North Dakota State University
CROP & PEST REPORT

NDSU EXTENSION

No. 12 July 15, 2021

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NDSU FIELD DAYS FOR 2021

The following is a list of 2021 annual Field Days events. Please visit the Research Extension Center and Agronomy Seed Farm websites for more details. Hope to see you there in person!

July 13 -**Hettinger Research Extension Center**
(5-7 p.m. MDT followed by supper)

July 14 - **Dickinson Research Extension Center**
(9 a.m. start MDT)

July 14 & 15 - **Williston Research Extension Center**
July 14: dryland tour - Williston Research Extension Center *(4-7 p.m.)*
July 15: irrigated tour - Nesson Research & Development farm, located 23 miles E of Williston on #1804 *(8:30 a.m.-12 noon)*

July 19 - **Agronomy Seed Farm** Casselton
(5 p.m. start)

July 20 - **Carrington Research Extension Center**
(9 a.m.-3 p.m.)

July 21 - **North Central Research Extension Center**
(tentatively 9 a.m.-12 noon)

July 22 - **Langdon Research Extension Center**
(8 a.m.-1 p.m.)

July 27 - **Central Grasslands Research Extension Center**
(10 a.m. - 3 p.m.)

Entomology

EUROPEAN CORN BORER INCREASING

European corn borer (ECB) Z-race moths (univoltine) were detected at 10 of the 13 of trap sites and ECB E-race (bivoltine) at 5 of the 13 trap sites last week (Table 1). ECB-Z is our dominant corn borer in ND and increasing trap counts were observed in Ransom County near Shenford and Nelson County near Lakota. First detections of ECB Z-race were observed at 6 trap sites: Cass County near Kindred, Griggs County near Cooperstown, Steele county near Finley, Traill County near Alton, Grand Forks County near Gilby/Mcanna, and Richland County near Antelope. We also detected the first E-race ECB moth at 4 trap sites: Cass County near Casselton, Traill County near Alton, and Ransom County near Shenford and Sheldon. Corn crop stages were V6 to V10.

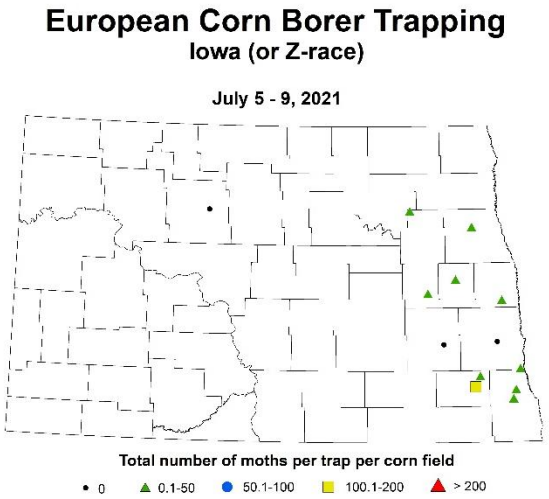
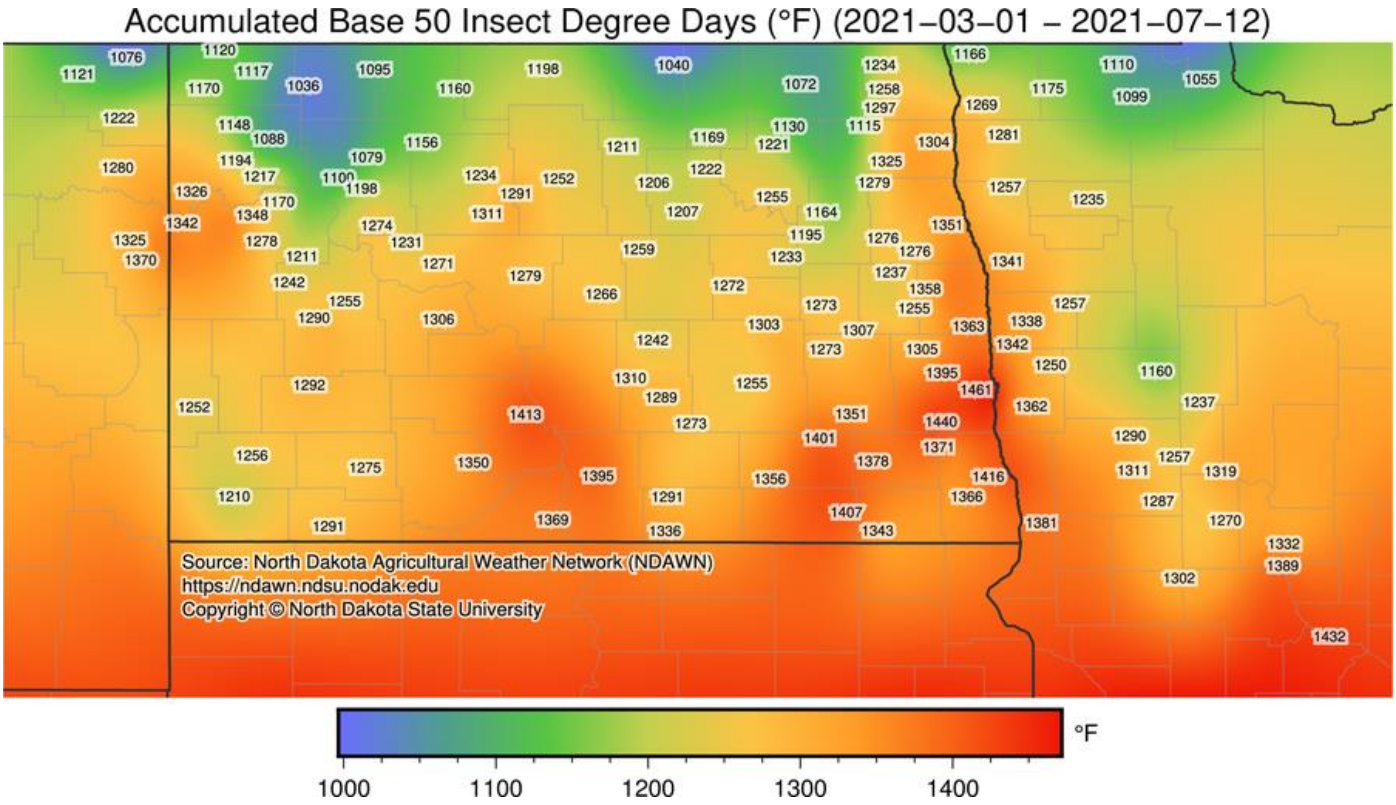


Table 1. European Corn Borer Pheromone Trapping in ND 2021

Area	County	Nearest town	Race	June 18-24	June 25-July 1	July 2-8
EC	Barnes	Cuba	Z	0	0	0
EC	Barnes	Cuba	E	0	0	0
EC	Cass	Casselton	Z	0	0	0
EC	Cass	Casselton	E	0	0	1
EC	Cass	Kindred	Z	0	0	6
EC	Cass	Kindred	E	0	0	0
EC	Griggs	Cooperstown	Z	0	1	1
EC	Griggs	Cooperstown	E	0	0	0
EC	Steele	Finley	Z	0	0	25
EC	Steele	Finley	E	0	0	0
EC	Traill	Alton	Z	0	0	49
EC	Traill	Alton	E	0	0	1
NC	Ward	Minot	Z	1	1	0
NC	Ward	Minot	E	0	1	1
NE	Grand Forks	Gilby/Mcanna	Z	0	1	9
NE	Grand Forks	Gilby/Mcanna	E	0	0	0
NE	Nelson	Lakota	Z	0	8	31
NE	Nelson	Lakota	E	0	0	0
SE	Ransom	Shenford	Z	28	106	121
SE	Ransom	Shenford	E	0	0	8
SE	Ransom	Sheldon	Z	3	30	10
SE	Ransom	Sheldon	E	0	0	1
SE	Richland	Colfax	Z	0	1	5
SE	Richland	Colfax	E	0	0	0
SE	Richland	Antelope	Z	0	0	2
SE	Richland	Antelope	E	0	0	0
			Total # of Z =	**32**	**148**	**259**
			Total # of E =	**0**	**1**	**12**

The accumulated degree days (ADD; base 50°F) in ND for univoltine ECB-Z development range from 1095 in northern areas and 50% of moths emerged to >1400 ADD in southern areas and 100% of moths emerged (see map below). **This indicates that the univoltine ECB moths are 50-100% emerged and 3rd instar larvae will be tunneling into the corn stalk. After the larvae are inside stalks, foliar insecticides are no longer effective for control of ECB.** See last week's *Crop & Pest Report* #11, July 8th for E.T for ECB.

