North Dakota State University
CROP & PEST REPORT

NDSU EXTENSION

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entomology

ALFALFA WEEVIL SCOUTING AND THRESHOLDS

The total accumulated degree days (ADD) for adult activity is 200 to 400 ADD (NDAWN insect degree day map, next page). So, adult weevils, egg hatch and early instar larvae are present in southern North Dakota, while the northern part of North Dakota is behind in adult weevil emergence and egg hatch. Cool weather has slowed weevil development.

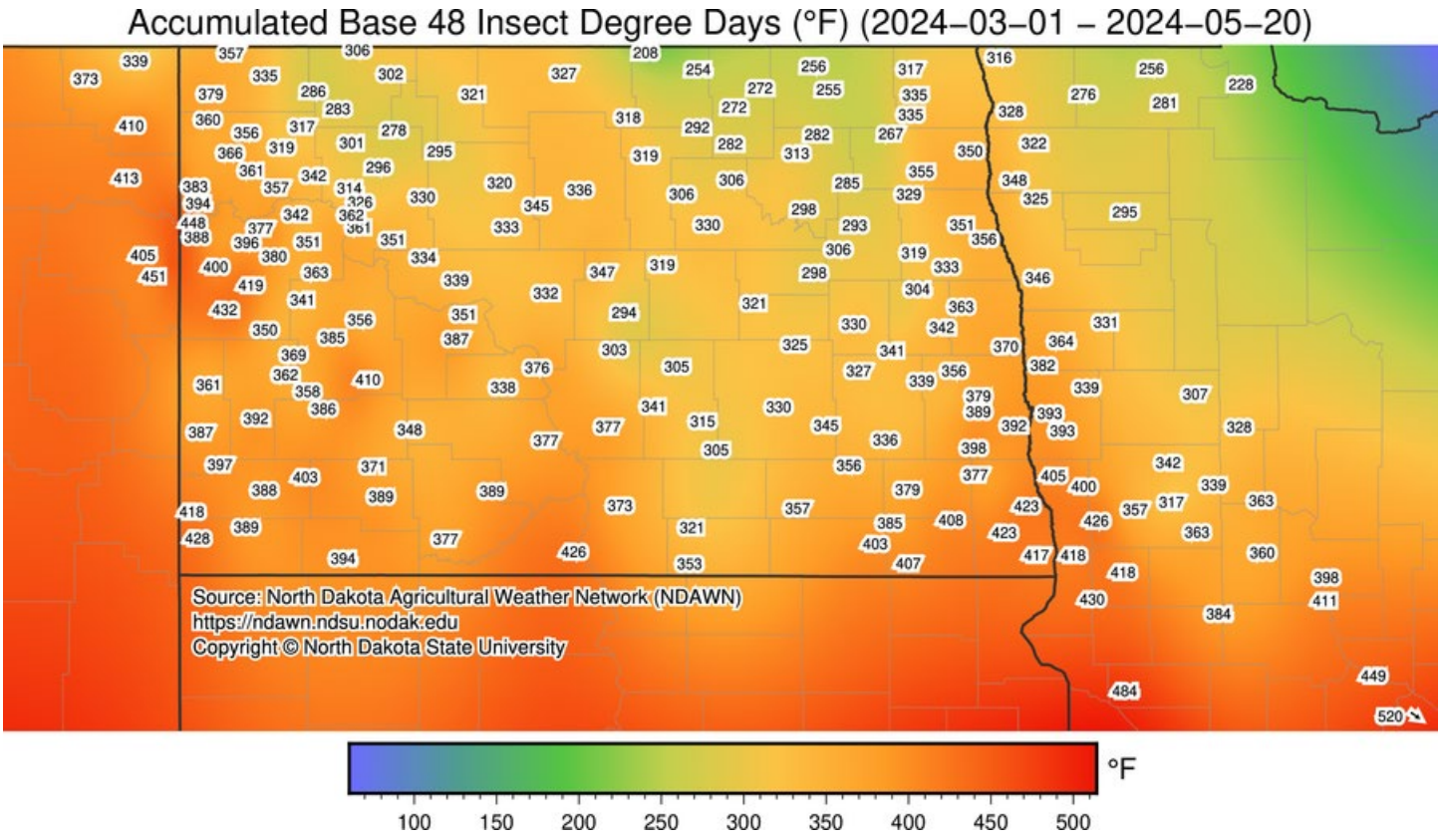
Scouting should begin when adult and 1st to 2nd instar larvae are present (300 to 438 ADD) and treat with an insecticide if you are above the economic threshold. Fields should be scouted regularly and at least weekly up through the first cutting. Scout in a "W" pattern or by selecting random sites in the field, with a minimum of five sampling sites per field.

How to Scout for alfalfa weevils: To determine if alfalfa weevil is present or absent in a field, a sweep net is a good tool to use for detection. But, for determining if your alfalfa needs to be treated with an insecticide or not, use the **stem-bucket method**. Fields should be scouted weekly up through the first cutting. Scout in a "W" pattern or by selecting random sites in the field, with a minimum of five sampling sites per field.

At each sampling site in the field, select a minimum of 30 stems and cut them off at the base. Invert the cut stems into the 5-gallon pail and vigorously beat the plants in the pail to dislodge the larvae. First-instar larvae feeding in rolled leaf tips won't dislodge easily, so be sure to examine leaf tips for larvae.

Alfalfa weevil larvae from bucket sampling method (Photo by P. Beauzay, NDSU)

Current Alfalfa Weevil Degree-Day Accumulations (base 48°F) as of May 20, 2024 (Source: NDAWN)



Count and record 1) the number of stems sampled, 2) the total number of larvae counted, and 3) the height of the alfalfa at the sampling sites. Repeat this procedure for all sampling sites within the field. When finished, total the number of larvae found and divide by the total number of stems sampled to calculate an average number of larvae per stem for the entire field. Then, calculate average plant height for the field.

Threshold numbers in Table 1 are the average number of larvae per stem sampled in the field using the 30-stem sampling method. These economic thresholds apply prior to the first cutting only. For insecticides registered for control of alfalfa weevil, please refer to the 2024 North Dakota Field Crop Insect Management Guide.

The best IPM strategy for alfalfa weevil is **cutting alfalfa early**. This is an effective cultural strategy that reduces the insecticide usage and protects the natural enemies such as parasitic wasps. Cutting occurs soon after alfalfa reaches the early bud stage. At this time, continued feeding by larvae may not be great enough to warrant the cost of insecticide application. Early cutting is recommended when alfalfa has reached 50 percent budding and alfalfa weevil larvae have reached the economic threshold.

If economic alfalfa weevil infestations are observed, early cutting (hay) is one of the best strategies for mitigating alfalfa weevil damage.

Table 1. Recommended economic thresholds for control of alfalfa weevil larvae for North Dakota prior to the first cutting. [Average number of larvae per stem using the 30-stem sampling method.]

