# Harris Fire Burnover

Facilitated Learning Analysis

*"I've never seen [a fire] come out of nowhere so fast. All it took was the wind switch"*


**Cover photo:** The damage sustained to the Type 6 Fire Engine as a result of the burnover.

# Contents

## Executive Summary

At 16:18 on July 16th, 2021, an ambulance was requested for a burn victim at the top of Bellion Road near Joliet, Montana. The call came in 58 minutes after the smoke plume had been reported for the fire, 40 minutes after the engine carrying the firefighter had arrived on scene, and about 10 minutes after the engine had first engaged with the fire.

This incident occurred during initial attack on the Harris Fire, a grass fire that ignited at the top of a plateau on private ranching land approximately 4 miles north of Joliet, Montana. The burn victim was an Engine Boss from Red Lodge Fire Rescue, with six years of experience in wildland fire. He and his crewmate on the engine were one of the first resources on scene.

**Figure 1**. Photo of the Harris Fire, taken shortly after the burnover.

Prior to the burnover, the instructions from the incident commander (IC) to the Red Lodge Fire Rescue Engine Crew were to keep the fire from spreading off the plateau where it was burning. About 7 minutes later, they noticed a change in wind direction and speed that caused a dramatic increase in fire behavior. The Engine Boss, who was on foot at the end of the hose line, made the decision to retreat to the black but was not able to reach it before approximately 20-foot flame lengths were on top of him. The result was 2nd and 3rd degree burns on 45% of his body, prompting him to be evacuated to the Billings Hospital and then life flighted to the burn center in Salt Lake City, where he received care. His crewmate rode the burnover out in the engine and walked away with no physical injuries.


**Figure 2**. A photo of the Red Lodge engine that was burned over, taken shortly after the incident.

At the time of the burnover, nearby resources included a Type 6 Joliet Volunteer Fire Department Engine in addition to the Type 6 Engine from Red Lodge Fire Rescue. There were also multiple ranchers in their personal vehicles, a water tender, and a Type 2 state helicopter with a state helicopter manager. The fire was burning in pastureland that had not been burned, grazed, or hayed in six years, consisting primarily of dense grass and some sage approximately two feet in height. The zone weather forecast for the day predicted high temperatures in the 90s, with isolated to scattered showers and thunderstorms with strong wind gusts and low chance of wetting rain.

Nothing extraordinary happened leading up to this incident. Rather, it was a string of perfectly ordinary and understandable events and decisions that led to this devastating outcome. For this reason, nearly every wildland firefighter can put themselves in the boots of those involved and learn from the unintended consequence.

> ***"I thought it was just a plain old grass fire and we were gonna put her out and go home."***
>
> -Dan, Red Lodge Fire Rescue Engine Boss

## The Lead In

The 2021 fire season started extremely hot and dry. On July 1st of that year, the National Weather Service issued a fire weather briefing that warned that the above-normal temperatures and long-term drought conditions throughout the month of June had resulted in high fire weather danger for Montana. The report stated that fire weather danger for the first half of July 2021 would rival past big fire years, including 2006, 2012, and 2017, with "no relief in sight" (Appendix A).

A couple of weeks later, the lightening-ignited Harris Fire was first detected at 03:31 on the night of July 16th. The Joliet Volunteer Fire Department responded, and firefighters were able to knock it down at around 5 acres. At 04:44 in the early morning, they determined that there were no remaining hot spots, and they departed after asking the landowner to check the area the following afternoon.

At around 15:00 on the afternoon of the 16th, an engine from Joliet Volunteer Fire Department began to patrol the ignitions from the previous night. As they approached the Harris Fire from Highway 212, they noticed a smoke plume rising from the plateau. They called the plume in to dispatch at 15:16, requested resources, and proceeded to the incident.

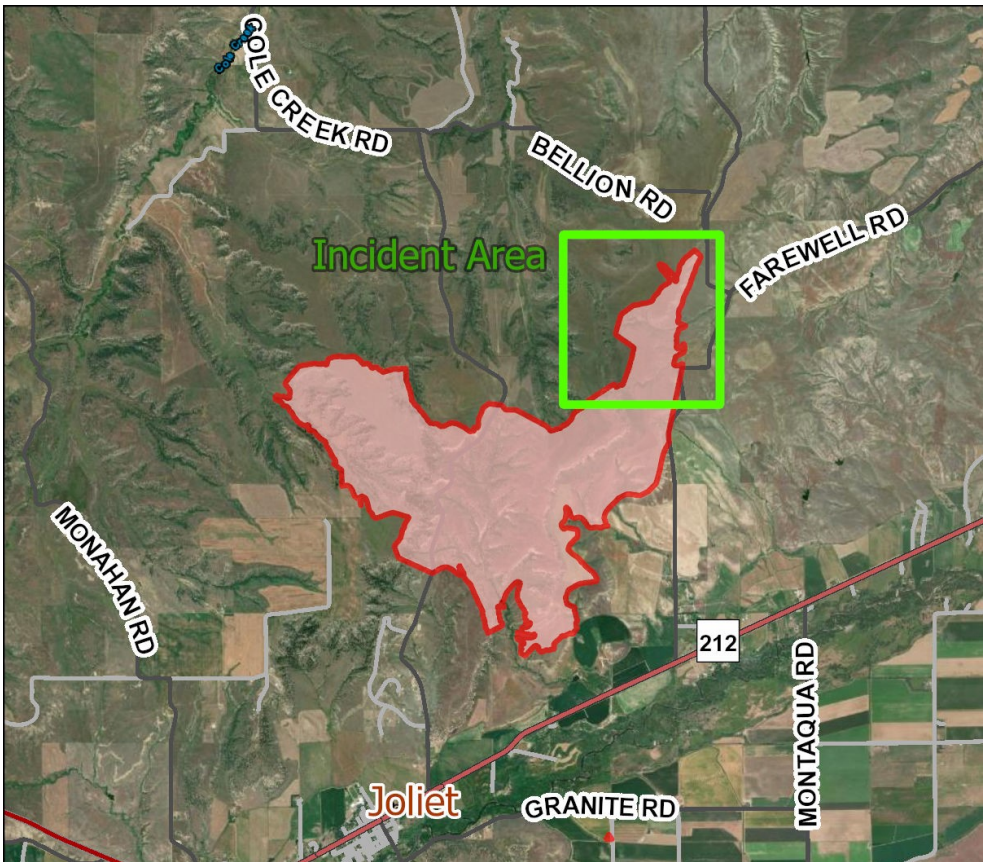



**Figure 3.** Map of fire in relation to the town of Joliet, Highway 212, and Bellion Road.

Three minutes after the Joliet Engine reported the smoke plume and requested resources, Dan and Scott, the Engine Boss and Firefighter staffing Engine 78 (E78) from Red Lodge Fire Rescue, called in to dispatch and reported that they were in route to the fire. Scott recalls being approximately 25 miles south of the fire when they called in, and the dispatch log shows that the engine arrived on scene at 15:38. Presumably, Dan was excited to be responding to an event, as he had expressed frustration to the department's fire chief that morning about his lack of opportunities to actively engage with fire that season.

When Dan and Scott first tied in with the incident, they positioned themselves in a pasture beneath the main perimeter of the fire. The fire at that time was burning primarily above and to the west of them, on top of a thumb-shaped plateau, and was backing down the slope. From their location in the pasture, they agreed that the appropriate way to engage that portion of the fire would be to hold it at the toe of the slope after it backed down the hill.

Immediately upon arrival, Dan, an engine boss with six years of fire experience, began quizzing Scott on their escape route. Scott was a novice firefighter who had completed basic training in May and was on probation through December 2021. All through the academy training period, Dan had been Scott's

mentor, and he continued to fill that role during Scott's probationary period. While evaluating their potential tactics, the two collectively decided that, if the fire made a run down the hill, they would return to the engine and retreat to Bellion Road, the 20-foot-wide dirt road they had used to approach the fire.

Approximately 25 minutes after they first tied in with the fire, the IC requested that Dan and Scott reposition to the top of the plateau. Once there, they were able to connect with the IC in person for a briefing sometime between 16:05 and 16:10. That meeting took place in an area that was already black and cold. By this point, the fire was burning with two fingers: a western one on top of the plateau and an eastern one burning on the slope below the plateau, which left a pocket of unburned fuels between the two fingers. The wind was blowing from the northeast at approximately 5-10 miles per hour, pushing the western finger to the southwest and creating flanking fires on both sides. Because of the proximity of ranches and the town of Joliet to the fire, as well as the continuous fuels in front of the fire, the priority for the IC was to catch that finger on top of the plateau before it burned into the coulee to the south.

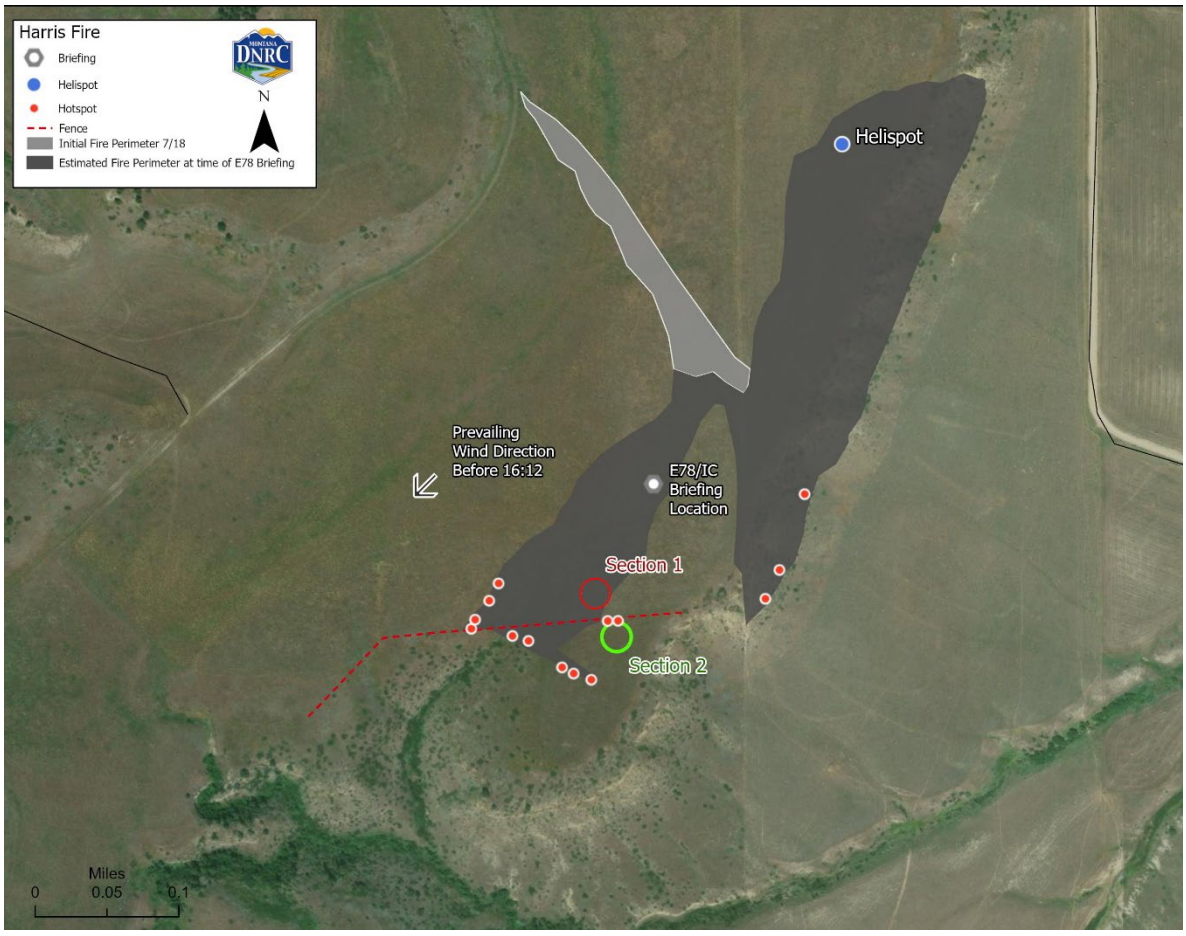



**Figure 4.** Map of the approximate perimeter of the existing black, as well as the active hotspots, prior to the burnover. Sections 1 and 2 on the map indicate Dan and Scott's general positions following their briefing with the incident commander.

