PURDUE UNIVERSITY | Extension - Entomology

Pest&Crop newsletter

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In This Issue

Armyworm Moth Captures Varied, Larval Activity Soon to be Detected

(Christian Krupke) & (John Obermeyer)

Over the past seven weeks, armyworm moth captures at the Purdue Ag Research Centers (see accompanying "Armyworm Pheromone Trap Report") have been variable, certainly not eye-popping! This happens most years, as do localized outbreaks. It is a reminder to conduct timely scouting in high-risk fields when the larvae are actively feeding, mid to later May. The increased popularity of cereal rye as a cover crop presents new opportunities for egg-laying females to find attractive food sources. The timing of planting this year, where many cover-cropped or weedy fields may be "planted green" is not helpful to those trying to avoid hungry armyworms.

Like every year, some (true) armyworm moths overwinter here, but some are also blown here from states to the south and west. Don't confuse this annual pest with the fall armyworm (different species) that doesn't arrive until mid-later summer. The fall armyworm caused a stir late last summer with damage to many forage fields, especially alfalfa. Contrast this with the (true) armyworm's preferred hosts, that being grasses. Highest risk crops for egg laying is where dense grassy vegetation, e.g., wheat, grass hay, grass cover crops exist. Ideally, grass cover crops, will be terminated 2-3 weeks before corn emergence to prevent the "green bridge." With this spring's wet and windy weather, spraying of cover crops has been delayed and the 2-3 week window hasn't been possible.

At this week's Diagnostic Training Center (West Central Indiana), participants were able to see early armyworm damage on forage grasses, notching of the leaf from the blade edge to the midrib. With diligent scouting effort, were able to find tiny larvae (about 3/8" long) on the ground under residues. Larvae generally only feed on the foliage during the night. It won't be long before these larvae are larger and their damage becomes very noticeable on grass hosts. Happy scouting!

Notching on corn leaves from small armyworm larvae

Small armyworm larva and feeding damage to leaf

Degrees of early armyworm leaf damage, “windowpane” feeding from newly hatched larvae

Armyworm Pheromone Trap Report – 2022

(John Obermeyer)

County/Cooperator	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11
Dubois/SIPAC Ag Center	0	0	120	21	8	2					
Jennings/SEPAC Ag Center	0	0	10	2	2	5	0				
Knox/SWPAC Ag Center	0	5	58	24	65	10	12				
LaPorte/Pinney Ag Center	0	24	11	44	12	16	9				
Lawrence/Feldun Ag Center	4	31	31	163	306	154	40				
Randolph/Davis Ag Center	0	0	0	0	23	35	10				
Tippecanoe/Meigs	0	5	19	70	58	84	3				
Whitley/NEPAC Ag Center	0	0	15	17	23	155	276				

Wk 1 = 4/1/22-4/6/22; Wk 2 = 4/7/22-4/13/22; Wk 3 = 4/14/22-4/20/22; Wk 4 = 4/21/22-4/27/22; Wk 5 = 4/28/22-5/4/22; Wk 6 = 5/5/22-5/11/22; Wk 7 = 5/12/22-5/18/22; Wk 8 = 5/19/22 – 5/25/22; Wk 9 = 5/26/22-6/1/22; Wk 10 = 6/2/22-6/8/22; Wk 11 = 6/9/22-6/15/22

Cressleaf Groundsel

(Marcelo Zimmer) & *(Bill Johnson)*

Every spring we receive several calls and e-mails about a certain 3-foot tall weed with yellow flowers (Figure 1). The most common yellow-flowered weeds we have in Indiana are cressleaf groundsel, the buttercup species, and dandelion. Occasionally, we have some fields of canola or rapeseed in the state. But, by far the most prevalent specie we see in no-till corn and soybean fields, and occasionally pastures, is cressleaf groundsel. I have only rarely observed wild mustard in Indiana. Wild mustard is more common in the northern tier of states near the Canadian border. This year, field activities were delayed due to cool temperatures and frequent precipitation. These weather conditions also allowed cressleaf groundsel to reach the reproductive stage, and it is currently flowering in many Indiana fields that haven’t been worked yet. This article is intended to provide information on the biology and life cycle of cressleaf groundsel, as well as how to control it in fields and pastures.

Biology and Identification

Cressleaf groundsel is a winter annual weed that has become more prevalent in Indiana pastures and agronomic crop ground over the past decade (Figure 2). The small seeds produced by this weed allow it to thrive in reduced and no-till systems as well as poorly established pastures. Cool and wet springs of the past few years have also favored cressleaf groundsel, as it is a weed that prefers moist soils and typically struggles in hot and dry weather.

