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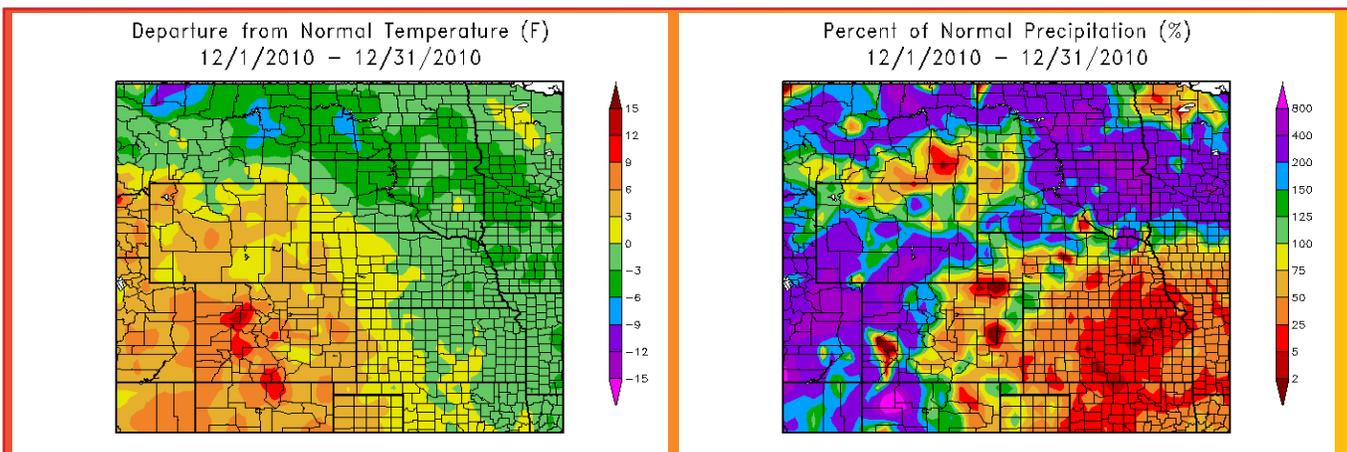
Freezing fog in western Nebraska - Photo by Ken Dewey
<http://www.nebraskaweatherphotos.org>

December 2010 Climate Summary

Region Breakdown

Temperatures across the High Plains Region this month were below normal in the eastern half and above normal in the western half. The dividing line between the above and below normal temperatures ran from southwestern South Dakota into central Nebraska, and then into west-central Kansas. December temperature departures ranged from 7 degrees F (3.9 degrees C) below normal in North Dakota to 10 degrees F (5.6 degrees C) above normal in Colorado.

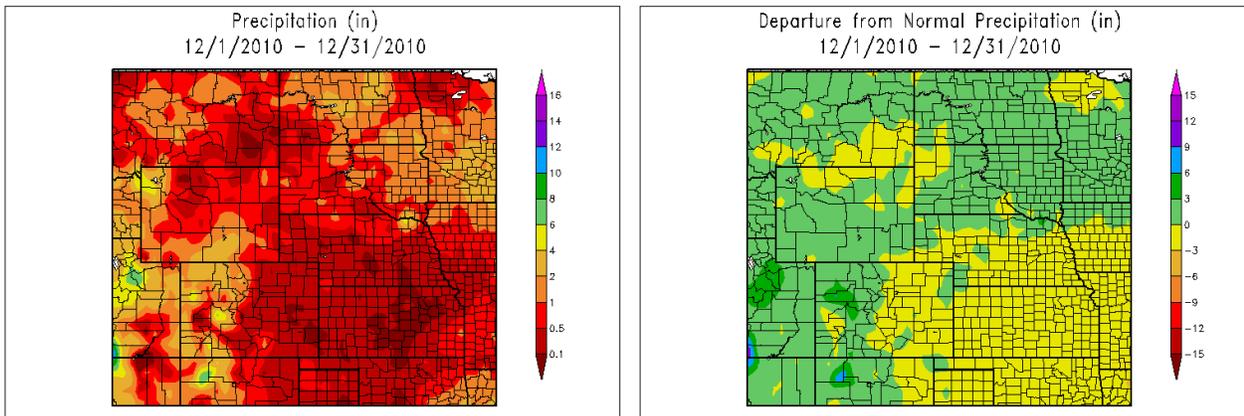
Great Sand Dunes National Park in Colorado recorded its warmest December with an average temperature of 31.0 degrees F (-0.6 degrees C) which was 8.0 degrees F (4.4 degrees C) above normal. This just surpassed the old record of 30.9 degrees F (-0.6 degrees C) which occurred in 1977 (period of record 1950-2010). Cortez, Colorado also had its warmest December on record with an average temperature of 36.7 degrees F (2.6 degrees C). This broke the old record of 36.3 degrees F (2.4 degrees C) which was set in 1980 (period of record 1911-2010).



