

# Part 1: Scientists, Missoula County shift wildfire focus to home ignition zone

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A crowd gathers to watch a fire burn on Mount Sentinel in this file photo. Recent fires around the West have demonstrated the potential for

*Editor's note: This is part one of a two-part story on urban fires. Part 2 can be read by following this link.*

It's been called an "urban firestorm" or "urban conflagration." Regardless of the title, the citizens of Superior and Louisville, Colo., all agree that the Dec. 30 fire that burned more than 1,000 homes and businesses nearly to the ground was an urban disaster.

The Marshall Fire started in the grasslands west of the two suburbs as residents were going about their business, some no doubt preparing for New Year's Eve festivities. They likely wouldn't have been aware of the fire on an average day when fire departments could snuff out the flames.

But the winds of Dec. 30 were extreme, accelerating down the Rocky Mountain Front with some gusts topping 105 mph. Grassfires burn fast anyway, but this caused the fire to race toward the towns, spitting burning embers ahead of it that then caused several buildings on the edge of town to begin to burn.

From there, the structures themselves started a domino effect, the embers of each penetrating nearby houses, causing entire neighborhoods to burn at about the same time.

Video shows residents emerging from stores, confused and scared, as wind and smoke enveloped the towns. Trying to flee the parking lots, people ended up in bumper-to-bumper traffic as debris bounced off their vehicles. Amazingly, only two people remain unaccounted for.

Post-fire photos show neighborhoods with houses reduced to ash piles, and only the concrete stairwells remain of the four-story Element Hotel. A snowstorm finally blew through on New Year's Eve, a day too late for the thousands who suddenly found themselves homeless.

Some in Missoula may see the fire as another sad but distant event of 2021. But some fire experts hope people take it as a warning to improve plans for evacuation and home defense.

"Could it happen? Missoula doesn't have that extent of development yet. But the answer is yes, to a limited extent," said retired U.S. Forest Service fire behaviorist Jack Cohen.

### **Dissecting an urban conflagration**

Understanding what caused the Colorado disaster is key to reducing the extent of the next one. Four factors played a role, Cohen said: high winds, a wildfire with a wide leading edge and non-fire-resistant structures in relatively dense

neighborhoods. And these four led to a final factor: firefighters unable to deal with such an overwhelming situation so buildings burned.

Unlike a point source like a bonfire, a wildfire with a wide fire front can send multiple burning embers into a community, causing a number of house fires to start simultaneously. But those embers aren't likely to sail far away from the flame front without a good wind blowing them. And stronger winds can create a "blizzard of burning embers."

"And it doesn't have to be 100 mph," Cohen said. "It was 30 to 40 mph winds that spread the West Wind Fire into Denton. And it was the same thing for the Lytton, British Columbia, fire where winds were 25 to 30 mph. And that was a grassfire too."



The sun sets over Montana in a blanket of smoke. (William Munoz/Missoula Current file)

While it's not unusual to have high winds along places like the Colorado Front or the plains of eastern Montana, climate scientists are hypothesizing that a warming climate creates conditions that favor more severe storms accompanied by strong winds, which could end up in uncharacteristic places.

Though Missoula isn't historically a windy town, throughout the night of Nov. 15, winds toppled trees and power lines in the Missoula area, with the Missoula Airport registering gusts of more than 65 mph while Point Six above Snowbowl hit 75 mph.

If the burning embers rain on a fire-resistant house with a clear "home ignition zone" – an area 100 to 200 feet around the house – little damage is likely to result. But a house with wood siding, large windows and flammable items next to the house, such as leaf litter or firewood, could be in trouble, because the flames will work their way inside the house. A fire department might be able to limit the destruction of one such fire. But put a bunch of similar homes right next to each other, and they'll not only catch fire but also create their own embers that winds will shower on nearby houses.

"At that point, the community spreads the fire and the wildfire has nothing to do with it," Cohen said. "Multiple ignitions simultaneously result in fire-involved structures and are completely destroyed because at that point, there's no

fire suppression. What I've been trying to get people to understand is fire protection is overwhelmed. And that's when a community disaster happens."

### **Solutions**

Cohen has investigated multiple community disasters, carefully observing the scene, noting details that firefighters cannot because they're too busy trying to save buildings. After seeing similarities in each case, he worked with other fire scientists to devise a more effective fire risk analysis for communities, compared the ability to control wildfire to the ability to control community vulnerability. In essence, they compared trying to control thousands of acres to improving a half-acre of property.

"The ability to be effective is intractable when we define the problem as wildfire," Cohen said.

