KANSAS CLIMATE and DROUGHT UPDATE – January 2018 Summary

General

- U.S. Drought Monitor: Below normal precipitation during the past 30 days led to, an addition of severe drought (D2) and expansion of areas of moderate drought (D1) and severe drought (D2) during January. Abnormally dry (D0) conditions cover 100% of Kansas.

- Precipitation in January was below normal for the entire state, although some areas recorded significant precipitation.

- No severe weather was reported in January, but there were several winter weather advisories, several days with extreme fire danger, and also several days with wind chill warnings.

- La Nina advisory issued by forecasters for winter 2017/18. La Nina affects temperature and precipitation across the U.S., generally favoring above normal temperatures and below median precipitation across southern U.S, and below average temperatures and above median precipitation across the northern tier of the United States. Reduced snowfall is usual over parts of the central-southern Plains.

Lakes and Streams

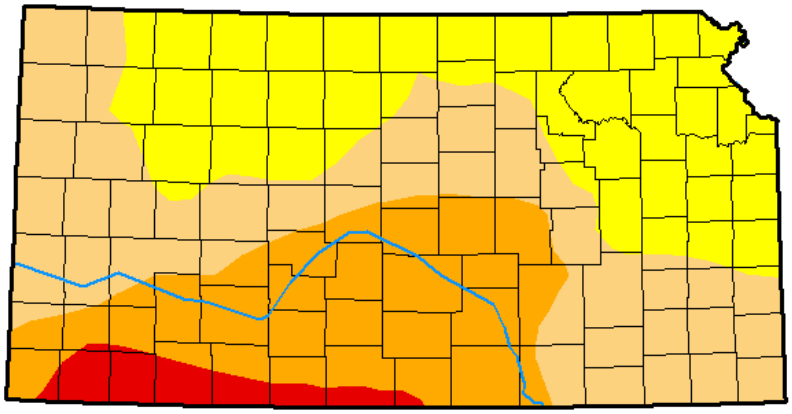
- Water Rights above the USGS gage on the Little Arkansas River at Alta Vista have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

General Conditions

With much below normal precipitation, there was a steep increase in the drought conditions during January. Extreme drought conditions cover over 4 percent of the state at the end of the month. Severe drought has expanded to over a quarter of the state while moderate drought covers an additional 36 percent of the state. No area of the state is currently drought-free. With the wet summer last year and current dryness, increased fire danger continues.

U.S. Drought Monitor

Kansas



January 30, 2018

(Released Thursday, Feb. 1, 2018)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	65.29	29.07	4.30	0.00
Last Week *01-23-2018*	0.00	100.00	52.91	19.19	4.08	0.00
3 Months Ago *10-31-2017*	85.96	14.04	0.64	0.00	0.00	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *01-31-2017*	35.09	64.91	26.02	6.68	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

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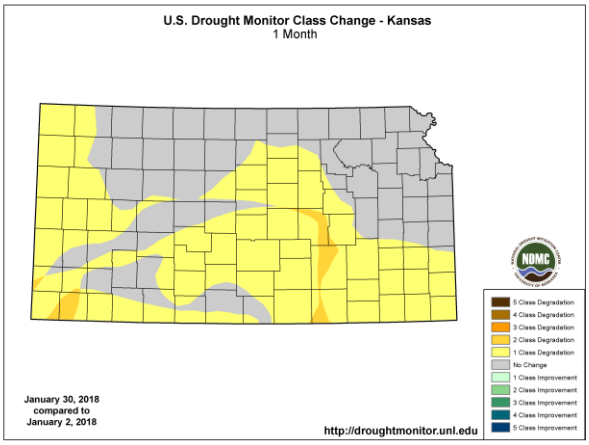
NCEI/NOAA

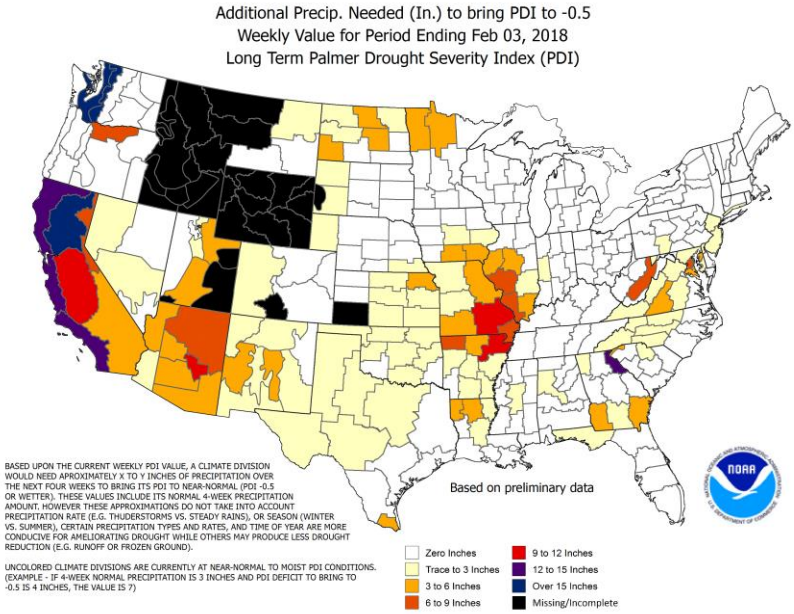
http://droughtmonitor.unl.edu/

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.



Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought.

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml



Long-term PDI Precipitation needed to remove drought for weeks ending on date					
Climate Division	Jan 6	Jan 13	Jan 20	Jan 27	Feb 3
North Central	0.53	0.31	0.47	0.41	0.51
Northeast	3.12	2.86	3.04	3.12	3.16
Central	2.9	2.75	2.7	2.73	2.78
East Central	0.94	0.54	0.47	0.69	0.72
South Central	2.47	2.36	2.35	2.51	2.54
Southeast	0.44	-	0.3	0.85	1.18

Federal Disaster Declarations 2018

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

No USDA drought disasters have been declared in 2018 for Kansas.

Presidential Federal Disasters

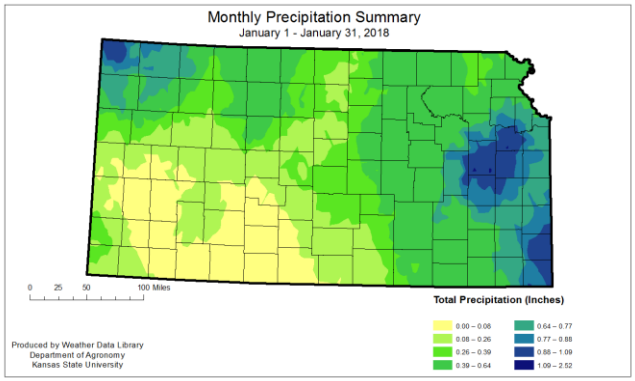
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

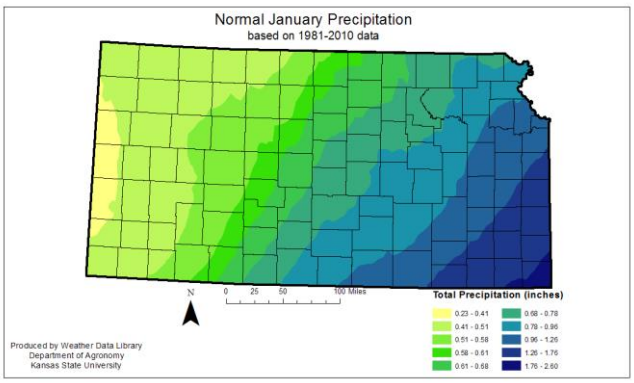
Climate Summary (Precipitation and Temperature)

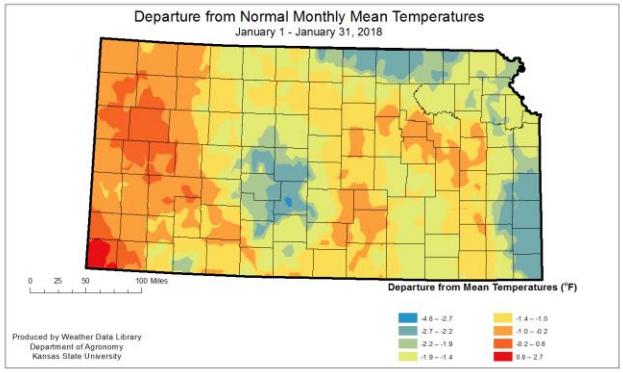
Parts of Kansas recorded some significant precipitation in January. At Tribune, a small snow event on January 12th snapped a 97-day period without any precipitation, tying the previous record set in 1901. When it comes to a wetting precipitation event – defined as a tenth of an inch or greater – Elkhart is just two days shy of the 120-day record set in 1936. Manhattan established a new record of 87 days, which ended on January 10th with 0.17 inches. The previous record was 76 days set in 1927. State-wide the average precipitation was 0.34 inches or 46 percent of normal. The East Central Division came closest to normal with 0.65 inches or 67 percent of normal. The South Central Division, with just 0.18 inches, had the lowest percent of normal with just 21 percent. The greatest monthly precipitation totals were 2.52 inches at Osage City, Osage County (NWS) and 2.05 inches at St. Francis 12.1 NW, Cheyenne County (CoCoRaHS). Most of the precipitation came in the form of snowfall. A series of storms brought snowfall across mainly the northern half of the state. Forty-six locations set daily records for snowfall. Multiple locations tied for the greatest daily snowfall at 9 inches at Atwood, Rawlins County, on the 22nd. The greatest snowfall totals for the month were 12 inches at Atwood, Rawlins County (NWS) and 14.4 inches at Goodland 16.6 NW, Sherman County (CoCoRaHS).

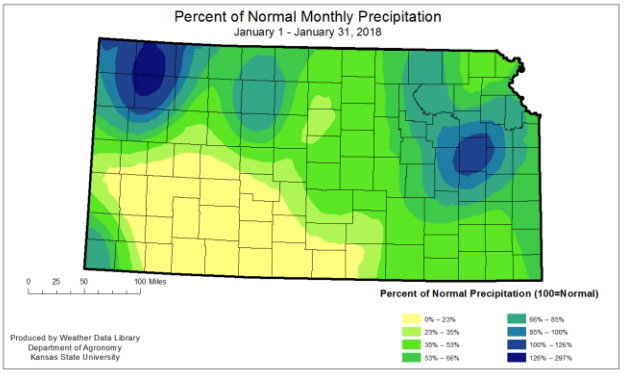
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	January 1-31, 2018			January 1-January 31, 2018			April 1, 2017-January 31, 2018			September 1, 2017-January 31, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.28	-0.17	61	0.28	-0.17	61	17.62	-1.89	89	3.95	-0.97	77
West Central	0.22	-0.28	48	0.22	-0.28	48	19.49	0.72	104	4.84	-0.13	97
Southwest	0.19	-0.28	41	0.19	-0.28	41	19.36	1.37	108	3.85	-1.08	80
North Central	0.36	-0.27	60	0.36	-0.27	60	22.41	-2.78	89	5.57	-1.79	75
Central	0.29	-0.40	43	0.29	-0.40	43	21.32	-4.71	82	5.12	-2.39	70
South Central	0.18	-0.65	21	0.18	-0.65	21	24.81	-2.72	90	5.81	-2.87	66
Northeast	0.31	-0.50	40	0.31	-0.50	40	24.61	-6.99	77	5.02	-5.12	50
East Central	0.65	-0.29	67	0.65	-0.29	67	29.19	-4.75	84	6.22	-5.04	53
Southeast	0.58	-0.67	46	0.58	-0.67	46	36.40	-0.35	98	7.65	-5.69	57
STATE	0.34	-0.40	46	0.34	-0.40	46	24.09	-2.19	92	5.37	-2.75	69





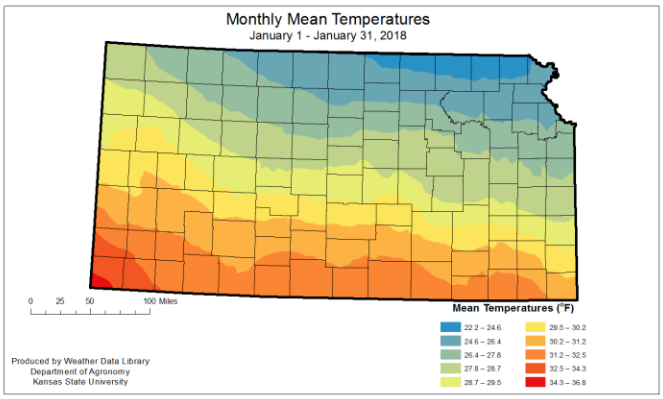


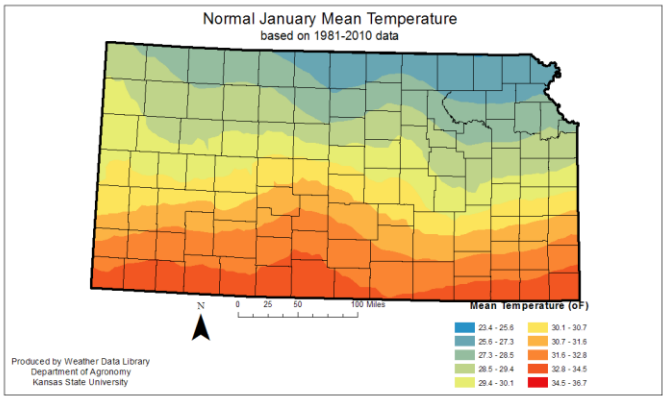


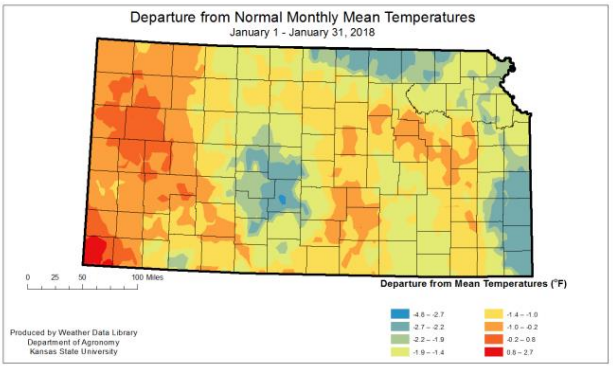
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

January continued the pattern of wide temperatures swings, as might be expected with the dry air in place. The statewide average temperature was 28.8 °F, or 1.1 degrees cooler than normal. The warm days weren't persistent enough to outweigh the very cold start to the month. The western divisions came closest to normal, with the Southwest Climate Division coming in as the warmest, averaging 32.7 °F, or 0.1 degrees warmer than normal. The central and eastern divisions were all colder than normal. The Northeast had the greatest departure, with an average of 25.0 °F or 2.5 degrees cooler than normal. The warmest temperature reported for the month was 83 °F at Medicine Lodge, Barber County, on the 20th. The coldest reading was -16 °F at Belleville, Republic County, on the 1st. Records were set on both the cold and warm end of the spectrum. On the cold side, there were 37 new record low maximum temperatures and 31 new record low minimum temperatures. On the warm side, there were 41 new record high maximum temperatures and 53 new record high minimums.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	January 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	43.3	13.1	28.2	-0.6	74	20	-9	1
West Central	47.1	12.8	30.0	0.2	77	11	-10	1
Southwest	50.8	14.5	32.7	0.6	80	20	-9	1
North Central	38.5	13.3	25.9	-2.0	69	11	-16	1
Central	41.8	15.4	28.6	-1.3	77	11	-10	1
South Central	45.2	16.8	31.0	-1.1	83	20	-8	1
Northeast	36.7	13.3	25.0	-2.5	66	26	-13	1
East Central	38.5	15.9	27.2	-1.9	68	25	-22	1
Southeast	42.1	18.3	30.2	-1.5	69	22	-7	2
STATE	42.7	14.8	28.8	-1.1	83	20th	-22	1st
Data Source: KSU Weather Library								







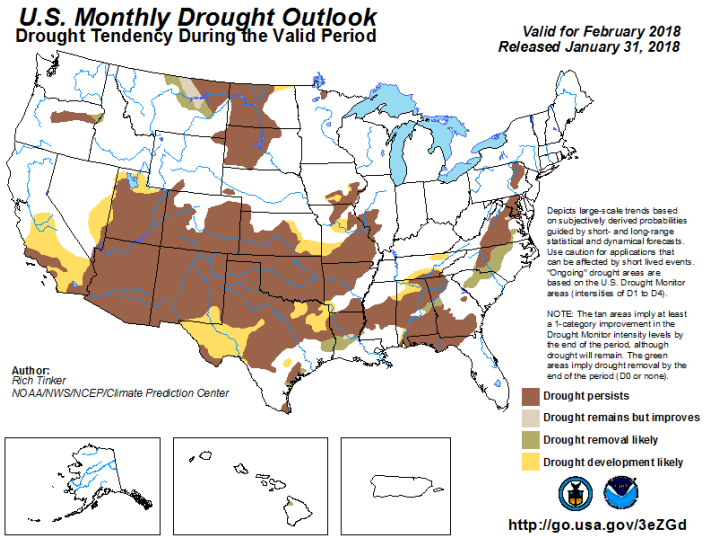
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

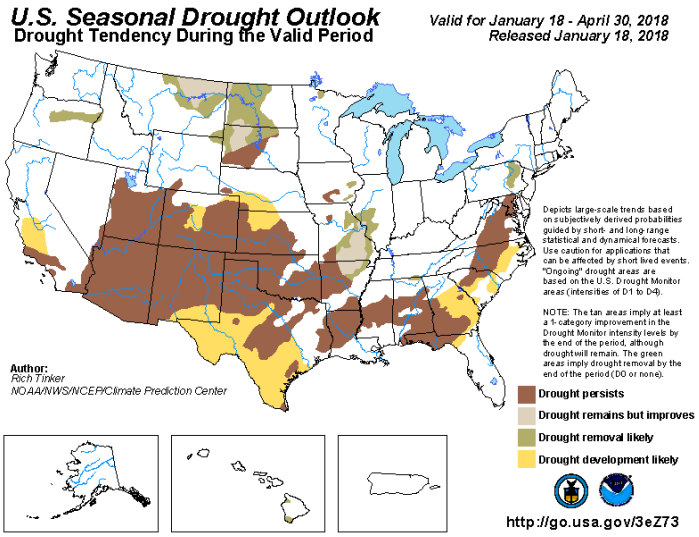
Future Outlook

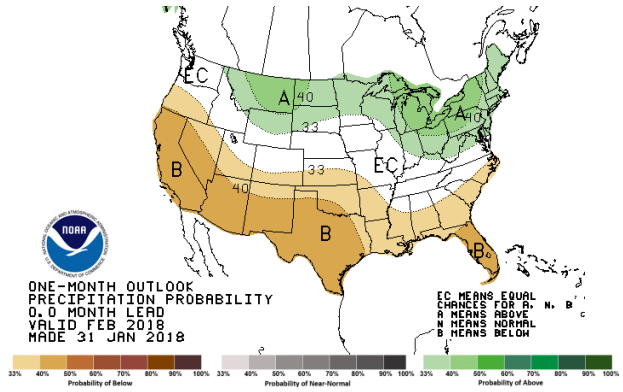
The Monthly Drought Outlook indicates drought conditions to remain in southern and western Kansas.
The February outlook has a slight chance for drier than normal conditions in the southern half the state, and equal chances for above or below normal precipitation in the rest of the state. Given the low amount of moisture that typically is seen in February, improvement in the current drought status is unlikely.

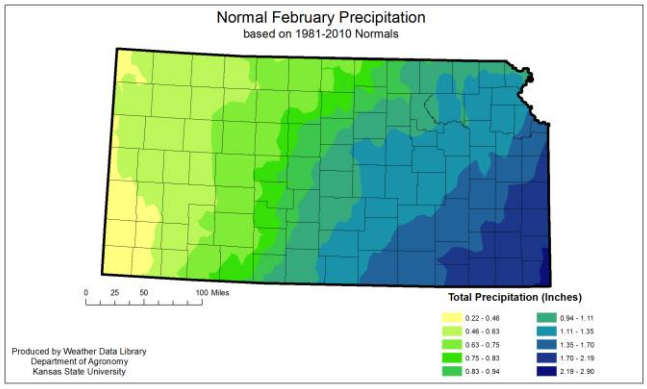
Seasonal Outlook also favors continued drought in south central, central and western Kansas with expansion of areas affected to include the north central Kansas. For the February-April time period probability favors below normal precipitation and above normal temperatures for western parts of the state. The remaining area have equal chances of below or above normal precipitation and temperatures for the period.

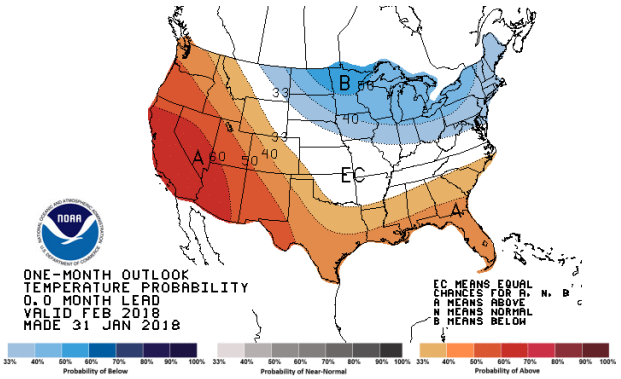
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

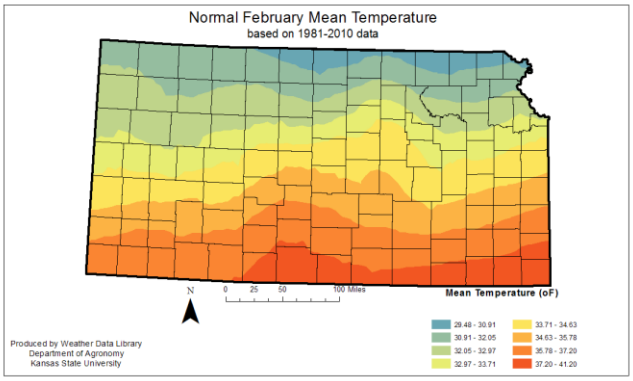


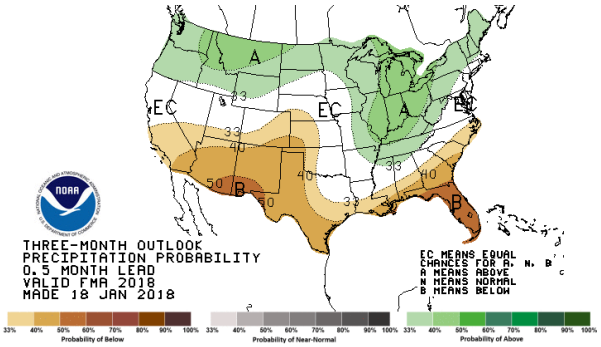


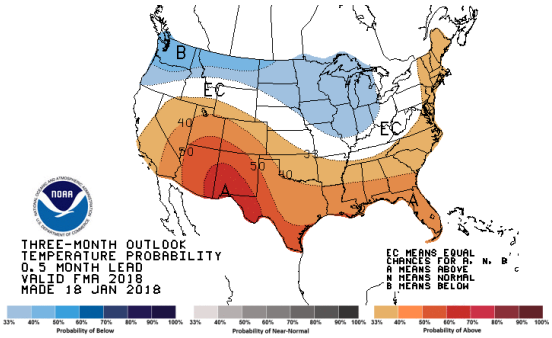












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of February 1, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (February 1, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ February 1, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs remained below normal in January. Additional releases were made from Milford to reach the lower winter pool elevation target. These releases were beneficial with the extended freezing conditions over the month. Bypassing all inflows from Tuttle and the releases from Milford resulted in near median flows in the Kansas River.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received very little inflow in January. Melvern declined over the month from lack of inflow and minimum releases. Pomona and Hillsdale declined primarily from releases to lower lake level, according to the seasonal plan. Flow in the Marais des Cygnes River maintained near median values due to the releases from Pomona and Hillsdale reservoirs.

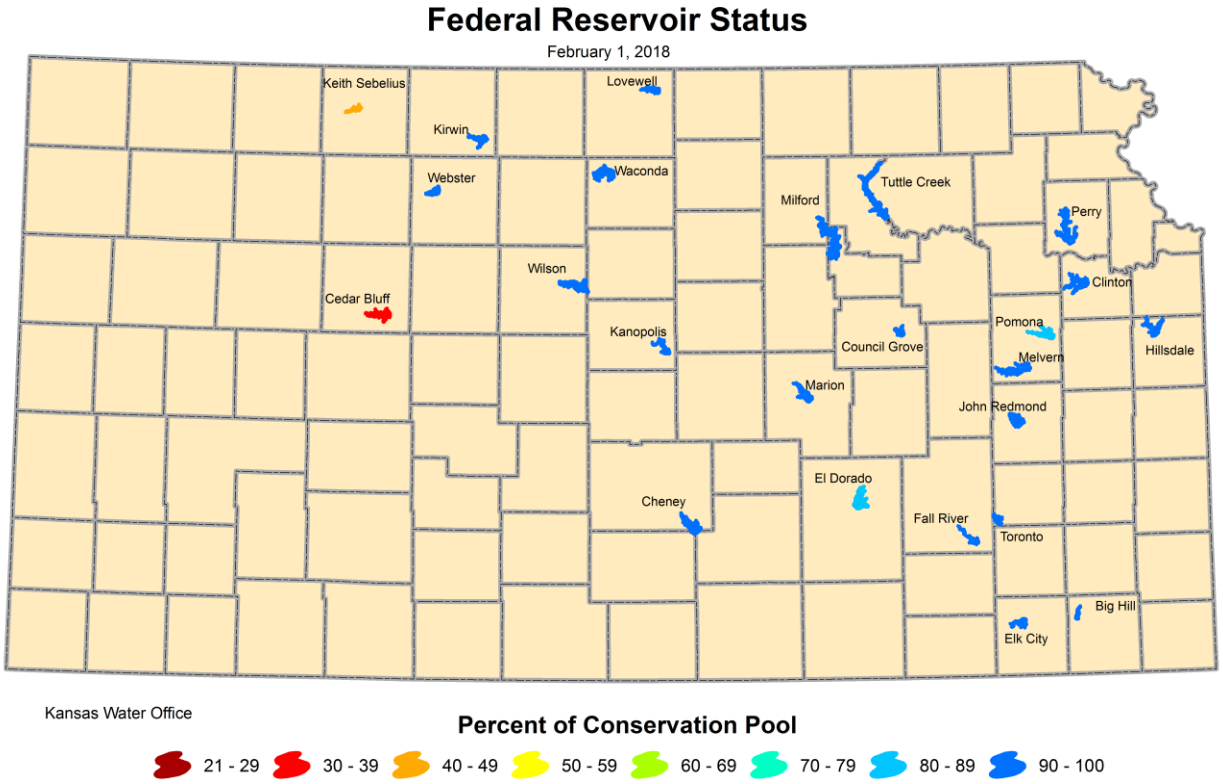
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low throughout the month and streamflow declined throughout the basin, especially the Upper Neosho. Conservation storage is full in John Redmond but steadily declined in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow in the upper system.

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs remained near conservation pool levels in January but reservoir releases were necessary to supplement low flow conditions of the Fall and Verdigris Rivers.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool.

Smoky Hill basin: The middle Smoky Hill basin maintained near median streamflow. Kanopolis Lake declined throughout December and into the first week of January due to releases necessary to accommodate a periodic inspection of the outlet works. After the inspection the discharge was reduced to 10 cfs and inflows were sufficient to refill conservation storage.

General Reservoir Conditions



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**01/31/2018**		
Norton[1]	2304.3	2291.84	-12.46	39.8
Harlan County, NE	1945.73	1938.72	-7.01	72.6
Lovewell[1]	1582.6	1581.3	-1.3	89.6
Milford[1]	1144.4	1143.34	-1.06	95.7
Cedar Bluff	2144	2117.68	-26.32	29.8
Kanopolis[1]	1463	1463.34	0.34	100
Wilson[1]	1516	1516.18	0.18	100
Webster[1]	1892.5	1893.66	1.16	100
Kirwin[1]	1729.3	1728.67	-0.63	97.1
Waconda[1]	1455.6	1454.59	-1.01	94.3
Tuttle Creek[1]	1075	1073.13	-1.87	92.3
Perry[1]	891.5	893.22	1.72	100

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Clinton[1]	875.5	876.28	0.78	100
Melvern[1]	1036	1034.91	-1.09	95
Pomona[1]	974	972.33	-1.67	88.5
Hillsdale[1]	917	915.97	-1.03	93.7
Arkansas River Basin		**02/01/2018**		
Cheney	1421.6	1420.47	-1.01	94.0
El Dorado	1339	1335.55	-3.66	83.0
Toronto[1]	901.5	901.50	0.07	100.0
Fall River[1]	948.5	947.98	-0.20	97.0
Elk City[1]	796	796.36	0.20	100.0
Big Hill	858	857.64	-0.52	98.0
Council Grove[1]	1274	1272.45	-1.21	93.0
Marion[1]	1350.5	1348.70	0.20	100.0
John Redmond[1]	1039	1041.58	0.78	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

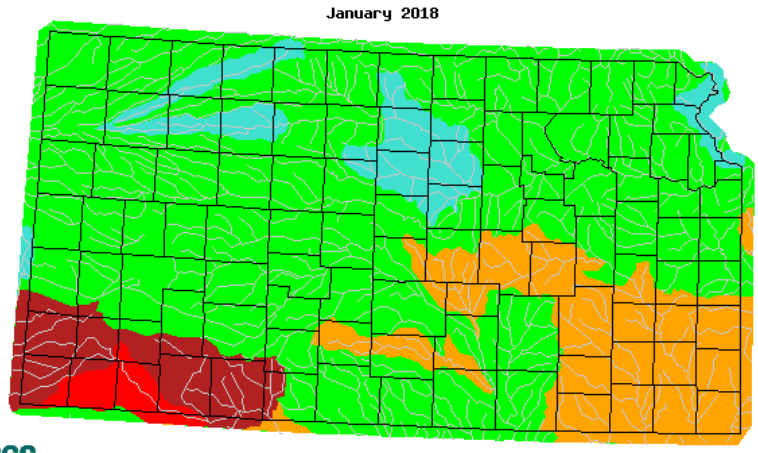
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. The following warnings and watches were in issued by KDHE and remain in effect until testing begins again in spring.

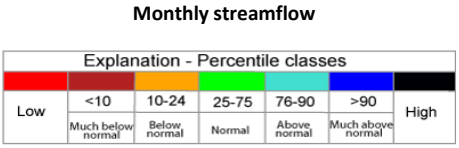
November 28, 2017: Public Health Watch for Central park Pond, Shawnee County and Hiawatha City Lake, Brown County.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

Monthly stream flow compared to historical is reflected in the map below.





In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

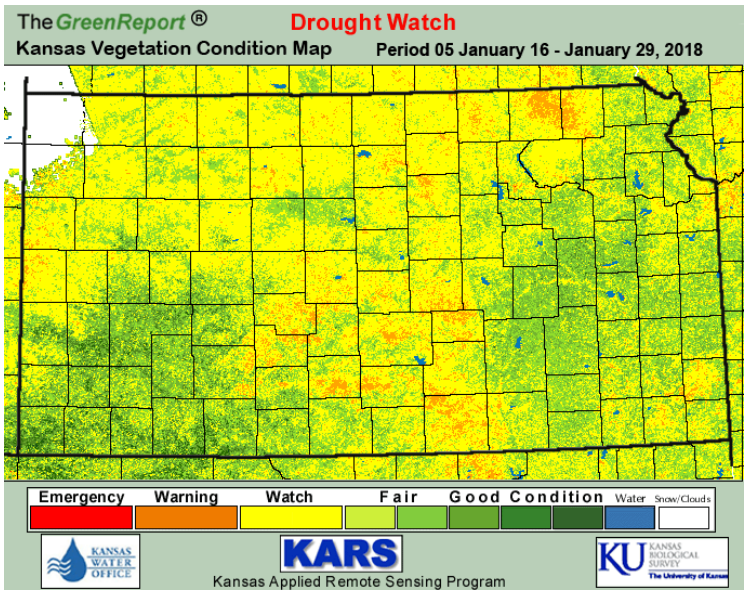
Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

MDS administration occurred during the month, with administration beginning August 10, 2017 on the Little Arkansas River at Alta Mills. The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.

There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage.

Streamflows as of February 1, 2018				
Gaging Station	**Current Flow**	**Feb MDS**	**Jan MDS**	**Comment**
Republican River at Concordia	Ice	125	100	
Republican River at Clay Center	Ice	150	125	
Mill Creek near Paxico	9	8	8	
Delaware River near Muscotah	Ice	10	10	
Rattlesnake Creek near Macksville	0	5	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	11	15	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	5	8	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	6	10	10	No surface water diversions junior to MDS above gage

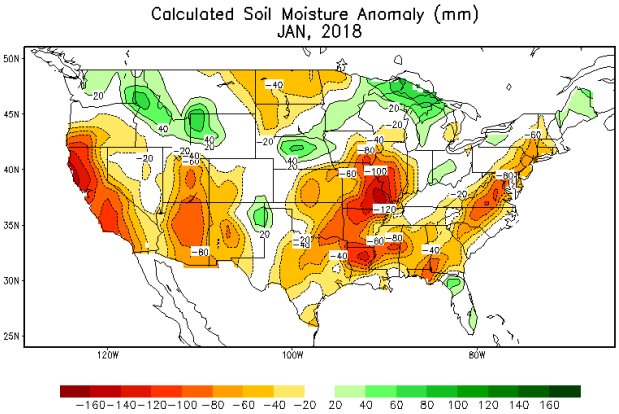
Soil, Crop and Vegetation

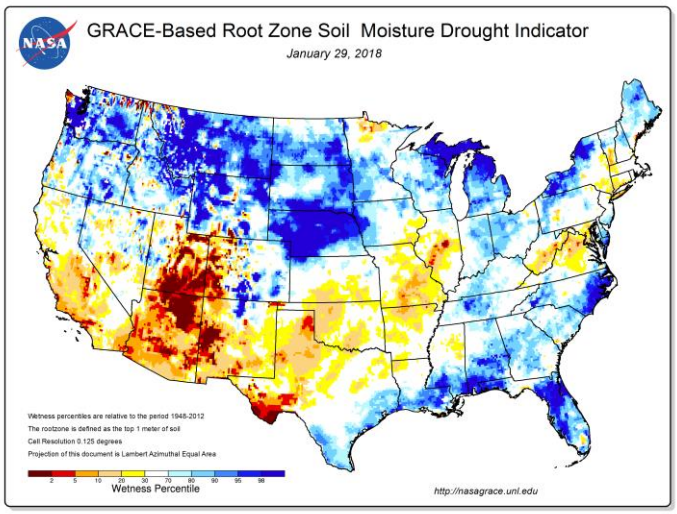


Kansas Vegetative Conditions
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. Areas in the south-central are showing signs of dryness. Most of the northern areas are in the 'watch' category. East and southwest are in good condition due to mostly warmer temperatures, although nothing is really growing at this time.

Soil Moisture
The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture.
Anomalies are defined as deviations from the 1971-2000 monthly climatology. The monthly soil anomaly is provided below.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml

NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present).

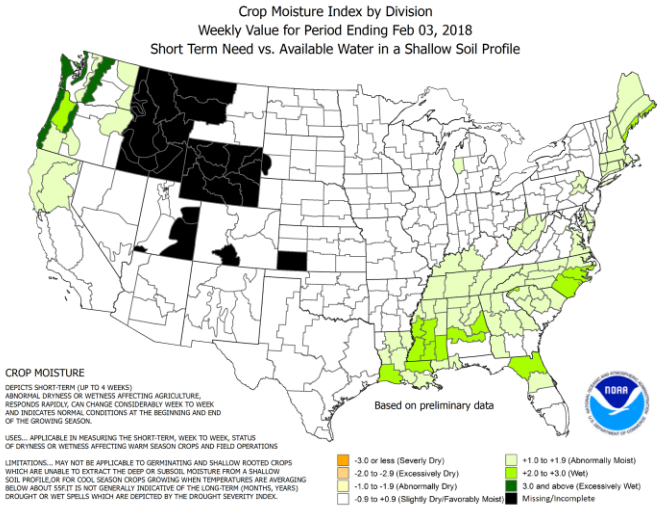




Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion which may be found at: http://www.ksre.ksu.edu/p.aspx?tabid=255.

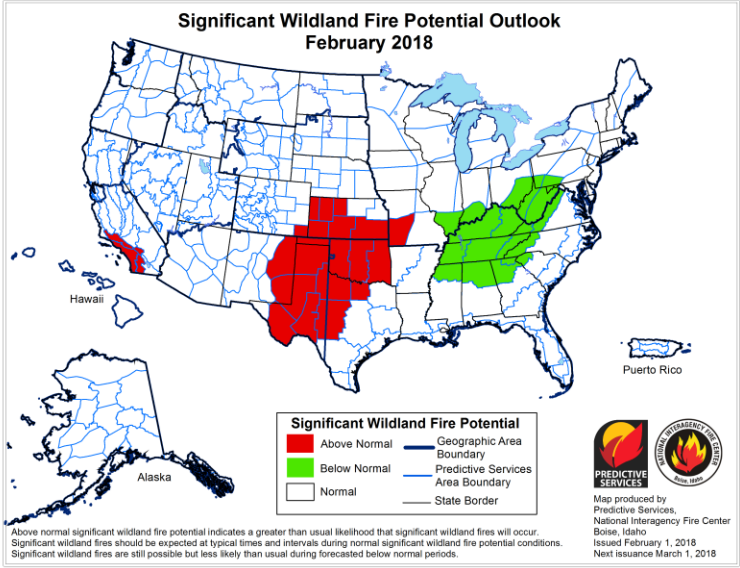
USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report for the state as a whole for the month of January topsoil moisture was 35% very short, 44% short, 19% adequate, and 2% surplus. Subsoil moisture was 22% very short, 48% short, 30% adequate, and 0% surplus. Winter wheat condition was 10% very poor, 34% poor, 42% fair, 13% good, and 1% excellent.

Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA/JAWF Weekly Weather and Crop Bulletin.



Fire Outlooks

As dry conditions continue, there is an increased potential for wildfire.



Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, KWO Drought, contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.org.

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response.

USDA has programs for agricultural producers and businesses for drought affected areas. In some cases eligibility is dependent on a federal disaster declaration but other programs are triggered by specific conditions.

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

Appendix A

January 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	1.06	0.68	279%	31.9	2.5	74 (19)	-7 (6)
Dodge City	0.09	-0.49	16%	33.6	1.4	74 (10)	-9 (1)
Garden City	T	-0.34	0%	32.2	1.3	73 (10)	-9 (1)
Goodland	0.68	0.30	179%	31.6	2.0	74 (19)	-7 (6)
Guymon, OK	0.01	-0.39	3%	37.4	1.8	80 (30, 20)	-1 (16)
Hill City	0.38	-0.07	84%	30.1	0.8	70 (19)	-3 (16)
Lamar, CO	0.09	-0.21	30%	31.9	3.0	75 (20)	-9 (16)
McCook, NE	0.97	0.46	190%	26.7	-0.5	60 (9)	-6 (2)
Springfield, CO	0.14	-0.23	38%	33.9	1.7	79 (19)	-8 (16)
Central							
Concordia	0.42	-0.16	72%	28.6	0.0	66 (25)	-10 (1)
Hebron, NE				26.2	0.6	62 (25)	-15 (1)
Medicine Lodge	0.08	-0.63	11%	34.2	0.8	69 (25)	-4 (1)
Ponca City, OK	0.11	-0.89	11%	35.7	0.8	69 (21)	-1 (1)
Salina	0.34	-0.29	54%	31.6	0.5	69 (25)	-5 (1)
Wichita (ICT)	0.20	-0.63	24%	34.1	1.8	67 (25)	-2 (1)
East							
Bartlesville, OK	0.46	-1.16	28%	34.1	-0.9	71 (21)	-2 (17)
Chanute	0.61	-0.65	48%	33.2	0.6	67 (25,21)	-3 (1)
Fall City, NE	0.09	-0.56	14%	25.6	-0.9	63 (25)	-17 (1)
Johnson Co. Exec. Apt	0.70	-0.42	63%	28.6	-1.5	64 (21)	-9 (1)
Joplin, MO	0.47	-1.56	23%	33.1	-1.8	72 (21)	-6 (16)
Kansas City (MCI), MO	1.13	0.06	106%	28.4	-0.4	64 (25,21)	-11 (1)
St. Joseph, MO	0.77	0.21	138%	28.6	1.4	62 (25)	-14 (1)
Topeka (TOP	0.94	0.08	109%	29.4	-0.3	68 (25)	-9 (1)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE – February 2018 Summary

General

- U.S. Drought Monitor indicates almost 10% of Kansas in extreme drought, with severe drought covers about 25%.

- Precipitation in February was generally below normal. State-wide average precipitation was 41% of normal.

- La Nina advisory issued by forecasters for winter 2017/18. La Nina affects temperature and precipitation across the U.S., generally favoring above normal temperatures and below median precipitation across southern U.S, and below average temperatures and above median precipitation across the northern tier of the United States. Reduced snowfall is usual over parts of the central-southern Plains.

- Drought Outlooks favor continuing drought conditions for the majority of Kansas through March

- Wildfire danger remains high, due to dry conditions, availability of fuel and winds.

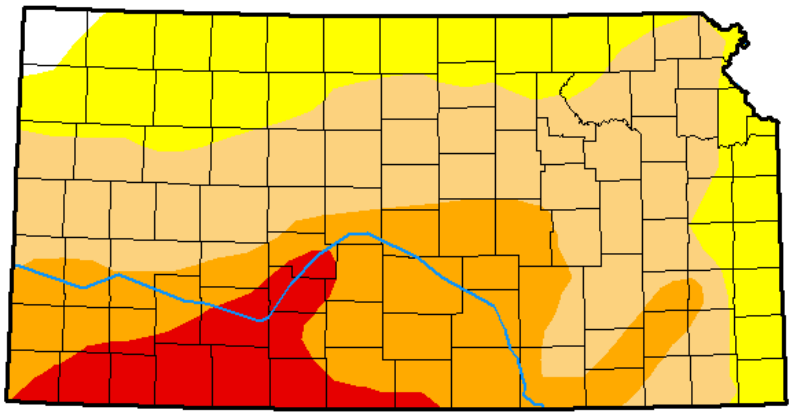
Lakes and Streams

- Water Rights above the USGS gage on the Little Arkansas River at Alta Vista have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

General Conditions

Extreme northwest Kansas saw improvement, due to the wet conditions in January and February. The rest of the state saw deterioration. Extreme drought conditions now cover almost 10 percent of the state. Severe drought has expanded to a quarter of the state while moderate drought covers an additional 36 percent of the state. The fire danger continues.

U.S. Drought Monitor
Kansas



February 27, 2018
(Released Thursday, Mar. 1, 2018)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	1.22	98.78	73.49	34.44	9.50	0.00
Last Week *02-20-2018*	0.11	99.89	71.05	36.34	9.50	0.00
3 Months Ago *11-28-2017*	52.88	47.12	15.33	0.00	0.00	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *02-28-2017*	34.23	65.77	37.34	6.68	0.00	0.00

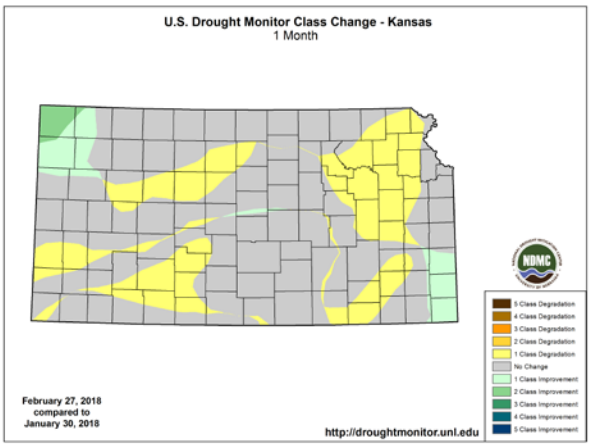
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Deborah Bathke
National Drought Mitigation Center

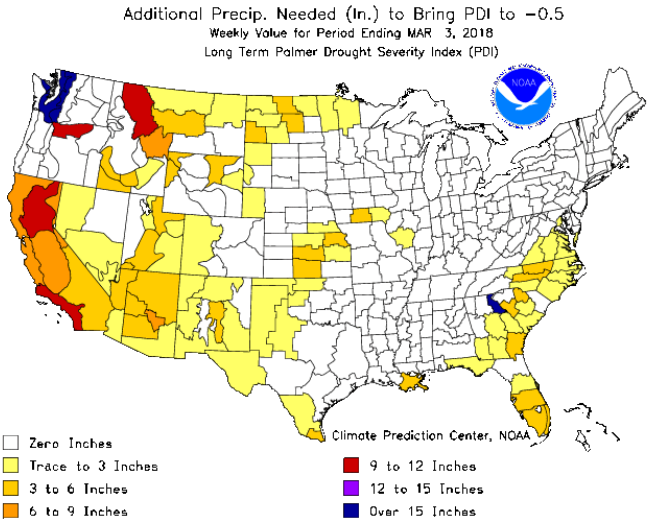
http://droughtmonitor.unl.edu/



More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought.

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml



Long-term PDI Precipitation needed to remove drought for weeks ending on date					
Climate Division	Feb 3	Feb 10	Feb 17	Feb 24	Mar 3
North Central	0.51	0.16	0.36	0.35	1.64
Northeast	3.16	3.09	3.22	2.38	3.28
Central	2.78	2.88	3.13	3.15	3.75
East Central	0.72	0.78	0.90	-	0.53
South Central	2.54	2.68	3.0	2.77	3.54
Southeast	1.18	1.51	1.59	-	-

Federal Disaster Declarations 2018

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

No USDA drought disasters have been declared in 2018 for Kansas.

Presidential Federal Disasters

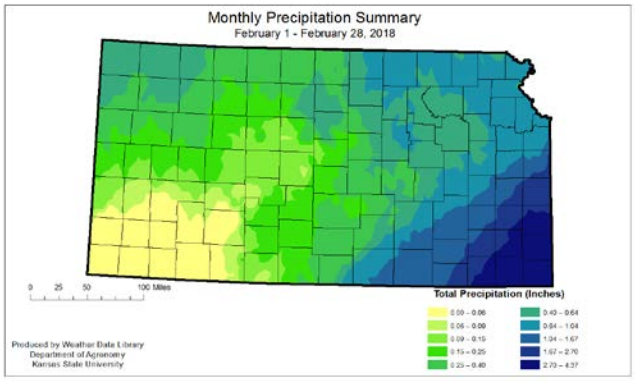
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

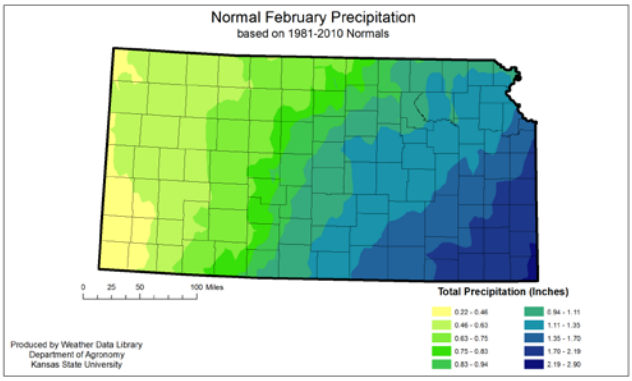
Climate Summary (Precipitation and Temperature)

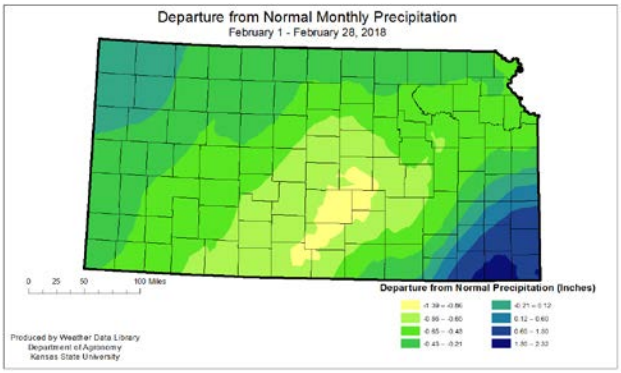
While most locations saw at least some moisture in February, overall the precipitation was below normal for the month. Eight locations, mainly is the Southwest Division, saw just a trace of precipitation during the month. State-wide the average precipitation was 0.53 inches or 41 percent of normal. The Southeast Climate Division was the only area of the state that was above normal for the month, with an average of 1.99 inches or 109 percent of normal. The Southwest Division, with an average of just 0.02 inches, had the lowest percent of normal with just 2 percent. The greatest monthly precipitation totals were 4.37 inches at Coffey Waterworks, Montgomery County (NWS) and 4.05 inches at McCune 1.6 NW, Crawford County (CoCoRaHS). Most of the precipitation came in the last week of the month. There was some snow during the month, with twelve locations setting daily records for snowfall. The greatest daily snowfall report was 4.5 inches at Tribune 1W, Greeley County, on the 6th. The greatest snowfall totals for the month were 9.6 inches at Goodland, Sherman County (NWS) and 16.0 inches at St. Francis 12.1 NW, Cheyenne County (CoCoRaHS).

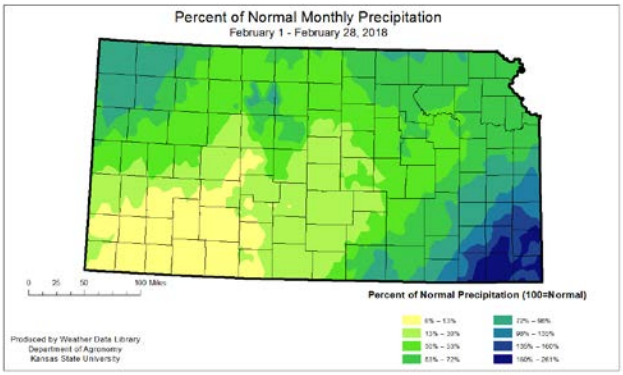
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	February 1-28, 2018			January 1-February 28, 2018			April 1, 2017-February 28, 2018			Sept. 1, 2017-February 28, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.16	-0.38	28	0.44	-0.55	43	17.78	-2.27	88	4.11	-1.35	72
West Central	0.20	-0.39	36	0.42	-0.68	41	19.69	0.33	102	5.04	-0.53	91
Southwest	0.02	-0.53	2	0.21	-0.81	21	19.38	0.84	105	3.87	-1.61	72
North Central	0.32	-0.51	38	0.68	-0.78	48	22.73	-3.29	87	5.89	-2.30	71
Central	0.43	-0.58	45	0.72	-0.98	44	21.75	-5.29	81	5.55	-2.97	67
South Central	0.44	-0.72	33	0.61	-1.38	27	25.25	-3.44	88	6.25	-3.59	62
Northeast	0.49	-0.63	43	0.81	-1.11	41	25.11	-7.61	76	5.51	-5.75	49
East Central	0.58	-0.75	39	1.23	-1.05	51	29.77	-5.50	83	6.81	-5.78	52
Southeast	1.99	0.27	109	2.57	-0.40	82	38.38	-0.09	99	9.64	-5.42	63
STATE	0.53	-0.46	41	0.86	-0.87	43	24.62	-2.65	90	5.90	-3.21	66







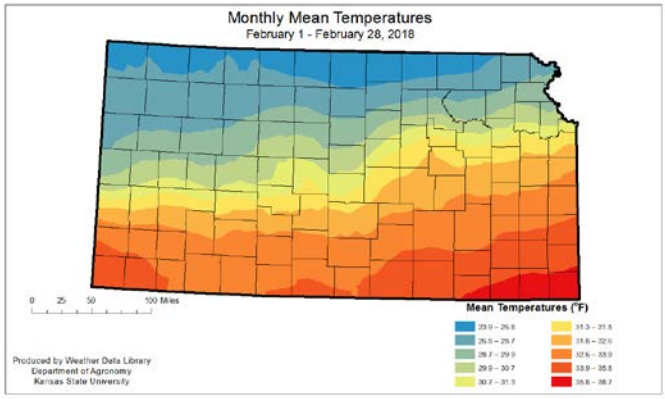


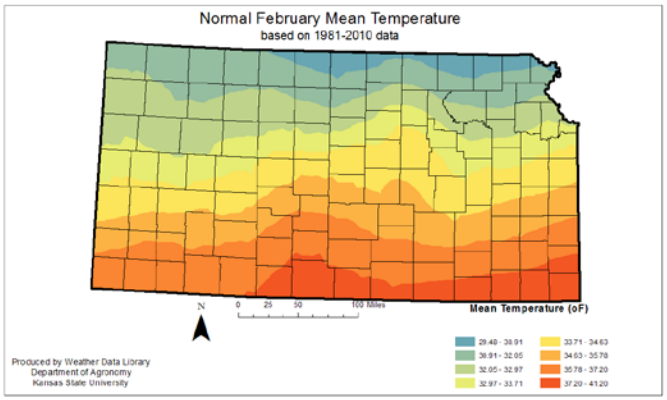
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

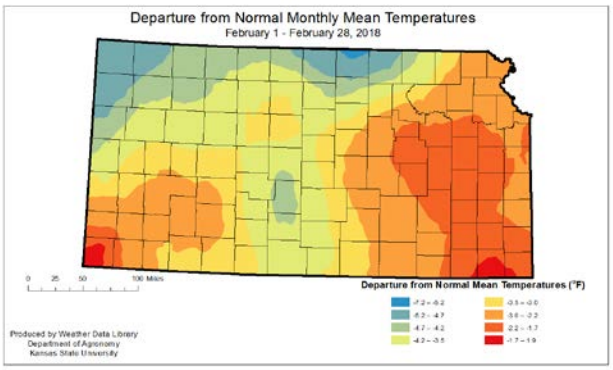
February continued the pattern of wide temperatures swings, as might be expected with the dry air in place. The statewide average temperature was 30.7 °F, or 3.3 degrees cooler than normal. The warm days weren't persistent enough to outweigh the very cold start to the month. All divisions averaged below normal for the month. The Northwest had the greatest departure, with an average of 26.7 oF or 5.0 degrees cooler than normal. The Southeast Division came closest to normal with an average temperature of 34.6 °F and a departure of -1.9 degrees. The warmest temperature reported for the month was 80 °F at Ashland, Clark County, on the 15th and Tallgrass Prairie Park, Chase County, on the 19th. The coldest reading was -10 °F at Marysville, Marshall County, on the 5th. Records were set on both the cold and warm end of the spectrum. On the cold side, there were 7 new record low maximum temperatures and 7 new record low minimum temperatures. On the warm side, there were 22 new record high maximum temperatures and 17 new record high minimum.

Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	February 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	40.6	12.8	26.7	-5.0	78	28	-7	20
West Central	44.3	14.2	29.3	-3.8	79	19	-1	7
Southwest	49.2	17.6	33.4	-2.2	80	15	0	12
North Central	39.8	14.8	27.3	-4.8	78	28	-8	5
Central	44.3	17.8	31.1	-3.1	79	28	-1	5
South Central	45.9	20.1	33.0	-3.5	78	15	4	7
Northeast	40.3	17.6	28.9	-3.4	74	28	-10	5
East Central	42.9	20.5	31.7	-2.0	76	16	-2	5
Southeast	46.2	23.0	34.6	-1.9	78	16	2	5
STATE	43.7	17.6	30.7	-3.3	80	15th	-10	5th
Data Source: KSU Weather Library								







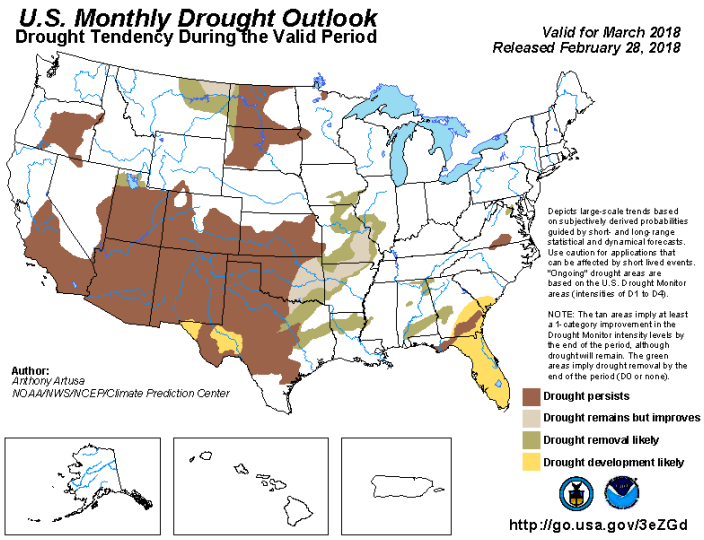
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

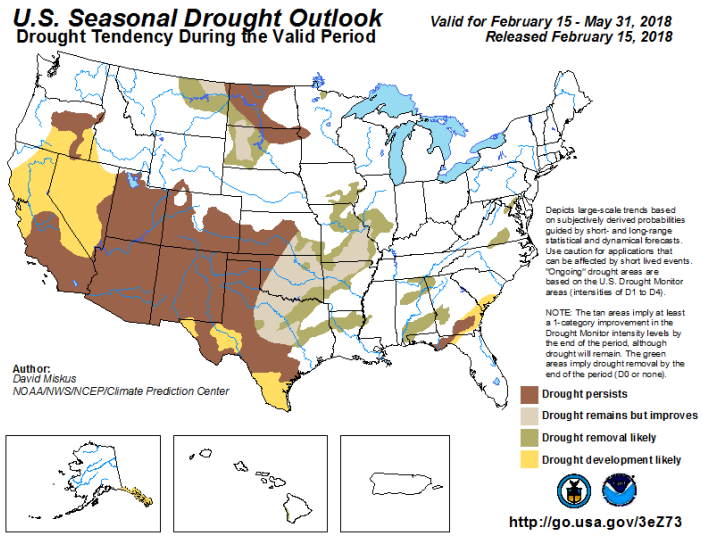
Future Outlook

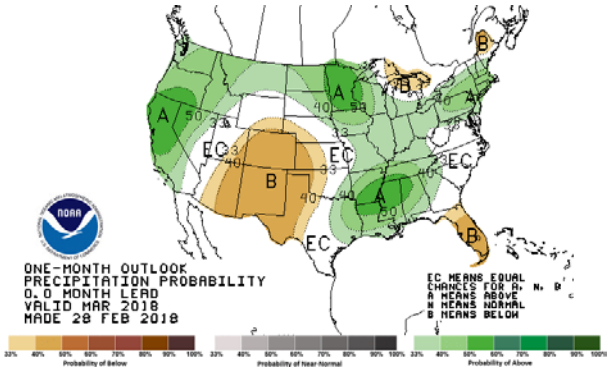
The Monthly Drought Outlook indicates drought conditions to remain in southern and western Kansas. The March outlook has a slight chance for drier than normal conditions state wide, with an increased chance of warmer than normal temperatures. Since March is a critical transition month, that combination is likely to result in further deterioration of the drought conditions. With the wet summer last year and current dryness, increased fire danger continues.

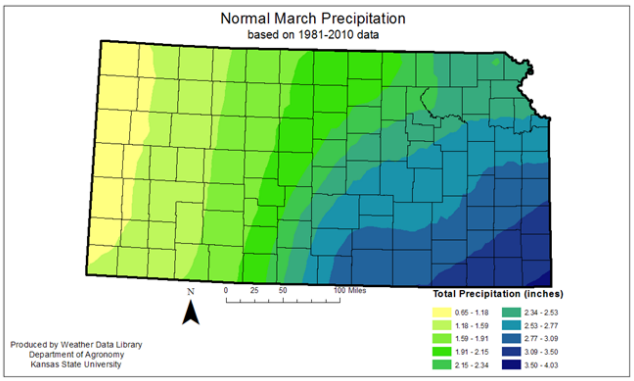
Seasonal Outlook also favors continued drought in south central, central and western Kansas with the south east improving. For the March-May time period probability favors below normal precipitation and above normal temperatures for western parts of the state. The remaining areas have equal chances of below or above normal precipitation and temperatures for the period.

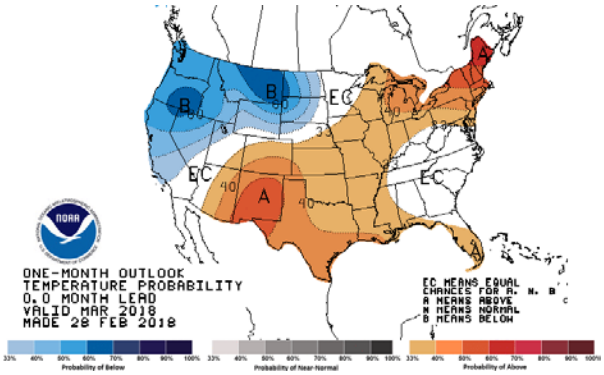
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

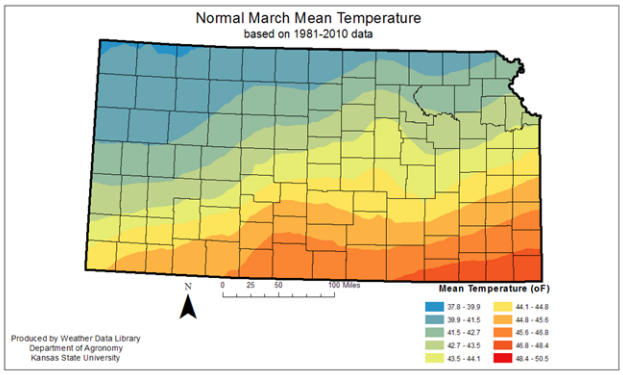


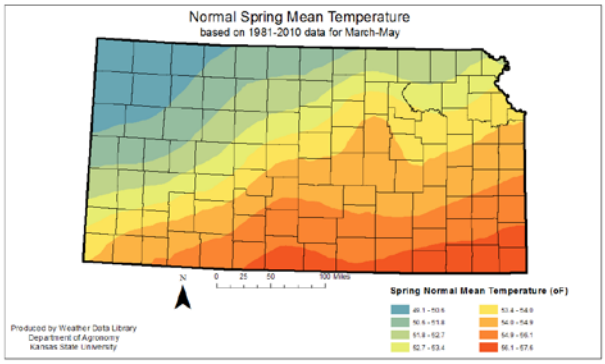


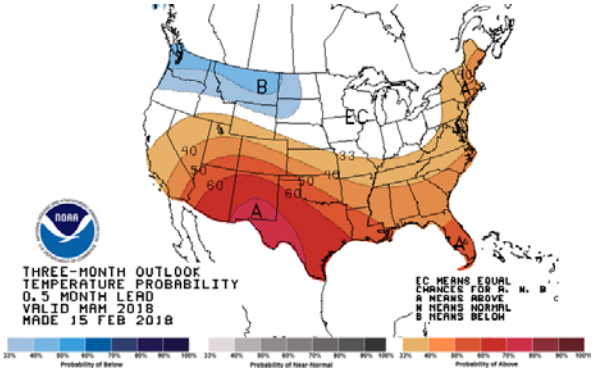


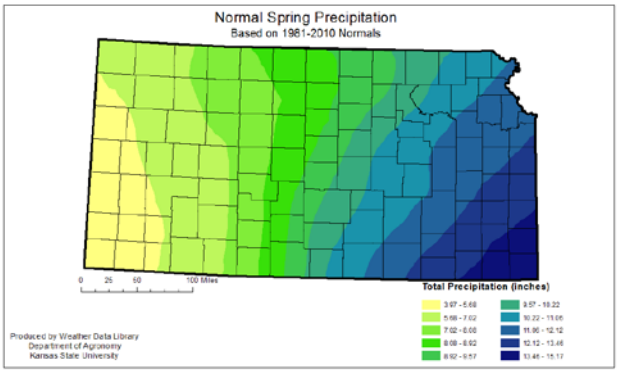


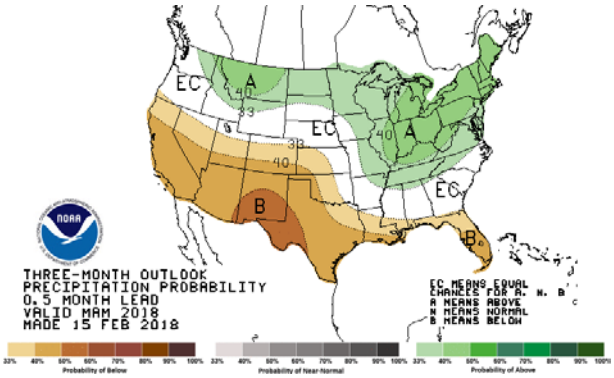












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of March 6, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (March 6, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ March 6, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs remained below normal in February. Additional releases were made from Milford and Perry to reach the lower winter pool elevation target. Bypassing inflows from Tuttle and the releases from Milford and Perry resulted in near median flows in the Kansas River, especially in the lower reach. Thus far, storage in the basin has not negatively impacted from the abnormally dry conditions in recent months.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received very little inflow in February. Melvern and Pomona declined over the month from lack of inflow and minimum releases. Hillsdale declined primarily from releases to lower lake level, according to the seasonal plan. Flow in the Marais des Cygnes River fluctuated but reached near median values due to the releases from Hillsdale reservoir. Tributaries appear to be maintaining some contribution as the Marais des Cygnes River maintaining flow gains.

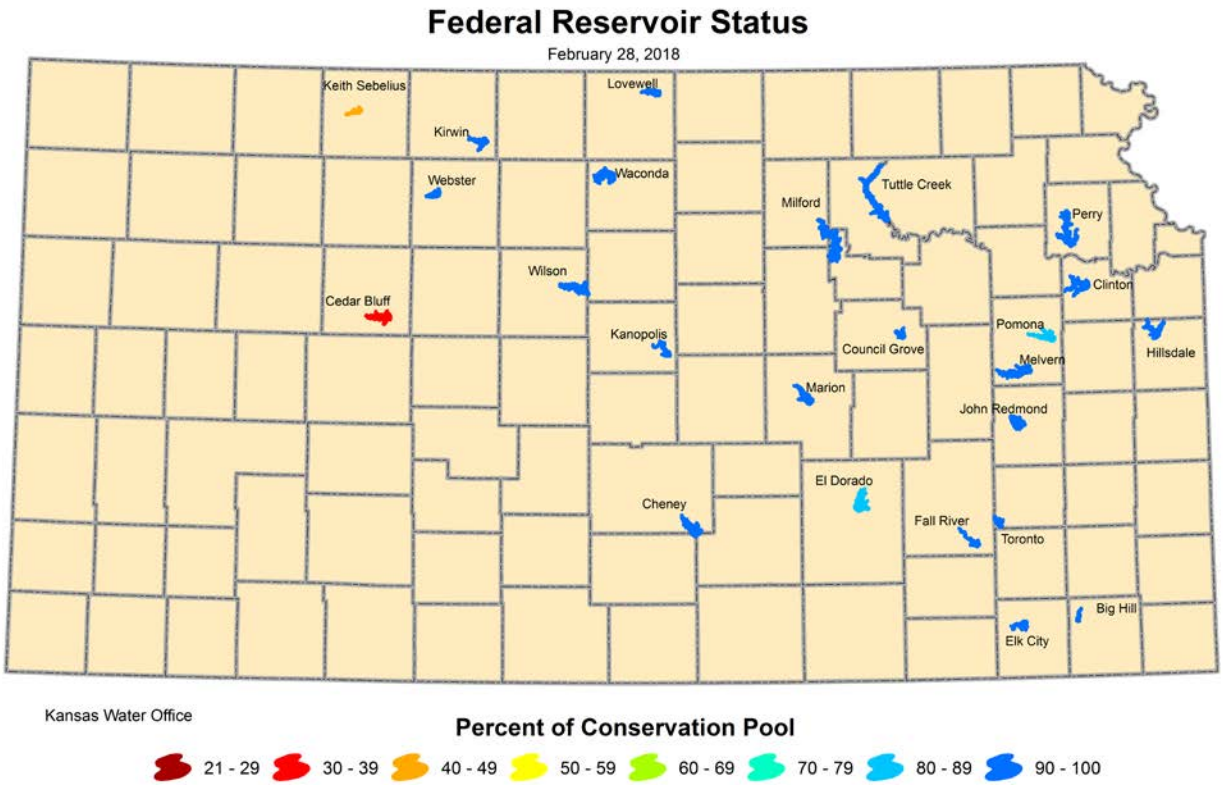
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low throughout the month and streamflow declined the Upper Neosho. Conservation storage is full in John Redmond but steadily declined in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow in the upper system. The Neosho River experienced a precipitation event mid to late February which brought flows well above historic median values.

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs remained near conservation pool levels in February but reservoir releases were necessary to supplement low flow conditions of the Fall and Verdigris Rivers for most of the month. The same precipitation event that benefited the Lower Neosho also passed through the lower Verdigris River basin; Elk City Lake did receive some inflow from this event but it was very minimal for the other basin reservoirs.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool.

Smoky Hill basin: The middle Smoky Hill basin maintained near median streamflow. Kanopolis Lake declined throughout December and into the first week of January due to releases necessary to accommodate a periodic inspection of the outlet works. After the inspection the discharge was reduced to 10 cfs and inflows were sufficient to refill conservation storage. In February, the Corps again released water to lower the pool level for further inspections.

General Reservoir Conditions



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**2/28/2018 1:15 PM**		
Norton[1]	2304.3	2292.08	-12.22	40.7
Harlan County, NE	1945.73	1939.22	-6.51	74.4
Lovewell[1]	1582.6	1581.46	-1.14	90
Milford[1]	1144.4	1141.58	-2.82	88.8
Cedar Bluff	2144	2117.58	-26.42	29.7
Kanopolis[1]	1463	1462.7	-0.3	98.2
Wilson[1]	1516	1516.17	0.17	100
Webster[1]	1892.5	1893.99	1.49	100
Kirwin[1]	1729.3	1729.05	-0.25	99
Waconda[1]	1455.6	1454.46	-1.14	93.6
Tuttle Creek[1]	1075	1073.8	-1.2	95
Perry[1]	891.5	890.21	-1.29	93.5
Clinton[1]	875.5	875.58	0.78	100
Melvern[1]	1036	1034.75	-1.25	94.3
Pomona[1]	974	972.12	-1.88	87.1
Hillsdale[1]	917	915.54	-1.46	91.2
Arkansas River Basin		**2/27/2018 8 am**		
Cheney	1421.6	1420.66	-0.94	95.0
El Dorado	1339	1335.16	-3.84	83.0
Toronto[1]	901.5	901.66	0.16	100.0
Fall River[1]	948.5	948.02	-0.48	93.0
Elk City[1]	796	796.63	0.63	100.0
Big Hill	858	858.41	0.41	100.0
Council Grove[1]	1274	1272.15	-1.85	89.0
Marion[1]	1350.5	1348.62	0.12	100.0
John Redmond[1]	1039	1042.00	1.00	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

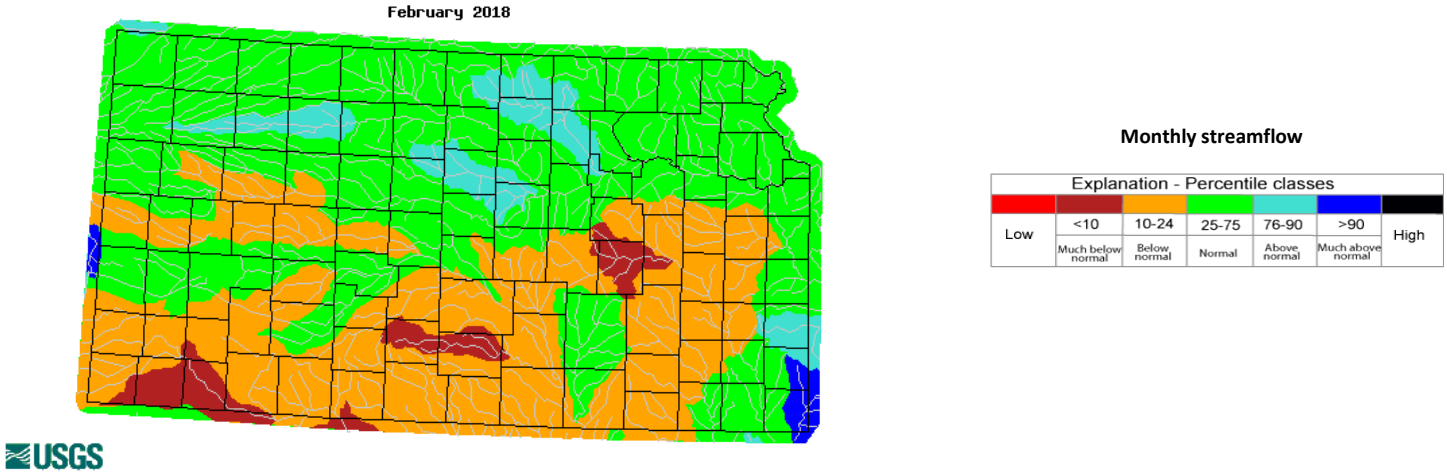
Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. The following warnings and watches were in issued by KDHE and remain in effect until testing begins again in spring.

November 28, 2017: Public Health Watch for Central park Pond, Shawnee County and Hiawatha City Lake, Brown County.

Streamflow Conditions
WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

Monthly stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

MDS administration occurred during the month, with administration beginning August 10, 2017 on the Little Arkansas River at Alta Mills. The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.

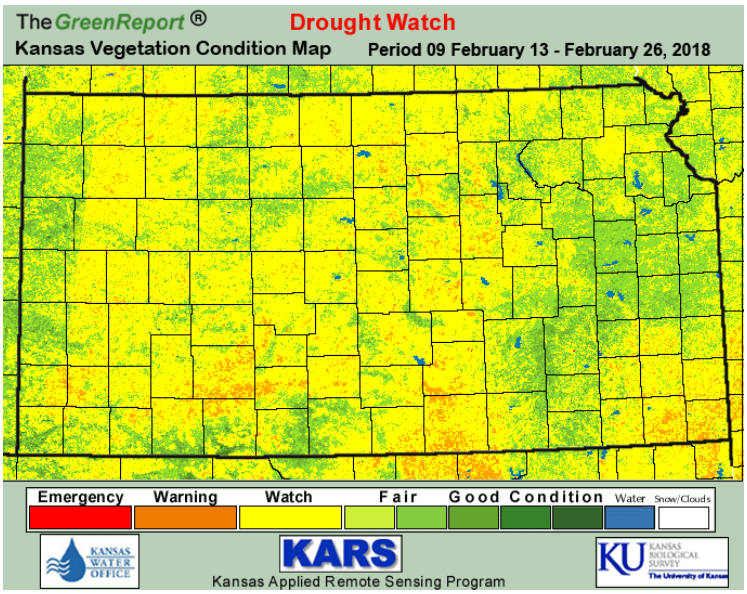
There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage.

Streamflows as of February 28, 2018			
Gaging Station	**Current Flow**	**Feb MDS**	**Comment**
Republican River at Concordia	Ice	125	
Republican River at Clay Center	Ice	150	
Mill Creek near Paxico	9	8	
Delaware River near Muscotah	38	10	
Rattlesnake Creek near Macksville	0	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	10	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	6	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	6	10	No surface water diversions junior to MDS above gage

Soil, Crop and Vegetation

Kansas Vegetative Conditions

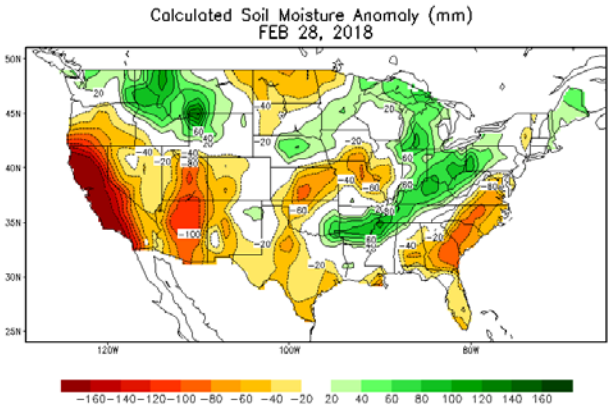
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress.

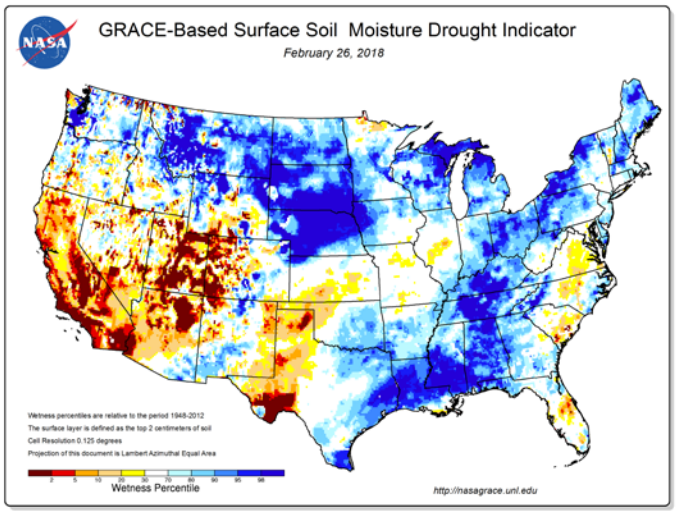


Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The monthly soil anomaly is provided below.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml

NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present).

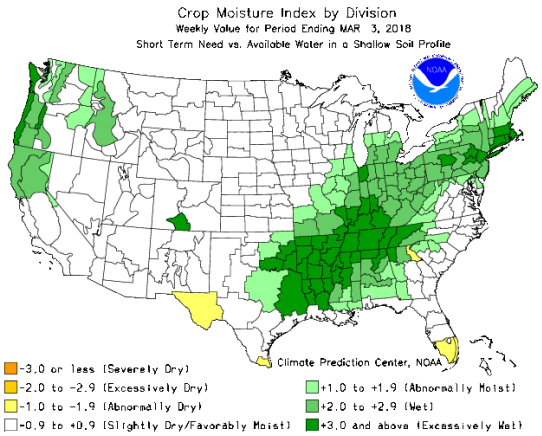




Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion.

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report for the state as a whole for the month of February 2018, topsoil moisture supplies rated 36 percent very short, 38 short, 22 adequate, and 4 surplus, according to the USDA's National Agricultural Statistics Service. Subsoil moisture supplies rated 26 percent very short, 45 short, 28 adequate, and 1 surplus

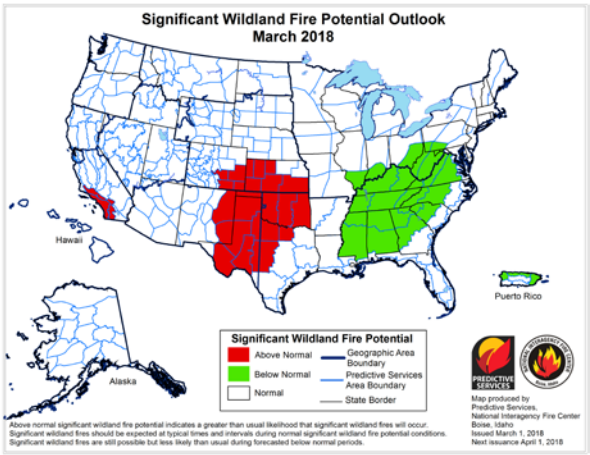
Field Crops Report: Winter wheat condition rated 13 percent very poor, 36 poor, 39 fair, 11 good, and 1 excellent.

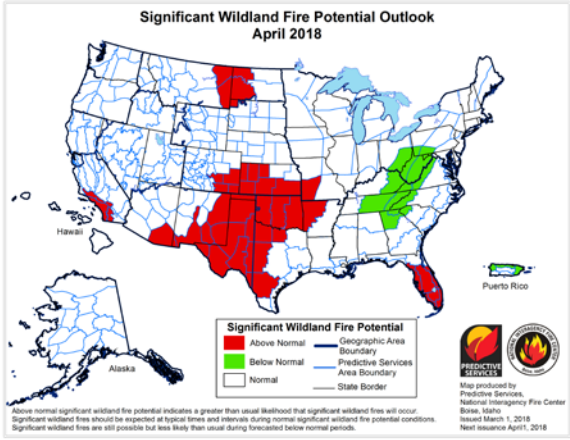


Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA/JAWF Weekly Weather and Crop Bulletin.

Fire Outlooks

As dry conditions continue, there is an increased potential for wildfire. According to the National Interagency Fire Center, wildfire activity is likely to increase in March in a manner typical to most years beginning in the central through southern Great Plains and the Southwest where preexisting drought conditions and fuel loadings have promoted an environment favorable for Above Normal significant wildland fire potential entering spring.





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, KWO Drought, contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov.

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://kwo.org/reports_publications/Drought.htm

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

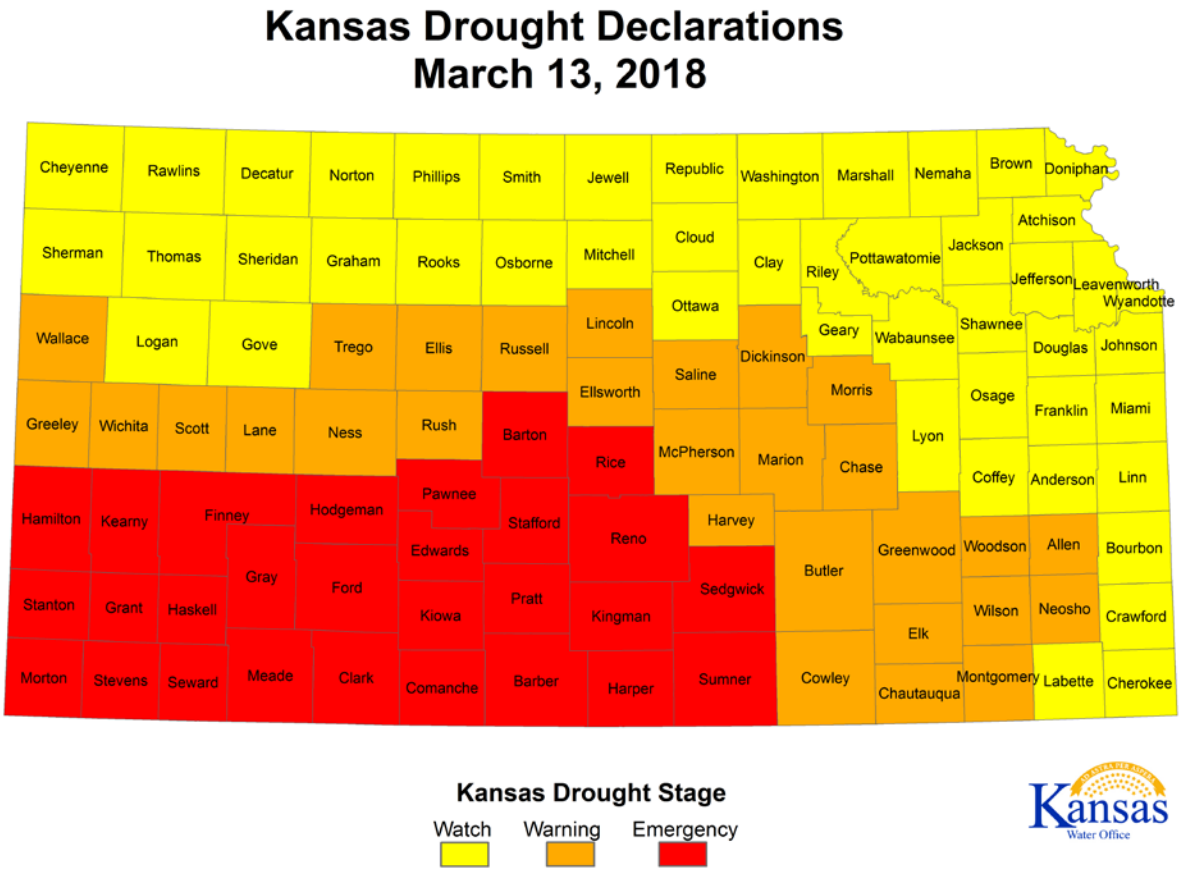
Appendix A

February 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.50	0.08	119%	29.0	-2.6	70 (18)	-8 (21,20)
Dodge City	0.06	-0.62	9%	34.1	-1.8	77 (18)	4 (21)
Garden City	T	-0.54	0%	32.6	-2.2	77 (18)	3 (11, 7)
Goodland	0.61	0.12	124%	29.3	-3.0	70 (18)	0 (21)
Guymon, OK	0.01	-0.46	2%	38.2	-0.4	80 (14)	10 (11)
Hill City	0.44	-0.08	85%	29.9	-3.0	76 (27)	2 (221, 7)
Lamar, CO	0.08	-0.32	20%	32.7	-0.9	76 (18)	-2 (21)
McCook, NE	0.54	-0.08	87%	25.9	-5.0	64 (18)	0 (11)
Springfield, CO	0.06	-0.38	14%	33.9	-1.5	74 (18)	1 (21)
Central							
Concordia	0.57	-0.22	72%	29.3	-3.4	73 (27)	0 (4)
Hebron, NE				26.5	-3.1	70 (27)	-6 (4)
Medicine Lodge	0.30	-0.74	29%	35.5	-2.7	79 (14)	8 (12)
Ponca City, OK	1.15	-0.19	86%	38.4	-1.3	78 (15)	6 (12)
Salina	0.14	-1.03	12%	34.4	-1.1	74 (27)	6 (5)
Wichita (ICT)	0.28	-0.90	24%	35.9	-1.3	72 (15,14)	8 (5)
East							
Bartlesville, OK	3.31	1.34	168%	37.8	-2.0	81 (15)	4 (12)
Chanute	2.00	0.10	105%	36.1	-1.3	77 (15)	2 (5)
Fall City, NE	0.24	-0.70	26%	28.1	-2.8	74 (27)	-4 (5)
Johnson Co. Exec. Apt	0.71	-0.86	45%	32.4	-2.4	68 (27)	0 (5)
Joplin, MO	4.94	2.62	213%	39.1	-0.7	77 (15)	4 (5)
Kansas City (MCI), MO	1.32	-0.14	90%	32.3	-1.2	71 (27)	-2 (5)
St. Joseph, MO	0.69	-0.24	74%	29.9	-2.1	71 (27)	0 (5)
Topeka (TOP	0.81	-0.51	61%	33.1	-1.3	71 (27)	-1 (4)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE – Mid March 2018 Summary

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11
Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.



Drought Watch counties: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

Drought Warning counties: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

Drought Emergency counties: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Overview

- U.S. Drought Monitor indicates almost 20% of Kansas in extreme drought, with severe drought covering about 56% of the state. Severe drought expanded the week ending March 13 to include all or portions of another 10 counties in eastern Kansas.

- Drought Outlooks favor continuing drought conditions for the majority of Kansas through March

- Wildfire danger remains high, due to dry conditions, availability of fuel and winds. Over 27,000 acres burned in the first 7 days of March. Additional fires reported through March 14.

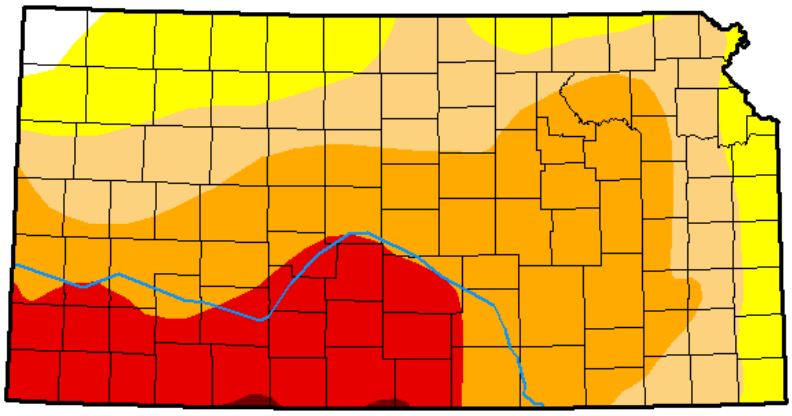
- Water Rights above the USGS gage on the Little Arkansas River at Alta Vista have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

General Conditions

First two weeks of March saw continued deterioration in drought related conditions to consider nearly 82% of Kansas in some level of drought by U.S. Drought Monitor evaluation, Extreme drought conditions now covers almost 20 percent of the state. Severe drought has expanded to 56% of the state while moderate drought covers an additional 26 percent of the state. The fire danger continues with numerous wildfires occurring.

U.S. Drought Monitor

Kansas



March 13, 2018

(Released Thursday, Mar. 15, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	1.22	98.78	81.77	56.19	19.33	0.30
Last Week *03-06-2018*	1.23	98.77	76.69	44.45	18.82	0.34
3 Months Ago *12-12-2017*	0.89	99.11	20.58	1.85	0.00	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *03-14-2017*	31.83	68.17	39.34	9.01	0.57	0.00

Intensity:

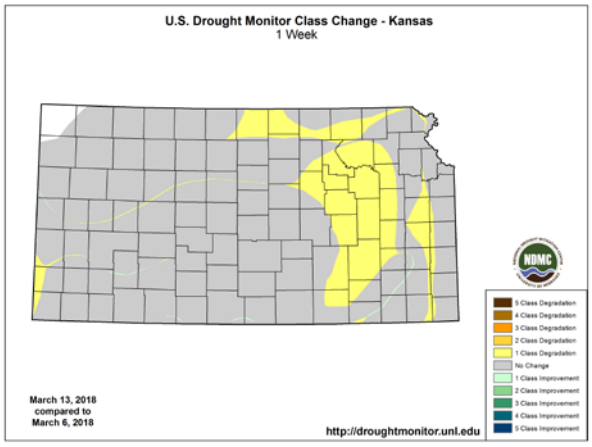
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Richard Tinker
CPC/NOAA/NWS/NCEP

http://droughtmonitor.unl.edu/

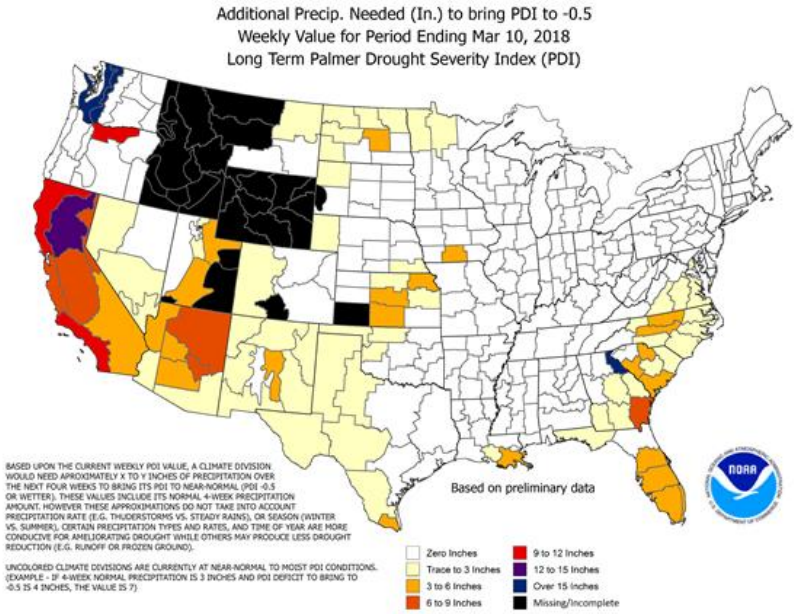


More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought.

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Long-term PDI Precipitation needed to remove drought for weeks ending on date		
Climate Division	Mar 3	Mar 10
North Central	1.64	2.07
Northeast	3.28	3.76
Central	3.75	4.4
East Central	0.53	0.88
South Central	3.54	4.21
Southwest	unknown	unknown



Federal Disaster Declarations 2018

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

No USDA drought disasters have been declared in 2018 for Kansas.

Presidential Federal Disasters

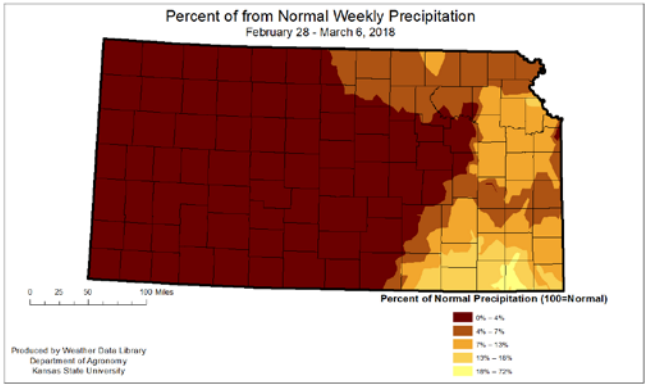
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

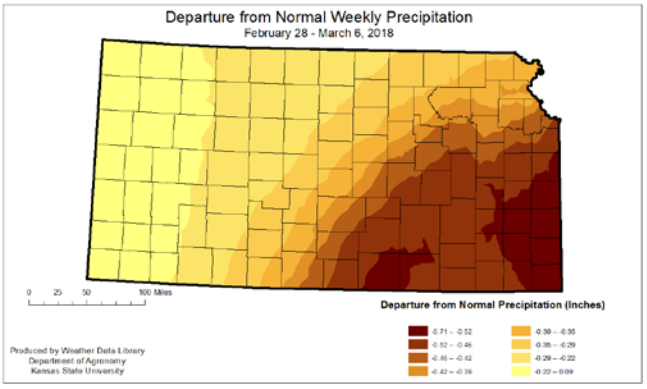
Climate Summary (Precipitation and Temperature)

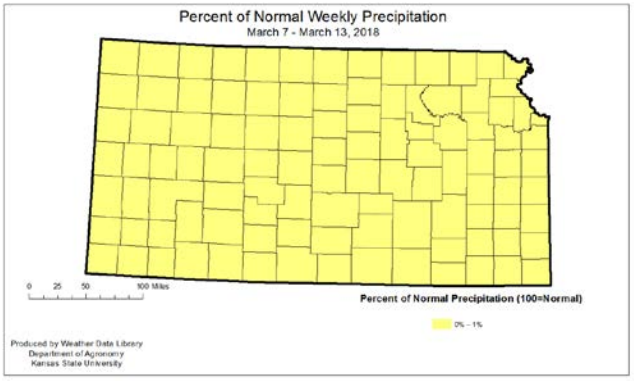
Precipitation summary is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

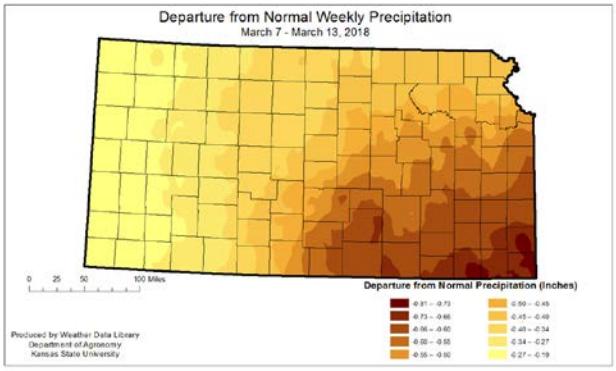
Kansas Climate Division Precipitation Summary (inches)												
	March 7-13, 2018			January 1-March 13, 2018			April 1, 2017-March 13, 2018			Sept. 1, 2017-March 13, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.01	-0.20	6	0.44	-0.73	36	17.78	-2.45	87	4.11	-1.54	70
West Central	0.00	-0.21	0	0.42	-0.87	34	19.69	0.14	101	5.04	-0.72	88
Southwest	0.00	-0.20	0	0.21	-0.98	18	19.38	0.66	104	3.87	-1.79	70
North Central	0.00	-0.30	0	0.68	-1.05	40	22.73	-3.56	86	5.89	-2.57	69
Central	0.00	-0.36	0	0.72	-1.30	37	21.75	-5.61	80	5.55	-3.28	64
South Central	0.00	-0.46	0	0.62	-1.78	22	25.25	-3.85	86	6.25	-4.00	60
Northeast	0.01	-0.37	3	0.81	-1.45	35	25.11	-7.94	75	5.52	-6.07	48
East Central	0.00	-0.48	0	1.23	-1.47	43	29.77	-5.93	82	6.81	-6.20	50
Southeast	0.06	-0.53	9	2.57	-0.92	70	38.39	-0.59	97	9.64	-5.93	61
STATE	0.01	-0.35	2	0.86	-1.18	36	24.62	-2.96	89	5.90	-3.53	64

Below are the percent of normal precipitation and the departure from normal precipitation for the first two weeks of March. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by on KSU Weather Data Library.)





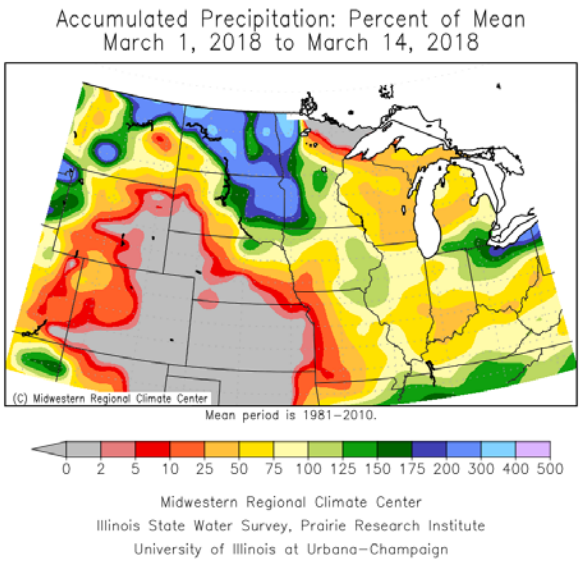




The map on the right quantifies March 2018 precipitation (to-date) showing Kansas and surrounding states. Note Kansas has had no precipitation.

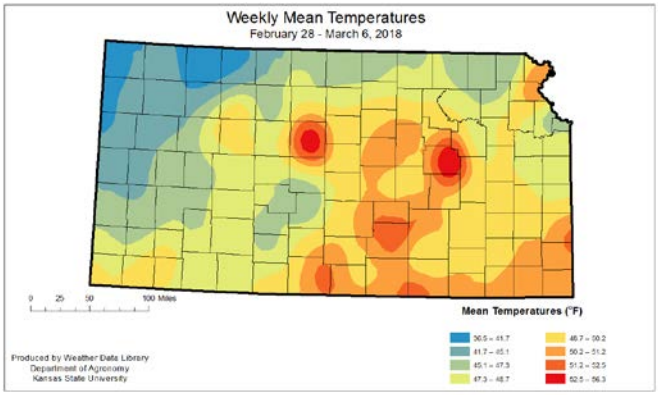
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

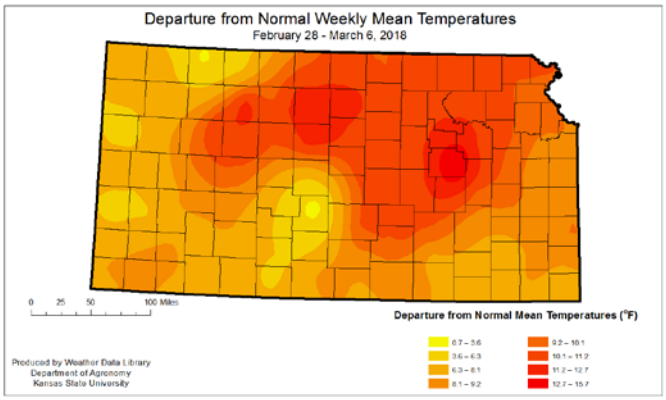
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

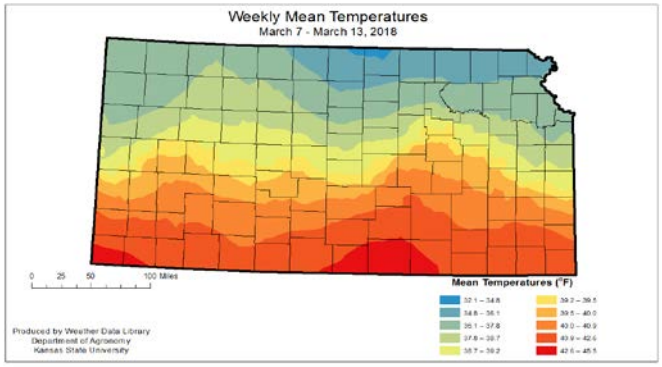


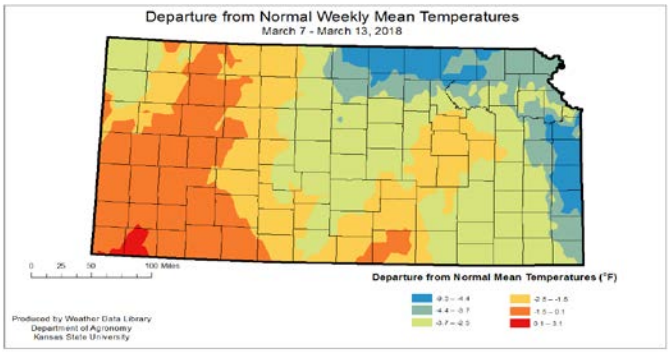
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	March 7-13, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	54.1	16.9	35.5	-2.9	68	10	11	7
West Central	59.5	18.4	38.9	-0.9	73	9	10	7
Southwest	61.5	21.2	41.4	-1.0	76	10	11	7
North Central	52.1	19.9	36.0	-4.1	73	11	10	8
Central	57.1	20.9	39.0	-2.7	75	10	10	8
South Central	60.0	23.9	41.9	-1.7	78	10	13	13
Northeast	48.1	23.6	35.8	-4.6	64	10	12	8
East Central	51.4	25.9	38.6	-3.1	73	10	15	8
Southeast	54.0	28.0	41.0	-2.9	72	10	18	9
STATE	55.3	22.1	38.7	-2.7	78	10th	10	8th
Data Source: KSU Weather Library								

Below are the weekly mean temperatures and the departure from normal temperatures for the first two weeks of March. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by on KSU Weather Data Library.)









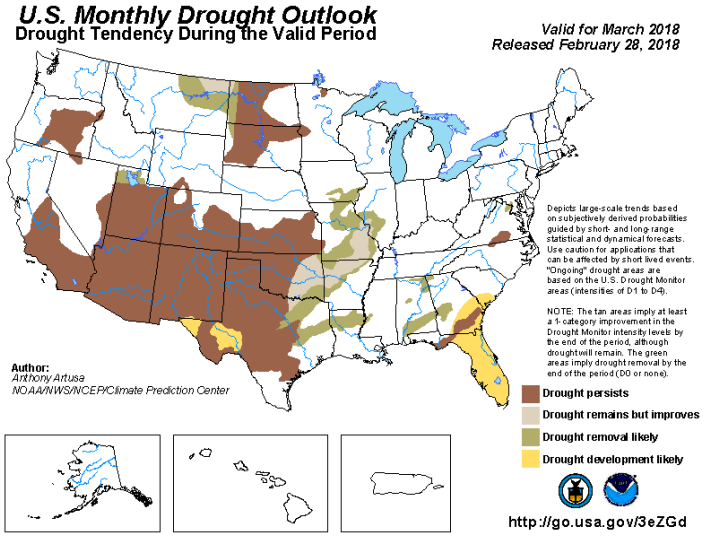
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

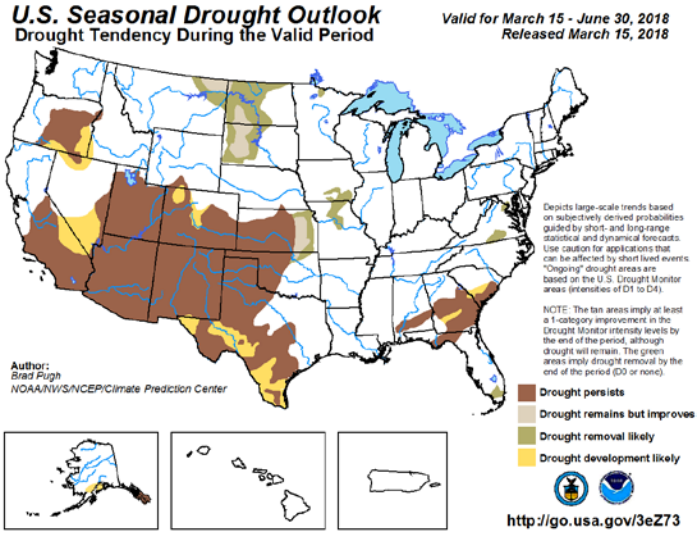
Future Outlook

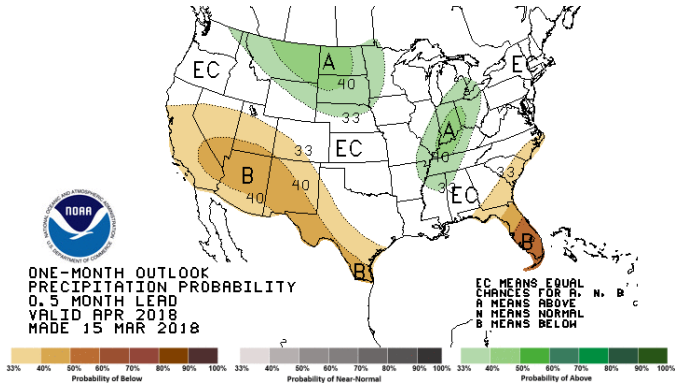
The Monthly Drought Outlook indicates drought conditions to remain in southern and western Kansas. The March outlook has a slight chance for drier than normal conditions state wide, with an increased chance of warmer than normal temperatures. Since March is a critical transition month, that combination is likely to result in further deterioration of the drought conditions. With the wet summer last year and current dryness, increased fire danger continues.

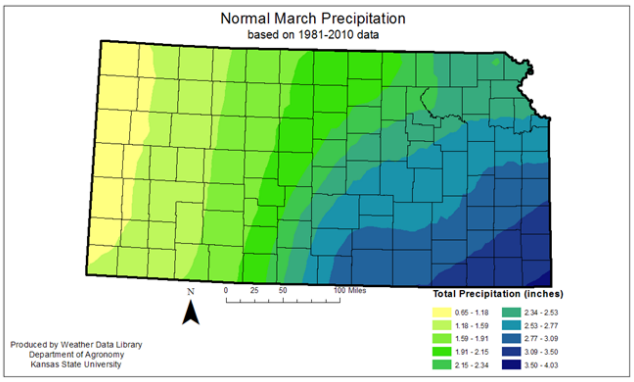
Seasonal Outlook also favors continued drought in south central, central and western Kansas with the east improving. For the March 15-June 30 time period probability favors below normal precipitation and above normal temperatures for western parts of the state. The remaining areas have equal chances of below or above normal precipitation and temperatures for the period.

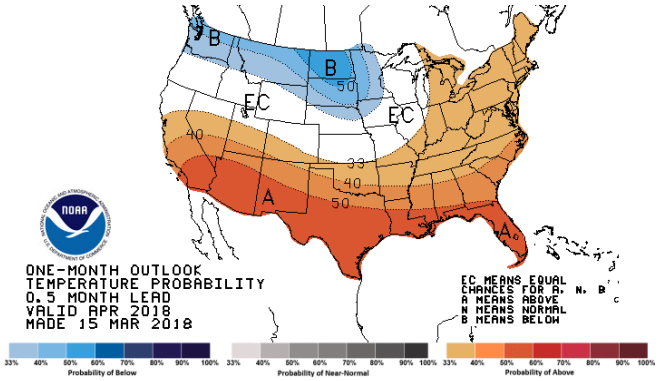
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

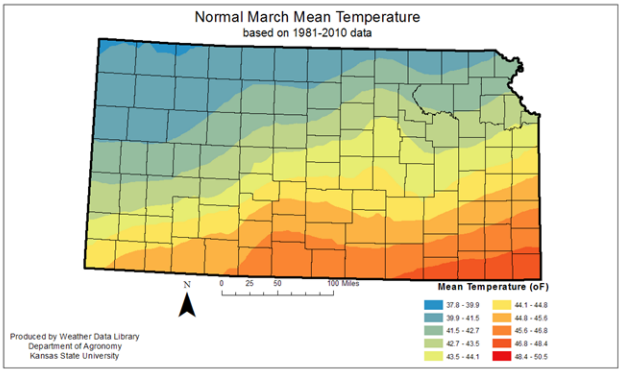


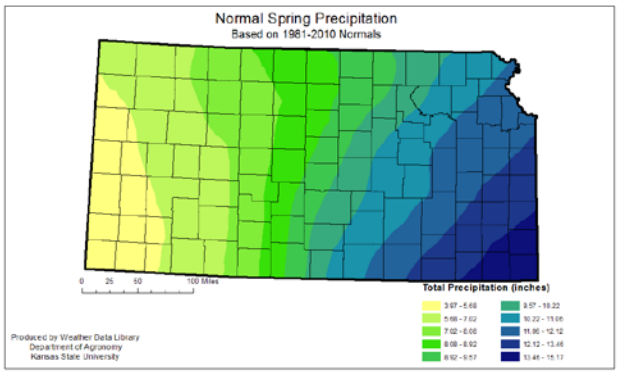


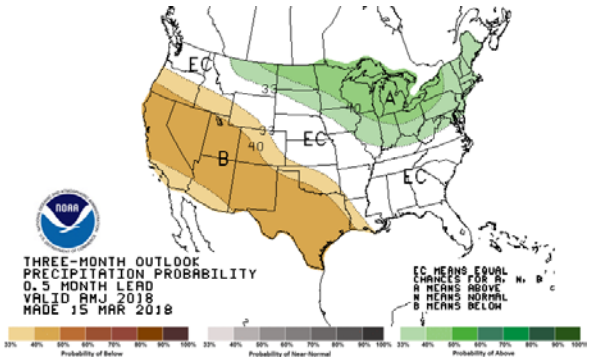


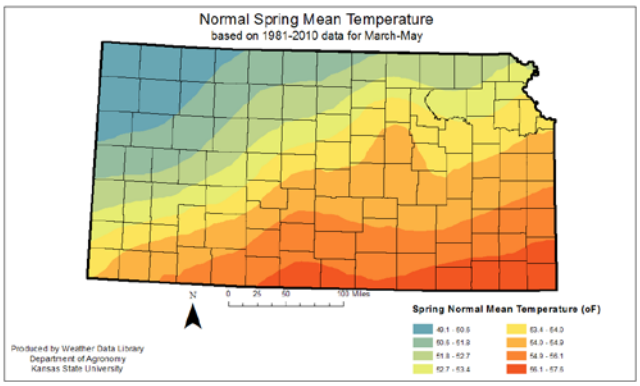


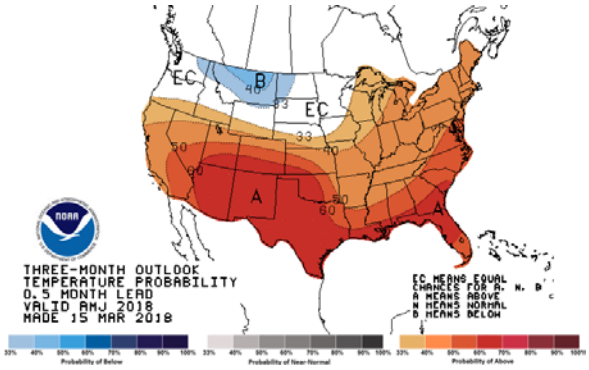












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of March 15, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (March 15, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ March 15, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs remain below normal for March. However, storage in the basin has not been negatively impacted from the abnormally dry conditions in recent months. Clinton is full and the other three reservoirs are below the top of Multipurpose elevation due to planned seasonal drawdowns. That said, the lower seasonal elevations may extend longer than planned if inflow conditions don't improve. Flow in the Kansas River has declined to less than half of historic median levels but remain above the low flow Assurance District and Water Quality flow targets.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs have experienced minimal inflow in recent months. All three reservoirs are also below the top of Multipurpose elevation due to planned seasonal drawdowns and are currently in a slow decline from lack of inflow and minimum release requirements. Flow in the Marais des Cygnes River is well below median values but tributaries appear to be maintaining some contribution.

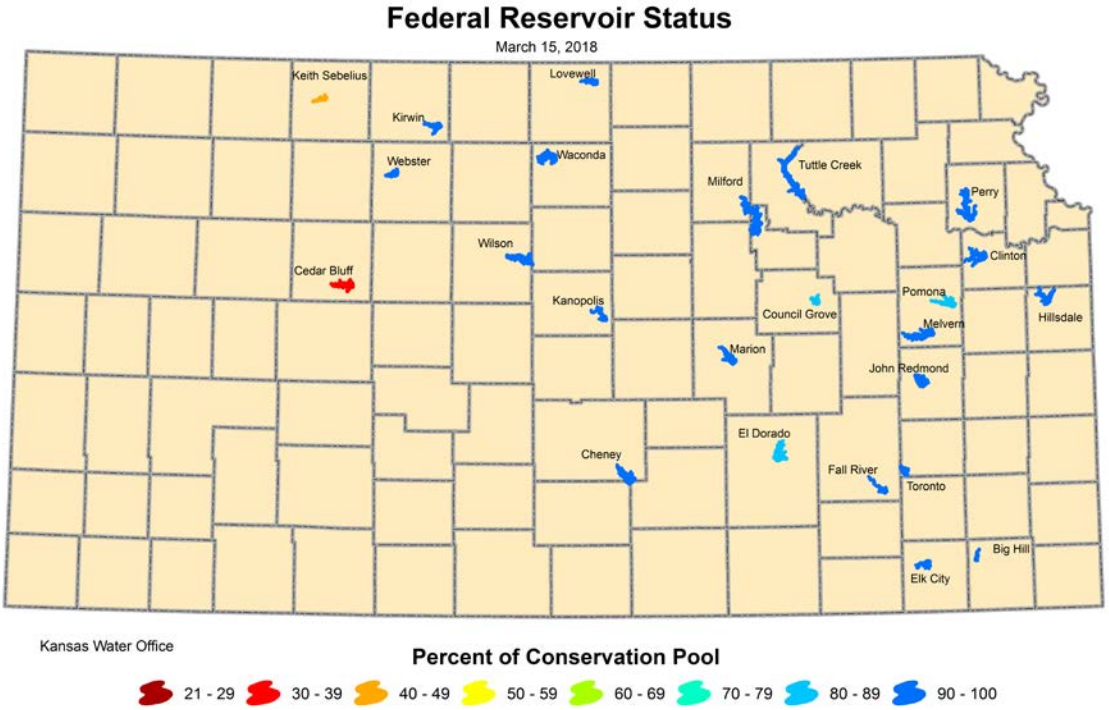
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs generally low and streamflow is declining throughout the system. Conservation storage is full in John Redmond but steadily declined in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow in the upper system and releases from John Redmond are necessary to meet the needs of Wolf Creek power plant.

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs are at or near conservation pool levels; reservoir releases are necessary to supplement low flow conditions of the Fall and Verdigris Rivers. Streamflow throughout the basin are low due to dry conditions but storage is healthy.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool.

Smoky Hill basin: The middle Smoky Hill basin is maintaining near median streamflow. Kanopolis Lake declined throughout December and into the first week of January due to releases necessary to accommodate dam safety inspections. After the inspection the discharge was reduced to 10 cfs and inflows were sufficient to refill conservation storage. In February and March the Corps again released water to lower the pool level for further inspections and work on the service gates. Inflow to Kanopolis is slightly below median historic values and a healthy rain and runoff event will be needed to refill storage to normal pool.

General Reservoir Conditions



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**03/15/2018**		
Norton[1]	2304.3	2292.14	-12.16	40.9
Harlan County, NE	1945.73	1939.55	-6.18	75.6
Lovewell[1]	1582.6	1581.47	-1.13	91
Milford[1]	1144.4	1141.55	-2.85	88.7
Cedar Bluff	2144	2117.48	-26.52	29.5
Kanopolis[1]	1463	1462.18	-0.82	95
Wilson[1]	1516	1516.11	0.11	100
Webster[1]	1892.5	1893.89	1.39	100
Kirwin[1]	1729.3	1729.18	-0.12	99.7
Waconda[1]	1455.6	1454.42	-1.18	93.4
Tuttle Creek[1]	1075	1074.42	-0.58	97.6
Perry[1]	891.5	889.46	-2.04	89.9
Clinton[1]	875.5	875.5	0	100
Melvern[1]	1036	1034.58	-1.42	93.6
Pomona[1]	974	971.96	-2.04	86.1
Hillsdale[1]	917	915.39	-1.61	90.4
Arkansas River Basin		**03/13/2018 08:00 AM**		
Cheney	1421.6	1420.70	-0.90	95.0
El Dorado	1339	1335.01	-3.99	82.0
Toronto[1]	901.5	901.76	0.26	100.0
Fall River[1]	948.5	947.73	-0.77	89.0
Elk City[1]	796	796.60	0.60	100.0
Big Hill	858	858.05	0.05	100.0
Council Grove[1]	1274	1272.02	-1.98	88.0
Marion[1]	1350.5	1348.57	0.07	100.0
John Redmond[1]	1039	1041.62	0.62	100.0

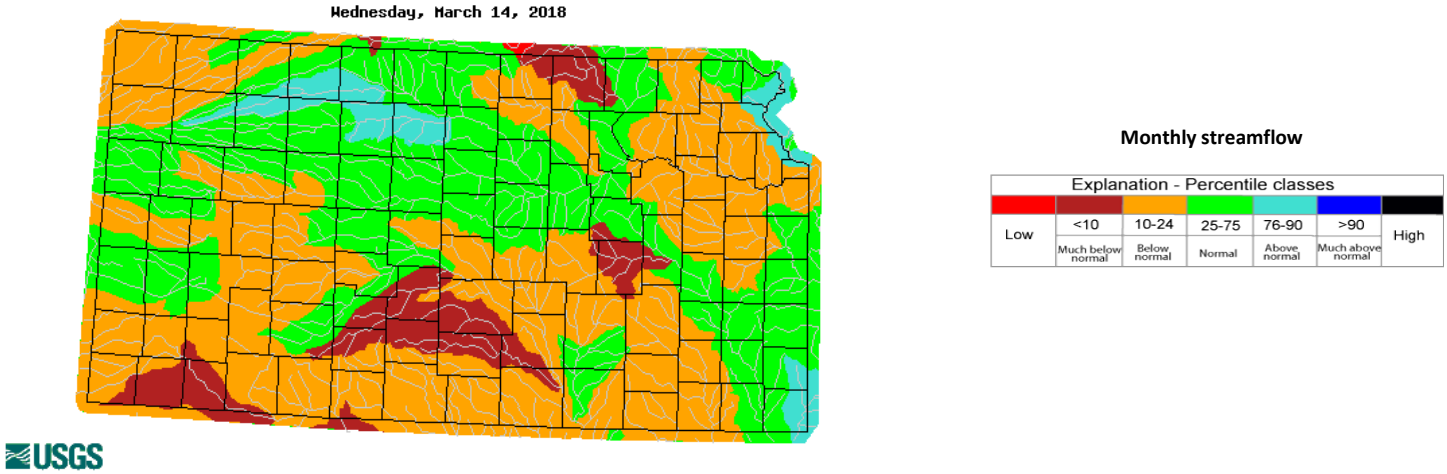
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. Spring evaluation resumed in March. There are currently no warnings and watches in effect.

Streamflow Conditions
WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

14-Day average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

MDS administration occurred during the month, with administration beginning August 10, 2017 on the Little Arkansas River at Alta Mills. The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage.

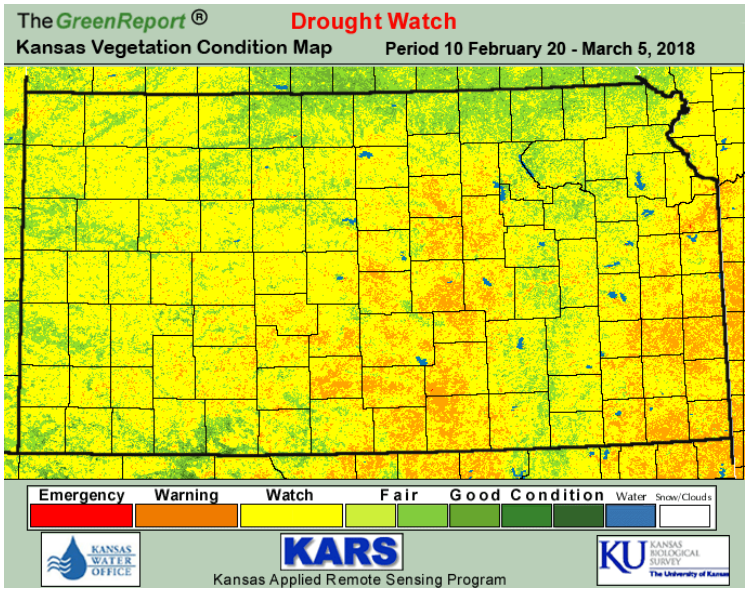
Streamflows as of March 14, 2018			
Gaging Station	**Current Flow**	**Mar MDS**	**Comment**
Republican River at Concordia	Eqp	150	
Republican River at Clay Center	251	200	
Little Blue River near Barnes	150	125	
Mill Creek near Paxico	7	8	Admin pending weekend rains

Delaware River near Muscotah	13	20	Admin pending weekend rains
Rattlesnake Creek near Macksville	0	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	9	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	5	8	MDS admin began Aug 10, 2017
North Fork Ninnescah River above Cheney	57	50	
South Fork Ninnescah River near Pratt	6	10	No surface water diversions junior to MDS above gage
South Fork Ninnescah River near Murdock	105	90	
Whitewater River near Towanda	17.7	15	
Medicine Lodge River near Kiowa	59	60	

Soil, Crop and Vegetation

Kansas Vegetative Conditions

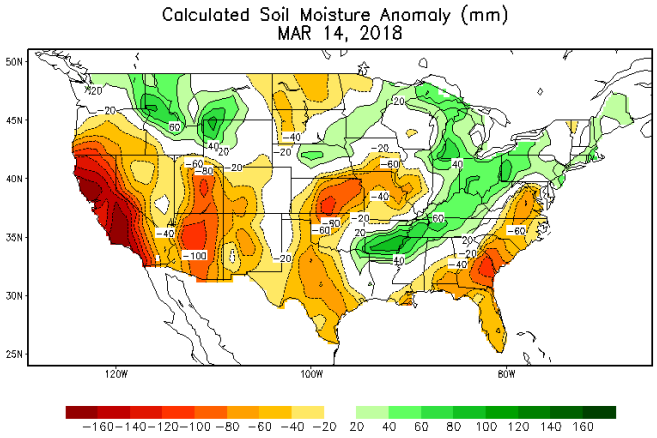
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress.

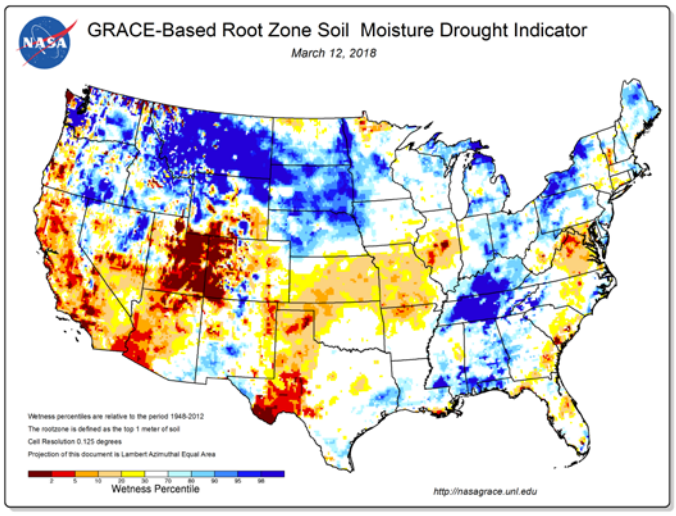


Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)

NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present).

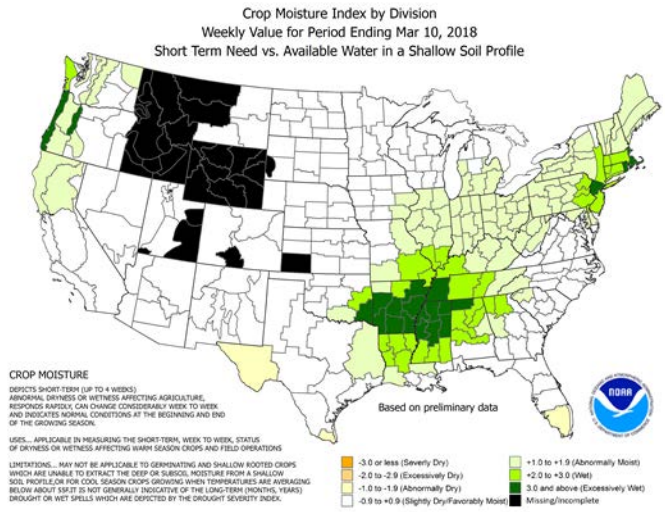




Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion.

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending March 11, 2018 indicates topsoil moisture supplies rated 48 percent very short, 32 short, 20 adequate, and 0 surplus. Subsoil moisture supplies rated 33 percent very short, 41 short, 26 adequate, and 0 surplus.

Field Crops Report: Winter wheat condition rated 17 percent very poor, 36 poor, 35 fair, 11 good, and 1 excellent.



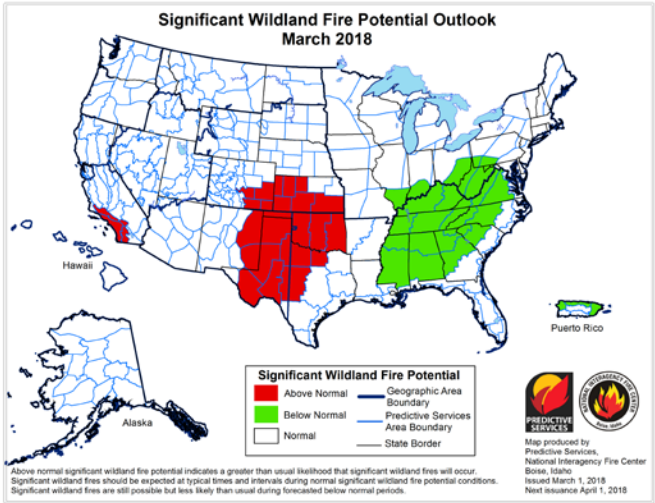
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA/JAWF Weekly Weather and Crop Bulletin.

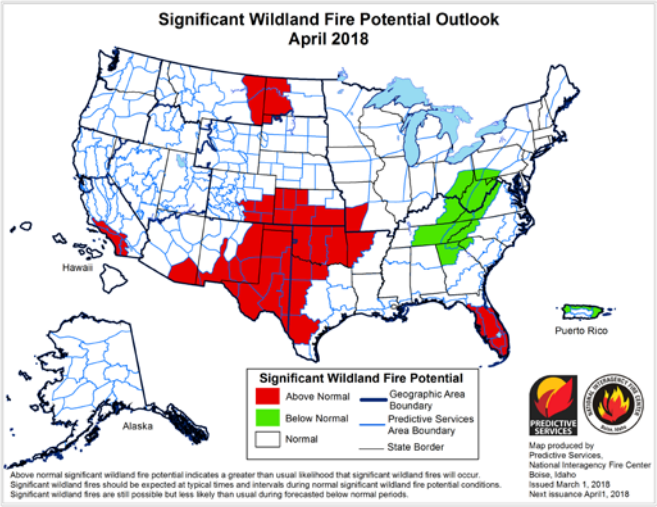
Fire

March conditions resulted in numerous Red Flag warnings alerting citizens to potential increases in wildfire activity due to ideal conditions for wildland fire combustion and rapid spread.

Through March 8, 2018 57 wildfires were reported to Kansas Department of Emergency Management, burning over 27,000 acres statewide. Wildfires also occurred March 8 through 15.

As dry conditions continue, there is an increased potential for wildfire. According to the National Interagency Fire Center, wildfire activity is likely to increase in March in a manner typical to most years beginning in the central through southern Great Plains and the Southwest where preexisting drought conditions and fuel loadings have promoted an environment favorable for Above Normal significant wildland fire potential entering spring.





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, KWO Drought, contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov.

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://kwo.org/reports_publications/Drought.htm

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE – End of March 2018 Summary

General Overview

- U.S. Drought Monitor indicates over 20% of Kansas in extreme drought, with severe drought covering about 56% of the state. Southwest Kansas had further deterioration the last week of March as exceptional drought expanded to include all or portions of 8 counties in and extreme drought expanded further into portions of 5 counties.

- USDA Drought Disaster Designations as of March 21, 2018 have been made for 28 primary counties and 12 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

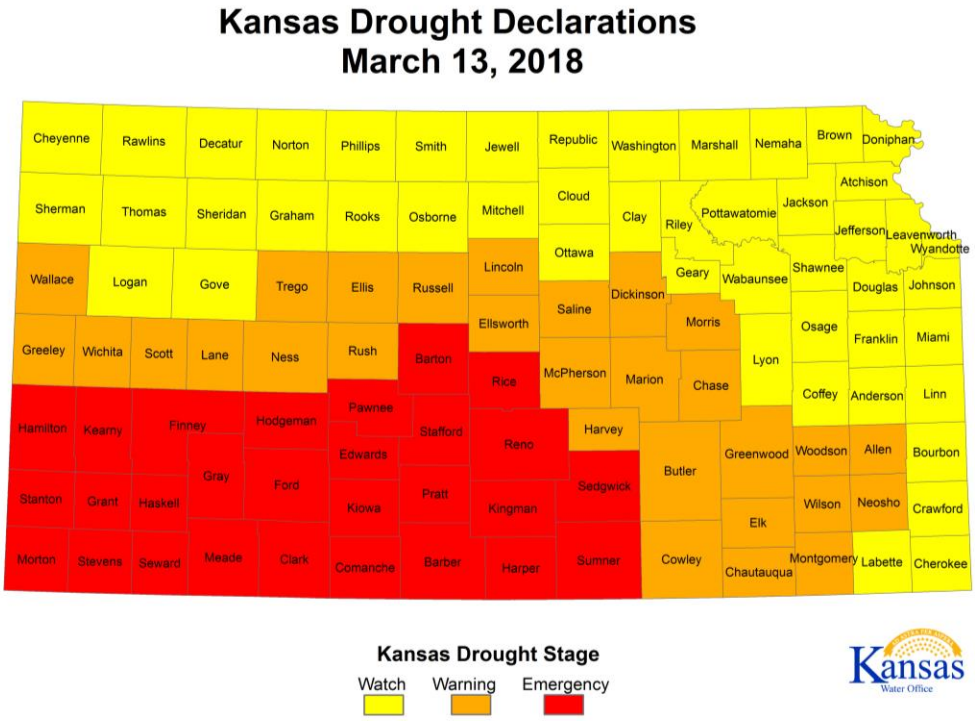
- Wildfire danger remains high, due to dry conditions, availability of fuel and winds. Over 27,000 acres burned in the first 7 days of March. Additional fires reported throughout March.

- Administration was put in effect March 23, 2018 for 40 water rights above the Muscotah gage on the Delaware River.

- Water Rights above the USGS gage on the Little Arkansas River at Alta Vista have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.



