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NDSU FIELD DAYS: JULY-AUGUST 2019

Plan to attend a nearby NDSU Field Days to learn the latest in new crop varieties, agronomy, soil science, pest issues and more!

July 8: Central Grassland REC, Streeter, N.D. 4-7 PM
July 9: Hettinger Research Extension Center – Hettinger, N.D. 5-7 PM
July 10: Dickinson Research Extension Center – Dickinson, N.D. 8:30 -noon
July 10: Williston Research Extension Center (dryland crops and horticulture) – Williston, N.D. 3 PM
July 11: Nesson Valley Irrigation Field Day – Williston, N.D. 8:30 AM
July 15: Agronomy Seed Farm – Casselton, N.D. 5 PM
July 16: Carrington Research Extension Center – Carrington, N.D. 9 AM - noon and 1 - 3 PM
July 17: North Central Research Extension Center – Minot, N.D. 9 AM - noon
July 18: Langdon Research Extension Center – Langdon, N.D. 8 AM - noon
Aug 15: Oaks Irrigation Field Tour – Oakes, N.D 9 AM - noon
The IPM Scouts have observed very low populations of both cereal aphids in wheat and soybean aphids in soybean in eastern ND. Cereal aphids were found on wheat near the NDSU Greenhouse complex in Fargo, Cass County on June 25th. Cereal aphids are also being reported on wheat in South Dakota and Minnesota. Soybean aphids also were found last week on soybeans in Walsh and Grand Forks Counties in NE ND. These are the first aphid detections for the season. See IPM scouting maps from last week on next page.

Scouting is key to integrated pest management (IPM) and knowing when populations are getting close to the economic threshold level or action threshold. For a scouting protocol, walk a Z or W pattern across the field and inspect 10 randomly selected stems at 5 sites for aphids.

There are many natural factors that keep cereal aphids and soybean aphids in check. For example, strong thunderstorms can wash the aphids off leaves and drown them. Or, predators such as lady beetles, aphid lions, and syrphid larvae play a major role in reducing aphid populations. Parasitic wasps also help lower aphid populations. When natural enemies are present in large numbers, and the crop is well developed, farmers are discouraged from spraying fields.

Cereal aphids migrate into the northern Great Plains and do not overwinter in ND. Three primary species of aphids cause problems in ND wheat including the greenbug, the bird cherry oat aphid and the English grain aphid. All aphids are small, ¼ inch long, and pear-shaped with two cornicles (tailpipes) on the posterior end. The English grain aphid is the most common aphid seen in small grains in ND and prefers the wheat head. The bird cherry oat aphid feeds primarily on leaves in the lower part of the small grain plant, and it is the most virulent aphid transmitting barley yellow dwarf virus (BYDV). When large numbers of aphids infected with BYDV are blown up from the south, BYDV can spread quickly through small grain fields. Symptoms of BYDV are yellowing of leaves, often the flag leaf, from the tip back toward stem, and stunted plants. BYDV has not been confirmed in ND yet this season. At greatest risk are later planted fields - much of our crop this year! Cereal crops are most susceptible to aphid feeding injury from the vegetative to boot stages. Scouting should begin as soon as cereal aphids are detected and continue up through the heading stage of wheat and barley.

**Cereal Aphid Economic Threshold:** To protect small grains from yield loss due to aphid feeding, the treatment threshold is 85% stems with more than one aphid present, prior to complete heading. Heavy infestations of cereal aphids can reduce grain quality (protein and test weight), especially in early growth stages of cereal grains.
**Soybean aphids.** This small aphid is yellowish-green, about $\frac{1}{16}$ inch long, and pear-shaped with two black cornicles. They are commonly found feeding on the underside of the leaf and in the top ‘tender’ leaves of vegetative soybeans now. Aphids suck fluid from plants. When infestations are large, infested leaves are wilted or curled. The aphids excrete honeydew, a sweet substance that accumulates on surfaces of lower leaves and promotes the growth of black sooty mold. Start scouting fields in the V3 to V4 crop stage to determine if soybean aphids are present in fields.

**Soybean Aphid Economic Threshold:**
R1 (beginning of flowering) to R5 (beginning seed) = average of 250 aphids per plant and when populations are actively increasing in 80% of field.
THISTLE CATERPILLAR IN CROPS AND GARDENS

We have received several reports of the colorful painted lady butterfly fluttering around fields and pollinator gardens. In one situation, severe defoliation by thistle caterpillars was reported in a sunflower field near Linton in Emmons County. Thistle caterpillars defoliated young sunflower plants down to just the stem with little leaf tissue left.