In western Montana, residents tend to think of forest fires as the danger to communities. However, as Cohen noted, several recent firestorm disasters have been initiated by grassfires. He can rattle off several such incidents, from the fires last month that ravaged Denton and Gibson Flats near Great Falls to the January 2006 prairie fires in Oklahoma and Texas that burned more than 200 homes. With the Santa Rosa fire in 2017, the Tubbs Fire ran out of stubby vegetation before it reached Coffee Park, but the embers had already inundated the dense subdivisions of Coffee Park.

This is why fire scientists argue that forest thinning does little to nothing to stop wildfire in extreme conditions. Firefighters are pulled back for their safety and firebrands can leap thinned areas. That's also when urban disasters occur. When conditions aren't extreme, wildland firefighters can usually put fires out before they reach communities.



The Boulder 2700 fire on Flathead Lake. (Trevon Baker photo)

In 2021, Montana had 2,555 fires, but crews dealt with most of them. Only 48 grew large enough to be named. But some forest managers still justify logging as a way to reduce community wildfire risk. Cohen said such efforts aren't effective.

"We're already successful at stopping 95-98% of wildfires. But if we're not doing preparatory projects to handle the 3% of the fires that are causing us 80-95% of the problems, particularly in light of climate change, then don't do it. Because it won't work," Cohen said. "That seems to be the hard sell."

When it comes to controlling community vulnerability, it's a matter of convincing people that all they need to do is improve the conditions in their home ignition zone. And if Missoula wants higher density, then houses need to be built of tougher stuff and designed differently. That's a lot easier and better for ecosystems than having to clear-cut the forest.

"We need to start thinking in terms of engineering our design and materials, and this can be done with codes," Cohen said. "And the greater the density, the more important those kind of codes become."

## Part 2: Scientists, Missoula County shift wildfire focus to home ignition zone

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*In Part 1, fire behaviorist Jack Cohen compared the Dec. 30 fire in Superior and Louisville, Colo., to other urban fire disasters to identify the causes and propose solutions for communities wanting to avoid the same fate. Here in Part 2, Missoula County starts looking at what it can do and a potential wildfire hazard challenges the residents of Grant Creek.*

### **Missoula County Changes**

Proposing new zoning tends to garner public opposition. Some people don't like to be told what they can't do on their property. Building codes aren't popular either.

However, Missoula County Commissioner Dave Strohmaier said there's a high likelihood that the county will be creating new building codes and zones this year to deal with wildfire risk, based upon the recent lessons of Colorado, Denton and Lytton, British Columbia.

"What we have learned over the years is the critical nature of the home ignition zone to averting community disaster," Strohmaier said. "We've not done ourselves any great service on focusing our attention on areas beyond the first 100 feet of one's home. Because ultimately, that's going to determine whether a structure is saved or not. Not whether you've done fuel treatments some distance from the community."

Since the county has yet to discuss what zoning to apply and what building codes might be required, Strohmaier couldn't go into much detail, particularly with codes. The challenge with building codes is the county has to have enough staff to enforce the codes.

But commissioners and staff have already pondered the possibility of creating "donuts" of zoning around more populous areas where regulations would change to prevent the urban chain reaction of houses burning simultaneously.

"There may be areas in the urban core that are within a couple miles of an ember shower, but we wouldn't include those in regulations. Then you go out a little ways and there's this zone that has enough proximity to wildland fuels and

enough density of development that once fire starts, it could propagate from one property to another, unless those property owners have addressed the home ignition zone.”



Smoke from burnout operations rises above the Madison River during the Maple Fire in Yellowstone National Park, September 10, 2016.

Outside the donut would be the “live-and-let-live zone,” Strohmaier said, where houses are so sparse that they can burn down without setting their neighbors’ homes on fire.

The county will also begin working on updating the Community Wildfire Protection Plan, even though its last revision was in 2018. The Protection Plan identifies the wildfire risk in regions of the county and the actions that agencies and property owners should take to first prevent and then respond to wildfire. But the wildfire hazard map is a little limited, being based on flame length, a measurement more applicable to trees than grass.

“It’s yet to be determined how we’ll use the existing mapping,” Strohmaier said. “What is it that ignites people’s homes? It is not the wall of flames that we see in dramatic images. Even though it looks scary and pretty awesome, that’s not what starts structures on fire. It’s predominantly the firebrands that cause fire to start in the home ignition zone, whether we’re talking grassfires or heavier forest fuels. We’ve gone astray focusing on fire intensity.”

