Issue 1049

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Extension Agronomy

eUpdate

04/17/2025

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Planting cotton in Kansas: Soil temperature and seed quality are key

Cotton can overcome many environmental stresses and produce profitable lint yields when the crop gets off to a good, uniform start. The question becomes, when is the "best" time to plant cotton to ensure good establishment? Cotton production in Kansas is typically thermally limited, with slower warming in soil temperatures and higher surface residue levels than in other cotton-growing areas. Because of our relatively thermally-limited environment, cotton in Kansas must be planted as early as possible to maximize yield potential. However, those extra heat units from early planting are only beneficial if an adequate stand is made. For many reasons, including seedling chilling, potential herbicide injury, thrips damage, and seedling diseases, it pays to plant when growers can get an adequate stand and when the crop will grow vigorously.

Like corn, the goal is to achieve an adequate and uniform stand, both in terms of space between plants as well as plant age. The recommended planting window for cotton in Kansas is relatively narrow compared to other summer crops, roughly May 1 through June 5. However, it is best to make planting decisions based on soil conditions rather than calendar dates. Soil temperature trends can be monitored using the Kansas Mesonet (http://mesonet.k-state.edu/agriculture/soiltemp/). The Mesonet can provide a general idea of soil temperatures and trends across the state. However, producers must monitor conditions at the field level, considering differences in residue, soil moisture, and other factors that can result in warmer or cooler temperatures than those observed at the local Mesonet station. Cotton seed germination and early growth/emergence are favored by soil temperatures above 64°F and adequate, but not excessive, soil moisture. Based on USDA-ARS research work at Lubbock, TX, seedling cotton requires more than 100 hours above 64°F at the seed level to emerge.

Soil Temperatures – Current, Departure from Normal, and Forecast

We often use 60°F at planting depth in Kansas as our baseline temperature. As of April 13, the statewide average 7-day 4-inch soil temperature is 57.3°F or 2.3°F above normal. As is often the case this time of year, there have been large swings in air temperature. Highs in the 90s in southwest Kansas on April 12 were followed by lows in the 20s on the 15th. This has led to daily average soil temperature fluctuations, but the 7-day averages are still running slightly above normal. The 8 to 14-day outlook favors above normal temperatures to close out the month of April. The average date on which the statewide 7-day average soil temperature first reaches and remains over 60°F is May 6, but this threshold should be reached earlier than normal this year, given the warmer-than-normal forecast..

