

# CLIMATE UPDATE

A MONTHLY SUMMARY FROM THE NEBRASKA STATE CLIMATE OFFICE

nscsco.unl.edu

## October sees affects of above-normal temps

### Introduction

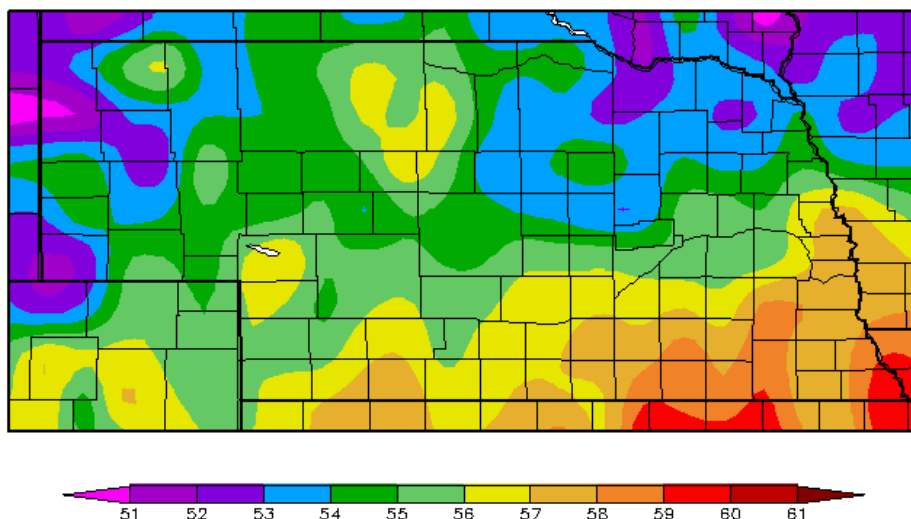
At least five frontal boundary passages occurred during the month of October, but the majority of precipitation received during the month fell across eastern areas of the state. Pieces of energy ejecting out of the Gulf of Alaska upper air low made their way across the northern half of the country on a regular basis. However, an upper-air-blocking high-pressure system positioned over the southern Mississippi River valley blocked the movement of Gulf of Mexico moisture northward in advance of frontal moving through the western corn belt.

Although western Nebraska dryness developing during October is a concern in regard to poor subsoil moisture recharge, harvest activity benefited from the lack of moisture. Wet conditions carried over from the month of September hindered harvest activity during the early part of the month across the eastern third of the state. Well-above-normal temperatures for most of October counteracted wetness issues and led to rapid field and grain drying.

The primary periods of active weather across the state were Oct. 3 to 6, 10, 19 to 20, 25 to 26 and 31. The most organized and widespread precipitation event of the month occurred Oct. 3 to 6. All of the October severe-weather reports posted by trained storm spotters occurred with this event, including 21 hail events and eight wind events. The heaviest 24-hour precipitation total recorded statewide in this timeframe was at Tyron 0.3 S, which reported 3.46 inches during the 24-hour period ending at 8 a.m. Oct. 4.

Even with five distinct periods of frontal boundary activity across the state during the month of October, the absence of cold air after systems passed east of the state was noteworthy. North Platte recorded a total of four days with below-normal temperatures compared to six for Omaha. Maximum departures from normal on the

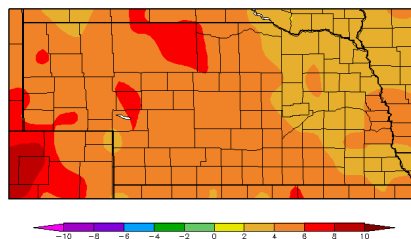
### AVERAGE TEMPERATURE | OCTOBER



HIGH PLAINS REGIONAL CLIMATE CENTER

Maps generated using provisional data.

### DEPARTURE FROM NORMAL TEMPERATURE OCTOBER



coldest day of the month (Oct. 12) were 10 F to 15 F below normal compared to 15 F to 20 F above normal on the warmest day of the month, Oct. 28.