Departure from 1971-2000 Normal Average Temperature (left) and Percent of Normal Precipitation (right) for December 2010 in the High Plains Region. Maps produced by High Plains Regional Climate Center. Available at: <http://hprcc.unl.edu/maps/current>

Precipitation Summary

Southern portions of the Region including Kansas, Nebraska, and eastern Colorado received little to no precipitation this month. This caused existing drought conditions to persist and led to the development of drought in eastern Kansas as well. While the southern portion of the Region remained dry, several storm systems impacted the northern portions of the Region this month. The Dakotas were hit particularly hard by heavy snowfall which set new records and impacted travel. Several areas of both North Dakota and South Dakota had liquid equivalent precipitation totals which were over 400 percent of normal. One location which set many records this month was Williston, North Dakota. Williston had its 3rd wettest December on record with 1.95 inches (50 mm) of liquid equivalent precipitation (period of record 1894-2010). The current record held with 2.50 inches (64 mm) recorded in 2008. It also recorded its snowiest December with 35.3 inches (90 cm) of snow (period of record 1962-2010). 14.3 inches (36 cm) of this total fell on December 10th and set the highest one-day total snowfall record for December. The old record of 11.4 inches (29 cm) was also set in 2008. Later in the month, on December 21st, a new December snow depth record of 23.0 inches (58 cm) was also set.



Above: Total precipitation (inches) (left) and Departure from Normal Precipitation (inches) (right) for December 2010 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>.

December 2010 Records - Highlights

Monthly Records			
Precipitation in inches, Temperature in degrees F			
Snowiest	New Record	Old Record	Period of Record
Waterford City, ND	28.5	28.1/2008	1912-2010
Williston, ND	35.3	32.0/2008	1894-2010
Sisseton, SD	36.0	28.3/2009	1900-2010
Summit 1 W, SD	31.3	26.0/2005	1956-2010
Wettest	New Record	Old Record	Period of Record
Dinosaur National Monument, CO	2.31	1.93/1966	1948-2010
Sisseton, SD	2.32	2.03/1968	1900-2010
Rawlins Muni AP, WY	2.10	1.34/1978	1951-2010
Warmest	New Record	Old Record	Period of Record
Cortez, CO	36.7	36.3/1980	1911-2010
Great Sand Dunes National Park, CO	31.0	30.9/1977	1950-2010

All Data are Preliminary and Subject to Change.

* indicates multiple records, latest year is listed

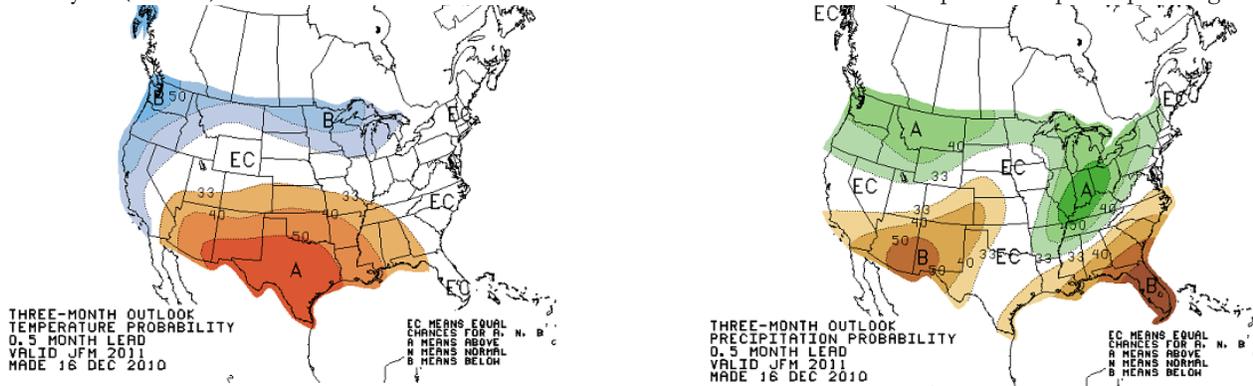
Source: National Weather Service Cooperative Observation Network Data

