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entomology

SOYBEAN GALL MIDGE – 'TENTATIVELY' CONFIRMED IN ND

Two gall midge flies are associated with soybeans: the soybean gall midge, *Resseliella maxima* Gagné, and the white-mold gall midge, *Karshomyia caulicola* (Coquillett). **The soybean gall midge is a new economic insect pest of soybeans**, which first was reported causing yield losses in Nebraska, Iowa, and South Dakota soybean fields in 2018. This pest also was detected in Minnesota in 2018 and Missouri in 2019. The known distribution of soybean gall midge continues to expand in the five infested states, and infestations in South Dakota and Minnesota border southeastern North Dakota.

We recently were alerted to a possible soybean gall midge in a soybean field near Gwinner, Sargent County, by Brandon Schulzetenberg, Centrol Crop Consulting. After looking at the pictures of 'larvae in the stem lesion' (***Figure 1***) and the lack of white mold infection in the field, we quickly visited the field. After 8 hours of scouting, we finally found one stem with a lesion on the field edge that had about 10 tiny white to orange-reddish larvae. **The infestation was obviously very low due to the difficulties in finding one midge-infested stem.** The lesion was located mid-plant, which suggests that this was the second generation of soybean gall midge. Larvae were collected and carefully placed in a 95% alcohol vial, and then sent to Dr. Justin McMechan's laboratory at the University of Nebraska for DNA testing on whether it is a positive match for soybean gall midge or white-mold gall midge. DNA results are pending for soybean gall midge. However, the DNA results for the white-mold gall midge were negative.

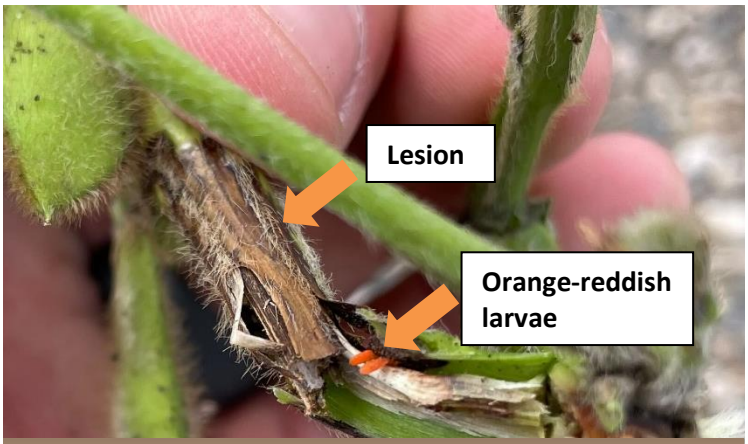

Figure 1. Soybean stem infested with 'suspect' soybean gall midge larvae from Sargent County, ND (B. Schulzetenberg, Centrol Crop Consulting)

NDSU Extension Entomology has been proactive in surveying for soybean gall midge since 2019. A total of 78 fields in 11 counties in 2019; 605 fields in 47 counties in 2020 and 588 fields in 48 counties in 2021 were surveyed. All fields were found negative in 2019, 2020 and 2021. In 2022, we surveyed 435 soybean fields in 45 counties for soybean gall midge that were negative pending the 'tentative' confirmation for the one field in Sargent County.

What to Do if You Find Suspect Soybean Gall Midge in North Dakota - If you happen to find white or orange larvae in the stems of soybeans, you need to confirm whether it is the soybean gall midge or white-mold gall midge. Collect more than 10 larvae and place them in alcohol vials, or collect two to three plants with larvae and place them in a plastic bag. Notify and send collected samples to the Extension agent in your county or to NDSU Extension Entomology for further identification. For more information, see the NDSU Extension publication on ***Soybean Gall Midge and White-mold Gall Midge in Soybean E2006***.

Integrated Pest Management (IPM) of Soybean Gall Midge - Because the soybean gall midge is a newly discovered insect pest, entomologists have been studying different integrated pest management strategies in the infested states. Studies on planting dates, host plant resistance, crop rotation, tillage and insecticide control for this pest are being conducted in states with economic populations. For more information, see the websites on soybean gall midge that summarizes the IPM research:

- Soybean Gall Midge, Soybean Research and Information Network
- Midwest Soybean Gall Midge Discussion Series, University of Minnesota Extension
- Soybean Gall Midge Alert Network, University of Nebraska Extension

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HESSIAN FLY PROBLEMS IN WHEAT

Hessian fly was observed infesting spring wheat near Olga in Cavalier County. They were weakening the stems causing some to break or lodge usually right above the second node. Most stems were broken, with 1-2 flaxseed-like maggots (***Figure 1***) but some stems had as many as 6 maggots (Source: Jeremy Sauer, AgriVantage Crop Consulting). The field had a significant infestation, almost 5% of heads were lodged or not harvestable. Northwest Minnesota also reported high pressures of Hessian fly near the Beltrami area and the least amount of pressure in the fields closest to Crookston (Source: Dr. Jochum Wiersma, UMN).

Figure 1. Flaxseed stage of the Hessian fly (A. Chirumamilla, LREC)

Hessian fly prefers wheat (all types – spring, winter, durum) as a host. Other hosts are barley, rye, triticale, winter rye, and winter barley. In addition, several wild grasses (quack grass, ryegrass) can be infested by Hessian fly as well as volunteer wheat.

Hessian fly has two ***generations per year in the Northern Great Plains.*** The fall flaxseed stage larvae that we are seeing now will pupate and then the second-generation flies emerge in late August into September. Female flies search for suitable hosts to lay eggs in like winter wheat, volunteer wheat, rye cover crops, grassy weed hosts and other seeded grass crop in the fall.

Larvae will hatch from the eggs in 3 to 10 days and feed on the plant for two weeks developing into the flaxseed stage. They overwinter in the flaxseed stage. Fall planted grass crops that are infested with Hessian fly are stunted, and plants will generally die in the four-leaf stage during the winter. Next May, adult flies will emerge and females will lay eggs in spring planted grass crops to continue their life cycle.

Some sustainable pest management strategies include:

- **Choose suitable cover crops that are not known hosts of Hessian fly.**
  Do not use wheat, barley, or rye as cover crops in areas with severe Hessian fly populations, since they are favorable to their reproduction and feeding. Oats are less favorable to Hessian fly egg laying and feeding. However, Hessian fly appears to be adapting to rye since it is commonly planted as a cover crop and available in the fall for egg laying.
- **Destroying volunteer wheat in spring before planting and planting winter wheat after the Hessian fly dates: after September 1-15 in the northern ND and after September 15-30 in the southern ND.** By destroying the volunteer wheat and planting winter wheat later, the life cycle of Hessian fly is broken. As flies emerge, there is no place for them to lay eggs.
- The high labeled rate of insecticide seed treatments on wheat (Cruiser and Gaucho) can be used at planting time to reduce Hessian fly infestations. Research has shown that a pyrethroid insecticides applied shortly after wheat emerges (at or before the two- to three-leaf stage) have been effective against Hessian fly. If applied at the right time, a pyrethroid insecticide kills adult flies and may also kill young larvae before they become embedded behind the leaf sheaths. However, insecticides are rarely warranted in ND due to typical low populations of Hessian fly.

