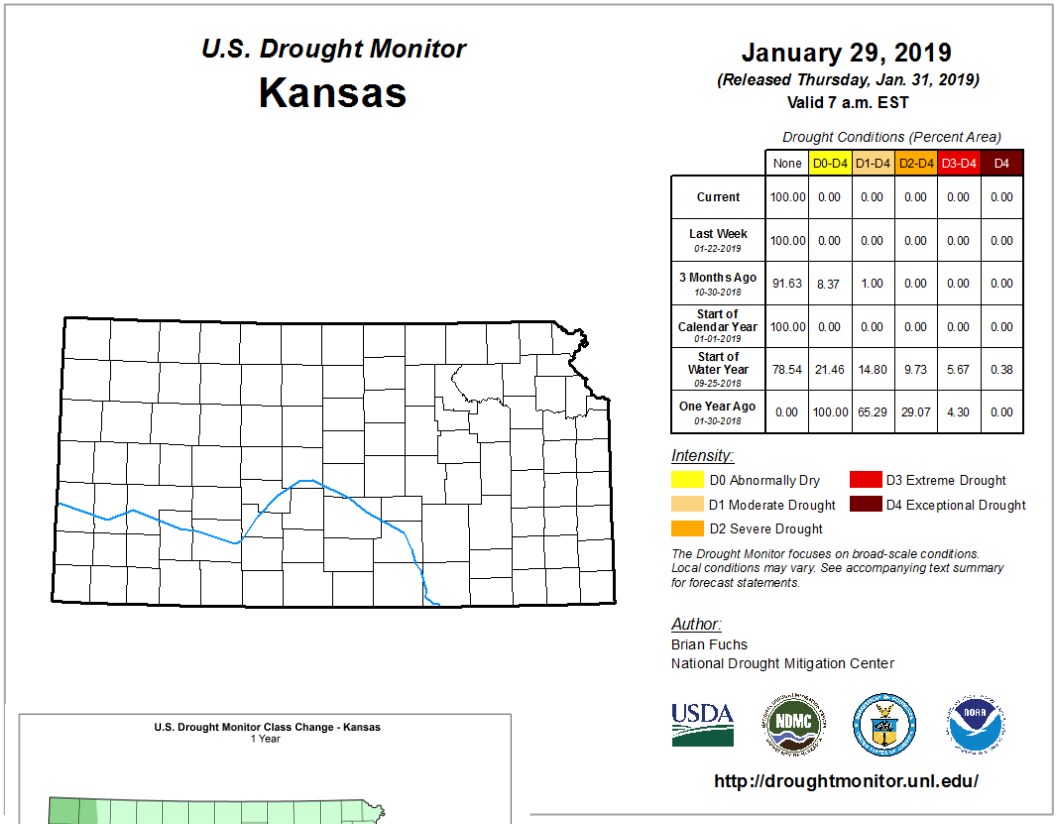
KANSAS CLIMATE and DROUGHT UPDATE
January 2019 Summary

Highlights

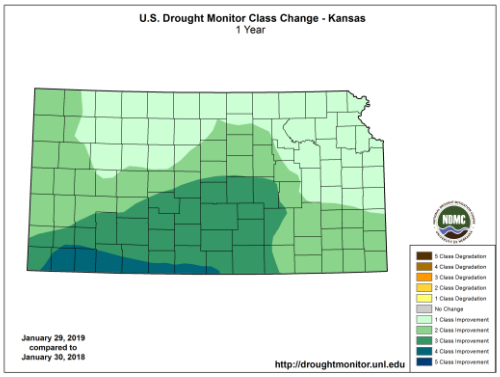
- Executive Orders 19-01 rescinded all drought declarations be the State of Kansas on January 8, 2019.
- U.S. Drought Monitor drought designations were removed for all of Kansas during the first days of the month.
- An El Niño Watch is in effect (as of Jan. 10), with El Niño expected to form and continue through the Northern Hemisphere spring 2019 (a 65% chance).

General Conditions

The state became drought free by the U.S. Drought Monitor and remained drought free all month. This was the 5th consecutive week without drought in Kansas.



	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 01-22-2019	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago 10-30-2018	91.63	8.37	1.00	0.00	0.00	0.00
Start of Calendar Year 01-01-2019	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 09-25-2018	78.54	21.46	14.80	9.73	5.67	0.38
One Year Ago 01-30-2018	0.00	100.00	65.29	29.07	4.30	0.00

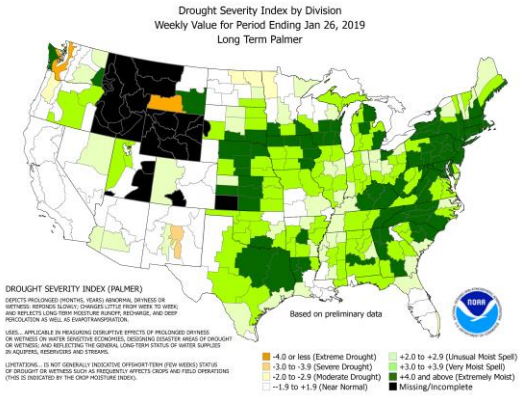


Changes in drought classification from one year ago are shown on the left for reference.

More information can be found on the U.S. Drought Monitor web site https://droughtmonitor.unl.edu/ .

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor.