Thistle caterpillars are only an occasional pest problem in North Dakota since the butterflies get blown in annually. The last major outbreak of thistle caterpillars in North Dakota was 2012. Larvae (caterpillars) injure plants by defoliation. Host plants include Canada thistle, sunflower, soybean and vegetable plants. Larvae feed for two to four weeks. They are dark brown or black with yellow stripe of side of body, spiny hairs, and 1½ inch long when mature. Larvae create loose webbing when feeding on the leaves. Black fecal pellets also can be found in the webs. Mature larvae pupate, and adult butterflies will emerge in 7 to 10 days. Two generations are typical in North Dakota. Although the thistle caterpillar feeds on Canada thistle, it does not control this noxious weed due to the thistle’s extensive root system. Painted lady butterflies are often attracted to fields that are weedy with Canada thistles for egg-laying.

Economic thresholds are dependent on the crop, crop stage and the presence of other foliage-feeding caterpillars, such as green cloverworm. All are lumped into the threshold for total leaf area lost. When doing defoliation estimates, sample foliage in the top, middle and lower canopies and average the percent defoliation. If the majority of larvae are >1¼ inch long, most of the feeding damage has occurred and treatment is not advised.

Economic Thresholds:

SOYBEAN - vegetative to bloom 40% defoliation, bloom to pod fill 20% defoliation and pod fill to harvest 35% defoliation. An average infestation of 4 to 8 larvae per row foot typically cause 20-30% defoliation. As plants reach flowering and pod filling, defoliation poses a greater risk for yield loss.

SUNFLOWER - 25% defoliation and when larvae are still small (<1¼ inch long).
TOO EARLY FOR WHEAT MIDGE CONTROL

Emergence of the male wheat midge has just begun at 1300 Accumulated Degree Days (ADD) using a 40°F base temperature. The male emerges before the female wheat midge. Females start to emerge at 1300 ADD, at 1475 ADD about 50% emerged, and at 1600 ADD about 90% emerged. See wheat midge NDawn map below. The hot weekend forecast with the 90°F will push the degree-days to climb into 1300+ ADD, so the female wheat midge emergence will start to emerge.

Some growers with early planting dates have spring wheat fields that are near late heading-flowering for scab control. However, it is too early to pull the trigger for wheat midge management. For pest management, we are more concerned with the female wheat midge that lays the eggs on wheat heads. The optimal insecticide application timing for wheat midge control is between late heading through early heading. After 50% flowering, the female wheat midge is not attracted to the wheat heads for egg laying, and the beneficial parasitic wasp is emerging which provides natural control of wheat midge eggs and larvae.

What was your spring wheat planting date? Planting dates correlate to the risk of wheat midge infestation. Early planted spring wheat (prior to 200 wheat midge ADD) will head before wheat midge emergence, and late-planted wheat (after 600 wheat midge ADD) will head after peak emergence of wheat midge. Spring wheat planted between 200 and 600 wheat midge ADD will head at the time of peak wheat midge emergence and will be higher risk. The NDawn DD model for wheat midge is setup to integrate wheat planting dates with susceptibility to wheat midge emergence and it calculates the risk for wheat midge infestation. Growers and crop consultants can assess the NDawn Wheat midge DD model at: https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html Select your nearest NDawn station and enter your wheat planting date. The output indicates the expected growth stage of the wheat and whether it is susceptible to wheat midge infestation, as well as how far along the wheat midge emergence is, such as, 50% females emerged.

Wheat fields that are susceptible to wheat midge infestation should be confirmed by scouting for economic populations of wheat midge. Wheat midge scouting is conducted at night when temperatures are greater than 59°F and the winds are less than 6 mph. Use a flash light and slowly scan the heads of wheat plants for wheat midge adults (small orange fly), counting the number of adults per head, and then calculate an average number of adults per head. The economic thresholds for wheat midge are: one or more wheat midge observed for every four or five heads on hard red spring wheat, or one or more midge observed for every seven or eight heads on durum wheat.

Consult the NDSU Extension publication E1330 (revised) Integrated Pest Management of the Wheat Midge in ND for more information.
SCOUTING SOYBEAN

Nodulation

Soybean plants have the ability to form a symbiotic relationship with nitrogen-fixing Rhizobia bacteria, resulting in the formation of nodules. At this time of the year, the soybean plants are developing rapidly, and nodules started to develop shortly after plants emerged. If the plant is around 6 inches tall with the first or second true leaves (trifoliolate leaves) unfolded, bacteria in the nodules will start fixing Nitrogen gas into plant available N. The number of nodules will increase until about the R5 (the beginning of the seed formation). To check for nodulation, dig up a plant, wash the roots in a small bucket of water, and observe the presence or absence of nodules on the root. To check the activity of the nodule, cut the nodule open and see if the color is pink or reddish, indicating appropriate functioning of the nodule.
Iron Deficiency Chlorosis

Driving around the countryside some of the soybeans fields are starting to show a yellowing, caused by iron deficiency chlorosis (IDC) of soybean plants. The unifoliate leaves of soybeans are usually green, as they can utilize the iron present in the seed. As the trifoliolate leaves start to develop, chlorosis often starts to appear when soybeans are grown on high pH soils with free bi-carbonate and poorly drained regions of the field. The deficiency appears first on the youngest leaves. Under severe conditions, the growing point is injured, and recovery is limited, resulting in a reduced soybean yield. It is important to note the IDC tolerance level of the soybean variety in the affected field and in the future, plant varieties with more tolerance in fields with severe IDC expression.

