JET STREAM JARGON

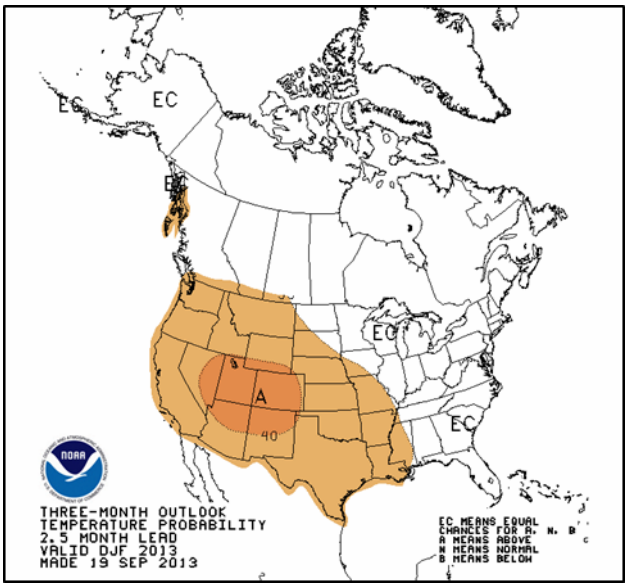
Fall/October 2013

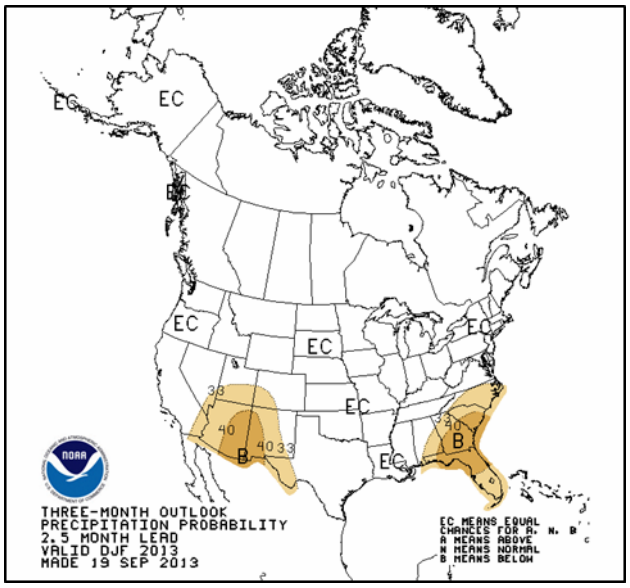
2013 - 2014 Winter Outlook

Submitted by Joe Lester, Meteorologist

The official December-January-February outlook from the Climate Prediction Center calls for an increased likelihood of above normal temperatures, and no clear signal with regard to precipitation. See the images below.

Seasonal weather predictions are very difficult and often impossible to make. There are many factors that influence winter weather in our region, including arctic sea ice, snow cover, tropical thunderstorm activity, the El Nino Southern Oscillation (ENSO), and other teleconnection patterns in the Northern Hemisphere. In a typical winter, due to our proximity to the Rocky Mountains, our region experiences alternating periods of cold and snowy Canadian air, and warm/dry Chinook winds…and the 2013-14 winter will be no different. Our advice is to stay tuned to the forecast and be prepared for both extremes!





Inside this issue:

Special points of interest:

- Tips on how to keep safe during winter weather
- Social Media is a good way to stay informed about upcoming weather
- 2013 Summer was warm and dry
- After wildfires, a threat lingers for many years

The Jet Stream Jargon is published twice a year by the National Weather Service office in Bilings, Montana.

Questions or comments? Please email

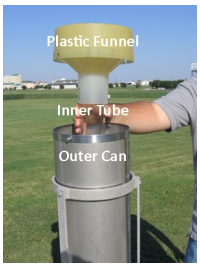
carolyn.willis@noaa.gov or call 406-652-0851

Coop Corner

Submitted by Carolyn Willis, Observing Program Leader

It's hard to believe that winter is almost upon us, after sweating through near 100 degree days not that long ago! It's that time of year when any water in your rain gage could freeze and crack the tube. Whether you have a metal 8" standard rain gage, or the 4" plastic rain gage, please remove the funnel and tube until next spring.

