KANSAS CLIMATE and DROUGHT UPDATE – January 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

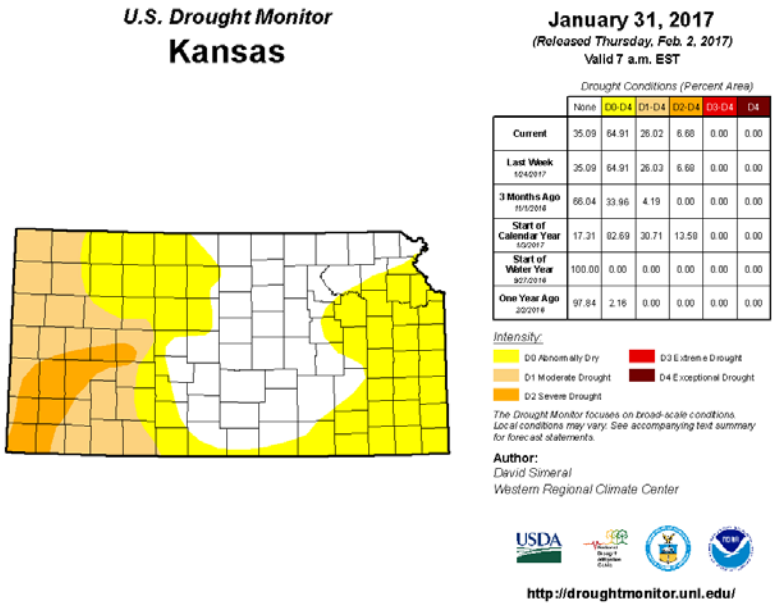
- U.S. Drought Monitor: Dry and drought conditions continued in Kansas during January 2017. The majority of Kansas was considered at least abnormally dry in early January, but did improve slightly by the end of the month. Severe drought classification for southwestern Kansas included all or part of 18 counties for part of the month.

Lakes and Streams

- Norton and Cedar Bluff continued to be significantly below conservation pool throughout the month.

General Conditions

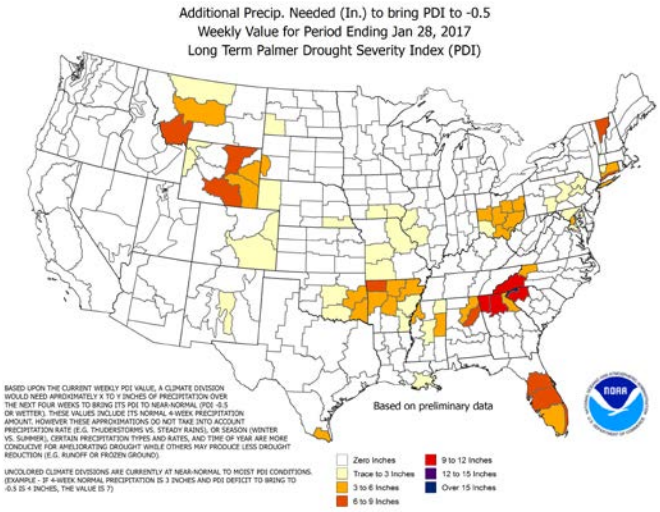
The higher than normal precipitation resulted in improved conditions in the U.S. Drought Monitor. However, since this is the driest part of the year, improvements were limited. Until we move into the wetter season, the rate of change is likely to slow, especially in the western half of the state.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	35.09	64.91	26.02	6.68	0.00	0.00
Last Week 1/24/2017	35.09	64.91	26.03	6.69	0.00	0.00
3 Months Ago 11/1/2016	66.04	33.96	4.19	0.00	0.00	0.00
Start of Calendar Year 1/3/2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 9/27/2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 2/2/2016	97.84	2.16	0.00	0.00	0.00	0.00

More information on the Drought Monitor categories can be found in a separate document under useful links on the KWO drought page.

Palmer Drought Severity Index (PDSI) - The Palmer Index is an indicator used in the U.S. Drought Monitor. The PDI for the period ending January 28, 2017 no precipitation is needed to bring any of Kansas climate divisions to their normal moisture conditions.



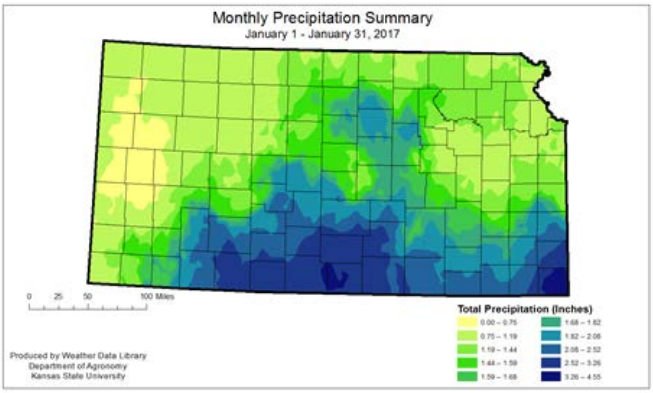
Climate Summary (Temperature and Precipitation)

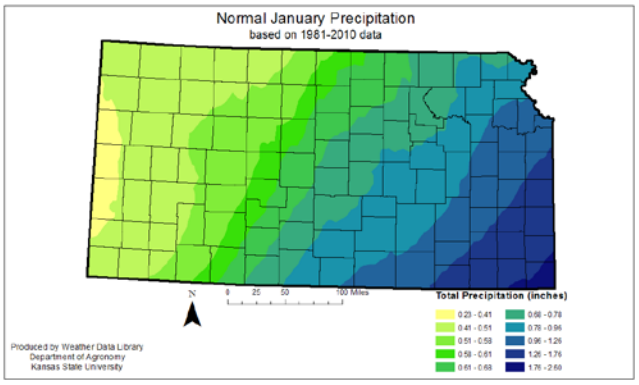
The highlight of January weather was the storm system that moved through the state from the 13th through the 16th. In advance of the event, ice storm warnings were issued. Eastern Kansas missed most of the ice, while Southwest Kansas saw significant icing followed by as much as 6 inches of snow. This event pushed the state-wide average precipitation to 1.60 inches, or 227 percent of normal. It ranks as the 7th wettest January in 123 years of record.

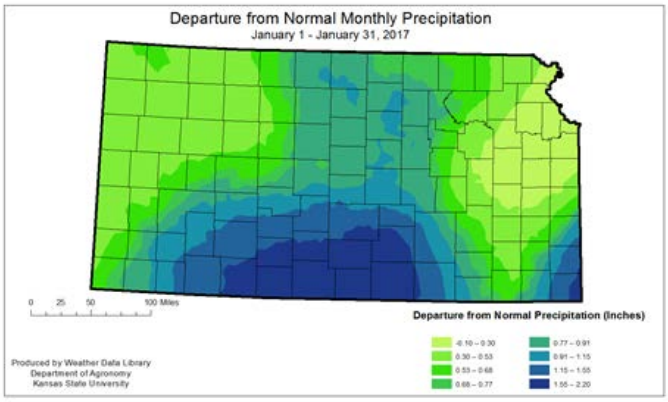
The South Central Climate Division had the highest precipitation both in amount and percent of normal. The divisional average was 3.59 inches or 361 percent of normal. The West Central Division had the lowest average precipitation at 0.81 inches or 158 percent of normal. The Northeast Division was closest to normal with an average of 1.06 inches or 140 percent of normal. The National Weather Service Cooperative station at Sun City, Barber County, reported the greatest monthly precipitation with 5.13 inches. For the Community Collaborative Rain, Hail, and Snow network (CoCoRaHS) the greatest monthly total was 4.16 inches at Deerfield 0.6 NE, Kearny County. Greatest 24hr totals reported: 2.39 inches at Coldwater, Comanche County, on the 16th (NWS); 3.74 inches at Sharon 0.2 W, Barber County, on the 16th (CoCoRaHS).

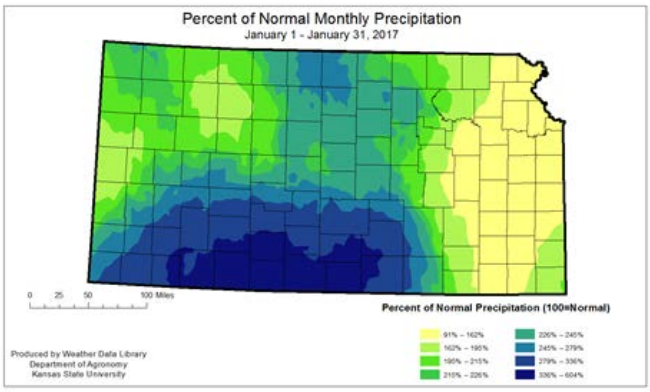
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library.

Kansas Climate Division Precipitation Summary (inches)												
	January 1-31, 2017			January 1–31, 2017			April 1, 2016 – January 31, 2017			September 1, 2016 – January 31, 2017		
Climate Division	**Actual**	**Depart Normal**	**Percent Normal**	**Actual**	**Depart Normal**	**Percent Normal**	**Actual**	**Depart Normal**	**Percent Normal**	**Actual**	**Depart Normal**	**Percent Normal**
Northwest	0.87	0.42	195	0.87	0.42	195	19.52	0.07	100	5.01	0.15	101
West Central	0.81	0.31	158	0.81	0.31	158	18.77	0.05	99	3.17	-1.74	65
Southwest	1.73	1.26	359	1.73	1.26	359	22.19	4.25	123	3.39	-1.48	68
North Central	1.31	0.68	207	1.31	0.68	207	30.71	5.62	122	7.56	0.30	107
Central	1.56	0.87	223	1.56	0.87	223	31.17	5.22	119	7.34	-0.07	96
South Central	2.89	2.06	361	2.89	2.06	361	36.67	9.23	132	11.54	2.95	130
Northeast	1.06	0.25	140	1.06	0.25	140	34.43	2.93	108	10.83	0.81	108
East Central	1.20	0.26	126	1.20	0.26	126	34.90	1.06	102	10.60	-0.53	94
Southeast	2.14	0.89	175	2.14	0.89	175	42.30	5.66	116	15.15	1.94	115
STATE	1.60	0.86	227	1.60	0.86	227	30.31	4.12	114	8.34	0.31	98

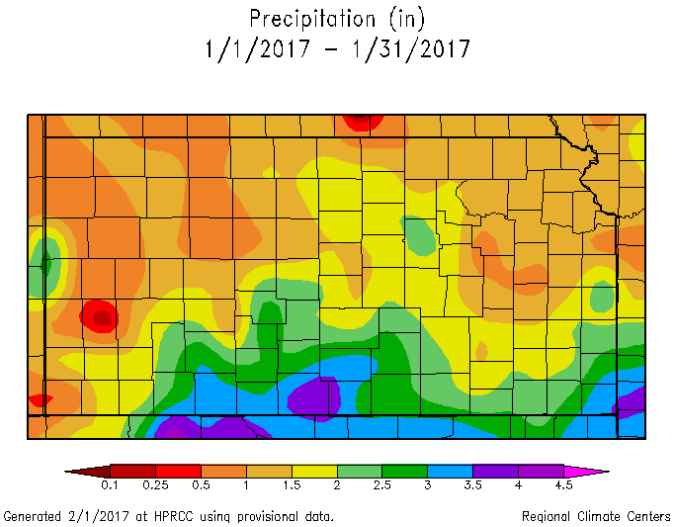


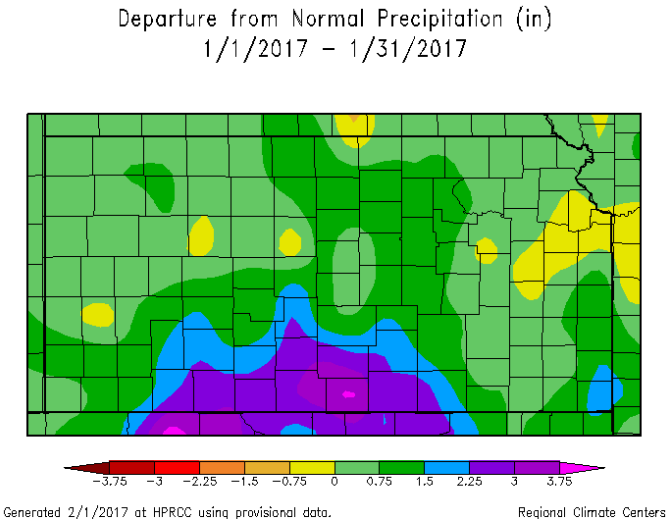






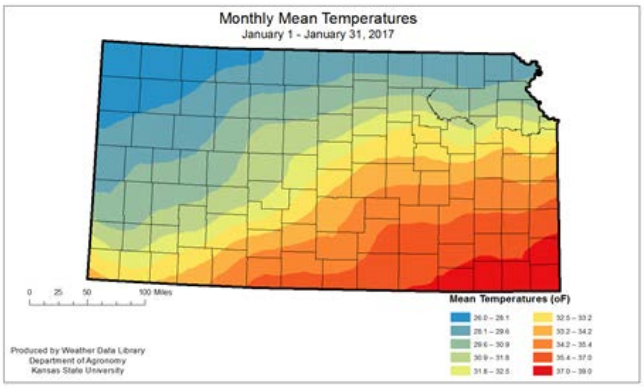
Precipitation summary for the month is provided in the maps below from the High Plains Regional Climate Center. The Climate Center information is provided also as a comparison to the K-State data. Various time intervals can be accessed at the climate center http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps .

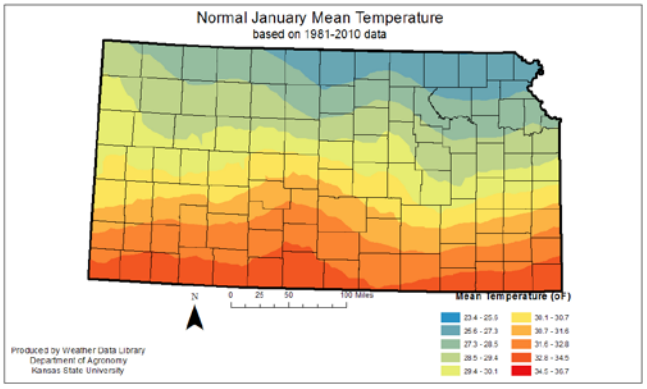


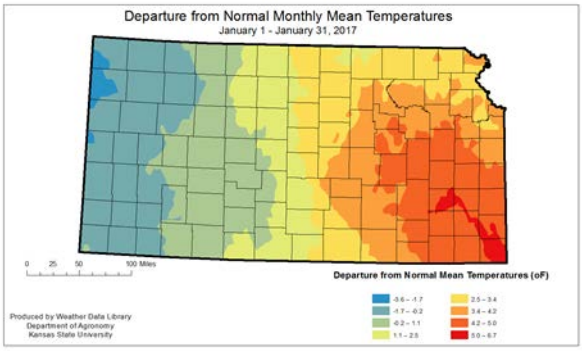


Warmer than normal temperatures returned in January. The state-wide average temperature was 31.9 °F, or 2. degrees warmer than normal. This was the 35th warmest since 1896. The western divisions were the closet to normal for the month. The Northwest Division averaged 27.8 °F or -0.7 degrees cooler than normal, while the Southwest Division averaged 32.7 °F or 0.6 degrees warmer than normal. The West Central Division fell right in between, with an average of 29.8 °F which was exactly normal. The Southeast Division had the greatest departure with an average temperature of 36.7 °F, or 4.6 degrees warmer than normal. Even with the warmth, three record low maximum temperatures were tied, while one record low minimum temperature was tied. On the warm side, there were 23 new record high maximum temperatures set and 68 new record high minimum temperatures set. The coldest minimum temperature reported was 15 °F at Colby 1SW, Thomas County, on the 6th. The highest temperature reported was 78 °F at Pratt, Pratt County, on the 31st.

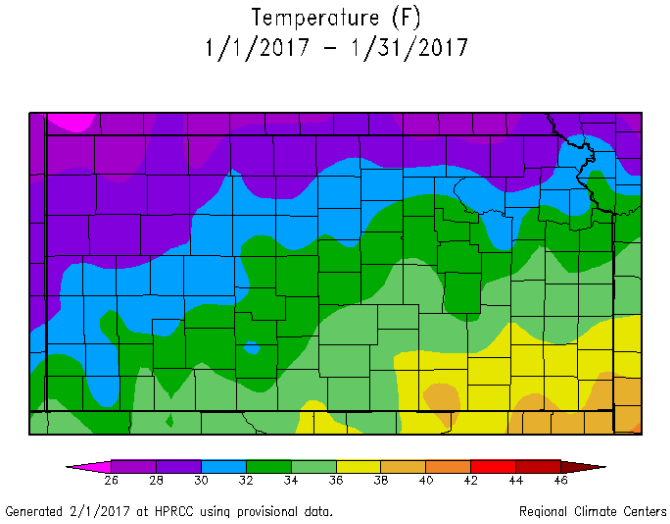
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	January 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	38.9	16.8	27.8	-0.7	65	31	-15	6
West Central	41.7	17.8	29.8	0.0	71	31	-8	6
Southwest	45.2	20.1	32.7	0.6	75	12	-10	7
North Central	40.3	20.2	30.3	2.4	69	31	-10	6
Central	43.1	21.8	32.5	2.6	70	31	-4	7
South Central	46.1	23.0	34.6	2.5	78	31	-2	7
Northeast	40.0	20.2	30.1	2.8	64	31	-6	6
East Central	43.4	23.0	33.2	4.1	69	31	-4	6
Southeast	47.2	25.2	36.2	4.5	74	12	2	7
STATE	42.9	20.9	31.9	2.1	78	31st	-15	6th
Data Source: KSU Weather Library								

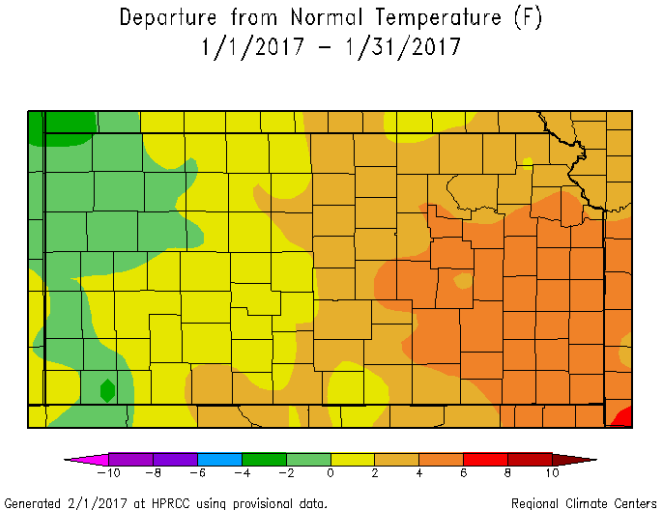






Temperature summary by the High Plains Regional Climate Center for the month is provided in the maps below.



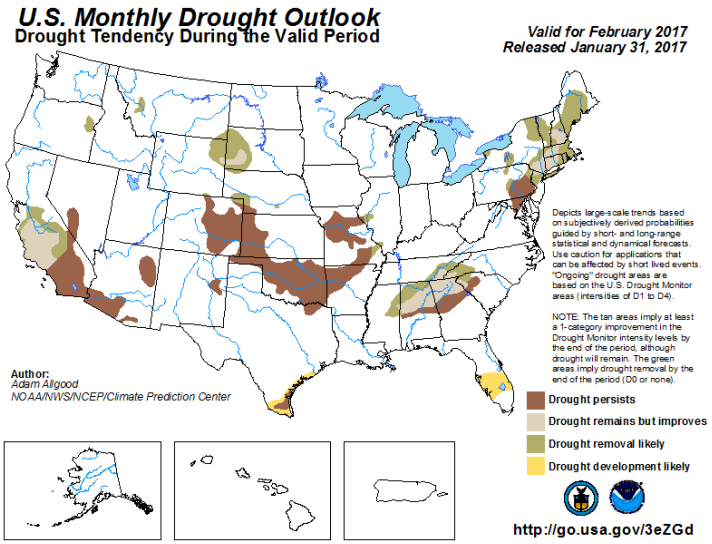


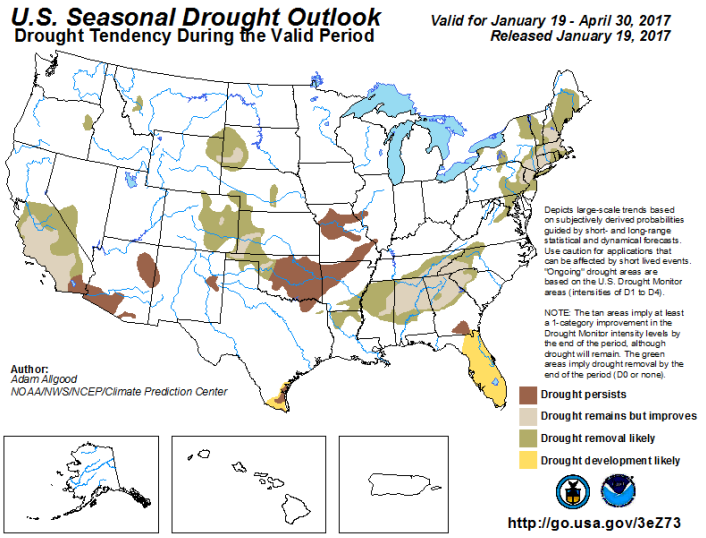
The month was rather calm as far as severe weather events. There were no reports of tornadoes, hail or high winds. As mentioned earlier, the major severe weather event was the ice storm that went from January 13th through the 16th.

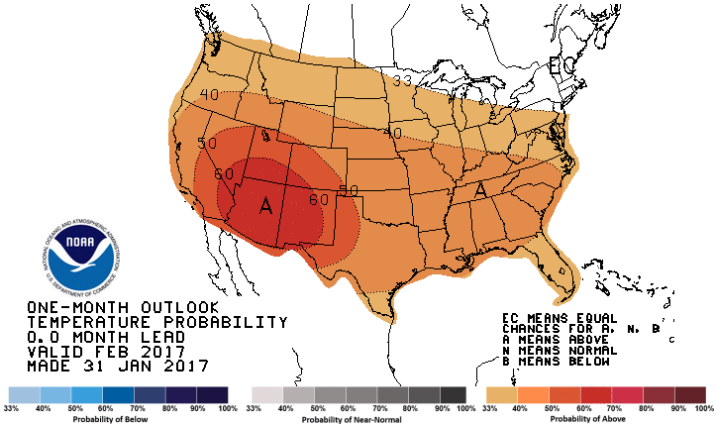
Future Outlook

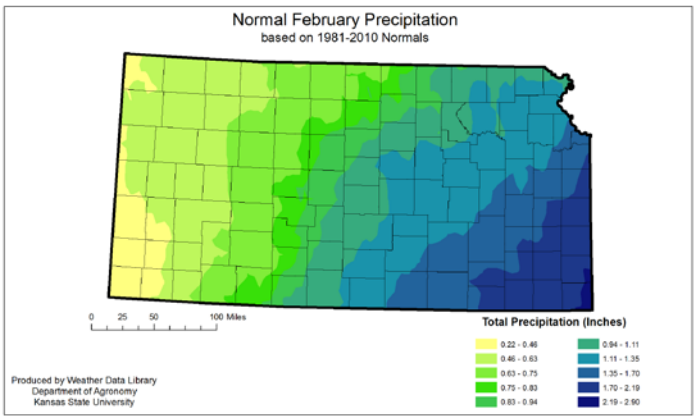
The U.S. Monthly indicates drought conditions in the west to continue but the Seasonal Drought Outlook (3-month) indicates drought conditions to improve!

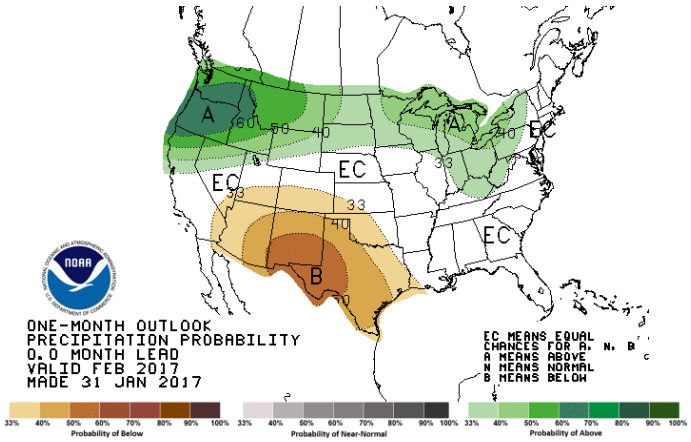
Both the Drought Outlooks and individual temperature and precipitation outlooks are provided below.

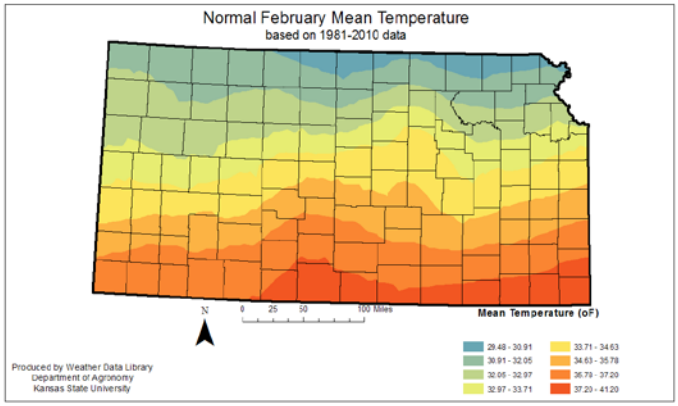


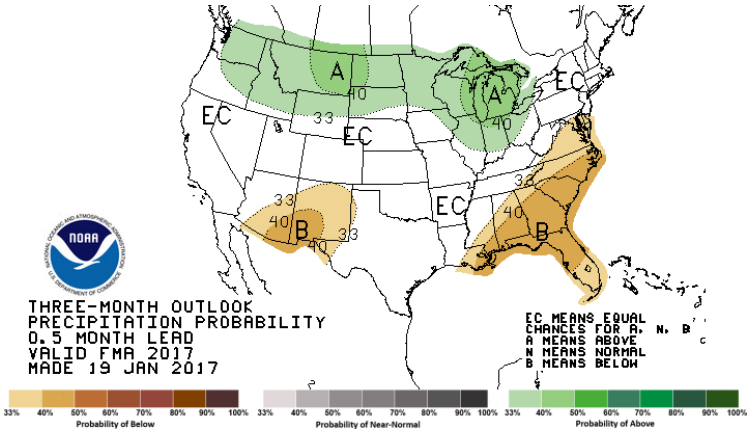


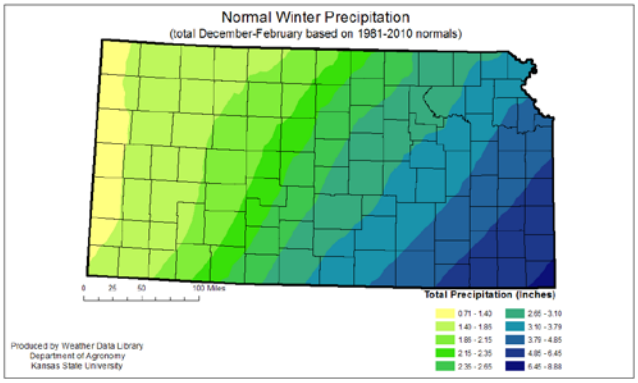


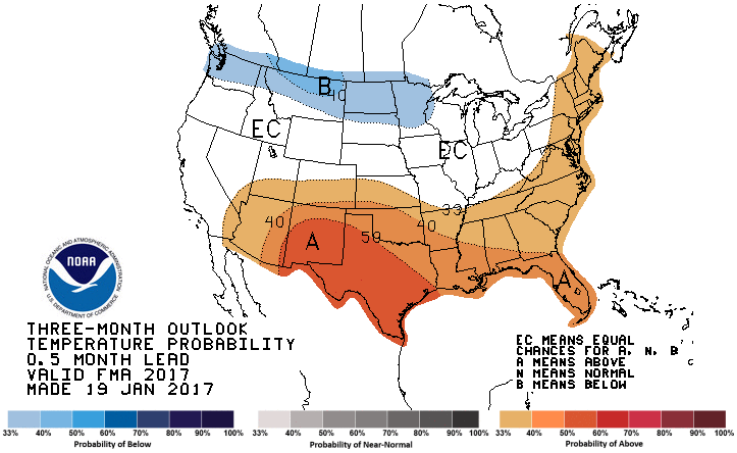


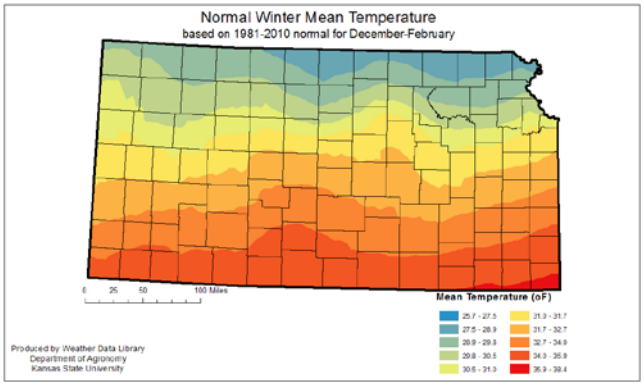












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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, under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of January 30, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed. (January 30, 2017, http://victoriaks.com/utilities.htm.)

Surface Water Supply Conditions

Kansas River basin: Tuttle Creek, Perry, Milford, and Clinton reservoirs received sufficient inflow to maintain storage but a significant amount of water was released to lower lake levels to winter target elevations. Flows in the Kansas River were well above historical median values for the majority of January due to these releases.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs evacuated storage much of January to reach lower winter target elevations. Flow in the Marais des Cygnes River was healthy and maintained above median values with reservoir storage evacuation.

Cottonwood/Neosho basin: Streamflow and storage was maintained at healthy levels throughout the basin in January, however releases were made from Marion and Council Grove reservoirs to reach the winter target elevation.

Verdigris basin: Toronto, Fall River, Big Hill, and Elk City reservoirs maintained storage around normal pool elevation. Streamflow was relatively low in the first half of the month but well above historic median the second half.

Saline basin: Elevation at Wilson Lake slowly declined over the month from the fall target elevation of 1,517 feet but remained above normal pool of 1,516.

Smoky Hill basin: The middle Smoky Hill basin maintained some streamflow in January. Kanopolis Lake inflow was near normal for January and the Corps evacuated storage to bring the elevation down to conservation pool level. The Smoky Hill River is gaining downstream of Kanopolis and minimal releases are being made. Cedar Bluff Reservoir did not experience any significant inflow but did rise in elevation slightly.

Harmful Blue-Green Algal Blooms (lake water safety)

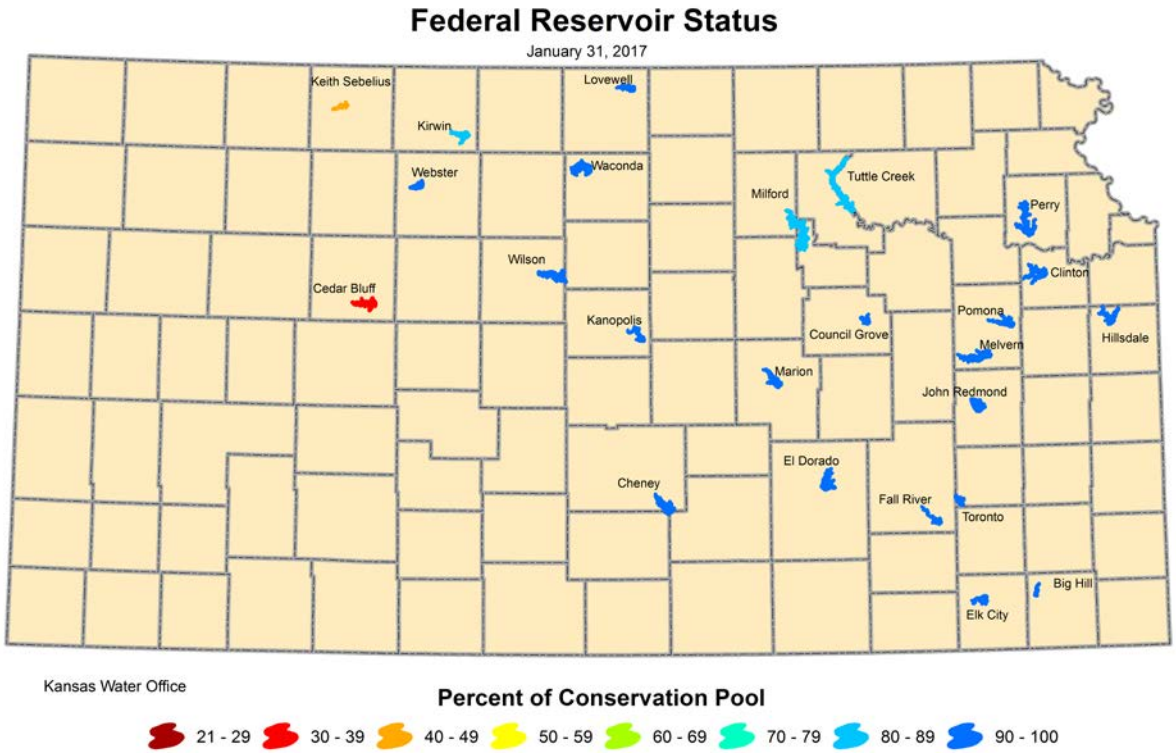
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water 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.

The following lakes will remain on the watch list until the beginning of the 2017 HAB season, Milford Reservoir Zone C, Clay and Geary counties and Lake Shawnee, Shawnee County.

The following lakes will remain on the warning list until the beginning of the 2017 HAB season, South Lake, Johnson County and Vineyard Park Pond, Ellis County.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton and Cedar Bluff reservoirs remain significantly below full conservation pool.



Kansas Federal Reservoir Conservation Pool Levels

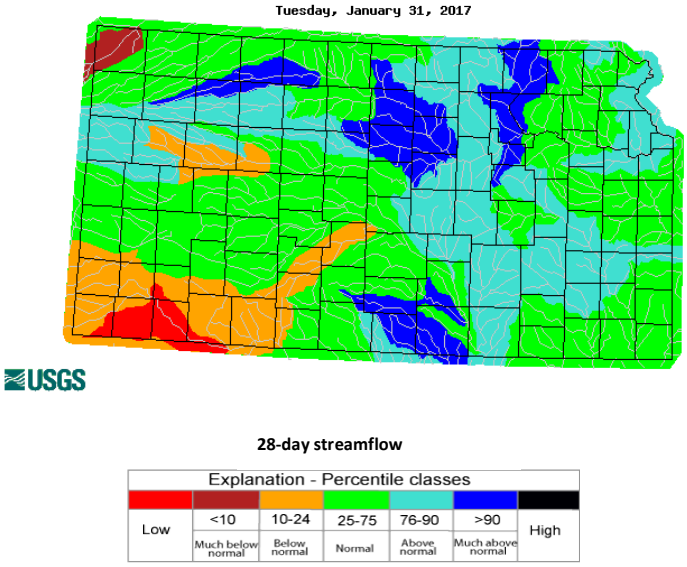
Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**01/31/2017 06:00 AM**		
Norton[1]	2304.3	2291.60	-12.70	39.0
Harlan County, NE	1945.73	1936.21	-9.52	63.9
Lovewell[1]	1582.6	1583.58	0.98	100.0
Milford[1]	1144.4	1141.11	-3.29	87.0
Cedar Bluff	2144	2118.87	-25.13	31.7
Kanopolis[1]	1463	1462.85	-0.15	99.1
Wilson[1]	1516	1516.24	0.24	100.0
Webster[1]	1892.5	1891.27	-1.18	94.2
Kirwin[1]	1729.3	1725.67	-3.58	82.6
Waconda[1]	1455.6	1455.00	-0.60	96.6
Tuttle Creek[1]	1075	1071.90	-3.10	87.6
Perry[1]	891.5	889.52	-1.98	90.2
Clinton[1]	875.5	874.59	-0.91	94.6
Melvern[1]	1036	1034.25	-1.75	92.2
Pomona[1]	974	973.01	-0.99	93.0
Hillsdale[1]	917	916.05	-0.95	94.2
Arkansas River Basin		**01/31/2017 08:00 AM**		
Cheney	1421.6	1422.00	0.40	100.0
El Dorado	1339	1339.06	0.06	100.0
Toronto[1]	901.5	902.37	0.87	100.0
Fall River[1]	948.5	949.22	0.72	100.0
Elk City[1]	796	796.81	0.81	100.0
Big Hill	858	858.21	0.21	100.0
Council Grove[1]	1274	1273.50	0.00	100.0
Marion[1]	1350.5	1348.58	0.08	100.0
John Redmond[1]	1039	1041.57	0.57	100.0

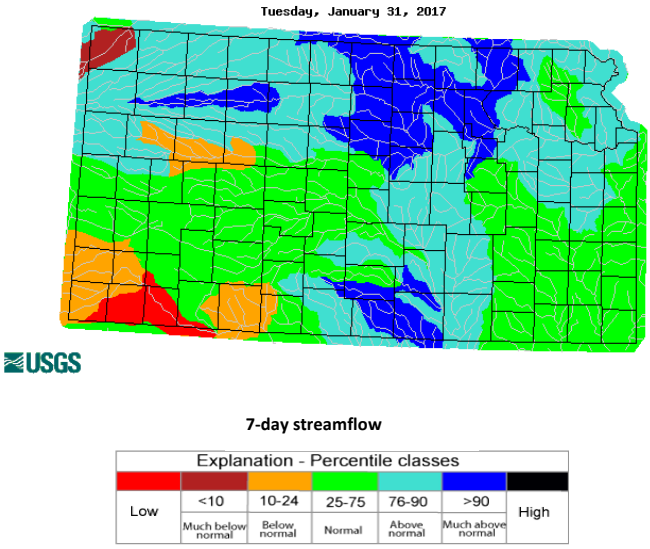
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

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.
* data not available 10/30/16 this data for 11/2/16.

Streamflow Conditions

The comparison of present **7-day** streamflow to historical is shown on the map below left and the monthly streamflow compared to historical is shown on the map below, right.





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.

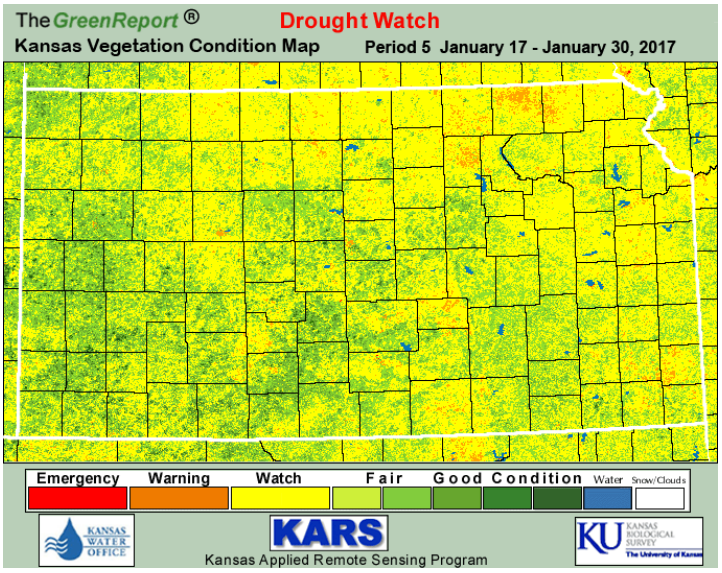
Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow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

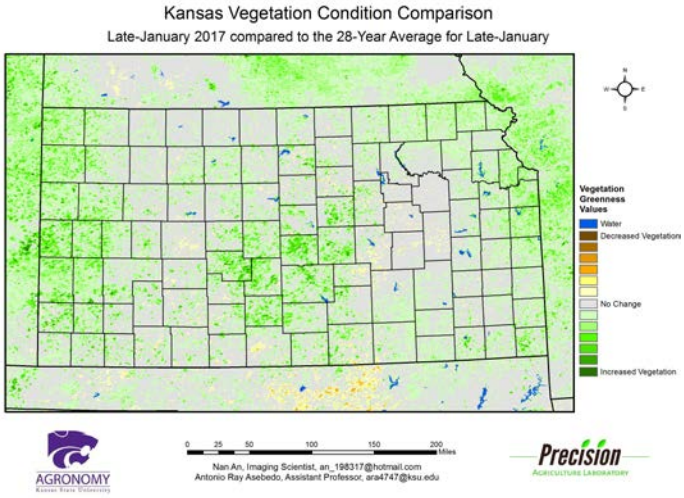
Flooding and High Flows
USGS WaterWatch data Based on USGS monitored stream gages, USGS WaterWatch indicates no flood conditions in Kansas in December.

Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

Soil, Crop and Vegetation

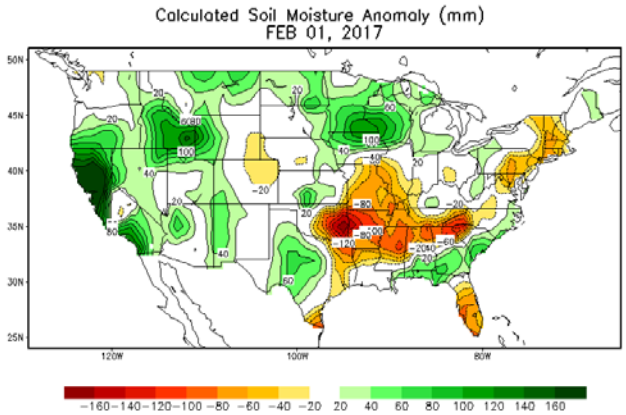
Kansas Vegetative Conditions
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. Most of the state is showing good vegetative conditions due to warm temperatures and decent moisture. Most of the "green" areas are dormant winter wheat.



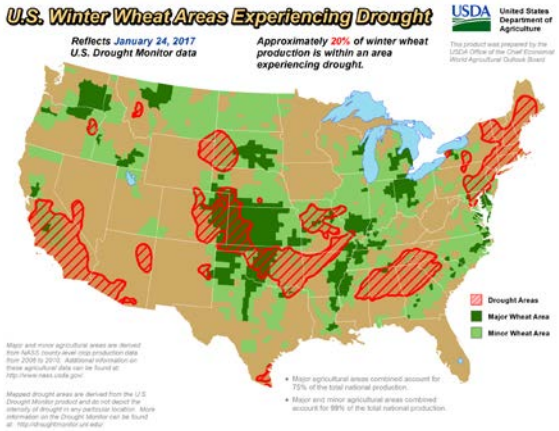


Compared to the 27-year average at this time for Kansas, this year's Vegetation Condition Report for late December from K-State's Precision Agriculture Laboratory is provded on the left.

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 anomaly for January was unavailable at time of this report so the daily anomaly is provided.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml



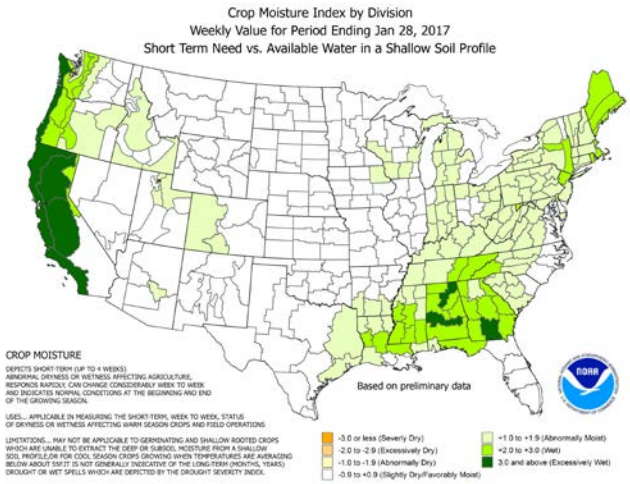
Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion which may be found at: http://www.ksre.ksu.edu/p.aspx?tabid=255.



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 published January 30, 2017 reported topsoil moisture rated 15 percent very short, 22 short, 60 adequate, and 3 surplus. Subsoil moisture rated 14 percent very short, 27 short, 58 adequate, and 1 surplus.

Field Crops Report: Winter wheat condition rated 7 percent very poor, 13 poor, 36 fair, 42 good, and 2 excellent.

Livestock, Pasture, and Range Report: Hay and roughage supplies rated 0 percent very short, 2 short, 89 adequate, 9 surplus. Stock water supplies were 2 percent very short, 7 short, 90 adequate, and 1 surplus. (http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Crop_Progress_and_Condition/current.pdf)



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.

Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report is 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 a 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 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.56	0.18		29.9	0.5	63 (30)	-9 (6)
Dodge City	2.56	1.98		33.4	1.2	70 (30)	0 (7)
Garden City	1.28	0.94		31.5	0.6	70 (30)	-4 (7)
Goodland	0.92	0.54		28.8	-0.8	64 (30)	-8 (7,5)
Guymon, OK	2.01	1.61		35.9	0.3	77 (11)	-7 (7)
Hill City	1.06	0.61		30.6	1.3	66 (30)	-7 (6,5)
Lamar, CO	0.43	0.13		30.7	1.8	67 (30,11)	13 (7)
McCook, NE	0.70	0.19		28.2	1.0	65 (90)	-12 (6)
Springfield, CO	0.18	-0.19		31.9	-0.3	72 (31)	-9 (7)
Central							
Concordia	1.75	1.17		31.2	2.6	65 (30)	-5 (6)
Hebron, NE				28.9	3.3	62 (30)	-10 (6)
Medicine Lodge	3.70	2.99		35.7	2.3	73 (30)	2 (7)
Ponca City, OK	2.62	1.62		39.5	4.6	73 (30, 24)	3 (7)
Salina	2.02	1.39		38.0	7.0	68 (30)	6 (5)
Wichita (ICT)	2.79	1.96		36.6	4.4	73 (30)	4 (7)
East							
Bartlesville, OK	3.21	1.59		38.3	3.3	77 (11)	3 (7,6)
Chanute	1.84	0.58		37.6	5.0	73 (11)	6 (6)
Fall City, NE	0.96	0.31		29.1	2.6	61 (30)	-11 (6)
Johnson Co. Exec. Apt	0.89	-0.23		33.1	3.0	63 (30,11)	0 (7,6)
Joplin, MO	3.65	1.62		39.6	4.7	74 (11)	4 (7)
Kansas City (MCI), MO	1.39	0.32		32.3	3.5	63 (11)	-4 (6)
St. Joseph, MO	0.97	0.41		32.6	5.4	61 (30)	-6 (7)
Topeka (TOP	1.28	0.42		33.4	3.7	65 (30)	-1 (7)

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 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: Dry and moderate and severe drought conditions continued in Kansas during February 2017. Degradation from slightly dry conditions to moderate drought conditions occurred in the last week of February for in all or parts of 22 counties in eastern Kansas

- February 23, 2017, USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

- An additional 13 counties also quality for natural disaster assistance as contiguous counties. These are Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Pawnee, Rush, Seward, Trego and Wallace counties.

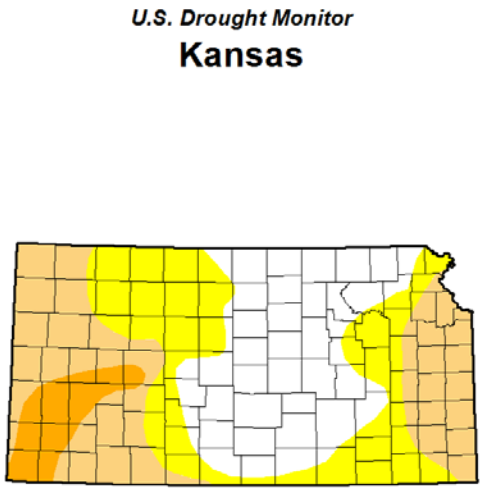
- Wildfires occurred in February affecting at least 5,000 acres.

Lakes and Streams

- Norton and Cedar Bluff continued to be significantly below conservation pool throughout the month.

General Conditions

The lower than normal precipitation resulted in worsening conditions in the U.S. Drought Monitor. Biggest deterioration occurred in the eastern parts of the state, where February precipitation is generally higher and deficits accumulate much more quickly.



February 28, 2017
(Released Thursday, Mar. 2, 2017)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

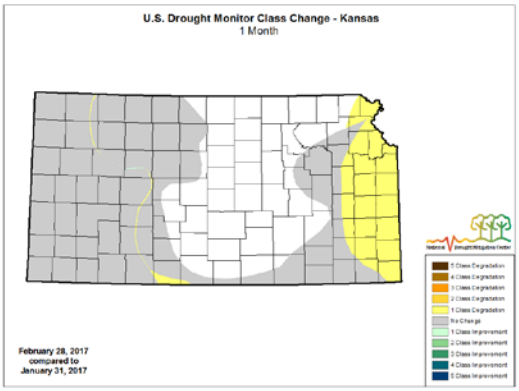
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	34.23	65.77	37.34	6.68	0.00	0.00
Last Week 2/21/2017	34.23	65.77	26.20	6.68	0.00	0.00
3 Months Ago 11/29/2016	47.46	52.54	30.50	10.50	0.00	0.00
Start of Calendar Year 1/3/2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 9/27/2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 3/1/2016	94.55	5.45	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.

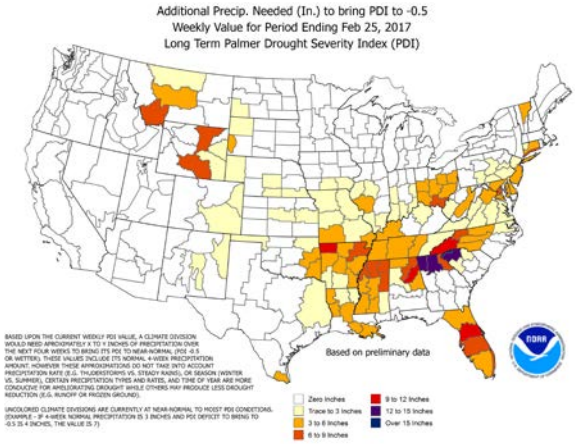
Author:
Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/



More information on the Drought Monitor categories can be found in a separate document under useful links on the KWO drought page.

Palmer Drought Severity Index (PDSI) - The Palmer Index is an indicator used in the U.S. Drought Monitor. The PDI for the period ending February 25, 2017 no precipitation is needed to bring any of Kansas climate divisions to their normal moisture conditions.



Federal Disaster Declarations

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.

USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

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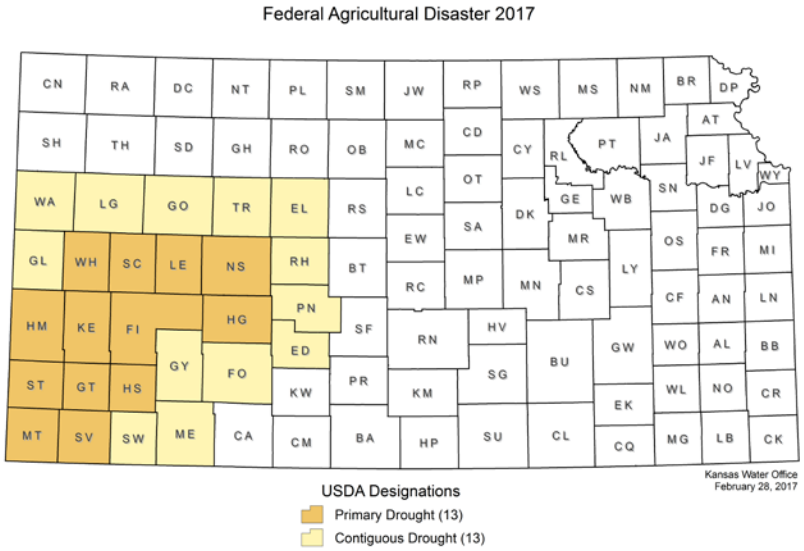
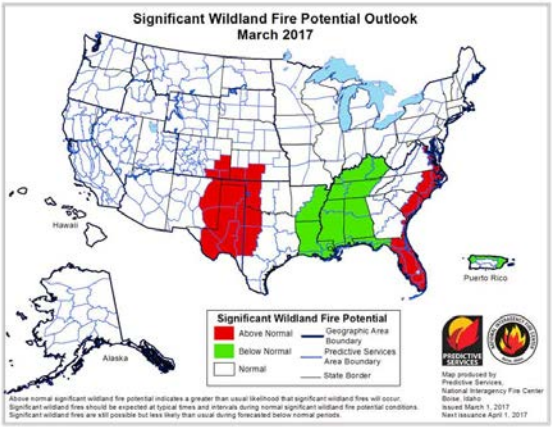




Wildfires

February saw conditions in much of Kansas conducive to wildfires. Red flag warnings were issued many days around Kansas warning of potential fire danger and recommending no burning. Some of the fires reported:

- February 11 - 200 acres in rural Cowley County.
- February 23 – Montezuma (Gray County), 749 acres.
- February 23- large grass fires in Finney County, 4,000 acres.
- February 23 – Haskell County, 350 acres.

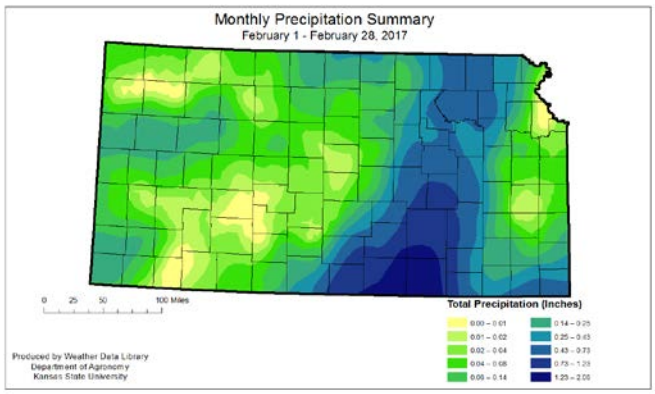
On March 1 the Predictive Services section at the National Interagency Fire Center issued their Wildland Fire Potential Outlook for March through June. The data represents the cumulative forecasts of the ten Geographic Area Predictive Services Units and the National Predictive Services Unit.

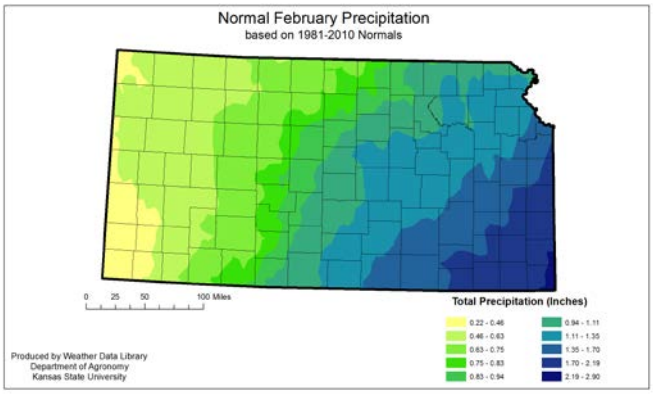
Climate Summary (Temperature and Precipitation)

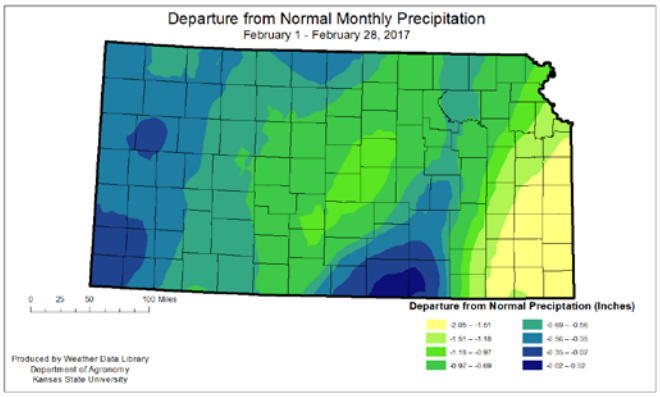
February was much warmer and drier than normal. The warmer than normal temperatures were accompanied by much drier than usual conditions. The state-wide average precipitation was 0.23 inches, or just 23 percent of normal. This ranks as the 14th driest February since 1895. The South Central came closest to normal with an average of 0.44 inches or 44 percent of normal. The Northwest Division was the driest with an average of just 0.01 inches, which was 2 percent of normal. Still, despite the dry pattern, 14 stations set daily record precipitation values. The greatest 24-hour precipitation total for a National Weather Service (NWS) station was 1.87 inches at Smileyberg, Butler County, on the 20th. The greatest 24-hour precipitation total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 1.93 inches at Arkansas City 3.1 N, Cowley County, also on the 20th. The stations with the greatest monthly totals: 2.03 inches at Winfield 3NE, Cowley County (NWS); 2.08 inches at Arkansas City 3.9 SSW, Cowley County (CoCoRaHS). While snow wasn't a huge factor, there were still some snow events during the month. The greatest snowfall total for February at a National Weather Service station was 1.8 inches at Smith Center, Smith County. The greatest snowfall total for the month at a CoCoRaHS station was 2.5 inches at Phillipsburg 5.7 E, Phillips County.

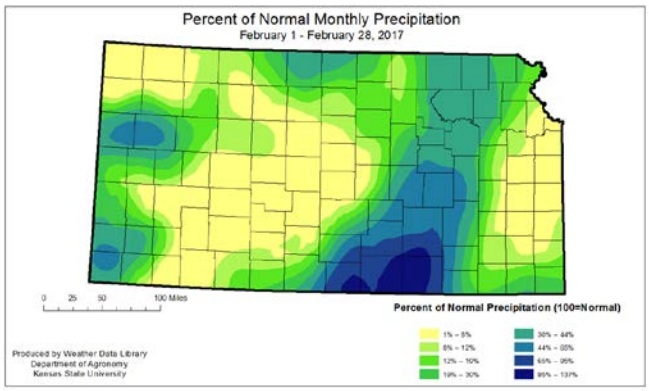
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library.

Kansas Climate Division Precipitation Summary (inches)												
	February 1-28, 2017			January 1- February 28, 2017			April 1, 2016 – February 28, 2017			September 1, 2016 – February 28, 2017		
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	-0.53	2	0.89	-0.10	89	19.53	-0.46	97	5.02	-0.38	91
West Central	0.08	-0.51	15	0.89	-0.21	81	18.85	-0.46	96	3.26	-2.25	59
Southwest	0.05	-0.50	10	1.78	0.76	171	22.24	3.75	119	3.44	-1.97	62
North Central	0.09	-0.73	10	1.40	-0.05	95	30.80	4.88	118	7.65	-0.43	97
Central	0.12	-0.89	10	1.69	-0.01	97	31.29	4.33	115	7.46	-0.96	86
South Central	0.57	-0.59	44	3.46	1.47	175	37.24	8.63	129	12.12	2.37	120
Northeast	0.27	-0.85	24	1.33	-0.59	73	34.69	2.07	106	11.10	-0.04	100
East Central	0.24	-1.09	19	1.44	-0.84	63	35.14	-0.03	99	10.84	-1.63	86
Southeast	0.55	-1.17	35	2.69	-0.28	93	42.85	4.49	112	15.70	0.77	106
STATE	0.23	-0.76	19	1.83	0.10	109	30.54	3.36	111	8.57	-0.45	89

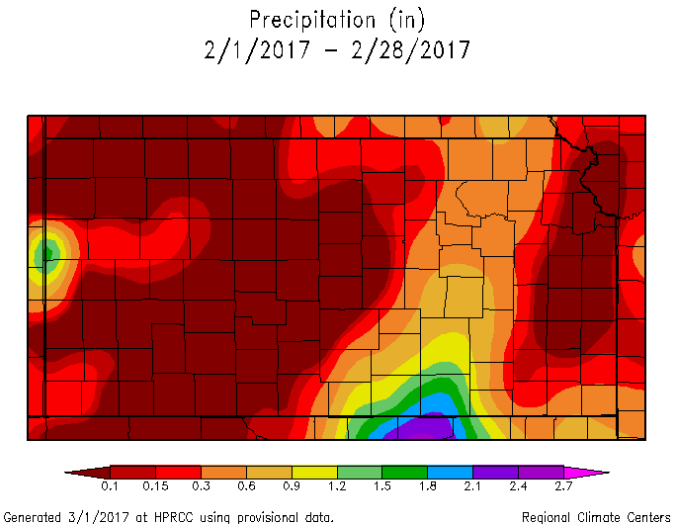


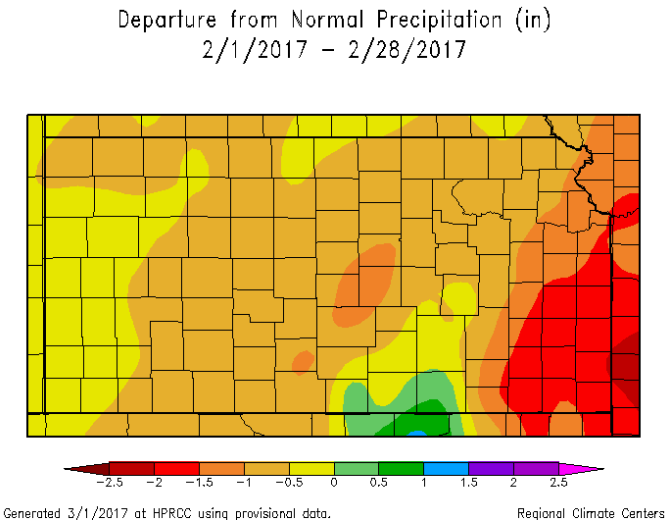






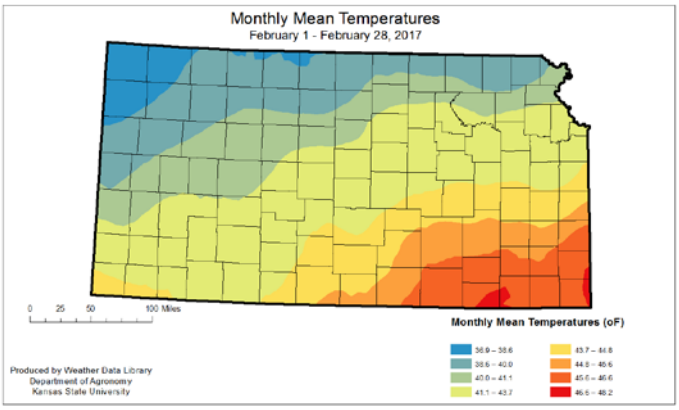
Precipitation summary for the month is provided in the maps below from the High Plains Regional Climate Center. The Climate Center information is provided also as a comparison to the K-State data. Various time intervals can be accessed at the climate center http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps .

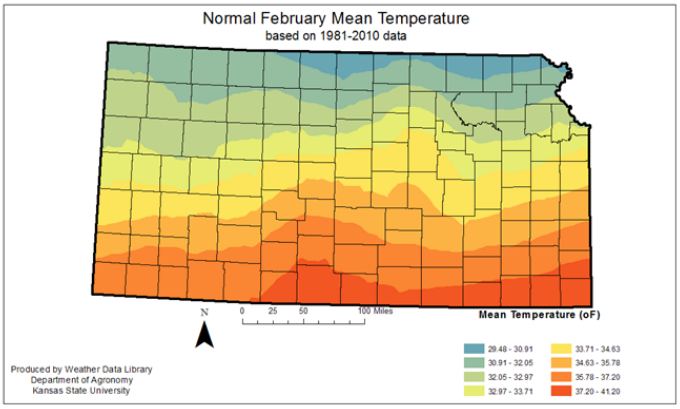


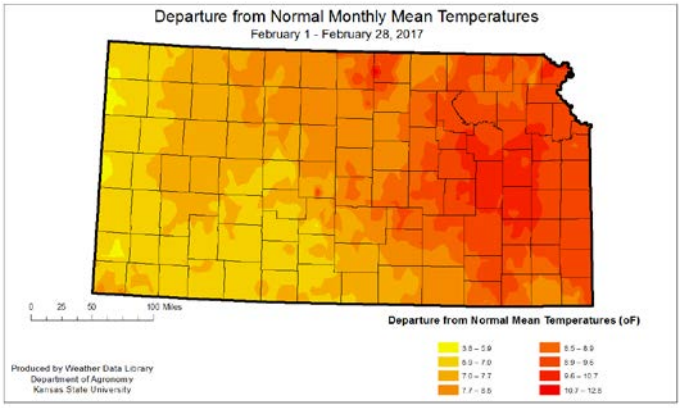


The state-wide average temperature was 41.9° F, which is 7.9 degrees warmer than normal. This places it as the 7th warmest since 1895. The January to February period, not surprisingly, also ranks in the top ten warmest as the 9th warmest. Overall, the East Central Division showed the greatest departure from normal with an average of 42.8° F and a departure of 9.0 degrees. The West Central Division, which averaged 40.1° F, was the closest to normal and was still 7.0 degrees warmer. The highest temperature reported was 90° F at Liberal, Seward County, on the 11th. The lowest temperature reported was 0° F at Brewster 4W, Thomas County, on the 4th. Not surprisingly, there were no record cold maximum or minimum temperatures. There were 155 new daily record high maximums, and 10 of those set new record highs for February. There also were 106 new daily record high minimum temperatures, of which 6 set new records for the month.

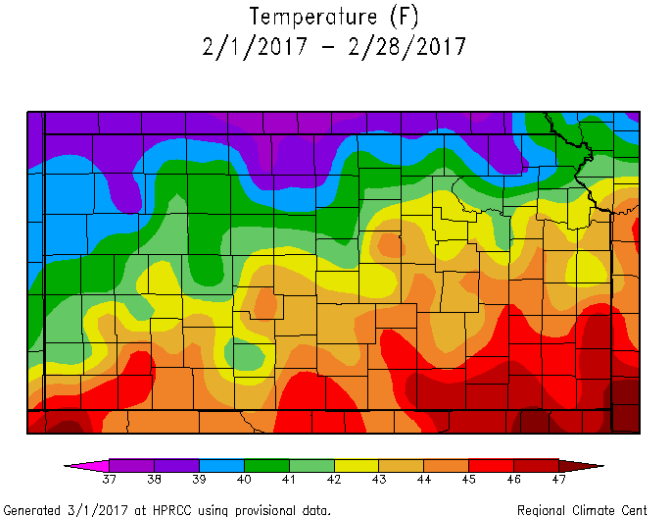
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	February 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	55.5	23.2	39.3	7.7	87	10	0	25
West Central	57.3	22.9	40.1	7.0	88	11	4	25
Southwest	61.5	25.1	43.3	7.7	90	11	6	25
North Central	54.5	26.1	40.3	8.1	80	23	9	26
Central	57.0	27.0	42.0	7.9	85	11	7	25
South Central	58.6	28.7	43.6	7.1	85	11	6	25
Northeast	53.9	26.6	40.2	8.0	78	23	12	9
East Central	55.9	29.6	42.8	9.0	82	23	11	9
Southeast	59.0	31.9	45.4	8.9	85	12	13	9
STATE	57.0	26.8	41.9	7.9	90	11th	0	4th
Data Source: KSU Weather Library								

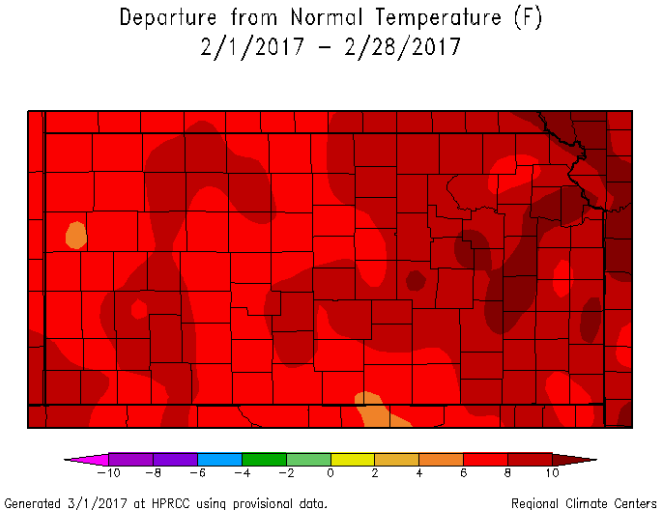






Temperature summary by the High Plains Regional Climate Center for the month is provided in the maps below.



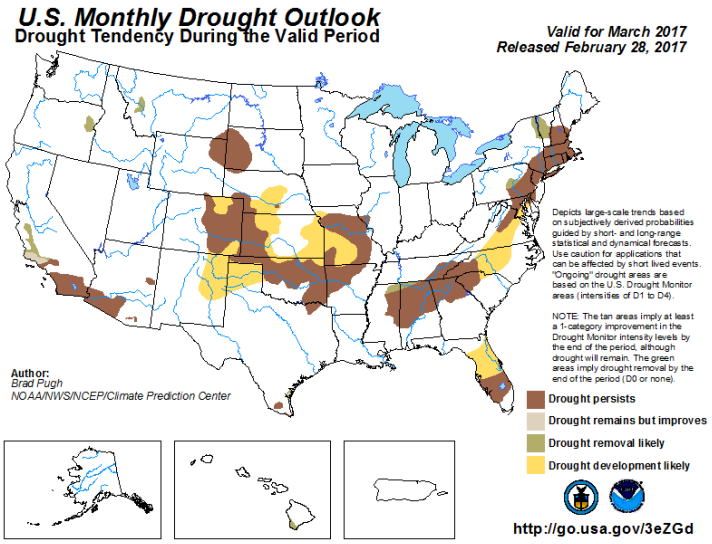


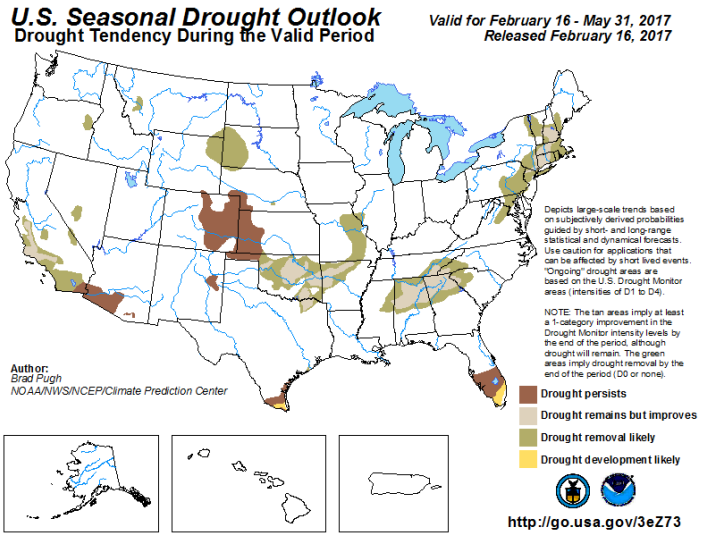
The month was again calm as far as severe weather events. There were no reports of tornadoes, hail or high winds. Snowfall wasn't an issue this month. The biggest concern was the increase in extreme fire weather days, with the potential for wildfires.

