# VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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In This Issue



## Southern Blight of Tomato and Pepper

*(Dan Egel, egel@purdue.edu, (812) 886-0198)*

Southern blight of pepper and tomato thrives under hot, dry conditions. Usually, such conditions are more likely in August. Production under tunnels may contribute to the dry conditions that influences southern blight. This article will discuss the symptoms, biology and management of southern blight of tomato.

Southern blight has a wide host range affecting many vegetable, field and ornamental crops. Tomato is the most important host. The disease is caused by the fungus *Sclerotium rolfsii*. This fungus is related to the one that causes white mold. The first symptom one is likely to observe of southern blight is plant wilt. At the base of the plant, one is likely to notice a canker with sclerotia (Figure 1). These sclerotia are survival structures for the fungus and allow the disease to occur in the same location years later. The sclerotia for southern blight are round, about the size of a sesame seed and usually occur near the base of the plant. In contrast, sclerotia of white mold are irregular in shape, are pea-size and may occur several feet up the plant. The fungus that causes southern blight also lives off of organic matter without being parasitic (saprophytic).

Figure 1. Southern blight causes sclerotia about the size of a sesame seed at the base of the plant.

Control of this disease can be difficult. The best crops for rotation are grass plants such as corn and small grains. Deep plowing the residue may help reduce the severity of the disease. Fungicides are not available to manage this disease. The use of high calcium levels and ammonium type fertilizers has been reported to help in management.

## Late Season Fungicide Applications

*(Dan Egel, egel@purdue.edu, (812) 886-0198)*

Recent heavy rains have caused an increase in foliar disease in many vegetable fields. A sudden increase in foliar disease may lead some growers to purchase expensive fungicides to take care of the problem. However, there are several considerations before one applies the most expensive fungicide.

1. The optimum time to apply a very effective, and perhaps expensive fungicide, is right before or at the time of intense disease pressure. This is because an effective fungicide on the leaf surface just as spores arrive may help to halt or at least significantly slow disease progress. Using a disease-forecasting system such as **MELCAST** for cucurbit growers should help to time such applications.
2. An effective fungicide applied after infection may enter

into the leaf and halt some infections, but such an application will not be as effective as one applied right at or before infection.

3. When looking at a field that one wants to rescue, note that no fungicide will bring back green tissue. No amount of 'kick-back' that a fungicide may have will cause brown tissue to turn green. The most one can hope for is that plants that have had an effective fungicide application will begin to produce healthy new growth.
4. Unfortunately, the amount of diseased tissue that one observes in a field is almost certainly worse than can be observed with the eye. This is because initial infections can't be seen with the naked eye until 7-10 days after infection.
5. Make sure that the symptoms you observe are really an infectious disease and not physical injury or a nutritional problem.
6. Check the Pre-Harvest Interval of the fungicide you intend to use.

The message here is that the best time to apply effective and potentially expensive fungicide applications is earlier in the season—right before or early in the disease cycle. Be realistic about late season fungicide applications!

## Root-knot Nematode on Vegetable Crops

*(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)*

Root-knot nematodes (RKN) are a devasting soilborne pest on a wide range of vegetables and fruits. Root-knot nematode infections result in root swellings called galls (Figure 1). Heavily infected crops by RKN display aboveground symptoms such as stunted growth, wilting, and leaf yellowing. We often found root-knot nematode causes damage to watermelons, cantaloupes, and tomatoes in southern Indiana. Recently we found RKN caused damage to carrots inside a high tunnel in northern Indiana.

Figure 1. Galling of tomato roots infested by root-knot nematode.

As part of a federally funded research project, our extension team and nematology lab at Purdue are trying to understand the extent of damage caused by root-knot nematode on vegetable crops in Indiana and identify the RKN species that exist in our region. This effort will help us develop effective management approaches. If you want to find out if root-knot nematode is a problem at your farm, please contact Wenjing Guan (guan40@purdue.edu) or Dan Egel (egel@purdue.edu). We will arrange a soil nematode test for you.

Meanwhile, we are asking vegetable farmers' and agricultural professionals' to take this short survey https://purdue.ca1.qualtrics.com/jfe/form/SV_73bKsHblfzLZQdU The purpose of the survey is to assess awareness about the pathogen among vegetable farmers in our region and understand research and extension needs in controlling this pest. The survey will take no more than 3 minutes. Thank you very much!

