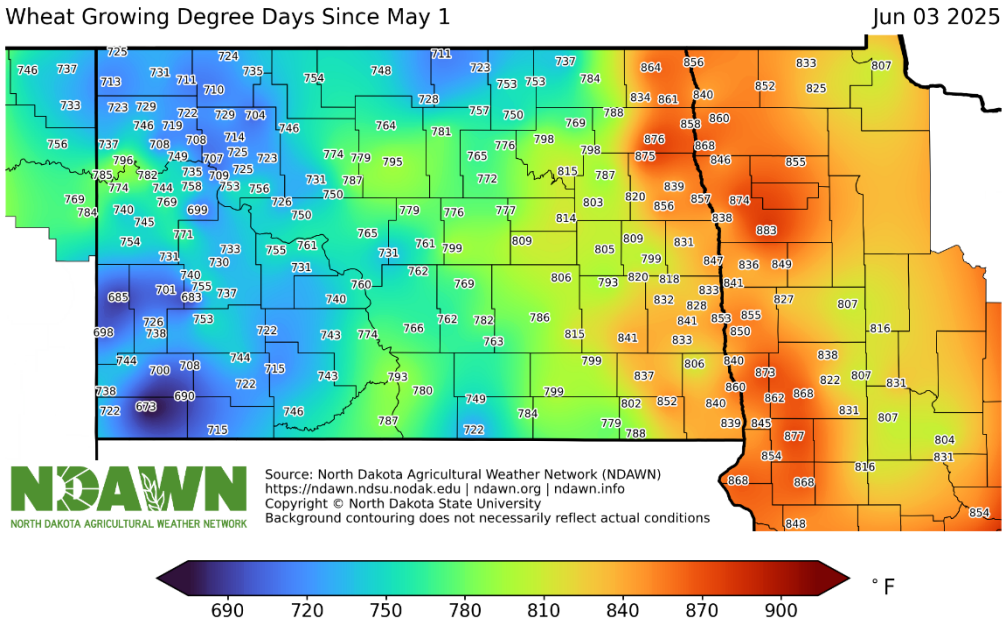

Figure 5. Wheat Growing Degree Days (Base 32°) for the period of May 1 through June 3, 2025

Using May 10 as a planting date, the accumulated growing degree days for corn (base temperature 50°) is given in Figure 6. You can calculate corn growing degree days based on your exact planting date(s) here: https://ndawn.ndsu.nodak.edu/corn-growing-degree-days.html.

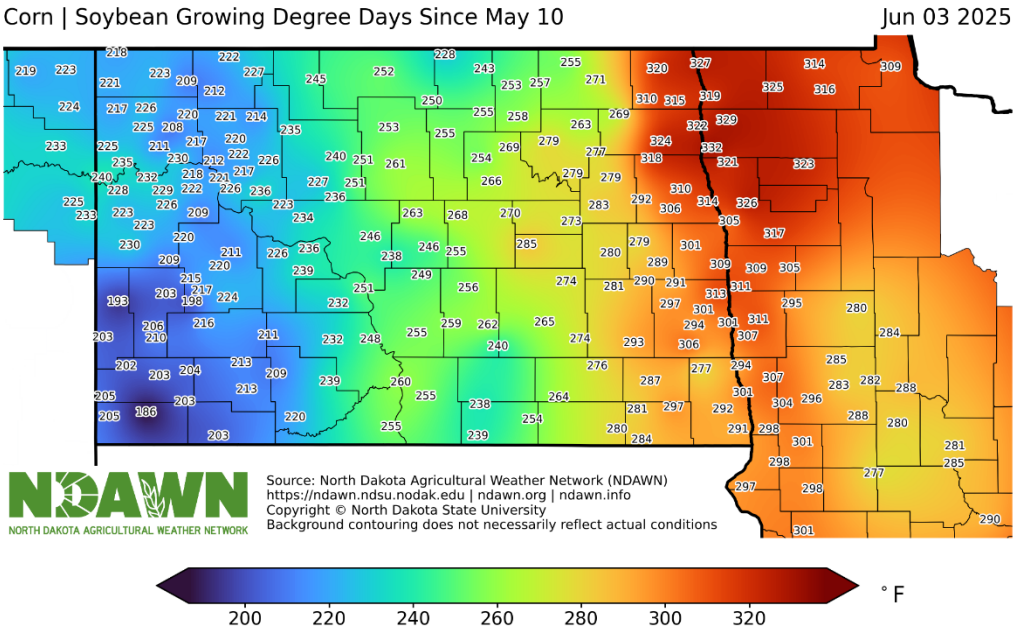

Figure 6. Corn Growing Degree Days (Base 50°) for the period of May 10 through June 3, 2025

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

Since my last report, the North Dakota Agricultural Weather Network (NDAWN) team installed two new weather stations. One near Ellendale, ND and the other near Jud, ND. In the next week the NDAWN team is scheduled to install new stations near Woodworth in NW Stutsman County and another near Heaton in SE Wells County. In addition, the station just east of Tappen, ND will be upgraded to include soil moisture data and an all-season rain gauge that can measure both rain and the liquid equivalency in snow during our cold season.

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EXTENDING KNOWLEDGE ❯❯ CHANGING LIVES

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