Drought Watch counties: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

Drought Warning counties: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

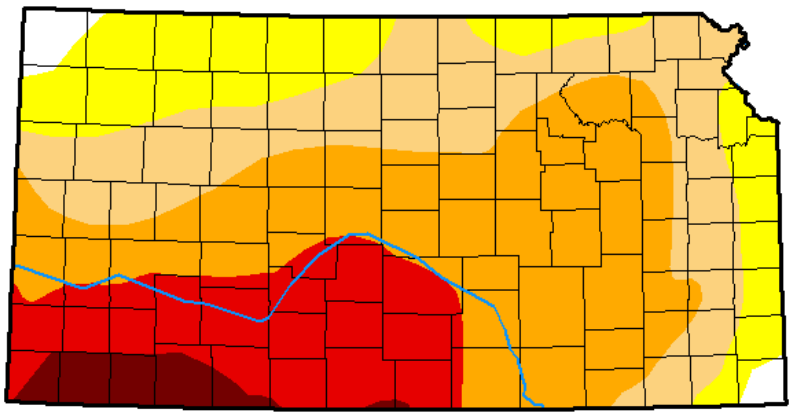
Drought Emergency counties: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

Despite rains in the last part March deterioration in drought related conditions continued, precipitation did not make up climate division deficits. Exceptional drought expanded from Oklahoma into southwest Kansas. The northwest and southeast corners of the state remain drought-free. The rest of the state saw deterioration. Exceptional drought conditions now cover just over 3 percent of the state, with extreme drought covers an additional 17 percent of the state. Severe drought has expanded to a quarter of the state while moderate drought covers an additional 36 percent of the state. With the wet summer last year and current dryness, increased fire danger continues.

U.S. Drought Monitor

Kansas



March 27, 2018

(Released Thursday, Mar. 29, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	1.78	98.22	81.45	56.19	20.90	3.70
Last Week *03-20-2018*	1.22	98.78	81.77	56.19	19.33	0.30
3 Months Ago *12-26-2017*	0.00	100.00	32.70	8.63	0.00	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *03-28-2017*	9.58	90.42	42.82	9.01	0.57	0.00

Intensity:

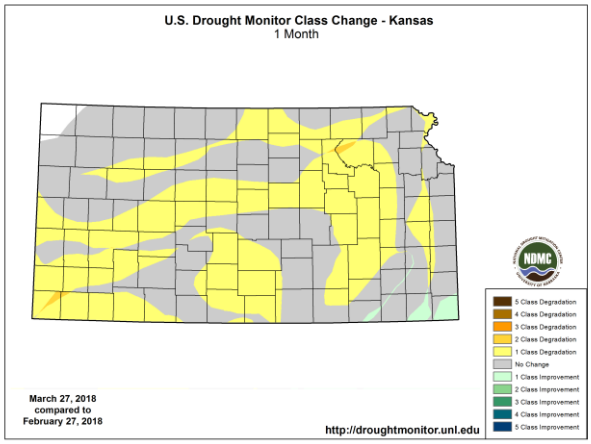
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Chris Fenimore
NCEI/NESDIS/NOAA

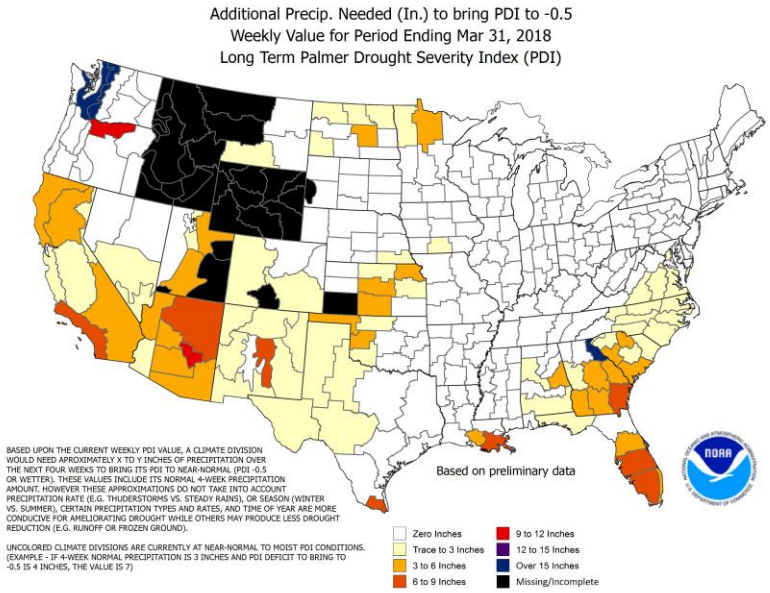
http://droughtmonitor.unl.edu/



More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought.
More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Long-term PDI Precipitation needed to remove drought for weeks ending on date			
Climate Division	Mar 17	Mar 24	March 31
North Central	2.52	1.38	1.97
Northeast	4.27	4.55	4.73
Central	5.04	4.25	5.13
East Central	1.27	0.65	0.49
South Central	4.84	3.56	4.19
Southwest	unknown	unknown	unknown

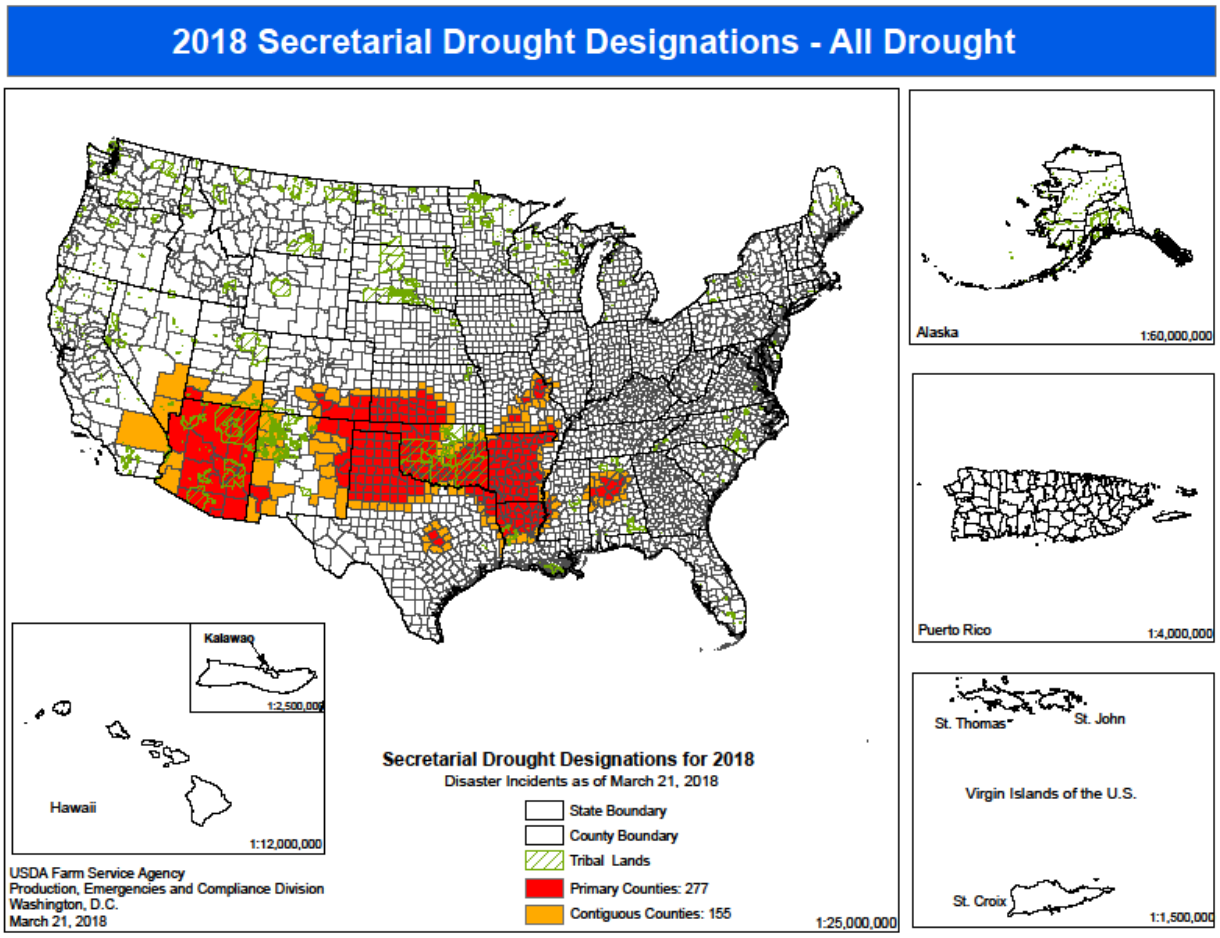


Federal Disaster Declarations 2018

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

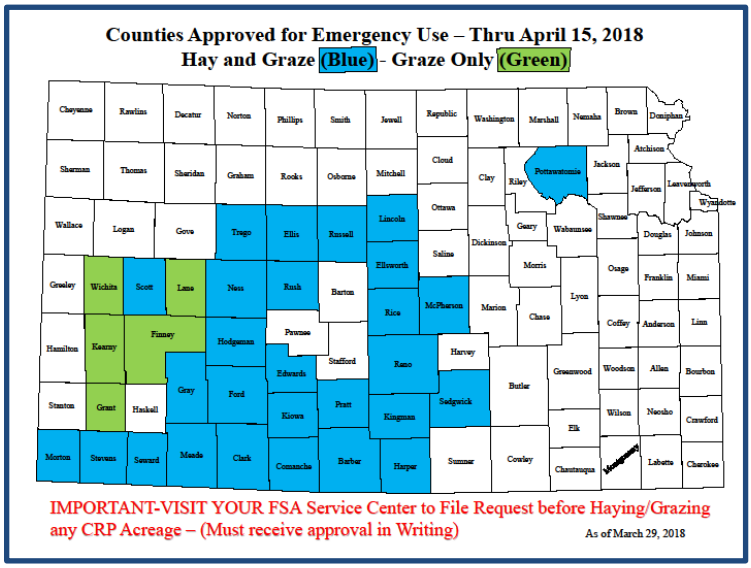
USDA drought disasters have been declared in 2018 for Kansas. Designations are for 28 primary counties and 12 contiguous counties. Primary counties include Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgewick, Seward, Stafford, Stanton, Stevens, and Sumner. Contiguous counties are Butler, Cowley, Ellsworth, Greeley, Harvey, Lane, McPherson, Ness, Rush, Russell, Scott and Wichita.



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency.

USDA-FSA has approved emergency haying and grazing on CRP acreages in some counties in Kansas (March 29, 2018). FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



Presidential Federal Disasters

Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

Climate Summary (Precipitation and Temperature)

Precipitation: The Southwest Climate Division again missed out on most of the precipitation during March. State-wide the average precipitation was 0.97 inches or 41 percent of normal. No division reached normal for precipitation for the month. The Southwest Division, with an average of just 0.33 inches, had the lowest percent of normal at just 22 percent. The East Central Division had the closest to normal precipitation with an average of 1.50 inches or 55 percent of normal. The greatest monthly precipitation totals were 3.78 inches at Stillwell 1N, Johnson County (NWS) and 4.10 inches at Plevna 3.1 NNW, Reno County (CoCoRaHS). There was some snow during the month, with two locations matching or setting daily records for snowfall. The greatest daily snowfall report was 4.5 inches at Tribune 1W, Greeley County, on the 6th. The greatest snowfall totals for the month were 3.0 inches at both Ransom 2NE, Ness County and Wakeeney, Trego County (NWS); and 2.7 inches at St. Francis 12.1 NW, Cheyenne County (CoCoRaHS).

March Weekly Precipitation Highlights

Week ending March 9, the state-wide average precipitation was just 0.06 inches, or 2 percent of normal. That is 0.35 inches below normal for the period. Winds up to 61 mph were observed in western Kansas.

Week ending March 13, the state-wide precipitation average was zero inches, or zero percent of normal. That is 0.45 inches below normal for the period. No division averaged measurable precipitation

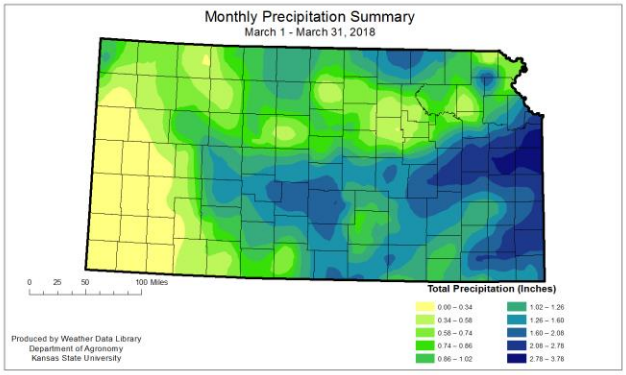
Week ending March 20, state-wide the precipitation average 0.74 inches or 148 percent of normal. This is the most widespread precipitation Kansas has seen in 2018.

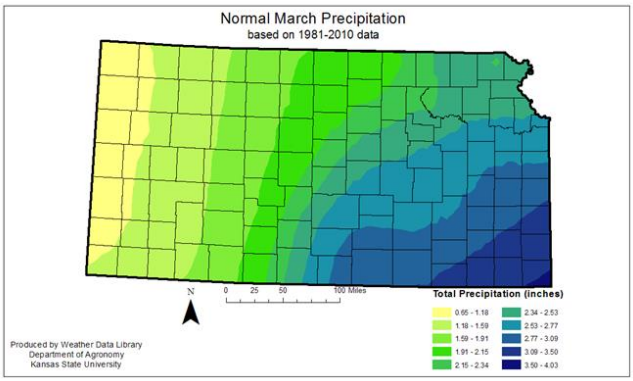
Week ending March 27, precipitation was concentrated in eastern third of the state, but were still below climate division normal. State-wide, the precipitation averaged 0.13 inches or 19 percent of normal.

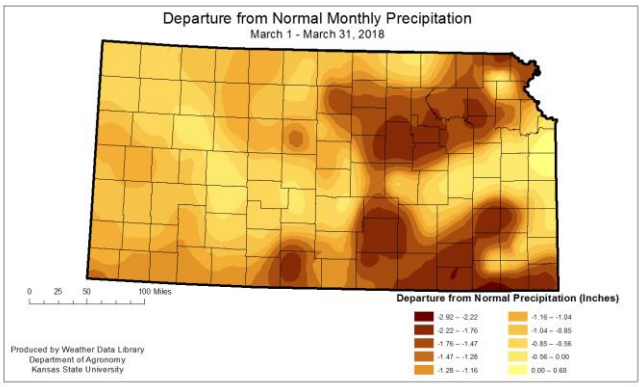
Reports of baseball size hail in North Central Kansas on the 23rd and hail up to 1.5 inches in East Central Kansas on the 25th.

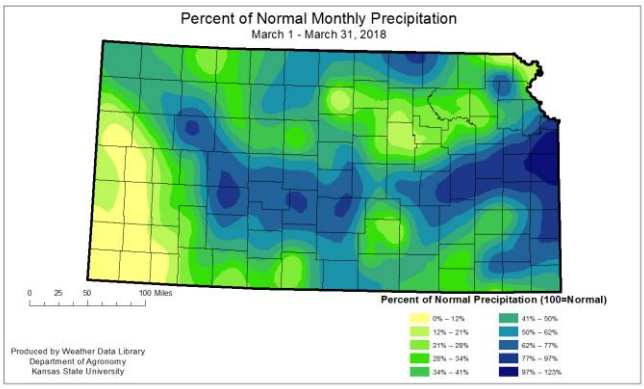
Precipitation summary is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	March 1-31, 2018			January 1-March 31, 2018			April 1, 2017-March 31, 2018			Sept. 1, 2017-March 31, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.38	-0.93	27	0.84	-1.46	35	18.18	-3.18	84	4.51	-2.26	64
West Central	0.83	-1.20	41	1.54	-1.94	44	23.59	-4.45	84	6.75	-3.46	65
Southwest	1.15	-1.13	50	1.99	-2.22	47	26.29	-8.71	75	6.70	-6.84	49
North Central	0.57	-0.83	38	1.00	-1.50	39	20.27	-0.50	98	5.62	-1.35	80
Central	0.90	-1.35	40	1.63	-2.32	42	22.67	-6.62	78	6.47	-4.29	61
South Central	1.47	-1.18	54	2.72	-2.20	53	31.26	-6.66	81	8.30	-6.94	52
Northeast	0.32	-1.04	21	0.53	-1.85	21	19.70	-0.20	100	4.20	-2.64	63
East Central	1.40	-1.23	53	2.03	-2.59	42	26.67	-4.65	85	7.67	-4.80	60
Southeast	1.60	-1.42	53	4.19	-1.81	68	40.00	-1.49	95	11.26	-6.82	61
STATE	0.97	-1.15	41	1.85	-2.00	43	25.60	-3.79	87	6.88	-4.35	61

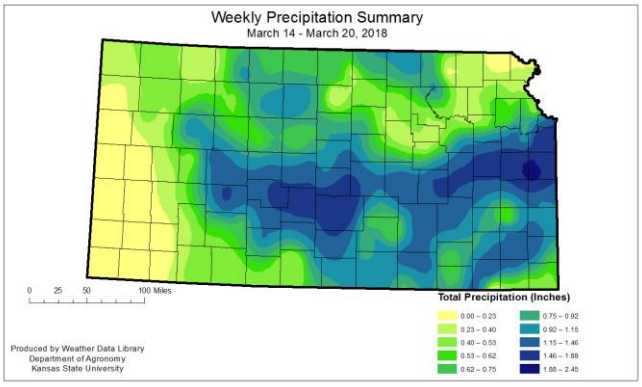


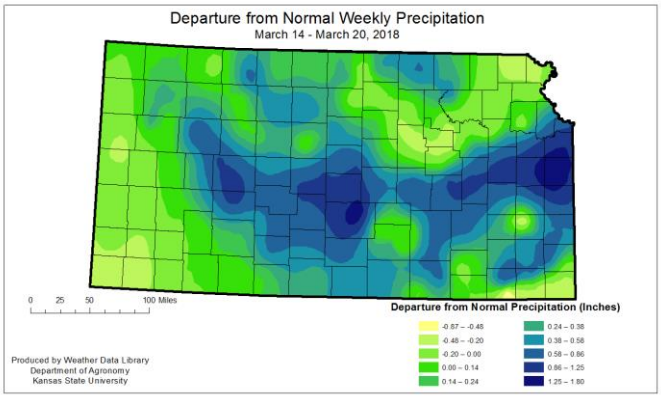


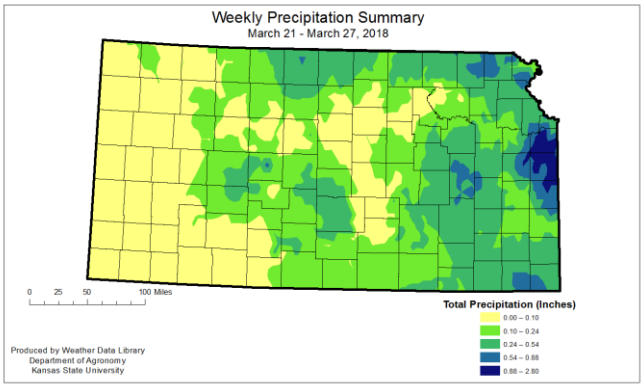


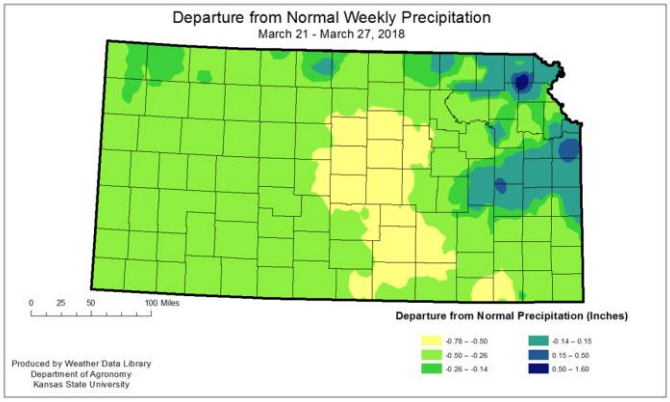


Below are the March precipitation summary percent of normal precipitation and the departure from normal precipitation for the last two weeks of March. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.)









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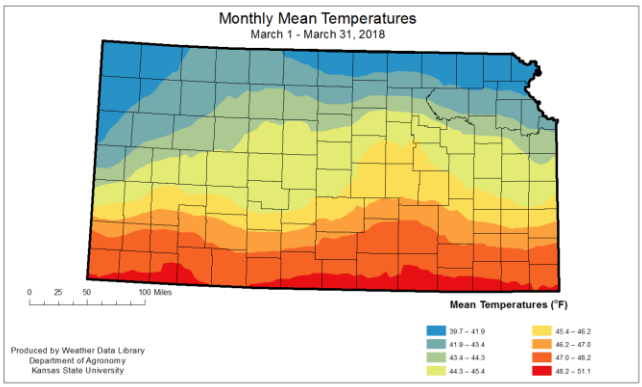
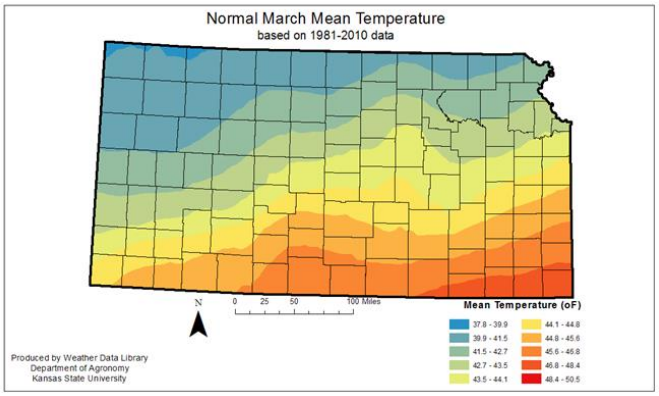
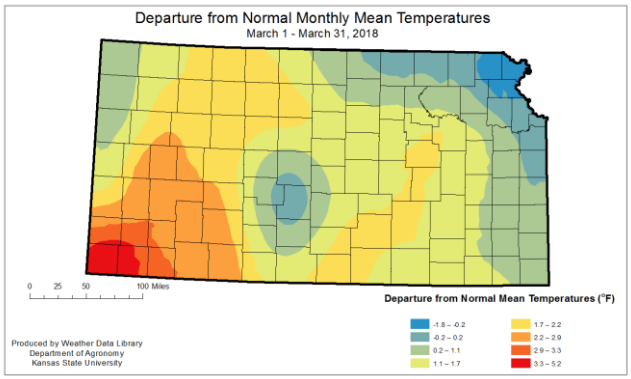
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Temperature: March continued the pattern of wide temperatures swings, as might be expected with the dry air in place. The statewide average temperature was 44.7 ^{o}F, or 1.2 degrees warmer than normal. The cold days weren't persistent enough to outweigh the warmer start to the month. Only the Northeast Divisions averaged below normal for the month. The average temperature for the Northeast was 42.1 ^{o}F, or 0.4 degrees cooler than normal. The Southwest Division had the greatest departure, with an average of 47.6 ^{o}F or 3.3 degrees warmer than normal. The warmest temperature reported for the month was 93 ^{o}F at Ashland, Clark County, on the 24th. The coldest reading was 7 ^{o}F at Alton 2SW, Osborne County, on the 8th. Records were set on both the cold and warm end of the spectrum, with most of those records on the warm side of the spectrum. On the cold side, there was one new record low maximum temperature and no new record low minimum temperatures. On the warm side, there were 27 new record high maximum temperatures and 10 new record high minimums.

Temperature summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

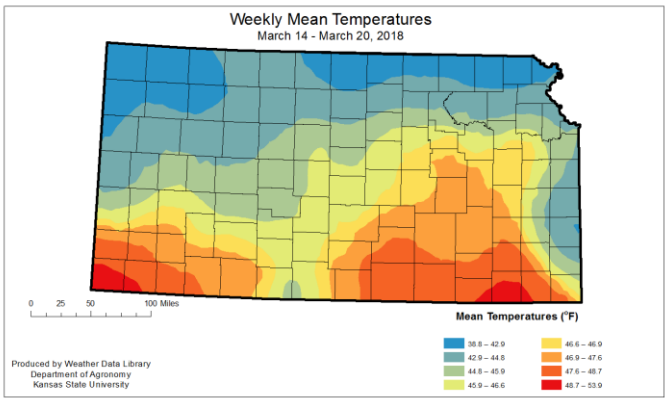


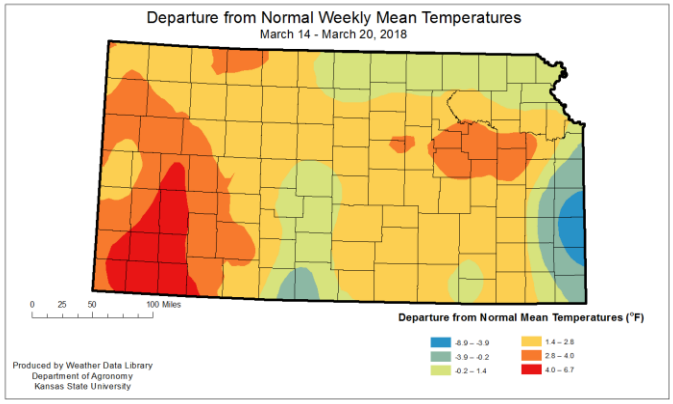


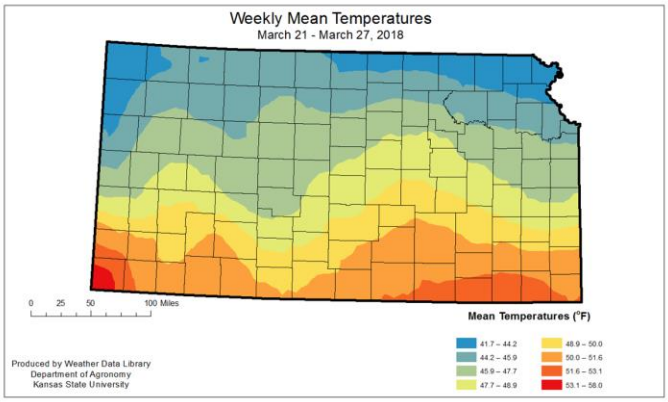


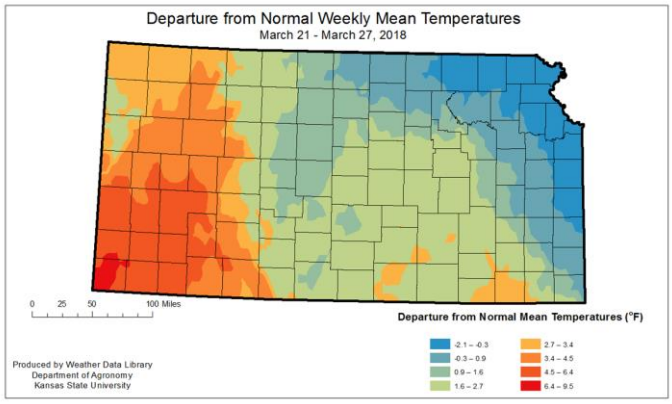
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	March 1-31, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	59.5	24.6	42.1	1.9	89	24	11	7
West Central	62.1	25.6	43.8	2.3	91	24	10	7
Southwest	65.3	29.6	47.4	3.3	93	24	11	7
North Central	57.1	28.7	42.9	0.7	81	5	10	8
Central	60.0	30.4	45.2	1.5	83	16	10	8
South Central	62.0	32.3	47.1	1.7	81	15	13	8
Northeast	54.0	30.2	42.1	-0.4	80	16	12	8
East Central	56.3	32.8	44.5	0.8	79	16	15	8
Southeast	59.2	34.3	46.7	0.9	79	24	17	8
STATE	59.5	29.8	44.6	1.4	93	24th	10	7th
Data Source: KSU Weather Library								

Below are the weekly mean temperatures and the departure from normal temperatures for the last two weeks of March. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by on KSU Weather Data Library.)









Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

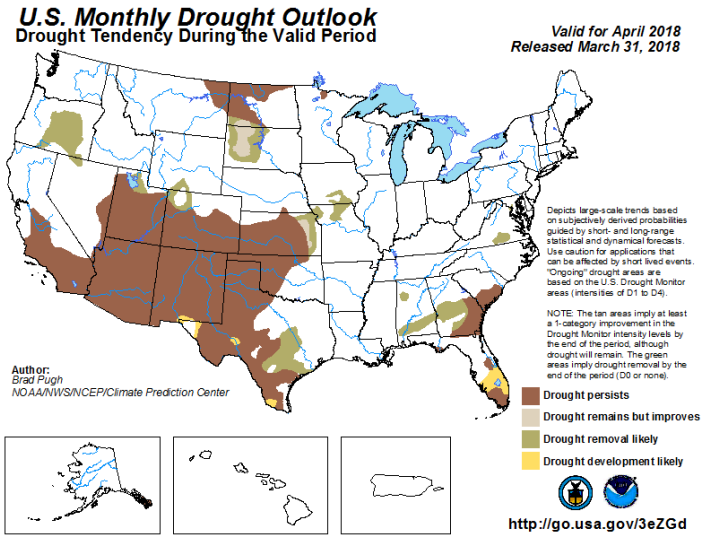
Severe weather: There were 17 hail reports and 3 damaging wind reports. In addition, there were several winter weather advisories and several days with extreme fire danger.

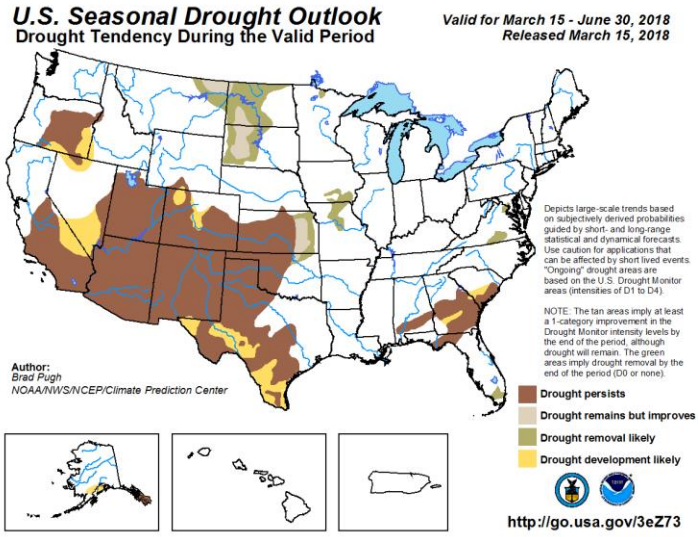
Future Outlook

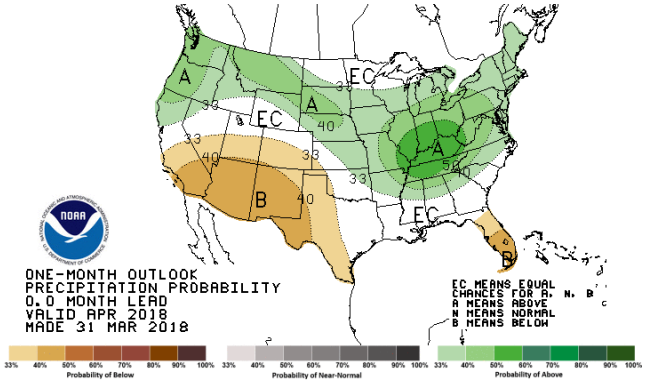
The Monthly Drought Outlook indicates drought conditions to remain in southern, central and western Kansas. Improvement of drought conditions is possible in the east and northeast portions of Kansas. The April outlook has a slight chance for wetter than normal conditions across the eastern portions of the state, with drier than normal conditions in the southwest corner of the state. The temperature outlook is for cooler than normal temperatures statewide. Unless April moisture is significant, even that combination is unlikely to result in significant improvement of the drought conditions

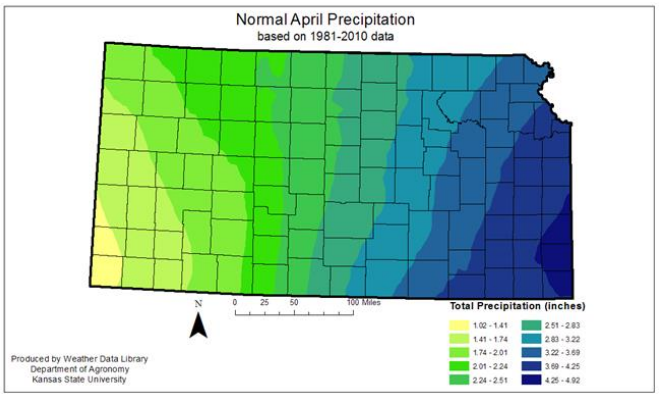
Seasonal Outlook (3-month) favors continued drought in south central, central and western Kansas with the east improving. For the March 15-June 30 time period probability favors below normal precipitation and above normal temperatures for western parts of the state. The remaining areas have equal chances of below or above normal precipitation and temperatures for the period.

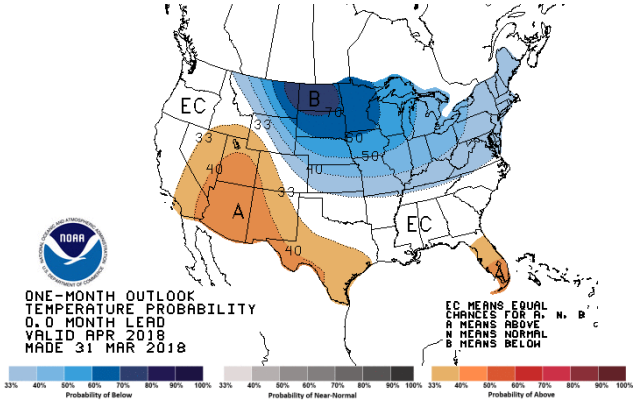
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

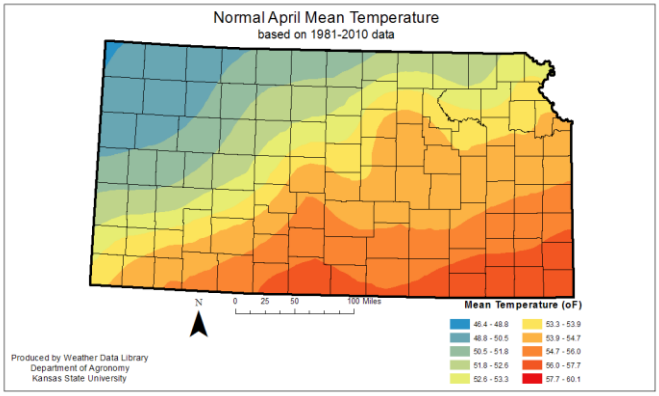


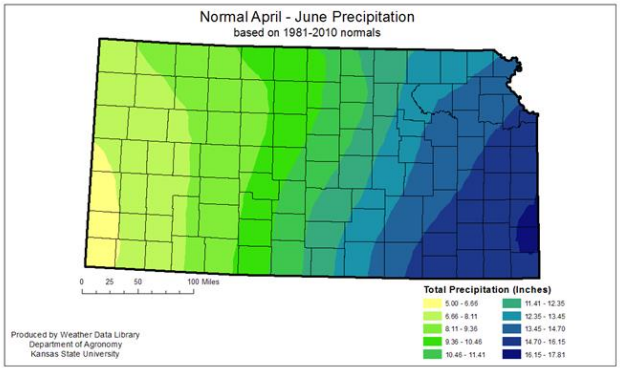


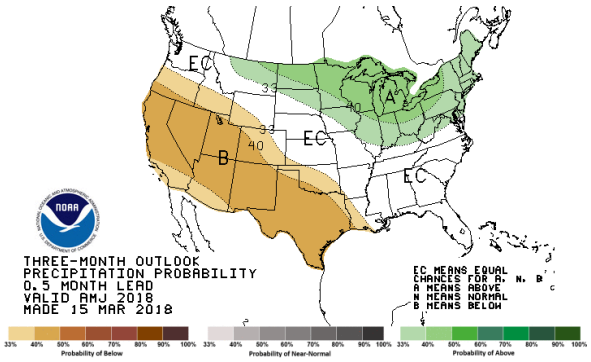


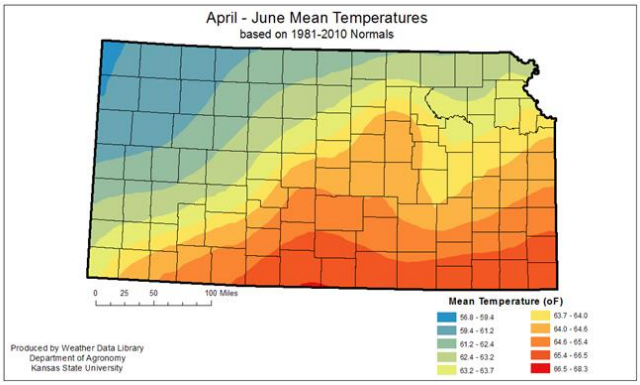


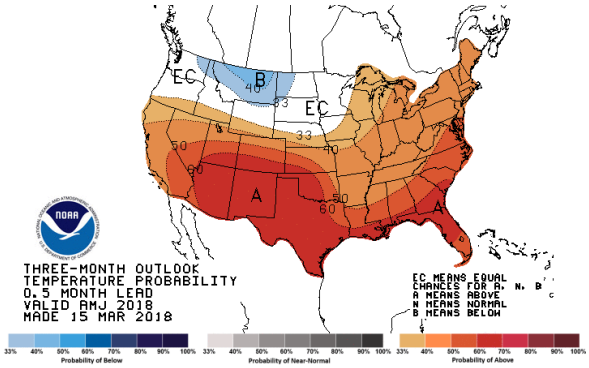












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of March 30, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (March 30, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ March 30, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs remained below normal for March. However, storage in the basin has not been negatively impacted from the abnormally dry conditions in recent months. Clinton maintained a full pool and the other three reservoirs were below the top of multipurpose elevation due to planned seasonal drawdowns. The lower seasonal elevations may extend longer than planned if inflow conditions don't improve. Flow in the Kansas River remained less than half of historic median levels but maintained above the low flow Assurance District and Water Quality flow targets.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs benefited from a mid-March precipitation event and recovered storage from the lower winter target elevations. Flow in the Marais des Cygnes River also benefited from the mid-month rain and rose to above median values.

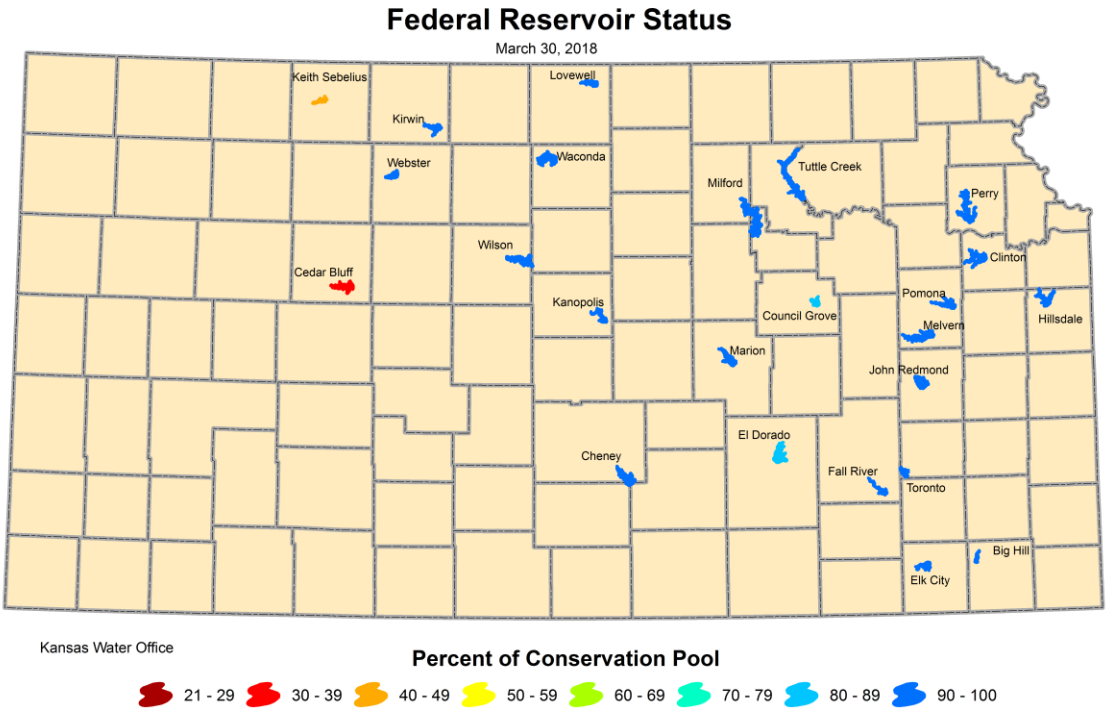
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low and streamflow is declining throughout the system. Conservation storage is full in John Redmond but steadily declined in Marion and Council Grove. Releases were necessary to maintain sufficient streamflow for the majority of the month in the upper system and releases from John Redmond are necessary to meet the needs of Wolf Creek power plant.

Verdigris basin: Toronto, Fall River, and Big Hill reservoirs are at or near conservation pool levels; Elk City maintained above normal pool. Reservoir releases were necessary to supplement low flow conditions of the Fall and Verdigris Rivers in the first half of March but rain provided sufficient runoff to maintain streamflow for the second half. Streamflow throughout the basin were below median values for the majority of the month but storage is healthy.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool and streamflow conditions remained near median values throughout the month.

Smoky Hill basin: The middle Smoky Hill basin maintained streamflow but did not experience any significant runoff events. Kanopolis Lake declined again in early March due to releases necessary to accommodate additional dam safety inspections. After the inspection the discharge was reduced to 10 cfs and inflows were sufficient to refill most of the water released for the inspections but ended the month about 4 tenths of a foot below the top of Multipurpose Pool elevation. Inflow to Kanopolis remained slightly below median historic values and a healthy rain and runoff event will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of Multipurpose.

General Reservoir Conditions



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**03/30/2018 11:14 am**		
Norton[1]	2304.3	2292.31	-11.99	41.5
Harlan County, NE	1945.73	1940.04	-5.69	77.4
Lovewell[1]	1582.6	1581.62	-0.98	92.2
Milford[1]	1144.4	1141.66	-2.74	89.1
Cedar Bluff	2144	2117.44	-26.56	29.5
Kanopolis[1]	1463	1462.58	-0.42	97.4
Wilson[1]	1516	1516.23	0.23	100
Webster[1]	1892.5	1893.9	1.4	100
Kirwin[1]	1729.3	1729.45	0.15	100
Waconda[1]	1455.6	1454.61	-0.99	94.4
Tuttle Creek[1]	1075	1074.88	-0.12	99.5
Perry[1]	891.5	889.47	-2.03	89.9
Clinton[1]	875.5	875.92	0.42	100
Melvern[1]	1036	1035.06	-0.94	95.7
Pomona[1]	974	973.01	-0.99	93
Hillsdale[1]	917	916.85	-0.15	99.1
Arkansas River Basin		**3/30/2018 8 am**		
Cheney	1421.6	1420.95	-0.65	96.0
El Dorado	1339	1334.94	-4.06	82.0
Toronto[1]	901.5	902.69	1.19	100.0
Fall River[1]	948.5	948.20	-0.30	96.0
Elk City[1]	796	796.90	0.90	100.0
Big Hill	858	858.26	0.26	100.0
Council Grove[1]	1274	1271.96	-2.04	88.0
Marion[1]	1350.5	1348.61	-0.49	96.0
John Redmond[1]	1039	1041.78	0.78	100.0

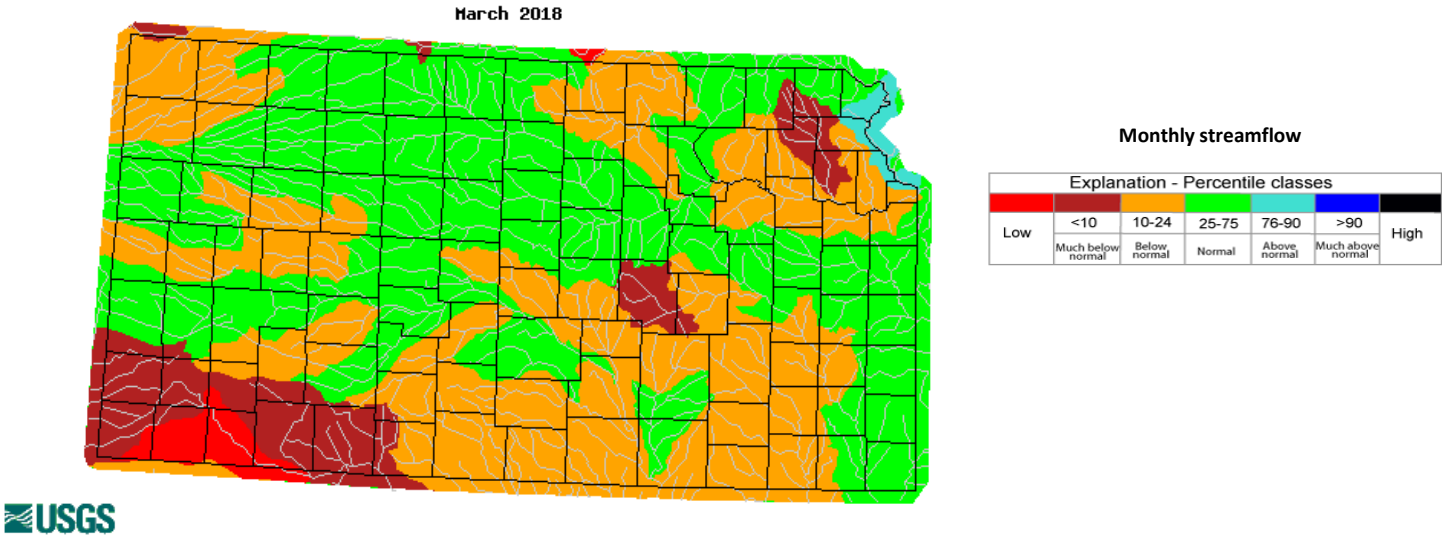
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. Spring evaluation resumed in March. There are currently no warnings and watches in effect.

Streamflow Conditions
WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

March average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

MDS administration occurred during the month, with administration beginning August 10, 2017 on the Little Arkansas River at Alta Mills.

Administration has been in effect since March 23, 2018 for 40 water rights above the Muscotah gage on the Delaware River.

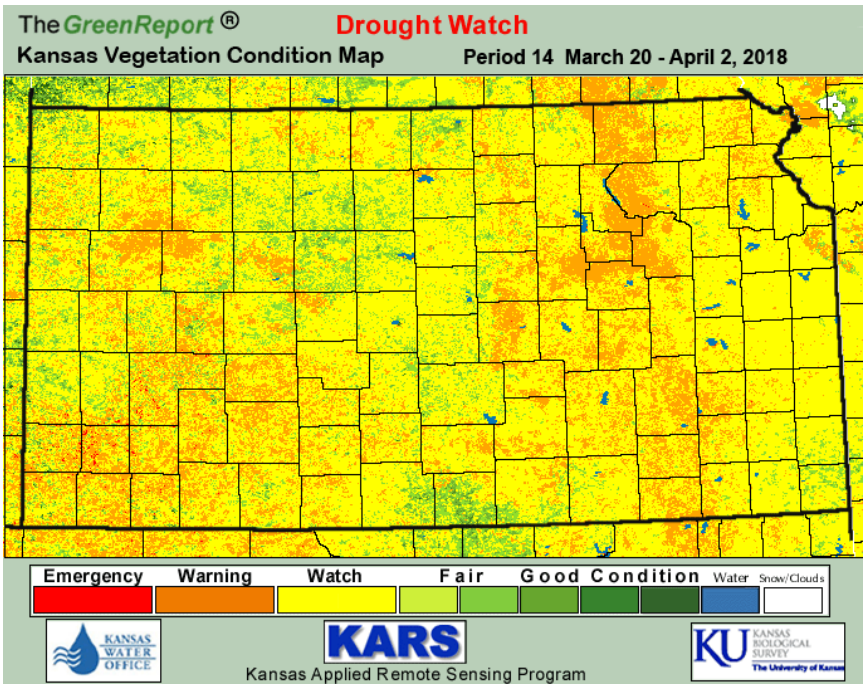
The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage and others where the below MDS flows will be of sufficient number of days to require administration soon.

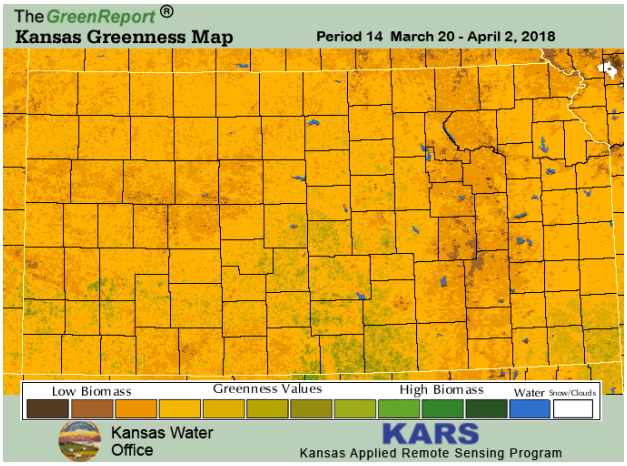
Streamflows as of April 4, 2018				
Gaging Station	**Current Flow**	**Mar MDS**	**Apr MDS**	**Comment**
Republican River at Concordia	157	150	150	
Republican River at Clay Center	246	200	250	
Little Blue River near Barnes	176	125	150	
Mill Creek near Paxico	8	8	25	Orders pending – anticipated 4/9/18
Delaware River near Muscotah	20	20	20	Admin beginning March 23, 2018
Rattlesnake Creek near Macksville	1	10	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	9	15	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	5	8	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	6	10	8	
Whitewater River near Towanda	15	15	20	No surface water diversions junior to MDS above gage
Medicine Lodge River near Kiowa	64	60	60	

Soil, Crop and Vegetation

Kansas Vegetative Conditions

The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. Many of the areas shown as orange (warning) are wheat areas, indicating lack of growth of the wheat. The second map provides an overview of the greenness to better identify wheat condition..

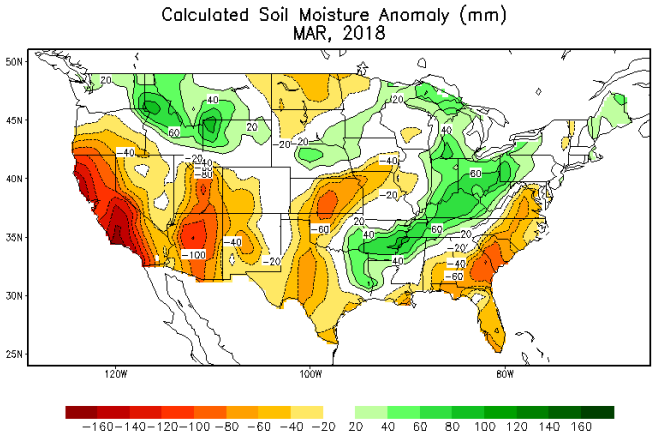


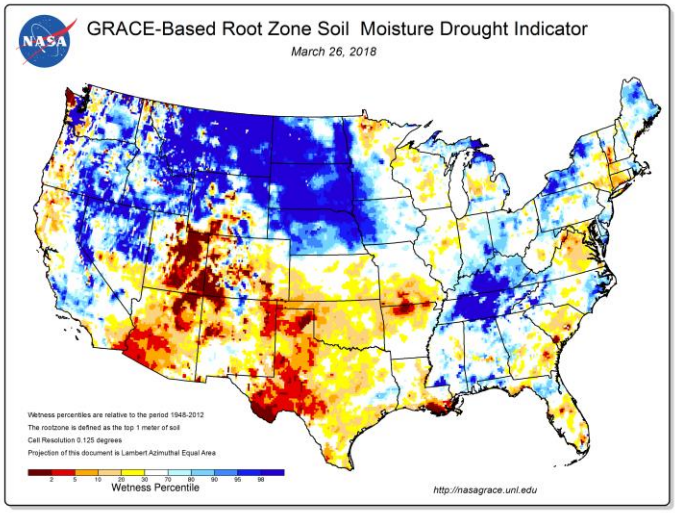


Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)

NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present).

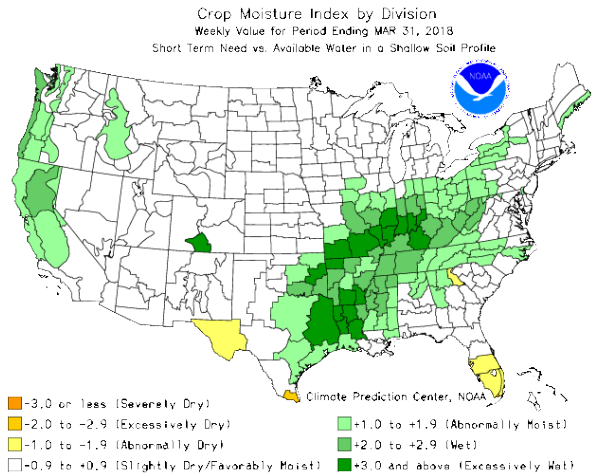




Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion.

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending April 1, 2018 indicates topsoil moisture supplies rated 33 percent very short, 35 short, 31 adequate, and 1 surplus. Subsoil moisture supplies rated 29 percent very short, 43 short, 28 adequate, and 0 surplus.

Field Crops Report: Winter wheat condition rated 13 percent very poor, 34 poor, 43 fair, 10 good, and 0 excellent.



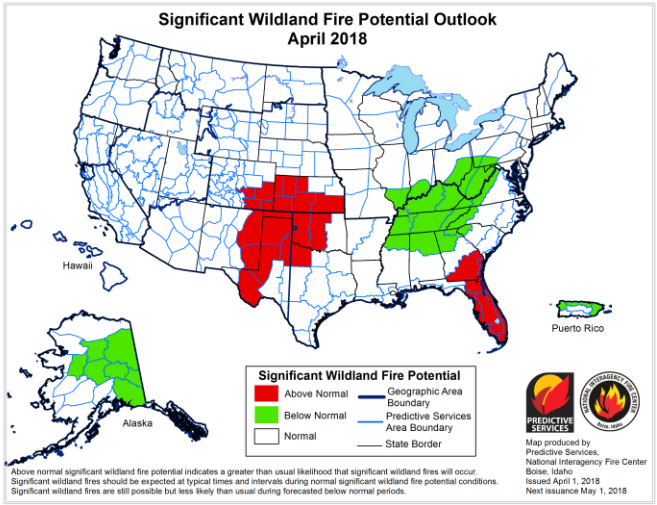
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA/JAWF Weekly Weather and Crop Bulletin.

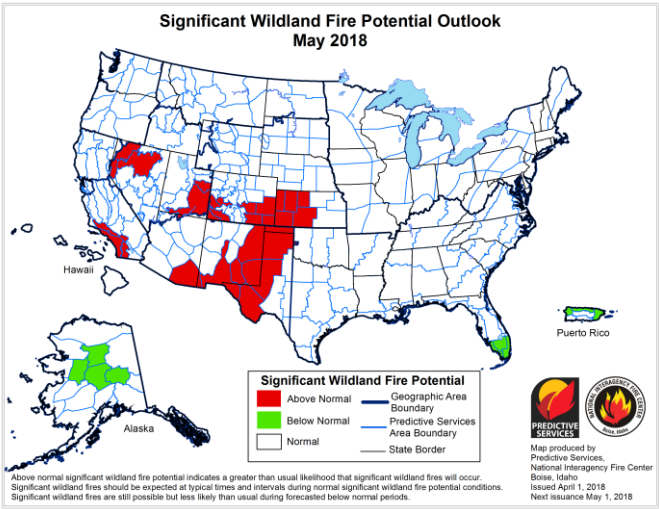
Fire

March conditions resulted in numerous Red Flag warnings alerting citizens to potential increases in wildfire activity due to ideal conditions for wildland fire combustion and rapid spread.

Through March 8, 2018 57 wildfires were reported to Kansas Department of Emergency Management, burning over 27,000 acres statewide. Wildfires also occurred March 8 through 15.

Dry conditions increase the potential for wildfire. According to the National Interagency Fire Center, wildfire activity is likely to continue in western and southern Kansas in April and in the west into May. Periods of concern will be wind events coupled with low humidities that impact fire activity.





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

March 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.31	-0.58	35%	41.8	2.1	84 (23)	11 (7)
Dodge City	1.06	-0.53	67%	47.8	3.4	89 (23)	16 (12, 7)
Garden City	0.38	-1.08	26%	46.3	2.7	91 (23)	11 (7)
Goodland	0.41	-0.66	38%	42.4	1.9	87 (23)	13 (7)
Guymon, OK	0.04	-1.39	3%	50.6	4.3	92 (23)	17 (7)
Hill City	0.41	-1.22	25%	44.3	2.5	80 (15,4)	11 (8)
Lamar, CO	0.28	-0.56	33%	45.7	3.2	86 (23)	11 (12)
McCook, NE	0.37	-0.99	27%	42.1	2.7	78 (4)	15 (12,7)
Springfield, CO	0.17	-0.96	15%	44.6	1.8	84 (23)	10 (7)
Central							
Concordia	0.58	-1.43	29%	43.7	0.6	75 (23,15)	13 (8)
Hebron, NE				42.3	2.2	75 (15)	11 (8)
Medicine Lodge	1.02	-1.24	45%	48.9	2.2	81 (15)	18 (12)
Ponca City, OK	0.40	-2.31	15%	50.6	1.8	79 (22, 15)	21 (14, 8)
Salina	0.75	-1.64	31%	47.6	2.2	81 (15)	14 (8)
Wichita (ICT)	1.12	-1.57	42%	49.2	2.7	79 (15)	21 (14)
East							
Bartlesville, OK	0.54	-2.94	16%	49.6	0.8	78 (22,16)	18 (14,8)
Chanute	1.46	-1.58	48%	48.0	0.9	77 (16)	20 (14)
Fall City, NE	1.04	-1.30	44%	41.8	-0.1	72 (15)	17 (14,8)
Johnson Co. Exec. Apt	3.23	0.60	123%	44.0	-0.9	75 (15)	20 (8)
Joplin, MO	2.30	-1.12	67%	48.9	0.0	77 (16)	22 (8)
Kansas City (MCI), MO	1.65	-0.72	70%	43.6	-0.6	76 (15)	19 (8)
St. Joseph, MO	0.35	-1.90	16%	42.3	-0.6	74 (15)	18 (14,13)
Topeka (TOP	1.05	-1.44	42%	45.7	0.9	78 (15)	16 (8)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE – Mid-April 2018 Summary

General Overview

- U.S. Drought Monitor indicates over 27% of Kansas in extreme drought, with severe drought covering nearly 60% of the state. Exceptional drought expanded to include all or portions of 11 southwestern counties, now covering 7% of Kansas

- Drought Declarations for Kansas counties under Executive Order 18-11, issued March 13, 2018 includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.

- USDA Drought Disaster Designations as of April 11, 2018 have been made for 48 primary counties and 20 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

- Administration was effective April 13, 2018, on the Republican River from the Clay Center gage to state line, covering 225 water rights.

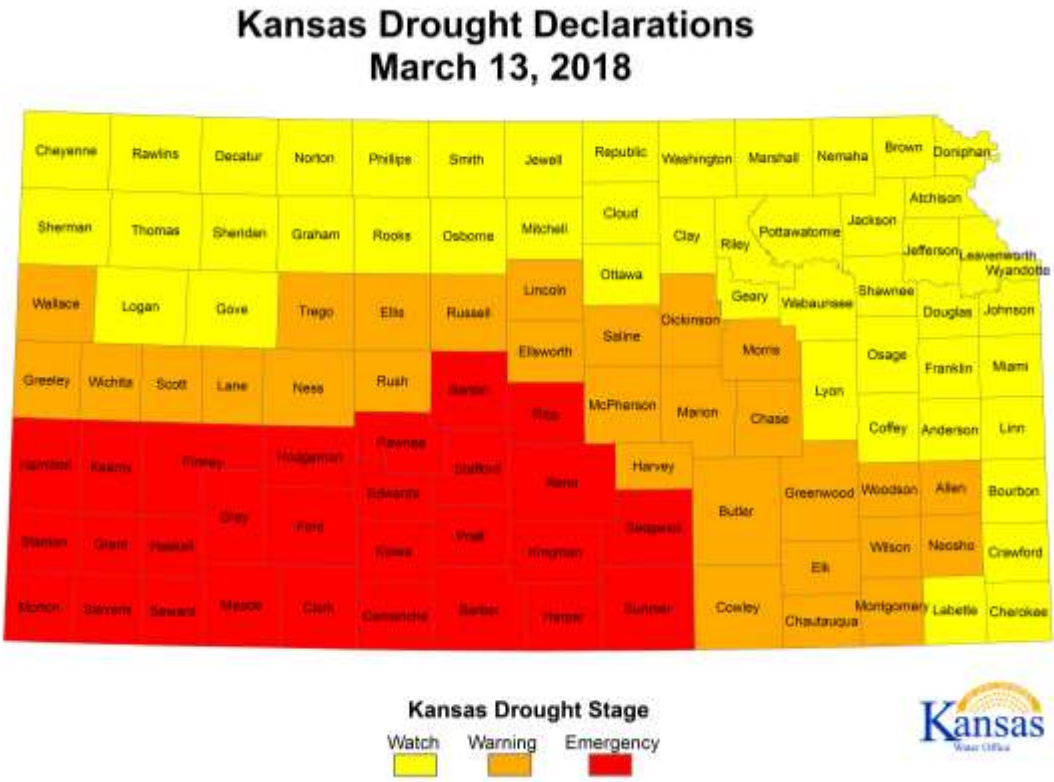
- Administration was effective on Mill Creek above the gage near Paxico, April 12, 2018 covering 14 water rights.

- Administration was effective on the Whitewater River above the gage near Towanda, April 12, 2018 covering 11 water rights

- Administration was put in effect March 23, 2018 for 40 water rights above the Muscotah gage on the Delaware River.

- Water Rights above the USGS gage on the Little Arkansas River at Alta Vista have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11
Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.



<u>Drought Watch counties</u>: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

<u>Drought Warning counties</u>: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

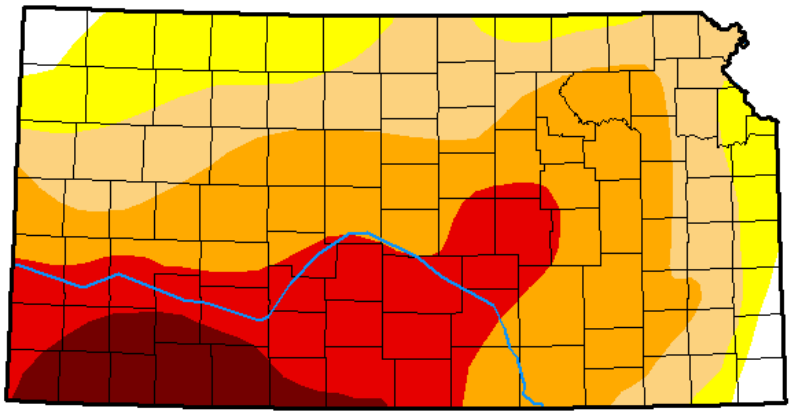
<u>Drought Emergency counties</u>: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

The state drought conditions continue to decline with severity increasing. Exceptional drought conditions now cover just over 7 percent of the state, with extreme drought covers an additional 27 percent of the state. Severe drought has expanded to nearly 60 percent of the state while moderate drought covers an additional 13percent of the state.

U.S. Drought Monitor

Kansas



April 10, 2018

(Released Thursday, Apr. 12, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	2.64	97.36	83.37	59.47	27.06	7.09
Last Week *04-03-2018*	2.64	97.36	81.66	56.19	25.59	4.32
3 Months Ago *01-09-2018*	0.00	100.00	52.43	17.23	1.50	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *04-11-2017*	49.35	50.65	8.55	0.00	0.00	0.00

Intensity:

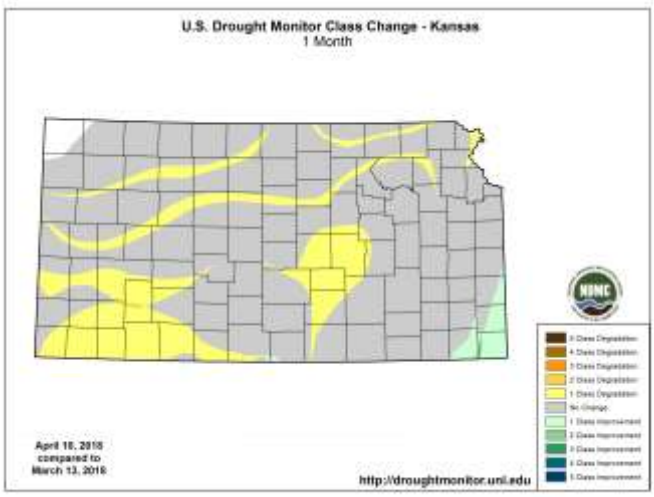
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

David Miskus
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

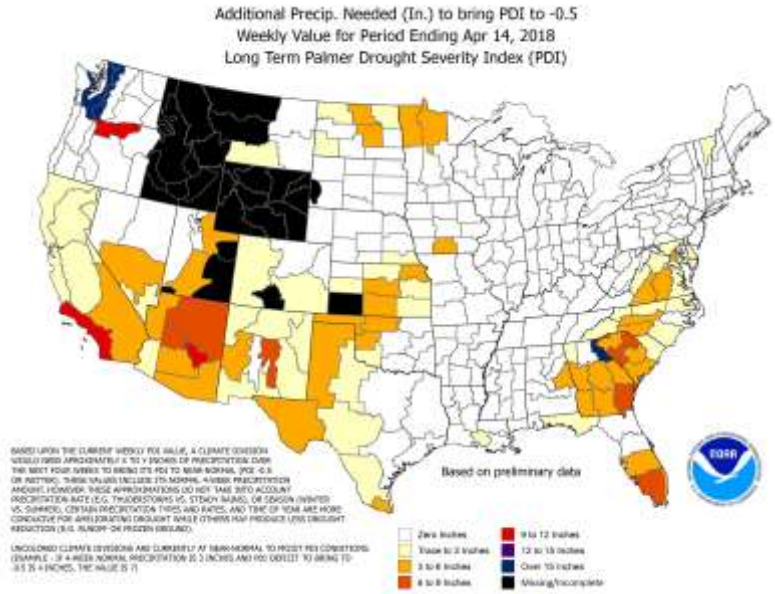


More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought.

More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Long-term PDI Precipitation needed to remove drought for weeks ending on date		
Climate Division	Apr 7	Apr 14
North Central	2.69	3.10
Northeast	4.90	5.53
West Central	-	0.65
Central	5.27	5.72
East Central	0.58	1.16
Southwest	unknown	unknown
South Central	4.67	5.09
Southeast	-	0.66

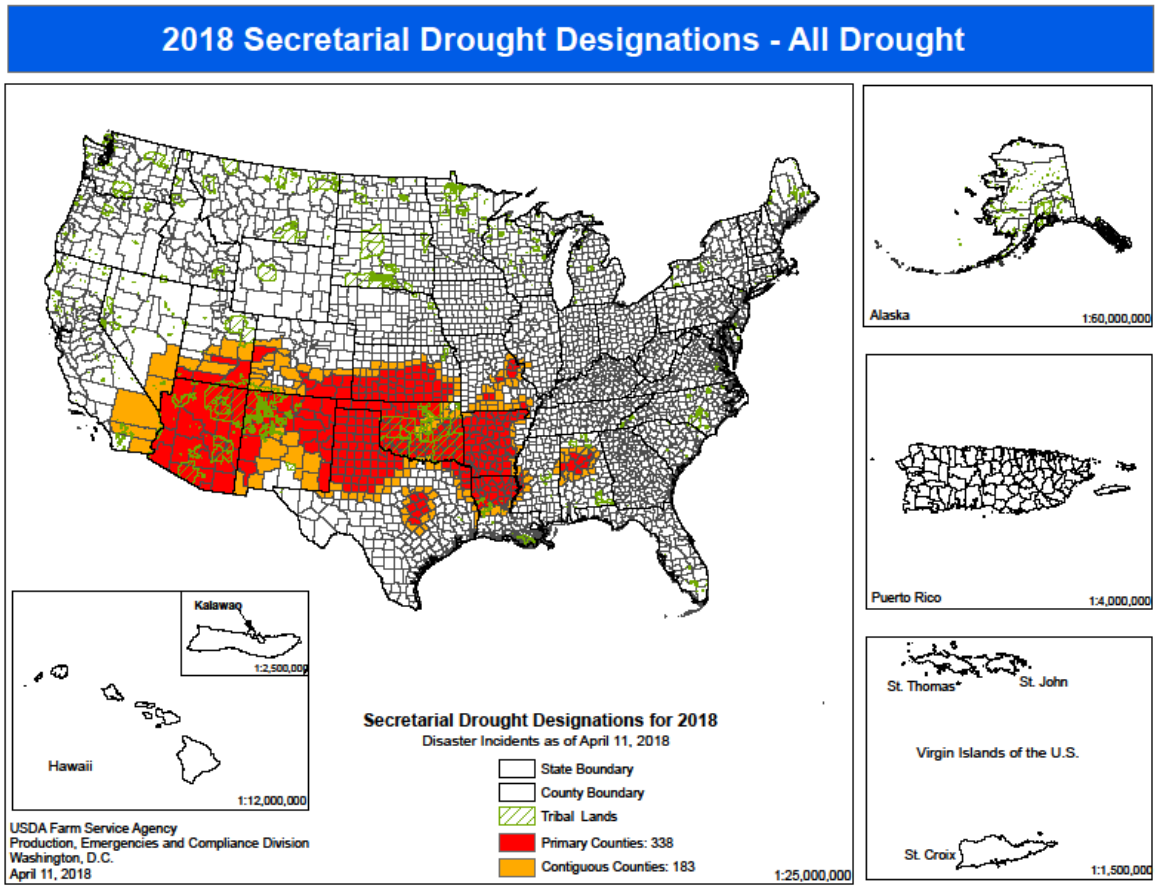


Federal Disaster Drought Declarations 2018

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

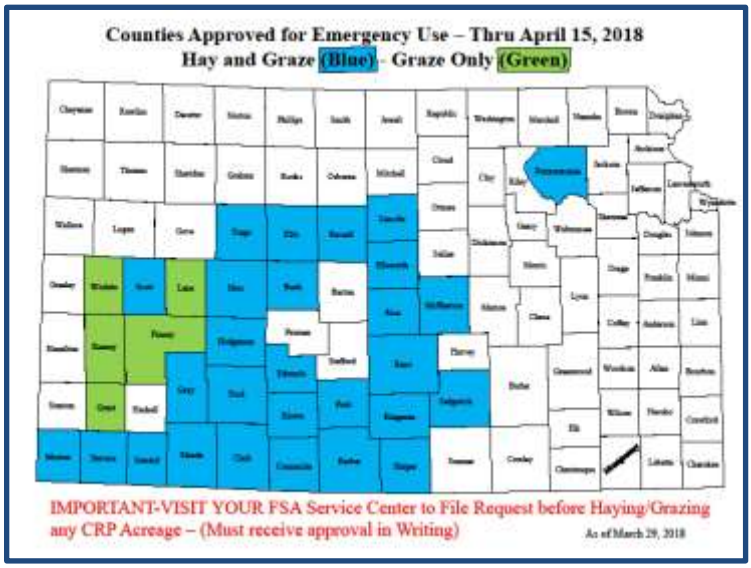
USDA drought disasters have been declared in 2018 for Kansas. Designations are for 48 primary counties and 20 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, Comanche, Cowley, Dickinson, Edwards, Elk, Ellsworth, Finney, Ford, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, Pawnee, Pratt, Reno, Rice, Rush, Saline, Sedgewick, Seward, Stafford, Stanton, Stevens, Sumner, Wilson and Woodson. Contiguous counties are Anderson, Bourbon, Clay, Coffey, Crawford, Ellis, Geary, Gove, Greeley, Labette, Lane, Lincoln, Linn, Lyon, Ottawa, Russell, Scott, Trego, Wabaunsee and Wichita. (Note those underlined added in April.)



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency.

USDA-FSA has approved emergency haying and grazing on CRP acreages in some counties in Kansas (March 29, 2018). FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



Presidential Federal Disasters

Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

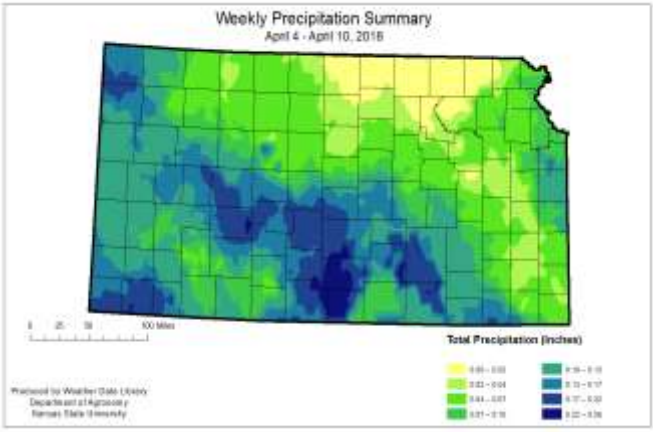
Climate Summary (Precipitation and Temperature)

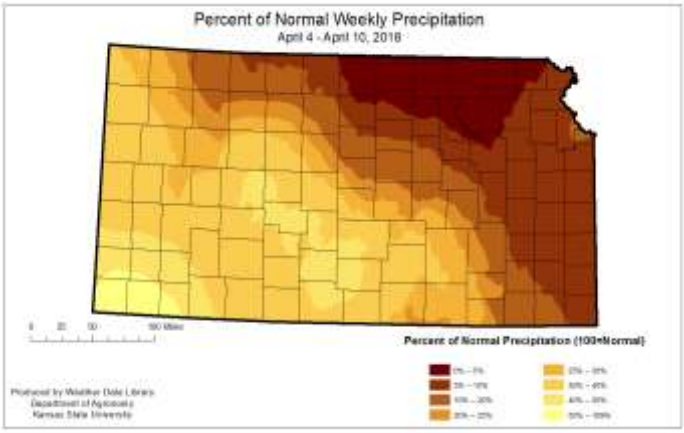
Precipitation Week of April 4-10: The greatest precipitation was reported in the areas with the most extreme drought conditions – Southwest and South Central Climate Divisions of Kansas. Unfortunately, precipitation was still much lower than normal. The Southwest Division averaged 0.12 inches, or 35 percent of normal. The South Central Division averaged 0.20 inches or 36 percent of normal. Statewide average precipitation was just 0.09 inches or 19 percent of normal. The highest precipitation total for a National Weather Service Coop station was 0.90 inches at Augusta in Butler County, in the South Central Division. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 0.42 inches at Hugoton 0.6 NNW, Stevens County, in the Southwest Division. For the Kansas Mesonet stations, the greatest total was 0.35 inches at Hodgeman. Other stations with three tens of an inch or more included Richfield, Lake City and St. John. Unfortunately, the ET values for the western stations were also high, leaving effective moisture deficits of -0.60 to -0.90 inches for the week.

Precipitation summary is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	April 4-10, 2018			January 1-April 10, 2018			April 1, 2017- April 10, 2018			Sept. 1, 2017- April 10, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.04	-0.37	9	1.05	-1.83	36	0.04	-0.54	6	4.72	-2.63	62
West Central	0.10	-0.30	25	1.14	-1.92	37	0.10	-0.46	17	5.76	-1.77	76
Southwest	0.12	-0.23	35	0.66	-2.22	22	0.12	-0.38	24	4.32	-3.02	60
North Central	0.02	-0.52	3	1.57	-2.69	37	0.03	-0.74	3	6.78	-4.21	61
Central	0.14	-0.42	26	1.77	-2.99	38	0.15	-0.66	19	6.60	-4.98	58
South Central	0.20	-0.36	36	2.25	-3.18	40	0.20	-0.61	25	7.88	-5.40	58
Northeast	0.02	-0.67	3	2.24	-2.94	42	0.24	-0.73	24	6.94	-7.58	47
East Central	0.04	-0.69	5	3.33	-2.63	54	0.54	-0.50	54	8.91	-7.36	53
Southeast	0.12	-0.62	17	4.35	-2.71	60	0.16	-0.90	16	11.42	-7.73	59
STATE	0.09	-0.46	19	2.05	-2.58	40	0.17	-0.61	21	7.08	-4.94	59

Below are the April precipitation summary percent of normal precipitation and the departure from normal precipitation for the first two weeks of April. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.)



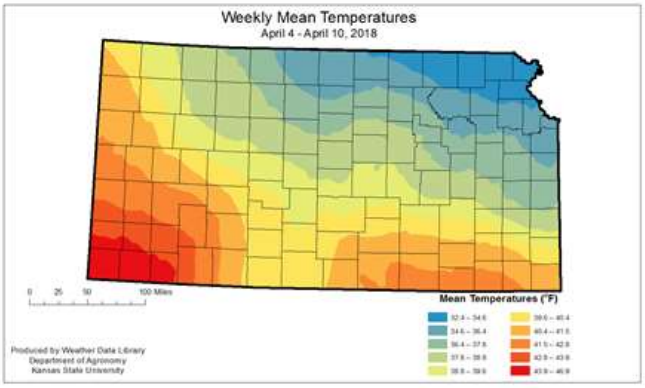


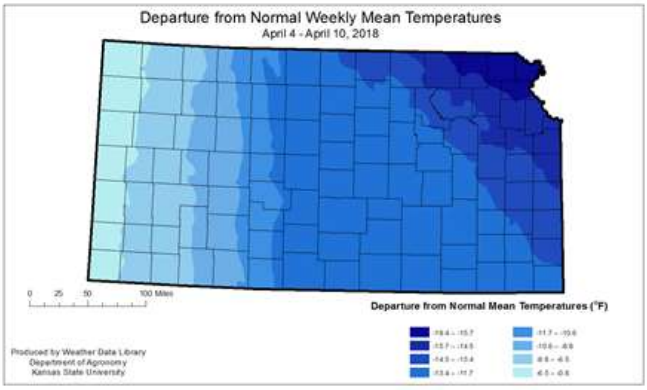
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Temperature Week of April 4-10: As the vigorous cold air that arrived over the weekend persisted through the beginning of the week, temperatures were cooler than normal in all divisions. The statewide average temperature was 38.7 °F, or 11.7 degrees cooler than normal. The Northeast Division had the greatest departure from normal with an average of 33.5 °F, or 16.9 degrees cooler than normal. The Southwest Division came closest to normal, with an average of 43.7 °F or 7.4 degrees cooler than normal. The highest maximum temperature was 78 °F at Russell 1E, Russell County, on the 10th. The lowest minimum temperature was 4 oF at both Alton 6ESE, Osborne County, and Atwood 2SW, Rawlins County, on the 7th.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	April 4-10, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	55.9	23.2	39.5	-7.5	72	5	4	7
West Central	56.0	23.5	39.7	-8.4	76	6	10	7
Southwest	60.1	27.3	43.7	-7.0	78	6	14	7
North Central	50.8	20.5	35.6	-14.2	77	10	8	7
Central	54.3	23.0	38.6	-12.3	79	10	8	7
South Central	54.7	26.4	40.6	-11.8	75	6	14	4
Northeast	45.7	21.3	33.5	-16.9	71	6	12	7
East Central	48.9	24.3	36.6	-14.5	74	6	15	4
Southeast	53.6	27.3	40.5	-12.4	72	6	18	9
STATE	53.3	24.1	38.7	-11.7	79	10th	4	7th
Data Source: KSU Weather Library								

Below are the weekly mean temperatures and the departure from normal temperatures for the time period. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by on KSU Weather Data Library.)





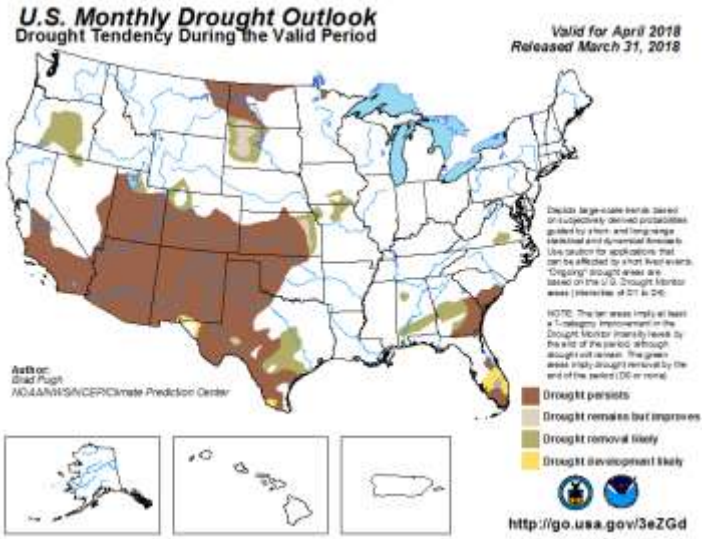
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

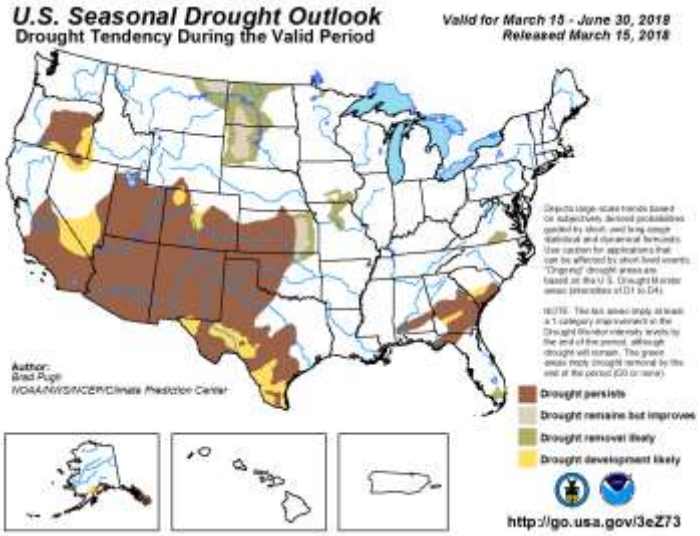
Future Outlook

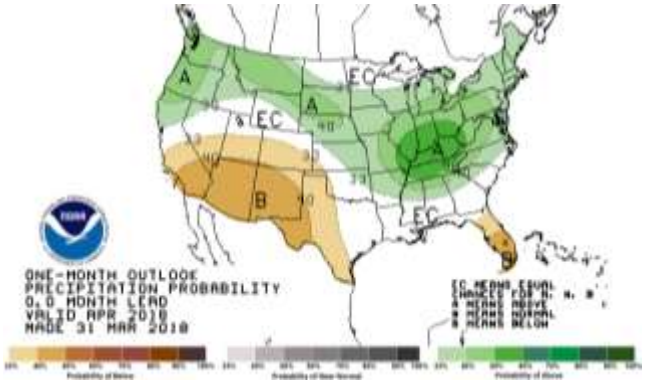
The Monthly Drought Outlook indicates drought conditions to remain in southern, central and western Kansas. Improvement of drought conditions is possible in the east and northeast portions of Kansas. The April outlook has a slight chance for wetter than normal conditions across the eastern portions of the state, with drier than normal conditions in the southwest corner of the state. The temperature outlook is for cooler than normal temperatures statewide. Unless April moisture is significant, even that combination is unlikely to result in significant improvement of the drought conditions

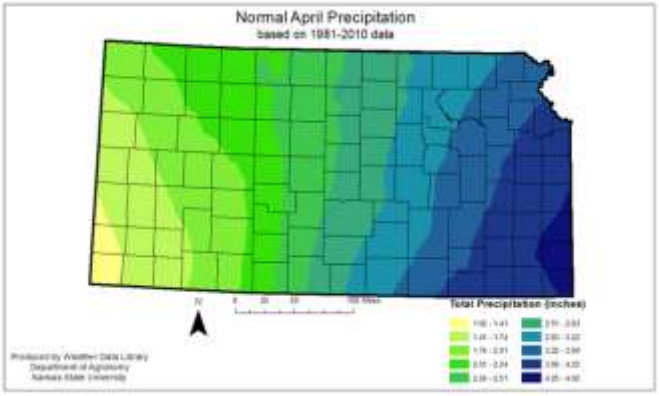
Seasonal Outlook (3-month) favors continued drought in south central, central and western Kansas with the east improving. For the March 15-June 30 time period probability favors below normal precipitation and above normal temperatures for western parts of the state. The remaining areas have equal chances of below or above normal precipitation and temperatures for the period.

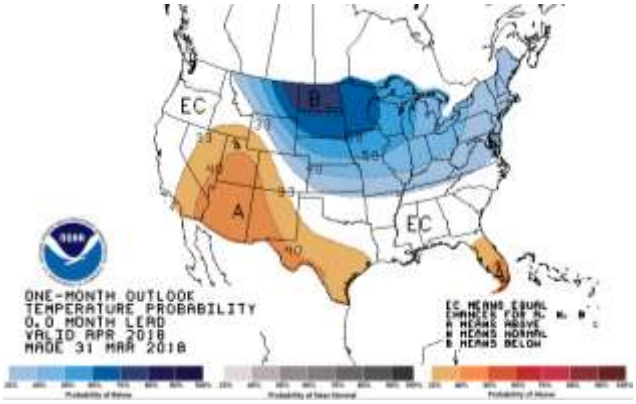
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

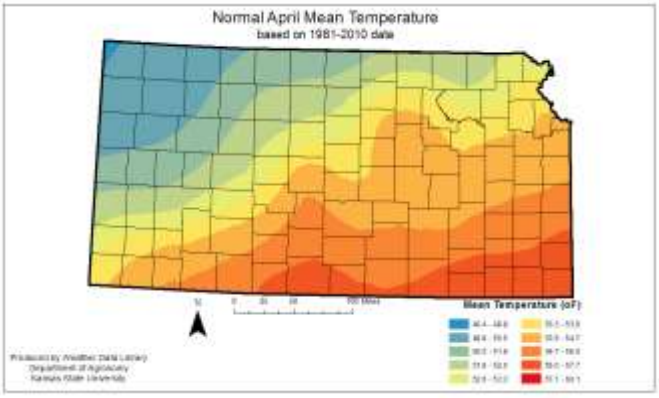


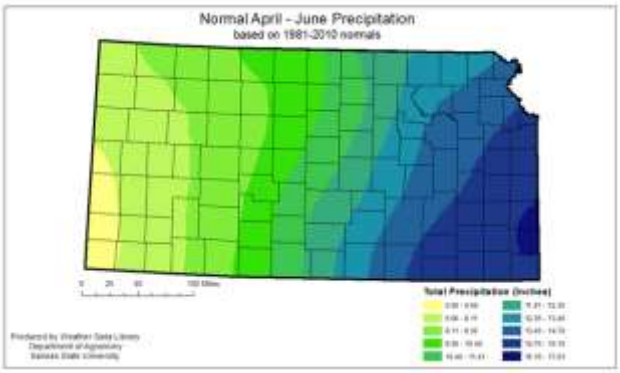


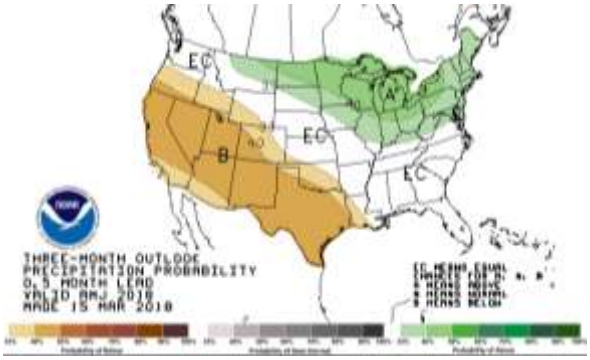


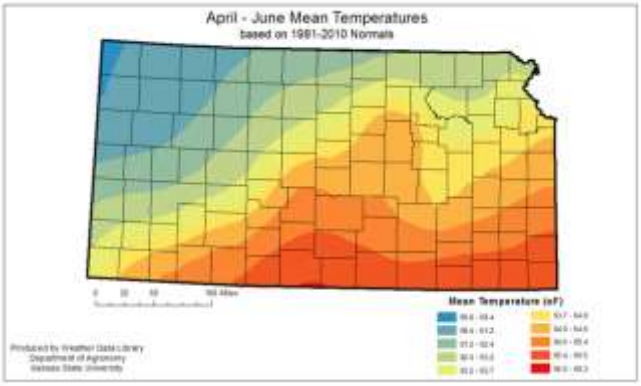


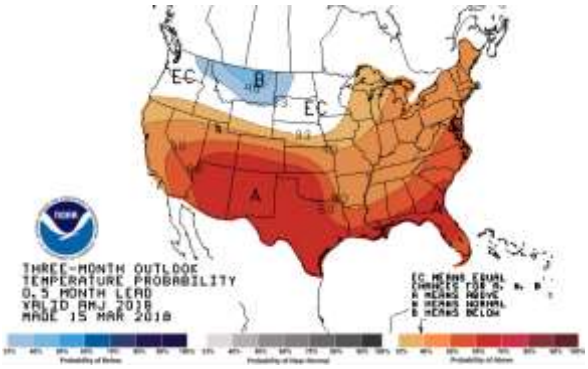












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of April 16, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (April 16, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ April 16, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs continue to decline in April. However, storage in the basin has not been significantly impacted from the abnormally dry conditions in recent months. Clinton maintained a full pool and the other three reservoirs were below the top of multipurpose elevation due to planned seasonal drawdowns. The lower seasonal elevations may extend longer than planned if inflow conditions don't improve. Flow in the Kansas River remained less than half of historic median values with the majority of the flow from reservoir releases, primarily Tuttle Creek, which is experiencing a slight decline in elevation.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs are all set to minimum gate settings. Melvern and Pomona have not refilled from their lower winter target elevation and are experiencing a slight declining trend in April. Reservoir releases have not been necessary to supplement flow in the Marais des Cygnes River.

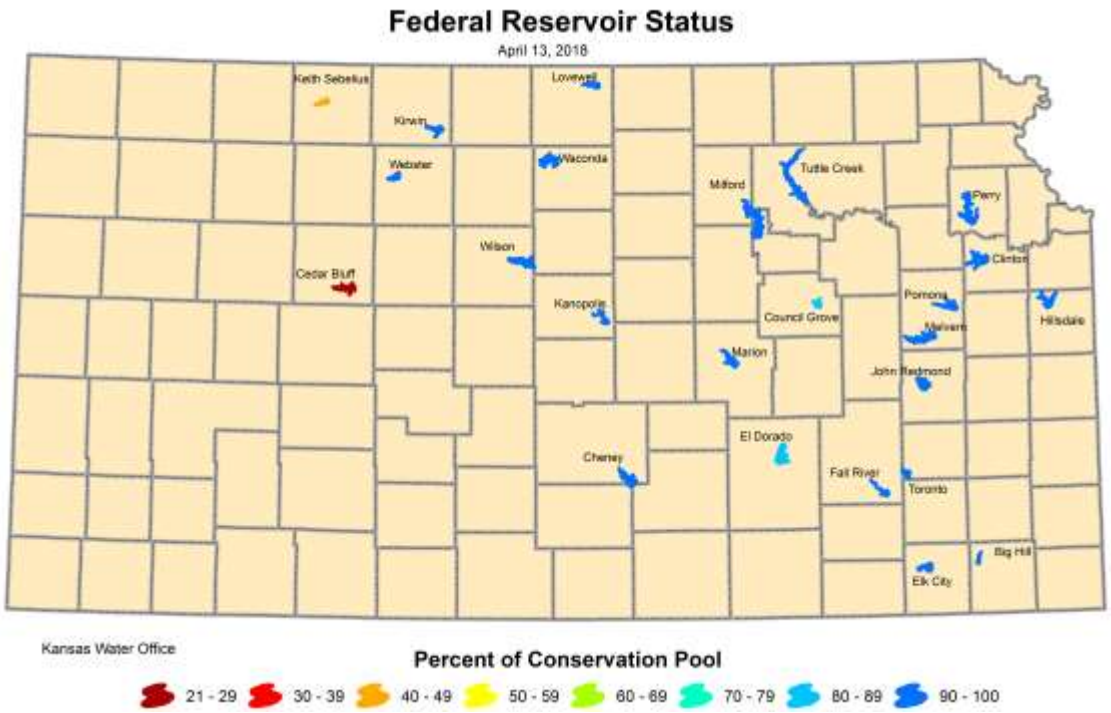
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs are generally low and streamflow is declining throughout the system. Conservation storage is full in John Redmond but steadily declined in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow and releases from John Redmond are on-going to meet the needs of Wolf Creek power plant.

Verdigris basin: Toronto, Fall River, and Big Hill reservoirs are at or near conservation pool levels; Elk City Reservoir is maintaining above normal pool. Reservoir releases are necessary to supplement low flow conditions of the Fall and Verdigris Rivers but reservoir storage is healthy.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool and streamflow conditions are maintaining near median values.

Smoky Hill basin: The middle Smoky Hill basin maintained streamflow but has not experience any significant runoff events. Inflow to Kanopolis Lake remained slightly below median historic values and a healthy rain and runoff event will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of Multipurpose. The target flow of 20 cfs at the Mentor gage has been maintained with minimal releases from Kanopolis, allowing a very gradual rise in elevation in April.

General Reservoir Conditions



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**04/13/18**		
Norton[1]	2304.3	2292.33	-11.97	41.6
Harlan County, NE	1945.73	1940.28	-5.45	78.3
Lovewell[1]	1582.6	1581.64	-0.96	92.3
Milford[1]	1144.4	1141.95	-2.45	90.2
Cedar Bluff	2144	2117.32	-26.68	29.3
Kanopolis[1]	1463	1462.78	-0.22	98.7
Wilson[1]	1516	1516.22	0.22	100.0
Webster[1]	1892.5	1893.78	1.33	100.0
Kirwin[1]	1729.3	1729.51	0.26	100.0
Waconda[1]	1455.6	1454.71	-0.89	94.7
Tuttle Creek[1]	1075	1074.59	-0.41	98.3
Perry[1]	891.5	889.42	-2.08	89.7
Clinton[1]	875.5	875.89	0.39	100.0
Melvern[1]	1036	1034.99	-1.01	95.4
Pomona[1]	974	973.04	-0.96	93.2
Hillsdale[1]	917	917.03	0.03	100.0
Arkansas River Basin		**04/12/18**		
Cheney	1421.6	1420.99	-0.61	96.0
El Dorado	1339	1334.73	-4.27	81.0
Toronto[1]	901.5	902.97	1.47	100.0
Fall River[1]	948.5	948.48	-0.02	100.0
Elk City[1]	796	796.88	0.88	100.0
Big Hill	858	858.03	0.03	100.0
Council Grove[1]	1274	1271.84	-2.16	87.0
Marion[1]	1350.5	1348.50	-1.20	91.0
John Redmond[1]	1039	1041.43	0.43	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

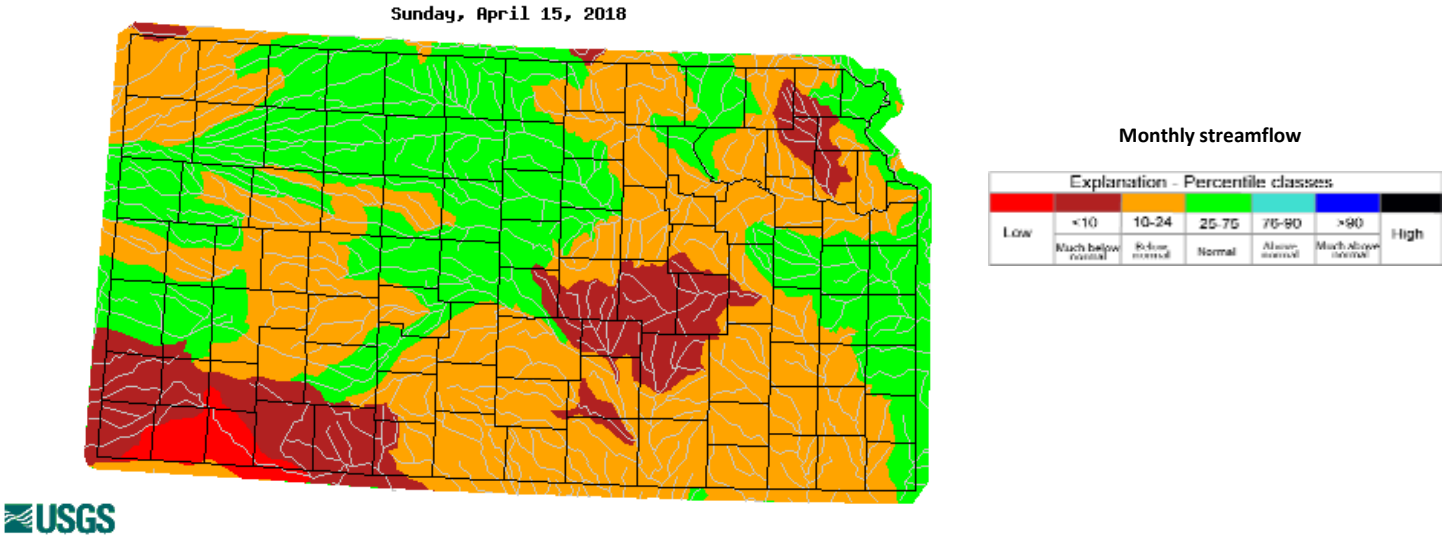
Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. Spring evaluation resumed in March. There are currently no warnings and watches in effect.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

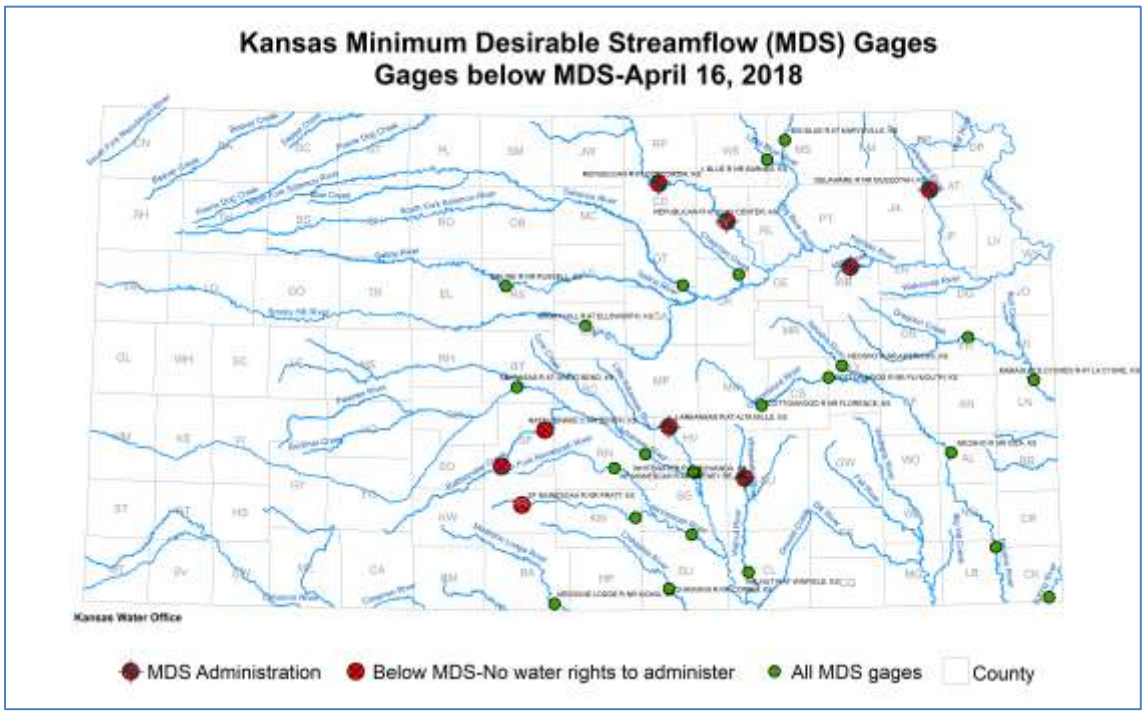
7-day average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. MDS administration is occurring at numerous locations. Please see table below of current administration.



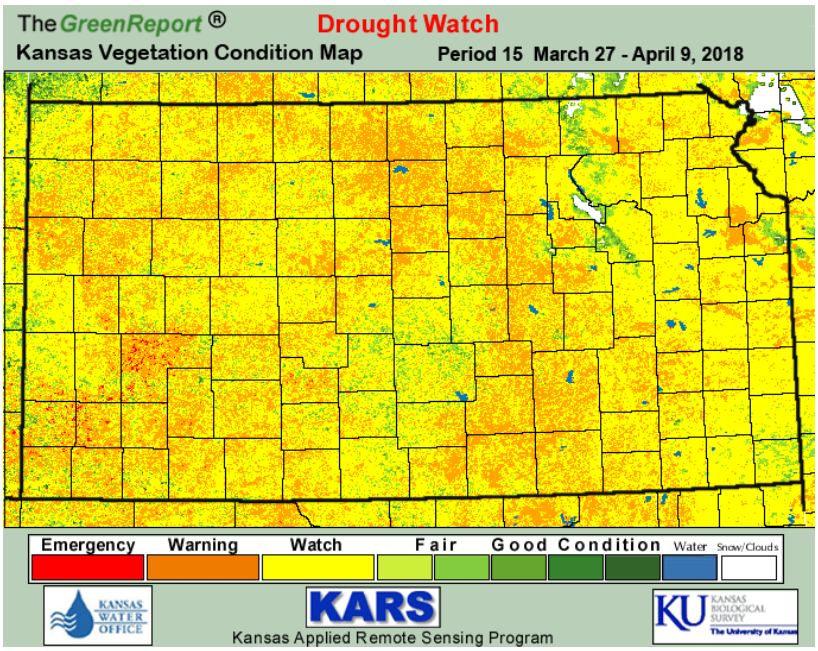
The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage and others where the below MDS flows will be of sufficient number of days to require administration soon.

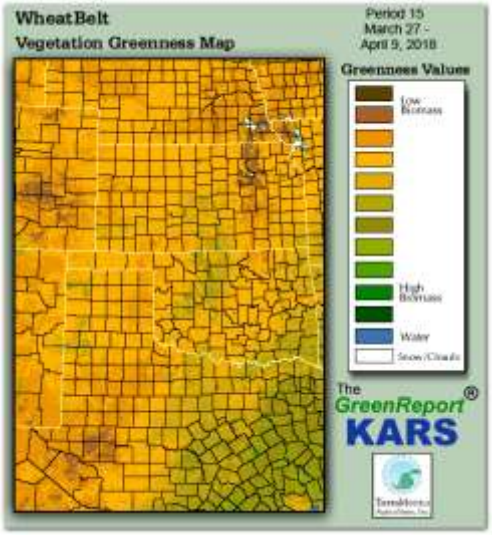
Streamflows as of April 16, 2018			
Gaging Station	**Current Flow**	**Apr MDS**	**Comment**
Republican River at Concordia	100	150	Admin began April 13, 2018
Republican River at Clay Center	184	250	Admin began April 13, 2018
Little Blue River near Barnes	165	150	
Mill Creek near Paxico	8	25	Admin began April 12, 2018
Delaware River near Muscotah	15	20	Admin began March 23, 2018
Rattlesnake Creek near Macksville	1	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	8	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	4	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	6	8	No surface water diversions junior to MDS above gage
Whitewater River near Towanda	12	20	Admin began April 12, 2018
Medicine Lodge River near Kiowa	59	60	

Soil, Crop and Vegetation

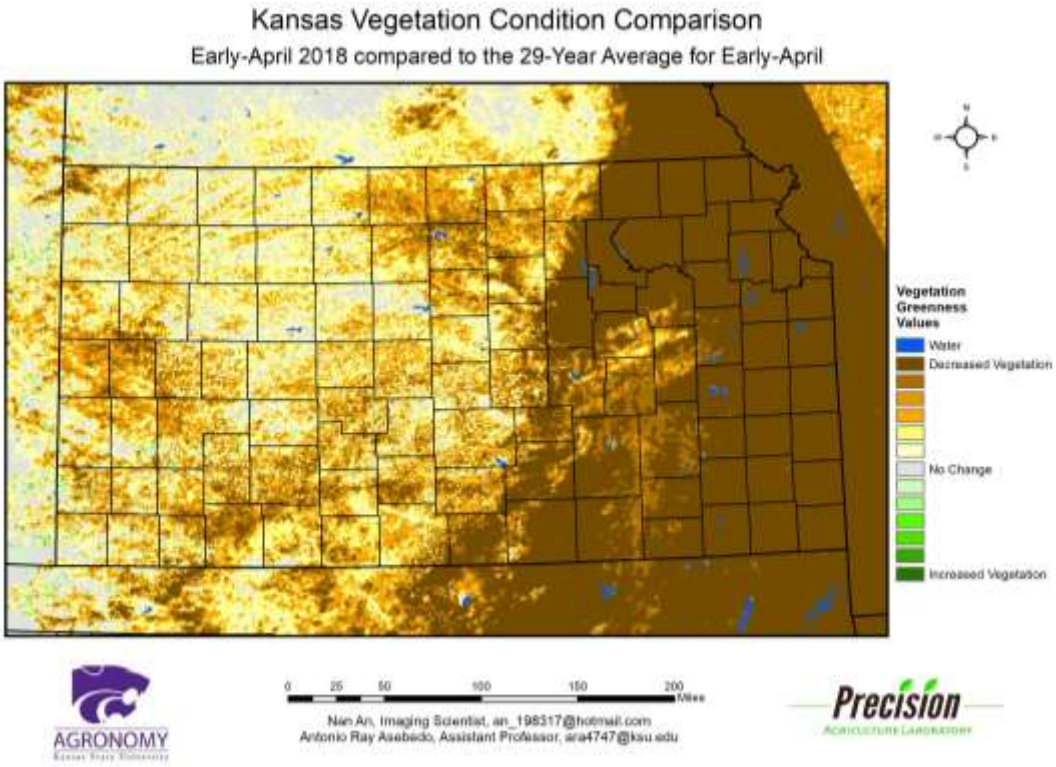
Kansas Vegetative Conditions

The Kansas Vegetative Condition map provides current conditions. It is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. Many of the areas shown as orange (warning) are wheat areas, indicating lack of growth of the wheat. The second map provides an overview of the greenness to better identify wheat condition..



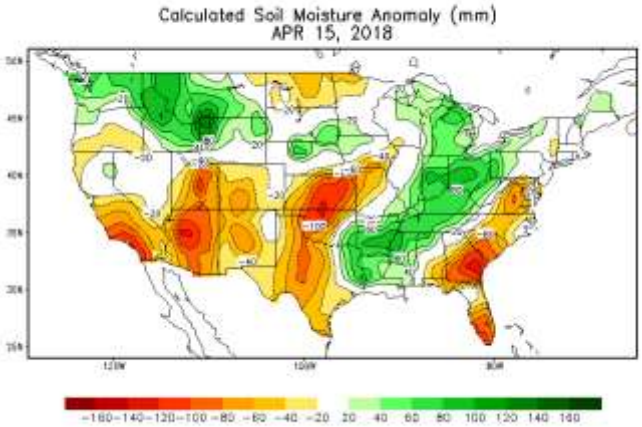


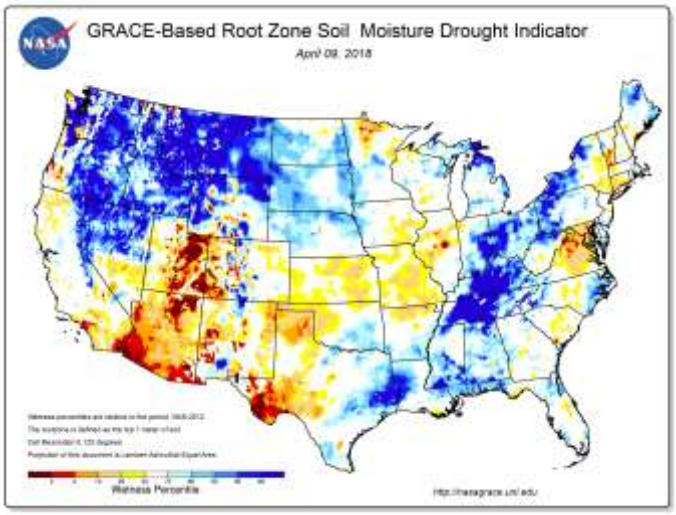
The KSU Department of Agronomy produces a comparison map, comparing present year with historical vegetative conditions **.**



Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)



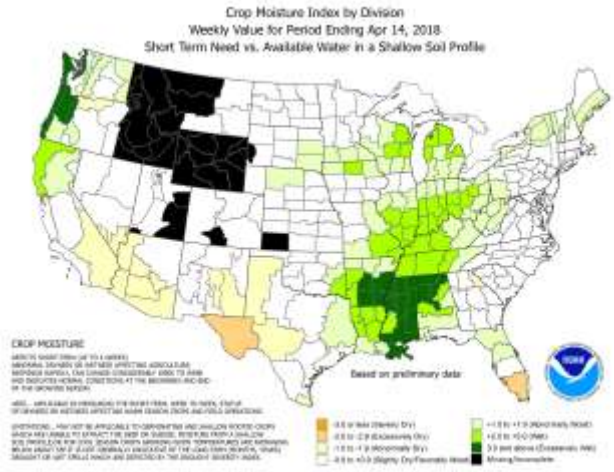


NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present).

Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion.

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending April 14, 2018 indicates topsoil moisture supplies 36 percent very short, 36 short, 28 adequate, and 0 surplus. Subsoil moisture supplies rated 31 percent very short, 39 short, 30 adequate, and 0 surplus.

Field Crops Report: Winter wheat condition rated 14 percent very poor, 32 poor, 42 fair, 11 good, and 1 excellent.



Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA/JAWF Weekly Weather and Crop Bulletin.

Fire

April conditions resulted in numerous wildfires and Red Flag warnings alerting citizens to potential increases in wildfire activity due to ideal conditions for wildland fire combustion and rapid spread. Dry conditions increase the potential for wildfire. According to the National Interagency Fire Center, wildfire activity is likely to continue in western and southern Kansas in April and in the west into May. Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf . These indicate portions of Kansas will remain above normal in wildfire activity in April and May 2018.

Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE
End-April 2018 Summary

General Overview

- U.S. Drought Monitor exceptional drought expanded to include all or portions of 11 southwestern counties, now covering 7% of Kansas. this brings the area of Kansas in extreme drought or worse to over 27%.

- Drought Declarations for Kansas counties remain in effect under Executive Order 18-11, issued March 13, 2018 includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.

- USDA Drought Disaster Designations as of April 25, 2018 have been made for 48 primary counties and 20 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

- Administration was effective April 13, 2018, on the Republican River from the Clay Center gage to state line, covering 225 water rights.

- Administration was effective on Mill Creek above the gage near Paxico, April 12, 2018 covering 14 water rights.

- Administration was effective on the Whitewater River above the gage near Towanda, April 12, 2018 covering 11 water rights

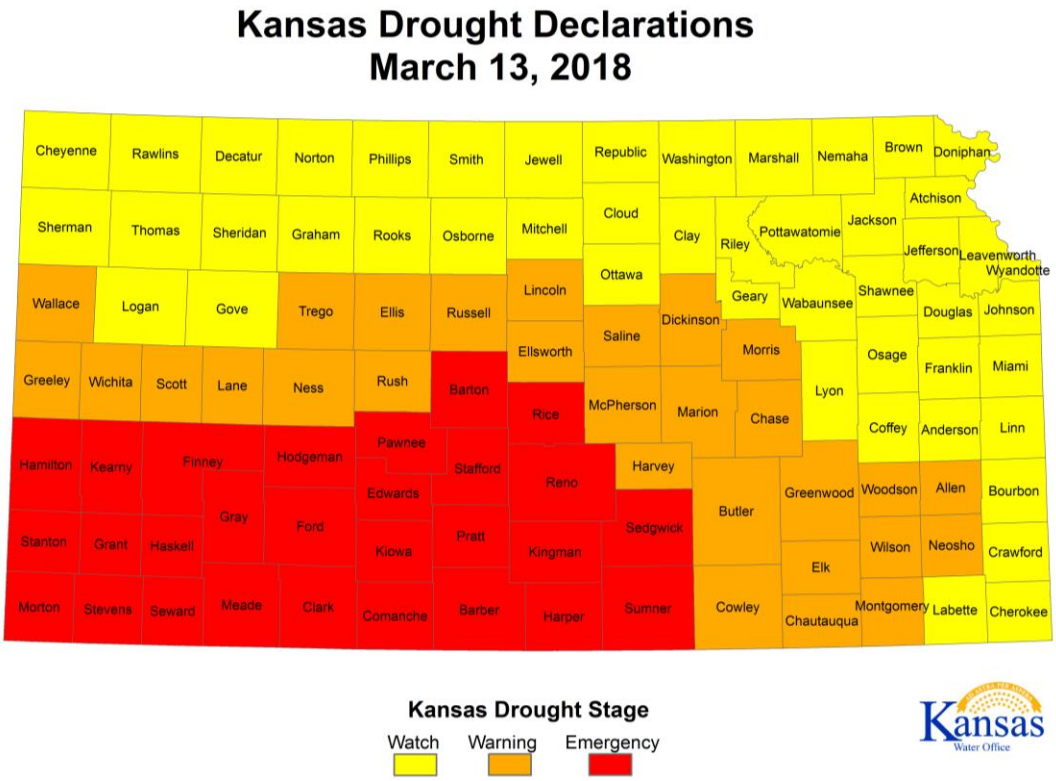
- Administration was put in effect March 23, 2018 for 40 water rights above the Muscotah gage on the Delaware River.

- Water Rights above the USGS gage on the Little Arkansas River at Alta Mills have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

- As of April 24, Kansas crops located in drought: 85% of hay production; 86% of winter wheat (nationally 37%); 81% of corn and 87% soybeans

- As of April 24, 89% of cattle in Kansas are located in drought (15% exceptional, 26% extreme, 29% severe and 19% moderate)

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11
Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.



<u>Drought Watch counties</u>: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

<u>Drought Warning counties</u>: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

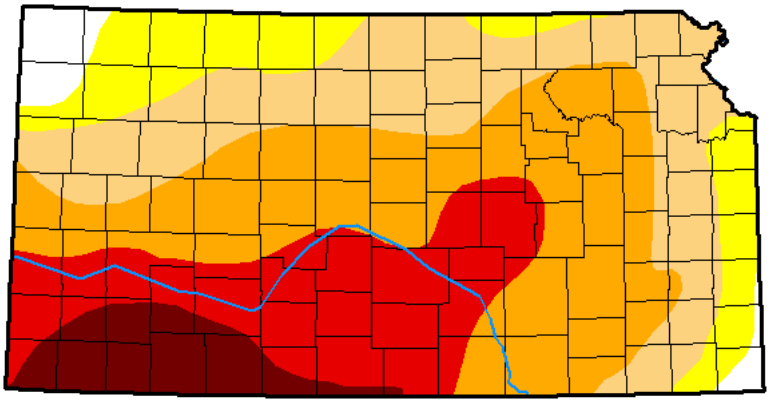
<u>Drought Emergency counties</u>: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

Only three percent (%), the northwest and southeast corners of Kansas, is not affected by dry or drought conditions at the end of April according to the U.S. Drought Monitor. Despite some widespread rains, the state drought conditions continue in most of Kansas. The affected area and severity has not deteriorated further the last couple of weeks. Exceptional drought conditions now cover just over 7 percent of the state, with extreme drought covering an additional 20% of the state. Severe drought has expanded to nearly 60 percent of the state during April, while moderate drought covers an additional 25% of the state.

U.S. Drought Monitor

Kansas



April 24, 2018

(Released Thursday, Apr. 26, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	3.10	96.90	84.85	59.47	27.16	7.20
Last Week *04-17-2018*	2.00	98.00	83.37	59.47	27.37	7.20
3 Months Ago *01-23-2018*	0.00	100.00	52.91	19.19	4.08	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *04-25-2017*	88.39	11.61	0.00	0.00	0.00	0.00

Intensity:

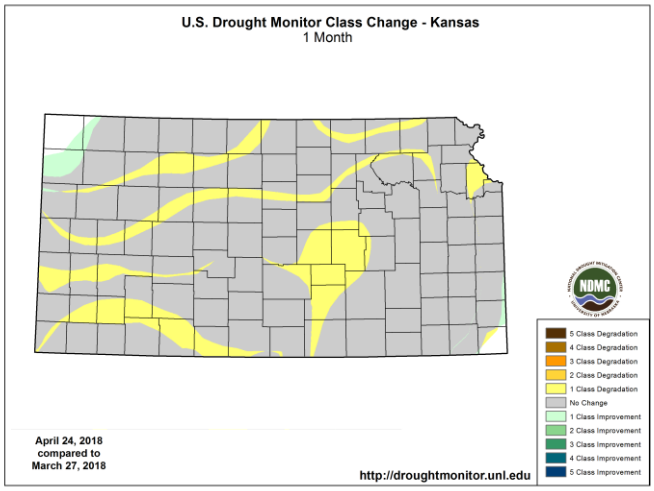
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Brad Rippey
U.S. Department of Agriculture

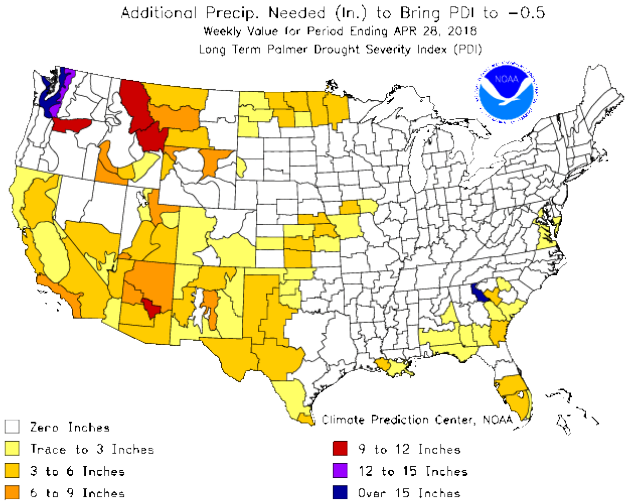
http://droughtmonitor.unl.edu/



More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought.

More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml



Long-term PDI Precipitation needed to remove drought for week ending on date				
Climate Division	Apr 7	Apr 14	Apr 21	Apr 28
Northwest	-	-	-	-
North Central	2.69	3.10	2.64	2.96
Northeast	4.90	5.53	5.42	5.60
West Central	-	0.65	-	0.55
Central	5.27	5.72	4.86	5.16
East Central	0.58	1.16	1.08	1.26
Southwest	Unknown	unknown	unknown	unknown
South Central	4.67	5.09	3.91	3.90
Southeast	-	0.66	-	-

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

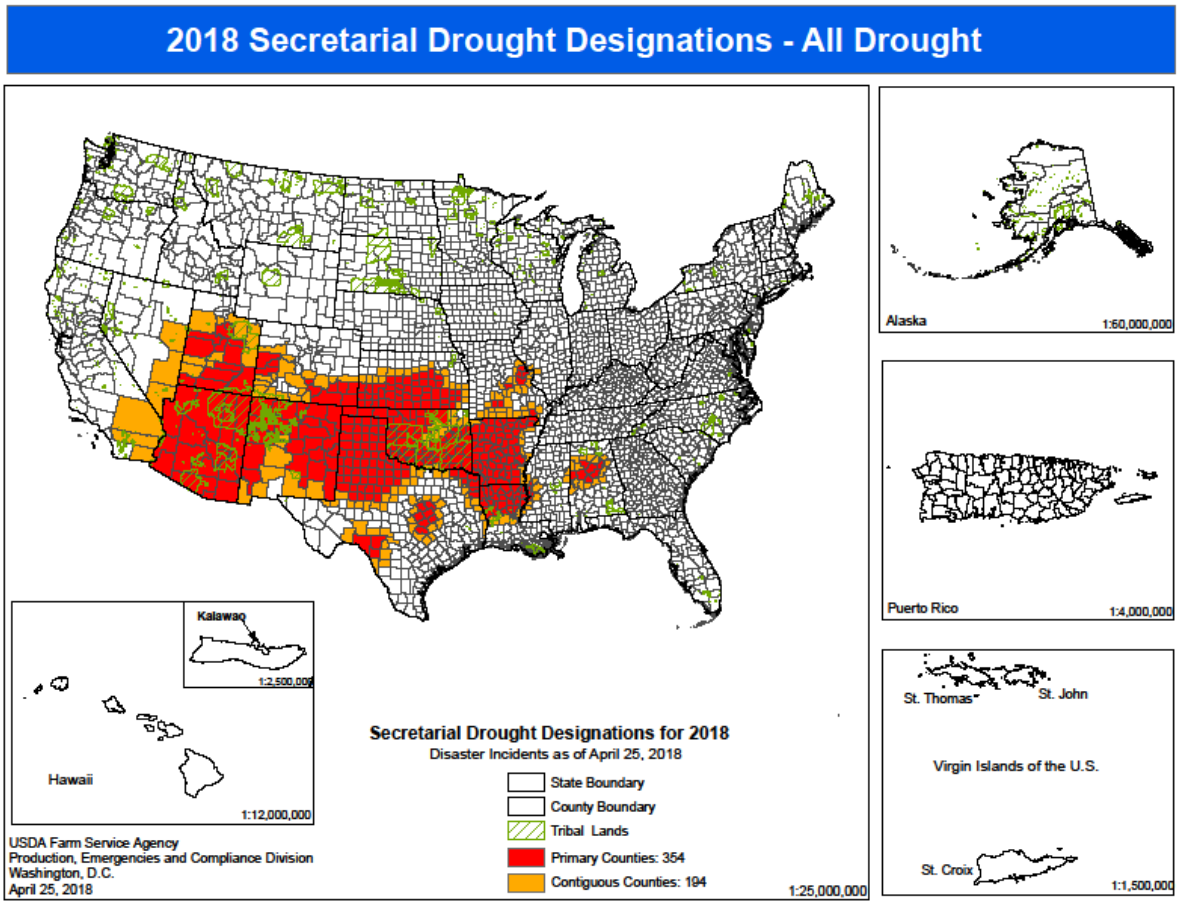
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

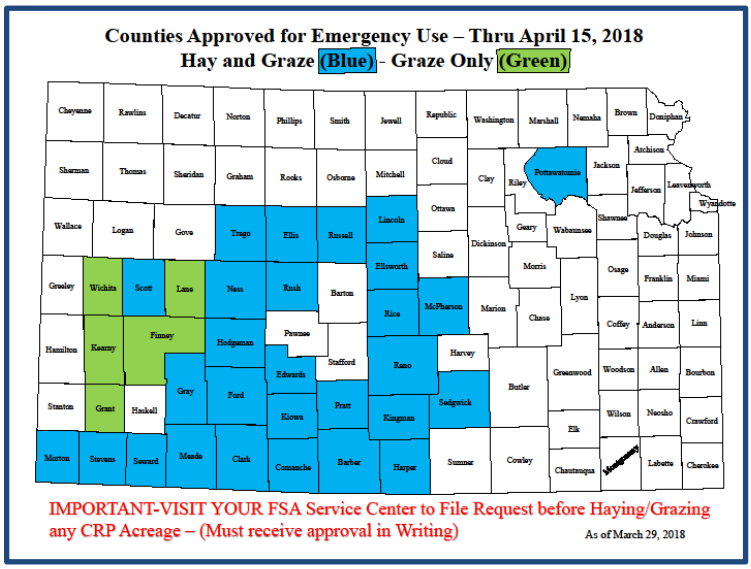
USDA drought disasters have been declared in 2018 for Kansas. Designations are for 48 primary counties and 20 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, Comanche, Cowley, Dickinson, Edwards, Elk, Ellsworth, Finney, Ford, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, Pawnee, Pratt, Reno, Rice, Rush, Saline, Sedgewick, Seward, Stafford, Stanton, Stevens, Sumner, Wilson and Woodson. Contiguous counties are Anderson, Bourbon, Clay, Coffey, Crawford, Ellis, Geary, Gove, Greeley, Labette, Lane, Lincoln, Linn, Lyon, Ottawa, Russell, Scott, Trego, Wabaunsee and Wichita.



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency.

USDA-FSA has approved emergency haying and grazing on CRP acreages in some counties in Kansas (March 29, 2018). FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



Climate Summary - Precipitation

While precipitation began to fall towards the end of the month, April continued the pattern of below normal precipitation. The state-wide average precipitation was 1.19 inches which was just 45 percent of normal. April is one of the months with higher normal precipitation, so the deficit of -1.48 inches has had a negative impact on vegetation. The division that came closest to normal precipitation was the Southcentral Division with an average of 1.57 inches or 58 percent of normal. The Northeast Division had the greatest departure, with an average of 1.01 inches or just 31 percent of normal. The greatest monthly total for a National Weather Service Cooperative station was Augusta, Butler County with 3.29 inches. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Winfield 5.9SW, Cowley County, with 3.06 inches. Among the Kansas Mesonet stations, the Butler County station near El Dorado had the greatest total at 2.38 inches

Precipitation week of April 11-17: Some snow and rain, but April 10-17 was another dry week in Kansas. The Southwest Climate Division averaged just 0.01 inches, or 2 percent of normal. The South Central Division averaged 0.03 inches or 4 percent of normal. The wettest division was the East Central, and that averaged just 0.13 inches or 16 percent of normal. Statewide average precipitation was just 0.06 inches or 9 percent of normal. The highest precipitation total for a National Weather Service Coop station was 0.81 inches at Chapman in Dickinson County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 0.92 inches at Princeton 2.0 NE, Franklin County, in the East Central Division. For the Kansas Mesonet stations, the greatest total was 1.14 inches at Olathe in Johnson County.

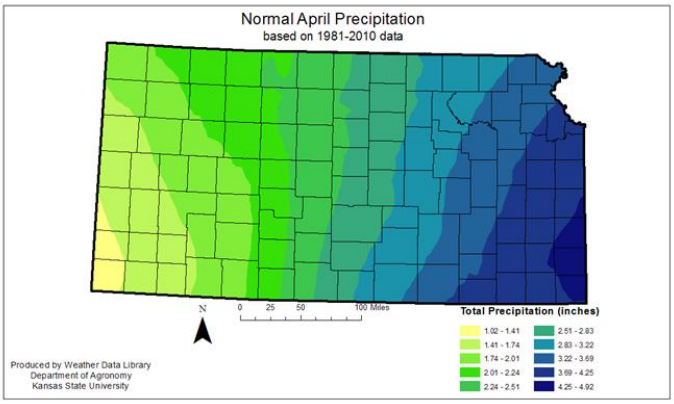
Precipitation week of April 18-24**:** Most of Kansas received precipitation as rain moved across the state. The Northeast Climate Division tied with the Northwest Division for the lowest total at 0.23 inches. However, the percent of normal for the Northeast was just 30 percent, while the Northwest percent of normal was 41 percent. The southern divisions all came in at above normal for the week, with the South Central Division averaging 0.89 inches or 132 percent of normal. Statewide average precipitation was just 0.55 inches or 86 percent of normal. These totals don't include precipitation that fell on the 24th that was reported on the 25th. For the week ending on April 24th, the highest precipitation total for a National Weather Service Coop station was 2.05 inches at Arkansas City, Cowley County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 2.17 inches at Winfield 5.9 SW, also in Cowley County. For the Kansas Mesonet stations, the greatest total was 2.20 inches at Butler County station near El Dorado.

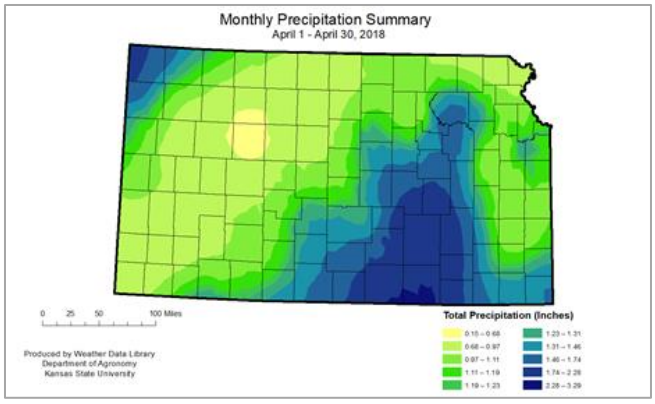
Precipitation summary is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

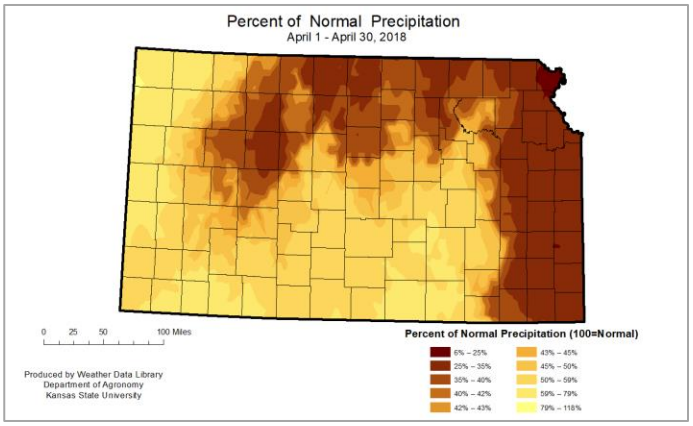
Kansas Climate Division Precipitation Summary (inches)

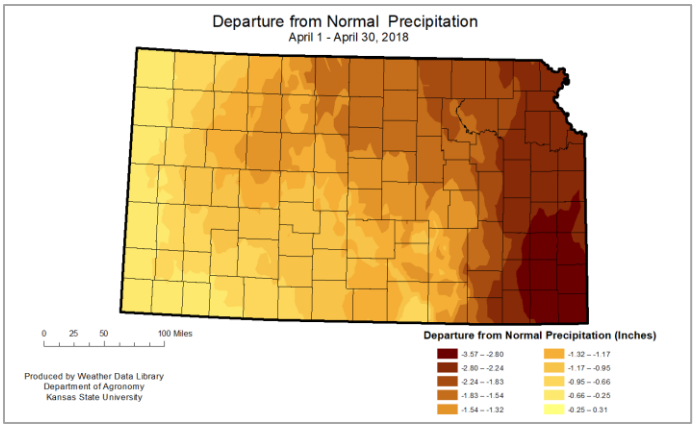
Climate Division	April 1-30, 2018			January 1-April 30, 2018			April 1, 2017- April 30, 2018			Sept. 1, 2017- April 30, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.67	-1.4	32	1.69	-2.68	39	0.67	-1.40	32	5.36	-3.49	61
West Central	0.81	-1.10	42	1.84	-2.57	42	0.81	-1.10	42	6.46	-2.42	73
Southwest	0.89	-0.75	54	1.44	-2.58	36	0.89	-0.75	54	5.11	-3.38	60
North Central	0.99	-1.53	39	2.56	-3.45	43	0.99	-1.53	39	7.76	-4.98	61
Central	1.21	-1.45	45	2.82	-3.79	43	1.21	-1.45	45	7.65	-5.77	57
South Central	1.57	-1.13	58	3.57	-3.75	49	1.57	-1.13	58	9.21	-5.96	61
Northeast	1.01	-2.24	31	3.16	-4.30	42	1.01	-2.24	31	7.87	-8.92	47
East Central	1.63	-1.93	46	4.50	-3.98	53	1.63	-1.93	46	10.08	-8.71	54
Southeast	1.66	-2.21	43	5.80	-4.07	59	1.66	-2.21	43	12.87	-9.09	59
STATE	1.19	-1.48	45	3.07	-3.45	47	1.19	-1.48	45	8.11	-5.79	58

Below are the precipitation summary and the normal precipitation for April and comparisons to normal from Kansas State University Department of Agronomy. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.)









Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Climate Summary - Temperature

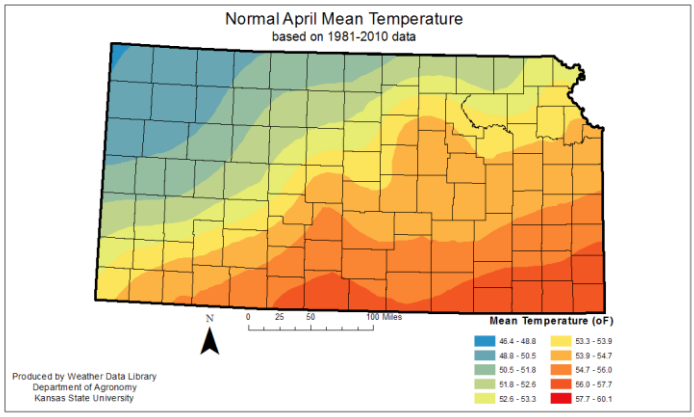
Month of April: April 2018 set a new record as the coldest since 1895. The state-wide average temperature for the month was 46.7 ^{o}F. This was 6.5 degrees cooler than normal. The Northeast Division had the greatest departure with an average of 44.5 ^{o}F which was a departure of -9.0 degrees. The West Central Division came closest to normal with an average of 46.0 ^{o}F, which was a departure from normal of -4.7 degrees. There were 189 new record daily cold maximum temperatures, of which 18 set new record low maximums for the month. In addition, there were 291 new daily record low minimum temperatures, of which 3 set new records for the month. The records weren't all on the cold side, however. There were 26 new record high maximum temperatures and 10 new record high minimum temperatures record during April. The warmest temperature reported during the month was 99 ^{o}F at Ashland, Clark County, and Wilmore 16SE, Comanche County, on the 13th. The coldest temperature reported during April was 4 ^{o}F. This was reported at multiple locations and dates with the latest at Atwood, Rawlins County, on the 8th

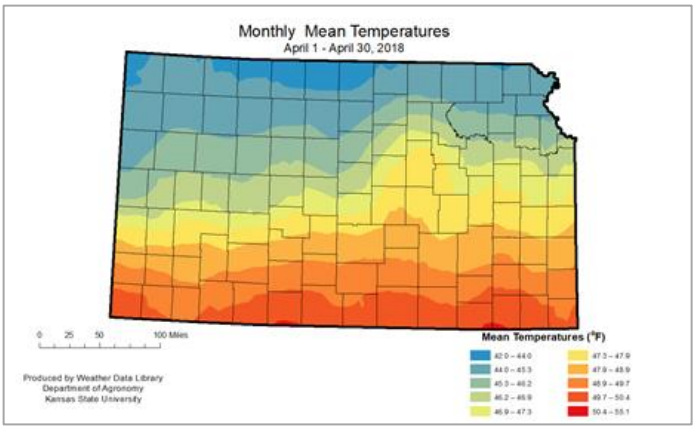
Temperature Week of April 11-17: As another wave of cold air arrived over the weekend and persisted through the beginning of the week, temperatures were cooler than normal in all climate divisions. The statewide average temperature was 48.7 ^{o}F, or 4.0 degrees cooler than normal. The North Central Division had the greatest departure from normal with an average of 46.7 ^{o}F, or 5.6 degrees cooler than normal. The Southwest Division came closest to normal, with an average of 50.9 ^{o}F or 2.0 degrees cooler than normal. Warmer than normal temperatures at a few locations for the period weren't enough to bring the Southwest divisional average up to normal. The highest maximum temperature was 99 ^{o}F at Ashland, Clark County, on the 13th. The lowest minimum temperature was 12 ^{o}F at both Alton 6ESE, Osborne County, on the 16th.

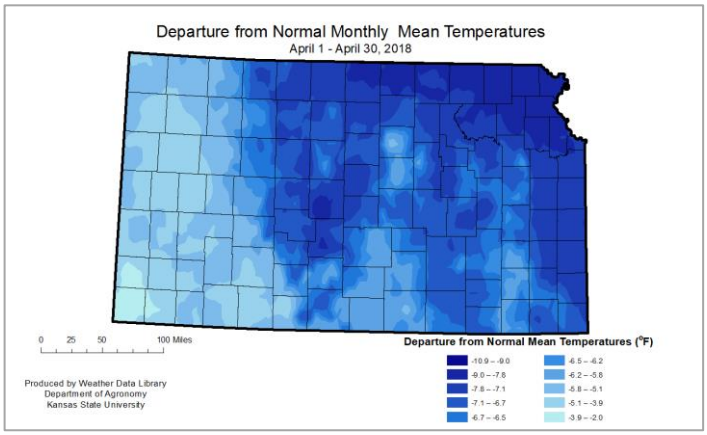
Temperature Week of April 18-24: Cold air arrived over the weekend and persisted through the beginning of the week, temperatures were cooler than normal in all climate divisions. The statewide average temperature was 48.7 ^{o}F, or 6.3 degrees cooler than normal. The Northeast Climate Division had the greatest departure from normal with an average of 47.8 ^{o}F, or 7.6 degrees cooler than normal. The West Central Division came closest to normal, with an average of 47.6 ^{o}F or 4.9 degrees cooler than normal. The few locations with warmer than normal temperatures for the period weren't enough to bring any divisional average up to normal. The highest maximum temperature was 97 ^{o}F at both Ashland, Clark County and Coldwater, Comanche County**,** on the 18th**.** The lowest minimum temperature was 16 ^{o}F at Plainville 4 WNW, Rooks County, on the 20th.

Climate Division	Kansas Climate Division Temperature Summary (^{o}F) April 1-30, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	60.6	28.7	44.7	-4.9	88	12	4	7
West Central	62.7	29.2	46.0	-4.8	92	13	10	7
Southwest	65.6	31.6	48.6	-4.9	99	13	4	1
North Central	59.2	30.7	45.0	-7.8	91	13	8	7
Central	61.9	32.4	47.1	-6.7	95	13	8	7
South Central	63.5	34.2	48.8	-6.4	99	13	14	4
Northeast	57.2	31.9	44.5	-9.0	88	14	12	7
East Central	58.7	34.4	46.5	-7.6	87	13	15	4
Southeast	61.8	36.0	48.9	-6.8	87	13	17	7
STATE	61.2	32.1	46.7	-6.5	99	13th	4	7th
Data Source: KSU Weather Library								

Below are the weekly mean temperatures and the normal for the time period, as well as the departure from normal temperatures from Kansas State University Department of Agronomy. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by on KSU Weather Data Library.)







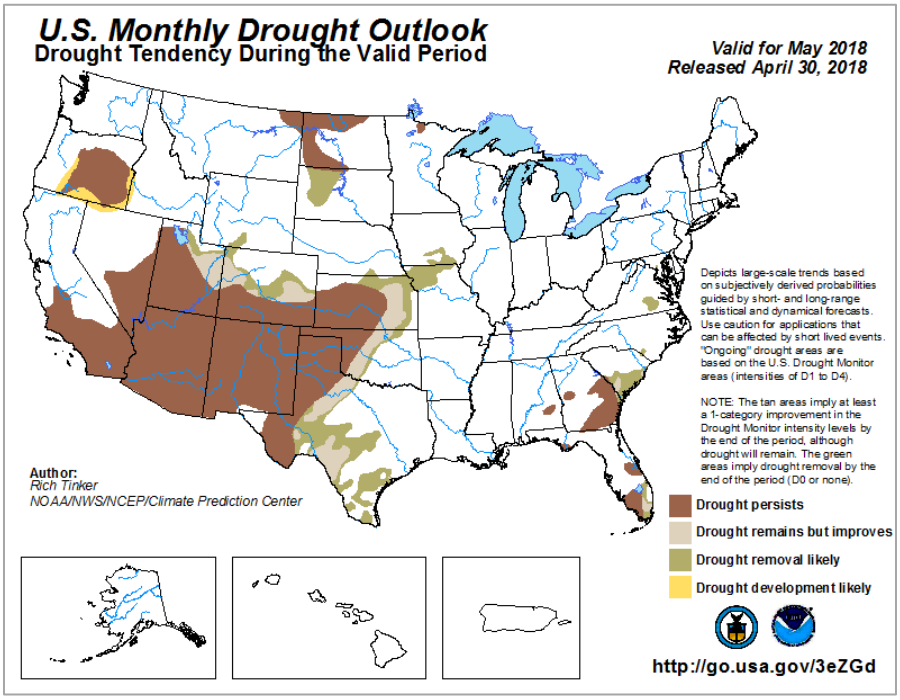
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

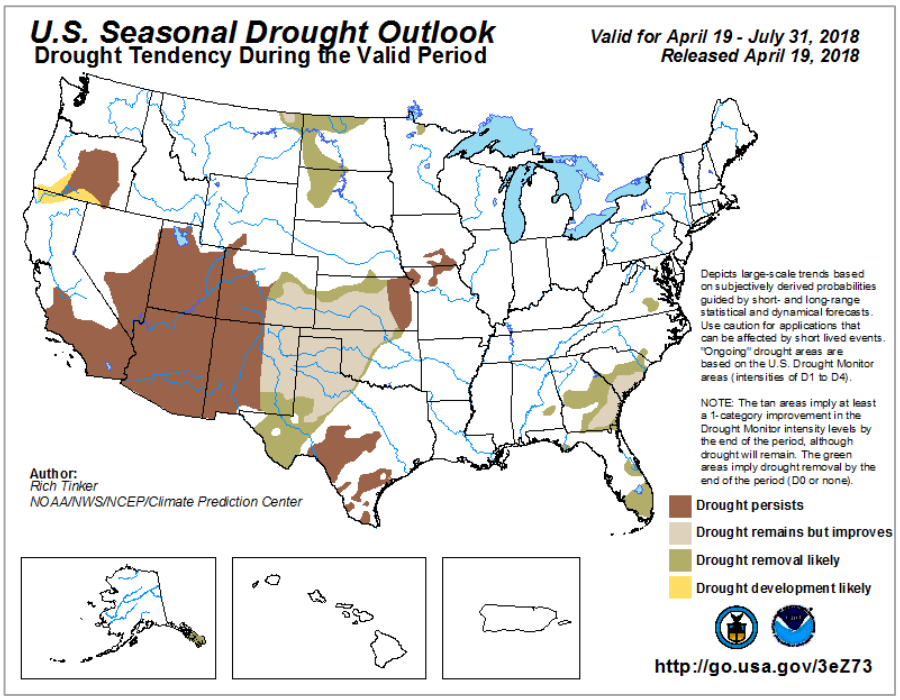
Future Outlook

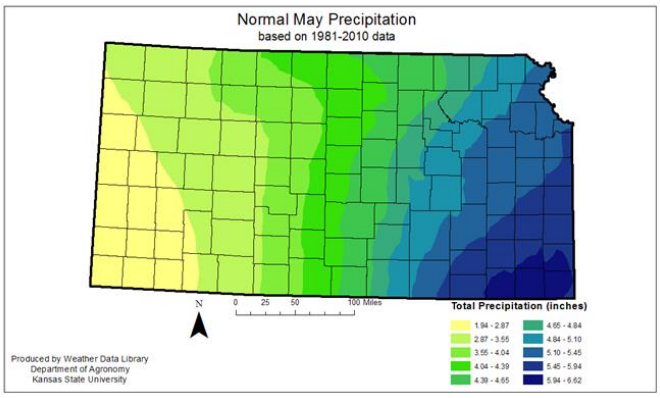
The Monthly Drought Outlook indicates drought conditions to remain in southern, central and western Kansas. Improvement of drought conditions is possible in scattered areas of east and northeast Kansas. The May outlook has a slight chance for wetter than normal conditions across the state. The temperature outlook is for cooler than normal temperatures statewide. Unless May moisture is significant, that combination is unlikely to result in significant improvement of the drought conditions. With the wet summer last year, current dryness, and the cool start to the year, increased fire danger continues in Southwest Kansas.

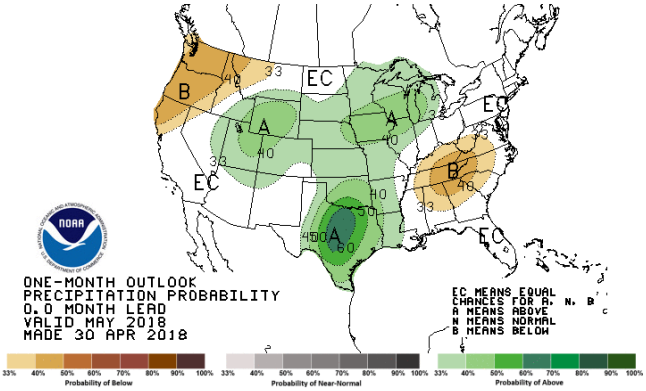
Seasonal Outlook (3-month) favors continued drought with possible improvement in south central, central and western Kansas. For the April 19-July 31 time period probability favors below normal precipitation and above normal temperatures for western parts of the state. The remaining areas have equal chances of below or above normal precipitation and temperatures for the period.

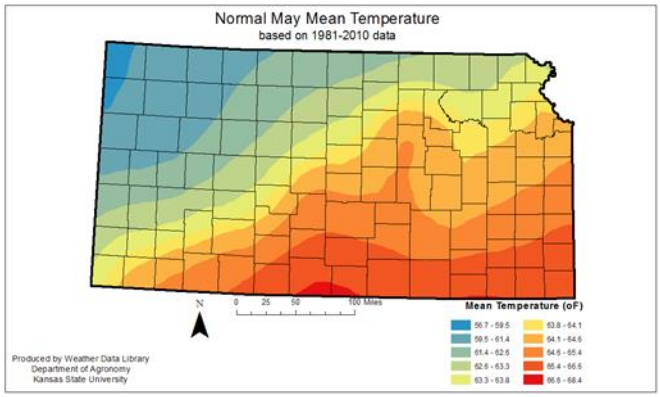
The individual temperature and precipitation outlooks that contribute to these outlooks are provided below for the one and three month periods.

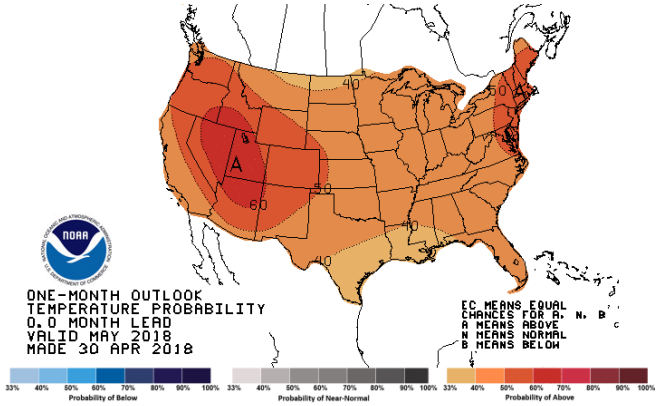


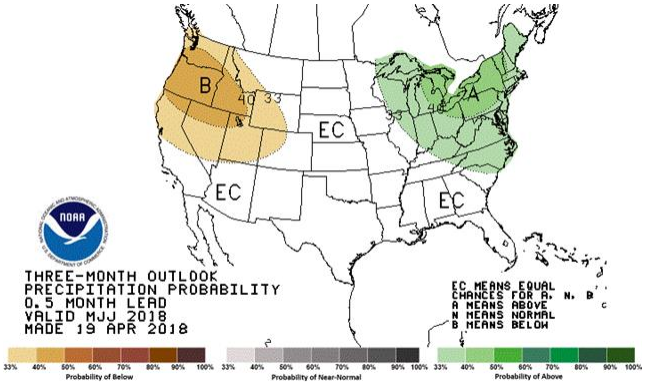


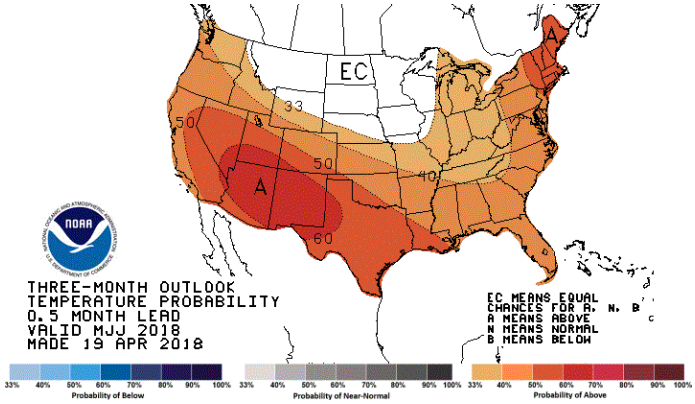












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of May 4, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (May 4, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ May 4, 2018)

Surface Water Supply Conditions as of April 17

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs continue to decline in April. However, storage in the basin has not been significantly impacted from the abnormally dry conditions in recent months. Clinton maintained a full pool and the other three reservoirs were below the top of multipurpose elevation due to planned seasonal drawdowns. The lower seasonal elevations may extend longer than planned if inflow conditions don't improve. Flow in the Kansas River remained less than half of historic median values with the majority of the flow from reservoir releases, primarily Tuttle Creek, which is experiencing a slight decline in elevation.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs are all set to minimum gate settings. Melvern and Pomona have not refilled from their lower winter target elevation and are experiencing a slight declining trend in April. Reservoir releases have not been necessary to supplement flow in the Marais des Cygnes River.

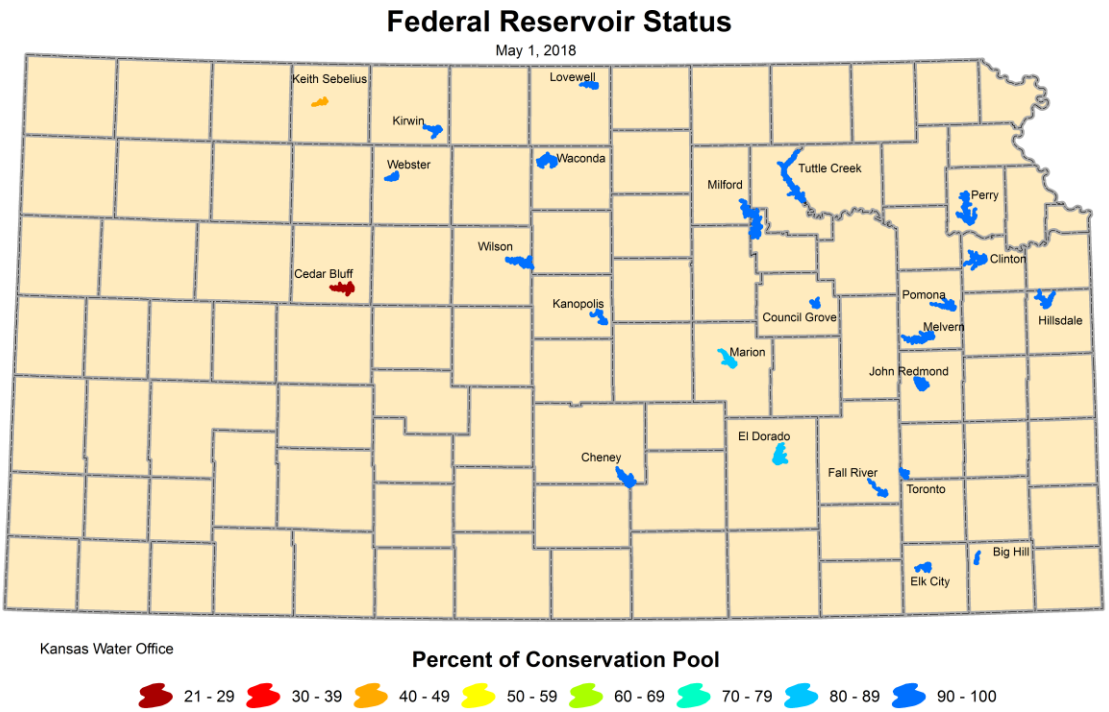
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs are generally low and streamflow is declining throughout the system. Conservation storage is full in John Redmond but steadily declined in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow and releases from John Redmond are on-going to meet the needs of Wolf Creek power plant.

Verdigris basin: Toronto, Fall River, and Big Hill reservoirs are at or near conservation pool levels; Elk City Reservoir is maintaining above normal pool. Reservoir releases are necessary to supplement low flow conditions of the Fall and Verdigris Rivers but reservoir storage is healthy.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool and streamflow conditions are maintaining near median values.

Smoky Hill basin: The middle Smoky Hill basin maintained streamflow but has not experience any significant runoff events. Inflow to Kanopolis Lake remained slightly below median historic values and a healthy rain and runoff event will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of Multipurpose. The target flow of 20 cfs at the Mentor gage has been maintained with minimal releases from Kanopolis, allowing a very gradual rise in elevation in April.

General Reservoir Conditions



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**4/30/2018**		
Norton[1]	2304.3	2292.46	-11.84	42
Harlan County, NE	1945.73	1940.66	-5.07	79.7
Lovewell[1]	1582.6	1582.21	-0.39	97
Milford[1]	1144.4	1142.27	-2.13	91.5
Cedar Bluff	2144	2117.18	-26.82	29
Kanopolis[1]	1463	1463.12	0.12	100
Wilson[1]	1516	1516.29	0.29	100
Webster[1]	1892.5	1893.75	1.25	100
Kirwin[1]	1729.3	1729.67	0.37	100
Waconda[1]	1455.6	1454.81	-0.79	95.6
Tuttle Creek[1]	1075	1074.18	-0.82	96.5
Perry[1]	891.5	889.31	-2.19	89.1
Clinton[1]	875.5	875.79	0.29	100
Melvern[1]	1036	1034.81	-1.19	94.6
Pomona[1]	974	972.93	-1.07	92.5
Hillsdale[1]	917	917.15	0.15	100
Arkansas River Basin		**5/1/2018**		
Cheney	1421.6	1421.04	-0.56	97
El Dorado	1339	1334.63	-4.37	80
Toronto[1]	901.5	904.11	2.61	100
Fall River[1]	948.5	949.79	1.29	100
Elk City[1]	796	797.07	1.07	100
Big Hill	858	857.97	-0.03	100
Council Grove[1]	1274	1271.83	-2.17	87
Marion[1]	1350.5	1348.41	-2.09	84
John Redmond[1]	1039	1041.02	0.02	100

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

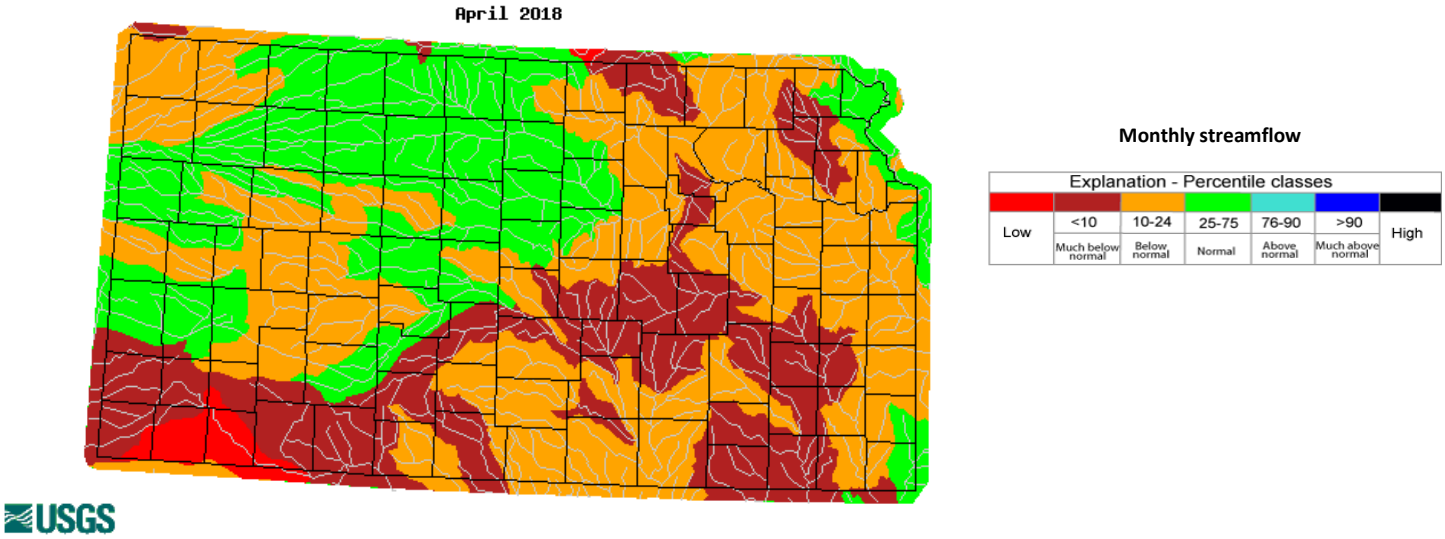
Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. Spring evaluation resumed in March. There are currently no warnings and watches in effect.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

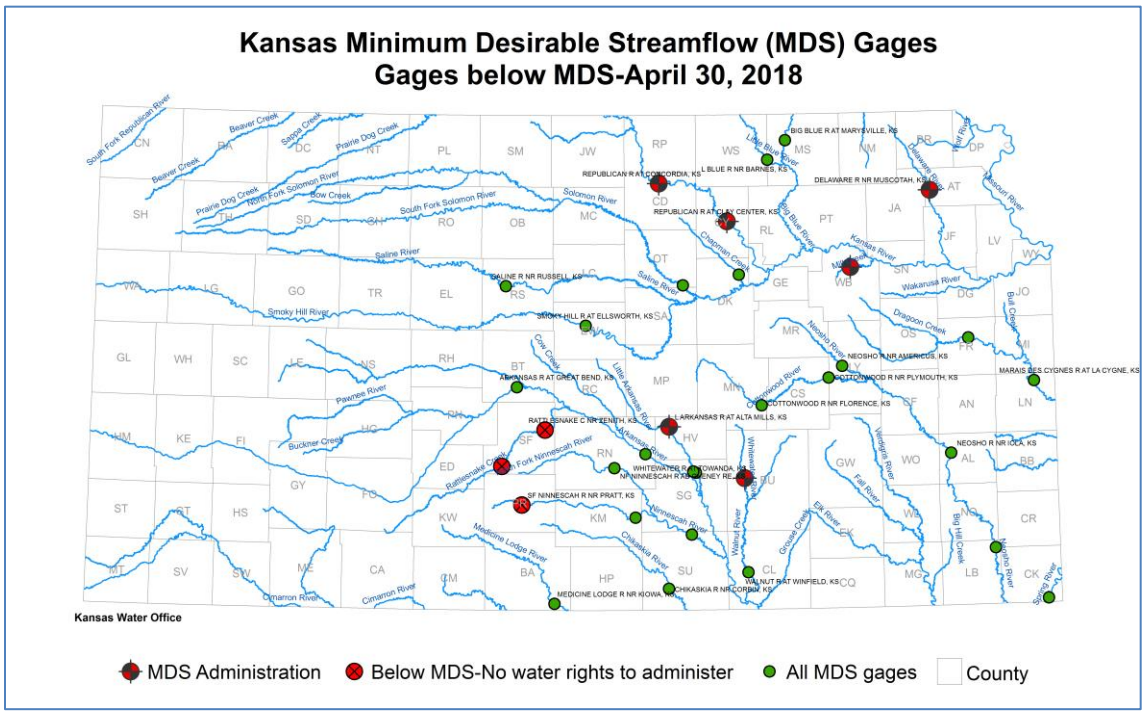
April 2018 average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. MDS administration is occurring at numerous locations. Please see table below of current administration.



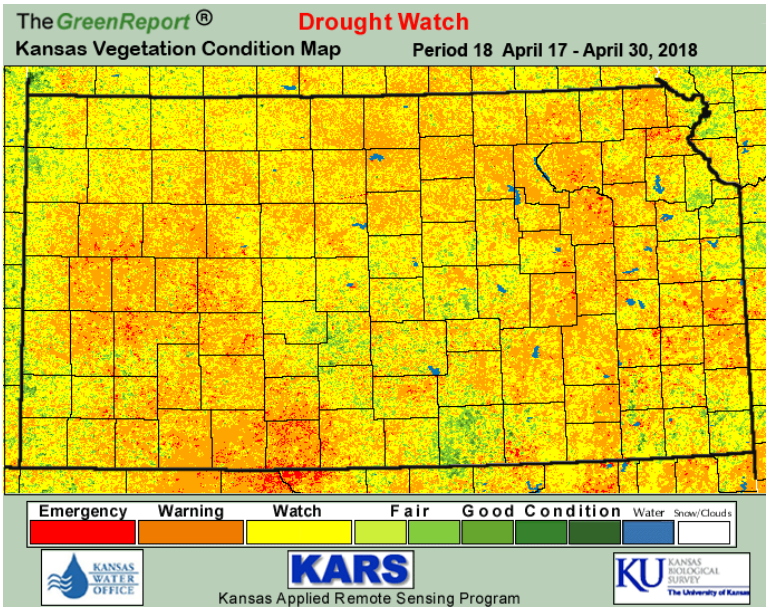
The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage and others where the below MDS flows will be of sufficient number of days to require administration soon.

Streamflows as of April 30, 2018			
Gaging Station	**Current Flow**	**Apr MDS**	**Comment**
Republican River at Concordia	73	150	Admin began April 13, 2018
Republican River at Clay Center	169	250	Admin began April 13, 2018
Little Blue River near Barnes	176	150	
Mill Creek near Paxico	13	25	Admin began April 12, 2018
Delaware River near Muscotah	13	20	Admin began March 23, 2018
Rattlesnake Creek near Macksville	1	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	11	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	6	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	6	8	No surface water diversions junior to MDS above gage
Whitewater River near Towanda	17	20	Admin began April 12, 2018
Medicine Lodge River near Kiowa	69	60	

Soil, Crop and Vegetation

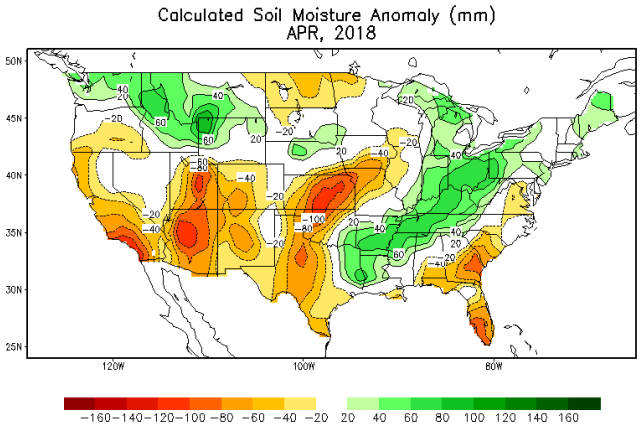
Kansas Vegetative Conditions

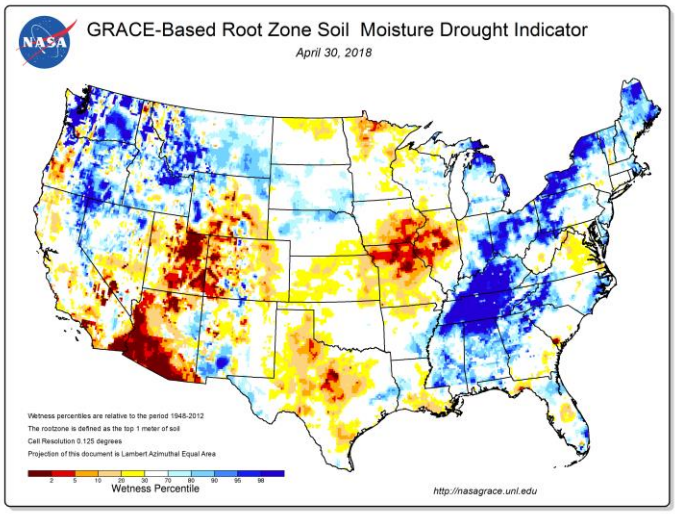
The Kansas Vegetative Condition map provides current conditions. It is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The period has shown slight improvement in south central and northwest Kansas where wheat is trying to grow.



Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)



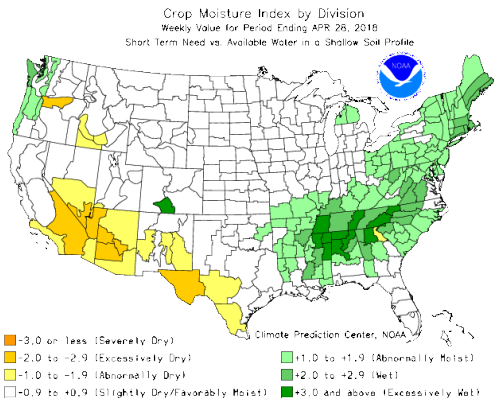


NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present).

Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion.

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending April 29, 2018 indicates topsoil moisture supplies rated 27 percent very short, 32 short, 40 adequate, and 1 surplus. Subsoil moisture supplies rated 27 percent very short, 38 short, 35 adequate, and 0 surplus.

Field Crops Report: Winter wheat condition rated 16 percent very poor, 34 poor, 37 fair, 12 good, and 1 excellent.

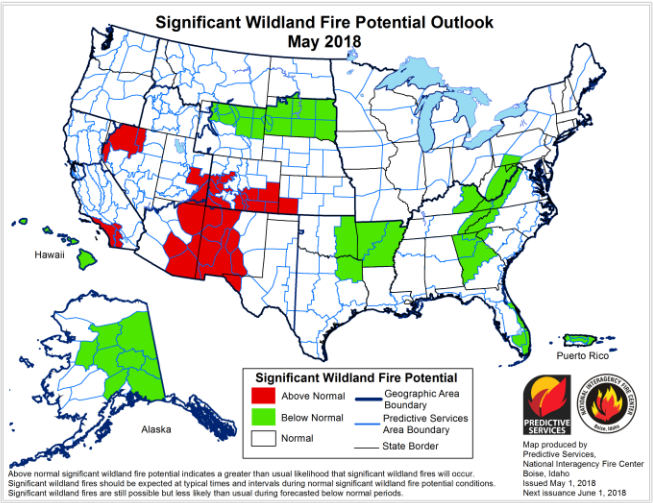


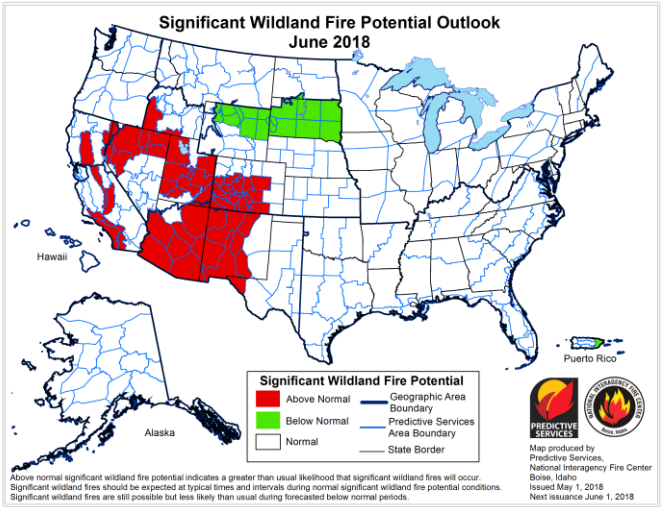
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

Fire

April conditions resulted in numerous wildfires and Red Flag warnings alerting citizens to potential increases in wildfire activity due to ideal conditions for wildland fire combustion and rapid spread. Dry conditions increase the potential for wildfire. According to the National Interagency Fire Center, wildfire activity is likely to continue in western and southern Kansas in April and in the west into May. Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:**
http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States,
https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf . These indicate portions of Kansas will remain above normal in wildfire activity in April and May 2018.





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought

Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

April 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	1.71	0.25	117%	46.0	-1.9	86 (29,12)	14 (7)
Dodge City	0.97	-0.85	53%	49.4	-4.5	96 (12)	16 (7,6)
Garden City	0.40	-1.32	23%	48.3	-4.8	94 (12)	14 (15)
Goodland	1.48	-0.11	93%	46.0	-3.2	86 (29)	12 (6)
Guymon, OK	1.06	-0.45	70%	52.3	-3.0	94 (12)	19 (7)
Hill City	0.57	-1.55	27%	46.4	-5.2	86 (29)	5 (7)
Lamar, CO	1.15	-0.17	87%	50.4	-1.8	92 (12)	18 (2)
McCook, NE	1.02	-1.29	44%	45.2	-4.3	86 (29)	3 (7)
Springfield, CO	0.48	-0.79	38%	48.3	-3.3	88 (12)	17 (7)
Central							
Concordia	0.99	-1.46	40%	46.4	-6.7	85 (12)	12 (7)
Hebron, NE				45.4	-5.6	83 (30,12)	14 (7)
Medicine Lodge	1.39	-1.04	57%	51.1	-5.1	96 (12)	19 (7,4)
Ponca City, OK	2.08	-1.36	60%	52.6	-5.8	89 (17,13)	22 (16,7)
Salina	1.20	-1.85	39%	49.7	-5.5	90 (12)	15 (7)
Wichita (ICT)	1.76	-0.83	68%	50.7	-5.4	87 (12)	18 (7)
East							
Bartlesville, OK	1.49	-2.49	37%	51.9	-6.9	88 (17)	23 (16,8)
Chanute	1.13	-3.27	26%	51.1	-5.8	82 (30)	23 (7,4)
Fall City, NE	0.71	-2.47	22%	45.2	-8.0	85 (13)	11 (2)
Johnson Co. Exec. Apt	0.92	-3.07	23%	47.4	-7.7	80 (30,13)	17 (4)
Joplin, MO	2.11	-2.36	47%	51.8	-6.6	83 (12)	23 (7)
Kansas City (MCI), MO	1.04	-2.66	28%	47.4	-7.5	83 (13)	16 (7)
St. Joseph, MO	0.56	-3.23	15%	45.9	-8.3	84 (13)	10 (2)
Topeka (TOP)	1.06	-2.47	30%	48.4	-6.7	84 911)	18 (7,4)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value

T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal

Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE
Mid-May 2018 Summary

Highlights

- U.S. Drought Monitor showed a second week of improvements in drought conditions the week ending May15. The most significant improvements were made in south-central Kansas, where a large area of 2 to 4 inches of rain (locally more) fell on areas of Severe (D2) to Extreme (D3) Drought. The previous week saw a small area of improvement centered around Cloud and Washington counties.

- Drought Declarations for Kansas counties remain in effect under Executive Order 18-11; issued March 13, 2018 includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.

- USDA Drought Disaster Designations as of May 9, 2018 have been made for 68 primary counties and 21 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

- Administration was effective April 13, 2018, on the Republican River from the Clay Center gage to state line, covering 225 water rights.

- Administration was effective on Mill Creek above the gage near Paxico, April 12, 2018 covering 14 water rights.

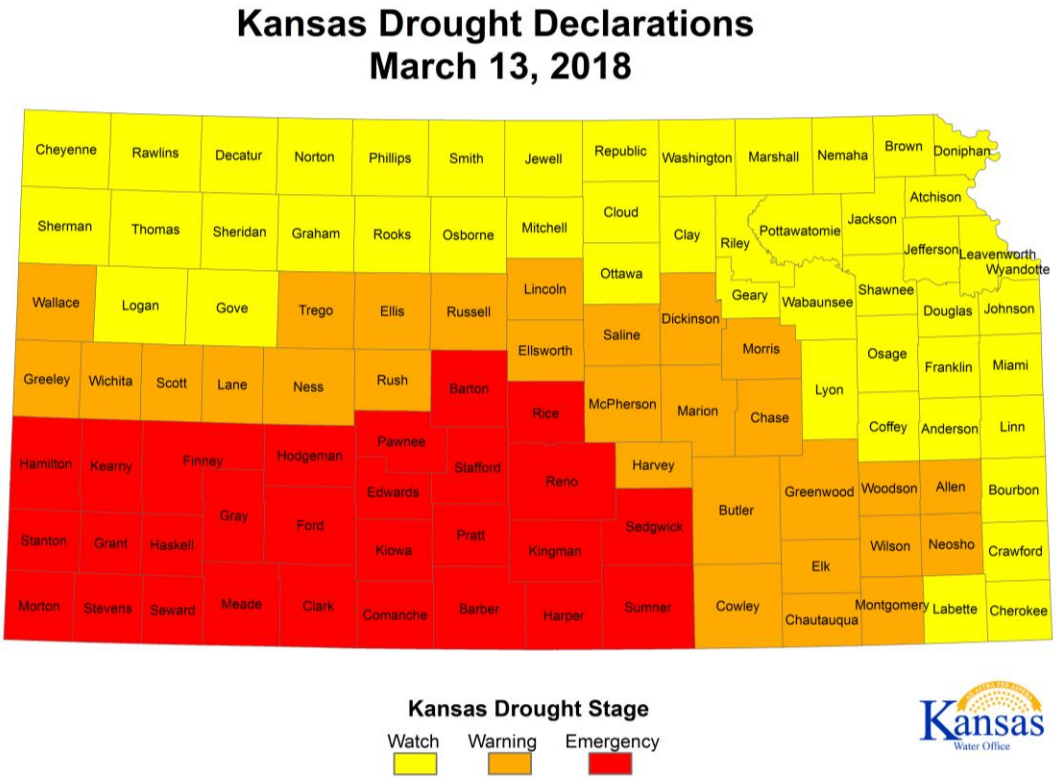
- Administration was effective on the Whitewater River above the gage near Towanda, April 12, 2018 covering 11 water rights

- Administration was put in effect March 23, 2018 for 40 water rights above the Muscotah gage on the Delaware River.

- Water Rights above the USGS gage on the Little Arkansas River at Alta Mills have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status. These Drought Declarations remain in place until rescinded or replaced.



Drought Watch counties: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

Drought Warning counties: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

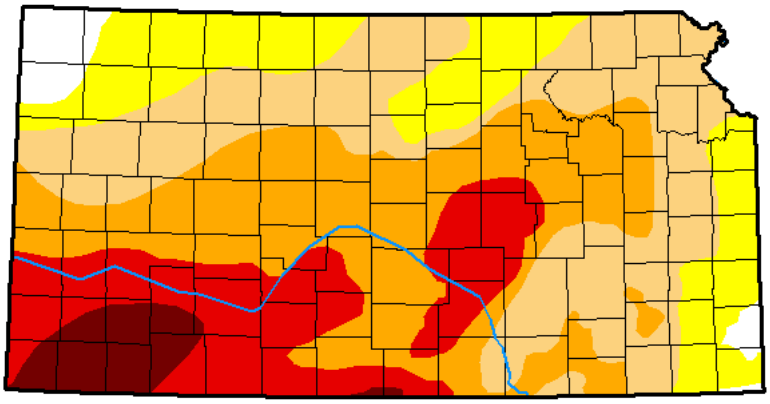
Drought Emergency counties: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

Only three percent (%), the northwest and southeast corners of Kansas, is not affected by dry or drought conditions at the end of April according to the U.S. Drought Monitor. A locally heavy rain in early May is reflected by the lessening of severity for some areas. But Drought conditions only improved for removal of drought in parts of southeast Kansas. Drought at some level continues for the majority of Kansas.

U.S. Drought Monitor

Kansas



May 15, 2018

(Released Thursday, May. 17, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	3.02	96.98	80.15	50.32	21.75	4.60
Last Week *05-08-2018*	2.49	97.51	81.65	57.51	27.16	7.20
3 Months Ago *02-13-2018*	0.11	99.89	61.05	36.34	9.50	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *05-16-2017*	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

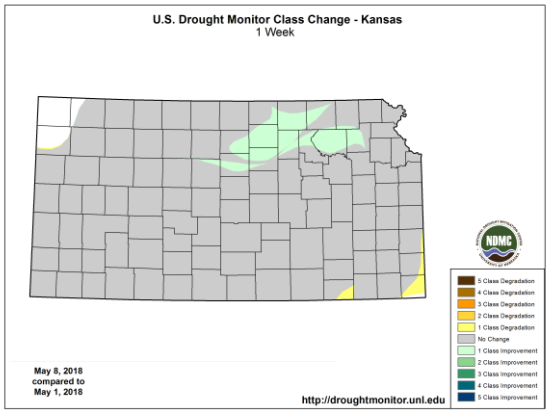
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

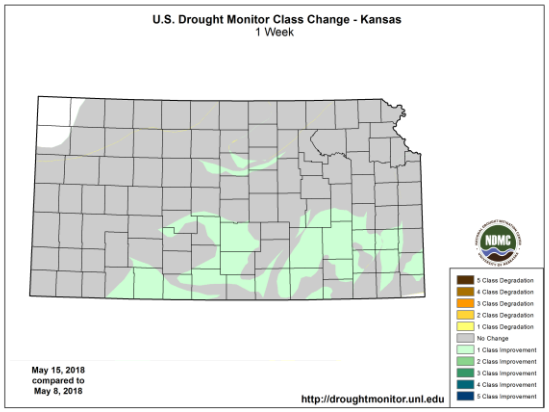
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Eric Luebehusen
U.S. Department of Agriculture

http://droughtmonitor.unl.edu/



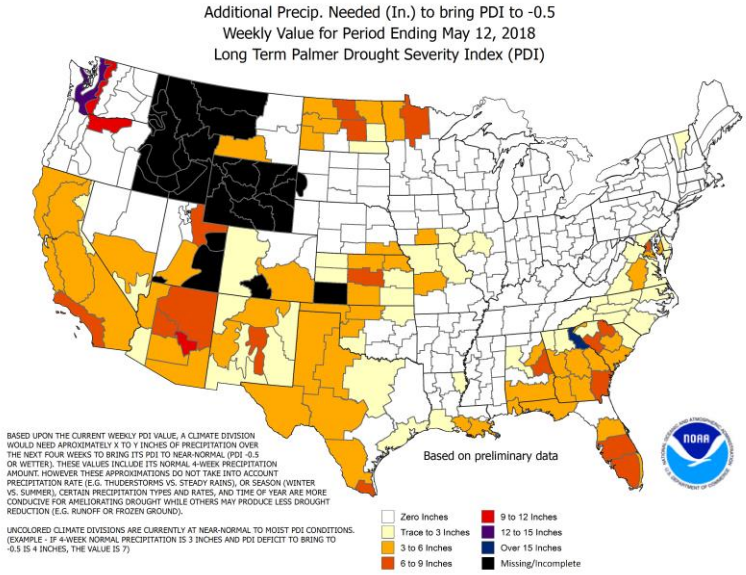


Improvements each of the first two weeks of May shown on left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Apr 28	May 5	May 12
Northwest	-	-	1.64
North Central	2.96	2.07	3.76
Northeast	5.60	3.00	5.36
West Central	0.55	1.52	2.69
Central	5.16	5.13	6.37
East Central	1.26	1.71	3.05
Southwest	unknown	unknown	2.12
South Central	3.90	3.49	4.79
Southeast	-	1.29	2.57



More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

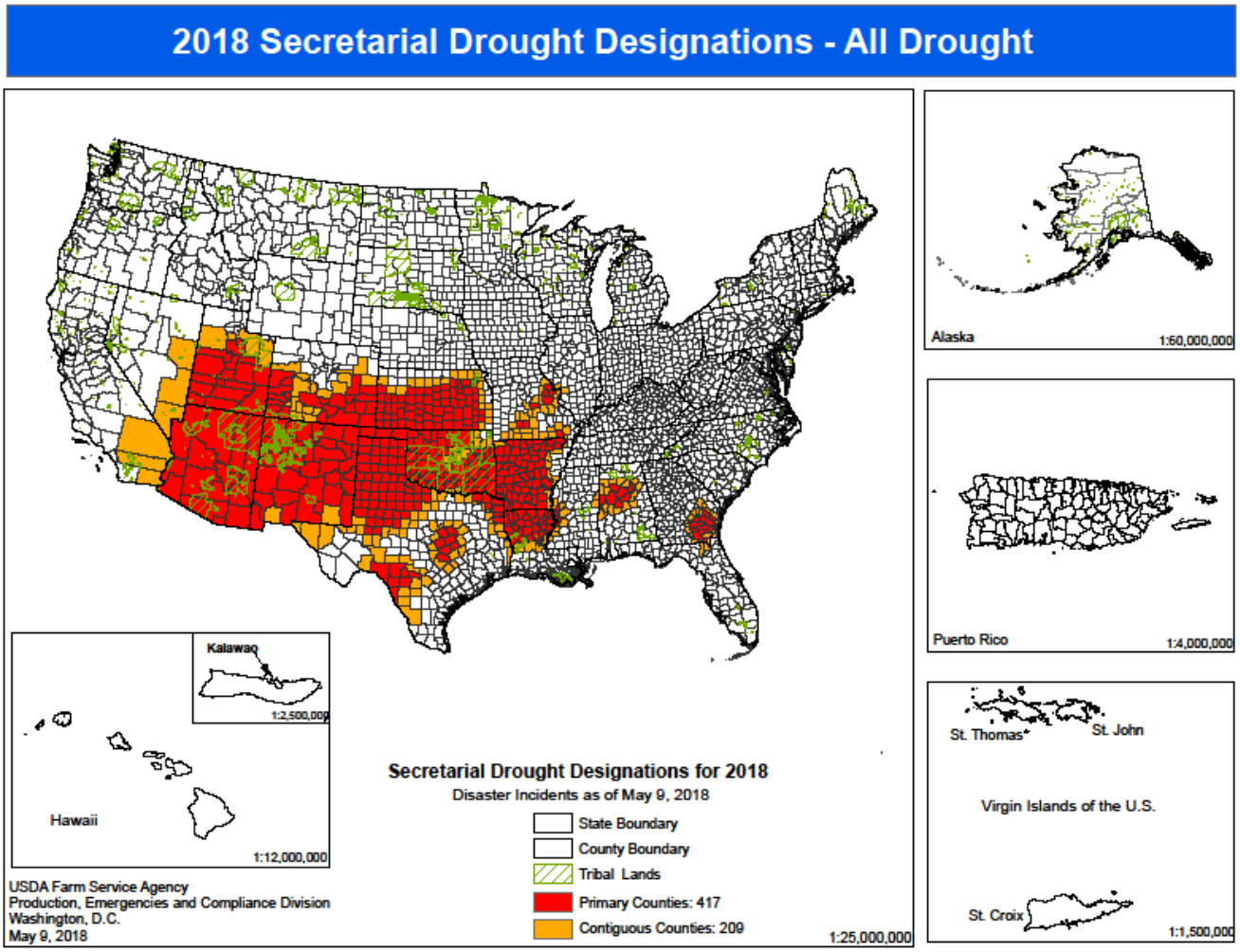
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

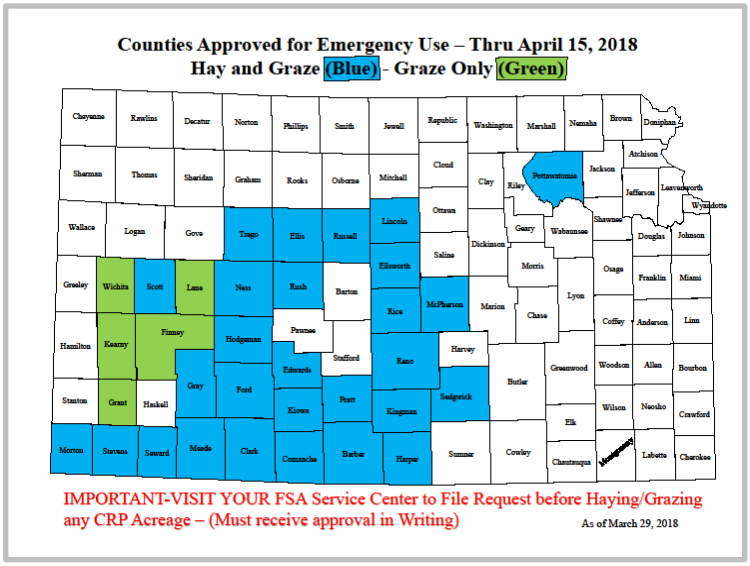
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor. Those in Bold in the list below were designated in May.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 68 primary counties and 21 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, **Clay**, **Coffey,** Comanche, Cowley, Dickinson, Edwards, Elk, **Ellis,** Ellsworth, Finney, Ford, **Geary**, Grant, Gray, **Greeley**, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, **Jackson,** Kearny, Kingman, Kiowa, **Lane, Lincoln, Lyon**, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, **Osage, Ottawa**, Pawnee, **Pottawatomie**, Pratt, Reno, Rice, **Riley,** Rush, **Russell,** Saline, **Scott,** Sedgewick, Seward, **Shawnee,** Stafford, Stanton, Stevens, Sumner, **Trego, Wabaunsee, Wallace, Wichita,** Wilson and Woodson. Contiguous counties are Anderson, **Atchison,** Bourbon, **Brown**, **Cloud,** Crawford, **Douglas, Franklin**, Gove, **Graham**, Jefferson**,** Labette, Linn, **Logan**, **Marshall, Mitchell**, **Nemaha, Osborne, Rooks, Sherman and Washington.**



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency.

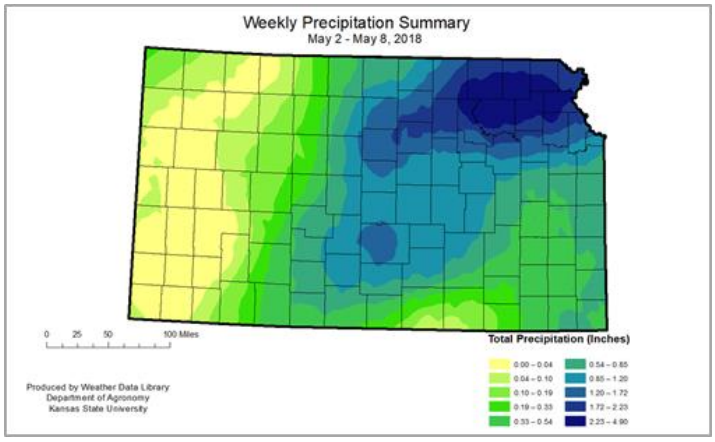


USDA-FSA has approved emergency haying and grazing on CRP acreages in some counties in Kansas (March 29, 2018). FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

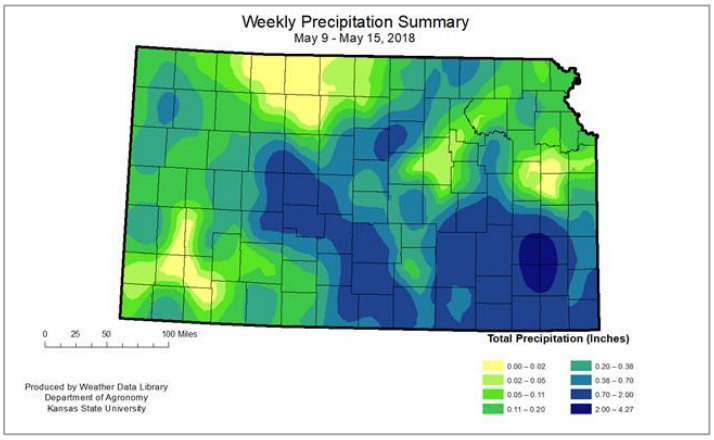
A fact sheet is available at
https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf

Climate Summary - Precipitation

Precipitation week of May 2-8**:** The statewide average precipitation was just 0.70 inches or 75 percent of normal. Unfortunately, the western climate divisions saw very little, with amounts averaging just 0.02 inches in the Northwest Climate Division to 0.18 inches in the West Central Division. The greatest total for the week at a National Weather Service Cooperative station was 3.69 inches at Clay Center, Clay County. For the Community Collaborative Rain Hail and Snow network, the greatest weekly total was 4.90 inches at Hunter 2.1 NNW, Mitchell County. Among the Kansas Mesonet stations the greatest weekly amount reported was 3.26 inches at the Clay County site, north of Clay Center.



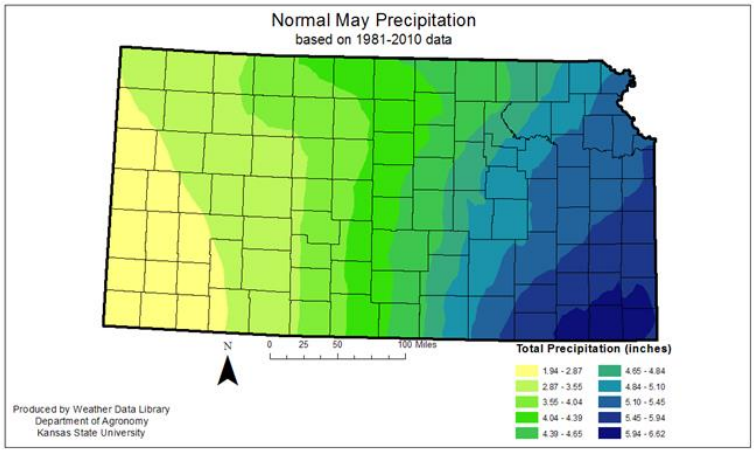
Precipitation week of May 9-15**:** The statewide average precipitation was just 0.66 inches or 67 percent of normal. The western divisions fared better than last week, but generally saw less than half an inch of precipitation. The Northwest Division had the greatest shortfall with an average of just 0.08 inches, or 12 percent of normal. The Southeast Division had the largest average precipitation at 2.18 inches or 172 percent of normal. The greatest total for the week at a National Weather Service Cooperative station was 4.27 inches at the Chanute FAA Airport, Neosho County. For the Community Collaborative Rain Hail and Snow network, the greatest weekly total was 3.11 inches at Winfield 7.9 W, Cowley County. Among the Kansas Mesonet stations the greatest weekly amount reported was 2.35 inches at the Parsons Mesonet site, in Labette County

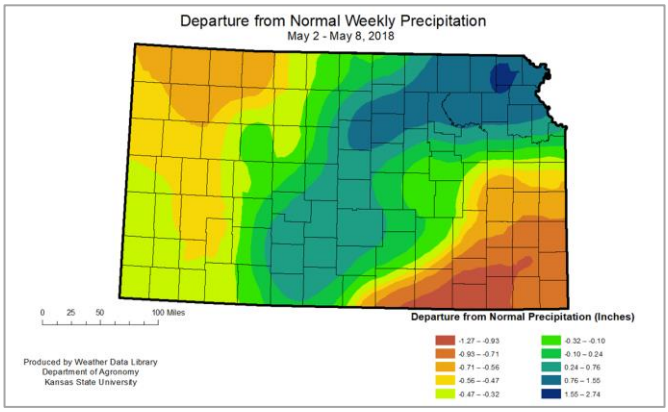


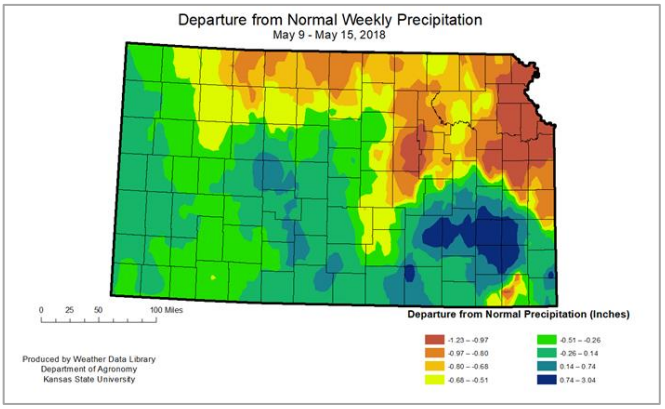
The precipitation summary is provided by Kansas State University Department of Agronomy as are the data tables and maps. Weekly maps of precipitation and departure from normal are provided in this section along with normal monthly precipitation. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) In addition, weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)

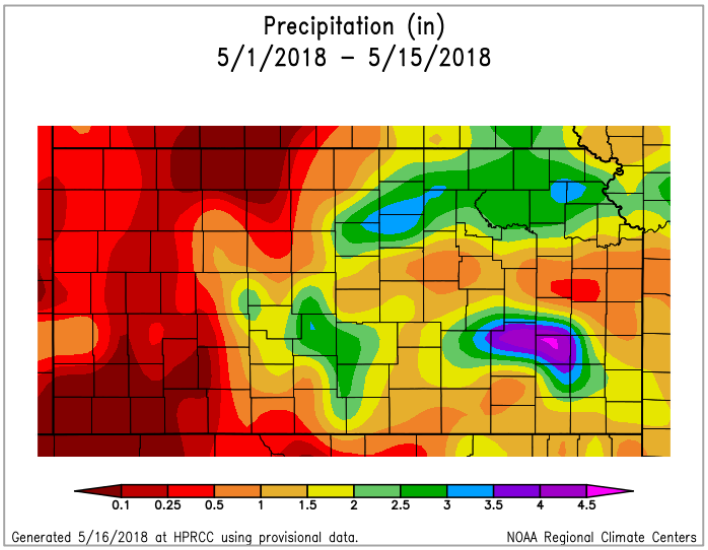
Climate Division	May 9-15, 2018			January 1-May 15, 2018			April 1, 2017- May 15, 2018			Sept. 1, 2017- May 15, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.08	-0.69	12	1.80	-4.10	30	0.78	-2.82	21	5.47	10.37	51
West Central	0.38	-0.28	59	2.39	-3.35	42	1.36	-1.88	43	7.02	10.21	68
Southwest	0.36	-0.23	61	1.92	-3.27	36	1.37	-1.44	48	5.58	9.65	58
North Central	0.26	-0.67	27	4.33	-3.54	53	2.77	-1.62	60	9.54	14.60	64
Central	0.63	-0.32	73	4.39	-4.14	52	2.78	-1.80	61	9.22	15.35	61
South Central	0.88	-0.07	90	5.28	-4.00	56	3.28	-1.38	70	10.92	17.13	63
Northeast	0.21	-0.88	20	5.21	-4.49	53	3.07	-2.43	55	9.92	19.04	52
East Central	0.57	-0.58	51	5.90	-4.95	54	3.03	-2.90	51	11.48	21.17	53
Southeast	2.18	0.89	172	8.41	-4.20	66	4.27	-2.35	66	15.48	24.70	62
STATE	0.66	-0.26	67	4.44	-3.97	49	2.55	-2.01	53	9.47	15.79	59

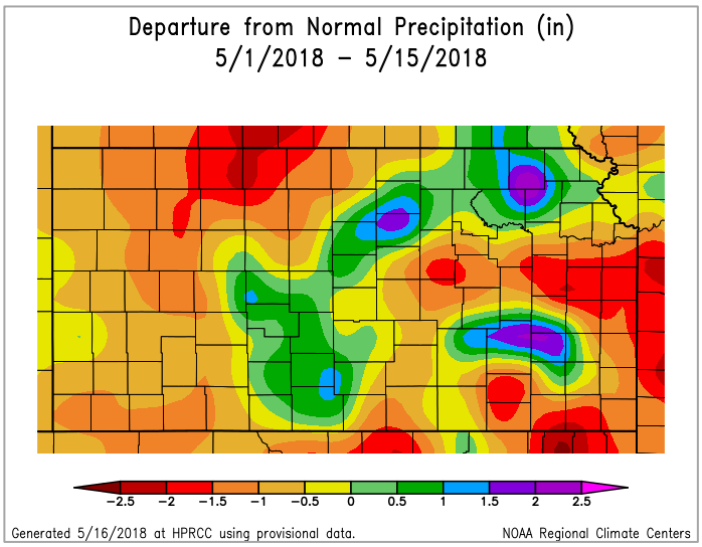






Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps. A snapshot of the first 15 days of May precipitation is provided below:





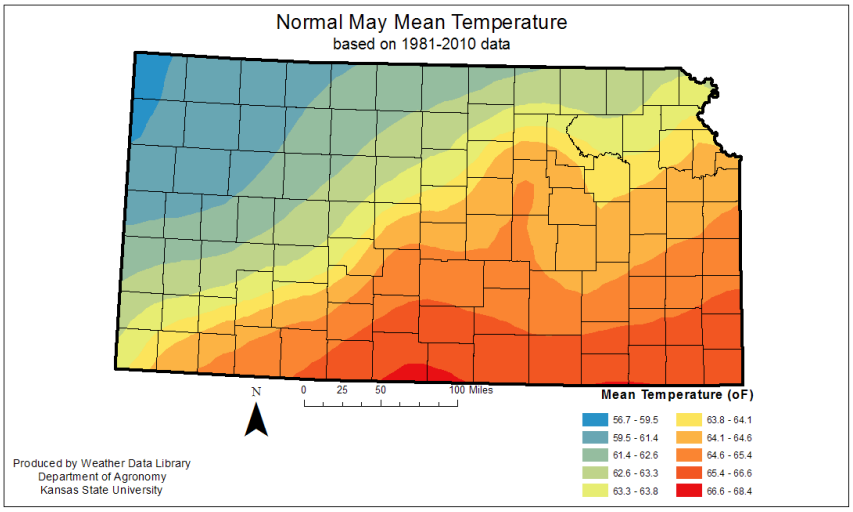
Climate Summary – Temperature

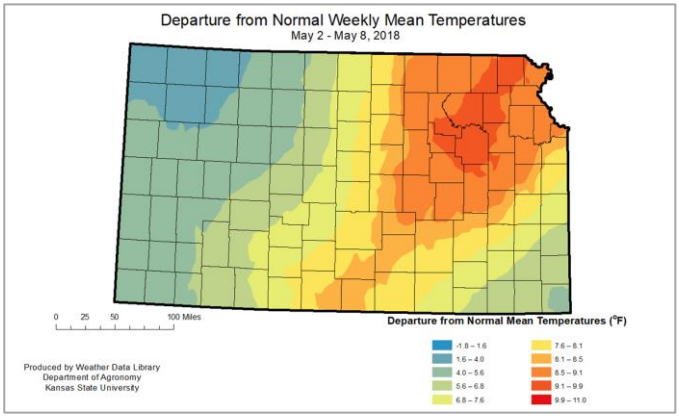
Temperature Week of May 2-8: May has started with much warmer than normal temperatures. The statewide average temperature for the week ending on May 8th was 65.7 °F. That is 6 degrees warmer than normal. In the Northwest, the temperatures ranged from a high of 90 °F at Atwood on the 8th to a low of 20 °F at Brewster 4W on the 2nd. The warmest temperature reported in the state was 93 °F reported at Dodge City WFO, Ford County, on the 7th. The coldest temperature was the 20 °F at Brewster 4W on the 2nd.

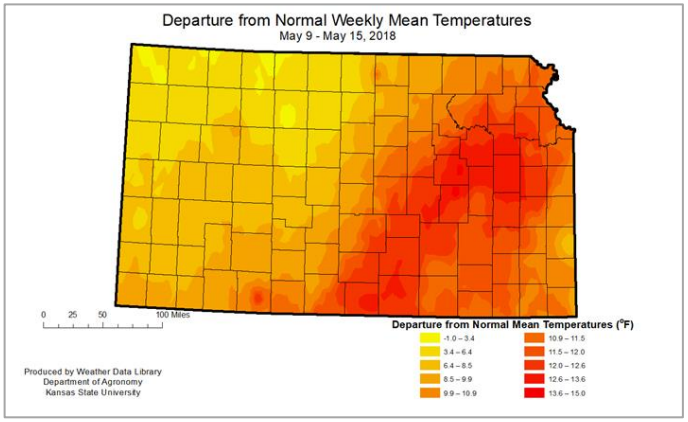
Temperature Week of May 9-15: It was another warm week. The statewide average temperature for the week ending on May 15th was 71.2 °F. That is 9 degrees warmer than normal. While there was a wide range from highest to lowest temperature, the diurnal range was much lower than in previous weeks at just 41.3 degrees. In the East Central that range was just 34 degrees. The warmest temperature reported in the state was 96 °F reported Ashland, Clark County, on the 10th. The coldest temperature was the 43 °F at Brewster 4W on the 9th.

Temperatures summaries and maps are provided by Kansas State University Department of Agronomy. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps below provide a glimpse at the temperature variation from normal in the early May. In addition, weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

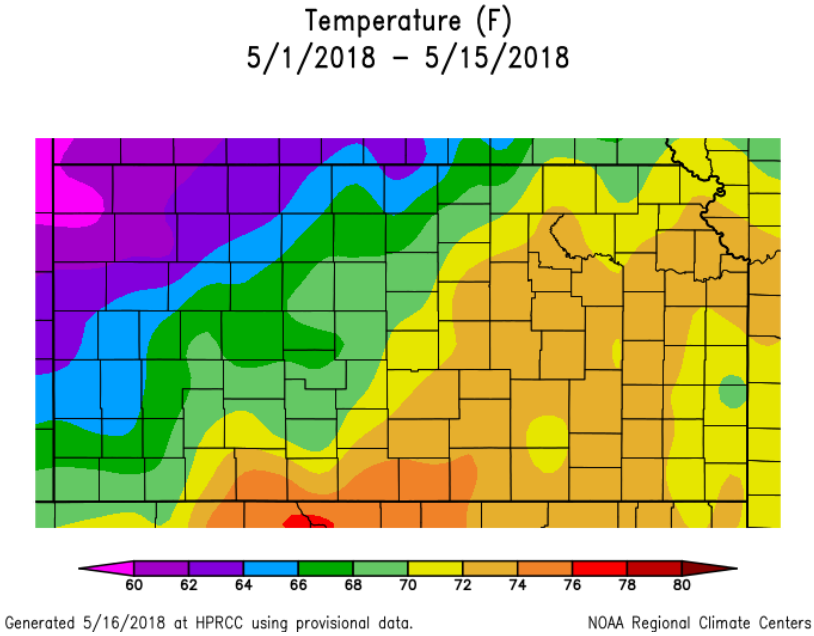
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	May 9-15, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	75.1	48.5	61.8	2.9	92	11	45	10
West Central	82.2	50.9	66.5	6.7	94	10	43	9
Southwest	85.8	54.0	69.9	7.4	96	10	45	10
North Central	83.3	56.1	69.7	7.8	91	12	49	13
Central	86.1	58.5	72.3	9.3	94	11	50	13
South Central	88.9	62.2	75.5	11.4	95	15	53	13
Northeast	86.8	60.6	73.7	11.1	91	14	54	9
East Central	86.7	64.2	75.5	12.4	92	14	58	13
Southeast	87.5	64.4	76.0	11.7	93	10	53	15
STATE	84.7	57.7	71.2	9.0	96	10th	43	9th
Data Source: KSU Weather Library								

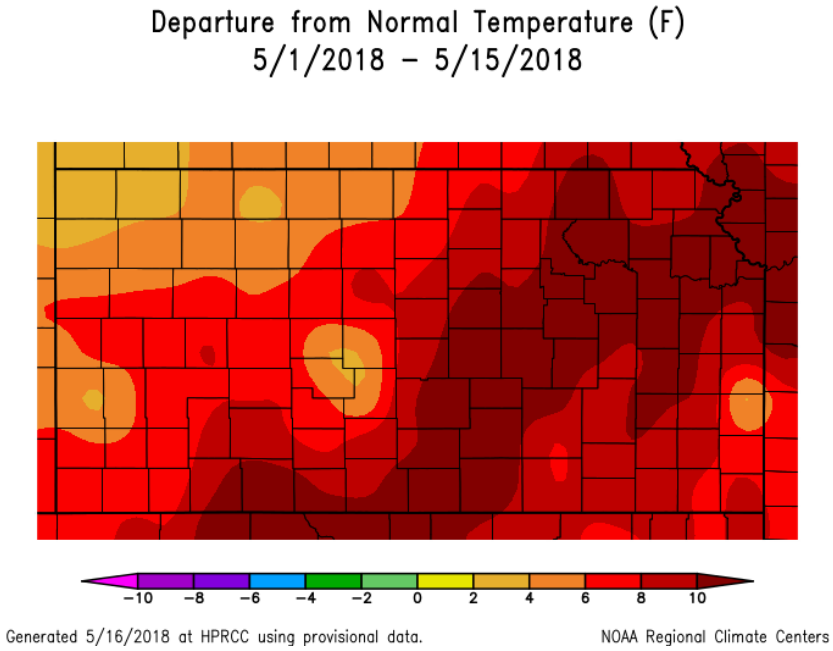






Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps. A snapshot of the first 15 days of May temperatures is provided below:

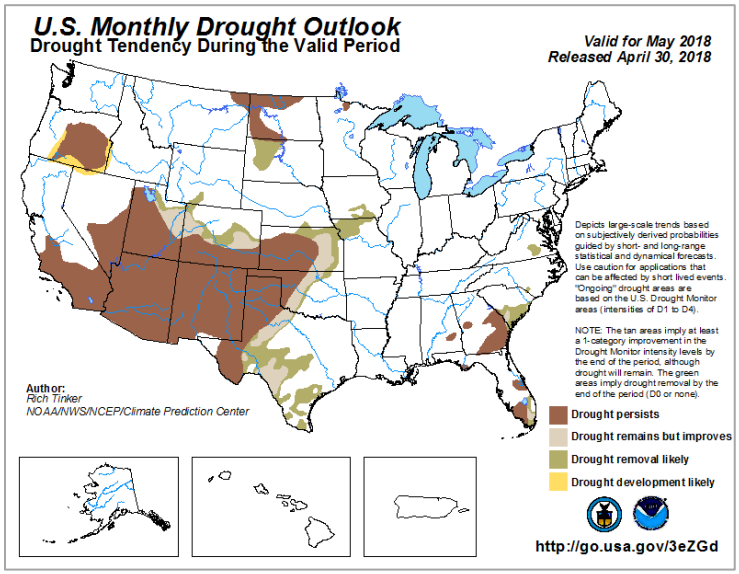


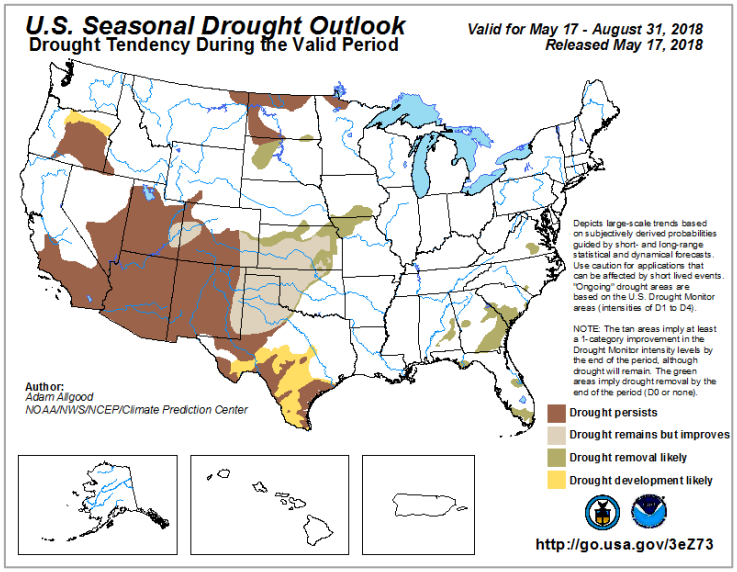


Future Outlook

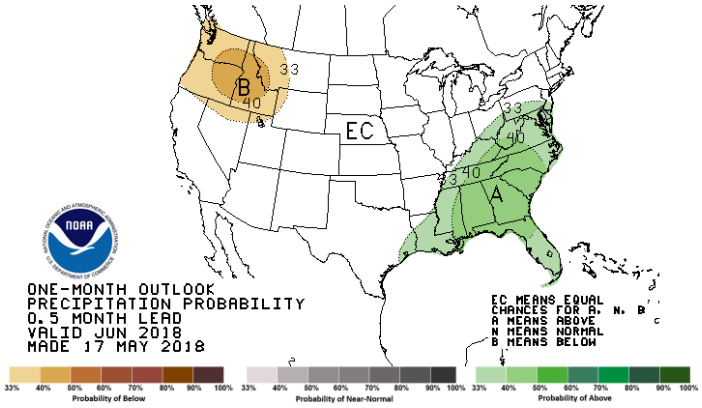
The Monthly Drought Outlook indicates drought conditions to remain in southern, central and western Kansas. Improvement of drought conditions is possible in scattered areas of east and northeast Kansas.

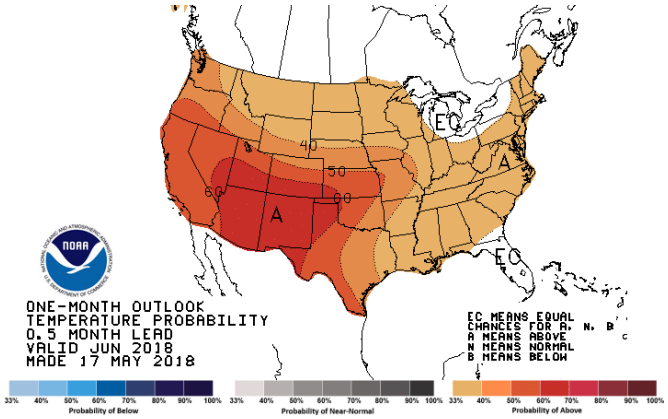
Seasonal Outlook (3-month) favors drought remaining across most of Kansas but possible improvement in south central, central and western Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available for various intervals.



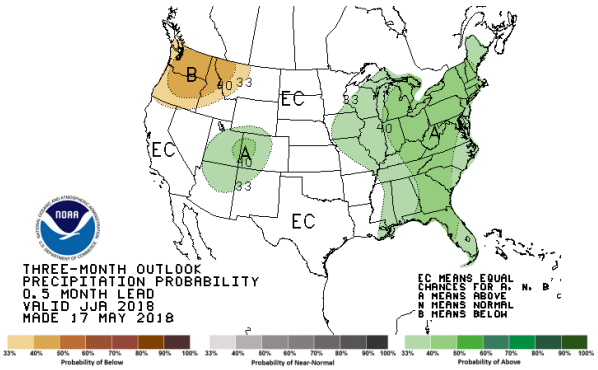


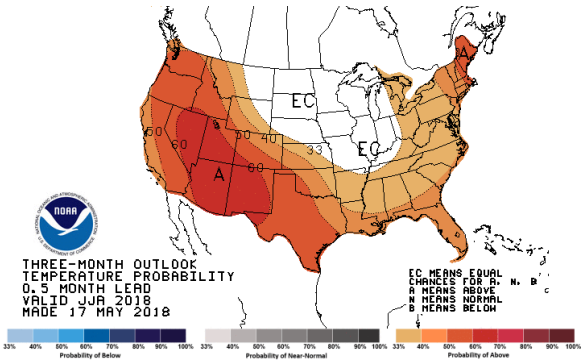
The one month climate outlooks favor above normal temperature and equal chances of below or above normal precipitation and for all of Kansas in June.





The Long-term, 3 month outlooks give equal chances of above or below normal precipitation and above normal temperatures in all but north eastern Kansas for June-July-August.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions
Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:
Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of May 14, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (May 14, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ May 14, 2018)

Surface Water Supply Conditions
Kansas River basin: Other than an early month runoff event, inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs is well below normal for May. However, overall storage is in pretty good shape, especially Tuttle Creek and Milford. Perry remains below the top of multipurpose pool and Clinton is nearly two feet below the seasonal target elevation. Flow in the Kansas River responded nicely to the early May precipitation but it declined to below historic median values. Without additional rain the Kansas River will return to low flow conditions, requiring reservoir releases to maintain target flows.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs are all set to minimum gate settings. Melvern and Pomona have not refilled from their lower winter target elevation and are experiencing a declining trend in May. Reservoir releases have not been necessary to supplement flow in the Marais des Cygnes River but flow is declining and is significantly below historic median, especially in the lower system.

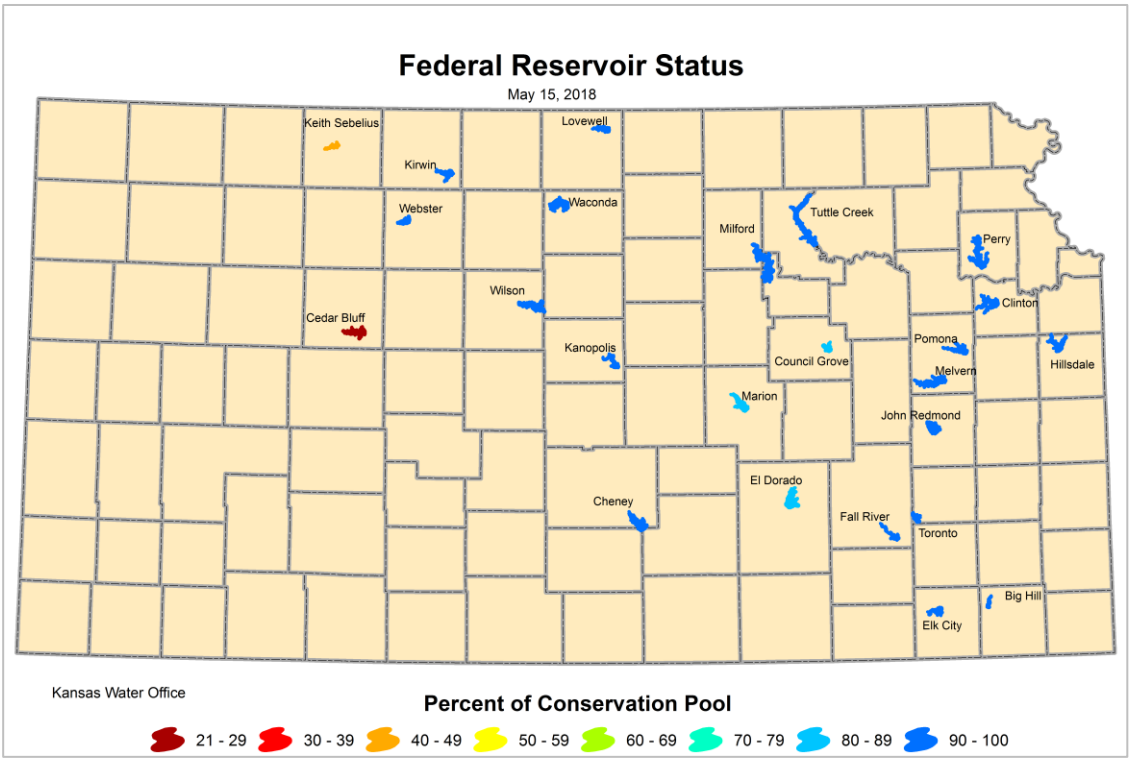
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs have been generally low for May. Streamflow was declining throughout the system until May 14th when a storm produced significant runoff in the Lower Neosho basin, primarily downstream of John Redmond. Conservation storage is full in John Redmond but steadily declining in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow in the Upper Neosho and releases are minimal from John Redmond, as the Lower Neosho River does not need supplemental releases at this time.

Verdigris basin: The May 14th precipitation benefited greatly increased the inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs. All are above conservation pool levels and releasing in excess of minimum gate settings to pass inflow and reduce pool elevations. Since May 14th, flow in the Verdigris River is approaching historic median flows in the lower reaches. Flow in the upper reaches and the Fall River rose to above median values. The amount of excess storage in the system should sustain healthy streamflow into the summer.

Saline basin: The elevation at Wilson Lake is being maintained slightly above normal pool and streamflow conditions are near median values.

Smoky Hill basin: The middle Smoky Hill basin is maintaining streamflow but has not experienced any significant runoff events in May. Inflow to Kanopolis Lake remains slightly below median historic values and a healthy rain and runoff event will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of Multipurpose. The target flow of 20 cfs at the Mentor gage has been maintained with minimal releases from Kanopolis, allowing a very gradual rise in elevation in May.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**05/15/2018 1:14 PM**		
Norton[1]	2304.3	2292.41	-11.89	41.9
Harlan County, NE	1945.73	1940.9	-4.83	80.6
Lovewell[1]	1582.6	1582.88	0.28	100
Milford[1]	1144.4	1144.54	0.14	100
Cedar Bluff	2144	2117.07	-26.93	28.9
Kanopolis[1]	1463	1463.6	0.6	100
Wilson[1]	1516	1516.56	0.56	100
Webster[1]	1892.5	1893.65	1.15	100
Kirwin[1]	1729.3	1729.74	0.44	100
Waconda[1]	1455.6	1455.18	-0.42	97.6
Tuttle Creek[1]	1075	1075.95	0.95	100
Perry[1]	891.5	890.38	-1.12	94.4
Clinton[1]	875.5	875.79	0.29	100
Melvern[1]	1036	1034.78	-1.22	94.5
Pomona[1]	974	972.84	-1.16	91.9
Hillsdale[1]	917	917.12	0.12	100
Arkansas River Basin		**05/15/2018 8:00 AM**		
Cheney	1421.6	1421.43	-0.17	99.0
El Dorado	1339	1334.82	-4.18	81.0
Toronto[1]	901.5	902.97	1.47	100.0
Fall River[1]	948.5	950.18	1.68	100.0
Elk City[1]	796	797.25	1.25	100.0
Big Hill	858	858.15	0.15	100.0
Council Grove[1]	1274	1271.80	-2.20	87.0
Marion[1]	1350.5	1348.40	-2.10	84.0
John Redmond[1]	1039	1041.20	0.20	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

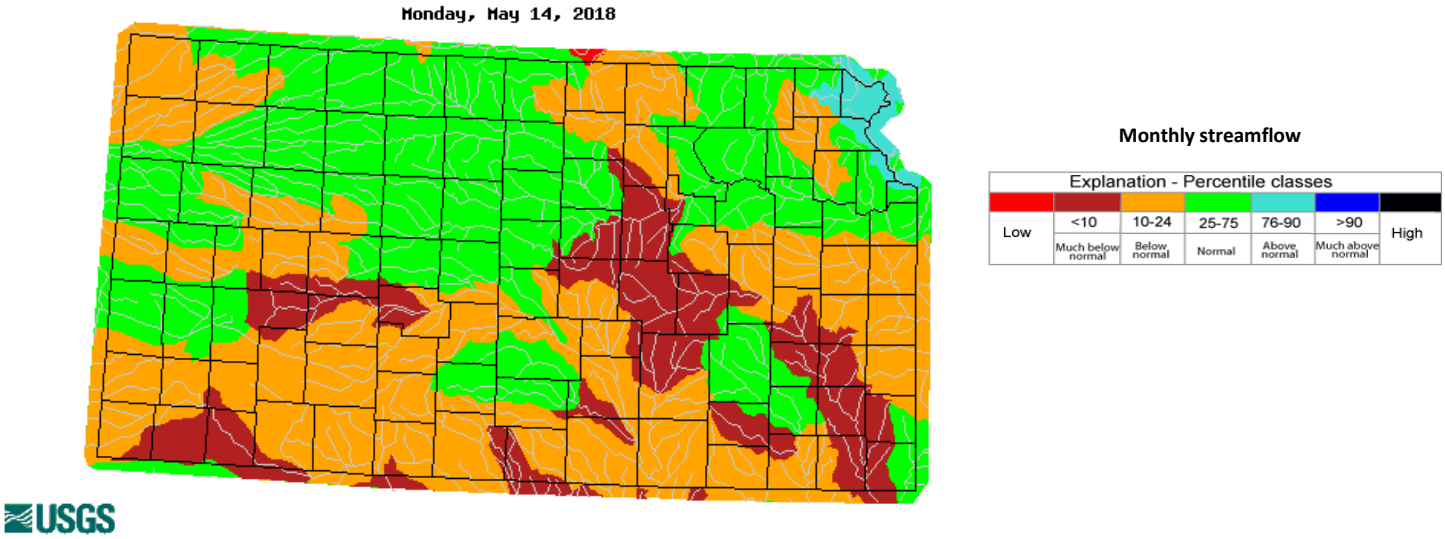
Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. Spring evaluation resumed in March. There are currently no warnings and watches in effect.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

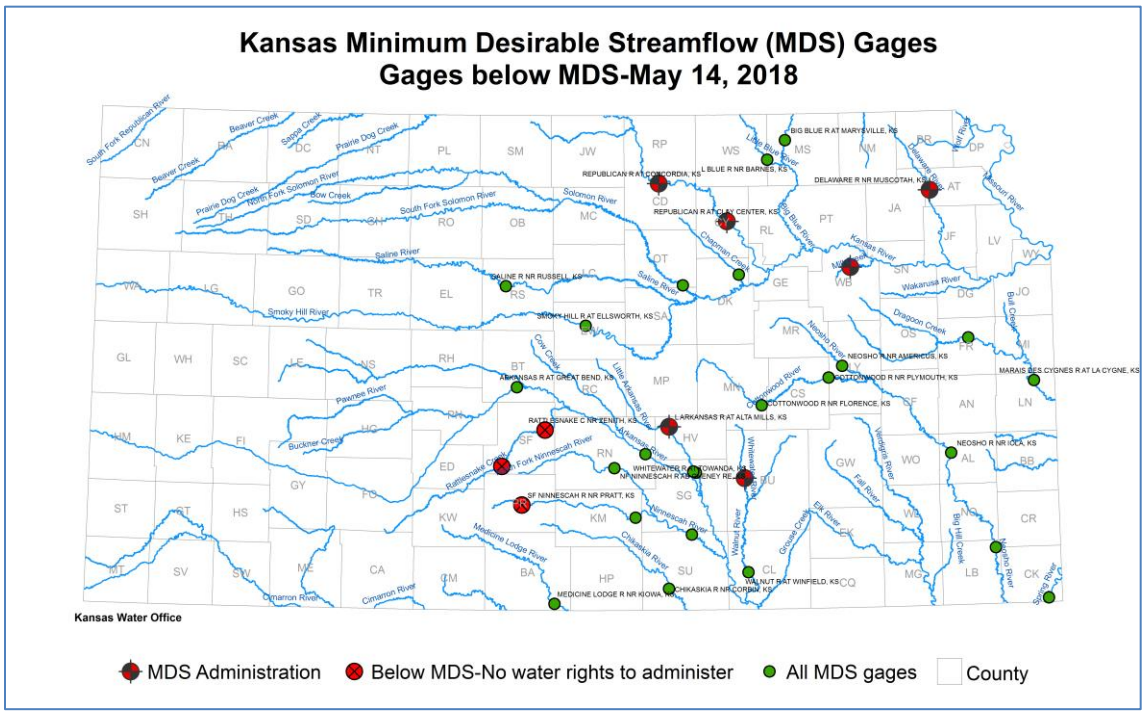
14-day average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. MDS administration is occurring at numerous locations. Please see table below of current administration.



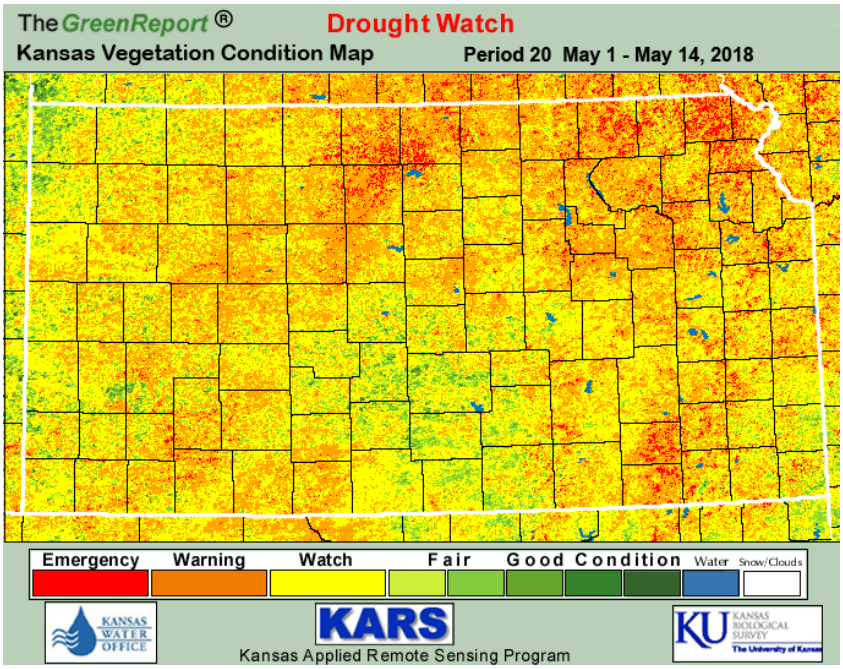
The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage and others where the below MDS flows will be of sufficient number of days to require administration soon.

Streamflows as of May 14, 2018			
Gaging Station	**Current Flow**	**May MDS**	**Comment**
Republican River at Concordia	76	150	Admin began April 13, 2018
Republican River at Clay Center	241	250	Admin began April 13, 2018
Smoky Hill River at Ellsworth	35	35	Below MDS as of May 11, 2018
Little Blue River near Barnes	168	150	
Mill Creek near Paxico	14	30	Admin began April 12, 2018
Delaware River near Muscotah	9	20	Admin began March 23, 2018
Rattlesnake Creek near Macksville	1	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	11	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	4	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	7	8	No surface water diversions junior to MDS above gage
Ninnescah River near Peck	108	100	
Whitewater River near Towanda	10.1	25	Admin began April 12, 2018
Walnut River at Winfield	113	100	
Chikaskia River near Corbin	43	40	
Neosho River near Iola	44	40	

Soil, Crop and Vegetation

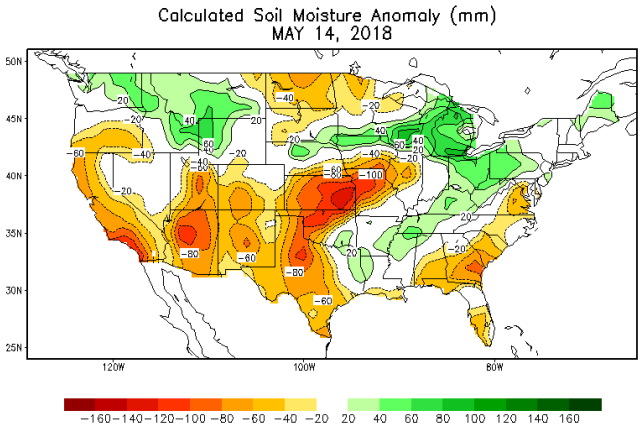
Kansas Vegetative Conditions

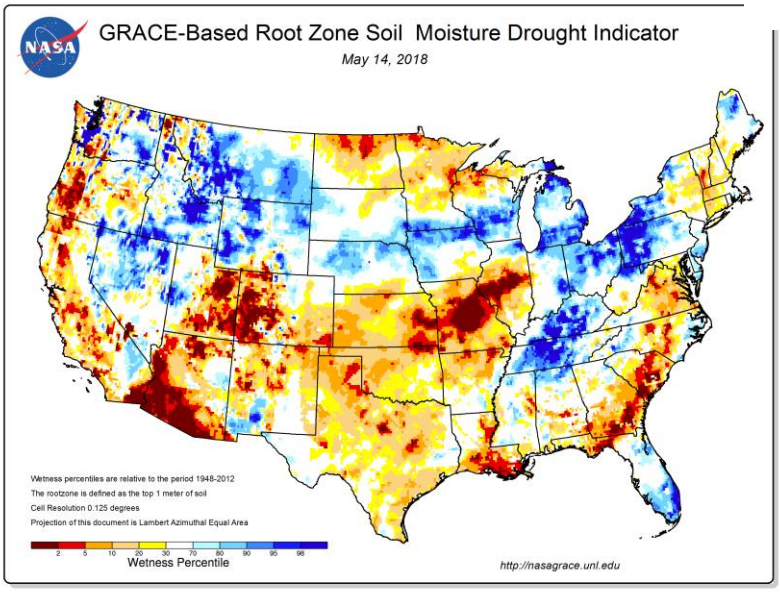
The Kansas Vegetative Condition map provides current conditions. It is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas, considered in good or excellent condition only cover 15 percent (%) of the state. Statewide 18 % of the vegetation is considered in very poor condition, 33 % poor and 34% fair.(Data from Kansas Applied Remote Sensing Program.)



Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





NASA is generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

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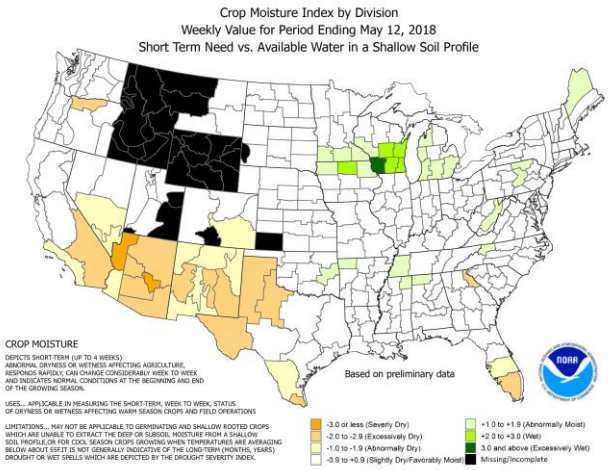
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending May 12, 2018 indicates topsoil moisture supplies rated 28 percent very short, 32 short, 40 adequate, and 0 surplus. Subsoil moisture supplies rated 25 percent very short, 37 short, 38 adequate, and 0 surplus.

Field Crops Report: Winter wheat condition rated 18 percent very poor, 33 poor, 34 fair, 14 good, and 1 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 10 percent very poor, 21 poor, 46 fair, 22 good, and 0 excellent.

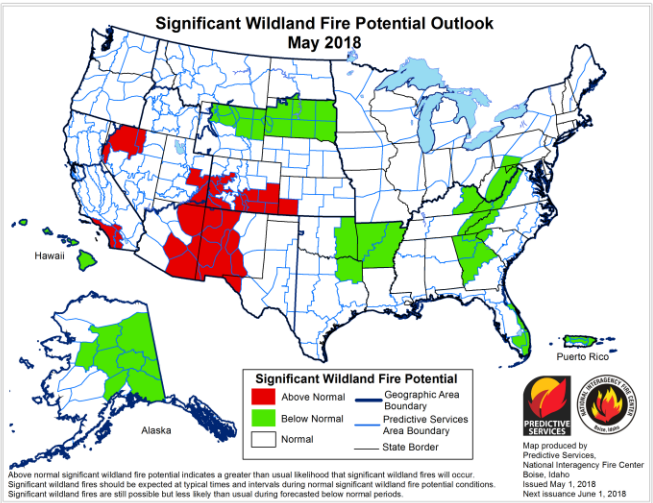


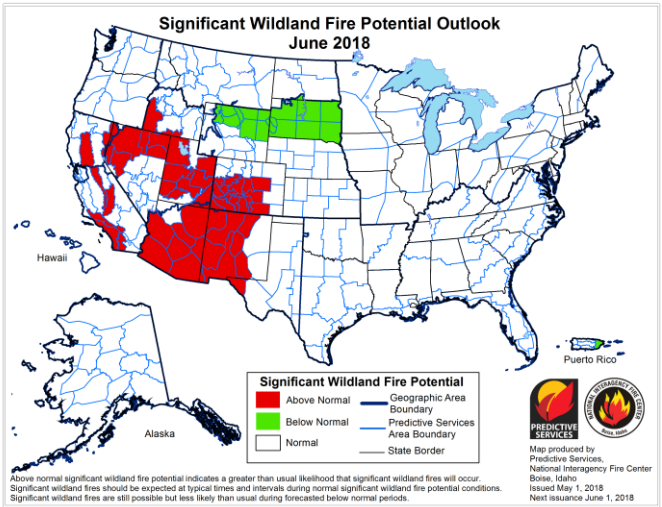
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

Fire

April conditions resulted in numerous wildfires and Red Flag warnings alerting citizens to potential increases in wildfire activity due to ideal conditions for wildland fire combustion and rapid spread. Dry conditions increase the potential for wildfire. According to the National Interagency Fire Center, wildfire activity is likely to continue in western and southern Kansas in April and in the west into May. Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf . These indicate portions of Kansas will remain above normal in wildfire activity in April and May 2018.





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

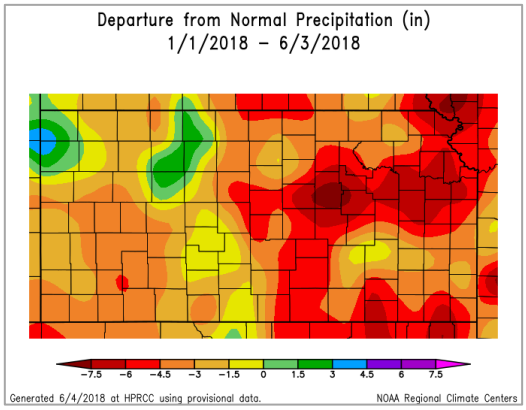
The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE
May 2018 Summary

Highlights

- U.S. Drought Monitor showed improvements in drought conditions throughout May as locally heavy rains fell in various areas. One and two category improvements were made in much of Kansas.



- Precipitation for the calendar year remains below normal for almost the entire state.

- Drought Declarations for Kansas counties remain in effect under Executive Order 18-11; issued March 13, 2018 includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.

- USDA Drought Disaster Designations as of May 30, 2018 have been made for 68 primary counties and 21 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

- Administration will begin June 1, 2018 on the Little Blue River near Barnes, affecting 20 water rights.

- Administration was effective April 13, 2018, on the Republican River from the Clay Center gage to state line, covering 225 water rights.

- Administration was effective on Mill Creek above the gage near Paxico, April 12, 2018 covering 14 water rights.

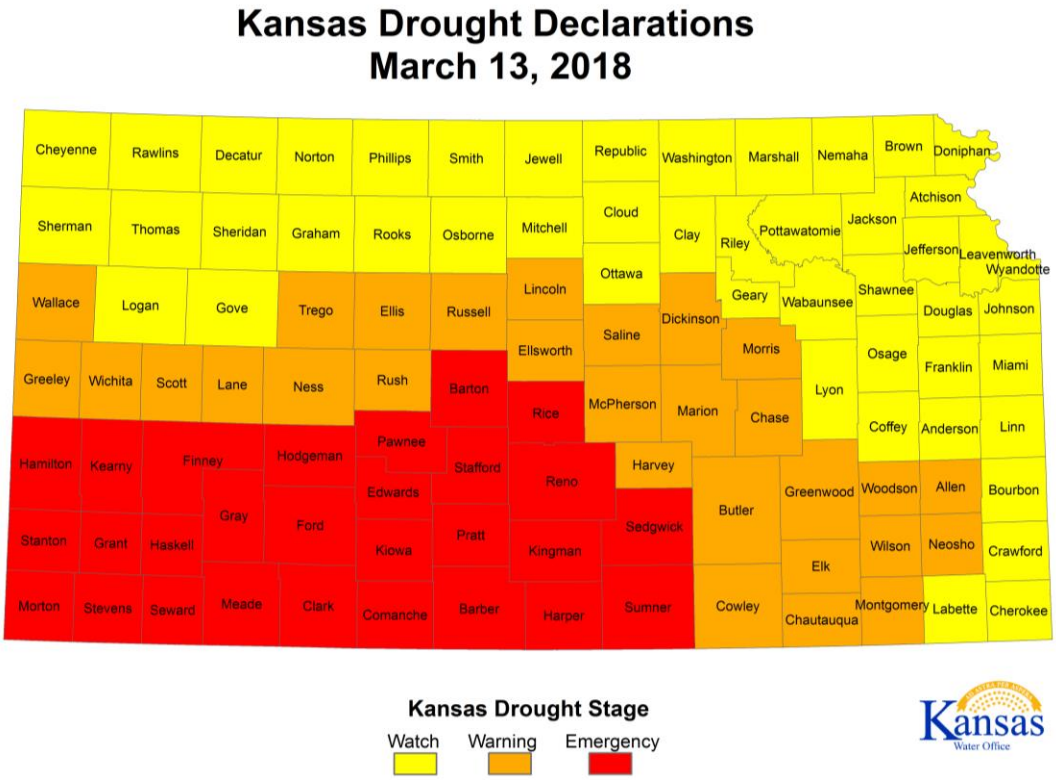
- Administration was effective on the Whitewater River above the gage near Towanda, April 12, 2018 covering 11 water rights

- Administration was put in effect March 23, 2018 for 40 water rights above the Muscotah gage on the Delaware River.

- Water Rights above the USGS gage on the Little Arkansas River at Alta Mills have been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017.

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status. These Drought Declarations remain in place until rescinded or replaced.



Drought Watch counties: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

Drought Warning counties: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

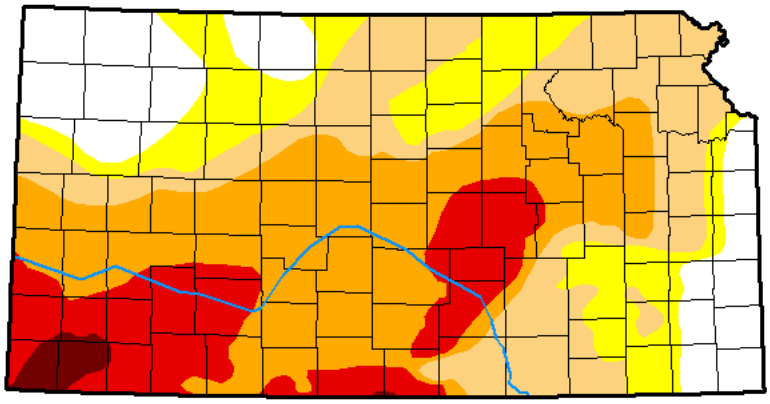
Drought Emergency counties: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

Fifteen percent (%), the northwest and southeast corners of Kansas, is not affected by dry or drought conditions at the end of May according to the U.S. Drought Monitor. Locally heavy rains in May are reflected by the lessening of severity for some areas. Drought at some level continues for the majority of Kansas.

U.S. Drought Monitor

Kansas



May 29, 2018

(Released Thursday, May. 31, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	15.19	84.81	69.40	45.96	15.85	1.47
Last Week *05-22-2018*	7.95	92.05	75.29	47.36	15.85	1.60
3 Months Ago *02-27-2018*	1.22	98.78	73.49	34.44	9.50	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *05-30-2017*	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

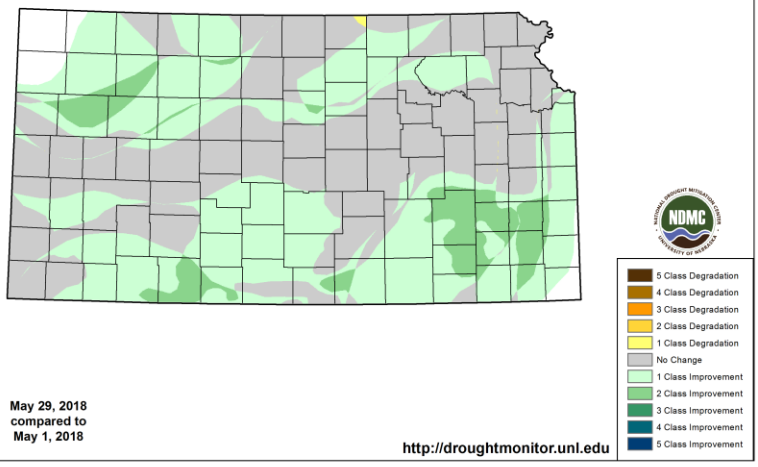
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Anthony Artusa
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

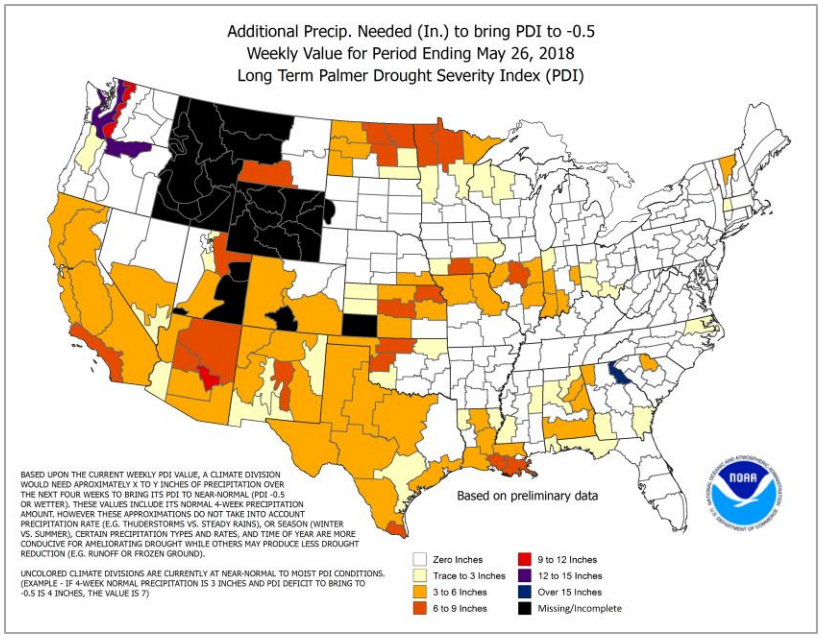
U.S. Drought Monitor Class Change - Kansas
1 Month



Improvements over May shown on left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.



Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	May 19	May 26	Jun 2
Northwest	1.21	2.04	-
North Central	3.97	5.37	2.00
Northeast	6.08	7.53	5.11
West Central	1.57	2.99	-
Central	6.82	7.74	5.35
East Central	2.62	3.32	3.10
Southwest	1.5	2.39	1.77
South Central	4.31	5.74	3.60
Southeast	-	-	-

More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

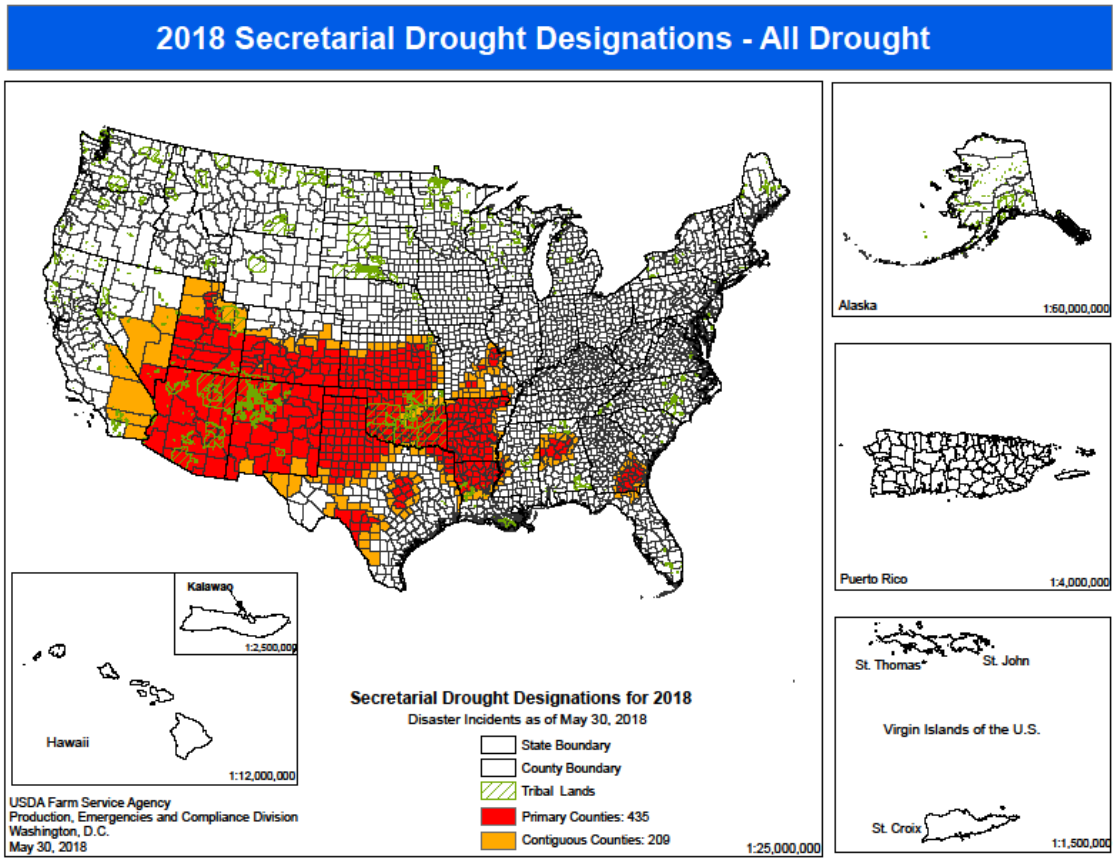
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

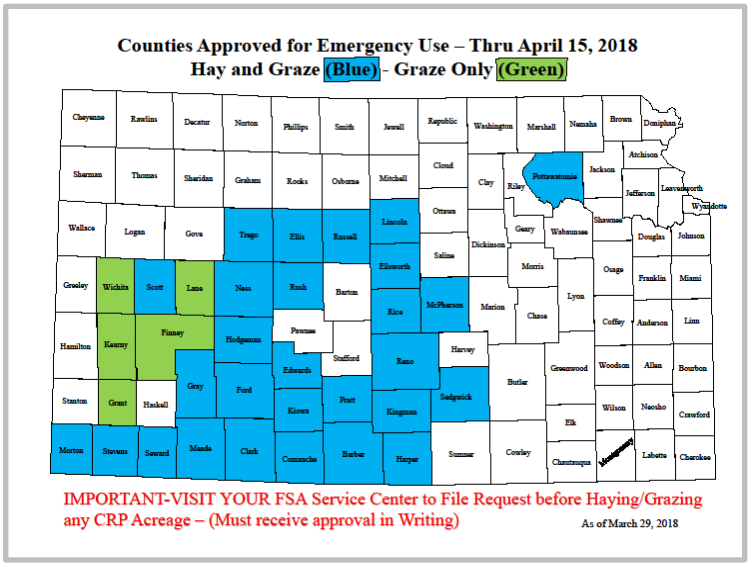
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor. Those in **Bold** in the list below were designated in May.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 68 primary counties and 21 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, **Clay**, **Coffey,** Comanche, Cowley, Dickinson, Edwards, Elk, **Ellis,** Ellsworth, Finney, Ford, **Geary**, Grant, Gray, **Greeley**, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, **Jackson,** Kearny, Kingman, Kiowa, **Lane, Lincoln, Lyon**, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, **Osage, Ottawa**, Pawnee, **Pottawatomie**, Pratt, Reno, Rice, **Riley,** Rush, **Russell,** Saline, **Scott,** Sedgewick, Seward, **Shawnee,** Stafford, Stanton, Stevens, Sumner, **Trego, Wabaunsee, Wallace, Wichita,** Wilson and Woodson. Contiguous counties are Anderson, **Atchison,** Bourbon, **Brown**, **Cloud,** Crawford, **Douglas, Franklin**, Gove, **Graham**, Jefferson**,** Labette, Linn, **Logan**, **Marshall, Mitchell**, **Nemaha, Osborne, Rooks, Sherman and Washington.**



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency.



USDA-FSA has approved emergency haying and grazing on CRP acreages in some counties in Kansas (March 29, 2018). FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

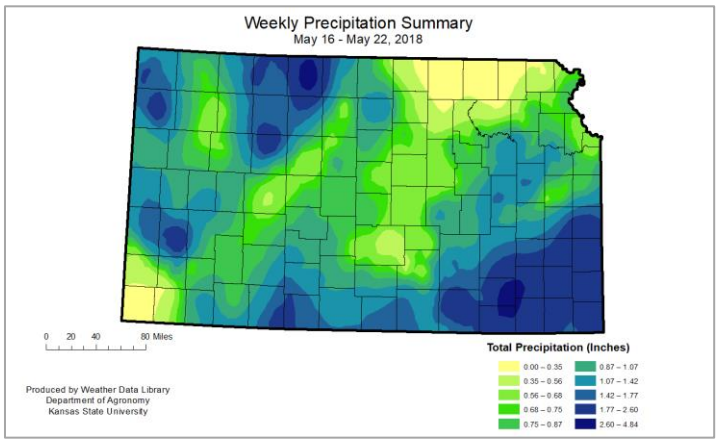
A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf

Climate Summary - Precipitation

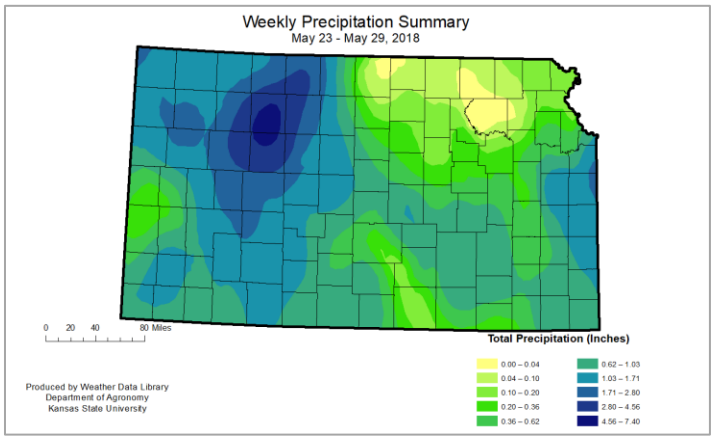
Month of May

The below normal precipitation pattern continued in May, with totals were much closer to normal. The state-wide average precipitation was 3.92 inches which was 94 percent of normal. As the month was much warmer than normal, the benefit from that precipitation was less than it might have been. The division with the largest surplus was the West Central Climate Division, with an average of 3.66, or 114 percent of normal. The East Central Division had the greatest departure, with an average of 3.48 inches or 67 percent of normal. The greatest monthly total for a National Weather Service Cooperative station was Wakeeney, Trego County, with 11.88 inches. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Latham 0.2 W, Butler County, with 8.95 inches. Among the Kansas Mesonet stations, the Hill City station in Graham County had the greatest total at 7.49 inches.

Precipitation week of May 16-22**:** The greatest precipitation was reported in the areas with the most extreme drought conditions – Southwest and South Central Kansas. All three western climate divisions saw above normal precipitation for the week. Although the Southeast Climate Division had the highest average precipitation at 1.88 inches, the Southwest Division had the greatest percent of normal with an average of 0.98 inches or 160 percent of normal. Statewide average precipitation was just 0.99 inches or 103 percent of normal. The highest precipitation total for a National Weather Service Coop station was 4.10 inches at Pittsburg in Crawford County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 3.29 inches at Devon 0.1 SE, Bourbon County.

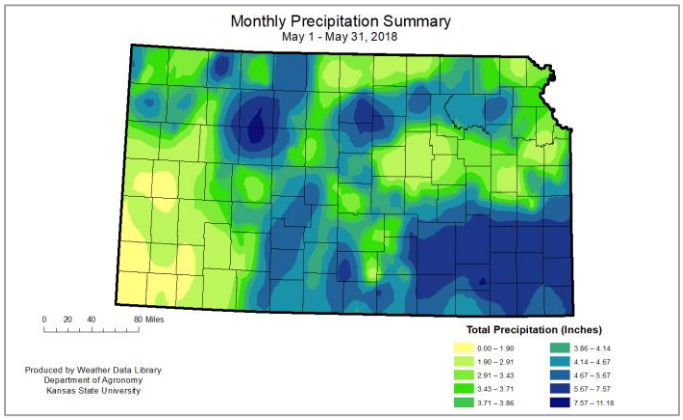


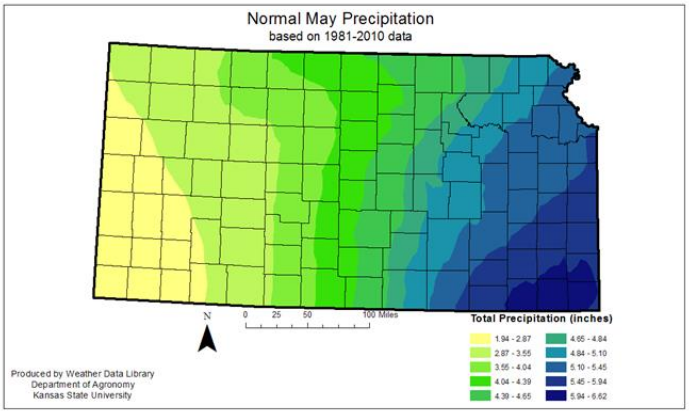
Precipitation week of May 23-29**:** The greatest precipitation was reported in the areas with the most extreme drought conditions – Southwest Kansas. All three western divisions saw above normal precipitation for the week. The only divisions with below normal precipitation for the week were the Northeast and North Central divisions. The West Central Division had the greatest average precipitation at 2.03 inches or 254 percent of normal. The Northeast Division had the lowest average precipitation at 0.74 inches or 78 percent of normal. Statewide average precipitation was 1.35 inches or 146 percent of normal for the week. The highest precipitation total for a National Weather Service Coop station was 7.40 inches at Hill City 1E in Graham County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 9.88 inches at Morland 9.7 S, in Graham County. The greatest total for a Kansas Mesonet station was 6.26 inches, at Hill City, also in Graham County.

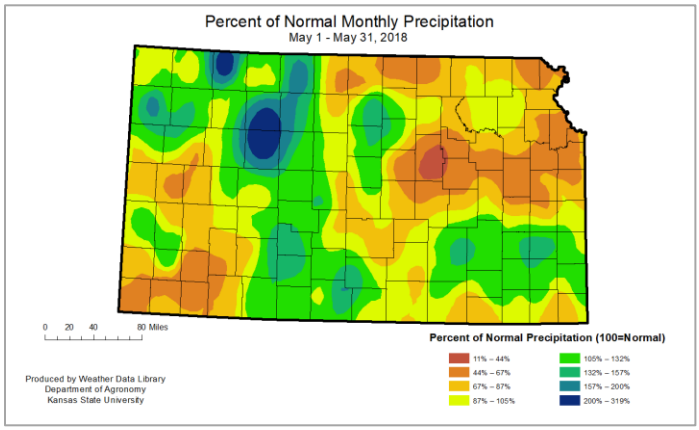


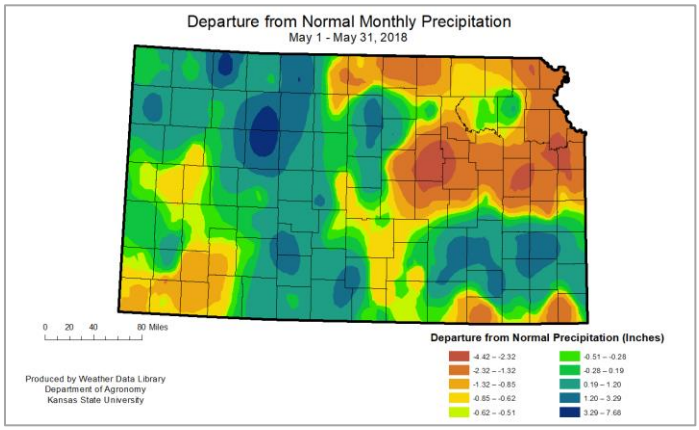
The precipitation summary is provided by Kansas State University Department of Agronomy as are the data tables and maps. Weekly maps of precipitation and departure from normal are provided in this section along with normal monthly precipitation. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) In addition, weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	May 1-31, 2018			January 1-May 31, 2018			April 1, 2017- May 31, 2018			Sept. 1, 2017- May 31, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	3.12	-0.34	89	4.81	-3.02	61	3.79	-1.74	68	8.48	-3.83	67
West Central	3.66	0.63	114	5.50	-1.93	72	4.47	-0.47	88	10.12	-1.79	83
Southwest	2.67	-0.06	97	4.11	-2.64	60	3.56	-0.81	81	7.78	-3.43	70
North Central	3.57	-0.51	84	6.04	-4.05	59	4.47	-2.13	66	11.25	-5.57	66
Central	3.86	-0.41	93	6.67	-4.21	62	5.06	-1.87	74	11.50	-6.20	66
South Central	4.63	0.24	107	8.20	-3.51	69	6.20	-0.89	88	13.83	-5.74	70
Northeast	3.39	-1.40	74	6.55	-5.70	54	4.40	-3.64	57	11.25	-10.33	53
East Central	3.48	-1.67	67	7.96	-5.67	57	5.09	-3.61	58	13.54	-10.40	55
Southeast	6.41	0.62	112	12.21	-3.45	78	8.07	-1.59	84	19.29	-8.46	69
STATE	3.92	-0.25	94	6.98	-3.71	64	5.09	-1.75	75	12.01	-6.06	67









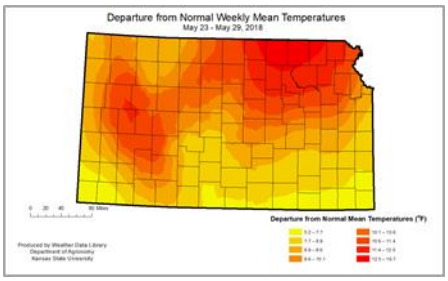
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Climate Summary – Temperature

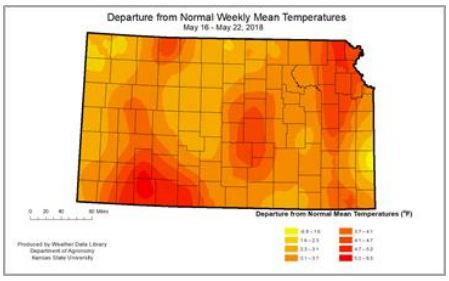
Month of May

May came close to setting the record as the hottest since 1895. The state-wide average temperature for the month was 70.6 ^{o}F. This was 7.2 degrees warmer than normal, and ranked as the second warmest. The swing from the cold of April to the warmth of May was the largest change on record at 23.7 degrees. The Northeast Climate Division had the greatest departure with an average of 72.4 ^{o}F which was a departure of +8.6 degrees. The Northwest Division came closest to normal with an average of 64.5 ^{o}F, which was a departure from normal of +4.6 degrees. There were 90 new record daily warm maximum temperatures, of which 6 set new record warm maximums for the month. In addition, there were 60 new daily record warm minimum temperatures, of which 1 set a new record for the month. This month, there were no new records on the cold side for either coldest maximum or coldest minimum temperatures. This is one reason that the monthly average was so much warmer than normal with relatively few records. The warmest temperature reported during the month was 103 ^{o}F at Abilene, Dickinson County on the 29th. The coldest temperature reported during May was 35 ^{o}F, reported at Syracuse, Hamilton County, on the 4th.

Temperature Week of May 16-22: Temperatures were more moderate than the last week, but still warmer than normal. The statewide average temperature was 67.8 ^{o}F, or 3.3 degrees warmer than normal. The Southeast Climate Division had the greatest departure from normal with an average of 70.0 ^{o}F, or 3.7 degrees warmer than normal. The North Central Division came closest to normal, with an average of 67.0 ^{o}F or 2.8 degrees warmer than normal. The highest maximum temperature was 93 ^{o}F at multiple locations on the 17th and the 19th. The lowest minimum temperature was 42 ^{o}F at multiple locations on the 21st.

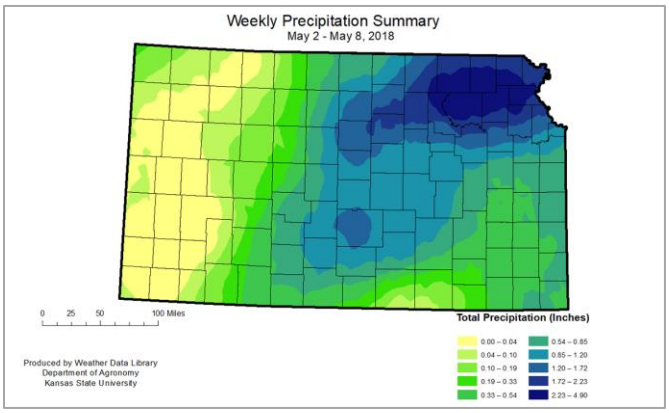


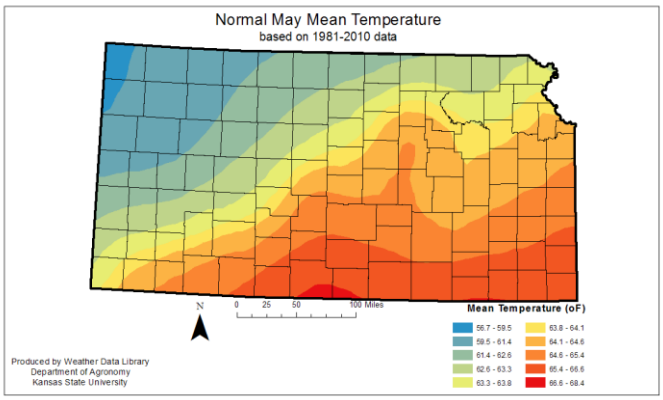
Temperature Week of May 23-29: Temperatures were much warmer than normal. The statewide average temperature was 76.6 ^{o}F, or 9.9 degrees warmer than normal. The North Central Climate Division had the greatest departure from normal with an average of 78.1 ^{o}F, or 11.6 degrees warmer than normal. The Southeast Division came closest to normal, with an average of 67.9 ^{o}F or 8.6 degrees warmer than normal. The highest maximum temperature was 103 ^{o}F at Abilene 1W in Dickinson County on the 26th. The lowest minimum temperature was also reported on the 26th: 50 ^{o}F at Goodland in Sherman County.

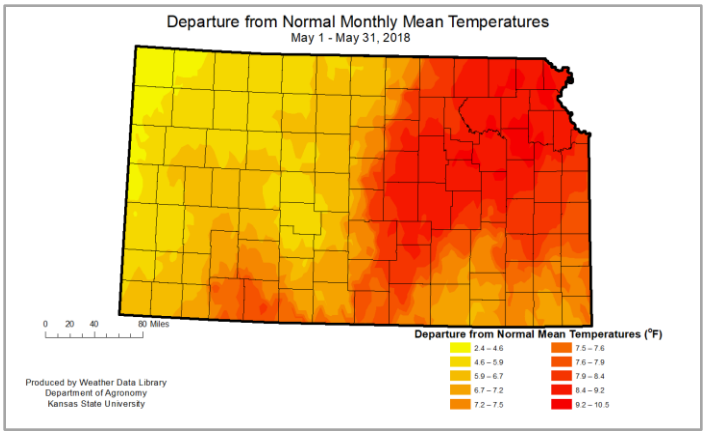


Temperatures summaries and maps are provided by Kansas State University Department of Agronomy. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps below provide a glimpse at the temperature variation from normal. In addition, weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (^{o}F) May 1-31, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	79.0	50.1	64.5	4.6	99	27	39	4
West Central	83.4	51.7	67.5	6.6	100	27	37	4
Southwest	85.4	54.5	70.0	6.2	98	26	35	5
North Central	83.8	57.4	70.6	7.4	100	27	43	4
Central	85.5	58.3	71.9	7.6	103	26	40	4
South Central	86.0	60.3	73.1	7.8	96	26	44	5
Northeast	85.1	59.7	72.4	8.6	99	27	48	5
East Central	84.2	61.2	72.7	8.5	97	27	49	2
Southeast	84.5	61.7	73.1	7.7	99	27	45	1
STATE	84.1	57.2	70.6	7.2	103	26th	35	5th
Data Source: KSU Weather Library								







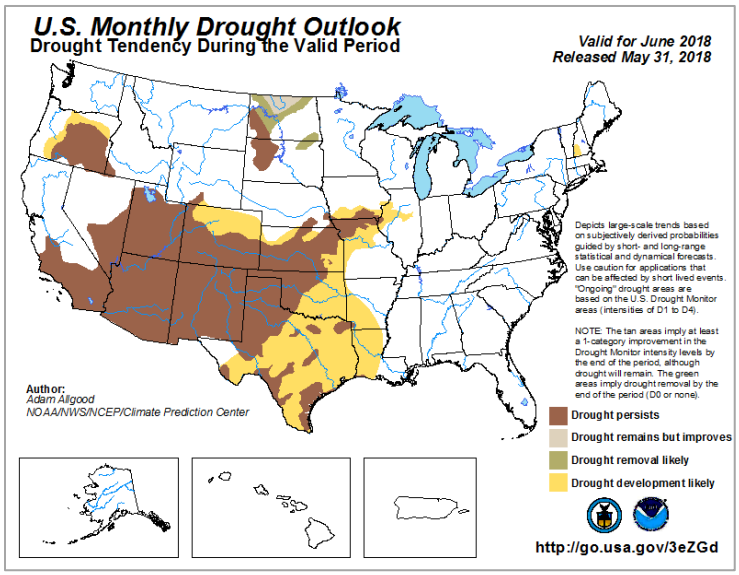
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

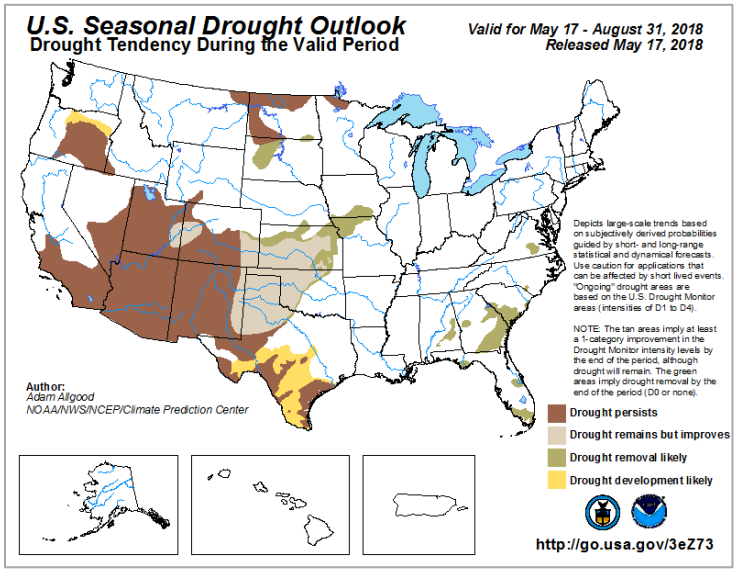
With the resurgence of moisture, severe weather reports during the month also increased. With 34 tornadoes reported, it was slightly higher than the average of 24 (based on 1950-2016 SPC data), and makes a slight dent in the late start to the season. There were 258 hail reports and 131 damaging wind reports. One of the most destructive events was the heavy flooding in Graham and Gove counties, where widespread rainfall amounts in excess of 4 inches were reported.