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2022 IPM CROP SURVEY – WHEAT AND BARLEY

The IPM (Integrated Pest Management) Crop Survey helps ND farmers, crop consultants, and ag audiences stay up-to-date on important diseases and insect pests of wheat and barley grown in North Dakota. Eight IPM scouts and insect trappers operated out of the Dickinson Research Extension Center, the North Central Research Extension Center (Minot), the Carrington Research Extension Center, the Langdon Research Extension Center, the Williston Research Extension Center, and the Fargo Agricultural Experiment Station. The NDSU IPM scouts were:

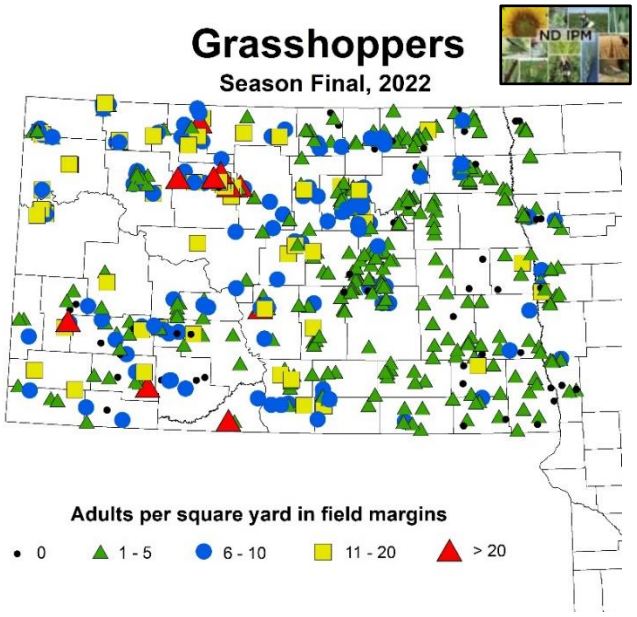
- **Carrie Nichols**, central and south-central counties, worked out of Carrington REC with Greg Endres
- **Breanna Hosman**, southwest and west central counties, worked out of Dickinson REC with Ryan Buetow
- **Alexius Holter and Riley Racine**, north central counties, worked out of NCREC in Minot with Travis Prochaska and Leo Bortolon
- **Scott Roseth**, northwest counties, worked out of Williston REC with Charlemagne Lim
- **Tommy Crompton**, southeast and east central counties, worked out of NDSU campus, Fargo with Janet Knodel, Pat Beauzay, Andrew Friskop and Sam Markell
- **Nancy Feil and Raelyn Klindt**, northeast counties, worked out of Langdon REC with Anitha Chirumamilla, and Benson County Extension Office with Scott Knoke.

NDSU IPM field scouts surveyed a total of 636 wheat fields (winter wheat, hard red spring wheat, durum wheat) and 110 barley fields for 18 diseases and 6 insect pests in North Dakota. The survey started on June 1st and continued through August 18th. Crops were surveyed from the 2-leaf stage (seedling) through ripening stages. IPM survey data/maps provided near real-time pest information to North Dakota farmers and others in agriculture to assist with scouting and pest management decision making. Pest maps from the 2022 IPM Survey in North Dakota were uploaded weekly onto

the NDSU IPM website. Some of the insect pest highlights for wheat and barley are summarized below. For diseases, see the "Plant Pathology" section of this CPR.

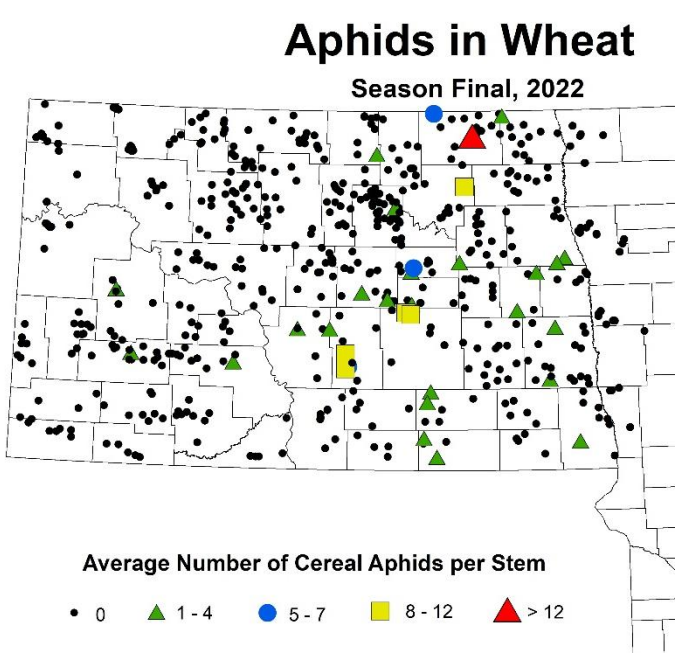
Grasshoppers – Grasshoppers were surveyed for in all crops including wheat, barley, soybeans, and sunflowers. Adult grasshoppers were observed in 90% of the fields surveyed. This shows high populations of adult grasshoppers over the last five years: 91% in 2021 and 2020, 86% in 2019, 75% in 2018 and only 36% in 2017. The number of adult grasshoppers per 4 sweeps (1 yd^2) ranged from 0 to 69. The highest densities of grasshoppers were observed in western North Dakota.

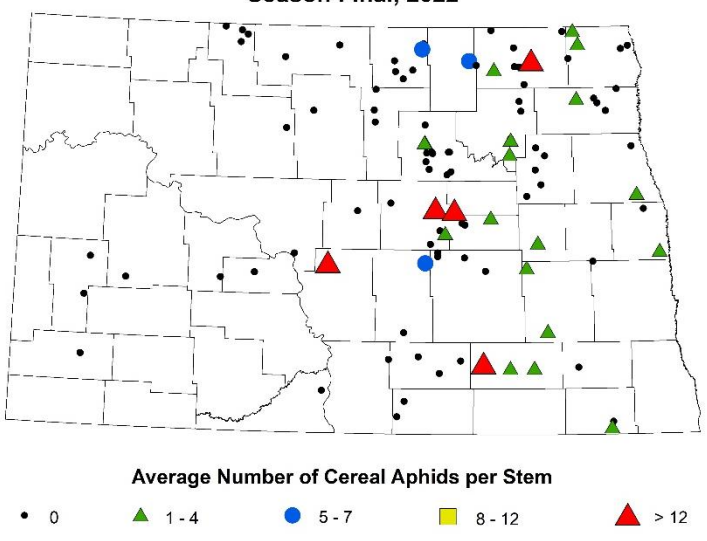
The drought from the past two years dramatically increased grasshopper populations and favored reproduction. Defoliation was common on field edges early in the season and then in-fields later summer throughout the state. Whole-field treatments were necessary in areas where grasshopper populations were high (see yellow and red areas on grasshopper map).



