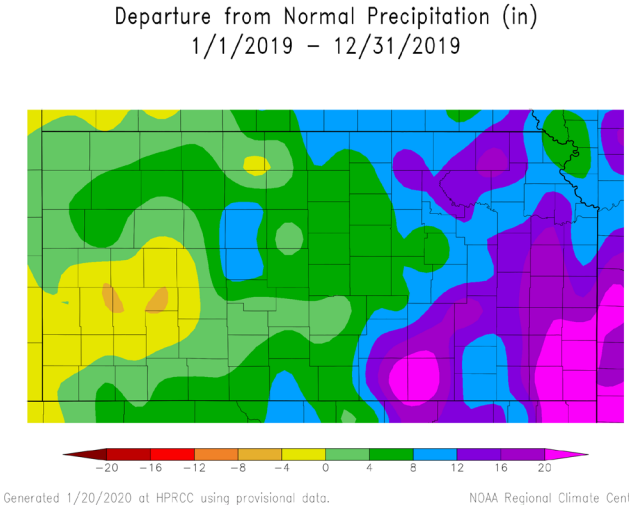
KANSAS CLIMATE UPDATE
January 2020 Summary

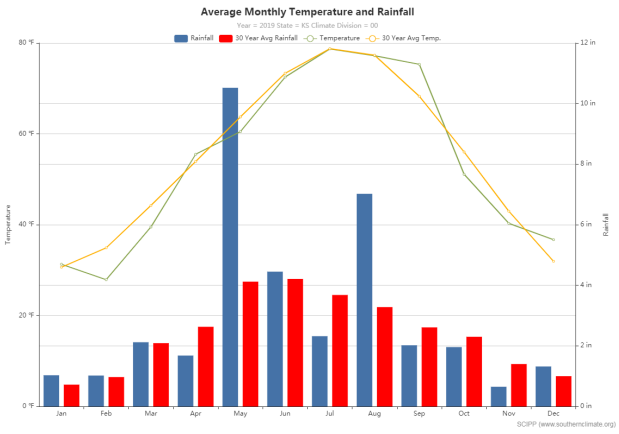
Highlights

- U.S. Drought Monitor indicated continuing areas of abnormally dry (D0), moderate drought (D1), severe drought (D2) and moderate drought (D3) in western and south central Kansas conditions though January although, some improvement in the drought conditions did occur.
- Statewide temperatures 2.9ºF warmer than normal, 26th warmest January.
- February outlook: equal chances of above/below normal temperatures; below normal precipitation in the east.
- Drought Outlook favors drought continuing for the current area of drought in extreme western Kansas.

Year 2019 Climate Highlights

- 2019 was a relatively wet year for Kansas. The month of May ranked as the wettest month on record for statewide average precipitation since 1895. August ranked as the wettest August.
- Despite above normal precipitation statewide, southwest Kansas missed the large August rains and entered a drier period that expanded into south central Kansas. Drought conditions persisted through the end of 2019 in some areas of southwest and south central Kansas.

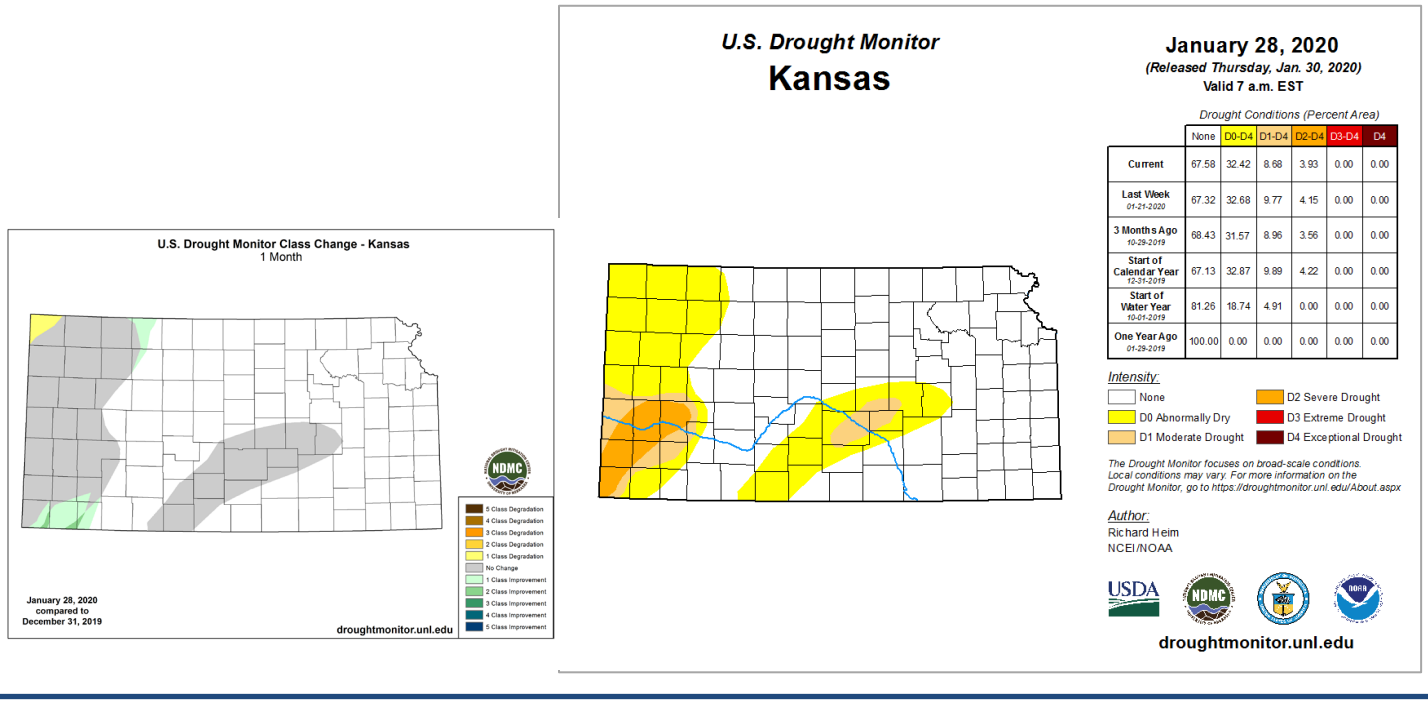




General Drought Conditions

The U.S. Drought Monitor indicated dry and drought conditions in parts of western and central Kansas at the beginning of the month. These drought conditions improved in parts of South Central and Southwest Kansas. The condition at the end of the month is shown below in Figure 1. Change in drought classification over the month is also shown.

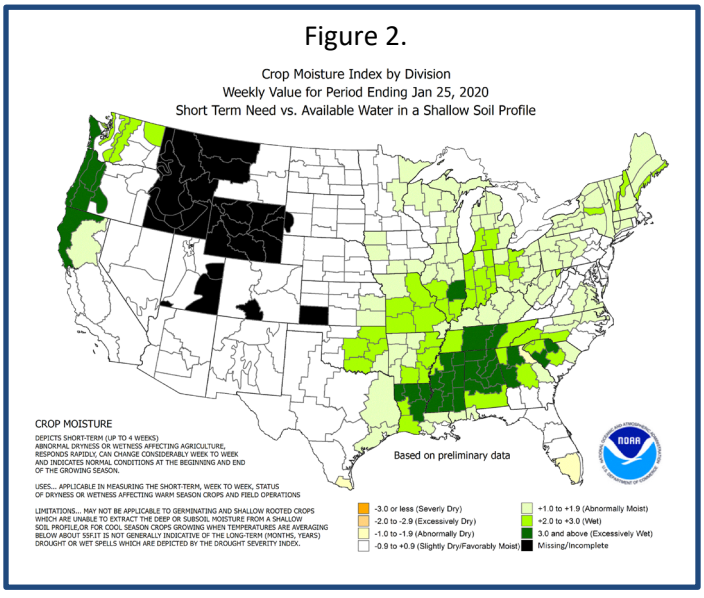
Figure 1. U.S. Drought Monitor Maps of Drought status



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

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The Crop Moisture (Figure 2) component evaluates short term needs and available water. More information on the PDSI and its parts can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml.

Figure 2.



Climate Summary - Precipitation

January was wetter than normal due to a series of storms. Statewide average precipitation for the month was 1.27 inches, 179 percent of normal. This ranks as the 16th wettest January in the 126-year record. Not all climate divisions were wet, however. The Northwest Division was the driest, with an average of 0.34 inches, 79 percent of normal. The Southeast had the highest average precipitation at 2.35 inches, 194 percent of normal. The highest 24-hour rainfall total for a National Weather Service Cooperative station was 3.22 inches at Greensburg, Kiowa County, on the 29th. The greatest 24-hour rainfall total for a Community Collaborative Rain, Hail and Snow network station was 2.28 inches at Parsons 0.8 SE, Labette County, on the 11th. The greatest monthly precipitation totals for January: 4.90 inches at Oswego, Labette County (NWS); 4.11 inches at Parsons 0.8 SE, Labette County (CoCoRaHS). Two locations set 24-hour precipitation records for January: White City, with 1.14 inches on the 11th and Liberal with 1.42 inches on the 28th. Liberal also set a 24-hour snowfall record for January with 10.5 inches on the 24th. Table 1 summarizes the monthly precipitation (KSU Weather Data Library).

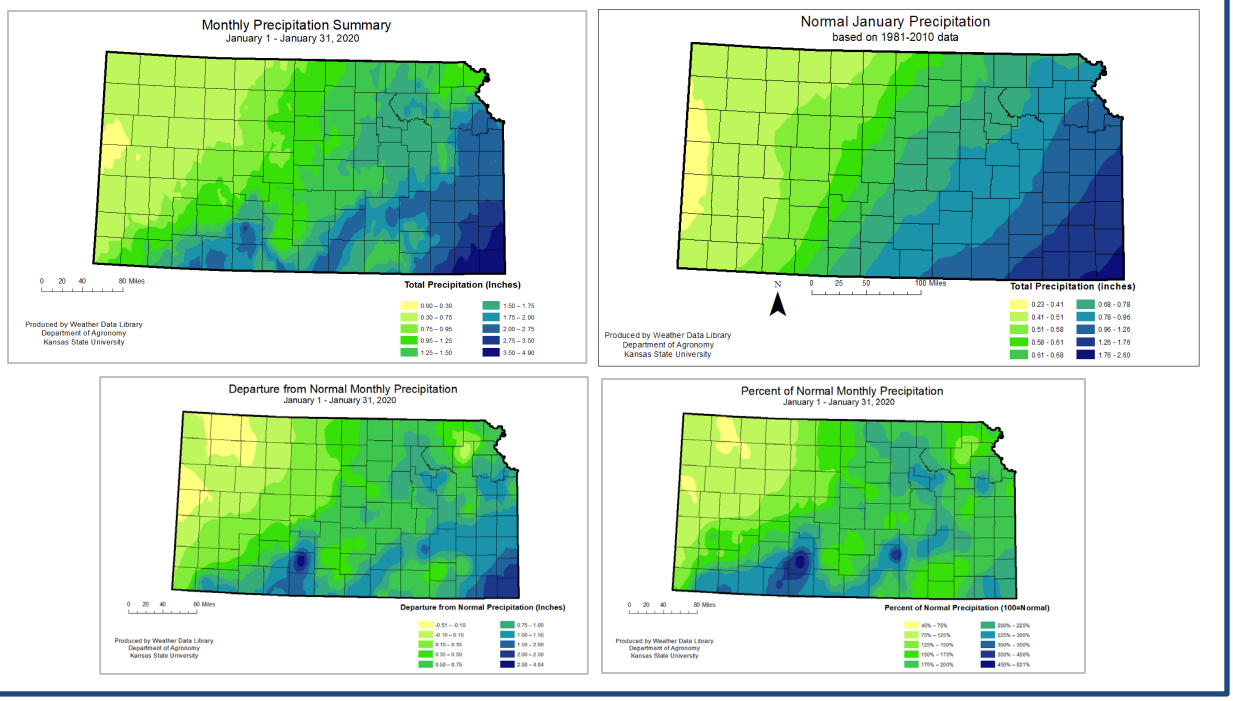
Table 1.

Kansas Climate Division Precipitation Summary (inches)

Climate Division	January 1 - 31, 2020			January 1 – 31, 2020			April 1, 2019 – Jan. 31, 2020			Sept 1, 2019 – Jan. 31, 2020		
	Actual	Depart Normal*	% of Normal	Actual	Depart Normal*	% of Normal	Actual	Depart Normal*	% of Normal	Actual	Depart Normal*	% of Normal
Northwest	0.34	-0.09	79	0.34	-0.09	79	23.99	4.37	122	3.54	-1.41	72
West Central	0.97	0.36	159	0.97	0.36	159	32.79	7.62	130	7.25	-0.09	99
Southwest	1.05	0.27	135	1.05	0.27	135	42.62	11.05	135	9.42	-0.70	93
North Central	0.39	-0.10	80	0.39	-0.10	80	19.75	1.00	105	3.5	-1.46	71
Central	1.25	0.58	187	1.25	0.58	187	33.36	7.35	128	6.48	-1.01	87
South Central	1.96	1.05	215	1.96	1.05	215	47.7	13.79	141	10.45	-0.78	93
Northeast	1.05	0.60	233	1.05	0.60	233	17.75	-0.23	99	3.55	-1.37	72
East Central	1.63	0.82	201	1.63	0.82	201	38.02	10.52	138	9.15	0.49	106
Southeast	2.35	1.14	194	2.35	1.14	194	55.66	18.95	152	13.63	0.33	102
STATE	1.27	0.56	179	1.27	0.56	179	34.51	8.25	131	7.48	-0.62	92

The maps of Figure 3 below summarize precipitation for the month. (State maps by KSU are based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library. State weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.)

Figure 3. Monthly Precipitation maps



Climate Summary-Temperature

Temperatures for January were warmer than normal. Statewide average temperature for the month was 32.8 ºF, which is 2.9 degrees warmer than normal. This ranks as the 26th warmest January on record. The Southeast Climate Division had the greatest departure with an average of 36.0 ºF, 4.2 degrees warmer than normal. The Northwest Division came closest to normal, with an average of 30.5 ºF, 2.0 degrees warmer than normal. Even with the warmer pattern, the Northwest and West Central divisions saw lows below zero. The remaining divisions all had a lowest minimum in the single digits. The warmest maximum temperature was 69 oF at Coffeyville Airport, Montgomery County, on the 10th. The coldest minimum temperature was -3 oF at St. Francis, Cheyenne County, on the 7th. There were 9 daily record high maximum temperatures and 34 daily record high minimum temperatures. There was one new record low maximum: 22 ºF at Hillsdale Lake, on the 21st. Table 2 summarizes the monthly temperatures (KSU Weather Data Library).

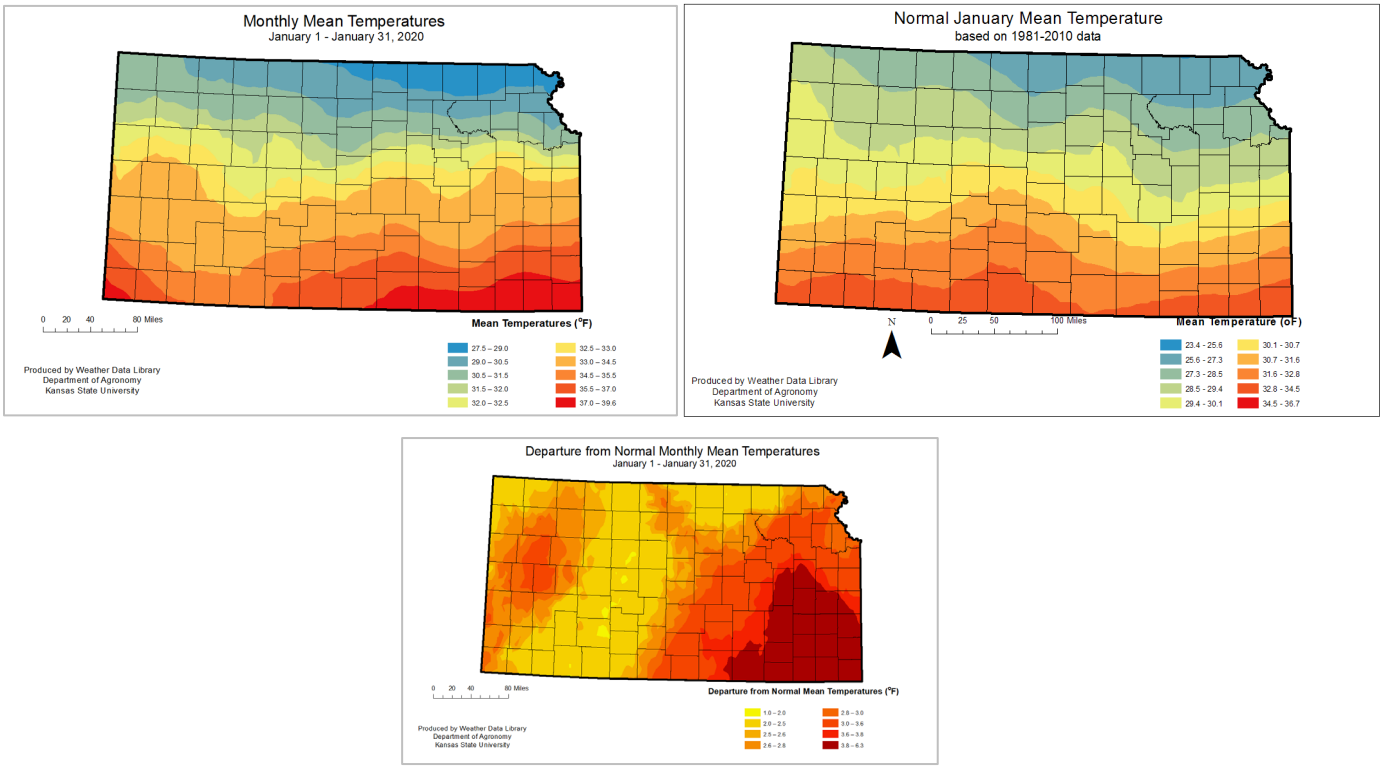
Table 2.

Climate Division	Kansas Climate Division Temperature Summary (ºF) January 2020							
	Maximum	Minimum	Average	Departure*	High	Date	Low	Date
Northwest	43.8	17.2	30.5	2.0	61	17	-3	7
West Central	45.7	18.4	32.0	2.3	66	1	-2	11
Southwest	50.2	21.4	35.8	3.7	66	14	5	11
North Central	39.5	20.7	30.1	2.2	59	8	2	21
Central	42.4	22.6	32.5	2.6	61	27	6	21
South Central	46.5	24.5	35.5	3.4	63	27	9	11
Northeast	38.7	21.3	30.0	2.5	61	10	3	21
East Central	41.8	23.4	32.6	3.5	65	10	4	11
Southeast	46.0	25.9	36.0	4.2	69	10	7	21
STATE	43.8	21.7	32.8	2.9	69	10th	-3	7th

*Departure from normal is departure from the base period of 1981-2010, KSU Weather Data Library.

The maps in Figure 4 below summarize temperature for the month. (State maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library. State weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.) Some maps obtained from the High Plains Regional Climate Center, ACIS system.

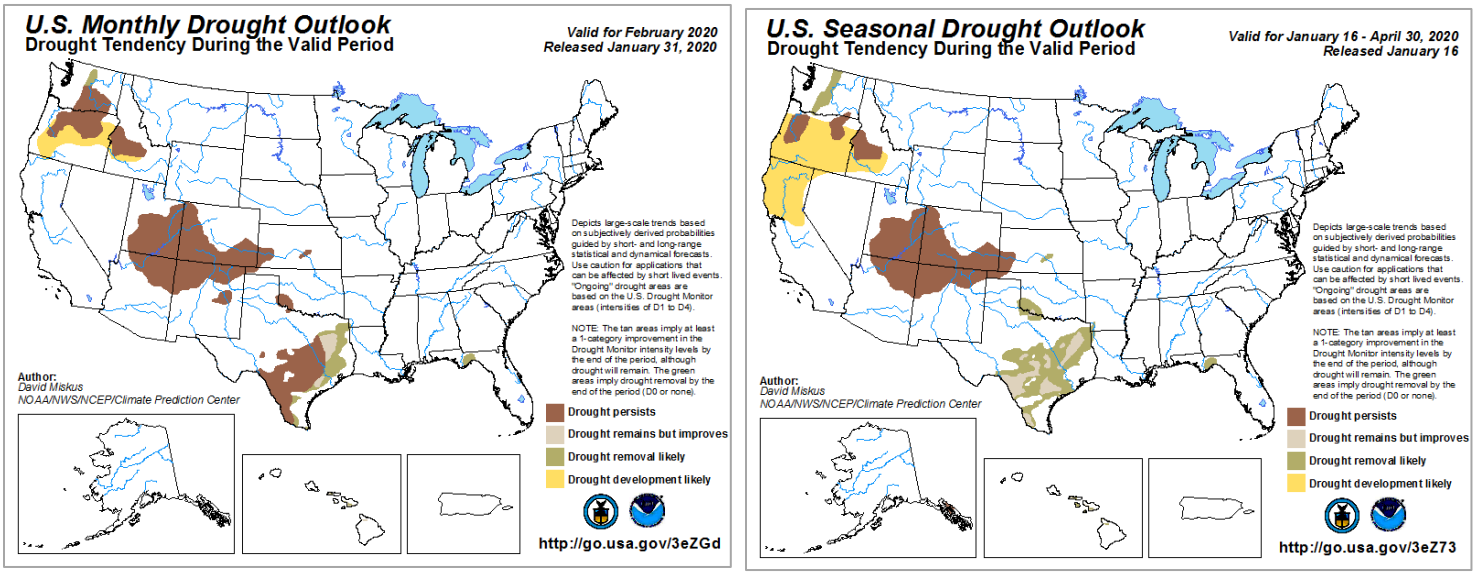
Figure 4. Monthly Temperature Maps



Outlooks

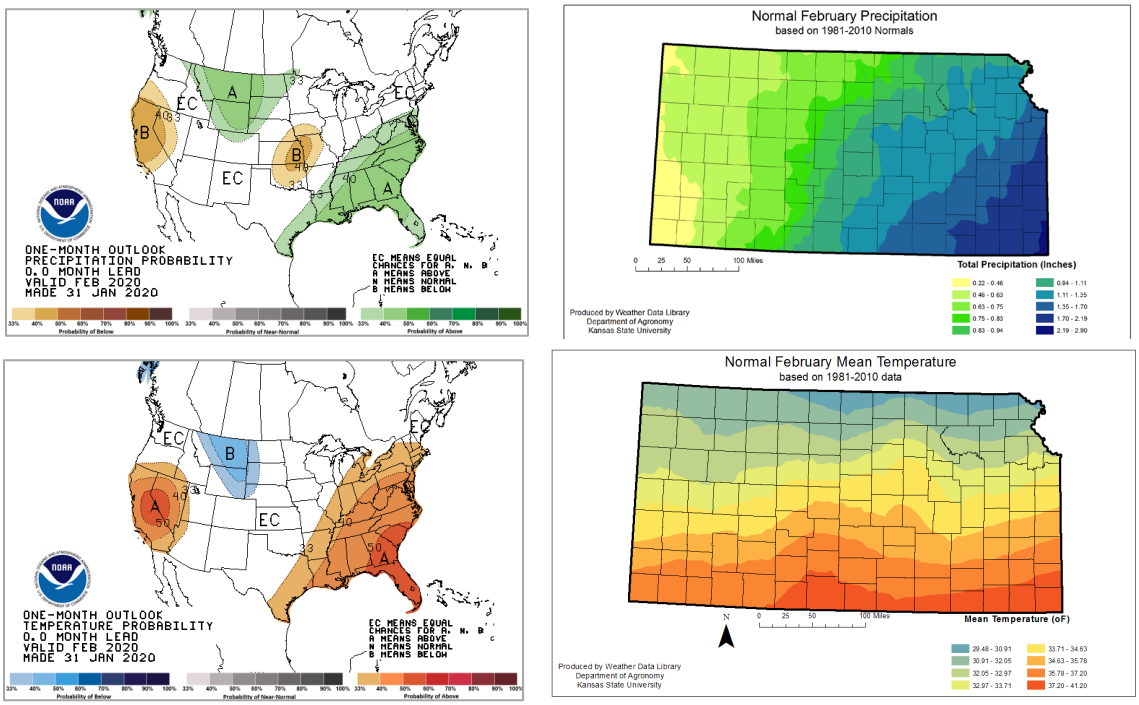
The Monthly Drought Outlook issued January 31, 2020 indicates drought conditions in southwest and a small area of central Kansas to persist. The Seasonal Outlook (3-month) favors the area of drought in southwest Kansas persisting in the late-January through April period with the removal of drought in the small central area. The individual temperature and precipitation outlooks that contribute to these outlooks are available below.

Figure 5. Drought Outlooks



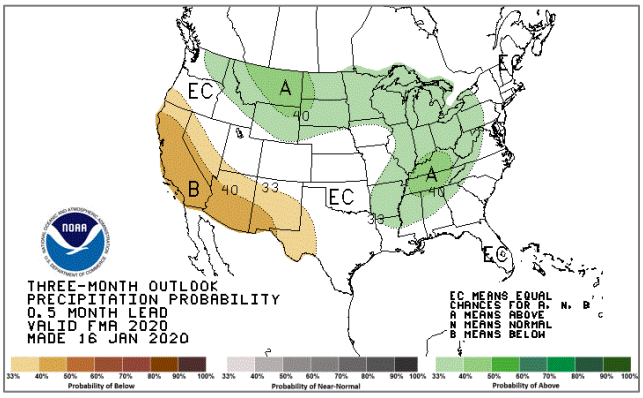
The monthly precipitation outlook is neutral with equal chances of below, near or above normal precipitation in western Kansas, and increased chances of drier than normal conditions in the east. The temperature outlook indicates equal chances of below, near and above normal temperatures across the state, except for the south east where above normal is favored. One month outlooks are provided in Figure 6.

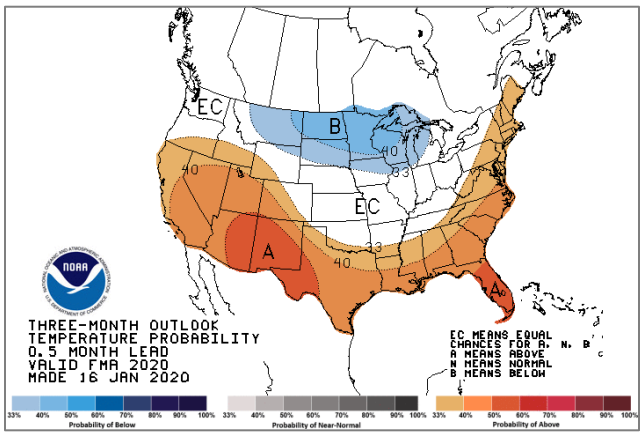
Figure 6. Next Month Precipitation and Temperature Outlooks

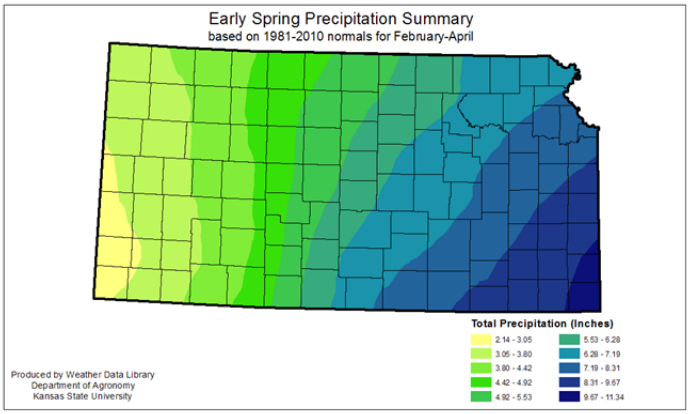


The U.S. three month outlook for February through April suggests equal chances of above, normal or below -average precipitation and temperatures for the state.

Figure 7. Three Month Precipitation and Temperature Outlooks







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 Supply

Reservoir Storage

Table 3 provides conservation pool status for each federal reservoir.

Table 3. Kansas Federal Reservoir Conservation Pool Levels-January 31, 2020

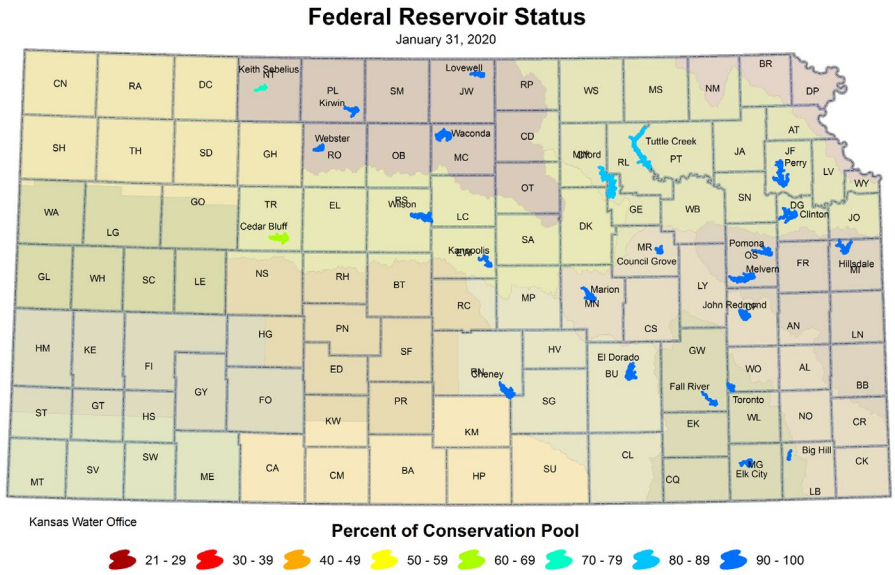
	Current Conditions		Multipurpose /Conservation Pool			
Reservoir	Pool Elevation (Feet MSL)	Storage (Acre-Feet)	Top of Pool (Feet MSL)	Conservation Storage (Acre-Feet)	Change from Top of Pool (Feet)	Percent of Pool Full
Kansas River Basin						
Keith Sebelius Lake	2300.24	26,377	2304.3	34,510	-4.06	76.4%
Harlan County Lake NE	1945.96	317,157	1945.73	314,112	0.23	100.0%
Lovewell Reservoir	1582.13	34,283	1582.6	35,666	-0.47	96.1%
Webster Reservoir	1892.46	76,209	1892.45	76,171	0.01	100.0%
Kirwin Reservoir	1729.15	97,658	1729.25	98,169	-0.10	99.5%
Waconda Lake	1454.65	207,695	1455.6	219,469	-0.95	94.6%
Cedar Bluff Reservoir	2133.83	111,584	2144	172,452	-10.17	64.7%
Kanopolis Lake	1462.63	47,287	1463	48,378	-0.37	97.7%
Wilson Lake	1515.29	236,178	1516	242,528	-0.71	97.4%
Milford Lake	1141.46	329,766	1144.4	373,152	-2.94	88.4%
Tuttle Creek Lake	1071.68	222,904	1075	257,014	-3.32	86.7%
Perry Lake	890.00	184,944	891.5	200,004	-1.50	92.5%
Clinton Lake	875.59	119,355	875.5	118,699	0.09	100.0%
Melvern Lake	1035.23	142,723	1036	147,972	-0.77	96.5%
Pomona Lake	973.08	51,916	974	55,514	-0.92	93.5%
Hillsdale Lake	916.64	75,700	917	77,415	-0.36	97.8%
Arkansas River Basin						
Marion Reservoir	1350.59	81,236	1350.5	80,659	0.09	100.0%
Council Grove Lake	1274.02	44,041	1274	43,984	0.02	100.0%
John Redmond Reservoir	1041.90	69,580	1041	62,611	0.90	100.0%
Toronto Lake	901.59	16,728	901.5	16,528	0.09	100.0%
Fall River Lake	952.01	28,704	948.5	20,690	3.51	100.0%
Elk City Lake	797.03	41,222	796	37,422	1.03	100.0%
Big Hill Lake	858.33	23,732	858	23,361	0.33	100.0%
Cheney Reservoir	1422.09	171,762	1421.6	167,074	0.49	100.0%
El Dorado Lake	1339.17	160,005	1339	158,630	0.17	100.0%

[1]Source: U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and U.S. Geological Survey

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.

In Figure 8 illustrates status of Conservation Pool storage at the federal reservoirs.

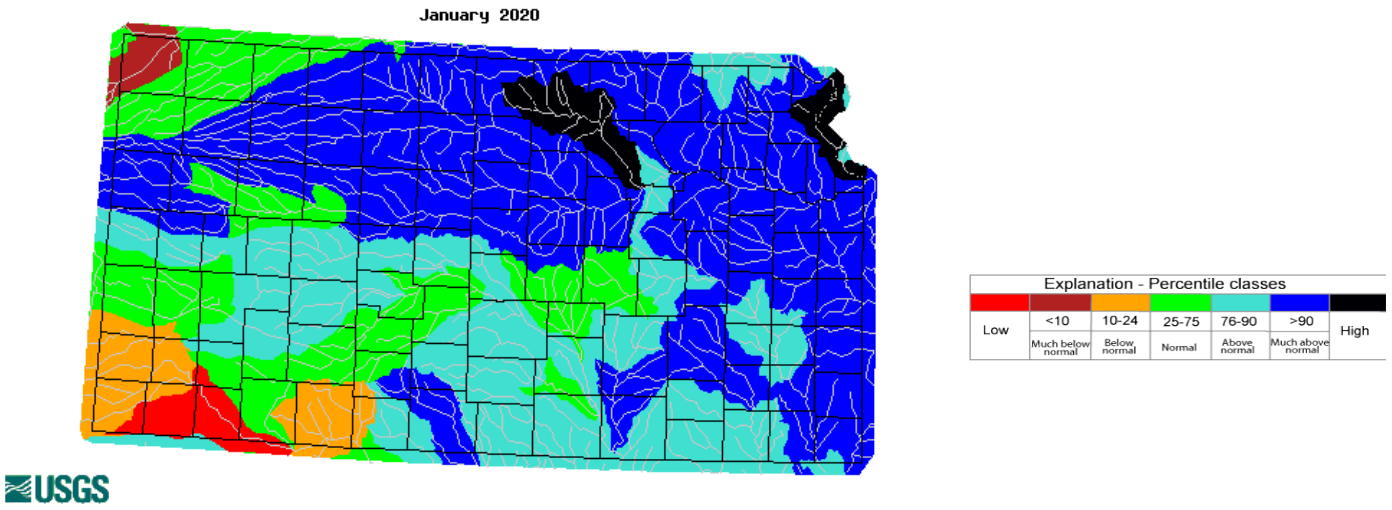
Figure 8. Reservoir Storage



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. A summary of flooding in is found later in this report. Figure 9 summarizes streamflow.

Figure 9. Monthly streamflow compared to historical streamflow



Minimum Desirable Streamflow: Low flows may be reflected at gage locations when the flow does not reach Minimum Desirable Streamflow (MDS). MDS requirements are in place to ensure base flows in certain streams to protect existing water rights and to meet in-stream water uses related to water quality, fish and wildlife and recreation. The Kansas Department of Agriculture, Division of Water Resources monitors 23 streams and rivers at 33 locations for minimum desirable streamflow. When flows drop below an established threshold, pumping restrictions are imposed on permits or water rights granted after the minimum desirable streamflow provision was made into law in 1984.

Although no water right administration was in effect in this month, the table below notes locations of concern including those below MDS.

Table 4.
Streamflows of Note

Gaging Station	Jan 6 Flow	Jan 13 Flow	Jan 20 Flow	Jan 27 Flow	Jan MDS	Comment
Rattlesnake Creek near Macksville	6	5.2	5	5.2	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	22	ice	25.5	Eqip	15	
South Fork Ninnescah River near Pratt	12	12	12.4	12.4	10	No surface water diversions junior to MDS above gage

Vegetation, Soil Moisture and Crops

Vegetative Conditions

The Vegetative Condition map depicts vegetation stress. It is produced using satellite data by the National Drought Mitigation Center https://vegdri.unl.edu/Home.aspx and often customized for Kansas by the Kansas Biological Survey in the GreenReport. December is out of season for the vegetative conditions, so is not part of this report.

Soil Moisture and Rangeland

The Climate Prediction Center (CPC), monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The monthly soil anomaly is shown in Figure 10. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml).

Within Kansas soil moisture is now being measured through the Kansas Mesonet and Kansas State University the percent of soil saturation (representative of grassland vegetation) is shown in Figure 10. (http://mesonet.k-state.edu/agriculture/soilmoist/)

Figure 10.

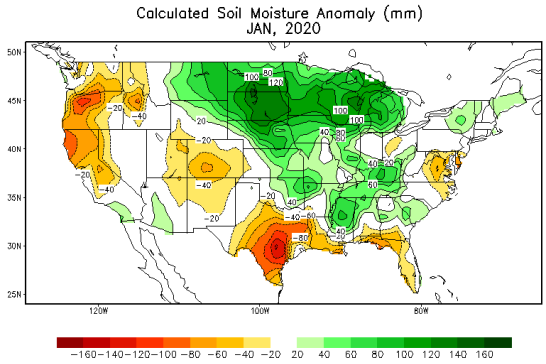
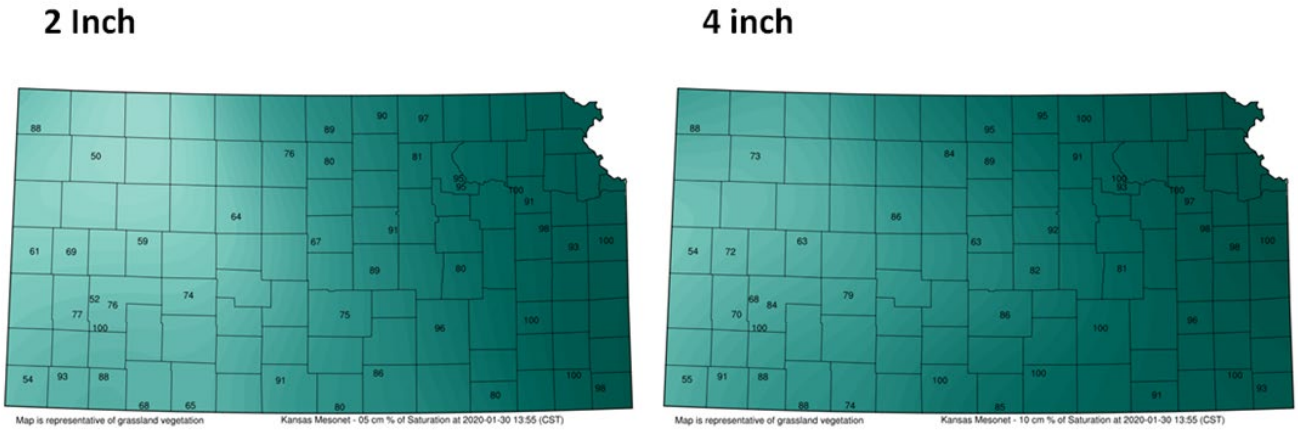


Figure 11. Percent of Soil Saturation as of January 30, 2020



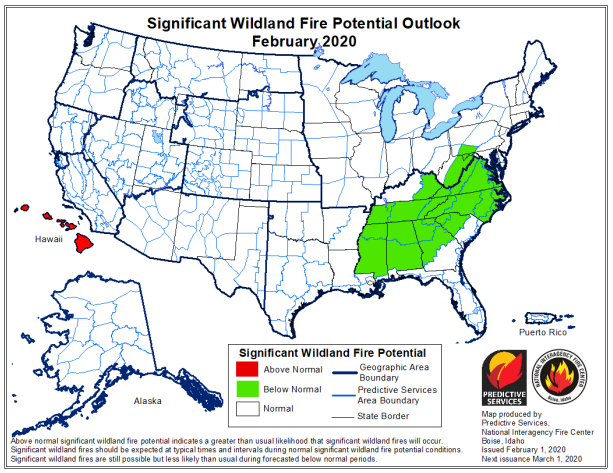
The National Agricultural Statistics Service, USDA Crop Progress and Condition provides a summary of the climatic effects on soil and crops. For the month of January 2020, topsoil moisture supplies rated 10 percent very short, 22 short, 54 adequate, and 14 surplus, according to the USDA's National Agricultural Statistics Service. Subsoil moisture supplies rated 9 percent very short, 23 short, 59 adequate, and 9 surplus.

Field Crops Report:
Winter wheat condition rated 8 percent very poor, 15 poor, 43 fair, 31 good, and 3 excellent.

Fire

The National Weather Service issues Red Flag Warnings when conditions favoring wildfire are at an increased risk. These are issued daily when needed. A Significant Wildland Fire Potential Outlook is issued monthly for the United States. Figure 12 is the most recent outlook for possible wildfires tor the next month. Additional forecasts can be found at https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .

Figure 12. Wildfire Outlook



Disaster Designations 2020

A total of 70 Kansas counties were identified in Federal Emergency Declarations in 2019, due to storms, winds, tornadoes, flooding, landslides and mudslides. The President's action makes federal funding available to state, eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency work and repair or replacement of facilities in those counties. At the beginning of 2020 many Kansas communities have applied for assistance are waiting for their funds. .

Federal funding is also available on a cost-sharing basis for hazard mitigation measures statewide. Some additional counties may be eligible for federal declaration and aid in the future once damage assessment is completed by FEMA.

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. Mary Knapp, at the Kansas Climate Office, Weather Data Library is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at such as precipitation, temperature, evapotranspiration (ET), soil moisture and more 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 for 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 National Drought Mitigation Center also produces VegDRI maps which 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
Monthly Weather Summary

January 2020
Summary

Station[1]	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
	Total	Departure[2]	Percent Normal	Mean	Departure[2]	Highest	Lowest
West							
Burlington, CO	0.32	-0.06	84%	33.7	4.3	62 (17)	2 (11,10)
Dodge City	1.00	0.42	172%	35.6	3.4	62 (8)	10 (11)
Garden City	0.35	0.01	103%	34.1	3.2	58 (22,7)	8 (11)
Goodland	0.40	0.02	105%	33.0	3.4	61 (17)	0 (11)
Guymon, OK	1.20	0.80	300%	39.4	3.8	69 (14)	12 (11)
Hill City	0.47	0.02	104%	32.8	3.5	58 (26,4)	7 (11)
Lamar, CO	0.17	-0.13	57%	34.3	5.4	67 (14)	-2 (11)
McCook, NE	0.29	-0.22	57%	31.8	4.6	60 (4)	0 (11)
Springfield, CO	0.11	-0.26	30%	35.6	3.4	69 (14)	3 (11)
Central							
Concordia	1.17	0.59	202%	32.0	3.4	57 (8)	6 (21)
Hebron, NE				28.9	3.3	52 (7)	3 (21)
Medicine Lodge	1.11	0.42	161%	36.7	3.3	61 (26)	15 (11)
Ponca City, OK	1.40	0.40	140%	40.8	5.9	69 (9)	18 (20)
Salina	0.98	0.35	156%	33.5	2.5	59 (7)	10 (21)
Wichita (ICT)	2.37	1.54	286%	36.5	4.3	61 (9)	15 (21)
East							
Bartlesville, OK	3.26	1.64	201%	39.1	4.1	65 (10,9)	16 (21)
Chanute	2.51	1.25	199%	38.0	5.4	67 (10)	12 (21)
Falls City, NE	0.79	0.14	122%	28.8	2.3	57 (9)	2 (21)
Johnson Co. Exec. Apt	1.45	0.33	129%	32.4	2.3	64 (9)	7 (21)
Joplin, MO	3.66	1.63	180%	39.0	4.1	68 (10)	15 (21,20)
Kansas City (MCI), MO	2.00	1.73	741%	32.3	3.5	66 (9)	4 (21)
St. Joseph, MO	1.45	0.89	259%	30.5	3.3	63 (9)	0 (21)
Topeka (TOP)	1.64	0.78	191%	33.4	3.7	63 (9)	7 (21)

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 UPDATE
February 2020 Summary

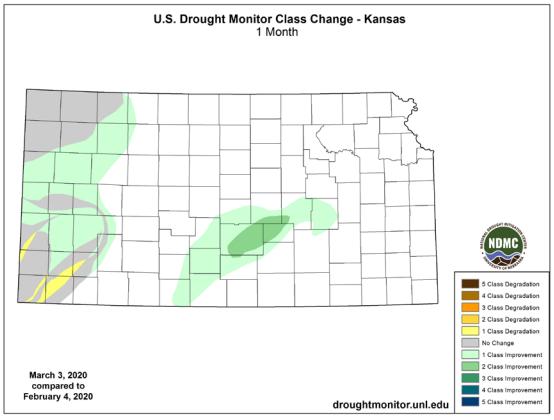
Highlights

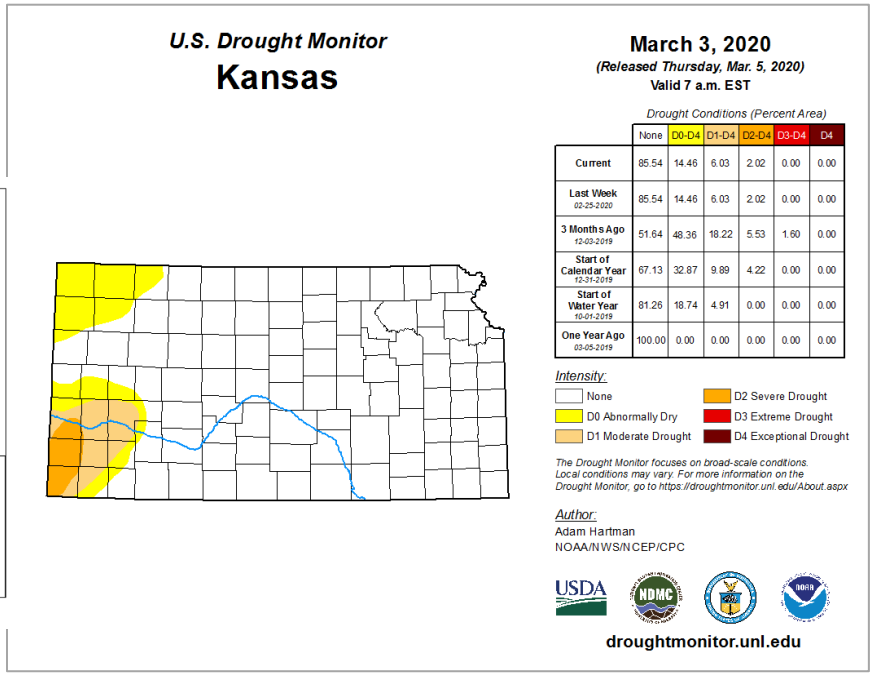
- U.S. Drought Monitor indicated continuing areas of abnormally dry (D0), moderate drought (D1), severe drought (D2) and moderate drought (D3) in western and south central Kansas conditions though February although, some drought was removed from central/south central Kansas by the end of February.
- Statewide February precipitation was 1.19 inches, 114 percent of normal, 33rd wettest February.
- Statewide February temperatures averaged 0.9°F cooler than normal, 66th warmest February.
- March outlook: increased chance of above normal temperatures; below normal precipitation in the west.
- Drought Outlook favors drought continuing for the current area of drought in extreme western Kansas.

General Drought Conditions

The U.S. Drought Monitor indicated dry and drought conditions in parts of western and central Kansas at the beginning of the month. All drought was erased from the central and south central parts of the state. However, severe drought remains in the Southwest, and abnormally dry conditions remain in the Northwest. The condition at the end of the month is shown below in Figure 1. Change in drought classification over the month is also shown.

Figure 1. U.S. Drought Monitor Maps of Drought status

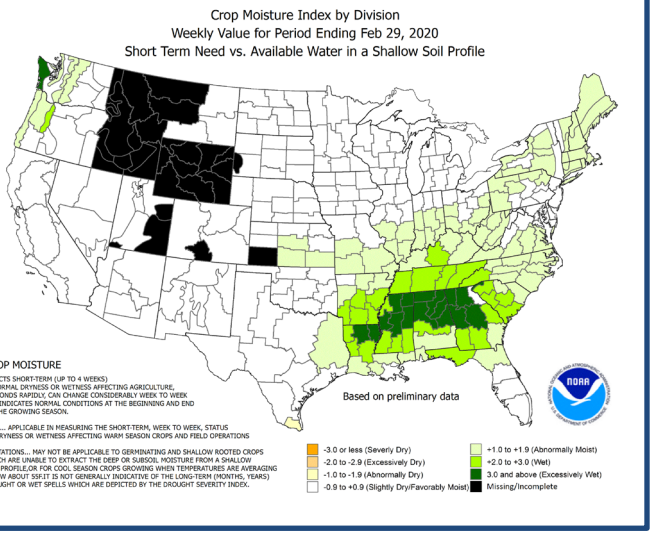




More information can be found on the U.S. Drought Monitor web site https://droughtmonitor.unl.edu/ .

