In This Issue

Armyworm Pheromone Trap Report – 2023

(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	80	56	14	25	48	3	4	6		
Jennings/SEPAC Ag Center	21	20	39	8	12	11	1	1	0		
Knox/SWPAC Ag Center	37	242	46	26	16	6	5	3	0		
LaPorte/Pinney Ag Center	60	296	216	54	56	401	140	5	5		
Lawrence/Feldun Ag Center	159	99	197	70	41	119	48	329	91		
Randolph/Davis Ag Center	57	0	0	2	5	414	280	48	9		
Tippecanoe/Meigs	36	56	51	8	6	39	31	32	23		
Whitley/NEPAC Ag Center	0	259	179	13	39	323	142	39	2		

Wk 1 = 4/1/23-4/5/23; Wk 2 = 4/6/23-4/12/23; Wk 3 = 4/13/23-4/19/23; Wk 4 = 4/20/23-4/26/23; Wk 5 = 4/27/23-5/3/23; Wk 6 = 5/4/23-5/10/23; Wk 7 = 5/11/23-5/17/23; Wk 8 = 5/18/23 – 5/24/23; Wk 9 = 5/25/23-5/31/23; Wk 10 = 6/`/23-6/7/23; Wk 11 = 6/8/23-6/14/23

Early Soybean Planting Years: Drought-Stricken Or Bin-Busting Yields?

(Shaun Casteel)

Indiana soybean planting in 2023 is following the same track as 1988 and 2018, which could be devastating or bin busting! As you may or may not recall, 1988 was one of the worst droughts we have experienced. Indiana soybeans yielded 27.5 bu/ac, which was 11.5 bu less (30% reduction) than the trend yield (39 bu/ac). The only year with a faster pace was another drought year—2012. Late season rains saved the 2012 crop and Indiana yielded 44.0 bu/ac (5.8 bu below yield trend, ~12% reduction). Soybeans were planted at a fast pace in 1991 due to dry and drought conditions, but the yields were nearly unaffected (3% less than trend).

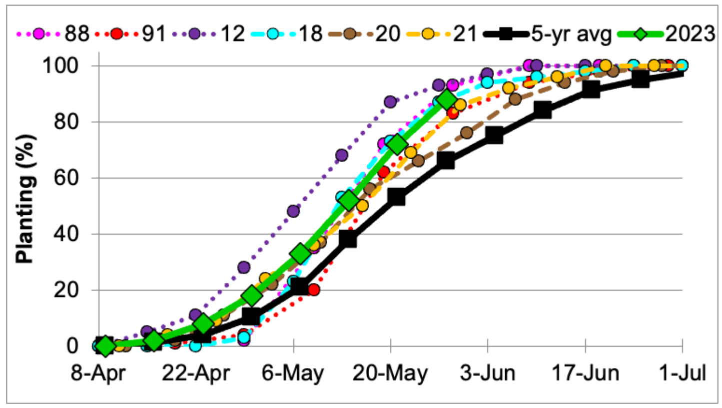

Figure 1. Early soybean planting progress in Indiana from 1988, 1991, 2012, 2018, 2020, 2021, and 2023. Five-year average from 2018 to 2022. Adapted from USDA-NASS, 2023.

Indiana has had six years that soybean planting progress was substantially faster than the five-year average (Figure 1). Three of those years were drought years (1988, 1991, 2012) while the other years (2018, 2020, 2021) were yield-breaking years!

Timely planting of soybean (some may call it "early planting") is the foundation for building great yield potential of soybean. Soybean usually develop more trifoliate nodes (and thereby, mainstem pods later in the season) with plants that have shorter internodes and more reproductive branches. These soybeans usually intercept more sunlight, accumulate more thermal energy, close the row earlier in the season, and extend reproduction duration. All of these physiological effects provide promise of high yields, which seem to match the advanced planting progress of 2018, 2020, and 2021. In fact, Indiana soybean yield record was surpassed with each of these early planting years (57.0, 57,5, and 59.5 bu/ac, respectively).

Soybeans are rated 70% good to excellent as of May 30th, which speak to the number of timely planted fields that were able to get well established (i.e., plant population and root system). These soybeans will continue to root deep with benefits for later season water needs during seed fill. A few of the early (~early to mid-April) and later planted (~late May) fields have or will be struggling with adequate stand establishment and early season development. These fields will be more prone to negative yield effects as the return of rain is delayed. At this point, we have a lot of season left to make up for shortfalls in soil moisture.

Keith Johnson)

Purdue Crop Chat Episode 50, Dry Weather Impacting Nitrogen, Herbicide Applications

(Dan Quinn) & *(Shaun Casteel)*

Purdue Crop Chat is a regular podcast from Hoosier Ag Today and the Purdue University Extension Service, featuring Purdue Extension soybean specialist Dr. Shaun Casteel and Extension Corn Specialist Dr. Dan Quinn. On this episode, Shaun and Dan welcome Dr. Bill Johnson, Professor of Weed Science at Purdue. He shares weed management tips and what growers are facing right now. Listen here.

This podcast is made possible by the Indiana Corn Marketing Council and Indiana Soybean Alliance. Your Indiana corn and soybean checkoff investments yesterday are paying off today. New research, new uses, demand creation — bringing dollars back to the farm. Check it out at YourCheckoff.org.

Last Call To Register For The Grazing School

(Keith Johnson)

Want to learn how to improve grazing utilization? Attending a day and a half grazing school will be a great start to improving pasture utilization by your livestock.

The fee to attend is $75. Additional individuals from the same farm are permitted at a cost of $50, but extra materials will not be included. *Attendance at the June 16 and 17 east central Indiana school (Winchester, IN) is being accepted until June 7.*

Do your livestock a favor. Attend the Grazing School! Details are at the "Indiana Forage Council website (www.indianaforage.org). This is an opportunity for producers and anyone that interacts with forage-livestock producers. Call Keith Johnson at (765) 494-4800 if there are questions.

Properly managed pasture is beneficial to plants and livestock, too. (Photo Credit:

Overgrazing During Dry Weather Has Long Term Consequences

(Keith Johnson), *(Nick Minton)* & *(Ron Lemenager)*

This past week warm late-spring temperature and lack of moisture was apparent in Indiana. Unfortunately, the forecast indicates more of the same for the next ten days. Having livestock graze a pasture to the level that it looks like a golf course putting green has long term consequences that are not good for the wellbeing of the forages in the pasture. Meristems are where cell initiation, continued division, and elongation occurs. When close grazing happens, meristems cannot affectively produce what would be the next growth to graze. In time, less productive plants like Kentucky bluegrass and white Dutch white that can take close grazing because the meristems are at or slightly below the soil surface will increase and troublesome weeds may begin to appear and become dominant, too. There are long term consequences to the livestock, too, if they cannot get a full meal each day.

