

Inside this Issue...

Projections for 2022 Sugarbeet Crop	1
Wheat – Fungicide Seed Treatments	2
Crop Production Resources.....	5
Preemergence is Paramount if you intend to Grow Sugarbeet in 2022	6
Fertilizer Rates when Costs are High (Part 1 - N Calculators) ...	7
Fertilizer Rates when Costs are High (Part 2 - starter fertilizers)	7
Fertilizer Rates when Costs are High (Part 3- specifics for crops)	8
PPO-Inhibitor (Group 14) Resistant Waterhemp Confirmed in Seven Counties	9
Around the State.....	10
North Central ND	10
South-Central/Southeast ND	11
Southwest ND	11
Weather Forecast.....	12



plant pathology

PROJECTIONS FOR 2022 SUGARBEET CROP

Farmers in the USA grow and process sugar from sugar cane and sugarbeet. Sugar cane is produced in Florida, Louisiana, and Texas and sugarbeet is produced in Minnesota, North Dakota, Idaho, Michigan, Montana, Nebraska, Colorado, Wyoming, Oregon, California and Washington. The United States Department of Agriculture estimates that 1.162 million acres of sugarbeet will be planted in the USA in the 2022 growing season.

Minnesota and North Dakota have three sugar cooperatives – American Crystal Sugar Company, Minn-Dak Farmers Cooperative and Southern Minnesota Beet Sugar Cooperative. In addition, farmers in western North Dakota produce sugarbeet that are processed in neighboring Sidney, Montana. Growers in Minnesota and North Dakota will plant about 653,000 acres that represent about 56% of the total US sugarbeet production.

Farmers are encouraged to continue their efforts at improving efficiency by ensuring that planting is done in properly prepared and weed-free seed beds, by using adequate seeding rate and uniform seed spacing to start with a good plant population to give the crop a solid foundation (Figure 1). Growers have the option of using several effective fungicidal seed treatments to control Rhizoctonia seedling damping-off. Farmers with a history of Aphanomyces in their fields are advised to use Tachigaren seed treatment and to apply and incorporate precipitated calcium carbonate to their fields to manage Aphanomyces damping-off and root rot.



Figure 1. Sugarbeet field with a good plant population and excellent early season weed control.

In the northern Red River Valley and other areas where sugarbeet root maggot is an issue, growers have the option of using insecticidal seed treatments where insect population is relatively low and at-plant insecticides where root maggot population is higher.

Growers in Minnesota and North Dakota will typically start planting around April 11 when their insurance coverage comes in to effect. However, wet field conditions since early April has delayed land preparation and planting operations. Growers are encouraged to continue best management practices to have a profitable sugarbeet crop in 2022.

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WHEAT – FUNGICIDE SEED TREATMENTS

Fungicide seed treatments are labeled in wheat to manage seed-borne diseases, seedling blights, and early-season root rot. They do not have season-long residual and will have little success managing late-season root rots. They are most effective managing seed-borne diseases (Figure 1) and will provide some suppression of early season root rots (Figure 2). With delayed planting likely being a common theme this year, I am anticipating questions regarding if a seed treatment should be used and what type of seed treatment is suggested. The good news is that there are several fungicide seed treatments available for wheat. Most of these appear in the North Dakota Plant Disease Management Guide (PP622) or in the NDSU Extension Pest Management App. You will notice that most labeled seed treatments have more than one mode of action to help manage and suppress diseases that occur as a complex. For example, a field may have multiple root rot pathogens present such as *Pythium* and *Fusarium*. Selecting a fungicide seed treatment with multiple modes of action would be helpful, especially one having efficacy on *Pythium* (such as FRAC 4 or 22) and one having efficacy on *Fusarium* (such as FRAC 3, 7 or 11). If cool and wet soils persist, we may see more issues with *Pythium* as the pathogen thrives in cool wet soils, whereas *Fusarium* can infect in a wide array of temperatures and soil moisture conditions.



Figure 1. The seed-borne disease loose smut on durum.



Figure 2. Healthy wheat root on far left. The other wheat roots have discolored lesions on the sub-crown internode caused by a root rot pathogen.

Stand Response from a Fungicide Seed Treatment in Wheat

I started compiling and summarizing wheat fungicide seed treatment data several years ago and have continued this effort into 2022. The primary objective is to determine the effect fungicide seed treatments have on wheat stand (% response when compared to naked seed). I have reported results in past issues of the *Crop and Pest Report* and will report updated data that includes the 2021 growing season. As an added bonus this year, I organized the data to see if stand response was influenced by geography (eastern ND vs. western ND), mode of action (ie: FRAC groups and number of FRAC groups), soil temperature, and rainfall amounts prior to and after seeding.

In the data collected from 2003 to 2021, the average stand response when a fungicide seed treatment was used was 8.4% (Figure 3). This indicates that across 183 replicated treatments, a fungicide seed treatment improved stand by 8.4%. Also, a favorable stand response (greater than zero) was observed 72% of the time.

