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In This Issue

Armyworm, Worth The Look In High-Risk Crops

(Christian Krupke) & (John Obermeyer)

Armyworm moth captures have varied this spring, with some being quite impressive (see "Armyworm Pheromone Trap Report"). High-risk crops should be monitored for the next several weeks. Moths prefer to lay their eggs on dense grassy vegetation (e.g., wheat, grass hay, and grass cover crops). Larval development has been slow with recent cooler temperatures, but will speed up with the current warming trend. The smaller caterpillars are rarely noticed, and usually just notch leaves. Larger worms, >0.75", mean bigger appetites! As is usually the case with armyworm moths, larvae will be at different sizes because of the many flushes of moths.

Corn – Corn that has been no-tilled into, or growing adjacent to, a grass cover crop (especially cereal rye) should be inspected immediately for armyworm feeding in southern counties. Hatched larvae will move from the dead/dying grasses to emerging/emerged corn. Armyworm feeding, usually done at night, gives corn a ragged appearance, with feeding extending from the leaf margin toward the midrib. When larvae are numerous and/or large, damage may be so extensive that most of the plant, with the exception of the midrib and stalk, is consumed. A highly damaged plant may recover if the growing point has not been destroyed. If more than 50% of the plants show armyworm feeding, and live larvae less than 1-1/4 inches long are numerous in the field, control may be necessary. Larvae greater than 1-1/4 inches consume a large amount of leaf tissue and are more difficult to control. If armyworm are detected migrating from border areas or waterways within fields, spot treatments in these areas are possible if the problem is identified early enough. Seed-applied insecticides provide no protection from this pest, and although some Bt-corn hybrids may suppress small larvae, once larvae are large they offer no control. Monitoring and treatment when necessary are your only real control options here.

Wheat & Grass Pasture – Examine plants in different areas of a field, especially where plant growth is dense. Look for flag leaf feeding, clipped heads, and armyworm droppings on the ground. Shake the plants and count the number of armyworm larvae on the ground and under plant debris. They will often feed and be out in the open on cloudy or cool days. On sunny days, the armyworm will take shelter under crop residue or soil clods. If counts average approximately 5 or more per linear foot of row, the worms are less than 1-1/4 inches long, and leaf feeding is evident, control may be justified. If larvae are present and they are destroying the flag leaves or the heads, treat immediately.

Armyworm damage to wheat flag leaf and larva feeding on florets of the head.

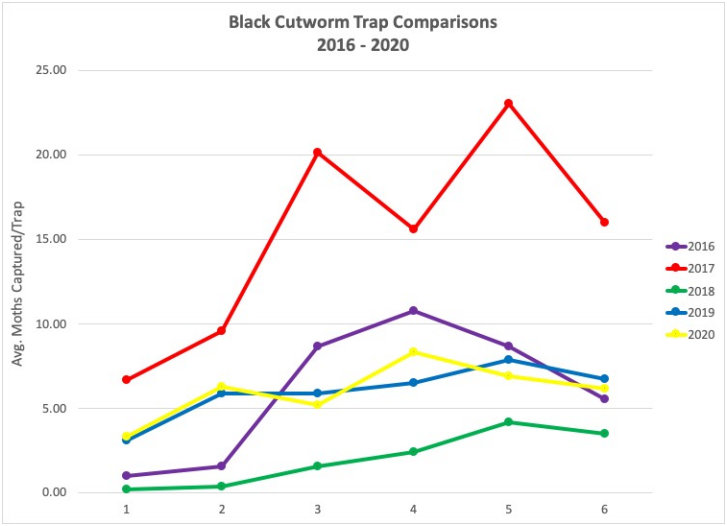
Armyworm feeding damage to seedling corn in high-risk field.

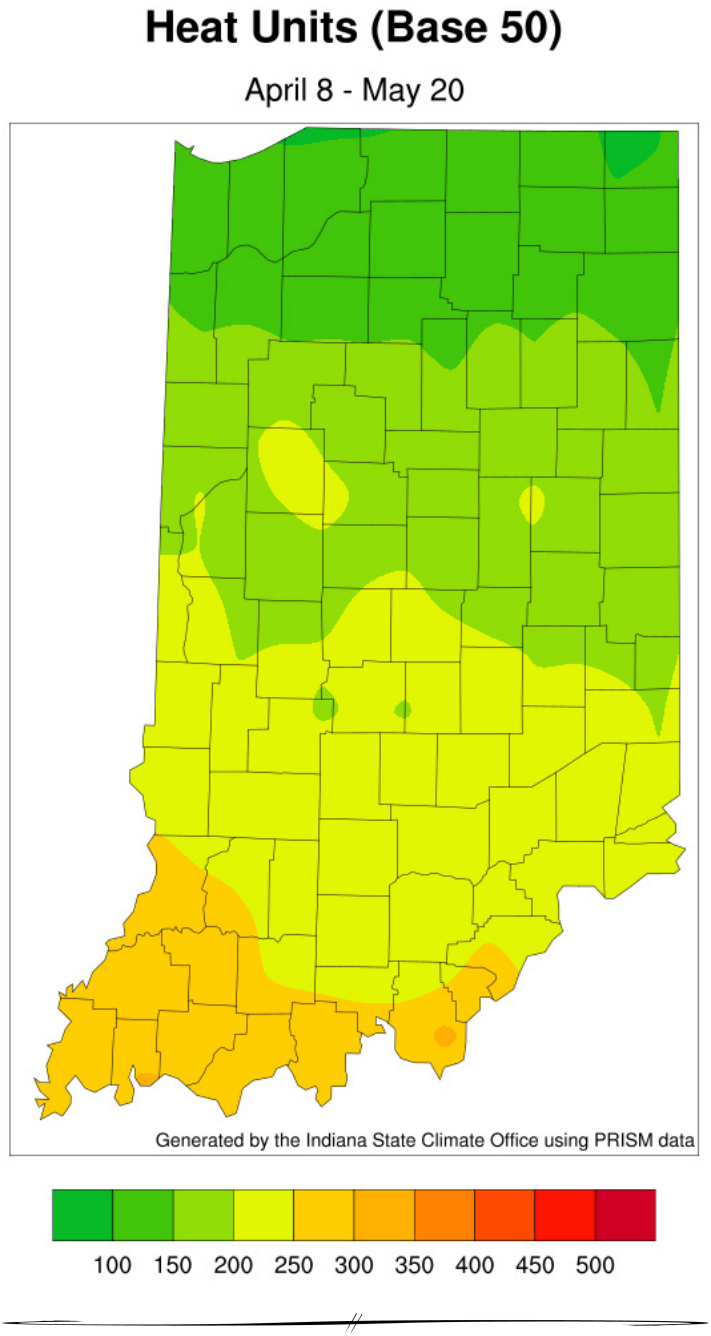
Black Cutworm Moth Trap Captures Compared