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



Climate Summary - Precipitation

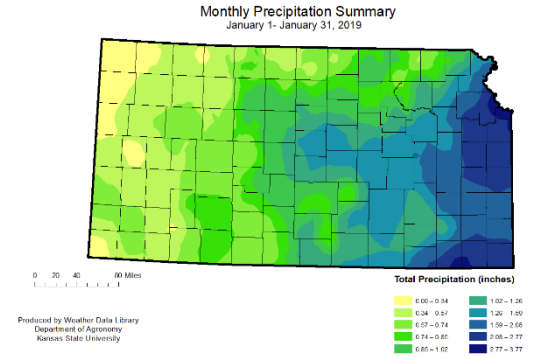
January continued the trend for wetter than normal conditions across most of the state. State-wide average precipitation for the month was 1.00 inches, 131 percent of normal. The Northwest Climate Division was the driest with an average of 0.36 inches. That is a deficit of 0.09 inches, 80 percent of normal. The East Central Division had the greatest percent of normal at 171 percent and an average precipitation of 1.67 inches. The Southeast Division had the greatest average precipitation with 1.70 inches, 137 percent of normal. The highest 24-hour rainfall total for a National Weather Service Cooperative station was 2.03 inches at Coffeyville Water Works, Montgomery County on the 12th. The greatest 24-hour rainfall total for a Community Collaborative Rain, Hail and Snow network station was 2.21 inches at Ottawa 5.6 SW, Franklin County on the 13th. The greatest monthly precipitation totals for January: 3.77 inches at Coffeyville Water Works, Montgomery County (NWS) and 3.76 inches at Leavenworth 3.8 SSW, Leavenworth County (CoCoRaHS). Most precipitation was in the form of snow. Monthly totals ranging from trace amounts in southern Kansas to 18.3 inches at the CoCoRaHS station of Hunter 2.1 NNW in Mitchell County.

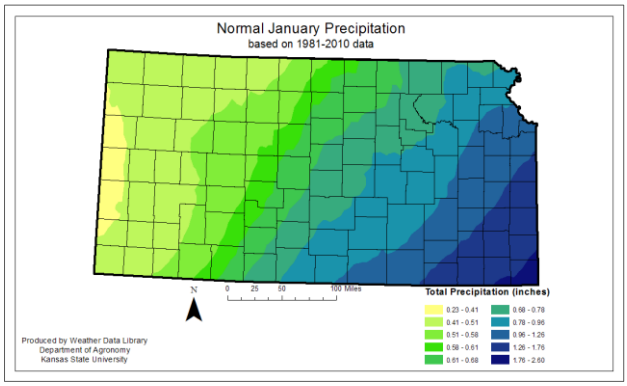
Information in this summary is taken from information generated by Kansas State University Department of Agronomy (KSU) along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information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

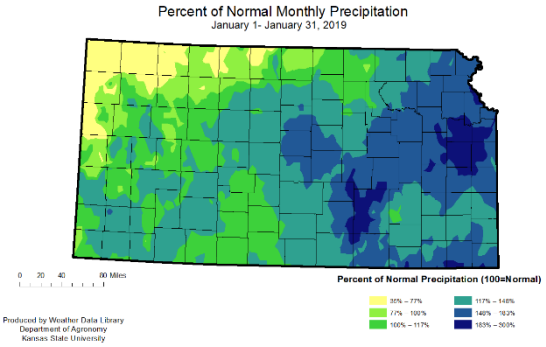
Kansas Climate Division Precipitation Summary (inches)

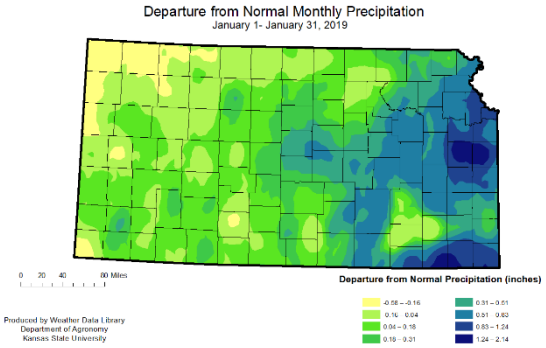
Climate Division	January 1-31 2019			January 1- 31, 2019			April 1, 2018- Jan 31, 2019			Sept 1, 2018- Jan 31, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.36	-0.09	80	0.36	-0.09	80	23.63	4.12	120	7.47	2.55	149
West Central	0.69	0.19	138	0.69	0.19	138	25.67	6.90	135	9.82	4.85	195
Southwest	0.69	0.22	143	0.69	0.22	143	26.69	8.70	148	9.29	4.36	188
North Central	0.84	0.21	130	0.84	0.21	130	32.75	7.56	130	14.54	7.18	198
Central	1.03	0.34	149	1.03	0.34	149	32.60	6.57	126	15.12	7.61	204
South Central	0.91	0.08	106	0.91	0.08	106	35.73	8.20	130	15.70	7.02	184
Northeast	1.06	0.25	123	1.06	0.25	123	33.29	1.69	106	16.25	6.11	162
East Central	1.67	0.73	171	1.67	0.73	171	30.99	-2.95	90	14.66	3.40	128
Southeast	1.70	0.45	137	1.70	0.45	137	38.08	1.33	103	16.51	3.17	126
STATE	1.00	0.26	131	1.00	0.26	131	31.23	4.95	122	13.26	5.14	171

The maps below summarize precipitation for the month. (Sources: Normal map-K-State Weather Data Library; Precipitation, percent of normal and departure maps are from the High Plains Reginal Climate Center, NOAA.)









