Jet Stream Jargon

National Weather Service
Billings, MT

April 2017 Spring Issue

Inside this issue:

From the Desk of the Meteorologist in Charge

Wow! What a winter 2016-17 turned out to be. The combination of snow and cold, and it's longevity through December, January and early February made many people, including myself, longing for Spring and some warmer weather. The upside of this past winter has been the bountiful snow in the mountains that will certainly aid our area's water supply as we head into the summer months. So despite the challenges this winter provided many of us, it is useful to keep in mind there is often a silver lining amid what may initially seem like adversity.

As we head into Spring, and you read further along in this issue of the Jetstream Jargon, you will see that our concern now turns to that mountain snowpack and what that may mean for potential flooding across the area. As is true each Spring, the runoff from the mountain snowpack melting has a few factors that determine whether the runoff is eventful or uneventful. First, we will be monitoring the state of the snowpack as we move through April (i.e. will it stay above normal or fall below normal) to determine how the risk changes as we approach May 1st. Traditionally, we don't see much runoff until we get into May. Second, we will be monitoring temperatures to determine when the mountain snowpack has "ripened" for melting and then keep our eyes open for prolonged stretches of well above normal temperatures which could melt the snowpack too quickly. Finally, we always look for what we believe is the "fly in the ointment"...slow moving, large weather systems that produce widespread, multi-day rains across the Northern Rockies. These types of systems have historically complicated the spring runoff in our area or exacerbated any existing high flows on area rivers and streams. So, at this point, it is truly difficult to say too much about our potential for spring flooding other than it is possible, and those with interests near rivers, streams and drainages should certainly keep this in mind as we move through April and May. If you have culverts or ditches that are full of debris from the winter or overgrown, it would be a good focus area for spring cleaning.

Despite our challenging budgetary climate, we have been able to take some actions to harden our capabilities, such as improving our communications capabilities via the internet, upgrading a number of 20+ year old computer components on our WSR-88D weather radar and replacing the 20+ year system that provided programming to the NOAA Weather Radios. I have been amazed that we were able to get as much out of the 20+ year old technology as we did. However, repairing these items became nearly impossible due to the age of the technology.

Finally, we are looking forward to leveraging a new data stream coming to us from the recently launched GOES-16 (also known as GOES-R) satellite. This new satellite will provide us with 1-minute data updates and 1 km resolution data in many cases. The new satellite will also, for the first time, provide us with lightning detection from space (both cloud-to-ground and cloud-to-cloud). This provides great promise for us to extend research findings into our severe weather warnings and potentially add more advance lead time to severe weather warnings.

I hope you enjoy the information our staff has provided in the following pages. Have a safe and productive summer!

Keith W. Meier

Winter Recap

A Recap of Meteorological Winter (December - February)

In stark contrast to last winter, the 2016-17 winter will be remembered mostly for it's snowfall, in particular a big mid December snow event, along with an extended period of snow cover. Overall temperatures were well below normal across the region, but there were not any extreme cold snaps.

After a dry and mild start to winter, cold air arrived in our region on December 5th. The largest snow event of the winter (for the western half of our forecast area) occurred on the 15-16th of December. A whopping 23 inches of snow fell at Big Timber, and many areas from Billings westward received at least a foot of snow. The 16.9 inches that fell at the Billings airport was the 5th highest 2-day total since records began in 1934. Cold air settled into the region by the 17th, with most locations seeing low temps in the -20s and -30s. Finally, as the cold air began its retreat, strong winds along the western foothills caused significant blowing and drifting snow, closing I-90 from Livingston to Park City for about 27 hours. The peak wind gust at Livingston was 83 mph. It was a remarkable stretch of winter weather from December 15th to 19th.

Late December saw near normal temperatures. Cold air returned for the first half of January, when most of the area experienced below zero nighttime temperatures for a couple weeks, along with periods of snowfall. The second half of January was a little warmer than normal and snow cover diminished, but overall it was a very cold month. February was near or a little warmer than normal.

Billings received 55 inches of snow from December through February, which was the 3rd most on record for meteorological winter. Billings also reported snow cover of at least 1" for an extended period of time, from December 10th through January 29th. The 51 consecutive days was the 6th longest stretch on record for Billings. Livingston observed its 6th coldest winter on record. Here is a summary of statistics at our four main climate stations :