We have had a lot going on in the Cooperative Observing Network throughout the summer. Vickie or I tried to visit each of you. Many repairs were needed and a few stations were moved when observers retired or were no longer able to continue due to other circumstances. I want to take this opportunity to thank each of our observers for your dedication to the program. We really appreciate everything you do for us and for the country.

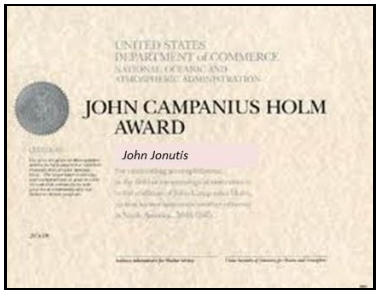


"The Holm Award is the agency's second most prestigious, and only 25 were presented this year..."

John Jonutis, Mizpah, Montana Wins Prestigious John Companius Holm Award

Submitted by Carolyn Willis, Observing Program Leader

John Jonutis, of Mizpah, Montana received the John Companius Holm Award for outstanding service in the Cooperative Weather Observer Program. The Holm Award is the agency's second most prestigious, and only 25 were presented this year to observers from around the country. John also was awarded the Benjamin Franklin award for 55 years of service. John has taken weather observations since 1958 from his ranch in southeast Montana. Congratulations to John on receiving these two awards!



Coop News

Submitted by Vickie Stephenson, Hydrometeorological Technician

It has been one very busy summer in our Cooperative Observer Program. I have moved, installed, or closed a number of stations in our warning area this summer. I want to welcome and recognize our NEW observers, who have stepped up to help the National Weather Service with daily reporting, as well as thank the outgoing observers who have been dedicated observers for many years:

Denise Loyning replaced Stacey Hendrickson - **Absarokee**

Benjamin Knudson replaced the Big Horn County Sheriffs dispatchers - **Hardin**

Jack Miller replaced Barbara Breeding – **Judith Gap**

Betty Tempero replaced Marie Cantrell – **Pompey's Pillar**

Tom Wolfe replaced Dan Hartman – **Silver Gate** (old Cooke City station)

John Herman replaced Lucille Ottesen - **Sonnette**

Thank you all for your dedication to the COOP program. You are all so very much appreciated! Have a great winter and remember to give us a call if you have questions or concerns regarding the COOP program!
Bring on the snow!!

Severe Weather - What a Difference A Year Makes...Again!

Submitted by Tom Frieders, Warning Coordination Meteorologist

Let's go back to 2011. We all remember the widespread heavy rainfall and flooding across much of the region. Then we went into 2012, bringing the opposite, with expanding drought and wildfires. The number of severe thunderstorms in 2012 was near record low levels when a total of 29 Severe Thunderstorm Warnings were issued by our Billings office. (Only 1987 and 1988 were lower.) A total of only 37 severe thunderstorm reports were received in 2012. (Large hail, damaging winds.)

So, as we began 2013, what were we to expect? If you recall, our climate outlooks early this spring indicated no strong signals for the spring and summer. Well, the numbers are in through the summer months and mother nature certainly changed her tune for most areas once again. While the area started dry during the late winter and early spring, weather turned much more active in May and that weather persisted into September. So far, our office has issued 211 Severe Thunderstorm and Tornado Warnings with well over 300 reports of severe weather. You have to go back to 2005 to find a year seeing more active severe weather. This doesn't even count the additional 48 warnings issued for potential Flash Flooding. A persistent moist atmosphere was the main factor in keeping the weather very active as significant rain, hail and wind storms continued to impact the region into the middle of September. Speaking of September, our Billings NWS office had issued an average of only two warnings for severe weather and flash flooding in the month of September since 1986. This year, 20 warnings were issued, showing how unusual this September was in regards to storms.

Social Media - Stay Connected

Submitted by Tom Frieders, Warning Coordination Meteorologist

Are you connected to Social Media? This is just another way to stay informed whether at home or on the go. Not only is our NWS office connected on Facebook (US National Weather Service Billings) but we are also on Twitter (@NWSBillings) and have a YouTube Channel (NWSBillingsMT.) Follow us and stay informed!

