



Station Fire 10/11/2015



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Crooked Creek Fire 09/28/2015



Spruce Fire 08/18/2015

2015 Annual Fire Weather Report

WFO Riverton, WY

Kelly Allen, Fire Weather Program Manager

January 2016

To: Chris Foltz
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From: Kelly Allen, NWS Riverton
Fire Weather Program Manager

Subject: 2015 NWS Riverton Fire Weather Program Summary

Please find attached the 2015 NWS Riverton Fire Weather Program Summary which also includes Red Flag Warning Verification and Statistics, the number of Fire Weather Watches issued, Spot Forecast Statistics, and information on IMET Dispatches

WFO Riverton Fire Weather Program Summary - 2015

Month to Month Climate and Operations:

January and February

Climate:

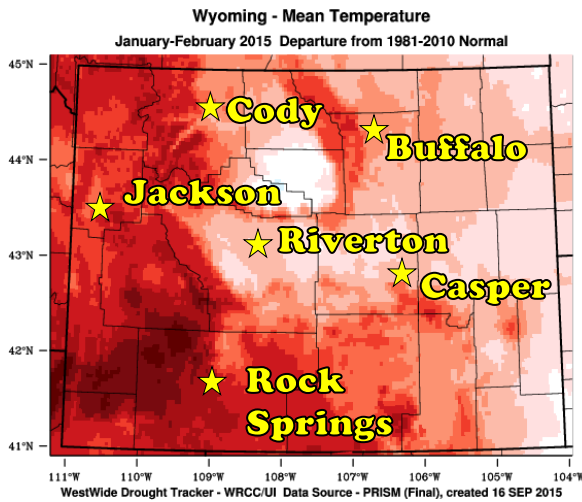


Fig. 1

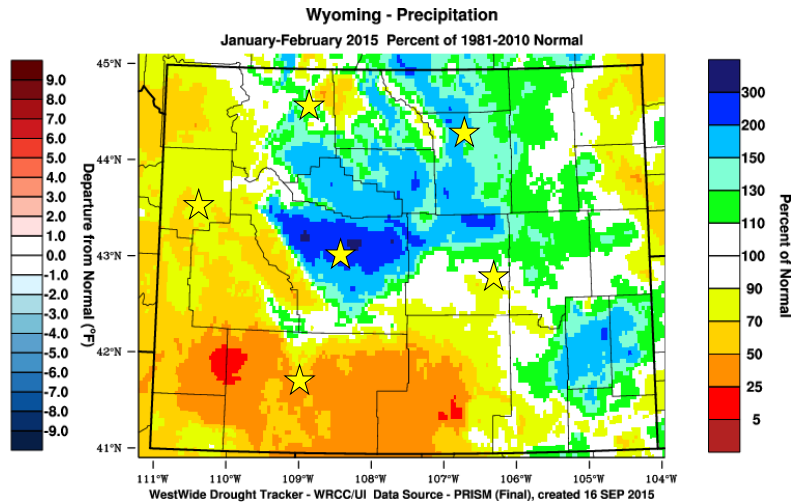


Fig. 2

January and February were quite warm with temperatures almost 10°F above normal in some locations along and west of the Divide (Fig. 1). There were a couple of snow storms east of the Divide that kept the temperatures a little closer to normal but overall, temperatures were above normal east of the Divide as well. There were a couple of storms that moved through early in February that dropped a decent amount of snow, but it was so warm across the south that the precipitation came as rain for much of the Interstate 80 corridor. There was another significant snow storm that came just in time for Valentine's Day, dropping a foot of snow in Buffalo and almost 6 inches in Riverton. This storm brought a lot of water along with it, which helped bring precipitation totals above normal in the central basins and along the Interstate 25 corridor (Fig. 2). In between the two large snow storms, there was quite a wind event on February 4th through 7th that brought down 18 high voltage transmission lines west of Meeteetse; at one point, over 2,100 people were without power. The highest wind gust recorded during this event was 114 mph in Clark. During this event, a fire started near Clark, but it was snuffed out by a strong wind gust, like Mother Nature blowing out a birthday candle.

Notable Climate Records:

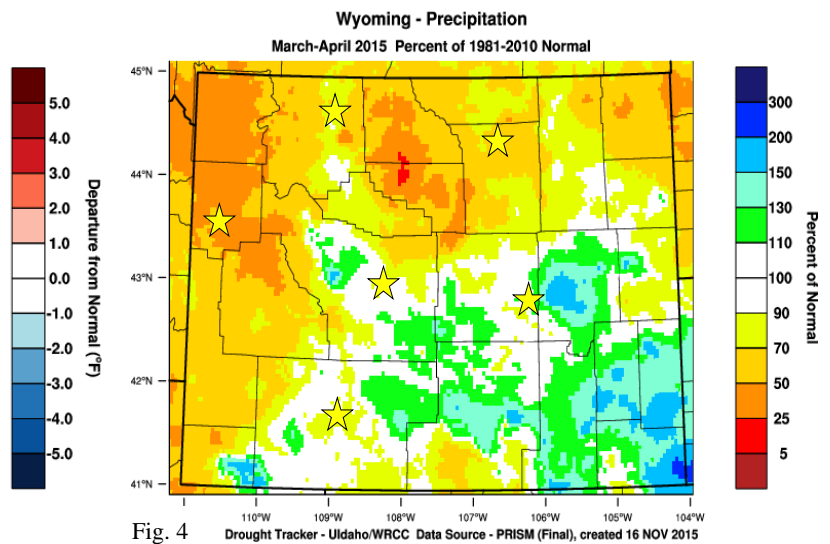
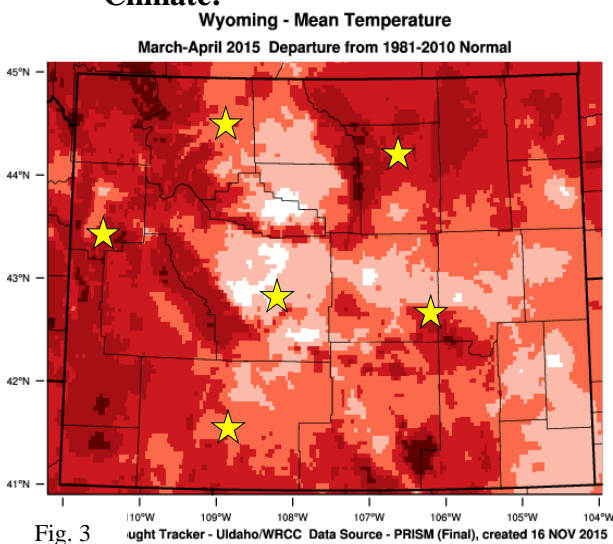
- Big Piney tied with 2001 for the driest January on record (Period of Record began 1998)
- Big Piney also recorded it's warmest daily high temperature ever in the month of February, which was 57°F, set on February 13th
- Buffalo reached 67°F on January 26th and again on the 27th, this was the warmest temperature ever recorded in Buffalo during the month of January
- Buffalo reached 69°F on February 4th, which was the warmest temperature ever recorded in Buffalo during the month of February
- Buffalo also had their wettest February on record
- Lake Yellowstone recorded their warmest February on record (Period of Record began 1998)
- Lander recorded a total of a trace of precipitation in January, which ties 1900 and 1931 as the driest on record
- Riverton recorded their wettest February on record, total precipitation was 385% of normal

Operations:

- Normal off-season Fire Weather AOP discussion and coordination took place for the Northern Rockies GACC
- An in-person AOP Meeting took place in Salt Lake City for the newly formed Great Basin GACC. At this meeting, each fire weather focal point gave presentations about any unique aspect of their program or technological development at their office. We also heard from Nick Nausler about Great Basin Summertime Climate patterns including monsoon characteristics. Matt Lammers came in to introduce us to the new spot forecast verification program available through the Joint Fire Science Program. The SPC also joined via conference call to talk about their fire weather and lightning products. At the end, we had a panel discussion about the impact of our weather forecasts on prescribed fires and we also talked with several external partners about the fuels status dilemma. At this meeting, the Great Basin GACC meteorologists also introduced their new proposal for a semi-automated fuels status program.
- Kelly Allen participated on the 2014 BLM Wyoming Leadership Award Selection Committee
- Dave Lipson taught an S290 course at the Wyoming Fire Academy February 25th -26th
- There were 11 spots completed in January, and 3 in February; All were for prescribed burns

March and April

Climate:



March and April were also very warm (Fig. 3) when compared to normal and much of the west and north were quite dry (Fig. 4). There were a few Red Flag Days ahead of large spring storms with record breaking high temperatures and wind gusts in excess of 60 mph in some spots. The storms that moved through did end up delivering some moisture, especially as we moved into April. Most of the moisture ended up falling east of the Divide and across the south, which began to make a dent in what had been a dry start to the year.

Notable Climate Records:

- Big Piney had their warmest March on record
- Big Piney had a high temperature of 69 degrees on March 31st, which was the warmest temperature ever recorded in the month of March in Big Piney
- Lake Yellowstone had their warmest March on record

Operations:

- Kelly Allen hosted three partner meetings in March: Worland, Casper, and Kaycee.
- Kelly Allen and Chris Jones attended the Wyoming Bureau of Land Management Leadership Meeting on March 19th in Casper. At this meeting, Kelly and Chris presented the 2014 State Fire

Management Leadership Award to the next winner, and Kelly presented the 2015 seasonal outlook to BLM fire and aviation leadership.

- Kelly Allen hosted three partner meetings in April: Rock Springs, Marbleton, and Lander
- Dave Lipson attended the IMET training workshop in Boise, April 6-11
- Chuck Baker attended the virtual IMET training in March
- Kelly Allen completed S390 training March 24th-27th
- Dave Lipson taught a portion of S390 March 25th at the Wyoming Fire Academy in Riverton
- Kelly Allen and ASA Kathleen O’Leary completed materials for a “Safe Spring Burning Campaign” raising awareness about wildfires caused by agricultural burning through pamphlets, posters, and a local radio interview urging property owners to call the NWS to obtain weather conditions before burning. Pamphlets were tailored to meet the needs of each county and were distributed to county Fire Wardens and Chiefs.
- Participated in the Rocky Mountain GACC AOP meeting on April 1st
- Kelly Allen recorded an online version of the “Save Your Bacon, A Firefighter’s Practical Guide to Weather in the Field” S290 refresher course. The video is 30 minutes long and is posted with a printable worksheet for led instruction.
- A new internet format was adopted region-wide on March 30th, at this time, we lost functionality of the Fire Weather Zone Combiner
- The Fire Weather Planning Forecast and Dispatch Area Forecast was first issued on March 23rd, they continued once per day through April, a total of 39 through the period
- 17 spot forecasts were issued in March and 15 in April, all of which were for prescribed burns.
- Some low elevation grassy zones began to dry out and become critical by mid March, several more were added in April.
- The first Red Flag Warning was issued on March 21st, there were a total of 24 Red Flag Warnings for the months of March and April, 23 of which verified, and there was one missed event in zone 288.