(John Obermeyer)

Every spring, dozens of cooperators throughout the state put forth considerable effort in trapping for the arrival and intensity of black cutworm moths. I'm personally indebted to these faithful bug counters, hoping you also appreciate their efforts as reported in the "Black Cutworm Adult Pheromone Trap Report." If you recognize a name or two on this list of reporters, by county, please thank them from afar…while adhering to social distancing!

This year's average trap catches, compared to the previous four, looks just like 2019, rather mediocre. However, within these averages are many intensive moth captures over the six weeks of monitoring, many reporting the most they had ever captured. Presumably, this tells us that the moths were well distributed throughout the state during their arrival. This is one piece of important information, as we now track larval development, and follow-up with scouting in high-risk fields! See the accompanying heat unit map for black cutworm development in your area. 300 accumulated heat units (50°F base), after intensive captures, could indicate black cutworm cutting to plants. Happy scouting!





Control Of "Volunteer" Corn In A Corn Replant Situation

(Marcelo Zimmer) & *(Bill Johnson)*

Due to the recent cold wet weather, corn planted in late April has either struggled to emerge or the corn that did emerge may have been severely injured by frost events. There are also some fields planted in early May where standing water may result in poor corn stands due to poor water drainage. Therefore, there are a number of fields which may need to be replanted. The purpose of this article is to discuss the options to kill an existing stand of corn in a replant situation.

The first issue to address is what herbicide resistance traits are stacked in the corn you would like to remove from the field. If the corn is non-GMO (no herbicide-resistance traits), your options for control are tillage, glyphosate (e.g. Roundup, others), clethodim (e.g. Select Max, others), paraquat (e.g. Gramoxone, others) + metribuzin (e.g. Tricor, others), or glufosinate (e.g. Liberty, others). The best solution to control non-GMO

corn will be to use tillage or glyphosate. Non-GMO corn is very sensitive to glyphosate and no waiting intervals are needed to replant. You can also use glyphosate or tillage to control Liberty Link corn hybrids (as long as the hybrid is not also Roundup Ready). For Roundup Ready corn that doesn't carry the Liberty Link trait, tillage, Select Max, or paraquat + metribuzin (Gramoxone + Tricor) would be the logical methods for termination. Another option for corn that is not Liberty Link is to plant Liberty Link corn and apply a follow up treatment of Liberty postemergence to control plants that survived the first application. Use of 32 to 34 oz/A of Liberty has been effective for control of small corn (V1 to V3) in our research.

If your corn is NOT non-GMO, then the options are somewhat more complicated. Many popular commercial hybrids are stacked with either Roundup Ready and Liberty Link traits, or both traits. If you have corn stacked with both traits, our experience has been that tillage will be the most reliable method, and would not have the waiting interval associated with Select Max, but tillage is not desirable for those in a long-term no-till situation, or those with cover crops in the field.

Numerous clethodim products, including Select Max, can be used to control the stacked trait corn in a replant situation. The use of Select Max will provide better corn control than Gramoxone + Tricor, but it requires a waiting interval of 6 days after the field is treated with Select Max. The directions on the label indicate that up to 6 fl oz/A can be applied plus 0.25% NIS and 2.5 to 4 lb/A of AMS as the spray additives. Apply to corn that is 12 inches or less. Avoid overlapping the boom as overlaps may result in excessive crop injury. Another option to control "volunteer" corn stacked with both the Liberty Link and Roundup Ready traits is to plant Enlist corn and spray Assure II (quizalofop) at 5-12 fl oz/A (plus 1% v/v of COC or 0.25% v/v of NIS) when the Enlist corn is between the V2-V6 growth stages. Enlist corn is resistant to ACCase-inhibiting herbicides in the aryloxyphenoxypropionate family (FOPs) such as Assure II, which is the only FOP herbicide labeled for POST applications to Enlist corn.