Insect Pests of Small Grains:

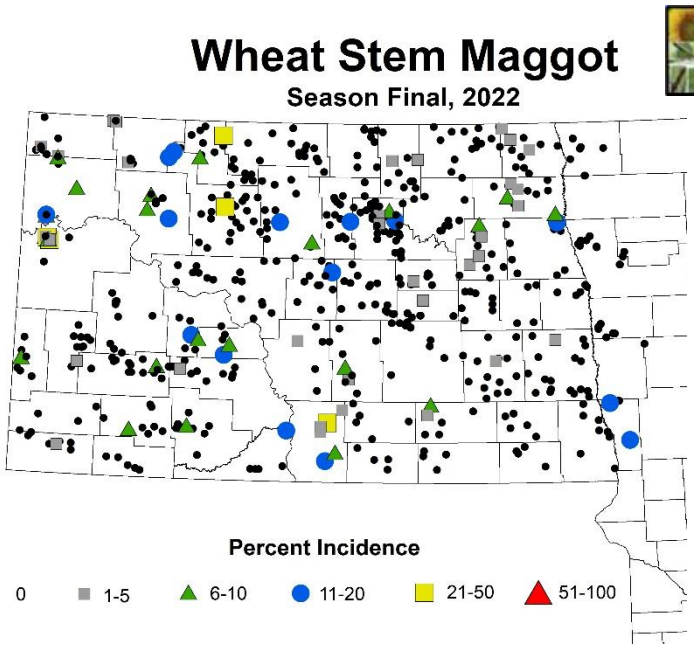
Grain aphids were observed in 5% of the wheat fields and 23% of the barley fields surveyed in 2022. Grain aphids were first detected in mid-June with highest population in August and in the central and northeast area of the state. In wheat, the average number of aphids per stem ranged from 1-20. In barley, average number of aphids per stem ranged from 1-35. Insecticide applications were uncommon for aphid populations.

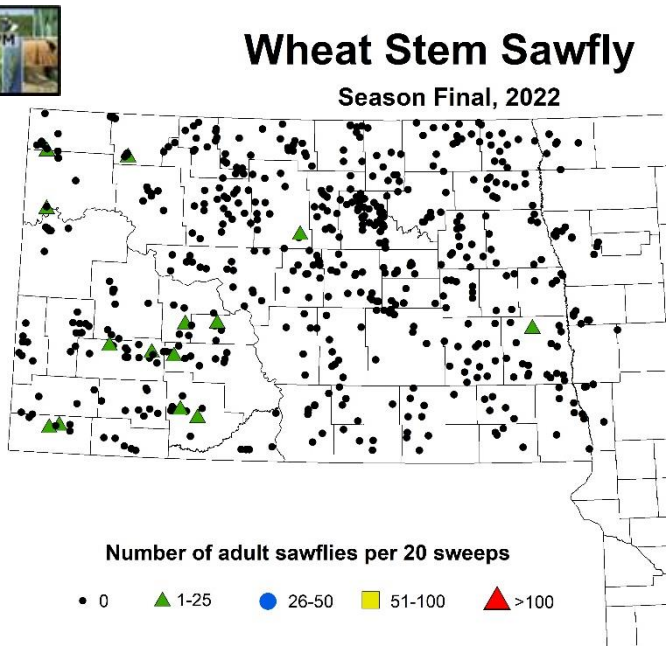




Wheat stem maggot was observed in 12% of wheat fields surveyed in ND from mid-July through mid-August, and damaged white heads ranged from 1 to 32% of plants sampled. In 2022, wheat fields with ≥20% damaged heads were observed in Emmons, McKenzie, Mercer, Renville, and Ward counties.

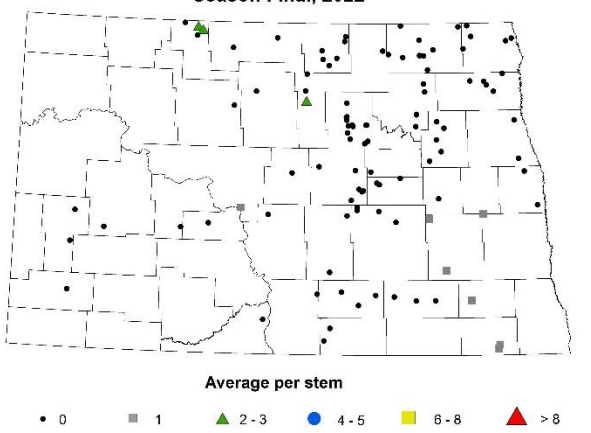
Wheat stem sawfly continued to be low since 2020 and was collected with sweep nets in only 2% of the wheat fields surveyed from late June through late July in 2022. Wheat stem sawflies were most common in the northwest (Divide, Williams Counties), north central (McHenry County) and southwest (Grant, Mercer, Morton, Stark Counites). An unusual observation was one wheat stem sawfly that was collected on June 30 in Cass County in southeast ND.





Cereal leaf beetle was not detected in wheat or barley in 2022. The counties of North Dakota that are known to have cereal leaf beetle are Burke, Divide, McKenzie, Mountrail, and Williams counties in northwest; Renville, McHenry, and Ward counties in north central; and Cavalier and Nelson counties in northeast.

Barley thrips were low and observed in only 9% of barley fields surveyed.

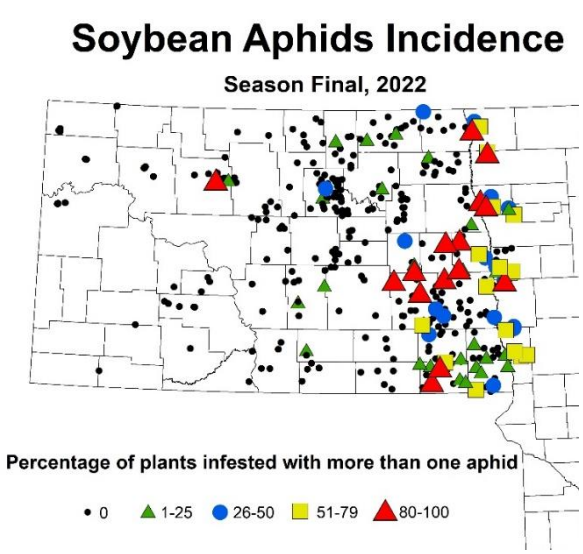


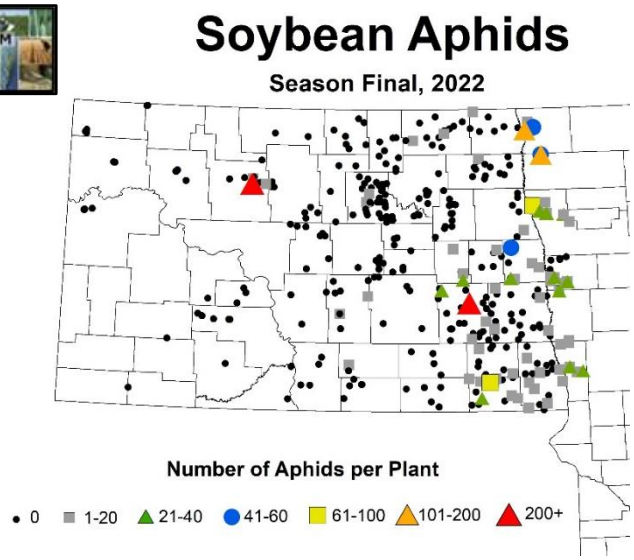
2022 IPM CROP SURVEY- SOYBEAN AND SUNFLOWER

NDSU IPM scouts surveyed a total of 404 soybean fields and 234 sunflower fields in North Dakota during 2022. The survey was initiated in early June and continued through August 18. Crops were surveyed from the 2-leaf stage through R6 growth stage in soybeans and R5.8 growth stage in sunflowers. Some of the insect pest highlights for soybean and sunflower are summarized on the next pages.

