North Dakota State University
CROP & PEST REPORT
NDSU EXTENSION

No. 16 August 25, 2022

Inside this Issue...

AG NDSU FIELD DAYS REMAINING

The North Dakota State University Research Extension Centers and NDSU departments have a few 2022 field days remaining.

The dates and locations for some remaining field day events are:

September 10 –Branch Out: The Arboretum Experience.
NDSU Arboretum near Absaraka

(12-5pm CDT trees and ornamentals) pre-registration required
https://www.ndsu.edu/agriculture/academics/events/branch-out-ndsu-arboretum-experience

September 20- Cover Crops, Intercropping and Soil Health Field Day
(9:00 a.m. registration)

Hickson research site. Take I-29 south of Fargo to the Kindred exit #48 then turn East and then turn left (going N) in Highway 81. Drive 0.5 mile and you will see the Field day flags. Second stop (transportation on you own) will be at the Fargo experiment station located at the corner of Dakota Drive and 15th Ave N. Lunch (Registration needed) will at the Fargo location before the afternoon education and program will end around 3 p.m.

Additional information on a Sugarbeet pathology tour and on two Carrington (CREC) row crop tours can be found in the Sugarbeet pathology section of this issue and in the South Central/Southeast regional report in this issue.

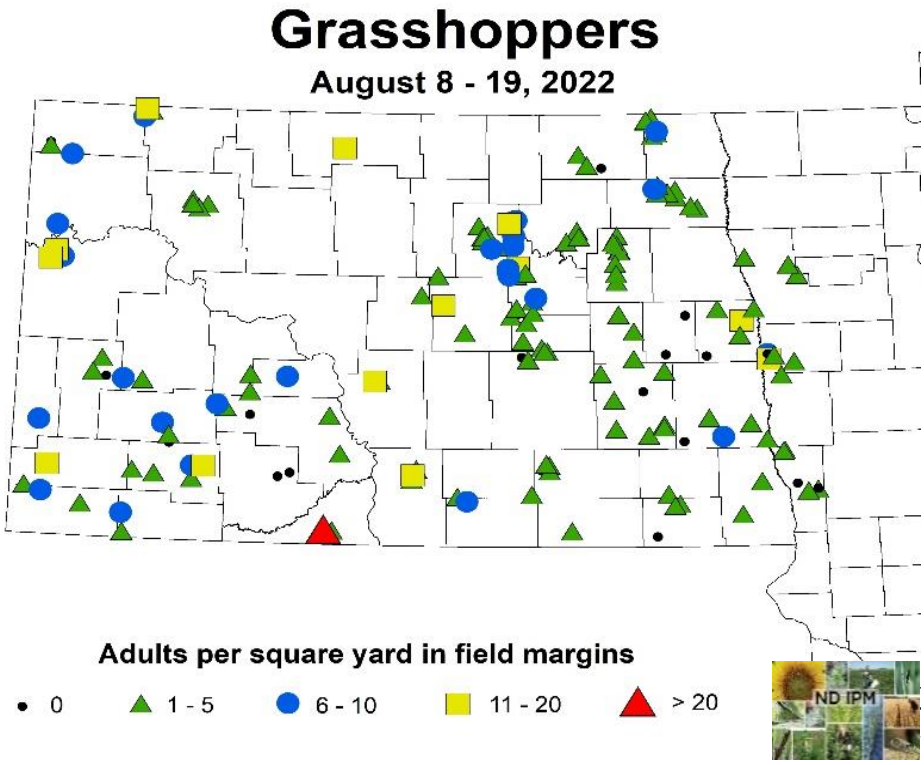
entomology

SCOUT FOR GRASSHOPPERS IN MATURING CROPS

Continue to scout for grasshoppers in maturing field crops, especially after the small grain harvest since adult grasshoppers will move off of harvested fields in search of 'greener' field crops. Adult grasshoppers also can clip heads off when foliage is dying or has been heavily defoliated. It is not uncommon to see a mixture of adult and nymph grasshoppers this year due to the cool spring, which delayed egg hatching, nymphal growth and development, and emergence of winged adults. The five most common field crop grasshoppers in North Dakota are the clearwinged grasshopper *(Camnula pellucida),* two striped grasshopper *(Melanoplus bivittatus),* migratory grasshopper *(Melanoplus sanguinipes),* differential grasshopper *(Melanoplus differentialis)* and red legged grasshopper *(Melanoplus femurrubrum)*.

Cropland grasshopper species emerge at different seasonal times. Early hatching grasshoppers in mid-spring are clearwinged grasshopper, two striped grasshopper and migratory grasshopper. The two striped grasshopper is usually the first to appear in the spring. Late spring hatching grasshoppers are the differential grasshopper and red legged grasshopper. The red legged grasshopper also is known for prolonged hatch due to the female placing eggs in various crops like soybean fields. Egg hatching is first observed along south facing slopes in field and range sites where there is little vegetative cover and soils are sandy. After rain and warm temperatures, flushes of egg hatching often occur.

IPM Crop Scouts observed grasshoppers in 82% of the fields scouted last week. The average number of adult grasshoppers per square yard ranged from 1 to 12. Economic populations of adult grasshopper are when **more than 8 adult grasshoppers per square yard are present in field and when more than 21 adult grasshoppers per square yard are present in margins of fields**.



If it is necessary to treat with an insecticide, check PHI (Preharvest Interval) of your insecticide label. "The preharvest interval (PHI) is the wait time between a pesticide application and when a crop can be harvested. The label will state how long the crop must remain in the field after spraying. During the PHI, the pesticide may be broken down in

the plant, or on its surface. Sun, rain, and warm temperatures may affect how quickly this happens. The preharvest interval (PHI) is the minimum amount of time between the last application of a pesticide and when the crop can be harvested." (Source: National Pesticide Information Center, http://npic.orst.edu/health/phi.html). See Table (below) for a listing of some common insecticides and their PHI by crop.

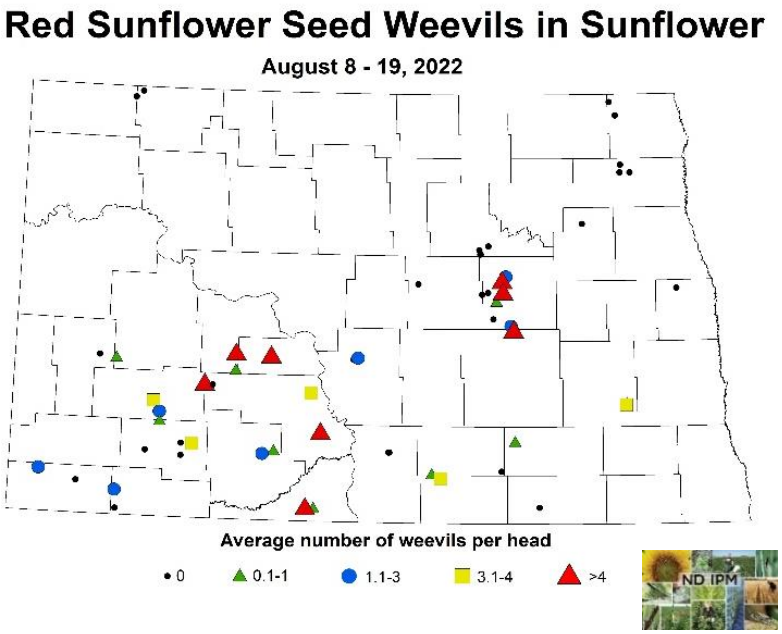
Insecticide Group	Insecticide Trade Name	Pre-harvest Intervals in Days for Grain						
		Barley	Wheat	Corn	Sunflower	Soybean	Sugarbeet	Flax
Organophosphate 1B	Dimate 4E	-	35	28	-	21	-	-
Organophosphate 1B	Malathion 57EC	7	7	7	-		-	-
Diamide 28	Vantacor (nymphs only)	1	1	14	1	1	-	1
Oxadiazine 22A	Steward EC	-	-	14	-	21	-	-
Pyrethroid 3A	Acephate 97	-	-	-	-	14	-	-
Pyrethroid 3A	Asana XL	-	-	21	-	21	21	-
Pyrethroid 3A	Baythroid XL	30	30	21	30	21	-	-
Pyrethroid 3A	Besiege	30	30	21	45	30	-	-
Pyrethroid 3A	Brigade 2EC/generics	-	-	30	-	18	-	-
Pyrethroid 3A	Delta Gold	-	-	21	21	21	-	-
Pyrethroid 3A	Elevest	-	-	30	-	18	-	-
Pyrethroid 3A	Endigo ZC	30	-	-	-	30	-	-
Pyrethroid 3A	Fastac CS	-	14	30	-	21	50	-
Pyrethroid 3A	Hero	-	-	30	-	21	-	-
Pyrethroid 3A	Mustang Maxx	14	14	7	30	21	50	7
Pyrethroid 3A	Tombstone	-	30	21	30	45	-	-
Pyrethroid 3A	Warrior II/generics	30	30	21	45	30	-	-
Pyrethroid 3A + Neonicotinoid 4A	Leverage 360	-	-	-	-	21	-	-
Pyrethroid 3A + Neonicotinoid 4A	Skyraider	-	-	-	-	18	-	-
Pyrethroid 3A + Sulfoximine 4C	Ridgeback	-	-	30	-	18	-	-
Pyropene 9D + Pyrethroid 3A	Renestra	-	-	-	-	21	-	-

Disclaimer: Mention of any insecticides does not imply endorsement of one product versus another nor discrimination against any product not mentioned by the authors or university.

RED SUNFLOWER SEED WEEVIL UPDATE

About 95% of the sunflower are blooming and 19% ray flower dry (Source: USDA NASS – North Dakota Crop Progress and Condition, August 22, 2022). **Continue to scout sunflowers through the R5.7 stages for weevils.**

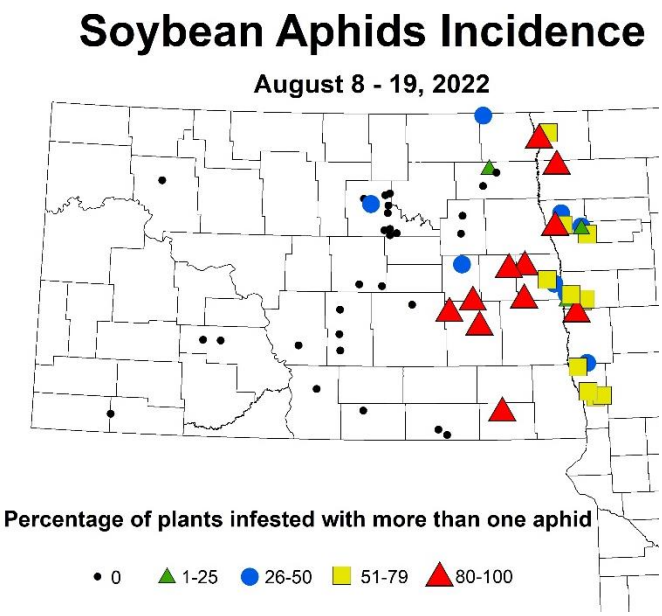
Weevil populations increased this past week as more sunflowers are flowering. IPM Crop Scouts recorded sunflower stages from R5.1 to R5.8. Red sunflower seed weevils were observed in 27% of the sunflower fields scouted last week. The average number of weevils per head ranged from 1 to 13. Economic populations are shown by the yellow square and red triangle on the map.

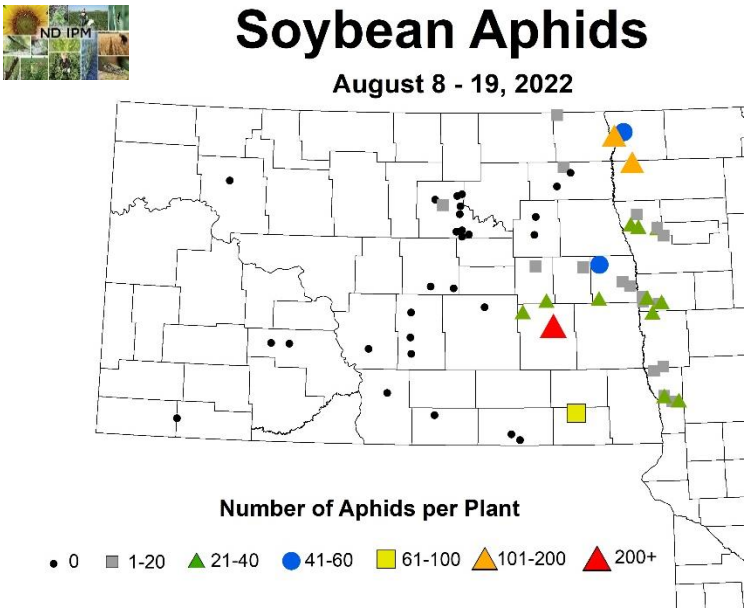


SOYBEAN APHID UPDATE

Soybean aphids continued to increase slightly this past week. Temperatures in the low to mid-80s are favorable for soybean aphid development. Continue to scout fields until R6 (full seed).

