North Dakota State University
CROP & PEST REPORT
NDSU EXTENSION

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entomology

KEEP INSECTS OUT OF STORED GRAINS

Confused flour beetle (Tribolium confusum) infesting wheat (Clemson University, USDA Cooperative Extension slide series, bugwood.org)

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.

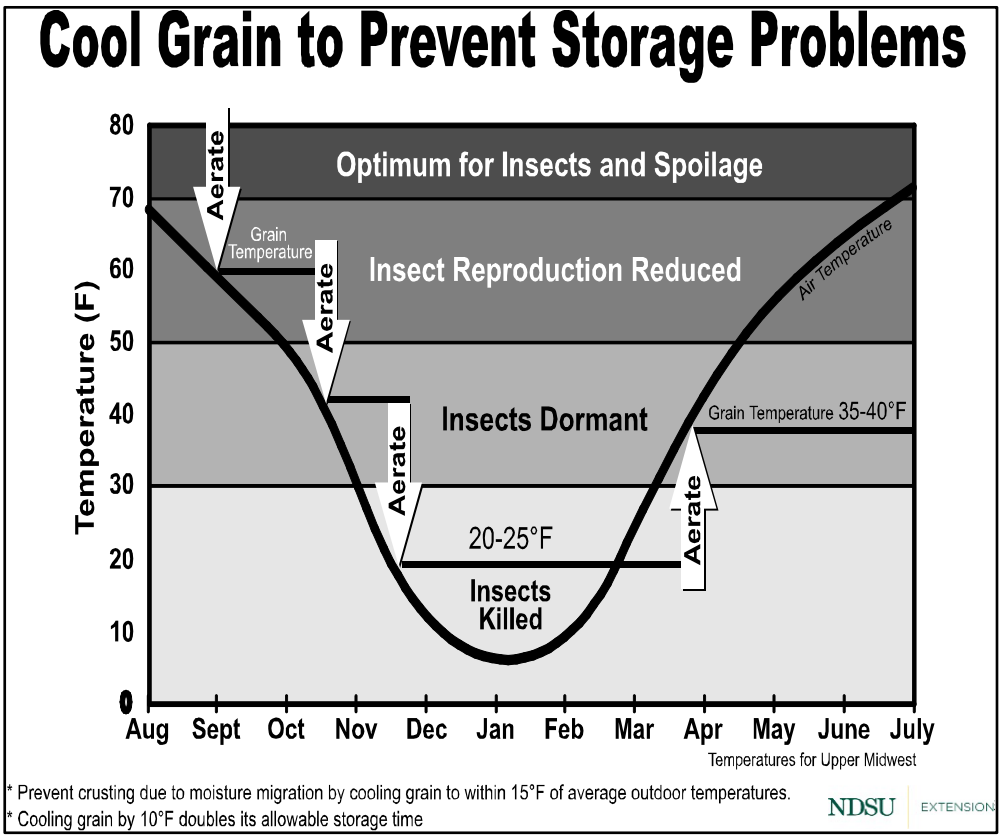
The area outside of the grain bins needs to be cleaned and treated. Remove weeds and vegetation, up to 10 ft border around empty grain bins. Treat the outside surfaces, especially cracks and ledges near doors and fans to prevent insect pests from entering grain bins.

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 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.

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). Please see the stored grains section of the *2023 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 below 50°F to prevent insect reproduction and spoilage problems.



WHEAT STEM SAWFLY GROWER SURVEY

If you haven't had time to complete the wheat stem sawfly survey on pest management practices due to harvest, it is still available for your valuable input. This short survey will help us to better understand where the wheat stem sawfly is distributed across the Midwest region, and determine current practices related to its mitigation on farm yields and profits. Even if you are not currently impacted by the wheat stem sawfly, we still need your help to better understand this pest which is impacting the Midwest.

If you are the primary operator of a farm located in MT, WY, CO, NE, SD, ND, MN, IA, or KS, we encourage you participate in this survey. Participation will require approximately 30 minutes of your time.