Soybean Insect Pests:

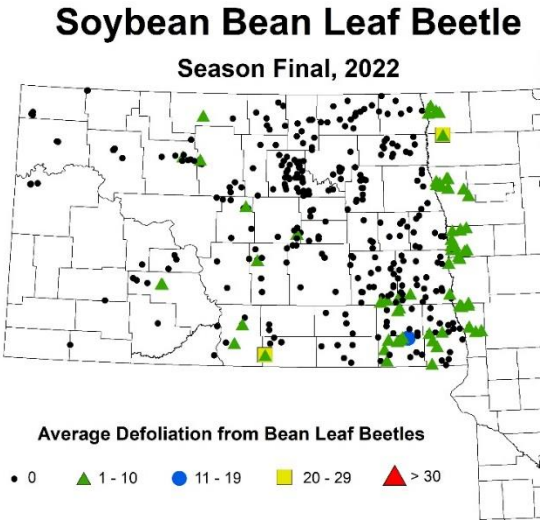
Soybean aphids - No soybean aphids were observed in 87% of the soybean fields surveyed for the fourth year in a row! There were no soybean aphids observed in 91% of the soybean fields in 2021, 96% in 2020 and 93% in 2019. Late in the season, soybean aphids started to increase in sporadic locations. The percent of plants infested with soybean aphids in fields was low with an average of 37% of plants infested and ranged from 1 to 100% of plants infested. The average number of aphids per plant was 20 aphids per plant and ranged from 1 to 330 aphids per plant. Most of the positive fields were located in the eastern part of North Dakota. Soybean aphids reached the economic threshold (E.T.) level in only two fields in Barnes and Ward Counties (average of 250 aphids per plant, 80% of plants infested with one or more aphids and increasing population levels).





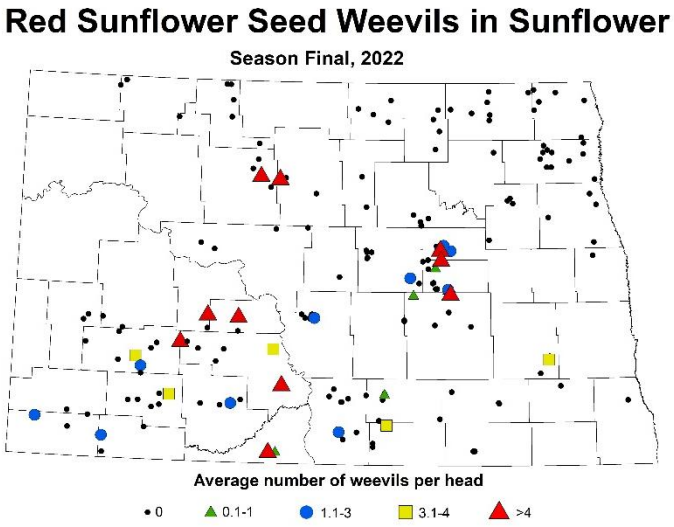
Bean leaf beetles are becoming a more common pest of soybean in North Dakota. Beetles were detected in sweep net samples and defoliation estimates in soybean. Defoliation ranged from 1 to 20% defoliation. The second generation was more dominant in August. It was present in southeastern North Dakota, but also was found in north central and east central North Dakota. Bean leaf beetle was present at economic levels in a low percentage of soybean fields in 2022.

Spider mites were observed in 30% of the soybean fields scouted and most common on field edges late in the season.

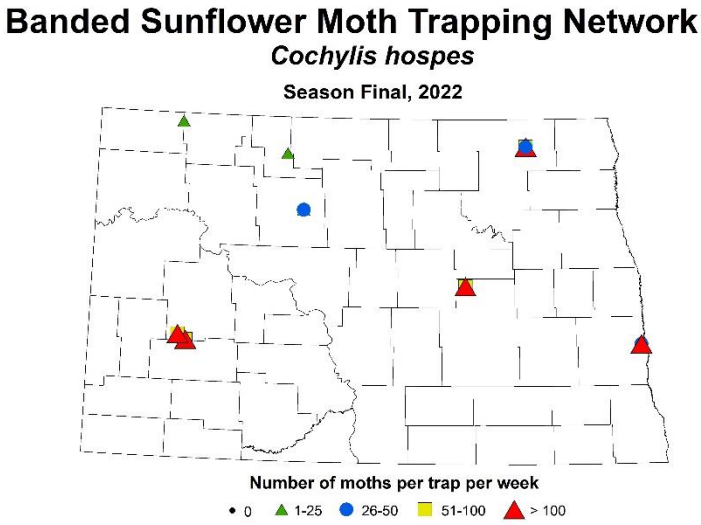


Sunflower Insect Pests:

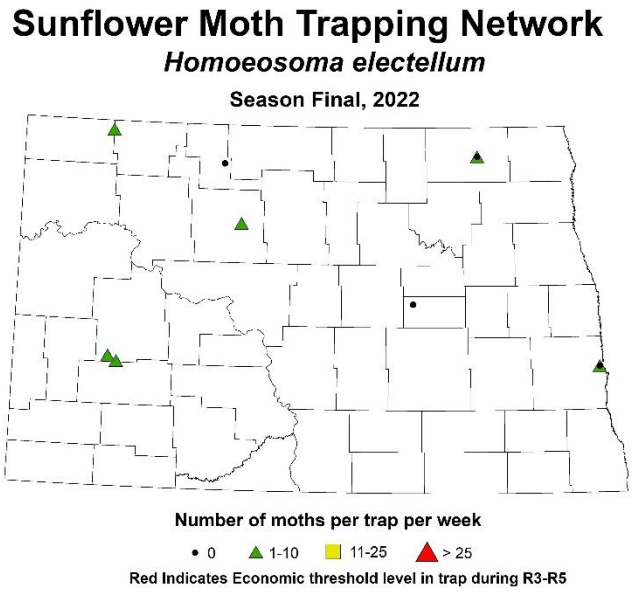
Red sunflower seed weevils were observed during flowering from late July through mid-August. The average number of weevils per head ranged from 1 to 16 weevils per head depending on field site. About 72% of the total weevils counted were observed in the field edges versus 28% of weevils in the field (>50 ft). In 2022, the E.T. for red sunflower seed weevils was 3-4 weevils per head for oilseed sunflowers. Approximately 38% of the fields surveyed were above the E.T. and these fields required an insecticide application. The highest populations were in southwest, north central, and south-central areas of North Dakota.