First trifoliolate leaf has is light green due to iron deficiency chlorosis.

As IDC progresses, the veins tend to stay green and tissue becomes yellow in between the veins. In a severely affected plant, the tissue will become
TERMINATION TIMING OF SOYBEAN PLANTED INTO RYE

Though this report has little to do with current management issues, I thought it might be interesting to some of you to see the results of some of our ongoing research. In the wetter regions of the state, planting a cover crop like rye or camelina after the harvest of a small grain crop may be beneficial to the cropping system as it has the potential of protecting the soil until the next crop is sown. Soybean is the most common crop to follow small grains in this region of the state and I have had numerous questions about the best time to terminate a rye cover crop in the spring when planting soybeans. To help answer this question, we established a simple experiment where rye was terminated two weeks and one week before planting soybeans, at planting, one week and two weeks after planting. The effect of treatment timing on rye biomass can be seen in the front range of the following photo, with the earliest termination timing on the left and the latest timing on the right. As can be noted, the earliest timings resulted in little or no rye residue remaining at the time this picture was taken.

Emerged weeds were counted earlier this week. Weed numbers declined as termination timing was delayed (see accompanying table) with very few weeds emerging in the last termination timing. Rye obviously has the potential for suppressing weed emergence! We were also concerned about the establishment of soybean in an actively growing rye crop. Data from this location (see table), showed no difference in emergence between the various treatments. In a dry spring, one could expect that soybean emergence would be impacted if the actively growing rye crop depleted the soil moisture prior to soybean planting. It was noted, that soybean plants growing in the latest rye removal date were about a full trifoliate behind the other rye termination timings.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weed counts 6/21 (no./sq ft)</th>
<th>Soybean population (no./acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 weeks pre-plant</td>
<td>13.8</td>
<td>157,978</td>
</tr>
<tr>
<td>1 week pre-plant</td>
<td>10.5</td>
<td>162,624</td>
</tr>
<tr>
<td>At planting</td>
<td>9.9</td>
<td>169,594</td>
</tr>
<tr>
<td>1 week post-plant</td>
<td>3.5</td>
<td>153,332</td>
</tr>
<tr>
<td>2 weeks post-plant</td>
<td>1.8</td>
<td>168,432</td>
</tr>
</tbody>
</table>

Planting a cover crop is recommended for fields that were not planted this spring. Not only can it protect the soil from erosion, it will use excess soil moisture, reduce nitrogen losses and suppress weeds. With the new date for use of crops planted to prevent plant acres, planting a forage crop may make economic sense especially if you or your neighbor raise cattle, or if you have access to equipment to bale hay. Picking the right species to plant, the best planting date and finding seed are critical next steps.

Joel Ransom
Extension Agronomist, Small Grains and Corn
SCOUT FOR FUSARIUM YELLOWS/DECLINE OF SUGARBEET

Fusarium yellows/decline symptoms were observed in research plots and in several commercial sugarbeet fields in the Moorhead factory district. The fungi *Fusarium oxysporum* and *Fusarium secorum* cause Fusarium yellows and Fusarium decline, respectively, on sugarbeet. Fusarium yellows/decline may cause significant reduction in plant stand and root yield, and it is recommended that infected roots not be placed in long-term storage.

The pathogens may infect seedlings and older plants in fields where average soil temperature is at or above 55°F and in the presence of adequate moisture or wet conditions. In seedlings and young plants, oldest leaves become yellow following by wilting and death (*Figure 1*). Cross sections of infected roots will show darkening of the vascular system. On older plants (*4 leaves and older*), symptoms include interveinal yellowing and death of older leaves (*Figure 2*).

