



Nebraska Winter Weather Awareness Day

Thursday, November 5, 2020



Snow? Say It Ain't So!

It's already snowed and the growing season is over, so that means another winter is on the way for Nebraska. With more snow and cold to come, now is the perfect time to brush up on the hazards of winter and prepare for whatever Mother Nature has in store.

Outlook for the Winter

Often this time of year, the #1 question of many NWS meteorologists is "What kind of winter will we have?" Though not an easy answer by any means, there are long term signals which can give insight into the winter ahead. In this packet, you will find NOAA's official winter outlook and get some idea of how the winter may unfold. Keep in mind the winter outlook doesn't forecast individual storms, but the expected trend of temperature and precipitation throughout the entire winter season. Check it out on page 5.

Probabilistic Messaging

This winter, the NWS is expanding its use of "probabilistic" forecast messaging to convey certain elements of the winter forecast. We are all familiar with the phrase "a 20% chance of snow". But what about the phrase "a 70% chance of 2" or more of snow and a 35% chance of 6" or more of snow"? The use of probabilities to provide information about weather forecasts has been around for decades. The NWS will expand on that concept this winter with a testbed of ten offices around the Central Plains, including the Omaha/Valley and Sioux Falls, SD NWS offices. Find out more information about the concept of probabilistic messaging this winter on page 9.

Winter Storm Severity Index

Do you remember the Thanksgiving weekend storm of 1983? How about the Christmas Blizzard in 2009? Both were big storms and had big impacts on Nebraska. The NWS is using a combined scale of winter weather elements to help categorize the severity of winter storms before the hit. It's called the Winter Storm Severity Index (WSSI) and was actually introduced a few years ago. After testing and tweaking, the WSSI is now an official NWS product. You can learn more about the elements of the WSSI and how to apply it to winter storms on page 10.

Recap of Last Winter, Safety & More

Every year, we take a bit of time to look back at the previous winter season, which varied widely across the state. Some areas received almost double the amount of normal snow (northern Panhandle) and other areas less than 15" of snow (southeast corner). The good news is that no matter how much snow falls, we all can be prepared for the season. Now is a good time for a refresher on winter safety and preparedness. If we do our part as individuals, we can collectively work together to keep ourselves and communities safe this upcoming winter.

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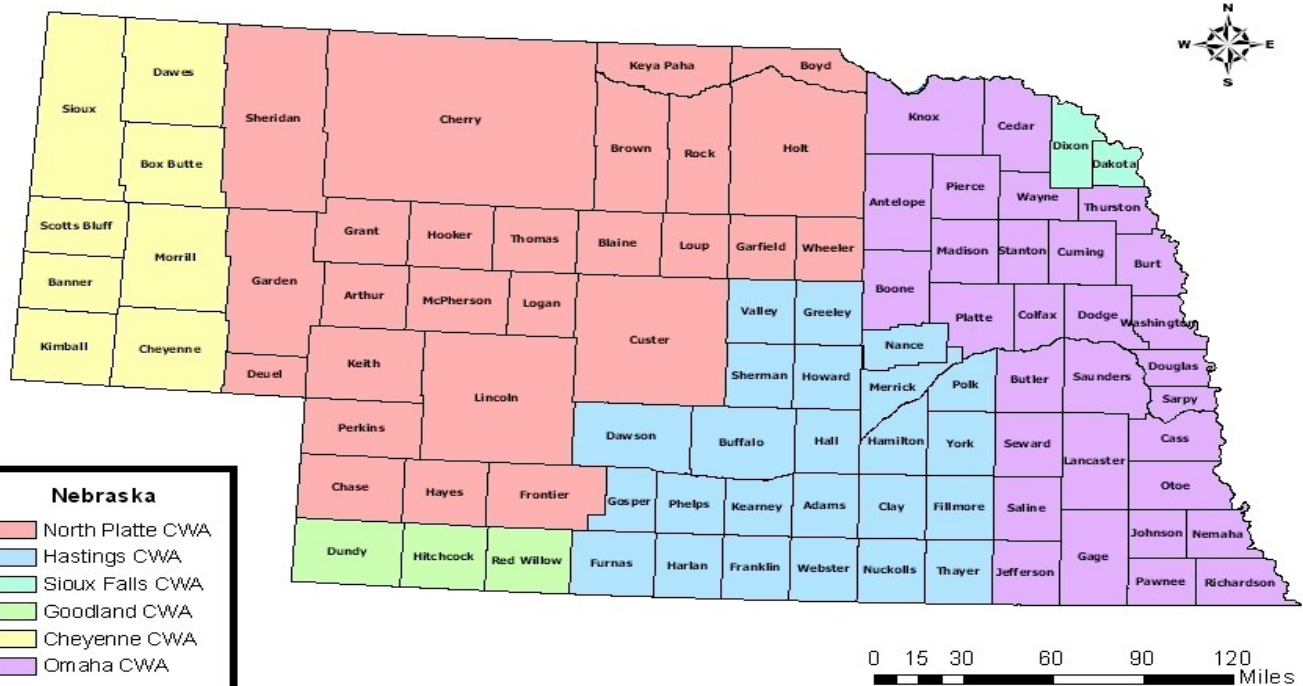


National Weather Service Offices Serving Nebraska

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National Weather Service Coverage Area



Panhandle

Cheyenne, WY

1301 Airport Parkway
Cheyenne, WY 82001

(307) 772-2468

www.weather.gov/cheyenne

West and North Central

North Platte

5250 E. Lee Bird Drive
North Platte, NE 69101

(308) 532-4936

www.weather.gov/northplatte

Extreme Southwest

Goodland, KS

920 Armory Road
Goodland, KS 67735

(785) 899-7119

www.weather.gov/goodland

South Central

Hastings

6365 N. Osborne Drive West
Hastings, NE 68901

(402) 462-4287

www.weather.gov/hastings

East

Omaha/Valley

6707 N. 288th Street
Valley, NE 68064

(402) 359-5205

www.weather.gov/omaha

Extreme Northeast

Sioux Falls, SD

26 Weather Lane
Sioux Falls, SD 57104

(605) 330-4247

www.weather.gov/siouxfalls



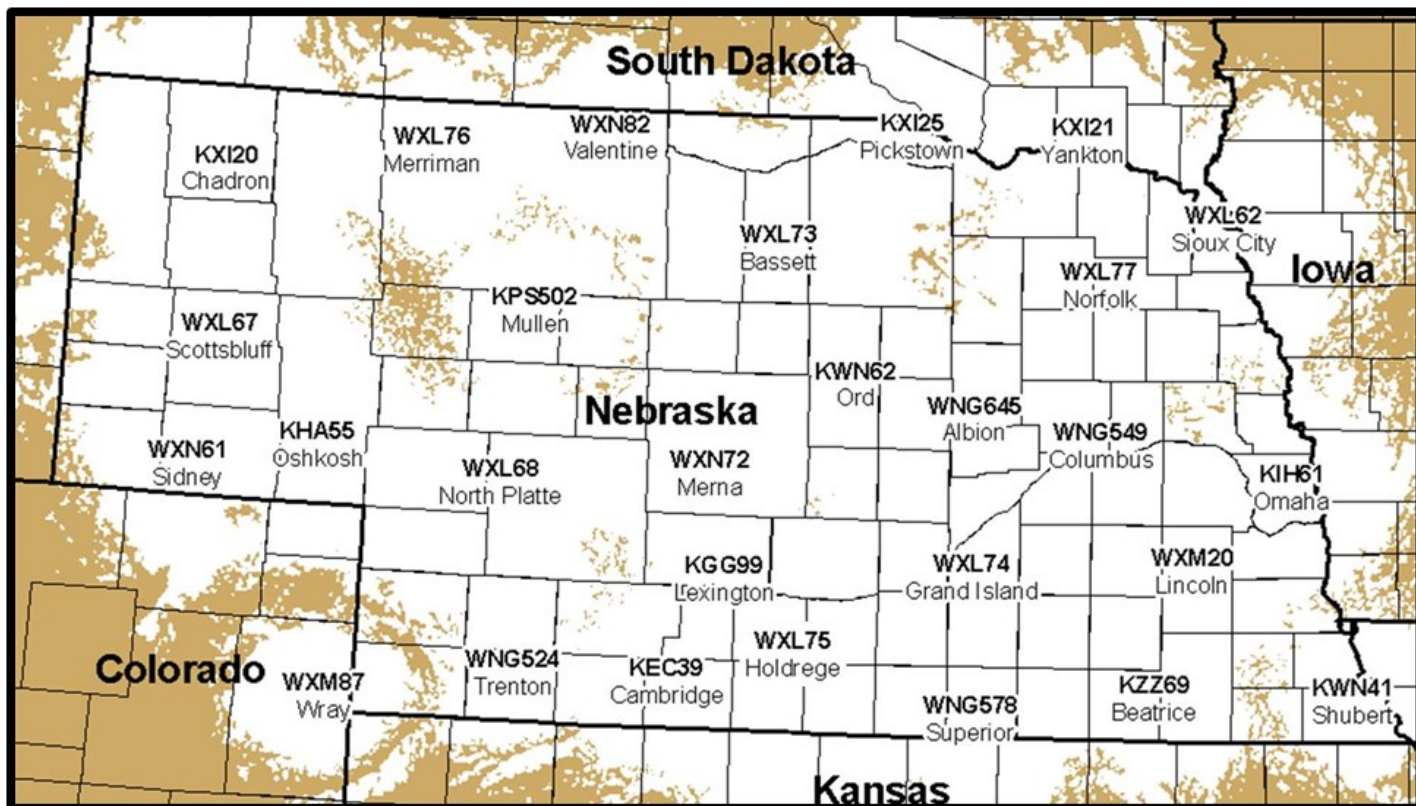
Building a Weather-Ready Nation



NOAA Weather Radio All-Hazards (NWR)



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NOAA Weather Radio All-Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service office. NWR broadcasts official NWS warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week.

Working with the Federal Communication Commission's (FCC) Emergency Alert System, NWR is an "All-Hazards" radio network, making it your single source for comprehensive weather and emergency information. In conjunction with Federal, State, and Local Emergency Managers and other public officials, NWR also broadcasts warning and post-event information for all types of hazards, including natural (such as tornadoes or floods), environmental (such as chemical releases or oil spills), and public safety (such as AMBER alerts or 911 Telephone outages).

Known as the "Voice of NOAA's National Weather Service," NWR is provided as a public service by the National Oceanic and Atmospheric Administration (NOAA). NWR includes 1000 transmitters, covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. NWR requires a special radio receiver or scanner capable of picking up the signal. Broadcasts are found in the VHF public service band at these seven frequencies (MHz):

162.400	162.425	162.450	162.475	162.500	162.525	162.550
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Coverage information and SAME Codes for every county in the U.S. can be found at:

www.weather.gov/nwr/Maps



National Weather Service Social Media



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Have you found us on your favorite social media platform?

Do you have a Facebook page or a Twitter account?

Did you know that your local National Weather Service office is on social media? Each office in the NWS has a Facebook and Twitter account. Find your local NWS office and check it out!

Each office's Facebook and Twitter account keeps you informed and up-to-date with the latest forecasts, watches and warnings for your local area. Be a part of the process, we always need ground truth reports and we love to see your pictures. Comment on our Facebook posts, or send us a tweet, with your information, report or question and we will respond to it as quick as we can.

Follow your local office...