Maximum temperatures exceeded that 80 F mark 10 times during October at North Platte compared to four days at Omaha. With such a dry air mass across western Nebraska, daytime temperatures rapidly warmed as vegetative evapotranspi-

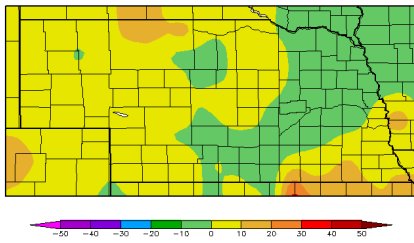
ration added little low-level moisture to the atmosphere after several hard freeze events. A slightly moister air mass and lack of hard freeze conditions across the southern tier of counties continued to promote pasture growth throughout most of the month.

### Temperatures

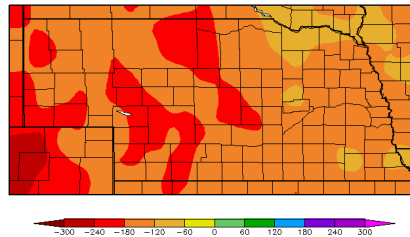
The upper atmospheric pattern for the month of October favored a trough extending from the Gulf of Alaska into the Pacific Northwest. Blocking high pressure over the southern Mississippi River valley forced systems ejecting out of the western U.S into the western Great Lakes, which led to dry frontal boundary passages after the first full week of the month. The flow around this blocking high meant that low-level southerly winds were taking drier air from central and western Texas northward instead of the low-level moisture out of the Gulf of Mexico.

With dry air in place for most of October

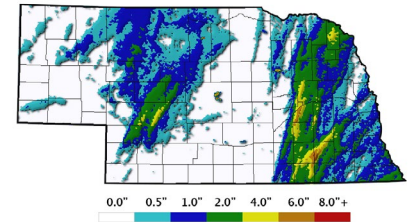
**DEPARTURE FROM NORMAL COOLING DEGREE DAYS**



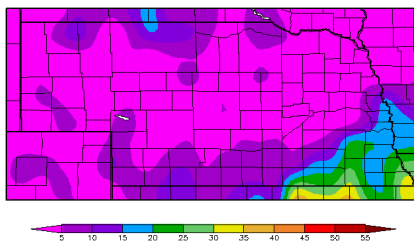
**DEPARTURE FROM NORMAL HEATING DEGREE DAYS**



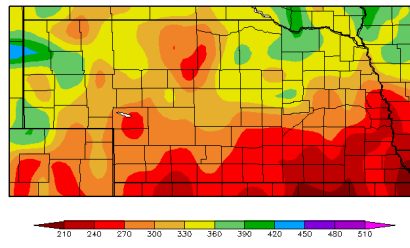
**PRECIPITATION IN INCHES**



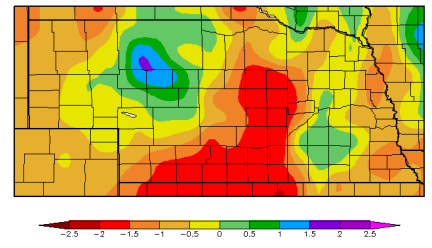
**COOLING DEGREE DAYS**



**HEATING DEGREE DAYS**



**DEPARTURE FROM NORMAL PRECIPITATION**



MAP AT TOP RIGHT BY NSCO; ALL OTHER MAPS BY HIGH PLAINS REGIONAL CLIMATE CENTER

coupled with the lack of Arctic air intrusions, maximum temperatures were able to consistently breach the 70 F mark, while low temperatures rarely dipped below freezing. Locations along the Kansas-Nebraska border and the southern half of the Southwest and South Central climate districts had not received a hard freeze by the end of October. The typical hard freeze date for this area of the state occurs between Oct. 17 and 25.