*Figure 1. Symptom of Fusarium yellows on 2-6 leaf stage sugarbeet – yellowing or necrosis first on oldest true leaves*

*Figure 2. Typical symptoms of Fusarium yellows on an older plant – interveinal chlorosis and necrosis starting on oldest leaves followed by similar symptoms on younger inner leaves*
Sometimes there is distinct necrosis of half the leaf on one side of the midrib (Figure 3) which then spreads to the other side of the mid-rib. Typically, necrosis occurs first on older leaves followed by death of the younger leaves. Under severe disease conditions, infected plants may die with seedlings being more vulnerable. In fields where the disease is not severe, older leaves of infected plants display typical foliar symptoms, but the plants survive. Roots of infected plants have roots with no external symptoms but may be sprangled. When these roots are cut in a cross section, there is a distinct darkening and damage of the vascular system. Roots of infected plants do not store well in piles, having high respiration rates resulting in low sugar concentration during storage. The best and only way to manage Fusarium yellows/decline is by planting varieties with tolerance to Fusarium yellows and other root diseases common to specific fields. Consult your agriculturists or seed sales representatives for Fusarium tolerant varieties appropriate for your growing area. At this time, fields should be scouted for Fusarium yellows/decline and records should be kept to be used when deciding on varieties the next time fields with the diseases are planted to beets again.

Mohamed Khan
Extension Sugarbeet Specialist
NDSU & U of MN
701-231-8596

FUSARIUM HEAD BLIGHT RISK IN NORTH DAKOTA
Winter wheat is in the flowering stages of development or beyond, some barley will start to head soon, and spring wheat is still a week or two from entering heading and flowering stages. Presently, a few pockets of moderate to high scab risk exist for flowering susceptible wheat varieties in northwest and southeast ND (Figure 1). For moderately susceptible (Figure 2) or moderately resistant (Figure 3) varieties, scab risk is moderate to high for a pocket in southeast ND. Scab risk will likely remain elevated or may even increase in the coming days. Conditions that favor scab include prolonged periods (2-3 days) of high humidity, frequent rain events and warm temperatures. Several areas of the state will see favorable conditions for scab, so it is extremely important to monitor the growth stages of small grains and apply a fungicide when needed.

The best time to apply a fungicide for scab in wheat is when a majority (>50%) of the main stems are at early flowering (Figure 3). For barley, the best time for a fungicide application is when a majority (>50%) of the main stems are at full head (Figure 4). Research conducted at NDSU and throughout the United States (funded by United States Wheat and Barley Scab Initiative) suggest that applying a fungicide to wheat 4-7 days after early flowering has started (late) provides more disease suppression than applications made prior to early flowering (early). The same trend is observed in barley where fungicides applied after full-head (late) provide more suppression than fungicides applied prior to full-head (early). Fungicides that provide the most suppression of scab and deoxynivalenol (vomitoxin) are prothioconazole+tebuconazole (Prosaro), metconazole (Caramba), prothioconazole (Proline) and pydiflumetofen+propiconazole (Miravis Ace) when applied at early-anthesis (or a few days after). For more information on scab fungicide efficacy and timing, please read CPN-3001 Optimizing Fungicide Use for Fusarium Head Blight (Scab) and Associated Mycotoxins (https://cropprotectionnetwork.org/library/) and NDSU Extension Publication.

Figure 1. Fusarium head blight risk for susceptible varieties on June 25.

Figure 2. Fusarium head blight risk for moderately resistant varieties on June 25.
Figure 3. The best time to make a scab fungicide application in wheat is at early flowering defined as yellow anthers (flowers) extruding from the center portion of the head.
Figure 4. The best time to make a scab fungicide application in barley is at full head.
BE ON THE LOOKOUT FOR PALMER AMARANTH

In the last week, I have gone on field visits to Benson and Nelson counties to look at potential Palmer amaranth infestations. In one field in each county, we were able to find Palmer amaranth growing in dense populations as localized patches in the headland rows, with a few scattered plants nearby. The density in these patches indicates that at least one or more mature plants went through a combine last year. Luckily, these infestations were caught early enough to control the plants before they will go to seed. One population was detected at a small enough stage to control with herbicides, while the other population was already 16” tall and had overtaken some corn rows by the time I visited.

At this time, we do not know how these plants were introduced, only that the introduction was likely last year. Until recent rains, these counties have been relatively dry, which is good conditions for Palmer growth. The upcoming warmer temperatures will favor rapid growth of any Palmer amaranth plants that are currently growing in the state. Early detection is the key for keeping Palmer amaranth populations at manageable levels. With many acres being sprayed this week, these findings serve as a good reminder to scout after an herbicide application is made in order to look for weed escapes or herbicide resistant weeds in general, not just Palmer amaranth.

Joe Ikley
Extension Weed Specialist
ENVIRONMENTAL CONDITIONS CAN INFLUENCE HERBICIDE PERFORMANCE

Growers planting their crops experienced a variety of conditions in April and May 2019. For example, a review of weekly average air temperatures collected at the Fargo NDAWN station in April and May indicated temperatures averaged 34 F for the week beginning April 8 and averaged only 47 F for the week beginning May 6. Average temperatures finally climbed over 55 F the week beginning May 27.