May

Climate:

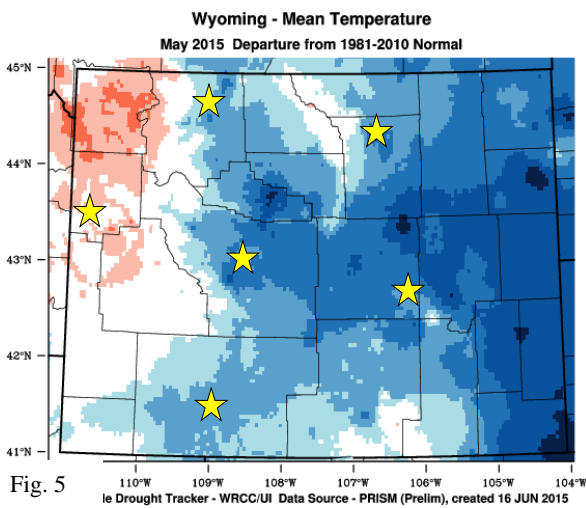


Fig. 5 Wyoming - Mean Temperature May 2015 Departure from 1981-2010 Normal. Drought Tracker - WRCC/UI Data Source - PRISM (Prelim), created 16 JUN 2015

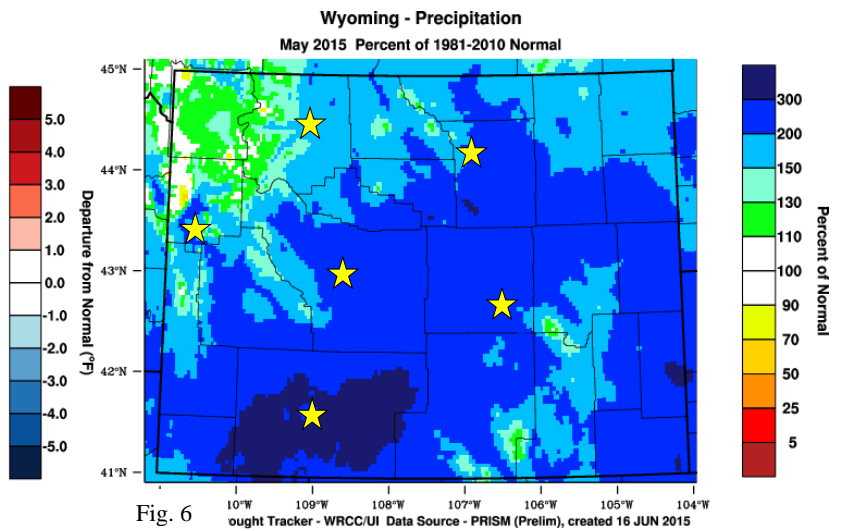


Fig. 6 Wyoming - Precipitation May 2015 Percent of 1981-2010 Normal. Drought Tracker - WRCC/UI Data Source - PRISM (Prelim), created 16 JUN 2015



Fig. 7

The tide began to turn in May when much colder (Fig. 5) and wetter than normal (Fig. 6) conditions appeared across most of the state. The last, widespread snow storm occurred around Mother’s Day where as much as 23 inches of snow fell on Casper Mountain, and a couple inches of rain/snow fell in the lower elevations. Beyond that, there was wave after wave of almost stratiform rain with wet, slow moving thunderstorms embedded (Fig. 10). Toward the end of the month, all of this moisture began to add up as the

soil was saturated and the water no longer had anywhere to go. Some of these storms were very damaging, causing multiple large landslides in Wind River Canyon (Fig.7 and Fig. 8), closing the highly-traveled route for days on end as well as flooding sections of east Thermopolis (Fig. 9).



Fig. 8 – County10.com

Fig. 9

Fig. 10

Notable Climate Records:

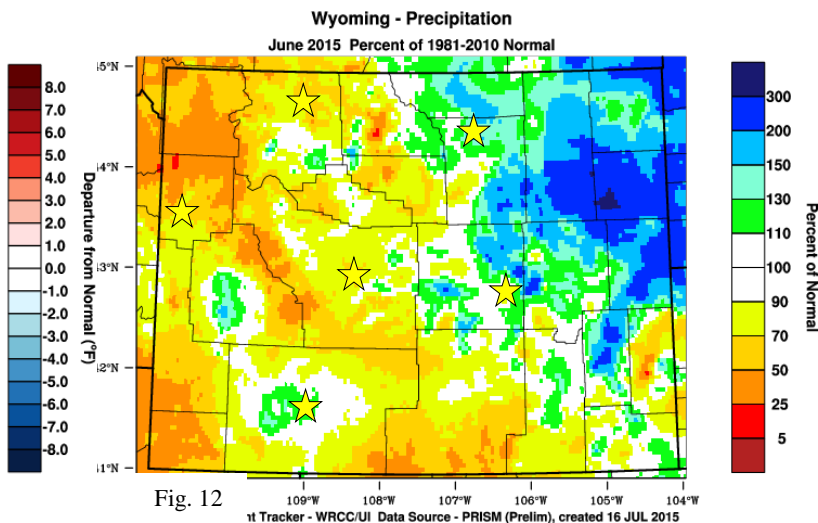
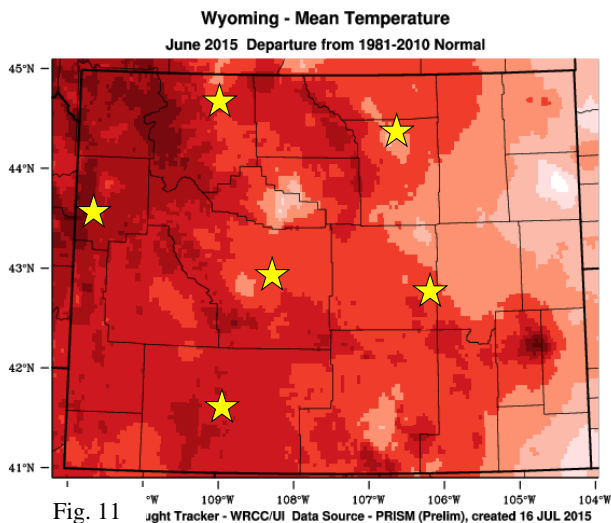
- While no climate site set a record for coldest or wettest May, almost all had one of their top 10 wettest May since record keeping began.

