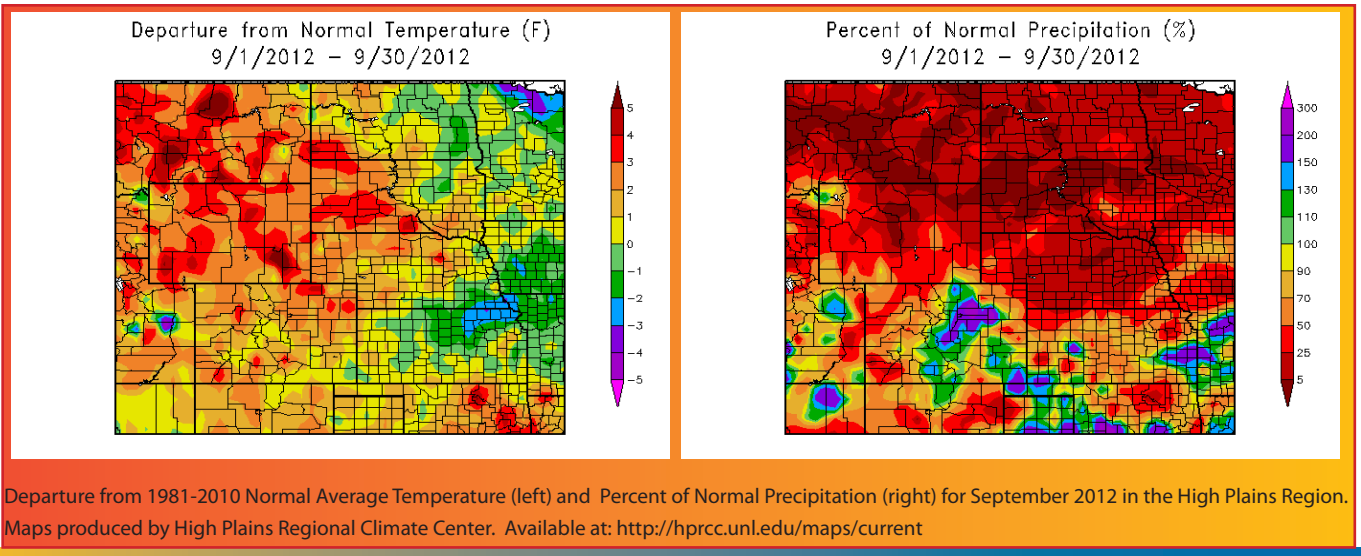
727 Hardin Hall
3310 Holdrege Street
Lincoln, NE 68583-0997
402 472-6706
Fax 402 472-8763
http://hprcc.unl.edu

High Plains Regional Climate Meeting in Nebraska City, Nebraska - Photo by Adnan Akyuz
www.ndsu.edu/ndsco

September 2012 Climate Summary

Region Breakdown

While most the High Plains Region had near normal average temperatures, September 2012 continued to be dry. Most locations in the Region had average temperatures which were within 1.0-2.0 degrees F (0.6-1.1 degrees C) of normal. The largest temperature departures occurred in a few areas of Wyoming, where average temperatures were over 4.0 degrees F (2.2 degrees C) above normal, and an area along the border of northeastern Kansas and south-eastern Nebraska where average temperatures were 2.0-3.0 degrees F (1.1-1.7 degrees C) below normal. Unlike the majority of this year, the temperatures this month were not record setting; however a small number of locations did break into the top 10 warmest Septembers on record. Lander, Wyoming had its 6th warmest September on record with an average temperature of 63.2 degrees F (17.3 degrees C). In 1990, Lander had its warmest September with an average temperature of 64.8 degrees F (18.2 degrees C) (period of record 1891-2012). Even with some below normal temperatures this month, 2012, as a whole, has continued to be one of the warmest on record for much of the Region. For instance, the average temperature in Topeka, Kansas was 0.5 degrees F (0.3 degrees C) below normal this month, but this year's January 1-September 30 time period still ranked as the warmest. The average temperature in Topeka for that time period was 64.4 degrees F (18.0 degrees C), which easily beat the 1934 record of 62.3 degrees F (16.8 degrees C) (period of record 1887-2012).