Palmer Drought Severity Index (PDSI) - The Palmer Drought Severity Index is an indicator of relative dryness or wetness and is one factor used the U.S. Drought Monitor. The Crop Moisture (Figure 2) component evaluates short term needs and available water. More information on the PDSI and its parts can be found at http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml.

Figure 2.



Climate Summary - Precipitation

A series of storms crossed the state in February, with a southerly track to the systems. Statewide average precipitation for the month was 1.19 inches, 114 percent of normal. This ranks as the 33rd wettest February in the 126-year record. Not all divisions were wet, however. The North Central Division was the driest, with an average of 0.25 inches, 29 percent of normal. The Southeast had the highest average precipitation at 2.32 inches, 129 percent of normal. The highest 24-hour rainfall total for a National Weather Service Cooperative station was 3.50 inches at Garnett 1E, Anderson County, on the 13th. The greatest 24-hour rainfall total for a Community Collaborative Rain, Hail and Snow network station was 3.55 inches at Lyons 4.2 WNW, Rice County, on the 24th. The greatest monthly precipitation totals for January: 6.61 inches at Garnett 1E, Anderson County (NWS); 4.96 inches at Sterling 0.5 NNW (CoCoRaHS). The Garnett daily rainfall for the 13th also set a new February daily record for the location. Snowfall was mixed, with the highest amounts reported in North Central, KS. Thirteen new daily record snowfall amounts were reported during the month. Table 1 summarizes the monthly precipitation (KSU Weather Data Library).

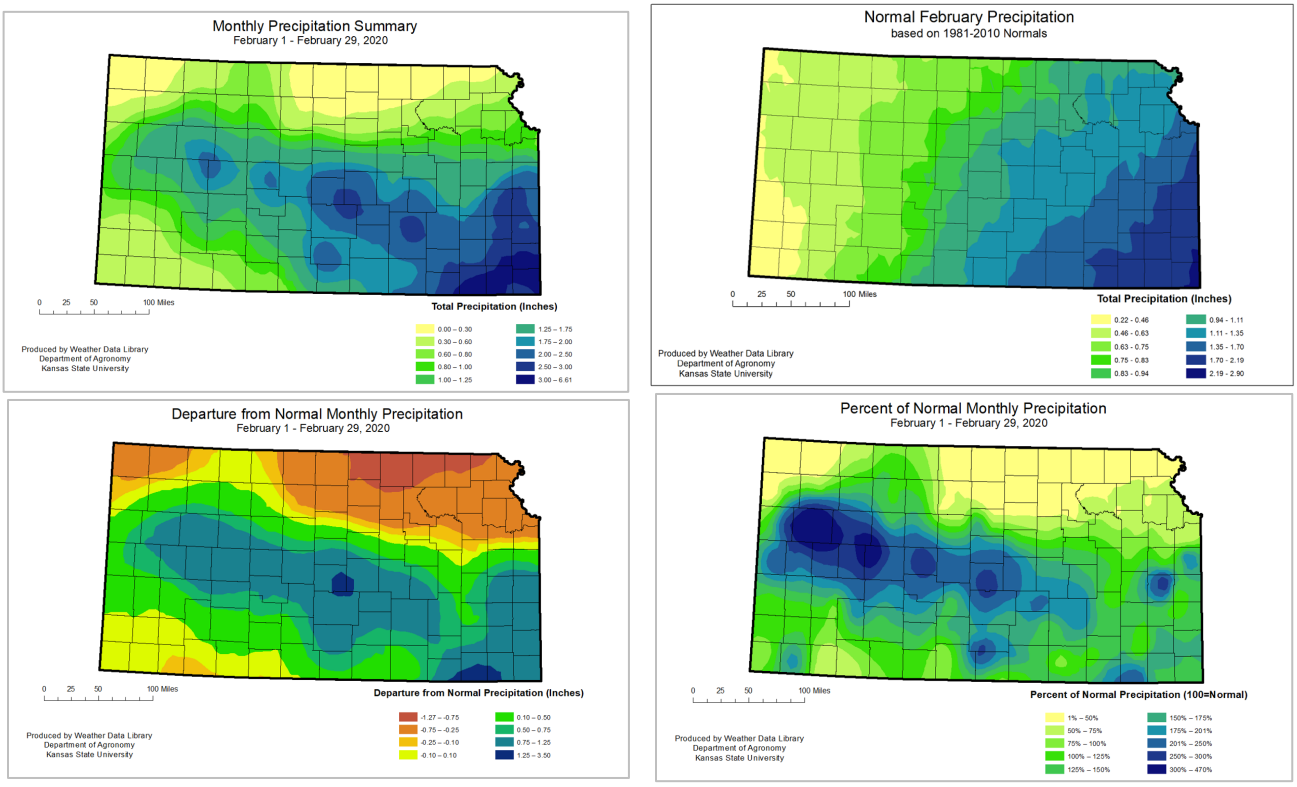
Table 1.

Kansas Climate Division Precipitation Summary (inches)

Climate Division	February 1 - 29, 2020			Jan. 1 – Feb. 29, 2020			April 1, 2019 – Feb. 29, 2020			Sept 1, 2019 – Feb. 29, 2020		
	Actual	Depart Normal*	% of Normal	Actual	Depart Normal*	% of Normal	Actual	Depart Normal*	% of Normal	Actual	Depart Normal*	% of Normal
Northwest	0.34	-0.22	61	0.74	-0.26	74	24.38	4.19	121	3.93	-1.58	71
West Central	1.34	0.72	216	1.83	0.72	165	21.2	1.82	109	4.94	-0.64	89
Southwest	0.73	0.16	128	1.74	0.71	169	18.44	-0.11	99	4.24	-1.25	77
North Central	0.25	-0.62	29	1.20	-0.28	81	33.19	7.15	127	7.66	-0.55	93
Central	1.57	0.52	150	2.84	1.11	164	34.94	7.87	129	8.06	-0.48	94
South Central	1.78	0.56	146	3.46	1.43	170	39.85	11.13	139	10.98	1.10	111
Northeast	0.48	-0.69	41	1.55	-0.40	79	43.12	10.38	132	9.92	-1.37	88
East Central	1.43	0.03	102	3.45	1.14	149	49.18	13.87	139	11.93	-0.69	95
Southeast	2.32	0.52	129	4.67	1.66	155	57.99	19.48	151	15.95	0.86	106
STATE	1.19	0.15	114	2.49	0.74	142	35.74	8.44	131	8.72	-0.42	95

The maps of Figure 3 below summarize precipitation for the month. (State maps by KSU are based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library. State weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.)

Figure 3. Monthly Precipitation maps



Climate Summary-Temperature

Temperatures for February were slightly cooler than normal. Statewide average temperature for the month was 33.5 oF, which is 0.6 degrees cooler than normal. This ranks as the 66th warmest February on record, right in the middle of the distribution. The North Central Division had the warmest departure with an average of 32.9 oF, 0.6 degrees warmer than normal. The West Central Division had the coldest departure, with an average of 31.2 oF, 2.0 degrees cooler than normal. The coldest readings were in the eastern divisions, with subzero readings in all three divisions. The remaining divisions all had lowest minimums below zero or in the single digits. The warmest maximum temperature was 84 oF Atwood, Rawlins County, on the 3rd. The coldest minimum temperature was -5 oF at Horton, Brown County, on the 15th and at Osage City, Osage County on the 14th. There were 48 daily record high maximum temperatures, all on the 2nd or 3rd of the month. There were 27 new record low maximums. On the low temperature side of the scale, there were 8 record high minimum temperatures and 21 record low minimums. Table 2 summarizes the monthly temperatures (KSU Weather Data Library).

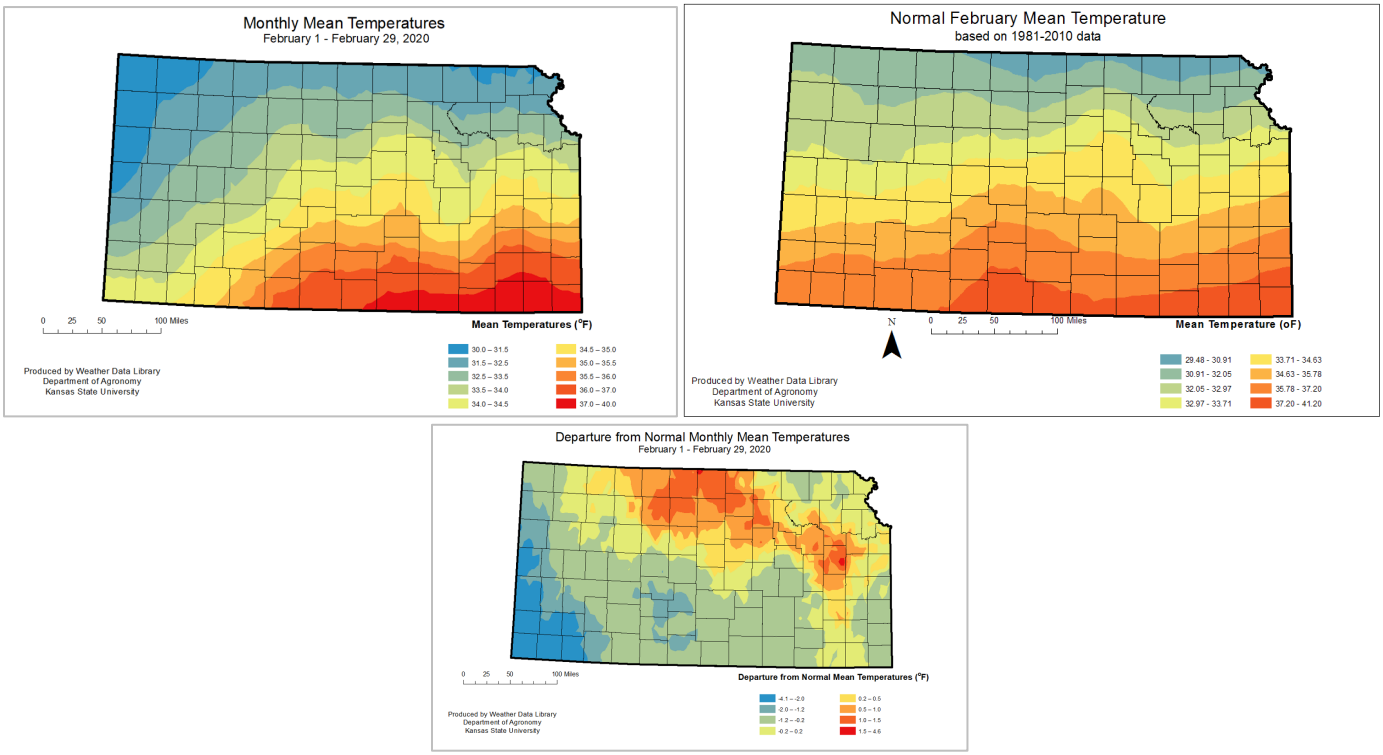
Table 2.

Climate Division	Kansas Climate Division Temperature Summary (ºF) February 2020							
	Maximum	Minimum	Average	Departure*	High	Date	Low	Date
Northwest	44.8	17.1	31.0	-0.8	84	3	-3	20
West Central	44.4	18.0	31.2	-2.0	82	3	-1	5
Southwest	47.3	21.9	34.6	-1.2	78	3	5	13
North Central	45.4	20.4	32.9	0.6	77	3	0	14
Central	46.5	22.2	34.4	0.1	81	3	0	14
South Central	47.6	24.3	35.9	-0.7	80	2	7	14
Northeast	43.4	19.9	31.7	-0.8	69	3	-5	14
East Central	45.2	22.4	33.8	-0.1	73	3	-5	14
Southeast	46.8	25.3	36.0	-0.7	79	3	-1	14
STATE	45.7	21.3	33.5	-0.6	84	3rd	-5	14th

*Departure from normal is departure from the base period of 1981-2010, KSU Weather Data Library.

The maps in Figure 4 below summarize temperature for the month. (State maps based on data from the Cooperative Observer and Kansas Mesonet, and provided by KSU Weather Data Library. State weekly maps of precipitation information can be accessed at http://climate.k-state.edu/maps/weekly/.) Some maps obtained from the High Plains Regional Climate Center, ACIS system.

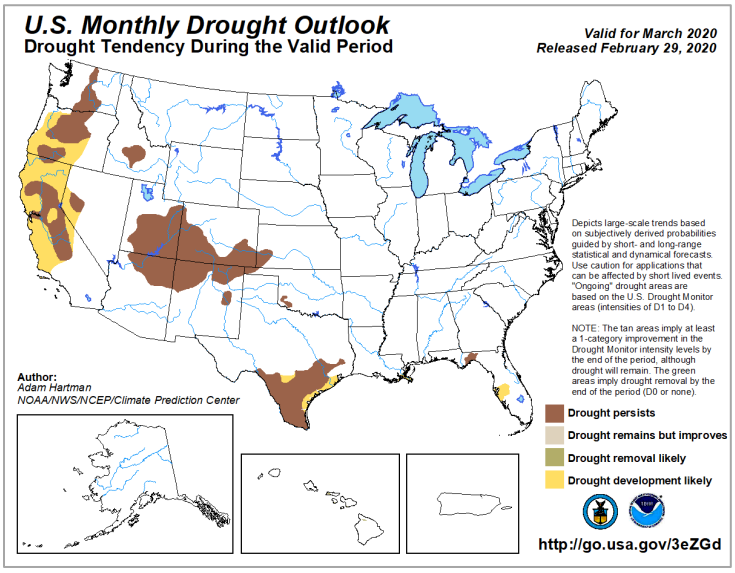
Figure 4. Monthly Temperature Maps

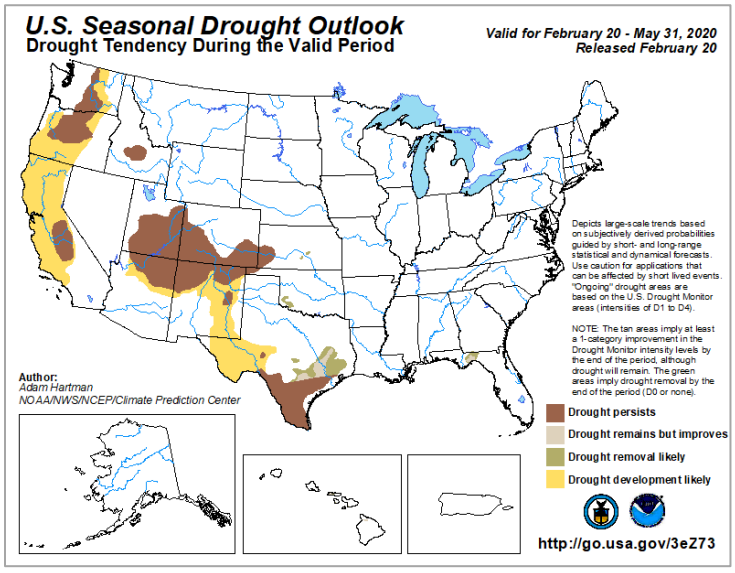


Outlooks

The Monthly Drought Outlook issued February 29, 2020 indicates drought conditions in southwest Kansas to persist. The Seasonal Outlook (3-month) favors the area of drought in southwest Kansas through May with the removal of the remaining small central area of drought. The individual temperature and precipitation outlooks that contribute to these outlooks are available below.

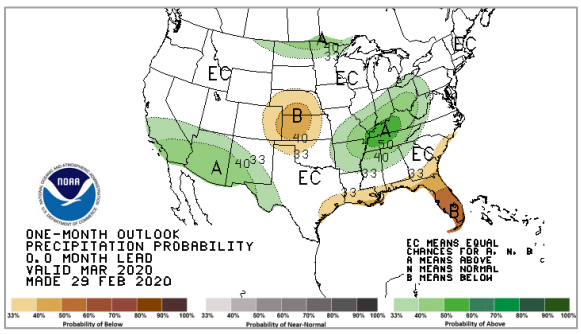
Figure 5. Drought Outlooks

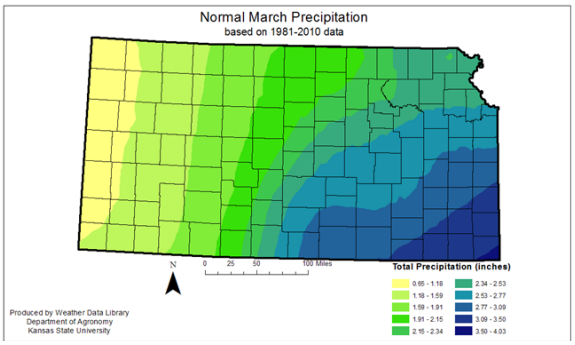


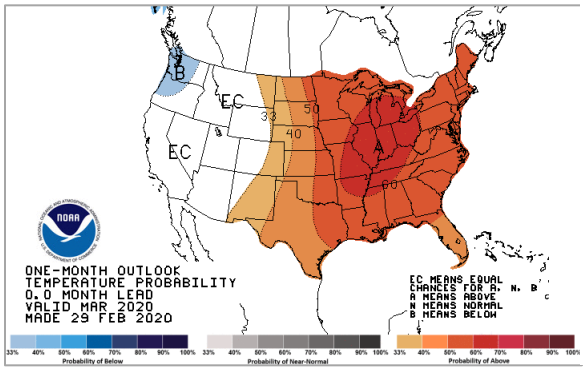


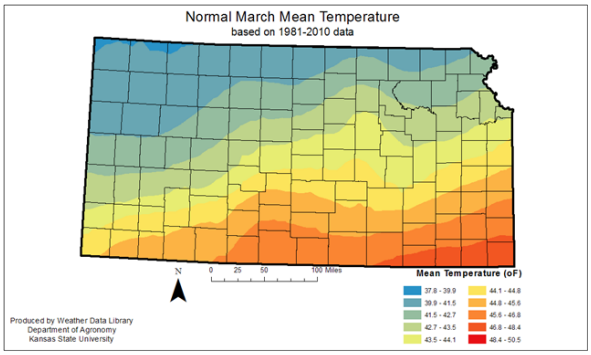
The March precipitation outlook is shows an increased chance of below normal precipitation across all but the eastern areas of the state, where equal chances prevail. The temperature outlook favors above normal temperatures across the state. One month outlooks are provided in Figure 6.

Figure 6. Next Month Precipitation and Temperature Outlooks



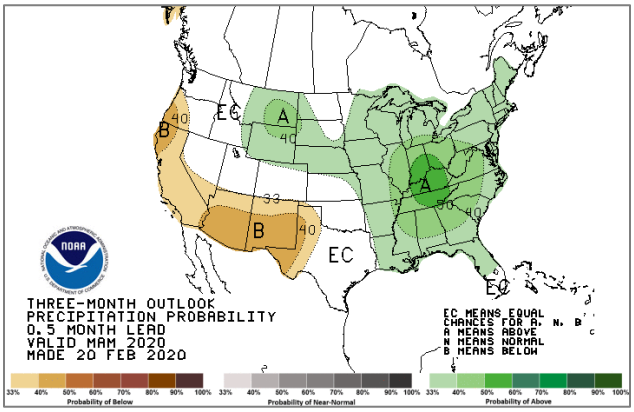


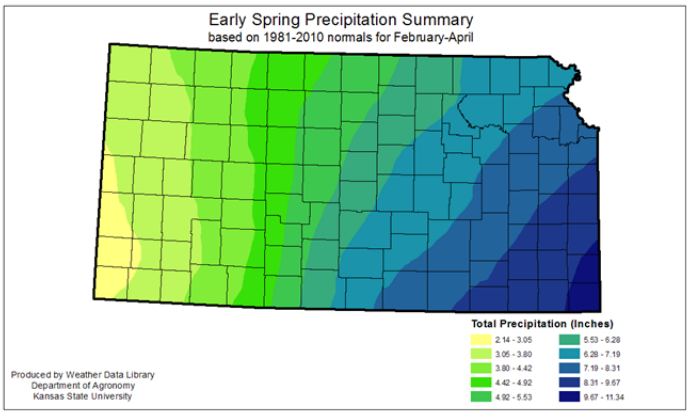


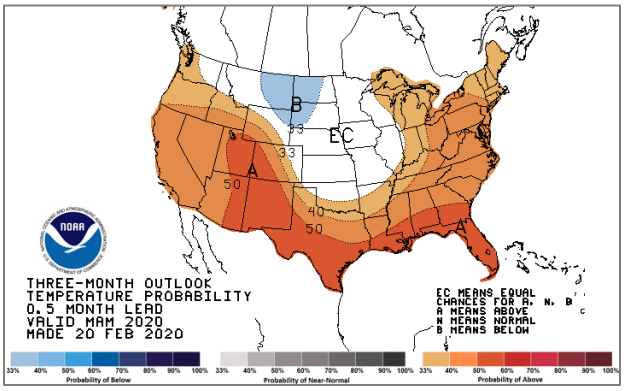


The U.S. three month outlook for February through April suggests equal chances of above, normal or below -average precipitation and temperatures for the state.

Figure 7. Three Month Precipitation and Temperature Outlooks







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 Supply

Reservoir Storage

Table 3 provides conservation pool status for each federal reservoir.

Table 3. Kansas Federal Reservoir Conservation Pool Levels-March 4, 2020

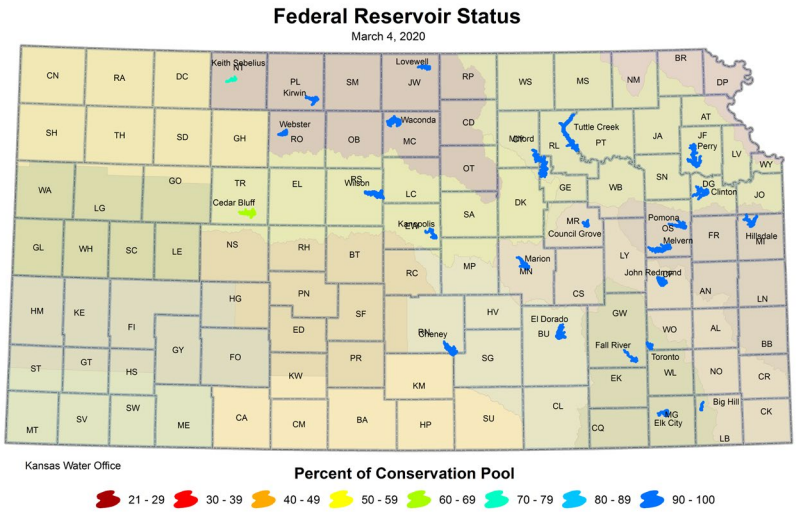
	Current Conditions		Multipurpose /Conservation Pool			
Reservoir	Pool Elevation (Feet MSL)	Storage (Acre-Feet)	Top of Pool (Feet MSL)	Conservation Storage (Acre-Feet)	Change from Top of Pool (Feet)	Percent of Pool Full
Kansas River Basin						
Keith Sebelius Lake	2300.53	26,910	2304.3	34,510	-3.77	78.0%
Harlan County Lake NE	1945.93	316,760	1945.73	314,112	0.20	100.0%
Lovewell Reservoir	1581.34	32,039	1582.6	35,666	-1.26	89.8%
Webster Reservoir	1892.50	76,360	1892.45	76,171	0.05	100.0%
Kirwin Reservoir	1729.11	97,453	1729.25	98,169	-0.14	99.3%
Waconda Lake	1454.60	207,090	1455.6	219,469	-1.00	94.4%
Cedar Bluff Reservoir	2134.31	114,024	2144	172,452	-9.69	66.1%
Kanopolis Lake	1462.42	46,667	1463	48,378	-0.58	96.5%
Wilson Lake	1515.23	235,641	1516	242,528	-0.77	97.2%
Milford Lake	1141.49	330,190	1144.4	373,152	-2.91	88.5%
Tuttle Creek Lake	1077.98	291,430	1075	257,014	2.98	100.0%
Perry Lake	889.93	184,267	891.5	200,004	-1.57	92.1%
Clinton Lake	875.72	120,302	875.5	118,699	0.22	100.0%
Melvern Lake	1034.35	136,967	1036	147,972	-1.65	92.6%
Pomona Lake	972.94	51,382	974	55,514	-1.06	92.6%
Hillsdale Lake	915.46	70,290	917	77,415	-1.54	90.8%
Arkansas River Basin						
Marion Reservoir	1350.64	81,557	1350.5	80,659	0.14	100.0%
Council Grove Lake	1272.73	40,433	1274	43,984	-1.27	91.9%
John Redmond Reservoir	1042.46	74,955	1041	62,611	1.46	100.0%
Toronto Lake	902.18	18,063	901.5	16,528	0.68	100.0%
Fall River Lake	951.89	28,412	948.5	20,690	3.39	100.0%
Elk City Lake	797.72	43,842	796	37,422	1.72	100.0%
Big Hill Lake	858.12	23,496	858	23,361	0.12	100.0%
Cheney Reservoir	1421.75	168,499	1421.6	167,074	0.15	100.0%
El Dorado Lake	1339.12	159,601	1339	158,630	0.12	100.0%

[1]Source: U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and U.S. Geological Survey

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.

In Figure 8 illustrates status of Conservation Pool storage at the federal reservoirs.

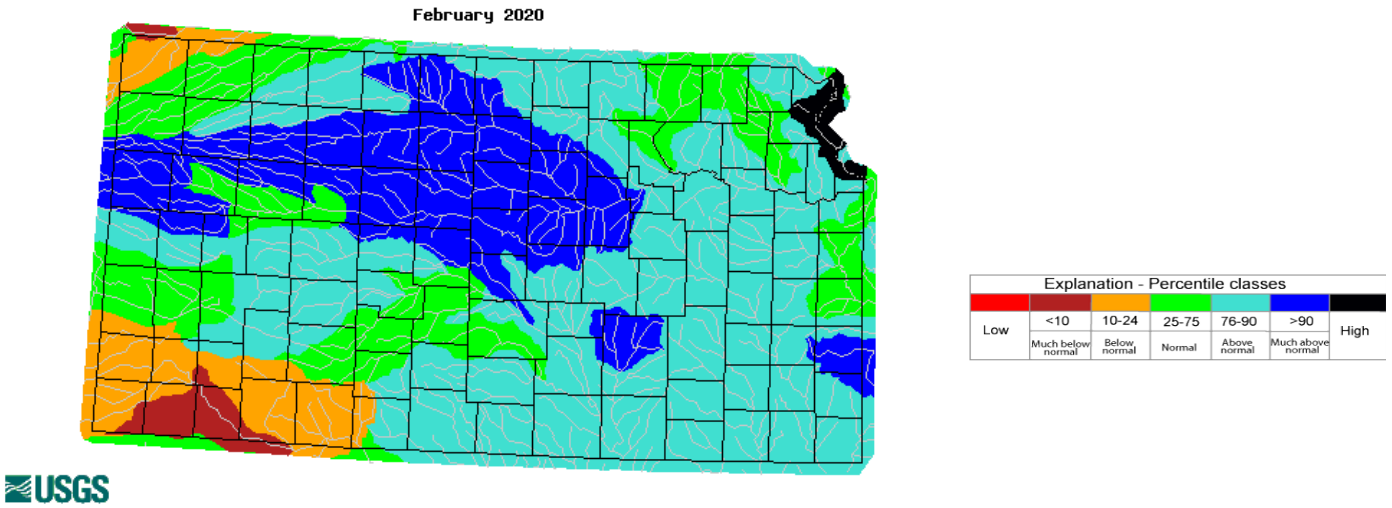
Figure 8. Reservoir Storage



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. A summary of flooding in is found later in this report. Figure 9 summarizes streamflow.

Figure 9. Monthly streamflow compared to historical streamflow



Minimum Desirable Streamflow: Low flows may be reflected at gage locations when the flow does not reach Minimum Desirable Streamflow (MDS). MDS requirements are in place to ensure base flows in certain streams to protect existing water rights and to meet in-stream water uses related to water quality, fish and wildlife and recreation. The Kansas Department of Agriculture, Division of Water Resources monitors 23 streams and rivers at 33 locations for minimum desirable streamflow. When flows drop below an established threshold, pumping restrictions are imposed on permits or water rights granted after the minimum desirable streamflow provision was made into law in 1984.

Although no water right administration was in effect in this month, the table below notes locations of concern including those below MDS.

Table 4.
Streamflows of Note

Gaging Station	Feb 3 Flow	Feb 10 Flow	Feb 18 Flow	Feb 24 Flow	Feb MDS	Comment
Rattlesnake Creek near Macksville	7	6.5	6	9	5	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	30	27	Eqp	42	15	
South Fork Ninnescah River near Pratt	13	13	13	21	10	No surface water diversions junior to MDS above gage

Vegetation, Soil Moisture and Crops

Vegetative Conditions

The Vegetative Condition map depicts vegetation stress. It is produced using satellite data by the National Drought Mitigation Center https://vegdri.unl.edu/Home.aspx and often customized for Kansas by the Kansas Biological Survey in the GreenReport. December is out of season for the vegetative conditions, so is not part of this report.

Soil Moisture and Rangeland

The Climate Prediction Center (CPC), monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The monthly soil anomaly is shown in Figure 10. (.http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml).

Within Kansas soil moisture is now being measured through the Kansas Mesonet and Kansas State University the percent of soil saturation (representative of grassland vegetation) is shown in Figure 10. (http://mesonet.k-state.edu/agriculture/soilmoist/)

Figure 10.

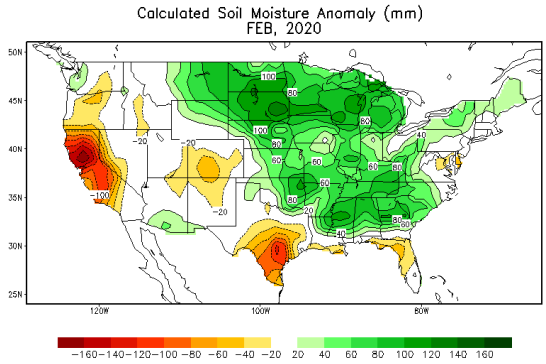
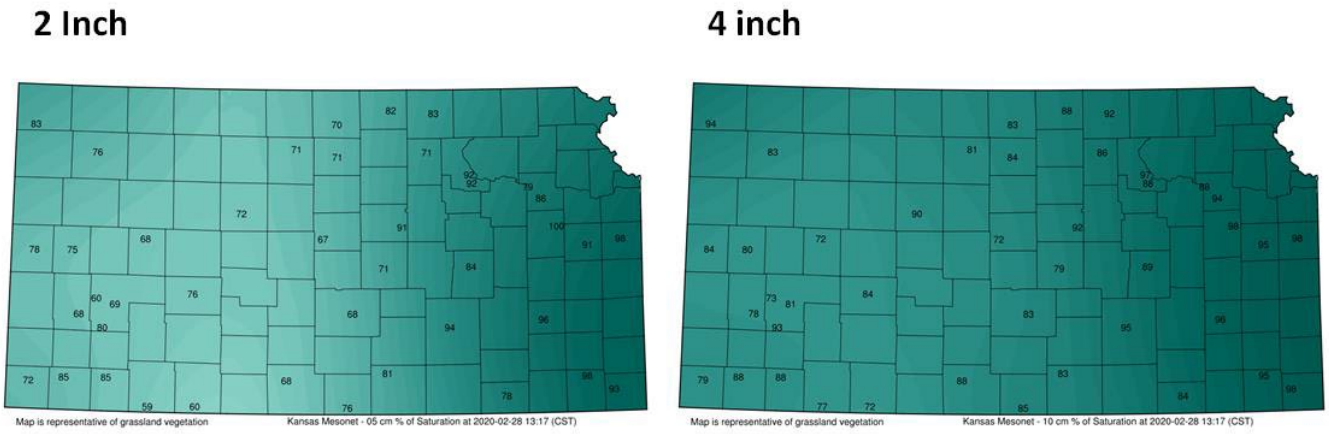


Figure 11. Percent of Soil Saturation as of February 28, 2020



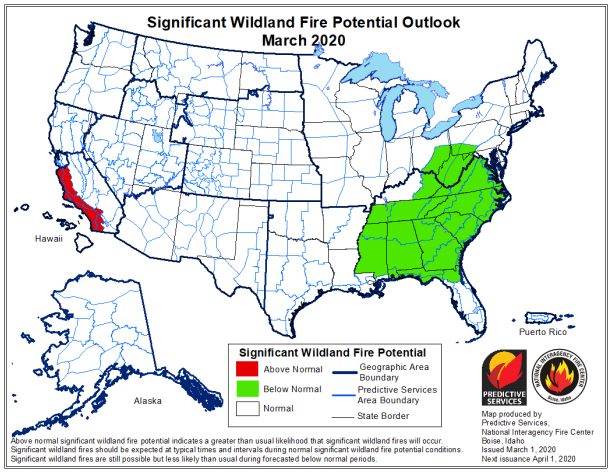
The National Agricultural Statistics Service, USDA Crop Progress and Condition provides a summary of the climatic effects on soil and crops. For the week ending March 2, 2020, topsoil moisture supplies rated 5 percent very short, 15 short, 64 adequate, and 16 surplus, according to the USDA's National Agricultural Statistics Service. Subsoil moisture supplies rated 7 percent very short, 13 short, 69 adequate, and 11 surplus.

Field Crops Report:
Winter wheat condition rated 3 percent very poor, 17 poor, 37 fair, 37 good, and 6 excellent.

Fire

The National Weather Service issues Red Flag Warnings when conditions favoring wildfire are at an increased risk. These are issued daily when needed. A Significant Wildland Fire Potential Outlook is issued monthly for the United States. Figure 12 is the most recent outlook for possible wildfires tor the next month. Additional forecasts can be found at https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf .

Figure 12. Wildfire Outlook



Disaster Designations 2020

A total of 70 Kansas counties were identified in Federal Emergency Declarations in 2019, due to storms, winds, tornadoes, flooding, landslides and mudslides. The President's action makes federal funding available to state, eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency work and repair or replacement of facilities in those counties. At the beginning of 2020 many Kansas communities have applied for assistance are waiting for their funds. Additional designations for 2019 storms have been made in 2020.

Federal funding is also available on a cost-sharing basis for hazard mitigation measures statewide. Some additional counties may be eligible for federal declaration and aid in the future once damage assessment is completed by FEMA.

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. Mary Knapp, at the Kansas Climate Office, Weather Data Library is the primary source of the narrative on weather. She works closely with meteorologists throughout the state and region. Details of current conditions at such as precipitation, temperature, evapotranspiration (ET), soil moisture and more 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)

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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.

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APPENDIX A
Monthly Weather Summary

February 2020 Summary	Precipitation (inches)			Temperature °F			
						Extreme (Date)	
Station[1]	Total	Departure[2]	Percent Normal	Mean	Departure[2]	Highest	Lowest
West							
Burlington, CO	0.06	-0.36	14%	31.6	0.0	77 (2)	-3 (5)
Dodge City	0.95	0.27	140%	36.2	0.3	74 (2)	8 (13)
Garden City	0.38	-0.16	70%	34.2	-0.6	77 (2)	7 (13)
Goodland	0.40	-0.09	82%	32.7	0.4	79 (2)	1 (20)
Guymon, OK	0.30	-0.17	64%	37.8	-0.8	80 (2)	14 (21)
Hill City	0.68	0.16	131%	34.7	1.8	83 (2)	4 (20)
Lamar, CO	0.20	-0.17	54%	32.7	-0.9	83 (2)	-1 (5)
McCook, NE	0.07	-0.55	11%	32.7	1.8	77 (2)	-3 (20)
Springfield, CO	2.93	2.23	419%	16.2	-1.9	46 (2)	-18 (5)
Central							
Concordia	0.18	-0.61	23%	36.1	3.4	71 (2)	4 (13)
Hebron, NE				33.3	3.7	69 (29)	1 (13)
Medicine Lodge	1.57	0.53	151%	37.7	-0.5	78 (2)	10 (21)
Ponca City, OK	1.12	-0.22	84%	40.5	0.8	77 (2)	13 (21,14)
Salina	1.39	0.22	119%	35.7	0.2	73 (2)	2 (14)
Wichita (ICT)	1.94	0.76	164%	37.4	0.2	76 (2)	9 (13)
East							
Bartlesville, OK	2.83	0.86	144%	39.9	0.1	77 (2)	12 (21,14)
Chanute	2.35	0.45	124%	39.0	1.5	74 (2)	9 (13)
Falls City, NE	0.08	-0.86	9%	31.8	0.9	64 (29)	0 (13)
Johnson Co. Exec. Apt	0.81	-0.76	52%	34.8	0.0	66 (2)	0 (14)
Joplin, MO	0.65	0.36	224%	51.5	7.2	66 (1)	33 (3)
Kansas City (MCI), MO	0.68	-0.78	47%	35.4	1.9	65 (2)	0 (14)
St. Joseph, MO	0.52	-0.41	56%	32.9	0.9	63 (29)	-5 (13)
Topeka (TOP)	0.82	-0.50	62%	35.1	0.7	72 (2)	1 (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
March 2020

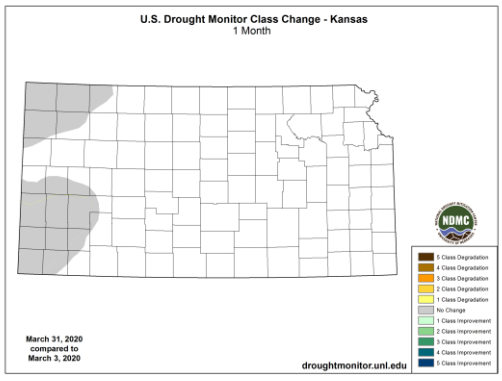
Highlights

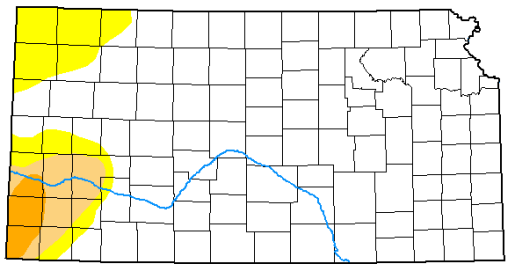
- U.S. Drought Monitor indicated continuing areas of abnormally dry (D0), moderate drought (D1), severe drought (D2) in parts of western Kansas.
- Statewide March precipitation was generally above average, ranking 94 out of 126.
- Statewide March temperatures were above average, ranking 111 out of 126.
- April outlook: slight chance of above normal temperature or equal chance above/below normal; slight chance of above normal precipitation or equal chance above/below normal.
- Drought Outlook favors long-term reduction or removal of drought from the state.

General Drought Conditions

The U.S. Drought Monitor indicated dry and drought conditions in parts of western Kansas at the beginning of the month. There has been no change in drought or dry conditions over the month of March. The condition at the end of the month is shown below in Figure 1. Change in drought classification over the month is also shown.

Figure 1. U.S. Drought Monitor Maps of Drought status





U.S. Drought Monitor
Kansas

March 31, 2020
(Released Thursday, Apr. 2, 2020)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	85.54	14.46	6.04	2.02	0.00	0.00
Last Week 03-24-2020	85.54	14.46	6.03	2.02	0.00	0.00
3 Months Ago 12-31-2019	67.13	32.87	9.89	4.22	0.00	0.00
Start of Calendar Year 12-31-2019	67.13	32.87	9.89	4.22	0.00	0.00
Start of Water Year 10-01-2019	81.26	18.74	4.91	0.00	0.00	0.00
One Year Ago 04-02-2019	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:
None
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. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
David Simeral
Western Regional Climate Center

droughtmonitor.unl.edu

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

Climate Summary

Figure 2 and Figure 3 below summarize observed precipitation and temperature, respectively, for the month using the PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

Figure 2. Monthly Precipitation maps

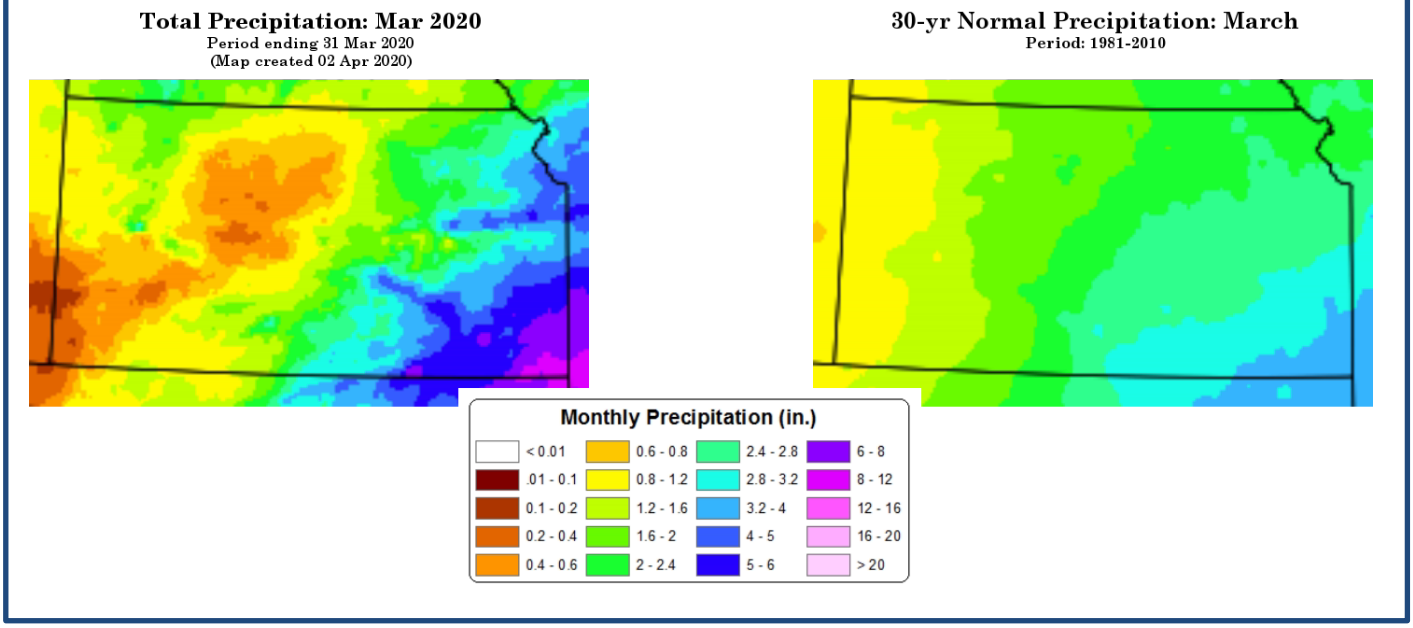
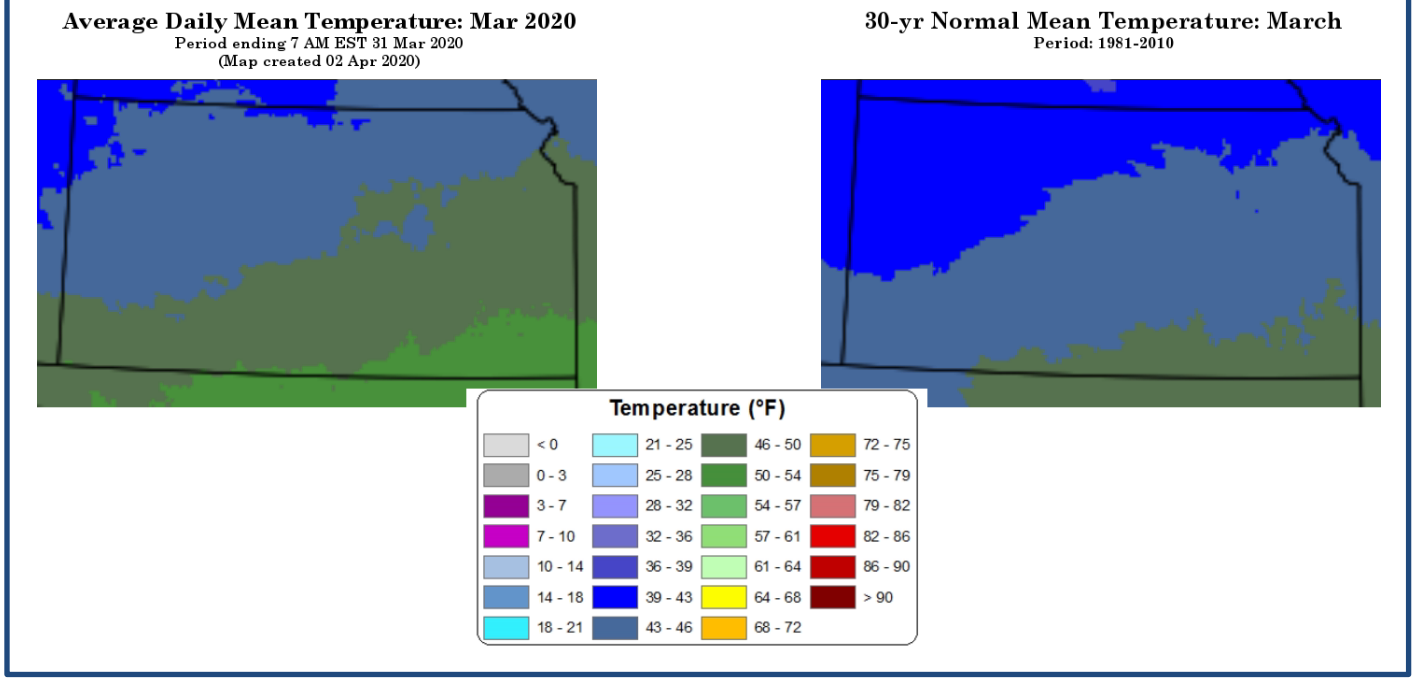


Figure 3. Monthly Temperature Maps



Outlooks

Figure 4. Drought Outlooks

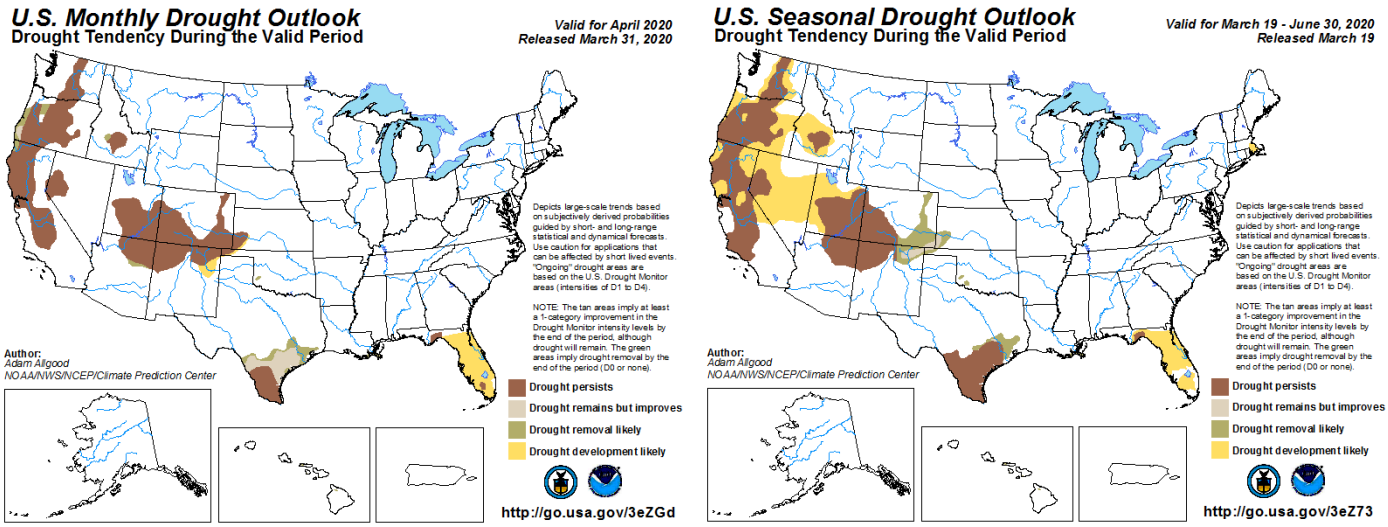


Figure 5. Next Month Precipitation and Temperature Outlooks

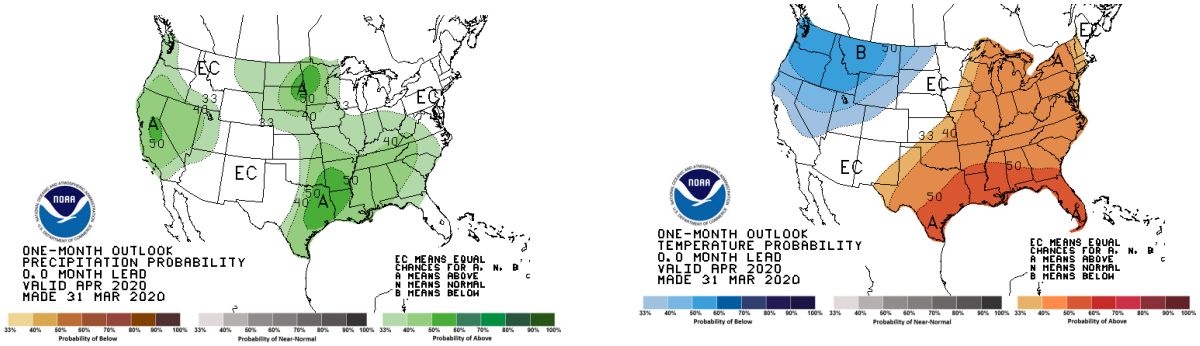
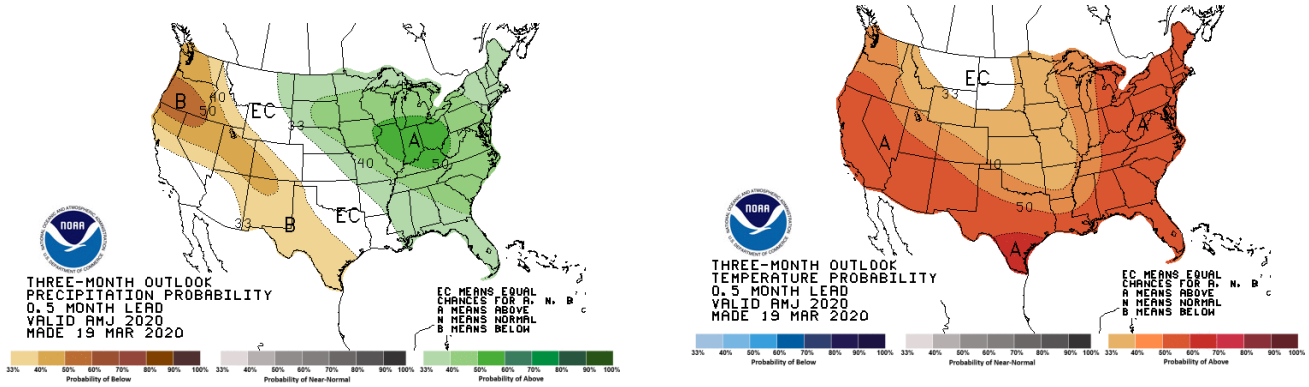