Much like most winter annual weeds, cressleaf groundsel emerges as a rosette in the fall then bolts, flowers, and produces seed in the spring. Basal rosette leaves are deep pinnate serrations with roundly lobed leaf margins (Figure 3). Leaves are typically 2 to 10 inches in length (Britton and Brown 1970). Bolting stems are hollow and can reach up to three feet in height with inflorescences that contain six to twelve yellow ray flowers that are often compared to the flowers of common dandelion (Figure 4). When looking for cressleaf groundsel in older weed id or taxonomic guides be aware that it has traditionally been placed in the *Senecio* genus and only recently was placed into the *Packera* genus.

Toxic Properties

The competitiveness of cressleaf groundsel with agronomic crops has not been researched, though its presence as a winter annual in no-till fields will have the same implications of slowing soil warming and drying as other winter annual weeds. The presence of this weed in pastures and hayfields should be of more concern as it does contain toxic properties when ingested by livestock. Leaves, flowers, and seeds of cressleaf groundsel contain alkaloids that will cause liver damage in livestock, which is termed seneciosis, and typically occurs on a chronic level (Kingsbury 1964). Symptoms of seneciosis are loss of appetite, sluggish depressed behavioral patterns, and in extreme cases aimless walking without regard to fences or structures. Although cressleaf groundsel is not as toxic as many of its relatives in the *Packera* genus, livestock producers encountering this weed in pastures or hay should take steps to avoid prolonged ingestion by animals.

Control

Herbicide applications for cressleaf groundsel control are most effective when applied to plants in the rosette stage. Plants that are larger, or bolting are very difficult to control with herbicides. Infestations in pastures can be controlled with 2,4-D or a combination of 2,4-D and dicamba applied to rosettes in the fall or early spring prior to bolting (Nice 2008). Producers should be

aware that applications of these herbicides will also kill favorable broadleaves (legumes) that are present in pastures.

Control recommendations for cressleaf groundsel in no-till agronomic crop fields have typically been to apply 2,4-D @ 1 qt/A to actively growing rosettes in the fall. Research at the University of Illinois (Lake and Hager 2009) has shown that fall or spring applications of glyphosate (Roundup PowerMax II @ 22 to 44 oz/A plus liquid AMS @ 5% v/v) to 2-8 inch diameter rosettes can achieve 94% or greater control of cressleaf groundsel. We have observed that control of cressleaf groundsel with spring burndowns can be challenging if the plants are large and spray applications are made in cool weather. In situations like this, we often observe severe injury and necrosis of leaves, but new growth will appear from live buds on the plant. In some instances, resprays are needed to finish off the cressleaf groundsel.

References:

Britton N and A Brown (1970) An Illustrated Flora of the Northern United States and Canada. Volume 3. Dover Publications, Inc., New York. Pp 540-544.

Kingsbury KM (1964) Poisonous Plants of the United States and Canada. Pentice-Hall, Inc., Englewood Cliffs, N.J. pp 425-435

Lake JT and AG Hager (2009) Herbicide Selection and Application Timing for Control of Cressleaf Groundsel (Packera glabella). Weed Technol. 23:221-224

Nice G (2008) Guide to Toxic Plants and Forages. Purdue Extension Publication WS-37

Figure 1. Cressleaf groundsel plant (Photo: Marcelo Zimmer).

Figure 2. Field infested with cressleaf groundsel at the SEPAC farm (Photo: Glenn Nice).

Figure 3. Cressleaf groundsel rosette early in the spring (Photo: PPDL).

Figure 4. Cressleaf groundsel has hollow stems (Photo: Marcelo Zimmer).

Timing of the Hay Harvest

(Keith Johnson) & *(Ron Lemenager)*

To make excellent quality hay, the forage needs to be cut at the right growth stage and packaged into a bale at the right moisture content without incidence of rain damage. As forages mature, protein and digestibility concentrations decline. If the forage is harvested too late, dry matter intake by the consuming animal will be less because of high fiber concentration.

Baling hay too wet can result in mold formation, reduced quality and the possibility of spontaneous combustion. When the hay is baled too dry, leaf loss occurs which results in less yield and quality.

The link below is a video about timing the hay harvest.

Timing of the Hay Harvest – YouTube

Making quality hay requires awareness of the maturity stage of the grass and legume, and weather conditions. Top forage-livestock producers make timing the hay harvest a management priority.

