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Research and Extension

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09/19/2016

These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update 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 Steve Watson, 785-532-7105 swatson@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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1. Optimum sowing dates and seeding rates for wheat in Kansas

Ensuring that the wheat crop is sown during the optimum window of sowing dates and seeding rate are two steps needed to help ensure that the crop can reach its maximum yield potential (Figure 1). Sowing date affects yield potential due to its effect on stand establishment, soil and air temperatures to which the crop is exposed, tiller formation, disease pressure, and more. The optimum seeding rate will vary based on sowing date, and its adjustment is crucial to ensure the crop can maximize its yield potential.

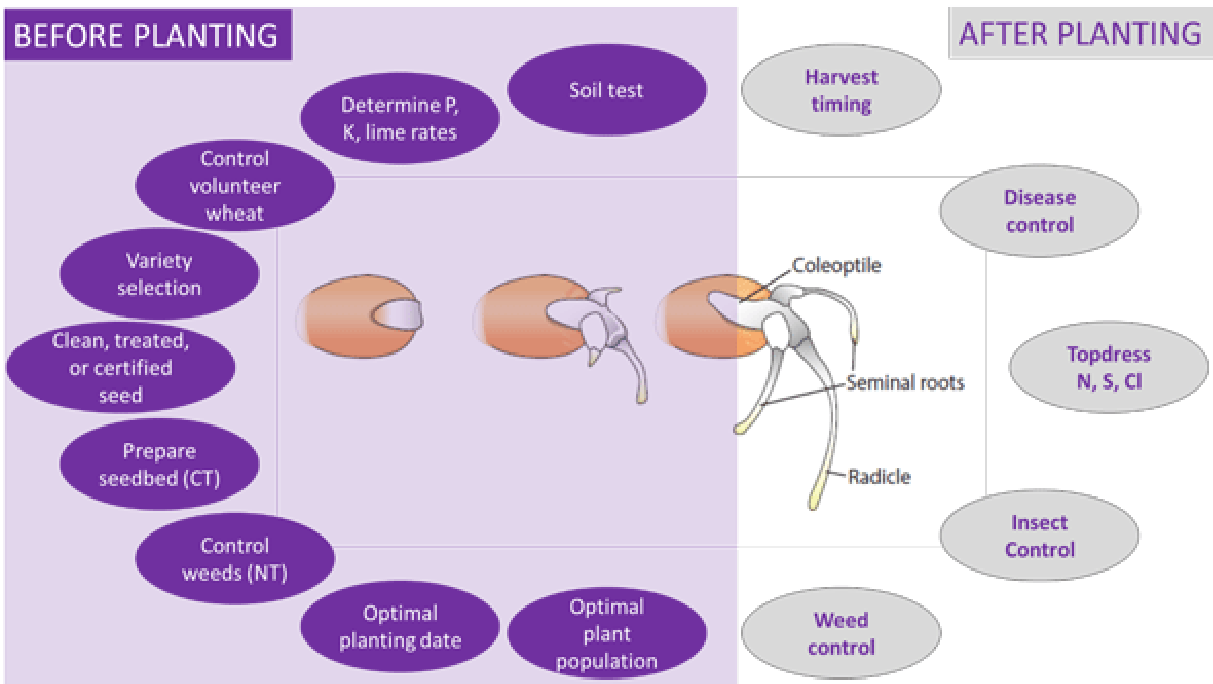

Figure 1. Best management practices to be adopted before and after planting to ensure maximum yield potential can be attained in a given growing season. Schematic representation by Romulo Lollato, K-State Research and Extension.

1. **Sowing dates**

a) K-State recommendations

Optimum sowing date for winter wheat is quickly approaching for a large portion of Kansas (Figure 2). Depending on geographical location, optimum sowing window can start as early as September 10th and last until the end of September (northwest Kansas), or it can start as late as October 5th and last until October 20th (southeast Kansas). This gradient in sowing dates, with earlier dates in the northwest, is a function of temperature. Northern regions will have cooler air and soil temperatures earlier in the year as compared to southern regions.

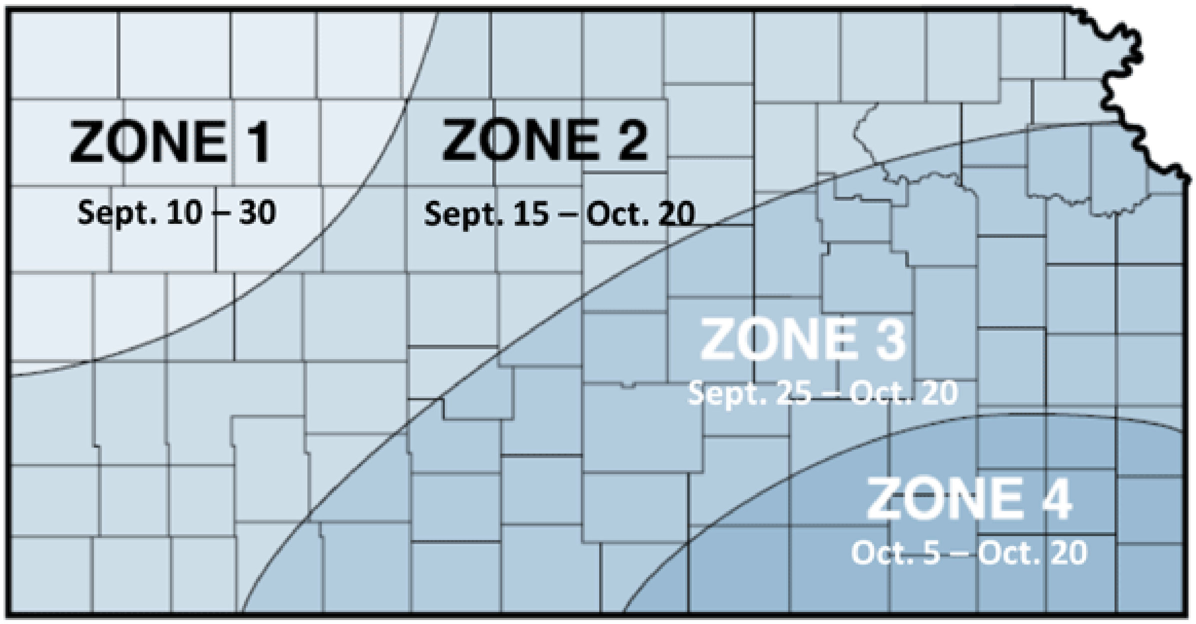

Figure 2. Optimum planting dates for winter wheat according to geographical location within Kansas. Figure adapted from K-State Research and Extension publication L-818, Kansas Crop Planting Guide.

b) Actual Kansas wheat sowing dates

According to historical data released by the USDA-NASS crop progress reports, on average, producers in Kansas planted approximately 50% of the crop prior to October 4th, and about 90% of the crop prior to October 25th during the 1994-2015 period (Figure 3).

