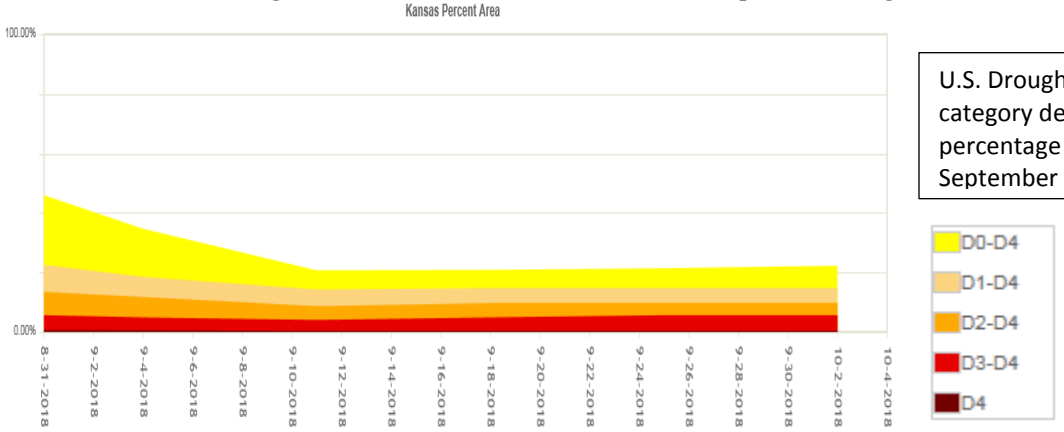
Kansas Water Office

KANSAS CLIMATE and DROUGHT UPDATE
September 2018 Summary

Highlights

- Executive Orders 18-18 remains in effect for 50 counties in emergency status, and 5 in watch, primarily to allow continued assistance to mitigate drought impacts on livestock.

- U.S. Drought Monitor drought designations for September ended the month with slightly over 20 percent of Kansas affected by dry or drought conditions. The drought conditions persisting in parts of eastern Kansas. Severe drought or worse was indicated for parts of 27 counties during at least part of September. Of these, 17 included extreme drought conditions with five of these in exceptional drought.



U.S. Drought Monitor drought category designations percentage of Kansas during September 2018

- Emergency water permits for livestock remain in effect allowing producer withdrawals at two state fishing lakes and four federal lakes.

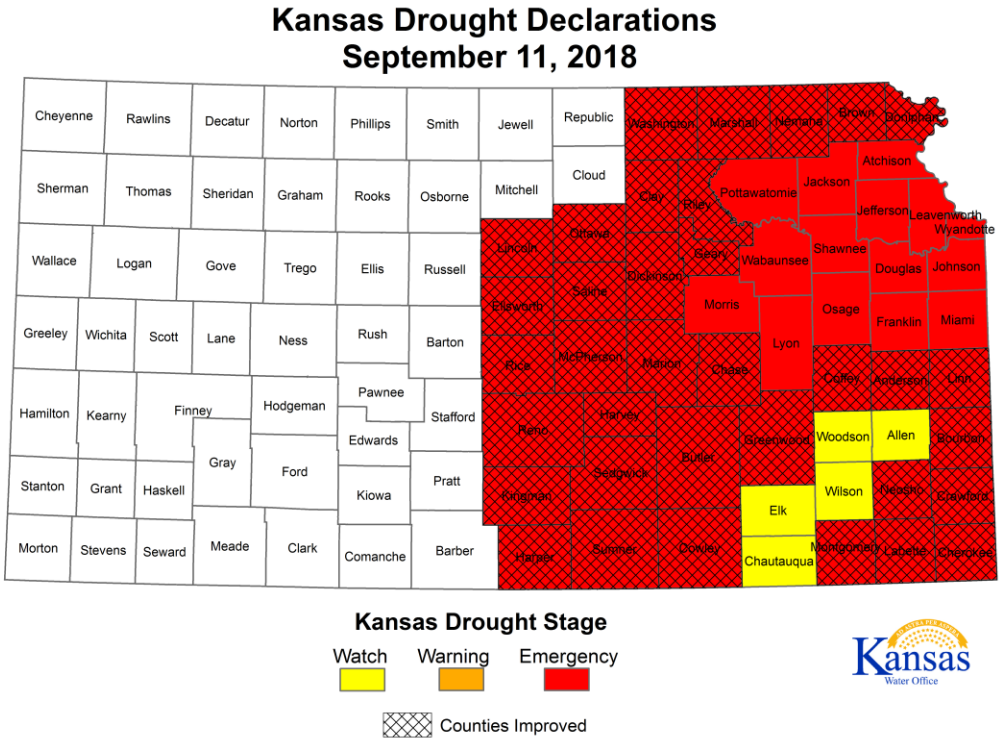
- Administration of MDS continued on streams in September but ceased on many: Little Arkansas River at Alta Mills has been since August 10, 2017; Mill Creek above Paxico since April 12, 2018, ceased September 18, 2018; Republican River above the Clay Center and Concordia gages since April 13, 2018, ceased September 4, 2018; and Delaware River above the Muscotah gage since March 23, 2018, ceased September 5, 2018.

- Kansas Department of Health and Environment Public Health Advisories as Closure, Warning or Watches were in place at the end of September for 23 Kansas water bodies. This includes 17 warnings and 6 watches due to the presence of harmful algae (HAB). A public health watch indicates water may be unsafe for humans and animal – contact is discouraged. A public health warning indicates contact with water should not occur, it is unsafe.

- Flash flooding occurred due to heavy rains September 3, with flooding disaster declared for Jewell, Kingman, Marshall, Pratt and Riley counties. The most extreme was the major flooding on Wildcat Creek in Manhattan.

- A total of 16 flooding events or high flow conditions were measured at 15 USGS stream gages in September. These are included in Appendix B.

Governor Jeff Colyer, MD issued Drought Declarations for Kansas counties with Executive Order (EO) 18-17 on September 11, 2018 placing 50 counties in emergency status and 5 into a watch status. A total of 55 counties were downgraded, 50 of these having drought declarations removed. EO 18-18 corrected the listing of counties. The September 11 map shows these counties. These Drought Declarations remain in place until revised or rescinded by a subsequent EO.



Drought Watch counties: Allen, Chautauqua, Elk, Wilson, Woodson

Drought Emergency counties: Anderson, Atchison, Bourbon, Brown, Butler, Chase, Cherokee, Clay, Coffey, Cowley, Crawford, Dickinson, Doniphan, Douglas, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Johnson, Kingman, Labette, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Miami, Montgomery, Morris, Nemaha, Neosho, Osage, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Sedgwick, Shawnee, Sumner, Wabaunsee, Washington, Wyandotte

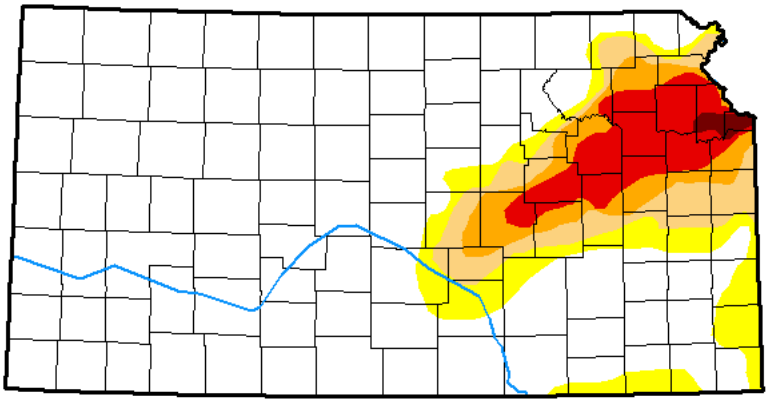
In counties under Emergency Drought Declaration, livestock water may be available from some state fishing lakes and federal reservoirs when properly permitted. To initiate the process, please contact the Kansas Water Office at 785-296-3185.

General Conditions

The rainfall and cooler temperatures in early September resulted in improvement in drought conditions across the state in the U.S. Drought Monitor. The near normal temperatures in the West moderated the impacts of below normal precipitation. Drought was completely removed from the west, and greatly improved in the central divisions. Exceptional drought continues in eastern Kansas, and extreme drought has shifted into East Central Kansas. Currently, over 77 percent of the state is drought free, while less than 1 percent is in exceptional drought conditions. The change in drought categories map) shows where changes occurred.