Figure 6. Three Month Precipitation and Temperature Outlooks



Water Supply

Reservoir Storage

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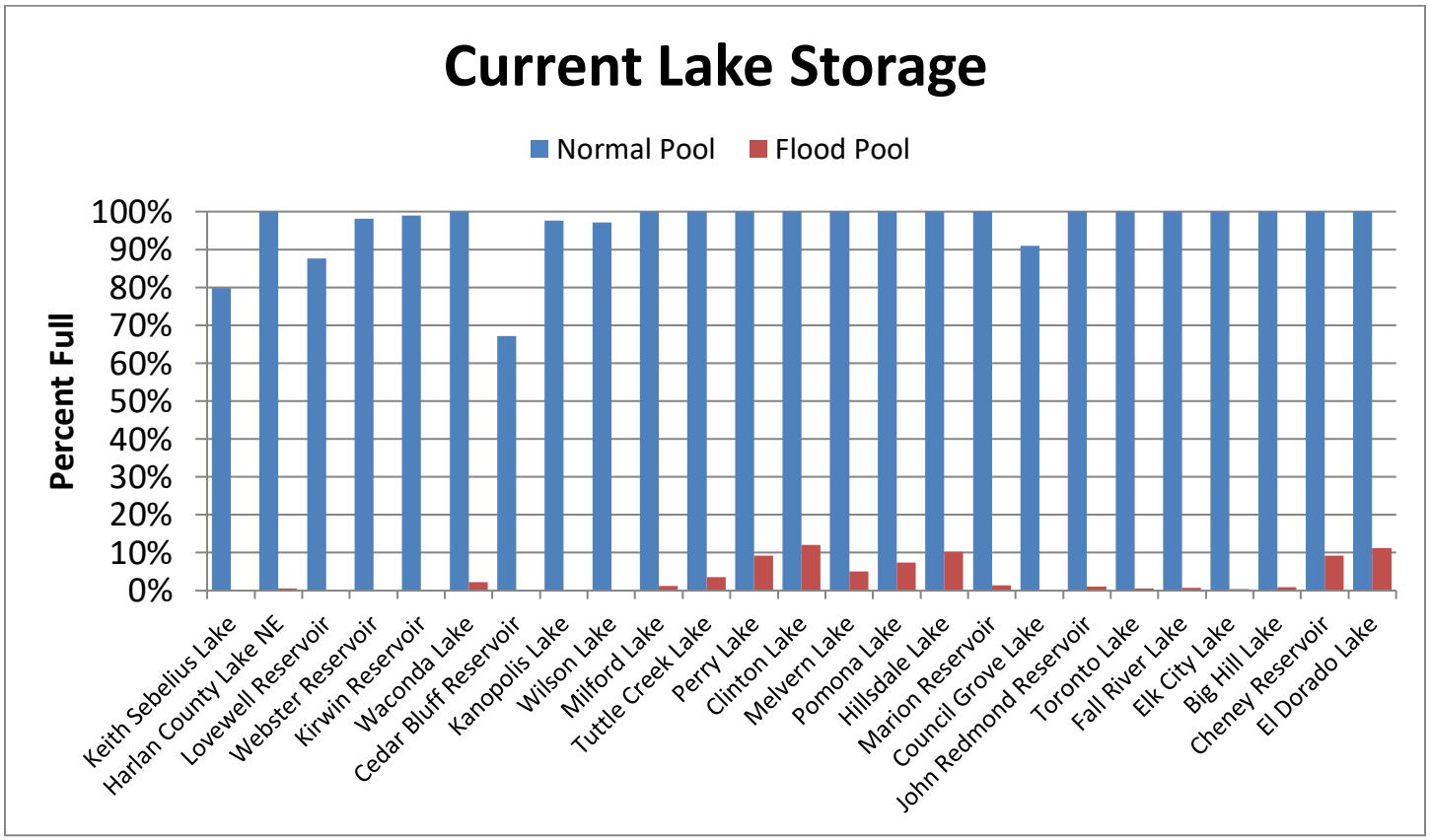
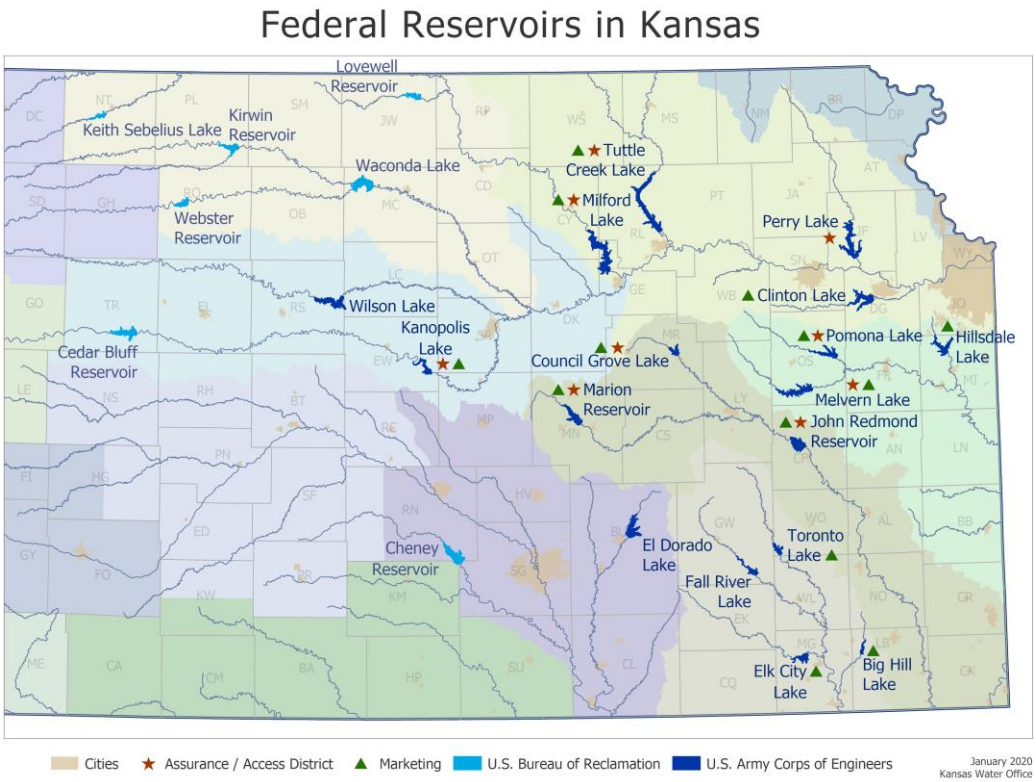
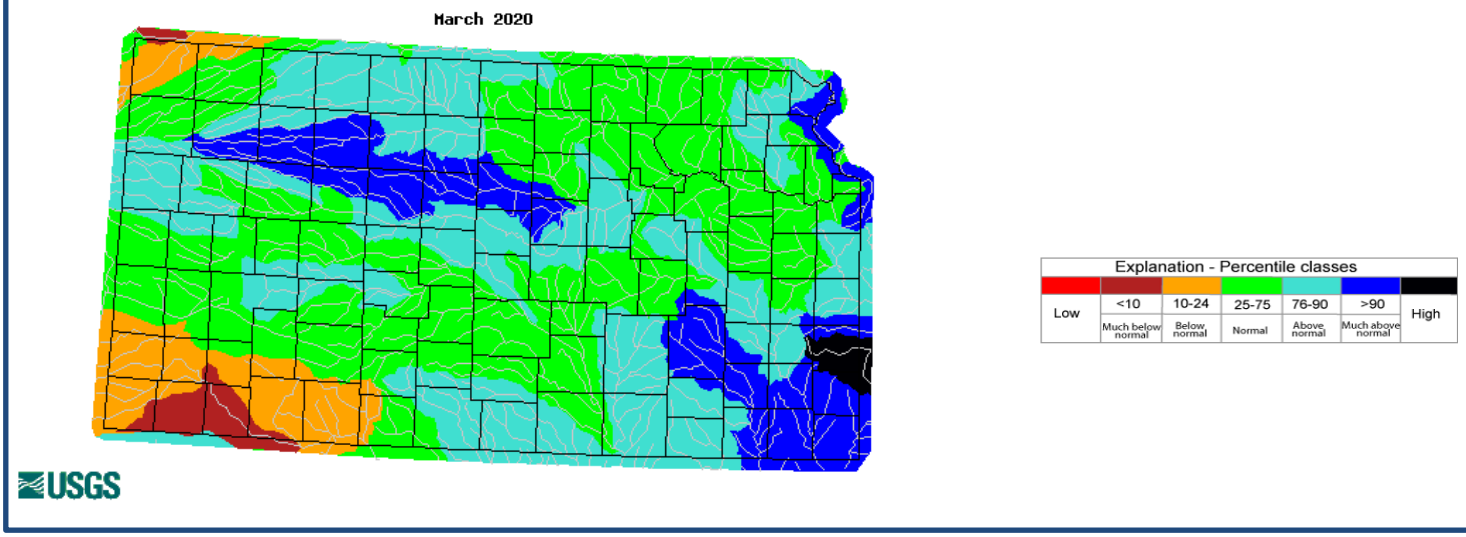




Streamflow Conditions

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. A summary of flooding in is found later in this report. Figure 9 summarizes streamflow.

Figure 9. Monthly streamflow compared to historical streamflow



Minimum Desirable Streamflow: Low flows may be reflected at gage locations when the flow does not reach Minimum Desirable Streamflow (MDS). MDS requirements are in place to ensure base flows in certain streams to protect existing water rights and to meet in-stream water uses related to water quality, fish and wildlife and recreation. The Kansas Department of Agriculture, Division of Water Resources monitors 23 streams and rivers at 33 locations for minimum desirable streamflow. When flows drop below an established threshold, pumping restrictions are imposed on permits or water rights granted after the minimum desirable streamflow provision was made into law in 1984.

The table below notes locations of concern including those below MDS.

Streamflows as of April 6, 2020			
Gaging Station	**Current Flow**	**Apr MDS**	**Comment**
Rattlesnake Creek near Macksville	6	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	27	15	No surface water diversions junior to MDS above gage

Vegetation, Soil Moisture and Crops

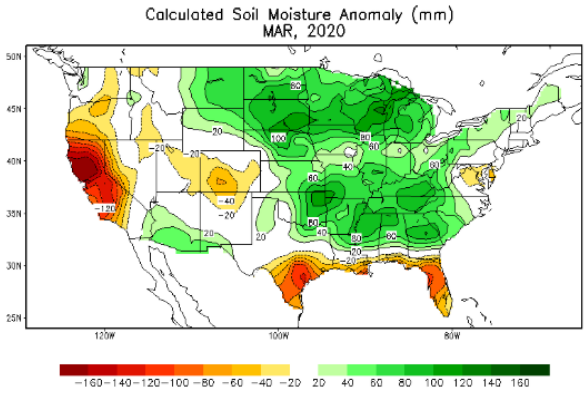
Vegetative Conditions

The Vegetative Condition map depicts vegetation stress. It is produced using satellite data by the National Drought Mitigation Center https://vegdri.unl.edu/Home.aspx and often customized for Kansas by the Kansas Biological Survey in the GreenReport.

Soil Moisture and Rangeland

The Climate Prediction Center (CPC), monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. The monthly soil anomaly is shown in Figure 10. (http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml).

Figure 10.

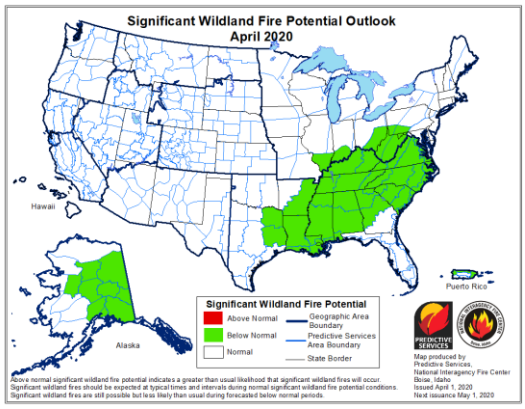


Within Kansas soil moisture is now being measured through the Kansas Mesonet and Kansas State University the percent of soil saturation (representative of grassland vegetation). For current estimated statewide soil saturation visit: http://mesonet.k-state.edu/agriculture/soilmoist/.

Fire

The National Weather Service issues Red Flag Warnings when conditions favoring wildfire are at an increased risk. These are issued daily when needed. A Significant Wildland Fire Potential Outlook is issued monthly for the United States. Figure 11 is the most recent outlook for possible wildfires tor the next month. Additional forecasts can be found at https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm.

Figure 11.



Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. 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. Details of current conditions at such as precipitation, temperature, evapotranspiration (ET), soil moisture and more are available at http://mesonet.k-state.edu/.

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KANSAS CLIMATE
April 2020

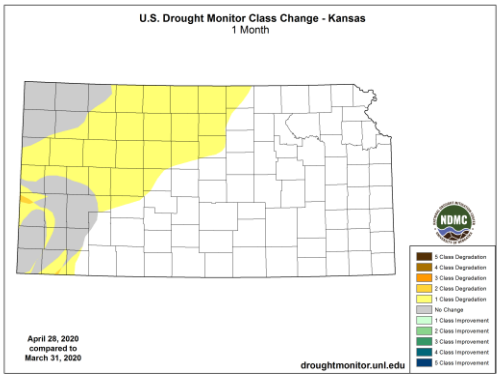
Highlights

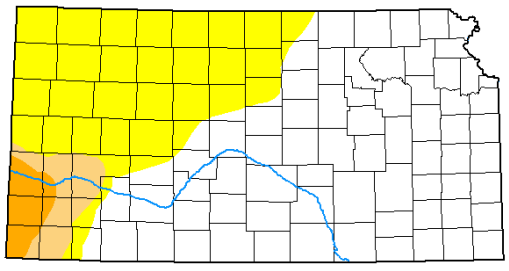
- U.S. Drought Monitor indicated continuing areas of abnormally dry (D0), moderate drought (D1), severe drought (D2) in parts of western Kansas. The abnormally dry conditions expanded throughout the month of April.
- Statewide April precipitation was generally below average, ranking 20 out of 126.
- Statewide April temperatures were near average, ranking 46 out of 126.
- May outlook: chance of above normal temperature or equal chance above/below normal; slight chance of above normal precipitation or equal chance above/below normal.
- Drought Outlook favors drought persisting in southwest Kansas.

General Drought Conditions

The U.S. Drought Monitor indicated dry and drought conditions in parts of western Kansas at the beginning of the month. Throughout the month of April abnormally dry conditions have expanded across western Kansas and into north-central Kansas. The condition at the end of the month is shown below in Figure 1. Change in drought classification over the month is also shown.

Figure 1. U.S. Drought Monitor Maps of Drought status





U.S. Drought Monitor
Kansas

April 28, 2020
(Released Thursday, Apr. 30, 2020)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	62.03	37.97	6.85	2.85	0.00	0.00
Last Week 04-21-2020	77.02	22.98	6.85	2.85	0.00	0.00
3 Months Ago 01-28-2020	67.58	32.42	8.68	3.93	0.00	0.00
Start of Calendar Year 12-31-2019	67.13	32.87	9.89	4.22	0.00	0.00
Start of Water Year 10-01-2019	81.26	18.74	4.91	0.00	0.00	0.00
One Year Ago 04-30-2019	95.03	4.97	0.00	0.00	0.00	0.00

Intensity:
None
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. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Deborah Bathke
National Drought Mitigation Center

droughtmonitor.unl.edu

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

Climate Summary

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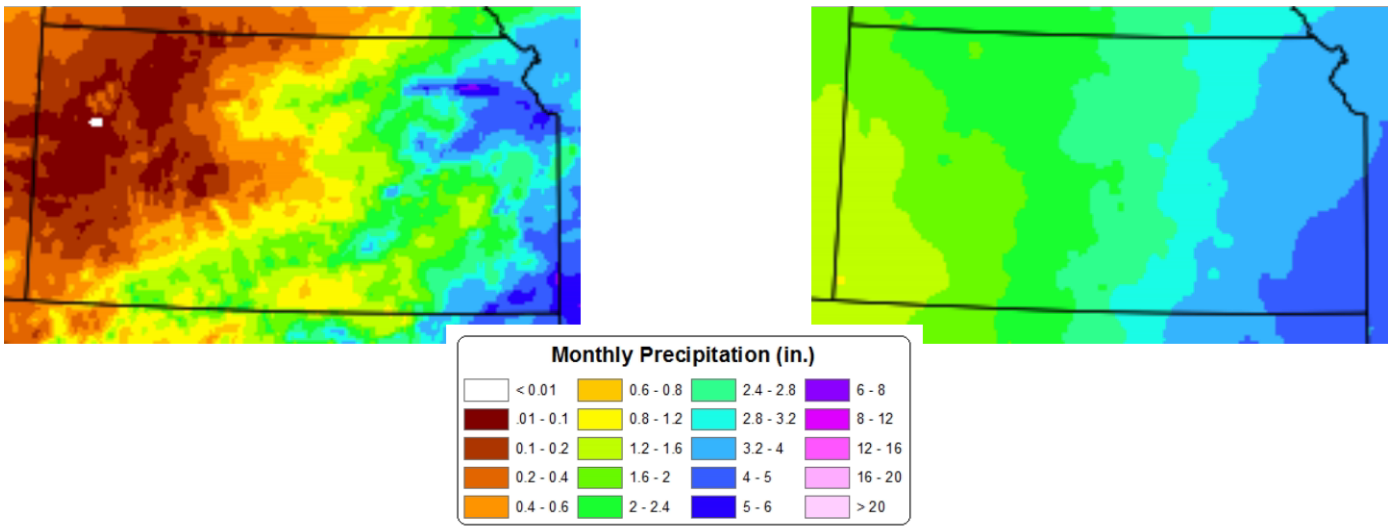
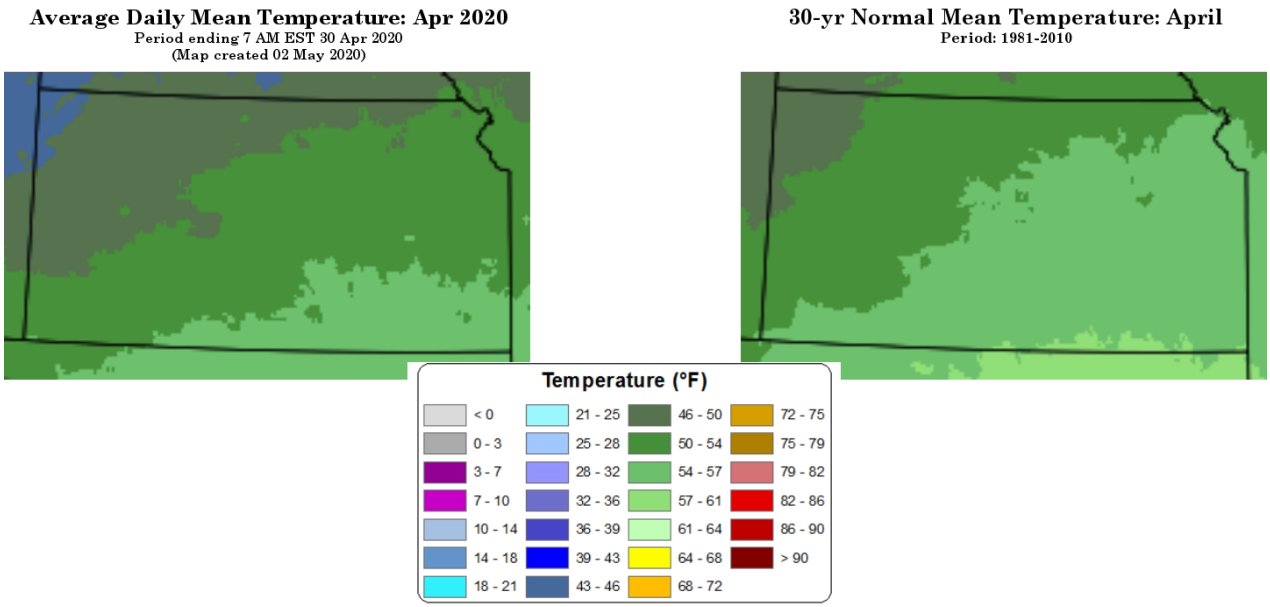


Figure 3. Monthly Temperature Maps



Outlooks

Figure 4. Drought Outlooks

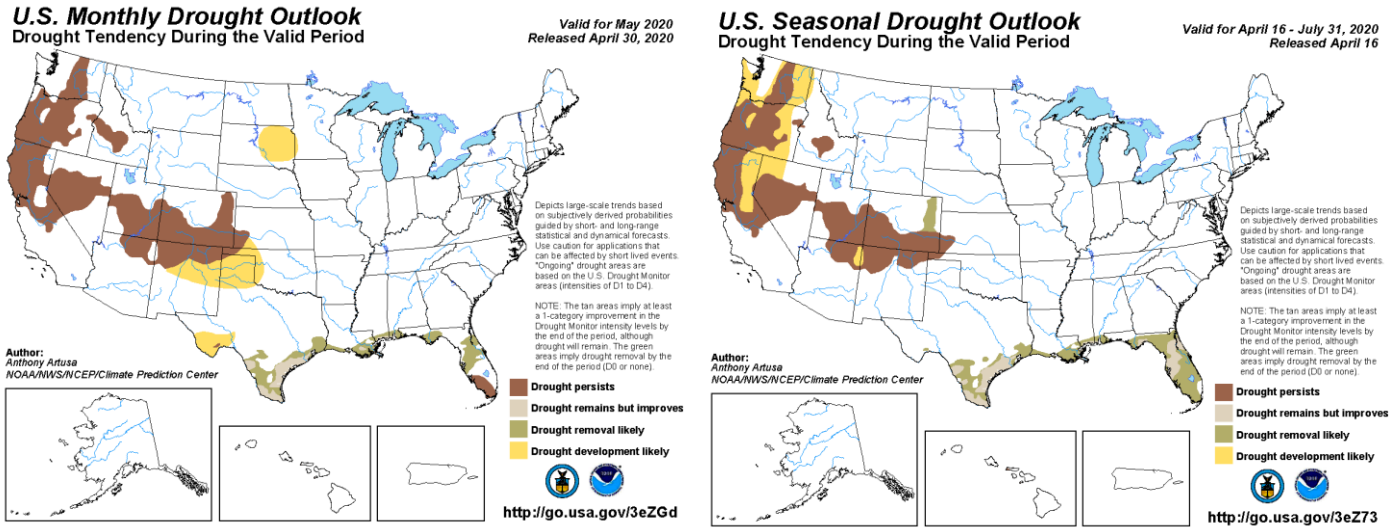


Figure 5. Next Month Precipitation and Temperature Outlooks

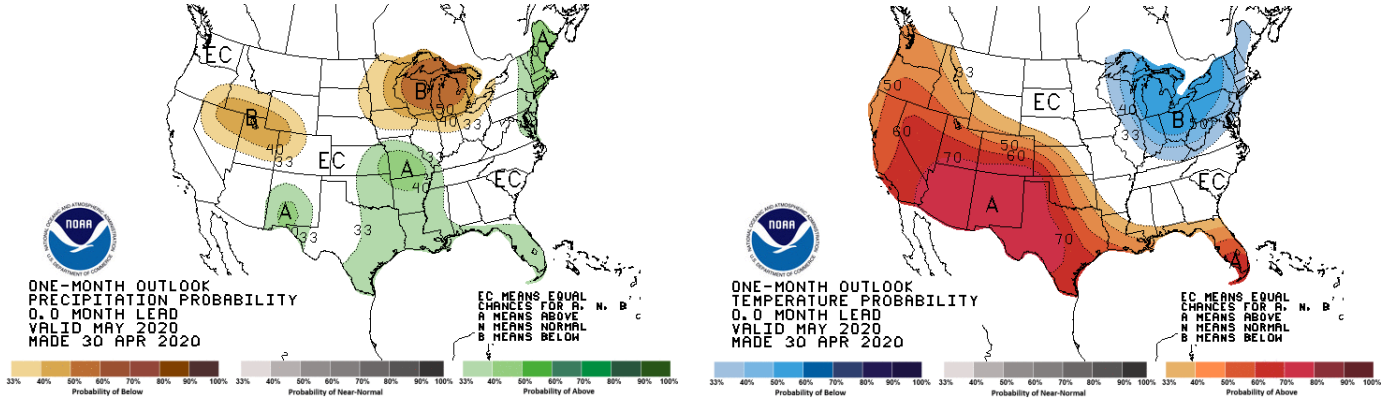
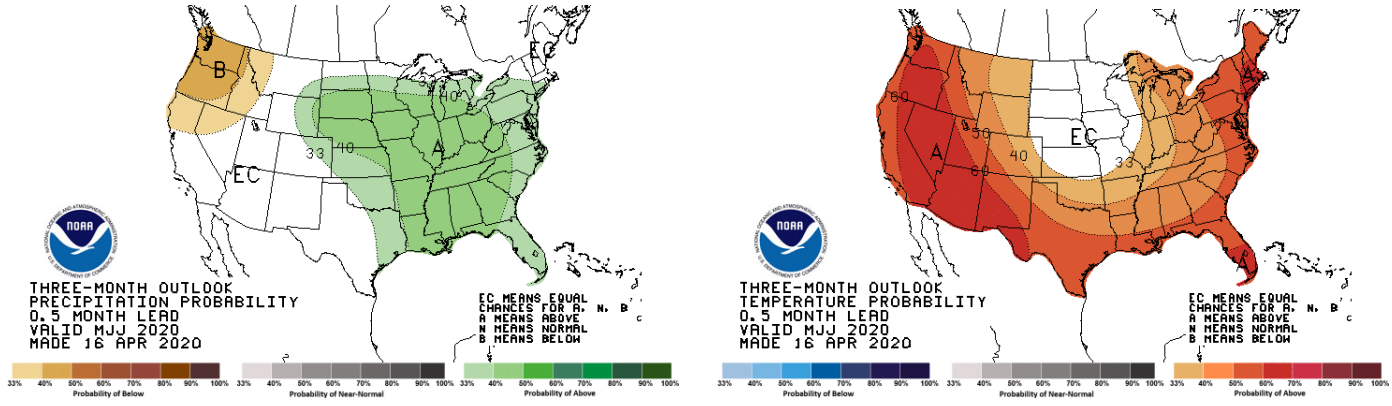


Figure 6. Three Month Precipitation and Temperature Outlooks



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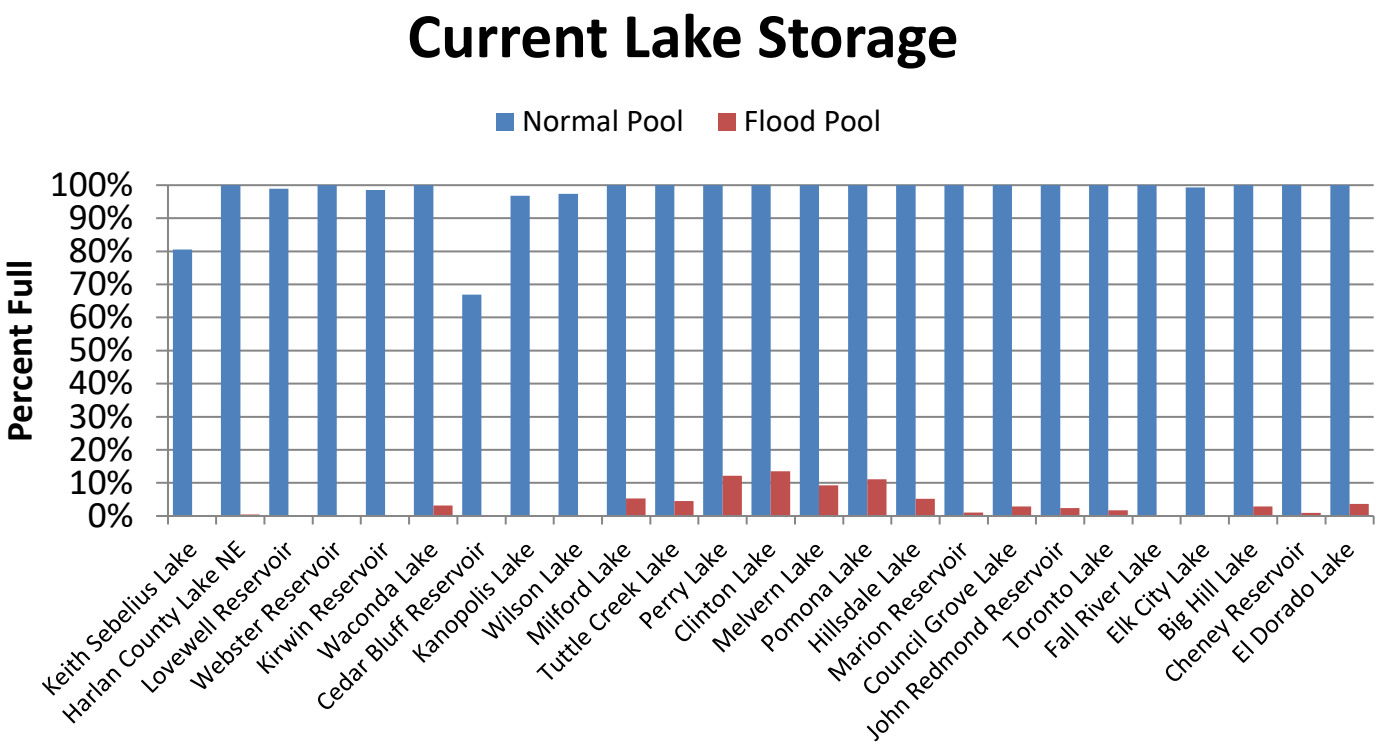

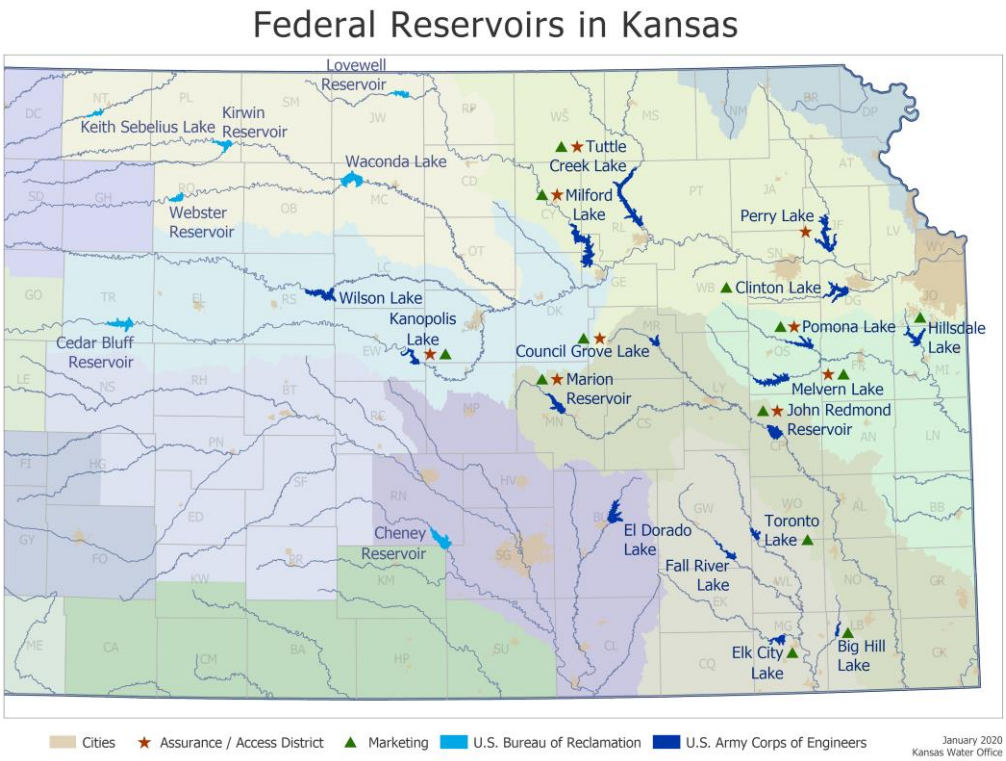

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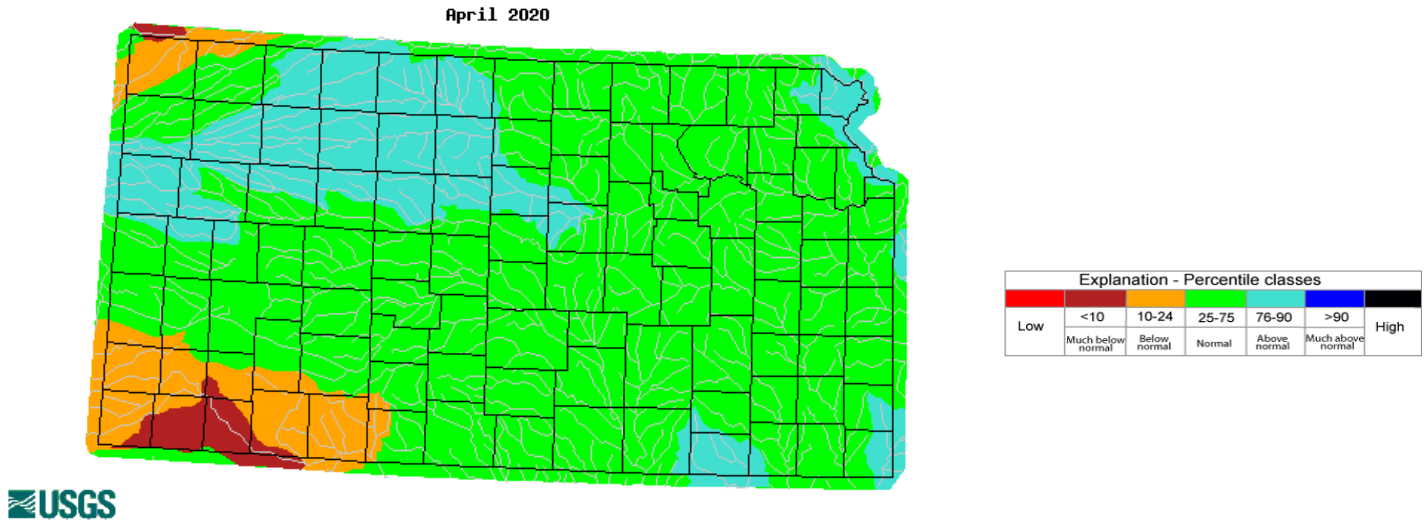

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The table below notes locations of concern including those below MDS.

Streamflows as of April 27, 2020			
Gaging Station	**Current Flow**	**Apr MDS**	**Comment**
Rattlesnake Creek near Macksville	7	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	27	15	No surface water diversions junior to MDS above gage

Vegetation, Soil Moisture and Crops

Vegetative Conditions

The Vegetative Condition map depicts vegetation stress. It is produced using satellite data by the National Drought Mitigation Center https://vegdri.unl.edu/Home.aspx and often customized for Kansas by the Kansas Biological Survey in the GreenReport.

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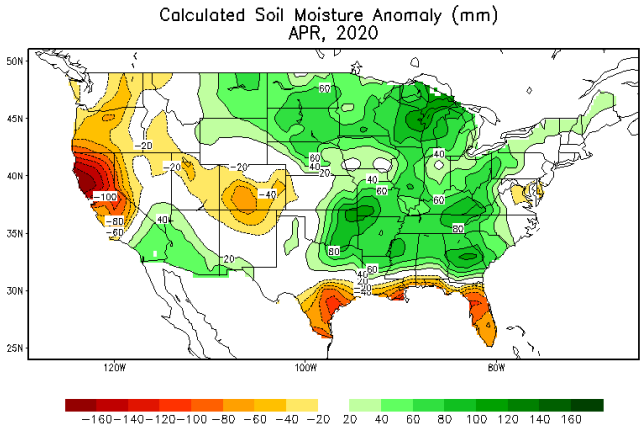

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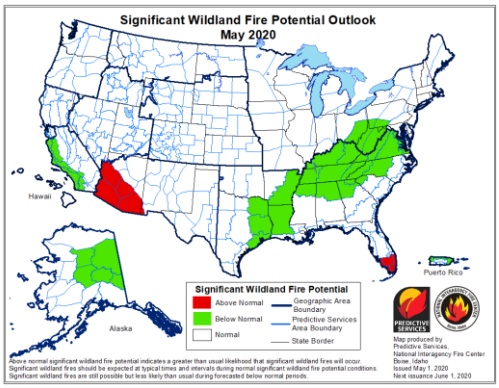

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The National Interagency Coordination Center in Boise, Idaho, produces wildfire potential outlook maps monthly. (https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm)

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

Kansas Water Office

KANSAS CLIMATE
May 2020

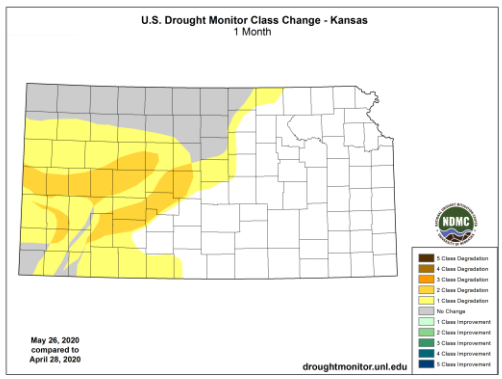
Highlights

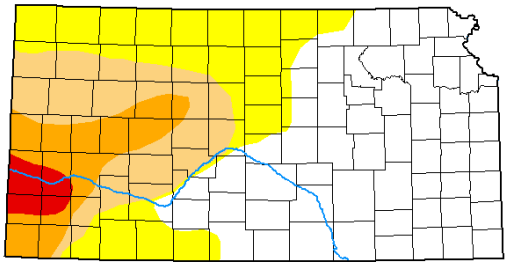
- U.S. Drought Monitor indicated the expansion of drought conditions (D1-D3) in parts of western Kansas. of abnormally dry (D0), moderate drought (D1), severe drought (D2) in parts of western Kansas. Moderate drought conditions (D1) are beginning to enter central Kansas.
- June outlook: high probability of above normal temperature; chance of below normal precipitation.
- Drought Outlook favors expansion of drought conditions during the month of June, but improvement or removal of drought conditions over the long-term.

General Drought Conditions

The U.S. Drought Monitor indicated a small area of moderate to severe drought in southwest Kansas at the beginning of the month. Throughout the month of May, there drought conditions intensified and swelled to about four times the extent. The condition at the end of the month is shown below in Figure 1. Change in drought classification over the month is also shown.

Figure 1. U.S. Drought Monitor Maps of Drought status





U.S. Drought Monitor
Kansas

May 26, 2020
(Released Thursday, May. 28, 2020)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	49.84	50.16	27.46	11.63	2.49	0.00
Last Week 05-19-2020	47.75	52.25	27.46	11.65	2.49	0.00
3 Months Ago 02-25-2020	85.54	14.46	6.03	2.02	0.00	0.00
Start of Calendar Year 12-31-2019	67.13	32.87	9.89	4.22	0.00	0.00
Start of Water Year 10-01-2019	81.26	18.74	4.91	0.00	0.00	0.00
One Year Ago 05-28-2019	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:
None
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. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Curtis Riganti
National Drought Mitigation Center

droughtmonitor.unl.edu

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

Climate Summary

Figure 2 and Figure 3 below summarize observed precipitation and temperature, respectively, for the month using the PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

Figure 2. Monthly Precipitation maps

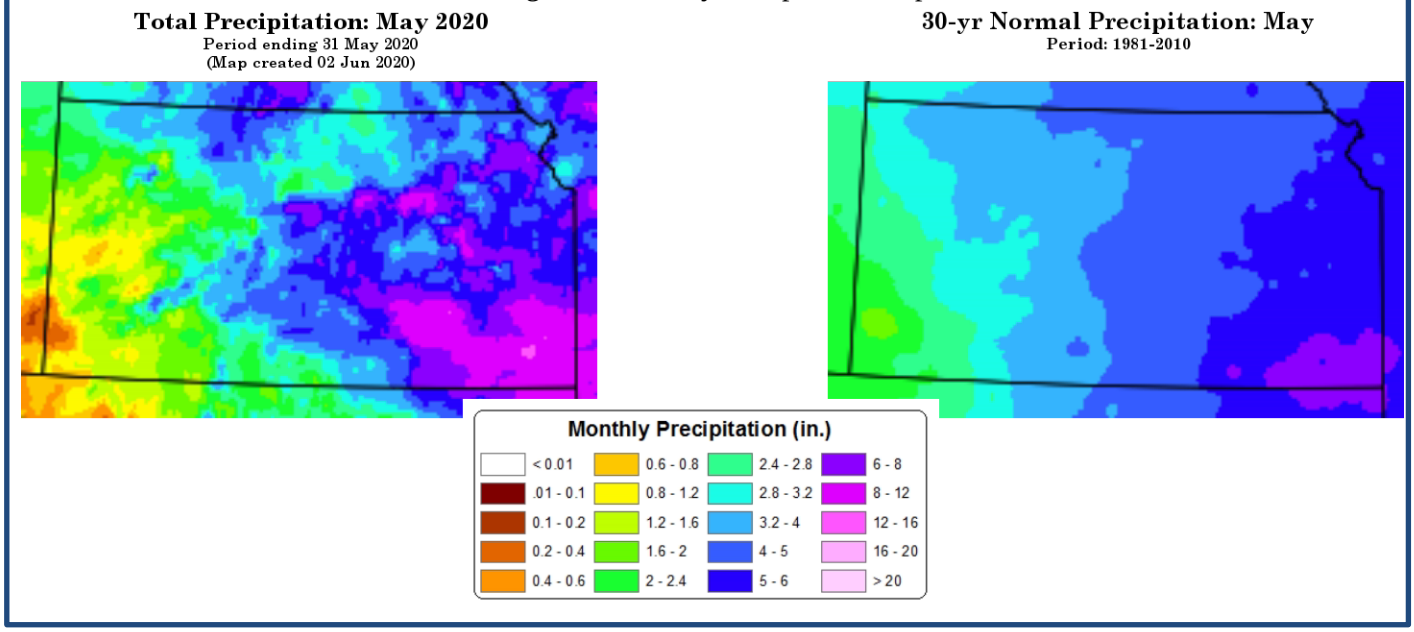
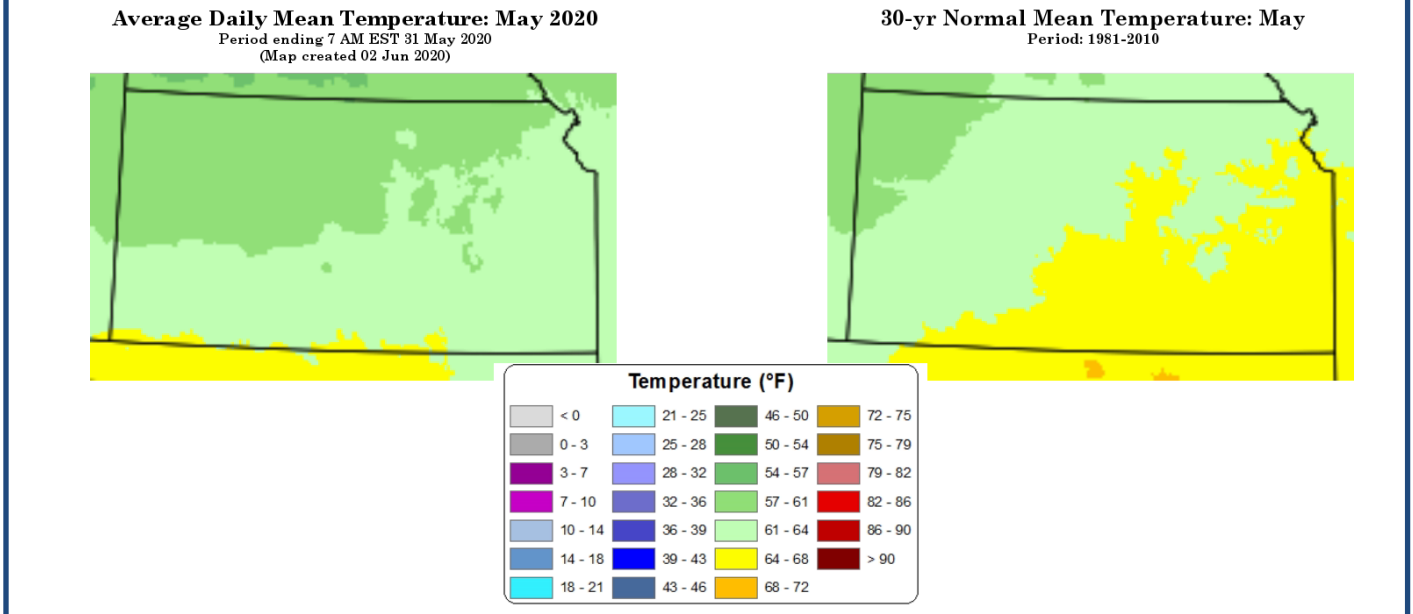