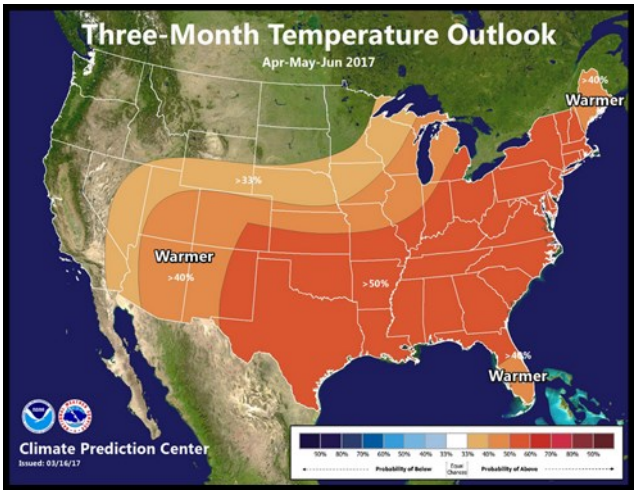
	Avg. Temp (°F)	Departure from Normal	Total Precip (inches)	Departure from Normal	Total Snowfall (inches)	Departure from Normal
Billings	**22.3** (11th coldest)	- 5.5	**3.13** (7th wettest)	+ 1.67	**55.0** (3rd highest)	+ 27.2
Livingston	**23.4** (6th coldest)	- 5.2	**1.68** (23rd wettest)	+ 0.17	*Records go back to:* *1934 @ Billings* *1948 @ Livingston* *1937 @ Miles City* *1907 @ Sheridan*	
Miles City	**17.7** (21st coldest)	- 4.6	**0.58** (16th driest)	- 0.26		
Sheridan	**19.8** (22nd coldest)	+ 4.9	**2.70** (22nd wettest)	+ 1.04		

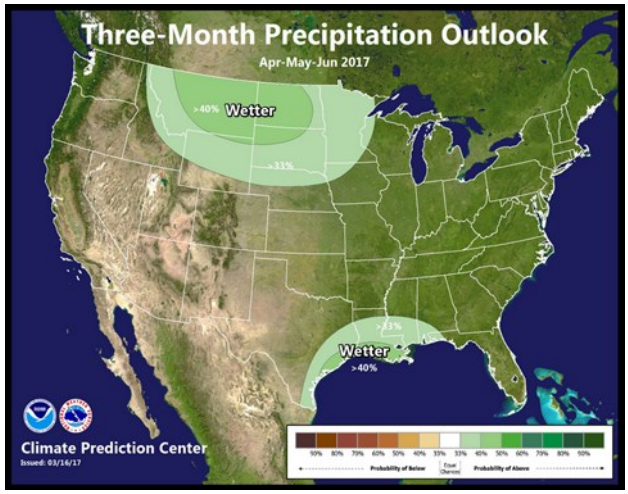
Interesting Note: As of April 1, 2017; Billings has picked up a ***seasonal*** snowfall total of nearly 71 inches! This is the 16th snowiest winter season on record (so far) for Billings.

Spring Outlook

Outlook for the Spring and early Summer (April through June)

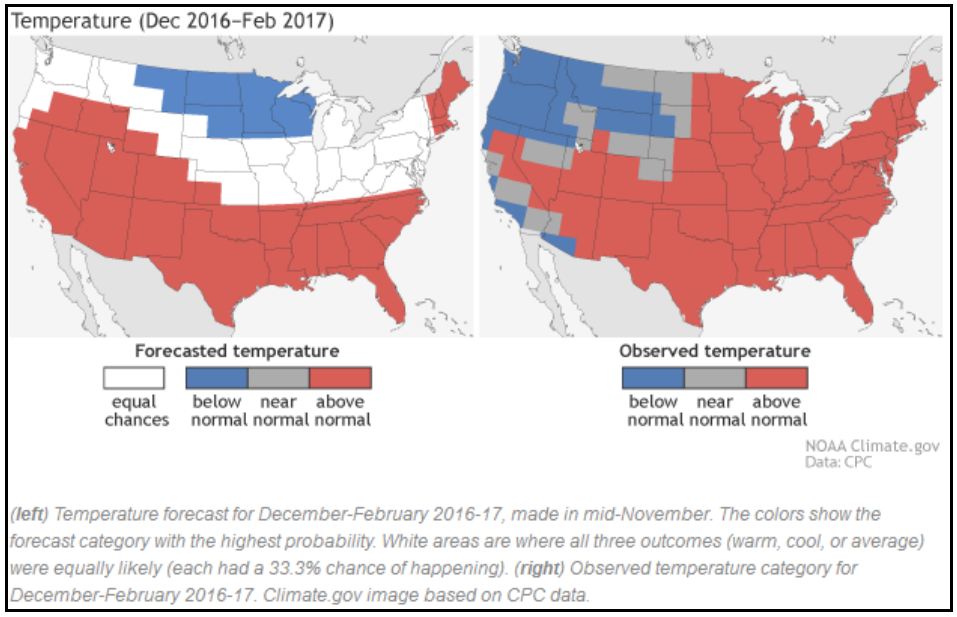
April through June represents the wettest time of year for our region, with nearly half of our normal annual precipitation falling during this 3-month period. Current indications are that there are equal chances for above, below or near normal temperatures. For precipitation, the odds are elevated for wetter than normal conditions. Given the mountain snowpack is currently near or above normal, and wetter than normal conditions are possible over the next couple months, there is an increased potential for river flooding this spring. Here are the official temperature and precipitation outlooks from the Climate Prediction Center.