**The FLA team estimates the time between when E78 arrived on the fire to when the IC briefed Dan and Scott at the top of the plateau was approximately 30 minutes.**

## Engaging the Fire

Dan recalls first engaging that priority finger of the fire with a mobile attack along the eastern flank. The section that they were attacking (section 1) was backing to the east, towards the edge of the plateau on the north side of a barbed-wire fence that cut across the base of the thumb-shaped plateau. To the south of them, Dan and Scott could see that the head of the finger had hooked east as well, with unburned fuel between them and that flank. The consistent breeze from the northeast, however, moderated fire behavior, causing the fire to back slowly towards them with low flame lengths.

Dan and Scott attacked that first section of the fire with Scott driving E78 along the edge of the black, and Dan manning the hose on the passenger side. In accordance with department common practice, Dan was not wearing his line pack and fire shelter, as neither he nor Scott would ever get past the end of the hardline hose. In that first section, Dan was always in Scott's direct line of sight, and the three-to four-foot flame lengths "took down easy" and quickly.

After putting out that first section, Dan and Scott drove through a hole that had been cut in the fence by the Joliet Volunteer Fire Engine (E15) operating in front of them. They then drove into an unburned section of the field and stationed their engine pointing towards the fence, on the south side. Since they were now out of the black, they reassessed and determined that their escape route was back into the black, either by going back through the hole cut in the barbed wire fence, or by busting through the fence. They were not overly concerned with the portion of the fire burning to the south of them, as the consistent northeasterly breeze continued to push against that flank. The relative ease with which they had caught the first section left them feeling confident that this section would lay down quickly as well.

**Figure 5.** A photo of the unburned fuels on top of the plateau, near where the burnover occurred. The grass and thatch were denser than many other fields in the area because of the long time since grazing, haying, or burning.

Scott and Dan then re-engaged with the fire in this second section the same way they had the first, with Scott driving the engine and Dan manning the hose while walking with the engine on the passenger side.

Dan had the hose over his shoulder and was working it back and forth towards the flames, while Scott focused on keeping an eye on Dan, maintaining communication, and following Dan's orders.

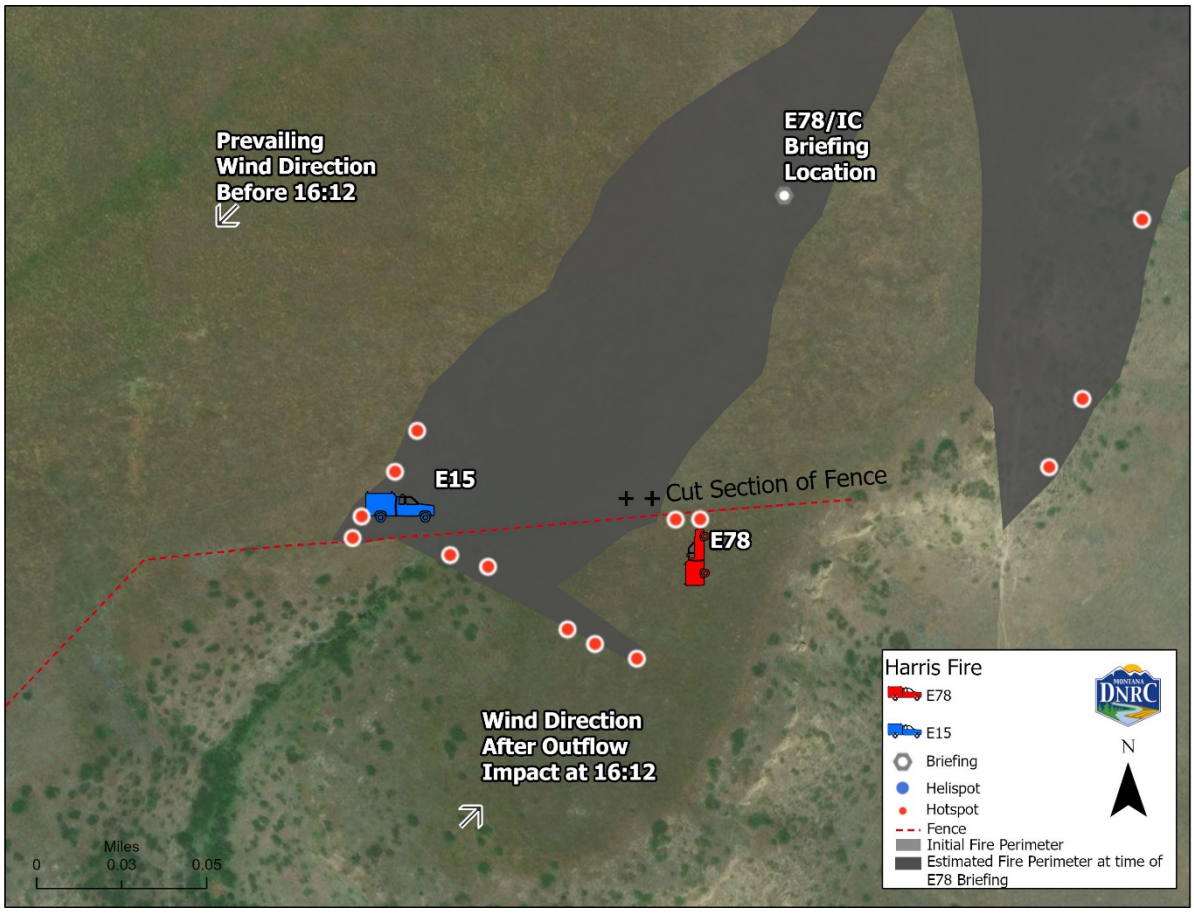



**Figure 6.** The position of E78, as well as E15, relative to the existing black and the barbed wire fence immediately prior to the burnover.

**The FLA team estimates that the time between the briefing with the IC at the top of the plateau to when they engaged this second section of the fire was approximately 5 minutes.**

## The Burnover

This second section proved harder to suppress. Dan was having to retrace his steps and hit areas with water repeatedly. Then, sometime between 16:12 and 16:15, wind direction and speed drastically changed. It picked up from a light breeze to where "it was blowing hard," and the wind was now coming from the southwest, a shift of nearly 180 degrees. Scott remembers flames being approximately 15 feet from the passenger side of the engine when he heard Dan say, "we have a problem." Dan, who was 10 to 15 feet from the opposite side of the engine, between

> ***"There was no wind and [then] all of the sudden there was a hurricane coming with a fire in front of it."***
>
> -Dan, recalling the sudden shift in wind and fire behavior prior to the burnover

the vehicle and the fence, told Scott “I’m heading back to the black.” Concerned for Scott’s safety in the engine, Dan ordered him to “hit it” and return to the black as well.

Seconds later, the flame front was on top of Scott in the engine. The flames were high enough that he could not see the top of them from inside the vehicle. Given that he was already caught in the fire and aware that there was a cliff face somewhere nearby, Scott stayed in place and let it burn over the engine. He later described it as being “hotter than hell in the cab” for the 20-30 seconds of the burnover.

**Figure 7.** A comparison of the inside and the outside of the Red Lodge Engine, from photos taken two weeks after the burnover. The comparison highlights that, even though riding out this event inside the engine was certainly miserable for Scott, he was in the safest possible position at that moment, and for that reason was able to escape this incident with no physical injuries.

For Dan, those few seconds between when he recognized that they had a problem and when the flame front hit were not enough for him to return to the engine or reach the black. He later said “I’ve been on many fires, [and] I’ve never seen one come out of nowhere so fast. All it took was the wind switch.” Although he was only 15 or so feet from the burned portion of the field that he and Scott had just left, the fire was traveling too fast for him to get there. With no line gear on him, and no time to deploy a shelter even if he had carried it, he was left with just his PPE to protect him from the 20-foot high, fast-moving flame front, which hit him after slamming into the driver’s side of the engine and eddying under to the passenger side.

**The FLA team estimates that the time between engaging the second section of the fire to when the burnover occurred was approximately two minutes. Once the engine crew recognized the increase in fire behavior, the FLA team estimates that they only had a few seconds to react before the flaming front reached their position.**

## After the Incident

> ***"Good job – you didn't panic."***
>
> -Dan to Scott, immediately after the burnover

Even after the flame front hit, Dan kept running towards the black. He hopped over the fence, unaware at that moment of the extent of his injuries. Scott, who had not seen Dan since the burnover, remembers immediately cranking the steering wheel to pull out once it had passed. The dense smoke had reduced visibility to near zero, but he did eventually find the fence and was able to bust through it to get to the cold black. This second opening that he created in the fence was just east of the original fence opening. Scott then spotted Dan again from the passenger window of the engine, walking through the just-burned field searching for his helmet.

Scott drove the now heavily damaged engine over to Dan to check in with him. Dan was still very coherent, and the first thing he did was commend Scott: "good job – you didn't panic." Dan then extinguished the portions of the engine that were still on fire and asked Scott to get in touch with the IC and inform him that they were now "out of the game and need EMS up here right away." By the time Scott had relayed that message over the radio, Dan had found his helmet, so Scott transported him to the cold black in the engine. Dan continued to pace around in circles near the engine until the IC arrived. The Joliet Volunteer Fire Engine, with an EMT on board, arrived quickly thereafter.

The IC and the EMT confirmed that EMS had been called as they checked Dan's airway and had him do some breathing. They otherwise determined that they could not do anything for Dan on top of the plateau. Both Scott and the IC remember that Dan's face had a glow to it, and the right side of his face had been burned to the point where it was drooping. The back side of his clothes had also been burned through, especially on the right side, where his PPE was in tatters.

**Figure 8.** The condition of Dan's PPE on the right side of his body. These photos were taken shortly after the burnover, prior to relocating Dan from the top of the plateau to the bottom of the hill to wait for EMS.

Due to the extent of Dan's burns, the IC and EMT made the decision to call Help Flight. Help Flight, however, could not make it to the burnover site due to an approaching thunderstorm. So, the EMT once again called EMS, asking them to "kick it in the butt" out to the fire. A Montana State Area FMO then arrived on the scene to load Dan into the state truck and take him down to the base of the hill, where they would eventually meet EMS for transportation to Billings Hospital. Dan left the scene with EMS at 16:50.

At the Billings Hospital, Dan was evaluated and flown to the University of Utah's Burn Center in Salt Lake City for treatment. Prior to leaving Billings, he was able to talk with both a State Area Aviation Officer and the Red Lodge Assistant Chief, who remembers Dan apologizing repeatedly for the situation. Dan remained in Salt Lake for nearly 9 weeks to receive treatment for his burn injuries.