Figure 3. Monthly Temperature Maps



Outlooks

Figure 4. Drought Outlooks

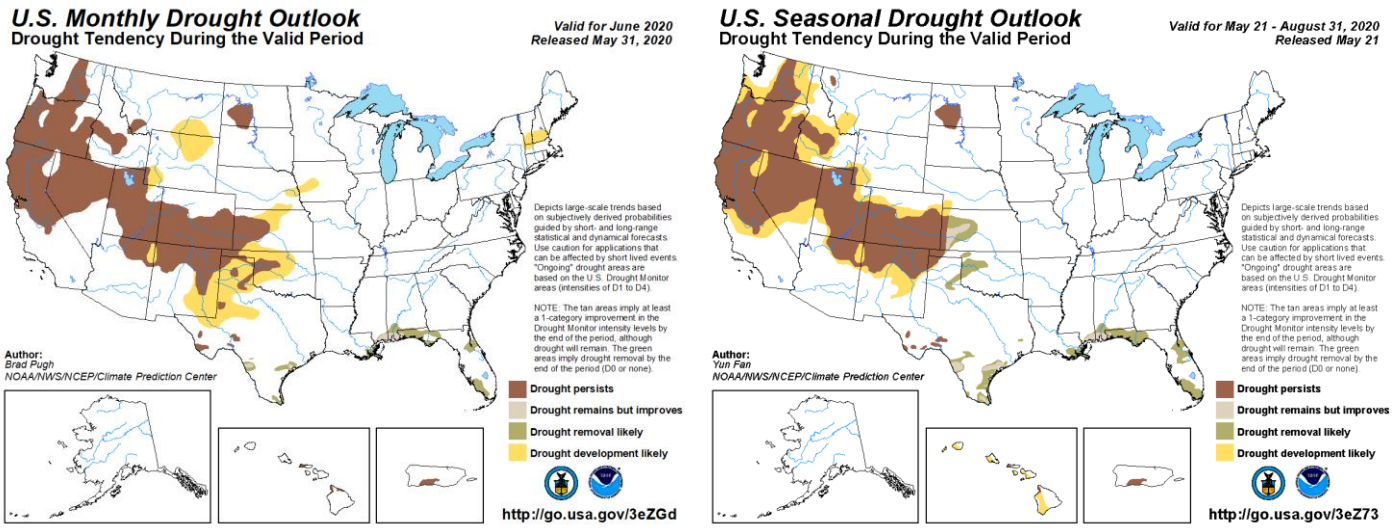


Figure 5. Next Month Precipitation and Temperature Outlooks

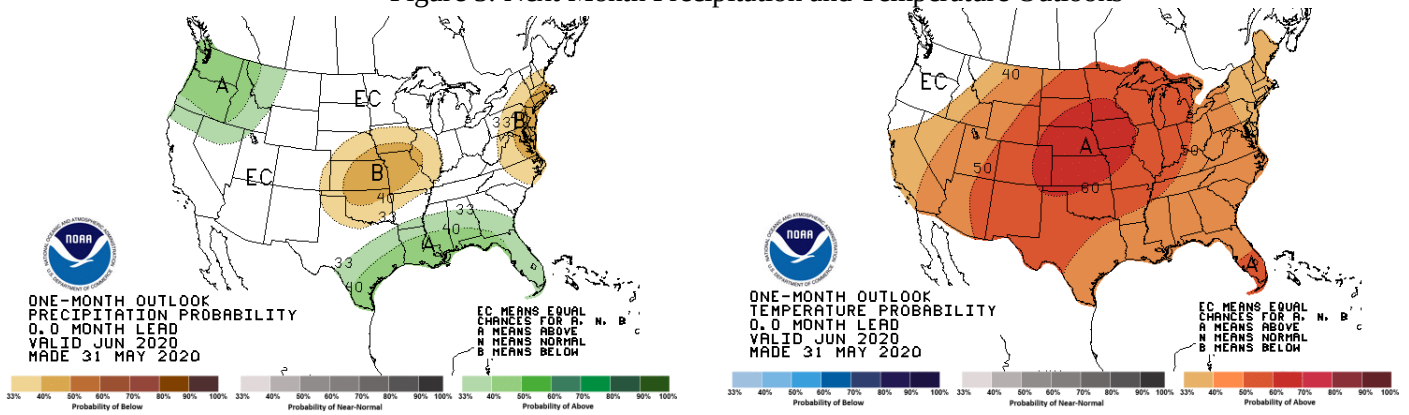
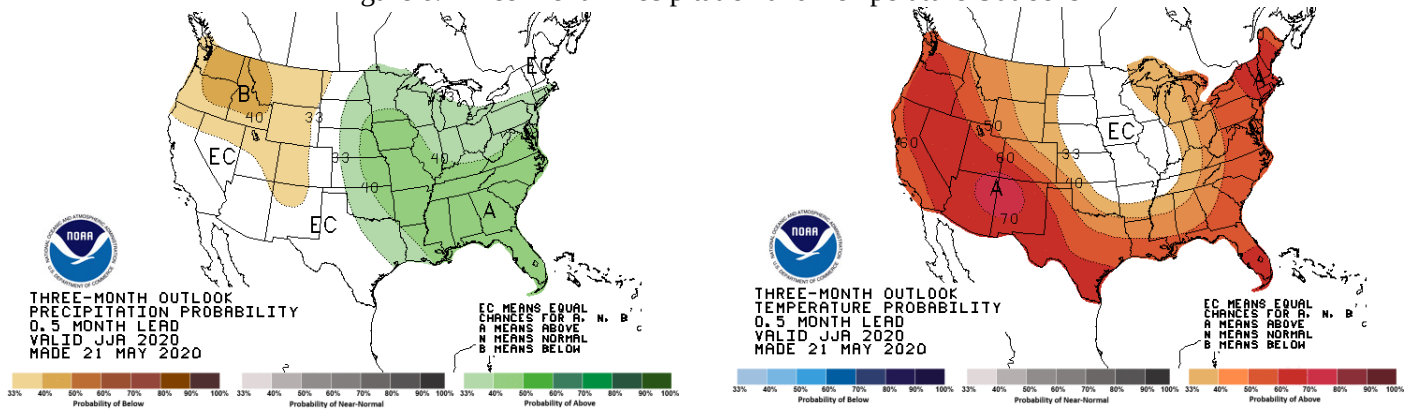


Figure 6. Three Month Precipitation and Temperature Outlooks



Water Supply

Reservoir Storage

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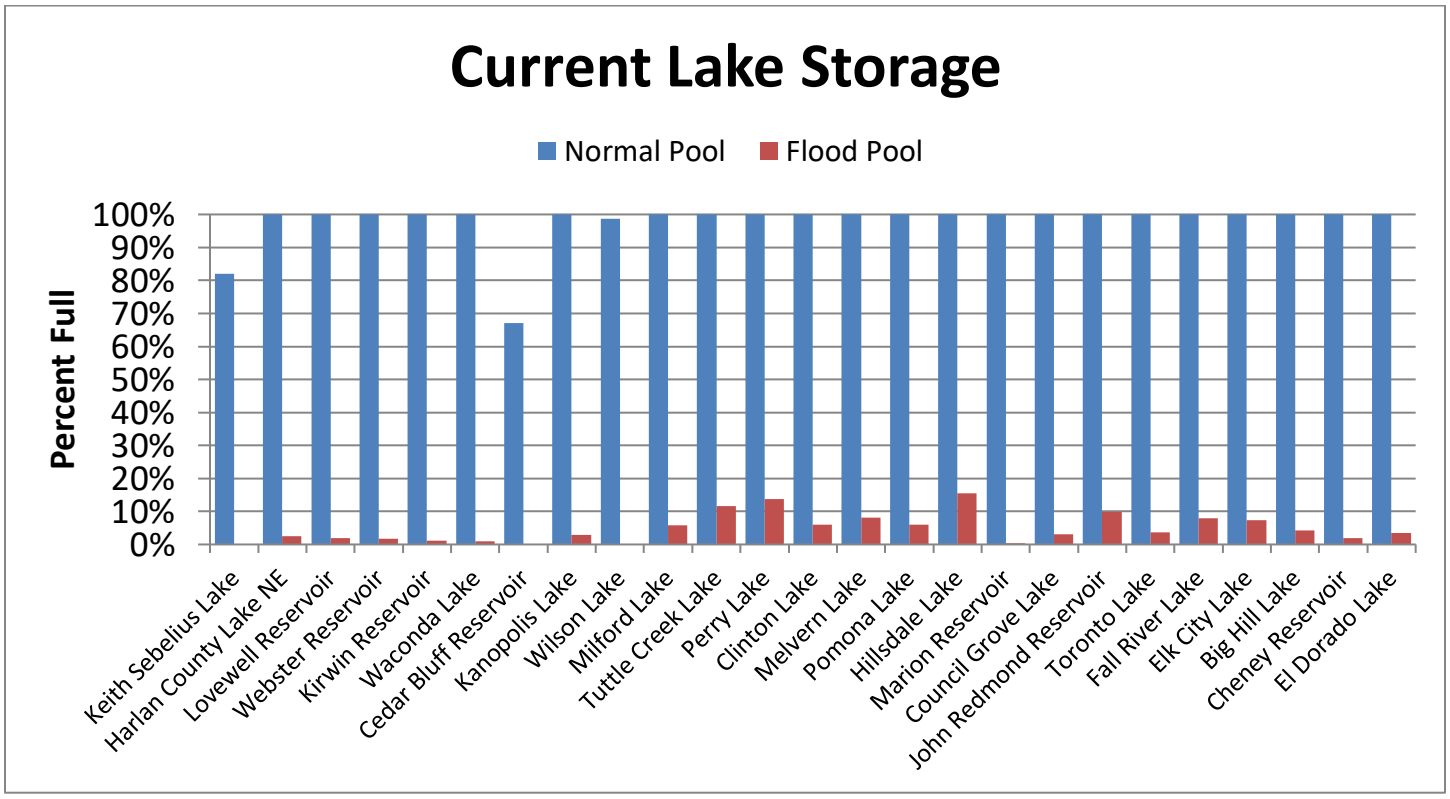

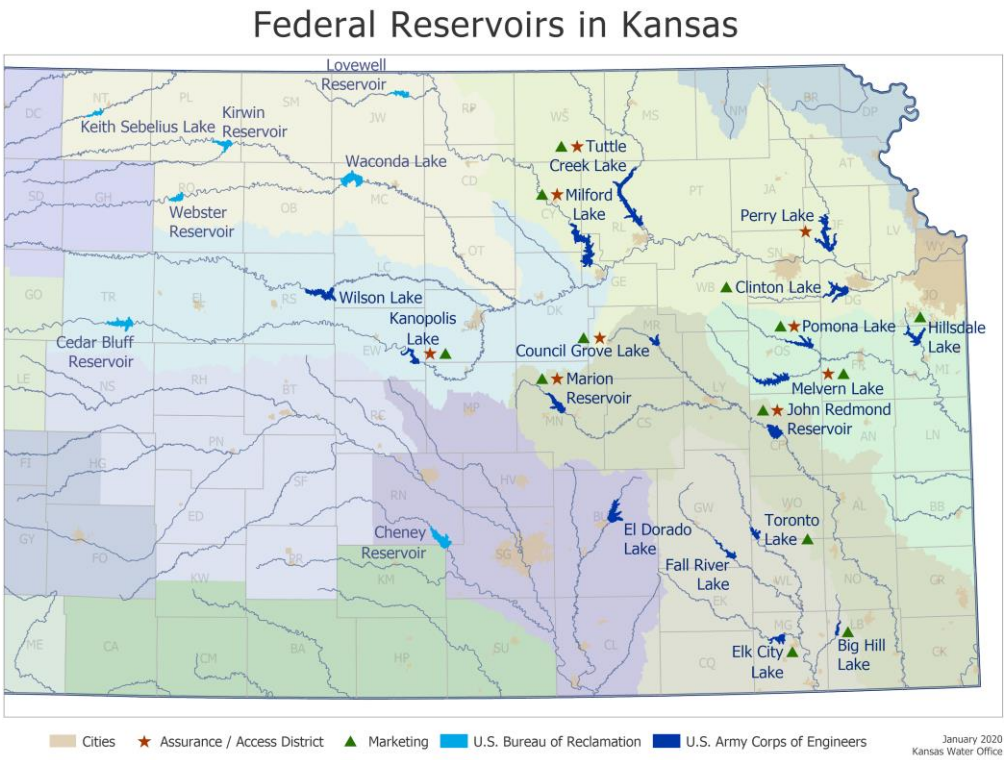

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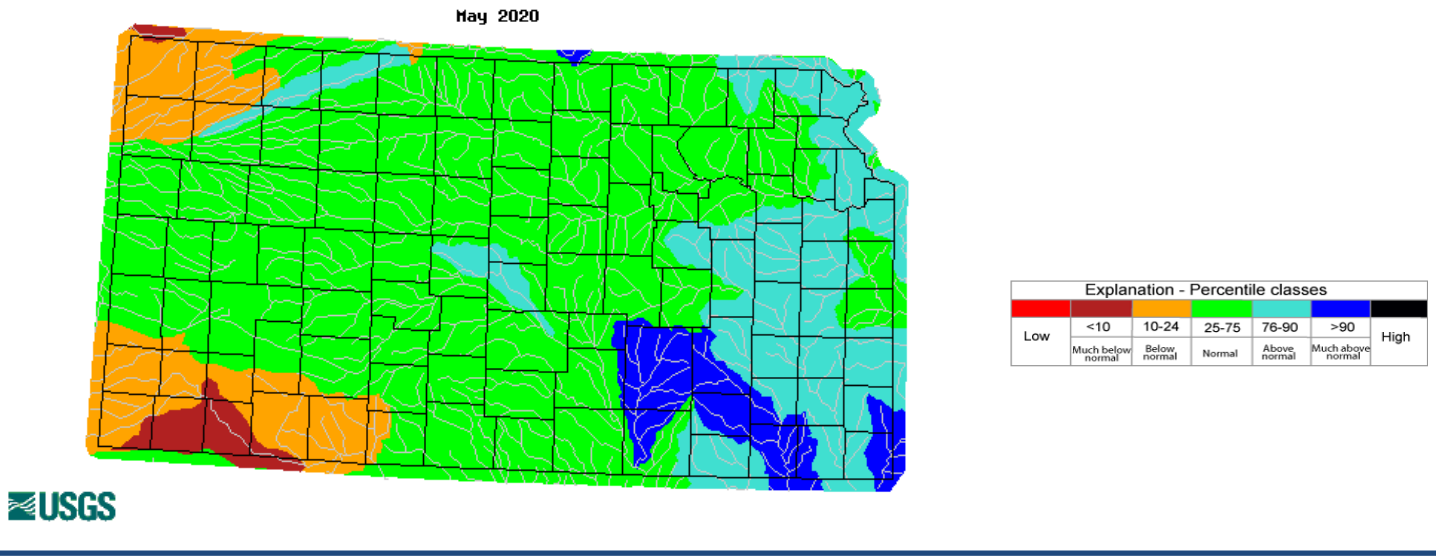

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There are currently no gages under MDS in Kansas.

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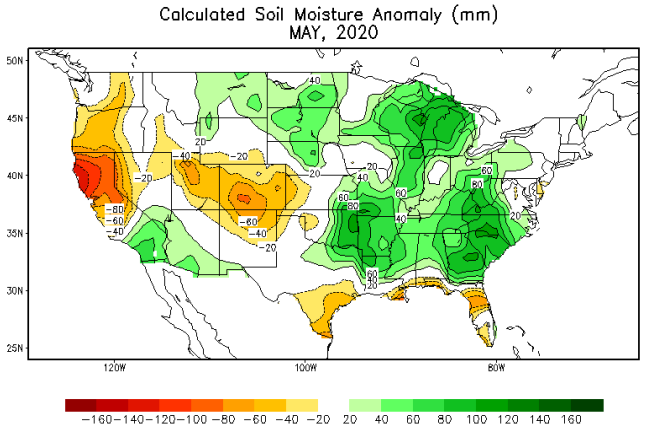

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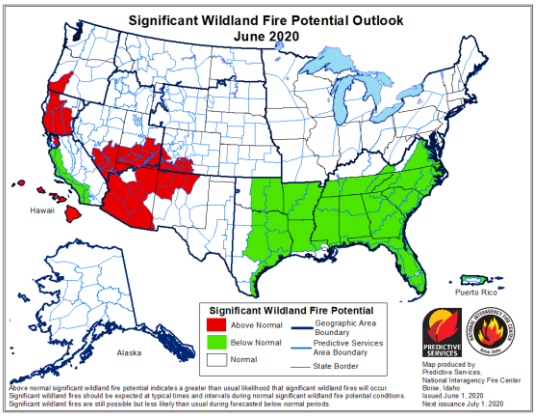

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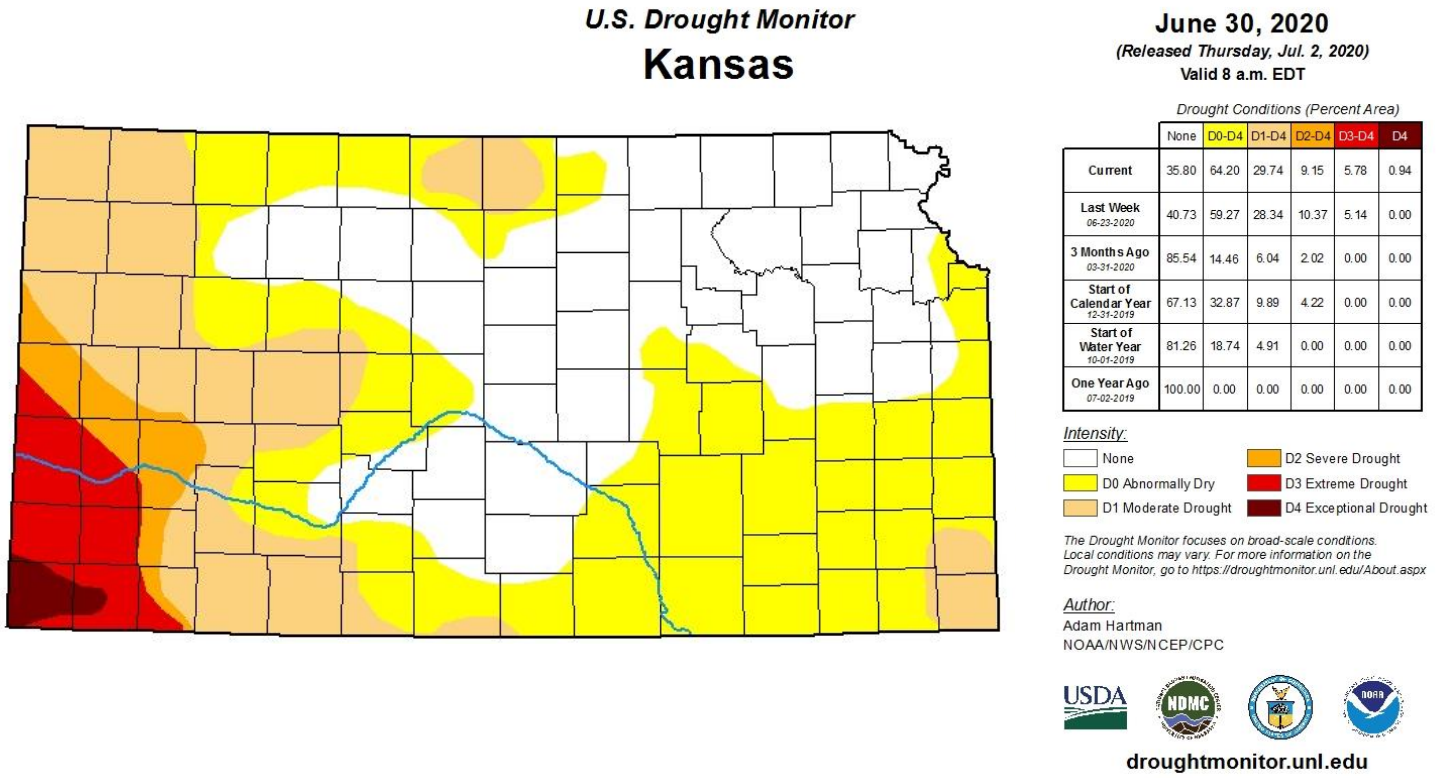
KANSAS CLIMATE
June 2020

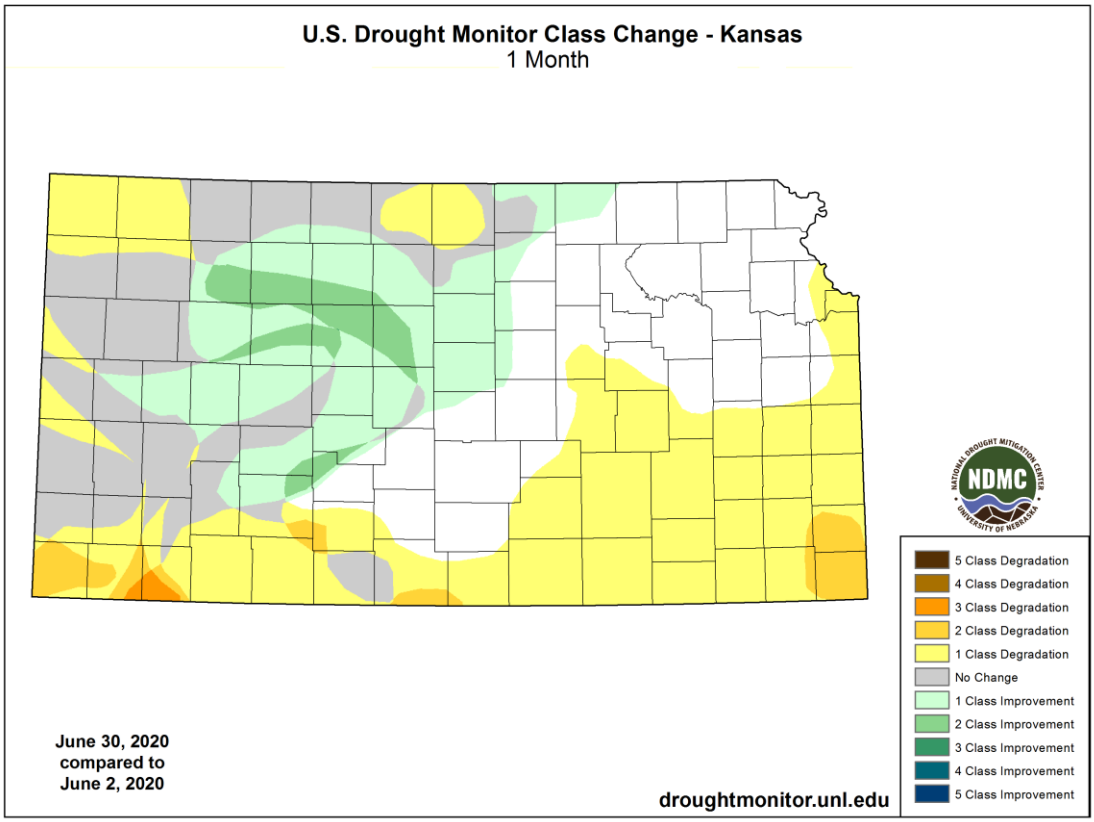
Highlights

- U.S. Drought Monitor indicated the expansion of drought conditions to (D4) Exceptional Drought in Morton and Stevens counties. Small pockets of precipitation slightly improved conditions in Graham, Sheridan, and Scott counties.
- Drought concerns in southeast Kansas are growing.
- July outlook: high probability of above normal temperature; high probability of below normal precipitation.
- Drought Outlook favors expansion of drought conditions during the month of July, and little improvement or removal of drought conditions over the summer. Extreme eastern Kansas shows the best chance for improved conditions long term.

General Drought Conditions

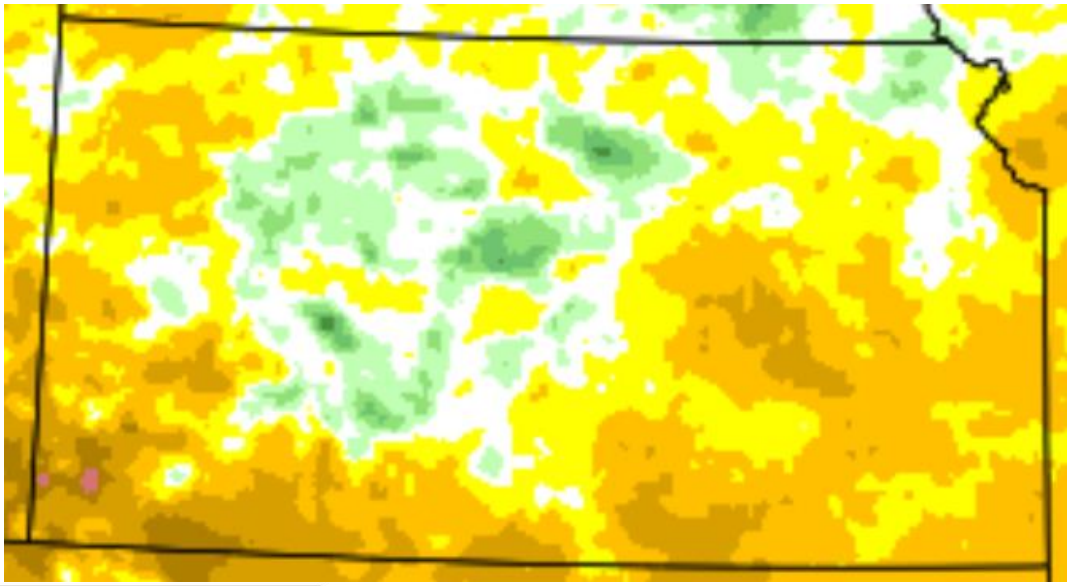
The U.S. Drought Monitor indicated areas of degradation in southwest and southeast Kansas. Throughout the month of June, drought conditions have generally intensified and expanded from west to east. The condition at the end of the month is shown below in Figure 1. Change in drought classification over the month of June is also shown.





Climate Summary

Total Precipitation Anomaly: May 2020 – June 30, 2020
Base Period: 1981-2010



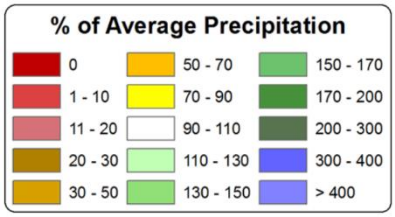
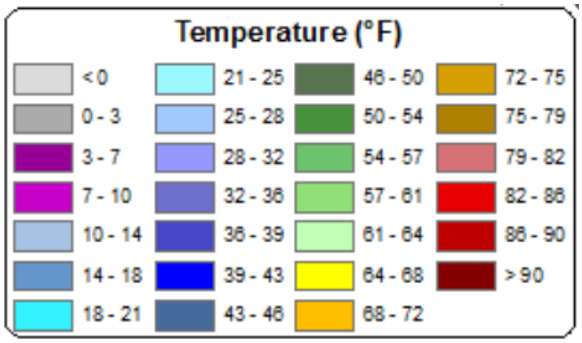


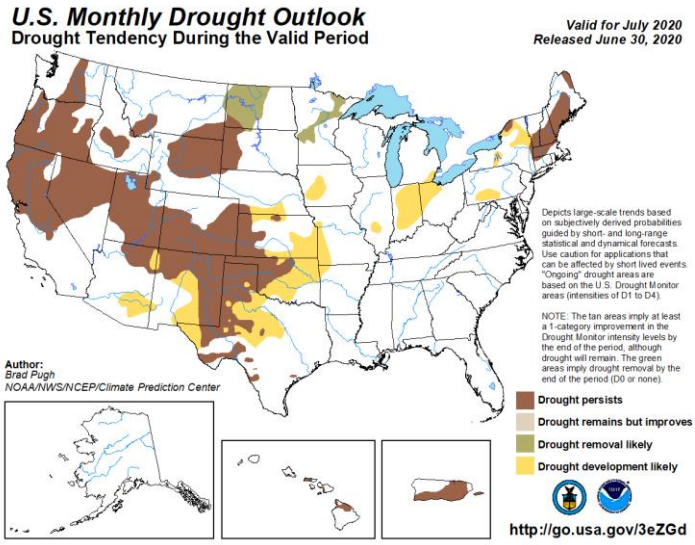
Figure 3 above summarizes observed precipitation anomaly. Figures 4, 5 below show temperature for the month. PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

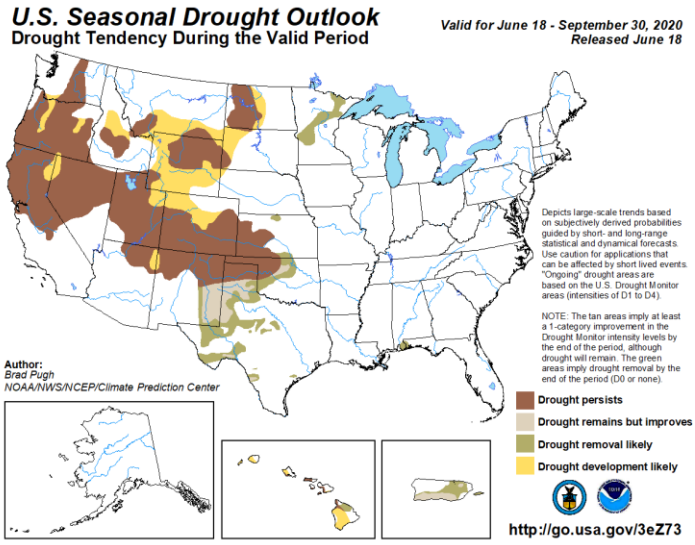
30- Year Normal Mean Temperature: June 1981-2010



Average Daily Mean Temperature: June 2020

Outlooks





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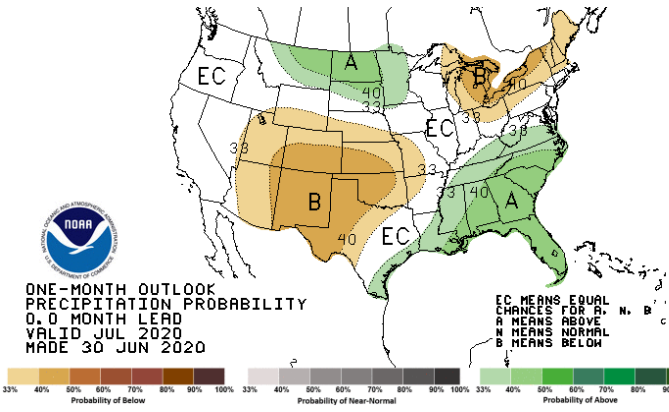

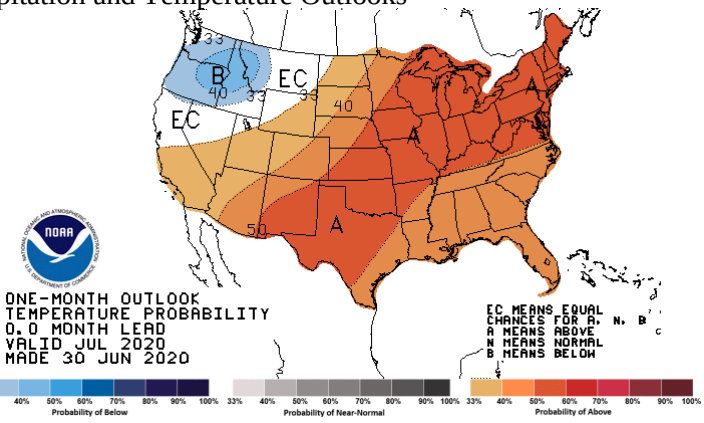

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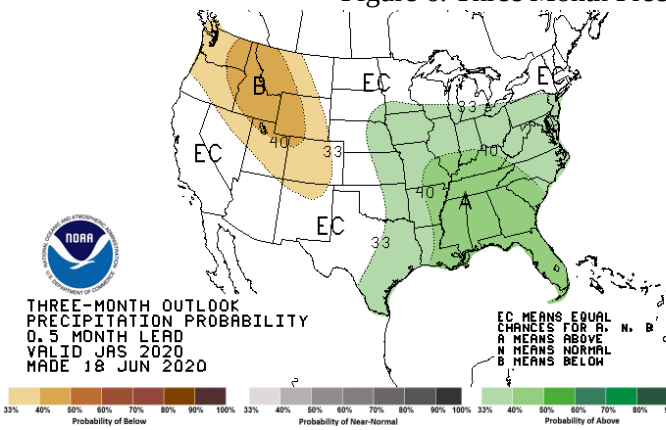

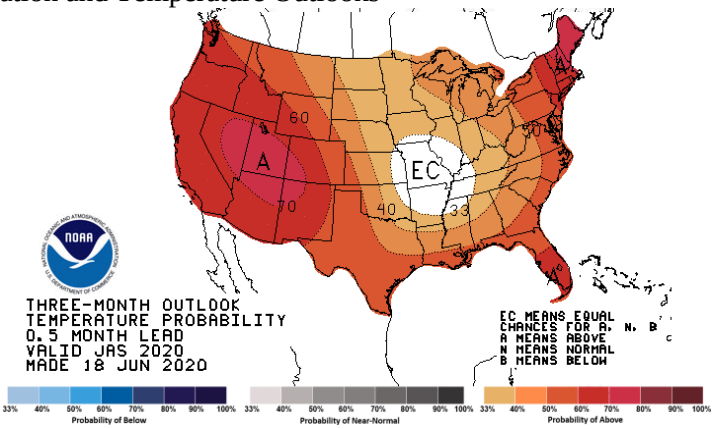

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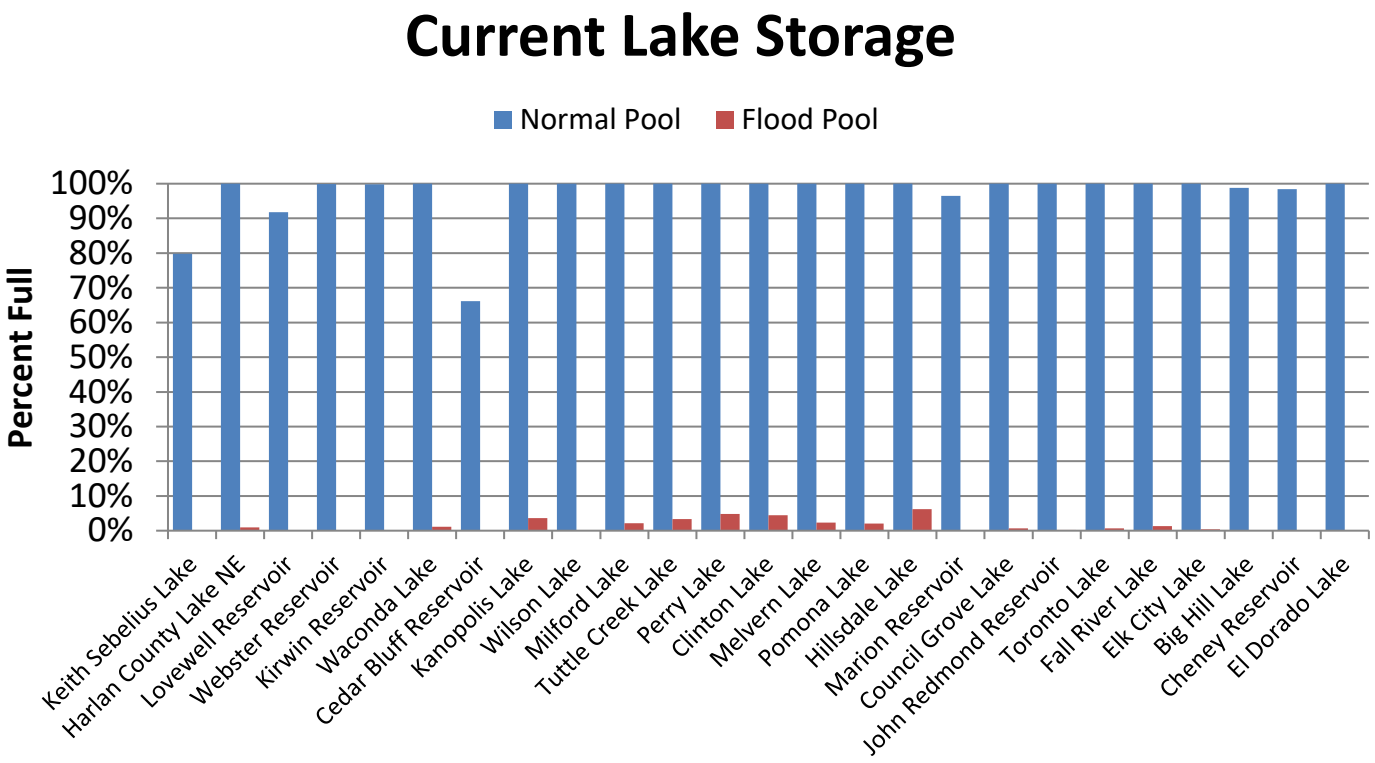

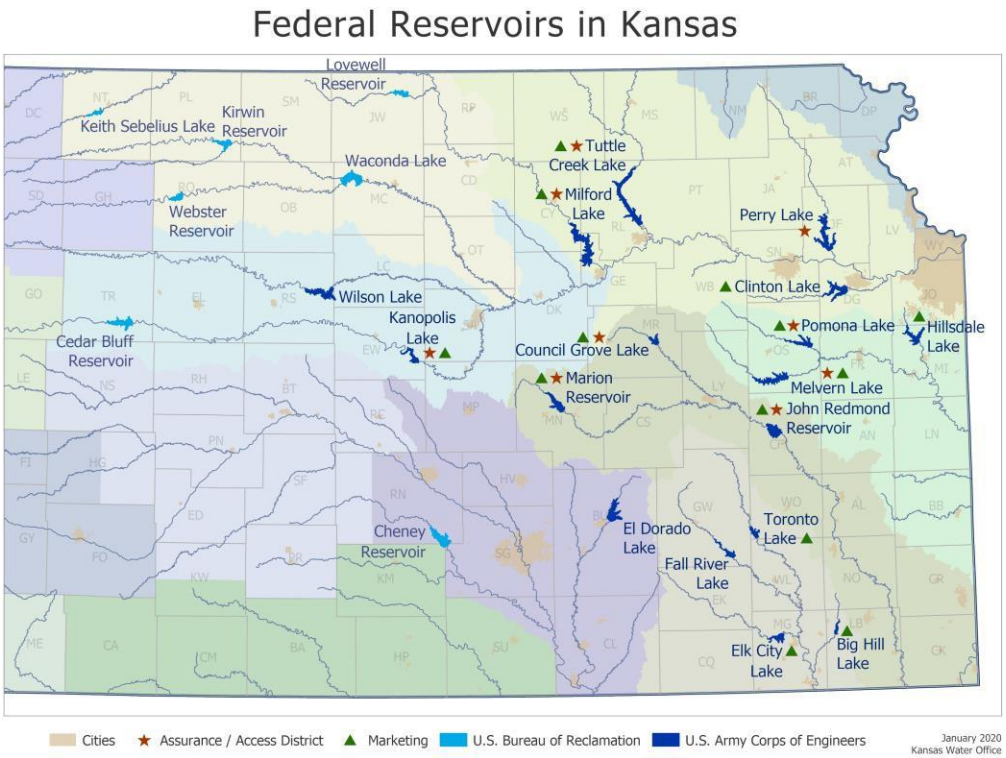

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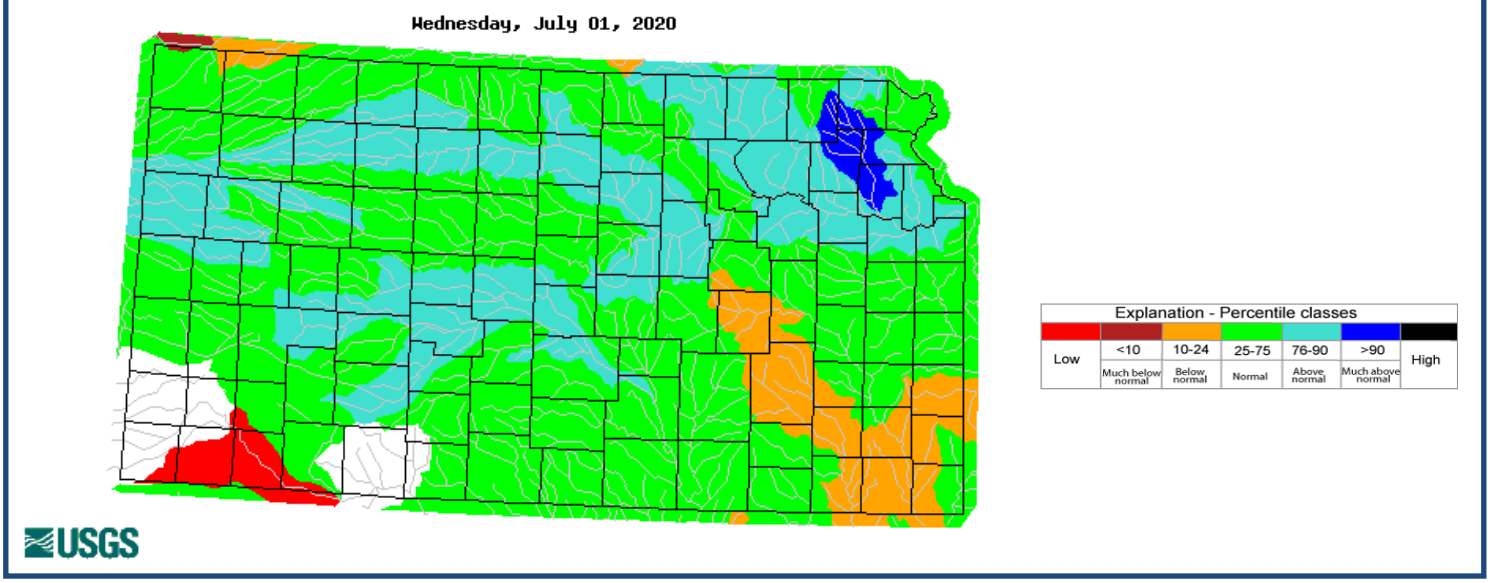

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Streamflows as of June 29, 2020			
Gaging Station	**Current Flow**	**Jun MDS**	**Comment**
Rattlesnake Creek near Macksville	Dry	10	No surface water diversions junior to MDS above gage
Rattlesnake Creek near Zenith	22	15	No surface water diversions junior to MDS above gage
North Fork Ninnescah River above Cheney	38	30	
South Fork Ninnescah River near Pratt	11	8	No surface water diversions junior to MDS above gage

Vegetation, Soil Moisture and Crops

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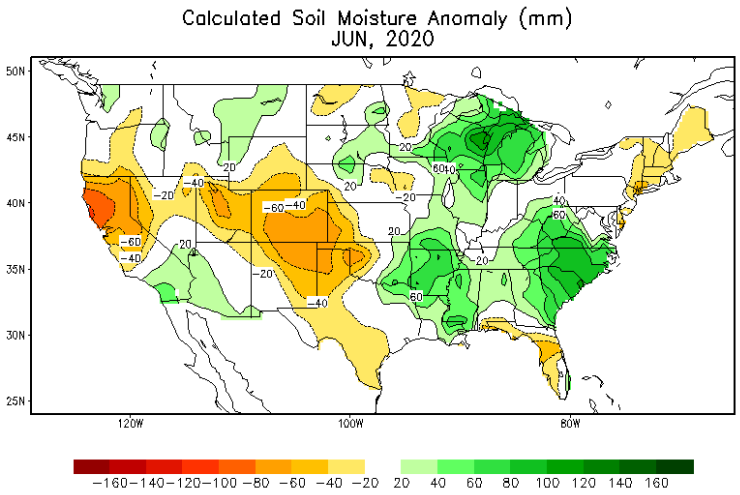

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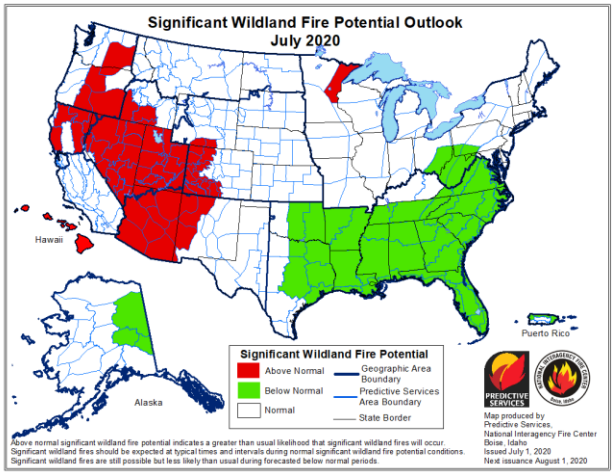

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Please contact the Kansas Water Office (785) 296-3185 or info@kwo.ks.gov should you have any questions or suggestions.

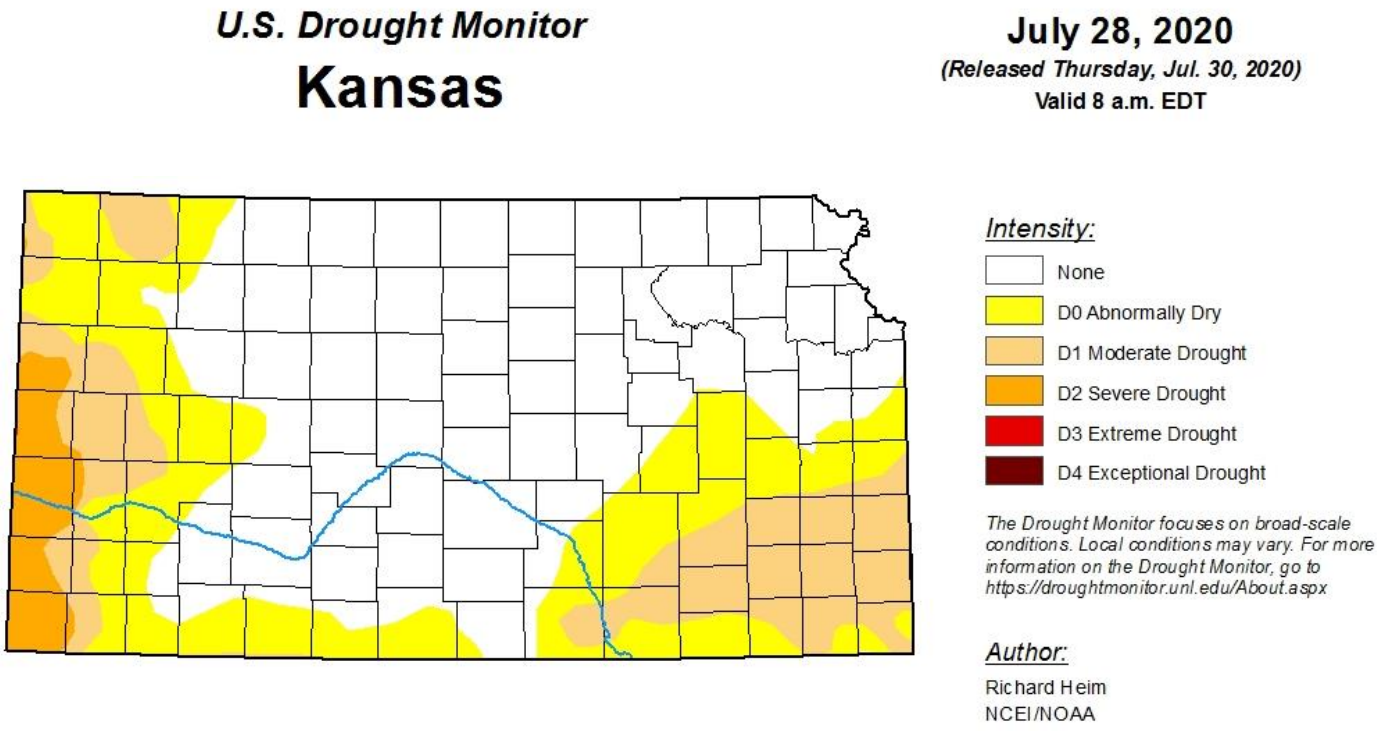
KANSAS CLIMATE
July 2020

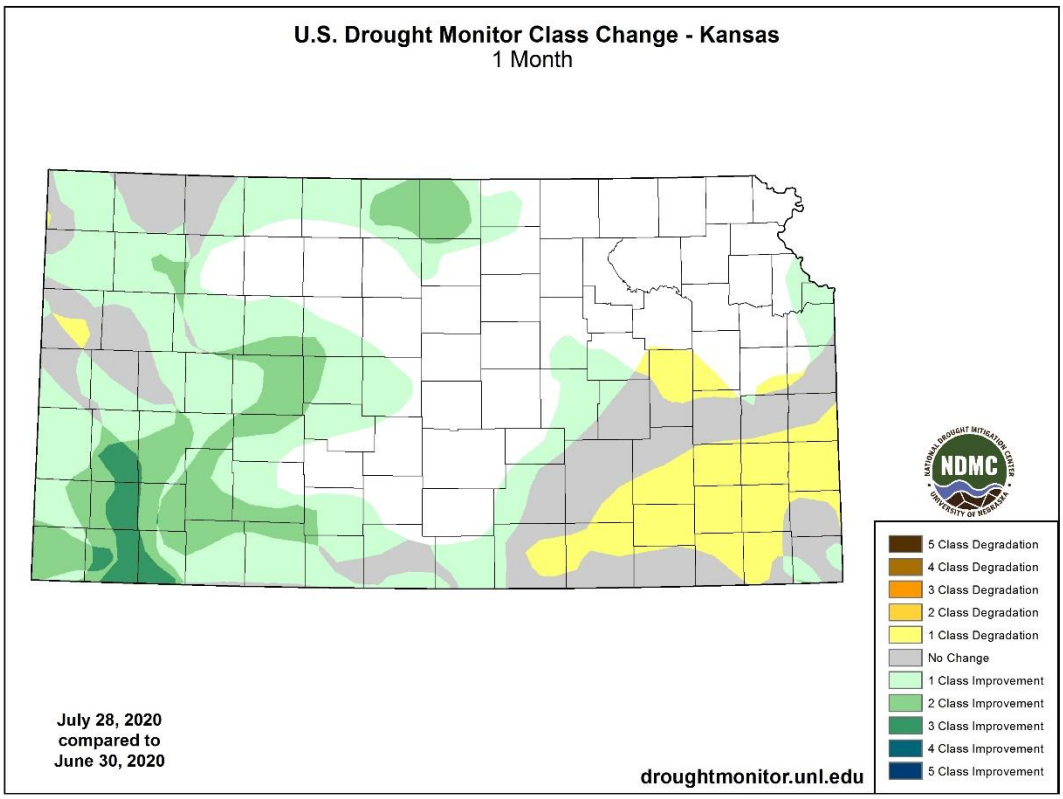
Highlights

- A wet second half of July has improved drought conditions across most of the state.
- Below average rainfall in southeast Kansas is increasing the probability for drought conditions to persist.
- August outlook: strong probability for below normal temperature; low confidence in precipitation forecasting.
- Drought Outlook predicts conditions staying similar during the month of August, and little improvement or removal of drought conditions in western Kansas for the next few months.