Please follow this link to the survey, or use the QR code to access the survey.
https://ssp.qualtrics.com/jfe/form/SV_dciiOcMQk0QVgqO

Janet J. Knodel
Extension Entomologist

plant pathology

OVERVIEW OF SOYBEAN CYST NEMATODE (SCN) – THE MOST IMPORTANT BIOTIC PROBLEM OF SOYBEAN

Soybean Cyst Nematode (SCN) is the 2,000-pound gorilla in the room, and it continues to slowly expand in ND. Nationally, SCN is estimated to cause more yield loss then the next three to five most important soybean diseases, combined.

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. The nematode can survive for many years, and is thought to commonly go through two to three life cycles in our climate annually. The cycle begins when nematodes infect soybeans early in the season. The females will swell as they fill with eggs, and eventually their body will 'pop' out of the roots and die; this is what we call a 'cyst'. The cyst is a very study structure that protects the eggs, and can last for many years. Each cyst will commonly have 100-200 eggs, so multiple that by three cycles in a season, and you have the potential for a very explosive population.

Figure 1. Severe damage from Soybean Cyst Nematode, which appears only as a general area of yellow and stunted soybeans.

SCN is a parasite, that depends on the host (soybean or dry bean) for its own survival. Like any effective 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; a hand-lens and flashlight helps a lot (Figure 2). They 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 (see articles below).***

If found, SCN can be managed, but it takes time. The objective is to keep your egg levels low. In North Dakota, we have a couple advantages (and maybe a disadvantage as well) when it comes to preventing or managing SCN. First, most ND growers likely don't have SCN yet (the SE is maybe an exception). SCN moves only when soil is moved. While we can't control soil movement by wind-blowing or flood water, we can be careful about introducing SCN on equipment. Cleaning off equipment before bringing it to your farm (especially if it is coming from an area of known infestation) will help prevent the spread. Second, many ND growers have lots of good rotation options, and the only crop hosts of SCN are soybean and dry bean. Rotation to any other crop will help reduce SCN egg levels. Genetic resistance is important and can be very effective, and resistant options are available. However, nearly all our resistance soybeans have the same source of resistance (PI88788) and some varieties are not as effective as we would like. For those that have SCN and have access to soybean varieties with Peking resistance, it is a powerful tool that they should seriously consider. Many seed treatments are also available and can be considered; data is continually being generated on their suitability and efficacy.

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

Figure 3. Numerous older brown cysts.

THE 2023 SOYBEAN CYST NEMATODE (SCN) SAMPLING PROGRAM HAS BEGUN

The North Dakota Soybean Council (NDSC) and NDSU Extension SCN soil sampling program makes it easy for ND growers to soil sample for SCN, *and the NDSC will cover all the laboratory fees.*

The program was initiated a decade ago, and approximately 5,000 samples have been submitted. The program has given all of us a very good idea of where, and how, SCN is expanding (Figure 1 and 2).