> ***"In my 30+ years of fighting fire, this is what I've been most afraid of."***
>
> -IC of the incident

## The consensus

Everyone's account from that day agreed upon at least one fact: that wind speed and direction on the fire changed dramatically at approximately 16:15. Prior to this wind shift, the Joliet Volunteer Firefighter/EMT had just returned from refilling the tank on his engine to re-engage the western flank of the fire. Instead, the wind shift forced him to drive through the flame front to get to the black. He later recounted that "it happened so fast, you didn't have time to judge, you just had to move." The helicopter manager, who was on foot at the western flank, guessed that the wind gusts were blowing at 50 miles per hour out of the east. He recalled looking up as the gust hit and watching the winds forcefully shake the Type 2 helicopter in the air, just before the smoke reduced visibility on the ground to near-zero.

The pilot for that helicopter had successfully completed two bucket drops at the southern head of the fire prior to the burnover. When he first arrived at the fire, the pilot noted that there was a thunderstorm to the west, but it was approximately 28 miles away. Although it was on his radar to monitor, he thought they had some time to fight this fire before the storm hit. On the way back from the dip site to conduct his third drop, however, the outflow winds hit. He described it as "like a light switch had been turned on." The gusts immediately increased from a consistent 10 miles per hour to around 55 miles per hour at approximately 200 feet above ground level, which forced the pilot to jettison the water from his bucket.

Between the Joliet Volunteer Firefighter, the helicopter manager, the helicopter pilot, and the IC, there were over 60 years of firefighting experience on the plateau the day of the burnover. All of them were taken by surprise with the sudden and complete wind shift. What none of them (or anyone else present on the fire) knew at the time of the burnover was that the National Weather Service had issued a significant weather advisory at 15:50 (Appendix B). The advisory described the thunderstorm that the helicopter pilot had noticed as an event that was producing "strong wind gusts," of 50 to 60 mph. The storm was moving east at 30 mph, with Joliet among the predicted impacted locations.

## Key takeaways

Almost every single experienced wildland firefighter reading this analysis will find the series of events recounted here familiar: an initial attack in light, flashy fuels with rapidly changing conditions. It can, therefore, be tempting to write this off as an unavoidable situation in an inherently risky profession. While the FLA team agrees that accepting some level of risk while fighting fire is inevitable, we do believe there are some key lessons for the reader to consider, should they ever find themselves in a similar situation.

1) **Remember the importance of PPE and wearing it correctly**. Dan's injuries would have been much worse had he not been wearing his Nomex, a layered shirt, gloves, and a helmet in the appropriate manner.
2) **Remaining in your vehicle during a burnover may be the best option in light, flashy fuels.** Scott was able to walk away from the Harris Fire that day with no physical injuries. The comparison of the conditions inside and outside of E78 suggest that this was the safest place he could have been in that moment.

We also encourage you to reflect on the following questions, especially as they relate to fast-moving initial attack scenarios:

1) **When planning your escape route, how much time do you really have to react?** It was repeated throughout this analysis, both from individuals involved in the incident and those not involved, how common it is in our current firefighting environment to operate outside of the black. In this case, however, there were some slightly unusual circumstances, such as the high grassy fuel loads, that contributed to the unintended outcome. Take the time to consider such factors, as well as harder to predict factors such as unexpected wind shifts, when planning an escape route.
2) **Is the higher level of risk that comes with missing elements of LCES acceptable to you? If yes, what values must be threatened for you to accept that higher level of risk?** When asked, Scott shared that his major lesson learned from the day was, "what were we doing here?" With time to reflect, he regretted entering an unburned area with an inadequate escape route to save a few acres of grass, especially when an alternate suppression strategy may have been as effective at keeping the fire on the plateau.
3) **What is the process in your organization for quickly communicating special weather statements and advisories about changing conditions?** In this case, the special weather statement was issued only minutes before the thunderstorm impacted wind speed, direction, and fire activity at the scene, and no one on the fire received this information in time to react and reevaluate their tactics.
4) **When the forecast restates the same thing every day, how do you ensure that you still account for the potential impacts of extreme weather during initial attack?** Even if those on the hill had received the special weather statement in a timely manner, it had been hot and dry with a chance of thunderstorms in the area for weeks. Such repetition during fire season often results in the line of thinking that "nothing bad happened yesterday, so today we should be fine again." Even for the most experienced firefighters, extreme fire weather should still be of note; in fact, these are often the firefighters that must battle most against complacency to objectively consider the potential risk posed by extreme fire weather.

5) **Is your assessment of fuels valid?** Just as in timber litter fuel types, there can be significant variations in grass fuels with regards to fuel loading and arrangement. In many areas of the west, grazing lands are enrolled in conservation programs that govern the frequency of grazing, haying, or burning, resulting in significantly higher amounts of fuel on the ground. How do you make sure that your assumptions about fire behavior and spread rates are still valid as you make decisions about tactics?

Finally, those involved with the incident have struggled to cope with the impact of the burnover. As the Red Lodge Fire Rescue Chief puts it, "I challenge you to find a more well-connected fire chief in the state (of Montana), and this thing still ate my lunch." While every organization hopes to avoid a situation like this, it is always best to plan for the worst possible scenario. Doing so, however, is often difficult for smaller wildland firefighting institutions that may not have the same resources as a state or federal organization. For that reason, the FLA team has assembled a list of resources in Appendix C that may help you and your organization prepare for an unintended outcome such as the one described in this FLA.

## FLA Team

**Team lead:**

**Darryl Jones,** Fire Protection Chief
South Carolina Forestry Commission

**Team member & subject matter experts:**

**David Hamilton,** Training, Safety, and Workforce Development Program Manager
Montana Department of Natural Resources & Conservation