U.S. Drought Monitor

Kansas



October 2, 2018

(Released Thursday, Oct. 4, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	77.69	22.31	14.80	9.73	5.67	0.38
Last Week *09-25-2018*	78.54	21.46	14.80	9.73	5.67	0.38
3 Months Ago *07-03-2018*	27.21	72.79	55.68	28.82	5.67	0.00
Start of Calendar Year *01-02-2018*	0.00	100.00	32.70	8.75	0.00	0.00
Start of Water Year *09-25-2018*	78.54	21.46	14.80	9.73	5.67	0.38
One Year Ago *10-03-2017*	59.19	40.81	10.08	1.35	0.00	0.00

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:

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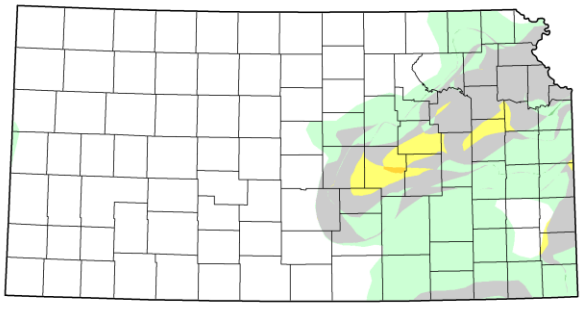
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

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



5 Class Degradation
4 Class Degradation
3 Class Degradation
2 Class Degradation
1 Class Degradation
No Change
1 Class Improvement
2 Class Improvement
3 Class Improvement
4 Class Improvement
5 Class Improvement

October 2, 2018
compared to
September 4, 2018

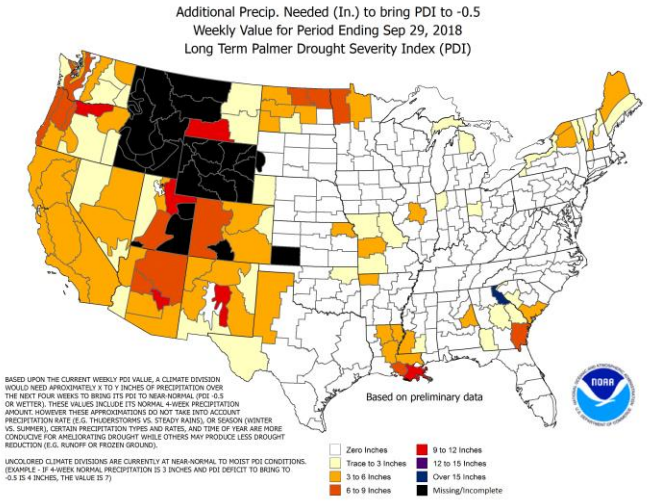
http://droughtmonitor.unl.edu

Changes in drought classification are shown on the left.

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

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

Long-term PDI Precipitation needed to remove drought for week ending on date			
Climate Division	Sept. 22	Sept. 29	
Northwest	-	-	
North Central	-	-	
Northeast	2.84	3.33	
West Central	-	-	
Central	-	-	
East Central	-	-	
Southwest	-	-	
South Central	-	-	
Southeast	-	-	



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

State Drought Mitigation

Livestock Water

Emergency livestock water is available to producers in counties under Kansas Drought Emergency Declarations. The Kansas Water Office will verify eligibility for arrange for withdrawal permit processing. Permits have been issued at three state fishing lakes (Chase, Lyon, McPherson) and four federal lakes (Fall River, Melvern, Milford, and Tuttle Creek). The producer must pump and haul water to livestock tanks and follow procedures to ensure aquatic nuisance species are not introduced to water bodies. If harmful algal blooms advisories are issued for a lake, withdrawals are not allowed. In September all permits were cancelled upon producer request at Chase State Fishing Lake.

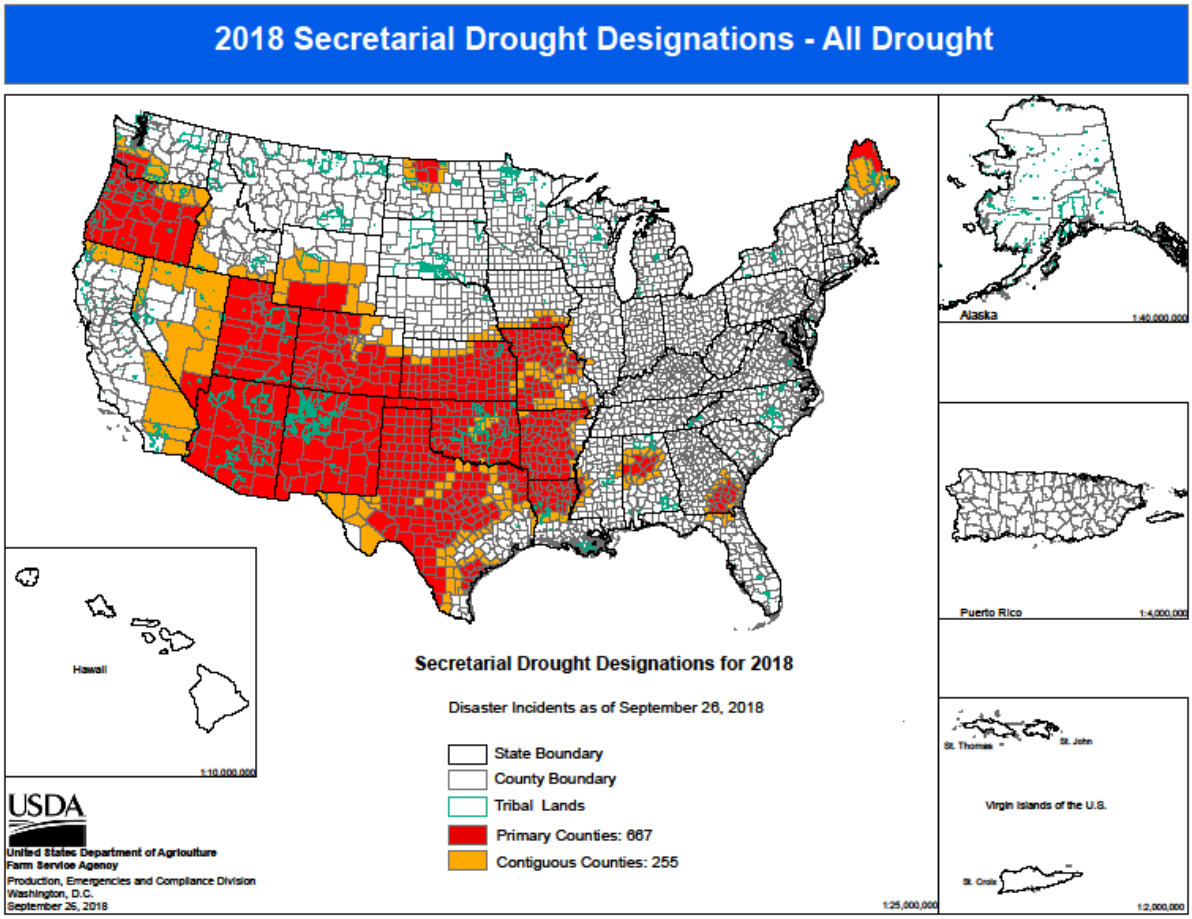
Financial assistance for livestock water supply wells, pipeline and tanks may also be available through Environmental Quality Incentives Program (EQIP) Drought Initiative by NRCS or Kansas Department of Agriculture-Division of Conservation through the Livestock Water Supply Financial Assistance Initiative in Emergency counties. Applications can be made through local conservation districts.

Federal Disaster Drought Declarations 2018

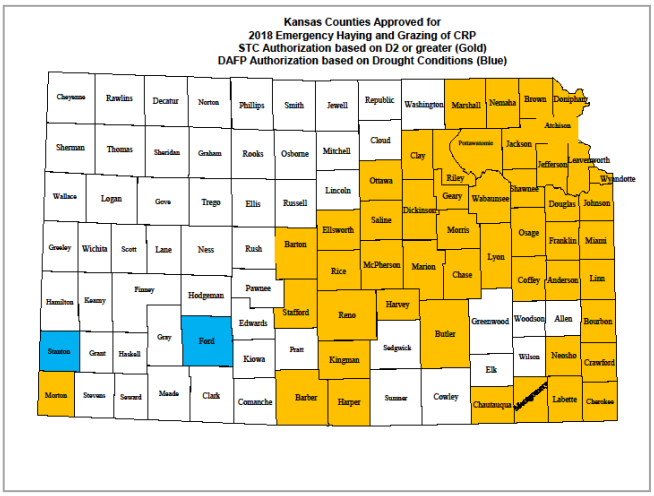
U. S. Department of Agriculture Drought Disaster

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

USDA drought disasters have been declared in 2018 for Kansas. Designations are for 85 primary counties and 11 contiguous counties. Primary counties include Allen, Anderson, Atchison, Barber, Barton, Brown, Butler, Chase, Chautauqua, Cherokee, Clark, Clay, Coffey, Comanche, Cowley, Dickinson, Doniphan, Douglas, Edwards, Elk, Ellis, Ellsworth, Finney, Ford, Franklin, Geary, Grant, Gray, Greeley, Greenwood, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jackson, Jefferson, Johnson, Kearny, Kingman, Kiowa, Labette, Lane, Leavenworth, Lincoln, Linn, Lyon, Marion, Marshall, McPherson, Meade, Miami, Montgomery, Morris, Morton, Nemaha, Neosho, Ness, Osage, Ottawa, Pawnee, Pottawatomie, Pratt, Reno, Rice, Riley, Rush, Russell, Saline, Scott, Sedgewick, Seward, Shawnee, Stafford, Stanton, Stevens, Sumner, Trego, Wabaunsee, Wallace, Washington, Wichita, Wilson, Woodson and Wyandotte. Contiguous counties are Bourbon, Cloud, Crawford, Gove, Graham, Logan, Mitchell, Osborne, Republic, Rooks, and Sherman.