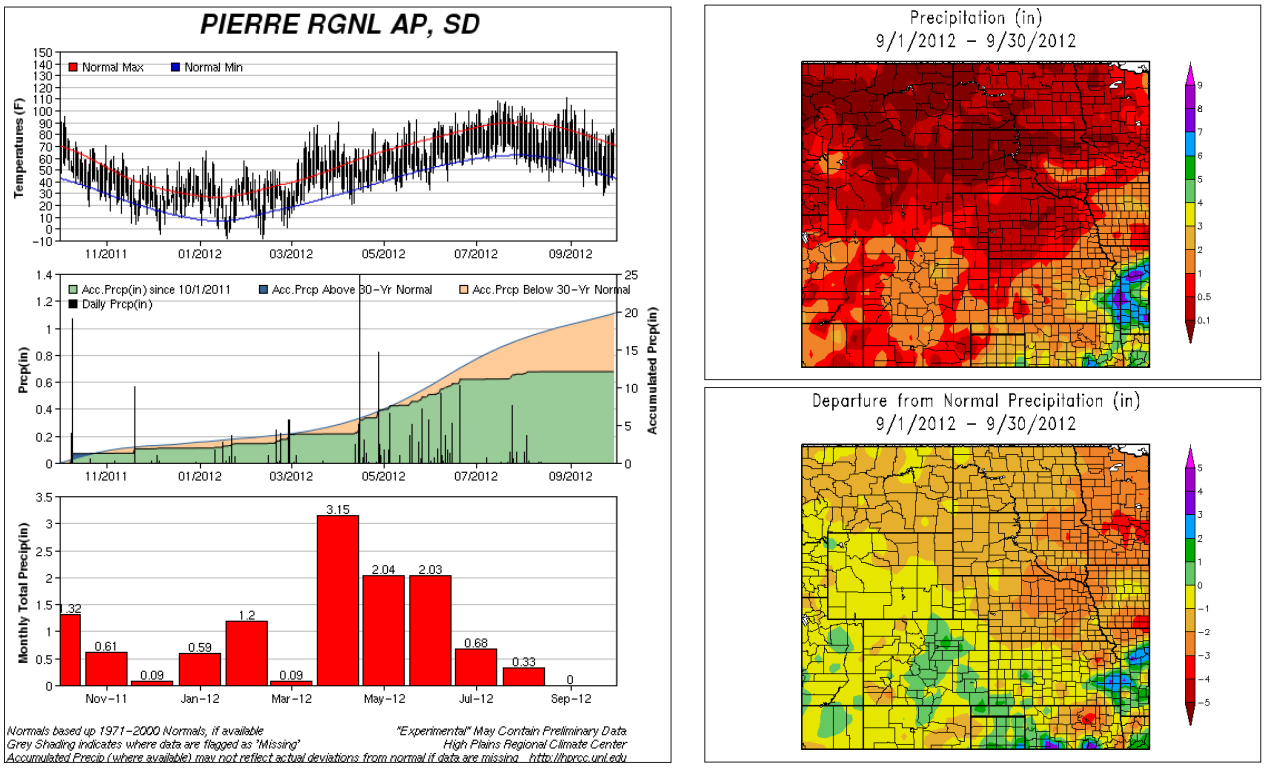
Departure from 1981-2010 Normal Average Temperature (left) and Percent of Normal Precipitation (right) for September 2012 in the High Plains Region.
Maps produced by High Plains Regional Climate Center. Available at: http://hprcc.unl.edu/maps/current

Precipitation Summary

September was yet another dry month for the majority of the High Plains Region. Precipitation totals which were less than 50 percent of normal were widespread. In addition, a large area of central and northern South Dakota and pockets of North Dakota, Nebraska, and Wyoming received at most 5 percent of normal precipitation. This dearth of precipitation caused many new records to be set this month. Aberdeen, South Dakota had its driest September on record with only 0.01 inches (0 mm) of precipitation which was 2.18 inches (55 mm) below normal. The old record of 0.05 inches (1 mm) was set back in 1979 (period of record 1893-2012). Interestingly there were numerous stations across South Dakota that received no measurable precipitation this month. One of these locations was Pierre, South Dakota which tied with 1893 for its driest September on record (period of record 1893-2012).