**Mike Maltaverne**
Montana State Fire Chief's Association

**Patrick Lonergan**, President
Montana County Fire Wardens Association

**Writer/Editor:**

**Julia Berkey**, Forestry Outreach Specialist
Montana Department of Natural Resources & Conservation

# Appendix A

Fire Weather Briefing for July 1, 2021

# Appendix A: Fire Weather Briefing

July 1, 2021 at 10:00 AM

National Weather Service

# Great Falls MT

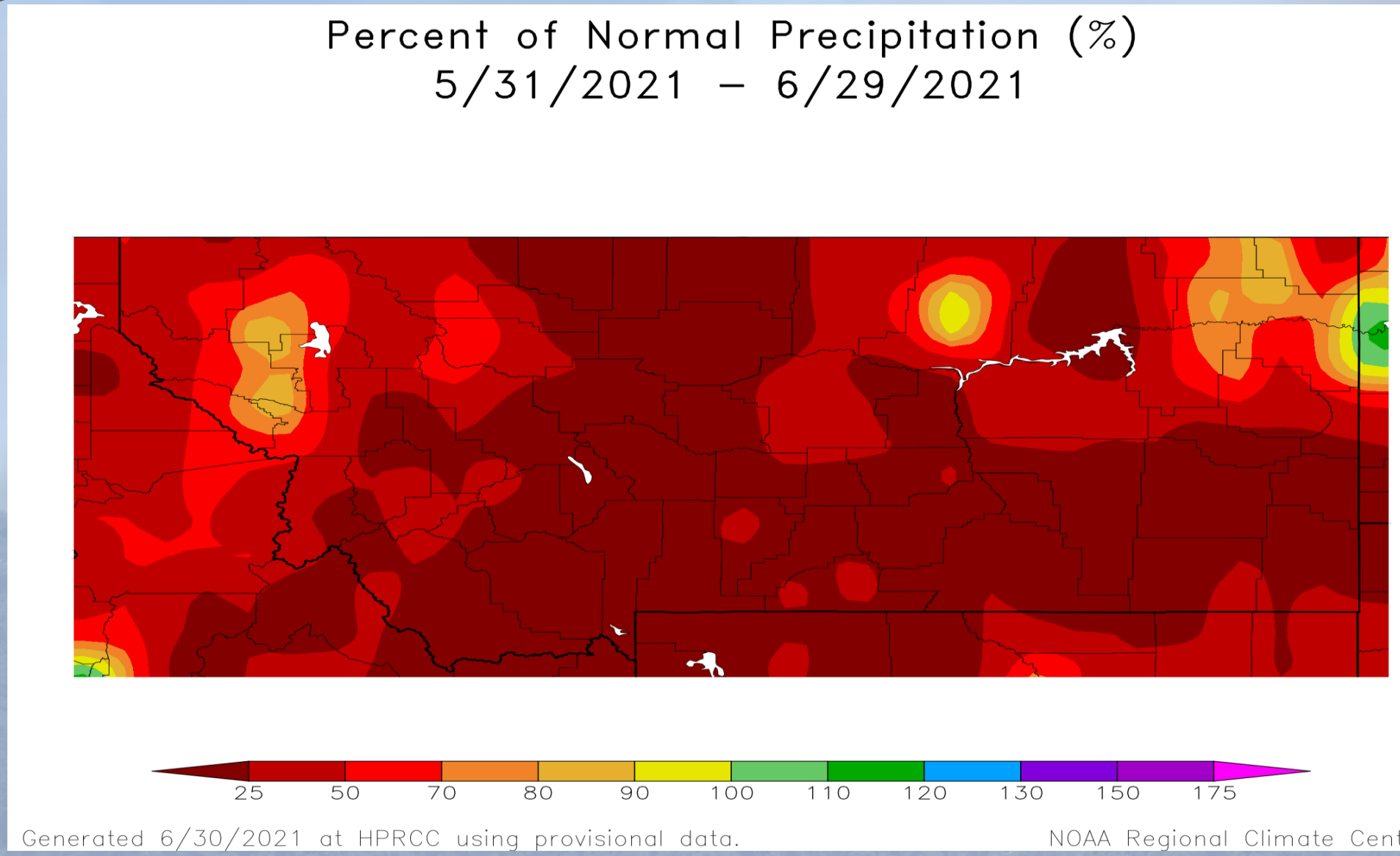
Building a Weather-Ready Nation

# Fire Weather Danger Rapidly Increasing

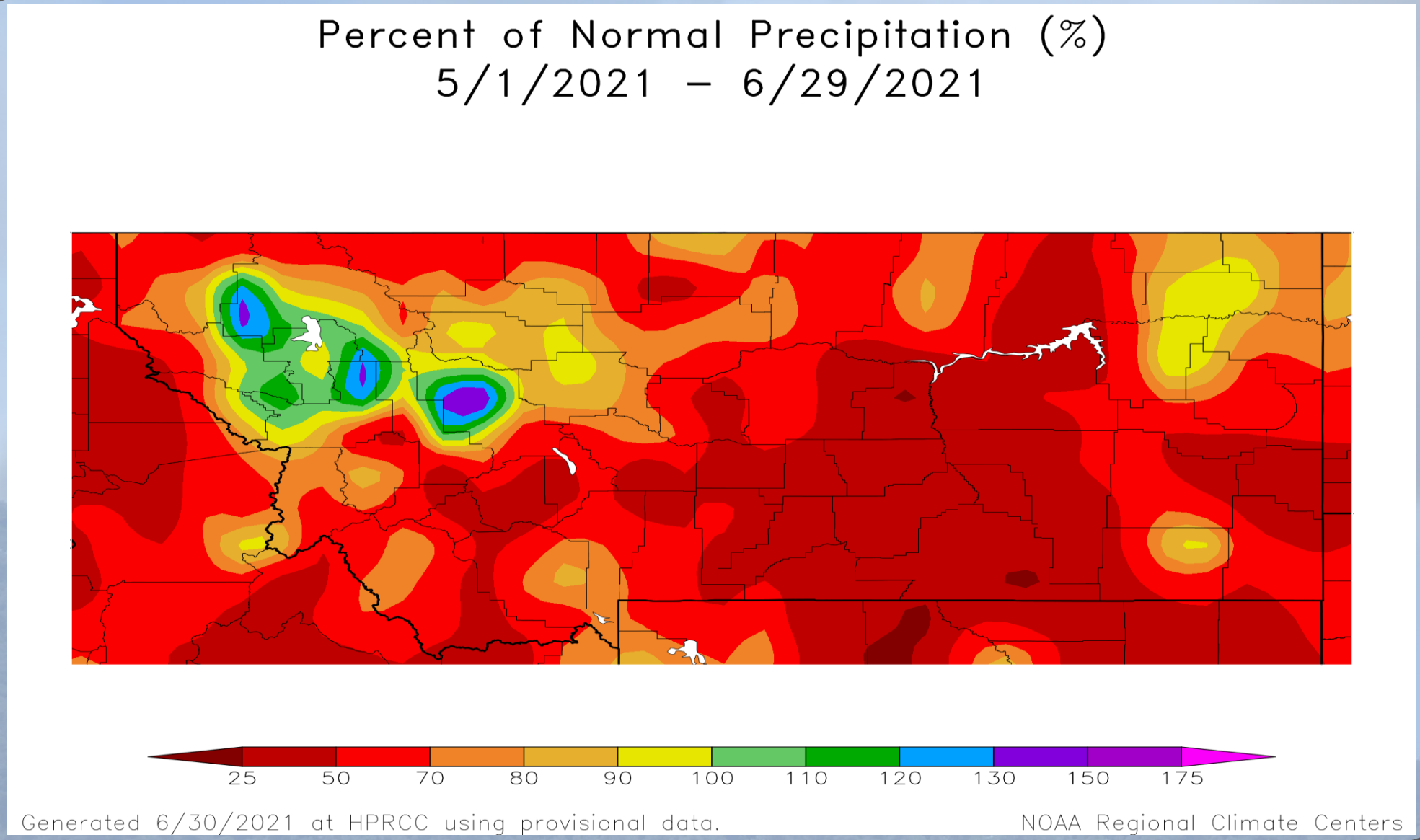
## Key Messages

- Dry June conditions have rapidly intensified long-term drought across much of the state, especially east of the Continental Divide
- Above normal temperatures and dry conditions will continue into mid-July (no relief in sight)
- Increasing thunderstorm chances (beginning today) and winds (next week) will result in increasing fire weather danger
- Fire weather danger currently rivaling recent big fire years (2017, 2012, 2006), but for different reasons

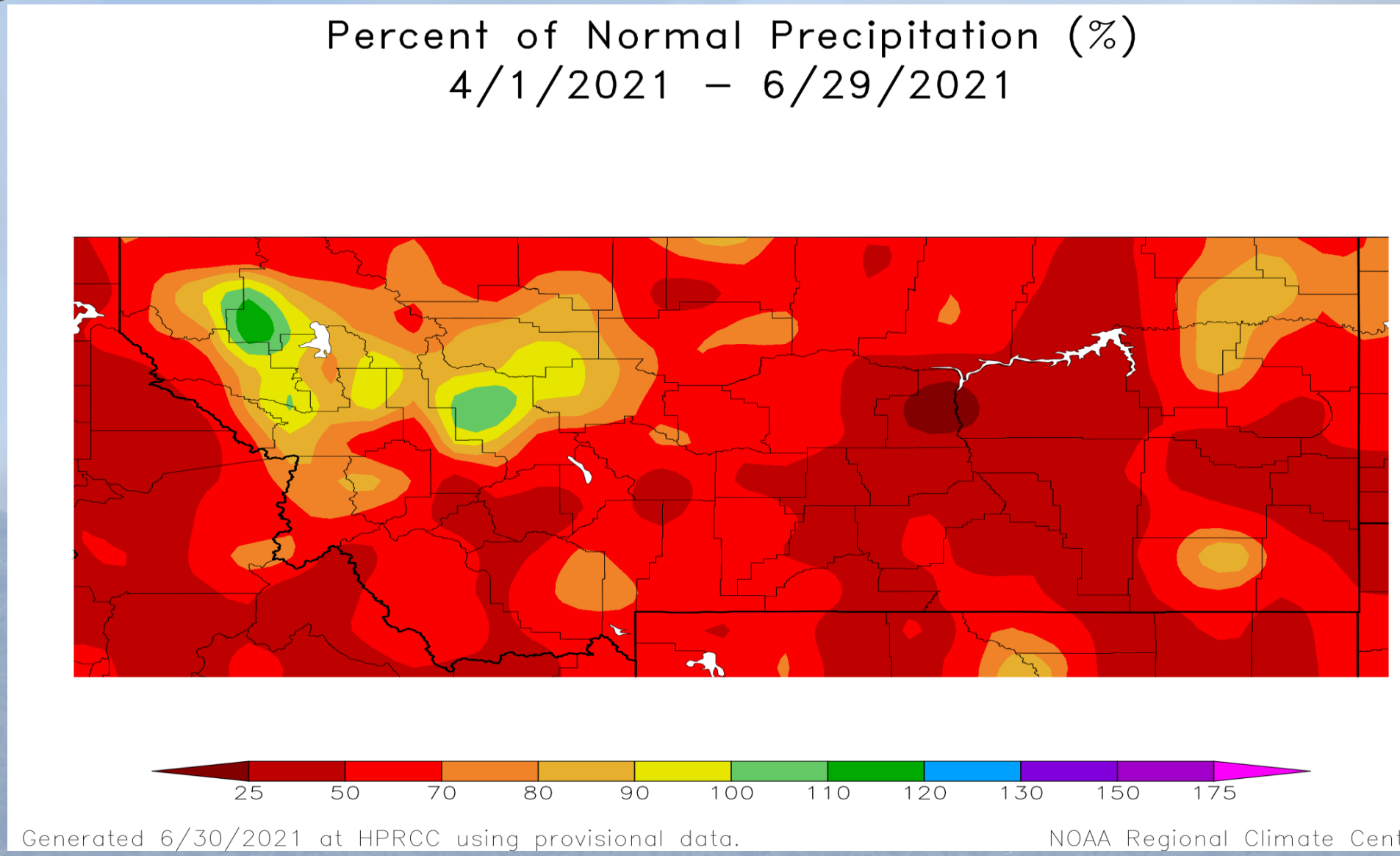
# Percent of Normal Precipitation – Last 30 Days



# Percent of Normal Precipitation – Last 60 Days

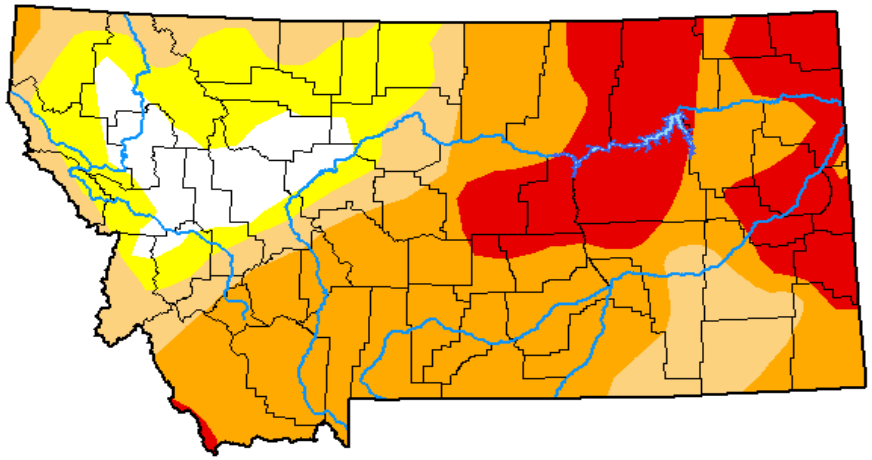


# Percent of Normal Precipitation – Last 90 Days



# Current Drought Monitor

## U.S. Drought Monitor
## Montana



**June 29, 2021**
*(Released Thursday, Jul. 1, 2021)*
**Valid 8 a.m. EDT**

*Drought Conditions (Percent Area)*

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|---|---|---|---|---|---|
| **Current** | 7.49 | 92.51 | 78.41 | 60.96 | 19.94 | 0.00 |
| **Last Week** 06-22-2021 | 8.77 | 91.23 | 68.60 | 47.84 | 14.25 | 0.00 |
| **3 Months Ago** 03-30-2021 | 16.61 | 83.39 | 41.97 | 17.16 | 0.44 | 0.00 |
| **Start of Calendar Year** 12-29-2020 | 36.37 | 63.63 | 34.41 | 8.27 | 0.36 | 0.00 |
| **Start of Water Year** 09-29-2020 | 11.86 | 88.14 | 40.59 | 4.22 | 0.02 | 0.00 |
| **One Year Ago** 06-30-2020 | 49.45 | 50.55 | 15.19 | 2.19 | 0.00 | 0.00 |

*Intensity:*

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

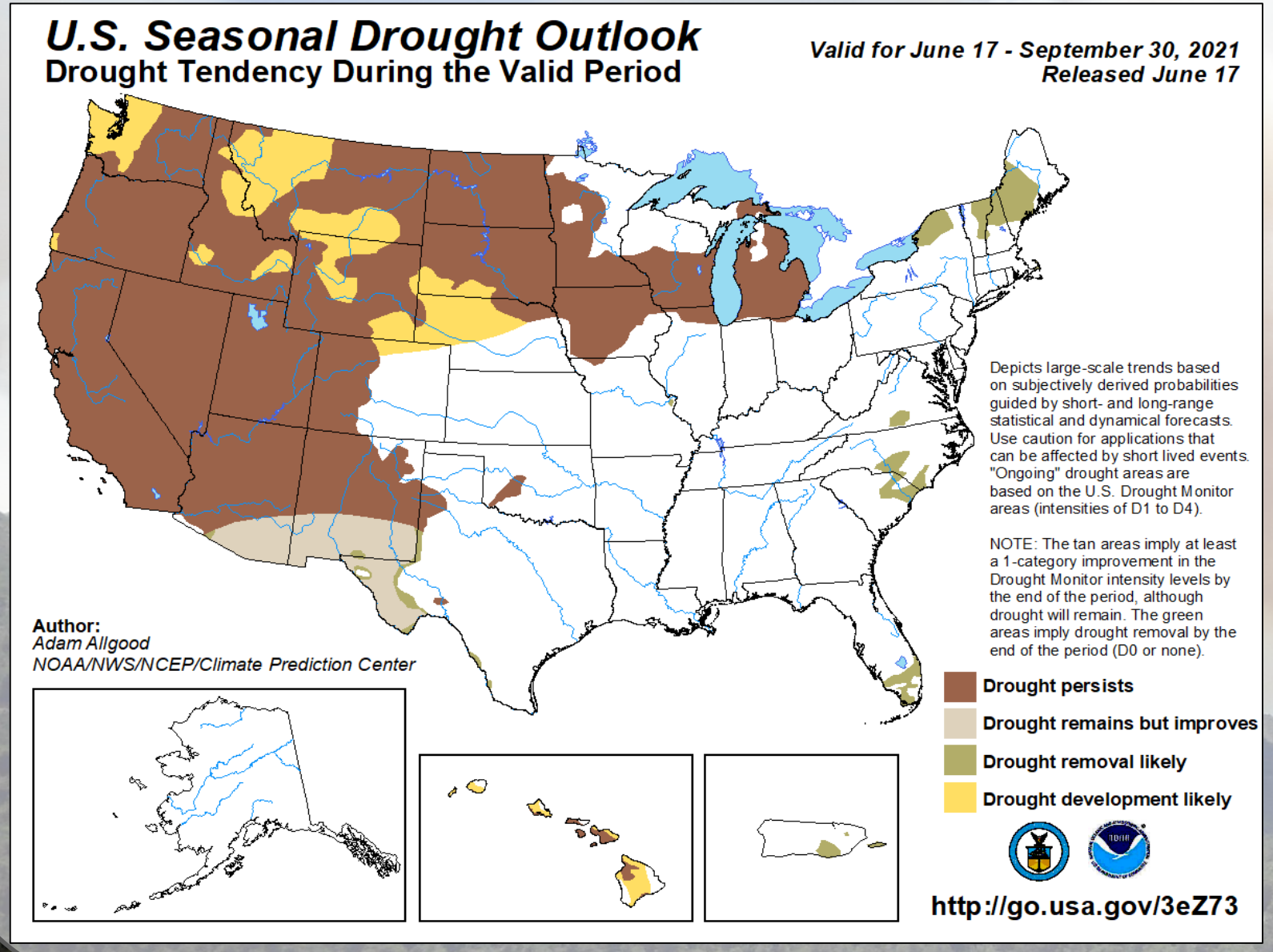
*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx*