General Drought Conditions

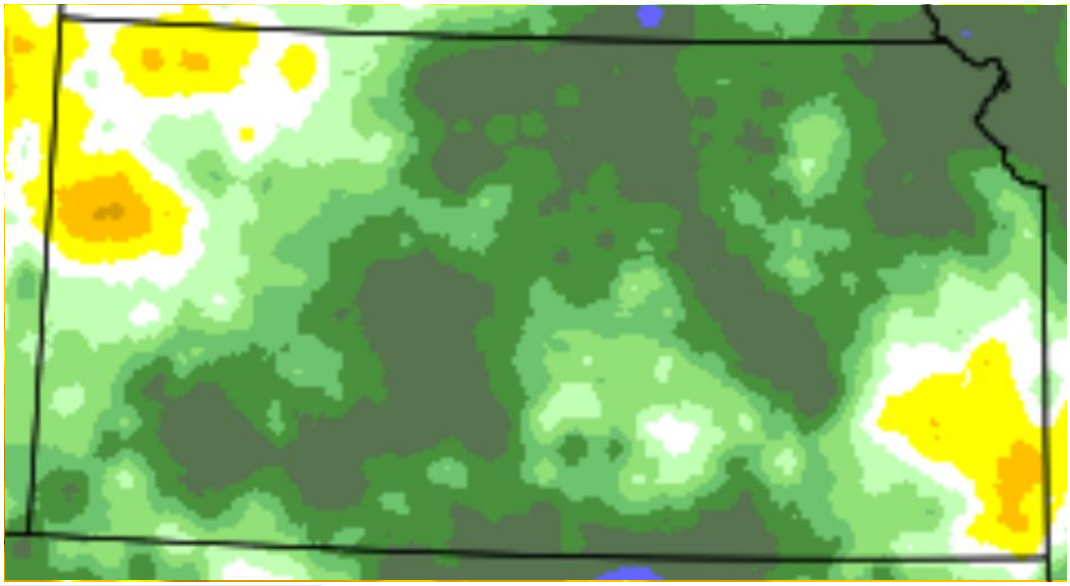
Drought continues to impact our western and southeastern counties. Recent rainfall has greatly improved conditions across most of the state. Our western counties have seen drought conditions level off or greatly improve.





Climate Summary

Total Precipitation Anomaly: July, 2020
Base Period: 1981-2010



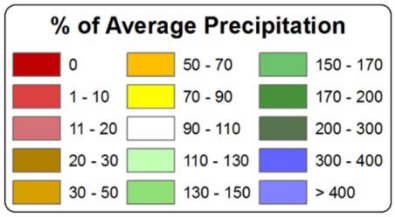
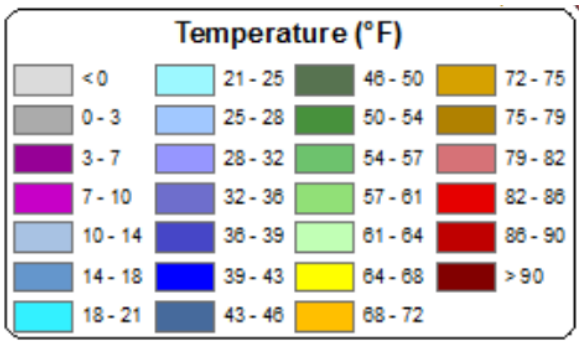


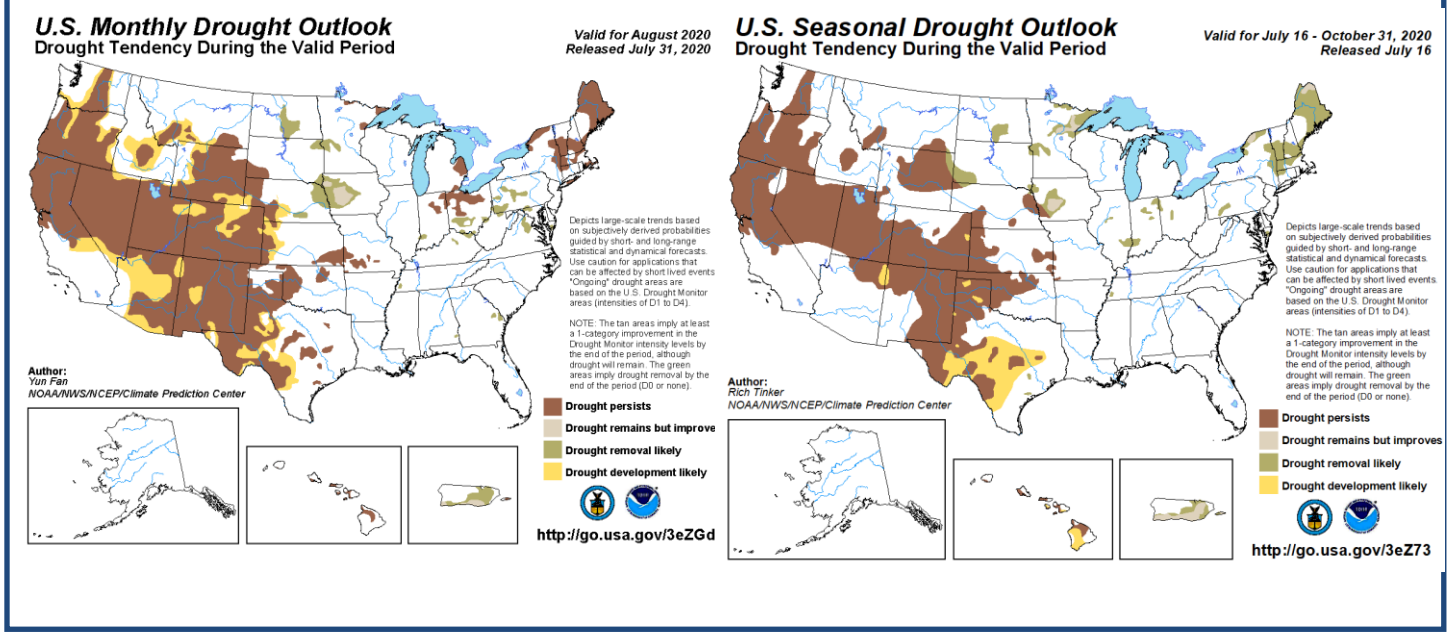
Figure 3 above summarizes observed precipitation anomaly. Figures 4, 5 below show temperature for the month. PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

30- Year Normal Mean Temperature: June 1981-2010



Average Daily Mean Temperature: June 2020

Outlooks



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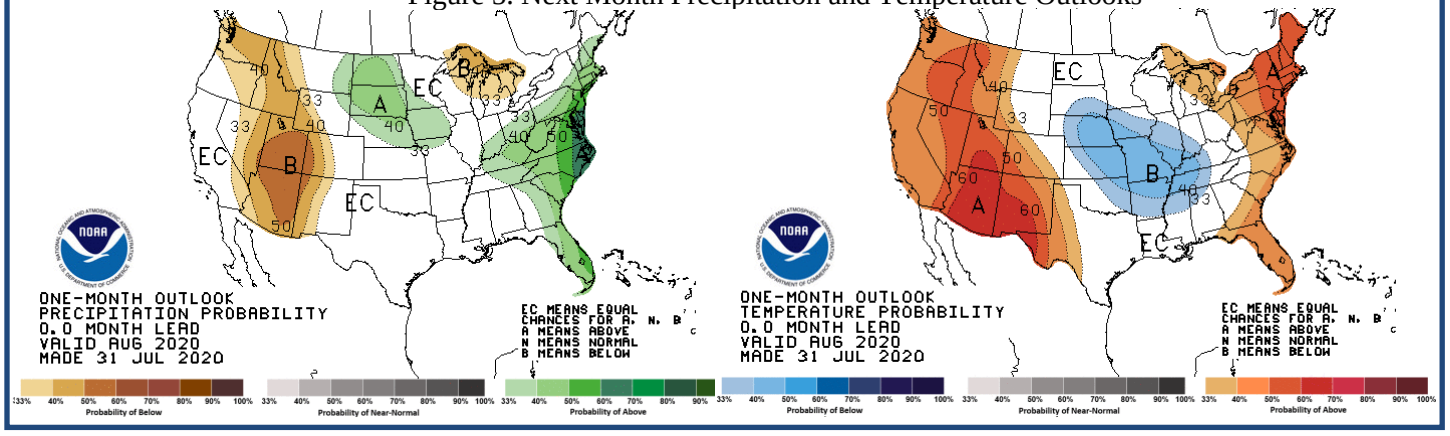

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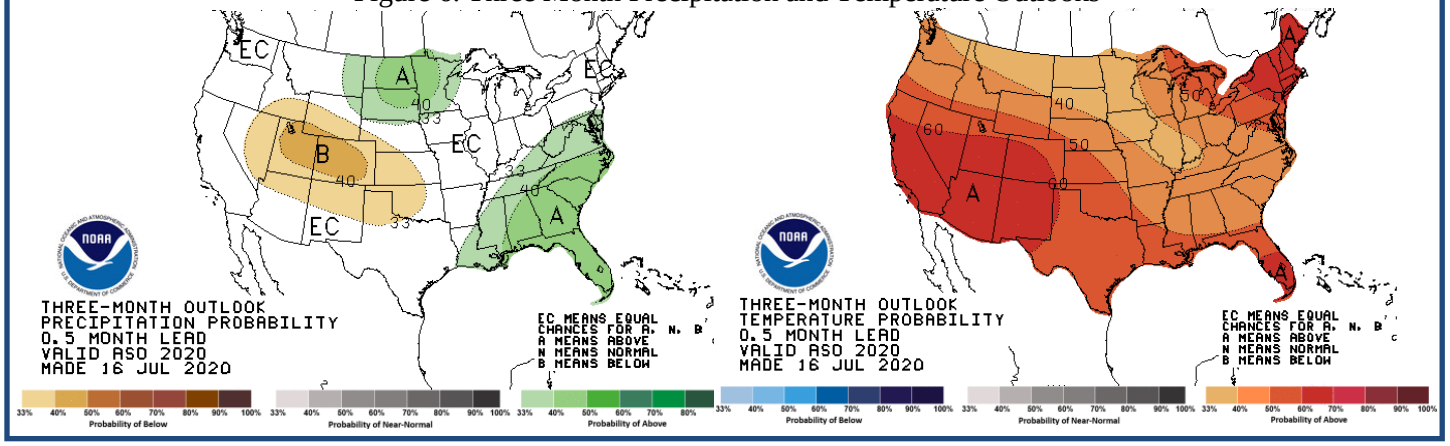

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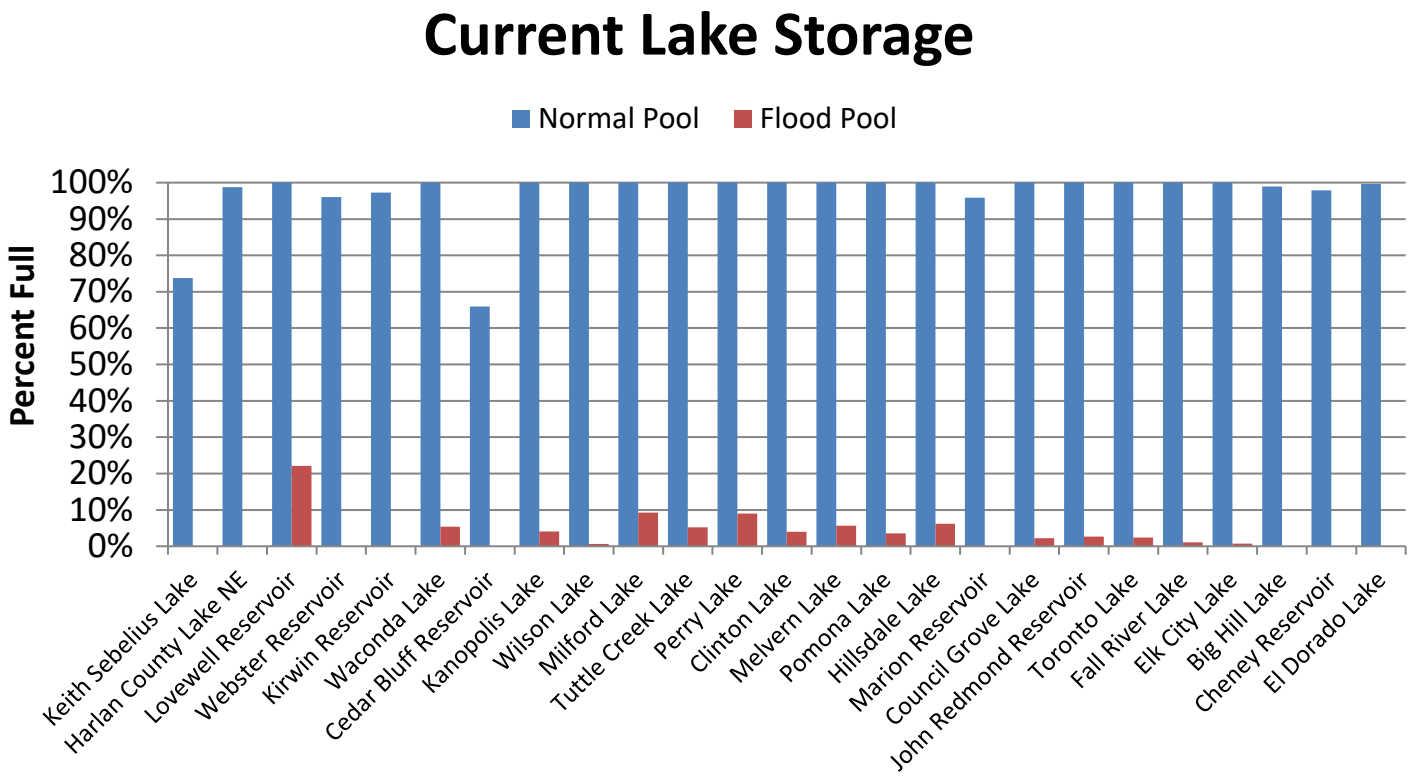

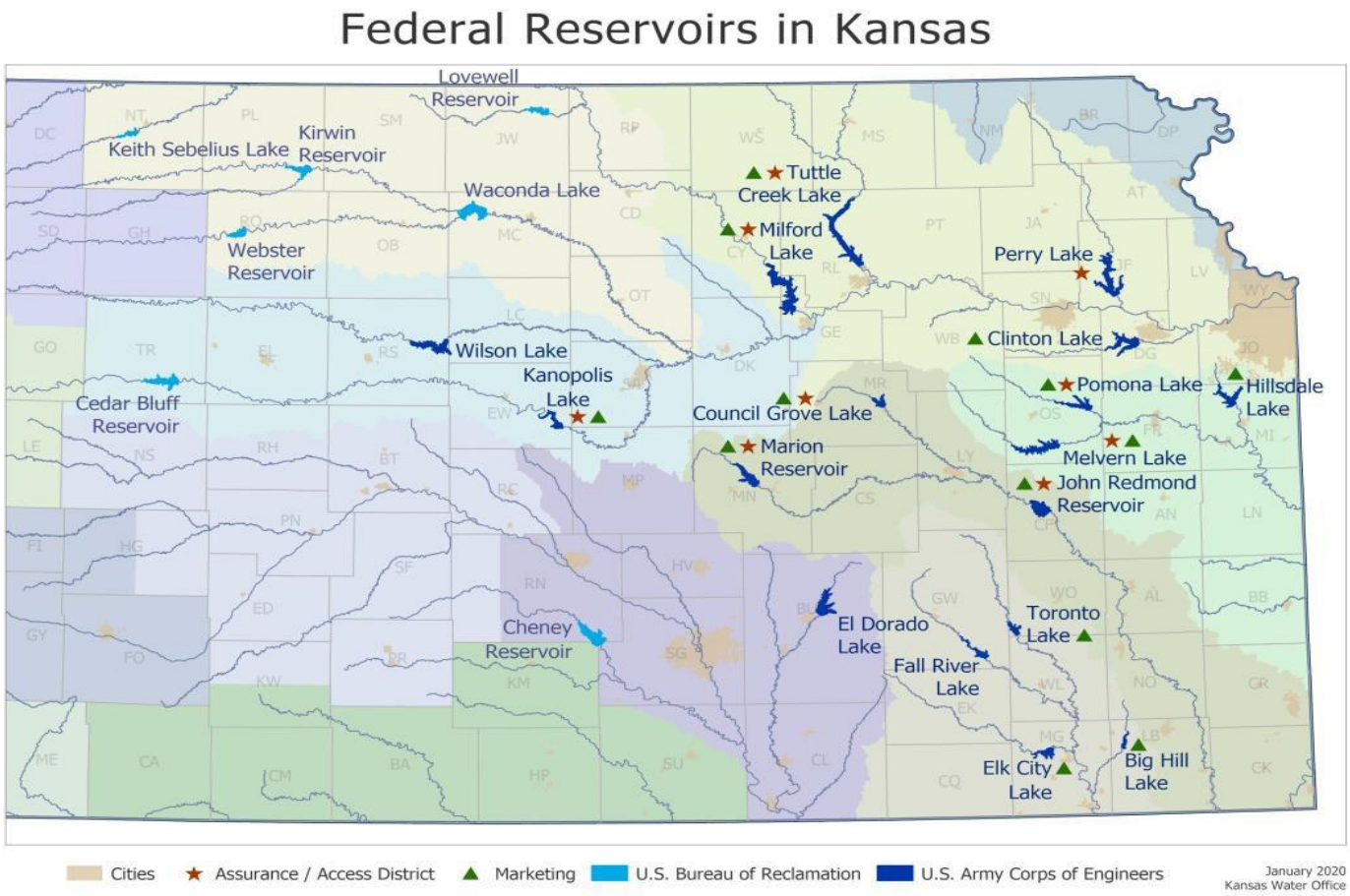

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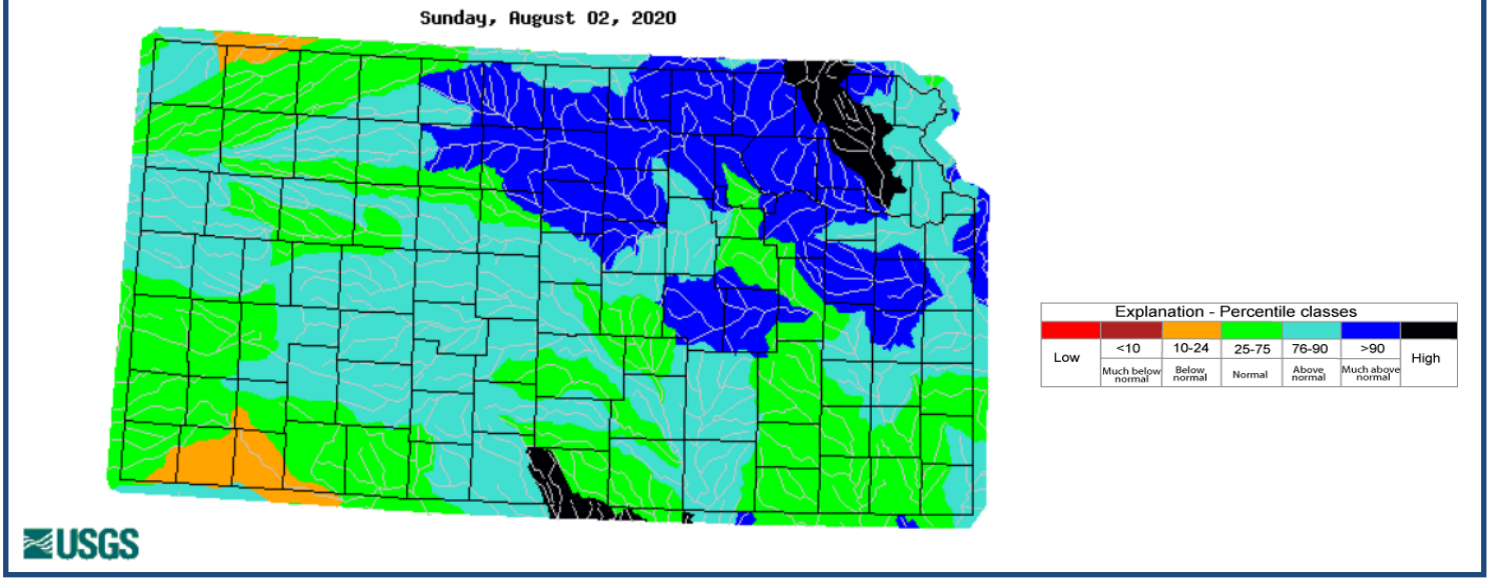

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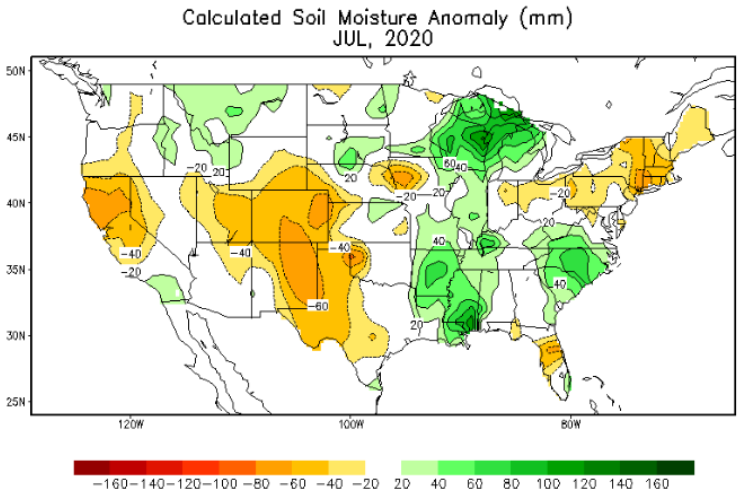

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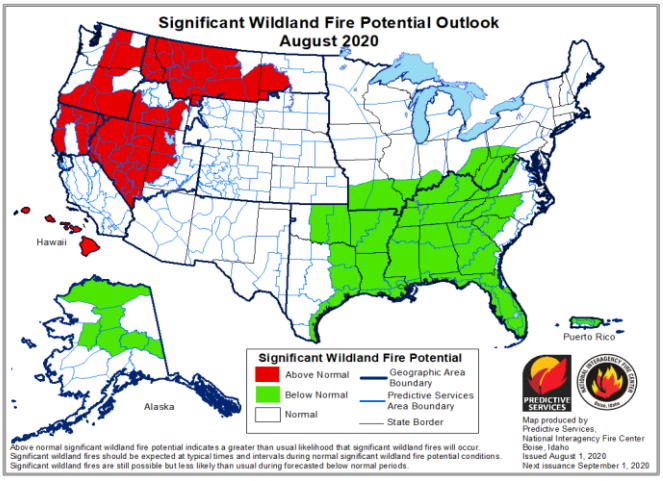

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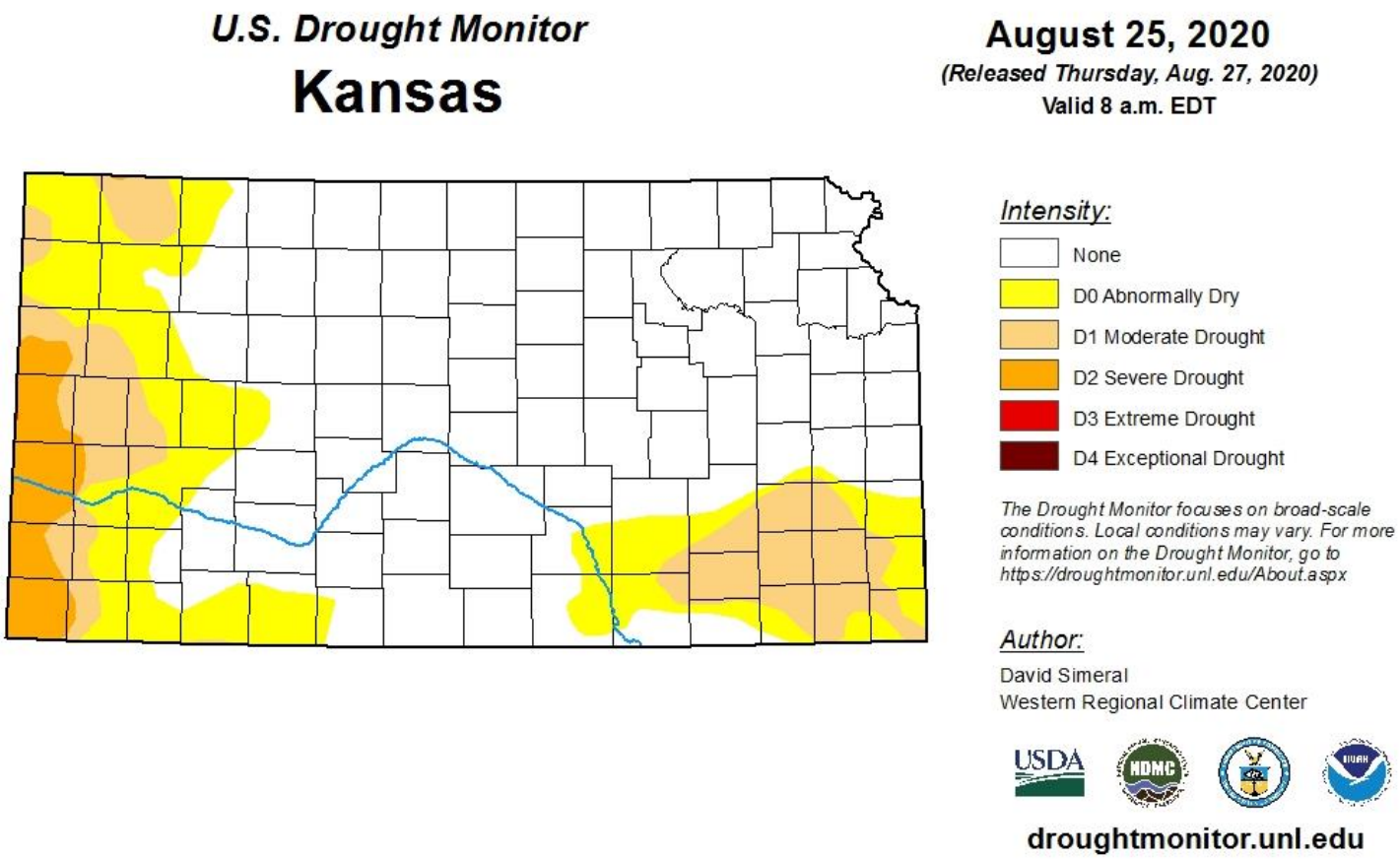
KANSAS CLIMATE
August 2020

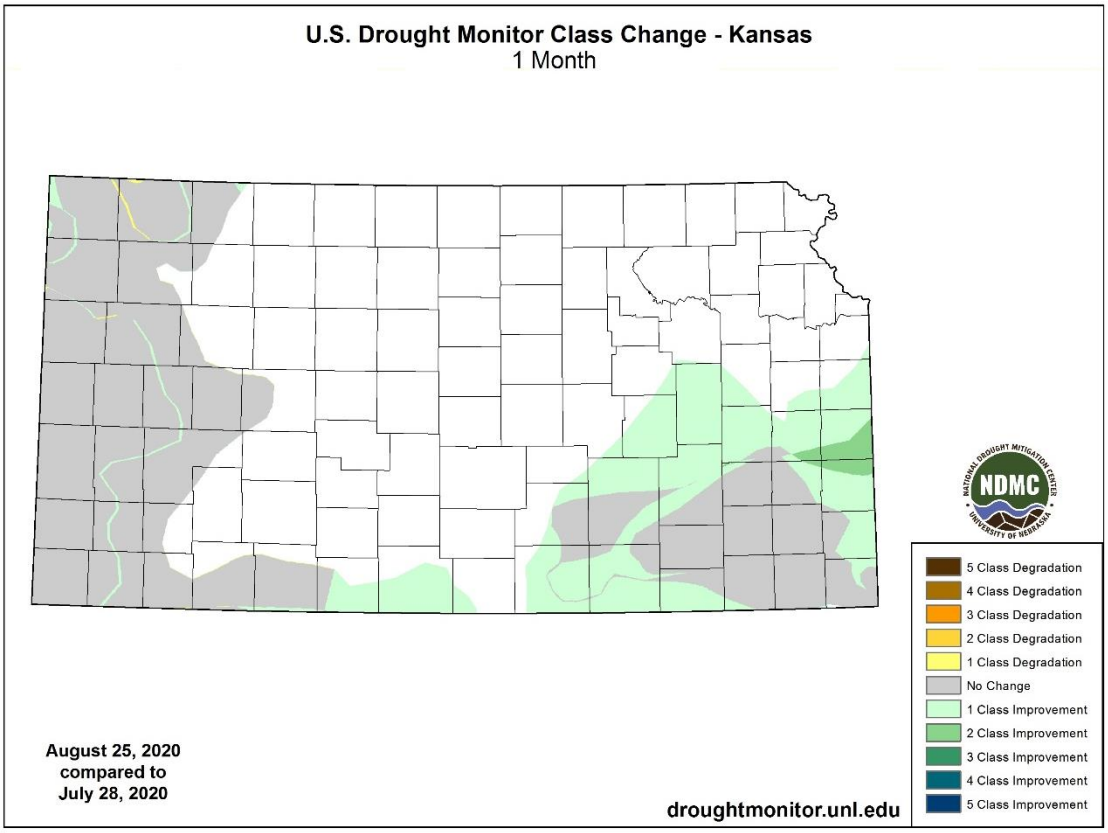
Highlights

- A dry August reinforced drought conditions across most of the state.
- Southeast Kansas is using reservoir storage to meet downstream targets.
- September outlook: Likely expansion of dry conditions in Western, Northwestern Kansas.
- Seasonal Outlook predicts a warmer than normal fall with below normal precipitation in much of the State.

General Drought Conditions

Drought continues to impact our western and southeastern counties.





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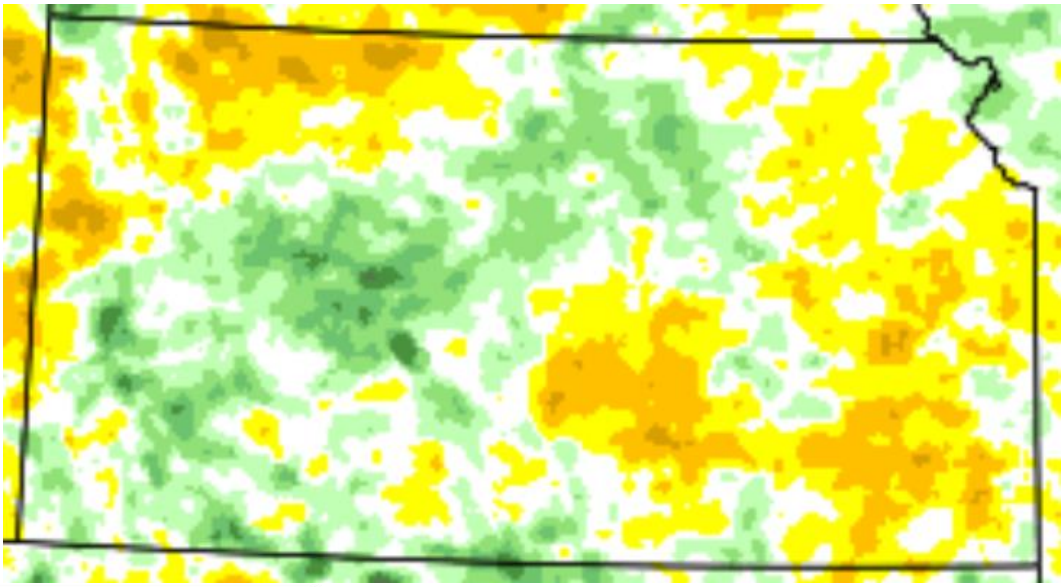

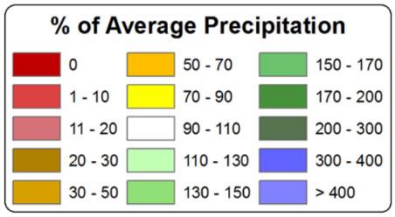

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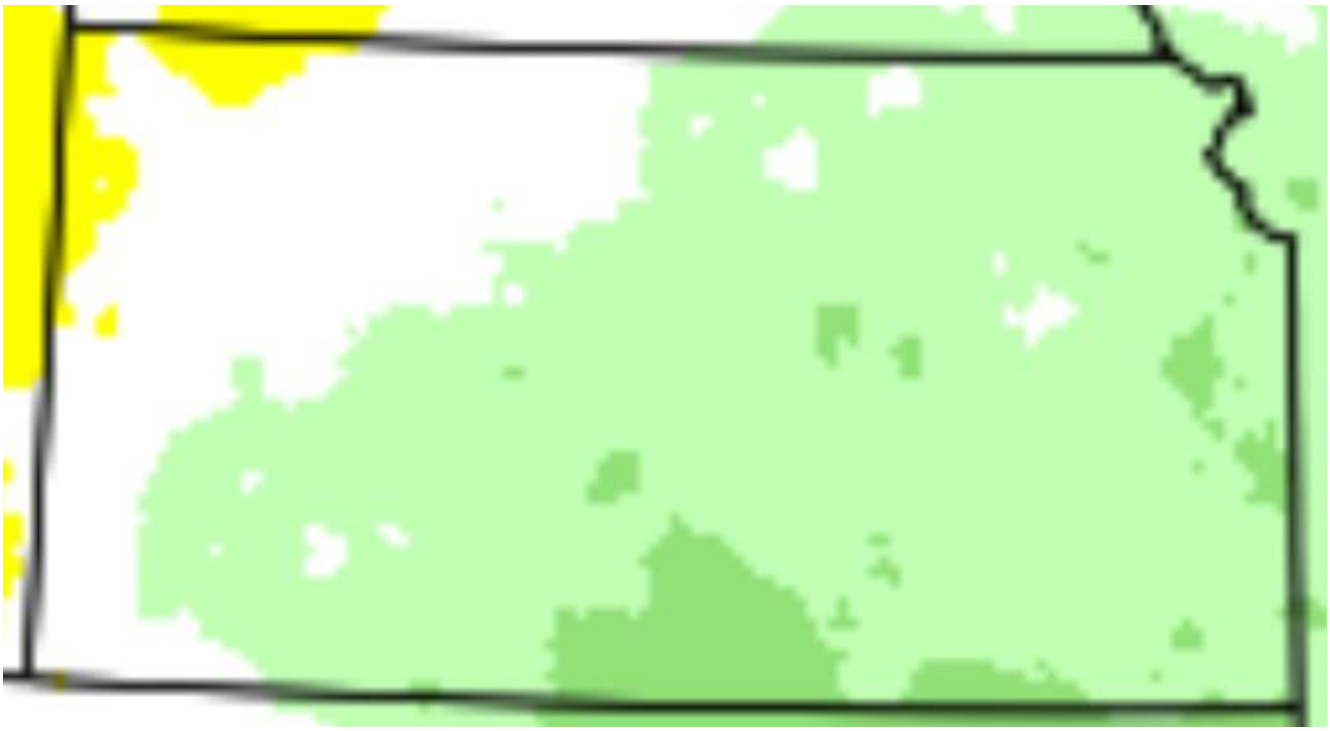
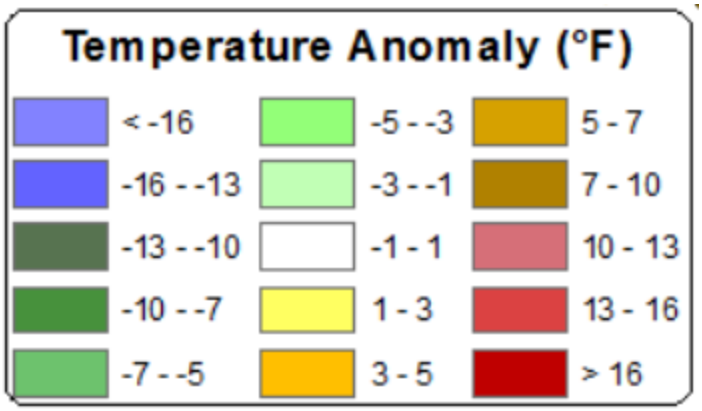
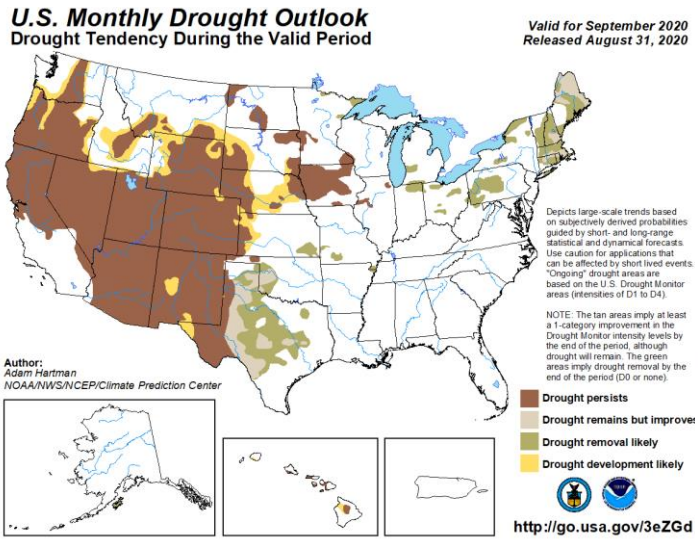
Deviation from 30-year normal
Daily Mean Temperature Anomaly: August 2020
Base period:1981-2010

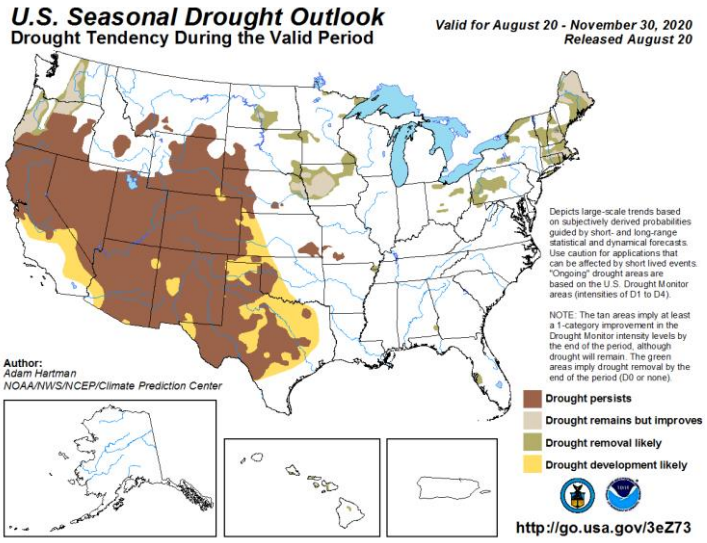




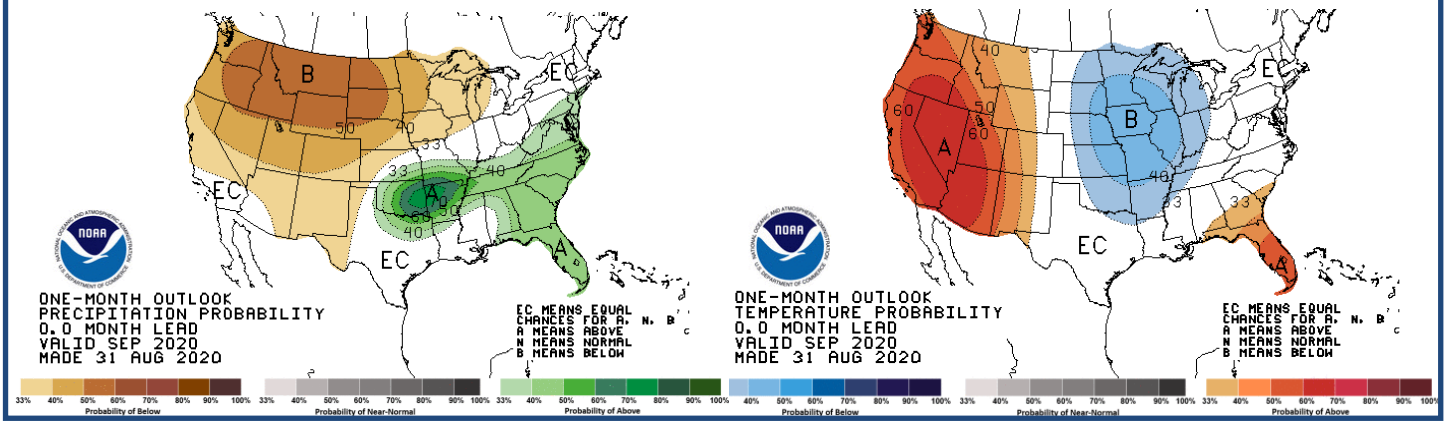
Outlooks

Monthly and Seasonal Drought Outlook

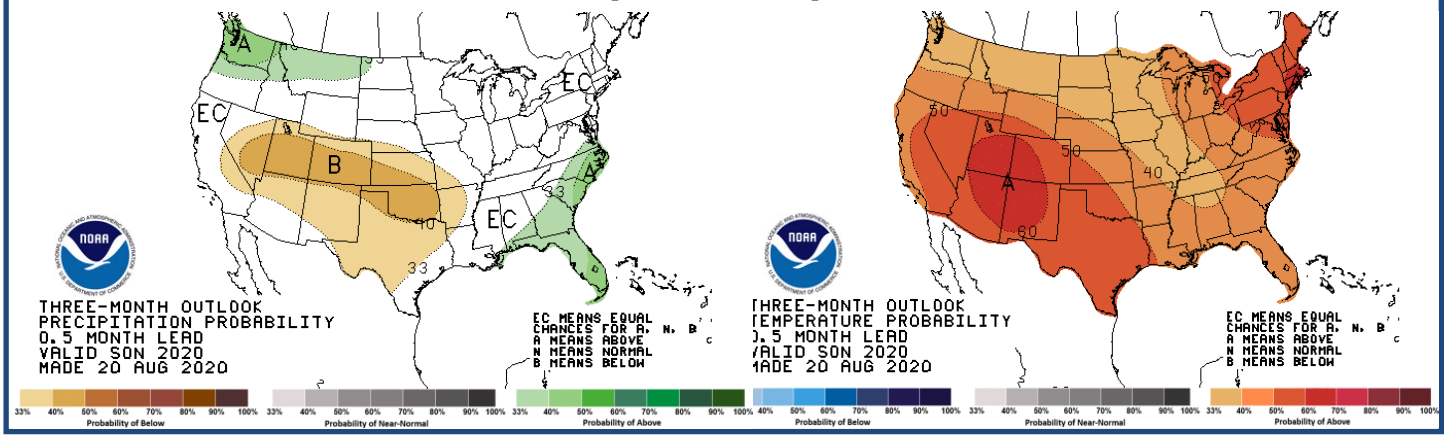




One Month Precipitation and Temperature Outlook



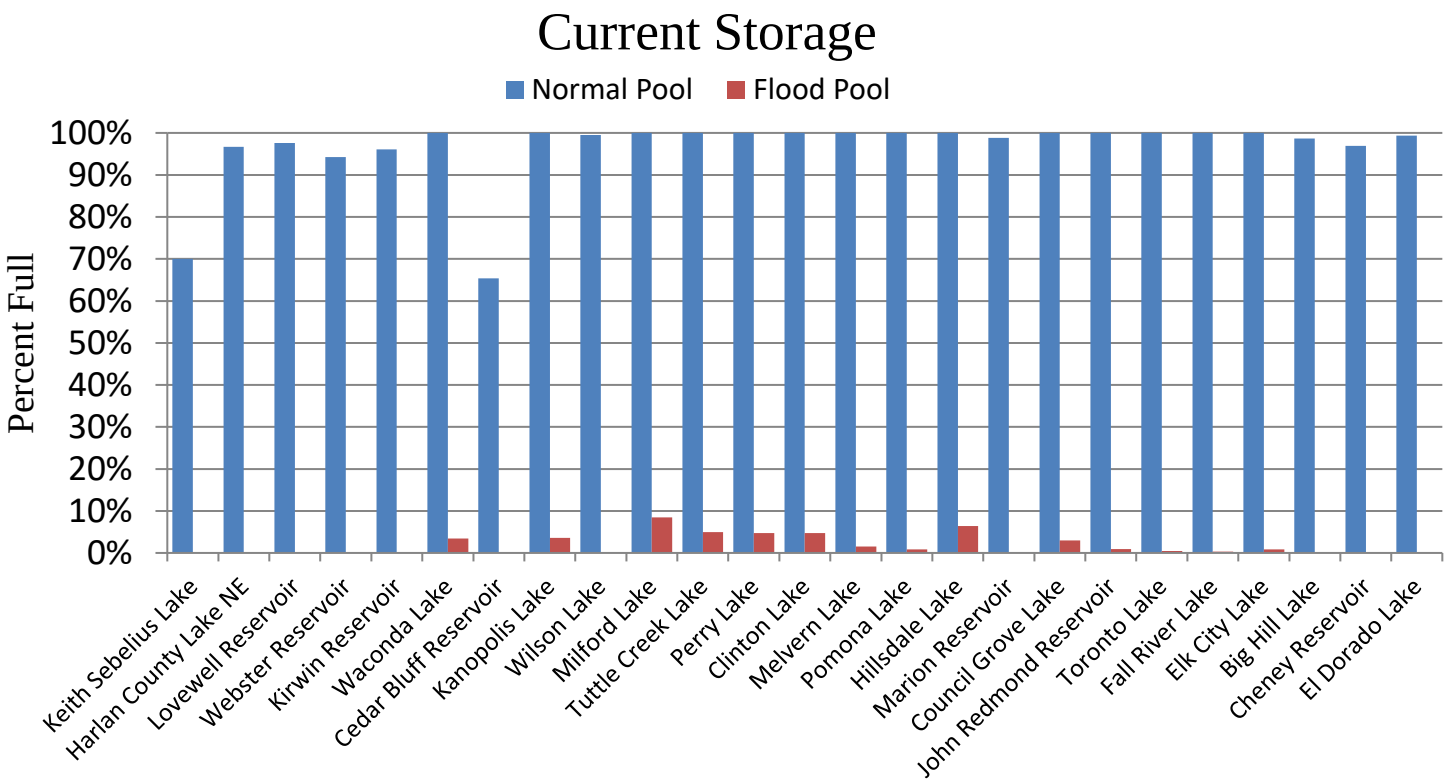
Three Month Precipitation and Temperature Outlook

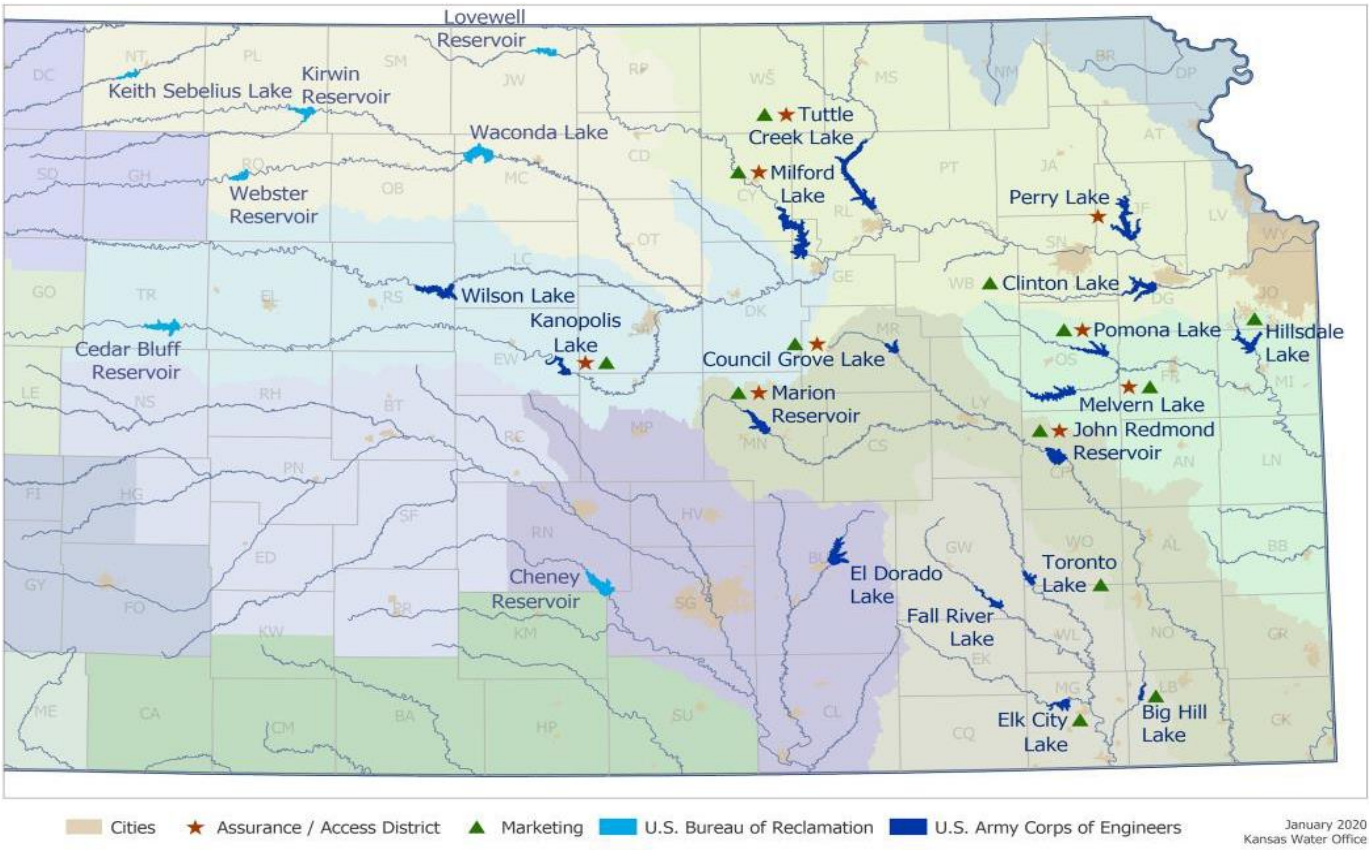


Water Supply

Reservoir Storage

Graph below provides the volumes in conservation and flood pool for federal reservoirs in Kansas.





