Issue 863

K-STATE Research and Extension

Extension Agronomy

eUpdate

07/08/2021

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.

Subscribe to the eUpdate mailing list: https://listserv.ksu.edu/cgi-bin?SUBED1=EUPDATE&A=1

eUpdate Table of Contents | 07/08/2021 | Issue 863

1. Identifying nutrient deficiency symptoms in soybeans

This time of year, soybeans may begin showing signs of chlorosis or other leaf discoloration in all or parts of the field. There may be many causes of discoloration. Nutrient deficiencies are one possibility.

General considerations

The relative mobility of the nutrient within the plant will determine if the deficiency symptom will first be noticeable on the lower leaves or upper leaves.

Mobile Nutrients: These nutrients can be transferred from older tissues to the youngest tissues within the plant. Deficiency symptoms are first noticeable on the lower, oldest leaves.

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Magnesium (Mg)

Immobile Nutrients: These nutrients are not easily transferred within the plant. Therefore, symptoms occur first on the upper, youngest leaves.

- Boron (B)
- Calcium (Ca)
- Copper (Cu)
- Iron (Fe)
- Manganese (Mn)
- Molybdenum (Mo)
- Sulfur (S)
- Zinc (Zn)

Possible causes of nutrient deficiencies:

1. Low soil levels of the nutrient
2. Poor inoculation (in the case of N deficiency)
3. Unusually low or high soil pH levels depending on the nutrient in question
4. Roots are unable to access sufficient amounts of the nutrients - due to poor growing conditions, excessively wet or dry soils, cold weather, or soil compaction
5. Root injury due to mechanical, insect, disease, or herbicide injury
6. Genetics of the plant

The following is a brief description of the symptoms of some of the most common nutrient deficiencies in soybeans.

Nutrient deficiency symptoms

Nitrogen. Chlorotic or pale green plants starting with the lower leaf (Figure 1a). Within the plant, any

available nitrogen (N) from the soil or from nitrogen fixation within nodules on the roots goes to the new growth first. Soybeans prefer to take up N from the soil solution as much as possible, since this requires less energy than the nitrogen fixation process. However, both sources of N are important for soybeans since they are a big user of N. Nitrogen deficiency can be associated with poor nodulation (Figure 1b).

Figure 1a. Soybean field showing signs of chlorosis. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Figure 1b. Lack of nodulation on far right soybean plants. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Iron. Iron chlorosis, occurs in calcareous soils (contains calcium carbonates) with high soil pH. The classic symptom is chlorosis (yellowing) between the veins of young leaves since iron is not mobile within the plant (Figures 2 and 3). A side effect of iron deficiency can be N deficiency, since iron is necessary for nodule formation and function. If iron is deficient, N fixation rates may be reduced. Iron deficiency occurs on calcareous soils, in addition to high pH, plant stress can favor the development of iron chlorosis, and therefore the severity can vary significantly from year to year in the same field.

Figure 2. Iron chlorosis in soybeans; the upper leaves become chlorotic. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Figure 3. Close-up of iron chlorosis in soybeans. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Magnesium. Lower leaves will be pale green, with yellow mottling between the veins. At later stages, leaves may appear to be speckled bronze. This deficiency may occur on very sandy soils.

Manganese. Stunted plants with interveinal chlorosis (Figure 4). Can be a problem in soils with high pH (>7.0), or on soils that are sandy or with a high organic matter content (>6.0% OM). Manganese activates enzymes which are important in photosynthesis, as well as nitrogen metabolism and synthesis. Symptoms are hard to distinguish from iron chlorosis.

Figure 4. Manganese deficiency symptoms are similar to symptoms of iron chlorosis in soybeans. Photo by Jim Camberato, Purdue University.

Phosphorus. Phosphorus deficiency may cause stunted growth, dark green coloration of the leaves, necrotic spots on the leaves, a purple color to the leaves, and leaf cupping. These symptoms occur first on older leaves. Phosphorus deficiency can also delay blooming and maturity. This deficiency may be noticeable when soils are cool and wet, due to decrease in phosphorus uptake.