*Author:*
Deborah Bathke
National Drought Mitigation Center

**droughtmonitor.unl.edu**

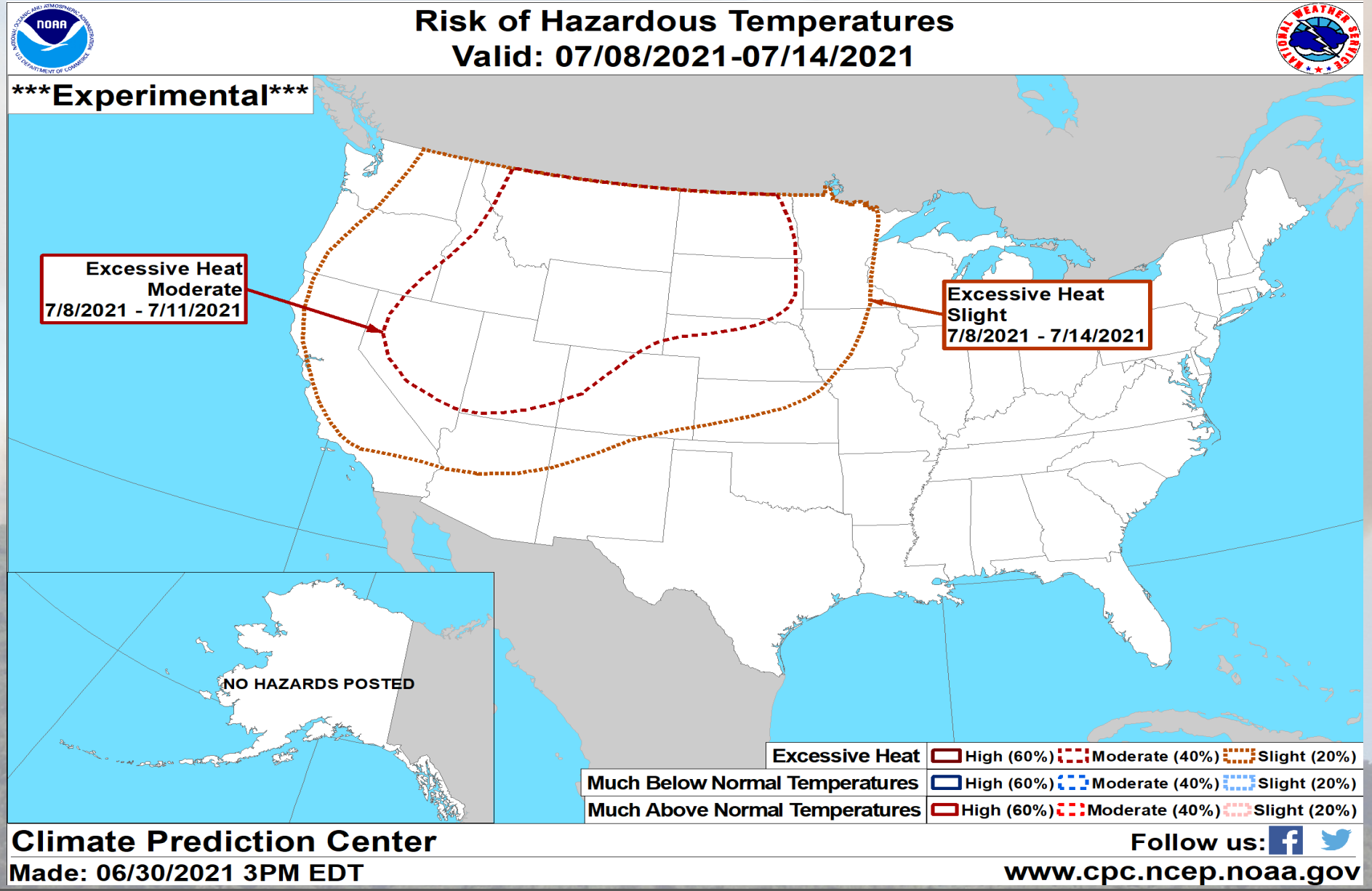
- **Dry June conditions have rapidly intensified existing long-term drought, especially southwest MT through central & northeast MT**
- **Many locations reported top-ten driest June of record**

# Current Seasonal Drought Outlook

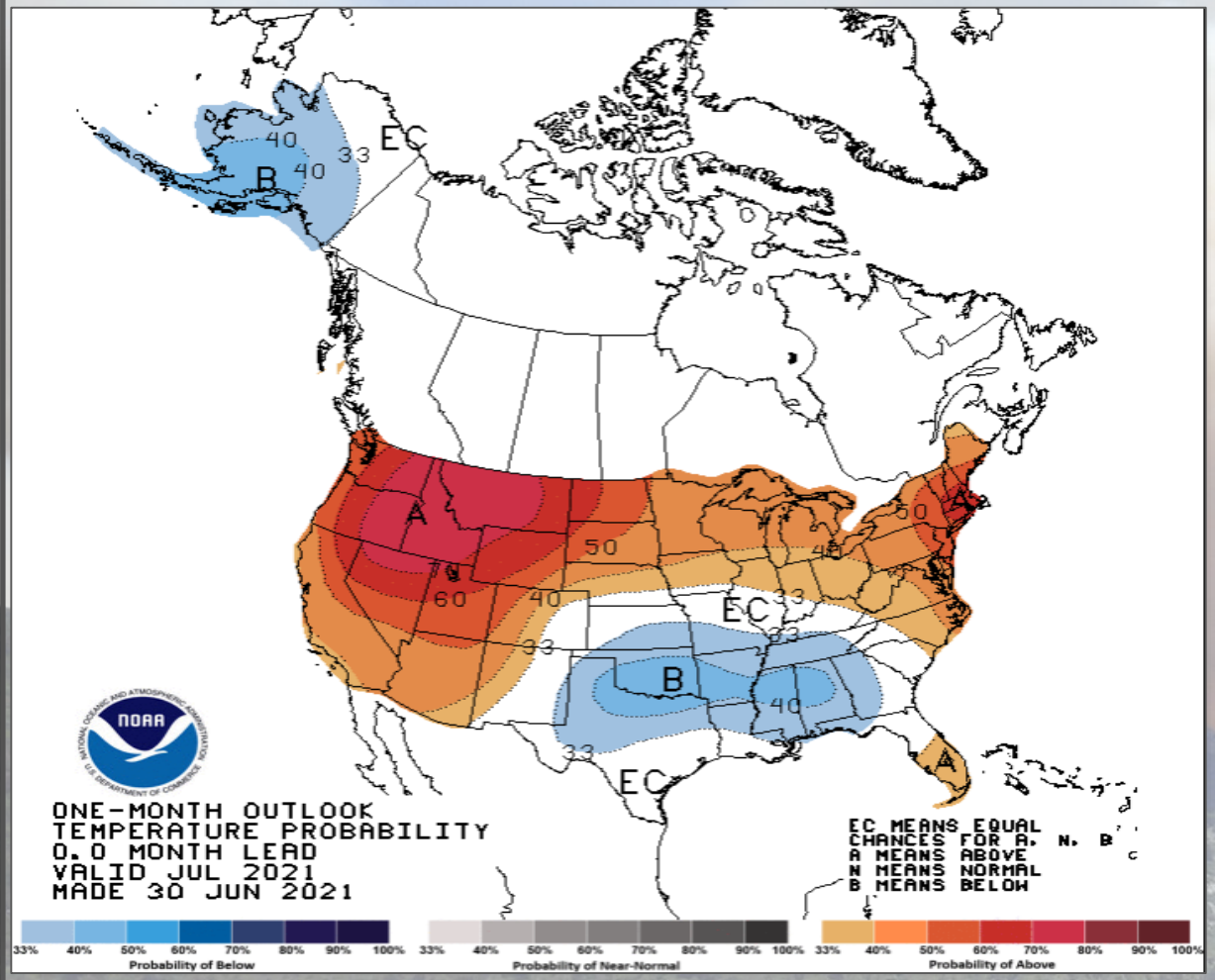



- Drought is expected to develop or persist across the state through the remainder of the summer