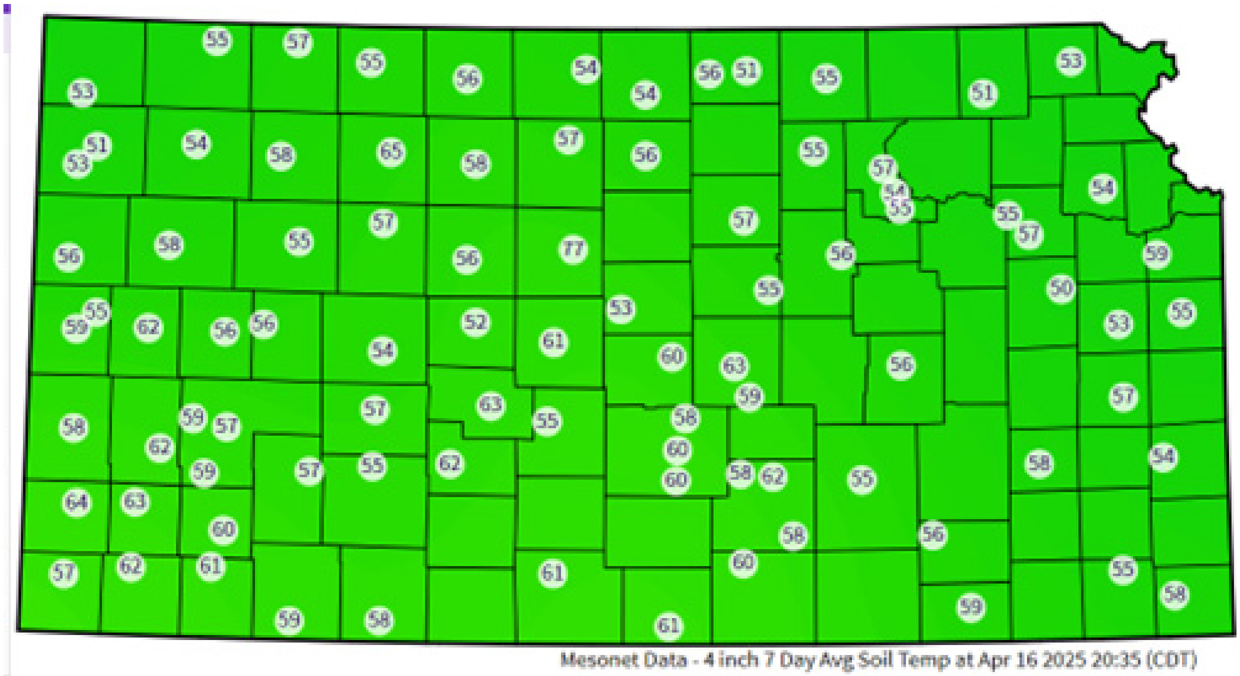

Figure 1. Average 7-day 4-inch soil temperatures (°F) as of April 16, 2025. Data and image courtesy of Kansas Mesonet (mesonet.k-state.edu).

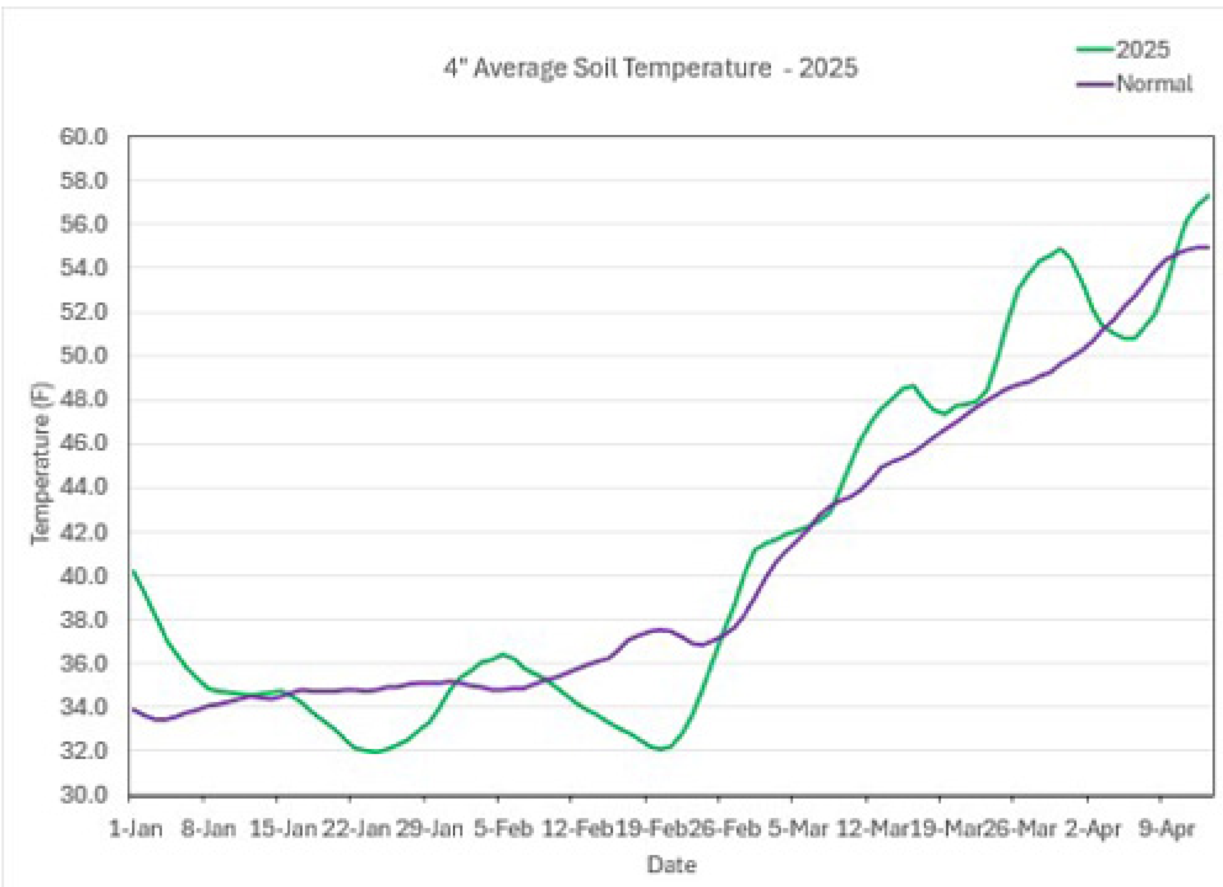

Figure 2. 30-Year average (1991-2020), and 2025 average 4-inch soil temperatures. Average