NWS Cheyenne, WY

@NWSCheyenne

NWS Cheyenne

NWS Goodland, KS

@NWSGoodland

NWS Goodland

NWS North Platte, NE

@NWSNorthPlatte

NWS North Platte

NWS Hastings, NE

@NWSHastings

NWS Hastings

NWS Sioux Falls, SD

@NWSSiouxFalls

NWS Sioux Falls

NWS Omaha, NE

@NWSOmaha

NWS Omaha

Social media information about other NWS offices can be found at:
www.weather.gov/socialmedia



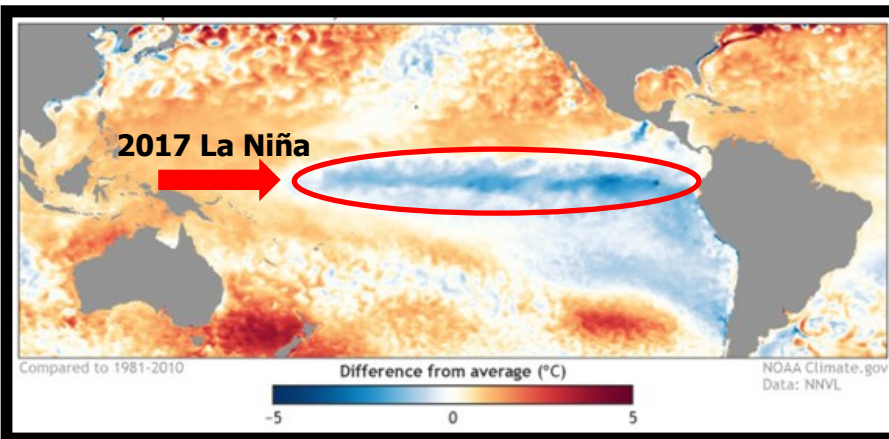
2020-2021 Winter Outlook



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If you haven't heard a lot about La Niña yet, get prepared. In early September, a La Niña advisory was declared as La Niña conditions were present in the tropical Pacific and expected to persist through the winter 2020 months.

So what exactly makes a La Niña anyhow?



A La Niña requires a few things. First off, it requires below normal temperatures (equal to or less than -0.5°C) in the tropical Pacific.

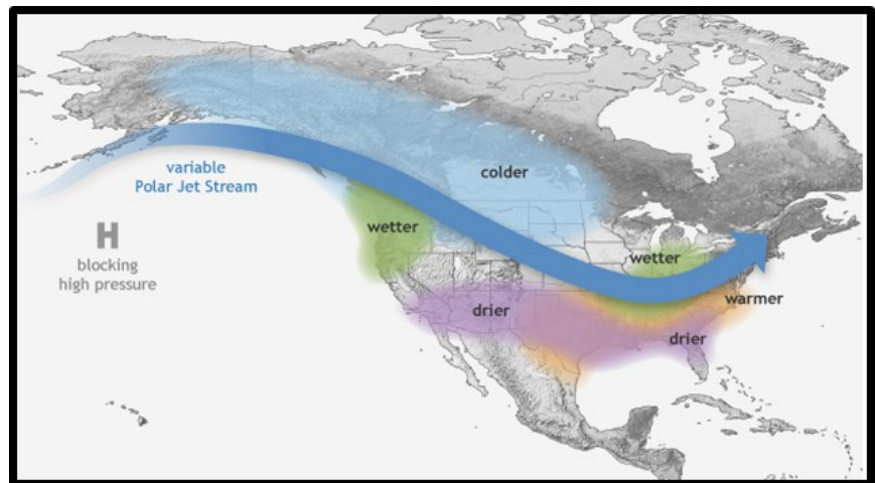
It also requires the confidence that these below normal temperatures are expected to persist for several months.

Finally, it requires the atmosphere to respond to these cooler than average temperatures.

But what impact does this have on the weather?

Nationally, a shift in the polar jet can result in significant impacts on winter weather. Cooler than normal temperatures often invade the northern Plains, wet conditions are often observed across the Pacific Northwest, and drier and warmer than normal conditions are favored across much of the south.

The image to the right shows a typical La Niña pattern.



But what does that mean for Nebraska?

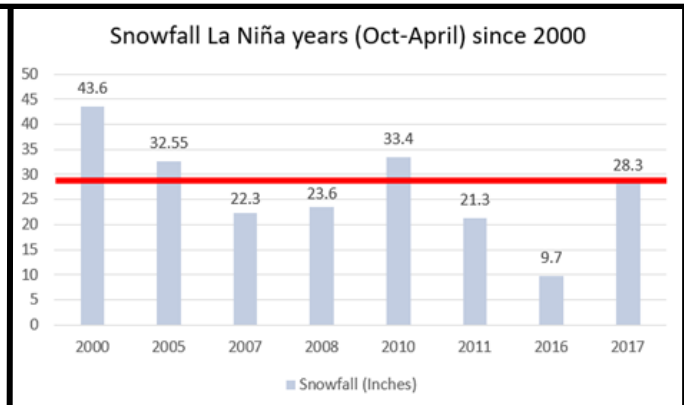
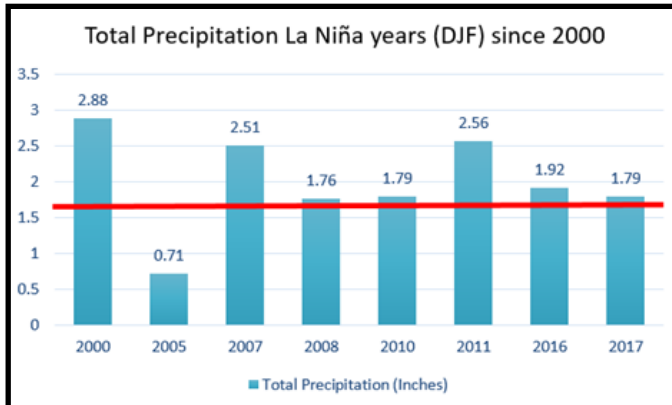
While there are significant impacts from La Niña across parts of the United States, impacts across Nebraska are mixed. The table below shows the total precipitation for the months of December through February (DJF are the months that ENSO events typically have their largest impacts) and seasonal snowfall (October through April) for the Grand Island and Hastings sites averaged together (for all the La Niña events since the year 2000). While the data is limited, for the most recent La Niña events, DJF precipitation has varied fairly close to slightly above normal. Seasonal snowfall, however, has been more variable and leaned near to below normal during the most recent La Niña winters (although variability is large).



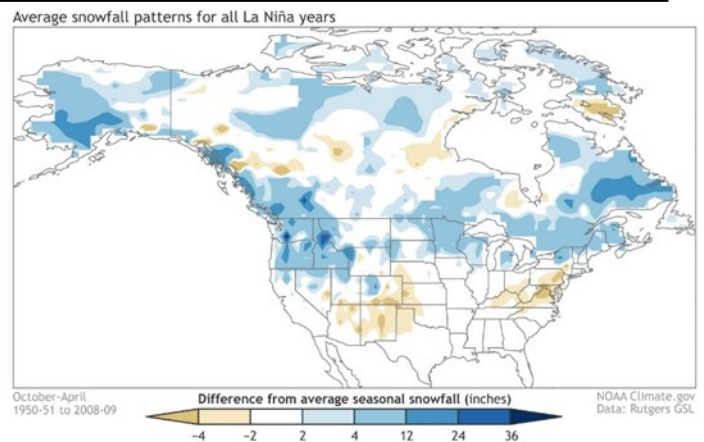
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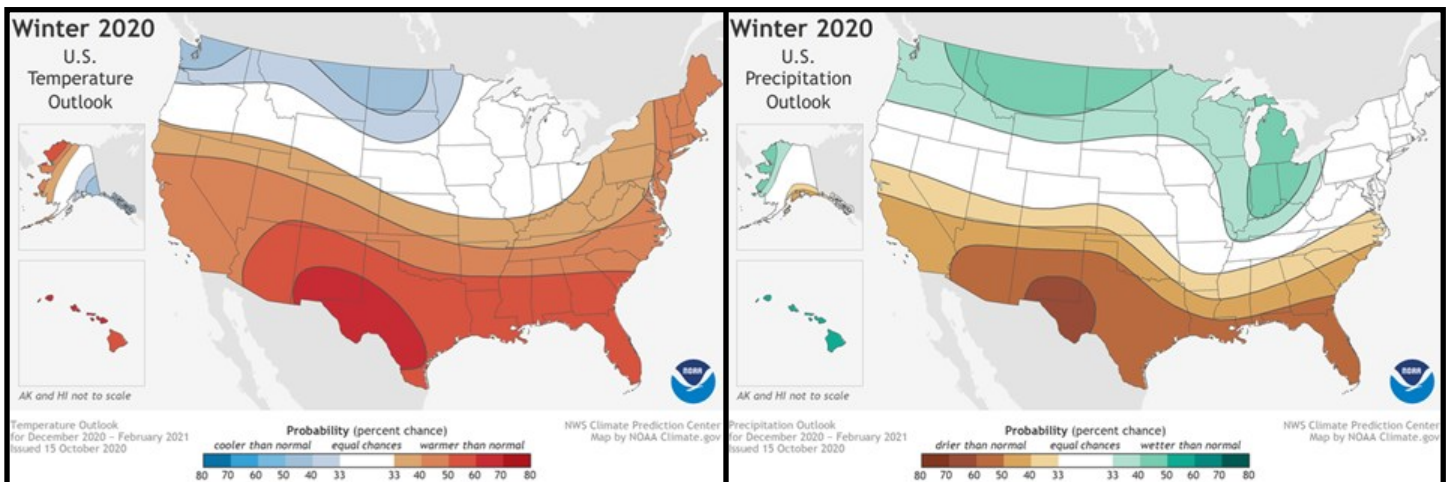


The above analysis from Grand Island/Hastings is consistent with national maps (right), which also show a slight tendency for less than normal snowfall during La Niña winter across much of Nebraska.



So where does this leave us?

The winter outlook from NOAA was issued on October 15, 2020. This maps below represent the current forecast for both temperature and precipitation this winter. This forecast has been heavily influenced by the current La Niña, which is expected to strengthen through the winter months. Locally, this means there are equal chance for below, near or above normal temperatures and precipitation this winter.



