National Weather Service
Aberdeen, South Dakota

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Winter Weather Forecasting

Have you ever wondered how the National Weather Service can tell a major winter storm is brewing and will impact your area in the coming days or hours? How can meteorologists tell if a storm is intensifying and where it will bring the most snow? It's a highly sophisticated process. It all starts with observing the current situation. The National Weather Service operates a widespread network of observing systems. Geostationary satellites, Doppler radars, and automated surface observing systems that feed into the current state-of-the-art numerical computer models help to provide a glimpse of what will happen next - ranging from hours to days. The models are then analyzed by NWS meteorologists who use their experience and expertise to write and disseminate forecasts.

So why then is predicting the exact amount of snowfall so challenging? Although snow forecasts continue to improve, they remain a challenging task for meteorologists. Heavy snow often falls in small bands that are hard to discern on larger resolution computer models. In addition, extremely small temperature differences define the boundary line between rain, snow and/or freezing rain/drizzle.

The best bet is to just be prepared for winter weather. Winter weather too often catches people unprepared. Researchers say that 70 percent of the fatalities related to ice and snow occur in automobiles, and about 25 percent of all winter related fatalities are people that are caught off guard, out in the storm. One of the gravest dangers of winter weather is wind chill. The wind chill is based on the rate of heat loss from exposed skin by combined effects of wind and cold. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Animals are also affected by wind chill.

A Warm and Dry 2012

2012 was a dry and warm year across central and northeast South Dakota as well as west central Minnesota. In addition, NCDC (National Climatic Data Center) announced the warmest year on record for the contiguous United States for 2012. South Dakota was the warmest out of a 118 year period of record, and also the 13th driest. For South Dakota, average temperatures for the year were from 3 to 4 degrees above normal. The average highs were from 4 to 6 degrees above normal for the year. Pierre and Kennebec both topped at 111 degrees on August 29th while Mobridge and Timber Lake hit 106 degrees also on August 29th. None of the locations in the east hit 100 degrees with Sisseton coming close at 99 degrees on July 2nd. In fact, Aberdeen had its second warmest year on record with Watertown and Sisseton having their third warmest year on record. Mobridge had their fourth warmest year on record while Pierre had its sixth warmest year on record. Bitter cold temperatures also did not occur with yearly lows only falling in the teens below zero.

The other story outside of the warmth was the extreme dryness resulting in expanding and worsening of drought conditions across the region. Yearly precipitation amounts were from nearly 4 inches to almost 8 and a half inches below normal. Aberdeen had its tenth lowest yearly precipitation while Sisseton recorded its 17th lowest yearly precipitation. At the end of 2012, almost the entire area was covered with severe to exceptional drought conditions.

