Science Societies

Delta T: A new tool to make every spray drop count

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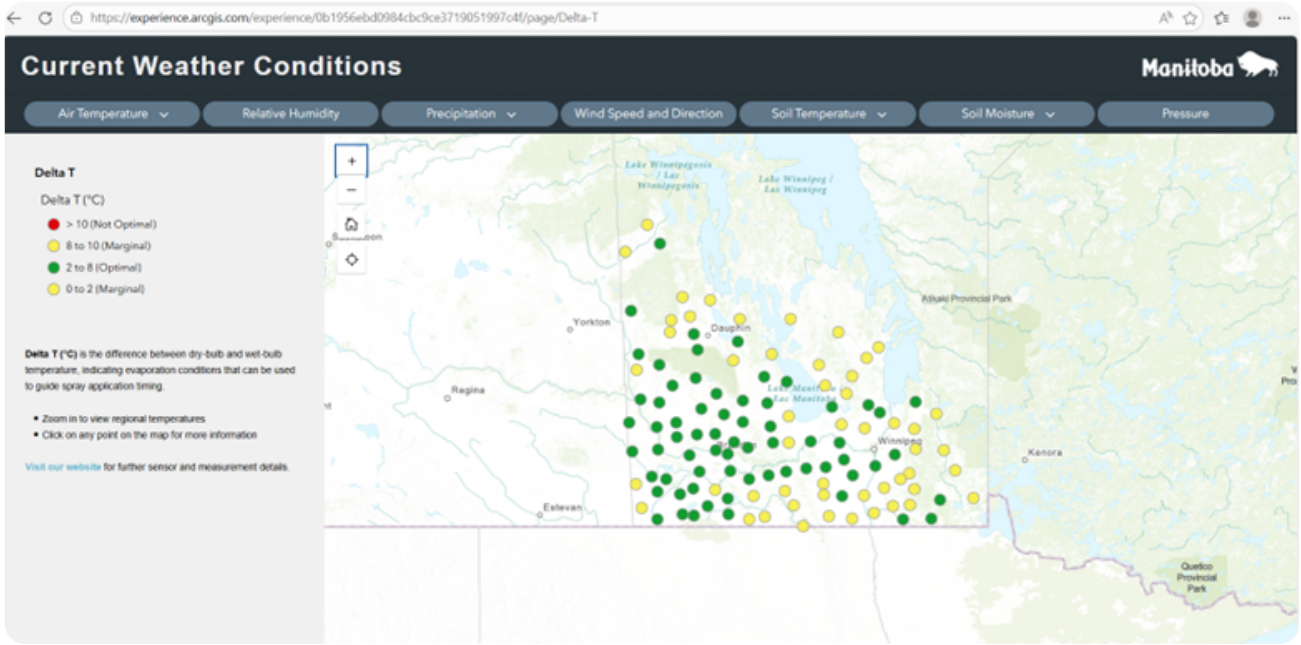

Adoption of Delta T values as a spray decision support tool is increasing in the arid parts of the Northern Great Plains. Delta T values have been reported in North Dakota since about 2022 and are now being reported as well in Manitoba. This screenshot is from May 1, 2026.

Delta T is a calculation that combines relative humidity and temperature into a practical measure. It can help farmers and their CCAs determine optimal spraying conditions to reduce herbicide drift and evaporation, improving weed control effectiveness. Monitoring Delta T and adjusting spraying practices accordingly can preserve herbicide performance and combat increasing herbicide resistance.

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It's not just enough to spray herbicides, they need to be sprayed well. Effective herbicide application means using the right products at the right time, and the environment in which we spray is a key factor in determining how well they can do their job. Poor spraying conditions that affect herbicide efficacy will reduce weed control. This contributes to herbicide resistance, the single biggest threat to contemporary weed management. Every season gets more challenging as we see herbicides start to fail on new weeds and already resistant weeds becoming resistant

to more products. Without new modes of action coming to our rescue, we need to preserve the herbicides we have by spraying under optimum conditions.