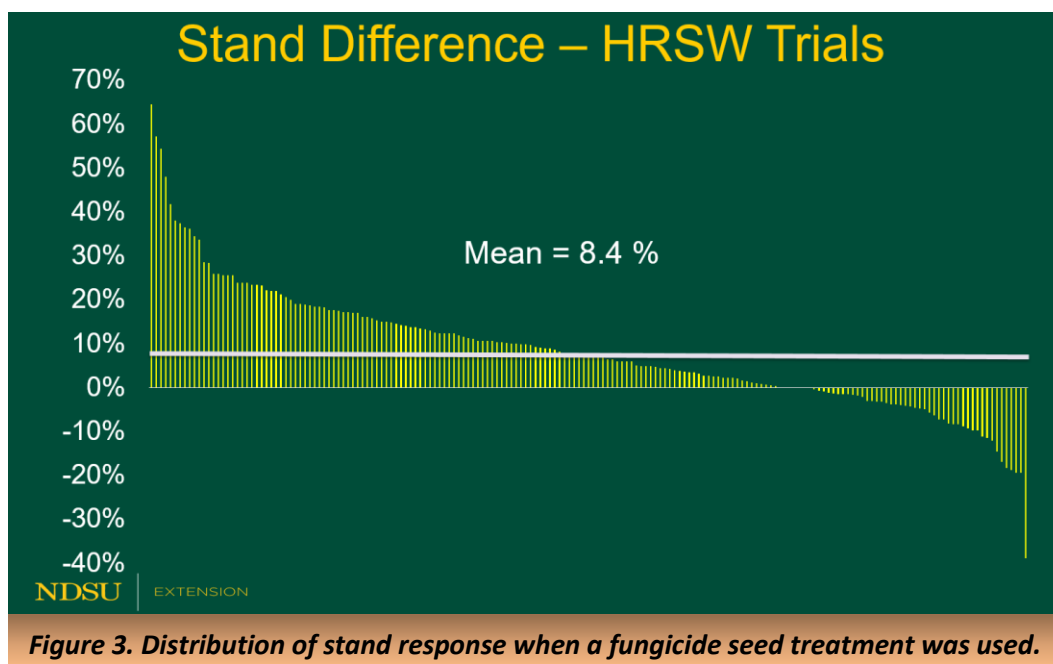


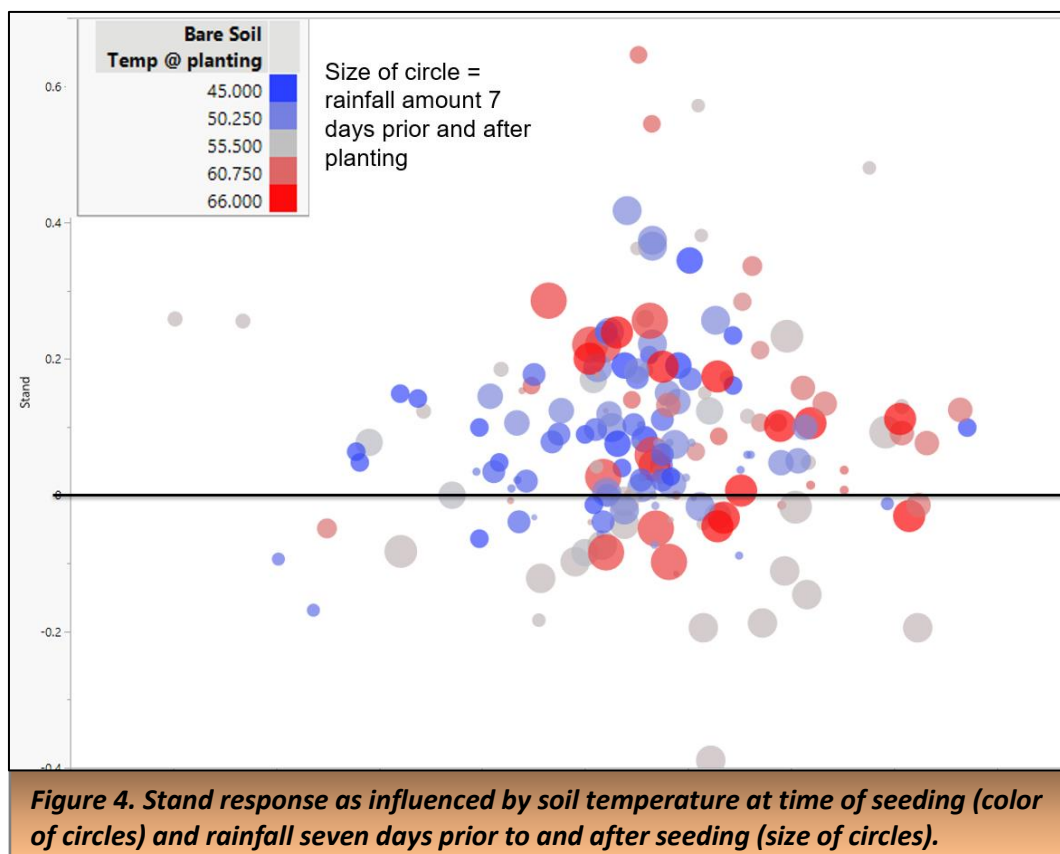
Table 1. Average stand response for Eastern ND (Fargo) and Western ND (Dickinson/Mott/New Hradec) testing sites.

Stand Response Based on Geography	
Eastern ND (Fargo)	9.8%
Western ND (Dickinson/Mott/New Hradec)	7.7%
<i>*Not significantly different from each other</i>	

Table 2. Average stand response for active ingredients with respect to FRAC groups.