Inconsistent environmental conditions have continued during weed control. For example, warm for a few days and then a return to jacket or sweater weather. One would guess many growers began POST weed control programs in dry bean and soybean the last two weeks and will continue making POST sprays at least into early July. It is timely to consider how environmental conditions interact with herbicides and affect both crop tolerance and weed control.

Best weed control is usually when herbicides are applied to actively growing weeds. The literature suggests ideal temperatures for applying most POST herbicides range between 65 and 85 F. Herbicides applied under cooler temperatures, for example, below 60 F, or when weeds are not actively growing can take longer to effectively control weeds and be less effective in general.

Some herbicides may injure crops if applied above 85 F. Avoid applying volatile herbicides such as 2,4-D ester, MCPA ester and dicamba during hot weather, especially near susceptible broadleaf crops, shelterbelts, farmsteads, or gardens.

Temperatures following herbicide application can influence crop tolerance. For example, desired crops degrade herbicides by metabolism. However, metabolism slows during cool or cold conditions, which extends the amount of time required to degrade herbicides in plants. Likewise, rapid degradation under warm conditions allows crop plants to avoid herbicide injury. Herbicides may be sprayed following cold night-time temperatures if day-time temperatures warm to at least 60 degrees.

Finally, what are "adverse environmental conditions" or conditions to avoid. Mostly common, adverse conditions are prolonged periods without significant precipitation or low air temperatures. On the other hand, high relative humidity, adequate soil moisture, and moderate to warm air temperatures all favor enhanced herbicide absorption and resultant control. Remember that, if conditions occur for enhanced absorption into weeds, conditions are also favorable for enhanced absorption into the crop, which could result in crop injury.

Tom Peters
Extension Sugarbeet Agronomist
NDSU & U of MN
INSECT SAMPLING IN TURFGRASS

Before resorting to pesticidal sprays, it is important to know what is causing the issue in your lawn. While diseases may first come to mind, insects are just as often the issue. Turfgrass insects can be extremely destructive to residential lawns. There are many insects which can damage lawns in North Dakota and the Red River Valley, including chinch bugs, grubs, and the larval stages of many moth species. Some may only be present for a short time, yet their damage can be an eyesore well into summer. Sampling is necessary to detect and estimate the number of insects present in a given area and determine if chemical control is needed.

The following are reliable sampling methods for determining pest populations of turfgrass insects commonly found in North Dakota:

**Flotation sampling** — Cut both ends out of a metal cylinder such as a coffee can. Pound it 3 to 4 inches into the ground in a damaged area and fill it with water. Small insects will float to the top quickly. Estimate the number of insects per square foot based on the number present in the area covered by the can.

**Irritant sampling** — Mow the grass in the damaged area. Then, mix 2 tablespoons of liquid dishwashing detergent in 2 gallons of water and pour the entire batch over 1 square yard. Any larvae present in the canopy should come to the surface in a few minutes.

**Soil sampling** — Cut a square foot of turf on three sides, undercutting 2 to 3 inches deep with a sharp, flat-edge shovel. Roll the sod back and count the number of grubs in the sampling area. Crumble some of the soil from the root zone to expose more grubs. After counting, level the soil and roll the sod back into place. Be sure to provide water for several days to promote re-establishment. Roots should recover quickly if the sample was cut deeply enough.

The most common turfgrass insect pests are listed in the table below with their appropriate sampling method and respective thresholds. Control is not advised if there are fewer insects found than the presented threshold.

<table>
<thead>
<tr>
<th>Pest</th>
<th>Sampling Method</th>
<th>Control Threshold</th>
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<tbody>
<tr>
<td>Chinch bugs</td>
<td>Flotation or irritant sampling</td>
<td>15 to 20 per square foot</td>
</tr>
<tr>
<td>Armyworms</td>
<td>Irritant sampling</td>
<td>5 larvae per square yard</td>
</tr>
<tr>
<td>Cutworms</td>
<td>Irritant sampling</td>
<td>5 larvae per square yard</td>
</tr>
<tr>
<td>Sod webworms</td>
<td>Irritant sampling</td>
<td>4-6 larvae per square foot</td>
</tr>
<tr>
<td>May and June beetles</td>
<td>Soil sampling</td>
<td>3-4 larvae per square foot</td>
</tr>
<tr>
<td>Northern masked chafer</td>
<td>Soil sampling</td>
<td>8-9 larvae per square foot</td>
</tr>
<tr>
<td>Bluegrass billbug</td>
<td>Soil sampling</td>
<td>6-8 larvae per square foot</td>
</tr>
</tbody>
</table>

For questions about identifying and managing turfgrass pests, please call the Plant Diagnostic Lab at 701-231-7854. Adapted from extension publication H-1553, *Home Lawn Problems and Solutions for North Dakota*.