Future Outlook

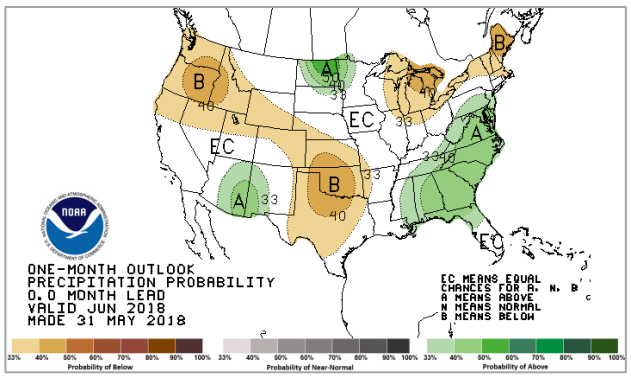
The Monthly Drought Outlook indicates drought conditions to remain in most of southern, central and western Kansas. Improvement of drought conditions is possible in scattered areas of east and northeast Kansas.

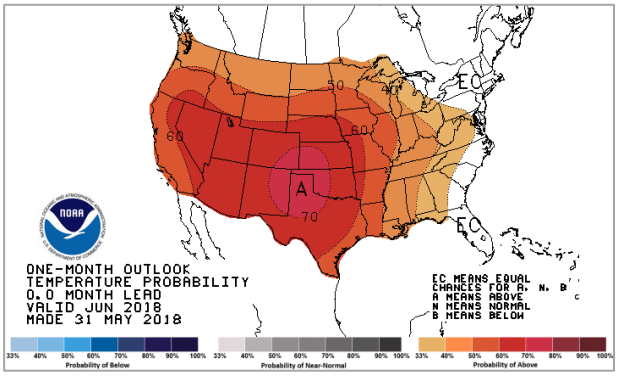
Seasonal Outlook (3-month) favors drought remaining across most of Kansas but possible improvement in south central, central and western Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available for various intervals.



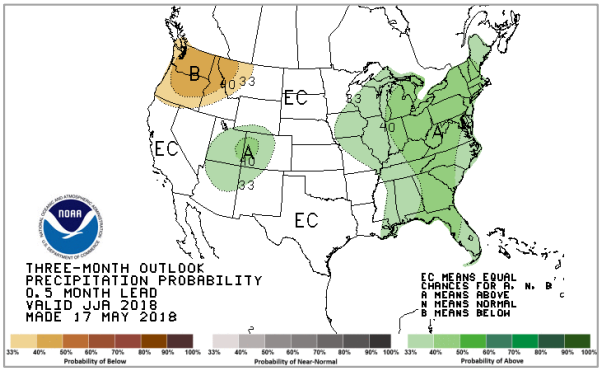


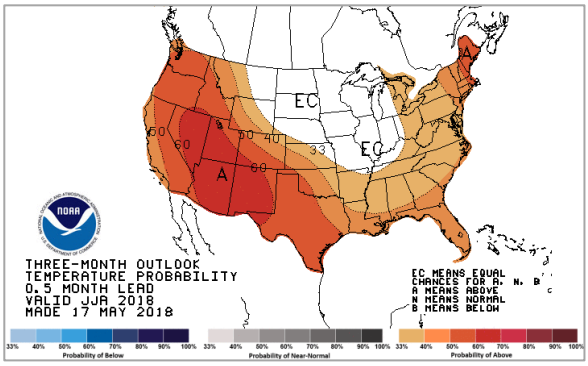
The one month climate outlooks favor above normal temperature and below normal precipitation and for almost all of Kansas in June.





The long-term, 3 month outlooks give equal chances of above or below normal precipitation and above normal temperatures in all but north eastern Kansas for June-July-August.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions
Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:
Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of May 31 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (May 31, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ May 31, 2018)

Surface Water Supply Conditions
Kansas River basin: Despite an early month runoff event, inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs was well below normal for May. However, overall storage is in pretty good shape, especially Tuttle Creek and Milford. Perry remains below the top of multipurpose pool and Clinton is nearly two feet below the seasonal target elevation. Additional releases were purposely made from Milford to lower the pool level according to the seasonal plan. Flow in the Kansas River responded nicely to the early May precipitation but only rose above historic median values for a brief period. Without additional rain the Kansas River will require reservoir releases to maintain target flows.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs are all set to minimum gate settings. Melvern and Pomona have not refilled from their lower winter target elevation and experienced a declining trend in May. Reservoir releases have not been necessary to supplement flow in the Marais des Cygnes River but flow declined and is significantly below historic median, with the exception of one runoff event on May 24th.

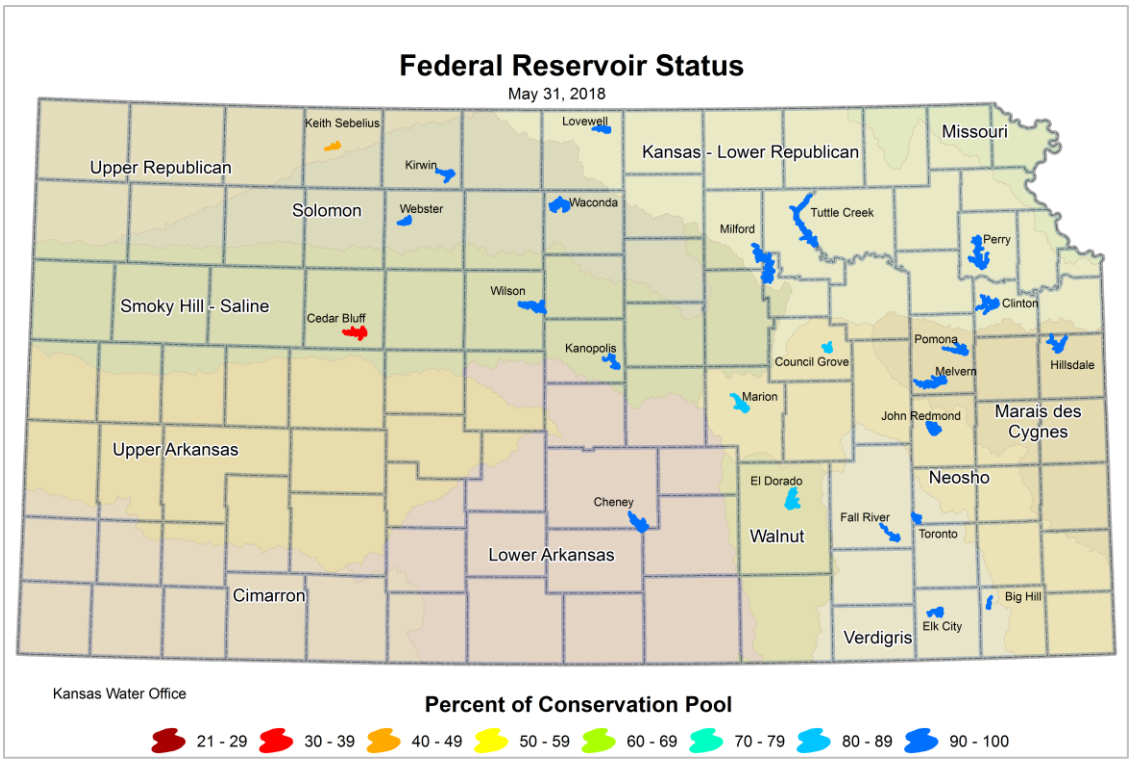
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low for May. Streamflow was declining throughout the system until May 14th when a storm produced significant runoff in the lower Neosho basin, primarily downstream of John Redmond. Conservation storage is full in John Redmond but steadily declining in Marion and Council Grove. Releases are necessary to maintain sufficient streamflow in the upper Neosho and releases are minimal from John Redmond, as the lower Neosho River did not need supplemental releases.

Verdigris basin: The May 14th precipitation greatly increased the inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs. All are above conservation pool levels and releasing in excess of minimum gate settings to pass inflow and reduce pool elevations. Since May 14th, flow in the Verdigris River was very healthy. The amount of excess storage in the system should sustain healthy streamflow into the summer.

Saline basin: The elevation at Wilson Lake was maintained slightly above normal pool in May. Due to a large precipitation event within the Saline River basin, releases were increased from 15 cfs to 1,000 cfs at the end of the month to make room for the projected inflow in early June. Wilson crested about two feet high on June 2nd.

Smoky Hill basin: Flows in the Smoky Hill basin were generally declining and low until May 28th. The same storm that resulted in significant runoff and flooding conditions in the Saline basin also hit portions of the Smoky Hill. The main locations to benefit from this event were the Smoky Hill River upstream of Cedar Bluff Reservoir and also Big Creek which drains into the Smoky Hill upstream of the Russell gage. This large event took about six days to reach Kanopolis Lake, which is expected to rise more than a foot (to elevation 1,465+) with the initial surge and maintain some decent inflow that will be helpful in managing the lower Smoky Hill River. Additional precipitation will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of the Multipurpose Pool. The target flow of 20 cfs at the Mentor gage has been maintained with minimal releases from Kanopolis over the month.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**05/30/2018 01:14 PM**		
Norton[1]	2304.3	2293.03	-11.27	44.1
Harlan County, NE	1945.73	1941.28	-4.45	82.1
Lovewell[1]	1582.6	1582.96	0.36	100.0
Milford[1]	1144.4	1143.33	-1.07	95.7
Cedar Bluff	2144	2118.65	-25.35	31.4
Kanopolis[1]	1463	1464.00	1.00	100.0
Wilson[1]	1516	1516.29	0.29	100.0
Webster[1]	1892.5	1899.26	6.81	100.0
Kirwin[1]	1729.3	1731.15	1.90	100.0
Waconda[1]	1455.6	1455.60	0.00	100.0
Tuttle Creek[1]	1075	1076.16	1.16	100.0
Perry[1]	891.5	890.34	-1.16	94.2
Clinton[1]	875.5	875.71	0.21	100.0
Melvern[1]	1036	1034.75	-1.25	94.3
Pomona[1]	974	972.78	-1.22	91.5
Hillsdale[1]	917	916.96	-0.04	99.8
Arkansas River Basin		**05/31/2018 08:00 AM**		
Cheney	1421.6	1421.41	-0.19	99.0
El Dorado	1339	1335.01	-3.99	82.0
Toronto[1]	901.5	903.30	1.80	100.0
Fall River[1]	948.5	951.27	2.77	100.0
Elk City[1]	796	798.54	2.54	100.0
Big Hill	858	858.39	0.39	100.0
Council Grove[1]	1274	1271.72	-2.28	86.0
Marion[1]	1350.5	1348.31	-2.19	84.0
John Redmond[1]	1039	1041.50	0.50	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur.

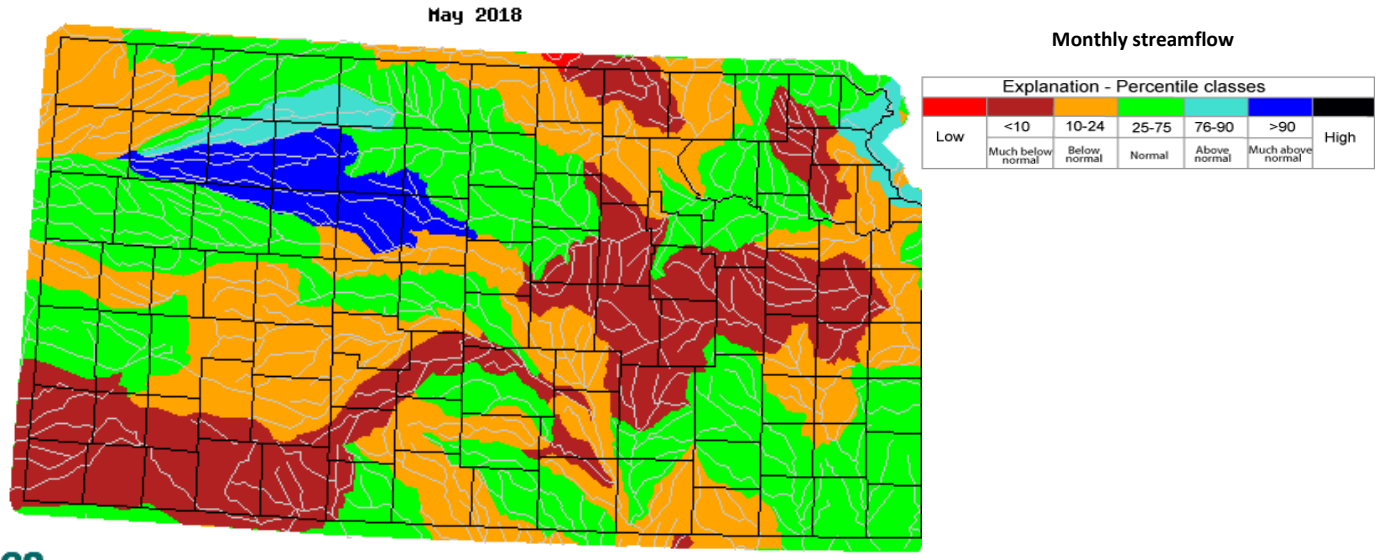
As of May 24, 2018
Watches in effect: Central Lake, Topeka; and Colwich City Lake, Colwich City.

Warnings in effect: none

Closures: none

Streamflow Conditions
WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

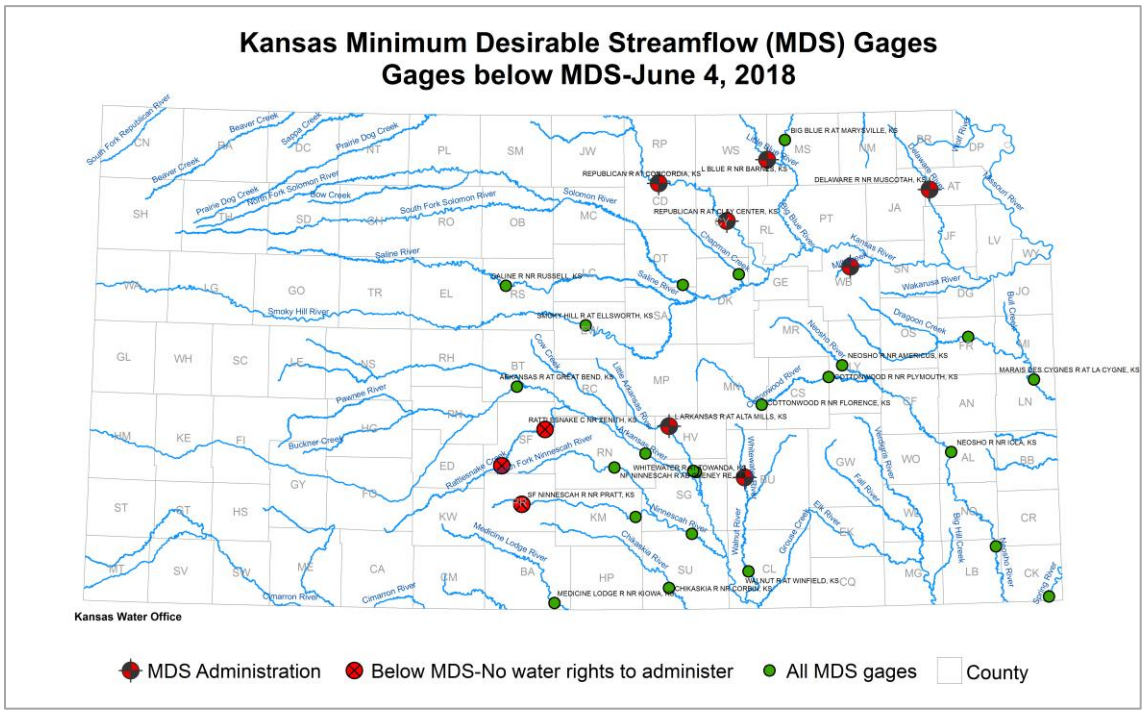
Monthly average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. MDS administration is occurring at numerous locations. Please see table below of current administration.

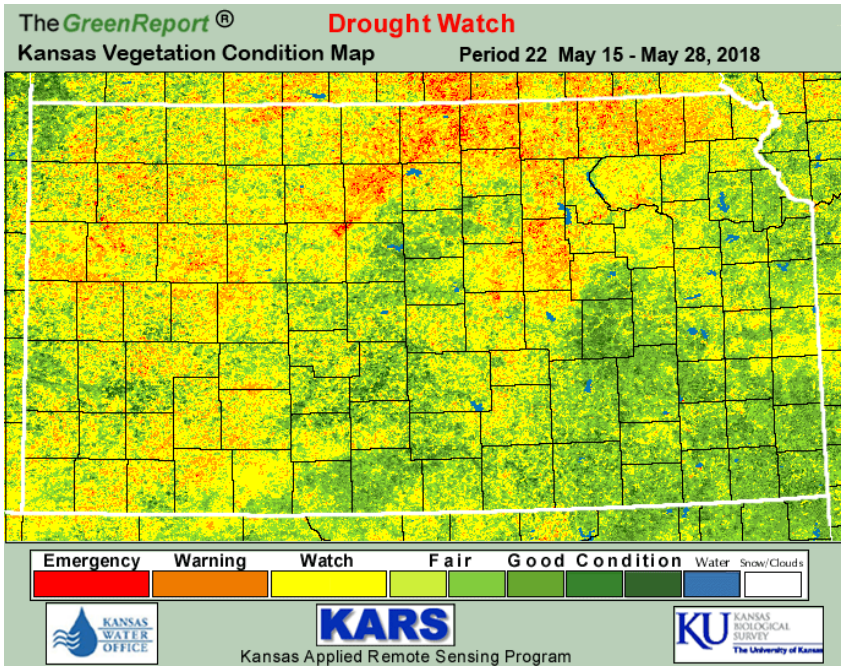


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage and others where the below MDS flows will be of sufficient number of days to require administration soon.

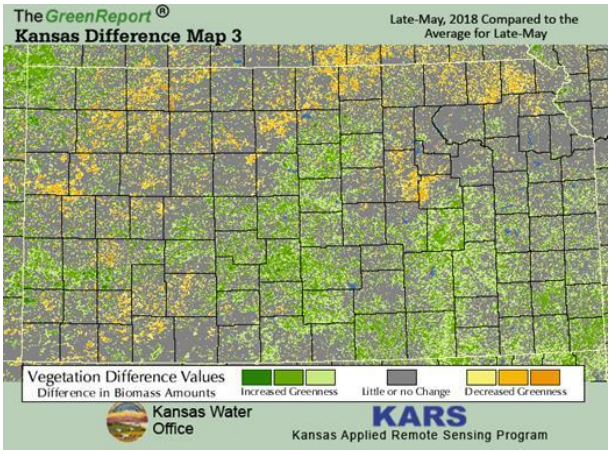
Streamflows as of June 4, 2018				
Gaging Station	**Current Flow**	**May MDS**	**June MDS**	**Comment**
Republican River at Concordia	305	150	150	Admin began April 13, 2018
Republican River at Clay Center	280	250	250	Admin began April 13, 2018
Smoky Hill River at Ellsworth	15	35	45	
Little Blue River near Barnes	241	150	150	Administration begin June 1, 2018
Mill Creek near Paxico	22	30	35	Admin began April 12, 2018
Delaware River near Muscotah	24	20	20	Admin began March 23, 2018
Arkansas River at Great Bend	14	10	10	
Rattlesnake Creek near Macksville	0.35	10	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	9.6	15	15	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	459	8	8	MDS admin began Aug 10, 2017
South Fork Ninnescah River near Pratt	8	8	8	No surface water diversions junior to MDS above gage
North Fork Ninnescah River above Cheney	34	40	30	
Whitewater River near Towanda	153	25	25	Admin began April 12, 2018

Soil, Crop and Vegetation

Kansas Vegetative Conditions



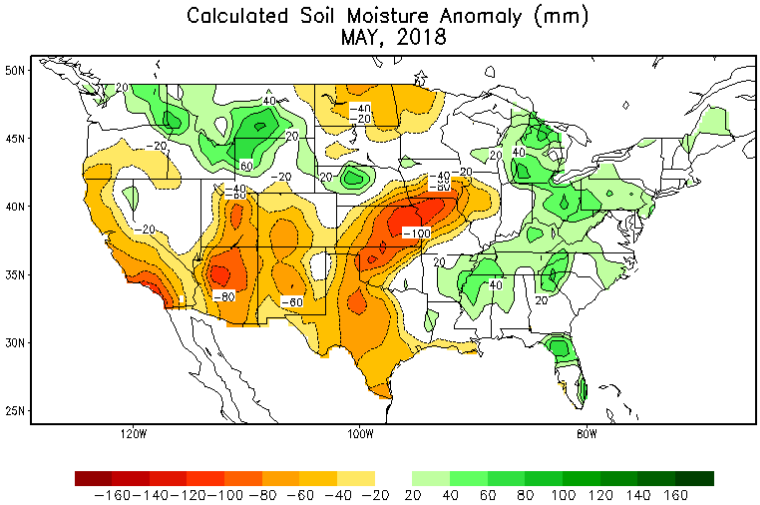
The Kansas Vegetative Condition map provides current conditions with a Drought Watch for the period ending May28. It is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas, considered in good or excellent condition only covered 15 percent (%) of the state in mid may but by the end of the month conditions were much improved, especially in the southern half of the state.

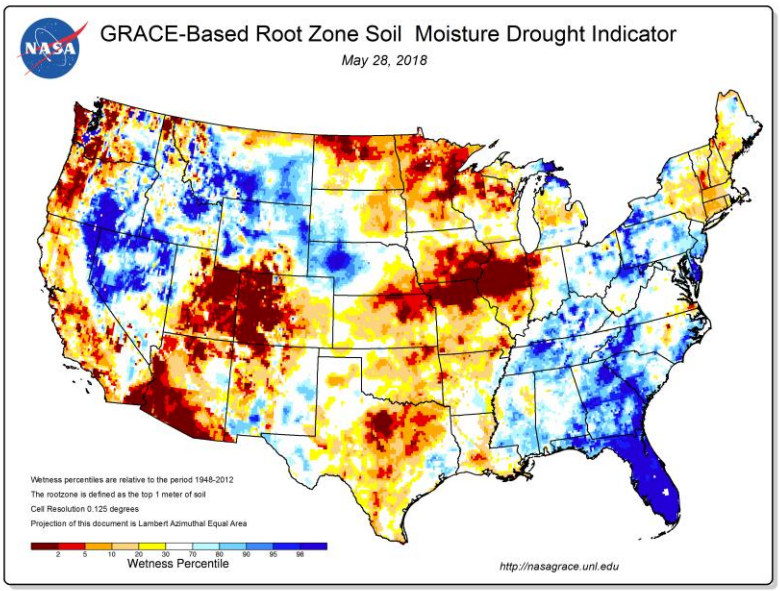


The Kansas Difference Map 3 provides a comparison of current conditions to average conditions for late May. (Data from Kansas Applied Remote Sensing Program.)

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought . NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

Crops and Rangeland

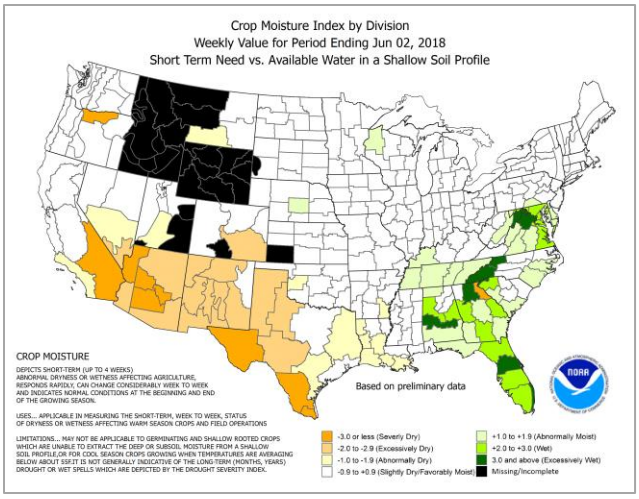
USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending May 27, 2018 indicates topsoil moisture supplies rated 17 percent very short, 31 short, 48 adequate, and 4 surplus. Subsoil moisture supplies rated 18 percent very short, 37 short, 44 adequate, and 1 surplus.

Field Crops Report: Overall the winter wheat condition rated 15 percent very poor, 33 poor, 35 fair, 15 good, and 2 excellent. Corn condition rated 2 percent very poor, 6 poor, 35 fair, 49 good, and 8 excellent.

Crop Progress by District for the Week Ending May 27, 2018

	Percent									
	NW	**WC**	**SW**	**NC**	**C**	**SC**	**NE**	**EC**	**SE**	**STATE**
Winter Wheat Headed	51	91	96	79	97	97	92	94	97	89
Winter Wheat Coloring	0	2	15	2	26	25	13	4	27	15
Corn Planted	83	89	95	86	98	99	99	100	99	93
Corn Emerged	59	75	80	67	91	97	93	97	94	81

Pasture and Range Report**:** Pasture and range conditions rated 8 percent very poor, 21 poor, 42 fair, 27 good, and 2 excellent.

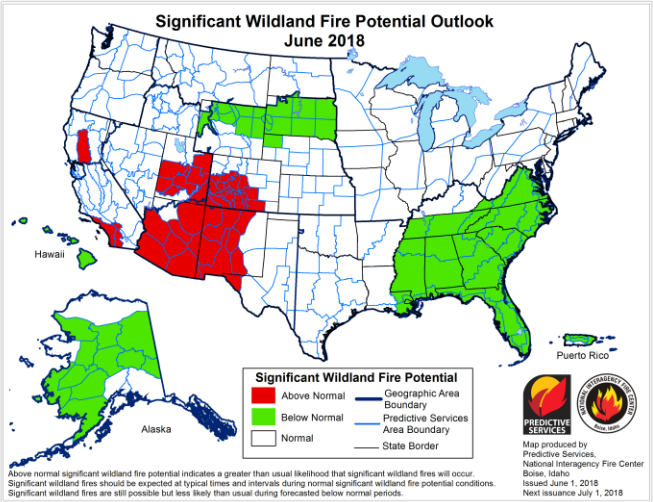


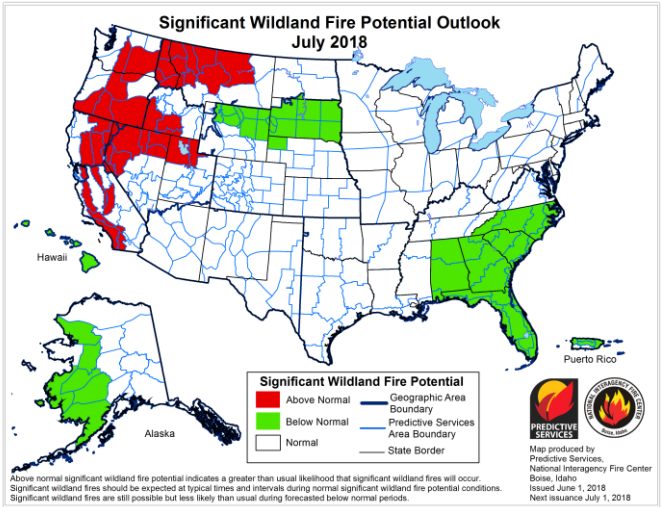
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the

Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

May 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	3.28	0.70	127%	63.4	4.8	92 (27,26)	37 (4)
Dodge City	2.30	-0.55	81%	72.2	8.0	98 (26)	44 (4)
Garden City	2.59	-0.29	90%	69.8	6.5	98 (28)	42 (4)
Goodland	6.10	3.15	207%	64.2	4.8	92 (27,26)	39 (4)
Guymon, OK	2.94	0.50	120%	72.6	7.7	98 (27,26)	40 (5)
Hill City	7.83	4.05	207%	67.5	5.0	94 (26)	44 (4,5)
Lamar, CO	0.30	-1.72	15%	69.0	6.8	99 (27,26)	35 (5)
McCook, NE	3.32	0.18	106%	64.9	5.3	96 (26)	40 (5)
Springfield, CO	0.80	-1.56	34%	66.8	5.5	95 (27,26)	31 (3)
Central							
Concordia	4.08	-0.08	98%	71.3	8.2	97 (27)	49 (4)
Hebron, NE	3.38	-1.42	70%	70.4	8.7	101 (26)	47 (5)
Medicine Lodge	5.72	2.42	173%	74.5	7.5	95 (14,11)	47 (5)
Ponca City, OK	4.12	-0.69	86%	75.6	8.0	94 (26)	44 (5)
Salina	2.09	-2.66	44%	74.8	9.5	100 (27,26)	49 (5)
Wichita (ICT)	4.74	0.17	104%	75.1	9.1	96 (26)	52 (5)
East							
Bartlesville, OK	5.46	0.14	103%	73.7	6.0	94 (9)	46 (5)
Chanute	8.35	2.55	144%	73.7	7.8	90 (29, 28)	48 (5)
Falls City, NE	2.56	-2.02	56%	72.6	8.8	101 (26)	48 (5)
Johnson Co. Exec. Apt	3.68	-1.55	70%	72.7	8.0	91 (28)	53 (5)
Joplin, MO	2.82	-2.28	55%	73.3	8.5	93 (27)	48 (5)
Kansas City (MCI), MO	5.47	0.24	105%	73.4	8.9	94 (28)	54 (5)
St. Joseph, MO	2.99	-2.43	55%	74.1	9.6	102 (26)	46 (5)
Topeka (TOP)	3.80	-1.11	77%	74.7	9.7	97 (26)	51 (5)

1. Airport Automated Observation Stations (NWS/FAA)

2. Departure from 1981-2010 normal value

T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal

Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE
Mid-June 2018 Summary

Highlights

- U.S. Drought Monitor June 19, 2018 has removed extreme drought from southwest Kansas due to the most recent rains, although impacts remain, especially in the agricultural sector. In eastern Kansas, abnormally dry and moderate drought conditions were expanded as the region continues to miss out on the rain events and the recent heat has worsened conditions.

- Drought Declarations for Kansas counties remain in effect under Executive Order 18-11; issued March 13, 2018 includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.

- Kansas Department of Health and Environment has issued a Public Health Warning for Sebelius (Norton) Lake, Norton County; and Webster Lake, Rooks County due to the concentration of blue-green algae. Conditions are unsafe, no water contact should occur.

- Kansas Department of Health and Environment has issued Public Health Watches for Colwich City Lake, Sedgewick County due to the concentration of blue-green algae. Contact with the water is discouraged; water may be unsafe for humans and animals.

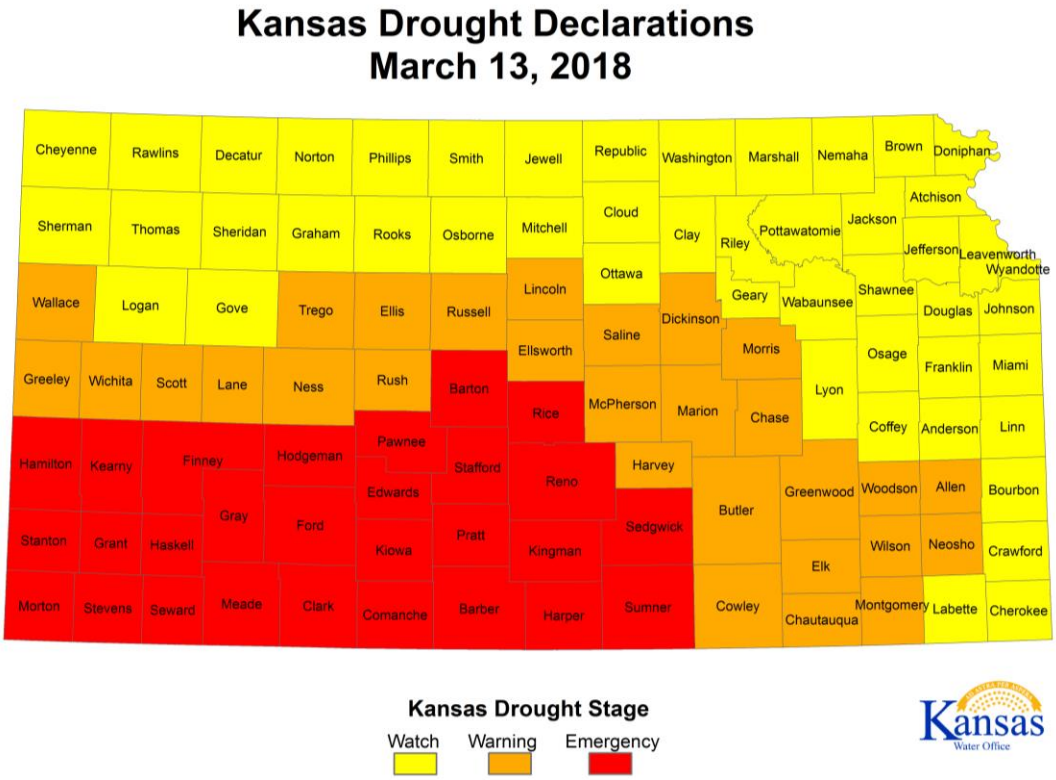
- USDA Drought Disaster Designations as of June 13, 2018 have been made for 68 primary counties and 21 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

- Surface Water Rights being administered on six streams. USGS gage on the Little Arkansas River at Alta Mills has been administrated under Minimum Desirable Streamflow (MDS) since August 10, 2017. MDS is also being administered on the Little Blue River near Barnes, Republican River from the Clay Center gage to state line, Mill Creek above the gage near Paxico, Whitewater River above the gage near Towanda, Delaware River above the Muscotah gage.

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status. These Drought Declarations remain in place until rescinded or replaced.



Drought Watch counties: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

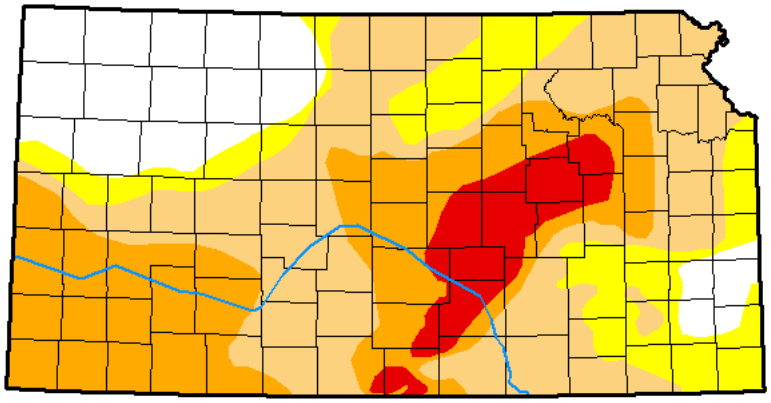
Drought Warning counties: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

Drought Emergency counties: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

Although less than normal, the continued rains resulted in some improvement in the U.S. Drought monitor the week ending June 12. The week ending June 19 saw removal of extreme drought from southwest Kansas due to local rains. Kansas no longer had any exceptional drought in the state. Conditions deteriorated in eastern Kansas the week ending June 19, after some improvement earlier in June.

U.S. Drought Monitor
Kansas



June 19, 2018
(Released Thursday, Jun. 21, 2018)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	16.98	83.02	68.07	33.63	7.17	0.00
Last Week 06-12-2018	20.40	79.60	66.48	33.63	12.65	0.00
3 Months Ago 03-20-2018	1.22	98.78	81.77	56.19	19.33	0.30
Start of Calendar Year 01-02-2018	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year 09-26-2017	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago 06-20-2017	98.90	1.10	0.00	0.00	0.00	0.00

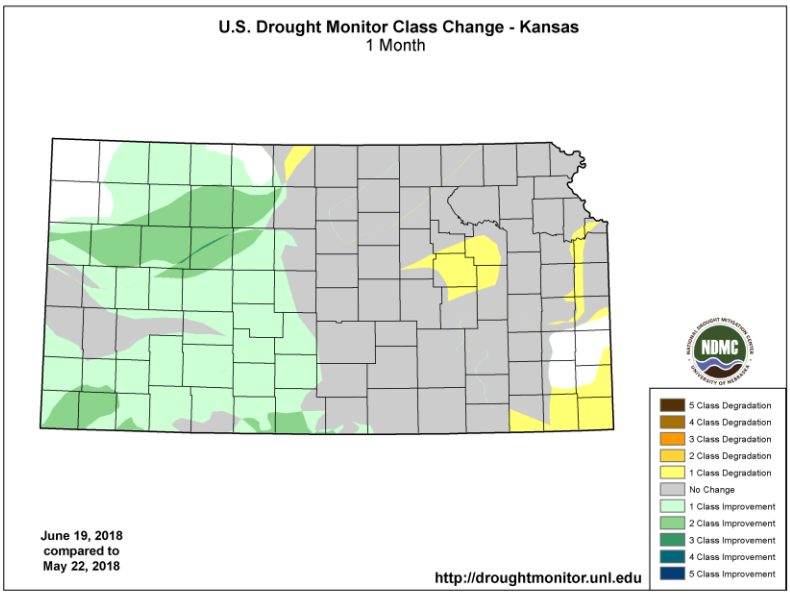
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brian Fuchs
National Drought Mitigation Center

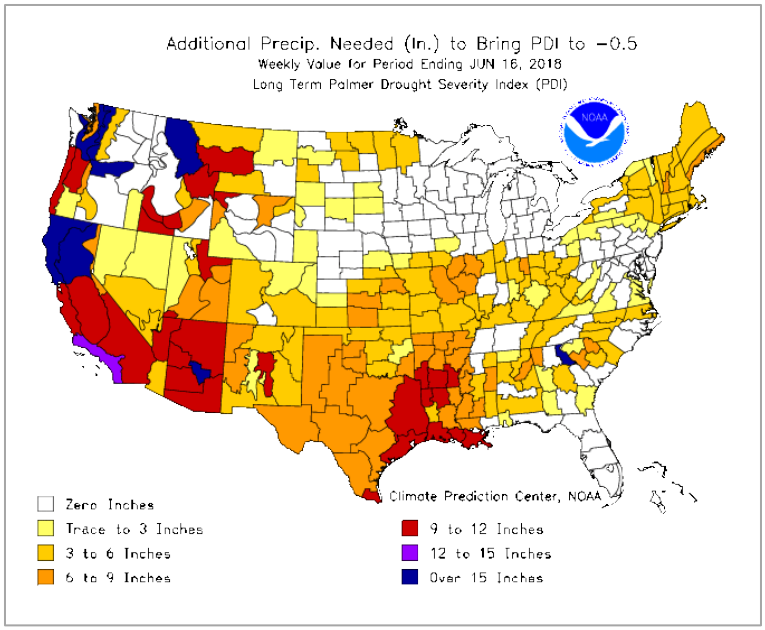
http://droughtmonitor.unl.edu/



Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.



Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Jun 2	June 9	Jun 16
Northwest	-	-	-
North Central	2.00	3.13	5.11
Northeast	5.11	6.34	7.36
West Central	-	-	2.73
Central	5.35	6.52	8.12
East Central	3.10	4.16	5.3
Southwest	1.77	2.94	4.06
South Central	3.60	4.48	6.09
Southeast	-	2.09	3.05

More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

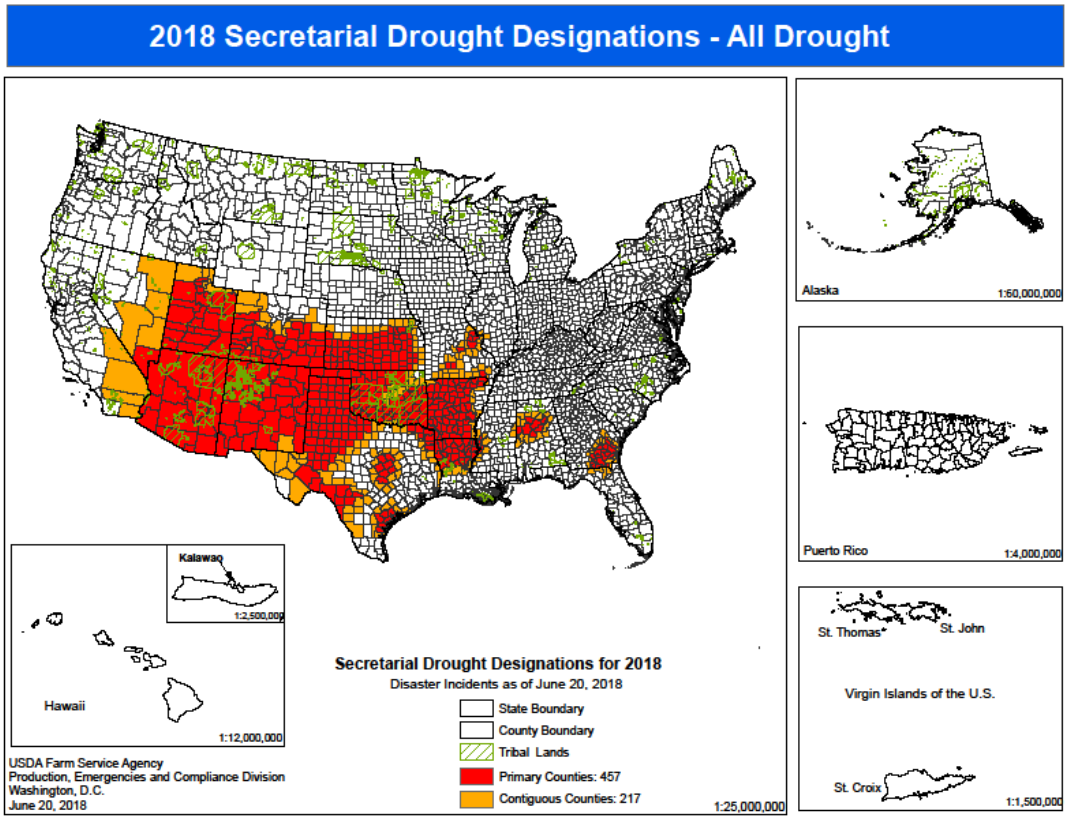
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

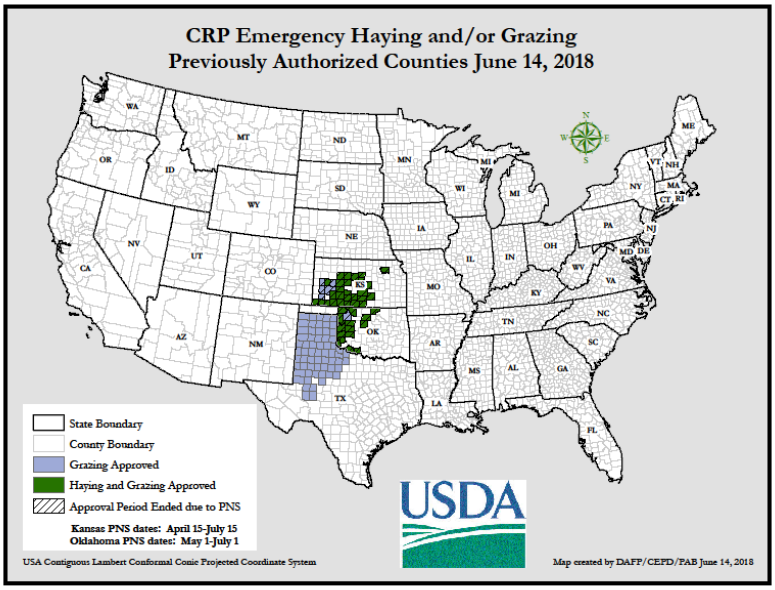
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor. Those in **Bold** in the list below were designated in June.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 68 primary counties and 21 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Kearny, Kingman, Kiowa, Lane, Lincoln, Lyon, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Wichita, Wilson and Woodson. Contiguous counties are Anderson, Atchison, Bourbon, Brown, Cloud, Crawford, Douglas, Franklin, Gove, Graham, Jefferson, Labette, Linn, Logan, Marshall, Mitchell, Nemaha, Osborne, Rooks, Sherman and Washington.



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency. The USDA-FSA approved emergency haying and grazing on CRP acreages in some counties in Kansas has ended due to primary nesting season.

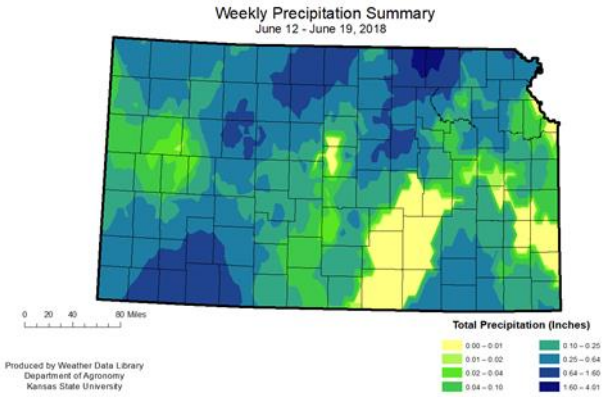


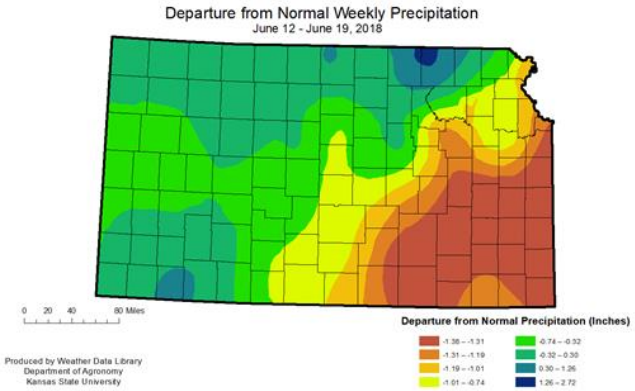
A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf

Nesting Season map at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/PDF/MAP-Primary%20Nesting%20Season_5_10_2018.pdf

Climate Summary - Precipitation

June 13-19: While there was generally beneficial rain across most of the state, the southeastern portion missed out. The Southeastern Division had both the lowest average precipitation and the lowest percent of normal. The average precipitation in the Southeastern division was just 0.04 inches or 2 percent of normal. In contrast, the division with the greatest percentage of normal was the West Central Division, where the average was 2.01 inches or 320 percent of normal. Statewide average precipitation was 1.26 inches or 154 percent of normal. The heaviest rainfalls were on the border of the Northeast and North Central divisions.





June 6-12**:** All areas were below normal for the week. Statewide average precipitation was 0.55 inches, which was 51 percent of normal and resulted in a deficit of 0.48 inches for the week. The Northwest Climate Division was closest to normal with an average of 0.62 inches or 91 percent of normal. The West Central Division had the lowest precipitation with an average of 0.12 inches, or 16 percent of normal. The Southeast division had the greatest average precipitation at 0.98 inches or 67 percent of normal.

May 30-June 5**:** Statewide average precipitation was 0.08 inches, which was 80 percent of normal and resulted in a deficit of 0.24 inches for the week. The North Central, South Central and Northeast climate divisions saw above normal precipitation for the week. The Southwest Division had the lowest precipitation with an average of 0.16 inches, or 19 percent of normal. The North Central Division had the greatest percent of normal with an average of 1.11 inches or 116 percent of normal. The Northeast Division had the highest divisional average at 1.18 inches, but that was just 113 percent of normal.

Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

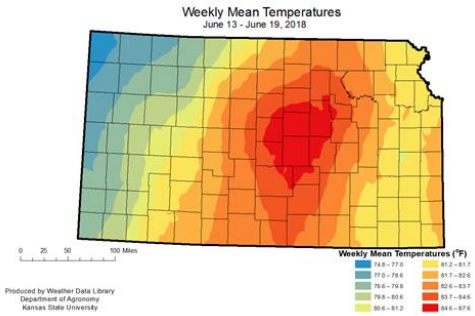
Kansas Climate Division Precipitation Summary (inches)

Climate Division	June 13-19 , 2018			January 1-June 19, 2018			April 1, 2017- June 19 , 2018			Sept. 1, 2017- June 19 , 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.92	0.31	150	7.14	-2.51	73	6.12	-1.23	83	10.81	-3.32	75
West Central	2.01	1.38	320	7.88	-1.36	83	6.85	0.11	99	12.50	-1.21	89
Southwest	1.66	0.90	223	6.06	-2.77	69	5.51	-0.94	86	9.72	-3.57	73
North Central	2.56	1.69	290	10.25	-2.25	82	8.69	-0.32	96	15.46	-3.77	80
Central	1.46	0.53	165	8.39	-5.14	63	6.78	-2.80	72	13.22	-7.12	66
South Central	0.73	-0.39	70	9.76	-5.11	66	7.76	-2.49	76	15.40	-7.32	67
Northeast	1.35	0.14	134	10.16	-5.35	68	8.02	-3.28	74	14.87	-9.98	61
East Central	0.89	-0.43	69	10.33	-6.94	59	7.47	-4.87	60	15.91	-11.67	57
Southeast	0.04	-1.39	2	13.40	-6.18	68	9.26	-4.32	68	20.47	-11.20	64
STATE	1.26	0.27	154	9.25	-4.20	69	7.36	-2.24	79	14.28	-6.55	70

Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

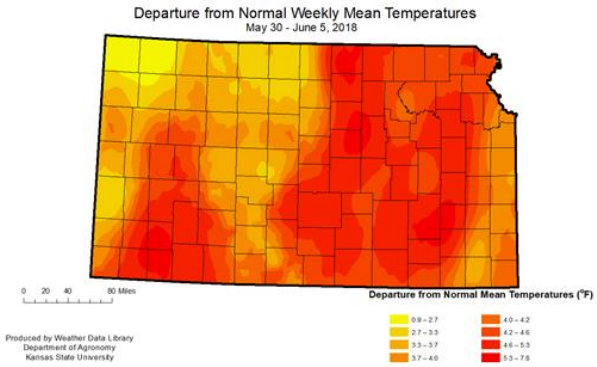
Climate Summary – Temperature

Temperature Week of June 13-19: Temperatures were again warmer than normal. The statewide average temperature was 82.1 °F, or 8.6 degrees warmer than normal. The Central and North Central climate divisions had the greatest departure from normal with a departure of 10.2 degrees. The divisional averages were 84.9 °F and 83.9 °F, respectively. The Southeast Division came closest to normal, with an average of 81.5 °F or 7.0 degrees warmer than normal. The highest maximum temperature was 107 °F at Tribune 13NNE in Greeley County on the 16th. The lowest minimum temperature was 53 °F at Brewster 4W, Thomas County, on the 13th.



Temperature Week of June 6-12: Temperatures were warmer than normal. The statewide average temperature was 79.3 °F, or 8.0 degrees warmer than normal. The Central Climate Division had the greatest departure from normal with an average of 81.6 °F, or 9.3 degrees warmer than normal. The Southeast Division came closest to normal, with an average of 78.3 °F or 5.8 degrees warmer than normal. The highest maximum temperature was 105 °F at Lakin in Kearny County on the 11th of June. The lowest minimum temperature was 52 °F at multiple locations on both the 8th and the 12th.

Temperature Week of May 30-June 5: Temperatures were warmer than normal, though not as much as the previous week. The statewide average temperature was 73.0 °F, or 4.0 degrees warmer than normal. The Southeast Climate Division had the greatest departure from normal with an average of 7.7 °F, or 4.7 degrees warmer than normal. The Northwest Division came closest to normal, with an average of 68.5 °F or 2.5 degrees warmer than normal. The highest maximum temperature was 104 °F at Lakin, Kearny County, and Liberal, Seward County, on the 2nd of June. The lowest minimum temperature was 42 °F at Syracuse 1NE, Hamilton County, on the 3rd.



Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps below provide a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

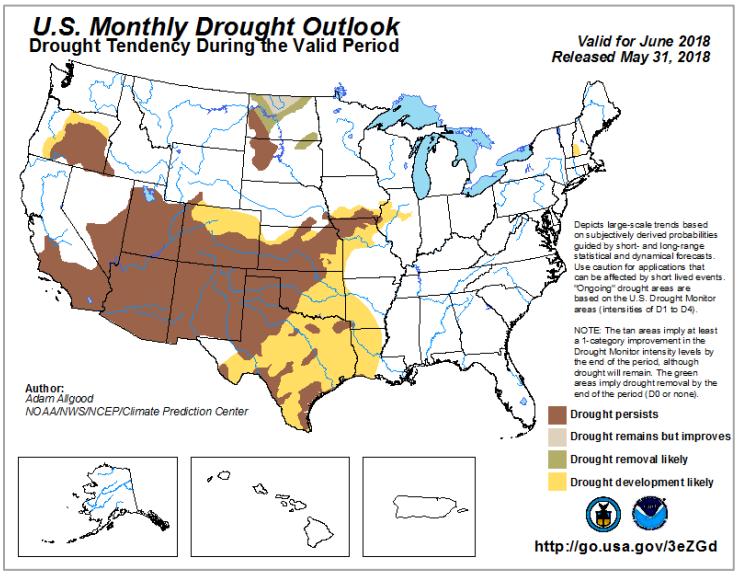
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	June 13-19 , 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	93.2	64.0	78.6	7.4	104	16	53	13
West Central	95.6	65.8	80.7	8.6	107	16	55	13
Southwest	94.6	67.2	80.9	7.1	103	16	56	13
North Central	95.4	72.3	83.9	10.2	104	15	61	13
Central	96.9	73.0	84.9	10.2	105	14	62	19
South Central	94.6	72.6	83.6	8.3	100	14	64	13
Northeast	92.4	73.3	82.8	9.7	100	15	65	13
East Central	91.9	72.6	82.2	8.7	99	15	61	19
Southeast	90.7	72.3	81.5	7.0	98	15	64	13
STATE	93.9	70.3	82.1	8.6	107	16th	53	13th
Data Source: KSU Weather Library								

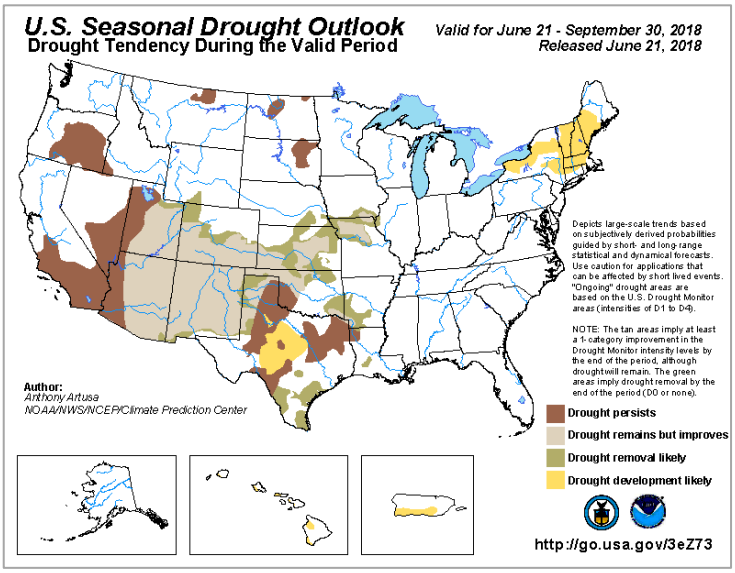
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Future Outlook

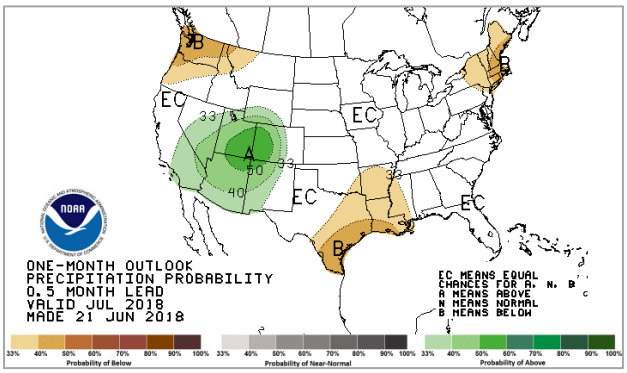
The Monthly Drought Outlook indicates drought conditions to remain in most of southern, central and western Kansas. Improvement of drought conditions is possible in scattered areas of east and northeast Kansas.

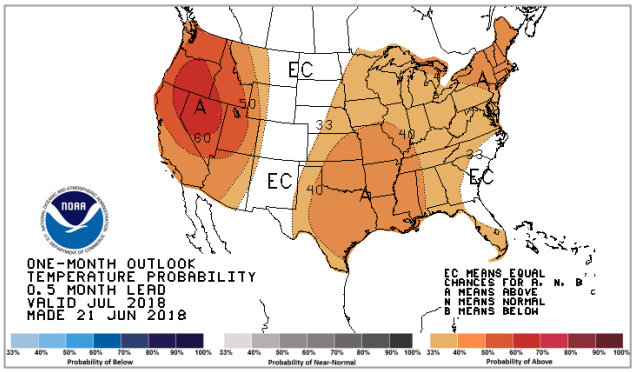
Seasonal Outlook (3-month) favors drought remaining but possibly improving across most of Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available for various intervals.



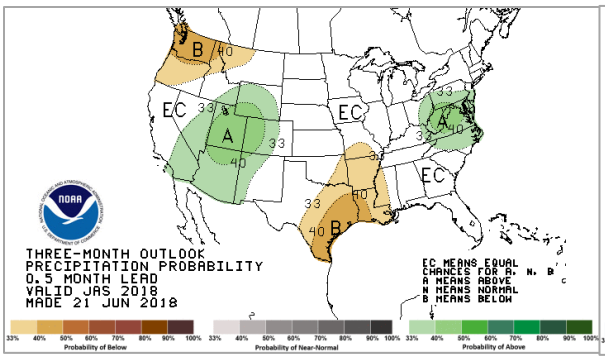


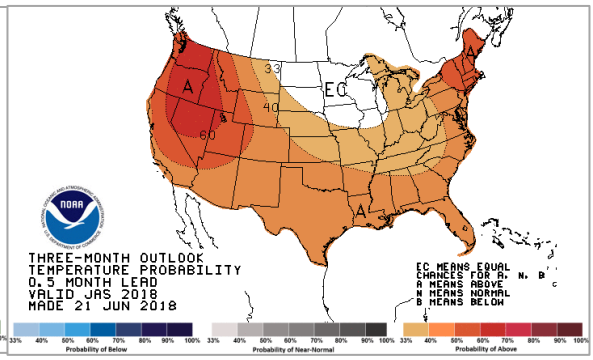
The one month climate outlooks favor above normal temperature and below normal precipitation and for almost all of Kansas in late June and early July.





The long-term, 3 month outlooks give equal chances of above or below normal precipitation and above normal temperatures in all but north eastern Kansas for July-August-September.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions
Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:
June 19, 2018, City of Norton issued Stage 3water restrictions due to unsafe lake water (blue-green algae) and dependence on well water. Customers are prohibited from watering of lawns and washing down of pavement.

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of June 19, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens allowed, but not between 10 am and 5 pm. (June 19, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ June 19, 2018)

Surface Water Supply Conditions
Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs has been well below normal for June. However, overall storage is in pretty good shape, especially Tuttle Creek. Perry remains below the top of multipurpose pool and Clinton is nearly two feet below the seasonal target elevation. Additional releases were purposely made from Milford to lower the pool level according to the seasonal plan. June flow in the Kansas River has been steady at about 20% of historic median values but in excess of low flow targets. Without additional rain the Kansas River will require reservoir releases to maintain target flows.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs are all set to minimum gate settings. Melvern and Pomona have not refilled from their lower winter target elevation and experienced a declining trend in June. Reservoir releases have been necessary to supplement flow in the Marais des Cygnes River, especially in the upper system.

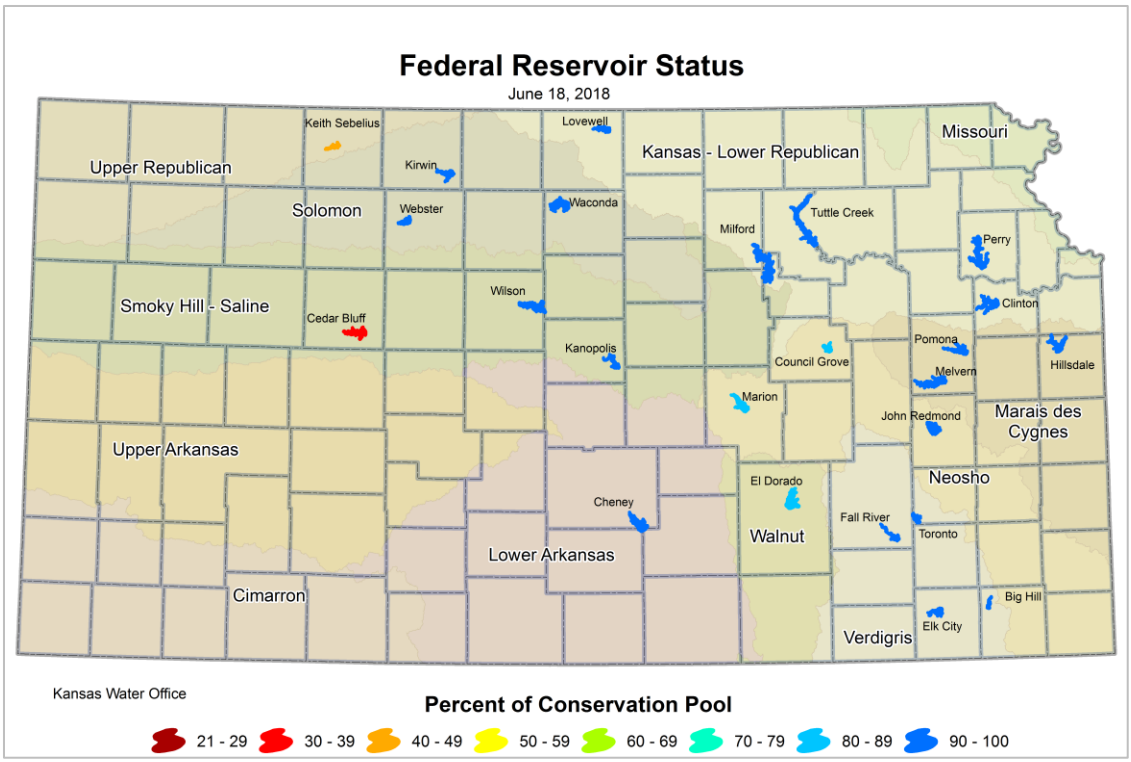
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs have been generally low for June. Streamflow is declining throughout the system. Conservation storage is full in John Redmond but steadily declining in Marion and Council Grove. Releases have been necessary to maintain sufficient streamflow in the upper and lower Neosho River.

Verdigris basin: Inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs has declined since the May runoff event but all are near or above conservation pool levels and releases have been in excess of minimum gate settings to pass inflow and reduce pool elevations.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in June. Due to a large precipitation event within the Saline River basin, releases were increased from 15 cfs to 1,000 cfs at the end of the May to make room for the projected inflow in early June. Wilson crested about two feet high on June 2nd and is maintaining at about 1 foot into flood storage, despite greater than normal releases.

Smoky Hill basin: Flows in the Smoky Hill basin were generally declining and low until May 28th. The storm that resulted in significant runoff and flooding in the Saline basin also hit portions of the Smoky Hill. The main benefit from this event was the Smoky Hill River upstream of Cedar Bluff Reservoir and Big Creek which drains into the Smoky Hill upstream of the USGS Russell gage. This large event took about six days to reach Kanopolis Lake and increase the pool elevation about 1.25 feet. Additional precipitation will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of the Multipurpose Pool. The pool rise increased the discharge through the uncontrolled spillway and flow in excess of the 20 cfs target flow at the USGS Mentor gage has been maintained so far in June.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**06/18/2018 01:14 PM**		
Norton[1]	2304.3	2292.76	-11.54	43.1
Harlan County, NE	1945.73	1940.83	-4.90	80.4
Lovewell[1]	1582.6	1581.55	-1.05	91.6
Milford[1]	1144.4	1143.07	-1.33	94.6
Cedar Bluff	2144	2119.15	-24.85	32.2
Kanopolis[1]	1463	1465.10	2.10	100.0
Wilson[1]	1516	1516.99	0.99	100.0
Webster[1]	1892.5	1895.10	2.65	100.0
Kirwin[1]	1729.3	1730.38	1.13	100.0
Waconda[1]	1455.6	1455.89	0.29	100.0
Tuttle Creek[1]	1075	1076.01	1.01	100.0
Perry[1]	891.5	890.11	-1.39	93.0
Clinton[1]	875.5	875.36	-0.14	99.2
Melvern[1]	1036	1034.46	-1.54	93.1
Pomona[1]	974	972.37	-1.63	88.8
Hillsdale[1]	917	916.54	-0.46	97.2
Arkansas River Basin		**06/18/2018 08:00 AM**		
Cheney	1421.6	1420.88	-0.72	96.0
El Dorado	1339	1334.83	-4.17	81.0
Toronto[1]	901.5	901.82	0.32	100.0
Fall River[1]	948.5	949.08	0.58	100.0
Elk City[1]	796	796.84	0.84	100.0
Big Hill	858	857.91	-0.09	100.0
Council Grove[1]	1274	1271.15	-2.85	83.0
Marion[1]	1350.5	1347.87	-2.63	80.0
John Redmond[1]	1039	1041.02	0.02	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur.

As of June 22 2018

Watches: Colwich City Lake, Sedgewick County
Warnings: Webster Lake, Rooks County; and Sebelius Lake (Norton), Norton County

June 14, 2018

Watches: Colwich City Lake, Sedgewick County.
Warnings: Central Lake, Shawnee County; and Sebelius (Norton) Lake, Norton County.

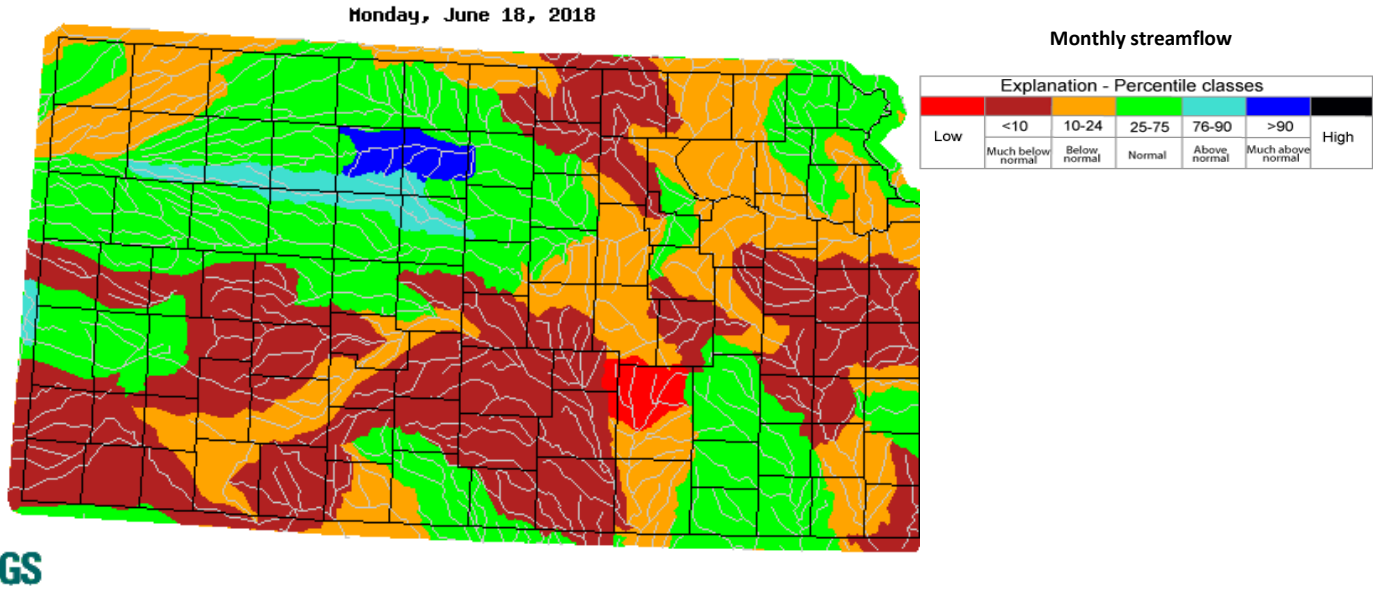
June 7, 2018

Watches: Marion County Lake, Marion County and Colwich City Lake, Sedgewick County.
Warnings: Central Lake, Shawnee County.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

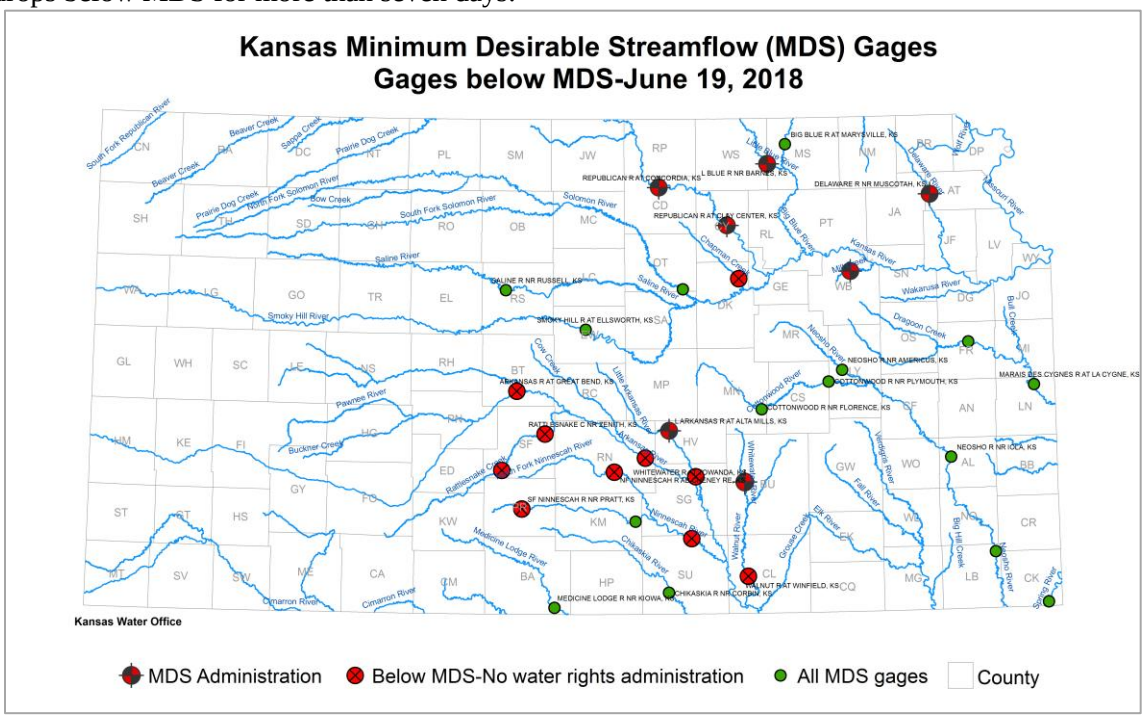
7-day average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

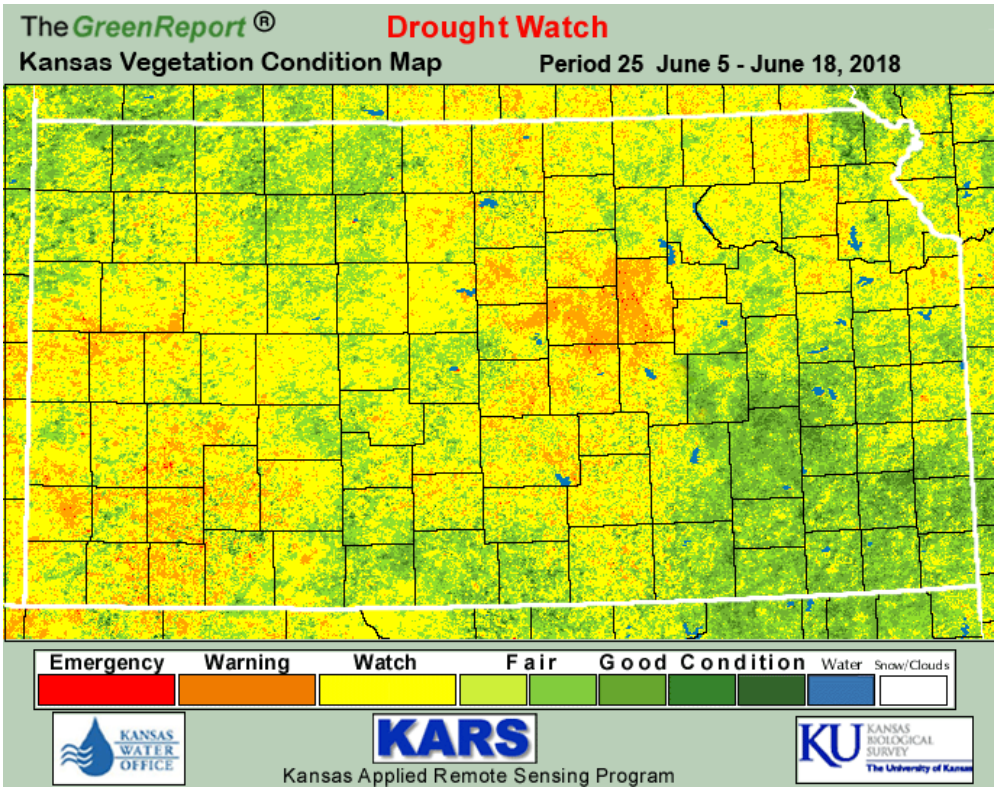


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since for some reason.

Streamflows as of June 19, 2018			
Gaging Station	**Current Flow**	**Jun MDS**	**Comment**
Republican River at Concordia	60	150	Admin began April 13, 2018
Republican River at Clay Center	119	250	Admin began April 13, 2018
Smoky Hill River at Ellsworth	51	45	
Chapman Creek near Chapman	9	15	9 days below -delayed for rain in forecast
Little Blue River near Barnes	89	150	Admin began June 1, 2018
Mill Creek near Paxico	4	35	Admin began April 12, 2018
Delaware River near Muscotah	2	20	Admin began March 23, 2018
Arkansas River at Great Bend	7	10	6 days below
Rattlesnake Creek near Macksville	Dry	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	4	15	No surface water diversions junior to MDS above gage
Arkansas River near Hutchinson	92	100	5 days below
Little Arkansas River at Alta Mills	1.54	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	13	20	7 days below -delayed for rain in forecast
North Fork Ninnescah River above Cheney	17	30	Not administered
South Fork Ninnescah River near Pratt	3	8	No surface water diversions junior to MDS above gage
South Fork Ninnescah River near Murdock	59	50	
Ninnescah River near Peck	32	70	7 days below -delayed for rain in forecast
Whitewater River near Towanda	4.46	25	Admin began April 12, 2018
Walnut River at Winfield	85.2	100	2 days below
Chikaskia River near Corbin	23.9	30	2 days below
Spring River near Quapaw, OK	335	350	1 day below

Soil, Crop and Vegetation

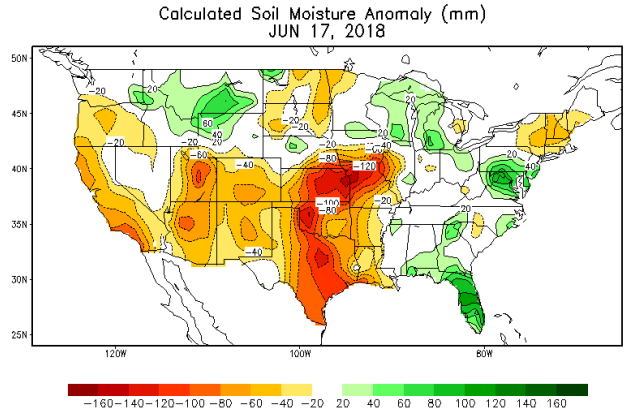
Vegetative Conditions

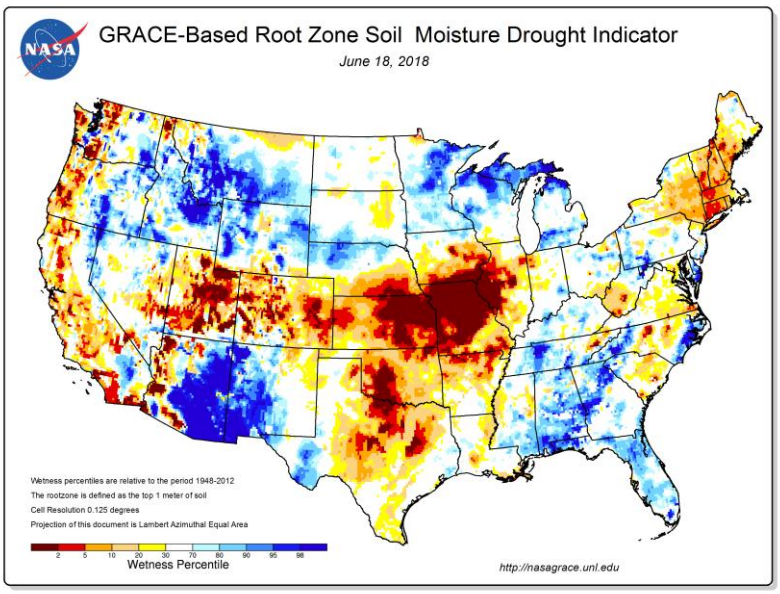


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

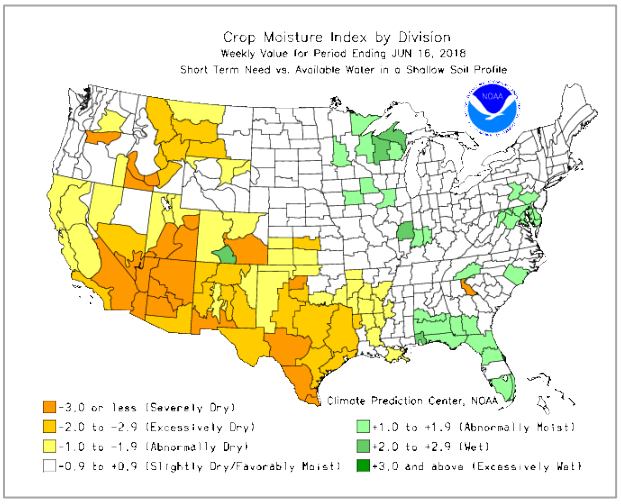
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending June 17, 2018 indicates topsoil moisture supplies rated 16 percent very short, 39 short, 44 adequate, and 1 surplus. Subsoil moisture supplies rated 17 percent very short, 37 short, 46 adequate, and 0 surplus.

Field Crops Report: Overall the winter wheat condition rated 15 percent very poor, 31 poor, 36 fair, 16 good, and 2 excellent. Corn condition rated percent very poor, 5 poor, 33 fair, 52 good, and 9 excellent. Soybean condition rated 1 percent very poor, 5 poor, 38 fair, 51 good, and 5 excellent. Sorghum condition rated percent very poor, 3 poor, 35 fair, 57 good, and 4 excellent. Cotton condition rated 1 percent very poor, 5 poor, 23 fair, 69 good, and 2 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 6 percent very poor, 18 poor, 44 fair, 30 good, and 2 excellent.

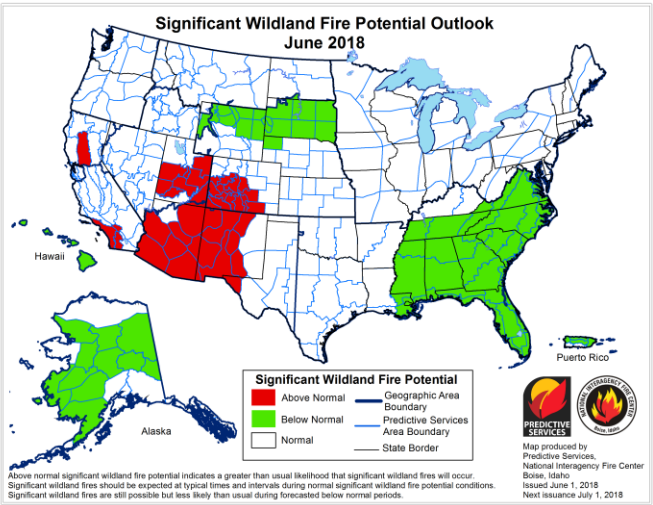
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA [Weekly Weather and Crop Bulletin](#).

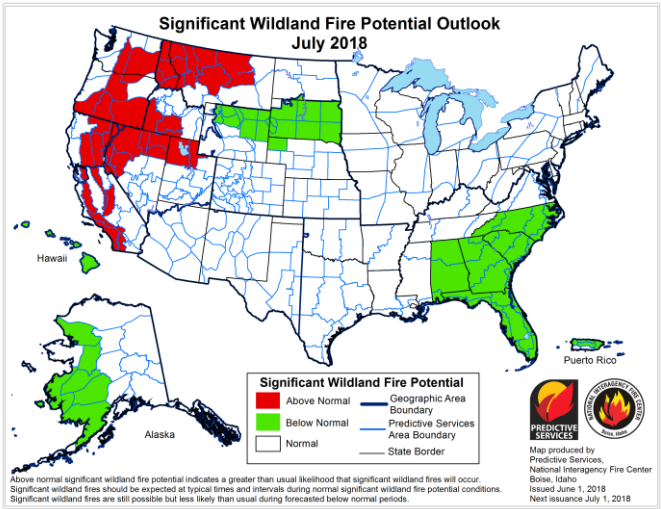


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE
June 2018 Summary

Highlights

- U.S. Drought Monitor June 26, 2018 has drought conditions improved in western Kansas. Including the removal of extreme in the southwest the previous week. In eastern Kansas, abnormally dry and moderate drought conditions were expanded as the region continues to miss out on the rain events and the recent heat has worsened conditions.

- Drought Declarations for Kansas counties remain in effect under Executive Order 18-11; issued March 13, 2018 includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status.

- Public Health Warning is in effect (Kansas Department of Health and Environment issued) for Carbondale West Lake, Osage County; Clarion Woods Park Lake Shawnee Count; and Webster Lake, Rooks County due to the concentration of blue-green algae. Conditions are unsafe, no water contact should occur. The Beach at Webster Lake is closed

- USDA Drought Disaster Designations as of June 20, 2018 have been made for 68 primary counties and 21 contiguous counties in Kansas.

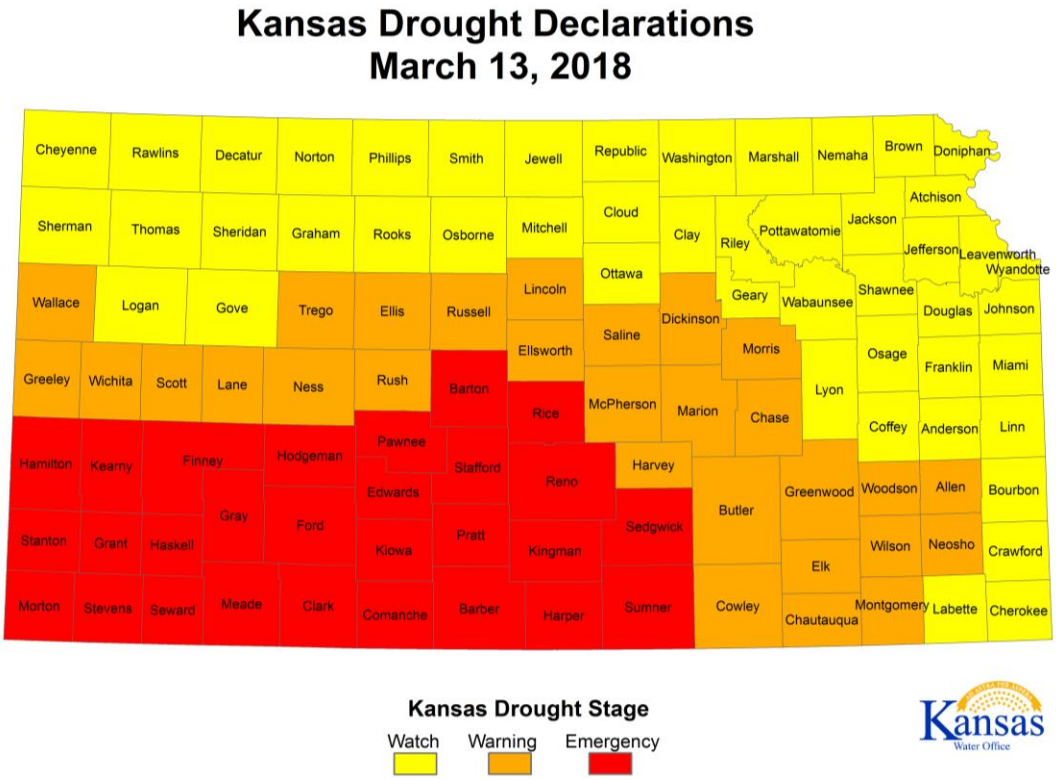
- USDA-FSA has approved CRP acreages some counties for grazing or haying and grazing. FSA must receive a written request to start the approval process. Twenty-eight counties are approved for emergency haying and grazing. Five counties are approved for emergency grazing only.

- Minimum Desirable Streamflow (MDS) Administration began at two sites in June: Little Blue River at the Barnes gage (20 permits or water rights) began June 1, 2018; and Chapman Creek at the Chapman gage (11 permits or water rights) began June 23, 2018.

- Administration of MDS continued on four streams in June: Little Arkansas River at Alta Mills has been since August 10, 2017; Republican River above the Clay Center and Concordia gages since April 13, 2018; Mill Creek above Paxico since April 12, 2018; Whitewater River above the gage near Towanda since April 12, 2018; and Delaware River above the Muscotah gage since March 23, 2018.

March 13, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-11

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-11. The declaration includes all 105 counties placing 28 counties in emergency status, 29 into a warning status and 48 into a watch status. These Drought Declarations remain in place until rescinded or replaced.



Drought Watch counties: Anderson, Atchison, Bourbon, Brown, Cherokee, Cheyenne, Clay, Cloud, Coffey, Crawford, Decatur, Doniphan, Douglas, Franklin, Geary, Gove, Graham, Jackson, Jefferson, Jewell, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Mitchell, Nemaha, Norton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Republic, Riley, Rooks, Shawnee, Sheridan, Sherman, Smith, Thomas, Wabaunsee, Washington, Wyandotte

Drought Warning counties: Allen, Butler, Chautauqua, Chase, Cowley, Dickinson, Elk, Ellis, Ellsworth, Greeley, Greenwood, Harvey, Lane, Lincoln, Marion, McPherson, Montgomery, Morris, Neosho, Ness, Rush, Russell, Saline, Scott, Trego, Wallace, Wichita, Wilson, Woodson

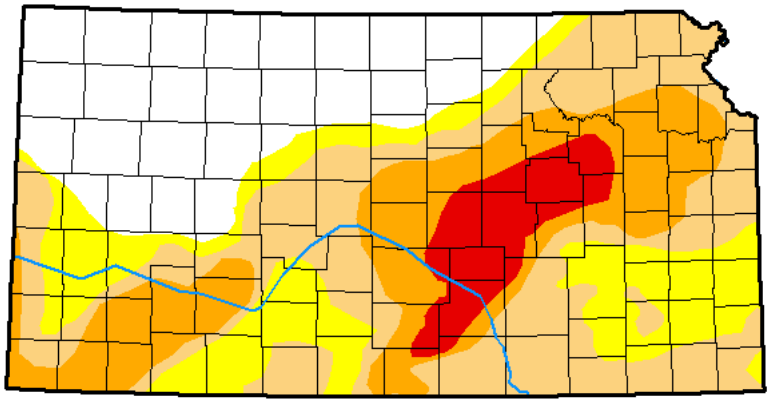
Drought Emergency counties: Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Harper, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Meade, Morton, Pawnee, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, Stanton, Stevens, Sumner

General Conditions

Continued rains resulted in some improvement in the U.S. Drought Monitor most weeks in June. The week ending June 19 saw removal of extreme drought from southwest Kansas due to local rains. Drought severity and removal continued in the west and central parts of Kansas the week ending June 26. Kansas no longer has any exceptional drought in the state. However conditions deteriorated in eastern Kansas.

U.S. Drought Monitor

Kansas



June 26, 2018

(Released Thursday, Jun. 28, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	27.17	72.83	54.93	25.26	6.75	0.00
Last Week *06-19-2018*	16.98	83.02	68.07	33.63	7.17	0.00
3 Months Ago *03-27-2018*	1.78	98.22	81.45	56.19	20.90	3.70
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *06-27-2017*	83.07	16.93	0.00	0.00	0.00	0.00

Intensity:

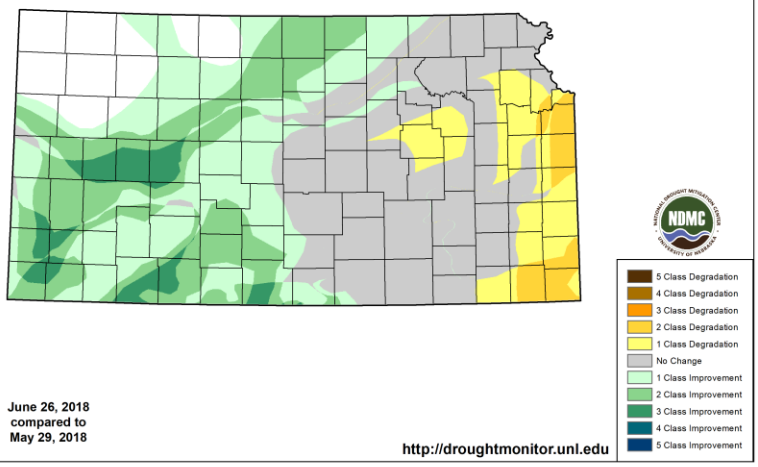
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/

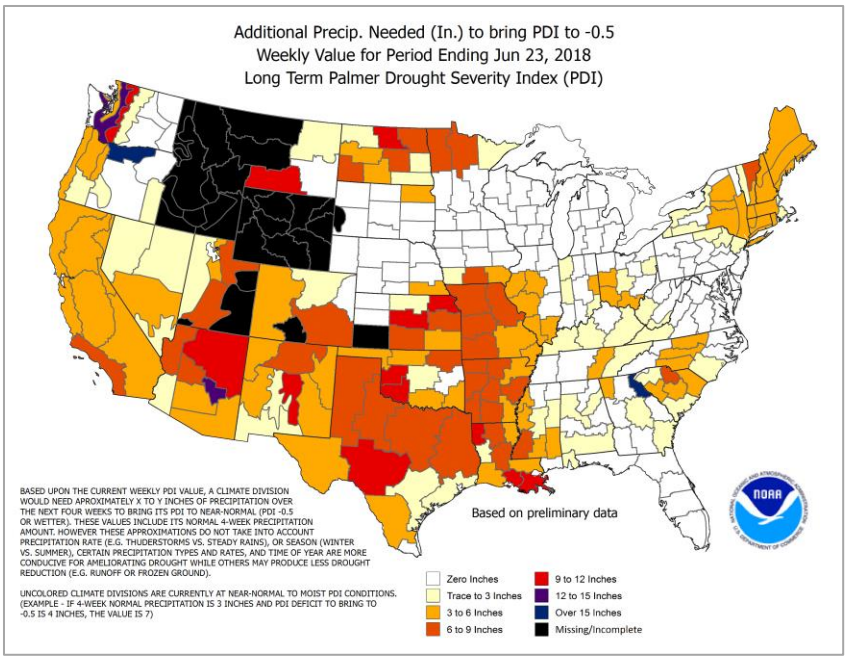
U.S. Drought Monitor Class Change - Kansas
1 Month



Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.



Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Jun 23	June 30	
Northwest	-	-	-
North Central	2.47	1.4	
Northeast	10.80	10.78	
West Central	-	-	
Central	10.89	10.74	
East Central	7.6	7.77	
Southwest	`1.23	-	
South Central	7.18	4.19	
Southeast	4.56	3.57	

More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

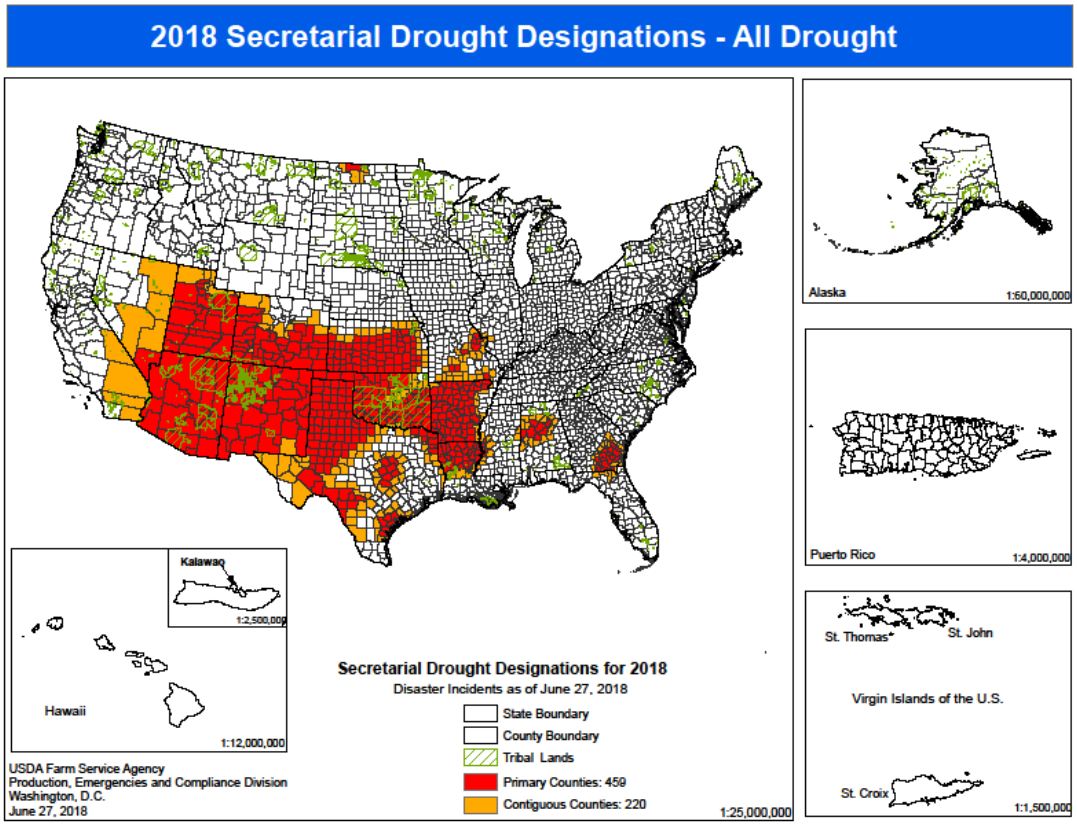
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

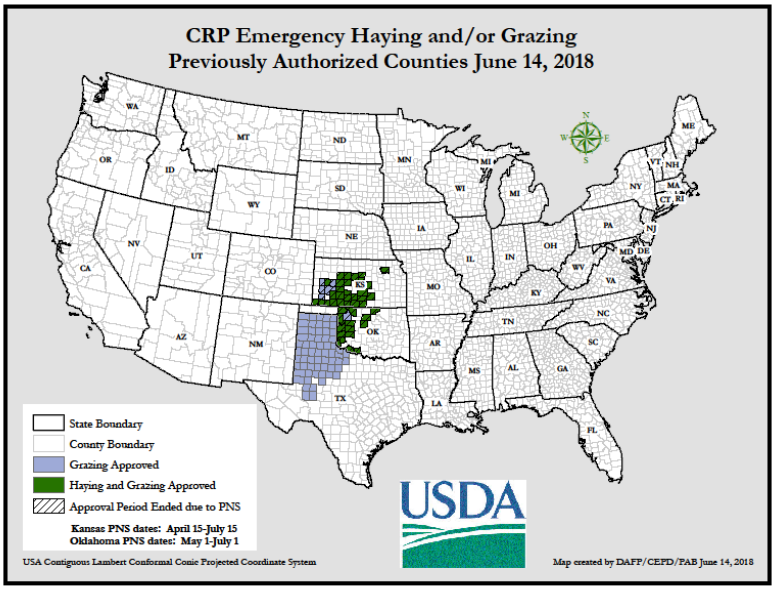
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor. Those in **Bold** in the list below were designated in June.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 68 primary counties and 21 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Kearny, Kingman, Kiowa, Lane, Lincoln, Lyon, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Wichita, Wilson and Woodson. Contiguous counties are Anderson, Atchison, Bourbon, Brown, Cloud, Crawford, Douglas, Franklin, Gove, Graham, Jefferson, Labette, Linn, Logan, Marshall, Mitchell, Nemaha, Osborne, Rooks, Sherman and Washington.



Haying and grazing of Conservation Reserve Program (CRP) acres is authorized under certain conditions to improve the quality and performance of the CRP cover or to provide emergency relief to livestock producers due to certain natural disasters. There are two types of haying and grazing authorization: managed and emergency. The USDA-FSA approved emergency haying and grazing on CRP acreages in some counties in Kansas has ended due to primary nesting season.

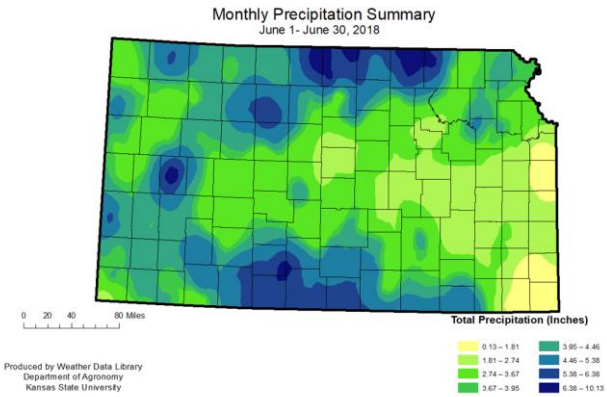


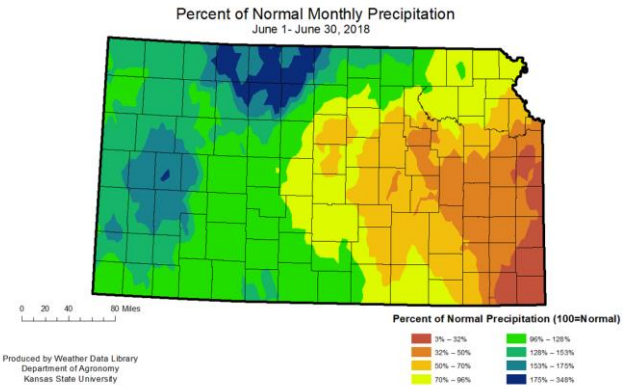
A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf

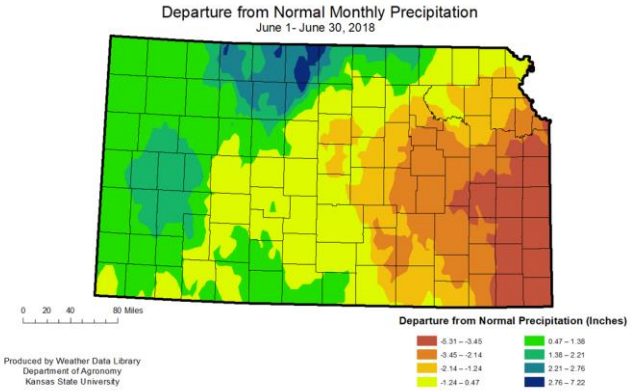
Nesting Season map at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/PDF/MAP-Primary%20Nesting%20Season_5_10_2018.pdf

Climate Summary - Precipitation

June precipitation came very close to normal, although the distribution was uneven. The state-wide average precipitation was 4.24 inches which was 99 percent of normal. As the month was much warmer than normal, the benefit from that precipitation was less than it might have been. The climate division with the largest surplus was the Northwest Division, with an average of 4.03, or 143 percent of normal. The Southeast Division had the greatest departure, with an average of 3.61 inches for a deficit of 2.31 inches. That is 61 percent of normal. The greatest monthly total for a National Weather Service Cooperative station was at Scott City, Scott County, with 7.29 inches on the 20th. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Courtland 6.1 N, Republic County, with 6.81 inches, also on the 20th. Among the Kansas Mesonet stations, the Viola station in Sumner County had the greatest. total at 6.81 inches







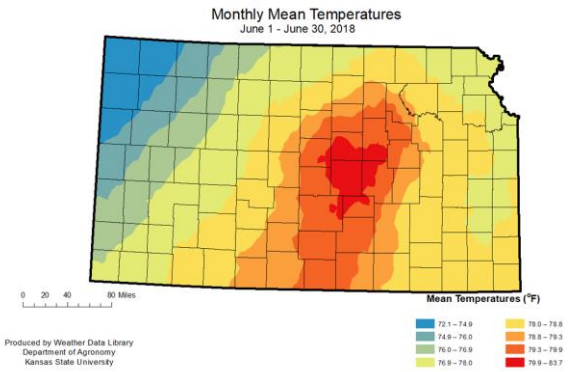
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

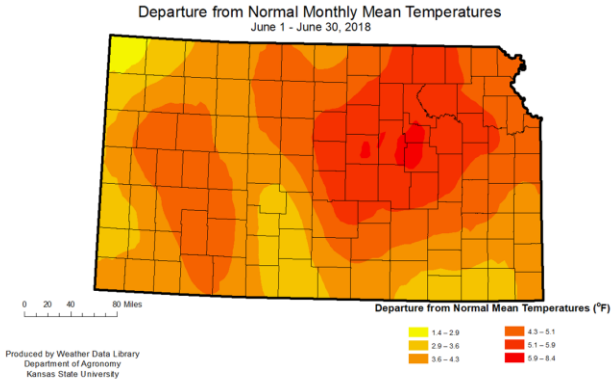
Kansas Climate Division Precipitation Summary (inches)												
Climate Division	June 1-30 , 2018			January 1-June 30, 2018			April 1, 2017- June 30 , 2018			Sept. 1, 2017- June 30 , 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	4.03	1.2	143	9.60	-1.07	89	8.59	0.22	102	13.28	15.14	86
West Central	3.89	1.08	139	9.70	-0.55	93	8.67	0.92	110	14.32	14.72	96
Southwest	4.34	1.13	136	8.42	-1.54	84	7.87	0.29	104	12.09	14.42	84
North Central	5.09	1.26	132	11.93	-1.99	86	10.37	-0.07	99	17.14	20.65	83
Central	3.24	-0.84	81	9.88	-5.09	67	8.27	-2.74	77	14.71	21.78	69
South Central	5.40	0.61	115	13.46	-3.04	82	11.46	-0.42	97	19.10	24.35	78
Northeast	4.76	-0.38	99	11.87	-5.52	71	9.73	-3.45	77	16.58	26.73	64
East Central	3.65	-1.93	64	11.93	-7.28	61	9.06	-5.23	63	17.50	29.52	58
Southeast	3.61	-2.33	61	15.95	-5.65	74	11.80	-3.81	76	23.02	33.69	68
STATE	4.24	-0.02	99	11.47	-3.47	78	9.59	-1.51	89	16.51	22.33	76

Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Climate Summary – Temperature

While the heat wasn't as dramatic as in May, June still came in as the 7th warmest since 1895. The state-wide average for the month was 77.9 °F. This was 4.2 degrees warmer than normal. The Central Climate Division had the greatest departure with an average of 79.8 °F which was a departure of +5.5 degrees. The Northwest and Southeast divisions came closest to normal with departures of +3.9 degrees. For the Northwest that was with an average temperature of 74.7 °F, while the Southeast had an average of 78.1 °F. There were 50 new record daily warm maximum temperatures. The real warmth came in the low temperatures where there were 116 new daily record warm minimum temperatures. Two of those set records for the warmest minimum temperatures for June. Despite the heat, there were 19 new record coldest maximums and 2 record coldest minimum temperatures. This nighttime warmth is one reason that the monthly average was so much warmer than normal with relatively few records. The warmest temperature reported during the month was 107 °F at Abilene, Dickinson County on the 28th. The coldest temperature reported during June was 41 °F, reported at Plainville 4WNW, Rooks County, on the 28th.





Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps below provide a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	June 1-30 , 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	90.0	59.4	74.7	3.9	104	16	41	28
West Central	92.8	60.9	76.8	5.1	107	16	46	3
Southwest	92.7	63.0	77.8	4.4	105	11	42	3
North Central	91.2	65.9	78.5	5.2	105	29	41	28
Central	92.8	66.8	79.8	5.5	107	28	48	3
South Central	91.2	67.2	79.2	4.2	101	28	50	3
Northeast	88.5	67.6	78.1	5.2	106	29	53	3
East Central	89.1	67.7	78.4	5.2	104	29	52	8
Southeast	88.2	68.0	78.1	3.9	100	29	54	3
STATE	90.7	65.2	77.9	4.7	107	26th	41	5th
Data Source: KSU Weather Library								

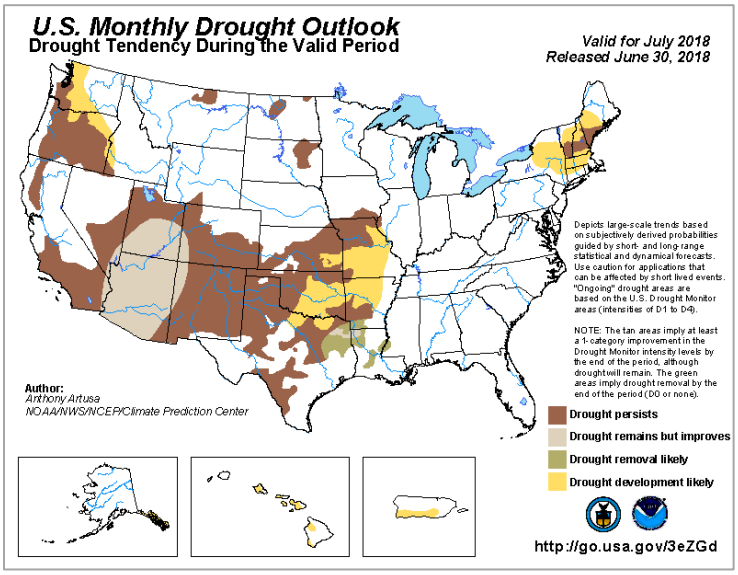
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

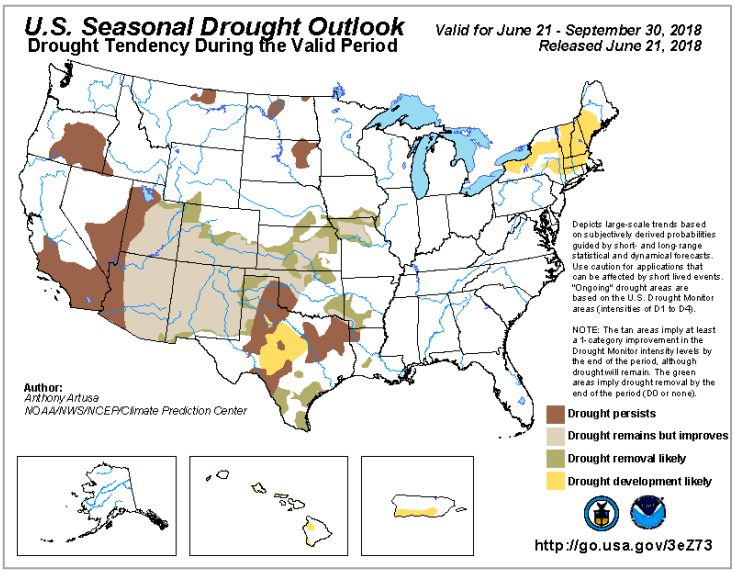
With the resurgence of moisture, severe weather reports during the month also increased. Tornado numbers were lower than in May with only 4 tornadoes reported. Unfortunately one hit the town of Eureka. Eight people were injured and damage was widespread. In addition to the tornado damage, there were significant damages from the hail and wind storms. Total storm reports: 4 tornadoes, 105 hail events, and 268 reports of damaging wind

Future Outlook

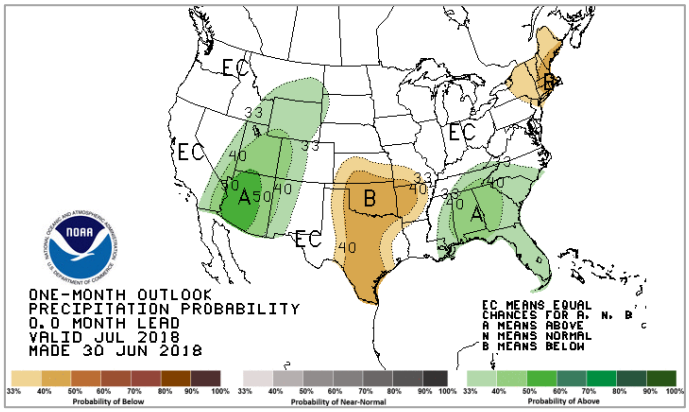
The Monthly Drought Outlook indicates drought conditions to remain in northeast, central and parts of southern Kansas. Improvement of drought conditions is possible in east central Kansas.

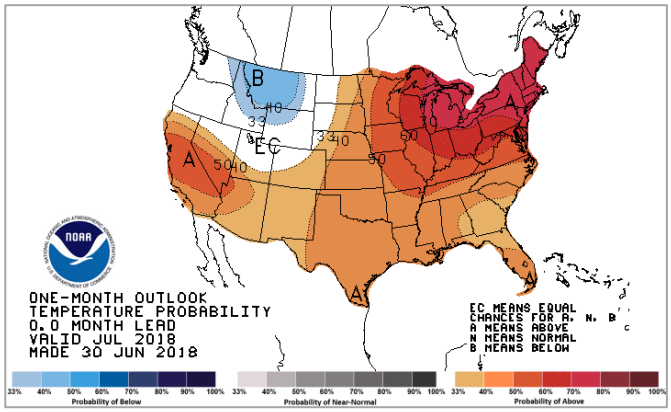
Seasonal Outlook (3-month) favors drought remaining but possibly improving across most of Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available for various intervals.



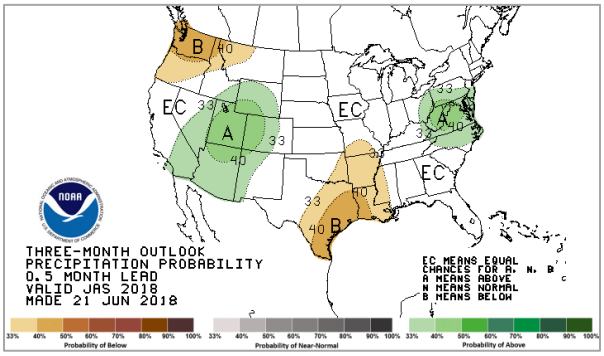


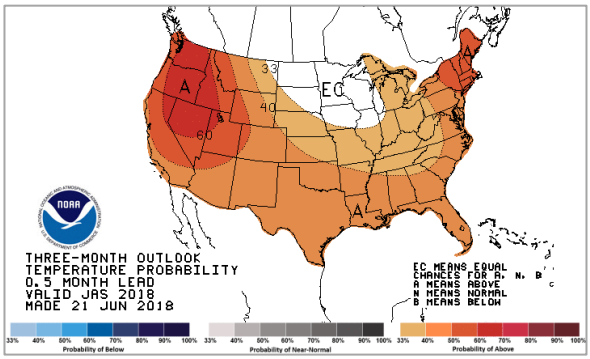
The one month climate outlooks favor above normal temperature and below normal precipitation and for almost all of Kansas in July.





The long-term, 3 month outlooks give equal chances of above or below normal precipitation and above normal temperatures in all of Kansas for July-August-September.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions
Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:
June 24, 2018, began water restrictions for the **City of Norton**. Watering only allowed between the hours of 6 p.m. and 10 a.m. on the designated day.(http://www.cityofnorton.com/CivicAlerts.aspx?AID=55)

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of June 29, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens not allowed between 10 am and 5 pm. (June 29, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ June 29, 2018)

Surface Water Supply Conditions as of June 19
Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs has been well below normal for June. However, overall storage is in pretty good shape, especially Tuttle Creek. Perry remains below the top of multipurpose pool and Clinton is nearly two feet below the seasonal target elevation. Additional releases were purposely made from Milford to lower the pool level according to the seasonal plan. June flow in the Kansas River has been steady at about 20% of historic median values but in excess of low flow targets. Without additional rain the Kansas River will require reservoir releases to maintain target flows.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs are all set to minimum gate settings. Melvern and Pomona have not refilled from their lower winter target elevation and experienced a declining trend in June. Reservoir releases have been necessary to supplement flow in the Marais des Cygnes River, especially in the upper system.

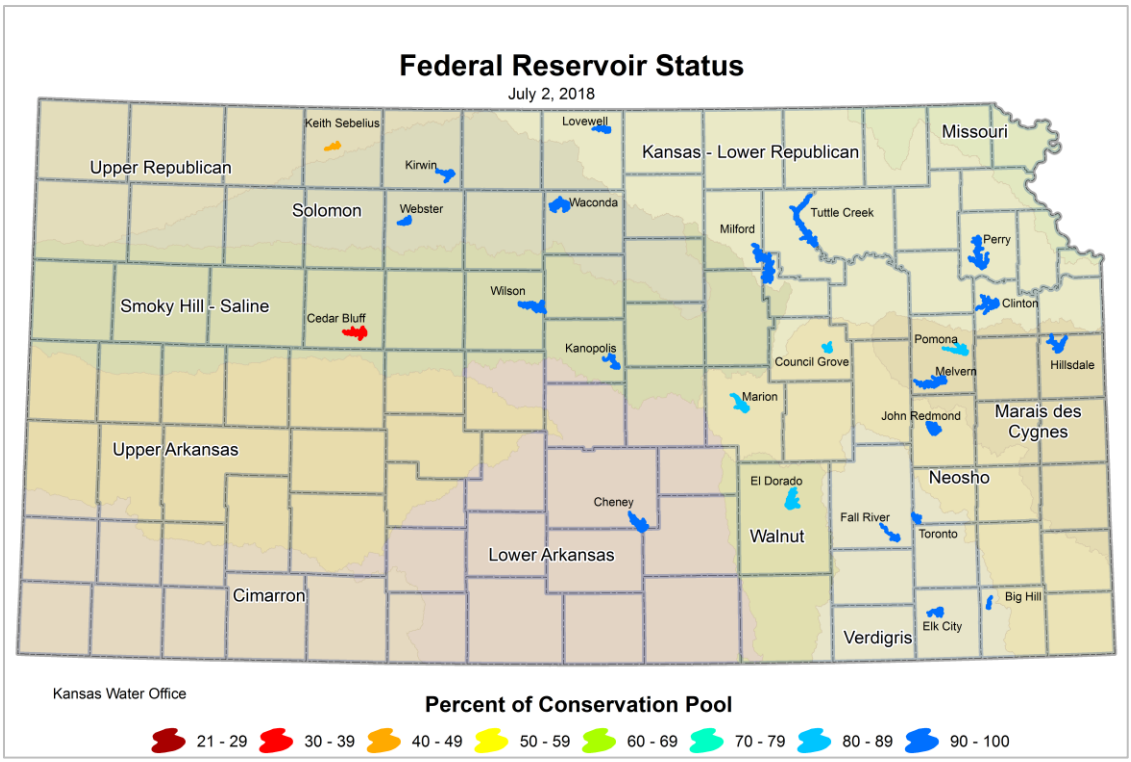
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs have been generally low for June. Streamflow is declining throughout the system. Conservation storage is full in John Redmond but steadily declining in Marion and Council Grove. Releases have been necessary to maintain sufficient streamflow in the upper and lower Neosho River.

Verdigris basin: Inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs has declined since the May runoff event but all are near or above conservation pool levels and releases have been in excess of minimum gate settings to pass inflow and reduce pool elevations.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in June. Due to a large precipitation event within the Saline River basin, releases were increased from 15 cfs to 1,000 cfs at the end of the May to make room for the projected inflow in early June. Wilson crested about two feet high on June 2nd and is maintaining at about 1 foot into flood storage, despite greater than normal releases.

Smoky Hill basin: Flows in the Smoky Hill basin were generally declining and low until May 28th. The storm that resulted in significant runoff and flooding in the Saline basin also hit portions of the Smoky Hill. The main benefit from this event was the Smoky Hill River upstream of Cedar Bluff Reservoir and Big Creek which drains into the Smoky Hill upstream of the USGS Russell gage. This large event took about six days to reach Kanopolis Lake and increase the pool elevation about 1.25 feet. Additional precipitation will be needed to refill storage to the summer target elevation of 1,467.7, 4.7 feet above the top of the Multipurpose Pool. The pool rise increased the discharge through the uncontrolled spillway and flow in excess of the 20 cfs target flow at the USGS Mentor gage has been maintained so far in June.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**Bulletin Updated:**	**07/02/18 01:14 PM**	
Norton[1]	2304.3	2292.92	-11.38	43.7
Harlan County, NE	1945.73	1940.43	-5.30	78.8
Lovewell[1]	1582.6	1584.18	1.58	100.0
Milford[1]	1144.4	1145.14	0.74	100.0
Cedar Bluff	2144	2120.32	-23.68	34.1
Kanopolis[1]	1463	1465.18	2.18	100.0
Wilson[1]	1516	1516.90	0.90	100.0
Webster[1]	1892.5	1896.78	4.33	100.0
Kirwin[1]	1729.3	1729.98	0.73	100.0
Waconda[1]	1455.6	1455.89	0.29	100.0
Tuttle Creek[1]	1075	1084.69	9.69	100.0
Perry[1]	891.5	890.02	-1.48	92.6
Clinton[1]	875.5	875.13	-0.37	97.8
Melvern[1]	1036	1034.25	-1.75	92.2
Pomona[1]	974	972.08	-1.92	86.8
Hillsdale[1]	917	916.24	-0.76	95.3
Arkansas River Basin		**07/02/2018 08:00 AM**		
Cheney	1421.6	1421.07	-0.53	97.0
El Dorado	1339	1335.04	-3.96	82.0
Toronto[1]	901.5	902.21	0.71	100.0
Fall River[1]	948.5	948.97	0.47	100.0
Elk City[1]	796	796.31	0.31	100.0
Big Hill	858	857.69	-0.31	99.0
Council Grove[1]	1274	1270.94	-3.06	81.0
Marion[1]	1350.5	1347.73	-2.77	79.0
John Redmond[1]	1039	1041.55	0.55	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur.

June 29, 2018

Watches: none

Warnings: Carbondale West Lake, Osage County; Clarion Woods Park Lake, Shawnee County; Webster lake Rooks County-**BEACH CLOSURE**

June 22, 2018

Watches: Colwich City Lake, Sedgewick County

Warnings: Webster Lake, Rooks County; and Sebelius Lake (Norton), Norton County

June 14, 2018

Watches: Colwich City Lake, Sedgewick County.

Warnings: Central Lake, Shawnee County; and Sebelius (Norton) Lake, Norton County.

June 7, 2018

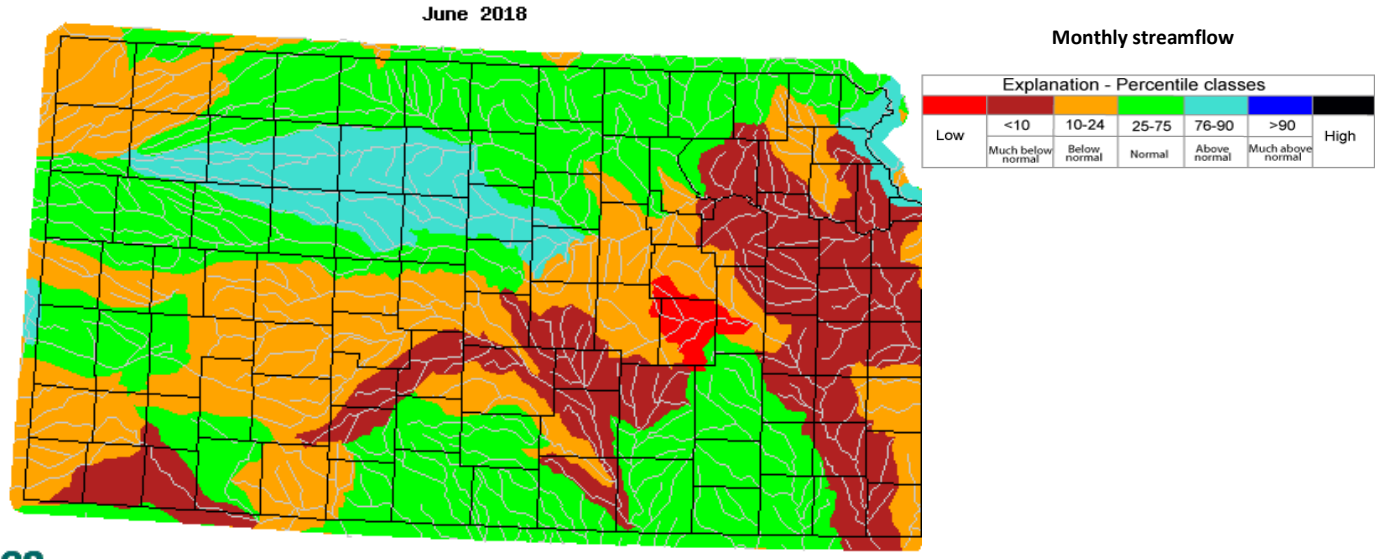
Watches: Marion County Lake, Marion County and Colwich City Lake, Sedgewick County.

Warnings: Central Lake, Shawnee County.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

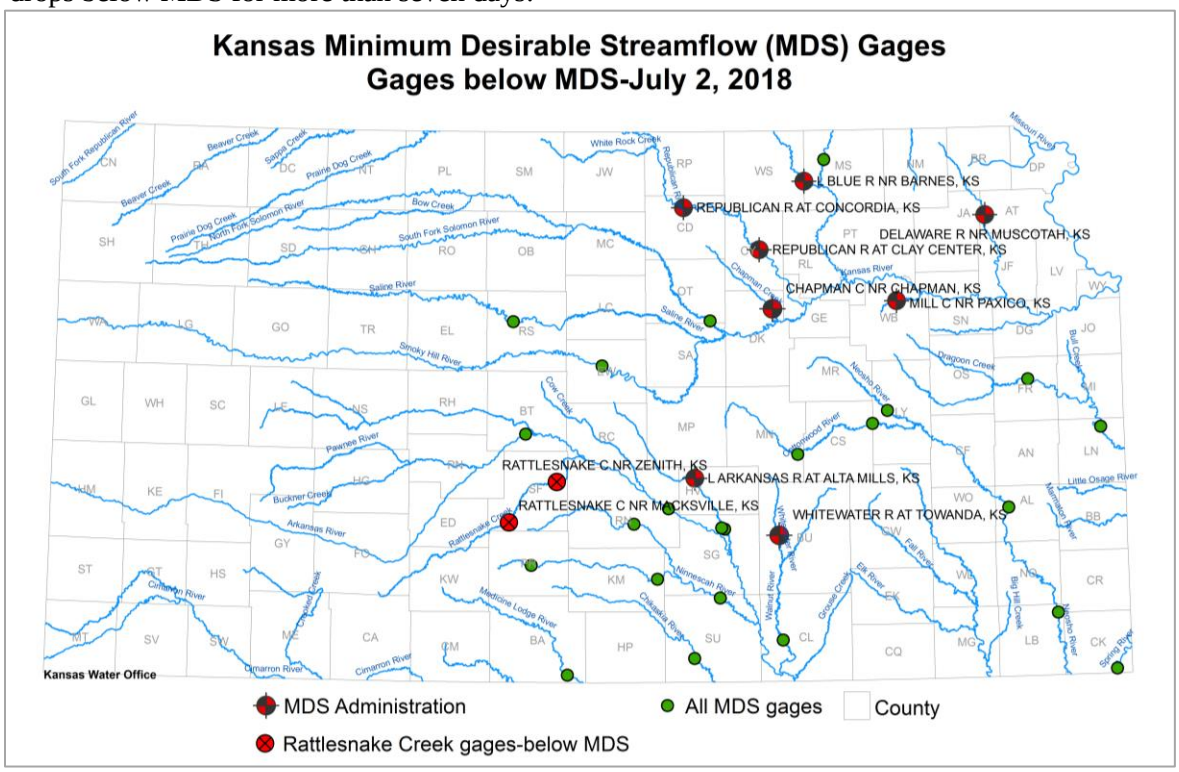
June 2018 average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

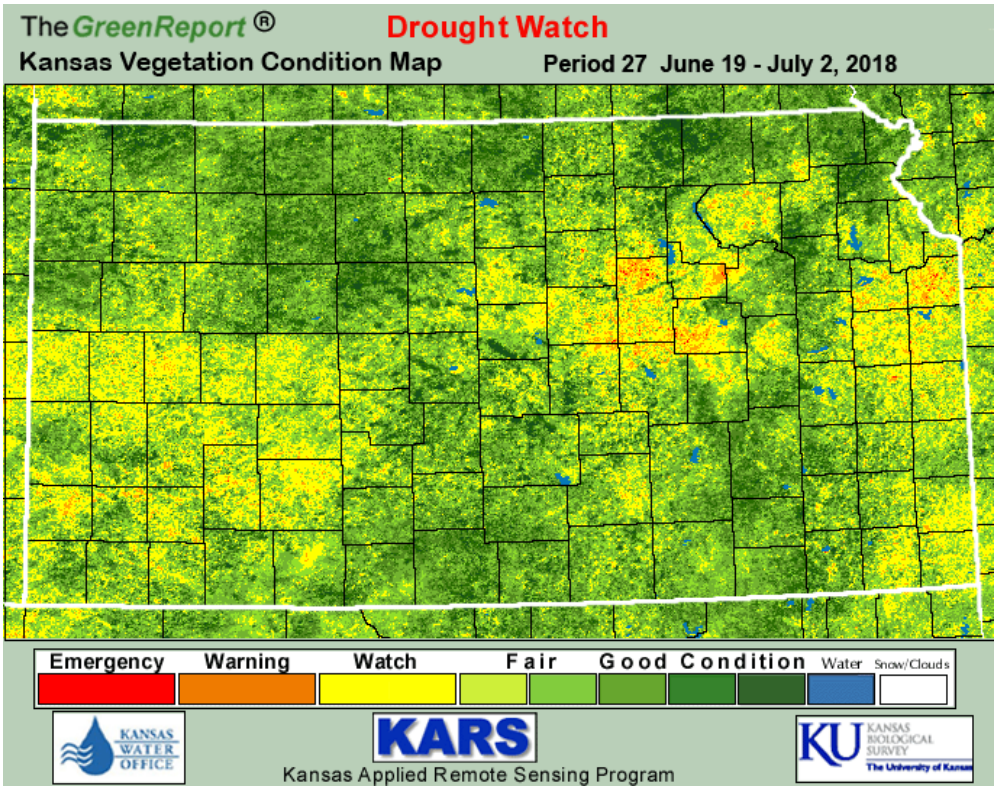


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since for some reason.

Streamflows as of July 2, 2018				
Gaging Station	**Current Flow**	**June MDS**	**July MDS**	**Comment**
Republican River at Concordia	378	150	150	Admin began April 13, 2018, Above June 20, 2018
Republican River at Clay Center	503	250	200	Admin began April 13, 2018, Above June 20, 2018
Chapman Creek near Chapman	**8**	**15**	**10**	**Admin began June 23, 2018**
Little Blue River near Barnes	**359**	**150**	**75**	**Admin began June 1, 2018**
Mill Creek near Paxico	3	35	10	Admin began April 12, 2018
Delaware River near Muscotah	46	20	5	Admin began March 23, 2018
Arkansas River at Great Bend	10	10	5	
Rattlesnake Creek near Macksville	0	10	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	5	15	5	No surface water diversions junior to MDS above gage
Arkansas River near Hutchinson	113	100	80	
Little Arkansas River at Alta Mills	2	8	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	107	20	20	
Ninnescah River near Peck	220	70	30	
Whitewater River near Towanda	12	25	10	Admin began April 12, 2018

Soil, Crop and Vegetation

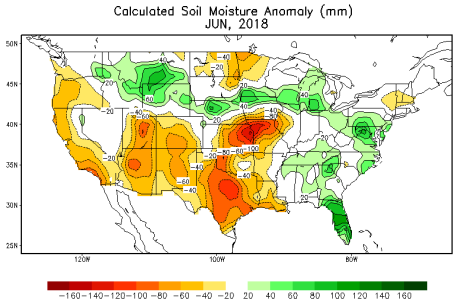
Vegetative Conditions

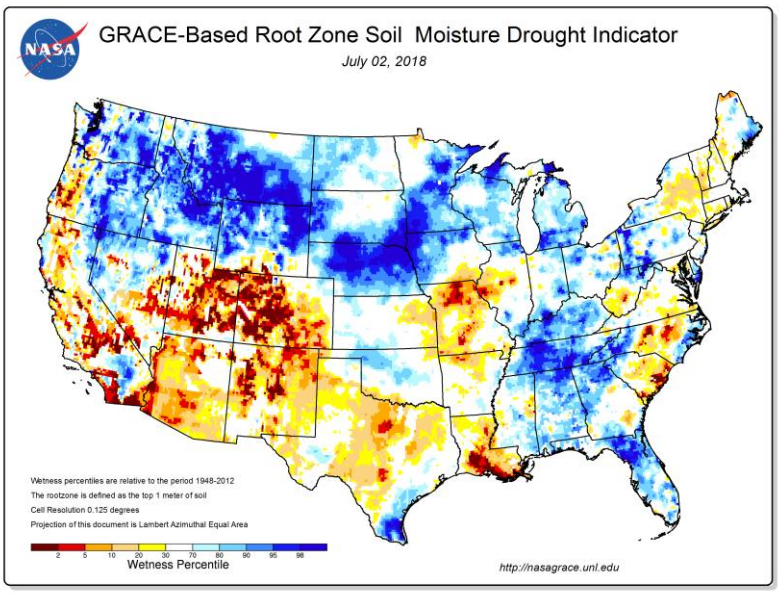


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

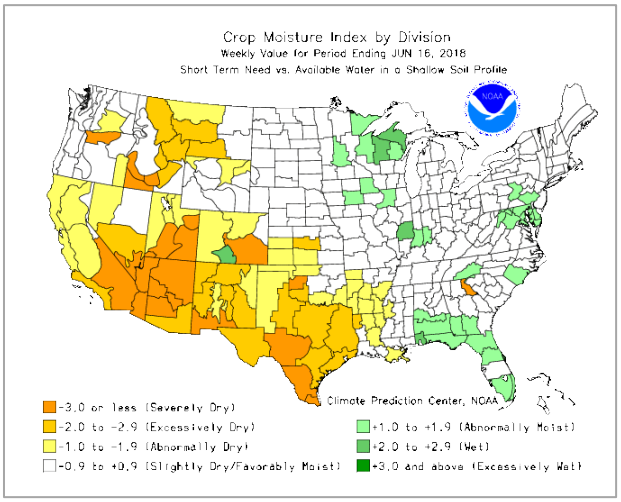
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending July 1, 2018 indicates topsoil moisture supplies rated 7 percent very short, 21 short, 68 adequate, and 4 surplus. Subsoil moisture supplies rated 10 percent very short, 28 short, 60 adequate, and 2 surplus.