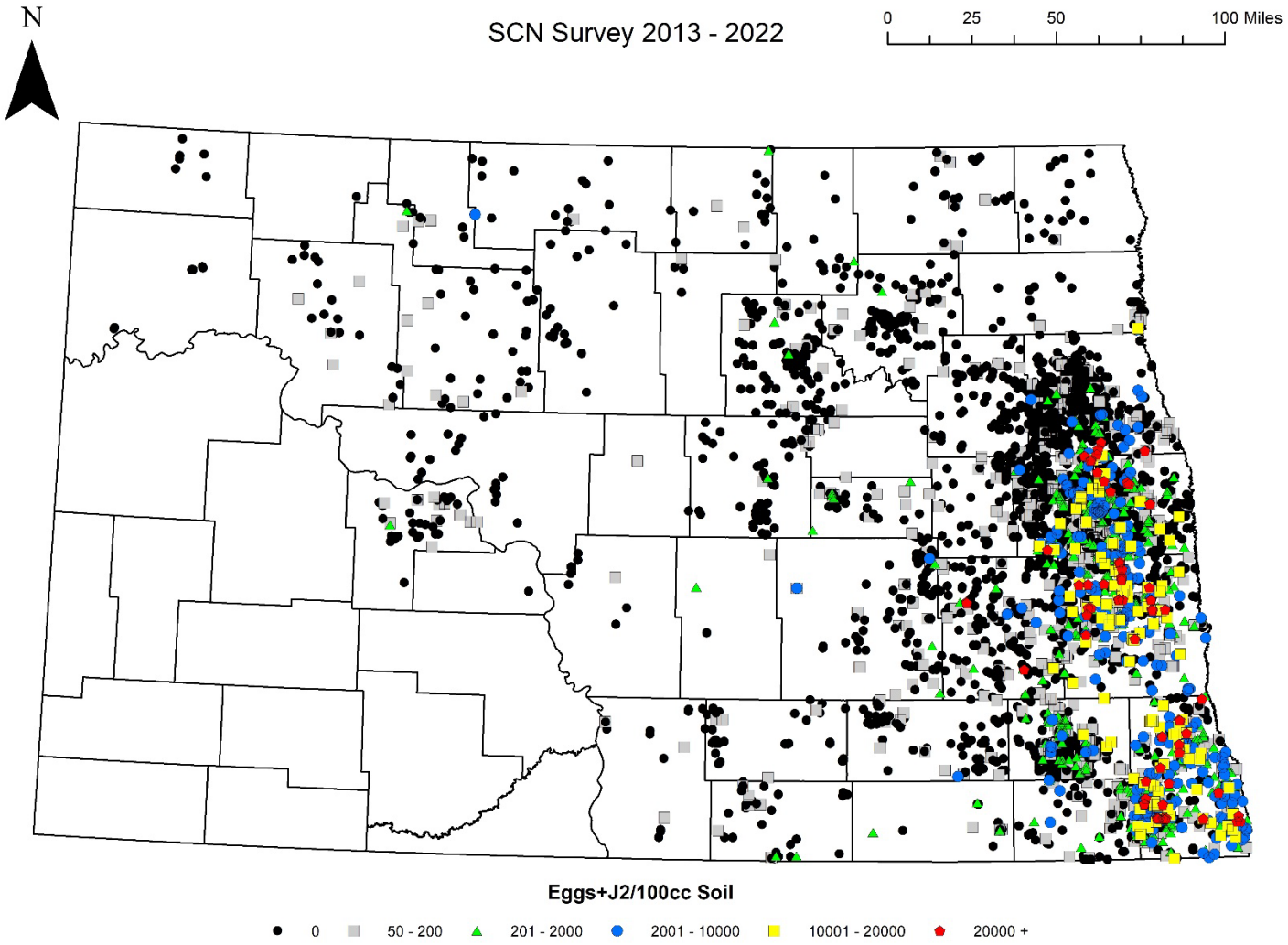


Figure 1. Egg levels in North Dakota from the NDSU Extension – North Dakota Soybean Council grower-based SCN sampling program. Black circles are negatives. Gray boxes (50-200 eggs/100cc) are very low levels, which could be real, or could be false positives. Generally, I would call these 'inconclusive'. Green triangles (200-2,000 eggs/100cc) are clear low-level positives. All other shapes are positives of different eggs/100cc, with blue being high, yellow being very high and red being extremely high egg levels.