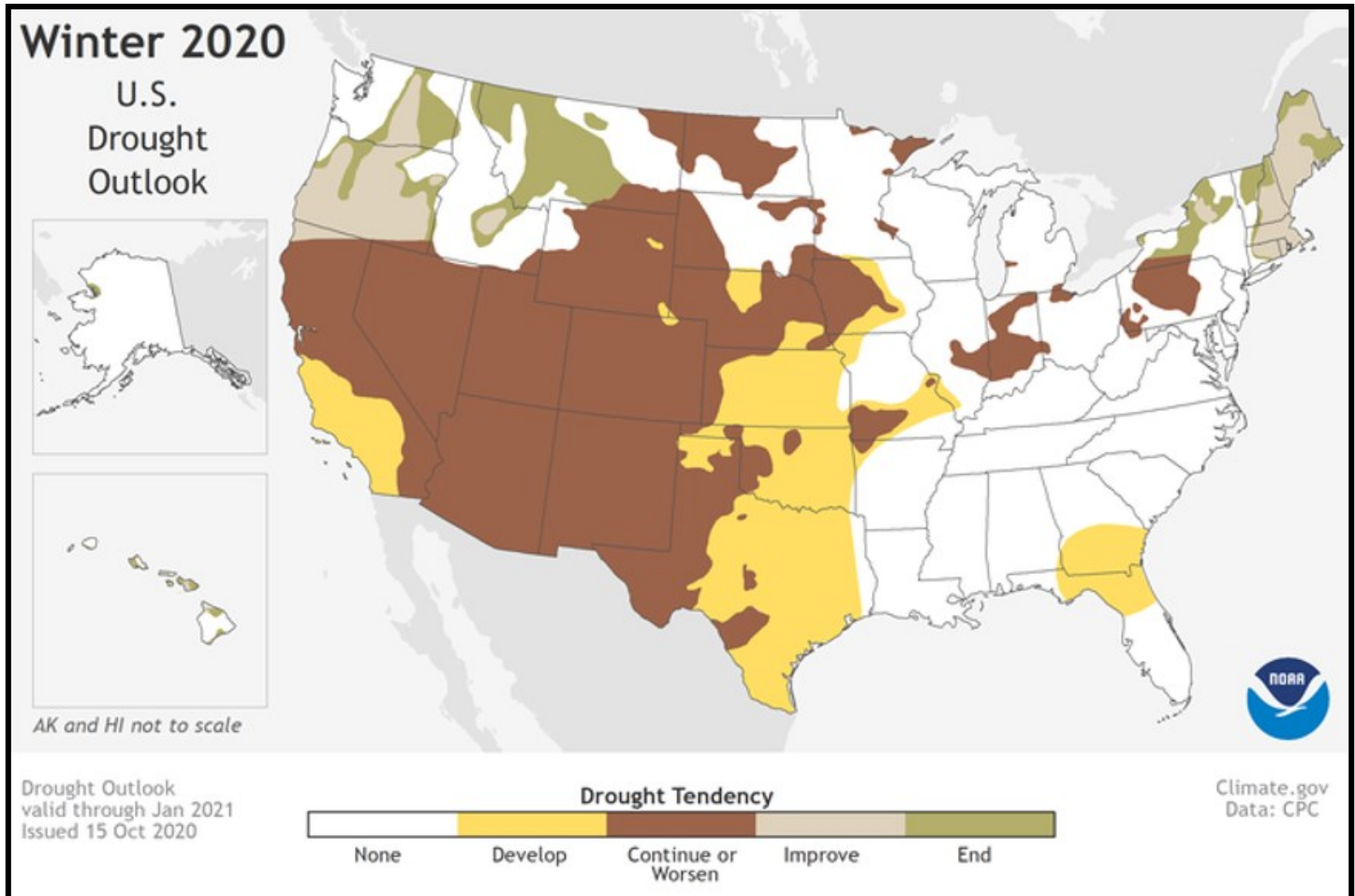


2020-2021 Winter Outlook



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Despite this forecast of equal chances for below, near or above normal temperatures and precipitation, remember that Nebraska receives only about 1/10th of its annual precipitation during the winter (DJF) months. Thus, even an unusually wet winter, which would be beneficial, would not likely be a drought buster for the state. Not surprisingly, drought is expect to continue or worsen across the entire state of Nebraska this winter.



While conditions may not improve significantly this winter, if La Niña does end up continuing into the spring, studies have shown that this could lead to a more active severe weather season across much of Nebraska. So enjoy this winter with typical fluctuating Nebraska weather, as spring may be a bit more active than previous years across the local area.



New National Weather Service Radar Page



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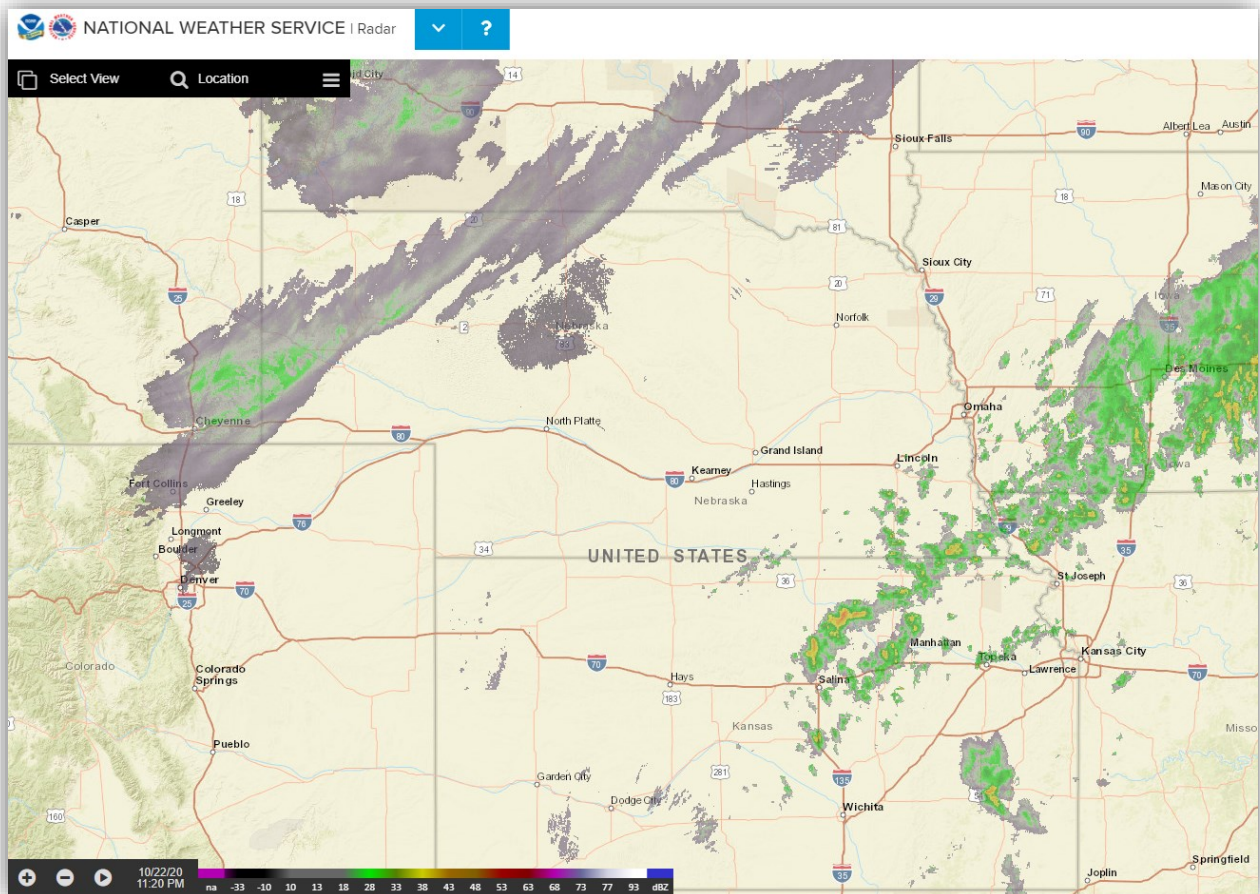
In December, the National Weather Service (NWS) will introduce a new look to the radar images currently displayed on NWS websites. This will be the first major change to the radar displays on NWS websites in over 20 years.

There are several enhancements to the radar display, including:

- Zoomable to individual radar sites anywhere in the country
- Regional and national mosaic radar images
- Watch, Warning and Advisory image overlays
- Access to multiple individual radar products, including velocity and dual-pol data
- Links to location specific 7-day forecast
- Variety of base layer backgrounds to choose
- Savable bookmark location for quick, easy access
- Downloaded KML file of radar images

The preliminary implementation date for the new website radar images is this December, though it's possible the official implementation date could change. In the meantime, you can check out how the new radar display looks at preview-weather.radar.gov.

Feel free to dig around on the site and see how it works!





Probabilistic Messaging



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There are a lot of sources and different methods to communicate weather information in today's world. The NWS uses a myriad of tools and methods for building effective winter storm graphics, messages, and briefings. This winter, the NWS Omaha/Valley and Sioux Falls, SD offices will be showcasing some new ways to communicate the forecast by participating in an NWS test with nine other offices in the region. You will still see some of your favorite winter graphics for snow, wind and cold, but also see some flashy new graphics to describe impending winter weather. Additionally, these offices will gather feedback over the course of the winter season about the effectiveness of these messaging methods with specific local, state and federal partners.

For the general public, we may be reaching out for formal feedback from time-to-time, but your informal feedback is always welcome. Thank you in advance for your feedback and assistance as we work persistently to improve our services!

The image below is an example of a snow amount probability graphic. The graphic conveys the likelihood of 2" or 4" of snow accumulation with a numerical probability (%). It is NOT the chance for snow, but a probabilistic prediction of how much snow will fall.

In this image, at Sioux Falls, SD, there is a high probability of 2" of snow (73%) but a low probability of 4" of snow (only 36%). In other words, there is a high likelihood that a light snow accumulation will occur (at least 2") but a much lower likelihood of heavier amounts (at least 4"). Armed with information like this, and when used in the context of other storm forecast information (timing, wind, etc.), the user can plan accordingly knowing snow accumulation is likely, but heavy snow amounts are not.





What Is The Winter Storm Severity Index?

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The Winter Storm Severity Index (WSSI) is a spatial assessment of the societal impacts of winter storms. It highlights regions and localities with the forecasted potential of damaging and life-threatening effects brought on by winter weather. This includes, but is not limited to tree damage, school closures, transportation issues like flight cancellations, traffic accidents, and road closures. These winter storms can create a direct risk to life and property and cause millions of dollars in damages.

The WSSI product allows forecasters, emergency management, and the general public to make informed and tactical decisions about the potential for significant weather related impacts. Using the winter storm severity index, experts are able to effectively assist in preparing the public for upcoming winter hazards.

Considerable time and discussion was put into the verbiage of the potential impacts scale (right). This is due to the importance of communication in meteorology. Meteorologists may produce an accurate forecast, but the public will not take appropriate action unless there is successful communication between both parties. Visuals are just as important as verbal communication when conveying hazards, which is where the WSSI product becomes an effective tool for weather personnel.

Potential Winter Storm Impacts	
	No Impacts Impacts not expected.
	Limited Impacts Rarely a direct threat to life and property. Typically results in little inconveniences.
	Minor Impacts Rarely a direct threat to life and property. Typically results in an inconvenience to daily life.
	Moderate Impacts Often threatening to life and property, some damage unavoidable. Typically results in disruptions to daily life.
	Major Impacts Extensive property damage likely, life saving actions needed. Will likely result in major disruptions to daily life.
	Extreme Impacts Extensive and widespread severe property damage, life saving actions will be needed. Results in extreme disruptions to daily life.

The WSSI and its Components...

The WSSI is comprised of six individual, but equally weighted components of winter storms. The summary graphic (Overall WSSI) is the maximum forecasted impact from any of the six impact components. The six components are:

- Blowing Snow
- Flash Freeze
- Ground Blizzard
- Ice Accumulation
- Snow Amount
- Snow Load

The goal of the product is to summarize multiple winter weather impacts from a storm into an easily consumable graphic. The WSSI creates a 72 hour summary graphic with 24 hour breakout graphics. The data comes from the NWS National Digital Forecast Database (NDFD) and is updated every 2 hours.



What Is The Winter Storm Severity Index?

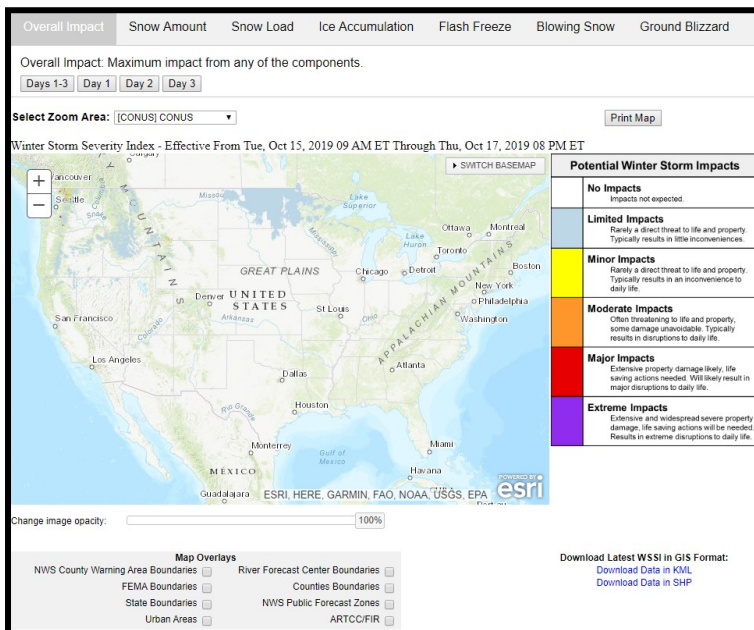
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What The Winter Storm Severity/Impact Index Is NOT...