If plants could cry out, they would yell "Stop" when overgrazing begins to occur. Note the visible manure in the upper center and the crushed aluminum can in the lower center of the photograph. If the pasture was properly grazed, the manure and aluminum can would not have been visible at the distance that the photograph was taken. (Photo Credit: Keith Johnson)

Here are some considerations to help stretch the forage supply that remains in a pasture, protect future plant productivity, and improve the wellbeing and productivity of livestock, too.

- Employ rotational stocking.
- Provide clean, cool water to reduce heat stress and maintain herd and flock health.
- Monitor the body condition of livestock as an indicator of nutritional status.
- Creep feed calves for near normal weaning weights.
- Early wean late winter- and spring-born calves to take pressure off both cows and pastures.
- Pregnancy check and market cull cows earlier than normal to reduce feed needs.
- Determine if poisonous plants are in overgrazed pastures and hay fields, and determine best control options.
- Inventory hay and other feed resources and determine whether

future purchases will be needed.
- Analyze hay and silage for nutrient profiles to help determine what supplemental feeds will provide a balanced ration.
- Use alternative feeds to supplement and stretch forage supplies.
- Limit hay access time to stretch hay supplies.
- Limit feed a nutrient dense diet to stretch forage supplies.
- Graze corn residues and stockpiled forages if available in the fall to reduce harvested feed needs.

A Purdue Extension publication was developed that provides details for each bullet point (ID-528 When Forages are in Short Supply Because of Drought (purdue.edu). While the emphasis is on beef cattle, there are many components of the publication that have value for all livestock species. Review the information in the publication now so a plan can be developed if it needs to be put into action. Doing nothing, is not a wise plan.

Listen carefully. Your forages may be crying out "Don't overgraze if you want to see us next year!".

Root Development in Young Corn

(Bob Nielsen)

Successful emergence (fast & uniform), while important, does not guarantee successful stand establishment in corn. The next crucial phase in the life of young corn plants is the initial establishment of a vigorous nodal root system. Successful stand establishment is largely dependent on the initial development of nodal roots from roughly V2 (two leaves with visible leaf collars) to V6.

Corn is a grass and has a fibrous type root system, as compared to soybeans or alfalfa that have tap root systems. Stunting or restriction of the nodal roots during their initial development (e.g., from excessively dry soil, excessively wet soil, extremely cold soil, insect damage, herbicide damage, sidewall compaction, tillage compaction) can easily stunt the entire plant's development. In fact, when you are attempting to diagnose the cause of stunted corn early in the season, the first place to begin searching for the culprit is below ground.

To better understand rooting development and problems associated with root restrictions, it is important to recognize that root development in corn occurs in two phases. The first phase is the development of the seminal or seed root system. The second phase is the development of the nodal or crown root system.

Corny Trivia: *Sometimes you may hear the seminal root system referred to as the primary root system and the nodal root system as the secondary root system. This classification was described by Cannon (1949) and certainly makes chronological sense. However, in terms of importance to the corn plant, the nodal root system is clearly the primary root system.*

The Seminal (Seed) Root System

Seminal (seed) roots originate from the scutellar node located within the seed embryo. Seminal roots are composed of the radicle and lateral seminal roots. Even though the seminal roots technically are nodal roots, they are traditionally discussed separately from the nodal roots that develop later from the crown area of the seedling.

The radicle root emerges first, rupturing through the seed coat near the tip end of the kernel (Fig. 1) and briefly elongates in that direction regardless whether the kernel tip points up, down, or sideways. The lateral seminal roots emerge later from behind the coleoptile (Fig. 2) and initially elongate toward the dent end of the kernel. However, soon both sets of seminal roots change the orientation of their elongation and begin to elongate downward in response to gravity (Fig. 3).

Fig. 1. Radicle root and coleoptile of pre-VE seedling.

Fig. 2. Lateral seminal roots, coleoptile, and radicle root of pre-VE seedling.

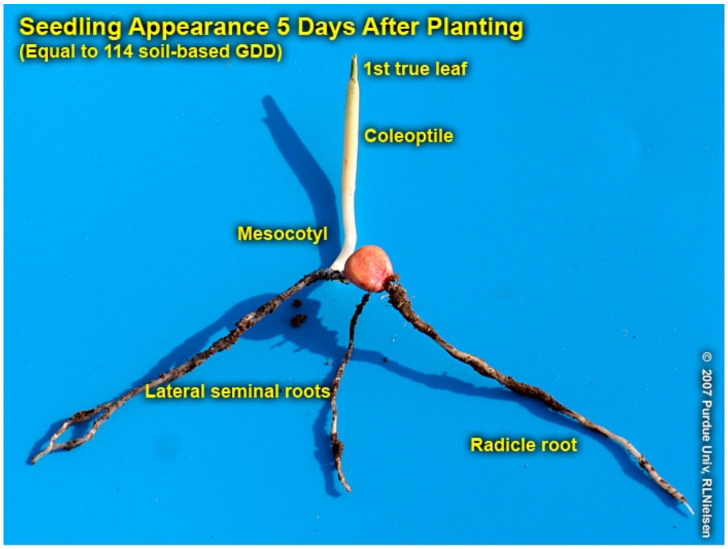

Figure 3. Seminal root system of VE seedling, but no evidence yet of nodal root system.

The seminal root system helps sustain seedling development by virtue of water uptake from the soil, but a young corn seedling depends primarily on the energy reserves of the kernel's starchy endosperm for nourishment until the nodal root system develops later. By about growth stage V1, the rate of new growth by the seminal root system slows down dramatically as the primary nodal root system begins to develop from nodes above the mesocotyl.

Even though the seminal root system contributes little to the season-long maintenance of the corn plant, early damage to the radicle or lateral seminal roots can stunt initial seedling development and delay emergence. Such damage will not necessarily cause immediate death of the seedling as long as the kernel itself and mesocotyl remain healthy, but may result in delayed emergence or the seedling leafing out underground. As more and more nodal roots become established over time, damage to the seminal root system will have less and less impact on seedling survival.

Examples of seminal root damage include imbibitional chilling injury (Nielsen, 2020a), post-germination injury from lethal or sub-lethal cold temperatures (Nielsen, 2020b), and "salt" injury from excessive rates of starter fertilizer placed too close to the kernel. Symptoms of such root damage include retarded root elongation, brown tissue discoloration, prolific root branching, and outright death of root tissue. If the radicle root is damaged severely during its emergence from the kernel, the entire radicle root may die. Once the radicle has elongated a half-inch or so, damage to the root tip will not necessarily kill the entire root, but rather axillary root meristems may initiate extensive root branching in response to damage to the apical meristem.

The images shown in Fig's. 4 – 6 show an example of a delayed emerger in a field where the "normal" emergers were already at late V1 to early V2. The radicle root was completely destroyed, though the lateral seminal roots were intact and healthy. The coleoptile on this seedling was split down the entire length of its side and would likely result in leafing out underground. The split coleoptile was likely due to the natural continued expansion of the enclosed leaves that would have otherwise emerged normally above ground.