data plotted are 7-day values. Dates plotted represent the midpoint of the 7-day average period (e.g., plotted data for April 13 are the 7-day averages for the period April 10-16. Graph created by Matthew SIttel, K-State Research and Extension.

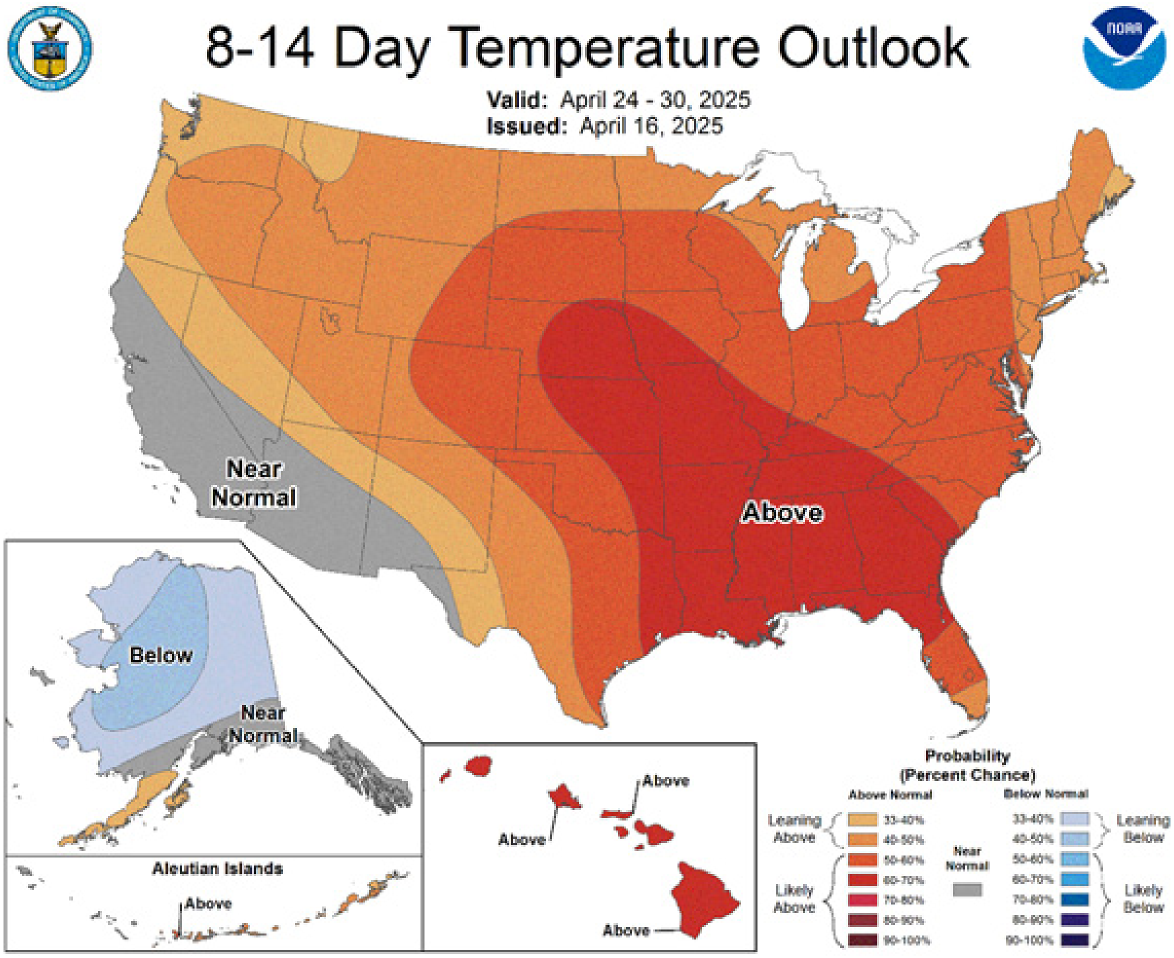

Figure 3. The Climate Prediction Center's 8 to 14-day temperature outlook for the period April 24-30, 2024. Source: NOAA Climate Prediction Center.