If you want to avoid the waiting interval to plant for clethodim and will not plant Enlist corn, your only herbicide option for termination of stacked trait corn is paraquat + metribuzin. In University research trials, 2-3 pt/A of Gramoxone + 4-6 oz/A of dry metribuzin (e.g. Tricor, others) has been effective for control of small corn (V1 to V3). Application of Gramoxone alone, without the addition of metribuzin, is likely to be less effective. Corn that has advanced past the V3 growth stage will generally be more difficult to control.

Information listed here is based on research and outreach extension programming at Purdue University and elsewhere. The use of trade names is for clarity to readers of this site, it does not imply endorsement of a particular brand nor does exclusion imply non-approval. Always consult the herbicide label for the most current and update precautions and restrictions.

Control Of Buttercups In Indiana fields

(Marcelo Zimmer), (Bill Johnson) & (Glenn Nice)

The Short Story

There are several buttercup species found in Indiana. The buttercups are toxic plants and can cause poisoning in grazing animals; however, buttercups are reported not to be toxic in hay. In the most frequently encountered buttercups, the flowers are yellow. These plants can be problematic in no-till crops, gardens, pastures, wheat, and waste areas. Fall or early spring applications of glyphosate + 2,4-D; Autumn (iodosulfuron) [corn only]; Princep (simazine) + 2,4-D [corn only]; and Canopy XL (sulfentrazone + chlorimuron) + 2,4-D [soybean only] have provided excellent control of smallflower buttercup (90 to 100% control). However, triazines alone have not controlled all buttercups. In grass pastures, Cimarron (metsulfuron), 2,4-D, and Crossbow (2,4-D + triclopyr) will provide good to excellent control of most buttercups. Control of buttercups with dicamba products has been more variable, but can range from fair to excellent. In winter wheat, Osprey (mesosulfuron), Olympus (propoxycarbazone-sodium), and Harmony Extra (thifensulfuron + tribenuron) provide excellent control of smallflower buttercup.

The Longer Story

The word 'buttercup' is a common name that is associated with a fairly large group of plants, which are predominantly in the genus *Ranunculus* spp. Plants in the buttercup family (Ranunculaceae), are also called the crowfoot family.

In Indiana, there are approximately 16 species in this group of plants called the buttercups (Table 1). However, other buttercup species can be found in the Western US and Canada, and in the Southern US.

Table 1. Ranunculus species that have the name 'buttercup' associated with them in Indiana.

Common Name	Latin Name	Common Name	Latin Name
littleleaf buttercup	*R. abortivus*	Mississippi buttercup	*R. laxicaulis*
tall buttercup	*R. acris*	longbeak buttercup	*R. longirostris*
bulbous buttercup	*R. bulbosus*	rock buttercup	*R. micranthus*
early buttercup	*R. ascicularis*	smallflower buttercup	*R. parviflorus*
fig buttercup	*R. ficaria*	Pennsylvania buttercup	*R. pensylvanicus*
yellow water buttercup	*R. fabellaris*	creeping buttercup	*R. repens*
Harvey's buttercup	*R. harveyi*	hairy buttercup	*R. sardous*
bristly buttercup	*R. hispidus*	cursed buttercup	*R. seleratus*

Information compiled from USDA Plant's Database [https://plants.sc.egov.usda.gov/java/]

Buttercups can often be found in no-till row crops, wheat fields, pastures, and neglected areas (Figure 1). Dense populations of small flower buttercup have been observed in our no-till studies in Southeast Indiana at the Southeast Purdue Agricultural Center.

Figure 1. Buttecup infestation in neglected area. (*Photo Credit: Adrienna Held*)

Identification

Typically when thinking of buttercups many think of single yellow flowers with five petals. In some cases that would be correct, but buttercup flowers can have a variable number of petals within the same species and some flowers can be white or pink. However, in Indiana they are most often bright to light yellow. In some species the petals are waxy in appearance. One characteristic of the flowers that is consistent is that there are many reproductive structures within a flower. The many female components of the flower are born on a cone like structure in the center and the many male components surround the cone.

These cones in the middle of the flower will eventually become the fruit of the plant. The fruit of the Ranunculus resembles a raspberry-looking structure (Figure 2). The seeds are an achene that always have a notch or described as a beak in Britton and Brown's "An Illustrated Flora of The Northern United States" (Figure 2). This 'beak' is often an identifying character of the species in question; it can be an indiscreet bump to a curled hook.

Figure 2. Buttercup plant (*Photo Credit: Adrienna Held*)

The leaves are variable even within a specific species[1]. They range from entire to many types of lobbing. Some are finely divided and others, as in the case of the basal leaves, can be rounded or kidney shaped. For simplicity sake, we will give identifying characteristics of only five buttercup species that we may often encounter in agriculture.