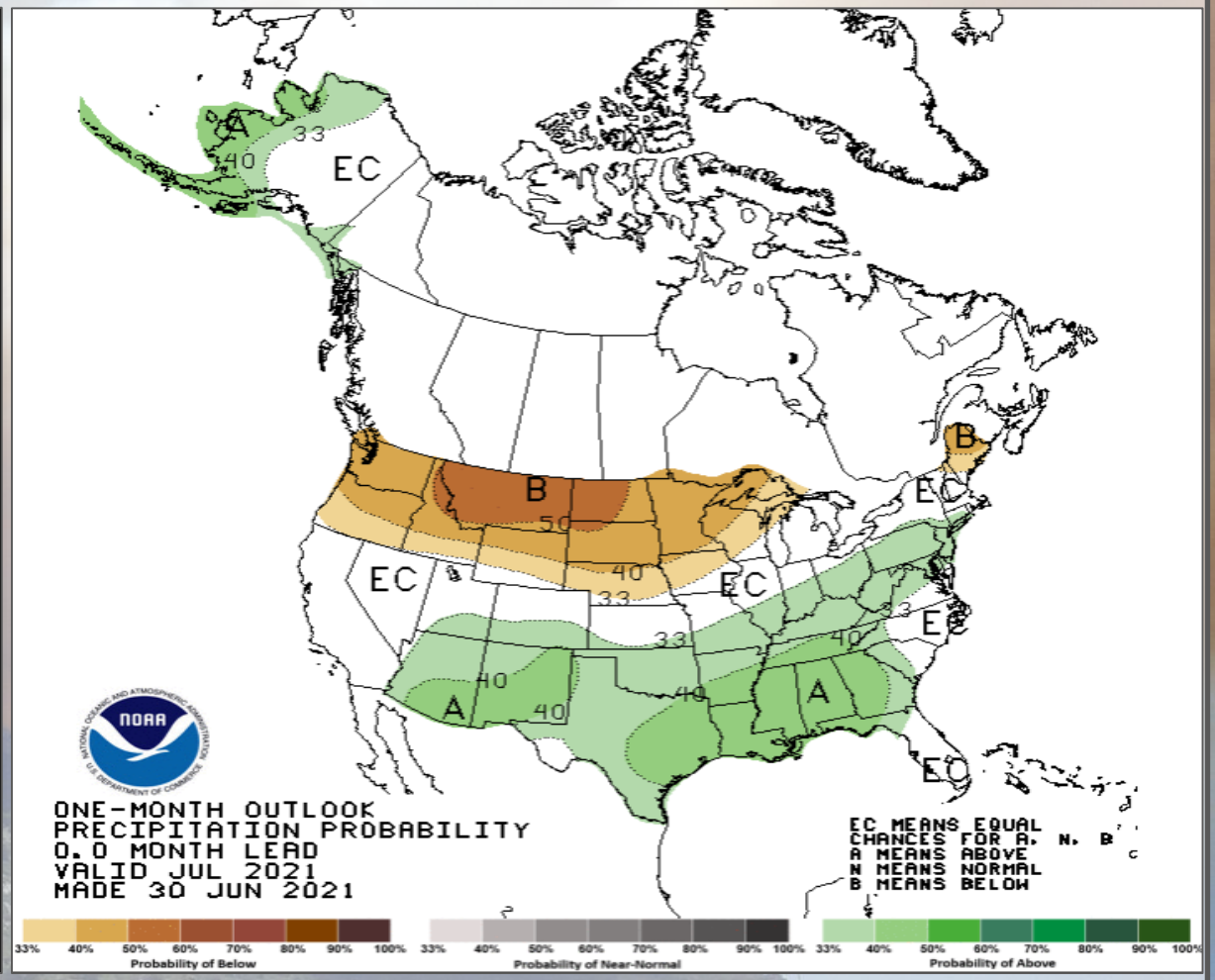
# Long-Term Temperature Hazards Outlook



# July Climate Outlook

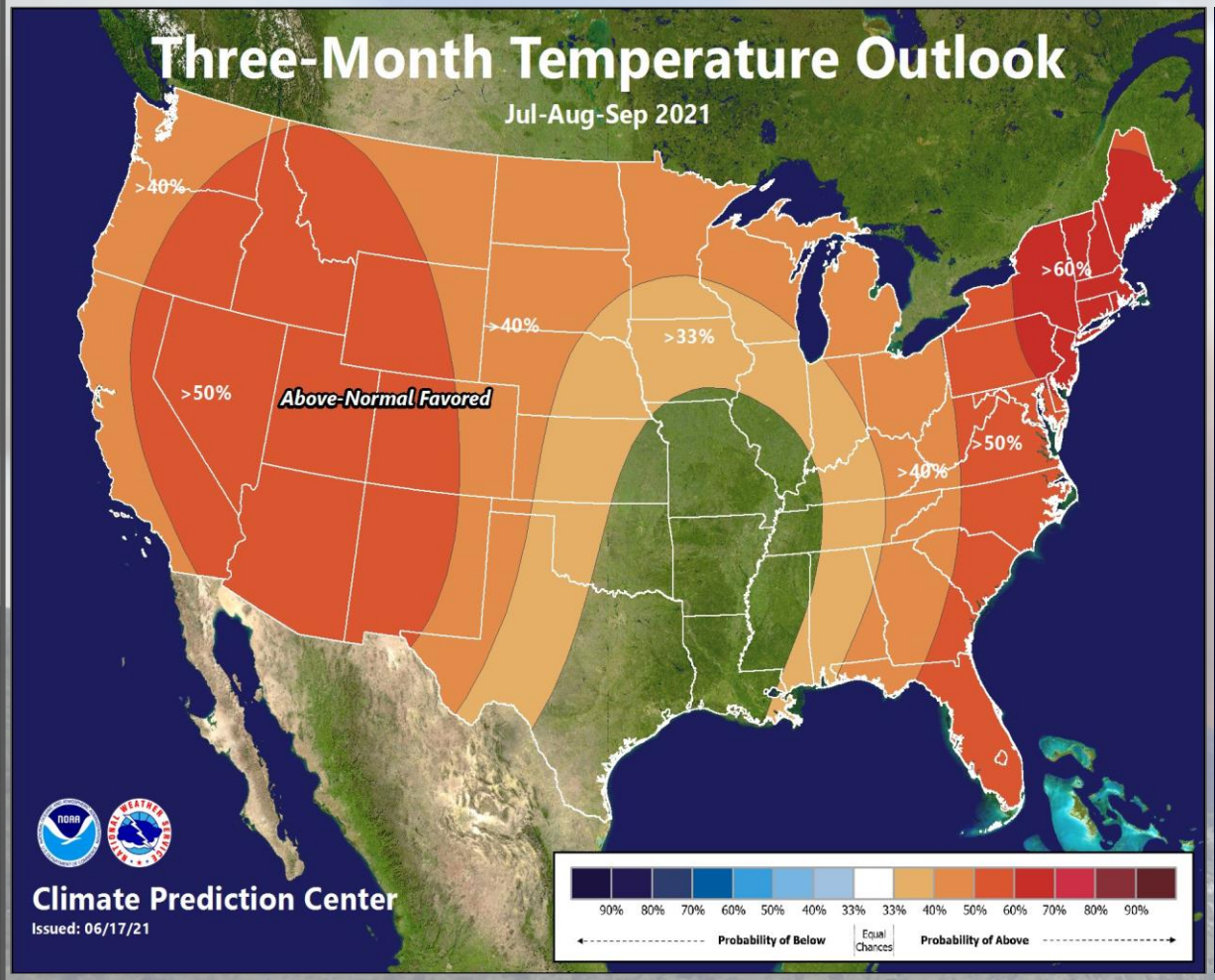


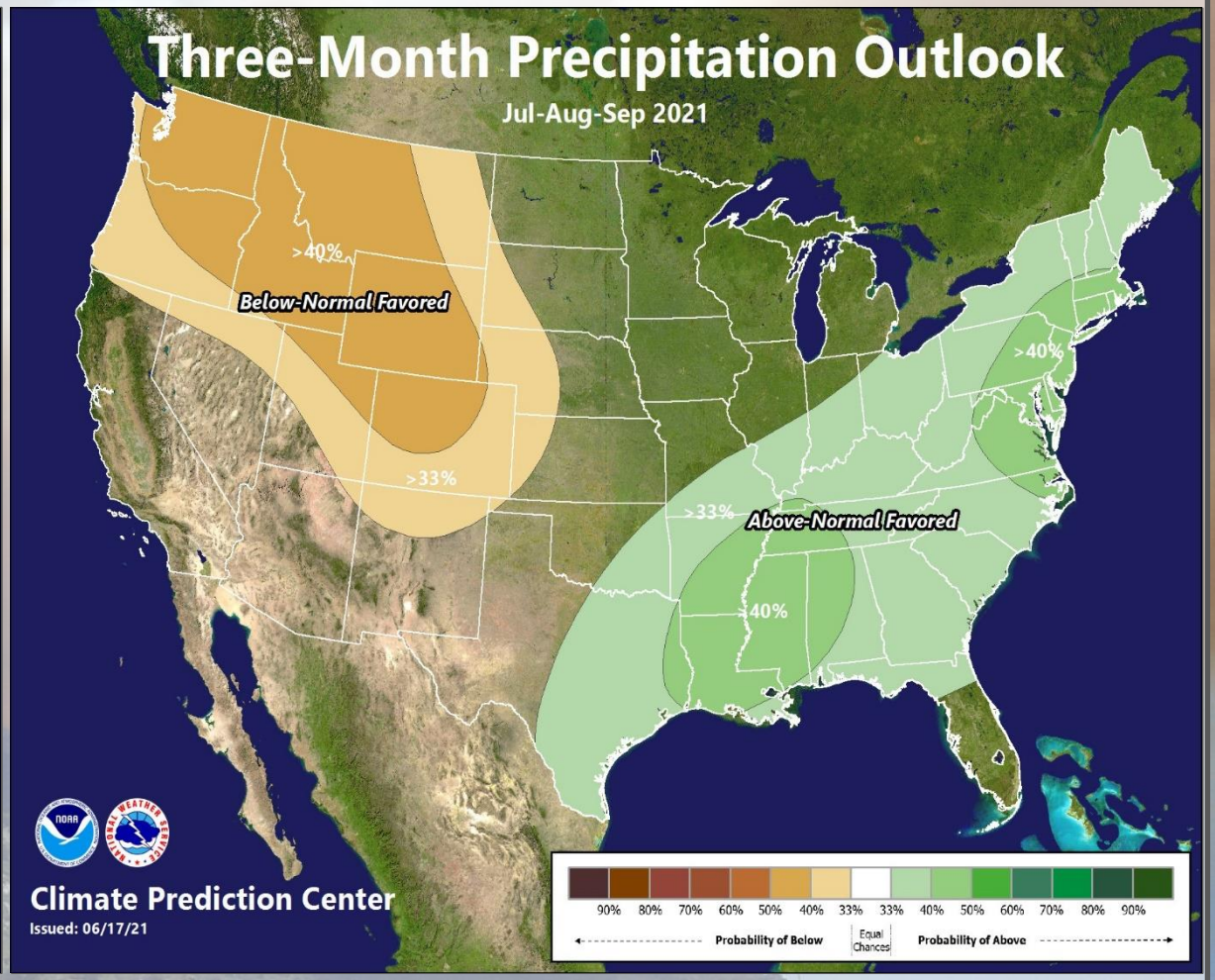

60 to 80% chance of above normal temperatures statewide




>= 50% chance of below normal precipitation

# July-August-September Climate Outlook

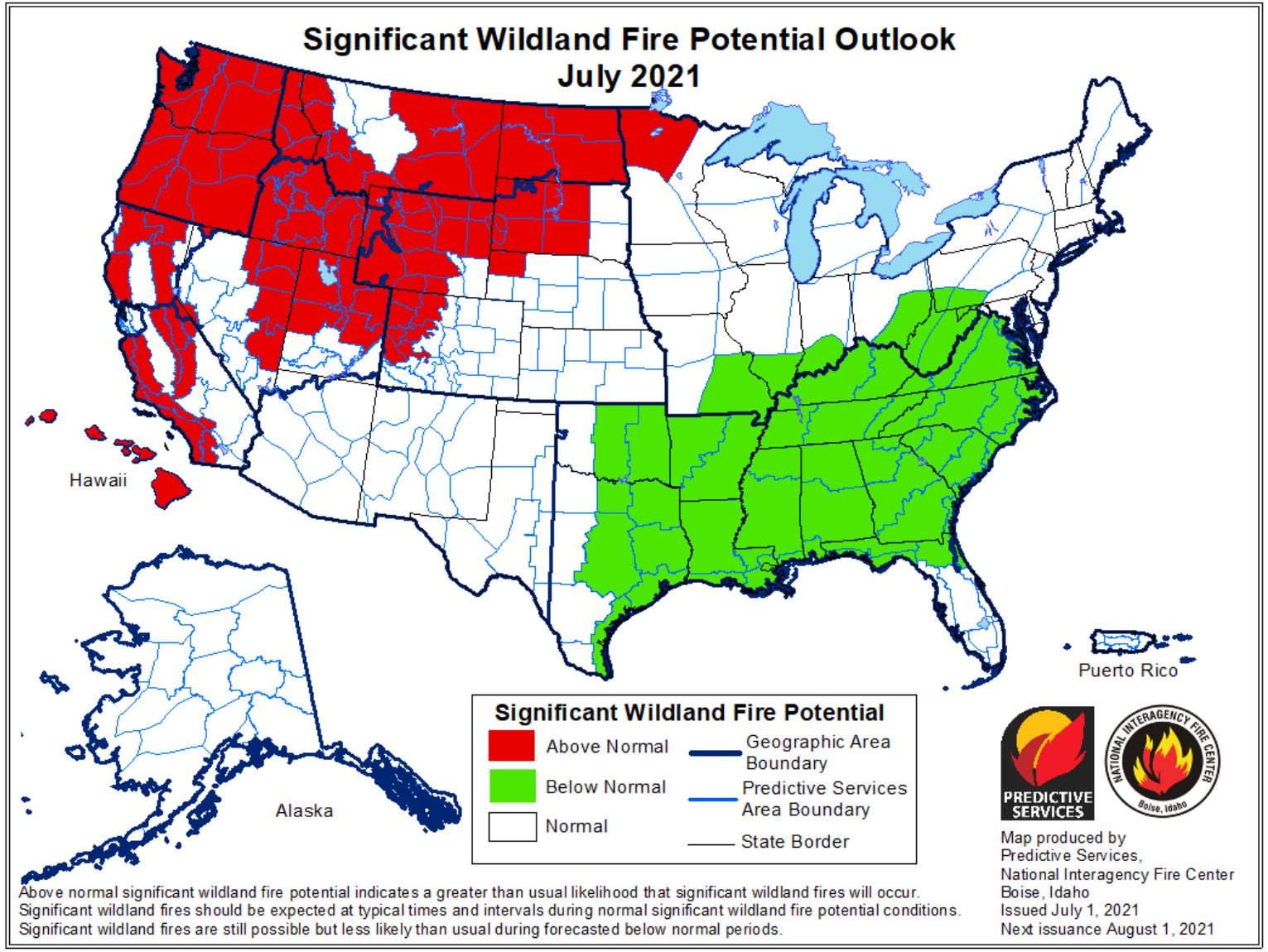



~45-55% chance of above normal temperatures statewide

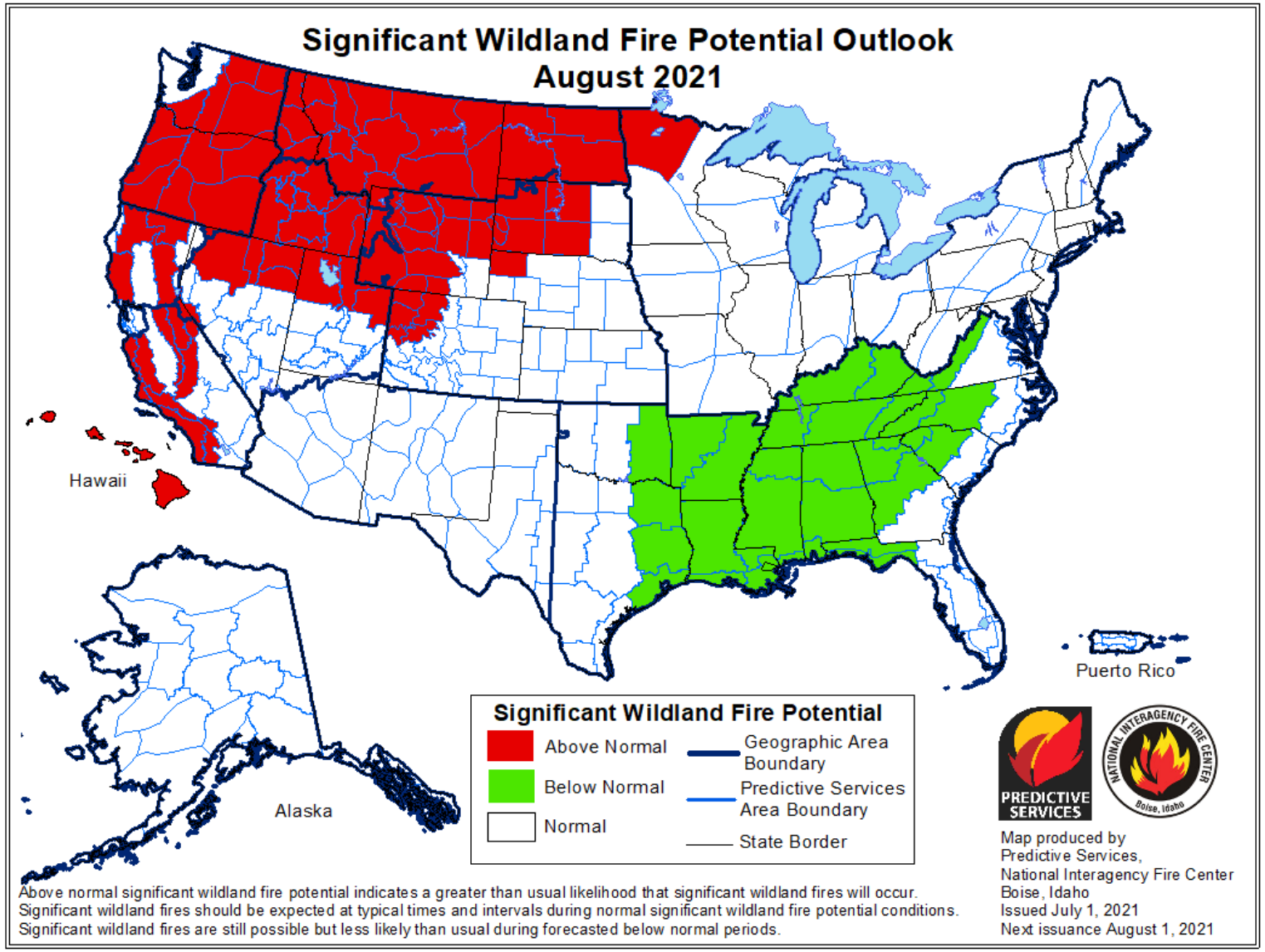
Below Normal precipitation favored, especially central and western areas

# July Significant Wildland Fire Potential Outlook




- New outlook for July features an upgrade of southern and eastern Montana to the Above Normal (red) designation
- Only west-central Montana remaining at Normal (white) designation

# August Significant Wildland Fire Potential Outlook




- Above Normal (red) designation for all of Montana

# Appendix B

## Weather Conditions for the Harris Fire

**DATE OF EVENT:** 7/16/2021

**FROM:** Tom Frieders (Warning Coordination Meteorologist – NWS Billings)

**EVENT:** A Red Lodge Fire engine was involved in a burn over event while doing initial attack on the lightning started Harris Fire. Scattered thunderstorms to the north of the wildfire (mainly north of I-90) produced gusty outflow winds and a wind shift that resulted in the burn over. Strongest wind gusts reported near the fire were 20 to 30 mph. Long range visibility (ability to visually see thunderstorms in the distance) was likely also poor due to hazy/smoky conditions in place from wildfire all across the western U.S.

**LOCATION:** Harris Wildfire between Joliet and Park City MT, 45.5381N, 108.9199W.

**NWS SUPPORT: FORECASTS/WATCHES/WARNINGS/ADVISORIES:**
* No Red Flag Warnings were in effect
* Fire Weather Forecast Discussions – attached below
* A Special Weather Statement was issued for nearby thunderstorms at 350 PM MDT and 420 PM MDT for the area for potential wind gusts of 50 to 60 MPH. – attached below
* Spot Weather Forecast was requested by Billings Interagency Dispatch at 436 PM MDT with the completed forecast published at 455 PM. – attached below

Fire Weather Forecast Discussions:

```
Fire Weather Planning Forecast for SCen and SErn Montana
National Weather Service Billings MT
318 AM MDT Fri Jul 16 2021

.DISCUSSION...

...Very Hot Temperatures Through Next Week...

A high pressure continues build over the districts today and into