Find us online at: [https://www.ag.ndsu.edu/pdl](https://www.ag.ndsu.edu/pdl)

Alexander Knudson
Entomological Diagnostician
NDSU Extension Plant Diagnostic Lab
Over the last 45 years, research into developing methods to optimally irrigate to conserve water and energy without sacrificing yields has been pursued worldwide. This research area is typically referred to as irrigation scheduling. Although many methods have been developed, according to the 2013 Farm and Ranch Irrigation Survey conducted by the National Agricultural Statistics Service (NASS), 80% of irrigators use either the crop appearance or soil moisture by feel methods to determine when to irrigate. Both of which are low tech and been used for many years. Why do irrigators prefer these two methods? Because they can generally be done at any time of the day, do not take a lot of time to perform and can easily be incorporated into the busy schedule of a farmer.

Irrigations can also be scheduled by tracking soil water amounts throughout the season, a soil water accounting method. This is often referred to as the “Checkbook Method”, which by the way was a term first coined in the original 1976 version of AE792 written by Darnell Lundstrom and Earl Stegman. The term “Checkbook Method” is now used worldwide and everyone knows it is a soil water accounting method. As presented in AE792, the checkbook method is easy to implement and can be done any time of the day. To setup the checkbook, all you need is the water holding capacities of the soil in your field, the crop type and an estimate of crop water use.

The soil water holding capacity by depth in your field is readily obtainable from the NRCS’s Websoil Survey website. Daily crop water use estimates are contained in tables in the publication. All you need to know is the crop type, the number of weeks past emergence and the high temperature for the day.

When used throughout the growing season, the checkbook method has been tested in many research studies and proven to be a reliable and accurate method of irrigation scheduling. The first version of AE792 was printed in 1976, reprinted in 1983 and revised in 1988. My colleague, Dean Steele and I have revised and updated the 1988 version.

Printed copies of AE792 can be obtained from any county Extension office or a pdf copy can be found online at https://www.ag.ndsu.edu/publications/crops/irrigation-scheduling-by-the-checkbook-method-1.

Tom Scherer
NDSU Extension Agricultural Engineer
(701) 231-7239
Spruce Sawfly Larvae Observed

Yellow-headed spruce sawflies were seen this week in the Devils Lake area. They are primarily a pest of Colorado blue spruce, where the larvae feed on expanding needles. Sometimes whole needles are eaten; in other cases, the needles are damaged to the point where the ends dry out and turn a pink/brown color (see photos). This symptom can be subtle at first, but an experienced eye will pick up on it quickly. These insects prefer trees that are under (about) 20 feet in height. Spruce sawflies are usually found in the central and western parts of the state.

Over the last several years, the larvae have consistently been observed at about 830 Growing Degree Days (base temp 40°F). They feed for 30-40 days total and should be susceptible to insecticides for at least 2 more weeks. Carbaryl and acephate are both labeled for sawfly control. For a small infestation, simply picking the larvae off the tree by hand and destroying them may be easier and is equally effective. A strong jet of water may also help reduced sawfly populations on trees.

When using insecticides, be sure to read, understand and follow all label directions.

Joe Zeleznik
NDSU Extension Forestry Specialist

Lezlee Johnson
North Dakota Forest Service
Forest Health Manager

Larva of the yellow-headed spruce sawfly. Notice that the tip of the needle in the lower right of the photo has been completely chewed off, reducing the needle to half its original length. Photo taken near Minnewaukan, ND (Scott Knoke).

These needles were damaged by the yellow-headed spruce sawfly larvae. The insects damaged these needles but did not consume them completely, resulting in brown/pink, dried-out needles. Photo taken in Richardton, ND (Joe Zeleznik).
DUTCH ELM DISEASE REPORTED – START SCOUTING NOW

The reports coming in now about wilting and dying American elm trees remind us that Dutch elm disease (DED) was first reported in Mandan fifty years ago and is now found throughout North Dakota. American elm, once common in cities, native forests and windbreaks, is our most susceptible elm. Siberian elm, commonly planted in windbreaks, is the most resistant but still can get the disease. DED is caused by a fungus which spreads from tree to tree via bark beetles and through root grafts. Elm trees infected with the DED pathogen by beetles show symptoms of wilting, curling, and yellowing of leaves on one or more branches in their upper crown. These symptoms can continue to spread through the tree for a few years before the tree finally dies. Elm trees infected through root grafts show wilting beginning lower in the crown and often die within the year.