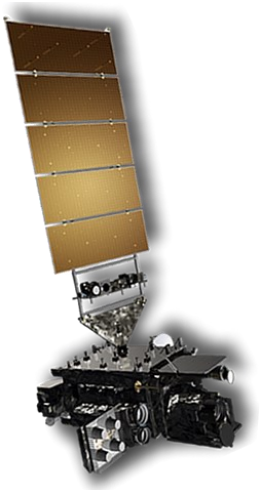
The 2016-17 Winter Outlook - How did it Verify?

The 2016-17 meteorological winter season has come to an end, but do you remember what the Winter Outlook looked like? The Climate Prediction Center recently looked back at its outlook from several months ago to examine its accuracy. As you can see from the temperature graphics below, some areas of the country verified quite well while others did not. Please see this article for more information: https://www.climate.gov/news-features/blogs/enso/winter-outlook-2017-%E2%80%93-how-did-we-do

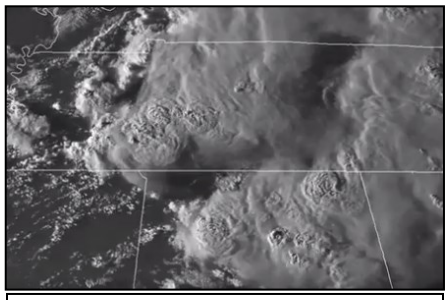


*(**left**) Temperature forecast for December-February 2016-17, made in mid-November. The colors show the forecast category with the highest probability. White areas are where all three outcomes (warm, cool, or average) were equally likely (each had a 33.3% chance of happening). (**right**) Observed temperature category for December-February 2016-17. Climate.gov image based on CPC data.*

New Weather Satellite: GOES-16

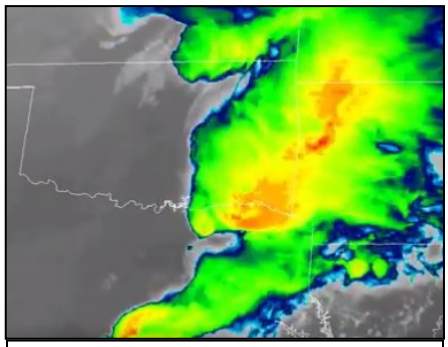


On the evening of November 19th, 2016 NASA successfully launched for the National Oceanic and Atmospheric Administration (NOAA) the first in a series of highly advanced geostationary weather satellites. NOAA's Geostationary Operational Environmental Satellite-R (GOES-R) lifted off on its way to boost the nation's weather observation capabilities, leading to more accurate and timely forecasts, watches and warnings.



3/28/17 - Visible satellite picture of severe storms over the MS and OH Valleys

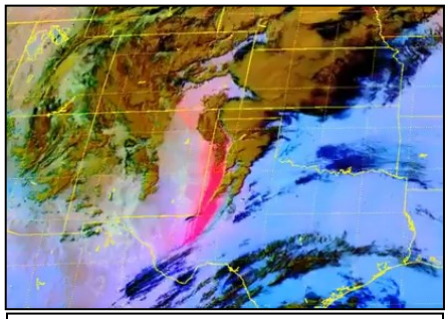
Shortly thereafter, it reached its final designated orbit, subsequently being renamed GOES-16. The new satellite will become operational this fall, after undergoing a checkout and validation of its six new instruments, including the first operational lightning mapper in geostationary orbit.



3/27/17 – Infrared satellite picture of severe storms over the OK and TX

The satellite's primary instrument, the Advanced Baseline Imager, will provide images of Earth's weather, oceans and environment with 16 different spectral bands, including two visible channels, four near-infrared channels, and 10 infrared channels. National Weather Service forecasters will utilize the lightning mapper to hone in on storms that represent the greatest threats. This is of particular importance to forecasters at our office in Billings, as radar coverage is sparse over portions of southeastern Montana. In addition to helping improve the monitoring and forecasting of severe weather, there are many other benefits to be recognized in fire weather and hydrology.

Beyond weather forecasting, GOES-R also will be part of the Search and Rescue Satellite Aided Tracking (SARSAT) System, an international satellite -based search and rescue network operated by NOAA. The satellite is carrying a special transponder that can detect distress signals from emergency beacons.



3/24/17 – Satellite picture showing a "pink" plume of dust picked up by high winds in TX

There are four satellites in the GOES-R series: –R, –S, –T and –U, which will extend NOAA's geostationary coverage through 2036.
You can follow the very latest on our series of satellites on Facebook (NOAA Satellite and Information Service) or Twitter @NOAASatellites.