The distribution of average temperatures across the state ranged from 51 F to 60 F. Average temperatures across extreme northwest Nebraska ranged from 51 F to 53 F for October and 52 F to 53 F across northeast Nebraska. The remainder of the area north of I-80 experience monthly average temperatures in the range of 53 F to 56 F, while areas south of I-80 averaged 56 F to 60 F.

Statewide monthly average temperature departures ranged from 2 F above normal to 8 F above normal. A more detailed breakdown shows that the northern Sandhills and southwestern Panhandle region experienced average temperatures of 6 F to 8 F above normal. The remainder of the western three-fourths of the state experienced average temperatures of 4 F to 6 F above normal, while the eastern fourth of the state averaged 2 F to 4 F above normal.

A more detailed breakdown of the temperature trends across the state during October indicates that average tempera-

**October 2016 storm reports**

- [www.spc.noaa.gov/climo/reports/161003\\_rpts.html](http://www.spc.noaa.gov/climo/reports/161003_rpts.html)
- [www.spc.noaa.gov/climo/reports/161004\\_rpts.html](http://www.spc.noaa.gov/climo/reports/161004_rpts.html)
- [www.spc.noaa.gov/climo/reports/161006\\_rpts.html](http://www.spc.noaa.gov/climo/reports/161006_rpts.html)

tures for the month of October ranged from 43.0 F at Bushnell 15 S to 54.5 F at Geneva. Average maximum temperatures ranged from 70.5 F at Chadron to 32.4 F at Bushnell 15 S, while average maximum temperatures ranged from 41.1 F at Fort Calhoun to 22.3 F at Agate.

The highest daily maximum temperature recorded during the month of October was 84 F at Edison, while the coldest daily maximum temperature was 31 at Bushnell 15 S. The highest daily minimum recorded during the month was 55 at Falls City Brenner Field, while the coldest daily minimum temperature was 15 F set at the Alliance Airport, Bridgeport 18 WSW, Bushnell 15 S, and Harrison 20 SSE. Harrison 20 SSE had the greatest number of days where the minimum temperature reached 32 F or lower with 18.

Heating Degree Day unit accumulations for October ranged from 210 HDD's along the Kansas- Nebraska border to 420 units

to 330 HDD units across the central third of the state, and 330 to 420 HDD units across the northern third of Nebraska. The greatest departures from normal occurred in pockets of the Panhandle and southern Panhandle as accumulations ran 180 to 240 units behind normal. Extreme northeast Nebraska averaged 60 to 120 HDD units below normal, while the remainder of the state averaged 120 to 180 HDD units below normal.

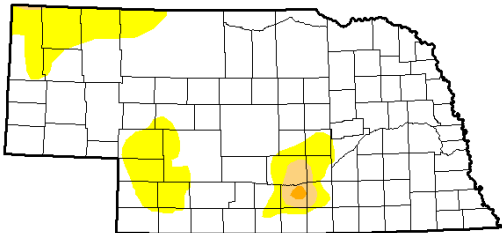
Because temperatures during the month of October was warm and high temperatures were above 70 F for more than half of the month, Cooling Degree Day unit accumulations were above normal. CDD unit accumulations ranged from 5 to 15 CDD units across the northwestern five-sixths of the state, while extreme southeast Nebraska experienced 15 to 35 CDD unit accumulations. This translated to normal to 10 CDD units above normal for the northwestern half of the state and normal to 15 HDD units above normal across southeast Nebraska. An area from south-central through northeast Nebraska averaged normal to 10 CDD units above normal.

