

CLIMATE UPDATE

A MONTHLY SUMMARY FROM THE NEBRASKA STATE CLIMATE OFFICE

nsco.unl.edu

September flip-flopped through highs, lows

Introduction

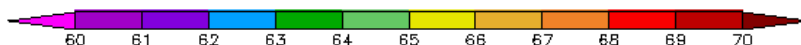
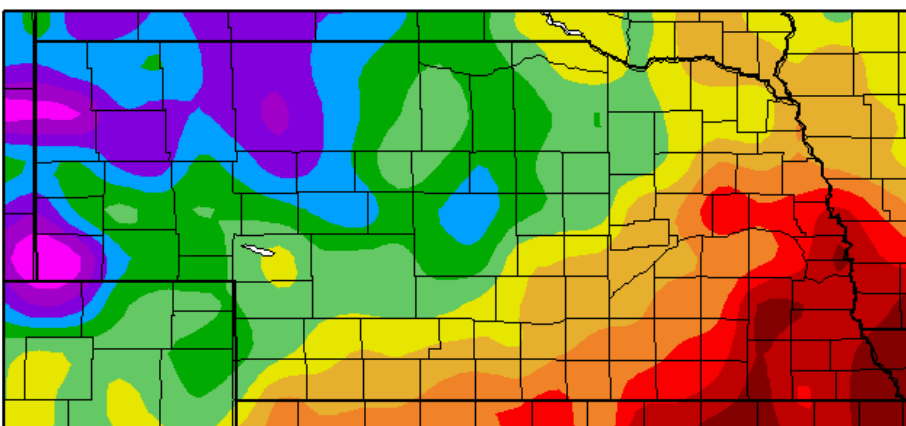
At least four strong upper air troughs passed through the central Plains during the month of September leading to localized heavy precipitation events as thunderstorms moved northeastward along southeastward-moving cold fronts. This allowed for thunderstorm cells to train and drop flooding rainfall across portions of southwest, central, northeast and east-central Nebraska.

Western Nebraska received more of the cold air intrusions that followed those fronts due to the direction of movement of the upper air troughs coming from the western United States. Since these systems moved northeast instead of due east, cold air penetration was limited in its impact on eastern Nebraska as troughs pushed over the top of the upper air ridges, instead of displacing them southward.

Omaha experienced below-normal temperatures Sept. 1 to 3, 10, 13 to 14, and 28 to 29. Periods of below-normal temperatures were limited to one to three days in length while Scottsbluff experienced three periods of below-normal temperatures that lasted four to seven days. Below-normal temperatures were recorded there from Sept. 4 to 10, 14 to 17, and 23 to 26. When Omaha experienced below-normal temperatures, daily departures were up to 8 F below normal, compared to 11 F below normal for Scottsbluff.

Temperatures soared during the third week of the month as a strong upper air trough moving into the Pacific Northwest led to development of a broad ridge covering the eastern two-thirds of the country. As the trough moved onshore, winds in the central Plains shifted to the south-southwest, and temperatures moved into the upper 80s to low 90s from

AVERAGE TEMPERATURE | SEPT. 1 TO 30, 2016



HIGH PLAINS REGIONAL CLIMATE CENTER

Map generated at HPRCC using provisional data.

Sept. 20 to 23. Temperatures remained warm for an additional day across the eastern half of the state. Average temperatures during this period were 10 to 20 F above normal, with the greatest departures occurring across the southern two tiers of counties.

September is considered a transition month as cold fronts begin to usher in more fall-like temperatures. Because of the increase likelihood of fronts moving through the region that are able to tap cool Canadian air masses, we can experience secondary spikes of severe weather typically associated with the state's spring weather.

Two tornadoes touched down, 33 hail events were reported and eight wind events occurred between Sept. 3 and 5, while 13 hail and seven wind events were reported on Sept. 15. These two periods accounted for 58 of the 76 storm reports issued during the month. Storm reports

issued on Sept. 8, 12 and 23 accounted for 12 additional hail events and three wind reports.

Temperature

The upper atmospheric pattern for the month of September closely resembled conditions experienced in August. Upper air troughs entered the Pacific Northwest, moved southeastward into the central Rockies, then moved northeastward into the northern Plains. These troughs impacted Nebraska on a 5- to 7-day interval, with western Nebraska experiencing longer periods of below-normal temperatures than eastern areas of the state.

Monthly average temperature departures ranged from 1 F below normal to 5 F above normal. A more detailed breakdown shows the western half of the state averaged 1 to 2 F above normal.