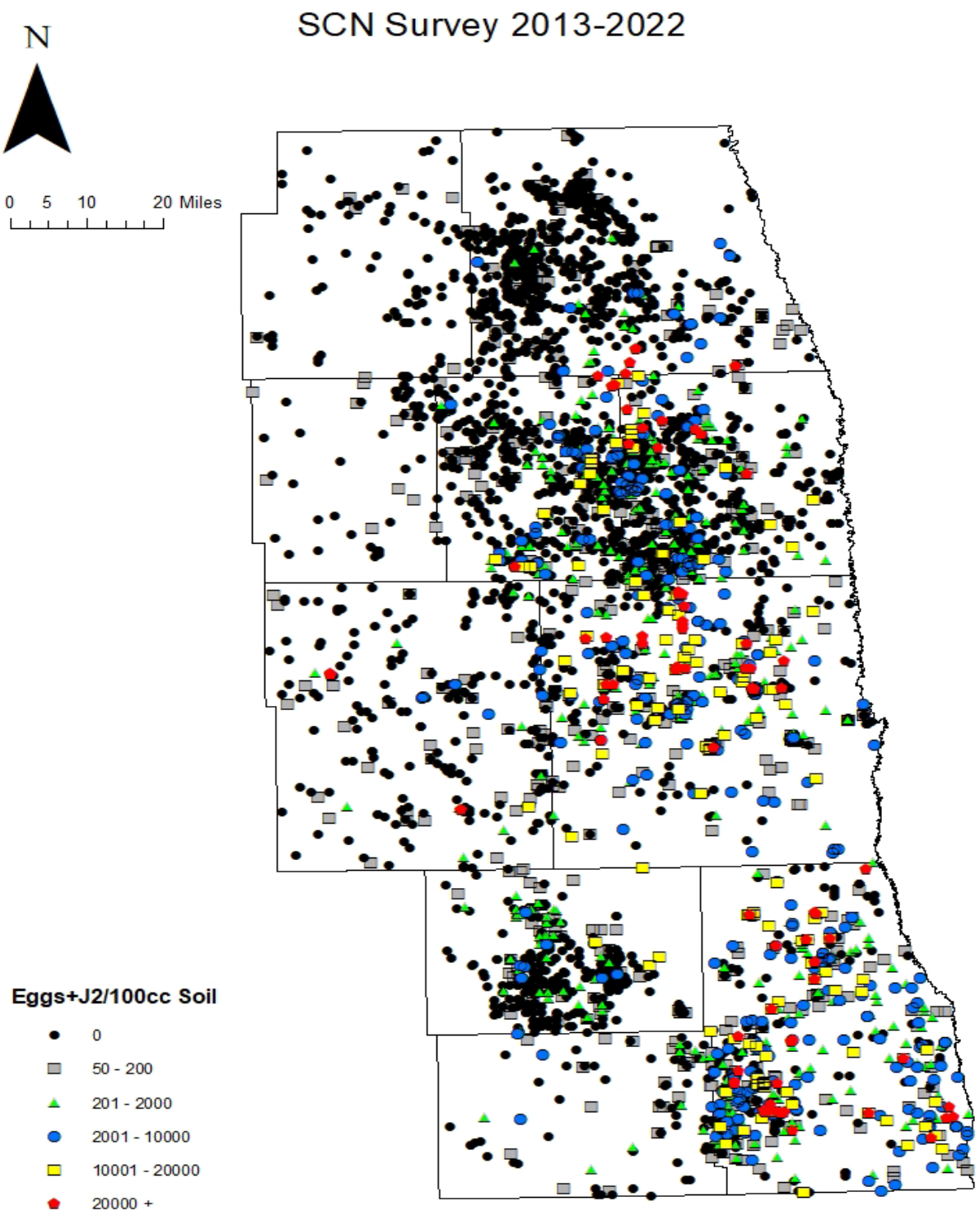


Figure 2. Egg levels in East Central and Southeastern North Dakota from the NDSU Extension – North Dakota Soybean Council grower-based SCN sampling program.

To participate, pick up to three pre-labeled SCN soil test bags from any 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 1,000 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 2023, 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.

HOW DO I SAMPLE FOR SCN?

Short answers…. End of the season, aim for the roots, 6-8 inches deep, and mix 10-20 cores per bag. However, the field locations/strategies vary depending on whether you know if have SCN or not.

What am I sampling for? It's helpful to remember you are sampling for a parasite that lives on the roots. They are found primarily in the top 6-8 inches of soil, they move when soil moves, they are often found in 'hot spots' (areas where they cluster in high levels), and they adapt! When we soil sample, we are measuring the amount of SCN eggs in the soil, which are measured in 100cc (which is approximately 3.4 ounces). We want to sample where the eggs are!

When to sample? The best time to sample is at the end of the growing season; before or after harvest until the ground freezes (September/October). This will coincide with the highest egg levels found in the growing season, and will give you the best chance of getting useful information for the future.