The dry weather continued to have an impact across the Region. According to the U.S. Army Corps of Engineers, the Missouri River had record low inflows this month of just 0.3 million acre feet. The previous record occurred in 1919 with 0.4 million acre feet (period of record 1898-2012). In addition, water and feed shortages for livestock were common and many producers continued to cull livestock. The dry weather did help with crop dry down and by the end of the month, the corn harvest was well ahead of average in Nebraska and the Dakotas.

The only areas of the Region which received above normal precipitation were central and southeastern Colorado, and southwestern and eastern Kansas. These areas had precipitation totals ranging from 110 percent of normal to 300 percent of normal. Denver, Colorado had its 5th wettest September on record with 2.95 inches (75 mm). The record held at 4.67 inches (119 mm), set back in 1961 (period of record 1872-2012). Heavy rainfall in Colorado actually caused problems in areas that had been affected by the wildfires this summer. According to InciWeb, rain caused rock and mud slides in the High Park Fire burn area, west of Fort Collins, Colorado. In addition, numerous trees had also fallen and this combination of rock, mud, and trees caused multiple closures of roads in that area. Luckily, according to *The Coloradoan*, no property damage or injuries were reported.



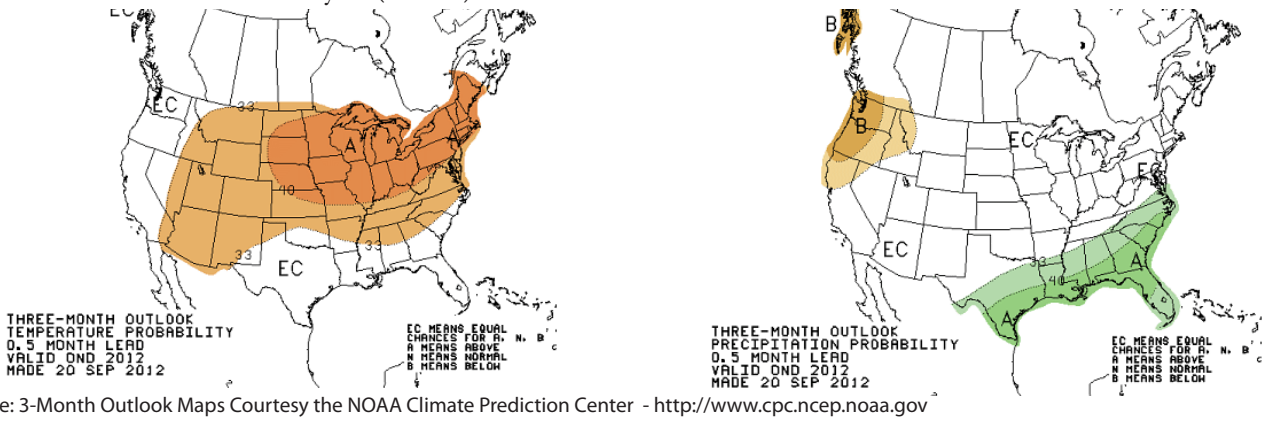
Above: Maximum, minimum, and normal temperatures, accumulated precipitation, and monthly total precipitation for Pierre, SD over the past year (top left). Total precipitation (inches) (top right) and Departure from Normal Precipitation (inches) (bottom right) for September 2012 in the High Plains Region. These maps are produced by HPRCC and can be found on the Current Climate Summary Maps page at: http://hprcc.unl.edu/maps/current.

The High Plains Regional Climate Center is one of the Regional Climate Centers, and is involved in the Applied Climate Information System (ACIS) development and management effort. Data found throughout this publication were derived using products built on the ACIS framework.