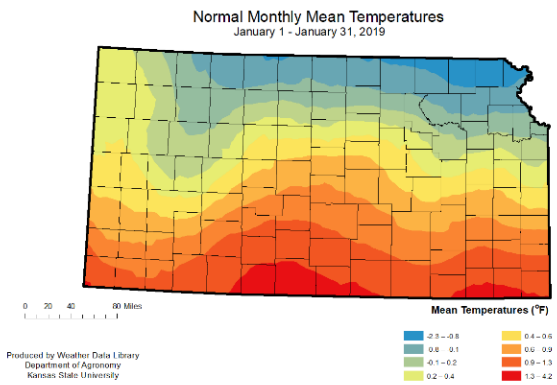
Climate Summary-Temperature

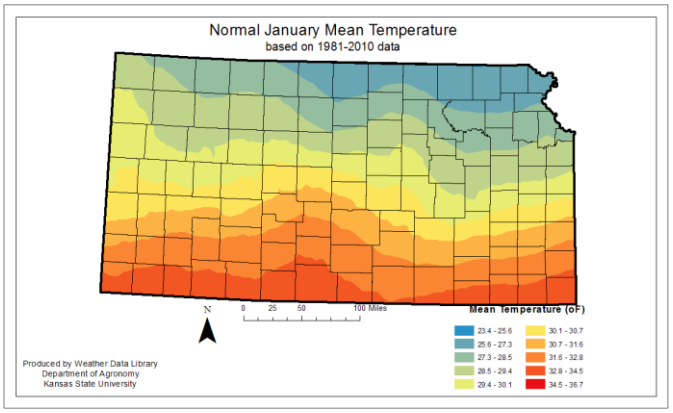
Temperatures varied wildly over the month, but averaged just slightly warmer than normal in January. State-wide average temperature for the month was 30.3 ^{o}F, which is 0.3 degrees warmer than normal. Only the Northeast Division was cooler than normal, with an average of 27.1 ^{o}F, or 0.4 degrees cooler than normal. The South Central Division was the warmest with an average of 33.3 ^{o}F or 1.1 degrees warmer than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 71 ^{o}F at Ashland, Clark County, on the 7th. The coldest minimum temperature at a NWS station was recorded at Marysville, Washington County, on the 25th as -10 ^{o}F. The coldest reading at a Kansas Mesonet station was -10.0 ^{o}F recorded at the Brown County station near Hiawatha on the 31st.

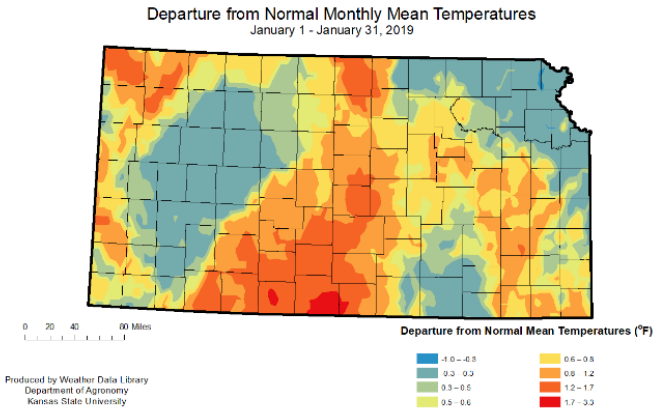
Information in this summary is taken from information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The maps provide a glimpse at the temperature variation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

Climate Division	Kansas Climate Division Temperature Summary (^{o}F)							
	January 2019							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	40.8	17.5	29.2	0.7	65	28	1	2
West Central	41.3	18.8	30.1	0.4	66	5	1	3
Southwest	44.1	21.2	32.7	0.6	71	7	1	2
North Central	37.7	19.0	28.4	0.5	66	6	-8	25
Central	40.6	20.8	30.7	0.8	67	6	0	30
South Central	44.0	22.6	33.3	1.2	70	7	7	29
Northeast	36.0	18.3	27.1	-0.4	64	6	-10	25
East Central	38.1	20.6	29.3	0.2	63	6	-5	30
Southeast	41.6	22.9	32.3	0.6	68	8	4	30
STATE	40.5	20.2	30.3	0.5	71	7th	-10	25th
Data Source: KSU Weather Library								

The maps below summarize temperature for the month. (Sources: Normal map-K-State Weather Data Library; Temperature, percent of normal and departure maps are from the High Plains Reginal Climate Center, NOAA.)