Note: GOES 16 images displayed are Preliminary and Non-Operational Data

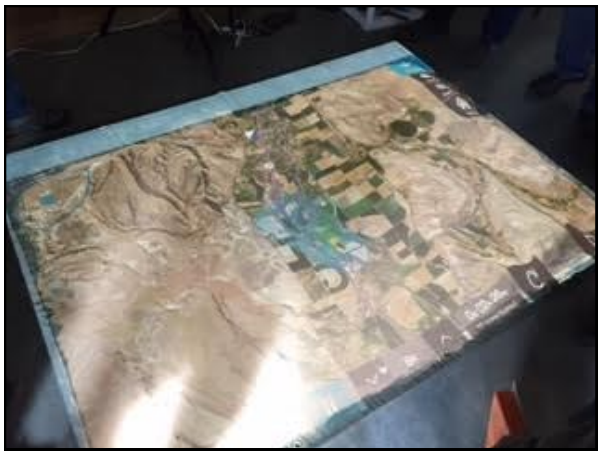
Community Preparedness

NWS Working with Partners to Test Disaster Preparedness

The National Weather Service works together with emergency managers and other local government groups on a daily basis to keep you safe. While current weather events are often the focus of our day-to-day operations, we also spend quiet weather days preparing for unexpected emergencies. One test of this preparedness was enacted on Saturday March 18, 2017. Multiple agencies including the fire department, law enforcement, emergency medical services, public health, BNSF, Carbon County Disaster and Emergency Services, Fromberg Schools, County Commissioners, Yellowstone County Disaster and Emergency Services, and the National Weather Service came together in the city of Fromberg to test a coordinated response to a simulated train derailment. It's about building professional relationships before a disaster and not during.

Charlie Hanson from Montana Disaster and Emergency Services moderates exercise.

The simulated incident took place during a spring morning in late May when the tourist season begins to pick up across Montana. The simulation was a train headed northbound next to Highway 310 when it struck a vehicle stalled on the railroad tracks near Fromberg. This simulated collision caused the train to derail and a few tankers to catch fire. Periodic injects of new information were included into the simulation as agencies began attacking the incident. Fifteen minutes in, firefighters first to the scene noticed a toxic haze over the region that caused irritation and difficulty breathing when contact was made. Thirty minutes into the simulation, more information about the toxic haze was introduced, and it was now known that the train was leaking sulfuric acid. At this point in the incident, things really started to intensify, as folks traveling on Highway 310 were in danger. Agencies needed to know where this toxic cloud was heading and if the highway needed to be shut down. The fire continued to grow, and the complexity of the incident quickly increased. Evacuation orders were issued shortly after, and firemen, emergency managers, and law enforcement had to deal with increasing public concern as the incident grew. Later in the simulation, managing the incident became more complicated as additional problems of containment, national media attention, arrival of senators and congressmen, cleanup, and dealing with grieving family members tested the response of the involved agencies. Although brief, the agencies also worked on demobilizing as conditions became safer, and the media attention waned.



An Event Simulator simulates a plume as it advances along the Clarks Fork River Valley.

The National Weather Service's responsibility through the simulation was to provide weather support that would help decision makers plan evacuation routes, road closures, and keep emergency personnel safe. The 6 hour simulation (taking place over a simulated week) proved a great success! All the agencies involved were able to exchange critical information on operations; some proving successful and others needing improvement. When the next disaster affects the region, the National Weather Service as well as all agencies involved, will be better prepared to keep you safe.

Severe Weather Safety

It's Time Again to Prepare For the Impacts of Spring and Summer Weather

We experienced it all in 2016; Damaging tornadoes, hail, wind and flooding!

Are you "Weather-Ready" for the 2017 severe thunderstorm season?

Here are some things you can do to ensure you are Weather-Ready:

Know Your Risk: Check our website each and every morning. It is a simple action that will ensure that you're ready for the day's weather. Don't leave home without knowing the forecast.

Take Action: It's always important to have an emergency supply kit, no matter what type of emergency impacts us. This includes a 72 hour supply of food and water. Also, develop a plan to ensure family and friends know how they can reach you in an emergency. This plan would include meeting places, and alternate ways to communicate in case of an emergency.

Be A Force of Nature: Inspire others by sharing your preparedness activities with family and friends.

Become a volunteer severe storm spotter and learn how to identify and report severe weather to your local National Weather Service Office, keeping your local community informed of potentially hazardous weather! Weather spotters play an important part in our daily forecast and warning operations.

Training will be conducted through May, and thanks to some great hosts willing to sponsor our training this year, we have a full schedule with classes available throughout the region.

Full schedule of training at:
https://www.weather.gov/byz/spotter_training

Severe Weather Communications

How Will You Stay Informed This Spring and Summer?