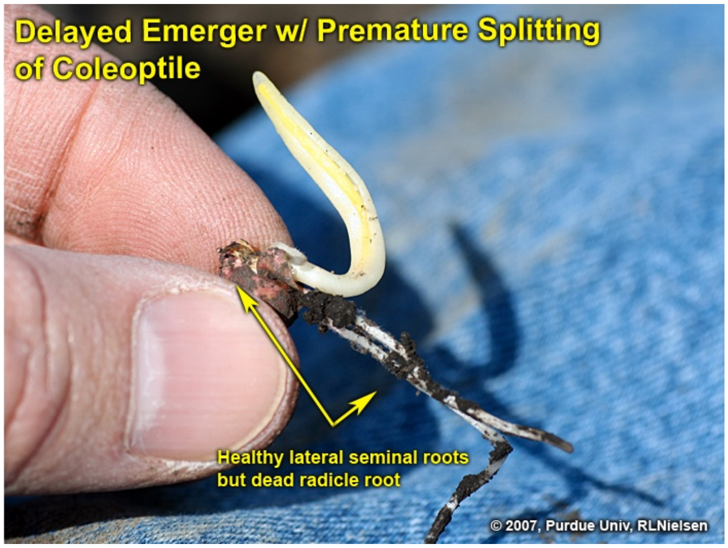

Fig. 4. Delayed emerger w/ healthy lateral seminal roots but damaged radicle root.

Fig. 5. Split coleoptile; precursor to leafing out underground.

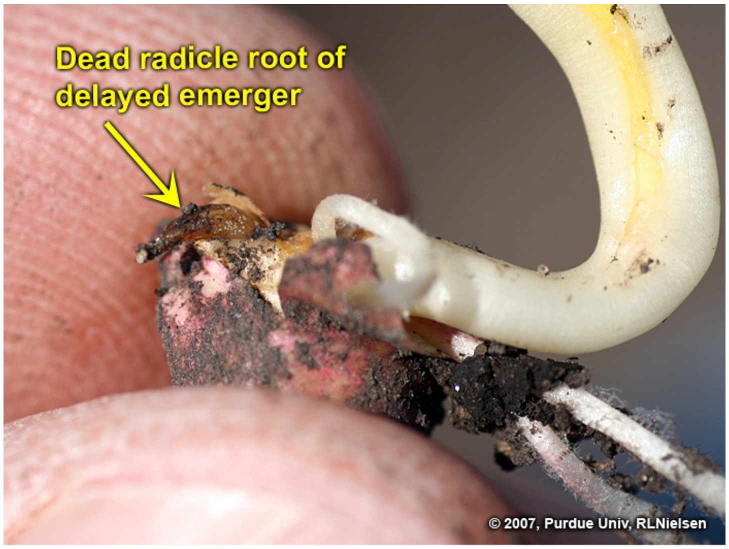

Fig. 6. Dead radicle root on a delayed emerger seedling.

The images shown in Fig's. 7 and 8 show another example of a delayed emerger in the same field where other seedlings were late V1 to early V2. The only visible damage to this delayed emerger was its radicle root whose apical meristem had been injured. The damage was less severe than the previous example and so the seedling was less severely stunted and managed to emerge above ground.

Fig. 7. Delayed emerger with healthy lateral seminal roots and damaged, but alive, radicle root.

Fig. 8. Closer view of damaged radicle root tip with numerous adventitious roots.

Fig. 9. V1 corn seedling.

The Nodal Root System

Nodal roots develop sequentially from individual nodes above the mesocotyl, beginning with the lowermost node in the area of the young seedling known as the "crown". When the collar of the first leaf first becomes visible, the first set of nodal roots can be identified by a slight swelling at the lowermost node. By late V1, the first set of nodal roots have noticeably begun to elongate (Fig's 9 and 10). By leaf stage V2, the first set of nodal roots are clearly visible and the second set of nodal roots may be starting to elongate from the second node of the seedling. Each set or "whorl" of nodal roots begins to elongate from their respective nodes at about the same timing that each leaf collar emerges from the true whorl of the seedling.

Fig. 10 First set of nodal roots elongating from lower most node of crown area of V1 corn seedling.

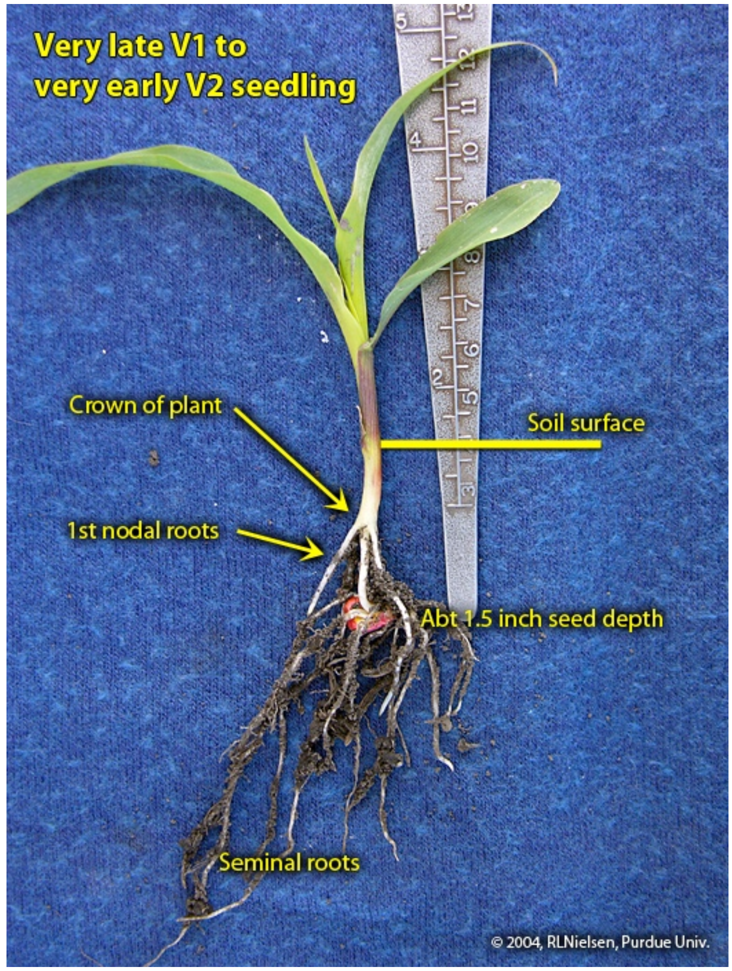

Fig. 12. Seminal and nodal roots of V2 seedling.