Field Crops Report: Overall the winter wheat condition rated 16 percent very poor, 30 poor, 37 fair, 15 good, and 2 excellent. Corn condition rated 4 percent very poor, 11 poor, 32 fair, 46 good, and 7 excellent. Soybean condition rated 1 percent very poor, 8 poor, 37 fair, 49 good, and 5 excellent. Sorghum condition rated 2 percent very poor, 5 poor, 31 fair, 57 good, and 5 excellent. Cotton condition rated 1 percent very poor, 4 poor, 29 fair, 61 good, and 5 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 6 percent very poor, 19 poor, 41 fair, 30 good, and 4 excellent.

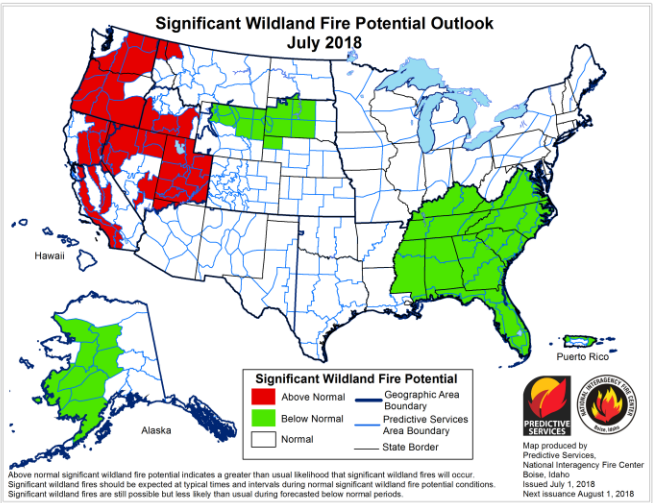
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA [Weekly Weather and Crop Bulletin](#).

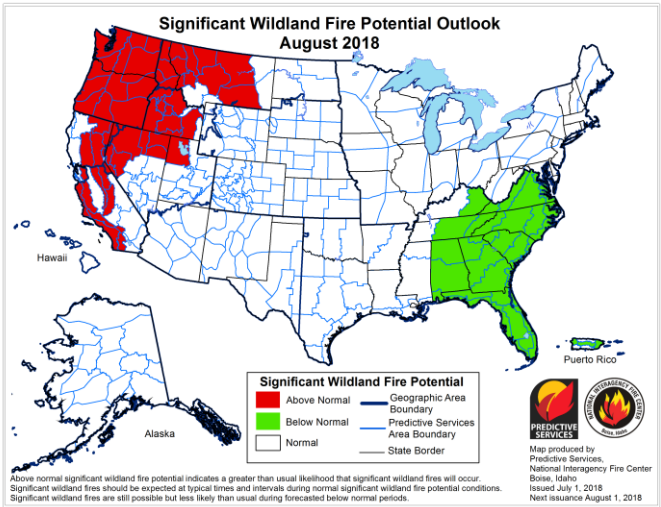


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

June 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	3.31	0.43	115%	73.1	4.6	102 (28)	47 (3)
Dodge City	2.85	-0.39	88%	79.4	5.5	104 (10)	53 (3)
Garden City	4.20	0.72	121%	77.4	4.6	103 (10)	49 (3)
Goodland	4.63	1.38	142%	73.7	4.0	101 (28,14)	49 (3)
Guymon, OK	4.34	1.40	148%	78.1	4.0	102 (10,1)	49 (3)
Hill City	0.81	6.05	-15%	77.1	4.2	105 (28)	48 (3)
Lamar, CO	0.93	-1.42	40%	78.9	7.3	109 (28,27)	47 (5)
McCook, NE	4.91	1.53	145%	75.1	5.2	106 (28)	45 (3)
Springfield, CO	1.65	-0.85	66%	74.8	3.5	103 (27)	45 (3)
Central							
Concordia	4.92	0.87	121%	78.8	5.4	101 (14,10)	55 (3)
Hebron, NE	4.78	0.00	100%	78.8	6.8	103 (10)	54 (3)
Medicine Lodge	6.32	2.21	154%	80.2	3.6	100 (28,27)	53 (3)
Ponca City, OK	3.40	-1.66	67%	81.0	4.4	99 (28,27)	56 (4,3)
Salina	3.23	-0.88	79%	81.9	6.2	103 (28,14)	53 (3)
Wichita (ICT)	3.41	-1.79	66%	81.4	5.5	100 (28,27)	57 (3)
East							
Bartlesville, OK	3.86	-1.51	72%	78.1	1.9	96 (28)	54 (4)
Chanute	3.97	-2.06	66%	78.4	3.8	97 (28)	57 (4,3)
Falls City, NE	4.52	-0.36	93%	76.7	3.4	99 (29)	53 (3)
Johnson Co. Exec. Apt	1.18	-4.60	20%	77.9	4.5	98 (28)	58 (5,4)
Joplin, MO	2.99	-2.87	51%	79.5	4.0	97 (28)	54 (4)
Kansas City (MCI), MO	3.71	-1.52	71%	77.8	4.3	99 (28)	56 (5)
St. Joseph, MO	4.64	0.46	111%	78.0	4.4	97 (29,28)	54 (5)
Topeka (TOP)	4.60	-0.80	85%	80.1	5.9	100 (28)	58 (4)

1. Airport Automated Observation Stations (NWS/FAA)

2. Departure from 1981-2010 normal value

T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal

Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE
Mid-July 2018 Summary

Highlights

- U.S. Drought Monitor has drought conditions improved in western and southern Kansas. However much of the state is in drought. In eastern Kansas, moderate, severe and extreme drought conditions were expanded in early July as the region continues to miss out on the rain events and the recent heat has worsened conditions.

- Executive Order 18-16 was issued July 6, 2016 adding 22 counties to Emergency Drought Declarations. The EO places 50 counties in emergency status, 27 into a warning status and 28 into a watch status.

- Emergency Water for livestock has been requested in Chase, McPherson and Osage counties.

- Administration of MDS continued on seven streams in July: Little Arkansas River at Alta Mills has been since August 10, 2017; Republican River above the Clay Center and Concordia gages since April 13, 2018; Mill Creek above Paxico since April 12, 2018; Whitewater River above the gage near Towanda since April 12, 2018; Delaware River above the Muscotah gage since March 23, 2018; Little Blue River at the Barnes gage (20 permits or water rights) began June 1, 2018 but ceased July 3; and Chapman Creek at the Chapman gage (11 permits or water rights) began June 23, 2018.

- July 13, 2018- Public Health Warning is in effect (Kansas Department of Health and Environment issued) for: Atchison County Park Lake, Atchison County; Carbondale West Lake, Osage County; Central Park Lake (Pond), Shawnee County; Clarion Woods Park Lake, Shawnee County; Jerry Ivey Pond, Saline County; Lake Afton, Sedgwick County; Melvern Outlet Pond, Osage County; Melvern Outlet Swim Pond, Osage County, ***Closure (The present algae bloom is isolated to the Outlet Pond and Outlet Swim Pond; Melvern Lake is not affected.);*** Rooks County State Fishing Lake, Rooks County; and Webster Lake, Rooks County due to the concentration of blue-green algae. Conditions are unsafe, no water contact should occur. **The Beach at Webster Lake is closed**

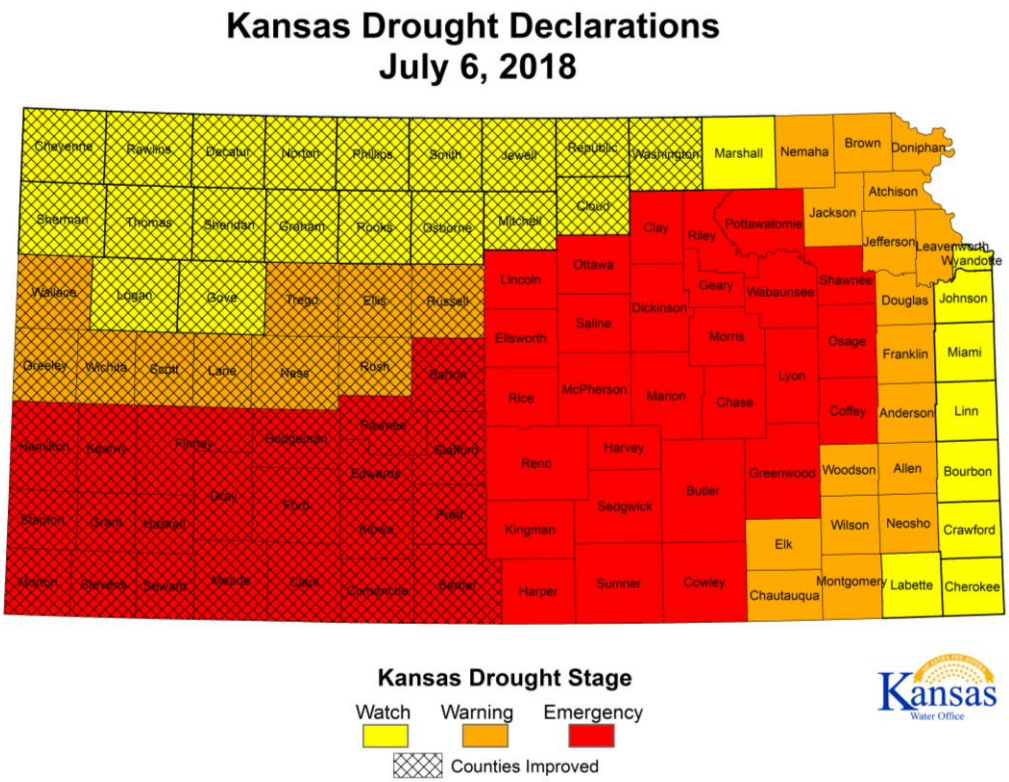
- USDA Drought Disaster Designations as of July 11, 2018 have been made for 68 primary counties and 22 contiguous counties in Kansas.

- USDA-FSA has approved CRP acreages 44 Kansas counties for haying and grazing through September 30, 2018. FSA must receive a written request to start the approval process.

- Conservation Reserve Program (CRP) practice CP25 acres for emergency grazing only, has been authorized by USDA through September 30, 2018. Emergency Haying is not authorized for CP25 acres. . Interested producers should visit with their county offices as soon as possible to determine eligibility and receive approval.

July 6, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-16

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-16. The declaration includes all 105 counties placing 50 counties in emergency status, 27 into a warning status and 28 into a watch status. These Drought Declarations remain in place until rescinded or replaced.



Drought Watch counties: Bourbon, Cherokee, Cheyenne, Cloud, Crawford, Decatur, Gove, Graham, Jewell, Johnson, Labette, Linn, Logan, Marshall, Miami, Mitchell, Norton, Osborne, Phillips, Rawlins, Republic, Rooks, Sheridan, Sherman, Smith, Thomas, Washington, Wyandotte

Drought Warning counties: Allen, Anderson, Atchison, Brown, Chautauqua, Doniphan, Douglas, Elk, Ellis, Franklin, Greeley, Jackson, Jefferson, Lane, Leavenworth, Montgomery, Nemaha, Neosho, Ness, Rush, Russell, Scott, Trego, Wallace, Wichita, Wilson, Woodson

Drought Emergency counties: Barber, Barton, Butler, Chase, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Lincoln, Lyon, Marion, McPherson, Meade, Morris, Morton, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Saline, Sedgwick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Wabaunsee

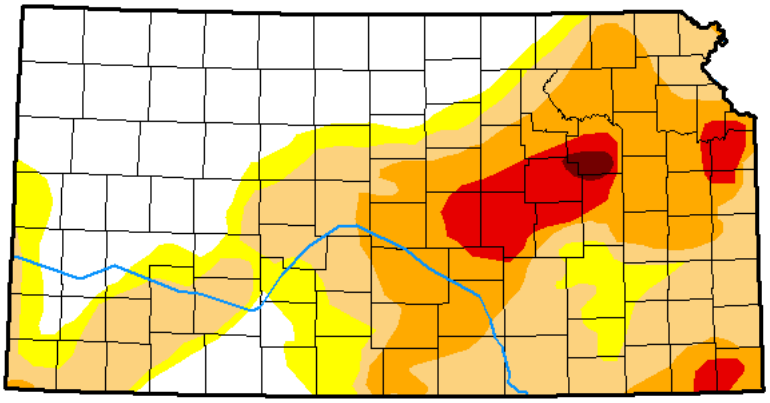
General Conditions

Continued rains resulted in some improvement in the U.S. Drought Monitor into July. Heavy rainfall the night of July 16 prevented the introduction of abnormal dryness in north-central Kansas, where some long-term precipitation deficits and groundwater shortages are present. Heavy rain the week ending July 17 in parts of central Kansas led to small areal improvements where severe and extreme drought conditions were present from the previous week. In areas that mostly missed the rain, short- and long-term deficits caused degradation of conditions. Exceptional drought was introduced in a small area of east-central Kansas, and extreme drought was introduced in the Kansas side of the Kansas City Metropolitan Area and in far southeast Kansas.

It is important to remember that these conditions, spotty rains and high temperatures have adversely affected many water supplies, pastures and crops in Kansas not fully reflected by the U.S. Drought Monitor.

U.S. Drought Monitor

Kansas



July 17, 2018

(Released Thursday, Jul. 19, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	33.78	66.22	53.48	25.48	6.01	0.41
Last Week *07-10-2018*	33.78	66.22	53.40	25.36	5.67	0.00
3 Months Ago *04-17-2018*	2.00	98.00	83.37	59.47	27.37	7.20
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *07-18-2017*	60.28	39.72	5.30	0.00	0.00	0.00

Intensity:

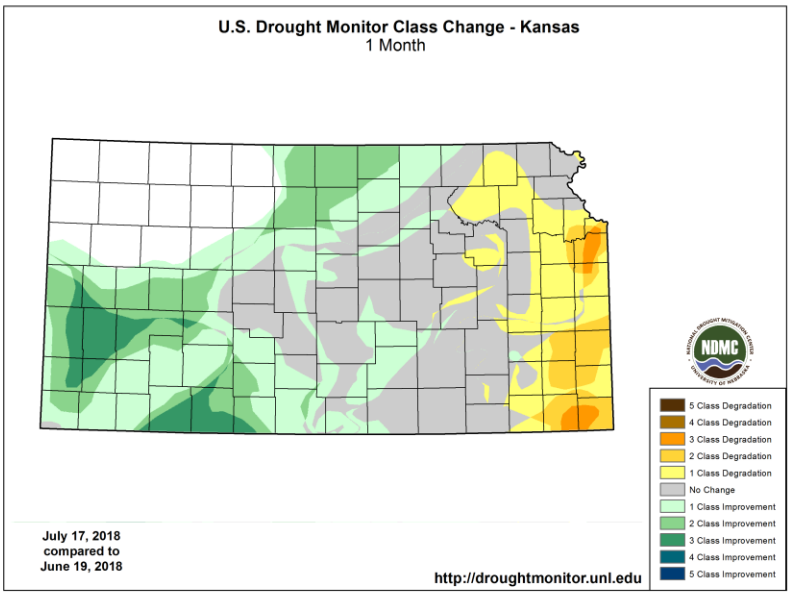
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Curtis Riganti
National Drought Mitigation Center

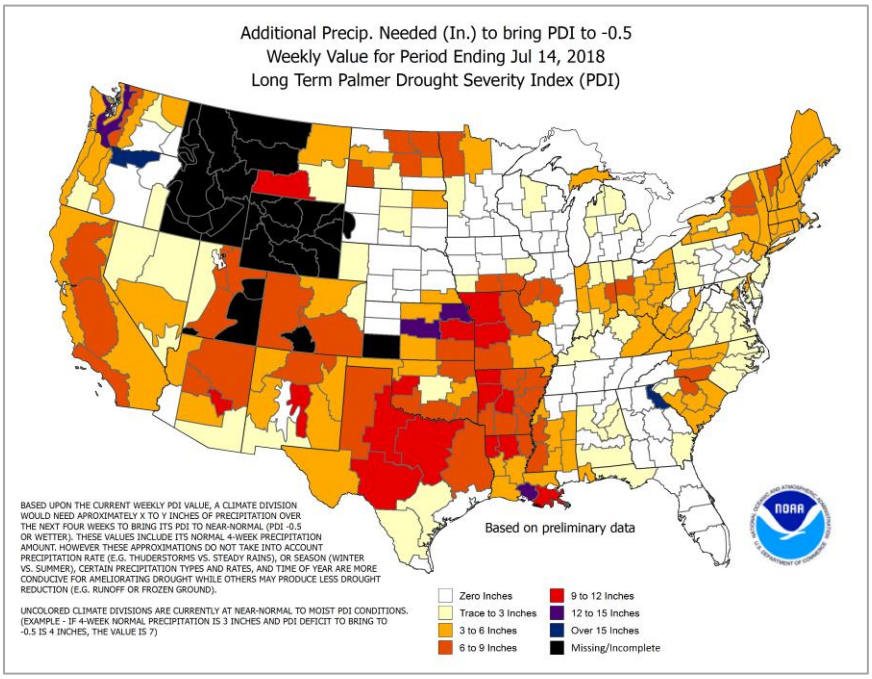
http://droughtmonitor.unl.edu/



Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.



Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	June 30	July 7	July 14
Northwest	-	-	-
North Central	1.4	2.58	3.56
Northeast	10.78	12.3	13.3
West Central	-	-	-
Central	10.74	11.85	12.70
East Central	7.77	9.32	10.74
Southwest	-	-	-
South Central	4.19	5.18	4.77
Southeast	3.57	5.27	6.44

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

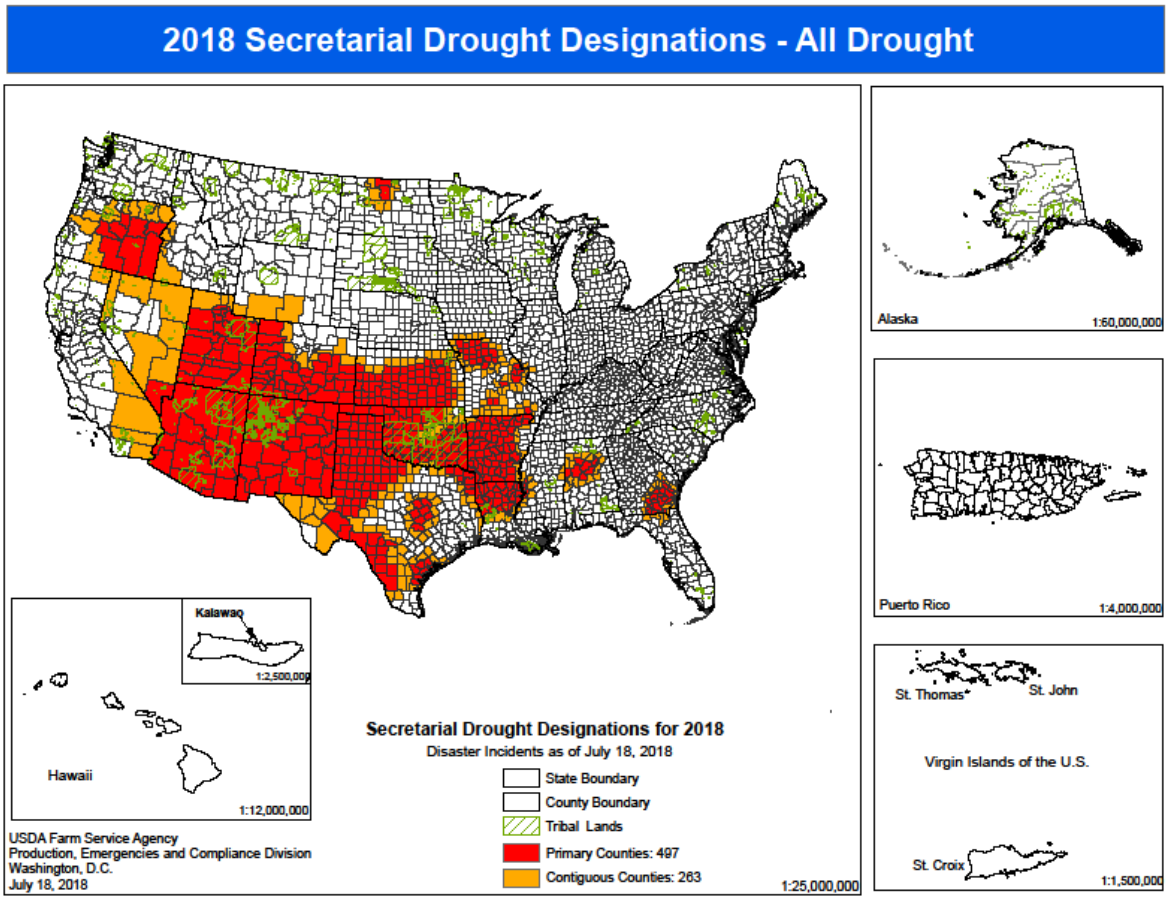
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

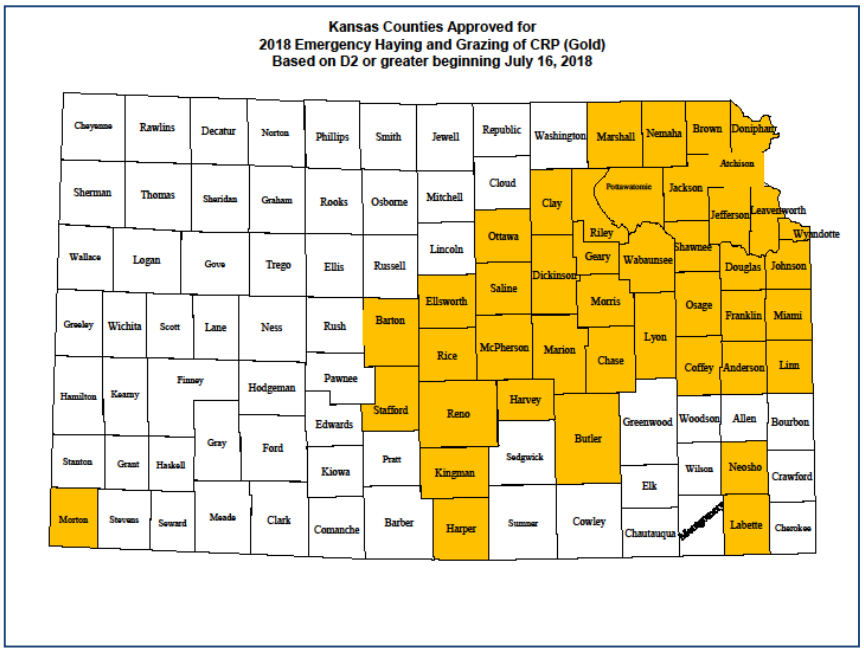
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 68 primary counties and 21 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Kearny, Kingman, Kiowa, Lane, Lincoln, Lyon, Marion, McPherson, Meade, Montgomery, Morris, Morton, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Wichita, Wilson and Woodson. Contiguous counties are Anderson, Atchison, Bourbon, Brown, Cloud, Crawford, Douglas, Franklin, Gove, Graham, Jefferson, Labette, Linn, Logan, Marshall, Mitchell, Nemaha, Osborne, Rooks, Sherman and Washington.



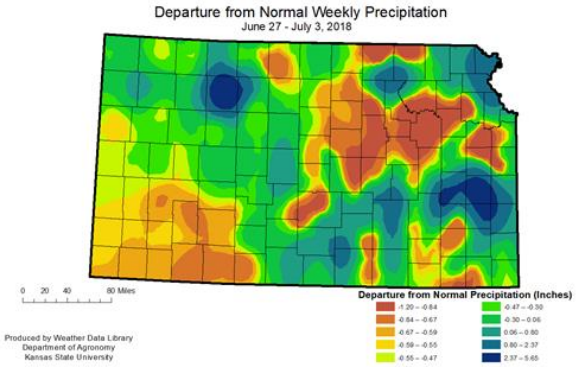
Haying and grazing of Conservation Reserve Program (CRP) acres is now authorized to provide emergency relief to livestock producers due to certain natural disasters. The USDA-FSA approved emergency haying and grazing on CRP acreages in the 44 counties in Kansas shown on the map on the right, beginning July 16, 2018, through September 30, 2018. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres. Interested producers should visit with their county offices as soon as possible to determine eligibility and receive approval.



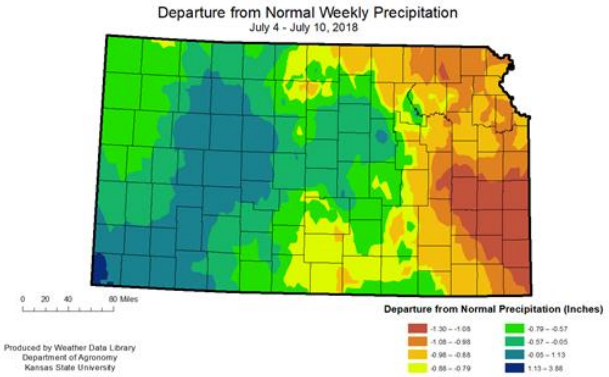
A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf

Climate Summary - Precipitation

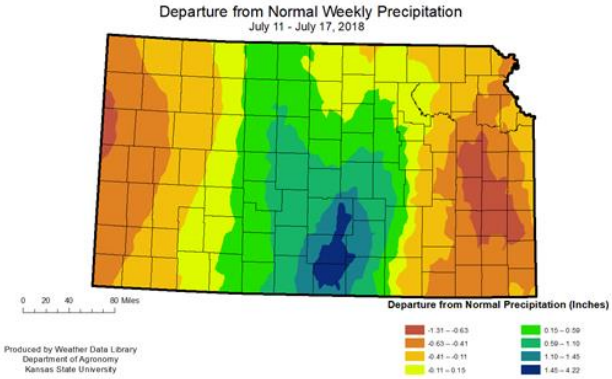
July 6- The Northwest Climate Division had the highest percent of normal with an average of 1.01 inches or 150 percent of normal. The Southwest Division came in with the lowest precipitation, with an average of 0.02 inches, or 2 percent of normal. Statewide average precipitation was 0.73 inches, which was 71 percent of normal and resulted in a deficit of 0.17 inches for the week. The highest precipitation total for a National Weather Service Coop station was 5.53 inches at Hill City 1E in Graham County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 3.15 inches at Garnett 0.4 NNE in Anderson County. The greatest total for a Kansas Mesonet station was 5.59 inches, at the Hill City station in Graham County.



July 13 - The Southwest Climate Division had the highest percent of normal with an average of 0.81 inches or 140 percent of normal. The East Central Division came in with the lowest precipitation, with an average of 0.02 inches, or 2 percent of normal. Statewide average precipitation was 0.38 inches, which was 50 percent of normal and resulted in a deficit of 0.50 inches for the week. The highest precipitation total for a National Weather Service Coop station was 4.42 inches at Richfield 10 WSW, Stanton County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 5.66 inches at Weskan 0.4 NNW, Washington County. The greatest total for a Kansas Mesonet station was 3.56 inches, at the Hays station in Ellis County.



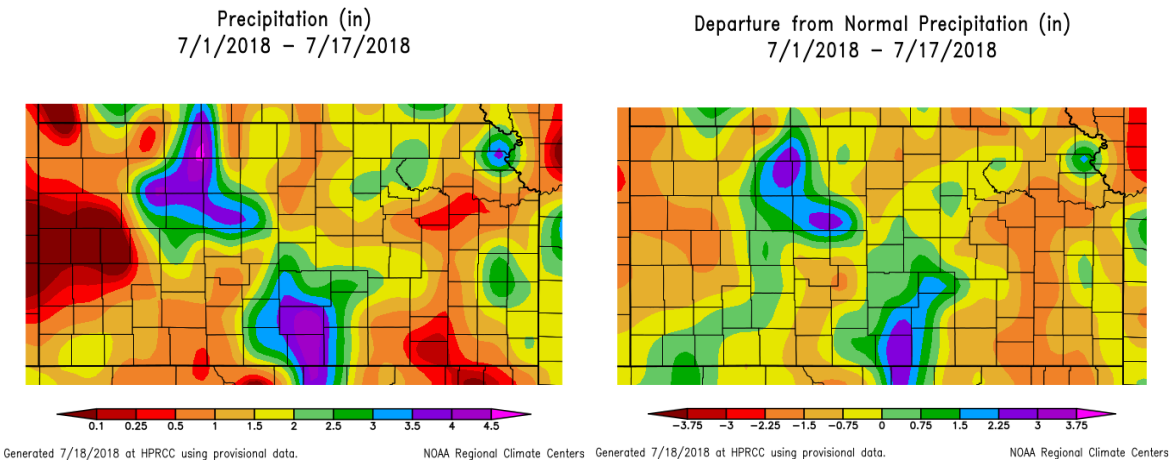
July 20- This week the rainfall was concentrated in the central third of the state as the three central divisions had greatest percent of normal. The South Central Division was the only division with above normal precipitation at an average of 1.24 inches or 145 percent of normal. The Central Division came very close to normal with an average of 0.88 inches or 96 percent of normal. The West Central Division came in with the lowest precipitation, with an average of 0.06 inches, or 7 percent of normal. Statewide average precipitation was 0.52 inches, which was 59 percent of normal and resulted in a deficit of 0.34 inches for the week. The highest precipitation total for a National Weather Service Coop station was 4.90 inches Norwich, Kingman County. The highest total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 4.56 inches at Pretty Prairie 3.3 NNW, Reno County. The greatest total for a Kansas Mesonet station was 2.93 inches, at the Viola station in Sedgwick County.



Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

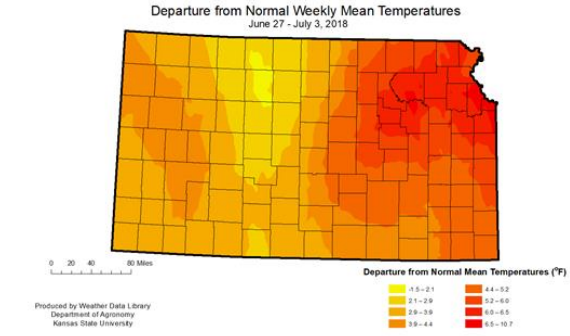
Kansas Climate Division Precipitation Summary (inches)												
Climate Division	July 11-17 , 2018			January 1-July 17 2018			April 1, 2017- July 17 , 2018			Sept. 1, 2017- July 17 , 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.07	-0.74	8	9.89	-2.67	78	8.87	-1.39	85	13.55	-3.49	78
West Central	0.06	-0.72	7	10.95	-1.11	89	9.92	0.36	101	15.58	-0.95	92
Southwest	0.38	-0.22	62	9.56	-1.89	83	9.01	-0.06	99	13.16	-2.75	83
North Central	0.65	-0.32	66	13.00	-3.24	80	11.44	-1.31	89	18.21	-4.76	79
Central	0.88	-0.03	96	11.63	-5.53	69	10.02	-3.19	77	16.46	-7.51	70
South Central	1.24	0.42	145	14.89	-3.67	80	12.89	-1.05	93	20.52	-5.90	77
Northeast	0.65	-0.37	62	12.78	-7.17	66	10.64	-5.11	70	17.49	-11.80	61
East Central	0.25	-0.77	24	12.28	-9.44	56	9.41	-7.39	56	17.86	-14.17	55
Southeast	0.31	-0.64	31	16.34	-7.71	68	12.20	-5.85	68	23.41	-12.72	64
STATE	0.52	-0.34	59	12.44	-4.62	74	10.56	-2.65	82	17.47	-6.98	73

Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

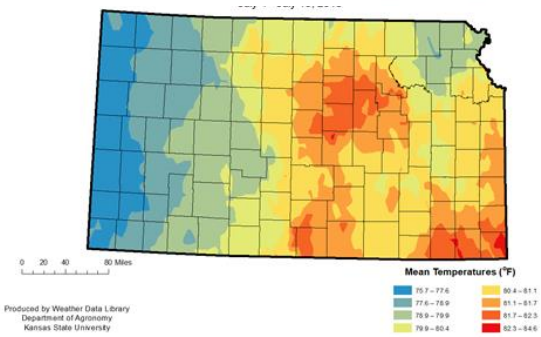


Climate Summary - Temperatures

July 6- Temperatures continued to be warmer than normal. The statewide average temperature was 80.8 °F, or 3.6 degrees warmer than normal. The East Central Division had the greatest departure from normal with an average of 81.9 °F, or 5.0 degrees warmer than normal. The Northwest Division came closest to normal, with an average of 77.3 °F or 2.0 degrees warmer than normal. The highest maximum temperature was 107 °F at Abilene 1W in Dickinson County on the 28th of June. The lowest minimum temperature was 41 °F at Plainville 4WNW, also on the 28th of June.

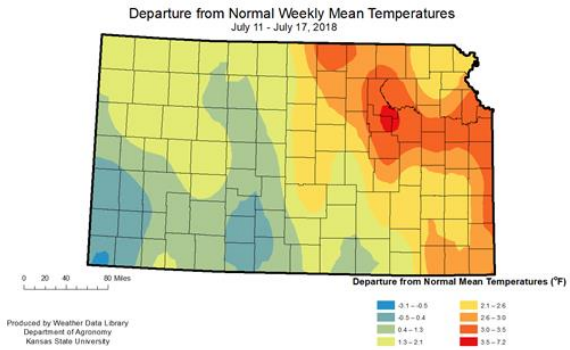


July 13 - Temperatures continued to be warmer than normal, although not to the level of last week. The statewide average temperature was 79.9 °F, or 1.7 degrees warmer than normal. The East Central Division again had the greatest departure from normal with an average of 80.5 °F, or 2.6 degrees warmer than normal. The Southwest Division came closest to normal, with an average of 78.3 °F, which was actually 0.2 degrees cooler than normal. The highest maximum temperature was 104 °F at Tuttle Creek Reservoir in Riley County on the 4th of July. The lowest minimum temperature was 49 °F at Marion Lake, Marion County,



on the 10th of July.

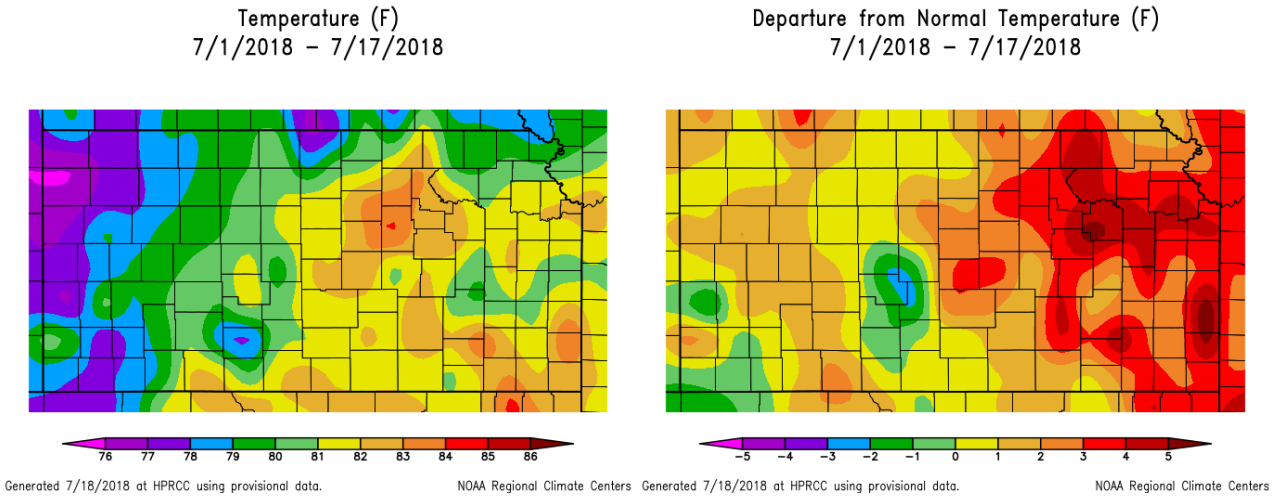
July 20-The greatest departure from normal temperatures were concentrated in Northeastern Kansas. The Northeast Climate Division averaged 83.4 °F, which was 5.3 degrees warmer than normal. In contrast, the Southwest Division came closest to normal with an average of 80.2 °F or 1.1 degrees warmer than normal. The statewide average temperature was 81.9 °F, or 3.0 degrees warmer than normal. The highest maximum temperature was 105 °F at the Manhattan Airport in Riley County on the 13th of July. The lowest minimum temperature was 55 °F at Brewster 4W, Thomas County, on the 11th of July.



Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	July 11-17 , 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	91.5	65.3	78.4	1.3	99	12	55	11
West Central	93.3	65.7	79.5	1.9	99	13	58	15
Southwest	94.0	66.4	80.2	1.1	99	16	61	13
North Central	94.2	70.9	82.6	3.3	102	13	62	11
Central	95.7	71.0	83.3	3.2	103	12	65	14
South Central	93.5	70.9	82.2	1.7	99	13	67	14
Northeast	95.3	71.4	83.4	5.3	103	13	67	15
East Central	95.0	72.0	83.5	4.9	102	13	68	15
Southeast	94.8	72.4	83.6	4.1	102	13	68	14
STATE	94.1	69.6	81.9	3.0	103	12th	55	11th
Data Source: KSU Weather Library								

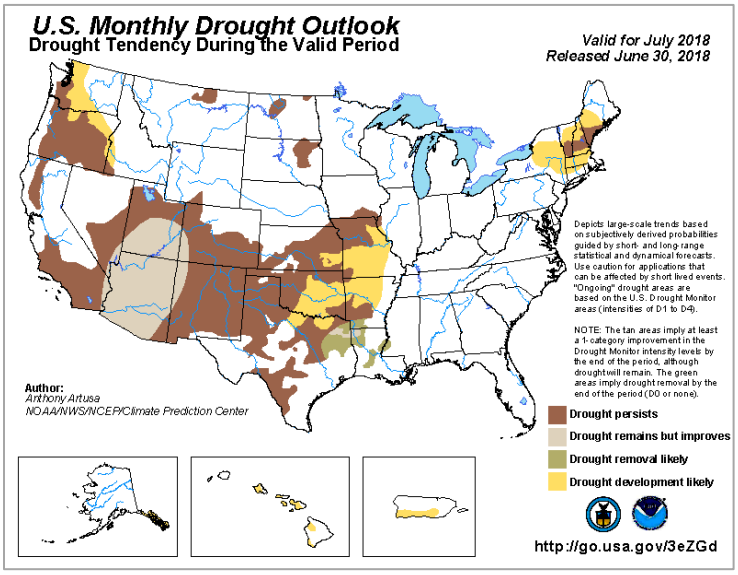
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

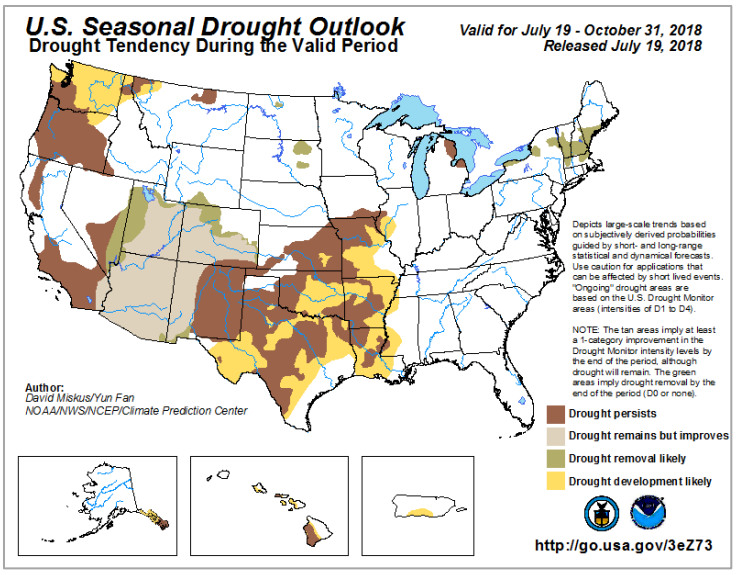


Future Outlook

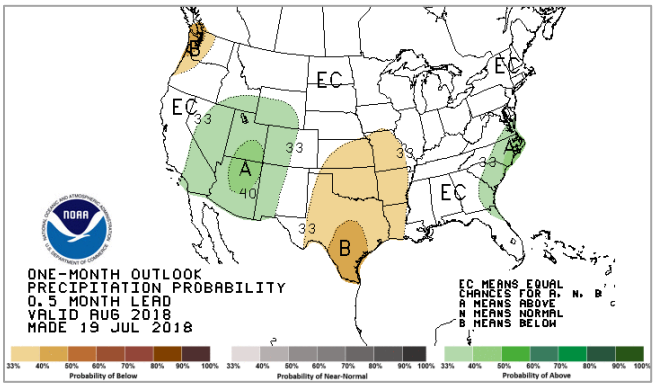
The Monthly Drought Outlook indicates drought conditions to remain in northeast, central and parts of southern Kansas. Improvement of drought conditions is possible in east central Kansas.

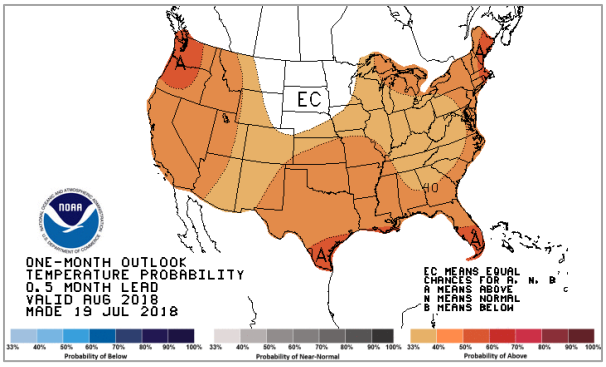
Seasonal Outlook (3-month) favors drought remaining but possibly improving across most of Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available for various intervals.



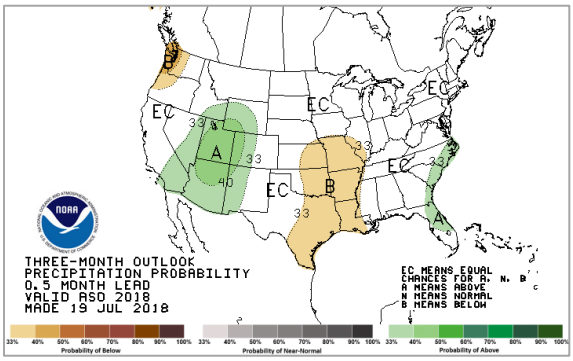


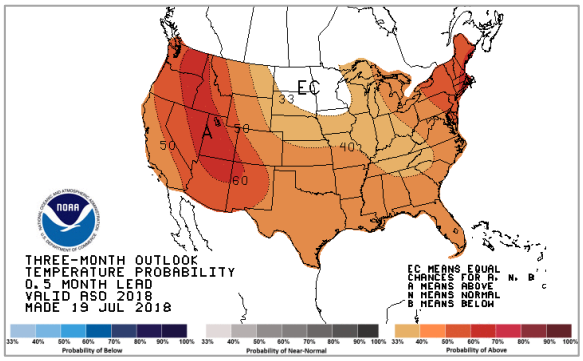
The one month climate outlooks favor above normal temperature and below normal precipitation and for almost all of Kansas in August.





The long-term, 3 month outlooks give equal chances of above or below normal precipitation in western Kansas and below normal precipitation in eastern Kansas. Above normal temperatures are favored for all of Kansas for August-September-October.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions
Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:
July 17, 2018 the **City of Gardner** Water Warning took effect. Mandatory restrictions focus on outdoor water use.

July 11, 2018 a water warning issued by **Public Wholesale Water Supply District #26** covers most of Chase County including the City of Strong City, Chase County Rural Water District #1, Public Wholesale Water Supply District #26, and the City of Cottonwood Falls. Voluntary and mandatory water restrictions are now in effect for water users obtaining water from these suppliers as well as domestic wells within the city limits of Strong City.

June 24, 2018, began water restrictions for the **City of Norton**. Watering only allowed between the hours of 6 p.m. and 10 a.m. on the designated day.(http://www.cityofnorton.com/CivicAlerts.aspx?AID=55)

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of June 29, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens not allowed between 10 am and 5 pm. (June 29, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ June 29, 2018)

Surface Water Supply Conditions
Kansas River basin: Inflow to Perry and Clinton reservoirs remains well below normal for July. The water stored in Milford and Tuttle from a mid-June runoff event brought levels up significantly, especially at Tuttle. Flooding conditions on the Missouri River are subsiding, allowing releases to resume from Tuttle and Milford. Prior to theses flood pool releases the Kansas River flow declined to the low flow Assurance District targets. Flows have improved significantly and will probably be maintained above median values for a few weeks.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs have maintained minimum gate settings in July and inflows are minimal. All reservoirs are experiencing a declining trend in July. Reservoir releases are necessary to supplement flow in the Marais des Cygnes River, especially in the upper system.

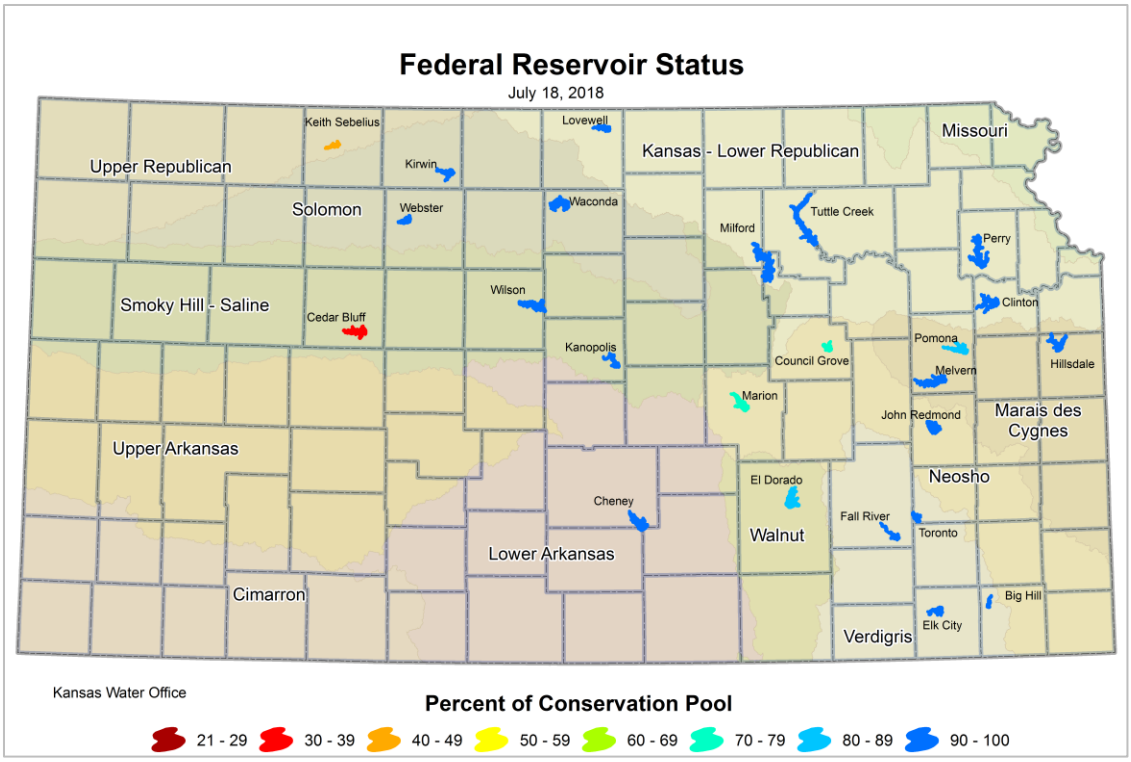
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were exceptionally low in June and continue to be in July. Conservation storage is nearly full in John Redmond but if current conditions persist it may decline 40% or more in the next few months. Releases from Marion and Council Grove continue to be necessary for streamflow and demand support, and are both experiencing a steady decline.

Verdigris basin: Inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs have been low in July but all are near or above conservation pool levels. Releases from Toronto, Fall River, and Elk City have been necessary to maintain flows in the Verdigris River.

Saline basin: The elevation at Wilson Lake continues to be maintained above normal pool in July.

Smoky Hill basin: The Smoky Hill River continues to benefit from somewhat abnormal precipitation events. Cedar Bluff Reservoir has experienced a net gain in storage so far this year, for the first time in several. Kanopolis Lake and the Lower Smoky Hill River started July in a somewhat marginal position for maintaining sufficient flow but inflow increased significantly by mid-month and storage is in pretty good shape.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**07/18/18 06:00 AM**		
Norton[1]	2304.3	2292.85	-11.45	43.4
Harlan County, NE	1945.73	1939.56	-6.17	75.6
Lovewell[1]	1582.6	1582.75	0.15	100.0
Milford[1]	1144.4	1145.06	0.66	100.0
Cedar Bluff	2144	2121.01	-22.99	35.4
Kanopolis[1]	1463	1465.85	2.85	100.0
Wilson[1]	1516	1517.14	1.14	100.0
Webster[1]	1892.5	1893.89	1.44	100.0
Kirwin[1]	1729.3	1730.10	0.85	100.0
Waconda[1]	1455.6	1455.55	-0.05	99.7
Tuttle Creek[1]	1075	1084.02	9.02	100.0
Perry[1]	891.5	889.57	-1.93	90.4
Clinton[1]	875.5	874.65	-0.85	94.9
Melvern[1]	1036	1033.85	-2.15	90.5
Pomona[1]	974	971.67	-2.33	84.3
Hillsdale[1]	917	915.84	-1.16	92.9
Arkansas River Basin		**07/18/2018 08:00 AM**		
Cheney	1421.6	1421.48	-0.12	100.0
El Dorado	1339	1334.82	-4.18	81.0
Toronto[1]	901.5	902.12	0.62	100.0
Fall River[1]	948.5	948.83	0.33	100.0
Elk City[1]	796	795.94	-0.06	100.0
Big Hill	858	857.50	-0.50	98.0
Council Grove[1]	1274	1270.35	-3.65	78.0
Marion[1]	1350.5	1347.50	-3.00	78.0
John Redmond[1]	1039	1040.96	-0.04	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur.

July 13, 2018- Public Health Warning is in effect (Kansas Department of Health and Environment issued) for: Atchison County Park Lake, Atchison County; Carbondale West Lake, Osage County; Central Park Lake (Pond), Shawnee County; Clarion Woods Park Lake, Shawnee County; Jerry Ivey Pond, Saline County; Lake Afton, Sedgwick County; Melvern Outlet Pond, Osage County; Melvern Outlet Swim Pond, Osage County, ***Closure (The present algae bloom is isolated to the Outlet Pond and Outlet Swim Pond; Melvern Lake is not affected.);*** Rooks County State Fishing Lake, Rooks County; and Webster Lake, Rooks County, ***with Beach Closure.***

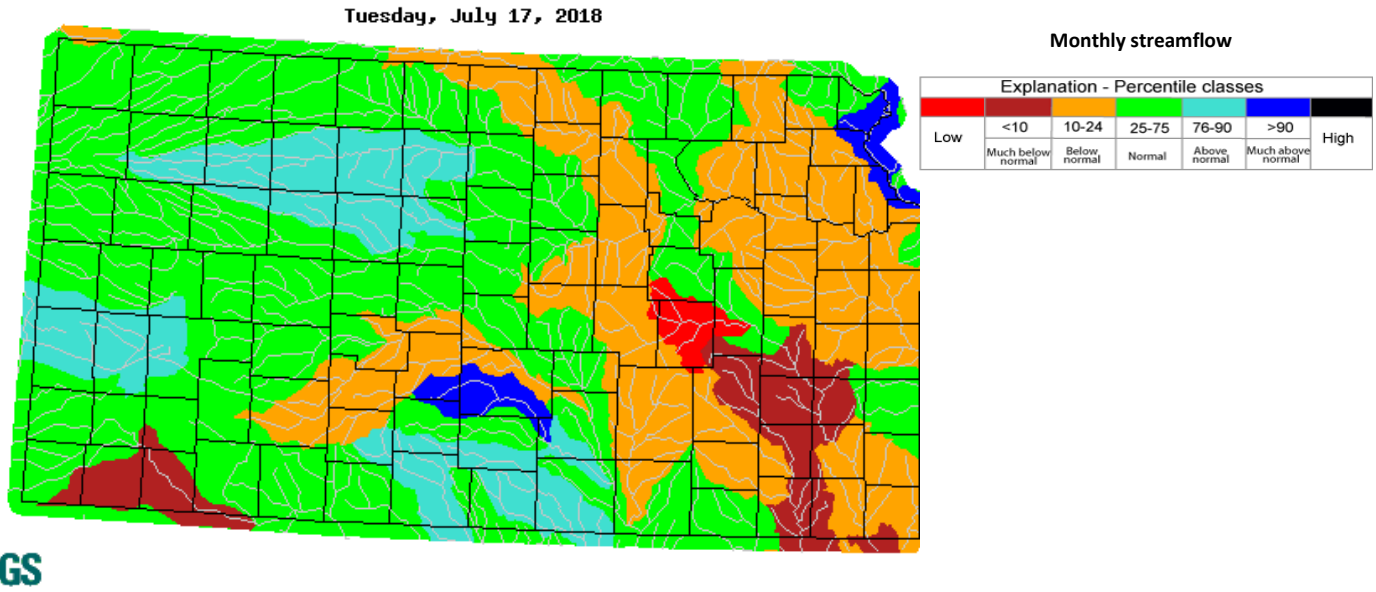
July 5, 2018-Public Health Warning is in effect (Kansas Department of Health and Environment issued) for Atchison County Park lake, Atchison County; Carbondale West Lake, Osage County; Clarion Woods Park Lake, Shawnee County; Melvern Outlet Pond and Melvern Swim Pond, Osage County; and Webster Lake, Rooks County due to the concentration of blue-green algae. Conditions are unsafe, no water contact should occur. The Beach at Webster Lake was closed.

July 5, 2018 – Public Health Watch in effect for Jerry Ivey Pond, Saline County.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region.

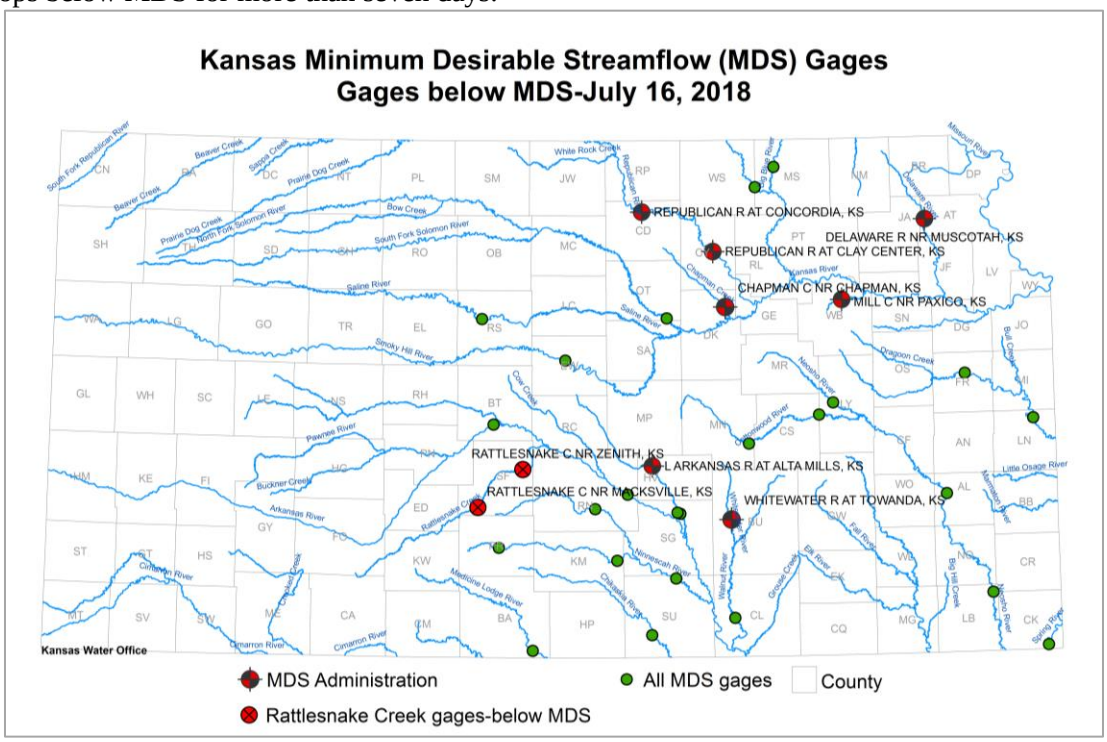
June 2018 average stream flow compared to historical is reflected in the map below.



In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

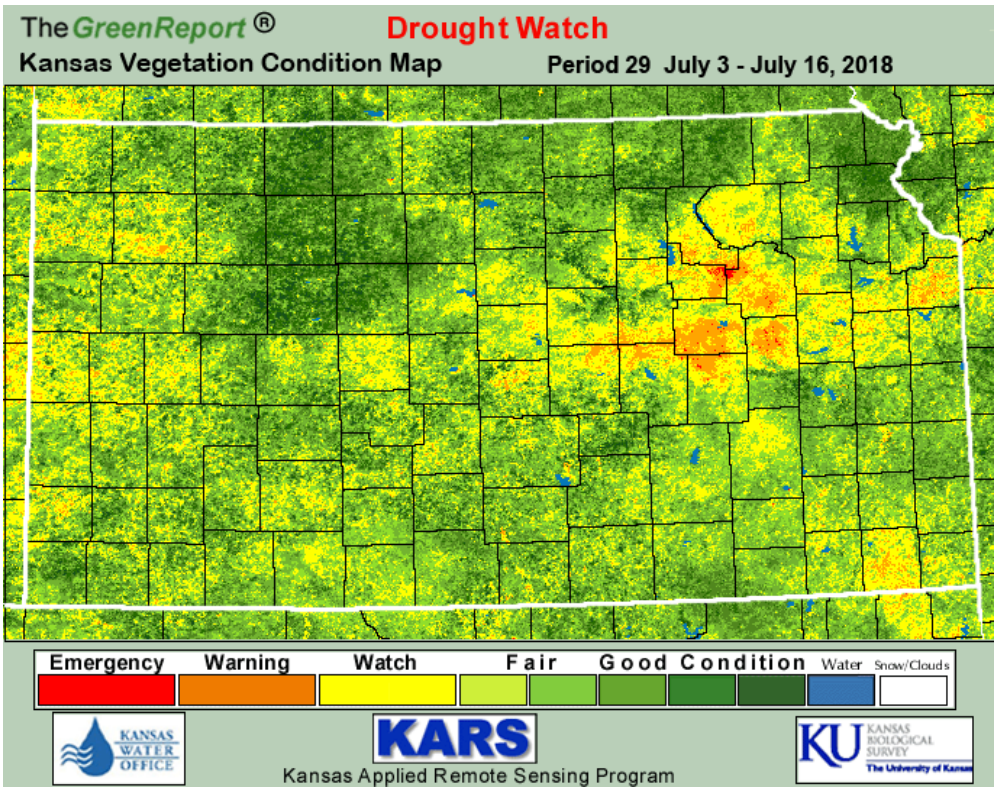


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since for some reason.

Streamflows as of July 16, 2018			
Gaging Station	**Current Flow**	**Jul MDS**	**Comment**
Republican River at Concordia	149	150	Admin began April 13, 2018
Republican River at Clay Center	247	200	Admin began April 13, 2018
Chapman Creek near Chapman	12	10	Admin began June 21, 2018 Above July 15, 2018
Little Blue River near Barnes	370	75	Admin ceased July 3, 2018
Mill Creek near Paxico	2	10	Admin began April 12, 2018
Delaware River near Muscotah	8	5	Admin began March 23, 2018 Above July 14, 2018
Marais des Cygnes near Ottawa	34	25	
Arkansas River at Great Bend	5	5	
Rattlesnake Creek near Macksville	Dry	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	Eqp	5	No surface water diversions junior to MDS above gage
Arkansas River near Hutchinson	104	80	
Little Arkansas River at Alta Mills	1.11	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	25	20	
South Fork Ninnescah River near Pratt	9	5	
Whitewater River near Towanda	7	10	Admin began April 12, 2018
Cottonwood River near Plymouth	48	20	
Neosho River near Iola	45	40	
Spring River near Quapaw, OK	249	200	

Soil, Crop and Vegetation

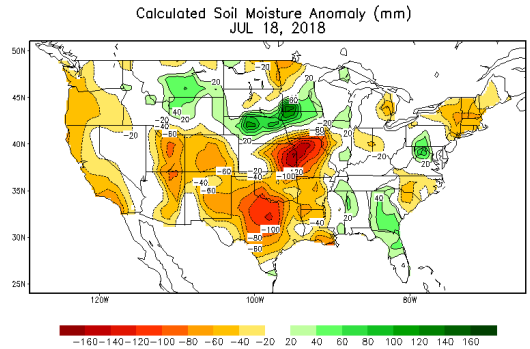
Vegetative Conditions

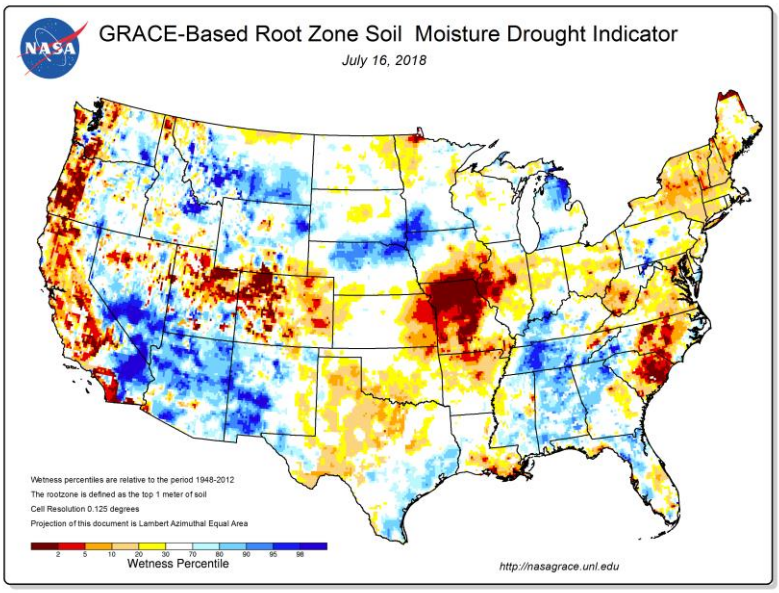


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

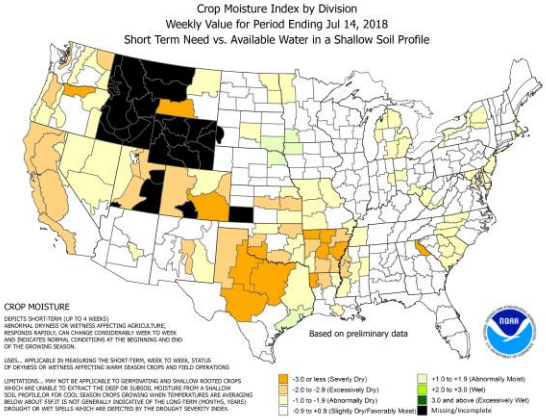
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending July 16, 2018 indicates topsoil moisture supplies rated 12 percent very short, 32 short, 54 adequate, and 2 surplus. Subsoil moisture supplies rated 11 percent very short, 35 short, 53 adequate, and 1 surplus.

Field Crops Report: Corn condition rated 6 percent very poor, 14 poor, 32 fair, 42 good, and 6 excellent. Soybean condition rated 3 percent very poor, 12 poor, 40 fair, 41 good, and 4 excellent. Sorghum condition rated 2 percent very poor, 5 poor, 34 fair, 54 good, and 5 excellent. Cotton condition rated 1 percent very poor, 3 poor, 33 fair, 56 good, and 7 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 8 percent very poor, 23 poor, 40 fair, 27 good, and 2 excellent.

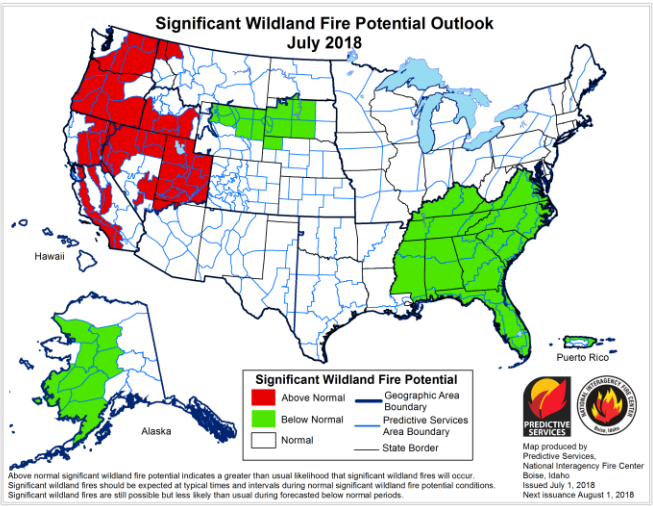
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

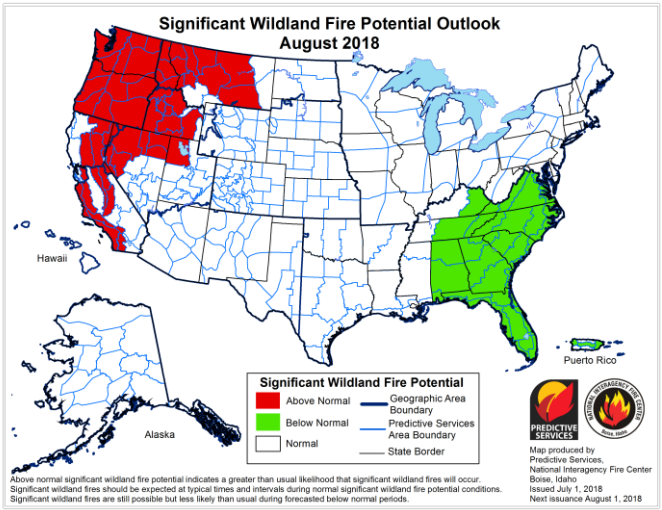


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE
July 2018 Summary

Highlights

- Executive Order 18-16 was issued July 6, 2016 adding 22 counties to Emergency Drought Declarations. The EO places 50 counties in emergency status, 27 into a warning status and 28 into a watch status.

- U.S. Drought Monitor has drought conditions improved in western and southern Kansas during the month as rains moved across some areas. However, the conditions in eastern Kansas deteriorated as moderate, severe, extreme and exceptional drought conditions expanded as the region continued to miss out on the rain events.

- Emergency Water for livestock has been requested in Chase, Greenwood, McPherson, Osage and Pottawatomi/Riley counties.

- Administration of MDS continued on seven streams in July: Little Arkansas River at Alta Mills has been since August 10, 2017; Republican River above the Clay Center and Concordia gages since April 13, 2018; Mill Creek above Paxico since April 12, 2018; Whitewater River above the gage near Towanda since April 12, 2018; Delaware River above the Muscotah gage since March 23, 2018; Little Blue River at the Barnes gage (20 permits or water rights) began June 1, 2018 but **ceased July 3**; and Chapman Creek at the Chapman gage (11 permits or water rights) began June 23, 2018.

- July 27, 2018 - Kansas Department of Health and Environment Public Health Warning or Watches were added for five lakes additional Kansas lakes. This includes three new warnings and two new watches for a total of 13 lakes in warning and four in watch due to the presence of harmful algae (HAB). T**he Beach at Webster Lake, Rooks County is closed**. A public health watch indicates water may be unsafe for humans and animal –contact is discouraged. A public health warning indicates contact with water should not occur it is unsafe.

- USDA Drought Disaster Designations as of July 25, 2018 have been made for 76 primary counties (up from 68) and 19 contiguous counties in Kansas. (Only 10 Kansas counties not designated.)

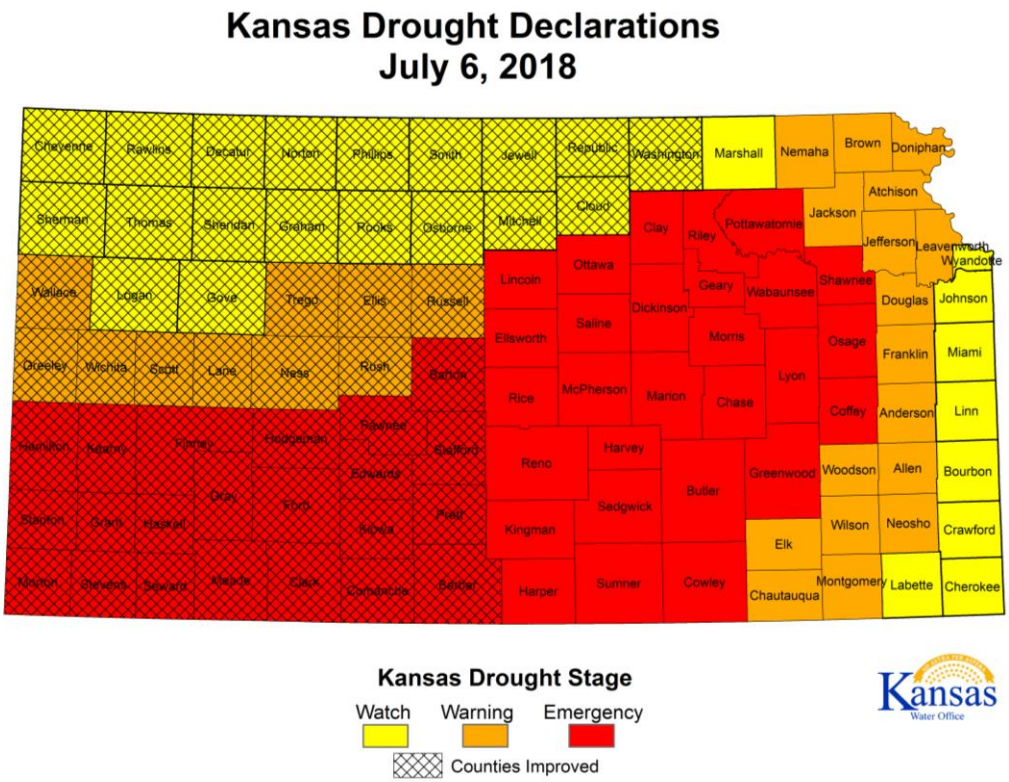
- USDA-FSA has approved Conservation Reserve Program (CRP) acreages 44 Kansas counties for haying and grazing through September 30, 2018. FSA must receive a written request to start the approval process. Emergency grazing has been authorized for CP25 by USDA through September 30, 2018 also. Emergency haying is not authorized for CP25 acres. Interested producers should visit with their county offices as soon as possible to determine eligibility and receive approval.

- Kansas Department of Agriculture-Division of Conservation is offering financial assistance for livestock water supply wells, pipeline and tanks installed after June 1, 2018, and before the announcement of the Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS on July 24, 2018 through the Livestock Water Supply Financial Assistance Initiative. Applications can be made through local conservation districts.

- NRCS is offering technical and financial assistance to producers in Kansas suffering from ongoing drought conditions. Drought recovery funding assistance is available through the Environmental Quality Incentives Program (EQIP) Drought Initiative for eligible landowners and producers in declared drought emergency counties to address livestock water shortages. Applications for assistance under the EQIP Drought Initiative are currently being accepted. The application evaluation cut-off period will be August 24, 2018 with contract funding to occur shortly after. Due to immediate need, applicants may apply for waivers to initiate necessary practices before contracts are funded.

July 6, 2018 Governor Orders Drought Declaration for all Kansas Counties - Executive Order 18-16

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-16. The declaration includes all 105 counties placing 50 counties in emergency status, 27 into a warning status and 28 into a watch status. These Drought Declarations remain in place until rescinded or replaced.



Drought Watch counties: Bourbon, Cherokee, Cheyenne, Cloud, Crawford, Decatur, Gove, Graham, Jewell, Johnson, Labette, Linn, Logan, Marshall, Miami, Mitchell, Norton, Osborne, Phillips, Rawlins, Republic, Rooks, Sheridan, Sherman, Smith, Thomas, Washington, Wyandotte

Drought Warning counties: Allen, Anderson, Atchison, Brown, Chautauqua, Doniphan, Douglas, Elk, Ellis, Franklin, Greeley, Jackson, Jefferson, Lane, Leavenworth, Montgomery, Nemaha, Neosho, Ness, Rush, Russell, Scott, Trego, Wallace, Wichita, Wilson, Woodson

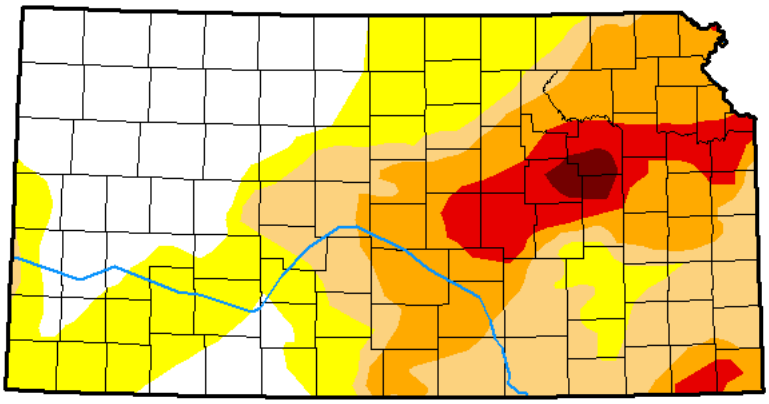
Drought Emergency counties: Barber, Barton, Butler, Chase, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Lincoln, Lyon, Marion, McPherson, Meade, Morris, Morton, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Saline, Sedgwick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Wabaunsee

General Conditions

July rains resulted in some improvement in the U.S. Drought Monitor. Above normal rain in the west brought improvements in the drought conditions there. Unfortunately, the lack of rain coupled with warmer temperatures resulted in expansion of the drought in the east. Exceptional drought reappeared, and extreme drought has shifted into Central and East Central Kansas. Currently, 28 percent of the state is drought free, while just under 1 percent is in exceptional drought conditions. It is important to remember that these conditions, spotty rains and high temperatures have adversely affected many water supplies, pastures and crops in Kansas and are not fully reflected by the U.S. Drought Monitor.

U.S. Drought Monitor

Kansas



July 31, 2018

(Released Thursday, Aug. 2, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	28.11	71.89	47.75	27.63	8.32	0.95
Last Week *07-24-2018*	28.04	71.96	53.51	26.25	7.69	0.95
3 Months Ago *05-01-2018*	3.10	96.90	84.88	59.47	27.16	7.20
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *08-01-2017*	50.42	49.58	4.83	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

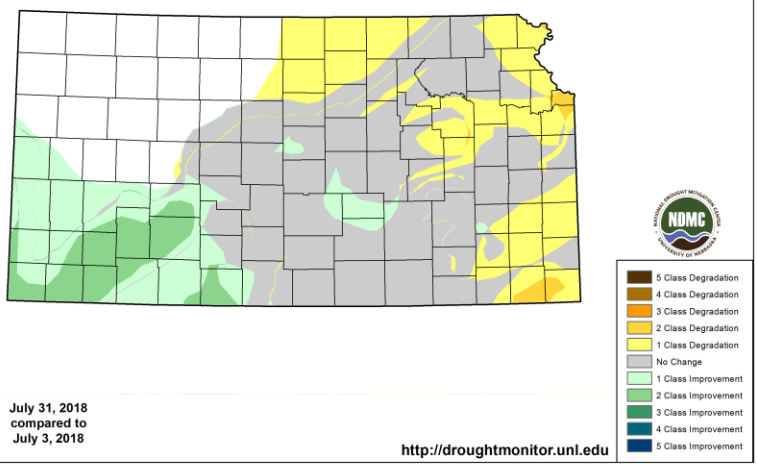
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Chris Fenimore
NCEI/NESDIS/NOAA

http://droughtmonitor.unl.edu/

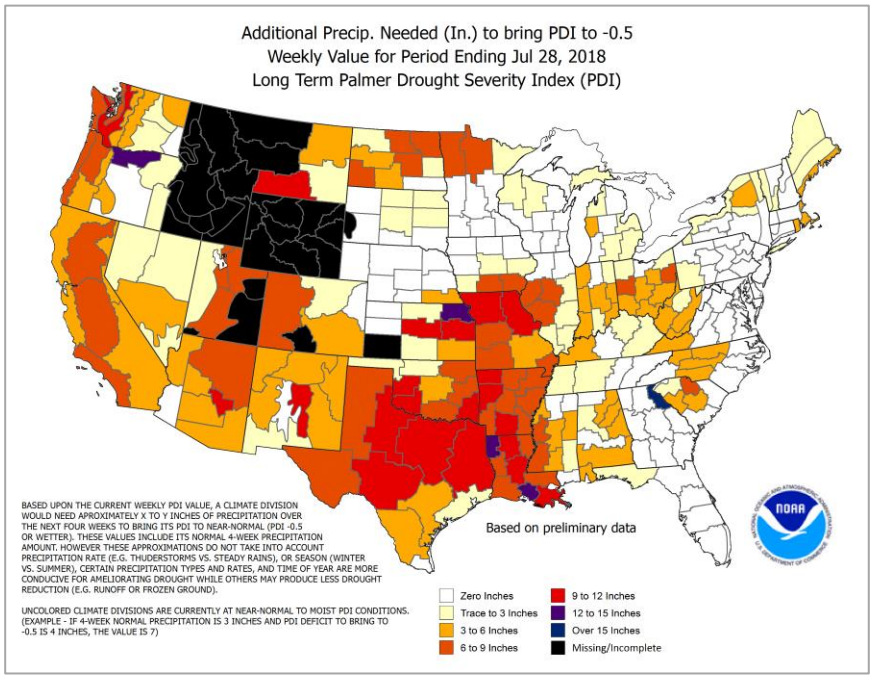
U.S. Drought Monitor Class Change - Kansas
1 Month



Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.



Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	July 21	July 28	
Northwest	-	-	
North Central	3.14	1.73	
Northeast	13.39	13.07	
West Central	-	-	
Central	11.56	10.57	
East Central	11.16	10.89	
Southwest	-	-	
South Central	5.0	1.81	
Southeast	6.55	5.75	

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Federal Disaster Drought Declarations 2018

Presidential Federal Disasters

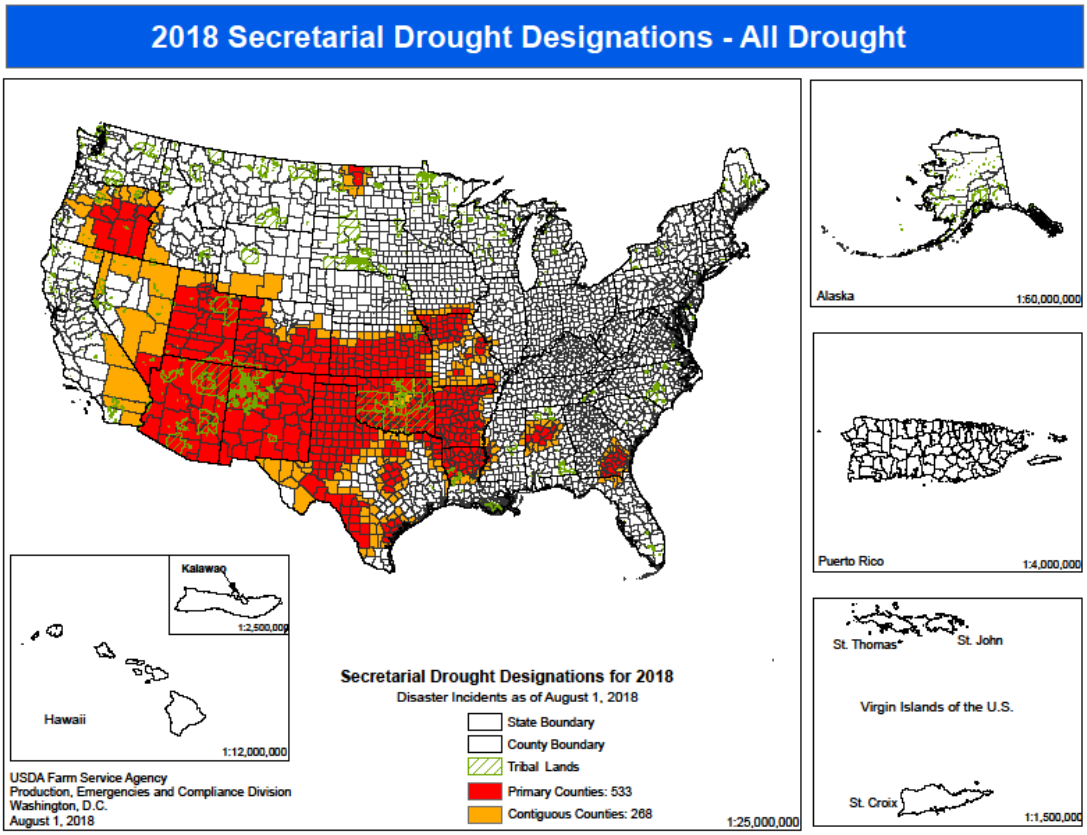
Presidential major disaster declarations must be requested of the President by a governor. A Presidential disaster declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

U. S. Department of Agriculture Drought Disaster

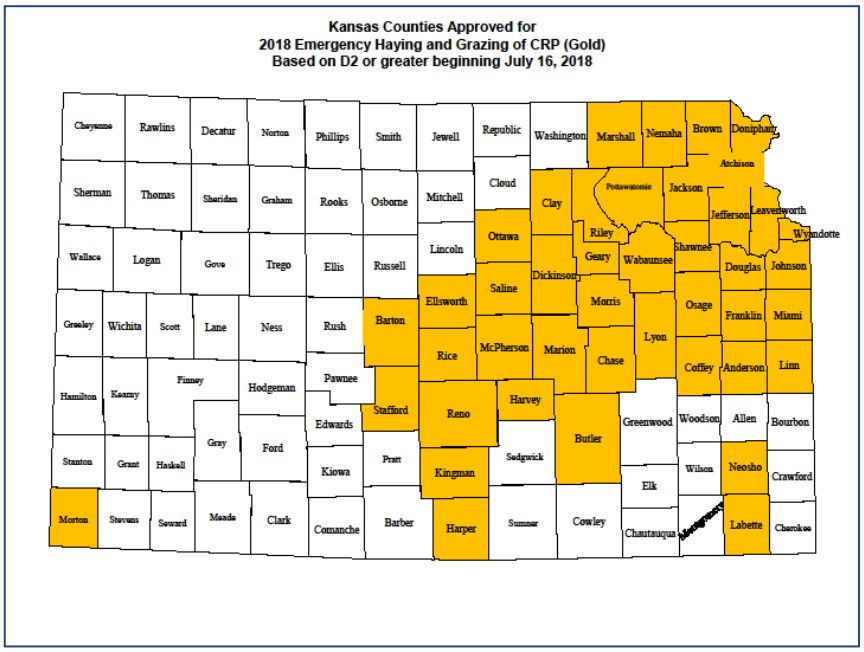
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

Designation may be through set process or using Fast Track Secretarial disaster designations for severe drought. Fast Track for drought provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor. Those in **bold** were added July 25, 2018.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 76 primary counties and 19 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, **Cherokee**, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, **Douglas**, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, **Franklin**, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, **Johnson,** Kearny, Kingman, Kiowa, **Labette,** Lane, **Leavenworth,** Lincoln, Lyon, Marion, McPherson, Meade, **Miami,** Montgomery, Morris, Morton, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Wichita, Wilson, Woodson and **Wyandotte**. Contiguous counties are Anderson, Atchison, Bourbon, Brown, Cloud, Crawford, Doniphan, Gove, Graham, Jefferson, Linn, Logan, Marshall, Mitchell, Nemaha, Osborne, Rooks, Sherman and Washington.



Haying and grazing of Conservation Reserve Program (CRP) acres is now authorized to provide emergency relief to livestock producers due to certain natural disasters. The USDA-FSA approved emergency haying and grazing on CRP acreages in the 44 counties in Kansas shown on the map on the right, beginning July 16, 2018, through September 30, 2018. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres. Interested producers should visit with their county offices as soon as possible to determine eligibility and receive approval.



A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf

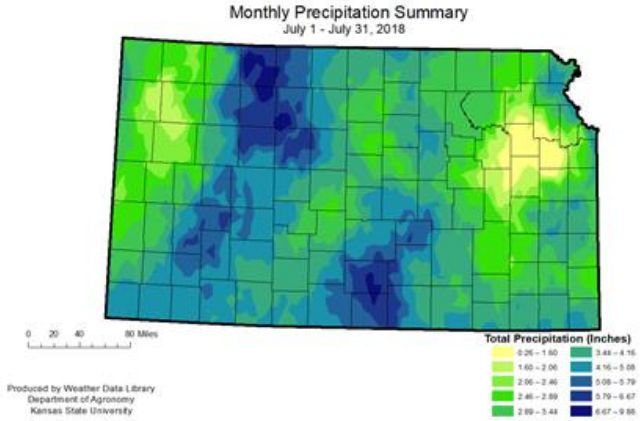
Climate Summary - Precipitation

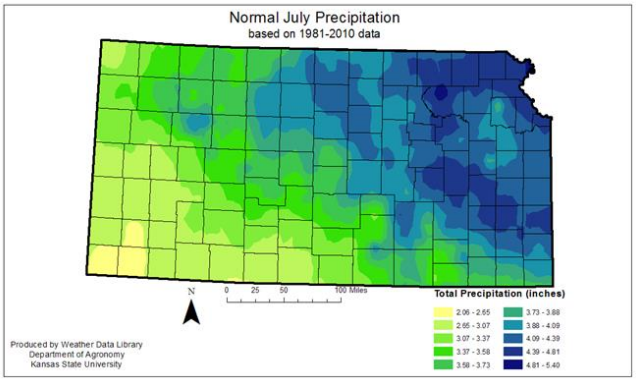
The July precipitation showed a split pattern, with the greatest rainfall totals in the western and central parts of the state. The state-wide average precipitation was 3.94 inches which was 110 percent of normal. The climate division with the largest surplus was the Southwest Division, with an average of 5.56 inches, or 205 percent of normal. During the last week of the month, 88 out of 106 reporting stations in the Southwest Division had 2 inches or more of precipitation, indicating a more general distribution than was the case in June. The East Central Division had the greatest shortfall, with an average of 2.20 inches creating a deficit of 2.10 inches. That translates to 50 percent of normal. The greatest monthly total for a National Weather Service Cooperative station was at Hill City 1E, Graham County, with 9.88 inches. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Pratt 1.6 SSE, Pratt County, with 10.06 inches on the 20th. Among the Kansas Mesonet stations, the Hill City station in Graham County had the greatest monthly total with 9.56 inches.

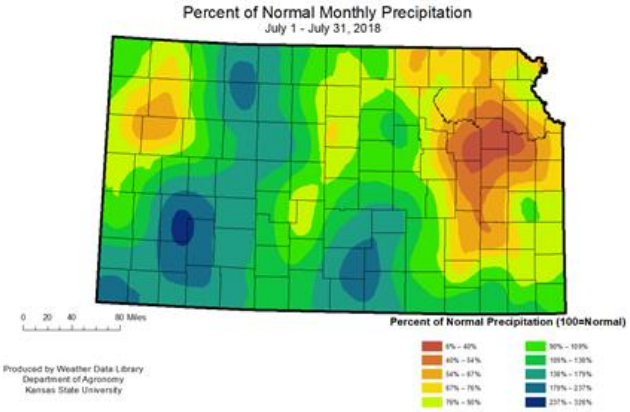
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

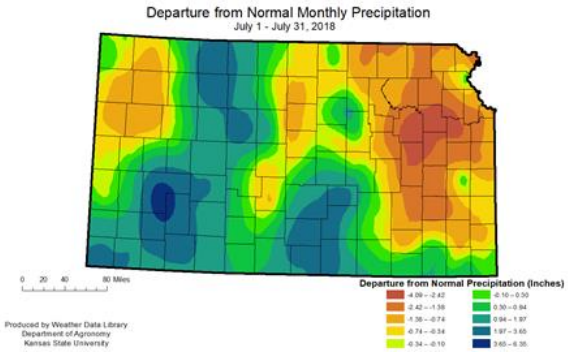
Kansas Climate Division Precipitation Summary (inches)

Climate Division	July 1-31 , 2018			January 1-July 31, 2018			April 1, 2017- July 31 , 2018			Sept. 1, 2017- July 31 , 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	3.20	-0.29	89	11.87	-2.29	82	10.85	-1.01	90	15.53	-3.10	82
West Central	3.80	0.36	109	13.70	0.01	99	12.67	1.48	112	18.33	0.17	100
Southwest	5.66	2.89	205	14.03	1.30	110	13.48	3.13	130	17.63	0.44	103
North Central	3.68	-0.43	90	14.92	-3.11	83	13.35	-1.19	92	20.13	-4.63	81
Central	4.36	0.42	110	13.97	-4.94	75	12.36	-2.60	84	18.80	-6.92	74
South Central	4.99	1.46	140	17.93	-2.10	89	15.92	0.51	104	23.56	-4.32	84
Northeast	3.05	-1.33	69	13.94	-7.83	66	11.79	-5.77	69	18.64	-12.46	61
East Central	2.20	-2.10	50	13.35	-10.16	56	10.48	-8.11	56	18.93	-14.90	55
Southeast	3.38	-0.69	83	18.64	-7.03	72	14.50	-5.17	73	25.72	-12.04	68
STATE	3.94	0.21	110	14.92	-3.75	82	13.03	-1.80	92	19.94	-6.12	79





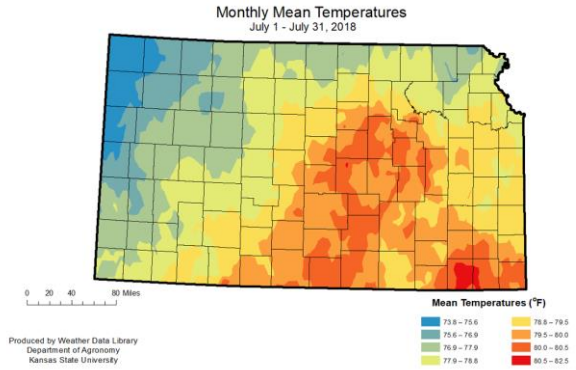


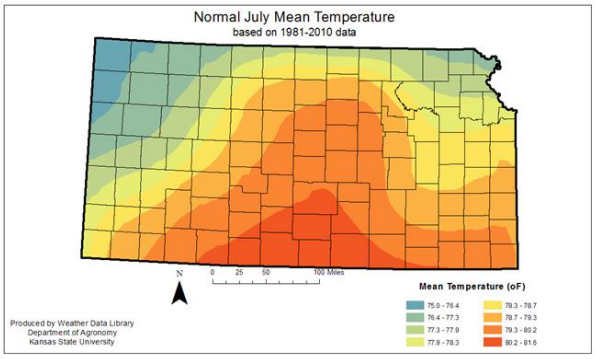


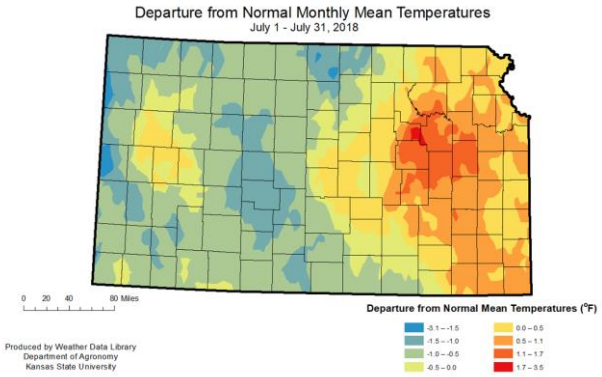
Climate Summary - Temperatures

July started on a warm note but ended with a cool pattern. State-wide average temperature for the month was 79.0 °F. This was just 0.4 degrees warmer than normal, and ranks as the 55th warmest since 1895. The East Central Division had the greatest departure with an average of 79.8 °F which was 1.4 degrees warmer than normal. The six divisions in the central and western parts of the state were all within a half a degree Fahrenheit of normal. The Northwest Division was the coldest with an average of 76.2 °F and a departure of -0.5 degrees. There were just 4 new record daily warm maximum temperatures and only 4 new daily record warm minimum temperatures. None of the daily records set new monthly temperature records for July. Similar patterns were seen on the cold side. There were 2 new record coldest maximums and 2 record coldest minimum temperatures. The warmest temperature reported during the month was 112 °F at Ashland, Clark County on the 26th. The coldest temperature reported during July was 42 °F, reported at Brewster 4W, Sherman County, on the 26th.Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	July 1-31 , 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	89.7	62.7	76.2	-0.5	100	19	42	27
West Central	91.7	63.6	77.6	0.3	105	20	54	1
Southwest	92.5	64.9	78.7	-0.2	112	21	51	31
North Central	90.7	67.0	78.8	-0.2	103	4	52	7
Central	92.6	67.6	80.1	0.3	104	3	55	27
South Central	91.6	68.9	80.3	-0.1	103	21	61	27
Northeast	90.6	67.2	78.9	1.0	103	13	46	22
East Central	91.5	68.0	79.8	1.4	102	13	56	27
Southeast	91.7	69.3	80.5	1.2	103	20	57	27
STATE	91.4	66.6	79.0	0.4	112	21st	46	22nd
Data Source: KSU Weather Library								





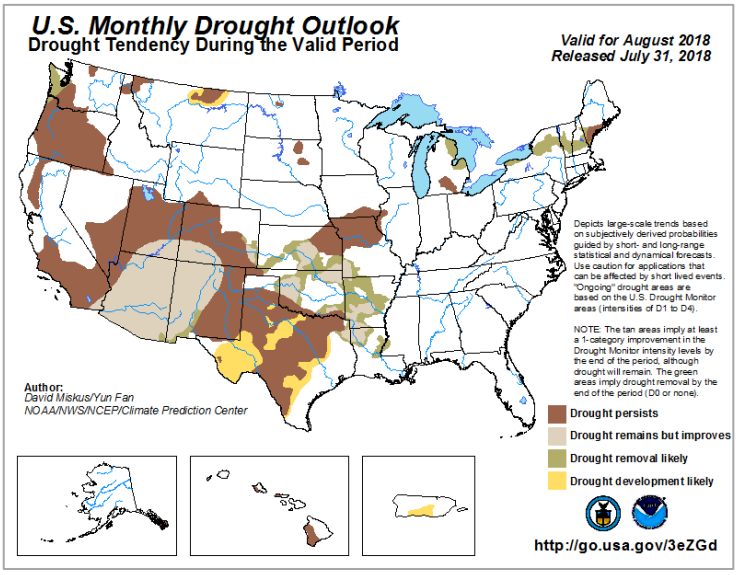


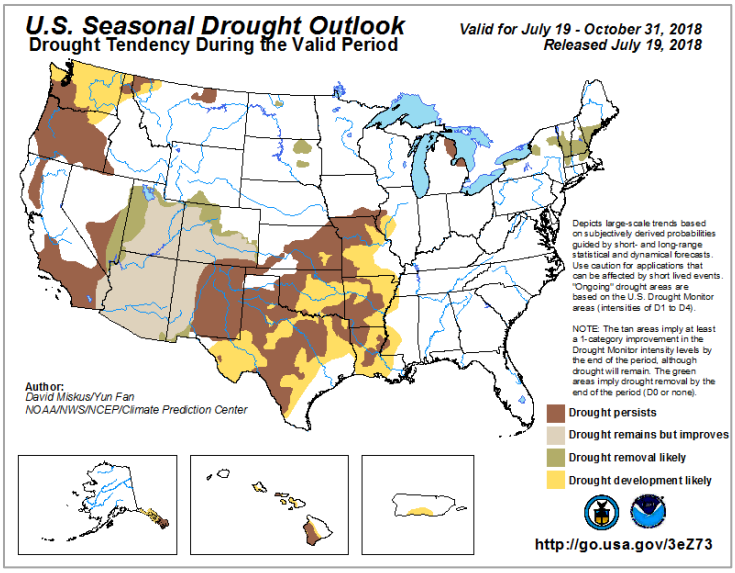
With the resurgence of moisture, severe weather reports during the month also increased. Tornado numbers continued on the low side with only 1 tornado reported. Unfortunately wind and hail caused significant damage. Complete damage estimates are not yet available. In one instance, storm damage contributed to a house explosion in Topeka. Several people were injured. Damage to the home was estimated at $150,000 with damage to neighboring homes at $100,000. Total storm reports: 1 tornado, 50 hail events, and 135 reports of damaging wind.

Future Outlook

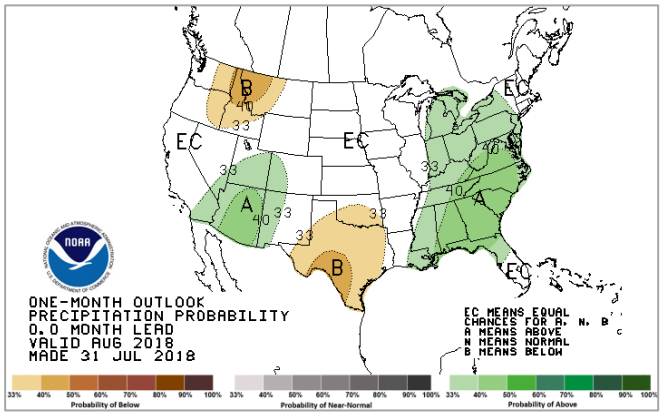
The Monthly Drought Outlook indicates drought conditions to remain in northeast Kansas. Improvement of drought conditions is possible in the remainder of Kansas.

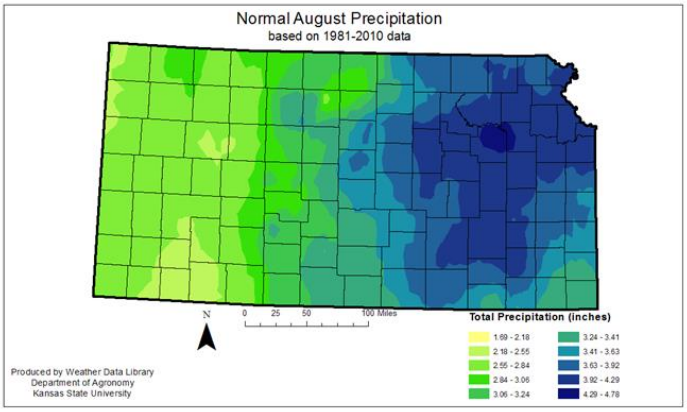
Seasonal Outlook (3-month) favors drought remaining but possibly improving across most of Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available for various intervals.

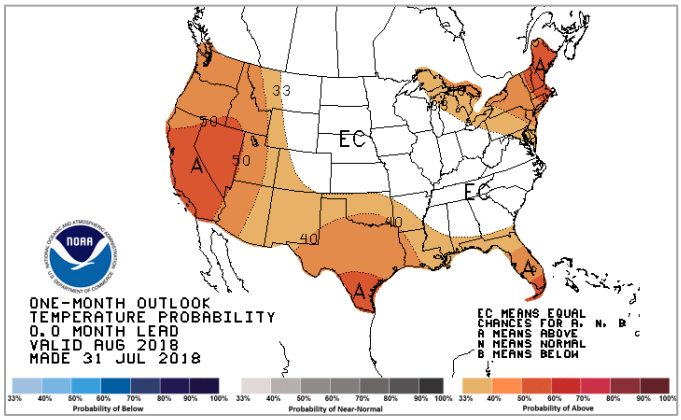


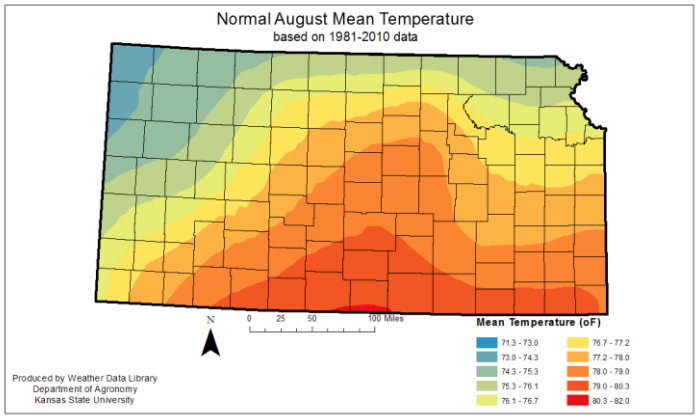


The one month, August, climate outlook favor equal chances of above or below normal temperature and precipitation for almost all of Kansas in August.

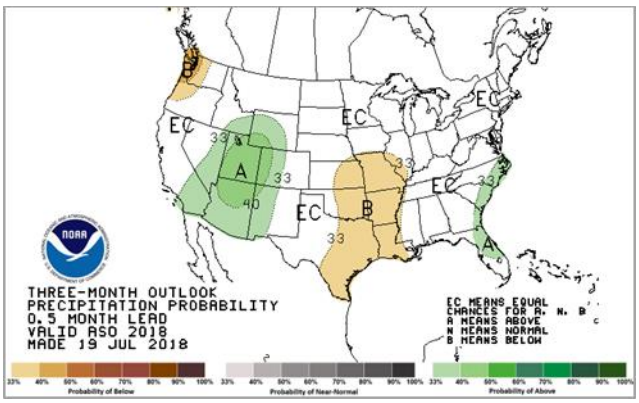


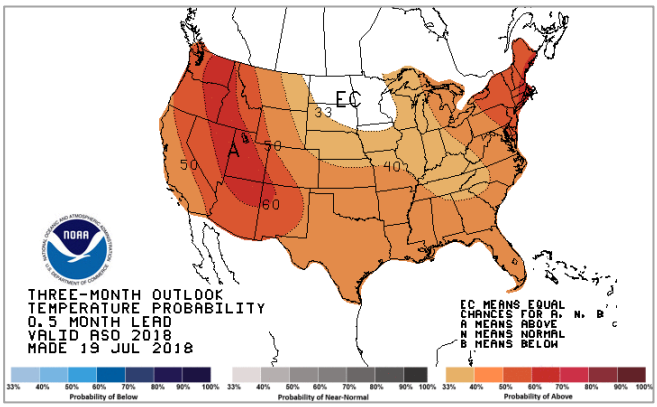






The long-term, 3 month outlooks give equal chances of above or below normal precipitation in western Kansas and below normal precipitation in eastern Kansas. Above normal temperatures are favored for all of Kansas for August-September-October.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

July 20, 2018 the **City of Gardner,** Johnson County Water Warning took effect. Mandatory restrictions focus on outdoor water use. (http://www.gardnerkansas.gov/Home/Components/News/News/304/16?backlist=%2f)

July 11, 2018 a water warning issued by **Public Wholesale Water Supply District #26** covers most of Chase County including the City of Strong City, Chase County Rural Water District #1, and the City of Cottonwood Falls. Voluntary and mandatory water restrictions are now in effect for water users obtaining water from these suppliers as well as domestic wells within the city limits of Strong City.

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of August 2, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens not allowed between 10 am and 5 pm. (August 2, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ August 2, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Perry and Clinton reservoirs remained well below normal for July and inflow declined significantly for Milford and Tuttle reservoirs. Flood pool releases from Tuttle and Milford began in mid-July and maintained the flow in the Kansas River above historic median values throughout the second half of the month. Clinton and Perry are below normal pool levels due to low inflow and abnormally dry conditions in the basin will be more apparent in the weeks to come.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs maintained minimum gate settings throughout July and inflows are negligible. All reservoirs experienced a declining trend in July. Reservoir releases are necessary to supplement flow in the Marais des Cygnes River, especially in the upper system. Additional releases from Melvern and Pomona will be necessary to meet Marais des Cygnes Water Assurance District demands in August. Storage supplies are somewhat depleted but sufficient and no municipal or industrial conservation measured have been implemented. There is a chance that some non-Assurance District water users (irrigation, recreation, etc.) will have their use restricted in the next few months.

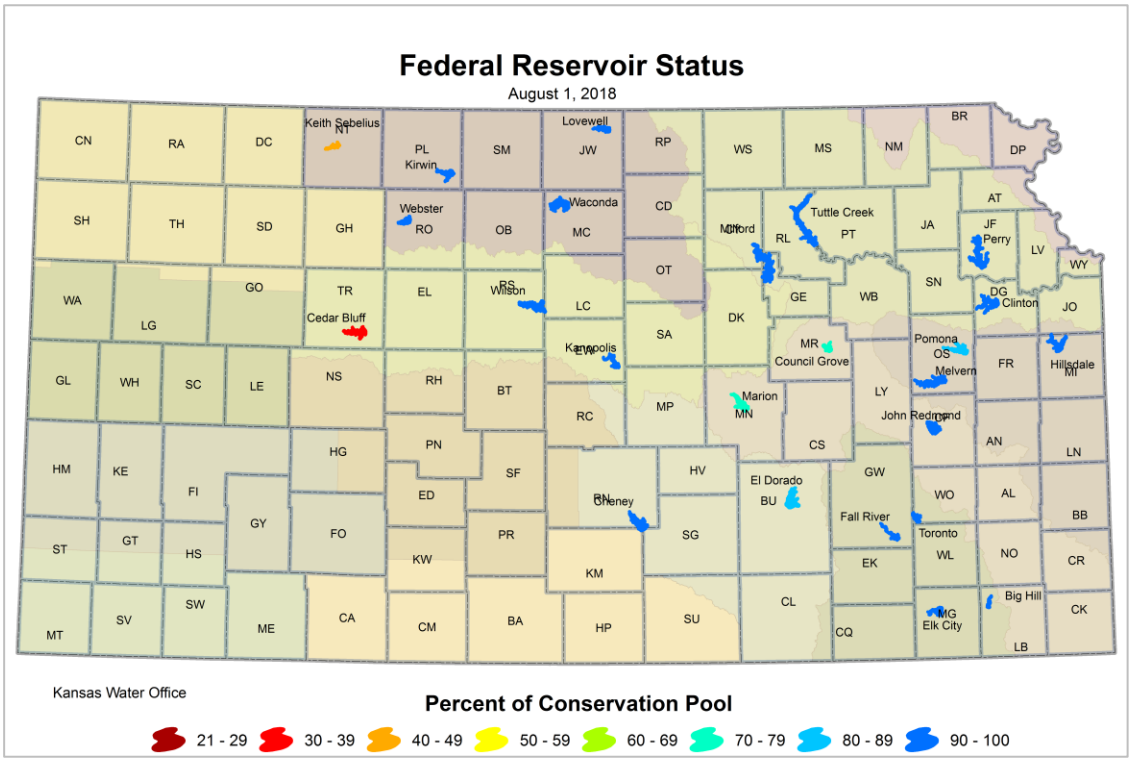
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were exceptionally low in July. Conservation storage is nearly full in John Redmond but if current conditions persist it may decline significantly in the next few months. Releases from Marion and Council Grove continue to be necessary for streamflow and demand support, and are both experiencing a steady decline. Potential implementation of conservation measures is being evaluated.

Verdigris basin: Inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs were relatively low in July but all remained near or above conservation pool levels. Releases from Toronto, Fall River, and Elk City were necessary to maintain flows in the Fall and Verdigris Rivers.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in July.

Smoky Hill basin: The Smoky Hill River continues to benefit from somewhat abnormal precipitation events. Cedar Bluff Reservoir has experienced a net gain in storage so far this year, for the first time in several. Kanopolis Lake and the Lower Smoky Hill River started July in a somewhat marginal position for maintaining sufficient flow but inflow increased significantly by mid-month and storage is in very good shape.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**08/01/2018 06:00 AM**		
Norton[1]	2304.3	2293.37	-10.93	45.4
Harlan County, NE	1945.73	1938.72	-7.01	72.6
Lovewell[1]	1582.6	1581.35	-1.25	89.9
Milford[1]	1144.4	1143.55	-0.85	96.5
Cedar Bluff	2144	2121.21	-22.79	35.8
Kanopolis[1]	1463	1467.00	4.00	100.0
Wilson[1]	1516	1516.96	0.96	100.0
Webster[1]	1892.5	1893.36	0.91	100.0
Kirwin[1]	1729.3	1729.98	0.73	100.0
Waconda[1]	1455.6	1455.62	0.02	100.0
Tuttle Creek[1]	1075	1075.37	0.37	100.0
Perry[1]	891.5	889.17	-2.33	88.5
Clinton[1]	875.5	874.28	-1.22	92.8
Melvern[1]	1036	1033.50	-2.50	89.1
Pomona[1]	974	971.37	-2.63	82.6
Hillsdale[1]	917	915.51	-1.49	91.1
Arkansas River Basin		**08/01/2018 08:00 AM**		
Cheney	1421.6	1421.54	-0.06	100.0
El Dorado	1339	1334.61	-4.39	80.0
Toronto[1]	901.5	901.76	0.26	100.0
Fall River[1]	948.5	948.39	-0.11	99.0
Elk City[1]	796	796.14	0.14	100.0
Big Hill	858	857.40	-0.60	98.0
Council Grove[1]	1274	1269.87	-4.13	75.0
Marion[1]	1350.5	1347.27	-3.23	76.0
John Redmond[1]	1039	1040.57	-0.43	95.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

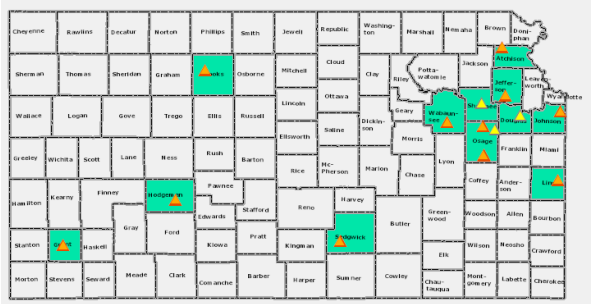
Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

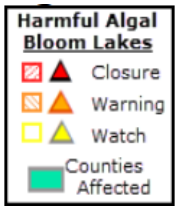
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

August 2, 2018- Public Health Warning was in effect (Kansas Department of Health and Environment issued) for: Atchison County Park Lake, Atchison County; Carbondale West Lake, Osage County; Frazier Lake, Grant County; Hodgeman County State Fishing Lake, Hodgeman County; Jerry Ivey Pond, Saline County; Lake Afton, Sedgwick County; Lake Wabaunsee, Wabaunsee County; Marais des Cygnes Wildlife Area Lake, Linn County; Melvern Outlet Pond, Osage County; Melvern Outlet Swim Pond, Osage County, ***Closure (The present algae bloom is isolated to the Outlet Pond and Outlet Swim Pond; Melvern Lake is not affected.);*** Perry Lake ***Zone B***, Jefferson County; South Park Lake, Johnson County; and Webster Lake, Rooks County, ***with Beach Closure.***

August 2, 2018 – Public Health Watch in effect for Mary's Lake, Douglas County; Overbrook City Lake, Osage County; and Rock Garden Pond; Shawnee County.



Location of Lakes Under Investigation for Harmful Blue-Green Algal Blooms (HAB) – August 3, 2018.
(https://maps.kdhe.state.ks.us/habkscounty/)



July 27, 2018- Public Health Warning was in effect (Kansas Department of Health and Environment issued) for: Atchison County Park Lake, Atchison County; Carbondale West Lake, Osage County; Frazier Lake, Grant County; Hodgeman County State Fishing Lake, Hodgeman County; Lake Afton, Sedgwick County; Lake Wabaunsee, Wabaunsee County; Marais des Cygnes Wildlife Area Lake, Linn County; Melvern Outlet Pond, Osage County; Melvern Outlet Swim Pond, Osage County, ***Closure (The present algae bloom is isolated to the Outlet Pond and Outlet Swim Pond; Melvern Lake is not affected.);*** Rooks County State Fishing Lake, Rooks County; Perry Lake ***Zone A***, Jefferson County; South Park Lake, Johnson County; and Webster Lake, Rooks County, ***with Beach Closure.***

July 27, 2018 – Public Health Watch in effect for Central Park Lake (Pond), Shawnee County; Mary's Lake, Douglas County; Overbrook City Lake, Osage County; and Rock Garden Pond; Shawnee County.

July 20, 2018- Public Health Warning was in effect (Kansas Department of Health and Environment issued) for: Atchison County Park Lake, Atchison County; Carbondale West Lake, Osage County; Frazier Lake, Grant County; Jerry Ivey Pond, Saline County; Lake Afton, Sedgwick County; Lake Wabaunsee, Wabaunsee County; Melvern Outlet Pond, Osage County; Melvern Outlet Swim Pond, Osage County, ***Closure (The present algae bloom is isolated to the Outlet Pond and Outlet Swim Pond; Melvern Lake is not affected.);*** Rooks County State Fishing Lake, Rooks County; South Park Lake, Johnson County; and Webster Lake, Rooks County, ***with Beach Closure.***

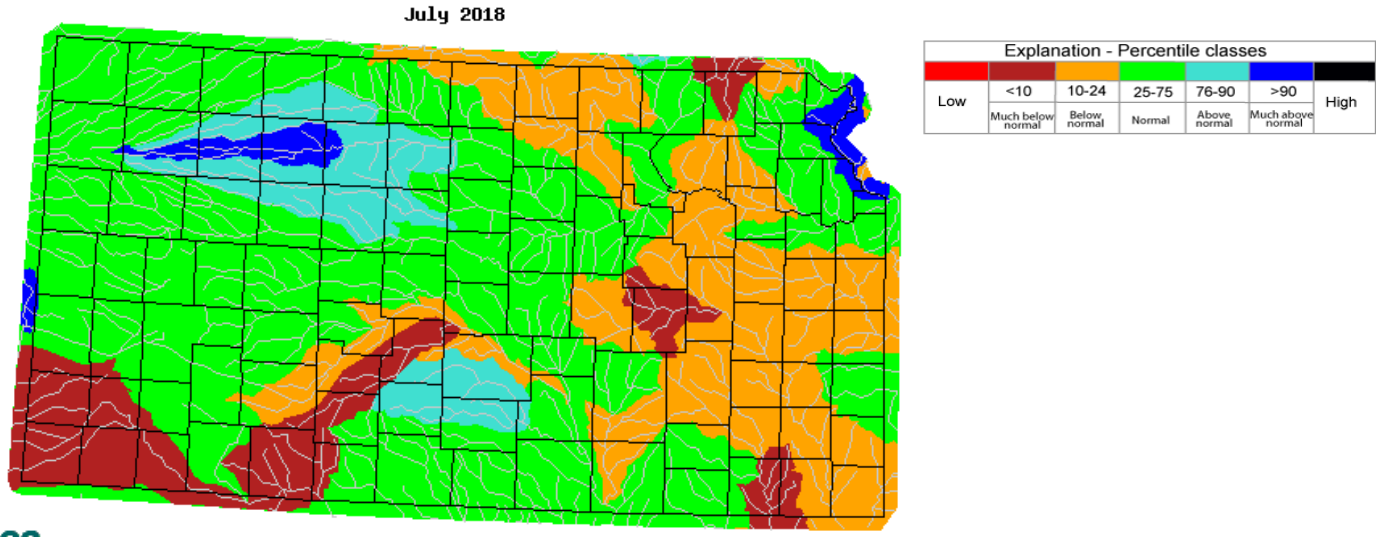
July 20, 2018 – Public Health Watch in effect for Central Park Lake (Pond), Shawnee County; Mary's Lake, Douglas County.

Farm ponds can develop blue-green algae which pose risk to livestock. K-State has information on this in the July 27, 2018 Agronomy Updates https://webapp.agron.ksu.edu/agr_social/eu_issue.throck?eu_id=292. The first article explains the basics and risk to livestock (https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1909) A second article discusses management and sampling of farm ponds (https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1910)

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a 7-day period or other timeframe.

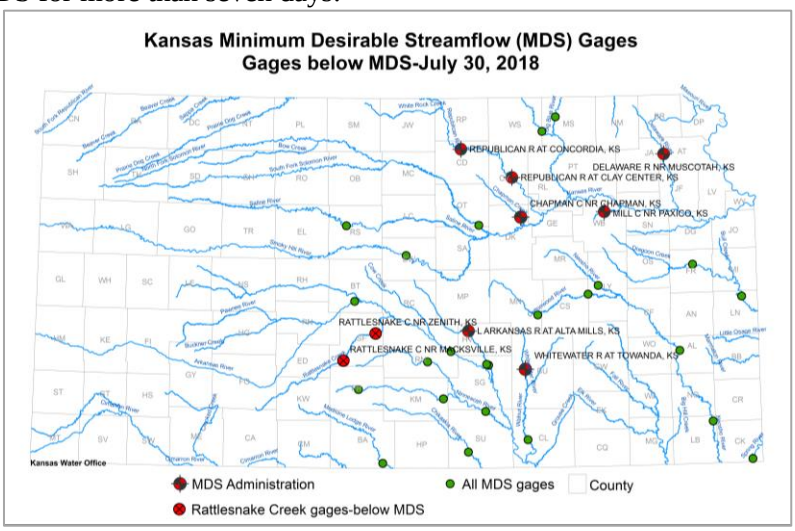
The July average streamflow compared to historical streamflow for the month of the year is reflected in the map below.



Low flows, when compared to historical records occurred in July 2018. Seven stream gage locations set record low 7-day streamflow averages, 17 tied low flows of zero. Appendix B provides details on these low flows such as locations and the streamflow averages.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

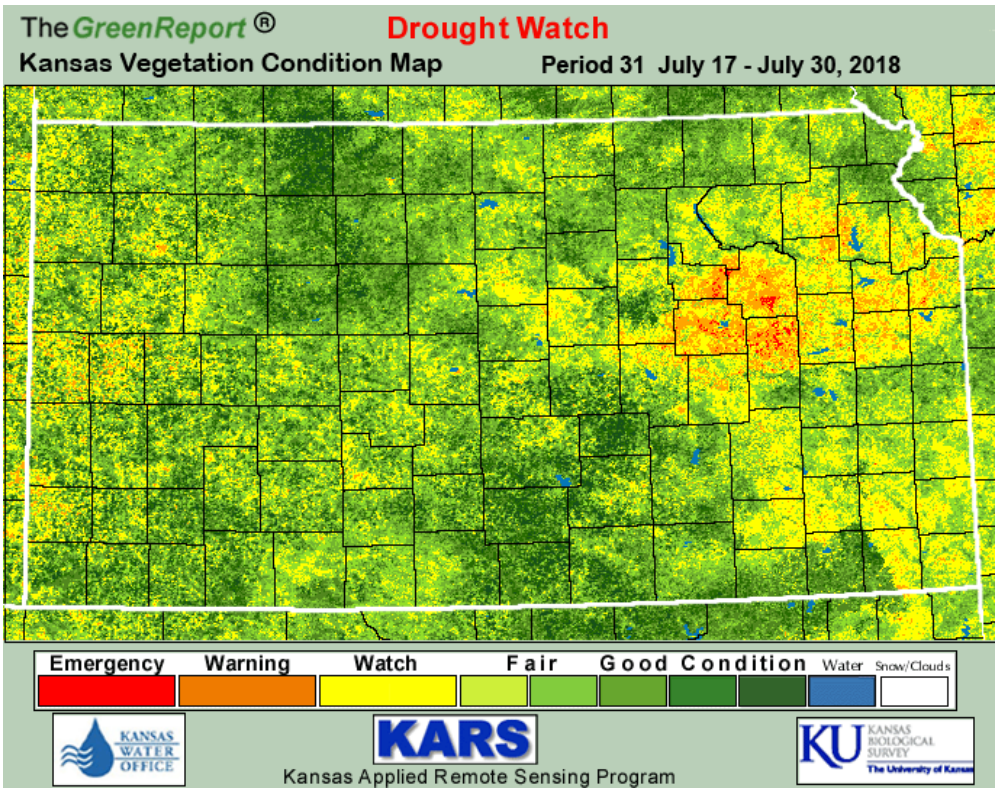


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since for some reason.

Streamflows as of July 30, 2018				
Gaging Station	**Current Flow**	**Jul MDS**	**Aug MDS**	**Comment**
Republican River at Concordia	134	150	150	Admin began April 13, 2018
Republican River at Clay Center	253	200	200	Admin began April 13, 2018 Above July 27, 2018
Chapman Creek near Chapman	15	10	10	Admin began June 21, 2018 Above July 26, 2018
Little Blue River near Barnes	79	75	80	**Admin ceased July 3, 2018**
Mill Creek near Paxico	2	10	5	Admin began April 12, 2018
Delaware River near Muscotah	11	5	3	Admin began March 23, 2018 Above July 29 ,2018
Arkansas River at Great Bend	7	5	3	
Rattlesnake Creek near Macksville	Dry	5	1	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	6	5	3	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	645	8	8	MDS admin began Aug 10, 2017 Above July 29, 2018
Whitewater River near Towanda	487	10	5	Admin began April 12, 2018 Above July 29, 2018
Neosho River near Parsons	73	50	50	
Spring River near Quapaw, OK	339	200	160	

Soil, Crop and Vegetation

Vegetative Conditions

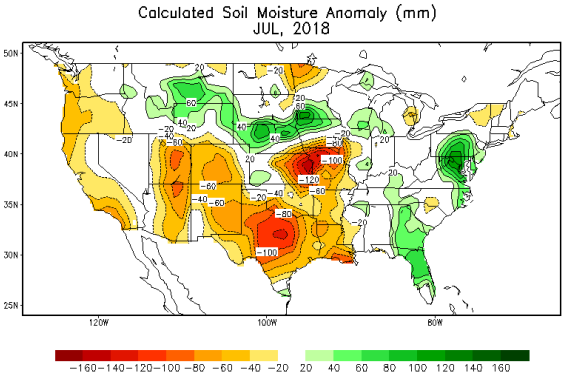


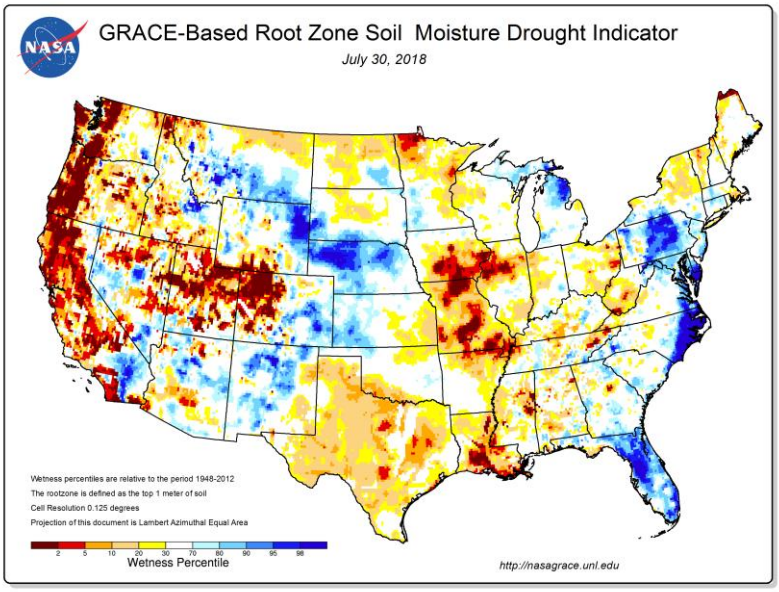
The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

The area of poor conditions remains in east-central Kansas. SE Kansas is showing some areas of conditions in the watch category. Most vegetation in the rest of the state is in good condition although it is reported that pastures are sparse in many locations across the state.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

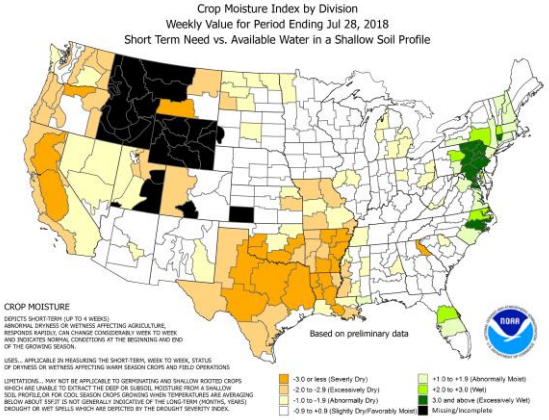
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending July 28, 2018 indicates topsoil moisture supplies rated 11 percent very short, 27 short, 60 adequate, and 2 surplus. Subsoil moisture supplies rated 11 percent very short, 29 short, 59 adequate, and 1 surplus.

Field Crops Report: Corn condition rated 8 percent very poor, 15 poor, 30 fair, 39 good, and 8 excellent. Soybean condition rated 6 percent very poor, 15 poor, 36 fair, 39 good, and 4 excellent. Sorghum condition rated 1 percent very poor, 5 poor, 31 fair, 56 good, and 7 excellent. Cotton condition rated 1 percent very poor, 3 poor, 35 fair, 50 good, and 11 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 12 percent very poor, 23 poor, 36 fair, 27 good, and 2 excellent.

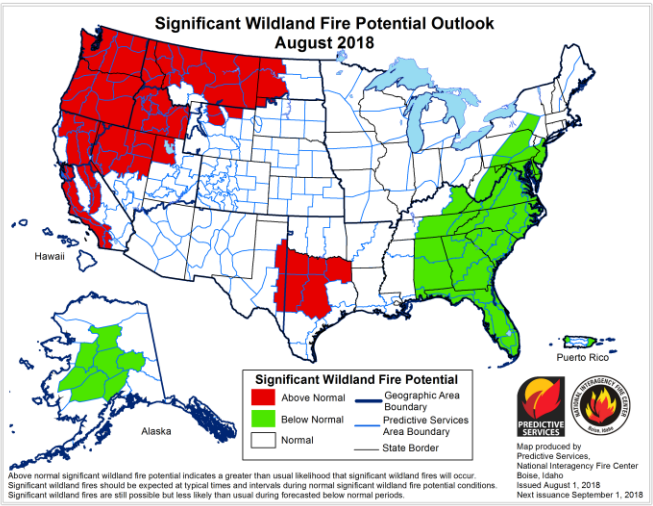
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

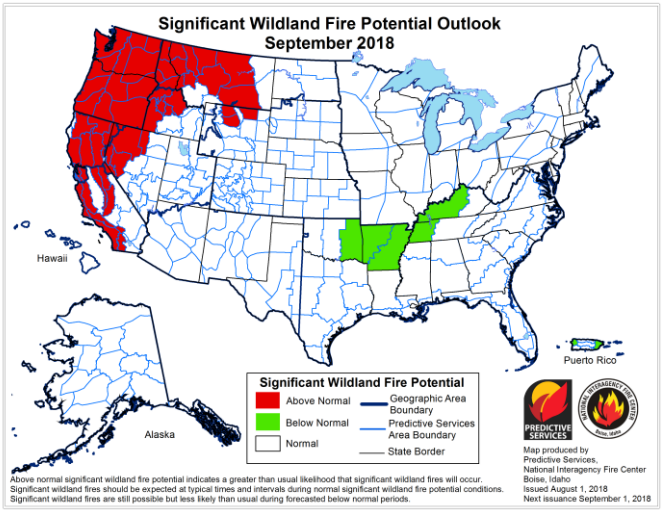


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

July 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	1.55	-1.58	50%	75.0	0.5	100 (19)	48 (31)
Dodge City	3.93	0.85	128%	79.4	-0.2	103 (20)	55 (31)
Garden City	9.13	6.35	328%	77.6	-0.6	102 (20,19)	54 (31)
Goodland	1.03	-2.44	30%	75.5	-0.2	100 (19)	50 (31)
Guymon, OK	1.37	-1.29	52%	80.0	0.4	110 (20)	53 (31)
Hill City	4.08	0.37	110%	78.4	-0.7	100 (12, 4)	55 (31)
Lamar, CO	1.05	0.08	108%	67.1	2.5	91 (19,22)	40 (2)
McCook, NE	6.61	3.36	203%	76.4	0.5	98 (12,11)	51 (31)
Springfield, CO	3.76	0.93	133%	75.2	-1.0	104 (20)	48 (31)
Central							
Concordia	2.55	-1.37	65%	77.3	-1.8	97 (12,3)	56 (31)
Hebron, NE	2.67	-1.46	65%	77.3	0.2	100 (12)	56 (31)
Medicine Lodge	5.17	1.79	153%	80.6	-1.5	99 (13,12)	58 (31)
Ponca City, OK	2.99	-0.34	90%	82.1	0.3	103 (19)	60 (31)
Salina	3.05	-1.24	71%	80.7	-0.5	101 (12,3)	59 (31)
Wichita (ICT)	4.59	1.27	138%	82.1	1.0	101 (19)	62 (31,30)
East							
Bartlesville, OK	3.34	-0.07	98%	80.3	-0.8	102 (19)	60 (8)
Chanute	3.24	-1.13	74%	80.3	0.8	98 (19)	58 (27)
Falls City, NE	1.21	-3.83	24%	76.7	-0.8	100 (12)	57 (25)
Johnson Co. Exec. Apt	3.27	-0.45	88%	78.6	0.3	99 (12)	61 (31)
Joplin, MO	2.06	-1.75	54%	80.7	0.5	102 (19)	58 (27)
Kansas City (MCI), MO	5.29	0.84	119%	78.9	0.6	100 (12)	59 (31)
St. Joseph, MO	1.10	-4.09	21%	77.2	0.1	98 (13,12)	55 (25)
Topeka (TOP)	0.49	-3.33	13%	80.3	1.3	101 (12,11)	57 (31)

1. Airport Automated Observation Stations (NWS/FAA)

2. Departure from 1981-2010 normal value

T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal

Source: National Weather Service F-6 Climate Summaries

Summary of Recent 7-day Average Flow Conditions
(2018-07-01 -- 2018-07-31)
["--", no data; ">", greater than all historical minimum values]

USGS station number	USGS station name	Drain. area [mi^2]	2018-07-01 to 2018-07-31 No. of days with zero flows	Lowest 7-day average flow Date	Stream flow [ft^3/s]	Rank	Historical annual minimum 7-day flows No. of years	Min. (year) [ft^3/s]	No. of years with zero flows
06893390	INDIAN C AT STATE LINE RD, LEAWOOD, KS	64.17	0	2018-07-13	13.2	1	15	15.6 (2008)	0
06878600	LYON C NR JUNCTION CITY, KS	258.00	0	2018-07-23	0.36	1	7	1.07 (2012)	0
07182260	COTTONWOOD R AT EMPORIA, KS	1833.00	0	2018-07-16	18.8	1	4	44.7 (2014)	0
06891850	STRANGER C AT EASTON, KS	216	0	2018-07-28	2.04	1	3	3.64 (2016)	0
07144050	EMMA C AT SEDGWICK, KS	173.6	0	2018-07-08	0.12	1	3	1.21 (2015)	0
06892518	KANSAS R NR LAKE QUIVIRA, KS	59985.00	0	2018-07-15	1270	1	2	1700 (2016)	0
07179785	NF COTTONWOOD R NR DURHAM, KS	103.00	0	2018-07-10	0.05	1	2	2.23 (2017)	0
07139000	ARKANSAS R AT GARDEN CITY, KS	27071	22	2018-07-01	0	Tie 1	80	0 (1922)	55
06846500	BEAVER C AT CEDAR BLUFFS, KS	1680	17	2018-07-01	0	Tie 1	72	0 (1947)	65
07141900	WALNUT C AT ALBERT, KS	1618	4	2018-07-08	0	Tie 1	60	0 (1963)	40
06911900	DRAGOON C NR BURLINGAME, KS	114	21	2018-07-11	0	Tie 1	58	0 (1960)	40
07142300	RATTLESNAKE C NR MACKSVILLE, KS	697	24	2018-07-01	0	Tie 1	58	0 (1988)	17
06910800	MARAIS DES CYGNES R NR READING, KS	177	18	2018-07-14	0	Tie 1	49	0 (1976)	21
06862850	SMOKY HILL R BL SCHOENCHEN, KS	5810	6	2018-07-11	0	Tie 1	36	0 (1982)	29
07140850	PAWNEE R NR BURDETT, KS	1091	18	2018-07-01	0	Tie 1	36	0 (1982)	35
06870300	GYPSUM C NR GYPSUM, KS	117	9	2018-07-07	0	Tie 1	27	0 (1955)	11
06914950	BIG BULL C NR EDGERTON, KS	28.7	2	2018-07-13	0	Tie 1	25	0 (2003)	5
07141220	ARKANSAS R NR LARNED, KS	34002	29	2018-07-01	0	Tie 1	19	0 (2002)	14
06863000	SMOKY HILL R AT PFEIFER, KS	6033	16	2018-07-01	0	Tie 1	18	0 (2005)	12
06911490	SALT C AT LYNDON, KS	97.8	4	2018-07-05	0	Tie 1	18	0 (2000)	11
06891260	WAKARUSA R NR RICHLAND, KS	164	4	2018-07-28	0	Tie 1	15	0 (2003)	3
07142019	CHEYENNE BOTTOMS DV NR GREAT BEND, KS	1500	11	2018-07-07	0	Tie 1	9	0	7

Summary of Recent 7-day Average Flow Conditions
(2018-07-01 -- 2018-07-31)
["--", no data; ">", greater than all historical minimum values]

USGS station number	USGS station name	Drain. area [mi^2]	2018-07-01 to 2018-07-31 No. of days with zero flows	Lowest 7-day average flow Date	Stream flow [ft^3/s]	Rank	Historical annual minimum 7-day flows No. of years	Min. (year) [ft^3/s]	No. of years with zero flows
								(2009)	
07144486	CALFSKIN C AT 119TH ST, WICHITA, KS	16.1	3	2018-07-26	0	Tie 1	7	0 (2011)	6
07179700	ROCK C NR DUNLAP, KS	120.00	25	2018-07-07	0	Tie 1	5	0 (2013)	3
07182200	SF COTTONWOOD R NR BAZAAR, KS	190.00	0	2018-07-29	0.31	2	5	0 (2013)	1
07145600	ARKANSAS R ON HWY 160 AT OXFORD, KS	43801.00	0	2018-07-14	342	2	4	339 (2015)	0
07144570	ARKANSAS R AT MULVANE, KS	40870.00	0	2018-07-16	202	2	3	175 (2015)	0
06888990	KANSAS R AT TOPEKA WATER PLANT, KS	56686.00	0	2018-07-13	1010	2	2	815 (2016)	0
06879810	WILDCAT C AT SCENIC DRIVE, MANHATTAN, KS	86.00	0	2018-07-13	0.23	Tie 2	6	0.19 (2013)	0
06892360	KILL C AT 95TH ST NR DESOTO, KS	53.4	0	2018-07-21	0.02	3	15	0 (2003)	2
07182390	NEOSHO R AT NEOSHO RAPIDS, KS	2753	0	2018-07-17	28.8	3	8	24.7 (2012)	0
06888300	ROCK C NR LOUISVILLE, KS	128.00	0	2018-07-13	1.01	3	7	0.99 (1964)	0
07186055	COW C NR SCAMMON, KS	222.00	0	2018-07-28	4.6	3	4	1.6 (2014)	0
07148111	GROUSE C NR SILVERDALE, KS	388.00	0	2018-07-30	5.95	3	3	2.13 (2016)	0

KANSAS CLIMATE and DROUGHT UPDATE
Mid-August 2018 Summary

Highlights

- Executive Order 18-16, issued July 6, 2016 was updated August 14, 2018 adding 22 counties to Emergency Drought Declarations. The change means 72 counties are in emergency status, 15 in warning status and 18 in watch status.