Potassium. Soybean typically requires large amounts of potassium. Like phosphorus deficiency, potassium deficiency occurs first on older leaves. Symptoms are chlorosis at the leaf margins and between the veins (Figure 5). In severe cases, all but the very youngest leaves may show symptoms.

Figure 5. Potassium deficiency: chlorosis of the lower leaves. Photo by Dave Mengel, K-State Research and Extension.

Sulfur. Stunted plants, pale green color, similar to nitrogen deficiency except chlorosis may be more apparent on upper leaves. Plant-available sulfur is released from organic matter. Deficiency is most likely during cool wet conditions or on sandy soils with low organic matter content.

For more information, see K-State Research and Extension publication MF-3028, *Diagnosing Nutrient Deficiencies in the Field* at: http://www.ksre.ksu.edu/bookstore/pubs/MF3028.pdf

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

Dave Mengel, Professor Emeritus, Soil Fertility

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

2. Plugging water wells: Guidelines for landowners and cost-share information

Water wells are an extremely important resource for any landowner, but there are some abandoned wells that exist that can pose a hazard to people, animals, and groundwater. An abandoned water well is a well that has been taken out of use, a well that is in such a state of disrepair that using it for any purpose is impractical, or a well that is a physical hazard or threatens to contaminate aquifers.

According to Kansas law K.A.R. 28-30-7, all abandoned water wells are required to be plugged. A landowner is allowed to do this themselves, or they may hire a Kansas licensed water well contractor to do so. There are both hand-dug wells and cased wells that may need to be abandoned, and they have slightly different methods for plugging.

The general steps for plugging are:

Step 1: Prepare site by removing all pumping equipment and any debris.

Step 2: Remove the top of the casing and cut off 3 feet below the surface.

Step 3: Disinfect water by adding chlorine, see Table 1 of the K-State Extension publication for the amount needed: MF935 Plugging Abandoned Wells--Water Quality Series

Step 4: Fill the water zone with porous material, meaning sand or gravel less than 1 inch in size. Refer to the plugging diagrams for examples (Figures 1 & 2).

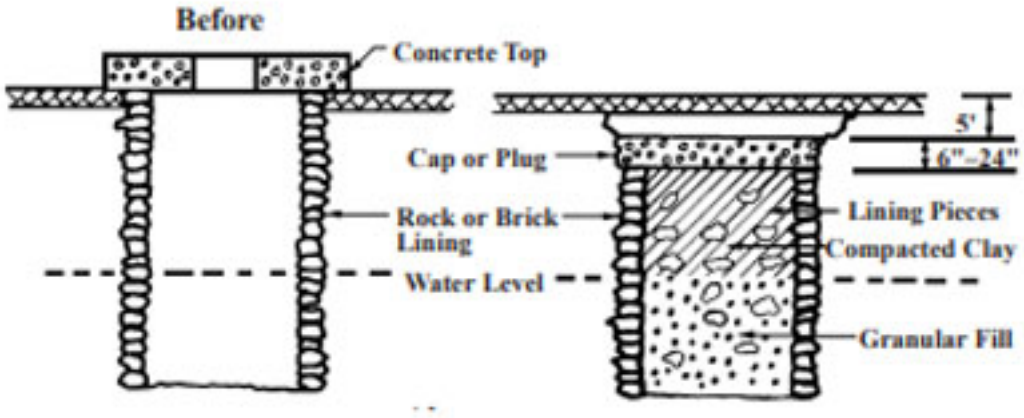

Figure 1. Plugging diagram for a hand-dug well, before and after plugging.