FRAC group Combinations (with regards to active ingredients)	
FRAC 3	9.1%
FRAC 3,3,4	10.7%
FRAC 3,4	8.5%
FRAC 3,4,11	8.1%
FRAC 3,4,7	7.4%
<i>*Not significantly different from each other</i>	

Data was organized into two general testing geographies; Eastern and Western ND. The Eastern ND site included Fargo and Western ND site included data from Dickinson/Mott/New Hradec (Table 1). The analysis revealed that the Fargo site had a stand response of 9.8% and the Dickinson/Mott/New Hradec site had a 7.7% stand response; however these two values were not statistically different from each other. The influence of mode of action and number of mode of actions also was not significant, yet all combinations provided favorable stand responses (Table 2).



To simplify Figure 4, every value above the solid black line indicates a favorable stand response. The color of the circles represent soil temperature (45 to 66 F) at time of seeding and the size of the circle represents the total amount of rainfall received seven days prior to and 7 days after seeding. **Figure 4 suggests that there are no consistent trends in stand response with regards to soil temperature and rainfall amounts.** Volumetric water content would be a more appropriate measure of soil moisture, however these values were not available for all years. Future studies will look to see if soil moisture influences stand response from a fungicide seed treatment in wheat.

I would like to thank LeAnn Lux, Marcia McMullen, Roger Ashley, and Daryl Ritchison for their help in compiling the data.

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CROP PRODUCTION RESOURCES

Getting it Right

Farmers and crop advisers had an opportunity to participate in [soybean](#), [sunflower](#), [canola](#) and [dry bean](#) Getting-it-Right virtual meetings during January, February and March 2022.

The recordings of those meetings, conducted by North Dakota State University (NDSU) Extension in cooperation with the respective commodity groups, are available at www.ndsu.edu/agriculture/ag-hub/getting-it-right. Scroll to the conference video section.

The virtual meetings provided concise presentations to provide participants with research-based production recommendations for 2022. Topics covered in the meetings included cultivar performance; plant-growth stages; plant establishment; plant nutrition and soil management, weed, disease and insect management, an overview of crop markets; and commodity organization updates.

In addition to the video presentations, specific crop-related educational resources to supplement the information from the presentation are available at the [Getting it Right website](#). There are also links, on the bottom of the page, to access to the previous year's (2021) Getting-it-Right meeting series videos, which include presentations on [flax](#) production.



Getting it Right information about soybean, sunflower, canola and dry bean

Science for Success

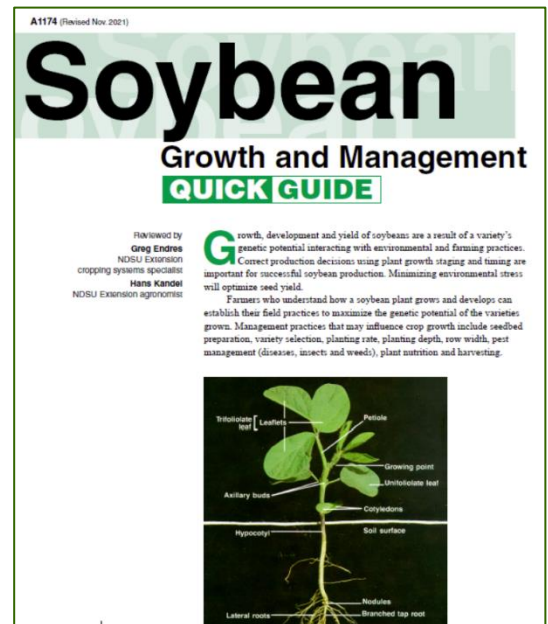
The Science for Success partnership brings together seventeen soybean Extension specialist from land-grant institutions, including NDSU, across the country, representing more than 80% of U.S. soybean acres. A number of recent publications are available in pdf format

1. The [Soybean Growth Cycle](#): Important Risks, Management and Misconceptions
2. [Foliar Fertilizers](#) Rarely Increase Yield in U.S. Soybean
3. How to Pick [the Right Soybean Row Spacing](#)
4. Soybean [Plant Population](#) Density
5. The Best Soybean [Planting Date](#)



Soybean Growth and Management Quick Guide

North Dakota State University Extension has released updates to the publication [Soybean Growth Guide](#) for farmers and crop advisers that produce or manage soybean. The guide provides a narrative description and pictures of the various soybean plant vegetative and reproductive growth stages. Correct production decisions using plant growth staging and timing are important for successful soybean production.



May Soybean Planting Considerations

A large North Dakota grower [study](#), with over 1,000 reported observations, indicates that there is a reduced yield potential of about 0.3 bushel per acre per day, when planting is delayed between May 1 and May 31. You can watch a short [video](#) with information about this topic.

[Hans Kandel](#)

Extension Agronomist Broadleaf Crops

PREEMERGENCE IS PARAMOUNT IF YOU INTEND TO GROW SUGARBEET IN 2022

One of these days it will warm-up and the rain and snow will end. Growers will immediately engage, spreading spring fertilizer, conducting tillage, and planting small grains, sugarbeet, and corn. It might be easy to deprioritize PRE herbicides, especially with the urgency to get seeds in soil. We observed waterhemp the first few days of May in 2020 and 2021. The longer-term averages are for waterhemp emergence the first half of May.

Sugarbeet growers control waterhemp by applying chloroacetamide herbicides once sugarbeet reach the 2-If stage. We don't have effective POST herbicides, so producers need to properly use soil residual herbicides, especially the chloroacetamide herbicides applied POST to sugarbeet and PRE to waterhemp. However, our delayed planting complicates weed management. The problem is waterhemp will germinate and emerge the same time as sugarbeet, especially in 2022 due to late planting.