IPM Crop Scouts observed soybean aphids in 73% of the 26 soybean fields scouted last week compared to 31% of the 61 soybean fields scouted two weeks ago. Incidence of plants infested by soybean aphids ranged from 18% to 100% and the average number of aphids per plant ranged from 2-330 aphids per plant. One field, near Valley City in Barnes County, was above the economic threshold. **The economic threshold for soybean aphids is an average of 250 aphids per plant with more than 80% of plants infested and aphid populations increasing.** Most soybean fields with soybean aphids were found in southeastern and northeastern areas of ND. Soybean crop stages ranged from R3 (beginning pod) to R6 (full seed).





IPM INSECT TRAPPING UPDATE

All insect traps have been removed from fields. This is the last report for canola and sunflower.

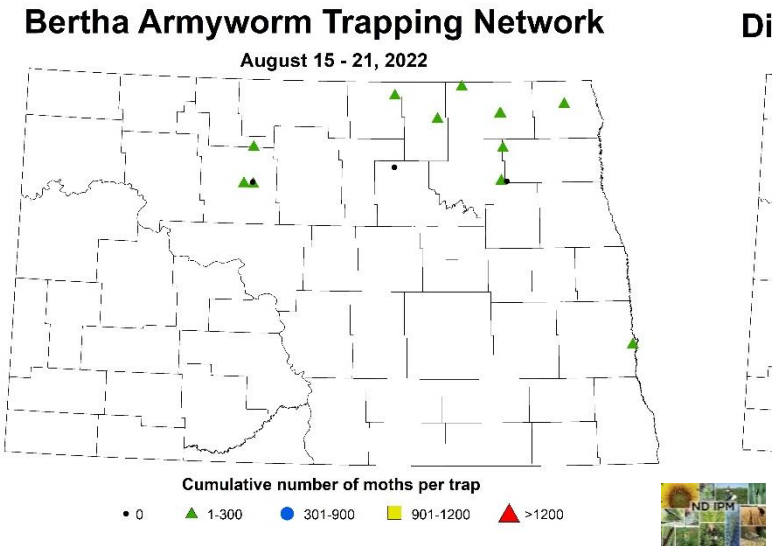
Canola:

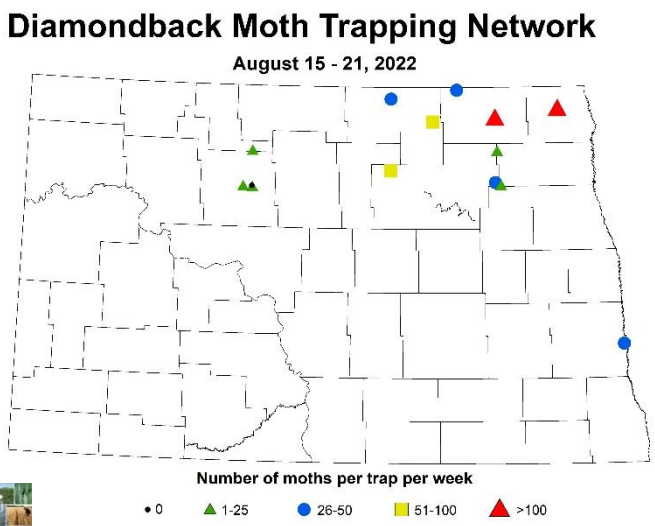
Canola growth stages ranged from 5.1 (seeds in lower pods full size, translucent) to 5.4 (seeds in lowering pods yellow or brown).

Trap catches for **bertha armyworm** continued to decrease, 0-6 moths per trap per week, with 31% of the trap sites capturing moths. Cumulative numbers of bertha armyworm moths per season also were very low, with all trap sites below the economic threshold of >300 cumulative moths per season. **No risk of bertha armyworm in canola this year**.

Trap catches for **diamondback moths** continued to decrease with a total of 581 moths compared to a total of 731 moths last week. Moths were captured at 85% of the trap sites, mainly in eastern ND. Two trap sites located in Cavalier and Pembina Counties had over 100 moths per trap per week.

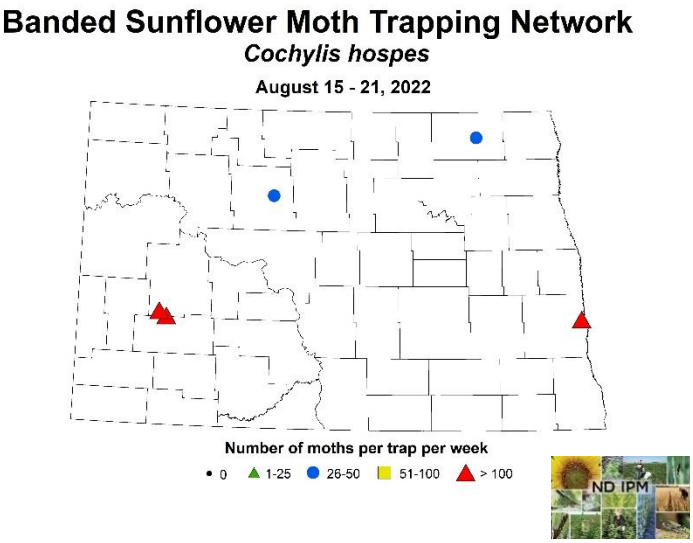
See maps on next page.





Sunflower:
Sunflower growth stage advanced to R4 (bud open ray flowers visible) to R5.9 (90% flowered).

Banded sunflower moth was captured at all trap sites and trap catches ranged from 30-411 moths captured per site. The highest trap site was located in Dunn County with 411 moths per trap per day.
Arthuri sunflower moth was captured at 3 trap sites and trap catches ranged from 0-5 moths per trap per week.
Sunflower head moth was captured at 3 trap sites (1 in Ward County and 2 in Dunn County), but trap catches were low, 3-5 moths per trap per week.



CLEAN UP GRAIN BINS TO REDUCE INSECT PESTS

The key to preventing grain insect problems in grain bins is cleaning empty grain bins and trucks hauling new grains. Any old grain or even dust residue left in the bin is enough for some grain insects to survive and lead to new infestations reducing the quality and salability of your new grains. Bins need to be super clean, completely empty and free of insect-infested grain. Leftover grain should be removed from the bin, and the walls should be swept and vacuumed. All grain handling equipment including augers, combines, trucks and wagons also need to be thoroughly cleaned and grain residues removed before harvest.

After cleaning, be sure to check for any cracks, crevices or holes in grain bins and seal them up. This is how most grain insects get into the bins and storage facilities.

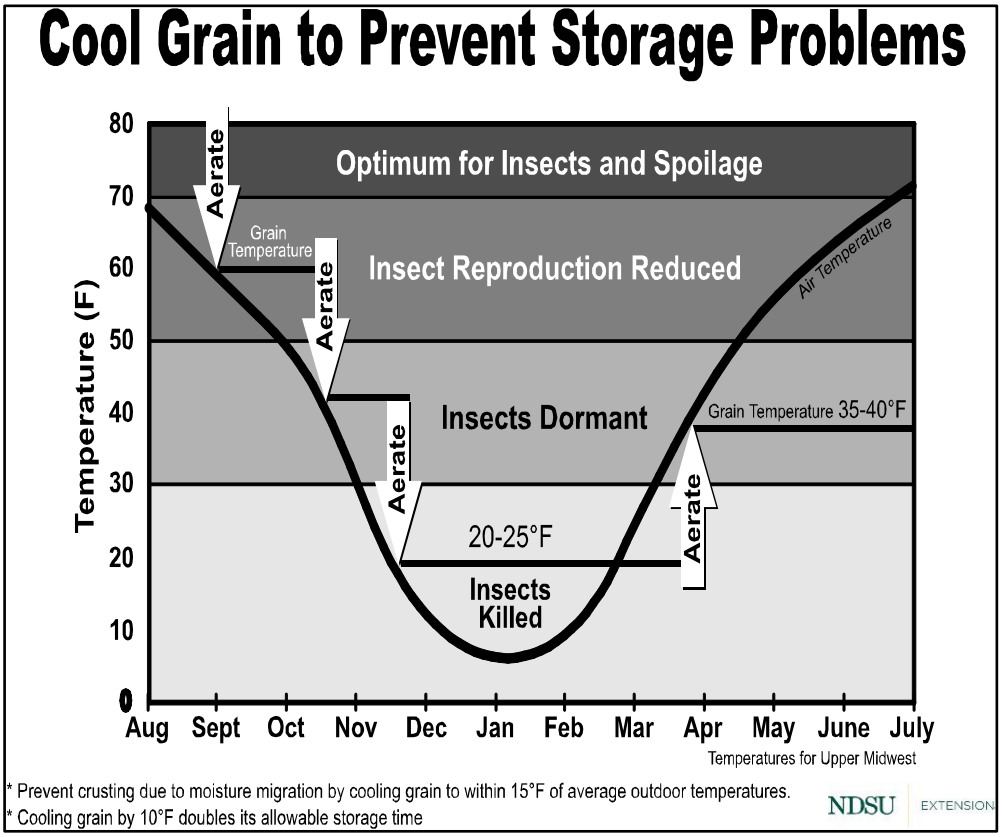
The area outside of the grain bins needs to be cleaned and treated. Remove weeds and vegetation, up to 10 ft border around empty grain bins. Treat the outside surfaces, especially cracks and ledges near doors and fans to prevent insect pests from entering grain bins.

Once the cleaning and repairs are done, it's time to spray a residual bin spray or surface treatment, both inside and outside the grain bin. Some insecticide examples are malathion, Tempo, Centynal EC, Diacon IGR Plus (insect growth regulator + adulticide), or a combination of chemicals. They should be applied to bin surface areas 2 to 3 weeks before new grain is placed in the bin. The treatment will kill insects emerging from their hiding places (cracks, crevices, under floors and in aeration systems). Also, insects crawling or flying in from the outside will be killed. Apply the spray to as many surfaces as possible, especially joints, seams, cracks, ledges and corners. Spray the ceiling, walls and floors to the point of runoff. Use a coarse spray at a pressure of more than 30 lb per square inch and aim for the cracks and crevices.

Indian meal moth – adult (top) and larva (bottom) (James Kalisch, UNE - Lincoln)

Any grain that will be stored for long-term, more than 10 months, should have an insecticide protectant on it to maintain the commodities quality and protect your investment. Cooling the grain to <50°F will keep insects dormant, and temperature < 20-25°F will kill insects (see chart on next page). Please see the stored grains section of the *2022 North Dakota Field Crop Insect Management Guide* for insecticides registered in stored grains.

For additional information, please see Dr. Kenneth Hellevang's NDSU website on Grain Drying and Handling which addresses all aspects of stored grain management, such as cooling grain to prevent insect and spoilage problems



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CORN INSECT TRAPPING UPDATE

European corn borer (ECB) Z-race moths (univoltine) have been decreasing for the past 4 weeks. This week, ECB Z-race and E-race moth (bivoltine) were not detected at any trap sites (see Table 1). Corn crop stages were R4 (dough) to R5 (dent).