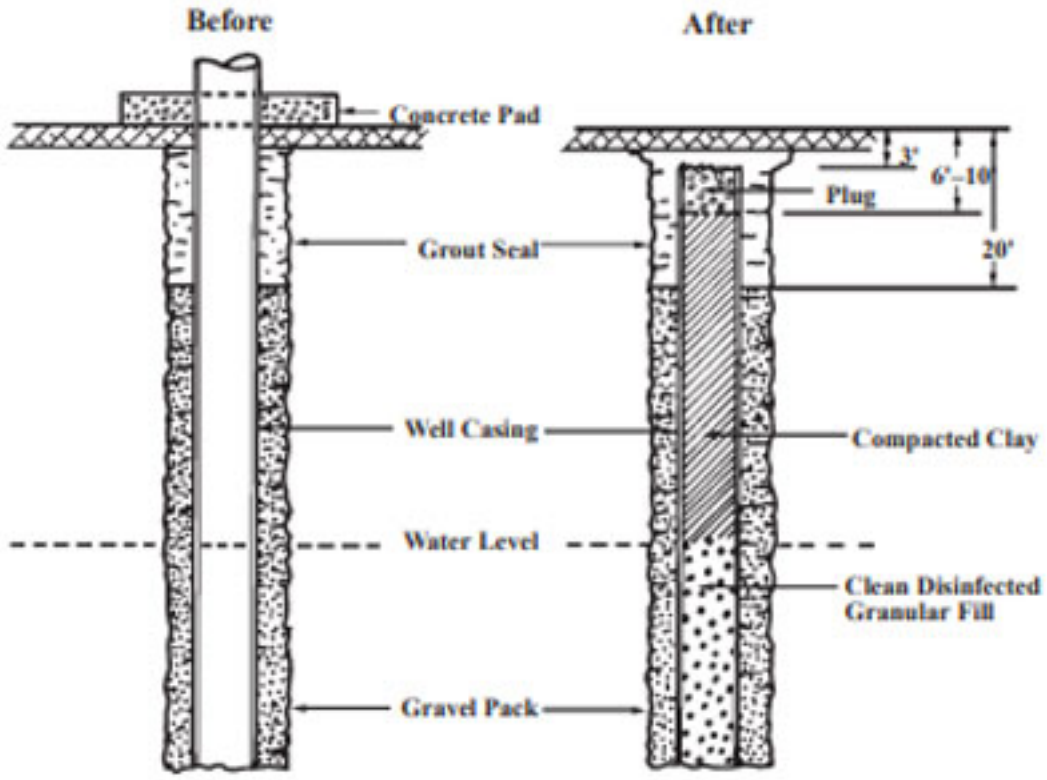

Figure 2. Plugging diagram for a drilled well, before and after plugging.

Step 5: Add compacted clay above the water zone. Stop when you are five feet below the ground level.

Step 6: Add a grout plug. This can be bentonite clay, cement grout, or neat cement. See the K-State Extension publication for grout recipes, and to estimate how much is needed for your specific well size. MF935 Plugging Abandoned Wells--Water Quality Series. The thickness of the grout plug should be about 6 inches for most wells.

Step 7: Fill in the rest of the hole to the surface using compacted subsoil, and then use topsoil for the very surface. This will settle over time, so mounding the soil up about 10" should be about right.

Step 8: Fill out a plugging record form WWC-5P and submit to the Kansas Department of Health and Environment's Bureau of Water-Geology Section. This form is available at: https://www.kdheks.gov/waterwell/

For more information:

MF935 Plugging Abandoned Wells--Water Quality Series

Bureau of Water, Geology Section, Water Well Program

Cost-share assistance

Cost-share assistance is available to landowners to plug abandon wells in most Kansas counties through their local county conservation district. Landowners should contact their local conservation district for county specific details on landowner cost share limits. According to the Kansas Department of Agriculture-Division of Conservation general policy guidelines for well decommissioning (code 351), a landowner is eligible to receive a maximum cost-share assistance of $1,000 per well and may plug multiple wells.

A few important details when receiving cost-share assistance:

1. The personnel eligible to plug abandoned wells are either licensed well drillers or the well owner. An exception is on irrigation wells where a licensed well driller must plug the well.
2. Gas and oil wells are not eligible for cost-share.
3. The Kansas Department of Health and Environment (KDHE) form WWC-5P (Plugging Certification) shall be completed for each well. The original WWC-5P form shall be sent to the Kansas Department of Health & Environment (KDHE), one copy shall be kept in the landowner file, and one copy shall be sent to the water well owner.