A successful hay harvest requires close attention to weather conditions. A red sky as nightfall occurs is a good omen that a dry day lies ahead. You just hope for several dry days in a row!

Hybrid Maturity Decisions for Delayed Planting

(Bob Nielsen)

This article was originally published at https://www.agry.purdue.edu/ext/corn/news/timeless/HybridMaturityDelayedPlant.html.

Bottom Line

Delayed planting certainly shortens the growing season for corn, both in terms of calendar days but more importantly in terms of available GDDs for the plants to safely mature before a fall frost or killing freeze. The good news is because hybrids appear to decrease their GDD needs with delayed planting, one can plant adapted, full-season hybrid maturities later than otherwise expected. However, by about the last week of May, some growers in the central and, especially, northern parts of Indiana need to consider switching to earlier-maturity hybrids to minimize the risk of not maturing safely prior to a killing fall freeze. The steps outlined in this article will help growers and consultants determine "safe" hybrid maturities for late planting.

Delayed planting seasons create a lot of frustrations for everyone involved with planting crops. One of the agronomic questions that comes up when planting is seriously delayed is whether farmers should consider switching from their normal full-season maturity hybrids to shorter-maturity hybrids. The question is based, of course, on the perceived risk of the crop not reaching physiological maturity before a killing fall freeze and the yield losses that could result. A related, and economic, concern with delayed planting of normal full-maturity hybrids is the risk of high grain moisture contents at harvest and the resulting costs incurred by artificial drying of the grain or price discounts by buyers.

The traditional "days to maturity" rating system for hybrids (Nielsen, 2012) does not literally refer to calendar time and so is not helpful in making decisions about switching to early-maturity hybrids with delayed planting. How fast a corn plant develops (i.e., moves through growth stages) is very dependent on temperature (warm = fast, cool = slow). The accumulation of heat on a daily basis can be quantified on the basis of calculated Growing Degree Days or GDDs (Nielsen, 2020). The relative maturity of a hybrid can be more reliably characterized by how many GDDs it requires from planting to physiological maturity (kernel black layer).

> **NOTE:** Most seed companies publish "GDDs to Black Layer" ratings for the hybrids in their lineup, but sometimes do not clearly state whether the accumulated GDD values are "from planting" or "from emergence". The discussion and guidelines provided in this article assume "GDDs from planting". If your seed company rates their hybrids "from emergence", you need to add about 115 GDDs to the hybrid's rating to account for the GDDs required from planting to emergence.

Interestingly, it appears that **hybrids mature in fewer GDDs than predicted when planted "late".** Based on research we conducted some years ago (Nielsen et al., 2002), hybrids planted later than about May 1 mature approximately 6.8 fewer GDDs for every day of delay beyond May 1, through at least the 2nd week of June (the latest planting dates we evaluated in the research). For example, a hybrid rated at 2700 GDDs from planting to physiological maturity (kernel black layer) and planted on May 31 reaches physiological maturity in less than 2500 GDDs after planting (e.g., 2700 – (30 days x 6.8)).

The following simple calculator can be used to quickly estimate the adjusted GDD requirements of a hybrid in response to delayed planting. With that estimate in hand, you can then compare that value with an estimate of the GDDs available between the date you expect to plant and the end of the season using long-term climate data tools like the **Corn GDD Tool** described in the following paragraphs.

The calculator can be accessed via the original article at https://www.agry.purdue.edu/ext/corn/news/timeless/HybridMaturityDelayedPlant.html.

Use the U2U Corn GDD Tool to Identify "Safe" Hybrid Maturities for Late Planting

The USDA-NIFA funded **Useful to Usable (U2U)** multi-state research and Extension project developed a GDD decision support tool that is hosted by the Midwest Regional Climate Center at https://mygeohub.org/groups/u2u/purdue_gdd. The **Corn GDD Tool** estimates county-level GDD accumulations and corn development dates based on current and historical GDD data plus

user-selected start dates, relative hybrid maturity ratings, GDDs to blacklayer, and freeze temperature threshold values. The estimates are displayed graphically and in tabular form, plus the results can be downloaded in a Comma Separated Value (.csv) formatted file for you to work with in your own spreadsheet program. The GDD Tool is currently applicable to the states of North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Ohio, Kentucky, and Tennessee.

The choice of the date to represent the "end of the season" can be straight-forward or one of those "eyes of the beholder" decisions. If the main concern is to identify a "safe" hybrid maturity that will reach physiological maturity before a typical fall freeze date, then the steps described in this article are appropriate for you to follow. Some growers may opt to select an "end of season" date earlier than the historical first fall freeze date to ensure that physiological maturity will occur earlier during a time period that may allow for some grain drydown in the field and thus minimize their expenses of drying the grain artificially.