Our local Billings Facebook Page has just exceeded 4700 "Likes" and Twitter is quickly approaching 1000 followers. These social media outlets not only offer an opportunity for us to keep everyone informed on upcoming hazards, but it's been a great interactive tool. We have received a lot of valuable feedback from those of you being impacted by the storms. Help us spread the word by "sharing" and/or "retweeting" our messages.

- **Facebook**
- **Twitter**
- **YouTube**

Your Billings National Weather Service office keeps you informed!

Extreme weather - Your Reports are Invaluable - Thank You!

Submitted by Tom Frieders, Warning Coordination Meteorologist

As we continue to see the impacts of extreme weather, locally and nationally, we want to continue to stress the importance of your reports! All of us at the NWS office here in Billings want to thank our spotters and observers for their reports of hazardous weather. These reports are not only appreciated by our forecasters but are invaluable to our local communities to assist in accurate forecasts and warnings. Over 300 reports of severe weather have been received so far in 2013, not including the many more reports of less threatening weather that keep us informed at all times. Thank you to our Spotters, Cooperative Observers (COOP) and CoCoRaHS observers for both severe reports and daily reports!

With winter's arrival, the challenges continue and the reports remain important. Whether you have snow drifts to your rooftop, see numerous accidents during your commute, or you're sliding on a thin coat of ice from freezing drizzle, please continue to keep us informed. You may call our 800 number, send us an email, submit your COOP or CoCoRaHS report, or post to social media; whatever the means, we will be watching for your reports.

Winter Safety Tips

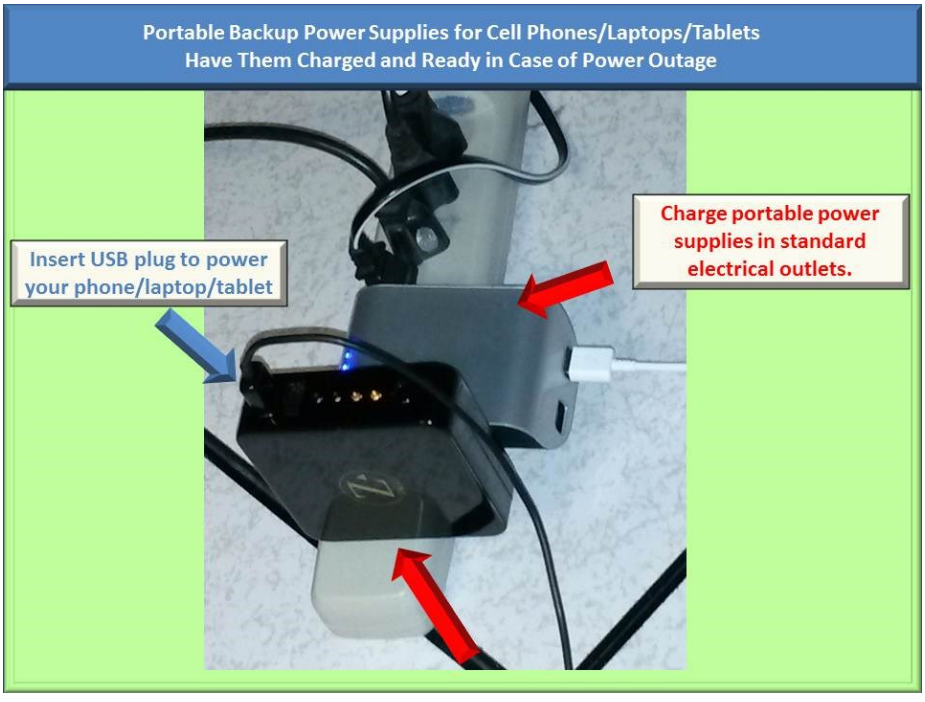
Submitted by Julie Arthur, Meteorologist

The first day of winter is Saturday December 21st, 2013.

Here are some actions you can take to keep safe during winter storms.