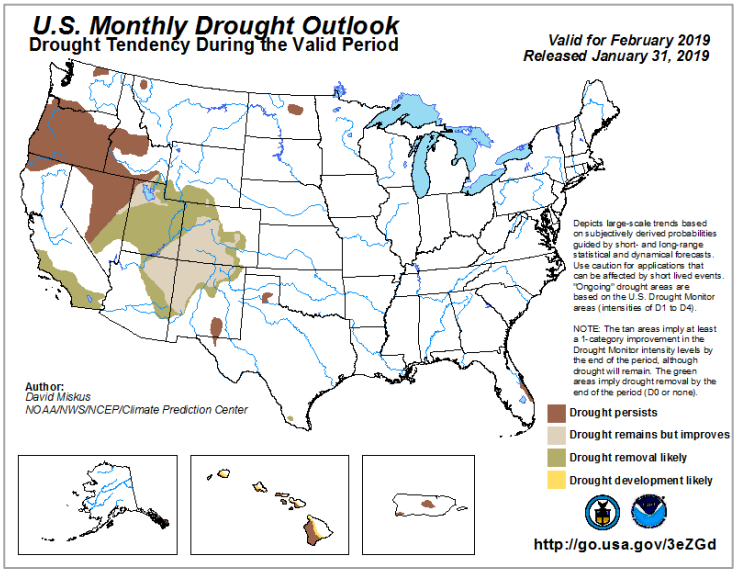


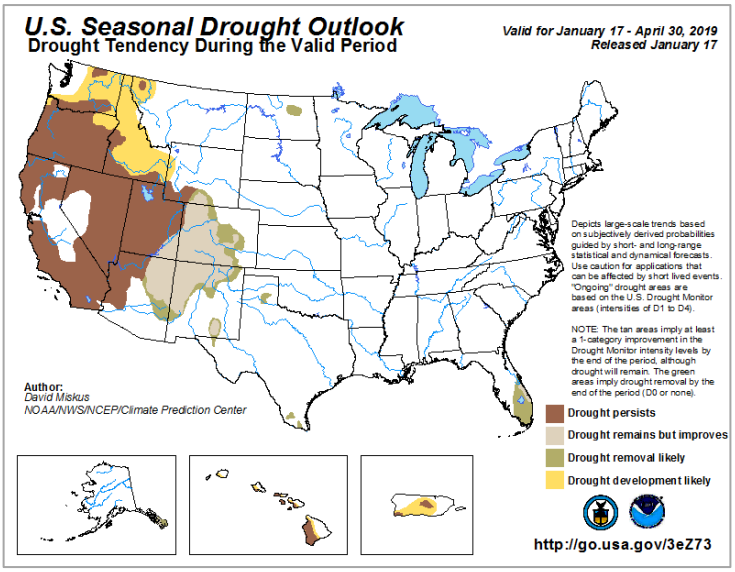




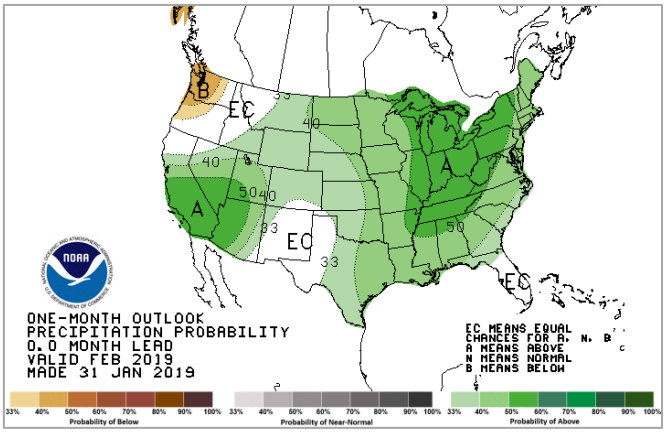
Future Outlook

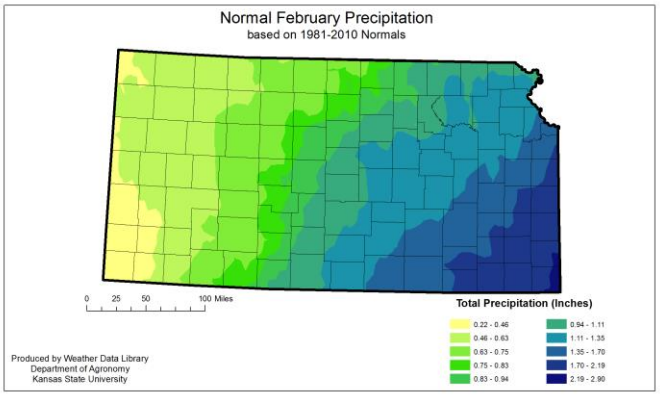
The Monthly Drought Outlook for February 2019 indicates no drought conditions in Kansas.
Seasonal Outlook (3-month) favors no drought in Kansas. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

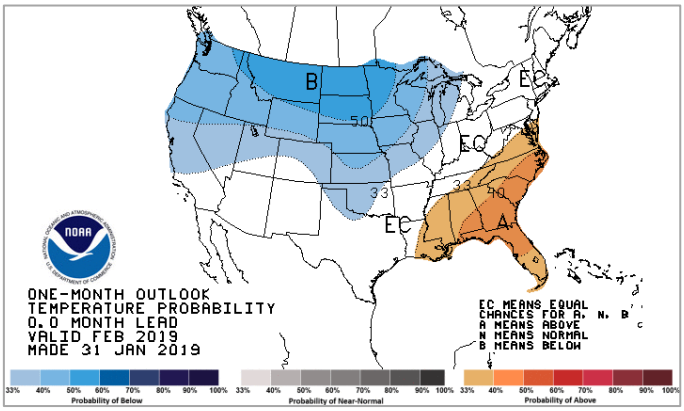


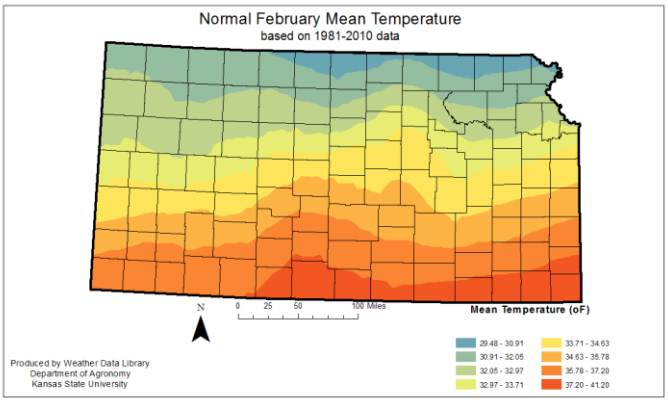


The February precipitation outlook favors above normal precipitation across Kansas and well as below normal temperatures.