*The project is funded by United States Department of Agriculture National Institute of Food and Agriculture grant no. 2021-51181-35904.*

## Late Season Pest Management in Pumpkins

*(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)*

Squash bugs and cucumber beetles (both spotted and striped) are in full swing this time of year on your cucurbit crops. We no longer have to worry about flowers developing into harvestable fruits, so it is a time that you need to think strategically about insect pest damage thresholds in relation to the decision to spray. Here are some suggestions that I can offer to help with the process:

Squash bugs are piercing-sucking pests that contain phytotoxins in their saliva, meaning that when they feed on the plant they can cause damage locally to those cells which results in cell death. What you will see is crumpling yellow and brown leaves. Sometimes they will feed directly on the developing fruits as well, leaving sunken discolored scars which can impact quality and create entry points for pathogen infection. If you are a home or market gardener, you will still be able to harvest your pumpkins if the damage is restricted to the vines but they will not look good. If you have a pumpkin patch that you open to the public for picking you likely want to keep those vines looking good and therefore would be more inclined to treat this pest. They are tough to kill with insecticides. Regardless of the product you use, timing is key. The small nymphs are easier to kill compared to the adults (Figure 1). They are often on the underside of the leaves so coverage is crucial and you should consider incorporating a sticker/spreader when making the application.

Figure 1. Squash bug nymphs.

Cucumber beetles, both spotted (Figure 2) and striped (Figure 3), will congregate in the beautiful large flowers that are present on pumpkin vines. They identify these flowers as a great site to meet and mingle for mating, hence the large aggregations that can be found. Their presence in the flowers is not damaging but they can feed on the fruits which will cause damage to the rind.

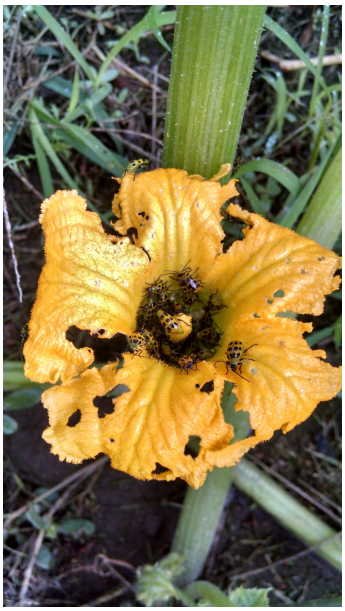

Figure 2. Spotted cucumber beetles

Figure 3. Striped cucumber beetles

If you are treating for cucumber beetles or squash bugs you need to be on alert for aphid outbreaks (Figure 4) that tend to result a few weeks later. This is because the chemicals used to knock down the beetle and squash bug pests also knock down the natural enemies that are keeping the aphids in check. To minimize these non-target effects careful selection of the active ingredient in the pesticide and timing of applications to maximize impact on the pest are your best practices. Below is a table of product active ingredient, IRAC code and pests they are labeled for. The list is not comprehensive. Always refer to the product label for specific crop and pest designations as well as mixing instructions. The label is the law.

Figure 4. Aphids on a pumpkin leaf

| Active Ingredient | [1]IRAC code | Squash Bugs | Cucumber Beetles | Aphids |
|---|---|---|---|---|
| Esfenvalerate | 3A | X | X | |
| Acetamiprid | 4A | X | X | X |
| Bifenthrin | 3A | X | X | |
| Cyclaniliprole | 28 | X (nymphs only) | X | X |
| Zeta-cypermethrin | 3A | X | X | |
| Dinotefuran | 4A | X | | X |
| Lambda-cyhalothrin | 3A | X | X | X |
| Flonicamid | 29 | | | X |
| Flupyradifurone | 4D | | | X |

[1]IRAC is the insecticide resistance action code designated for each active ingredient based on the mode of action for the product. To maintain the efficacy of products you should rotate your applications among different IRAC groups.

# Cover Crop Demonstration Plots Show Weed Suppression Potential

*(Stephen Meyers, slmeyers@purdue.edu, (765) 496-6540)*

Attendees at a July field day at the Meigs Horticulture Research Farm in Lafayette, Indiana saw first-hand the potential of cover crops to suppress weeds in a SARE-funded demonstration plot.

***First, some background:***

Three cover crop species were sown with a ten-foot drill on September 10, 2021:

- Oats at 100 lb/acre
- Cereal rye at 65 lb/acre
- Rapeseed at 15 lb/acre

The oats winter-killed. The cereal rye and rapeseed did not.

All plots were roller-crimped in early June 2022 using the roller-crimper in Figure 1 which crushed the cereal rye (Figure 2) and

rapeseed stems at multiple points and provided excellent cover crop termination.