- Stay aware of the forecast so you can be prepared before a storm arrives.
- Be sure to have batteries, flashlights, cell phones, and a NOAA Weather Radio on hand at home and at work, in case of loss of heat, power and telephone service.
- Portable backup power supplies are available for charging cell phones and laptop computers. Have them charged and ready to keep your communications items powered up in case of a power outage. (See photo below)
- A first-aid kit is also essential.
- If you are planning to travel, always check the weather forecast before hitting the road.
- Leave plenty of time to reach your destination.
- Winterize your vehicle before winter arrives and carry a winter storm survival kit.
- Be sure to move farm animals and pets to safety and have plenty of food and water available for them.
- If you're caught outside in a storm, find shelter. If there is no shelter, build a lean-to, windbreak or snow cave, and build a fire. To stay hydrated, melt snow for drinking water. Do not eat snow, as it will lower your body temperature.
- If you are in a vehicle, run the motor about 10 minutes each hour for heat. Open the window a little to get fresh air to avoid carbon monoxide poisoning. Keep your exhaust pipe unblocked and be visible to rescuers. Move to keep blood circulating and to keep warm.
- If you're inside, stay inside. If you do not have heat, close off unneeded rooms.
- To keep up-to-date on the latest weather information, go to http://weather.gov or your local television and radio stations. Don't forget about Facebook, Twitter and You Tube as well. Check with your cell phone provider to see if they offer a service where you can get warnings over your cell phone.
- Also check http://www.srh.noaa.gov/cte.htm to see how to get forecasts over your wireless device.

Have a safe Winter Season!



Winter Weather Awareness Week

October 21-25, 2013

The National Weather Service (NWS) offices in Montana are sponsoring the winter weather awareness week. This information is provided in order to inform you of the different types of winter weather we have in Montana and also to provide safety information related to each type. Click on this link to learn more.

Average Frost and Freeze Dates

Submitted by Sean Campbell, Meteorologist Intern

Many people have started harvesting crops and gardens across the region. Important dates to keep in mind are the first frost, freeze and hard freeze dates in the fall. The following are the normal first frost, freeze and hard freeze dates for Billings, Miles City and Sheridan. The frost temperature is based on 36 degrees Fahrenheit, the freezing temperature is based on 32 degrees Fahrenheit and the hard freeze temperature is based on 28 degrees Fahrenheit. The normal dates are based on a 30 year average from 1981 to 2010. The first frost, freeze and hard freeze dates are based on a period of record. Recordkeeping began for the Billings Airport in 1934, the Miles City Airport in 1937 and at the Sheridan Airport in 1907.

City	Normal First Frost	Earliest Frost on Record	Normal First Freeze	Earliest Freeze on Record	Normal First Hard Freeze	Earliest Hard Freeze
Billings	Sep 24	Aug 24	Oct 4	Sep 4	Oct 11	Sep 11
Miles City	Sep 21	Aug 22	Sep 29	Sep 2	Oct 7	Sep 11
Sheridan	Sep 11	Jul 2	Sep 20	Aug 17	Oct 3	Aug 25

Fall Normals

Submitted by Sean Campbell, Meteorologist Intern

Meteorological fall arrived at midnight on Sunday, September 1, 2013, and ends at 11:59 pm on Saturday, November 30, 2013. Here are the normal temperatures and precipitation for Billings, Miles City and Sheridan for the fall season. Normals are 30 year averages calculated from 1981 to 2010. All temperatures are in degrees Fahrenheit and all precipitation amounts are in inches.

Billings					
Date	High	Low	Average	Precipitation	Snowfall
9/1 – 9/30	73.1	47.5	60.3	1.30	1.1
10/1 – 10/31	59.4	37.1	48.2	1.18	4.1
11/1 – 11/30	45.3	26.3	35.8	0.63	6.5
9/1 – 11/30	59.3	37.0	48.2	3.11	11.7

Miles City				
Date	High	Low	Average	Precipitation
9/1 – 9/30	74.2	46.1	60.1	1.08
10/1 – 10/31	59.2	33.8	46.5	0.92
11/1 – 11/30	43.2	20.9	32.0	0.39
9/1 – 11/30	59.3	34.7	47.0	2.39

Sheridan				
Date	High	Low	Average	Precipitation
9/1 – 9/30	74.2	41.6	57.9	1.43
10/1 – 10/31	60.1	30.9	45.5	1.41
11/1 – 11/30	45.9	19.4	32.7	0.71
9/1 – 11/30	59.9	31.5	45.7	3.55

2013 Summer in Review

Submitted by Joe Lester, Meteorologist

Summer 2013 was warm and dry across most of our region, though not in the extreme sense that was felt in 2012. Moderate drought continued in areas west and south of Billings due to the warmer and drier than normal conditions experienced through August. Far southeast Montana, particularly areas east of Miles City, observed above normal precipitation and below normal temperatures during the summer. Because of the generally cool and wet weather in this region, drought conditions no longer exist in far southeast Montana. A wet fall has also resulted in significant improvements in the drought across south central Montana as well.