Table 1. 2022 pheromone trap catches for European corn borer (ECB) moths in corn, ND (last 4 weeks only)

Area	County	Nearest town	ECB Z-race moths					ECB E-race moths				
			July 27-Aug. 2	Aug. 3-9	Aug. 10-16	Aug. 17-23	Total trap	July 27-Aug. 2	Aug. 3-9	Aug. 10-16	Aug. 17-23	Total trap
EC	Barnes	Cuba	0	0	0	0	0	0	0	0	0	0
EC	Cass	Casselton	0	0	0	0	0	0	....	....	....	0
EC	Cass	Rush River	1	0	0	0	1	0	0	0	0	0
EC	Cass	Grandin	6	0	0	0	6	0	0	0	0	0
EC	Griggs	Cooperstown	0	0	1	0	1	0	0	0	0	0
EC	Steele	Finley	5	0	1	0	6	0	0	0	0	0
EC	Steele	Luverne	0	0	0	0	0	0	0	0	0	0
NC	Ward	Minot	0	1	0	0	1	0	0	0	0	0
SE	Sargent	Gwinner	0	0	1	0	1	0	0	0	0	0
SE	Ransom	Shenford	28	4	2	0	34	0	0	0	0	0
SE	Ransom	Sheldon	44	11	5	0	60	0	0	0	0	0
SE	Richland	Lidgerwood	3	0	0	0	3	0	0	0	0	0
SE	Richland	Antelope	1	0	0	0	1	0	0	0	0	0
		Total moths	**88**	**16**	**10**	**0**	**114**	**0**	**0**	**0**	**0**	**0**

Adult corn rootworms continue to emerge at low numbers at Gwinner (Sargent Co.) and Shenford (Ransom Co.) fields (Table 2). Based on total counts this week, 98% of collected adults were northern corn rootworm (NCR) and 2% were western corn rootworm (WCR) adults. The first NCR also was observed near Rush River, Cass Co. Corn rootworm catches have been slowing down at Wyndmere (Richland Co.) since the first week of August. Corn crop stages were R4 (dough) to R5 (dent).

Table 2. Adult corn rootworms (northern and western corn rootworms) per 4 traps per week in ND field corn, 2022

Area	County	Nearest town	July 20-26	July 27-Aug. 2	Aug. 3-9	Aug. 10-16	Aug. 17-23
EC	Barnes	Cuba	0	0	0	0	0
EC	Cass	Casselton	0	0	0	0	0
EC	Cass	Rush River	0	0	0	0	1
EC	Cass	Grandin	0	0	0	0	0
EC	Griggs	Cooperstown	0	0	0	0	0
EC	Steele	Finley	0	0	0	0	0
EC	Steele	Luverne	0	0	0	0	0
NC	Ward	Minot	0	0	0	0	0
SE	Sargent	Gwinner	0	1	5	12	9
SE	Ransom	Shenford	0	9	2	5	4
SE	Ransom	Sheldon	0	0	1	0	0
SE	Richland	Lidgerwood	0	1	8	9	0
SE	Richland	Antelope	0	0	0	1	0
SE	Richland	Wyndmere	39	144*	53	64	43
		Total corn rootwromm =	**39**	**155**	**69**	**91**	**57**
		Percentage of NCR =	**100%**	**95%**	**97%**	**95%**	**98%**
		Percentage of WCR =	**0%**	**5%**	**3%**	**5%**	**2%**

Economic thresholds (ET) is 14 or more adults (individually or in combination) per sticky trap per week

***Asterisk indicates that particular corn field is at or above ET**

Most fields are below the economic threshold (E.T.) of >2 beetles per trap per day (or >14 beetles per trap per week). So far, only the field near Wyndmere, Richland Co., was above the E.T. with more than two beetles per trap per week four weeks ago. If above E.T., a high corn rootworm population is expected the following year and a corn rootworm management tool will likely be necessary to protect the following year's corn crop.

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plant pathology

UPDATE ON SUGARBEET DISEASES AND PLOT TOUR ON AUGUST 30 IN ANDREA, MN

There have not been many observations of root diseases, such as Rhizoctonia root rot, to date. We have observed some Fusarium yellows and growers are encouraged to identify fields with the conspicuous yellowing of leaves and plan to use available resistant varieties next season.

Over the past six years, Cercospora leaf spot (CLS) was reported as the most damaging leaf disease of sugarbeet in our area. Since 2016, *Cercospora beticola* has developed resistance to many of the individual fungicides used for its control. The pathogen has rendered the quinone outside (strobilurin) fungicides ineffective and the demethylation inhibitor (triazole) fungicides less effective. The non-specific fungicides, namely triphenyltin hydroxide, mancozeb and copper products are used as the main mixing partners to control the fungus on CLS susceptible and resistant varieties.

CR+ resistant varieties.

Over the past four years, research was done in the laboratory, greenhouse and field to better understand how best to use improved CLS resistant varieties, called CR+, to manage Cercospora leaf spot.

CR+ varieties are not immune to Cercospora. They typically have significantly lower disease severity and rather than requiring six to eight fungicide applications during the growing season for disease control, may require one to four fungicide applications, based on environmental conditions, and pathogen population at different times of the season. Research on managing CR+ varieties is ongoing at St. Thomas and Prosper in North Dakota, and Andrea, Minnesota.

Other research that will be highlighted at the field demonstration include the use of higher water volume with fungicides to control CLS; the effectiveness of individual fungicides and fungicide mixtures at controlling CLS; the most effective and economical fungicide mixtures in a rotation program to control CLS; and how best to manage CR+ varieties with timely fungicide applications.

The sugarbeet plot tour will start at 10:00 a.m., August 30 in Andrea, MN. To get to the research site from the intersection of Hwy 75 and 210 in Breckenridge, drive East 11.7 miles on Hwy 210 and turn North on 310th Ave for 2 miles. Continuing education credits credits will be available for Certified Crop Advisors and lunch will be provided at Foxhole in Foxhome, compliments of Betaseed.

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Extension Sugarbeet Specialist
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CORN DISEASE SURVEY OBSERVATIONS

The NDSU Extension Cereal Crop Pathology team had a busy two weeks visiting 110 corn fields in North Dakota. Our preliminary report indicates disease pressure is low this year in corn. The state's most important corn disease (Goss's wilt) was identified in only 17% of the fields and disease levels within fields were low (***Figure 1***). Although conditions were favorable for Goss's wilt (rain storms, high winds, and prolonged dews), I believe the use of resistant hybrids was able to keep the disease in check this year. Other diseases commonly found in fields were common smut and common corn rust and both of these diseases are not considered to be economically important.

Figure 1. A small area of a field with Goss's wilt lesions on the upper leaves.

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CHECK SMALL GRAIN FIELDS FOR ERGOT

I have received a few reports of ergot being observed in both wheat and barley fields. In nearly all of these conversations, the ergot was most noticeable on the edges of the field and the incidence lessened the further they walked into a field. The pathogen infects through female flowers and mimics pollination in small grain crops. In other words, any disruption in pollination will increase the risk for ergot. Ergot can be easily identified in small grain fields that are at maturity. The hard black to purple ergot bodies protrude from florets and can be easily spotted in an amber colored small grain field (***Figure 1***). Ergot body size can vary and be smaller than a wheat kernel or four to five times bigger than a wheat kernel.

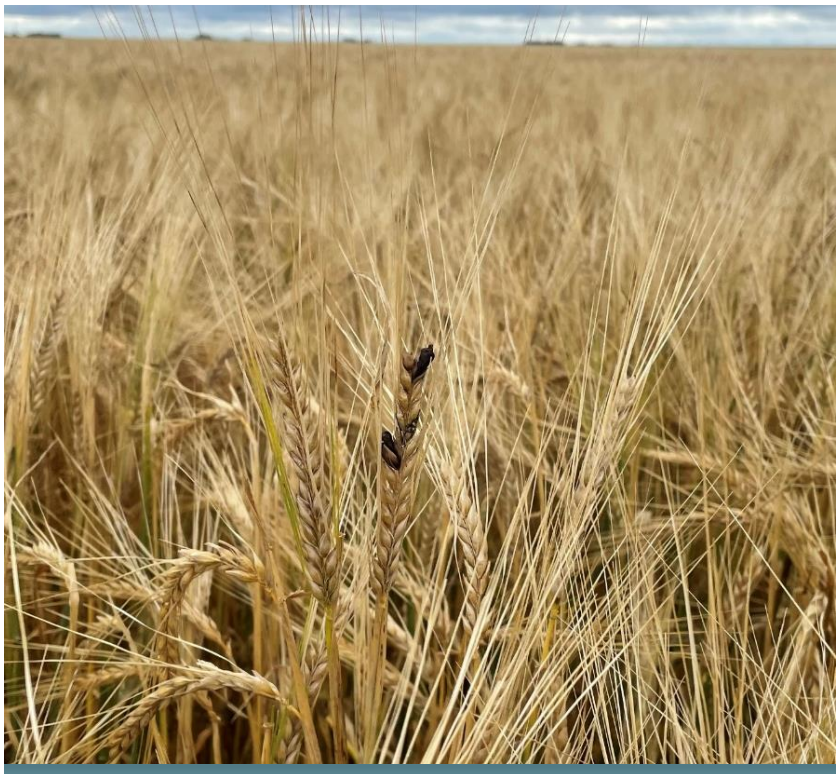

Figure 1. Ergot in barley that was found on the edge of a field.

Ergot is a common disease in North Dakota and our state has over 50 reported grass hosts including wheat, barley, durum, rye, quackgrass, and smooth brome. One of the biggest carriers of ergot is smooth brome (***Figure 2***), which often lines road ditches and section lines in the state. The observations of ergot on field edges is often the result of pathogen transfer from grassy weeds into the small grain field. For example, smooth brome tends to head-out earlier than a small grain field. If a smooth brome spikelet is infected, it will secrete “honey dew”, which is a mixture of sugar and spores. Insects will be attracted to the honey dew and then carry the honey dew into a nearby small grain crop as it is starting to head.

Figure 2. Ergot on smooth brome. Smooth brome is very susceptible to ergot and one of the primary grass hosts.

If you are able to mow or swath grassy hosts on field edges before heading, this will significantly disrupt the disease cycle. In conversations with agronomists across the state, several field edges did not get mowed or swathed this year as an attempt to manage grasshopper movement into fields.

If you see heavier levels of ergot in your field, check to see how far the ergot extends into the field. A harvest strategy can be used for fields with heavier ergot levels on field edges. Harvesting and separating the grain collected from field edges will

reduce the risk of contaminating high quality grain.

Ergot thresholds are determined as the proportion of sclerotia weight per grain weight. The ergot threshold for wheat is 0.05% and 0.1% in barley. For reference, 0.05% in wheat can be as little as 10 ergot bodies in 2 pounds of wheat seed.

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PROTECT YOUR YIELD IN THE FUTURE BY SCOUTING SOYBEANS FOR DISEASES NOW.

Charcoal rot, sudden death syndrome (SDS), brown stem rot (BSR) and soybean cyst nematode (SCN) are all economically important, **and often show up in late August.** Now is the best time of the year to grab a pocket knife, a shovel (or probe), a hand lens and get out in the field. If you find these diseases, management tools are available that may help you protect yield for years to come. Below you will find disease identification resources that will be helpful when scouting the fields.

SOYBEAN DISEASE RESOURCES

I recommend several resources that may help you identify your soybean diseases.

1) The 'Soybean Disease Diagnostic Series' jointly created by NDSU and UMN Extension *specifically for our growing region* was just updated last month (some additional photos, updated prevalence information, one additional disease). All diseases common (and some uncommon) in our region are included in the series, with an emphasis specifically on identification. We thank the North Dakota Soybean Council and Minnesota Soybean Research and Promotion Council for support in the creation of this diagnostic guide.

2) Another helpful local resource is the UMN soybean pest management website. Diseases are separated into leaf, stem and seed/root diseases – and provides important information about symptoms and signs.

3) The Soybean Research and Information Network is a website of the North Central Soybean Research Program (an excellent soybean-checkoff supported multi-state program). This link takes you to the disease page, but information about insects, agronomics and other information can also be found on the site.

4) The SCN Coalition is a public private partnership focused on soybean cyst nematode. This information is excellent, with videos, publications and numerous SCN resources.

5) The Crop Protection Network is a website operated by many Extension plant pathologists from across the soybean growing states. The searchable website includes publications, and image library, and information on numerous soybean, corn and small grain diseases.

CHARCOAL ROT OF SOYBEANS

A few years ago, several fields experienced very severe charcoal rot in the Southeast and East central RRV (***Figure 1***). While we do not have a good handle on how prevalent the disease is, we are fairly certain it is more common that we think. We encourage you to scout for charcoal rot.

Figure 1. Large patches of charcoal rot infected soybean. Photo in Cass County in 2018.