We highly recommend sugarbeet growers identifying waterhemp as their primary or secondary weed control challenge in sugarbeet use a preemergence herbicide. We recommend three weed management programs:

- Ethofumesate (Nortron, Ethotron, Ethofumesate 4SC or Nektron) PPI or PRE at 2 to 6 pt/A
- Dual Magnum PRE at 8 to 12 fl oz/A using the 24c local needs label in North Dakota and Minnesota
- Ethofumesate + Dual Magnum PRE at 2 pt + 8 fl oz/A

Discuss which plan is best for your sugarbeet fields with your Agriculturalist, Crop Consultant, or Ag-Retailer.

[Tom Peters](#)

Extension Sugarbeet Agronomist
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FERTILIZER RATES WHEN COSTS ARE HIGH (PART 1 - N CALCULATORS)

Although commodity grain/oilseed prices are high, fertilizer N, P, K and S prices have outpaced them in 2022. Three major crops, corn, spring wheat/durum, and sunflower, have N recommendations that are directly linked to gain from N rate and the cost of N through their N calculators.

Using the N calculators in spring 2022:

The N calculators have an upper N cost limit of \$1/pound N. Some N booked in the fall, and even some ammonia and urea may be less than \$1/pound N this spring, but UAN is certainly greater than this and if the spring is compressed, as it seems it will be, then the other choices may be greater than \$1/pound N also. To still be able to use the N calculators, divide the commodity price AND the N cost by 2. Example:

Confection sunflower contract is 40 cents per pound and N cost is \$1.20/pound N.

- Dividing each by two, the result is 20 cents per pound sunflower and \$0.60/pound N.
- Inserting 20 cents per pound sunflower and \$0.60/pound N into the calculator will give the same recommendation value for pounds N suggested (plus or minus 20 pounds N, because you have common sense) as if the calculator went up to the calculator went up to 40 cents and \$1.20/pound N. The ratio is important, not the actual values. An updated calculator coming out later this year.

On a laptop/desk-computer, the calculator addresses are:

<https://www.ndsu.edu/pubweb/soils/wheat/>

<https://www.ndsu.edu/pubweb/soils/corn/>

<https://www.ndsu.edu/pubweb/soils/sunflower/>

For the app free to download on iPhones and Androids, search app store for North Dakota N calculator. When the app is downloaded, all 3 crop N calculators are imbedded in it.

FERTILIZER RATES WHEN COSTS ARE HIGH (PART 2 - STARTER FERTILIZERS)

Phosphate fertilizer placed with or near the seed are important for the following crops to more consistently reach their environment-directed yield potential:

Corn

All small grains

Canola

Sugar beet**Potato**

Soybean should not have any fertilizer, except for iron (Fe) in iron-deficiency-chlorosis (IDC) prone areas in eastern ND with water as a carrier. Consistent yield decreases and never a yield increase resulted from seed-placed fertilizers at Carrington over a number of years with a number of products.

Sunflower and flax yield is not increased with P application, so no P is recommended for sunflower and flax regardless of soil test P value and whether it is broadcast or banded.

In **dry bean, small yield gains** have been seen in Carrington research with low starter P rates (2 gallon per acre, but not more), except in 2021 in very dry soils when yield decreases were noted. Starter is not necessary, but it may be helpful.

Present yield results from starter placement with **pulse seed** is not compelling, but it might be more logistically practical compared to broadcast and I have not read anywhere where it was detrimental to yield. More research is necessary to better indicate pulse response to starters in a range of soil test P soils.

FERTILIZER RATES WHEN COSTS ARE HIGH (PART 3- SPECIFICS FOR CROPS)

Corn- Use N calculator, Starter P important, Use K calculator for K rates

https://www.ndsu.edu/pubweb/soils/corn_k/ or download North Dakota K calculator for iPhones and Androids, use sulfate-based S at a rate at least 10 pounds S per acre, use Zn in the starter if soil test DTPA Zn is less than 1 ppm.

Soybean- No N recommended, high residual nitrate-N is not a deterrent, although in IDC-prone areas, a companion cover crop of barley, oats should be seeded when soybean is seeded to reduce IDC severity from higher soil nitrate. Except in the sandiest soils, S should not be required, but if it keeps raining, be alert. P is recommended when soil P test is 7 ppm or less. Broadcast P, not starter. Potassium if soil test is low- see circular for critical value.

Canola- N rate is capped, and the N rate should not be decreased even as high as N costs are today. P should go into the starter, and a starter should always be used. Consult the rate limitations in the canola fertilizer circular. Potassium should not be a problem in most of our soils. Consult your soil tests and the circular. ALWAYS apply sulfate-S. Elemental S is not helpful, even if applied in the fall. No micronutrients are necessary.

Small grains- for **spring wheat/durum**, use N calculator for rate. Apply at least 10 pounds per acre sulfate-S fertilizer (usually ammonium sulfate). Use a P-based starter. Potassium is generally not necessary. Responses of wheat to chloride (Cl) are small, and due to K prices, probably not cost effective this season. No micronutrients are necessary.

Barley- 2-row malting- new research from NDSU indicates that rate should be 140 pounds total known N for greatest yield, and due to higher prices 120 pounds total known N is probably more profitable. From 120, subtract soil nitrate-N to 2 feet in depth and subtract any previous crop credits. The result will be a profitable 2-row malting barley rate that should result in near maximum yield, with acceptable protein and plump. Always use a P-based starter. Apply potash if chloride is less than 40, but 5 pounds Cl per acre is enough in a band to generate the plump required at harvest. Apply sulfate-S at 10 pounds S per acre. Elemental S is not helpful. No micronutrients are required.