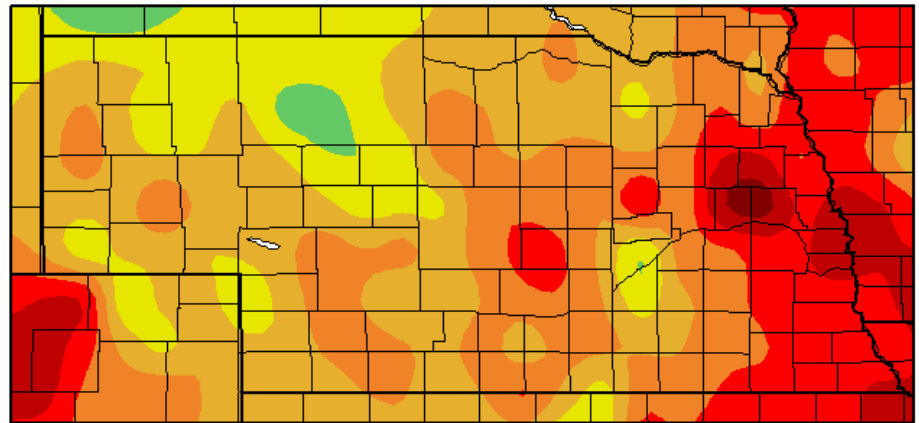
Eastern Nebraska averaged 1 to 5 F above normal with most of the eastern two tiers of counties averaging 3 to 5 F above normal.

The first freezing temperatures of the fall occurred across the northern Panhandle. Preliminary data from stations that report in real-time show Agate 3 E experienced five mornings in September where minimum temperatures reached 32 F or lower. At least 12 locations in the state recorded one morning of minimum temperatures reaching 32 F or lower, with at least six locations reaching hard freeze status of 28 F or lower. All stations reporting frost or freeze conditions during September were in the northern half of the Panhandle.

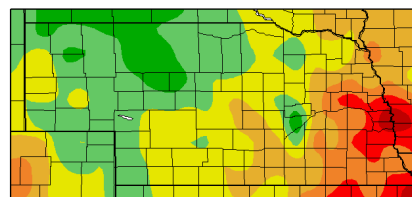
On the opposite end of the spectrum, Curtis 3 NNE recorded nine days of maximum temperatures reaching or exceeding 90 F, while Beaver City and Fairbury 5 S recorded seven days each. The vast majority of locations that received multiple days of 90 F or greater were located south of Interstate 80 and east of Kearney. Most of the 90 F days were recorded during an unusual stretch of warm weather between Sept. 20 and 23 when much of southeastern and east-central Nebraska experienced upper 80's to low 90's and average temperatures ran 15 to 20 F above normal.

Cooling Degree Day unit accumulations were 50 units below normal to 20 units above normal across the western third of the state,

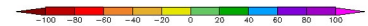
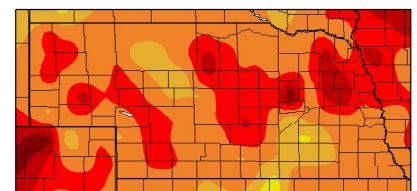
DEPARTURE FROM NORMAL TEMPERATURE | SEPT. 1 TO 30, 2016



DEPARTURE FROM NORMAL COOLING DEGREE DAYS



DEPARTURE FROM NORMAL HEATING DEGREE DAYS



SOURCE: HIGH PLAINS REGIONAL CLIMATE CENTER

with the most significant departures located across the northern third of the Panhandle and northwestern Sandhills. The central third of the state averaged normal to 40 units above normal, while the eastern third of Nebraska ran 40 to 80 units above normal. Total CDD unit accumulations for September ranged from 40 over extreme northwest Nebraska to 220 units in the southeastern corner of the state.

Heating Degree Day unit accumulations for September ranged from 60 units across southeastern Nebraska to 160 units in the northwestern corner of the state. One isolated pocket of 180 CDD unit accumulations were noted around the Kimball area. Departures from normal generally ranged from 40 to 80 units above normal, and the greatest departures from normal were located in pockets of northeast, north-central, west-central and the Panhandle of Nebraska.

A further breakdown of the September

temperature trends reveals that the highest maximum temperature recorded during the month was 100 F at Mason City, while the lowest temperature recorded was 25 F at both the Agate 3 E and Harrisburg 12 WNW stations. The highest low temperature recorded during the month was 76 F at the Falls City and Lincoln airports. The lowest high temperature recorded was 55 F at Harrison 20 SSE, Agate 3 E and Clay Center.