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?

Don't know if you SCN, or have received previous negative results? For those who are sampling to determine if they have SCN, focus on areas when SCN is most likely to be introduced into a field (strategy 3 on figure 1). Keeping in mind that SCN is a living organism and moves when we move soil, I would recommend that you 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)

OR, focus on suspicious areas, such as:

- Unexplained yellow areas in fields (sometimes resembling IDC) that often show up in August.
- Areas with unexplained low yields (do the soybeans look OK but yield poorly in a spot?).
- High pH spots in the field (SCN loves high pH).
- Lighter soils (SCN damage is often higher in lighter and drier soils).

Figure 1. Three sampling strategies commonly used for SCN. Photo courtesy of the SCN Coalition

Do you have SCN already? 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 is to take soil cores from similar areas in a field and group the samples (strategies 1 and 2 on Figure 1). Understanding your egg levels, and monitoring over time, is the most effective way to determine if your genetic resistance, rotation strategies and/or seed treatments are effectively managing the problem.

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/inconclusive (but not necessarily confirmed). This is because there are other nematodes laying eggs in the soil, and these are often indistinguishable from SCN. Anything higher should be viewed as a positive, and, it should be managed. SCN can explode very quickly, so a 500 could easily become 5,000, 10,000 or more after the next planting of soybeans.

WANT MORE INFORMATION ON SCN?

More detailed information about SCN and SCN sampling can be found at the 2022 NDSU Extension publication "Soybean Cyst Nematode", available here: https://www.ndsu.edu/agriculture/sites/default/files/2022-04/pp1732.pdf

The most comprehensive resource for SCN is The SCN Coalition [www.thescncoalition.com]. The SCN Coalition 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 videos, sampling information, management strategies and much more.

Lastly, ND Extension agents are very engaged in the SCN Sampling program and are an excellent resource for more information.

Sam Markell
Extension Plant Pathologist, Broad-leaf Crops

plant science

CORN CROP CONDITION AND YIELD ESTIMATION

I was on the road around eastern North Dakota the week before Labor Day to check corn fields and do yield estimates. Highly variable is still the best way to describe crop conditions in the state. In many counties I drove past corn fields that looked fair to good from the road and within half or 1 mile, I could find corn fields that I would characterize as poor or extremely poor. Some fields are so drought stressed that they have very small or no cobs and can only serve as silage, though low-quality silage at best. Much of the nutritional content in corn silage comes from corn ears, so chopping corn with small or no ears results in a generally low-quality feed source. At the NDSU corn variety trial locations in south east ND, I counted kernels and estimated yields ranging from 120-170 bushels per acre in better looking fields. My estimates were 80-120 bushels per acre in the more drought-stressed locations. I also noted that stalks seem to be generally thinner than normal (due to drought stress) and found patches of root-lodged corn, most likely due to rootworm feeding in fields with continuous corn production. If you note that your corn stalks seem to be thin, go out and push against the stalks at chest height to test their strength. If stalks break or are easily pushed over, be aware of the potential for late season stalk breakage and lodging issues as the crop dries down. I also noticed low-levels of corn smut at most locations, again an indicator of drought stress during pollination as the corn smut fungus is able to get a foothold in silks that fail to get pollinated. Even though common corn smut is unsightly, it does not negatively affect yield and cannot be treated with a fungicide. Your best management plan is to rotate the field out of corn, which will also help address any rootworm issues.

Included here are photos of corn ears I sampled while on the road. The first is a drought-affected ear showing evidence of poor pollination and kernel set due to water stress. The second is a much better-looking ear from a plant that was not as stressed during pollination and early grain fill.