the weekend, continuing the warming trend. Highs today will again
be in the 90s. We expect to see isolated to scattered showers and
thunderstorms over all districts, with the best chances in south-
central Montana. Storms will again have strong wind gusts, but the
chance of wetting rain will remain relatively low. This weekend,
high temperatures will be in the upper 90s to 105 degrees which is
expected to last through the middle of next week. Minimum
humidity will be in the lower to mid teens, with winds generally
less than 15 mph. Reimer
```

```
Fire Weather Planning Forecast for SCen and SErn Montana
National Weather Service Billings MT
213 PM MDT Fri Jul 16 2021

...Very Hot Temperatures Through Next Week...

.DISCUSSION...
A ridge of high pressure will dominae over the districts today
and into the weekend, continuing the warming trend. Highs will be
in the 95 to 105 degree range for much of the next several days.
We expect to see isolated to scattered showers and thunderstorms
over all districts this evening, with the best chance in south-
central Montana. A couple of stronger storms may produce brief
heavy rain, but storms will again have strong wind gusts with low
chance of wetting rain. Only a few showers or storms are possible
in far southeast Montana Saturday, with dry conditions Sunday and
Monday. Minimum humidity will be in the lower to mid teens, with
winds generally less than 15 mph. However, look for increased SE
winds (15-25 mph) across southeastern Montana Monday and Tuesday.
We may start to see some showers and storms move back into the
high country by the middle of next week. BT
```

Special Weather Statement:

```
Special Weather Statement
National Weather Service Billings MT
350 PM MDT Fri Jul 16 2021
```

```
MTZ034-066-141-170-162230-
Beartooth Foothills MT-Northern Carbon MT-Northern Stillwater MT-
Northern Sweet Grass MT-
350 PM MDT Fri Jul 16 2021

...SIGNIFICANT WEATHER ADVISORY...

At 348 PM MDT, Doppler radar was tracking thunderstorms producing
strong wind gusts 11 miles west of Columbus, moving east at 30 mph.

Wind gusts of 50 to 60 mph are possible with these storms. A gust to
63 mph was reported in Big Timber with this activity.

Locations impacted include...

Columbus, Joliet, Absarokee, Reed Point, Halfbreed Lake Wildlife,
Park City, Boyd, Molt, and portions of I-90 from Big Timber to Park
City.
```