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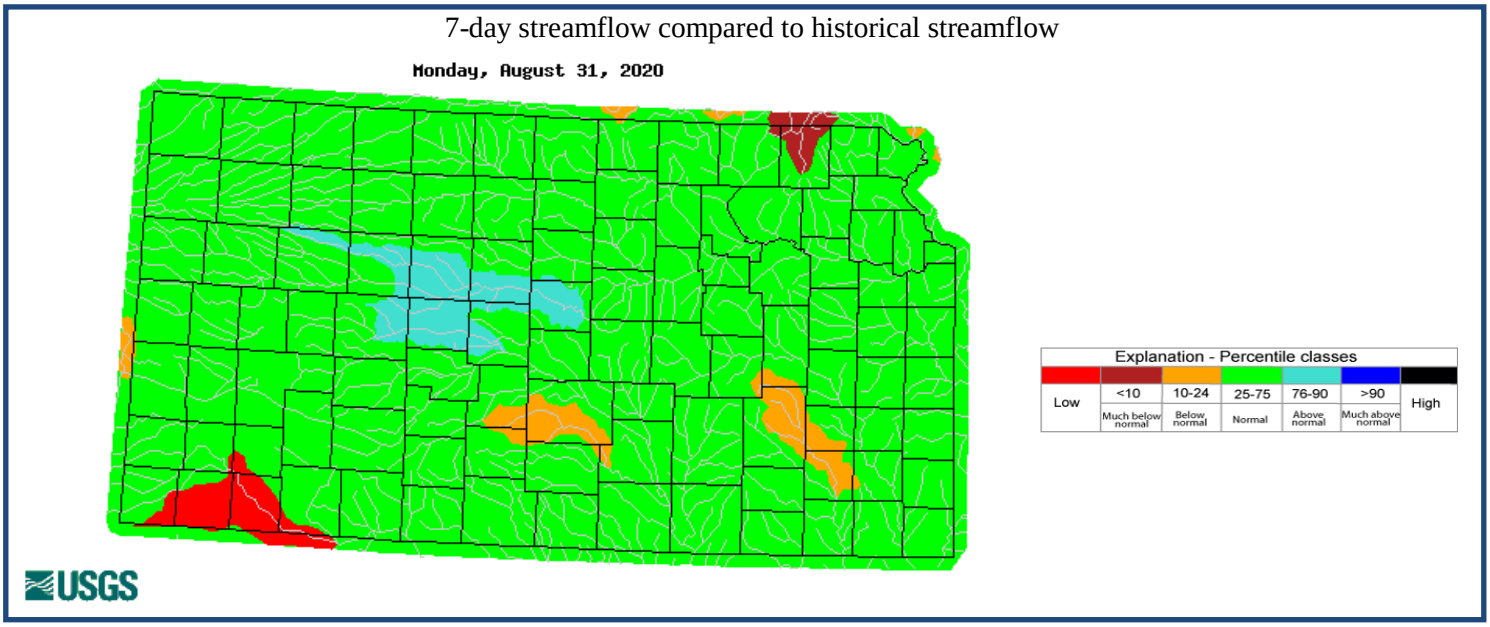

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There are currently no streams under MDS in Kansas.

Vegetation, Soil Moisture and Crops

Vegetative Conditions

The Vegetative Condition map depicts vegetation stress. It is produced using satellite data by the National Drought Mitigation Center https://vegdri.unl.edu/Home.aspx and often customized for Kansas by the Kansas Biological Survey in the GreenReport.

Soil Moisture and Rangeland

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

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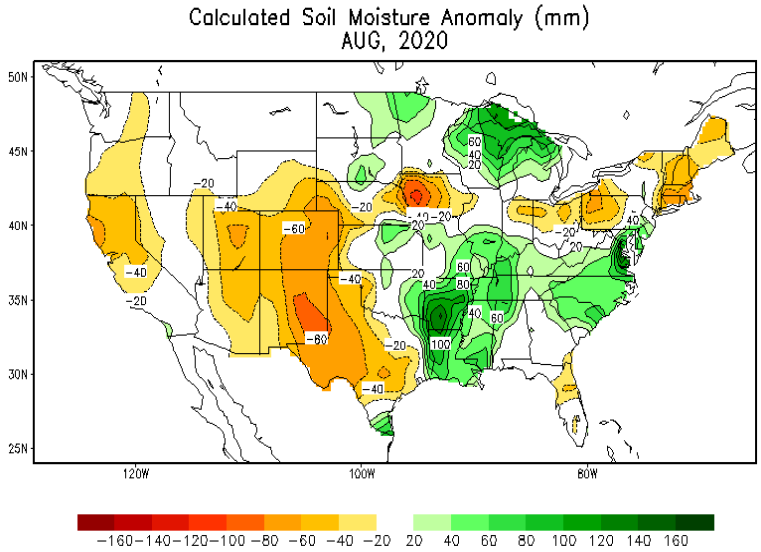

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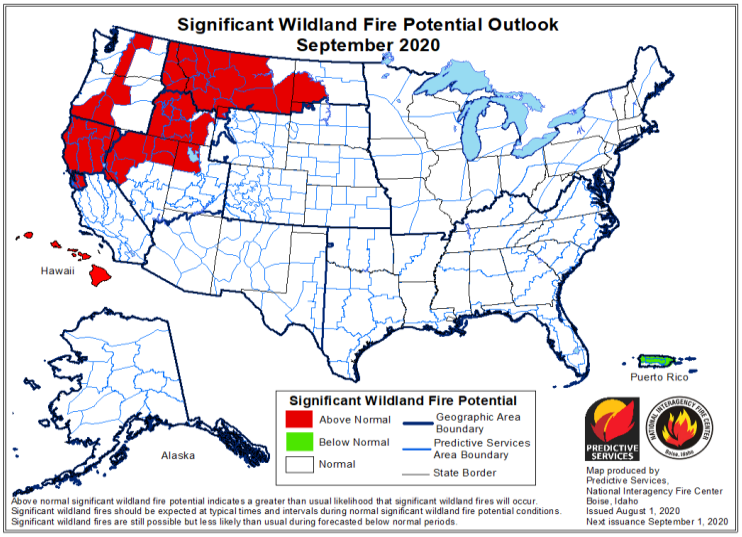

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Please contact the Kansas Water Office (785) 296-3185 or info@kwo.ks.gov should you have any questions or suggestions.

Kansas Water Office

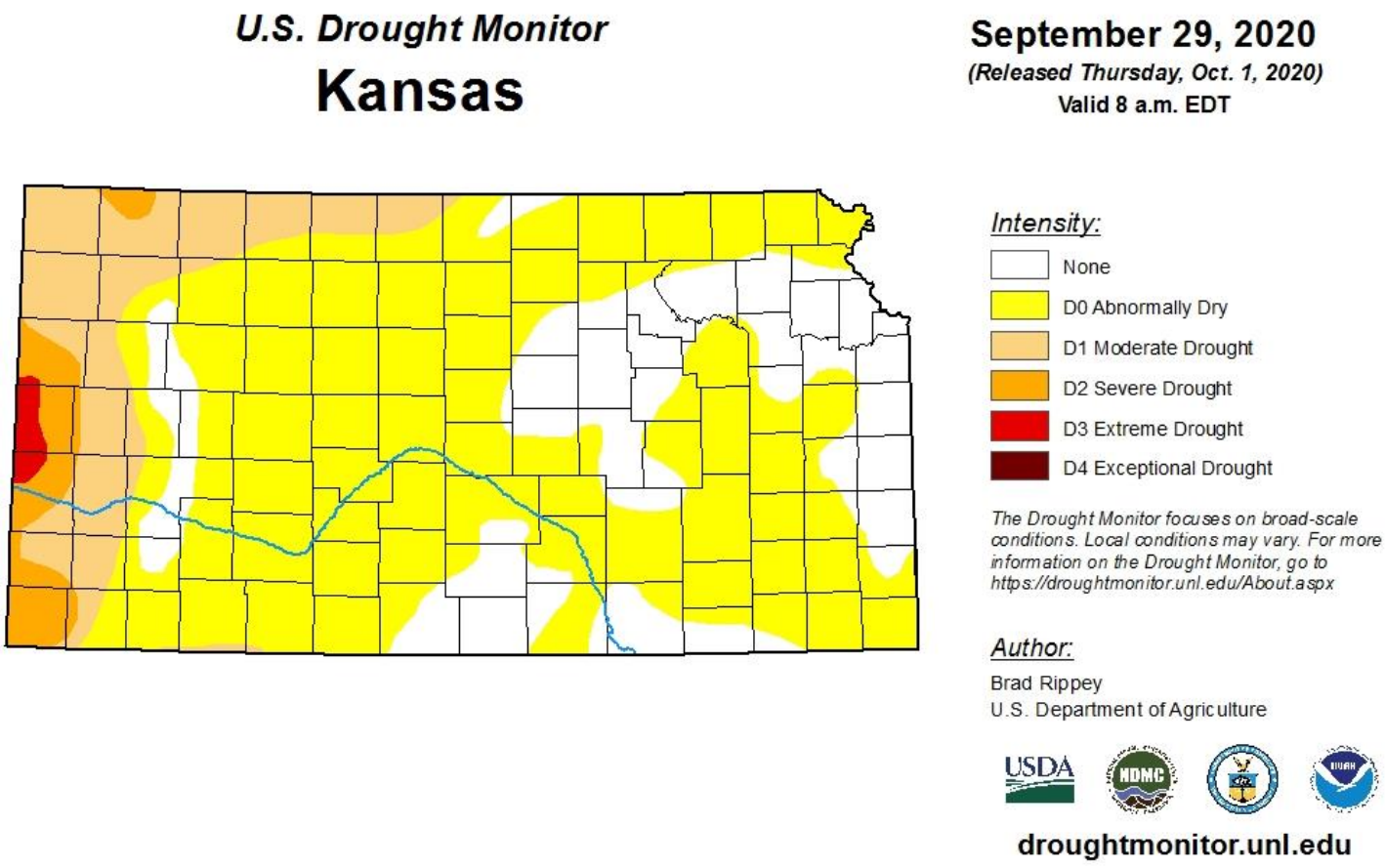
KANSAS CLIMATE
September 2020

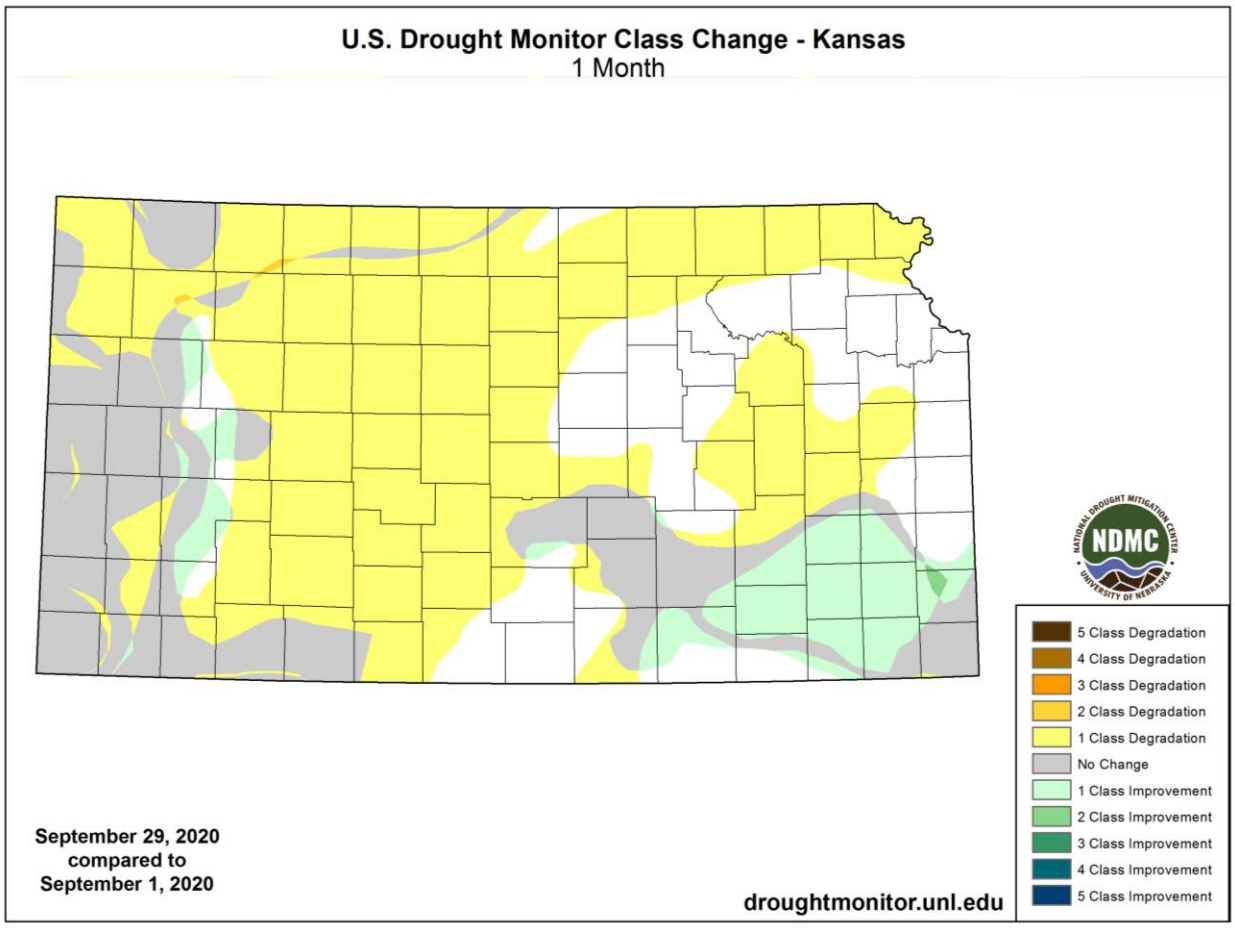
Highlights

- A dry September reinforced drought conditions in western Kansas.
- Southeast Kansas is using reservoir storage to meet downstream targets.
- October outlook: Most of the state expected to see less than half of its normal October precipitation.
- Seasonal Outlook predicts a warmer than normal fall with below normal precipitation in much of the State.

General Drought Conditions

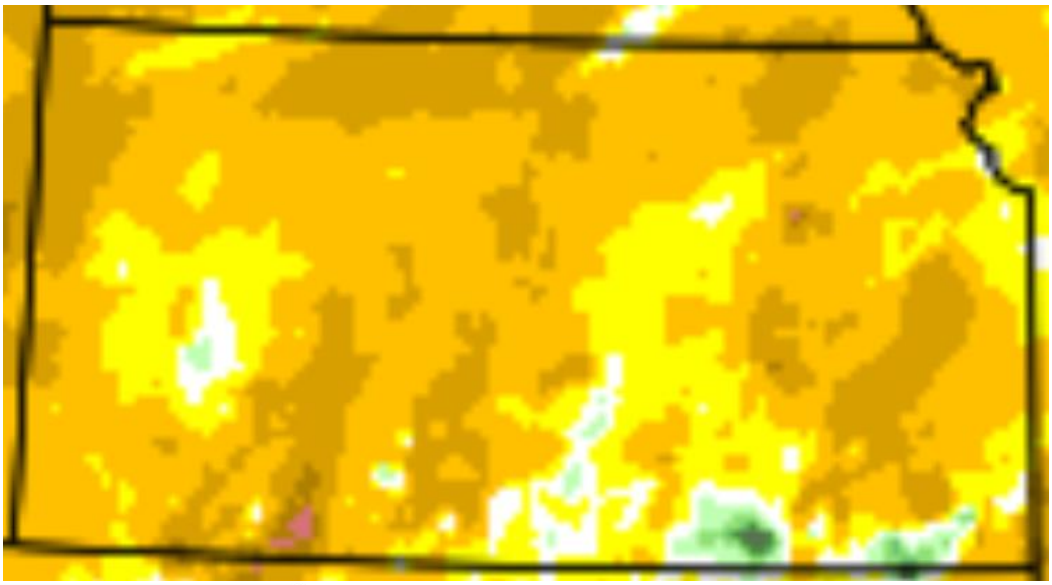
Drought continues to impact our western counties while most of the state experiences abnormally dry conditions.





Climate Summary

Total Precipitation Anomaly: September, 2020
Base Period: 1981-2010



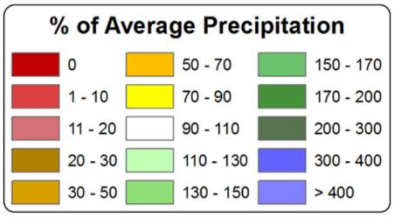
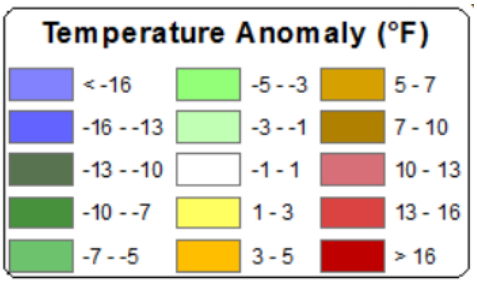
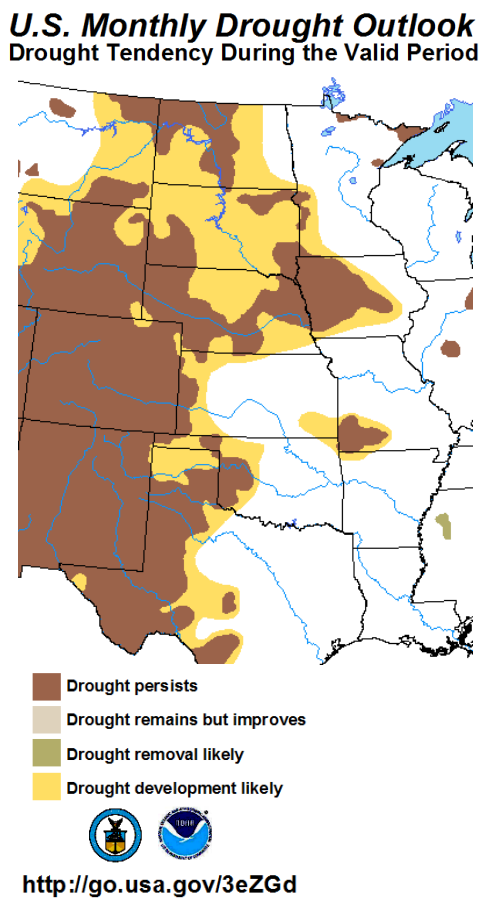


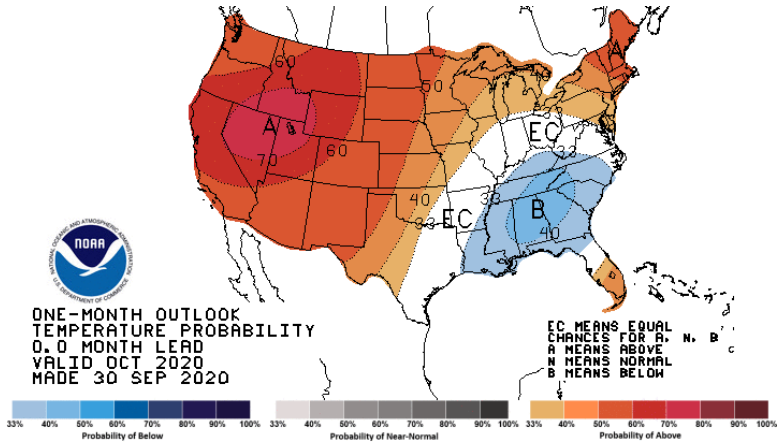
Figure 3 above summarizes observed precipitation anomaly. Figures 4, 5 below show temperature for the month. PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

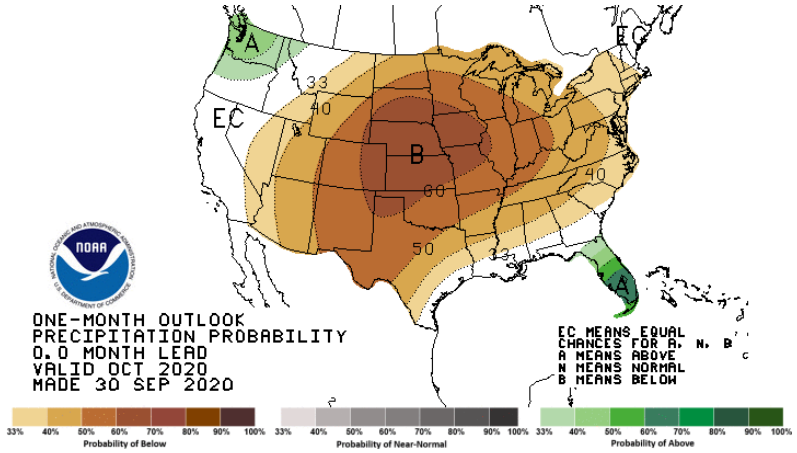
Deviation from 30-year normal
Daily Mean Temperature Anomaly: September 2020
Base period:1981-2010



Outlooks



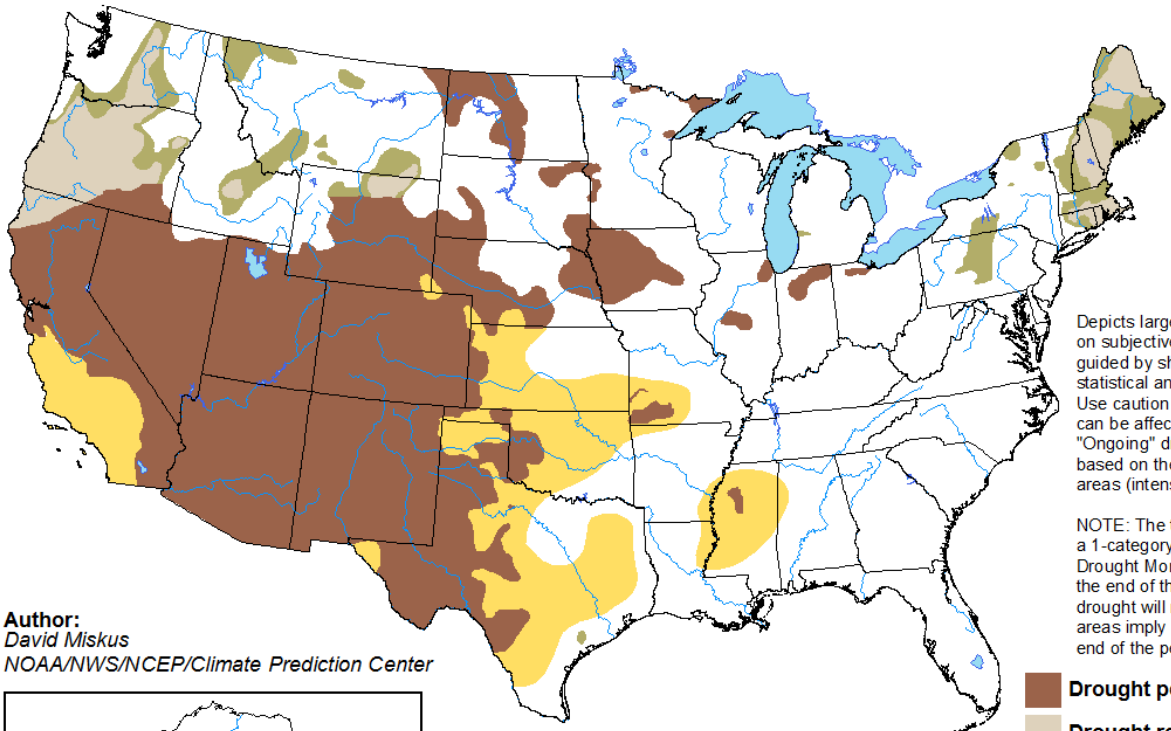




U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

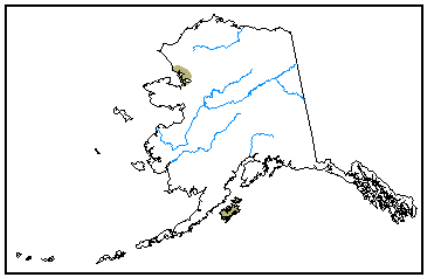
Valid for September 17 - December 31, 2020
Released September 17

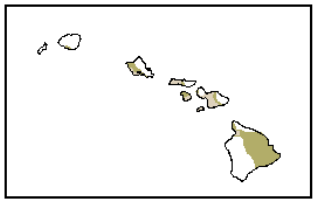


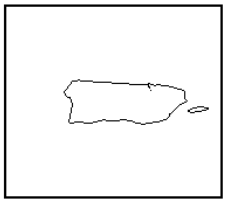
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:
David Miskus
NOAA/NWS/NCEP/Climate Prediction Center

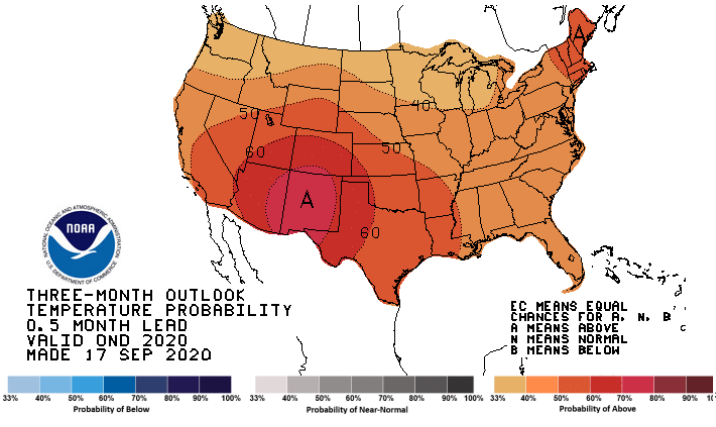


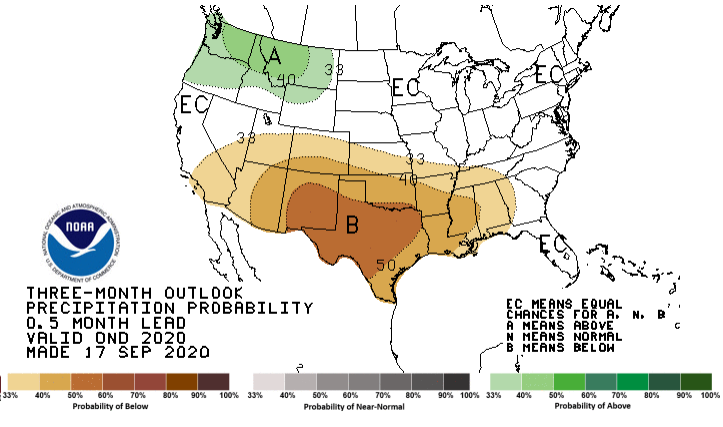




- **Drought persists**
- **Drought remains but improves**
- **Drought removal likely**
- **Drought development likely**

http://go.usa.gov/3eZ73





Water Supply

Reservoir Storage

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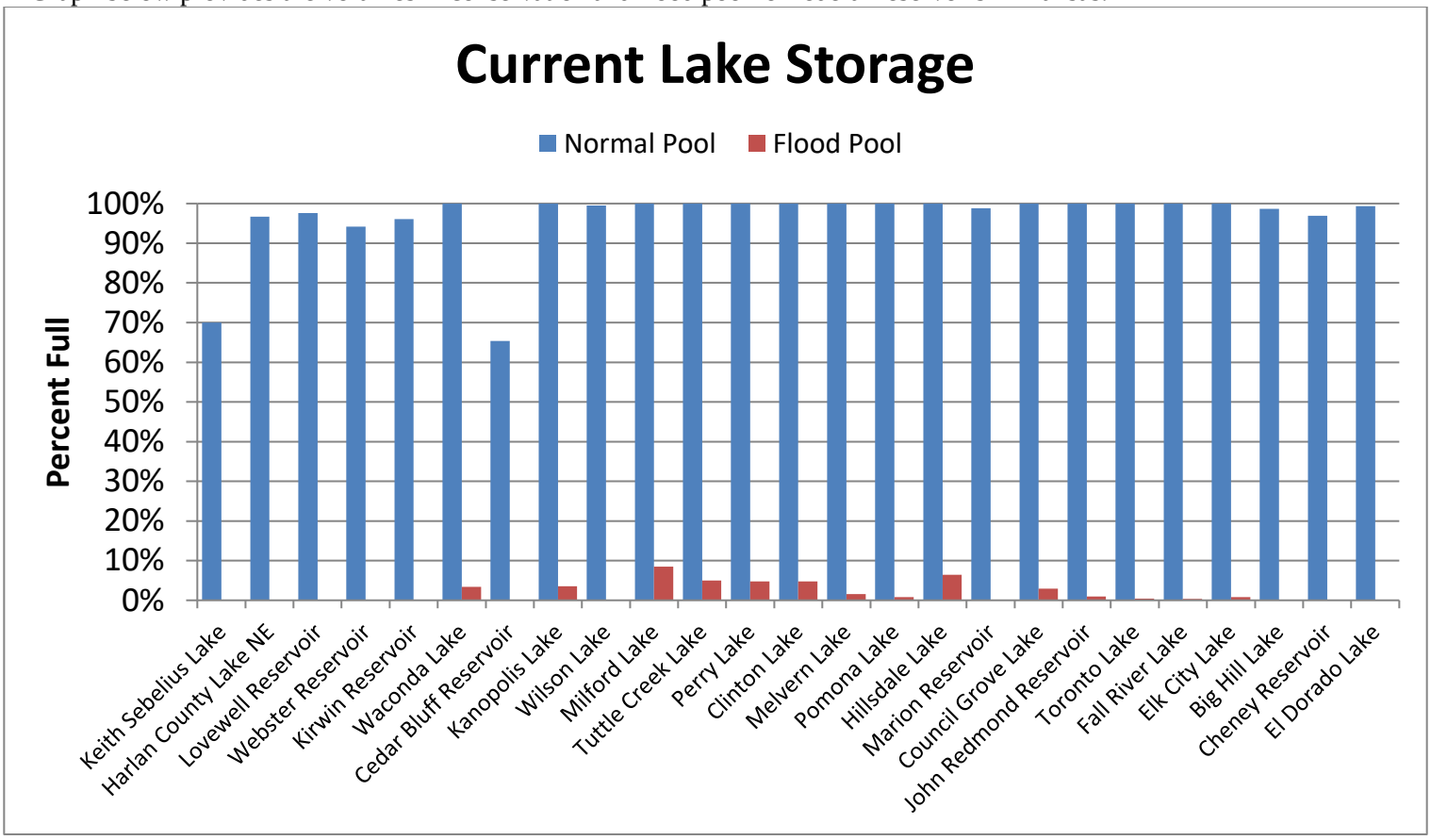
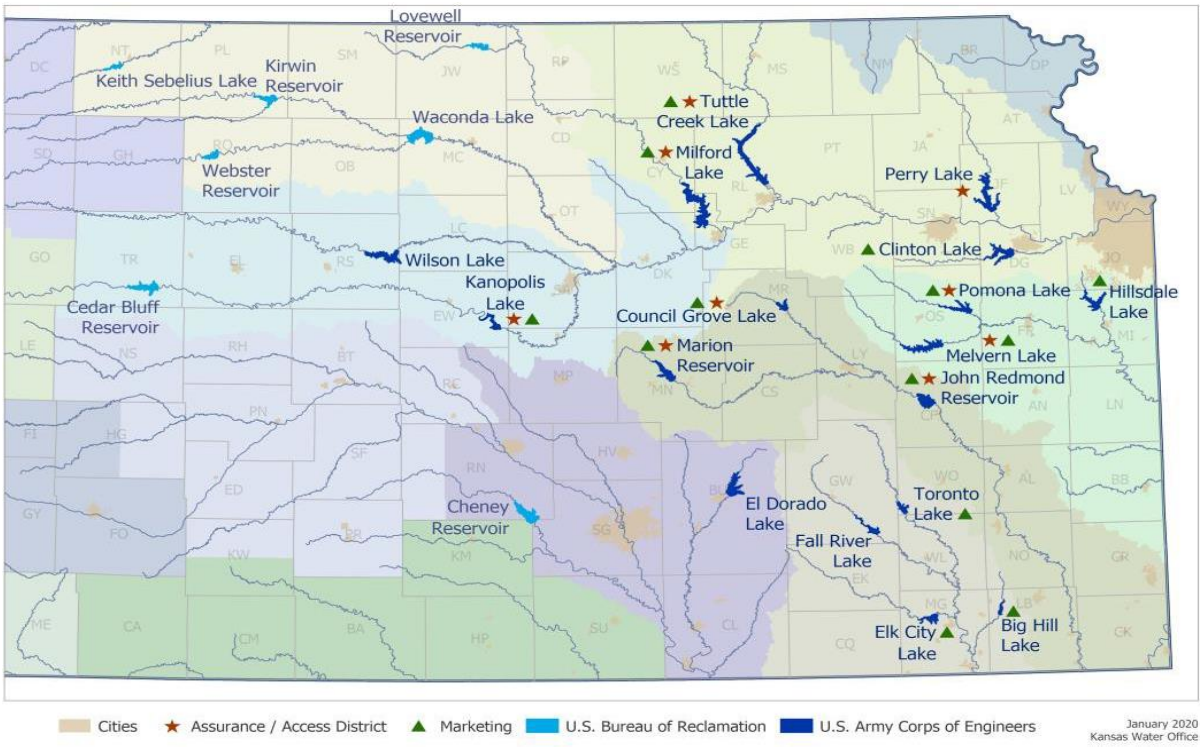


Federal Reservoirs in Kansas



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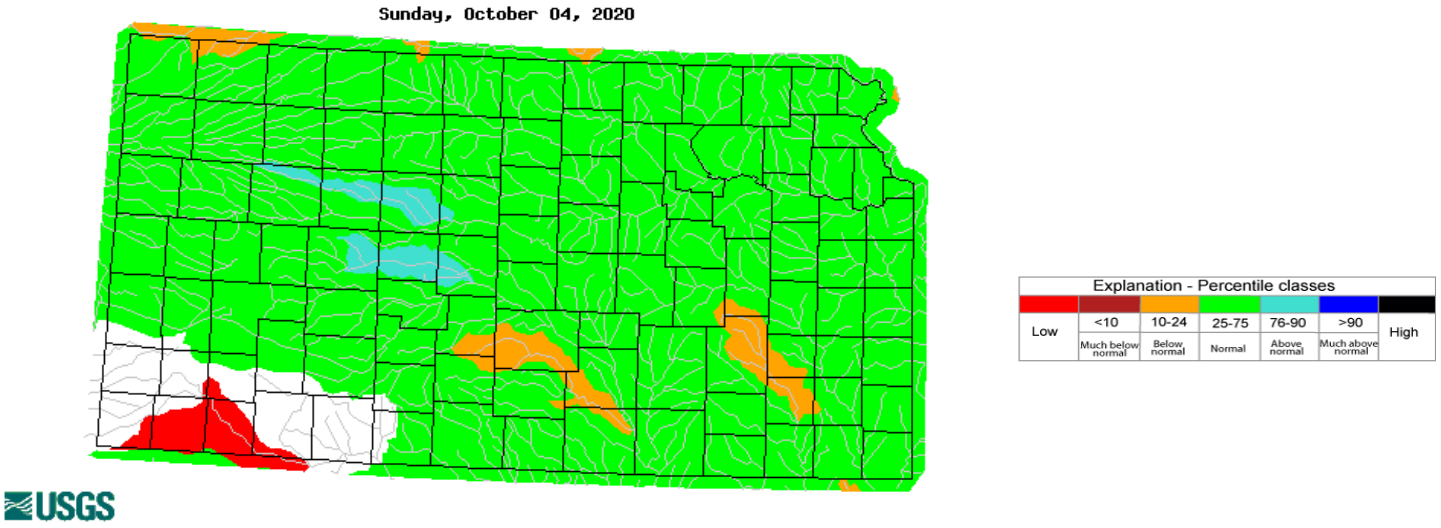
7-day streamflow compared to historical streamflow



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MDS is currently being administered on the following streams:

- Little Arkansas River above Alta Mills (September 28, 2020)

https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/minimum-desirable-streamflow

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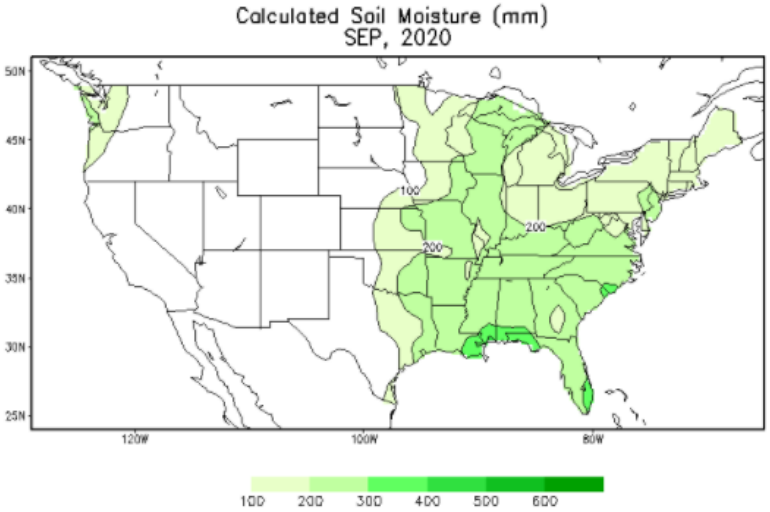

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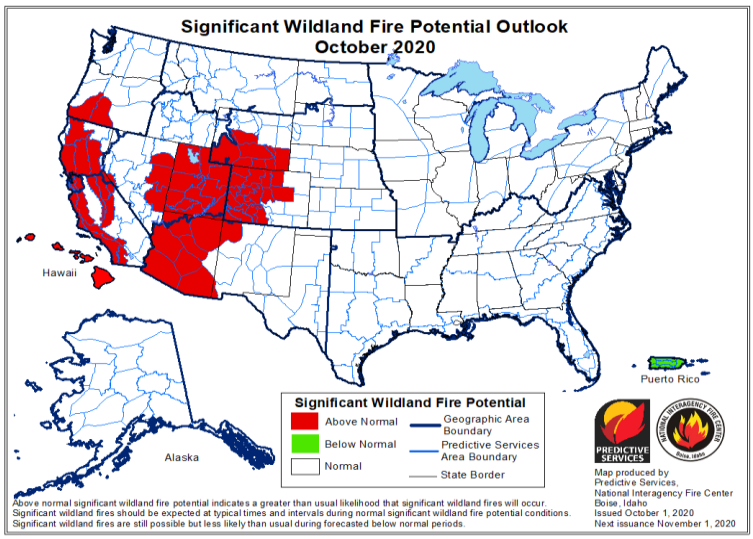

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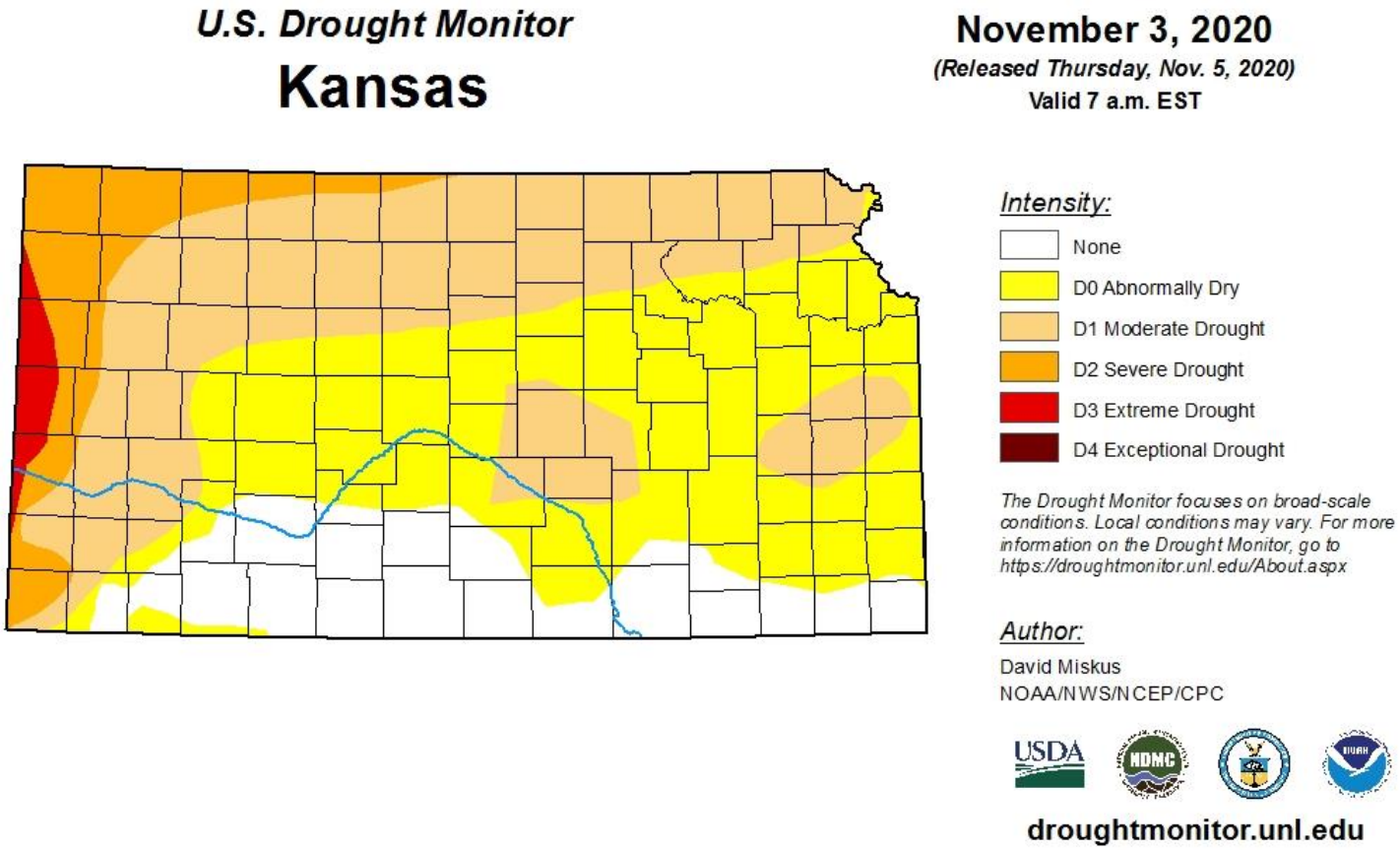
KANSAS CLIMATE
October 2020

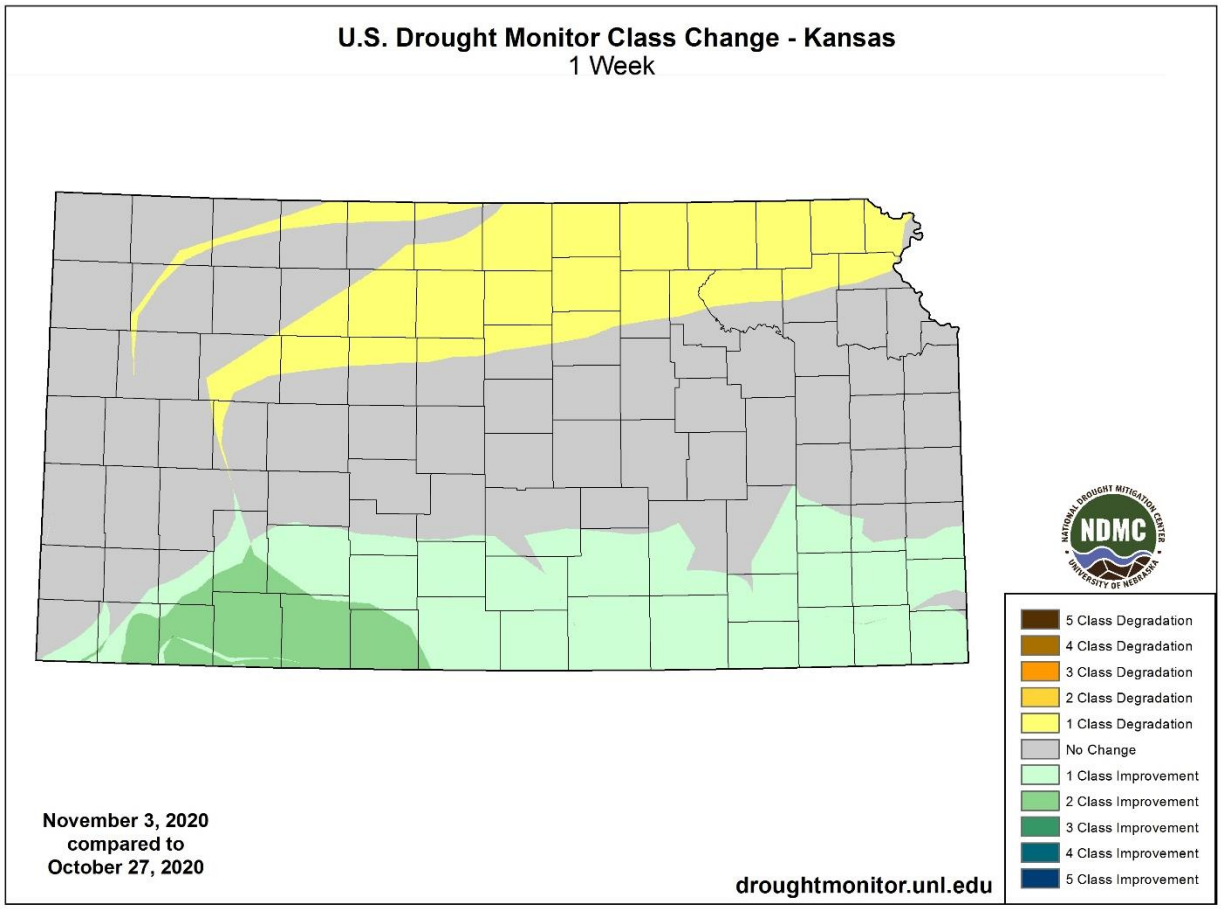
Highlights

- A dry October reinforced drought conditions in western Kansas.
- Southeast Kansas is using reservoir storage to meet downstream flow targets and our Kansas Basing reservoirs are releasing storage to meet water quality targets.
- November outlook: Most of the state has a expected to see below normal precipitation and above normal temperatures.
- 3-month outlook predicts warm and dry conditions for much of the State.

General Drought Conditions

Drought continues to impact our western counties while most of the state experiences abnormally dry conditions.