> **Corny Trivia:** Frost often develops on exposed leaf surfaces at temperatures of 32F or slightly higher and can cause significant leaf injury or death, but the corn plant usually remains alive and capable of remobilizing non-structural carbohydrates from the stalk tissues to the immature grain. A temperature of 28F for several hours is considered lethal for corn plants.

Figure 1 below shows a screen capture from the **Corn GDD Tool** in which I selected "Tippecanoe Co., IN", a start date (aka planting date) of May 31, a relative hybrid maturity rating of 112 "days", and a freeze temperature threshold of 28F. The tool displays default values for GDDs to silking and black layer, but these can modified by the user. The graph depicts the estimates of silking and black layer dates for the 112-day hybrid planted on May 31, as well as the range of the estimates. When you are viewing the actual graph on the Web site, estimates of GDD accumulations at specific dates "pop up" when you hover your computer mouse over parts of the line graph.

Heed the Following Advice!

The **Corn GDD Tool** does not currently account for the previously described phenomenon wherein corn hybrids typically mature in fewer GDDs than expected when planted later than May 1. In other words, the **GDD Tool** assumes the same GDDs to black layer for a given hybrid maturity whether planted April 20 or May 31. Consequently, you can be led astray by the Tool if you do not modify the "Black Layer GDDs" value in the Tool's input area. For example, the screen capture displayed in Fig. 1 for a 112-day hybrid with a default GDD rating of 2691 planted in Tippecanoe Co. on May 31 indicates the hybrid would mature on or about October 24, shortly after the average first killing 28F freeze. If, however, you manually change the expected "Black Layer GDD" value from 2691 to a more realistic 2487 GDDs (estimated using the calculator above), the **GDD Tool** then estimates the hybrid would safely mature by about October 1, well ahead of the usual killing fall freeze date (Fig. 2).

Final Considerations

- Availability of early-maturity hybrids with good yield potential, disease resistance (especially Gray leaf spot), and overall tolerance to stress may vary depending on seed company and location. Do not forget these important genetic characteristics when deciding whether to switch to earlier maturity hybrids in late planting situations.
- Some research suggests that yield decreases due to late planting are greater for full-season hybrids than for short-season hybrids (e.g., Jeschke and Paszkiewicz), whereas recently published research from Iowa documented very few differences among hybrid maturities in their relative rates of yield loss to delayed planting (Baum et al., 2019). This inconsistency for relative yield loss to delayed planting suggests growers should focus on whether particular hybrid maturities are expected to mature safely when planted late AND/OR whether expected differences in grain moisture content at harvest merit the decision to switch to earlier maturity hybrids in late planting situations.
- Most research indicates that optimum plant populations do not change as planting is delayed (Nielsen, 2019).

Figures

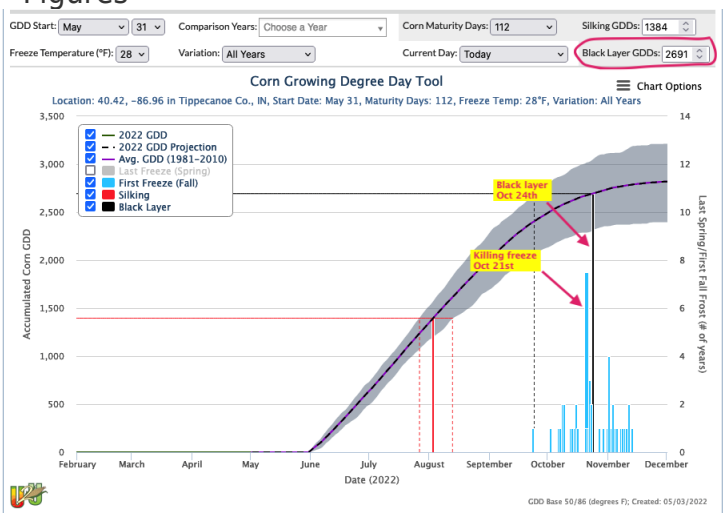

Fig. 1. Screen capture of U2U GDD Tool graphical display of historical and estimated future GDD accumulations and predicted corn development stages for a 112-day hybrid planted May 31 in Tippecanoe County, IN.

