Rapid Lesson Sharing

Event Type: Pyro-Vortex Incident

Date: July 12, 2025

Location: Deer Creek Fire
Utah

"This pyro-vortex was large enough with enough damage for the National Weather Service to classify the incident as an EF2 tornado."

An EF2 tornado is a "significant" tornado, classified on the Enhanced Fujita Scale with wind speeds between 111 and 135 mph. This level of tornado can cause substantial damage to buildings, uproot trees, and overturn vehicles.

Description

Fire personnel were located at numerous locations in and around the tornado area—in vehicles, helicopter and on the ground—when it began forming and making the fire behavior more intense. As the rotation began, it was quickly communicated over the radio for personnel to move to the safety zone. Some vehicles and personnel were already in the safety zone, some personnel took refuge in the black, and one engine parked at an existing clearing and ended up in the middle of the tornado.

Tornado damage to a structure.

The entire event impacted personnel for approximately 25 minutes from start to finish. Prior to, during, and after the incident, accountability checks were ongoing via radio. All personnel were accounted for and uninjured.

The incident started as a pyro-vortex on July 12, 2025, at approximately 1250 located at 38.38275, -109.13812. This pyro-vortex was large enough with enough damage for the National Weather Service to classify the incident as an EF2 tornado. The tornado activity was likely influenced by local weather patterns and convective heat.

Background

The Deer Creek Fire started at approximately 1356 on July 10, 2025, just east of the intersection between La Sal Pass Road and Upper Two-Mile Road, 30 miles east of Moab, Utah. The initial size-up indicated a rapid rate of spread with a heavy Initial Attack (IA) response request.

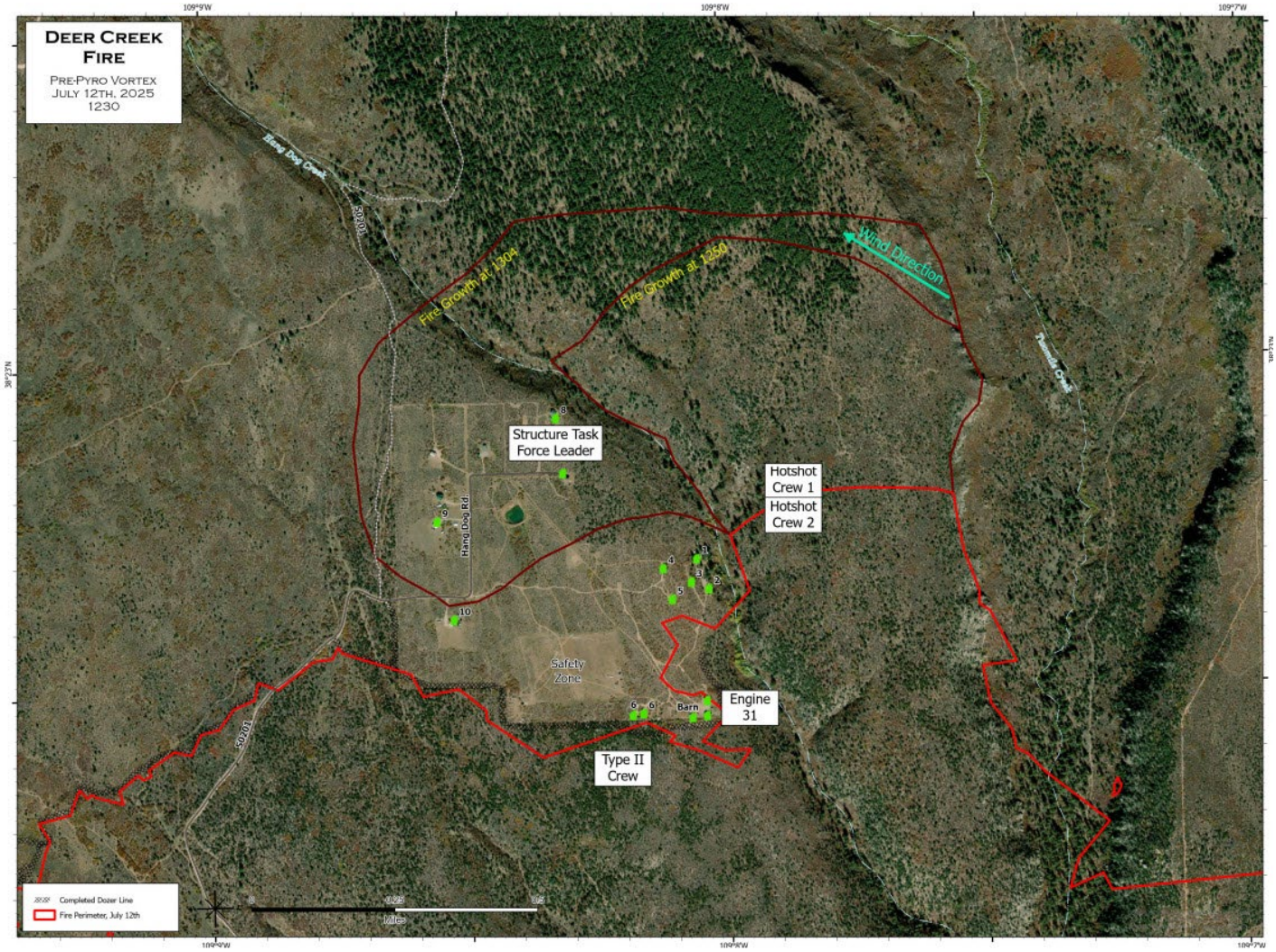
Upon arriving on scene, the Type 3 Incident Commander (IC) noted that the fire was 20-30 acres. Shortly after he arrived, the fire doubled in size. The IC stated, *"the fire was exhibiting extreme fire behavior in an area with a lot of urban interface."* The fire made a six-mile run to the east within the first five hours.