Univoltine ECB-Z Degree Day Model (Lower base – 50°F)	
Accumulated Degree Days	**ECB Life Stage**
911	10%of moths emerged
986	25% of moths emerged
1078	50% of moths emerged
1100	Egg hatch, begin scouting
1177	75% of moths emerged
1274	90% of moths emerged
1300	3rd instar larvae, make final treatment decision



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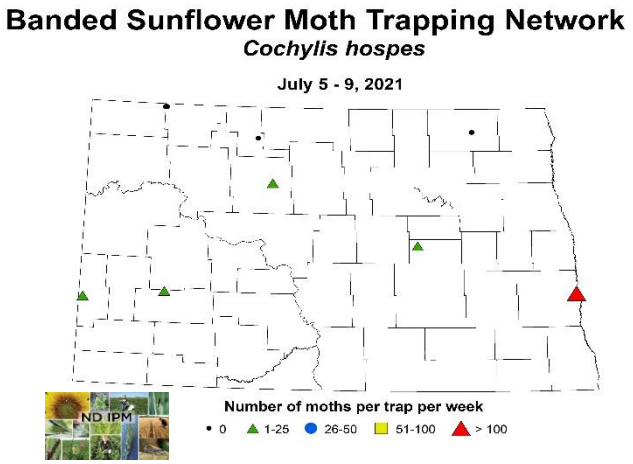
IPM CROP SURVEY - INSECT UPDATE

Soybean aphid numbers continue to be low and were observed in only 2% of the soybean fields scouted last week in Cass county of ND and Clay county of MN. The percent of plants infested was 3-15% with an average of only 1-10 aphids per plant. Growth stages of soybeans ranged from V6 to R3 (early pod). Continue to scout soybean fields at least weekly through R6 (full seed).

Spider mites are still hard to find and were observed in only 1 field out of 61 soybean fields scouted in Williams county. The forecast for no rain and hot temperatures in 90s °F could cause increases in mite populations for next week. Continue to scout.

IPM maps of insect pests and diseases are posted on the IPM website: https://www.ag.ndsu.edu/ndipm.

SCOUT FOR BANDED SUNFLOWER MOTH EGGS



Based on pheromone trap catches, banded sunflower moth (BSM) and Arthuri sunflower moth (ASM) have emerged this last week. Trap catches are low at most trap sites except Cass County. Sunflowers were in the late vegetative to R2 stages.

The **egg sampling procedure** for BSM and ASM is simpler and quicker than sampling for adult moths, and may provide more time to react if a treatment is needed. See NDSU Extension YouTube video for a demonstration. Because the eggs are very small, you need a magnifier to count the small eggs accurately, such as head-mounted magnifier. Egg scouting is conducted when most of the plants in the field are at plant stage R3 (distinct bud elongated ¾ inch above the nearest leaf, yellow ray petals not visible). *Steps for egg sampling are*:

1) Divide each side of the field into two sections.
2) Sample the center of each section at 20 feet into the field from the field edge.
3) Randomly select five buds.
4) From each bud, randomly select six bracts (Figure 1) from the outer whorl and count the eggs on each bract.
5) Average the egg counts from the five buds

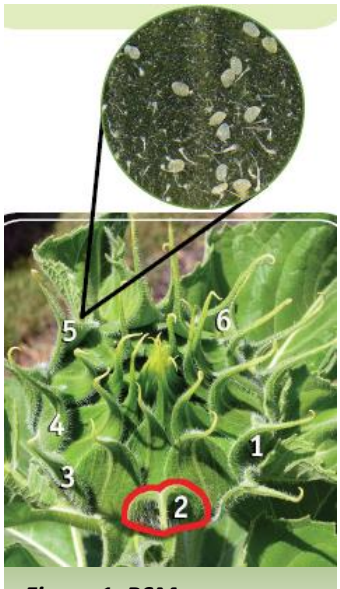


Figure 1. BSM egg on outer bracts.

The economic injury level (EIL) is used to determine if an insecticide treatment is warranted. The EIL is the average number of eggs per six bracts and considers treatment cost ($/acre), market price ($/pound) and plant population per acre. The EIL for $8 and $10 treatment costs are shown in Tables 1 and 2. For example, the EIL would be 2.1-2.6 eggs per 6 bracts for $8/acre (Table 1, red box) and 2.7-3.2 eggs per 6 bracts for $10/acre (Table 2, red box) insecticide cost.

If the number of BSM eggs is above EIL, insecticide should be applied at the R5.1 sunflower plant growth stage (when 10% of head area has disk flowers that are flowering or completed flowering) for optimal control of BSM-ASM and other head-infesting insect pests, including the red sunflower seed weevil. One red sunflower seed weevil was observed by the CREC IPM Scout, Carrie Nichols, in Stutsman County last week.

Table 1. Number of eggs of BSM per 6 bracts for the economc injury level when the cost of control equal $8 per acre.

Market Price	Sunflower Plants per Acre											
$ per lb	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000
0.18	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.7	2.6	2.5	2.4	2.3
0.19	3.9	3.6	3.4	3.2	3.0	2.8	2.7	2.6	2.5	2.3	2.2	2.2
0.20	3.7	3.4	3.2	3.0	2.8	2.7	2.6	2.4	2.3	2.2	2.1	2.1
0.21	3.5	3.3	3.1	2.9	2.7	2.6	2.4	2.3	2.2	2.1	2.0	2.0
0.22	3.3	3.1	2.9	2.7	2.6	2.5	2.3	2.2	2.1	2.0	1.9	1.9
0.23	3.2	3.0	2.8	2.6	2.5	2.3	2.2	2.1	2.0	1.9	1.9	1.8
0.24	3.1	2.8	2.7	2.5	2.4	2.2	2.1	2.0	1.9	1.9	1.8	1.7

Table 2. Number of eggs of BSM per 6 bracts for the economc injury level when the cost of control equal $10 per acre.

Market Price	Sunflower Plants per Acre											
$ per lb	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000
0.18	5.1	4.7	4.5	4.2	4.0	3.7	3.6	3.4	3.2	3.1	3.0	2.8
0.19	4.8	4.5	4.2	4.0	3.7	3.6	3.4	3.2	3.1	2.9	2.8	2.7
0.20	4.6	4.3	4.0	3.8	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.6
0.21	4.4	4.1	3.8	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.5	2.4
0.22	4.2	3.9	3.6	3.4	3.2	3.1	2.9	2.8	2.6	2.5	2.4	2.3
0.23	4.0	3.7	3.5	3.3	3.1	2.9	2.8	2.7	2.5	2.4	2.3	2.2
0.24	3.8	3.6	3.3	3.1	3.0	2.8	2.7	2.5	2.4	2.3	2.2	2.1

ARMYWORM AND BLACK CUTWORM TRAPPING NETWORK

Trap catches are summarized in Table 1. Armyworm numbers have stabilized and black cutworm numbers continue to be low. There was one report of high densities of armyworm (2-5 per square foot) in an irrigated wheat field near Park Rapids, MN. These larvae were small, about ¼ inch long and were early instars. Economic threshold is 2 larvae per square foot after wheat has headed. The grower was expecting 60-80 bu/acre wheat, so the wheat field was treated for armyworms.