Information from North Carolina State University's cotton web page illustrating the importance of heat unit accumulation immediately following planting is shown in Table 1.

Table 1. Relationship between predicted DD-60s and Planting Conditions (Source: North Carolina State University, https://cotton.ces.ncsu.edu/)

Predicted DD-60 accumulation for five days following planting	**Planting conditions**
10 or less	Very Poor
11 – 15	Marginal
16 – 25	Adequate
26 – 35	Good
36 – 49	Very Good
50	Excellent

Avoid planting cotton if the low temperature is predicted to be below 50°F for either of the two nights following planting or predicted daily DD-60s is near zero for the day of planting.

Effects of cold soil on cotton seeds

Cotton seed exposed to cold for the first 2-3 days after planting, OR when the seed is absorbing moisture from the soil, is susceptible to chilling injury. The greatest sensitivity is during the first day after planting when the seed is taking up water, as shown in Figure 4. In the first 30 minutes after planting, the seed will absorb up to 60% of the water necessary for germination.

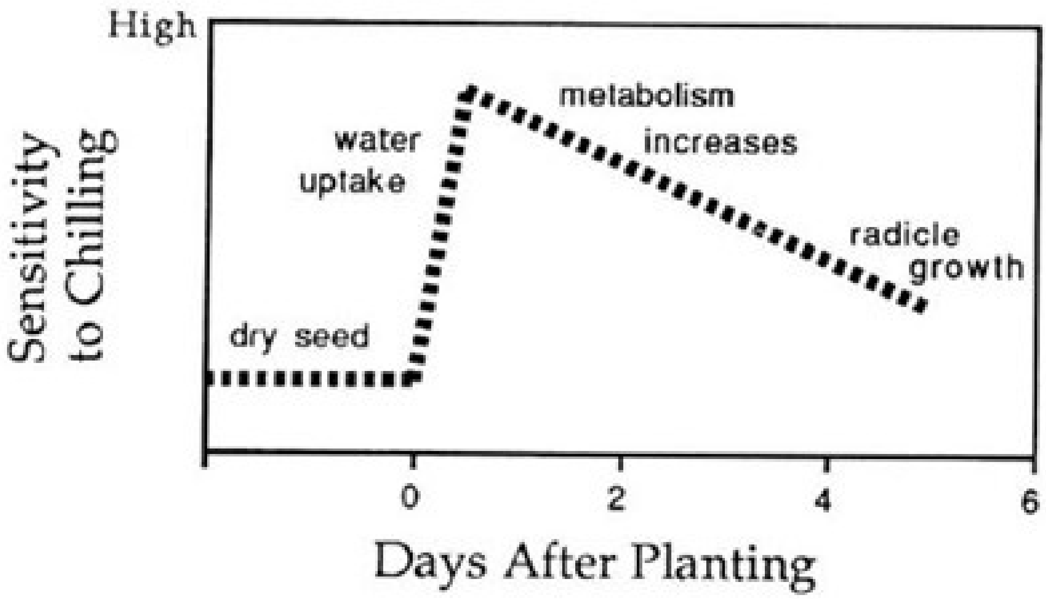

Figure 4. Relative sensitivity of cotton to chilling in the first several days after planting. K. Hake, W. McCarty, N. Hopper, and G. Jividen.

Seedlings may suffer damage if soil temperatures drop below 50°F during this critical germination period. Damage may result in malformed seedlings, loss of or damage to the taproot, and a greater likelihood of seedling disease problems. Injury usually kills the root tip, stopping normal taproot growth and leading to lateral root development (Figure 5). If the plants survive, the root system will not develop normally. Very cold soil temperatures (<45°F) will likely lead to seedling death.

Figure 5. Seedlings in A and B were exposed to the same temperature (86°F) with the exception of the first six hours of imbibition in which seedlings in A were exposed to chilling temperatures of 40°F. Photos by N. Hopper, Texas Tech University and J. Burke, USDA-ARS, Lubbock, TX.