Multiple overhead and suppression resources noted that the fire behavior had been very active and "extreme" at times. But until the afternoon of the July 12, "it was a *normal* level of extreme", based upon winds, alignment and fuel conditions. Local terrain-driven fire runs were influenced by numerous drainages, including Hang Dog Creek and Two-Mile Creek.

The fire also battled the dominant more northerly and westerly winds that appeared to be influenced by the La Sal Mountain Range. These battling winds and many drainages and mesas in the area, combined with a mix of dry fuels, made firefighting conditions on the ground challenging.

The next day, the pyro-vortex (then tornado) occurred over the Deer Creek Fire.

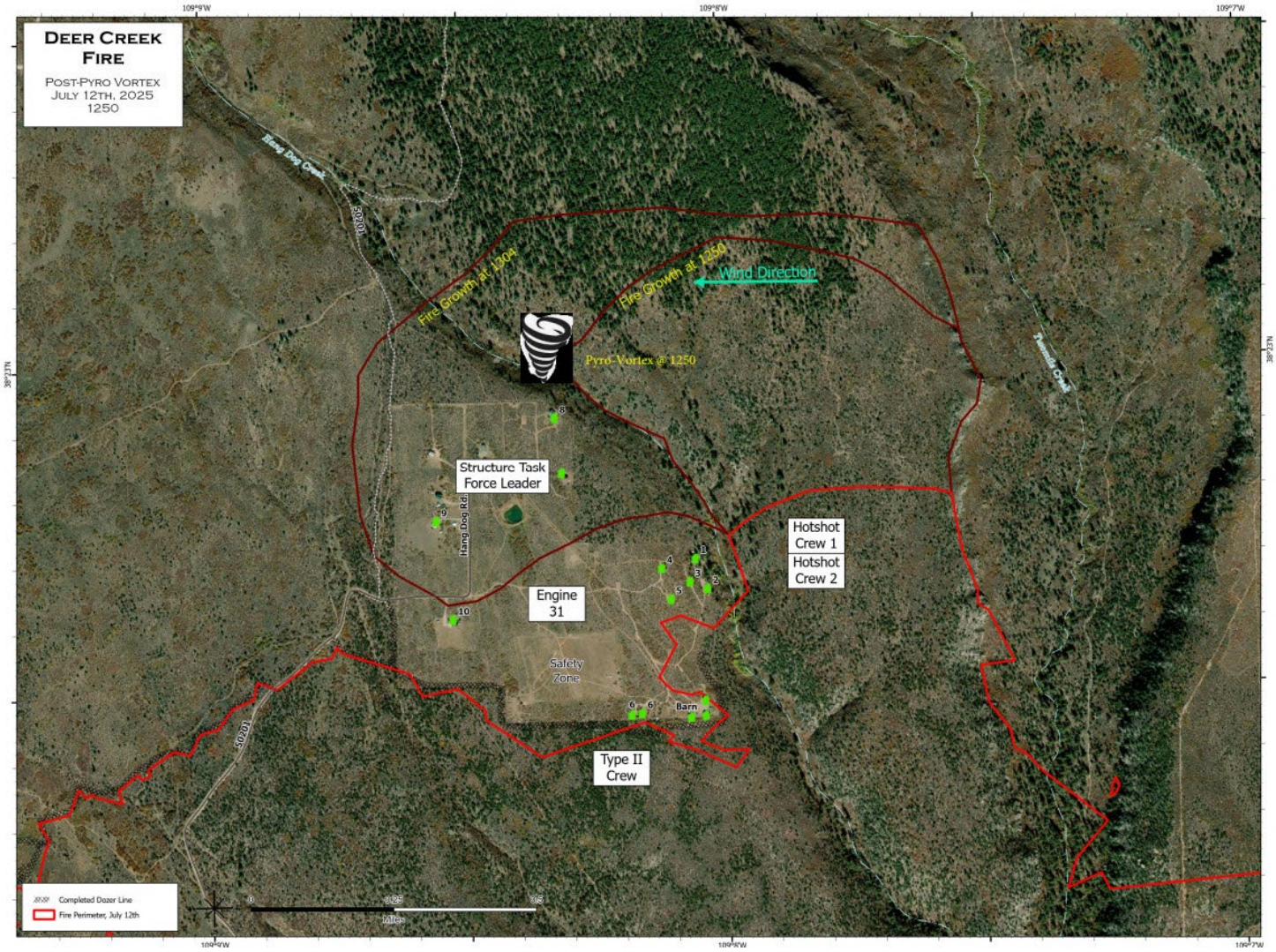
The Day of the Event – July 12, 2025



On July 12, crews were actively engaged on the fire. The fire was initially broken up into three divisions: Division Alpha to the west, Division Zulu to the east, and the Structure Group whose primary mission was assessing and prepping structures in and around the fire, including the Wolf Springs (Hang Dog) subdivision.

The general makeup of the suppression resources was a mix of state, local and federal fire personnel. An Incident Management Team had been activated. On the afternoon of July 12 they had begun shadowing the Type 3 organization, preparing to transition command the following day.

It was mentioned in briefing that the wind forecast may be unpredictable, as seen the previous day. Local and federal crews were working the fire as normal. Division Alpha was actively engaged on the western side of the fire along Upper Two-Mile Road. The Structure Division had a mix of local and federal engines, some heavy equipment and a 20-person Type 2 crew.



The Type 2 crew had been moved that morning from Division Zulu to the Structure Division and were working on putting in handline south of the safety zone, cleaning up a dozer line. Two hotshot crews on Division Zulu, one of which had just arrived that morning, were going direct on the eastern side of Hang Dog Creek and leapfrogging each other as they progressed east toward Two-Mile Creek.