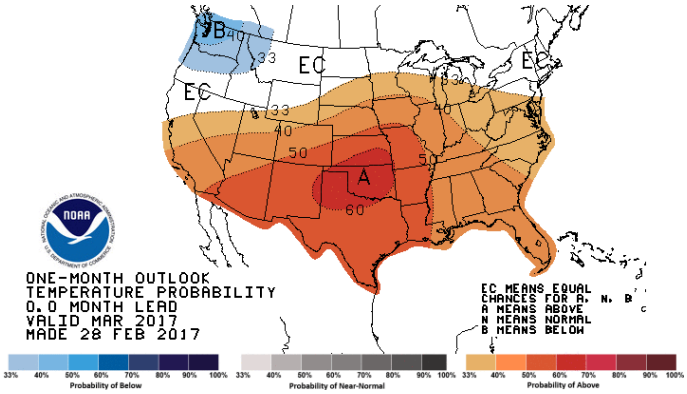
Future Outlook

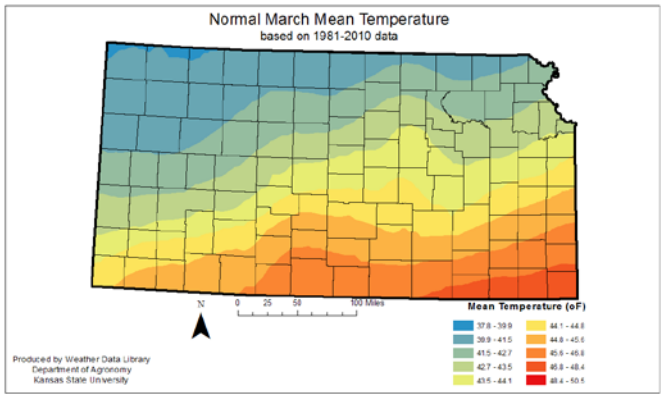
The updated March outlook does not indicate any immediate chance for improvement. The U.S. Monthly indicates drought conditions in the west to continue but the Seasonal Drought Outlook (3-month) indicates drought conditions to improve!

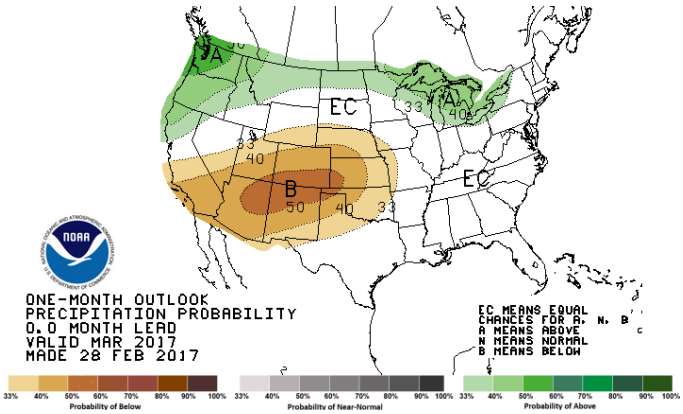
Both the Drought Outlooks and individual temperature and precipitation outlooks are provided below.

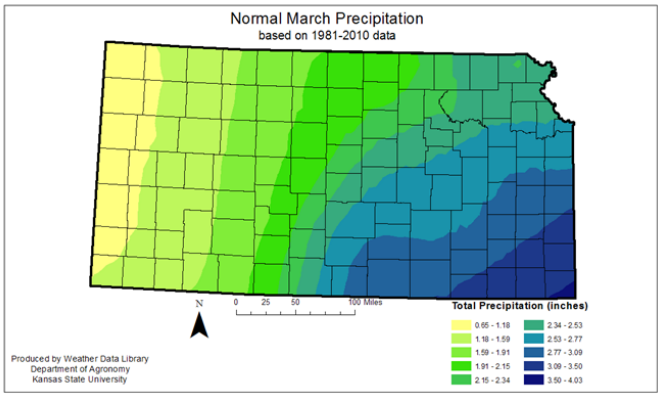


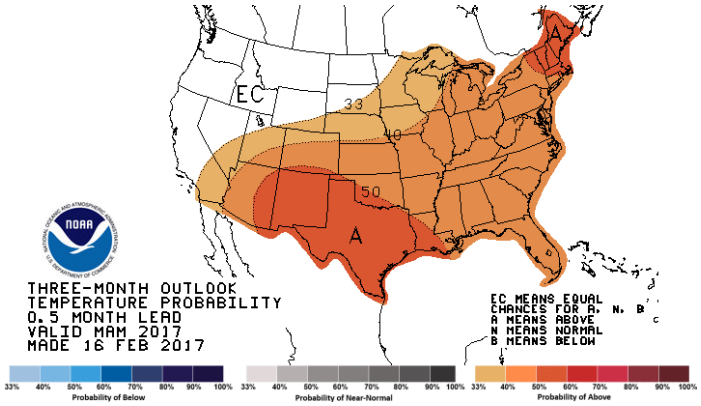


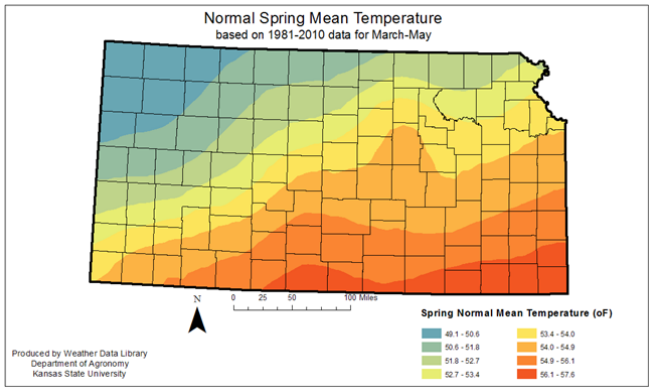


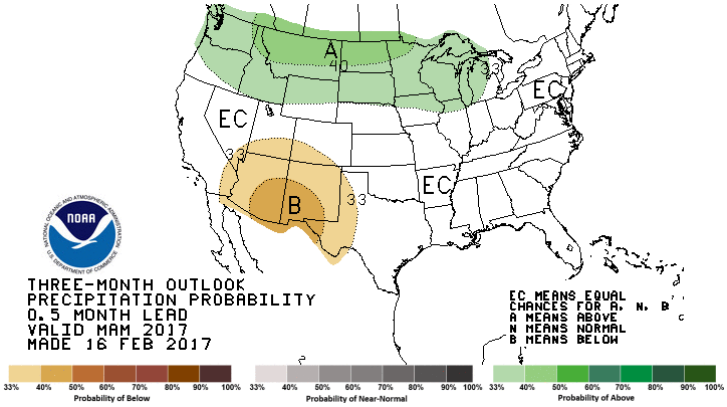


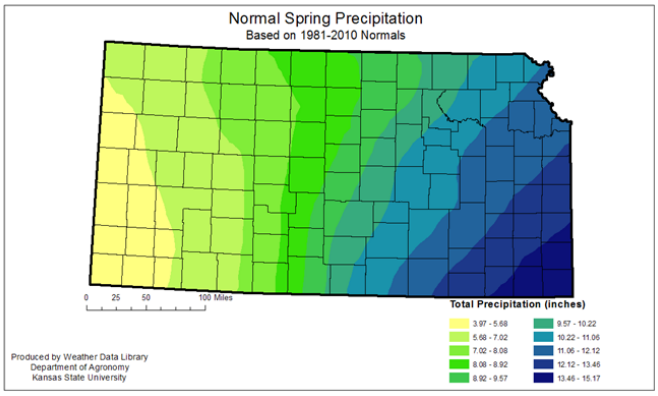












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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, under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of February 28, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed. (February 28, 2017, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for Medicine Lodge, Barber County (February 28, 2017). Citizens may water before 10 am and after 9 pm. https://medicinelodge.kansas.gov/

Surface Water Supply Conditions

Kansas River basin: Tuttle Creek, Perry, Milford, and Clinton reservoirs received sufficient inflow to maintain levels at lower winter target elevations in February. Flows in the Kansas River diminished over the month and dropped below historical median values.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs all declined in February and have all nearly reached the lower winter target elevations. Flow in the Marais des Cygnes River declined and maintained below median values for the majority of the month.

Cottonwood/Neosho basin: Streamflow and reservoir target elevations were maintained throughout the basin in February, however streamflow did start to reflect the lack of precipitation and declined below historic median values.

Verdigris basin: Toronto, Fall River, Big Hill, and Elk City reservoirs maintained storage at or above normal pool elevation. Streamflow was relatively healthy in the basin but was almost exclusively a reflection of reservoir releases.

Saline basin: Elevation at Wilson Lake remained stable, slightly above the normal pool elevation of 1,516.

Smoky Hill basin: The middle Smoky Hill basin maintained some streamflow in February. Kanopolis Lake inflow was near normal for February and elevation was maintained at conservation pool level. The Smoky Hill River is gaining downstream of Kanopolis and maintained flow well above the target flow of 20 cfs at Mentor. Cedar Bluff Reservoir did not experience any significant inflow and started declining as temperature increased.

Harmful Blue-Green Algal Blooms (lake water safety)

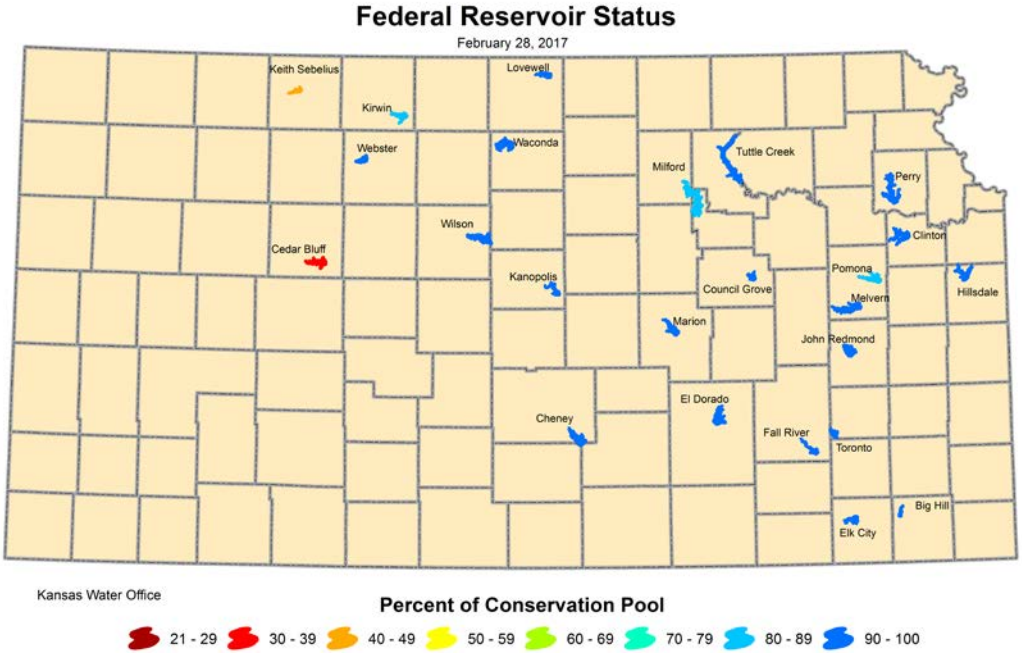
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water 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.

The following lakes will remain on the watch list until the beginning of the 2017 HAB season, Milford Reservoir Zone C, Clay and Geary counties and Lake Shawnee, Shawnee County.

The following lakes will remain on the warning list until the beginning of the 2017 HAB season, South Lake, Johnson County and Vineyard Park Pond, Ellis County.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton and Cedar Bluff reservoirs remain significantly below full conservation pool.



Kansas Federal Reservoir Conservation Pool Levels

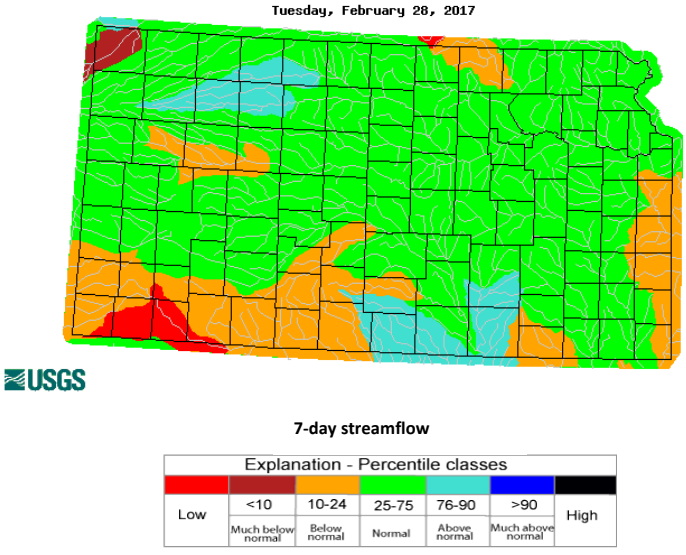
Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**02/28/2017 06:00 AM**		
Norton[1]	2304.3	2291.75	-12.55	39.5
Harlan County, NE	1945.73	1937.17	-8.56	67.1
Lovewell[1]	1582.6	1583.88	1.28	100.0
Milford[1]	1144.4	1141.36	-3.04	88.0
Cedar Bluff	2144	2118.78	-25.22	31.6
Kanopolis[1]	1463	1462.88	-0.12	99.3
Wilson[1]	1516	1516.18	0.18	100.0
Webster[1]	1892.5	1891.94	-0.51	97.5
Kirwin[1]	1729.3	1726.10	-3.15	84.6
Waconda[1]	1455.6	1454.56	-1.04	94.1
Tuttle Creek[1]	1075	1072.55	-2.45	90.1
Perry[1]	891.5	889.22	-2.28	88.7
Clinton[1]	875.5	874.52	-0.98	94.2
Melvern[1]	1036	1034.14	-1.86	91.7
Pomona[1]	974	972.08	-1.92	86.8
Hillsdale[1]	917	915.19	-1.81	89.3
Arkansas River Basin		**02/28/2017 08:00 AM**		
Cheney	1421.6	1421.62	0.02	100.0
El Dorado	1339	1339.05	0.05	100.0
Toronto[1]	901.5	902.01	0.51	100.0
Fall River[1]	948.5	949.31	0.81	100.0
Elk City[1]	796	796.49	0.49	100.0
Big Hill	858	858.01	0.01	100.0
Council Grove[1]	1274	1272.60	0.00	100.0
Marion[1]	1350.5	1348.63	0.13	100.0
John Redmond[1]	1039	1040.98	-0.02	100.0

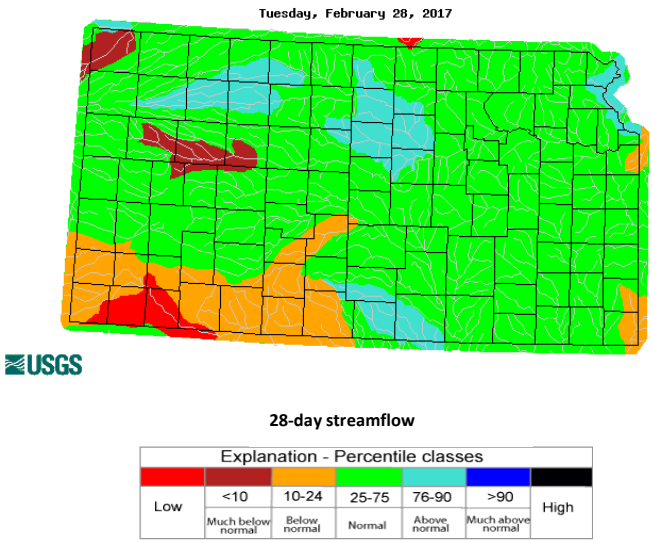
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

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.
* data not available 10/30/16 this data for 11/2/16.

Streamflow Conditions

The comparison of present **7-day** streamflow to historical is shown on the map below left and the monthly streamflow compared to historical is shown on the map below, right.





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.

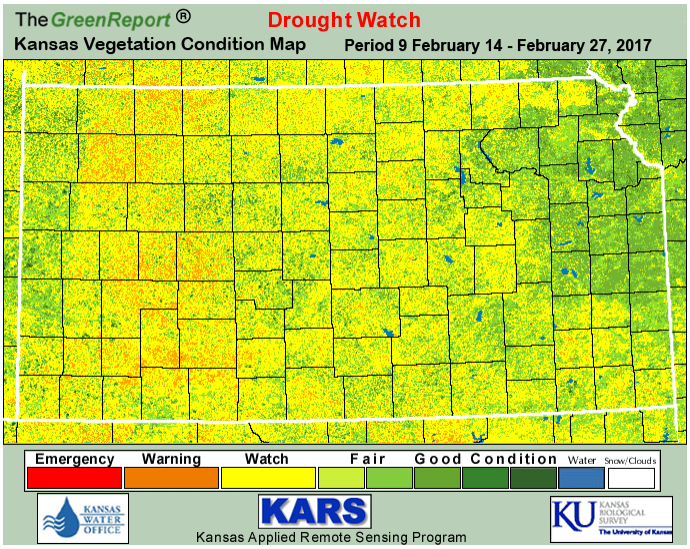
Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow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

Flooding and High Flows
USGS WaterWatch data Based on USGS monitored stream gages, USGS WaterWatch indicates no flood conditions in Kansas this month.

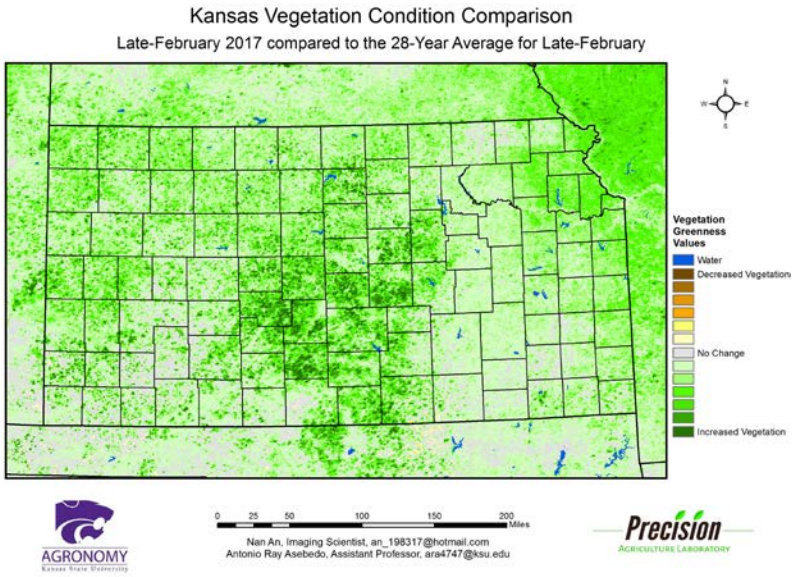
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

Soil, Crop and Vegetation

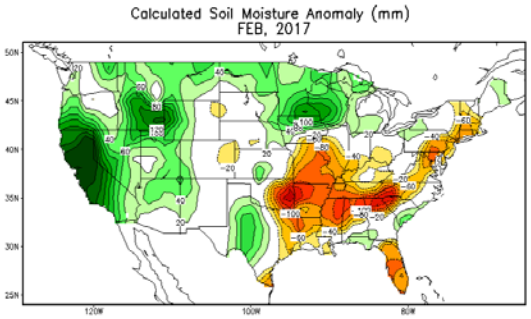
Kansas Vegetative Conditions
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. Some improvement of conditions in the eastern areas of the state the last week of February. Central areas are good, with western areas slightly dry.



The map on the left compares the 27-year average vegetatin condition at this time for Kansas, to this year's Vegetation Condition Report for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory. Much of the state has above normal vegetative activity. The highest NDVI values are in the Central and South Central parts of the state, where precipitation has been more favorable.



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

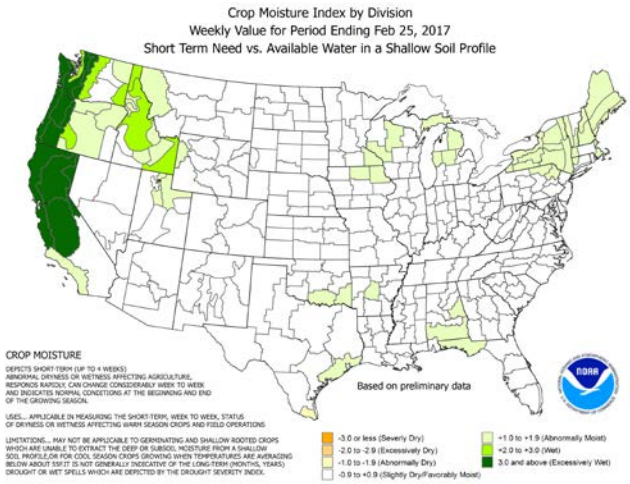


Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion which may be found at: http://www.ksre.ksu.edu/p.aspx?tabid=255.

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 published February 27, 2017 reported topsoil moisture rated 21 percent very short, 34 short, 45 adequate, and 0 surplus. Subsoil moisture rated 21 percent very short, 35 short, 44 adequate, and 0 surplus.

Field Crops Report: Winter wheat condition rated 5 percent very poor, 16 poor, 36 fair, 40 good, and 3 excellent.

Livestock, Pasture, and Range Report: Hay and roughage supplies rated 1 percent very short, 6 short, 90 adequate, 3 surplus. Stock water supplies were 2 percent very short, 13 short, 84 adequate, and 1 surplus. (http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Crop_Progress_and_Condition/current.pdf)



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.

Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report is 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 a 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

February 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	T	-0.42	1%	40.0	8.3	86 (10)	6 (26)
Dodge City	0.01	-0.67	2%	43.7	7.8	87 (10)	9 (25)
Garden City	0.01	-0.53	2%	42.1	7.3	87 (10)	7 (25)
Goodland	0.01	-0.48	2%	39.6	7.3	87 (10)	7 (25)
Guymon, OK	0.01	-0.46	2%	46.5	7.9	93 (10)	10 (25)
Hill City	0.01	-0.51	14%	41.0	8.1	82 (10)	8 (25)
Lamar, CO	0.05	-0.32	14%	41.2	7.6	84 (10)	4 (26)
McCook, NE	T	-0.62	0%	39.9	8.0	80 (21)	7 (25)
Springfield, CO	0.01	-0.43	2%	41.1	5.7	82 (10)	5 (25,3)
Central							
Concordia	0.10	-0.69	13%	41.3	8.6	77 (22)	12 (25, 9)
Hebron, NE				39.2	9.6	76 (22)	11 (9)
Medicine Lodge	0.22	-0.82	21%	45.5	7.3	84 (22)	12 (25)
Ponca City, OK	0.31	-1.03	23%	48.1	8.4	84 (23)	16 (3)
Salina	0.08	-1.09	7%	44.6	9.1	81 (22)	15 (2)
Wichita (ICT)	0.83	-0.35	70%	45.8	8.5	77 (22)	17 (9)
East							
Bartlesville, OK	0.91	-1.06	46%	47.6	7.8	86 (11)	18 (9)
Chanute	0.31	-1.59	16%	46.7	9.3	82 (22,11)	17 (9)
Fall City, NE	0.41	-0.53	44%	41.0	10.1	77 (22)	11 (9)
Johnson Co. Exec. Apt	0.03	-1.54	2%	43.6	8.8	79 (22)	15 (9)
Joplin, MO	0.34	-1.98	15%	49.4	9.6	83 (23)	19 (9)
Kansas City (MCI), MO	0.06	-1.40	4%	43.6	10.1	79 (22)	12 (9)
St. Joseph, MO	0.05	-0.88	5%	41.1	9.1	77 (22)	13 (9,8)
Topeka (TOP	T	-0.42	1%	40.0	8.3	86 (10)	6 (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

KANSAS CLIMATE and DROUGHT UPDATE – March 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: Abnormally dry and moderate and severe drought conditions continued in Kansas during most of March. Considerable improvement occurred the last few days of March as reflected in the April 4 Drought Monitor.

- State of Disaster Emergency due to wildfires issued for 20 counties on March 13, for fires beginning March 4 burning over 651,000 acres.

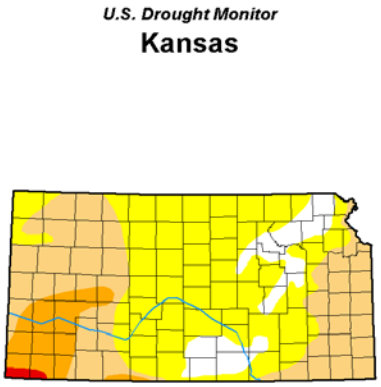
- March 13, 2017, USDA disaster assistance due to drought became available to farmers and ranchers in Cowley and Sumner counties as contiguous counties with the primary designation of Kay County Oklahoma. A total of 13 primary and 19 contiguous Kansas counties are now eligible for federal assistance.

Lakes and Streams

- Norton and Cedar Bluff continued to be significantly below conservation pool throughout the month.

General Conditions

The higher than normal precipitation resulted in improving conditions in the U.S. Drought Monitor at the end of the month. Biggest improvement was in the southwest where extreme drought was removed entirely in the April 4th Drought Monitor. Slight degrading of conditions had occurred during the month, with minor area increases to moderate and severe areas and the addition of extreme drought in Morton and Stevens counties in mid-March.



March 28, 2017
(Released Thursday, Mar. 30, 2017)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

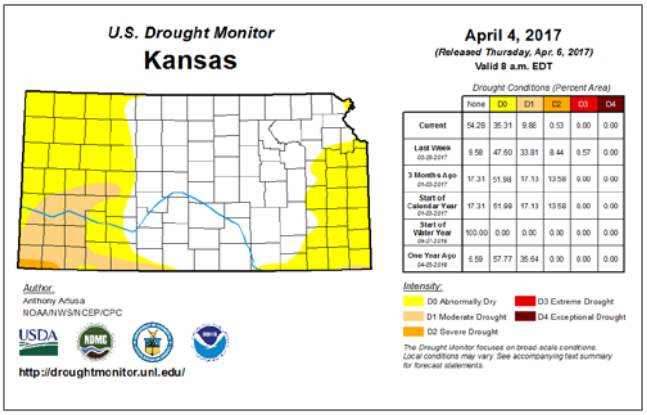
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	9.59	90.42	42.82	9.01	0.57	0.00
Last Week 03-21-2017	3.00	97.00	47.87	9.01	0.57	0.00
3 Months Ago 12-27-2016	17.31	82.69	30.71	13.58	0.00	0.00
Start of Calendar Year 01-03-2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 09-27-2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 03-29-2016	25.99	74.01	22.20	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.

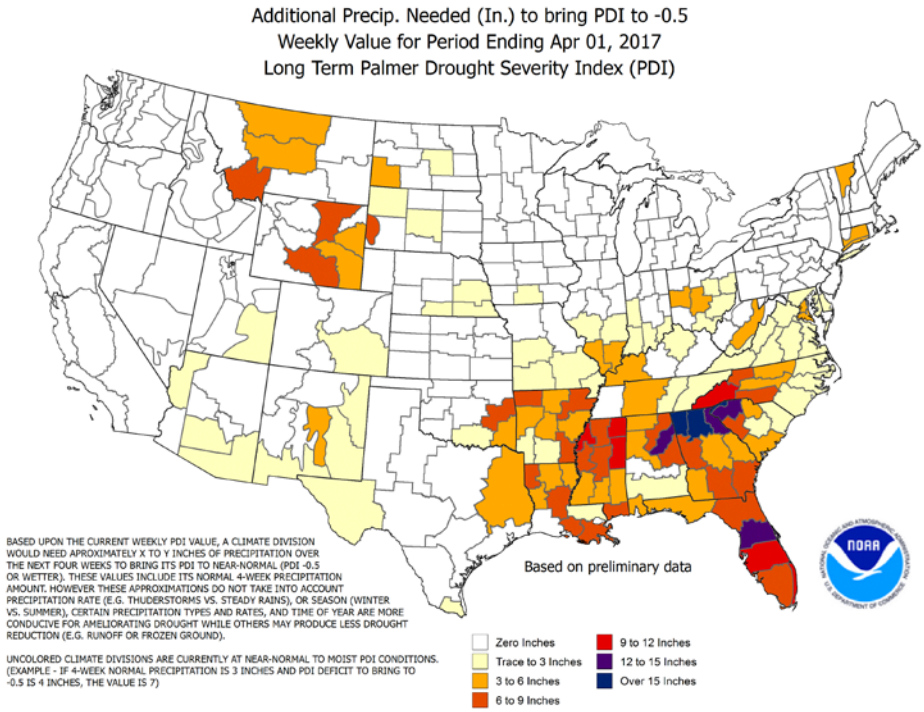
Author:
Eric Luebehusen
U.S. Department of Agriculture

http://droughtmonitor.unl.edu/



More information on the Drought Monitor categories can be found in a separate document under useful links on the KWO drought page.

Palmer Drought Severity Index (PDSI) - The Palmer Index is an indicator used in the U.S. Drought Monitor. The PDI for the period ending March 25, 2017 indicates six Kansas Climate Divisions are in need of some precipitation to bring these areas to their normal moisture conditions (out of drought).

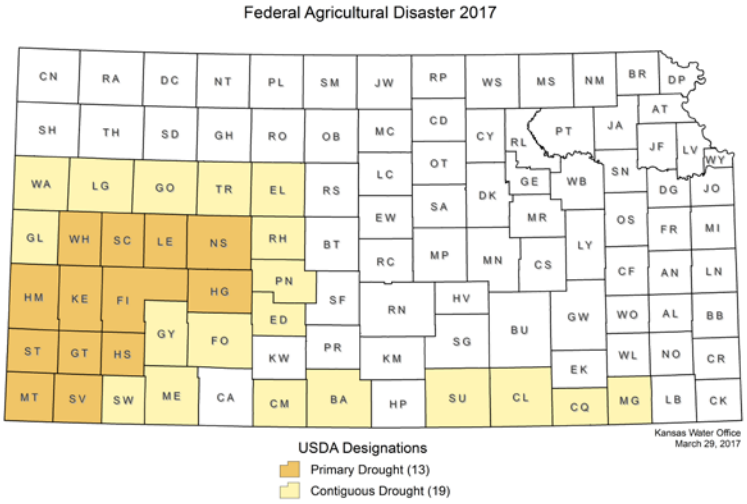


Federal Disaster Declarations

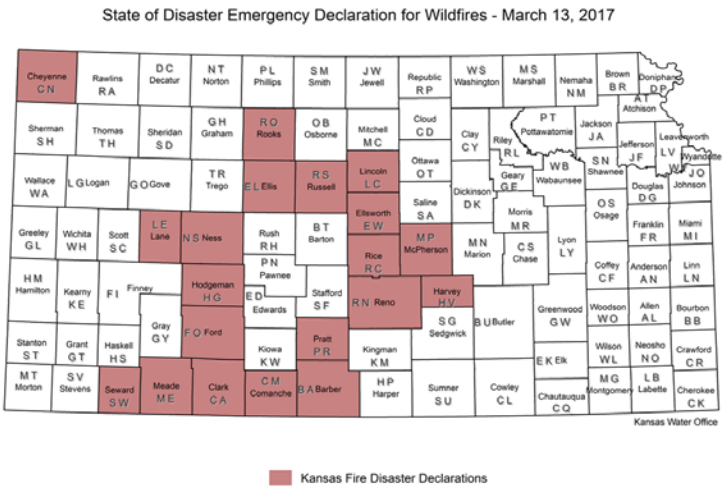
USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.

USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.



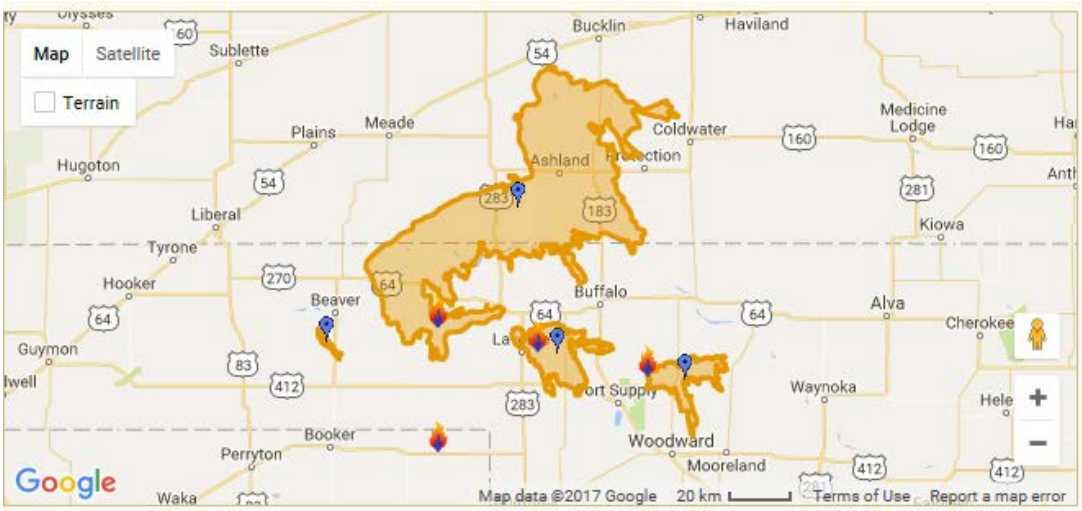
Wildfires



During March, wildfires significantly impacted the state. Dry weather conditions, available fuel and high winds contributed to fire danger and the spreading of them. On March 13, 2017, a State of Disaster Declaration was issued by the governor March 4 for 20 Kansas Counties affected by wildfires. At that time it was estimated that 651,000 acres had been burned across the state. Named in the declaration were Barber, Cheyenne, Clark, Comanche, Ellis, Ellsworth, Ford, Harvey, Hodgeman, Lane, Lincoln, McPherson, Meade, Ness, Pratt, Reno, Rice, Rooks, Russell and Seward counties.

One death was attributed to the fires due to smoke inhalation and 11 injuries were reported. According to initial damage reports, more than 40 homes were destroyed along with an unknown number of outbuildings. One bridge in Meade County and three bridges in Clark County were also destroyed in addition to miles of fencing, utility poles and other structures. An unknown number of livestock were also killed.

The map below obtained from InciWeb https://inciweb.nwcg.gov/incident/5135/ shows the extent of the largest fire, the Starbuck that burned over 715,000 acres, 627,000 of those acres in Kansas (Meade, Clark and Comanche counties) As of March 8, the estimates were that more than 502,000 acres total in Clark and Comanche counties, making it the most widespread single fire on record for Kansas.



A Recovery Reference Guide has been compiled to assist Kansans with losses due to these fires. It may be found at http://kansastag.gov/press_release_detail.asp?PRid=1480 .

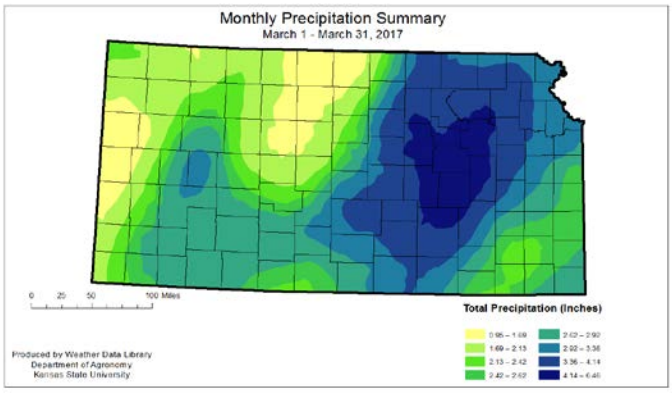
USDA made avaiable $6 million in funding to implement practices to help farmers, ranchers and forest landowners affected by the wildfires through NRCS EQIP program. This will assist in restoration of grazing land, rebuilding of fences, protection of watersheds and implementation of various conservation practices.

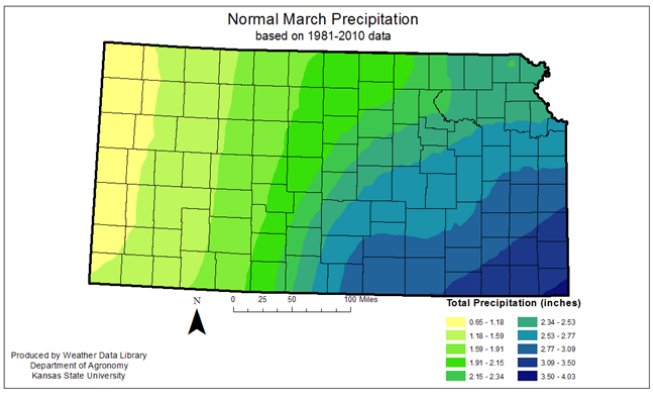
Climate Summary (Temperature and Precipitation)

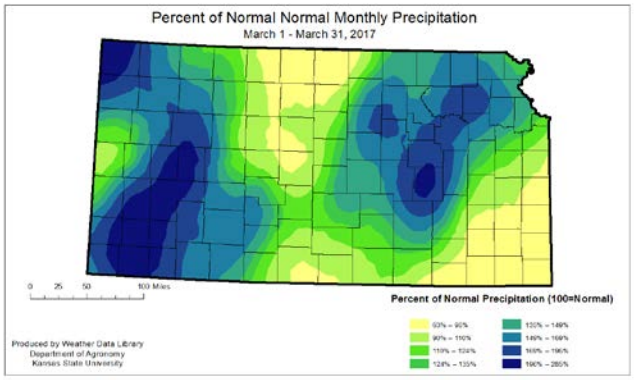
Much of March was warm and dry. The state-wide average precipitation was 2.28 inches, or 141 percent of normal. This ranks as the 14th wettest March since 1895. All divisions were above normal for the month. The Northwest Division was the driest with an average of 1.41 inches, which was 107 percent of normal. The Southwest Division saw the greatest percent of normal, with an average of 3.30 inches or 244 percent of normal. The greatest 24-hour precipitation total for a National Weather Service (NWS) station was 3.07 inches at Peck 2S, Sumner County on the 29th. The greatest 24-hour precipitation total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 5.71 inches at El Dorado 7.9 NNW, Butler County, also on the 29th. The stations with the greatest monthly totals: 6.46 inches at Tallgrass National Prairie Park, Chase County (NWS)); 7.21 inches at Hutchinson 3.6 NE, Reno County (CoCoRaHS). While snow wasn't a huge factor, there were still some snow events during the month. The greatest snowfall total for March at a National Weather Service station was 3.6 inches at Hoyt 2S, Jackson County. The greatest snowfall total for the month at a CoCoRaHS station was 2.1 inches at McFarland 0.1 SE, Wabaunsee County.

Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library.

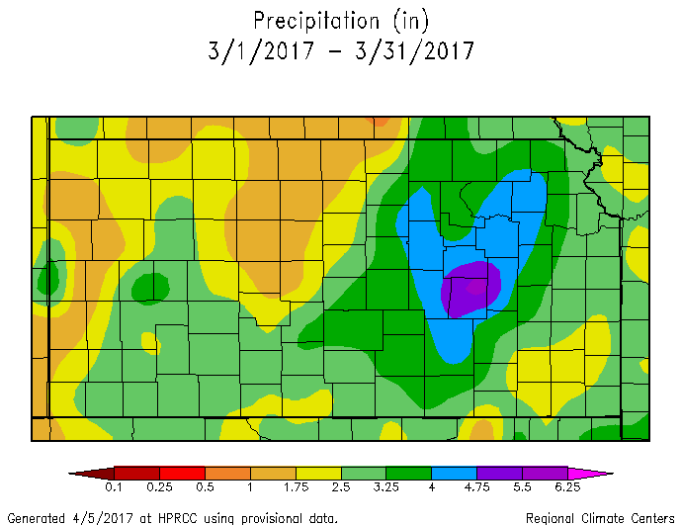
Kansas Climate Division Precipitation Summary (inches)												
	March 1-31, 2017			January 1- March 31, 2017			April 1, 2016 – March 31, 2017			September 1, 2016 – March 31, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.41	0.1	107	2.30	0.00	99	20.94	-0.36	98	6.43	-0.28	94
West Central	2.30	0.90	163	3.19	0.69	127	21.15	0.44	101	5.55	-1.36	80
Southwest	3.30	1.94	244	5.08	2.70	212	25.54	5.69	127	6.74	-0.04	98
North Central	2.43	0.41	118	3.83	0.36	108	33.23	5.29	118	10.08	-0.02	101
Central	3.18	0.93	140	4.86	0.91	121	34.47	5.26	117	10.64	-0.03	97
South Central	3.30	0.67	127	6.77	2.15	147	40.55	9.32	128	15.42	3.04	121
Northeast	2.91	0.63	128	4.24	0.03	103	37.61	2.71	107	14.01	0.59	105
East Central	2.95	0.30	111	4.39	-0.53	89	38.09	0.28	100	13.79	-1.32	91
Southeast	3.10	0.08	105	5.79	-0.21	99	45.95	4.57	111	18.81	0.86	106
STATE	2.82	0.70	141	4.65	0.80	127	33.36	4.06	113	11.40	0.26	100

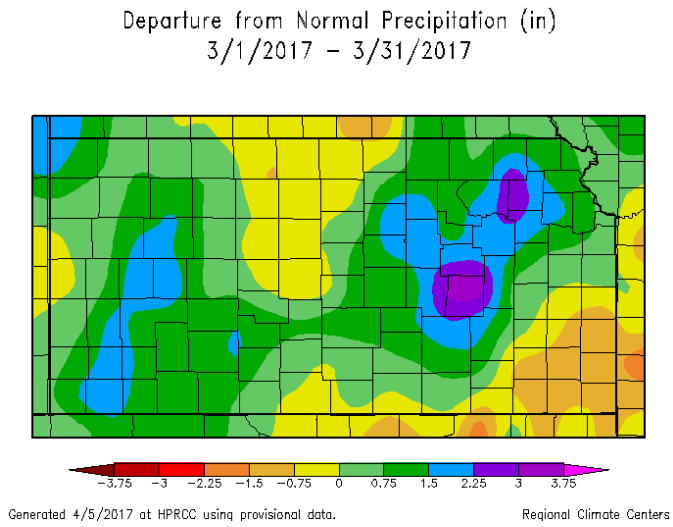


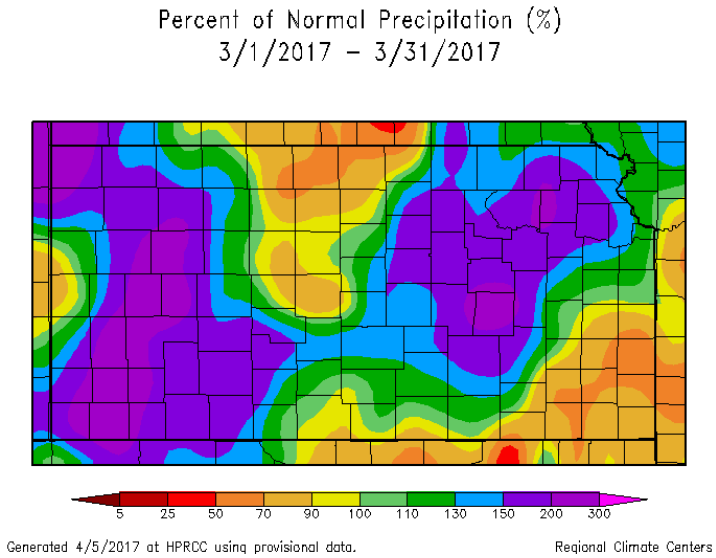




Precipitation summary for the month is provided in the maps below from the High Plains Regional Climate Center. The Climate Center information is provided also as a comparison to the K-State data. Various time intervals can be accessed at the climate center. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps .



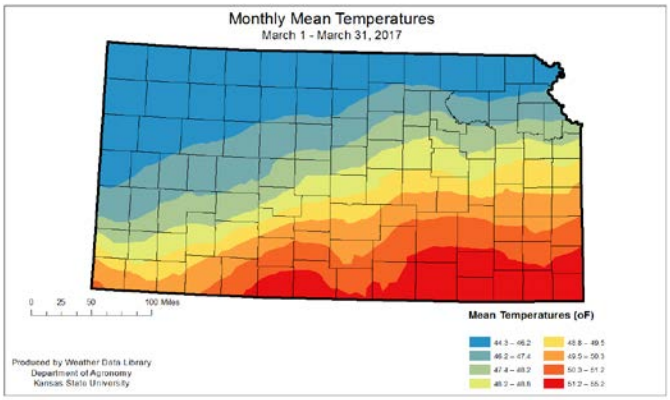


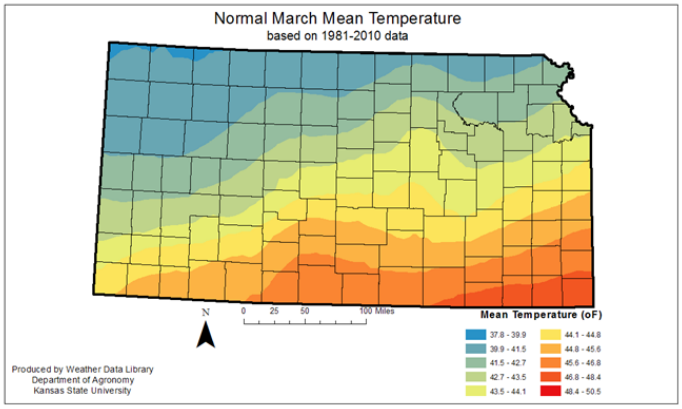


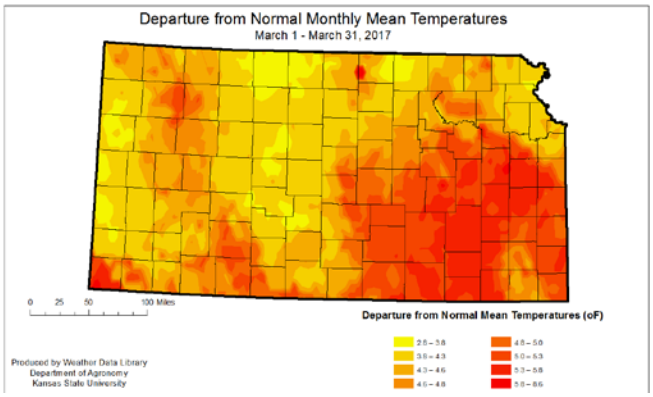
Warmer than normal temperatures were accompanied by much drier than usual conditions, until the last week of the month. The last seven days pushed many locations above normal for March. The state-wide average temperature was 47.7 ^{o}F, which was 4.4 degrees warmer than normal. That places this March as the 17th warmest since 1895. The warmest temperatures were recorded on the 20th of the month. On that day Coldwater, Comanche County, set the warmest reading for the month at 99 ^{o}F., while many locations saw readings in the 90s. There were 134 new daily record maximum temperatures this month and 66 occurred on the 20th. Of those new records, 14 set new daily record maximums for March. Overall, the Southwest Climate Division showed the greatest departure from normal with an average of 49.2 ^{o}F and a departure of 5.2 degrees. The Northeast Division, which averaged 46.0 ^{o}F, was the closest to normal and was still 3.4 degrees warmer. Not surprisingly, there were no record cold minimum temperatures. However, despite the warmth there were 9 new record low maximum temperatures across the state. The lowest temperature reported was 9 ^{o}F at Wallace, Wallace County, on the 2nd. There were 70 record warm minimum temperatures reported during March.

The month was more active as far as severe weather events. There were 10 reports of tornadoes, 56 hail and 67 high wind events. Snowfall wasn't an issue this month. The most damaging features were wildfires, with more than 500,000 acres burned in Clark County alone.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	March 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	60.5	28.3	44.4	4.2	91	20	12	2
West Central	63.6	28.8	46.2	4.6	94	20	9	2
Southwest	67.1	31.7	49.4	5.2	99	20	10	3
North Central	58.9	32.9	45.9	3.7	92	20	15	14
Central	61.4	34.7	48.1	4.4	93	20	17	13
South Central	63.5	36.1	49.8	4.3	94	20	16	2
Northeast	57.8	34.1	46.0	3.4	90	20	17	3
East Central	60.1	36.9	48.5	4.7	90	20	18	12
Southeast	62.4	38.9	50.7	4.9	90	21	19	15
STATE	61.7	33.6	47.7	4.4	99	20th	9	3rd
Data Source: KSU Weather Library								

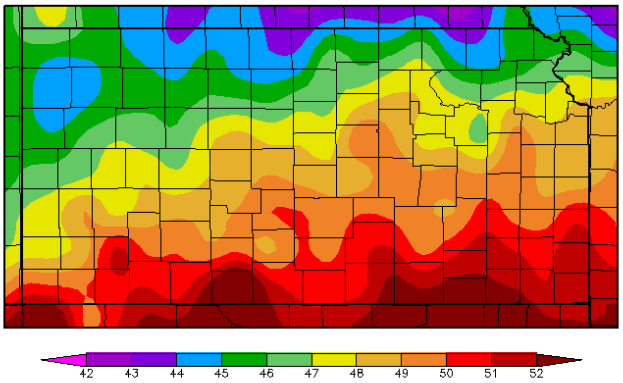






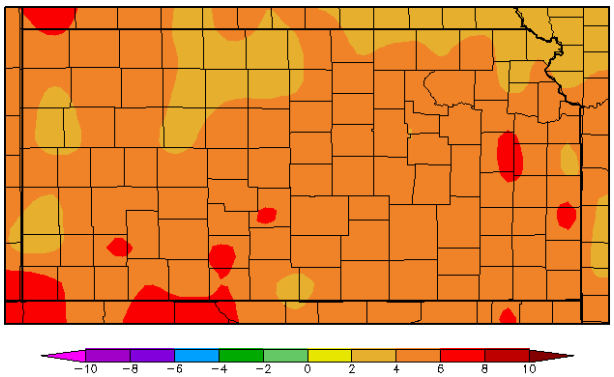
Temperature summary by the High Plains Regional Climate Center for the month is provided in the maps below.

Temperature (F)
3/1/2017 – 3/31/2017



Generated 4/5/2017 at HPRCC using provisional data. Regional Climate Centers

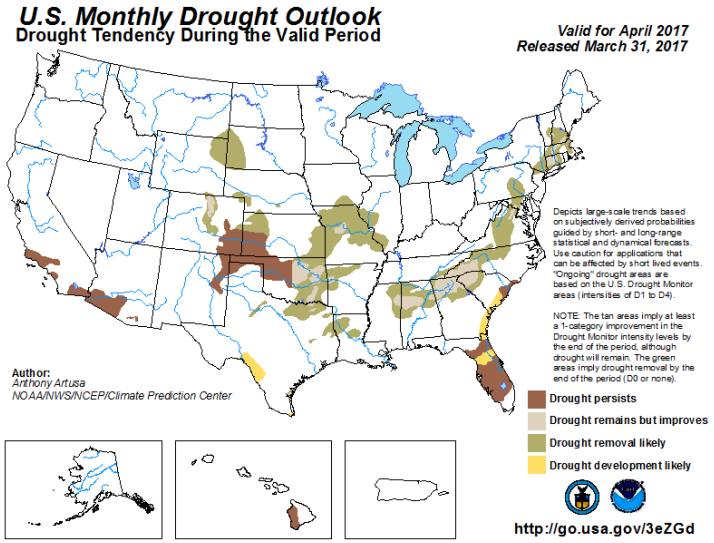
Departure from Normal Temperature (F)
3/1/2017 – 3/31/2017

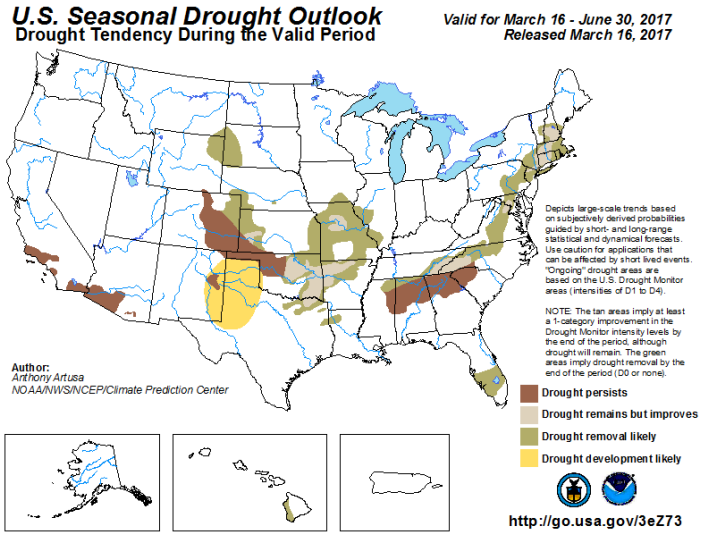


Generated 4/5/2017 at HPRCC using provisional data. Regional Climate Centers

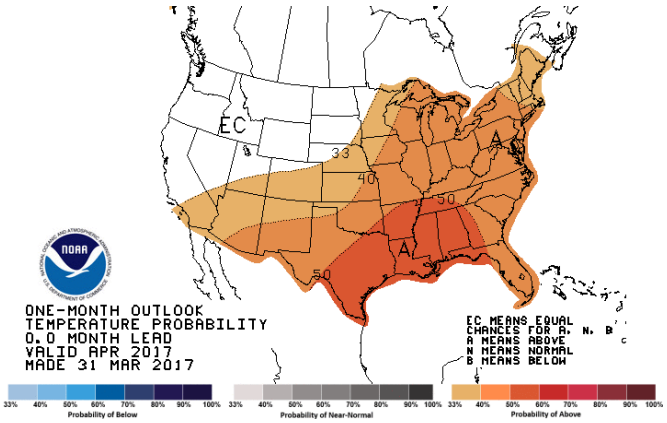
Future Outlook

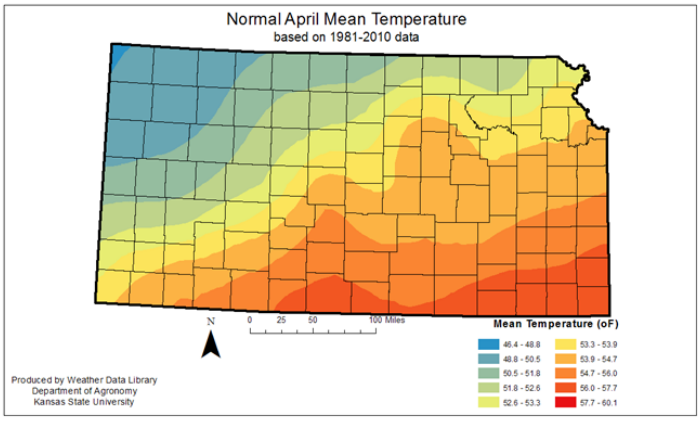
The April outlook is neutral, indicating drought conditions in the west to continue. Continued normal rainfall is critical to sustain improvements. The Seasonal Drought Outlook (3-month) indicates drought conditions to improve.

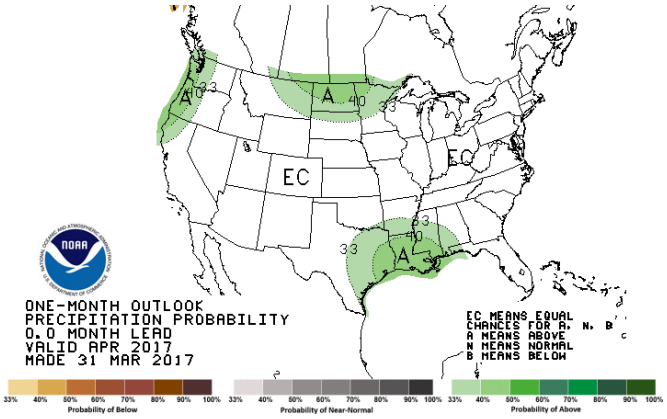


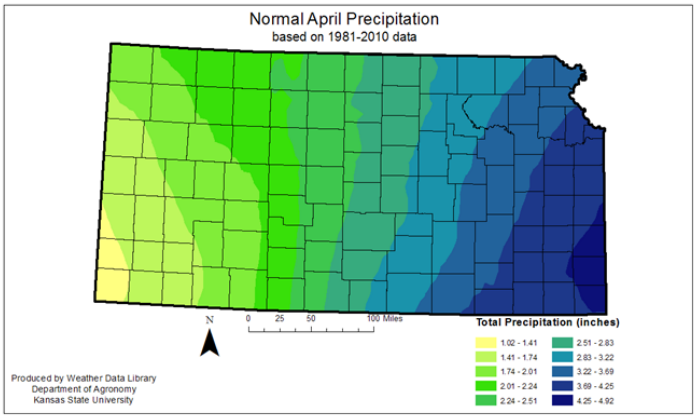


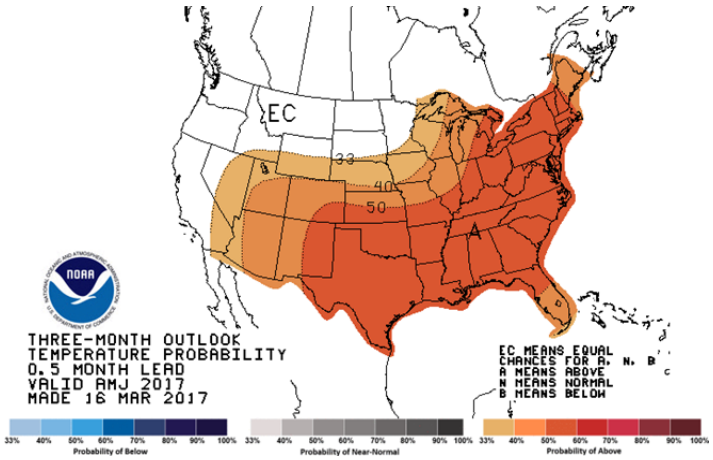
The individual temperature and precipitation outlooks are provided below.

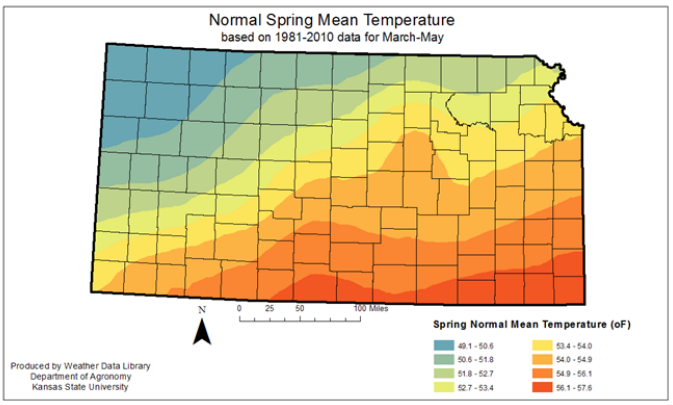


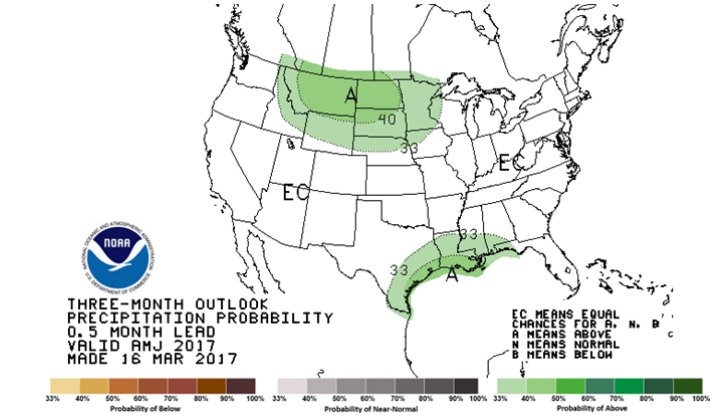


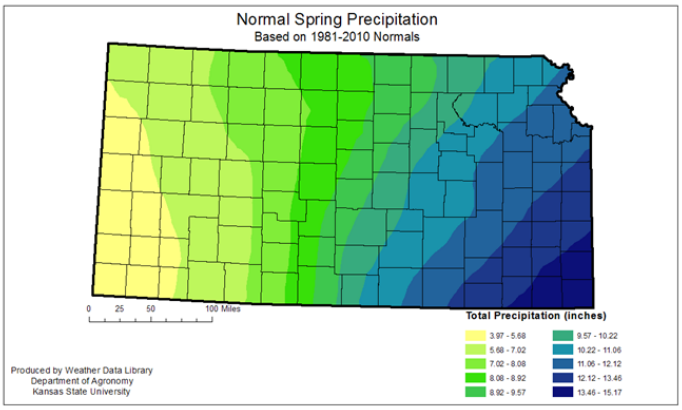












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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, under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of March 30, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed. (March 30, 2017, http://victoriaks.com/utilities.htm.)

Water Emergency currently in place for Medicine Lodge, Barber County (March 30, 2017). Citizens may water before 10 am and after 9 pm. https://medicinelodge.kansas.gov/

Surface Water Supply Conditions

Kansas River basin: Tuttle Creek, Perry, Milford and Clinton reservoirs received sufficient inflow to maintain levels at lower winter target elevations for the majority of March. Flows in the Kansas River remained well below historical median values until the end of the month. All reservoirs were at flood pool elevations and rising at the end of March.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs all declined for the majority of March. Precipitation events in the last week of the month put Melvern and Pomona into flood pool operations. Hillsdale did not receive as much inflow but did gain storage. Flow in the Marais des Cygnes River maintained below median values for the majority of the month but began April very healthy.

Cottonwood/Neosho basin: Streamflow and reservoir elevations were trending downward until the last three days of March, when significant runoff throughout the basin triggered flood storage operations.

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs maintained storage near or above normal pool elevation. Streamflow was relatively healthy in the basin but was almost exclusively a reflection of reservoir releases. As in other north east Kansas basins, the end of March rain drastically increased streamflow and storage.

Saline basin: Elevation at Wilson Lake remained stable, slightly above the normal pool elevation of 1,516. It ended the month beginning to rise toward the late spring / summer target elevation of 1,517. Wilson Lake has now been full since September 2016 after setting record low levels for 2+ years prior.

Smoky Hill basin: The middle Smoky Hill basin maintained some streamflow in March, a good sign for alluvial aquifer condition. Kanopolis Lake inflow was maintained at conservation pool level but inflows were below normal until the late March precipitation. The Smoky Hill River maintained a base flow gain downstream of Kanopolis throughout the month, and late month rain improved all conditions. Cedar Bluff Reservoir did experience a small amount of inflow and rose in elevation at the end of the month.

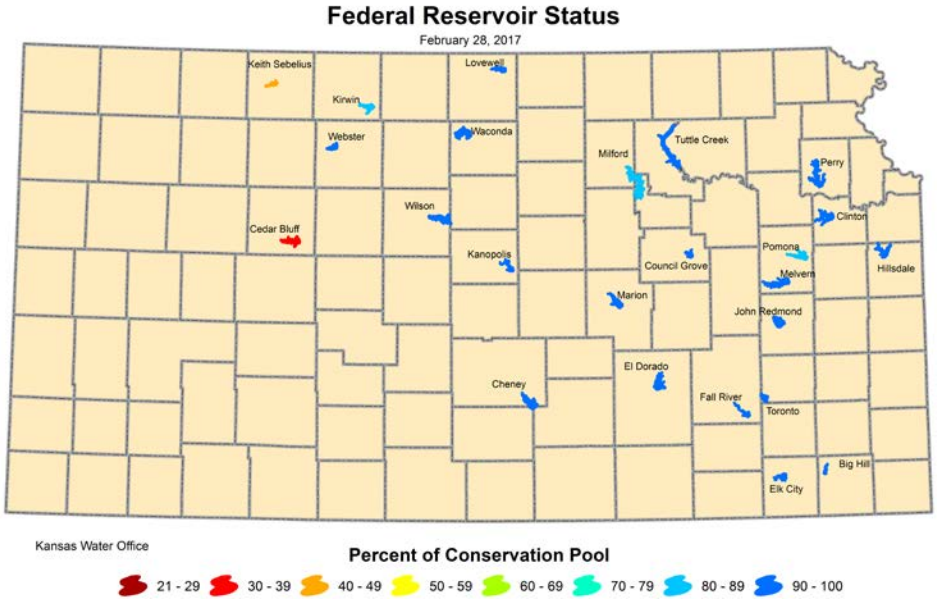
Harmful Blue-Green Algal Blooms (lake water safety)

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.

No advisories were issued in March.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton and Cedar Bluff reservoirs remain significantly below full conservation pool.



Kansas Federal Reservoir Conservation Pool Levels

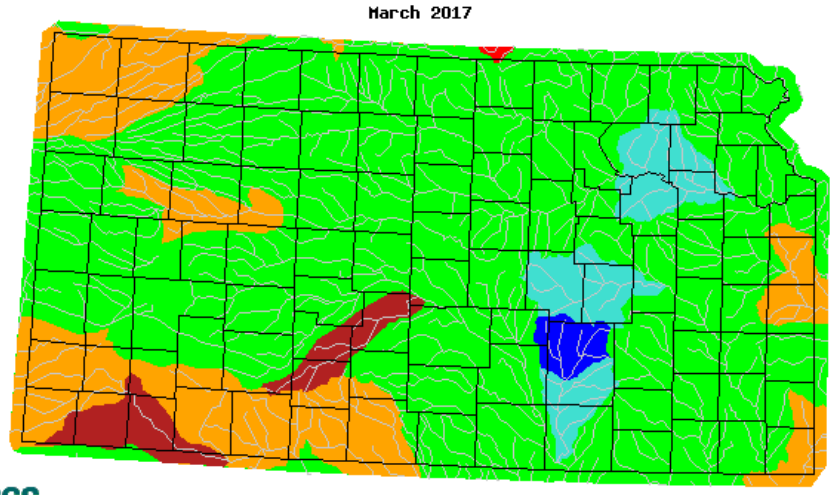
Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**04/10/2017 06:00 AM**		
Norton[1]	2304.3	2292.11	-12.19	40.8
Harlan County, NE	1945.73	1938.35	-7.38	71.2
Lovewell[1]	1582.6	1584.36	1.76	100.0
Milford[1]	1144.4	1146.26	1.86	100.0
Cedar Bluff	2144	2119.01	-24.99	31.9
Kanopolis[1]	1463	1465.92	2.92	100.0
Wilson[1]	1516	1517.13	1.13	100.0
Webster[1]	1892.5	1893.15	0.70	100.0
Kirwin[1]	1729.3	1726.76	-2.49	87.6
Waconda[1]	1455.6	1455.13	-0.47	97.3
Tuttle Creek[1]	1075	1078.61	3.61	100.0
Perry[1]	891.5	900.90	9.40	100.0
Clinton[1]	875.5	879.73	4.23	100.0
Melvern[1]	1036	1040.61	4.61	100.0
Pomona[1]	974	979.68	5.68	100.0
Hillsdale[1]	917	917.04	0.04	100.0
Arkansas River Basin		**04/10/2017 08:00 AM**		
Cheney	1421.6	1423.57	1.97	100.0
El Dorado	1339	1340.88	1.88	100.0
Toronto[1]	901.5	904.03	2.53	100.0
Fall River[1]	948.5	953.83	5.33	100.0
Elk City[1]	796	797.83	1.83	100.0
Big Hill	858	858.47	0.47	100.0
Council Grove[1]	1274	1280.05	7.25	100.0
Marion[1]	1350.5	1351.72	2.12	100.0
John Redmond[1]	1039	1058.54	17.54	100.0

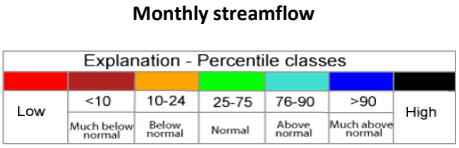
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

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.
* data not available 10/30/16 this data for 11/2/16.

Streamflow Conditions

The comparison of the present monthly streamflow compared to historical is shown on the map below.





USGS

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. No MDS administration occurred in March.

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates some flood conditions occurred in Kansas this month.