Infection occurs early in the growing season, but is not often observed until after flowering, and is far more severe and obvious when in a hot and dry growing season. The disease is caused by a soil-borne pathogen (*Macrophomina phaseolina*) that infects many crops (corn, sunflower, other legumes, etc..), but we have observed the disease to be most severe in our area on soybeans.

The disease is typically first noticed when patches of soybeans (often large patches) prematurely wilt and die. The leaves will remain ON the wilted and dying plants (***Figure 2***).

Plant tissue on the lower stem and tap root may appear gray or silver and 'peeling' away (***Figure 3***).

If you remove the outer tissue ('shaving' tissue gently with a pocket knife works very well) you will see profuse charcoal-colored specs called microsclerotia (***Figure 4***).

Figure 2. Wilted soybeans with leaves still attached

(***Figures 3 & 4 on Next Page***)

Figure 3. Lower stem tissue 'shaved away',

Figure 4. Lower stem with a dusty gray to silver

SUDDEN DEATH SYNDROME (SDS) OF SOYBEANS

Sudden Death Syndrome (SDS) was first confirmed in the state in 2018 (Richland County), and in 2020 was confirmed hundreds of miles away in Cavalier County. We don't know exactly how prevalent SDS is in the state, but the Richland and Cavalier County confirmations suggest it is more common than we think. Additionally, the severity of SDS is tightly linked to the presence of soybean cyst nematode (see article below). You can certainly have SDS without SCN, but you are more likely to find (and suffer yield loss) from SDS if you have SCN. I suggest you scout areas of your field known to have high SCN pressure.

The pathogen is a soil-borne root rot pathogen (*Fusarium virguliforme*) that can survive for several years. The pathogen infects soybeans soon after planting, and *wet* conditions favor development of the disease. Thus, for infection to occur and disease to develop, soybeans will have had to have *some* moisture. The pathogen will cause root rotting, but more importantly, produces a *plant toxin* that moves up from the root tissue into the rest of the plant. It is the plant toxin that causes the foliar symptoms.

SDS often shows up in fields in oval/circular spots or clusters of plants in a field (***Figure 1***). When the disease is becoming severe, yellow patches of soybeans are often visible from a distance.

Figure 1. Area of a soybean field with Sudden Death Syndrome (Dr. Berlin Nelson).

The first foliar symptoms of SDS are bright chlorotic (yellow) spots that occur diffusely (not connected to one another) between the leaf veins (***Figure 2***). Soon after, necrotic areas between the leaf veins occur, often bordered by a relatively thin yellow halo (***Figure 3***). With time, the necrotic areas coalesce, leaving only the veins of the leaves green. In severe cases, leaves may drop, but petioles will remain attached to the plant (***Figure 4***).

Examination of stem and roots tissue is very important to distinguish SDS from other diseases, particularly brown stem rot (see next article). With a knife, scrape off the outside of the tissue of the lower stem and tap root near the soil line. SDS infected stems have tanning or browning, but the pith (center of the stem) will remain white (***Figure 5***).

Figure 2. A mix of beginning and advanced foliar symptoms of Sudden Death Syndrome (Dr. Berlin Nelson).

Figure 4. Severe symptoms of Sudden Death Syndrome, including leaf drop (note naked petioles) and interveinal chlorosis and necrosis.

Figure 3. Progression of symptoms of Sudden Death Syndrome.

Figure 5. Tan to brown soybean root tissue consistent with Sudden Death Syndrome (Dean Malvick, UMN, extracted from Soybean Disease Diagnostic Series, NDSU Extension Publication-1867).

BROWN STEM ROT OF SOYBEANS (BSR)

Brown stem rot (BSR) is known to occur in the state, although the exact prevalence is unknown. Like SDS, BSR is often more damaging when soybean cyst nematode (SCN) is present. Like many diseases, BSR is favored by short/no crop rotation.

Brown stem rot (BSR) is caused by a fungal pathogen (*Cadophora gregata*) that can overwinter/survive in infected soybean stem residue. Infection occurs through the roots in the spring and moves into the stem, impacting the movement of nutrients and water in the plant.

Foliar symptoms to not always occur with BSR, however, if they do, they often mimic the interveinal chlorosis seen with SDS. Examination of the stem is critical for identification of BSR. Brown stem rot causes a distinct browning of the pith, while the rest of the tissue will appear white and health. The symptom resembles a 'lead in a pencil' look (***Figure 1***).

Figure 1. Lower stem symptoms of Brown Stem Rot (BSR). (Dean Malvick, UMN, extracted from Soybean Disease Diagnostic Series, NDSU Extension Publication-1867).

SOYBEAN CYST NEMATODE (SCN)

Soybean Cyst Nematode (SCN) is the 2,000-pound gorilla in the room. Nationally, SCN is estimated to cause more yield loss then the next three to five most important soybean diseases. And, SCN makes diseases like sudden death syndrome (above) and brown stem rot worse.

Thanks to the *grower-based* SCN sampling program supported by the North Dakota Soybean Council and operated by NDSU Extension, we do have a good understanding of where SCN occurs in the state. High levels of SCN (as measured by egg counts) occur throughout the Southeast and East Central parts of the state, with expanding prevalence occurring in areas to the north and west. SCN reproduction is favored by dry and hot growing seasons, *and* these above-ground symptoms are brought on more by drought stress. I expect to see more 'visible' SCN this year. Please see my next article on the SCN-Sampling Program for details on how to sample and how to interpret the results.

The soybean cyst nematode (*Heterodera glycines*) is a parasitic worm that feeds and reproduces on soybeans, dry beans and a few weed hosts found in North Dakota. Essentially, it's a parasite, and like any good parasite, the objective is not to 'kill' the host (that is somewhat counterproductive for the nematode). Rather, the nematode flourishes when it takes water and nutrients from the roots. Consequently, soybeans that are infected by SCN are difficult to detect by their above-ground symptoms. It's not until they are experiencing yield losses of 15-30% (or more), that they may turn yellow and/or appear stunted (***Figure 1***). You *may* be able to observe the white female cysts on the roots and use of a hand-lens and flashlight helps a lot (***Figure 2***). The cysts are much smaller than a nodule, and when young appear white to cream colored. As they age, they turn brown, and are extremely difficult to see (***Figure 3***).

Consequently, soil sampling is the most effective way to find SCN, and the only way to quantify how bad your infestation is.

Figure 1. Severe damage from Soybean Cyst Nematode

Figure 2. Numerous white-cream colored cysts compared to a much larger nodule

Figure 3. Numerous older brown cysts

2022 SOYBEAN CYST NEMATODE (SCN) SAMPLING PROGRAM BEGINS IN SEPTEMBER

We encourage soybean growers to sample for soybean cyst nematode (SCN) this growing season, and NDSU Extension and the North Dakota Soybean Council are working together again to coordinate a soybean cyst nematode (SCN) soil testing program.

There are three main reasons to soil sample for SCN.

1) It is the best way to identify an infected field (do you have SCN?)
2) It is the only way to quantify how bad your infestation is (how high are your egg levels?)
3) It is the best way to determine how well your management tools are working (are your egg levels changing?).

Anyone interested in soil sampling for SCN can pick up to three pre-labeled SCN soil test bags from their County Extension office. The laboratory fees from SCN samples submitted though the sampling program are covered by the North Dakota Soybean Council. A total of 2,000 SCN soil test bags will be available to growers on a first come first serve basis.

To submit a sample; fill the bag with soil, provide site information, and send the bag to the partner lab (Agvise). *Results will be mailed directly to the submitting growers*. Notably, laboratory fees are covered for samples submitted in the *pre-labeled bags* only, so it is critical to pick them up from the county Extension office.

The egg levels and geospatial positions from previous years samples that were used to generate SCN distribution maps in North Dakota show 'hot spots' in much of the SE and EC part of the state, and movement west and north (***Figures 1 and 2***). In 2022, we will use egg level data and add to the map. Importantly, NDSU does not have access to any personal information – just the egg level and geospatial data to generate a map.

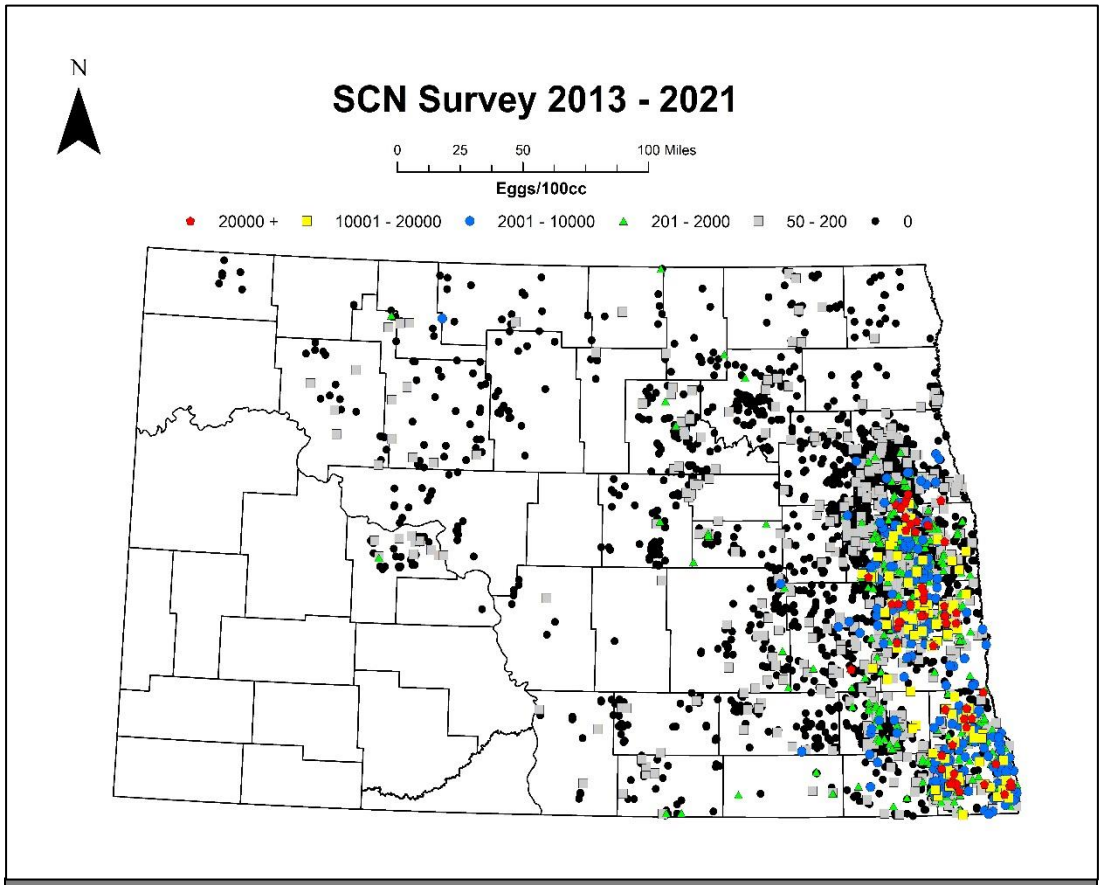

Figure 1. Egg levels in North Dakota from the NDSU Extension – North Dakota Soybean Council grower-based SCN sampling program. Black circles are negatives. Gray boxes (50-200 eggs/100cc) are very low levels, which could be real, or could be false positives. Green triangles (200-2,000 eggs/100cc) are low-level positives. All other shapes and colors are positives of different numbers of eggs/100cc.