**Precipitation**

Precipitation during October was hard to come by across western Nebraska, as

**U.S. DROUGHT MONITOR FOR NEBRASKA**

OCT. 4, 2016



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	83.97	16.03	1.59	0.16	0.00	0.00
<b>Last Week</b> 9/27/2016	77.29	22.71	1.59	0.16	0.00	0.00
<b>3 Months Ago</b> 7/2/2016	70.18	29.82	2.22	0.00	0.00	0.00
<b>Start of Calendar Year</b> 1/22/2015	99.99	0.01	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 9/27/2015	77.29	22.71	1.59	0.16	0.00	0.00
<b>One Year Ago</b> 10/6/2015	71.09	28.91	0.00	0.00	0.00	0.00

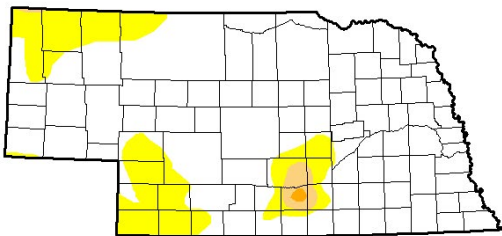
**Intensity:**  
■ D0 Abnormally Dry     ■ D3 Extreme Drought  
■ D1 Moderate Drought     ■ D4 Exceptional Drought  
■ D2 Severe Drought

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

**Author:**  
 Brian Fuchs  
 National Drought Mitigation Center



OCT. 25, 2016



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	82.17	17.83	1.59	0.16	0.00	0.00
<b>Last Week</b> 10/18/2016	84.91	15.09	1.59	0.16	0.00	0.00
<b>3 Months Ago</b> 7/26/2016	57.84	42.16	10.07	0.00	0.00	0.00
<b>Start of Calendar Year</b> 1/22/2015	99.99	0.01	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 9/27/2015	77.29	22.71	1.59	0.16	0.00	0.00
<b>One Year Ago</b> 10/21/2015	73.24	26.76	1.08	0.00	0.00	0.00

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



SOURCE: DROUGHTMONITOR.UNL.EDU

the vast majority of moisture received was concentrated in the first week of the month. Eastern Nebraska received better precipitation coverage later in the month as several systems tapped Gulf of Mexico moisture and produced pockets of light to moderate precipitation. The lack of moisture for western Nebraska began to stress crops and increase drought concerns by month end.

Severe weather during the month occurred on Oct. 3, 4 and 6. There were a total of 21 preliminary hail events and eight wind events reported by storm spotters during the month. The western

third of Nebraska received the brunt of the severe weather, but paid a price during the remainder of the month with a lack of measurable moisture.

Enough cold air to generate atmospheric cooling and wet snowfall on the western periphery of precipitation field followed the eastward advancing front that brought severe weather to western Oct. 6. Snow was reported from the southeastern Panhandle northeastward through the eastern Sandhills. Most locations failed to receive measurable snowfall, but pockets of 1- to 3-inch totals were reported within this broad region. The highest NOAA

Cooperative Observer Network observer snowfall report was 4 inches at O'Neill, which also was the highest cumulative total for the month of October.

Outside of the Oct. 6 snow event, the remainder of precipitation that fell during the month came in the form of rain. Tobias 2.1 WSW, a NeRAIN site, recorded the highest statewide total with 4.35 inches of moisture during October. The highest 24-hour total set during the month was just down the road at another NeRAIN site, Tobias 0.3 S, with 3.46 inches.

Looking at the spread of precipitation across the state from the Cooperative and NeRAIN, there were four days where at least one observer location reported 24-hour totals exceeding one inch. There were an additional five days where at least one site reported over a half inch, but less than one inch. On the other end of the spectrum, there were five days where no location reported measurable moisture and nine days where at least one station reported between a trace and a tenth of an inch of moisture.

The general precipitation trend across the state was drier than normal, with several small areas of above-normal moisture. Less than 0.50 inches of moisture was common across south-central and central Nebraska, along with the western half of the Panhandle and southern half of the southwestern corner of the state. There were three pockets of moisture greater than two inches observed across the state, including just to the north of North Platte, Geneva to Columbus, and the extreme northeastern corner of the state.