Operations:

- 31 Routine Narrative Planning Forecasts and Dispatch Area Forecasts were issued during the month
- NFDRS Forecasts began May 1st, there were 31 issued during the month
- 1 Spot was issued for a prescribed burn
- Four more partner meetings were held in Dubois, Jackson, Yellowstone, and Cody wrapping up a total of 10 preseason meetings with 144 attendees
- All zones hit greenup by the end of the first week and were no longer critical
- A Fire Weather brown bag was held on May 18th, Kelly Allen and Chuck Baker gave presentations on the new spot forecast verification web site and NWS Riverton spot forecast biases, tips on forecasting Mixing Height and Wet Flag, a review of the Pole Creek Prescribed Burn turned wildfire, and Chuck provided some tips on how to effectively communicate risk to wildland fire fighters in your forecast discussions. We also had a guest speaker from the Wyoming Bureau of Land Management’s High Plains District out of Casper, Fuels Specialist Eric Chapman. Eric walked us through the critical fuels determination process.

June

Climate:



The deluge continued into June as severe thunderstorms threatened on several days of the month. There were also several days with flash flood watches posted as the ground remained saturated. Temperatures were well above normal however (Fig. 11), providing further instability for thunderstorms. As is typical with thunderstorms, precipitation was spotty (Fig. 12) with the hardest-hit area along the Interstate 25 corridor. A severe thunderstorm on June 16th pummeled Wind River Canyon with 2" diameter hail, taking out car windows (Fig. 13). This storm held together all the way to the south side of Casper, where it continued to drop ping pong ball sized hail. There were several funnel cloud sightings this month as well; however, flash flooding continued to be the main story. There was significant flooding west of Casper (Fig. 14) and in and around Buffalo (Fig. 15). Water covered or damaged several roads and some homes and businesses around Buffalo were inundated with over 60 inches of water. Dead Horse Creek rose rapidly, closing portions of Interstate 90 one night. Water also overtook several portions of Highway 26 just west of Casper, closing the road for several hours there as well. There was also flooding reported in Worland, just south of Greybull, and the Bighorn River flooded low lying areas of Thermopolis near Hot Springs State Park.



Fig. 13



Fig. 14 – Mariah Sharee Photo



Fig. 15

Notable Climate Records:

- Big Piney had their warmest June on record
- Greybull recorded their warmest June on record (Period of Record began 1998)
- Lake Yellowstone had their warmest June on record

Operations:

- NWS Riverton had a new forecast system (AWIPS 2) installed on June 1st, the most significant overhaul to the computer system we use to prepare our daily forecasts in 20 years
- The Fire Weather Planning Forecast began afternoon issuance, in addition to the morning issuance on June 3rd
- 58 Fire Weather Planning Forecasts were issued, 30 Dispatch Area Forecasts, and 30 NFDRS Forecasts
- 7 Spot forecasts were issued, 2 of which were for wildfires, 1 was for a prescribed burn
- The North Fork Wind River Fire was the first wildfire spot of the season, it occurred on BIA land at about 8,000ft elevation

July

July was cooler than normal across the board (Fig. 20) as cloudy skies and stormy days continued (Fig. 21). In fact, there was even some accumulating snow in the Tetons on July 27th (Fig. 16). Many of the storms were wet toward the beginning of the month with significant flash flooding in Rock Springs on two different days (Fig. 18). Toward the end of the month, storms became windier (Fig. 17) with significant wind damage occurring in the Bighorns with some comparatively minor damage along the west slopes (Fig. 19). In fact, a swath of damage took out a large section of trees and destroyed several camping trailers and RVs, leading first responders to believe that the damage was from a tornado. Much drier and windier conditions returned at the end of the month.



Jackson Hole Mountain Resort
July 27 - 16

Fig. 16



Fig. 17

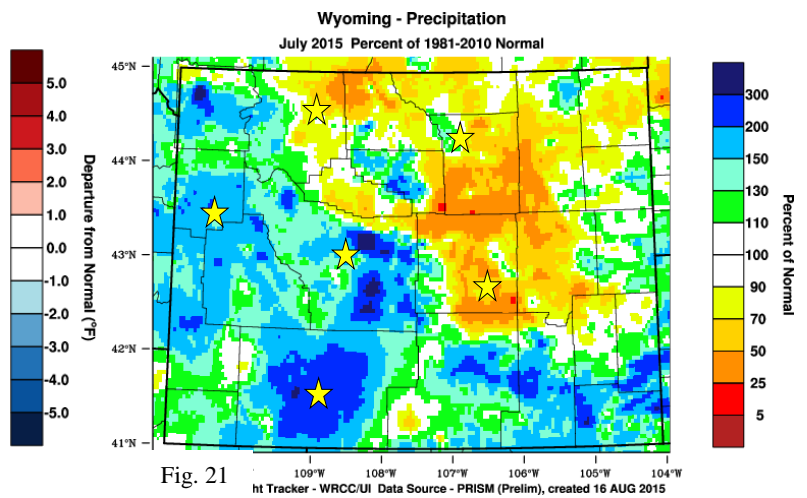
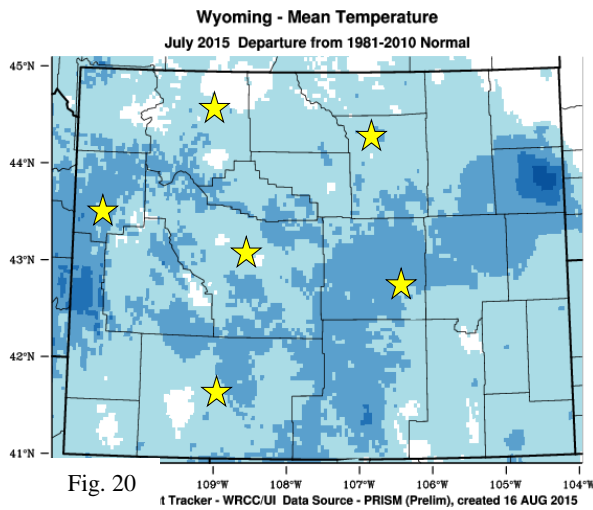