- **Smallflower buttercup [*parviflorus*]**[2] – This is an annual and can reach a mature height of 6 to 10 inches. Stem and petioles can be hairy. Basal leaves have long petioles and round leaves which are more or less 3-cleft and approximately 1 inch in diameter. The upper stem leaves are either short petioled, or sessile (attached to the stem without a petiole) and lobed into 3 to 5 linear to oblong lobes. Flowers are yellow and tiny, measuring 0.06 to 0.2 inches wide. Close inspection of the flower will show small oblong petals a little longer than the calyx (the whorl of sepals below the flower, the 'flowers cup'). The fruit is round and approximately 0.17 inches wide. The seed is an achene that is flat and has a sharp beak about 0.25% of its length. The surface of the achene has tiny bumps, but this will require a magnifying glass to see. Generally blooms in the summer months.
- **Tall buttercup [*acris*]**[2] – This buttercup is a perennial and can reach a height of 2 to 3 feet tall. This buttercup is also hairy. The upper portion of the stems can branch. The basal leaves are tufted; divided 3 to 7 lobes and the margins of the lobes can be further indented. The upper leaves have short petioles and are divided 3 times. Flowers are bright yellow with a waxy appearance and about 1 inch wide. The petals are 2 to 3 times longer than the calyx and round. The fruit is bulbous and 0.5 to 0.6 inches wide. The achene has a short sharp beak.
- **Harvey's buttercup [R. harveyi]**[2] – This buttercup is also a perennial. It is branched and can reach a height of 8 to 18 inches tall. Harvey's buttercup does not have any hair; it is 'glaborous'. It tends to branch as you move up the stems. The basal leaves are on long petiols and round or slightly kidney shaped. They have rounded ridges on the margins (crenate) or can be slightly lobed and are 0.4 to 1.5 inches wide. Like smallflower buttercup, the upper leaves are sessile or have small petioles and are deeply cleft about 3 times. Flowers are bright yellow, with 4 to 8 petals and are 0.5 to 0.75 inches wide. In this case, the petals are 4 to 5 times longer than the calyx. The fruit is 0.17 inches in diameter and the achene is tipped with a small straight beak.
- **Littleleaf buttercup [*abortivus*]**[3, 4] – Annual or biennial, this buttercup is slightly hairy, branches from the base of the plant, and is 6 to 20 inches tall. Basal leaves are round with margins similar to Harvey's buttercup and are on long petioles. Upper leaves have short petioles and are divided into 3 to 4 leaflets. The flowers are yellow and have 5 small oblong petals. Petals are close to the same size as the sepals. Achenes have a small hooked beak. Generally blooms March to June
- **Creeping buttercup or corn buttercup [*repens*]**[2, 5] – This buttercup can be distinguished at first glance by having stolons that root at the nodes. This perennial can spread forming colonies. This plant can be hairy to sparsely hairy. Basal leaves and upper leaves have 3 leaflets. In the upper leaves two leaflets are sessile while the center is extended on the petiole. Flowers are bright and shinny having a waxy appearance and are approximately 1 inch wide. Petals are round and are longer than the sepals. Fruits are 0.3 inches wide and the achene has a short thick and slightly bent beak.

Toxicity:

Buttercups are problematic in pastures. The buttercup family includes several toxic plants. This family also contains the larkspur and staggerweed (Delphinium spp.) which are other well-known toxic plants. The whole plant is toxic to livestock. Cursed crowfoot (*R. sceleratus*) is reported to be one of the most toxic[6]. The toxic component is an acrid volatile substance called anemoral and an irritant called protoanemonin, which is also reported to be a plant produced anibiotic[6, 7]. All buttercups have various amounts of these or related compounds. Symptoms of poisoning are drooling, diarrhea, increased heart rate, behavior changes such as weakness and depression, bleeding, and convulsions[6, 8]. Protoanemonin has been reported to cause irritation to the skin in humans. Amounts of plant tissue required to be dangerous depends on species of plant. In the article "Poisonous Pasture Plants and Livestock" by Dwight Lingenfelter and Bill Curran of Pennsylvania State University, approximately 1 to 3% of body weight could cause poisoning[9]. Toxicity does not appear to carry through in the hay, possibly due to the rapid break down of the toxins involved[6].

Control:

There may be differences between specific species and herbicide efficacy research done on one species may not mean that the same

treatment will be successful on all species. Much of the work done in the Midwest has focused on smallflower buttercup. Products that are reported to be effective on smallflower buttercup may not be as affective on all buttercups, especially for tall buttercup which is a perennial[10, 11].

In studies done at Purdue University[10], smallflower buttercup was controlled above 95% and higher with 2,4-D [1 pt/A], glyphosate [0.5 to 0.75 lb ae/A], Autumn [0.3 oz/A and up], chlorimuron plus 2,4-D, and fall applications of 2,4-D [1 pt/A]. Glyphosate plus 2,4-D can be used as a fall or early spring burndown in corn or soybean.

In winter wheat, Osprey, Olympus, and Harmony Extra provided excellent control of smallflower buttercup[10, 12]. Osprey and Olympus can be applied in the fall or early spring before jointing. Harmony Extra can be applied in the fall or spring after the 2-leaf stage and before jointing.

Buttercups in grass pastures can be an increased concern due to the toxicity posed to grazing animals. The products Cimarron Plus, Cimarron Max, and Crossbow have excellent (> 90% control) of most buttercups you will encounter. Other products that have good control of buttercups are 2,4-D, Curtail, Milestone, and Forefront. Dicamba may provide fair to good control but appears to be a little more variable than 2,4-D.

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Foliar Diseases Of Wheat And Fusarium Head Blight (Scab) Management

(Darcy Telenko)

Rainy, wet conditions will favor many fungal diseases in wheat. Already our southern neighbors have started reporting multiple diseases in wheat. These include – strip rust and Septoria leaf spot. A number of resources are available to help distinguish wheat leaf diseases, they include the Purdue Wheat Field Guide (https://ag.purdue.edu/agry/dtc/Pages/WheatFG.aspx) and "*Identifying Rust Diseases of Wheat and Barley.*" https://www.ars.usda.gov/ARSUserFiles/50620500/Cerealrusts/Rust_Diseases_National.pdf

Samples can always be submitted to the Purdue Plant Pest Diagnostic Lab for disease identification and confirmation. https://ag.purdue.edu/btny/ppdl/Pages/default.aspx

Wheat in Indiana is starting to head out across the state and there are reports of flowering starting in southern Indiana. During flowering (anthesis) **warm, wet weather** with high relative humidity will favor the development of Fusarium head blight (scab). Fusarium head blight (FHB) is caused by the fungus *Fusarium graminearium*. It infects wheat during flowering, beginning at Feekes 10.5.1. Symptoms of FHB will appear as bleached spiklets on the head later in the season. Infection can lead to small or shriveled grain kernels referred to as "tombstones." In addition to shriveled grain, this fungus can produce mycotoxins such as deoxynivalenol (DON), which can accumulated in the infected grain.