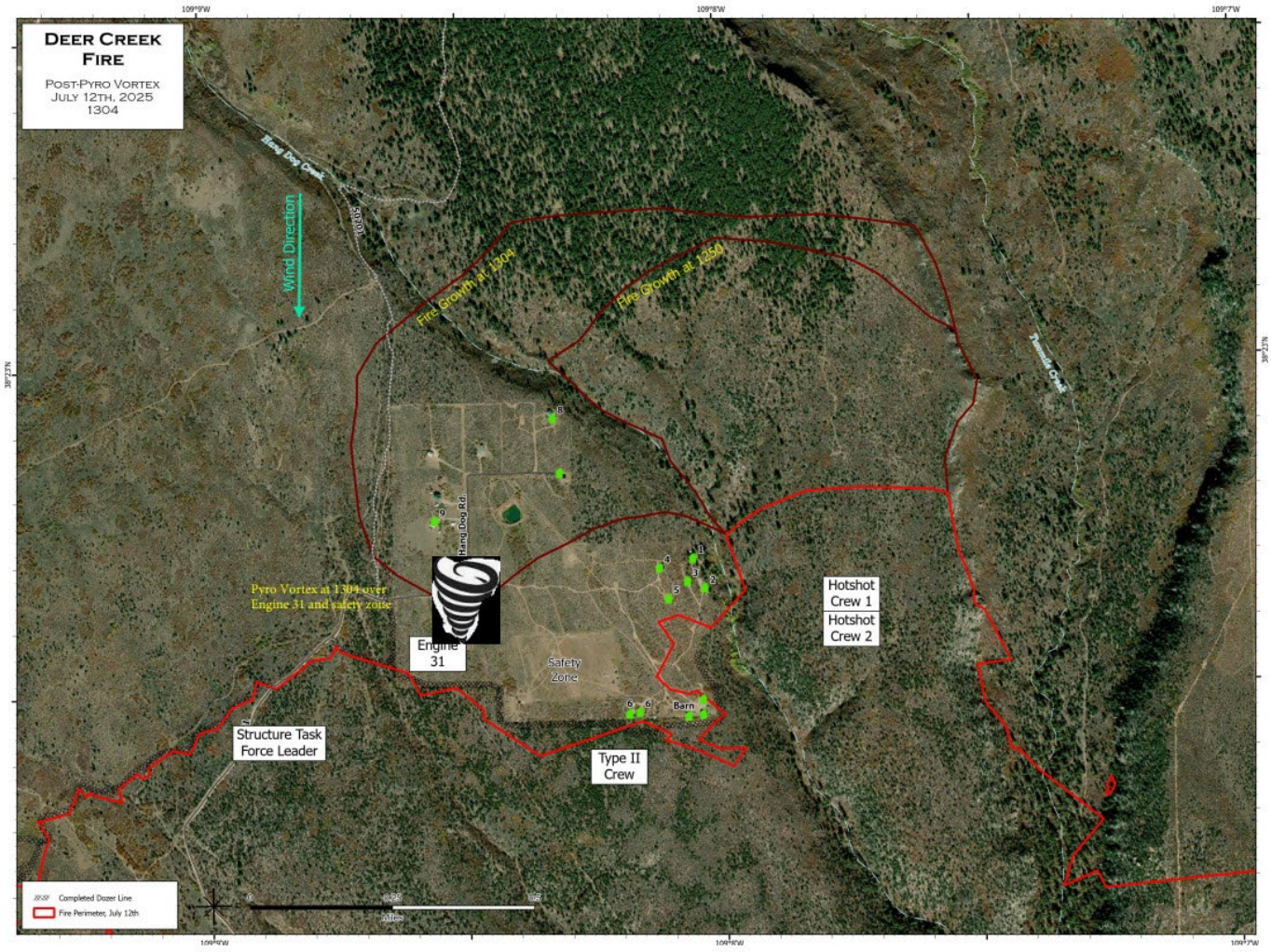
Extreme Shift in Fire Behavior

Around 1230, most of the fire resources noticed an extreme shift in fire behavior. The fire activity on the mesa between Hang Dog Creek and Two-Mile Creek started to increase as the winds and drainages aligned. The fire quickly ran through the pinyon-juniper fuel component along the Mesa and quickly spread into the conifer stand to the north.

At approximately 1240, the fire became established in the stand of ponderosa pines between Hang Dog Creek and Two-Mile Creek northeast of the Hang Dog subdivision. As the fire activity increased in the timber, the fire behavior rapidly changed.

Division Zulu was in the safety zone, located at the south end of the Hang Dog subdivision, which was in a pre-existing clearing and was large enough to double as the staging/parking area. Division Zulu saw the increasing fire activity and updated his resources. The two hotshot crews on the eastern side of Hang Dog Creek also noticed the increase in fire activity and began pulling back into the hard black directly south.

The Structure Division Task Force Leader (TFLD) was assessing the northern-most structure in the Hang Dog subdivision and watched the increase in activity. The TFLD began notifying his resources that the *"fire activity was picking up,"* and directed them to start making their way toward the safety zone.



The Type 2 crew was working south of the safety zone and overheard the radio traffic. Because their view was obscured by heavy brush, two of the crew overhead walked to the safety zone for a better vantage. After seeing the quickly intensifying fire activity, the Crew Boss decided the safest plan was to have the crew remain south of the safety zone in the hard black.

At approximately 1245, the tornado between Hang Dog Creek and Two-Mile Creek was rapidly growing to the northwest and began to rotate counterclockwise, then switched direction heading due west across Hang Dog Creek. After crossing Hang Dog Creek, the tornado shifted from a westerly direction to almost straight south.