Fig. 18



Fig. 19

Climate:



Notable Climate Records:

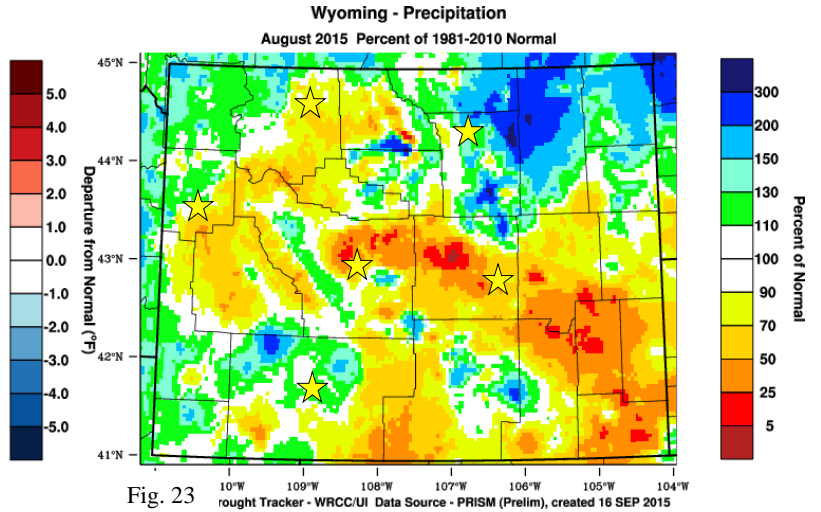
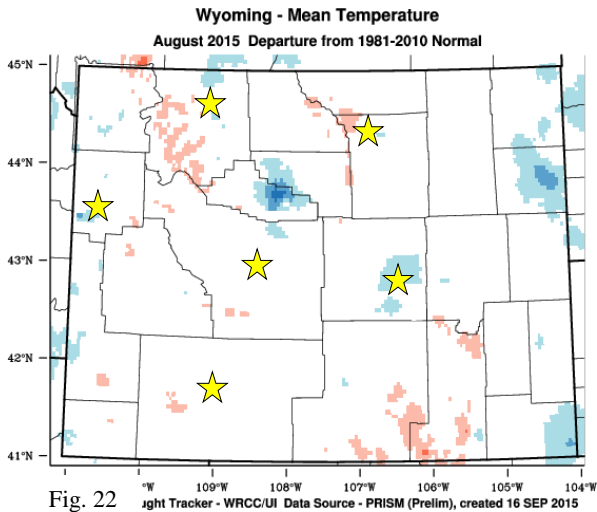
- Big Piney had their coldest and wettest July on record
- Greybull only recorded a trace of rain during the month, tying it with 2007 for the driest July on record
- All climate sites were cooler than normal, some within their top 5 coolest July's of record, precipitation patterns and records were spotty

Operations:

- 62 Routine Narrative Planning Forecasts issued
- 31 NFDRS Point Forecasts issued
- 13 Spot forecasts were issued, 12 of which were for wildfires
- 10 Red Flag Warnings were issued
- Low elevation zones were critical again by the end of the month
- The Bitter Creek Wildfire started on July 26th south of Rock Springs and it quickly grew to almost 2,500 acres during red flag conditions
- Weekly conference calls with the Bridger-Teton National Forest began on July 28th, these conference calls were attended by our office on an event-driven basis
- Weekly conference calls with the Eastern Great Basin Began on July 22nd
- Kelly Allen joined as the Central Region Representative on a fire weather grids team tasked by the National Wildfire Coordination Group to construct a nationally consistent methodology for the development of mixing height, transport winds, and ventilation rate grids. She attended 2 team conference calls this month.

August

Climate:



Temperatures in August were about as average as they can be (Fig. 22) with precipitation patterns highly dependent on where thunderstorms decided to form and track (Fig. 23). Even though we had our fair share of wildfires, none of them were large, complex smoke factories affecting the air quality beyond the local area. Much of the smoke hanging in the air this month was from Washington and Idaho. Visibility and air quality was quite poor at times (Fig. 24). The conditions got drier and drier as the month went on, with most zones reporting critically dry fuels by the 19th of August.

