K-STATE Research and Extension

Extension Agronomy

eUpdate

03/08/2019

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. Kansas wheat crop update - March 8, 2019

The 2018-2019 Kansas wheat crop is a study in contrast, with essentially two separate crops (Figure 1). About 50% of the Kansas wheat crop was planted in a timely manner and benefited from ample fall moisture. These fields are usually well developed and, with the ample profile moisture, likely have a high yield potential. However, October was extremely wet with all parts of the state recording at least ¾ of an inch more than normal. Parts of south central and central Kansas had between 5 and 11 inches greater than average. This rainfall delayed sowing of the remaining half of the wheat area in the majority of the state, resulting in the slowest sowing pace since 1994 (Figure 2). The delayed sowing resulted in a less-developed crop going into the winter, often with only the first leaf out, which becomes more susceptible to potential winterkill due to less fall tillering and less time to acclimate to cold conditions. Also, the yield of the late sown-crop will depend more on spring-formed tillers, which are typically less productive. Thus, the yield potential of this crop might be compromised, unless conditions during grain filling have below-normal temperatures and above-normal precipitation.

Figure 1. Wheat crop planted early (left panel) versus late (right panel). The late-planted crop is now showing about 2-3 leaves per plant, and just initiating the first tiller. Photos taken on 03/06/2019 in Stafford County, Kansas, by Mary Knapp, K-State Weather Data Library.

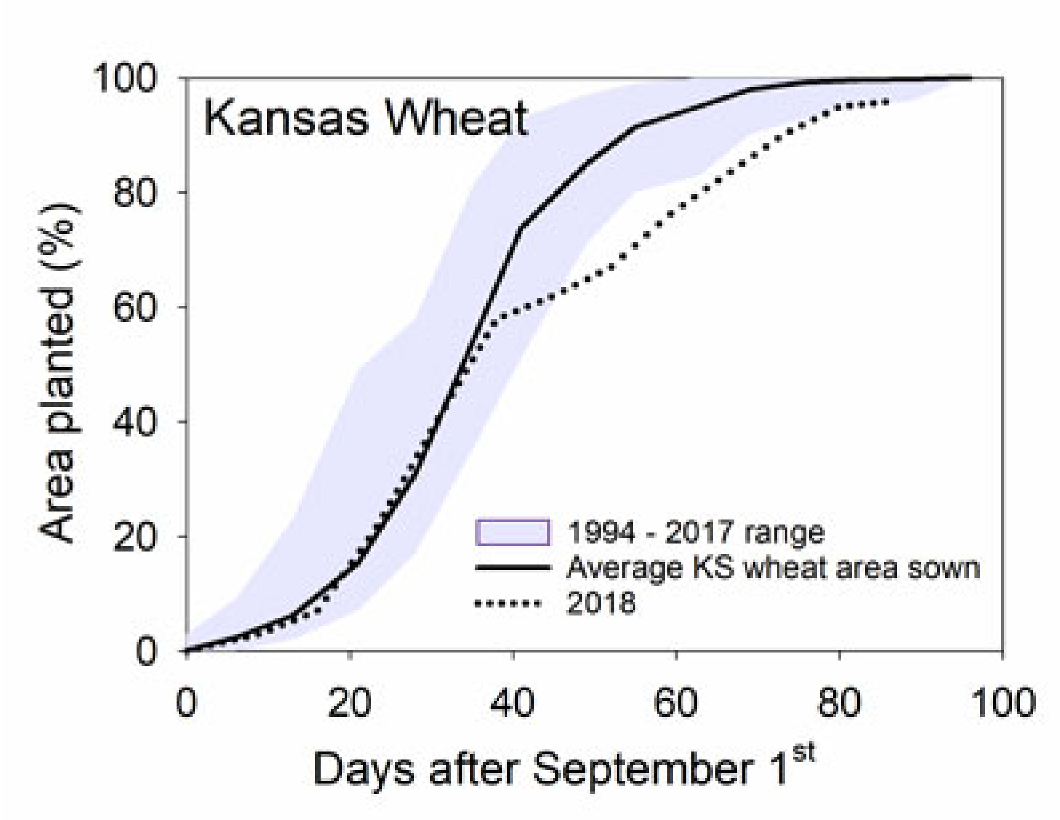

Figure 2. Wheat planting progress in 2018 (dotted line) as compared to the 1994-2017 mean (solid line) and range (purple area). A new record was set for late planting after October 5th.

Air temperatures

Mean air temperatures during the 2018-19 winter wheat growing season have been below the long-term normal for the majority of Kansas during both fall and winter (Figure 3).

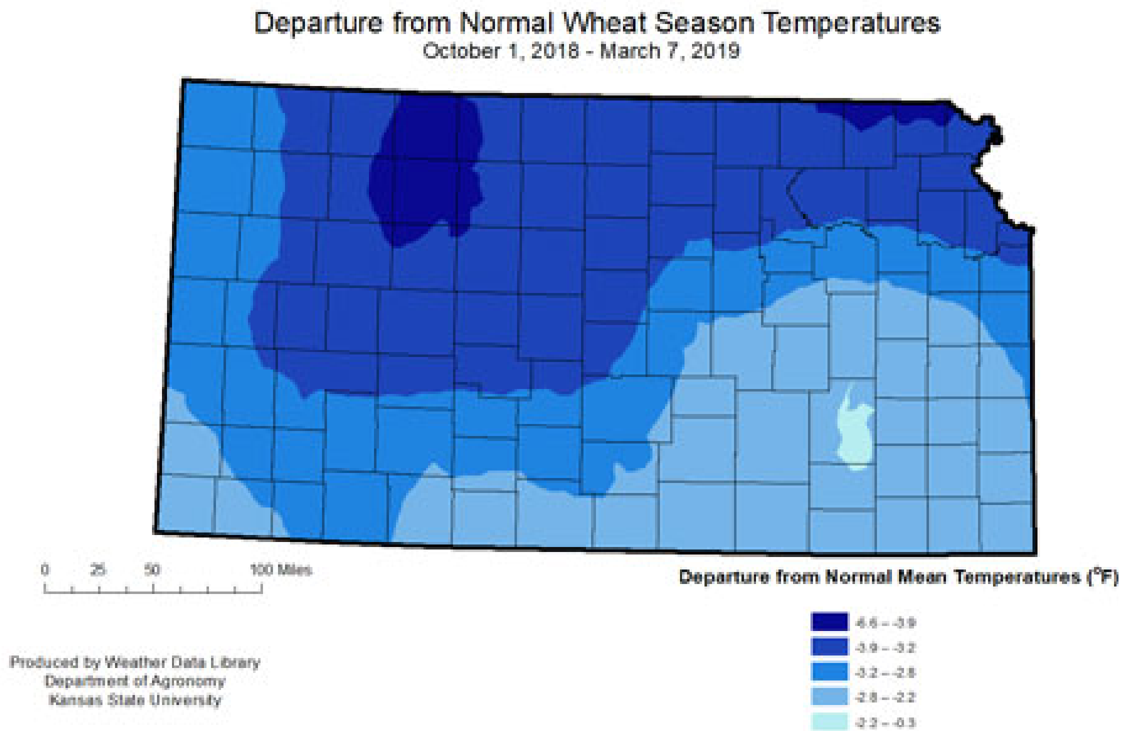

Figure 3. Departure from normal temperatures (Weather Data Library).

Temperatures were between 1 and 5 degrees F below-normal during October, which delayed development, and 11.3 degrees F below-normal during February, having a substantial impact on soil temperatures within the seed zone (Figure 4). Cooler temperatures during the fall decreased canopy and root development. The crop could potentially have benefited from slightly warmer temperatures to enhance tillering, fall canopy closure, and crown root elongation. Additionally, it will also likely delay spring development. In a year where weather conditions are close to normal, the crop would be at about the first hollow stem stage of development in Hutchinson now (early-to-mid March). However, with cooler air and soil conditions, the crop has not initiated spring growth yet.