Figure 1. A roller-crimper fabricated at a Purdue Agriculture Center.

Figure 2. A cereal rye plant following roller-crimping with its stem bent at multiple locations.

***What we observed (photos taken July 8, 2022):***

A small strip of land without any cover crop (Figure 3) contained an abundance of marestail and some lambsquarters. Marestail is a common weed of no-till systems, and many populations of marestail have some level of glyphosate resistance. It often emerges in the fall, but can emerge sporadically throughout the year. Lambsquarters is a summer annual weed common in Indiana.

Figure 3.

Winter-killed oats did not suppress weeds and had just as many marestail and lambsquarters as the no cover crop plot (Figure 4).

Figure 4.

Rapeseed provided better weed control than oats. This plot contained no marestail, but did contain many small lambsquarters (Figure 5). However, the early June termination timing was too late for the rapeseed plot, resulting in viable seeds being produced and rapeseed volunteers germinating in this plot.

Figure 5.

It may come as no surprise that cereal rye provided the most weed suppression with a limited number of weeds visible (Figure 6).

Figure 6.

***The take-away:***

When planted early in the fall and allowed to reach their full potential prior to roller-crimping, cereal rye and rapeseed can suppress common winter and summer annual weeds. However, none of the cover crops provided complete weed control, and winter-killed oats provided no control. Complete weed control may require additional weed control measures such as herbicides. As fall approaches, consider adding cover crops into your overall weed management program.

# Irrigation Demonstration Update Aug 9, 2022, Pinney Purdue Ag Center

*(Liz Maynard, emaynard@purdue.edu, (219) 548-3674) & (Christian Charlson, ccharls@purdue.edu)*

At Pinney Purdue (PPAC) 2.67 inches of rain fell July 27 through August 9. The potential evapotranspiration (PET) over the period was 1.68 inches. Estimates for water use by the crops are equal to or just slightly lower than potential evapotranspiration. For tomatoes, estimated water use was 1.68 inches, and for watermelons, 1.52 inches. There were fewer irrigations over this period than in the previous two weeks: 1 in the sensor-based watermelon treatments, 4 in the evapotranspiration (Et)-based treatments for tomato and watermelon, and 7 in the sensor-based treatment for tomatoes. The sensor-based watermelon treatment is allowed to dry to a greater exent than the sensor-based tomato treatment.

The first bell peppers are ready to pick; the earliest tomatoes are at the mature green stage, earliest eggplant are approaching maturity, and earliest watermelon appear full-sized. Younger fruit continue to develop on all plants.

The graph below (Figure 1) shows sensor readings for the unirrigated and the Et-based watermelon beds, along with bars indicating the daily totals of rainfall and irrigation. During the period from July 28 to 31 the decrease in soil moisture during daytime hours is visible in the lines for both beds. Beginning Aug. 1 the soil moisture in unirrigated plots decreased much less quickly. This is likely because the soil had become dry enough at that depth that the watermelon could not easily extract moisture. There may have been moisture deeper in the soil that the plant could use. Rain on Aug. 3 replenished the soil moisture in the unirrigated plots; the irrigation plots also received irrigation before it rained.

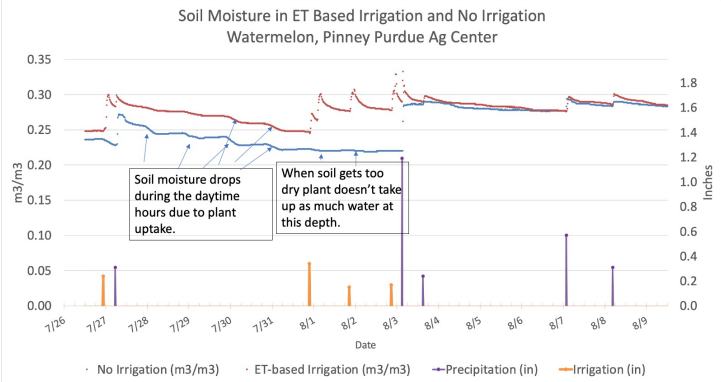


Figure 1. Soil moisture measured by electronic sensors at 12 inch depth in watermelon plots irrigated based on evapotranspiration (Et-based) or not irrigated, and daily precipitation and irrigation. Pinney Purdue Ag Center, July 27-Aug. 9, 2022.