Climate Summary

Total Precipitation Anomaly: October, 2020
Base Period: 1981-2010

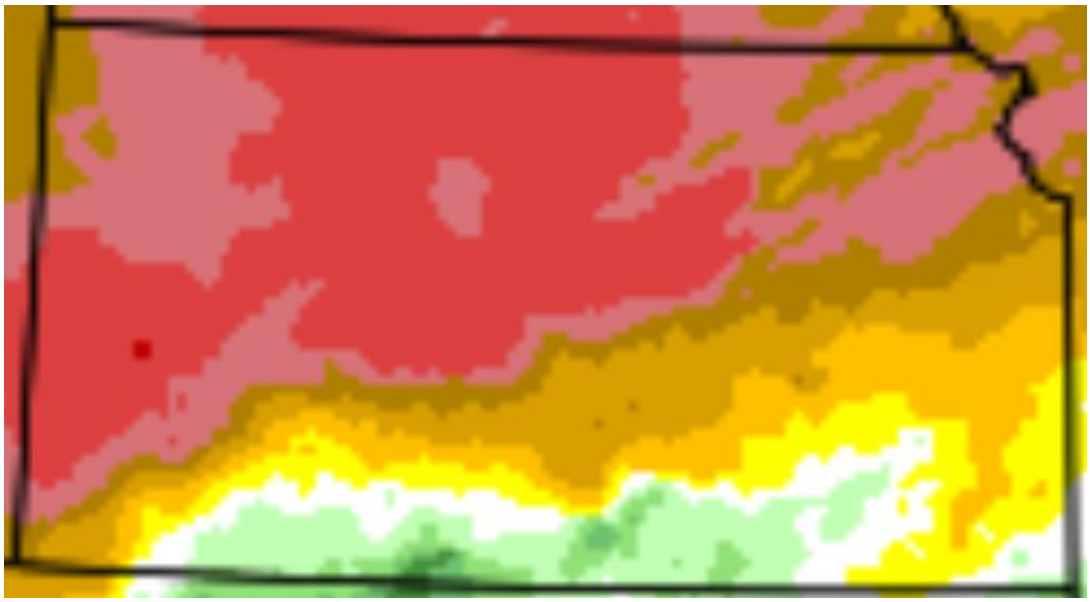
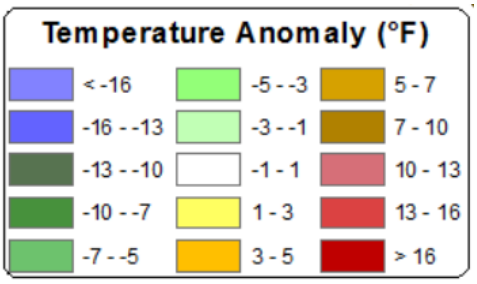
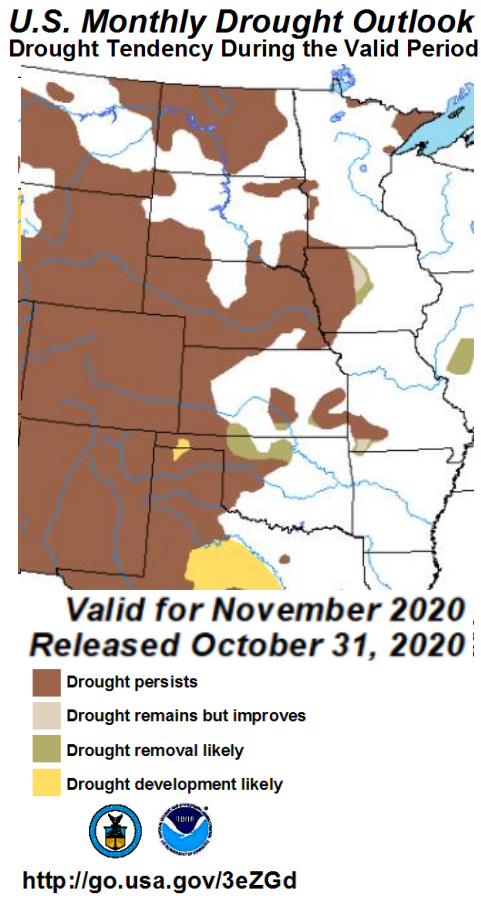


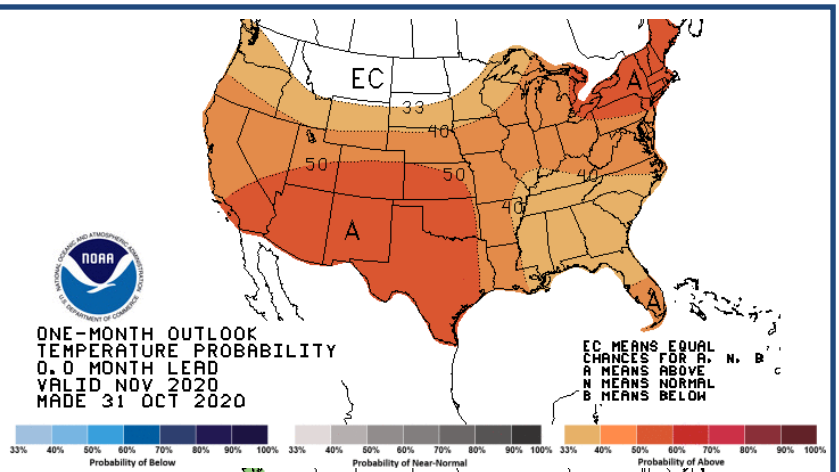
Figure 3 above summarizes observed precipitation anomaly. Figures 4, 5 below show temperature for the month. PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

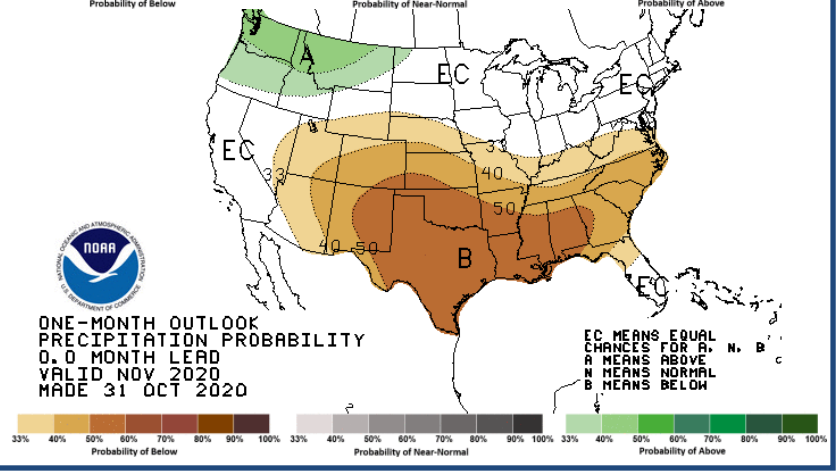
Deviation from 30-year normal
Daily Mean Temperature Anomaly: September 2020
Base period:1981-2010



Outlooks



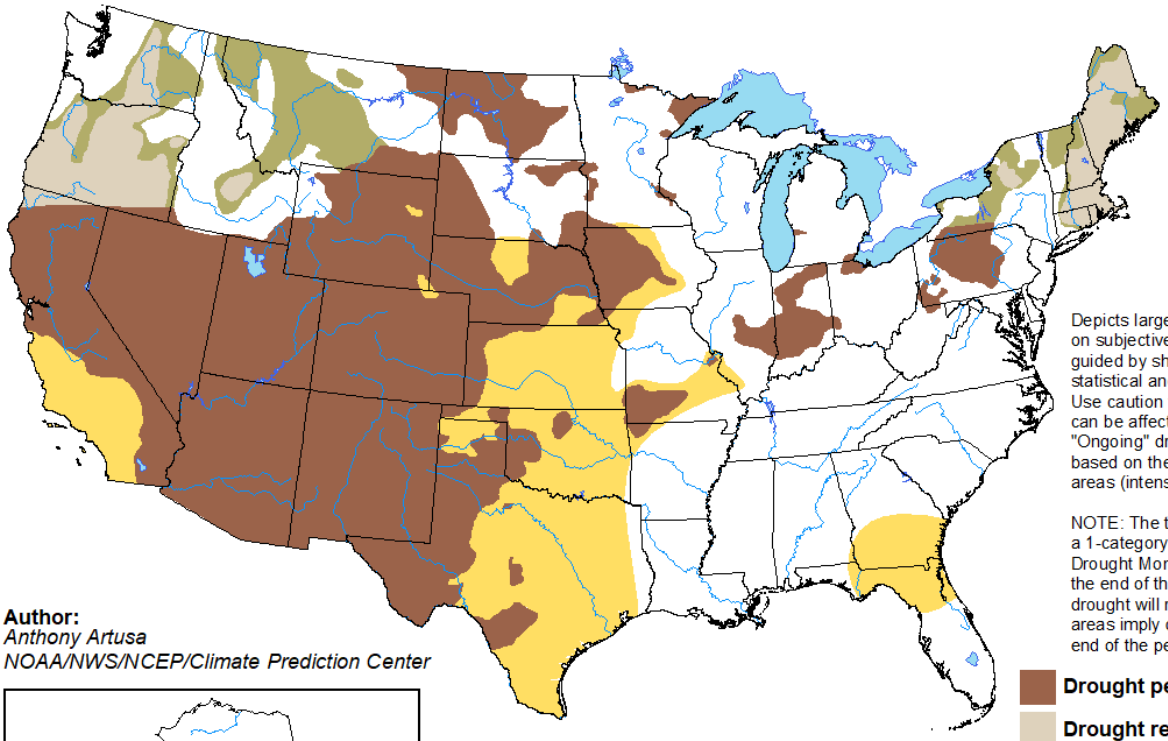




U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for October 15, 2020 - January 31, 2021
Released October 15, 2020



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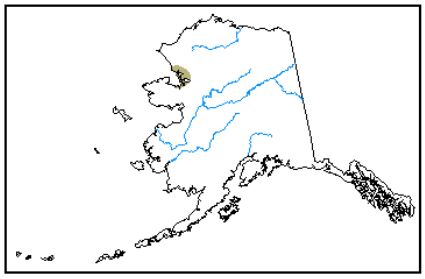
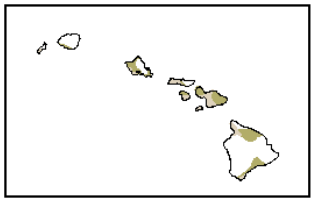
Drought remains but improves

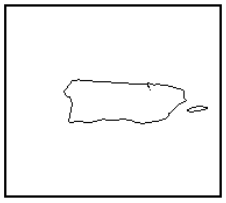
Drought removal likely

Drought development likely

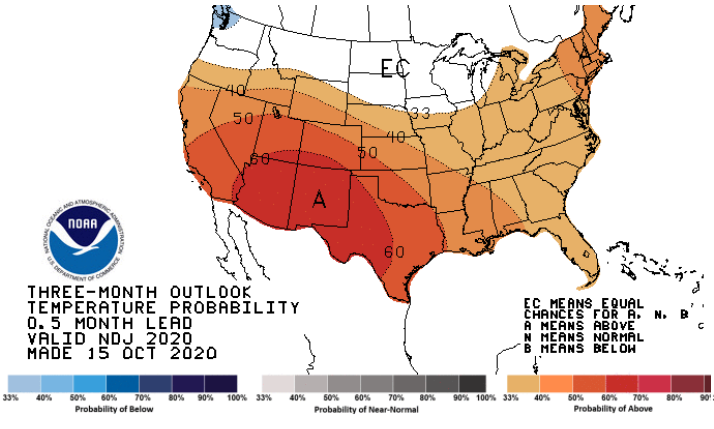
Author:
Anthony Artusa
NOAA/NWS/NCEP/Climate Prediction Center

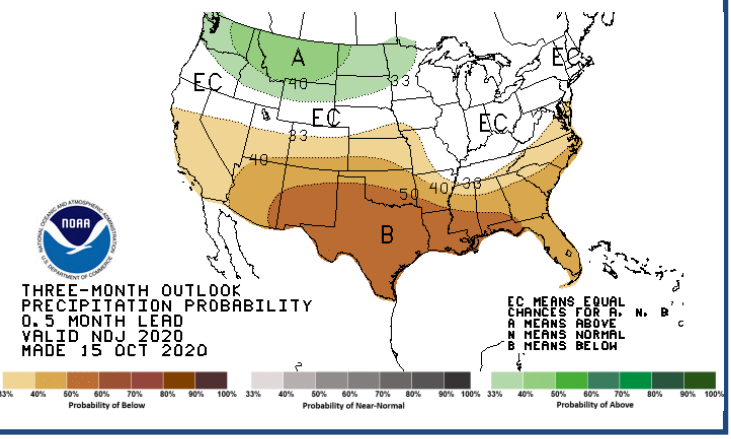






http://go.usa.gov/3eZ73





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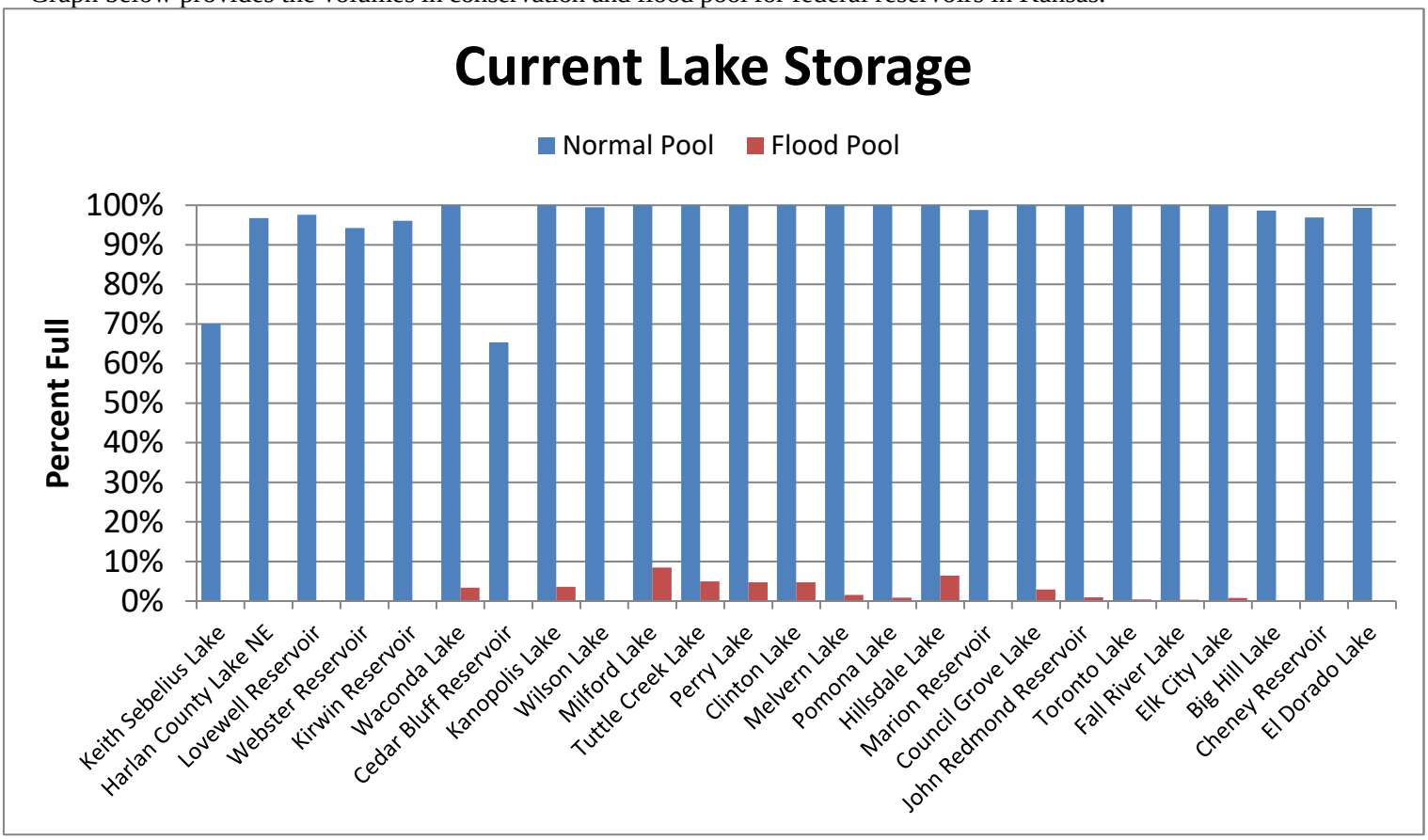

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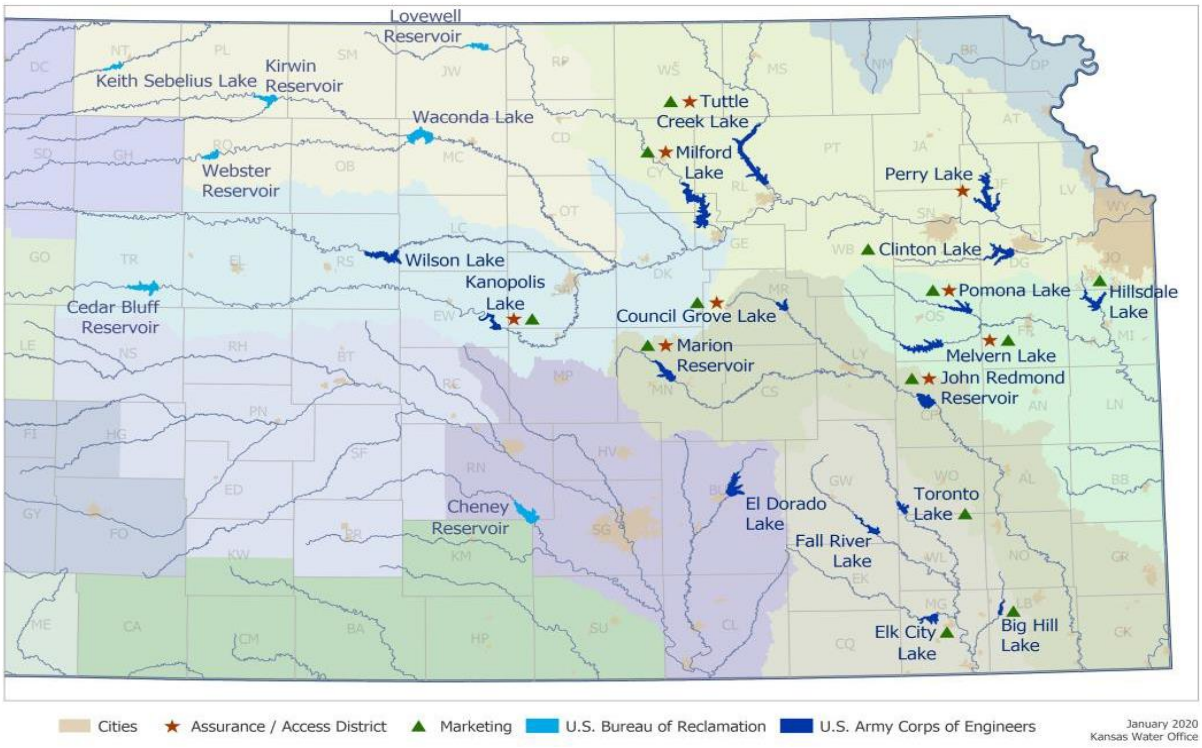

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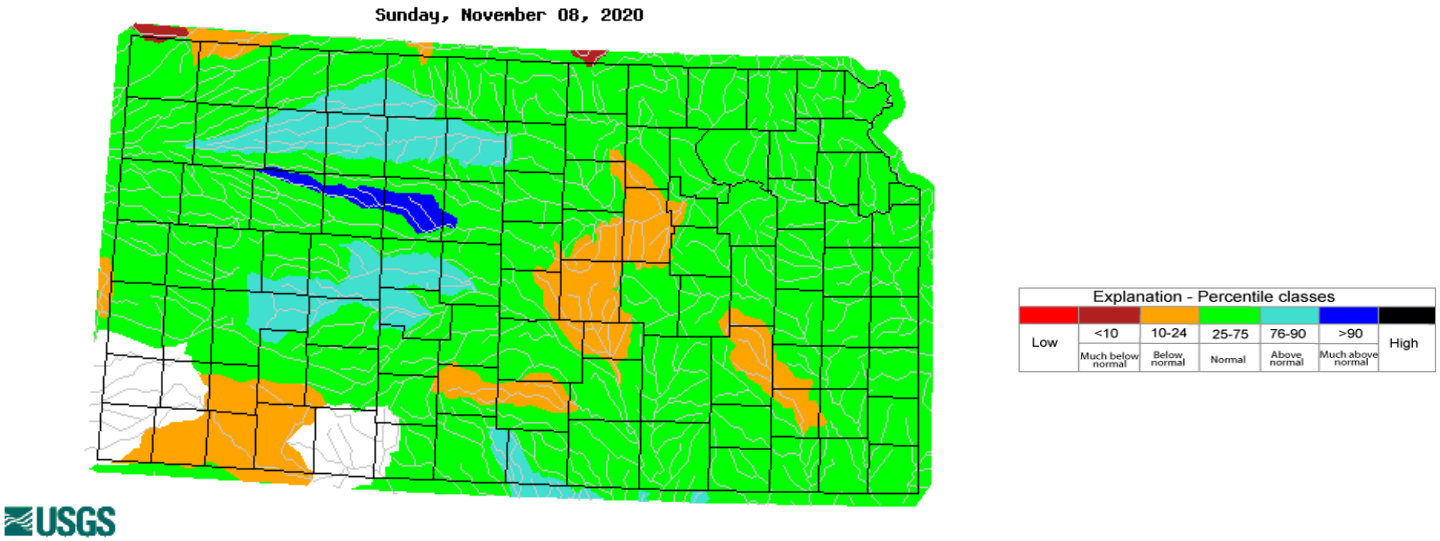

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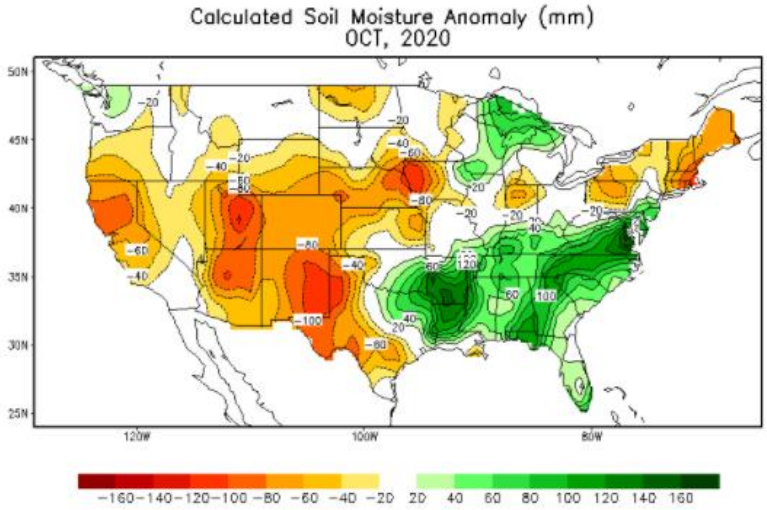

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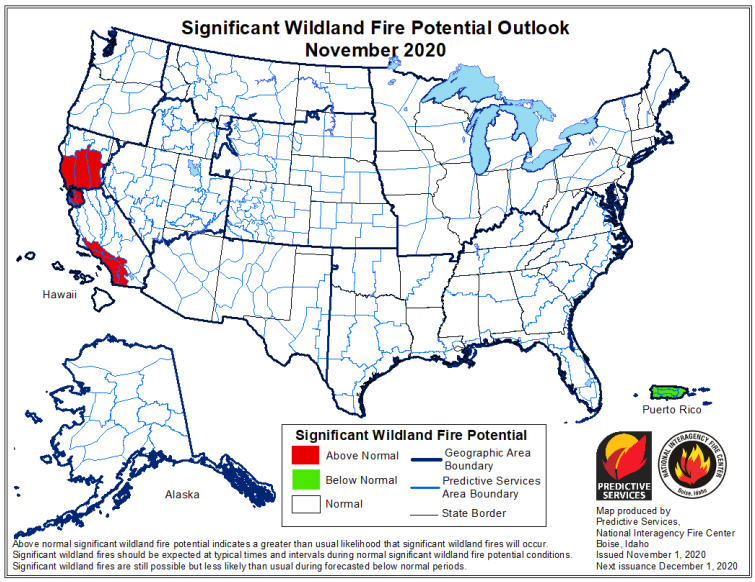

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RESOURCES and REFERENCES

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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 for 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 National Drought Mitigation Center also produces VegDRI maps which 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 the Kansas Water Office (785) 296-3185 or info@kwo.ks.gov should you have any questions or suggestions.

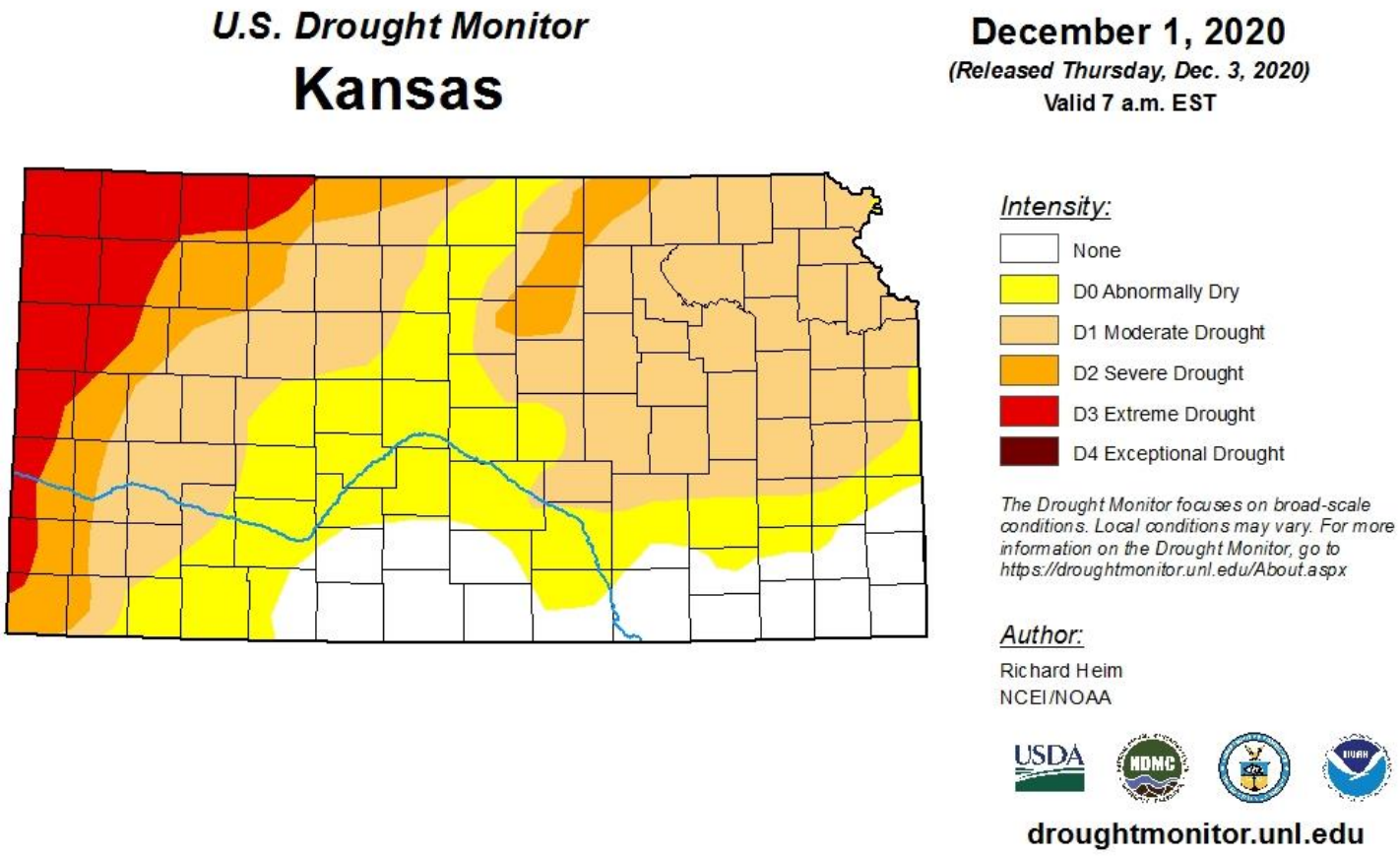
KANSAS CLIMATE
November 2020

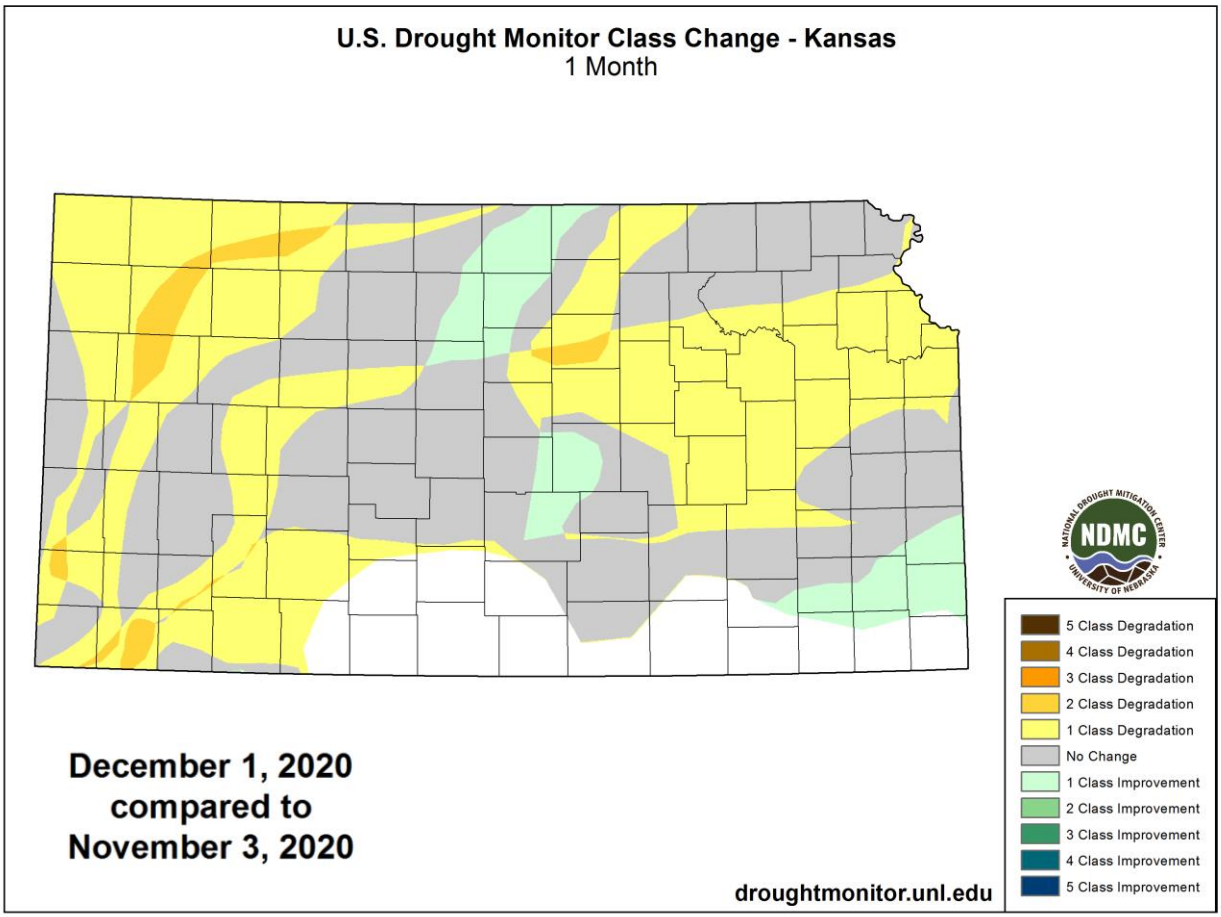
Highlights

- A dry November perpetuated drought conditions in Kansas.
- Southeast Kansas is using reservoir storage to meet downstream flow targets and our Kansas Basing reservoirs are releasing storage to meet water quality targets.
- November outlook: Most of the state has a expected to see below normal precipitation and above normal temperatures.
- 3-month outlook predicts warm and dry conditions for much of the State as La Nina pattern likely continues.

General Drought Conditions

Drought continues to impact most of the state. Concern has shifted from available soil moisture for crop production to meeting the demands of our many users below our reservoirs.





Climate Summary

Total Precipitation Anomaly: November, 2020
Base Period: 1981-2010

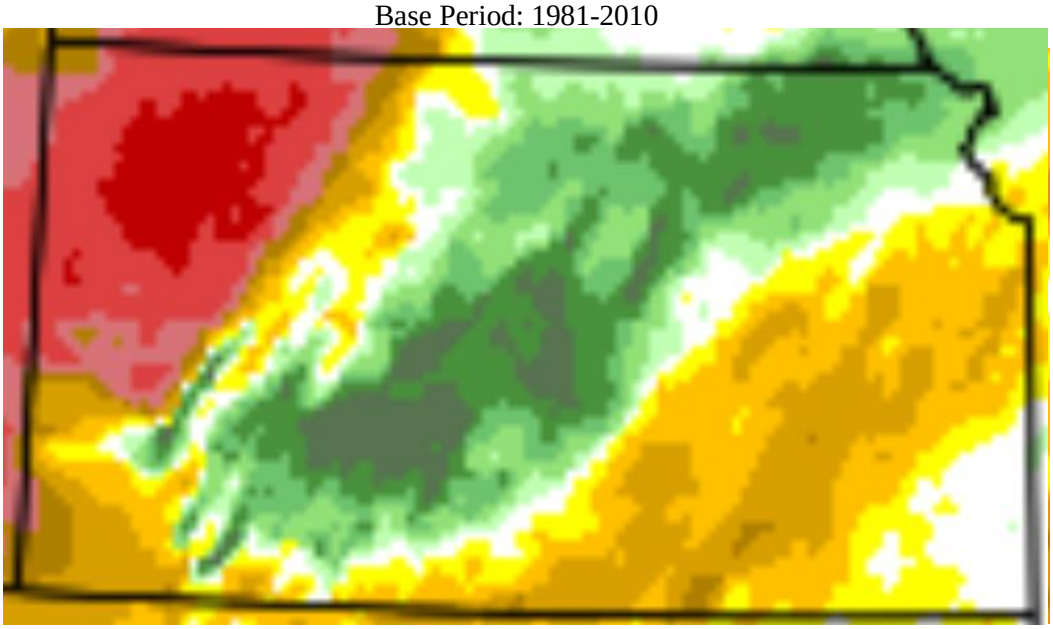
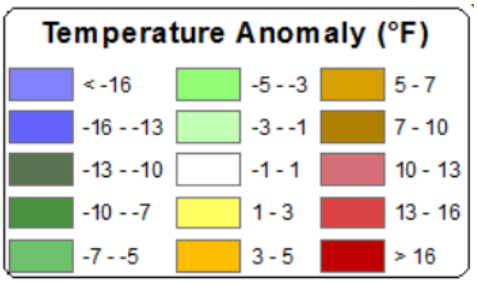
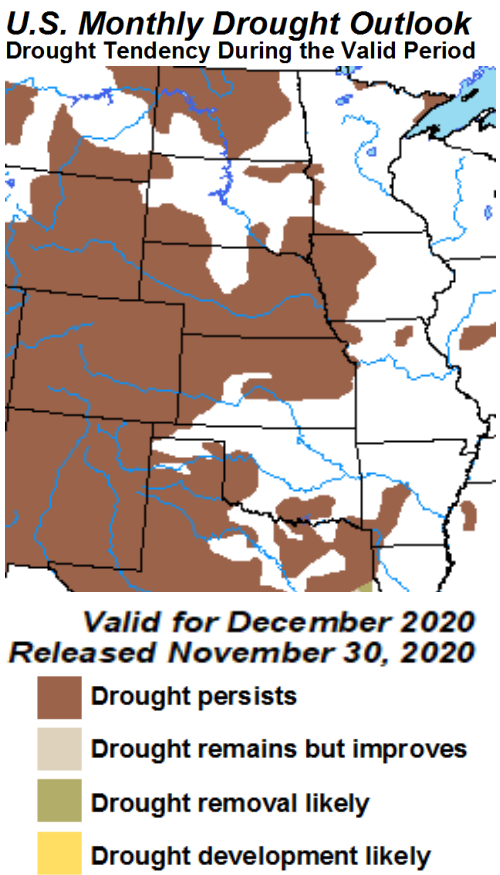


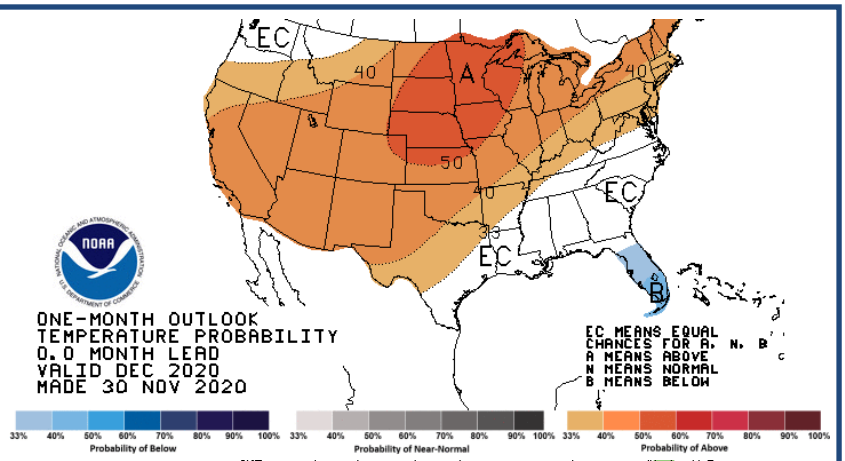
Figure 3 above summarizes observed precipitation anomaly. Figures 4, 5 below show temperature for the month. PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

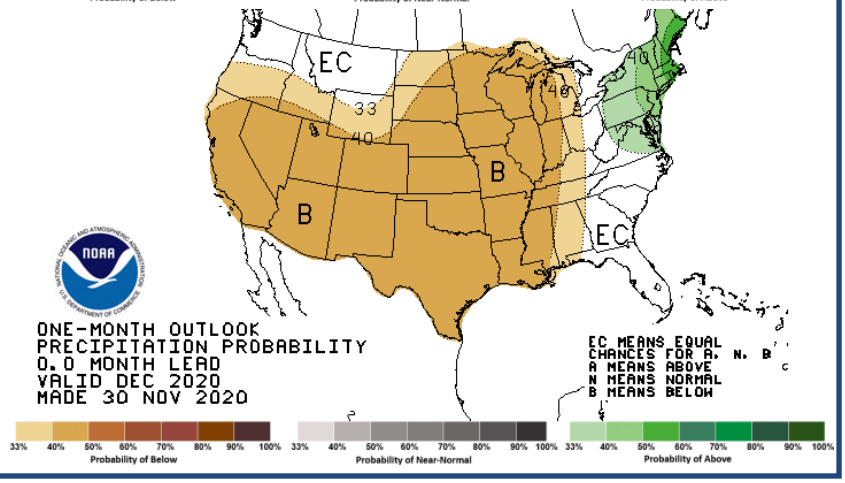
Deviation from 30-year normal
Daily Mean Temperature Anomaly: November 2020
Base period:1981-2010



Outlooks





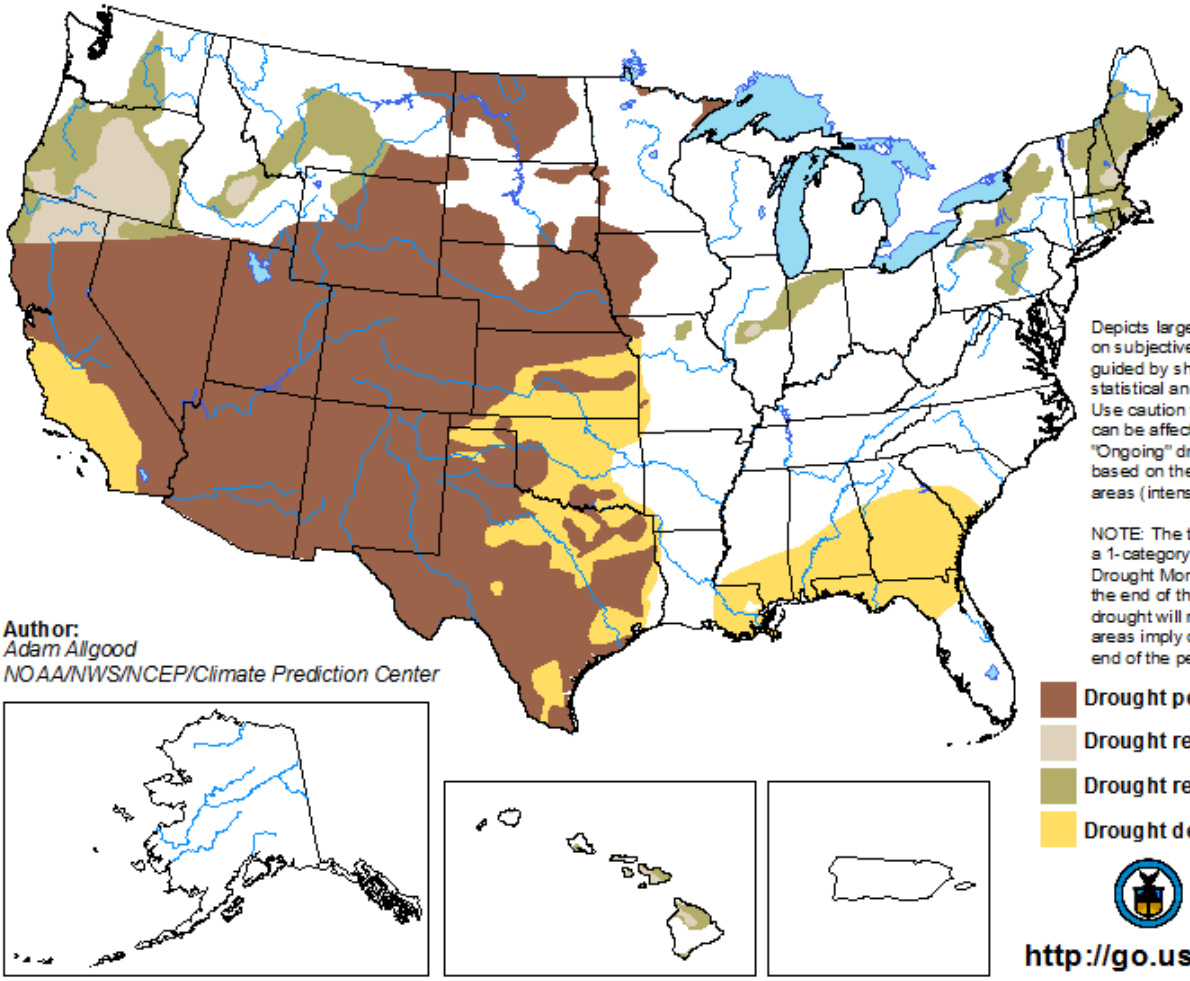


Outlooks

U.S. Seasonal Drought Outlook

Valid for November 19, 2020 - February 28, 2021
Released November 19, 2020

Drought Tendency During the Valid Period



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Author:
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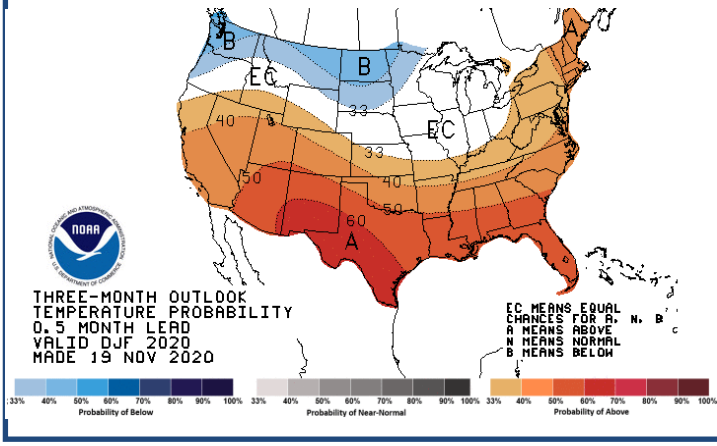
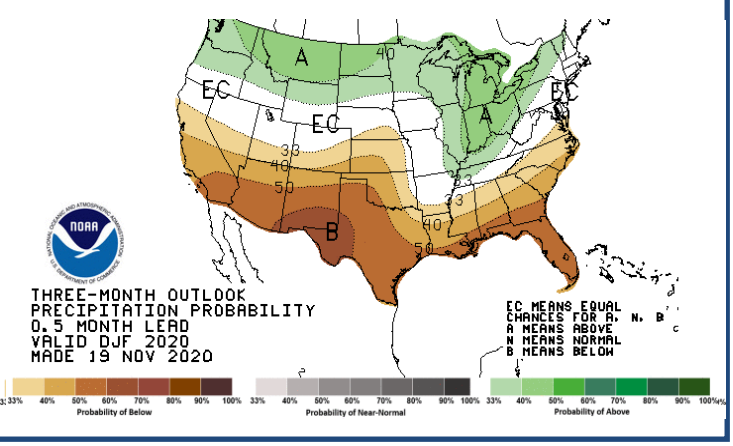
http://go.usa.gov/3eZ73





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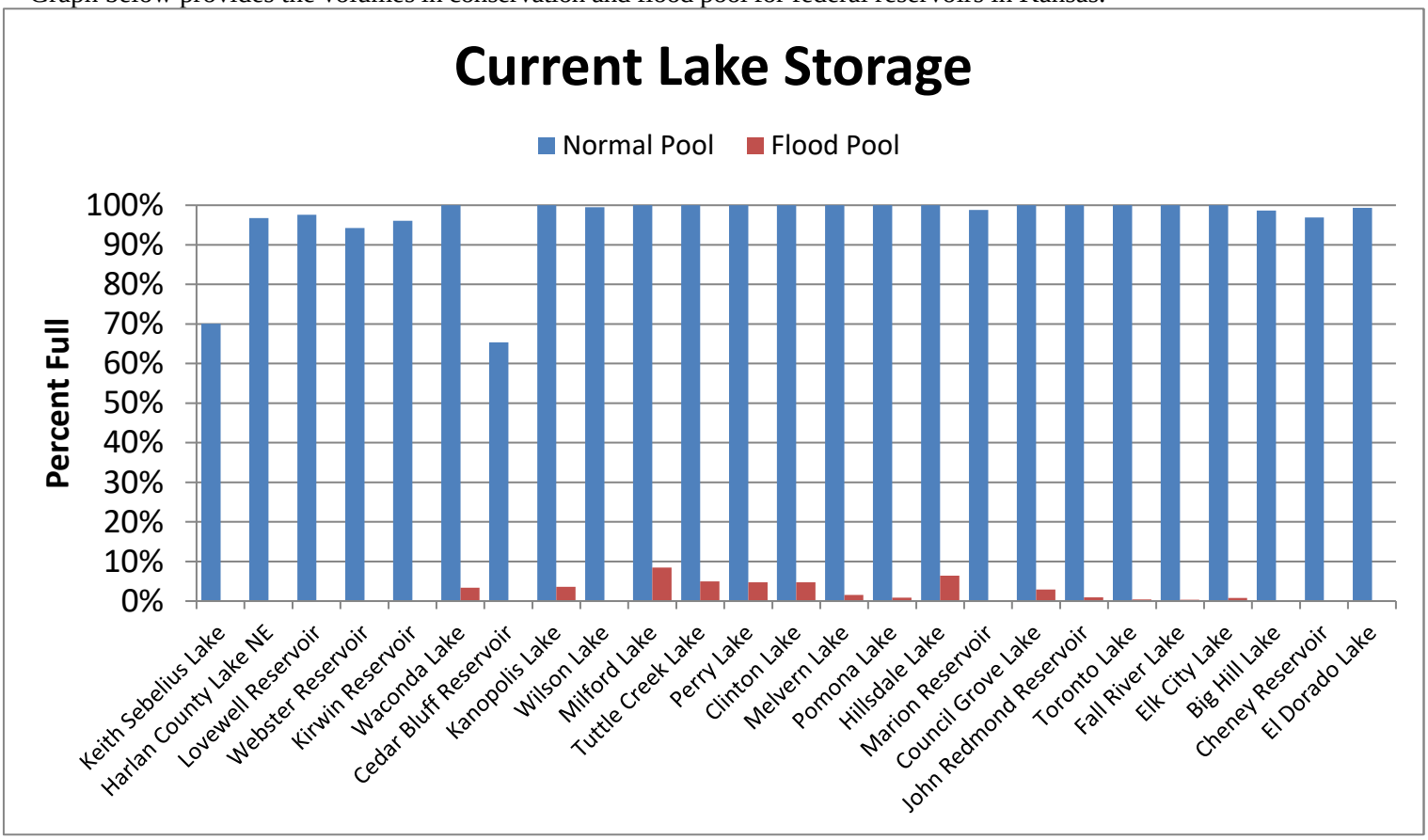