Figure 1. Wheat beginning to flower and Fusarium head blight infection. (*Photo Credits: Darcy Telenko*)

A number of resources are available to help you make disease management decisions in wheat.

1) **The Fusarium Risk Assessment Tool** is available at the following website. http://www.wheatscab.psu.edu/. This tool estimates the risk of

a Fusarium head blight epidemic (> than 10% field severity) using weather conditions (temperature, rainfall, and relative humidity) measured 15 days prior to flowering. See below for the current risk map – much of central and southern Indiana is colored yellow (medium risk for scab development) and orange (high risk for scab development in susceptible varieties) due to recent wet weather.

Keep in mind that actual disease risk depends heavily on the growth stage of wheat in your area. We are still on the early side; the estimate is most relevant just prior to flowering (Feekes 10.5.1) or the early stages of grain development. Fusarium head blight risk is highest when there are three or more days with extended periods of high relative humidity and moderate temperatures (65 to 80°F) during the early stages of kernel development.

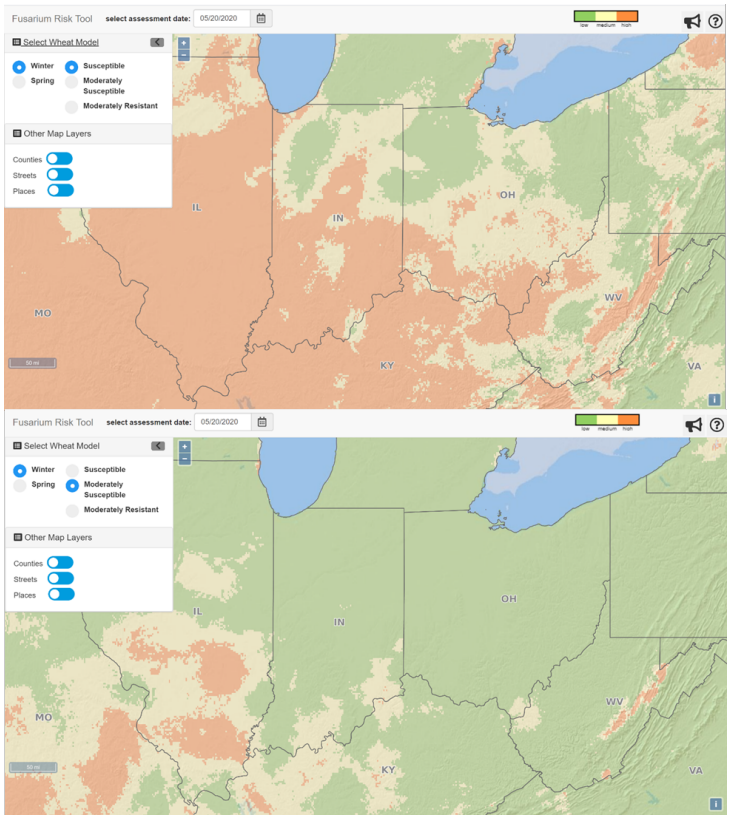

Figure 2. Fusarium Risk Assessment Tool Indiana map generated on 20 May 2020. Orange = high risk, Yellow = medium risk, and Green = low risk for Fusarium head blight on wheat just prior to flowering or the early stages of grain development. (*Image Credit: http://www.wheatscab.psu.edu/*)

I wanted to remind you that this tool is available. Farmers and crop advisors can sign up for alerts from the U.S. Wheat and Barley Scab Initiative; these can be sent to a cell phone as a text or email. To sign up visit https://scabusa.org/fhb_alerts.

2) **Fungicide Application:** A fungicide application might be considered if a Fusarium head blight (FHB) susceptible variety is planted, or if you are worried about scab on your farm. These applications should be made at Feekes 10.5.1, or early flowering to suppress FHB. Fungicides recommended for FHB and DON include Prosaro, Caramba, Proline, and Miravis Ace. The use of products containing strobilurin fungicides may result in higher levels of DON accumulation in grain when damaged by FHB. These are not labelled for FHB management.

Fungicide Efficacy Tables are updated yearly and available from the Crop Protection Network publications https://crop-protection-network.s3.amazonaws.com/publications/fungicide-efficacy-for-control-of-wheat-diseases-filename-2019-07-01-160518.pdf

These tables can help you identify products to use based on your targeted disease. As a reminder follow the label on harvest restriction as some products may have 30 to 45 days required between last fungicide application and harvest. Once the full head has emerged flowering will likely occur in 3-5 days, depending on weather and variety. It is time to keep an eye on your fields. Those most at risk would be fields that were planted to a Fusarium head blight susceptible variety or those with limited rotation that follow a previous crop of wheat or corn.

Effects Of Flooding Or Ponding On Corn Prior To Tasseling

(Bob Nielsen)

The consequences of flooding, ponding, and saturated soils on young corn depend heavily on the duration of the stress and temperatures.