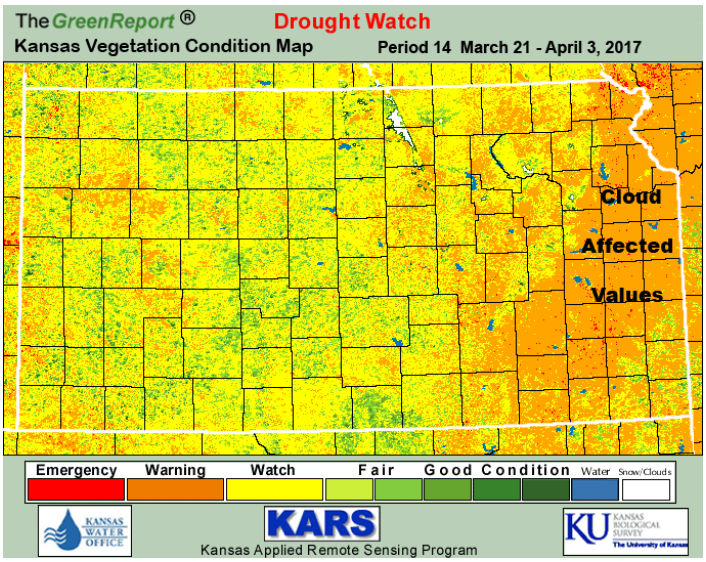
USGS Station number	USGS station name	Drain. area (Mi2)	NWS flood stage (ft)	No. days above flood	NWS flood class	Highest peakfrom 2017-03-01 to 2017-03-31				Historical Peaks	
						Date	Stage (ft)	Streamflow [ft3/s] (date)	Rank	No. Years	Max. (ft3/s) (year)
6856600	REPUBLICAN R AT CLAY CENTER, KS	24542	15	2	minor	3/30/2017	16.86	8830 (2017-03-31)	65	99	195000 (1935)
6878000	CHAPMAN C NR CHAPMAN, KS	300	19	3	minor	3/30/2017	20.33	3540	29	62	46700 (1951)
6888500	MILL C NR PAXICO, KS	318	21	1	minor	3/29/2017	22.63	12300	31	62	77200 (1951)
6891850	STRANGER C AT EASTON, KS	216	17	2	moderate	3/30/2017	18.01	3490	--	--	--
6910800	MARAIS DES CYGNES R NR READING, KS	177	19	2	moderate	3/29/2017	21.86	9130	16	46	67400 (1982)
7145700	SLATE C AT WELLINGTON, KS	154	19	1	minor	3/29/2017	19.34	2560	39	55	28500 (1975)
7146500	ARKANSAS R AT ARKANSAS CITY, KS	43713	11	2	minor	3/30/2017	12.51	22100	49	97	103000 (1923)
7147800	WALNUT R AT WINFIELD, KS	1880	18	2	minor	3/30/2017	18.96	19200	49	96	105000 (1944)
7179730	NEOSHO R NR AMERICUS, KS	622	26	1	minor	3/30/2017	26.41	11800	10	51	17400 (1993)
7180400	COTTONWOOD R NR FLORENCE, KS	754	22	2	minor	3/29/2017	23.41	11200	20	54	73700 (1998)
7182250	COTTONWOOD R NR PLYMOUTH, KS	1740	32	3	minor	3/29/2017	33.31	17200	22	52	92900 (1998)
7182260	COTTONWOOD R AT EMPORIA, KS	1845	20	3	moderate	3/30/2017	24.74	18100	1	1	9570 (2014)
7182390	NEOSHO R AT NEOSHO RAPIDS, KS	2753	22	3	moderate	3/31/2017	25.66	23300	2	5	24900 (2010)

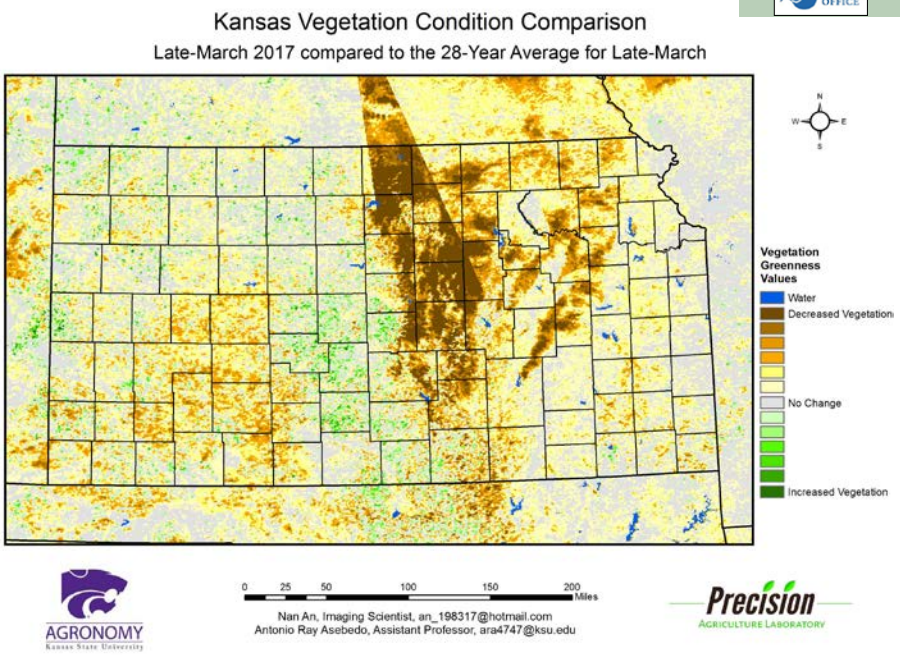
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

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. Recent moisture over the state has yet to reflect improved conditions.



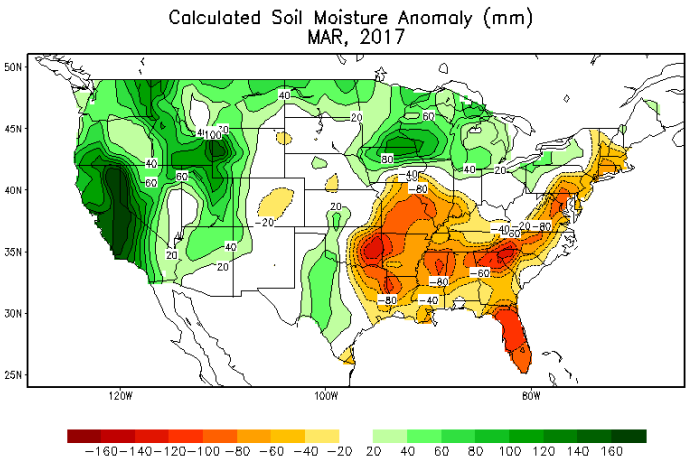


The map on the left compares the 28-year average vegetation condition at this time for Kansas, to this year's Vegetation Condition Report from K-State's Precision Agriculture Laboratory.

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

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.

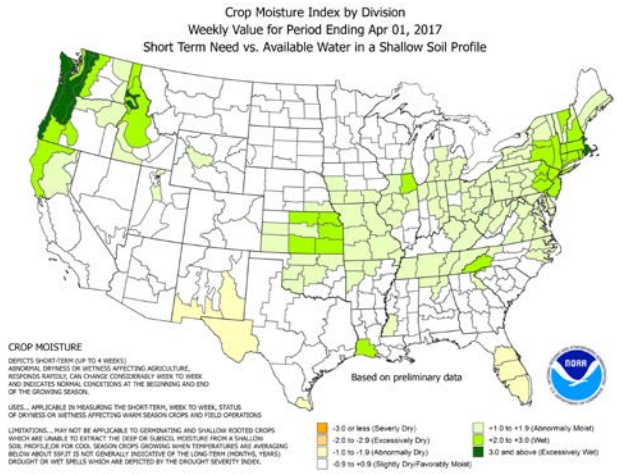


USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report for the state as a

whole published April 3, 2017 reported topsoil moisture rated 8 percent very short, 18 short, 58 adequate and 16 surplus. Subsoil moisture rated 8 percent very short, 24 short, 63 adequate and 5 surplus.

Field Crops Report: Winter wheat condition rated 5 percent very poor, 15 poor, 37 fair, 40 good and 3 excellent.

Livestock, Pasture, and Range Report: Hay and roughage supplies rated 1 percent very short, 7 short, 83 adequate, 9 surplus. Stock water supplies were 2 percent very short, 8 short, 78 adequate and 12 surplus. (http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Crop_Progress_and_Condition/current.pdf)



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.

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

March 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	2.93	2.04	329%	46.1	6.4	86 (9)	10 (2)
Dodge City	2.59	0.99	162%	49.5	5.1	94 (19)	17 (2)
Garden City	2.50	1.04	171%	48.6	4.9	93 (19)	17 (7,2)
Goodland	1.68	0.61	157%	45.5	5.0	89 (19)	13 (2)
Guymon, OK	1.95	0.52	136%	51.9	5.6	94 (19)	18 (3,2)
Hill City	2.10	0.47	129%	46.0	4.2	90 (19)	16 (2)
Lamar, CO	0.53	-0.31	63%	47.8	5.3	89 (19)	11 (2)
McCook, NE	1.00	-0.36	74%	45.5	6.1	91 (19)	14 (13)
Springfield, CO	0.02	-1.11	2%	47.6	4.8	86 (19)	10 (7)
Central							
Concordia	3.19	1.18	159%	46.5	3.5	89 (19)	20 (13)
Hebron, NE				44.1	4.0	85 (19)	18 (3)
Medicine Lodge	2.23	-0.03	99%	50.8	4.1	93 (19)	19 (2)
Ponca City, OK	2.25	-0.46	83%	53.9	5.1	90 (19)	24 (2)
Salina	3.62	1.23	151%	50.3	4.9	92 (19)	19 (2)
Wichita (ICT)	3.50	0.81	130%	51.5	5.0	89 (20,19)	23 (13)
East							
Bartlesville, OK	3.60	0.12	103%	53.3	4.5	91 (20)	22 (2)
Chanute	2.02	-1.02	66%	52.0	4.9	87 (20,19)	19 (15)
Fall City, NE	3.42	1.08	146%	45.9	4.0	89 (19)	18 (15,3)
Johnson Co. Exec. Apt	2.31	-0.32	88%	48.4	3.5	85 (19)	19 (15)
Joplin, MO	2.70	-0.72	79%	53.0	4.1	85 (20,19)	21 (15)
Kansas City (MCI), MO	2.81	0.44	119%	48.1	3.8	87 (19)	19 (15)
St. Joseph, MO	2.57	0.32	114%	46.6	3.7	88 (19)	14 (3)
Topeka (TOP	4.03	1.54	162%	49.0	4.2	89 (19)	21 (15,14)

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 – April 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: Abnormally dry and moderate and severe drought conditions continued in Kansas during early April but by the end of the month only 11.5% of the state was considered dry (no drought). May 2 saw removal of the dry conditions as well.

- April 4, a presidential directive prompted USDA to authorize emergency grazing of Conservation Reserve Program (CRP) lands in three states including Kansas. Ranchers impacted by March wildfires may be eligible.

- Qualified producers in 32 counties remain eligible for USDA disaster programs due to drought conditions in early 2017.

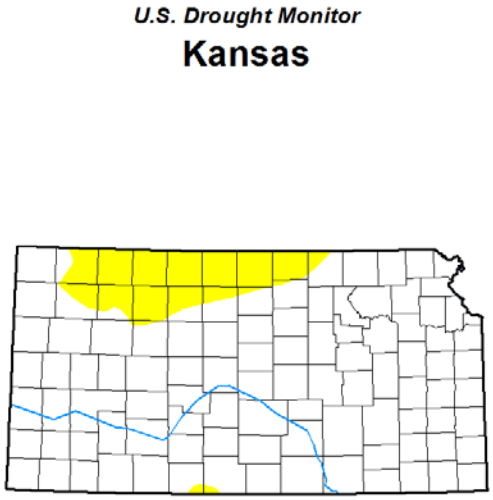
Lakes and Streams

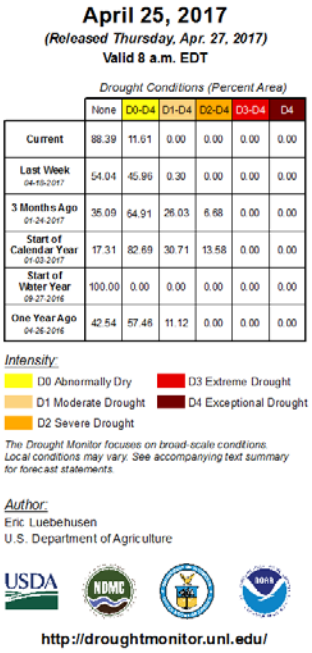
- Norton and Cedar Bluff continued to be significantly below conservation pool throughout the month.

- Precipitation the last week of April filled reservoir conservation pools that were not already full with the exception of Norton (42%), Cedar Bluff (32%) and Kirwin (90%).

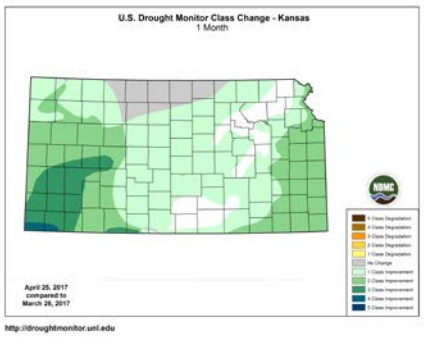
General Conditions

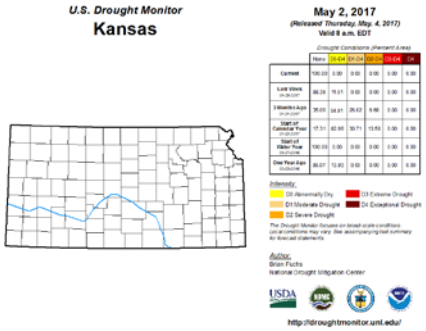
Higher than normal precipitation resulted in the U.S. Drought Monitor indicating improving conditions for much of Kansas by the end of April. Not included in the April 25 Drought Monitor were the heavy rains and snows that occurred April 25-30. By May 2, 2017 all dry conditions had been removed from Kansas in the Drought Monitor.





	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	88.39	11.61	0.00	0.00	0.00	0.00
Last Week 04-18-2017	54.04	45.96	0.30	0.00	0.00	0.00
3 Months Ago 01-24-2017	35.09	64.91	26.03	6.68	0.00	0.00
Start of Calendar Year 01-03-2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 09-27-2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 04-26-2016	42.54	57.46	11.12	0.00	0.00	0.00

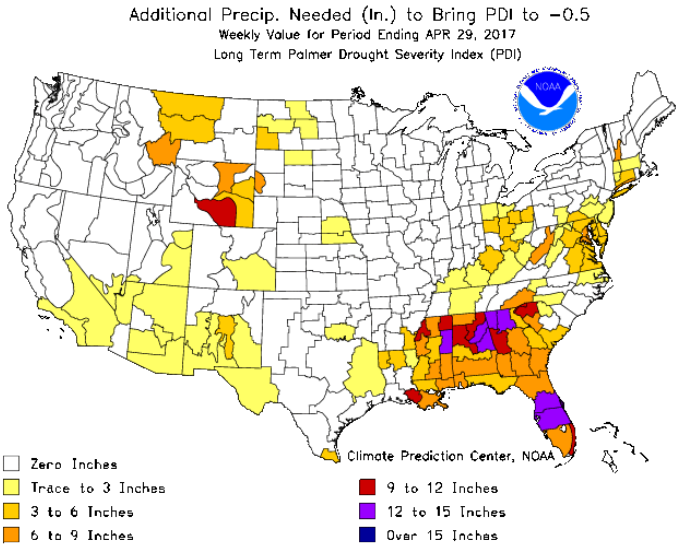




More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

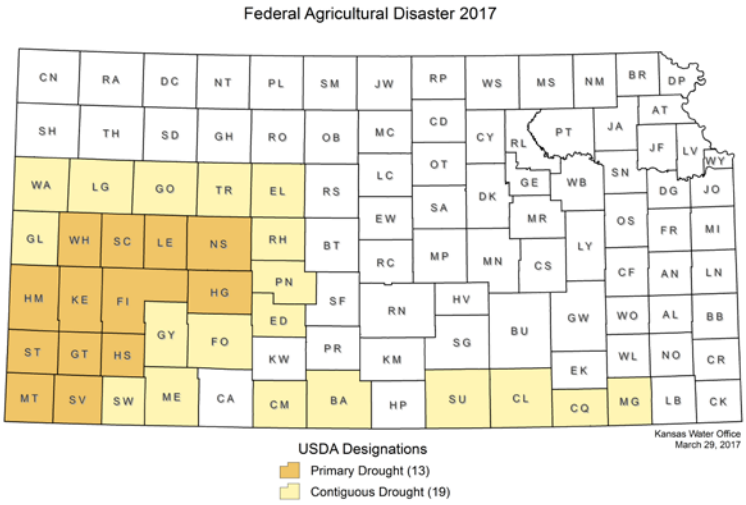
Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. More information on the PDSI can be found at http://www.droughtmanagement.info/palmer-drought-severity-index-pdsi/

The PDI for the period ending April 29, 2017 indicates all of Kansas drought free.



Federal Disaster Declarations

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

Early April estimated damages in Kansas:

- Counties affected include Clark, Comanche, Ellis, Ellsworth, Ford, Hodgeman, Kiowa, Lane, Lincoln, Meade, Ness, Russell, and Seward.

- An estimated 630,000 acres burned, primarily pasturelands.
- Estimated livestock loss: between 3,000 and 9,000 head of cattle.
- Large volumes of hay and feed destroyed.
- Estimated cost of fencing destroyed exceeds $36 million.

FEMA-Fire Management Assistance Declarations
Federal Emergency Management Agency (FEMA) issued Fire Management Assistance Declarations FM-5170 through 5176, for seven fire incidents in Kansas in early March. Assistance to state, local and tribal governments and certain private non-profit organizations for emergency work and repair was made available through these emergency declarations. No individual assistance has been approved.

Note Kansas Governor declared a state of emergency for 20 Kansas counties affected by wildfires (17-031).

Climate Summary (Temperature and Precipitation)

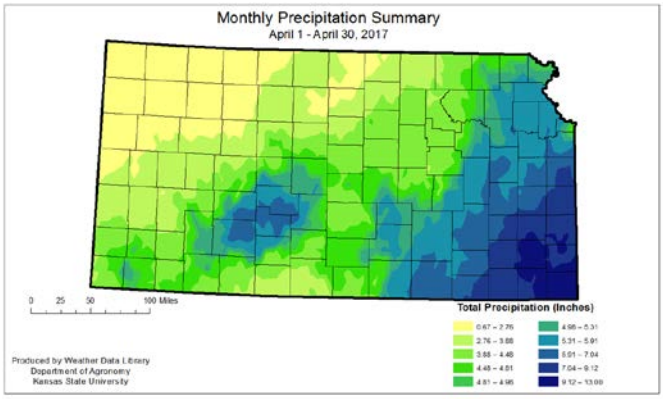
Much of the month was warmer than normal, the last week brought a return to cold, wintery weather in the western third of the state, and cold rainy weather in the east. Thirteen stations recorded record amounts of snow for a three-day spring storm ending on the 1st of May. There were widespread reports of more than a foot of snow. This was complicated by strong winds, with averages over 30 mph for more than six hours, and peak winds in excess of 55 miles per hour. The storm also included cold temperatures with lows below the freezing mark each of the three days of the storm, with some locations reporting over 48 hours of below freezing temperatures.

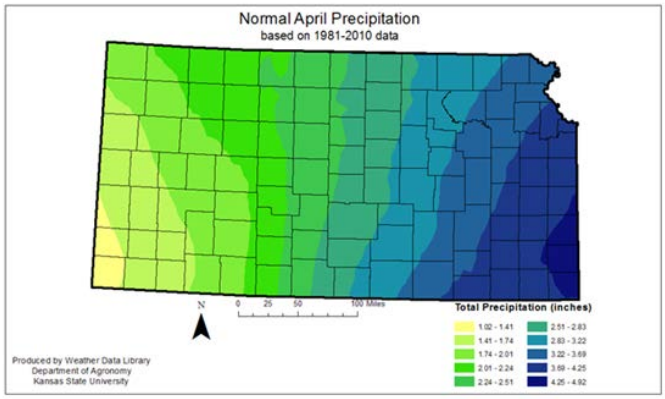
Despite the cold end, April was warmer than normal state-wide. There were four record high maximum temperatures during the month and 28 record high minimum temperatures during the month. On the cold side, there were 29 new record cold maximum temperature in April and 5 new record low minimum temperatures. Freezing temperatures were reported in all nine climate divisions, with the coldest low temperatures in the North Central and Central divisions reaching the mid to low twenties on the 27th of April. These temperatures resulted ranking 47th warmest April on record.

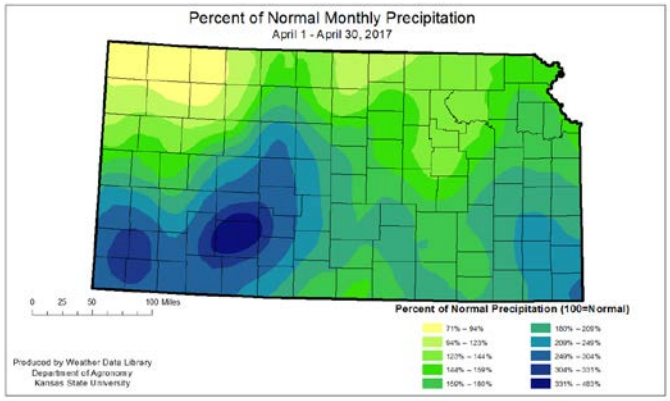
April 2017 was the sixth wettest April of 123 years, with 135 daily records set around Kansas. The state-wide average precipitation was 4.86 inches, or 145 percent of normal.

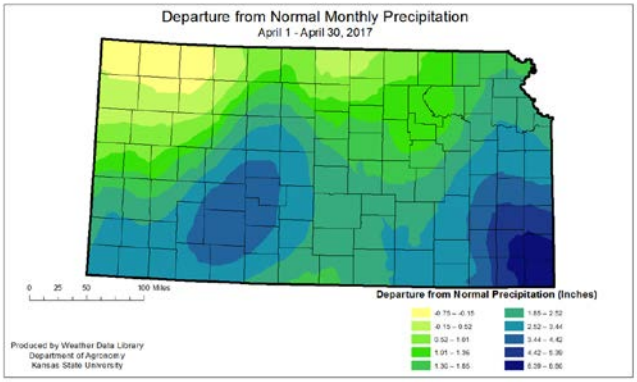
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library.

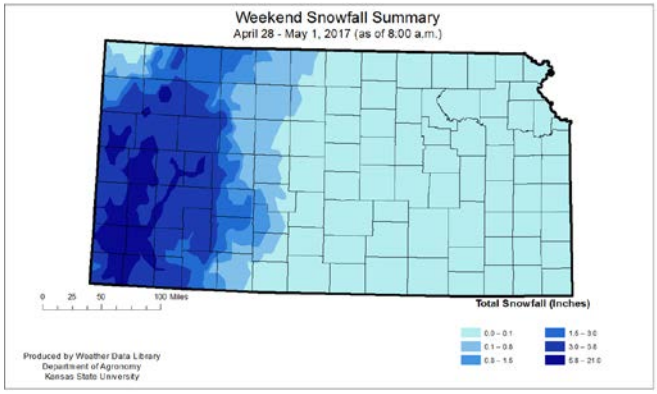
Kansas Climate Division Precipitation Summary (inches)												
	April 1-30, 2017			January 1- April 30, 2017			April 1, 2016 – April 30, 2017			September 1, 2016 – April 30, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.30	-0.77	62	3.57	-0.80	80	1.30	-0.77	62	7.70	-1.08	86
West Central	2.94	1.03	157	5.72	1.31	129	2.94	1.03	157	8.09	-0.73	91
Southwest	4.74	3.10	292	8.98	4.96	223	4.74	3.10	292	10.64	2.22	125
North Central	3.88	1.36	153	7.49	1.50	123	3.88	1.36	153	13.74	1.12	109
Central	5.27	2.61	202	9.74	3.13	148	5.27	2.61	202	15.51	2.18	115
South Central	6.03	3.33	227	12.74	5.42	176	6.03	3.33	227	21.39	6.31	140
Northeast	4.70	1.45	147	8.91	1.45	121	4.70	1.45	147	18.68	2.01	113
East Central	5.01	1.45	138	9.40	0.92	110	5.01	1.45	138	18.80	0.13	99
Southeast	8.32	4.45	213	14.11	4.24	143	8.32	4.45	213	27.12	5.29	125
STATE	4.86	2.19	185	9.27	2.76	144	4.86	2.19	185	16.01	2.20	113



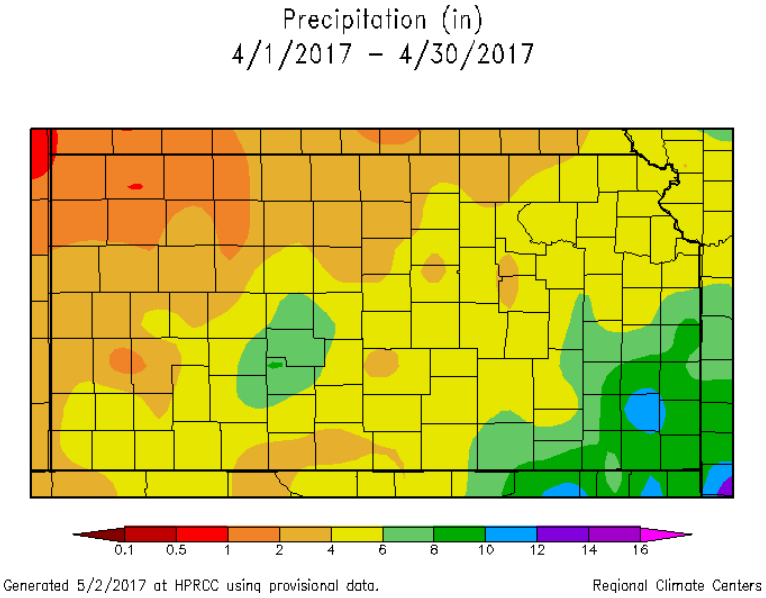


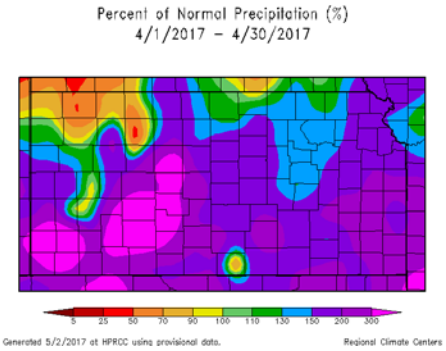


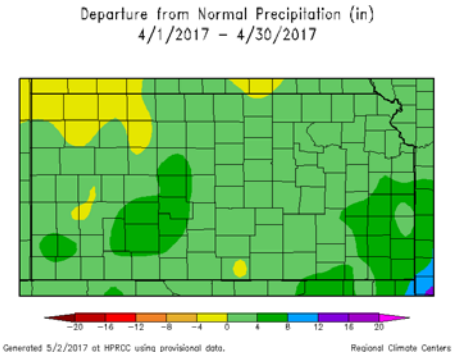




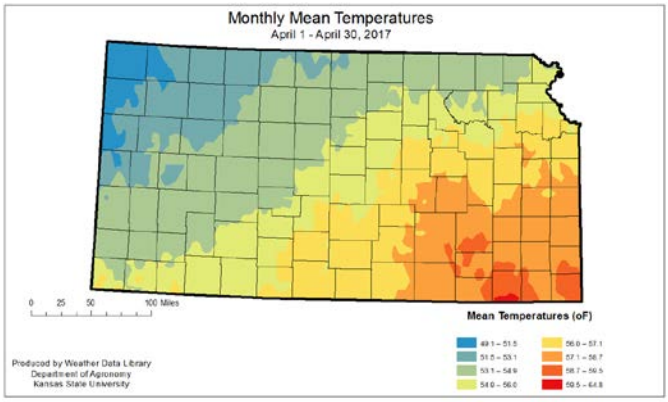
Precipitation summary for the month is provided in the maps below from the High Plains Regional Climate Center. The Climate Center information is provided also as a comparison to the K-State data. Various time intervals can be accessed at the climate center. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps .

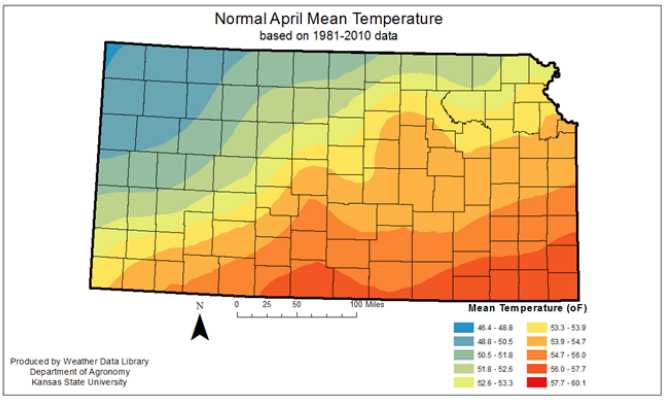


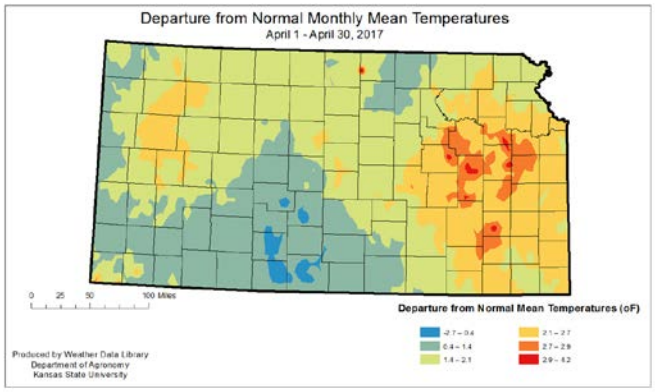




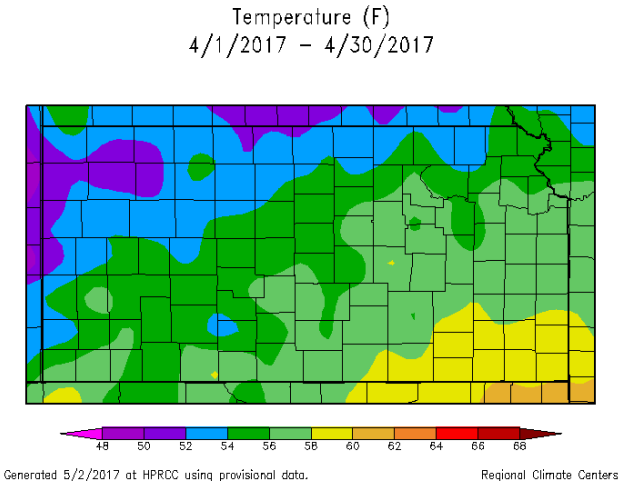
Climate Division	Kansas Climate Division Temperature Summary (°F)							
	April 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	65.2	37.8	51.5	1.7	89	15	25	12
West Central	66.3	38.7	52.5	1.6	90	15	26	2
Southwest	68.3	42.2	55.3	1.7	92	20	26	7
North Central	65.5	42.2	53.9	1.1	88	20	25	27
Central	67.0	43.5	55.3	1.3	90	21	20	27
South Central	67.4	44.4	55.9	0.7	87	20	28	7
Northeast	64.8	44.5	54.7	1.2	83	19	27	7
East Central	66.7	45.9	56.3	2.2	82	19	20	7
Southeast	68.3	47.2	57.7	1.9	83	9	31	7
STATE	66.6	42.9	54.8	1.5	92	20th	20	27th
Data Source: KSU Weather Library								

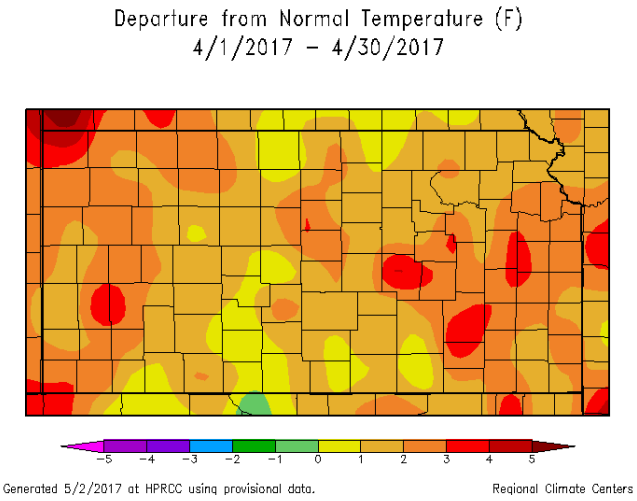






Temperature summary by the High Plains Regional Climate Center for the month is provided in the maps below.

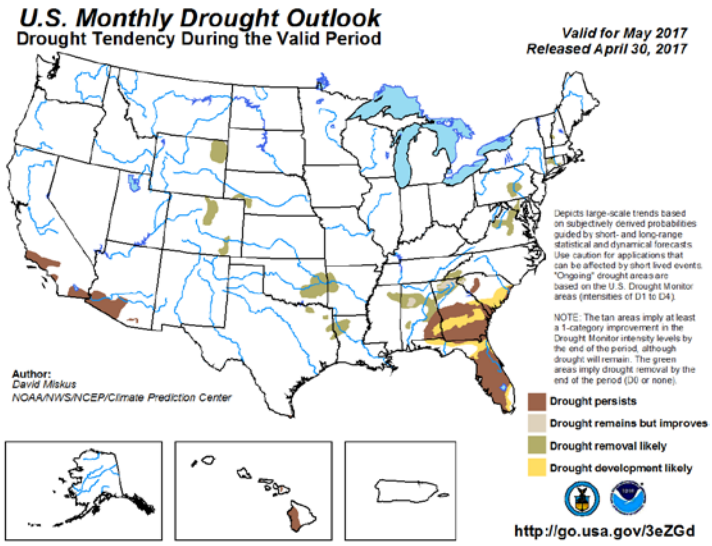


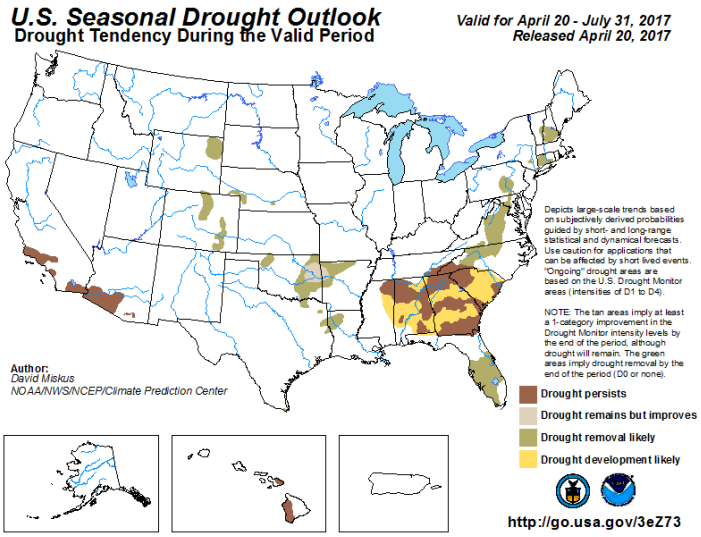


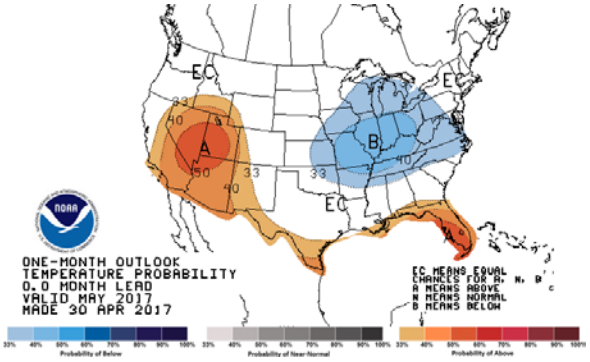
Future Outlook

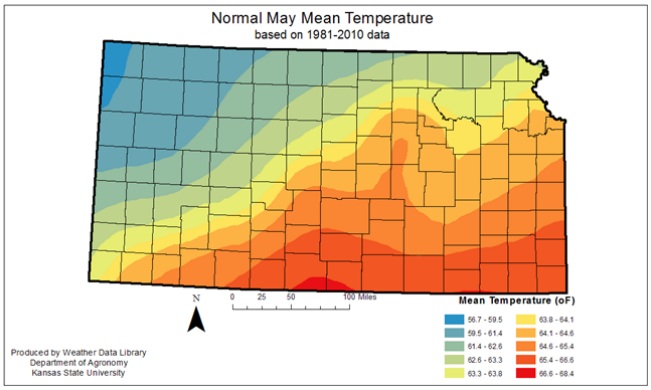
The May Drought Outlook is neutral, with no drought conditions in the state expected. The Seasonal Drought Outlook (3-month) also indicates drought conditions to remain absent.

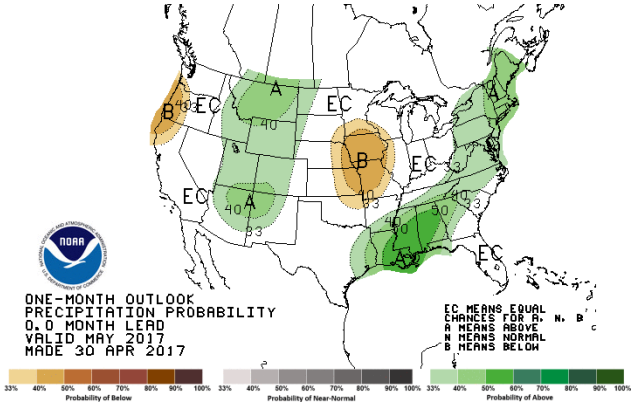
The individual temperature and precipitation outlooks are provided below for the one and three month periods. One month probabilities favor below normal temperatures and precipitation in eastern Kansas and normal in the west. Three month probabilities favor above normal temperatures and normal precipitation for the May, June and July period.

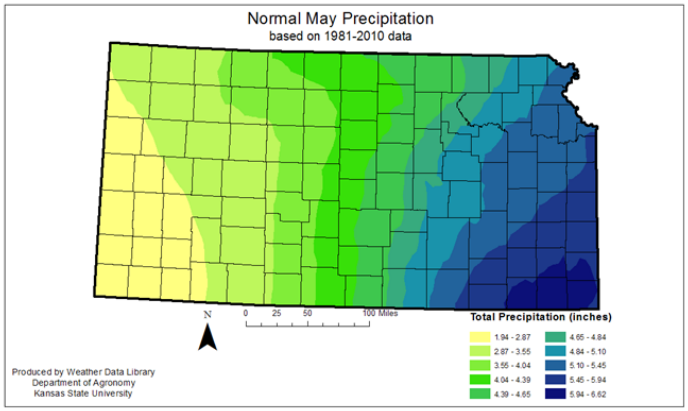


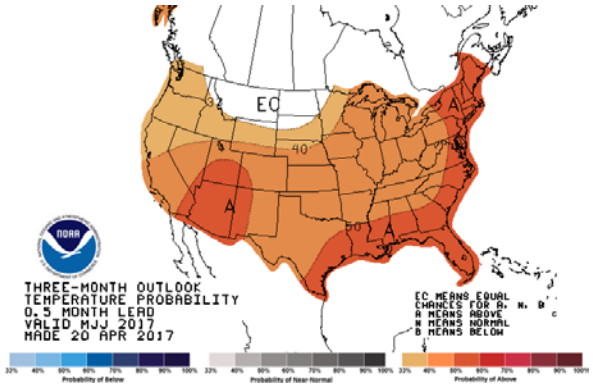


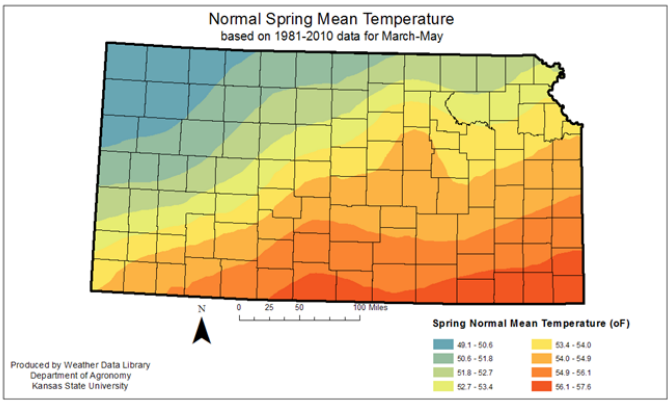


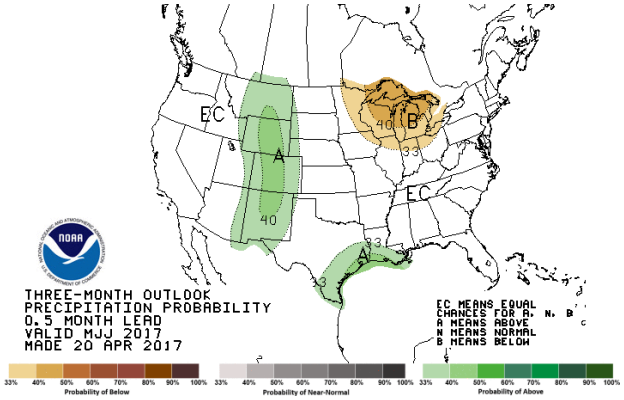


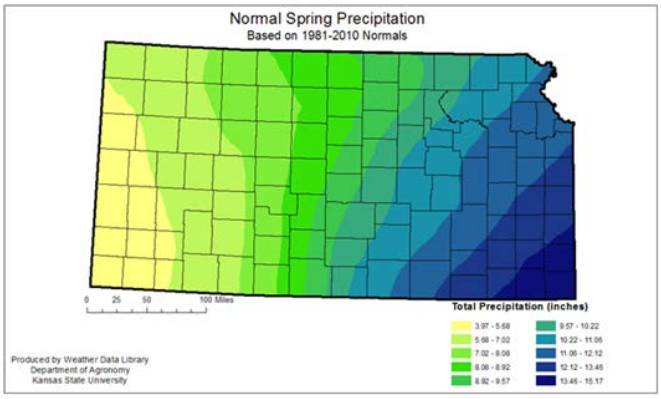












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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, under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of April 26, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed. (April 26, 2017, 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 26, 2017)

Surface Water Supply Conditions

Kansas River basin: Tuttle Creek, Perry, Milford and Clinton reservoirs received sufficient inflow to maintain levels at or above normal pool in April. Tuttle was drawn down below normal pool elevation to make room for anticipated additional inflow. Flows in the Kansas River remained well above historical median values throughout the month.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs experienced significant inflows at the beginning and end of April. Flow in the Marais des Cygnes River was maintained well above median values for the majority of the month, largely due to flood pool released from Pomona and Melvern reservoirs.

Cottonwood/Neosho basin: Marion, Council Grove, and John Redmond reservoirs all maintained flood pool storage throughout the month of April. Significant releases were made from all reservoirs, especially John Redmond. Streamflow remained well above historic median values in all reaches of the Cottonwood and Neosho rivers.

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs maintained storage well into flood pool. Streamflow was moderated by reservoir storage but the Fall and Verdigris rivers far exceeded historic median flow values the majority of the month.

Saline basin: Water level elevation at Wilson Lake increased another foot + during April and ended the month nearly 1.5 feet above normal pool elevation of 1,516.

Smoky Hill basin: The middle Smoky Hill basin experienced several healthy runoff events in April. The lower Smoky Hill basin streamflow was well above normal for April and Kanopolis Lake elevation increased to (and above) it's summer target level. Kanopolis storage is very healthy. Cedar Bluff Reservoir did experience a small amount of inflow and rose slightly in elevation at the beginning and end of the month.

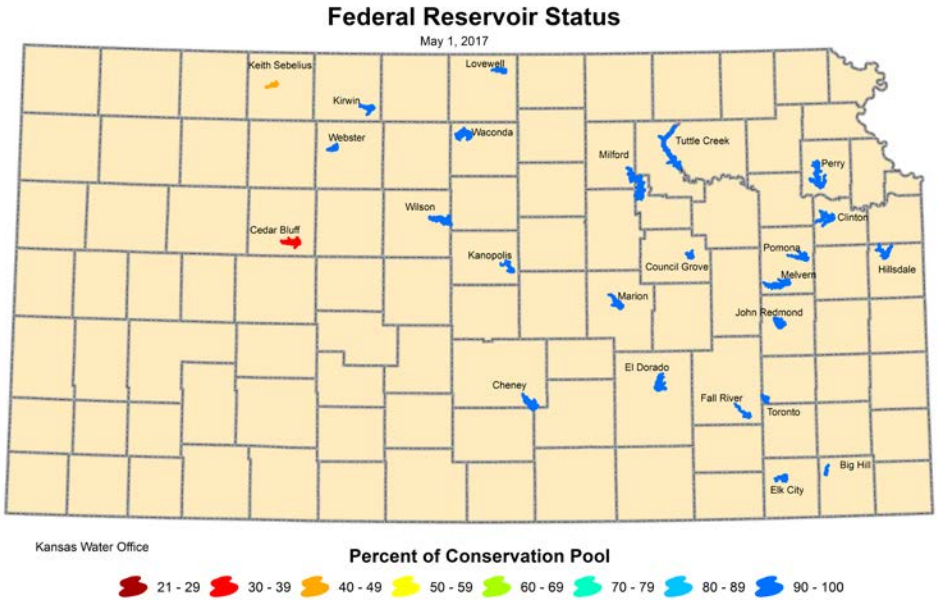
Harmful Blue-Green Algal Blooms (lake water safety)

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.

No advisories in effect.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton and Cedar Bluff reservoirs remain significantly below full conservation pool.



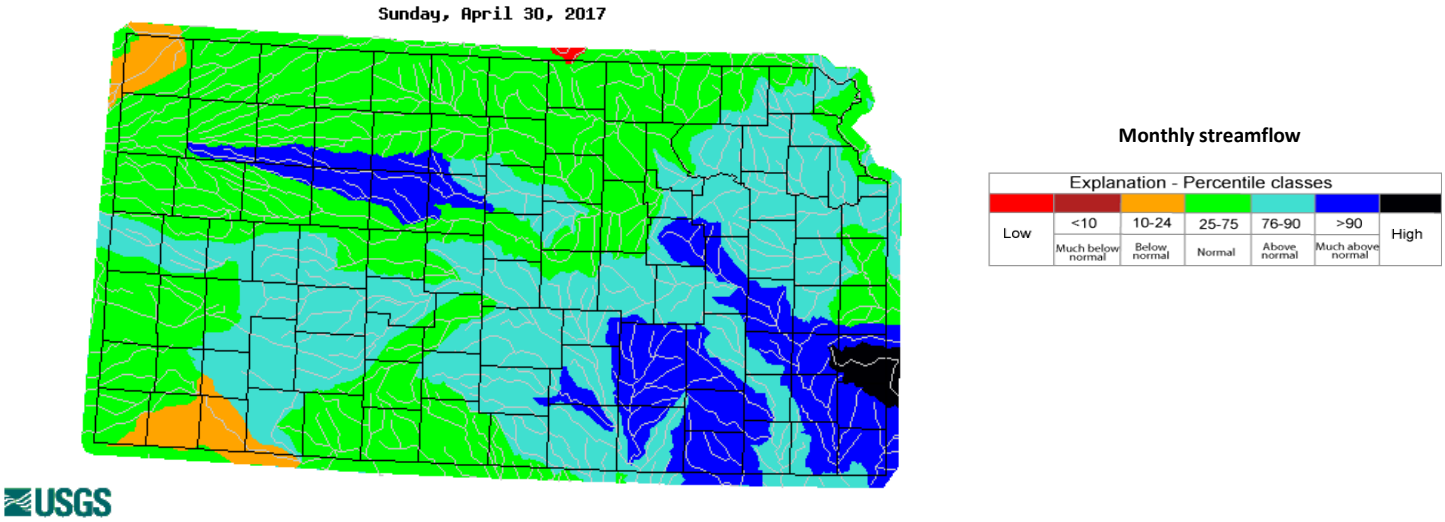
Kansas Federal Reservoir Conservation Pool Levels

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		**05/01/2017 06:00 AM**		
Norton[1]	2304.3	2292.36	-11.94	41.7
Harlan County, NE	1945.73	1939.43	-6.30	75.1
Lovewell[1]	1582.6	1584.96	2.36	100.0
Milford[1]	1144.4	1146.42	2.02	100.0
Cedar Bluff	2144	2119.05	-24.95	32.0
Kanopolis[1]	1463	1467.43	4.43	100.0
Wilson[1]	1516	1517.45	1.45	100.0
Webster[1]	1892.5	1893.73	1.28	100.0
Kirwin[1]	1729.3	1727.15	-2.10	89.5
Waconda[1]	1455.6	1455.67	0.07	100.0
Tuttle Creek[1]	1075	1076.33	1.33	100.0
Perry[1]	891.5	892.98	1.48	100.0
Clinton[1]	875.5	878.19	2.69	100.0
Melvern[1]	1036	1038.48	2.48	100.0
Pomona[1]	974	978.36	4.36	100.0
Hillsdale[1]	917	920.28	3.28	100.0
Arkansas River Basin		**05/01/2017 08:00 AM**		
Cheney	1421.6	1422.75	1.15	100.0
El Dorado	1339	1340.65	1.65	100.0
Toronto[1]	901.5	913.38	11.88	100.0
Fall River[1]	948.5	959.03	10.53	100.0
Elk City[1]	796	807.02	11.02	100.0
Big Hill	858	861.71	3.71	100.0
Council Grove[1]	1274	1275.07	1.27	100.0
Marion[1]	1350.5	1351.17	0.67	100.0
John Redmond[1]	1039	1054.92	13.92	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.

Streamflow Conditions
The comparison of the present 28-dayy streamflow compared to historical is shown on 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. No MDS administration occurred in March.

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates some flood conditions occurred in Kansas this month.

USGS station number	USGS station name	Drain. Area [mi2]	NWS flood stage [ft]	No. of days above flood stage	NWS flood class	Highest peak from 2017-04-01 to 2017-04-30				Historical Peaks	
						Date	Stage (ft)	Stream flow (date) [ft^3/s]	Rank	No. of years	Max. [year] [ft^3/s]
6888500	MILL C NR PAXICO, KS	318	21	1	Minor Flooding	4/5/2017	22.3	11300	32	62	77200 [1951]
6891850	STRANGER C AT EASTON, KS	216	17	4	Moderate Flooding	4/6/2017	19.92	5650	--	--	--
6913000	MARAIS DES CYGNES R NR POMONA, KS	1040	20	1	Minor Flooding	4/30/2017	20.31	7720	40	61	69400 [1928]
6914100	POTTAWATOMIE C NR SCIPIO, KS	343	23	1	Major Flooding	4/30/2017	25.44	8710	5	13	141000 [2007]
6915800	MARAIS DES CYGNES R AT LA CYGNE, KS	2669	25	1	Minor Flooding	4/30/2017	28.54	18600	17	30	131000 [2007]
6916600	MARAIS DES CYGNES R NR KS-MO ST LINE, KS	3250	27	1	Minor Flooding	4/30/2017	28.67	23800	25	56	137000 [2007]
6917000	L OSAGE R AT FULTON, KS	314	22	2	Moderate Flooding	4/30/2017	28.02	13300	14	66	62800 [1986]
6917500	MARMATON R NR FORT SCOTT, KS	388	38	2		4/30/2017	43.25	22800	13	56	38100
7146500	ARKANSAS R AT ARKANSAS CITY, KS	43713	11	2	Minor Flooding	4/7/2017	12.87	23600	45	97	103000 [1923]
7156900	Cimarron River near Forgan, OK	8536	5	3	Moderate Flooding	4/9/2017	6.04	1380 (2017-04-18)	44	76	69000 [1942]
7170500	VERDIGRIS R AT INDEPENDENCE, KS	2892	30	1	Minor Flooding	4/30/2017	33.94	26700	45	100	153000 [2007]
7182260	COTTONWOOD R AT EMPORIA, KS	1845	20	4	Moderate Flooding	4/1/2017	24.64	18600	1	1	9570 [2014]
7182390	NEOSHO R AT NEOSHO RAPIDS, KS	2753	22	5	Moderate Flooding	4/1/2017	24.54	20500	3	5	24900 [2010]
7183000	NEOSHO R NR IOLA, KS	3723	15	1	Minor Flooding	4/30/2017	16.79	22000	61	108	436000 [1951]
7183500	NEOSHO R NR PARSONS, KS	4905	21	3	Minor Flooding	4/22/2017	21.24	21200	72	93	410000 [1951]
7184000	LIGHTNING C NR MCCUNE, KS	197	12	3	Minor Flooding	4/22/2017	13.91	3440	47	64	67500 [1993]
7187600	SPRING R NR BAXTER SPRINGS, KS	2448	14	2	Moderate Flooding	4/30/2017	27.99	103000	1	5	60900 [2009]

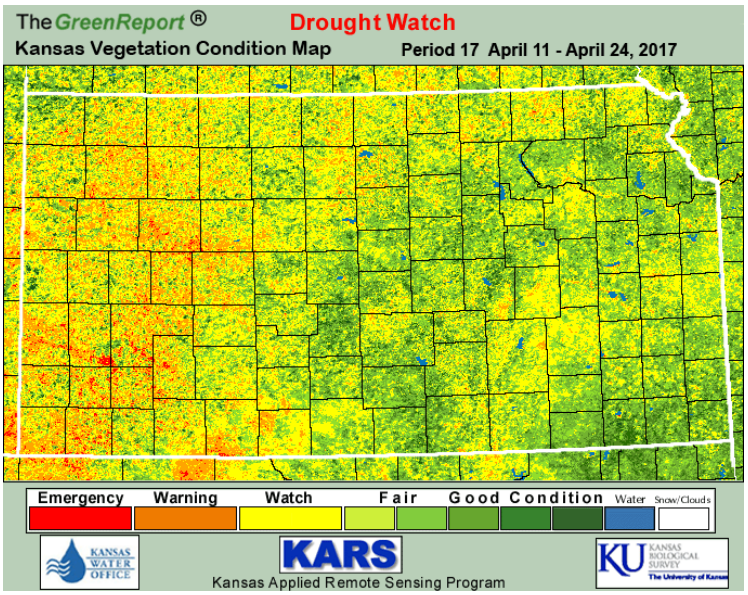
Near Flood stage, Minor Flooding, Moderate Flooding Major Flooding

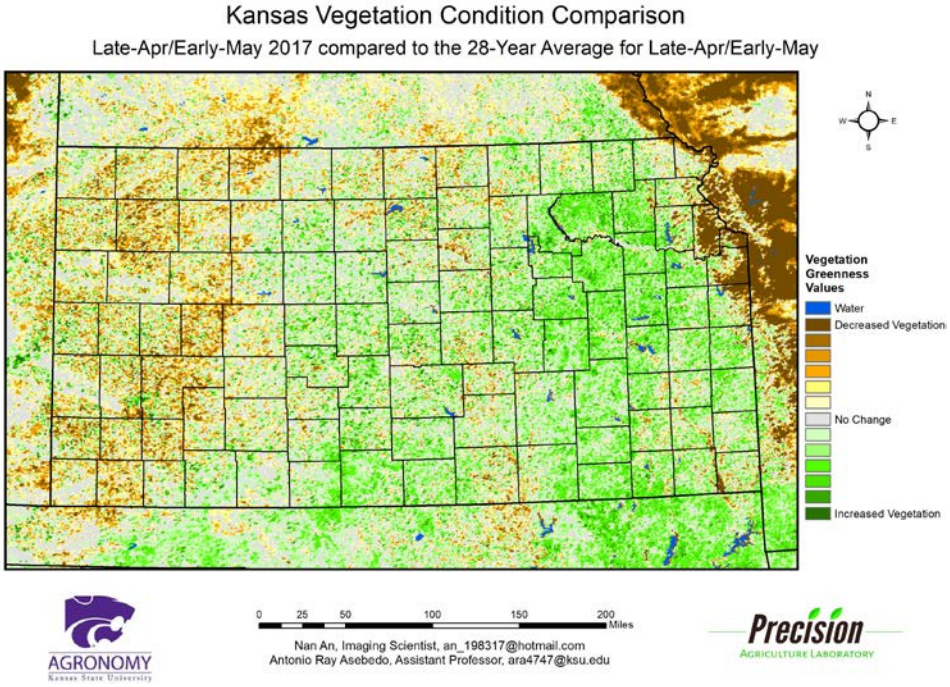
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

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. Most of the eastern and central areas of the state were showing good conditions by April 24. The western areas are still in need of moisture.



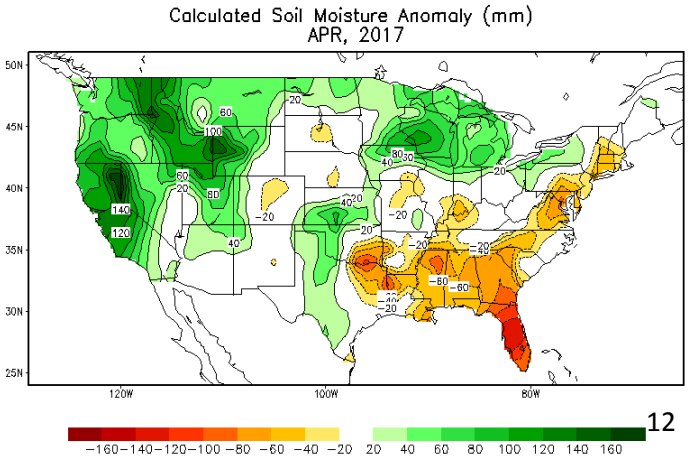


The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition from K-State's Precision Agriculture Laboratory.

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

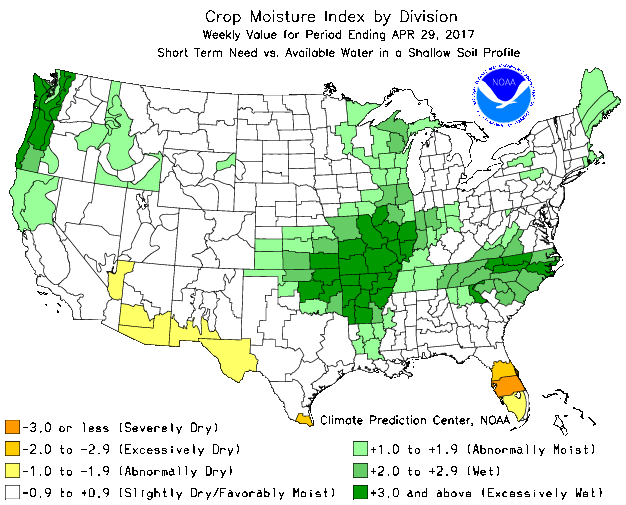
Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion which may be found at:
http://www.ksre.ksu.edu/p.aspx?tabid=255.



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 published May 1, 2017 reported topsoil moisture rated 0 percent very short, 4 short, 70 adequate, and 26 surplus. Subsoil moisture rated 1 percent very short, 10 short, 75 adequate, and 14 surplus.

Field Crops Report: Winter wheat condition rated 4 percent very poor, 12 poor, 35 fair, 43 good and 6 excellent.

Livestock, Pasture, and Range Report: Hay and roughage supplies rated 1 percent very short, 5 short, 86 adequate, 8 surplus. Stock water supplies were 1 percent very short, 3 short, 76 adequate and 20 surplus. (http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Crop_Progress_and_Condition/current.pdf)



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.

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

April 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	2.53	1.07	173%	51.7	3.8	86 (14)	30 (11,10)
Dodge City	7.66	5.84	421%	55.5	1.6	88 (19)	32 (30)
Garden City	3.44	1.72	200%	54.6	1.6	91 (19)	27 (6)
Goodland	2.12	0.53	133%	51.1	1.9	88 (14)	27 (11)
Guymon, OK	4.04	2.53	268%	57.6	2.4	91 (19)	31 (23,6)
Hill City	2.25	0.13	106%	55.1	3.5	87 (14)	26 (11)
Lamar, CO	1.42	0.10	108%	54.3	2.0	91 (14)	26 (2)
McCook, NE	1.25	-1.06	54%	53.3	3.8	89 (14)	25 (11)
Springfield, CO	4.84	3.57	381%	51.6	0.0	85 (19)	26 (23,10)
Central							
Concordia	5.34	2.89	218%	53.7	0.6	81 (19)	27 (11)
Hebron, NE	3.00	0.21	108%	52.9	1.9	85 (19)	25 (11)
Medicine Lodge	4.22	1.79	174%	57.8	1.7	87 (9)	30 (6)
Ponca City, OK	6.23	2.79	181%	60.6	2.2	83 (25,15)	36 (27,6)
Salina	3.65	0.60	120%	57.7	2.5	86 (15)	30 (27)
Wichita (ICT)	7.28	4.69	281%	57.8	1.7	82 (19)	34 (27)
East							
Bartlesville, OK	10.62	6.64	267%	60.5	1.7	85 (8)	32 (7)
Chanute	11.02	6.62	250%	59.1	2.3	82 (15)	31 (7)
Fall City, NE	6.41	3.23	202%	54.6	1.4	80 (19,9)	30 (7)
Johnson Co. Exec. Apt	5.80	1.81	145%	56.7	1.6	79 (15)	33 (7)
Joplin, MO	11.24	6.77	251%	60.5	2.1	82 (15,14)	31 (7)
Kansas City (MCI), MO	6.64	2.94	179%	57.0	2.2	81 (19,15)	34 (7)
St. Joseph, MO	4.64	0.85	122%	54.3	0.1	82 (19)	31 (7)
Topeka (TOP	6.04	2.51	171%	57.6	2.5	82 (19,15)	31 (7)

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 – May 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

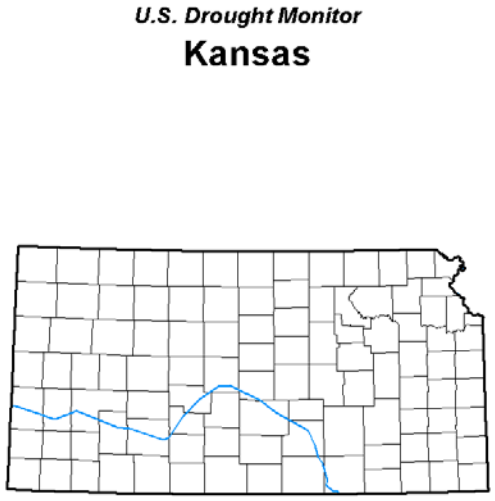
- U.S. Drought Monitor: no dry or drought conditions in Kansas during May.
- Producers in 32 counties remain eligible for USDA disaster programs due to drought conditions in early 2017.
- The state-wide average precipitation for May was 4.66 inches which is 113 percent of normal.
- Federal Disaster Declaration for 27 Kansas Counties affected by the April 28-May 3 winter storm allow county governments to apply for assistance.

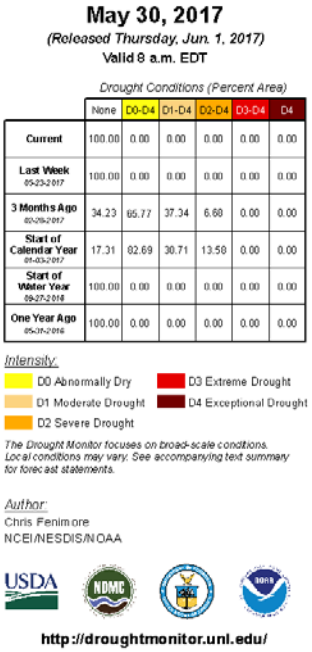
Lakes and Streams

- Marion Reservoir, Marion County is under a Blue-Green Algae (BGA) public health warning as of June 2, waters are unsafe. People, pets and livestock should not consume the water or come in contact with it.
- Norton and Cedar Bluff reservoirs continued to be below conservation pool at 45% and 33% respectively May 30.
- Flood flows occurred at 32 locations for varying durations throughout the month of May.

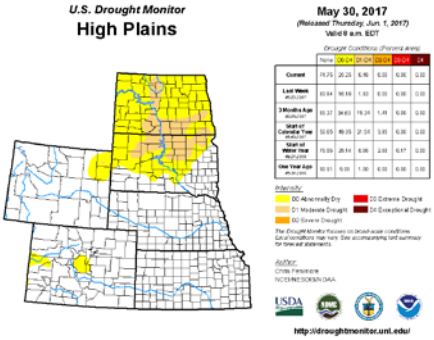
General Conditions

The higher than normal precipitation resulted in continued drought free conditions state-wide for May.

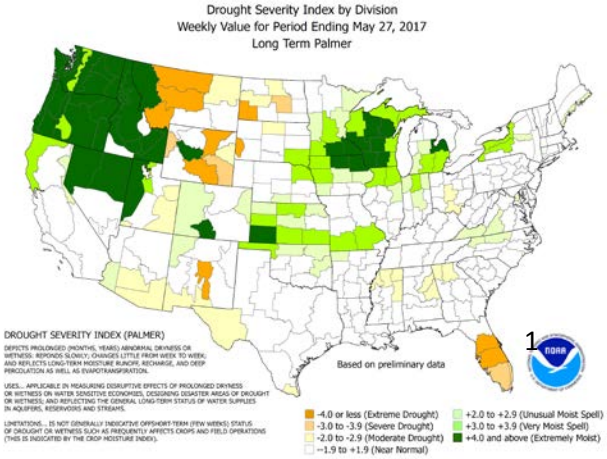




	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week 05-23-2017	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago 02-28-2017	34.23	65.77	37.34	6.68	0.00	0.00
Start of Calendar Year 01-03-2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 09-27-2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 05-31-2016	100.00	0.00	0.00	0.00	0.00	0.00



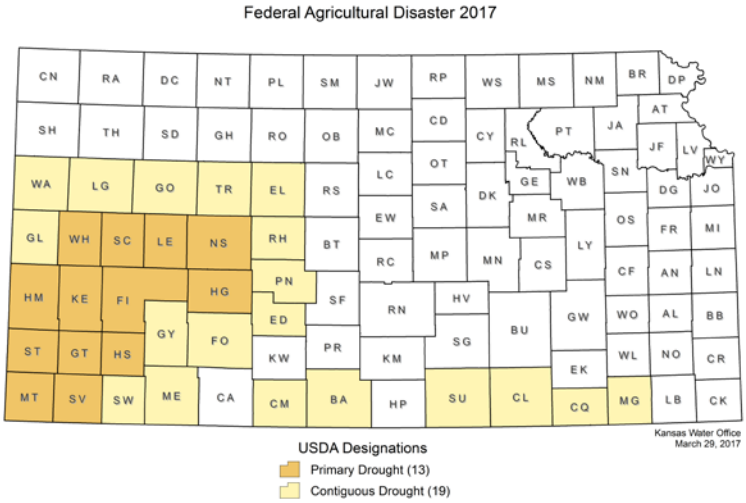
More information on the U.S. Drought Monitor categories can be found at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.



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

Federal Disaster Declarations

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

FEMA-Fire Management Assistance Declarations

Federal Emergency Management Agency (FEMA) issued Fire Management Assistance Declarations FM-5170 through 5176, for seven fire incidents in Kansas in early March. Assistance to state, local and tribal governments and certain private non-profit organizations for emergency work and repair was made available through these emergency declarations. No individual assistance has been approved.

Note: Kansas Governor declared a state of emergency for 20 Kansas counties affected by wildfires (17-031).

Federal Disaster for Severe Winter Storm

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck Kansas April 28-May 3.

Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace and Wichita. Additional designations may be made at a later date if requested by the state and warranted by the results of further damage assessments.