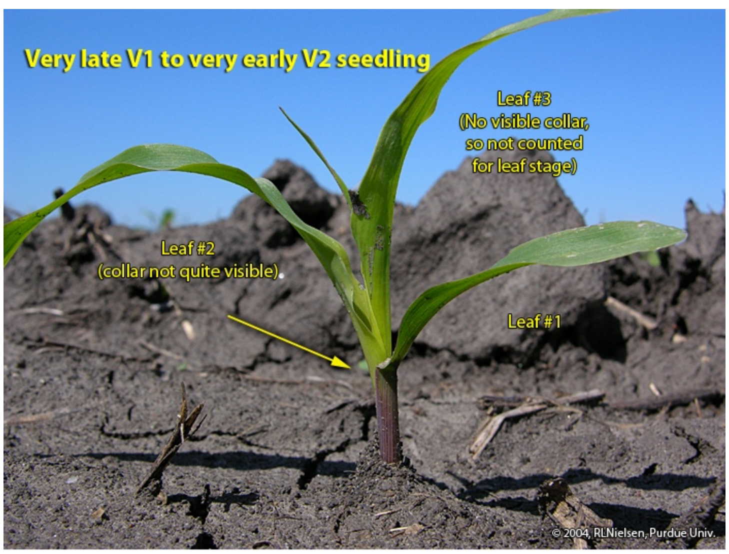

Fig. 11. Late V1 to early V2 corn seedling.

Regarding Seeding Depth & Rooting Depth: *Some folks believe that planting corn deeper encourages deeper rooting and vice versa. This belief is mostly myth with a slight hint of truth mixed in. It certainly is true that the depth of the SEMINAL root system is influenced by seeding depth. However, the NODAL root system that develops from the crown of the plant is not influenced much at all by seeding depth. This is because the depth of the crown is fairly constant regardless of seeding depth. During emergence of the seedling, the mesocotyl elongates and elevates the coleoptile and crown towards the soil surface. As the coleoptile nears the soil surface, changes in the ratio of red to far red wavelengths of light causes a change in the supply of one or more growth hormones from the coleoptile to the mesocotyl tissue and mesocotyl elongation consequently comes to a halt (Vanderhoef & Briggs, 1978). Since the depth at which the emerging seedling senses the change in red to far red light is fairly constant, the resulting depth of the crown (base) of the coleoptile is nearly the same (1/2 to 3/4 inch) for seeding depths of one inch or greater.*

Elongation of the stalk tissue begins between leaf stages V4 and V5. Elongation of the internode above the fifth node usually elevates the sixth node above ground. Subsequent elongation of higher-numbered stalk internodes will result in higher and higher placement of the remaining stalk nodes. Sets of nodal roots that form at above ground stalk nodes are commonly referred to as “brace” roots, but function identically to those nodal roots that form below ground. If surface soil conditions are favorable (moist and not excessively hot), brace roots will successfully penetrate the soil, proliferate, and effectively scavenge the upper soil layers for water and nutrients.

Corny Trivia: *Root hairs are lateral extensions of root epidermal cells, grow to a length of several millimeters, and number about 200 per square millimeter (Gardner et al., 1985). Their typical life span is only about 2 days at moderate temperatures and less so at higher temperatures (Gardner et al., 1985). Root hairs are visible even on the radicle root of a young seedling (Fig. 13). Collectively, the surface area represented by root hairs is very large and can account for a large share of nutrient and moisture uptake by the plant.*

Fig. 13. Root hairs on a V2 corn seedling.

Corny Trivia: *The primary meristem of a root is located near the root tip (Fig. 14). Elongation of cells behind the meristem leads to elongation of the root.*

Fig. 14. Apical meristem of root.

A split stalk of an older plant will reveal a "woody" or "pithy" triangle of stalk tissue at the bottom of the corn stalk. This triangle is typically comprised of four stalk nodes, stacked sequentially with #1 at the bottom, whose associated internodes do not elongate (Fig. 15). The first internode to elongate is USUALLY the one above the fourth node, which elongates about 1/4 to 1/2 inch, above which is found the fifth node, which is typically still below or just at the soil surface. Consequently, five sets or whorls of nodal roots will usually be detectable below ground, one set for each of the below ground stalk nodes (Fig. 16).

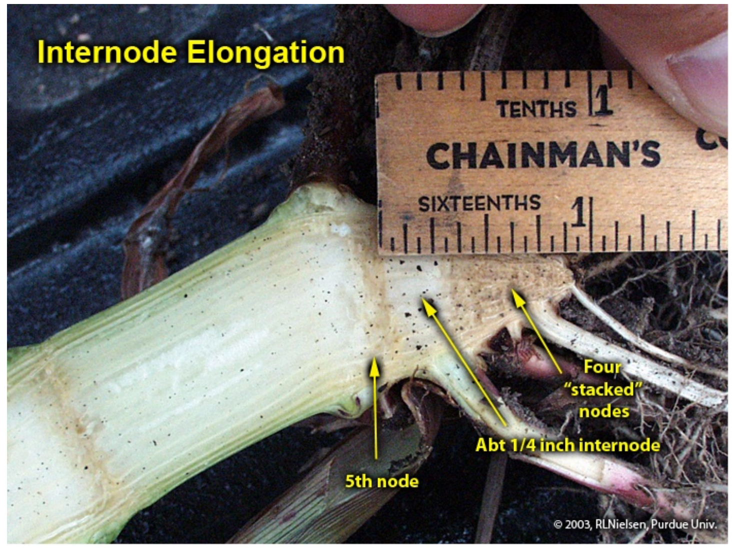

Fig. 15. Internode elongation between fourth and fifth nodes of a corn plant.

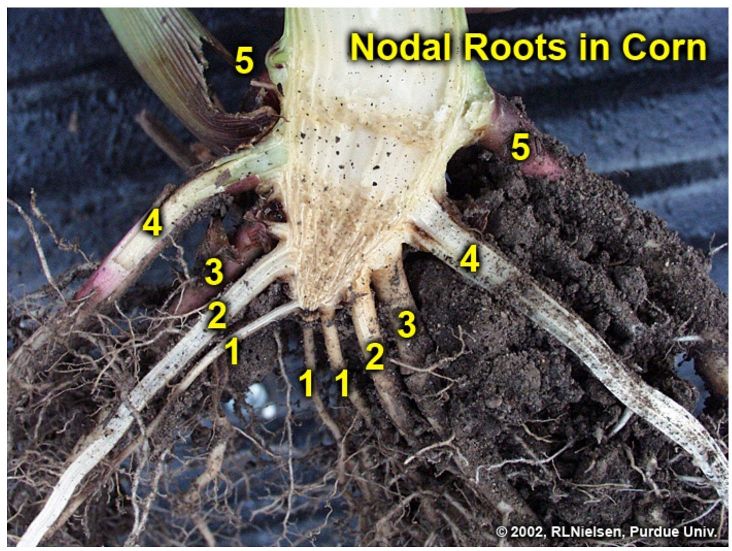

Fig. 16. Five identifiable sets or "whorls" of nodal roots in a split stalk section.