Here are some of your options to help you stay informed regarding incoming hazardous weather:

NOAA Weather Radio: This is your direct link to NWS warnings! Specially built receivers will alert you when watches and warnings are issued for your area and also keep you informed on the latest forecast 24/7. Weather Radio receivers can be purchased in most electronic and many department stores for $30 dollars or less.

More information at: http://www.wrh.noaa.gov/byz/nwrhome.php

Wireless Emergency Alerts: If you have a newer smartphone that is Wireless Emergency Alert Capable, you are already signed up. Your phones will alert you for Tornado Warnings, Flash Flood Warnings, Amber Alerts or critical Presidential Alerts during national emergencies.

More Information: https://www.fema.gov/frequently-asked-questions-wireless-emergency-alerts

Red Cross Apps: The Red Cross has numerous apps available for emergencies. Specifically for severe weather, a Tornado App is available. This app will alert you for both Tornado and Severe Thunderstorm watches and warnings. Check out the wide variety of apps available.

More information: http://www.redcross.org/get-help/prepare-for-emergencies/mobile-apps

FEMA App: Install the FEMA App and receive alerts from the National Weather Service and get safety reminders, tips for survival among other preparedness information.

https://www.fema.gov/mobile-app

Forecast on the go: Point your mobile web browser to

http://mobile.weather.gov

Severe Weather Awareness

Follow us on Facebook and Twitter to learn more about severe weather! Remember to look for safety tips on hazardous weather each Wednesday on ***Weather-Ready Wednesday***.

Know Your Risk, Take Action and Be a Force of Nature.
WATCH - Potential exists for severe weather to occur within the next several hours but the exact location and timing aren't known. **Action can be taken to protect property such as putting your vehicle in the garage, putting away patio furniture, etc.**

WARNING - Severe weather is occurring or will occur shortly. **Immediate action should be taken to protect yourself by going to the lowest portion of a sturdy building, or into a closet, hallway or room without windows. When Thunder Roars, Go Indoors!**

Tornado: A violently rotating column of air, in contact with the ground, that extends from the base of a thunderstorm to the ground. This is often visible as a funnel cloud with swirling dust or debris near the surface.

- You may have only minutes to find shelter before a tornado strikes. Practice a family tornado drill at least once a year.
- In 2016, Montana had 6 tornadoes confirmed.

Severe Thunderstorm: A thunderstorm that produces hail of 1 inch or larger (quarter size) and/or a wind gust to 58 mph or higher.

- In 2016, Montana had 205 high wind and damaging wind events, 256 large hail reports.
- Sheridan County, WY had 6 high wind reports and 4 large hail reports.
- In 2016, there were 38 lightning fatalities nationwide.
- Plan outdoor activities to avoid thunderstorms.
- Check to see if officials in charge of sports have a written lightning safety plan.

Flash Flood: A sudden inundation of water in low-lying areas, usually brought on by heavy rain, dam break, rapid snowmelt or ice jams.

- In 2016, Montana had 3 Flash Floods.
- It only takes 12 inches of water to carry off a small vehicle.
- Whether driving or walking, any time you come to a flooded road, Turn Around Don't Drown®.
- Get to higher ground as quickly as possible.

Extreme Heat:

- During a heat wave, reschedule strenuous outdoor activities for the coolest time of the day.

Wildfires:

- If you live near wildland areas, make sure your home is Firewise and fire-safe.

Hydrology Outlook

From the Hydrology Desk - *Todd Chambers - Senior Forecaster*

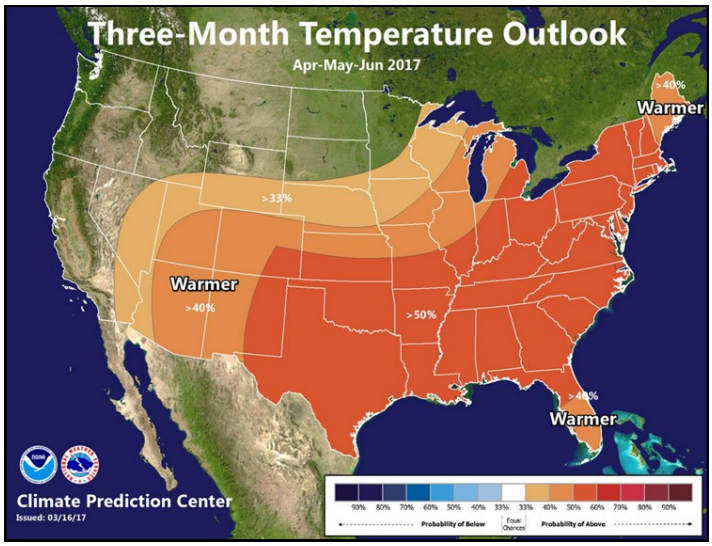
As we head into the spring runoff season the question for those living along area waterways is whether their beloved river or stream will bring forth an early summer nightmare of muddy debris and flood damage. So, what do we look at to derive a flood season outlook in the northern Rockies? And, what can we discern about this year's flood potential?