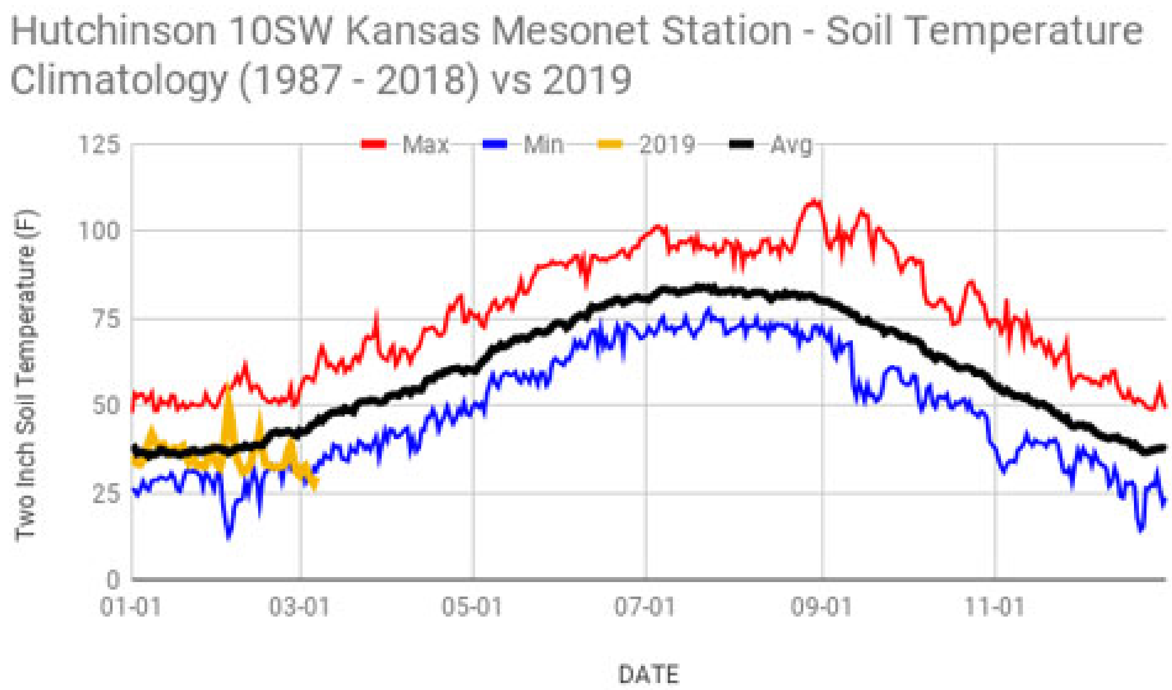

Figure 4. 2019 soil temperatures compared to climatology at the Hutchinson 10SW Kansas Mesonet station. Record low temperatures are being recorded the first week of March.

Precipitation

Rain and snowfall over the winter continues to keep soils saturated at the surface in near-record amounts. While this provides ample moisture for the winter crops – it isn't being utilized yet due to frozen soils (see accompanying eUpdate article on field working conditions). This above-average precipitation and moist soils will also affect decisions regarding fertilizer topdressing to the wheat crop (see accompanying eUpdate article on N management for wheat). Warm temperatures are needed to initiate plant growth to begin uptake of the above normal precipitation the last six months. Forecasted temperatures for the remainder of the month and into April aren't conducive for the crop to begin growth.

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2. Topdressing wheat with nitrogen: Timing, application methods, sources, and rates

In a normal year, producers would start planning for topdressing nitrogen (N) on the winter wheat crop in early February. However, with challenges related to excessive moisture and snowfall, and below-average temperatures in significant parts of the state, the majority of the Kansas producers have not been able to topdress their crop. Additionally, about half of the Kansas wheat crop is extremely small (less than one tiller) due to late planting last fall coupled with below-average winter temperatures. Thus, some key elements that need to be considered when deciding on the exact program you plan to use include: timing, N source, application method and N rate.

Ideally, the N in topdress applications will be moved into the root zone with precipitation well before jointing begins in order to be most efficiently utilized by wheat. With some of the small wheat out there with limited fall tillers, having adequate N available to support spring tillering when it breaks dormancy will be important. Also, the potential number of meshes per head is determined after spring green-up and prior to jointing; thus, having available N in the root zone can help ensure a good yield potential. Some combination of fall pre-plant or at-seeding N, and/or early topdressed N, is also normally needed to supply adequate N to support head differentiation. The following will discuss some of the issues to consider when making topdressing decisions.

Timing

The most important factor in getting a good return on topdress N is usually timing. It is critical to get the N on early enough to have the maximum potential impact on yield, especially in a year with limited fall tillering. While waiting until spring just prior to jointing can be done with success, this can be too late in some years, especially when little or no N was applied in the fall. For the well-drained, medium- to fine-textured soils that dominate our wheat acres, the odds of losing much of the N that is topdress-applied in the winter is low. For these soils, topdressing can begin anytime now, and usually the earlier the better. For wheat grown on sandier soils, earlier is not necessarily better for N applications. On these soils, there is a greater chance that N applied in the fall or early winter could leach completely out of the root zone if precipitation is unusually heavy. Waiting until closer to spring green-up to make topdress N applications on sandier soils will help manage this risk.

On poorly drained and/or shallow claypan soils, especially in south central or southeast Kansas, N applied in the fall or early winter would have a significant risk of denitrification N loss. Waiting until closer to spring green-up to make topdress N applications on these soils will help minimize the potential for this N loss.

Keep in mind that N should not be applied to the soil surface when the ground is deeply frozen and especially when snow covered. This will help prevent runoff losses with snow melt or heavy precipitation. This will be a special challenge this year, as most of Kansas soils are deeply frozen. Additionally, once the soils start to melt, they will likely be too wet for any field work. Therefore, every field should be considered for characteristics such as slope, N source, tillage system, and the short-term forecast for temperature and precipitation.

On both sandy soils subject to leaching and poorly-drained soils prone to denitrification, split applications may be a strategy to consider. This would involve applying enough N in the fall at or prior to planting to give good support for fall growth and tillering -- generally 20-30 pounds of N. Then follow up with an additional application of about 20-30 pounds of N in late winter or early spring to support spring tillering, possibly applied with herbicides. This late-winter/early-spring application becomes especially important when stands are thin due to poor emergence, as many fields are this year. Finally, come back around jointing or a few days later with a final application to support heading and grain fill. This strategy can also provide flexibility in a year like this with poor fall growth, allowing to hold back part of the N for later in the spring as we have a better idea of soil moisture and weather conditions for the season.

Application method

Most topdressing is broadcast applied. In high-residue situations, this can result in some immobilization of N, especially where liquid UAN is used. If no herbicides are applied with the N, producers can get some benefit from applying the N in a dribble band on 15- to 18-inch centers. This can minimize immobilization and may provide for a more consistent crop response.

Nitrogen source

The typical sources of N used for topdressing wheat are UAN solution and dry urea. Numerous trials by K-State over the years have shown that both are equally effective. In no-till situations, there may be some slight advantage to applying dry urea since some of it will fall to the soil surface (Figure 1) and be less affected by immobilization than broadcast liquid UAN, which tends to get hung up on surface residues.

Figure 1. Urea broadcast to tillering wheat in a topdress application. Photo by Romulo Lollato, K-State Research and Extension.

Dribble (surface band) UAN applications would also avoid some of this tie-up on surface crop residues. However, if producers plan to tank-mix with an herbicide, they will have to use liquid UAN and broadcast it.

Controlled-release products such as polyurethane coated urea (ESN) might be considered on very sandy soils prone to leaching, or poorly-drained soils prone to denitrification. Generally, a 50:50 blend of standard urea and coated urea will provide some N immediately to support tillering and head development, and also continue to release some N in later stages of development. This would work best in settings with high loss potential.