I also want to highlight an up-coming opportunity to learn more about intercropping, cover crops, forages, and the new perennial small grain Kernza. The NDSU Plant Sciences Department will be hosting a **Cover Crop, Intercropping, and Soil Health Field Day on Tuesday, September 19th from 9:00 am to 3:30 pm Central Time**. The morning session will be at the Hickson research site 15 miles south of Fargo. Attendees must provide their own transportation to and from Hickson. A free lunch will be served at noon on the Fargo campus and the afternoon sessions will all take place at the main campus agronomy research plots. You can attend the morning or afternoon session but are encouraged to come to both! For more details and to register for a lunch, please visit our event page: https://www.ndsu.edu/agriculture/extension/events/ndsu-cover-crops-intercropping-and-soil-health-field-day
If you have any questions about this event, please contact Dr. Marisol Berti or myself, Dr. Clair Keene. See you there!

Clair Keene
Extension Agronomist Small Grains and Corn

SULFUR FERTILIZATION- FALL OR SPRING?

In the general theme of 'good agronomy is seldom convenient', fertilization with sulfur (S) is part of this discussion. Ideally, one would hope that a logistical asset would be the ability to apply a S source in the fall to save the application logistics in the spring. However, S sources are only used by crops in the sulfate form ($-SO_4^{2-}$), which is an anion, and does not 'stick' to clay and organic matter like K or ammonium ions. If we have any fall rains, or snow melt like this past spring, or early spring rains, the sulfate will move to a deeper depth, perhaps out of the root zone completely, or just deep enough to harm the plant developmentally early in the season. One of the most severe S deficiencies I have dealt with was on a Fargo soil along the Durbin road SE of Casselton a number of years ago. Anions leach in clay soils, too. Then the question is 'how about elemental S?' Elemental S has to oxidize to sulfate to be taken up by crops. The most efficient oxidizers are *Thiobacillus sp* and other S bacteria, which perform best at very low pH; below pH 5. At pH values experiences in most of North Dakota and the region, performance of these bacteria would be very poor. In addition, relying on information from a soil survey of S oxidizing organisms conducted in south Saskatchewan about 25 years ago the number of S oxidizing bacteria and their activity is very low. The most active S oxidizing organisms in the survey were fungi, that did not oxidize S out of necessary metabolic function, but as rather an 'after-thought'. In every S trial conducted in North Dakota and the region over the past 30 years, the rate of elemental S oxidation was very low; not zero, but very low. Think about what might happen (and does happen) when elemental S is applied early fall before the S is required by say spring wheat. Some S oxidizes, then the late fall rains come, it freezes, there is snow, it melts, it rains in the spring, and the sulfate leaches, and what do you have left? Elemental S. It oxidizes very slowly, and the crop suffers because it might not have enough to supply the crop when the crop needs it.
The up-shot of all this is that despite the logistics behind a spring S application as ammonium sulfate, a spring ammonium sulfate application for small grains, corn, canola, potato and perhaps other crops if experiences has shown that certain fields or parts of fields are susceptible, is the way to success.

UPDATED NORTH DAKOTA NITROGEN CALCULATOR AVAILABLE

The North Dakota Nitrogen Calculator has been updated within the past couple days. It now includes an N calculator for 2-row malting barley, as well as updated calculator using data from 2020-2023 for corn and spring wheat/durum. To

proceed, delete your present ND Nitrogen Calculator from you IPhone or Android, and upload the new 'ND Nitrogen Calculator' onto your phone.

Dave Franzen and Honggang Bu

Dave Franzen
Extension Soil Specialist
701-799-2565

UAS REMOTE ID REQUIREMENT BEGINS SEPTEMBER 16, 2023

Beginning September 16, 2023, all Unmanned Aerial Systems (UAS) required to be registered with the FAA will also require remote identification capability. A drone cannot be legally flown on or after September 16, 2023, whether for recreational or commercial purposes, without remote ID capability[1].

What is Remote ID?
Remote ID is the ability of a drone, while in flight, to provide identification and location information that is receivable by a broadcast signal. Think of it as a digital license plate for drones.

Why is Remote ID needed?
Remote ID holds drone pilots responsible for their drone operations. Also, the FAA considers Remote ID an essential component for integrating drones into the National Airspace System. Remote ID requirements are governed by FAA Part 89.

Does my drone have Remote ID capability?
Maybe. Drone manufacturers have been anticipating this requirement and building drones with factory-installed Remote ID. Check your drone using the FAA UAS Declaration of Compliance[2] lookup tool. You may need to install a firmware update to activate Remote ID on your drone.