Oats- follow circular for N rate

https://www.ndsu.edu/fileadmin/soils.del/pdfs/North_Dakota_Fertilizer_Recommendation_Tables_and_Equations_SF882.pdf starter P is important. Potassium only if soil test is less than 100 ppm. Apply sulfate-S at 10 pounds S/acre. No micronutrients required.

Sugar beet- use circular rate provided in North Dakota publication or Minnesota publication, depending on where your farm is. Do not reduce the rate of N due to higher N prices. Your sugar check will suffer for it.

Sunflower- Use N calculator for rate. Sulfur is not required except in the soils with deep sands, deep water table and lots of fall to spring rains/snow. Potassium is generally not required, consult circular for critical soil test. No P is required. No micronutrients are necessary.

Potato- Fertilizer is required at recommended rates for quality as well as yield. Use the same rates as recommended regardless of fertilizer costs.

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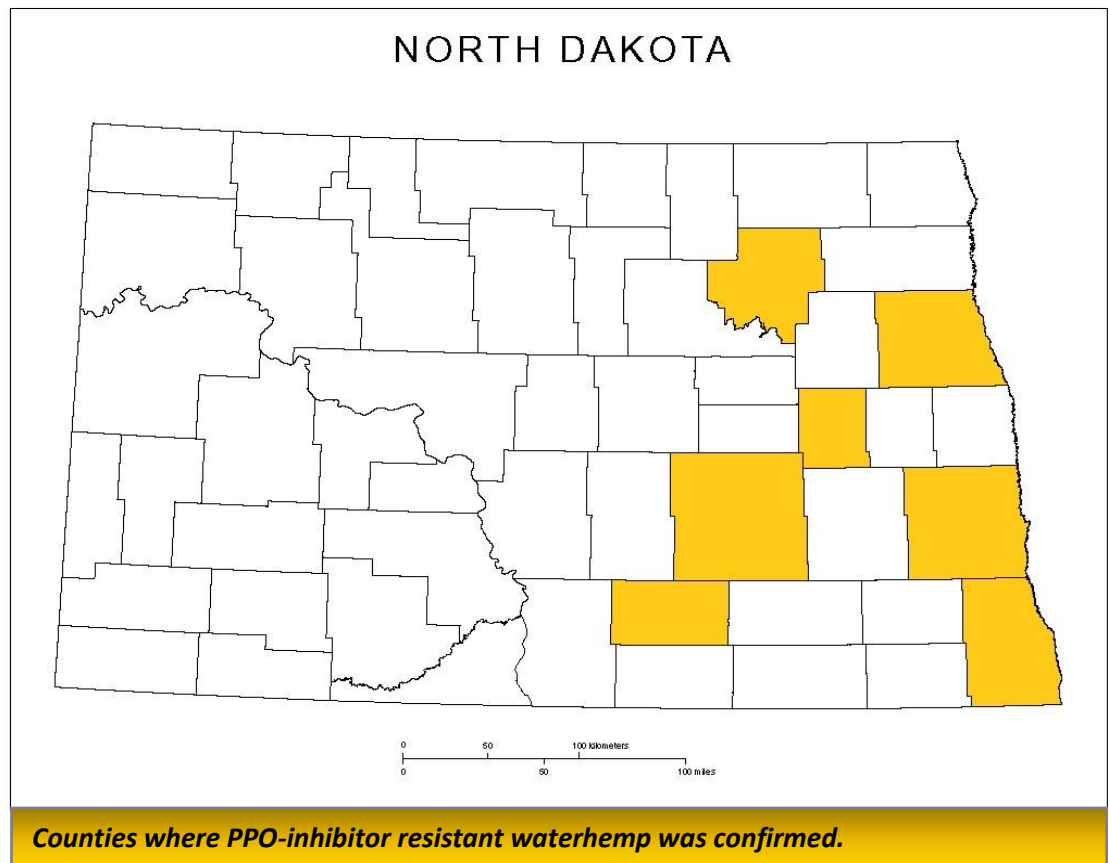


PPO-INHIBITOR (GROUP 14) RESISTANT WATERHEMP CONFIRMED IN SEVEN COUNTIES

We conducted a survey of late-season pigweed escapes last fall to test for herbicide resistance across North Dakota. We tested over 50 pigweed samples for resistance to glyphosate (Group 9), ALS-inhibitors (Group 2), and PPO-inhibitors (Group 14). We received samples from 16 counties across the state, and samples included redroot pigweed, Powell amaranth, waterhemp, and Palmer amaranth.

After screening for resistance in the greenhouse, we worked with the National Agricultural Genotyping Center (NAGC) for genetic confirmation of resistance, where possible. One test the NAGC utilizes is a rapid assay to detect a mutation that confers resistance to PPO-inhibiting herbicides in waterhemp. Using this test, we confirmed PPO-resistant waterhemp in 7 counties across North Dakota (Cass, Grand Forks, Griggs, Logan, Ramsey, Richland, Stutsman). All populations with resistance to PPO-inhibitors also had resistance to glyphosate and ALS-inhibitors.