Temperature and humidity are key factors affecting herbicide movement to the target weeds. Once the herbicide solution leaves the tank and becomes airborne, spray droplets are susceptible to being lost through drift or evaporation. Spraying under the right environmental conditions, especially temperature and humidity, will reduce droplet loss. Monitoring these factors is crucial to ensure what's being sprayed is hitting the mark. Low humidity will cause droplets to evaporate faster, which can reduce uptake and increase drift. But simply looking at relative humidity (RH) doesn't provide a clear picture of risk—this is because evaporation changes at different air temperatures even though RH is the same.

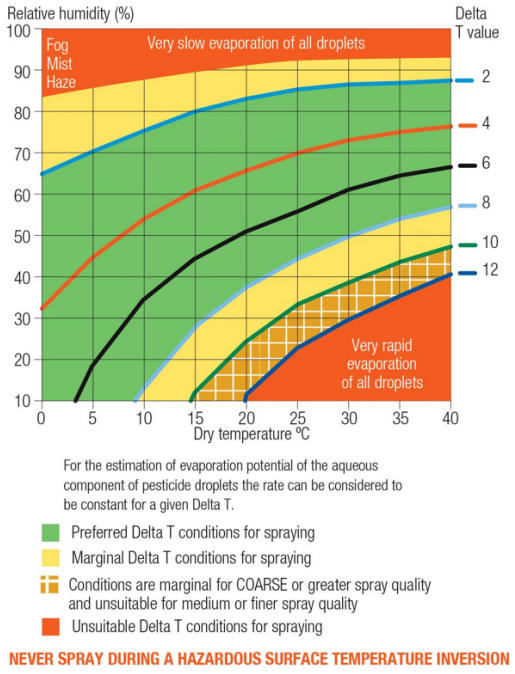

Figure 1. *The relationship of Delta T, temperature, and relative humidity (from Grains Research and Development Corporation, Australian Government)*

How Delta T works and how it is measured

Delta T is a calculation that combines RH and temperature into a practical measure (Figure 1). It shows how dry the atmosphere is by measuring the temperature difference between a dry bulb and a wet bulb thermometer. A dry bulb is an air temperature sensor exposed directly to air while a wet bulb is an identical air temperature sensor wrapped in wet material. Water is evaporating from the wet bulb and cooling it, resulting in a lower temperature compared with the dry bulb. The drier the air,

the faster the evaporation rate and the larger the temperature difference between the two bulbs. The Delta T value and the potential for spray droplets to evaporate is higher. In humid conditions when evaporation is slow, the wet bulb temperature will be close to the dry bulb temperature, and Delta T is low.

Delta T can be measured with a sling psychrometer (Figure 2) that has identical dry and wet bulb thermometers. The psychrometer is swung in a circle, and each bulb measures temperature as it is exposed to moving air. Subtract the wet bulb temperature from the dry bulb temperature; for example, if the dry bulb temperature is 26°C and wet bulb temperature is 22°C, then Delta T is 4°C. We can get Delta T directly from other sources like handheld devices that measure temperature and humidity and calculate Delta T. Some sprayers and many stationary weather stations also calculate Delta T. Now that Delta T is being widely reported, we can make use of this practical tool through real-time measurement and forecasting.

Using Delta T to improve spraying practices

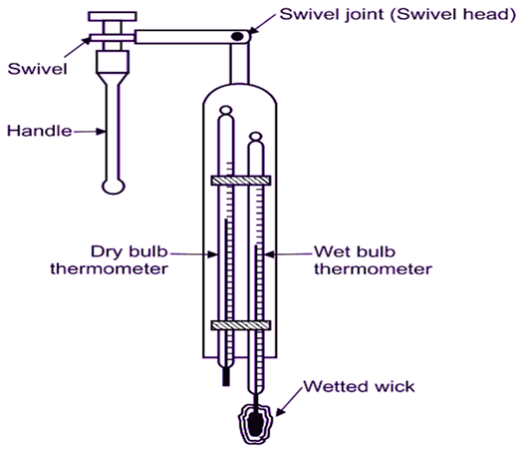

Figure 2. *Sling psychrometer (from Electricalworkbook.com).*

How and why do we use Delta T? Applicators in Australia started to use this measurement because spraying lower water volumes in hot, dry conditions affects spray quality. Fine droplets can evaporate completely, and larger spray droplets will shrink and become more driftable. Recommendations from Australia suggest conditions are safest to spray when Delta T is between 2 and 8°C. Higher Delta T conditions mean rapid evaporation, and coverage and efficacy could be reduced. Low Delta T conditions

occur under high humidity, and there is potential for temperature inversions, which can increase drift. It's important to monitor Delta T continuously as it will change throughout the day with changing temperature and RH. Delta T can rise significantly in the hottest and driest parts of the day, and spray performance can compromised.

Can we still spray when Delta T is high? Andrew Thostensen, Pesticide Program Specialist (Emeritus) from North Dakota State University, states that when Delta T conditions become marginal for spraying, applicators may want to consider altering their application practices and/or curtail operations when Delta T values become extreme. Using coarser droplet size and higher water volumes can mitigate some risk.

Applying contact herbicides when Delta T numbers are too high can result in poor performance and possibly outright failure.

Thorough coverage for all herbicides is necessary for efficacy, but with contact herbicides, coverage is crucial for getting enough active ingredient to the target weeds. Reliance on contact herbicides such as glufosinate for weed control in major crops like soybeans, corn, and canola is increasing. Monitoring Delta T and adjusting spray parameters when relying on contact herbicides may be critical to ensuring success. Applying contact herbicides when Delta T numbers are too high can result in poor performance and possibly outright failure. Spraying under optimum conditions for systemic herbicides is also important, especially for products like dicamba where drift

can have serious consequences. In high Delta T conditions, coarse and ultra-coarse droplets will shrink and become more drift prone, putting nearby sensitive crops at risk. Monitor and record Delta T values, and include that information when assessing the success of spray operations.

As a relatively new tool, we need to learn how to incorporate Delta T when making spray decisions. Knowing Delta T values can be useful information—if its high, then we can alter spraying practices to compensate for poor conditions. According to Jason Deveau, Application Technology Specialist with Ontario Ministry of Agriculture, Food, and Agribusiness, lowering booms, slowing down, coarser droplets, higher water volumes, and even the use of a humectant can improve the potential for better coverage and reduce the potential of off-target drift. When Delta T is extreme, it may be necessary to halt spraying and wait for better conditions. Using Delta T to make spray decisions will optimize herbicide performance and can help make the best use of the weed control products we have available.

Dig deeper

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Self-study CEU quiz

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1. What is the main purpose of using Delta T in herbicide application?

a. To assess atmospheric conditions affecting spray effectiveness.

b. To measure soil moisture levels for improving crop growth decisions.

c. To determine spray droplet size and adjust nozzle equipment settings.

d. To calculate fertilizer needs based on soil nutrient availability.

2. What two factors are combined to calculate Delta T?

a. Wind speed and pressure.

b. Temperature and humidity.

c. Soil moisture and temperature.

d. Rainfall and evaporation.

3. What happens to spray droplets in low-humidity conditions?

a. They become heavier.

b. They stick better to plants.

c. They increase in size.

d. They evaporate faster.

4. What Delta T range is considered safest for spraying?

a. 0–2°C.

b. 2–8°C.

c. 8–12°C.

d. Above 12°C.

5. What is one recommended adjustment when Delta T is high?

a. Increase spraying speed to cover more area in a shorter time period.

b. Use finer droplets to improve coverage on target weeds and plants.

c. Use coarser droplets and higher water volume to reduce evaporation.

d. Spray only at night regardless of temperature and humidity conditions.

This quiz was drafted with AI assistance and reviewed and edited by the editorial team for accuracy and appropriateness.

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