Haying and grazing of Conservation Reserve Program (CRP) acres is in place to provide emergency haying and grazing on CRP acreages in the counties in Kansas colored on the map at right. These counties may graze through **September 30, 2018** with county office approval. In addition CRP CP25 acres in these counties may be eligible for grazing through September 30, 2018. Emergency haying is not available for CP25 acres. Counties in blue have DAFP authorization, gold are authorized based on D2 or greater on the U.S. Drought Monitor. A fact sheet is available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2017/emergency_haying_and_grazing_oct2017.pdf



Climate Summary - Precipitation

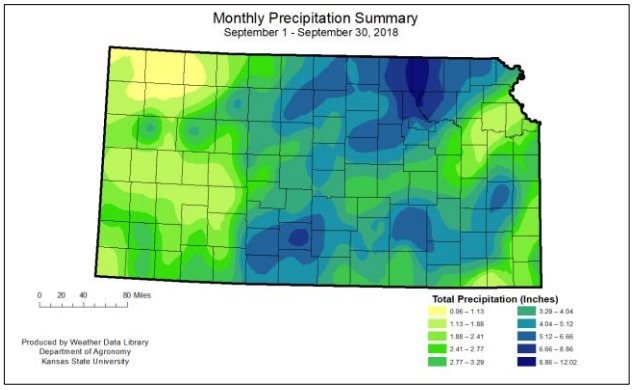
The September average divisional precipitation ranged from 0.98 inches in the Northwest Climate Division to 4.36 inches in the North Central. This resulted in a 0.56 inch deficit in the Northwest (61% of normal) and a 1.73 inch surplus in the North Central (164% of normal). State-wide average was 1.36 inches, which is a 0.66 inch surplus, or 133 percent of normal. The greatest monthly total for a National Weather Service Cooperative station was at Marysville, Marshall County, with 12.23 inches. The Community Collaborative Rain, Hail and Snow network station with the greatest monthly precipitation was Manhattan 3.7 N, Riley County, with 11.37 inches. Among the Kansas Mesonet stations, the Manhattan station on the North Farm, had the greatest monthly total with 8.00 inches. Most of the rainfall occurred during the first week of the month, particularly over the Labor Day weekend. The flooding produced by the intense rains resulted in a Governor's disaster declaration that covered 5 counties: Jewell, Kingman, Marshall, Pratt and Riley.

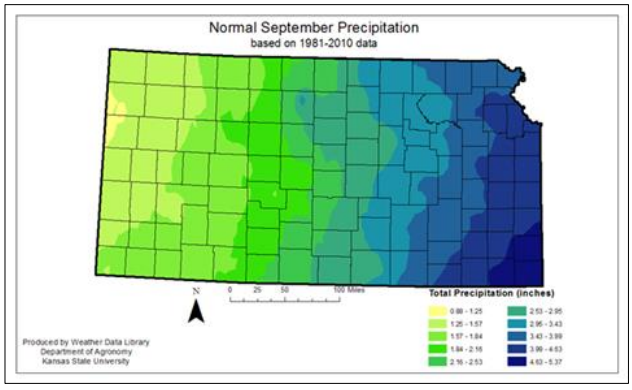
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library.) Weekly maps of precipitation information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

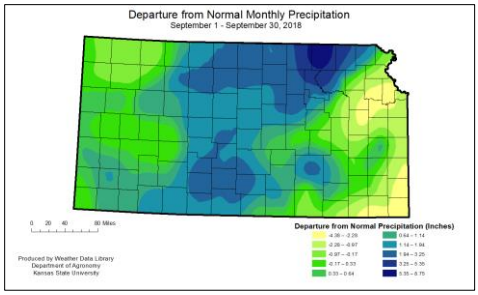
Kansas Climate Division Precipitation Summary (inches)

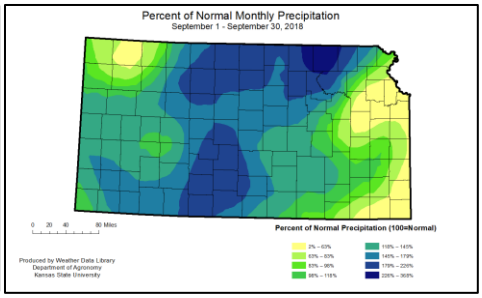
Climate Division	Sept 1-30, 2018			January 1-Sept 30, 2018			April 1, 2017- Sept 30 , 2018			Sept 1 - Sept 30, 2018		
	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal	Actual	Depart Normal	Percent Normal
Northwest	0.98	-0.54	61	18.54	0.13	100	17.14	16.11	105	0.98	1.52	61
West Central	2.20	0.60	141	19.21	1.32	106	18.11	15.40	116	2.20	1.60	141
Southwest	2.54	0.92	155	20.34	3.28	119	19.93	14.68	135	2.54	1.62	155
North Central	4.36	1.73	164	24.14	0.20	101	22.58	20.46	110	4.36	2.63	164
Central	3.84	1.33	155	22.87	-2.12	92	21.32	21.04	102	3.84	2.51	155
South Central	4.12	1.52	162	26.16	0.09	101	24.13	21.44	113	4.12	2.60	162
Northeast	4.28	0.67	124	23.77	-5.50	82	21.32	25.07	87	4.28	3.61	124
East Central	2.94	-0.72	80	22.00	-9.26	69	19.10	26.34	72	2.94	3.66	80
Southeast	4.09	0.08	106	29.92	-3.50	89	25.73	27.42	93	4.09	4.01	106
STATE	3.28	0.66	130	23.19	-1.43	96	21.25	20.77	105	3.28	2.62	130

The maps below summarize precipitation. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps









Climate Summary-Temperature

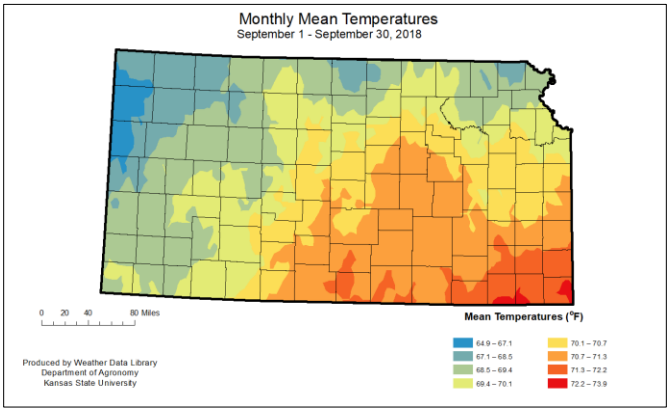
Temperatures also were highly variable in September. State-wide average temperature for the month was 69.9 °F, which is 1.8 degrees warmer than normal. All climate divisions were warmer than normal. The Northwest Division had the largest departure, with an average of 67.9 °F, or 2.6 degrees warmer than normal. The South Central Division came closest to normal with an average of 71.3 °F or 1.1 degrees warmer than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 105 °F at Johnson, Stanton County, on the 1st. The coldest minimum temperature was 30 °F, recorded at Brewster 4W, Sherman County, on the 27th. There were 10 record daily high maximum temperatures in the month, and 10 record daily low maximum temperatures. On the minimum temperature side, there were 27 record high minimums compared to only one record low minimum.