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.



Climate Outlook

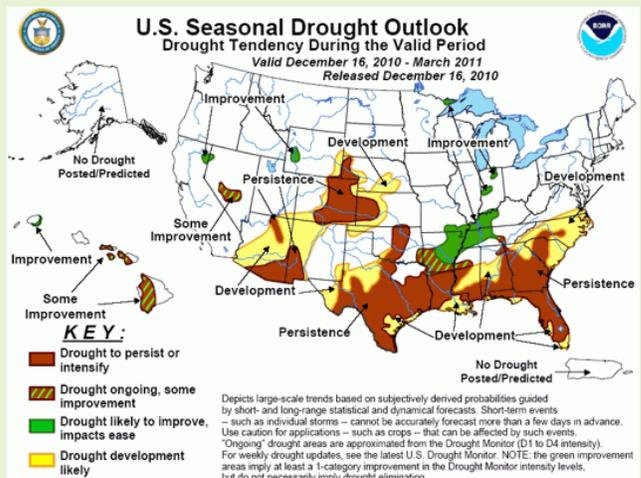
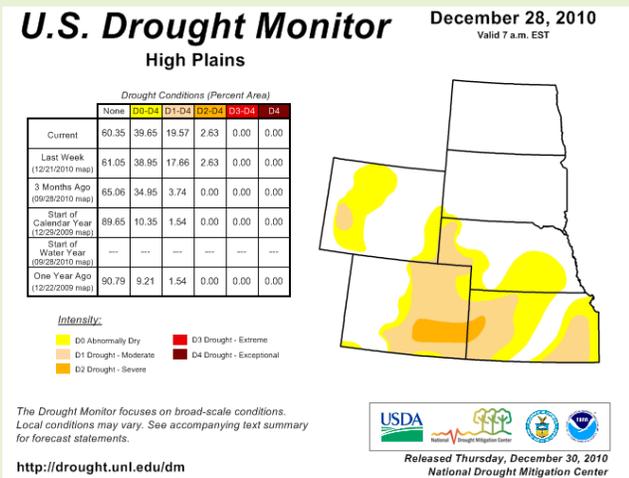
La Niña conditions were present across the equatorial Pacific this month and are expected to continue into spring 2011. The temperature outlook indicates a higher probability of above normal temperatures for Kansas, most of Colorado, and a very small portion of southwest Nebraska. North Dakota and northern South Dakota have a higher probability of below normal temperatures. Equal chances of above, near, or below normal temperatures are predicted elsewhere in the Region. The precipitation outlook indicates a higher probability of above normal precipitation for North Dakota, the majority of Wyoming and northwestern South Dakota. The majority of Colorado, western Kansas, and west-central Nebraska have a higher probability of below normal precipitation. Equal chances of above, near, or below normal precipitation are predicted elsewhere in the Region. The seasonal outlooks combine the effects of long-term trends, soil moisture, and when applicable, the El Niño Southern Oscillation cycle (ENSO). More information about these forecasts can be found here: <http://www.cpc.ncep.noaa.gov/>.



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, drought conditions deteriorated across the southern portions of the Region this month. By the second week of December drought abnormally dry conditions (D0) had expanded north from Oklahoma into eastern Kansas and severe drought conditions (D2) had expanded from eastern Colorado into western Kansas. In addition, D0 had spread further east in Nebraska. By the end of the month moderate drought conditions (D1) had developed in eastern Kansas as well. Only slight improvements were seen in extreme northwestern Colorado where the D0 area was eliminated and in western Wyoming where the D1 and D0 areas were trimmed due to heavy snowfall. According to the U.S. Seasonal Drought Outlook released December 16th drought conditions across Colorado, Kansas, and Nebraska were expected to persist and the D1 area in Wyoming was expected to improve.