Nitrogen rate

Producers should have started the season with a certain N recommendation in hand, ideally based on a profile N soil test done before the crop is planted and before any N has been applied. If a soil sample was taken at sowing, profile nitrate-N can help determine the rate to be applied based on the yield goal. However, it is not too late to use the profile N soil test if taken in late winter/very early spring before green-up. While it will not be as accurate as when sampled in the fall, it can still identify fields or areas in fields with high levels of available nitrate N. Unfortunately, it is not reliable in measuring recently applied N. So if a high rate of N has already been applied, a late winter profile sample probably shouldn't be taken. Remember that topdressing should complement or supplement the N applied in the fall and the residual soil N present in the soil. The total N application, planting and topdressing, should equal the target recommended rate.

If the wheat was grazed this fall and winter, producers should add an additional 30-40 lbs N/acre for every 100 lbs of beef weight gain removed from the field. If conditions are favorable for heavy fall and/or spring grazing, additional N maybe necessary, especially for a grain crop.

Low grain prices this year may also play a role for N rate decisions this spring. However, is important to keep in mind that N is the most limiting nutrient for wheat, and the optimum agronomic N application rate will likely result in economic returns. In general, producers may consider a later topdress application (around jointing) with a better idea of the overall crop condition and expectations for the rest of the season; rather than cutting back on N rates now and potentially limiting yields.

Some fields may also benefit from an application of sulfur and chloride. Like N, these nutrients are mobile in the soil, and a topdress application before jointing is considered an effective application time. Sulfur and chloride topdress applications should be made based on soil test and history of response. For more information on sulfur fertility, please see the recent eUpdate article, "Sulfur deficiency in wheat", in Issue 723, December 7, 2018.

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3. A storm is brewing...spring fieldwork troubles

Cold weather persists into March and is a blessing for some. Due to increased moisture in the fall and continuing into winter, the cold has frozen soil and solidified roads for field access. Fortunately, this means the moisture profile is quite saturated with ample moisture for the winter and the start of the growing season for summer crops. Unfortunately, this also means that the increased moisture is trapped within the sub-surface and is not evaporating. This increased soil moisture will be realized when the temperatures warm and soils thaw. Field conditions are anticipated to be difficult with excessive mud across a large majority of the state, especially in eastern and parts of western Kansas.

As the cold winter continues later than usual into March, this further delays melting. As this threshold is bumped later into the year, it approaches the spring rainy season, narrowing the available window for field work. Should spring moisture be delayed, then ample time would allow surface moisture to evaporate with warmer/drier conditions. However, the current spring outlook from the Climate Prediction Center puts emphasis on increased chances of above-normal precipitation (Figure 1). Should this occur, the window of feasible field work will likely be small, especially with reasonable soil temperatures for planting. These issues will be enhanced with additional moisture also forecasted as both rain/snow next week (March 11-13, Figure 2).

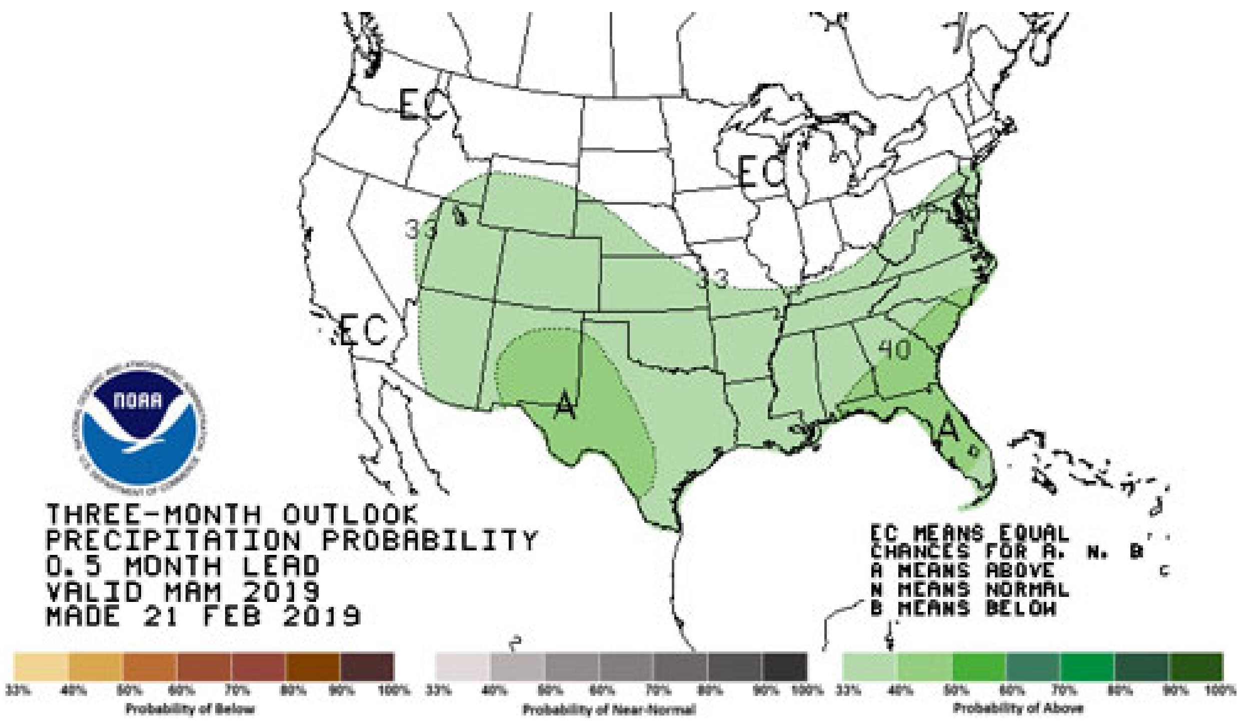

Figure 1. Climate Prediction Center precipitation outlook for March, April, and May.

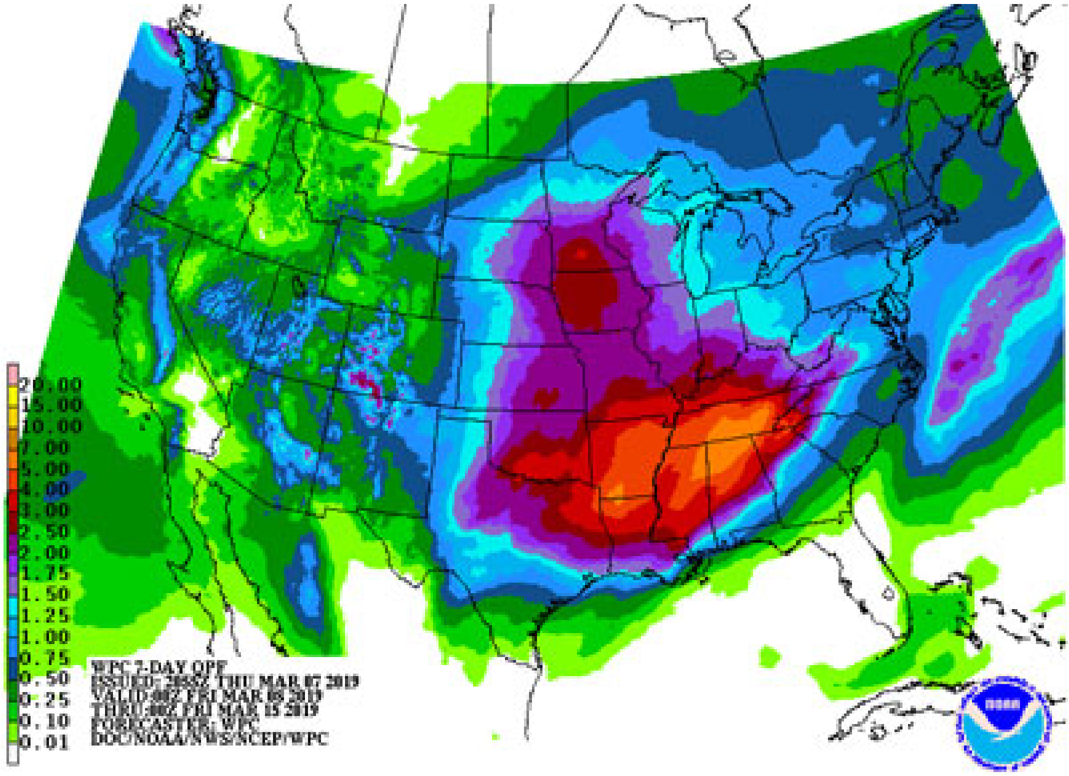

Figure 2. Quantitative Precipitation Forecast (QPF) for the United States through March 14th.