Banded sunflower moth were monitored for using winged pheromone traps. Moths were collected at all 8 trap sites in 7 counties throughout the sunflower acreage of ND. The first moth was trapped early July and peak moth catch occurred in early August during flowering. Traps that captured more than 100 banded sunflower moths per trap per week were in 5 of the 8 trap sites in Cass, Cavalier, Dunn (2 sites) and Foster Counties. A total of 3,880 banded sunflower moths were captured among all trap sites.



Sunflower moth was collected at only 6 of the 8 trap sites. Sunflower moth migrates into ND and was first detected during early July. Peak catch occurred during late July through mid-August during flowering. Economic numbers of sunflower moths is ≥ 25 moths per trap per week, but no trap site reached this level in 2022. A total of only 20 sunflower moths were captured among all trap sites.



Acknowledgments: Sincere thanks to the hard-working field scouts and insect trappers! We also appreciate the help of Darla Bakko, NDSU Dept. of Plant Pathology, for data compilation, and Dr. Honggang Bu, NDSU Dept. of Soil Science, for ArcMap programming. This survey is supported by the Crop Protection and Pest Management Program - Extension Implementation Program, award number 2021-70006-35330 from the USDA National Institute of Food and Agriculture, and the North Dakota Department of Agriculture CAPS Program.

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IPM Scout, Tommy Crompton, scouting for red sunflower seed weevils (V. Calles Torrez)

2022 CORN INSECT TRAPPING – SEASON REVIEW

We want to thank to the *North Dakota Corn Council* for their support for the European corn borer and corn rootworm trapping networks. Field data are posted on the NDSU IPM website.

European corn borer - European corn borer (ECB) moths (Table 1) were monitored in conventional non-Bt and Bt corn fields from mid-June to late August using modified Hartstack traps with pheromone lures. We had 13 trap sites in 8 counties including Barnes, Cass, Griggs, Steele, Ward, Sargent, Ransom, and Richland.

A grand total of 585 moths were trapped this year, which is about 31% fewer moths than last year. The ECB Z-race moths (univoltine) had 579 individuals and was by far the more common than the ECB E-race moths (bivoltine). The first ECB Z-race moths were trapped the third week of June from Sheldon and Shenford (Ransom County) corn sites. The peak flight of ECB Z-race moths occurred from July 13 to 26 during V11 to R2 (blister) stage at most sites. No ECB Z-race moths were trapped at Cuba (Barnes) corn site. The ECB E-race moths were found at low numbers (a total of 6 individuals) at three sites: Minot (Ward County), Gwinner (Sargent County), and Sheldon (Ransom County). No ECB E-race moths were trapped at 10 of the 13 corn sites.

Corn rootworms - Corn rootworm beetles (Table 2) were monitored using four unbaited Pherocon AM® yellow sticky traps in a linear transect at each of the 14 sites in 8 counties. A total of 411 corn rootworm individuals were counted from these traps, which represented 66% greater numbers of beetles compared to 2021. For 2022, 96% of collected beetles were northern corn rootworm and 4% were western corn rootworm. Fifty percent of the fields had corn rootworms present in the traps this year compared to 66% in 2021.

Overall, most fields were below the economic threshold (E.T.) of >2 beetles (either species or in combination of the 2 species) per trap per day (or >14 beetles per trap per week). The exception was the Wyndmere field in Richland County, which was above the E.T. with more than two beetles per trap per week. 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.

Table 1. 2022 pheromone trap catches for European corn borer (ECB) moths per trap in corn, ND												
Area	County	Nearest town	ECB Z-race moths									
			June 15-21	June 22-28	June 29-July 5	July 6-12	July 13-19	July 20-26	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	0
EC	Cass	Casselton	0	0	0	1	6	6	0	0	0	0	13
EC	Cass	Rush River	0	0	1	0	39	....	1	0	0	0	41
EC	Cass	Grandin	....	....	0	1	3	0	6	0	0	0	10
EC	Griggs	Cooperstown	0	0	0	2	2	2	0	0	1	0	7
EC	Steele	Finley	0	0	4	10	22	3	5	0	1	0	45
EC	Steele	Luverne	0	0	0	2	1	1	0	0	0	0	4
NC	Ward	Minot	0	0	0	0	0	0	0	1	0	0	1
SE	Sargent	Gwinner	0	0	2	4	2	0	0	0	1	0	9
SE	Ransom	Shenford	0	6	49	15	48	43	28	4	2	0	195
SE	Ransom	Sheldon	0	8	53	28	28	63	44	11	5	0	240
SE	Richland	Lidgerwood	0	0	0	0	1	0	3	0	0	0	4
SE	Richland	Antelope	0	0	4	1	4	0	1	0	0	0	10
			ECB E-race moths										
EC	Barnes	Cuba	0	0	0	0	0	0	0	0	0	0	0
EC	Cass	Casselton	0	0	0	0	0	0	0	....	....	....	0
EC	Cass	Rush River	0	0	0	0	0	0	0	0	0	0	0
EC	Cass	Grandin	....	....	0	0	0	0	0	0	0	0	0
EC	Griggs	Cooperstown	0	0	0	0	0	0	0	0	0	0	0
EC	Steele	Finley	0	0	0	0	0	0	0	0	0	0	0
EC	Steele	Luverne	0	0	0	0	0	0	0	0	0	0	0
NC	Ward	Minot	0	0	0	0	1	1	0	0	0	0	2
SE	Sargent	Gwinner	0	0	1	0	0	0	0	0	0	0	1
SE	Ransom	Shenford	0	0	0	0	0	0	0	0	0	0	0
SE	Ransom	Sheldon	3	0	0	0	0	0	0	0	0	0	3
SE	Richland	Lidgerwood	0	0	0	0	0	0	0	0	0	0	0
SE	Richland	Antelope	0	0	0	0	0	0	0	0	0	0	0
Total ECB Z-race moths			**0**	**14**	**113**	**64**	**156**	**118**	**88**	**16**	**10**	**0**	**579**
Total ECB E-race moths			**3**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**6**
Seasonal grand total			**3**	**14**	**114**	**64**	**157**	**119**	**88**	**16**	**10**	**0**	**585**

Table 2. 2022 adult corn rootworms (northern and western corn rootworms) per 4 traps per week in ND field corn								
Area	County	Nearest town	July 20-26	July 27-Aug. 2	Aug. 3-9	Aug. 10-16	Aug. 17-23	Seasonal grand total
EC	Barnes	Cuba	0	0	0	0	0	**0**
EC	Cass	Casselton	0	0	0	0	0	**0**
EC	Cass	Rush River	0	0	0	0	1	**1**
EC	Cass	Grandin	0	0	0	0	0	**0**
EC	Griggs	Cooperstown	0	0	0	0	0	**0**
EC	Steele	Finley	0	0	0	0	0	**0**
EC	Steele	Luverne	0	0	0	0	0	**0**
NC	Ward	Minot	0	0	0	0	0	**0**
SE	Sargent	Gwinner	0	1	5	12	9	**27**
SE	Ransom	Shenford	0	9	2	5	4	**20**
SE	Ransom	Sheldon	0	0	1	0	0	**1**
SE	Richland	Lidgerwood	0	1	8	9	0	**18**
SE	Richland	Antelope	0	0	0	1	0	**1**
SE	Richland	Wyndmere	39	144*	53	64	43	**199**
		Total corn rootwromm =	**39**	**155**	**69**	**91**	**57**	**411**
		Percentage of NCR =	**100%**	**95%**	**97%**	**95%**	**98%**	**96%**
		Percentage of WCR =	**0%**	**5%**	**3%**	**5%**	**2%**	**4%**
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**								

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plant pathology

IT'S A GREAT TIME TO SAMPLE FOR SOYBEAN CYST NEMATODE (SCN).