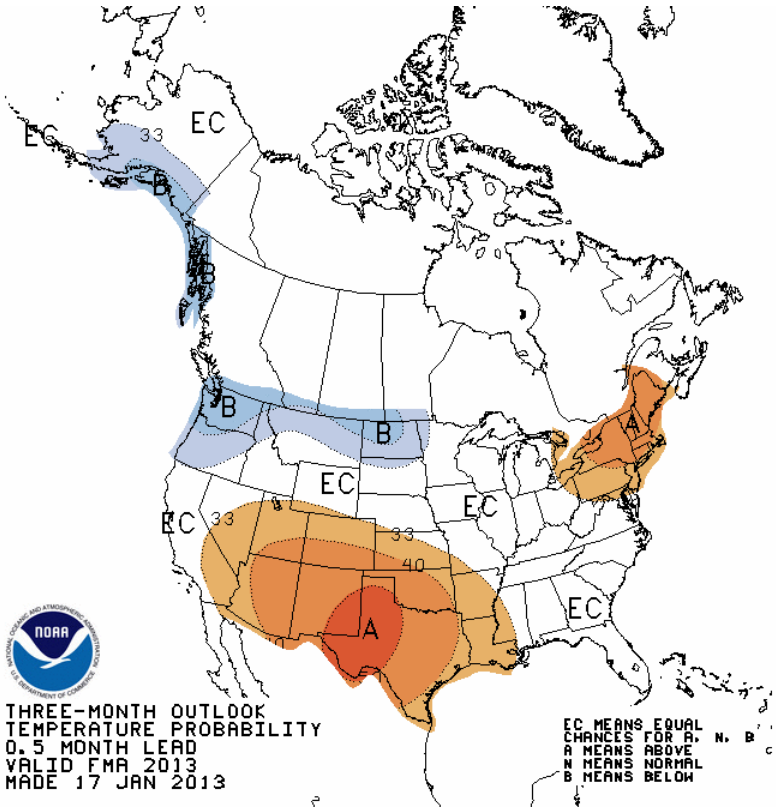
2012 CLIMATE

Temperature Data	**Aberdeen**	**Sisseton**	**Wheaton**	**Watertown**
Warmest Temperature/Date	98 / Jul 15th, Aug 29	99 / July 2nd	97 / Jul 3rd, 5th	98 / Aug 1st
Coldest Temperature/Date	-17 / Dec 10th	-15 / Jan 19th	-16 / Jan 19th, 20th	-14 / Jan 19th
Average Yearly High/Departure from Normal	59.8 / +5.2	58.4 / +3.9	57.0 / +4.1	58.0 / +4.4
Average Yearly Low/Departure from Normal	33.6 / +2.1	35.2 / +2.2	35.3 / +3.2	35.4 / +2.9
Yearly Average/Departure from Normal	46.7 / +3.7	46.8 / +3.1	46.1 / +3.6	46.7 / +3.7
Precipitation/Wind Data				
Yearly Precipitation / Departure from Normal	14.64 / -7.08	17.51 / -4.82	21.27 / -3.67	18.39 /-3.69
Highest Wind Gust MPH / Date	63 / Jun 17th	60 / Apr 15th	N/A	61 / Jun 19th
Temperature Data	**Pierre**	**Kennebec**	**Mobridge**	**Timber Lake**
Warmest Temperature/Date	111 / Aug 29th	111 /Aug 29th	106 / Aug 29th	106 / Aug 29th
Coldest Temperature/Date	-11 / Dec 10th	-13 / Jan 18th	-14 / Feb 11th	-13 / Feb 11th
Average Yearly High/Departure from Normal	63.7 / +4.5	66.8 / +5.7	60.8 / +4.0	61.6 / +4.3
Average Yearly Low/Departure from Normal	36.7 / +1.1	37.0 / +1.6	34.5 / +1.4	35.5 / +1.9
Yearly Average/Departure from Normal	50.2 / +2.8	51.9 / +3.7	47.7 / +2.8	48.5 / +3.0
Precipitation/Wind Data				
Yearly Precipitation / Departure from Normal	11.57 / -8.44	14.26 / -5.37	13.71 / -4.16	14.10 / -4.33
Highest Wind Gust MPH / Date	74 / Oct 18th	N/A	77 / Jun 7th	N/A