Since elm bark beetle populations rapidly build up in dying elm trees and in dead elm wood with intact bark, one of the most effective ways to slow the spread of DED on a community level is to identify and remove this material within 2-3 weeks of noticing the symptoms. Waiting until fall or winter to do all the removals is not effective at slowing DED spread. Infected elm wood can be burned, buried, chipped, or debarked. Failure to remove DED-infected material immediately (within 2 or 3 weeks of identification) allows beetles to continue to spread the pathogen unchecked.

To prevent spread of DED by root grafts, roots can be severed by digging a 36-inch-deep trench all the way around the infected tree. In many communities, underground utilities may limit the use of this technique. The infected tree must still be removed immediately (within 2-3 weeks of noticing the symptoms). Before attempting any trenching, call North Dakota One call, (800) 795-0555, or 811, to mark utility lines.
Fungicide injections can be effective at preventing DED from infecting healthy trees. This should be done by a trained tree care professional. Fungicide treatment lasts about 3 years and is most effective when a community-wide sanitation program is in place where infected material is removed and disposed of promptly and properly (within 2-3 weeks).

When replacing the trees lost to DED, it is possible to replant DED-resistant elm trees along with a diversity of other well adapted trees. To learn more, see: https://www.ag.ndsu.edu/publications/lawns-gardens-trees/elms-for-north-dakota/f1893.pdf “Elms for North Dakota” includes a list of recommended elm trees.

Lezlee Johnson  
North Dakota Forest Service  
Forest Health Manager

Joe Zeleznik  
NDSU Extension Forestry Specialist

AROUND THE STATE

NORTH CENTRAL ND

Continued hit and miss rain fell over the North Central region over the last week: Minot 0.77”; Rugby 1.46”; Bottineau 1.63”; Rolla 2.85”; Plaza 0.26”; Mohall 0.82”; and Garrison 0.39”. Grasshopper nymph numbers are increasing in the area. Local growers are making their spray applications – taking advantage of the calmer days. Some areas continue to spray for canola flea beetle, especially in areas north and west of Minot. However, numbers appear to be dropping around Minot. Small grains and soybeans are looking good. Canola is approaching the 5-leaf to 7-leaf stage.

TJ Prochaska  
Extension Cropping Systems Specialist  
NDSU North Central Research Extension Center

NORTHWEST ND

Scattered rain showers and thunderstorms moved through the Northwest last Thursday, Friday, and Saturday bringing much needed rain to the area. Most places received 0.5-1.0” with some localized areas receiving 1.5-2.0” over 2 or 3 days. For parts of western Williams and Divide Counties, this was the first significant rain since snowmelt. The rain will help crops stressed by lack of moisture, but more will be needed to meet crop demand through flowering and seed set. Here is an update on crop development at the Williston Research Extension Center as of Monday, June 24th: barley is headed out but not yet flowering; spring wheat is flag leaf to head emergence starting; oat is flag leaf to head emergence starting; flax is at first flower; pea is flowering; lentil is flowering; and soybean is at 2nd-3rd trifoliate.

A pipeline reclamation field walk was held June 20th north of Ray, ND with farmer Shane Hodenfield. Shane provided a history of the site and background on his decision to plant the pipeline disturbed area to perennials, Clair Keene discussed species selection and forage management, and Keith Brown of the Williams County SCD measured water infiltration on the pipeline and undisturbed soils (see photo).
The Williston REC dryland field day is coming up on Wednesday, July 10th and everyone is welcome. Attendees can pick either the dryland agronomy or horticulture tour. Both start at 3:45 pm followed by a steak and lamb supper at 7:00 pm. The Nesson Valley irrigated tour is Thursday, July 11th 9:00 am to noon followed by a hamburger lunch. The Nesson Valley site is 23 miles east of Williston on Highway 1804.

Clair Keene
Extension
Cropping Systems
Specialist
NDSU Williston Research Extension Center

NORTHEAST ND

Most of the northeast received between 0.5 and 2 inches of rainfall in the last week, with exceptions of 0.12 inches at Grand Forks NDAWN station and 3 inches at the Rolla NDAWN. Small grains look excellent in many areas with little to no disease. Canola has initiated bolting. Sunflowers are at V4 stage. Herbicide applications continue on soy and dry beans. A hot spot of grasshoppers showed up at the end of last week in Walsh County in Fordville and Adams area.

Lesley Lubenow
Area Extension Specialist/Agronomy
NDSU Langdon Research Extension Center

SOUTH-CENTRAL/SOUTHEAST ND

Based on NDAWN, the region’s total rainfall May 1 through June 24 ranged from 3.4 inches (Carrington) to 8.2 inches (Oakes). During the past week (June 18-24), the region received 1.2 inches (Carrington) to 3” (Oakes). The region is generally good to excess in soil moisture. While the recent rain will benefit cash crops, it has made harvest difficult for the hay crop.