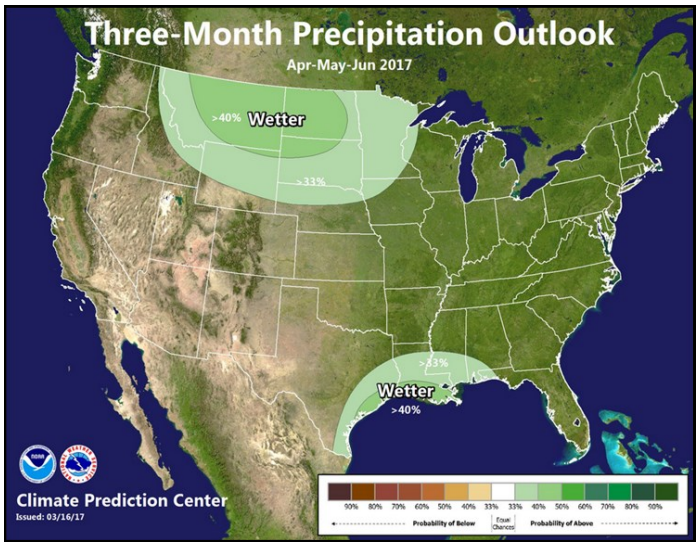
First we look at snowpack, which is the main driver of high water in our rivers and streams. If there is little snow in the mountains, flooding potential falls off a cliff. Where are we this season? Well, the fall was wet but also warm, so the snowpack got off to a slow start in October and November in the high country. However, a persistent flow of rich moisture off the Pacific laid down a significant snowpack through the rest of the winter, especially over the Beartooth/Absaroka peaks. As a result, most of our area is near normal for snowpack this time of year. The low basin is the Musselshell sitting at about 80 percent of average, while the Yellowstone and Clarks Fork drainages are the wettest at around 140 to 160 percent.

For the latest Snowpack Information:
NRCS Snowpack Information

Once we figure out if we have the fuel for flooding (good mountain snowpack) we need to look at the spring and early summer outlooks. This is because the manner in which the snowpack melts is the key to how heavy the runoff gets at any one time. A cool spring will prevent snow melt and result in more gentle flows, while a prolonged heat wave in late May can bring a torrent of snow melt into rivers and streams causing them to go out of their banks. So temperatures heading into April, May and June are a big factor. The current temperature outlook for the spring and early summer points toward equal changes of above or below normal temperatures (lower left image).

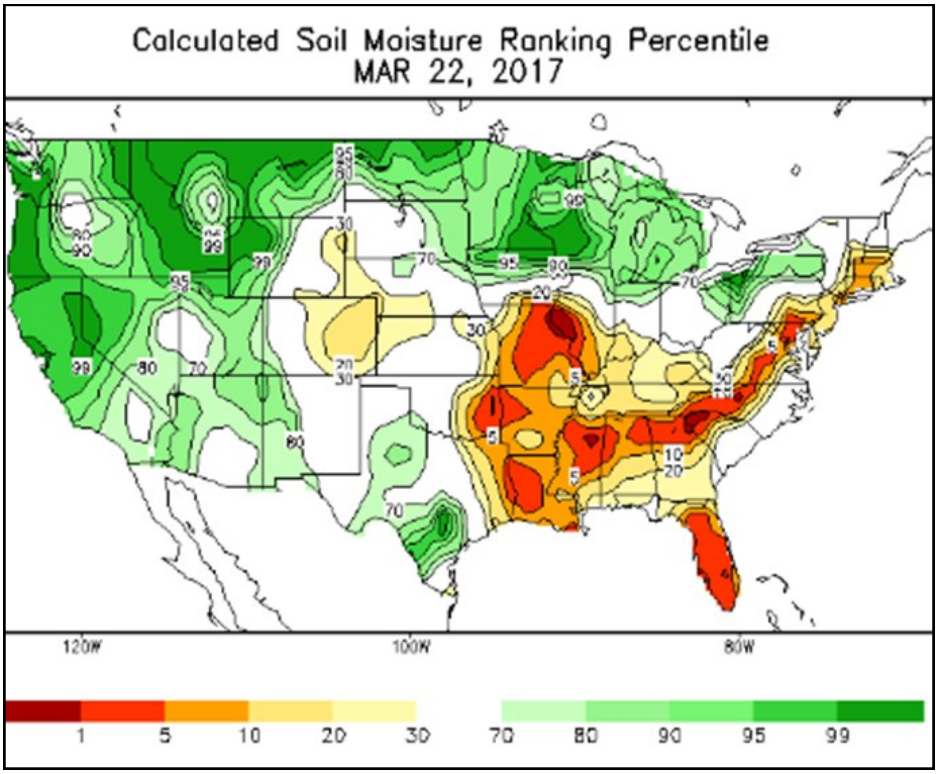
Next we look at the spring precipitation outlooks. The main component of the flooding in 2011 was not the above normal snowpack that existed that spring, but the year's worth of rain that fell in May. So, a dry outlook will limit flooding potential and a wet outlook will enhance it, as rain water fills up waterways that are already beginning to fill up due to snow melt. The current moisture outlook for the spring and early summer shows a strong lean toward above normal precipitation (lower right image), which actually continues through the summer months. Remember that the period from mid-March through mid-June is the wettest time of year!