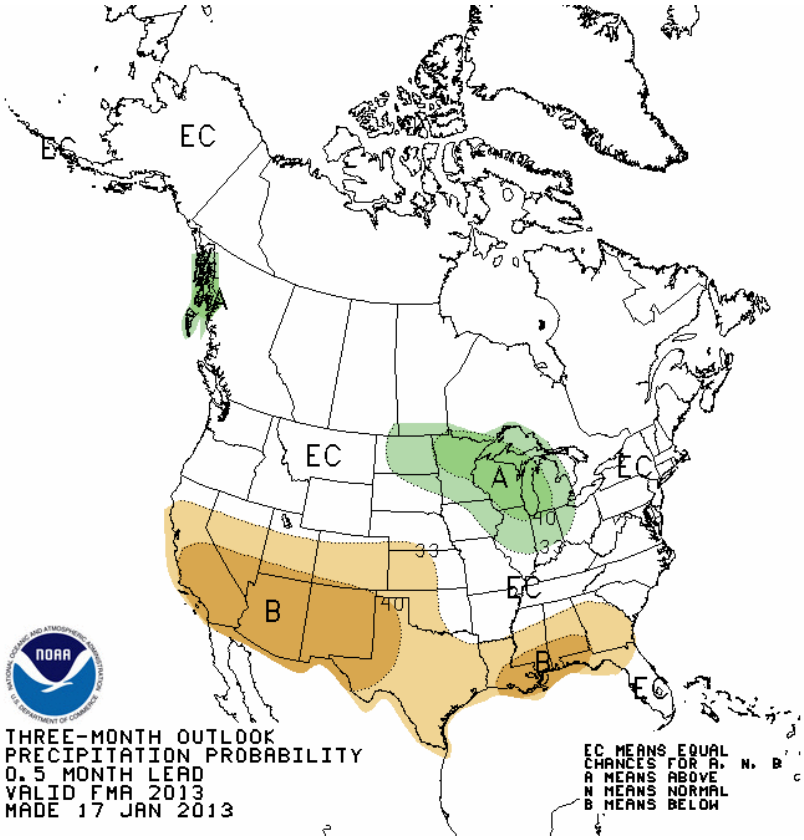
Snowfall Records

City	*1-day record totals/date*	*2-day record totals/date*	*3-day record totals/date*	*Seasonal record/ date*
Aberdeen	18”/ Mar 28, 1900	19”/ Mar 27-28, 1900	20.7”/Nov 23-25, 1993	109.8”/1936-37
Pierre	18”/Mar 27, 1975	20.1”/Mar 27-28, 1975	20.8”/Mar 26-28, 1975	82.0”/1951-52
Watertown	19.0”/Apr 25, 2008	20.0” Mar 23-24, 1937	20.0”/Mar 22-24, 1937	79.4”/2010-11
Mobridge	15.0”/Mar 4, 1966	23.9”/Mar 3-4, 1966	31.2”/Mar 2-4, 1966	83.3”/2010-11
Summit	22.0”/Jan 4, 1997	32.0”/Mar 3-4, 1985	33.0”/ Mar 2-4, 1985	103”/2010-11
Timber Lake	24.0”/Feb 28, 1951	30.0”/Mar 3-4, 1966	31.0”/Mar 2-4, 1966	92.9”/1949-50
Clear Lake	18.0”/Dec 22, 1968	25.0”/Mar 3-4, 1985	25.0”/Mar 2-4, 1985	109.2”/1968-69
Murdo	24.0”/Mar 14, 1913	24.0”/Mar14-15, 1913	24.0”/Mar 14-16, 1913	76.0”/1985-86

Seasonal Outlook



Temperature outlook for February through April



Precipitation outlook for February through April

Winter Hazard Headline Simplification Test

The National Weather Service (NWS) uses the terms Watch, Warning and Advisory (WWA) to describe how likely we believe a weather or flooding event is, how bad we think the associated impacts will be, and when the impacts will occur. Results from surveys, service assessments and feedback from some of our partners indicate many people may not fully understand what these terms mean or how to properly respond to stay safe and protect property.

In support of our Weather-Ready Nation initiative, the NWS wants to start a conversation on how we might simplify and clarify our products. For this demonstration, we are proposing an alternative way to express headlines within our hazard messages, with winter hazard messages as a focus NWS relies on the official WWA terms and their associated products to alert the public to a significant weather or water hazard. Forecasters issue a Watch when they believe there is the potential for a significant hazard to occur, but its occurrence, location, and/or timing is still uncertain. The term Advisory is used for imminent hazards that only merit caution, in other words, that are not implicitly dangerous, but could become dangerous if caution is not exercised. The term Warning is used when a dangerous hazard is imminent or already occurring.

This demonstration, which will run through March 31, 2013, will provide you with the opportunity to compare headline text from a shortened version of our official WWA messages for winter weather hazards with a proposed alternative. These alternative messages are being created at selected locations for demonstration purposes only. Also, the alternative messages will only be accessible via this Web page and via special links from the NWS Home Page and the Home Pages of participating NWS Weather Forecast Offices (WFOs). These messages are not being disseminated. All official NWS winter weather hazard messages will be disseminated as usual.

To access the webpage that allows you to see a side by side comparison of the official product versus the "translated" product, please go to: http://nws.weather.gov/haz_simp/messages.php?wfo=ABR. On that webpage you will also be able to leave feedback on the product comparison. You can learn more about this demonstration by visiting the following page: http://nws.weather.gov/haz_simp/.