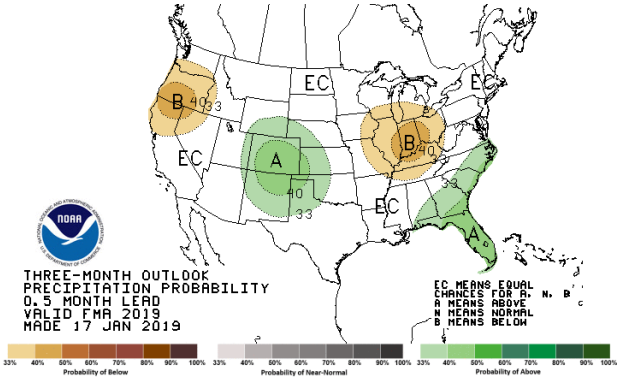


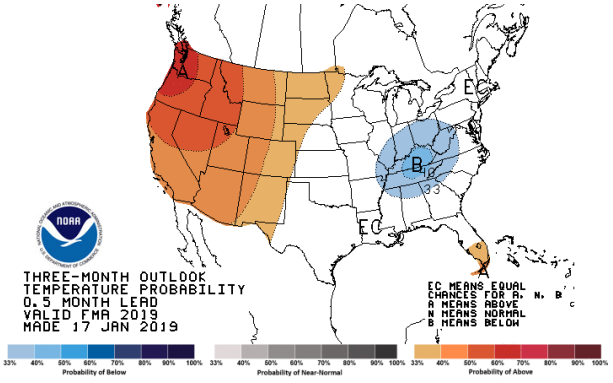




A mild winter could be in store for much of the United States this winter according to NOAA's Climate Prediction Center. The U.S. three month outlook for February through April favors above-average precipitation for western half of Kansas with equal chances of below, above or normal temperatures for all of Kansas.

Additionally, El Nino neutral conditions are present but is expected to form and continue in the northern hemisphere spring 2019 according to NOAA's Climate Prediction Center. The anticipated weak El Nino may influence the winter season by bringing wetter conditions across the southern United States, and warmer, drier conditions to parts of the North.





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

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Many updates and new plans are developed when drought conditions exist. Individual system stage designation and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers. There are an increasing number of systems that restrict summertime outdoor water use to times of day of lower evaporation.

Surface Water Supply Conditions

Kansas River basin: Milford, Tuttle Creek, Perry, and Clinton reservoirs all experienced higher than normal inflows in January. With high inflows, all system reservoirs had healthy storage and the only reason Milford, Tuttle Creek, and Clinton were below the top of normal pool at the end of the month is due to intentional drawdown for a planned lower winter target elevation.

Marais des Cygnes basin: Melvern, Pomona, and Hillsdale reservoirs all experienced higher than normal inflows in January and flood pool storage. All reservoirs were drawn down to winter target elevations. Flows in the Marais des Cygnes River greatly exceeded historic median values throughout the month.

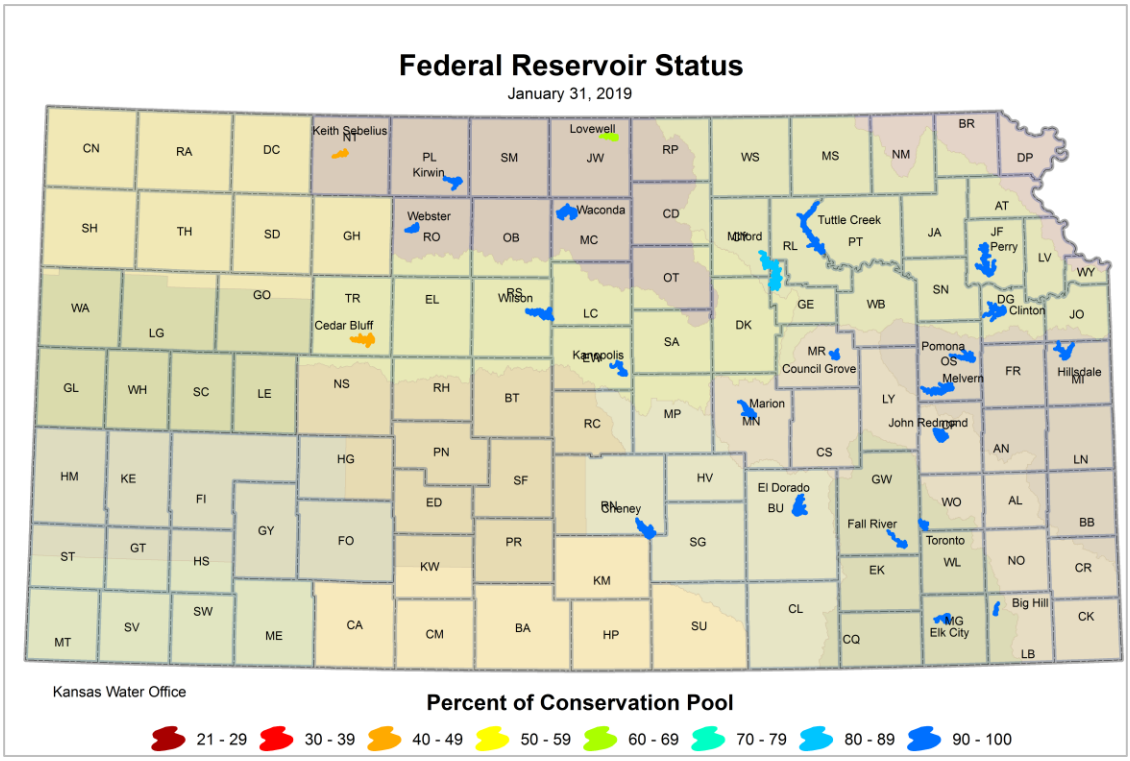
Cottonwood/Neosho basin: All system reservoirs experienced higher than normal inflows. Flood pool releases were necessary from all three reservoirs. Both the Cottonwood River and all reaches of the Neosho River experienced unseasonably high flows throughout the month.