Hydrology Outlook

A final consideration is soil moisture. Dry soils can soak up a good deal of snow melt as it works down the mountains and into the plains. Even along riverbeds, dry soil can pull significant moisture out of the channels and into the surrounding ground. If the soils are already moist then snow melt runoff will be maximized, increasing flood potential when snowpack is favorable. So, where are we soil moisture-wise this spring? Thanks to a wet fall and good low elevation snow pack during the winter, soil conditions are wet for this time of year for most of the region.



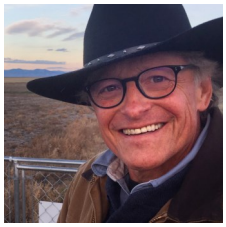
Given the normal to above normal snowpack, the forecast for seasonal temperatures and above normal precipitation, along with wet soil conditions, we should expect a strong runoff season with plenty of water in area rivers and streams. There will be a period of high flows that will present an elevated threat for flooding in some areas. At this time the focus is on the Clarks Fork and the Yellowstone where the heaviest snowpack exists, but a wet spring could create other areas of concern. Bottom line is the potential exists for flooding this year and those living along area waterways should be prepared when the waters begin to rise later this spring.

For the latest Spring Flood Forecasts:
Seasonal River Flood Forecasts

CoCoRaHS

Community, Collaborative, Rain, Hail & Snow Network

Vickie Stephenson, Hydrometeorological Technician



Kevin Hyde

Montana Climate Office – Montana Mesonet Coordinator – CoCoRaHS State Coordinator

I am pleased to introduce the newest member of the Montana CoCoRaHS family, Kevin Hyde, who, to our delight, has recently accepted the position as the CoCoRaHS State Coordinator. Kevin has called Missoula home since 1999. As the Montana Mesonet Coordinator, Kevin travels the state working with ranchers and extension agents, digging soil pits and installing climate stations to develop a high density climate and soil monitoring system. The data and maps on the Montana Climate Office website support agricultural viability and environmental management through improved irrigation and cropping efficiency, and rangeland planning. Kevin is very excited to be joining our team and has a great vision for the future of Montana CoCoRaHS. He is working toward getting a grant to help acquire rain gauges for our program, which is very exciting for us here at the National Weather Service, since we are not budgeted to purchase rain gauges for observers.

Kevin enjoys cycling, hiking, and photography, all of which keep him exploring the wilds. Quote from Kevin: "Wherever else I've lived, good fortune got me to Montana – and with continued good fortune, and good sense, I stay." Welcome, Kevin! We are happy to have you on board!

A few notes for our observers:

It's about that time again….to return your inner tube and funnel to your rain gauges for the spring/summer season. If you take your rain gauge indoors for the winter, please take it back outside. We don't suggest that you take it indoors for the winter because it will not catch the snow to allow measurement of the moisture content.

I conducted a CoCoRaHS webinar this winter in hopes of not only recruiting new observers, but also to give a refresher to the current observers, especially on snow measuring. I might like to try again this next fall. Stay tuned for details. Thanks to all of you for your dedication and all that you do! Keep up the great work!

COOP Corner

Cooperative Observer Program

2017 Length of Service Awards

Each year the National Weather Service (NWS) recognizes members of our NWS Cooperative Weather Observer Program (COOP) family who meet certain pre-established criteria for Length of Service Awards. These awards are given to observers in each of two categories: individuals and institutions. A station information report identifies an observer as either an Individual or an Institution. The Individual Award is first granted after 10 years of service and every 5 years thereafter. Observers who are descendants of observers having taken observations at the same site for 100 or more years are qualified to receive the ***Family Heritage Award*** every 25 years. The Honored Institution Award is first granted for 25 years of service and then every 25 years thereafter.

Thanks to all of you who dedicate your time and effort to your communities in Montana and Wyoming! You are the life blood of this program.