Plant Growth Stage (Height)	Treatment Cost	Crop Value ($/ton)						Management Decision
		$50	$75	$100	$125	$150	$175	
		Number of Alfalfa Weevil Larvae per Stem						
50% bud or greater								Cut early
Early bud (>20 inches)	$7/acre	4.0	2.7	2.0	1.6	1.3	1.2	Cut early, or use a short PHI/PGI product
	$8/acre	4.6	3.1	2.3	1.8	1.5	1.3	
	$9/acre	5.2	3.5	2.6	2.1	1.7	1.5	
	$10/acre	5.8	3.8	2.9	2.3	1.9	1.6	
	$11/acre	6.3	4.2	3.2	2.5	2.1	1.8	
	$12/acre	6.9	4.6	3.5	2.8	2.3	2.0	
Late vegetative (16 to 20 inches)	$7/acre	3.8	2.4	1.8	1.4	1.1	0.9	Use a short to mid-PHI/PGI product
	$8/acre	4.4	2.8	2.1	1.6	1.3	1.1	
	$9/acre	4.9	3.2	2.4	1.8	1.5	1.2	
	$10/acre	5.5	3.6	2.6	2.1	1.7	1.4	
	$11/acre	6.1	4.0	2.9	2.3	1.9	1.6	
	$12/acre	6.7	4.4	3.2	2.5	2.1	1.7	
Midvegetative (10 to 15 inches)	$7/acre	3.6	2.2	1.5	1.1	0.9	0.7	Use a long-residual product
	$8/acre	4.1	2.6	1.8	1.4	1.1	0.8	
	$9/acre	4.7	3.0	2.1	1.6	1.2	1.0	
	$10/acre	5.3	3.4	2.4	1.8	1.4	1.2	
	$11/acre	5.9	3.7	2.7	2.1	1.6	1.3	
	$12/acre	6.4	4.1	3.0	2.3	1.8	1.5	

(Source: NDSU Extension E1676 Integrated Pest Management of Alfalfa Weevil in North Dakota)

CANOLA FLEA BEETLE SCOUTING CRITICAL

Canola planting is in full swing with about 21% planted, ahead 7% from last year and 2% was emerged (Source: USDA News Release NASS - May 13, 2024). Flea beetles continue to be observed in most major canola production areas – Minot, Langdon, Devils Lake and Dickinson.

Scouting 2-3 times a week will be important to ensure that your canola insecticide seed treatment is working and protecting the seedling to the 6-8 leaf stage. Warm, sunny weather will increase flea beetle feeding pressures and larger populations will move into canola fields. Whereas cool, wet weather will reduce flea beetle feeding pressures and slow beetle's movement into canola fields, mainly field edges.

Striped flea beetle on left and crucifer flea beetle on right (Patrick Beauzay, NDSU Extension)

If more than 20-25% defoliation is observed in canola fields, a foliar insecticide spray is warranted to prevent yield loss. Pyrethroids (IRAC 3A) are the only class of insecticide labeled for foliar control of flea beetles in canola (active ingredients - bifenthrin, deltamethrin, lambda-cyhalothrin, zeta-cypermethrin). One premix is labeled as Besiege (chlorantraniliprole + lambda-cyhalothrin). For insecticides registered for control of flea beetles for canola, please refer to the 2024 North Dakota Field Crop Insect Management Guide.

What is the best foliar insecticide to apply for control against both striped and crucifer flea beetles in canola?
Foliar insecticide treatment efficacy was examined for control of crucifer and striped flea beetles in spring canola. Plots were rated for flea beetle feeding injury using the 0-6 scale developed by Dr. Janet Knodel, with 0 = no feeding and 6 = dead plant. Within each plot, 10 randomly selected seedlings were rated. For analysis, the 10 ratings were averaged for a single rating value per plot. Feeding injury was rated at pre-spray, 7, 10 and 14 days after emergence (DAE).

2023 Foliar Insecticide trials for control of flea beetles in spring canola **(Table 1):**
In general, all pyrethroids with the exception of Delta Gold gave good protection against flea beetle injury. Brigade applied twice gave the best protection among pyrethroids, but it may not be necessary or advisable to do this in one field season due to an increased risk of flea beetle populations developing resistance to bifenthrin (IRAC 3A, pyrethroid). If a single foliar application can provide protection through the 4-6 leaf crop stage, canola can tolerate additional flea beetle feeding pressure without a significant decrease in yield. If a second foliar application is needed based on the established economic threshold of 20-25% defoliation, we recommend either using a different pyrethroid (although cross-resistance within the pyrethroid class could develop), or an entirely different mode of action.

Among the IRAC 28 diamides (Vantacor and Exirel), Exirel showed excellent performance against flea beetles. Exirel (cyantraniliprole) has good translaminar and systemic activity, while Vantacor does not. Exirel would be a good choice for a first foliar application, although recent research has shown that striped flea beetles are not controlled as well as crucifer flea beetles with cyantraniliprole. Another concern is when applying Exirel after using Lumiderm (also cyantraniliprole) as an insecticidal seed treatment, which would give greater potential for flea beetles to develop resistance to cyantraniliprole because it would be essentially making back-to-back cyantraniliprole applications in one field season (high risk for insecticide resistance development).

Table 1. Treatment means for flea beetle injury, plant stand, test weight, and grain yield at Fargo, 2023.

Treatment	Injury Pre-spray	Injury 7 DAE	Injury 10 DAE	Injury 14 DAE	Plant Stand (plants/ft²)	Test Weight (bu/acre)	Grain Yield (lbs/acre)
Fungicide Check	1.8 c	4 a	3.9 a	4.7 a	9.2 a	53.1 b	1,962 de
Helix Vibrance at 23 fl oz/cwt	1.8 c	4 a	3.8 ab	4.5 ab	10 a	53.6 a	1,911 e
Brigade 2EC at 2.6 fl oz/acre	2.6 ab	2.2 c-f	2.6 d-g	3.3 e	7.8 a	54.1 a	2,435 ab
Ridgeback at 4.5 fl oz/acre	2.3 bc	2.1 def	2.9 c-f	3.6 de	9 a	54.1 a	2,430 ab
Vantacor at 2.5 fl oz/acre	3 a	2.8 bcd	3 cde	3.9 b-e	9 a	54 a	2,179 bcd
Exirel at 7 fl oz/acre	2.2 bc	1.7 f	2.4 fg	3.4 e	10.2 a	53.9 a	2,401 ab
Delta Gold at 1.5 fl oz/acre	2.2 bc	3 b	3.3 bc	4.6 a	10.7 a	53.9 a	2,291 bc
Warrior II at 1.92 fl oz/acre	2.2 bc	2.7 bcd	3.1 cd	4.1 a-d	10.6 a	53.9 a	2,379 ab
Mustang Maxx at 4 fl oz/acre	2.6 ab	2.6 bcd	2.7 d-g	3.7 cde	8.3 a	53.8 a	2,335 ab
Brigade 2EC (2 apps) at 2.6 fl oz/acre	2.4 abc	1.8 ef	2.4 g	3.9 b-e	8.8 a	53.8 a	2,568 a
F-value	**2.32**	**8.65**	**6.74**	**3.91**	**1.49**	**2.16**	**4.68**
P-value	**0.0256**	**<0.0001**	**<0.0001**	**0.0007**	**0.1736**	**0.0372**	**0.0002**
LSD	**0.65**	**0.70**	**0.54**	**0.67**	**2.3**	**055**	**257.8**

Means within a column that share the same letter are not significantly different (P<0.05).

There were no significant differences among treatments for plant stand. For test weight at Fargo, the fungicide check had significantly lower test weight than all other treatments. The same trends observed for feeding injury were observed for yield, with a fairly strong relationship between feeding injury and yield. Treatments ranked with the highest to lowest yield were Brigade applied twice, Brigade applied once, Ridgeback, Exirel, Warrior II, Mustang Maxx, Delta Gold, Vantacor, Helix Vibrance seed treatment and Fungicide check.

Thanks for support from the Northern Canola Growers Association. Disclaimer: Mention of insecticides does not imply any discrimination against any product not tested by the authors or the university.

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Extension Entomologist

plant pathology

EARLY SEASON FUNGICIDE USE IN WHEAT

What are the targeted diseases?

Tan spot is the primary disease that is being targeted by early season fungicide treatment in North Dakota wheat fields. *Stagonospora nodorum* blotch also occurs, but with much less frequency. Favorable conditions for tan spot are cool weather and prolonged periods of leaf wetness. We have had a few days of favorable tan spot conditions in just about every area of the state, and it is possible that winter wheat that was planted into wheat stubble (pathogen survives on wheat residue – Figure 1) may have some early lesion development. The good news is that crop rotation and genetic resistance can drastically reduce tan spot risk in spring wheat. For identification tips on fungal leaf spots (and other diseases and disorders), please visit the new immersive Identifying Wheat Diseases in North Dakota.

Figure 1. The tan spot pathogen overwinters on wheat residue as small pepper grain fruiting bodies (pseudothecia) that harbor spores.

What fungicides to use and how do they move in the plant?

There are several very good to excellent fungicides that can be used to manage fungal leaf spots. The latest fungicide efficacy information is available on the Crop Protection Network Website Fungicide Efficacy for Control of Wheat Diseases. As a reminder, fungicides have limited movement and will only protect leaves that are available at the time of application. The new leaves that emerge after fungicide application are largely unprotected.

What is the yield response?

It is very difficult to place an exact yield response value on the use of an early-season fungicide. However, there are some trends that consistently hold true. A greater yield response (~4%) will be observed in high disease risk situations which include favorable weather for tan spot, wheat-on-wheat production systems, no-till, and use of a susceptible variety. Yield responses are much less (<1%) in production systems that avoid wheat on wheat, use conventional tillage, and use a wheat variety with average to above average resistance (3 to 5 tan spot score in the NDSU HRSW Variety Selection Guide).

To further expand upon these insights, funding was received from SBARE and the North Dakota Wheat Commission to evaluate fungicides and varieties on reducing fungal leaf spots. A total of nine trials were conducted from 2021 to 2023 across five locations Carrington, Fargo, Hettinger, Minot and Thompson. One of the goals of the research was to determine the value of the early-season application of propiconazole (Tilt) on three HRSW varieties (ND-VitPro, SY-Valda and Shelly). Data was grouped according to tan spot levels (severity and canopy location). Five of the research trials had no documentation of tan spot (no disease) and four of the research sites had very low levels of tan spot (low disease). Results indicated that in both “no” and “low” disease environments there were no significant differences between Tilt and the non-treated check regardless of variety (Figures 2 and 3). The take-home message from this research suggests that the application of propiconazole in a low to no disease environment will not significantly protect yield. If you are planning to make an early-season fungicide application in wheat, please take into account the price of wheat, the cost of the fungicide, and wheat disease risk in your field.

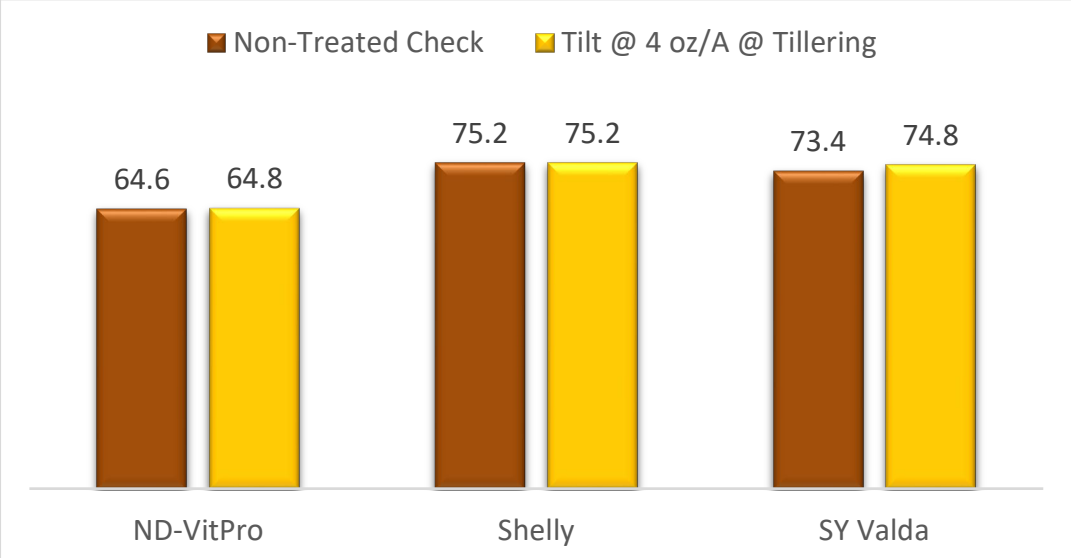

Figure 2. Yield (bu/A) comparisons between a non-treated check and Tilt across three varieties in no disease locations. Yield differences between treatments within a variety were not significant.

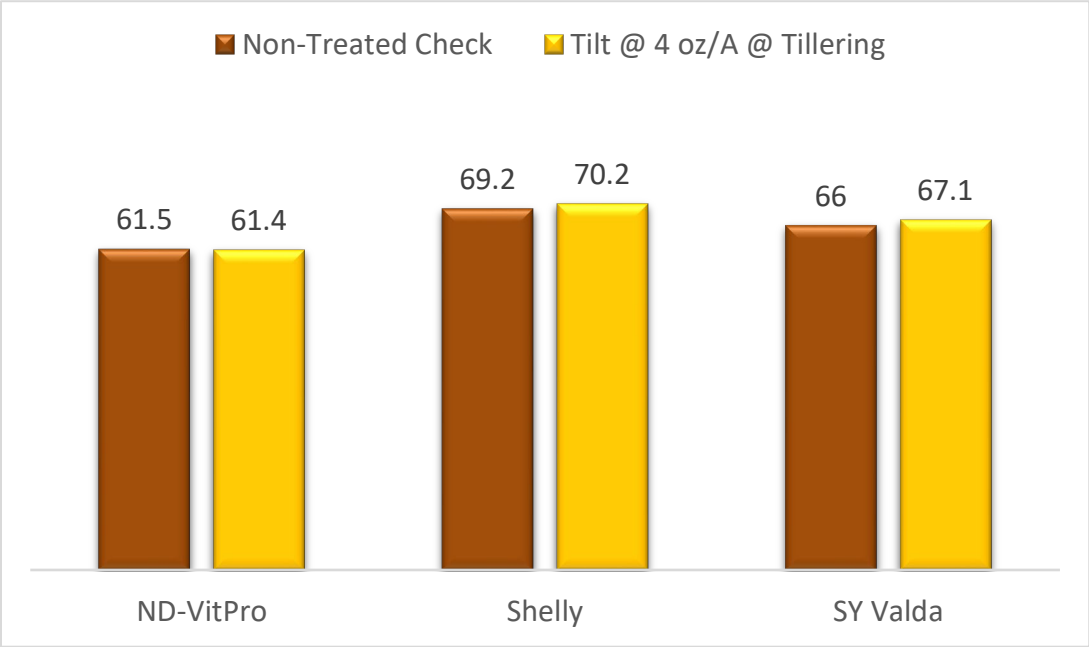

Figure 3. Yield (bu/A) comparisons between a non-treated check and Tilt across three varieties in low disease locations. Yield differences between treatments within a variety were not significant