Average temperature for the month ranged from a high of 71.2 F at Falls City Brenner Field to 58.7 F at Harrison 20 SSE. The average maximum temperature for September had a range of 84.3 F at Curtis 3 NNE to 74.3 F at Oakdale, which translates into a preliminary range of 10 F. The average minimum temperature range was 19 F with the high September maximum minimum temperature average of 60.5 F at Falls City Brenner Field and the low of 41.5 F at Harrison 20 SSE.



CONTACT US

e) nsco@unl.edu
p) 402.472.5206

ON THE WEB

nsco.unl.edu

FOLLOW US



ADDRESS

Nebraska State Climate Office
153 Hardin Hall
3310 Holdrege St.
Lincoln, NE 68503-0931

School of Natural Resources
University of Nebraska - Lincoln
East Campus

Precipitation

Precipitation across the state was a hit-or-miss affair during September. Although storm systems crossed the state on a frequency of every five to seven days, the lack of low-level moisture feeding into the frontal boundary limited the extent of precipitation coverage for the western half of the state. More robust precipitation totals were noted across eastern Nebraska as cold fronts were able to feed off of low-level moisture moving north out of the Gulf of Mexico in advance of the surface fronts.

Much of western Nebraska's precipitation fell in early September as a strong upper-air trough moved into the central Plains that tapped low- and mid-level moisture from Hurricane Norton, which had moved into the southwestern U.S. between Sept. 5 and 10; Norton made landfall on the tip of the Baja Peninsula on Sept. 6.

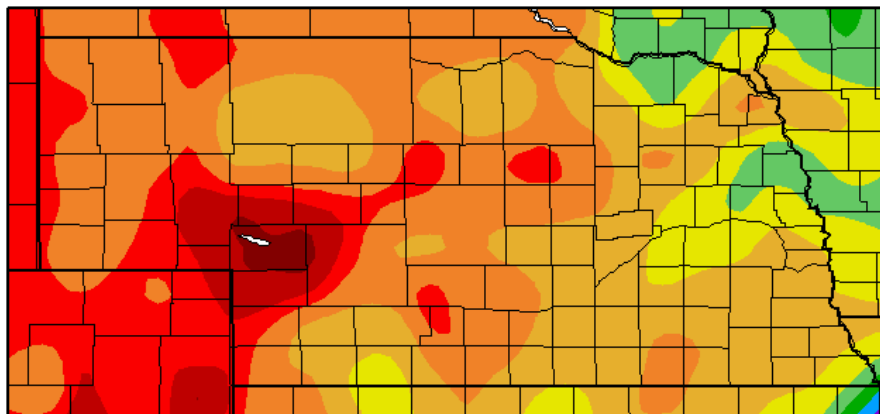
In advance of the upper air trough crossing the state, severe weather broke out along the surface cold front that began slowly moving eastward across the western third of the state between Sept. 3 and 5. During this period, storm reports indicated two tornadoes touched down Sept. 3 and a total of 33 hail and eight wind storm reports were issued for the period. A similar pattern was noted on Sept. 15 when 13 hail and seven wind events occurred primarily across the southeastern half of the state.

A total of 58 hail and 18 wind events were documented by the Storm Prediction Center in Norman, Oklahoma. Hail was severe enough on Sept. 24 that the Scottsbluff Airport and Harrison 9 NE observers reported 0.2 inches of snow on the ground even though air temperatures were above 50 F.

There were no other tornadoes touchdowns reported after Sept. 3. Note, these reports are preliminary and additional reports may be added once the National Center for Environment Information releases final storm reports after data has gone through quality control routines.

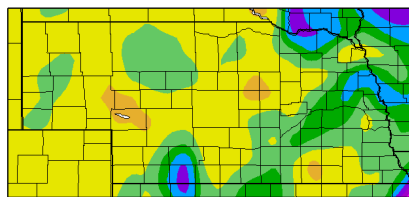
Although there were a couple of days of widespread severe weather, most of the precipitation events reported during September were not associated with severe weather outbreaks. According to NERain data, four days this month had

PRECIPITATION IN INCHES | SEPT. 1 TO 30, 2016



SOURCE: HIGH PLAINS REGIONAL CLIMATE CENTER

DEPARTURE FROM NORMAL PRECIPITATION



SOURCE: HIGH PLAINS REGIONAL CLIMATE CENTER

zero precipitation reported from at least one NERain location. There also were 17 days when one or more locations recorded at least 1 inch of moisture, 12 days where at least one station recorded 2 inches, and three days were at least 3 inches were reported at one or more locations. The longest consecutive streak of at least one station reporting an inch or greater moisture in a 24-hour period occurred from Sept. 3 to 10.