Intense rainfall events (technically referred to as “toad stranglers” or “goose drowners”) flood low-lying corn fields and create ponding (standing water) in poorly drained areas (depressions, compacted soil) within other fields. Other areas within fields, while technically not flooded or ponded, often remain saturated for lengthy periods of time. Recurrent heavy rainfall events simply “add insult to injury” by re-wetting, re-ponding, and re-flooding the same areas of the fields.

High water sign.

What are the prospects for recently submerged corn fields or plants simply enduring days and days of saturated soils? The flippant answer is that suffering crops will survive until they die.

What I really mean is that no one can tell you with certainty the day after the storm whether a ponded area of a corn field will survive or whether there will be long-term yield consequences until enough time has gone by such that you can assess the actual recovery of the damaged plants. We can, however, talk about the factors that increase or decrease the risks of severe damage or death to flooded soils.

Plant death by submersion.

- Plants that are completely submerged are at higher risk than those that are partially submerged.
    - Plants that are only partially submerged may continue to photosynthesize, albeit at limited rates.
- The longer an area remains ponded, the higher the risk of plant death.
    - Soil oxygen is depleted within about 48 hours of soil saturation. Without oxygen, the plants cannot perform critical life sustaining functions; e.g. nutrient and water uptake is impaired and root growth is inhibited (Wiebold, 2013).
    - Many agronomists will tell you that young corn can survive up to about 4 days of outright ponding if temperatures are relatively cool (mid-70's F or cooler); fewer days if temperatures are warm (mid-70's F or warmer).
- Even when surface water subsides quickly, the likelihood of dense surface crusts that form as the soil dries increases the risk of emergence failure for recently planted crops.
    - Be prepared with a rotary hoe to break up the crust and aid emergence. For those "youngsters" among you who do not know how to use a rotary hoe, see Hanna et al. (2001).
- The greater the deposition of mud or old crop residues on plants as the water subsides, the greater the stress on the plants due to reduced photosynthesis.
    - Ironically, such situations would benefit from another rainfall event to wash the mud deposits from the leaves.
- Mud and crud that cakes the leaves and stalks encourage subsequent development of fungal and bacterial diseases in damaged plant tissue. In particular, bacterial ear rot can develop when flood waters rise up to or above the developing ears of corn plants (Nielsen, 2003).

Orange lower leaves due to rapid remobilization of mobile nutrients to upper canopy.

- Corn younger than about V6 (six fully exposed leaf collars) is more susceptible to ponding damage than is corn older than V6.
    - This is partly because young plants are more easily submerged than older taller plants and partly because the corn plant's growing point remains below ground until about V6. The health of the growing point can be assessed initially by splitting stalks and visually examining the lower portion of the stem (Nielsen, 2019a). Within 3 to 5 days after water drains from the ponded area, look for the appearance of fresh leaves from the whorls of the plants.

Leaf rolling and wilting above ground in response to roots dying below ground from excessive soil moisture.

- Extended periods of saturated soils AFTER the surface water subsides will take their toll on the overall vigor of the crop.
    - Some root death will occur and new root growth will be stunted until the soil dries to acceptable moisture contents. As a result, plants may be subject to greater

injury during a subsequently dry summer due to their restricted root systems.
    - Nutrients like nitrogen are rapidly remobilized from lower leaves to upper, newer leaves; resulting in a rapid development of orange or yellow lower leaves.
    - Because root function in saturated soils deteriorates, less photosynthate is utilized by the root system and more accumulates in the upper plant parts. The higher concentration of photosynthate in the stems and leaves often results in dramatic purpling of those above-ground plant parts (Nielsen, 2017).
    - As more of the root system dies, the ability of the affected plants to take up water decreases and, ironically, the plants begin to show signs of drought stress (leaf rolling, plant wilting, leaf death).
    - Damage to the root system today will predispose the crop to the development of root and stalk rots later by virtue of the photosynthetic stress imposed by the limited root system during the important grain filling period following pollination. Monitor affected fields later in August and early September for the possible development of stalk rots and modify harvest-timing strategies accordingly.
- Concomitant (I found a new word in the dictionary!) with the direct stress of saturated soils on a corn crop, flooding and ponding can cause significant losses of soil nitrogen (N) from either denitrification of nitrate-N in heavier soils or leaching of nitrate-N in coarser soils.
    - Significant loss of soil N will cause nitrogen deficiencies and possible additional yield loss.
    - On the other hand, if the corn dies in the ponded areas it probably does not matter how much nitrogen you've lost.
- Lengthy periods of wet soil conditions favor the development of seedling blight diseases in young corn seedlings, especially those caused by Pythium fungi (Sweets, 2014).
    - Fungicidal seed treatments effectively protect the seed and seedling for only about 3 weeks after planting. After that, especially if seedling development has been delayed by cold or excessive soil moisture, the risk of infection increases quickly. Fields that looked acceptable one week can be devastated by seedling blight by the next week if conditions are favorable for the disease and seedling development has not yet reached about V3 to V4.
    - Poorly drained areas of fields are most at risk for the development of these diseases and so will also be risky for potential replant operations.
- The risk of diseases like common smut and crazy top also increases when soils are saturated or plants are submerged and temperatures are cool (Pataky and Snetselaar, 2006; Jackson-Ziems, 2014).
    - The fungus that causes crazy top depends on saturated soil conditions to infect corn seedlings.
    - The common smut fungal organism is ubiquitous in soils and can infect young corn plants through tissue damaged by floodwaters. There is limited hybrid resistance to either of these two diseases and predicting damage is difficult until later in the growing season.
- Wind damage to corn during severe storms results in either stalk breakage (aka "green snap") or root lodging (plants uprooted and laying nearly flat to the ground). The risk of permanent damage is greater during late vegetative development and less with younger plants.
    - The yield effect of "green snap" damage depends on the percentage of field affected and whether the stalk breakage occurs above or below the ear, but is usually serious regardless. Obviously, stalk breakage below the ear results in zero yield for that plant. Stalk breakage above the ear results in significant yield loss due to the loss of upper canopy photosynthesis capacity for that plant.
    - Root lodged corn will recover or straighten up to varying degrees depending on the growth stage of the crop. Generally, younger corn has a greater ability to straighten up with minimal "goose-necking" than older corn. Yield effects of root lodging depend on whether soil moisture remains adequate for root regeneration, the severity of root damage due to the uprooting nature of root lodging, and the degree of "goose-necking" that develops and its effect on the harvestability of the crop.