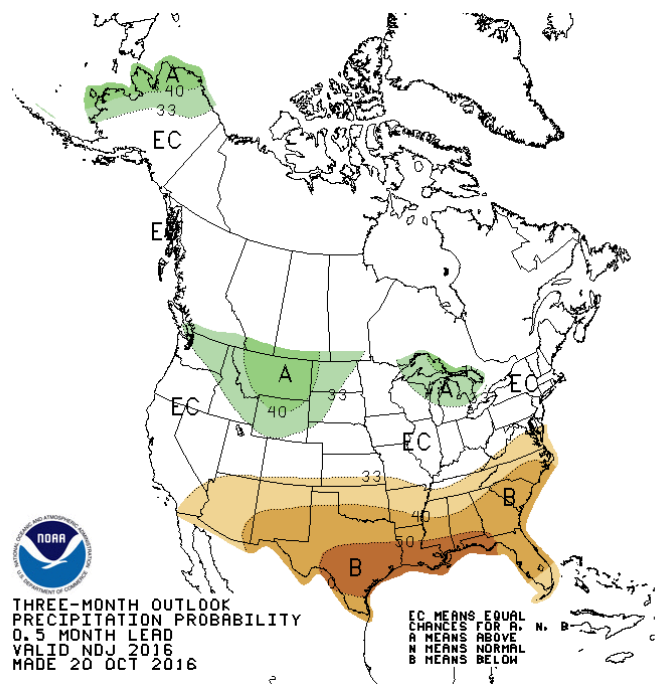
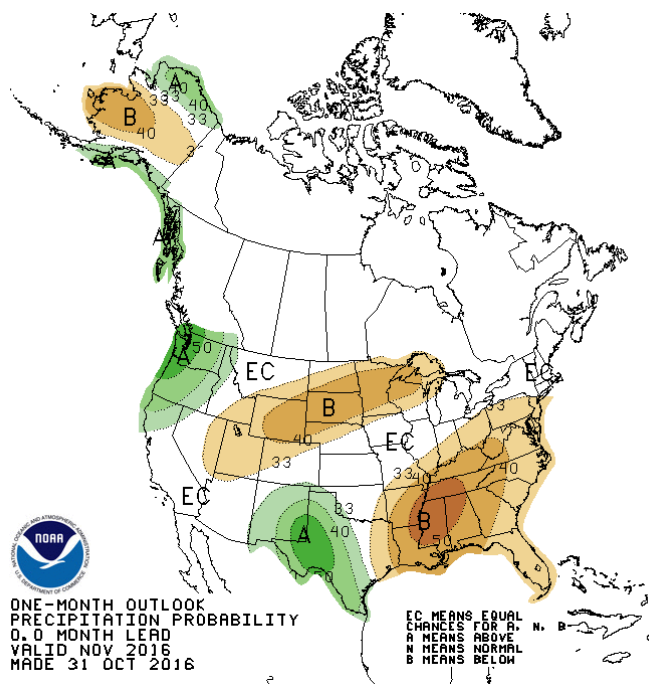
Precipitation departures were 1.50-2.00 inches below normal where less than a half of an inch of moisture was received. Areas that received more than two inches of moisture had surplus moisture for the month of October, while areas receiving 0.50 to 2.00 inches had departures ranging from 1.50 inches to normal conditions, respectively.

**Drought Conditions**

Because appreciable precipitation across the western half of the state was negligible, a slight increase in the areal coverage of abnormally dry (D0) increased from 13.4 percent with the Oct. 4 release to 16.24 percent with the Oct. 25 release of the U.S. Drought Monitor.

30-DAY OUTLOOK PRECIPITATION

90-DAY OUTLOOK PRECIPITATION



There was no change in the amount of area depicted in moderate (D1) and severe (D2) drought. On Oct. 25, the U.S. Drought Monitor indicated 0.16 percent of the state was experiencing severe drought, while another 1.43 percent of the area was depicted with moderate drought conditions.