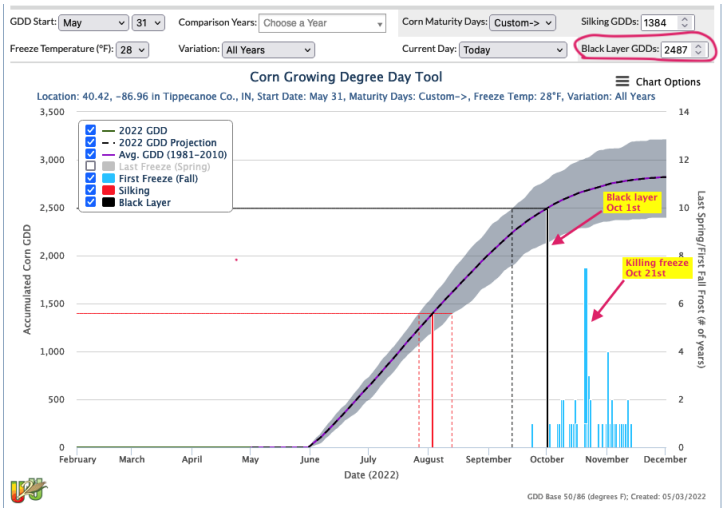

Fig. 2. Screen capture of U2U GDD Tool graphical display of historical and estimated future GDD accumulations and
predicted corn development stages for a 112-day hybrid planted May 31 in Tippecanoe County, IN,
BUT WITH ITS GDD MATURITY REQUIREMENTS ADJUSTED FOR LATE PLANTING.

Related reading

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Control of “Volunteer” Corn in a Corn Replant Situation

(Marcelo Zimmer) & (Bill Johnson)

Due to the cold wet weather we experienced in late April and early May, corn planted in April has struggled to emerge in many areas of the state. There are also some fields planted where standing water may result in poor corn stand establishment due to poor water drainage. Therefore, there are a number of fields that 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) + 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 interval is 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, clethodim, or paraquat + metribuzin (Gramoxone + Tricor) would be the logical methods for termination. Another option for corn that is not Liberty Link is to replant a Liberty Link corn hybrid and apply a follow-up treatment of glufosinate (Liberty) postemergence to control plants that survived the first application. The use of 32 to 34 oz/A of Liberty has been effective for the control of small corn (V1 to V3) in our research. Keep in mind that we are facing a herbicide shortage situation this growing season and certain products have inflated costs or may not be readily available at your ag retailer.

If the corn to be terminated is GMO, then the options are somewhat more complicated. Many popular commercial hybrids are stacked with either Roundup Ready and Liberty Link traits, or both. 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 clethodim, 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. Growers should also be aware that broadleaf herbicides such as 2,4-D or dicamba (group #4) can antagonize the activity of clethodim and result in reduced control of volunteer corn.

Another option to control "volunteer" corn stacked with both the Liberty Link and Roundup Ready traits is to plant corn containing the Enlist trait. Enlist corn hybrids are resistant to the ACCase-inhibiting herbicides (Group #1) in the aryloxyphenoxypropionate family (FOPs) such as Assure II (quizalofop) herbicide. Assure II is the only FOP herbicide labeled for POST applications to Enlist corn. 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.

If you want to avoid the preplant interval for clethodim and will not plant Enlist corn, your only herbicide option for termination of stacked trait corn is paraquat plus metribuzin. In University research trials, 2-3 pt/A of Gramoxone plus 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.

The 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 updated precautions and restrictions.

Too Dry or Too Wet?

(Beth Hall)

Indiana has been receiving less precipitation than normal, particularly over the last 30 days (Figure 1). In fact, southern Indiana has only received 25%-50% of the precipitation amounts it normally sees during this period. One would think this would mean "Abnormally Dry (D0)" if not "Moderate Drought (D1)" classifications for the U.S. Drought Monitor. However, as mentioned in previous articles, drought is not caused by just a lack of precipitation. This week, drought leadership teams from Indiana, Ohio, and Kentucky discussed this dilemma where precipitation data is suggesting the introduction of Abnormally Dry status for the tri-state area. Interestingly, other indicators such as soil moisture, stream flow, and local observations from residents in the area are indicating normal, if not wet, conditions are still prevailing. While the amount of precipitation has not recently kept up with what is normal for this time of year, there have been a lot of wet days. For example, Evansville, IN has had 10 wet days over the past 30 days (33% wet days), Indianapolis, IN has had 16 wet days (53%), and Fort Wayne, IN has had 13 wet days (43%). This has managed to keep conditions wet or near normal, even though total precipitation has been low.