From now until freeze up is an ideal time to soil sample for SCN, and the North Dakota Soybean Council supported sampling program makes it easy! The North Dakota Soybean Council will cover the laboratory fees of the first 2,000 soil samples submitted in the program. All you need to do is pick up pre-labeled sampling bags from any County Extension office, take a soil sample and submit the sample to the lab. Your results will be sent to you directly.

Soil sampling gives you information on whether you have SCN, and/or whether your management tools are working. Remember to *think like the nematode*. If you don't know if you have SCN, sample in the areas where SCN might be introduced to your field on soil, such as a field entrance (on dirty equipment), low spots (flooding or birds) or shelter belts (from blowing soil). If you know you have SCN, go to an area you want to monitor, and consider going back every time you grow soybeans.

For additional information on SCN, please visit these previous articles in the NDSU Crop & Pest Report #16, August 25.

SCN overview (**Page 16**)

Information on the North Dakota Soybean Council supported sampling program (**Page 17**)

How to sample for SCN (**Page 19**)

A ONE-STOP SHOP FOR SOYBEAN CYST NEMATODE INFORMATION

The SCN Coalition (www.thescncoalition. com) is a public-private partnership whose mission is to deliver the best management information about the number one yield-limiting pest of soybeans, soybean cyst nematode (SCN). The partnership includes numerous companies, soybean checkoff organizations and universities who are working together to provide soybean growers the information they need to make the best management decisions for their farms. The coalition's website hosts videos, infographics, recommendations and more, that address the pressing questions and needs of soybean growers as they manage SCN.

Please consider visiting www.thescncoalition.com to learn more.

Sam Markell
Extension Plant Pathologist, Broad-leaf Crops

SMALL GRAIN DISEASE OBSERVATIONS FROM 2022

Environment is often the key corner of a disease triangle to explain disease observations from year to year. The growing season of 2022 was cold and wet followed by rainfall and elevated humidity in June into July. From a small grain disease perspective, thunderstorms can help increase risk for some diseases like bacterial leaf streak, and prolonged days with high humidity will increase Fusarium head blight (scab) risk. Below are some summary statements with regards to small grain diseases. Foliar disease summary figures represent disease occurrence from fields scouted between flag leaf and soft dough. Fusarium head blight summary figures represent disease occurrence from fields scouted between milk stages to soft dough, and ergot summary figures are from fields scouted from milk stages to physiological maturity.

The two most common foliar diseases detected in 2022 were tan spot and bacterial leaf streak. Tan spot is a disease that can be managed effectively with host resistance, fungicides, and cultural practices such as crop rotation. Bacterial leaf streak predominately relies on host resistance for effective management. Both diseases were detected in fewer fields than expected based on field conditions this year. In the 251 fields scouted between flag leaf and soft dough, tan spot was found in 10% and bacterial leaf streak was found in 8% of the fields (***Figure 1***). Pertaining to decisions for foliar diseases next year, I encourage placing an emphasis on selecting a variety that has a bacterial leaf streak of "5" or less. Head diseases were commonly reported from wheat fields this year (***Figure 1***). The scouts reported Fusarium head blight in 20% (83 fields scouted), and ergot in 15% of the fields (100 field scouted). However, incidence within a field was generally low for both head diseases. To date, I have yet to receive a report of concerning levels of deoxynivalenol (vomitoxin) or ergot in grain lots of wheat.

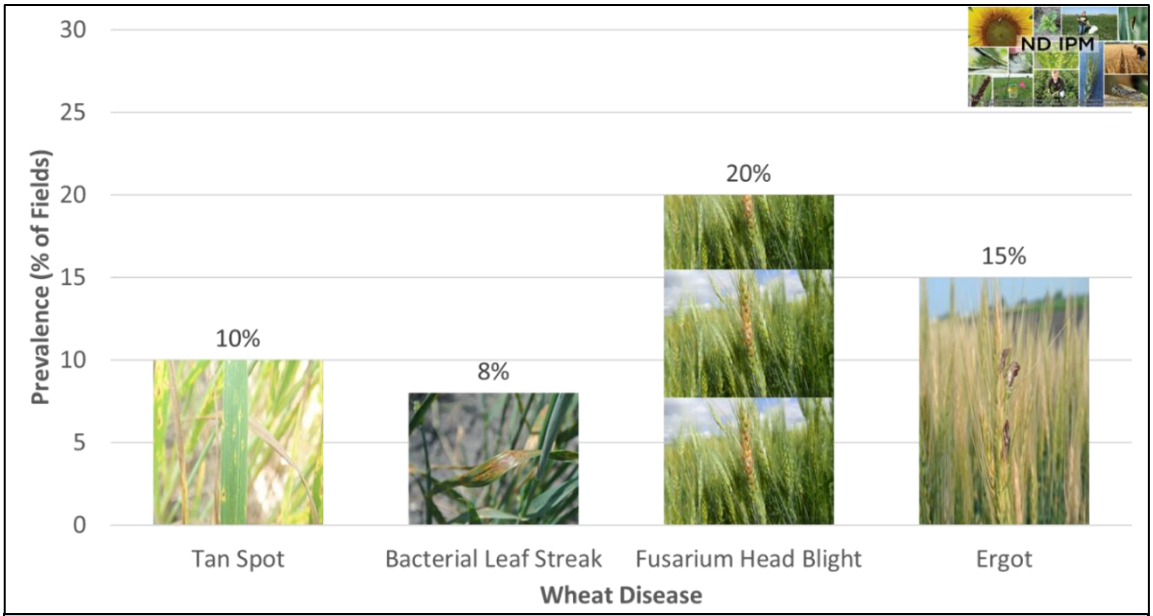

Figure 1. Prevalence (% of fields with a disease) of four wheat diseases from fields surveyed by Integrated Pest Management Scouts in 2022.

Barley disease pressure was also lower than expected this year. For foliar diseases, spot blotch and net blotch were recorded in 3% of the scouted fields (67 fields), and bacterial leaf streak was recorded in 4% of the fields. Fusarium head blight was recorded in 21% of the fields (at low severities) and ergot was documented in 31% of the scouted fields (45 fields). Similar to wheat, I have not received any reports of quality concerns in barley grain lots.

This survey is supported by the Crop Protection and Pest Management Program - Extension Implementation Program, award number 2021-70006-35330 from the USDA National Institute of Food and Agriculture.