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://www.ndmc.unl.edu/dm/monitor.html>
 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
Alamosa San Luis Airport	44.7	11.4	28.0	11.0	62	12/03	-2	12/18+	0.38	0.05	115
Akron Washington County Airport	45.8	20.2	33.0	4.3	66	12/03	-2	12/31	0.05	-0.35	12
Colorado Springs Municipal Airport	47.6	21.4	34.5	5.5	70	12/03	-8	12/31	0.07	-0.35	17
Grand Junction Walker Field Airport	45.2	26.1	35.6	7.4	54	12/22+	-9	12/31	0.64	0.12	123
Pueblo Memorial Airport	49.8	16.6	33.2	2.9	75	12/03	-10	12/31	0.44	0.05	113

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	39.6	19.0	29.3	-0.9	62	12/09	6	12/31	0.14	-0.72	16
Dodge City Regional Airport	46.2	21.4	33.8	0.7	66	12/20	4	12/31	0.42	-0.35	55
Goodland Renner Field	46.3	16.9	31.6	2.0	68	12/03	-2	12/31	0.15	-0.25	37
Topeka Municipal Airport	42.9	20.5	31.7	0.3	71	12/30	7	12/13	0.19	-1.23	13
Wichita Mid-Continent Airport	44.5	23.8	34.2	0.5	68	12/30	13	12/31	0.12	-1.23	9

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	42.6	16.0	29.3	4.2	63	12/28	-1	12/31	0.29	-0.13	69
Grand Island Airport	36.2	14.9	25.6	0.0	60	12/09	-1	12/31	0.24	-0.42	36
Lincoln Municipal Airport	35.6	14.4	25.0	-1.5	59	12/30	0	12/13+	0.24	-0.62	28
Omaha Eppley Airfield	33.2	16.1	24.6	-1.0	62	12/30	1	12/13+	0.54	-0.38	59
Norfolk Karl Stefan Airport	31.9	13.7	22.8	-0.9	55	12/09	-4	12/31	0.42	-0.23	65
North Platte Regional Airport	40.0	13.9	27.0	1.3	64	12/03	-2	12/31	0.44	0.04	110
Valentine Miller Field	36.3	9.9	23.1	-0.5	57	12/09	-10	12/12	0.86	0.53	261

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismark Municipal Airport	18.5	4.6	11.6	-3.6	39	12/27+	-17	12/11	1.40	0.96	318
Fargo International Airport	17.5	2.5	10.0	-2.5	36	12/09	-17	12/13+	1.75	1.18	307
Grand Forks International Airport	15.5	1.0	8.2	-3.0	35	12/09	-18	12/12	0.72	0.17	131
Theodore Roosevelt Airport	20.5	4.9	12.7	-5.5	38	12/09	-12	12/12	0.22	-0.12	65
Williston International Airport	18.0	0.5	9.3	-3.7	33	12/27+	-18	12/22	1.95	1.38	342

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>.

December 2010 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	20.8	5.1	13.0	-3.0	43	12/09	-10	12/19	1.77	1.39	466
Huron Regional Airport	24.7	8.1	16.4	-2.2	51	12/09	-8	12/12	1.38	0.99	354
Pierre Regional Airport	26.2	9.5	17.8	-4.1	51	12/09	-9	12/12	1.96	1.48	408
Rapid City Regional Airport	34.5	14.3	24.4	-0.3	54	12/29	0	12/31	0.61	0.20	149
Sioux Falls Joe Foss Field Airport	25.0	7.7	16.4	-1.9	48	12/09	-7	12/19	1.54	1.02	296