- It is not a specific forecast for specific impacts. For example, a depiction of “moderate” severity does not mean schools will have to close.
- It is not meant to be the sole source of information about a Winter Storm. It should always be used in context with other NWS forecast and warning information.
- The WSSI does not account for conditions that have occurred prior to the creation time. It only uses forecast information. Therefore during an ongoing winter weather situation, the WSSI will not be representative of the entire event.

Learn more about this product at www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php

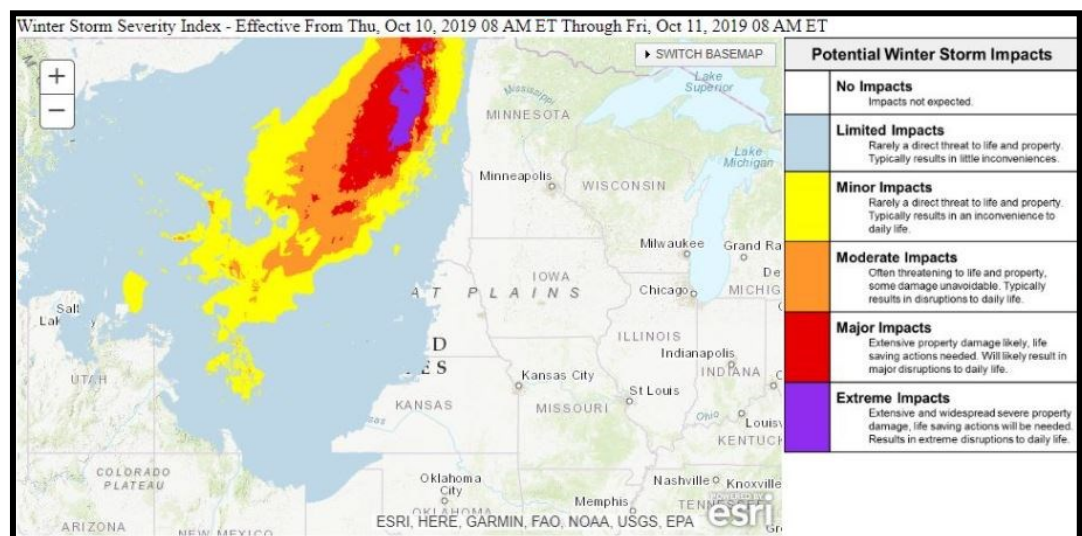


This is a view of the WSSI home page.

This is an example of the WSSI output when winter weather is forecast.

You can zoom in/out as needed.

This example is from the blizzard that affected the Dakotas around October 10th.





Pathfinder: Improving Winter Road Messaging For The Public

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NEBRASKA

Good Life. Great Journey.

DEPARTMENT OF TRANSPORTATION

weather forecasts and road conditions into consistent transportation impact messages for the public.

The Nebraska Department of Transportation (NDOT) and the National Weather Service (NWS) offices serving Nebraska will continue the program called "Pathfinder" this winter across the entire state. This program is sponsored by the Federal Highway Administration (FHWA), and is a collaborative strategy to proactively manage the transportation system ahead of and during adverse weather events, and translate

Pathfinder is a unique public-private partnership. It brings to the collaborative table private sector meteorological services, in this case the Iteris Corporation, to team with the NWS and NDOT to provide a consistent message to the traveler. Born out of the 2002 Winter Olympics in Salt Lake City, Pathfinder combines the resources of the NWS with Iteris road-weather forecasts to provide NDOT with information about road-weather impacts across Nebraska. NDOT will continue to lead a collaborative effort with the NWS to create a "shared impact message" for the public. This message will be focused on how the weather will impact road conditions, be consistent among each entity, and shared across the various dissemination platforms of all parties involved.



Pathfinder is a state-wide project, involving all eight NDOT districts and all six NWS offices serving Nebraska. While its initial focus is on winter weather, Pathfinder will be able to address all types of weather impacts across the state, including high-end wind events and dust.



In the end, Pathfinder is geared toward two specific outcomes:

- 1) providing the traveling public consistent road-weather messaging for safer, smoother travel
- 2) continuing to foster relationships among the various public and private sector entities involved in informing the traveling public.

For more information about the Pathfinder project in Nebraska, contact either of the following:

Jesse Schulz
NDOT Meteorologist
402-479-4609

Mike Moritz
Warning Coordination Meteorologist
NWS Hastings
402-462-2127 ext. 726

Pathfinder Website (link to videos, fact sheets and case studies): <https://go.usa.gov/xPDQZ>



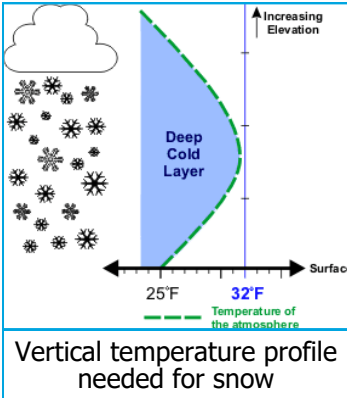


Determining Winter Precipitation Types



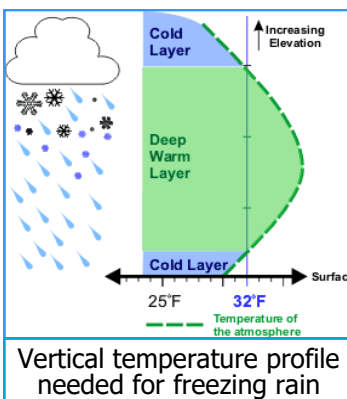
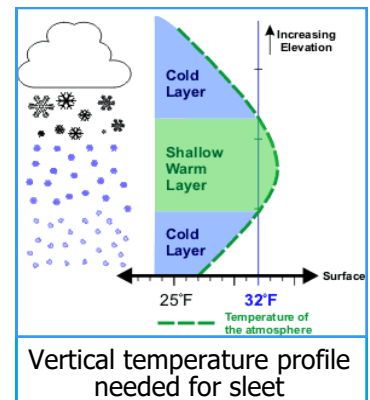
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One of the difficult tasks for a forecaster is trying to figure out what type of precipitation is going to occur in the winter. An important piece of the puzzle involves determining the temperature throughout the troposphere (basically the lower 7-8 miles of the atmosphere) where the temperature usually decreases with height. However, there are times when the temperature actually increases with height in the lower troposphere and this can cause problems for the forecaster.



Snow/Rain Process: How does the temperature affect the precipitation type? Ice crystals form at heights where the temperature is several degrees below freezing. As they fall, the crystals grow by several times, eventually forming snowflakes. If the entire column of the atmosphere remains below freezing all the way to the ground, we get **snow**. However, what happens if the snowflakes encounter a warm layer in the atmosphere that is above freezing? If the layer is warm and/or deep enough, the snowflakes melt and we get **rain**.

Sleet Process: If the warm layer is not quite as warm or as deep (let's say a degree or two above freezing for 500 feet) the snowflakes will partially melt, and then refreeze as they encounter a cold layer closer to the ground. By the time they hit the ground, they look like tiny frozen ice balls known as sleet.



Freezing Rain Process: This process is similar to sleet formation except that the warm layer completely melts the snowflakes into raindrops. But before reaching the ground, the rain falls through another cold layer. If the temperature in this layer and at the ground is several degrees below freezing, the rain drops will instantaneously freeze wherever they land (on trees, sidewalks, roads, power lines, etc.), causing a potential hazardous situation known as freezing rain.

Forecasters use information from radiosondes (weather balloons) to determine the temperature profile of the atmosphere. Due to cost factors, radiosondes are normally only launched twice per day at NWS sites across the country. In Nebraska, they are launched from the North Platte and Omaha offices. Due to the sparse coverage in both space and time, one can see why it might be tough to determine whether we will get snow in Chadron, while those in York may see a mixture of sleet, rain, and freezing rain.



Challenges Of Forecasting Snowfall Amounts



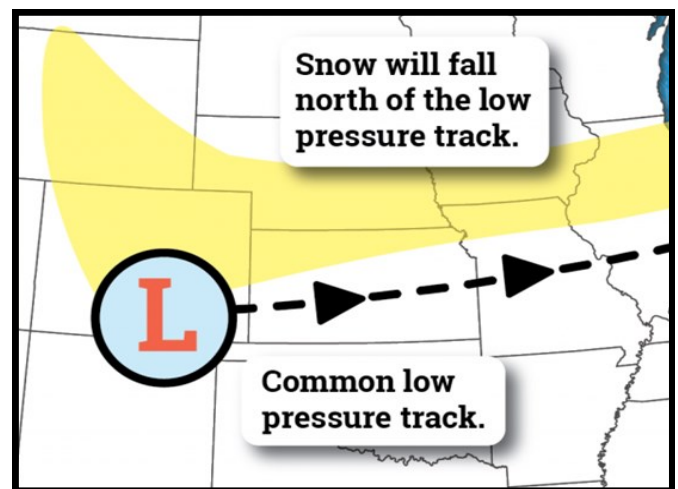
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Forecasting the amount of snowfall is challenging for meteorologists. Most people do not understand why forecasts for heavy amounts of snow can become a bust, or when little is expected you get dumped on. There are several factors involved in forecasting snow amounts. Let's take a look at some of them.

Surface Temperature - A ground temperature above freezing can cause much of the snow to melt upon impact. However, if it is snowing very hard, the snow could still accumulate and may get deep in some cases.

Precipitation Type - The temperature and moisture profiles in the lowest 10,000 feet of the atmosphere are critical in determining what type of precipitation you will have. The temperature at the surface does not necessarily indicate what sort of precipitation one will have. Refer back to the previous page for more detailed information about determining various precipitation types.

Storm Track - Another important consideration in forecasting snow amounts where the storm (low pressure) track is. The heaviest snow band typically occurs north-northwest of the surface low pressure track (see image to right). A shift north or south of the low can result in a shift of this band as well. Forecasters use their best judgement based on guidance from various computer models to determine the location of the heaviest band of snow.



Snow to Liquid Ratio - Many people use the rule of thumb that 1" of liquid water equals 10" of snow. This is not always the case, especially in the Plains states. Snow in this area is more typically 14 to 1 (or 14" of snow for every 1" of liquid water), but can vary quite a bit depending on the moisture content of the atmosphere. Very wet snows may have less than a 10 to 1 ratio and dry snows can have a 20 to 1 ratio! This can be an important factor in determining snowfall amounts.

Thunder Snow - There are times when a low pressure system moves across the area will have enough moisture and instability aloft to create thunder snow. In these cases, snowfall rates can increase tremendously and pile up 2 to 3" of snow per hour.

All of these factors are taken into consideration when forecasting snow amounts. Any changes to the factors listed, as well as some others not mentioned, can lead to a change in the amount of snowfall that was originally forecasted. It is important for everyone to pay close attention to updates to the forecast during a winter storm event to see if there are changes.