DeAnn Presley, Soil Management Specialist
deann@ksu.edu

Peter Tomlinson, Environmental Quality Specialist
ptomlin@ksu.edu

3. First report of southern rust in Kansas for 2021

Southern rust has been detected in southeast Kansas (Figure 1). Unlike some other corn diseases, such as gray leaf spot, southern rust does not survive in Kansas during winter months and blows in annually from more tropical regions. The earlier it arrives, the higher the risk to the Kansas corn crop.

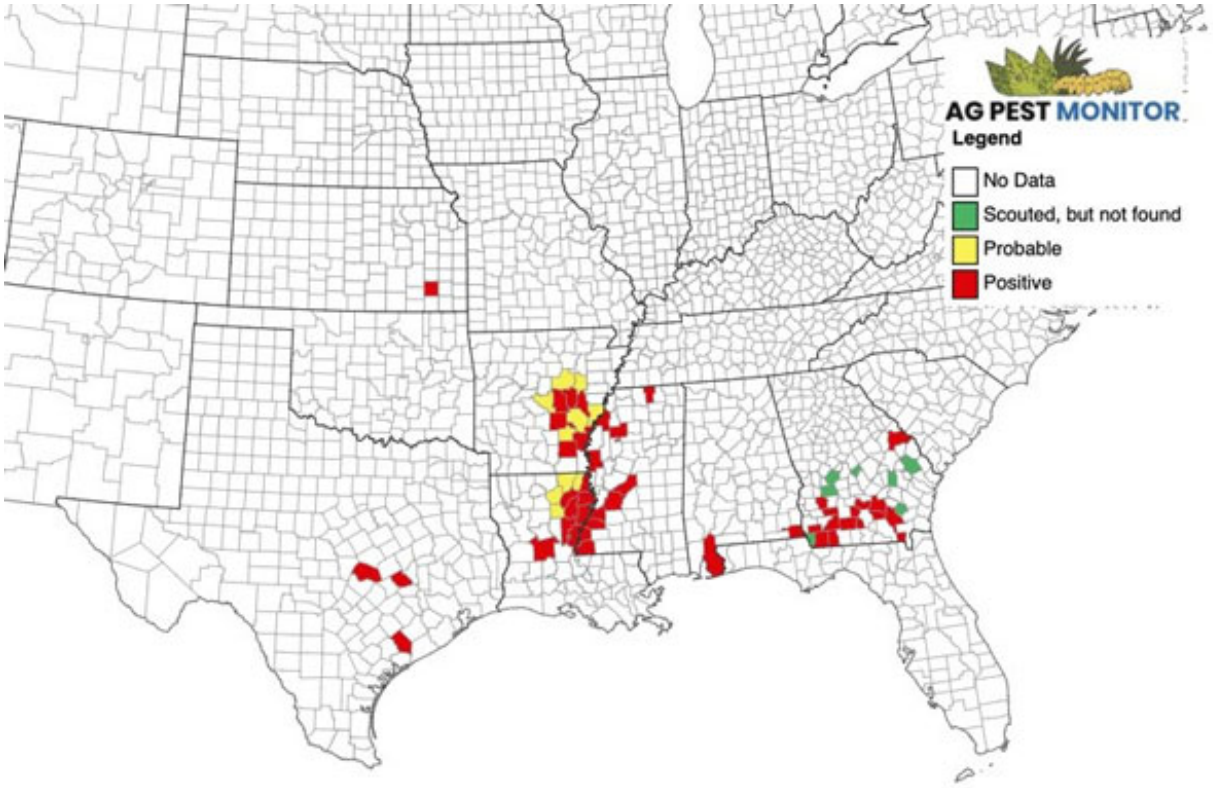

Figure 1. Southern corn rust (Puccinia polyspora**) in Kansas and surrounding states as of July 7, 2021. Source: https://corn.ipmpipe.org/southerncornrust/.**

It is not recommended to apply a fungicide to control southern rust unless the disease has been observed in the canopy. Now that southern rust has been reported in southeast Kansas, it is time to be actively scouting. Once pustules are observed, the pathogen can reproduce rapidly if temperatures and humidity are high.