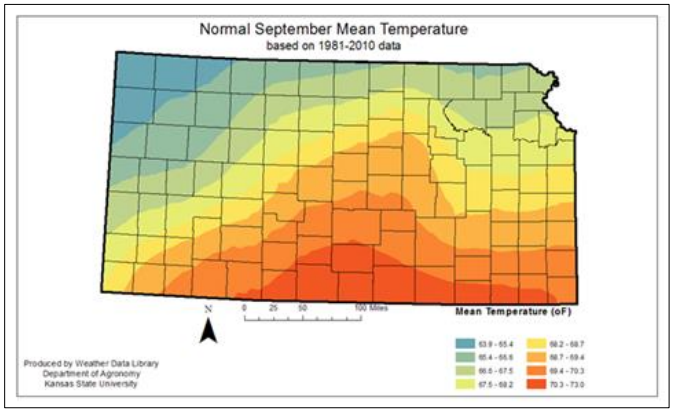
Information in this summary is taken from weekly information generated by Kansas State University Department of Agronomy along with data tables and maps. (Maps based data from the Cooperative Observer and Kansas Mesonet, provided by KSU Weather Data Library.) The weekly maps a glimpse at the temperature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

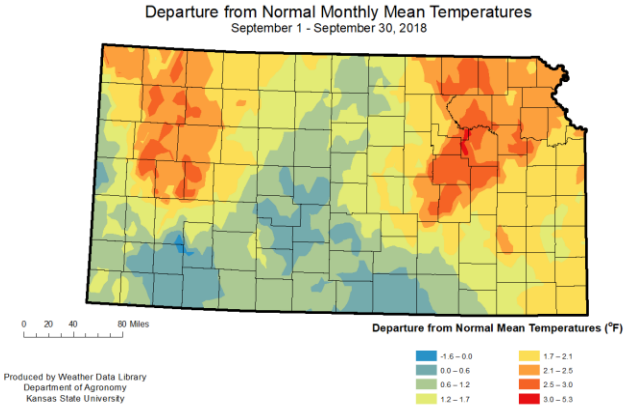
Climate Division	Kansas Climate Division Temperature Summary (°F) September 2018							
	Maximum	Minimum	Average	Departure	High	Date	Low	Date
Northwest	81.3	54.4	67.9	2.6	99	19	30	27
West Central	81.9	55.6	68.8	2.3	101	1	34	26
Southwest	82.3	57.2	69.8	1.2	105	1	36	27
North Central	80.1	58.9	69.5	1.6	100	1	38	27
Central	81.1	59.8	70.5	1.4	101	1	39	26
South Central	82.0	60.7	71.3	1.1	101	1	40	27
Northeast	80.2	59.3	69.7	2.3	96	2	41	26
East Central	79.9	60.3	70.1	1.9	98	18	39	27
Southeast	81.1	62.0	71.6	1.9	97	1	38	27
STATE	81.1	58.7	69.9	1.8	105	1st	30	27th
Data Source: KSU Weather Library								

While hail and high winds were again major contributors to severe weather in Kansas during September, the big story was the Labor Day flood event. Damage in these counties featured washed out roads, bridges, culverts and flooding to some businesses and residential properties. Complete damage estimates are not yet available. There was one tornado report during the month consisting of land spout funnels in Hamilton County, on the 3rd.

The maps below summarize temperature. Climate maps are also available from the High Plains Regional Climate Center at https://hprcc.unl.edu/maps.php?map=ACISClimateMaps .



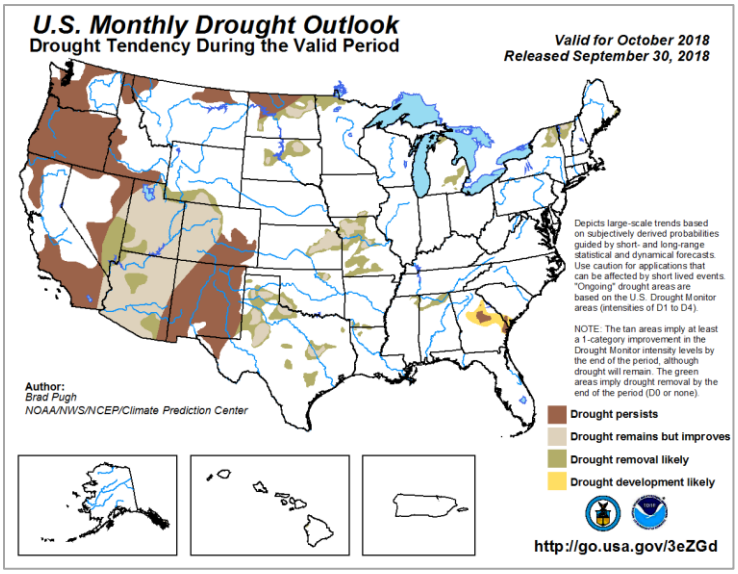


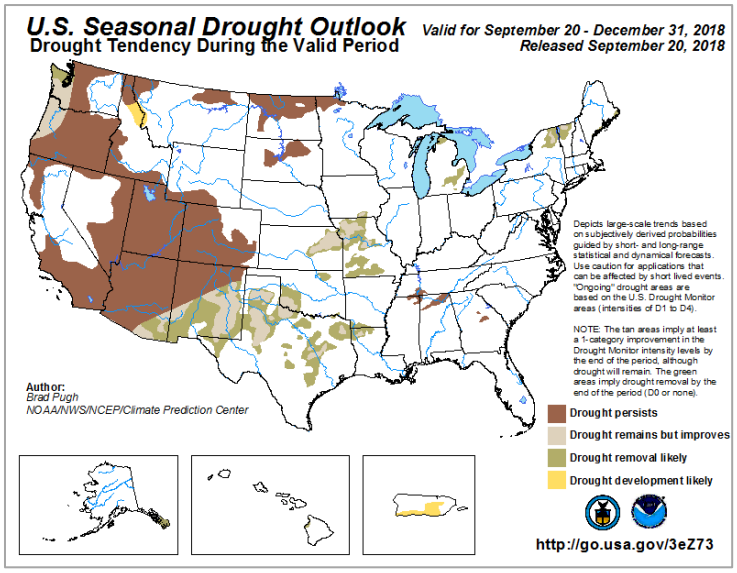


Future Outlook

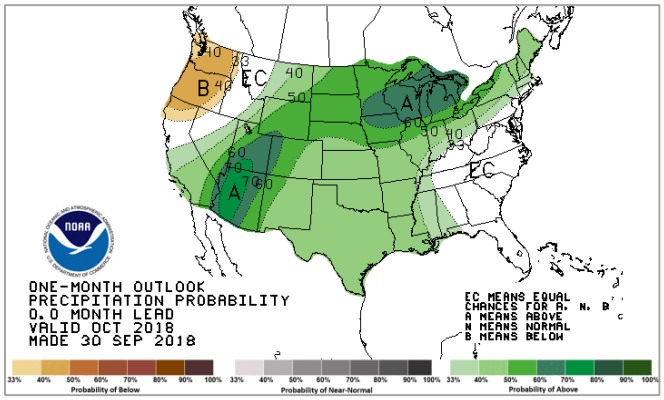
The Monthly Drought Outlook indicates drought conditions to remain, but could improve in northeast Kansas in October.

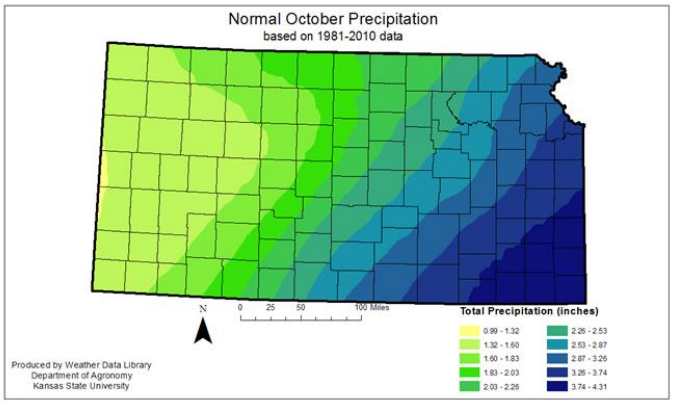
Seasonal Outlook (3-month) favors drought remaining in eastern Kansas, but possibly improving through the end of December. The individual temperature and precipitation outlooks that contribute to these outlooks are available below. Others time intervals are also available from the climate prediction center.

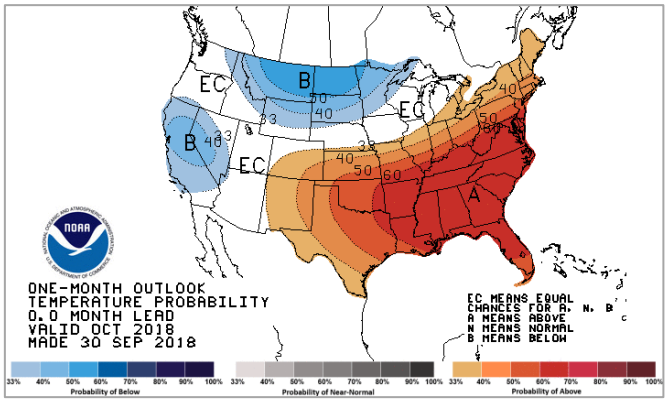


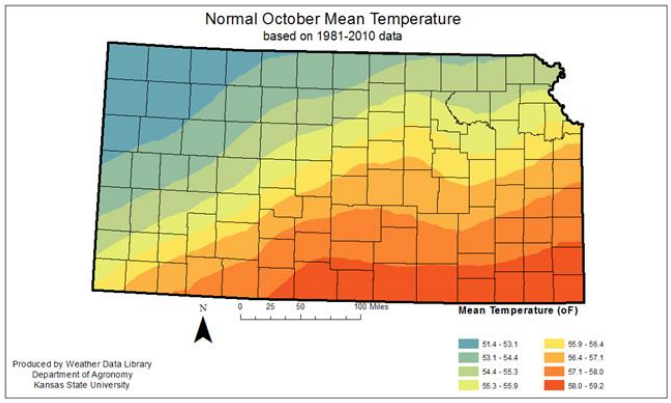


The October outlook has increased chances for above normal precipitation across most of the state. However, a more even distribution across the month will be needed to continue improvement of drought conditions across the state. The temperature outlook is for warmer than normal temperatures statewide.