Andrew Friskop
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2022 CORN DISEASE REPORT - BACTERIAL DISEASES AND LATE-SEASON SCOUTING

The corn disease survey in 2022 provided a great snapshot of common foliar diseases in the state. In a previous *Crop and Pest Report*, I indicated Goss's wilt was found in 17% of the fields this year. Compared to previous years, this value was lower than expected (***Figure 1***). We also confirmed the increase in prevalence of bacterial leaf streak of corn. Bacterial leaf streak of corn was first identified in 2020 and this year we confirmed bacterial leaf streak in 12% of the fields (***Figure 2***). A few important facts about bacterial leaf streak (1) the pathogen that causes bacterial leaf streak in corn is NOT the same as the pathogen that causes bacterial leaf streak in wheat; (2) preliminary observations suggest bacterial leaf streak does not appear to cause as much yield loss as Goss's wilt; and (3) future management is going to rely heavily on resistant hybrids.

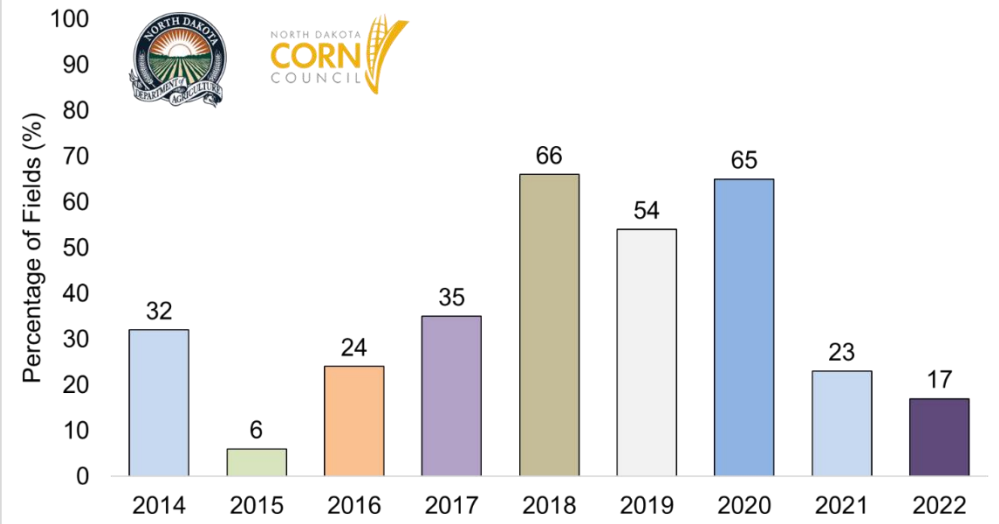

Figure 1. Goss's wilt prevalence in scouted fields from 2014 to 2022.

As we approach the end of the corn growing season, I am asking everyone for some help in scouting fields for tar spot. First, **we have not confirmed tar spot in North Dakota**, but we know it is close. The last month has provided conducive conditions for tar spot and I encourage growers and agricultural professionals to check corn fields for this disease. This will help proactively plan for future research and Extension efforts dedicated to this disease. For diagnosis, here are a few tips. The tar spot pathogen produces raised, irregular black structures (stromata) on the corn leaves (***Figure 3A***). These structures remain attached to the leaf surface even with aggressive removal tactics such as the use of water and rubbing your finger on the black lesions. In some cases, the lesions will have necrotic halos around tar spot lesions giving it a fisheye appearance (***Figure 3B***). There are also a few common mimics to tar spot as well. One is saprophytic mold (sooty mold) on corn leaves and insect frass. Sooty mold will appear dusty and be easily removed with a finger (***Figure 3C***). Insect frass often occurs as a little black spot and will appear to be embedded on leaf tissue. However, the addition of water and then rubbing your finger on the black spot will remove the frass. If you feel you have found a suspicious tar spot lesion, please work through your local county Extension office to help with diagnosis.

Figure 2. Corn leaf with symptoms of bacterial leaf streak. Note yellow to orange-colored linear lesions running parallel to the veins of the corn leaf.

Figure 3. (A) Tar spot on green leaves of corn (photo credit – Tom Lux); (B) Tar spot on senesced leaves with some lesions having "fisheye" appearance; and (C) Sooty mold on a senesced corn leaf.

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soils

GROWING SEASON 2022 ALMOST COMPLETE, 2023 CROP PLANNING BEGINS

The 2022 was a wild ride with respect to fertilizer, and 2023 may continue that theme.
Fertilizer N, P and K costs are higher than they were last year at this time. I see no indication that they might be less expensive next spring. Here are some items that will help to maximize the impact of any fertilizer applied for the 2023 crop year:

-Soil test by zone (unless the field has had a recent history of manure application, then grid sampling is a better map)

-Utilize a laboratory for the soil sample analysis that takes advantage of national soil testing certification. Either the NAPT sponsored by the American Society of Agronomy or the ALP out of Colorado are excellent certification laboratories. The laboratory should use soil analysis methods recommended by the NCERA-13 committee on soil testing in the North Central region of the USA

-Base fertilizer choices and rates on NDSU recommendations on fields in North Dakota. The N calculator for corn, sunflower and spring wheat/durum is temporarily located at www.ag.ndsu.edu/temp/cnc/. Circulars for sunflower and corn are published with a 2022 publication date on the web. The spring wheat/durum recommendations should be published shortly.

Recommendations for other crops appear in North Dakota Fertilizer Recommendation Tables and Equations, which has not been updated for corn, spring wheat/durum and sunflower, but it is useful for other crops until it is revised this winter.

-Fields subject to flooding in the state should be etched in farmer's recent memory. This year 2022 is not the first or last time that most of these lands have been flooded. Fall fertilizer on these fields is not recommended.

-Fields that are bare of residue going into winter may not keep any N, P or K applied to the surface and worked in. An incorporation to 4 inches in depth leaves much of the fertilizer within the surface 2 inches. There are many fields in 2022 from winter through spring (and summer in some cases) that lost huge amounts of soil, amounting to more than 2 inches in some fields. If there is a cover crop, or residue, soil loss is seldom an issue and fall application is reasonably safe.

-Remember that sulfur (S) is a spring fertilizer. Elemental S is poorly effective in this region and any sulfate that is produced from its fall application is easily lost by leaching during snow melt, early spring rains on the soils that need it most. Also, the S soil test is nearly worthless, so don't bother to have it run on your soil samples.

SOIL HEALTH AND SOIL FERTILITY EDUCATION/INTERACTION OPPORTUNITIES

Great resources for transitioning to a more soil-sustainable farming system can be found on the NDSU Soil Health pages.

The site includes podcasts and other information to help farmers and landowners determine a better way to produce crops and minimize input costs.

Also, the DIRT Workshop is scheduled in Fargo, December 12-14. The NDSU Soil Health page updates information regarding this event, which provides a platform on which farmers/crop consultants/landowners have the chance to interact with people in various stages of transition from uber-tillage to more sustainable farming systems.