The latest forecast, no matter the season, can always be found at www.weather.gov



Winter Weather Dangers



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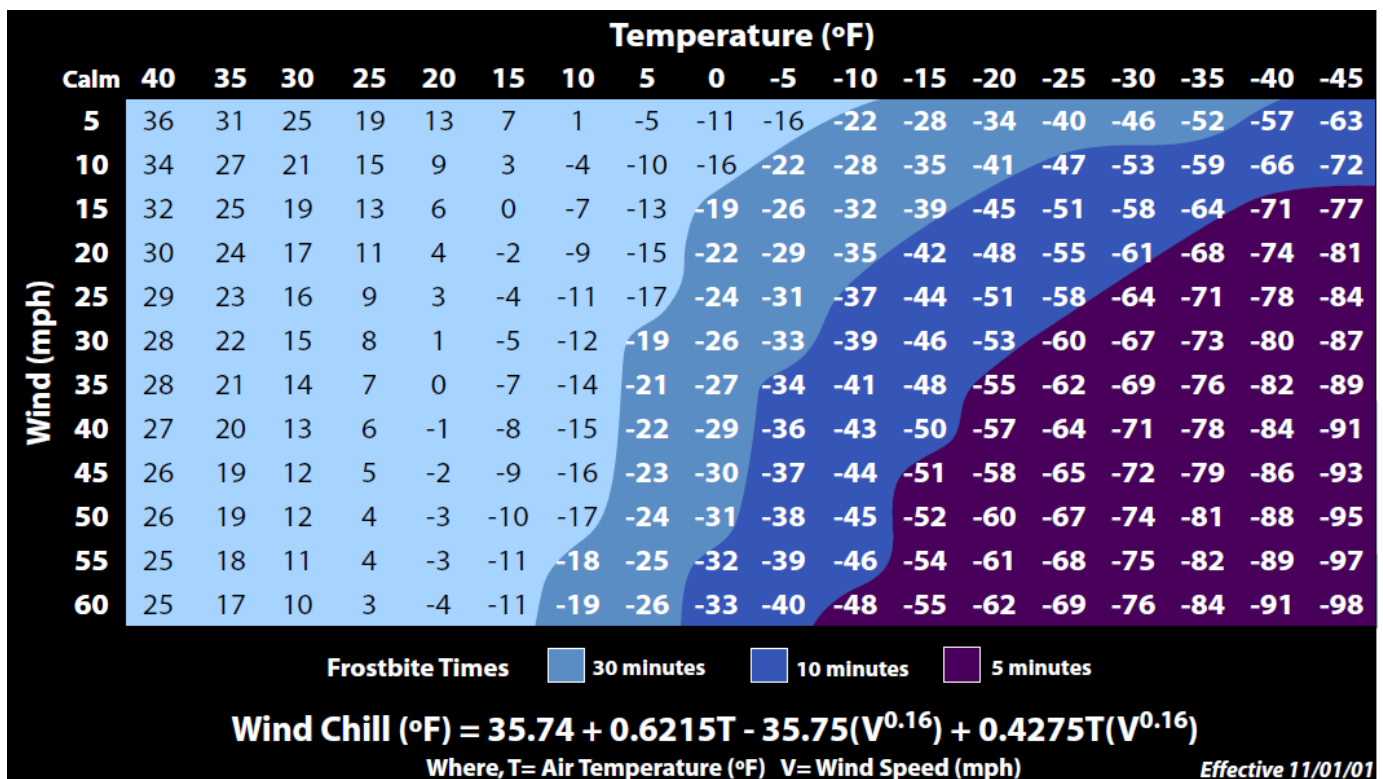
Exposure to cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. What constitutes extreme cold varies in different parts of the country. In the south, near freezing temperatures are considered extreme cold. Further north, extreme cold means temperatures well below zero. Freezing temperatures can cause severe damage to citrus fruit crops and other vegetation. Pipes may freeze and burst in homes that are poorly insulated or without heat.

Wind Chill

- Is not the actual temperature, but how the combination of wind and cold feels on exposed skin.
- It is based on the rate of heat loss from exposed skin. As the wind speed increases, heat is carried away from the body at an accelerated rate, driving down the body temperature.
- Wind chill will also impact animals!
- The only impact on inanimate objects (cars or pipes) will be to shorten the time it takes for that object to cool, they cannot cool below the actual air temperature.

More information about the Wind Chill Index can be found at :

www.weather.gov/safety/cold-wind-chill-chart





Winter Weather Dangers



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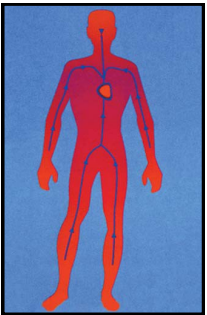
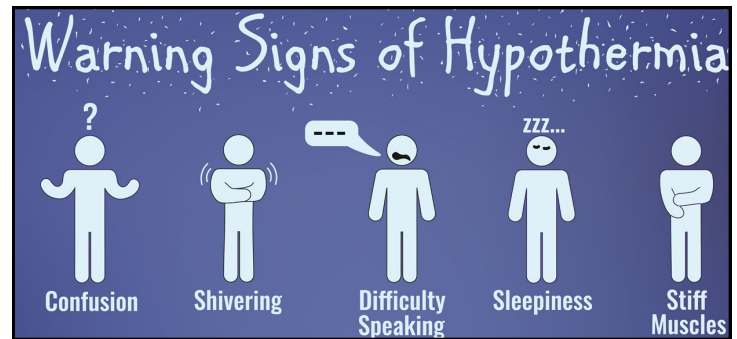


Frostbite

- Damage to body tissue caused by extreme cold.
- Can cause a loss of feeling and a pale appearance in the extremities. Your body cuts circulation to the extremities to protect the vital organs.
- Can occur in a matter of minutes!

Hypothermia

- It is a potentially dangerous drop in body temperature (below 96°), caused by a prolonged exposure to the cold.
- It can cause long lasting health issues, or could even result in death!
- Age (children and elderly), certain illnesses or even certain medications can make one more susceptible to hypothermia.



If You Need To Provide First Aid

- Get indoors as quickly as possible. Seek medical attention!
- Warm the person slowly, starting with the body core. Warming extremities first drives cold blood toward the heart and can lead to heart failure!
- Get the person into dry clothes and in extra layers. Remove any tight items.
- Drink warm liquids. Do not give alcohol, drugs, coffee or anything hot.

Are You Prepared For The Cold?

- Before heading out the door, make sure you check the forecast so you'll know what to expect.
- Adjust your schedule (if possible) to avoid the coldest part of the day.
- Dress for the cold! Layer your clothes and protect your head and extremities.
- Make sure your pets and livestock have enough food and water!
- Is your home and vehicle prepared?

Learn more at: www.weather.gov/safety/winter





Winter Weather Safety Tips



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Be Prepared Before the Storm Strikes!

When preparing your home or workplace for the upcoming winter season, keep in mind that the primary concerns deal with the loss of heat, power and telephone service, along with a shortage of supplies if a winter storm continues for an extended period of time.

Make sure to have the following supplies available:

- Flashlight and extra batteries
- Battery-powered NOAA Weather Radio and portable radio to receive emergency information - these may be your only links to the outside world.
- Extra food and water. Have high energy food, such as dried fruit, nuts and granola bars, and food which doesn't require any cooking or refrigeration.
- Extra medicine and baby items
- First-aid supplies
- Heating fuel. Refuel BEFORE you are empty. Fuel carriers may not reach you for days after a winter storm.
- Emergency heat source: fireplace, wood stove, space heater
 - Use properly to prevent a fire and remember to ventilate properly.
- Fire extinguisher and smoke alarm
 - Test smoke alarms once a month to ensure they work properly.



On the farm and for pets:



- Move animals into sheltered areas.
- Shelter belts, properly laid out and oriented, are better protection for cattle than confining shelters.
- Haul extra feed to nearby feeding areas.
- Have plenty of water available. Animals can die from dehydration in winter storms.
- Make sure your pets have plenty of food, water and shelter.



Winter Weather Safety Tips



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I'm caught outside:

- Find shelter!
- Attempt to stay dry.
- Cover all exposed body parts.
- If there is no shelter available:
 - Build a lean-to, windbreak or cave to protect yourself.
 - Build a fire for heat and to attract attention.
 - Place rocks around the fire to absorb and reflect heat.
 - Melt snow for water, eating snow lowers body temperature.

I'm caught in a vehicle:

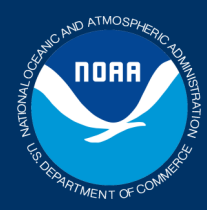
- Stay in the vehicle! You could quickly become disoriented in wind-driven snow and cold.
- Run the motor about 10 minutes each hour for heat.
- Open the window a little for fresh air to avoid carbon monoxide poisoning.
- Make sure the exhaust pipe is not blocked.
- Be visible to rescuers!
 - Turn on the dome light at night when running the engine.
 - Tie a colored cloth, preferably red, to your antenna or door.
 - After the snow stops falling, raise the hood to indicate you need help.
- Exercise from time to time, move arms, legs, fingers, and toes vigorously to keep blood circulating and to keep warm.



I'm caught inside:

- Stay inside! If using alternate heat from a fireplace, wood stove, space heater, etc., be sure to use fire safeguards and properly ventilate.
- If you don't have heat available:
 - Close off unneeded rooms.
 - Stuff towels or rags in cracks under doors.
 - Cover windows at night.
- Eat and drink, providing the body with energy and preventing dehydration.
- Wear layers of loose fitting, lightweight, warm clothing. Remove layers to avoid perspiration and subsequent chill.





Winter Weather Travel Tips



Winter Weather Awareness Day - November 5, 2020

Along with your home and workplace, vehicles also need to be prepared for the upcoming winter season. It is very important to fully check and winterize your vehicle, which includes having a mechanic check your battery, antifreeze, wipers, windshield washer fluid, ignition system, thermostat, lights, exhaust system, heater, brakes, and oil levels.

If you must travel during winter conditions, it is best not to travel alone. Try to plan your travel during the day, and make sure to let others know your destination, route, and when you expect to arrive. Make sure to keep your gas tank near full to avoid ice in the tank and fuel lines.

Always carry a Winter Storm Survival Kit in your car!!

- ♦ Mobile phone, charger and batteries
- ♦ Flashlight with extra batteries
- ♦ First-aid kit
- ♦ Knife
- ♦ Shovel
- ♦ Tool kit
- ♦ Tow rope
- ♦ Battery booster cables
- ♦ Compass and road maps
- ♦ A windshield scraper and brush or small broom for ice/snow removal
- ♦ Blankets and sleeping bags, or newspapers for insulation
- ♦ Rain gear, extra sets of dry clothes, socks, mittens, and stocking caps



- ♦ Large empty can to use as emergency toilet. Tissues, paper towels, and plastic bags for sanitary purposes
- ♦ Small can and waterproof matches to melt snow for drinking water
- ♦ Cards and games
- ♦ High calorie, non-perishable food, such as canned fruit, nuts, and high energy "munchies" (Include a non-electric can opener if necessary)
- ♦ A small sack of sand or cat litter for generating traction under wheels and a set of tire chains or traction mats.
- ♦ A brightly colored (preferably red) cloth to tie to the antenna





Road Condition Information

Winter Weather Awareness Day - November 5, 2020



Before you travel, check out the latest road conditions. Road report information across Nebraska can be found at the Nebraska Department of Roads web site at:

511.nebraska.gov

Nebraska: When in-state, call **511**.

When out of state call: 1-800-906-9069

If you are located inside the states listed below, you can dial 511 for road information.