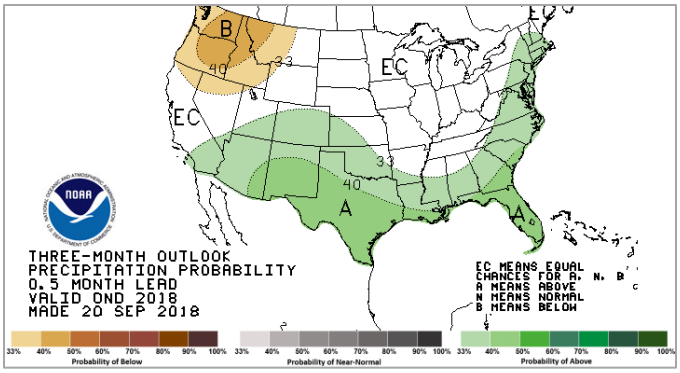


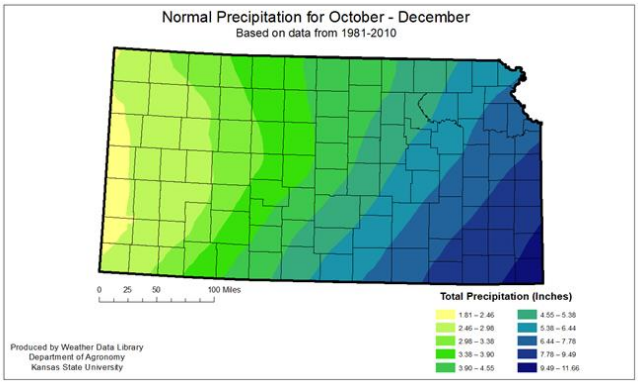


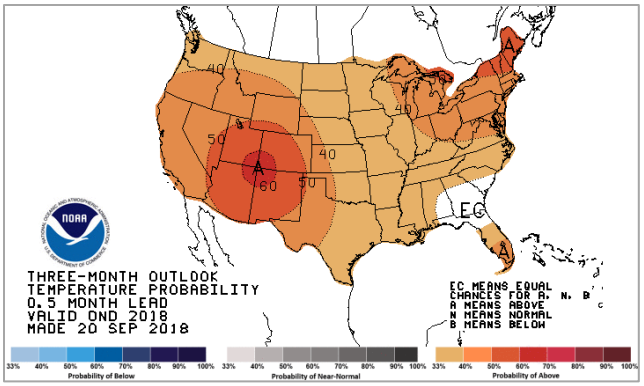


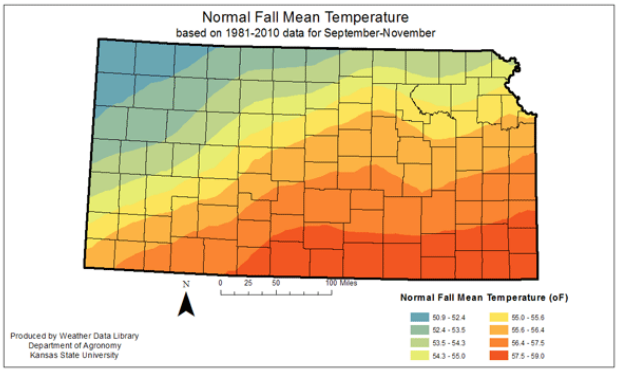


The 3- month outlooks favors above normal precipitation in western and south central Kansas and equal chances of normal, above or below normal precipitation in eastern and north central Kansas. Above normal temperatures are favored for all of Kansas for October-November-December.









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

Water

Public Water Supply Conditions

Cities and rural water districts are encouraged to measure their current water supply as well as review and use their conservation and drought emergency plans as needed. Please note stage designation or name and corresponding conservation measures are defined by each water supplier, so requirements to conserve and conservation measures are not uniform among public water suppliers.

Numerous communities have conservation measures in place throughout the summer or year to restrict outdoor watering to times with less evaporative loss. The conservation measures in place that are in addition to these that we are aware of include the**: City of Oswego,** Labette County, issued a water watch August 16, 2018; **City of Burlington** enacted a stage 3 water emergency initiating mandatory water conservation for all its consumers August 15, 2018, including Coffey County Rural Water Districts 2 and 3 and the cities of Gridley, LeRoy and New Strawn; **City of Gardner,** Johnson County, issued a Water Warning July 20, 2018; **City of Spring Hill,** Johnson and Miami counties**,** requested residents take voluntary conservation measures due to drought conditions July 12, 2018; and **Public Wholesale Water Supply District #26**, Chase County, issued a water warning July 11, 2018 which includes the City of Strong City, Chase County Rural Water District #1, and the City of Cottonwood Falls.

Surface Water Supply Conditions

Kansas River basin: Milford, Tuttle, and Perry reservoirs all experienced higher than normal inflows in September. Clinton Reservoir's watershed did not receive any significant runoff producing precipitation events and continues to decline. Despite higher than normal inflows to Perry it was not sufficient to refill conservation storage. Flood storage was retained at Milford and Tuttle throughout the month because there wasn't enough capacity on the Missouri River. The Missouri River main stem reservoirs are evacuating flood storage so channel capacity is limited.

Marais des Cygnes basin: Inflows to Melvern, Pomona, and Hillsdale reservoirs remained far less than normal in September. Both the upper and lower reaches of the Marais des Cygnes River received significant runoff in the first half of the month and streamflow was well above normal but reservoir releases accounted for the majority of stream flow in the upper reaches of the Marais des Cygnes River for the second half of the month. The lower reach maintained near median values throughout September. Storage supplies are somewhat depleted but sufficient and no municipal or industrial conservation measured have been implemented.

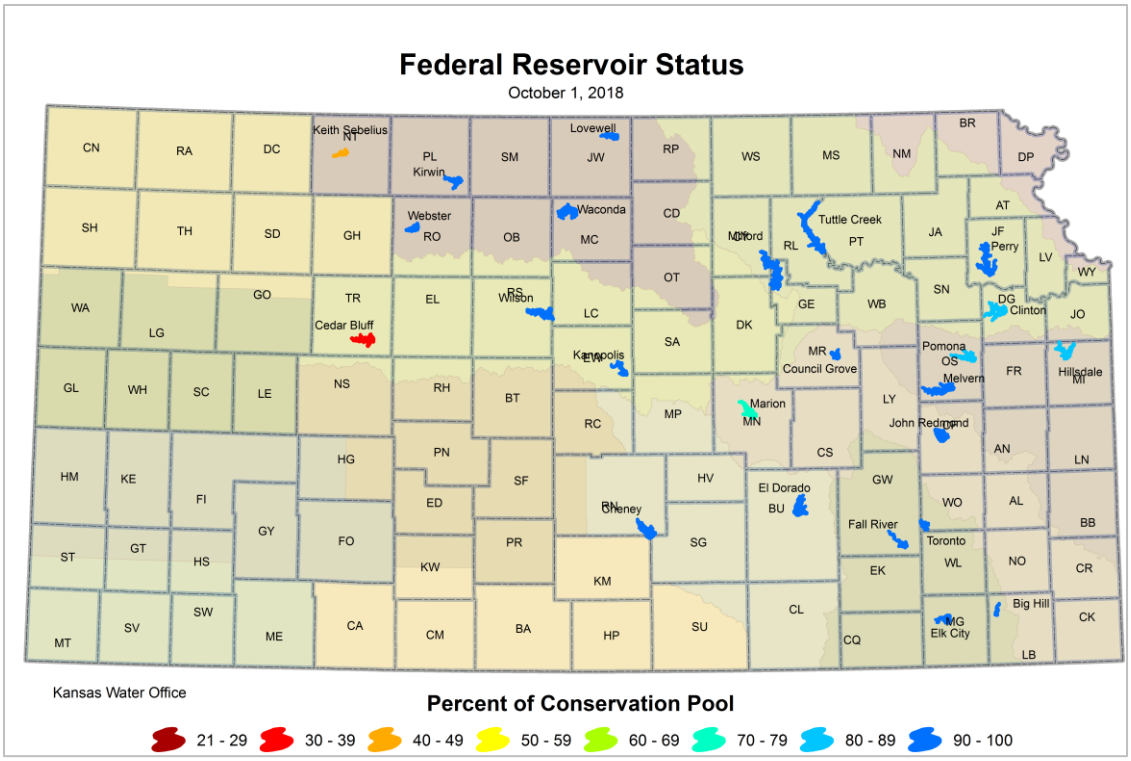
Cottonwood/Neosho basin: Inflows to Marion Reservoir remained exceptionally low in September but the system as a whole was replenished from September rains. Council Grove Reservoir conservation storage was refilled and flood pool releases were necessary from Council Grove and John Redmond reservoirs. Marion experienced further declines.