Seed Quality – Warm and Cold Germination Scores

In addition to adequate soil temperature, it is imperative that producers in Kansas plant cotton seed with exceptional seed quality and understand both their warm and cold germination scores on their seed lots. Warm germination scores are standardized across the industry and are legally required on seed tags. Cold germination tests are not required by law but are available from reputable seed companies. Be cautioned that cold germination test procedures are not necessarily uniform across companies. Be sure to ask and understand what methodology was used before comparing cold germination scores across companies.

Generally, the cold germination test for cotton should be conducted at 64.4 degrees, with that temperature held constant for seven days. To be counted as germinated, the seed must sprout, and the radicles of the sprouted seed must reach at least 4 cm in length. However, the results for the cold germination test are not nearly as repeatable as those of the warm test, which is the primary reason why there is no legal standard such as for warm germination. Producers should plan to plant cotton seeds with the highest cold germination scores first. Cold scores greater than 85% are generally preferred for early planting. Some companies may be able to provide the Cool-Warm Vigor Index score for their seed. This test, developed in Texas, gives a score that is the combined percentage of the 4-day warm germination test and the cool germination test. Scores <120 = Poor, 120 to 139 = Fair, 140 to 159 = Good, >160 = Excellent. Producers should first plant seeds with the highest scores and move to lower-scoring seed lots as soil temperatures increase.

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2. Integrating spray drones into herbicide applications

Controlling tough weeds remains a challenge for Kansas growers, and chemical weed control remains the top strategy for their management in the state. Herbicides can be applied to crop fields using large row-crop sprayers, small hand-held or mounted sprayers, airplanes, or spray drones (Figure 1). The choice of application equipment depends on factors such as field size, field landscape, crop type, weed pressure, and socio-economic aspects. Among these methods, spray drone technology is gaining in popularity for herbicide applications. According to the American Spray Drone Association, in 2024, more than 10.3 million acres were treated with spray drones nationwide in more than 50 crops, providing $215 million in revenue for rural businesses.

Figure 1. Spray drone with white propellers made out of nylon carbon fiber filament and equipped with a dual atomizing spraying system (spray tank, centrifugal sprinklers, and magnetic drive impeller pumps), phased array radar system, and binocular vision system. Photo by Jeremie Kouame, Kansas State Research Extension

Characteristics of spray drones

Most commercial spray drones are the multi-rotor type. Current spray drone tank capacities typically range from around 2.5 gallons to 8 gallons and even up to 18 gallons, with some models offering larger capacities. The efficiency of the spray drone and the area it can cover are affected by several factors, including carrier volume (with 2 gallons per acre (GPA) commonly used), tank capacity, refill time, flight time and speed, spray swath width, nozzle type, nozzle number, flow rate, battery life and charging time. The application rate in row crops is usually between 1.5 to 2 GPA. The current flight time of many spray drones is about 7-10 minutes per battery. With its 18-gallon capacity and up to 30-foot swath width, the AG-272, manufactured in Texas by Hylio, is claimed to be able to cover up to 50 acres/hour at 2 GPA. Spray drones are equipped with multiple collision avoidance sensors and wireless remote controllers. Current models of drones have terrain sensors that maintain the optimum flight height to spray uneven and hilly terrain, automatically navigate hills and slopes, and avoid obstacles (Figure 2).

Figure 2. Rear phased array radar system for terrain follow. Photo by Jeremie Kouame, Kansas State Research and Extension.

Dual atomizing system

The newest design for discharging spray from drones uses rotary disc atomizers positioned under large propellers (Figure 3). The atomizer design and flow rate determine the droplet size and eliminates nozzle changes, pressure problems, and clogging. Moreover, rotating-disc-atomizer drones don't have the clogging issues that hydraulic-nozzle drones have.