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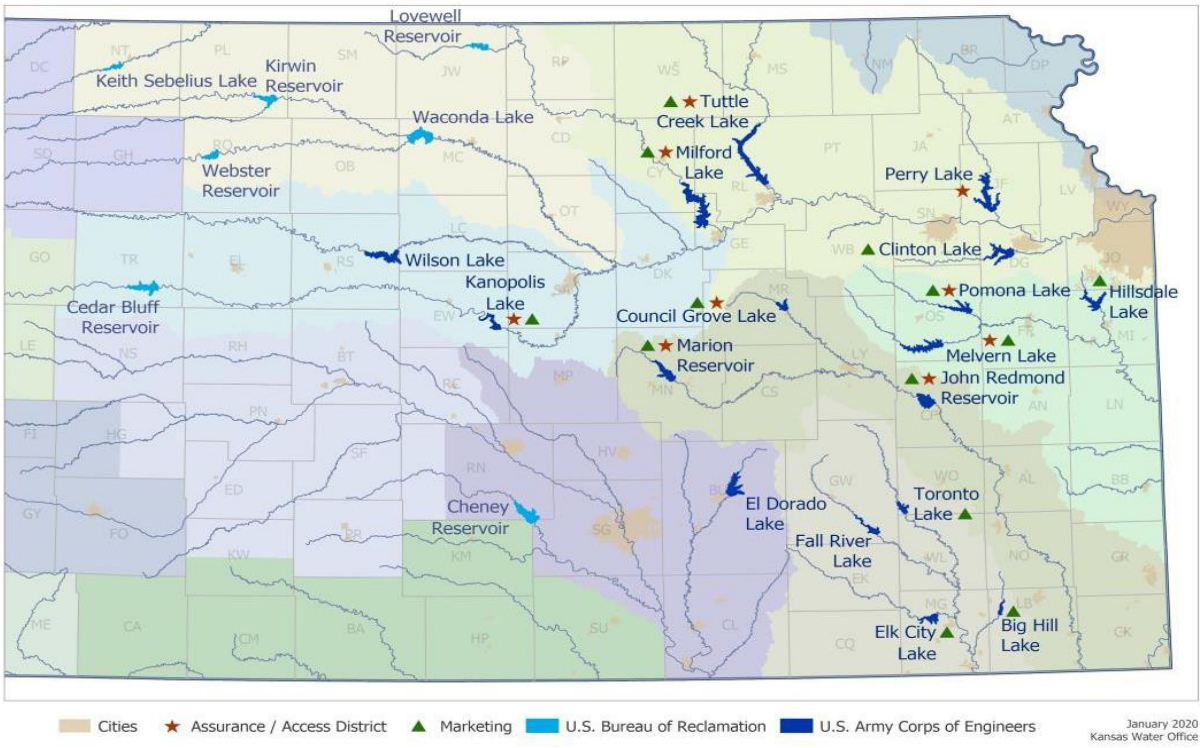

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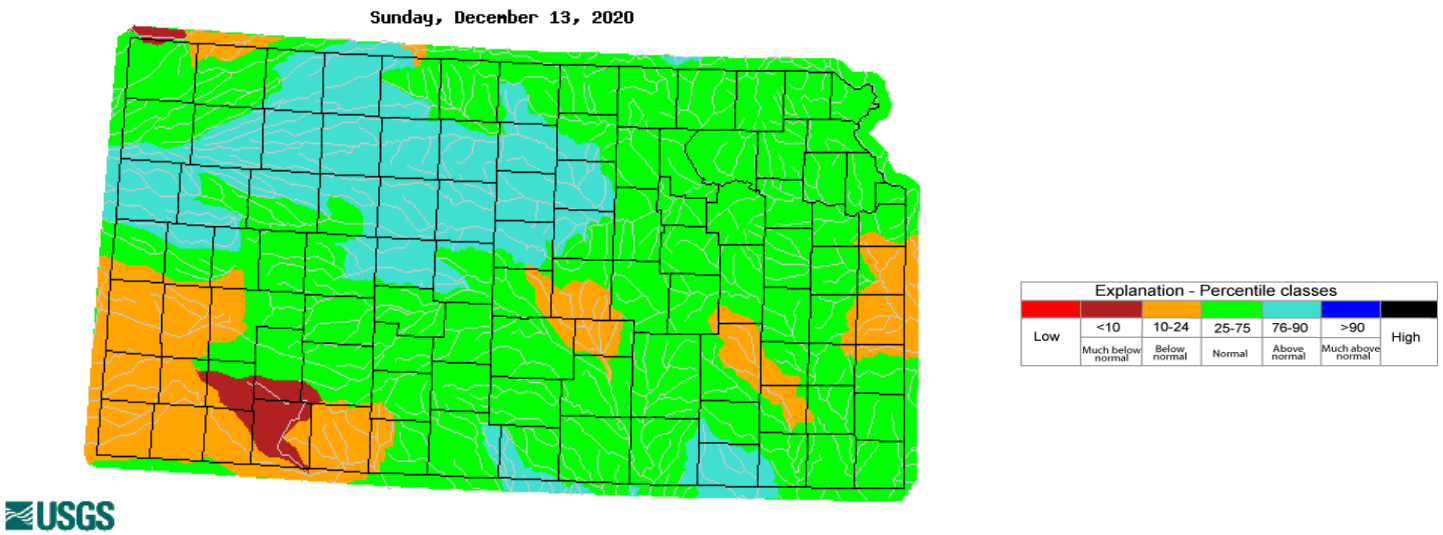

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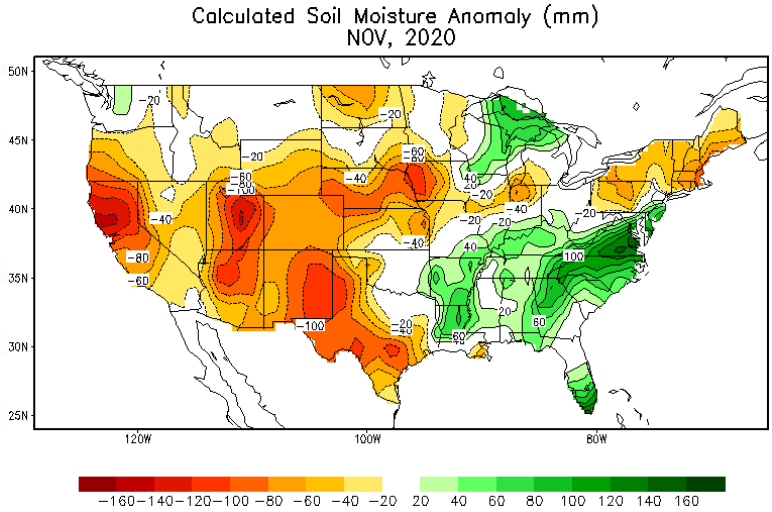

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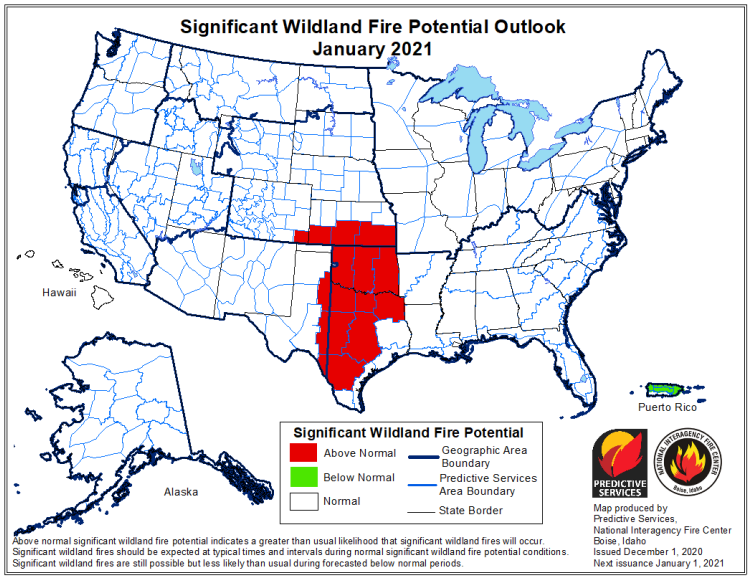

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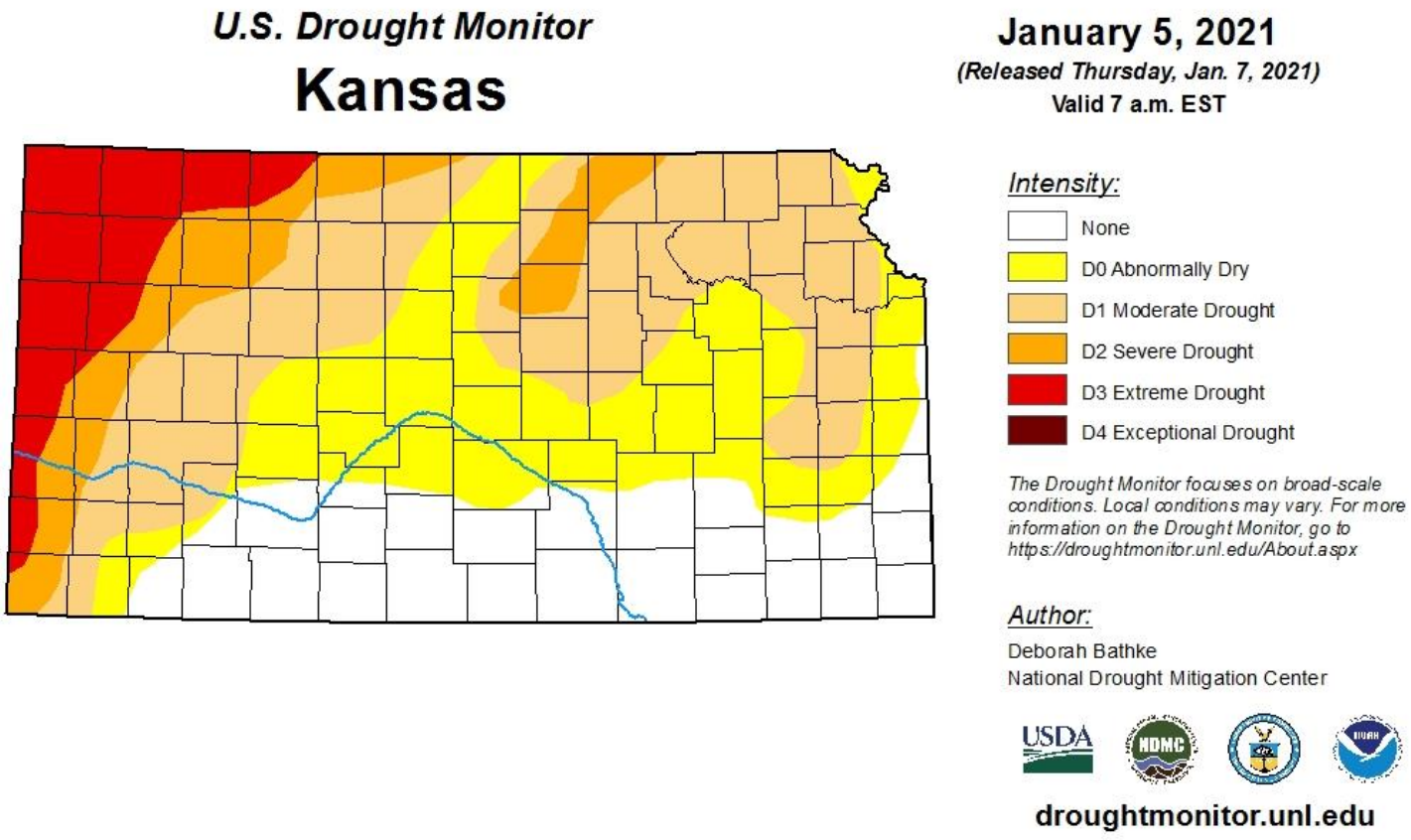
KANSAS CLIMATE
December 2020

Highlights

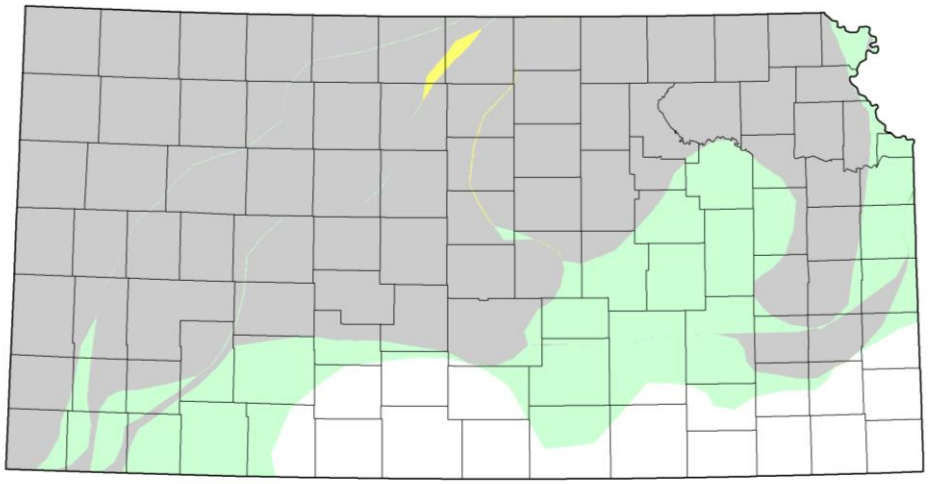
- A dry December perpetuated drought conditions in Kansas. Slight improvement in Southern and Eastern Kansas.
- January outlook: Eastern Kansas has above average precipitation potential and above normal temperatures statewide.
- 3-month outlook predicts warm and dry conditions for much of the State as La Nina pattern likely continues.
- Likelihood of a dry spring is increasing.

General Drought Conditions

Drought continues to impact most of the state. Concern has shifted from available soil moisture for crop production to meeting the demands of our many surface water users.



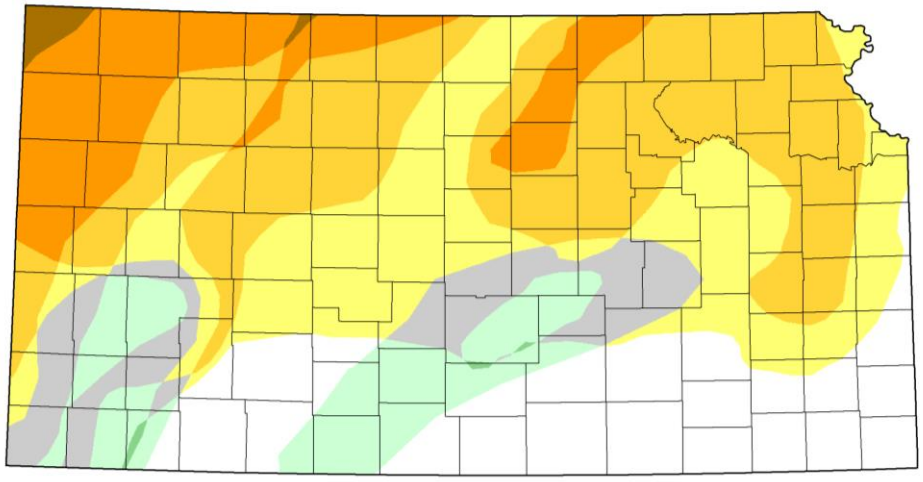
U.S. Drought Monitor Class Change - Kansas
1 Month

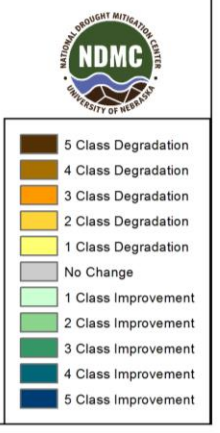


January 5, 2021
compared to
December 8, 2020

droughtmonitor.unl.edu

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





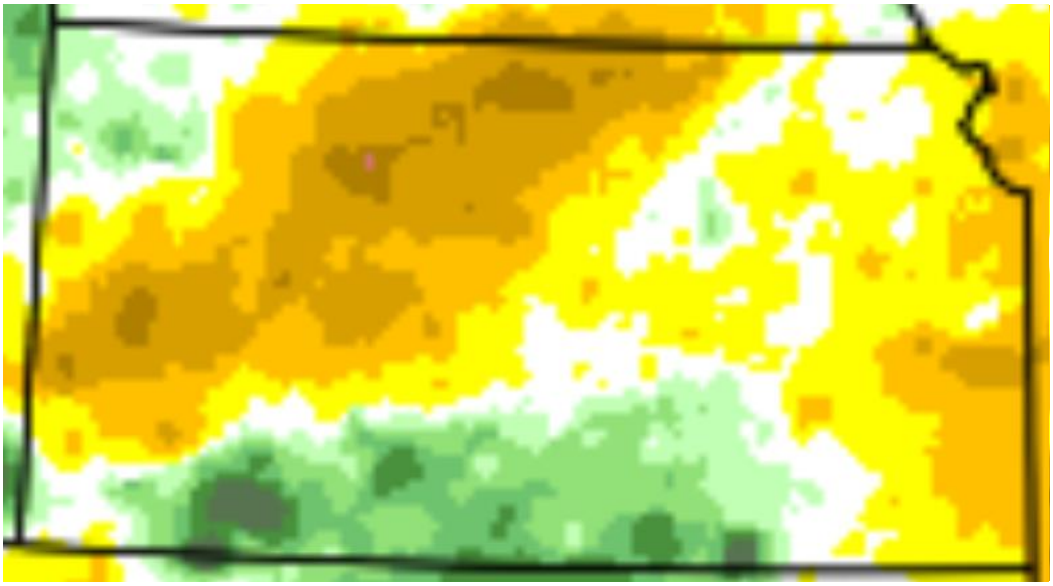
January 5, 2021
compared to
January 7, 2020

droughtmonitor.unl.edu

Climate Summary

Total Precipitation Anomaly: December, 2020

Base Period: 1981-2010



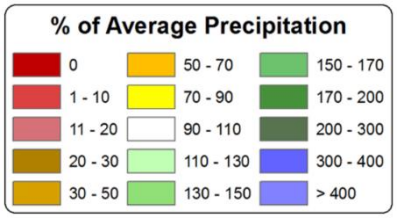
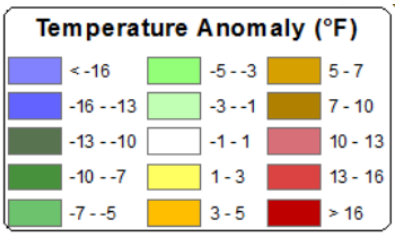


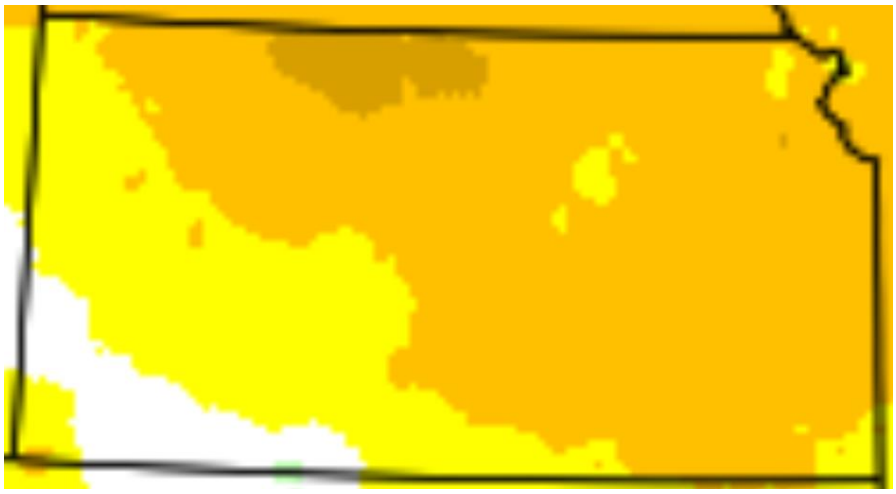
Figure 3 above summarizes observed precipitation anomaly. Figures 4, 5 below show temperature for the month. PRISM dataset available at http://www.prism.oregonstate.edu/6month/. Additional state maps are available through the KSU Weather Data Library at http://climate.k-state.edu/maps/monthly/.

Deviation from 30-year normal

Daily Mean Temperature Anomaly: December, 2020

Base period:1981-2010



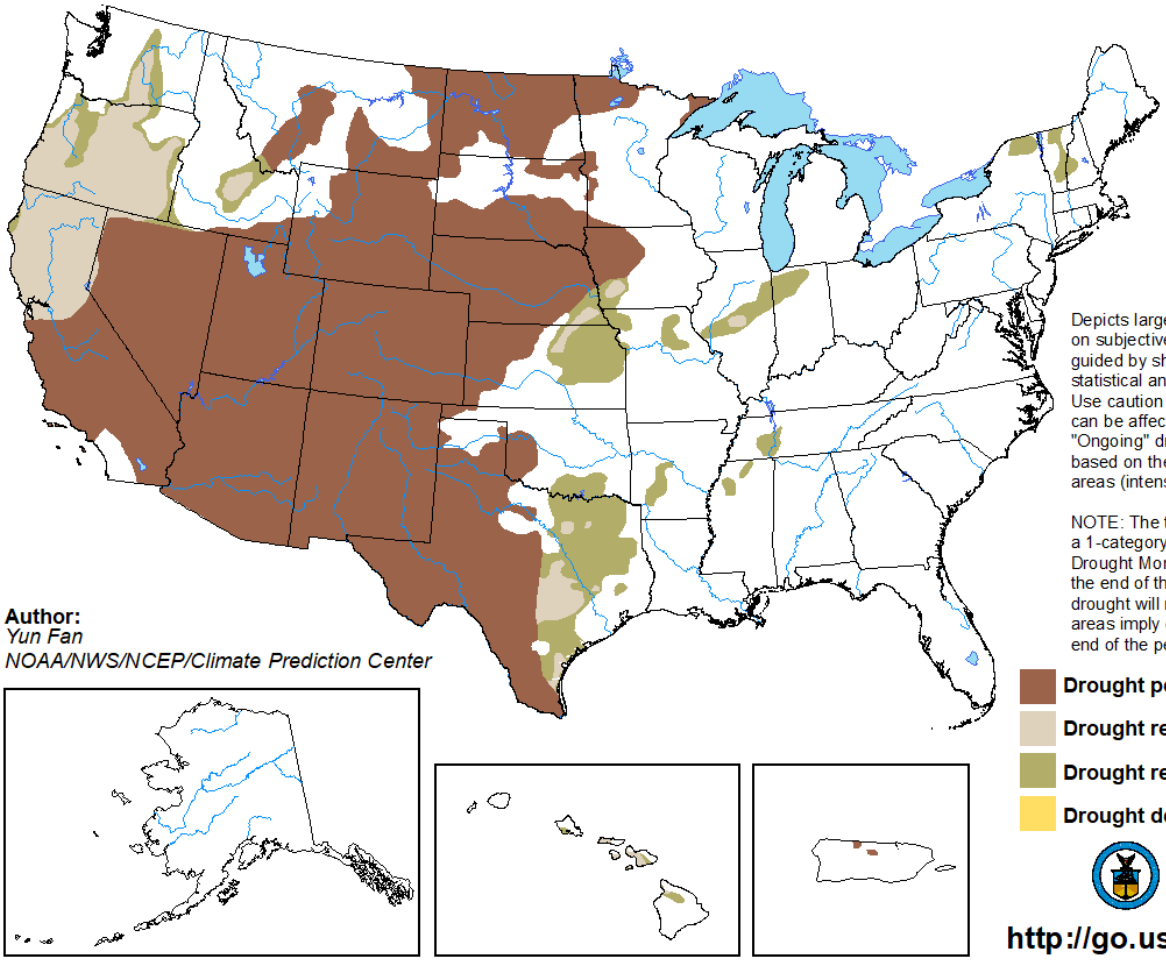


Monthly Outlooks

U.S. Monthly Drought Outlook

Drought Tendency During the Valid Period

Valid for January 2021
Released December 31, 2020



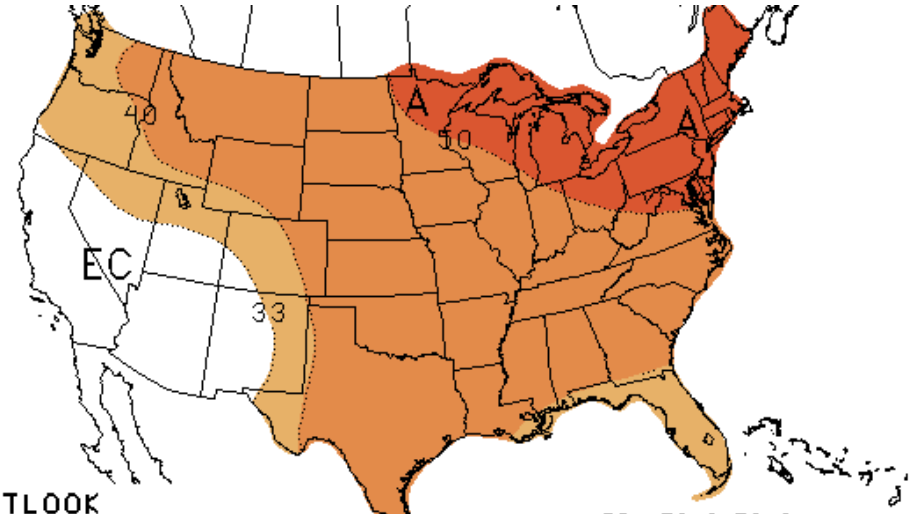
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Drought persists
Drought remains but improves
Drought removal likely
Drought development likely

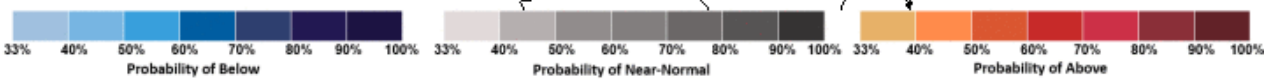
Author:
Yun Fan
NOAA/NWS/NCEP/Climate Prediction Center

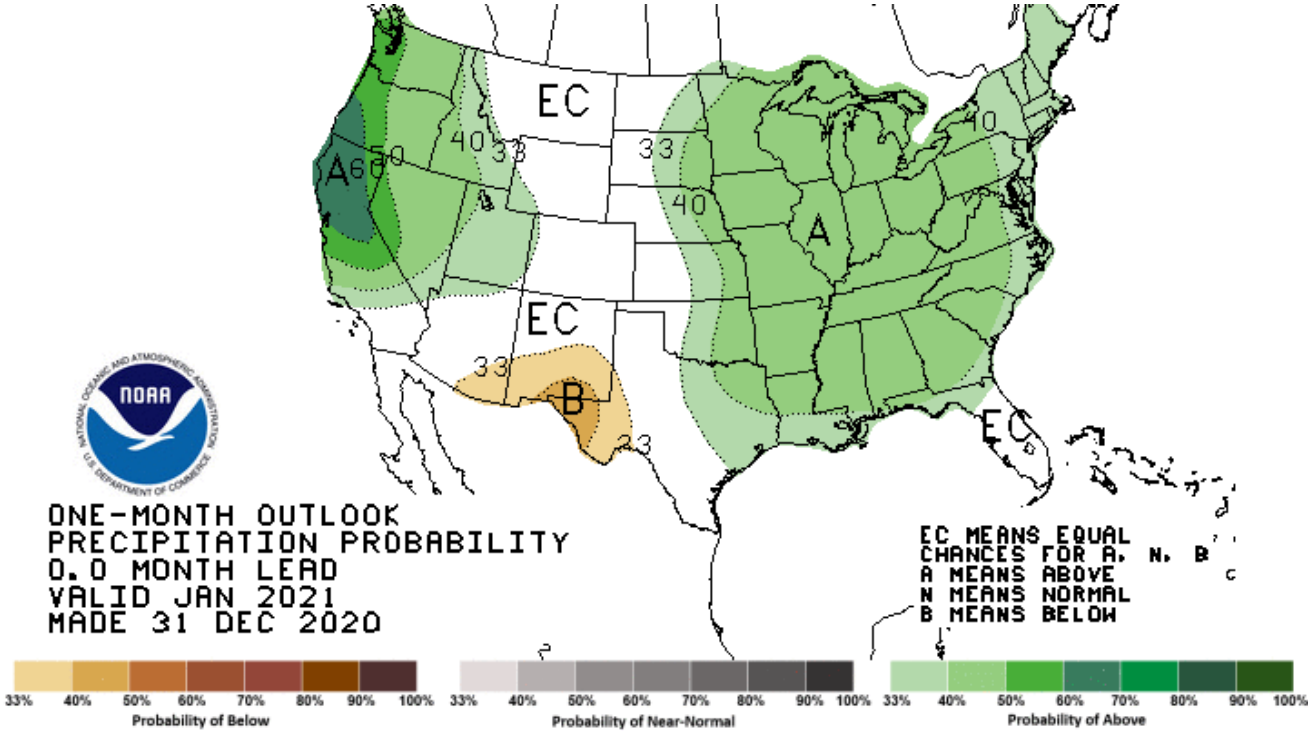
http://go.usa.gov/3eZGd



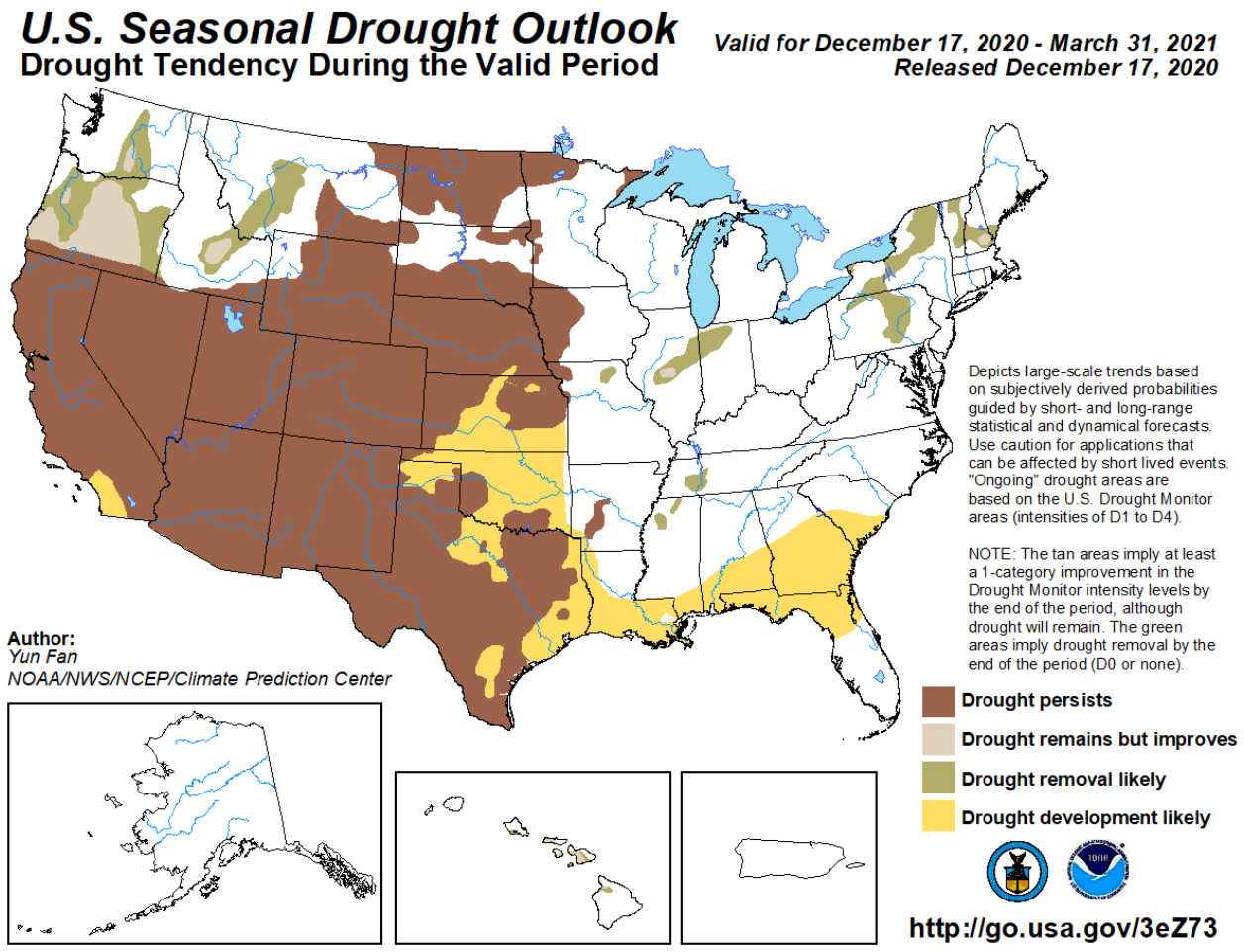
ONE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.0 MONTH LEAD
VALID JAN 2021
MADE 31 DEC 2020

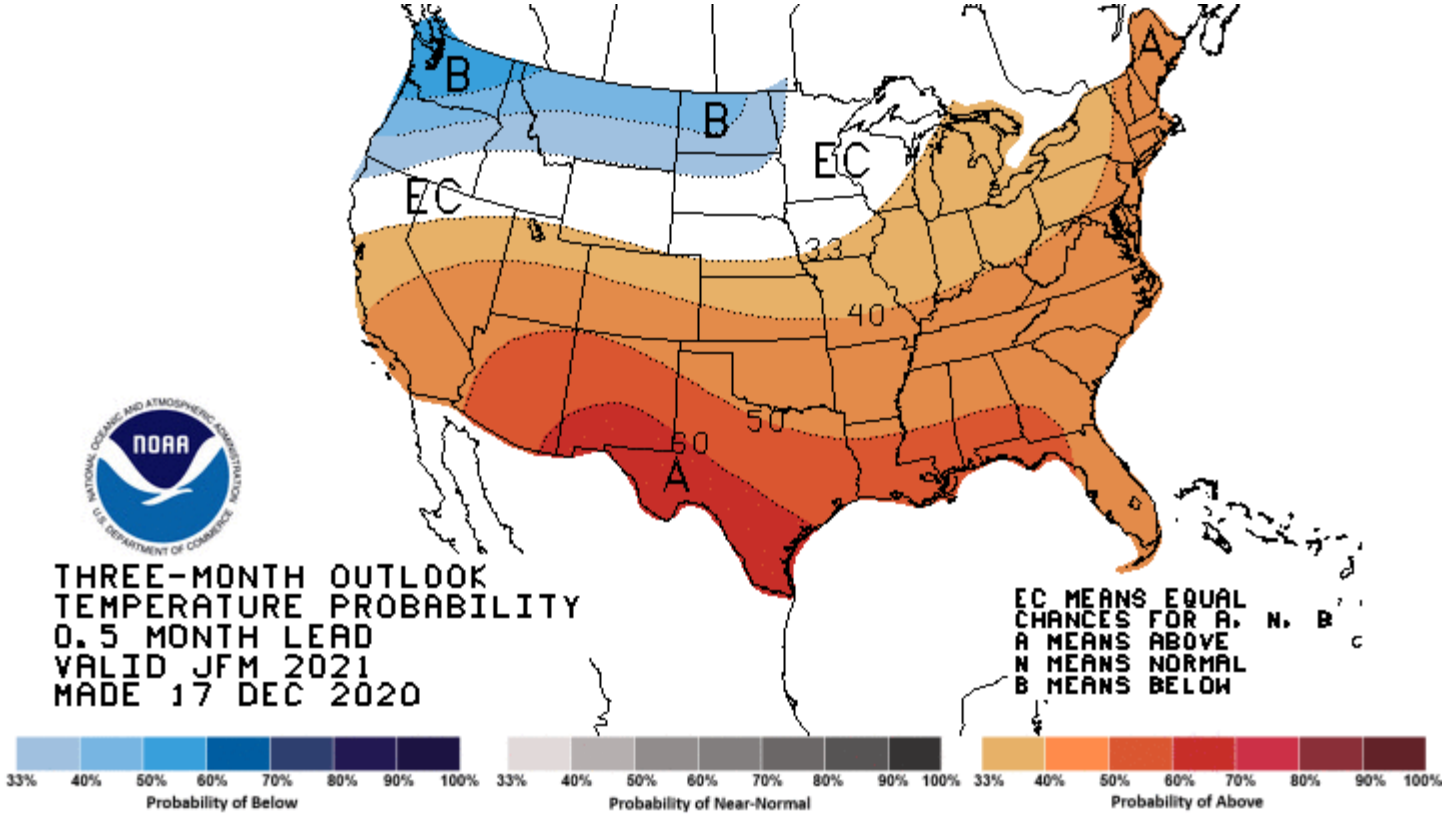
EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW

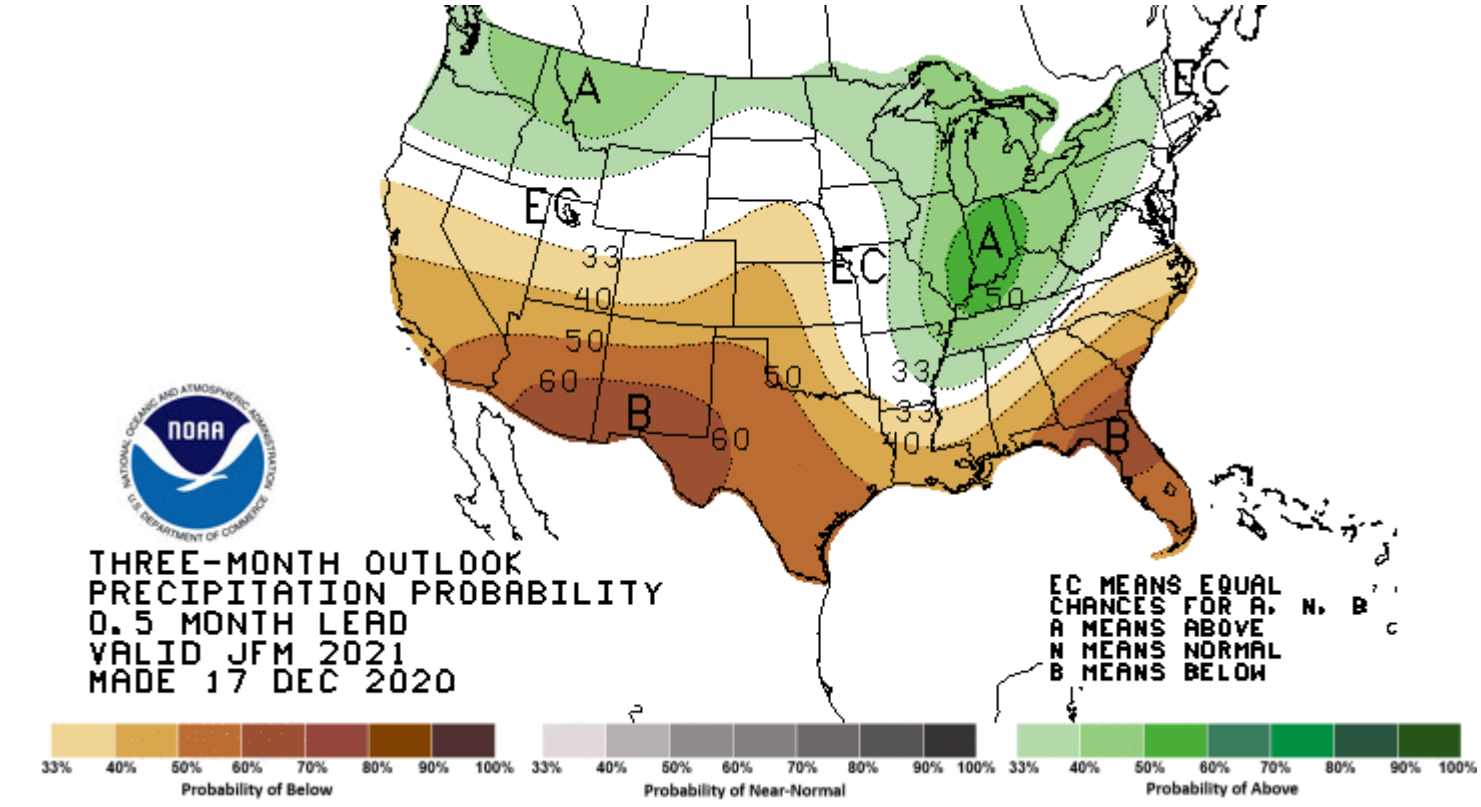




Seasonal Outlooks

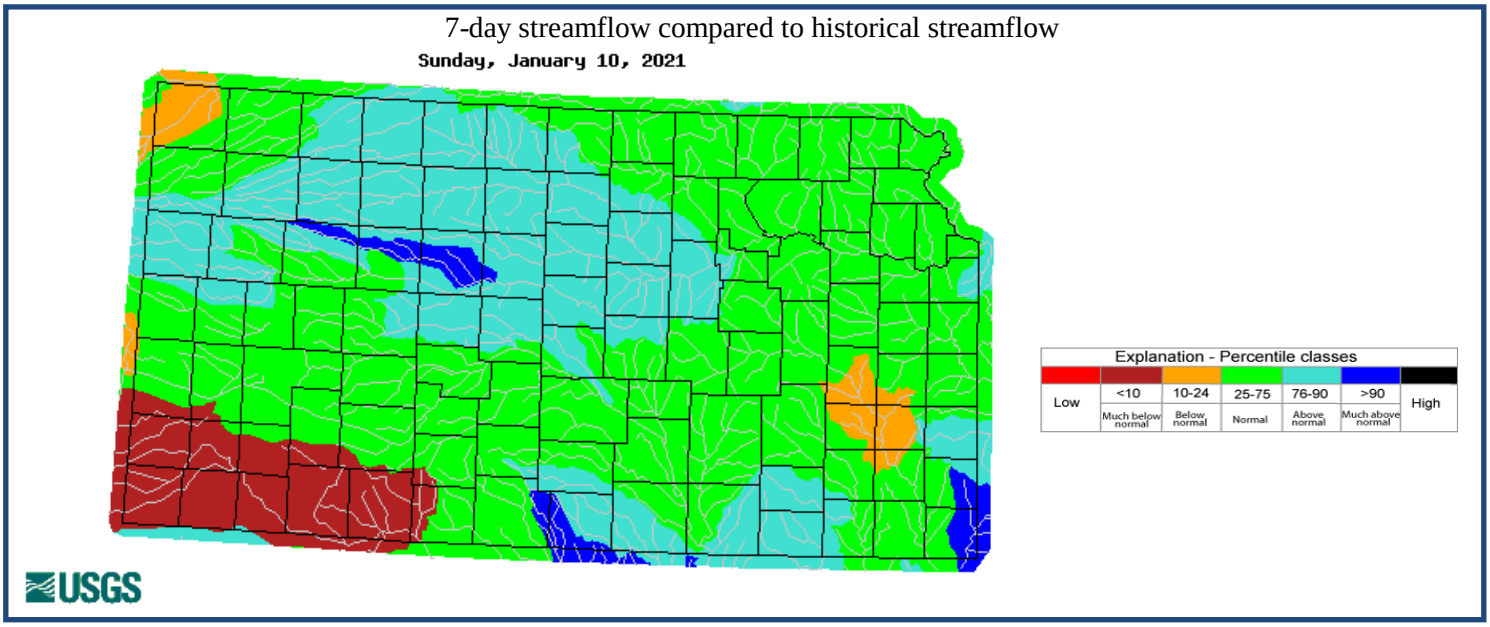



B
B
EC
EC
A
33
40
50
60
A
THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID JFM 2021
MADE 17 DEC 2020
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Below
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Near-Normal
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Above


A
EC
EC
A
33
40
50
60
50
33
33
40
B
60
B
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID JFM 2021
MADE 17 DEC 2020
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Below
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Near-Normal
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Above

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. A summary of flooding in is found later in this report. Figure 9 summarizes streamflow.



Minimum Desirable Streamflow: Low flows may be reflected at gage locations when the flow does not reach Minimum Desirable Streamflow (MDS). MDS requirements are in place to ensure base flows in certain streams to protect existing water rights and to meet in-stream water uses related to water quality, fish and wildlife and recreation. The Kansas Department of Agriculture, Division of Water Resources monitors 23 streams and rivers at 33 locations for minimum desirable streamflow. When flows drop below an established threshold, pumping restrictions are imposed on permits or water rights granted after the minimum desirable streamflow provision was made into law in 1984.

MDS is currently being administered on the following streams:

- Little Arkansas River above Alta Mills (September 28, 2020)

https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/minimum-desirable-streamflow

Vegetation, Soil Moisture and Crops

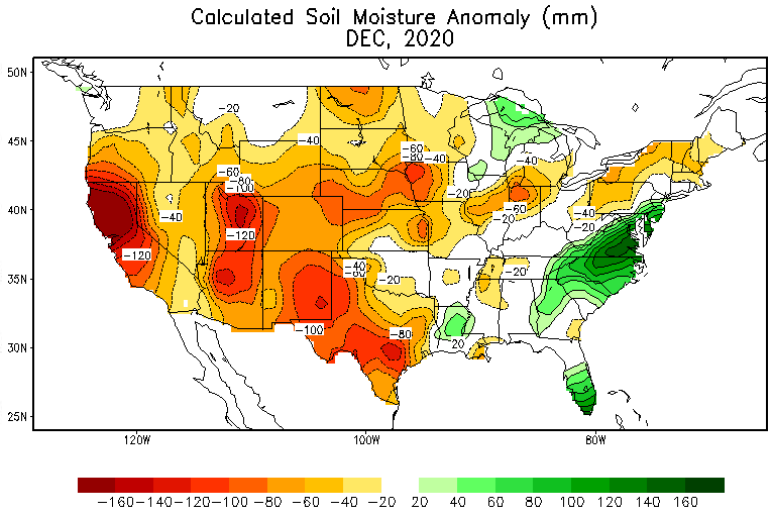
Vegetative Conditions

The Vegetative Condition map depicts vegetation stress. It is produced using satellite data by the National Drought Mitigation Center https://vegdri.unl.edu/Home.aspx and often customized for Kansas by the Kansas Biological Survey in the GreenReport.

Soil Moisture and Rangeland

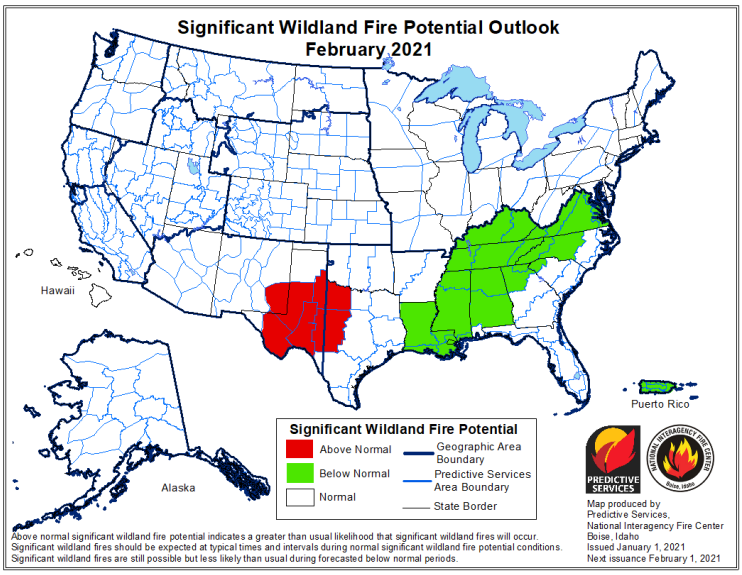
The Climate Prediction Center (CPC), monitors soil moisture and predicts future soil moisture. Anomalies are defined as deviations from the 1971-2000 monthly climatology. (http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml).

Within Kansas soil moisture is now being measured through the Kansas Mesonet and Kansas State University the percent of soil saturation (representative of grassland vegetation). For current estimated statewide soil saturation visit: http://mesonet.k-state.edu/agriculture/soilmoist/.



Fire

The National Weather Service issues Red Flag Warnings when conditions favoring wildfire are at an increased risk. These are issued daily when needed. A Significant Wildland Fire Potential Outlook is issued monthly for the United States. Pictured to the right is the most recent outlook for possible wildfires tor the next month. Additional forecasts can be found at https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm.



Kansas Climate Summary

The Kansas Weekly Climate Summary and Drought Report are compiled at least monthly, more frequently when conditions warrant, by the KWO. 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. Details of current conditions at such as precipitation, temperature, evapotranspiration (ET), soil moisture and more are available at http://mesonet.k-state.edu/.

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