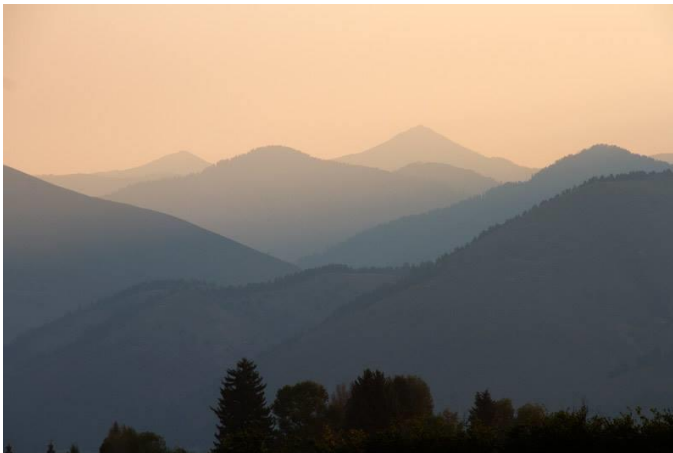


Fig. 24 – Dave Hunt Photo



Fig. 25 – Bighorn Radio Network Photo

Notable Climate Records:

- Record cold low of 29°F at Casper airport the morning of August 23rd was the coldest temperature ever recorded in the month of August, it was their earliest freeze on record, and the coldest record low so early in the season.

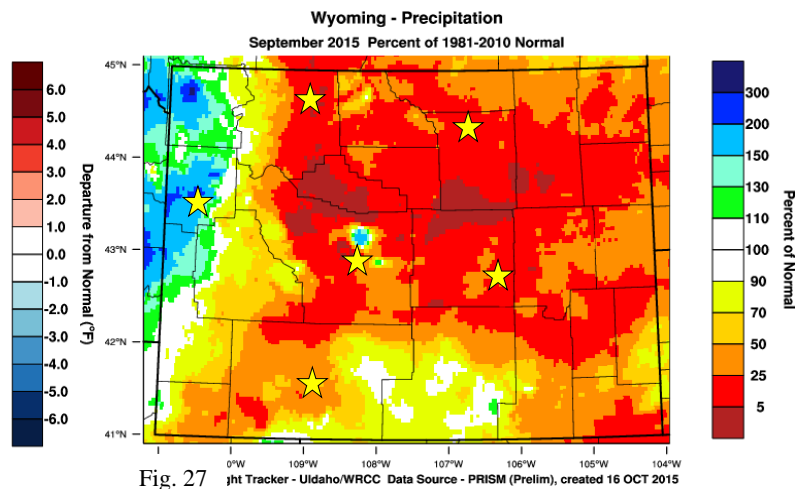
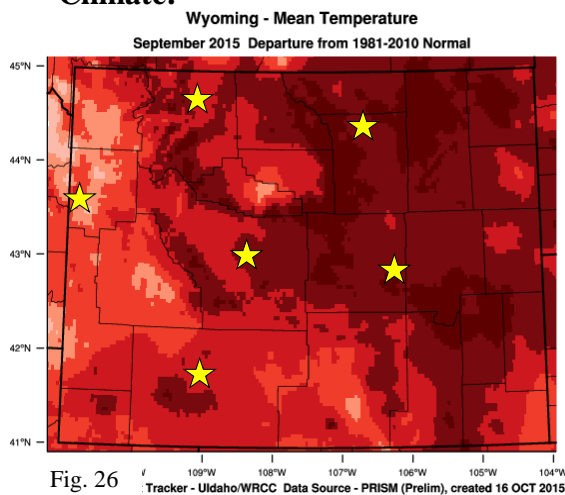
Operations:

- 62 Routine Narrative Planning Forecasts issued
- 31 NFDRS Point Forecasts issued.
- 45 Spot Forecasts were issued, 43 for wildfires
- 46 Red Flag Warnings were issued, 3 of which did not verify, there were 0 missed events
- Bridger-Teton and Eastern Great Basin coordination calls continued weekly through the month

- Little Bob Lake wildfire started in the southern Shoshone National Forest on August 18th, daily spot forecasts were provided through the month, it ended up burning a little over 1,400 acres high in the Shoshone wilderness.
- Red Lakes wildfire was caused by kids playing with fire along the South Fork Highway near Cody. The fire grew rapidly during Red Flag conditions and caused the highway to close for several hours. Power poles were burned and the water treatment plant was threatened. (Fig. 25)
- Kelly Allen attended 2 Fire Weather Grid Consistency Team meetings

September

Climate:



September was anything but normal. Temperatures were very warm (Fig. 26) and precipitation east of the Divide was scarce (Fig. 27). A significant rain and high elevation snow event between September 14th and 18th effectively ended the season for much of the Teton Dispatch area, while it brought wind gusts as high as 81 mph east of the Divide and along the Interstate 80 corridor with little to no wetting rain. The wet spring and early summer, combined with a wet 2014 with few fires primed the lower elevations with thick fine fuel loads that became tinder by the beginning of September, with the situation only growing worse as the month went on.

Notable Climate Records:

- Buffalo and Greybull recorded their warmest and driest September on record
- Lander had their warmest September on record and all of their precipitation for the month fell out of one storm on the 28th when 0.17” was recorded
- Riverton recorded their warmest and 2nd driest September on record. Only 0.02” of rain fell during the month.
- All climate locations east of the Divide, had a monthly average temperatures that fell within the top 5 warmest ever recorded for September, most were within the top 3.