The greatest monthly September precipitation report from NERain stations was 13.10 inches at Beemer 2 E, with West Point having the second highest total of 10.11 inches. Six stations reported monthly precipitation between 7 and 9 inches; 21 stations between 5 and 7 inches; and 64 stations between 4 and 5 inches.

Beemer 2 E had the greatest 24-hour precipitation total with 8.25 inches, with Pilger 7.4 E coming in second with 6.91 inches. Two other stations submitted

maximum 24-hour totals of 5 to 6 inches; four locations had 4 to 5 inches; five locations received 3 to 4 inches; and 13 locations reported 2 to 3 inches.

Preliminary reports from cooperative weather observers reporting for the National Weather Service recorded a state maximum monthly precipitation value of 10.18 inches at Lyons and maximum 24-hour total of 5.13 inches at McCook. Four locations had three separate days of at least one inch of rainfall during September; they were Crofton, Bradshaw, Lyons and David City. Valley 1 WNW had the greatest number of days, 12, with at least 0.01 inches of moisture. It is possible that higher values will be realized once the remainder of the cooperative weather observations are digitized by the NCEI.

Drought Conditions

With portions of western and central Nebraska experiencing several rounds of precipitation activity during September, there was close to a 35 percent reduction in the amount of area that went from D0 (abnormally dry) to no drought signature, according to the first and last issuance of U.S. Drought Monitor for Nebraska. On Sept. 9, the USDM indicated that 30.14 percent of the surface area of Nebraska was under D0 conditions and had decreased to 20.83 percent by the Sept. 26 depiction.

Abnormally dry conditions on Sept. 6 covered the northern third of the Panhandle and south-central Nebraska;

they were a carryover from the last USDM depiction issued in August. The Sept. 6 issuance included a new area covering west-central Nebraska that included the communities of the North Platte, Ogallala and Gothenburg. This area also extended northward to cover the south-central through northwestern Sandhills and an expansive area including the northwestern through south-central Sandhills.

The vast majority of the area removed from D0 was located on the eastern and northern fringes of the west-central area that was introduced the first week of September. Further east, south-central Nebraska saw net reduction of 50 percent of the D2 (severe drought) area and 15 percent of the D1 (moderate drought) area on the eastern side of the drought pocket. The percentage of area in D1 was reduced from 1.65 percent to 1.43 percent from the beginning to the end of the month, while D2 was reduced from 0.33 percent to 0.16 percent of the state's surface land area.

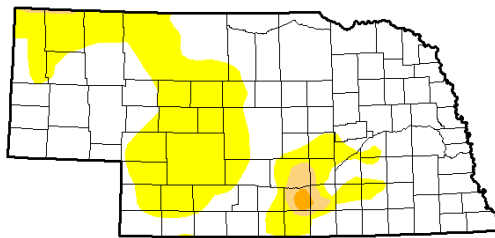
Crops

Warmer-than-normal temperatures during September pushed crops rapidly toward maturity. Although precipitation coverage and amounts were higher in eastern Nebraska, surface irrigation supplies were sufficient to meet producer demands due to generous winter snowfall in the Rockies and periodic heavy rainfall from mid-April through early July. Crop ratings for corn, soybean and sorghum all showed little change between the first and last Nebraska Agricultural Statistics Service crop ratings issued during September.

Corn was rated 1 percent very poor, 5 percent poor, 20 percent fair, 58 percent good and 16 percent excellent in the Sept. 4 NASS report. The last report for the month, issued Sept. 25, indicated no change in ratings for the very poor, poor and fair rating. The amount of crop with a "good" rating decreased one percentage point, while the "excellent" rating increased one percentage point. Corn maturity (Black Layer) was at 8 percent on Sept. 4 and increased to 69 percent by Sept. 25. NASS reported Sept. 25 that 7 percent of the corn crop had been harvested.