Following are the awards scheduled to be presented this year:

Station Name	Observer Name	Yr(s) of Service	Service Date
City of Colstrip	Institution (Dan Becker)	35	11/01/1982
Brandenberg	Dick Brewer	35	12/01/1982
Melstone	Lorrie Balock	30	06/01/1987
Livingston 12 S	Martin Davis	30	07/15/1987
Hysham	Eunice Achtenberg	30	04/02/1987
Alzada	Ed Lawrence	25	09/16/1992
Knobs 4 SW	Charles Brence	20	05/21/1997
Huntley Experimental Station	John Pulasky	20	07/11/1997
Roundup	Cindy Charltonn	15	04/12/2002
Rapelje	Larry Gee	15	05/01/2002
IML – Air Science	Shane Hansen	10	03/01/2007

Spring and Summer Data Tables

Spring Normals

Meteorological spring is classified as the months of ***March, April and May***. Here are the average temperatures and precipitation for the Billings Airport, the Miles City Airport, and the Sheridan Airport for the spring season. Averages are calculated using a 30-year period of record: 1981 to 2010. All temperatures are in degrees Fahrenheit and all precipitation amounts are in inches.

Billings

Date	High	Low	Average	Precipitation	Snowfall
3/1 – 3/31	48.6	26.9	37.7	1.06	10.2
4/1 – 4/30	57.6	34.7	46.2	1.66	8.3
5/1 – 5/31	67.5	43.6	55.6	2.18	2.0
3/1 – 5/31	57.4	35.1	46.3	4.90	20.5

Miles City

Date	High	Low	Average	Precipitation
3/1 – 3/31	46.5	22.8	34.7	0.60
4/1 – 4/30	58.8	33.2	46.0	1.37
5/1 – 5/31	68.6	43.1	55.9	2.18
3/1 – 5/31	58.4	34.2	46.3	4.15

Sheridan

Date	High	Low	Average	Precipitation
3/1 – 3/31	48.4	22.0	35.2	0.98
4/1 – 4/30	57.4	29.8	43.6	1.60
5/1 – 5/31	66.7	38.2	52.5	2.35
3/1 – 5/31	57.8	31.4	44.1	4.93

Summer Normals

Meteorological summer is classified as the months of ***June, July and August***. Here are the average temperatures and precipitation for the Billings Airport, the Miles City Airport, and the Sheridan Airport for the summer season. Averages are calculated using a 30-year period of record: 1981 to 2010. All temperatures are in degrees Fahrenheit and all precipitation amounts are in inches.

Billings				
Date	**High**	**Low**	**Average**	**Precip**
6/1 – 6/30	77.2	52.1	64.7	2.12
7/1 – 7/31	86.8	58.8	72.8	1.32
8/1 – 8/31	85.7	57.3	71.5	0.75
6/1 – 8/31	83.3	56.1	69.7	4.19

Miles City				
Date	**High**	**Low**	**Average**	**Precip**
6/1 – 6/30	78.6	52.6	65.6	2.51
7/1 – 7/31	88.3	59.5	73.9	1.64
8/1 – 8/31	87.2	58.0	72.6	0.91
6/1 – 8/31	85.2	57.8	71.5	5.06

Sheridan				
Date	**High**	**Low**	**Average**	**Precip**
6/1 – 6/30	76.7	46.4	61.6	2.12
7/1 – 7/31	87.1	53.0	70.0	1.18
8/1 – 8/31	86.3	51.6	69.0	0.72
6/1 – 8/31	83.3	51.4	67.4	4.02

Last Hard Freeze, Freeze & Frost Dates in the Spring/Summer

Many people will start planting their crops and gardens over the next few months. To keep crops and plants protected from the cold, it is important to know when the ***average*** last hard freeze, freeze and frost typically occur in the spring/summer. It is also important to know the dates of the ***latest*** hard freeze, freeze and frost. The following are the ***average*** last hard freeze, freeze and frost dates and the ***latest*** hard freeze, freeze and frost dates for ***Billings, Miles City and Sheridan***. The hard freeze temperature is based on 28 degrees Fahrenheit, the freezing temperature is based on 32 degrees Fahrenheit and the frost temperature is based on 36 degrees Fahrenheit. Averages are based on a 30 year period of record: 1981 to 2010. Record keeping began at the Billings Airport in 1934, at the Miles City Airport in 1937 and at the Sheridan Airport in 1907.

City	Average Last Hard Freeze	Latest Hard Freeze on Record	Average Last Freeze	Latest Freeze on Record	Average Last Frost	Latest Frost on Record
Billings	Apr 23	May 28	May 7	Jun 13	May 18	Jun 13
Miles City	Apr 27	May 28	May 9	Jun 8	May 18	Jun 18
Sheridan	May 8	Jun 3	May 19	Jun 24	Jun 5	Jun 30

Information Stop

Advanced Hydrologic Prediction Services (Rivers and Lakes):

http://water.weather.gov/ahps2/index.php?wfo=byz

Severe Weather Preparedness:

http://www.wrh.noaa.gov/byz/severe/index.php?wfo=byz

Lighting Safety:

http://www.lightningsafety.noaa.gov/

Lightning Safety for You and Your Family:

http://www.nws.noaa.gov/os/lightning/resources/lightning-safety.pdf

Flood Safety:

http://www.nws.noaa.gov/floodsafety/