ACIS
Applied Climate Information System - Regional Climate Centers

Climate Outlook

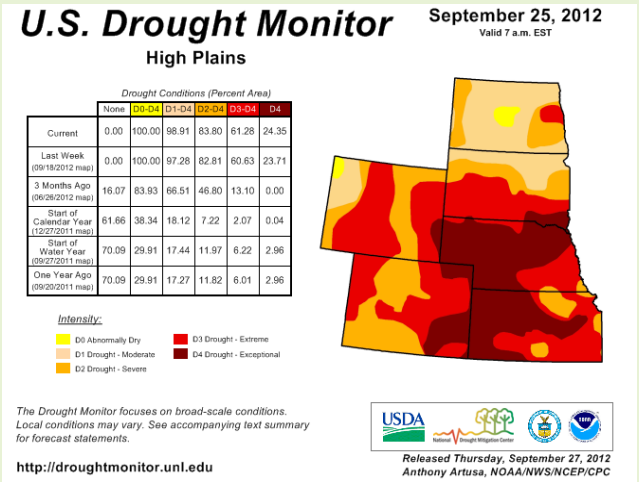
ENSO-neutral conditions continue and weak El Niño conditions are likely to develop later this fall. For the next three months, the temperature outlook indicates a higher probability of above normal temperatures for the entire High Plains Region, with the highest probability being in the southeastern half of North Dakota, most of South Dakota, the majority of Nebraska, and northeastern Kansas. The precipitation outlook indicates equal chances of above, near, or below normal precipitation for the entire High Plains Region. The seasonal outlooks combine the effects of long-term trends, soil moisture, and when applicable, the El Niño Southern Oscillation cycle (ENSO).

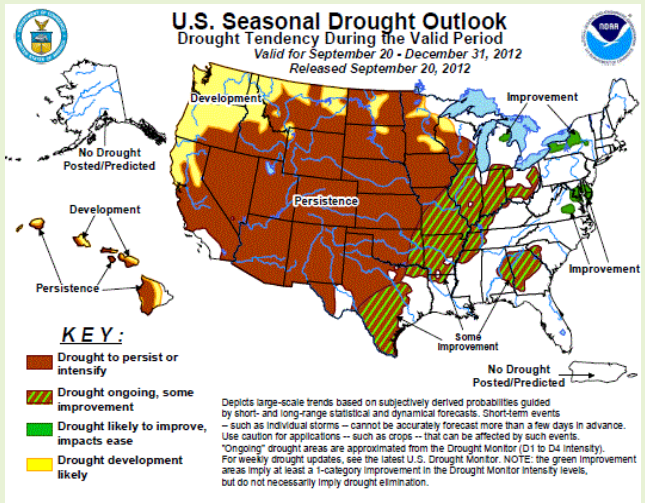


Above: 3-Month Outlook Maps Courtesy the NOAA Climate Prediction Center - http://www.cpc.ncep.noaa.gov
(left) The Three-Month Temperature Probability Outlook, (right) The Three-Month Precipitation Probability Outlook

Drought Watch

According to the U.S. Drought Monitor, there have been significant changes in drought conditions over the last month in the High Plains Region. By the end of September, about 99 percent of the Region was under moderate (D1) to exceptional (D4) drought, with nearly 24 percent of the Region in the D4 designation. In contrast, at the end of last month, only 15 percent of the Region was in D4. D4 areas expanded to include most of the state of Nebraska, a small portion of eastern Wyoming, southeastern South Dakota, northeastern Colorado and much of the western and central parts of Kansas. By the end of the month, just over 75 percent of Nebraska was in D4 drought. Extreme drought conditions (D3) also expanded in Nebraska, North Dakota, South Dakota, and Wyoming. In addition, every part of the Region had at least some sort of drought designation or either abnormally dry conditions (D0). About the only improvements occurred in eastern Kansas, where the remnants of Hurricane Isaac helped downgrade drought conditions there. According to the U.S. Seasonal Drought Outlook released September 20th, drought conditions were expected to improve in the far southeastern corner of Kansas and develop in central North Dakota and northern South Dakota. All other areas of drought in the Region were expected to persist through the end of the year.





The U.S. Drought Monitor is produced as a joint effort of the U.S. Department of Agriculture (USDA), National Drought Mitigation Center, U.S. Department of Commerce and the National Oceanic and Atmospheric Administration (NOAA). Real-time data provided through ACIS from the Regional Climate Centers are often used by the agencies involved in the U.S. Drought Monitor when determining the area and intensity of drought conditions, although the product itself is not produced by HPRCC. For current Drought Monitor information, please see: http://droughtmonitor.unl.edu/
Portions of this Drought Watch are courtesy the Drought Monitor Text Discussion found on the Drought Monitor webpage.