Verdigris basin: Inflows to Toronto, Fall River, Elk City, and Big Hill reservoirs were moderate to above normal in September. Stream flow in the Verdigris and Fall Rivers were maintained well above normal due to flood pool releases throughout the month.

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

Smoky Hill basin: The middle Smoky Hill River continued to benefit from somewhat abnormal precipitation and sustained runoff in September. Kanopolis Lake received enough inflow to reach the seasonal target elevation of 1467.7 and then some. Cedar Bluff Reservoir also received some inflow but no substantial gains were experienced.

Surface Water Supply Conditions
Reservoir Storage



Kansas Federal Reservoir Conservation Pool Levels

Reservoir	Top of Multipurpose / Conservation Pool (Feet MSL)	Multipurpose/Conservation Pool Elevation (Feet MSL)	Change from Top of Pool (Feet)	Percent of Conservation Pool Full
Kansas River Basin		**10/01/2018 6:00 AM**		
Norton[1]	2304.3	2293.07	-11.23	44.3
Harlan County, NE	1945.73	1938.36	-7.37	71.3
Lovewell[1]	1582.6	1582.28	-0.32	97.3
Milford[1]	1144.4	1147.92	3.52	100.0
Cedar Bluff	2144	2120.96	-23.04	35.3
Kanopolis[1]	1463	1467.14	4.14	100.0
Wilson[1]	1516	1516.48	0.48	100.0
Webster[1]	1892.5	1893.03	0.53	100.0
Kirwin[1]	1729.3	1729.29	-0.01	100.0
Waconda[1]	1455.6	1457.28	1.68	100.0
Tuttle Creek[1]	1075	1091.08	16.08	100.0
Perry[1]	891.5	889.74	-1.76	91.2
Clinton[1]	875.5	873.39	-2.11	87.6
Melvern[1]	1036	1033.67	-2.33	89.8
Pomona[1]	974	971.34	-2.66	82.4
Hillsdale[1]	917	914.78	-2.22	87.0
Arkansas River Basin		**10/01/2018 8:00 AM**		
Cheney	1421.6	1422.08	0.48	100.0
El Dorado	1339	1338.99	-0.01	100.0
Toronto[1]	901.5	901.97	0.47	100.0
Fall River[1]	948.5	949.42	0.92	100.0
Elk City[1]	796	796.35	0.35	100.0
Big Hill	858	857.93	-0.07	100.0
Council Grove[1]	1274	1274.19	0.19	100.0
Marion[1]	1350.5	1346.68	-3.82	72.0
John Redmond[1]	1039	1041.49	0.49	100.0

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

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

Harmful Blue-Green Algal Blooms (lake water safety)

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

Please note lakes are only tested if a suspected bloom is reported to Kansas Department of Health and Environment (KDHE). Then testing is added to the next round of testing. So if in doubt stay out of the water and avoid contact with the water. Report new algae-blooms to KDHE: www.kdheks.gov/algae-illness or call 785-296-1664.

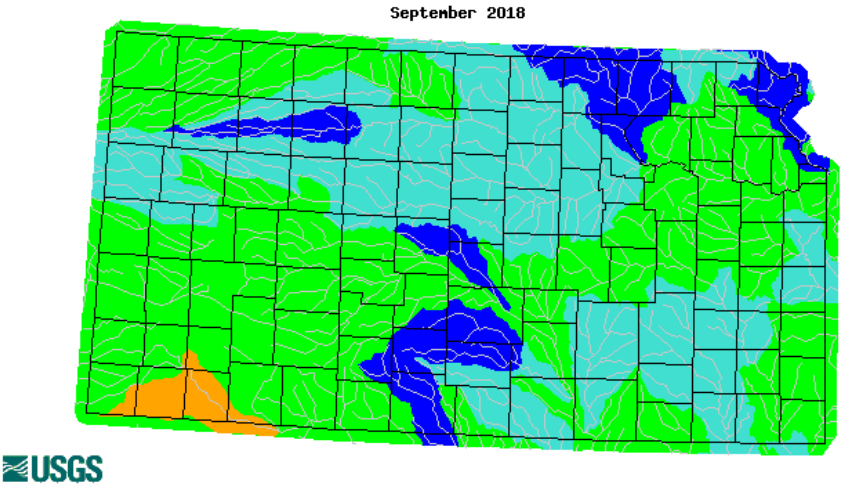
Lake Public Health Advisories

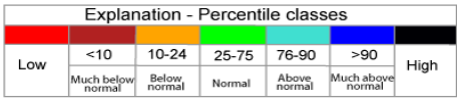
Water Body	County	9/20/2018	9/27/2018
Atchison County Park Lake	Atchison	Warning	Warning
Atchison County State Fishing Lake	Atchison	Watch	watch
Carbondale West Lake	Osage	Warning	Warning
Central Park Lake	Shawnee	Warning	Warning
Frazier Lake	Grant	Warning	Warning
Hodgeman Co. State Fishing Lake	Hodgeman	Warning	Warning
Jerry Ivey Pond	Saline	Warning	Warning
Lake Afton	Sedgewick	Warning	Warning
Lake Scott State Park	Scott	Watch	Warning
Lake Wabaunsee	Wabaunsee	Warning	Warning
Lakewood Park Lake	Saline	Warning	Warning
Marais des Cygnes Wildlife Area Lake	Linn	Warning	Warning
Mary's Lake	Douglas	Watch	watch
Melvern Lake	Osage	Watch	watch
Melvern Outlet Pond	Osage	Warning	Warning
Melvern Outlet Swim Pond	Osage	Warning	Warning
Overbrook City Lake	Osage	Warning	Warning
Pomona Lake	Osage	Watch	watch
Rock Garden Pond	Shawnee	Warning	Warning
South Park Lake	Johnson	Warning	Warning
Tomahawk Park Lake	Johnson	Watch	watch
Webster Lake	Rooks	Warning	Warning
West Campus Pond, KU Campus	Douglas		watch

Streamflow Conditions

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

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



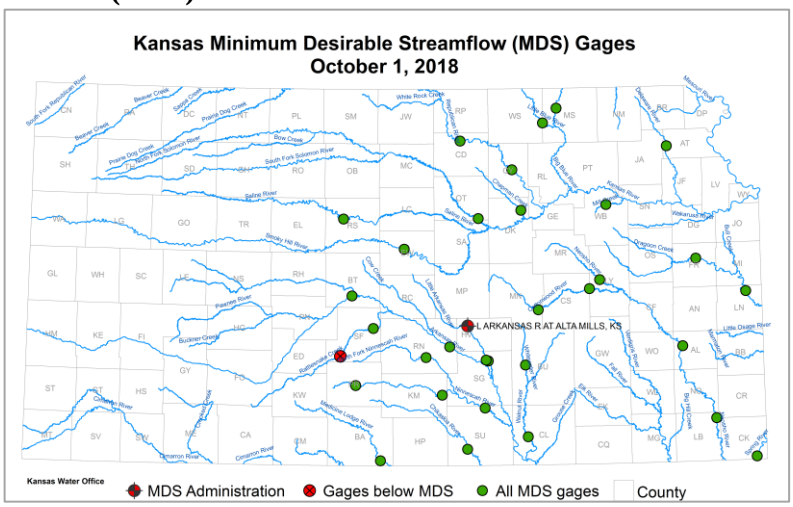


Stream flooding during the month is summarized in Appendix B.