When deciding to spray for southern rust is important to consider hybrid susceptibility, disease incidence (how many plants are affected), and the growth stage of the crop. Infection early in the season on a susceptible hybrid, coupled with conducive weather conditions, pose the highest risk for yield loss.

Research has suggested that applications between VT to R3 have great potential for protecting corn yield, however if fungicide is applied between VT and R1 a second spray may be required to protect end of season yields. Most fungicides that are labeled for southern rust are also effective for gray leaf spot and will have residual activity for approximately three weeks after application, depending on the product. Application at dent (R5) are unlikely to provide yield benefit and the pre-harvest interval should be carefully observed. Fields that have not yet been sprayed should be monitored for disease development.

Efficacy ratings for corn fungicide management of southern rust have been compiled by a working group of corn researchers and can be found here: https://cropprotectionnetwork.org/resources/publications/fungicide-efficacy-for-control-of-corn-diseases

Southern rust produces characteristic orange pustules filed with spores, primarily on the upper side of the leaf (Figure 2). If you run your finger across the pustules, the orange spores will be visible on your hand. The Kansas State Plant Diagnostic Lab (clinic@ksu.edu) can also confirm southern rust by observing spores under the microscope. Additional information about sending in a sample can be found here: https://www.plantpath.k-state.edu/extension/diagnostic-lab/.

Figure 2. Southern rust on corn. Photo courtesy of University of Nebraska: https://cropwatch.unl.edu/plantdisease/corn/southern-rust

For more information on identifying corn rusts, see K-State Research and Extension Bulletin MF3016, Corn Rust Identification and Management in Kansas.

Additional information on important considerations for identification of various corn leaf diseases was published in a recent eUpdate article, "Fungicide considerations for corn diseases: Scouting is key".

Rodrigo Borba Onofre, Postdoctoral Research & Plant Pathology Extension Fellow
onofre@ksu.edu

4. Use the Mesonet Animal Comfort Tool to monitor livestock conditions this summer

The winter of 2020-2021 was not as harsh as some winters, but there were still conditions that resulted in negative impacts on cattle, particularly calves. One indication of the winter weather impacts was the number of requests for Mesonet data to document losses under the Livestock Indemnity Program. Aside from winter stress, monitoring summer stress is also important to ensure healthy livestock.

While cold and wet conditions are often the focus in the winter months, the summer stresses are focused more on temperature, humidity and solar impacts. Obviously these take additional proactive steps to reduce potential exposure than the cold impacts. Actual animal response to temperature stress will be dependent on a number of factors not accounted for in the index. Those include, but are not limited to: age, hair coat (winter vs summer; wet vs dry), health, body condition, micro-environment, and acclimatization. However, despite some of these unknowns, producers can evaluate the environmental conditions to livestock using the Kansas Mesonet Animal Comfort tool.

Users can access this tool from either the main Mesonet page by selecting from the drop down menu, Agriculture, and then Comfort Index (Figure 1); or directly from this link: http://mesonet.k-state.edu/agriculture/animal/