The TFLD from the Structure Group began driving south from the north side of Hang Dog, noting the *"flame lengths coming off the main column were about 250-300 feet tall."* From all accounts and video footage, the tornado was rotating counterclockwise and large amounts of debris and fuels were being sucked into the column. [See Video 1]

As the fire moved north to south through Hang Dog subdivision, it continued to intensify and pick up speed, engulfing multiple structures with a combination of fire and intense winds. One structure that had a very well-established defensible space that was not directly impacted by the fire had a portion of the roof ripped off and the windows blown out by the tornado. A heavy locked property gate was pulled from the ground and tossed down the road.

The hotshot crews moved deeper into the hard black. Inflow winds were so powerful that the ash and debris made it very difficult to see while sandblasting their face and eyes. The Type 2 crew south of the safety zone noted the same conditions as the inflow winds sucked in massive amounts of air from all directions, creating an ash dust storm.

Most of the Structure Group engines moved into the safety zone or continued west on Hang Dog Road toward the black. As the rotating column approached Hang Dog Road, the last outgoing engine pulled into one of the structure sites they had assessed the day before. The engine captain was concerned with being stuck in the back of a multi-vehicle line with the column approaching rapidly. *"I saw it the day before,"* the engine captain said, *"and noted that we could wait out intense fire behavior there if needed."*

The engine captain parked facing the oncoming column that was about 1/4 mile away and coming toward them. [See Video 2] The captain warned his crew that it was going to get smoky and there was going to be fire all around, but they had good defensible space.

At approximately 1309, the tornado stalled out over the last structure site and the parked engine.

During the event, the structure ignited and a mix of debris and fire were immediately sucked into the column. The engine was near the center of the tornado surrounded in a cyclone of hot embers, ash and debris which intensified as the structure next to them burned.