Water Right Administration/Minimum Desirable Streamflow (MDS)

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

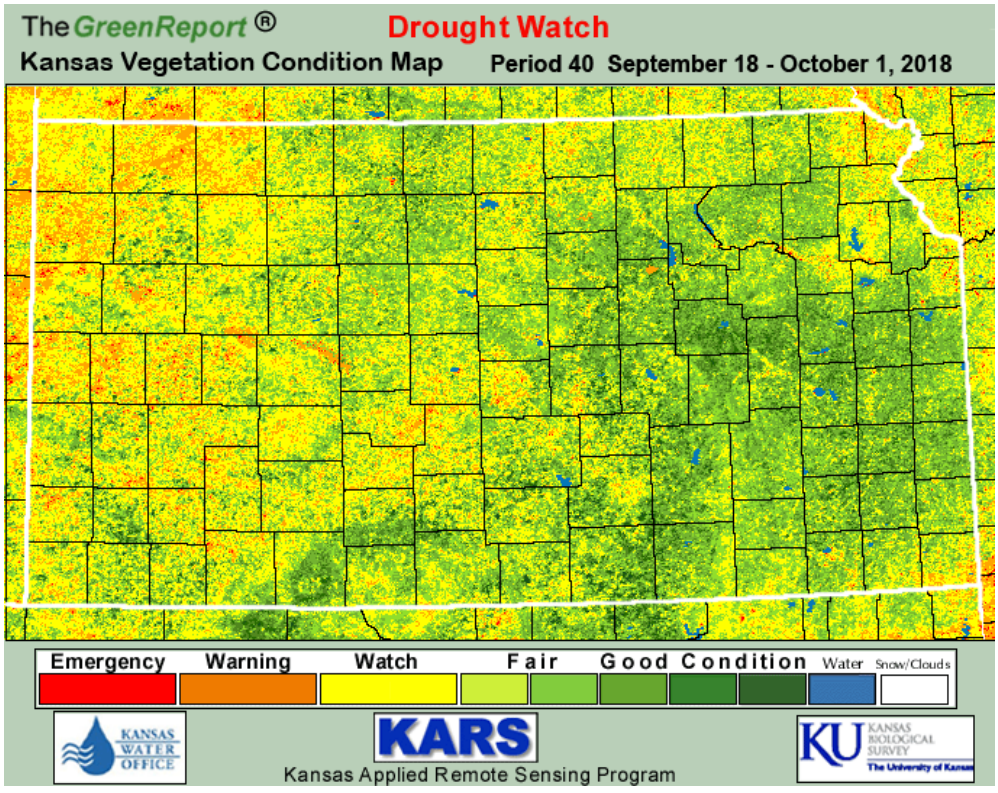
The table below provides a snapshot of conditions for streams of interest to the Kansas Department of Agriculture, Division of Water Resources. Administration ceased in September above three gages on the Republican and Delaware rivers.



Streamflows					
USGS Gaging Station	**Sept. 24 Flow**	**Sept. MDS**	**Oct. 1 Flow**	**Oct. MDS**	**Comment**
Republican River at Concordia	215	80	137	65	Admin began April 13, 2018, ceased Sept 4, 2018
Republican River at Clay Center	375	100	302	90	Admin began April 13, 2018, ceased Sept 4, 2018
Mill Creek near Paxico	8	5	8	2	Admin began April 12, 2018, ceased Sept 18, 2018
Delaware River near Muscotah	5	3	3	2	Admin began March 23, 2018, ceased Sept 5, 2018
Rattlesnake Creek near Macksville	Dry	1	Dry	1	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	4	3	5	3	No surface water diversions junior to MDS above gage
Little Arkansas River at Alta Mills	11	8	2	8	MDS admin began Aug 10, 2017, Above Sept 4, 2018

Crop , Vegetation and Soil

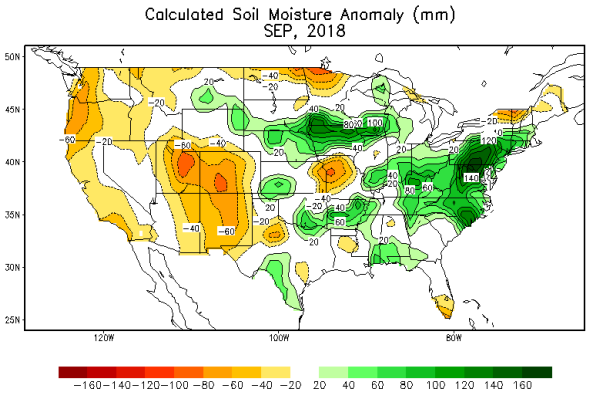
Vegetative Conditions

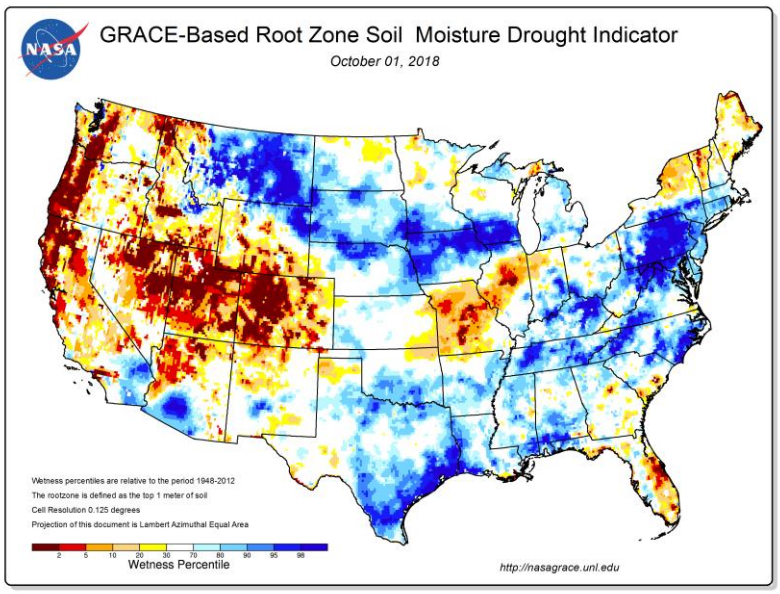


The Vegetative Condition map provides current conditions related to drought effects on vegetation. It is produced using satellite data. Areas in yellow, orange and red indicate areas of vegetative stress. The green areas are considered to be in good or excellent condition.

Soil Moisture

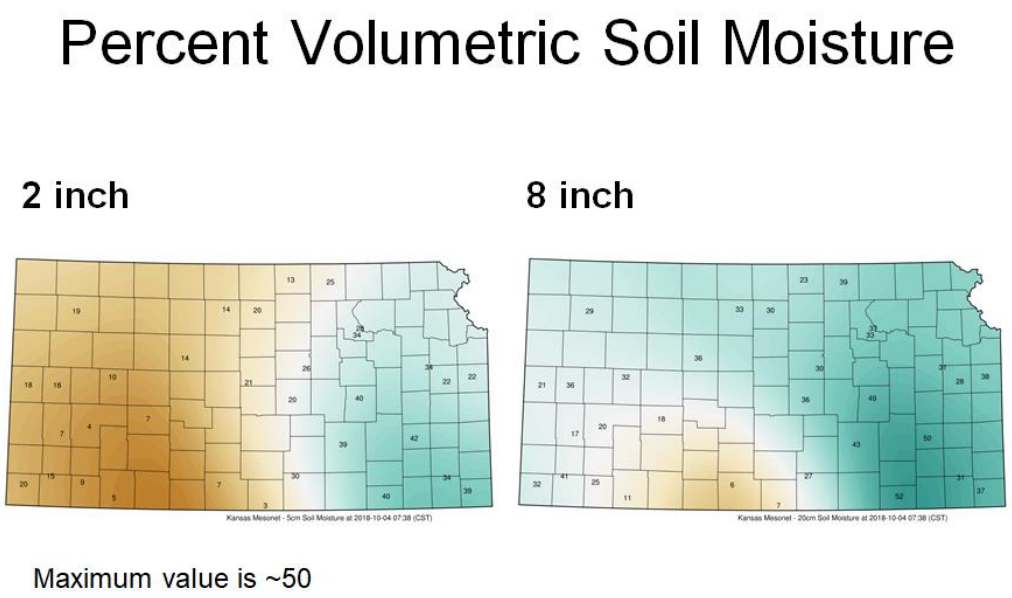
The Climate Prediction Center (CPC), also monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The soil anomaly is provided below indicates deficit soil moisture for most of Kansas. (.[http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)](http://www.cpc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





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

In Kansas, lack of rainfall continues to result in drying soils. The recent soil moisture data from the Kansas Mesonet shows dry surface conditions, with more available moisture at the 8" (20 cm) level. (KSU, October 4, 2018)



Soil Moisture Map by KSU: Darkest brown is driest to darkest teal being wettest.

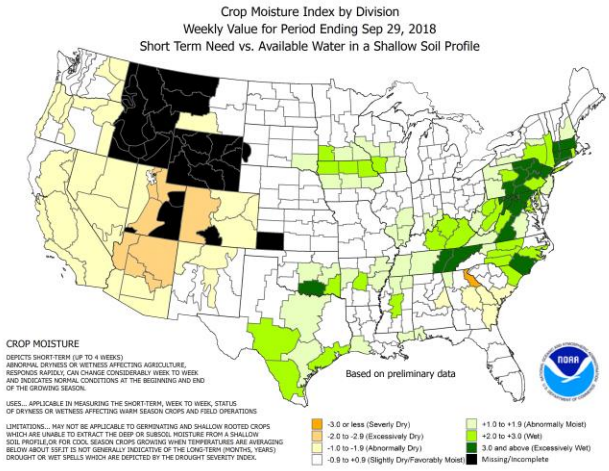
Crops and Rangeland

USDA Crop Progress and Condition provide some indication of the climatic effects on soil, and livestock feed and water supplies. The Kansas report by USDA's National Agricultural Statistics Service for the state as a whole for the week ending September 29, 2018 indicates topsoil moisture supplies rated 2 percent very short, 15 short, 79 adequate, and 4 surplus. Subsoil moisture supplies rated 3 percent very short, 16 short, 80 adequate, and 1 surplus.