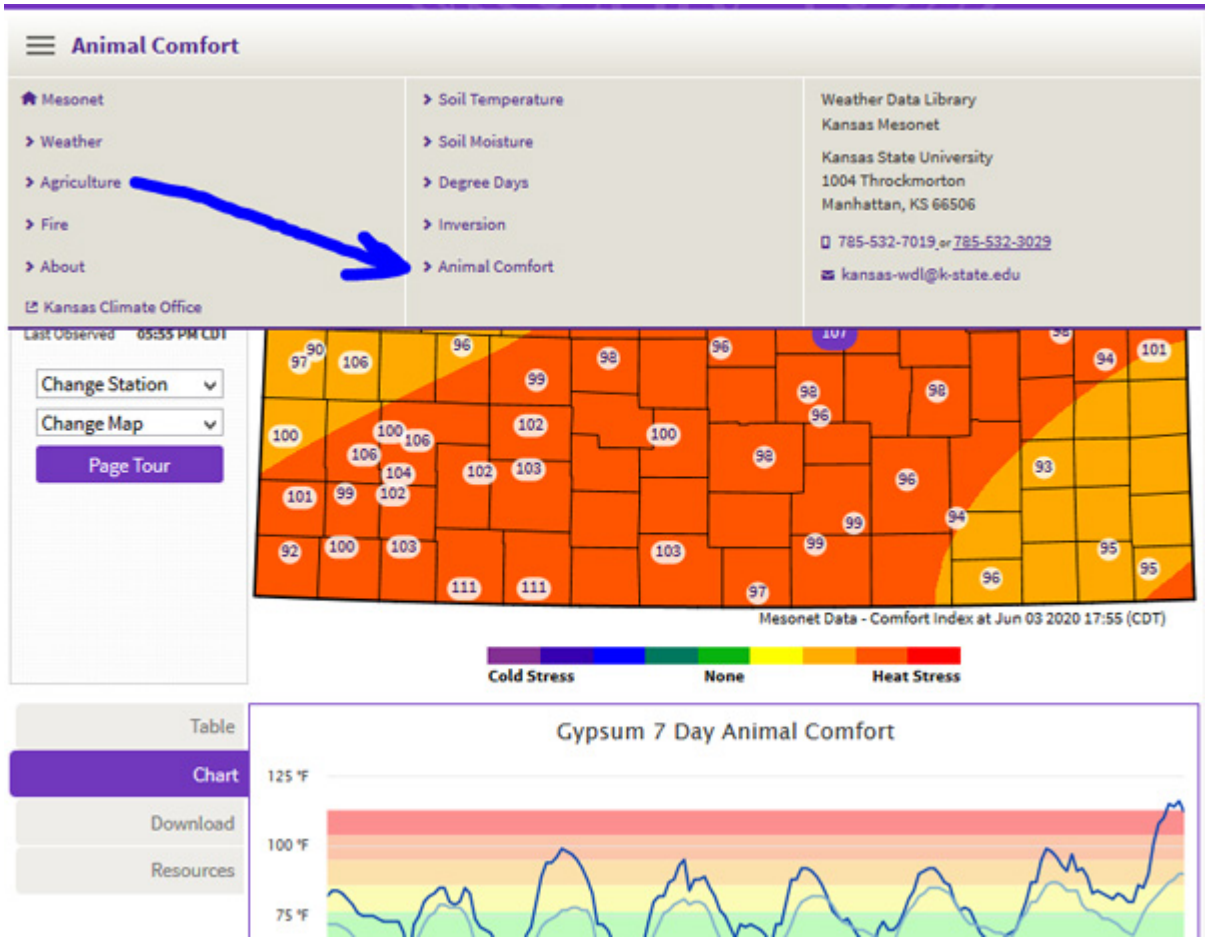

Figure 1. Screenshot of the menu path to the Animal Comfort Index page on the Kansas

Mesonet.

Understanding the Comfort Index

Building on the Comprehensive Comfort Index produced at University of Nebraska, this tool illustrates the impact of both extremes of hot and cold. The index is unique in that it includes, in addition to air temperature and relative humidity, effects of wind speed and solar radiation. Development and validation of the index used data from beef and dairy cattle. The map indicates where current conditions fit on the scale.

Using the "Resources" tab on the webpage, users can learn more about the index, scale and resulting potential impact (Figure 2). This also describes the colors used on the map and chart. In addition, users can examine the Nebraska publication if they would like to review the actual calculations.

Heat and cold stress level categories for the cattle comfort advisor:

Comfort level	Map indicator	Index Value, °F	General Interpretation
Heat Danger		> 105	Animal deaths may exceed 5%
Heat Caution		> 95 to 105	Decreased production, 20% or more Reduced conception , as low as 0%
Heat Caution		> 85 to 95	Decreased production, 20% or more Reduced conception , as low as 0%
Comfortable		77 to 85	
Comfortable		32 to 77	
Comfortable		15 to 32	
Cold Caution		< 15 to -20	18 to 36% increase in dry matter intake
Cold Danger		< -20 to -40	
Cold Danger		< -40	

Figure 2. Cattle comfort ranges. Graphic from Kansas Mesonet.