- U.S. Drought Monitor has drought conditions improved in western and southern Kansas during early August as rains moved across some areas. However, the conditions in eastern Kansas deteriorated as moderate, severe, extreme and exceptional drought conditions expanded as the region continued to miss out on the rain events.

- Emergency Water for livestock has had additional requests in Geary, Lyon and Osage counties in early August. This adds to July requests in Chase, Greenwood, McPherson, Osage and Pottawatomi/Riley counties. Emergency water permits have now been issued at four state fishing lakes and four federal lakes in these counties.

- 35% of the pasture and rangeland in Kansas was in poor to very poor condition for the week ending August 12.

- Administration of MDS continued on six streams in August: Little Arkansas River at Alta Mills has been since August 10, 2017; Republican River above the Clay Center and Concordia gages since April 13, 2018; Mill Creek above Paxico since April 12, 2018; Whitewater River above the gage near Towanda since April 12, 2018; Delaware River above the Muscotah gage since March 23, 2018; and Chapman Creek at the Chapman gage (11 permits or water rights) began June 21, 2018.

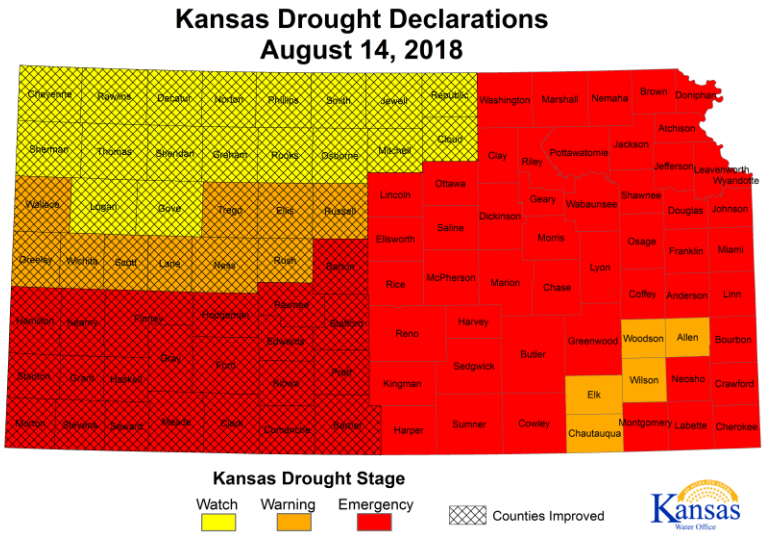
- Kansas Department of Health and Environment Public Health Warning or Watches in place for 16 Kansas lakes. This includes 12 warnings and 7 watches due to the presence of harmful algae (HAB). **Lakewood Park Lake, Saline County** and **Webster Lake, Rooks County are closed** as is the **Melvern Outlet Swim Pond, Osage County.** A public health watch indicates water may be unsafe for humans and animal – contact is discouraged. A public health warning indicates contact with water should not occur, it is unsafe.

- Kansas Department of Agriculture-Division of Conservation is offering financial assistance for livestock water supply wells, pipeline and tanks installed after June 1, 2018, and before the announcement of the Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS on July 24, 2018 through the Livestock Water Supply Financial Assistance Initiative. Applications can be made through local conservation districts.

- NRCS is offering technical and financial assistance to producers in Kansas suffering from ongoing drought conditions. Drought recovery funding assistance is available through the Environmental Quality Incentives Program (EQIP) Drought Initiative for eligible landowners and producers in declared drought emergency counties to address livestock water shortages. Applications for assistance under the EQIP Drought Initiative are currently being accepted. The application evaluation cut-off period will be August 24, 2018 with contract funding to occur shortly after. Due to immediate need, applicants may apply for waivers to initiate necessary practices before contracts are funded.

August 14, 2018 Governor ‘s Executive Order 18-16 amended – Adding Emergency Drought Counties

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-16 on July 6, 2018 placing 50 counties in emergency status, 27 into a warning status and 28 into a watch status. August 14, 2018, 12 warning counties and 10 watch were upgraded to emergency under the order by the Director of the Kansas Water Office with recommendations from the Governor’s Drought Response team. These Drought Declarations remain in place until rescinded or replaced.



<u>18 Drought Watch counties</u>: Cheyenne, Cloud, Decatur, Gove, Graham, Jewell, Logan, Mitchell, Norton, Osborne, Phillips, Rawlins, Republic, Rooks, Sheridan, Sherman, Smith, Thomas

<u>15 Drought Warning counties</u>: Allen, Chautauqua, Elk, Ellis, Greeley, Lane, Ness, Rush, Russell, Scott, Trego, Wallace, Wichita, Wilson, Woodson

<u>72 Drought Emergency counties</u>: **Anderson, Atchison**, Barber, Barton, **Bourbon**, **Brown,** Butler, Chase, **Cherokee**, Clark, Clay, Coffey, Comanche, Cowley, **Crawford,** Dickinson, **Doniphan, Douglas,** Edwards, Ellsworth, Finney, Ford, **Franklin,** Geary, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, **Jackson, Jefferson, Johnson,** Kearny, Kingman, Kiowa, **Labette**, **Leavenworth,** Lincoln, **Linn**, Lyon, Marion, **Marshall,** McPherson, Meade, **Miami**, **Montgomery,** Morris, Morton, **Nemaha, Neosho,** Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Saline, Sedgwick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Wabaunsee**, Washington, Wyandotte**

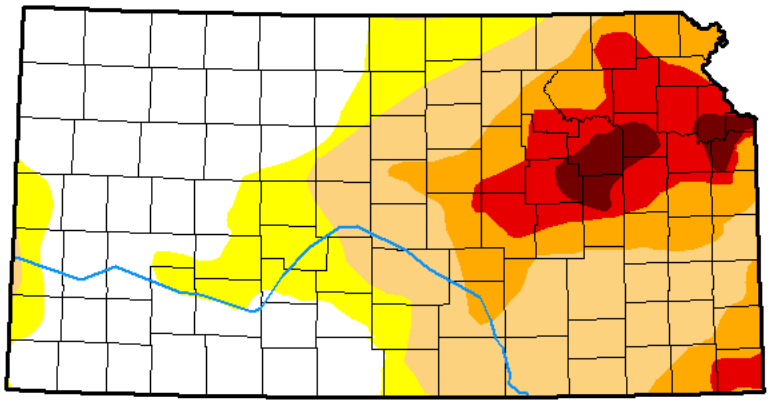
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

Early August rains continued improvement in the U.S. Drought Monitor in westerns and portions of central Kansas. Expansion of the drought in the east as well as increase severity in the east occurred as the area falls further behind in precipitation despite storms moving through. Then Change in drought categories map shows where the changes have occurred over the past four weeks. It is important to remember that these conditions have adversely affected many water supplies, pastures and crops in Kansas and are not fully reflected by the U.S. Drought Monitor.

U.S. Drought Monitor

Kansas



August 14, 2018

(Released Thursday, Aug. 16, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	37.68	62.32	48.99	24.40	11.32	2.53
Last Week *08-07-2018*	36.00	64.00	52.83	26.31	8.88	1.21
3 Months Ago *05-15-2018*	3.02	96.98	80.15	50.32	21.75	4.60
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *08-15-2017*	63.16	36.84	13.87	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

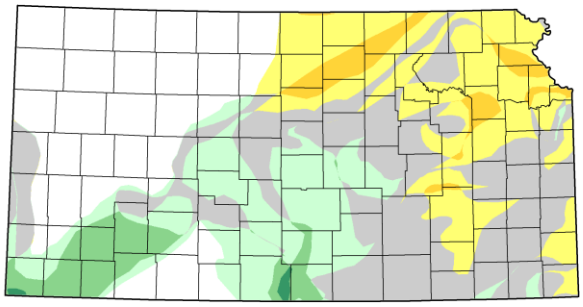
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/

U.S. Drought Monitor Class Change - Kansas
1 Month



August 14, 2018 compared to July 17, 2018

http://droughtmonitor.unl.edu

- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

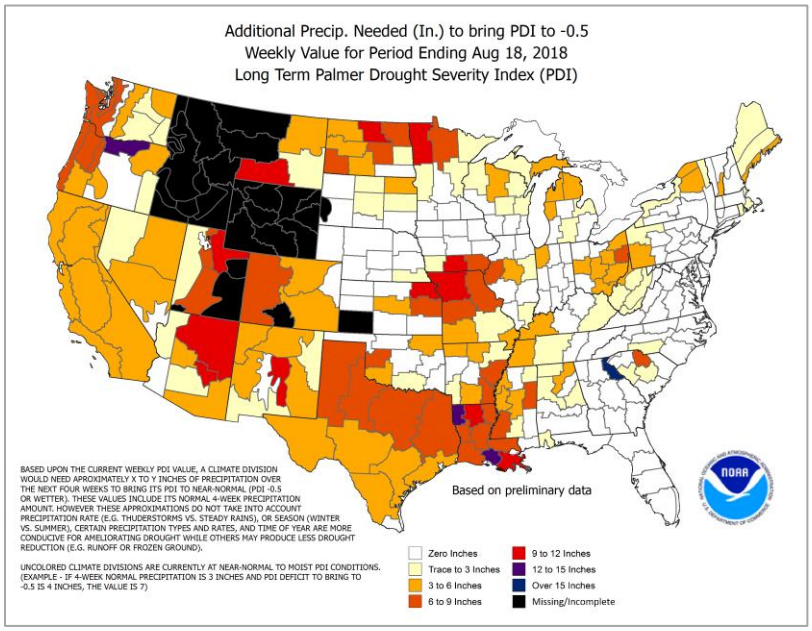
Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of

relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Aug. 4	Aug. 11	Aug. 18
Northwest	-	-	-
North Central	0.78	-	-
Northeast	12.96	12.69	11.31
West Central	-	-	-
Central	9.96	9.84	5.75
East Central	10.76	10.24	7.27
Southwest	-	-	-
South Central	0.68	1.29	-
Southeast	5.29	5.67	-



More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

State Drought Mitigation

Livestock Water

Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. As of August 16, 2018, fifteen requests have been received from producers in seven counties. Currently permits have been issued at four state fishing lakes (Chase, Lyon, McPherson, and Osage) and four federal lakes (Fall River, Melvern, Milford, and Tuttle Creek). The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies.

Morris County pond-2018

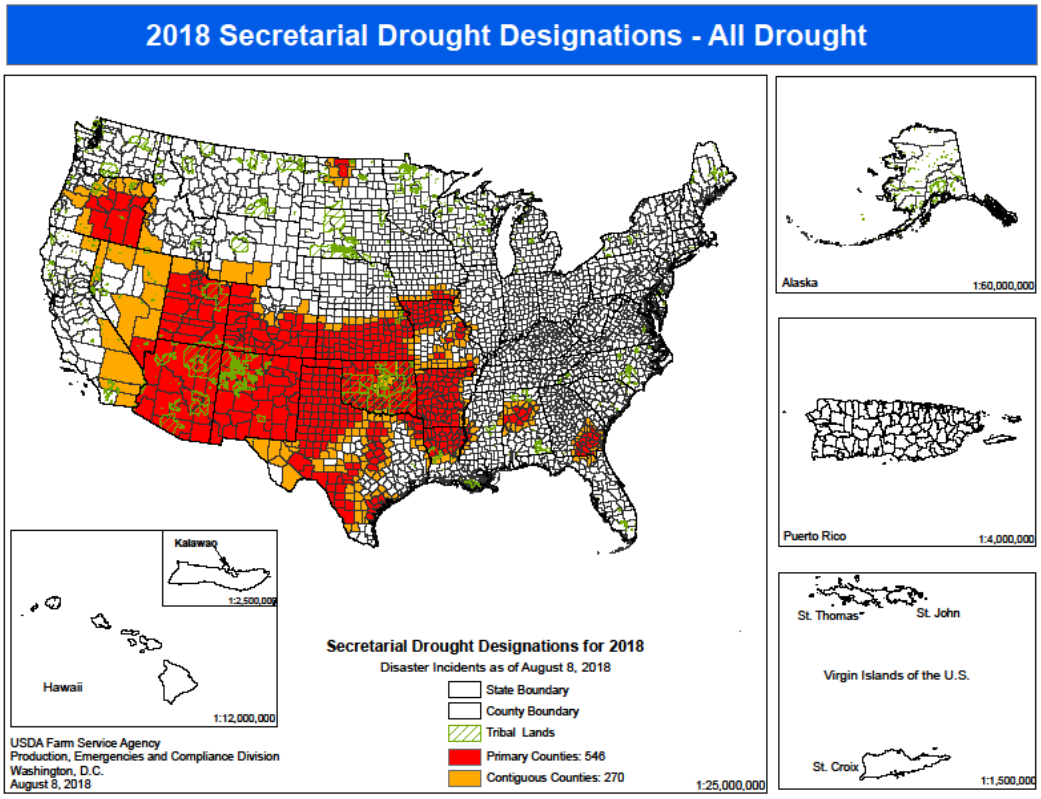
The Kansas Department of Agriculture, Division of Conservation has made available assistance to landowners that have previously drilled livestock water supply wells or previously installed livestock water supply pipeline and tanks in response to the ongoing drought. Applications must be made to local conservation district from August 1-31, 2018. Eligible livestock wells, pipeline and tanks must serve pastures 40 acres or larger with a permanent perimeter fence. Eligible areas will be the same as the NRCS EQIP 2018 Environmental Quality Incentives Program (EQIP) Drought Initiative. These eligible areas are located in the following Kansas counties: Barber, Barton, Butler, Chase, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Lincoln, Lyon, Marion, McPherson, Meade, Morris, Morton, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Saline, Sedgwick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, and Wabaunsee.

Federal Disaster Drought Declarations 2018

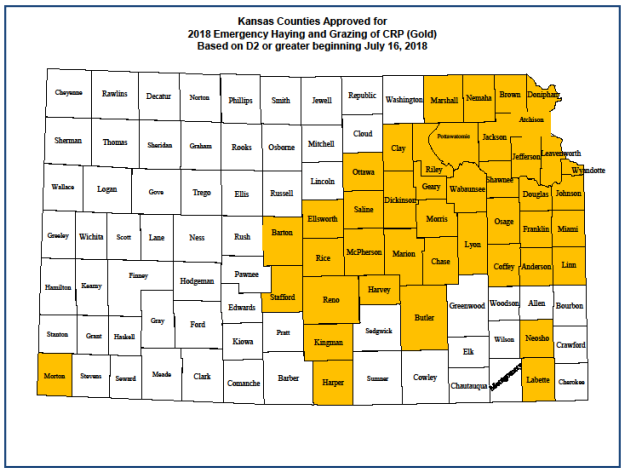
U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 78 primary counties and 17 contiguous counties. Primary counties include Allen, Barber, Barton, Butler, Chase, Chautauqua, **Cherokee**, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, **Doniphan, Douglas**, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, **Franklin**, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, **Jefferson, Johnson,** Kearny, Kingman, Kiowa, **Labette,** Lane, **Leavenworth,** Lincoln, Lyon, Marion, McPherson, Meade, **Miami,** Montgomery, Morris, Morton, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Wichita, Wilson, Woodson and **Wyandotte**. Contiguous counties are Anderson, Atchison, Bourbon, Brown, Cloud, Crawford, Gove, Graham, Linn, Logan, Marshall, Mitchell, Nemaha, Osborne, Rooks, Sherman and Washington.

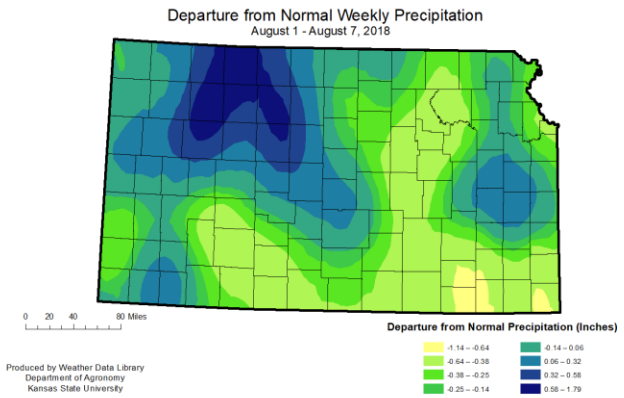


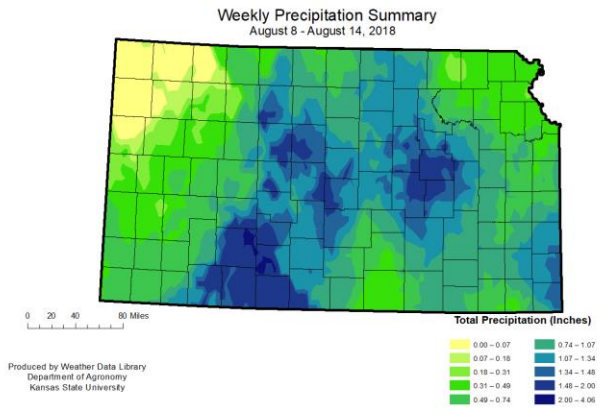
Haying and grazing of Conservation Reserve Program (CRP) acres is in place to provide emergency haying and grazing on CRP acreages in the 44 counties in Kansas. these counties are shown on the map on the right may graze through September 30, 2018 with county office approval. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres.
A fact sheet is available at
https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



Climate Summary - Precipitation

The first week of August the north central and northwest climate divisions saw rainfall. The second week saw the rainfall shift to the central portions of the state.



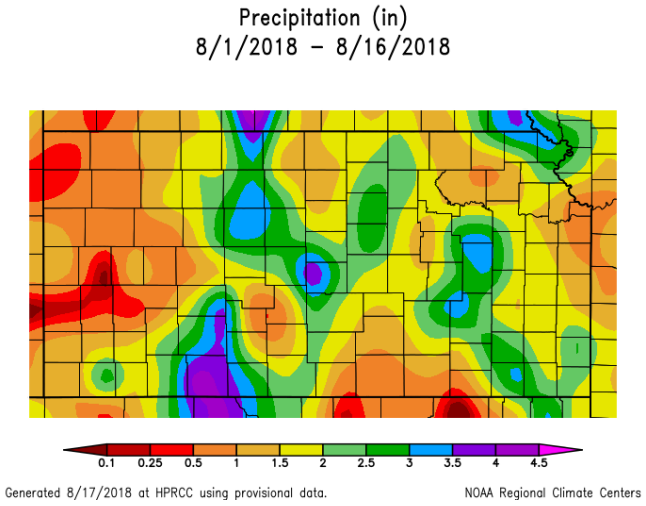


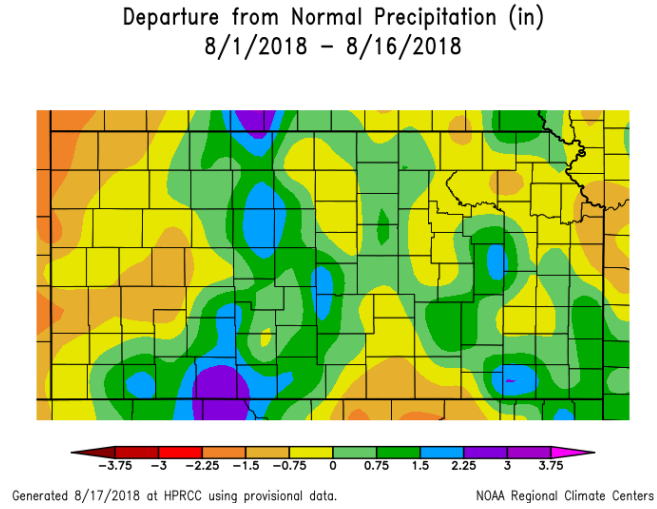
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)

Climate Division	August 8 - 14, 2018			January 1-August 14, 2018			April 1, 2017- August 14 , 2018			Sept. 1, 2017- August 14 , 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.06	-0.62	8	12.83	-2.75	81	11.81	-1.47	88	16.49	-3.56	81
West Central	0.16	-0.50	24	14.79	-0.30	97	13.76	1.17	108	19.41	-0.15	98
Southwest	0.86	0.19	127	15.32	1.22	108	14.77	3.05	125	18.92	0.36	102
North Central	0.90	0.11	109	17.00	-2.64	86	15.44	-0.72	95	22.21	-4.16	84
Central	1.33	0.47	156	16.60	-4.02	82	14.99	-1.68	91	21.43	-6.00	79
South Central	1.11	0.32	139	19.84	-1.78	92	17.84	0.85	105	25.47	-4.00	86
Northeast	0.38	-0.51	42	14.96	-8.57	65	12.82	-6.51	68	19.67	-13.20	61
East Central	0.99	0.06	105	15.23	-10.14	59	12.36	-8.09	60	20.80	-14.88	57
Southeast	1.01	0.19	125	20.54	-6.78	75	16.40	-4.92	77	27.62	-11.78	70
STATE	0.80	0.02	99	16.59	-3.67	84	14.70	-1.72	92	21.62	-6.03	80

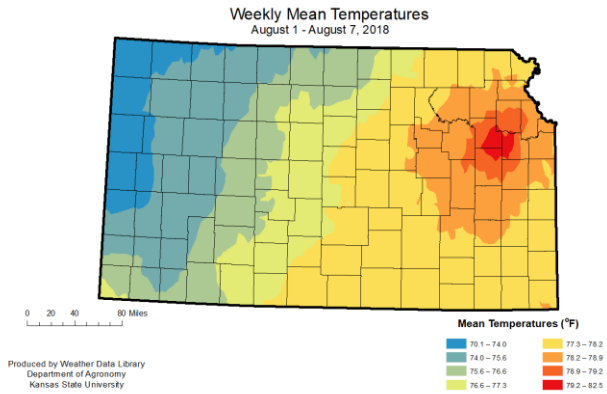
The maps below summarize precipitation for August through August 16. Climate maps are available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .

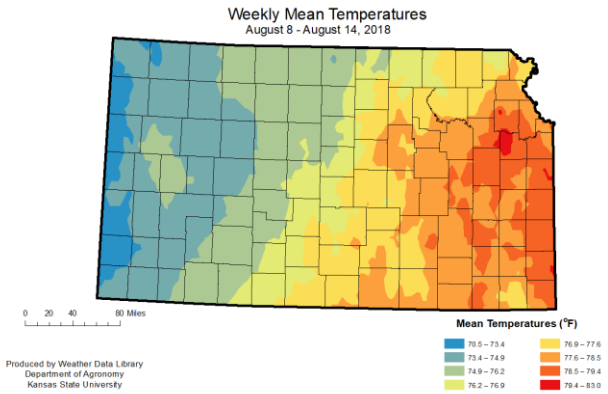




Climate Summary-Temperature

The first week of August saw cooler temperatures than July. The second week of August continued cooler than normal for the state. However the eastern part of Kansas continued warmer than normal.

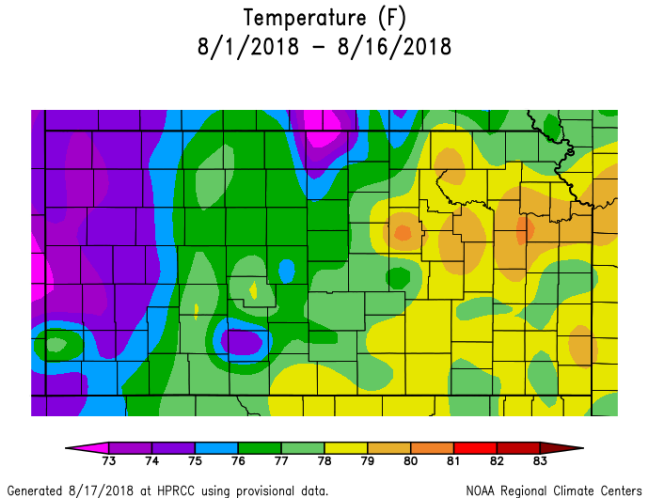


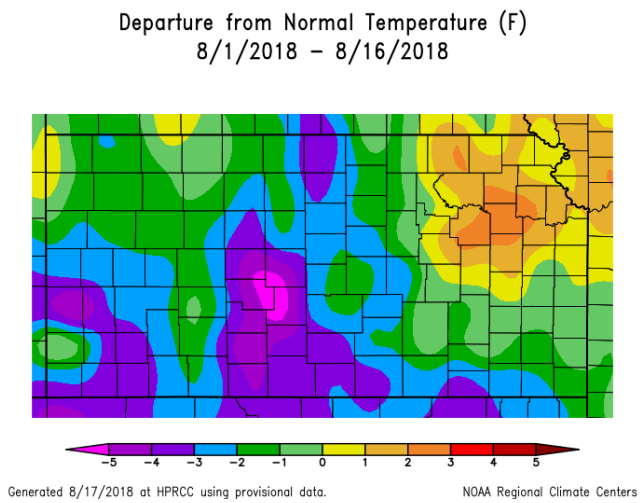


Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	August 8-14 , 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	87.5	60.4	74.0	-1.7	95	10	51	12
West Central	88.6	60.8	74.7	-1.8	96	8	54	12
Southwest	87.9	60.9	74.4	-3.8	96	9	52	13
North Central	89.1	63.6	76.4	-1.6	96	13	56	13
Central	89.5	63.9	76.7	-2.4	98	12	56	11
South Central	88.9	65.6	77.2	-2.9	96	10	60	11
Northeast	91.0	65.6	78.3	1.1	95	10	59	12
East Central	90.4	66.9	78.7	0.6	96	12	61	11
Southeast	89.3	67.8	78.6	-0.8	101	8	64	11
STATE	89.1	63.9	76.6	-1.5	101	8th	51	12th
Data Source: KSU Weather Library								

The maps below summarize temperature for August through August 16. Climate maps are available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .

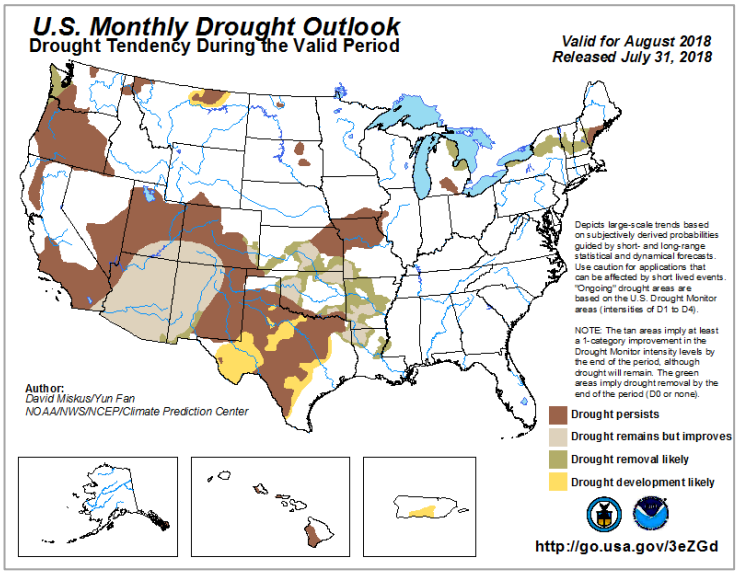


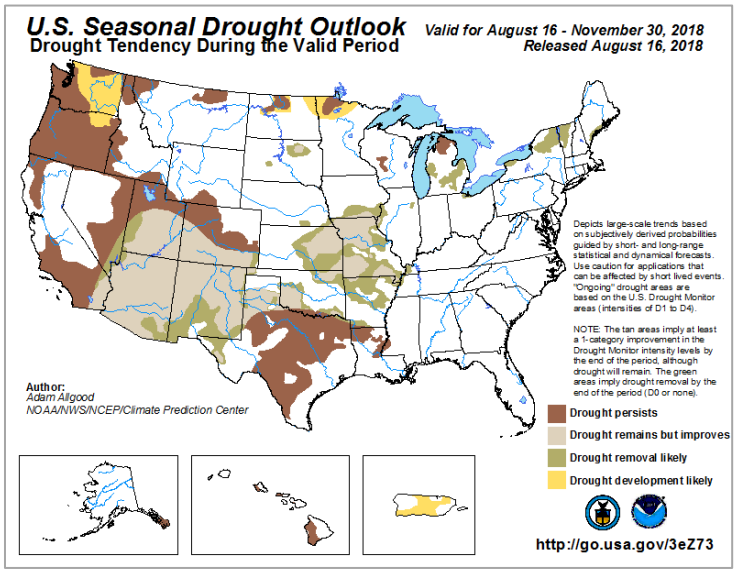


Future Outlook

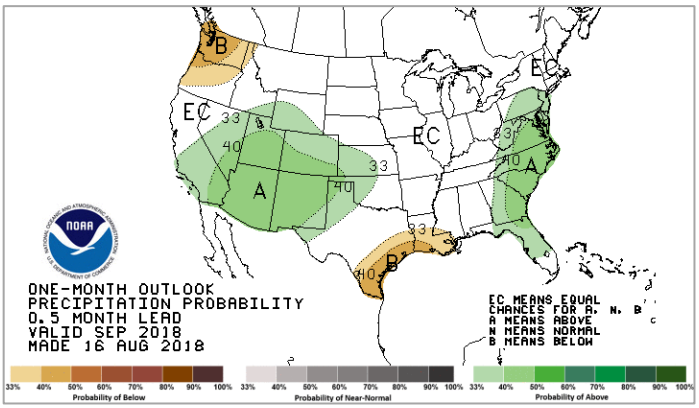
The Monthly Drought Outlook indicates drought conditions to remain in northeast Kansas. Improvement of drought conditions is possible in the remainder of Kansas.

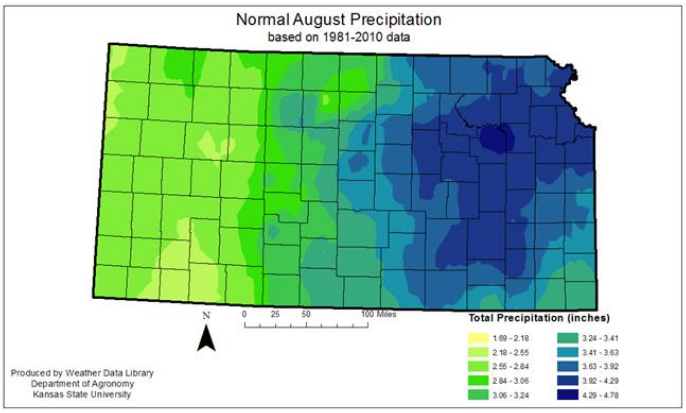
Seasonal Outlook (3-month) favors drought remaining in eastern Kansas, but possibly improving around the edge of the affected area. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

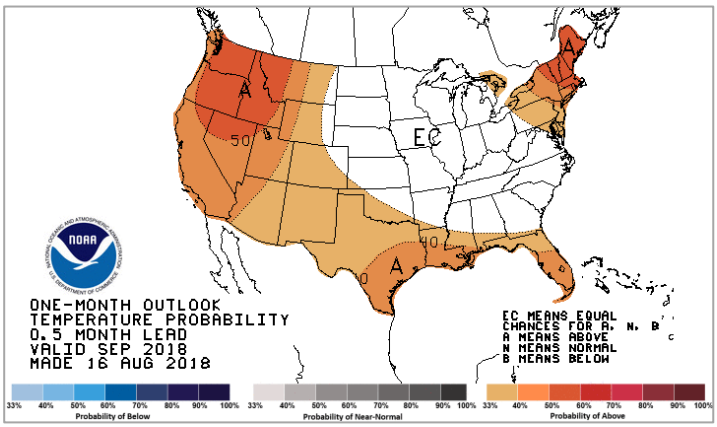


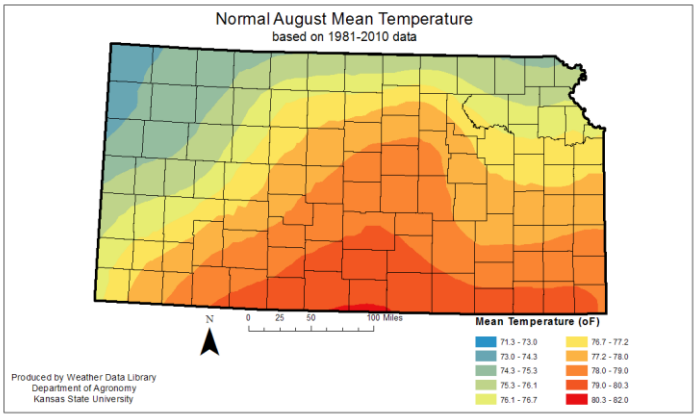


The one month, August, climate outlook favor equal chances of above or below normal temperature and precipitation for almost all of Kansas in August.

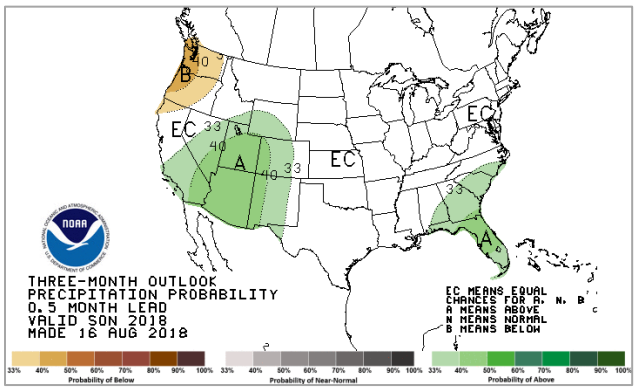


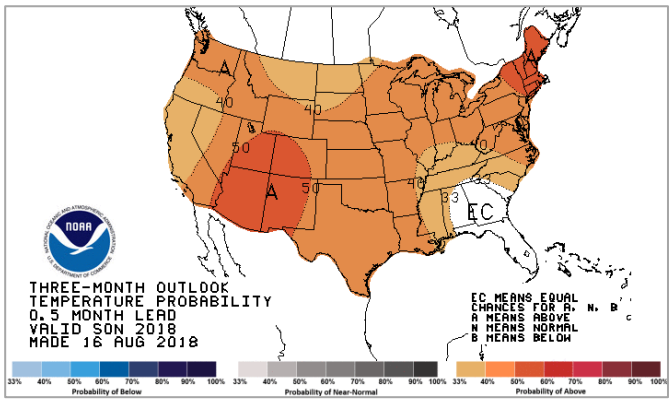






The long-term, 3 month outlooks give equal chances of above or below normal precipitation in western Kansas and below normal precipitation in eastern Kansas. Above normal temperatures are favored for all of Kansas for August-September-October.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

August 16, 2018, **City of Oswego** issued water watch, asking residents to limit or eliminate nonessential water use.

August 1, 2018 the **City of Burlington** issued a stage 1 water watch for its consumers including, Coffey County Rural Water Districts 2 and 3 and the cities of Gridley, LeRoy and New Strawn. Consumers are asked to limit or eliminate outdoor watering, washing of automobiles, swimming pools, fountains and evaporative air conditioning systems and the waste of water. August 15, the city enacted a stage 3 water emergency initiating mandatory water conservation.

July 20, 2018 the **City of Gardner,** Johnson County Water Warning took effect. Mandatory restrictions focus on outdoor water use. (http://www.gardnerkansas.gov/Home/Components/News/News/304/16?backlist=%2f)

July 11, 2018 a water warning issued by **Public Wholesale Water Supply District #26** covers most of Chase County including the City of Strong City, Chase County Rural Water District #1, and the City of Cottonwood Falls. Voluntary and mandatory water restrictions are now in effect for water users obtaining water from these suppliers as well as domestic wells within the city limits of Strong City.

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of August 17, 2018 (www.russellcity.org/148/Current-Water-Status). The water restrictions include a prohibition on outdoor watering from 10:00 am to 7:00 pm. It also prohibits the waste of water.

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. No lawn watering or filling of private swimming pools is allowed. Watering of trees, flowers and gardens not allowed between 10 am and 5 pm. (August 17, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County. Citizens may water before 10 am and after 9 pm.(https://medicinelodge.kansas.gov/ August 17, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to all Kansas basin reservoirs is well below normal in August, particularly for Clinton and Perry reservoirs. However, storage is in jeopardy to be sufficient for demands anytime in the near future. Releases for Milford and Perry are at minimum outflow settings but Tuttle Creek is releasing to maintain flow in the Kansas River, which is less than half of historic median values. Persistence of the recent drought conditions will cause reservoir levels to decline in the coming months.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs remain at minimum gate settings in August and inflows are negligible. All reservoirs are experiencing a declining trend in August. Reservoir releases are necessary to supplement flow in the Marais des Cygnes River, especially in the upper system. Additional releases from Melvern and Pomona may be necessary to meet Marais des Cygnes Water Assurance District demands in August. Storage supplies are somewhat depleted but sufficient and no municipal or industrial conservation measured have been implemented.

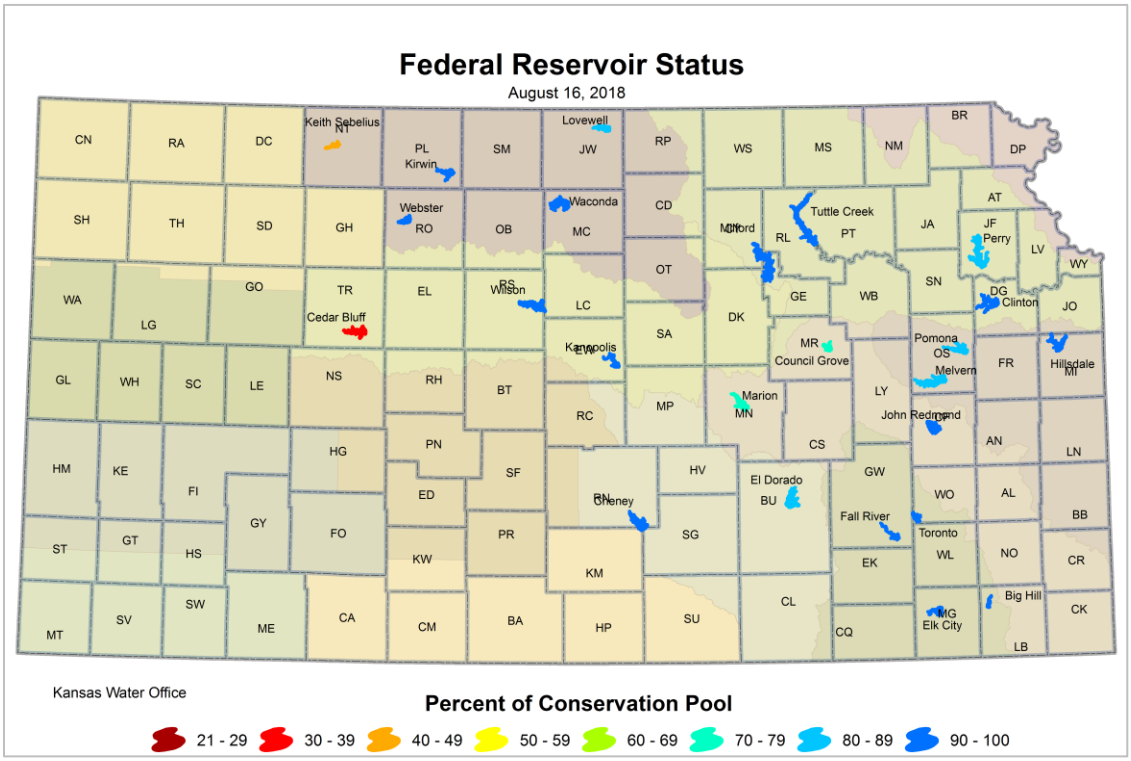
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs remain exceptionally low in August, particularly Council Grove. Of the three basin reservoirs, John Redmond is in the best shape due to a few runoff events in the lower Cottonwood basin. Despite providing supplemental water to Wolf Creek it remains within a foot of full conservation storage. Releases from Marion and Council Grove continue to be necessary for streamflow and demand support, and are both experiencing a steady decline. Potential implementation of conservation measures is being evaluated.

Verdigris basin: Inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs were relatively low until the night of August 14/15. The lower Verdigris basin received more than 8 inches of rain and Elk City rose more than 6 feet above normal pool. The precipitation even brought the Verdigris River from about 50 cfs to more than 20,000 cfs in a matter of hours. The upper basin did not receive such a drastic amount but Toronto and Fall River are at normal pool or slightly above.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in August.

Smoky Hill basin: The Smoky Hill River continues to benefit from somewhat abnormal precipitation events. Cedar Bluff Reservoir has experienced a net gain in storage so far this year, for the first time in several. Kanopolis Lake has received enough inflow to nearly reach the seasonal target elevation of 1467.7 and is discharging through the uncontrolled spillway at about 200 cfs, more than sufficient for the downstream demands.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**08/16/2018 06:00 AM**		
Norton[1]	2304.3	2293.25	-11.05	44.9
Harlan County, NE	1945.73	1938.31	-7.42	71.1
Lovewell[1]	1582.6	1579.75	-2.85	77.9
Milford[1]	1144.4	1143.28	-1.12	95.4
Cedar Bluff	2144	2121.21	-22.79	35.8
Kanopolis[1]	1463	1467.01	4.01	100.0
Wilson[1]	1516	1517.12	1.12	100.0
Webster[1]	1892.5	1892.55	0.10	100.0
Kirwin[1]	1729.3	1729.66	0.41	100.0
Waconda[1]	1455.6	1455.69	0.09	100.0
Tuttle Creek[1]	1075	1074.99	-0.01	100.0
Perry[1]	891.5	888.83	-2.67	86.8
Clinton[1]	875.5	874.05	-1.45	91.4
Melvern[1]	1036	1033.31	-2.69	88.2
Pomona[1]	974	971.24	-2.76	81.8
Hillsdale[1]	917	915.20	-1.80	89.1
Arkansas River Basin		**08/16/2018 08:00 AM**		
Cheney	1421.6	1421.35	-0.25	99.0
El Dorado	1339	1334.44	-4.56	79.0
Toronto[1]	901.5	901.45	-0.05	99.0
Fall River[1]	948.5	948.38	-0.12	99.0
Elk City[1]	796	802.03	6.03	100.0
Big Hill	858	857.41	-0.59	98.0
Council Grove[1]	1274	1269.55	-4.45	73.0
Marion[1]	1350.5	1346.99	-3.51	74.0
John Redmond[1]	1039	1040.19	-0.81	90.0

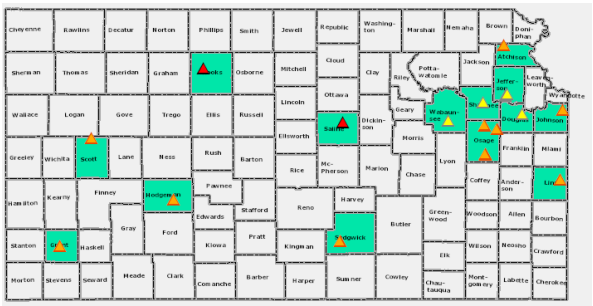
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

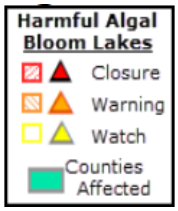
Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

Lake Public Health Advisories				
Water Body	**County**	**8/2/2018**	**8/9/2018**	**8/17/2018**
Atchison County Park Lake	Atchison	Warning	Warning	Warning
Carbondale West Lake	Osage	Warning	Warning	Warning
Cottonwood River South of Emporia	Lyon			Watch
Frazier Lake	Grant	Warning	Warning	Warning
Hodgeman Co. State Fishing Lake	Hodgeman	Warning	Warning	Warning
Jerry Ivey Pond	Saline	Warning	Warning	Warning
Lake Afton	Sedgewick	Warning	Warning	Warning
Lake Scott State Park	Scott		Warning	Warning
Lake Wabaunsee	Wabaunsee	Warning	Warning	Watch
Lakewood Park Lake	Saline		Closure	Closure
Marais des Cygnes Wildlife Area Lake	Linn	Warning	Warning	Warning
Mary's Lake	Douglas	Watch	Watch	Watch
Melvern Outlet Pond	Osage	Warning	Warning	Warning
Melvern Outlet Swim Pond	Osage	Closure	Closure	Warning
Overbrook City Lake	Osage	Watch	Watch	Warning
Perry Lake Zone A	Jefferson		Watch	Watch
Perry Lake Zone B	Jefferson	Warning	Watch	Watch
Rock Garden Pond	Shawnee	Watch	Watch	Watch
South Park Lake	Johnson	Warning	Warning	Warning
Webster Lake	Rooks	Warning*	Warning*	Closure
		*Beach closure		



Location of Lakes Under Investigation for Harmful Blue-Green Algal Blooms (HAB).
(https://maps.kdhe.state.ks.us/habkscounty/)

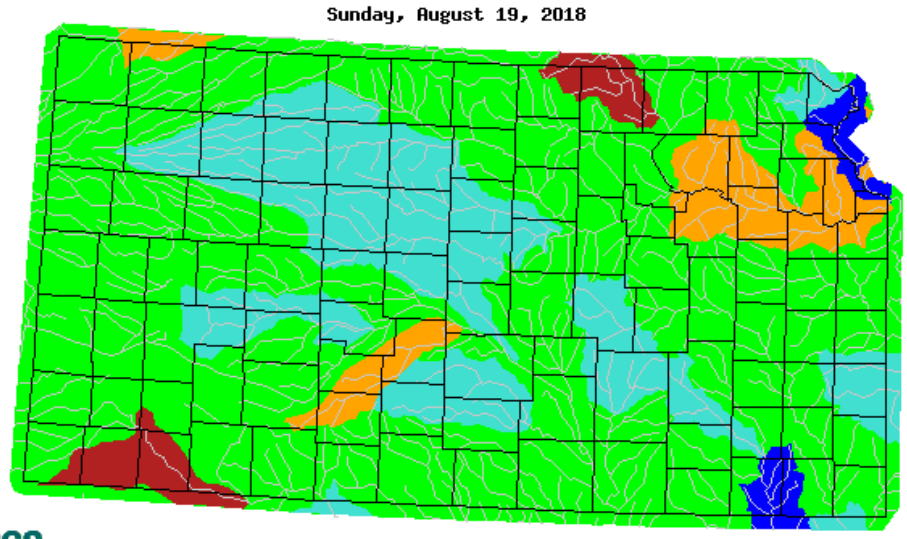


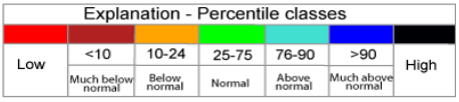
Farm ponds can develop blue-green algae which pose risk to livestock. K-State has information on this in the July 27, 2018 Agronomy Updates https://webapp.agron.ksu.edu/agr_social/eu_issue.throck?eu_id=292. The first article explains the basics and risk to livestock (https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1909) A second article discusses management and sampling of farm ponds (https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1910)

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a 7-day period or other timeframe.

The 14-dayaverage streamflow compared to historical streamflow for the day of the year is reflected in the map below.





USGS

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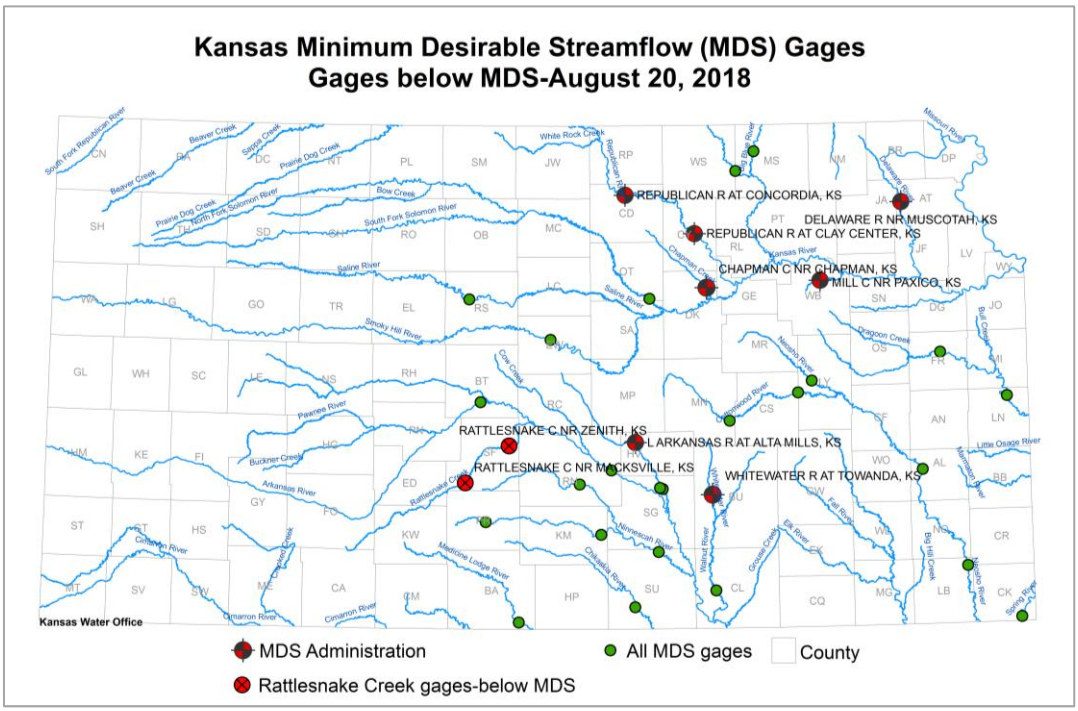
Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

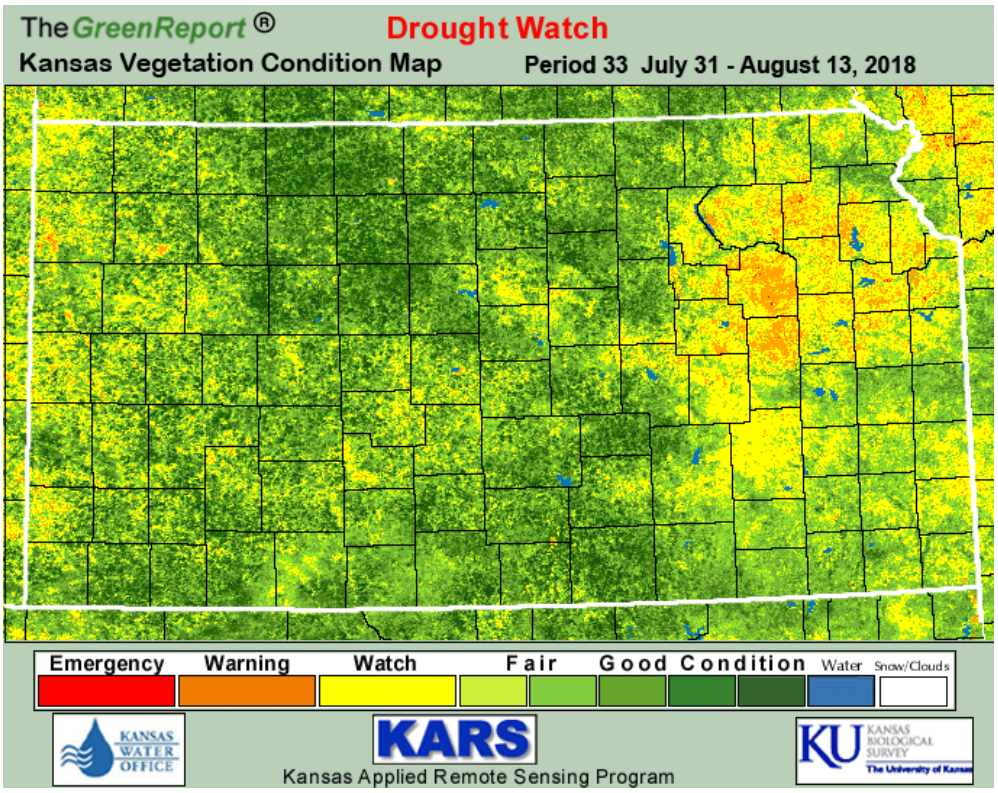


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.There are locations where flows are below MDS, but administration is not in effect since for some reason.

Streamflows				
USGS Gaging Station	**August 13 Flow**	**August 20 Flow**	**August MDS**	**Comment**
Republican River at Concordia	2	281	150	Admin began April 13, 2018
Republican River at Clay Center	133	442	200	Admin began April 13, 2018
Chapman Creek near Chapman	6	13	10	Admin began June 21, 2018
Little Blue River near Barnes	35	398	80	Admin ceased July 3, 2018
Mill Creek near Paxico	1	7	5	Admin began April 12, 2018
Delaware River near Muscotah	Dry	12	3	Admin began March 23, 2018
Rattlesnake Creek near Macksville	Dry	Dry	1	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	4	15	3	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	3	546	8	MDS admin began Aug 10, 2017
Whitewater River near Towanda	4.46	79	5	Admin began April 12, 2018

Soil, Crop and Vegetation

Vegetative Conditions



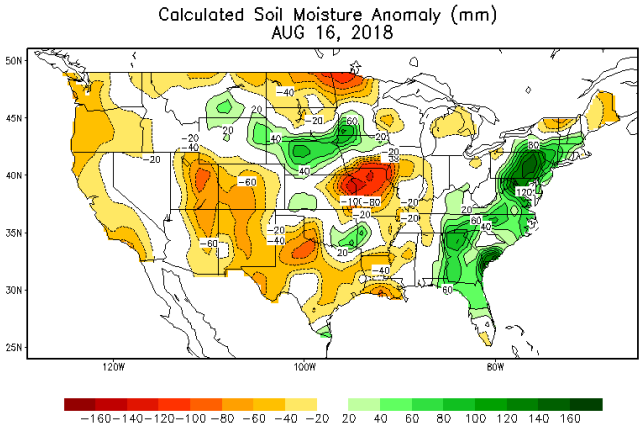
The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

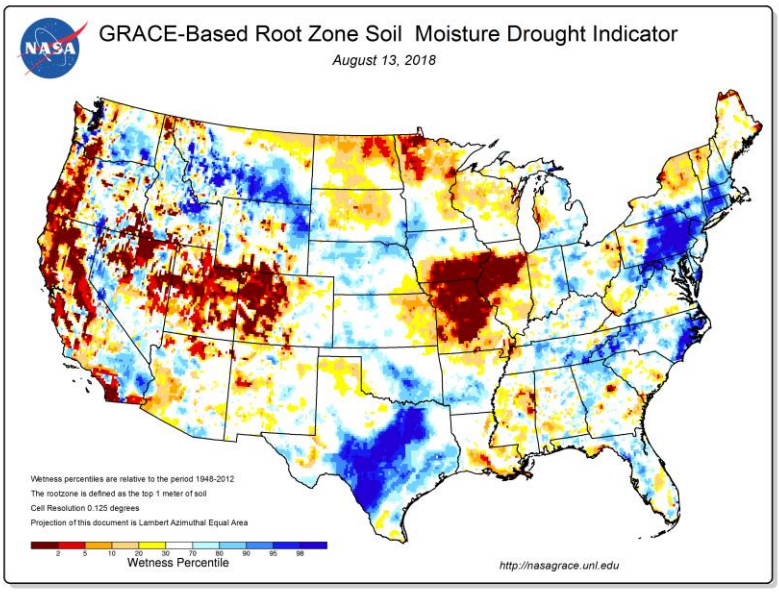
The area of poor conditions remains in east-central Kansas. Southeast Kansas is showing some areas moving into the watch category. Most vegetation in the rest of the state is in fair to good condition. The Kansas Water Office has received reports of pastures in poor condition in many areas of the state.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas.

(.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

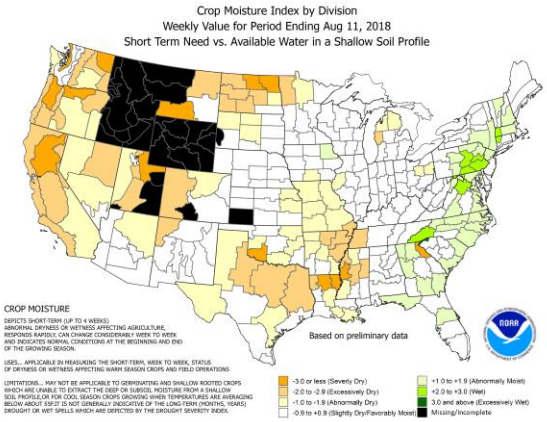
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending August 20, 2018 indicates topsoil moisture supplies rated 5 percent very short, 17 short, 71 adequate, and 7 surplus. Subsoil moisture supplies rated 8 percent very short, 23 short, 67 adequate, and 2 surplus.

Field Crops Report: Corn condition rated 9 percent very poor, 17 poor, 28 fair, 39 good, and 7 excellent. Soybean condition rated 6 percent very poor, 15 poor, 37 fair, 37 good, and 5excellent. Sorghum condition rated 2 percent very poor, 6 poor, 30 fair, 51 good, and 11 excellent. Cotton condition rated 1 percent very poor, 2 poor, 32 fair, 53 good, and 12 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 13 percent very poor, 20 poor, 35 fair, 28 good, and 4 excellent.

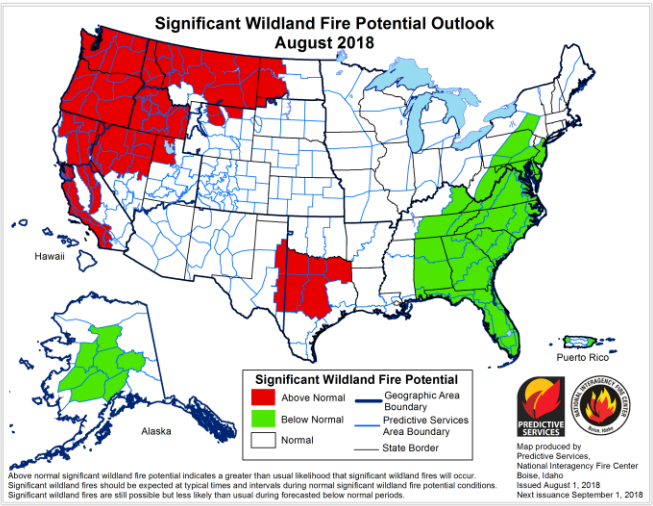
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

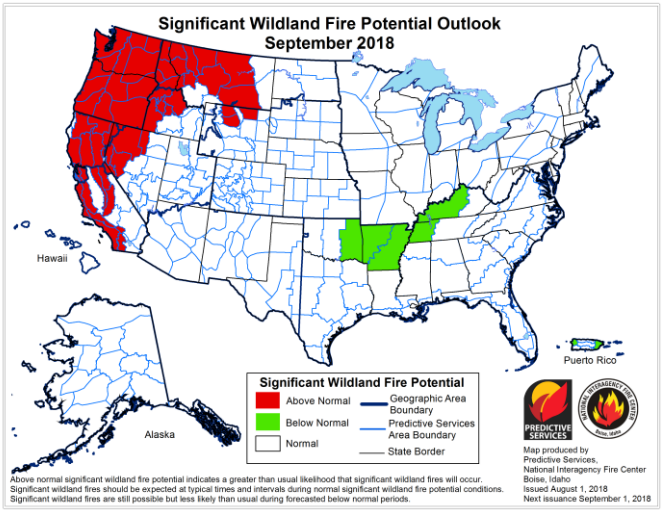


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE
August 2018 Summary

Highlights

- Executive Order 18-16, issued July 6, 2016 was updated August 14, 2018 adding 22 counties to Emergency Drought Declarations. The change means 72 counties were in emergency status, 15 in warning status and 18 in watch status at the end of August.

- U.S. Drought Monitor has drought conditions improved in western and southern Kansas during early August as rains moved across some areas. However, the conditions in eastern Kansas deteriorated as moderate, severe, extreme and exceptional drought conditions expanded as the region continued to miss out on the rain events until the very end of the month when conditions improved some. For the end of August, the week ending September 4, 2-8 inches of rain caused a 1-2 category drought improvement across southeastern Kansas, while 1-3 inches of rain in far western Kansas was good for a 1-category reduction. Unfortunately, the core D3-D4 drought area in east-central Kansas received much lower totals (less than an inch), and little or no improvements were made there.

- Emergency Water for livestock has had additional requests in Geary, Lyon and Osage counties in early August. This adds to July requests in Chase, Greenwood, McPherson, Osage and Pottawatomi/Riley counties. Emergency water permits have now been issued at four state fishing lakes and four federal lakes in these counties.

- Administration of MDS continued on six streams in August: Little Arkansas River at Alta Mills has been since August 10, 2017; Republican River above the Clay Center and Concordia gages since April 13, 2018; Mill Creek above Paxico since April 12, 2018; Whitewater River above the gage near Towanda since April 12, 2018 ceasing August 28th; Delaware River above the Muscotah gage since March 23, 2018; and Chapman Creek at the Chapman gage (11 permits or water rights) began June 21, 2018 ceasing August 28th.

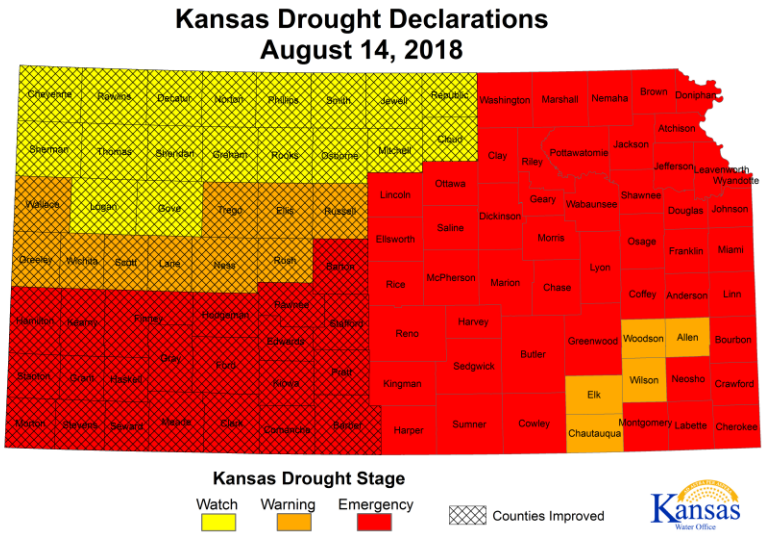
- Kansas Department of Health and Environment Public Health Advisories as Closure, Warning or Watches were in place at the end of August for 21 Kansas water bodies. This includes 15 warnings and 6 watches due to the presence of harmful algae (HAB). As many as 24 water bodies were affected during the month. **Lakewood Park Lake, Saline County**, **Webster Lake, Rooks County** and the **Melvern Outlet Swim Pond, Osage County were closed for some part of August due to unsafe toxin levels.** A public health watch indicates water may be unsafe for humans and animal – contact is discouraged. A public health warning indicates contact with water should not occur, it is unsafe.

- Kansas Department of Agriculture-Division of Conservation is offering financial assistance for livestock water supply wells, pipeline and tanks installed after June 1, 2018, and before the announcement of the Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS on July 24, 2018 through the Livestock Water Supply Financial Assistance Initiative. Applications can be made through local conservation districts.

- NRCS is offering technical and financial assistance to producers in Kansas suffering from ongoing drought conditions. Drought recovery funding assistance is available through the Environmental Quality Incentives Program (EQIP) Drought Initiative for eligible landowners and producers in declared drought emergency counties to address livestock water shortages. Applications for assistance under the EQIP Drought Initiative are currently being accepted. The application evaluation cut-off period will be August 24, 2018 with contract funding to occur shortly after. Due to immediate need, applicants may apply for waivers to initiate necessary practices before contracts are funded.

August 14, 2018 Governor ‘s Executive Order 18-16 amended – Adding Emergency Drought Counties

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order 18-16 on July 6, 2018 placing 50 counties in emergency status, 27 into a warning status and 28 into a watch status. August 14, 2018, 12 warning counties and 10 watch were upgraded to emergency under the order by the Director of the Kansas Water Office with recommendations from the Governor’s Drought Response team. These Drought Declarations remain in place until rescinded or replaced.



<u>18 Drought Watch counties</u>: Cheyenne, Cloud, Decatur, Gove, Graham, Jewell, Logan, Mitchell, Norton, Osborne, Phillips, Rawlins, Republic, Rooks, Sheridan, Sherman, Smith, Thomas

<u>15 Drought Warning counties</u>: Allen, Chautauqua, Elk, Ellis, Greeley, Lane, Ness, Rush, Russell, Scott, Trego, Wallace, Wichita, Wilson, Woodson

<u>72 Drought Emergency counties</u>: Anderson, Atchison, Barber, Barton, Bourbon, Brown, Butler, Chase, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Crawford, Dickinson, Doniphan, Douglas, Edwards, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Saline, Sedgwick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Wabaunsee, Washington, Wyandotte

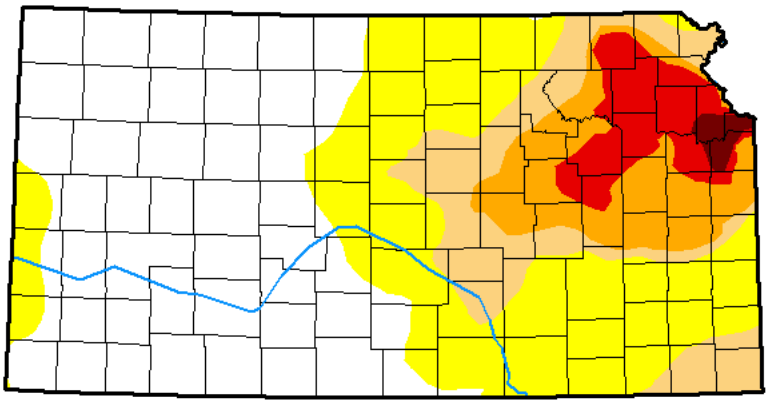
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

Early August rains continued improvement in the U.S. Drought Monitor in westerns and portions of central Kansas. Expansion of the drought in the east as well as increase severity in the east occurred as the area falls further behind in precipitation despite storms moving through. The summary of August change in drought categories is shown below.

U.S. Drought Monitor

Kansas



August 28, 2018

(Released Thursday, Aug. 30, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	45.57	54.43	25.60	14.79	6.25	0.75
Last Week *08-21-2018*	37.66	62.34	45.16	21.15	7.73	0.75
3 Months Ago *05-29-2018*	15.19	84.81	69.40	45.96	15.85	1.47
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *08-29-2017*	62.50	37.50	19.90	0.00	0.00	0.00

Intensity:

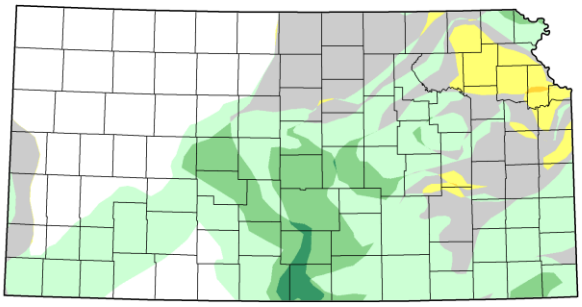
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Jessica Blunden
NCEI/NOAA

http://droughtmonitor.unl.edu/

U.S. Drought Monitor Class Change - Kansas
1 Month



August 28, 2018 compared to July 31, 2018

http://droughtmonitor.unl.edu

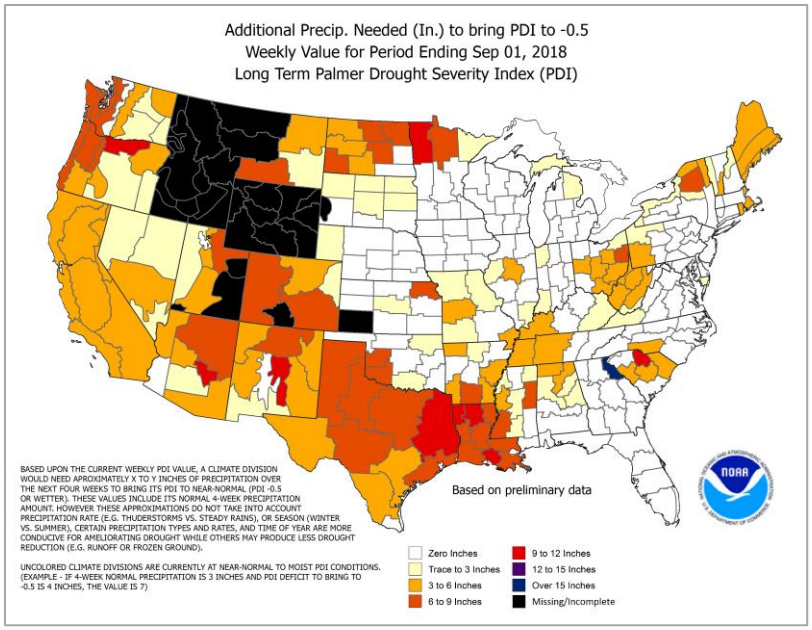
- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Aug. 18	Aug. 25	Sept. 1
Northwest	-	-	-
North Central	-	-	-
Northeast	11.31	7.13	7.44
West Central	-	-	-
Central	5.75	2.49	2.26
East Central	7.27	1.47	-
Southwest	-	-	-
South Central	-	-	-
Southeast	-	-	-



More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

State Drought Mitigation

Livestock Water

Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. At the end of August, fifteen requests had been received from producers in seven counties. Permits have been issued at three state fishing lakes (Chase, Lyon, McPherson) and four federal lakes (Fall River, Melvern, Milford, and Tuttle Creek). The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed.

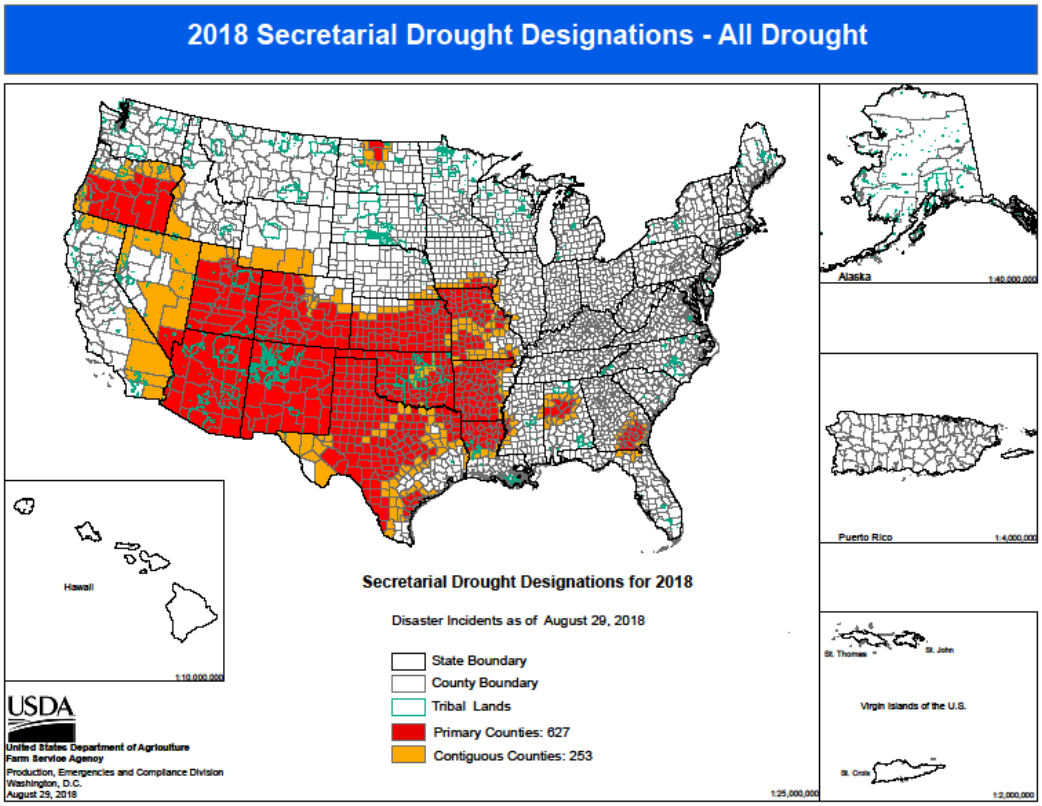
The Kansas Department of Agriculture, Division of Conservation has made available assistance to landowners that have previously drilled livestock water supply wells or previously installed livestock water supply pipeline and tanks in response to the ongoing drought. Applications must be made to local conservation district from August 1-31, 2018. Eligible livestock wells, pipeline and tanks must serve pastures 40 acres or larger with a permanent perimeter fence. Eligible areas will be the same as the NRCS EQIP 2018 Environmental Quality Incentives Program (EQIP) Drought Initiative. These eligible areas are located in the following Kansas counties: Barber, Barton, Butler, Chase, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Edwards, Ellsworth, Finney, Ford, Geary, Grant, Gray, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Kearny, Kingman, Kiowa, Lincoln, Lyon, Marion, McPherson, Meade, Morris, Morton, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Saline, Sedgwick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, and Wabaunsee.

Federal Disaster Drought Declarations 2018

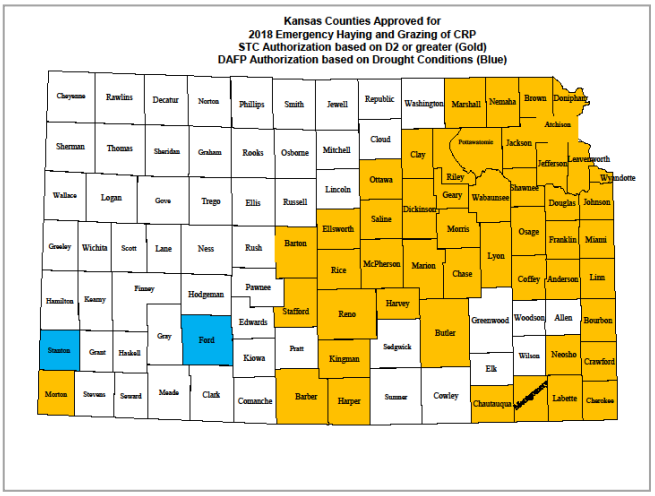
U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte. Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.



Haying and grazing of Conservation Reserve Program (CRP) acres is in place to provide emergency haying and grazing on CRP acreages in the counties in Kansas colored on the map at right. These counties may graze through September 30, 2018 with county office approval. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres. Counties in blue have DAFP authorization, gold are authorized based on D2 or greater on the US Drought Monitor. A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



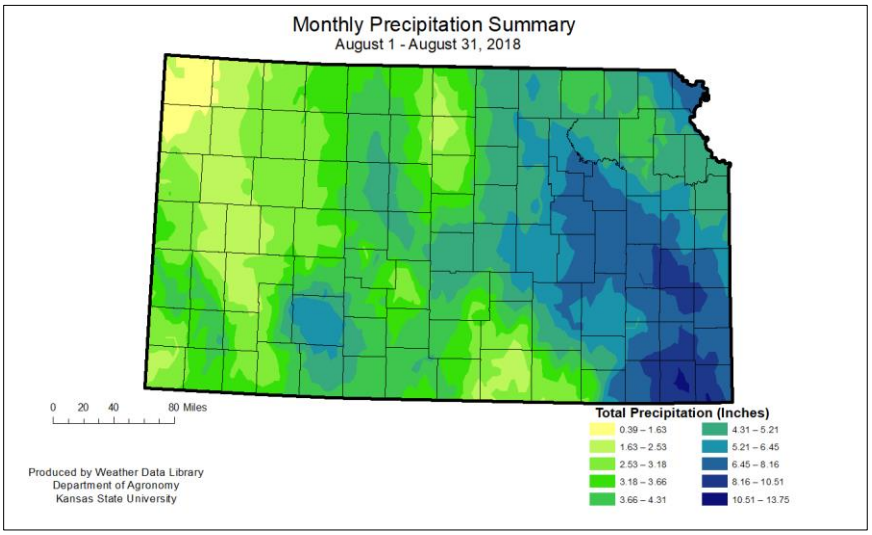
Climate Summary - Precipitation

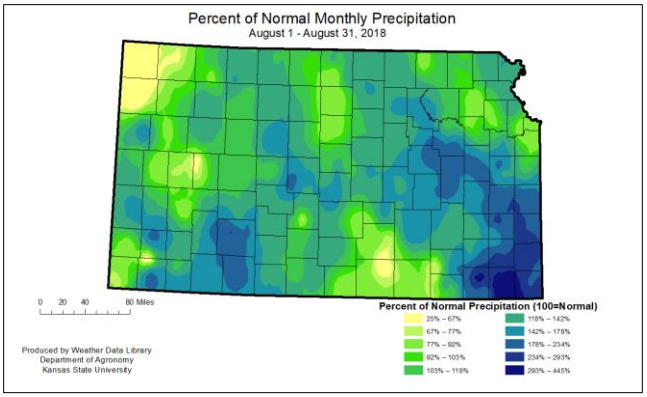
The August precipitation showed a more even distribution than earlier in the summer and brought drought relief. The state-wide average precipitation was 4.17 inches which was 125 percent of normal. The climate division with the largest surplus was the Southeast Division, with an average of 7.02 inches, or 188 percent of normal. The Northwest Division had the greatest shortfall, with an average of 2.00 inches creating a deficit of 0.73 inches. That translates to 73 percent of normal. Due to the cooler temperatures and favorable distribution, the negative impacts of that deficit were minimal. The greatest monthly total for a National Weather Service Cooperative station was at Bartlett 1 WSW, Labette County, with 13.75 inches. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Iola 2.7 SSE, Allen County, with 12.98 inches. Among the Kansas Mesonet stations, the Cherokee station near Columbus, had the greatest monthly total with 8.85 inches.

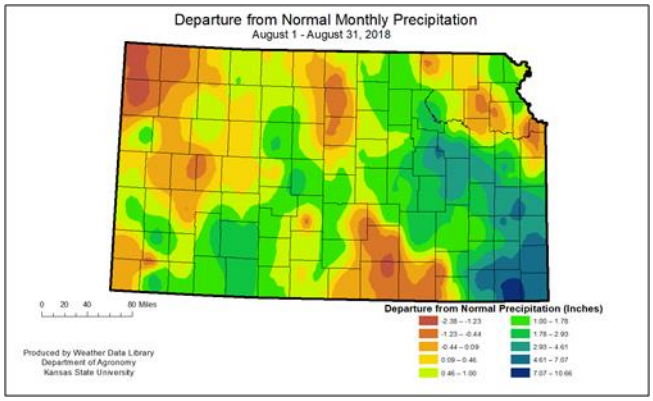
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation August 2018 Summary (inches)												
	August 1 - 31, 2018			January 1-August 31, 2018			April 1, 2017- August 31 , 2018			Sept. 1, 2017- August 31 , 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	72.2	-2.5	72.2	13.88	-3.01	82	12.86	-1.73	88	17.54	-3.82	82
West Central	73.3	-2.2	73.3	16.15	-0.14	99	15.12	1.33	110	20.77	0.00	100
Southwest	75.1	-2.2	75.1	17.98	2.54	116	17.43	4.37	133	21.58	1.68	108
North Central	74.9	-2.1	74.9	18.89	-2.42	89	17.32	-0.51	97	24.09	-3.95	86
Central	76.4	-1.8	76.4	18.91	-3.57	84	17.30	-1.23	93	23.74	-5.55	81
South Central	77.2	-2.0	77.2	21.79	-1.68	93	19.78	0.93	105	27.42	-3.90	88
Northeast	76.8	0.5	76.8	17.80	-7.86	69	15.66	-5.80	73	22.51	-12.49	64
East Central	77.0	-0.2	77.0	19.97	-7.64	72	17.10	-5.58	75	25.55	-12.37	67
Southeast	77.2	-1.3	77.2	26.30	-3.11	89	22.16	-1.25	95	33.37	-8.12	80
STATE	75.6	-1.5	75.6	19.38	-2.62	88	17.49	-0.66	96	24.40	-4.99	83

The maps below summarize precipitation for August. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps







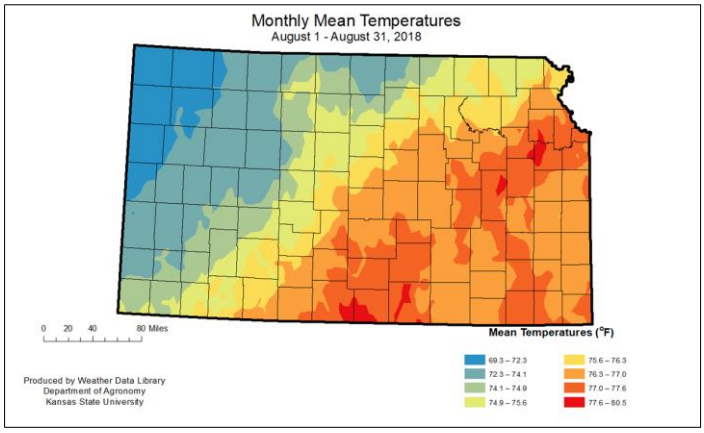
Climate Summary-Temperature

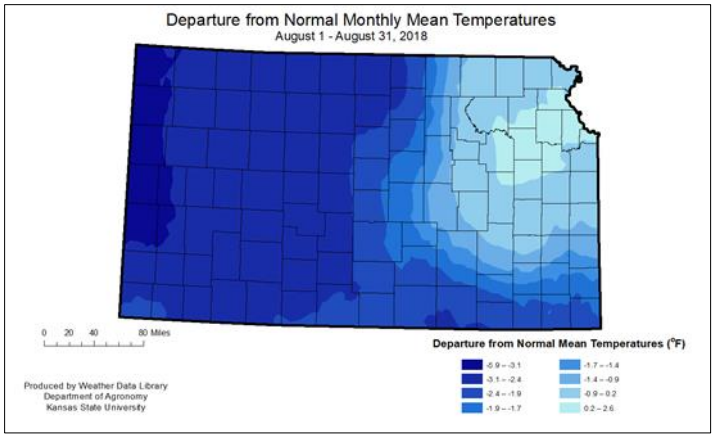
After a very warm start to the summer, August had a cooler note. State-wide average temperature for the month was 76.5 oF. This is 1.5 degrees cooler than normal, and ranks as the 37th coolest since 1895. The Northeast Climate Division had the largest warm signal with an average of 76.8 ^{o}F which was 0.5 degrees warmer than normal. The Northwest Division was the coldest with an average of 76.2 ^{o}F and a departure of -2.5 degrees. There were no new record daily warm maximum temperatures. Minimum temperatures were warmer than normal with 34 new daily record warm minimum temperatures were set. None of the daily records set new monthly temperature records for August. There were 41 new record coldest maximums and 6 record coldest minimum temperatures. The warmest temperature reported during the month was 103 ^{o}F at Marysville, Marshall County, on the 6th. The coldest temperature reported during August was 41 ^{o}F, reported at Brewster 4W, Sherman County, on the first.

Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (^{o}F)							
	August 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	100	41	72.2	-2.5	100	27	41	1
West Central	101	48	73.3	-2.2	101	28	48	21
Southwest	101	50	75.1	-2.2	101	31	50	22
North Central	99	48	74.9	-2.1	99	6	48	30
Central	101	52	76.4	-1.8	101	31	52	29
South Central	101	44	77.2	-2.0	101	31	44	26
Northeast	101	56	76.8	0.5	103	6	56	1
East Central	101	57	77.0	-0.2	101	5	57	29
Southeast	101	59	77.2	-1.3	101	8	59	1
STATE	101	41	75.6	-1.5	103	6th	41	1st
Data Source: KSU Weather Library								

The maps below summarize temperature for August through August 16. Climate maps are available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .



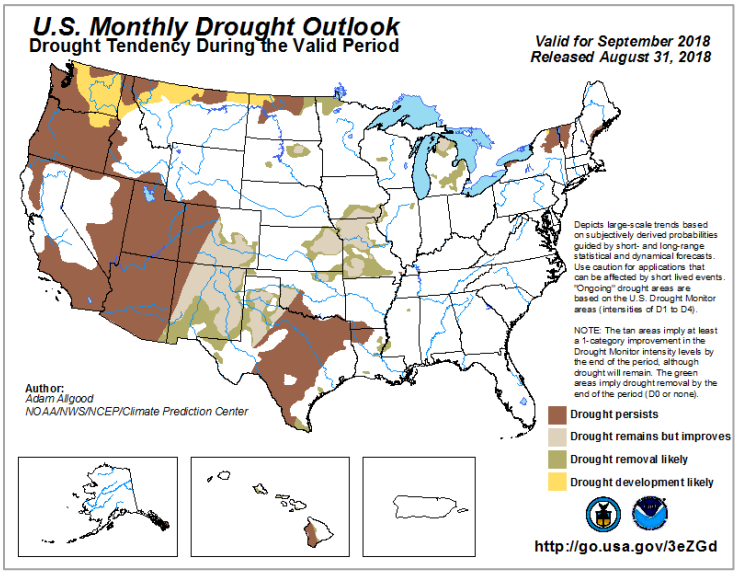


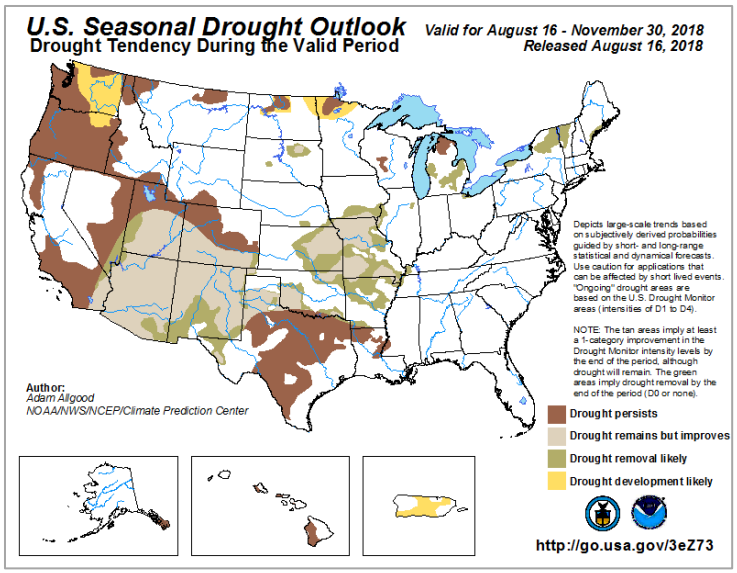
With the resurgence of moisture, severe weather reports during the month also increased. Tornado numbers continued on the low side with only 4 tornados reported. Unfortunately wind and hail caused significant damage in Sherman, Cheyenne, and Rooks counties. Complete damage estimates are not yet available. Total storm reports: 4 tornadoes, 32 hail events, and 45 reports of damaging wind.

Future Outlook

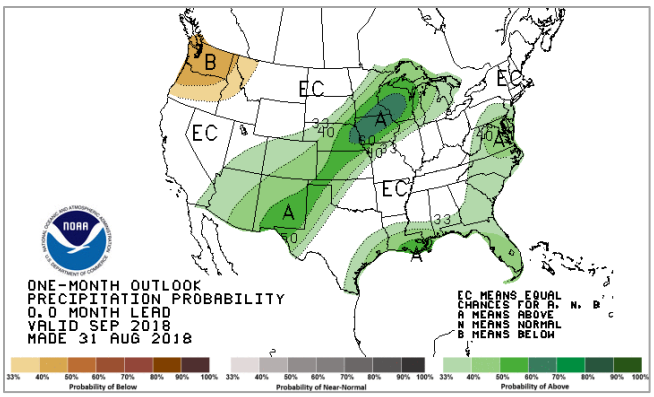
The Monthly Drought Outlook indicates drought conditions to remain, but improve in northeast Kansas in September. Improvement is also anticipated in the south east.

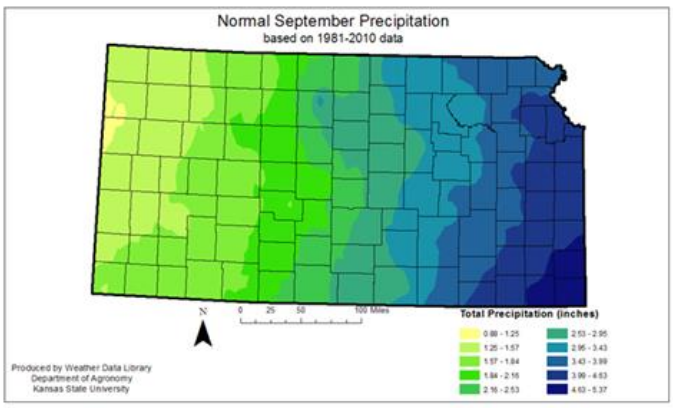
Seasonal Outlook (3-month) favors drought remaining in eastern Kansas, but possibly improving around the edge of the affected area. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

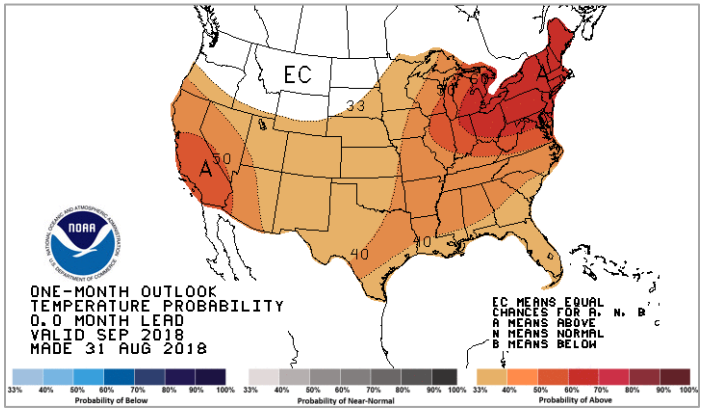


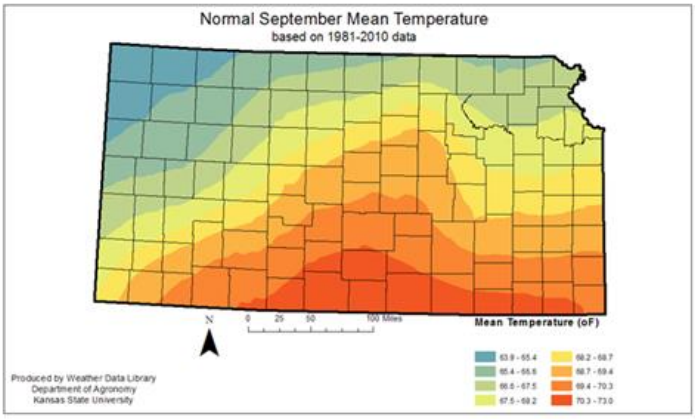


The one month, September climate outlook favors above normal temperature and precipitation for almost all of Kansas.

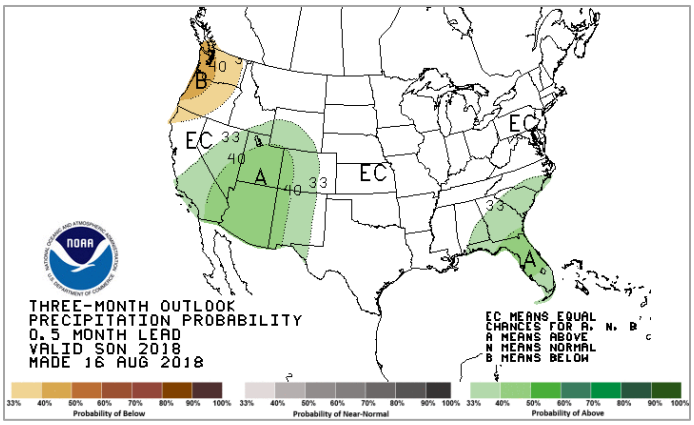


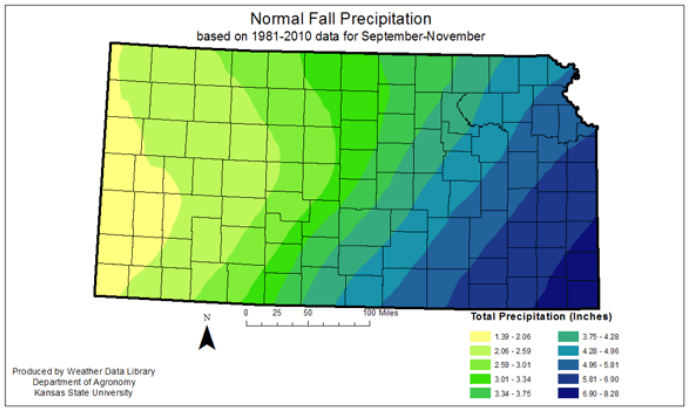


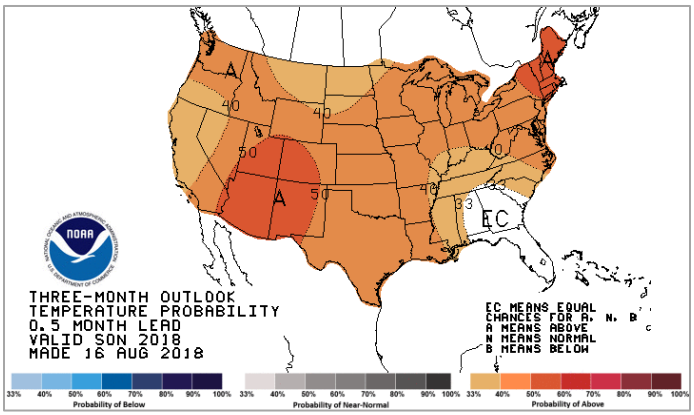


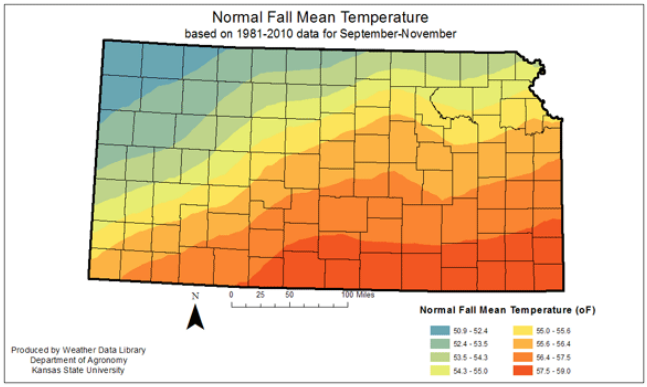


The long-term, 3 month outlooks give favors above normal precipitation in western and central Kansas and equal chances of normal, above or below normal precipitation in eastern Kansas. Above normal temperatures are favored for all of Kansas for August-September-October.









Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions
Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed.

Known issues:

August 16, 2018, **City of Oswego,** Labette County, issued a water watch asking residents to limit or eliminate nonessential water use. (https://www.oswegokansas.com/ , Sept. 4, 2018)

August 1, 2018 the **City of Burlington** issued a stage 1 water watch for its consumers including, Coffey County Rural Water Districts 2 and 3 and the cities of Gridley, LeRoy and New Strawn. August 15, the city enacted a stage 3 water emergency initiating mandatory water conservation. (https://burlingtonkansas.gov/, Sept. 4, 2018)

July 20, 2018 the **City of Gardner,** Johnson County, Water Warning took effect.
(http://www.gardnerkansas.gov/Home/Components/News/News/304/16?backlist=%2f , Sept. 4, 2018)

July 12, 2018 **the City of Spring Hill,** Johnson and Miami counties**,** requested residents take voluntary conservation measures due to drought conditions. https://www.springhillks.gov/CivicAlerts.aspx?AID=352

July 11, 2018 a water warning issued by **Public Wholesale Water Supply District #26** covers most of Chase County including the City of Strong City, Chase County Rural Water District #1, and the City of Cottonwood Falls. Voluntary and mandatory water restrictions are now in effect for water users obtaining water from these suppliers as well as domestic wells within the city limits of Strong City.

Stage II water restrictions, remain in place under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of Sept. 4, 2018 (www.russellcity.org/148/Current-Water-Status).

Stage II water restrictions have been in place for the **City of Victoria**, Ellis County since June 2017. (Sept. 4, 2018, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for **Medicine Lodge**, Barber County https://medicinelodge.kansas.gov/ Sept. 4, 2018)

Surface Water Supply Conditions
Kansas River basin: Inflow to all Kansas basin reservoirs was below normal for August, particularly for Clinton and Perry. For the majority of the month releases from Milford and Perry were at minimum outflow settings but Tuttle Creek released to maintain flow in the Kansas River, which remained below historic median values.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs remained at minimum gate settings in August and inflows were extremely low. Hillsdale experienced a declining trend throughout the month but Melvern and Pomona experienced a slight gain in storage after a rain in the last week of August. Reservoir releases were necessary to supplement flow in the upper reach of the Marais des Cygnes River until the late month rain. The lower system, downstream of La Cygne, experienced higher than normal flow in the second half of August primarily from runoff events in the watershed of Pottawatomie Creek. Storage supplies are somewhat depleted but sufficient and no municipal or industrial conservation measured have been implemented.

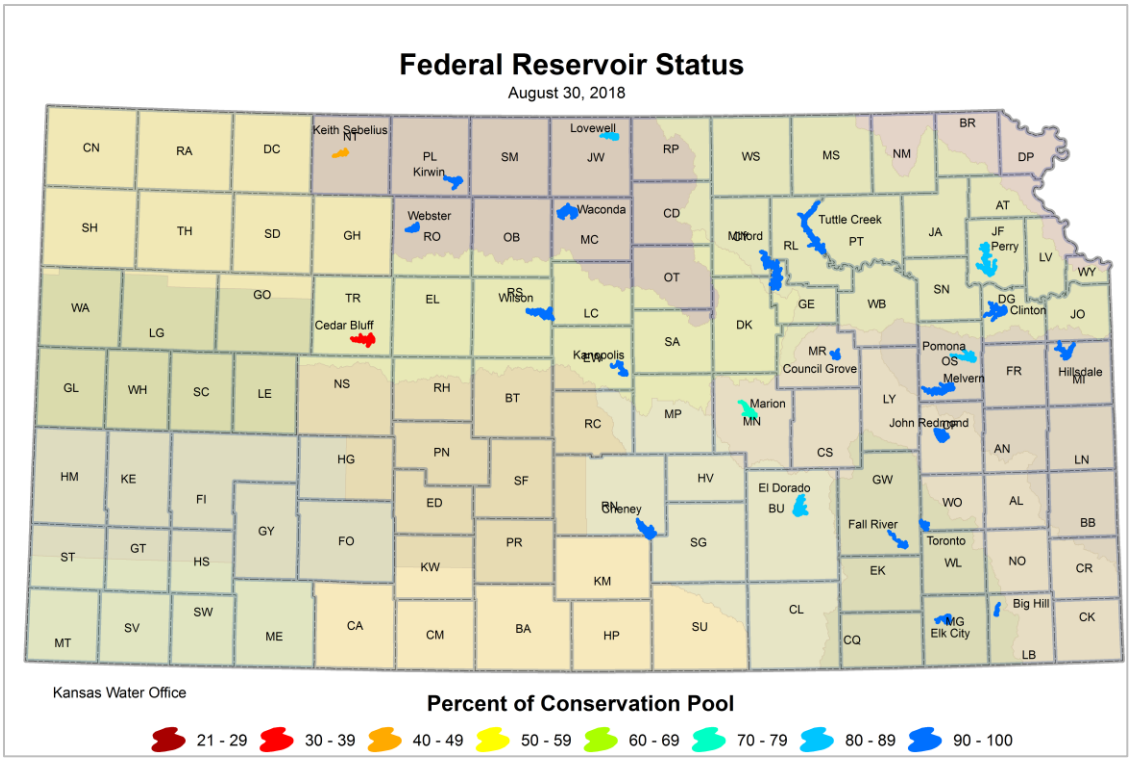
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were exceptionally low in the first half of August, particularly Council Grove and Marion. Several precipitation events occurred in the second half of the month and benefited Council Grove and John Redmond. John Redmond ended the month a couple feet into flood pool and Council Grove refilled nearly 20% of conservation storage, not full but most significant inflow since summer 2017. Marion experienced further declines.

Verdigris basin: Inflow to Toronto, Fall River, Elk City, and Big Hill reservoirs were relatively low until the night of August 14/15. The lower Verdigris basin received more than 8 inches of rain and Elk City rose more than 6 feet above normal pool. The precipitation even brought the Verdigris River from about 50 cfs to more than 20,000 cfs in a matter of hours. Additional rain event throughout the basin recharged all the reservoirs and flood pool releases maintained flows in the Verdigris River above normal levels through the second half of the month.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in August. Inflow remained above normal and releases in excess of low flow settings were necessary to manage lake level.

Smoky Hill basin: The Smoky Hill River continued to benefit from somewhat abnormal precipitation and sustained runoff in August. Cedar Bluff Reservoir has experienced a net gain in storage so far this year, for the first time in several. Kanopolis Lake has received enough inflow to reach the seasonal target elevation of 1467.7 and then some. Discharge through the uncontrolled spillway maintained downstream flow at or above normal levels for the majority of the month.

Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**08/30/2018 06:00 AM**		
Norton[1]	2304.3	2293.23	-11.07	44.9
Harlan County, NE	1945.73	1938.14	-7.59	70.5
Lovewell[1]	1582.6	1580.14	-2.46	80.8
Milford[1]	1144.4	1144.38	-0.02	99.9
Cedar Bluff	2144	2121.10	-22.90	35.6
Kanopolis[1]	1463	1468.02	5.02	100.0
Wilson[1]	1516	1516.80	0.80	100.0
Webster[1]	1892.5	1891.67	-0.78	96.2
Kirwin[1]	1729.3	1729.31	0.06	100.0
Waconda[1]	1455.6	1455.77	0.17	100.0
Tuttle Creek[1]	1075	1076.35	1.35	100.0
Perry[1]	891.5	888.73	-2.77	86.4
Clinton[1]	875.5	873.95	-1.55	90.8

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Melvern[1]	1036	1033.89	-2.11	90.7
Pomona[1]	974	971.74	-2.26	84.8
Hillsdale[1]	917	915.15	-1.85	89.0
Arkansas River Basin		**08/30/2018 08:00 AM**		
Cheney	1421.6	1421.59	-0.01	100.0
El Dorado	1339	1335.01	-3.99	82.0
Toronto[1]	901.5	901.98	0.48	100.0
Fall River[1]	948.5	950.51	2.01	100.0
Elk City[1]	796	795.96	-0.04	100.0
Big Hill	858	858.17	0.17	100.0
Council Grove[1]	1274	1272.38	-1.62	90.0
Marion[1]	1350.5	1347.01	-3.49	74.0
John Redmond[1]	1039	1042.73	1.73	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

Lake Public Health Advisories

Water Body	County	8/17/2018	8/23/2018	8/31/2018
Atchison County Park Lake	Atchison	Warning	Warning	Warning
Atwood Township Lake	Rawlins	-	Warning	Warning
Carbondale West Lake	Osage	Warning	Warning	Warning
Central Park Lake	Shawnee	-	-	Warning
Cottonwood **River** South of Emporia	Lyon	Watch	Watch	Watch
Frazier Lake	Grant	Warning	Warning	Warning
Hodgeman Co. State Fishing Lake	Hodgeman	Warning	Watch	Watch
Jerry Ivey Pond	Saline	Warning	Warning	Warning
Lake Afton	Sedgewick	Warning	Warning	Warning
Lake Scott State Park	Scott	Warning	Warning	Warning
Lake Wabaunsee	Wabaunsee	Watch	Watch	Warning
Lakewood Park Lake	Saline	Closure	Warning	Warning
Linn Valley Lake	Linn	-	Watch	-
Marais des Cygnes Wildlife Area Lake	Linn	Warning	Warning	Warning
Mary's Lake	Douglas	Watch	Watch	Watch
Melvern Lake	Osage	-	Watch	Watch
Melvern Outlet Pond	Osage	Warning	Warning	Warning
Melvern Outlet Swim Pond	Osage	Warning	Warning	Warning
Overbrook City Lake	Osage	Warning	Warning	Warning
Perry Lake Zone A	Jefferson	Watch	Watch	-
Perry Lake Zone B	Jefferson	Watch	Watch	-
Pomona Lake	Osage	-	Watch	Watch
Rock Garden Pond	Shawnee	Watch	Watch	Watch
South Park Lake	Johnson	Warning	Warning	Warning
Webster Lake	Rooks	Closure	Closure	Warning - beach closed

Please note lakes are only tested if a suspected bloom is reported to Kansas Department of Health and Environment (KDHE). Then testing is added to the next round of testing. So if in doubt stay out of the water and avoid contact with the water. Report new algae-blooms to KDHE: www.kdheks.gov/algae-illness or call 785-296-1664.

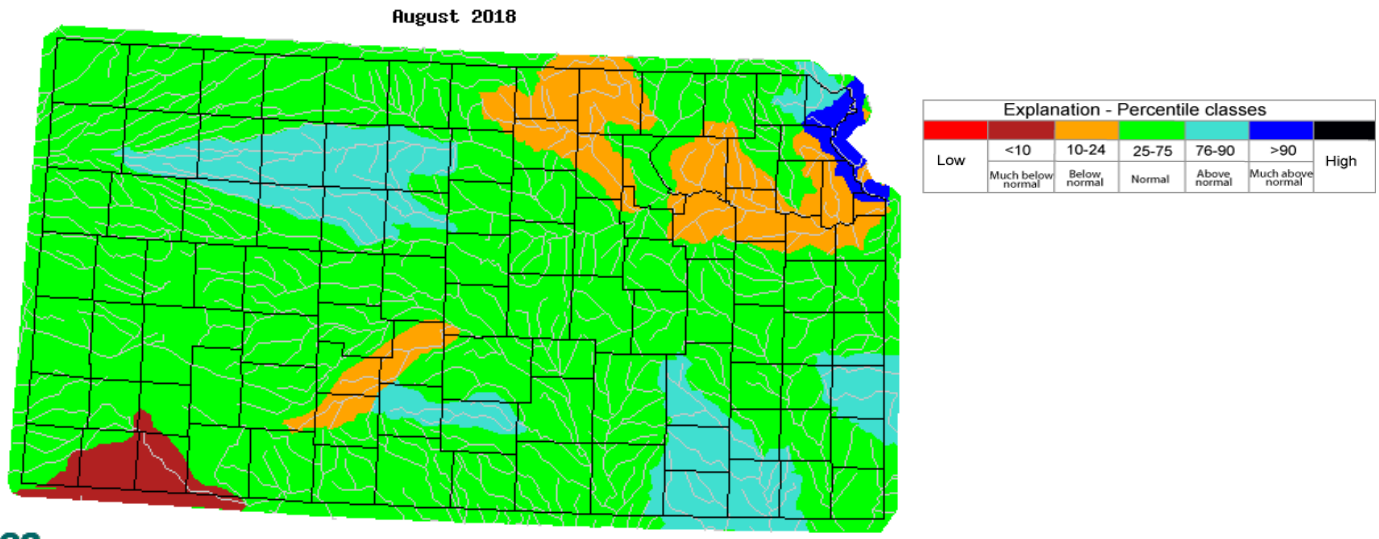
The location of public lakes under investigation for Harmful Blue-Green Algal Blooms (HAB) can be found at https://maps.kdhe.state.ks.us/habkscounty/

Farm ponds can develop blue-green algae also. This can pose risk to livestock and humans. KDHE and K-State have information on identifying, the risks online. The July 27, 2018 Agronomy Updates https://webapp.agron.ksu.edu/agr_social/eu_issue.throck?eu_id=292 explains the basics and risk to livestock A second article discusses management and sampling of farm ponds. The KDHE website also provides blue green algae basics for private ponds and their testing.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a 7-day period or other timeframe.

The August 2018 streamflow compared to historical streamflow for the day of the year is reflected in the map below.



USGS

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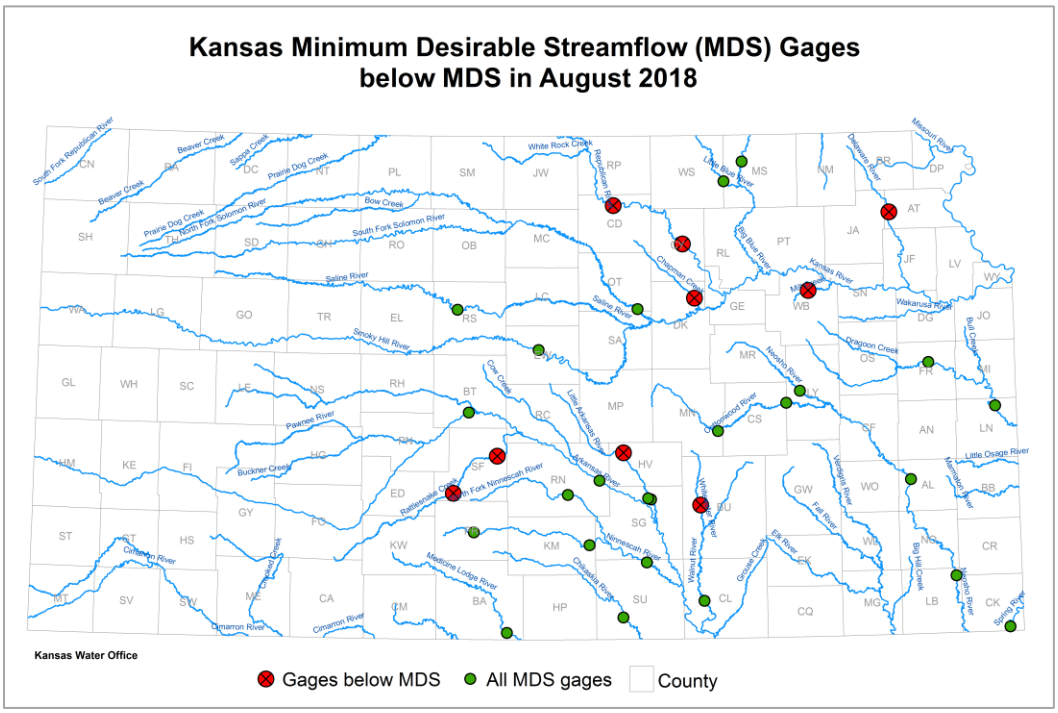
Low flows, when compared to historical records occurred in August 2018. Six stream gage locations set record low 7-day streamflow averages, 14 tied low flows of zero or nearly zero. Appendix B provides details on these low flows such as locations and the streamflow averages.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days.

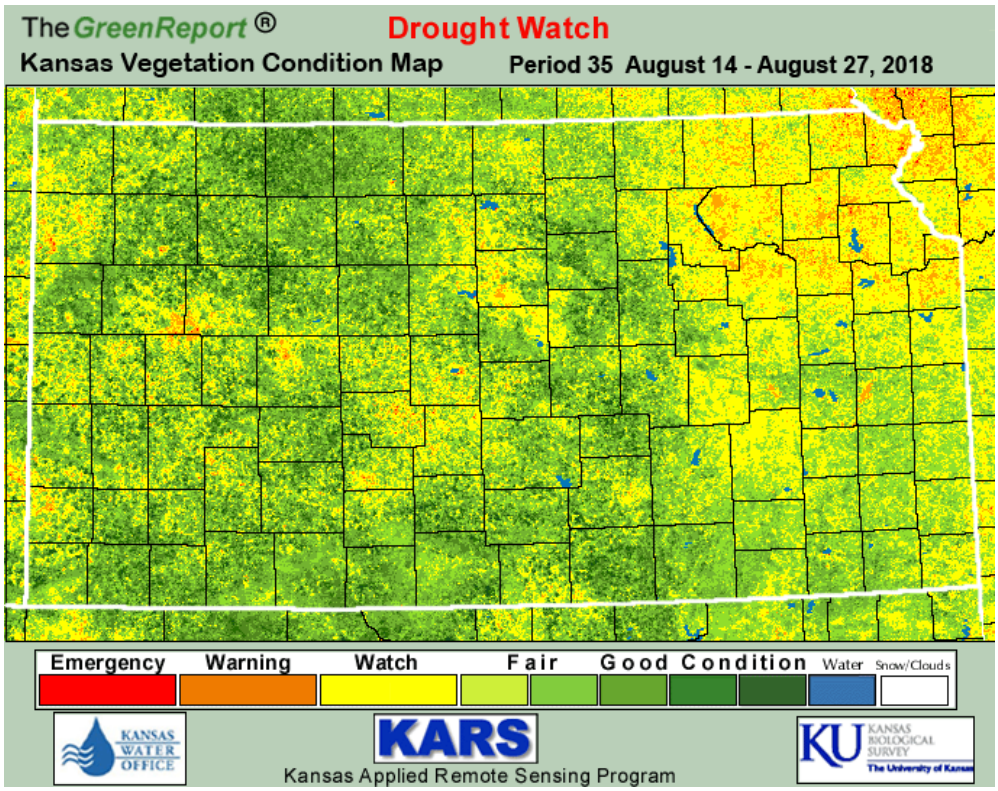


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.Streamflow was belowMDS at 9 gages during at least part of August.

Streamflows				
USGS Gaging Station	**August 27 Flow**	**August MDS**	**September MDS**	**Comment**
Republican River at Concordia	281	150	80	Admin began April 13, 2018, ceased Sept 4, 2018
Republican River at Clay Center	442	200	100	Admin began April 13, 2018, ceased Sept 4, 2018
Chapman Creek near Chapman	13	10	10	Admin began June 21, 2018, ceased Aug 28, 2018
Little Blue River near Barnes	398	80	60	Admin ceased July 3, 2018
Mill Creek near Paxico	7	5	5	Admin began April 12, 2018, ceased Sept 4, 2018
Delaware River near Muscotah	12	3	3	Admin began March 23, 2018, ceased Sept 5, 2018
Rattlesnake Creek near Macksville	Dry	1	1	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	15	3	3	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	546	8	8	MDS admin began Aug 10, 2017, ceased Sept 4, 2018
Whitewater River near Towanda	79	5	5	Admin began April 12, 2018, ceased Aug 27, 2018

Soil, Crop and Vegetation

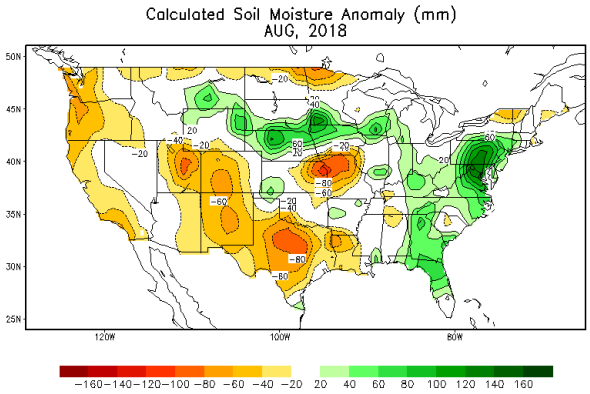
Vegetative Conditions

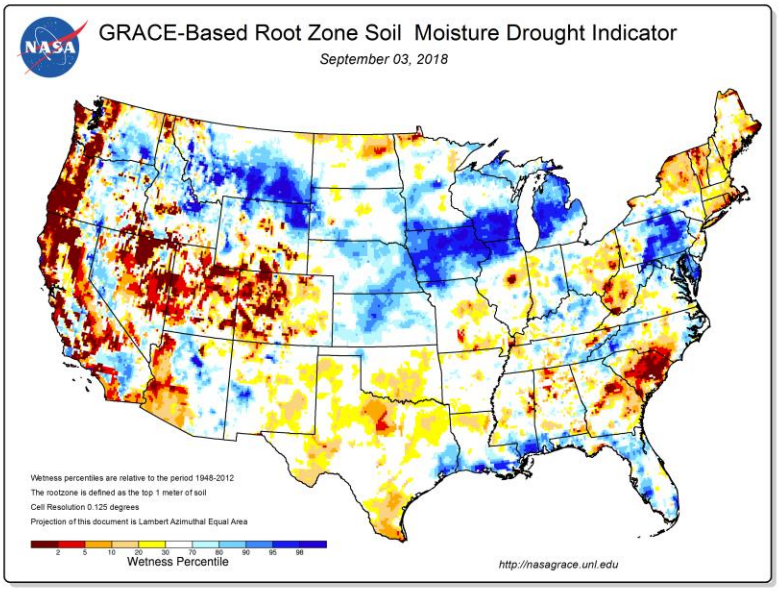


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. http://nasagrace.unl.edu/Default.aspx

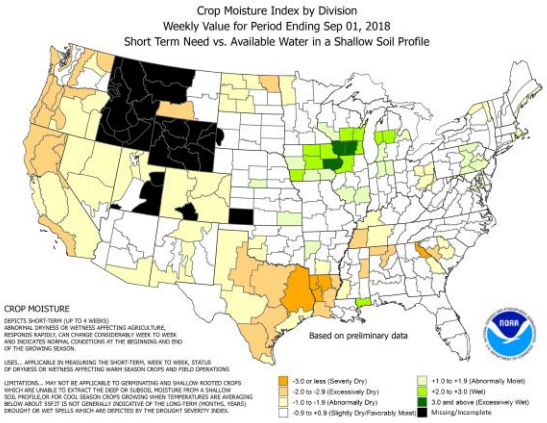
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending September 2, 2018 indicates topsoil moisture supplies rated 3 percent very short, 13 short, 77 adequate, and 7 surplus. Subsoil moisture supplies rated 5 percent very short, 19 short, 73 adequate, and 3 surplus.

Field Crops Report: Corn condition rated 11 percent very poor, 17 poor, 28 fair, 36 good, and 8 excellent. Soybean condition rated 4 percent very poor, 11 poor, 36 fair, 41 good, and 8 excellent. Sorghum condition rated 2 percent very poor, 6 poor, 26 fair, 52 good, and 14 excellent. Cotton condition rated 1 percent very poor, 2 poor, 25 fair, 59 good, and 13 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 9 percent very poor, 18 poor, 35 fair, 33 good, and 5 excellent.

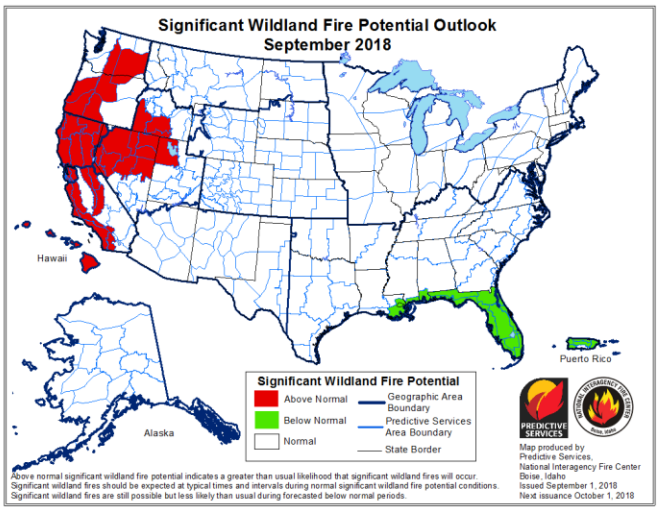
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

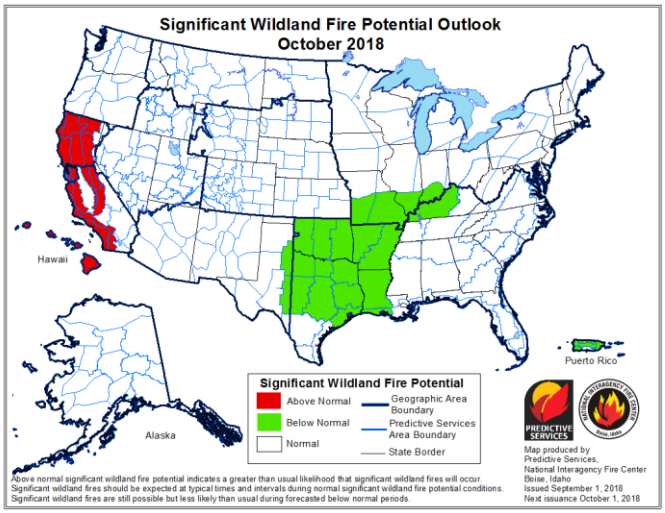


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

August 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	1.56	-0.85	65%	71.6	-0.5	97 (31)	47 (21)
Dodge City	6.68	3.93	243%	77.0	-1.1	100 (31)	54 (21)
Garden City	2.20	-0.25	90%	74.6	-2.1	100 (31)	53 (21)
Goodland	0.85	-1.85	31%	73.2	-0.5	100 (27)	46 (21)
Guymon, OK	1.78	-1.14	61%	78.2	0.1	104 (31,30)	52 (21)
Hill City	2.82	-0.09	97%	75.6	-1.1	100 (27)	52 (29)
Lamar, CO	1.74	-0.54	76%	75.2	-0.2	100 (30,27)	51 (21)
McCook, NE	1.82	-1.32	58%	73.5	-0.3	97 (27)	49 (29)
Springfield, CO	3.70	0.86	130%	69.7	-4.5	95 (31,5)	
Central							
Concordia	4.78	1.64	152%	74.4	-2.7	94 (27)	52 (29)
Hebron, NE	3.81	0.08	102%	74.8	-0.4	96 (27)	53 (29)
Medicine Lodge	4.54	1.42	146%	78.7	-1.6	99 (31)	57 (21,1)
Ponca City, OK	2.35	-0.90	72%	80.3	-0.7	99 (6,5)	60 (1)
Salina	4.60	0.65	116%	77.4	-2.2	99 (31)	57 (29)
Wichita (ICT)	3.05	-0.66	82%	79.3	-0.7	101 (31)	61 (2)
East							
Bartlesville, OK	4.25	1.18	138%	78.2	-2.0	99 (6)	58 (3,1)
Chanute	6.13	2.44	166%	78.2	-0.7	99 (6)	59 (1)
Falls City, NE	6.69	2.65	166%	75.8	0.4	101 (5)	56 (29)
Johnson Co. Exec. Apt	2.93	-0.79	79%	77.0	-0.6	95 (6,5)	61 (23,1)
Joplin, MO	6.62	3.27	198%	78.4	-1.3	99 (6)	58 (1)
Kansas City (MCI), MO	4.46	0.57	115%	77.3	0.2	97 (5)	59 (23)
St. Joseph, MO	1.67	-2.31	42%	76.0	0.7	98 (5)	55 (1)
Topeka (TOP)	4.86	0.62	115%	78.9	1.5	101 (5)	58 (1)

1. Airport Automated Observation Stations (NWS/FAA)

2. Departure from 1981-2010 normal value

T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal

Source: National Weather Service F-6 Climate Summaries

APPENDIX B
Low Streamflows

USGS Summary of Recent 7-day Average Flow Conditions
(2018-08-01 -- 2018-08-30)
["--", no data; ">", greater than all historical minimum values]

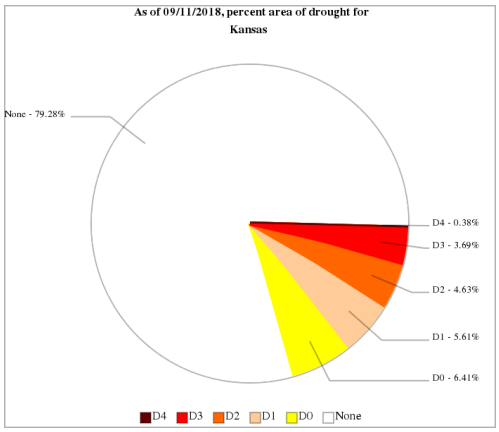
USGS station number	USGS station name	Drain. area [mi^2]	2018-08-01 to 2018-08-30				Historical annual minimum 7-day flows		
			No. of days with zero flows	Lowest 7-day average flow			No. years	Min. (year) [ft^3/s]	No. of years with zero flows
				Date	Streamflow [ft^3/s]	Rank			
6878600	LYON C NR JUNCTION CITY, KS	258	0	8/13/2018	0.17	1	8	1.08 (2012)	0
6888300	ROCK C NR LOUISVILLE, KS	128	0	8/7/2018	0.97	1	7	0.99 (1964)	0
7182260	COTTONWOOD R AT EMPORIA, KS	1833	0	8/1/2018	33.3	1	5	44.8 (2014)	0
6891850	STRANGER C AT EASTON, KS	216	0	8/9/2018	1.34	1	4	3.66 (2016)	0
6892518	KANSAS R NR LAKE QUIVIRA, KS	59985	0	8/18/2018	1460	1	3	1510 (2017)	0
7179785	NF COTTONWOOD R NR DURHAM, KS	103	0	8/1/2018	0.01	1	3	0.58 (2017)	0
7139000	ARKANSAS R AT GARDEN CITY, KS	27071	5	8/15/2018	0	Tie 1	81	0 (1922)	56
6860000	SMOKY HILL R AT ELKADER, KS	3555	18	8/13/2018	0	Tie 1	79	0 (1940)	63
6846500	BEAVER C AT CEDAR BLUFFS, KS	1680	20	8/11/2018	0	Tie 1	73	0 (1947)	66
6911900	DRAGOON C NR BURLINGAME, KS	114	22	8/1/2018	0	Tie 1	59	0 (1960)	40
7142300	RATTLESNAKE C NR MACKSVILLE, KS	697	30	8/1/2018	0	Tie 1	59	0 (1988)	18
6910800	MARAIS DES CYGNES R NR READING, KS	177	19	8/1/2018	0	Tie 1	50	0 (1976)	21
7140850	PAWNEE R NR BURDETT, KS	1091	4	8/16/2018	0	Tie 1	37	0 (1982)	36
6870300	GYPSUM C NR GYPSUM, KS	117	5	8/9/2018	0	Tie 1	28	0 (1955)	11
6911490	SALT C AT LYNDON, KS	97.8	22	8/1/2018	0	Tie 1	19	0 (2000)	11
6869950	MULBERRY C NR SALINA, KS	261	3	8/11/2018	0	Tie 1	17	0 (2006)	2
6891260	WAKARUSA R NR RICHLAND, KS	164	15	8/1/2018	0	Tie 1	16	0 (2003)	3
6892360	KILL C AT 95TH ST NR DESOTO, KS	53.4	3	8/10/2018	0	Tie 1	16	0 (2003)	2
7179300	NEOSHO R NR PARKERVILLE, KS	74.6	0	8/14/2018	0.03	Tie 1	7	0.03 (2014)	0
7179700	ROCK C NR DUNLAP, KS	120	17	8/1/2018	0	Tie 1	6	0 (2013)	3
7182200	SF COTTONWOOD R NR BAZAAR, KS	190	0	8/8/2018	0.22	2	6	0 (2013)	1
7187600	SPRING R NR BAXTER SPRINGS, KS	2448	0	8/9/2018	160	3	10	83 (2012)	0
6879810	WILDCAT C AT SCENIC DRIVE, MANHATTAN, KS	86	0	8/12/2018	0.26	3	7	0.19 (2013)	0
7186055	COW C NR SCAMMON, KS	222	0	8/8/2018	3.9	3	5	1.6 (2014)	0

KANSAS CLIMATE and DROUGHT UPDATE
Mid-September 2018 Summary

Highlights

- Executive Orders 18-17 and 18-18 in September adjusted drought declarations to reflect needs. Order 18-17 downgraded drought declarations for 55 counties, removing 50 counties from any drought declaration. As of September 18, 2018, 50 counties remain in emergency status, and 5 in watch, primarily to allow continued assistance to mitigate drought impacts on livestock.

- U.S. Drought Monitor for September 11 indicates about 21 Percent of Kansas remains dry or in drought.