The region’s corn growing degree day units accumulated from May 1 to June 24 range from 485 to 585, which is less growth of about 0.5 to 1.5 leaf compared to the long-term average for the same period.

Winter rye has advanced seed development and winter wheat is heading to early post-flower growth stages. Spring small grain seeded during late April are in the flag leaf to heading stages. Lots of variability exists with row crops, from early plant emergence to V6-7 corn and V2-3 soybean and dry bean. Early planted cool-season broadleaf crops including canola, field pea and flax are beginning to flower.

Flowering flax

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center
SOUTHWEST ND

Throughout the region some were planting sunflower and spring wheat later into June than ideal. With the wide range in planting dates there is still some spring wheat that is just emerging out of the soil and some of the early planted spring small grains are around flag leaf and some barley is beginning to head out. Winter wheat is flowering, some canola is starting to bloom, and alfalfa and hay fields are ready to be cut. Plant stress from acidic soils and aluminum toxicity is becoming more visible in our lime trial near Dickinson. Much of the region received some rainfall over the past week, however there are some dry patches scattered throughout the region. According to NDAWN, Dickinson received 1.01 inch of rain from June 11th to June 24th and over the same period Mott received 2.04 inches, Hettinger with 1.26 inch, and Carson with 0.43 inch.

Ryan Buetow
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center

WEATHER FORECAST
The June 27 through July 3, 2019 Weather Summary and Outlook

With just a few exceptions, this past week was another period with below average temperatures across the North Dakota Agricultural Weather Network (NDAWN). Temperatures were as much as 7° or 8° below normal along the North Dakota/Montana border (Figure 1). The only area near average was in parts of the northern Red River Valley. These next 7 days should be well above average for temperatures, especially across the eastern part of North Dakota into northwestern Minnesota.

Figure 1. Temperature departures from normal from June 20 through June 25, 2019
There was widespread rainfall during the past week with all NDAWN station recording some precipitation, but amounts varied greatly (Figure 2). Most of the rain occurred last Thursday through Friday Night, although there were some localized pockets of heavier rain on Monday. There will be several rain threats during this upcoming 7-day period.

**Figure 2. Rainfall for the period from June 20 through June 25, 2019**

Even with the additional rain from this past week, most of the region is still showing rainfall deficits for the month of June (Figure 3). June is the rainiest month of the year and the expected rain this week will definitely lower the moisture deficits in some, but unlikely in all areas.

**Figure 3. Percent of Average Rainfall for the period from June 1 through June 25, 2019**
A ridge of high pressure aloft is developing over the central and southern Great Plains. This will help boost temperatures over much of the United States between the Rocky and Appalachian Mountains. North Dakota will be on the northern periphery of this “bubble” of warm air. The temperatures will warm not only at the surface, but above our heads as well. In turn, this warmer air aloft tends to stabilize the atmosphere in the mid-levels around 5,000 to 15,000 feet suppressing thunderstorm development. But near the northern edge of that warmer air, near where the Jetstream will be blowing, thunderstorms tend to develop. In meteorological circles, these are often referenced as “ridge runners” as they run along the edge of that ridge of high pressure. This should bring multiple chances of thunderstorms from eastern Montana, through North Dakota into northern Minnesota. Amounts are going to vary, but most locations should record rainfall during this next week. This pattern tends to have storms form in eastern Montana into western North Dakota then move eastward in the evening and overnight. Although any location could experience severe weather, it will be more favored in western portions of the state where the thunderstorms first develop.

This ridge of high pressure will also allow moisture from the Gulf of Mexico to stream north into much of the north central portion of the lower 48 states. This, in combination with the expected thunderstorms on many days will lead to an increase in atmospheric moisture near the surface. Dew points, the best way to measure this low-level moisture, will climb into the 60s with some days in the 70s. In other words, it is going to get humid. This should increase the likelihood of heavy dew on many mornings, plus the rain lingering on the crops, will increase the risk of fungal diseases.

My projected growing degree days (GDDs) for the next seven days for Base 50°, 44° and 32° is presented in Figure 4. Most of the region will record between 25% and 50% more GDDs this week than last week with the highest totals expected in the Red River Valley into western Minnesota.

![Projected Growing Degree Days for the period of June 20 to June 26, 2019](image)

Using May 5 as a planting date, accumulated growing degree days for wheat (base temperature 32°) is given in Figure 5. You can calculate wheat growing degree days based on your exact planting date(s) here: [https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html](https://ndawn.ndsu.nodak.edu/wheat-growing-degree-days.html)
Using May 15 as a planting date, accumulated growing degree days for corn (base temperature 50°) is given in Figure 6. You can calculate corn growing degree days based on your exact planting date(s) here: https://ndawn.ndsu.nodak.edu/corn-growing-degree-days.html.

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