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	37.2	16.7	27.0	3.1	51	12/14	-19	12/17	1.36	0.74	219
Cheyenne Municipal Airport	41.2	19.9	30.5	3.5	57	12/26+	-6	12/31	0.35	-0.11	76
Lander Hunt Field Airport	37.4	15.5	26.4	5.1	56	12/13	-13	12/31	0.78	0.17	128
Laramie Regional Airport	34.1	14.6	24.3	3.0	52	12/14	-12	12/25	0.45	-0.01	98
Rawlins Municipal Airport	34.1	18.3	26.2	2.1	46	12/14+	-10	12/31	2.10	1.61	429
Sheridan County Airport	32.2	11.7	22.0	-0.4	52	12/08	-1	12/31+	0.20	-0.48	29

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State Spotlight - North Dakota

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



Precipitation:

The northwest, eastern, and central regions had above normal precipitation with many areas of greater than 200% in December. The central and southeast areas had greater than 300% of normal. The southwest corner of the state had below normal precipitation (Figure 1. High Plains Regional Climate Center). Precipitation totals ranged from about 0.15 inches in the southwest to 2.5 inches in the central region. In summary, December was wet and cold for most of the state with several wide spread storm systems. The National Weather Service (NWS) reporting breaking several liquid precipitation, snowfall, and at least one snow depth record in December. Williston had a record 35.3 inches of snow in December and a record snow depth set on the 21st of 23.0 inches. The first wide spread storm event was on the 3rd and 4th in which precipitation records were broken at Dickinson, Bismarck, Minot and Williston. The second wide spread system was on the 10th and 11th during which a record 14.3 inches of snow was recorded at Williston on the 11th. A light snow fell for most of the 13th. The 15th through the 17th had yet another wide spread storm system with only a few days before the next bout of snow fell on the 20th and 21st. The 24th again had light snow for most. The month closed with a final storm system on the 30th and 31st that brought high winds, freezing drizzle, and snow. White out conditions and snow drifts closed many roads and interstates in the east and southeastern parts of the state on the 31st.

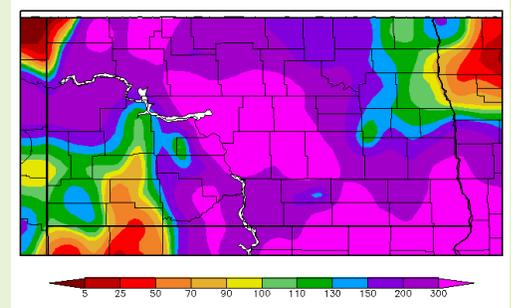


Figure 1. Percent of Normal Precipitation in December 2010 for North Dakota (High Plains Regional Climate Center)

Temperature:

The North Dakota Agricultural Weather Network (NDAWN) December average air temperatures ranged from 6°F to 15°F. NDAWN departure from normal temperatures ranged from 0°F to -5°F (Figure 2. North Dakota State Climate Office). Several days of cold arctic air brought the monthly average air temperatures down to below normal across the state. The 1st through the 19th had most days with below normal average air temperatures. The 11th through the 13th temperatures dipped farther to -10°F to -20°F below normal for most. From the 20th through the 30th temperatures rebounded to near normal with a few above normal days. More arctic air moved in on the last day of December bringing temperatures down again to -9°F to -17 °F below normal in the central and eastern region.

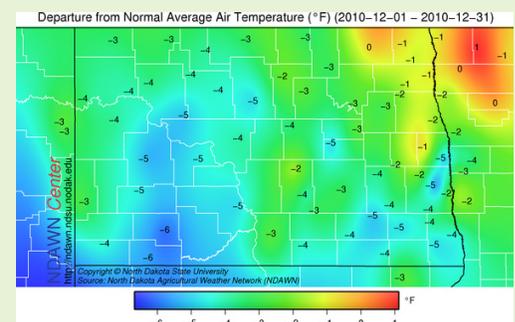


Figure 2. Temperature Departure from Normal in December 2010 for North Dakota (North Dakota State Climate Office)

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

Steve Gray - State Climatologist

Wyoming State Climate Office, University of Wyoming



December 2010 was marked by heavy snowfall in the southern half of the state, and slightly warmer-than-average (compared to 1971-2000) temperatures. According to the U.S. Drought Monitor, December snows led to the removal of “moderate” or greater drought designations from all but extreme southeast Wyoming (see <http://www.drought.unl.edu/dm/monitor.html>). As a result, the state is now enjoying the smallest area in drought it has seen since late 2009. Statewide average snowpack was around 115% of historical average (compared to 1971-2000) at the end of December versus 80% at this time in 2009 (<http://www.wrds.uwyo.edu/wrds/nrcs/nrcs.html>). Of particular note was the Upper Bear River basin in far southwest Wyoming having ~175% of historical average snowpack through the end of December.