# For Young Consumers Farm-to-Fork Is Not Organic

*(Ariana Torres, torres2@purdue.edu)*

Millennials and Gen Z are predicted to shape emerging food trends in America. Millennials – the largest living generation – are spending more food dollars in restaurants and convenient meal prepping than previous generations. Millennials are usually described as progressive, open to trying new foods, and willing to value sustainable food attributes. Gen Z – those born between 1997 and 2008 – are characterized by their health consciousness and social media connectivity. As the newest and most ethnically diverse generation, Gen Z consumers have been introduced to healthy lifestyle choices and sustainable living at an earlier age than previous generations. Together, these two generations comprise the most consumption-oriented consumers of all time with access to abundant information on foods.

This study investigated how young consumer's personal values towards foods from organic, local, sustainable, and small-family systems can used to create market segments. Market segmentation can help industry marketers to generate appropriate targeting, communication, and encouraging messages to help consumers make sustainable purchases. By understanding how these young consumers value different environmental and social attributes, market segmentation can allow food marketers to make attributes claims more relevant. Supplying foods with attributes that align with values can help marketers develop trust relationships with these two generations, that can result in long-term loyalties for products and businesses. Developing correct messages that appeal to their clientele can assist growers and retailers on enhancing the positioning of their

food products in a competitive environment.

**The Importance of Consumers' Values and Attitudes Towards Foods**

Researchers have reported the strong connection between messages that convey how foods are produced and marketed and consumers' values and attitudes. Among all food attributes, environmental (i.e., organic and sustainable) and social (i.e., local and small-family farms) features seem to be gaining attention among Americans. The interest in local foods from consumers, producers, and policymakers seems to be growing, reflected by increases in the number of farmers markets and food sales through local markets. These values and attitudes are strongly correlated with buying behavior, suggesting that young consumers adopt sustainable consumption patterns as a way to impact food systems with their dollar spending.

**Main Characteristics of Young Consumers**

- Data for this study comes from a 2017 web-based survey of 1,351 Millennials and Gen Z consumers. They were asked about the importance they place on fresh produce attributes such as organic (*ORGANIC*), local (*LOCAL*), sustainable (*SUSTAINABLE*), and small-family farms (*SMALL*).
- Most young consumers value foods coming from sustainable agriculture (79%), followed by local (73%), and small-family farms (71%). Interestingly, organic agriculture was the least important for young consumers, as they placed an average importance of 56%.
- Most young consumers (97%) in the sample buy fruits and vegetables from grocery stores, 44% buy from farmers markets, and only 2% of young consumers are involved with growing some produce.

**What Are the Market Segments of Young Consumers?**

Young consumers can be clustered in 4 distinct market segments: *Committed, Farm-to-Fork, Unattached,* and *Skeptic*).

The first market segment, the largest segment, represents 33% of the sample (426 consumers). Cluster 1 (labeled ***committed***) strongly valued all four attributes as important, as evidenced by the highest average values across all attributes (within column). The ***committed*** segment was comprised by a higher share of Millennials and Gen Z consumers purchasing in farmers markets (53%), being female (69%), seeking opportunities for campus/community involvement (59%), being out-of-state or international students, and living in on-campus housing.

The second market segment consisted of 27% of consumers. Consumers in the second cluster, labeled ***farm-to-fork***, had high preference for attributes commonly related with local food systems, such as local, sustainable, and small-family farming, but not with organic farming. The ***farm-to-fork*** is comprised of individuals with an agricultural background (47%), coming from Midwestern states (74%), and enrolled in an agricultural major (28%). While the ***committed*** and ***farm-to-fork*** segments are different, Millennials and Gen Z consumers in the ***farm-to-fork*** cluster shared some demographic similarities with consumers in cluster 1. For example, they reported a similar shopping behavior, as well as their proportion of female, involvement in campus/community events, and in-campus housing.

The third market segment consists of 26% of the sample (333 consumers). Consumers in the third cluster (labeled ***unattached***) had moderate expectations for all features, and did not show high preferences for any of the attributes. This group had mean score intermediate between cluster 2 and cluster 4 for most variables. For example, 39% of consumers in this group purchased at farmers markets, 53% were female, and 56% were from the Midwest. These unattached consumers were characterized by actively seeking campus/community involvement activities, being international, and living in on-campus housing.

The fourth market segment, labeled ***skeptic***, consists of 14% of the sample (178 consumers). The *skeptic* segment was the smallest group and was comprised by consumers who did not express high expectations in general. Consumers in this group scored the lowest on purchasing in farmers markets, lacked an agricultural background and reported being international or from out of the Midwest.