(**Figure 2 on Next Page)**

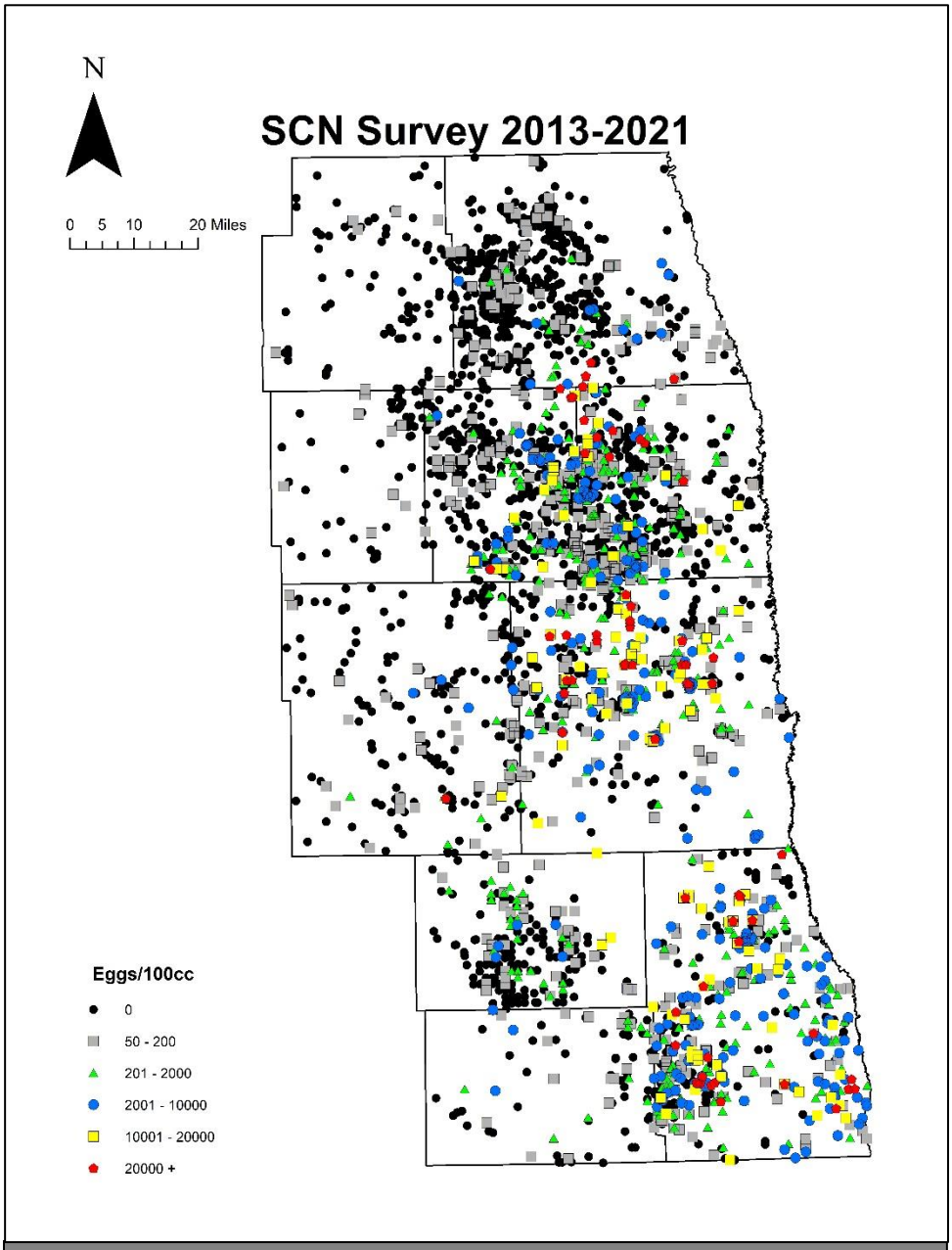

Figure 2. Egg levels in East Central and Southeastern North Dakota from the NDSU Extension – North Dakota Soybean Council grower-based SCN sampling program.

HOW TO SAMPLE FOR SOYBEAN CYST NEMATODE (SCN)

What am I sampling for? SCN is a parasitic nematode that will complete two to three life cycles each growing season. Each female will produce 100-200 eggs, which are protected within her body wall after she dies (called a 'cyst'). When we soil sample, we are measuring the amount off eggs in the soil, which are measured in 100cc (which is approximately 3.4 ounces).

When to sample? The best time to sample is at the end of the growing season; before or after harvest (September/October). This timing of sampling will coincide with the highest egg levels in the soil.

How do I sample? Aim for the roots, sample right next to the plant! You only need to go 6-8 inches deep. Take 10-20 small samples, mix up, and fill soil bag with the composite sample.

What sampling strategy do I use? There are several strategies, depending on the mission. For those who know they have SCN, you can determine how well their management tools are working by evaluating egg levels in the soil. The best strategy to do this is to take soil cores from similar areas in a field and group the samples (**strategies 1 and 2 on Figure 1**). For those who are sampling to determine if they have SCN at all, it is best strategy is to focus on areas when SCN is most likely to be introduced into a field, such as field entrances, shelter belts, and frequently flooded areas (**strategy 3 on Figure 1**).

Figure 1. Three sampling strategies commonly used for SCN. Photo courtesy of the SCN Coalition (www.thescncoalition.com).

Where to sample? SCN moves with anything that moves soil, the nematode loves high pH, and often the plant doesn't show above ground symptoms. Consequently:

Focus on areas that are likely to introduce soil to your field, such as:

- Field entrances (SCN being moved on equipment with soil)
- Low spots where water pools (SCN moving in water)
- Frequently flooded areas (SCN moving in water)
- Along shelter belts or fence lines (SCN moving with wind-dispersed soil)

Additionally, several areas should be considered suspicious for SCN, and can be sampled.

- High pH spots in the field (SCN loves high pH).
- Areas with unexplained low yields (do the beans look fine but yield poorly in a spot?).
- Areas that turned yellow in August (heavy SCN damage may show up as stunted or yellow beans when it is hot and dry late in the season).

How do I interpret the results? Results come back measured in eggs per hundred cc of soil (eggs/100cc). A 100cc is about 3.4 ounces. During the process, samples are diluted and measured in multiples of 50. If the samples are 0, no eggs were found. Sample 50-200 are very low levels and should be viewed as suspicious (but not necessarily confirmed). There are other nematodes laying eggs in the soil, and these are often indistinguishable from SCN. Anything higher than 200 eggs/100cc should be viewed as a positive, and they should be managed. SCN can explode very quickly, so a find of 1,000 eggs/100 cc should be aggressively managed, so it doesn't become 10 or 50 times higher after the next planting of soybeans.

For more information?

The SCN Coalition [www.thescncoalition.com] is a partnership of private companies, universities and soybean checkoff organizations that have rallied together to speak with one voice about SCN. The website contains teaching materials (video, print, grower videos, etc), sampling information, management strategies and much more. Your county Extension agent also is an excellent resource for information.

Sam Markell
Extension Plant Pathologist, Broad-leaf Crops

plant science

WINTER RYE AS A PRECEDING COVER CROP FOR DRY BEAN

Winter (cereal) rye is an excellent cover crop option to consider if dry bean is planned for 2023 following this year's small grain. It will provide benefits when planted this fall and into next spring and early summer.

2020 trial at Carrington REC (late June)

Winter rye is a common cover crop used in North Dakota and has many advantages when properly managed. Expected advantages when established prior to dry bean production, and with timely termination, include reduction in soil erosion, supplement weed management, utilize excess soil moisture and increasing long-term soil productivity.

The NDSU Carrington Research Extension Center conducted a study beginning in the fall of 2017 with the seeding of winter rye to provide living ground cover in the fall and spring prior to pinto bean production. Study objectives included determining optimum time for terminating rye based on bean planting date, assessing weed suppression and measuring productivity of the bean crop. The study was completed in 2021, providing a four-year database on the production strategy.

Findings of the study include:

- Pinto bean seed yield with preplant terminated rye was similar to yield with the conventional-tilled production system check.
- Delay in terminating rye until near or after dry bean planting allowed the rye to deplete topsoil moisture that was needed to timely establish bean plants and negatively impacted bean plant development, canopy closure and seed yield.
- Dry topsoil conditions during early bean plant establishment throughout the years of the study indicate rye termination at least two weeks before bean planting is suggested with similar environmental conditions as experienced in Carrington.
- Delayed rye termination did provide benefits of increased ground cover during the crop season and weed control similar as achieved with pre-emergence herbicides. Weed suppression with rye can be considered another management tool to supplement herbicides and other cultural weed control methods.
- Adequate topsoil moisture during bean planting and plant establishment would allow extended benefits of the live rye cover crop at planting ("green-planted beans") while maintaining seed yield potential.

- Soil moisture status and precipitation forecast should be taken into consideration when determining the best time to terminate rye at a particular location.

Details are available in the NDSU Extension publication A2050 "Winter rye as a preceding cover crop for pinto bean production in North Dakota," which is available online. An additional NDSU Extension publication, A2010 "Growing rye as a cover crop in North Dakota" is available online.

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center

Hans Kandel
Extension Agronomist Broadleaf Crops

2022 SOYBEAN IRON CHLOROSIS RATINGS AVAILABLE

Every growing season, North Dakota State University's soybean breeding program conducts research on the tolerance of soybean varieties to iron deficiency chlorosis (IDC). If producers had IDC in their fields in 2022, they should consider using the NDSU tolerance ratings generated in 2022 and previous years, to select soybean varieties for 2023, to minimize the chlorosis in their fields.

During the summer of 2022, NDSU's soybean breeding program tested 225 Enlist, GT27, Roundup Ready and Xtend soybean varieties, as well as 32 conventional varieties, for IDC tolerance. The test results are based on a replicated trial conducted at a location with a history of IDC. Visual ratings were taken three times during the growing season, at two-week intervals. The ratings were based on a 1 to 5 scale, with 1 indicating no chlorosis and 5 being the most severe chlorosis (**Figure 1**).

Figure 1. IDC iron chlorosis rating scale used to evaluate IDC tolerance.

Genetically soybean varieties differ in how tolerant they are to IDC symptoms. The chlorosis expression differs from field to field and this year the trial location had severe IDC. The data generated is intended to compare varieties against each other for the specific conditions this year. The most tolerant varieties had the lowest IDC rating. This summer's tests showed significant differences among soybean varieties. For example, the average scores for the conventional varieites tested ranged from 2.3 (most tolerant) to 4.4 (the least tolerant variety). The test results for the conventional and Enlist, GT27, RR and Xtend IDC variety tolerance trials are available at https://www.ag.ndsu.edu/varietytrials/soybean.

The IDC symptoms appear as yellowing leaf tissue between the veins while the veins may remain green. In a severely affected plant, the tissue will become brown and tissue may die. Plants with chlorosis are often stunted and growth and development are slow compared to healthy plants. Soybean plants may grow out of the chlorosis and become green again; however, yields are usually reduced due to IDC.

Although IDC tolerance in soybean varieties is important, it is critical to also consider other variety traits and yield. Varieties with similar IDC tolerance can vary greatly in their yield potential.
Most of the Research and Extension Centers in North Dakota conduct soybean variety trials and results will be reported on the NDSU variety trial website and the via the soybean variety selection tool.

Carrie Miranda
NDSU soybean breeder

Hans Kandel
Extension Agronomist Broadleaf Crops

SMALL GRAIN HARVEST BEGINS

Small grain harvest is getting started in eastern North Dakota and is underway in the western part of the state. In the northern third, harvest is likely still a week or two out for most growers. The spring wheat variety trial at Prosper in Cass County isn't quite ready to harvest this week. Later varieties are medium dough while earlier varieties are hard dough, but there is still quite a bit of green in the stems of many plots (**see photo**). Weather permitting, the site will be harvested next week. With wheat harvest starting, growers are advised to be on the lookout for potential issues.

Spring wheat variety trial at Prosper, ND on August 22, 2022.

It is difficult to tell at the moment if reports of wheat lodging are due to the high winds and strong storms that were scattered throughout our region in late July and early August or if Wheat Stem Sawfly (WSS) may be the culprit. If edges of fields are severely lodged, be sure to check the straw for signs of cutting at the base and the presence of wheat stubs sealed off with the frass and "sawdust" created by WSS larva.

Another issue to be on the lookout for is ergot. The fungal ergot bodies (sclerotia) are usually quite visible as large, black-purple protrusions from the seed head, replacing what would have been a seed in that floret. I have observed ergot bodies in weedy grasses like quackgrass around field edges this year. Field edges are likely to have a higher incidence of ergot, so if it is suspected, scout field edges and determine how far into the field the ergot is present. Harvest the interior of the field and keep it segregated from the edges. If possible, delay harvest of the edges as ergot bodies will drop off, but keep in mind this strategy leaves standing grain at risk of getting rained on and losing quality. If a field is badly infested, keep the grain segregated to avoid contaminating the grain from clean fields.

Clair Keene
Extension Agronomist Small Grains and Corn

soils

RELATIONSHIP OF CROP PRODUCTION AND SUSTAINABILITY, IS IT REALLY 'US VS THEM'?

Most people know what 'crop production' is, but the meaning of the term 'sustainability' is fuzzier. In my perspective as a soil scientist, sustainability is the ability of a soil to minimize adverse weather effects on crop production and minimize the crop nutrient inputs required to produce yield. The major driver of sustainability in this definition is keeping topsoil in place.