Frost depths

Current frost depths across the state are estimated through soil moisture/temperatures to be as deep as 10 inches in the northern part of the state (Figure 3). As the cold has continued, the depth has increased southward and deeper into the soil. This will likely induce delays on planting due to the duration of warmer temperatures necessary to increase sub-surface soil temperatures. It will also increase flood concerns as the precipitation (see Figure 2) will not infiltrate but rather run off, agitating streams and rivers in the region.

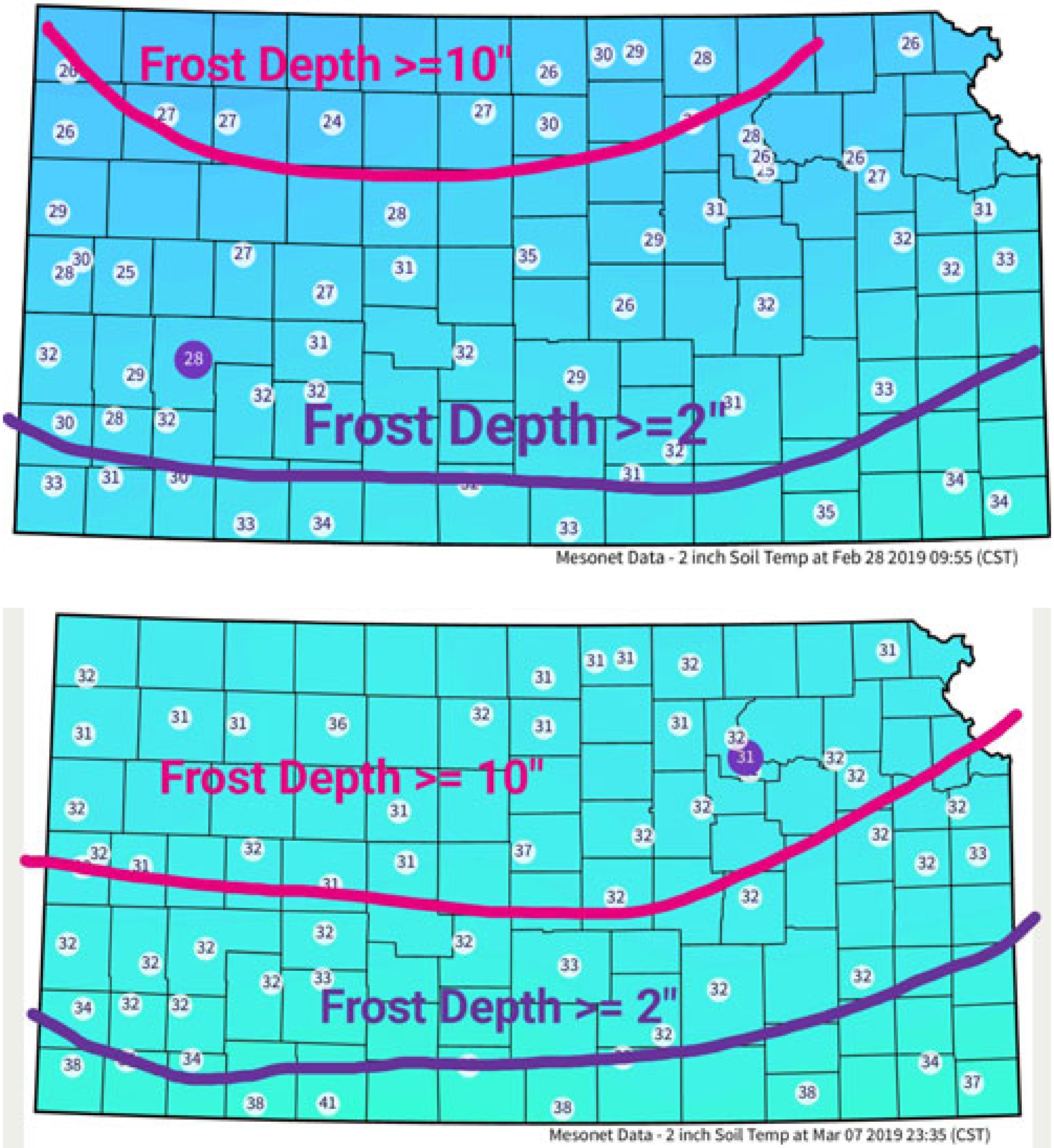

Figure 3. Frost depth increases from February 28 (top image) to March 7 (bottom image), as estimated by the Kansas Mesonet using soil temperature and moisture measurements.

Even as producers are able to enter the field, risks of resulting soil surface damage are possible. This includes easier compaction due to wet soils that may stunt future plant growth and further trap sub-surface moisture. Producers also risk undesired damage and disruption to the soil surface. This will modify evaporation properties and create additional issues in the future for field operations. From the wheat perspective, it is not recommended to apply fertilizer when the ground is covered with snow or frozen. Once the ground thaws, it will likely be a while until growers can get field work done, and perhaps delaying the N fertilizer application can result in reduced yields, if this delay is significant.

A companion article in this eUpdate issue provides more information on fertilizer options: “Nitrogen loss potential during the winter and fertilizer options this spring”.

For more information on N management for wheat, check out the accompanying article in this eUpdate, “Topdressing wheat with nitrogen: Timing, application methods, sources, and rates”. Lastly, equipment damage and resulting downtime will not aid in productivity this spring.

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4. Nitrogen loss potential during the winter and fertilizer options this spring

With the long, wet fall and winter across most of Kansas, many producers could not apply N fertilizer due to the persistent saturated soil conditions (Figure 1). For those that applied N in the fall or had a failed crop do to last summer's drought and are anticipating residual profile N the question is concerning possible loss of nitrogen (N), while others are considering alternative sources besides anhydrous ammonia this spring.

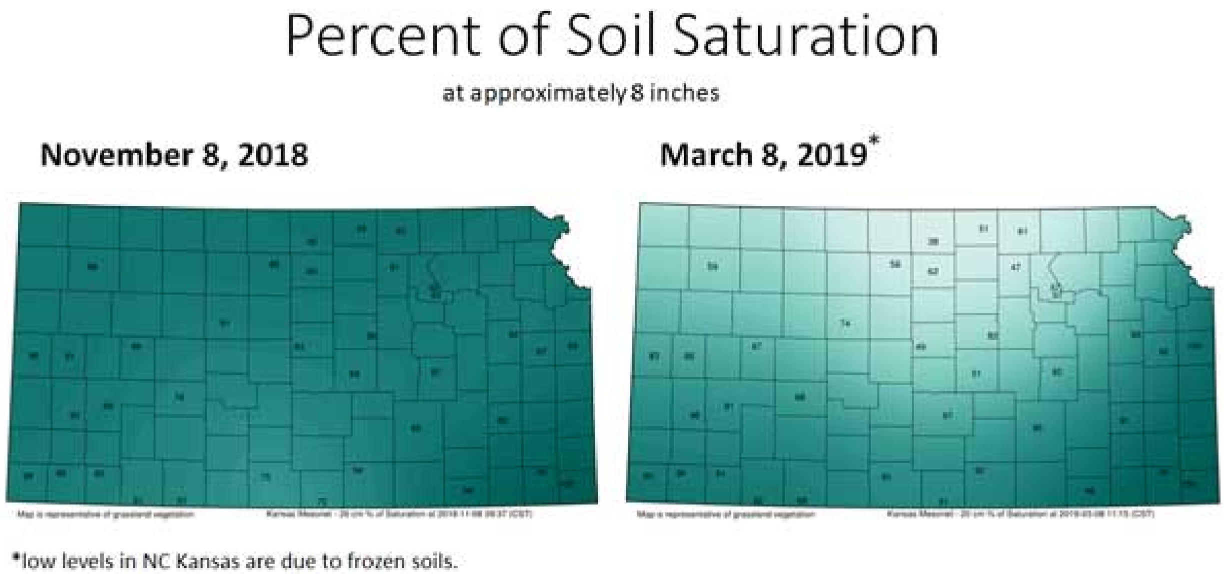

Figure 1. Fall soil moisture vs current (Kansas Mesonet)

Potential for N loss from fall-applied N

Nitrogen loss processes are associated with the nitrate-N (NO3) form of nitrogen. The process of nitrification is a biological process and is driven by soil oxygen content, soil temperature, pH, how the N is applied, and some characteristics of the fertilizer. Nitrification is an aerobic process, thus requiring high levels of soil oxygen. Conditions that reduce oxygen supplies, such as wet soils, will inhibit nitrification and keep N in the ammonium form. In addition, the cold soils in recent months minimize any microbial activity and the conversion to the nitrate-N form (Figure 2). Thus, up to this point, the fall-applied N fertilizer will not be subject to loss given the recent conditions of frozen soils across the state. Fertilizer applied as ammonia or urea, and the 75% of UAN that is in ammonium/ammonium-producing forms, will remain in the soil in the ammonium form until soils warm up and dry out later in the spring.

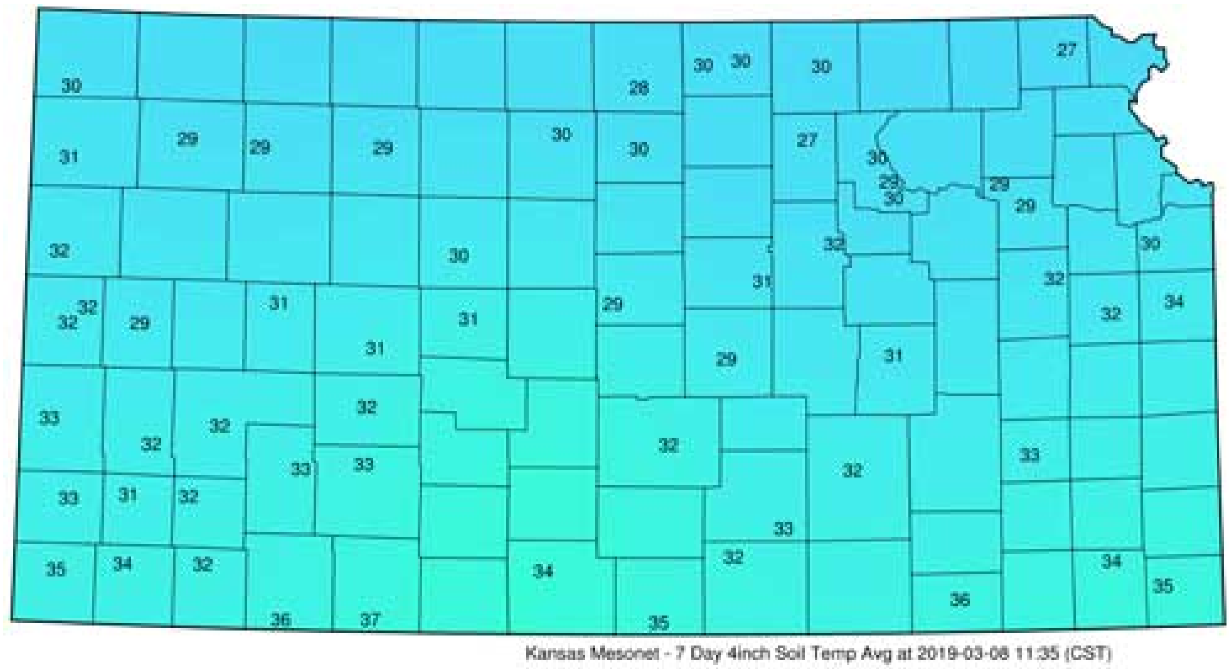

Figure 2. Average 4-inch soil temperatures for week ending 3/8/2019 (Kansas Mesonet)

Residual profile N

The amount of nitrogen in the profile can be hard to predict. The good news is that it is not too late to collect 24-inch profile soil samples to determine how much N is available for the upcoming crop. Due to the wet fall (Figure 3), it is possible that some of last year's N was lost due to leaching and denitrification. However, the potential exists for a significant amount to still be retained in the soil profile. Taking profile N samples this spring will allow producers to account for and take advantage of unutilized N and could represent a savings on N inputs this year. For more information on collecting and submitting profile N soil samples, please see KSRE publication MF734, "Soil Testing Laboratory".

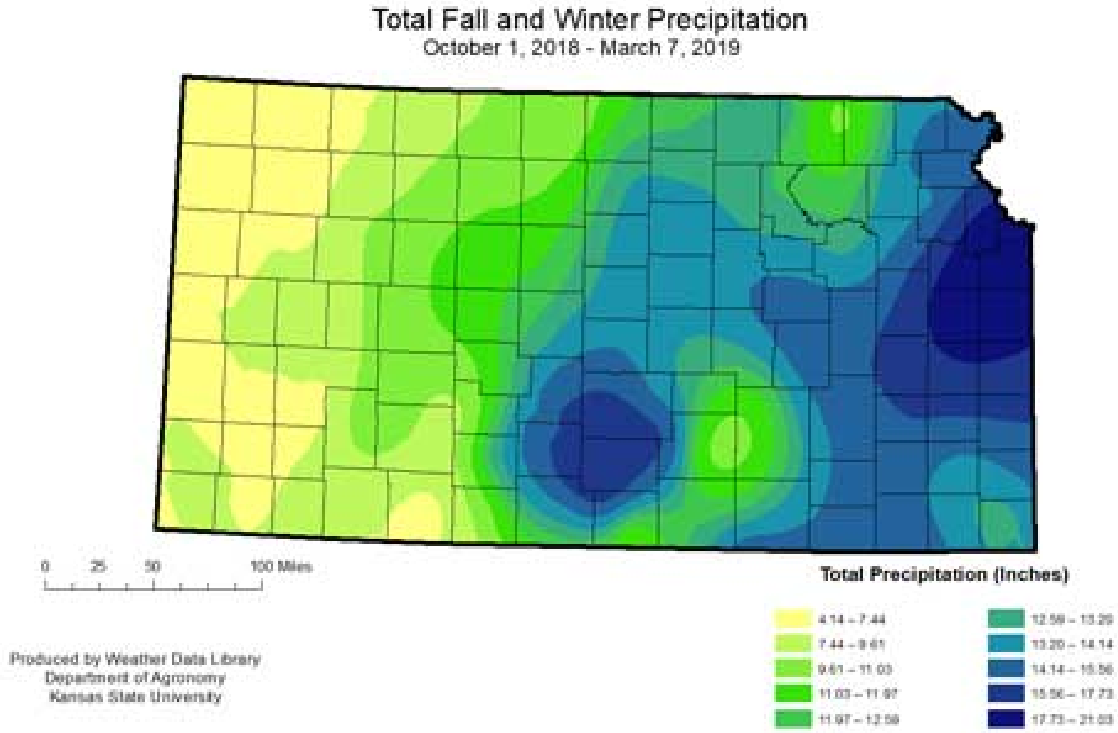

Figure 3. Total fall and winter precipitation (October 1, 2018 to March 7, 2019). (Weather Data Library)

Alternative N sources and timing

With wet soil conditions, some producers are considering switching to urea or UAN instead of anhydrous ammonia. These nitrogen sources are agronomically equivalent when applied correctly, and therefore are good alternatives. Dry and liquid fertilizer might provide more flexibility for application timing including pre-plant and side-dress N applications. With current corn hybrids, N uptake can generally extend to later in the growing season, providing a bigger window for side-dress N applications. However, some N at planting will be required depending on the intended timing for side-dress N application. For those using starter fertilizers, N can be applied at this time. With a 2x2 or dribble on the surface (2x0), higher rates of N are safe, and applications of at least 20-30 lbs can provide N during early growth, with the rest of the N applied as early side-dress (V6-V8 growth stage). Split-applied N can provide additional benefits including higher nitrogen use efficiency and reduced N loss potential for some soils.

With surface applied side-dress urea or UAN, the applications should be ideally planned before a forecasted rain that can help to move the N in the soil, or consider the use of a urease inhibitor to reduce the risk of N volatilization. Injecting the N fertilizer is another alternative to manage the risk of N volatilization or tie-up.

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5. Managing spring-planted cover crops for grazing

The following is a summary of "Managing Spring Planted Cover Crops for Livestock Grazing under Dryland Conditions in the High Plains Region", a fact sheet produced in collaboration with extension specialists and research scientists at K-State, Colorado State University, and University of Nebraska. The comprehensive publication details recommended practices for species selection, adjusting stocking rates, and grazing management. The entire fact sheet can be viewed and downloaded at https://www.bookstore.ksre.ksu.edu/pubs/MF3443.pdf.

Quick Facts

- Cool-season species should be chosen for spring planted cover crops to optimize growth and take advantage of winter and early spring moisture.
- Cool-season grasses tend to dominate, often to the detriment of other species, when planting cover crop mixtures in the spring.
- Yield variability is high when growing cover crops under dryland conditions in the High Plains Region ranging from under 1,000 lbs/ac in dry years to almost 5,000 lb/ac in wet years.
- Stocking rates must be flexible because of the large year-to-year variability in cover crop productivity.
- Spring planted cover crops can provide an average of 30 to 45 days of grazing.
- Start grazing spring planted cover crops when they reach 6 to 8 inches of growth to take advantage of their high nutrient content and palatability.

Selection of Species

Determining what to plant can be a daunting task with all of the varied species available for use as cover crops. For Kansas and Nebraska producers, local Land Grant Universities and the Midwest Cover Crops Council have developed a **decision tool** to help select species based on specified goals. When cover crops are grazed, one needs to choose species that will not only benefit soil health but will also be palatable and safe as forage for livestock. Fortunately, many of the species currently recommended for use as cover crops are also good for forage production. Factors such as nutritive content and potential toxicities must be considered.

While a number of potential problems can occur with various forages, most can be managed. The most frequent problem is the accumulation of nitrates that is common with oats and brassicas but can occur in a variety of species under certain growing and management conditions. Prussic acid is another toxicity to beware of when grazing, particularly with sorghums, but these species are less common in spring planted mixtures. Refer to publications on nitrate (**CSU** or **KSU** fact sheets) and prussic acid (**CSU** or **KSU** fact sheets) toxicities for more information. For a more complete overview of forage crops with potential toxicities, please see the publication **Grazing Management: Toxic Plants**.

For spring planted cover crops, most, if not all, of the species planted should be classified as cool-season in order to be able to plant early and take advantage of winter and early spring moisture. Species that fall into this category include the small grains (e.g. wheat, barley, oats, triticale, and cereal rye), brassicas (e.g. turnip, rapeseed/canola, and radish), and legumes (e.g. field/winter peas, winter lentils, vetch, and sweetclover).

Complex mixtures of 6 or more species, often referred to as "cocktails," are commonly recommended. The benefits of cocktails relative to single species or simple mixtures of 2 to 4 species depend on your specific management goals. Competitive cool-season grass species tend to be the highest biomass producers, which can optimize weed control and forage production. Mixtures are often used for benefits other than biomass production, such as providing nitrogen fixation by including legumes or soil pest suppression by including brassicas. From a grazing perspective, mixtures can produce forage with a range of palatability that can provide benefits and limitations.

Variability in Forage Production

Forage productivity will vary from year-to-year under dryland conditions, which makes this one of the biggest challenges facing producers that graze cover crops in the High Plains Region because stocking rates will need to be adjusted annually.

Producers have several options to manage this variability in forage production. A flexible herd size where animals can be added or subtracted based on a given year's productivity is the ideal situation. If it is difficult to adjust herd size, then the number of days a field can be grazed will have to be shortened or lengthened to achieve residue goals. In reality, expect to graze spring planted cover crops for about 30 days in most years. This resource should be viewed as supplemental forage during the late spring and early summer to help relieve dependence on other forage resources such as native rangeland and baled hay. In most years, native pasture growth is sufficient for turn-out when cool-season cover crops near maturity. High stocking rates can help suppress stem elongation and heading, but producers need to be careful to not overgraze and leave sufficient residue for soil health benefits.

As a final note, in years with minimal precipitation and forage productivity (i.e. ~1,000 lbs/ac or less), the best choice might be to not graze at all if your primary goal is soil protection. Ideally, you want to maintain a minimum of 30% ground cover, and approximately 1,000 lbs/ac is needed to achieve that goal.

Grazing Management

When it comes to managing grazing of cover crops, numerous options can be considered. The ultimate strategy that is chosen will be influenced by your overarching goal(s) for the cover crop. Cover crops are generally grown for more reasons than just achieving high levels of harvest efficiency (i.e. percent utilization of available forage) as you would if this were a dedicated forage crop. You want to leave enough residue behind to maintain most of the benefits associated with planting cover crops (Figure 1).

Figure 1. Example of grazing and trampling impacts when predominantly cool-season grain cover crops are grazed during the heading stage. Regrowth is minimal and utilization is light (<30%) at this point, but trampling has left more than the target minimum of 30% ground cover.

Grazing management options include:

- Continuous grazing: Calculate a stocking rate based on the estimated yield and put the whole herd in one large field to graze. Advantages associated with this system of grazing are that no fences are moved and only one water source is needed (i.e. labor and inputs are minimal). However, if the field is large, livestock will tend to overgraze the forage closest to the water source while underutilizing the forage farthest from the water, unless you are able to move the watering location. Harvest efficiency will generally be around 30% with continuous grazing.
- Rotational grazing: A large field is divided into two or more smaller units, or paddocks, and the animals are rotated from one paddock to the next. This is also a good option that has some advantages and disadvantages. The more paddocks that the field is divided into, the higher the stocking density (i.e. number of animals per acre). Maintaining residue levels and minimizing soil compaction are two issues to consider with this method. The need to move fences every day or every few days and how to handle watering the animals are two of the biggest hurdles to overcome that keep many producers from practicing rotational grazing.
- Strip grazing: Similar to rotational grazing where a temporary fence is set up to allow animals access to one to a few days' worth of feed but differs in that there is no back fence and animals can graze both fresh, residual, and regrowth forage. This method is convenient for watering animals as the fence can be set up so they have continuous access to a single water point. One drawback is increased compaction near the water source. Unlike rotational grazing, little regrowth accumulates when strip grazing because animals will continually search out and graze any new growth in the previously grazed strips.

Once you have settled on a method of grazing, the next decision you need to make is when to start grazing your cover crop. If you are grazing steers and heifers and your goal is to achieve a given level of weight gain, then you need to start early to take advantage of high forage quality. The mixes we have been using for spring planted cover crops tend to be dominated by cool-season cereal grains like oats and barley. Once these species achieve 6 to 8 inches of growth, you should think seriously about starting to graze (Figure 2). Alternatively, some producers are more concerned about meeting their biomass goals for soil health and delay the start of grazing until plants are fairly mature.

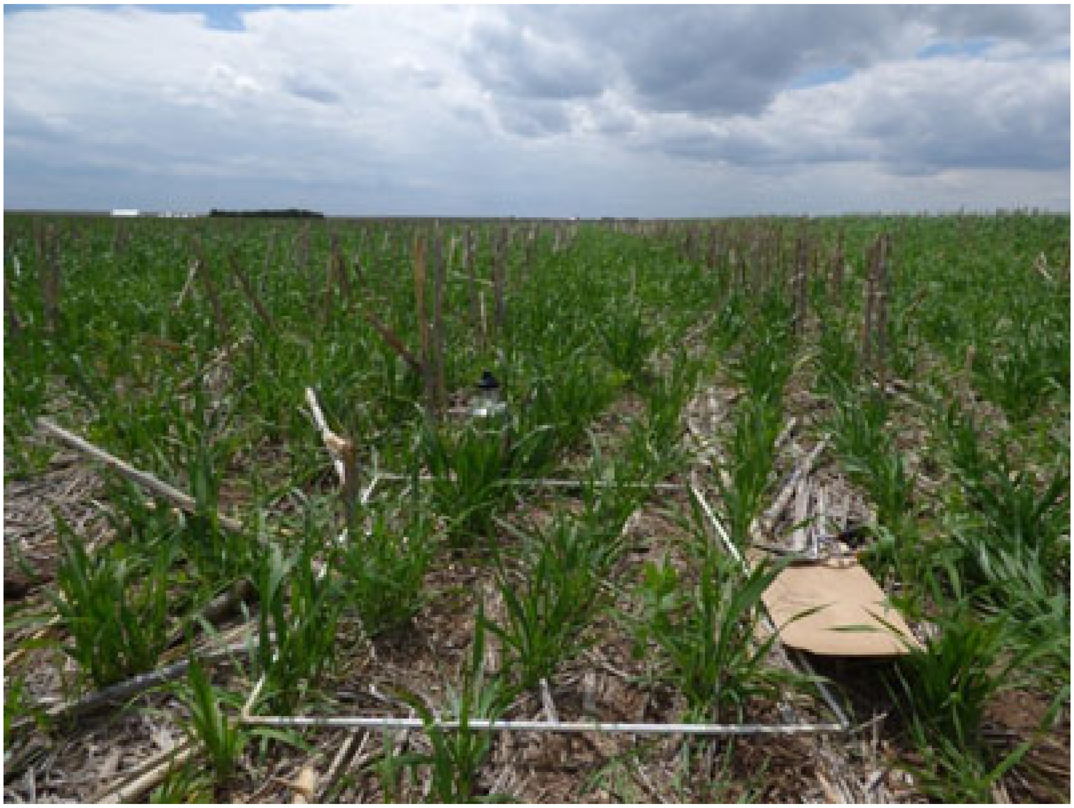

Figure 2. The above photo illustrates the proper time to start grazing (6 to 8 inches).

Determining Stocking Rates

Several key pieces of information are needed to estimate a stocking rate. The first is an estimate of the forage yield your field will produce during the period it will be grazed on a dry matter basis. How much forage will be consumed each day will depend on animal body weight and forage quality. For green and growing forages, intake will run from 2.5 to 3% of body weight on a dry matter basis. Another key input is the percent utilization desired. In dryland systems, 30% is a conservative starting point unless it appears to be an excellent moisture year with above average yields. Calculations can be made to estimate days of grazing for a given number of animals or the number of animals for a set grazing period. A **Carrying Capacity Calculator** is also available to help with these calculations. Example calculations to determine stocking rates are detailed in the full publication linked in the first paragraph of this article.

Example Timeline

An example timeline is shown below with suggested planting, start grazing, and end grazing dates for spring planted cover crops. This timeline will allow cover crops to effectively utilize winter and spring moisture to produce the highest yields possible under dryland conditions while providing livestock with high quality forage.

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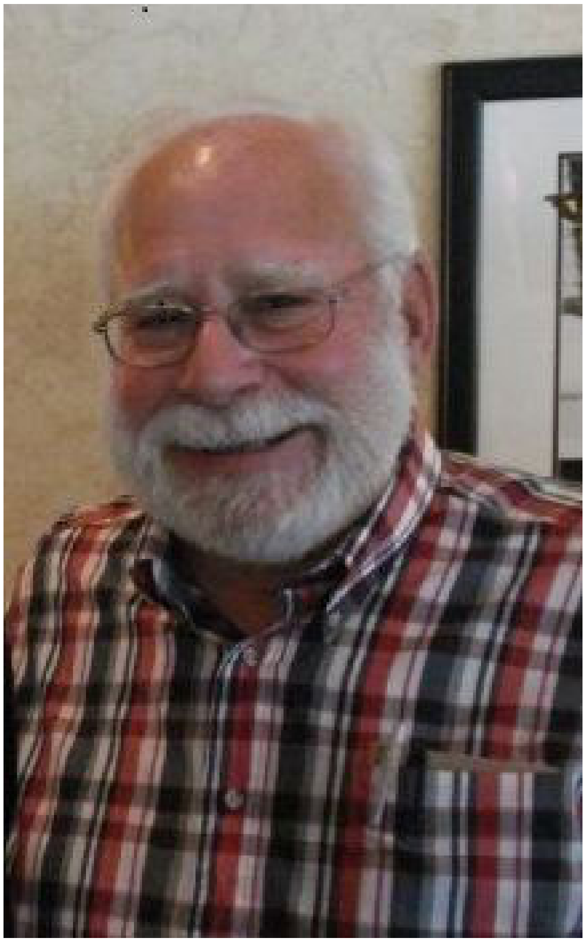
6. K-State Agronomy is sad to announce the passing of Dr. Stan Ehler

It is with great sadness that we announce the passing of Dr. Stan Ehler on February 28, 2019. Visitation and funeral services will take place in Manhattan on March 10 and 11. His full obituary and details for the services can be viewed at http://www.ymlfuneralhome.com/obituary/6241. The following is a short tribute to Dr. Ehler that was published upon his retirement from the Department of Agronomy in 2004.



Stan Ehler, associate professor of agronomy, retired from the Department of Agronomy in 2004. Dr. Ehler significantly impacted the lives of undergraduate students in agronomy and many other disciplines for 32 years. Originally from Champaign, Illinois, Ehler completed his B.S. (Soils) and M.S. (Weed Science) in 1962 and 1964 at Southern Illinois University. He received his Ph.D. (Turf Physiology) from the University of Missouri in 1975. Ehler began his teaching duties for K-State's Department of Agronomy in August 1972, and was promoted to associate professor in 1978.

His dedication to undergraduate teaching was a constant as he advised and counseled hundreds of students. When departmental faculty are on the road at Extension meetings and Field Days, they are regularly asked by agronomy alums, "How's Doc Ehler?" Ehler's advisees readily recall their advisor and share how he helped them, not only with academic matters, but with life issues as well. For many years, Ehler was a primary advisor for the Wheat State Agronomy Club. He also served as advisor to the Ag Student Council and the Crop Protection Club. His sense of humor and adventure are vividly remembered by many former undergraduates who had the pleasure of traveling with him to regional and national meetings.

At K-State Ehler developed several new undergraduate courses, including Crop Science, Weed Management, and Seed Technology. He also taught several other courses, including Grain Production, Grain Grading, Short Course in Agronomy, and Agronomy the Profession. Agronomy faculty can recall many of Ehler's salient points as he began his inputs with, "Well, Bud, let me tell you ...". His interest and understanding of production agronomy were particularly valued by many of his students. During his career, Ehler was recognized by his students and colleagues for his teaching and advising efforts.

Ag-Climate Update

Office of the Kansas State Climatologist | February 2019 | climate.k-state.edu

Polar Vortex Caused Cold Wave and El Niño is Officially Here

Summary

Kansas was hit with a severe cold wave caused by a weakened polar vortex, along with an official El Niño declaration by the NOAA in February. State-wide average temperature for this month was 26.6 °F, which is 7.3 °F cooler than normal (Fig. 1). The Southeast Division came closest to normal, with an average of 32.7 °F, or 3.8 °F cooler than normal. The Northwest Division had the largest departure with an average of 22.0 °F or 9.6 °F cooler than normal. Temperatures ranged from a high of 81 °F at Richfield 1NE, Morton County, on the 4th to a low of -7 °F at Oakley 4W, Logan County, on the 8th.

State-wide average precipitation for the month was 1.01 inches, 101 percent of normal (Fig. 1). Root zone soil moisture conditions were wetter across Kansas (see Fig. 3b). Monthly snowfall totals ranged from trace amounts in southern Kansas to 19.5 inches in Republic County.

Fig.1. Departures from normal temperature (°F) and precipitation (inches)

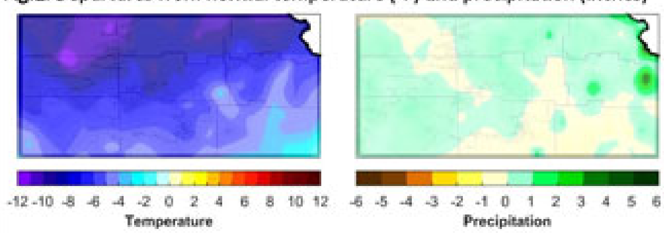
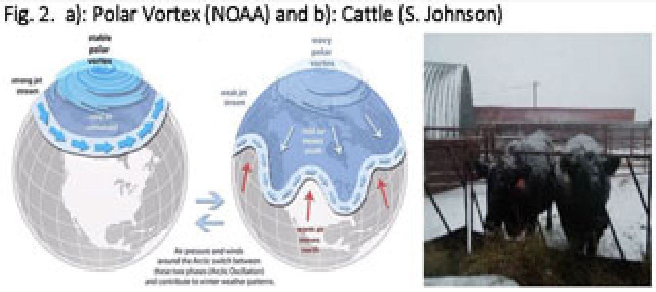


Fig. 2. a): Polar Vortex (NOAA) and b): Cattle (S. Johnson)



Impacts

Snow cover was more persistent in February which may have been a result of the polar vortex (Fig.2a). The repeated snow storms had a negative impact on cattle, with both higher feed demands and calving complications (Fig. 2b). Wet soil conditions have limited winter fertilizer applications for summer crops and wheat, and are delaying spring field work. Less GDD accumulation (Figs. 3a and 3b) is delaying crop development. There have been few signs that vegetation has broken dormancy.

Fig. 3a

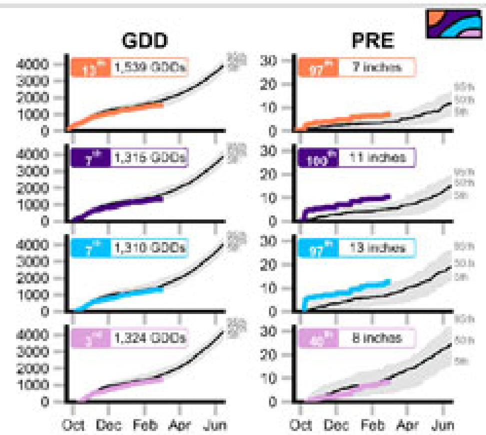


Fig. 3b

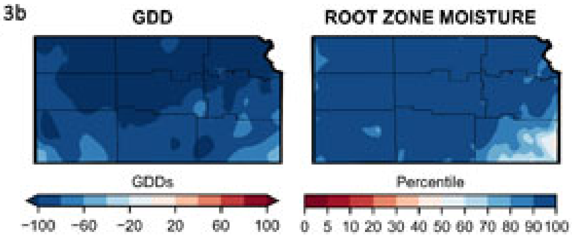
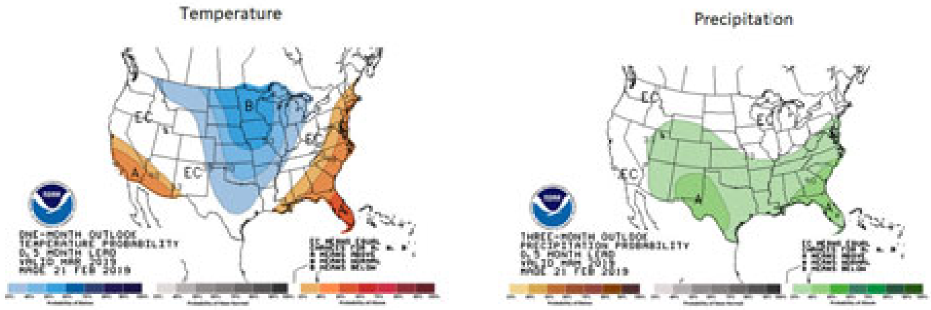


Fig. 3a. Planting-zone average accumulated Growing Degree Days (GDD) and precipitation (PRE) for winter wheat from planting date until Feb. 28 and their corresponding percentiles (base-period: 1981-2010). GDD is in °F.

Fig. 3b. Spatial distribution of departures from normal GDDs for February and the root zone soil moisture percentile (from the GRACE satellite) as of Feb. 25.

Fig. 4



CPC 1-month Outlook

The Climate Prediction Center (CPC) outlook for March favors a cooler-than-normal pattern across most of the state (Fig. 4). This cooler pattern stretches northward to the Canadian border. For Kansas, normal average temperatures range from 40.1 °F at Colby in the northwest to 47.3 °F at Columbus in the southeast. It is important to remember that this represents the average for March. Wide variations in temperatures are likely to continue, with much warmer-than-normal temperatures still possible.

Currently, things are settling down.The polar vortex has gone away and the weak-to-moderate El Niño is going to increase precipitation throughout most of the US. The outlook for precipitation is expected to be greater than normal for March (Fig.4). Wetter-than-normal conditions are also expected in the Desert Southwest and Southern Plains, increasing confidence in the forecast. Atmospheric systems from the southwest tend to bring greater amounts of moisture than those that originate in the north. As we move out of winter, the normal expected precipitation amount increases, with a sharp gradient increasing from the northwest to the southeast. Normal precipitation in Colby for March is 1.12 inches. For Columbus, the normal is 3.41 inches.

Highlights

When we examine the past 30 days, we can see the impact of both the polar vortex and the weak El Niño interacting together to create incredibly abnormal weather patterns for most of the U.S. Such conditions appear to be similar to the weather pattern we experienced during the winter of 2014/2015 when similar activity from a polar vortex and a weak El Niño also occurred.

Multiple snow events were the highlight in February. Travel difficulties were common, and virtually no field work was perfomed. Extreme cold and very low wind chills complicated the issue. There were 47 daily record low maximum temperatures recorded. In addition, there were 66 new daily record snowfall amounts reported.

In addition to the winter weather, the first severe storm of the season occurred on the 6th of February. Hail was the major component, with quarter-size stones reported near Columbus, and stones up to an inch reported in Harper County.

February Extremes

Kansas Mesonet, operated by the Department of Agronomy at Kansas State University, observed the following extremes this February (http://mesonet.k-state.edu/weather/historical/):

Highest air temperature: 79.2°F on Feb. 4 at Richfield

Lowest air temperature: −23.5° F on Feb. 9 at Cheyenne

Highest 4-in soil temperature: 52.9°F on Feb. 4 at Harper

Lowest 4-in soil temperature: 23.2°F on Feb. 9 at Leoti

Highest 30-ft wind speed: 55.3 mph on Feb. 24 at Garden City

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