**Take Home Message**

- The findings suggest a lack of trust of the organic label by an important segment of young consumers. Food safety recalls, along with distrust of big corporations entering the organic industry, are likely to lead young consumers to prefer food products that convey sustainability, localness, and small farming.
- For food retailers to build long-term trusting relationships with young consumers, they should use figures and messages that convey transparency about how the product was produced.
- Other labels can communicate the impact of the product in local and farming communities. One option may be to propose the coexistence of organic labels with labels that convey localness, sustainability, and impact on small-family farming systems. Another option may be for labels and logos convey potential benefits to the environment and local communities, such as information on carbon footprint, use of pesticides, or protection to pollinators.

**Literature cited**

Torres, A., 2020. For young consumers farm-to-fork is not organic: A cluster analysis of university students. *HortScience*, *55*(9), pp.1475-1481.

# Warm Temperatures and Rain Dominate Early August with Cooler Weather Inbound

*(Austin Pearson, pearsona@purdue.edu, (765) 675-1177)*

July temperatures averaged 1°F above normal but had a couple of periods of extreme heat. Twelve stations recorded maximum temperatures in excess of 100°F. Portions of the month were cooler than normal, which gave way to warmer temperatures

again in the last week of July. The heat and humidity continued during the first week of August, as the entire state experienced temperatures ranging from 4-6°F above normal. Northern Indiana measured the warmest temperatures, ranging from 5-6°F above normal (Figure 1). Statewide, minimum temperatures were 3-6°F above normal to start the month. There were regional differences in maximum temperatures as southern Indiana was near normal and northern Indiana was nearly 6°F above normal for the week. The Lafayette Purdue University Airport had an average maximum temperature of 90°F, with the highest temperature reaching 95°F on August 3rd. A cold front brought cooler weather to the northern part of the state on August 9th, with maximum temperatures in the mid to upper 70s. Since April 1, Modified Growing Degree Days (MGDDs) have tracked above normal for most of the state. Central and southern Indiana show the highest MGDD departures with some spots running 120-180 units above normal (Figure 2).

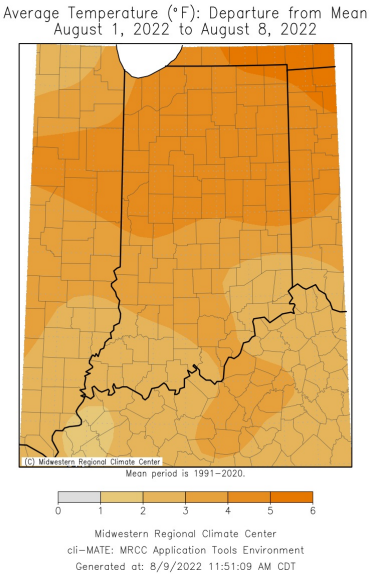


Figure 1. Average temperature in degrees Fahrenheit for August 1-9, 2022, represented as the departure from the 1991-2020 normal temperature during that period.

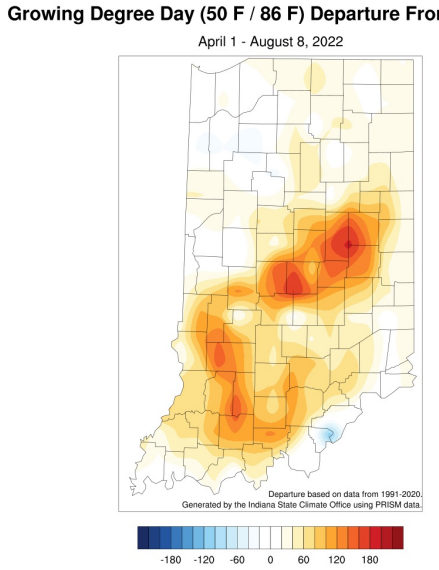


Figure 2. Modified Growing Degree Day (MGDD) (50◦F/86◦F) accumulation from April 1-August 8, 2022, represented as the departure from the 1991-2020 climatological average.

Through the first eight days of August, precipitation was above normal for most in the state. Indiana averaged 1.33 inches of rain, which was 0.25 inches above normal. Precipitation totals for northern and southern Indiana were over an inch (Figure 3). Southwestern Indiana averaged 1.89 inches of rain, which was 0.68 inches above normal for the week (Figure 4). There were areas with extreme precipitation, including Patoka Lake which measured 6.01 inches of rain (3.82 inches fell on August 6th). As a result, many of the stream gauges in southwestern Indiana averaged above-normal stream flows. Conversely, central Indiana was 0.13 inches below normal, with many locations totaling just over a half inch. Due to the ongoing drought, many of the stream flows in central Indiana remained below normal. On the August 2nd US Drought Monitor, the area affected by Moderate Drought (D1) was reduced slightly but continued for west-central Indiana (Figure 5). Abnormally Dry (D0) conditions continued through central Indiana. Additional improvements are expected in the August 8th US Drought Monitor.