Engine alarms signaled the loss of airbrake pressure, which was attributed to embers burning through the main airline. Otherwise, the engine remarkably sustained minimal damage. The engine captain stepped out of the engine numerous times during the event to check on the structure and assess the engine. He noted that he expected the surrounding air to be much hotter, explaining: *"The hot air appeared to be sucked up into the funneling vortex."*

In the Safety Zone

Resources in the safety zone were 1/3 mile to the east of the engine watching the tornado approach, noting large flying debris. The conditions in the safety zone were extreme. Video of the event clearly shows the tornado stalled out over the west side. [See Video 3]

Crews could not see more than a few feet due to the dust and debris being sucked into the tornado from all directions. The Type 2 crew that sheltered in the black south of the safety zone delt with extremely dusty conditions as the tornado spun around and ignited previously unburned fuels between their location and the safety zone. These newly ignited fuels produced intense heat even as they were deep into the hard black.

The tornado, lasting about 20 minutes, impacted fire activity in all directions as the inflow winds were pulled into it. By most accounts, after rotating over the structure and safety zone for approximately five minutes, the intensity of the tornado started to break up, with the main tornado pushing south and losing intensity as it went into the hard black.

After the tornado dissipated, the fire continued to make a strong northwest run.

Conclusion

This pyro-vortex was officially categorized as an EF2 Vortex by the National Weather Service. The Incident Meteorologist stated that the combating up-canyon winds from the southeast battling with the dominant winds off the La Sal Mountain Range from the northwest created the erratic wind conditions.

The catalyst for the pyro-vortex forming was the extreme amount of convective heat and energy from the ponderosa tree stand that ignited moments before. Despite the extreme fire behavior and the numerous fire personnel in close proximity to the pyro-vortex, nobody on the fire was injured. The hotshots and the Type 2 crew that sheltered in the black faced near blackout conditions as debris and particulate matter were pulled into the vortex with the inflow winds. [See Video 4]

One of most miraculous outcomes is that the engine that sheltered in place took only superficial damage. The engine was exposed to flying sheet metal, roofing material, trees, and other heavy debris swirling in the column. [See Video 5]

It has been noted by numerous fire personnel that a large Conex box shipping container was moved hundreds of feet and came to rest not far from where the engine crew parked. In addition, the structure next to the parked engine quickly caught fire when the tornado passed over with the remnants of the structure being pulled into the vortex.

Though the engine's airline did develop a leak from the hot ember wash, the most lasting damage was a dent to the side panel from what was likely a vehicle skid plate found not far from the engine.

While the safety zone was more than adequate for the resources on scene under normal fire conditions, the tornado impact on the western side created a feeling of unease from numerous personnel on the fire.

The incoming Operations from the CIMT arrived on scene shortly before the event and took a scheduled recon flight. She was uneasy with the safety zone's proximity to the tornado, but acknowledged the resources were in the best possible location. [See Video 6]

Lessons

Pyro-Vortex Tornado vs Fire Whirl

Most firefighters have seen some form of fire whirl. Fire whirls can be very extreme and sometimes long lasting. It is often assumed that every spinning fire vortex is a fire whirl. It is important to recognize the difference and categorize appropriately. While actual fire tornadoes are a very rare occurrence, they have been previously documented. In 2018, the Carr Fire outside of Redding, California, spawned a fire tornado that resulted in an event with great damage and multiple casualties.

Though fire tornadoes are unpredictable, there were some warning signs on the Deer Creek Fire. Numerous local firefighters noted the La Sal Mountain Range is notorious for unpredictable winds and fire behavior. The day before, a "very impressive" fire whirl was documented just south of the location around the same time of day. Numerous firefighters noted that they had seen the eddying effect in the two days leading up to the event. [See Video 7]

One of hotshot superintendents stated, *"We see fire whirls often, just not to that scale. I've been in fire for 31 years and I have never seen anything strong enough to rip a roof off a house."*

Communications

Often during the first 72 hours of a fire, the number of tactical channels does not meet the demand of firefighters on the ground. On the Deer Creek Fire that day, Division Zulu was sharing a state tactical channel with the Structure Group. Multiple crews and overhead noted that the assigned tactical channel was overloaded with everyone trying to communicate at the same time. Personnel had a hard time checking in with their resources and their line supervisors.

During Type 3 fires with multiple responding agencies, the ability to clone radios and use preexisting frequencies is often a challenge as local, state and federal agencies often use different radios and not everyone has the ability to manually program new frequencies. At the time of the tornado, Division Zulu made the decision to have all his resources switch over to Tac 2 for better communications. In this situation, it would have been beneficial for each division, including the Structure Group, to have their own Tac frequencies at the start of the shift.

Accountability

During the chaos of the event, it was assumed that the Type 2 crew made it back to the safety zone. In fact, only the Crew Boss and one of the assistants walked back to the safety zone to scout the access for the rest of the crew. It was assumed the entire crew was there with the two overhead.

The Crew Boss on the Type 2 crew made the decision to have his crew stay in the hard black rather than cross over the large green island with multiple barbed wire fences and a very thick brush component between the crew's location and the safety zone. The radio traffic on the Tac channel made it difficult for the Crew Boss to notify the division their crew was in fact in the "good hard black" and not the safety zone.