Verdigris basin: Inflows to Toronto, Fall River, Elk City, and Big Hill reservoirs were well above normal in January. Stream flows in the Verdigris and Fall Rivers were maintained above normal due to flood pool releases and generally healthy tributary gains.

Saline basin: The elevation at Wilson Lake was lowered to near normal pool. Inflow remained above normal and releases in excess of low flow settings were necessary to manage lake level.

Smoky Hill basin: The middle Smoky Hill River maintained higher than normal flows from baseflow and tributary gains in January. Kanopolis Lake made significant releases through the main service gates. The U.S. Army Corps of Engineers has drawn the pool down below the top of conservation to facilitate maintenance work this winter. Cedar Bluff Reservoir also received some inflow and gained elevation over the month due to steady higher than normal inflow.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**01/31/2019**		
Keith Sebelius Lake[1]	2304.3	2294.40	-9.90	49.4
Harlan County Lake NE	1945.73	1942.14	-3.59	85.4
Lovewell Reservoir[1]	1582.6	1578.15	-4.45	66.9
Webster Reservoir[1]	1892.45	1892.76	0.31	100.0
Kirwin Reservoir	1729.25	1730.07	0.82	100.0
Waconda Lake[1]	1455.6	1454.57	-1.03	94.2
Cedar Bluff Reservoir	2144	2123.34	-20.66	39.7
Kanopolis Lake[1]	1463	1461.82	-1.18	92.8
Wilson Lake[1]	1516	1515.92	-0.08	99.7
Milford Lake[1]	1144.4	1141.14	-3.26	87.2
Tuttle Creek Lake[1]	1075	1072.74	-2.26	90.8
Perry Lake[1]	891.5	891.67	0.17	100.0
Clinton Lake[1]	875.5	874.95	-0.55	96.7
Melvern Lake[1]	1036	1035.02	-0.98	95.5
Pomona Lake[1]	974	973.13	-0.87	93.9
Hillsdale Lake[1]	917	916.20	-0.80	95.1
Arkansas River Basin		**01/31/2019**		
Marion Reservoir[1]	1350.5	1350.89	0.39	100.0
Council Grove Lake[1]	1274	1274.34	0.34	100.0
John Redmond Reservoir	1041	1042.78	1.78	100.0
Toronto Lake	901.5	901.82	0.32	100.0
Fall River Lake	948.5	949.14	0.64	100.0
Elk City Lake	796	796.25	0.25	100.0
Big Hill Lake	858	858.16	0.16	100.0
Cheney Reservoir	1421.6	1421.72	0.12	100.0
El Dorado Lake	1339	1339.1	0.10	100.0

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

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

Harmful Blue-Green Algal Blooms (lake water safety)

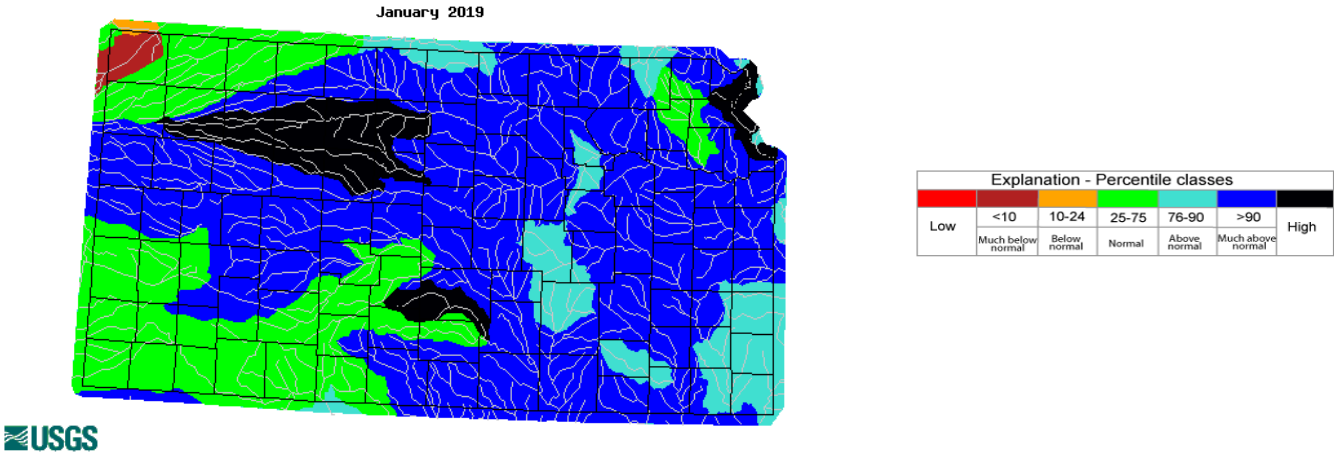
KDHE issues two levels of public health protection notifications for blue-green algae (BGA) Blooms: a Public Health Watch and Public Health Warning. Public Health Watch–Notifies public that a hazardous condition may exist, that the water may be unsafe for humans and animals and contact with the water is discouraged. Public Health Warning–Notifies public that conditions are unsafe, that contact with the water should not occur, and all conditions of Public Health Watch remain in effect. More information can be found at http://www.kdheks.gov/algae-illness/index.htm.

