

When Heat Stops Being “Just Weather”: Stress Degree Days, and Warm Nights

By late July, most growers expect some heat. What we are seeing now across much of the Renk footprint is more than that – it’s an extended stretch of high temperatures, sticky nights, and another strong ridge of high pressure building for the week across much of our area.

The crop has already worked through one major heat wave earlier this month. Now parts of the western and central Corn Belt are stacking another round of highs in the 90s and warm overnights as corn moves deeper into grain fill and late pollination pockets finish up. This week’s EARFULL focuses on when that heat stops being “just weather” and starts becoming measurable stress in the form of Stress Degree Days (SDDs), what warm nights over 70°F are doing inside the plant, and how to think about this week’s forecast for both dryland and irrigated acres.



Stress Degree Days:

Earlier issues have talked about heat and humidity around tassel and how corn manages stress by moving water. SDDs give us a simple way to measure how often the crop has been pushed past its comfort line.

For Midwest corn, 86°F is the key threshold. Each day the high exceeds 86°F, the “extra” degrees above 86 are added to a running SDD total. Iowa State work showed that under typical rain-fed Iowa conditions, corn reaches incipient water stress more than half the time when air temperatures hit 86°F.

This matters because long-term yield work suggests that when seasonal SDD totals stay below roughly 140, many rain-fed crops can still finish at or above trend yield. Once totals push beyond that 140 mark, it becomes “tough to find corn yield above trend,” even with solid management. Your recent heat-stress analysis shows some locations already carrying 80–90 SDDs, with another 50-plus units possible if next week’s high-pressure ridge holds together, which would move portions of the western and central Corn Belt into or past that 140-SDD zone.

The main agronomic message is simple: isolated hot days are not the story anymore. The story is accumulated stress.

Warm Nights:

The other half of this heat stretch and the part growers often feel most is warm nights. The corn plant runs day and night. During daylight, plants make sugars; around the clock, they burn some of those sugars through respiration. High nighttime temperatures in the 70s and 80s increase respiration, which means more of the day’s sugars get burned off instead of ending up in kernels. Extension and industry summaries emphasize that above-average night temperatures during reproductive growth can reduce yield by cutting both kernel number and kernel weight.

Overnight lows staying near or above 70°F for several nights in a row mean the crop is never fully resetting. Plants are starting each day with less cushion, which raises the odds that the combination of high daytime SDDs and warm nights quietly trims grain fill, even in fields that still look reasonable from the road.

Dryland vs. Irrigated:

The next ridge of high pressure will not treat all fields the same. The difference between dryland and irrigated acres is not whether they will feel hot – it is how much margin they have to ride through it.

In rain-fed systems, SDD totals and warm nights are strong signals that the crop's stress budget is tightening. As SDD totals approach or cross the 140 mark, long-term data says it becomes much harder to finish above trend yield unless the field has had unusually good moisture luck. Fields that already rolled hard in earlier heat, carry shallow roots, or sit on lighter soils are the most vulnerable as this next ridge sets in.

Irrigation changes how plants experience the same air temperature. A full soil profile allows corn to keep stomata open longer, maintain transpiration, and keep the canopy cooler internally even when air temperatures exceed 86°F. That means irrigated fields generally tolerate higher SDD totals before showing the same level of yield penalty, because water is available to support photosynthesis instead of forcing the plant to shut down.

However, irrigation does not fully erase the impact of warm nights. Canopy cooling from irrigation is helpful, but it does not pull nighttime air temperatures back out of the 70s and 80s. Respiration "tax" from warm nights still applies under irrigation, so kernel weight can still be trimmed in sticky night patterns – just usually less severely than in fields that are stressed for moisture.

What to Watch:

Given the forecast for another strong ridge and high-heat pattern across much of the region, the best use of scouting time over the next 7–10 days is to sort fields by stress response rather than by headline temperatures.

Watch warm nights as closely as highs. Note fields where overnight lows stay above 70 °F for several nights in a row, especially where pollination is wrapping up and grain fill is underway. Those are the acres most likely to see subtle yield drag from respiration even if daytime stress looks manageable.

Separate dryland and irrigated risk. On dryland, focus on lighter soils, uneven emergence pockets, and fields with shallow rooting that already showed stress earlier in the month. On irrigated acres, focus on timing and adequacy of sets around tassel and early grain fill; fields that slipped behind in irrigation timing may show more kernel number loss than neighbors.

References

- Iowa State University Extension and Outreach. "Water Stress in Corn: Estimating from Stress Degree Days (SDD)." Integrated Crop Management.
- Midwestern Regional Climate Center / Purdue University Extension. "About the Modified Stress Degree Day Product for Corn."
- Ohio State University Agronomic Crops Network. "Hot Night Temperatures Can Decrease Corn Yield."