Field Crops Report: Corn condition rated 9 percent very poor, 16 poor, 28 fair, 39 good, and 8 excellent. Soybean condition rated 3 percent very poor, 8 poor, 31 fair, 47 good, and 11 excellent. Sorghum condition rated 2 percent very poor, 5 poor, 23 fair, 56 good, and 14 excellent. Cotton condition rated 0 percent very poor, 1 poor, 25 fair, 60 good, and 14 excellent.

Pasture and Range Report**:** Pasture and range conditions rated 6 percent very poor, 13 poor, 36 fair, 39 good, and 6 excellent.

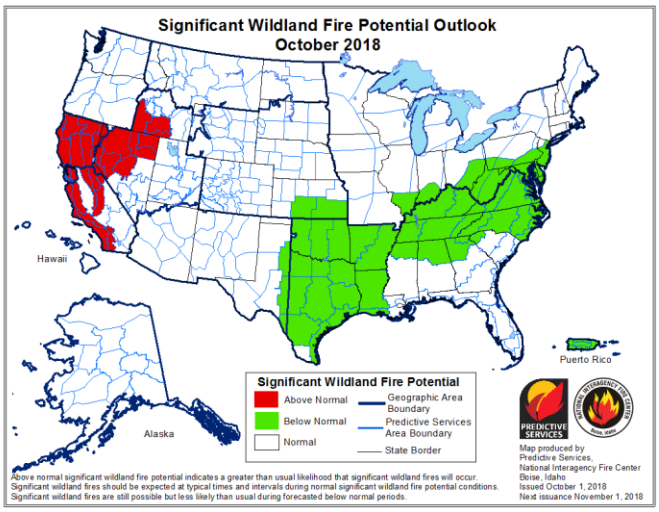
Based on the Palmer Drought Index, the Crop Moisture Index (CMI) uses a meteorological approach to monitor week-to-week crop conditions. It was developed by Palmer (1968) from procedures within the calculation of the PDSI. The CMI was designed to evaluate short-term moisture conditions across major crop-producing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

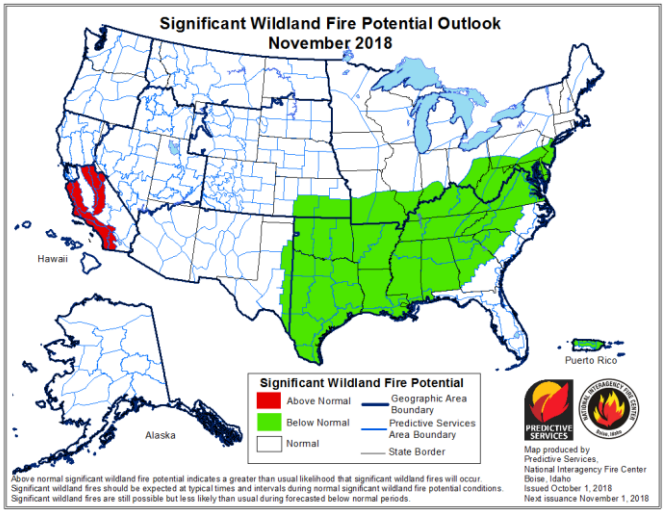


Fire

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

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





Kansas Climate Summary

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

RESOURCES and ACTIVITIES

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX A

September 2018 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.72	-0.42	63%	66.6	3.3	95 (18)	34 (26)
Dodge City	1.87	0.20	112%	69.7	0.5	93 (1)	43 (29,28)
Garden City	1.31	-0.16	89%	68.6	0.4	93 (18)	41 (29)
Goodland	1.00	-0.22	82%	67.1	2.5	96 (18)	35 (26)
Guymon, OK	1.67	-0.12	93%	71.3	0.9	95 (24,19)	40 (22)
Hill City	4.83	2.95	257%	69.3	1.9	96 (18)	37 (26)
Lamar, CO	0.49	-0.76	39%	70.1	3.6	102 (19)	31 (27)
McCook, NE	0.34	-1.10	24%	68.6	4.2	99 (19)	35 926)
Springfield, CO	1.38	0.05	104%	66.7	0.6	93 (17,13)	37 (27)
Central							
Concordia	5.29	2.38	182%	68.5	0.5	93 (20,18)	42 (22)
Hebron, NE	6.30	3.38	216%	68.8	2.8	95 (20,18)	42 (26,22)
Medicine Lodge	4.78	2.68	228%	71.8	0.6	97 (1)	42 (27)
Ponca City, OK	2.78	-0.51	84%	74.1	2.0	94 (19,18)	40 (27)
Salina	5.39	2.69	200%	70.5	0.3	96 (1)	44 (27)
Wichita (ICT)	2.77	-0.37	88%	72.7	1.7	98 (1)	43 (27)
East							
Bartlesville, OK	1.34	-2.50	35%	72.8	1.4	96 (19,18)	37 (27)
Chanute	4.39	0.72	120%	72.0	2.1	92 (19,18)	39 (27)
Falls City, NE	5.97	2.42	168%	68.7	2.0	96 (18)	42 (26)
Johnson Co. Exec. Apt	3.17	-1.34	70%	70.2	1.6	91 (20,19)	40 (27)
Joplin, MO	2.23	-2.72	45%	72.7	1.9	92 (20,19)	40 (27)
Kansas City (MCI), MO	1.30	-3.32	28%	70.6	2.4	94 (20,19)	40 (27)
St. Joseph, MO	0.41	-3.01	12%	69.5	2.8	97 (18)	38 (27)
Topeka (TOP)	1.12	-2.54	31%	71.4	3.0	96 (19,18)	40 (26)

1. Airport Automated Observation Stations (NWS/FAA)

2. Departure from 1981-2010 normal value

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

Source: National Weather Service F-6 Climate Summaries

APPENDIX B

Summary of September 2018 Flood and High Flow Conditions											
["--", no data; "<", less than all historical peaks]											
						Highest peak from 2018-09-01 to 2018-09-28				Historical Peaks	
USGS Station number	USGS station name	Drain. Area [mi2]	NWS flood stage [ft]	No. Days above flood stage	NWS flood class	Date	Stage (ft)	Stream flow (ft^3/s)	Rank	No. of years	Max. [ft^3/s] (year)
6818300	MISSOURI R AT ATCHISON, KS	426865	22	7	minor	9/4/2018	23.9	--	--	--	--
6818300	MISSOURI R AT ATCHISON, KS	426865	22	2	minor	9/30/2018	22.14	--	--	--	--
6856600	REPUBLICAN R AT CLAY CENTER, KS	24542	15	4	moderate	9/5/2018	21.02	14400	41	102	195000 (1935)
6879810	WILDCAT C AT SCENIC DRIVE, MANHATTAN, KS	86	14	1	major	9/3/2018	23.94	4310	1	6	3920 (2014)
6884200	MILL C AT WASHINGTON, KS	344	18	3	moderate	9/5/2018	19.54	4380	29	59	14600 (1993)
6884700	BIG BLUE R AT BLUE RAPIDS, KS	8342	26	7	minor	9/6/2018	39.86	--	--	--	--
6886500	FANCY C AT WINKLER, KS	174	16	1	minor	9/5/2018	16.25	9420	10	37	24000 (1972)
6914000	POTTAWATOMIE C NR GARNETT, KS	334	26	2	minor	9/8/2018	27.06	9070	47	63	57000 (1961)
7143300	COW C NR LYONS, KS	728	18	2	minor	9/6/2018	18.18	4000	17	73	28000 (1929)
7143310	COW C NR HUTCHINSON, KS	859.5	9.5	5	moderate	9/9/2018	11.25	--	--	--	--
7144910	SF NINNESCAH R NR PRATT, KS	117	9	1	minor	9/3/2018	14.44	17800	2	37	26200 (1991)
7145200	SF NINNESCAH R NR MURDOCK, KS	597	8	1	minor	9/5/2018	9.88	7980	21	67	28700 (1979)
7151500	CHIKASKIA R NR CORBIN, KS	794	10	1	minor	9/6/2018	10.63	6210	39	59	60000 (1923)
7169500	FALL R AT FREDONIA, KS	827	17	2	minor	9/7/2018	22.53	13300	32	83	77800 (2007)
7183000	NEOSHO R NR IOLA, KS	3723	15	2	minor	9/8/2018	17.12	22700	63	111	436000 (1951)
7183500	NEOSHO R NR PARSONS, KS	4905	21	2	minor	9/9/2018	21.69	22000	72	96	410000 (1951)