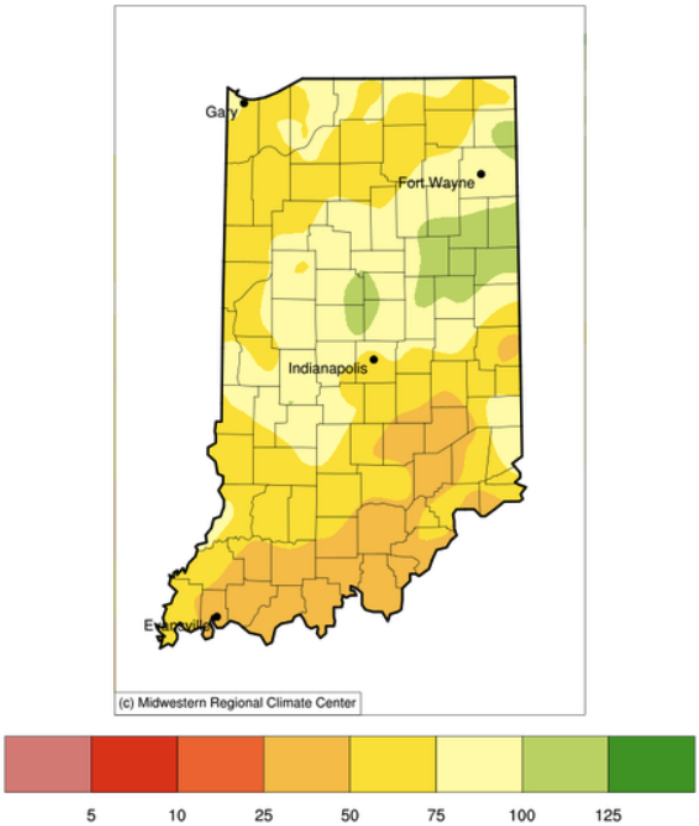


Figure 1. Accumulated precipitation presented as the percentage of the 1991-2020 normal amounts for April 19 – May 18, 2022.

Looking ahead, this pattern of rain every few days continues with predicted rain amounts ranging from 1-3 inches across Indiana for May 19-23, 2022.

Figure 2. Quantitative precipitation forecast (in inches) for May 19 – May 26, 2022. Source: National Weather Service.

If this forecast come true, this would be more precipitation that what is normal for that period. Both the 6-10- and 8-14-day climate outlooks are favoring above-normal precipitation across the state, so expect this wet pattern to continue for a while. The 1-month (June) and 3-month (June-July-August) climate outlooks were just released on 19 May 2022 from the national Climate Prediction Center. For both periods, climate models are favoring above-normal temperatures, but were equally favoring below-normal, normal, and above-normal precipitation amounts. This suggests too much uncertainty regarding precipitation to know if this wetter period will continue, how many wet days to anticipate, and how much precipitation will be received.

Warm temperatures last week helped catch this year's accumulated modified growing degree day value up to near normal. Figures 3 and 4 show the accumulation total and departure from normal for April 1 – May 18, 2022.