The 2018 HAB monitoring ended October 31st. At that time two water bodies remained in active bloom: Frazier Lake, in Grant County was at a Warning status; and South Lake, in Johnson County was at a Watch status. The next harmful algal bloom season will begin again on April 1, 2019.

Streamflow Conditions

WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at stream gages in the region. In general, a streamflow which is greater than the 75 percentile is considered *above normal*, a streamflow which is between 25 and 75 percentiles is considered *normal* and a streamflow which is less than the 25 percentile is considered *below normal*. Color codes are for basins with streamflow averages less than 25 percent of historic values. This comparison aids in evaluating water resources conditions for a time period.

December Streamflow compared to historical streamflow is reflected in the map below.



Water Right Administration/Minimum Desirable Streamflow (MDS)

Minimum Desirable Streamflow (MDS) is not being administered in Kansas. MDS administration requires water rights junior to MDS, usually with priority dates after April 12, 1984, to stop diverting water. Administration is ordered when streamflow drops below MDS for more than seven days. To rescind orders at most gages, daily average flow must be above MDS for 14 days.

The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources.

Streamflows as of January 28, 2019			
Gaging Station	**Current Flow**	**Jan MDS**	**Comment**
Little Blue River near Barnes	***	100	Temporarily Unavailable
Rattlesnake Creek near Macksville	4	5	No surface water diversions junior to MDS above gage
South Fork Ninnescah River near Pratt	10	10	No surface water diversions junior to MDS above gage

Vegetation and Soil Moisture

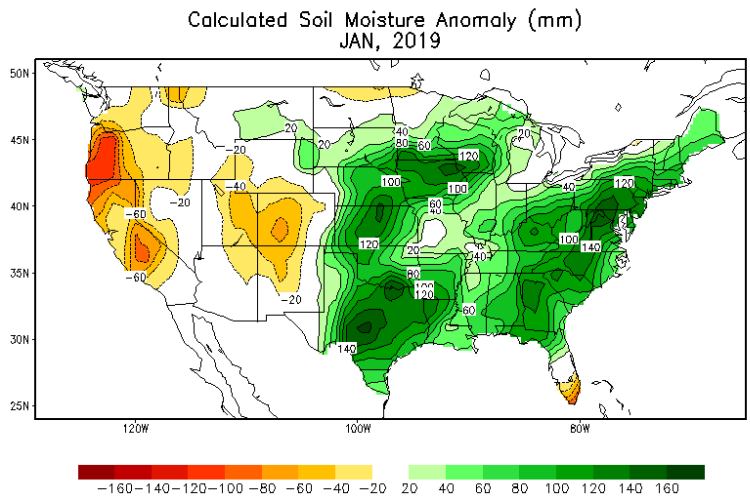
Vegetative Conditions

The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition. No current GreenReport is available

Soil Moisture and Rangeland

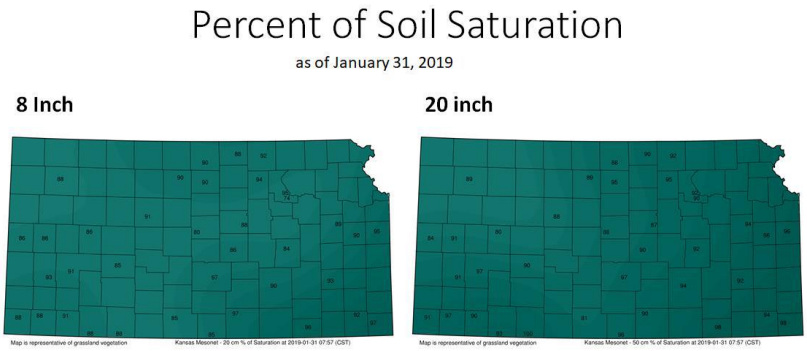
USDA Crop Progress and Condition provide a summary of the climatic effects on soil, and livestock feed. A summary is normally found here. However no current data was available at the time of this report.

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



Kansas soil moisture monitoring occurs through Kansas State University Mesonet at four depths, 5 cm, 10 cm, 20 cm and 50 cm measuring percentage of saturation and volumetric water content at about 36 stations. Installation of sensors began in mid-2017 and were completed early 2018. Maps and data are found at http://mesonet.k-state.edu/agriculture/soilmoist/ .