South Dakota: www.safetravelusa.com/sd/
Out of state: 1-866-MY-SD511 (1-866-697-3511)

Wyoming: map.wyoroad.info/
Out of state: 1-888-WYO-ROAD (1-888-996-7623)

Colorado: www.cotrip.org/home.htm
Out of state: 1-303-639-1111

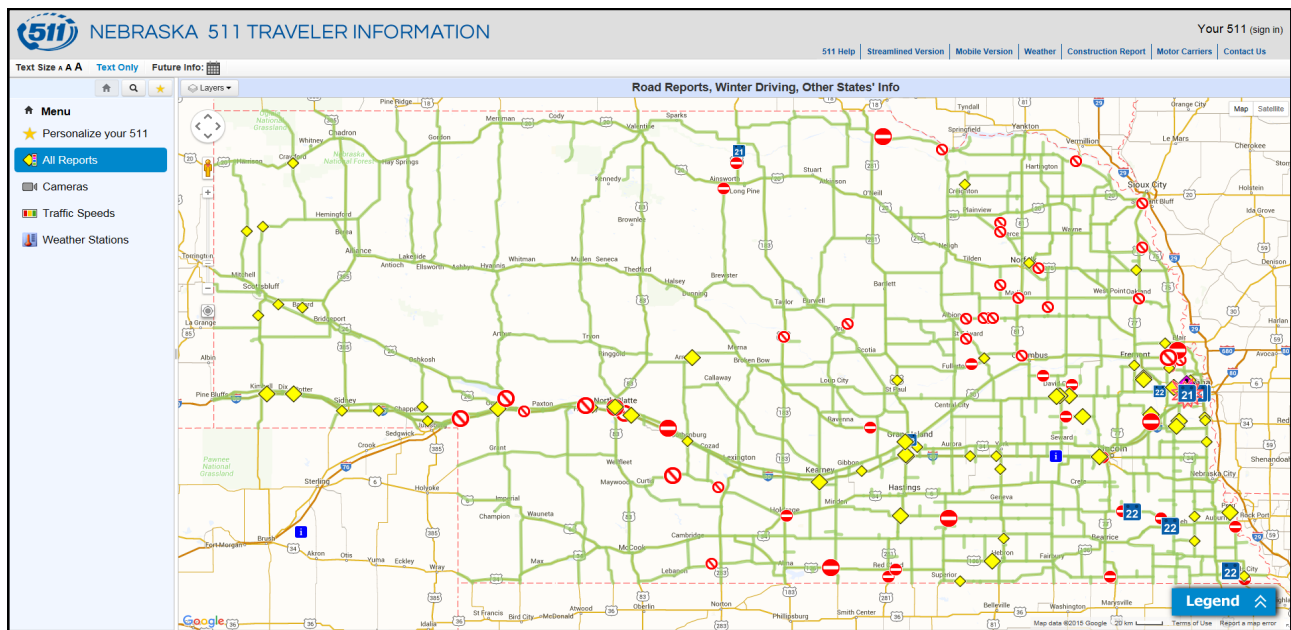
Kansas: www.kandrive.org/kandrive/
Out of state: 1-866-511-KDOT (1-866-511-5368)

Missouri: traveler.modot.org/map/
Out of state: 1-888-ASK-MDOT (1-888-275-6636)

Iowa: 511ia.org/
Out of state: 1-800-288-1047

National Traffic and Road Closure Information can be found at:

www.fhwa.dot.gov/trafficinfo/index.htm





Winter Preparedness For Schools



Winter Weather Awareness Day - November 5, 2020

Gathering Information

- Know where to get weather information: Utilize NOAA Weather Radio, local Media sources, Internet and paging services.
- Know how to get road information: State Highway Departments or Law Enforcement are often your best sources for road conditions. City and county transportation or school officials and drivers or security teams are also excellent sources.



Alerting Students and Staff

- Alert students and staff to take action: Use mobile communications for bus drivers and a PA system for school staff and students.

Activating a Plan

- Determine when to activate a plan: Gather information about the type of winter storm, expected impact and time of impact on the school district. The primary decision will be whether to cancel, delay or hold classes as usual. In Watch situations, immediate action will usually not be required. When a Warning or Advisory is issued, assess the weather situation by monitoring forecasts, current weather conditions and road conditions.

Canceling or Delaying Classes

- Determine when to cancel or delay classes: How much time do you have before the storm impacts the area? Not only must students be transported to school safely, but also back home via bus, car or on foot. What kind of an impact will the storm make? Will roads be impassable or will road conditions just have a minimal effect on transportation of students, causing only small delays?

School Bus Driver Actions

- For heavy/blowing/drifting snow: Be familiar with alternate routes, stay up to date on the latest forecast, and maintain communication with school officials.
- For ice storms: Remain alert for downed trees, utility lines, and other road hazards. Be familiar with alternate routes. Stay up to date on the forecast and maintain communication with school officials.
- Extreme cold: Learn to recognize and treat symptoms of hypothermia and frostbite.

Safety Instruction

- Educate school staff and students: Conduct drills and hold safety programs annually.
- Participate in annual Winter Weather Preparedness Day campaigns.
- Contact your local Emergency Manager or National Weather Service Office for a speaker to discuss winter weather safety.

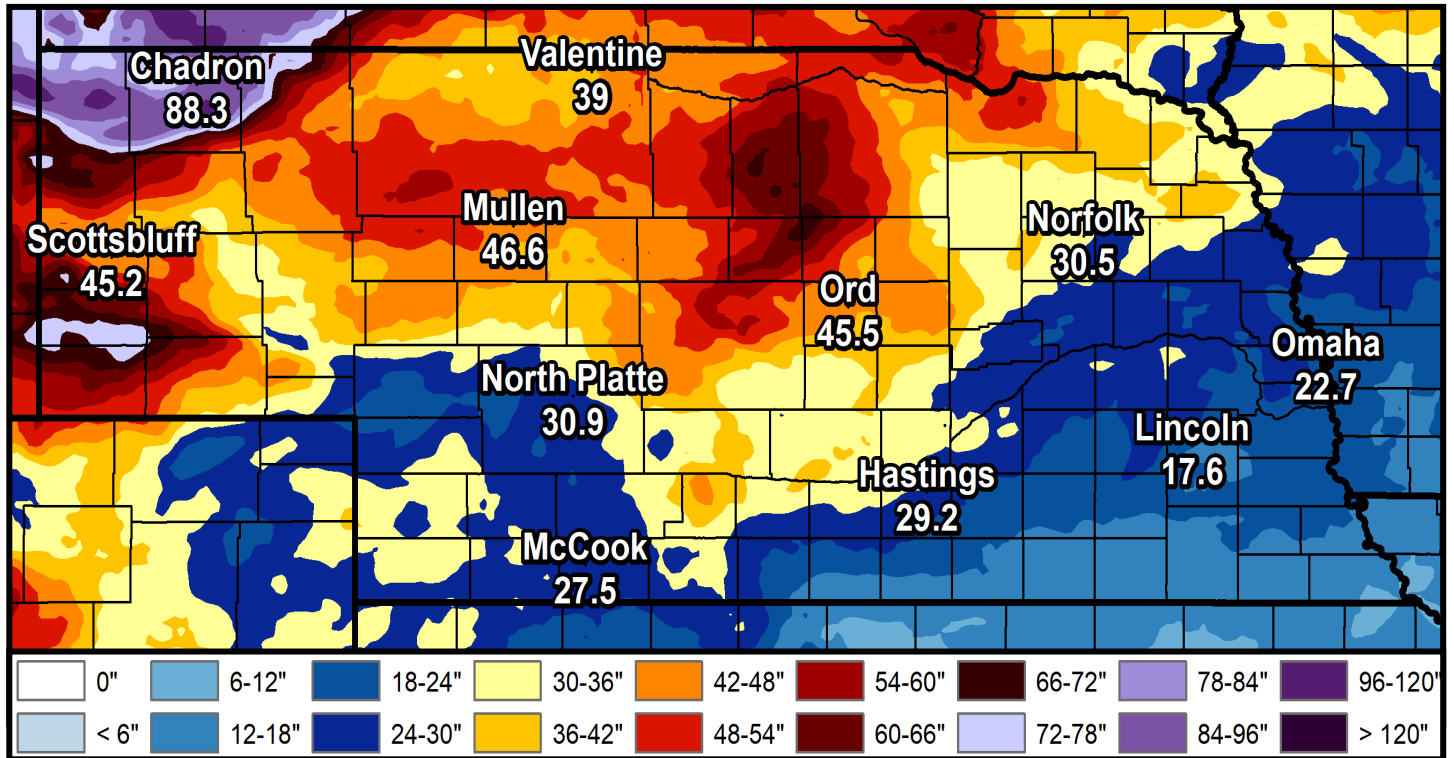


2019-20 Nebraska Winter Weather Summary

Winter Weather Awareness Day - November 5, 2020



2019-20 Season Statewide Snowfall Map



Location	Normal	2019-20 Total	% of Normal
Scottsbluff	42.1"	45.2"	107%
North Platte	28.5"	30.9"	108%
Valentine	33.3"	39.0"	117%
McCook	28.8"	27.5"	95%
Grand Island	29.0"	31.3"	108%
Norfolk	30.5"	30.5"	100%
Omaha	26.4"	22.7"	86%
Lincoln	25.9"	17.6"	68%



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

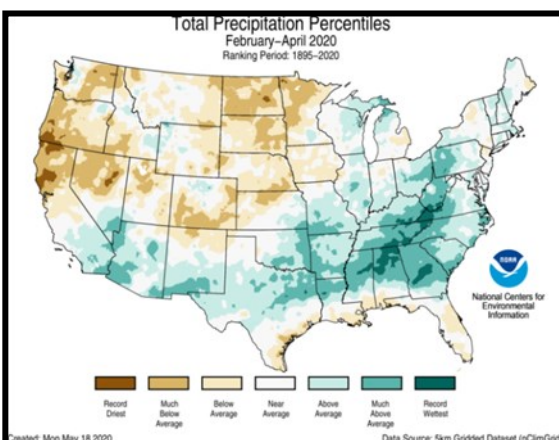
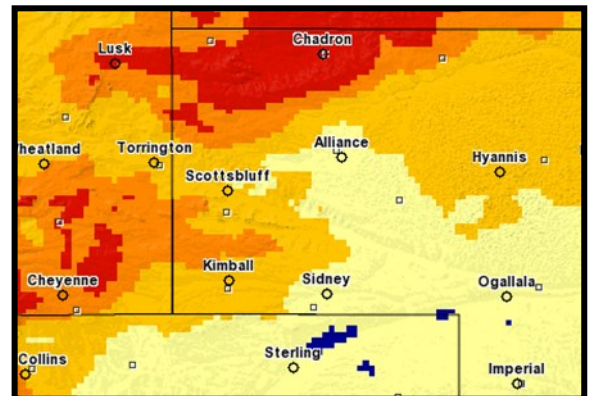
Nebraska Panhandle - NWS Cheyenne, WY

The 2019-2020 season was a tale of two seasons different seasons - average to slightly above average and impactful in 2019 up to February and then much drier and warmer through May 2020 with well below normal snowfall. The season started slightly late but had a strong 1-2 punch with back to back winter storms Pre-Thanksgiving and Post-Thanksgiving, about 5-6 days apart, and another after Christmas.