Bringing Your Safety Zone with You

Both the hotshots and the Type 2 crew had the benefit of having hard black around them during the tornado event. Rather than hike back to the safety zone—which, under normal circumstances, might have been doable—the crews made the decision to stay in the hard black.

The engine that decided to stay in place at the structure made that decision based upon scouting the area the day before and determined it had the appropriate level of defensible space, even with the conditions they had previously seen. Though the accompanying tornado caused the brush to burn and structure to catch fire, the engine did remarkably well with the extreme fire activity and impact of an EF2 tornado. The safety zone itself was adequate for the anticipated fire behavior and crews had improved it the day before.

Extreme Weather-Related Events can Happen at Any Time of the Day

Traditionally, fire blow-ups happen in the mid to late afternoon. This fire tornado formed extremely fast. Around 1230, the fire started showing signs of increased activity. The tornado started to form around 1247. After it formed, it made extremely fast runs. According to the Structure Group TFLD, *"I was driving down the road at 20 MPH away from the tornado and the vortex was gaining on me."* [See Video 8]

This event is an important reminder that extreme fire-related weather events can happen at any time of the day and that they happen very fast and sometimes with very unexpected results. This event reinforced the need to continuously assess the fire activity, verify your resources are in a good location, and ensure everyone has a back-up plan. The fire personnel on the line all recognized the severity of what they were seeing. The fact that no one was injured is a testament to good decision making.

This RLS was submitted by:

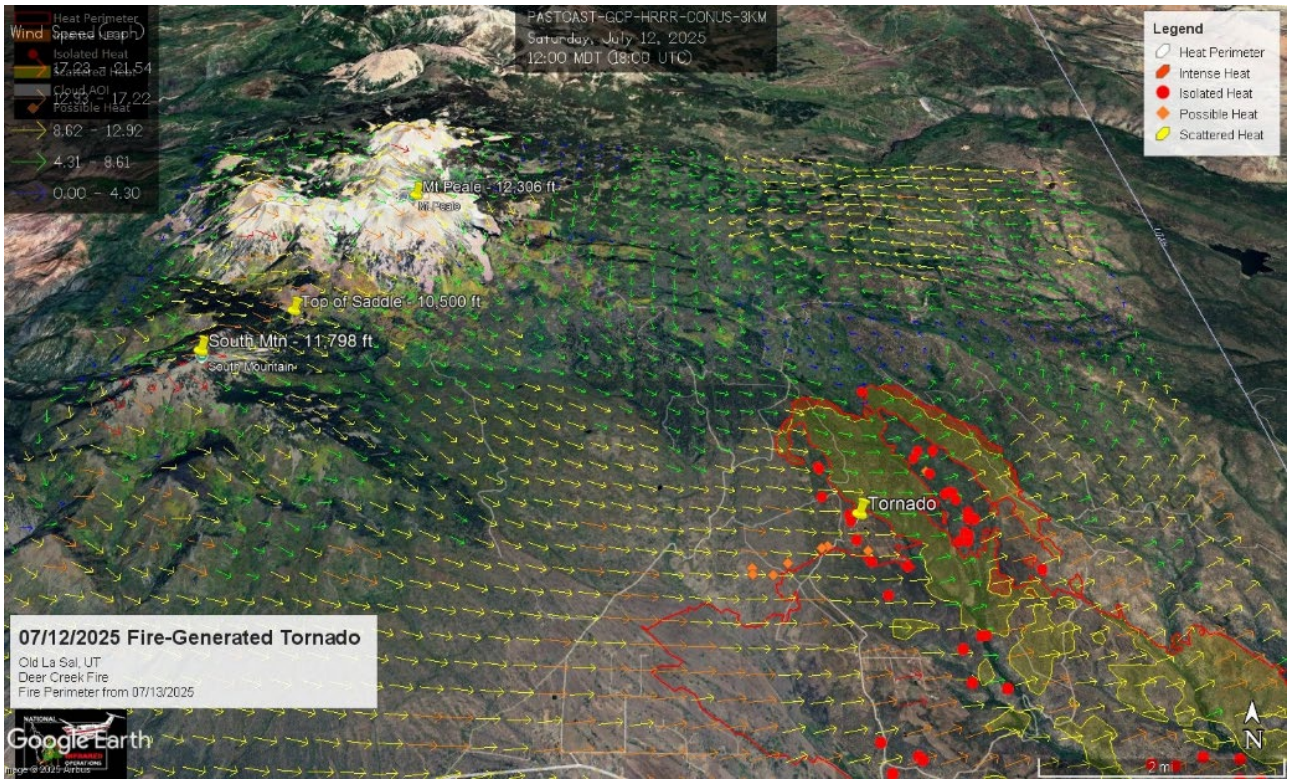
Jason Schroeder and Cheryl Cramer

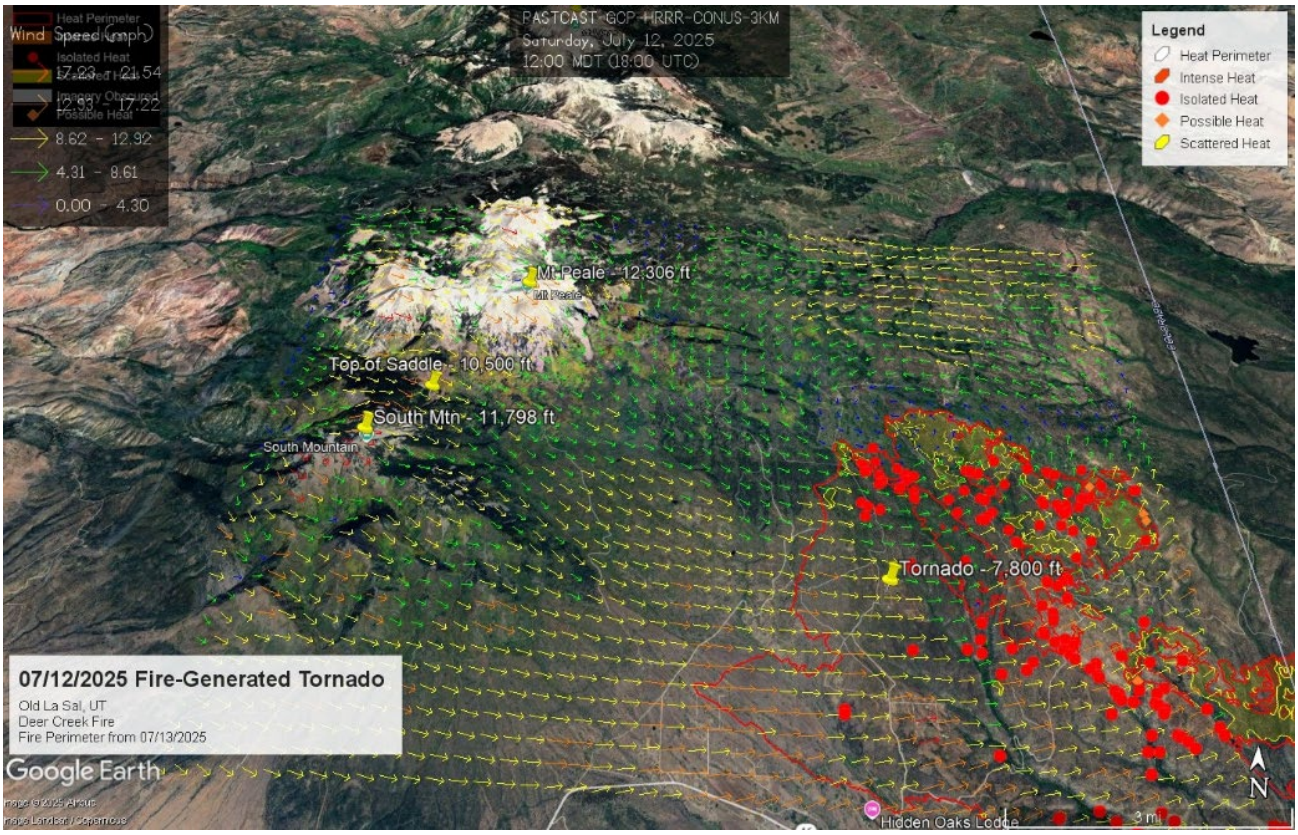
Appendix

National Fire Weather Services Report

By Julie Malingowski
National Fire Weather Services Coordinator -- Training, Dissemination, GIS
Incident Meteorologist (IMET)
National Weather Service -- Analyze, Forecast & Support Office
National Interagency Fire Center
Boise, Idaho