Andrew Friskop
Extension Plant Pathology, Cereal Crops

MANAGING RHIZOCTONIA ROOT AND CROWN ROT OF SUGARBEET AT THE FOUR- TO EIGHT-LEAF STAGE

As the season turns warmer and wetter, there may be increased risk of soilborne diseases in sugarbeet, depending on the amount of inoculum in the field, varietal resistance, and proactive use of fungicides. Fields with a history of Rhizoctonia and fields with short rotations since previous sugarbeet crops are most at risk. Sugarbeet following small grains tends to be lower risk for Rhizoctonia disease development. In sugarbeet, effective seed treatments for Rhizoctonia are standard and provide protection for the germinating seed and seedlings. Subsequent fungicide applications must also be preventative in order to be successful. Post-emergent applications complement varietal resistance and contribute to a healthy crop.

Post-emergence fungicides to control Rhizoctonia should be applied when sugarbeets are in the four- to eight-leaf stage. Within that window, earlier is better in high-risk fields based on cropping history (applications at four- to six-leaf stage instead of six- to eight-leaf stage). Research from NDSU and the University of Minnesota-Crookston has indicated multiple effective modes of action. Examples include QoI (azoxystrobin), SDHI [inpyrfluxam (Excalia)], and DMI (prothioconazole) options. For details please see the sugarbeet section in P622-24 “North Dakota Field Crop Plant Disease Management Guide”. Caution is required when applying complex mixtures, or combinations of fungicide, insecticide, and/or herbicide, to sugarbeet. Pesticide label requirements and tank-mix compatibility should always be confirmed.

Even though the biology of the fungus *Rhizoctonia solani* reduces the risk of fungicide resistance development, fungicide mode of action rotation is always a best practice to maximize the efficacy of crop protection tools over the long term. For example, an SDHI seed treatment could be followed by a QoI post-emergent fungicide. Like other soilborne diseases, steps to clean equipment between fields are important in reducing the spread of Rhizoctonia between fields, especially during wet and muddy times of the year.

Eric Branch
Extension Plant Pathologist and Sugarbeet Specialist

plant science

SMALL GRAINS BENEFITING FROM THE COOL AND WET WEATHER

The extended period of cool, wet weather we are experiencing, while understandably frustrating for those with acres left to plant, is generally very good for the small grain crops already seeded. Spring wheat benefits from cool temperatures and adequate moisture early in the season as it allows for optimal development of heads. The wheat head, or spike, is initiated early in the plant's development. The embryonic heads begin to form during tillering. The number of florets initiated at this stage will determine the potential number of kernels per head. When the wheat leaves begin to stand strongly erect but prior to jointing (the first node becoming visible and elevated above the ground), the terminal spikelet of the developing head is formed. If the wheat is stressed by excessive heat or drought at this stage, the terminal spikelet will develop sooner and thus limit grain yield potential. Wheat that was planted in April is in the 3-5 leaf stage with the earliest fields already tillering. Later planted fields range from not yet emerged through spiking and with 1 to 2 leaves. Given the week's forecast of cool to moderate temperatures, the spring wheat crop is being set up for a good start to the season in terms of yield potential.

Clair Keene
Extension Agronomist Small Grains and Corn

soils

WET SOIL, SULFUR AND OR NITROGEN DEFICIENCY

Some parts of North Dakota have received excessive rainfall during the past 2 weeks and more rainfall is expected in the state the weekend of May 25-26. I have received reports from eastern regions of pale wheat, asking if this is sulfur (S) deficiency. The pale wheat tended to be more on the 'bumps' within the field rather than the low areas. Sulfur deficiency is more likely to appear first on upper landscapes. In the east, these bumps tend to have sandier soil, with a greater chance of any sulfate leaching below the root zone. With rain expected within the next few days, I would hold

off on any rescue applications until the fields dried, then look again. In 4-5 leaf wheat, S deficiency would show on new growth, not old growth (see image).

Sulfur deficiency, spring wheat.
Note yellower leaves in new growth.

To truly diagnose an S deficiency, take leaf/plant samples from the suspected areas plus a separate leaf/plant sample from a 'good' area. Take them to a laboratory that regularly analyzes plant samples. The largest laboratory that analyzes plant samples in the region is Agvise Laboratories, Northwood, ND. The results of the tests will indicate whether the wheat yellowing is nutritional or not.

From Christine, ND to Hillsboro, ND, the high clay soils in the region have received saturating amounts of rainfall. In these high clay soils, where the movement of water downward is about 1/3 inch per day, these soils will remain saturated for some time, even if properly and effectively surface drained. With continued rainfall expected, these soils may be saturated for at least a couple weeks. Under these conditions, a great amount of denitrification would be expected. In one year where I conducted N rate trials under similar conditions, I estimated denitrification losses of over 100 pounds N per acre during the month of May. These soils are the ones specified in corn N recommendations that would greatly benefit from side-dress N application, so hopefully most growers have planned for this. Side-dress with a UAN coulter-style applicator would be most effective. Surface urea application is possible, but in corn application of over 60 pounds N per acre as urea would possibly burn leaves, particularly in larger corn where the whorl would capture a large percentage of the applications. Also, some rainfall would be needed after the urea application to drive the N into the soil, whereas the coulter-UAN would not need additional rainfall.

If growers had access to a GreenSeeker™ handheld sensor, or a Holland Scientific Crop Circle™ handheld sensor, algorithms for use of these devices are published for spring wheat and corn in my Extension Publications. Their best use is to compare areas of fields to a N-sufficient strip, made by applying additional N (maybe 100 pounds N per acre, or the other half of a full application rate) to a known area.

The following publications will provide directions on their use:
Spring wheat topdress https://www.ndsu.edu/fileadmin/snrs/Files/sf1176-6.pdf
Corn side-dress https://www.ndsu.edu/fileadmin/snrs/Files/sf1176-5_0.pdf
If not using the sensor, you will have to guess the rate; which is why my students and I devoted 6 years of research into developing these algorithms, so you didn't have to guess.
An additional benefit of an N-sufficient strip is that if S deficiency is present, or nearly present, the additional N in the strip will push the plants into a more S deficient state and the strip will be more yellow. If this happens, apply S, wait a week, then run the sensor again and use the appropriate algorithm for rate of N

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weeds

EARLY SEASON WEED ID: THE GOOD, THE BAD, AND THE UGLY

Death and taxes are as certain as pictures of fairy candelabra submitted each May for identification. One sure thing each spring is an abundance of weed ID requests, including oddballs like fairy candelabra and waterpod. It is a good time to highlight some of the most common samples sent in this time of year from across the state. I decided to break these down into 3 categories: The Good (or rather, the weeds you shouldn't worry about), The Bad (weeds that should be dealt with, but are manageable in most systems), and The Ugly (difficult to control weeds that become more problematic if not dealt with).