State Summaries

Colorado	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Akron Washington County Airport	80.7	51.6	66.2	3.2	97	09/01	43	09/28+	0.77	-0.39	66
Alamosa San Luis Airport	74.9	35.6	55.2	0.2	85	09/01	25	09/18	1.10	0.19	121
Colorado Springs Municipal Airport	76.8	49.1	63.0	2.1	90	09/04+	40	09/23+	1.42	0.23	119
Grand Junction Walker Field Airport	82.5	52.3	67.4	1.3	92	09/06+	44	09/30	0.46	-0.73	39
Pueblo Memorial Airport	83.1	49.9	66.5	1.8	98	09/01	38	09/18	0.73	-0.04	95

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	80.7	51.7	66.2	-1.8	97	09/04	38	09/23	1.08	-1.83	37
Dodge City Regional Airport	83.7	53.4	68.5	-0.7	100	09/03+	42	09/14	0.91	-0.76	54
Goodland Renner Field	82.2	48.5	65.4	0.8	97	09/11+	38	09/24+	0.45	-0.77	37
Topeka Municipal Airport	81.5	54.2	67.8	-0.5	100	09/03	35	09/23	0.58	-3.08	16
Wichita Mid-Continent Airport	84.2	59.4	71.8	0.8	106	09/03	47	09/18	2.64	-0.50	84

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	83.7	43.3	63.5	2.5	102	09/01	32	09/22	0.27	-1.46	16
Grand Island Airport	83.1	50.0	66.5	1.4	103	09/04	34	09/23	0.47	-1.76	21
Lincoln Municipal Airport	82.1	47.1	64.6	-1.4	102	09/04	32	09/23	1.73	-1.29	57
Norfolk Karl Stefan Airfield	82.3	47.0	64.6	0.8	102	09/04	30	09/23	0.61	-2.08	23
North Platte Regional Airport	83.2	43.2	63.2	0.9	100	09/04	33	09/22+	0.10	-1.31	7
Omaha Eppley Airport	80.3	50.4	65.3	-0.4	97	09/04	33	09/23	1.59	-1.09	59
Valentine Miller Field	82.9	45.9	64.4	2.1	100	09/10+	32	09/22	0.22	-1.42	13

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismark Municipal Airport	77.3	40.7	59.0	0.5	100	09/01	22	09/22	0.05	-1.54	3
Fargo International Airport	75.3	43.3	59.3	0.2	91	09/10	25	09/23	0.12	-2.45	5
Grand Forks International Airport	73.3	41.3	57.3	0.4	90	09/01	25	09/23	0.20	-1.85	10
Theodore Roosevelt Airport	77.8	42.0	59.9	2.7	101	09/01	26	09/22	0.17	-1.30	12
Williston International Airport	76.3	41.0	58.7	2.0	93	09/01	26	09/22	0.08	-0.98	8

All Data are Preliminary and Subject to Change. + indicates multiple dates, latest date listed.
Source: National Weather Service Cooperative Observation Network Data
Data are retrieved through the Applied Climate Information System (ACIS).
These data are available for the entire period of record through the CLIMOD system. For more information please see http://hprcc.unl.edu/services.

September 2012 Climate Summary

South Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Aberdeen Regional Airport	77.8	40.5	59.2	0.3	94	09/10	22	09/23	0.01	-2.18	0
Huron Regional Airport	80.7	43.7	62.2	0.5	98	09/10+	26	09/23	0.60	-1.86	24
Pierre Regional Airport	82.0	46.8	64.4	1.5	105	09/01	29	09/22	0.00	-1.87	0
Rapid City Regional Airport	81.8	45.9	63.9	3.1	101	09/01	32	09/23	0.14	-1.15	11
Sioux Falls Joe Foss Field Airport	78.9	46.5	62.7	1.4	96	09/11+	27	09/23	1.14	-1.63	41