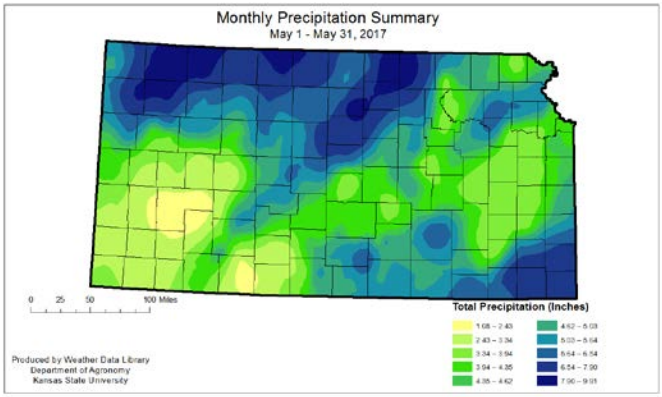
The declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

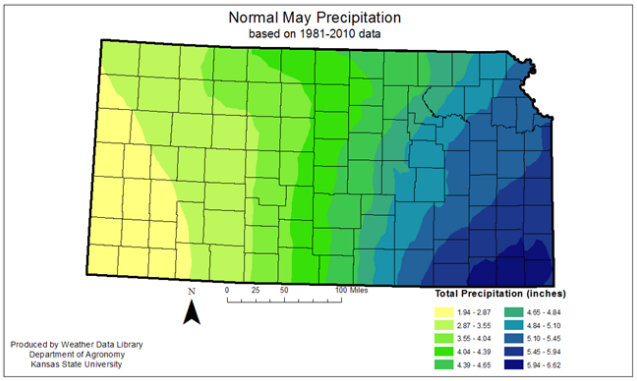
Climate Summary (Temperature and Precipitation)

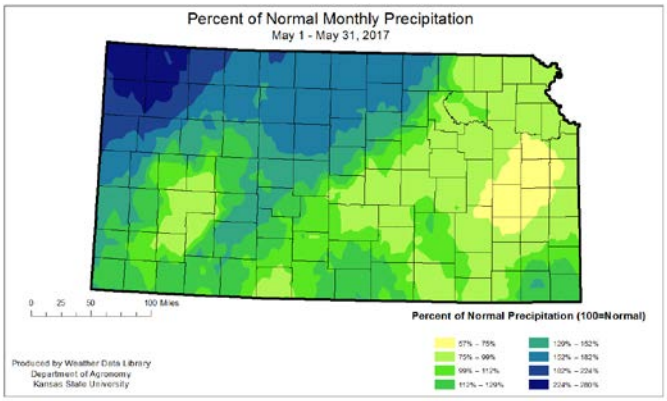
The epic April blizzard carried into the first of May, with significant snowfall reported from the event. This started a wetter than normal May for most of the state. The state-wide average precipitation was 4.66 inches which is 113 percent of normal. The North Central Climate Division had the highest percent of normal with an average of 6.32 inches or 154 percent of normal. The Northeast, East Central and Southwest divisions were below normal for the month, but given the very wet conditions in April, all divisions are above normal for the April – May period. Rains were frequent enough that even the divisions with below normal precipitation had planting delays. The greatest monthly precipitation total for a National Weather Service (NWS) Coop station was 9.49 inches at Oswego 1N, Labette County. The greatest monthly total for a Community Collaborative Rain, Hail and Snow (CoCoRaHS) station was 9.91 inches at Beloit 9.9 SSW, Mitchell County. The highest 24hr totals: 5.18 inches at Norwich, Kingman County, on the 12th (NWS); 5.00 inches at Abilene 0.7 E, Dickinson County, on the 19th (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)												
	May 1-31, 2017			January 1- May 31, 2017			April 1, 2016 – May 31, 2017			September 1, 2016 – May 31, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	4.66	1.2	134	7.93	0.10	100	5.66	0.13	102	12.06	-0.19	97
West Central	4.26	1.23	140	9.75	2.32	131	6.97	2.03	142	12.11	0.26	102
Southwest	2.39	-0.34	88	11.34	4.59	168	7.11	2.74	164	13.01	1.86	116
North Central	6.32	2.24	154	13.29	3.22	131	9.68	3.08	146	19.53	2.83	117
Central	5.42	1.15	130	14.80	3.92	137	10.33	3.40	152	20.58	2.98	117
South Central	5.02	0.63	114	17.61	5.90	151	10.90	3.81	154	26.26	6.79	133
Northeast	4.14	-0.65	88	12.66	0.41	105	8.45	0.41	107	22.43	0.97	105
East Central	4.11	-1.04	79	13.32	-0.31	97	8.93	0.23	101	22.71	-1.11	94
Southeast	5.85	0.06	101	19.80	4.14	127	14.01	4.35	144	32.81	5.19	119
STATE	4.66	0.49	113	13.68	3.00	130	9.27	2.43	137	20.42	2.44	112



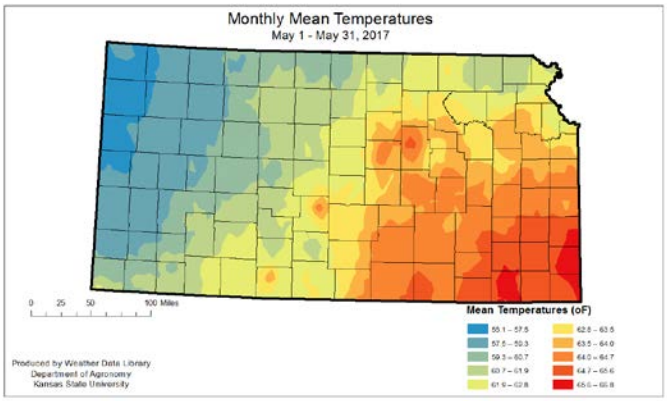


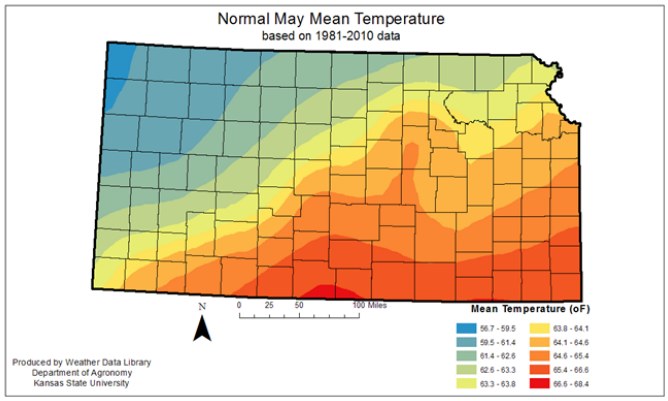


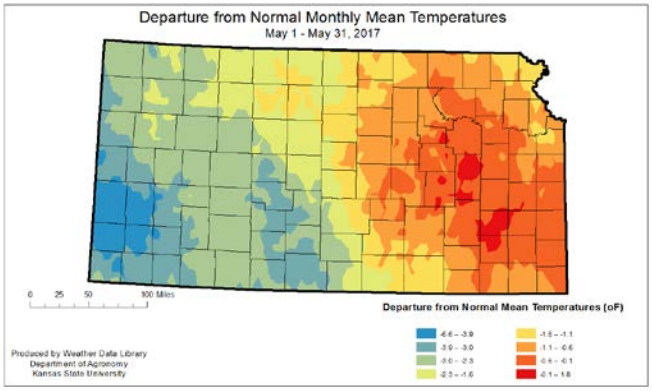
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Temperatures were slow to recover from the cooler than normal start. State-wide temperatures averaged 61.8 °F or -1.7 degrees from normal. The East Central and Southeast climate divisions averaged closest to normal with a departure of -0.7 °F respectively. The warmest reading for the month was 95 °F at Elkhart, Morton County, on the 26th. The coldest reading, not surprisingly was at the beginning of the month when Hays 1ESE recorded a low of 22 °F on the 1st. Despite the cool temperatures, there were five record high maximum temperatures during the month and seven record high minimum temperatures. On the cold side, there were 41 new record cold maximum temperatures in May and 33 new record low minimum temperatures. Of the record cold maximum temperatures, 15 set new records for any day in May. Freezing temperatures were reported in five of the nine climate divisions. The exceptions were the South Central Division and the eastern divisions. All divisions, except the Southeast, saw high temperatures reach 90 °F or more.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	May 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	72.1	44.3	58.2	-1.9	93	16	29	4
West Central	73.8	44.6	59.2	-2.1	93	16	28	1
Southwest	75.5	46.6	61.1	-2.7	95	26	30	2
North Central	74.3	48.8	61.6	-1.6	91	16	28	1
Central	75.5	50.0	62.8	-1.5	93	16	22	1
South Central	75.7	50.1	62.9	-2.5	92	15	34	5
Northeast	74.0	50.1	62.0	-1.7	91	16	36	1
East Central	74.3	52.7	63.5	-0.7	90	16	35	1
Southeast	76.2	53.3	64.8	-0.7	88	19	36	1
STATE	74.6	48.9	61.8	-1.7	95	26th	22	1st
Data Source: KSU Weather Library								







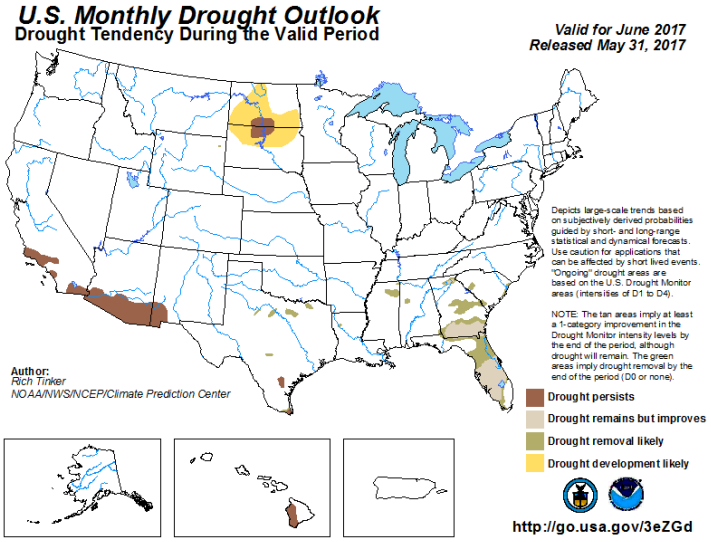
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

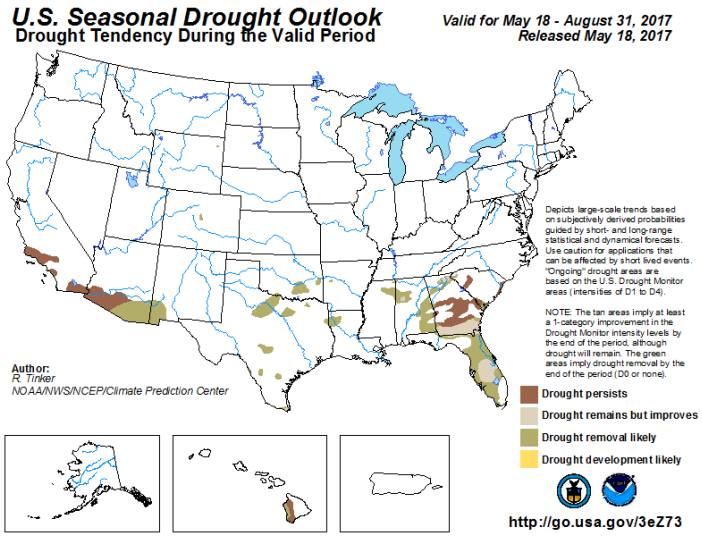
After the remnants of the winter storm, an outbreak of typical spring severe weather occurred. There were 37 reports of tornadoes, 160 hail reports and 106 high wind reports. The largest outbreak came during the week of May 16th to May 22nd when 35 tornadoes and 123 hail events were reported.

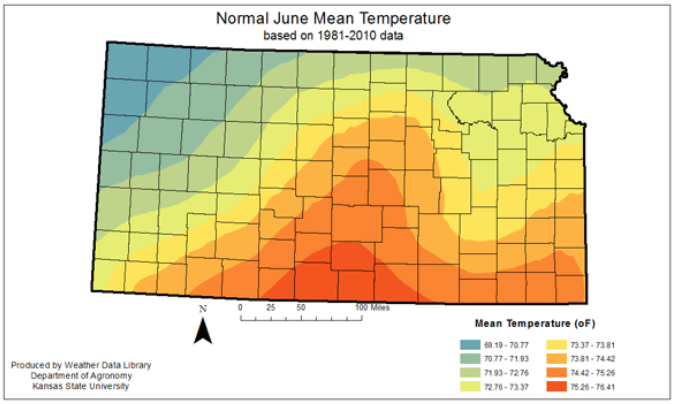
Future Outlook

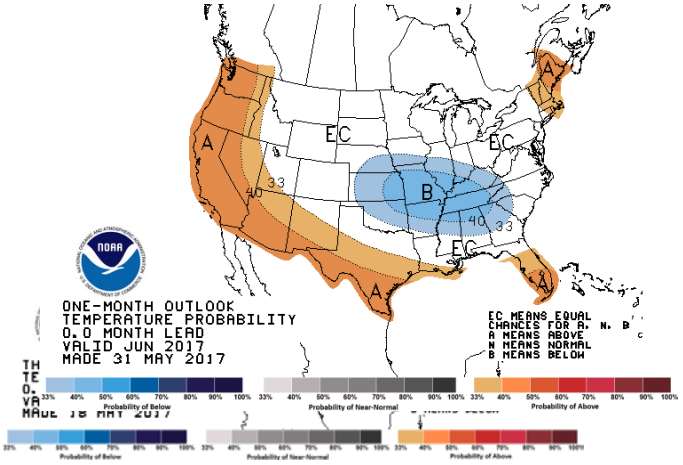
The June outlook calls for a slightly increased chance of wetter than normal conditions across the state coupled with equal chances of above or below normal temperatures. The Seasonal Drought Outlook (3-month) also indicates drought conditions to remain absent.

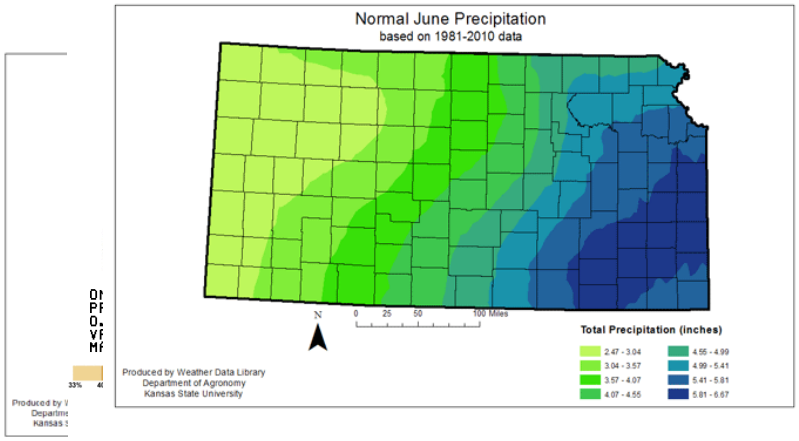
The individual temperature and precipitation outlooks are provided below for the one and three month periods. One month probabilities favor below normal temperatures and precipitation in eastern Kansas and normal in the west. Three month probabilities favor above and normal precipitation for the June, July and August period, with equal probabilities of temperatures being above or below normal.

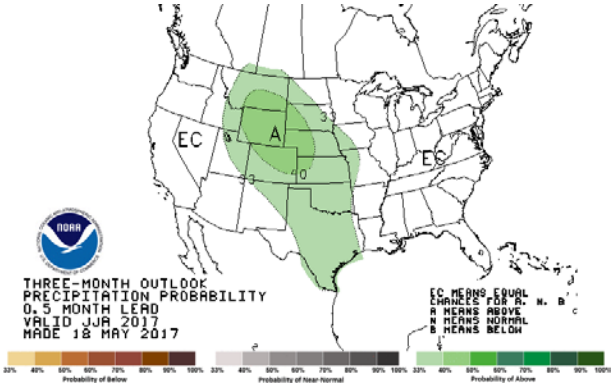


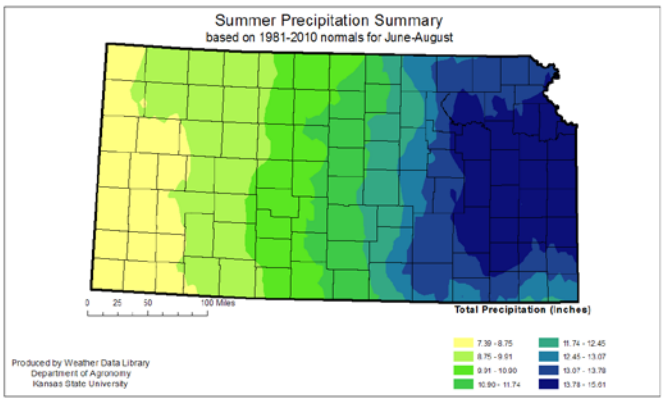












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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, under Resolution 03-16 are in place for the **City of Russell,** Russell County water customers as of May 30, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed. (May 30, 2017, 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 30, 2017)

Surface Water Supply Conditions

Kansas River basin: Tuttle Creek, Perry, Milford and Clinton reservoirs received above average inflow and maintained levels within flood pool in May. Flows in the Kansas River remained well above historical median values throughout the month.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs experienced healthy inflows in May. Flow in the Marais des Cygnes River was maintained near or above median values for the majority of the month, largely due to flood pool releases.

Cottonwood/Neosho basin: Marion, Council Grove, and John Redmond reservoirs all maintained flood pool storage throughout the month of May. Significant releases were made from all reservoirs, especially John Redmond. Streamflow remained well above historic median values in all reaches of the Cottonwood and Neosho rivers.

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs maintained storage well into flood pool. Streamflow was moderated by reservoir storage but the Fall and Verdigris rivers far exceeded historic median flow values the majority of the month.

Saline basin: Water level elevation at Wilson Lake increased another 2 feet during May and ended the month more than 3.5 feet above normal pool elevation of 1,516.

Smoky Hill basin: The middle Smoky Hill basin experienced several healthy runoff events and the lower Smoky streamflow was well above normal for May. Kanopolis Lake elevation remained above its summer target level. Kanopolis storage is very healthy. Cedar Bluff Reservoir did experience a small amount of inflow and rose steadily in elevation over the month, resulting in nearly a one foot increase.

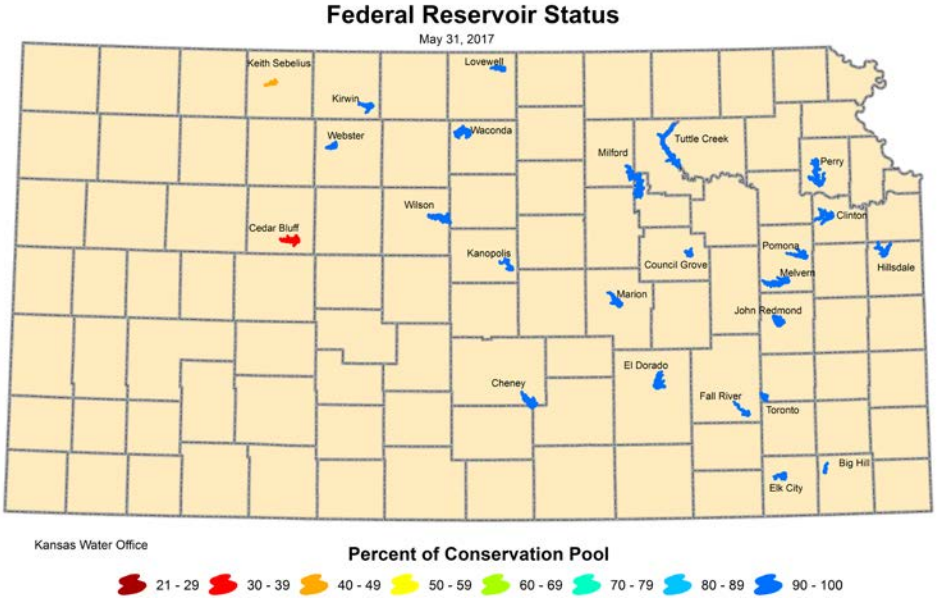
Harmful Blue-Green Algal Blooms (lake water safety)

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.

No advisories were in effect during May 2017, however on June 2nd a public health warning was issued by KDHE for Marion Reservoir, Marion County. This warning is to notify the public that conditions are unsafe and water contact should not occur (no swimming, wading, skiing or consumption of the water should occur).

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton and Cedar Bluff reservoirs remain significantly below full conservation pool. Kirwin is the only other reservoir where the conservation pool is not



full at 96%.

Kansas Federal Reservoir Conservation Pool Levels

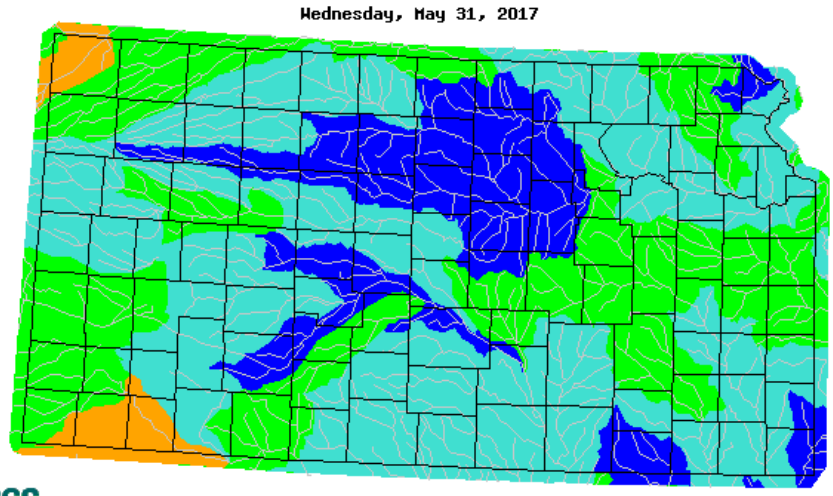
Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**05/30/2017 06:00 AM**		
Norton[1]	2304.3	2293.30	-11.00	45.1
Harlan County, NE	1945.73	1941.64	-4.09	83.5
Lovewell[1]	1582.6	1584.46	1.86	100.0
Milford[1]	1144.4	1148.71	4.31	100.0
Cedar Bluff	2144	2119.89	-24.11	33.3
Kanopolis[1]	1463	1473.07	10.07	100.0
Wilson[1]	1516	1519.69	3.69	100.0
Webster[1]	1892.5	1894.76	2.31	100.0
Kirwin[1]	1729.3	1728.38	-0.87	95.6
Waconda[1]	1455.6	1458.68	3.08	100.0
Tuttle Creek[1]	1075	1090.53	15.53	100.0
Perry[1]	891.5	897.23	5.73	100.0
Clinton[1]	875.5	877.63	2.13	100.0
Melvern[1]	1036	1038.50	2.50	100.0
Pomona[1]	974	977.98	3.98	100.0
Hillsdale[1]	917	918.40	1.40	100.0
Arkansas River Basin		**05/30/2017 08:00 AM**		
Cheney	1421.6	1424.85	3.25	100.0
El Dorado	1339	1343.10	4.10	100.0
Toronto[1]	901.5	918.60	17.10	100.0
Fall River[1]	948.5	964.65	16.15	100.0
Elk City[1]	796	811.73	15.73	100.0
Big Hill	858	858.11	0.11	100.0
Council Grove[1]	1274	1276.53	2.53	100.0
Marion[1]	1350.5	1352.15	1.65	100.0
John Redmond[1]	1039	1053.40	12.40	100.0

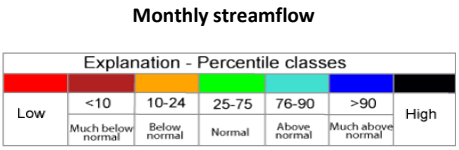
[1]Lake level management plan in place — Source: U.S. Army Corps of Engineers

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.

Streamflow Conditions

The comparison of the present 28-day streamflow compared to historical is shown on 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. No MDS administration occurred in May.

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates some flood conditions occurred in Kansas this month as monitored at the gages in the table below.

USGS station number	USGS station name	Drain. area [mi^2]	NWS flood stage [ft]	No. of days above flood stage	NWS flood class	Highest peak from 2017-05-01 to 2017-05-31 Date	Stage [ft]	Stream flow (date)[ft^3/s]	Rank	Historical Peaks No. of years	Max. (year) [ft^3/s]
6818300	MISSOURI R AT ATCHISON, KS	--	22	3		5/21/2017	23.51	--	--	--	--
6856000	REPUBLICAN R AT CONCORDIA, KS	23560	15	1		5/20/2017	15.64	13100	25	77	207000 1935
6856600	REPUBLICAN R AT CLAY CENTER, KS	24542	15	7		5/20/2017	19.89	13000	45	99	195000 1935
6869500	SALINE R AT TESCOTT, KS	2820	25	4		5/22/2017	27.05	3500 (2017-05-21)	33	96	61400 1951
6874000	SF SOLOMON R AT OSBORNE, KS	2012	14	2		5/20/2017	15.39	2050	34	69	81200 1951
6876700	SALT C NR ADA, KS	384	18	9		5/22/2017	20.67	2860	14	55	16000 1961
6876900	SOLOMON R AT NILES, KS	6770	24	4		5/23/2017	26.25	7710	35	104	178000 1951
6878000	CHAPMAN C NR CHAPMAN, KS	300	19	4		5/19/2017	21.84	6750	14	62	46700 1951
6884200	MILL C AT WASHINGTON, KS	344	18	3		5/20/2017	21.59	5650	20	56	14600 1993
6884700	BIG BLUE R AT BLUE RAPIDS, KS	8342	26	7		5/21/2017	35.24	--	--	--	--
6885500	BLACK VERMILLION R NR FRANKFORT, KS	410	19	2		5/1/2017	20.83	5390	41	63	38300 1959
6889200	SOLDIER C NR DELIA, KS	149	26	1		5/19/2017	26.45	6750	15	57	59600 2005
6891850	STRANGER C AT EASTON, KS	216	17	3		5/20/2017	19.74	5410	--	--	--
6914100	POTTAWATOMIE C NR SCIPIO, KS	343	23	1		5/1/2017	25.2	7620	5	13	141000 2007
6914500	POTTAWATOMIE C AT LANE, KS	513	23	1		5/1/2017	23.05	10800	17	25	75000 1961
6915800	MARAIS DES CYGNES R AT LA CYGNE, KS	2669	25	4		5/3/2017	29.61	24100	14	30	131000 2007
6916600	MARAIS DES CYGNES R NR KS-MO ST LINE, KS	3250	27	5		5/2/2017	30.59	26400	24	56	137000 2007
6917000	L OSAGE R AT FULTON, KS	314	22	3		5/1/2017	27.72	12000	18	66	62800 1986
6917500	MARMATON R NR FORT SCOTT, KS	388	38	1		5/1/2017	41.53	19200	14	56	38100 1961
7143310	COW C NR HUTCHINSON, KS	859.5	9.5	4		5/24/2017	10.72	--	--	--	--
7144480	COWSKIN C AT 119TH ST AT WICHITA, KS	86	18	1		5/12/2017	19.12	2280	6	14	5870 2009
7145200	SF NINNESCAH R NR MURDOCK, KS	650	8	2		5/12/2017	9.29	4920	34	64	28700 1979
7145700	SLATE C AT WELLINGTON, KS	154	19	2		5/13/2017	20.18	2870	37	55	28500 1975
7146500	ARKANSAS R AT ARKANSAS CITY, KS	43713	11	4		5/5/2017	11.72	19600	55	97	103000 1923
7147800	WALNUT R AT WINFIELD, KS	1880	18	1		5/13/2017	18.92	19200	49	96	105000 1944
7151500	CHIKASKIA R NR CORBIN, KS	794	10	3		5/12/2017	12.09	8320	29	56	60000 1923
7156900	Cimarron River near Forgan, OK	8536	5	1		5/11/2017	6.04	1380	44	76	69000 1942
7170500	VERDIGRIS R AT INDEPENDENCE, KS	2892	30	3		5/12/2017	34.42	27100	45	100	153000 2007
7183000	NEOSHO R NR IOLA, KS	3723	15	1		5/1/2017	15.8	20400	66	108	436000 1951
7183500	NEOSHO R NR PARSONS, KS	4905	21	7		5/1/2017	27.19	41900	17	93	410000 1951
7184000	LIGHTNING C NR MCCUNE, KS	197	12	6		5/1/2017	17.5	16100	15	64	67500 1993
7187600	SPRING R NR BAXTER SPRINGS, KS	2448	14	4		5/1/2017	27.62	100000	1	5	60900 2009

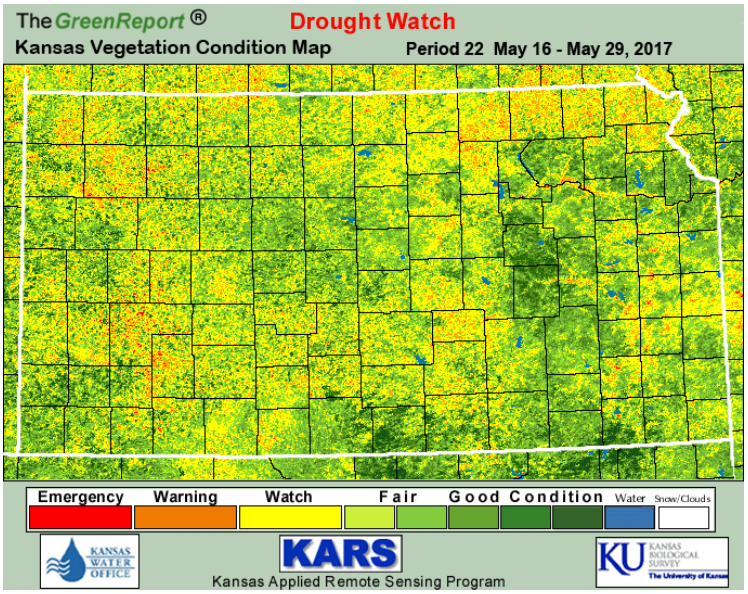
Near Flood stage, Minor Flooding, Moderate Flooding Major Flooding

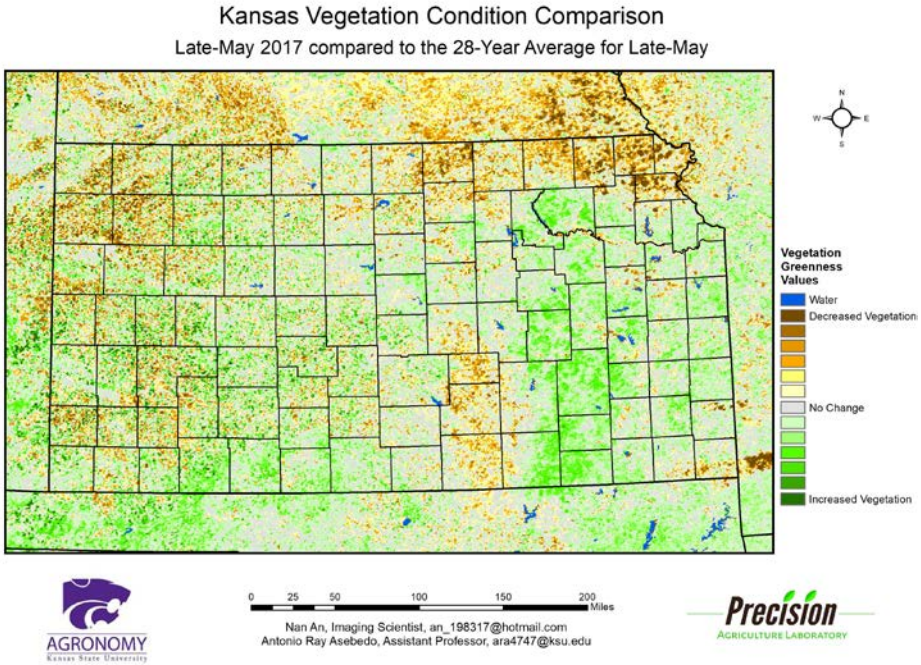
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

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. Most of Kansas is in fair condition with the Flint Hills of eastern Kansas showing great vegetative conditions. Pockets of dryness are still occurring in some parts of the state.



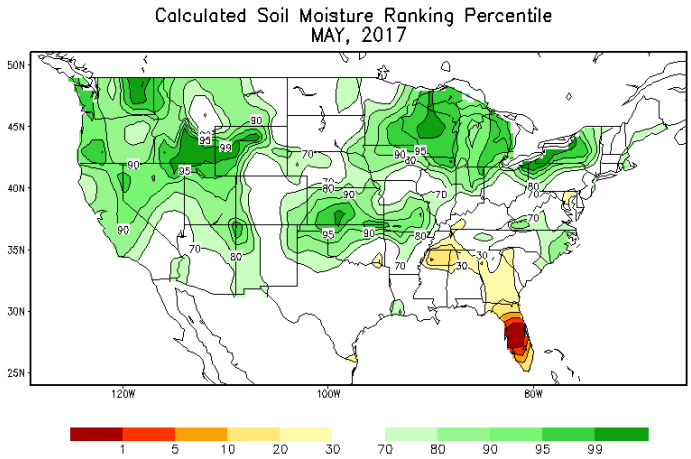


The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition from K-State's Precision Agriculture Laboratory.

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

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.

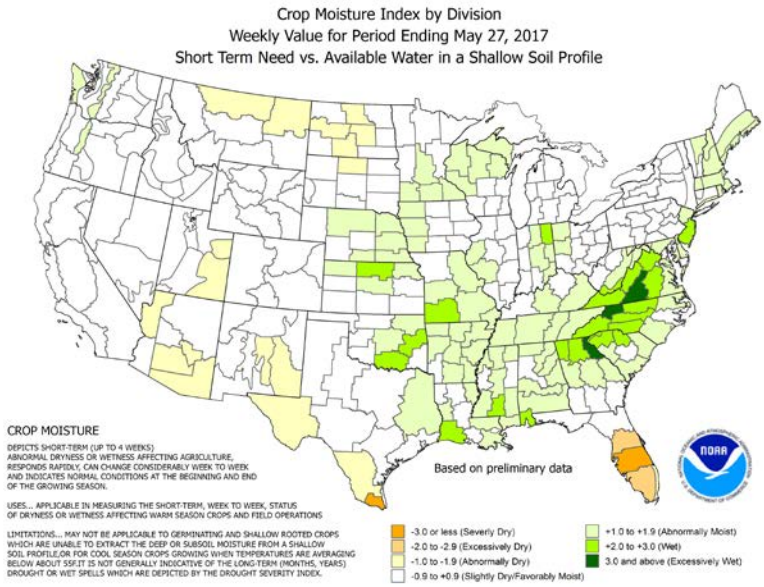


USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report for the state as a whole published May 30, 2017 reported topsoil moisture rated 0 percent very short, 2 short, 80 adequate and 18 surplus. Subsoil moisture rated 0 percent very short, 3 short, 87 adequate and 10 surplus.

Field Crops Report:

Winter wheat condition rated 9 percent very poor, 16 poor, 30 fair, 38 good, and 7 excellent.
Corn condition rated 2 percent very poor, 8 poor, 35 fair, 52 good, and 3 excellent.
Soybeans planted was 41 percent, ahead of 25 last year, but behind 46 average.
Sorghum planted was 11 percent, near 13 last year, and behind 23 average.
Cotton planted was 32 percent, ahead of 9 last year, but near 36 average.
Sunflowers planted was 7 percent, near 3 last year and 11 average.
Alfalfa hay condition rated 0 percent very poor, 4 poor, 25 fair, 63 good, and 8 excellent.

Livestock, Pasture, and Range Report: Pasture and range conditions rated 0 percent very poor, 2 poor, 15 fair, 67 good, and 16 excellent. Stock water supplies were 0 percent very short, 1 short, 87 adequate and 12 surplus. (http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Crop_Progress_and_Condition/current.pdf)



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.

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

May 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	4.96	2.38	192%	57.4	-1.2	86 (7)	30 (1)
Dodge City	4.62	1.77	162%	62.1	-2.1	90 (15)	34 (1)
Garden City	1.08	-1.80	38%	61.7	-1.6	92 (15)	35 (24)
Goodland	7.66	4.71	260%	58.5	-0.9	88 (15,7)	32 (4,3)
Guymon, OK	2.18	-0.26	89%	63.1	-1.8	95 (25)	36 (2)
Hill City	4.49	0.71	119%	62.1	-0.4	94 (15)	34 (1)
Lamar, CO	3.69	1.67	183%	60.5	-1.7	92 (25,15)	30 (4)
McCook, NE	3.55	0.41	113%	59.6	0.0	90 (7)	31 (4)
Springfield, CO	4.58	2.22	194%	57.6	-3.7	90 (25)	30 (1)
Central							
Concordia	8.00	3.84	192%	62.0	-1.1	86 (14)	34 (1)
Hebron, NE				62.0	0.3	90 (16,15)	33 (1)
Medicine Lodge	5.18	1.88	157%	66.1	-0.9	90 (31)	40 (21)
Ponca City, OK	4.29	-0.52	89%	67.7	0.1	91 (31,27)	40 (4)
Salina	3.87	-0.88	81%	65.8	0.5	91 (14)	38 (1)
Wichita (ICT)	4.44	-0.13	97%	65.9	-0.1	89 (31)	40 (1)
East							
Bartlesville, OK	7.59	2.27	143%	66.3	-1.4	92 (27)	42 (25,4)
Chanute	5.89	0.09	102%	66.1	0.2	87 (26)	40 (4,1)
Fall City, NE	3.10	-1.48	68%	63.2	-0.7	90 (15)	37 (1)
Johnson Co. Exec. Apt	4.33	-1.10	80%	63.7	-1.0	86 (15)	38 (1)
Joplin, MO	8.00	2.29	140%	67.1	0.1	87 (18)	41 (4)
Kansas City (MCI), MO	5.37	0.14	103%	63.8	-0.7	88 (15)	38 (4)
St. Joseph, MO	3.85	-1.57	71%	64.2	-0.2	92 (15)	37 (4)
Topeka (TOP	4.96	2.38	192%	57.4	-1.2	86 (7)	30 (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 – June 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: reported some dry conditions in Kansas in June.
- Kansas State University reports high temperatures will likely affect wheat crop in northwest, north central and west central Kansas as timing of high temperatures caught the crop in early to mid-grain fill.
- Producers in 32 counties remain eligible for USDA disaster programs due to drought conditions in early 2017.
- Federal Disaster Declaration for 27 Kansas Counties affected by the April 28-May 3 winter storm allow county governments to apply for assistance.

Lakes and Streams

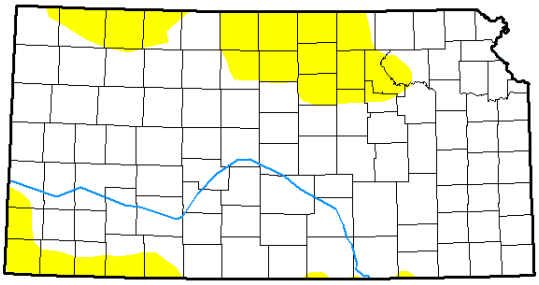
- Eight Blue-Green Algae (BGA) public health warnings in effect at the end of June include Keith Sebelius Reservoir, Norton County; Kirwin Lake, Phillips County; Marion Lake and Marion Reservoir, Marion County; Milford Reservoir Zone C, Geary, Dickinson and Clay counties; Sam's Pond, Hamilton County; Webster Lake, Rooks Count; and Wolf Pond, Barton County. A warning means these waters are unsafe for consumption or contact.
- Three Blue-Green Algae (BGA) public health watches in effect at the end of June include Milford Reservoir, Zones A and B, Geary, Dickinson and Clay counties and Overbrook City Lake, Osage County. A watch means the water may be unsafe , contact is discouraged.
- Norton and Cedar Bluff reservoirs continued to be below conservation pool the month.
- Flood flows occurred at 2 locations for briefly during the month.

General Conditions

Drought free conditions were present for the majority of Kansas most of June. Lower than normal precipitation with warmer than normal temperatures resulted in a return to abnormally dry conditions in portions of northwest, north central and southwest Kansas.

U.S. Drought Monitor

Kansas



June 27, 2017

(Released Thursday, Jun. 29, 2017)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	83.07	16.93	0.00	0.00	0.00	0.00
Last Week 06-20-2017	98.90	1.10	0.00	0.00	0.00	0.00
3 Months Ago 03-28-2017	9.58	90.42	42.82	9.01	0.57	0.00
Start of Calendar Year 01-03-2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 09-27-2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 06-28-2016	79.16	20.84	0.00	0.00	0.00	0.00

Intensity:

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

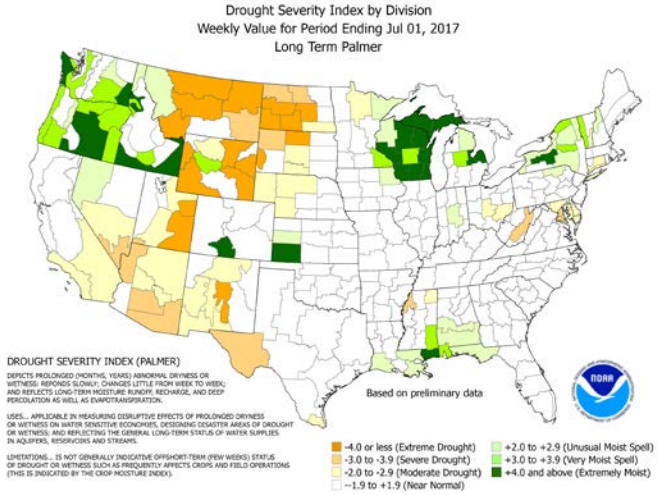
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

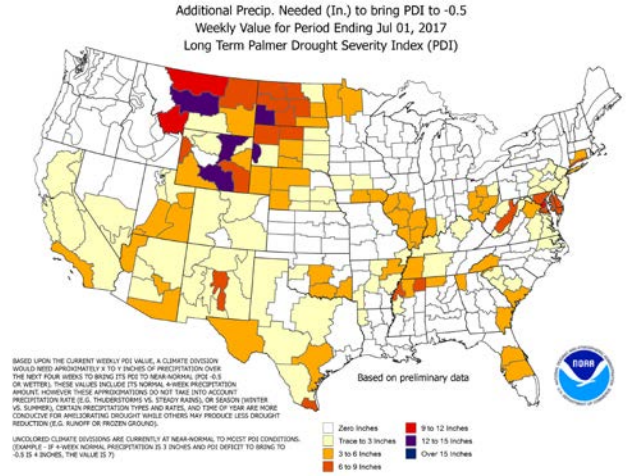
Author:
Jessica Blunden
NCEI/NOAA

http://droughtmonitor.unl.edu/

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

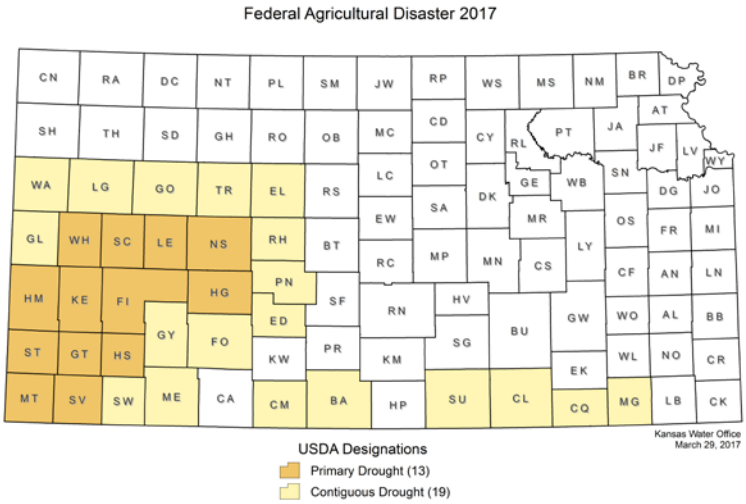
Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The additional precipitation map indicates the inches of precipitation needed to be out of drought. More information on the PDSI can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





Federal Disaster Declarations

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting

Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

Federal Disaster for Severe Winter Storm

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3.

Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita. Additional designations may be made at a later date if requested by the state and warranted by the results of further damage assessments.

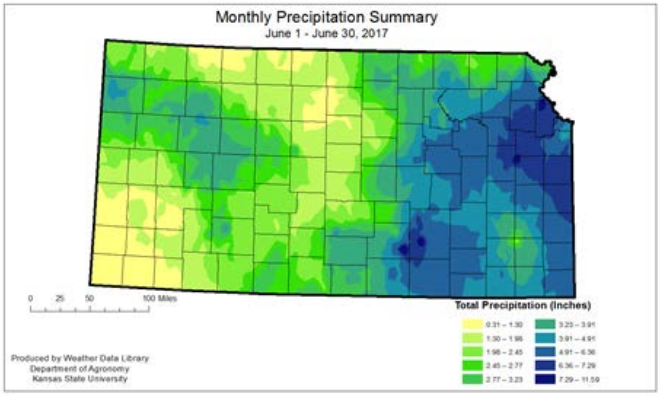
The declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

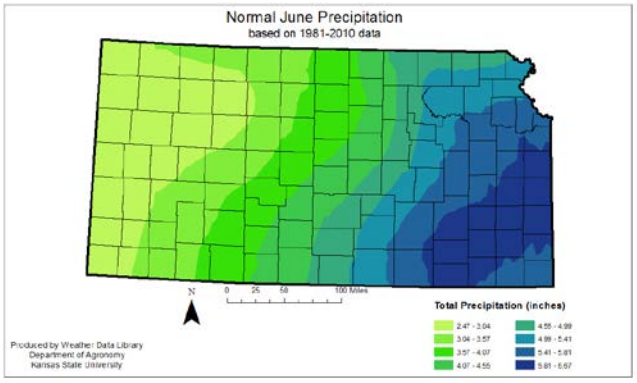
Climate Summary (Temperature and Precipitation)

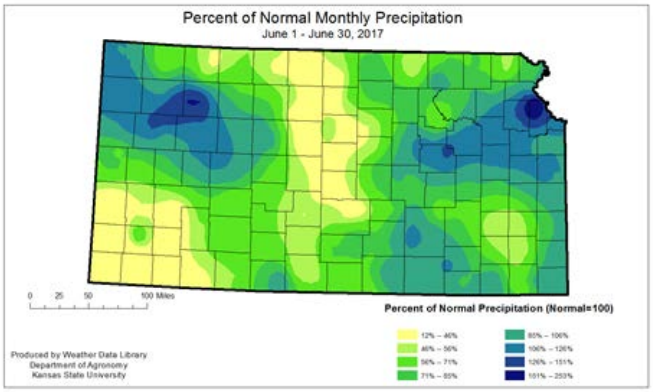
The wet May gave way to uneven rainfall in June. The statewide average precipitation was 3.23 inches or 74 percent of normal. The East Central and West Central divisions came closest to normal. The East Central Division averaged 5.57 inches or 99 percent of normal. The West Central Division averaged 2.74 inches or 98 percent of normal. In contrast, the Southwest Division averaged just 1.63 inches or 50 percent of normal, marking it as the division with the lowest percent of normal. The greatest monthly precipitation total for a National Weather Service (NWS) Coop station was 11.59 inches at Easton, Leavenworth County. The greatest monthly total for a Community Collaborative Rain, Hail and Snow (CoCoRaHS) station was 9.65 inches at Derby 2.9 N, Sedgwick County. The highest 24hr totals: 4.45 inches at Blue Rapids, Marshall County, on the 17th (NWS); 4.85 inches at Hope 9.4 WNW, Dickinson County, on the 30th (CoCoRaHS).

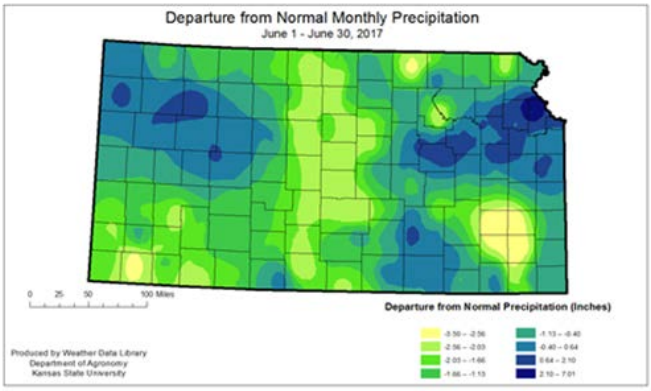
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	June 1-30, 2017			January 1- June 30, 2017			April 1, 2016 – June 30, 2017			September 1, 2016 – June 30, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.95	-0.88	71	12.82	2.15	121	10.01	1.64	120	16.95	1.87	113
West Central	2.74	-0.07	98	14.52	4.27	142	11.31	3.56	146	16.88	2.22	115
Southwest	1.63	-1.58	50	14.62	4.66	147	10.22	2.64	136	16.28	1.92	113
North Central	2.17	-1.66	54	16.08	2.18	115	12.41	1.98	119	22.33	1.80	109
Central	2.82	-1.26	69	17.48	2.51	118	12.90	1.89	119	23.25	1.57	107
South Central	3.64	-1.15	75	20.76	4.26	126	14.16	2.28	119	29.42	5.16	119
Northeast	3.84	-1.30	74	18.33	0.94	106	13.49	0.31	103	28.10	1.50	106
East Central	5.57	-0.01	99	19.25	0.04	99	14.52	0.23	100	28.65	-0.75	96
Southeast	4.88	-1.06	82	24.67	3.07	114	19.02	3.41	121	37.68	4.12	112
STATE	3.23	-1.03	73	17.79	2.85	122	13.19	2.09	121	24.53	2.30	110





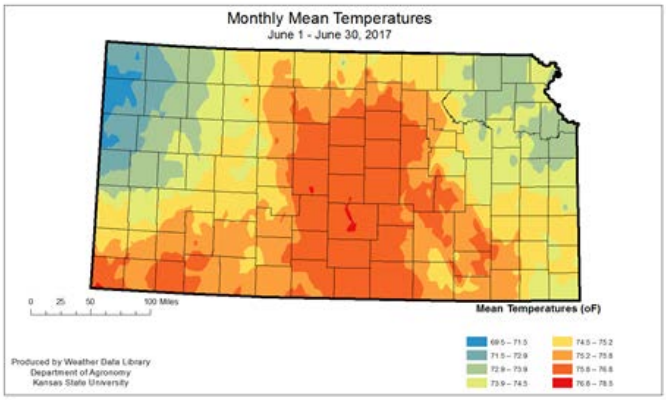


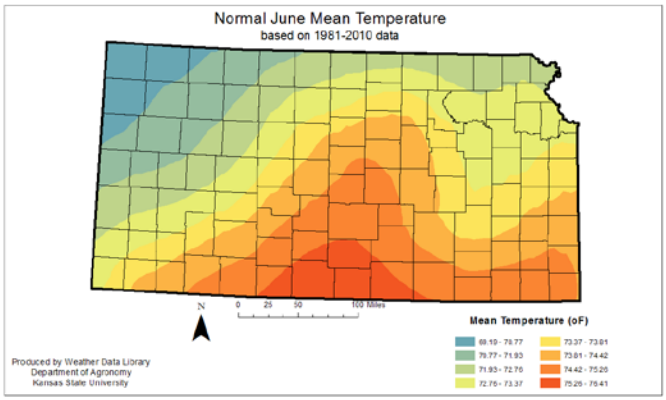


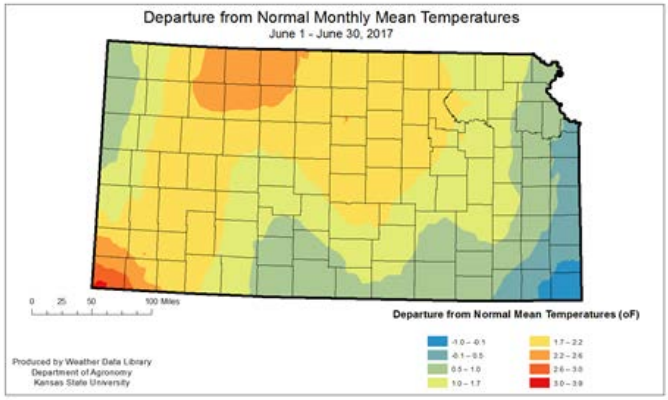
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

June temperatures rebounded from the cooler-than-normal conditions in May. State-wide temperatures averaged 74.9 °F or 1.6 degrees warmer than normal. The Southeast Division averaged closest to normal with an average of 74.6 °F, or 0.4 degrees warmer than normal. The Southwest Division had the greatest departure with an average of 76.4 °F which was 2.9 degrees warmer than normal. The warmest reading for the month was 110 °F at Tribune 14N, Greeley County, on the 17th. The coldest reading was 39 °F, recorded at Atchison 1S, Leavenworth County, on the 23rd. Despite the warm temperatures, there were only four record high maximum temperatures during the month and 12 record high minimum temperatures. On the cold side, there were 17 new record cold maximum temperature in June and 10 new record low minimum temperatures. None of the temperature records set new records for the month of June. All divisions saw high temperatures reach 90 °F or more, with all but the eastern divisions having highs in the 100s.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	June 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	88.4	57.6	73.0	2.1	105	22	45	24
West Central	89.5	58.5	74.0	2.2	110	17	46	24
Southwest	91.1	61.7	76.4	2.9	105	18	52	1
North Central	88.7	62.2	75.4	2.1	101	22	47	24
Central	89.5	63.3	76.4	2.0	103	17	50	24
South Central	88.6	63.9	76.3	1.3	101	18	53	2
Northeast	85.4	62.1	73.7	0.9	97	21	48	27
East Central	84.7	63.6	74.2	0.9	96	18	50	8
Southeast	85.7	63.6	74.6	0.4	95	16	49	8
STATE	88.0	61.8	74.9	1.6	110	17th	45	24th
Data Source: KSU Weather Library								

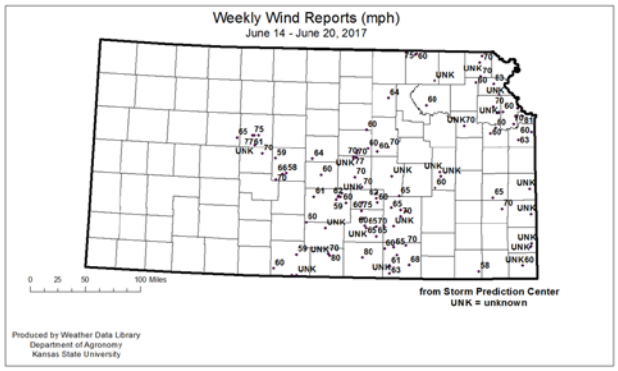


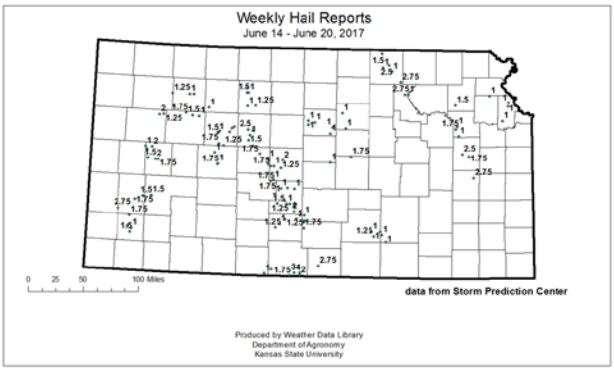




Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

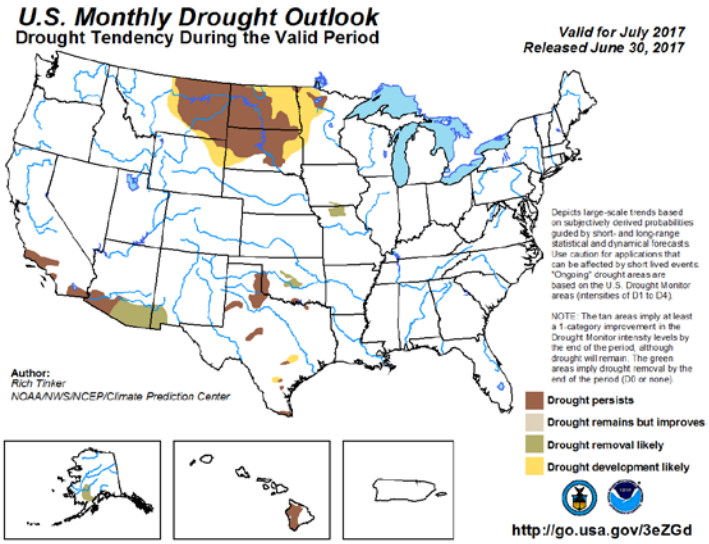
Severe weather was again a feature of the month, with most of the events in the form of hail and high winds. There were 3 reports of tornadoes, which is less than the 1950-2016 average of 14 tornadoes in June. In addition, there were 152 hail reports, and 178 high wind reports. One of the worst outbreaks came during the week of June 14th to June 20th when 117 hail events and 124 wind events were reported. The largest hail stones reported were 4.5 inches in diameter, reported near Ulysses, KS on the 20th.

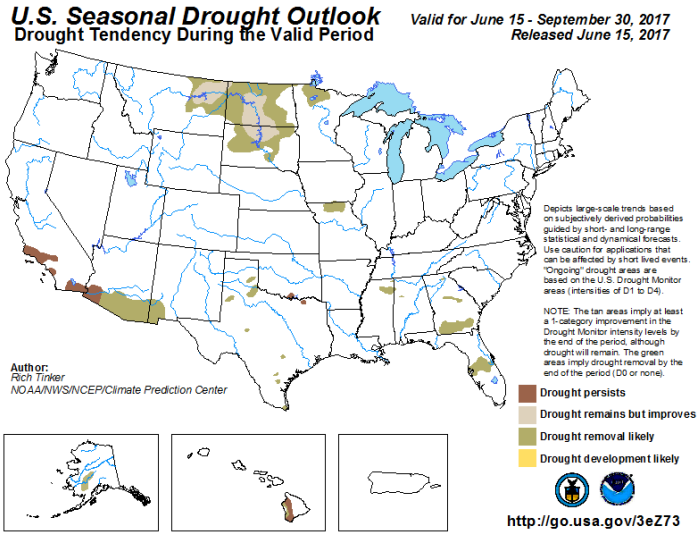




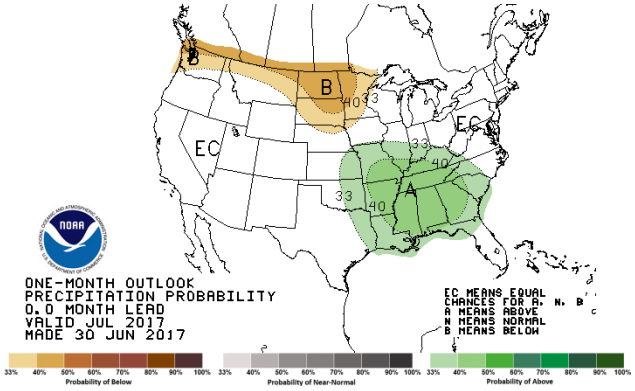
Future Outlook

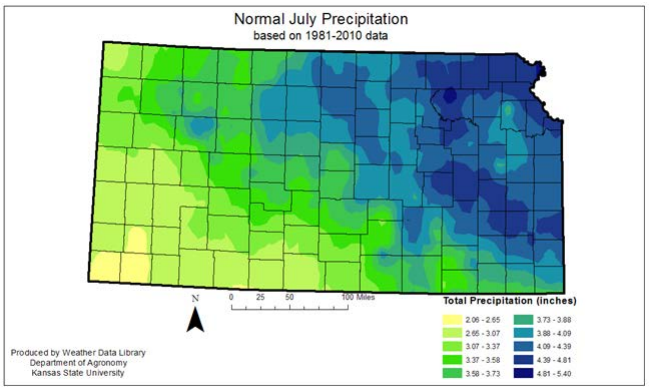
The Monthly and Seasonal Drought Outlooks indicate drought conditions to remain absent. Three month probabilities favor above normal temperature for the July, August September period, with equal probabilities of precipitation being above or below normal. The individual temperature and precipitation outlooks are provided below for the one and three month periods.

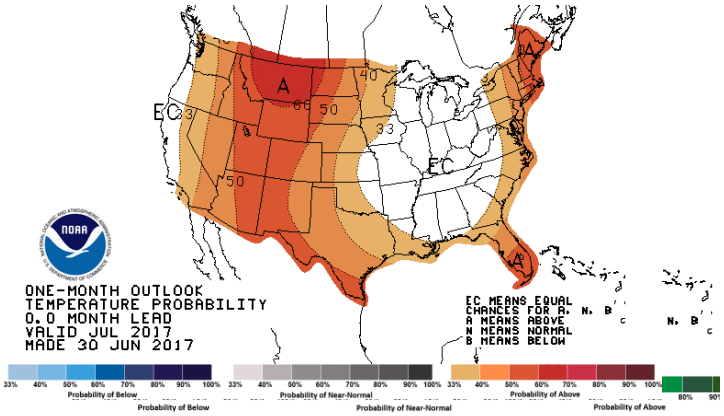


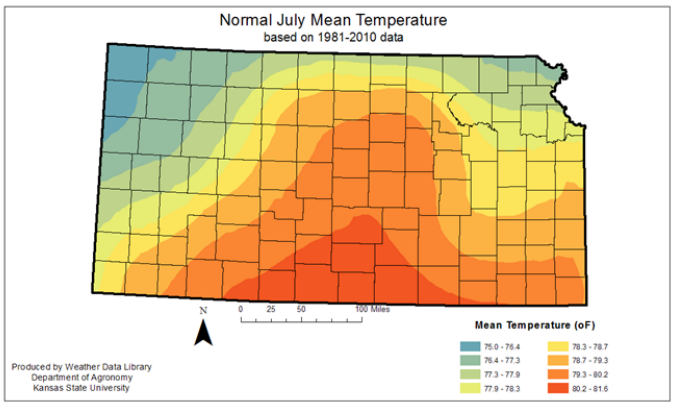


The July climate outlook calls for a slightly increased chance of wetter than normal conditions the across the eastern third of the state coupled with higher chances of above normal temperatures. The western 2/3rd of the state is favored for above normal temperatures and the probability is equal to be above or below normal precipitation.









Additional outlooks for additional 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 June 28, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed.
(June 28, 2017, 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 28, 2017)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford and Clinton reservoirs decreased in June and allowed some flood pool storage evacuation. Flows in the Kansas River were maintained well above historical median values for the majority of the month, largely due to the flood pool releases.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs experienced inflows sufficient to keep the all the reservoirs above normal pool elevation. Flow in the Marais des Cygnes River was maintained at a healthy level throughout the month.

Cottonwood/Neosho basin: Marion, Council Grove, and John Redmond reservoirs all maintained flood pool storage throughout the month of June. Significant releases were made from all reservoirs, especially John Redmond. Streamflow declined for most of the month in all reaches of the Cottonwood and Neosho Rivers.

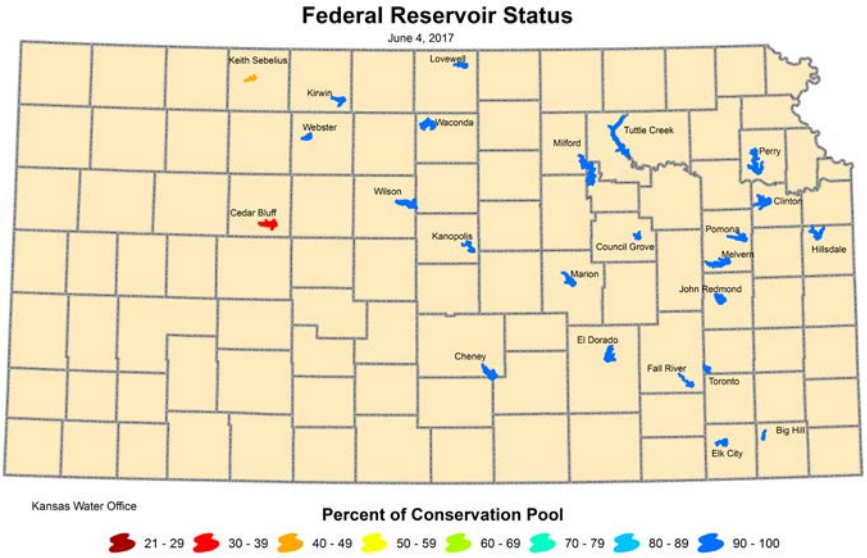
Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs maintained storage near or above normal pool in June. Streamflow of the Fall and Verdigris Rivers far exceeded historic median flow values in the first half of the month and declined below in the second half, mostly a reflection of reservoir releases.

Saline basin: The U.S. Army Corp of Engineers made releases to lower the water level elevation at Wilson Lake about two and a half feet in June. The elevation is being maintained above normal pool, as inflows continue.

Smoky Hill basin: The middle Smoky Hill basin experienced several small to moderate runoff events and the lower Smoky streamflow remained above normal for June. Kanopolis Lake elevation declined from releases but was above or near its summer target level. Kanopolis storage is very healthy. Cedar Bluff Reservoir did experience a small amount of inflow but there was no significant change in storage.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton (Keith Sebelius) and Cedar Bluff reservoirs remain significantly below full conservation pool. Kirwin and Waconda are also below conservation pool at 94% and 99% respectively.



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		**7/4/2017 6:00 AM**		
Norton[1]	2304.3	2293.19	-11.11	44.7
Harlan County, NE	1945.73	1941.20	-4.53	81.8
Lovewell[1]	1582.6	1582.93	0.33	100.0
Milford[1]	1144.4	1146.21	1.81	100.0
Cedar Bluff	2144	2119.89	-24.11	33.3
Kanopolis[1]	1463	1467.15	4.15	100.0
Wilson[1]	1516	1517.41	1.41	100.0
Webster[1]	1892.5	1893.86	1.41	100.0
Kirwin[1]	1729.3	1728.09	-1.16	94.2
Waconda[1]	1455.6	1455.39	-0.21	98.8
Tuttle Creek[1]	1075	1075.96	0.96	100.0
Perry[1]	891.5	894.06	2.56	100.0
Clinton[1]	875.5	878.04	2.54	100.0
Melvern[1]	1036	1036.89	0.89	100.0
Pomona[1]	974	978.05	4.05	100.0
Hillsdale[1]	917	918.07	1.07	100.0
Arkansas River Basin		**7/4/2017 8:00 AM**		
Cheney	1421.6	1422.04	0.44	100.0
El Dorado	1339	1339.45	0.45	100.0
Toronto[1]	901.5	901.82	0.32	100.0
Fall River[1]	948.5	948.95	0.45	100.0
Elk City[1]	796	796.56	0.56	100.0
Big Hill	858	857.88	-0.12	100.0
Council Grove[1]	1274	1276.33	2.33	100.0
Marion[1]	1350.5	1350.74	0.24	100.0
John Redmond[1]	1039	1041.06	0.06	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.

June 2 a public health warning was issued by KDHE for Marion Reservoir, Marion County. This warning is to notify the public that conditions are unsafe and water contact should not occur (no swimming, wading, skiing of consumption of the water should occur. This warning continued through all of June 2017.

June 9 Marion Reservoir, Marion County; and Webster Lake, Rooks County were under public health warnings.

June 15, Keith Sebelius Reservoir, Norton County; Kirwin Lake, Phillips County; Marion County Lake, Marion County; Marion Reservoir, Marion County; and Sam's Pond, Hamilton County were under public health warnings. Webster Lake, Rooks County was under a public health watch.

June 23, Kirwin Lake, Phillips County; Marion Reservoir, Marion County; Milford Reservoir, Geary, Dickinson and Clay counties; and Sam's Pond, Hamilton County were under public health warnings. Keith Sebelius Reservoir, Norton County; Marion County Lake, Marion County; and Webster Lake, Rooks County were under public health watches.

June 30 Keith Sebelius Reservoir, Norton County; Kirwin Lake, Phillips County; Marion County Lake, Marion County; Marion Reservoir, Marion County; Milford Reservoir Zone C, Geary, Dickinson, Clay counties; Sam's Pond, Hamilton County; Webster Lake, Rooks County; and Wolfs Pond, Barton County were under public health warnings. Milford Reservoir Zones A & B, Geary, Dickinson, Clay counties; and Overbrook Lake, Osage County were under a public health watch.

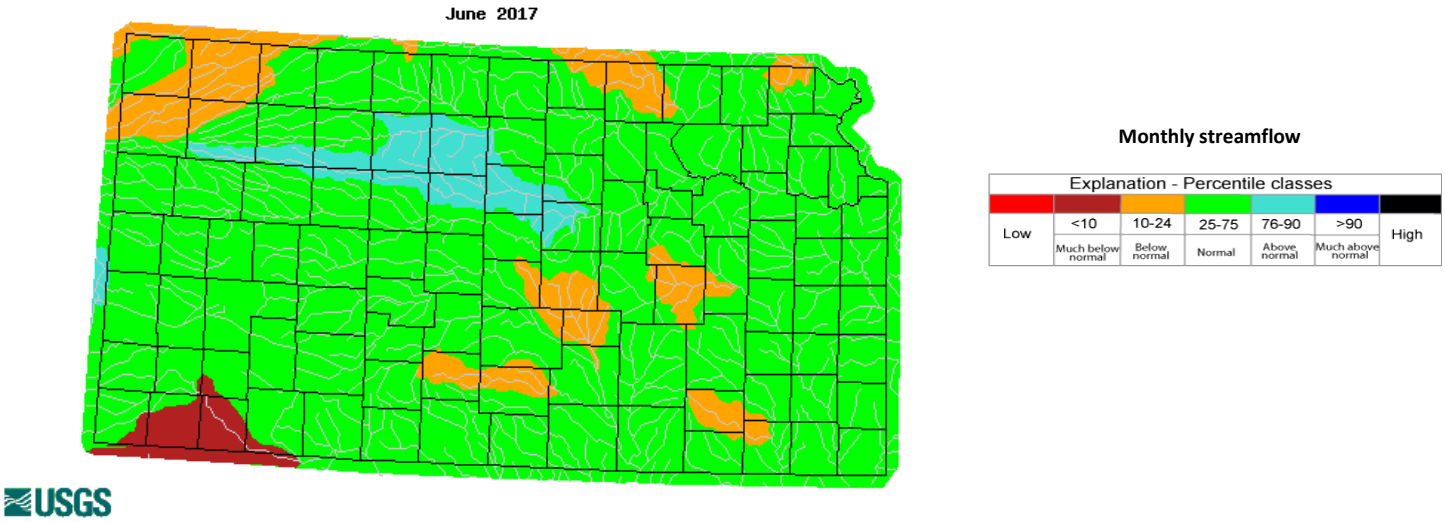
Streamflow Conditions

Despite rains, streamflows in a few Kansas locations during June had 7-day streamflow average of zero. These flows are provided in the table below. Data is from U.S.G.S WaterWatch. 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.

Summary of Recent 7-day Average Flow Conditions
(2017-06-01 -- 2017-06-30)
["--", no data; ">", greater than all historical minimum values]

			2017-06-01 to 2017-06-30				Historical annual minimum 7-day flows		
			No. of days	Lowest 7-day average flow					No. of years
USGS station number	USGS station name	Drain. area [mi^2]	with zero flows	Date	Stream flow [ft^3/s]	Rank	No. of years	Min. (year) [ft^3/s]	with zero flows
7139000	ARKANSAS R AT GARDEN CITY, KS	27071	9	6/15/2017	0	Tie 1	80	0 (1922)	55
6848500	PRAIRIE DOG C NR WOODRUFF, KS	1007	6	6/22/2017	0	Tie 1	77	0 (1949)	43
6846500	BEAVER C AT CEDAR BLUFFS, KS	1618	30	6/1/2017	0	Tie 1	72	0 (1947)	65
7137000	FRONTIER DITCH NR COOLIDGE, KS	--	8	6/1/2017	0	Tie 1	67	0 (1951)	67
7140850	PAWNEE R NR BURDETT, KS	1091	15	6/16/2017	0	Tie 1	36	0 (1982)	35
6860900	HACKBERRY C NR TREGO CENTER, KS	616	22	6/9/2017	0	Tie 1	3	0 (2015)	3
7179785	NF COTTONWOOD R NR DURHAM, KS	103	0	6/25/2017	3.29	2	2	2.23 (2017)	0
7144050	EMMA C AT SEDGWICK, KS	--	0	6/29/2017	7.66	3	3	1.21 (2015)	0

Stream flow June 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. No MDS administration occurred during the month.

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates some flood conditions occurred in Kansas this month as monitored at the gages in the table below.