The Good

While we don't often refer to weeds as good, I wanted to fit this group of weeds into my theme. Many folks would classify the following weeds as native/naturalized wildflowers, and I can't say they're wrong. These weeds often flower and complete their life cycle before we finish planting our crops. They are all currently flowering, or about to flower, and should finish their life cycle by this time next month. They are often found in abundance, as they seem to be filling a niche of utilizing soil resources in between annual crop life cycles. Most field prep activities will control the following plants:

Fairy candelabra (*Androsace occidentalis)*

Fairy candelabra is a small winter or spring annual plant in the primrose family. It is often found at high densities in fields in April and May. However, this plant will stay relatively small and will die off as the temperatures warm up. Typical seedbed preparation in both conventional and no-till will control this plant. Even if no control measures are taken, fairy candelabra will not be competitive with crops since these plants are currently nearing the end of their life cycle.

Mature fairy candelabra pulled from a flower bed.

Yellow whitlow-grass (*Draba nemorosa*)

This weed is sometimes called yellow whitlow-wort. It is a native winter or spring annual plant in the mustard family. Yellow whitlow-grass germinates in the fall or early spring like many winter annuals and rarely grows more than 4 to 5 inches tall. It will produce clusters of small, yellow, 4-petal flowers that form into small seed pods at maturity in the late spring/early summer. There is a similar species, simply known as whitlow-grass (*Draba verna*), which has white flowers instead of yellow flowers. Both whitlow-grasses are most often confused with fairy candelabra because of the similar small appearance and unique life cycle. In some cases, whitlow-grasses are confused with horseweed, but horseweed will not flower until July or August, and whitlow-grass will be dead and gone by then.

Flowering yellow whitlow-grass (picture credit: Ian Horner)

Flowering whitlow-grass (Picture credit: Erin Hill, Michigan State University)

Waterpod (*Ellisia nyctelea)*

Waterpod is another weed that is showing up across the landscape this year. Though the leaf structure may remind some of common ragweed or biennial wormwood, waterpod plants are much larger and more advanced than either of those two weeds at this stage in the growing season. Waterpod will be flowering and producing seed soon and will complete its life cycle as we near the summer solstice. Like the other weeds in the Good category, typical seedbed preparation will control waterpod.

Waterpod in a bare spot in a no-till field in early May

The Bad

A couple of winter annual weeds in the mustard family are ubiquitous across the state. Their life cycle is a few weeks longer than the previous 4 weeds, so they will often cause early season competition with crops if not controlled prior to crop emergence. Though these plants are very common, their rosettes and white flowers can often be confused with other winter annual weeds. With the rainfall patterns of last fall, there are several dozen winter annual weeds that we can find in fields across the state that are currently bolting from their rosettes and about to flower or are already flowering.

Shepherd's purse (*Capsella bursa-pastoris*)
Shepherd's purse is a small winter annual flowering plant in the mustard family (Brassicaceae). Originating in Europe, it was introduced into North America favoring colder climates and cultivated ground. Shepherd's purse is known for its heart/triangular shaped flat seed pods resembling a purse, that are found on a bolted stem that is attached to a rosette of lobed leaves. It can grow from 0.5 to 1.5 feet tall with small white flowers.

Rosette and bolting leaves of shepherd's purse.

Field pennycress (*Thlaspi arvense*)

Field pennycress is a member of the mustard family (Brassicaceae). It can be found in agricultural lands and roadsides in a wide range of soil types and environmental conditions. Field pennycress is a winter annual broadleaf plant that begins as a basal rosette with slender taproot systems. Stems from the basal rosette are hairless and usually simple but can be freely branched towards the top. When growing in unfavorable conditions, the stem remains unbranched and may reach only a few inches in height, but in fertile soils with little competition, the main stem may grow up to 3 feet tall.

Field pennycress in a field in early May

The Ugly

These are the weeds that will be highly competitive with crops and will persist through most, if not all, of the crop's life cycle. These weeds don't need much introduction, but there can be some confusion with their ID this time of year. Failure to properly ID and control these weeds now can lead to an ugly cropping year.

Kochia (*Bassia scoparia*)

Our 2024 Weed of the Year is living up to its reputation as a tough early-season weed. Kochia often germinates in very dense mats consisting of numerous individual plants. These mats often appear to be dull green due to kochia's leaf color. Young kochia seedlings are very densely hairy and will often be described as "puffballs" due to the dense hairs. Kochia cotyledons are linear. Leaves are linear to lanceolate and taper to a point.

A mat of seedling kochia. Note the linear cotyledons and densely hairy leaves that are linear and taper to a point.

Horseweed (*Erigeron canadensis*)

Our 2020 Weed of the Year is an annual troublemaker. Most of our horseweed will germinate in the fall, then overwinter as a rosette, and begin to bolt in the spring. These rosettes are now bolting, but are rarely misidentified. However, the rainfall patterns this spring have enabled several flushes of spring-emerging horseweed, that can be confused with kochia. Unlike kochia, horseweed seedlings will rarely be found growing in dense mats. Horseweed cotyledons are oval shaped and easily distinguished from kochia cotyledons. Young leaves are oval shaped and become more linear as the plant matures. Most horseweed leaf margins are toothed or lobed.

Seedling horseweed plants. Note oval cotyledons and oval to linear shaped leaves.

Narrowleaf hawksbeard (*Crepis tectorum*)

Our 2018 Weed of the Year also makes the Ugly list. This weed can be very problematic in the western part of the state in no-till fields. Though it has been dry in some areas, we received enough precipitation last fall to stimulate emergence of this winter annual weed. Narrowleaf hawksbeard is in the Asteraceae (composite) family. It grows 2 to 3 feet tall from a taproot, with milky sap found throughout the plant. Yellow flower heads are 1/2 to 3/4 inches in diameter resembling a dandelion or sowthistle flower. Fall rosette stage Narrowleaf hawksbeard can look somewhat similar to dandelion, however, hawksbeard leaf lobes protrude straight out rather than toward the center of the plant like dandelion

Rosette of narrowleaf hawksbeard. (Picture Credit: Brian Jenks)

Joe Ikley
Extension Weed Specialist

HERBICIDE CARRYOVER

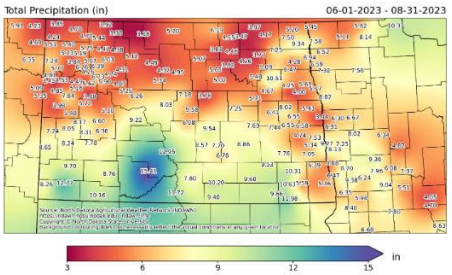
Crop rotation is the practice of growing different crops in the same field in a specific order. Rotating crops can have important production benefits such as increasing yields, improving nutrients and organic matter in the soil, and it can help disrupt the lifecycle of crop pests, reducing pesticide use. More recently, weed scientists have encouraged crop rotations as a way of introducing unique herbicide sites of action against target weeds, slowing the development of weed resistance.

Soil residual is an important characteristic of herbicides. Soil residual is especially important for control of *amaranthus* species which germinate and emerge for a prolonged duration in soils. However, some herbicides may persist from one growing season to the next and affect crops in the rotation. While pesticide labels provide guidance for crop rotation restrictions, environmental conditions, especially precipitation, will ultimately dictate the persistence of herbicides.

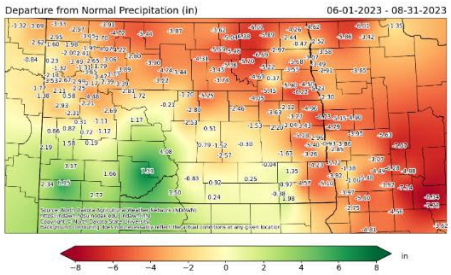
Degradation of residual herbicides occur over time. Some residual herbicides, such as the chloroacetamides (group 15), degrade rapidly or in approximately three weeks. Other herbicides, such as Authority® products (group 14) or Firstrate® products (group 2), require many months or multiple seasons to degrade and may affect crops in the sequence. Degradation by microbes in the soil is the primary way herbicides are broken down. Speed of degradation is influenced by environmental and soil adaptation factors. Soil moisture and temperature are by far the most important factors contributing to microbial activity.

Herbicide degradation by microbial activity is greatest under moist but not saturated soil conditions. Herbicide breakdown by soil microbes is reduced under dry or drought conditions and carryover into the next growing season may occur. Herbicide adsorption (binding) to soil particles may also be increased with dry conditions since the herbicide moves from the soil solution as moisture is lost and is attached to soil colloids.

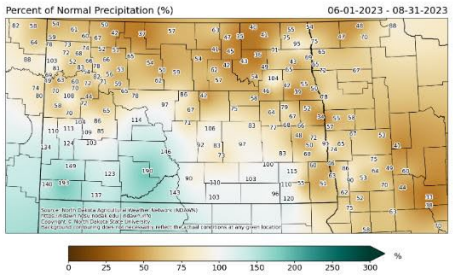
Refer to the herbicide label to determine crop rotational restrictions. However, you also need to check environmental conditions, most importantly rainfall (Figure 1) to determine if environmental conditions were appropriate for herbicide degradation. A general rule of thumb is 6-inches of rainfall or irrigation in June, July and August for soil microbes for pesticide degradation. Herbicides may persist longer than label guidelines when soils are drier or air temperatures are cooler than normal.



Total Precipitation



Departure from Normal Precipitation



Percent of Normal Precipitation

Rainfall was below normal in June, July, and August in eastern and central North Dakota, 2023 potentially decreasing microbial activity and increasing the persistence of residual herbicides (NDAWN.info.climate.statistics).

Tom Peters
Extension Sugarbeet Agronomist

NDSU & U of MN

around the state

AROUND THE STATE

NORTHEAST ND

Plantings are progressing at a great pace in the region with good moisture and optimum planting conditions. Early planted wheat and barley are at tillering stage while late planted fields are at 1-2 leaf stage. Field peas are nearing tendril stage. Early planted corn is up while the rest of the acres are being planted. Many farmers got a good start with their soybean, dry bean and canola acres last week. Overall, farmers have completed planting 30-75% of their acres. Canola flea beetles are increasing in numbers and chewing up volunteer canola. Lots of weeds are seen emerging in fields: Canada thistle, kochia, common ragweed, marshelder, biennial wormwood, red root pigweed, common mallow, foxtails foxtail barley, pennycrest, wild buckwheat, waterpod, common lambsquarter, and dandelions.

Spring wheat field in Ramsey County
Photo: Lindsay Overmyer, Extension ANR Agent, Ramsey

Field peas at tendril stage in Ramsey County
Photo: Lindsay Overmyer, Extension ANR Agent, Ramsey County

Striped flea beetle feeding on volunteer canola. *Photo: Venkat Chapara, Plant Pathologist, LREC*

Anitha Chirumamilla
Extension Cropping Systems Specialist
Langdon Research Extension Center

NORTHWEST ND

Last week's weather in the northwest has been a combination of windy, sunny, partly cloudy, rainy. The few scattered and light rain events slowed down planting a little bit. In Williston and surrounding areas, daytime high temperatures were warm, in the mid 70s°F last Thursday and Friday. Afterwards, it got down to mid and low 60s°F. Nighttime low temperatures got into the 40s°F. Average soil temperatures (4" depth) this past week were in the late 50s°F to mid 60s°F. Wind speeds last Saturday averaged 16 mph and gusts reached up to 36 mph, winds which slowed down burndown or preemergence applications of herbicides but not planting. Rain events were sporadic and scattered but the total was 0.43 inches in the last 7 days with most of the rain coming down last Friday and last Sunday (all according to NDAWN records). Crop conditions for the most part are good to excellent. Small grains and pulses are in the last legs of planting. Corn and canola planting are in the works.

Gramoxone, a restricted use pesticide, is very effective in controlling small weeds by acting as a contact herbicide. It is labeled and can be used as a burndown in front of all crops. However, its efficacy on weeds is reduced when spray volume is less than 10 gallons per acre (the minimum), especially on weeds that come out in thick mats like kochia. To get better coverage, increase the spray volume to 15-20 gallons per acre on thick weed mats and follow the recommended label rates. It is also important to know how much active ingredient (paraquat) is in the gramoxone formulation. The Gramoxone® SL 2.0 label contains 2.0 pounds active ingredient (ai) per gallon while the Gramoxone® SL 3.0 label has 3.0 pounds ai per gallon. Recommended rates will differ a little when using either label formulations. Also, each formulation label has similar but specific recommendations for nozzle selection. In gramoxone 2.0, flat-fan nozzles are recommended when spraying less than 20 gallons per acre. In gramoxone 3.0, medium to coarse droplets are recommended, however, if it's necessary to use nozzles that produce larger than coarse droplets, spray volume should be a minimum of 20 gallons per acre. The gramoxone labels also require addition of non-ionic surfactant (NIS) or oils (COC or MSO) when spraying the recommended rates, otherwise failure to do so will result in reduced performance of gramoxone. NIS is preferred.

Pea and lentil are out at the Williston REC dryland research farm. Lentil was planted 1st week of May and pea was planted 3rd week of April. Emergence occurred after the rain events in the weeks after planting. Pictures taken 5/21/2024.

Charlemagne "Charlie" Lim
Extension Cropping Systems Specialist
NDSU Williston Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

Most of this region received 0.25 to greater than 1 inch of rain in the past week, but field work was still completed in most areas of this region, but slower than the week before. Most counties in this region are reporting at least 50 percent of all acres having been planted in each county to some crop. Hard red spring wheat and barley are almost completely planted in this region. Canola, corn, and sunflowers in some areas have the next greatest percentage of crops planted.

Hard red spring wheat is mostly good to excellent condition in this part of the state, but there are some drown-out spots, unevenness in stands, and pockets of yellow wheat in some fields. The most advanced hard red spring wheat is in the three-leaf to first tiller stage of growth, with most wheat looking healthy other than the yellow plants in the field which could be deficient in sulfur and/or nitrogen. It is too early to know the emergence condition of corn and soybeans yet as a low percentage of these crops have emerged in the northern part of the region.

At least in Griggs County, kochia in early planted hard red spring wheat are already one-inch tall, meaning hard red spring wheat herbicide applications need to be made soon. Hard red spring wheat and spring barley herbicides should be applied when kochia is mostly two inches or less and NOT greater than three inches in height. Most summer annual weed species, such as waterhemp, hairy nightshade, and other later-season species have begun emerging as far north as Griggs County. These species are only beginning to emerge, so many more plants will be emerging over the next several weeks.

Most advanced stage of hard red spring wheat in Griggs County is at the first tiller stage.

Waterhemp seedlings beginning to emerge as far north as Griggs County.

Jeff Stachler
Griggs County Extension Agent

SOUTHWEST ND

Rainfall events over the past week were brief and scattered. We received between 0.1 inches in Bowman and Dunn counties and 0.3 inches in Adams and Oliver counties. Some areas in the Southwest region, including Golden Valley, Slope, and Bowman counties, are now experiencing moderate drought conditions.

With most small grains now planted, the timely application of post-emergence herbicide is crucial. Even if your pre-emergent herbicide application was initially successful in reducing weed populations, completing the herbicide program with a timely post-emergence application is essential.

In our region, some canola crops have already emerged, leading to significant flea beetle activity. Other pests of concern that farmers should be on the lookout for include grasshoppers, alfalfa weevils, and diamondback moths. Regular field scouting and monitoring of insect pest populations are important to determine if intervention is necessary.

Predaceous ground beetle that preys on flea beetles and other insects including many crop pests

Canola emerging in Stark County

Victor Gomes
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center

weather

WEATHER FORECAST

The May 23 to May 29, 2024 Weather Summary and Outlook

Several North Dakota Agricultural Weather Network (NDAWN) stations recorded either a frost (36°) or a freeze (32°) yesterday (See Figure 1). There looks to be some other days during this forecast period that low temperatures in the 30s will be possible. Although there will be some rain threats, it will be the mornings after the rain that would bring a clear sky that would allow for these chilly temperatures. We will probably have to wait until after Memorial Day before warmer air moves back into the region.

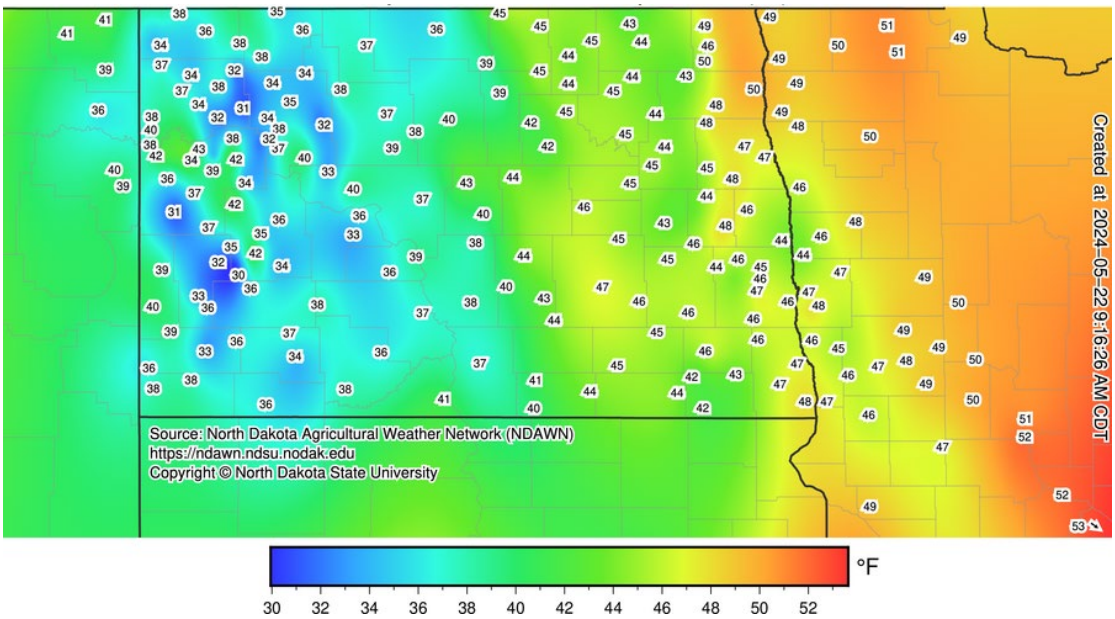


Figure 1. Minimum Temperatures at NDAWN stations on May 22, 2024

There was a widespread rain event on Friday, May 17, 2024. Although most areas recorded some precipitation, it was generally around or under 0.25 inches. The rain amounts were mostly light as the precipitation was falling in very dry air. In turn, most of the rain was evaporating before it reached the ground. Evaporation being a cooling process enhanced the wind with several NDAWN stations recording wind in excess of 50 mph that day. A heavier rain event associated with a storm that brought widespread severe weather to southern Minnesota and Iowa brought higher totals to far SE North Dakota and much of Minnesota on Monday. Total rain from May 16 through May 21, 2024 can be found in Figure 2.

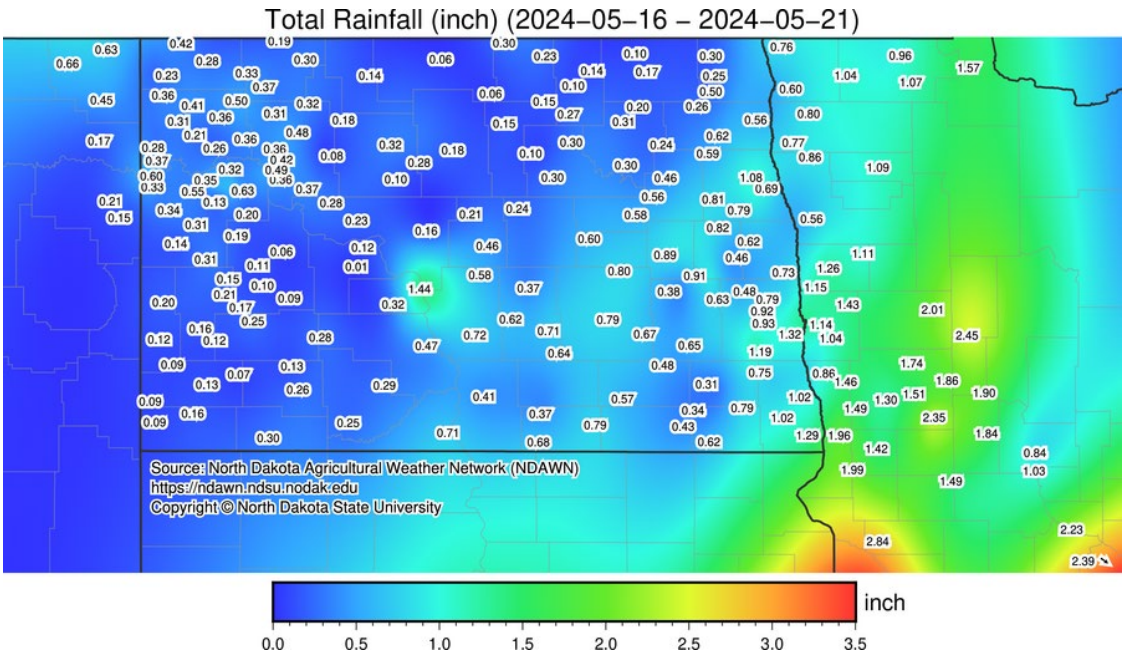


Figure 2. Total Rain from May 16 through May 21, 2024 at NDAWN Stations.