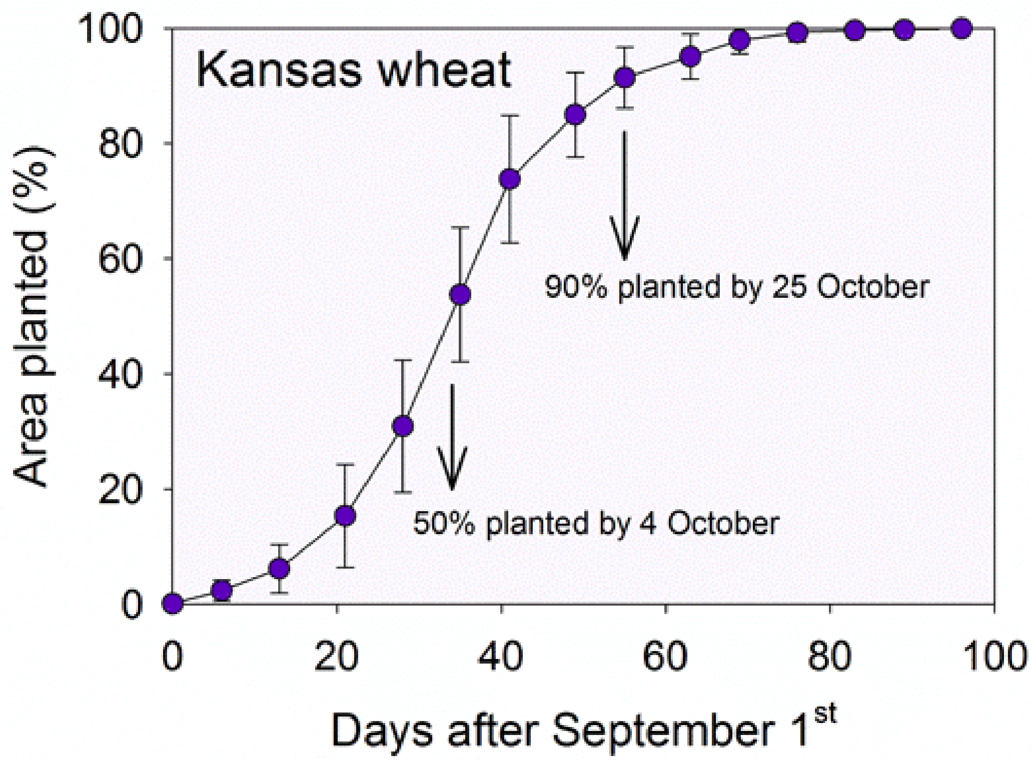

Figure 3. Average percent wheat area planted in Kansas after September 1st. Data represents average and standard deviation for percent planted area during the 1994-2015 period as reported by the USDA-NASS Crop Progress Reports (https://www.nass.usda.gov/Publications/National_Crop_Progress/).

Although 50% of the fields are, on average, planted by Oct. 4th, there is a large year-to-year variability (see error bars on Figure 3). This year-to-year variability is driven by sowing conditions, as extremely moist or dry soils may keep producers from sowing at the optimum planting date.

The largest variability in the progress of area planted in Kansas in the period 1994-2015 occurred between Sept. 20th and Oct. 15th. During the period between these dates, the difference in area planted between the earliest and the latest years between 1194 and 2015 was more than 40% (Figure 4). In other words, while 50% of the wheat area was sown by September 21st in the earliest year on record, only 7% of the area was sown by at the same date in the latest year on record. In the latest year, it was not until Oct. 11th that 50% of the wheat area was sown. The variability in planted area was lower at earlier planting dates (before Sept. 20th), probably because most producers tend to wait until the optimum planting window. Year-to-year variability in planted area also decreased toward the late planting window (after Oct. 15th), as most of the acreage had been planted by that time most years.

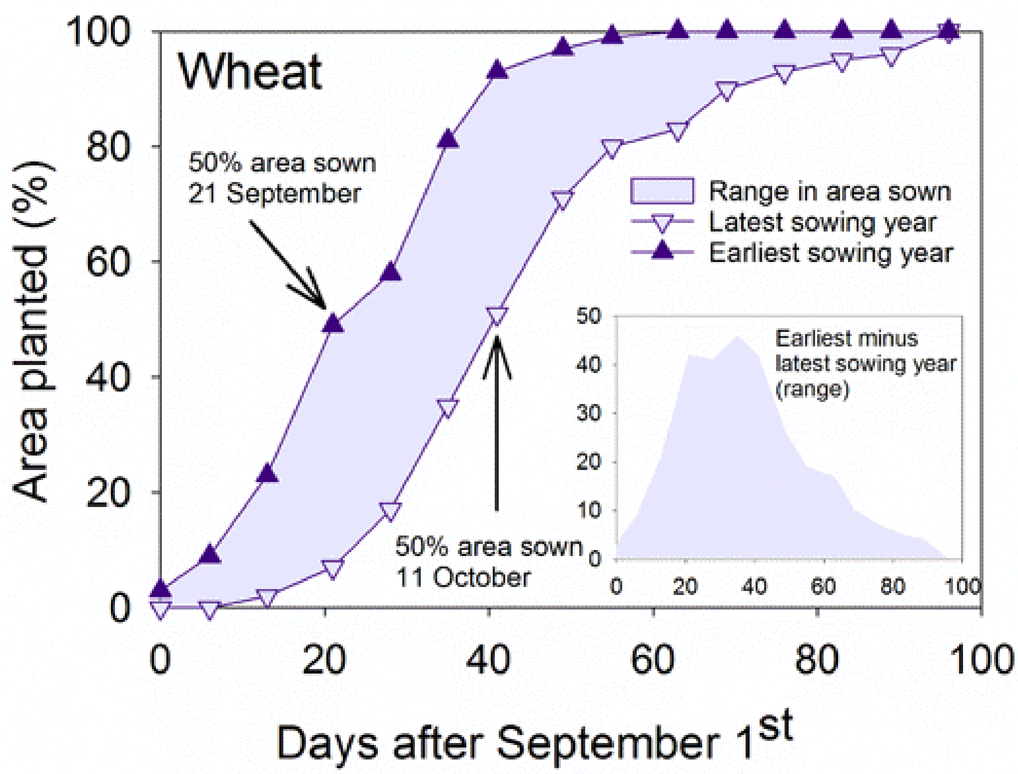

Figure 4. Percent wheat area planted in Kansas after September 1st for the earliest and latest years between 1994 and 2015 as reported in the USDA-NASS Crop Progress Reports (https://www.nass.usda.gov/Publications/National_Crop_Progress/). The range in area sown is shown as a light purple area in the main graph. Inset shows the difference in percent area planted between the earliest and the latest sowing years during this time period.

c) How wheat growth can be affected by sowing date

Sowing wheat early: Sowing wheat at an earlier-than-optimal date can result in lush vegetative growth, which will require more water to maintain the canopy later in the growing season. Producers who graze their wheat benefit from this lush growth and are encouraged to plant wheat two or three weeks earlier than the optimal sowing date for grain. Early sowing can also lead to an increased incidence of fall pest infestation, such as Hessian fly, and diseases transmitted by certain vectors more active in warmer temperatures, such as wheat streak mosaic (transmitted by wheat curl mites) and barley yellow dwarf (transmitted by bird cherry-oat aphids and greenbugs). The consequences of an earlier-than-optimal sowing date are discussed in a previous eUpdate article, available here.

Sowing wheat at the optimal time: The optimal sowing time differs year-to-year due to environmental conditions, such as temperature and precipitation, but the optimal winter wheat sowing range for different regions in Kansas is shown in Figure 1. Sowing wheat at the optimal time usually stimulates the right amount of fall tiller formation as well as root development to optimize yields while avoiding a lush vegetative growth. Fall-formed tillers contribute more to yield potential than spring-formed tillers. Therefore, it is crucial that about 3 to 5 tillers are well established before the winter sets in. Additionally, this tiller formation combined with a good crown root system development prior to winter dormancy increase winter hardiness of the crop, and consequently the chances of winter survival.

Sowing wheat late: Many reasons may lead producers to plant wheat late. Double-cropping wheat following a late-harvested summer crop, such as soybean or sorghum, is common in many regions of Kansas. Delayed planting date due to environmental conditions, such as soils that are too dry or too wet, may also occur. This year, many producers in central and eastern Kansas may face a delay in planting date due to wet soils (please see accompanying article in this issue of the Agronomy eUpdate, "Wheat planting conditions as of mid-September 2016"). When wheat is sown past the optimal window, it is generally sown into colder soils and the crop is exposed to cooler air temperatures. Sowing into colder soils will delay wheat emergence, so the importance of a seed fungicide treatment increases as planting date is delayed. Additionally, the crop will experience decreased fall tiller formation because wheat development is dependent on temperatures (Figure 4). Thus, increasing seeding rates in these circumstances is also warranted.

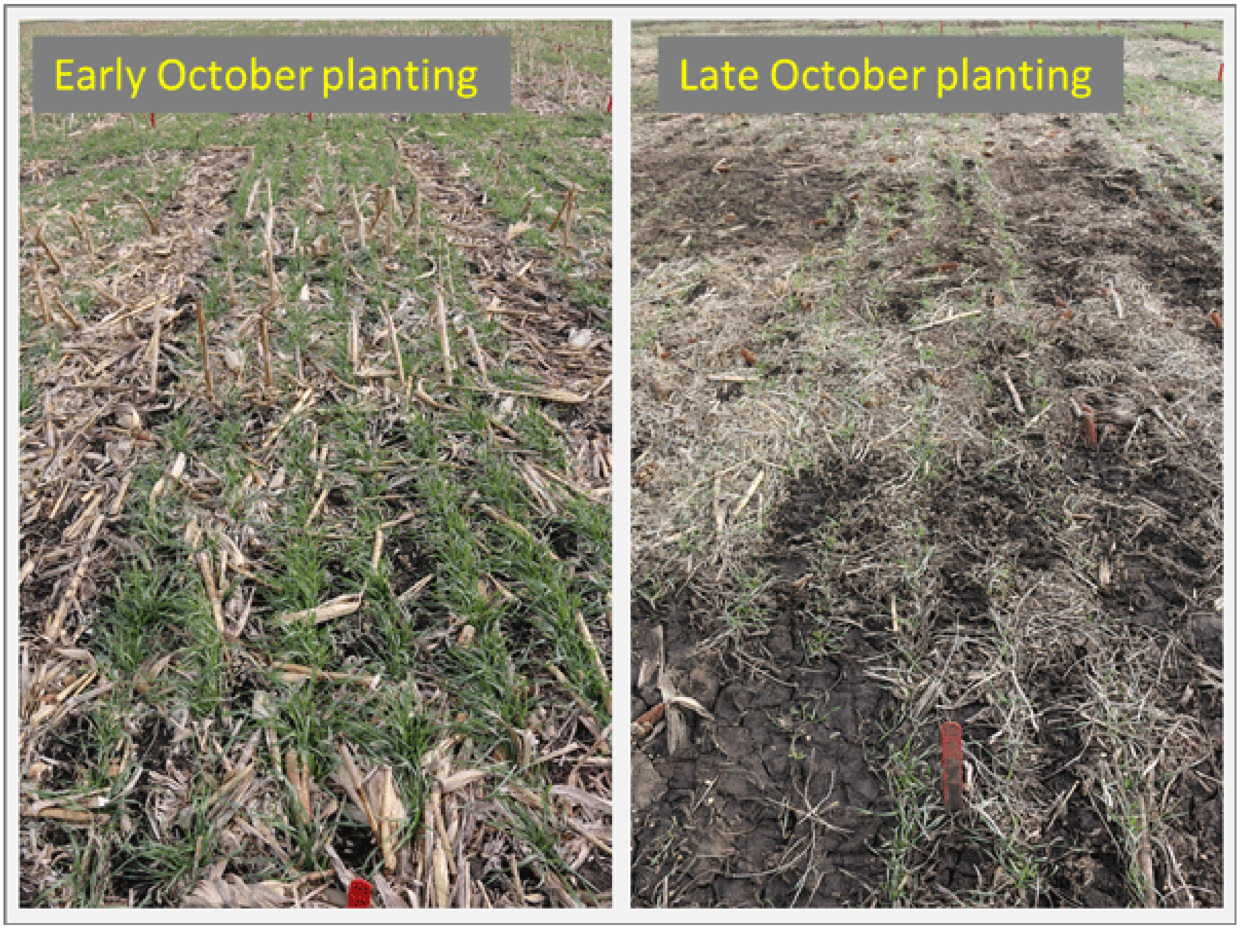

Figure 5. Difference in fall growth as a consequence of planting date following summer crops. Photos were taken December 8, 2015 from neighboring fields. One field was sown in early October no-till following corn (left); the other field was sown in late October no-till following soybeans (right). Photos by Romulo Lollato, K-State Research and Extension.

1. **Seeding rates**

Optimum seeding rate varies with geographical location in Kansas, following the precipitation gradient (Figure 5). If sown at the optimal date, the optimum seeding rate should be about 1,125,000 - 1,350,000 seeds per acre in the eastern portion of the state, where annual precipitation is more than 30 inches, or under irrigated conditions. The seeding rate should be decreased to 900,000 - 1,250,000 seeds/acre in the central region, where annual precipitation ranges between 20 and 30 inches; and a further decrease in seeding rate should occur in the western third of the state where annual precipitation is less than 20 inches, for a final seeding rate between 750,000 and 900,000 seeds per acre in that region.

Seeding rate should always be discussed along with planting date, and in many times with soil fertility status as well. As mentioned above, later planting dates will decrease the potential number of fall tillers formed and grain yield will be more dependent on the main stem along with maybe one or two tillers formed during the fall. Thus, the seeding rate should be increased as planting date is delayed (more information provided here). On the other hand, producers with a history of manure application and very high soil phosphorus and organic matter levels have been observing a yield increase from reduced plant populations. The reason behind this response is that high phosphorus levels and increased overall fertility resultant from long-term application of manure can increases the wheat tillering potential, decreasing the need for high plant populations.

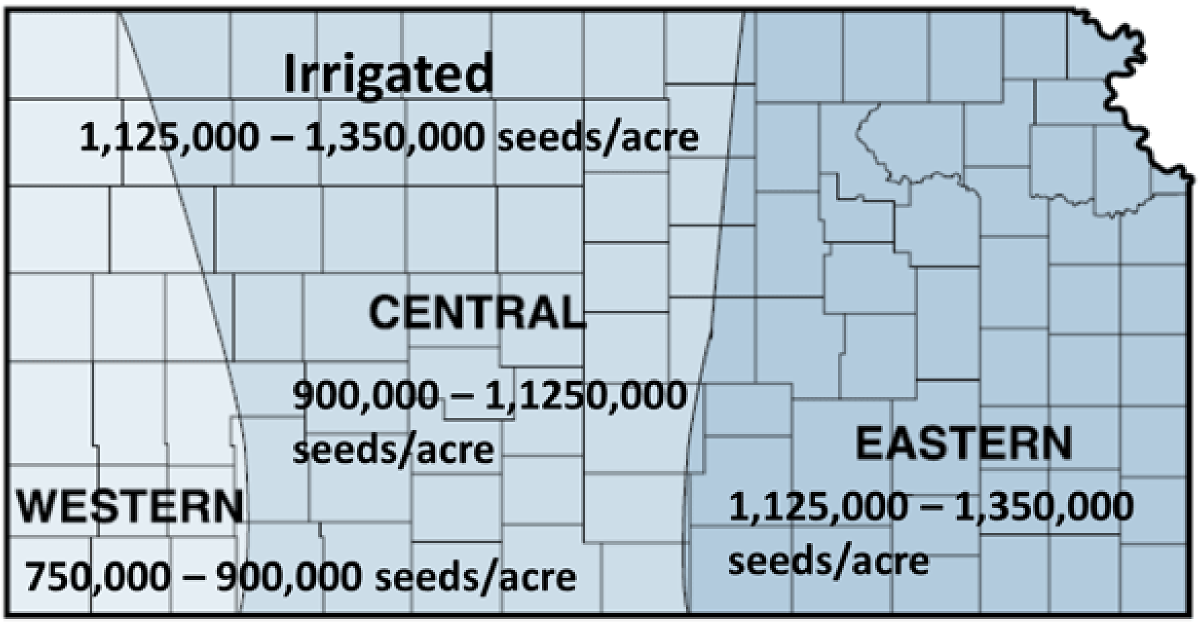

Figure 6. Optimum planting rates for winter wheat in Kansas. Figure adapted from K-State Research and Extension publication L-818, Kansas Crop Planting Guide.

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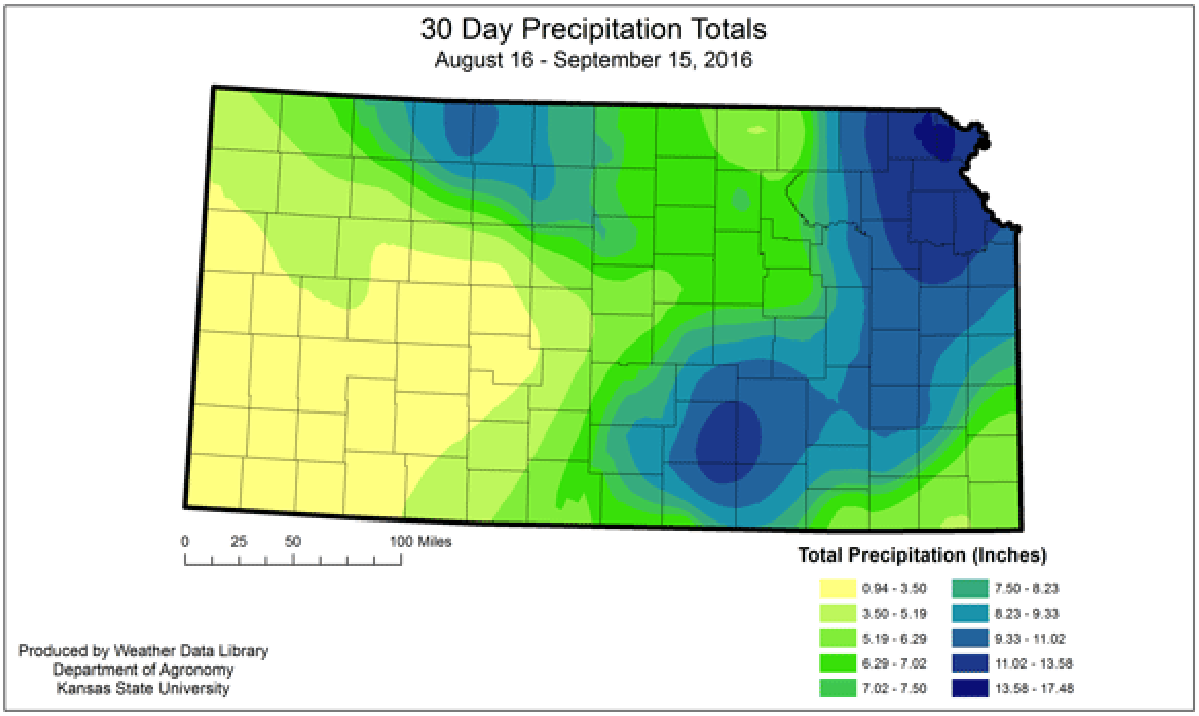
2. Wheat planting conditions as of mid-September 2016

Recent weather pattern

There have been significant rains throughout most of Kansas over last 30 days (August 16 - September 15), especially in central and eastern portions of the state (Figure 1). Most of the state received more than 4 inches of precipitation, and some regions received more than 10 inches in the period. Most of the state was at least 1.7 inches above normal for this period, with exception of southwest Kansas (Figure 2). While these rains can possibly translate into a "full moisture profile" going into the wheat growing season for most of the state, it can also provide some challenges for crop sowing and field operations.



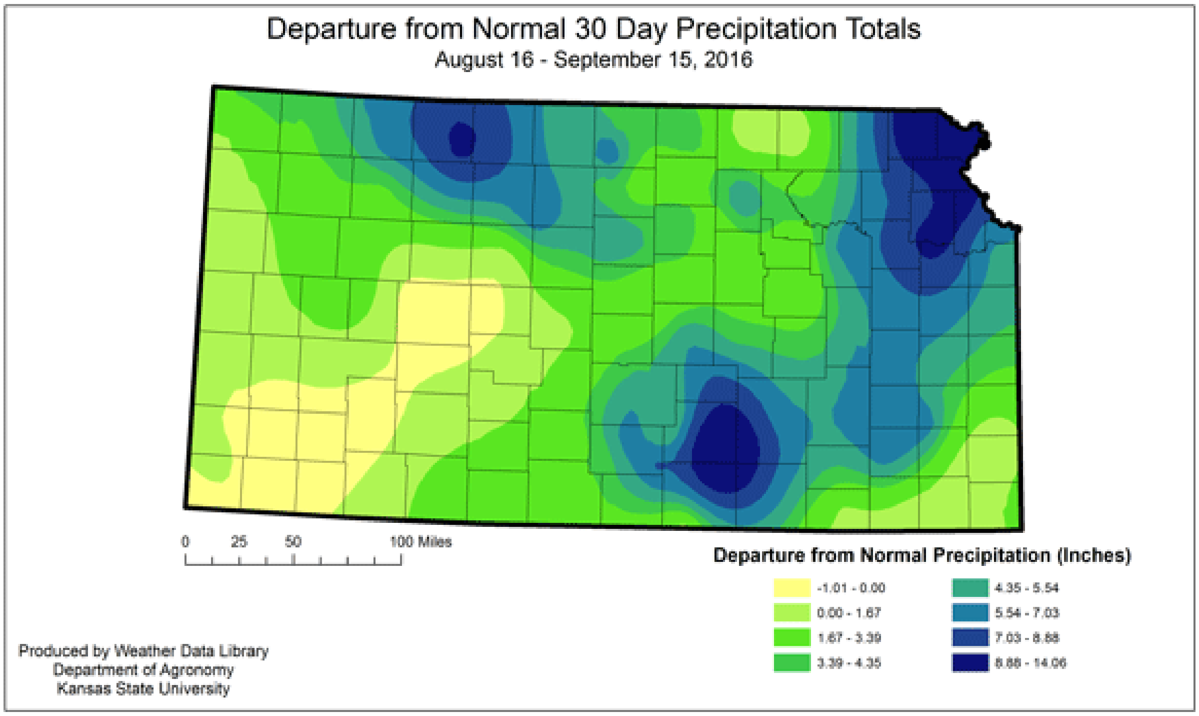


Figure 1. Total cumulative precipitation (top chart) and departure from normal 30-day precipitation totals (bottom chart) for the period between August 16 and September 15, 2016. Map by K-State Weather Data Library.

Heavy rains continued during the period of Sept.6-12, with the emphasis on south central Kansas for the week ending on the 12th of September (Figure 2). Additional rains fell in the northeastern portion of the state on Sept. 14 and are not included in Figure 2. The heaviest rainfall reported was 13.4 inches in Clearwater, Sedgwick County. By contrast, the western divisions were all below normal for the period, averaging less than a quarter of an inch or about a third of normal for the period. The statewide average was 1.91 inches or 252 percent of normal.

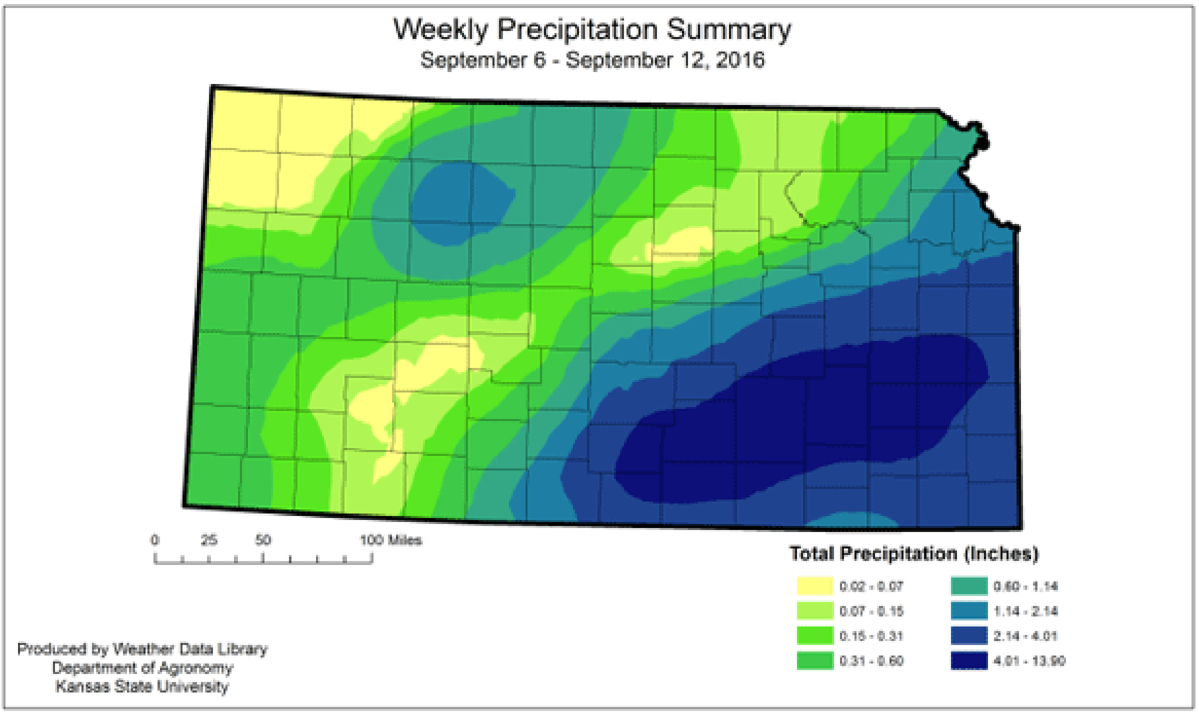


Figure 2. Total cumulative precipitation in the period between September 6 and September 12, 2016. Map by K-State Weather Data Library.

With the heavy rains over the last 10-14 days, flooding concerns occurred in the eastern and central parts of the state, while lack of recent rainfall increased concern for sufficient topsoil moisture in southwest Kansas, as winter wheat planting begins.

Future forecast

The weekly precipitation forecast for Kansas indicates that the probability of 0.1 to 1.75 inches of precipitation for the next 7 days. Central and north central Kansas have the highest precipitation probabilities (Figure 3). This forecast indicates that the heavy rainfall pattern observed in recent weeks may occur again in the next seven days for most of the state, which could present challenges for producers wanting to sow wheat at this time.

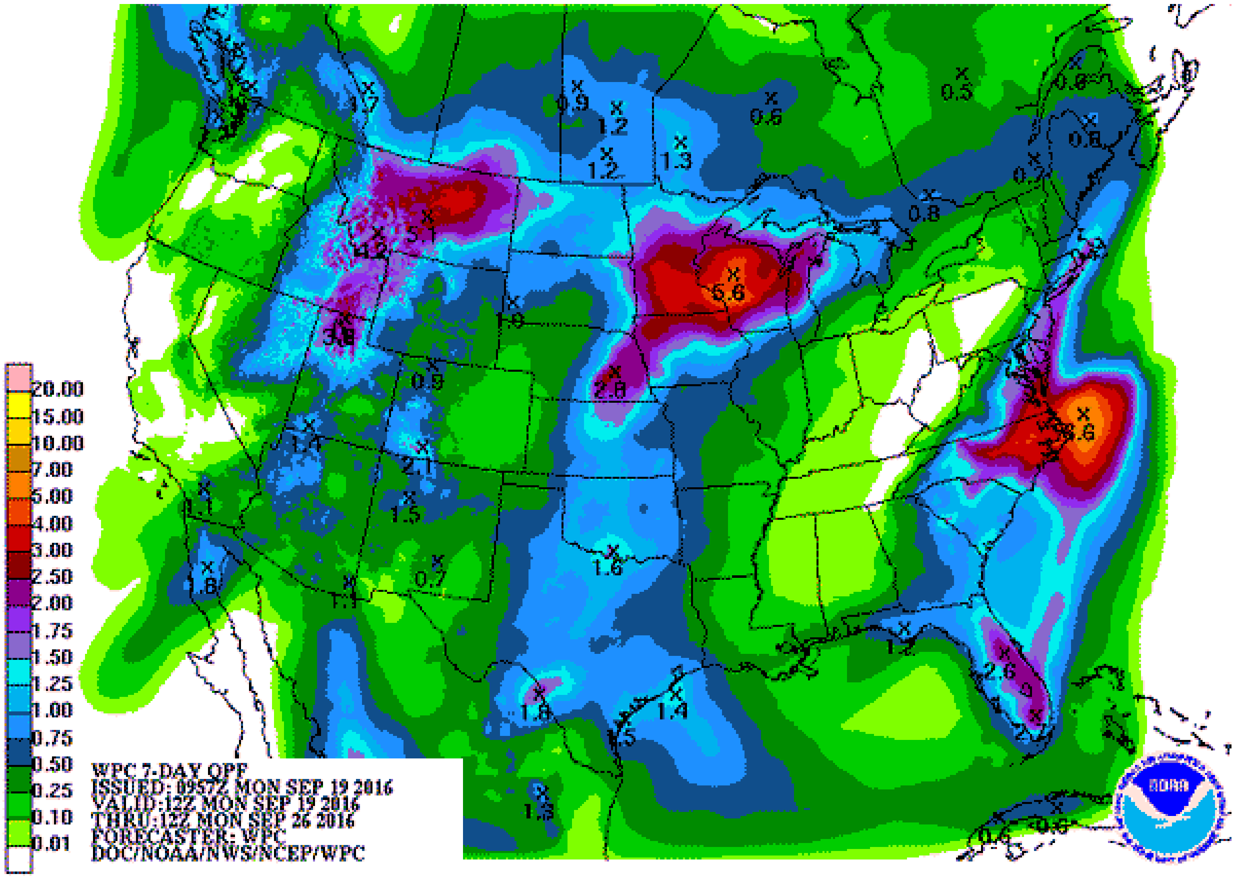


Figure 3. Weekly precipitation forecast as of September 16, 2016. Precipitation probabilities in Kansas for the next 7 days range from 0.1 to 1.75 inches.

Possible challenges for wheat planting and crop establishment

The current wheat planted acreage in Kansas, according to the latest USDA-NASS Crop Progress Report, was 4% as of Sept. 12. This is slightly below the 1994 - 2016 average of 6.2% (Figure 4), but is not a delay to be concerned about.

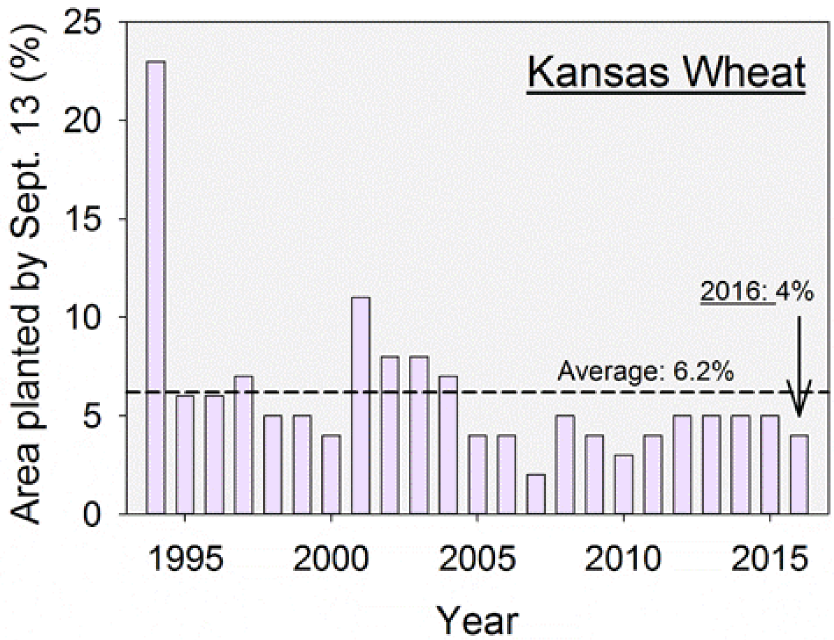


Figure 4. Percent wheat area in Kansas planted by September 13. Data shown for the period 1994 – 2015 as reported by the USDA-NASS Crop Progress Reports (https://www.nass.usda.gov/Publications/National_Crop_Progress/).

There could be a further delay in planting progress compared to previous years, mostly due to excessively moist soil conditions.

Planting wheat under wet conditions can present either mechanical or biological challenges.

- Mechanical challenges usually involve not being able to get equipment in the field to perform plowing or sowing operations, mudding up the equipment after field operations are started, and increased soil compaction due to machinery traffic in moist soils. Soil compaction can restrict adequate root growth, affecting plant anchorage and decreasing its ability to uptake water and nutrients.
- Among possible biological challenges, planting wheat into wet and cold soils can delay the crop's emergence, possibly increasing early-season disease and insect problems. In these situations, a fungicide and insecticide seed treatment might be a good option, especially if planting gets delayed.

In mid-September, we are still at the beginning of the optimum planting date for wheat for most of the state, so producers should not hurry and sow wheat into extremely moist soils. Waiting for the water to drain and/or evaporate so the soil dries adequately before performing the sowing operation would be the best option.

Planting wheat into a dry topsoil, as is the condition of many parts of southwest Kansas, can also be challenging. While a good seed distribution is generally achieved when sowing wheat into dry soils, the lack of moisture for germination can result in uneven stands and high within-field stand variability (Figure 5), which can ultimately impact resource-use efficiency and grain yield. Producers in southwest Kansas who are facing dry topsoil conditions have three main options:

1. Sowing the wheat at normal seeding rate and depth, and hope for rain
2. Plant deeper than usual to reach moisture
3. Wait for rain before planting

As it is still mid-September and we are in the early portion of the optimum sowing date range, producers should consider options 1 or 3 before option 2 above. Warm soils, typical in mid-September, can reduce wheat coleoptile length, which can result in sub-optimal stands if wheat is sown deeper than usual. For more information on the advantages and disadvantages of each of the options above, please click here.

Figure 5. Uneven wheat stands from sowing into dry soils. Photo by Romulo Lollato, K-State Research and Extension.

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3. Heavy rains in northeast Kansas September 14 reach historic levels

The heavy rains that occurred in south central Kansas on Sept. 8-9 moved in to Northeastern Division on Sept. 14. Hiawatha, in Brown County, had particularly heavy amounts. As reported in the Sept. 12, 2106 issue of the Agronomy eUpdate, the Hydrometerological Design Studies Center, a branch of the National Oceanic and Atmospheric Administration, NOAA Atlas 14, addresses the frequency of rainfall events on time-scales ranging from 5 minutes to 60 days. Not surprisingly, return rates will differ at different parts of the state, as rainfall patterns vary. The 24-hour total of 9.73 inches reported at the Hiawatha COOP station falls in the 200-year return rates. Other stations in the vicinity reported 11 inches. The table below shows the recurrence intervals, with the recent event highlighted:

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES for Hiawatha 9SE, Kansas

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION

NOAA Atlas 14, Volume 8, Version 2

Duration Average recurrence interval (years)

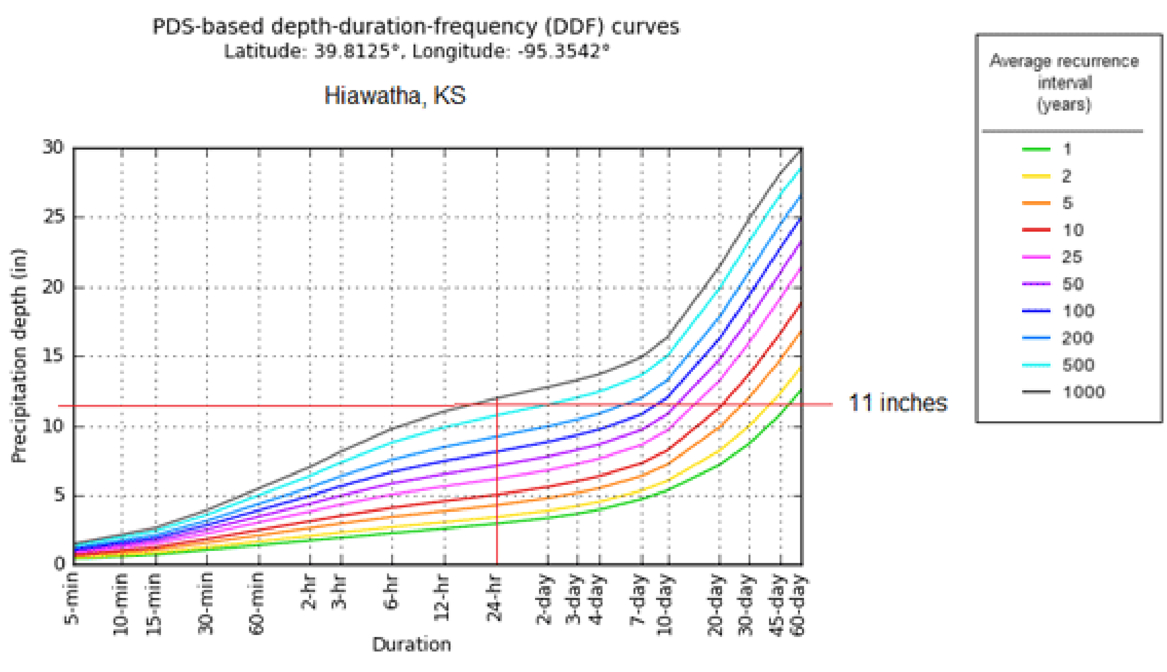
	1	2	5	10	25	50	100	**200**	500	1000
60-min	1.38	1.64	2.09	2.47	3.01	3.44	3.88	4.34	4.96	5.45
	(1.07	(1.27	(1.60	(1.89	(2.23	(2.49	(2.73	(2.93	(3.23	(3.46
	1.79)	2.13)	2.71)	3.22)	4.04)	4.67)	5.37)	6.14)	7.18)	7.97)
2-hr	1.72	2.05	2.62	3.11	3.8	4.36	4.94	5.54	6.36	7.01
	(1.34	(1.60	(2.03	(2.40	(2.85	(3.20	(3.51	(3.78	(4.19	(4.50
	2.21)	2.64)	3.37)	4.01)	5.07)	5.87)	6.77)	7.77)	9.13)	10.2)
3-hr	1.92	2.29	2.93	3.49	4.29	4.94	5.62	6.33	7.32	8.1
	(1.50	(1.79	(2.29	(2.71	(3.24	(3.65	(4.02	(4.36	(4.85	(5.23
	2.45)	2.93)	3.75)	4.48)	5.70)	6.62)	7.68)	8.84)	10.4)	11.7)
6-hr	2.25	2.68	3.42	4.08	5.04	5.83	6.66	7.54	8.77	9.76
	(1.78	(2.12	(2.69	(3.19	(3.85	(4.35	(4.81	(5.24	(5.88	(6.37
	2.84)	3.38)	4.33)	5.17)	6.63)	7.74)	9.02)	10.4)	12.4)	13.9)
12-hr	2.58	3.03	3.83	4.55	5.61	6.5	7.44	8.44	9.86	11
	(2.06	(2.42	(3.05	(3.60	(4.34	(4.90	(5.43	(5.94	(6.68	(7.25
	3.21)	3.78)	4.79)	5.71)	7.33)	8.55)	9.98)	11.6)	13.8)	15.5)
24-hr	2.92	3.4	4.24	5	6.14	7.08	8.09	**9.18**	10.7	11.9
	(2.36	(2.74	(3.41	(4.00	(4.80	(5.40	(5.98	*(6.52*	(7.33	(7.95
	3.60)	4.20)	5.25)	6.21)	7.93)	9.23)	10.8)	*12.5)*	14.9)	16.7)
2-day	3.33	3.85	4.76	5.57	6.77	7.76	8.81	9.93	11.5	12.8
	(2.71	(3.13	(3.86	(4.50	(5.34	(5.97	(6.57	(7.12	(7.96	(8.59

4.06)	4.70)	5.82)	6.84)	8.63)	9.98)	11.6)	13.3)	15.8)	17.7)

3-day	3.65 (2.99–4.42)	4.2 (3.44–5.09)	5.15 (4.20–6.26)	6 (4.87–7.31)	7.23 (5.73–9.14)	8.24 (6.38–10.5)	9.3 (6.97–12.1)	10.4 (7.53–13.9)	12 (8.36–16.4)	13.3 (8.98–18.3)
4-day	3.93 (3.23–4.74)	4.5 (3.70–5.43)	5.49 (4.49–6.63)	6.35 (5.17–7.71)	7.61 (6.05–9.56)	8.63 (6.70–11.0)	9.71 (7.30–12.6)	10.8 (7.85–14.4)	12.4 (8.68–16.9)	13.7 (9.30–18.7)
7-day	4.67 (3.88–5.58)	5.29 (4.38–6.32)	6.34 (5.24–7.60)	7.26 (5.96–8.73)	8.59 (6.87–10.7)	9.66 (7.56–12.1)	10.8 (8.17–13.8)	12 (8.73–15.7)	13.6 (9.57–18.3)	14.9 (10.2–20.2)

The full atlas, with access to other locations, can be found online at http://www.nws.noaa.gov/oh/hdsc/index.html

Additional precipitation maps for Kansas can be found on the Kansas Climate website at: http://climate.k-state.edu/



NOAA Atlas 14, Volume 8, Version 2

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