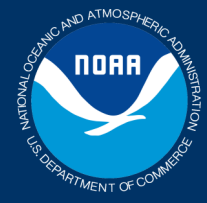


The **Post-Thanksgiving Storm** brought blizzard conditions to north and central NE Panhandle, resulting in high transportation and communication impacts. Before the onset of the snow, freezing drizzle and fog occurred that likely accreted ice on a 500 ft. antenna in Dawes County, south of Chadron, NE. This ice accretion, plus blizzard conditions for nearly 6 hours and winds gusting up to 50 mph – all likely led to the collapse of the antenna. The NWS Weather Radio Transmitter was attached to this antenna as well. NWS Cheyenne worked closely with NWS Rapid City to ensure continuous coverage for advisories, watches, and warnings to serve the area through the winter and spring.

By **January 1, 2020**, the northern Nebraska Panhandle was well above normal for snowfall with totals already 4 to 5 feet for the season up to that point. The North Platte River Valley was lower near Scottsbluff of 2 to 3 feet and slightly higher amounts towards Kimball in the southern Nebraska Panhandle. Image on the right courtesy of NOAA/NWS NOHRSC.



For late winter into **Spring 2020**, from February - April, precipitation was below normal to much below normal, with the state of Nebraska having the 21st driest period of the past 126 years. While more snow did occur across the NE Panhandle Feb. – Apr., overall impacts were lower in the late snow season vs. the front side. Still, Chadron managed 88.3" on the season, with Scottsbluff nearly half that at 45.2", and Sidney, NE receiving near 40". Nearly 60% of snowfall occurred before January 1st in 3 months with 40% of snowfall occurring in the last 4-5 months of the season.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

West and North Central Nebraska - NWS North Platte, NE

Temperatures during October through December 2019 averaged slightly below normal across western and north central Nebraska, then slightly above normal for January through March. Precipitation through the winter season averaged slightly below normal across southwest Nebraska and slightly above normal across north central Nebraska. Seasonal snowfall exceeded 24" across most locations. Seasonal snowfall was 30.9" at North Platte and 39" at Valentine. The Cooperative Observers at Broken Bow and Imperial recorded 40.5" and 24.0" respectively.

November: A winter storm affects the western Sandhills before Thanksgiving, followed by blizzard and winter storm conditions Thanksgiving weekend across north central Nebraska

On **November 25-26th**, a storm system caused winter storm conditions to develop on the evening of November 25th, which continued during the daytime and evening hours November 26th. Total snowfall amounts ranged from 4 to 10", with the highest amounts across portions of the western Sandhills. The snow combined with northerly winds of 20 to 30 MPH with a few gusts up to 40 MPH to produce blowing and drifting snow with visibilities below a mile at times. The winter storm caused roads to become snow covered, with Interstate 76 in Deuel County as well as Highway 30 and Highway 385 west of Big Springs in Deuel County to become closed on November 26th.

On **November 30th-December 1st**, a strong system caused blizzard and winter storm conditions to develop across north central Nebraska during the morning hours on November 30th and continued into the morning hours of December 1st. Snowfall amounts ranged from 3 to 10", with the heaviest snowfall occurring across far northern Nebraska. Strong northwest winds of 30 to 40 MPH with gusts around 50 MPH developed during the late morning hours and continued during the afternoon and evening hours. This caused considerable blowing and drifting and visibilities as low as a quarter mile at times. The blizzard conditions led to numerous road closures across north central Nebraska.

December: A strong winter storm impacted north central and central Nebraska

A strong winter storm impacted north central and central Nebraska into portions of southwest Nebraska beginning **December 28th** through the early morning hours on December 30th. Snow became moderate to heavy at times during the evening hours on December 28th and continued on December 29th. Strong northwest winds increased to 25 to 35 MPH with gusts to 40 MPH during the evening and overnight hours on December 28th. Wind gusts increased to 50 MPH at times during the daytime and into the evening and overnight hours on December 29th. The heaviest snowfall occurred across central into north central Nebraska, where 6 to 12" amounts were common, but ranged as high as 16 to 18". The strong northwest winds caused considerable blowing and drifting with visibility as low as a quarter mile at times. Snow drifts up to 12 to 15' were reported near Butte, in Boyd County. Most roads across central Nebraska into the eastern half of north central Nebraska became impassable on December 29th.

January and February

No significant storm systems affected western Nebraska January and February. Instead, several weak systems brought light snowfall to the area. Snowfall in January was especially light with monthly snowfall totals mainly 3" or less.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

West and North Central Nebraska - NWS North Platte, NE Cont.

March: Winter storm impacts the eastern panhandle and north central Nebraska.

A strong storm system caused winter storm conditions to develop during the late morning hours on **March 19th**, which continued into the early morning on March 20th. Total snowfall amounts ranged from 3 to 8". The snow combined with northwest winds of 25 to 35 MPH with gusts around 45 MPH at times to produce blowing and drifting snow with visibility as low as a quarter mile at times.

April

No significant storm systems affected western Nebraska in April. Instead, a few weak systems during the middle of April brought light snowfall to the area.

Month	North Platte	Valentine	Broken Bow	Imperial
October	1.1"	1.9"	T	3.7"
November	8.3"	10.3"	9.5"	9.0"
December	7.7"	11.4"	18.0"	0.7"
January	1.2"	3.3"	T	2.0"
February	7.0"	0.9"	5.0"	1.5"
March	2.3"	5.5"	6.0"	3.0"
April	3.3"	5.7"	2.0"	4.1"
Season Total	30.9"	39.0"	40.5"	24.0"

Extreme Northeast Nebraska - NWS Sioux Falls, SD

Snowfall from the 2019-2020 winter was near historical averages across extreme northeast Nebraska, including Dakota and Dixon Counties. Most areas received between 30 to 40" of snow for the season. The majority of this snow fell over the course of roughly 10 different storm systems, some of which also produced periods of mixed precipitation and minor ice accumulations.

Two particular storms deserve added attention. First, a band of moderate to heavy snow dropped 4 to 9" across extreme northeast Nebraska and surrounding areas on **November 26-27th**. Northwest wind gusts from 25 to 35 MPH also resulted in periodic reductions in visibility due to blowing and drifting snow. Concord reported 8.8", while Emerson reported 6.0". Second, the only documented blizzard of the season occurred on **January 17-18th**. Periods of heavy snow with wind gusts from 30 to 40 MPH on the morning of January 17th gave way to several hours of freezing drizzle and ice accumulations up to one-tenth of an inch. This light icing was followed by additional snowfall and northwest winds gusting from 40 to 50 MPH in the early morning hours of January 18th, resulting in numerous hours of visibility to one-quarter mile or less. Although snow amounts were not overly impressive with only 5.5" in Newcastle and Ponca, the combination of snow and wind resulted in blizzard conditions. Travel was not recommended for large parts of the region.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

Extreme Southwest Nebraska - NWS Goodland, KS

The 2019-2020 winter season can be called tame compared to the 2018-2019 season for extreme southwestern Nebraska. The Climate Prediction Center's Winter Outlook called for above normal temperatures and equal chances for precipitation. Temperature departures ranging from two to six degrees above normal reigned in the area from December to March. Coupled with below normal snowfall, abnormally dry conditions returned to the area in the late fall/to early winter.

After a relatively warm September, the winter season started out with temperatures around five to six degrees below normal in October. The first measurable snowfall resulting in more than a trace of precipitation occurred on **October 29th-30th**. Three to five inches of snow fell across extreme southwestern Nebraska.

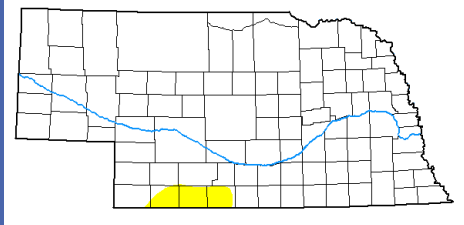
A pre-Thanksgiving winter storm impacted the region on **November 26th-27th**. On the 26th, snow began to move into Nebraska after midnight, accompanied by 30-40 MPH wind gusts. Near blizzard conditions were reported as a band of heavy snow moved into southwestern Nebraska from Colorado. The storm produced snowfall amounts ranging from 3-4" around McCook and nearly 9" around the Dundy and Hitchcock County border. Despite the snowfall, abnormally dry conditions returned to Hitchcock and Red Willow counties by the start of December.

December and **January** brought above normal temperatures and a significant drop in total snowfall. Over the course of the two months, Trenton Dam and McCook recorded around 2.5" of snow. Culbertson fared a little better, receiving 3" of snow on **December 15th**. The site recorded a combined 6" of snow in December and January.

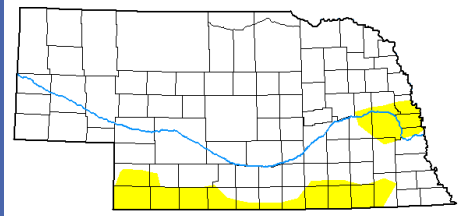
A potent winter storm system moved through the Central High Plains on the night of **January 16th**, continuing to impact the area into the 17th. Though the snow missed extreme southwestern Nebraska, the area was impacted by light freezing rain and dense freezing fog. The combination of poor visibility due to fog and light ice accumulations led to a few minor accidents in McCook.

U.S. DROUGHT MONITOR NEBRASKA

December 3, 2019



May 26, 2020

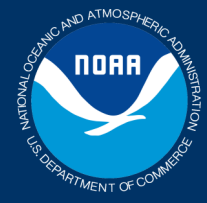


None
D0 - Abnormally Dry

droughtmonitor.unl.edu

Station	Monthly Temperature Departure from Normal						
	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020
Culbertson	-5.7	-1.8	3.7	3.3	-0.6	2.3	-2.8
Trenton Dam	-5.3	-1.1	4.6	3.3	1.1	2.6	-1.2
McCook	-5.2	-0.2	5.6	4.6	1.8	4.6	-0.2

Table 1: Temperature departure from normal (1991-2020). Red shading indicates above normal, blue shading indicates below normal and no shading is within one half degree of normal.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

Extreme Southwest Nebraska - NWS Goodland, KS Cont.

The above normal temperature trend continued into **February** and **March**, however, monthly snowfall values began to increase. Snowfall values ranged from 2-3" in February, roughly the same amount as the previous two months combined. March snowfall values were nearly double what they were in February, thanks to a **Pi Day (March 14th)** winter storm.

This was the only large-scale snow event to impact extreme southwestern Nebraska in the first half of 2020. On the morning of the March 13th, a low pressure system moved over the Desert Southwest before moving to the northeast, toward the area. As the storm system moved into extreme southwestern Nebraska, snow began across the area. The storm brought a total of 4-6" of snow to southwestern Nebraska. The snow brought some moisture to the area, however, 2019-2020 winter snowfall totals remained below normal.

McCook was particularly hard hit in terms of seasonal snowfall, receiving only 19.4" of snow. This is 14.5" below normal or roughly 57% of the normal snowfall for the area and 28.9" below the 48.3" of snow observed at the site during the 2018-2019 winter season. Culbertson and Trenton Dam received slightly below normal snowfall for the year.



A mid-March storm brought 4" of snow to McCook. Photo courtesy of Scott Ackermann.

Station	Sep 2019-May 2020 Snowfall	1991-2020 Normal	Percent of Normal
Culbertson	27.3	28.9	94%
Trenton Dam	20.6	21.8	94%
McCook	19.4	33.9	57%

Table 2: Sept '19- May '20 Snowfall, Normal, Percent of Normal Snowfall. Green is above normal, tan is below normal.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

South Central Nebraska - NWS Hastings, NE

There were a few minor snow events in late October-early November, but it wasn't until just before Thanksgiving that the NWS Hastings coverage area had its first notable winter storm system. On **November 26th**, anywhere from 6-10" of snow fell, mainly west of an Alma-Hastings-Columbus line, including 10" at Loup City and Spalding and 9.8" at St. Paul. Many locations set new snowfall records for the day, including 8.2" at Grand Island and 7.1" at Hastings. The heaviest snow in the late afternoon and early evening hours, at a rate of 1-2" per hour at times. Travel impacts were reported, with near-blizzard conditions as winds gusted to around 40 MPH. The Central Nebraska Regional Airport in Grand Island was closed for over 12 hours. Interstate 80 between York and Kearney was closed for a few hours in the evening. Numerous schools in the north and west were cancelled and area businesses closed. The end of the month went out with a howl, as high winds blasted the area on November 30th. Strong northwest winds with sustained speeds of 30-40 MPH occurred, with frequent gusts near 50 MPH. Occasional gusts over 60 MPH were also recorded, with peak gusts including 70 MPH near Norman, 68 MPH at Ord and 67 MPH at Cambridge.