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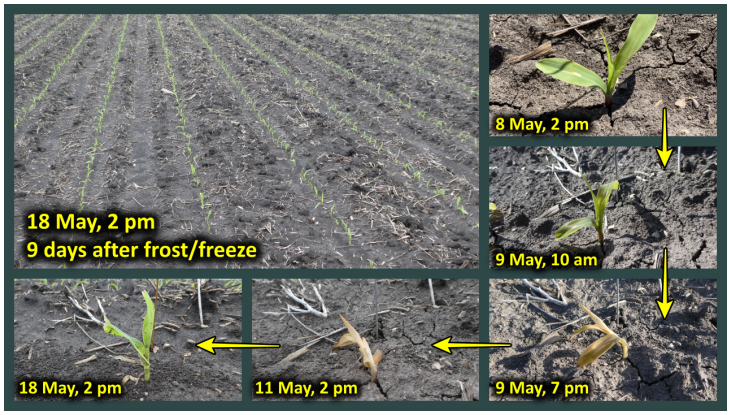
The Rest Of The Story On Frost/Freeze Event – May 8-18

(Bob Nielsen)

The rest of the story… Severe above-ground DAMAGE to V1-V2 CORN from FROST/FREEZE on May 9. With patience and return to warm weather, field seemingly near death 3 days after event RECOVERS completely! The key: Non-damaged below-ground growing points.



Will Ergot Reappear This Year?

(Keith Johnson)

Do you remember the spring season of 2019? Wet and cool conditions, to the extreme, delayed field operations. Another concern that can happen with these environmental conditions, and it did, was the development of ergot on perennial cool-season grasses and cereal rye. Symptoms when the ergot bodies (sclerotia) are consumed by livestock are similar to conditions with fescue toxicosis. Tillage incorporates ergot bodies into the soil. This reduces the chance of infection in following years. However, in a perennial grass hay and pasture system the ergot bodies will remain on the soil surface because no tillage occurs. Indiana's weather has been wet and cool the past couple of weeks. Will the ergot infection occur again? Fortunately, insects and microrganisms can use ergot bodies as a food source. Still, to be on the safe side, it is recommended to check seed heads of grasses in pastures and hayfields, especially the acreage that was infected with ergot last year, to see if ergot reappears. If it does, clip the seed heads in pastures, and send a representative hay sample to a laboratory that tests for the toxic alkaloids that ergot produces. Labs that offered the test in the region last year included the Iowa State Veterinary Diagnostic Laboratory and the University of Missouri Veterinary Health Center. It has been found that 100-200 ppb of the toxin is the threshold level for cattle and that as little as 25-50 ppb is the concern level for first-time-to-birth mares in late gestation. Please inform me at johnsonk@purdue.edu if ergot is found in your pastures or hay fields.

Tall fescue seed head infected with ergot.

Two individual ergot bodies (sclerotia) from a grass seed head.

Will The Flooding Continue?

(Beth Hall)

Two weekends ago, Indiana was facing freezing temperatures that broke numerous records across the state. This past weekend into early this week, the story has been lot of rain. As of the morning of Wednesday, May 20th, the northwest counties have received over 4 inches with a northwest to southeast gradient of decreasing amounts down to around an inch along the Ohio boarder (Figure 1). Will these rains continue? The current forecasts and outlooks are predicting much less rain across the state over the next seven days and only weak probabilities of above-normal precipitation into early June (Figure 2).