Local Winter Storm Scale

Have you ever wondered how some of the winter storms you have experienced in your lifetime compare to the most extreme storms in South Dakota history? We have used a special ranking system called the Local Winter Storm Scale (LWSS) to try to do just that. Ranking winter storms is not an easy task, especially when it comes to very old events when modern equipment was not available to accurately measure wind speed, visibility, etc. Because of these data quality limitations, we restricted our analysis to the period 1950-2012. We also know that weather can be highly variable from one location to another. To account for this variability, we have evaluated the top five worst storms broken out between regions of the NWS Aberdeen forecast area: Mobridge, Pierre, Aberdeen and Watertown.

The LWSS uses five weather elements frequently found to describe the potential impact of winter storms and blizzards: sustained winds, wind gust, snowfall, ice, and visibility.

More information, including newspaper articles and photographs, will be available on our webpage www.weather.gov/aberdeen very soon!

Aberdeen Area

Rank	Start Date	End Date	LWSS	Category
1	3/2/1966	3/6/1966	5.76	Extreme
2	11/27/2005	11/27/2005	5.28	Extreme
3	11/22/1993	11/26/1993	4.97	Crippling
4	3/22/1975	3/24/1975	4.84	Crippling
5	1/3/1997	1/4/1997	4.8	Crippling

Watertown Area

Rank	Start Date	End Date	LWSS	Category
1	2/2/1960	2/2/1960	5.48	Extreme
2	3/23/1975	3/24/1975	5.06	Extreme
3	4/25/2008	4/25/2008	4.81	Crippling
4	3/2/1966	3/5/1966	4.74	Crippling
5	3/26/1975	3/28/1975	4.44	Crippling

Pierre Area

Rank	Start Date	End Date	LWSS	Category
1	3/26/1975	3/28/1975	5.43	Extreme
2	11/9/1998	11/10/1998	5.03	Extreme
3	12/23/2009	12/26/2009	4.86	Crippling
4	3/2/1966	3/5/1966	4.7	Crippling
5	1/3/1997	1/5/1997	4.63	Crippling

Mobridge Area

Rank	Start Date	End Date	LWSS	Category
1	3/2/1966	3/5/1966	7.01	Catastrophic
2	3/11/1977	3/12/1977	4.36	Crippling
3	3/26/1975	3/28/1975	4.33	Crippling
4	3/24/1975	3/26/1975	4.33	Crippling
5	3/19/1982	3/20/1982	4.31	Crippling

Why is the Flu Common in Winter? (Wall Street Journal)

Scientists have struggled to understand the correlation between cold weather and the flu. This winter has seen a particularly severe flu season for a number of reasons. A wintertime spike in flu cases isn't only because of the chill outside, says Linsey C. Marr, a professor of civil and environmental engineering at Virginia Tech. It's also because of the conditions inside.

The link between the flu virus and air humidity has long been studied, but the results were never definitive. Last year, Dr. Marr, along with some of her colleagues, sought to put the question to rest. They figured out the flu kept its virulent characteristics best in human mucus, which Dr. Marr took from the dripping nose of her 1-month-old baby. They spiked droplets of human mucus with live flu virus, and then exposed it to air with varying levels of moisture.

In the study, published in 2012 in the journal PLoS One, the researchers found the virus survived best at humidity below 50%, similar to the conditions found indoors in "a really heated building," says Dr. Marr. "The virus is happy if the mucus droplet completely evaporates and leaves it floating around" in the air. "It's also fine in humidities above 98%, which you find in the rainy season in the tropics," she says, where the conditions outside resemble the environment the virus finds in the body. "But in between, in a humidity of 50% to 98%, the virus doesn't survive very well."

The presence of influenza is quite rare in the spring, summer and fall, when people don't use indoor heating as much and the humidity tends to be in the comfortable 50%-to-70% range, says Dr. Marr. But in the winter, when air from outside is heated and becomes drier, the flu virus survives well. In other words, give a virus a dry room heated to 70-to-80 degrees Fahrenheit, and you've created the perfect conditions for it to thrive, she says.

As for why this winter's flu season seems especially bad, Dr. Marr believes it is because of the particular strain of the virus, H3N2, which causes "stronger" symptoms, as well as an early start to the season. "There are many, many factors that affect the transmission of influenza," she says. "Humidity and the survival of the virus in airborne droplets is just one piece of the puzzle."

The full article can be read at the following link: http://online.wsj.com/article/SB10001424127887324235104578241632319689490.html

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

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What good is the warmth of summer, without the cold of winter to give it sweetness.

~ John Steinbeck