Tracking conditions

A particularly useful resource is the 7-day graph found under the "Chart" tab. This allows producers to monitor how conditions have fluctuated over the past week (Figure 3). Daily peaks can be expected each afternoon when temperatures are the warmest with peak solar radiation. Values then fall during the, usually cooler, overnight. Since stress impacts can be cumulative, having this feature allows producers to evaluate management requirements. This is especially a concern during warm overnights when values don't drop below higher stress levels.

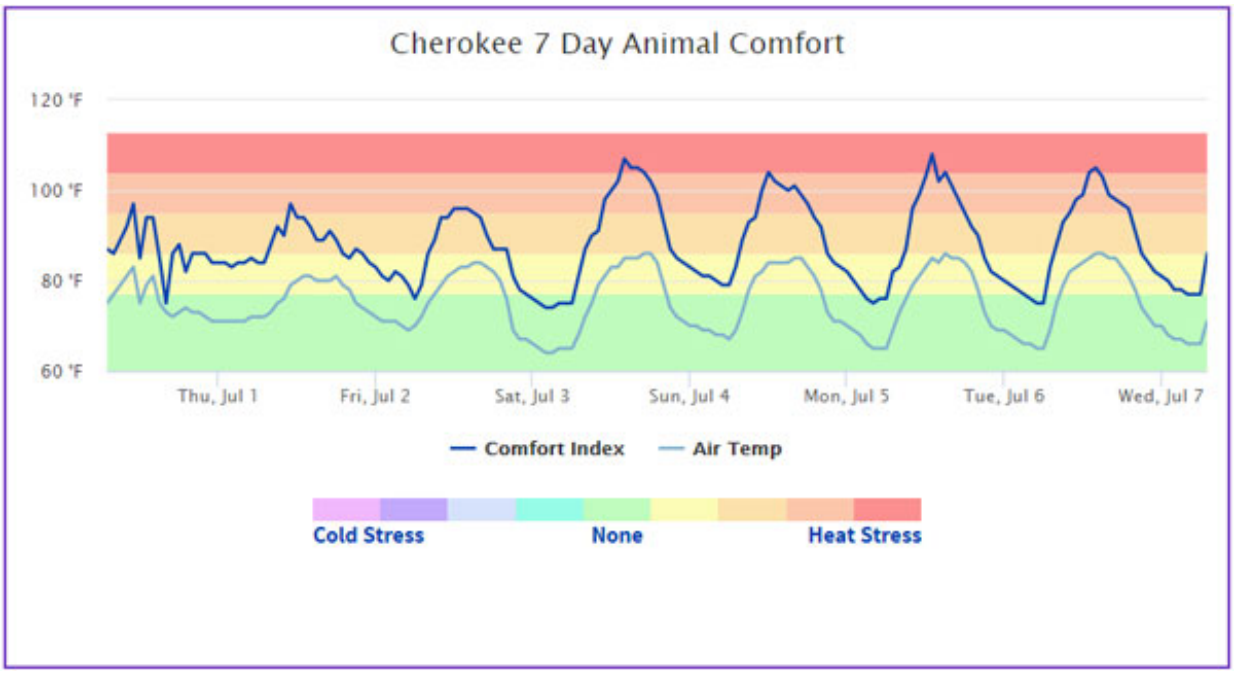

Figure 3. Animal Comfort index history at Cherokee County Mesonet station, near Columbus, KS. Graphic from Kansas Mesonet.

Figure 4. Cattle on a pasture near the Woodson Mesonet station. Photo by Chip Redmond, K-State Research and Extension.

Christopher "Chip" Redmond, Kansas Mesonet Manager

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

christopherredmond@ksu.edu

Mary Knapp, Weather Data Library
mknapp@ksu.edu

5. Maximizing the value of harvested forages: Considerations on proper storage of round bales

Harvesting forages for future use during the winter feeding period or during periods of drought represents a significant cost outlay for cattle operations. Previous research conducted at KSU suggests that large round bales composed of wheat or sudan hay can incur feed waste of up to 25% of a bale's weight when unrolled. Much of this loss can be attributed to factors associated with delayed harvest (reduced forage quality) and/or improper storage techniques prior to feeding.