Things were pretty quiet for the first half of December, with notable snowfall not occurring until **December 14th**. Most totals topped out around 2", with higher totals of 3-4" reported over Valley, Greeley, and Nance Counties. Similar to November, the month of December had its main event at the end, with a winter storm bringing a mixed bag of precipitation to send out 2019. Impacts from this storm were felt for multiple days, starting off with rain on **December 27th** and switching to snow by the 28th, but the strongest winds didn't arrive until the 29-30th. Anywhere from 4-13" of snowfall fell, with the highest amounts across northern and western portions of the area. Totals included 13.2" near Arcadia, 13" in North Loup, 12.2" in Ord and 11.1" in Kearney. There was a sharp drop off in totals, with only around 3" in Grand Island and Hastings, and just a dusting further southeast.

The combination of snow and northwest wind gusts frequently gusting to 40-50 MPH resulted in near-blizzard conditions and plenty of travel issues. Numerous road closure occurred, including along Interstate 80, Highway 30 and Highway 2. Many motorists were stranded for several hours on Interstate 80 during the overnight hours of the 29-30th.

Overall quiet conditions ushered in January 2020, and though there were a couple of snow during the first half of the month, the first more notable system didn't arrive until **January 17-18th**. This storm brought a wintry mix of precipitation, with snow, sleet, freezing rain and freezing drizzle. Thankfully, as wind gusts increased to around 50 MPH, accumulations were on the lighter side. Snow generally ranged from 1-2" and ice accumulations totaled less than one-quarter of an inch.



Heavy snow near Wolbach from Dec. 27-30.
Photo by Abe Klassen.



Heavy snow near Boelus
from Dec 27-30.
Photo by Paula Rathman.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

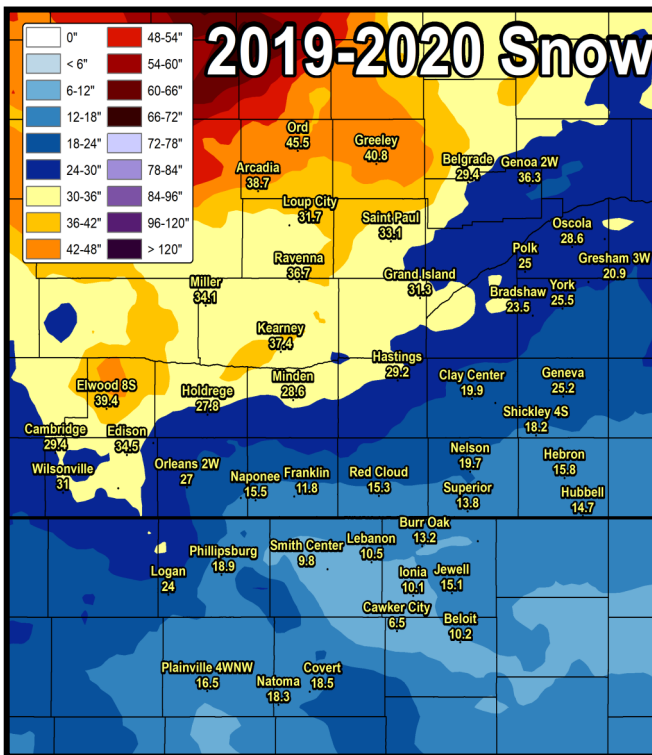
South Central Nebraska - NWS Hastings, NE Cont.

A handful of light snow events were scattered across the area through February. The main system of the month came on **February 24-25th**, and it was one of the more interesting events of the season. While most of the area had little-no accumulation, an intense, narrow band dumped upwards of 6-10" on portions of Dawson, Gosper, Furnas and Harlan counties. This band was no more than 10-15 miles wide, with totals on either side quickly tapering off to just a dusting. The highest totals included 10" in Elwood, 9" near Edison, 6-8" near Beaver City and 7" near Lexington.



Heavy snow in Beaver City from Feb 24-25. Photo by Furnas County Sheriff's Office.

A widespread wet snowfall of 3-6" blanketed most of the area on **March 13th**. Thanks to some recent warmer temperatures, much of this snow initially melted on contact. It wasn't until temperatures cooled overnight that snow began to accumulate. The highest report was 6" in Minden, other reports included 5.4" in Bradshaw and 5" at Palmer, Elwood, and Bladen. There was a taste of the upcoming severe weather season mixed in with winter on **March 19th**. This event started off with afternoon thunderstorm development, with the strongest storms dropping large amounts of hail, with a few locations seeing hail up to the size of ping pong balls. North winds increased behind a passing cold front, with gusts reaching between 55-65 MPH. The Lexington Airport recorded a gust of 63 MPH. Late in the afternoon and evening, rain switched over to snow as it moved further north, resulting in snowfall of 1-5" north of a line from Lexington to Fullerton.



For the second time in 3 years, Easter felt the affects of crummy wintry weather. This Easter Sunday, **April 12th**, brought stiff north winds gusting near 50 MPH at times and very cold temperature to the entire area, and many locations also experienced several hours of freezing drizzle and at least brief snow. Snow accumulations for most were less than 1", but some spots in Valley County were in the 1-2" range. Several counties endured fairly widespread power outages, as the combination of gusty winds and freezing drizzle led to coating of power lines and line galloping. The Grand Island Utilities Director noted this was one of the top-five worst power outage events of his career, and the Polk County Rural Power District reported at least 25 damaged or broken poles. This event was impressive for temperatures by mid-April standards, starting a six-day stretch of cold temperatures across the area, running from the 12-17th. At Hastings, this stretch was a record for the overall coldest six-day stretch so late into the spring. The 2019-2020 winter season came to an end on April 16th. While not overly impactful, this late-season system brought 2-6" of snow, with the highest totals focused across northeastern portions of the area. The highest amounts included 5.9" north of York, 5.5" in Greeley, 5.3" in Osceola, and 5.1" in Bradshaw.



2019-20 Nebraska Winter Weather Summary



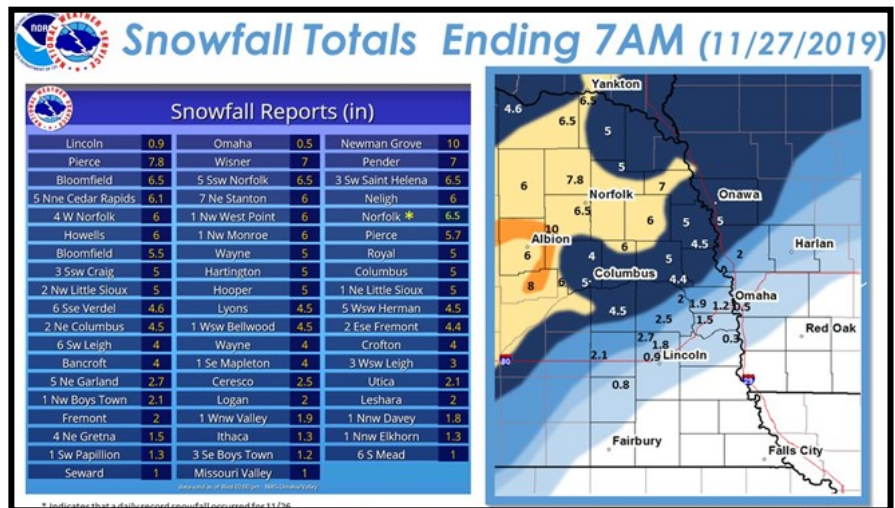
Winter Weather Awareness Day - November 5, 2020

Eastern Nebraska - NWS Omaha/Valley, NE Seasonal Summary Winter 2019-2020

Last winter was defined by early season snows across central and northeast Nebraska, and snow deficits across southeast Nebraska and far western Iowa that left snow lovers wanting for much of the season. The Norfolk area got off to a fast start, racking up just over 10" of snow by the end of November (a 7" November surplus). Snowfall then slowed for the region, with no months thereafter reporting more than 7" of snow. This left the city close to average for the season, at 30.5" of snow. Meanwhile in Omaha and Lincoln, plow drivers were in light demand, with both cities running snow deficits throughout the winter. A couple significant storms did affect each city in January, but the best snow of the year held off until mid April. Omaha ended the season with 22.7" of snow (about 4" below average), while Lincoln reached 17.6" (around 8" below average).

November 26th-27th, 2019

A potent storm system swept into the Central Plains on the 26th, producing a band of snow from northern Kansas to southwestern Minnesota. The heaviest snowfall impacted central/northeast Nebraska and northwest Iowa, with totals ranging from 5 to 10". Norfolk reported a storm total of 6.5", while Newman Grove, NE was the regional winner with 10" of fresh snow. The snow cutoff was sharply in line with the Interstate 80 corridor, resulting in mixed precipitation and far less snowfall in the Lincoln and Omaha Metros.



January 17th-18th, 2020

A winter storm pushed mixed precipitation through the region on the 17th, leaving a coating of ice, sleet and snow over all of eastern Nebraska and western Iowa. Precipitation was followed by wind gusts of 40 to 60 MPH on the 18th. The combined winds and wintry precipitation had significant travel impacts, presenting a challenge for road crews. Snow totals for this event ranged from 1 to 5", with Omaha receiving 1.9", Lincoln getting 1.8" and 3.6" in Norfolk.

January 21st-23rd, 2020

January's second notable winter storm moved slowly through the region from the 21st to 23rd. Limited snow rates and temperatures near freezing helped reduce travel impacts. Nevertheless Omaha and Lincoln saw their best snow of the month, with storm total snowfalls of 5.3" and 2.0" respectively. Meanwhile, 4" of snow was reported in Falls City, Filley and Cook.



2019-20 Nebraska Winter Weather Summary



Winter Weather Awareness Day - November 5, 2020

Eastern Nebraska - NWS Omaha/Valley, NE Cont.

March 13th-14th, 2020

Snow arrived on the afternoon of the 13th and lingered through the morning of the 14th, prompting Winter Weather Advisories along the Interstate 80 Corridor. Ultimately the heaviest snow band stayed just north of the interstate (approximately from Grand Island to just north of Lincoln), limiting impacts to travel. Most of the region ended up with 1 to 3" of new snow, but Brainard, NE managed 6.5".

April 15th-17th, 2020

The storm of the season for winter 2019-2020 was late in coming, holding out until mid April! But for those who waited, it was a fascinating storm, proving to be both a forecast challenge and beautiful storm. Light snow began on the 15th and lingered through the afternoon of the 16th, resulting in very limited accumulations. Then things got going in earnest on the evening of the 16th, with two heavy bands of snow that set up over east central Nebraska and southwest Iowa. At times snow rates approached or exceeded 2" per hour. Multiple locations recorded 8" of snow or more, including Corning, IA at 10.8" and Ashland, NE with 9". Best of all, for those who are less inclined toward snow, what fell melted quickly. Nearly all of it succumbed to the high sun angle and warmer temperatures on the afternoon of the 17th.