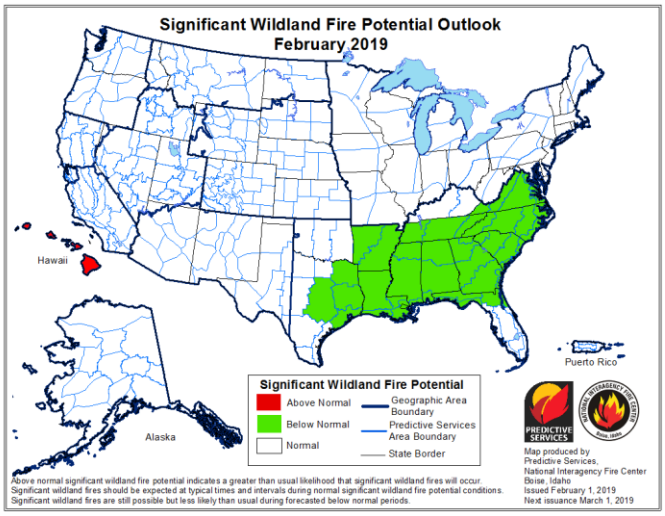
Figures below shows the 8-inch and 20-inch soil moisture on January 31, 2019.

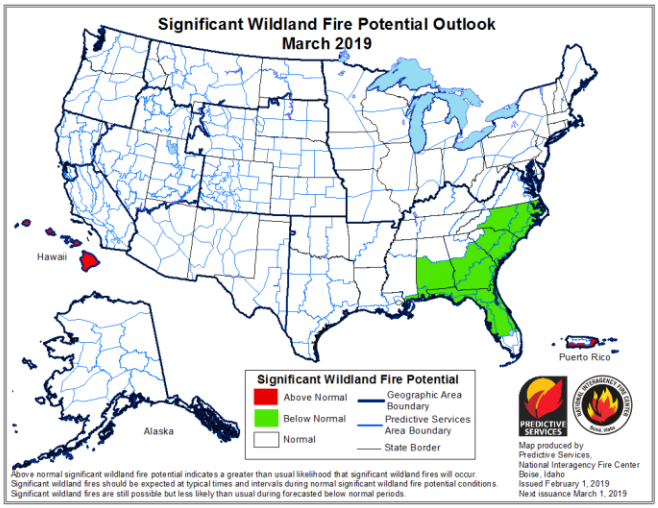


Fire

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

Significant Wildland Fire Potential Outlook is issued monthly for the United States, https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf . Those below were issued December 1, 2018. Due to federal government shutdown the January 1, 2019 predictions were unavailable.





Kansas Climate Summary

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

RESOURCES and REFERENCES

Kansas climate data is provided by Kansas State University, Weather Data Library through the Kansas Mesonet. (http://www.ksre.k-state.edu/wdl/). Soil moisture data was added in 2018 (http://mesonet.k-state.edu/agriculture/soilmoist)

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

The High Plains Regional Climate Center (https://hprcc.unl.edu/) has precipitation and temperature summary maps available at the state, region and nation.

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

The Kansas Department of Agriculture-Division of Water Resources monitors stream flow using the USGS gages for determination of administrative needs. Administration may be needed due to Minimum Desirable Streamflow (MDS) requirements, impairments and reservoir release protection. (https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/minimum-desirable-streamflow.)

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

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

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

The Monthly and Seasonal Drought Outlooks, developed by the NOAA Climate Prediction Center, assess the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. (http://www.cpc.ncep.noaa.gov/) Also see: http://www.noaa.gov/.

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

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

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

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

APPENDIX A

January 2019 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.48	0.10	126%	31.6	2.2	65 (5)	2 (1)
Dodge City	0.73	0.15	126%	33.5	1.3	64 (6)	8 (30)
Garden City	0.09	-0.25	26%	30.4	-0.5	59 (27)	4 (2)
Goodland	0.33	-0.05	87%	32.1	2.5	65 (5)	5 (1)
Guymon, OK	0.23	-0.17	58%	36.6	1.0	74 (21)	6 (2)
Hill City	0.86	0.41	191%	30.0	0.7	62 (5)	4 (23)
Lamar, CO	0.47	0.17	157%	31.6	2.6	70 (6)	-1 (2, 1)
McCook, NE	0.10	-0.41	20%	29.6	2.4	64 (27)	4 (30,1)
Springfield, CO	0.65	0.28	176%	33.7	1.5	66 (21,5)	2 (1)
Central							
Concordia	0.62	0.04	107%	28.5	-0.1	61 (5)	0 (30)
Hebron, NE				27.2	1.6	62 (5)	-4 (25,24)
Medicine Lodge	0.87	0.16	123%	34.5	1.1	64 (27,7)	12 (30)
Ponca City, OK	2.15	1.15	215%	36.0	1.1	63 (7,6)	13 (30)
Salina	1.20	0.57	190%	31.3	0.3	61 (5)	5 (30)
Wichita (ICT)	1.32	0.49	159%	33.4	1.2	62 (7)	9 (30)
East							
Bartlesville, OK	2.83	1.21	175%	35.1	0.1	69 (7)	10 (25)
Chanute	1.56	0.30	124%	33.3	0.7	67 (7)	7 (30)
Falls City, NE	0.33	-0.32	51%	26.1	-0.4	62 (5)	-10 (30)
Johnson Co. Exec. Apt	0.99	-0.13	88%	28.6	-1.5	60 (6)	-5 (30)
Joplin, MO	2.72	0.69	134%	35.0	0.1	66 (7)	6 (25)
Kansas City (MCI), MO	1.70	0.71	172%	28.1	-0.7	61 (7)	-6 (30)
St. Joseph, MO	0.77	0.21	138%	26.6	-0.6	58 (7,6)	-9 (30)
Topeka (TOP)	1.66	0.80	193%	29.6	-0.1	62 (5)	-3 (30)

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