Table 1. Summary of pheromone trap catches for true armyworm and black cutworm in ND wheat, 2021.

Area	County	Insect Pest	June 7-18	June 21-25	June 28-July 2	July 5-9
Central	Foster	Armyworm	-	0	0	1
Central	Wells	Armyworm	-	0	0	2
EC	Cass	Armyworm	4	17	13	7
EC	Traill	Armyworm	-	11	18	24
NC	Renville	Armyworm				0
NC	Pierce	Armyworm	-	0	0	0
NE	Cavalier	Armyworm	0	0	1	3
NE	Ramsey	Armyworm	-	0	0	5
NE	Towner	Armyworm	-	1	18	4
NE	Walsh	Armyworm	-	0	0	1
NW	Mountrail	Armyworm	-	1	0	0
NW	Renville	Armyworm	-	0	1	0
NW	Ward	Armyworm	-	0	0	0
NW	Williams	Armyworm	-	1	1	0
SE	McIntosh	Armyworm	-	-	0	0
SE	Ransom	Armyworm	-	3	14	15
SW	Golden Valley	Armyworm	0	0	1	0
SW	Hettinger	Armyworm	0	2	0	0
WC	Dunn	Armyworm	0	0	0	0
WC	McKenzie	Armyworm	-	0	0	0
		TOTAL #	**4**	**36**	**67**	**62**
Area	**County**	**Insect Pest**	**June 7-18**	**June 21-25**	**June 28-July 2**	**July 5-9**
Central	Foster	Black cutworm	-	0	2	1
Central	Wells	Black cutworm	-	0	0	0
EC	Cass	Black cutworm	0	1	1	0
EC	Traill	Black cutworm	-	0	1	0
NC	Pierce	Black cutworm	-	1	0	0
NE	Cavalier	Black cutworm	0	0	0	2
NE	Ramsey	Black cutworm	-	0	0	0
NE	Towner	Black cutworm	-	0	0	0
NE	Walsh	Black cutworm	-	0	0	0
NW	Mountrail	Black cutworm	-	0	0	1
NW	Renville	Black cutworm	-	0	1	0
NW	Ward	Black cutworm	-	0	0	0
NW	Williams	Black cutworm	-	0	1	0
SE	McIntosh	Black cutworm	-	-	0	1
SE	Ransom	Black cutworm	-	0	1	0
SW	Golden Valley	Black cutworm	2	0	0	0
SW	Hettinger	Black cutworm	1	0	0	0
WC	Dunn	Black cutworm	0	0	0	0
WC	McKenzie	Black cutworm	-	1	0	0
		TOTAL #	**3**	**3**	**7**	**5**

Janet J. Knodel
Extension Entomologist

WHICH INSECTICIDE IS BEST FOR GRASSHOPPER CONTROL

All stages of grasshoppers (1st instars to adults) can be observed in the field crops now. Some species of grasshoppers emerge earlier than other species, so different life stages are common in early summer. Due to the heat pushing degree days, **an increasing number of adult grasshoppers are present, which represents a greater risk to field crops.** Adults are more mobile (wings to fly) and fly to find greener fields for feeding, and have a larger appetite**.** Continue to frequently scout for grasshopper infestations.

Grasshopper Nymph - Economic Threshold
50-75 nymphs per square yards in field margins or 30-45 nymphs per square yard inside field

Grasshopper Adult - Economic Threshold
21-40 adults per square yards in field margins or 8-15 adults per square yard inside field

In 2020, low and high labeled rates of pyrethroid and premix insecticides were tested for control of adult grasshoppers in late growth stage soybeans at the NDSU Agronomy Farm, Casselton, ND. Insecticide products, active ingredients, and application rates are listed in Table 1.

Insecticide applications were made on August 20 when soybean plots were at the R5 growth stage. Applications were made using a CO_2 sprayer equipped with TeeJet 11002 flat-fan air induction nozzles at 40 psi and using a carrier volume of 20 GPA. The center two rows of each plot were harvested on October 6.

Table 1. Treatment list.

Treatment Number	Insecticide	Active Ingredient(s)	Application Rate
1	Untreated Check 1	---	---
2	Untreated Check 2	---	---
3	Warrior II low rate	lambda-cyhalothrin	1.6 fl oz/acre
4	Warrior II high rate	lambda-cyhalothrin	1.92 fl oz/acre
5	Cobalt Advanced low rate	lambda-cyhalothrin + chlorpyrifos	6 fl oz/acre
6	Cobalt Advanced high rate	lambda-cyhalothrin + chlorpyrifos	13 fl oz/acre
7	Brigade low rate	bifenthrin	2.1 fl oz/acre
8	Brigade high rate	bifenthrin	6.4 fl oz/acre
9	Mustang Maxx low rate	zeta-cypermethrin	3.2 fl oz/acre
10	Mustang Maxx high rate	zeta-cypermethrin	4 fl oz/acre
11	Hero low rate	bifenthrin + zeta-cypermethrin	2.6 fl oz/acre
12	Hero high rate	bifenthrin + zeta-cypermethrin	6.1 fl oz/acre
13	Fastac CS low rate	alpha-cypermethrin	3.2 fl oz/acre
14	Fastac CS high rate	alpha-cypermethrin	3.8 fl oz/acre
15	Asana XL low rate	esfenvalerate	5.8 fl oz/acre
16	Asana XL high rate	esfenvalerate	9.6 fl oz/acre
17	Baythroid XL low rate	beta-cyfluthrin	2 fl oz/acre
18	Baythroid XL high rate	beta-cyfluthrin	2.8 fl oz/acre

Grasshopper counts averaged 4 grasshoppers/yd^2 and percent defoliation averaged 14.7% across all treatments, determined immediately prior to insecticide application. There were no significant differences among treatments for pre-spray grasshopper counts or percent defoliation, indicating that grasshoppers were evenly distributed across the trial and were at a population density great enough to threaten economic yield loss.

At 7 Days After Treatment (DAT), the untreated checks had significantly more grasshoppers/yd^2 and greater defoliation than all insecticide treatments (Table 2). All insecticide treatments had higher grain yield compared to the untreated checks, and there were no significant differences among insecticide treatments (Table 2).

Table 2. Treat means for grasshoppers per yd^2 and percent defoliation at pre-spray 7 DAT, and grain yield at Casselton, 2020.

	7 DAT			
Trt No.	Grass-hoppers per yd^2	Percent Defoliation	Trt No.	Yield bu/acre
2	4.0a	26.3a	17	40.3a
1	3.7a	26.3a	13	39.6a
17	1.1b	15.0b	15	38.7a
13	1.0b	13.8b	14	38.5a
7	1.0b	13.8b	9	37.6a
18	1.0b	11.3b	16	37.4a
15	0.9b	17.5b	12	37.2a
9	0.9b	15.0b	10	37.1a
10	0.9b	12.5b	6	37.1a
11	0.9b	15.0b	18	36.6a
12	0.9b	16.3b	4	36.4a
8	0.9b	12.5b	3	35.6a
14	0.9b	12.5b	7	35.5a
16	0.9b	13.8b	11	35.3a
3	0.8b	13.8b	5	34.4a
5	0.8b	17.5b	8	33.7a
4	0.7b	16.3b	2	26.3b
6	0.7b	13.8b	1	25.7b
F-value	**77.31**	**7.10**		**8.02**
P-value	**<0.0001**	**<0.0001**		**<0.0001**
HSD	**0.6**	**8.2**		**7.2**
DF	**17, 51**	**17, 51**		**17, 51**

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

Our results indicate that all low and high labeled rates of all insecticides tested provided control of grasshoppers, and prevented economic yield loss. Percent defoliation increased in the untreated checks, while remaining steady in the insecticide treatments. Additionally, substantial pod feeding was noticed in the untreated checks compared to the insecticide treatments. Yield loss in the untreated checks was likely due to a combination of defoliation and pod feeding during the critical pod-filling period between the R5 and R6 growth stages.

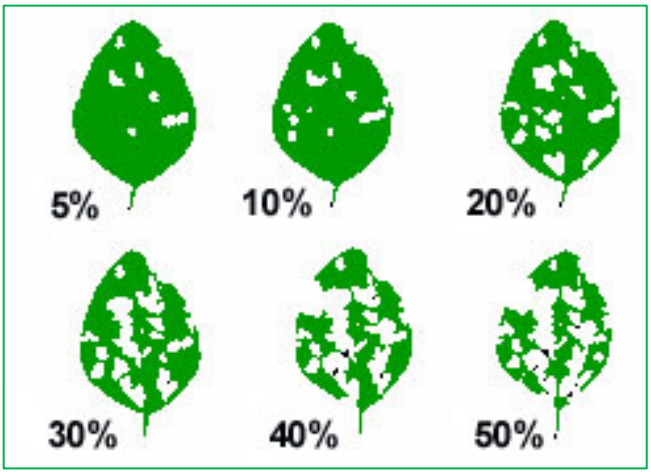
Remember to consider the big picture of insect pests present in fields before selecting an insecticide to use. For example, soybean and dry bean fields may also have spider mites or soybean aphids present as well as grasshoppers. For control of spider mites, avoid using pyrethroid, Group 3A, insecticides, which flare mite populations. The only pyrethroid that will control spider mites is bifenthrin (consult product labels for spider mite rates). Other modes of action for control of spider mites, soybean aphids and grasshoppers are organophosphates (Group 1B), such as chlorpyrifos (Lorsban and generics). Another alternative is premixes (2 or more A.I.) of an organophosphate and a pyrethroid, such as Match-up or Tundra Supreme (chlorpyrifos + bifenthrin), or Stallion (chlorpyrifos + zeta-cypermethrin), which will control spider mites, soybean aphids and grasshoppers.

***Disclaimer**: Mention of any insecticide products do not imply endorsement of one product versus another nor discrimination against any product not mentioned by the authors or NDSU.*

RED-HEADED FLEA BEETLE IN SOYBEANS AND CORN

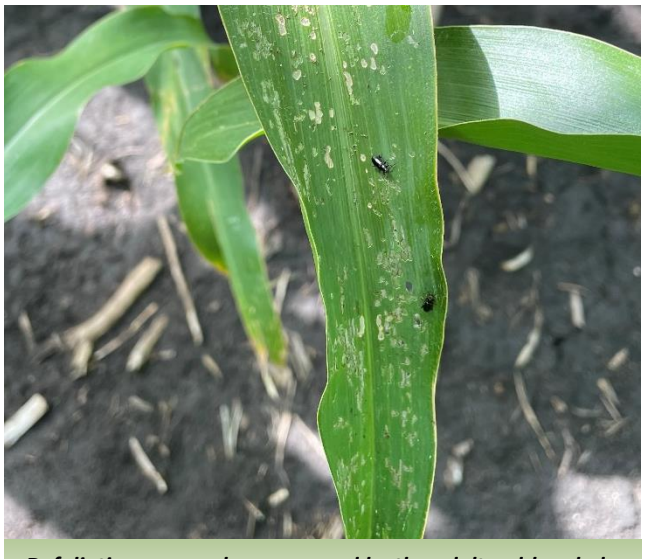
There have been several calls, emails, and texts about the red-headed flea beetle (*Systena frontalis*) causing defoliation in soybeans and in corn. The beetles also will clip silks of corn. The red-headed flea beetle is about $^{1}/_{6}$ inch long and dark black with a reddish head and readily hops around. It feeds on over 40 different host plants including cabbage, beans, beets, corn, alfalfa, potatoes, nursery crops, cranberry and many weed species. It overwinters in the egg stage in the soil. Eggs hatch in June and larvae feed on the roots. Larvae pupate and then adults emerge in July-August and feed on foliage until September. Adults deposit eggs in soil, which overwinter. There is only one generation per year.

The red-headed flea beetle is not typically an economic insect pest in soybeans or corn. Extension reports from other states indicate that the adult stage is readily controlled by foliar insecticides registered in different crops. An action threshold for determining the need for a rescue treatment would be based on percent defoliation and the stage of soybean: 30% in vegetative stages (prebloom), 15% in bloom to pod-fill, and 25% in pod-fill to maturity (unless pod feeding observed). While there isn't any develop threshold for the red-headed flea beetle in corn, we can use the adult corn rootworm threshold of 25-50% of the plants with clipped silks during pollen shed as to when control would be justified. With the high market value of corn, the lower percentage would be more feasible.



Adult red-headed flea beetle (P. Beauzay, NDSU)

Defoliation on soybean leaves caused by the adult red-headed flea beetle (Mark Huso)



Defoliation on corn leaves caused by the adult red-headed flea beetle (Mike Bjertness)

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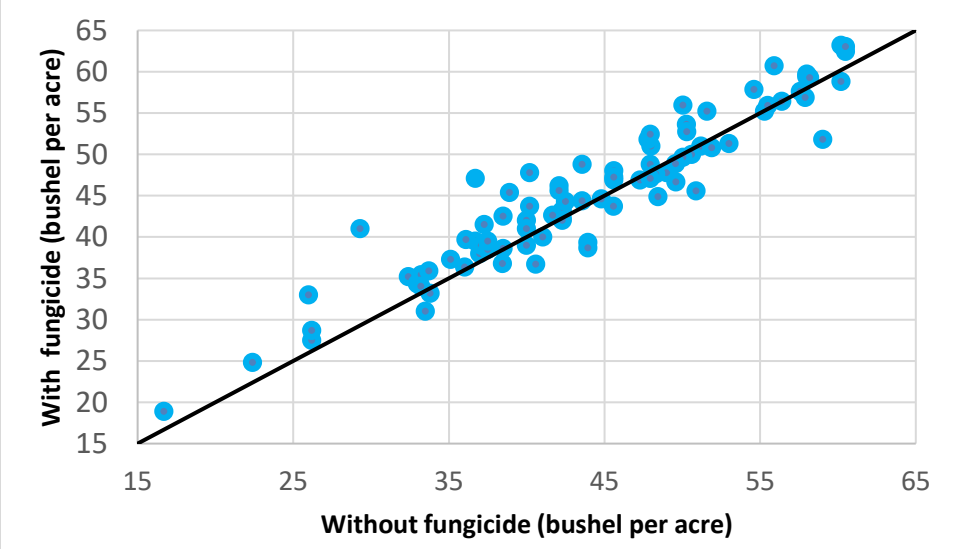
plant science

FUNGICIDE APPLICATION ON SOYBEAN

In many crops, fungicides are applied to protect plants from plant disease. In the northern soybean growing region, the number of serious fungal diseases during the growing season are limited. However, producers have been asking about prophylactic application of fungicides at the early reproductive stages of soybean plant development. We have conducted soybean fungicide research for many years (Photo 1). Here we present a summary of the research trials.

Data from 58 replicated trials were analyzed. The trials were conducted starting in 2004 through 2020. Experiment locations included Fargo, NW Minnesota, Carrington, Dazey, Wishek, Colfax, Mapleton and Northwood. A total of 89 comparisons between fungicides and non-treated controls (no fungicide applied) were conducted. The fungicides analyzed here include Headline and Priaxor, with NIS, at various rates and applied at crop growth stages from R1 through R3. The graph 1 represents the data from 89 control plots and the yield from the fungicide treatment.

Photo 1. Fungicide application July 16, 2020.



Graph 1. Soybean yield with application of fungicide and without fungicide for 89 comparisons, 2004-2020.

Each blue dot on the graph shows the soybean yield for the non-treated control (without fungicide, horizontal axis) and when a fungicide was applied (vertical axis). The black line in Graph 1 represents the point where the yield with a fungicide treatment and yield of the non-treated control were the same. The dots above the black line represent trial

results where the fungicide treatment yielded more that the control, while blue dots below the line indicate that soybean with the fungicide application yielded lower than the non-treated control. The average soybean yield without fungicide was 44.6 bushel per acre while the yield with fungicide was significantly higher, at 45.9 bushel per acre. Across all data points, this represents a 1.3 bushel or 3% increase in yield.

However, the yield increase throughout the study was disproportionately dependent on a few trials. The data analyzed here were extracted from replicated research plots and statistical differences could be calculated in each individual trial. A significant yield increase was only found in eight out of the 89 comparisons (9% of the time). When the remaining 81 comparisons were analyzed (without those eight significant comparisons) the yield without fungicide was 44.7 bushel per acre and with fungicide 45.5 bushel per acre, a 0.8 bushel or 2% increase.

For a fungicide application to be economical, various factors and input costs should be considered:

First - Fungicides are most likely to pay off if it manages an important disease impacting the crop. Until 2020, we didn't worry too much about foliar diseases robbing yield on soybeans (bacterial blight is not managed by fungicides, fungal diseases were rare), and disease pressure throughout these trials were demonstrated to be low. However, frogeye leaf spot, a disease that causes yield loss in other parts of the country, was found throughout SE North Dakota in 2020. While the disease likely showed up too late in the season to cause yield loss last year, it is something growers should watch for in the future. Notably, if fungicides are being considered for frogeye leaf spot, multiple modes of action should be used.

Second - Without an imminent disease threat, agronomics and economics are critical. We have been unable to predict under which conditions a fungicide application is most likely to increase yields while disease is not a factor, but other considerations are known. The value of the crop, cost of application per acre and the cost of product per acre have to be foremost considered. The price of the crop is higher in 2021 than in recent years, but the current drought conditions are reducing yield potential.

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plant pathology

DISTINGUISHING SOYBEAN LEAF DISEASES

In response to questions about leaf spots on soybeans, I am providing brief information and photos on three leaf diseases of soybeans; Bacterial blight, Septoria brown spot, and Frogeye leaf spot.

Bacterial blight.

Symptoms often begin as very small water-soaked spots on leaves. These become small angular lesions, often with a yellow halo (Figure 1, left leaf image), which will eventually enlarge, turn black and tatter the leaves (Figure 1,

right leaf image). The disease often shows up after a thunderstorm that damages leaf tissue (winds, hail, etc.), providing an entry point for the pathogen. Disease development is favored by cool and wet weather, which is something we have not had in 2021! So, even though we are seeing some bacterial blight, the hot dry weather is a severe limitation for the disease. Even in a 'normal' year, the disease is not considered an economic concern, and even if it were, fungicides do not manage the disease.

Figure 1. Bacterial blight (Photos: https://www.ag.ndsu.edu/publications/crops/soybean-disease-diagnostic-series).

Septoria Brown Spot.

Leaf symptoms begin as small dark brown spots, that may or may not have a halo (Figure 2, left image). Brown spots may coalesce and infected leaves may turn yellow, creating leaves that appear golden with brown spots or patches (Figure 2, middle image). Symptoms are first found on the lower canopy and appear to work their way up the plant (Figure 2, right image). The disease is favored by warm and wet weather. We have had the warm, but not-so-much the wet. Yield loss from Septoria brown spot is thought to be rare in our region even in a favorable year, and particularly so if the disease doesn't impact the upper canopy.

Figure 2. Septoria brown spot (Photos courtesy Dean Malvick, UMN) from: https://www.ag.ndsu.edu/publications/crops/soybean-disease-diagnostic-series

Frogeye Leaf Spot.

Symptoms of Frogeye leaf spot begin as small dark spots, and enlarge to 1/8-1/4 inch, circular to irregular leaf lesions (Figure 3, top leaf image). Lesions centers are commonly gray-brown with a darker reddish-purple border. Visible gray fungal growth may be visible on the underside of the lesions (Figures 3, middle and lower leaves). Frogeye leaf spot is somewhat difficult to differentiate from other soybean leaf spots (diseases and chemical injury), so I suggest you visit this Frogeye leaf spot Extension publication created by a multi-state group of pathologists. The publication is full of photos of the most common Frogeye leaf spot mimics [Link https://crop-protection-network.s3.amazonaws.com/publications/cpn-1017-frogeye-leaf-spot.pdf].

I have not seen Frogeye leaf spot yet this year but looking for the disease as soybeans get into reproductive stages is a good idea. Frogeye leaf spot was first found in ND last year, and was observed in at least 10 counties. The disease is favored by warm temperatures, humid conditions and frequent rains. Certainly, we have had the warm, but less-so the latter of the two environmental conditions. The pathogen survives on soybean residue (and seed), but how well it overwinters in ND is not certain. In states further to our south, Frogeye leaf spot is a yield threat, but the potential impact on yield is unclear in ND. In areas (and situations) where Frogeye leaf spot does cause yield loss, the disease shows up in early reproductive stages when it is hot and rain is frequent. While I recommend keeping your eyes on the crop, it seems unlikely that we will see much Frogeye leaf spot, unless it rains more frequently.

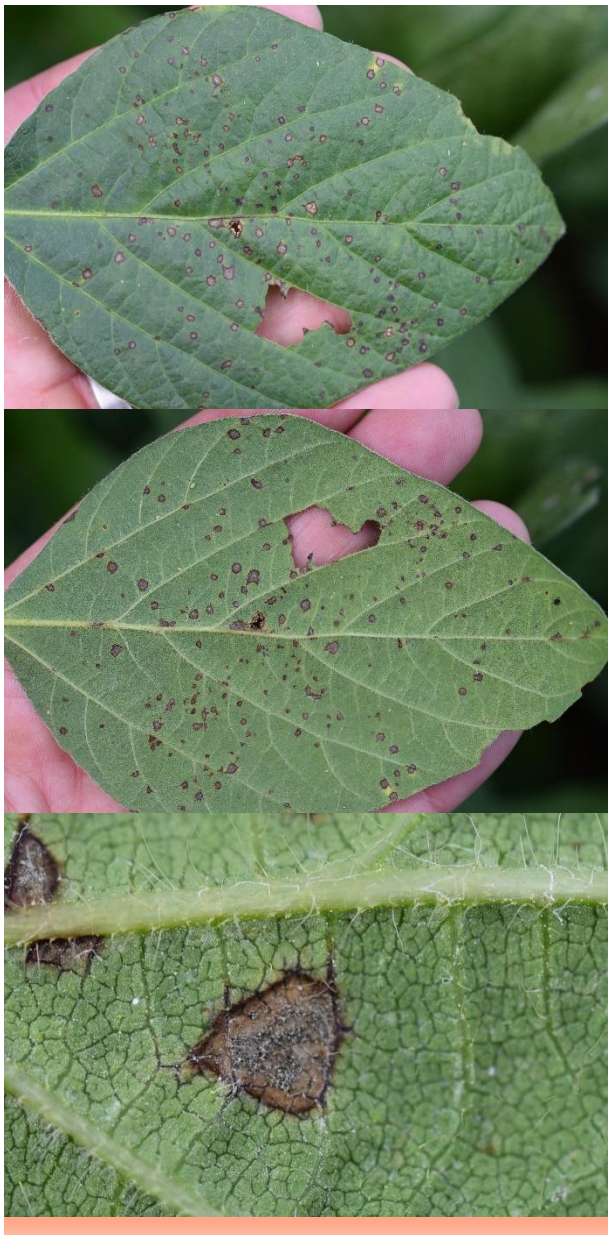

Figure 3. Frogeye leaf spot (Markell, ND 2020)