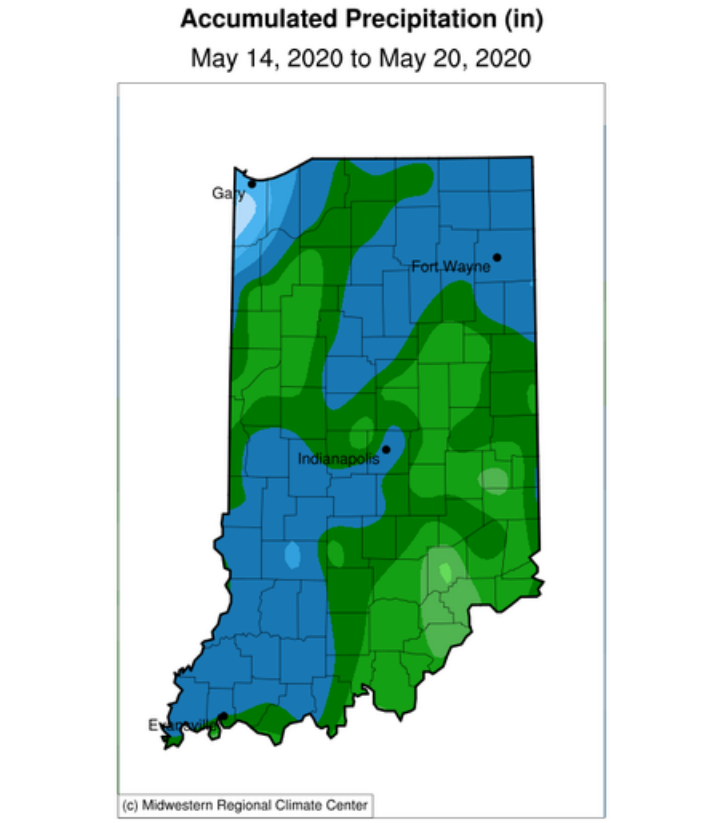


Figure 1. Total precipitation amounts for the 7-day period representing May 14-20, 2020.

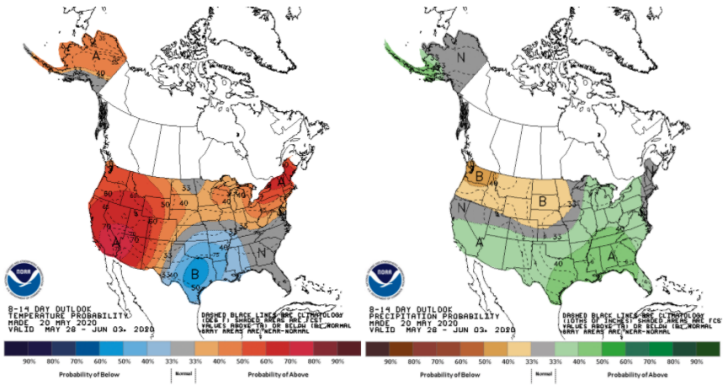


Figure 2. The National Climate Prediction Center's 8-14-day outlook for temperature (left) and precipitation (right) representing May 28 – June 3, 2020. Intensity of the shading indicates the probabilistic confidence of above/below normal conditions occurring.

Regarding temperatures, the forecasts suggest normal to above-normal temperatures over the next week with only moderate confidence of above normal temperatures continuing into early June (Figure 2). This should hopefully help growing degree-day (GDD) accumulations catch up to normal (Figures 3 and 4). To track how GDDs have been accumulating since April 1, April 15, and May 1, check out the Indiana State Climate Office website for these daily updated maps (https://ag.purdue.edu/indiana-state-climate/growing-degree-day-climate-maps/).

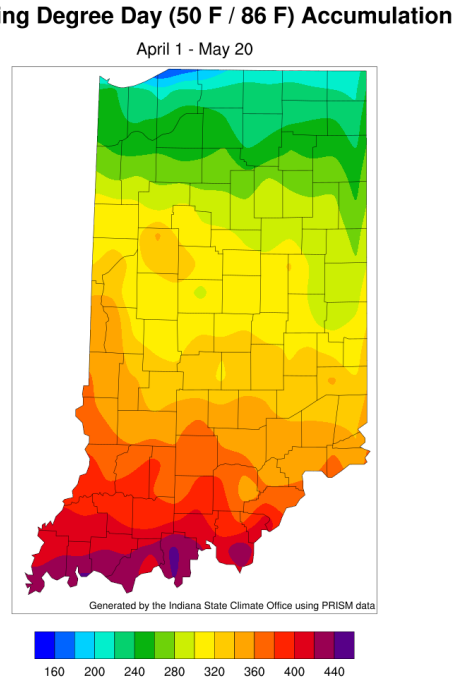


Figure 3. Modified growing degree-day accumulations for April 1 – May 20, 2020.

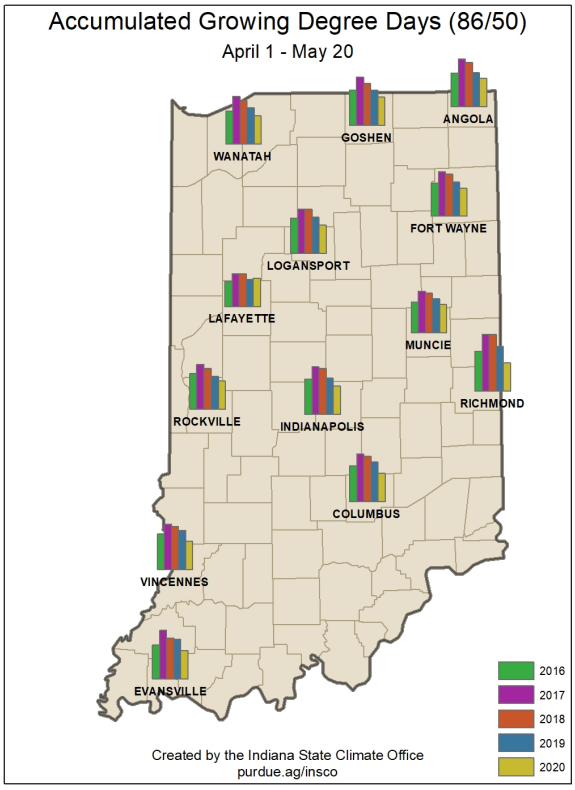


Figure 4. Modified growing degree accumulation comparisons for the past 5 year representing the period April 1 through May 20, 2020.

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