The Soil and Soil Water Workshop will be held January 18 at the Fargodome, the day after the Weeds workshop. It provides updated information on all things soil-related and provides opportunities to receive continuing education credits in Nutrient Management and Soil/Water categories for Certified Crop Advisors. If you are not on the email list for Soil and Soil Water Workshop updates and registration, please contact niki.lynnes@ndsu.edu

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weeds

SCOUT FOR AND CREATE WEED MAPS BEFORE SOYBEAN AND SUGARBEET HARVEST

Weeds emerged simultaneously with crops in 2022 causing weed interference in corn, soybean, wheat and sugarbeet. Unfortunately, weed escapes were evident in wheat and are evident in soybean and sugarbeet (I even observed waterhemp towering over sunflowers today). Wheat has been harvested but there is still time to scout for and map weedy patches in soybean and sugarbeet fields. You may also elect to draw maps of localized areas in fields you wish to avoid harvesting due to high weed density.

I suggest you draw weed maps and document the two or three most prevalent weed species in fields. 'Dropping a pin' using the combine GPS mapping system as you travel through a weedy section at harvest is easy and provides useful information about the distribution of weeds in fields. Many growers have their own drones or have access to drones. Use them to collect images or video footage of the crop that can be viewed or analyzed to identify high density weed patches. I consider weed maps, especially spatial maps collected annually to be field records just as valuable as yield monitor data.

It might be worth collecting seed and conducting a resistance test, If weed control from herbicides is less than expected. My sugarbeet team is especially interested in monitoring fields or geographical regions were common lambsquarters and common ragweed was difficult to control, especially in sugarbeet. My colleague, Dr. Debalin Sarangi also is actively tracking herbicide resistance in Minnesota. In addition, we recognize there are instances where preemergence chemistry may not have met your expectations. It is not inconceivable that there could be resistance concerns with soil residual herbicides.

Don't collect seed too early for a resistance test. We need good quantity of viable seed. The most common problem is collecting immature seed by stripping seed from the head rather than mature seed which you can brush off gently. Common ragweed is especially difficult to work with and needs to be mature before harvest. Make sure sample is fully dry and stored in a paper bag as moisture may cause the sample to rot.

Tom Peters
Extension Sugarbeet Agronomist
NDSU & U of MN

forestry

WINTER PREP FOR TREES

This past year has been pretty variable across the state, especially in terms of tree stress. While early-season moisture was good throughout North Dakota, drought conditions have slowly crept back into several of the western counties. As we prepare for winter, there are simple management actions that we can take to help trees survive the winter and even thrive next summer.

For conifers, it's very important that they go into winter fully hydrated. Conifers that are drought-stressed are more prone to the type of damage that is generically called 'winter injury'. Winter injury takes many forms and has several potential causes; nevertheless, studies have shown that trees that are well-hydrated going into winter are less likely to suffer damage over the cold season. Watering should get the soil moist, but not saturated, to as deep as you can get it. Remember also that tree roots extend far beyond the edge of the tree crown. The larger the area that can be watered, the better.

Foliar diseases were more prominent in 2022 because of the early-season moisture. If your trees had foliar fungal problems such as frogeye leaf spot, apple scab, oak leaf blister, or one of the anthracnose diseases, then be sure to rake up and remove or destroy all the fallen leaves this autumn. Fungal spores over-winter in the fallen leaves so getting rid of this source of inoculum will go a long way towards preventing foliar diseases next year.

Finally, make sure to protect the stems of young/small trees from the various ravages of winter. Often, this means putting some type of white wrap or corrugated white pipe on the stem to help prevent sunscald (another form of winter injury). Perhaps more importantly, these products can help prevent damage from deer, rabbits, or voles. Make sure that the wrap goes high enough that it will reach well beyond the expected snowpack, as rabbits can climb the drifts and girdle stems or even branches of deciduous trees. Sometimes, it may even be better to place a fence further out from the stem, to keep the deer away from the lower branches.

A young apple tree, with simple protection from winter problems such as sunscald, or wildlife such as rabbits and other rodents.

Joe Zeleznik
NDSU Extension Forestry Specialist

around the state

AROUND THE STATE

NORTHEAST ND

The harvest season is going smooth and at a fast pace. While majority of small grains are in bins, there are a few acres still standing and waiting to be harvested.

A producer in Cavalier County reported Hessian fly infestation in his wheat field. (***Figure 1***) The infestation appeared to be high with 5% of stems lodged and were not harvestable. Brown pupae looking like flax seed were observed at the lower nodes of lodged stems. Please look at the Entomology section article 'Hessian Fly Problems in Wheat' for more information.

Figure 1: A Wheat field with hessian fly infestation, lodged stem and brown pupae tucked in the leaf sheath near the lower node. (Anitha Chirumamilla, Extension Cropping Systems Specialist, LREC)

Soybeans are turning color and need a few more days to drop leaves.

Dry beans range from dropping leaves to nearing harvest. (***Figure 2***) White mold is becoming more obvious in dry beans with white fungal growth on stems and black sclerotia in pods. (***Figure 3***)

Nearly half of the Canola has been harvested and the rest are being sprayed to desiccate. (***Figure 4***)

Sunflowers and corn are still not at maturity.

Figure 2: A pinto bean field in Cavalier County (Anitha Chirumamilla, Extension Cropping Systems Specialist, LREC)

Figure 3: White mold in pinto beans with white fungal growth on stem and black sclerotia on pods (Anitha Chirumamilla, Extension Cropping Systems Specialist, LREC)

Figure 4: A farmer getting his sprayer ready to desiccate his Canola crop (Anitha Chirumamilla, Extension Cropping Systems Specialist, LREC)

Anitha Chirumamilla
Extension Cropping Systems Specialist
Langdon Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

According to NDAWN, the region received 1.9 inches (Courtenay; Stutsman County) to 4.8 inches (Fingal; Barnes County) during July 1 to September 19, with most of the region receiving about ≥2.5 inches. Also, during this period, the Carrington REC received 3.9 inches and Oakes research site received 3.6 inches. Rain received during September will aid in seed yield of late-planted crops, and establishment of winter cereals and cover crops. However, considerably higher amount of water is needed to replenish soil for the 2023 crop.

The region's current harvest activity is with dry bean and within 7-10 days, soybean harvest will be the focus. Corn generally is in the dent (R5) stage but majority of acres should be mature (black layer; R6 stage) by the end of the month. Sunflower also is nearing or at maturity.

Tasks surrounding soybean harvest include:

- Taking soil samples for SCN egg detection (See the article in Plant Pathology 'It's A Great Time To Sample For Soybean Cyst Nematode (SCN)' for more information on how to do this.
- Monitoring for pigweed species, Kochia, and other weed escapes or late-emergers (***Figure 1***) and isolating or eradicating these field areas
- Protect soil by reducing or avoiding tillage, and use of cover crops.

Figure 1. NDSU Extension agents examining waterhemp plants.

Carrington REC dryland variety trial yield averages: barley – 85.9 bu/A; spring wheat – 56.2 bu/A; RR canola – 1790 lb/A; flax – 22.7 bu/A; and dry bean – 2075 lb/A. Data will be available at the website or by contacting the CREC.

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EXTENDING KNOWLEDGE ❯❯ CHANGING LIVES

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