Sam Markell
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soils

FERTILIZER PLANNING FOR 2022

With the 2021 fertilization season in the past for most of this year's crops, it is not too early to consider planning for the 2022 season. For most of the state, yields will be less than what was hoped for and in some fields, there will be no grain yield; all due to the drought. For every 'bad' there is usually a 'good'. In this case, the good is that the residual nitrate should be very high after a disappointing harvest. In order to take advantage of the nitrate bonanza, it is necessary to soil sample and determine how much might be applied to the next crop. Also, it is important to soil sample for residual nitrate even if the field might be in soybean next year in the eastern half of the state where iron deficiency chlorosis (IDC) is a problem. High soil nitrate (roughly over 80 pounds of N per acre) makes IDC worse by interfering with iron (Fe) metabolism in the leaves. If high nitrate is found to be significant in front of a soybean seeding, then selection of more IDC tolerant varieties is especially important and consideration of seeding a companion barley/oat with or near soybean seeding will also help reduce the nitrate effect.

For those farmers who have yield monitors (and that is the majority of ND farmers) and even those who do not, it will be easy to see that yield will vary across fields. Residual nitrate likewise varies across fields. Sampling in a zone strategy instead of a composite soil test will greatly improve understanding nitrate variation across each field. Also, in the zone strategy, make sure that the salty areas are a separate zone. I think most will see that fertilization of these salty areas is usually not necessary the next year. For the rest of the field, given fertilizer rates used in 2021 and the yields that will come off of those fields, areas of fields with residual nitrate greater than 100 pounds of N per acre will not be uncommon. Taking advantage of the residual nitrate credit may make a difference in 2022 input costs of $50 per acre or more, which I think is a little more than the cost of having a field sampled.

Make plans now for sampling to happen this fall. Sampling in August is not too soon to sample after early season crop harvest.

Dave Franzen
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around the state

AROUND THE STATE

NORTH CENTRAL ND

A break in the dry pattern was observed last week with the region receiving some much-needed precipitation. However, probably not enough to impact the drought-like conditions in the area. Here are some quick precipitation reports as observed by area NDAWN stations over the last week (beginning July 5th): Minot: 0.82" (NCREC: 1.09"); Bottineau: 0.96"; Garrison: 2.30"; Karlsruhe: 0.76"; Mohall: 1.27"; Plaza: 1.32"; and Rugby: 0.65". Bare soil temperature at the NCREC is observed at 81 degrees F.

Two calls have dominated the office over the last week. (1) Grasshoppers – Are people spraying and what are they observing in the region? As noted from these calls, it appears grasshopper numbers are matching the observations of Alexius Holter, the north central scout. Grasshoppers, mainly nymphs, are being found around field edges. However, most populations are not economic. I have taken a few calls from growers near the Williams-Divide County line where some adults are being reported with numbers above economic threshold along the field edge. As a reminder, the **economic thresholds are 50-75 nymphs per square yard for grasshopper nymphs in the field margins and 21-40 for**

number of adults in the field margins. Continue scouting to determine if any action may be needed in your area. (2) Blister beetles – what can we do? Please remember that blister beetles may be toxic to some livestock. Spraying and crimping are not recommended. Please refer to the July 1st issue of the NDSU Extension Crop & Pest Report for more information on blister beetles.

Crops are rapidly progressing in the region. Soybeans have already begun to flower. Spring wheat fields are mostly in Feekes 10.5 to 11.1. Canola fields are flowering and podding in some areas. Corn is observed from V6-V12, and a few farmers were spreading nitrogen last week.

The NCREC Field Day will be July 21st from 08:30 AM-1:00 PM CDT. A ribbon cutting ceremony for the center's new seed conditioning facility will be held at 11:30 a.m., followed by lunch. The Northern Pulse Growers Association and Northern Canola Growers Association are partial sponsors of the lunch. A detailed program can be found in Figure 1.

Figure 1. NCREC Field Day.

TJ Prochaska
Extension Crop Protection Specialist
NDSU North Central Research Extension Center

Leo Bortolon
Extension Cropping Systems Specialist
NDSU North Central Research Extension Center

NORTHEAST ND

No significant rain in this region for the past week. Crops are getting by with previous rains. Some areas are very dry, and some farmers are planning to hay their small grains whereas some areas are doing good. Producers are inquiring about testing nitrate levels in small grains. Canola is in flowering and pod forming stage. Fungicide sprayings are going on in canola. Soybeans are nearing flowering and peas are at pod and seed development stages. Edibles and some soybeans are on the ropes. Beans need rain badly in most of the region. Sunflowers are at the R1 stage. Sugarbeets are looking good. Corn is variable, poor to good. Most of the producers are done with inputs other than weed control. Soybean aphids were reported in Western Grand Forks County, with very few plants infested below threshold levels. Wheat stem maggots and cereal aphids are noted at below threshold. Grasshoppers are maturing to adults and populations are moving into fields. Poor yields of alfalfa first cut with 1 bale or less per acre. Lots of ditch hay being cut and baled.

Anitha Chirumamilla
Extension Agent Cavalier County

NORTHWEST ND

Temperatures were more moderate in the Northwest last week with highs in the 70s and 80s. Most places received 0.5-1.25" of rain total between Thursday, July 8 and Friday, July 9. This timely rain was much needed to support grain development, though yields are already limited by the extremely dry conditions earlier in the season. Early planted small grains are beginning to fill seeds and are in the early milk stages. Later planted fields are heading and flowering. Peak canola bloom seems to be behind us already and many fields are starting to taper off. Peas and lentils are in early pod stage. The forecast for the coming week shows high temperatures in the 80s for the first half of the week and then climbing into the 90s by Thursday and through next week. There are no strong chances of rain this week.

A reminder that the **Williston Research Extension Center dryland field day is this Wednesday, July 14th starting at 3:45 pm Central** and running until 7:00 pm. The ribbon cutting for the new WREC seed cleaning facility will be at 6:00 pm followed by a steak and lamb supper at 7:00 pm. Speakers include Dr. Brian Jenks of the NCREC discussing weed control during drought, Dr. Audrey Kalil of WREC discussing root rot in peas, and Dr. Carrie Miranda, the new NDSU soybean breeder, talking about variety development in the NDSU soybean program.

Clair Keene
Extension Cropping Systems Specialist
NDSU Williston Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

According to NDAWN, the region's April 1 to July 12 rainfall ranges from 3.3 inches (Dazey) to 10.6 inches (Jamestown), with the Carrington REC at 3.8 inches. July 1-12 rain total ranges from 2 inches (McHenry) to less than 0.25 inch generally along Hwy 281 from Carrington to Ellendale. During the past week (July 6-12), daily water use by row crops averaged about 0.2 inch per day.

Winter rye is mature and the majority of spring-seeded small grain are in the dough stages with plants losing color. The normal three-week seed fill period has been reduced due to continuing inadequate soil moisture and high air temperatures. In summary, our adverse growing season has greatly reduced the number of small grain heads per acre, number of seeds per head and seed weight – all contributing to very disappointing grain yield.