In terms of precipitation, many National Weather Service COOP stations in the southern half of Wyoming reported > 150% of historical average precipitation for December, with at least nine stations receiving greater than 200%. While one must also remember that many of these same stations see less than 0.5” of precipitation in an average December, this still represents a major step in the right direction as we build soil moisture and runoff for the coming year. Much of this precipitation resulted from two strong storms in the latter half of the month. In the Sierra Madre, Medicine Bow, and Laramie Mountains of southeastern Wyoming, a storm lasting from 12/18 through roughly 12/23 was particularly notable. Over this period several high-elevation NRCS SNOTEL stations reported snowfall totals of > 50”, with two stations (Blackhall Mtn. and Brooklyn Lake) receiving more than 5 ft of snow. Another storm from December 29th through the 31st brought multiple reports of > 12” of snowfall to the northwestern quadrant of the state, while relatively large amounts of snow were also seen in the southeast. Numerous daily snowfall records were set during this storm. In total, December 2010 was the fourth wettest December on record for the combined Green and Bear River drainages in southwestern Wyoming.

It must also be noted that several areas in Wyoming missed out on these December storms. Locations in the northern Bighorn Basin reported below normal precipitation for the month, and parts of Weston, Converse and Niobrara Counties within the Cheyenne and Niobrara River drainages were also noticeably dry. Likewise, apart from the strong storms reported above, many locations saw little or no snow for the month. The city of Riverton in west-central Wyoming, for example, received 75% of its precipitation for the month on December 29. Though it is still early in the water year (October – September) and December is a historically dry month for many Wyoming localities, this recent dryness warrants close monitoring in coming months.

As for temperatures, December 2010 was generally warmer-than-average across the state. Parts of Fremont and Sweetwater Counties were particularly warm at 4-5° F above average (compared to 1971-2000) for the month. On December 13 and 14, strong west to southwesterly winds brought very warm temperatures to some parts of the state. Riverton and Rock Springs, for example, both set record highs over this period. Peak wind gusts for these days often exceeded 50 mph.

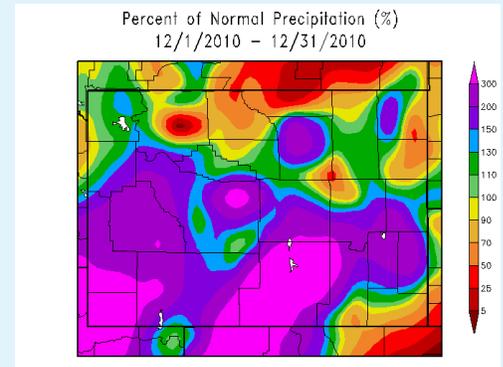


Figure 1. Map showing December 2010 precipitation as a percentage of historical averages (vs. 1971-2000 normal period) for Wyoming. Courtesy HPRCC.

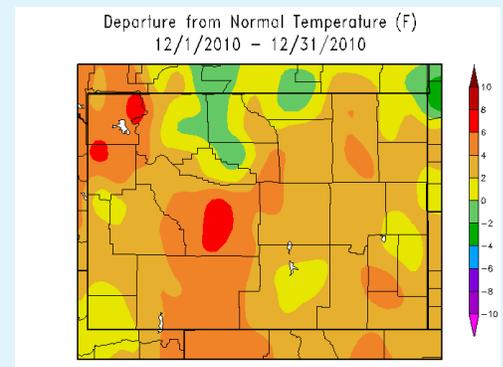


Figure 2. Map showing mean December 2010 temperatures from historical averages (vs. 1971-2000 normal period) for Wyoming. Courtesy HPRCC.

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

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