Although huge amounts of topsoil have been lost in North Dakota, amounting from 2 to 3 feet in most areas, some remnants remain. In some areas of the world that have been cultivated for thousands of years, no topsoil remains. An example is the central loess plateau of China. If fertilized, this region can be incredibly productive. However, it requires half again more fertilizer than what we would dream of applying here. To produce 200 bu/acre corn requires 300 pounds N per acre in this region of China, vs about 180 pounds N per acre here. In Kazakhstan, to produce 25 ton sugar beets with 18% sugar, farmers have to apply at least 200 pound N per acre, vs about 120 pounds per acre here. Part of the reason for greater fertilizer inputs per unit yield where no topsoil is present and organic matter is less than 1 percent of soil weight is the inability of the soil to supply the nutrient. The other part of the reason for higher inputs is the lower resilience of within year and between year weather changes and the lower efficiency of nutrient uptake due to greater stress from poor soil aggregation, water infiltration and water availability through the season.

In terms of nutrients lost when wind blows North Dakota soil away, if the beginning soil organic matter is 3%, each inch of topsoil lost equals a fertilizer equivalent loss of about $800 per acre at 2021 prices. This loss is not reflected directly on a farmer annual balance sheet, but reveals itself in lower yield potential and the need for greater fertilizer input into the future.

North Dakota N fertilizer calculators for spring wheat/durum, corn and sunflower contain a direct N credit for 6 years or more continuous no-till/strip-till/one-pass seeding, amounting to about 50 pounds N per acre. The savings over 20 years of farming in N costs alone would amount to about $600 per acre if N costs were 60 cents per pound N. The long-term credit is due to greater efficiency of N use, and the greater activity of natural asymbiotic N-fixing soil organisms.

Movement to no-till/strip-till/one-pass seeding requires a change not only in planting, but it starts at the combine at harvest, the fall before seeding. Especially at the onset, minimizing residue through baling straw, harvesting corn by not using a chopper-head, leaving sunflower/corn/wheat straw as high as possible, so that the residue managers on the spring planter/seeder have as little residue covering the surface as possible. This results in faster soil drying, faster soil warm-up and it minimizes planter skips.

Crop production and sustainability in terms of soil conservation are excellent partners. Paying closer attention to soil retention including reducing tillage, use of cover crops where helpful, and better residue management will pay dividends in future crop productivity and lower fertilizer input costs.

Dave Franzen
Extension Soil Specialist
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around the state

NORTH CENTRAL ND

Hit and miss moisture fell throughout parts of the north central region over the last week. Even a surprise rumble of thunder or two. At the NCREC, 0.58” of rain was observed since last Monday (August 15th). The following are precipitation observations across the area as noted at local NDAWN stations from August 15th through August 22nd: Bottineau: 0.26”; Garrison: 0.34”; Karlsruhe: 0.69”; Mohall: 0.28”; Plaza: 0.01”; and Rugby: 1.06”. Bare soil temperatures of 77°F were observed on the morning of August 22nd.

Small grain harvest continues to gain momentum, especially south of Minot in parts of Burleigh and McLean Counties. Grasshopper calls are once again building in the crop protection office. Some growers in western North Dakota have made 3-4 insecticide applications to help control populations, however, those populations appear to rebound quickly (***Figure 1***). Please continue to scout for thresholds that may be economic. If an application is needed, you may be able to get by with a boarder application. The summer generation of canola flea beetle also is emerging. Reports are still low in numbers but may be something to note to help forecast what you might see next spring. The adult generation emerging now will be the overwintering population for next year. Population survival will be tied to winter conditions observed over the upcoming winter.

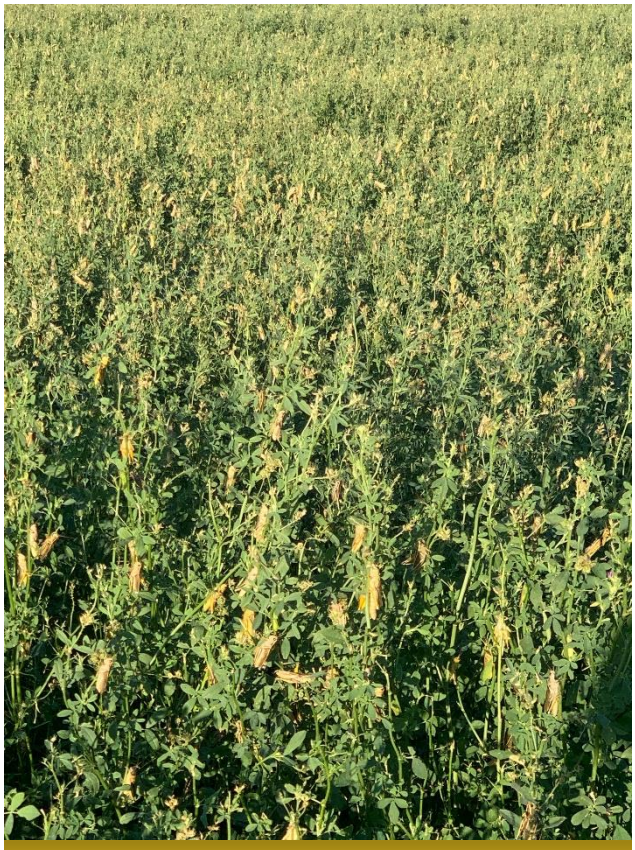

Figure 1. Grasshopper populations impacting alfalfa fields near Ryder, ND. (J. Hansen)

The 2022 IPM scouting season by NDSU Extension has come to an end. I would like to thank the two NCREC based scouts, Alexius Holter and Riley Racine, for all their efforts and hard work over the past summer. Alexius focused her efforts on disease and insect scouting in small grains, soybean, and sunflower in the north central area. Riley checked and maintained numerous insect traps throughout the north central and western parts of North Dakota. Their efforts were very much appreciated over the last few months. I would also like to thank Austin Kraklau, Agronomy Research Specialist at the NCREC. He serves as a weather observer for Ward County. Many of his observations are referenced regularly throughout the season.

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

About 10% of small grains were harvested in the NE region with average yields of wheat ranging from 30-60 bu and barley running between 80-120 bu. The quality of both wheat and barley were reported as good. The rest of the fields are turning color and harvestings will follow in two weeks (***Figure 1***).

Corn is looking good in this region, ranging from R1 to late milk stage with average stage at early milk. Concerns of Corn making it to maturity continues as we are getting close to the end of August. Goss's Wilt has been reported from a corn field in Ramsey County (***Figure 2***).

Last week rains helped soybeans, dry beans, potatoes and sugarbeets as moisture stress was showing up in some sandier soils. Soybean aphids continue to show up in low numbers and hot spots in a few counties. However, some fields are close to R5-R6 stages and may pass the susceptible stage of insecticide treatment before the numbers reach the threshold.

Most of the canola is done flowering and is at pod development stages. Field peas are getting closer to harvest. Sunflowers ae the best-looking crop in the NE region, with many of the fields at 60% flowering stage. Again, producers are concerned about sunflowers making it to maturity before frost.

Alfalfa yielded two cuttings this year with a possible third cut if they can make it to Labor Day weekend without a frost.

Grasshoppers continue to feed and cause damage in corn and soybeans (***Figure 3***).

Figure 1: A ripe wheat field and a field turning color in Cavalier County (Anitha Chirumamilla, Extension Cropping Systems Specialist, LREC)

Figure 2: Goss's wilt in corn. (Lindsay Overmyer, ANR Extension Agent, Ramsey County)

Figure 3: Grasshopper feeding damage in Corn. (Jeff Stachler, ANR Extension Agent, Griggs County)

Anitha Chirumamilla
Extension Cropping Systems Specialist
Langdon Research Extension Center

NORTHWEST ND

The northwest counties received few rain showers in the past two weeks. Most of the rain fell on the 17th of August, with scattered and limited rain shower events happening a few days prior. Williston, Watford City, and Charbonneau were fortunate to receive total rainfalls of 0.53, 0.32, and 0.22", respectively. NDAWN stations recorded total rainfalls of 0.08 – 0.17" in Burke county (Bowbells and Noonan), 0.09 – 0.19" in Divide county (Crosby, Fortuna, and Grenora), 0.0 – 0.32" in McKenzie county (Arnegard, Charbonneau, Hawkeye, and Watford City), 0.01 – 0.04" in Mountrail county (Crane Creek, Rat Lake, and Ross), and 0.0 – 0.53" in Williams county from August 8th to August 22nd. High daytime temperatures in the low and high 90s happened on the 8th, 14th, and 21st while low daytime temperatures in the high 60s and in the 70s occurred on the 9th through 11th. Nighttime temperatures in the 50s and in low 60s in the past two weeks.

Harvesting of winter wheat is complete. Field pea harvesting continues. Harvesting of lentils just started in the past week with some areas having lentils in the R6 to R7 stages. Most of the canola fields are mature; only a few canola acres are at stage 5.2 to 5.4. Safflower are approaching maturity. In some fields, spring small grains are being harvested but considerable acres are still at ripening stage, anywhere from milk to hard dough. Most corn fields are at R2 to R4. Sunflowers are at R4 to R5.9. Most soybeans are in the R4 to R5 stages. In some areas, harvesting of flax has started, but most flax fields are at ripening stage, when capsules are brown, stem and upper leaves are yellow.

Crop yields were across the board, with earliest planted crops having the best yields. Lentil yields were 15 to 25 bushels. Field pea yields were 32 to 50 bushels. At the WREC's dry land farm, spring wheat yields were in the low 30s. One irrigated flax field located a few miles south of WREC yielded an average of 65 bushels. At the Nesson valley research farm, initial spring wheat and barley yields were 60 and 90 bushels, respectively.

In this corner of the state where there's less moisture during the growing season, dry sandy soils, and predominantly no till systems, effective weed control can be a bit of a challenge in some places, especially when herbicide options are limited. For the most part, I've seen less weeds in fields planted to corn, canola, sunflower, and small grains, although it wouldn't take long to find kochia, common lambsquarters, pigweeds, foxtails, wild oat, or barnyard grass in the field.

In other crops, some weeds stand out, especially when controls were not as effective due to various factors (i.e. drought conditions, weed size, temperature at time of herbicide application, herbicide resistance, etc.).

Kochia has been most prominent in open spaces and thin crop stands, and in fallow or prevent plant field situations (***Figure 1A***). Russian thistle has been problematic in dry sandy fields (***Figure 1B***).

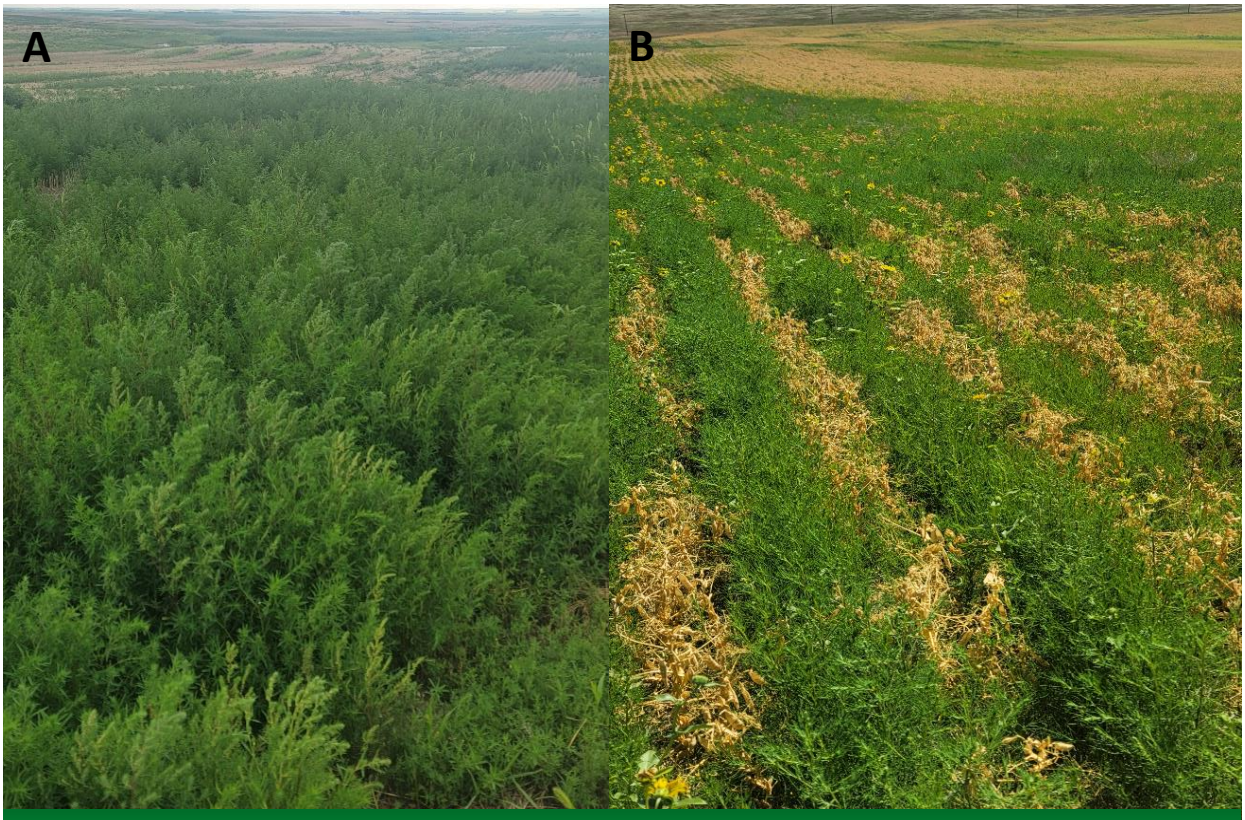

Figure 1. Kochia soaking all the nourishment it can get from a fallow or prevent plant field (A) and Russian thistle thriving in a dry sandy field planted to peas.