October is a critical month in regard to soil moisture recharge for the next growing season and significant dryness usually leads to increase in drought, either during the latter half of the month or early portions of November. U.S. Drought Monitor authors were actively considering increase in drought coverage for the Panhandle, southwest and south-central regions of the state. This area would be a northward extension of drought conditions across southwestern Kansas and southeastern Colorado.

**Crops**

Warmer than normal temperatures during October helped offset the wet conditions that developed during September across eastern Nebraska. At the beginning of October, northeastern Nebraska was the wettest area of the state. Additional pockets of wetness were reported in the David City to West Point area, as well as the southeastern corner of the state from

Pawnee City to Falls City.

Inclement weather during the Oct. 3 to 6 period led to the most significant harvest delays during the month as pockets of moderate rainfall were noted north of I-80 in the North Platte, West Point and Sioux City areas. Minor harvest delays of 1 to 2 days were noted after precipitation events during the Oct. 19 to 20 and Oct. 25 to 26 periods, primarily for those area that had excessively wet conditions at the beginning of the month.

Total harvest activity was over 75 percent complete by the last Nebraska Agricultural Statistical Service crop progress report issued Oct. 30. Corn harvest was 69 percent complete, sorghum was 81 percent complete, and soybeans were 91 percent complete. On the first NASS release of the month (Oct. 2) the corn harvest was 15 percent complete, while sorghum and soybean harvest was 23 percent and 27 percent, respectively. It looked likely that corn harvest would be virtually complete prior to Nov. 13 if dry conditions continued into November.

**ENSO Conditions and outlook**

Sea Surface Temperature deviations

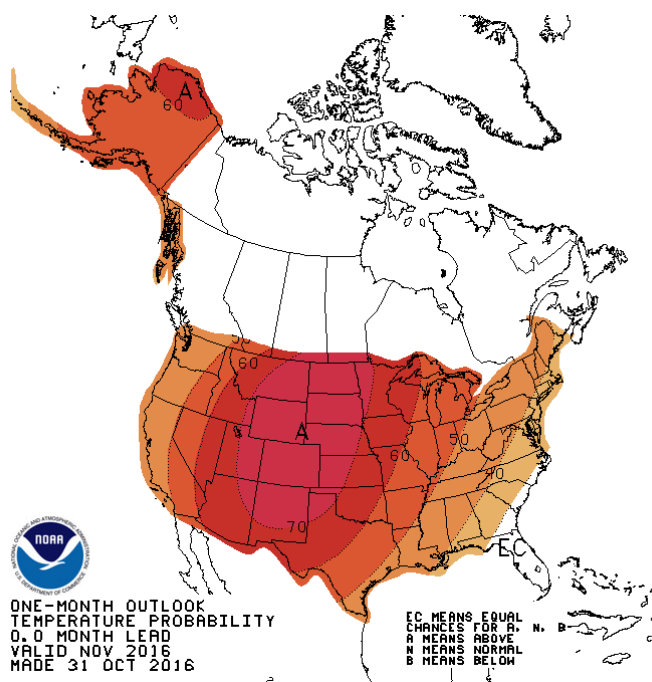
in the Equatorial Pacific monitored by the Climate Prediction Center (CPC) shows that the latest three-month average for the months of August to October averaged 0.7 C (1.25 F) below normal. This was decrease of 0.2 C compared to the July to September basin average. In order to qualify as an official La Nina event, CPC requires five consecutive rolling three-month averages (for example, June to August, July to September, October to December) and this marks the second consecutive rolling three-month average that has been below the -0.5 C threshold.

The Australian Bureau of Meteorology uses 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.