The county is referencing protection plans being used elsewhere, including ironically, Boulder County, Colo., to get ideas on what to update in Missoula County’s plan.

### **Case study: Grant Creek**



The Missoula County Community Wildfire Protection Plan is a useful guide for the county. But there's too much area to cover for the plan to really get down to the nitty-gritty of what individual neighborhoods or smaller communities should consider if they want to address risk.

That's where the Wildfire Risk Task Force comes in for the Friends of Grant Creek, a neighborhood organization. A year ago, the Friends of Grant Creek recruited a handful of neighbors, some of whom have firefighting experience, to form the task force to evaluate the drainage and propose a wildfire protection plan tailored for Grant Creek.



The Roaring Lion fire near Hamilton.

Mike Cole, Wildfire Risk Task Force leader who works for Type 1 Wildfire Incident teams in the summer, said the task force spent the summer inventorying the properties throughout the drainage, looking at forest stands and property condition. Now, it's time to sit down and flesh out the plan.

"If you have a site-specific plan, you have more options working with the agencies," Cole said. "The city and county don't have resources to do something like this for every drainage, so it's up to local residents. We had enough concern from residents that we volunteered to take this on."

Some of the concern was sparked when Ken Ault of KJA Development bought a former rock quarry at the bottom of Grant Creek and announced in February 2020 his intent to build four-story apartment buildings with 960 units on the 44 acres. Current zoning, however, would allow only three-story buildings with 500 units.

Even so, Friends of Grant Creek worried about adding at least 500 more vehicles to the traffic at the bottom of Grant Creek Road. The big problem is Grant Creek Road is one-way-in and one-way-out. If a wildfire sparked along Grant Creek, in particular a wildfire in extreme conditions, could evacuation be hindered by a traffic jam or accident near the development?

Is that a possible scenario? Cole said yes.

"If you look at the lower end of Grant Creek, it's got a lot of grass surrounding subdivisions," Cole said. "Then you look at Louisville and the surrounding grasslands. Compare that to (the Prospect Drive development). Does this look like your neighborhood? It certainly does."

When Cohen read about the proposed high-density apartment development, he immediately hoped it would have interior sprinklers and nonflammable siding on the exterior, including the ceilings of the balconies and alcoves.

He pointed to the remains of the four-story Element Hotel and two-story fourplexes in Superior, Colo, and said such buildings often burn in independent parts during firestorms. Each unit catches fire at different times as flammable furniture and other items on the balconies or in alcoves catch fire. Then nearby windows fracture and collapse, allowing the fire inside.

“We’re going to have to recognize the primary vulnerability is particularly with multi-story structures where it becomes extremely difficult to suppress fires. Particularly if there’s more than one,” Cohen said.

Friends of Grant Creek have asked the City of Missoula to do a traffic study to assess the current situation before adding another 500-plus cars. Cole said they may have to wait months, maybe years, because traffic studies are expensive. In the meantime, the City of Missoula reported five injury accidents, not counting fender-benders, on the lower section of road between January and September 2021.

That’s the kind of situation the Wildfire Risk Task Force will have to compensate for in their plan. But they don’t know that there’s much they can do to stave off disaster, especially if reaction times have to speed up.

“If you’re looking at new construction projects, you need to look at what the fire environment is going to look like 30 or 50 years from now,” Cole said. “The information and models we used to base evacuations on, with the climate influencing fire behavior, are we going to have to reduce the time we’d normally take to evacuate people. And are we going to have fewer options?”

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[https://missoulia.com/opinion/columnists/community-destruction-during-extreme-wildfires-is-a-home-ignition-problem/article\\_ef8aa717-99f1-5300-a137-3ebb25d6db00.html](https://missoulia.com/opinion/columnists/community-destruction-during-extreme-wildfires-is-a-home-ignition-problem/article_ef8aa717-99f1-5300-a137-3ebb25d6db00.html)

Guest column

## **Community destruction during extreme wildfires is a home ignition problem**

**DAVE STROHMAIER and JACK COHEN**

Aug 9, 2020

**W**e must abandon our expectation that we can suppress 100% of wildfires and reject the false narrative that community protection requires wildfire control. Community wildfire disasters have only occurred during extreme wildfire burning intensities, when high wind speed, low relative humidity, and flammable vegetation result in rapid fire growth rates and showers of burning embers (firebrands) starting new fires. Under these conditions, wildfire suppression, the principal method used for protecting communities, quickly becomes overwhelmed.