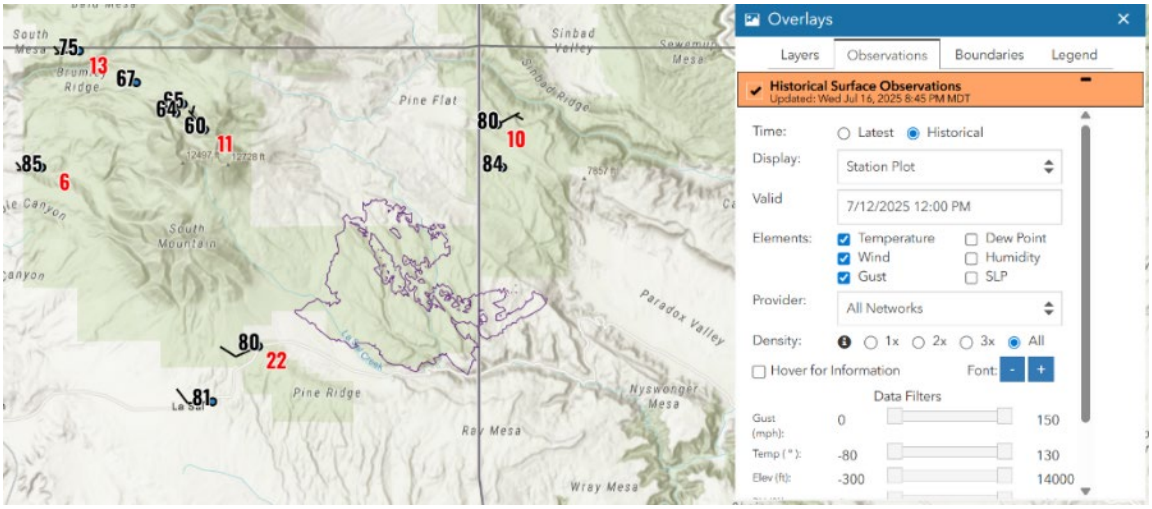
- On July 12, 2025, general northwest winds were in place with some wind acceleration through the saddle between South Mountain and Mt. Peale. Sustained winds were generally 4-11 mph with gusts near 20 mph at 1200.





Modeled representation of the terrain-driven winds using the HRRR model at 1200. Acknowledgement to Natalie Wagenbrenner with the Missoula Fire Sciences Laboratory for the WindNinja run.

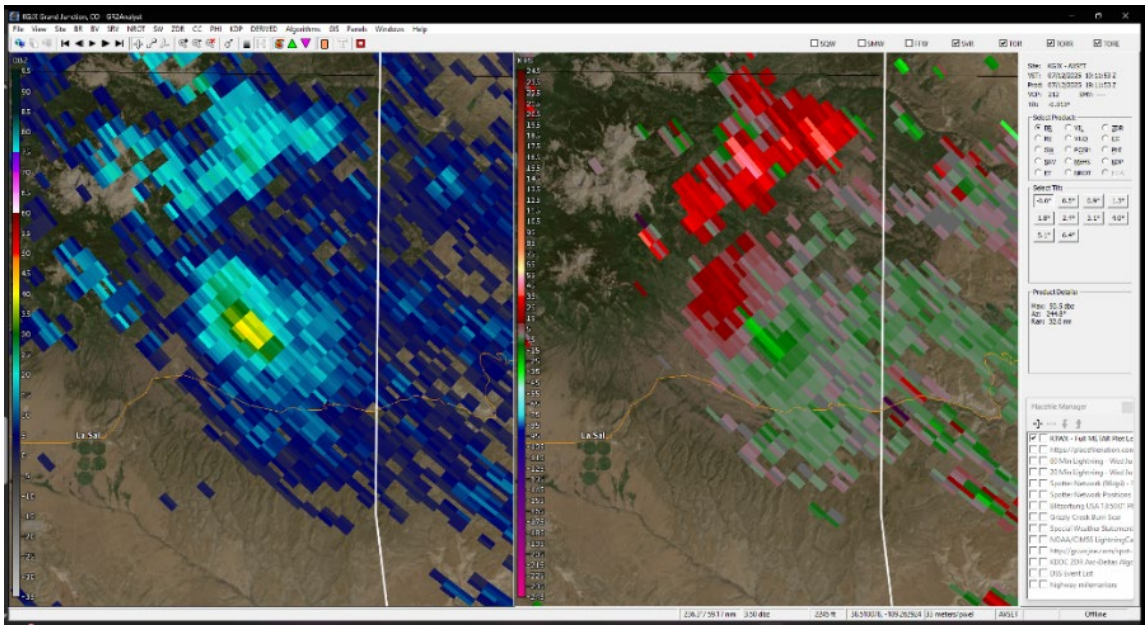
- East of the fire perimeter, southeast upvalley winds had developed in the Paradox Valley from daytime heating, bringing winds to the north end of the fire perimeter.



Carpenter Ridge RAWS observation at 1200.

- Significant heat on the fire greatly contributed to the rising, rotating air column needed to organize the winds and support sustained updraft in supporting tornadic development.
- Northwest winds funneling through the saddle meeting with southeast winds coming from heating in the Paradox Valley, combined with strong heating from the fire, all led to the support of the fire-generated tornadic vortex producing EF2 tornado damage.

- The tornadic winds occurred 6 miles east-southeast from the apex of the 10,500-foot saddle between South Mountain and Mt. Peale.
- A couple of radar scans from Grand Junction picked up on rotation, but it was extremely difficult for a meteorologist to discern activity as a tornado based on its short life span. Radar showed the smoke plume reaching over 16,700 feet above ground.



Radar and tornado damage assessment at 1311 provided by NWS Grand Junction.