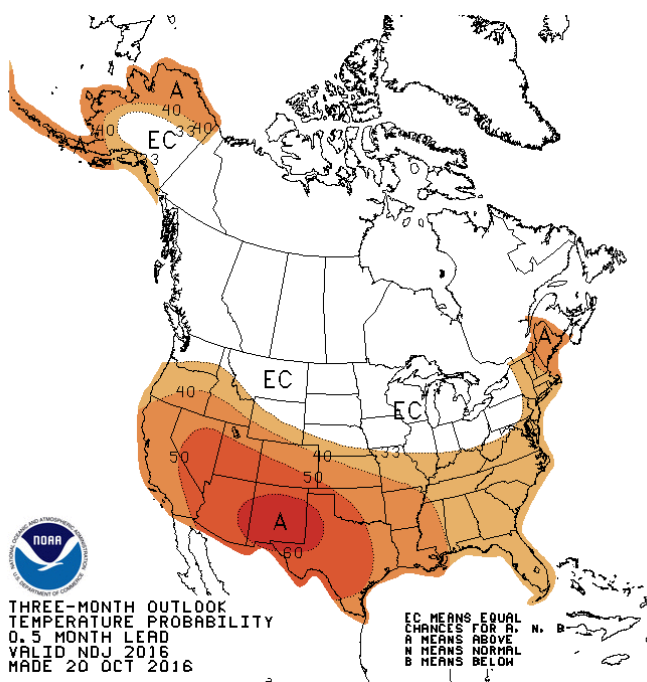
The end of the September 30-day SOI reading was 13.5, which decreased to -5.0 by the end of October. It is not unusual to see sharp swings in the 30-day SOI value and the 90-day SOI stood at 4.50 at the end of October. The three-month average SOI was just under the La Nina threshold



### 30-DAY OUTLOOK TEMPERATURE



### 90-DAY OUTLOOK TEMPERATURE



and the consensus of the global models was further strengthened over the next two months, which would meet the criteria for a weak event. Throw out models indicating warming over the next two months and a moderate event is forecasted by the average of the remaining models.

The Climate Prediction Center flipped back to a La Nina watch with the release of their October Long Lead Outlooks. The assign a 70%+ likelihood of a weak La Nina event developing through the remainder of the year, before dissipating during the first half of next spring. CPC has confirmed that their winter forecast issued in October will not change, as it had already incorporated La Nina into their extended forecasts.

CPC indicates projects that the three-month forecast for November to January will bring above-normal temperatures to the southern half of the United States, along with the northeast and southern half of the Pacific Northwest. North of this area, including Nebraska is depicted as having equal chances of receiving above normal, normal or below-normal temperatures.

Two distinct areas of above-normal moisture are projected for the United States by the CPC. An area encompassing

northern Idaho, Montana, Wyoming, the western half of the Dakotas and eastern portions of Oregon and Washington has the highest probabilities of receiving above-normal moisture. A second smaller area is depicted for northern Michigan and northeastern Wisconsin. Below-normal precipitation is projected for the southern third of the U.S., while the remainder of the nation has equal chances for above normal, normal or below-normal precipitation, including Nebraska.

The November temperature outlook by CPC indicates above-normal temperatures are likely nationwide, with the highest probabilities assigned to Rocky Mountains and western High Plains region. The western four-fifths of Nebraska is depicted with a 70 percent likelihood of above-normal temperatures, while the southeastern one-fifth of the state has been assigned a 65 percent to 70 percent chance of experiencing above-normal temperatures during the month.

The November precipitation forecast favors below normal precipitation from Utah northeast to the Upper Peninsula of Michigan. Areas north of a line from Scottsbluff to Sioux City, Iowa, are within this projected below-normal precipitation region, while the remainder of the state

has equal chances of receiving above-normal, normal, below-normal precipitation. In addition, below-normal moisture is also forecasted over the southeastern U.S. were severe to extreme drought conditions have developed over the past few months. Southern Texas and the Pacific Northwest are the only two areas depicted to receive above normal moisture.



**CONTACT US**

e) nsco@unl.edu  
p) 402.472.5206  
**ON THE WEB**  
nsco.unl.edu

**FOLLOW US**

@MShulski3 NeClimate

**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