Corn, soybean, dry bean and sunflower are entering growth stages where seed yield will be dramatically reduced if adverse weather continues. Corn is near or at tasseling (VT). Drought and heat stress at VT can reduce yield an average of 3% per day and yield reduction at least doubles with stress during silking (R1). Soybean growth stages range from full flower (R2) to early pod development (R3-4). The approximate month period of R3 (pods at least 0.25 inch in length at one of the upper 4 plant nodes) through R6 (seeds have filled pods within upper 4 plant nodes) is the most critical to have minimal plant stress.

Upcoming crop tours planned by the Carrington REC:
*Field Day: July 20; Agronomy tours at 9:30 a.m. and 1:15 p.m.
*Row Crop: August 25; afternoon

Irrigated mature winter rye for seed production.

Corn planted at Carrington REC on April 29 now nearing VT stage.

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center

SOUTHWEST ND

According to NDAWN from July 1st to July 12th Dickinson received 0.94 inch of rain, Beach 0.53, Amidon 0.39, Bowman 0.46, Hettinger 0.56, Mott 1.36, Carson 0.55, Mandan 2.19, Hazen 1.13, and Dunn 0.65. Drought stress and weed pressure are some of the major impacts across the region. Pockets within the region are seeing high grasshopper pressure. As sunflowers continue to mature, be sure to keep red sunflower seed weevil scouting as a priority on sunflower acres.

Ryan Buetow
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NDSU Dickinson Research Extension Center

weather

WEATHER FORECAST

The July 15 to July 21, 2021 Weather Summary and Outlook

Temperatures mostly finished within a couple of degrees from average during the period of July 7 through July 13, 2021 (Figure 1). The area with the highest anomalies were in the southern Red River Valley into west central Minnesota where temperatures were around 4° below average. These next 7 days look quite warm with all locations likely recording temperatures well above average. Western portions of North Dakota will probably record the highest temperature anomalies during this forecasting period.

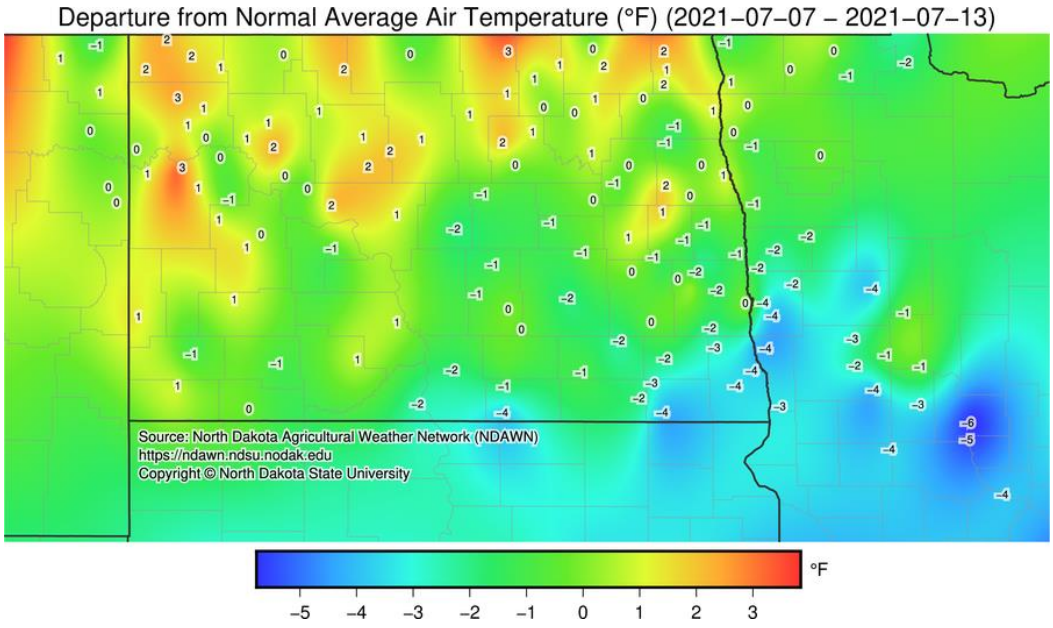

Figure 1. Temperature departures from average at selected NDAWN for the period of July 7 through July 13, 2021

Widespread rains were recorded this past week across central and western North Dakota (Figure 2). Some severe weather was associated with these storms, but damage was not widespread. As mentioned, this next week looks quite warm and, with the heat, will come few opportunities for rain. In turn, high stress levels on area crops with several days of 90° or higher temperatures are expected.

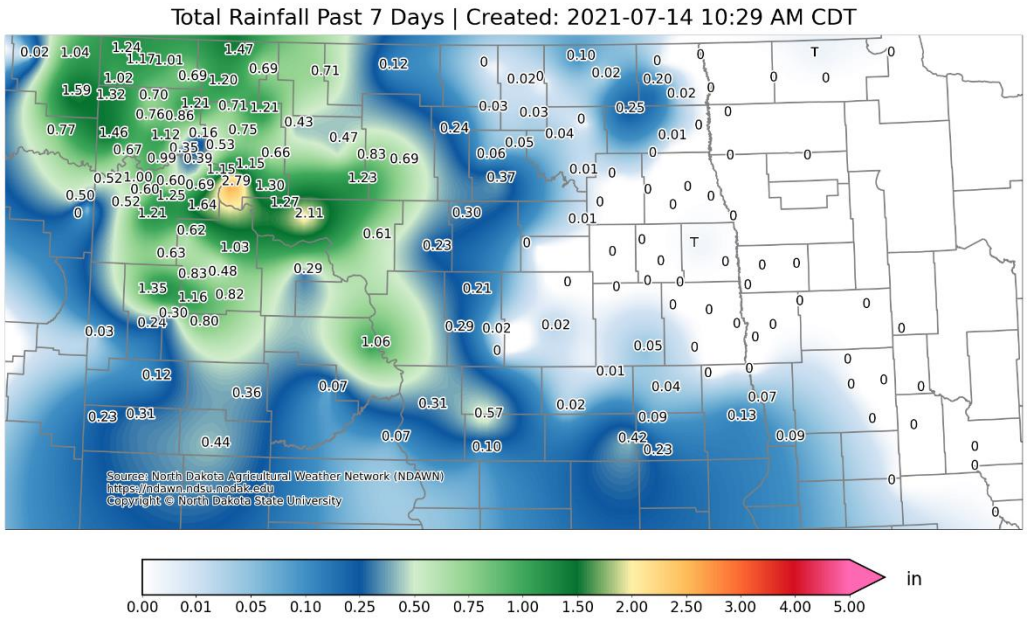

Figure 2. Total rainfall for 168-hour period ending at 10:30 AM on July, 14, 2021 at NDAWN weather stations

The warm temperatures during this forecast period will be a "dry heat". This will mean increased evaporation potential and few hours with high relative humidity. My forecasted number of hours with relative humidity greater than 85% can be found in Figure 3.