Summary of Recent Flood and High Flow Conditions (2017-06-01 -- 2017-06-30)											
						Highest peak from 2017-06-01 to 2017-06-30					
										Historical Peaks	
USGS station number	USGS station name	Drain. area [mi2]	NWS flood stage [ft]	No. of days above flood stage	NWS flood class	Date	Stage [ft]	Stream flow (date) [ft3/s]	Rank	No. of years	Max. (year) [ft3/s]
6856600	REPUBLICAN R AT CLAY CENTER, KS	24542	15	1		6/30/2017	15.43	6890	78	99	195000 (1935)
6891850	STRANGER C AT EASTON, KS	216	17	1		6/30/2017	19.78	5460	--	--	--

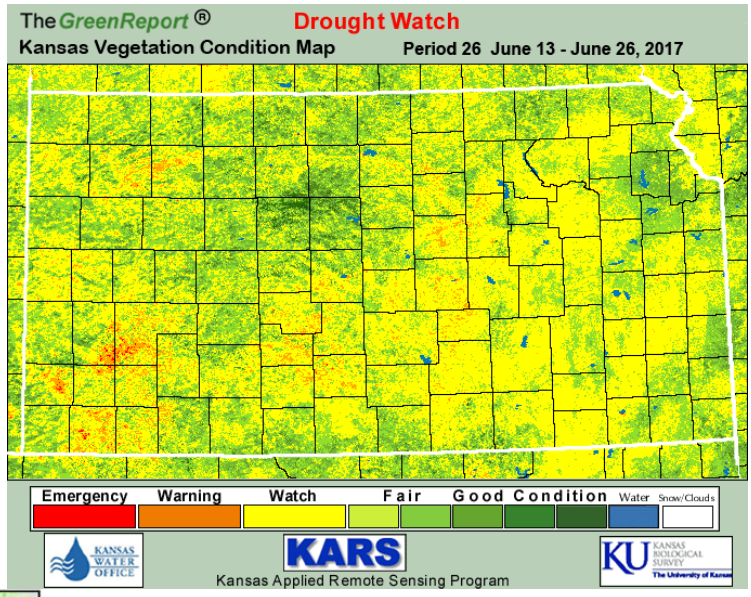
Near Flood stage, Minor Flooding, Moderate Flooding Major Flooding

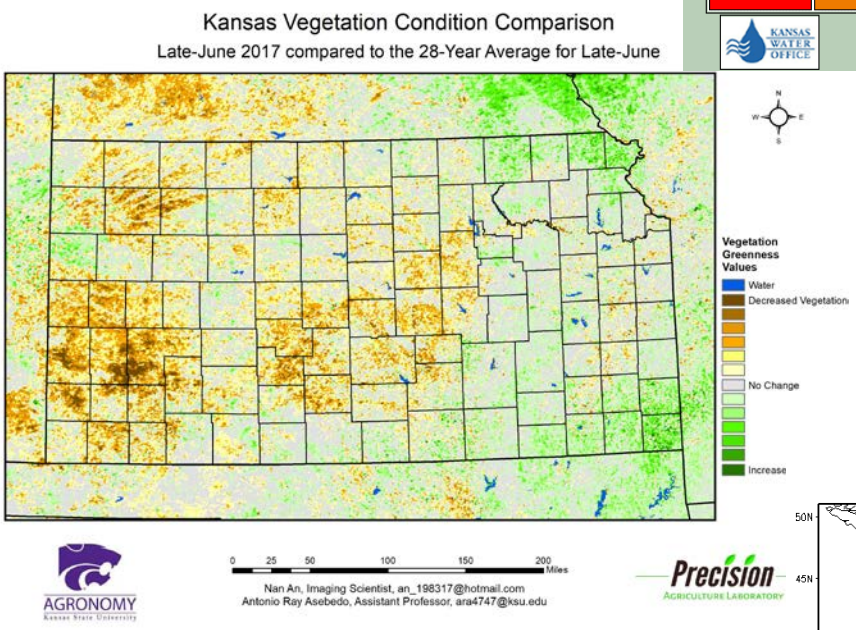
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

Soil, Crop and Vegetation

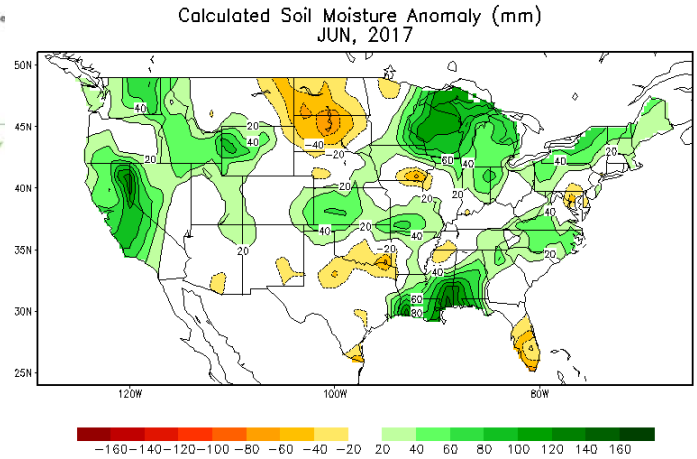
Kansas Vegetative Conditions

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. Vegetative conditions were very spotty the first two week of June, with good conditions in the east and parts of the west, while poor conditions were present in the southwest and northeast parts of the state. By the end of the month there was some improvement in areas of the north, central and southwest Kansas.





The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition from K-State's Precision Agriculture Laboratory.



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

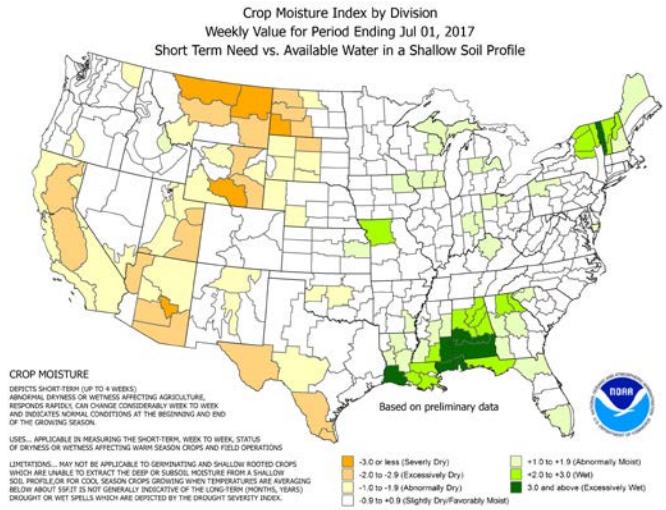
Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion which may be found at:
http://www.ksre.ksu.edu/p.aspx?tabid=255.

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 published June 25, 2017 reported topsoil moisture rated 2 percent very short, 14 short, 79 adequate, and 5 surplus. Subsoil moisture rated 1 percent very short, 9 short, 86 adequate, and 4 surplus.

Field Crops Report:
Winter wheat condition rated 8 percent very poor, 15 poor, 31 fair, 40 good, and 6 excellent. Winter wheat mature was 85 percent. Harvested was 48 percent, behind 53 last year, but near 47 for the five-year average.

Corn condition rated 1 percent very poor, 6 poor, 32 fair, 50 good, and 11 excellent.
Soybeans condition rated 0 percent very poor, 2 poor, 29 fair, 63 good, and 6 excellent.
Sorghum condition rated 1 percent very poor, 3 poor, 26 fair, 65 good, and 5 excellent.
Cotton rated 1 percent very poor, 3 poor, 19 fair, 70 good, and 7 excellent.
Alfalfa hay condition 0 percent very poor, 2 poor, 23 fair, 68 good, and 7 excellent. Alfalfa second cutting was 52 percent complete.

Livestock, Pasture, and Range Report: Pasture and range conditions rated 0 percent very poor, 2 poor, 18 fair, 65 good, and 15 excellent. Stock water supplies were 0 percent very short, 2 short, 95 adequate, and 3 surplus. (http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Crop_Progress_and_Condition/current.pdf)



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.

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

June 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	4.24	1.36	147%	70.2	1.7	99 (21)	47 (14)
Dodge City	3.12	-0.12	96%	75.4	1.5	102 (17)	56 (26,2)
Garden City	0.65	-2.83	19%	76.0	3.1	104 (17,11)	53 (14)
Goodland	4.44	1.19	137%	71.5	1.8	100 (21)	48 (1)
Guymon, OK	1.79	-1.15	61%	77.0	2.9	105 (17)	56 (19,1)
Hill City	1.57	-1.19	57%	76.3	3.3	104 (22)	49 (24)
Lamar, CO	0.73	-1.62	31%	74.1	2.5	105 (22)	45 (14)
McCook, NE	0.27	-3.11	8%	74.8	4.9	106 (21)	47 (24)
Springfield, CO	0.54	-1.96	22%	71.2	-0.2	101 (22)	49 (14)
Central							
Concordia	3.34	-0.71	82%	75.8	2.4	98 (20,15)	52 (24)
Hebron, NE	0.77	-4.01	16%	75.6	3.6	99 (15)	49 (24)
Medicine Lodge	1.99	-2.12	48%	77.1	0.5	99 (17)	56 (19)
Ponca City, OK	3.41	-1.65	67%	78.2	1.6	97 (16,15)	57 (8)
Salina	1.69	-2.42	41%	79.2	3.6	103 (17)	56 (24)
Wichita (ICT)	4.58	-0.62	88%	77.1	1.3	96 (16,15)	58 (8)
East							
Bartlesville, OK	2.55	-2.82	47%	75.8	-0.4	95 (15)	50 (8)
Chanute	1.87	-4.16	31%	75.7	1.1	93 (15)	49 (8)
Fall City, NE	3.53	-1.35	72%	74.4	1.0	97 (15)	50 (27,26)
Johnson Co. Exec. Apt	5.79	0.01	100%	73.6	0.3	91 (5)	50 (26)
Joplin, MO	4.18	-1.68	71%	75.7	0.2	93 (16)	54 (8,7)
Kansas City (MCI), MO	6.43	1.20	123%	74.7	1.1	93 (15,5)	53 (26)
St. Joseph, MO	2.77	-1.41	66%	75.2	1.6	96 (5)	51 (25,24)
Topeka (TOP	6.59	1.19	122%	75.5	1.3	94 (15)	53 (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

KANSAS CLIMATE and DROUGHT UPDATE – July 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: The month ended with abnormally dry conditions for over 50% of the state and a small area of north central Kansas in moderate drought (D1).

- Producers in 32 counties remain eligible for USDA disaster programs due to drought conditions previously declared.

- July 12, 2017, producers in Cherokee and Crawford counties became eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to excessive rainfall and flooding April 24-May 11, 2017.

- Federal Disaster Declaration for 27 Kansas Counties affected by the April 28-May 3 winter storm allow county governments to apply for assistance.

Lakes and Streams

- Eight Blue-Green Algae (BGA) public health warnings in effect at the end of July include : Marion County Lake, Marion County; Marion Reservoir, Marion County; Milford Reservoir (Zone B), Geary, Dickinson and Clay counties; and Webster Lake, Rooks County.

- Three Blue-Green Algae (BGA) public health watches in effect at the end of July include Milford Reservoir (Zone C), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; and South Lake, Johnson County. A watch means the water may be unsafe , contact is discouraged.

- Norton and Cedar Bluff reservoirs continued to be below conservation pool.

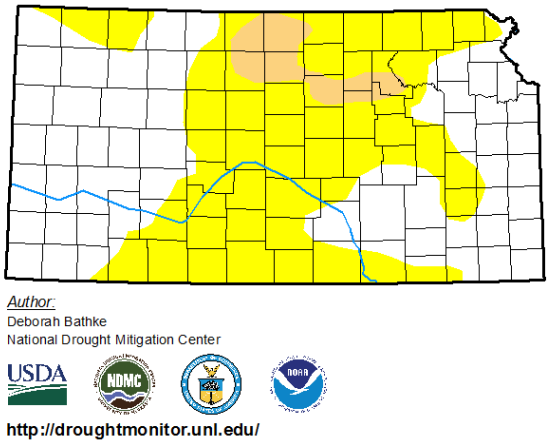
- Flood flows occurred at 4 locations briefly during the month.

- Flow on the Little Arkansas River at Alta Vista has been below Minimum Desirable Streamflow (MDS) of 8 cfs for over 7 days, administration is anticipated.

General Conditions

Lower than normal precipitation with warmer than normal temperatures in July resulted in an expansion of the abnormally dry condition in the U.S. Drought Monitor. Moderate drought also returned in parts of the state.

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



August 1, 2017
(Released Thursday, Aug. 3, 2017)
Valid 8 a.m. EDT

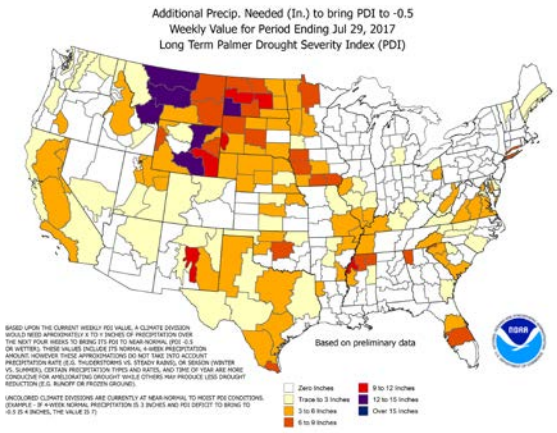
Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	50.42	44.74	4.83	0.00	0.00	0.00
Last Week 07-25-2017	49.39	45.77	4.83	0.00	0.00	0.00
3 Months Ago 05-02-2017	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2017	17.31	51.98	17.13	13.58	0.00	0.00
Start of Water Year 09-27-2016	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 08-02-2016	86.67	13.33	0.00	0.00	0.00	0.00

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

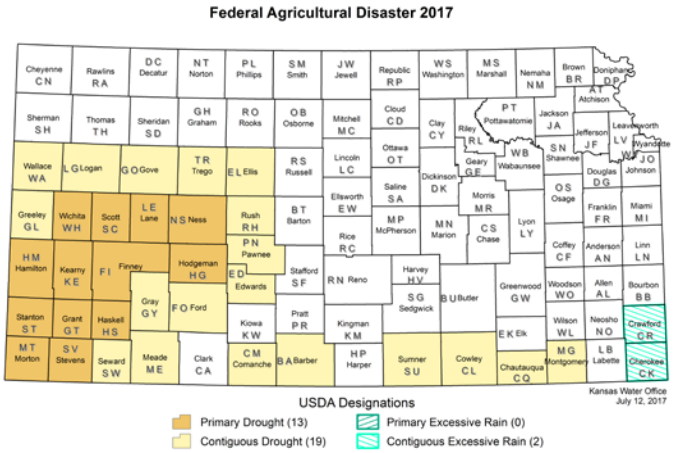
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

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



Federal Disaster Declarations

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster (drought) assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

July 12, 2017, Cherokee and Crawford counties became eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to excessive rainfall and flooding April 24-May 11, 2017.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

Federal Disaster for Severe Winter Storm

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3. Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita. Additional designations may be made at a later date if requested by the state and warranted by the results of further damage assessments.

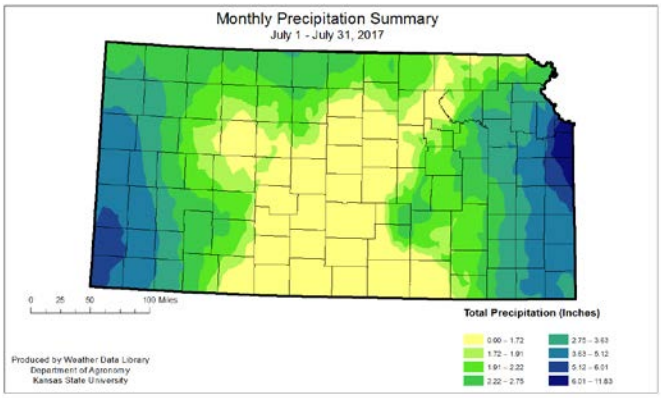
The declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

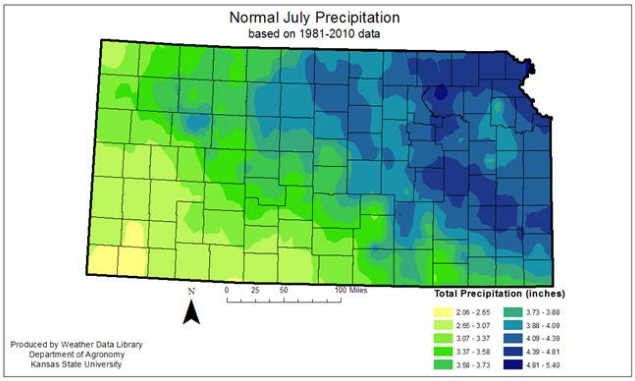
Climate Summary (Temperature and Precipitation)

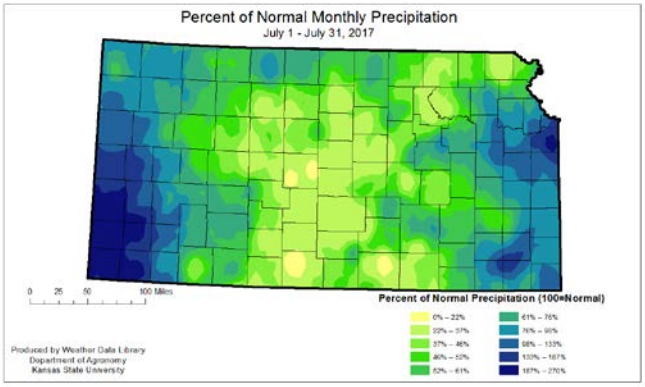
July was drier than normal across much of the state. The statewide average precipitation was 2.32 inches or 65 percent of normal. Only the Southwestern Climate Division was above normal for the month. The average precipitation in that division was 3.37 inches or 125 percent of normal. The Central Division had the least percent of normal with an average of 1.71 inches or 43 percent of normal. The South Central Division had the lowest average at 1.53 inches or 46 percent of normal. Year-to-date averages are still above normal in all except the Northeast and East Central divisions. The greatest monthly precipitation total for a National Weather Service (NWS) Coop station was 7.89 inches at Richfield 1 NE, Morton County. The greatest monthly total for a Community Collaborative Rain, Hail and Snow (CoCoRaHS) station was 11.69 inches at Overland Park 3.3 S, Johnson County. The highest 24hr totals: 6.20 inches at Overland Park S87th, Johnson County, on the 27th (NWS); 6.34 inches at Lenexa 2.0 NE, Johnson County (CoCoRaHS).

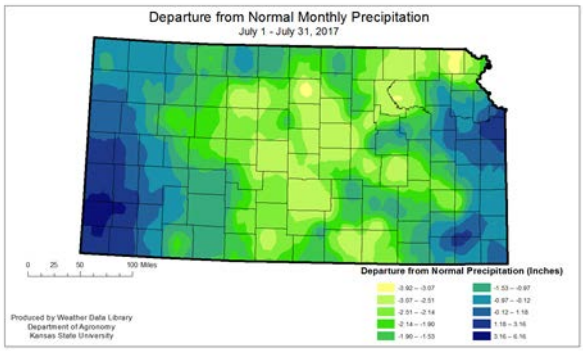
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	July 1-31, 2017			January 1- July 31, 2017			April 1, 2016 – July 31, 2017			September 1, 2016 – July 31, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.64	-1.85	46	14.68	0.52	103	11.74	-0.12	98	18.74	0.17	100
West Central	2.19	-1.25	66	17.06	3.37	125	13.59	2.40	122	19.21	1.11	106
Southwest	3.37	0.60	126	18.22	5.49	144	13.79	3.44	135	19.76	2.63	116
North Central	1.87	-2.24	45	18.65	0.62	103	14.65	0.11	100	24.81	0.15	101
Central	1.71	-2.23	43	19.17	0.26	102	14.59	-0.37	98	24.49	-1.14	95
South Central	1.53	-2.00	46	22.11	2.08	110	15.61	0.20	101	30.62	2.83	109
Northeast	2.01	-2.37	45	20.66	-1.11	95	15.71	-1.85	89	30.36	-0.62	98
East Central	2.94	-1.36	68	22.06	-1.45	93	17.47	-1.12	93	31.26	-2.44	91
Southeast	3.15	-0.92	77	27.56	1.89	107	22.02	2.35	111	40.36	2.73	107
STATE	2.32	-1.41	65	20.22	1.55	110	15.58	0.75	106	26.79	0.82	103





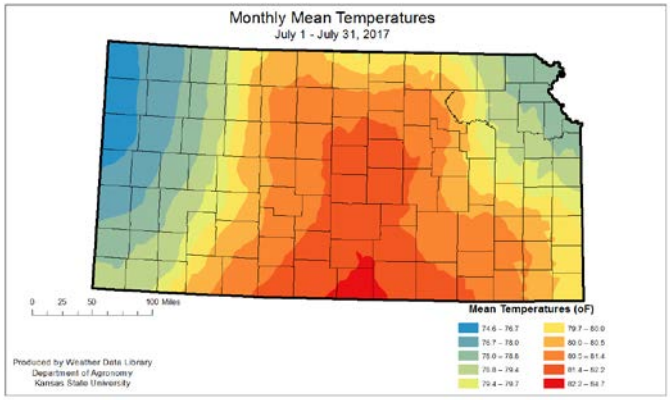


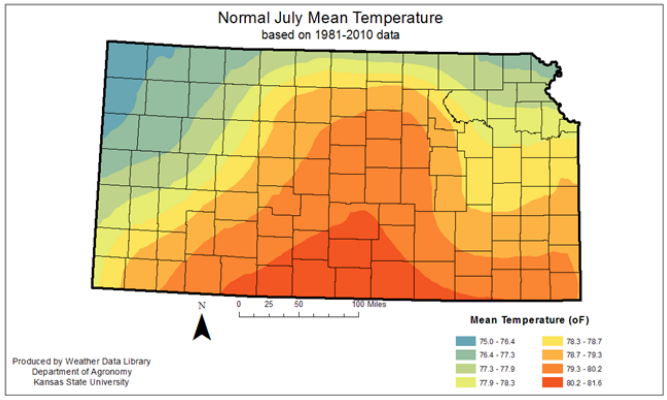


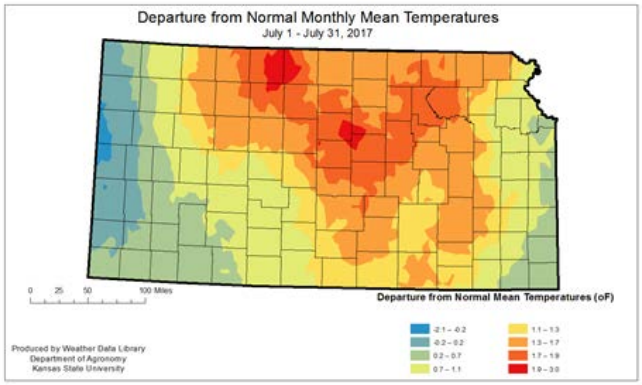
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

Temperatures were warmer than normal state-wide, with highest temperatures in the middle of the month offset by a cooler than normal start and end to the month. State-wide temperatures averaged 79.8 °F or 1.2 degrees warmer than normal. The West Central Climate Division averaged closest to normal with an average of 78.0 °F, or 0.7 degrees warmer than normal. The North Central Division had the greatest departure with an average of 80.7 °F which was 1.7 degrees warmer than normal. The warmest reading for the month was 111 °F at the Salina Airport, Saline County, on the 22nd. The coldest reading was 48 °F, recorded at Tribune 1W, Greeley County, on the 1st. Despite the warm temperatures, there were no record high maximum temperatures during the month and only 11 record high minimum temperatures. On the cold side, there were 2 new record cold maximum temperature in July and 2 new record low minimum temperatures. None of the temperature records set new records for the month of July. All divisions saw high temperatures reach 100 °F or more.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	July 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	92.0	63.6	77.8	1.0	109	22	51	7
West Central	92.5	63.5	78.0	0.7	109	22	48	1
Southwest	93.9	65.6	79.7	0.8	106	23	49	1
North Central	93.5	67.9	80.7	1.7	109	22	53	2
Central	94.5	68.6	81.5	1.6	111	22	51	1
South Central	94.1	68.9	81.5	1.1	107	22	50	15
Northeast	90.3	68.5	79.4	1.5	104	23	56	2
East Central	89.6	69.1	79.4	1.0	107	23	51	1
Southeast	91.1	69.6	80.4	1.0	106	23	57	1
STATE	92.4	67.3	79.8	1.2	111	22nd	48	1st
Data Source: KSU Weather Library								





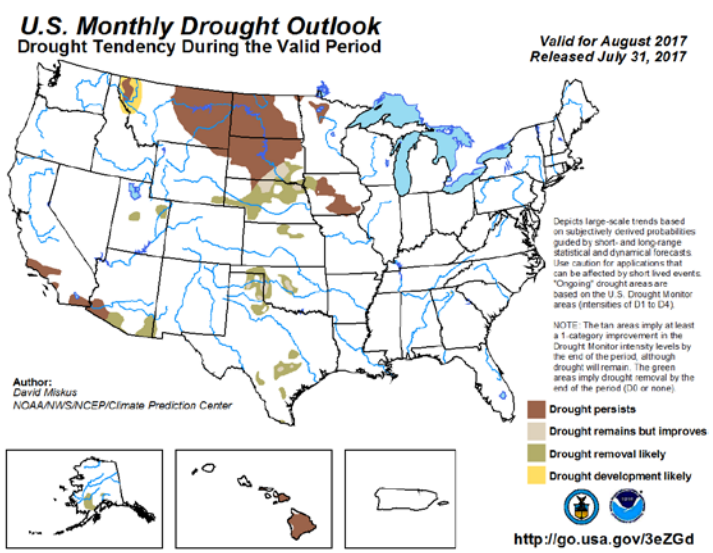


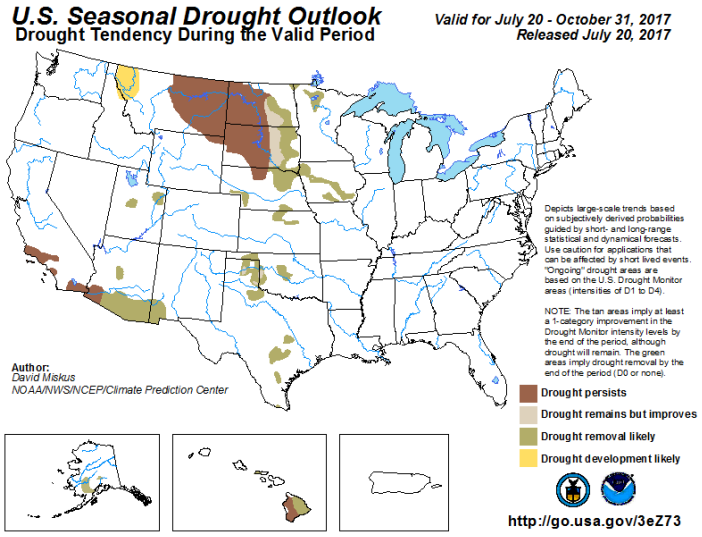
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

Severe weather was limited this month, with most of the events in the form of hail and high winds. There was one reported tornado, which is less than the 1950-2016 average of 5 tornadoes in July. In addition to the tornado, there were 17 hail reports, and 38 high wind reports. The most damaging event of the month was the flooding in Johnson County, following the heavy rains on the 27th. Catastrophic flooding was reported along several local streams, including Indian Creek in Overland Park, Kansas and Tomahawk Creek in Leewood, Kansas. Numerous swift water rescues were performed across the city and surrounding areas.

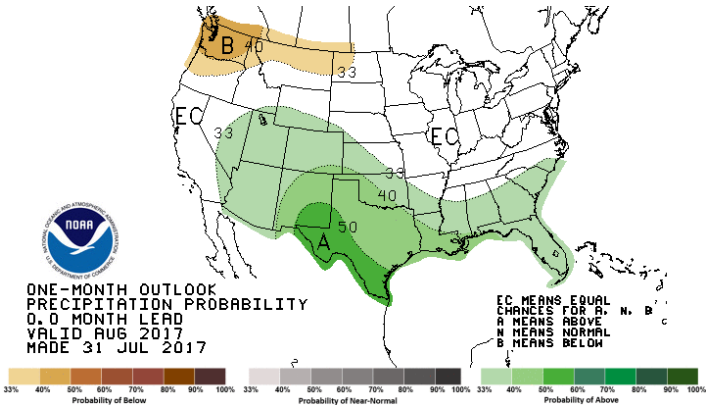
Future Outlook

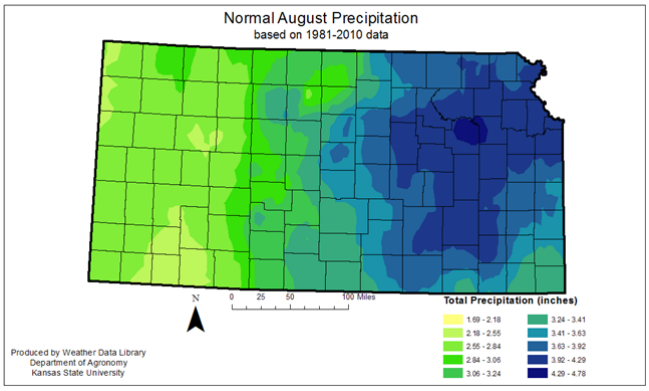
The Monthly and Seasonal Drought Outlooks indicate drought conditions to remain absent. Three month probabilities favor above normal temperature for the July, August September period, with equal probabilities of precipitation being above or below normal. The individual temperature and precipitation outlooks are provided below for the one and three month periods.

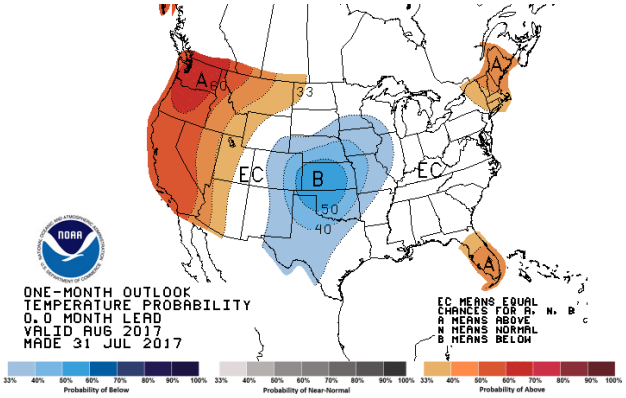


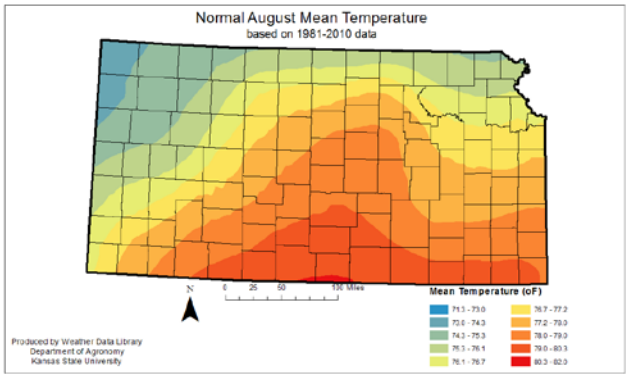


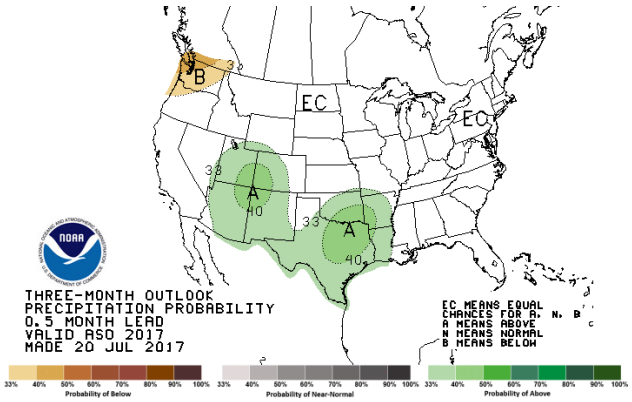
The August climate outlook calls for a increased chance of wetter than normal conditions the across western and south central Kansas. The entire state is favored for above normal temperatures. For the August –September - October time period probability is for equal chances of above or below normal precipitation and favors above normal temperatures statewide

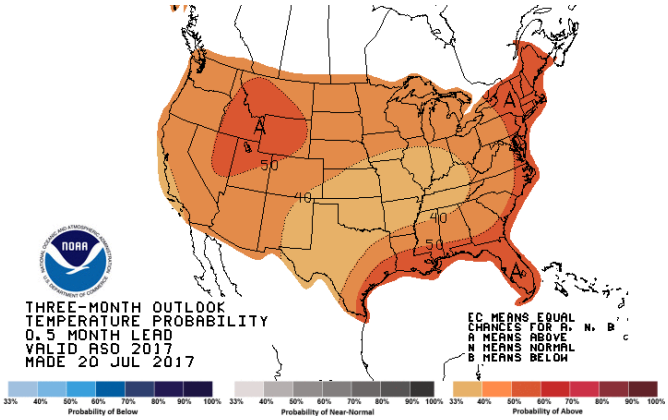












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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 August 1, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed.
(August 1, 2017, 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 1, 2017)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford and Clinton reservoirs decreased in July and allowed some flood pool storage evacuation. Milford was drawn down below multipurpose elevation in an effort to allow vegetation growth around the perimeter of the reservoir. Flows in the Kansas River were maintained near historical median values for the majority of the month, largely due to the flood pool releases.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs maintained storage above normal pool elevation. Flow in the Marais des Cygnes River was maintained at a healthy level throughout the month.

Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs all decreased throughout the month of July and streamflow declined in all reaches of the Cottonwood and Neosho Rivers. Conservation storage is essentially full but some releases are necessary to maintain sufficient streamflow.

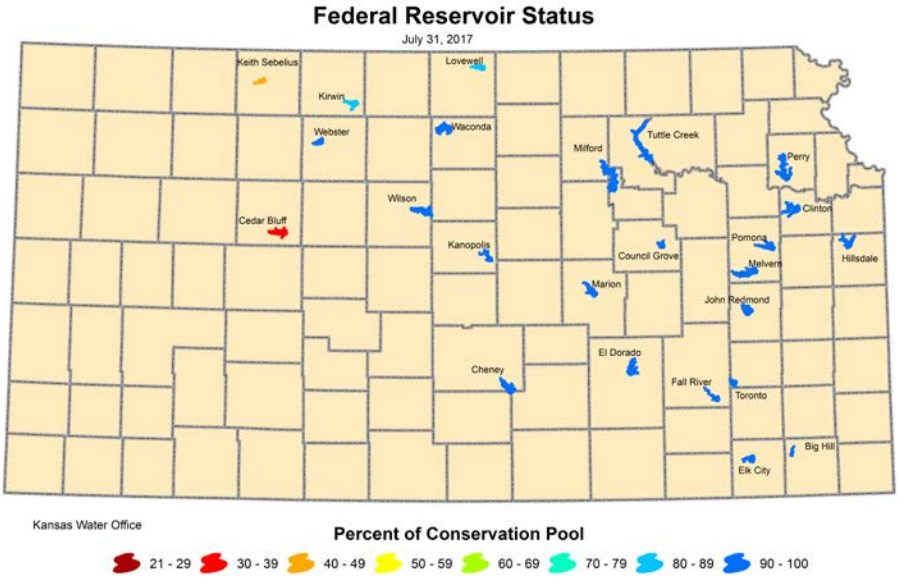
Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs maintained storage near or above normal pool in July. Streamflow of the Fall and Verdigris Rivers are below flow targets and releases are being managed to maintain streamflow and meet demands.

Saline basin: The elevation at Wilson Lake is being maintained above normal pool, as inflows continue.

Smoky Hill basin: The middle Smoky Hill basin experienced a moderate runoff event early in July and the lower Smoky streamflow remained near normal throughout the month. Kanopolis Lake elevation declined from releases but remained above multipurpose pool elevation. Kanopolis storage is healthy. Cedar Bluff Reservoir did not receive any significant inflow and the water level steadily declined.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton (Keith Sebelius) and Cedar Bluff reservoirs remain significantly below full conservation pool at 40% and 32 % respectively. Kirwin has dropped further below full conservation pool at 87%.



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		**7/31/2017 6:00 am**		
Norton[1]	2304.3	2291.89	-12.41	40.0
Harlan County, NE	1945.73	1939.90	-5.83	76.8
Lovewell[1]	1582.6	1580.02	-2.58	79.9
Milford[1]	1144.4	1143.47	-0.93	96.2
Cedar Bluff	2144	2119.30	-24.70	32.4
Kanopolis[1]	1463	1466.15	3.15	100.0
Wilson[1]	1516	1516.93	0.93	100.0
Webster[1]	1892.5	1892.05	-0.40	98.0
Kirwin[1]	1729.3	1726.54	-2.71	86.6
Waconda[1]	1455.6	1454.99	-0.61	96.5
Tuttle Creek[1]	1075	1075.46	0.46	100.0
Perry[1]	891.5	892.85	1.35	100.0
Clinton[1]	875.5	877.09	1.59	100.0
Melvern[1]	1036	1036.19	0.19	100.0
Pomona[1]	974	974.82	0.82	100.0
Hillsdale[1]	917	917.43	0.43	100.0
Arkansas River Basin		**7/31/2017 8:00 am**		
Cheney	1421.6	1421.21	-0.39	98.0
El Dorado	1339	1338.91	-0.09	100.0
Toronto[1]	901.5	901.72	0.22	100.0
Fall River[1]	948.5	948.83	0.33	100.0
Elk City[1]	796	795.96	-0.04	100.0
Big Hill	858	857.87	-0.13	100.0
Council Grove[1]	1274	1274.18	0.18	100.0
Marion[1]	1350.5	1350.27	-0.23	99.0
John Redmond[1]	1039	1041.00	0.00	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 this month.

July 7: Public health **warnings** were in affect by KDHE for Marion Reservoir, Marion County; Milford Reservoir all Zones, Geary, Dickinson, Clay counties; Sam's Pond, Hamilton County; Webster Lake, Rooks County; and Wolfs Pond, Barton County. This warning is to notify the public that conditions are unsafe and water contact should not occur (no swimming, wading, skiing of consumption of the water should occur.

Public health watches Webster Lake, Rooks County and Overbrook City Lake, Osage County.

July 13: Public health **warnings** for Marion County Lake, Marion County; Milford Reservoir (all Zones), Geary, Dickinson and Clay counties; and Wolf Pond, Barton County.

Public health watches Marion Reservoir, Marion County; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; and Webster Lake, Rooks County.

July 20: Public health **warnings** for Marion County Lake, Marion County; Milford Reservoir (Zones A and C), Geary, Dickinson and Clay counties; and Wolf Pond, Barton County.

Public health watches for Marion Reservoir, Marion County; Milford Reservoir (Zone B), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; Webster Lake, Rooks.

July 27: Public health **warnings for** Marion County Lake, Marion County; Marion Reservoir, Marion County; Milford Reservoir (Zone B), Geary, Dickinson and Clay counties; and Webster Lake, Rooks County.

Public health watches for Milford Reservoir (Zone C), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; and South Lake, Johnson County.

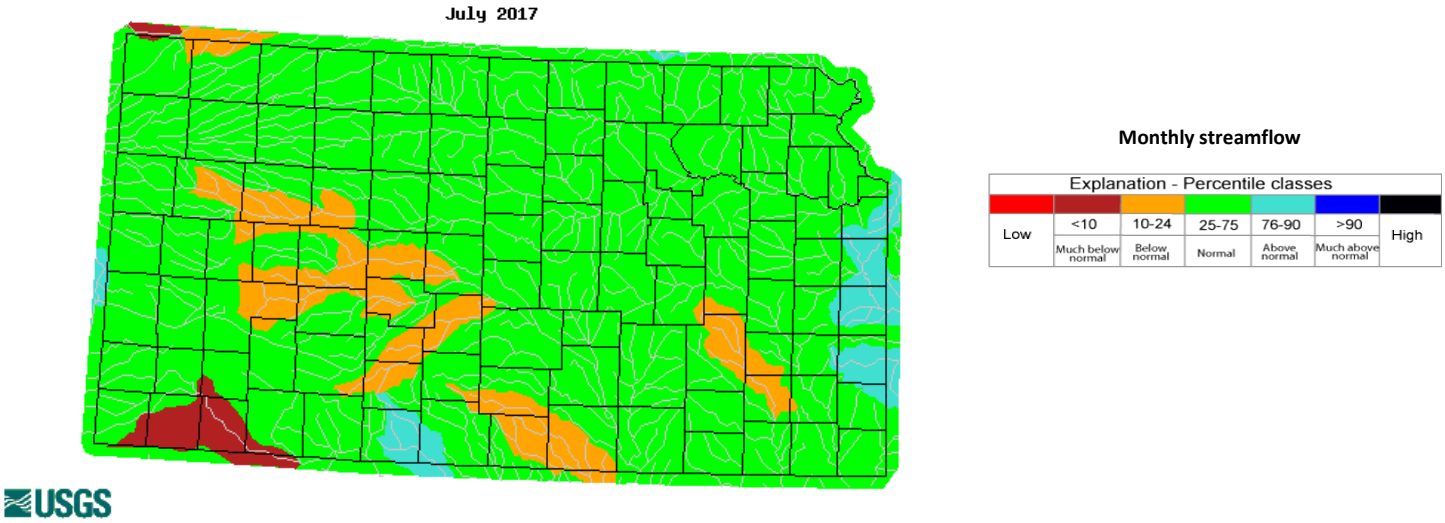
August 3: Public health **warnings for** Marion County Lake, Marion County; Marion Reservoir, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Milford Reservoir (Zone C), Geary, Dickinson and Clay counties; and Webster Lake, Rooks County.

Public health watches for Milford Reservoir (Zone A), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; South Lake, Johnson County; and Villa High Lake, Thomas County.

Streamflow Conditions

Despite rains, streamflows in a few Kansas locations during June had 7-day streamflow average of zero. These flows are provided in the table below. Data is from U.S.G.S WaterWatch. 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. No MDS administration occurred during the month, but administratin is expected August 2, 2017 on the Little Arkansas River at Alta Mills.

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates some flood conditions occurred in Kansas this month as monitored at the gages in the table below.

Summary of Recent Flood and High Flow Conditions (2017-07-01 -- 2017-07-31)											
						Highest peak from 2017-07-01 to 2017-07-31					
										Historical Peaks	
USGS station number	USGS station name	Drain. area [mi2]	NWS flood stage [ft]	No. of days above flood stage	NWS flood class	Date	Stage [ft]	Stream flow (date) [ft3/s]	Rank	No. of years	Max. (year) [ft3/s]
6891850	STRANGER C AT EASTON, KS	216	17	1		7/1/2017	19.27	4790	--	--	--
6893080	BLUE R NR STANLEY, KS	46	16	1		7/27/2017	20.19	18500	4	45	20200 (1990)
6893300	INDIAN C AT OVERLAND PARK, KS	26.6	14	1		7/27/2017	17.97	13400	1	51	12800 (1984)
6893390	INDIAN C AT STATE LINE RD, LEAWOOD, KS	64.17	20	5		7/27/2017	27.96	23800	1	11	18700 (2010)

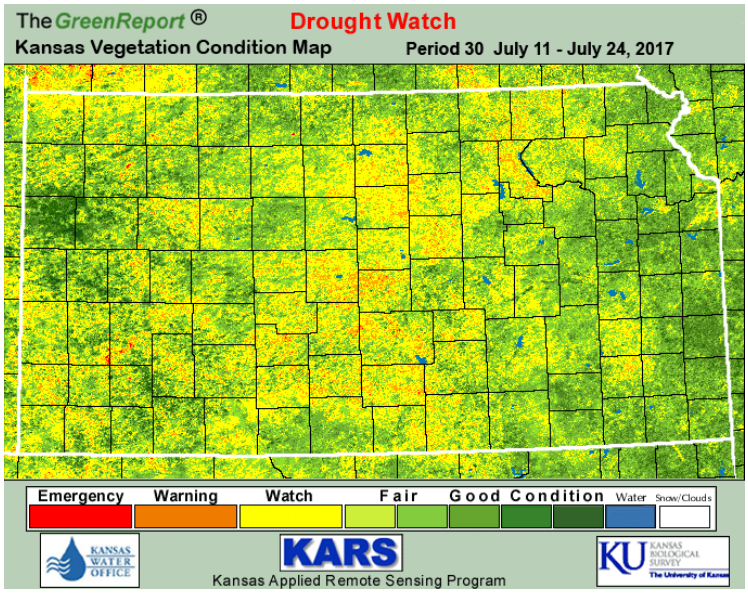
Near Flood stage, Minor Flooding, Moderate Flooding Major Flooding

Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

Soil, Crop and Vegetation

Kansas Vegetative Conditions

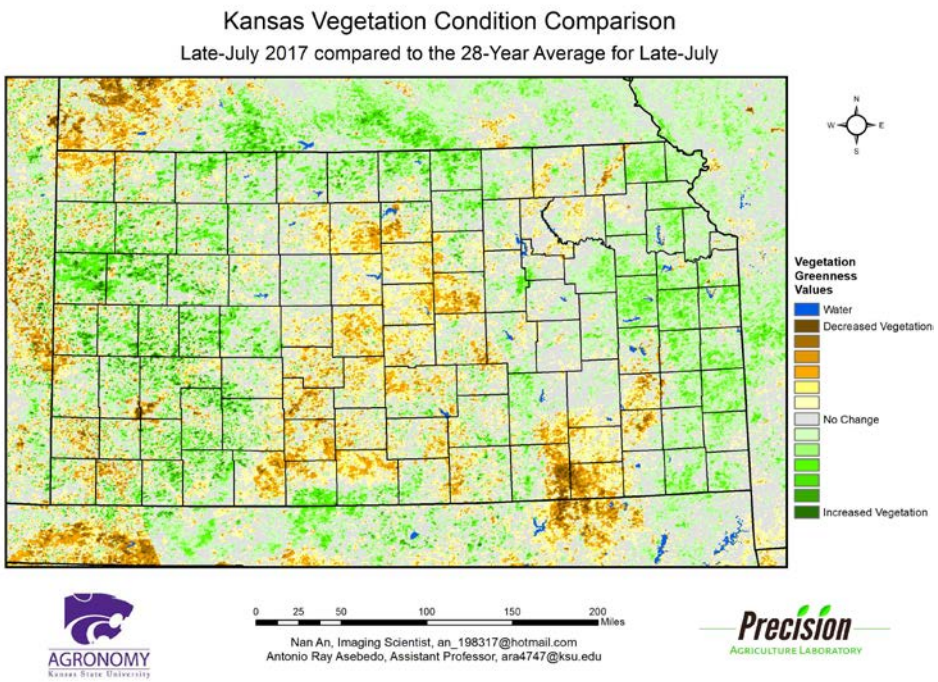
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress.



Vegetative conditions in most areas of the state began July in great shape, with one area in the south west having been consistently dry all season and spotty dryness in some areas. As the month progressed areas in the central and some western parts of the state began to show additional signs of vegetation stress which continued and expanded until the end of the month. Southwest also showed improvement part of July but ended with scattered areas of stress. Eastern areas remained in good condition throughout the month.

Week 3 The area of dryness in the central part of the state is expanding to the north. Some areas in the SW have shown improvement. The east remains in good condition.

Week 4 Some areas in the center of the state are showing signs of vegetation stress. The SW has shown improvement over the last several weeks. The east remains in good condition.

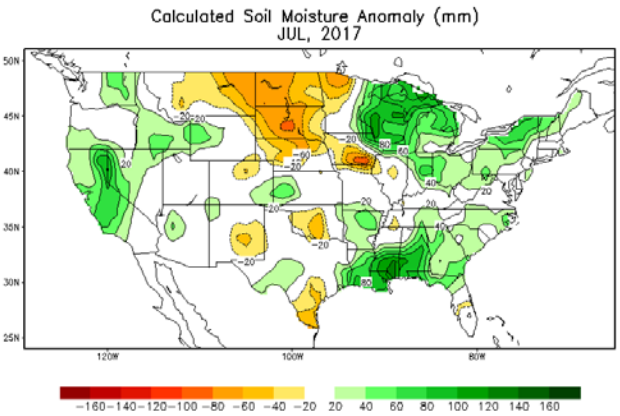


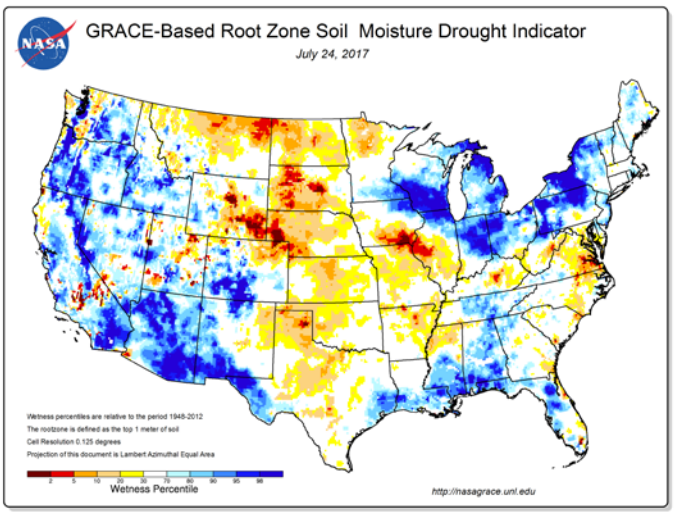
The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition. The camparison is from K-State's Precision Agriculture Laboratory.

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 published July 31, 2017 reported topsoil moisture rated 11 percent very short, 37 short, 48 adequate, and 4 surplus. Subsoil moisture rated 6 percent very short, 34 short, 59 adequate, and 1 surplus.

Field Crops Report:
Corn condition rated 3 percent very poor, 10 poor, 31 fair, 47 good, and 9 excellent.

Soybean condition rated 1 percent very poor, 7 poor, 41 fair, 48 good, and 3 excellent.

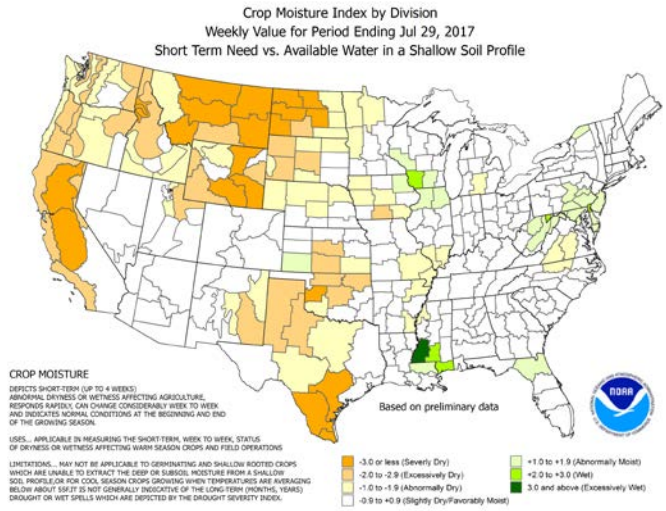
Sorghum condition rated 1 percent very poor, 6 poor, 30 fair, 58 good, and 5 excellent.

Cotton condition rated 1 percent very poor, 4 poor, 29 fair, 60 good, and 6 excellent.

Sunflower condition rated 0 percent very poor, 2 poor, 32 fair, 62 good, and 4 excellent.

Alfalfa condition rated 1 percent very poor, 8 poor, 30 fair, 57 good, and 4 excellent.

Pasture and Range Report: Pasture and range conditions rated 1 percent very poor, 8 poor, 32 fair, 52 good, and 7 excellent.
Stock water supplies rated 1 percent very short, 12 short, 86 adequate, and 1 surplus.



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.

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

June 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	4.05	0.92	129%	76.4	1.9	100 (10,6)	54 (23)
Dodge City	2.16	-0.92	70%	80.5	0.9	104 (21)	54 (1)
Garden City	3.37	0.59	121%	79.5	1.3	102 (21,11)	53 (1)
Goodland	3.38	-0.09	97%	76.9	1.2	99 (21,11)	56 (4)
Guymon, OK	1.41	-1.25	53%	81.7	2.1	103 (25,21)	55 (1)
Hill City	1.74	-1.97	47%	81.3	2.2	109 (21)	54 (1)
Lamar, CO	6.30	3.41	218%	79.0	1.7	105 (11)	50 (1)
McCook, NE	2.17	-1.08	67%	80.0	4.1	107 (21,19)	50 (1)
Springfield, CO	5.08	2.25	180%	75.8	-0.4	100 (11)	48 (1)
Central							
Concordia	2.34	-1.58	60%	80.8	1.7	105 (21)	58 (1)
Hebron, NE	2.13	-2.00	52%	79.9	2.8	101 (21,10)	53 (1)
Medicine Lodge	0.98	-2.40	29%	82.8	0.7	106 (22,21)	57 (1)
Ponca City, OK	3.26	-0.07	98%	84.1	2.4	105 (22)	64 (1)
Salina	1.69	-2.60	39%	84.7	3.6	111 (22)	56 (1)
Wichita (ICT)	1.73	-1.59	52%	82.5	1.4	107 (22)	58 (1)
East							
Bartlesville, OK	1.75	-1.66	51%	81.4	0.3	105 (22)	61 (2)
Chanute	2.36	2.01	674%	81.3	1.8	104 (22)	60 (2)
Fall City, NE	1.11	-3.93	22%	78.8	1.3	100 (21)	57 (1)
Johnson Co. Exec. Apt	9.88	6.16	266%	78.1	-0.2	98 (22)	60 (1)
Joplin, MO	3.11	-0.70	82%	82.0	1.8	101 (22)	62 (2)
Kansas City (MCI), MO	5.00	0.55	112%	79.1	0.8	98 (22,21)	60 (1)
St. Joseph, MO	1.72	-3.47	33%	78.5	1.4	96 (22)	57 (30)
Topeka (TOP	4.80	0.98	126%	80.4	1.4	103 (22)	60 (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 – August 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: August ended with abnormally dry conditions over more than one third of Kansas. Moderate drought (D1) was affecting about 20% of Kansas, primarily in the central part of the state.

Lakes and Streams

- Eleven Blue-Green Algae (BGA) public health warnings in effect at the end of August include : Brown County State Fishing Lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City Lake, Brown County; Marion County Lake, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; South Lake, Johnson County and Webster Lake, Rooks County. Water contact should not occur in these areas.

- Three Blue-Green Algae (BGA) public health watches in effect at the end of August include Milford Reservoir (Zones A,B and C), Geary, Dickinson and Clay counties; Perry Lake (Zones B, C and D) and Veteran's Lake , Cowley County. A watch means the water may be unsafe, contact is discouraged.

- Flood flows occurred at 12 locations during the month.

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

Disasters and Assistance

- Producers in 43 counties remain eligible for USDA disaster programs due to agricultural disaster designations in 2017.

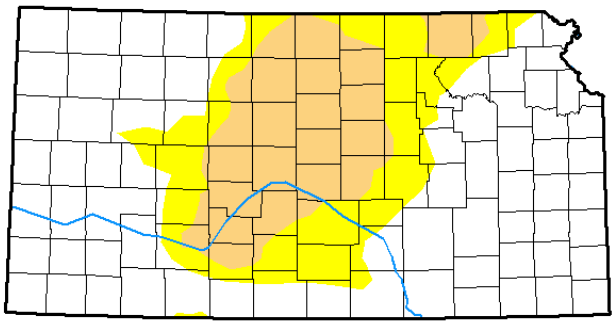
- August 22, 2017, the U.S. Department of Agriculture (USDA) designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017.

General Conditions

The near normal precipitation coupled with cooler than normal temperatures limited the expansion of the abnormally dry condition. However, areas of the state with much lower than normal precipitation had an expansion of moderate drought. The much cooler than normal temperatures that have started the month will reduce some of the evaporative demand. Extended dry weather, however, will result in further intensification of the drought.

U.S. Drought Monitor

Kansas



August 29, 2017

(Released Thursday, Aug. 31, 2017)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	62.50	37.50	19.90	0.00	0.00	0.00
Last Week *08-22-2017*	63.49	36.51	18.52	0.00	0.00	0.00
3 Months Ago *05-30-2017*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year *01-03-2017*	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year *09-27-2016*	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago *08-30-2016*	94.79	5.21	0.97	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:

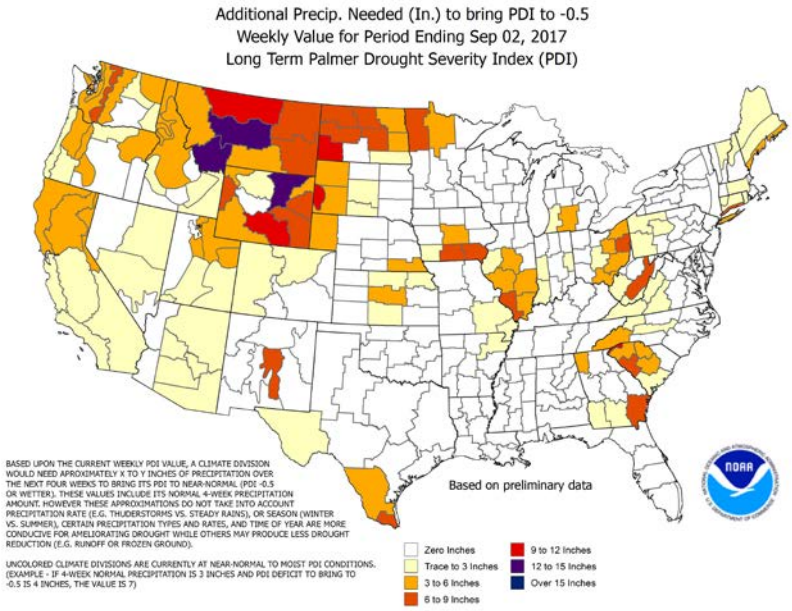
Chris Fenimore

NCEI/NESDIS/NOAA

http://droughtmonitor.unl.edu/

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.



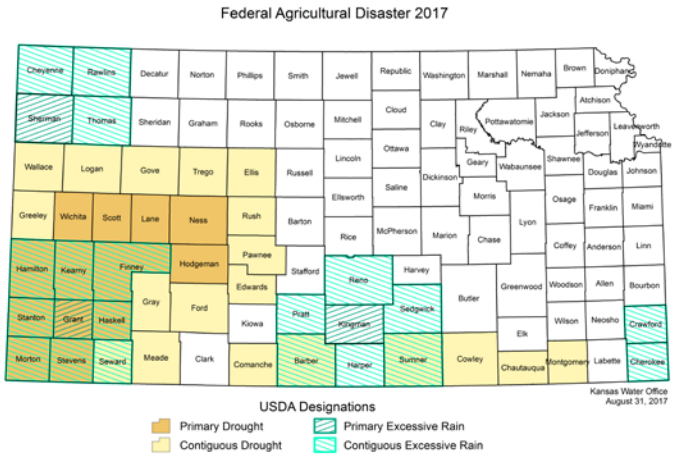
Precipitation Needed to End Drought (inches)					
	Week Ending				
Climate Division	**August 5**	**August 12**	**August 19**	**August 26**	**September 2**
North Central	*1.47*	*1.94*	*1.54*	*2.28*	*3.00*
North East	*2.39*	*3.2*	*3.44*	*0.84*	*1.07*
Central	*5.47*	*5.16*	*4.78*	*5.11*	*5.04*
South Central	*1.78*	*0*	*0.66*	*1.4*	*1.64*

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

Federal Disaster Declarations 2017

USDA 2017 agricultural disaster designations have been made for 43 Kansas Counties: 15 primary and 28 contiguous for a variety of causes including drought and excessive rain. Some counties qualify for programs for both of these causes.

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster (drought) assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

July 12, 2017, Cherokee and Crawford counties became eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to excessive rainfall and flooding April 24-May 11, 2017.

August 22, 2017, the USDA designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017. As contiguous counties; Barber, Cheyenne, Finney, Hamilton, Haskell, Harper, Kearny, Morton, Pratt, Rawlins, Reno, Sedgwick, Sumner, Seward, Stanton, Stevens, and Thomas are also already eligible.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting

Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

Federal Disaster for Severe Winter Storm

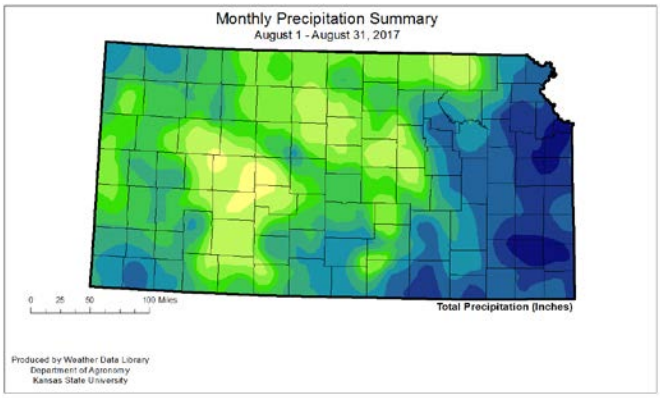
June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3. Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita. Additional designations may be made at a later date if requested by the state and warranted by the results of further damage assessments.

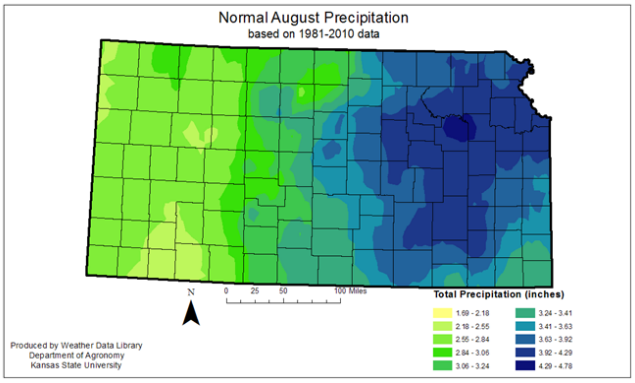
The declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

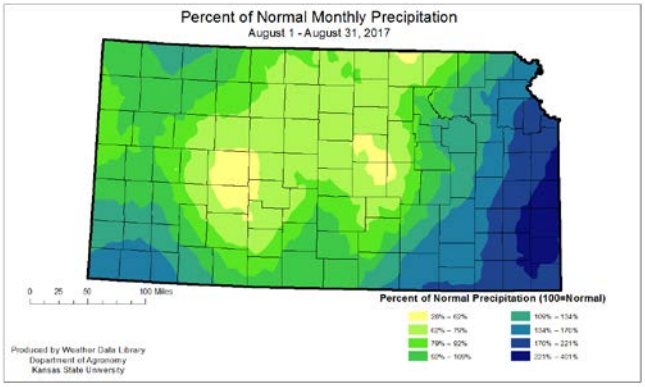
Climate Summary (Temperature and Precipitation)

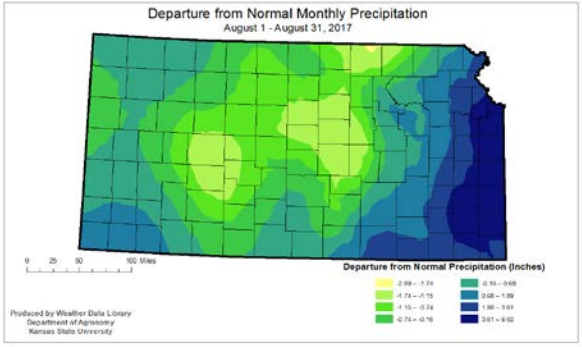
August had closer to normal precipitation than July, but was skewed heavily to the east. State-wide precipitation averaged 3.46 inches which was 104 percent of normal. All three eastern divisions plus the South Central division averaged at or above normal for the month. The Central and West Central divisions tied for the lowest percent of normal at 60 percent each. For the Central Division that meant an average of 2.51 inches or a departure of -1.42 inches. For the West Central that was an average of 1.56 inches with a departure of -1.05 inches. The greatest daily precipitation total reported at a National Weather Service Coop (NWS) station was 8.85 inches at Hillsdale Lake, Miami County, on the 22nd. The greatest daily total reported at a Community Collaborative Rain Hail and Snow network station (CoCoRaHS) was 8.30 inches at Wellsville 3.6 NNW, Douglas County, also on the 22nd. The monthly extremes for both networks: 12.52 inches at Erie, Neosho County (NWS) and 13.00 inches at Overland Park 1.7 NE, Johnson 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)												
	August 1-31, 2017			January 1- August 31, 2017			April 1, 2016 – August 31, 2017			September 1, 2016 – August 31, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	2.04	-0.69	74	16.71	16.89	98	13.77	14.59	93	20.77	21.30	97
West Central	1.56	-1.05	60	18.62	16.29	115	15.15	13.79	110	20.77	20.71	101
Southwest	2.50	-0.21	92	20.72	15.44	135	16.29	13.06	125	22.26	19.84	112
North Central	2.54	-0.75	77	21.09	21.31	98	17.09	17.83	95	27.25	27.95	97
Central	2.15	-1.42	60	21.16	22.48	94	16.58	18.53	90	26.47	29.20	90
South Central	3.54	0.10	103	25.55	23.47	109	19.05	18.85	101	34.06	31.23	108
Northeast	3.93	0.03	100	24.58	25.66	95	19.63	21.46	91	34.28	34.88	98
East Central	5.56	1.47	136	27.57	27.61	99	22.98	22.68	100	36.77	37.80	96
Southeast	6.88	3.14	188	34.30	29.41	116	28.75	23.41	122	47.09	41.36	113
STATE	3.46	0.13	104	23.61	22.00	108	18.97	18.15	104	30.18	29.29	102





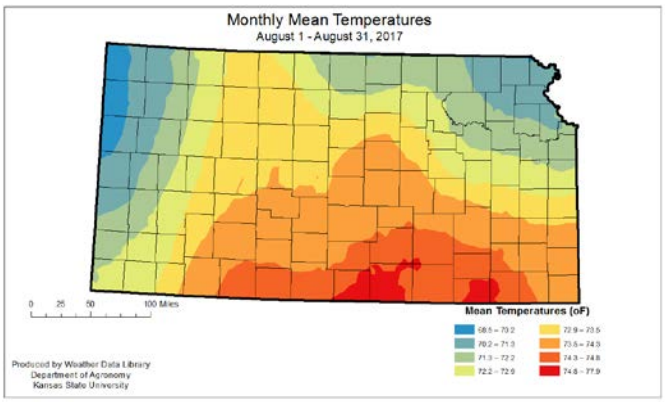


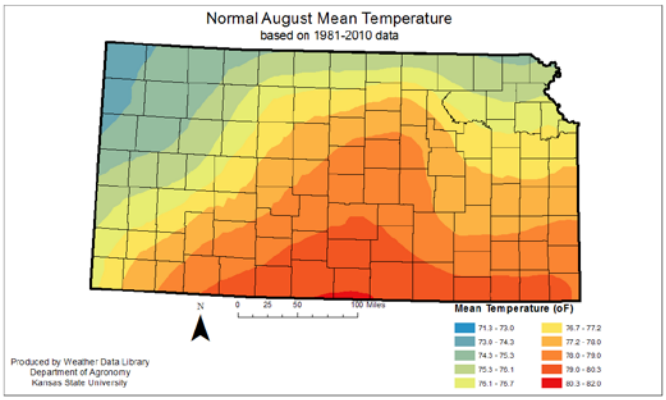


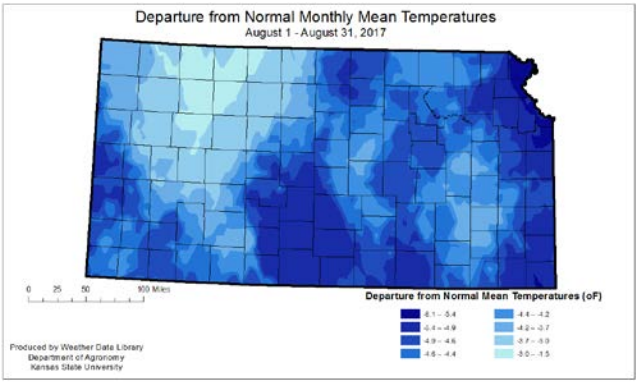
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

The most notable weather feature for August was the cooler than normal temperatures. The state-wide average temperature was 72.7 °F, which is a -4.4 degree departure from normal. All climate divisions were in the cooler than normal range. The Northwest Division was closest to normal with an average temperature of 71.1 °F, or -3.6 degrees from normal. The East Central Division had the greatest departure; the average for that division was 72.1 °F which resulted in a departure of -5.0 degrees. Only the three eastern divisions failed to break the 100 degree mark. The warmest reading was 104 °F, reported at Larned #2, Pawnee County, on the 21st. The coldest reading was 43 oF, reported at Brewster 4W, Thomas County, on the 28th. Not surprisingly, there were no new record high maximum temperatures and only three new record high minimum temperatures. On the other hand, there were 49 new record low daily maximum temperatures and 16 new record low minimum temperatures. None of the temperature records were records for the month.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	August 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	84.9	57.2	71.1	-3.6	101	21	43	28
West Central	86.1	57.7	71.9	-3.7	101	21	47	24
Southwest	85.6	60.6	73.1	-4.2	100	19	49	31
North Central	85.2	59.9	72.5	-4.5	101	21	47	4
Central	86.3	60.8	73.5	-4.6	102	20	49	23
South Central	86.1	62.7	74.4	-4.8	104	21	50	29
Northeast	82.5	60.4	71.5	-4.8	95	21	49	4
East Central	82.3	62.0	72.1	-5.0	96	21	51	23
Southeast	84.3	63.6	74.0	-4.6	99	6	53	23
STATE	84.8	60.5	72.7	-4.4	104	21st	43	28th
Data Source: KSU Weather Library								





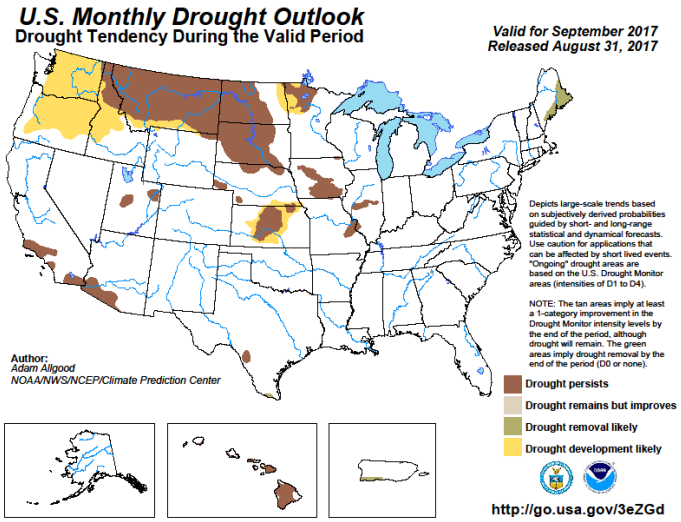


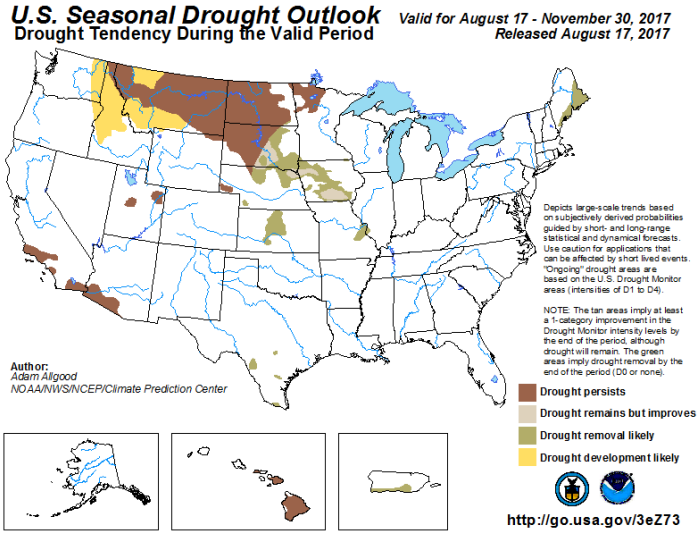
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

Severe weather was again limited this month, with most of the events in the form of hail and high winds. There was one reported tornado, which is less than the 1950-2016 average of three tornadoes in August. In addition to the tornado, there were 56 hail reports, and 63 high wind reports. The most damaging event of the month was the flooding in eastern Kansas, following the heavy rains on the 5th and 6th of August. Flooding was reported along several local streams, including areas that had been flooded at the end of July.