Can I install Remote ID on a drone that lacks factory-installed remote ID?
Yes. First, purchase and install onto your drone an FAA-compliant Remote ID Broadcast Module. Then, update your drone's registration with the FAA. Expect to pay $300-400 for a broadcast module.

Where can I find more information?
See the FAA UAS Remote Identification[3] website.

Footnotes
[1] There are a few exceptions. For example, drones weighing less than 0.55 lbs and flown under the FAA's Exception for Limited Recreational Operations, or drones flown within an FAA-recognized identification area (FRIA). However, the exceptions are highly unlikely to apply to an agricultural use case.
[2] https://uasdoc.faa.gov/listDocs
[3] https://www.faa.gov/uas/getting_started/remote_id

Rob Proulx
Extension Agriculture Technology Systems Specialist

around the state

NORTHEAST ND

Most of the region received a good amount of rain on the Labor Day ranging from 0.7 to 1.54 inches. While the rain might help some late sown crops that are inching towards maturity, it might not help majority of the crops that are at or passed the physiological maturity. On the other hand, this untimely rain halted the small grain harvestings. Approximately, 70-85% of wheat and barley acres were harvested with yields ranging from 30-100 bu/acre. Some of the farmers commented that they had the best yields ever from some of their fields. In general, most of the farmers were surprised to see above average yields for the little amount of moisture we received. Test weights are good too but protein levels were comparatively low this year. Some canola acres were swathed while others are being sprayed for straight combining. Soybeans are dropping leaves or turning color. Late season diseases such as brown stem rot and white mold are showing up in soybeans. Farmers are encouraged to test their soybean fields for soybean cyst nematodes by taking advantage of a free-soil sample analysis program sponsored by the North Dakota Soybean Council, see article on pages 4-8. Contact your local County Extension agents for sampling bags and instructions. Dry beans are getting ready to be harvested next week. Corn is at denting stage and sunflowers are at R7-R8 stages. Reports of waterhemp infestations in ditches have been confirmed in Cavalier County.

Waterhemp found in ditches in Cavalier County Photos: Bailey Reiser, ANR Extension Agent, Cavalier County

Anitha Chirumamilla
Extension Cropping Systems Specialist
Langdon Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

The past week and including Labor Day weekend provided cooperative weather for harvest of early seeded crops. Commercial field reports from farmers and crop advisers consistently indicate generally favorable spring grain yield and good-excellent quality.

The region's row crops are rapidly advancing toward maturity with expectations of very good seed yield. At the Carrington REC, our first-planted corn trials (May 12) have accumulated 2010 growing degree day units as of September 4. This amount is about 190 units ahead of the long-term average for this period. The CREC's dryland dry bean variety trial, consisting of 40 varieties and experimental lines, was planted May 25 and reached physiological maturity during August 18-September 1.

The wet day of September 5 will delay harvest for several days, giving you opportunities. Besides handling harvested grain and maybe field equipment repairs, this period can also be used to scout soybean and dry bean fields for disease and weeds. Note diseases including white mold and phythophthora (soybean) as preliminary plans are made regarding future crop sequences and variety selection. Soil samples can also be obtained for SCN, see articles on pages 4-8. Single plants or small patches of pigweeds (waterhemp and Palmer Amaranth), kochia or other herbicide-resistant weeds should be pulled, removed from the field and destroyed. Larger patches should be mowed (to reduce seed production) or isolated and later destroyed to prevent seed distribution throughout field during crop harvest.

CREC dryland dry bean variety trial (August 28).

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center

North Dakota State University
CROP & PEST REPORT
NDSU Dept. 7660; PO Box 6050
Fargo, ND 58108-6050

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Janet Knodel
Co-Editor

Entomology
701-231-7915

Plant Sciences
701-231-7971

Soils
701-231-8881

Sam Markell
Marcia McMullen
Co-Editors

Plant Pathology
701-231-7056

Weeds
701-231-7972

Ag Engineering
701-231-7261

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