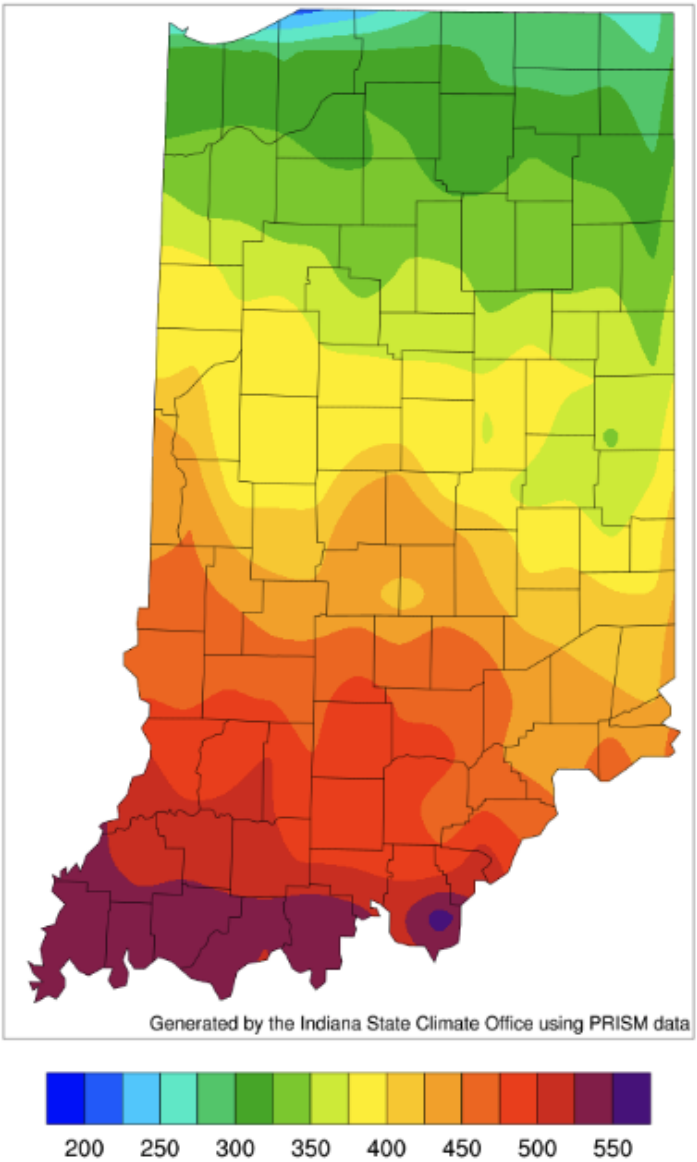


Figure 3. Modified growing degree day (50°F / 86°F) accumulation from April 1-May 18, 2022.

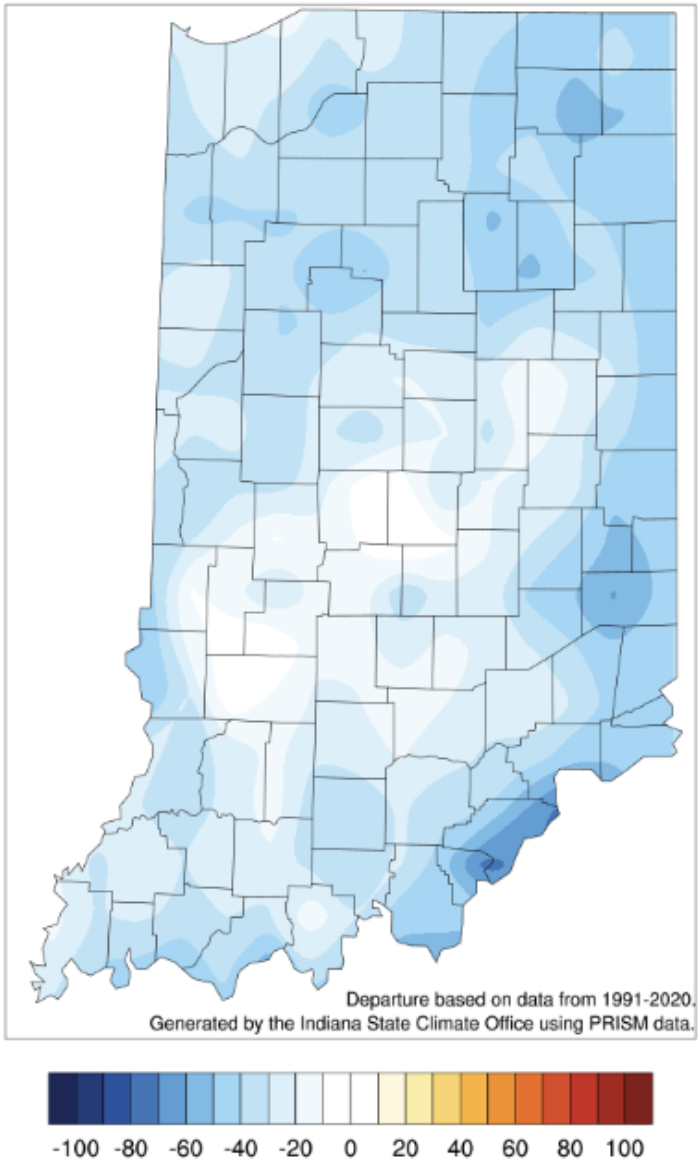


Figure 4. Modified growing degree day (50°F / 86°F) accumulation from April 1-May 18, 2022, represented as the departure from the 1991-2020 climatological average.

Conserve the Soil, Conserve the Climate

(Dr. Jeffrey Dukes), (Beth Hall), (Melissa Widhalm), (Hans Schmitz) & *(Austin Pearson)*

Farming for a Better Climate

Agriculture is part of the solution when it comes to combating climate change, and it all starts with soils. Why? Out of all agricultural practices, soil management is the main contributor of greenhouse gas emissions (68%), such as carbon dioxide (CO_2) and nitrous oxide (N_2O). Your approach to soil management will have a significant effect on the amount of carbon that is either stored in the ground or released to the atmosphere.