Though it was a warm summer, we did not see many days of extreme heat. In fact, Billings failed to reach 100 degrees for the first time since 1997. Miles City reached 100 degrees on only one day, July 11th, while the average for an entire summer is about six. It was also a fairly humid summer, especially in late July and August, due to a persistent ridge of high pressure aloft, frequent monsoonal flow, and a lack of significant dry frontal passages. This tendency toward “high” humidity resulted in an active thunderstorm season.

A couple of large wildfires impacted the Beartooth and Absaroka Mountains: the Emigrant Fire near the Paradise Valley and Rock Creek Fire near Red Lodge. Fire activity was fairly quiet otherwise, in stark contrast to a very busy 2012.

The following table summarizes temperature and precipitation statistics at our four official climate sites. Records go back to 1934 at Billings, 1937 at Miles City, 1907 at Sheridan and 1948 at Livingston. Normals are calculated from the 1981-2010 period.

Statistics for Meteorological Summer 2013
(June 1st through August 31st)

June - August Stats	Average Temp (deg F)	Departure from Normal	Precipitation (inches)	Departure from Normal
Billings	**71.7 (8th warmest)**	**+ 2.0**	**1.74 (9th driest)**	**- 2.45**
Miles City	**71.9 (26th warmest)**	**+ 0.4**	**5.32 (38th wettest)**	**+ 0.26**
Sheridan	**68.9 (17th warmest)**	**+ 1.5**	**2.67 (26th driest)**	**-1.35**
Livingston	**67.9 (5th warmest)**	**+ 3.0**	**3.41 (14th driest)**	**- 1.56**

New Arrivals and Departures

Submitted by Carolyn Willis, Observing Program Leader

Marc Singer, our Science and Operations Officer, and his wife Mikaela, welcomed their second daughter to the family on September 13th. Hossa Marie Singer weighed in at 8 lbs .10 oz.

David AO Smith, our Electronics Technician, has accepted a position with a private company in Michigan, near where he grew up. David's last day of work was Friday, October 4. We wish him well in his new job!

Winter Normals

Submitted by Sean Campbell, Meteorologist Intern

Meteorological winter arrives at midnight on Sunday, December 1, 2013, and ends at 11:59 pm on Friday, February 28, 2014. Here are the normal temperatures and precipitation for Billings, Miles City and Sheridan for the winter season. Normals are 30 year averages calculated from 1981 to 2010. All temperatures are in degrees Fahrenheit and all precipitation amounts are in inches.

Billings					
Date	**High**	**Low**	**Average**	**Precipitation**	**Snowfall**
12/1 – 12/31	35.2	17.8	26.5	0.50	8.2
1/1 – 1/31	36.4	17.8	27.1	0.48	8.4
2/1 – 2/28	40.2	20.6	30.4	0.48	6.2
12/1 – 2/28	37.2	18.7	28.0	1.46	22.8

Miles City				
Date	**High**	**Low**	**Average**	**Precipitation**
12/1 – 12/31	30.9	9.7	20.3	0.29
1/1 – 1/31	30.0	8.9	19.5	0.32
2/1 – 2/28	35.5	13.2	24.4	0.23
12/1 – 2/28	32.4	11.5	22.0	0.84

Sheridan				
Date	**High**	**Low**	**Average**	**Precipitation**
12/1 – 12/31	35.2	10.6	22.9	0.56
1/1 – 1/31	36.2	11.4	23.8	0.56
2/1 – 2/28	39.0	14.2	26.6	0.54
12/1 – 2/28	36.7	12.9	24.8	1.66

Canada geese at Riverfront Park near Billings get ready for their flight south for the winter. Photo by Carolyn Willis