Wyoming	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Casper Natrona County International AP	79.4	42.9	61.2	3.3	90	09/10	31	09/14	0.31	-0.77	29
Cheyenne Municipal Airport	75.1	46.4	60.8	2.6	89	09/01	38	09/22	1.30	-0.18	88
Lander Hunt Field Airport	78.6	47.7	63.2	4.6	87	09/09	37	09/13	0.35	-0.70	33
Laramie Regional Airport	72.7	38.3	55.5	2.2	83	09/06	31	09/18+	0.47	-0.64	42
Rawlins Municipal Airport	75.0	40.9	58.0	2.6	82	09/10+	33	09/28+	0.38	-0.59	39
Sheridan County Airport	80.5	42.1	61.3	3.4	92	09/15+	32	09/13	0.00	-1.43	0

All Data are Preliminary and Subject to Change. + indicates multiple dates, latest date listed.
Source: National Weather Service Cooperative Observation Network Data
Data are retrieved through the Applied Climate Information System (ACIS).
These data are available for the entire period of record through the CLIMOD system. For more information please see http://hprcc.unl.edu/services.

State Spotlight - North Dakota

F. Adnan Akyüz - State Climatologist, Barb Mullins - Assistant to the State Climatologist
North Dakota State Climate Office, North Dakota State University

Precipitation:

The North Dakota Agricultural Weather Network (NDAWN) September precipitation in North Dakota was well below normal with the lowest amounts of ~0.01 inches in the west and the far northeast corner (Figure 1, NDAWN Center). The greatest amounts of precipitation measured by NDAWN were 0.66 inches at Cando, 0.65 inches at Pillsbury, and 0.58 inches at Prosper. According to the U.S. Drought Monitor September 25th assessment, 28.49% of the state was experiencing severe to extreme drought (D2-D3) and 66.41% of the state was experiencing moderate drought (D1). The driest area with extreme drought (D3) was in parts of Grand Forks, Nelson, Griggs, Steele and Trail Counties.

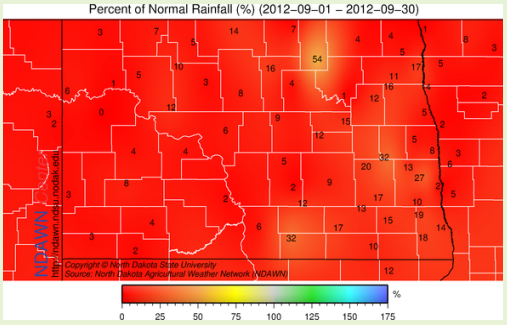


Figure 1. Percent of Normal Precipitation in September 2012 for North Dakota (North Dakota State Climate Office)

Temperature:

NDAWN September average air temperatures ranged from ~53 °F in the northeast to ~61 °F in the west. Departure from normal average air temperatures ranged from below normal of approximately -2 °F in the Red River Valley to above normal of approximately 7 °F in the west (Figure 2, NDAWN Center). The first wide spread frost occurred on the 17th. Producers were concerned about the lack of precipitation in September. However, conditions were suitable most days for harvest to progress at a swift rate.

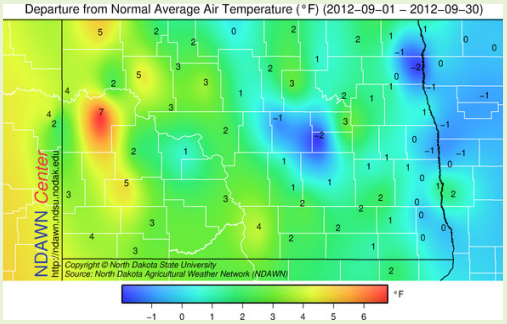


Figure 2. Temperature Departure from Normal in September 2012 for North Dakota (North Dakota State Climate Office)

For more information about the North Dakota State Climate Office: http://www.ndsu.edu/ndsco
For more information on the North Dakota Agricultural Network: http://www.ndawn.ndsu.nodak.edu
The North Dakota Agricultural Network is a part of the Automated Weather Data Network (AWDN).

State Spotlight - Wyoming

Tony Bergantino - Assistant State Climatologist
Wyoming State Climate Office, University of Wyoming

Precipitation

Compared to the 1981-2010 Normal period, September was mostly drier than August with the exception of the extreme northwest. So far, Cheyenne and Old Faithful were the only locations above their 1981-2010 Normals. Cheyenne was just slightly above normal and Old Faithful was between 130% and 150% above. This is in stark contrast to most of the rest of the state, especially the northern half where most stations were less than 50% of Normal. The southern portion of the state was also dry although a few stations made it to the 80%-90% of Normal level.