U.S. DROUGHT MONITOR FOR NEBRASKA

SEPT. 6, 2016



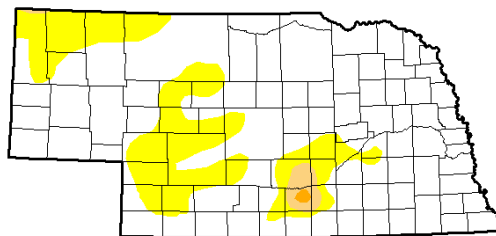
	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	67.88	32.12	1.98	0.33	0.00	0.00
Last Week 8/29/2016	61.96	38.04	2.09	0.33	0.00	0.00
3 Months Ago 6/7/2016	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 1/22/2015	99.99	0.01	0.00	0.00	0.00	0.00
Start of Water Year 8/23/2015	71.41	28.59	0.00	0.00	0.00	0.00
One Year Ago 9/2/2015	73.41	26.59	0.00	0.00	0.00	0.00

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

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

Author:
David Simeral
Western Regional Climate Center

SEPT. 27, 2016



	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	77.29	22.71	1.59	0.16	0.00	0.00
Last Week 9/20/2016	77.29	22.71	1.72	0.16	0.00	0.00
3 Months Ago 6/28/2016	64.95	35.05	2.23	0.00	0.00	0.00
Start of Calendar Year 1/22/2015	99.99	0.01	0.00	0.00	0.00	0.00
Start of Water Year 8/23/2015	71.41	28.59	0.00	0.00	0.00	0.00
One Year Ago 9/29/2015	71.41	28.59	0.00	0.00	0.00	0.00

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

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

Author:
Chris Fenimore
NCE/NESDIS/NOAA

SOURCE: DROUGHTMONITOR.UNL.EDU

Soybean ratings were similar to corn in regards to NASS crop report changes during the month of September. Soybeans on Sept. 4 were rated 1 percent very poor, 4 percent poor, 18 percent fair, 61 percent good and 16 percent excellent. On Sept. 24 soybeans were rated 1 percent very poor, 3 percent poor, 19 percent fair, 59 percent good and 18 percent excellent. Soybean maturity ratings increased from 12 percent mature on Sept. 4 to 63 percent mature on Sept. 25. Harvest activity ramped up during the last week of the month and 11 percent of the crop was estimated to be harvested by NASS in their last crop report of September.

Sorghum crop ratings were 0 percent very poor and poor, 16 percent fair, 64 percent good and 20 percent excellent. The Sept. 24 NASS crop report indicated that the very poor conditions increased

1 percent and excellent conditions increased 4 percent. Crop ratings for fair and good condition ratings dropped 2 percent and 3 percent, respectively. The percentage of the crop reaching maturity increased from 16 percent to 63 percent between the first and last crop ratings issued by NASS during the month of September.

Winter wheat planting during the month of September increased from 5 percent of the acreage on Sept. 4 to 72 percent on Sept. 25. Although there were pockets of dryness across the primary wheat growing areas of western and southern Nebraska, most producers had enough surface moisture to plant and provide moisture for early establishment. NASS noted that 42 percent of the wheat crop had emerged in the Sept. 25 crop report and likely would exceed 60 percent by month's end.

ENSO conditions and outlook

Sea Surface Temperature deviations in the Equatorial Pacific monitored by the Climate Prediction Center shows that the latest three-month average for the months of July to September averaged 0.5 C (0.9 F) below normal. This was a decrease of 0.2 C compared to the June to August basin average. In order to qualify as an official La Nina event, CPC requires five consecutive rolling three-month averages (such as June to August, July to September or October to December).

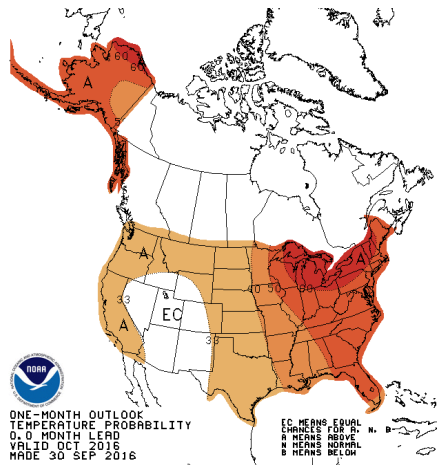
The Australian Bureau of Meteorology uses the Southern Oscillation Index, which is a measure of the pressure differential between Tahiti and Darwin, to determine if an event has moved into a La Nina or El Nino territory. SOI values typically fall between -35 and +35. If the SOI value is -7 or below, it qualifies as having conditions typical of an El Nino, while a value of 7 or greater qualifies for La Nina conditions.