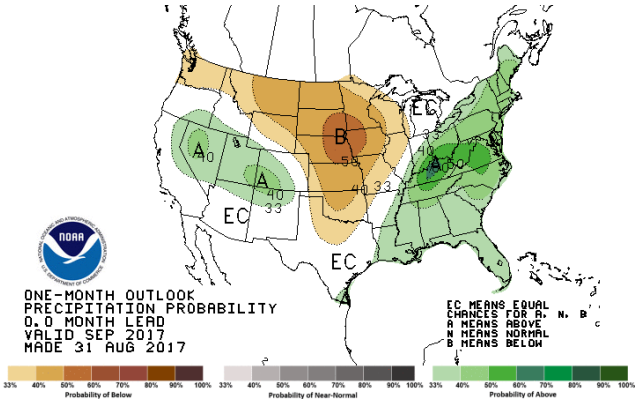
Future Outlook

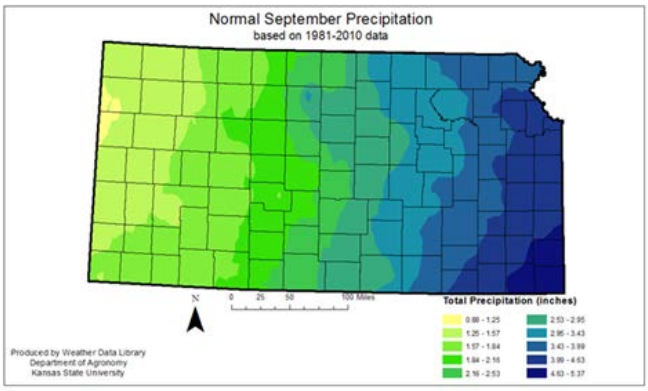
The Monthly Drought Outlook indicates drought conditions to remain in central Kansas in September. The September precipitation outlook calls for drier than normal conditions state-wide. This is coupled with increased chances of below normal temperatures in the eastern half of the state, with equal chances of above or below normal temperatures across the rest of the state. The Seasonal Drought Outlook favors improved conditions. Note the monthly outlook is the more recent forecast. The individual temperature and precipitation outlooks are provided below for the one and three month periods.

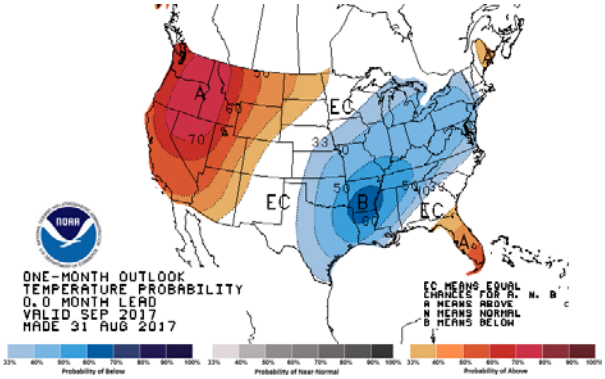


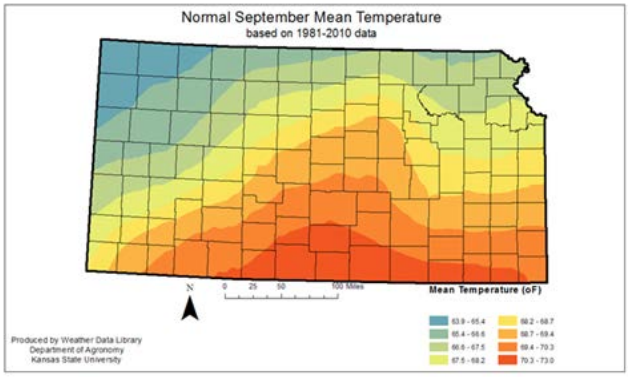


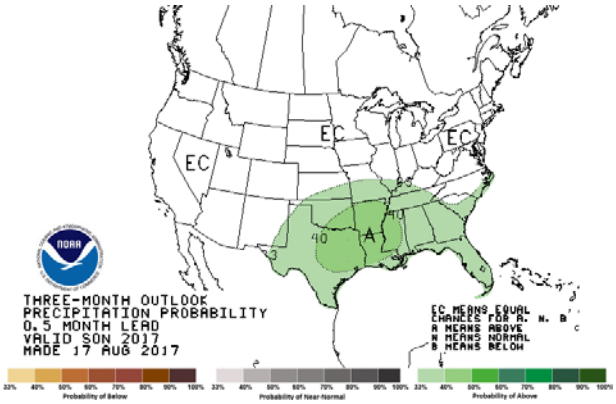
The August climate outlook calls for an increased chance of wetter than normal conditions the across western and south central Kansas. The entire state is favored for above normal temperatures. For the August –September - October time period probability is for equal chances of above or below normal precipitation and favors above normal temperatures statewide

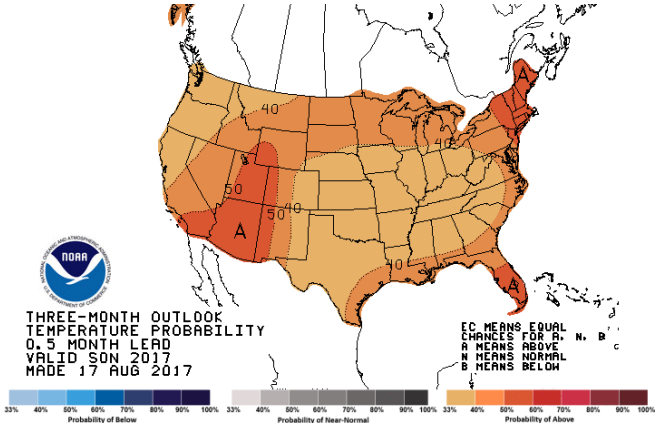












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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 September 7, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed.
(September 7, 2017, 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/ September 7, 2017)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs was highly variable in August. A mid-month precipitation event provided enough inflow to raise pool levels near fall target elevations, and higher in the case of Clinton. Flows in the Kansas River generally declined below historic median values, particularly in the upper reaches.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received significant inflow during the mid-August precipitation event, gaining storage above normal pool elevation. Flow in the Marais des Cygnes River was maintained at a healthy level throughout the month.

Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs all decreased throughout the month of August and streamflow declined in all reaches of the Cottonwood and Neosho Rivers. Conservation storage is nearly full and some releases are necessary to maintain sufficient streamflow.

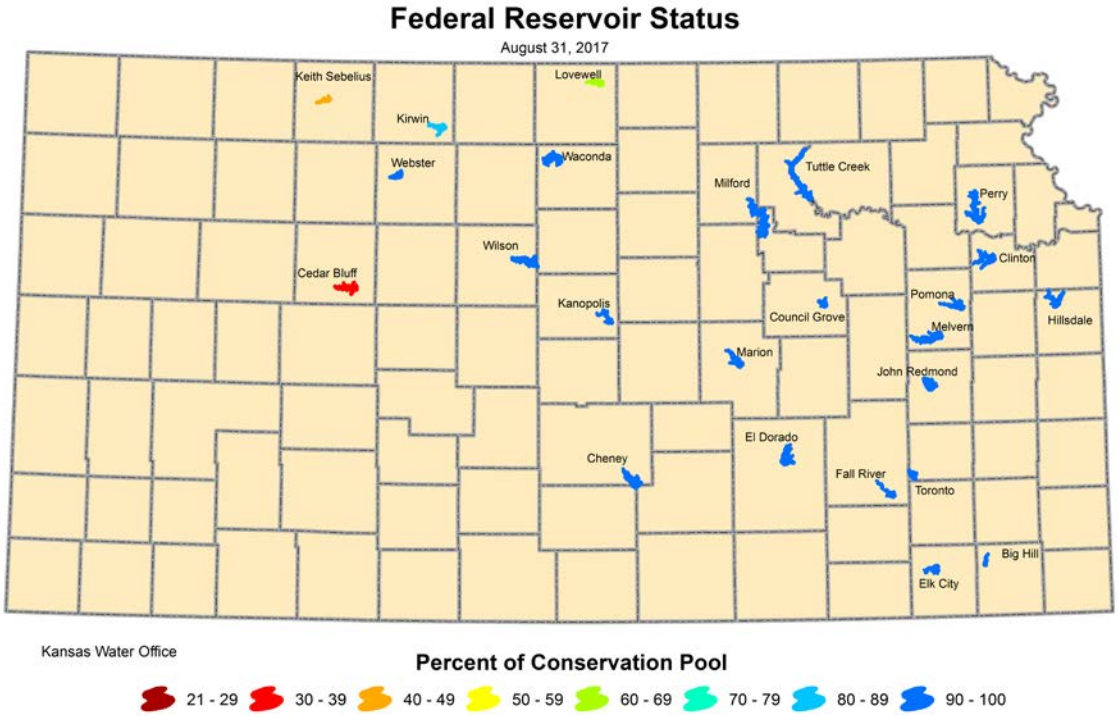
Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs maintained storage near or above normal pool in August but inflows declined significantly in the latter part of the month, along with streamflow throughout the basin.

Saline basin: The elevation at Wilson Lake is being maintained above normal pool, as inflows continue.

Smoky Hill basin: The middle Smoky Hill basin experienced a small amount of runoff early in August, which helped maintain some streamflow. The lower Smoky streamflow declined to below normal levels over the month as Kanopolis Lake elevation declined and the discharge through the uncontrolled spillway was reduced. But Kanopolis storage is in good shape.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton (Keith Sebelius) and Cedar Bluff reservoirs remain significantly below full conservation pool at 39% and 32 % respectively. Kirwin has continued to drop, ending August at 80% of full conservation pool.



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		**8/30/2017 6:00 am**		
Norton[1]	2304.3	2291.66	-12.64	39.2
Harlan County, NE	1945.73	1938.49	-7.24	71.7
Lovewell[1]	1582.6	1577.38	-5.22	62.0
Milford[1]	1144.4	1144.87	0.47	100.0
Cedar Bluff	2144	2118.75	-25.25	31.5
Kanopolis[1]	1463	1465.17	2.17	100.0
Wilson[1]	1516	1516.89	0.89	100.0
Webster[1]	1892.5	1890.28	-2.17	89.6
Kirwin[1]	1729.3	1725.13	-4.12	80.1
Waconda[1]	1455.6	1454.82	-0.78	95.6
Tuttle Creek[1]	1075	1078.71	3.71	100.0
Perry[1]	891.5	894.11	2.61	100.0
Clinton[1]	875.5	879.24	3.74	100.0
Melvern[1]	1036	1036.39	0.39	100.0
Pomona[1]	974	976.76	2.76	100.0
Hillsdale[1]	917	923.51	6.51	100.0
Arkansas River Basin		**8/30/2017 8:00 AM**		
Cheney	1421.6	1421.04	-0.56	97.0
El Dorado	1339	1338.74	-0.26	99.0
Toronto[1]	901.5	901.85	0.35	100.0
Fall River[1]	948.5	948.38	-0.12	99.0
Elk City[1]	796	795.98	-0.02	100.0
Big Hill	858	858.03	0.03	100.0
Council Grove[1]	1274	1273.84	-0.16	99.0
Marion[1]	1350.5	1349.81	-0.69	95.0
John Redmond[1]	1039	1041.28	0.28	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 this month.

August 3: Public health **warnings for** Marion County Lake, Marion County; Marion Reservoir, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Milford Reservoir (Zone C), Geary, Dickinson and Clay counties; and Webster Lake, Rooks County.

Public health watches for Milford Reservoir (Zone A), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; South Lake, Johnson County; and Villa High Lake, Thomas County.

August 10: Public health **warnings for** Central Park Lake, Shawnee County; Marion County Lake, Marion County: Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Webster Lake, Rooks County.

Public health watches for Milford Reservoir (Zones A,B and C), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Sam's Pond, Hamilton County; South Lake, Johnson County; and Villa High Lake, Thomas County.

August 17: Public health **warnings for** Central Park Lake, Shawnee County; Marion County Lake, Marion County: Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Milford Reservoir (Zone A), Geary, Dickinson and Clay counties; Webster Lake, Rooks County.

Public health watches for Milford Reservoir (Zone A), Geary, Dickinson and Clay counties; Overbrook City Lake, Osage County; Perry Lake (Zone C), Jefferson County; Sam's Pond, Hamilton County; South Lake, Johnson County; and Villa High Lake, Thomas County**.**

August 24: Public health **warnings** for Brown County State Fishing Lake, Brown County; Central Park lake, Shawnee County; Hiawatha City Lake, Brown County; Marion County Lake, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Milford Reservoir (Zones A,B and C), Geary, Dickinson and Clay counties; and South Lake, Johnson County.

Public health watches for Perry Lake (Zones A,B and C), Jefferson County, Veteran's Lake , Cowley County; Overbrook City Lake, Osage County; and Sam's Pond, Hamilton County.

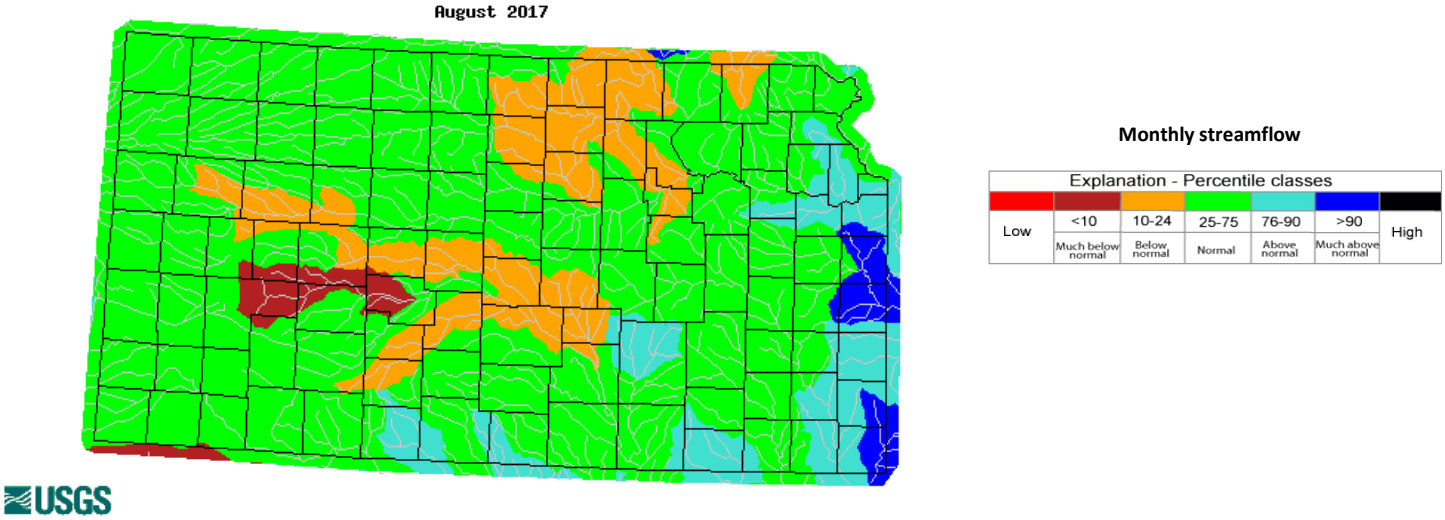
August 31: Public health **warnings** Brown County State Fishing Lake, Brown County; Central Park lake, Shawnee County; Hiawatha City Lake, Brown County; Marion County Lake, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Overbrook City Lake, Osage County; Perry Lake (Zone A), Jefferson County; Sam's Pond, Syracuse, Hamilton County; South Lake, Johnson County; and Webster Lake, Rooks County.

Public health watches for Milford Reservoir (Zones A,B and C), Geary, Dickinson and Clay counties; Perry Lake (Zones B, C and D); and Veteran's Lake, Cowley 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 administratin 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.

Streamflows as of August 31, 2017				
Gaging Station	**Current Flow**	**Aug MDS**	**Sep MDS**	**Comment**
Republican River at Concordia	137	150	80	
Republican River at Clay Center	232	200	100	
Little Blue River near Barnes	84	80	60	
Rattlesnake Creek near Macksville	Dry	1	1	No surface water diversions above gage
Rattlesnake Creek near Zenith	4	3	3	No surface water diversions above gage
Arkansas River near Hutchinson	108	80	60	
Little Arkansas River at Alta Mills	3	8	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	23	20	20	
South Fork Ninnescah River near Pratt	6	5	5	No surface water diversions above gage

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates some flood conditions occurred in Kansas this month as monitored at the gages in the table below.

Summary of Recent Flood and High Flow Conditions (2017-08-01 -- 2017-08-31)											
						Highest peak from 2017-08-01 to 2017-08-31					
										Historical Peaks	
USGS station number	USGS station name	Drain. area [mi2]	NWS flood stage [ft]	No. of days above flood stage	NWS flood class	Date	Stage [ft]	Stream flow (date) [ft3/s]	Rank	No. of years	Max. (year) [ft3/s]
6891200	WAKARUSA R AT WAKARUSA, KS	135	15	1		8/22/2017	17.2	--	--	--	--
6891500	WAKARUSA R NR LAWRENCE, KS	425	23	1		8/22/2017	24.73	5160	35	79	24200 (1951)
6891850	STRANGER C AT EASTON, KS	216	17	2		8/23/2017	21.11	7520	--	--	--
6892000	STRANGER C NR TONGANOXIE, KS	406	23	1		8/22/2017	23.18	6760	40	86	40000 (2001)
6893080	BLUE R NR STANLEY, KS	46	16	1		8/22/2017	21.5	23400	1	45	20200 (1990)
6893300	INDIAN C AT OVERLAND PARK, KS	26.6	14	3		8/22/2017	18.39	14300	1	51	12800 (1984)
6893390	INDIAN C AT STATE LINE RD, LEAWOOD, KS	64.17	20	4		8/22/2017	28.22	24600	1	11	18700 (2010)
6913500	MARAIS DES CYGNES R NR OTTAWA, KS	1250	31	2		8/22/2017	31.4	15000	39	107	142000 (1951)
6915800	MARAIS DES CYGNES R AT LA CYGNE, KS	2669	25	5		8/25/2017	30.53	24100	14	30	131000 (2007)
6916600	MARAIS DES CYGNES R NR KS-MO ST LINE, KS	3250	27	3		8/26/2017	27.15	21700	31	56	137000 (2007)
7156900	CIMARRON RIVER NR FORGAN, OK	8536	5	3		8/24/2017	6.04	1380	44	76	69000 (1942)
7184000	LIGHTNING C NR MCCUNE, KS	197	12	3		8/18/2017	15.69	4920	39	64	67500 (1993)

Near Flood stage, Minor Flooding, Moderate Flooding Major Flooding

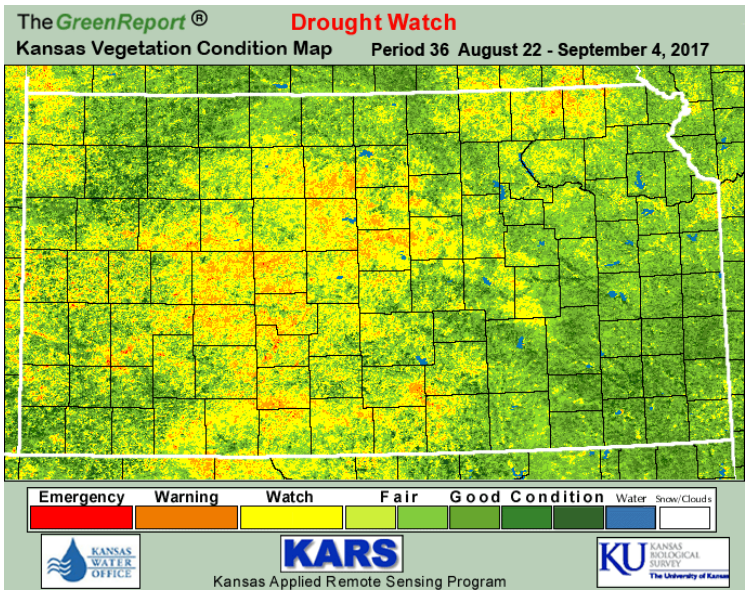
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

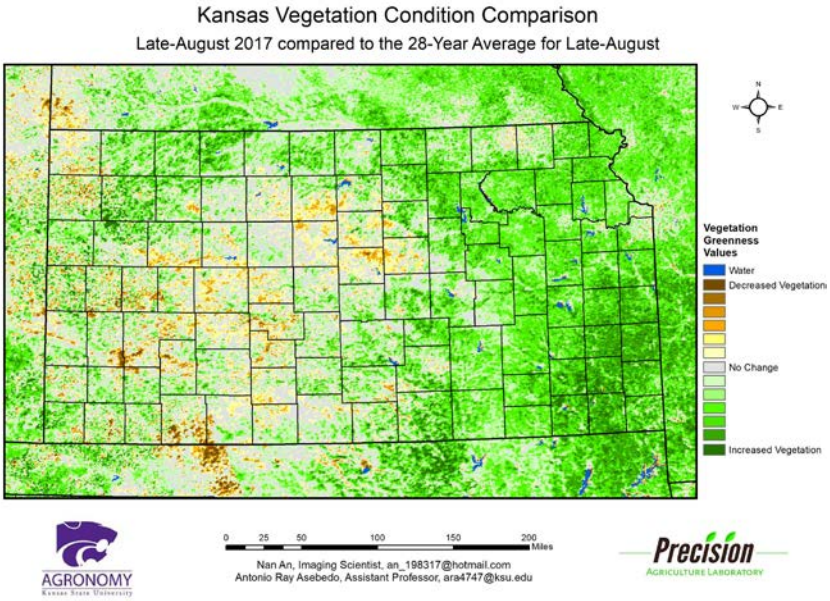
Soil, Crop and Vegetation

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.

Vegetative conditions in most areas of the state ended August in good vegetative condition, with the central areas of the state in poor condition due to lack of moisture. .

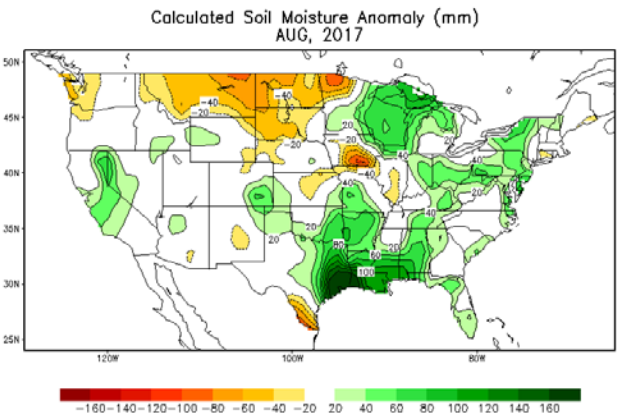


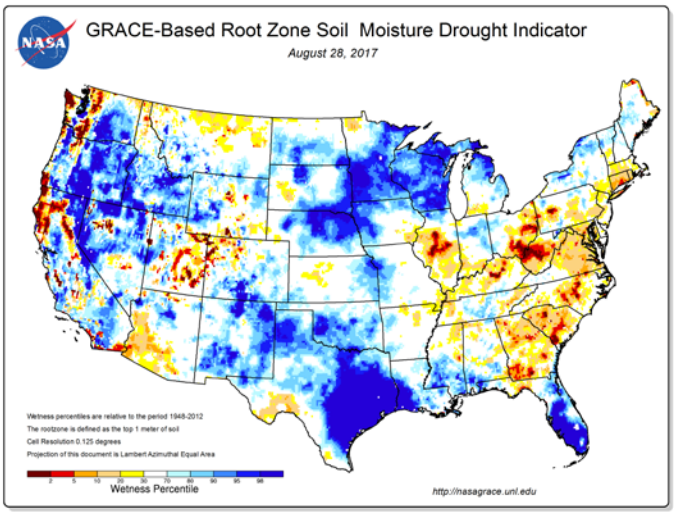


The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition. The camparison is from K-State's Precision Agriculture Laboratory.

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 published September 3, 2017 reported topsoil moisture rated 7 percent very short, 31 short, 60 adequate, and 2 surplus. Subsoil moisture rated 5 percent very short, 29 short, 65 adequate, and 1 surplus.

Field Crops Report:
Corn condition rated percent very poor, 12 poor, 30 fair, 42 good, and 12 excellent.

Soybean condition rated 2 percent very poor, 9 poor, 35 fair, 47 good, and 7 excellent.

Sorghum condition rated 2 percent very poor, 7 poor, 33 fair, 49 good, and 9 excellent.

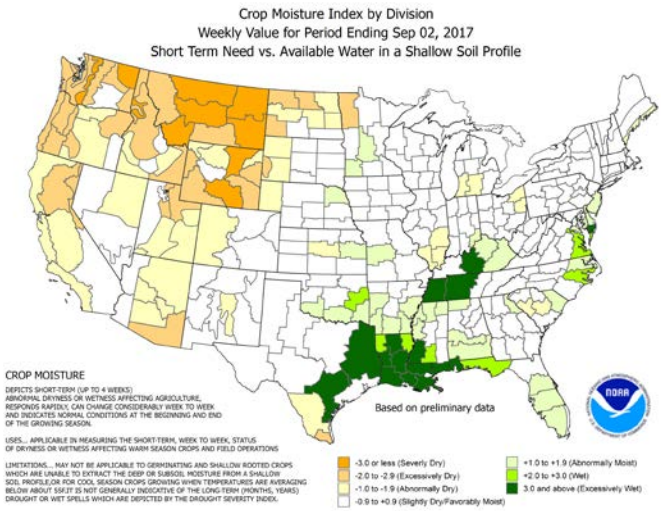
Cotton condition rated 2 percent very poor, 6 poor, 41 fair, 46 good, and 5 excellent.

Sunflower condition rated 0 percent very poor, 3 poor, 31 fair, 62 good, and 4 excellent.

Alfalfa condition rated 2 percent very poor, 9 poor, 35 fair, 51 good, and 3 excellent.

Pasture and Range Report: Pasture and range conditions rated 2 percent very poor, 7 poor, 34 fair, 53 good, and 4 excellent. Stock water supplies rated 3 percent very short, 8 short, 90 adequate, and 1 surplus.

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.



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

August 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	3.67	1.26	152%	70.6	-1.5	93 (20,19)	52 (29,28)
Dodge City	0.94	-1.81	34%	78.1	-3.0	100 (19)	51 (23)
Garden City	2.49	0.04	102%	73.2	-3.5	95 (19)	52 (29)
Goodland	1.75	-0.95	65%	70.9	-2.8	94 (19)	52 (17)
Guymon, OK	2.17	-0.75	74%	74.6	-3.5	98 (5)	50 (31)
Hill City	1.98	-0.93	68%	74.6	-2.0	102 (20,19)	52 (29,23)
Lamar, CO	0.73	-0.54	57%	61.9	-0.8	85 (19)	39 (30,25)
McCook, NE	3.64	0.50	116%	72.1	-1.7	97 (19)	49 (4)
Springfield, CO	1.70	-1.14	60%	69.8	-4.4	91 (19,18)	48 (31,30)
Central							
Concordia	3.39	0.25	108%	72.2	-4.9	94 (20)	51 (23)
Hebron, NE	2.57	-1.16	69%	72.0	-3.2	93 (20)	50 (4)
Medicine Lodge	3.61	0.49	116%	75.5	-4.8	101 (5)	53 (30,29)
Ponca City, OK	2.46	-0.79	76%	76.9	-4.1	100 (5)	55 (30)
Salina	1.09	-2.86	28%	76.5	-3.1	102 (20)	54 (23)
Wichita (ICT)	2.20	-1.51	59%	76.4	-3.6	99 (19)	57 (29,24)
East							
Bartlesville, OK	8.98	5.91	293%	75.7	-4.5	97 (19)	55 (30)
Chanute	11.33	7.64	307%	75.0	-3.9	95 (20,19)	55 (24)
Fall City, NE	2.42	-1.62	60%	71.3	-4.1	89 (2)	50 (4)
Johnson Co. Exec. Apt	9.57	5.85	257%	72.0	-5.6	90 (19)	54 (23)
Joplin, MO	5.46	2.11	163%	76.3	-3.4	96 (20)	60 (29,24)
Kansas City (MCI), MO	10.19	6.30	262%	71.8	-5.3	91 (19)	52 (4)
St. Joseph, MO	3.68	-0.30	92%	70.5	-4.8	92 (19)	47 (4)
Topeka (TOP	6.93	2.69	163%	73.0	-4.4	93 (19)	53 (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 – September 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: September ended with abnormally dry conditions over 40% of Kansas. Moderate drought (D1) was affecting about 10% of Kansas.

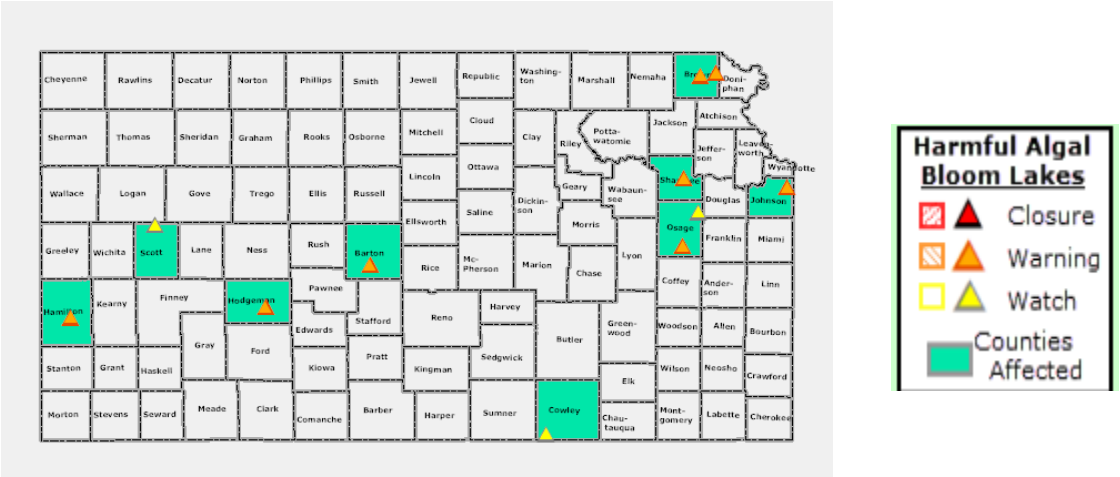
Lakes and Streams

- **Closure of Hodgeman County State Fishing Lake**, Hodgeman County occurred September 14, 2017 due to Blue-Green Algae (BGA). Water is unsafe. The lake remained closed until September 29.

- Nine Blue-Green Algae (BGA) public health warnings in effect at the end of September include. Water contact should not occur in these areas.

- Three Blue-Green Algae (BGA) public health watches in effect at the end of September. A watch means the water may be unsafe, contact is discouraged.

  Status of Kansas Department of Health and Environment Public Lakes Investigated for Harmful Algal Blooms and status at end of September.



- 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.

Disasters and Assistance

- Producers in 43 counties remain eligible for USDA disaster programs due to agricultural disaster designations in 2017.

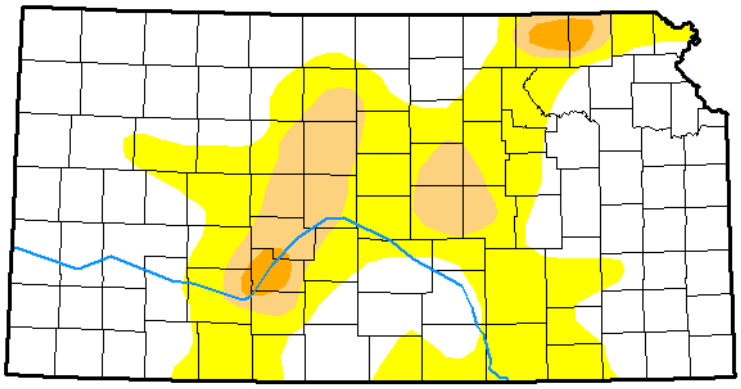
- August 22, 2017, the U.S. Department of Agriculture (USDA) designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017.

General Conditions

The variable precipitation coupled with warmer than normal temperatures resulted in expansion of the abnormally dry condition. Areas of the state with much lower than normal precipitation had an expansion of moderate drought. The near the end of September heavy rains resulted in significant improvement in the drought status on the U.S. Drought Monitor. particularly in the west. While only 38 percent of the state was drought free the week ending September 21 week, that number jumps to almost 60 percent at the end of this the month.

U.S. Drought Monitor

Kansas



September 26, 2017

(Released Thursday, Sep. 28, 2017)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	59.89	40.11	10.08	1.35	0.00	0.00
Last Week *09-19-2017*	38.20	61.80	20.49	1.61	0.00	0.00
3 Months Ago *06-27-2017*	83.07	16.93	0.00	0.00	0.00	0.00
Start of Calendar Year *01-03-2017*	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year *09-27-2016*	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago *09-27-2016*	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

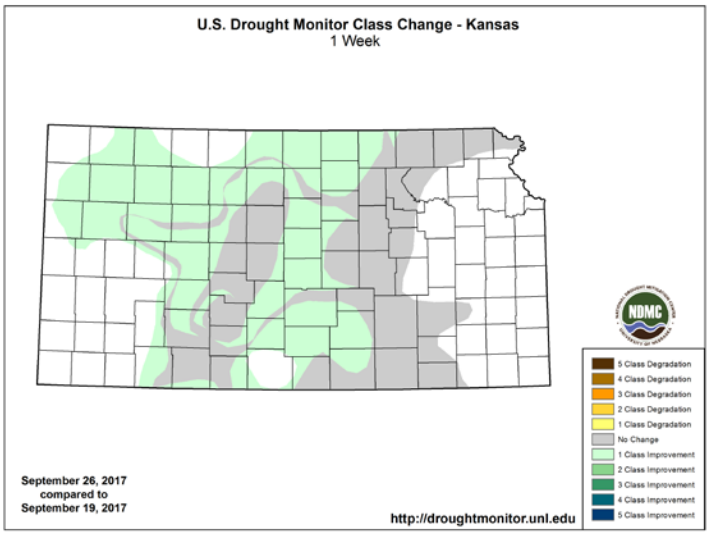
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Brad Rippey

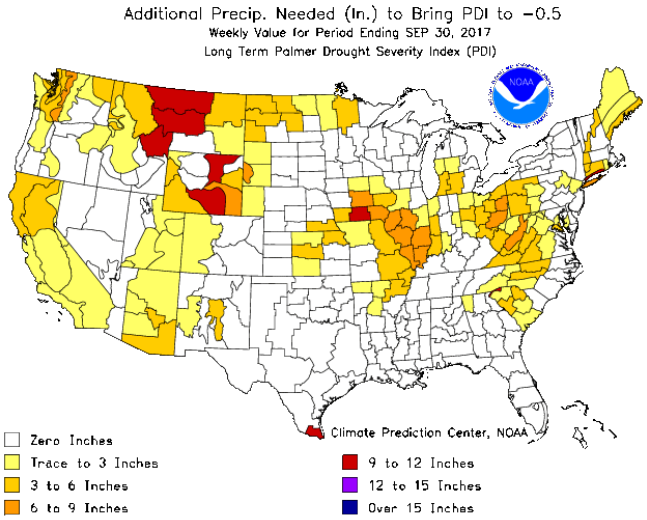
U.S. Department of Agriculture

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.



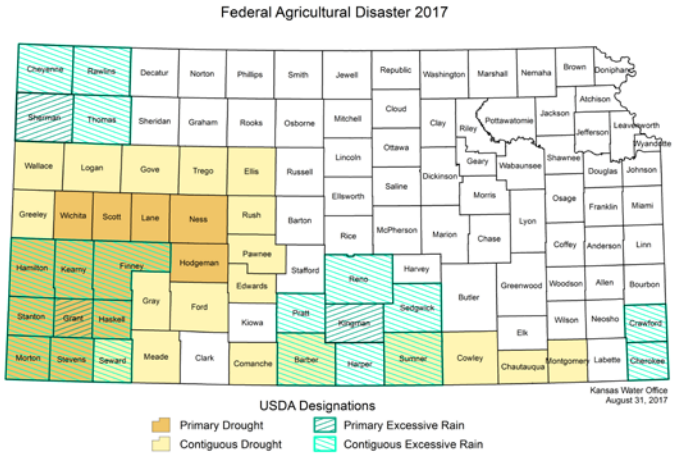
Precipitation Needed to End Drought (inches)					
	Week Ending				
Climate Division	**September 2**	**September 9**	**September 16**	**September 23**	**September 30**
North Central	3.00	4.00	4.56	4.87	1.26
North East	1.07	2.80	3.85	4.76	4.51
Central	5.04	5.35	5.76	6.20	3.79
South Central	1.64	2.66	3.41	4.71	2.76

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

Federal Disaster Declarations 2017

USDA 2017 agricultural disaster designations have been made for 43 Kansas Counties: 15 primary and 28 contiguous for a variety of causes including drought and excessive rain. Some counties qualify for programs for both of these causes.

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster (drought) assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

July 12, 2017, Cherokee and Crawford counties became eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to excessive rainfall and flooding April 24-May 11, 2017.

August 22, 2017, the USDA designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017. As contiguous counties; Barber, Cheyenne, Finney, Hamilton, Haskell, Harper, Kearny, Morton, Pratt, Rawlins, Reno, Sedgwick, Sumner, Seward, Stanton, Stevens, and Thomas are also already eligible.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

Federal Disaster for Severe Winter Storm

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3. Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita. Additional designations may be made at a later date if requested by the state and warranted by the results of further damage assessments.

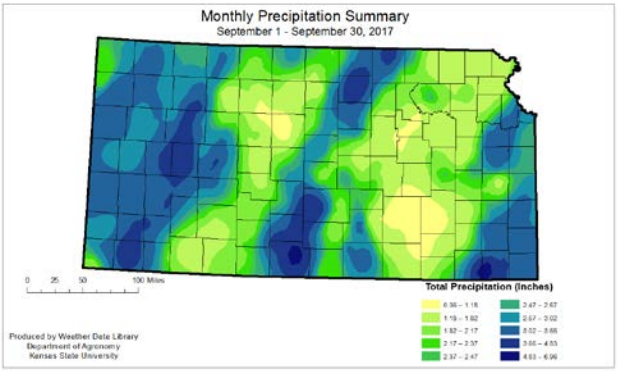
The declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

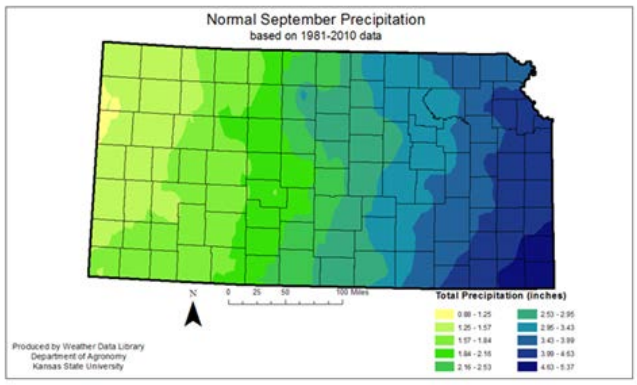
Climate Summary (Temperature and Precipitation)

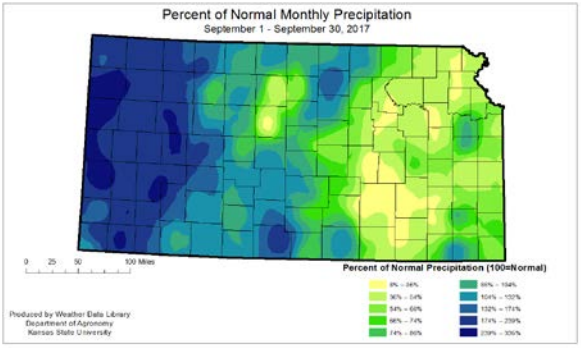
September saw a split pattern in the precipitation, with the heaviest rains in the western third of the state. All three western climate divisions saw more than 100 percent of normal, as did the South Central Division. None of the eastern divisions saw even half of their normal rainfall. This wasn't as much of a challenge in the East Central Division, which saw the only heavy precipitation in August. Statewide average precipitation was 2.09 inches or 94 percent of normal. Despite the overall low precipitation in the eastern third of the state, the greatest monthly total at a National Weather Service Coop (NWS) station was 6.79 inches at Mound Valley 3WSW, Labette County. The greatest monthly total at a Community Collaborative Rain Hail and Snow (CoCoRaHS) network station was 6.98 inches at Medicine Lodge 0.4 WSW, Barber County. The greatest daily totals for each network: 5.91 inches at Mound Valley 3WSW, Labette County, on the 19th (NWS); 6.40 inches at Preston 1.2 SE, Pratt County, on the 26th (CoCoRaHS).

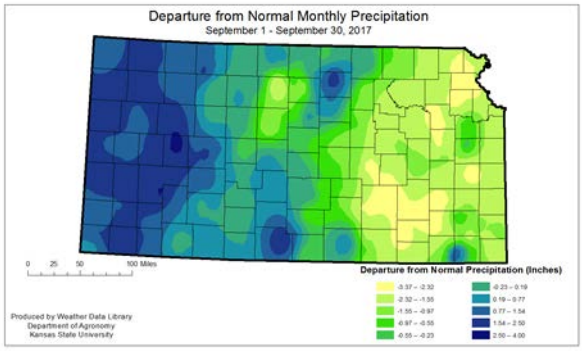
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	September 1-30, 2017			January 1- September 30, 2017			April 1, 2016 – September 30, 2017			September 1, 2017– September 30, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.71	0.19	110	18.41	0.00	100	15.47	-0.64	95	1.71	0.19	110
West Central	2.62	1.02	167	21.25	3.36	119	17.77	2.37	116	2.62	1.02	167
Southwest	2.45	0.83	154	23.11	6.05	136	18.68	4.00	128	2.45	0.83	154
North Central	2.37	-0.26	91	23.45	-0.49	97	19.46	-1.00	95	2.37	-0.26	91
Central	1.69	-0.82	70	22.85	-2.14	92	18.27	-2.77	87	1.69	-0.82	70
South Central	2.80	0.20	110	28.34	2.27	109	21.84	0.40	102	2.80	0.20	110
Northeast	1.44	-2.17	41	26.02	-3.25	88	21.07	-4.00	84	1.44	-2.17	41
East Central	1.74	-1.92	45	29.31	-1.95	92	24.72	-1.62	92	1.74	-1.92	45
Southeast	1.54	-2.47	37	35.84	2.42	106	30.29	2.87	109	1.54	-2.47	37
STATE	2.09	-0.53	94	25.69	1.07	105	21.04	0.27	102	2.09	-0.53	94







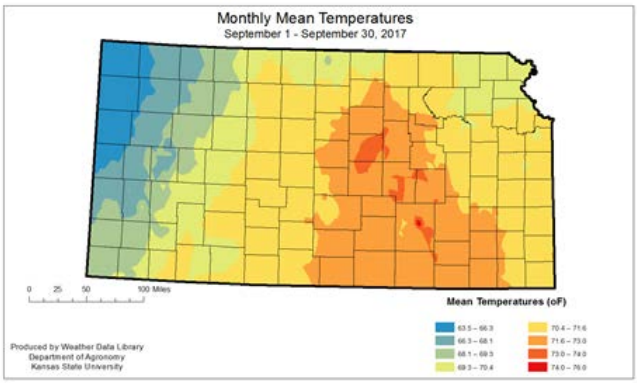


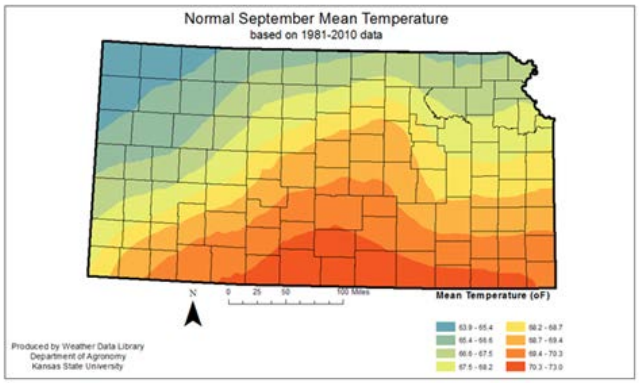
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

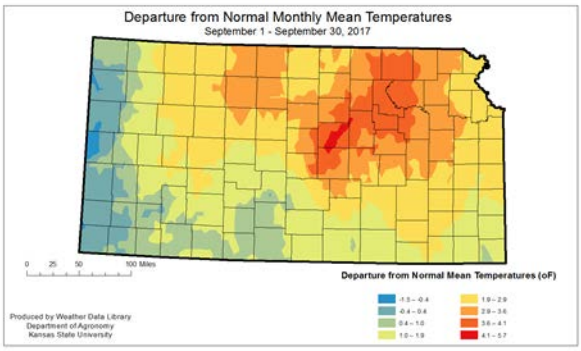
Temperatures averaged warmer than normal across all divisions. With all the rain, it isn't surprising that the western divisions came closest to normal for the month. The Southwest Division averaged 68.9 °F, or just 0.3 degrees warmer than normal. In contrast, the Northeastern Division averaged 70.5 °F or 3.2 degrees warmer than normal. The warmest reading for the month was 102 °F recorded at multiple locations and dates. The latest of those at Alton 6ESE on the 22nd. The coldest reading was 30 °F reported at Brewster 4W, Thomas County on the 6th. Most of the departure from normal came on the low temperature side. There were 67 new daily records for warm minimum temperatures, and only 51 new daily records for high maximum temperatures. Despite the warmth, there were 26 new record cold minimum temperatures and 6 new record low maximum temperatures. None of these set new records for the month.

Temperature 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)							
	September 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	81.1	51.1	66.1	0.9	102	20	30	20
West Central	82.9	51.9	67.4	1.1	100	4	36	6
Southwest	83.3	54.5	68.9	0.3	101	22	42	6
North Central	84.6	57.2	70.9	3.1	102	20	41	7
Central	85.7	58.6	72.2	3.1	101	21	40	6
South Central	84.5	58.8	71.6	1.4	99	22	43	7
Northeast	83.0	58.1	70.5	3.2	94	22	42	7
East Central	82.7	59.1	70.9	2.7	96	5	42	6
Southeast	83.7	59.6	71.6	2.0	98	5	43	6
STATE	83.5	56.5	70.0	2.0	102	22nd	30	20th
Data Source: KSU Weather Library								







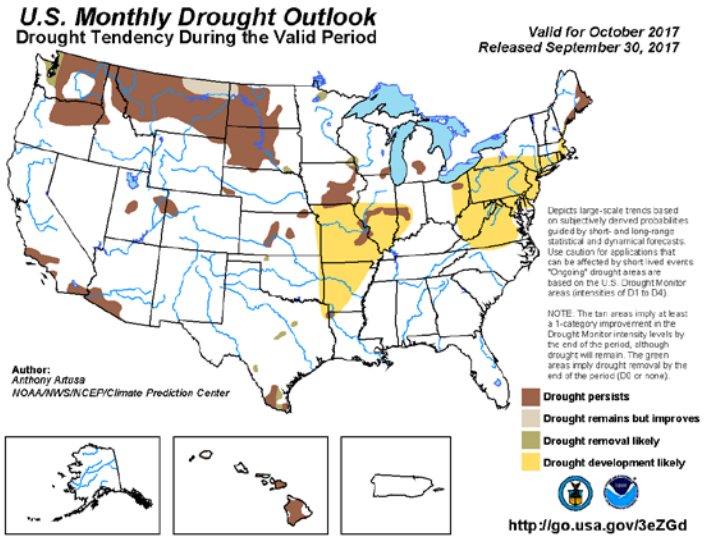
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

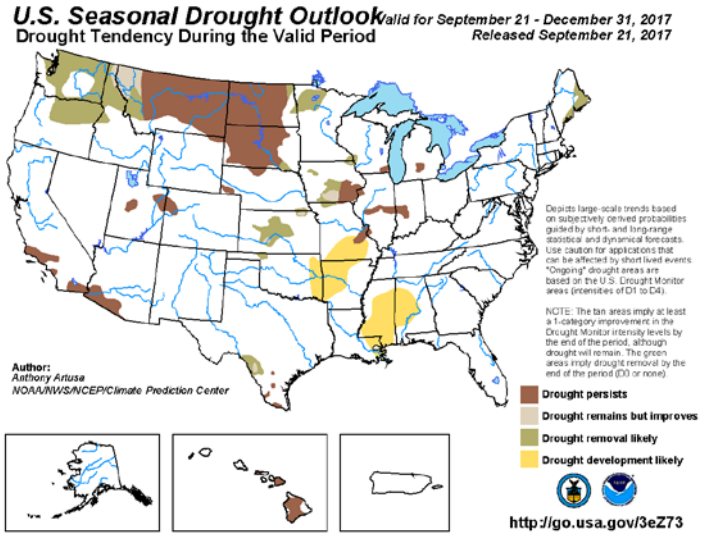
Severe weather was extremely limited this month. The Storm Prediction Center's storm data base only notes two hail events recorded in September, and no records of wind damage or tornadoes. The most damaging event of the month was the flooding in South Central Kansas, following the heavy rains from the 25th through the 26th of September.

Future Outlook

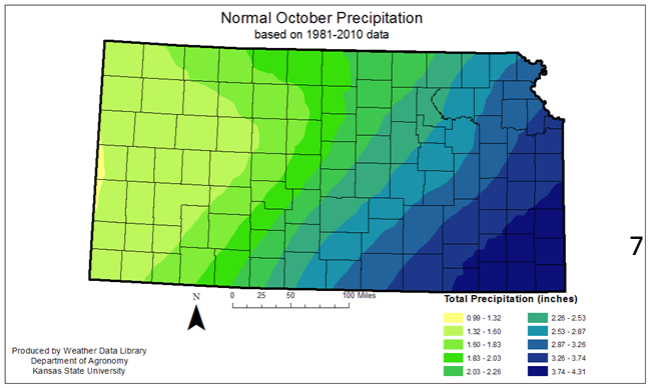
The Monthly Drought Outlook indicates drought conditions to remain in a small area of central Kansas in October. The October outlook calls for wetter than normal conditions from Southwest to North Central Kansas with equal chances of above or below normal precipitation across the rest of the state. This is coupled with increased chances of above normal temperatures in the eastern half of the state, with equal chances of above or below normal temperatures across the rest of the state. The much cooler than normal temperatures that have started the month will reduce some of the evaporative demand and the rainy start will alleviate some of the drought.

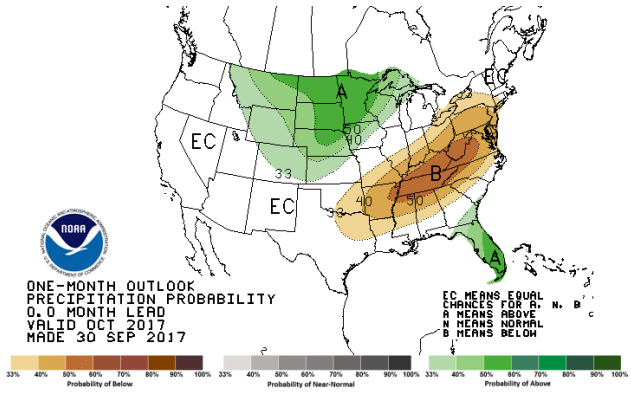
The Seasonal Drought Outlook favors improved conditions. Note the monthly outlook is the more recent forecast. The individual temperature and precipitation outlooks are provided below for the one and three month periods.

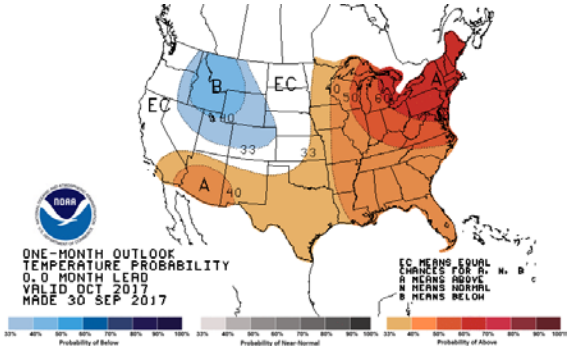


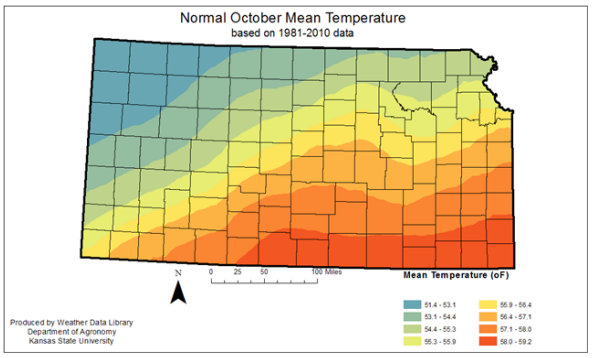


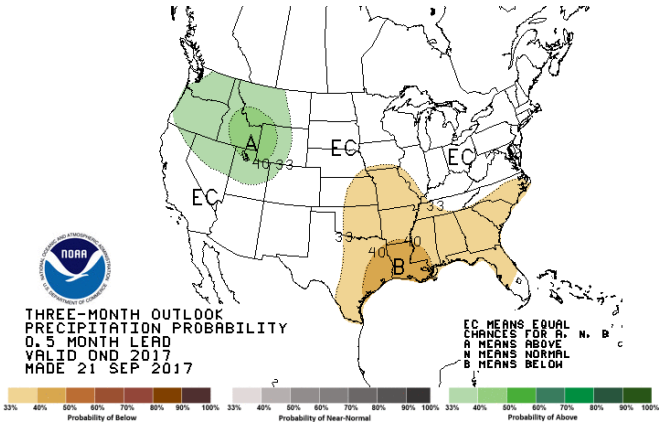
For the October-November-December time period probability is for equal chances of above or below normal precipitation in western Kansas and below in the east. Probabilities favor above normal temperatures statewide for the three month period.

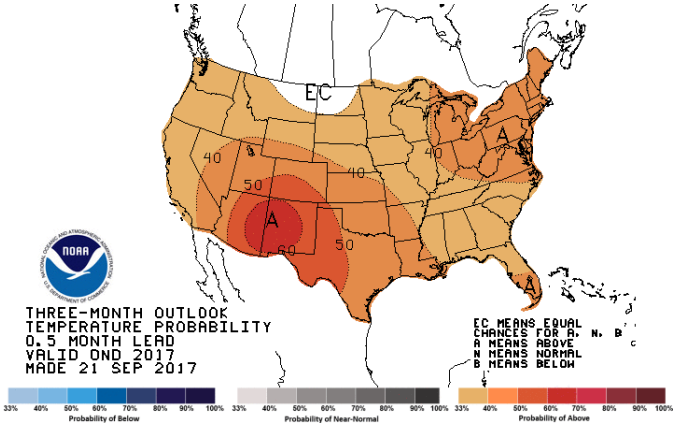












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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 September 27, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed.
(September 28, 2017, 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/ September 28, 2017)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs declined in September but was sufficient for all to make progress toward the higher fall target elevations. Flows in the Kansas River generally declined below historic median values, particularly in the upper reaches.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs did not receive any significant inflows during September and evacuated excess storage gained in August. Flow in the Marais des Cygnes River was maintained at a healthy level throughout the month due to flood pool releases.

Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs all decreased throughout the month of September and streamflow declined in all reaches of the Cottonwood and Neosho Rivers. Conservation storage remained nearly full in John Redmond but declined in Marion and Council Grove. Some releases were necessary to maintain sufficient streamflow in the upper Neosho River.

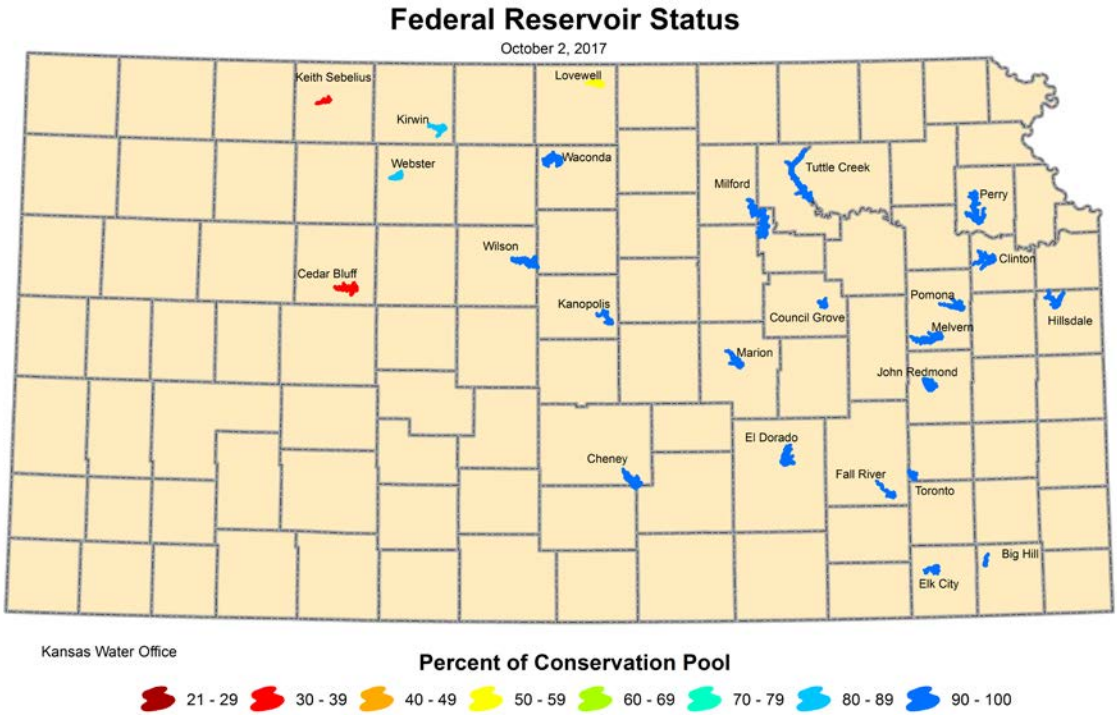
Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs declined below normal pool levels in September. Water Quality and Water Supply releases were necessary to maintain streamflow and meet industrial and municipal demands for much of the month.

Saline basin: The elevation at Wilson Lake is being maintained above normal pool, as inflows continue.

Smoky Hill basin: The middle Smoky Hill basin experienced a small amount of runoff in the last week of September, otherwise declined to nearly no flow. The lower Smoky River streamflow remained below historic median values throughout the month as Kanopolis Lake elevation declined and the discharge through the uncontrolled spillway was reduced.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton (Keith Sebelius) and Cedar Bluff reservoirs remain significantly below full conservation pool at 38% and 31 % respectively.



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		**10/02/2017 06:00 AM**		
Norton[1]	2304.3	2291.30	-13.00	38.0
Harlan County, NE	1945.73	1937.70	-8.03	69.0
Lovewell[1]	1582.6	1576.33	-6.27	55.7
Milford[1]	1144.4	1145.33	0.93	100.0
Cedar Bluff	2144	2118.37	-25.63	30.9
Kanopolis[1]	1463	1464.36	1.36	100.0
Wilson[1]	1516	1516.53	0.53	100.0
Webster[1]	1892.5	1889.84	-2.61	87.6
Kirwin[1]	1729.3	1724.96	-4.29	79.3
Waconda[1]	1455.6	1454.52	-1.08	93.9
Tuttle Creek[1]	1075	1078.36	3.36	100.0
Perry[1]	891.5	893.72	2.22	100.0
Clinton[1]	875.5	877.35	1.85	100.0
Melvern[1]	1036	1035.84	-0.16	99.3
Pomona[1]	974	976.16	2.16	100.0
Hillsdale[1]	917	917.76	0.76	100.0
Arkansas River Basin		**09/29/2017 08:00 AM**		
Cheney	1421.6	1420.68	-0.92	95.0
El Dorado	1339	1336.58	-2.42	89.0
Toronto[1]	901.5	901.17	-0.33	93.0
Fall River[1]	948.5	948.01	-0.49	93.0
Elk City[1]	796	795.49	-0.51	96.0
Big Hill	858	857.78	-0.22	99.0
Council Grove[1]	1274	1273.34	-0.66	96.0

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
Marion[1]	1350.5	1349.35	-1.15	91.0
John Redmond[1]	1039	1040.90	-0.10	99.0
[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 this month.

September 1: Public health **warnings for** Brown County State Fishing lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City lake, Brown County; Lake Scott State Park; Marion County Lake, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Overbrook City Lake, Osage County; Perry Lake (Zone A), Jefferson County; Sam's Pond, Syracuse, Hamilton County; South Lake, Johnson County; and Webster Lake, Rooks County.

Public health **watches** for Milford Reservoir (Zones A, B & C), Geary, Dickinson and Clay counties; Perry Lake (Zones B, C & D) Jefferson County; and Veteran's Lake, Cowley County.

September 14:

Closure due to Blue Green Algae: Hodgeman County State Fishing Lake, Hodgeman County

Public health **warnings** for Brown County State Fishing lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City lake, Brown County; Lake Scott State Park, Scott County; Marion County Lake, Marion County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Memorial Park Lake (Great Bend), Barton County; Sam's Pond, Syracuse, Hamilton County; South Lake, Johnson County; and Webster Lake, Rooks County.

Public health **watches** for Veteran's Lake, Cowley County; and Overbrook City Lake, Osage County.

September 21:

Closure due to Blue Green Algae: Hodgeman County State Fishing Lake, Hodgeman County

Public health **warnings** for Brown County State Fishing lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City lake, Brown County; Lake Scott State Park; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; Memorial Park Lake (Great Bend), Barton County; Sam's Pond, Syracuse, Hamilton County; South Lake, Johnson County; and Webster Lake, Rooks County.

Public health **watches** for Lake Scott State Park, Scott County; Veteran's Lake, Cowley County; and Overbrook City Lake, Osage County.

September 29, 2017
Closure of Hodgeman County State Fishing Lake reduced to a public health warning.

Public health **warnings** for Brown County State Fishing Lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City Lake, Brown County; Hodgeman County State Fishing Lake, Hodgeman County; Melvern Outlet Pond,

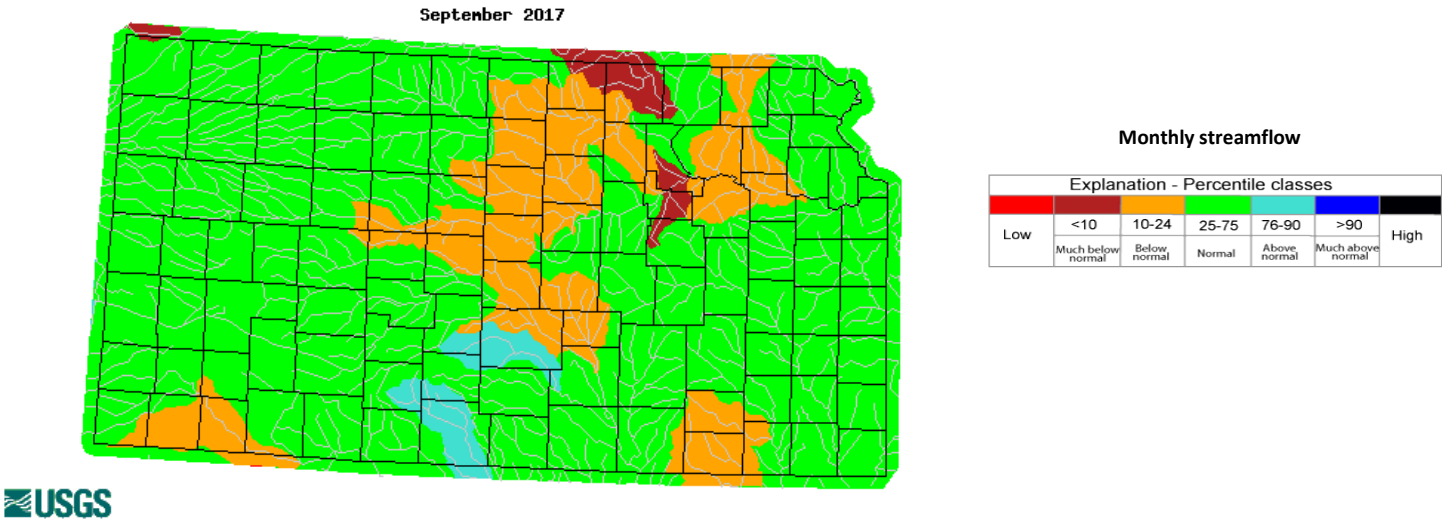
Osage County; Melvern Outlet Swim Pond, Osage County; Memorial Park Lake (Great Bend), Barton County; Sam's Pond, Syracuse, Hamilton County; and South Lake, Johnson County.

Public health **watches** for Lake Scott State Park, Scott County; Veteran's Lake, Cowley County; and Overbrook City Lake, Osage 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 administratin 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.

Streamflows as of September 27, 2017			
Gaging Station	**Current Flow**	**Sep MDS**	**Comment**
Republican River at Concordia	192	80	
Republican River at Clay Center	791	100	
Little Blue River near Barnes	188	60	
Rattlesnake Creek near Macksville	0	1	No surface water diversions above gage
Rattlesnake Creek near Zenith	15	3	No surface water diversions above gage
Little Arkansas River at Alta Mills	4	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	38	20	

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates no flood conditions occurred in Kansas.

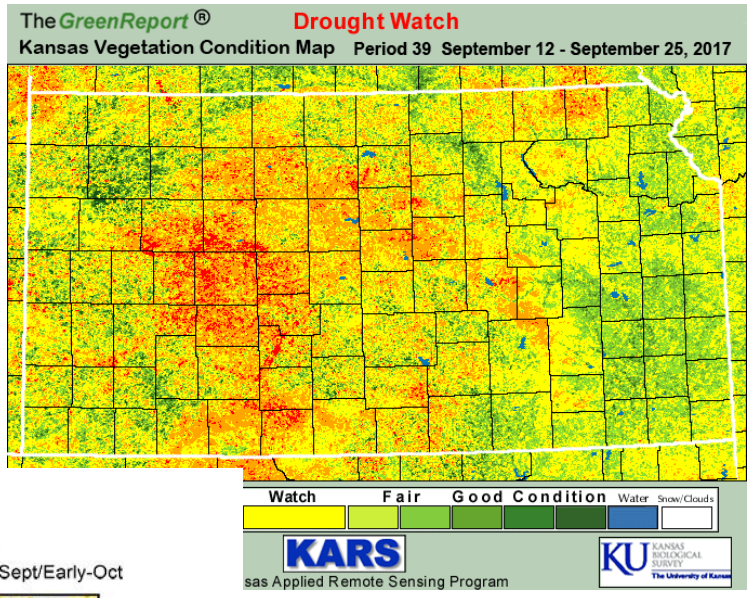
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

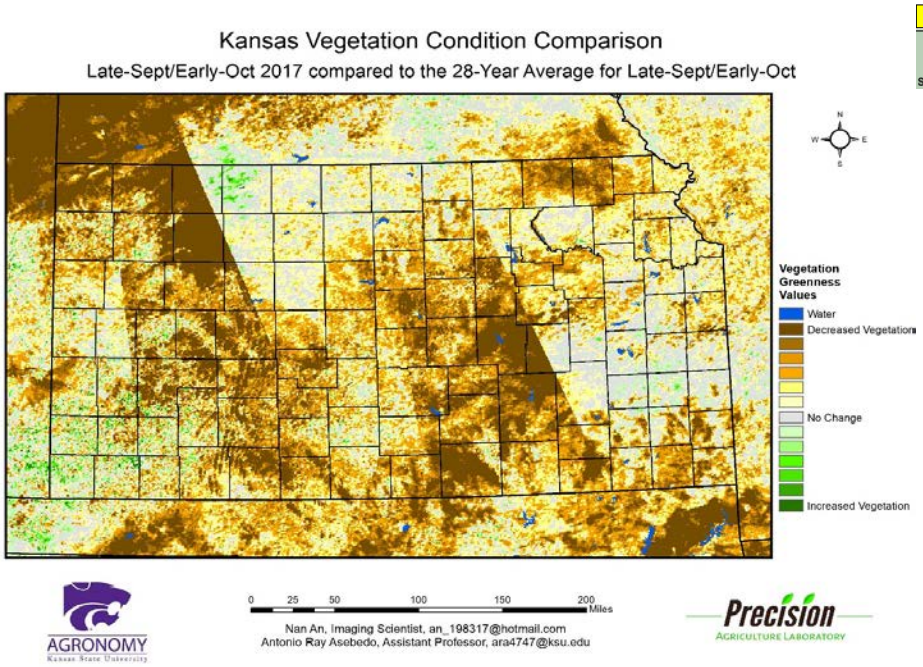
Soil, Crop and Vegetation

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.

The area of vegetation stress in central Kansas expanded during September moving farther west. the east beginning to show signs of stress late in the month, as shown by poor vegetation.



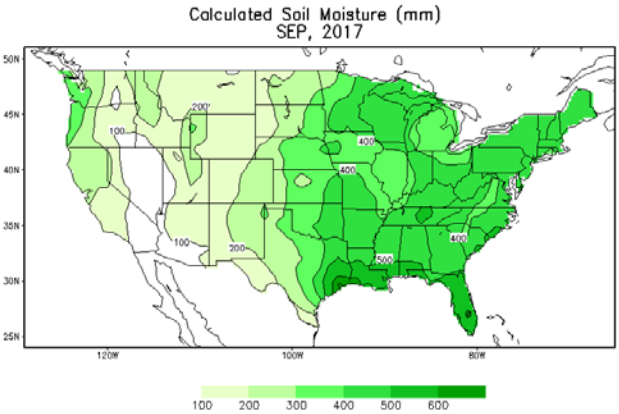


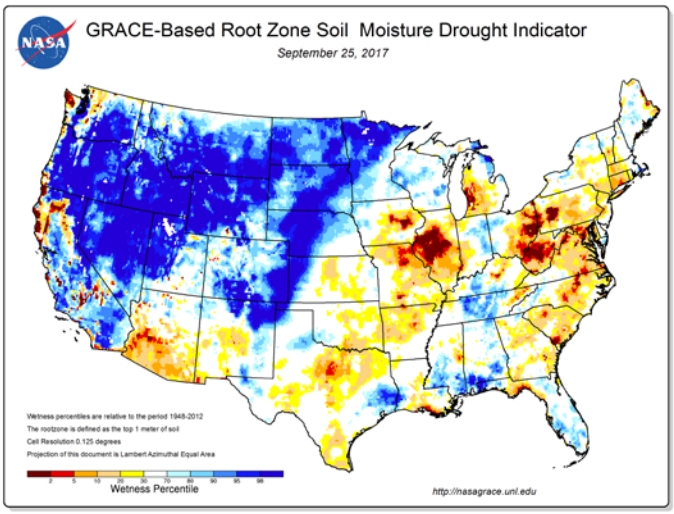
The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition. The camparison is from K-State's Precision Agriculture Laboratory.