WIRELESS EMERGENCY ALERTS CAPABLE

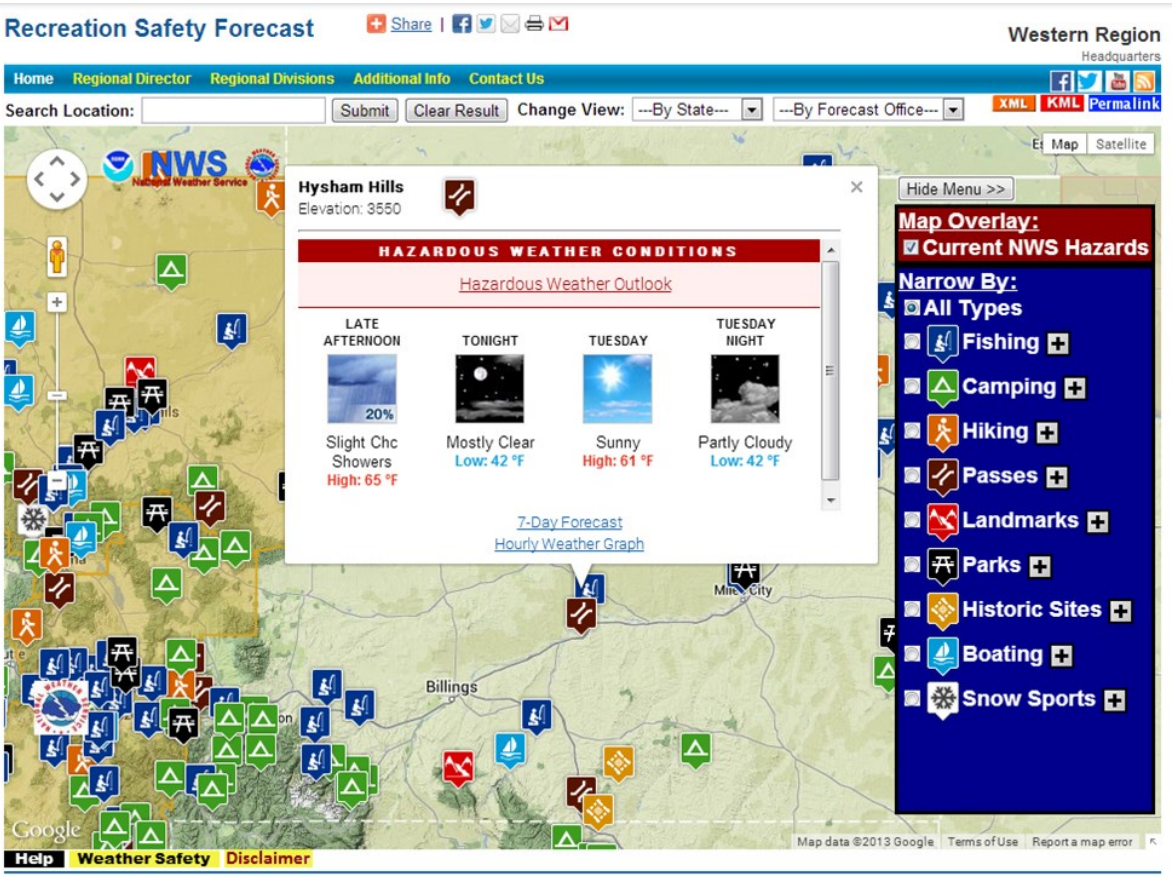
Weather Warnings On the Go!

America's wireless industry is helping to build a Weather-Ready Nation through a nationwide text emergency alert system, called Wireless Emergency Alerts (WEA), which will warn you when weather threatens. Wireless Emergency Alerts (WEA) are emergency messages sent by authorized government alerting authorities through your mobile carrier. Government partners include local and state public safety agencies, FEMA, the FCC, the Department of Homeland Security, and the National Weather Service. For more information, click on this link.

New Web Page - Recreation Safety Forecasts

Submitted by David Church, Meteorologist Intern

One of the great things about living in Montana and Wyoming is the seemingly endless opportunity for outdoor recreation. Whether you love fishing in the pristine streams and rivers cutting across the plains or hiking, camping or skiing among the tall peaks that never go long without a blanket of snow; there is a little something that draws us all into the great outdoors. However, we all know the weather around here can change at the drop of a hat, which can make it tough to be properly prepared. That is why we have developed the all-new Recreation Forecast webpage, to help you plan for and be prepared for the weather that will impact your outing.