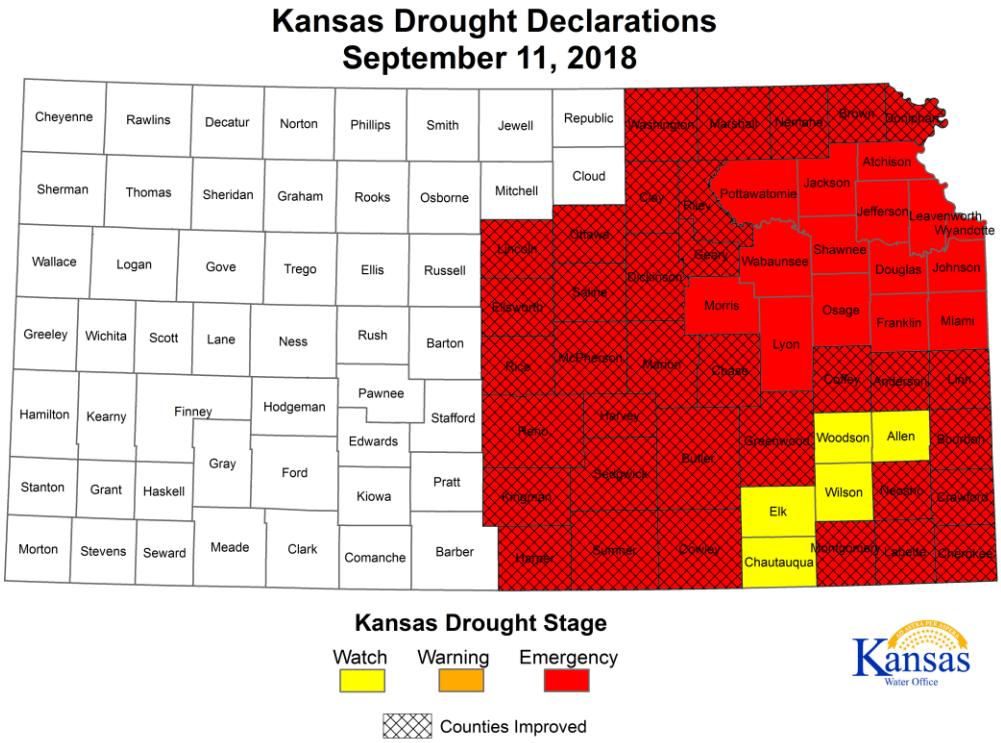
- Emergency water permits for livestock remain in effect allowing producer withdrawals at three state fishing lakes and four federal lakes.

- Kansas pastures and ranges have improved in general comparing the NASS/USDA September 16th value of 19% poor or very poor to an August 19th value of 33% poor or very poor.

- Administration of MDS continued on streams in September but ceased on many: Little Arkansas River at Alta Mills has been since August 10, 2017; Mill Creek above Paxico since April 12, 2018; Republican River above the Clay Center and Concordia gages since April 13, 2018, ceased September 4, 2018; and Delaware River above the Muscotah gage since March 23, 2018, ceased September 5, 2018.

- Kansas Department of Health and Environment Public Health Advisories as Closure, Warning or Watches were in place in mid-September for 23 Kansas water bodies. This includes 17 warnings and 6 watches due to the presence of harmful algae (HAB). A public health watch indicates water may be unsafe for humans and animal – contact is discouraged. A public health warning indicates contact with water should not occur, it is unsafe.

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order (EO) 18-17 on September 11, 2018 placing 50 counties in emergency status and 5 into a watch status. A total of 55 counties were downgraded, 50 of these having drought declarations removed. EO 18-18 corrected the listing of counties. These Drought Declarations remain in place until revised or rescinded by a subsequent EO.



Drought Watch counties: Allen, Chautauqua, Elk, Wilson, Woodson

Drought Emergency counties: Anderson, Atchison, Bourbon, Brown, Butler, Chase, Cherokee, Clay, Coffey, Cowley, Crawford, Dickinson, Doniphan, Douglas, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Johnson, Kingman, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Miami, Montgomery, Morris, Nemaha, Neosho, Osage, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Sedgwick, Shawnee, Sumner, Wabaunsee, Washington, Wyandotte

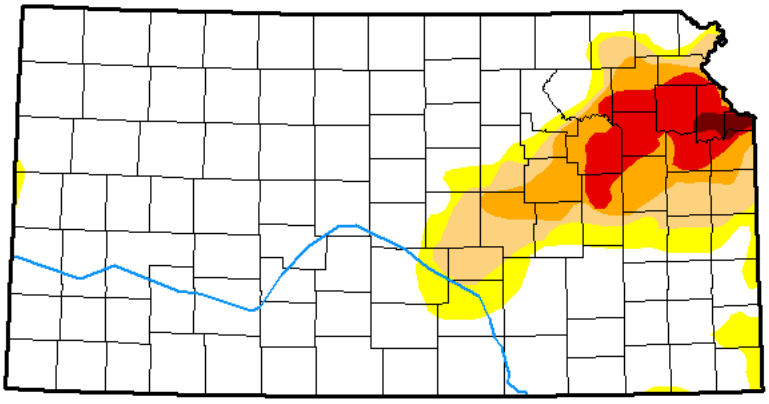
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

The continued rainfall and cooler temperatures resulted in continued improvement in drought conditions across the state in early September in the U.S. Drought Monitor. The heaviest precipitation did not reach extreme eastern Kansas, so the exceptional and extreme drought lingers in that area. Currently, just over 79 percent of the state is drought free. The change in drought categories map) shows where changes occurred.

U.S. Drought Monitor

Kansas



September 11, 2018

(Released Thursday, Sep. 13, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	79.28	20.72	14.31	8.70	4.07	0.38
Last Week *09-04-2018*	65.29	34.71	18.52	11.78	4.92	0.60
3 Months Ago *06-12-2018*	20.40	79.60	66.48	33.63	12.65	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago *09-12-2017*	46.12	53.88	17.20	0.65	0.00	0.00

Intensity:

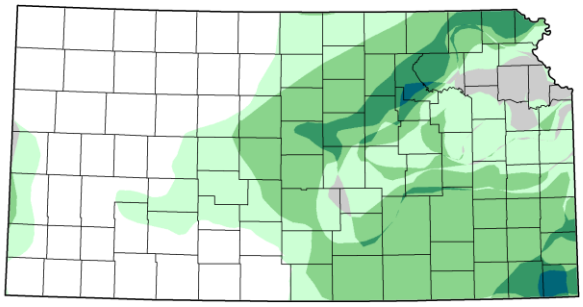
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
David Miskus
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

U.S. Drought Monitor Class Change - Kansas
1 Month



September 11, 2018 compared to August 14, 2018

http://droughtmonitor.unl.edu

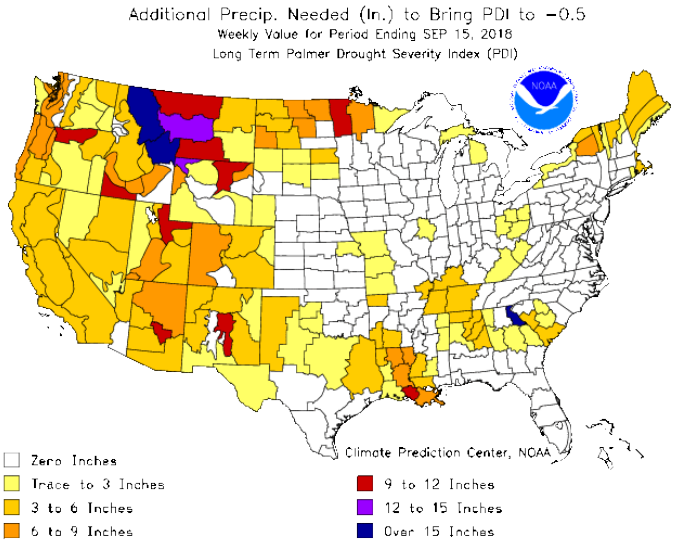
- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Sept. 1	Sept. 8	Sept. 15
Northwest	-	-	-
North Central	-	-	-
Northeast	7.44	-	1.47
West Central	-	-	-
Central	2.26	-	-
East Central	-	-	-
Southwest	-	-	-
South Central	-	-	-
Southeast	-	-	-



More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

State Drought Mitigation

Livestock Water

Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. In early September two permits were cancelled upon producer request, having withdrawn no water in August and their water supply had replenished. Permits have been issued at three state fishing lakes (Chase, Lyon, McPherson) and four federal lakes (Fall River, Melvern, Milford, and Tuttle Creek). The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed. By mid-September four permits were cancelled upon producer request.

Financial assistance for livestock water supply wells, pipeline and tanks may also be available through Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS or Kansas Department of Agriculture-Division of Conservation through the Livestock Water Supply Financial Assistance Initiative in Emergency counties. Applications can be made through local conservation districts.

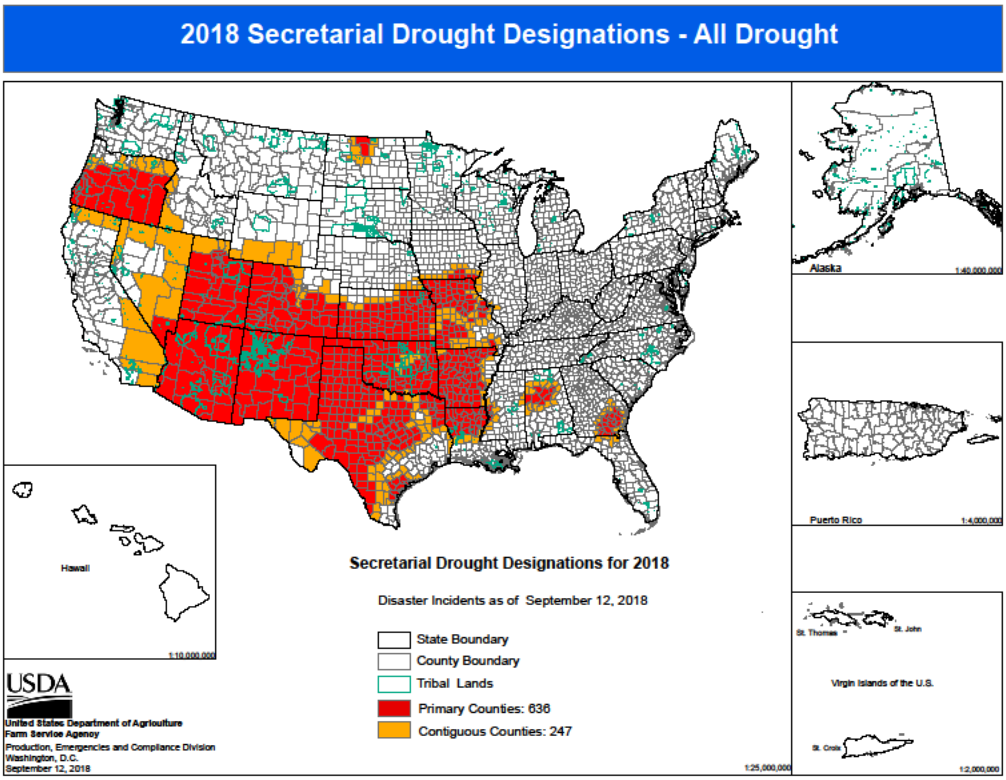
Federal Disaster Drought Declarations 2018

U. S. Department of Agriculture Drought Disaster

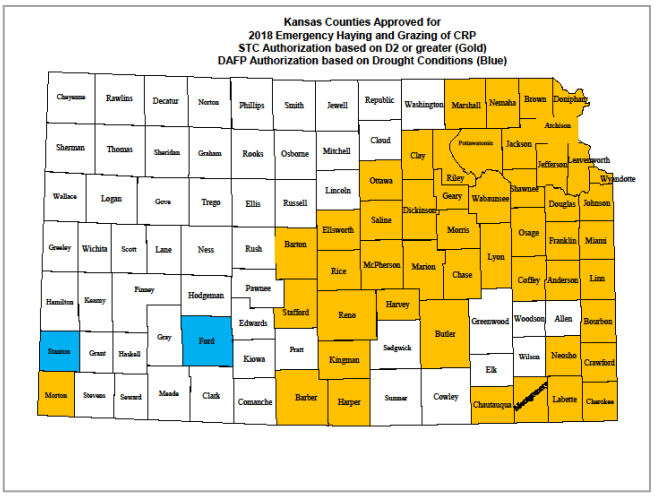
USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte.

Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.



Haying and grazing of Conservation Reserve Program (CRP) acres is in place to provide emergency haying and grazing on CRP acreages in the counties in Kansas colored on the map at right. These counties may graze through September 30, 2018 with county office approval. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres. Counties in blue have DAFP authorization, gold are authorized based on D2 or greater on the U.S. Drought Monitor. A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



Climate Summary - Precipitation

It was a wet pattern across the state for the week of August 29 - September 4. The state-wide average was 2.31 inches, which is 356 percent of normal for the period. The North Central Climate Division had the largest surplus, with an average of 3.81 inches, which is 3.16 inches greater than normal.

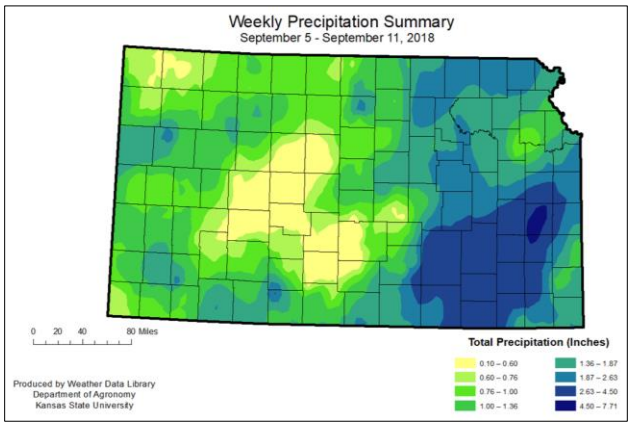
For the week of September 5-11, the state-wide average was 1.33 inches, which is 211 percent of normal for the period. The Southeast Climate Division had the largest surplus, with an average of 3.47 inches, which is 2.55 inches greater than normal.

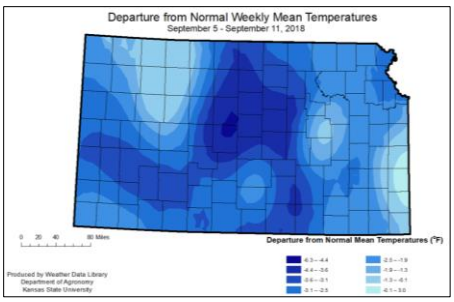
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

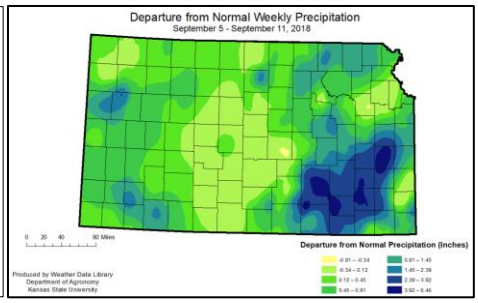
Kansas Climate Division Precipitation Summary (inches)

Climate Division	Sept 5-11, 2018			January 1-Sept 11, 2018			April 1, 2017- Sept 11 , 2018			Sept. 1, 2017- Sept 11, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.38	0.00	100	14.61	-2.89	83	13.59	-1.61	89	0.79	0.17	127
West Central	0.86	0.46	215	17.71	0.78	105	16.68	2.24	116	1.68	1.04	263
Southwest	0.93	0.51	221	19.92	3.81	124	19.37	5.64	141	2.14	1.47	319
North Central	0.89	0.26	141	22.79	0.48	102	21.23	2.40	113	3.92	2.92	392
Central	0.69	0.09	115	22.13	-1.32	94	20.52	1.02	105	3.26	2.29	336
South Central	1.01	0.41	168	25.36	0.93	104	23.35	3.55	118	3.57	2.61	372
Northeast	1.40	0.52	159	21.52	-5.51	80	19.38	-3.45	85	3.78	2.41	276
East Central	2.06	1.21	242	22.51	-6.43	78	19.64	-4.38	82	2.54	1.20	190
Southeast	3.47	2.55	377	29.87	-0.98	97	25.73	0.88	104	3.57	2.13	248
STATE	1.33	0.70	211	22.15	-0.84	96	20.26	1.11	106	2.83	1.84	286

The maps below summarize precipitation. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps







Climate Summary-Temperature

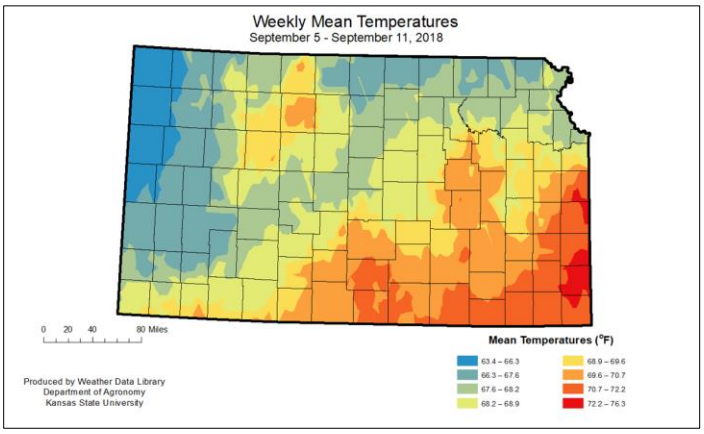
Temperatures were warmer than normal across much of the state for the week August 26- September 4. The state-wide average temperature was 75.8 ^{o}F, which is 1.5 degrees warmer than normal. The South Central Climate Division was the warmest, with an average temperature of 79.5 ^{o}F. That is 3.5 ^{o}F warmer than normal. The Northwest Division had the greatest departure on the cooler side. The average temperature for the division was 70.6 ^{o}F, with a departure of -0.7 ^{o}F. The highest maximum temperature was 103 ^{o}F at the Garden City Experiment Station, Finney County, on the 1st. The lowest minimum temperature was 47 ^{o}F at Brewster 4W, Sherman County, on the 29th.

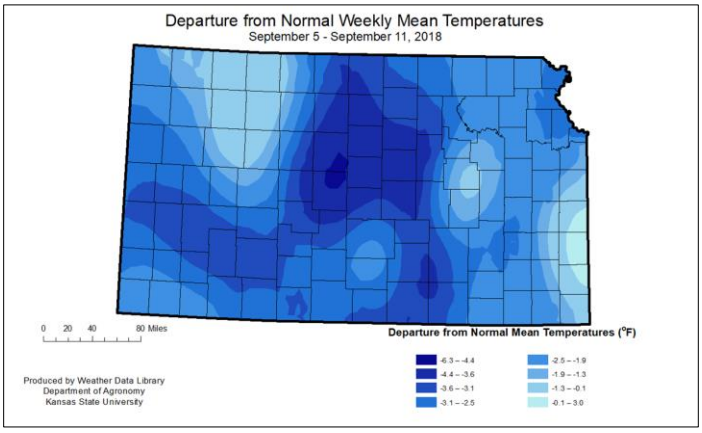
Temperatures were cooler than normal across much of the state for the week of September 5-11. The state-wide average temperature was 68.6 ^{o}F, which is 3.1 degrees cooler than normal. The Central Climate Division had the greatest departure from normal with an average temperature for the division of 68.3 ^{o}F, a departure of -4.4 ^{o}F. The Northwest Division had the coldest average at 66.8 ^{o}F, but that was just 2.2 degrees cooler than normal. The highest maximum temperature was 91 ^{o}F at Fort Scott, Bourbon County, on the 9th. The lowest minimum temperature was 50 ^{o}F at both Holton in Jackson County, and Marion Reservoir in Marion County, on the 9th.

Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

Climate Division	Kansas Climate Division Temperature Summary (^{o}F)							
	September 5-11, 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	74.8	58.7	66.8	-2.2	87	5	52	5
West Central	74.5	59.4	66.9	-3.1	90	5	52	10
Southwest	75.7	60.7	68.2	-3.9	87	5	54	10
North Central	74.3	61.5	67.9	-3.6	86	5	54	10
Central	74.6	62.0	68.3	-4.4	84	5	51	10
South Central	77.3	63.6	70.5	-3.2	88	6	53	10
Northeast	74.3	62.0	68.1	-2.7	81	5	50	9
East Central	74.5	62.9	68.7	-3.0	86	5	52	10
Southeast	77.3	65.9	71.6	-1.4	91	5	52	10
STATE	75.3	61.9	68.6	-3.1	91	5th	50	9th
Data Source: KSU Weather Library								

The maps below summarize temperature. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .

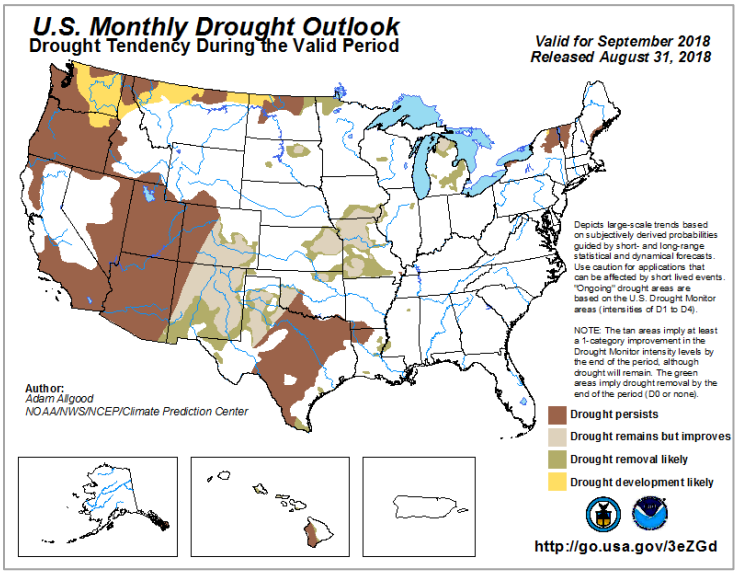


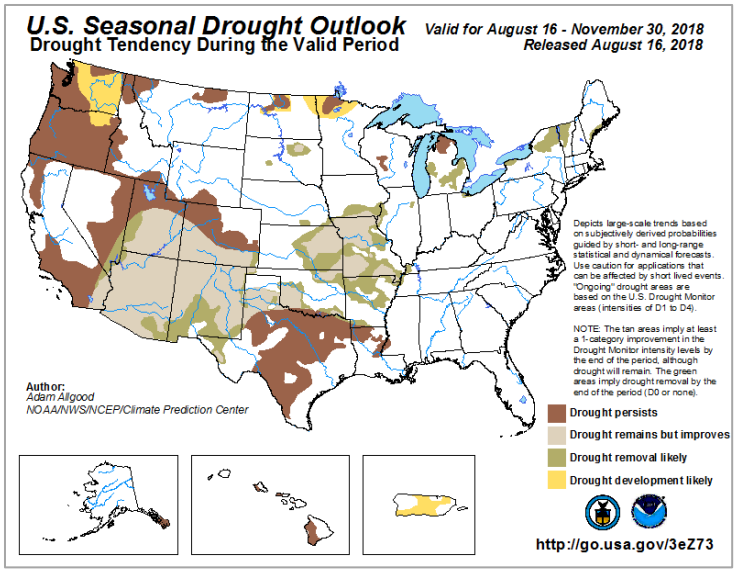


Future Outlook

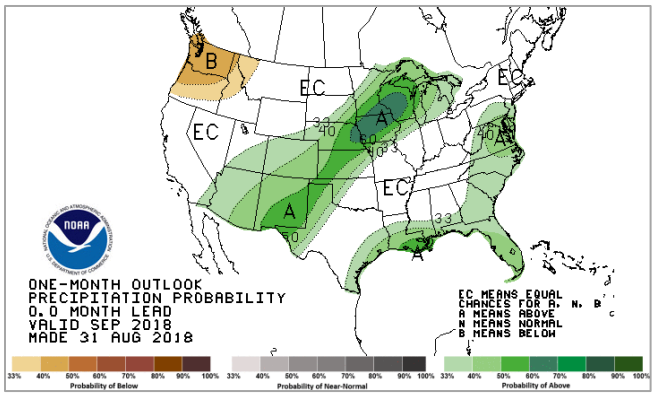
The Monthly Drought Outlook indicates drought conditions to remain, but improve in northeast Kansas in September. Improvement is also anticipated in the south east.

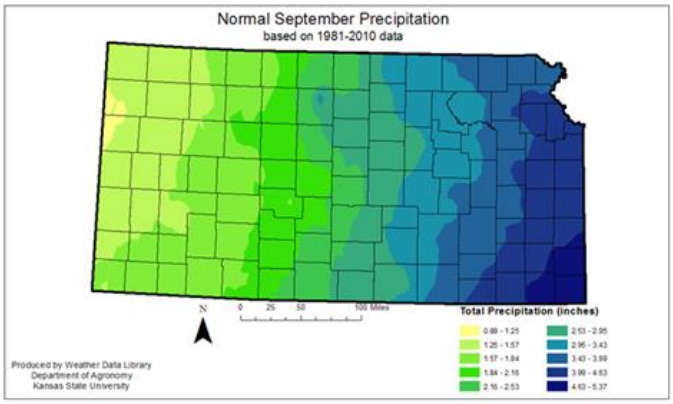
Seasonal Outlook (3-month) favors drought remaining in eastern Kansas, but possibly improving around the edge of the affected area. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

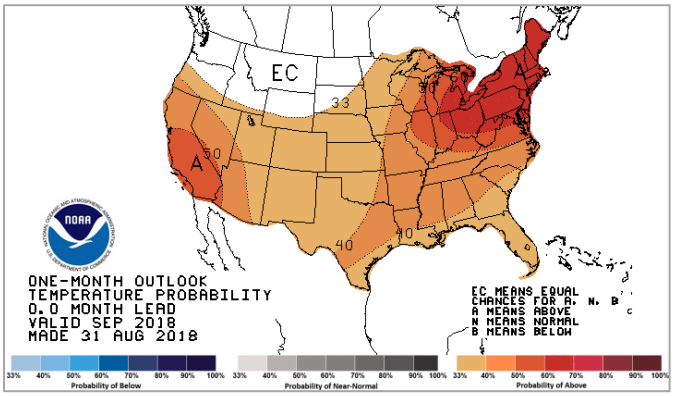


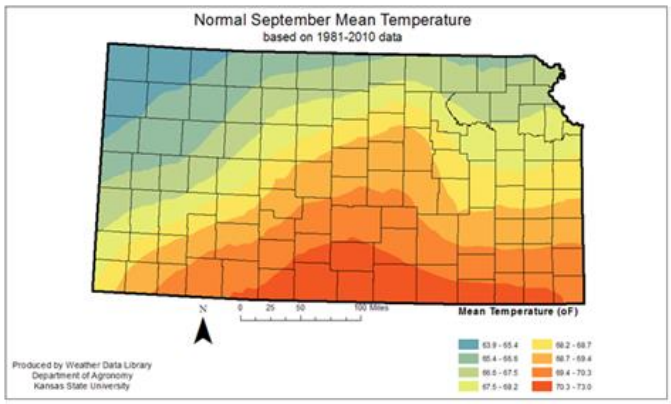


The one month climate outlook favors above normal temperature and precipitation for almost all of Kansas.

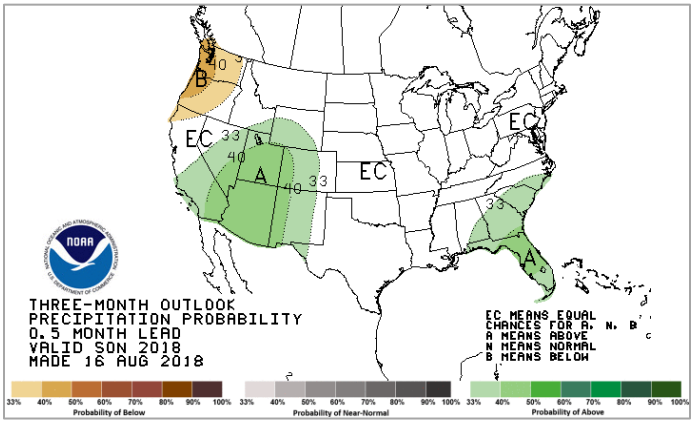


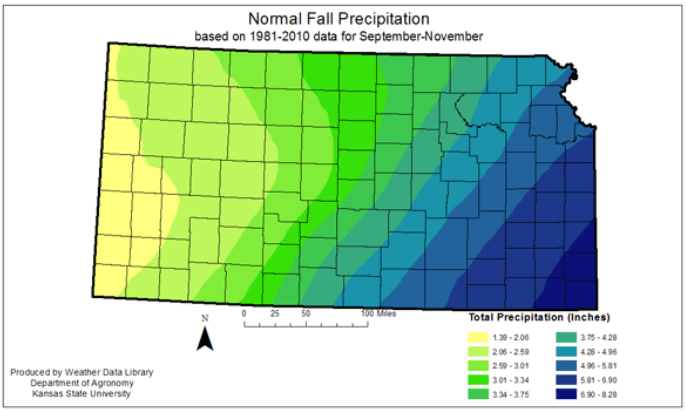


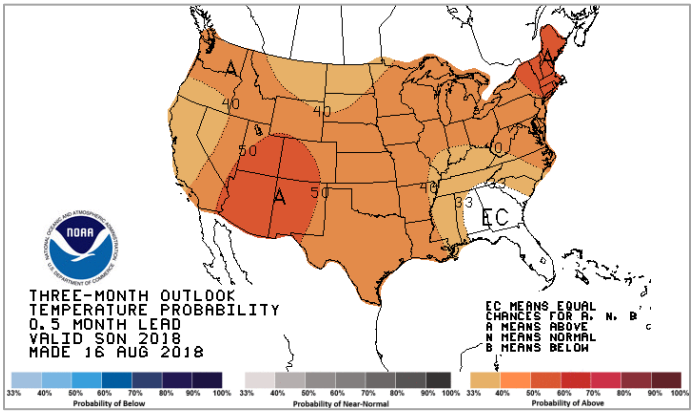


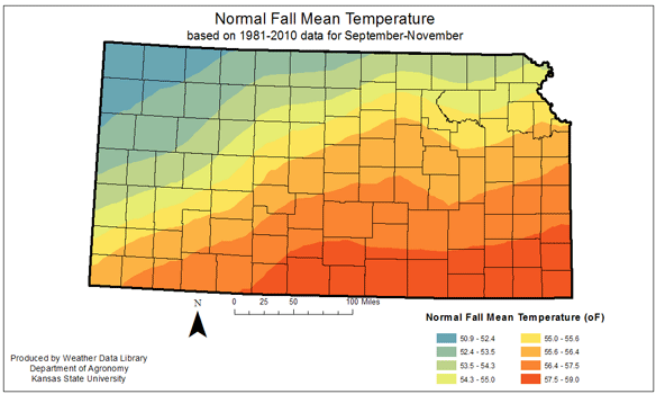


The long-term, 3 month outlooks give favors above normal precipitation in western and central Kansas and equal chances of normal, above or below normal precipitation in eastern Kansas. Above normal temperatures are favored for all of Kansas for September-October-November.









Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Please note stage designation or name and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers.

Numerous communities have conservation measures in place throughout the summer or year to restrict outdoor watering to times with less evaporative loss.

Known issues:

August 16, 2018, **City of Oswego,** Labette County, issued a water watch asking residents to limit or eliminate nonessential water use.

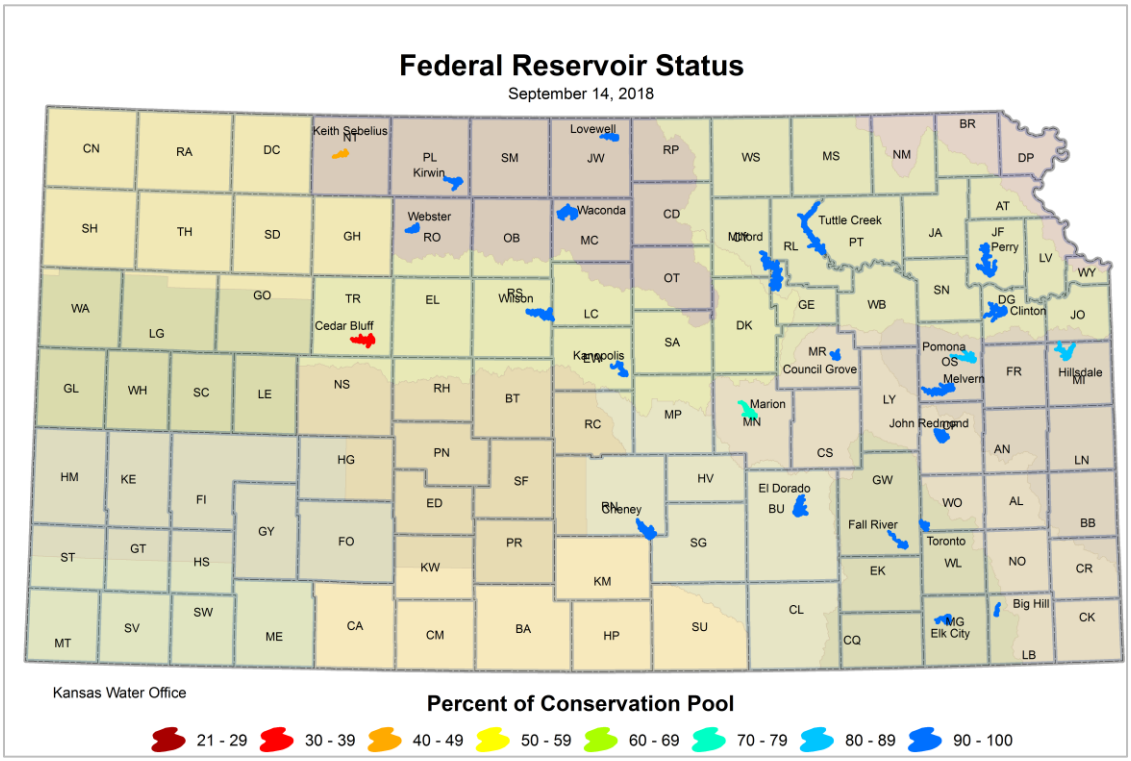
August 15, the **City of Burlington** enacted a stage 3 water emergency initiating mandatory water conservation for all its consumers, including Coffey County Rural Water Districts 2 and 3 and the cities of Gridley, LeRoy and New Strawn.

July 20, 2018 the **City of Gardner,** Johnson County, issued a Water Warning took effect with some mandatory restrictions.

July 12, 2018 **the City of Spring Hill,** Johnson and Miami counties**,** requested residents take voluntary conservation measures due to drought conditions.

July 11, 2018 a water warning issued by **Public Wholesale Water Supply District #26** covers most of Chase County including the City of Strong City, Chase County Rural Water District #1, and the City of Cottonwood Falls. Voluntary and mandatory water restrictions effect water users obtaining water from these suppliers as well as domestic wells within the city limits of Strong City.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**09/14/2018 6:00 AM**		
Norton[1]	2304.3	2293.32	-10.98	45.2
Harlan County, NE	1945.73	1938.41	-7.32	71.5
Lovewell[1]	1582.6	1582.45	-0.15	98.8
Milford[1]	1144.4	1149.96	5.56	100.0
Cedar Bluff	2144	2121.23	-22.77	35.9
Kanopolis[1]	1463	1467.98	4.98	100.0
Wilson[1]	1516	1516.99	0.99	100.0
Webster[1]	1892.5	1892.76	0.31	100.0
Kirwin[1]	1729.3	1729.36	0.11	100.0
Waconda[1]	1455.6	1457.58	1.98	100.0
Tuttle Creek[1]	1075	1096.91	21.91	100.0
Perry[1]	891.5	890.04	-1.46	92.7
Clinton[1]	875.5	873.76	-1.74	89.7
Melvern[1]	1036	1033.99	-2.01	91.1
Pomona[1]	974	971.69	-2.31	84.5
Hillsdale[1]	917	915.17	-1.83	89.2
Arkansas River Basin		**9/14/2018 8:00 AM**		
Cheney	1421.6	1422.17	0.57	100.0
El Dorado	1339	1338.85	-0.15	100.0
Toronto[1]	901.5	908.86	7.36	100.0
Fall River[1]	948.5	953.21	4.71	100.0
Elk City[1]	796	800.07	4.07	100.0
Big Hill	858	858.47	0.47	100.0
Council Grove[1]	1274	1274.73	0.73	100.0
Marion[1]	1350.5	1346.96	-3.54	74.0
John Redmond[1]	1039	1045.73	4.73	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

Please note lakes are only tested if a suspected bloom is reported to Kansas Department of Health and Environment (KDHE). Then testing is added to the next round of testing. So if in doubt stay out of the water and avoid contact with the water. Report new algae-blooms to KDHE: www.kdheks.gov/algae-illness or call 785-296-1664.

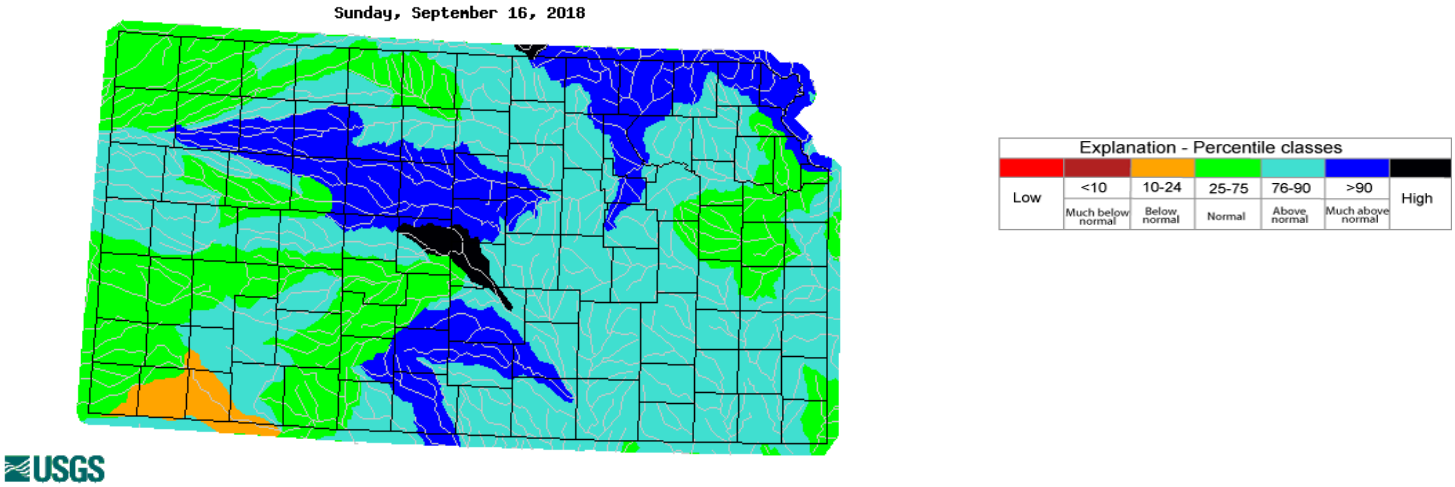
Lake Public Health Advisories

Water Body	County	9/7/2018	9/14/2018
Atchison County Park Lake	Atchison	Warning	Warning
Atwood Township Lake	Rawlins	Warning	Warning
Carbondale West Lake	Osage	Warning	Warning
Central Park Lake	Shawnee	Warning	Warning
Council Grove City Lake	Morris		Watch
Cottonwood **River** South of Emporia	Lyon	Watch	
Frazier Lake	Grant	Warning	Warning
Hodgeman Co. State Fishing Lake	Hodgeman	Watch	Warning
Jerry Ivey Pond	Saline	Warning	Warning
Lake Afton	Sedgewick	Warning	Warning
Lake Scott State Park	Scott	Warning	Watch
Lake Wabaunsee	Wabaunsee		Warning
Lakewood Park Lake	Saline	Warning	Warning
Marais des Cygnes Wildlife Area Lake	Linn	Warning	Warning
Mary's Lake	Douglas	Watch	Watch
Melvern Lake	Osage	Watch	Watch
Melvern Outlet Pond	Osage	Warning	Warning
Melvern Outlet Swim Pond	Osage	Warning	Warning
Overbrook City Lake	Osage	Warning	Warning
Pomona Lake	Osage	Watch	Watch
Rock Garden Pond	Shawnee	Warning	Warning
South Park Lake	Johnson	Warning	Warning
Tomahawk Park Lake	Johnson	Watch	Watch
Webster Lake	Rooks	Warning	Warning

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a time period.

14-Day Streamflow compared to historical streamflow is reflected in the map below.



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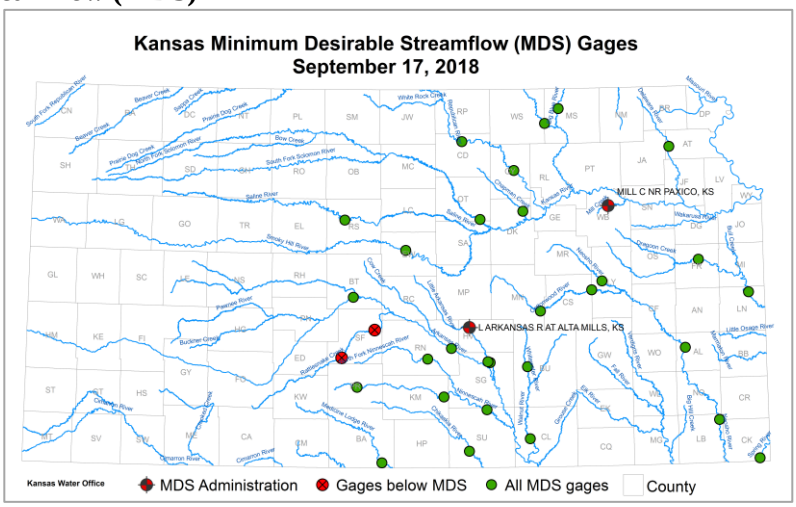
Water Right Administration/Minimum Desirable Streamflow (MDS)

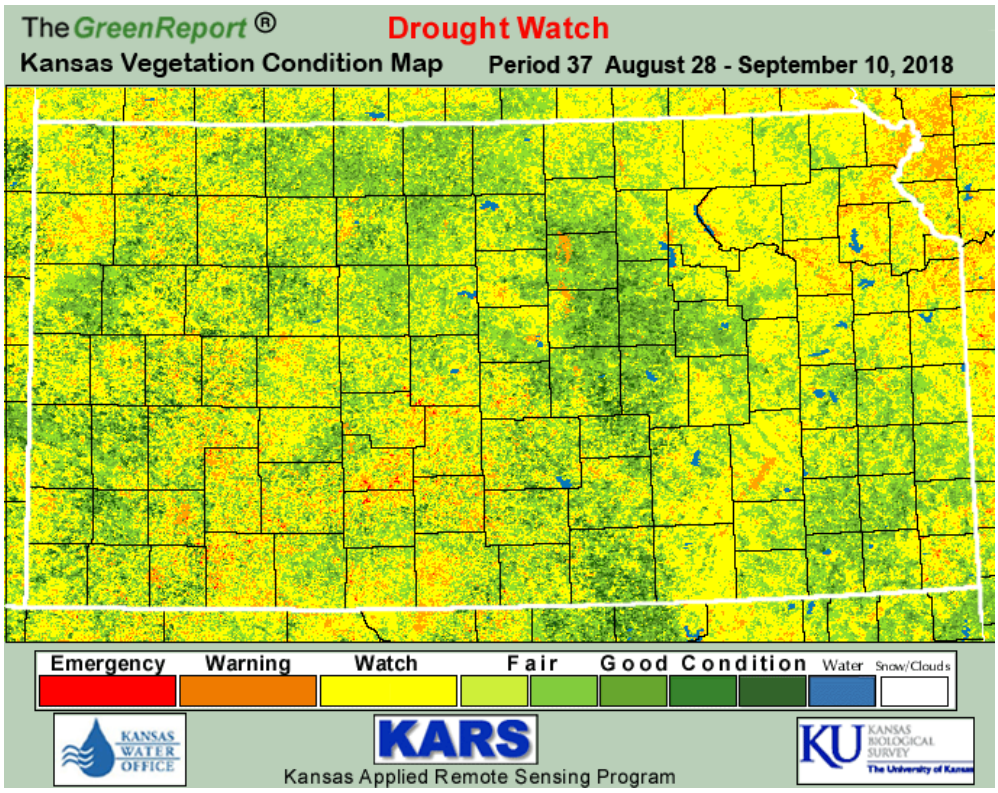
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. To rescind orders at most gages, daily average flow must be above MDS for 14 days.



The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources. Administration ceased in early September above three gages on the Republican and Delaware rivers.

Streamflows				
USGS Gaging Station	**Sept. 10 Flow**	**Sept. 17 Flow**	**Sept. MDS**	**Comment**
Republican River at Concordia	979	309	80	Admin began April 13, 2018, ceased Sept 4, 2018
Republican River at Clay Center	1,640	590	100	Admin began April 13, 2018, ceased Sept 4, 2018
Chapman Creek near Chapman	75	29	10	Admin began June 21, 2018, ceased Aug 28, 2018
Little Blue River near Barnes	1,570	451	60	Admin ceased July 3, 2018
Mill Creek near Paxico	30	10	5	Admin began April 12, 2018, Above Sept 4, 2018
Delaware River near Muscotah	107	9	3	Admin began March 23, 2018, ceased Sept 5, 2018
Rattlesnake Creek near Macksville	32	Dry	1	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	6	4	3	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	60	8	8	MDS admin began Aug 10, 2017, Above Sept 4, 2018
Whitewater River near Towanda	200	23	5	Admin began April 12, 2018, ceased Aug 27, 2018

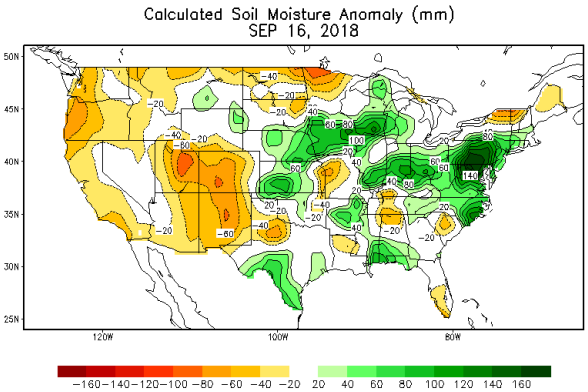
Vegetative Conditions

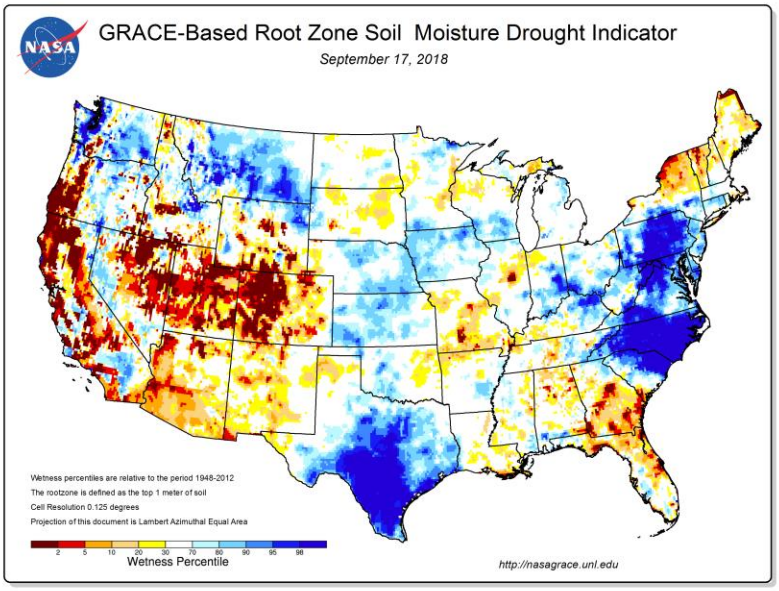


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. https://nasagrace.unl.edu/Default.aspx

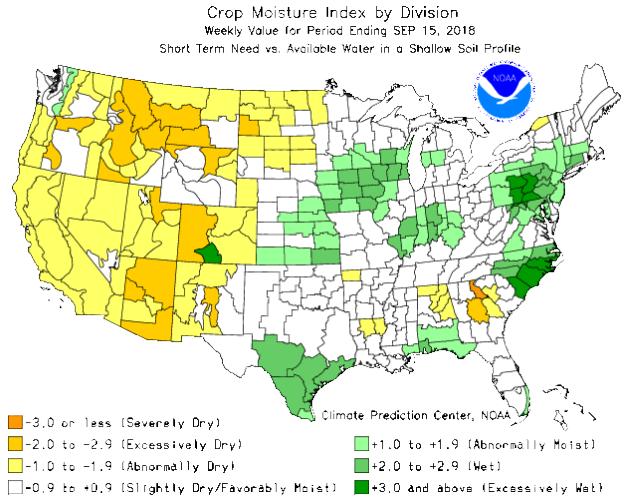
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending September 169, 2018 indicates topsoil moisture supplies rated 2 percent very short, 10 short, 80 adequate, and 8 surplus. Subsoil moisture supplies rated 3 percent very short, 13 short, 82 adequate, and 2 surplus.

Field Crops Report: Corn condition rated 10 percent very poor, 16 poor, 27 fair, 39 good, and 8 excellent. Soybean condition rated 3 percent very poor, 9 poor, 32 fair, 46good, and 10 excellent. Sorghum condition rated 2 percent very poor, 6 poor, 24 fair, 54 good, and 14 excellent. Cotton condition rated 1 percent very poor, 2 poor, 25 fair, 55 good, and 17 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 6 percent very poor, 13 poor, 34 fair, 42 good, and 5 excellent.

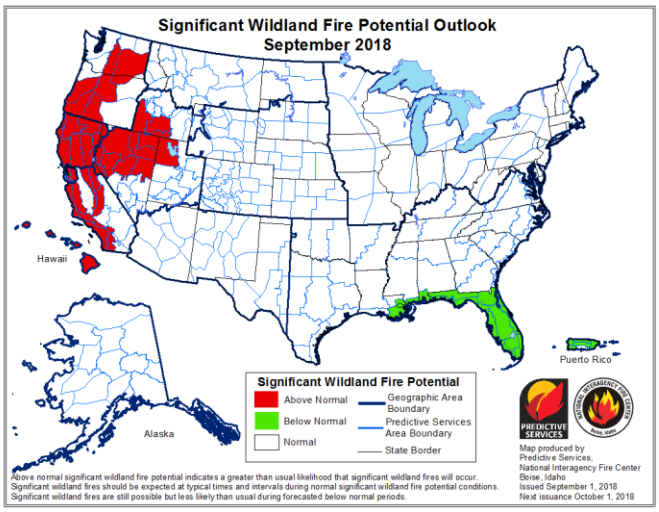
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA [Weekly Weather and Crop Bulletin](#).

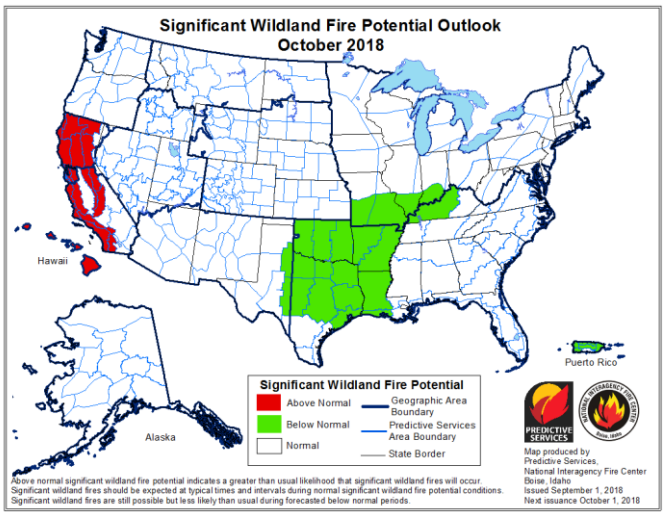


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

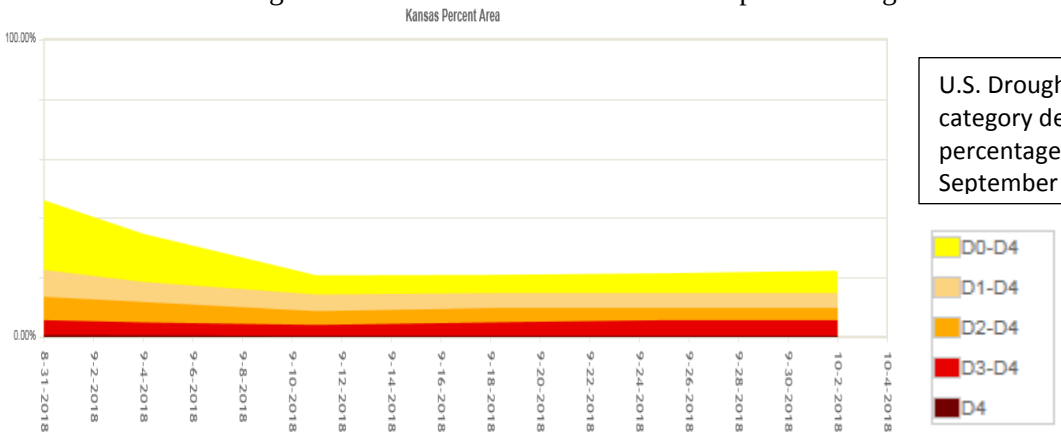
Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

KANSAS CLIMATE and DROUGHT UPDATE
September 2018 Summary

Highlights

- Executive Orders 18-18 remains in effect for 50 counties in emergency status, and 5 in watch, primarily to allow continued assistance to mitigate drought impacts on livestock.

- U.S. Drought Monitor drought designations for September ended the month with slightly over 20 percent of Kansas affected by dry or drought conditions. The drought conditions persisting in parts of eastern Kansas. Severe drought or worse was indicated for parts of 27 counties during at least part of September. Of these, 17 included extreme drought conditions with five of these in exceptional drought.



U.S. Drought Monitor drought category designations percentage of Kansas during September 2018

- Emergency water permits for livestock remain in effect allowing producer withdrawals at two state fishing lakes and four federal lakes.

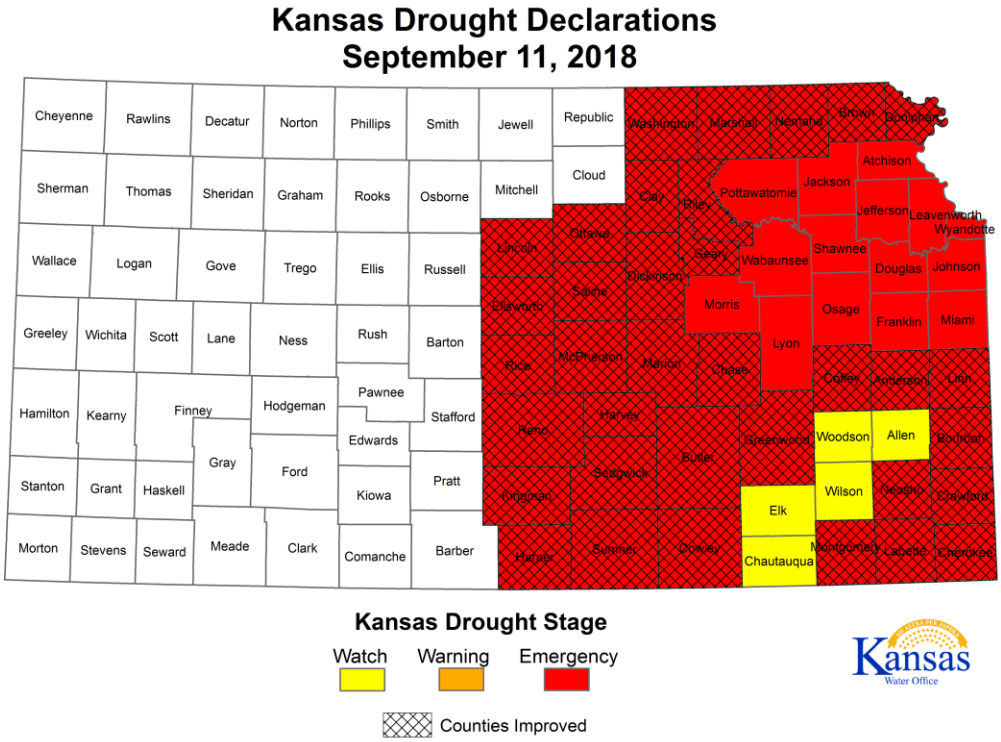
- Administration of MDS continued on streams in September but ceased on many: Little Arkansas River at Alta Mills has been since August 10, 2017; Mill Creek above Paxico since April 12, 2018, ceased September 18, 2018; Republican River above the Clay Center and Concordia gages since April 13, 2018, ceased September 4, 2018; and Delaware River above the Muscotah gage since March 23, 2018, ceased September 5, 2018.

- Kansas Department of Health and Environment Public Health Advisories as Closure, Warning or Watches were in place at the end of September for 23 Kansas water bodies. This includes 17 warnings and 6 watches due to the presence of harmful algae (HAB). A public health watch indicates water may be unsafe for humans and animal – contact is discouraged. A public health warning indicates contact with water should not occur, it is unsafe.

- Flash flooding occurred due to heavy rains September 3, with flooding disaster declared for Jewell, Kingman, Marshall, Pratt and Riley counties. The most extreme was the major flooding on Wildcat Creek in Manhattan.

- A total of 16 flooding events or high flow conditions were measured at 15 USGS stream gages in September. These are included in Appendix B.

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order (EO) 18-17 on September 11, 2018 placing 50 counties in emergency status and 5 into a watch status. A total of 55 counties were downgraded, 50 of these having drought declarations removed. EO 18-18 corrected the listing of counties. The September 11 map shows these counties. These Drought Declarations remain in place until revised or rescinded by a subsequent EO.



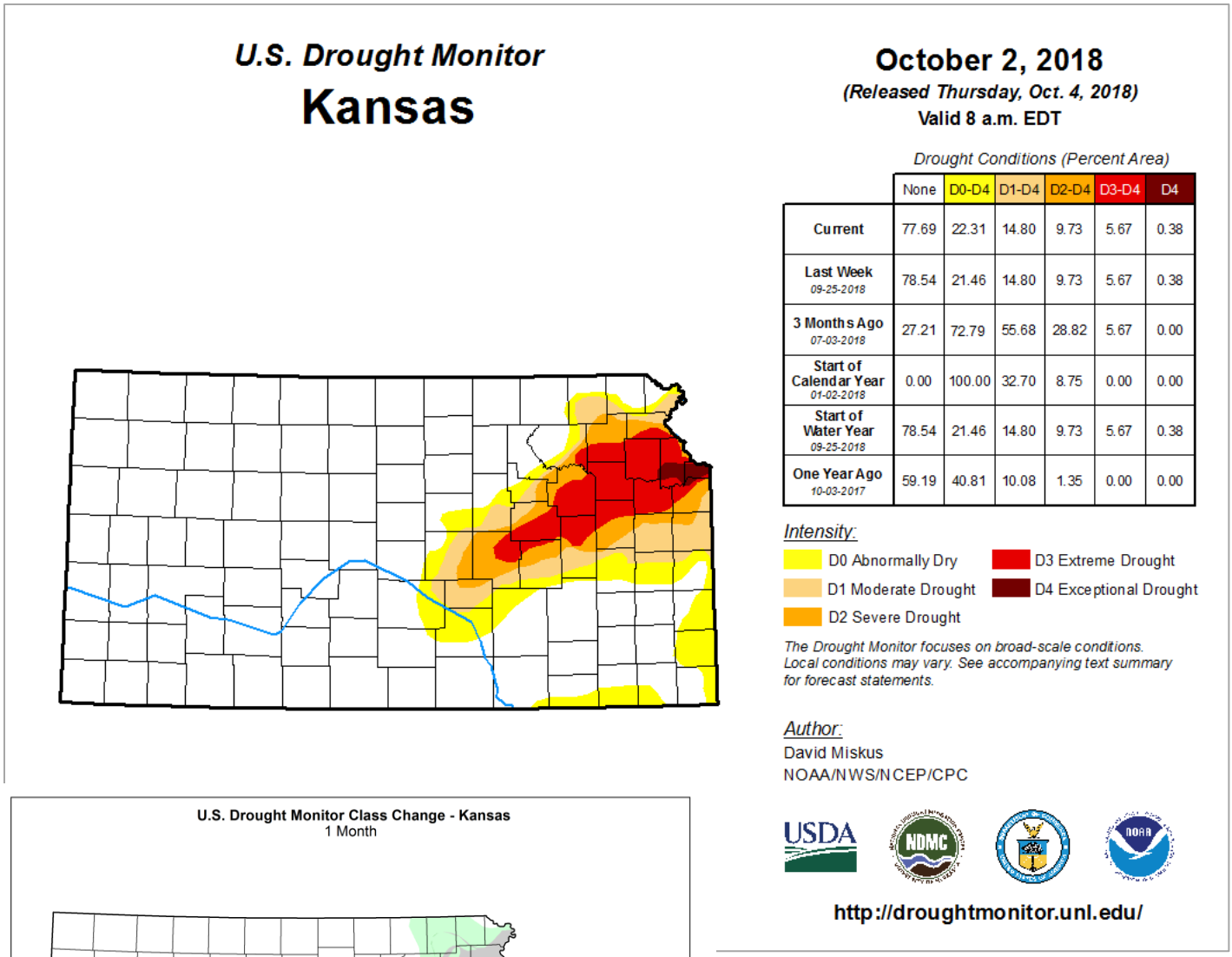
<u>Drought Watch counties</u>: Allen, Chautauqua, Elk, Wilson, Woodson

<u>Drought Emergency counties</u>: Anderson, Atchison, Bourbon, Brown, Butler, Chase, Cherokee, Clay, Coffey, Cowley, Crawford, Dickinson, Doniphan, Douglas, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Johnson, Kingman, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Miami, Montgomery, Morris, Nemaha, Neosho, Osage, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Sedgwick, Shawnee, Sumner, Wabaunsee, Washington, Wyandotte

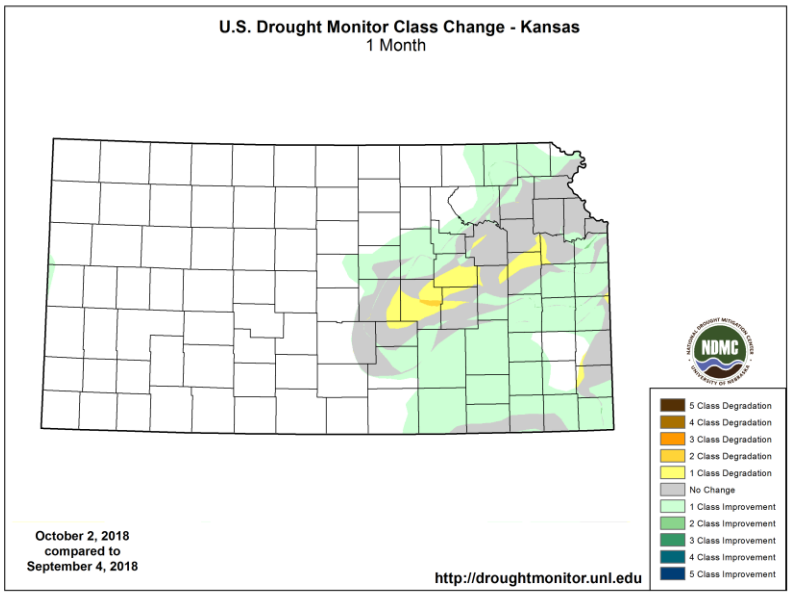
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

The rainfall and cooler temperatures in early September resulted in improvement in drought conditions across the state in the U.S. Drought Monitor. The near normal temperatures in the West moderated the impacts of below normal precipitation. Drought was completely removed from the west, and greatly improved in the central divisions. Exceptional drought continues in eastern Kansas, and extreme drought has shifted into East Central Kansas. Currently, over 77 percent of the state is drought free, while less than 1 percent is in exceptional drought conditions. The change in drought categories map) shows where changes occurred.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	77.69	22.31	14.80	9.73	5.67	0.38
Last Week 09-25-2018	78.54	21.46	14.80	9.73	5.67	0.38
3 Months Ago 07-03-2018	27.21	72.79	55.68	28.82	5.67	0.00
Start of Calendar Year 01-02-2018	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year 09-25-2018	78.54	21.46	14.80	9.73	5.67	0.38
One Year Ago 10-03-2017	59.19	40.81	10.08	1.35	0.00	0.00

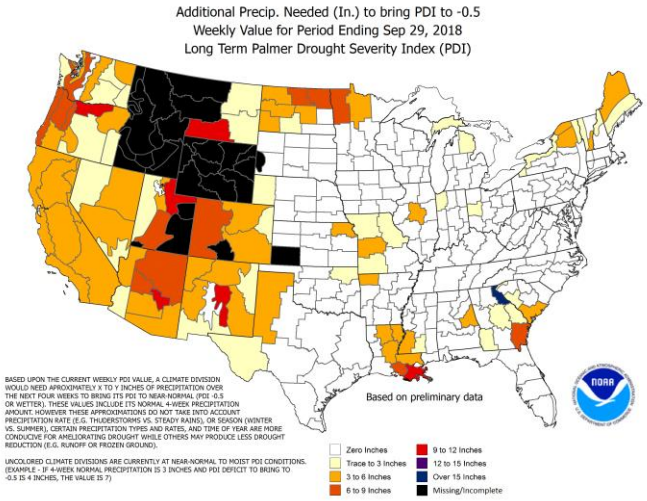


Changes in drought classification are shown on the left.

More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Sept. 22	Sept. 29	
Northwest	-	-	
North Central	-	-	
Northeast	2.84	3.33	
West Central	-	-	
Central	-	-	
East Central	-	-	
Southwest	-	-	
South Central	-	-	
Southeast	-	-	



More information on the PDSI can be found at
http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

State Drought Mitigation

Livestock Water

Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. Permits have been issued at three state fishing lakes (Chase, Lyon, McPherson) and four federal lakes (Fall River, Melvern, Milford, and Tuttle Creek). The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed. In September all permits were cancelled upon producer request at Chase State Fishing Lake.

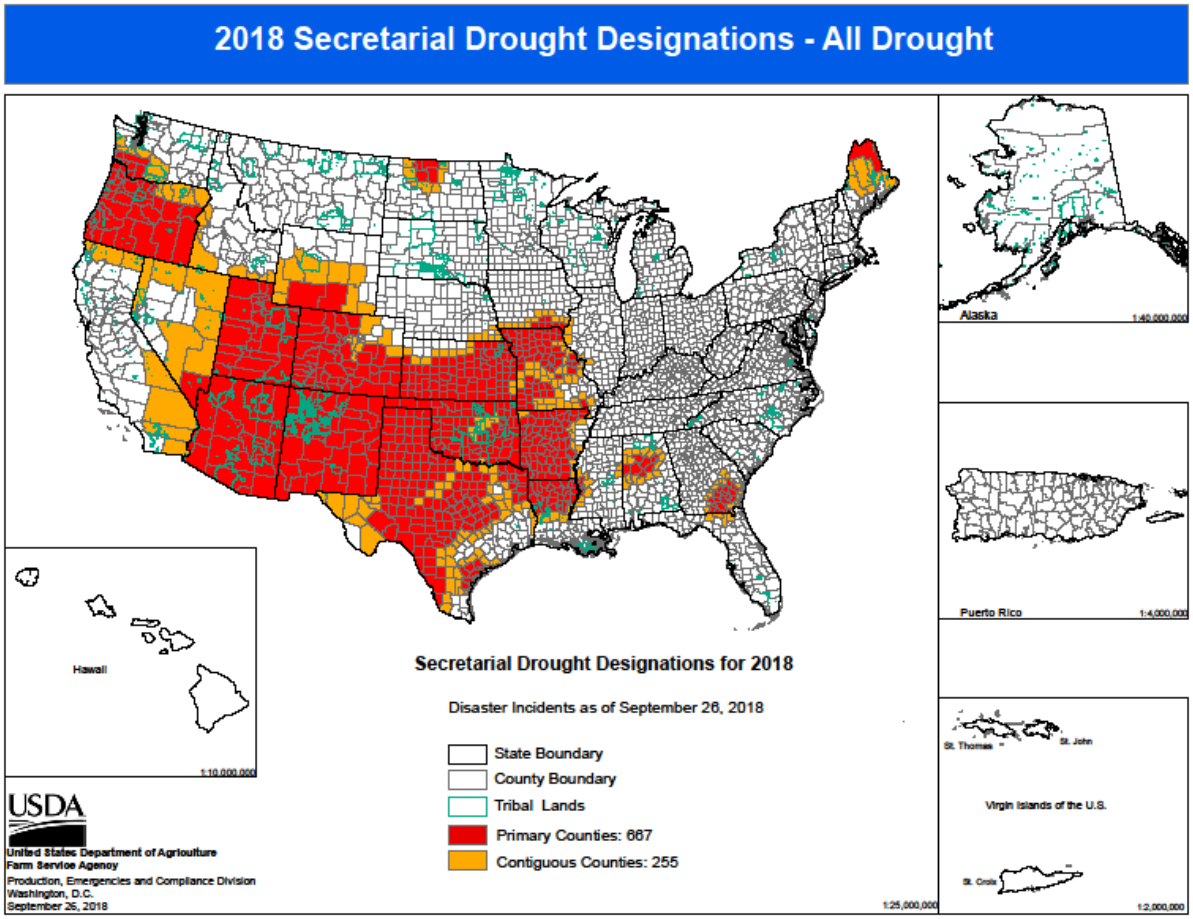
Financial assistance for livestock water supply wells, pipeline and tanks may also be available through Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS or Kansas Department of Agriculture-Division of Conservation through the Livestock Water Supply Financial Assistance Initiative in Emergency counties. Applications can be made through local conservation districts.

Federal Disaster Drought Declarations 2018

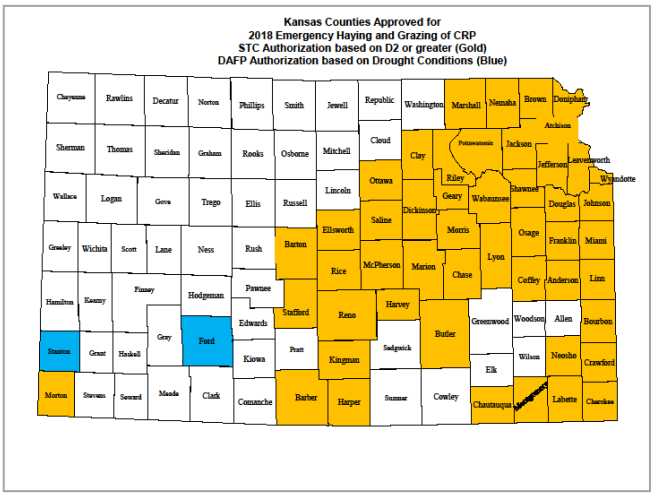
U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte. Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.



Haying and grazing of Conservation Reserve Program (CRP) acres is in place to provide emergency haying and grazing on CRP acreages in the counties in Kansas colored on the map at right. These counties may graze through **September 30, 2018** with county office approval. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres. Counties in blue have DAFP authorization, gold are authorized based on D2 or greater on the U.S. Drought Monitor. A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



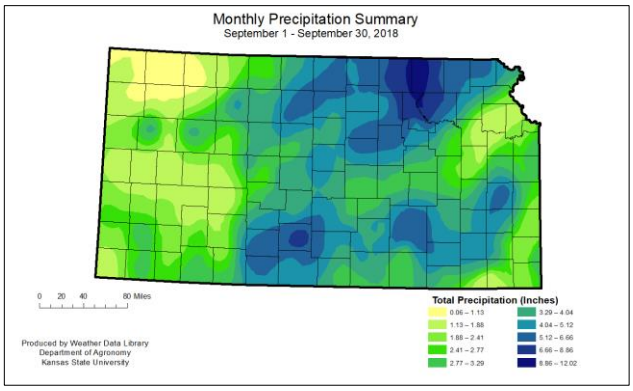
Climate Summary - Precipitation

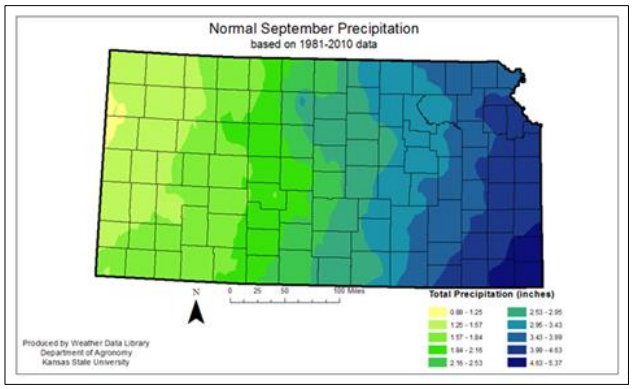
The September average divisional precipitation ranged from 0.98 inches in the Northwest Climate Division to 4.36 inches in the North Central. This resulted in a 0.56 inch deficit in the Northwest (61% of normal) and a 1.73 inch surplus in the North Central (164% of normal). State-wide average was 1.36 inches, which is a 0.66 inch surplus, or 133 percent of normal. The greatest monthly total for a National Weather Service Cooperative station was at Marysville, Marshall County, with 12.23 inches. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Manhattan 3.7 N, Riley County, with 11.37 inches. Among the Kansas Mesonet stations, the Manhattan station on the North Farm, had the greatest monthly total with 8.00 inches. Most of the rainfall occurred during the first week of the month, particularly over the Labor Day weekend. The flooding produced by the intense rains resulted in a Governor's disaster declaration that covered 5 counties: Jewell, Kingman, Marshall, Pratt and Riley.

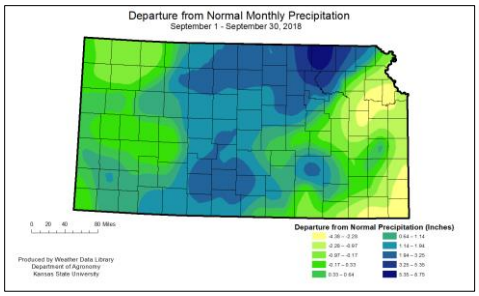
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

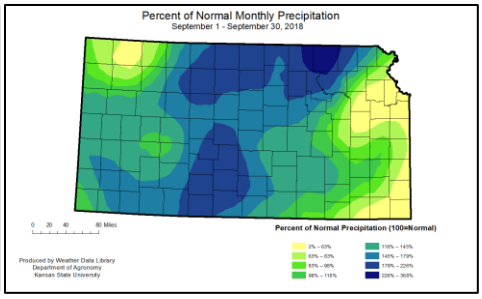
Kansas Climate Division Precipitation Summary (inches)												
	Sept 1-30, 2018			January 1-Sept 30, 2018			April 1, 2017- Sept 30 , 2018			Sept 1 - Sept 30, 2018		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.98	-0.54	61	18.54	0.13	100	17.14	16.11	105	0.98	1.52	61
West Central	2.20	0.60	141	19.21	1.32	106	18.11	15.40	116	2.20	1.60	141
Southwest	2.54	0.92	155	20.34	3.28	119	19.93	14.68	135	2.54	1.62	155
North Central	4.36	1.73	164	24.14	0.20	101	22.58	20.46	110	4.36	2.63	164
Central	3.84	1.33	155	22.87	-2.12	92	21.32	21.04	102	3.84	2.51	155
South Central	4.12	1.52	162	26.16	0.09	101	24.13	21.44	113	4.12	2.60	162
Northeast	4.28	0.67	124	23.77	-5.50	82	21.32	25.07	87	4.28	3.61	124
East Central	2.94	-0.72	80	22.00	-9.26	69	19.10	26.34	72	2.94	3.66	80
Southeast	4.09	0.08	106	29.92	-3.50	89	25.73	27.42	93	4.09	4.01	106
STATE	3.28	0.66	130	23.19	-1.43	96	21.25	20.77	105	3.28	2.62	130

The maps below summarize precipitation. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps









Climate Summary-Temperature

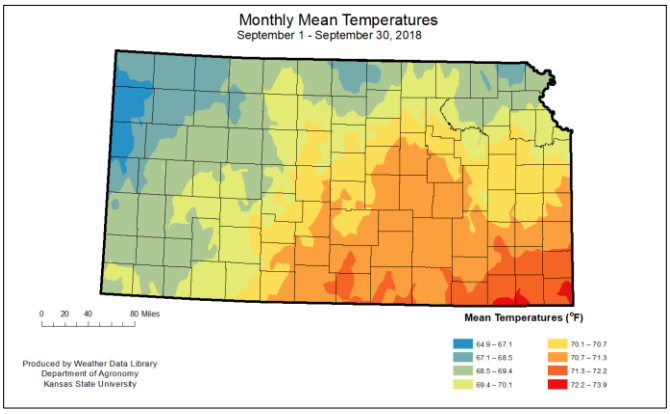
Temperatures also were highly variable in September. State-wide average temperature for the month was 69.9 °F, which is 1.8 degrees warmer than normal. All climate divisions were warmer than normal. The Northwest Division had the largest departure, with an average of 67.9 °F, or 2.6 degrees warmer than normal. The South Central Division came closest to normal with an average of 71.3 °F or 1.1 degrees warmer than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 105 °F at Johnson, Stanton County, on the 1st. The coldest minimum temperature was 30 °F, recorded at Brewster 4W, Sherman County, on the 27th. There were 10 record daily high maximum temperatures in the month, and 10 record daily low maximum temperatures. On the minimum temperature side, there were 27 record high minimums compared to only one record low minimum.

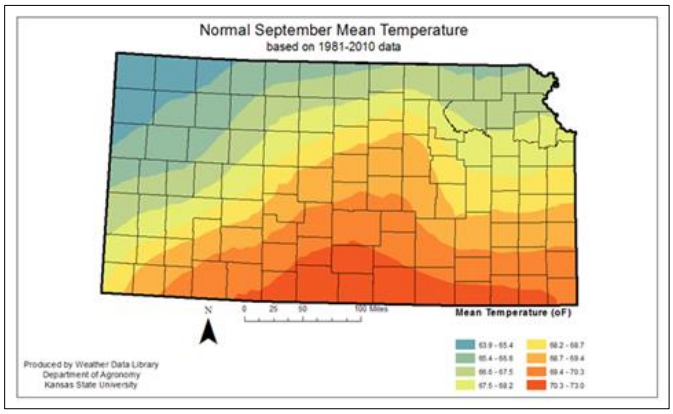
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

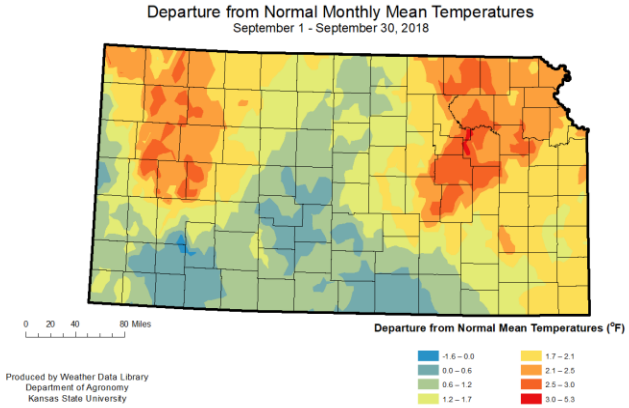
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	September 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	81.3	54.4	67.9	2.6	99	19	30	27
West Central	81.9	55.6	68.8	2.3	101	1	34	26
Southwest	82.3	57.2	69.8	1.2	105	1	36	27
North Central	80.1	58.9	69.5	1.6	100	1	38	27
Central	81.1	59.8	70.5	1.4	101	1	39	26
South Central	82.0	60.7	71.3	1.1	101	1	40	27
Northeast	80.2	59.3	69.7	2.3	96	2	41	26
East Central	79.9	60.3	70.1	1.9	98	18	39	27
Southeast	81.1	62.0	71.6	1.9	97	1	38	27
STATE	81.1	58.7	69.9	1.8	105	1st	30	27th
Data Source: KSU Weather Library								

While hail and high winds were again major contributors to severe weather in Kansas during September, the big story was the Labor Day flood event. Damage in these counties featured washed out roads, bridges, culverts and flooding to some businesses and residential properties. Complete damage estimates are not yet available. There was one tornado report during the month consisting of land spout funnels in Hamilton County, on the 3rd.

The maps below summarize temperature. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .



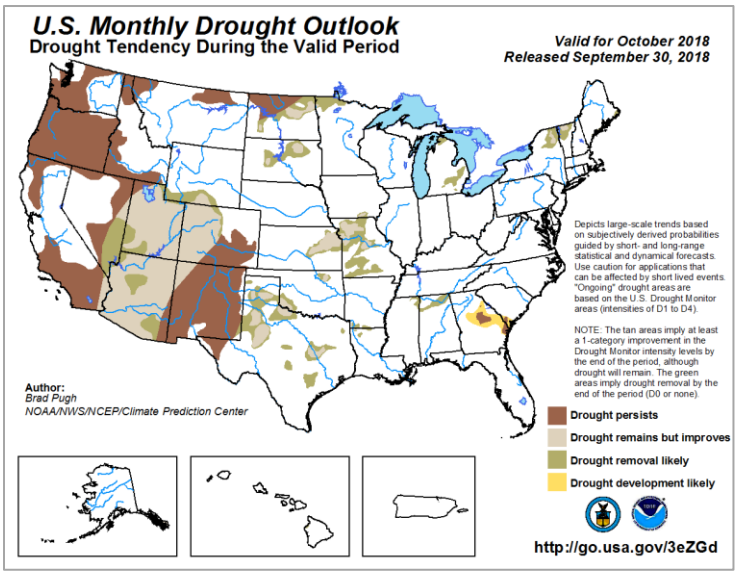


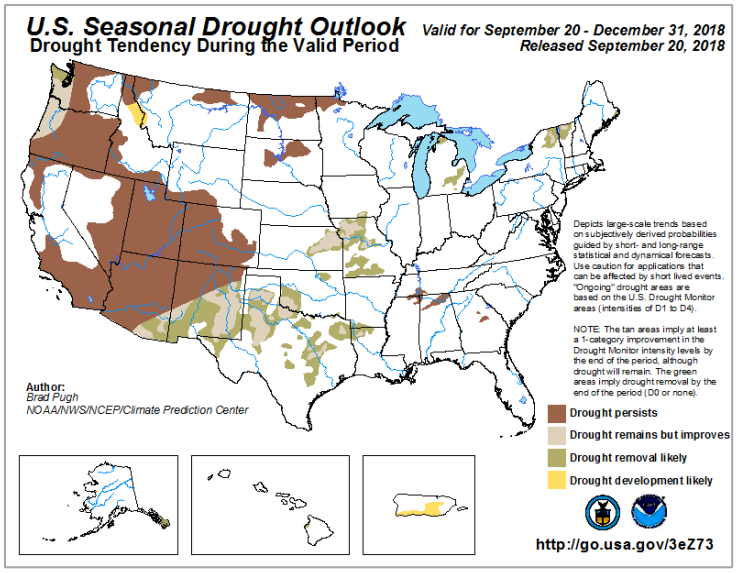


Future Outlook

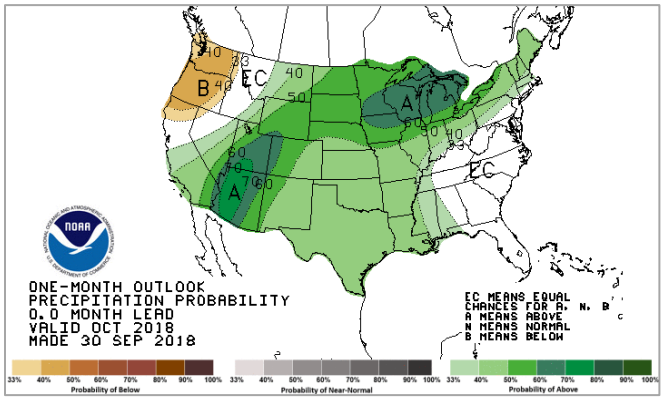
The Monthly Drought Outlook indicates drought conditions to remain, but could improve in northeast Kansas in October.

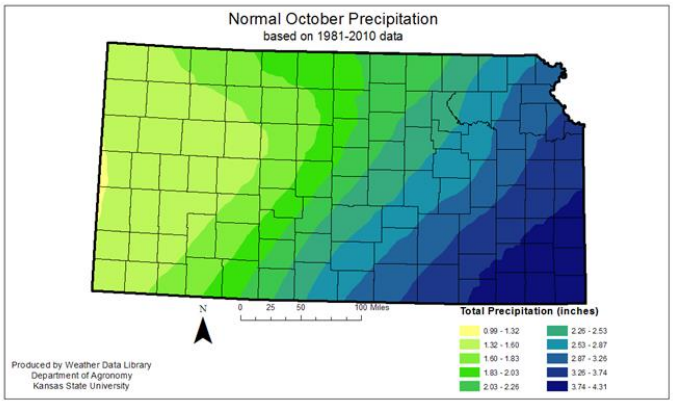
Seasonal Outlook (3-month) favors drought remaining in eastern Kansas, but possibly improving through the end of December. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

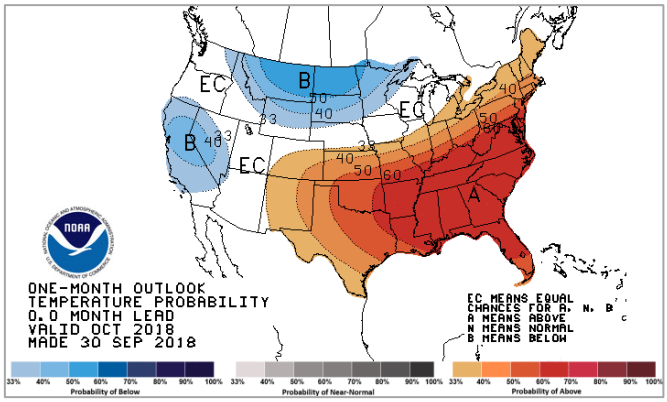


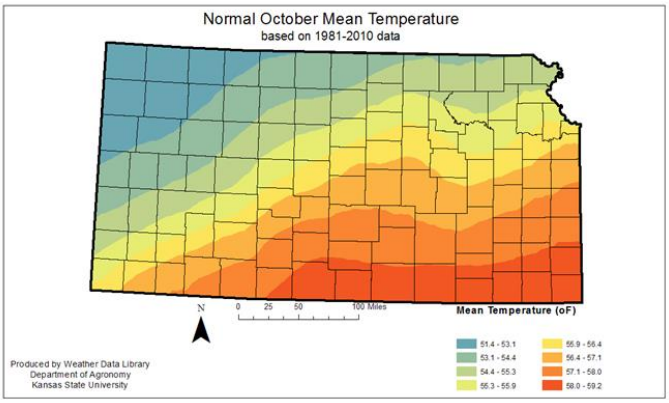


The October outlook has increased chances for above normal precipitation across most of the state. However, a more even distribution across the month will be needed to continue improvement of drought conditions across the state. The temperature outlook is for warmer than normal temperatures statewide.

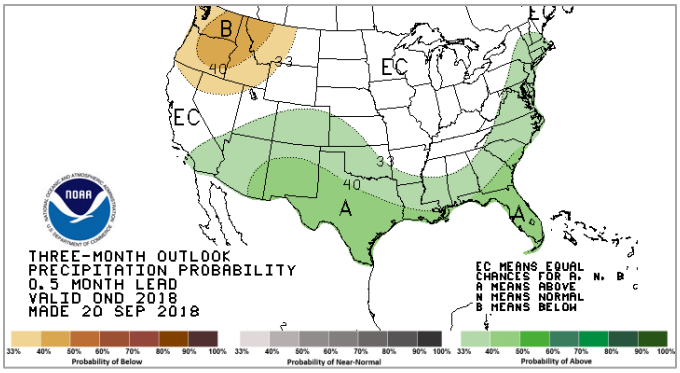


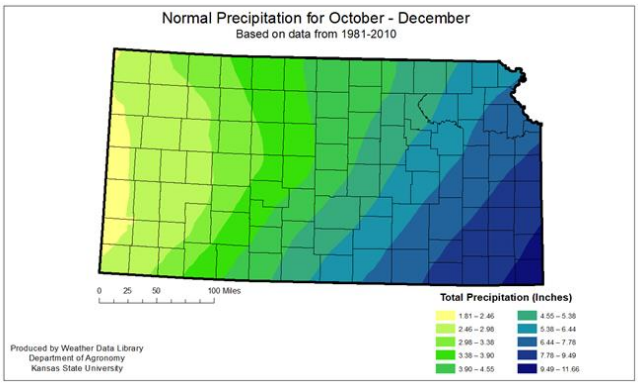


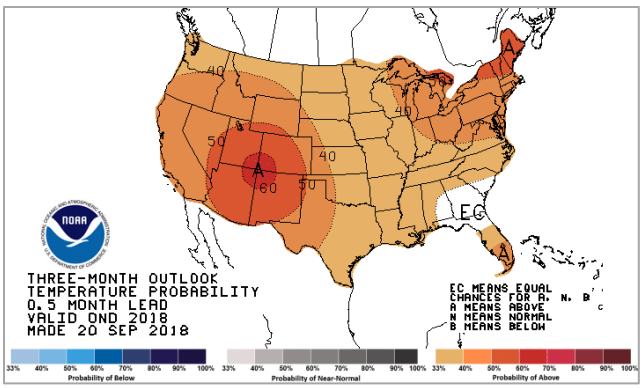


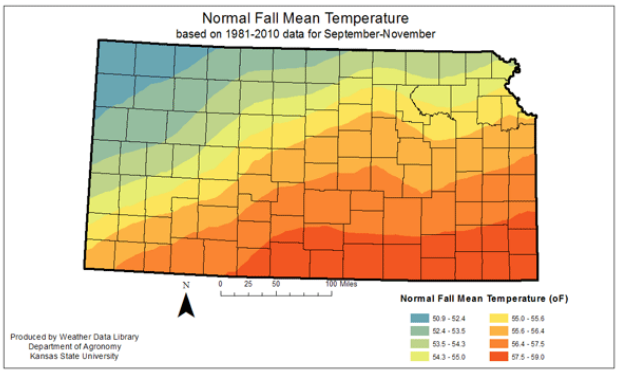


The 3- month outlooks favors above normal precipitation in western and south central Kansas and equal chances of normal, above or below normal precipitation in eastern and north central Kansas. Above normal temperatures are favored for all of Kansas for October-November-December.









Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Please note stage designation or name and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers.

Numerous communities have conservation measures in place throughout the summer or year to restrict outdoor watering to times with less evaporative loss. The conservation measures in place that are in addition to these that we are aware of include the**: City of Oswego,** Labette County, issued a water watch August 16, 2018; **City of Burlington** enacted a stage 3 water emergency initiating mandatory water conservation for all its consumers August 15, 2018, including Coffey County Rural Water Districts 2 and 3 and the cities of Gridley, LeRoy and New Strawn; **City of Gardner,** Johnson County, issued a Water Warning July 20, 2018; **City of Spring Hill,** Johnson and Miami counties**,** requested residents take voluntary conservation measures due to drought conditions July 12, 2018; and **Public Wholesale Water Supply District #26**, Chase County, issued a water warning July 11, 2018 which includes the City of Strong City, Chase County Rural Water District #1, and the City of Cottonwood Falls.

Surface Water Supply Conditions

Kansas River basin: Milford, Tuttle, and Perry reservoirs all experienced higher than normal inflows in September. Clinton Reservoir's watershed did not receive any significant runoff producing precipitation events and continues to decline. Despite higher than normal inflows to Perry it was not sufficient to refill conservation storage. Flood storage was retained at Milford and Tuttle throughout the month because there wasn't enough capacity on the Missouri River. The Missouri River main stem reservoirs are evacuating flood storage so channel capacity is limited.

Marais des Cygnes basin: Inflows to Melvern, Pomona, and Hillsdale reservoirs remained far less than normal in September. Both the upper and lower reaches of the Marais des Cygnes River received significant runoff in the first half of the month and streamflow was well above normal but reservoir releases accounted for the majority of stream flow in the upper reaches of the Marais des Cygnes River for the second half of the month. The lower reach maintained near median values throughout September. Storage supplies are somewhat depleted but sufficient and no municipal or industrial conservation measured have been implemented.

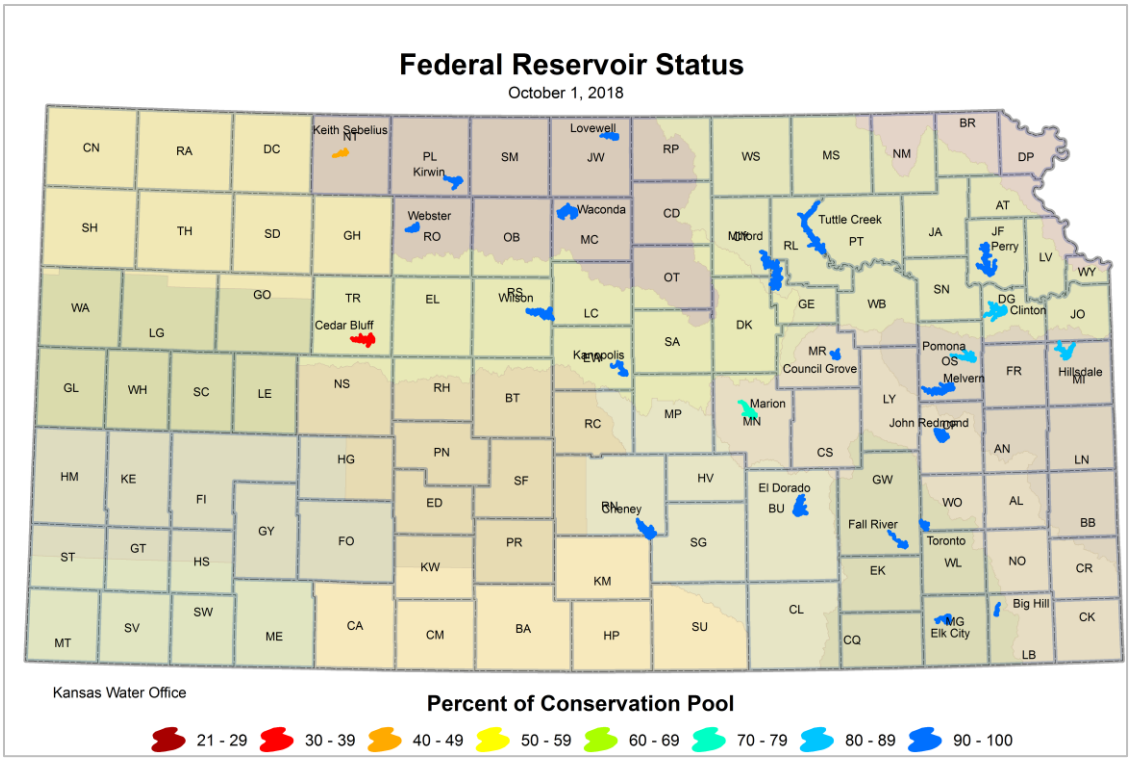
Cottonwood/Neosho basin: Inflows to Marion Reservoir remained exceptionally low in September but the system as a whole was replenished from September rains. Council Grove Reservoir conservation storage was refilled and flood pool releases were necessary from Council Grove and John Redmond reservoirs. Marion experienced further declines.

Verdigris basin: Inflows to Toronto, Fall River, Elk City, and Big Hill reservoirs were moderate to above normal in September. Stream flow in the Verdigris and Fall Rivers were maintained well above normal due to flood pool releases throughout the month.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in September. Inflow remained above normal and releases in excess of low flow settings were necessary to manage lake level.

Smoky Hill basin: The middle Smoky Hill River continued to benefit from somewhat abnormal precipitation and sustained runoff in September. Kanopolis Lake received enough inflow to reach the seasonal target elevation of 1467.7 and then some. Cedar Bluff Reservoir also received some inflow but no substantial gains were experienced.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**10/01/2018 6:00 AM**		
Norton[1]	2304.3	2293.07	-11.23	44.3
Harlan County, NE	1945.73	1938.36	-7.37	71.3
Lovewell[1]	1582.6	1582.28	-0.32	97.3
Milford[1]	1144.4	1147.92	3.52	100.0
Cedar Bluff	2144	2120.96	-23.04	35.3
Kanopolis[1]	1463	1467.14	4.14	100.0
Wilson[1]	1516	1516.48	0.48	100.0
Webster[1]	1892.5	1893.03	0.53	100.0
Kirwin[1]	1729.3	1729.29	-0.01	100.0
Waconda[1]	1455.6	1457.28	1.68	100.0
Tuttle Creek[1]	1075	1091.08	16.08	100.0
Perry[1]	891.5	889.74	-1.76	91.2
Clinton[1]	875.5	873.39	-2.11	87.6
Melvern[1]	1036	1033.67	-2.33	89.8
Pomona[1]	974	971.34	-2.66	82.4
Hillsdale[1]	917	914.78	-2.22	87.0
Arkansas River Basin		**10/01/2018 8:00 AM**		
Cheney	1421.6	1422.08	0.48	100.0
El Dorado	1339	1338.99	-0.01	100.0
Toronto[1]	901.5	901.97	0.47	100.0
Fall River[1]	948.5	949.42	0.92	100.0
Elk City[1]	796	796.35	0.35	100.0
Big Hill	858	857.93	-0.07	100.0
Council Grove[1]	1274	1274.19	0.19	100.0
Marion[1]	1350.5	1346.68	-3.82	72.0
John Redmond[1]	1039	1041.49	0.49	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

Please note lakes are only tested if a suspected bloom is reported to Kansas Department of Health and Environment (KDHE). Then testing is added to the next round of testing. So if in doubt stay out of the water and avoid contact with the water. Report new algae-blooms to KDHE: www.kdheks.gov/algae-illness or call 785-296-1664.

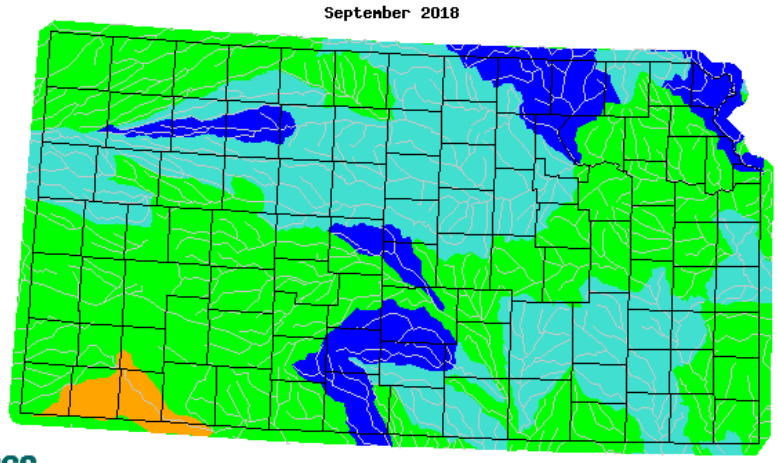
Lake Public Health Advisories

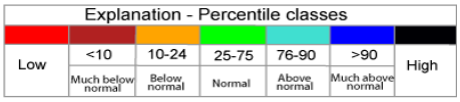
Water Body	County	9/20/2018	9/27/2018
Atchison County Park Lake	Atchison	Warning	Warning
Atchison County State Fishing Lake	Atchison	Watch	watch
Carbondale West Lake	Osage	Warning	Warning
Central Park Lake	Shawnee	Warning	Warning
Frazier Lake	Grant	Warning	Warning
Hodgeman Co. State Fishing Lake	Hodgeman	Warning	Warning
Jerry Ivey Pond	Saline	Warning	Warning
Lake Afton	Sedgewick	Warning	Warning
Lake Scott State Park	Scott	Watch	Warning
Lake Wabaunsee	Wabaunsee	Warning	Warning
Lakewood Park Lake	Saline	Warning	Warning
Marais des Cygnes Wildlife Area Lake	Linn	Warning	Warning
Mary's Lake	Douglas	Watch	watch
Melvern Lake	Osage	Watch	watch
Melvern Outlet Pond	Osage	Warning	Warning
Melvern Outlet Swim Pond	Osage	Warning	Warning
Overbrook City Lake	Osage	Warning	Warning
Pomona Lake	Osage	Watch	watch
Rock Garden Pond	Shawnee	Warning	Warning
South Park Lake	Johnson	Warning	Warning
Tomahawk Park Lake	Johnson	Watch	watch
Webster Lake	Rooks	Warning	Warning
West Campus Pond, KU Campus	Douglas		watch

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a time period.

September Streamflow compared to historical streamflow is reflected in the map below.



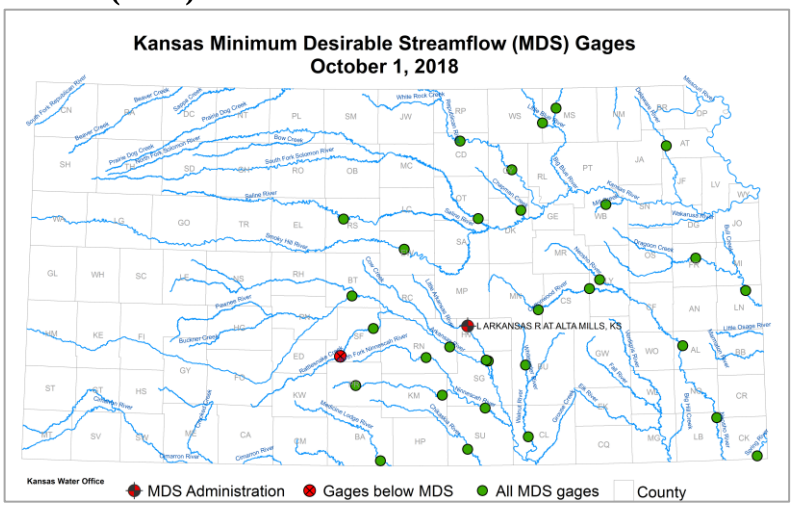


USGS

Stream flooding during the month is summarized in Appendix B.

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. To rescind orders at most gages, daily average flow must be above MDS for 14 days.

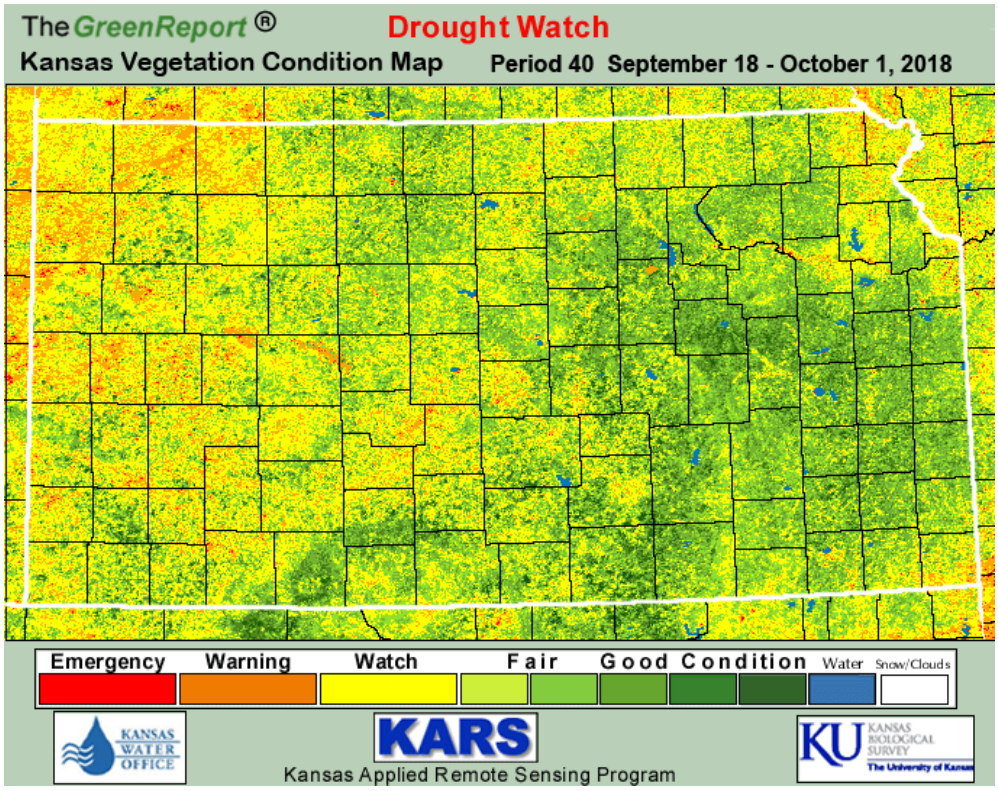


The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources. Administration ceased in September above three gages on the Republican and Delaware rivers.

Streamflows					
USGS Gaging Station	**Sept. 24 Flow**	**Sept. MDS**	**Oct. 1 Flow**	**Oct. MDS**	**Comment**
Republican River at Concordia	215	80	137	65	Admin began April 13, 2018, ceased Sept 4, 2018
Republican River at Clay Center	375	100	302	90	Admin began April 13, 2018, ceased Sept 4, 2018
Mill Creek near Paxico	8	5	8	2	Admin began April 12, 2018, ceased Sept 18, 2018
Delaware River near Muscotah	5	3	3	2	Admin began March 23, 2018, ceased Sept 5, 2018
Rattlesnake Creek near Macksville	Dry	1	Dry	1	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	4	3	5	3	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	11	8	2	8	MDS admin began Aug 10, 2017, Above Sept 4, 2018

Crop , Vegetation and Soil

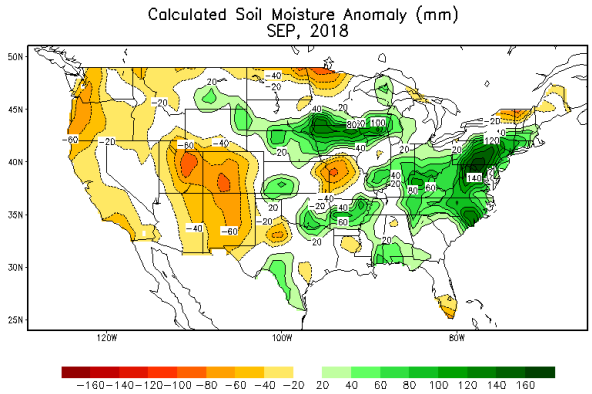
Vegetative Conditions

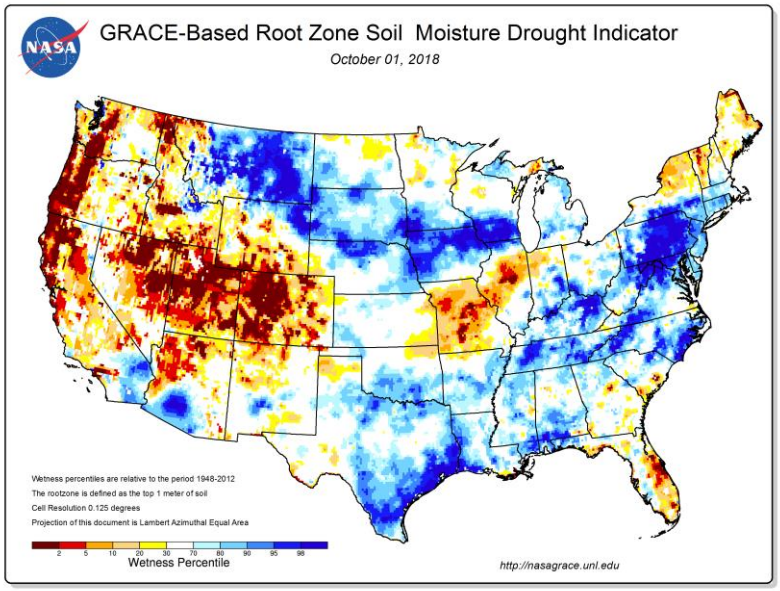


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

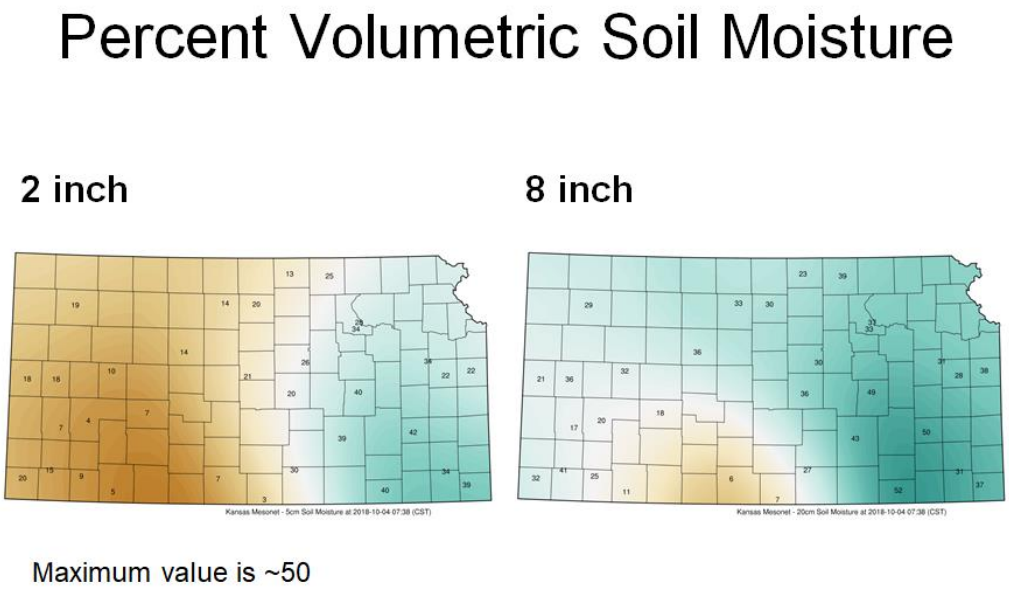
The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)





Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. https://nasagrace.unl.edu/Default.aspx

In Kansas, lack of rainfall continues to result in drying soils. The recent soil moisture data from the Kansas Mesonet shows dry surface conditions, with more available moisture at the 8" (20 cm) level. (KSU, October 4, 2018)



Soil Moisture Map by KSU: Darkest brown is driest to darkest teal being wettest.

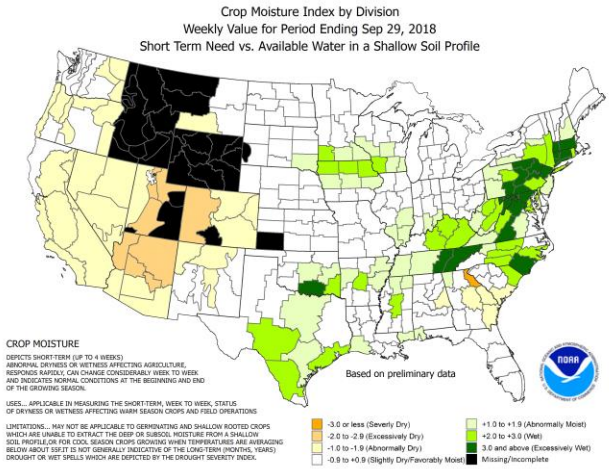
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending September 29, 2018 indicates topsoil moisture supplies rated 2 percent very short, 15 short, 79 adequate, and 4 surplus. Subsoil moisture supplies rated 3 percent very short, 16 short, 80 adequate, and 1 surplus.

Field Crops Report: Corn condition rated 9 percent very poor, 16 poor, 28 fair, 39 good, and 8 excellent. Soybean condition rated 3 percent very poor, 8 poor, 31 fair, 47 good, and 11 excellent. Sorghum condition rated 2 percent very poor, 5 poor, 23 fair, 56 good, and 14 excellent. Cotton condition rated 0 percent very poor, 1 poor, 25 fair, 60 good, and 14 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 6 percent very poor, 13 poor, 36 fair, 39 good, and 6 excellent.

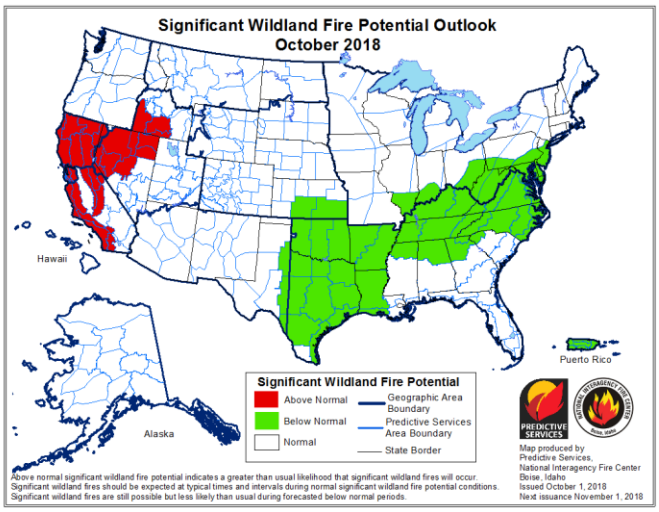
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA [Weekly Weather and Crop Bulletin](#).

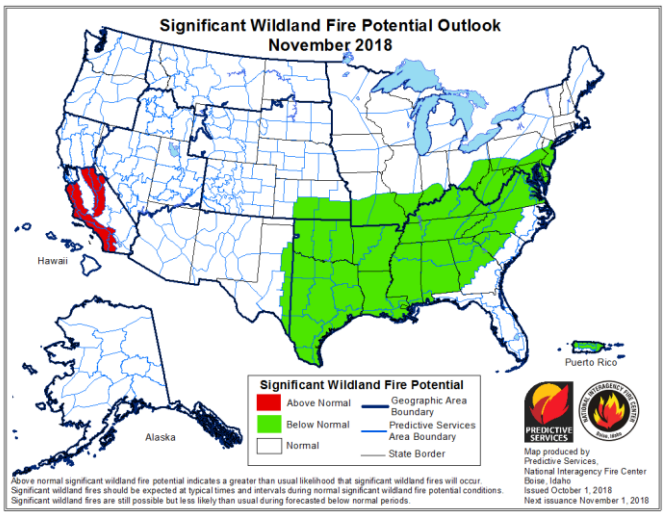


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection.

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center, assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. Also see: http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

September 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.72	-0.42	63%	66.6	3.3	95 (18)	34 (26)
Dodge City	1.87	0.20	112%	69.7	0.5	93 (1)	43 (29,28)
Garden City	1.31	-0.16	89%	68.6	0.4	93 (18)	41 (29)
Goodland	1.00	-0.22	82%	67.1	2.5	96 (18)	35 (26)
Guymon, OK	1.67	-0.12	93%	71.3	0.9	95 (24,19)	40 (22)
Hill City	4.83	2.95	257%	69.3	1.9	96 (18)	37 (26)
Lamar, CO	0.49	-0.76	39%	70.1	3.6	102 (19)	31 (27)
McCook, NE	0.34	-1.10	24%	68.6	4.2	99 (19)	35 926)
Springfield, CO	1.38	0.05	104%	66.7	0.6	93 (17,13)	37 (27)
Central							
Concordia	5.29	2.38	182%	68.5	0.5	93 (20,18)	42 (22)
Hebron, NE	6.30	3.38	216%	68.8	2.8	95 (20,18)	42 (26,22)
Medicine Lodge	4.78	2.68	228%	71.8	0.6	97 (1)	42 (27)
Ponca City, OK	2.78	-0.51	84%	74.1	2.0	94 (19,18)	40 (27)
Salina	5.39	2.69	200%	70.5	0.3	96 (1)	44 (27)
Wichita (ICT)	2.77	-0.37	88%	72.7	1.7	98 (1)	43 (27)
East							
Bartlesville, OK	1.34	-2.50	35%	72.8	1.4	96 (19,18)	37 (27)
Chanute	4.39	0.72	120%	72.0	2.1	92 (19,18)	39 (27)
Falls City, NE	5.97	2.42	168%	68.7	2.0	96 (18)	42 (26)
Johnson Co. Exec. Apt	3.17	-1.34	70%	70.2	1.6	91 (20,19)	40 (27)
Joplin, MO	2.23	-2.72	45%	72.7	1.9	92 (20,19)	40 (27)
Kansas City (MCI), MO	1.30	-3.32	28%	70.6	2.4	94 (20,19)	40 (27)
St. Joseph, MO	0.41	-3.01	12%	69.5	2.8	97 (18)	38 (27)
Topeka (TOP)	1.12	-2.54	31%	71.4	3.0	96 (19,18)	40 (26)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

APPENDIX B

Summary of September 2018 Flood and High Flow Conditions											
["--", no data; "<", less than all historical peaks]											
						Highest peak from 2018-09-01 to 2018-09-28				Historical Peaks	
USGS Station number	USGS station name	Drain. Area [mi2]	NWS flood stage [ft]	No. Days above flood stage	NWS flood class	Date	Stage (ft)	Stream flow (ft^3/s)	Rank	No. of years	Max. [ft^3/s] (year)
6818300	MISSOURI R AT ATCHISON, KS	426865	22	7	minor	9/4/2018	23.9	--	--	--	--
6818300	MISSOURI R AT ATCHISON, KS	426865	22	2	minor	9/30/2018	22.14	--	--	--	--
6856600	REPUBLICAN R AT CLAY CENTER, KS	24542	15	4	moderate	9/5/2018	21.02	14400	41	102	195000 (1935)
6879810	WILDCAT C AT SCENIC DRIVE, MANHATTAN, KS	86	14	1	major	9/3/2018	23.94	4310	1	6	3920 (2014)
6884200	MILL C AT WASHINGTON, KS	344	18	3	moderate	9/5/2018	19.54	4380	29	59	14600 (1993)
6884700	BIG BLUE R AT BLUE RAPIDS, KS	8342	26	7	minor	9/6/2018	39.86	--	--	--	--
6886500	FANCY C AT WINKLER, KS	174	16	1	minor	9/5/2018	16.25	9420	10	37	24000 (1972)
6914000	POTTAWATOMIE C NR GARNETT, KS	334	26	2	minor	9/8/2018	27.06	9070	47	63	57000 (1961)
7143300	COW C NR LYONS, KS	728	18	2	minor	9/6/2018	18.18	4000	17	73	28000 (1929)
7143310	COW C NR HUTCHINSON, KS	859.5	9.5	5	moderate	9/9/2018	11.25	--	--	--	--
7144910	SF NINNESCAH R NR PRATT, KS	117	9	1	minor	9/3/2018	14.44	17800	2	37	26200 (1991)
7145200	SF NINNESCAH R NR MURDOCK, KS	597	8	1	minor	9/5/2018	9.88	7980	21	67	28700 (1979)
7151500	CHIKASKIA R NR CORBIN, KS	794	10	1	minor	9/6/2018	10.63	6210	39	59	60000 (1923)
7169500	FALL R AT FREDONIA, KS	827	17	2	minor	9/7/2018	22.53	13300	32	83	77800 (2007)
7183000	NEOSHO R NR IOLA, KS	3723	15	2	minor	9/8/2018	17.12	22700	63	111	436000 (1951)
7183500	NEOSHO R NR PARSONS, KS	4905	21	2	minor	9/9/2018	21.69	22000	72	96	410000 (1951)

KANSAS CLIMATE and DROUGHT UPDATE
October 2018 Summary

Highlights

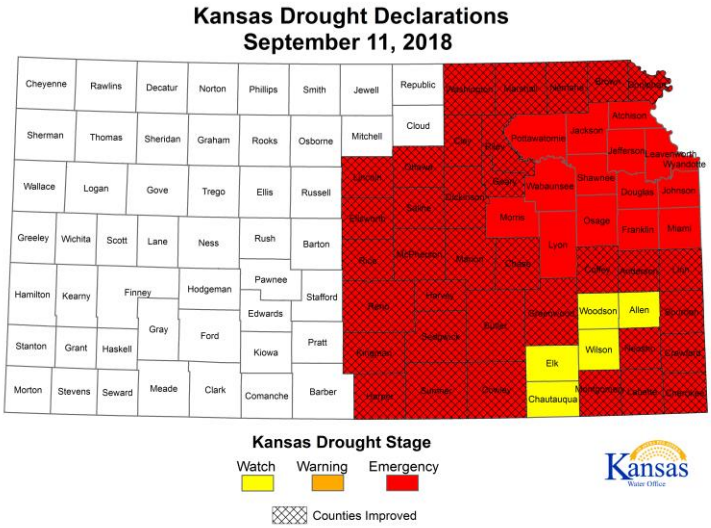
- Executive Orders 18-18 remains in effect for 50 counties in emergency status, and 5 in watch, primarily to allow continued assistance to mitigate drought impacts on livestock.

- U.S. Drought Monitor drought designations were removed for all but one percent of Kansas (parts of Wabaunsee, Jefferson, Leavenworth and Wyandotte counties) by October 16th. About 9 % of the state is still abnormally dry.

- Administration of MDS continued on Little Arkansas River at Alta Mills into October, but ceased October 18, 2018. Water rights junior to MDS above the gage had been under administration since August 10, 2017.

- Kansas Department of Health and Environment Public Health Advisories as Warnings (2) or Watches (1) were in place at the end of October for three Kansas water bodies due to the presence of harmful algae (HAB). This was an improvement from 21 lakes under advisories early in October. A public health watch indicates water may be unsafe for humans and animal – contact is discouraged. A public health warning indicates contact with water should not occur, it is unsafe.

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order (EO) 18-17 on September 11, 2018 placing 50 counties in emergency status and 5 into a watch status. A total of 55 counties were downgraded, 50 of these having drought declarations removed. EO 18-18 corrected the listing of counties. The September 11 map shows these counties. These Drought Declarations remain in place until revised or rescinded by a subsequent EO.



Drought Watch counties: Allen, Chautauqua, Elk, Wilson, Woodson

Drought Emergency counties: Anderson, Atchison, Bourbon, Brown, Butler, Chase, Cherokee, Clay, Coffey, Cowley, Crawford, Dickinson, Doniphan, Douglas, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Johnson, Kingman, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Miami, Montgomery, Morris, Nemaha, Neosho, Osage, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Sedgwick, Shawnee, Sumner, Wabaunsee, Washington, Wyandotte

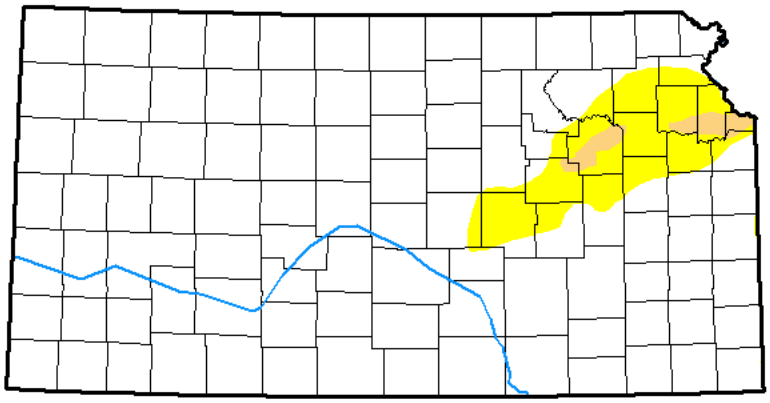
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

U.S. Drought Monitor drought conditions across the state continued to improve during October. The remaining exceptional and extreme drought in eastern Kansas was downgraded to moderate and severe drought October 9. One week later, October 16, only two pockets of moderate drought remained. Currently, over 91 percent of the state is drought free, while 1 percent is in moderate drought. The change in drought categories map shows where changes occurred.

U.S. Drought Monitor

Kansas



October 30, 2018

(Released Thursday, Nov. 1, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	91.63	8.37	1.00	0.00	0.00	0.00
Last Week *10-23-2018*	91.62	8.38	1.00	0.00	0.00	0.00
3 Months Ago *07-31-2018*	28.11	71.89	47.75	27.63	8.32	0.95
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-25-2018*	78.54	21.46	14.80	9.73	5.67	0.38
One Year Ago *10-31-2017*	85.96	14.04	0.64	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

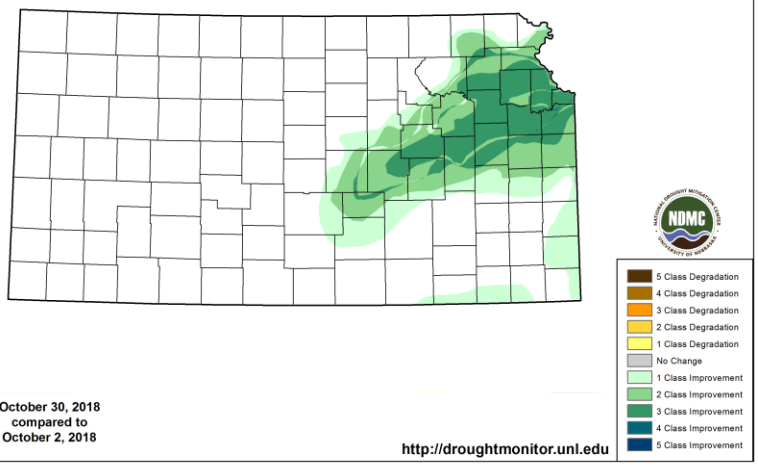
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Deborah Bathke
National Drought Mitigation Center

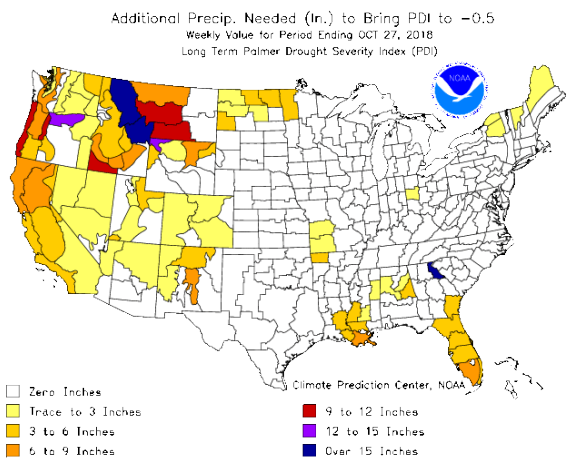
http://droughtmonitor.unl.edu/

U.S. Drought Monitor Class Change - Kansas
1 Month



Changes in drought classification are shown on the left.

More information can be found on the U.S. Drought Monitor web site.



Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

State Drought Mitigation

Livestock Water

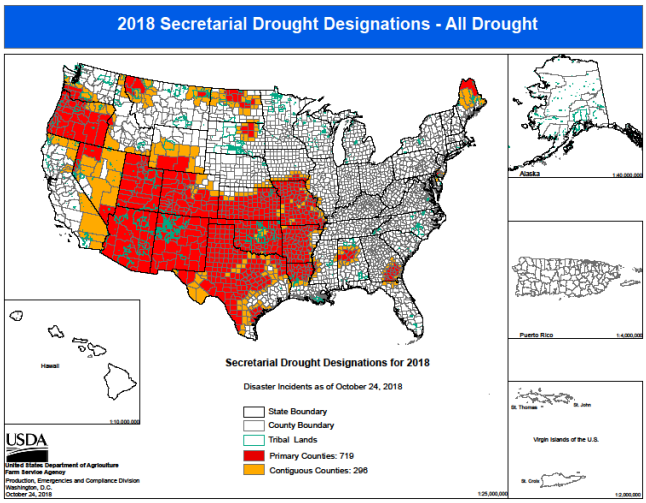
Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed.

Financial assistance for livestock water supply wells, pipeline and tanks may also be available through Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS or Kansas Department of Agriculture-Division of Conservation through the Livestock Water Supply Financial Assistance Initiative in Emergency counties. Applications can be made through local conservation districts.

Federal Disaster Drought Declarations 2018

U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.



USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte. Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.

Climate Summary - Precipitation

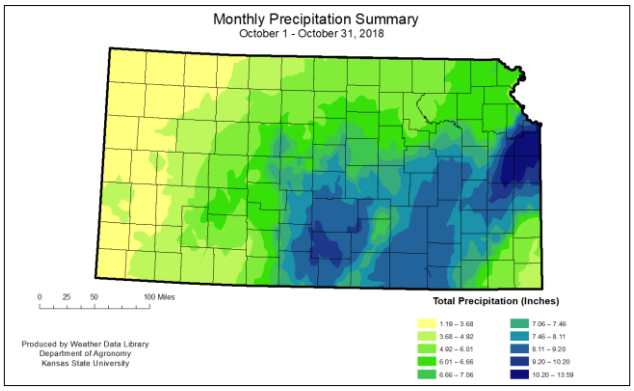
October was a very wet month across the state. It actually ranks as the second wettest October since 1895. The wettest October on record was in 1941 when the state-wide average was 5.99 inches. This year the state-wide average precipitation was 5.88 inches, 259 percent of normal. The Northwest Climate Division was the driest with an average of 2.62 inches. That is a surplus of 1.06 inches, 165 percent of normal. The South Central Division was the wettest, with an average of 7.97 inches. That is 5.33 inches above normal, 305 percent of normal. There were 165 new daily record rainfall totals, of which 3 were records for any day in October. The highest 24 hour rainfall total for a National Weather Service Cooperative station was 5.55 inches at Stilwell 1N, Johnson County, on the 8th. The greatest 24 hour rainfall total for a Community Collaborative Rain Hail and Snow network station was 6.44 inches recorded at Coats 3.3 NNE, Pratt County, on the 9th. The greatest monthly precipitation totals for October: 13.59 inches at Stilwell 1N, Johnson County (NWS) and 13.24 inches at Princeton 2.0 NE, Franklin County (CoCoRaHS). Not all precipitation was in the form of rainfall. A total of 257 stations reported snowfall in October, with monthly totals ranging from trace amounts in eastern Kansas to 9 inches at the CoCoRaHS station north of St. Francis, Cheyenne County.