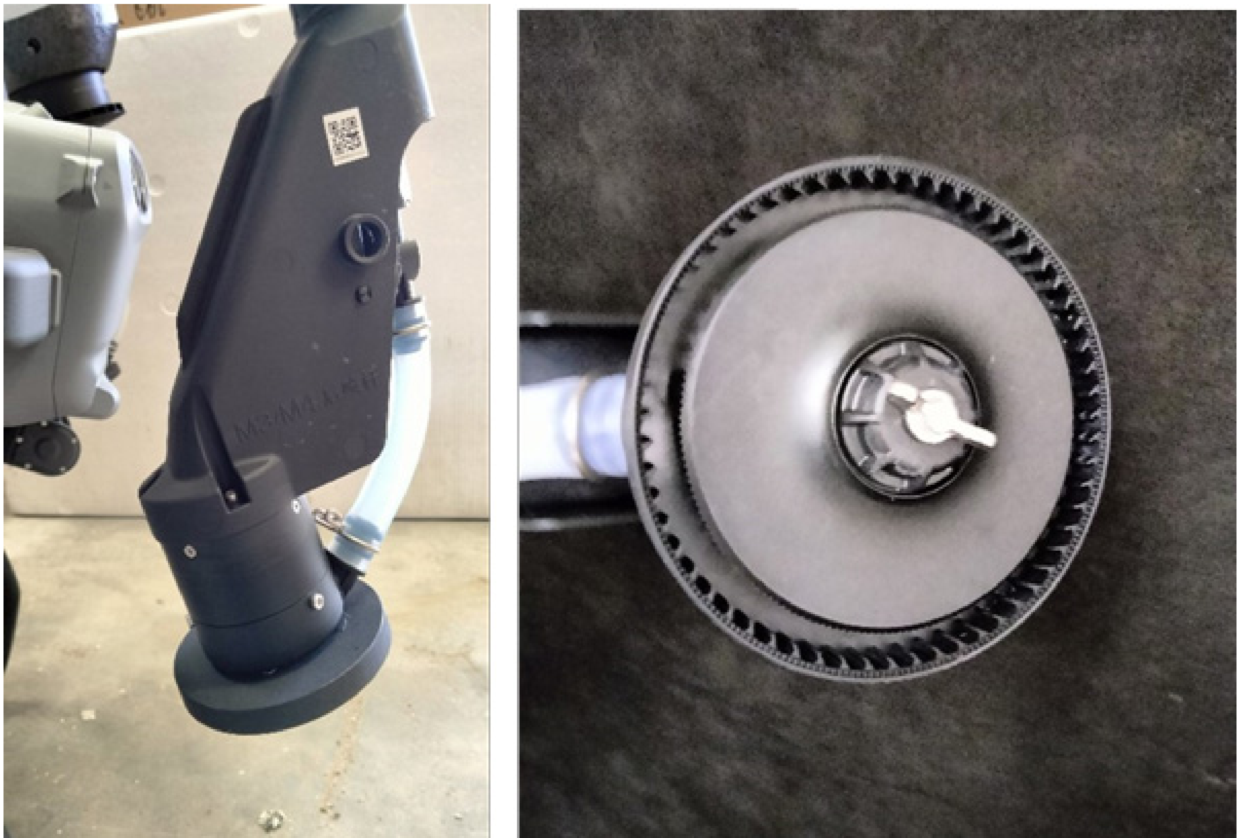

Figure 3. Spray lance and centrifugal sprinkler for a spray drone using a dual-atomizing spraying system. Photos by Jeremie Kouame, Kansas State Research and Extension.

Factors affecting herbicide deposition

Spray drones' propeller downwash affects spray distribution. The turbulence created by the drones' propellers improves droplet penetration into the canopy compared to traditional ground sprayers that are not air-assisted, which could probably improve the effectiveness of contact herbicides. However, downwash can be a factor that increases spray particles drift under conditions such as finer droplet sizes and increased flight heights and speeds. A study evaluating drift risk and nozzle types reported 81 to 95% higher spray drift risk for hollow cone nozzles than air-induction nozzles. Also, previous research suggested that extra-coarse nozzle could reduce downwind and airborne deposition compared to medium and fine nozzles.

Recommended uses for spray drones

Ditches, field borders, and roadsides. Weeds in ditches and along roadsides cause serious concern because of potential seed introduction into adjacent crop fields. Weeds in field margins, roadsides, and ditch banks can serve as a source for introducing and moving new weed species, including herbicide-resistant weeds. A best management practice is to prevent an influx of weeds by managing field borders. Spray drones can be used to control weeds in ditches and roadsides more efficiently than other weed control methods.

Site-specific management. Weed scientists have long recommended site-specific management strategies for reducing weed control costs. As weeds grow in patches in the fields, site-specific management can help target only field areas where weeds have escaped preemergence herbicide programs instead of a broadcast application, offering an opportunity to reduce the cost of postemergence herbicide programs. With the creation of high-resolution prescription maps, cost-effective postemergence herbicide applications can be achieved with spray drones. These targeted spraying maps can be created using drone imagery data from field scouting and some software programs such as PIX4Dfields.

Difficult soil conditions. When soil conditions are too wet due to the presence of standing water or present topographic limitations, such as too steep slopes or challenging terrains, making the use of other ground-based or other conventional methods of spraying challenging or not feasible, spray drones can become a good alternative. Some of the benefits of spray drones are that they allow a timely application of herbicides and can be used on fields with hills and terraces. Moreover, since spray drones do not come in contact with the soil, they do not create soil compaction issues that can impact water infiltration and crop root growth.

Harvest aids applications. Harvest aids can be important for efficient harvesting of certain crops. However, applying harvest aids with ground-based field sprayers can be very challenging as their wheels can roll over plants, break branches/tillers, and reduce yield. Spray drones can be safely used for harvest aid application without disturbing the crop. Previous research found harvest-aid performance sensitive to spray volume, with optimal defoliation efficacy attained with a 2.41 GPA and 8.95 mph flight speed.

Drones can be time-saving and labor-efficient

Due to the availability of GPS and LiDAR-based technology, drones nowadays can be programmed to fly over the field automatically without much human intervention. Such drone automation can rapidly spray herbicides throughout the field in a short period of time. Moreover, the drone's flight speed and height can be adjusted based on specific field needs. A single operator can efficiently manage the entire spraying operation, which is especially beneficial during peak seasons when labor availability is limited.

Despite the number of benefits and increasing popularity, such as site-specific weed management, less labor intensive, timesaving, and accessibility to hard-to-reach areas, drone applications still face challenges, such as limited payload capacity, battery life constraints, not suitable for larger areas and regulatory hurdles related to herbicide labeling and aerial application laws. Their adoption might increase as the technology improves, payload capacity keeps rising, and efficiency keeps improving.

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3. Alfalfa weevil activity continues in Kansas - Scouting advised

Alfalfa weevils have been active throughout Kansas for about 3-4 weeks. Alfalfa weevils are usually the first pest causing serious damage in the spring. However, every year is different as to when this damage starts based upon the temperatures in the fall and winter when the eggs are actually deposited and start developing. Eggs may be deposited and continue to develop anytime temperatures are over about 45°F. Thus, eggs may continue to hatch in the spring for 4-6 more weeks, depending upon when they were deposited in the stems. Larvae then feed anytime the temperature is between 40-80 °F, slowing down below or above those temperatures. But it takes temperatures in the lower 20°F range for a couple of hours to actually kill alfalfa weevil larvae.

Pictured here is a 10-day-old larva (about ¾ grown) plus a couple about 3 days old, and a very small one that just hatched, with the characteristic leaf feeding (Figure 1). Alfalfa weevil monitoring should continue until the first cutting.

