Jet Stream Jargon

National Weather Service Billings, Montana

2021 Spring Issue

Inside This Edition

From the Desk of the Meteorologist in Charge

For more than a year, our office staff have been working in a hybrid environment (a few individuals in the office and the remainder of the staff working from home). Currently, NWS leadership is anticipating this will continue indefinitely. One thing we have learned over this last year of working in a hybrid environment is that we are able to carry out the mission, whether it involves the small staff at the office issuing the various routine and warning products from our proprietary systems or it relies on the remote staff to provide necessary support to the in-office staff for briefings, social media engagement, IT work, equipment maintenance in the field, administrative issues, etc.

The upside of the last year of this hybrid work environment is that our staff has become even more nimble in our ability to carry out the mission from nearly anywhere. With a laptop and internet connectivity, I'm confident our staff has gotten comfortable utilizing technology such that service can be provided from nearly anywhere.

With the expectation that this working environment will continue into the future, we are taking proactive steps to facilitate the mobility of our staff and their ability to support the mission from outside the traditional workplace.

Additionally, we have found creative ways to engage with you through the use of webinars, recorded briefings, etc. Look for these to continue. One of the advantages of these remote interactions has been a reduction in the amount of "windshield" time required to travel various places. This time has allowed staff more time to create content and provide additional services. We do hope to eventually be able to resume some in-person interactions to continue building those critical relationships, but it is unclear when that will happen.

Thanks for the volunteer work you do to support our life and safety mission. Whether that is as a storm spotter, Coop/ CoCoRaHS observer, emergency services partner, etc., the collective efforts all contribute to our goal of a Weather Ready Nation.

Keith W. Meier

COOP Corner

Kurt Hooley - Observing Program Leader

After working with the COOP program for the past 18 months, I'm happy to say that I am your new Observing Program Leader for the National Weather Service Billings Forecast Office. As a result, this will allow me to focus more on your needs in the COOP Program. It has been over a year now since COVID-19 began to impact our lives, and I hope you all are healthy and well. Although in-person visits remain somewhat restricted, I do plan on some in-person visits during the course of the next 6 months. Otherwise, I hope to contact as many of you as possible by phone to see how things are going. **Important reminder**, don't forget to insert the inner tube and funnel back into your rain gauges. The last half of May is the best time to do this. We want to make sure long, hard freezes are finished for the season so the plastic tube doesn't crack. Please feel free to contact me with any questions or concerns you may have. I can be reached at 406-652-0851 ext. 251.

It's that time of year when we recognize the many years of service you have dedicated to providing valuable weather data to the National Weather Service, as well as the many other agencies that use the data. The awards are given to individual observers, families, and/or institutions. The following are the 2021 Length of Service Awards:

David Mader	Biddle	20 years
Ingrid Brown	Powderville	20 years
Stacey Brown	Powderville	20 years
Ennis Geraghty	Columbus	20 years
Neil and Carla Glennie	Judith Gap	15 years
Lyle and Dianna Neal	Lodge Grass	10 years

Congratulations to you all! You play a large role in the success of our mission: protecting life, property and the enhancement of the national economy. For more information about the National Weather Service Cooperative Observer Program visit: http://www.weather.gov/coop

Community, Collaborative, Rain, Hail and Snow Network (CoCoRaHS)

The CoCoRaHS Network in the Billings service area continues to thrive through our dedicated and reliable observers. We currently have about 120 observers in our area, of whom 50-60 submit data to us most every day, including days with NO precipitation! This is an awesome number because ZERO IS an observation. I wish to thank you all very much for your dedication.

Spring is here, with summer just around the corner, which means severe weather, i.e. thunderstorms. There are "Significant Weather" & "Hail" report forms on the left hand menu on your CoCoRaHS Home screen, used for heavy rain/hail/snow and flooding information. Feel free to use these forms to alert us of such *real time* issues in your area. Once submitted, the NWS office meteorologists receive an alarm immediately. These immediate reports help us provide timely warnings to the public as events unfold. These reports also help forecasters to establish a good lead time for the protection of life and property. Both forms have space for comments, so you can add any information that you think would be helpful to our meteorologists. You can get as detailed as you like, but be aware that your comments may be seen by the general public. If you are unaware of these features, please peruse through them on the CoCoRaHS website at www.cocorahs.org.

Shop the CoCoRaHS.org website store, located at the bottom of the Resources link from the home page on the left hand side of the webpage. There are many items, including new rain gauges and pieces and parts, if you don't need the whole thing replaced! Lots of fun stuff, too! Ever heard of a "Snow Swatter"?

We are always looking for volunteers to take "backyard" weather observations. Please spread the word and if you are already a Skywarn Weather Spotter and are interested, go to the Cocorahs.org website and see what you think.

If you have questions or concerns, please contact Tom Frieders, tom.frieders@noaa.gov at the Billings National Weather Service office at (406) 652-0851 or your provided 800 number. We are happy to be your first contact if you have concerns about the website or the program itself. And once again, thank you for your commitment and dedication!