So, what are some management considerations for PPO-inhibiting resistant waterhemp? The important point to know is that this mutation confers resistance to the postemergence PPO-inhibitors (fomesafen, lactofen, acifluorfen). The soil applied PPO-inhibitors (flumioxazin, sulfentrazone) still provide some control, but expected length of residual control will be reduced (approximately half the expected residual compared to a sensitive population). Three-way resistance (glyphosate, ALS-inhibitors, and PPO-inhibitors) in waterhemp limits the effective postemergence options to glufosinate, dicamba, and 2,4-D in soybean that have appropriate resistance traits. Our standard recommendation of overlapping residual Group 15 herbicides becomes more important in these populations to reduce the number of waterhemp plants that we are trying to control with postemergence herbicides. The NAGC will offer commercial testing for PPO-inhibitor resistance in waterhemp this growing season. Instructions on how to submit samples will be included in the next *Crop and Pest Report*.



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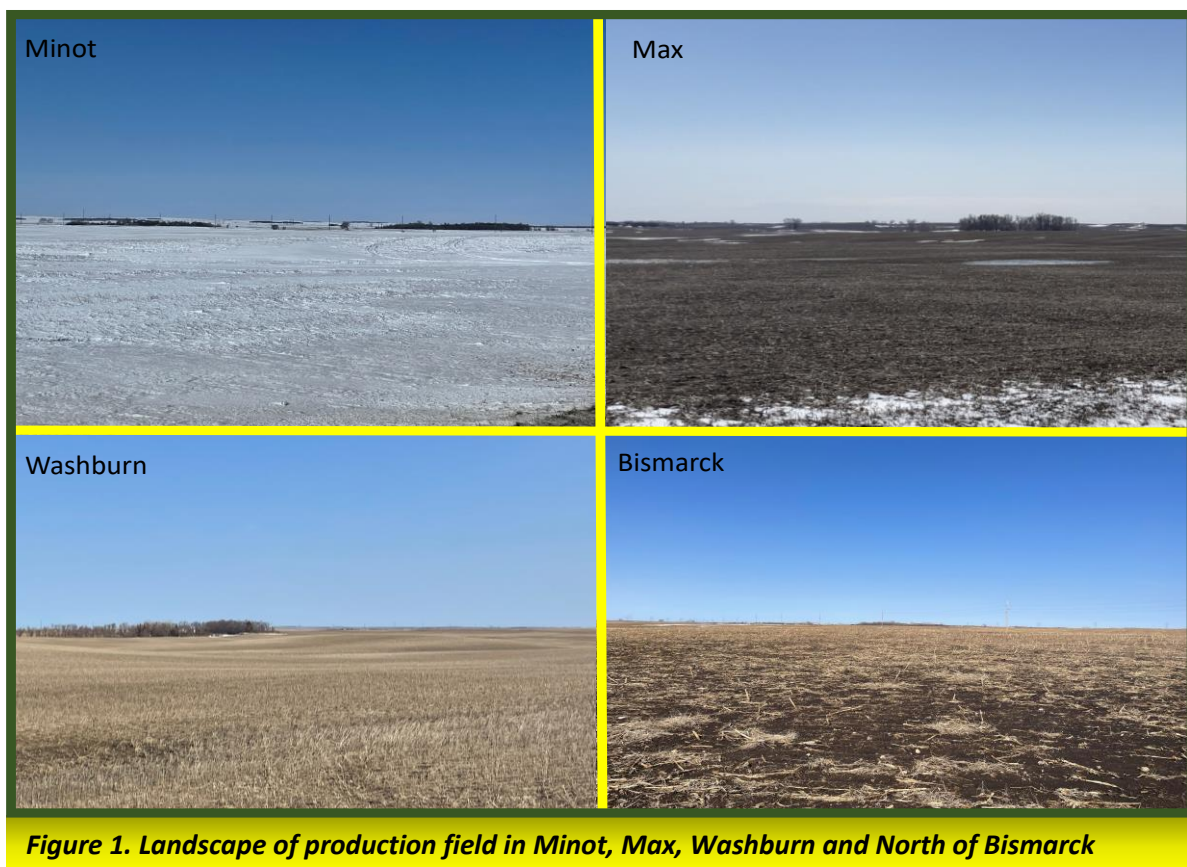


around the state

NORTH CENTRAL ND

Impactful weather has been the main storyline the past couple of weeks in the north central part of the state. Back-to-back blizzards dealt ranchers a tough hand to play, however, provided some much need moisture following the drought of 2021. The NCREC has reported 5.67" of liquid moisture and 28.0" of snow for the month of April.

As of April 25th, no farming activity has been observed in the region due to the weather. Some forecasted precipitation appears to be in the forecast with a slow warming trend into the coming week. Many growers are excited for the early precipitation for crops to take advantage of when planting does occur. Very few producers planted small grains before the snowstorms in Garrison area, but the majority of the small grains will be planted as soon as the field conditions allow. Planting date for small grains will be pushed a little further in the optimal planting date for the North Central region, so producers definitely will need to adjust seed rate accordingly. Before the blizzards, we observed few weeds green-up, mostly kochia. Also, alfalfa started to regrow in the fields around Minot. From Highway 2 to I-94 we were able to find a wide difference in the landscape (Figure 1, photos taken on April 25th and April 26th).



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[Leo Bortolon](#)

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NDSU North Central Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

The geographic area covered by this weekly report includes a northern border of Sheridan County to Griggs County southward to Sargent County and west to Emmons County. Reports will include information obtained from the region's Extension agents.

