

Understanding Fire Behaviors
Presentation by BMFPD Fire Chief John Benson
January 20, 2019 at Station One

Boulder Mountain Fire Protection District (BMFPD) Chief John Benson gave a presentation on “Understanding Fire Behaviors” on January 20, 2019 to nearly 40 district residents, explaining what factors influence the nature of wildfires. Below are highlights from his talk.

A New Normal

Wildfires today are much larger and hotter than when I began my firefighting career more than 35 years ago. Back then a fire that burned 10,000 acres was considered large; today’s wildfires have been known to burn several hundred thousand acres. For example, the Camp Fire in 2018 burned more than 153,000 acres, the deadliest and most destructive wildfire in California history to date. High winds spread the fire out of control, while road obstructions and traffic jams contributed to the high death toll as residents tried to escape the fire.

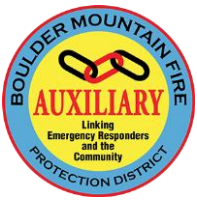
Given this new normal, this summer Boulder Mountain Fire Protection District (BMFPD) is devising new ways to evacuate residents by breaking up the district into smaller segments, making evacuations easier, quicker, and safer. Life safety is our number one priority, which means that apparatus and crews, may not all always go to immediately attack the fire, but will help with people evacuating the fire, if the fire is moving “fast and hot.” Among other hazards are the “lookie-loos and rubberneckerers” who come to watch a wildfire, making it difficult for fire crews to navigate the area and suppress the fire while keeping people safe.

With more than 2 million people living in the Wildland Urban Interface (WUI), wildfire danger is at an all-time high, particularly as home and forest densities increase.

How Fire Behaves

A wildfire’s behavior is contingent on three things: fuel, weather, and topography. Here in the District we have an abundance of all three:

- **Fuel:** grasses, shrubs, saplings and various sizes of trees provide ample “ladder fuel” between the ground and tree canopy. We look at the amount, type, and size of these flammable materials, and how volatile they are. These fuels come in 1, 10, 100, and 1,000 hours—the amount of time that a given fuel can either gain or lose its moisture. The goal is to break the



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chain of ladder fuels through mitigation and fuel reduction to help prevent crowning (where a fire quickly jumps from treetop to treetop), the worst-case scenario for firefighting.

Unfortunately, with the recent absence of moisture across the Front Range, it has been predicted that the Front Range is “ripe” for a large wildland fire. We try to do prescribed burns whenever possible to reduce the amount of available fuels, but because of various factors, this is much harder to do.

- **Weather:** temperature, relative humidity and winds all have a big impact on where a fire heads, how quickly it spreads, and how much damage it does. We look at cloud formation as an indicator of stable or unstable air. For example, lenticular clouds and the haze layer above Denver both signify stable air, which is good news when fighting fires. However, as the morning progresses, air near the ground can heat up, punching through the stable air layer, making it unstable and creating unpredictable fire behavior. Therefore, we check National Weather Service (NWS) and National Oceanic and Atmospheric Administration (NOAA) forecasts by zone, paying attention to lightning activity levels (LALs) and Haines Indexes, which measure gives us an indication of what the day’s weather will provide, and how it may contribute to erratic wildfire behavior.

Interestingly, large wildfires create their own local weather systems; these “Pyrocumulonimbus” clouds, which are basically fire generated thunderstorm clouds. These clouds can generate winds, lightning and thunderstorms just like regular thunderstorm clouds. BMFPD doesn’t have RAWS (Remote Automated Weather Stations) within the district, but Boulder County Sheriff’s Office (BCSO) has a portable, remote automated weather station when more localized conditions and forecasts are needed.

- **Topography:** our mountain environment, with hills, valleys, and canyons make for challenging firefighting conditions. Access and available water can be limited, with plenty of slopes and box canyons for fires to jump hillsides and quickly move through areas. In addition, our winding roads make evacuations more difficult and dangerous. Chief emphasized the importance of residents evacuating when notified. Again, we cannot emphasize life safety enough in these circumstances.

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How BMFPD Responds

BMFPD puts high value on being able to predict and respond to fire behavior, using the principles of LCES, which stands for Lookouts, Communications, Escape Routes, and Safety Zones. When a fire is reported, BMFPD Incident Command immediately starts planning a strategy, partnering with four nearby agencies that automatically respond to the fire tone. Our responders then assess the situation on site and provide a “size up report” that includes the direction and spread of the fire, location and number of homes and other infrastructure at risk, along with other important factors and conditions. This report may lead to calling mutual aid resources from other agencies (including aircraft), and initiating evacuation notices. Evacuation is always a top priority for Life Safety, which is why BMFPD Incident Commanders will order evacuations very early on if we have a wildfire starting to grow. As you have seen and heard from some of the fires that we have seen in California, sometimes notices don’t get through in a timely manner, due to damaged cell towers, fallen phone lines, and jammed circuits. We want to do everything humanly possible to stay ahead of that curve.

We encourage residents to proactively evacuate if you see smoke or flames. In addition, BMFPD has a Special Needs List and provides resources for elderly residents or those with injuries who need help evacuating.

In closing, Chief Benson encouraged everyone to sign up for emergency messages by visiting www.boco911alert.com. He also stressed the importance of mitigating your property for fire risk, report any suspicion of fire in the area (false alarms are better than the alternative), and leaving if you see smoke or flames.

Please visit our District’s websites for more information:

[BMFPD](#)

[BMFPD Auxiliary](#)

[BMFPD Wildfire Mitigation Crew and Emergency Response](#)