## Spot Weather Forecast:

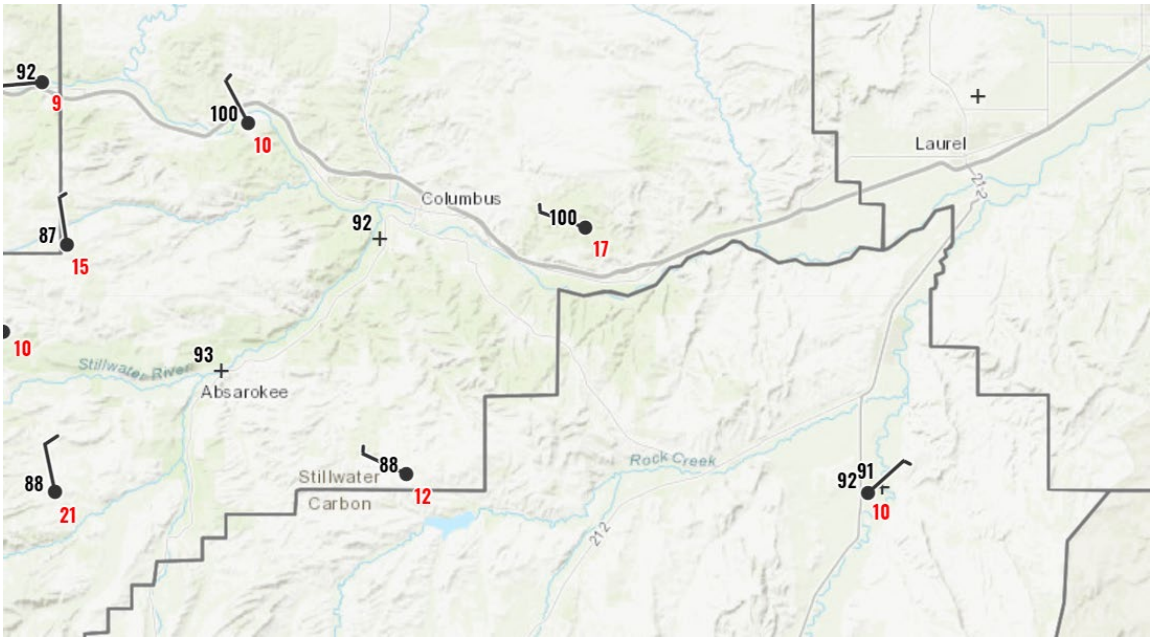
```
Spot Forecast for Harris Fire...Billings Dispatch

National Weather Service Billings MT
455 PM MDT Fri Jul 16 2021

Forecast is based on forecast start time of 1700 MDT on July 16.
If conditions become unrepresentative...contact the National Weather
Service.

Please contact our office if you have questions
or concerns with this forecast.

...EXCESSIVE HEAT WARNING IN EFFECT FROM NOON SATURDAY TO 9 PM
MDT THURSDAY...

.DISCUSSION...

Thunderstorm currently north of the fire is expected to stay
north, although wind gusts of 45 to 55 mph could impact the fire
from the west and northwest shortly. Isolated showers and
thunderstorms are possible through the evening, and gusty and
erratic winds will be the main threat. Expect west to northwest
winds to shift to the southwest overnight with only moderate RH
recoveries expected. Hot and dry conditions will continue on
Saturday.

.REST OF TODAY...

Sky/weather.........Partly cloudy. Haze. Isolated showers and
                    thunderstorms.
CWR.................10 percent.
LAL.................2...1 to 8 strikes/15 min/cell.
Max temperature.....91-96.
Min humidity........16-21 percent.
Wind (20 ft)........
 Slope/valley.......West to northwest winds 10 to 15 mph. Gusty and
                    erratic winds expected near thunderstorms.
 Ridgetop...........West 10 to 15 mph.
Mixing height.......12000 ft AGL.
Transport winds.....West around 10 mph.
Haines index........5.

.TONIGHT...
```

```
Sky/weather.........Mostly clear. Isolated showers and thunderstorms in
                    the evening. Haze.
CWR.................10 percent.
LAL.................2...1 to 8 strikes/15 min/cell.
Min temperature.....63-68.
Max humidity........45-52 percent.
Wind (20 ft)........
 Slope/valley.......Northwest winds 8 to 14 mph in the evening shifting to
                    the southwest to west 5 to 10 mph overnight.
                    Gusty and erratic winds expected near thunderstorms.
 Ridgetop...........Southwest around 10 mph.
Mixing height.......Decreasing to 300 ft AGL.
Transport winds.....West around 10 mph.

.SATURDAY...

Sky/weather.........Mostly sunny. Haze.
CWR.................0 percent.
LAL.................1...no thunderstorms.
Max temperature.....95-100.
Min humidity........13-18 percent.
Wind (20 ft)........
 Slope/valley.......West winds 5 to 10 mph. Gusts to 15 mph
                    in the afternoon.
 Ridgetop...........Southwest 10 to 20 mph.
Mixing height.......Increasing to 14000 ft AGL.
Transport winds.....West around 10 mph.
Haines index........5.
```

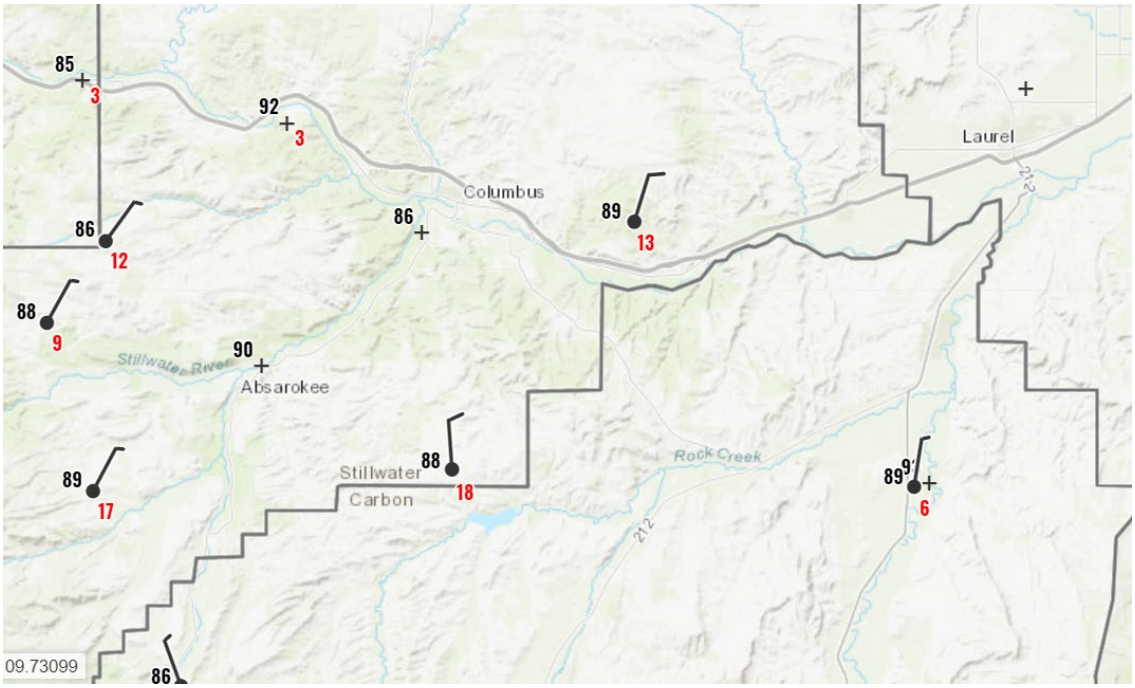
**OBSERVATIONS:**

* Observations not available at incident location, but temperatures were generally in the 90s with relative humidities near 20 percent ahead of the outflow from the thunderstorms. Cooled into 80s behind the outflow.
* Severe Drought Conditions in place, unable to access archived fire dangers

Local observations at 3pm (Temperatures in black, wind gusts in red)

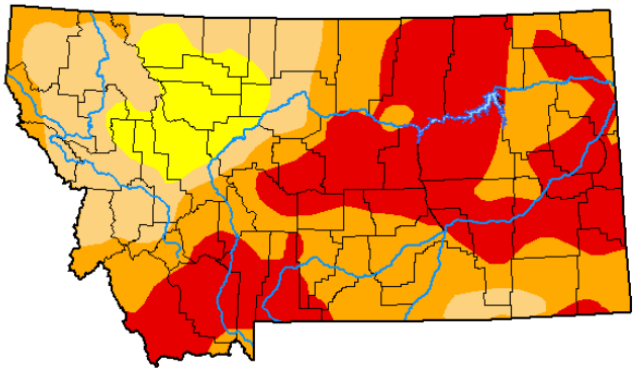


Local observations at 5pm (Temperatures in black, wind gusts in red)




**U.S. Drought Monitor**

# Montana



## July 13, 2021

***(Released Thursday, Jul. 15, 2021)***

**Valid 8 a.m. EDT**

*Drought Conditions (Percent Area)*

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|---|---|---|---|---|---|
| **Current** | 0.00 | 100.00 | 91.44 | 72.03 | 36.42 | 0.00 |
| **Last Week** *07-06-2021* | 0.00 | 100.00 | 84.34 | 65.23 | 25.90 | 0.00 |
| **3 Months Ago** *04-13-2021* | 13.53 | 86.47 | 44.64 | 18.74 | 8.46 | 0.00 |
| **Start of Calendar Year** *12-29-2020* | 36.37 | 63.63 | 34.41 | 8.27 | 0.36 | 0.00 |
| **Start of Water Year** *09-29-2020* | 11.86 | 88.14 | 40.59 | 4.22 | 0.02 | 0.00 |
| **One Year Ago** *07-14-2020* | 64.67 | 35.33 | 8.65 | 2.17 | 0.00 | 0.00 |

*Intensity:*

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx*

*Author:*

# Appendix C

## After-incident resources

The list below was primarily compiled for smaller or local (not state or federal) firefighting organizations. **Please reflect:** As a member of overhead or a Chief Officer, should you have to manage an injured firefighter and its aftermath, does your organization have access to the necessary resources? If not, do you know where to find them? Below is a short list of available resources. Don't discount your peers such as a neighboring Fire Chief or the next larger organization from yours. People will act swiftly and come to your aid if you call.

- Local Critical Incident Stress Debriefing (CISD) Team
- Local community foundations and non-profits that can assist
- State Forester
- Firefighter's Association
- State Fire Chief's Association
- International Association of Fire Fighters (IAFF)
- International Association of Fire Chiefs (IAFC)
- National Fallen Fire Fighters Foundation (NFFF) - LAST program: Checklist
- Wildland Firefighter Foundation (WFF)
- Eric Marsh Foundation
- USDA Preparedness Guide for Firefighters and their Families

## Mental Health Resources

- National Suicide Prevention Lifeline: 800-273-8255
    - Online Chat

- Anonymous assistance from the Wildland Firefighter Foundation: 208-336-2996

- National Wildland Fire and Aviation Critical Incident Stress Management Website

- Code Green Campaign, a first responder oriented mental health advocacy organization

- The Fire Mind (Search Fire Mind on Facebook) is dedicated to helping wildland firefighters. They offer initial consultation and service to connect you with a licensed professional that specializes in Fire/EMS trauma and mental health.
    - info@thefiremind.org

- Would you rather communicate with a counselor by text? If you are feeling depressed or suicidal, a crisis counselor will TEXT with you. The Crisis Text Line runs a free service. Just text: 741-741
- Wildfires - Learn About Who Is Most at Risk for Emotional Distress From Wildfires And Where To Find Disaster-related Resources
    - https://www.samhsa.gov/find-help/disaster-distress-helpline/disaster-types/wildfires

- Need to Talk to Someone?  - Warmlines
    - https://screening.mhanational.org/content/need-talk-someone-warmlines

- Article: 25 Simple and Proven Ways to De-Stress (Article)
    - https://www.entrepreneur.com/article/296344

- Article: How to Recognize and Overcome Trauma
    - https://www.mindful.org/how-to-recognize-and-overcome-trauma/

- A Manager's Guide to Suicide Postvention in the Workplace:  10 Action Steps for Dealing with the Aftermath of a Suicide
    - https://suicidology.org/wp-content/uploads/2019/07/Managers-Guidebook-To-Suicide-Postvention.pdf

- Study of suicidal thoughts and behavior among firefighters by Florida State University
    - https://www.sciencedirect.com/science/article/pii/S016503271530183X