The end of August SOI reading was 5.3, which increased to 13.5 by the end of September. This would signal weak La Nina conditions have developed and will need to be monitored for further strengthening as the fall progresses. If the SOI readings strengthen further, SST values should correspondingly cool in the central Equatorial Pacific and CPC likely would reissue their La Nina watch. At present, CPC has no La Nina watch in effect due to the lack of significant cooling in the western half of the Equatorial Pacific.

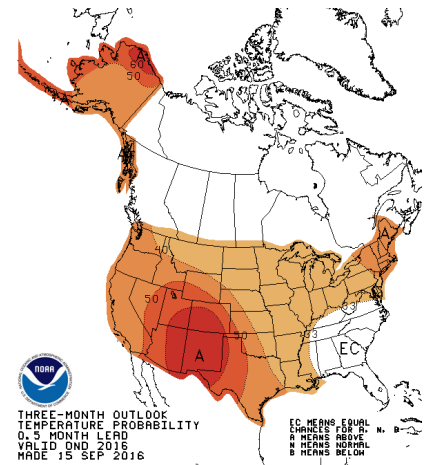
With CPC backing off of their La Nina forecast from previous months, climate outlooks for lower 48 contiguous states covering this fall and winter have backed off of the aggressive cooler-than-normal forecast that covered the northern third of the United States for this winter. Although CPC does depict cooler-than-normal temperatures dipping southward into North Dakota and Minnesota, it has backed off of forecasting the cold to push southward to the Nebraska/South Dakota border during the December to February period.

CPC projects that the three-month forecast for October to December will bring above-normal temperatures to all but the southeastern United States. No signal is given for precipitation over Nebraska during this period as Nebraska

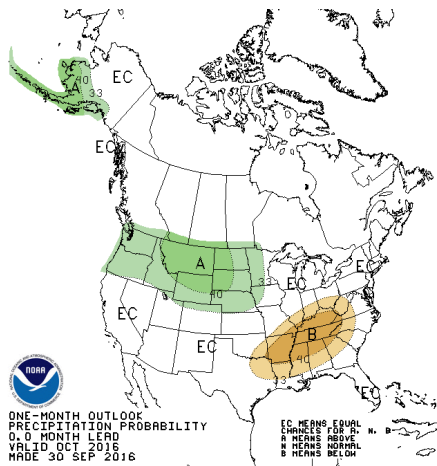
30-DAY OUTLOOK TEMPERATURE



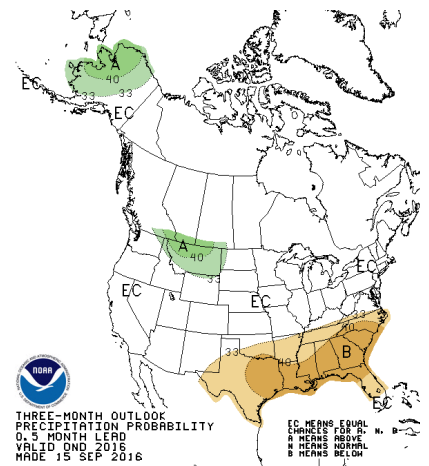
90-DAY OUTLOOK TEMPERATURE



30-DAY OUTLOOK PRECIPITATION



90-DAY OUTLOOK PRECIPITATION



SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

has equal chances of experiencing normal, above-normal or below-normal moisture. The closest area depicted to have a tendency for above-normal moisture is Montana and the western border of North Dakota.

The October outlook issued by CPC has seen a significant modification to their aggressive depiction of moisture chances in the central Plains that was issued in the middle of September. A broad area of above-normal moisture was projected to cover the southeastern half of Nebraska, as well as the entire state of Kansas. The updated 30-day outlook issued at the end of September shifted this area to cover the entire state of Nebraska, the northern Plains and the Pacific Northwest.

The temperature forecast issued for October in CPC's mid-September release

called for above-normal temperatures nationwide, except for the central and southern Plains, including the state of Kansas southward through Texas. The updated forecast for the month of October issued at the end of September called for areas east of the Continental Divide to experience above-normal temperatures, with the highest probabilities assigned to the Great Lakes region. CPC moved the equal chances of normal, above-normal, or below-normal temperatures from the southern and central Plains westward to include Arizona, New Mexico, Nevada and Utah.

— Report compiled by Al Dutcher, associate state climatologist, and Tyler Williams, climatologist and educator, both with the Nebraska State Climate Office.