Many producers do not recognize that with a 6-foot diameter large round bale, more than 1/3 the weight of a bale can be found in the outer 6 inches and 50% of the volume is in the outer 12 inches. Weathering losses in round bales stored outside unprotected are commonly found to occur up to 4 inches although hay type also influences the degree of loss due to weather exposure. For example, "stemmy" hays such as alfalfa, sudan, and mature small grains have a greater loss than grass hay. Moreover, areas that have higher rainfall also have a greater weathering loss than low rainfall areas. Unprotected hay that is stored outside has the greatest weathering loss, followed by covered hay stored outside, with the least amount of loss occurring with barn stored hay; however, there is still some storage loss found with storing hay in the barn, especially with an extended storage period.

Management practices for large round bales

Make a dense bale. A dense bale will sag less, have less surface area in contact with the ground, shed more precipitation and protect the inner bale from weathering, and make more efficient use of the bale wrap deployed. Bale density is affected by the baler, the experience of the operator, and the type of hay. Finer stemmed hays form denser bales. As a rule of thumb, the density of round bales should be a minimum of 10 pounds of hay per cubic foot.

Store bales end-to-end to reduce storage loss. Tightly stacking bales end to end better utilizes the storage area and protects the ends of bales from weathering. If bales are not stacked tightly against each other, rain will penetrate the ends and increase damage. Be mindful of positioning the hay bales on a well-drained site. A gently sloping site with a southern or southeastern exposure is ideal to maximize solar drying and encourage drainage away from the bales. To further reduce wastage on the bottom of the bales, some producers have elevated their bales using old tires, shipping pallets or stored on a base layer of 3 to 4 inches of crushed rock. When more than one row of bales is needed, be mindful to space adjacent rows at least 3 feet apart. This simple action will increase air flow and allow the sun to reach the back row.

Avoid stacking large round bales. Many producers will stack their large round bales in a pyramid formation with the thought of maximizing their utilization of space. However, this strategy will usually increase dry matter losses in the stack as a result of the trapped moisture and reduced air movement.

DO NOT cover bales. Aside from adding cost, covering bales will potentially trap moisture the same as wrapping them in plastic. If high moisture hay (over 18 percent) is sealed under plastic, quality losses may result from excessive heating and mold development.

DO NOT store bales under trees. During harvest, many producers will move the large round bales to the field perimeter with good intentions of moving bales to a central location when it is convenient. However, locating bales under trees will encourage degradation of their bales because

of trapped moisture and the inability to dry from sunlight.

Forage production for future use as a consequence of dry weather conditions or winter feeding is an important element for all cattle producers who wish to insure the nutritional needs of their cowherd are being met. Proper attention throughout the entire hay harvesting process, including proper storage will pay future dividends towards this effort.

Dale Blasi, Stocker, Forages, Nutrition and Management specialist
dblasi@ksu.edu

Jaymelynn Farney, Beef Systems Specialist, Parsons
jjkj@ksu.edu

6. Kansas Ag-Climate Update for June 2021

The Kansas Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

June 2021: Warm and dry

June experienced drier condition than normal especially in the western division. It ranked as the 44th driest June since 1895, with only the Southeast Division above normal. As a percent of normal, the North Central was the driest with 1.42 inches, 37 percent of normal. The Southeast was the wettest at 7.37 inches, 124 percent of normal. Precipitation carryover from May resulted in little change to the US Drought monitor. Surface temperatures that were warmer than normal dominated June. The statewide average for June was 2.7 degrees warmer than normal, ranking it as the 33rd warmest June of record

Warm, dry weather allowed for rapid progress in wheat harvest until the end of the month, when rains created delays (Figure 1). Harvest results were mixed with some very good yields and test weights and some results that were poorer than expected. The warm conditions also allowed for rapid progress in corn development, but created issues with late-planted corn and soybeans. Uneven emergence is an issue in some areas.

Figure 1. Wheat harvest in Kansas. Photo by Scott Dooley, K-State Research and Extension.

View the entire June Ag-Climate Update, including the accompanying maps and graphics (not

shown in this short article), at http://climate.k-state.edu/ag/updates/.