Virtual Severe Thunderstorm Spotter Training Opportunities

Tom Frieders - Warning Coordination Meteorologist

The National Weather Service (NWS) remains under tight travel and outreach restrictions due to COVID-19. Unfortunately, this means no in-person Severe Thunderstorm Spotter Training for the second spring in a row. We will, however, continue to provide virtual opportunities as we did last year, but in a little different format.

We have utilized ArcGIS StoryMaps to create an online collection, an eight part series. An option for you to review the materials at your own pace. Click here to get started!

If you would like to be part of a live virtual session, we have several of those scheduled. Click here for the latest schedule and registration details.

We appreciate your continued support for the Severe Thunderstorm Spotter program. Spotters provide that important “ground truth” with reports of damaging winds, large hail and tornadoes.

A Recap of Meteorological Winter (December 2020 - February 2021)

Joe Lester - Lead Meteorologist

After an historically cold and snowy stretch of weather in October and November, the first two-thirds of meteorological winter were quite dry and warm, with few snow events and a persistent lack of snow cover. Billings had its 4th warmest December-January on record, Sheridan was 3rd warmest, Livingston 7th warmest, and Miles City 4th warmest. The warm and dry weather caused drought conditions to worsen. By the end of January, much of southeast Montana and north central Wyoming were in Severe to Extreme Drought.

One of the most impactful weather events of the winter occurred on January 13th, when a cold front produced widespread strong winds . Gusts of 60 to 80 mph were common, and resulted in downed trees and power lines. It was also a very warm and dry day. The photo on the right shows blowing dust viewed from the Billings' rims.

A few days into February, an arctic front arrived and was followed by (finally!) a period of widespread overrunning snowfall, the first real dose of severe winter weather since October. Travel conditions became very hazardous and there were many accidents on area highways. The snowfall was followed by about 10 days of brutally cold temperatures. Billings and Livingston each had seven consecutive days with high temps remaining below zero. This streak was the longest on record for Livingston, and the 3rd longest at Billings. Temperatures turned warmer the 3rd week of February, and by the end of the month, lower elevation snow cover was nearly gone. Nonetheless, drought conditions improved slightly over much of the region, but remained severe in the east where snow was minimal.

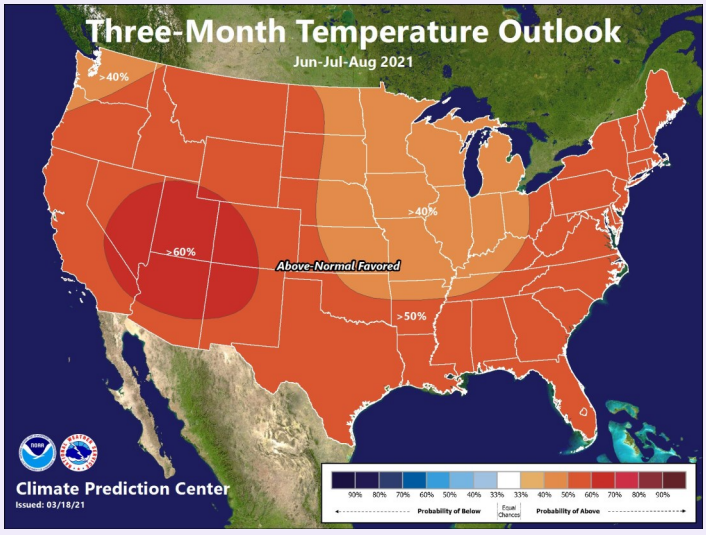
The following is a summary of temperatures and precipitation from December through February at our main climate stations.

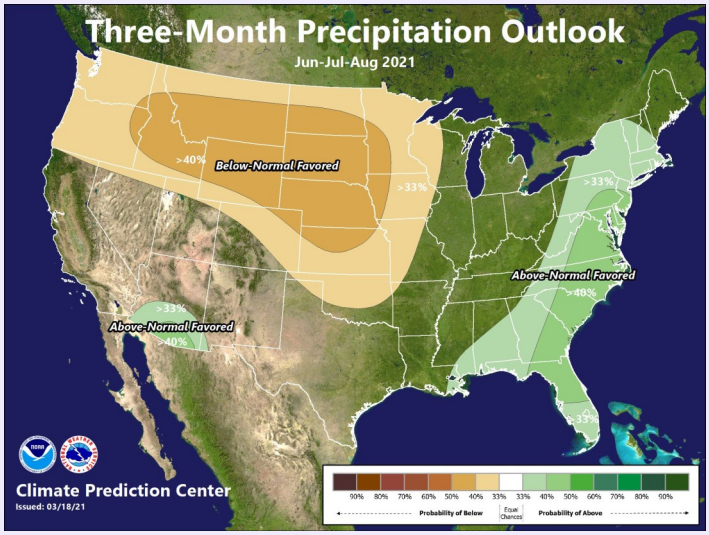
	Average Temp (°F)	Departure from Normal	Total Precip (inches)	Departure from Normal	Total Snowfall (inches)	Departure from Normal	Period of Record Began
Billings	**28.1**	**+ 0.2**	**1.74**	**+ 0.28**	**24.3**	**+ 1.5**	**1934**
Livingston	**27.8**	**+ 0.5**	**0.87**	**- 0.64**	**These stations do not report snowfall**		**1948**
Miles City	**23.6**	**+ 2.3**	**0.50**	**- 0.34**			**1937**
Sheridan	**25.4**	**+ 1.0**	**2.34**	**+ 0.68**			**1907**
Baker	**22.2**	**+ 3.0**	**0.34**	**- 0.64**			**1998**

2021 Summer Outlook

Joe Lester - Lead Meteorologist

Seasonal temperature and precipitation outlooks are created by the Climate Prediction Center (CPC) in College Park, MD, and are updated once per month. CPC considers the El Nino Southern Oscillation (ENSO - currently La Nina), recent climate trends, and several dynamic and statistical models when making their predictions. As you can see in the maps below, our region is currently highlighted for increased probabilities of warmer and drier than normal conditions from June through August. While this forecast may seem to suggest drought and an active fire season, keep in mind that these probabilities are small. Also, nearly half of our region's annual precipitation occurs from April to June. A wet spring would go a long way toward enhancing agriculture, and keeping our summer fire season in check.





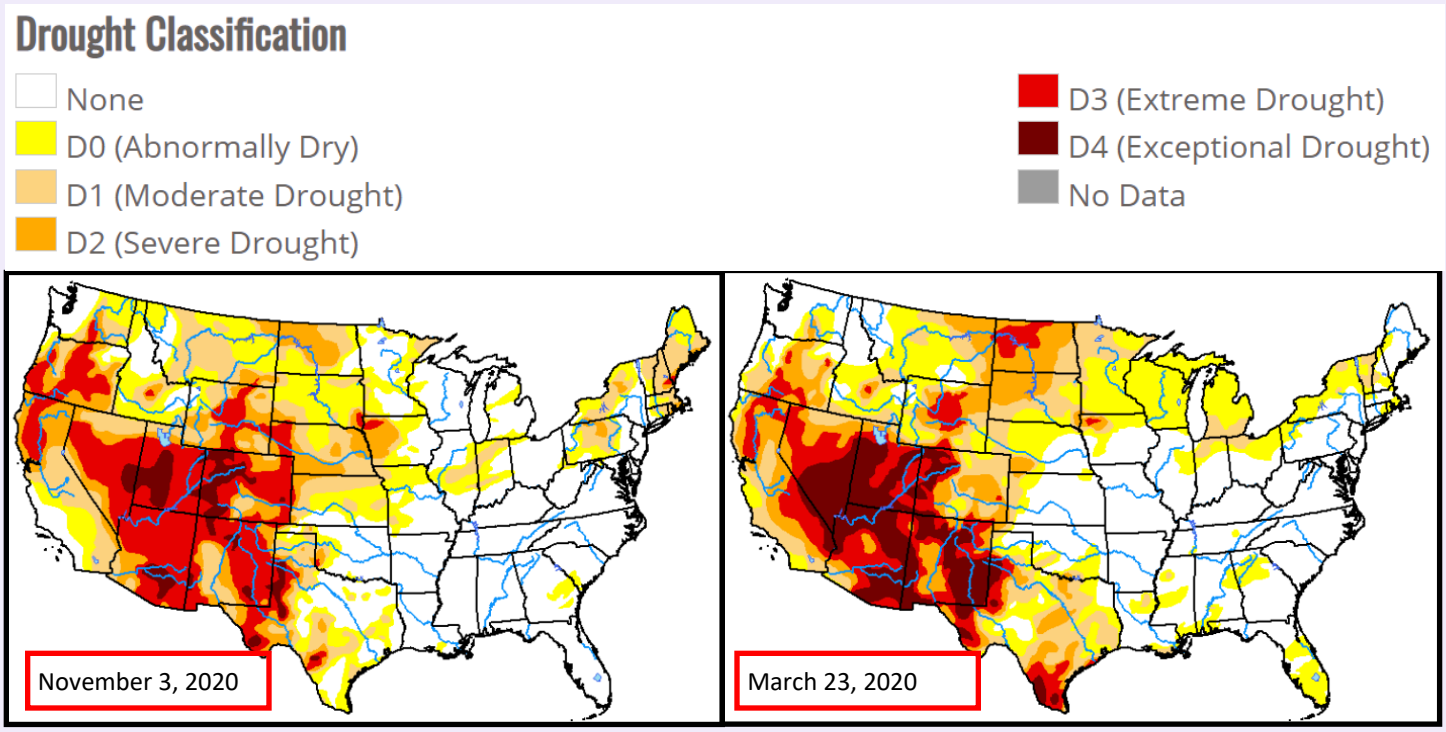
How hot can it get in southeast Montana and north central Wyoming? Because of its semi-arid continental climate, summers can be hotter than other locations that are further south and more humid. In fact, the record hottest temperature at Billings is higher than that of eight other states (Alaska, Connecticut, Hawaii, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont)! The following table shows record high temperatures at our main climate stations.

Site	Record High Temperature	Date
Billings	**108°**	**7/14/2002**
Livingston	**105°**	**8/5/1961**
Miles City	**111°**	**6/26/2012**
Sheridan	**107°**	**7/13/2005 & 7/14/2002**

From the Hydrology Desk

Todd Chambers - Lead Meteorologist

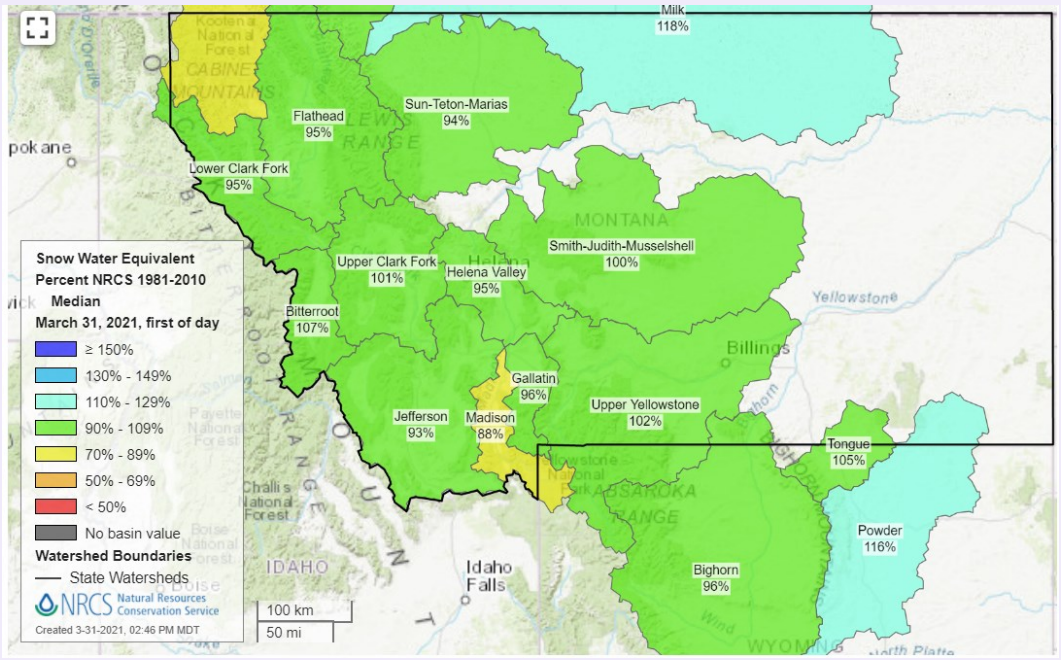
Last fall the drought monitor showed a large portion of the southern MT into northern WY in Moderate or worse drought (left image). But thanks to precipitation in mid-February and mid -March, drought conditions have improved in many areas. That said, conditions along the eastern state line have worsened into severe drought as recent precipitation has missed far eastern Montana and the western Dakotas.



The February/March precipitation has also boosted the snowpack across our mountains, which is key for river and streamflows this summer. As of the end of March (image on next page), the latest snowpack information from the Natural Resources Conservation Service (NRCS), shows most of the river basins near 100% of normal, and the Powder River basin at 116% thanks to the massive Colorado/Wyoming blizzard the second week of March that pushed heavy snow all the way into the southern Bighorn mountains. Given the current snow-pack, water supply forecasts look good for the summer.

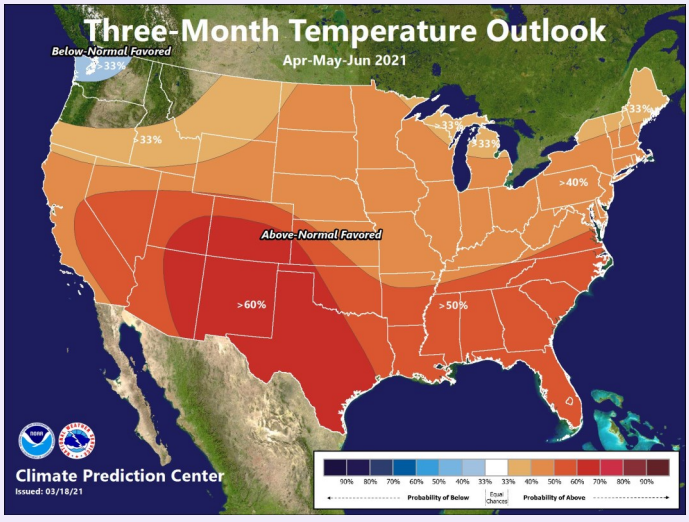
From the Hydrology Desk (cont.…)

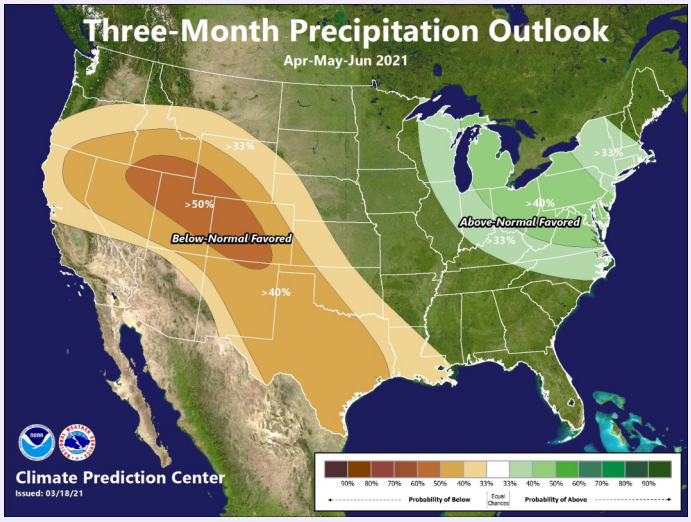
Todd Chambers - Lead Meteorologist



Current river flood outlooks (https://water.weather.gov/ahps/long_range.php) show little reason to be concerned based on snowpack alone. However, flooding of rivers in the Northern Rockies depends on more than just snowpack. Prolonged heatwaves in the early summer can cause rapid melting that can push rivers out of their banks. Multi-day heavy precipitation producing storm systems can also turn what was a low flood probability year into a flood reality. So, while the current flood outlook is for low flooding chances, we will have to keep an eye out for hot temperatures and heavy precipitation events that could throw a wrench in that forecast come May and June.

Below are the Seasonal Outlooks for the April through June period. They show an area of below normal precipitation over the Great Basin pushing north into Wyoming and southern Montana. For temperatures, the area is leaning warmer than normal through the period. This doesn't mean that a cool and wet late spring and early summer are out of the question, just that the current climate signals are leaning warmer and drier than normal.





Fire Weather Page

Dan Borsum - Lead Meteorologist

StoryMaps: Fire Siege 2020 – The Stories and Work of the NWS

A selection of the ArcGIS Online Storymaps that are part of the Fire Season 2020 Story project being lead by Krista Carrothers and Dan Borsum at NWS Billings.

Two of our meteorologists, Krista Carrothers and Dan Borsum, initiated a project to tell the stories of Fire Season 2020 through the eyes of the National Weather Service Meteorologists. This generated a nationwide NWS effort to create a collection of ArcGIS Storymaps that detail the NWS efforts in support of the fires and the profound impacts the fires had on their lives and others.

Why pick this past fire season? It was a year that started relatively slowly but as the month of August progressed, the number of fires across the west escalated, enhanced by a lightning outbreak on August 17-19 and then a wind event on September 7-9. Even snow for some parts of the west on Labor Day weekend was not enough to stop the fires, which would resurge through October.

These events would bring intense workload upon NWS Meteorologists and brought the threat of devastating fire right into their own families' lives. The specialized Incident Meteorologists (IMETs) who work onsite alongside firefighters monitoring conditions and developing strategies were deployed in record numbers in late September and October. These Storymaps are intended as a tribute to the NWS staffers' hard work in the face of long hours and emotional toil.

You can access the stories from this link:

https://storymaps.arcgis.com/stories/c6535ee477e14b72a20393a5f10aefbc

Meteorologists Strive to Improve Communication Of High Impact Weather

Brian Tesar - Lead Meteorologist

Residents across the area may recall the high wind episode back in January which affected the region. Wind gusts of 55 to around 80 mph were common.

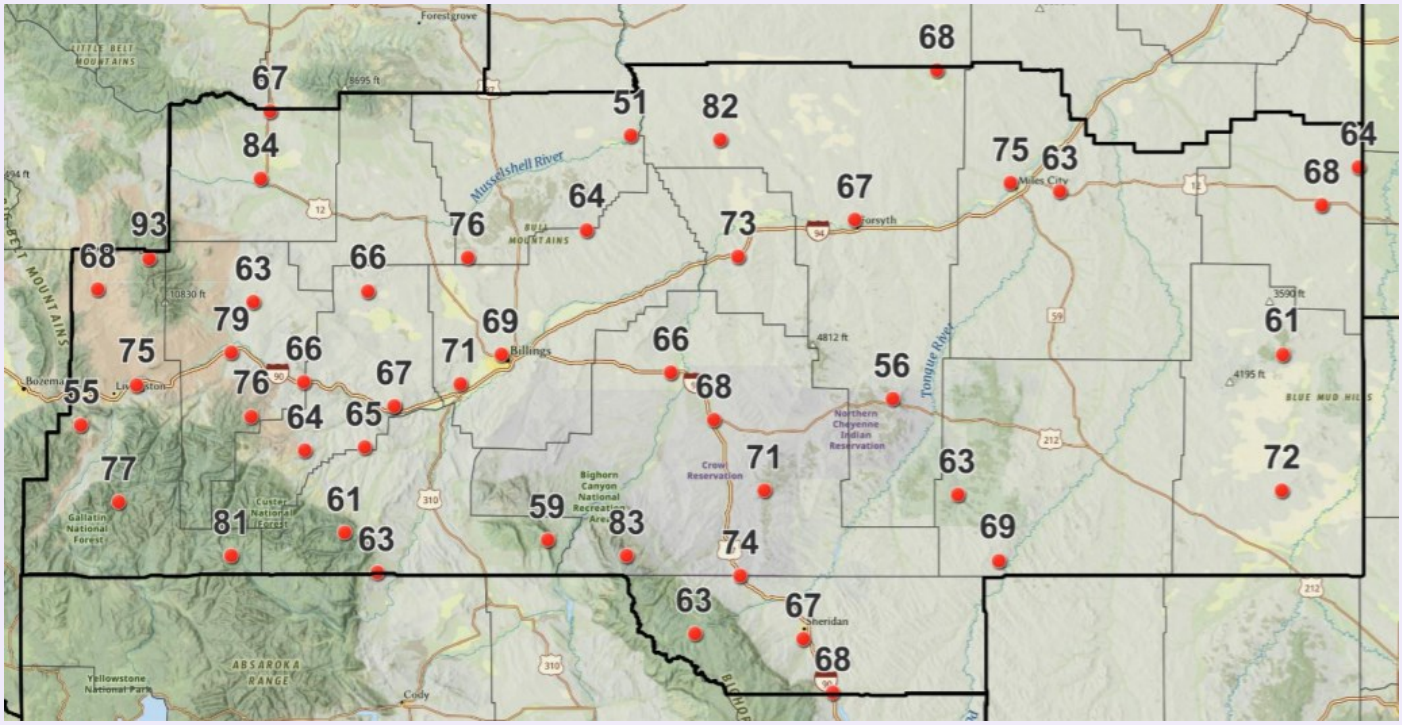


Figure 1 - Peak Wind Gust reports January 13-14th, 2021

The impacts were numerous including downed trees, power outages, home and fence damage, semi-trucks blown over, rapid growth of wildfires and flipped over irrigation sprinklers.

While the forecast laid out these possibilities well in advance, we continue to work at letting folks know just how potentially strong peak gusts may get and the associated risks. For instance, a High Wind Warning means gusts of at least 58 mph should be expected. That's relatively tame for many areas in the foothills and nearby plains, but gusts reaching 70-80 mph? That's a whole different animal, especially if it lasts for several hours like it did back in January.

However, meteorologists have new tools to examine the potential and probability of certain thresholds of wind or snow. Some new tools compare a developing weather pattern to past events and climatology. Other new model output will give meteorologists quick access to probabilities of given thresholds (think 30% chance of winds over 75 mph).

Meteorologists Strive to Improve Communication Of High Impact Weather (cont….)

Brian Tesar - Lead Meteorologist

This will allow meteorologists to choose more specific descriptions of risks associated with weather events, rather than simply using vague terms (i.e. low, medium, high).

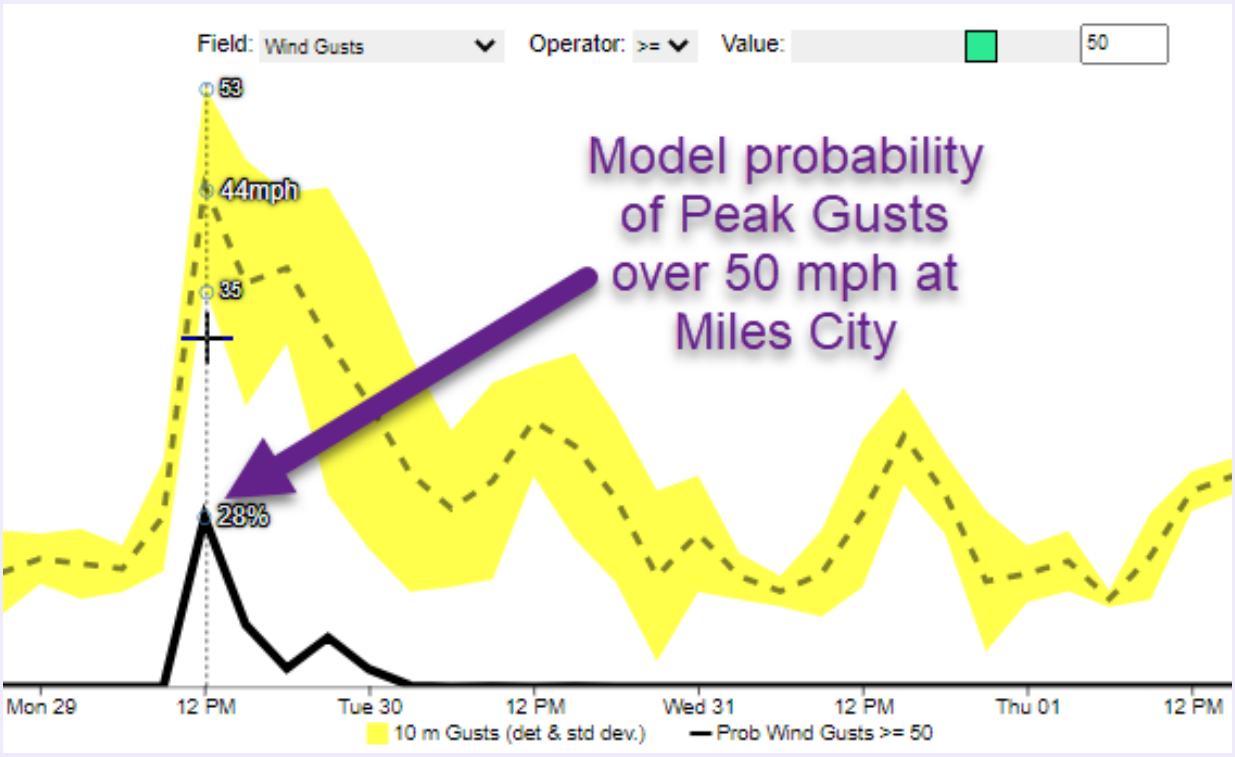


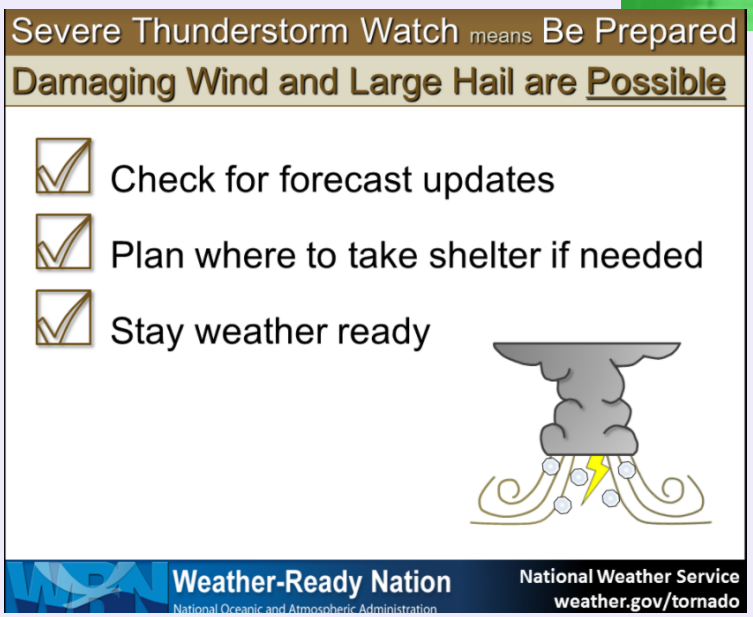
Figure 2- Model output for wind gust probability at Miles City, MT for March 29th, 2021.

Our meteorologists continue to train heavily on our new tools and experiment with the best way to communicate the information, either graphically or easy to understand language, to our partner agencies and the public. Be sure to keep a lookout on our website and social media outlets for this type of information. We always like to hear feedback as well, to help fine-tune our messaging!

Weather-Ready Wednesday

Julie Arthur - Meteorologist

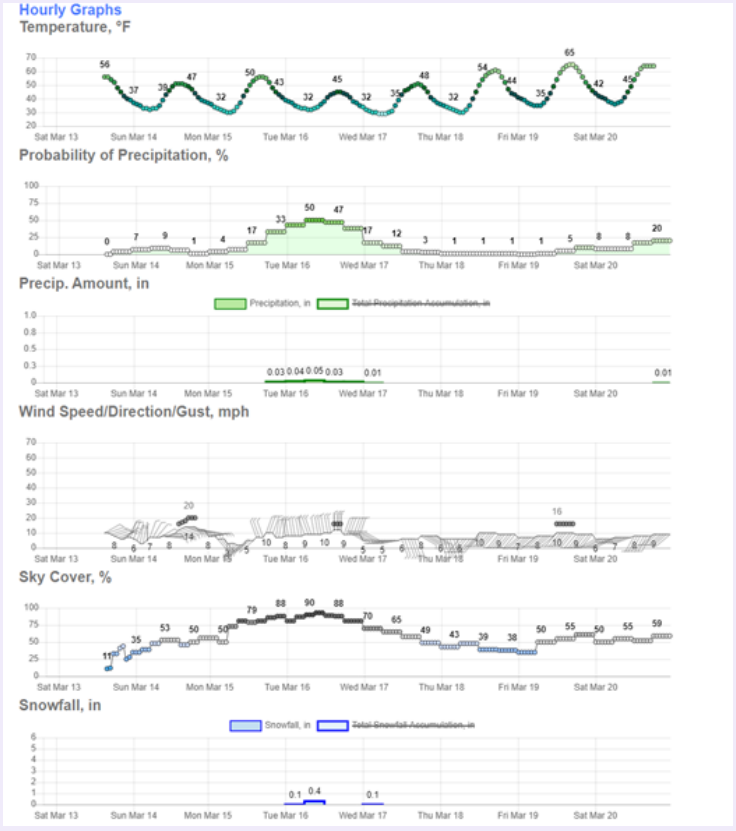
A reminder, that each Wednesday, we will post a weather safety tip or educational weather information on Social Media, including Facebook and Twitter. Our goal is to make the post relevant to current or upcoming weather conditions, so you can prepare accordingly. We enjoy seeing our posts shared or retweeted, so that safety information gets out to the widest audience possible. This service is one of the many provided by NWS Billings, MT to help keep you safe during hazardous weather!

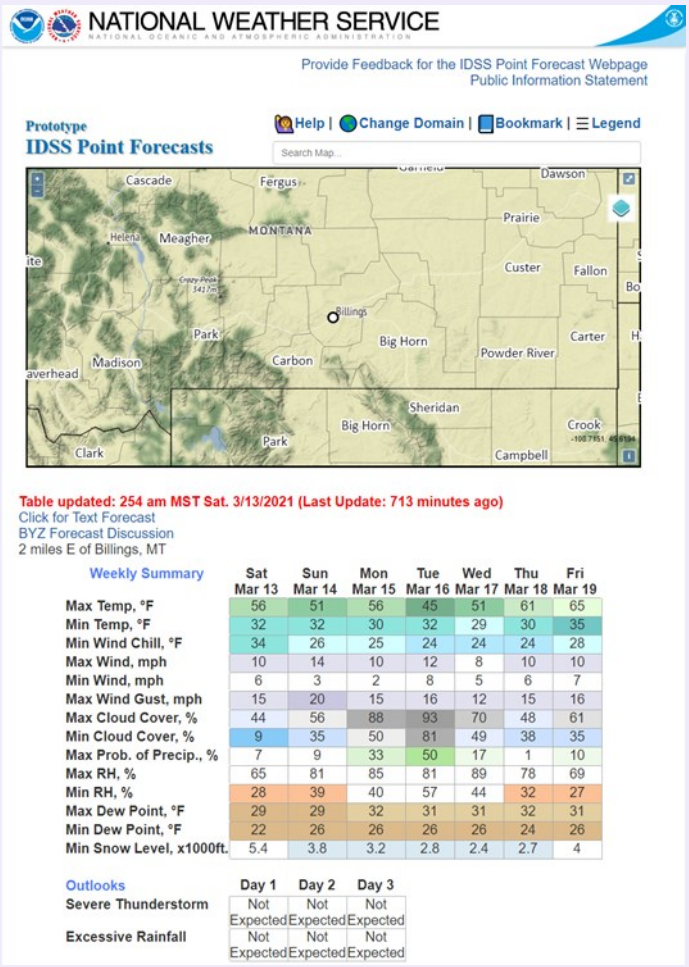


Navigating Our Website - Hourly Point Forecasts

Nick Vertz - Meteorologist

Meteorologists with the National Weather Service slave over our forecasts 24/7, 365 days a year, so of course we want better ways to deliver these forecasts to everyone. Over the past couple years, we developed a new page where everyone can get graphs and tables presenting a forecast at a single point in a more user-friendly and visually-appealing manner. When coming across this website, you can type into a search bar (located above the map) either your nearest town, or a latitude and longitude to get the forecast for that exact location. Below the map are two big tables, one giving daily forecasts, and the other giving hourly forecasts, for a multitude of weather data.





Weekly Summary	Sat Mar 13	Sun Mar 14	Mon Mar 15	Tue Mar 16	Wed Mar 17	Thu Mar 18	Fri Mar 19
Max Temp, °F	56	51	56	45	51	61	65
Min Temp, °F	32	32	30	32	29	30	35
Min Wind Chill, °F	34	26	25	24	24	24	28
Max Wind, mph	10	14	10	12	8	10	10
Min Wind, mph	6	3	2	8	5	6	7
Max Wind Gust, mph	15	20	15	16	12	15	16
Max Cloud Cover, %	44	56	88	93	70	48	61
Min Cloud Cover, %	9	35	50	81	49	38	35
Max Prob. of Precip., %	7	9	33	50	17	1	10
Max RH, %	65	81	85	81	89	78	69
Min RH, %	28	39	40	57	44	32	27
Max Dew Point, °F	29	29	32	31	31	32	31
Min Dew Point, °F	22	26	26	26	26	24	26
Min Snow Level, x1000ft.	5.4	3.8	3.2	2.8	2.4	2.7	4

Outlooks	Day 1	Day 2	Day 3
Severe Thunderstorm	Not Expected	Not Expected	Not Expected
Excessive Rainfall	Not Expected	Not Expected	Not Expected

Below these tables are hourly graphs of the same weather variables. Both the tables and graphs present an easy way to quickly glance over the upcoming forecast for the next day, or even week! Those interested in this page can find it by using the link below

https://www.weather.gov/forecastpoints

We Have an Instagram Now!

Nick Vertz - Meteorologist

We're excited to announce that we are on Instagram, and you can find us at ***nwsbillings***. However, note that we will use this platform a bit differently from our Facebook or Twitter accounts.

We will not use this platform as a venue to message time-sensitive products (such as thunderstorm or winter storm warnings, radar loops, dangerous incoming weather, etc.)

Instead, we are focusing on…

- Beautiful weather-related photos from across south-central and southeast Montana, and north-central Wyoming.
- Event or monthly reviews, such as posting observed wind speeds, snow totals, hail sizes, or temperature recaps, etc.
- Interesting weather facts
- Non-impactful weather forecasts (such as a 3-day temperature forecast for mild conditions)

So, if you're on Instagram, or been debating on getting one, now's the time to hop on and follow your local National Weather Service office! This is a prototype and may end at the end of June, so come check us out while we're still active!

Are you looking for at-home weather education materials?

We can help!

Check out our education resources at:
https://www.weather.gov/learning

INFORMATION STOP

Stay Informed During Hazardous or Severe Weather

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https://www.weather.gov/safety/thunderstorm

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Flood Safety:

https://www.weather.gov/safety/flood

Advanced Hydrologic Prediction Services (Rivers and Lakes):

https://water.weather.gov/ahps/