Operations:

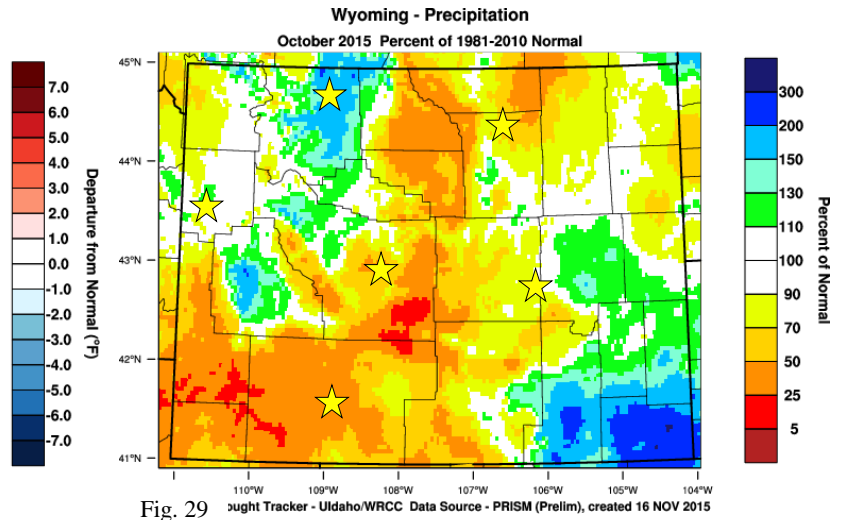
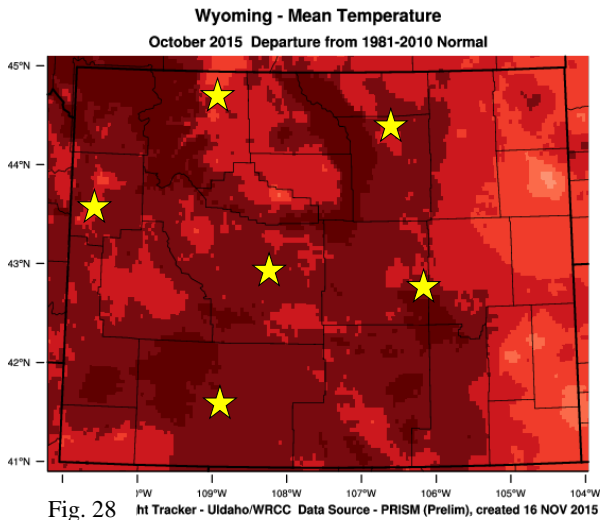
- 60 Routine Narrative Planning Forecasts issued
- 30 NFDRS Point Forecasts issued
- 30 Spot Forecasts issued, 25 were for wildfires, 5 for prescribed burns
- 106 Red Flag Warnings were issued and 18 were not verified, there were 0 missed events
- Dave Lipson was dispatched as an IMET to the Motorway Complex in Kooskia, Idaho from September 4th through the 18th
- The Spruce wildfire was started by lightning and was first observed September 9th in Yellowstone National Park. After a couple of days of gusty winds and low humidity, along with

strong winds ahead of the cold front that eventually put the fire out, it grew to almost 2,600 acres.

- The Crooked Creek wildfire started on Union Pass west of Dubois on September 28th. The fire grew rapidly to about 350 acres in a short period of time in one of the area's more sensitive wildland urban interfaces. Firefighters were able to prevent the fire from reaching any structures and there were no injuries.
- A grass fire near Diversion Dam grew out of control during Red Flag conditions on September 26th, closing U.S. Highway 26/287 for about an hour.

October

Climate:



October offered little relief for central Wyoming as the warm temperatures (Fig. 28) and inadequate moisture continued (Fig. 29). A couple of storm systems offered hope for relief, especially at the beginning of the month, but most of the rain fell in heavy bursts, mainly benefiting areas along the divide, luckily one of these areas was the upper Wind River Basin. A stretch of record high temperatures with bouts of low humidity and strong wind

Fig. 30



quickly followed. One of the highest impact wildfires in recent memory was the result of a fire at a bale facility northeast of Casper spread to the surrounding grasslands during Red Flag conditions and a high wind event on October 11th, wind gusts were around 60 mph and the fire spread to nearly 10,000 acres in a very short period of time (Fig. 30). Thirteen homes were destroyed, numerous livestock and pets were caught by the fast-moving flames, and over 1,300 people were evacuated from their homes and not allowed to return without escort for 51 hours. There was a lead time of 38 hours on the Red Flag Warning and 47.5 hours on the watch. Even though 13 homes were lost, 192 homes were in the estimated burn area and many of those were saved during a hard-fought battle by the 200 personnel on the fire along with air support from a DC10, MD87, helitack and several SEATs.

Notable Climate Records:

- Big Piney, Greybull, Riverton, and Lake Yellowstone had their warmest October on record
- Greybull tied their record for the warmest temperature recorded in the month of October when it hit 86°F on the 10th
- Lake Yellowstone had a high of 67°F on the 10th which was the warmest temperature ever recorded in October at this site