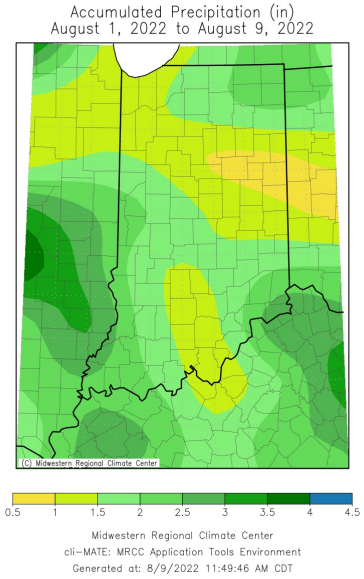


Figure 3. Accumulated precipitation (inches) from August 1-9, 2022.

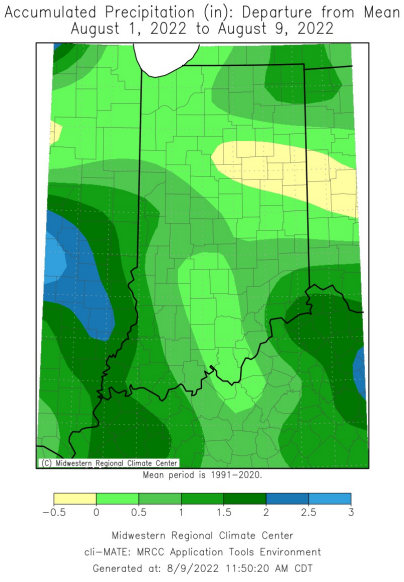

Figure 4. Accumulated precipitation from August 1-9, 2022, represented as the departure from the 1991-2020 normal precipitation that fell during that period.

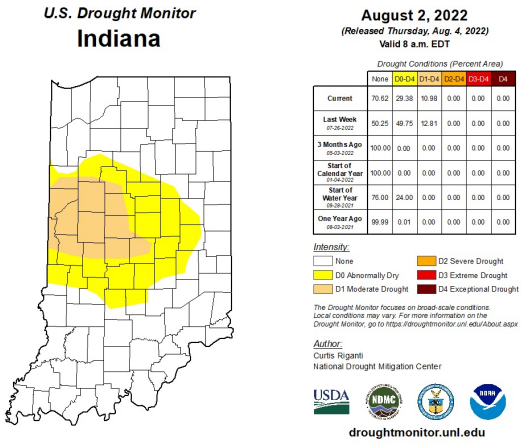


Figure 5. Indiana US Drought Monitor from August 2, 2022.

Turning focus to what's ahead, the 6-10 day Climate Prediction Center (CPC) Outlooks (August 15-19) have higher confidence in below-normal temperatures and near-normal precipitation is expected (Figure 6). The 8-14 day CPC Outlooks (August 17-23) continue this trend (Figure 7).

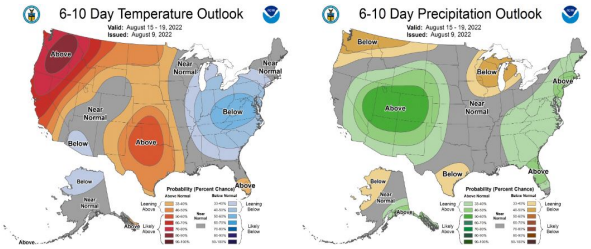


Figure 6. The CPC's 6-10 day temperature (left) and precipitation (right) outlooks for August 15-19, 2022.

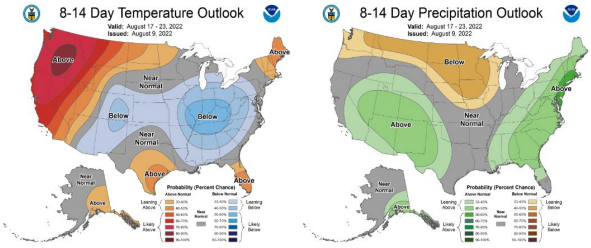


Figure 7. The CPC's 8-14 day temperature (left) and precipitation (right) outlooks for August 17-23, 2022.



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