But wildfires are inevitable and wildland fuel treatments don't stop extreme wildfires. Does that mean wildland-urban (WU) fire disasters are inevitable as well? Absolutely not! Wildfire research has shown that homeowners can create ignition resistant homes to prevent community wildfire disasters. How can this be possible?

Recall the destruction of Paradise, Calif., during the extreme 2018 Camp Fire. Most of the totally destroyed homes in Paradise were surrounded by unconsumed tree canopies. Although many journalists and public officials believe this outcome was unusual, the pattern of unconsumed vegetation adjacent to and surrounding total home destruction is typical of WU fire disasters. Home destruction with adjacent unconsumed shrub and tree vegetation indicates the following:

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- High intensity wildfire does not continuously spread through the residential area as a tsunami or flood of flame.
- Unconsumed shrub and tree canopies adjacent to homes do not produce high intensity flames that ignite the homes; ignitions can only be from burning embers and low intensity surface fires.
- The “big flames” of high intensity wildfires are not causing total home destruction.

Surprisingly, home ignitions during extreme wildfires result from conditions local to a home. A home’s ignition vulnerabilities in relation to nearby burning materials within 100 feet principally determine home ignitions. This area of a home and its immediate surroundings is called the home ignition zone (HIZ). Typically, lofted burning embers initiate ignitions within the HIZ. Although an intense wildfire can loft firebrands more than one-half mile to start fires, the miniscule local conditions where the burning embers land and accumulate determine the ignitions.

Importantly, most home destruction during extreme wildfires occurs hours after the wildfire has ceased intense burning near the community; the residential “fuels” — homes, other structures and vegetation — continue fire spread within the community.

Given the inevitability of extreme wildfires and home ignitions determined by conditions within the HIZ, community wildfire risk should be defined as a home ignition problem, not a wildfire control problem. Unfortunately, protecting communities by creating ignition resistant homes runs counter to established orthodoxy.

There are good reasons to reduce fuels or “treat” vegetation for ecological and commercial objectives. But fuel treatments are most effective on wildfire behavior within a fuel treatment. They do not stop extreme wildfires. So let’s call a spade a spade and not pretend that most of these projects truly reduce home ignition risk during extreme wildfires. The most effective “fuel treatment” addressing community wildfire risk reduces home ignition potential and occurs within HIZs and the community, which is to say, we can prevent WU fire disasters without necessarily controlling wildfires.

To make this shift, land managers, elected officials, and members of the public must question some of our most deeply ingrained assumptions regarding wildfire. For the sake of fiscal responsibility, scientific integrity and effective outcomes, it’s high time we abandon the tired and disingenuous policies of our century-old all-out war on wildfire and fuel treatments conducted under the guise of protecting communities. Instead, let’s focus on mitigating WU fire risk where ignitions are determined — within the home ignition zone.

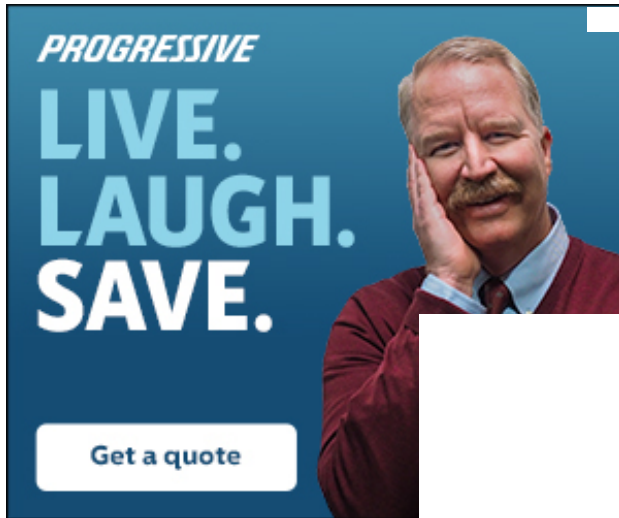
Dave Strohmaier is Missoula County Commissioner. He previously worked for both the Bureau of Land Management and U.S. Forest Service in fire management, and has published two books on the subject of wildfire in the West.

Jack Cohen, PhD, retired from U.S. Forest Service Research after 40 years as a research physical scientist where he conducted experimental and theoretical wildland fire research. In addition, he developed operational fire models for management applications and served operationally as a fire behavior analyst.

### For more information:

- Fire Adapted Missoula County, <https://sites.google.com/view/famcounty/home>

- "Your Home Can Survive a Wildfire," <https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Preparing-homes-for-wildfire>
- Preparing your home ignition zone for wildfire, <https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Preparing-homes-for-wildfire>



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