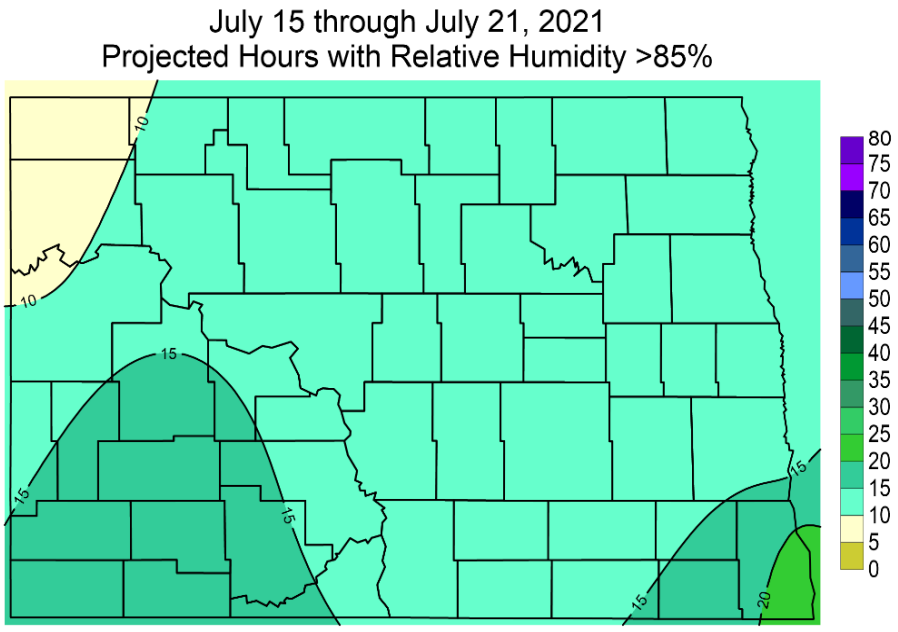

Figure 3. Estimated number of hours with Relative Humidity above 85% from July 15 through July 21, 2021

The projected growing degree days (GDDs) base 50°, 44° and 32° for the period of July 15 through July 21, 2021 can be found in Figure 4. Another reminder that growing degree day calculations stop at a maximum temperature of 86°. With most or all days exceeding that temperature from this weekend into next week, the main differences with GDDs this week will be associated with the minimum temperatures.

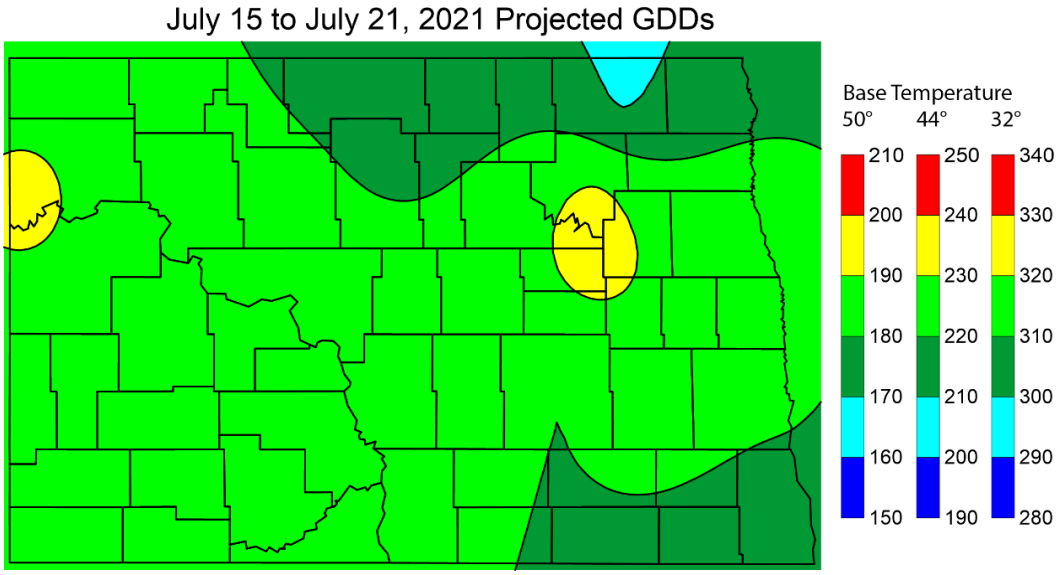

Figure 4. Projected Growing Degree Days, Base 50°, 44° and 32° for the period of July 15 to July 21, 2021

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

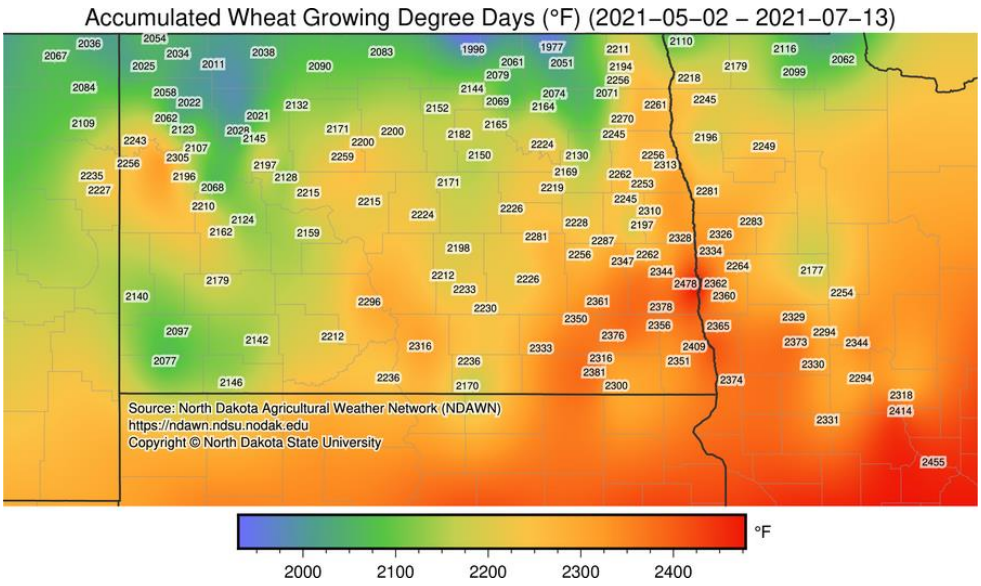

Figure 5. Accumulated Growing Degree Days for Wheat (Base 32°) since May 1, 2021

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.

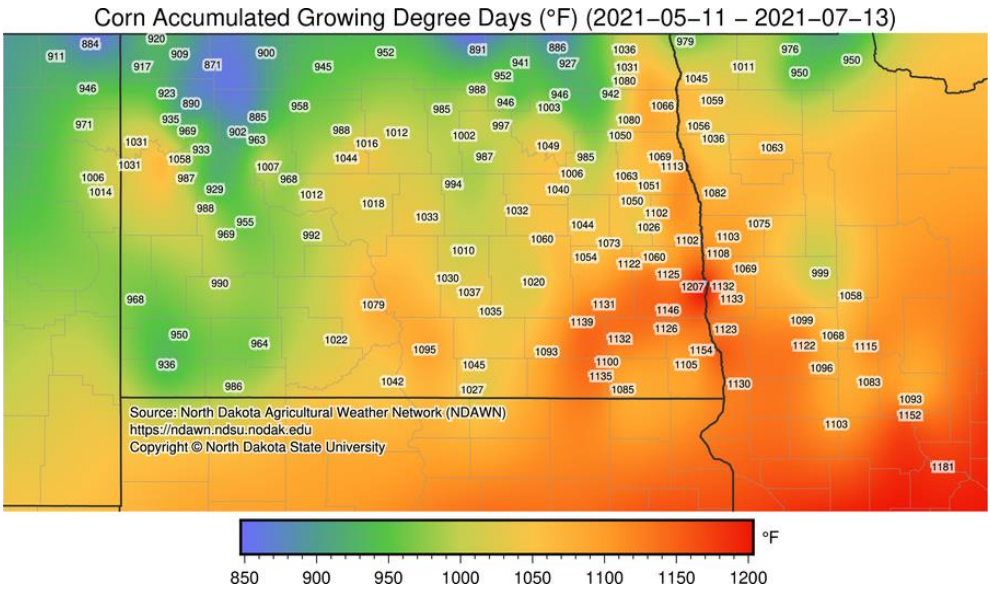

Figure 6. Accumulated Growing Degree Days for Corn (Base 50°) since May 10, 2021

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

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