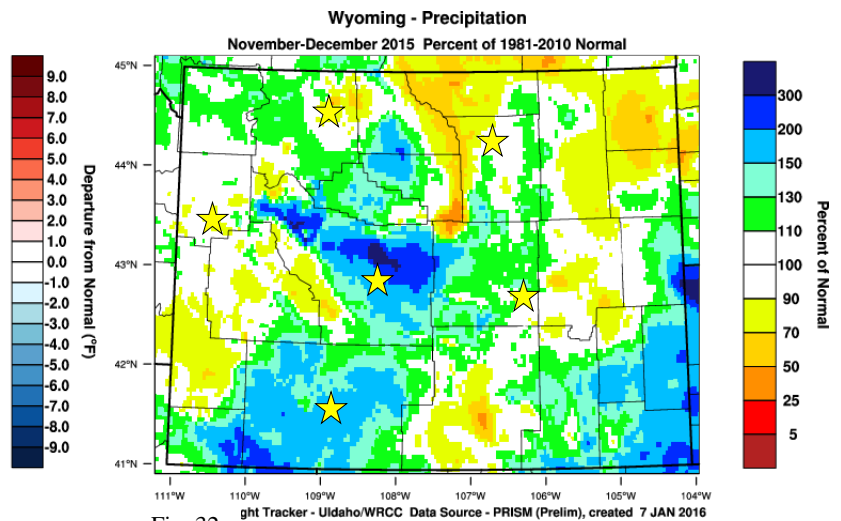
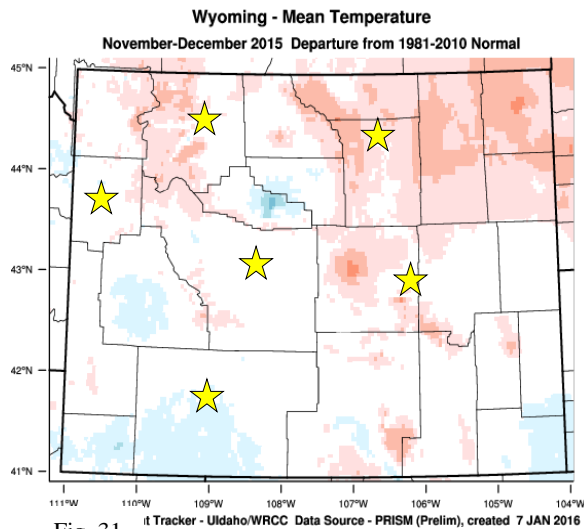
- The highest temperature recorded in Riverton for the month was 80°F on the 10th, setting a new record high for the month of October
- The highest temperature recorded in Worland for the month was 86°F on the 10th, setting a new record high for the month of October

Operations:

- 60 Routine Narrative Planning Forecasts issued
- 30 NDFRS Point Forecasts issued
- 41 Spot Forecasts issued, 23 were for wildfires, 16 for prescribed burns
- 10 Red Flag Warnings were issued and verified, there were 0 missed events
- Kelly Allen attended 1 Fire Weather Grid Consistency Team Meeting

November and December

Climate:



The year ended with temperatures near normal (Fig. 31) with a couple of larger snow storms, one over the Thanksgiving holiday and another moving through the week before Christmas, with a third storm on Christmas. These storms bumped precipitation up above normal across much of central and southern Wyoming (Fig. 32). The Thanksgiving storm occurred on some of the busiest travel days of the year, dropping a foot of snow on Lander and almost 10 inches around Riverton. The mid-December storm was a big one for the Casper area with widespread 12 to 14 inches of snow reported around town, with over 2 feet on Casper Mountain. The Christmas storm and the mid December storm closed Interstate 80 for days.

Notable Climate Records:

- Riverton airport saw its wettest and snowiest November on record (Period of Record 1995)

Operations:

- Routine Fire Weather Planning Forecasts (FWF), and NDFRS Point Forecasts stopped for the season on November 7th, 7 FWF and 6 NDFRS forecasts were issued during the month
- 16 Spot Forecasts were issued during the period, all of which were for prescribed burns

A word on El Nino: While a strong El Nino has been in place for the past several months, the typical weather pattern associated with an El Nino didn't really develop until January of 2016. For reference, a typical El Nino winter shifts the storm track well to the south, leaving much of Wyoming warmer and much drier than normal. While this does not occur with every El Nino event in Wyoming, this is what most seasonal climate predictions will advertise based on the most likely outcome. Another factor that could have affected the storm track, that brought storms into Washington and Oregon eastward into the northern Rockies, could be the extremely warm waters in the northern Pacific, this phenomenon is known as the Pacific Decadal Oscillation and it is in a very "positive" phase. However, now that a more traditional El Nino pattern has developed, expect the rest of the winter going into pre-greenup to be drier and warmer than normal. This could lead to an active early season in the low elevations for the 2016 fire season. However, El Nino springs tend to be wetter than normal, with the best chance for above normal precipitation across southern Wyoming after March, continuing through June.

☀ **NWS Riverton 2015 Red Flag Warning Events and Verification:**

- **Summary:**

A total of 196 RFW events occurred this season, much more than the 61 warnings issued during the 2014 season. The zone with the most Red Flags issued was Zones 280, which includes most of Natrona County, with 31 Red Flags warnings; the least warned zones include Yellowstone (Zone 140, Sublette County (Zone 278), and the northern Shoshone National Forest / Absaroka Range (Zone 286) where 0 Red Flags were issued for the season. Of the 196 warnings, 174 of them were verified. There were a total of 4 missed events. The following represents our performance for these events:

POD:	98%
FAR:	11%
CSI:	87%

The average lead time for the Red Flag Warning was 21.4 hours.

There were a total of 91 Fire Weather Watches, 89 of which were followed by a successful Red Flag Warning. There were 2 watches not followed by a successful warning. The number of Red Flag Warnings not preceded by a watch totaled 103.

☀ **NWS Riverton 2015 Fire Weather Spot Forecasts:**

Spot forecasts issued for Wildfires:	105
Spot forecasts issued for prescribed burns:	85
Spot forecasts issued for other purposes:	9
Total Number of Spot Forecasts issued:	199

Last year, 206 spots were issued, which ranked the 2014 season 7th for number of spots. Our top two years, 2006 and 2012, each had over 450 spots issued. National Weather Service-wide, the Riverton office ranked 38th for number of spots this year, and #7 in the Central Region.

☀ **NWS Riverton IMET Dispatch Days:**

There were zero IMET dispatch days within our CWA in 2015.

1 Riverton IMET was dispatched to the Motorway Complex in Kooskia, Idaho from September 4th through the 18th