According to NDAWN, rain during August through October 2021 totaled 7.5 inches (Denhoff) to 15 inches (Fingal), plus 1.3 inches (Linton) to 5.1 inches (Lisbon) are currently (April 25) indicated this spring. In general, the region is much better off with stored soil moisture, whenever planting begins, compared to spring 2021. Reports have indicated that some barley has been planted in the area.

While we impatiently wait for weather and soil conditions to allow general cool-season crop planting, NDSU Extension has resources available for review on crop establishment and nutrition, and early season plant protection. Videos and reference lists are available from this winter's Getting-it-Right canola, dry bean, soybean and sunflower virtual production meetings: www.ndsu.edu/agriculture/ag-hub/getting-it-right

[Greg Endres](#)

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SOUTHWEST ND

Early April brought fertilizer applications and a small percentage of wheat acres planted before the snow came. The snow and rainfall brought welcomed moisture, however it also brought with it many obstacles. The heavy winds created large drifts and power lines were blown down in some counties. As of Tuesday April 26th there are still areas scattered across the western portion of the state without power from the storms last weekend. Planting will be delayed for many this year, however without this moisture there wouldn't have been much of a crop. The forecast is showing more moisture later this week. We need more moisture, just preferably not all at once.

There are 2 separate issues I continue to be concerned about going into this year, soil acidity and salinity. Each can cause worsened drought responses by limiting water uptake for the plant. Salinity, or excess salts in the soil profile needs to be treated through water table management. This can be done with deep rooted perennials surrounding the white discharge site. Acidity is where the soil pH has dropped below 5.5, mainly due to N fertilizer use over time. Acidity needs to be treated with lime application. It is possible to find acidic zones even in fields that have historically had pH values in the upper 7's and 8's. Acidity is being found in no-till fields near the soil surface and in the root zone. This can cause nutrient tie-up, reduced stands, stunted growth, reduced microbial activity, and impact the breakdown of some pesticides. Dickinson REC director Chris Augustin and I have been continuing to collaborate with several county Extension ANR Agents on locating trial sites for no-till lime application research. It is important to remember to keep in mind a soil sample of 0-3" and 3-6" is helpful in finding stratified soil acidity in no-till systems. If testing for pH it also may be helpful to check for soluble aluminum. Preliminary research from 2021 showed that 2 tons of lime surface applied reacted with the soil during the growing season. To learn more about soil acidity be sure to check out the publication "What is Soil Acidity?" <https://www.ag.ndsu.edu/publications/crops/what-is-soil-acidity/sf2012.pdf>. Many are facing soil acidity issues in their soil that were not expecting it to be an issue. We've found fields with soil acidity pretty much anywhere there is long-term no till production. Liming is the preferred method of dealing with this issue, but there are also short-term band-aid approaches including tolerant varieties, seed placed phosphorus, and other in-furrow treatments. Variety selection is the most cost-effective short-term solution with several wheat varieties with tolerances, however we highly recommend lime application if pH is dropping to 5.5 or lower due to reduced effectiveness of inputs.

As you continue to prepare for the growing season be sure to take a step back and ensure you are using proper PPE.

[Ryan Buetow](#)

Extension Cropping Systems Specialist, NDSU Dickinson Research Extension Center

**WEATHER FORECAST****The April 28 to May 4, 2022 Weather Summary and Outlook**

Because of the weather delays in getting Plant 22 started, this first weather summary and outlook will be more aimed at giving out NDAWN information than a weather forecast. It appears there will be little if any field work possible in the next week with another rain/snow system this weekend. Temperatures will also remain well below average during the next 7 days or more. The rain/melted snow from the past week is presented in Figure 1.

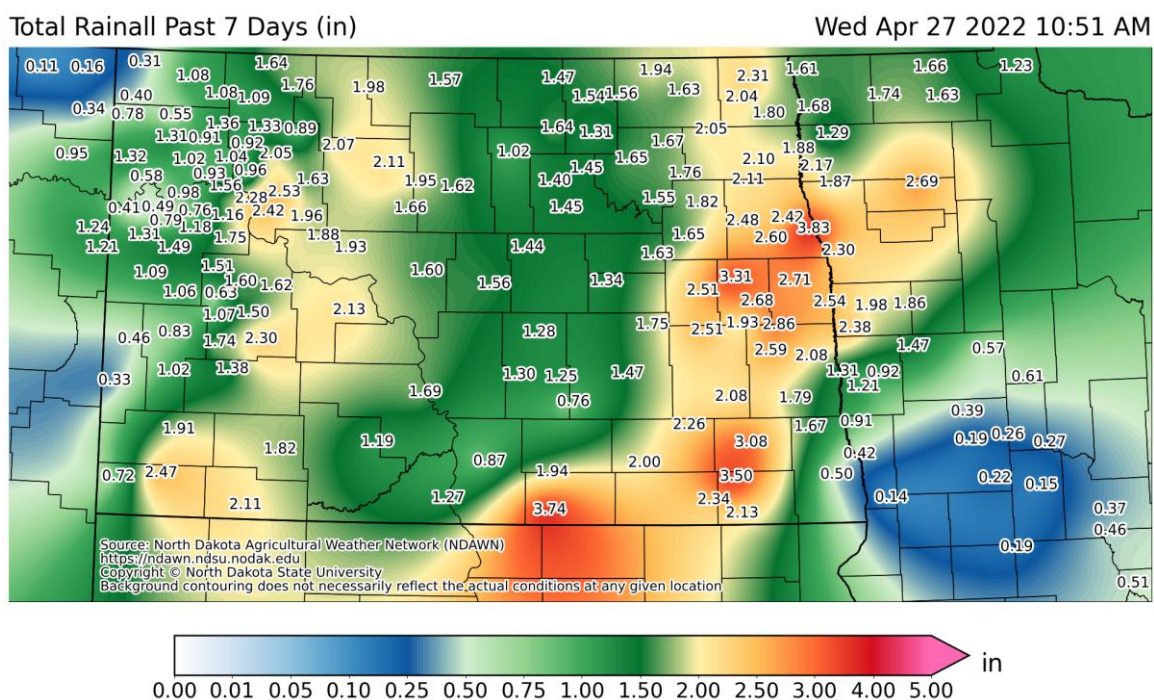
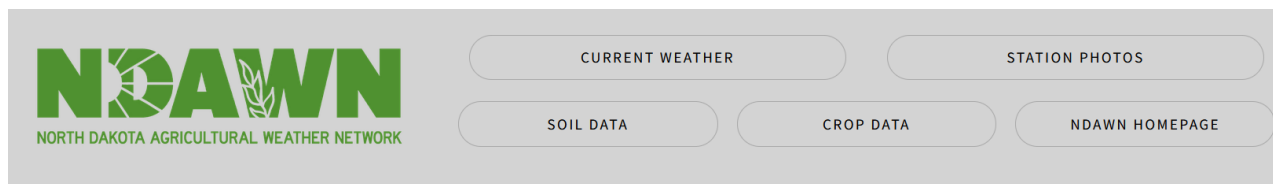