In no till soybean, green foxtail has been most prominent (***Figure 2***).

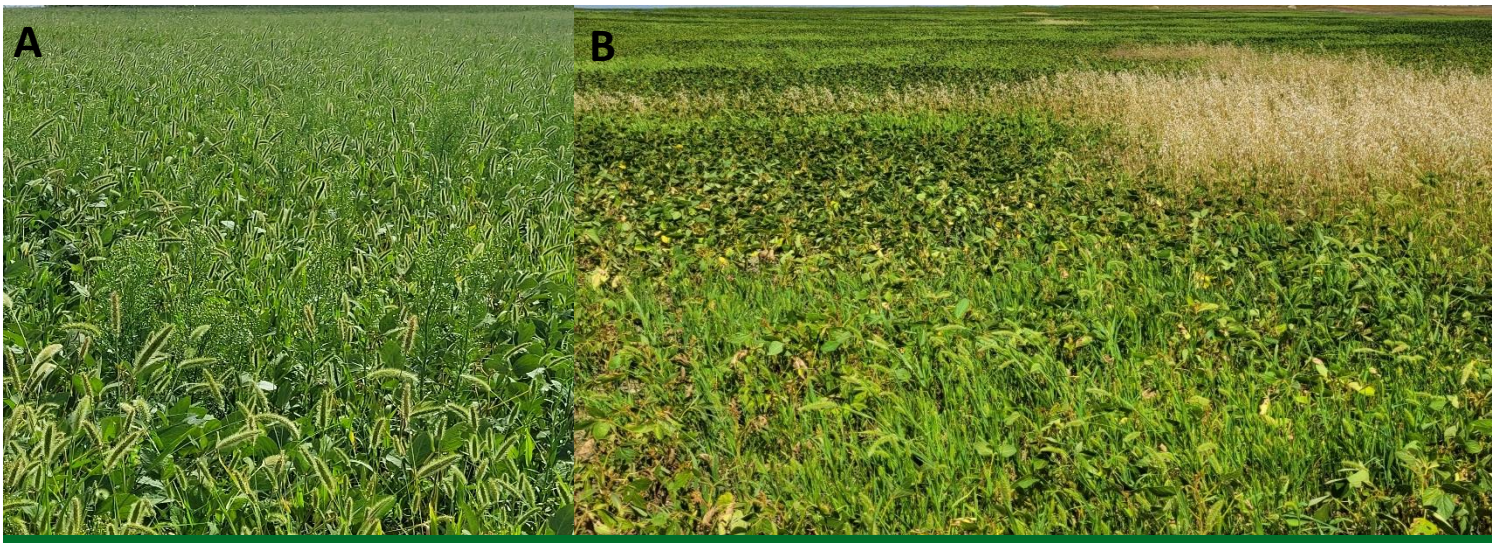

Figure 2. A no till soybean field with high green foxtail density and some horseweeds (A) and a sandy soybean field with high green foxtail density and few large patches of wild oat (B).

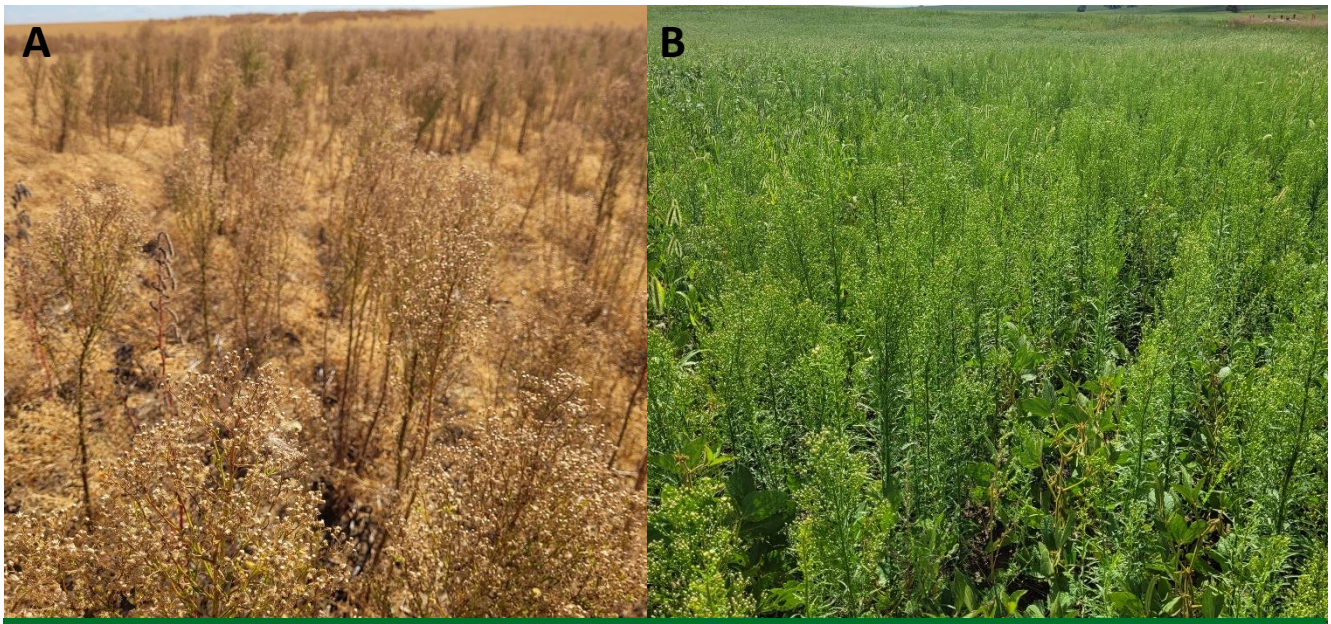

Figure 3. A desiccated lentil field (A) and a no till soybean field (B), both with high densities of horseweed.

Horseweed has also been problematic, not only in field peas but also in lentil (***Figure 3A***) and in soybean fields (**Figure 3B**). Tough and problematic weeds in certain fields this year will have to be controlled at some point before or after harvest, in the fall, and in front of the rotational crop. Not letting weeds go to seed is key to keeping herbicide-resistant and adapted weed biotypes at low the frequencies in the field, to delay resistance development, and to prolong the utility of existing herbicide chemistries, at least for another year.

Charlie Lim
Extension Cropping Systems Specialist
NDSU Williston Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

According to NDAWN, the region received 1.2 inches (Courtenay; Stutsman County) to 3.9 inches (Lisbon; Ransom County) during July 1 to August 22. The region's average daily water use by corn and soybean (plant emergence on May 31) was slightly less than 0.25 inch during Aug 16-22. Row crop plant moisture stress is becoming more common (***Figure 1***).

Figure 1. Soybean field in Stutsman County displaying various levels of plant moisture stress.

Harvest continues in the region with early seeded spring grain. Corn generally ranges from milk to dough (R3-4) stages. Soybean are in the seed development (R5-6) stages.

Dry bean are in the seed development to physiological maturity (R5-9) stages (***Figure 2***). Sunflower are blooming to early seed development (R5-6) stages (***Figure 3***).

Figure 2. Windbreaker pinto bean planted June 2 at CREC at physiological maturity (R9 stage).

Figure 3. Sunflower with wilted ray flowers (R6 stage) invaded by grasshoppers.]]

<u>Upcoming Carrington REC crop tours</u>:
*Corn (Fingal area) - August 31, 8 a.m.
*Row Crop (CREC) - September 1, 4:30 p.m.

Farmers, crop advisers and agricultural industry representatives are invited to view field research trials and receive production recommendations on corn, soybean, dry bean and sunflower at the annual **row crop field tour** on Thursday, Sept.1, at NDSU's Carrington Research Extension Center.

Registration begins at 4 p.m. with educational exhibits and refreshments. The tour begins promptly at 4:30 and includes the following subjects:

- Late-season corn plant development and management.
- Soybean variety selection tips.
- Dry bean variety performance.
- Sunflower plant establishment, sclerotinia head rot management and blackbird feeding reduction tools.
- White mold management in soybean and dry bean – fungicide efficacy and application methods including timing and spray droplet size.
- Cover crop management for row crops.

Crop, pest, and soil and water management continuing education credits will be available for certified crop advisers participating in the event.

A supper will follow the tour sponsored by North Dakota commodity organizations.

For more information about the tour, visit www.ndsu.edu/agriculture/ag-hub/events/carrington-rec-row-crop-tour or call the Carrington center at 701-652-2951.

Greg Endres
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NDSU Carrington Research Extension Center

weather

WEATHER FORECAST

The August 25 to August 31, 2022 Weather Summary and Outlook

The temperatures over the past week were mostly above average with some locations well above normal (**Figure 1**). Eastern North Dakota into northwestern Minnesota, in particular, continue to need temperatures to be above average to get enough growing degree days (GDDs) to finish off some of the crops before the first freeze. The rest of August looks to finish above average for temperatures, not necessarily every day, but taken as a whole.

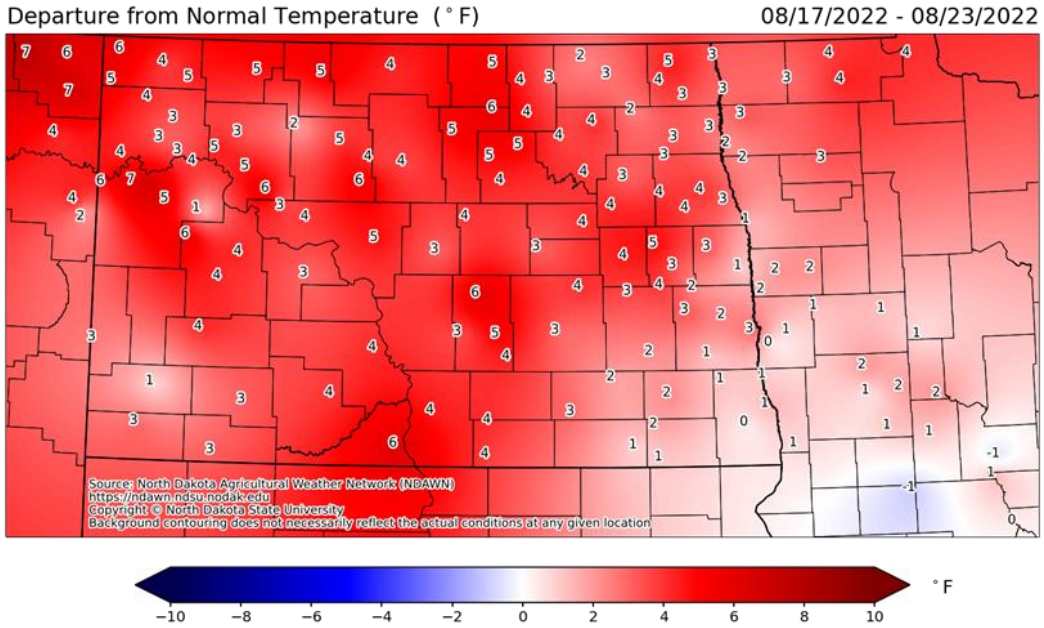

Figure 1. Departure from Normal Temperature at NDAWN Stations for the Period of August 17 through August 23, 2022

We have tended to be in a pattern with rain systems on Tuesday and Friday for the past few weeks. The abundant rains in parts of northeastern North Dakota into northwestern Minnesota were associated with thunderstorms last Thursday night into Friday and again this week on Tuesday evening into early Wednesday morning **(Figure 2**). Not everywhere, but I would not be surprised if some locations record thunderstorms again this Friday with some other disturbances creating hit and miss storms early next week as well.