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 published October 2, 2017 reported topsoil moisture rated 8 percent very short, 29 short, 55 adequate, and 8 surplus. Subsoil moisture rated 11 percent very short, 31 short, 57 adequate, and 1 surplus.

Field Crops Report:.
Corn condition rated 5 percent very poor, 13 poor, 31 fair, 39 good, and 12 excellent. Corn mature was 84 percent, behind 90 last year, and near 88 average. Harvested was 39 percent, behind 44 last year and 49 average.

Soybean condition rated 6 percent very poor, 13 poor, 38 fair, 38 good, and 5 excellent.

Sorghum condition rated 2 percent very poor, 8 poor, 32 fair, 47 good, and 11 excellent.

Cotton condition rated 1 percent very poor, 3 poor, 32 fair, 55 good, and 9 excellent. Cotton setting bolls was 98 percent, near 96 last year, and equal to average.

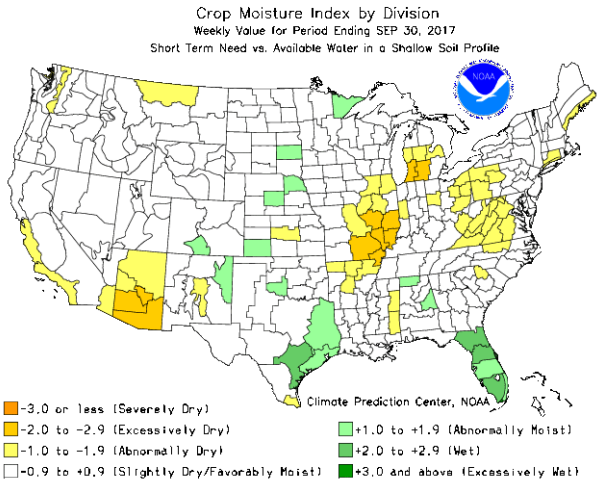
Sunflowers condition rated 1 percent very poor, 5 poor, 32 fair, 52 good, and 10 excellent. Sunflowers ray flowers dried was 83 percent, equal to last year, and near 86 average.

Alfalfa fourth cutting was 89 percent complete, near 88 last year, and ahead of 74 average.

Pasture and Range Report: Pasture and range conditions rated 5 percent very poor, 14 poor, 37 fair, 41 good, and 3 excellent.

Stock water supplies rated 4 percent very short, 19 short, 76 adequate, and 1 surplus.

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.



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

September 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	1.24	0.10	109%	64.5	1.1	97 (3)	37 (27,20)
Dodge City	1.54	-0.13	92%	72.0	2.8	101 (21)	45 (6)
Garden City	4.71	3.24	320%	69.8	1.6	98 (19,15)	43 (6)
Goodland	3.85	2.63	316%	65.8	1.2	96 (3)	38 (27)
Guymon, OK	4.79	3.00	268%	71.1	0.7	99 (14)	48 (6)
Hill City	1.38	-0.50	73%	71.2	3.7	101 (21)	41 (6)
Lamar, CO	2.29	1.04	183%	66.9	0.4	97 (21,3)	39 (20,19)
McCook, NE	3.08	1.64	214%	68.4	4.0	101 (3)	36 (6)
Springfield, CO	3.66	2.42	295%	65.4	1.2	93 (3)	39 (20)
Central							
Concordia	5.25	2.34	180%	70.7	2.7	95 (14)	44 (7,6)
Hebron, NE	2.04	-0.88	70%	70.7	4.8	97 (15,14)	43 (7,6)
Medicine Lodge	5.95	3.85	283%	72.4	1.2	98 (21)	45 (6)
Ponca City, OK	3.44	0.15	105%	74.5	2.4	97 (4)	46 (6)
Salina	1.83	-0.87	68%	75.1	4.9	100 (21)	46 (6)
Wichita (ICT)	2.34	-0.80	75%	73.8	2.8	98 (21,4)	46 (6)
East							
Bartlesville, OK	1.25	-2.59	33%	71.6	0.3	97 (4)	44 (6)
Chanute	3.59	-0.08	98%	72.2	2.3	94 (4)	47 (7,6)
Fall City, NE	2.90	-0.65	82%	70.8	4.1	93 (14)	44 (7,6)
Johnson Co. Exec. Apt	2.21	-2.30	49%	70.5	1.9	89 (21)	49 (6)
Joplin, MO	1.49	-3.46	30%	72.6	1.8	92 (20,4)	48 (6)
Kansas City (MCI), MO	2.80	-1.82	61%	71.1	2.9	90 (21)	46 (7)
St. Joseph, MO	1.03	-2.39	30%	70.3	3.7	93 (22,21)	42 (6)
Topeka (TOP	1.78	-1.88	49%	71.9	3.6	92 (22,21)	46 (7)

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 – October 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: Indicated moderate drought conditions for less than 1% of Kansas and abnormally dry conditions for about 14%.

Lakes and Streams

- Six Blue-Green Algae (BGA) public health warnings were in effect in mid-October. November 2 these were all removed.

- Four Blue-Green Algae (BGA) public health watches were in effect in mid-October. November 2 three watches were in effect: Central Park Pond, Shawnee Count; Hiawatha City Lake, Brown County; and Melvern Outlet river Pond, Osage County. A watch means the water may be unsafe, contact is discouraged.

- 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.

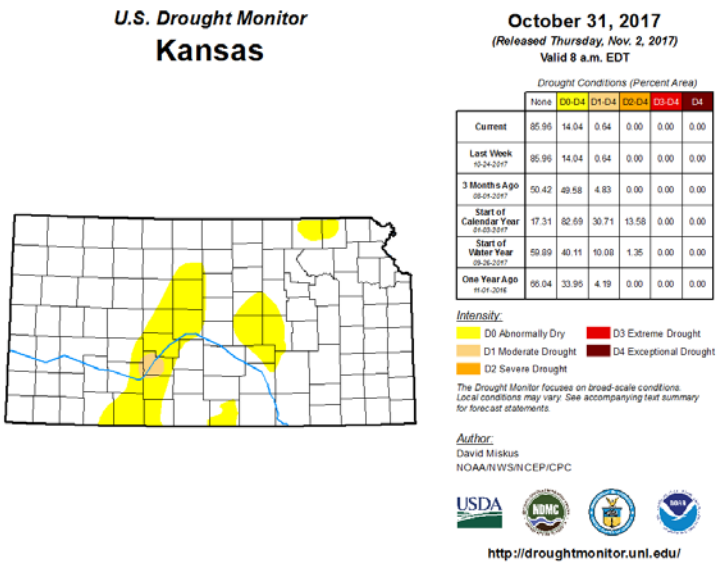
Disasters and Assistance

- Producers in 43 counties remain eligible for USDA disaster programs due to agricultural disaster designations in 2017.

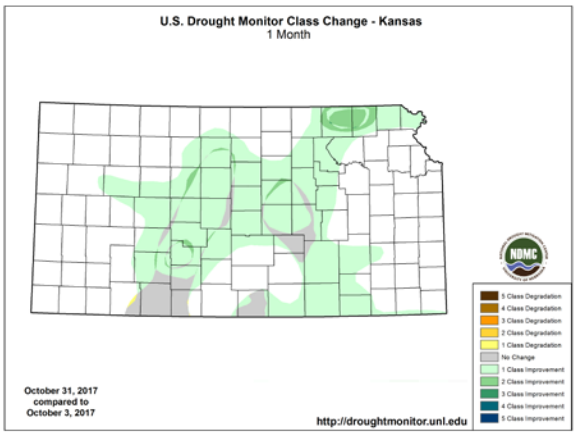
- August 22, 2017, the U.S. Department of Agriculture (USDA) designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017.

General Conditions

Overall conditions improved by U.S. Drought Monitor standards during October. The near normal precipitation coupled with only slightly warmer than normal temperatures resulted in improvement in the drought conditions across the state. There was a 26 percent decrease in drought coverage from the end of September through the end of October. The areas of D2 and D1 in early October were downgraded during the month, as was much of the abnormally dry areas (40.8% down to 14%).

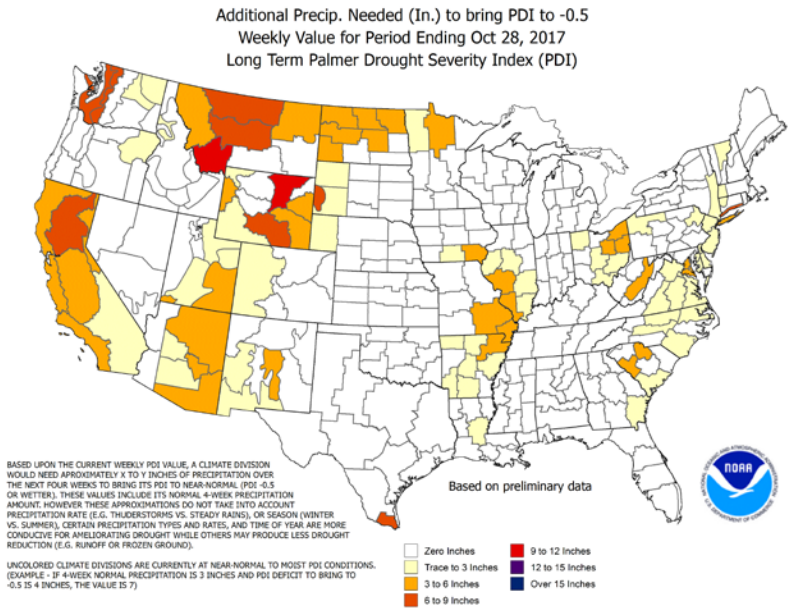


	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	85.96	14.04	0.64	0.00	0.00	0.00
Last Week 10-24-2017	85.96	14.04	0.64	0.00	0.00	0.00
3 Months Ago 08-01-2017	50.42	49.58	4.83	0.00	0.00	0.00
Start of Calendar Year 01-03-2017	17.31	82.69	30.71	13.58	0.00	0.00
Start of Water Year 09-26-2017	59.89	40.11	10.08	1.35	0.00	0.00
One Year Ago 11-01-2016	66.04	33.96	4.19	0.00	0.00	0.00



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.



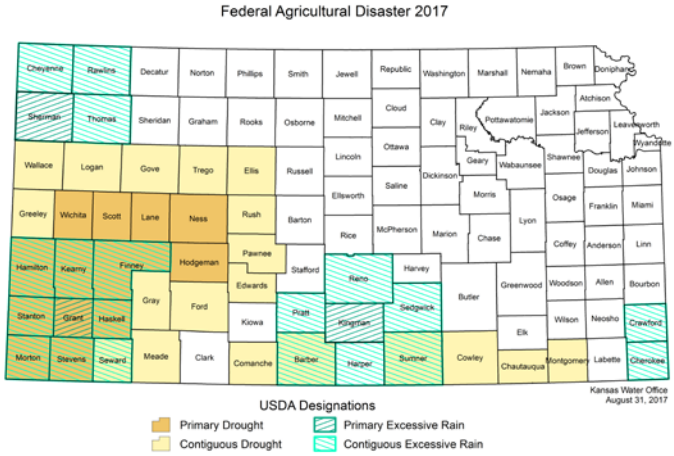
Precipitation Needed to End Drought (inches)					
	Week Ending				
Climate Division	**September 30**	**October 7**	**October 14**	**October 21**	**October 28**
North Central	1.26	0	0	0	0
North East	4.51	1.14	0	0	0
Central	3.79	0	0	0	0
South Central	2.76	0	0	0	0

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

Federal Disaster Declarations 2017

USDA 2017 agricultural disaster designations have been made for 43 Kansas Counties: 15 primary and 28 contiguous for a variety of causes including drought and excessive rain. Some counties qualify for programs for both of these causes.

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by drought. The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster (drought) assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

July 12, 2017, Cherokee and Crawford counties became eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to excessive rainfall and flooding April 24-May 11, 2017.

August 22, 2017, the USDA designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017. As contiguous counties; Barber, Cheyenne, Finney, Hamilton, Haskell, Harper, Kearny, Morton, Pratt, Rawlins, Reno, Sedgwick, Sumner, Seward, Stanton, Stevens, and Thomas are also already eligible.

Emergency Grazing of CRP

The U.S. Department of Agriculture (USDA), acting in response to a directive from President Donald J. Trump, authorized emergency grazing on Conservation Reserve Program (CRP) lands located in Kansas, Oklahoma, and Texas – the three states which were most heavily impacted by ongoing wildfires which began on March 6, 2017. USDA Acting Deputy Secretary Michael L. Young issued a memorandum authorizing the emergency grazing of cattle by ranchers pursuant to appropriate restrictions and conservation measures.

Federal Disaster for Severe Winter Storm

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3. Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita. Additional designations may be made at a later date if requested by the state and warranted by the results of further damage assessments.

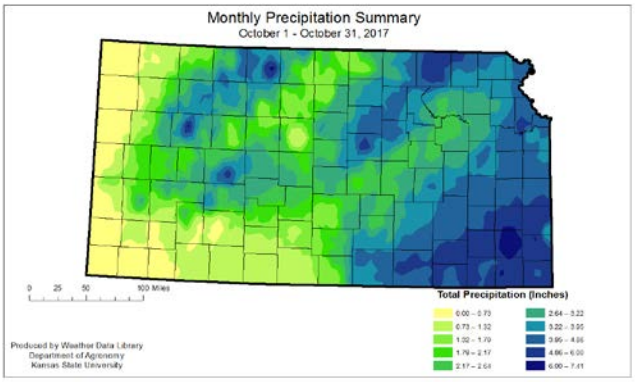
The declaration allows county governments to apply for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. It also activates the Hazard Mitigation Grant Program statewide for actions taken to prevent or reduce long term risk to life and property from natural hazards.

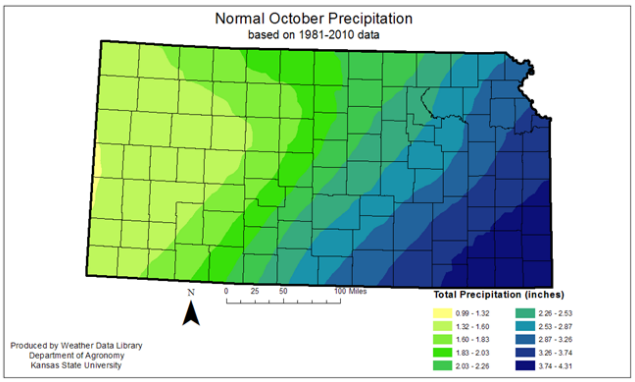
Climate Summary (Temperature and Precipitation)

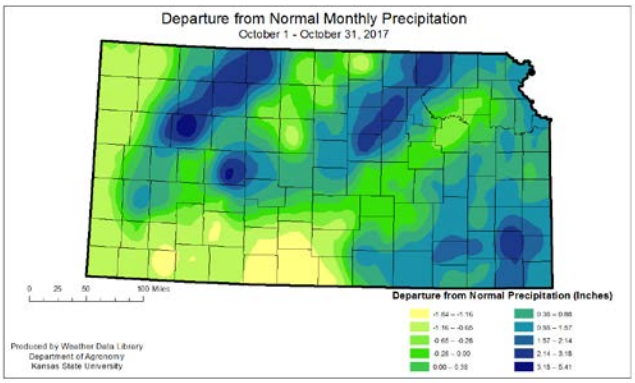
Extreme western Kansas saw a break in the heavy precipitation that dominated September, but heavy amounts were reported in the North Central Climate Division, as well as the eastern three divisions. Only the Southwestern Division had less than normal precipitation for the month. That division averaged 1.21 inches or 83 percent of normal. The September-October precipitation total for the Southwest Division is still averaging 3.66 inches or 120 percent of normal. Statewide average precipitation was 2.78 inches or 118 percent of normal. The greatest monthly total at a National Weather Service Coop (NWS) station was 7.08 inches at Chanute 4E, Neosho County. The greatest monthly total at a Community Collaborative Rain Hail and Snow (CoCoRaHS) network station was 7.41 inches at Phillipsburg 5.7 E, Phillips County. The greatest daily totals for each network: 6.37 inches at Gove 4W, Gove County, on the 3rd (NWS); 5.43 inches at Morland 9.7 S, Graham County, on the 3rd. The daily report at Gove 4W on the 3rd set an all-time record of the station. A second all-time record was set at Hill City 1E with 5.03 inches, also on the 3rd.

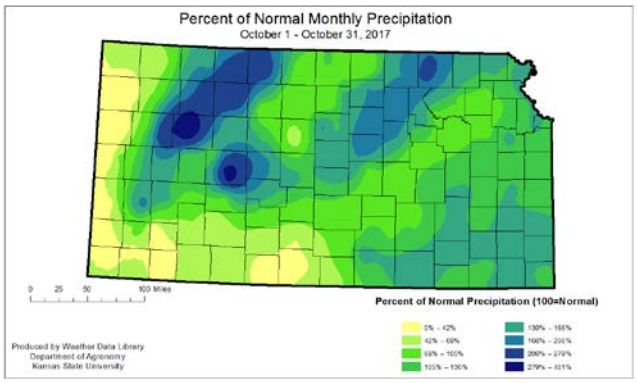
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	October 1-31, 2017			January 1- October 31, 2017			April 1, 2016 – October 31, 2017			September 1, 2017– October 31, 2017		
Climate Division	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	1.94	0.38	122	20.34	0.38	101	17.40	-0.26	97	3.65	0.57	113
West Central	1.99	0.53	135	23.24	3.89	120	19.76	2.91	117	4.61	1.55	150
Southwest	1.21	-0.31	83	24.32	5.74	131	19.89	3.69	123	3.66	0.52	120
North Central	2.73	0.75	135	26.18	0.25	100	22.19	-0.25	98	5.09	0.48	110
Central	3.04	0.91	145	25.88	-1.25	96	21.30	-1.87	93	4.73	0.08	104
South Central	2.69	0.05	102	31.04	2.33	108	24.54	0.46	102	5.49	0.25	104
Northeast	3.07	0.34	113	29.08	-2.92	90	24.14	-3.65	86	4.51	-1.83	71
East Central	3.47	0.38	110	32.78	-1.57	94	28.19	-1.24	94	5.21	-1.54	75
Southeast	4.97	1.30	135	40.81	3.72	109	35.27	4.18	112	6.52	-1.16	84
STATE	2.78	0.46	118	28.47	1.53	106	23.82	0.73	103	4.86	-0.08	104





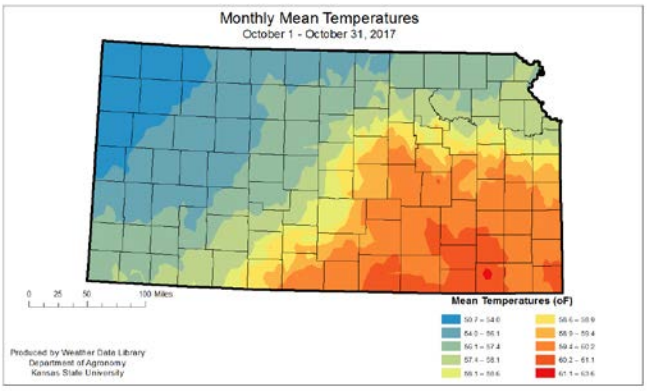


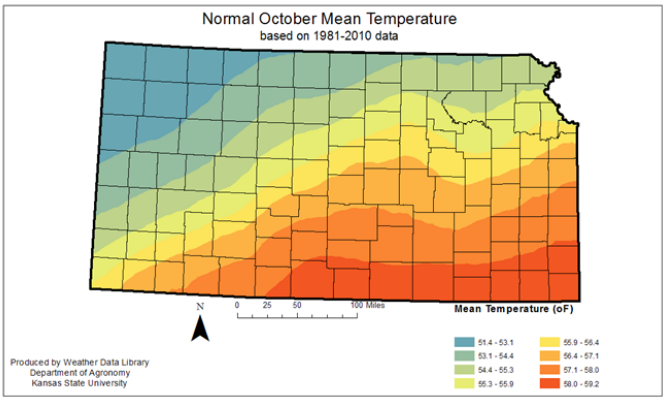


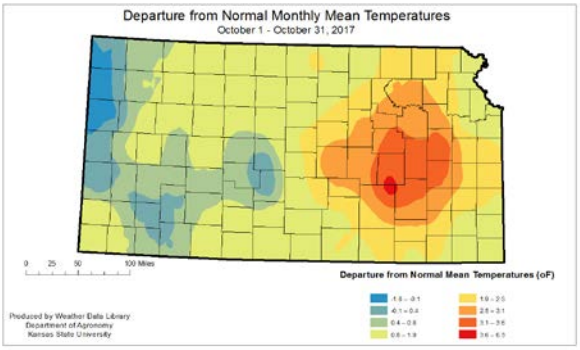
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

The cold temperatures that ended October were not enough to balance the warm start to the month. Temperatures averaged warmer than normal across all divisions. Statewide average temperature was 57.2 °F, or 1.5 degrees warmer than normal. The Southwest Division came closest to normal with an average of 56.5 °F, or 0.5 degrees warmer than normal. In contrast, the East Central Division averaged 58.9 °F or 2.5 degrees warmer than normal. The warmest reading for the month was 94 °F recorded at Hillsdale Lake, Miami County, on the 3rd. This set both a new daily record and a new monthly record for the location. The coldest reading was 11 °F reported at both Alton 2SW, Osborne County, and Russell 2E, Russell County, on the 28th. Most of the departure from normal came on the low temperature side. There were 17 new daily records for warm minimum temperatures, and only 6 new daily records for high maximum temperatures. Despite the warmth, there were 6 new record cold minimum temperatures and 8 new record low maximum temperatures. The 15 °F low reported at Great Bend 3W on the 31st set not only a record low for the date, but also a record low for the month at that location.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	October 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	68.0	37.9	53.0	0.7	85	26	15	28
West Central	70.7	39.1	54.9	1.3	91	13	12	29
Southwest	72.5	40.4	56.5	0.5	91	14	16	28
North Central	70.0	42.9	56.5	1.4	88	3	14	29
Central	72.0	44.4	58.2	1.9	91	3	11	28
South Central	73.0	45.2	59.1	1.4	89	13	15	28
Northeast	69.9	45.3	57.6	2.2	88	3	23	29
East Central	71.0	46.7	58.9	2.5	94	3	22	29
Southeast	72.4	47.4	59.9	2.0	89	10	23	29
STATE	71.1	43.3	57.2	1.5	94	3rd	11	28th
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

Severe weather was more active in October. The preliminary tornado count is 14, with 46 hail reports and 22 reports of damaging wind The tornadoes came in two outbreaks: on the 2nd in western KS and on the 6th in central KS. In both cases, the tornadoes were classified as EF0 or EF1. Damage was to trees, power poles/lines,

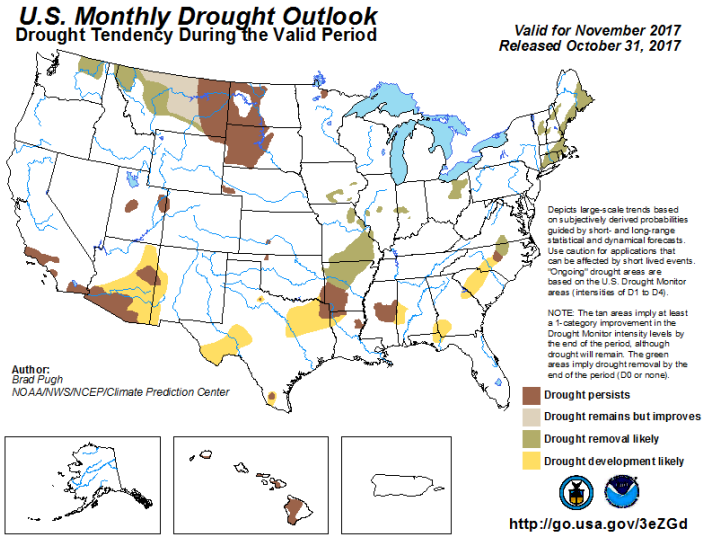
and outbuildings. There were no reports of injuries.

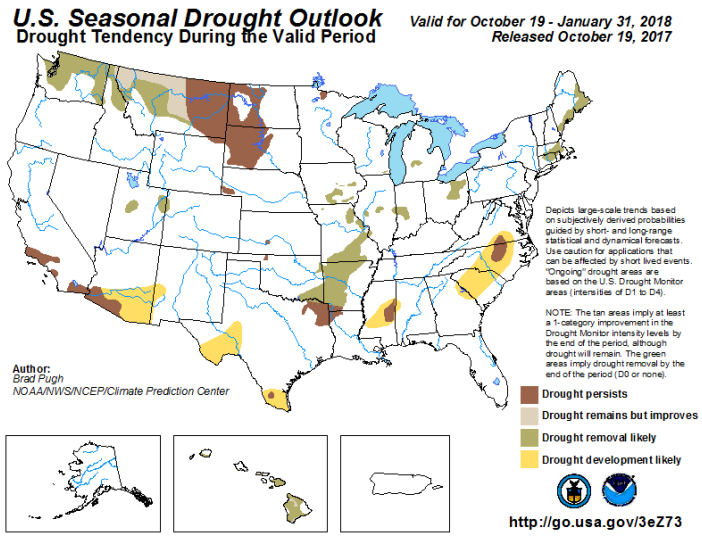
Future Outlook

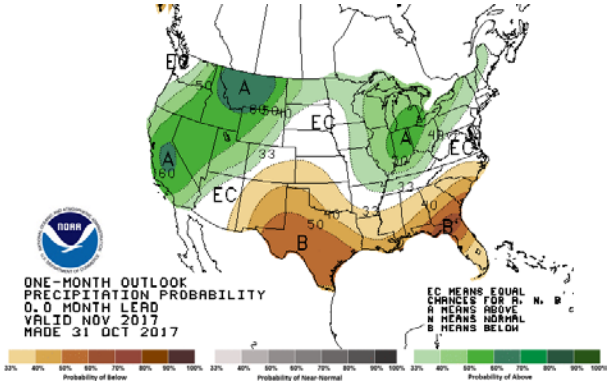
The October outlook calls for drier than normal conditions in southwest Kansas, with equal chances of above or below normal precipitation across the rest of the state. This is coupled with increased chances of above normal temperatures in the western and southern parts of the state, with equal chances of above or below normal temperatures across the rest of the state. The Monthly Drought Outlook indicates drought conditions to remain in only a tiny area of central Kansas

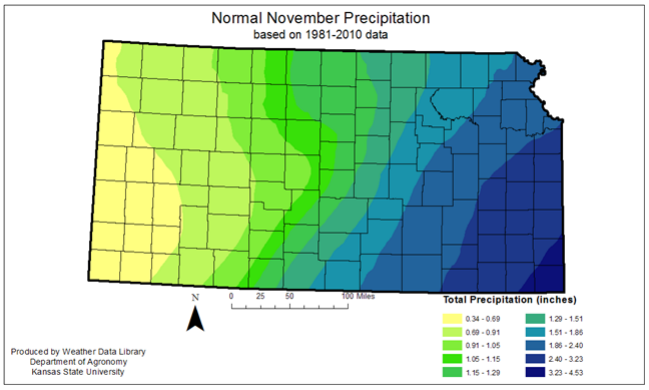
For the November-December-January time period probability is for equal chances of above or below normal precipitation in all of Kansas and favor above normal temperatures statewide.

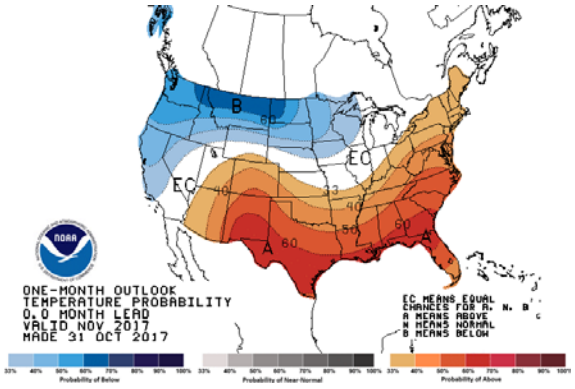
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

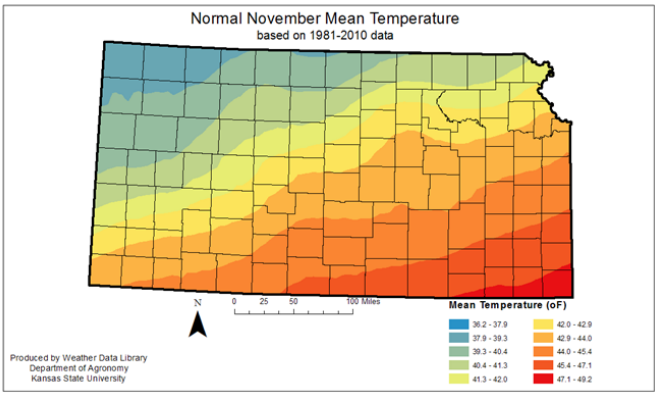


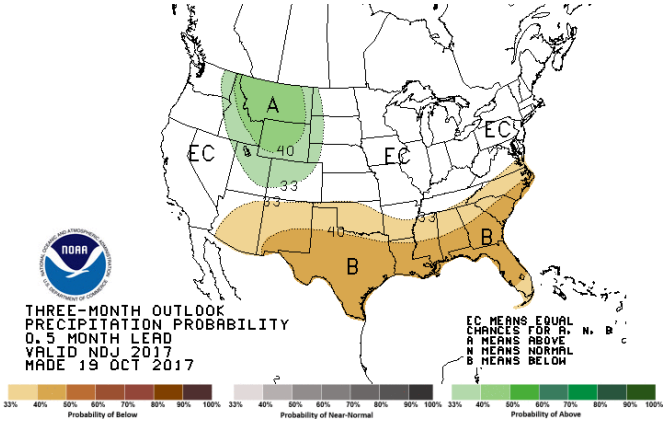


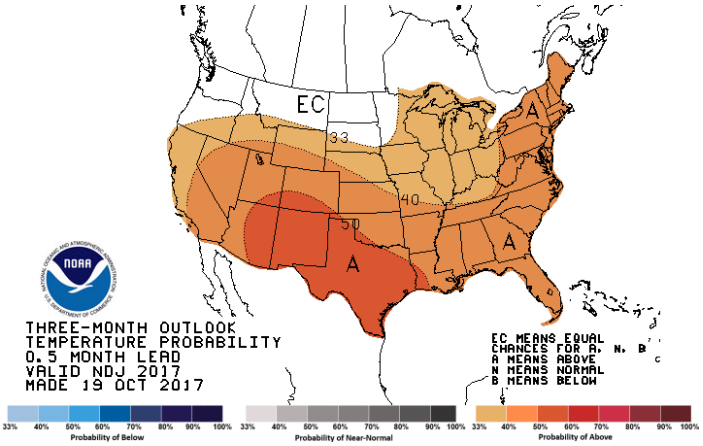












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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 November 1, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed.
(November 1, 2017, 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/ November 1, 2017)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs was highly variable in October. Milford and Tuttle Creek received a significant inflow event early in the month and releases that followed kept the Kansas River above median values for the majority of the month. Clinton experienced a moderate event later in the month and Perry had inflow just sufficient to maintain elevation. All reservoirs ended the month near their higher fall target levels. The Kansas River received very little runoff over the month.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received significant inflow during one mid-October precipitation event, gaining storage above normal pool elevation. Flow in the Marais des Cygnes River was maintained at a healthy level throughout the month due to reservoir releases.

Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low throughout the month of October and streamflow declined in the upper half of the basin. The lower reaches of the Neosho

River (below John Redmond) received several healthy runoff events. 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.

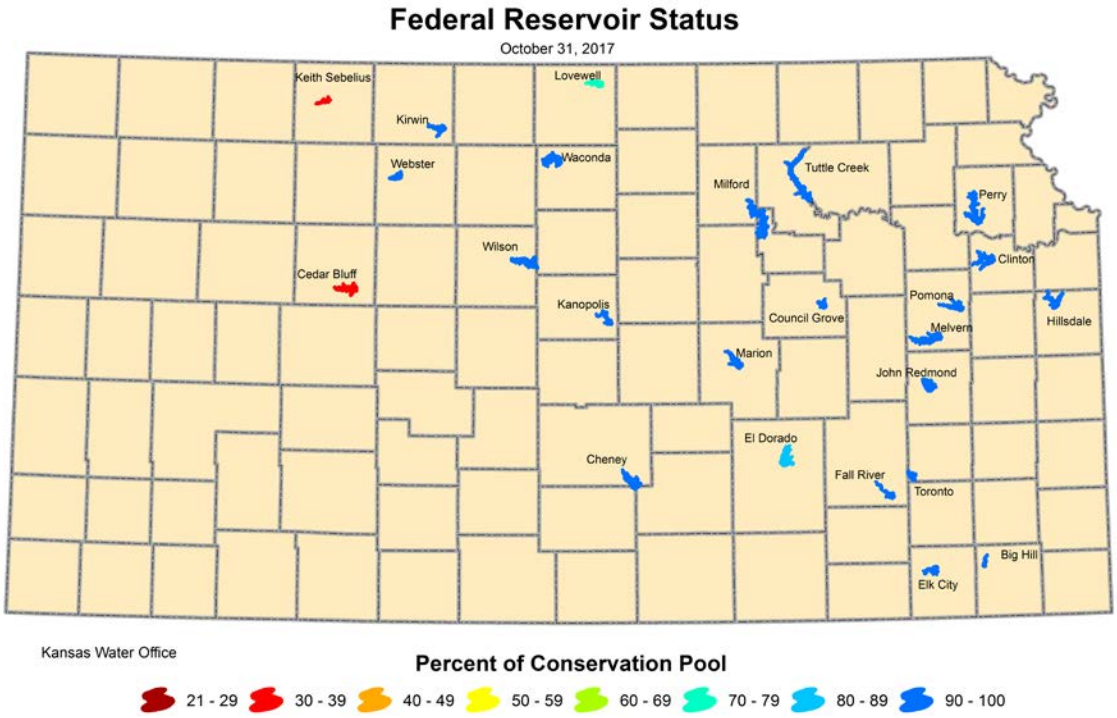
Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs experienced several inflow events over the month which brought storage back to near or above normal pool in October, a recovery from previous months declines.

Saline basin: The elevation at Wilson Lake is being maintained above normal pool, as inflows continue.

Smoky Hill basin: The middle Smoky Hill basin experienced a small amount of runoff early in October, which helped maintain some streamflow. Kanopolis Lake also experienced an early month inflow event that increased discharge through the spillway and resulted in median level flow conditions downstream.

General Reservoir Conditions

The conservation pools at the water supply reservoirs in eastern Kansas are full. Norton (Keith Sebelius) and Cedar Bluff reservoirs remain significantly below full conservation pool at 38% and 31 % respectively.



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		**10/31/2017 1:16 PM**		
Norton[1]	2304.3	2291.38	-12.92	38
Harlan County, NE	1945.73	1937.85	-7.88	70
Lovewell[1]	1582.6	1579.34	-3.26	75
Milford[1]	1144.4	1145.40	1	100
Cedar Bluff	2144	2118.04	-25.96	30
Kanopolis[1]	1463	1465.29	2.29	100
Wilson[1]	1516	1516.99	0.99	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
Webster[1]	1892.5	1892.14	-0.36	99
Kirwin[1]	1729.3	1727.64	-1.66	92
Waconda[1]	1455.6	1455.22	-1.38	98
Tuttle Creek[1]	1075	1081.94	6.94	100
Perry[1]	891.5	893.76	2.26	100
Clinton[1]	875.5	877.43	1.93	100
Melvern[1]	1036	1035.88	-0.12	100
Pomona[1]	974	976.35	2.35	100
Hillsdale[1]	917	917.95	0.95	100
Arkansas River Basin		**10/31/2017 08:00 AM**		
Cheney	1421.6	1420.68	-0.92	95
El Dorado	1339	1336.15	-2.85	87
Toronto[1]	901.5	901.76	0.26	100
Fall River[1]	948.5	948.66	0.16	100
Elk City[1]	796	796.75	0.75	100
Big Hill	858	858.10	0.10	100
Council Grove[1]	1274	1272.94	-1.06	94
Marion[1]	1350.5	1349.02	-1.48	89
John Redmond[1]	1039	1041.64	0.64	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. The following warnings and watches were in issued by KDHE this month.

October 5: Public health **warnings for** Brown County State Fishing lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City lake, Brown County; Melvern Outlet Swim Pond, Osage County; Memorial Park (Veteran's) Lake (great Bend, Barton County; Overbrook City Lake, Osage County; and South Lake, Johnson County.

Public health **watches** for Lake Scott State Park, Scott County.

October 19: Public health **warnings** for Brown County State Fishing lake, Brown County; Central Park Lake, Shawnee County; Hiawatha City lake, Brown County; Hodgeman County State Fishing Lake, Hodgeman County; Melvern Outlet River Pond, Osage County; Melvern Outlet Swim Pond, Osage County; and Memorial Park Lake (Great Bend), Barton County.

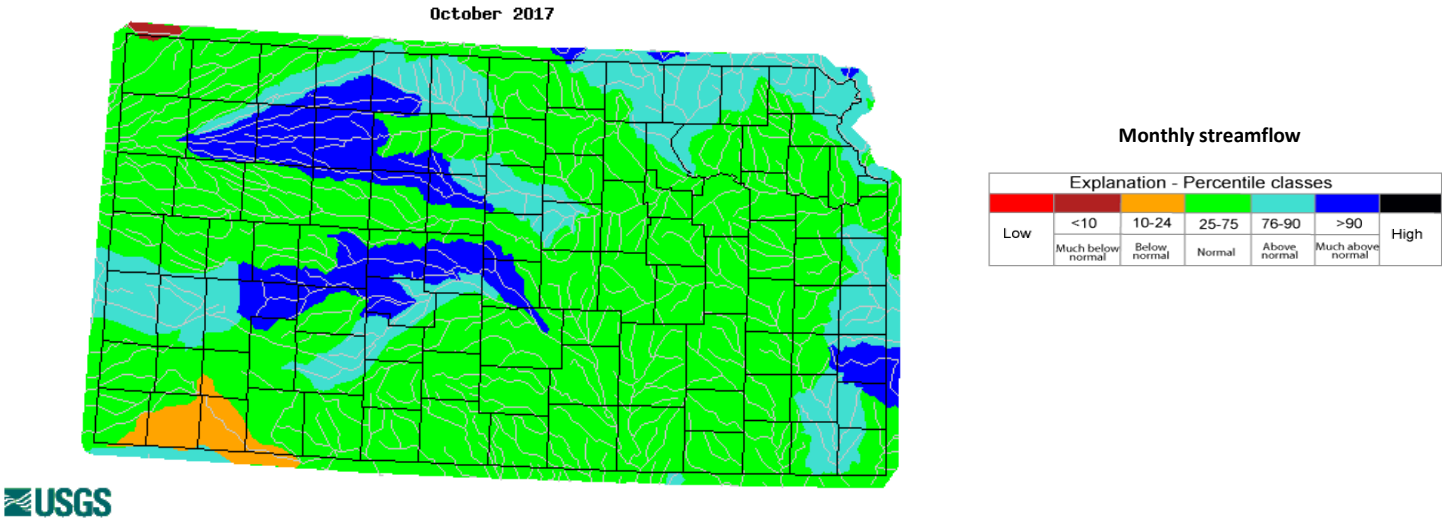
Public health **watches** for Cowley County State Fishing Lake, Cowley County; Lake Scott State Park, Scott County; and Melvern Outlet River Pond, Osage County.

November 2, 2017: Public health **watch for** Central Park Lake, Shawnee County; Hiawatha City lake, Brown County; Melvern Outlet Swim Pond, Osage 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.

Streamflows as of November 1, 2017				
Gaging Station	**Current Flow**	**October MDS**	**Nov MDS**	**Comment**
Republican River at Concordia	94	65	80	
Republican River at Clay Center	159	90	100	
Delaware River near Muscotah	**9**	2	**10**	Below MDS Nov 1, 2017
Rattlesnake Creek near Macksville	0	1	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	5	3	10	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	2	8	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	28	20	20	
South Fork Ninnescah River near Pratt	5	5	10	No surface water diversions junior to MDS above gage

Flooding and High Flows

USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates flood or high flow conditions occurred in Kansas as shown in the table below.

Summary of Recent Flood and High Flow Conditions - USGS WaterWatch October 2017											
				No. of		Highest peak					
			NWS	days		from 2017-10-01 to 2017-10-31				Historical Peaks	
USGS station number	USGS station name	Drain. area [mi^2]	flood stage [ft]	above flood stage	NWS flood class	Date	Stage [ft]	Stream flow (date)[ft^3/s]	Rank	No. of years	Max. (year) [ft^3/s]
6856600	REPUBLICAN R AT CLAY CENTER, KS	24542	15	2		10/7/2017	15.36	6800	79	100	195000 (1935)
6866900	SALINE R NR WAKEENEY, KS	696	13	2		10/3/2017	14.81	4000	8	46	13000 (1957)
6871000	NF SOLOMON R AT GLADE, KS	849	11	1		10/3/2017	14.62	4580	6	63	23300 (1957)
6871500	BOW C NR STOCKTON, KS	341	9	2		10/3/2017	10.33	1310	21	65	12900 (1951)
6872500	NF SOLOMON R AT PORTIS, KS	2315	15	2		10/4/2017	17.57	3790	34	70	35700 (1951)
6873000	SF SOLOMON R AB WEBSTER RE, KS	1040	8.5	2		10/3/2017	9.69	3260	28	73	55200 (1951)
6884700	BIG BLUE R AT BLUE RAPIDS, KS	8342	26	2		10/7/2017	29.73	--	--	--	--
7143310	COW C NR HUTCHINSON, KS	859.5	9.5	4		10/11/2017	10.69	--	--	--	--

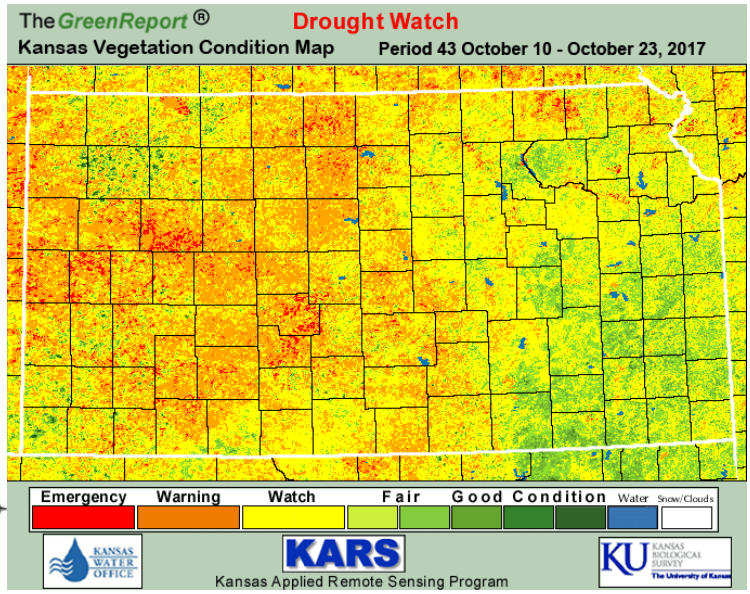
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

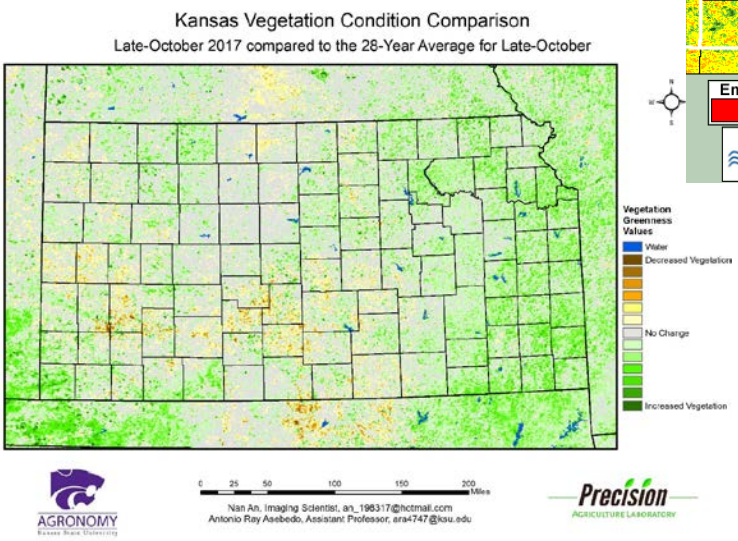
Soil, Crop and Vegetation

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.

Eastern Kansas remained in mostly good condition partially due to cool season grasses through mid-October. The central and western areas of the state remain dry.

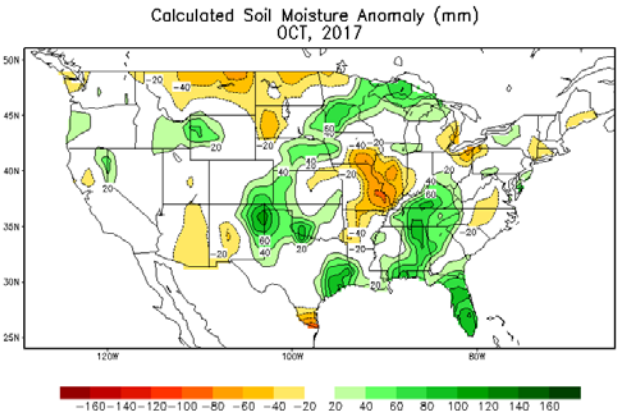


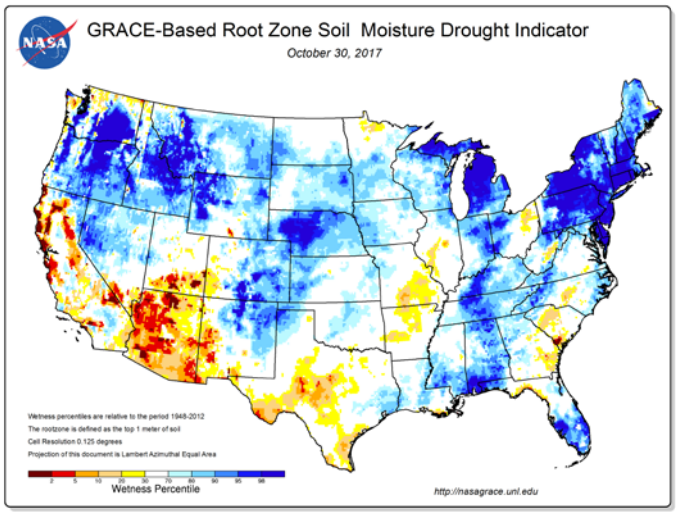


The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition. The camparison is from K-State's Precision Agriculture Laboratory.

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 published October 30, 2017 reported topsoil moisture rated 1 percent very short, 17 short, 78 adequate, and 4 surplus. Subsoil moisture rated 2 percent very short, 20 short, 75 adequate, and 3 surplus.

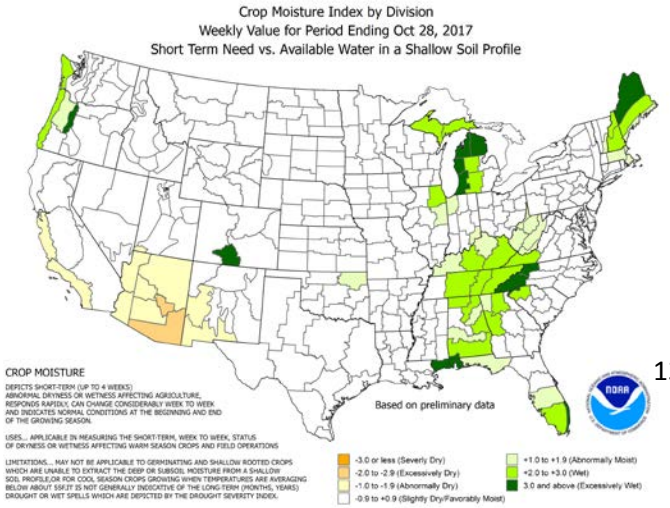
Field Crops Report:
Sorghum condition rated 2 percent very poor, 8 poor, 31 fair, 47 good, and 11 excellent.

Cotton condition rated 2 percent very poor, 8 poor, 29 fair, 53 good, and 8 excellent.

Sunflowers condition rated 1 percent very poor, 5 poor, 33 fair, 52 good, and 9 excellent. Sunflowers bracts turning yellow was 97 percent, equal to last year.

Alfalfa fourth cutting was 95 percent complete.

Pasture and Range Report: Pasture and range conditions rated 4 percent very poor, 15 poor, 37 fair, 41 good, and 3 excellent.
Stock water supplies rated 2 percent very short, 14 short, 82 adequate, and 2 surplus.



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.

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

October 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.51	-0.64	44%	51.6	0.6	86 (12)	17 (27)
Dodge City	0.37	-1.37	21%	57.7	1.1	91 (14)	17 (28)
Garden City	1.03	-0.25	80%	56.0	0.6	89 (12)	16 (28)
Goodland	0.44	-0.93	32%	51.8	-0.1	84 (2)	19 (27)
Guymon, OK	1.34	-0.23	85%	58.6	1.2	91 (14)	27 (28,27)
Hill City	5.32	3.80	350%	55.2	1.2	85 (18)	17 (28)
Lamar, CO	0.06	-0.74	8%	54.0	1.1	90 (12)	20 (27)
McCook, NE	1.05	-0.74	59%	52.6	1.3	84 (19)	16 (28)
Springfield, CO	0.37	-1.02	27%	53.8	-0.1	86 (12)	16 (27)
Central							
Concordia	3.50	1.58	182%	56.0	0.6	83 (2)	19 (28)
Hebron, NE	2.28	0.07	103%	55.0	2.1	83 (19,2)	19 (28)
Medicine Lodge	1.09	-1.75	38%	59.1	0.5	87 (2)	18 (28)
Ponca City, OK	4.36	0.98	129%	62.0	1.9	90 (14)	27 (28)
Salina	5.78	3.51	255%	59.6	2.1	90 (2)	23 (28)
Wichita (ICT)	3.60	0.82	129%	60.0	1.7	88 (14)	25 (28)
East							
Bartlesville, OK	4.71	1.24	136%	60.2	0.7	89 (14)	25 (29)
Chanute	5.03	1.37	137%	60.2	1.9	87 (14)	25 (31)
Fall City, NE	4.59	1.95	174%	56.5	1.8	86 (2)	22 (28)
Johnson Co. Exec. Apt	3.80	0.36	110%	57.6	0.6	85 (14,13)	27 (31,29)
Joplin, MO	4.31	0.28	107%	60.6	0.8	88 (9,2)	26 (28)
Kansas City (MCI), MO	4.87	1.71	154%	57.7	1.3	84 (2)	25 (31)
St. Joseph, MO	4.12	1.31	147%	56.8	2.1	87 (2)	23 (31)
Topeka (TOP	2.94	-0.09	97%	58.7	2.1	88 (2)	25 (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

KANSAS CLIMATE and DROUGHT UPDATE – November 2017 Summary

Climate, Drought and Flood Conditions and Responses for Kansas

General

- U.S. Drought Monitor: Scattered below normal streamflows and below normal precipitation during the past 30 days led to expansion of areas of Moderate Drought (D1) in south-central Kansas.
- 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.

Disasters and Assistance

- November 12, 2017, U.S. Department of Agriculture (USDA) has designated three counties in Kansas as primary natural disaster areas due to losses and damages caused by multiple disasters that occurred during the 2017 crop year. Marshall and Nemaha counties designated due to drought during May 2017 and Trego County due to high winds, hail and lightning. Producers in counties contiguous to Marshall and Nemaha; Brown, Jackson, Pottawatomie, Riley, and Washington and contiguous to Trego; Ellis, Gove, Graham, Ness and Rooks counties are also eligible for assistance.

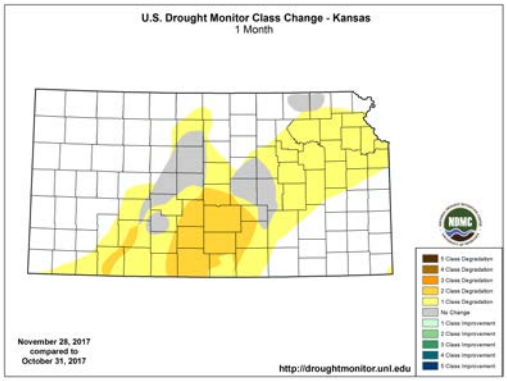
- Producers in 52 counties are eligible for USDA disaster programs due to agricultural disaster designations in 2017.

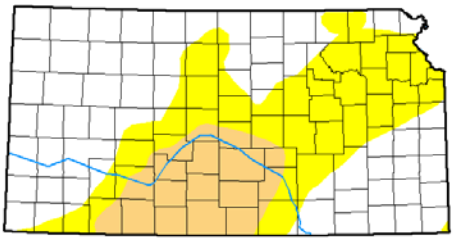
- November 7, 2017, Federal Presidential disaster was declared for severe storms, straight-line winds, and flooding from July 22 to July 27, 2017 in Johnson and Wyandotte counties.

- August 22, 2017, the U.S. Department of Agriculture (USDA) designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by high winds, hail, excessive rain and flash flooding that occurred from May 11, 2017, through June 20, 2017.

General Conditions

Much below normal precipitation, coupled with warmer than normal temperatures resulted in a steep increase in the drought conditions. U.S. Drought Monitor standards indicated dry conditions expanding across south central, central and north east Kansas during November. The month ending expansion of moderate drought conditions to all or portions of 19 counties in south central Kansas. The area of abnormally dry to moderate drought increased to 33 percent in November.





U.S. Drought Monitor
Kansas

November 28, 2017
(Released Thursday, Nov. 30, 2017)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	52.88	47.12	15.33	0.00	0.00	0.00
Last Week 11-21-2017	65.88	34.12	1.38	0.00	0.00	0.00
3 Months Ago 08-29-2017	62.50	37.50	19.90	0.00	0.00	0.00
Start of Calendar Year 01-03-2017	17.31	82.69	30.71	13.58	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 11-29-2016	47.46	52.54	30.50	10.50	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.

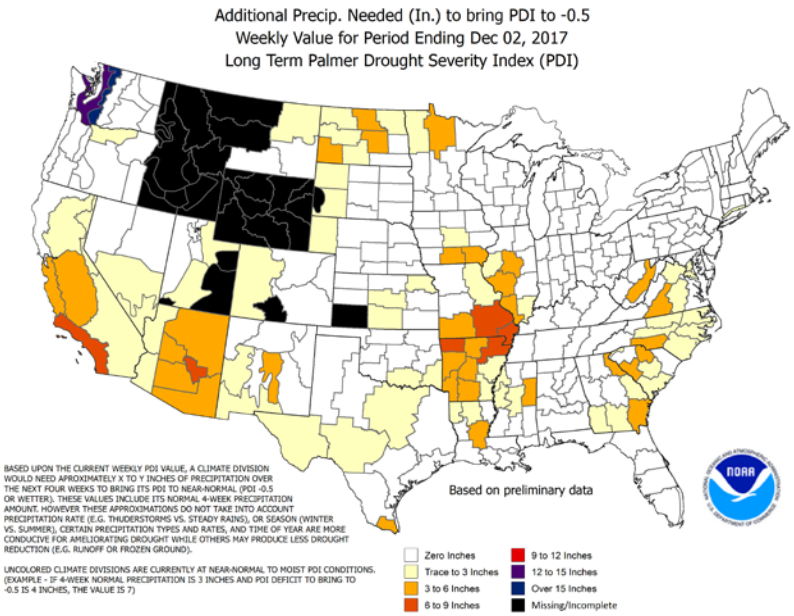
Author:
David Simeral
Western Regional Climate Center

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

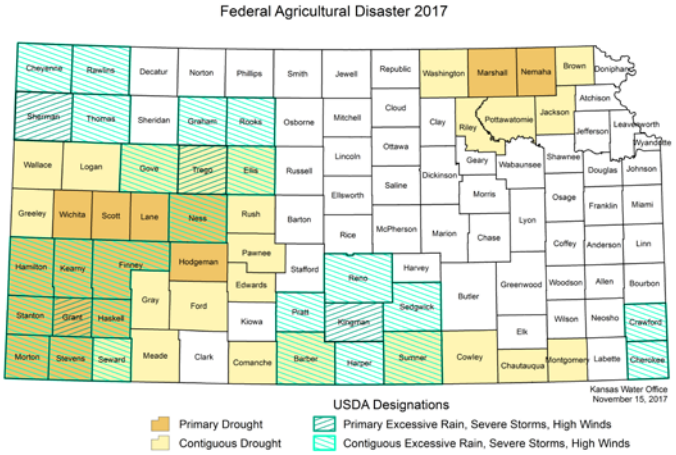


Precipitation needed to remove drought for weeks ending on Date					
Climate Division	Nov. 3	Nov. 11	Nov. 18	Nov. 25	Dec. 02
Northeast	0.66	0.93	1.35	2.41	2.77
Central	-	-	0.31	0.82	1.44
South Central	-	-	-	-	0.70

Federal Disaster Declarations 2017

USDA 2017 agricultural disaster designations have been made for 52 Kansas Counties: 18 primary and 28 contiguous for a variety of causes including drought and excessive rain. Some counties qualify for programs for both of these causes.

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by **drought.** The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster (drought) assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

July 12, 2017, Cherokee and Crawford counties became eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to **excessive rainfall and flooding** April 24-May 11, 2017.

August 22, 2017, the USDA designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by **high winds, hail, excessive rain and flash flooding** that occurred from May 11, 2017, through June 20, 2017. As contiguous counties; Barber, Cheyenne, Finney, Hamilton, Haskell, Harper, Kearny, Morton, Pratt, Rawlins, Reno, Sedgwick, Sumner, Seward, Stanton, Stevens, and Thomas are also already eligible.

November 12, 2017, U.S. Department of Agriculture (USDA) has designated three counties in Kansas as primary natural disaster areas due to losses and damages caused by multiple disasters that occurred during the 2017 crop year. Marshall and Nemaha counties designated due to **drought** during May 2017 and Trego County due to high winds, hail and lightning. Producers in counties contiguous to Marshall and Nemaha; Brown, Jackson, Pottawatomie, Riley, and Washington and contiguous to Trego; Ellis, Gove, Graham, Ness and Rooks counties are also eligible for assistance.

Presidential Federal Disasters

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3. Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita.

November 7, 2017, Federal Presidential disaster was declared for severe storms, straight-line winds, and flooding from July 22 to July 27, 2017 in Johnson and Wyandotte counties.

The 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.

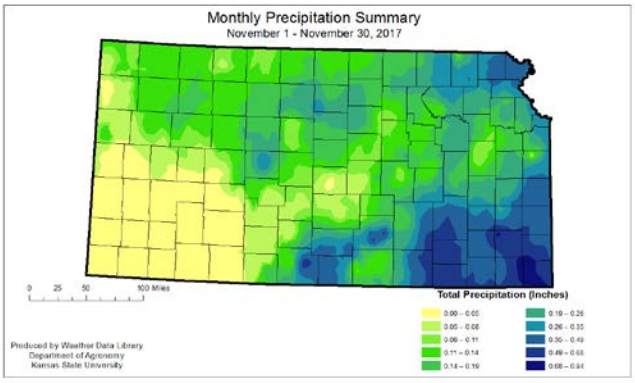
Climate Summary (Precipitation and Temperature)

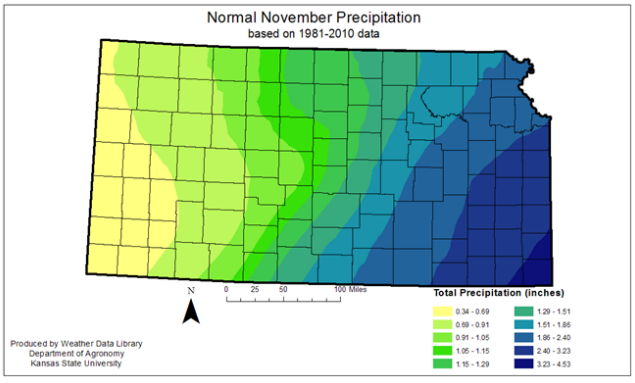
The major climate feature for November was the dryness. Statewide average precipitation was just 0.10 inches, which is a 3-way tie for the sixth driest November on record. The driest November on record was in 1989 when the statewide average precipitation was zero, and the greatest amount reported was just 0.01 inches. The Southeast Climate Division came closest to normal with an average of 0.37 inches or 14 percent of normal. The Southwest Division ended as the driest with an average of zero, which was zero percent of normal. Thanks to the wet conditions in the division in September, the Southwest is still at 99 percent of normal for the September through November period. Greatest monthly total for a National Weather Service (NWS) reporting station was 0.88 inches at Coffeyville Waterworks, Montgomery County. The greatest monthly total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 0.77 inches at Wichita 4.5 ENE, Sedgwick County. Not surprisingly, with the low monthly totals the 24hr maximum amounts were also low. The greatest 24hr amounts: 0.59 inches at Cedarvale 5SSE, Chautauqua County, on the 29th (NWS); 0.64 inches at Beaumont 6.6 SSW, Butler County on the 29th (CoCoRaHS).

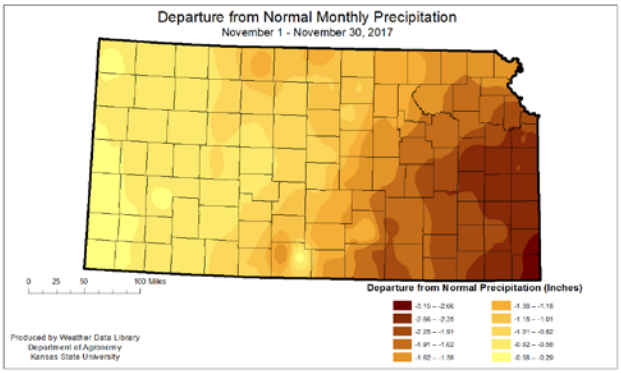
Although the warmth that ended the month made it a distant memory, snow was reported in November. Five locations in North Central Kansas set daily records for snowfall. The greatest snowfall report for the month was 2.5 inches at Ellis, Ellis County, on the 1st.

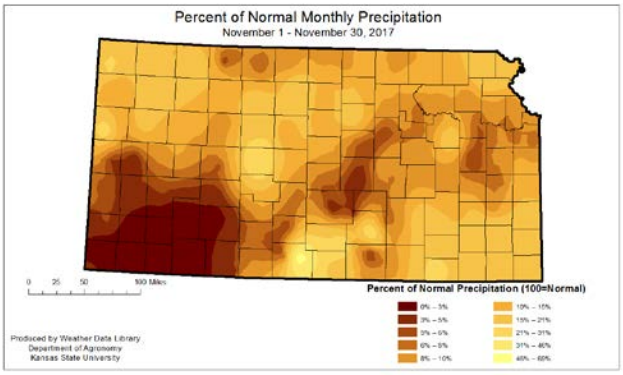
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

Kansas Climate Division Precipitation Summary (inches)												
	November 1-30, 2017			January 1- November 30, 2017			April 1, 2016 – November 30, 2017			September 1, 2017– November 30, 2017		
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	-0.81	1	20.35	-0.44	97	17.41	-1.08	93	3.65	-0.25	89
West Central	0.03	-0.76	3	23.24	3.10	115	19.77	2.13	112	4.62	0.78	119
Southwest	0.00	-0.66	0	24.32	5.09	127	19.89	3.04	119	3.66	-0.13	99
North Central	0.06	-1.17	4	26.23	-0.93	96	22.23	-1.44	93	5.14	-0.70	87
Central	0.09	-1.15	7	25.94	-2.42	92	21.36	-3.05	88	4.78	-1.11	83
South Central	0.13	-1.36	8	31.16	0.96	103	24.67	-0.91	96	5.62	-1.11	83
Northeast	0.09	-1.68	5	29.17	-4.61	86	24.22	-5.35	82	4.59	-3.52	57
East Central	0.11	-2.06	5	32.87	-3.65	88	28.28	-3.32	88	5.30	-3.61	58
Southeast	0.37	-2.22	14	41.18	1.50	103	35.63	1.95	105	6.88	-3.39	66
STATE	0.10	-1.32	5	28.56	0.21	102	23.91	-0.60	98	4.96	-1.39	83





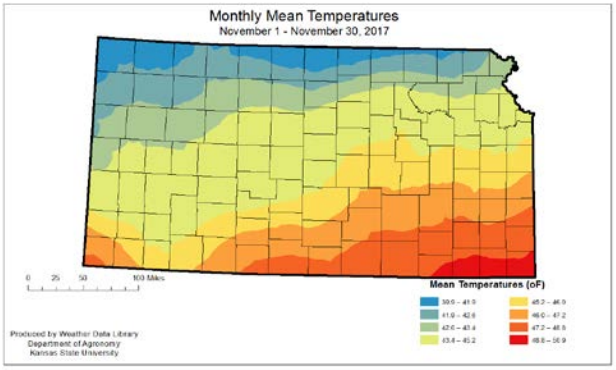


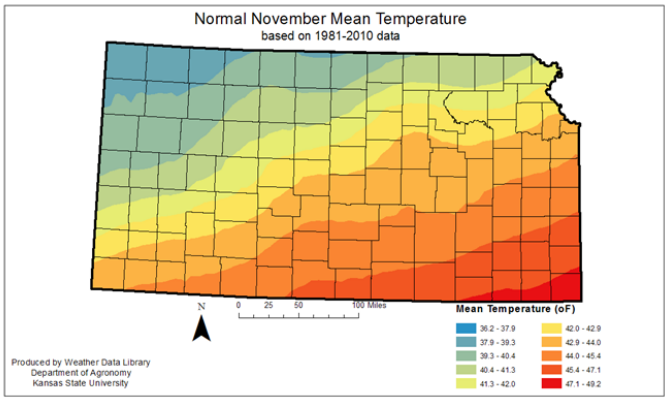


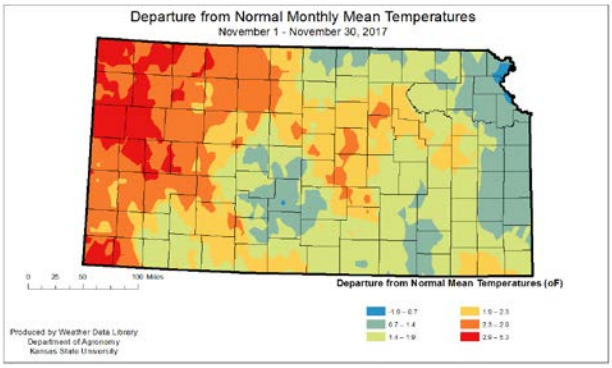
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

November ended on a warm note, pushing the statewide average to 44.2 °F or 1.6 degrees warmer than normal. That places it on the warm side of the distribution in a 7-way tie for the 36th warmest November since 1895. The warmest November on record occurred in 1999 when the statewide average temperature was 50.1 °F. There were 137 new record daily highs, one of which tied the monthly record high for the location. That was 87 °F reported at Atwood, Rawlins County, on the 28th. There were also 28 new record daily warm minimum temperatures. None of those set new records for the month. On the cold side of the scale, there were 6 new record low maximum temperatures and 4 new record low minimum temperatures during the month. The warmest reading of the month was 86 °F at Salina Airport, Saline County, on the 24th. The coldest temperature for the month was 12 °F reported at Burr Oak and Mankato, both in Jewell County, on the 22nd.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	November 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	56.6	27.4	42.0	2.6	86	28	15	8
West Central	58.7	28.2	43.5	2.9	86	28	17	29
Southwest	60.7	30.9	45.8	2.8	86	28	16	19
North Central	55.1	29.5	42.3	1.1	85	25	12	22
Central	57.0	31.5	44.2	1.4	87	24	13	22
South Central	58.0	33.9	45.9	1.3	84	25	16	9
Northeast	53.7	30.8	42.2	0.0	79	25	13	22
East Central	55.0	34.0	44.5	0.9	79	25	15	23
Southeast	57.8	36.5	47.1	1.2	80	25	18	23
STATE	57.0	31.4	44.2	1.6	87	24th	12	22nd
Data Source: KSU Weather Library								







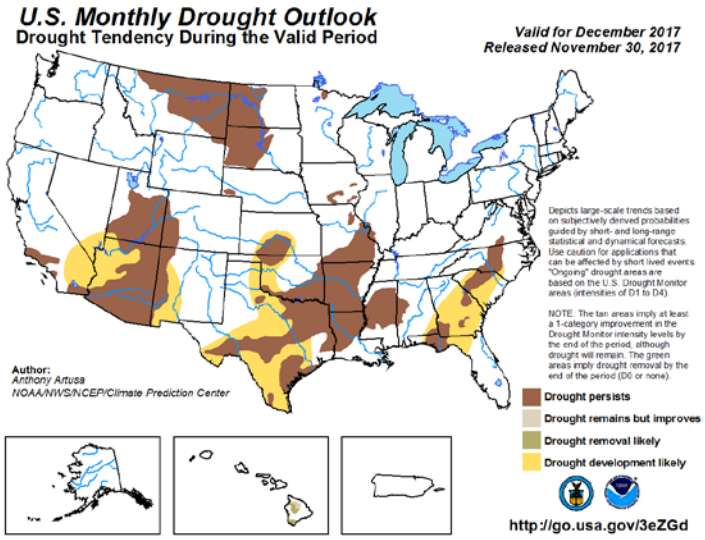
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

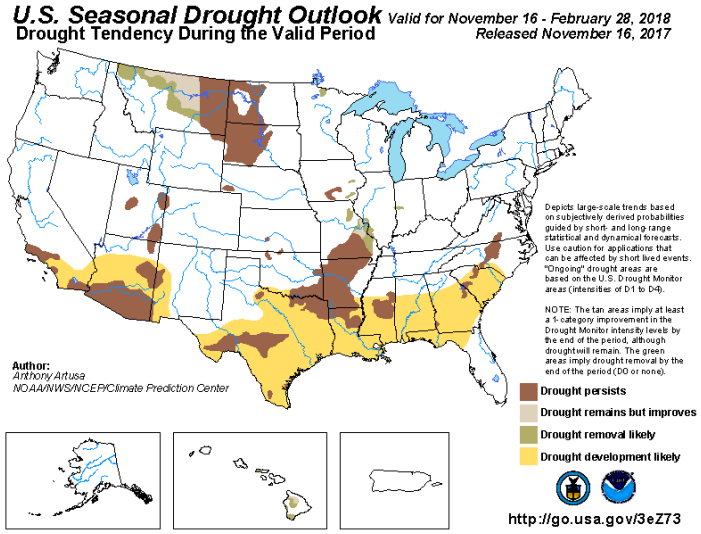
Future Outlook

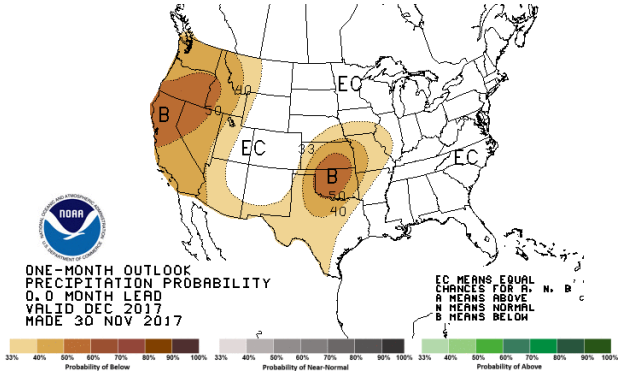
The December outlook calls for drier than normal conditions across Kansas, with equal chances of above or below normal temperature across the state. The Monthly Drought Outlook indicates drought conditions to remain in a south central Kansas

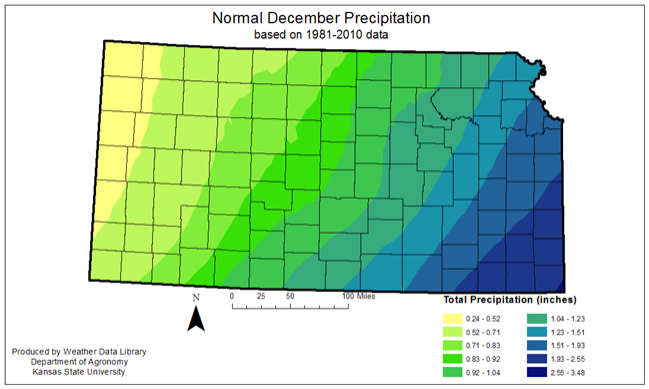
For the January-March time period probability is for equal chances of above or below normal precipitation and temperatures statewide.