Corn seedlings transition from nutritional dependence on kernel reserves to nutritional dependence on the nodal roots around the V3 leaf stage. Damage or stress to the first few sets of developing nodal roots during the time period V1 to V5 can severely stunt or delay a corn plant's development. Damage to the first few sets of nodal roots forces the young seedling to continue its dependence on kernel reserves longer than is optimum. If the kernel reserves are nearly exhausted, continued seedling development is easily stunted and seedling death is not uncommon. Typical stresses that can stunt initial nodal development include fertilizer salt injury, seedling diseases, herbicide injury, insect feeding damage, excessively wet or dry soils, soil compaction (tillage or planter).

Starter Fertilizer Note: *The success or not of this transition period that occurs around the V3 stage of development greatly influences whether the crop continues to develop strongly and uniformly. It is not uncommon for fields to develop rather uniformly up to about V3 while they are still relying upon kernel reserves. However, sometimes these heretofore uniform stands of corn "fall apart" beyond the V3 stage if* *nodal root development has been compromised by "crappy" growing conditions and the transition from kernel reserves to nodal root support fails or is less than successful. It is at this stage that starter fertilizer plays a role in ensuring that the transition period occurs successfully. At about V3, one or more of the nodal roots will tap into a starter fertilizer band placed approximately 2 inches to the side and 2 inches below the seed (the proverbial 2×2 placement). Starter fertilizer placed in this position has the advantages over seed-placed starter fertilizer because a) its position relative to nodal root development is more advantageous and b) higher rates of nitrogen and/or potassium can be used without risk of injury to the seed during germination and emergence.*

A somewhat uncommon, but dramatic, stunted root symptom is one referred to as the "floppy corn" or "rootless corn" syndrome (Nielsen, 2019a). This problem occurs most commonly as a result of the detrimental effects of excessively dry surface soil near the time of initial nodal root elongation in young (V2 to V4) corn plants. Young nodal roots that emerge from the crown area of the plant will die if their root tips (and associated meristematic areas) desiccate prior to successful root establishment in moist soil. The crown of a young corn plant is typically located only 3/4 inch or so below the soil surface and so is particularly vulnerable to dry upper soil conditions.

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"Rootless" Or "Floppy" Corn Syndrome

(Bob Nielsen)

Factors that contribute to a high risk for "rootless" or "floppy" corn syndrome in 2022 include…

- Late May or later planting,
- Shallow planting,
- Dry surface soils, and
- Multiple, consecutive days of extreme heat (upper 90s)

Excessive drying of the upper soil profile is conducive for the development of what some of us affectionately call the "rootless corn" or "floppy corn" syndrome. The problem illustrates a classic example of the importance of the timing of stress relative to stage of plant development.

Seminal roots, but no upper nodal roots.

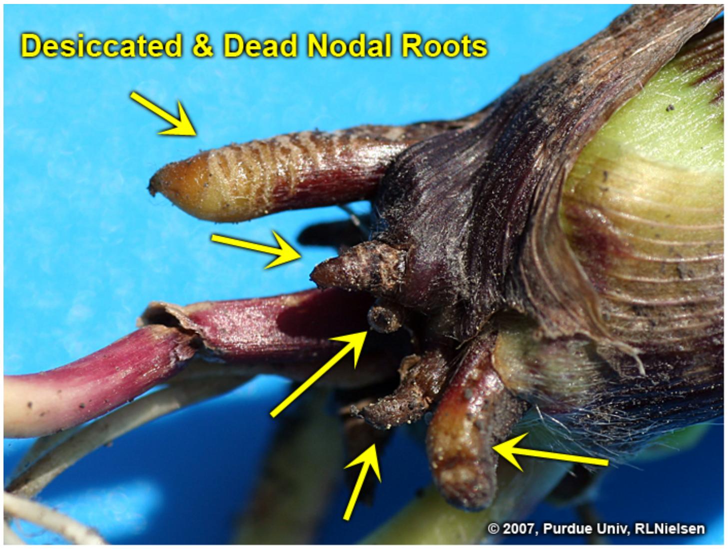
The permanent (aka nodal) roots of a corn plant initially elongate from nodes near the crown area of the young plant (approximately 3/4 inch below the soil surface) and first become visible between leaf collar stages V1 and V2 (Nielsen, 2020). The young roots develop in individual sets or "whorls", beginning with the lowermost node of the stalk and progressing sequentially over time in an acropetal fashion up to Node #6 or so. The main growing point or meristem of a root is located just behind the tip of the root and must remain alive in order for the root to develop normally.

Roots elongate downward primarily in response to gravity (i.e., a positive gravitropic response). There is evidence that roots also respond to soil moisture gradients (hydrotropism) by elongating toward soil regions with more favorable moisture levels (Eagen et al., 2005; Rodríguez and Cassab, 2021). However, the overarching determinant of roots' downward growth is likely gravity.

If nodal roots begin their initial elongation in bone-dry surface soil but elongate downward to adequate soil moisture at deeper depths before the meristematic root tip desiccates, then the root will survive and proliferate. If the root tip (and its accompanying meristem) desiccates prior to reaching soil moisture, the entire young nodal root often dies. This is particularly true if the axillary meristems along the length of the root (that eventually produce the adventitious branch roots) have not yet differentiated or become active.

The desiccating effect of bone-dry surface soils on young, newly elongating nodal roots is exacerbated by sunny weather and hot temperatures. Dry soil warms more quickly, and dramatically, than wet soil. On a warm, sunny day with air temperatures in the high 80s to low 90s F, soil temperature at the 3/4 inch or depth can exceed lethal levels for young roots. This is especially true for residue-free, conventionally-tilled fields.

The appearance of desiccated roots is what one would imagine; they are shriveled and discolored. This symptom is unlike that of any other lethal root stress, including salt injury from fertilizer. These symptoms are **NOT** like any associated with herbicide injury or insect feeding.



Desiccated & dead nodal roots.

An entire set or "whorl" of nodal roots can emerge and die within the course of a few days. If this happens to the first set of roots (Node #1) as they begin to elongate (between leaf stages V1 and V2), the young plant survives on what's left in the kernel reserves and what the seminal roots offer in terms of moisture and nutrient uptake until the next set of nodal roots develop and become established. If subsequent sets of nodal roots die in the same manner, the plant continues its dependence on the kernel and seminal root support.

In fact, it is amazing to me how the aboveground appearance of a plant whose nodal roots are desiccating and dying can appear fairly normal up until the fateful windy day when the mesocotyl simply can no longer support the plant and it literally flops over to the ground. "Floppy" corn plants are **NOT** technically root-lodged; they are simply broken over at the mesocotyl below the crown area of the plant. Obviously, the health of the mesocotyl and the seminal roots determine whether an affected plant can "hang on" until a decent "soaker" of a rain occurs to replenish soil moisture levels.

I began this article by telling you that the "Floppy Corn" Syndrome is a classic example of the importance of the timing of stress versus stage of plant development. Rooting of young plants is most vulnerable to the effects of dry surface soils up until the nodal root system has been fairly well-established (about V5 or V6). Consequently, "Floppy Corn" is more likely to occur in a field of younger, recently-planted corn than an adjacent field of older, earlier-planted corn whose nodal root development is farther along.

CORNY TRIVIA:Sometimes when several sets of nodal roots desiccate and die, the crown of the young plant may "appear" to be at or above the soil surface. That appearance is an optical illusion except in a few cases (Nielsen, 2004).

What Can Be Done to Alleviate the Problem? Unfortunately, very little can be done to prevent the situation from becoming worse. Row cultivation may encourage new nodal root development if moist soil is thrown around the base of the plants. However, if the soil is dry enough to be causing the problem in the first place, there's probably very little moist soil shallow enough to be brought up by row cultivation. The ultimate solution to the problem is a good soaking rain or at least enough of a rain to sustain new nodal root development long enough to allow the roots to reach deeper and hopefully wetter soil conditions before the upper soil dries again.

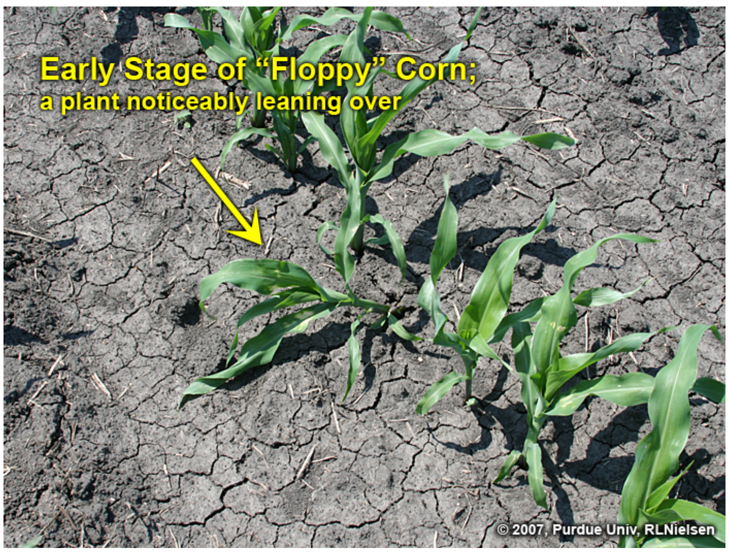
"Slightly shallow" seeding depth.

'Hindsight" Reminders or Foresight Advice.

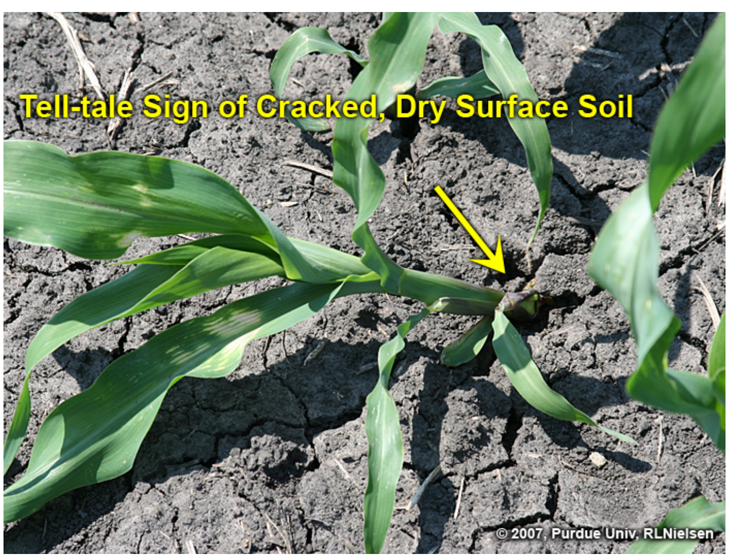
- "Rootless" corn develops more easily with extremely shallow seeding depths that results in nodal root initiation beginning closer to the soil surface than at the usual approximate 3/4 inch depth. This is one of several reasons that growers should avoid choosing seeding depths shallower than about 1 to 1-1/2 inches.
- Conversely, unusually deep planting (more than 2 inches) does not result in unusually deeper initial root elongation because the light-mediated elongation of the mesocotyl during emergence results in the crown of the seedlings being at roughly the same depth (3/4 inch) below the soil surface.
- Furrow erosion after planting, as a result of heavy rains, can create "shallow planted" seed as a consequence of removing topsoil.
- Shallow soil compaction from shallow tillage of fields that are "just a little on the wet side" can restrict initial nodal root development to the shallow, and often dry, soil above the compacted layer.
- Open seed slots resulting from no-till planting "on the wet side" can contribute to the desiccation and death of initial nodal root development if the initial nodal roots desiccate before they successfully penetrate through the furrow sidewalls.

Corn at V5 to V6.

Root system of "normal" plant.

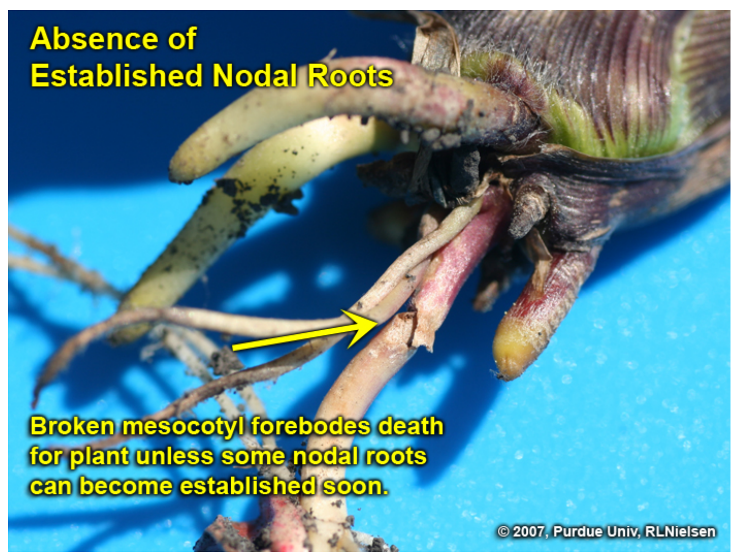


Early stage of "floppy" corn.



Early stage of "floppy" corn.

Absence of established nodal roots.



Broken mesocotyl.

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2023 OISC Clean Sweep Pesticide Disposal

(Nathan Davis, Office of Indiana State Chemist)

An OISC Clean Sweep Pesticide Disposal Program designed to collect and dispose of suspended, canceled, banned, unusable, opened, unopened or just unwanted pesticides (herbicides, insecticides, rodenticides, fungicides, miticides, etc.) is being sponsored by the Office of Indiana State Chemist (OISC). This disposal service is free of charge up to 250 pounds per participant. Over 250 pounds there will be a $2.00 per pound charge. This is a great opportunity for you to legally dispose of unwanted products at little or no cost.

All public and private schools, golf courses, nurseries, farmers, ag dealers, public, cities, towns, municipalities and county units of government or others receiving this notice are eligible to participate.

WHEN: 9:00 am to 3:00 pm Local Time

WHERE:

August 15, 2023: Wayne County Fairgrounds

August 16, 2023: Jackson County Fairgrounds

August 17, 2023: Elkhart County Solid Waste

August 22, 2023: Posey County Co-Op (Gibson County)

August 23, 2023: Newton County Highway Department

August 24, 2023: Hendricks County Fairgrounds

HOW: Complete a Clean Sweep Pesticide Disposal Participant Form to the best of your ability. Mail, e-mail cleansweep@groups.purdue.edu or fax the completed form to Nathan Davis at 765-494-4331 no later than Wed., August 9, 2023. Questions may be directed to Nathan at 765-494-7108. Then bring your leak free and safe to transport containers to the collection site. DO NOT mix materials.

If you have any questions feel free to contact Nathan Davis (davi1280@purdue.edu), Pesticide Investigator and Clean Sweep Program Coordinator for the Office of Indiana State Chemist https://oisc.purdue.edu/pesticide/clean_sweep.html

NOTE: OISC reserves the right to cancel this Pesticide Clean Sweep Project if there is not adequate demand. Participants submitting the enclosed planning form by August 9, 2023 will be contacted immediately if cancellation is necessary.

Dry Conditions Continue, Drought Conditions Expected To Worsen

(Austin Pearson)

Temperatures warmed into the 80s by the end of Memorial Day weekend, but low dew point temperatures made the heat bearable. The air felt dry, and any time I would stand up from my lawn chair, I would be shocked by static electricity. The state average temperature between May 1 and May 30 was 62.3F, which was 0.5F above the 1991-2020 climatological normal (Figure 1). Climate Divisions in the northwest and southwest experienced the largest temperature departures this week (0.9F and 1.0F respectively). Accumulated Modified Growing Degree Days, between April 1 and May 30, ranged from 360 to 800 units across the state (Figure 2). Northwestern Indiana continued to run above normal and southeastern Indiana remained below normal for the period. Cooler temperatures in April and the beginning of May were to blame.

Climate Division Data by State between Two Dates
From Midwestern Regional Climate Center

Indiana
5/ 1/2023 to 5/30/2023

cd	Temperature temp	norm	dev	Precipitation prcp	norm	dev	percent
1	61.5	60.6	0.9	2.26	3.83	-1.57	59
2	60.6	60.0	0.6	2.30	3.72	-1.42	62
3	59.8	59.6	0.2	2.23	3.61	-1.38	62
4	62.9	62.1	0.9	2.38	4.25	-1.87	56
5	61.6	61.5	0.1	2.43	4.23	-1.80	57
6	60.6	60.6	-0.0	2.67	4.11	-1.44	65
7	65.4	64.4	1.0	2.95	4.76	-1.81	62
8	64.3	63.7	0.7	2.87	4.76	-1.88	60
9	62.4	62.9	-0.5	2.53	4.62	-2.09	55
State	62.3	61.8	0.5	2.52	4.22	-1.71	60

Midwestern Regional Climate Center
MRCC Applied Climate System
Generated at:
Wed May 31 09:35:30 CDT 2023

Figure 1: Indiana climate division and state temperature, normal temperature, temperature departure from normal, precipitation, normal precipitation, precipitation departure from normal, and percent of mean precipitation for May 1-30, 2023.

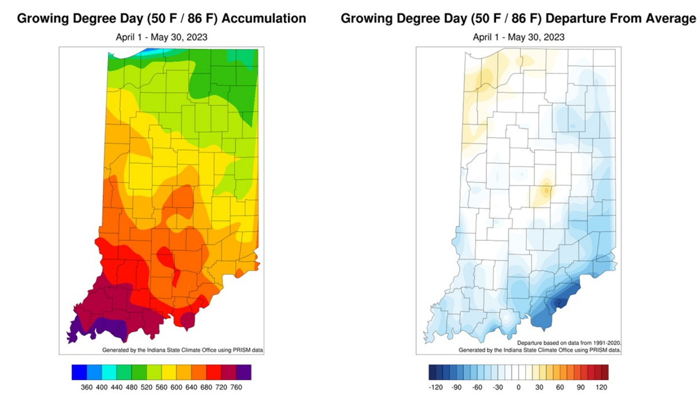


Figure 2: Total Accumulated Indiana Modified Growing Degree Days (MGDDs) April 1-May 30, 2023 (left) and Total Accumulated MGDDs represented as the departure from the 1991-2020 climatological normal (right).

The spigot turned off over the last seven days, which worsened the below-normal precipitation trend for the month. The entire state averaged 2.52 inches of rain from May 1 to May 30 (1.17 inches below normal) (Figure 1). Climate Division 9, located in southeast Indiana, was the driest (2.09 inches below normal). Most of the state averaged between 25-75 percent of normal since the beginning of the month (Figure 3). Dormant lawns, lowering water levels, and reduced streamflows have been reported across a large portion of the state. Jeff Burbrink, Elkhart County Extension Educator, indicated that his pond level dropped eight inches over a stretch of ten days.

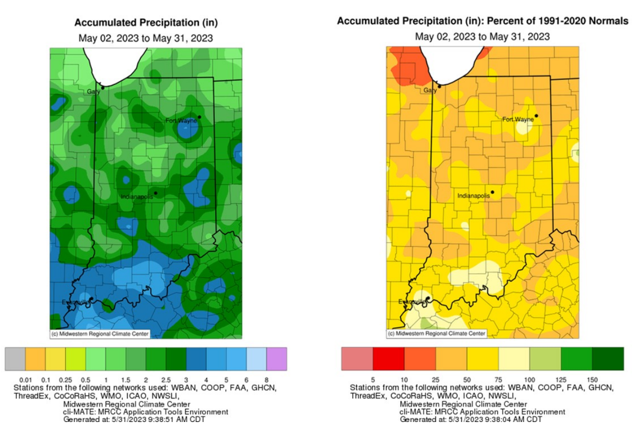


Figure 3: Interpolated map displaying accumulated precipitation for May 2-May 31, 2023 (left). Interpolated map displaying accumulated precipitation as a percent of the 1991-2020 climatological normal (right).

[CoCoRaHS](#) is a volunteer precipitation observation network and also has observers measuring evapotranspiration. Data between May 22 and May 29 indicated that ET rates ranged from 1 to 2 inches, which is fairly significant when we do not get rain. These ET rates can be viewed on the [MRCC Drought Information](#) page (Figure 4). Significant water loss can also be seen in the Purdue Mesonet four-inch soil moisture observations (Figure 5). Volumetric water content fell by more than 5 to 15 percent over the last week, which is why we are seeing things change quickly across the state. The two good things: 1) crops are building stronger root systems as they dig deeper to find moisture; and 2) weather has been perfect for making hay. Recent replanted crops may have issues finding moisture, so keep an eye on emergence in those areas. In response to the dryness, the June 1 [US Drought Monitor](#) (Figure 6) expanded abnormally dry conditions throughout much of the state, and we expect to see additional degradation given the forecast.