Nine of the Reference ET (Short Grass) gauges that have been deployed through the CoCoRaHS network had 90% of the records complete and those stations ranged from 3.94" of ETo in Big Horn County to 6.01" in Casper. For September the Water Balance ranged from -3.25" to -5.5".

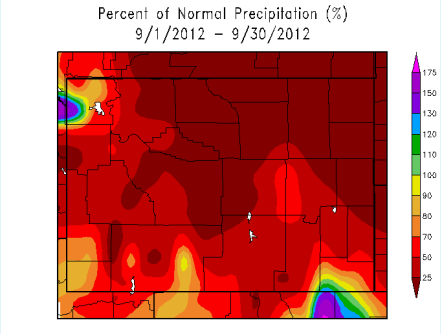


Figure 1. Map showing September 2012 precipitation as a percentage of historical averages (vs. 1971-2000 normal period) for Wyoming. Courtesy HPRCC.

Temperature

Temperatures across the state were above Normal again for September with one exception in Albany County that was just below its Normal. Much of the state was 2°F to 4°F above Normal with the far west counties being just above Normal.

Drought levels remained mostly the same in September with only a slight expansion of D4 in extreme eastern Laramie County. At the end of September, 98.01% of Wyoming was in drought (D1, D2, D3, or D4) and this is the highest percentage since February 6, 2007 when 98.74% of the state was in one level or another of drought. 2.72% of the state is currently in D4 which is the most since May 3, 2005.

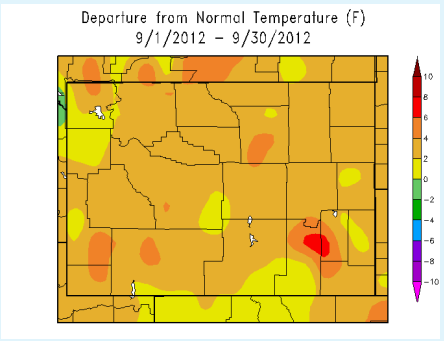


Figure 2. Map showing mean September 2012 temperatures from historical averages (vs. 1971-2000 normal period) for Wyoming. Courtesy HPRCC.

This report was prepared by the Wyoming State Climate Office, which is part of the Wyoming Water Resources Data System at the University of Wyoming. More information can be found at: http://www.wrds.uwyo.edu and http://www.wrds.uwyo.edy/sco/climate_office.html. Special thanks to the National Weather Service's Riverton and Cheyenne Offices, the NRCS Casper Office, the Cheyenne US Geological Survey Office, and Wyoming CoCoRaHS observers for supplying much of the data and information used in this report.

About the High Plains Regional Climate Center

The High Plains Regional Climate Center (HPRCC) operates out of the University of Nebraska - Lincoln (UNL) in Lincoln, Nebraska. As one of 6 regional climate centers throughout the nation, HPRCC works closely with other organizations such as the National Climatic Data Center (NCDC), Local and Regional National Weather Service (NWS) Offices, and other climate services organizations such as the National Drought Mitigation Center (also located at UNL) to provide climate data services and specialized climate products.

For More Information Online

High Plains Regional Climate Center: http://hprcc.unl.edu

High Plains Regional Climate Services: http://hprcc.unl.edu/services

CLIMOD: http://climod.unl.edu

Regional Climate Centers and ACIS: http://www.rcc-acis.org

National Weather Service: http://www.weather.gov

National Climatic Data Center: http://ncdc.noaa.gov

University of Nebraska - Lincoln: http://www.unl.edu

National Drought Mitigation Center: http://drought.unl.edu

Climate Prediction Center: http://www.cpc.noaa.gov

NOAA Storm Prediction Center: http://www.spc.noaa.gov

Photo of the Nebraska Sandhills by Bill Sorensen - Senior Programmer - HPRCC

Author Information

For questions, comments, or suggestions, please contact:
Natalie Umphlett - Regional Climatologist - High Plains Regional Climate Center
(402) 472-6764 - numphlett2@unl.edu
712 Hardin Hall
3310 Holdrege Street
Lincoln, NE 68583-0997