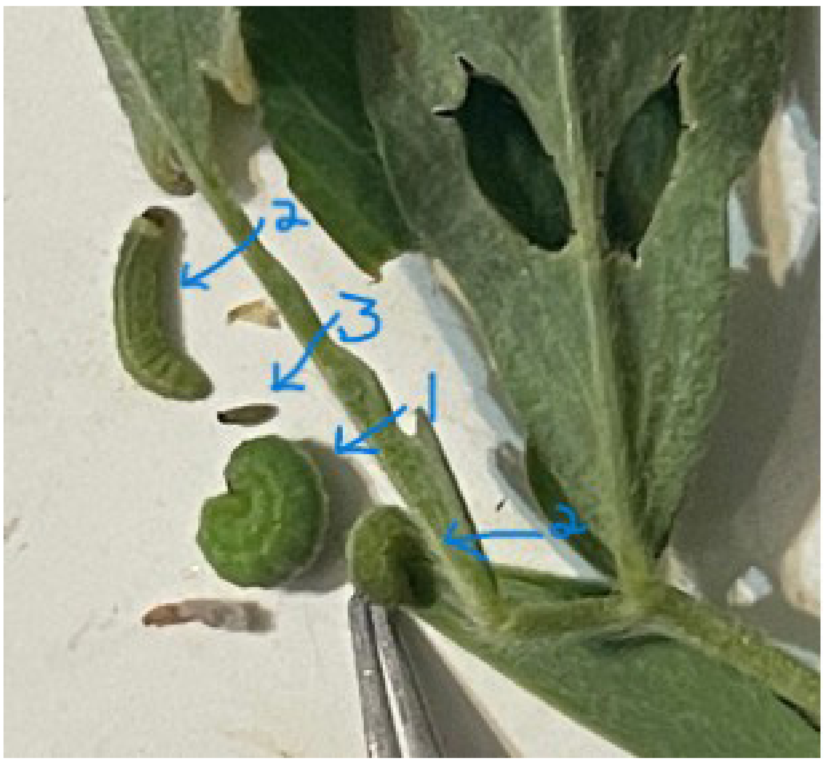

Figure 1. 10-day-old alfalfa weevil larva (1); two 3-day-old larvae (2); and a larva that just hatched (3). Photo by Department of Entomology, K-State Research and Extension.

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4. Updated insect pest management guides now available from K-State

Several K-State Research and Extension publications related to insect management in Kansas were recently updated and are available to the public.

These publications were prepared to help producers manage insect populations using the best available methods proven practical under Kansas conditions. They are revised annually and intended for use during the current calendar year. The user should know that pesticide label directions and restrictions are subject to change, and some may have changed since the publication date.

Full versions of each fact sheet are available online, with links provided below.

Alfalfa Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF809.pdf

Corn Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF810.pdf

Cotton Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF2674.pdf

Sorghum Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF742.pdf

Soybean Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF743.pdf

Sunflower Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF814.pdf

Wheat Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF745.pdf

The economics of control should be considered in any pest management decision. Because costs vary significantly over time and are influenced by factors beyond the scope of this publication, product cost is not a consideration for including or omitting specific insecticide products in these recommendations. Growers should compare product price, safety, and availability when making treatment decisions. Growers also need to consider the impacts of insecticides on non-target organisms like pollinators and natural enemies. Rotating insecticide groups can help combat insecticide resistance issues by leveraging different modes of action.

The user bears ultimate responsibility for correct pesticide use. For proper use, always read the label directions carefully before applying pesticides. Remember that illegal contamination of the treated crop or commodity can occur if pesticides are misused. K-State entomologists assume no responsibility for product performance, personal injury, property damage, or other types of loss resulting from the purchase, handling, or use of the pesticides listed.

More information on pests covered in these publications is available at:

www.entomology.k-state.edu/extension/insect-information/crop-pests/

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5. Southwest Kansas Spring Field Day focused on wheat, canola, and forages - May 19

K-State's Southwest Research-Extension Center invites producers, allied industry representatives, and anyone interested in agriculture to attend this year's Spring Field Day, which will be held on May 19, 2025, at 4500 E. Mary Street in Garden City.

Registration will begin at 3:30 p.m.; the program and tour of wheat, canola, and annual forage variety plots will start at 4:00 p.m., followed by a meal sponsored by industry partners. See the full schedule below.

Logan Simon, K-State southwest area agronomist; Mike Stamm, K-State agronomist and canola breeder; and John Holman, K-State cropping systems agronomist, will discuss the annual forages, canola, and wheat variety plots and how they have performed under this year's challenging growing conditions.

"This field day is an opportunity to share our story—what we are researching, why, and what that means for growers in western Kansas and beyond," said K-State Southwest Area Agronomist Logan Simon.

"There's strong interest among growers in pinpointing drought-tolerant varieties and forages that suit our region's cropping systems, and we're committed to addressing those demands, delivering evidence-based performance results to farmers so they can make the best decision for their operation."

Field days are an opportunity for growers to talk with researchers and Extension specialists about what they've observed in the field and take-home actionable insights for their operations.

Schedule for the 2025 SWREC Spring Field Day

3:30 PM	Registration and Check-in
4:00 PM	Dryland wheat varieties
5:15 PM	Irrigated canola varieties
5:45 PM	Irrigated forage varieties

Thanks to sponsorship by our industry partners, a meal will be provided at the SWREC headquarters following the last tour.

To RSVP for the 2025 Spring Field Day and catered meal, please call the SWREC office at 620-276-8286 or email lsimon@k-state.edu.


SWREC-GARDEN CITY
SPRING FIELD DAY
MAY 19, 2025
4:00 PM CT
4500 E Mary St, Garden
City, KS 67846
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