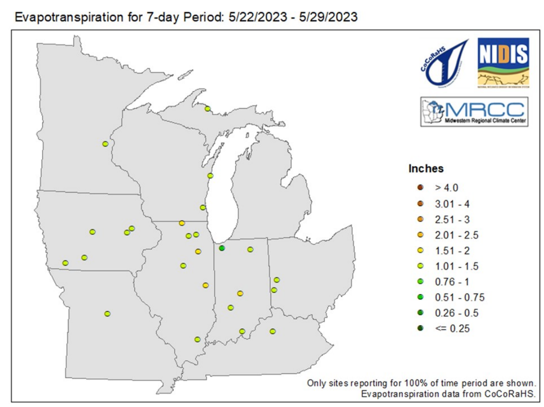


Figure 4: CoCoRaHS Evapotranspiration for 7-day period: May 22-29, 2023, which can be obtained from the MRCC Drought Information page.

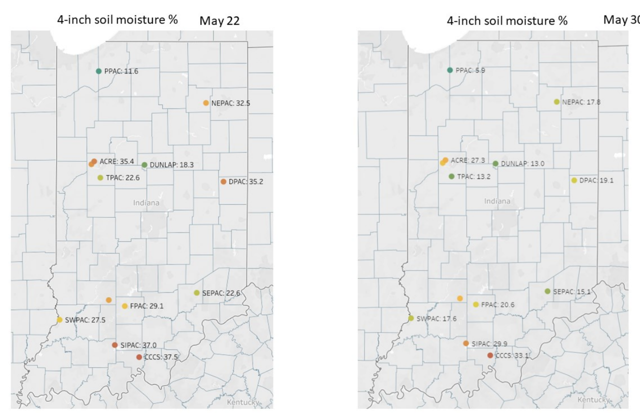
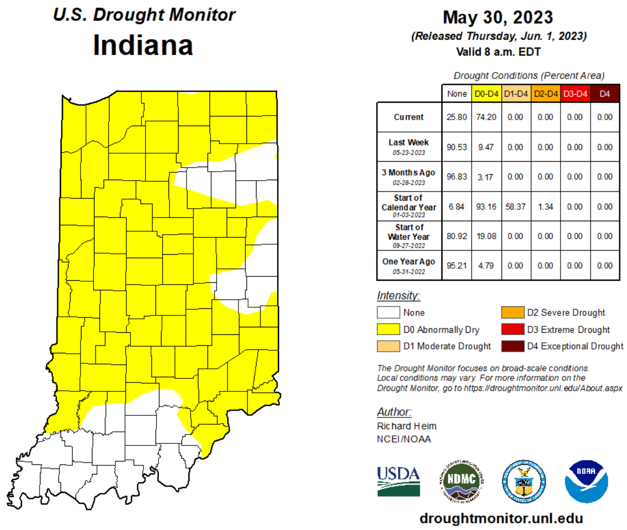


Figure 5: May 22 (left) and May 30 (right) Purdue Mesonet 4-inch soil moisture (volumetric water content) represented as a percentage. Data can be obtained by the Purdue Mesonet Data Hub.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	25.80	74.20	0.00	0.00	0.00	0.00
Last Week 05-23-2023	90.53	9.47	0.00	0.00	0.00	0.00
3 Months Ago 02-28-2023	96.83	3.17	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2023	6.84	93.16	58.37	1.34	0.00	0.00
Start of Water Year 09-27-2022	80.92	19.08	0.00	0.00	0.00	0.00
One Year Ago 05-31-2022	95.21	4.79	0.00	0.00	0.00	0.00

Figure 6: June 1, 2023, US Drought Monitor. The US Drought Monitor is released every Thursday morning by 8:30 AM.

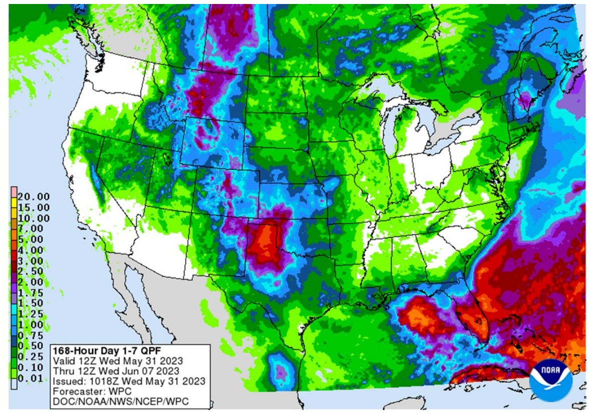


Figure 7: NWS Weather Prediction Center 7-day quantitative precipitation forecast for the continental United States, valid May 31-June 7, 2023.

Very isolated, convective precipitation was observed on May 30 and May 31, but did not resolve any of the broader drought impacts. The 7-day forecast, valid through June 7, does not show widespread precipitation across the state (Figure 7). Overall, precipitation will remain below normal, coupled with air temperatures in the upper 80s and low 90s. Paired with this, dew point temperatures are expected to drop into the 40s and, in some spots, the 30s. The 6-to-10-day climate outlook from the Climate Prediction Center has elevated chances for above-normal temperatures and below-normal precipitation through June 9 (Figure 8). The 8-14-day outlook depicts a cool down with a return to near normal precipitation (Figure 9). Breaking dry patterns is historically difficult, so we will see how long these drying conditions persist. Stay tuned.

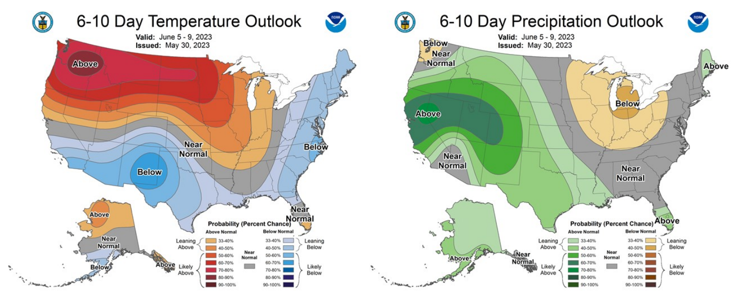


Figure 8: The CPC's 6–10-day temperature and precipitation outlooks, valid for June 5 through June 9, 2023.

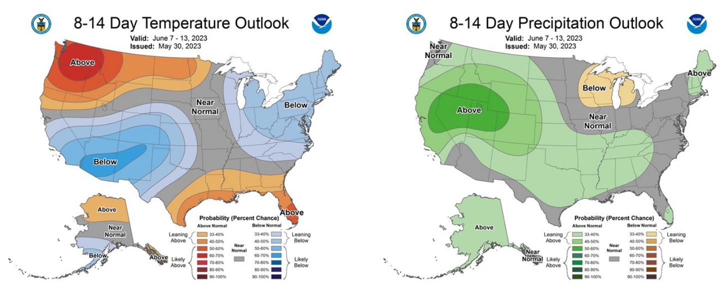


Figure 9: The CPC's 8–14-day temperature and precipitation outlooks, valid for June 7 through June 13, 2023.

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