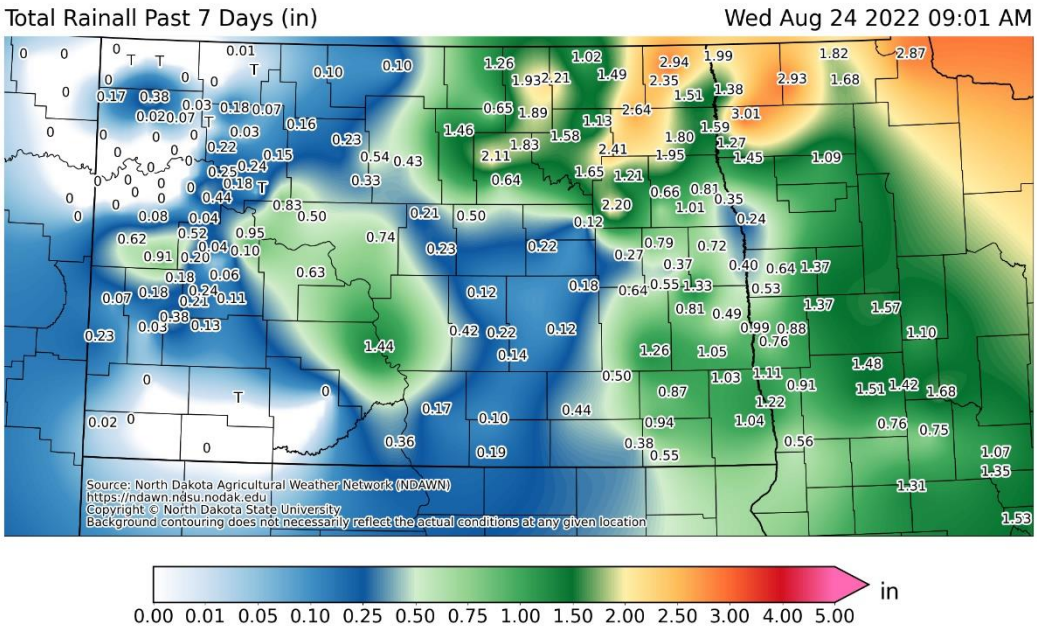

Figure 2. Total rainfall for the 168-hour period ending at 9:00 AM on August 24, 2022 at NDAWN stations

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.

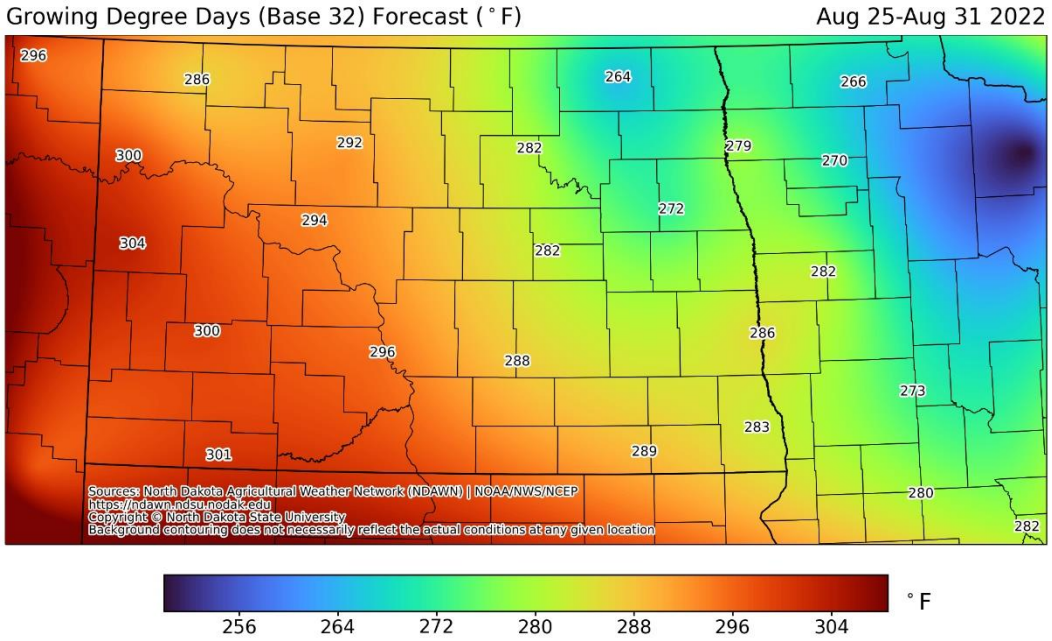

Figure 3. Estimated growing degree days base 32° for the period of August 25 to August 31, 2022.

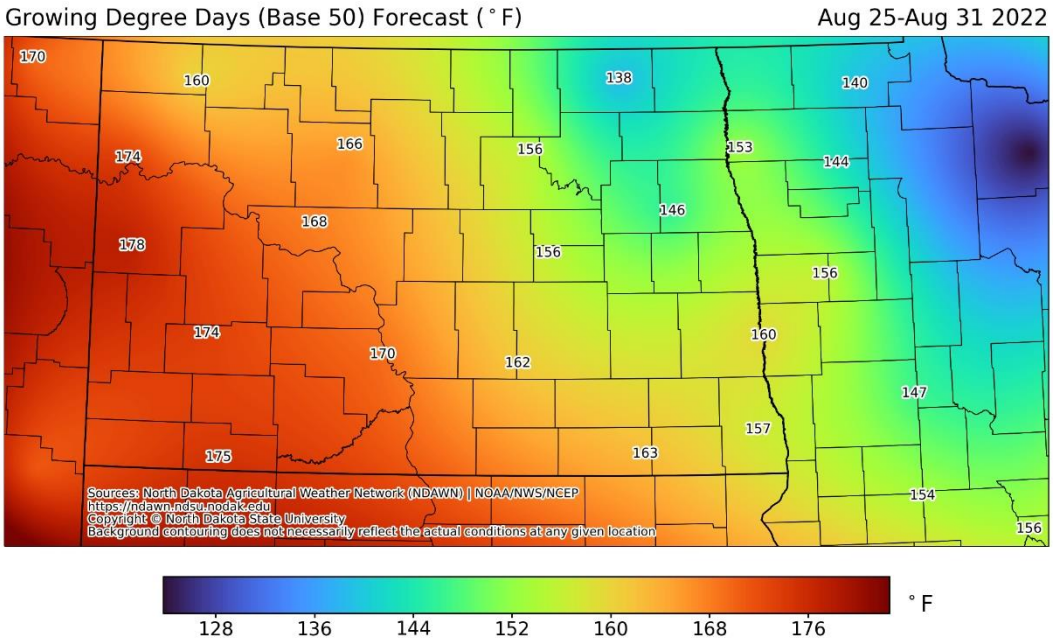

Figure 4. Estimated growing degree days base 50° for the period of August 25 to August 31, 2022.

Using May 15 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

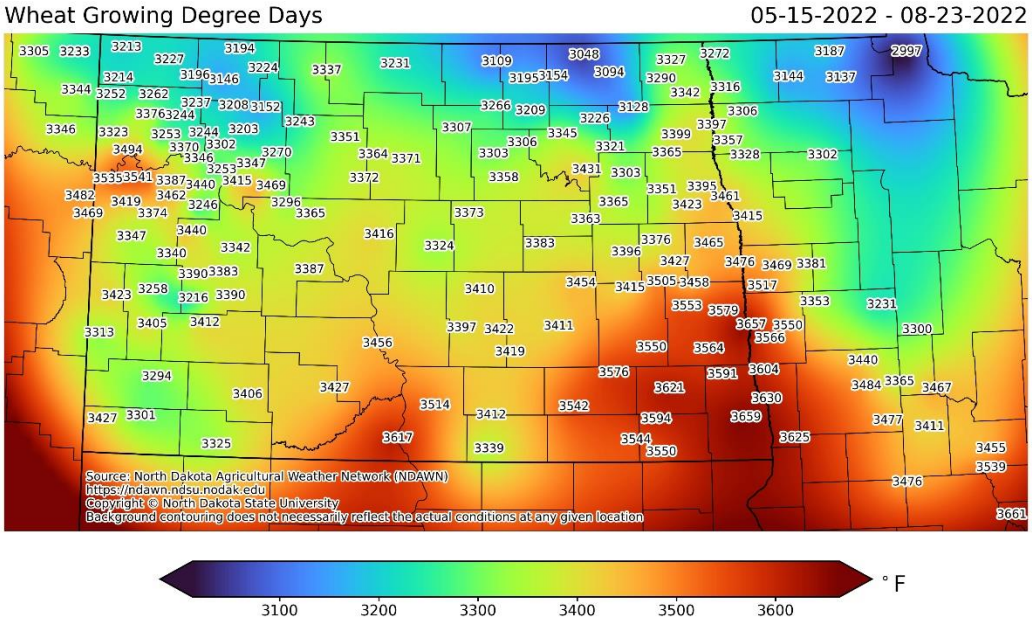

Figure 5. Wheat Growing Degree Days (Base 32°) for the period of May 15 through August 23, 2022.

Using May 20 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.

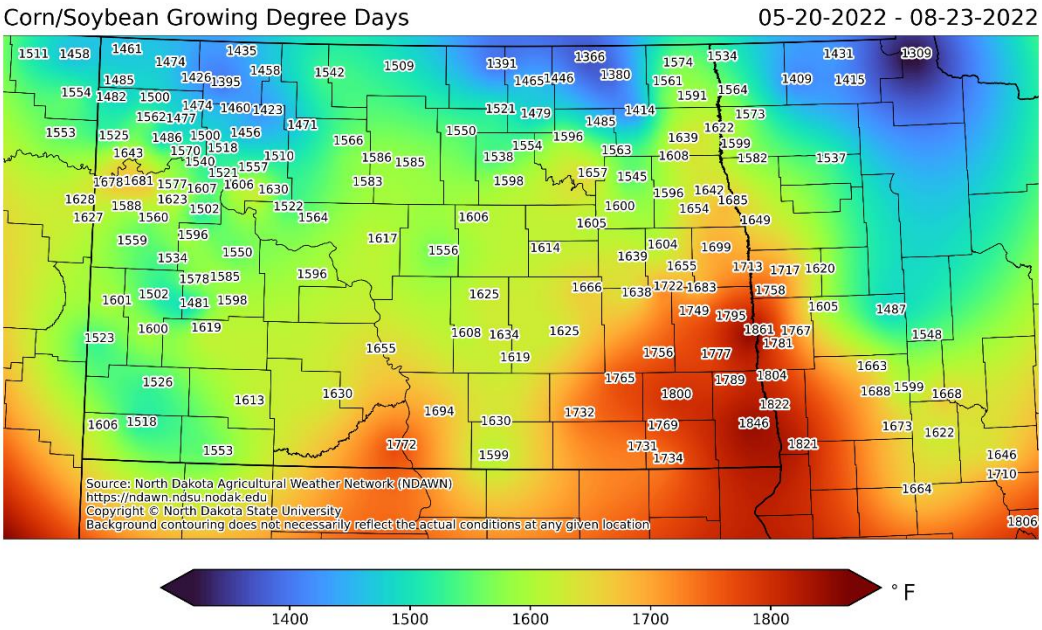

Figure 6. Corn Growing Degree Days (Base 50°) for the period of May 20 through August 23, 2022.

Soybeans also use base 50° like corn, but NDAWN has a special tool for soybeans that, based on your planting date and cultivar, you 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

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EXTENDING KNOWLEDGE ❯❯ CHANGING LIVES

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