For years the most prevalent soil management practices involved ***conventional tillage***, which has provided benefits in fighting weed pressure and increasing seedbed preparation. However, those years of soil management relying on conventional tillage have also contributed to soil organic carbon (SOC) loss, as this practice disturbs soil aggregates, exposes soil organic matter to degradation, and enhances CO_2 emissions. In search of soil health benefits, many agricultural producers are now looking at other options to manage soils through ***conservation tillage***.

As a concept, conservation tillage has been around a while and involves any tillage practice that leaves 30 percent or more of crop residue on the soil's surface. No-till, strip-till, and ridge-till are just a few examples. Many agricultural producers have incorporated these methods as an effective way to protect soil against water and wind erosion. Other benefits of conservation tillage include, enhanced water quality and water conservation, less fuel consumption, lower labor costs, and improved soil structure. According to the National Agricultural Statistics Service, just over one-quarter of all U.S. cropland acres are in no-till and another quarter report using other conservation tillage practices. The highest adoption rates are found across the Corn Belt.

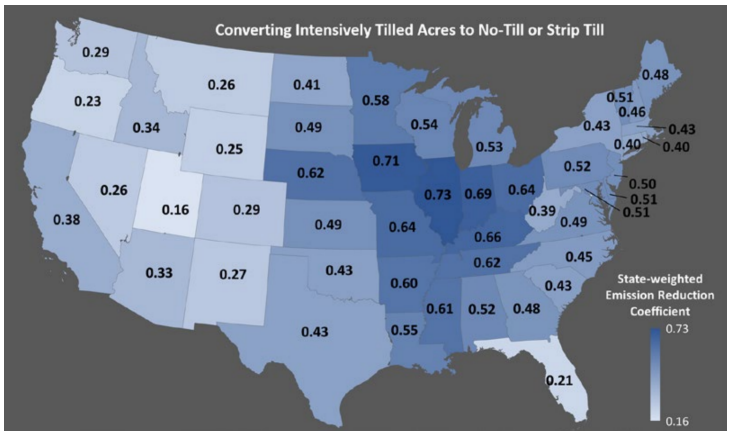
It's the soil structure improvements that make conservation tillage a powerful tool in the fight against climate change. Improving soil structure reduces CO_2 emissions by slowing microbial decomposition of SOC. This means more carbon is locked into the soil and kept out of the atmosphere where it would otherwise contribute to warming temperatures. Recent research suggests that no-till farming has the potential to sequester from 0 to 0.4 metric tons (MT) per acre per year, depending on climate and soil type. According to the U.S. Environmental Protection Agency, converting all U.S. cropland acres into no-till would store 123 million MT of carbon per year, equivalent to about 2% of all U.S. CO_2 emissions in 2019.

Converting to a conservation tillage system may seem like a no-brainer, but there are drawbacks such as increased chemical costs for pest management and susceptibility to cool and wet soils in the spring. Some producers are apprehensive due to the steep learning curves that exist with implementing conservation practices, the social stigma when fields don't appear 'clean', and the often-required redesign of their conventional management practices. Another concern producers face is the fear they won't compete with yields from a conventional system, thus reducing their farm's profitability.

However, under certain weather and climate patterns, conservation tillage can actually help protect yields. A recent Purdue University study compared tillage practices on mollisol soils and their profitability under current and future weather and climate patterns. The research shows **there is already an economic incentive for agricultural operations to adopt some form of conservation tillage, and the economics are enhanced in a changed climate.**

So, should you continue conventional tillage practices or should you migrate to a conservation tillage system? The answer is probably different for each of you. If you are considering adopting a conservation tillage system there are many valuable resources available through Purdue University Extension, the United States Department of Agriculture Natural Resources Conservation Service, Soil and Water Conservation Districts, your peers, and consultants.

Graphic originally appeared in the report *Combatting Climate Change on US Cropland* published by the American Farmland Trust (2/5/2021).



Adopting strip-till or no-till practices can help keep carbon in the ground. This graph shows estimates of how much these practices can reduce heat-trapping gas emissions, by state. Numbers shown are the average amount of heat-trapping gas emissions saved, as tons of CO2 equivalent per acre per year, averaged across each state's cropland.

Farming a Better Climate is written in collaboration by the Purdue Extension, the Indiana State Climate Office, and the Purdue Climate Change Research Center. If you have questions about this series, please contact in-sco@purdue.edu.

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