Tempeatures this past week were 2° to 4° above average in eastern North Dakota, but 1° to 3° below average in western North Dakota. Temperatures will be mostly below average this forecast period. Figures 3 and 4 below are forecasted growing degree Days (GDDs) base 32° (wheat and small grains) and 50° (corn and soybeans) for this forecast period. For daily, 2 day, or 7 day updates on GDDs for differing crops you can go to: https://ndawn.info/agriculture_gdd.html

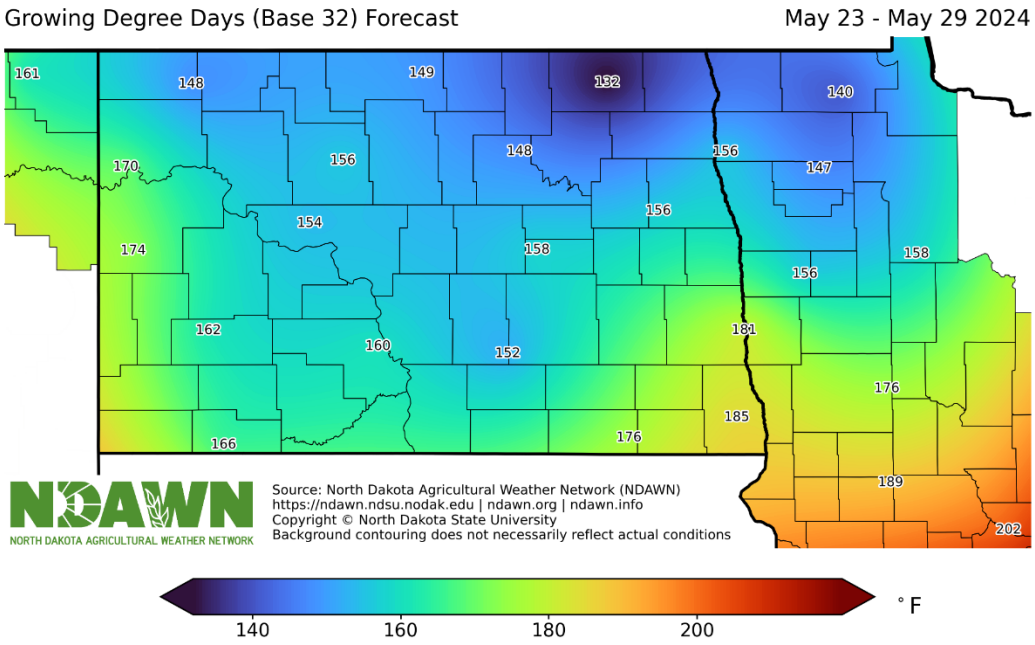


Figure 3. Estimated growing degree days base 32° for the period of May 23 to May 29, 2024.

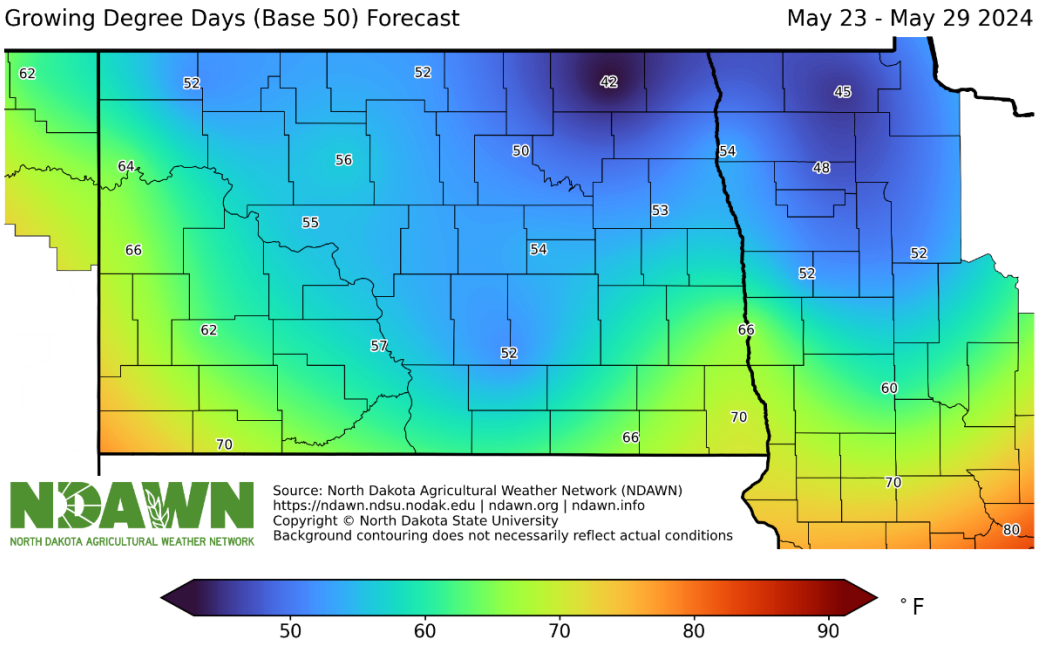


Figure 4. Estimated growing degree days base 50° for the period of May 23 to May 29, 2024.

Accumulated Sugarbeet Root Maggot degree days are now in the 300 to 400 degree day range (Figure 5). Almost all areas will get over 400 during the upcoming week with 600+ degree days likely not occurring until early June. The Sugarbeet Root Maggot tool can be found on both our older website (ndawn.org) and our mobile compliant website (https://ndawn.info/agriculture_gdd.html). On the mobile site just click on the Sugarbeet tab to find the information.

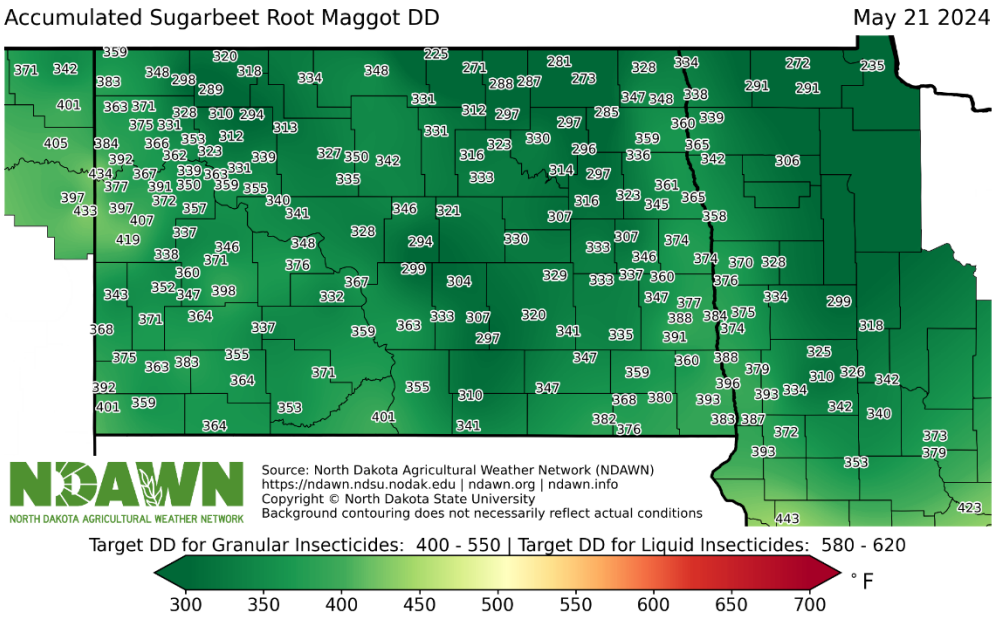


Figure 5. 2024 Accumulated Sugarbeet Root Maggot Degree Days at NDAWN stations through May 21, 2024.

Daryl Ritchison
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Interim State Climatologist

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