The Recreation Forecast webpage offers you an easy to navigate Google Map interface displaying icons for various popular recreation sites. A preview of the forecast for each site is available at the click of a button, along with a display of any hazardous weather alerts in effect and links to the full 7-day forecast or the hourly breakdown. This design is to make it easier for you to quickly find the recreation sites that are sporting the most optimal forecast for your plans.

There are several ways to quickly narrow down your search to find the recreation sites you are looking for. The search location box allows you to put in a city or address and will bring the map to that location so you can find surrounding recreation sites. The menu on the right hand side offers you the option to only show specific recreation types on the map. Finally, if you just want a good alphabetical list of the recreation sites click the plus icon next to the type you are looking for.

This webpage is still a work in progress and we are looking for your input as to what would make it more useful to you. If you have any favorite recreation sites that you don't see on our page, feel free to let us know. You may access this page at: http://www.wrh.noaa.gov/byz/rec_travel.php.

Burn Scar Flash Flooding - Summer 2013

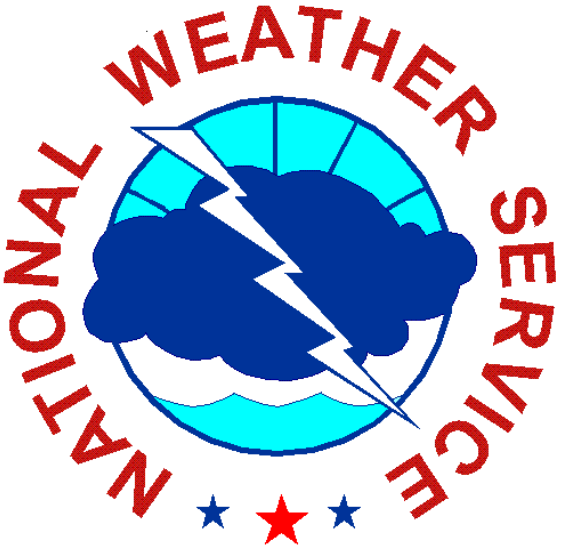
Submitted by Todd Chambers, Lead Meteorologist

Last summer, (2012) saw numerous large fires across south central and southeast Montana, with hundreds of thousands of acres burned. Once the fires were out, most people thought that the danger was over in these areas. However, after major wildfires, a threat lingers into subsequent years which may go unnoticed until the first heavy rainfall develops the following spring. Flash flooding becomes a problem in and around major wildfire burn scars for several years after the fire ends. Scorched soils become impervious to water resulting in almost all rainfall becoming runoff. The lack of vegetation to slow the downhill movement of water results in this already abnormally heavy runoff accelerating downhill dragging debris with it. The force of this mass of water and debris digs deep erosion channels, plugs culverts, and washes out roadways. In populated areas, homes may be threatened.

During the winter months NWS Billings staff embarked on an outreach effort among the various federal, state and local agencies in the area to alert residents near burn scars of this upcoming flash flood danger. Several public meetings were held to provide information on what to expect should heavy rainfall develop. During this past spring and summer many heavy rainfall events occurred over burn areas which resulted in flash flooding and some damage, mainly to roads. The burn scars in Musselshell County were especially hard hit as numerous thunderstorms with torrential rainfall moved across the Dahl, Wilson, and Delphia burn scars. Damage from flash flooding was also reported in and around the Ash Creek burn scar in Rosebud and Powder River counties, some of which impacted travel along US Hwy 212 when culverts along the highway filled with debris resulting in flooding of the highway. While fire activity was limited this past summer, there were still significant fires in the Paradise Valley and near Red Lodge. Plans are underway to have public meetings to discuss the flash flood threat with residents near these burn scars this winter, and the areas will need to be monitored for potential flash flooding for the next few years. In addition, the 2012 burn scars will continue to pose a threat of flash flooding through at least the summer of 2014.

Musselshell county burn scar flash flooding June 2nd 2013 - Musselshell County Disaster and Emergency Services

Ash Creek burn scar flash flooding aftermath showing debris 10 feet high that piled up when flash flooding was occurring. August 3rd 2013 - US Forest Service



NWS Windchill Chart

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

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

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

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

Effective 11/01/01