Figure 1. Total rainfall for the 168-hour period ending near 11 AM on April 27, 2022 at NDAWN weather stations

The graphic above is from <https://ndawn.info/>. If you are unaware of that website, it is an addition to our current website (<https://ndawn.ndsu.nodak.edu/>) that is mobile compliant. This means that the maps and the menus will adjust to the size of your screen. Our main website can be difficult to use with a phone, but this site is much easier to use with your smart phone. It does not have all the features of the main website, but it has many current weather maps available, plus some soil temperature and moisture information as well (see Figure 2, next page).



Current Weather



Figure 2. The top menu with available tools on the NDAWN.info webpage.

Although you will not be able to select your specific planting date, under the “CROP DATA” tab you will find tools for several row crops as well as pre-selected dates to use for calculating growing degree days (GDDs). If you raise sugar beets, cercospora guidance will become available on June 16 and sugar beet maggot guidance is already available. Plus, under the “CURRENT WEATHER” tab there will be maps available for a number of different parameters, plus a few maps that are not available on our other website.

In the next *Crop and Pest Report*, I will start presenting my forecast for the upcoming week. Once we get into the planting season, I will be posting other information like the current soil temperatures at 4 inches that can be found in Figure 3 as well as GDD maps and projected GDDs for the next week.

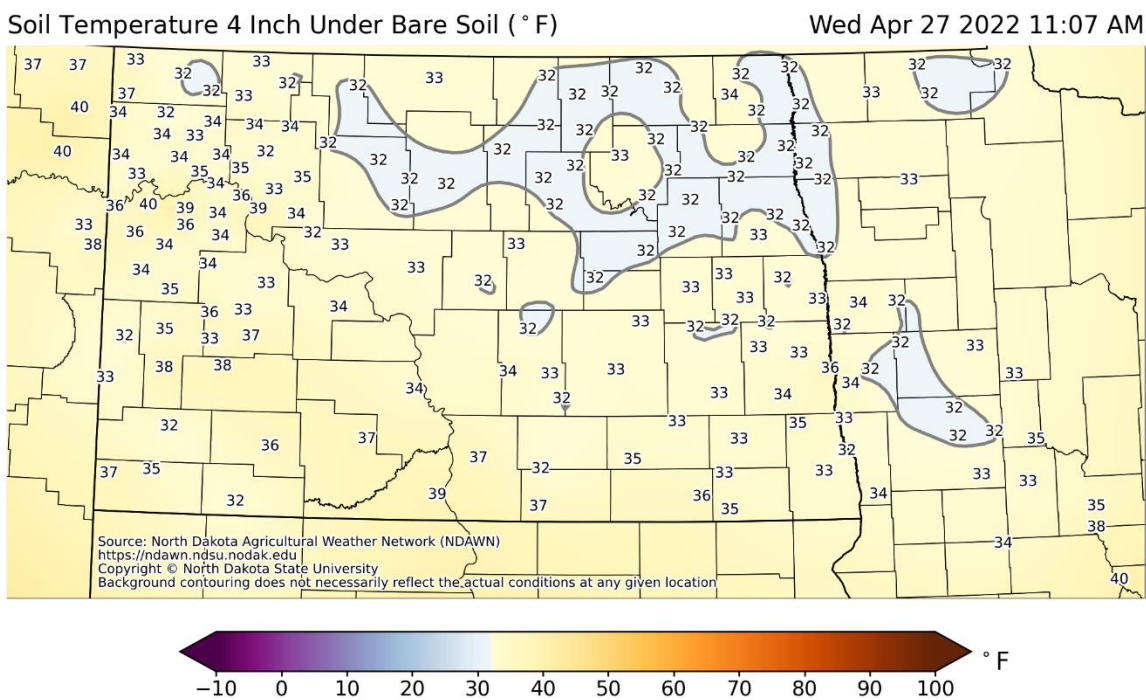


Figure 3. Soil temperatures at 4" depth under bare soil at NDAWN stations on April 27 at 11:07 AM.

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