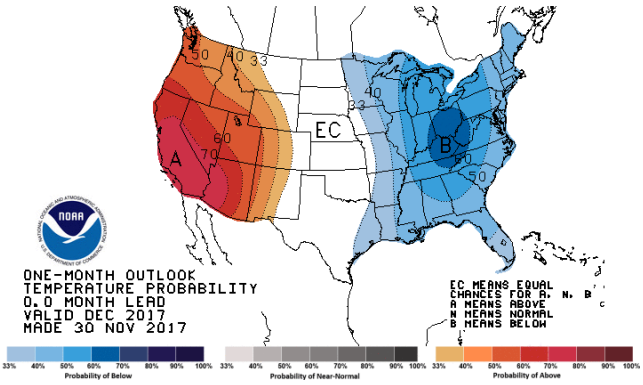
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

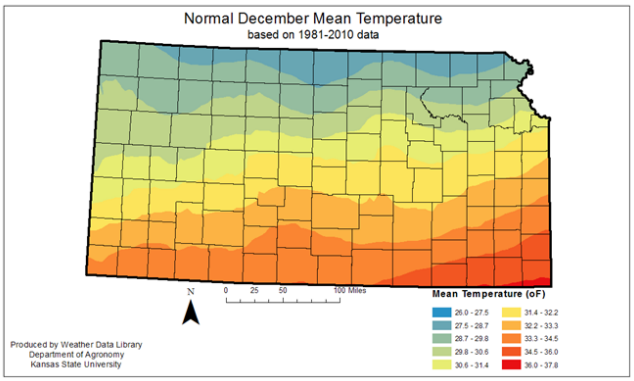


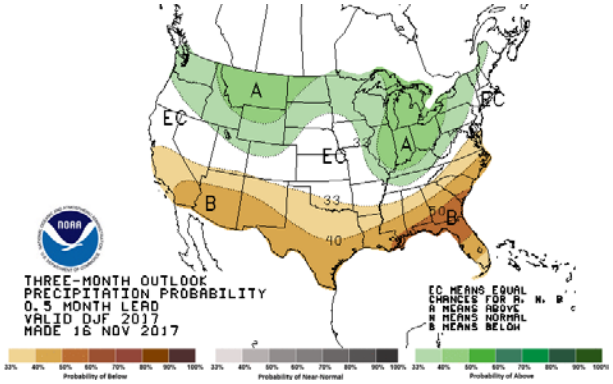


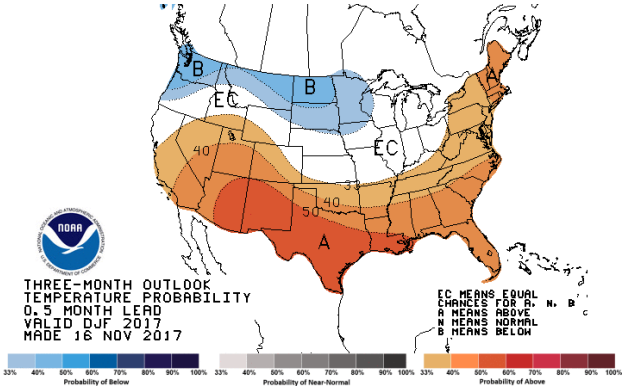












Additional outlooks for additional timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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 December 1, 2017 (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 III water restrictions have been in place for the **City of Victoria**, Ellis County since January 2014. No outdoor watering, washing of cars or filling of private swimming pools is allowed.
(December 1, 2017, 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/ December 1, 2017)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs was below normal in November. However, all reservoirs maintained their pool levels near the fall target elevations, due to the storage gained in early October. Releases from Tuttle Creek were necessary to support the low flow requirements on the Kansas River.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received very little inflow in November. However, Melvern's decline was more significant, ending the month 2 feet below the fall target elevation while Pomona and Hillsdale were only slightly low. Flow in the Marais des Cygnes River declined throughout the month but remained near median levels.

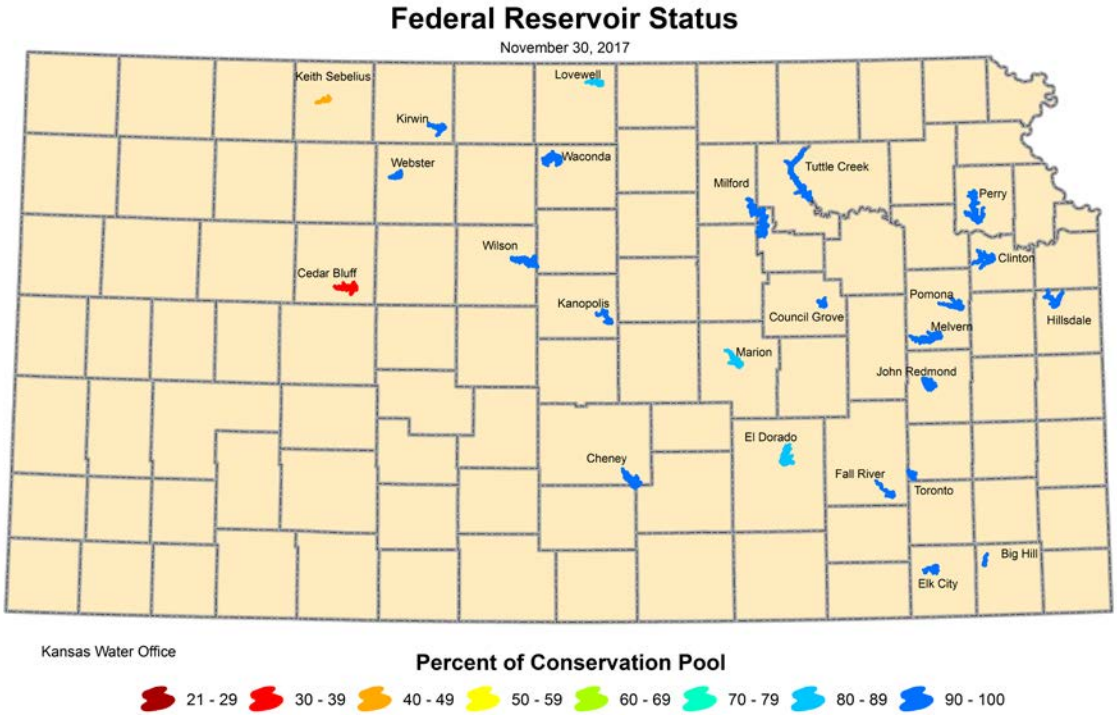
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low throughout the month of November and streamflow declined in throughout the basin, especially the Upper Neosho. Conservation storage is full in John Redmond but steadily declined in Marion and Council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

Verdigris basin: Toronto, Fall River, Big Hill and Elk City reservoirs above conservation pool levels in November but reservoir releases were necessary to support low flows in Fall and Verdigris Rivers.

Saline basin: The elevation at Wilson Lake is being maintained above normal pool, in fact, releases were increased to lower the pool elevation.

Smoky Hill basin: The middle Smoky Hill basin maintained moderate streamflow. Kanopolis Lake also declined throughout November but remains above multipurpose elevation. Downstream flow declined to below median values but is well above the low flow target value at Mentor.

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		**11/30/2017 01:18 PM**		
Norton[1]	2304.3	2291.44	-12.86	38.5
Harlan County, NE	1945.73	1938.10	-7.64	70.4
Lovewell[1]	1582.6	1581.07	-1.59	87.7
Milford[1]	1144.4	1145.84	1.44	100
Cedar Bluff	2144	2117.89	-26.1	30.2
Kanopolis[1]	1463	1464.85	1.86	100
Wilson[1]	1516	1516.86	0.87	100
Webster[1]	1892.5	1892.64	0.1	100
Kirwin[1]	1729.3	1728	-1.31	93.7
Waconda[1]	1455.6	1455.38	-0.22	98.7
Tuttle Creek[1]	1075	1081.71	6.71	100
Perry[1]	891.5	893.61	2.13	100
Clinton[1]	875.5	876.78	1.27	100
Melvern[1]	1036	1035.53	-0.47	97.8
Pomona[1]	974	976.03	2.04	100
Hillsdale[1]	917	917.82	0.83	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
Arkansas River Basin		**11/30/2017 08:00 AM**		
Cheney	1421.6	1420.62	-0.98	94.0
El Dorado	1339	1335.89	-3.11	86.0
Toronto[1]	901.5	901.65	0.15	100.0
Fall River[1]	948.5	947.99	-0.51	93.0
Elk City[1]	796	796.62	0.62	100.0
Big Hill	858	857.87	-0.13	100.0
Council Grove[1]	1274	1272.72	-1.28	92.0
Marion[1]	1350.5	1348.87	-1.63	88.0
John Redmond[1]	1039	1041.57	0.57	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 this month.

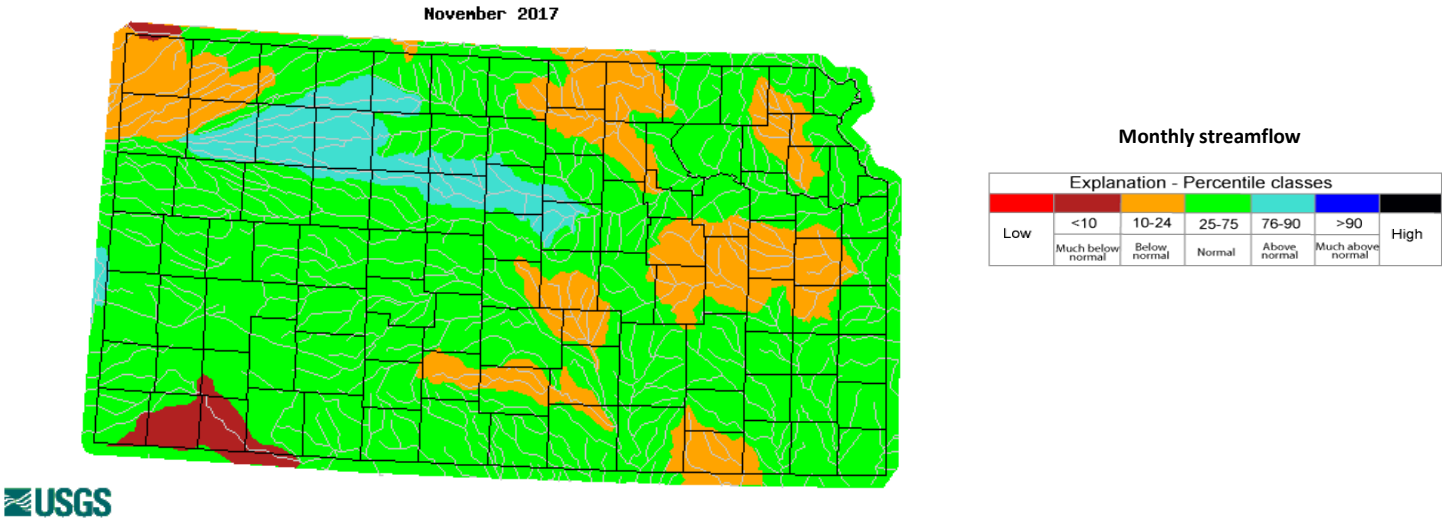
November 2, 2017: Public Health Watch for Central Park Pond, Shawnee County; Hiawatha City Lake, Brown County; and Melvern Outlet River pond, Osage County.

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.

Streamflows as of November 29, 2017			
Gaging Station	**Current Flow**	**Nov MDS**	**Comment**
Republican River at Concordia	76	80	
Republican River at Clay Center	152	100	
Delaware River near Muscotah	NA	10	Flow affected by backwater
Rattlesnake Creek near Macksville	0	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	9	10	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	4	8	MDS admin began Aug 10, 2017
Little Arkansas River at Valley Center	36	20	
South Fork Ninnescah River near Pratt	4	10	No surface water diversions junior to MDS above gage
Ninnescah River near Peck	139	100	

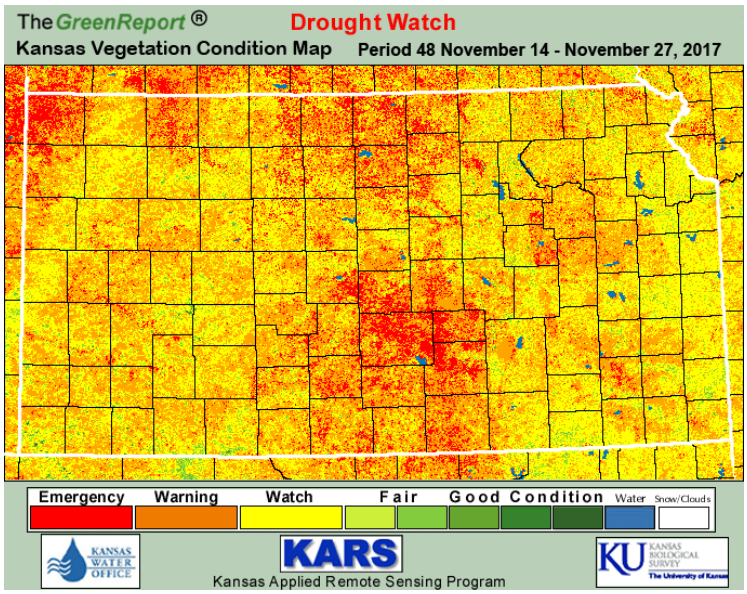
Flooding and High Flows
USGS WaterWatch data Based on USGS monitored stream gages; USGS WaterWatch indicates flood or high flow conditions did not occurred in Kansas in November 2017.

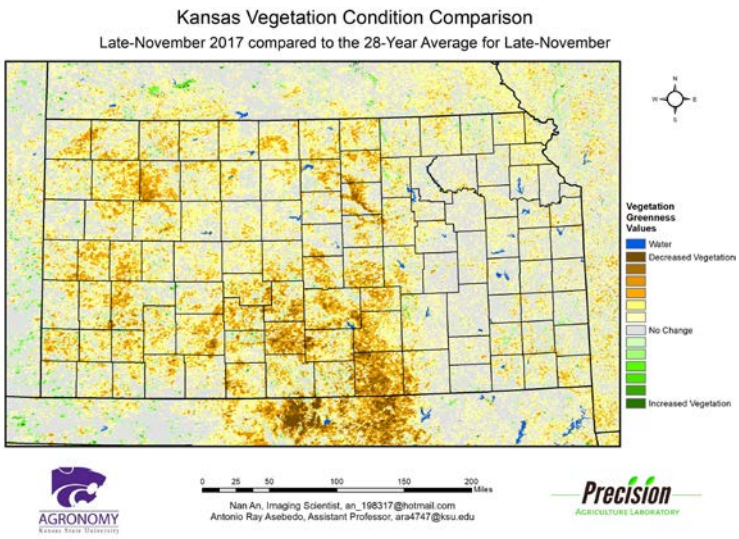
Please note: flood classification is National Weather Service (NWS) flood classes which are based on property damage and public threat. Minor flooding (orange) is defined as minimal or no property damage, but possibly some public threat or inconvenience. Moderate flooding (red) is some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. Major flooding is extensive inundation of structures and roads, and significant evacuations of people and/or transfer of property to higher elevations. NWS flood stage is found on the NWS River Conditions Map.

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.

Kansas was very dry at the end of November. Warm temperatures caused stress to vegetation including emerging winter wheat.



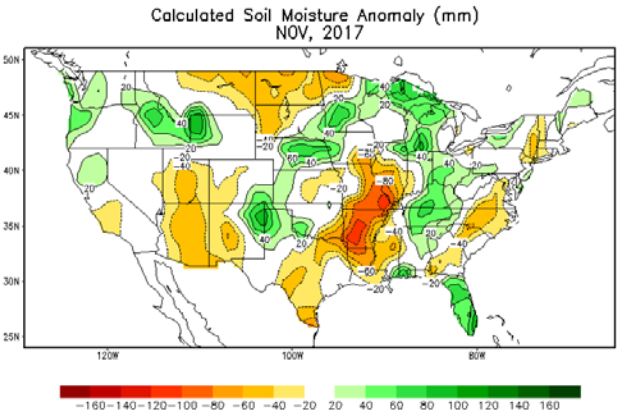


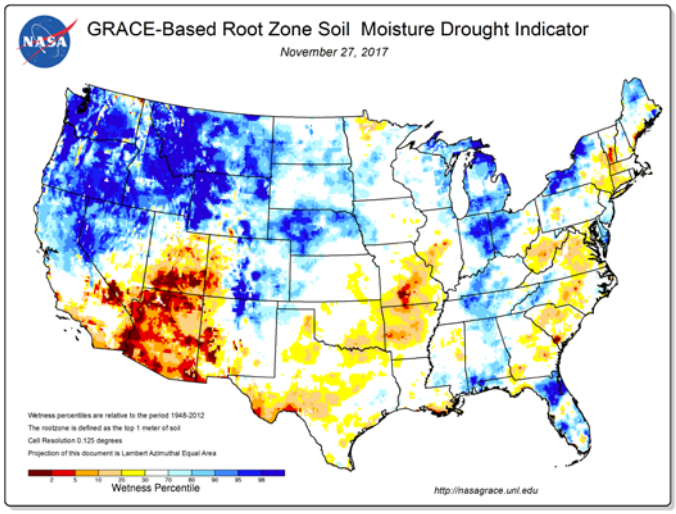
The map on the left compares the 28-year average vegetation condition for the period, to this year's Vegetation Condition. The camparison is from K-State's Precision Agriculture Laboratory.

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.

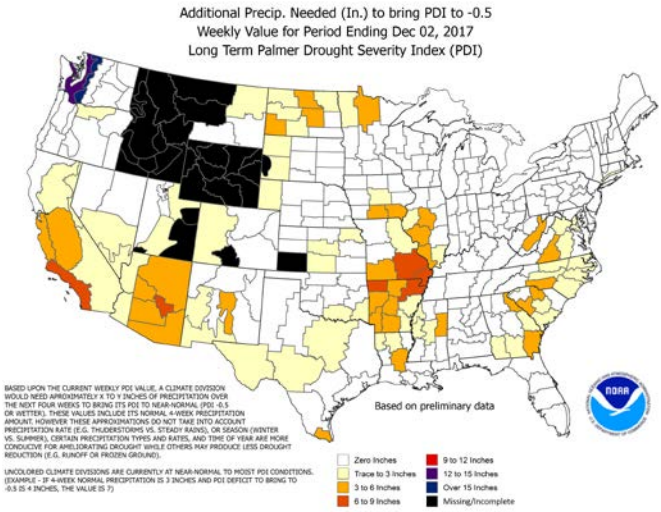
USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report for the state as a whole for the week ending November 27, 2017 reported topsoil moisture rated 8 percent very short, 31 short, 59 adequate, and 2 surplus. Subsoil moisture rated 6 percent very short, 29 short, 64 adequate, and 1 surplus.

Field Crops Report:
Winter wheat condition rated 4 percent very poor, 10 poor, 35 fair, 47 good, and 4 excellent.

Cotton condition rated 0 percent very poor, 4 poor, 26 fair, 61 good, and 9 excellent. Cotton harvested was 58 percent, behind 67 last year and the 68 average.

Pasture and Range Report:
Pasture and range conditions rated 4 percent very poor, 16 poor, 38 fair, 40 good, and 2 excellent. Stock water supplies rated 3 percent very short, 19 short, 78 adequate, and 0 surplus.

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.



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

November 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.02	-0.57	3%	43.3	5.1	82 (27)	16 (19,18)
Dodge City	0.01	-0.75	1%	46.1	3.0	82 (24)	20 (22,8)
Garden City	0.01	-0.54	2%	44.5	2.8	79 (17)	18 (19)
Goodland	0.03	-0.68	4%	43.5	4.5	82 (27)	18 (10)
Guymon, OK	T	-0.53	0%	49.5	3.9	84 (27,24)	21 (19)
Hill City	0.10	-0.85	11%	44.2	3.5	83 (24)	19 (29,8)
Lamar, CO	T	-0.38	0%	44.9	4.9	86 (27)	12 (19)
McCook, NE	0.16	-0.79	17%	42.4	4.2	79 (27)	17 (8)
Springfield, CO	0.07	-0.51	12%	45.9	4.2	85 (27)	17 (19)
Central							
Concordia	0.14	-0.97	13%	44.4	2.8	83 (24)	16 (22)
Hebron, NE	0.09	-1.35	6%	42.7	3.2	80 (24)	14 (22)
Medicine Lodge	0.64	-0.29	69%	47.6	2.1	78 (27,17)	21 (22)
Ponca City, OK	1.32	-0.49	73%	51.3	3.6	82 (24)	20 (22)
Salina	0.06	-1.19	5%	47.4	3.4	87 (24)	20 (22)
Wichita (ICT)	0.52	-0.91	36%	47.9	2.5	76 (24)	20 (22)
East							
Bartlesville, OK	0.23	-2.45	9%	50.0	2.0	80 (24,17)	21 (22)
Chanute	0.79	-1.71	32%	49.1	2.8	77 (12)	19 (22)
Fall City, NE	0.35	-1.61	18%	42.4	1.4	77 (24)	14 (22)
Johnson Co. Exec. Apt	0.10	-2.39	4%	45.1	1.1	72 (24)	18 (22)
Joplin, MO	0.52	-3.26	14%	51.0	2.6	79 (2)	19 (22)
Kansas City (MCI), MO	0.27	-1.88	13%	44.8	1.2	72 (24)	16 (22)
St. Joseph, MO	0.46	-1.09	30%	42.7	0.8	75 (24)	14 (22)
Topeka (TOP	0.10	-1.75	5%	45.8	2.0	79 (24)	18 (22)

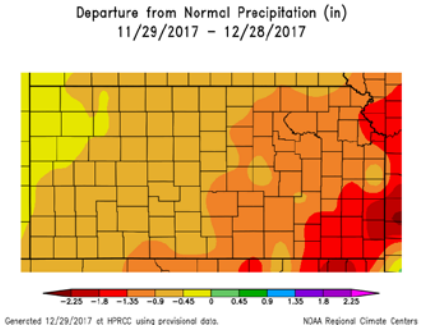
1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1981-2010 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries

KANSAS CLIMATE and DROUGHT UPDATE – December 2017 Summary

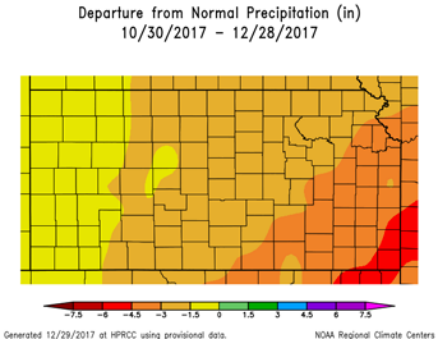
General

- 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) in south west and south central Kansas. Abnormally dry (D0) conditions expanded to include 100% of Kansas at the end of the month.

- Precipitation in December was below normal for the entire state, with the majority of the state receiving 25% or less of normal precipitation for the period. This amounts to departures from normal of up to 0.45 inches in the northwest to over 2.25 inches in south east Kansas.



- Precipitation for November-December was below normal for the entire state, with the state receiving 25% or less of normal precipitation in all but a few small areas that received 25-50% of normal precipitation for the period. This amounts to departures from normal of up to 1.5 inches in the west to up to 6 inches in south east Kansas.



- 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.

Disasters and Assistance

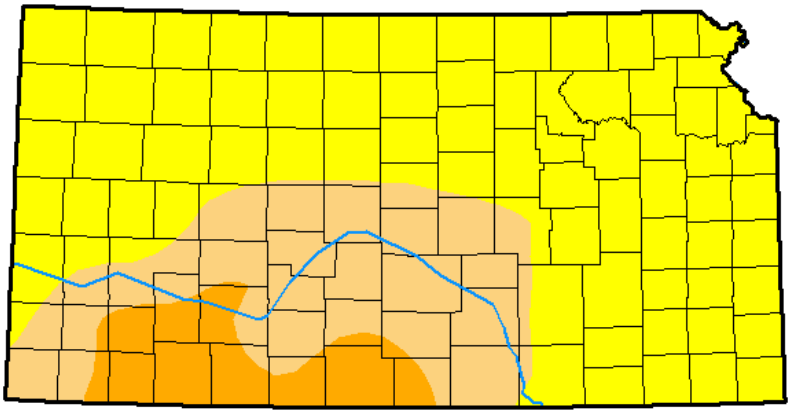
- Producers in 52 counties were eligible for USDA disaster programs due to agricultural disaster designations in 2017.

General Conditions

Much below normal precipitation, coupled with warmer than normal temperatures resulted in a steep increase in the drought conditions. U.S. Drought Monitor standards indicated dry conditions expanding across all of Kansas during December, while the moderate drought (D1) area has increased to cover 33 percent of the state. The month ended with expansion of severe drought (D2) conditions to nearly nine percent of the state, affecting all or portions of 13 counties in south central and south west Kansas.

U.S. Drought Monitor

Kansas



December 26, 2017

(Released Thursday, Dec. 28, 2017)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	32.70	8.63	0.00	0.00
Last Week *12-19-2017*	0.00	100.00	20.58	1.85	0.00	0.00
3 Months Ago *09-26-2017*	59.89	40.11	10.08	1.35	0.00	0.00
Start of Calendar Year *01-03-2017*	17.31	82.69	30.71	13.58	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 *12-27-2016*	17.31	82.69	30.71	13.58	0.00	0.00

Intensity:

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

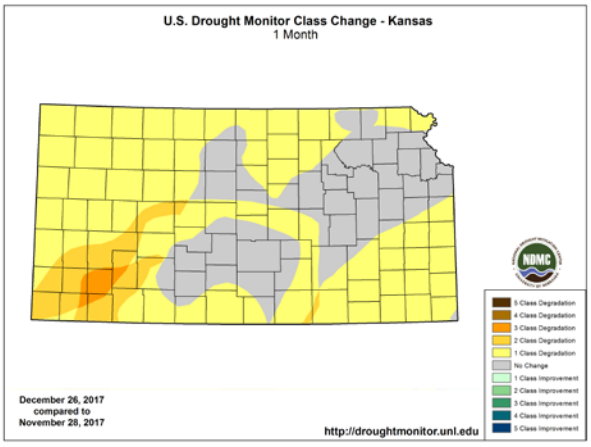
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

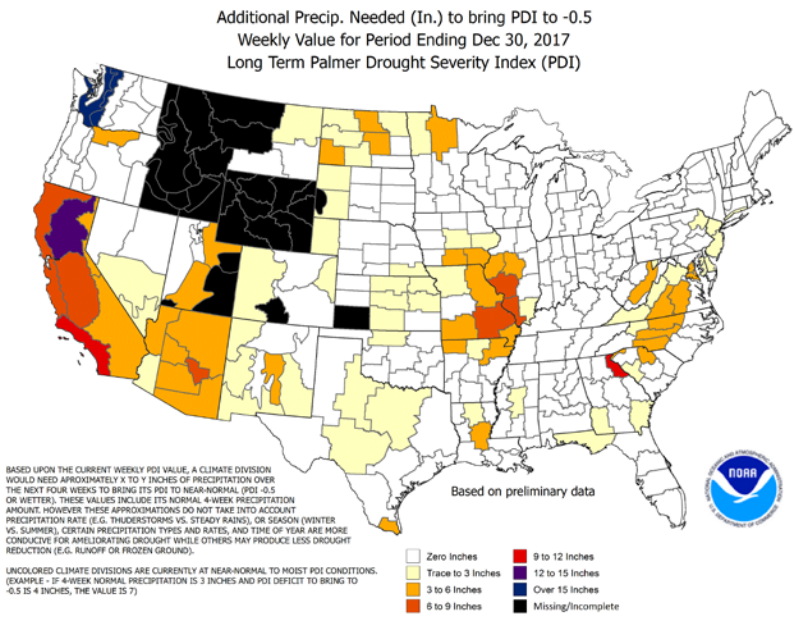
David Miskus

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.

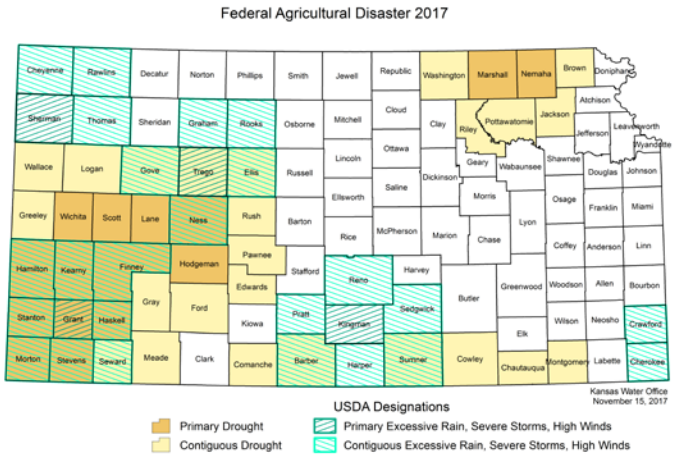
More information on the PDSI can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Precipitation needed to remove drought for weeks ending on Date					
Climate Division	Dec. 2	Dec. 9	Dec. 16	Dec. 23	Dec. 30
North Central	-	-	-	-	0.29
Northeast	2.77	2.80	2.91	2.89	2.98
Central	1.44	1.63	2.06	2.96	2.93
East Central	-	-	-	0.26	0.69
South Central	0.70	0.99	1.56	2.44	2.45

Federal Disaster Declarations 2017

USDA 2017 agricultural disaster designations have been made for 52 Kansas Counties: 18 primary and 28 contiguous for a variety of causes including drought and excessive rain. Some counties qualify for programs for both of these causes.

USDA designated natural disaster areas on Feb. 23, 2017, making all qualified farm operators in the designated areas of Kansas eligible for FSA's emergency (EM) loans, provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity.



USDA designated 13 Kansas Counties as primary disaster areas due to losses and damages caused by **drought.** The counties are Finney, Grant, Hamilton, Haskell, Hodgeman, Kearny, Lane, Morton, Ness, Scott, Stanton, Stevens and Wichita.

An additional 19 counties qualify for natural disaster (drought) assistance as contiguous counties to primary counties in Kansas or Oklahoma. These are Barber, Chautauqua, Comanche, Cowley, Edwards, Ellis, Ford, Gove, Gray, Greeley, Logan, Meade, Montgomery, Pawnee, Rush, Seward, Sumner, Trego and Wallace counties.

July 12, 2017, Cherokee and Crawford counties became

eligible for USDA disaster programs being contiguous to Missouri counties declared primary disaster areas due to **excessive rainfall and flooding** April 24-May 11, 2017.

August 22, 2017, the USDA designated Grant, Kingman and Sherman counties in Kansas as primary natural disaster areas due to losses and damages caused by **high winds, hail, excessive rain and flash flooding** that occurred from May 11, 2017, through June 20, 2017. As contiguous counties; Barber, Cheyenne, Finney, Hamilton, Haskell, Harper, Kearny, Morton, Pratt, Rawlins, Reno, Sedgwick, Sumner, Seward, Stanton, Stevens, and Thomas are also already eligible.

November 12, 2017, U.S. Department of Agriculture (USDA) has designated three counties in Kansas as primary natural disaster areas due to losses and damages caused by multiple disasters that occurred during the 2017 crop year. Marshall and Nemaha counties designated due to **drought** during May 2017 and Trego County due to high winds, hail and lightning. Producers in counties contiguous to Marshall and Nemaha; Brown, Jackson, Pottawatomie, Riley, and Washington and contiguous to Trego; Ellis, Gove, Graham, Ness and Rooks counties are also eligible for assistance.

Presidential Federal Disasters

June 16, 2017, President Donald Trump has granted Gov. Sam Brownback's request through the Federal Emergency Management Agency for a federal disaster declaration for 27 Kansas counties affected by a severe winter storm, snowstorm, straight-line winds and flooding that struck the Kansas April 28-May 3. Counties named in the declaration are Cherokee, Cheyenne, Crawford, Decatur, Finney, Gove, Graham, Grant, Greeley, Hamilton, Haskell, Kearny, Lane, Logan, Morton, Neosho, Norton, Rawlins, Scott, Seward, Sheridan, Sherman, Stanton, Stevens, Thomas, Wallace, and Wichita.

November 7, 2017, Federal Presidential disaster was declared for severe storms, straight-line winds, and flooding from July 22 to July 27, 2017 in Johnson and Wyandotte counties.

The 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)

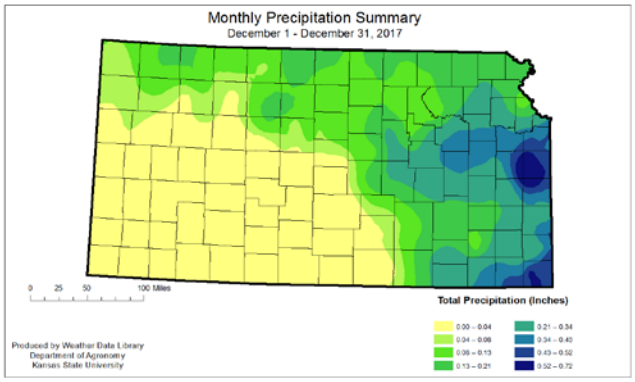
Moisture was limited in December. The statewide average precipitation was just 0.08 inches. That places it as the 4th driest December since 1895. December 1976 was the driest, when statewide average precipitation was just 0.05 inches. The Southwest and West Central Climate Divisions tied for the driest division with average precipitation of zero. The South Central Division wasn't much better with an average of just 0.01 inches. The Southeastern Division was one of the wetter divisions with an average of 0.19 inches, but it had the greatest departure from normal at -1.63 inches. The greatest precipitation total for the month at a National Weather Service Cooperative (NWS) station was 0.57 inches at Lecompton, Douglas County. For the Community Collaborative Rain Hail and Snow network (CoCoRaHS) the greatest monthly total was 0.49 inches at Garland 2.7 SW, Bourbon County. The greatest 24-hour totals were 0.57 inches at Lecompton, Douglas County (NWS) and 0.49 inches at Garland 2.7 SW, Bourbon County (CoCoRaHS). Despite the dry weather, twelve stations still managed to set daily precipitation records during the month.

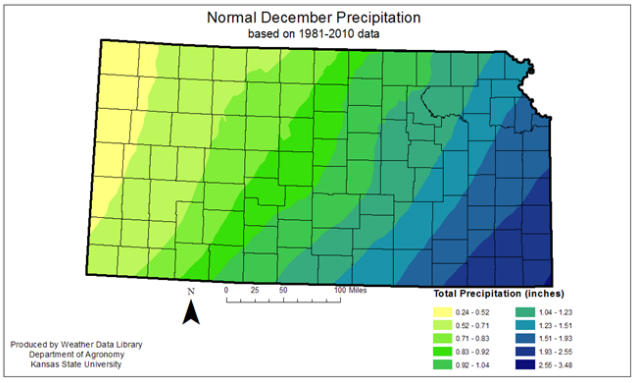
Not all of the precipitation came in the form of rainfall. Many locations in the northern half of the state recorded snowfall on the 24th and 26th of December. Eleven locations set daily records for snowfall. Multiple locations tied for the greatest daily snowfall at 2.5 inches on the 24th. The greatest snowfall report for the month was 4.3 inches at Norton Dam, Norton County.

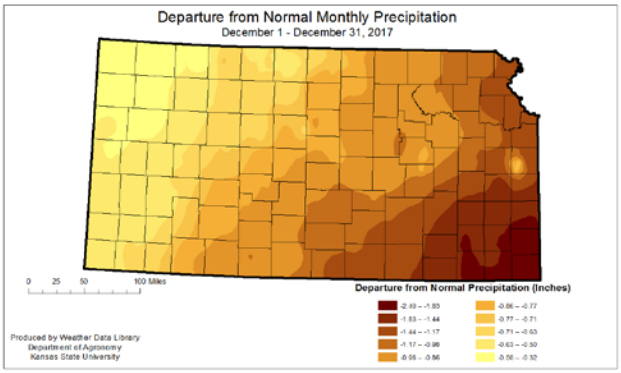
Precipitation summary for the month is provided in the table and maps below from the KSU Weather Library. In addition, weekly maps of precipitation and temperature information can be accessed at http://climate.k-state.edu/maps/weekly/.

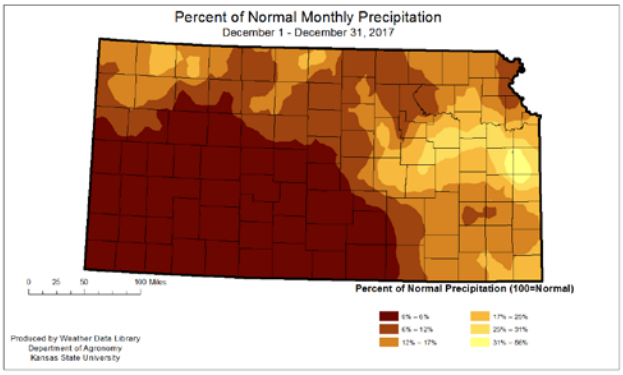
Kansas Climate Division Precipitation Summary (inches)

Climate Division	December 1-31, 2017			January 1- December 31, 2017			April 1, 2016 – December 31, 2017			September 1, 2017– December 31, 2017		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.02	-0.55	3	20.37	-0.99	94	17.43	-1.63	90	3.67	-0.80	78
West Central	0.00	-0.63	0	23.25	2.48	112	19.77	1.50	108	4.62	0.15	103
Southwest	0.00	-0.67	0	24.32	4.42	123	19.89	2.37	114	3.66	-0.80	84
North Central	0.07	-0.82	7	26.29	-1.75	93	22.30	-2.26	90	5.21	-1.52	76
Central	0.05	-0.88	4	25.99	-3.30	89	21.41	-3.93	85	4.83	-1.98	72
South Central	0.01	-1.11	1	31.18	-0.14	99	24.68	-2.02	92	5.63	-2.22	71
Northeast	0.11	-1.11	8	29.28	-5.72	83	24.33	-6.46	79	4.70	-4.64	51
East Central	0.28	-1.12	18	33.15	-4.77	86	28.55	-4.45	85	5.58	-4.73	52
Southeast	0.19	-1.63	10	41.37	-0.12	99	35.82	0.32	100	7.07	-5.02	58
STATE	0.08	-0.95	5	28.64	-0.75	98	23.99	-1.55	94	5.03	-2.36	72







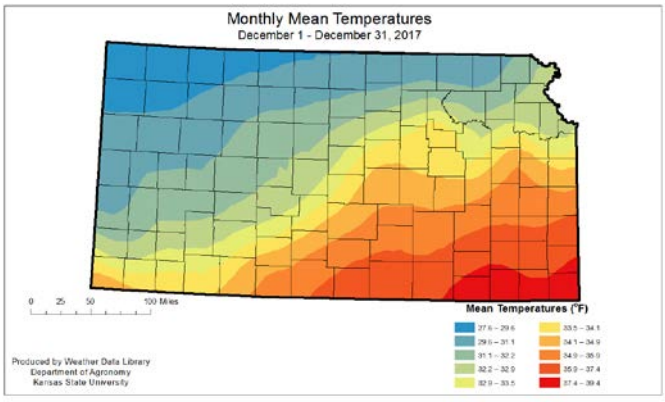


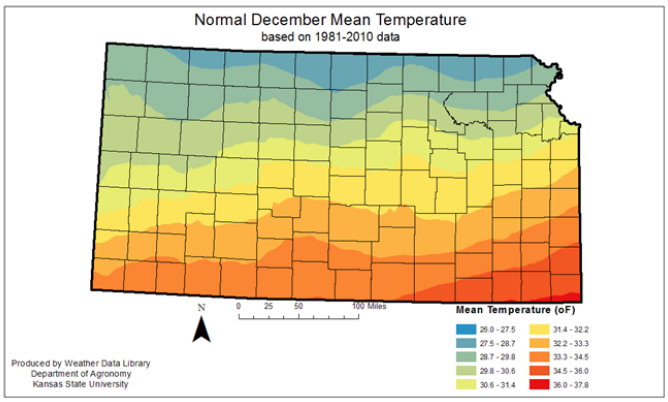
Precipitation maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps.

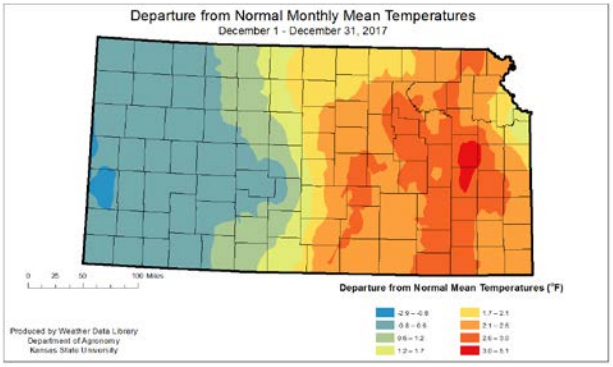
December started on a very warm note, but ended in the deep freeze. The statewide average temperature was 32.9 °F, or 1.5 degrees warmer than normal. The very cold end wasn't enough to outweigh the very warm start to the month. The first three weeks of the month all averaged above normal, while the week ending January 2nd averaged 12 degrees cooler than normal. The western divisions came closest to normal, with the West Central Climate Division averaging 30.8 °F, or 0.1 degrees warmer than normal. The eastern divisions had the greatest departures, with the Southeast Division averaging 36.8 °F, or 2.7 degrees warmer than normal. The warmest temperature reported for the month was 80 °F at Ashland, Clark County, on the 4th. The coldest reading was -11 °F at Baileyville, Nemaha County, on the 28th. Records were set on both the cold and warm end of the spectrum. On the cold side, there were 90 new record low maximum temperatures, but no new record low minimum temperatures. On the warm side, there were 33 new record high maximum temperatures and 31 new record high minimums.

There were no severe weather reports during the month. There were several days with extreme fire danger, and also several days with wind chill warnings.

Climate Division	Kansas Climate Division Temperature Summary (°F)							
	December 2017							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	44.3	14.9	29.6	0.3	67	3	-4	24
West Central	46.5	15.0	30.8	0.1	69	4	-5	31
Southwest	49.4	17.5	33.4	0.7	80	4	-5	31
North Central	44.1	18.4	31.3	1.8	71	4	-10	28
Central	46.7	20.1	33.4	1.9	72	3	-7	28
South Central	48.4	22.0	35.2	1.9	76	4	-2	31
Northeast	43.3	19.8	31.6	1.6	70	4	-11	28
East Central	44.8	22.8	33.8	2.2	74	5	-8	27
Southeast	47.6	26.0	36.8	2.7	76	4	-2	28
STATE	46.1	19.6	32.9	1.5	80	4th	-11	28th
Data Source: KSU Weather Library								







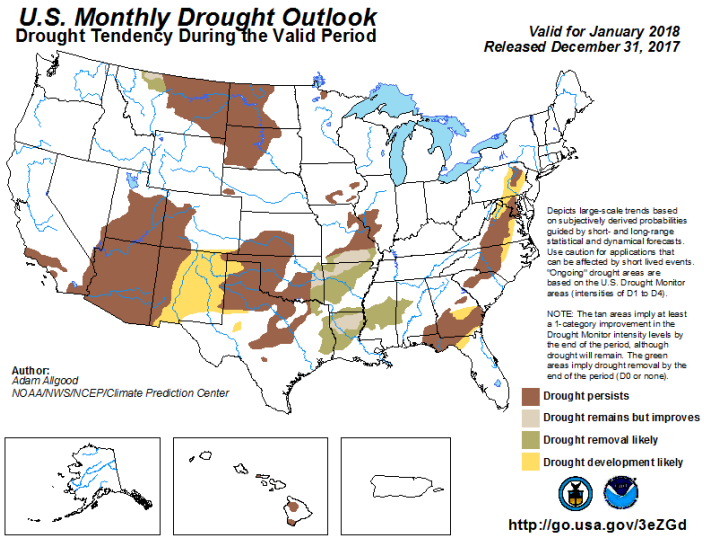
Temperature maps are also available from the High Plains Regional Climate Center at various time intervals. http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps

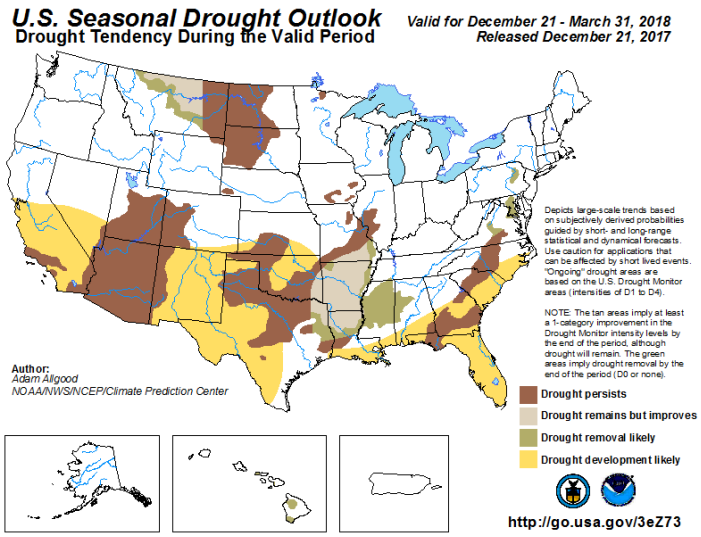
Future Outlook

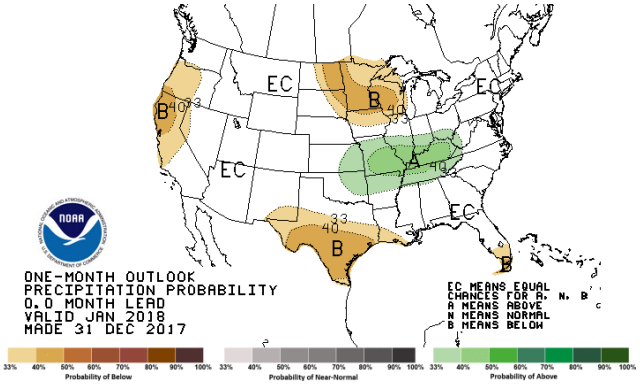
The Monthly Drought Outlook indicates drought conditions to remain in south central and south west Kansas.
The January outlook has a slight chance for wetter than normal conditions in the eastern portion of the state, and equal chances for above or below normal precipitation in the rest of the state. Given the low amount of moisture that typically is seen in January, improvement in the current drought status is unlikely. With the wet summer and current dryness, increased fire danger is likely.

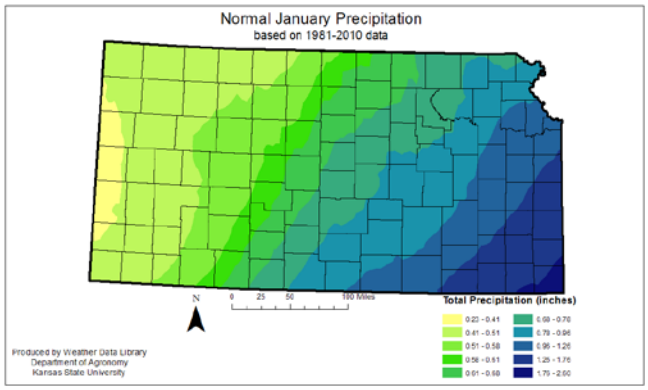
Season Outlook favors continued drought in south central Kansas with expansion of areas affected to include the entire southern border of Kansas. For the January-March time period probability favors below normal precipitation and above normal temperatures for almost the entire state.

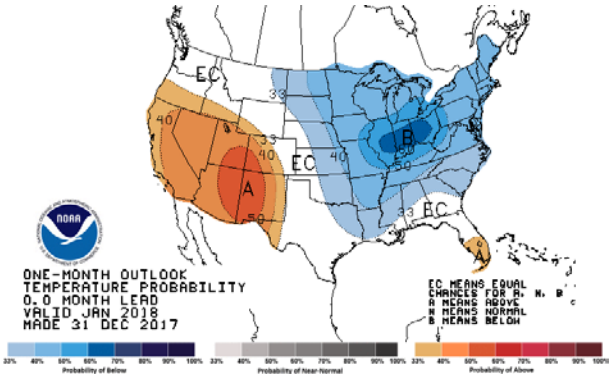
The individual temperature and precipitation outlooks are provided below for the one and three month periods.

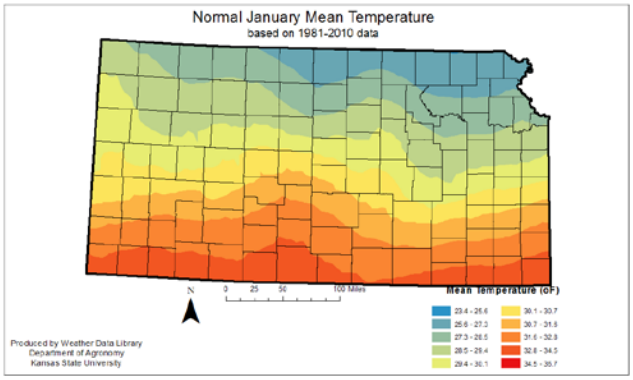


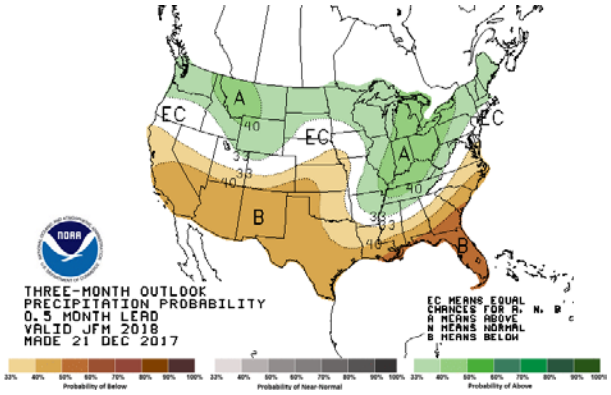


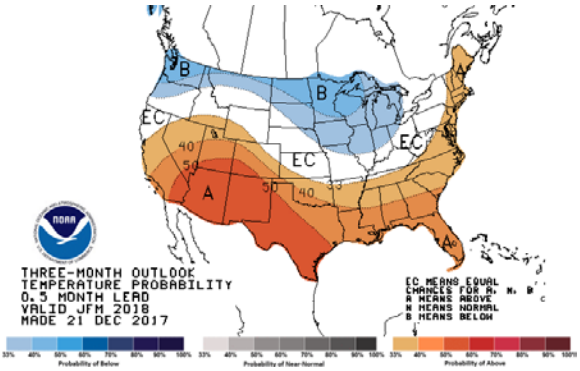












Additional outlooks for various timeframes are available from the national CPC for up to 13 months. (http://www.cpc.ncep.noaa.gov/products/predictions/90day/)

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 January 8, 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. (January 8, 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/ January 8, 2018)

Surface Water Supply Conditions

Kansas River basin: Inflow to Tuttle Creek, Perry, Milford, and Clinton reservoirs was below normal in December. Additional releases were made from Milford and Tuttle Creek to reach the lower winter pool elevation targets, however, the Tuttle Creek drawdown stopped one foot short of the winter target because it is expected to continue to decline. These releases were beneficial to the low flow conditions of the Kansas River, especially with the late month freezing conditions.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs received very little inflow in December. 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 declined from dry conditions for the first half of the month and then rose back to near median levels due to the releases from Pomona and Hillsdale reservoirs.

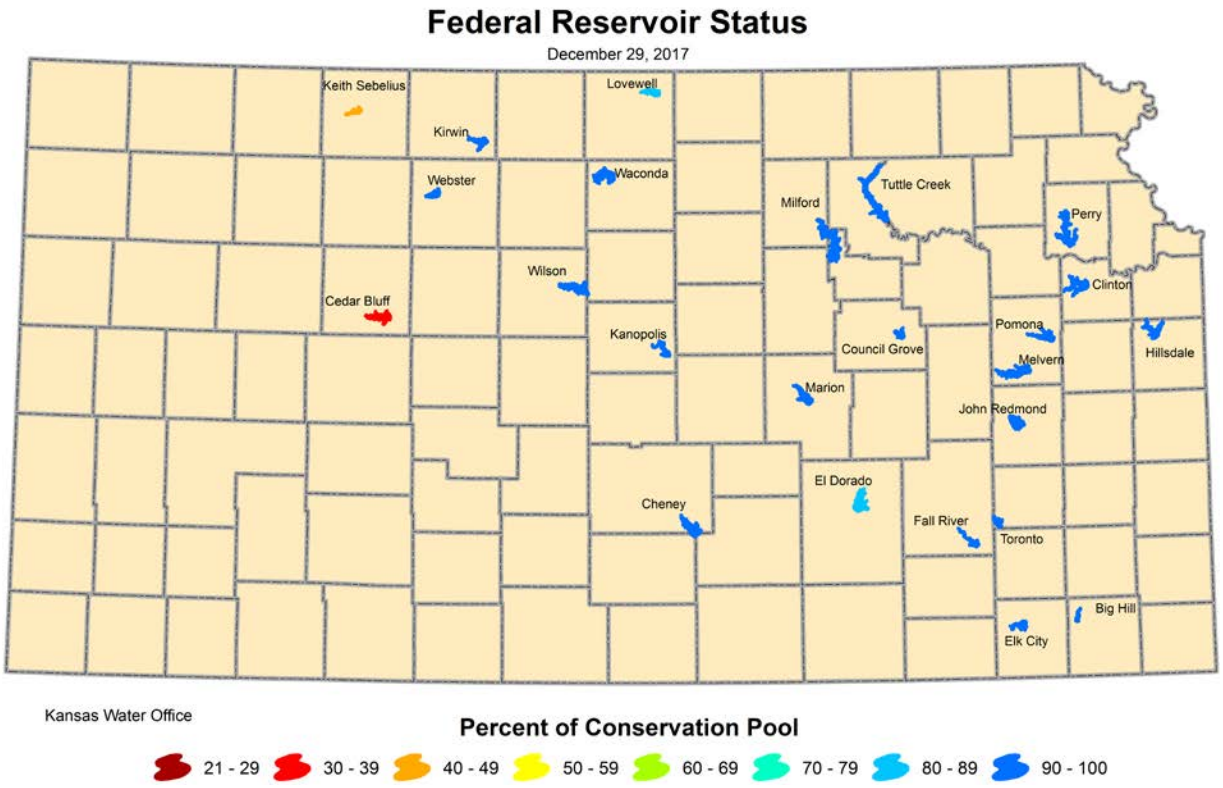
Cottonwood/Neosho basin: Inflows to Marion, Council Grove, and John Redmond reservoirs were generally low throughout the month of December and streamflow declined throughout the basin, especially the Upper Neosho. Conservation storage is full in John Redmond but steadily declined in Marion and Council 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 December 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 above normal pool.

Smoky Hill basin: The middle Smoky Hill basin maintained median streamflow. Kanopolis Lake also declined throughout December and dropped below multipurpose elevation, primarily due to releases necessary to accommodate a periodic inspection of the outlet works.

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		**12/28/2017**		
Norton[1]	2304.3	2291.54	-12.76	38.8
Harlan County, NE	1945.73	1938.34	-7.39	71.2
Lovewell[1]	1582.6	1581.16	-1.44	88.4
Milford[1]	1144.4	1145.26	0.86	100
Cedar Bluff	2144	2117.69	-26.31	29.9
Kanopolis[1]	1463	1463.25	0.25	100
Wilson[1]	1516	1516.23	0.23	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
Webster[1]	1892.5	1892.98	0.48	100
Kirwin[1]	1729.3	1728.22	-1.08	94.8
Waconda[1]	1455.6	1455.18	-0.42	97.6
Tuttle Creek[1]	1075	1073.15	-1.85	92.4
Perry[1]	891.5	893.45	1.95	100
Clinton[1]	875.5	876.6	1.1	100
Melvern[1]	1036	1035.14	-0.86	96
Pomona[1]	974	974.09	0.09	100
Hillsdale[1]	917	916.79	-0.21	98.7
Arkansas River Basin		**12/29/2017**		
Cheney	1421.6	1420.47	-1.13	94.0
El Dorado	1339	1335.55	-3.45	84.0
Toronto[1]	901.5	901.50	0.00	100.0
Fall River[1]	948.5	947.98	-0.52	93.0
Elk City[1]	796	796.36	0.36	100.0
Big Hill	858	857.64	-0.36	99.0
Council Grove[1]	1274	1272.45	-1.55	91.0
Marion[1]	1350.5	1348.70	0.10	100.0
John Redmond[1]	1039	1041.58	0.58	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)

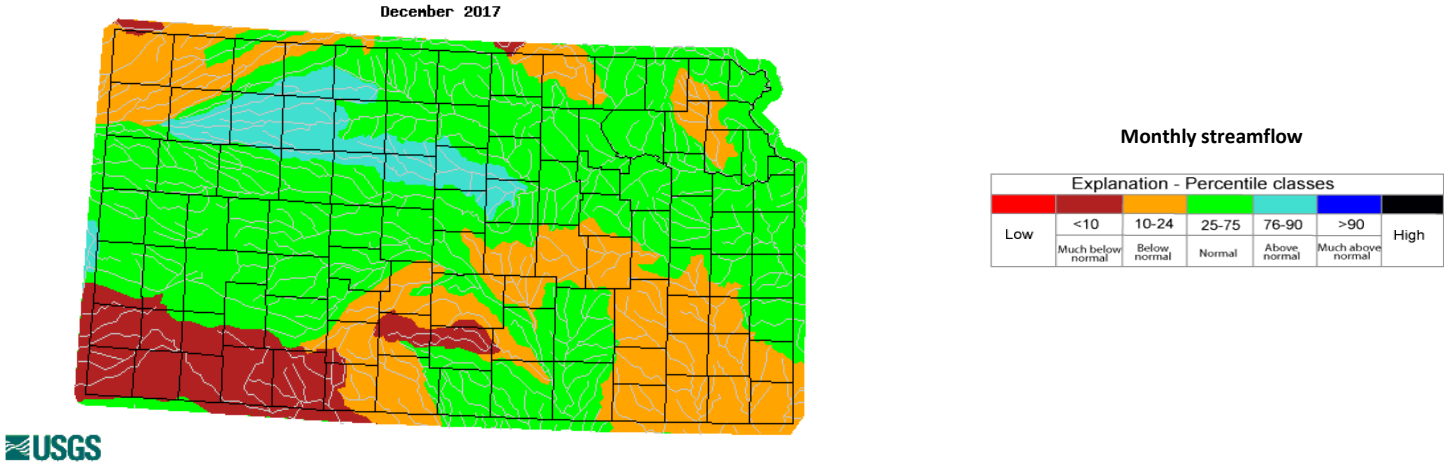
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water 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.

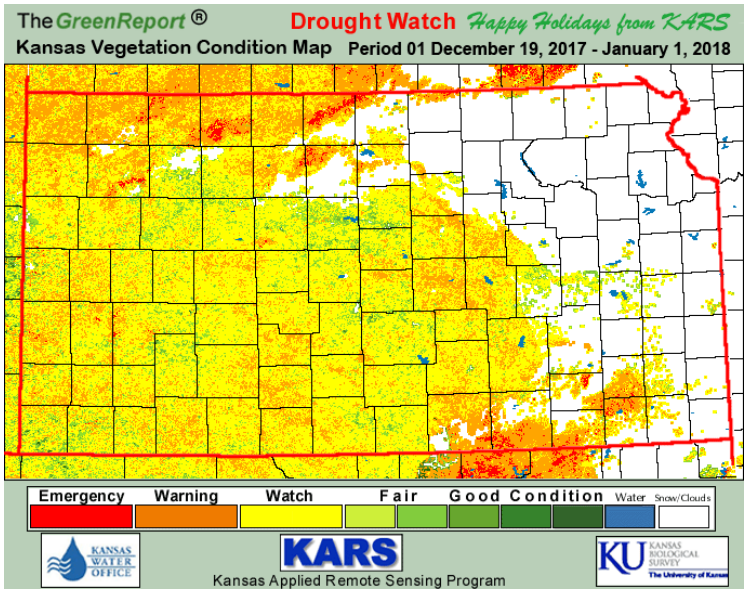
Water Right Administration/Minimum Desirable Streamflow (MDS)
Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow 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 three other locations where flows are below MDS, but administration is not in effect since there are no junior diversion above each gage.

Streamflows as of December 27, 2017			
Gaging Station	**Current Flow**	**Dec MDS**	**Comment**
Republican River at Concordia	Ice	100	
Republican River at Clay Center	274	125	
Mill Creek near Paxico	11	8	
Delaware River near Muscotah	Ice	10	
Rattlesnake Creek near Macksville	Ice	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	Ice	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	5	10	No surface water diversions junior to MDS above gage
Medicine Lodge River near Kiowa	41	50	Potentially going into 'Ice' conditions

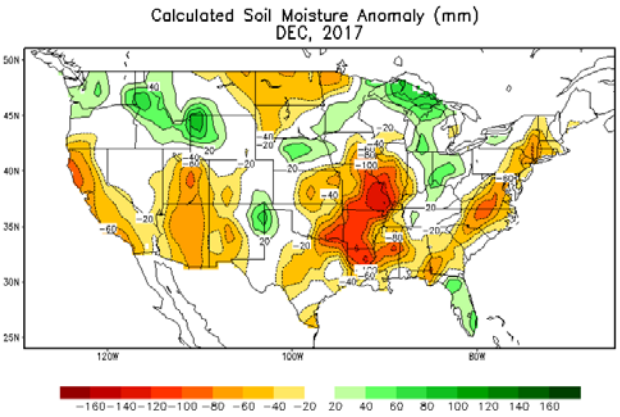
Soil, Crop and Vegetation

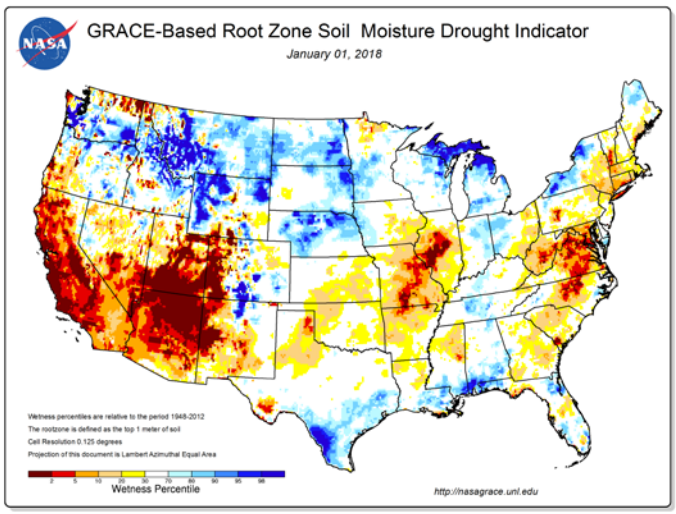


Kansas Vegetative Conditions
The Kansas Vegetative Condition map (on right) is produced by Kansas Applied Remote Sensing Program using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. Snow covers the eastern part of the state. Central areas are in "watch" catagories with some fair areas, where winter wheat is trying to hang on. North west in the "warning" category as lack of moisture and warm temperatures caused stress to vegetation including winter wheat.

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).





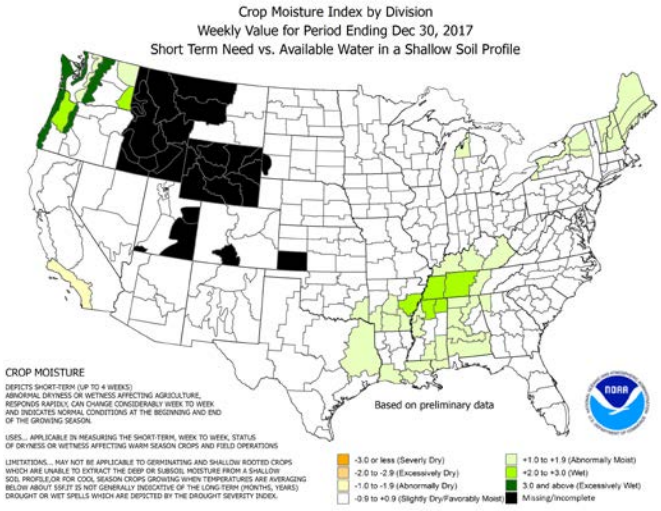
Soil erosion from winds is increased when vegetation is sparse and soils dry as in drought. K-State Research and Extension has publications on mitigating wind erosion which may be found at: http://www.ksre.ksu.edu/p.aspx?tabid=255.

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 December reported topsoil moisture rated 28 percent very short, 49 short, 23 adequate, and 0 surplus, according to the USDA's National Agricultural Statistics Service. Subsoil moisture rated 16 percent very short, 48 short, 36 adequate, and 0 surplus.

Field Crops Report:

Winter wheat condition rated 4 percent very poor, 18 poor, 41 fair, 34 good, and 3 excellent.

Cotton harvested was 86 percent complete, behind 92 last year and 94 average.



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.

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

December 2017 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.04	-0.39	9%	29.9	1.0	66 (12,3)	-4 (24)
Dodge City	T	-0.84	0%	33.2	0.4	78 (3)	-5 (31)
Garden City	T	-0.52	0%	32.0	0.3	74 (3)	-1 (31)
Goodland	0.09	-0.37	20%	30.1	0.2	65 (12)	-4 (24)
Guymon, OK	0.03	-0.61	5%	36.1	0.9	79 (3)	8 (31,26)
Hill City	0.03	-0.66	4%	30.7	0.3	68 (10)	1 (31)
Lamar, CO	0.01	-0.39	3%	31.2	1.6	74 (3)	1 (31)
McCook, NE	0.10	-0.54	16%	28.5	0.5	65 (10)	-2 (26)
Springfield, CO	0.04	-0.47	8%	32.6	0.3	73 (3)	0 (31)
Central							
Concordia	0.13	-0.72	15%	31.2	1.2	68 (3)	-7 (31,27)
Hebron, NE				29.5	1.6	65 (3)	-14 (27)
Medicine Lodge	0.00	-0.92	0%	35.6	0.9	69 (10)	2 (31)
Ponca City, OK	0.03	-1.39	2%	38.7	2.1	74 (4)	7 (31)
Salina	0.05	-0.89	5%	34.6	2.3	72 (3)	-2 (31)
Wichita (ICT)	0.03	-1.17	3%	36.7	2.9	67 (11, 10)	4 (31)
East							
Bartlesville, OK	0.29	-1.92	13%	38.3	1.8	78 (4)	6 (31)
Chanute	0.24	-1.51	14%	37.0	2.3	74 (4)	2 (31)
Fall City, NE	0.36	-0.62	37%	29.0	0.4	68 (4,3)	-12 (27)
Johnson Co. Exec. Apt	0.37	-1.27	23%	32.8	0.4	70 (4)	-4 (31)
Joplin, MO	1.37	-1.45	49%	37.6	0.4	73 (4,3)	5 (31)
Kansas City (MCI), MO	0.19	-1.34	12%	32.1	0.6	72 (4)	-6 (31)
St. Joseph, MO	0.14	-1.38	9%	39.7	0.2	69 (4)	-8 (31)
Topeka (TOP	0.31	-1.04	23%	33.3	1.3	70 (4)	-4 (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