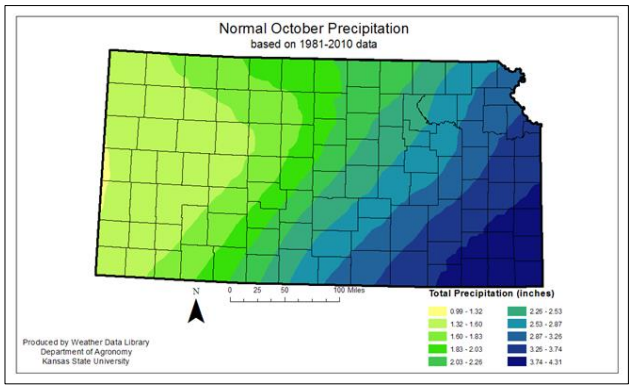
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

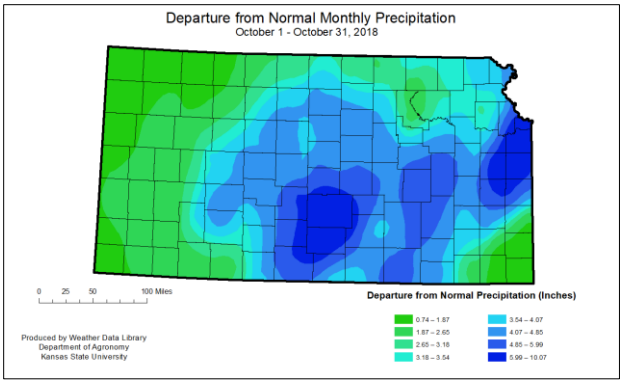
Kansas Climate Division Precipitation Summary (inches)

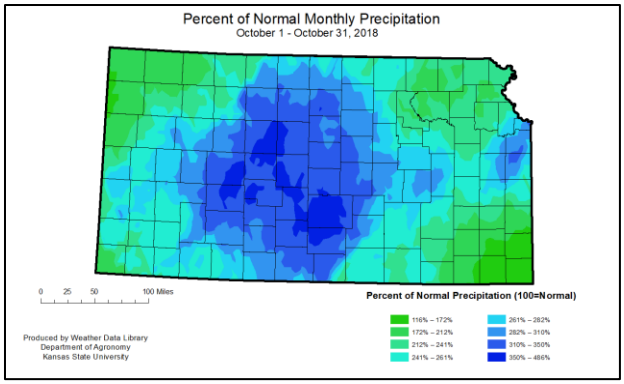
Climate Division	October 1-31, 2018			January 1-Oct 31, 2018			April 1, 2017- Oct 31 , 2018			Sept 1, 2018- Oct 31, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	2.62	1.06	165	21.62	1.66	107	20.23	2.57	113	4.07	0.99	129
West Central	3.90	2.44	265	23.18	3.83	118	22.08	5.23	129	6.22	3.16	203
Southwest	4.57	3.05	300	24.67	6.09	132	24.26	8.06	149	6.86	3.72	218
North Central	5.26	3.28	264	29.75	3.82	115	28.18	5.74	126	9.97	5.36	219
Central	6.90	4.77	332	29.88	2.75	111	28.32	5.15	123	10.84	6.19	236
South Central	7.97	5.33	309	34.03	5.32	119	32.01	7.93	133	11.98	6.74	233
Northeast	6.44	3.71	238	3074	-1.26	97	28.29	0.50	103	11.25	4.91	180
East Central	7.13	4.04	226	29.22	-5.13	84	26.33	-3.10	88	9.99	3.24	145
Southeast	7.33	3.66	204	36.94	-0.15	99	32.75	1.66	105	11.18	3.50	150
STATE	5.88	3.56	259	29.13	2.19	110	27.19	4.10	120	9.22	4.28	192

The maps below summarize precipitation. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps









Climate Summary-Temperature

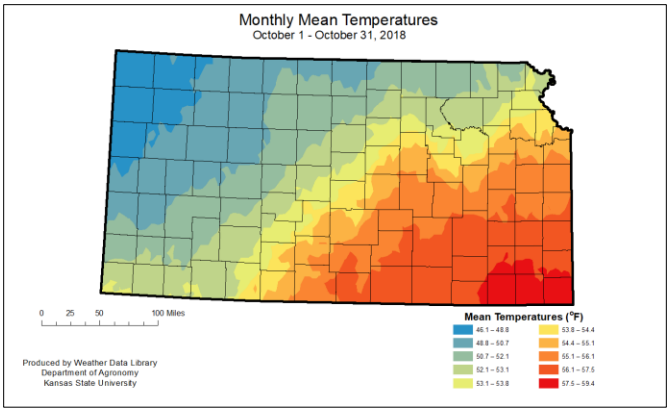
Despite a warm start to the month, October temperatures were cooler than normal. State-wide average temperature for the month was 53.0 ^{o}F, which is 2.3 degrees cooler than normal. All climate divisions were cooler than normal. The Northwest Division and the West Central division tied for the largest departure, with an average of 48.6 and 50.0 ^{o}F, or 3.6 degrees cooler than normal. The Southeast Division came closest to normal with an average of 57.1 ^{o}F or 0.8 degrees cooler than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 101 ^{o}F at Tribune 13NNE, Greeley County, on the 4th. The coldest minimum temperature at a NWS station was 12 ^{o}F, recorded at Brewster 4W, Sherman County, on the 16th. The Kansas Mesonet station in Cheyenne County, south of St. Francis, reported a low of 9 ^{o}F. There were 11 record daily high maximum temperatures in the month, and 121 record daily low maximum temperatures. On the minimum temperature side, there was one record high minimum compared to only 60 record low minimums.

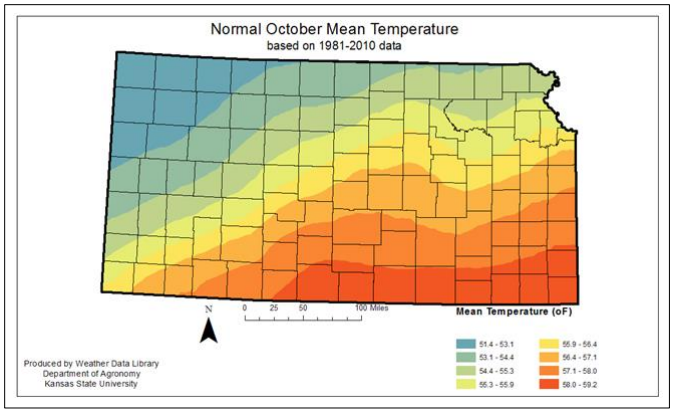
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

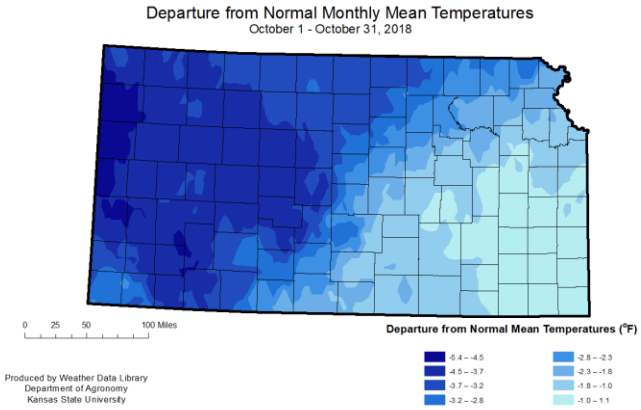
Climate Division	Kansas Climate Division Temperature Summary (^{o}F)							
	October 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	95	12	48.6	-3.6	95	4	12	16
West Central	101	12	50.0	-3.6	101	4	13	15
Southwest	99	21	53.1	-2.9	99	4	21	15
North Central	97	20	51.7	-3.3	97	4	20	16
Central	97	20	53.5	-2.8	97	4	20	15
South Central	97	26	55.4	-2.3	97	3	26	16
Northeast	91	26	52.7	-2.7	91	4	26	16
East Central	93	26	54.6	-1.7	93	3	26	16
Southeast	91	27	57.1	-0.8	91	4	27	16
STATE	101	12	53.0	-2.6	101	4th	12	16th
Data Source: KSU Weather Library								

For once hail wasn't featured in the severe weather reports. High winds and a tornado were major contributors to severe weather in Kansas during October. Flooding was again a feature, with much of the damage occurring in South Central, Kansas.

The maps below summarize temperature. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .



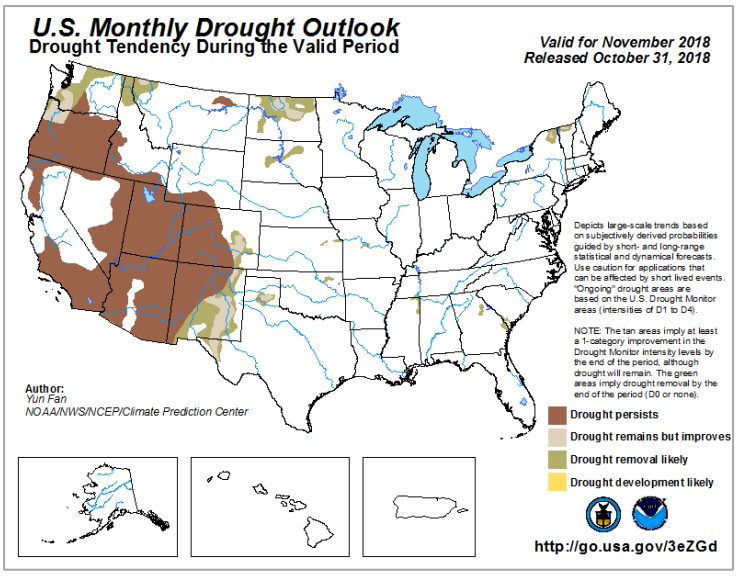


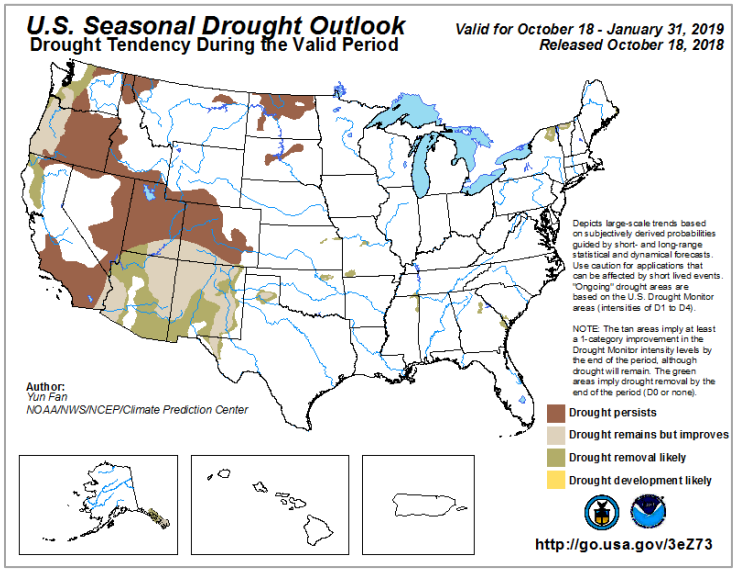


Future Outlook

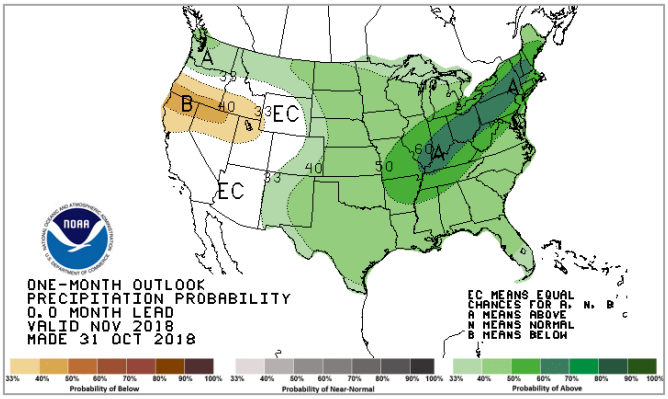
The Monthly Drought Outlook indicates drought conditions likely to improve in northeast Kansas in November.

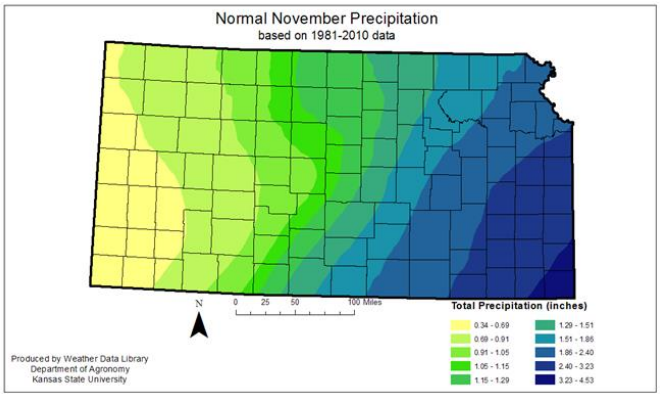
Seasonal Outlook (3-month) favors removal of the drought remaining in eastern Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

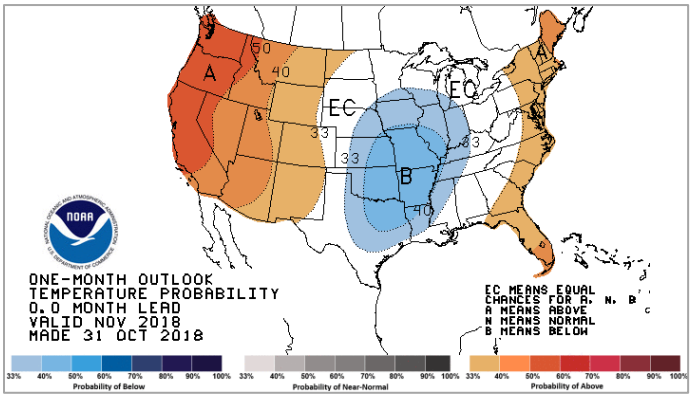


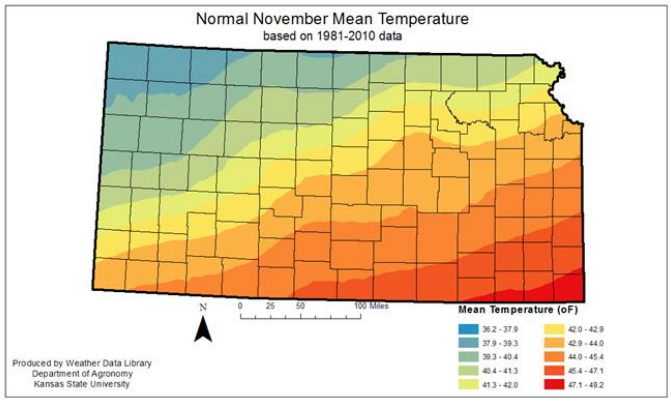


The November outlook has increased chances for above normal precipitation across most of the state. However, given the low normal precipitation at this time of the year, continued improvement is likely to be slow. The temperature outlook is for cooler than normal temperatures across all but the western edges of the state.

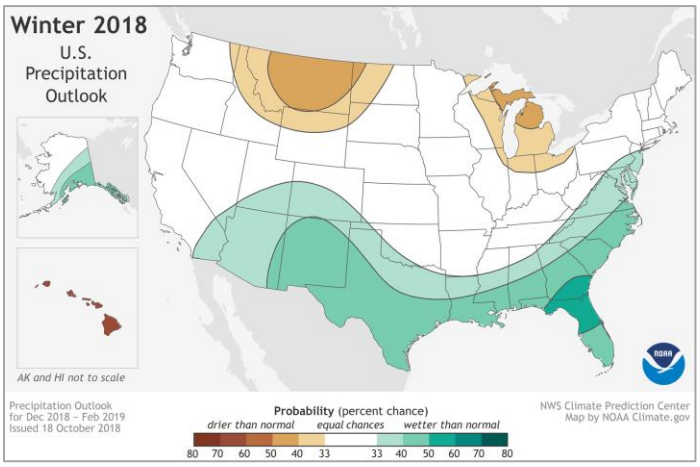


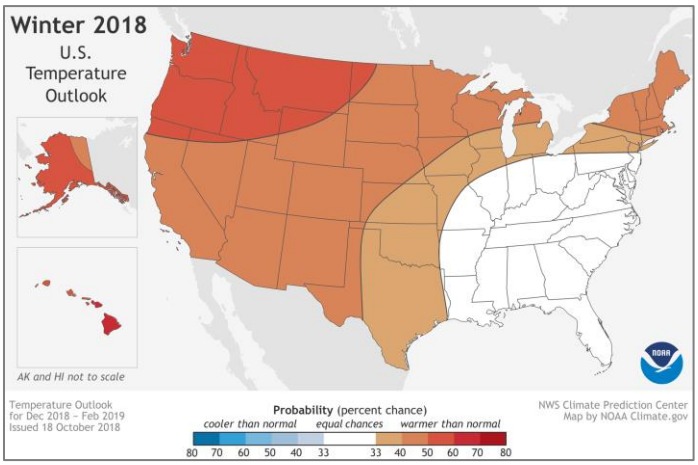






The A mild winter could be in store for much of the United States this winter according to NOAA's Climate Prediction Center. The U.S. Winter Outlook for December through February favors above-average temperatures for Kansas with equal chances of below, above or normal precipitation. Additionally, El Nino has a 70 to 75 percent chance of developing according to, NOAA's Climate Prediction Center. A weak El Nino is expected, which may influence the winter season by bringing wetter conditions across the southern United States, and warmer, drier conditions to parts of the North.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Please note stage designation or name and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers.

Numerous communities have conservation measures in place throughout the summer or year to restrict outdoor watering to times with less evaporative loss. The conservation measures in place that are in addition to these that we are aware of include the**: City of Oswego,** Labette County, issued a water watch August 16, 2018; and **City of Burlington** enacted a stage 3 water emergency initiating mandatory water conservation for all its consumers August 15, 2018, including Coffey County Rural Water Districts 2 and 3 and the cities of Gridley, LeRoy and New Strawn.

Surface Water Supply Conditions

Kansas River basin: Milford, Tuttle, and Perry reservoirs all experienced higher than normal inflows in October and all are retaining flood storage. Inflows to Clinton also increased over past months and storage gained was about 10 thousand acre-feet but it did not reach full normal pool. Flood storage evacuation from Milford, Tuttle Creek, and Perry was restricted the entire month due to near flood conditions in the Missouri River.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received significant inflow in October. All three reservoirs were in flood pool operations for the majority of the month, which resulted in higher than normal flows in the Marais des Cygnes River.

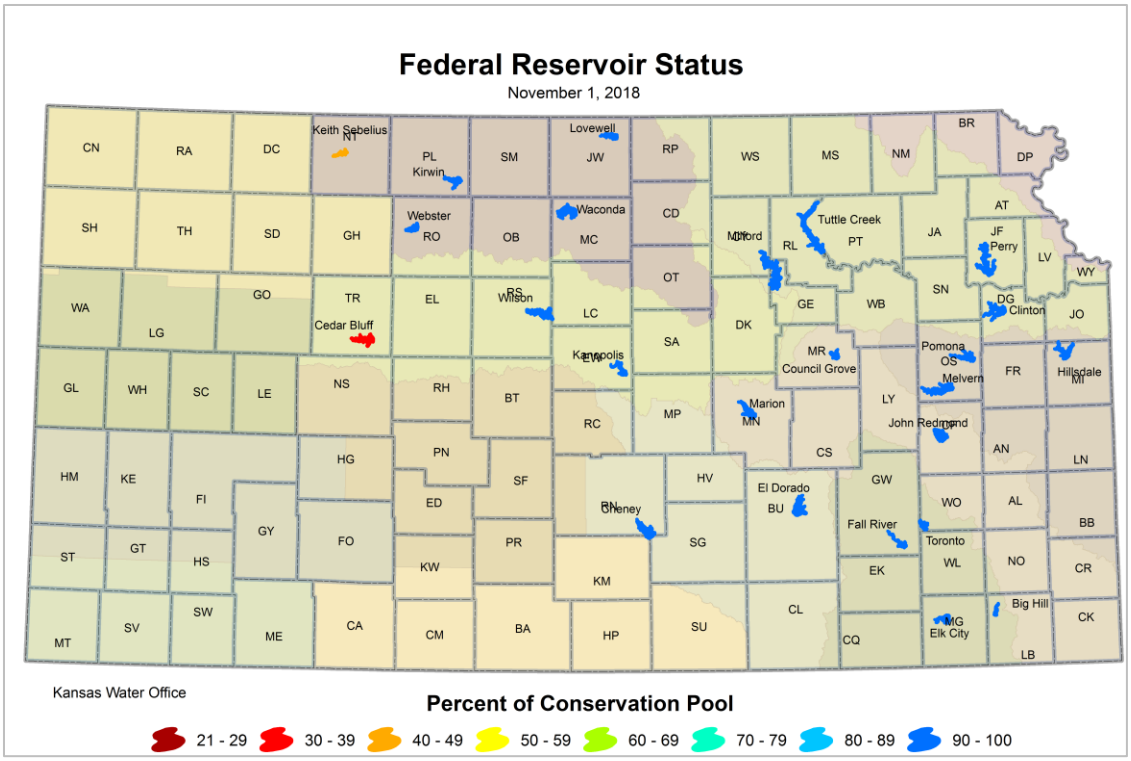
Cottonwood/Neosho basin: Inflows to Marion Reservoir remained lower than the rest of the system but it did make progress toward refilling conservation storage, gaining more than 2 feet and nearly 14 thousand acre-feet in October. Flood pool releases were necessary from Council Grove and John Redmond reservoirs.

Verdigris basin: Inflows to Toronto, Fall River, Elk City, and Big Hill reservoirs were moderate to above normal in October. Stream flow in the Verdigris and Fall Rivers were maintained well above normal due to flood pool releases throughout the month.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in October. Inflow remained above normal and releases in excess of low flow settings were necessary to manage lake level.

Smoky Hill basin: The middle Smoky Hill River continued to benefit from sustained runoff in October. Kanopolis Lake experienced high inflows and flood releases occurred through the main service gates was necessary for much of the month. Cedar Bluff Reservoir also received some inflow and gained about 3 thousand acre-feet over the month.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**Project Data Date/Time: 10/31/2018 06:00 AM**		
Norton[1]	2304.3	2293.28	-11.02	45.1
Harlan County, NE	1945.73	1939.05	-6.68	73.7
Lovewell[1]	1582.6	1582.12	-0.48	96.1
Milford[1]	1144.4	1153.89	9.49	100.0
Cedar Bluff	2144	2122.00	-22.00	37.3
Kanopolis[1]	1463	1473.82	10.82	100.0
Wilson[1]	1516	1516.77	0.77	100.0
Webster[1]	1892.5	1892.48	0.03	100.0
Kirwin[1]	1729.3	1729.98	0.73	100.0
Waconda[1]	1455.6	1457.54	1.94	100.0
Tuttle Creek[1]	1075	1103.71	28.71	100.0
Perry[1]	891.5	895.34	3.84	100.0
Clinton[1]	875.5	874.68	-0.82	95.1
Melvern[1]	1036	1038.63	2.63	100.0
Pomona[1]	974	973.40	-0.60	95.8
Hillsdale[1]	917	918.02	1.02	100.0
Arkansas River Basin		**11/01/2018 08:00 AM**		
Cheney	1421.6	1424.29	2.69	100.0
El Dorado	1339	1339.40	0.40	100.0
Toronto[1]	901.5	902.27	0.77	100.0
Fall River[1]	948.5	949.06	0.56	100.0
Elk City[1]	796	796.64	0.64	100.0
Big Hill	858	858.07	0.07	100.0
Council Grove[1]	1274	1274.50	0.50	100.0
Marion[1]	1350.5	1349.02	-1.48	89.0
John Redmond[1]	1039	1051.05	10.05	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. Warning that conditions are unsafe and water contact should not occur include that no swimming, wading, skiing or consumption of the water should occur. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

Lake Public Health Advisories

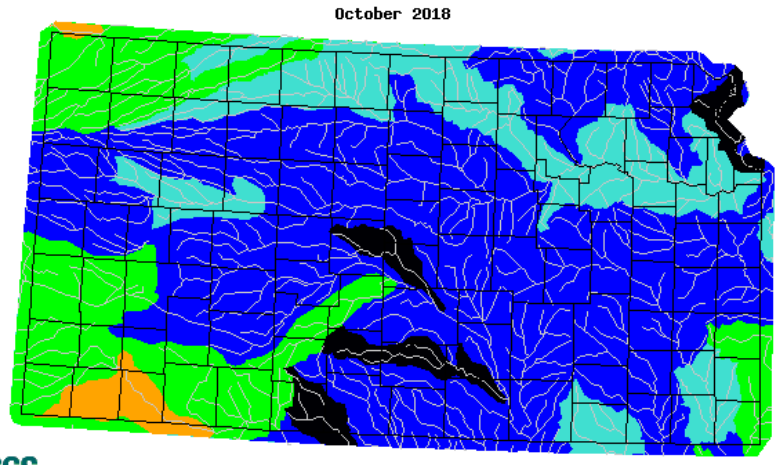
Water Body	County	10/5/2018	10/11/2018	10/19/2018	10/26/2018
Atchison County Park Lake	Atchison	Warning			
Atchison County State Fishing Lake	Atchison	Watch			
Carbondale West Lake	Osage	Warning	Warning	Warning	
Central Park Lake	Shawnee	Warning			
Frazier Lake	Grant	Warning	Warning	Warning	Warning
Hodgeman Co. State Fishing Lake	Hodgeman	Warning	Warning	Watch	
Jerry Ivey Pond	Saline	Warning	Warning	Warning	Warning
Lake Afton	Sedgewick	Warning	Warning		
Lake Scott State Park	Scott	Warning			
Lakewood Park Lake	Saline	Warning	Watch	Watch	
Marais des Cygnes Wildlife Area Lake	Linn	Warning	Warning	Warning	
Mary's Lake	Douglas	Watch	Watch		
Melvern Outlet Pond	Osage	Warning	Warning	Warning	
Melvern Outlet Swim Pond	Osage	Warning	Warning		
Overbrook City Lake	Osage	Watch	Watch		
Overbrook City Kids Pond	Osage	Watch	Watch		
Pomona Lake	Osage	Watch	Watch		
Rock Garden Pond	Shawnee	Warning	Warning	Warning	
South Park Lake	Johnson	Warning	Warning	Warning	Watch
Tomahawk Park Lake	Johnson	Watch	Watch		
Webster Lake	Rooks	Warning	Watch	Watch	

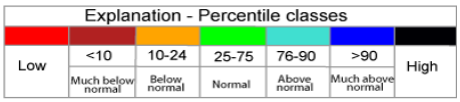
Please note lakes are only tested if a suspected bloom is reported to Kansas Department of Health and Environment (KDHE). Then testing is added to the next round of testing. So if in doubt stay out of the water and avoid contact with the water. Report new algae-blooms to KDHE: www.kdheks.gov/algae-illness or call 785-296-1664.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a time period.

October Streamflow compared to historical streamflow is reflected in the map below.





USGS

Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. To rescind orders at most gages, daily average flow must be above MDS for 14 days.

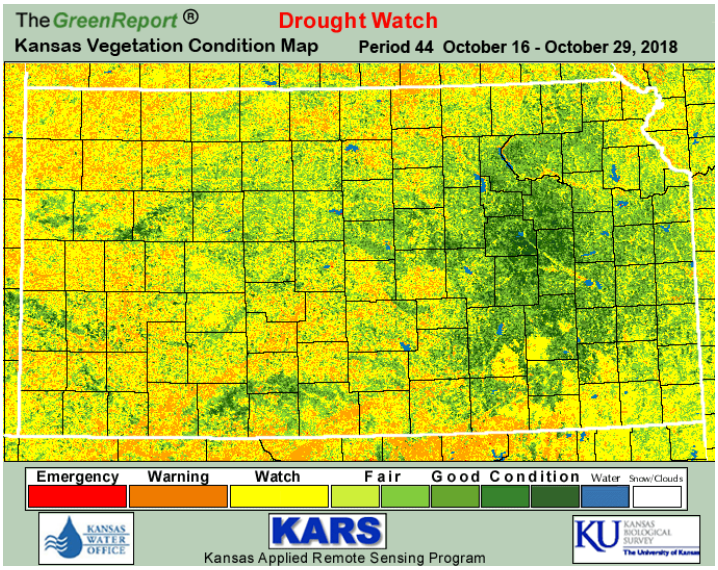
The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources. Flows at the gages on Rattlesnake Creek at Macksville and Zenith increased to exceed MDS during October.

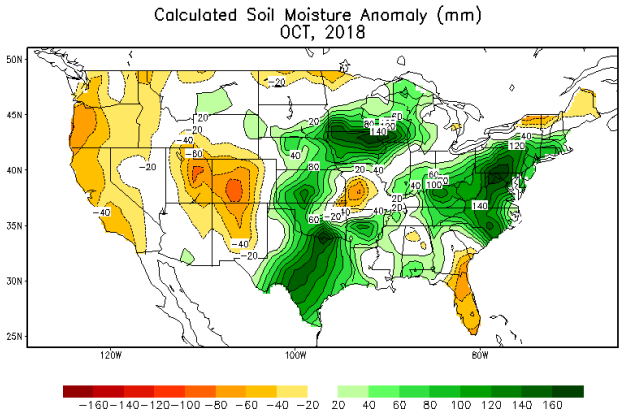
Streamflows					
USGS Gaging Station	**Oct. 1 Flow**	**Oct. 29 Flow**	**Oct. MDS**	**Nov. MDS**	**Comment**
Rattlesnake Creek near Macksville	Dry	4.7	1	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	5	19	3	10	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	2	84	8	8	MDS admin began Aug 10, 2017, ceased Oct 18, 2018

Crop , Vegetation and Soil

Vegetative Conditions

The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

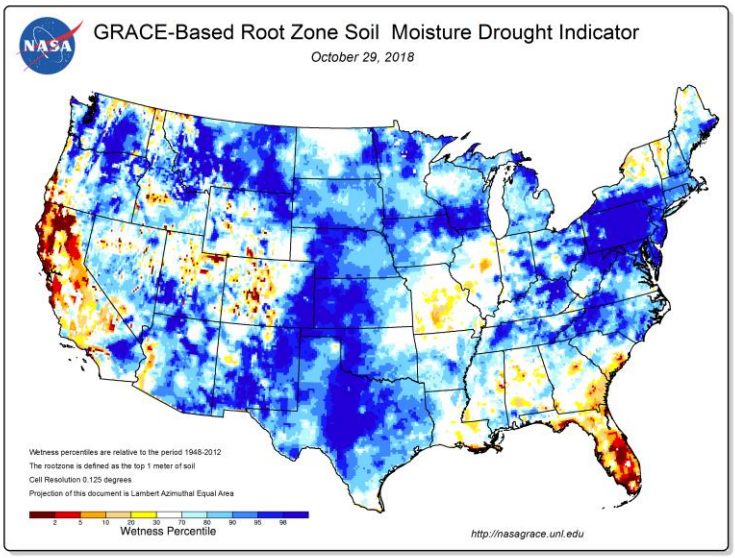




Soil Moisture

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)

Root zone soil moisture is another tool to look at drought. NASA generates soil moisture drought indicators each week using GRACE satellite data integrated with other observations. Indicators describe wet or dry conditions as a percentile of probability of occurrence within the period of record (1948-present). Surface soil moisture and shallow groundwater maps are also available. https://nasagrace.unl.edu/Default.aspx



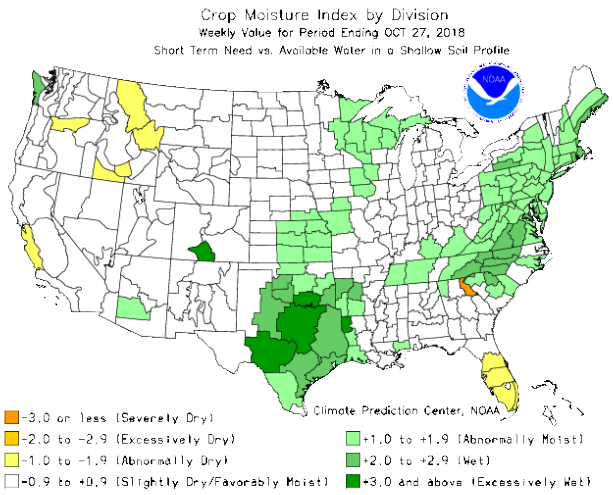
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending October 29, 2018 indicates topsoil moisture supplies rated 0 percent very short, 3 short, 75 adequate, and 22 surplus. Subsoil moisture supplies rated 1 percent very short, 7 short, 81 adequate, and 11 surplus.

Field Crops Report:

Winter wheat condition rated 3 percent very poor, 15 poor, 40 fair, 36 good, and 6 excellent. Soybean condition rated 4 percent very poor, 11 poor, 32 fair, 43 good, and 10 excellent. Sorghum condition rated 2 percent very poor, 5 poor, 23 fair, 56 good, and 14 excellent. Cotton condition rated 1 percent very poor, 4 poor, 36 fair, 54 good, and 5 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 4 percent very poor, 103 poor, 33 fair, 46 good, and 7 excellent.

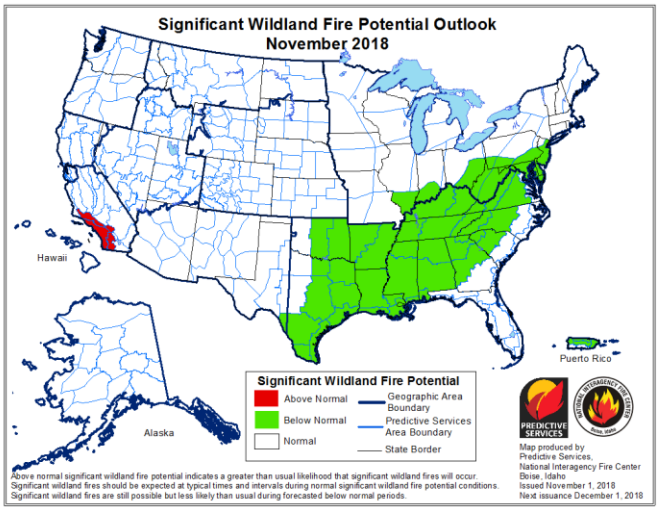


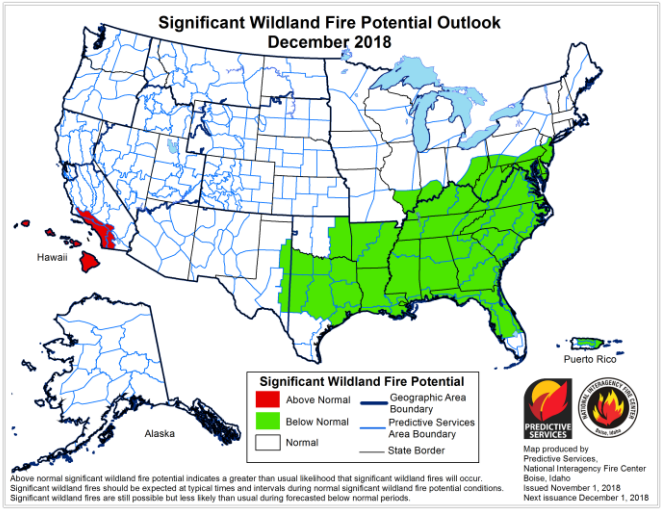
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps, which commonly display the weekly CMI across the United States, can be used to compare moisture conditions at different locations. Weekly maps of the CMI are available as part of the USDA Weekly Weather and Crop Bulletin.

Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://www.ksre.k-state.edu/wdl/.

RESOURCES and ACTIVITIES

Kansas climate data is provided by Kansas State University, Weather Data Library. (http://www.ksre.k-state.edu/wdl/)

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/)provides precipitation and temperature summary maps.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection. (https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/minimum-desirable-streamflow.)

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the

Vegetation Drought Response Index, by the National Drought Mitigation Center provides another a national perspective on vegetation conditions. VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Monthly and Seasonal Drought Outlooks, developed by the NOAA Climate Prediction Center, assess the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. (http://www.cpc.ncep.noaa.gov/) Also see: http://www.noaa.gov/.

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

October 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	2.44	1.29	212%	48.6	-2.1	92 (3)	14 (15)
Dodge City	6.45	4.71	371%	53.6	-3.0	96 (3)	25 (15)
Garden City	3.15	1.87	246%	51.8	-3.6	95 (3)	22 (16)
Goodland	2.36	0.99	172%	49.0	-2.9	94 (3)	16 (15)
Guymon, OK	5.29	3.72	337%	56.1	-1.2	97 (3)	30 (16,14)
Hill City	3.72	2.20	245%	51.5	-2.5	95 (3)	20 (15)
Lamar, CO	2.93	2.13	366%	51.4	-1.5	98 (3)	18 (15)
McCook, NE	2.53	0.74	141%	49.5	-1.8	96 (3)	19 (15)
Springfield, CO	2.91	1.52	209%	51.3	-2.6	94 (3)	24 (16)
Central							
Concordia	5.28	3.36	275%	53.0	-2.4	95 (3)	26 (15)
Hebron, NE				52.0	-1.3	93 (3)	25 (15)
Medicine Lodge	8.88	6.04	313%	56.9	-1.7	93 (3)	29 (16)
Ponca City, OK	8.23	4.85	243%	59.5	-0.6	92 (3)	32 (16)
Salina	5.70	3.43	251%	54.3	-3.2	94 (3)	28 (16)
Wichita (ICT)	6.28	3.50	226%	57.6	-0.6	93 (3)	30 (16)
East							
Bartlesville, OK	6.39	2.92	184%	58.6	-0.9	92 (3)	32 (21)
Chanute	7.52	3.86	205%	58.5	0.2	89 (3)	31 (16)
Falls City, NE	6.22	3.58	236%	52.5	-2.2	90 (3)	27 (21,16)
Johnson Co. Exec. Apt	9.98	6.54	290%	55.5	-1.5	88 (3)	28 (16)
Joplin, MO	2.57	-1.46	64%	58.7	-1.1	89 (5,3)	32 (21)
Kansas City (MCI), MO	10.76	7.60	341%	55.5	-0.9	91 (3)	26 (16)
St. Joseph, MO	6.43	3.62	229%	54.2	-0.5	92 (3)	29 (21)
Topeka (TOP)	7.01	3.98	231%	55.5	-1.1	93 (3)	27 (16)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE
November 2018 Summary

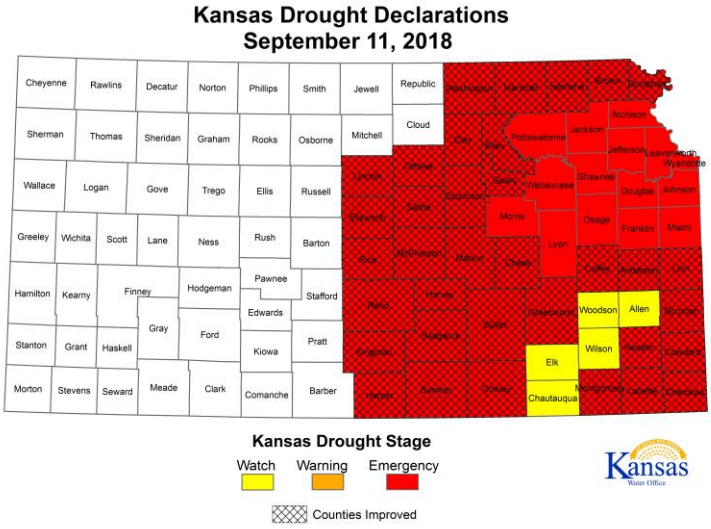
Highlights

- Executive Orders 18-18 remains in effect for 50 counties in emergency status, and 5 in watch, primarily to allow continued assistance to mitigate drought impacts on livestock from the summer.

- U.S. Drought Monitor drought designations were removed for all but under one percent of Kansas (About 6% of the state remained abnormally dry through November 20.

- Kansas Department of Health and Environment closed the season for Harmful Algal Bloom (HAB) monitoring October 31. At that time two water bodies remained in active bloom: Frazier Lake, in Grant County was at a Warning status; and South Lake, in Johnson County was at a Watch status. The next harmful algal bloom season will begin again on April 1st 2019.

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order (EO) 18-17 on September 11, 2018 placing 50 counties in emergency status and 5 into a watch status. A total of 55 counties were downgraded, 50 of these having drought declarations removed. EO 18-18 corrected the listing of counties. The September 11 map shows these counties. These Drought Declarations remain in place until revised or rescinded by a subsequent EO.



Drought Watch counties: Allen, Chautauqua, Elk, Wilson, Woodson

Drought Emergency counties: Anderson, Atchison, Bourbon, Brown, Butler, Chase, Cherokee, Clay, Coffey, Cowley, Crawford, Dickinson, Doniphan, Douglas, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Johnson, Kingman, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Miami, Montgomery, Morris, Nemaha, Neosho, Osage, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Sedgwick, Shawnee, Sumner, Wabaunsee, Washington, Wyandotte

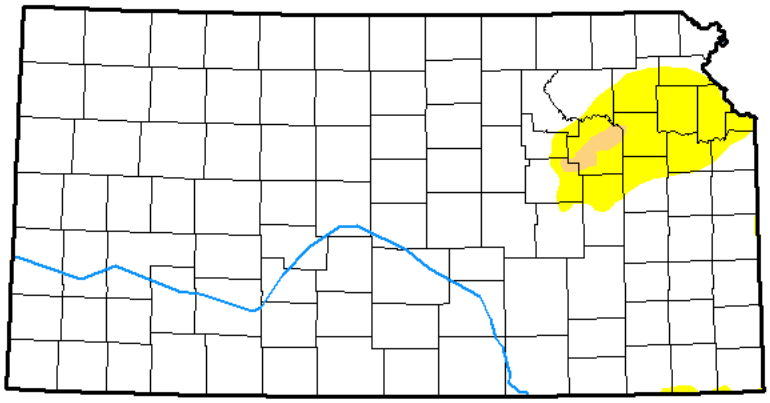
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

Despite the lower than normal precipitation, cooler than normal temperatures resulted in little change to the drought conditions. The area of the state that was drought free moved to 93 percent at the end of the month. Moderate drought and abnormally dry conditions linger in the eastern parts of the state.

U.S. Drought Monitor

Kansas



November 27, 2018

(Released Thursday, Nov. 29, 2018)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	93.34	6.66	0.46	0.00	0.00	0.00
Last Week *11-20-2018*	93.48	6.52	0.46	0.00	0.00	0.00
3 Months Ago *08-28-2018*	45.57	54.43	25.60	14.79	6.25	0.75
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-25-2018*	78.54	21.46	14.80	9.73	5.67	0.38
One Year Ago *11-28-2017*	52.88	47.12	15.33	0.00	0.00	0.00

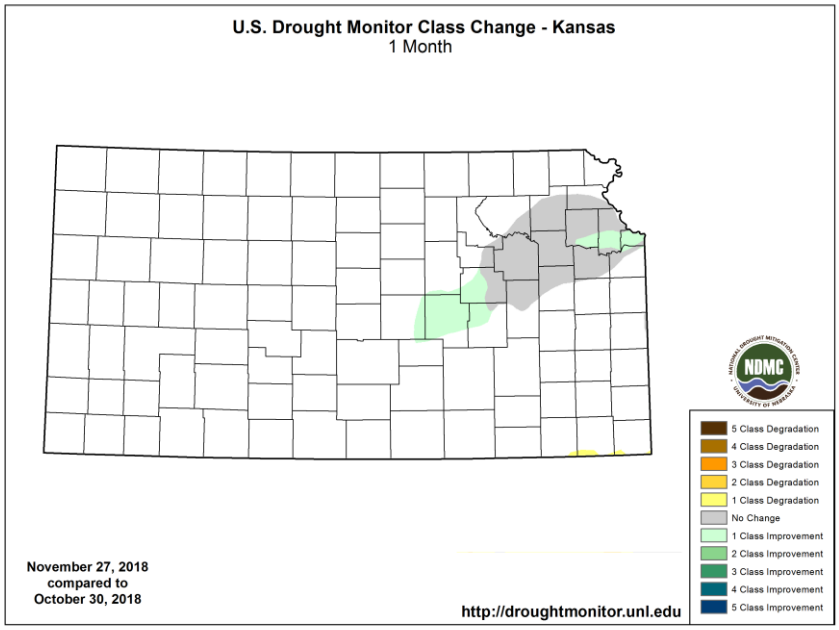
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/

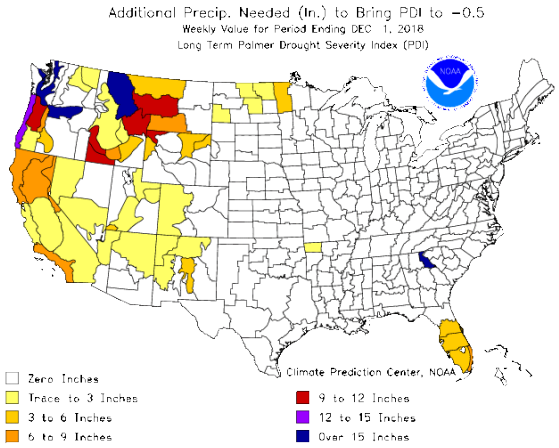


Changes in drought classification during the month are shown on the left.

More information can be found on the U.S. Drought Monitor web site https://droughtmonitor.unl.edu/ .

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml



State Drought Mitigation

Livestock Water

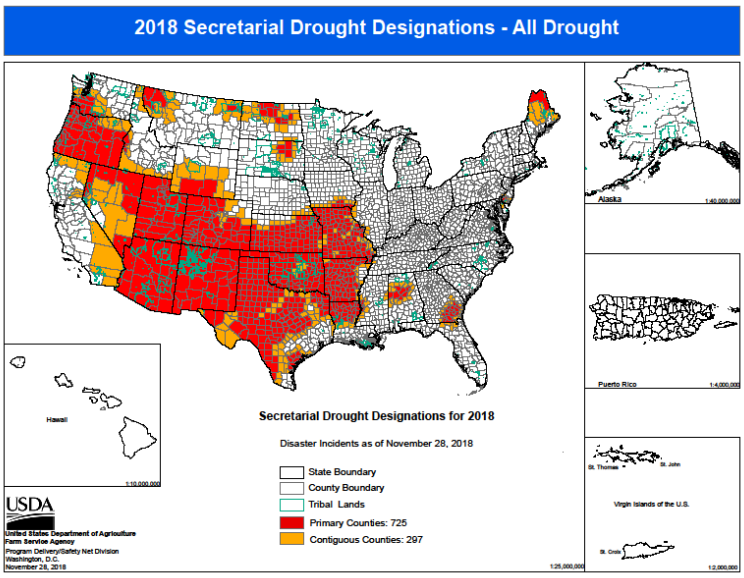
Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed.

Financial assistance for livestock water supply wells, pipeline and tanks may also be available through Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS or Kansas Department of Agriculture-Division of Conservation through the Livestock Water Supply Financial Assistance Initiative in Emergency counties. Applications can be made through local conservation districts.

Federal Disaster Drought Declarations 2018

U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.



USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte. Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.

Climate Summary - Precipitation

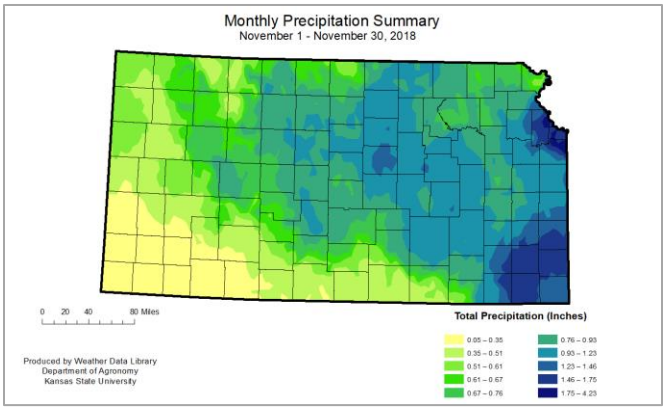
November was drier than normal across most of the state, providing a welcome relief to the very wet conditions in October. State-wide average precipitation was 1.26 inches, 89 percent of normal. The Southwest Climate Division was the driest with an average of 0.35 inches. That is a deficit of 0.31 inches, 53 percent of normal. The North Central Division was the wettest with an average of 1.99 inches, 180 percent of normal. There were 8 new daily record rainfall totals, none of which set new records for any day in November. The highest 24-hour rainfall total for a National Weather Service Cooperative station was 2.00 inches at Leavenworth 3SW, Leavenworth County, on the 26th. The greatest 24-hour rainfall total for a Community Collaborative Rain, Hail and Snow network station 1.28 inches at Courtland 0.1 SSE, Republic County, on the 27th. The greatest monthly precipitation totals for November: 4.23 inches at Leavenworth 3SW, Leavenworth County (NWS) and 2.05 inches at Erie, Neosho County (CoCoRaHS). Not all precipitation was in the form of rainfall. A total of 240 stations reported snowfall in November, with monthly totals ranging from trace amounts in southern Kansas to 17.3 inches at the CoCoRaHS station of Morrowville 4.8 SSW, Washington County.

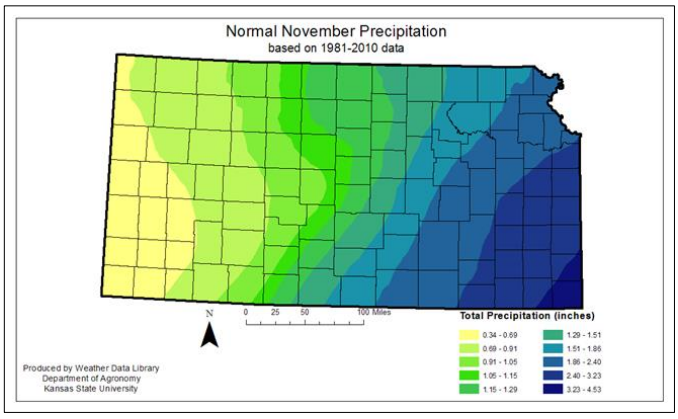
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

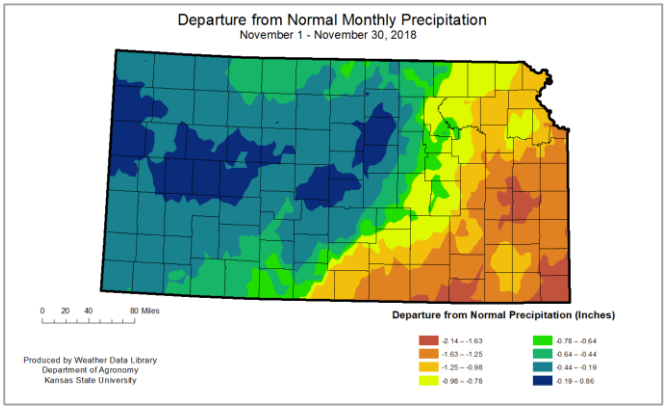
Kansas Climate Division Precipitation Summary (inches)

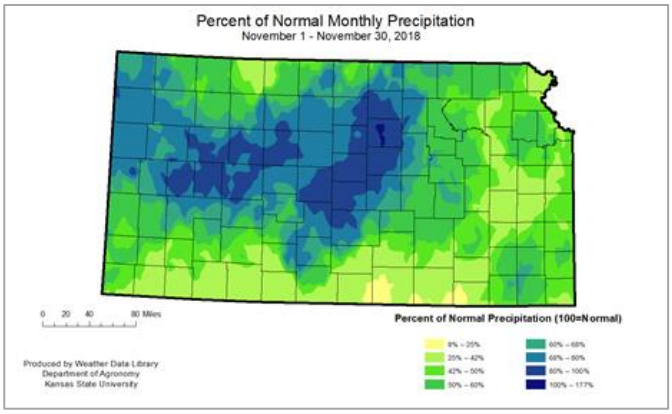
Climate Division	November 1-30, 2018			January 1-Nov 30, 2018			April 1, 2017- Nov 30 , 2018			Sept 1, 2018- Nov 30, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.59	-0.23	72	22.82	2.03	110	21.43	2.94	116	5.26	1.36	135
West Central	0.63	-0.16	80	24.25	4.11	120	23.15	5.51	131	7.29	3.45	190
Southwest	0.35	-0.31	53	24.96	5.73	130	24.54	7.69	146	7.15	3.36	189
North Central	1.99	0.76	162	31.68	4.52	117	30.11	6.44	127	11.90	6.06	204
Central	1.86	0.62	150	31.75	3.39	112	30.19	5.78	124	12.71	6.82	216
South Central	0.87	-0.62	58	34.77	4.57	115	32.75	7.17	128	12.72	5.99	189
Northeast	1.77	0.00	100	32.83	-0.95	97	30.38	0.81	103	13.34	5.23	164
East Central	1.75	-0.42	81	30.82	-5.70	84	27.92	-3.68	88	11.58	2.67	130
Southeast	1.85	-0.74	71	38.64	-1.04	97	34.45	0.77	102	12.88	2.61	125
STATE	1.26	-0.16	89	30.45	2.10	107	28.51	4.00	116	10.54	4.19	166

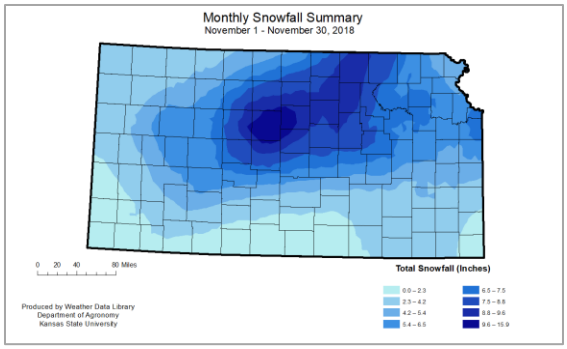
The maps below summarize precipitation. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps











Climate Summary-Temperature

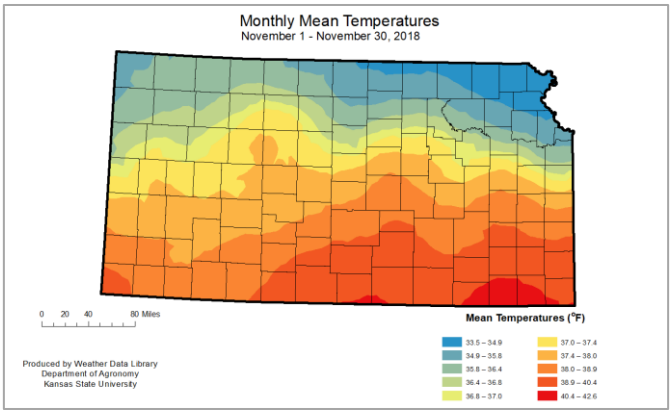
Despite some warm periods to the month, November temperatures were cooler than normal. State-wide average temperature for the month was 37.5 °F, which is 5.0 degrees cooler than normal. All climate divisions were cooler than normal. The Northeast Climate Division had the largest departure, with an average of 35.1 °F, or 7.1 degrees cooler than normal. The West Central Division came closest to normal with an average of 37.6 °F or 2.7 degrees cooler than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 82 °F at Yates Center, Woodson County, on the 13th. The coldest minimum temperature at a NWS station was 1 °F, recorded at Greensburg, Kiowa County, also on the 13th. There were no record daily high maximum temperatures in the month, and 90 record daily low maximum temperatures. On the minimum temperature side, there was one record high minimum compared to 59 record low minimums.

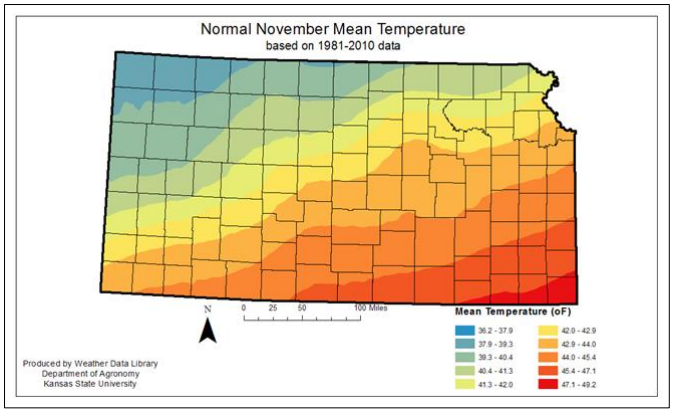
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

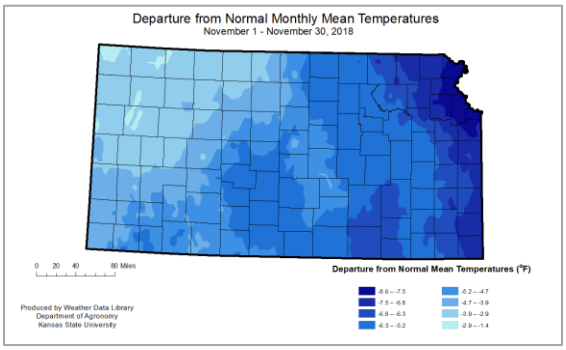
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	November 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	49.9	22.4	36.1	-2.9	68	23	5	13
West Central	52.0	23.5	37.8	-2.7	70	29	3	13
Southwest	53.0	24.9	38.9	-3.9	74	29	3	13
North Central	47.3	25.0	36.1	-5.1	67	24	6	13
Central	49.1	26.3	37.7	-5.1	69	1	5	13
South Central	51.0	27.8	39.4	-5.2	71	15	1	13
Northeast	45.3	25.0	35.1	-7.1	65	23	7	27
East Central	46.9	27.3	37.1	-6.5	68	25	8	13
Southeast	50.5	28.6	39.5	-6.3	82	13	6	14
STATE	49.4	25.6	37.5	-5.0	82	13th	1	13th
Data Source: KSU Weather Library								

Severe storm reports were limited to extreme southeastern Kansas in November. There was one hail report and six reports of wind damage. Severe winter weather was the main feature for the month, with blizzard-conditions across most of the central and northern areas of the state on the 25th and 26th. Sadly, there was one fatality when a stranded motorist attempted to walk to safety and died from exposure.

The maps below summarize temperature. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .



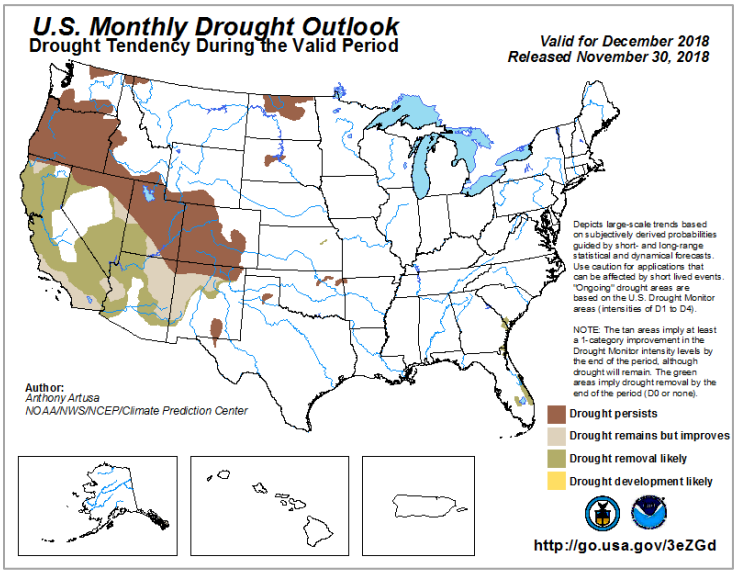


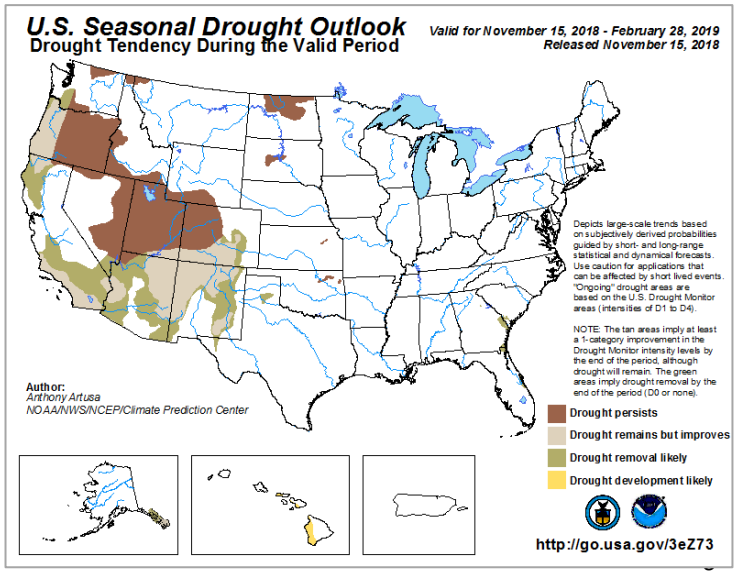


Future Outlook

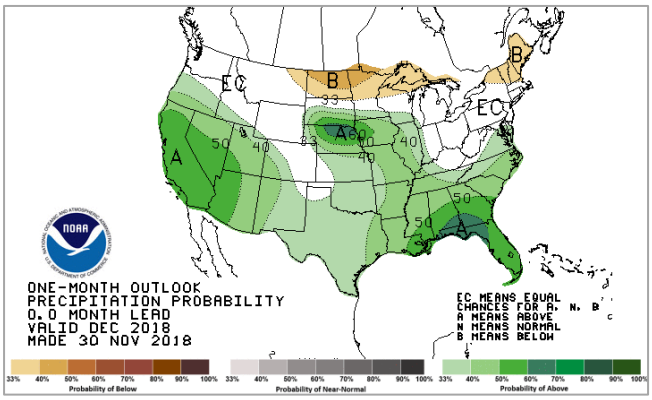
The Monthly Drought Outlook for December indicates drought conditions likely to improve in the small are of northeast Kansas where drought conditions remain at the end of November.

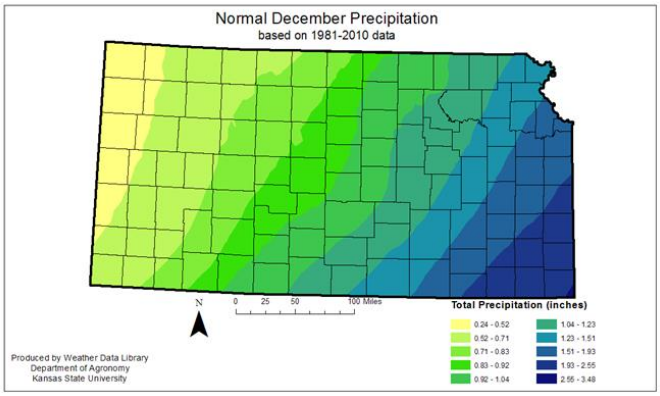
Seasonal Outlook (3-month) favors removal of the small area of drought remaining in eastern Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

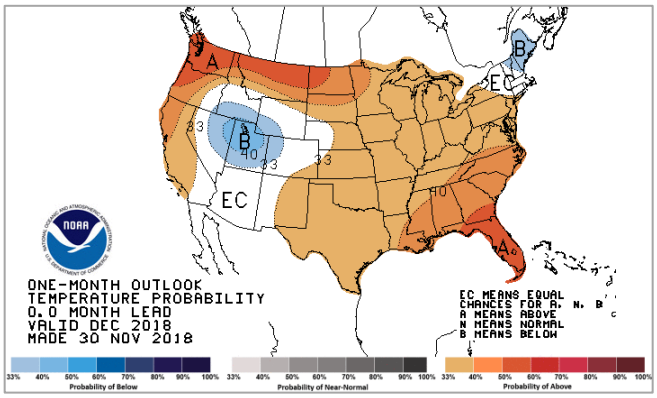


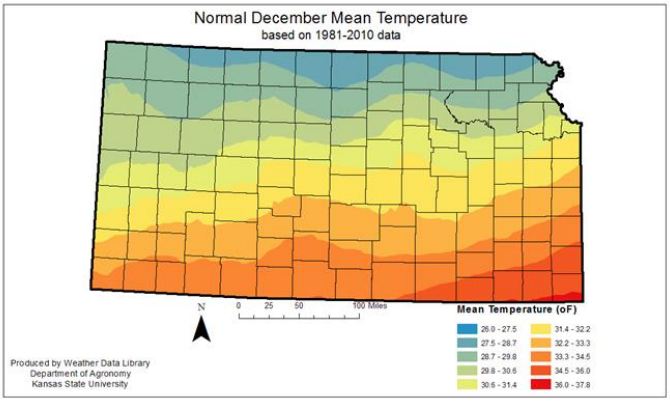


December outlook has increased chances for above normal precipitation across most of the state. However, given the low normal precipitation at this time of the year, continued improvement is likely to be slow. The temperature outlook is for warmer than normal temperatures across all but the western edges of the state.

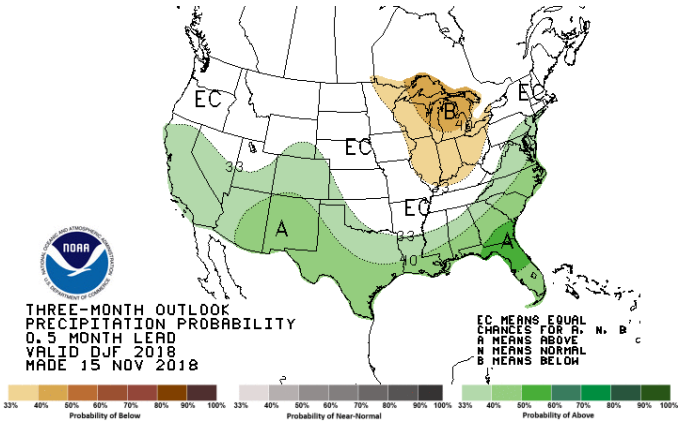


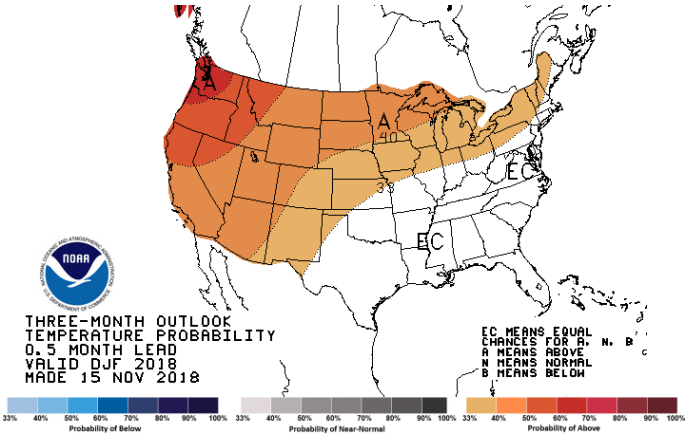






A mild winter could be in store for much of the United States this winter according to NOAA's Climate Prediction Center. The U.S. Winter Outlook for December through February favors above-average temperatures for the majority of Kansas with equal chances of below, above or normal precipitation. Additionally, El Nino has an 80 percent chance of developing according to, NOAA's Climate Prediction Center. The anticipated weak El Nino may influence the winter season by bringing wetter conditions across the southern United States, and warmer, drier conditions to parts of the North.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Many updates and new plans are developed when drought conditions exist. Individual system stage designation and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers. There are an increasing number of systems that restrict summertime outdoor water use to times of day of lower evaporation.

Surface Water Supply Conditions

Kansas River basin: Milford and Tuttle Creek reservoirs both continued to experience higher than normal inflows in November. Milford, Tuttle Creek, and Perry all maintained a substantial amount of water in their flood pools throughout the month, mostly from storage gained in October. November inflows to Clinton and Perry were very much near historic median. Flood storage evacuation from Milford, Tuttle Creek, and Perry was restricted the entire month due to near flood conditions in the Missouri River.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs had seasonally normal inflows for November. Melvern and Hillsdale maintained some storage in the flood pool near the higher fall target elevations. Pomona was drawn down prematurely to near its winter target elevation to help facilitate work on extension of a boat ramp. Flows in the Marais des Cygnes River were normal to slightly elevated over the month.

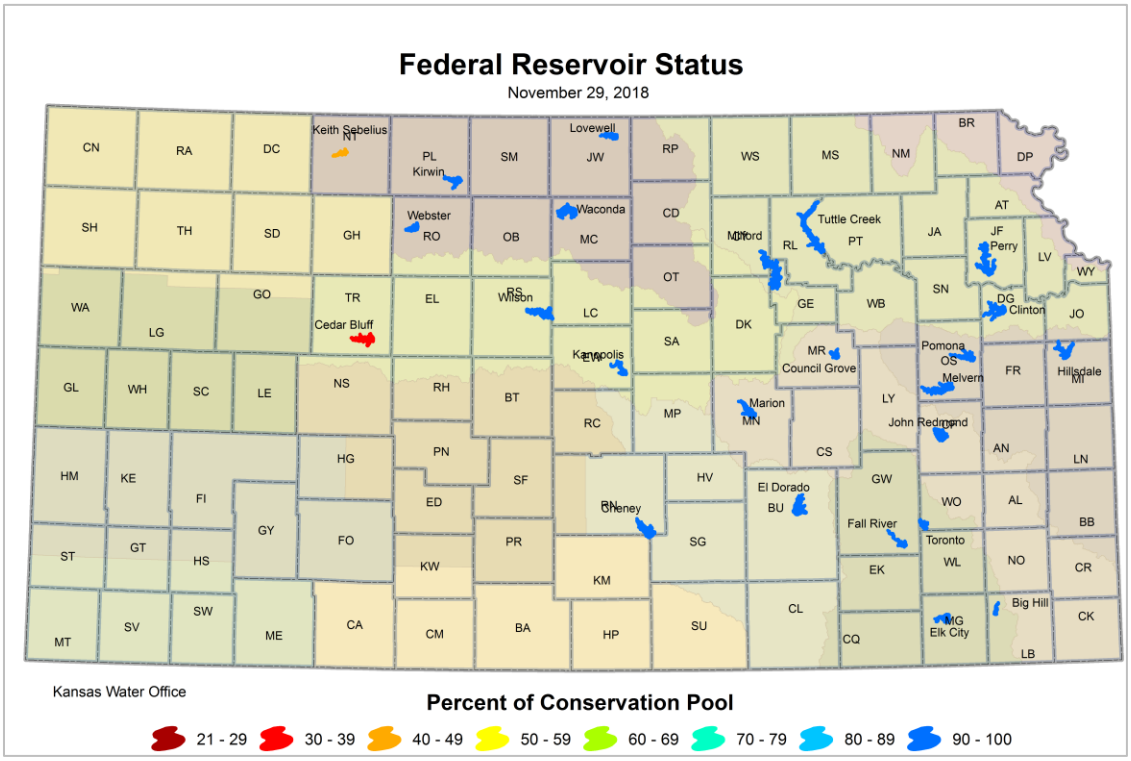
Cottonwood/Neosho basin: Inflows to Marion Reservoir were lower than the rest of the system and the pool elevation remained about 1.5 feet below conservation. Flood pool releases were necessary from Council Grove and John Redmond reservoirs throughout the month of November.

Verdigris basin: Inflows to Toronto, Fall River, Elk City, and Big Hill reservoirs were moderate to above normal in November. Stream flow in the Verdigris and Fall Rivers were maintained above normal due to flood pool releases and generally healthy tributary gains.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in November. Inflow remained above normal and releases in excess of low flow settings were necessary to manage lake level.

Smoky Hill basin: The middle Smoky Hill River maintained higher than normal flows from baseflow and tributary gains in November. Kanopolis Lake made significant flood pool releases through the main service gates, about 11 foot decline in pool elevation over the month. The U.S. Army Corps of Engineers will draw the pool down below the top of conservation to facilitate maintenance work this winter. Cedar Bluff Reservoir also received some inflow and gained elevation over the month due to steady higher than normal inflow.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**11/29/2018 6:00 AM**		
Norton[1]	2304.3	2293.39	-10.91	45.5
Harlan County, NE	1945.73	1939.78	-5.95	76.4
Lovewell[1]	1582.6	1582.35	-0.25	98.0
Milford[1]	1144.4	1144.34	-0.06	99.8
Cedar Bluff	2144	2122.14	-21.86	37.6
Kanopolis[1]	1463	1462.71	-0.29	98.2
Wilson[1]	1516	1516.55	0.55	100.0
Webster[1]	1892.5	1892.64	0.19	100.0
Kirwin[1]	1729.3	1730.30	1.05	100.0
Waconda[1]	1455.6	1456.49	0.89	100.0
Tuttle Creek[1]	1075	1084.26	9.26	100.0
Perry[1]	891.5	895.32	3.82	100.0
Clinton[1]	875.5	874.55	-0.95	94.3
Melvern[1]	1036	1037.53	1.53	100.0
Pomona[1]	974	972.48	-1.52	89.5
Hillsdale[1]	917	917.94	0.94	100.0
Arkansas River Basin		**11/29/2018 8:00 AM**		
Cheney	1421.6	1422.04	0.44	100.0
El Dorado	1339	1339.38	0.38	100.0
Toronto[1]	901.5	901.87	0.37	100.0
Fall River[1]	948.5	949.16	0.66	100.0
Elk City[1]	796	796.40	0.40	100.0
Big Hill	858	858.02	0.02	100.0
Council Grove[1]	1274	1274.24	0.24	100.0
Marion[1]	1350.5	1348.97	-1.53	89.0
John Redmond[1]	1039	1041.54	0.54	100.0

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

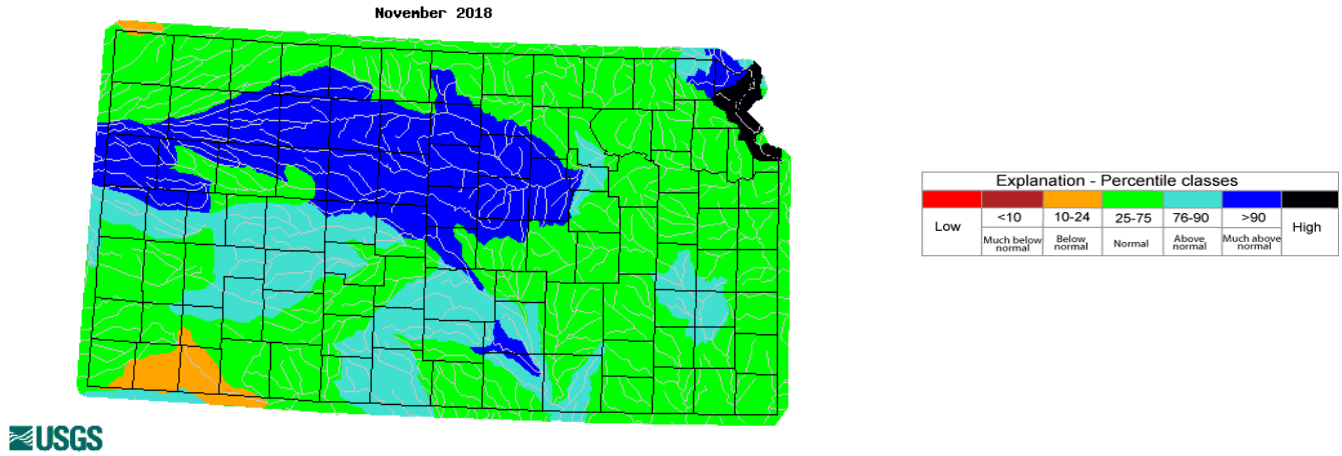
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

The 2018 HAB monitoring ended October 31st. At that time two water bodies remained in active bloom: Frazier Lake, in Grant County was at a Warning status; and South Lake, in Johnson County was at a Watch status. The next harmful algal bloom season will begin again on April 1, 2019.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a time period.

November Streamflow compared to historical streamflow is reflected in the map below.



Water Right Administration/Minimum Desirable Streamflow (MDS)

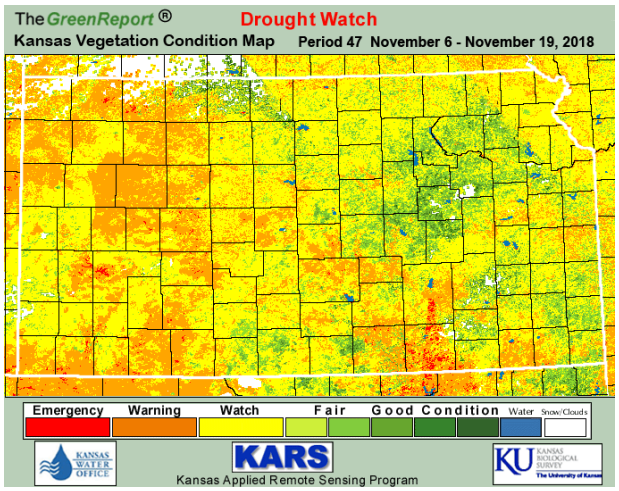
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. To rescind orders at most gages, daily average flow must be above MDS for 14 days.

The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.

Streamflows as of November 26, 2018			
Gaging Station	**Current Flow**	**Nov MDS**	**Comment**
Delaware River near Muscotah	ice	10	Admin ceased September 5, 2018
Rattlesnake Creek near Macksville	2	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	13	10	No surface water diversions junior to MDS above gage
South Fork Ninnescah River near Pratt	9	10	No surface water diversions junior to MDS above gage

Vegetation and Soil Moisture

Vegetative Conditions

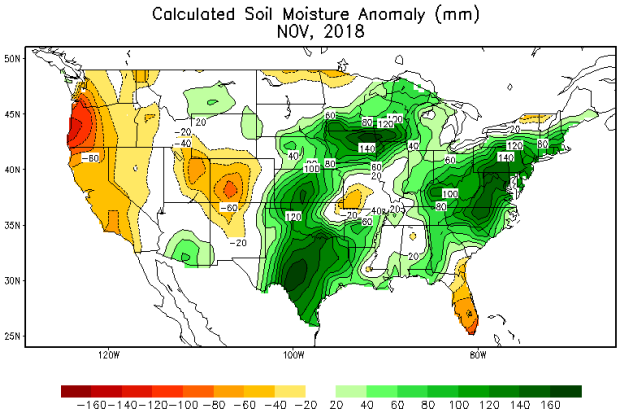


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture and Rangeland

USDA Crop Progress and Condition provide a summary of the climatic effects on soil, and livestock feed. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending November 25, 2018 indicates topsoil moisture supplies rated 0 percent very short, 2 short, 83adequate, and 15 surplus. Subsoil moisture supplies rated 0 percent very short, 5 short, 86 adequate, and 9 surplus.

Pasture and Range Report**:** Pasture and range conditions rated 3 percent very poor, 9 poor, 33 fair, 50 good, and 5 excellent.

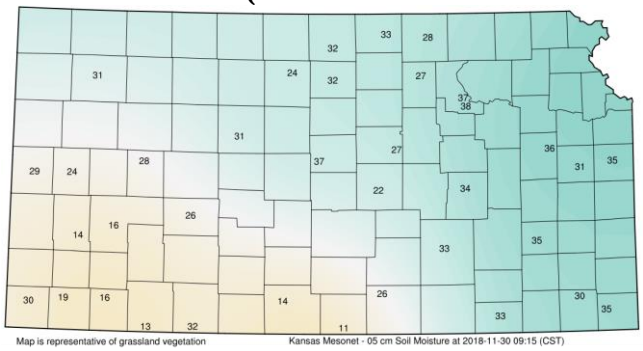


The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)

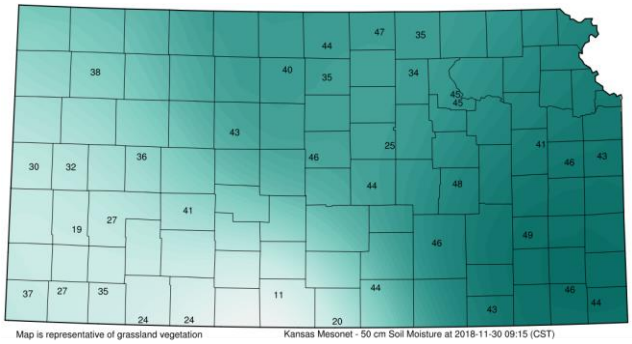
Kansas soil moisture monitoring occurs through Kansas State University Mesonet at four depths, 5 cm, 10 cm, 20 cm and 50 cm measuring percentage of saturation and volumetric water content at about 36 stations. Installation of sensors began in mid-2017 and were completed early 2018. Maps and data are found at http://mesonet.k-state.edu/agriculture/soilmoist/ . Maps of water content at 5cm and 50 cm are compared below for November 30, 2018.

Soil Water Content Nov. 30, 2018

5 cm (2inches



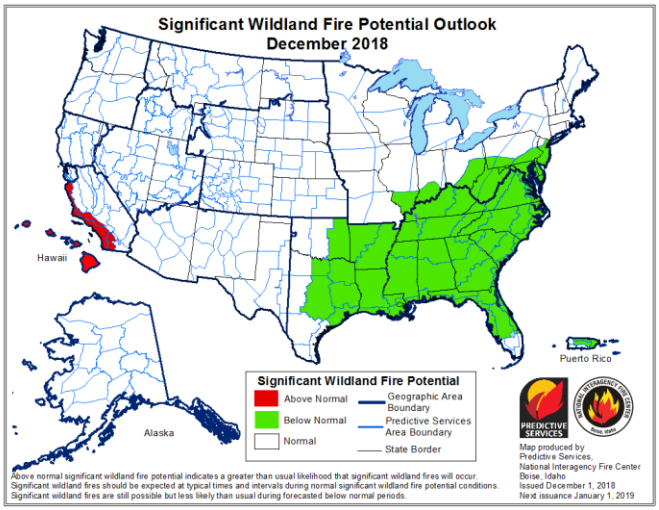
50 cm (20 inches)

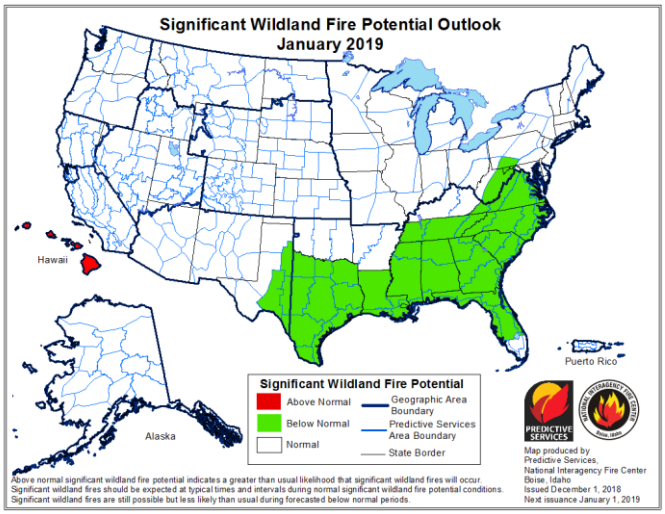


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://mesonet.k-state.edu/

RESOURCES and REFERENCES

Kansas climate data is provided by Kansas State University, Weather Data Library through the Kansas Mesonet. (http://www.ksre.k-state.edu/wdl/). Soil moisture data was added in 2018 (http://mesonet.k-state.edu/agriculture/soilmoist)

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/) has precipitation and temperature summary maps available at the state, region and nation.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection. (https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/minimum-desirable-streamflow.)

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Monthly and Seasonal Drought Outlooks, developed by the NOAA Climate Prediction Center, assess the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. (http://www.cpc.ncep.noaa.gov/) Also see: http://www.noaa.gov/.

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

November 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.66	0.07	112%	36.7	-1.5	66 (22)	7 (12)
Dodge City	0.51	-2.50	17%	39.4	-3.8	68 (15)	6 (13)
Garden City	0.11	-0.44	20%	37.5	-4.2	66 (15)	3 (13)
Goodland	0.64	-0.07	90%	37.3	-1.7	67 (22)	10 (18,12)
Guymon, OK	0.11	-0.42	21%	41.9	-3.7	75 (28)	13 (13)
Hill City	0.68	-0.27	72%	38.2	-2.5	68 (15)	10 (13)
Lamar, CO	0.17	-0.21	45%	39.9	-1.0	69 (24,2)	14 (13)
McCook, NE	1.62	0.37	130%	36.0	-2.2	69 (22)	8 (18)
Springfield, CO	0.35	-0.23	60%	37.5	-4.3	69 (28)	8 (12)
Central							
Concordia	1.75	0.64	158%	36.6	-5.0	63 (23,22)	10 (13)
Hebron, NE				35.9	-3.6	64 (22)	8 (18)
Medicine Lodge	0.58	-0.35	62%	40.8	-4.7	71 (15)	9 (13)
Ponca City, OK	0.06	-1.75	3%	42.7	-5.0	73 (24)	12 (13)
Salina	1.52	0.27	122%	38.3	-5.6	65 (23)	11 (13)
Wichita (ICT)	0.81	-0.62	57%	40.7	-4.7	70 (24)	12 (13)
East							
Bartlesville, OK	1.04	-1.64	39%	41.5	-6.5	70 (24)	12 (14)
Chanute	2.23	-0.27	89%	40.4	-5.9	68 (24)	13 (13)
Falls City, NE	0.49	-1.47	25%	33.5	-7.5	62 (22)	6 (27)
Johnson Co. Exec. Apt	0.88	-1.61	35%	36.1	-7.9	61 (24,22)	11 (13,10)
Joplin, MO	2.02	-1.76	53%	41.3	-7.1	70 (24)	9 (14)
Kansas City (MCI), MO	1.59	-0.56	74%	35.6	-8.0	63 (22)	9 (10)
St. Joseph, MO	0.42	-1.13	27%	34.5	-7.4	63 (22)	7 (27)
Topeka (TOP)	1.23	-0.62	66%	37.3	-6.5	64 (24,22)	12 (10)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE
December 2018 Summary

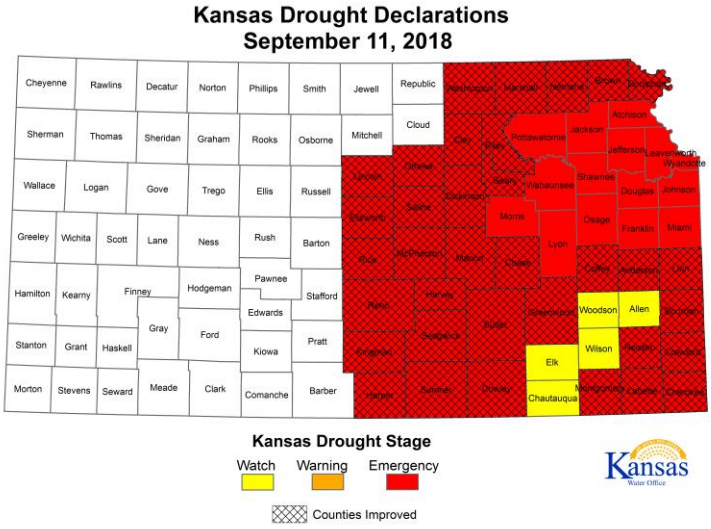
Highlights

- Executive Orders 18-18 remained in effect through December for 50 counties in emergency status, and 5 in watch, primarily to allow continued assistance to mitigate drought impacts on livestock from the summer.

- U.S. Drought Monitor drought designations were removed for all of Kansas during the month but abnormally dry conditions reappeared along the southern border briefly in December.

- Kansas Department of Health and Environment closed the season for Harmful Algal Bloom (HAB) monitoring October 31. At that time two water bodies remained in active bloom: Frazier Lake, in Grant County was at a Warning status; and South Lake, in Johnson County was at a Watch status. The next harmful algal bloom season will begin again on April 1st 2019.

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order (EO) 18-18 placed 50 counties in emergency status and 5 into a watch status. These Drought Declarations remain in place until revised or rescinded by a subsequent EO.



Drought Watch counties: Allen, Chautauqua, Elk, Wilson, Woodson

Drought Emergency counties: Anderson, Atchison, Bourbon, Brown, Butler, Chase, Cherokee, Clay, Coffey, Cowley, Crawford, Dickinson, Doniphan, Douglas, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Johnson, Kingman, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Miami, Montgomery, Morris, Nemaha, Neosho, Osage, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Sedgwick, Shawnee, Sumner, Wabaunsee, Washington, Wyandotte

In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

Despite the warmer than normal temperatures, the heavier than normal precipitation resulted in removal of the remaining abnormally dry conditions across the state. The area of the state that was drought free moved to 100 percent at the end of the month.

U.S. Drought Monitor

Kansas

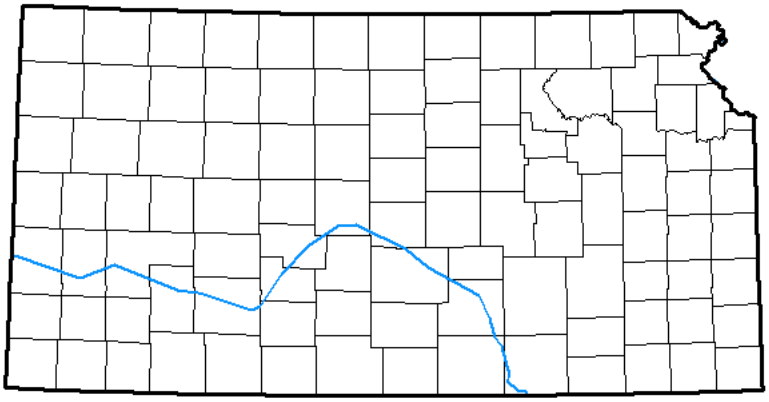
January 1, 2019

(Released Thursday, Jan. 3, 2019)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week *12-25-2018*	94.75	5.25	0.00	0.00	0.00	0.00
3 Months Ago *10-02-2018*	77.69	22.31	14.80	9.73	5.67	0.38
Start of Calendar Year *01-01-2019*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year *09-25-2018*	78.54	21.46	14.80	9.73	5.67	0.38
One Year Ago *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00



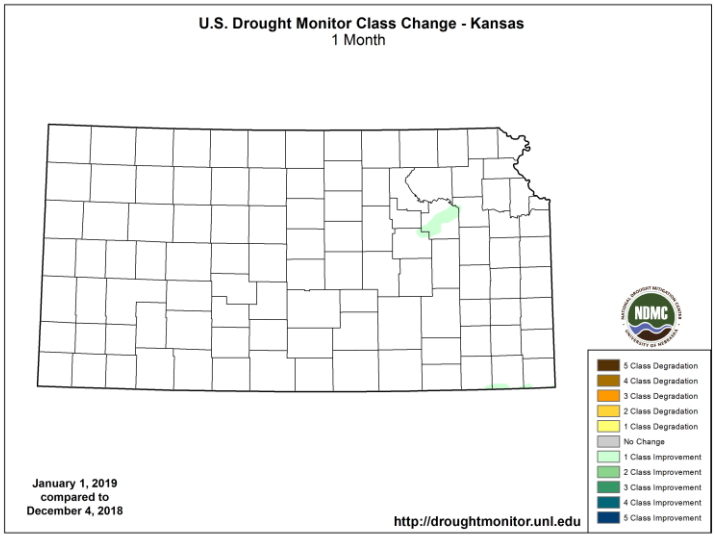
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
David Miskus
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

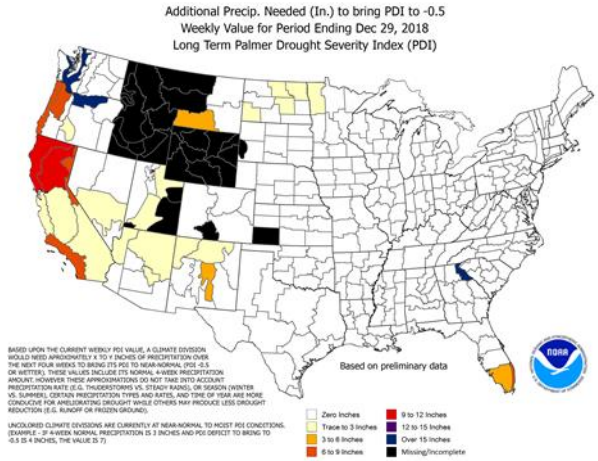


Changes in drought classification during the month are shown on the left.

More information can be found on the U.S. Drought Monitor web site https://droughtmonitor.unl.edu/ .

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought for the climate division.

More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml



State Drought Mitigation

Livestock Water

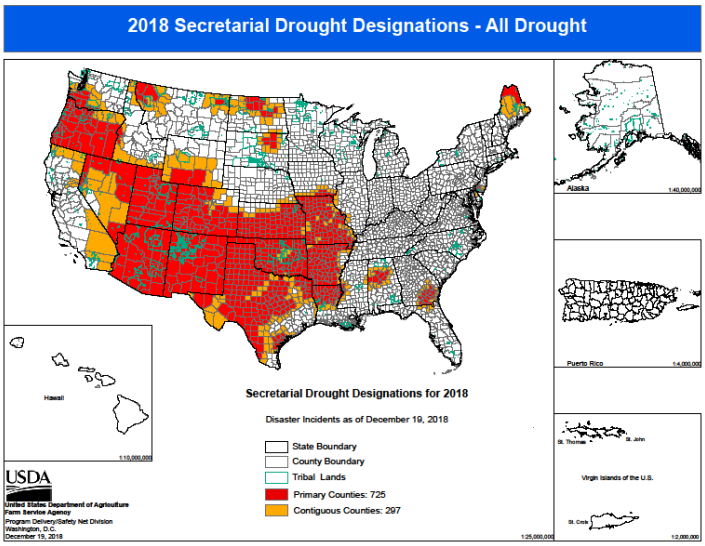
Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed.

Financial assistance for livestock water supply wells, pipeline and tanks may also be available through Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS or Kansas Department of Agriculture-Division of Conservation through the Livestock Water Supply Financial Assistance Initiative in Emergency counties. Applications can be made through local conservation districts.

Federal Disaster Drought Declarations 2018

U. S. Department of Agriculture Drought Disaster

USDA Secretary makes agricultural disaster designations based on crop losses in a designated county. Disaster designations make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger.



USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte. Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.

Climate Summary - Precipitation

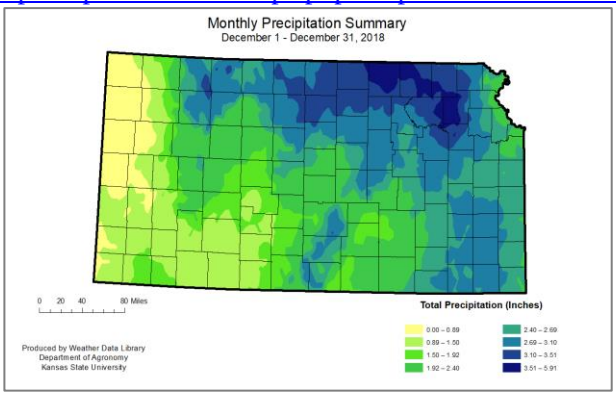
December 2018 was wetter than normal across most of the state, being the eighth wettest December on record. Precipitation fell mostly at the beginning and end of the month. With over 600 reports, the average amount on the 1st of December was 0.69 inches; for the 27th (the second big event), the average amount was 1.26 inches based on 625 reports. State-wide average precipitation for December was 2.22 inches, 232 percent of normal. The Southwest Climate Division was the driest with an average of 1.49 inches. That is a surplus of 0.82 inches, 230 percent of normal. The Northwest Division had the greatest percent of normal at 320 percent and an average precipitation of 1.90 inches. The highest 24-hour rainfall total for a National Weather Service Cooperative station was 2.95 inches at Hugoton, Stevens County, on the 26th. The greatest 24-hour rainfall total for a Community Collaborative Rain, Hail and Snow network station 3.20 inches at Kingman 8.1 SSE, Kingman County, on the 27th. The greatest monthly precipitation totals for December: 5.91 inches at Lenora, Norton County (NWS) and 4.76 inches at Hunter 2.1 NNW, Mitchell County (CoCoRaHS). Not all precipitation was in the form of rainfall. A total of 207 stations reported snowfall in December, with monthly totals ranging from trace amounts in eastern Kansas to 15.5 inches at the CoCoRaHS station of Traer 2.5 NNW, Decatur County.

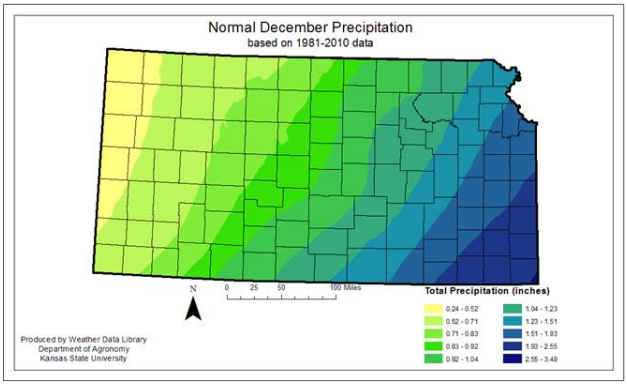
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.

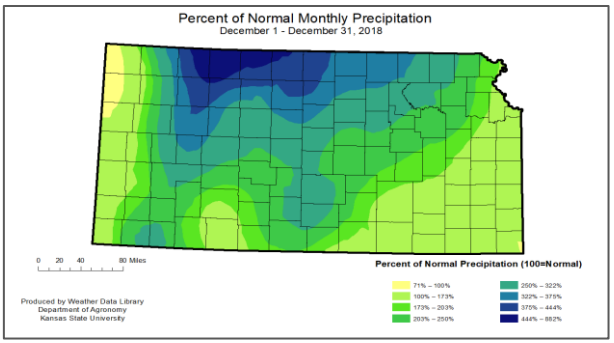
Kansas Climate Division Precipitation Summary (inches)

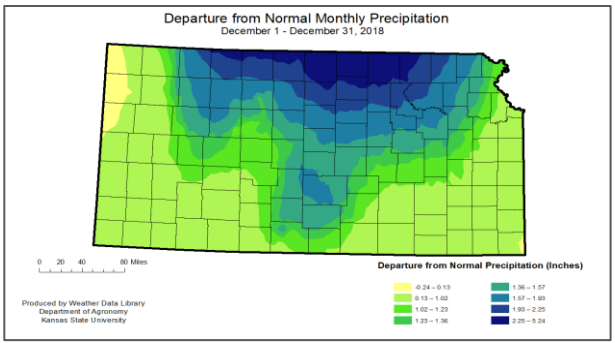
Climate Division	December 1-31 2018			January 1-Dec 31, 2018			April 1, 2017- Dec 31 , 2018			Sept 1, 2018- Dec 31, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.90	1.33	322	24.59	3.23	114	23.20	4.14	120	7.04	2.57	154
West Central	1.71	1.08	268	25.94	5.17	123	24.84	6.57	134	8.98	4.51	199
Southwest	1.49	0.82	230	26.40	6.50	132	25.99	8.47	148	8.60	4.14	193
North Central	2.77	1.88	310	33.41	5.37	119	31.84	7.28	129	13.63	6.90	203
Central	2.36	1.43	258	33.23	3.94	114	31.68	6.34	126	14.19	7.38	211
South Central	2.26	1.14	202	36.79	5.47	118	34.76	8.06	131	14.74	6.89	191
Northeast	2.52	1.30	209	34.49	-0.51	99	32.04	1.25	105	15.00	5.66	163
East Central	2.31	0.91	163	32.34	-5.58	84	29.45	-3.55	88	13.11	2.80	125
Southeast	2.79	0.97	155	40.73	-0.76	98	36.54	1.04	103	14.97	2.88	127
STATE	2.22	1.19	232	32.17	2.78	112	30.23	4.69	121	12.26	4.87	174

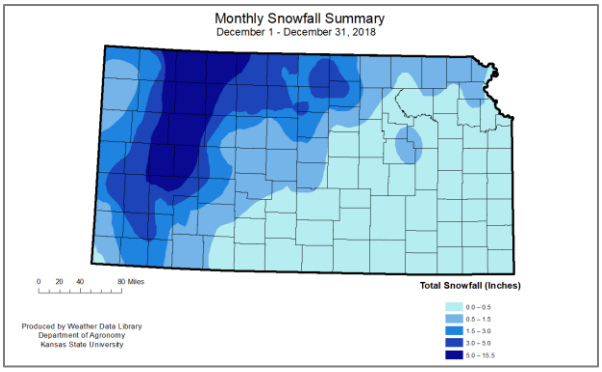
The maps below summarize precipitation. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps











Climate Summary-Temperature

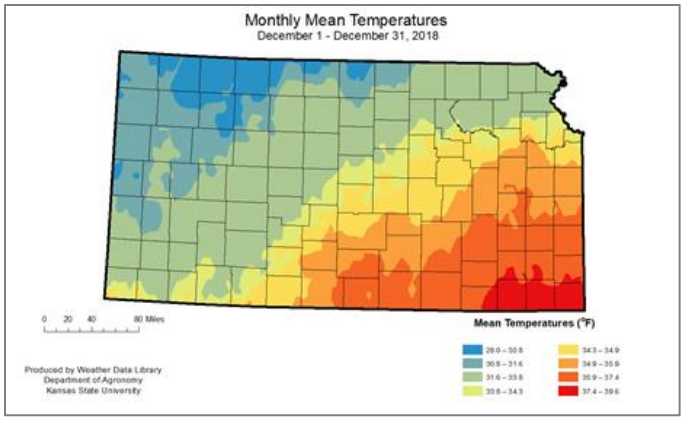
Despite some cool periods to the month, December temperatures were warmer than normal. State-wide average temperature for the month was 33.7 ^{o}F, which is 2.3 degrees warmer than normal. All climate divisions were warmer than normal. The Northeast Climate Division had the largest departure, with an average of 33.3 ^{o}F, or 3.5 degrees warmer than normal. The Southwest Division came closest to normal with an average of 33.8 ^{o}F or 1.1 degrees warmer than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 67 ^{o}F at Richfield 1NE, Morton County, on the 22nd. The coldest minimum temperature at a NWS station was -1 ^{o}F, recorded at Dresden, Norton Dam on the 30th and at Tuttle Creek Lake on 31st. The coldest reading at a Kansas Mesonet station was -3.6 ^{o}F recorded at the Grant County station near Ulysses on the 31st.

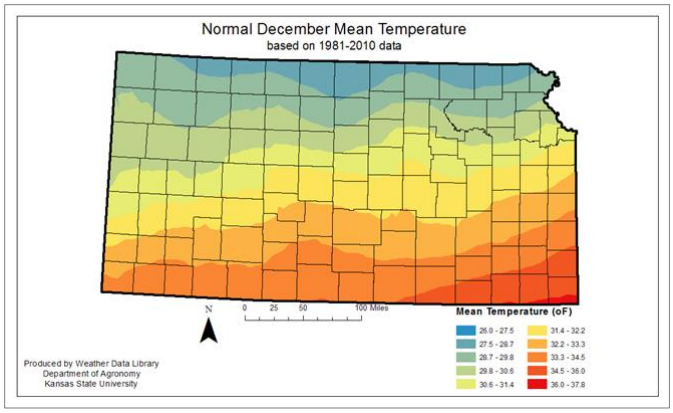
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature variation from normal. Weekly maps of information can be accessed at http://climate.k-state.edu/maps/weekly/.

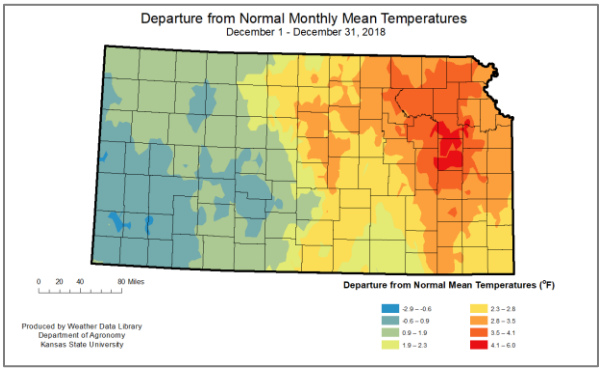
Climate Division	Kansas Climate Division Temperature Summary (^{o}F) December 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	43.2	18.0	30.6	1.5	64	18	-1	30
West Central	45.5	18.6	32.1	1.5	65	13	2	29
Southwest	47.7	19.8	33.8	1.1	67	22	-1	31
North Central	42.5	21.8	32.2	2.8	58	18	8	29
Central	44.3	23.1	33.7	2.3	59	17	9	29
South Central	47.0	23.8	35.4	2.1	61	17	11	31
Northeast	43.7	22.9	33.3	3.5	58	19	11	29
East Central	44.8	25.1	35.0	3.4	60	19	12	29
Southeast	47.0	26.6	36.8	2.8	64	17	14	9
STATE	45.1	22.2	33.7	2.3	67	22nd	-1	31st
Data Source: KSU Weather Library								

Severe storm reports were limited in Kansas during December. There were no reports of hail, wind or tornadoes. Severe winter weather was the main feature for the month, with blizzard-conditions across most of the western areas of the state on the 26th and 27th. Sadly, there was one fatality when a stranded motorist died from exposure.

The maps below summarize temperature. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .



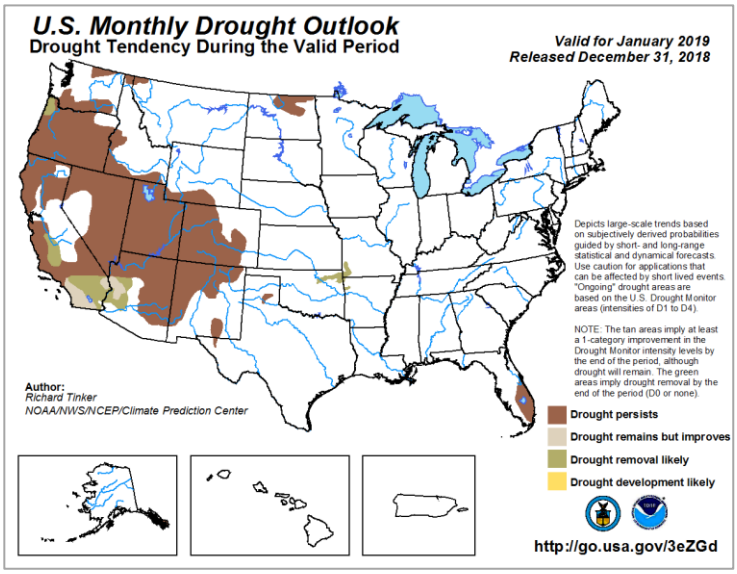


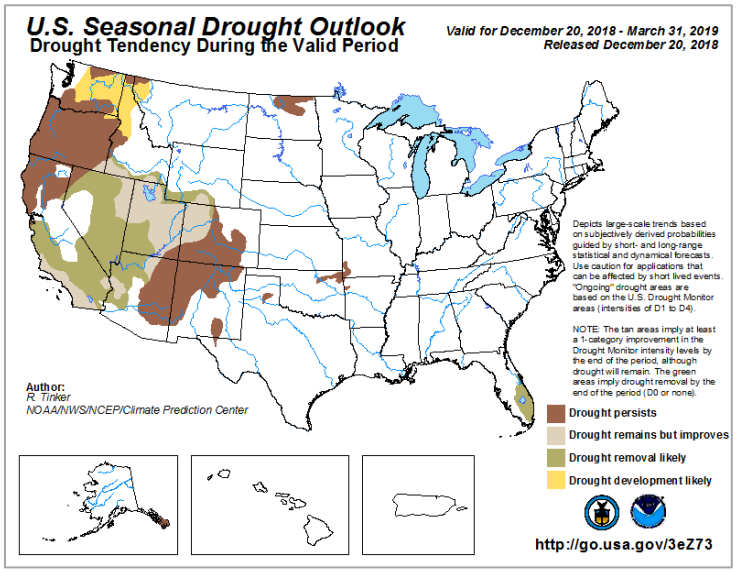


Future Outlook

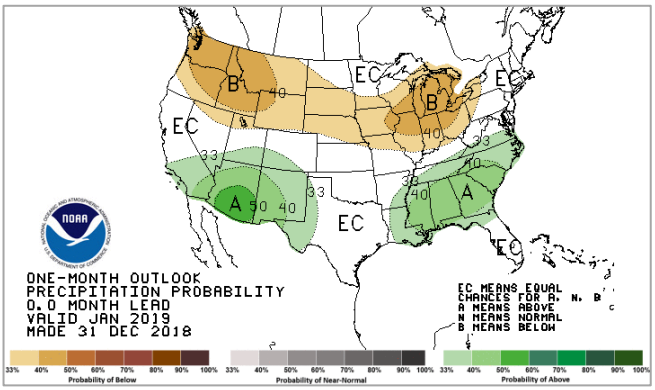
The Monthly Drought Outlook for January 2019 indicates no drought conditions in Kansas.

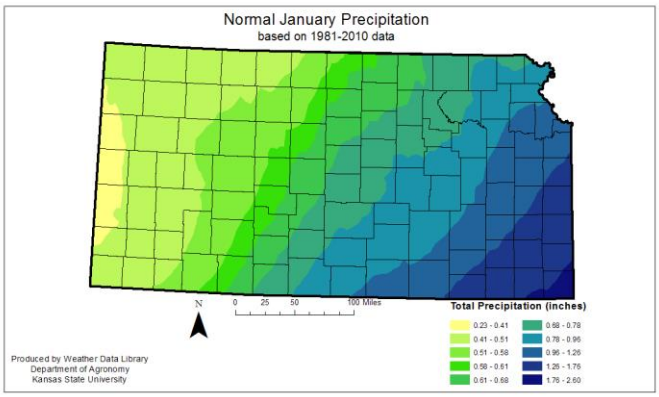
Seasonal Outlook (3-month) favors no drought remaining in Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

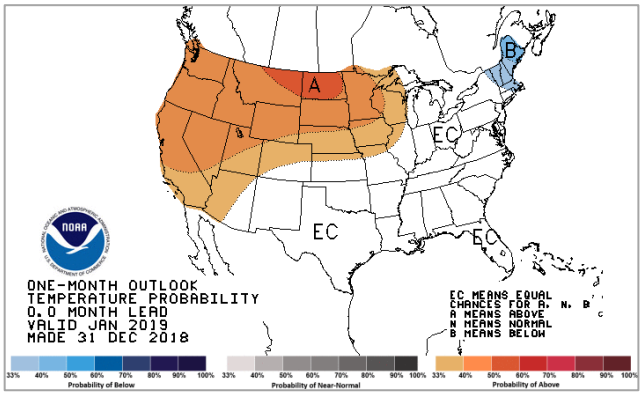


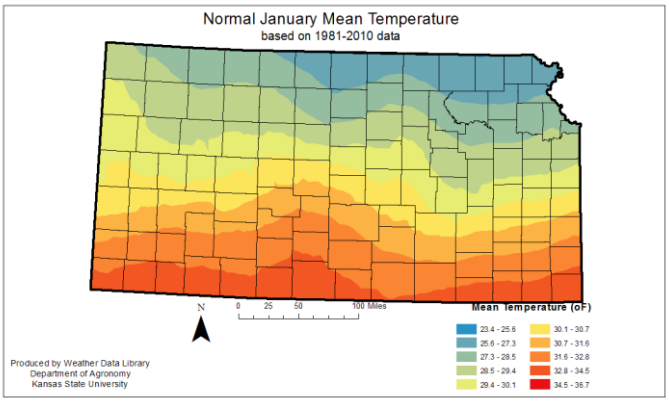


The January precipitation outlook is neutral to the east, with increased chances of above normal precipitation across the west. Given the low normal precipitation at this time of the year, changes in condition are likely to be slow. The temperature outlook is also neutral across the state.



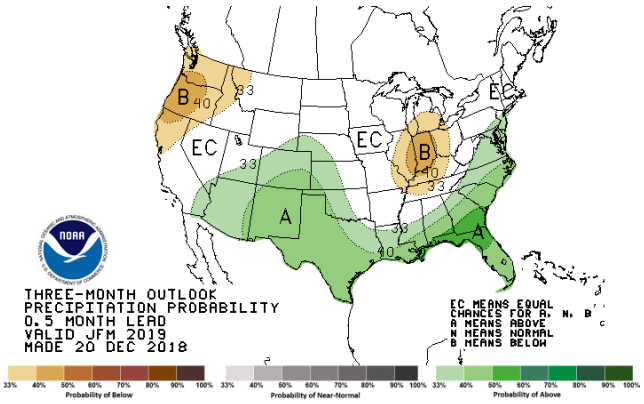


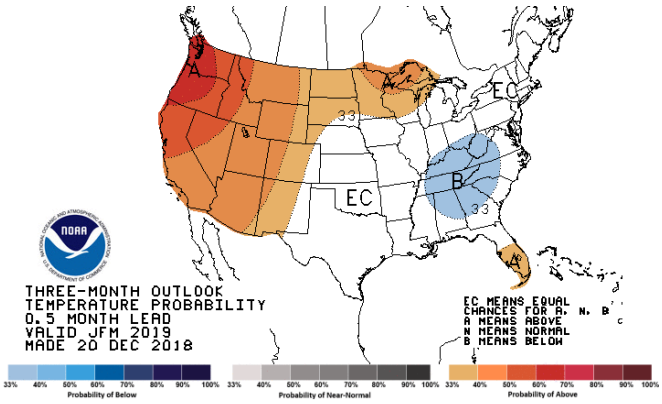




A mild winter could be in store for much of the United States this winter according to NOAA's Climate Prediction Center. The U.S. Winter Outlook for January through March favors above-average precipitation for western half of Kansas with equal chances of below, above or normal temperatures for all of Kansas.

Additionally, El Nino has an 90 percent chance of developing through the norther hemisphere winter 2018-19 according to NOAA's Climate Prediction Center. The anticipated weak El Nino may influence the winter season by bringing wetter conditions across the southern United States, and warmer, drier conditions to parts of the North.





Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Many updates and new plans are developed when drought conditions exist. Individual system stage designation and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers. There are an increasing number of systems that restrict summertime outdoor water use to times of day of lower evaporation.

Surface Water Supply Conditions

Kansas River basin: Milford, Tuttle Creek, Perry, and Clinton reservoirs all experienced higher than normal inflows in December. All reservoirs spent the majority of the month with pool elevations in flood storage, particularly Tuttle Creek. Mean monthly flow in the Kansas River (measured discharge at DeSoto) for December was the second highest since the year 1917, second only to 1973. A major contributor to the sustained high flows in December were flood pool releases from storage gains that started in September and restricted releases due to high flows on the Missouri River.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs all experienced higher than normal inflows in December and intermittent flood pool storage and releases were necessary. Flows in the Marais des Cygnes River exceeded historic median values for the majority of the month.

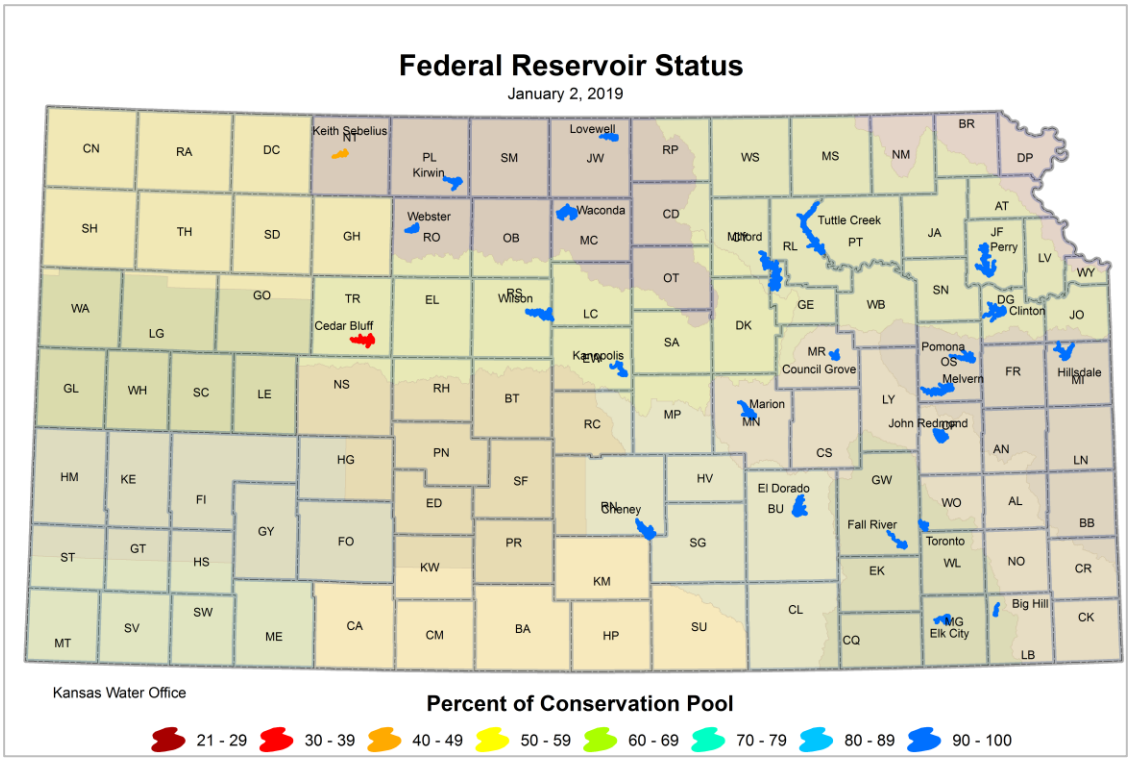
Cottonwood/Neosho basin: All system reservoirs experienced higher than normal inflows in December and the conservation storage of Marion Reservoir recovered. Flood pool releases were necessary from Council Grove and John Redmond reservoirs throughout the month of December.

Verdigris basin: Inflows to Toronto, Fall River, Elk City, and Big Hill reservoirs were well above normal in December. Stream flows in the Verdigris and Fall Rivers were maintained above normal due to flood pool releases and generally healthy tributary gains.

Saline basin: The elevation at Wilson Lake was maintained above normal pool in December. Inflow remained above normal and releases in excess of low flow settings were necessary to manage lake level.

Smoky Hill basin: The middle Smoky Hill River maintained higher than normal flows from baseflow and tributary gains in December. Kanopolis Lake made significant releases through the main service gates. Similar to the Kansas River flows, releases from Kanopolis were the second highest for December, second only to 1973. The U.S. Army Corps of Engineers has drawn the pool down below the top of conservation to facilitate maintenance work this winter. Cedar Bluff Reservoir also received some inflow and gained elevation over the month due to steady higher than normal inflow.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**01/02/2019 7:30 AM**		
Keith Sebelius Lake[1]	2304.3	2294.03	-10.27	47.9
Harlan County Lake NE	1945.73	1941.12	-4.61	81.5
Lovewell Reservoir[1]	1582.6	1583.53	0.93	100
Webster Reservoir[1]	1892.45	1893.08	0.63	100
Kirwin Reservoir	1729.25	1730.49	1.24	100
Waconda Lake[1]	1455.6	1456.79	1.19	100
Cedar Bluff Reservoir	2144	2122.61	-21.39	38.3
Kanopolis Lake[1]	1463	1461.92	-1.08	93.4
Wilson Lake[1]	1516	1516.41	0.41	100
Milford Lake[1]	1144.4	1146.18	1.78	100
Tuttle Creek Lake[1]	1075	1082.18	7.18	100
Perry Lake[1]	891.5	893.37	1.87	100
Clinton Lake[1]	875.5	876.75	1.25	100
Melvern Lake[1]	1036	1038.10	2.10	100
Pomona Lake[1]	974	975.31	1.31	100
Hillsdale Lake[1]	917	918.96	1.96	100
Arkansas River Basin		**01/02/2019 6:00 AM**		
Marion Reservoir[1]	1350.5	1350.52	0.02	100
Council Grove Lake[1]	1274	1274.57	0.57	100
John Redmond Reservoir	1041	1041.5	0.50	100
Toronto Lake	901.5	908.9	7.40	100
Fall River Lake	948.5	954.07	5.57	100
Elk City Lake	796	800.35	4.35	100
Big Hill Lake	858	858.84	0.84	100
Cheney Reservoir	1421.6	1423.05	1.45	100
El Dorado Lake	1339	1339.54	0.54	100

[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

Note: The conservation pool is the water storage for non-flood purposes of the reservoir, set by the elevation of the top of the pool.

Harmful Blue-Green Algal Blooms (lake water safety)

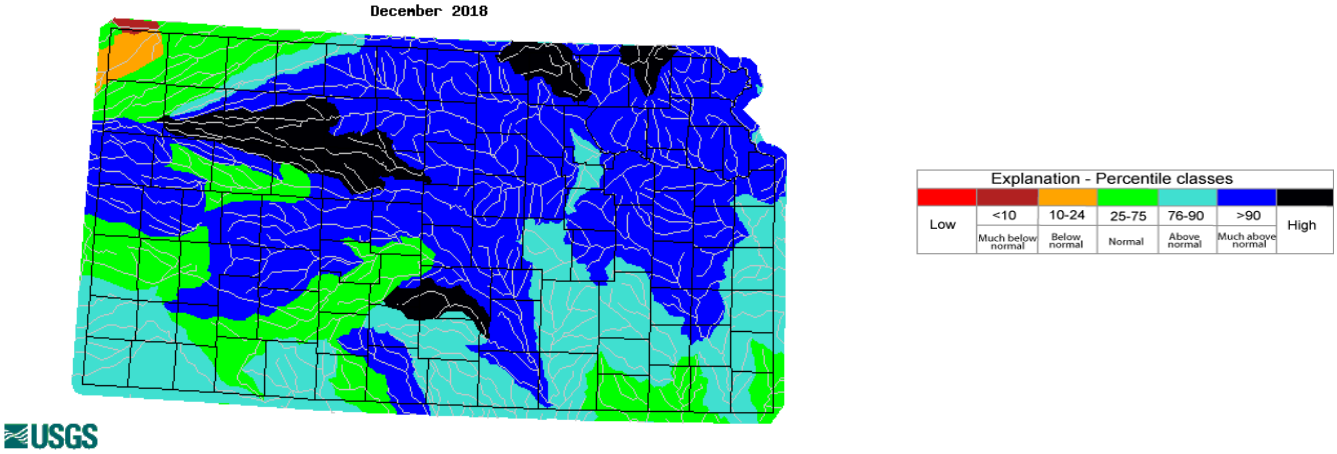
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

The 2018 HAB monitoring ended October 31st. At that time two water bodies remained in active bloom: Frazier Lake, in Grant County was at a Warning status; and South Lake, in Johnson County was at a Watch status. The next harmful algal bloom season will begin again on April 1, 2019.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a time period.

December Streamflow compared to historical streamflow is reflected in the map below.



Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. To rescind orders at most gages, daily average flow must be above MDS for 14 days.

The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.

Streamflows as of December 17, 2018			
Gaging Station	**Current Flow**	**Dec MDS**	**Comment**
Rattlesnake Creek near Macksville	3	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	20	15	No surface water diversions junior to MDS above gage
South Fork Ninnescah River near Pratt	10	10	

Vegetation and Soil Moisture

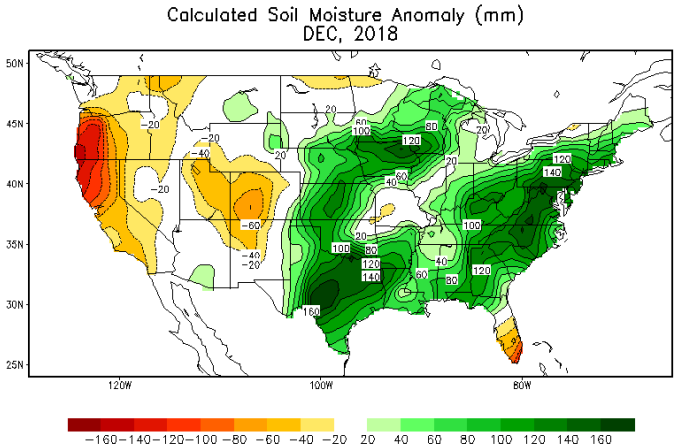
Vegetative Conditions

The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition. No current GreenReport is available

Soil Moisture and Rangeland

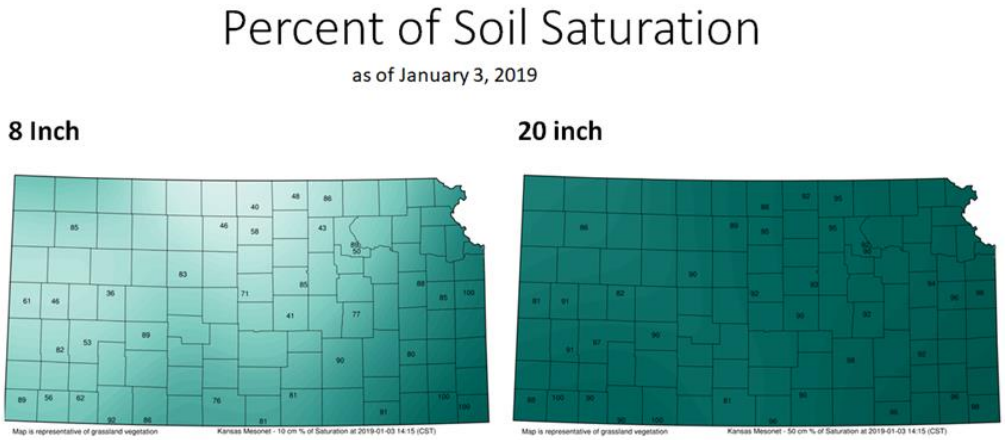
USDA Crop Progress and Condition provide a summary of the climatic effects on soil, and livestock feed. A summary is normally found here. However no current data was available at the time of this report.

The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)



Kansas soil moisture monitoring occurs through Kansas State University Mesonet at four depths, 5 cm, 10 cm, 20 cm and 50 cm measuring percentage of saturation and volumetric water content at about 36 stations. Installation of sensors began in mid-2017 and were completed early 2018. Maps and data are found at http://mesonet.k-state.edu/agriculture/soilmoist/ . Maps of water content at 5cm and 50 cm are compared below for November 30, 2018.

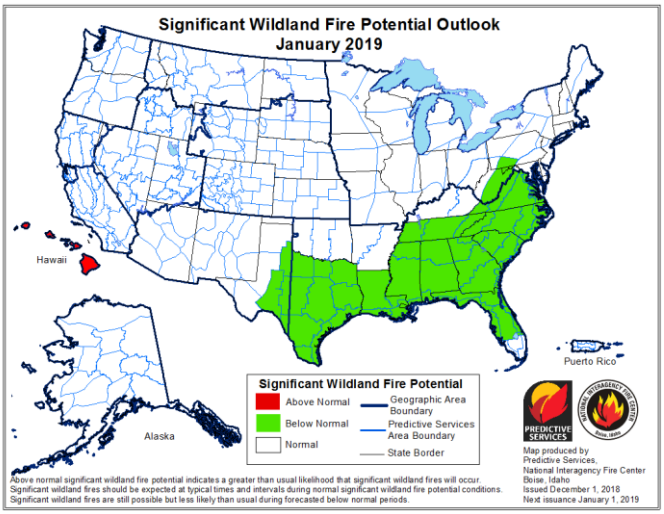
At the end of December, soils remain wet, and hover near the freezing mark. Soil moisture sensors aren't as reliable under freezing conditions, so have dropped the 2-inch soil saturation map. Figures below shows the 8-inch and 20-inch soil moisture on January 3, 2019.

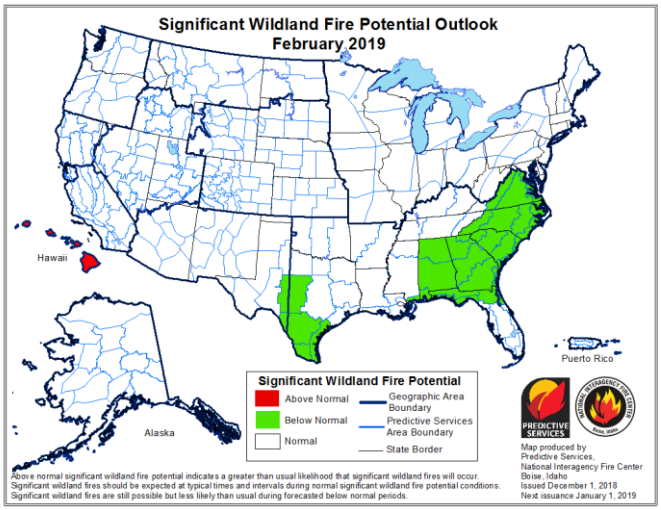


Fire

Periods of concern will be wind events coupled with low humidity that impact fire activity. Kansas Forest Service provides a grassland fire danger index at**:** http://www.kansasforests.org/fire_management/grasslandfireindex.html .

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf . Those below were issued December 1, 2018. Due to federal government shutdown the January 1, 2019 predictions were unavailable.





Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. Information from various federal, state, local and academic sources is used. Some of the data is preliminary and subject to change once final data is available. The KWO web site, http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response , contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. Kansas State Climatologist, Mary Knapp, is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at Evapotranspiration (ET) and Mesonet sites across Kansas are available at http://mesonet.k-state.edu/

RESOURCES and REFERENCES

Kansas climate data is provided by Kansas State University, Weather Data Library through the Kansas Mesonet. (http://www.ksre.k-state.edu/wdl/). Soil moisture data was added in 2018 (http://mesonet.k-state.edu/agriculture/soilmoist)

The U.S. Drought Monitor, from the National Drought Mitigation Center at the University of Nebraska-Lincoln, provides a "big picture" perspective of conditions across the nation. In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought. Palmer Drought Severity Index - The Palmer Index (PDSI) is one indicator used in the U.S. Drought Monitor.

The High Plains Regional Climate Center (https://hprcc.unl.edu/) has precipitation and temperature summary maps available at the state, region and nation.

The U.S. Geological Survey (USGS) Drought Watch provides information average streamflow measured at long-term gaging stations and compares them to normal flows.

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection. (https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/minimum-desirable-streamflow.)

The water levels of the federal lakes fluctuate during a year according to the management plan. Lake level Management plans are posted on the Kansas Water Office web site www.kwo.ks.gov .

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. For a full set of national and regional ***GreenReport***® maps, go to: http://www.kars.ku.edu/products/greenreport/greenreport.shtml. This Kansas Vegetation Drought Response Index map is developed weekly by the Kansas Biological Survey using state drought triggers as its key. In addition the VegDRI maps may be found at http://vegdri.unl.edu/

The National Weather Service (NWS) provides fire weather products and services for Kansas that include the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings and Spot Forecasts. The five NWS offices that serve Kansas websites may be accessed from the NWS Offices' page.

The Monthly and Seasonal Drought Outlooks, developed by the NOAA Climate Prediction Center, assess the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. (http://www.cpc.ncep.noaa.gov/) Also see: http://www.noaa.gov/.

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations and available state and federal assistance. The 2007 Municipal Water Conservation Plan Guidelines and the Drought Vulnerability Assessment Report, both by KWO, provide guidance regarding drought preparedness and response. These are available at http://www.kwo.ks.gov/reports2/climate-and-drought-monitoring-response.

USDA Drought Programs and Assistance website (https://www.usda.gov/topics/disaster/drought/usda-drought-programs-and-assistance) listing the various USDA programs and agencies to assist with drought issues.

The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

Please contact Diane Knowles at the Kansas Water Office (785) 296-3185 or diane.knowles@kwo.ks.gov should you have any questions or suggestions.

APPENDIX A

December 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.16	-0.27	37%	31.6	2.7	62 (12)	5 (31)
Dodge City	1.20	0.36	143%	34.4	1.6	60 (18)	12 (29,28)
Garden City	1.79	1.27	344%	31.9	0.2	60 (17)	2 (30)
Goodland	0.22	-0.24	48%	32.6	2.7	63 (21,17)	8 (31,29)
Guymon, OK	2.32	1.68	363%	36.1	1.0	64 (11)	5 (29)
Hill City	1.68	0.99	243%	31.6	1.6	60 (17,12)	5 (29,28)
Lamar, CO	0.12	-0.28	30%	31.1	1.5	67 (12)	5 (5)
McCook, NE	1.92	1.28	300%	28.3	0.3	55 (17)	-2 (29)
Springfield, CO	0.67	0.16	131%	31.7	-0.6	67 (21)	3 (29)
Central							
Concordia	2.63	1.78	309%	32.7	2.7	55 (16)	10 (29)
Hebron, NE				32.2	4.3	55 (19,16)	10 (29)
Medicine Lodge	2.51	1.59	273%	37.0	2.3	62 (19)	16 (9)
Ponca City, OK	2.30	0.88	162%	38.9	2.3	64 (11)	16 (9)
Salina	2.13	1.19	227%	34.7	2.4	56 (19,17)	15 (29)
Wichita (ICT)	1.80	0.60	150%	37.1	3.2	59 (11)	18 (30,9)
East							
Bartlesville, OK	2.55	0.34	115%	38.7	2.2	63 (11)	16 (10,11)
Chanute	2.37	0.62	135%	37.8	3.1	61 (16)	17 (9)
Falls City, NE	2.39	1.41	244%	32.6	3.6	58 (18)	12 (10)
Johnson Co. Exec. Apt	2.59	0.95	158%	34.9	2.5	56 (18)	14 (9)
Joplin, MO	2.69	-0.13	95%	38.8	1.6	60 (27,26)	17 (10,9)
Kansas City (MCI), MO	3.04	1.51	199%	34.8	3.3	58 (18)	14 (9)
St. Joseph, MO	2.65	1.13	174%	33.2	3.7	59 (18)	12 (9)
Topeka (TOP)	3.06	1.71	227%	35.8	3.8	57 (18,17)	15 (10)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries