Cold Spring Fire

A Case Study of 141 Sherwood Road, Nederland, Colorado

Boulder County Wildfire Partners Program

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WILDFIRE PARTNERS

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Abstract. *During July 2016, Boulder County experienced the Cold Springs Fire near Nederland, Colorado. The fire occurred in an area where Boulder County had been working with homeowners on mitigation through the Wildfire Partners program. Many of those properties were threatened by the fire, including 141 Sherwood Road. This property owner had taken significant mitigation measures prior to the fire, including those that were self-initiated and others resulting from participation in the Wildfire Partners program. The focus of this case study is specific to the 141 Sherwood Road property, and reviews pre-fire mitigation actions and a post-fire analysis of fire behavior and mitigation measures which influenced the survival of the home and its surroundings.*

Cold Springs Fire Overview

The Cold Springs Fire was first reported on Saturday, July 9, 2016 at 1:45pm, two miles northeast of Nederland, Colorado. The fire was started by a campfire on private property that had not been properly extinguished. The fire was burning at 8228' in lodgepole, ponderosa pine, douglas fir and closed time litter – the heavy fuel loading and wind conditions resulted in observed active crown fire behavior.[1] The fire prompted evacuation orders for nearly 2,000 people (and included the evacuation of large animals).[2] Full containment occurred on July 14, 2016. A total of 528 acres had burned on predominantly private lands. No lives were lost, but eight homes worth an estimated $2.43 million and seven outbuildings were destroyed in the fire.[3]

Boulder County Promotes Wildfire Mitigation

As the smoke began to clear and homeowners were allowed to return home, several important mitigation stories began to emerge. The fire perimeter and mandatory evacuation zone overlapped with residents who were participating in the Boulder County Wildfire Partners program. The program, initiated in 2014 through county and state grant funding, engages property owners in wildfire mitigation through a three-part process:

1) **Property Assessment.** Following a voluntary application process by the property owner, a qualified mitigation specialist goes to a property and assesses the Home Ignition Zone -- the home, its immediate surroundings, and property extending at least 100 ft. from the primary structure. During that process the mitigation specialist will discuss ignition vulnerabilities, mitigation solutions, and resources with the homeowner.

[1] National Interagency Fire Center, Cold Springs Fire incident information. Retrieved on October 6, 2016: http://inciweb.nwcg.gov/incident/4848/)

[2] 9NEWS (KUSA). Blair Shiff and Bobbi Sheldon, July 14 2016. Retrieved on October 6, 2016: http://www.9news.com/news/local/wildfires/evacuations-temporarily-lifted-for-cold-springs-fire/271699967

[3] DailyCamera. Mitchell Byars, July 14, 2016. Retrieved on October 6, 2016. http://www.dailycamera.com/boulder-county-news/ci_30126387/remaining-cold-springs-fire-evacuees-will-be-allowed

2) **Mitigation Actions**. After the assessment, the homeowner receives a customized report that outlines a series of required and recommended mitigation actions. All required actions must be completed in order to receive a program certificate. Mitigation actions focus on reducing ember ignitions, flame impingement, and radiant heat sources, and can include: window replacement from single to double-pane, cleaning gutters, adding metal flashing to deck junctions, removing all vegetation from within five feet of the primary structure, moving woodpiles 30 feet from structures, and thinning and limbing trees.
3) **Certification.** Upon successful completion of the required mitigation actions and passing a follow-up inspection, homeowners earn a Wildfire Partners certificate. The certificate shows their exemplary mitigation achievements. In some cases, homeowners have used the certificate to continue or obtain insurance coverage.

At the time of the Cold Springs Fire (July 2016), Wildfire Partners had 781 participating homeowners with 781 assessments completed and 281 homes certified. By the end of 2016, over 1,000 homeowners were participating in the program. Within the burn zone of the Cold Springs Fire, eight of the homes were participants in the Wildfire Partners program. All eight survived the fire, with the exception of one outbuilding.

Homeowner Takes Mitigation Action

In 2014, Robert Lanham, a resident at 141 Sherwood Road—who would later become the first person to report the Cold Springs Fire—signed up for the Wildfire Partners program. Prior to joining the program, however, Mr. Lanham had already taken significant action on his property to mitigate any potential wildfire threat.

Mr. Lanham's background in biology and geology, and interest in forestry, prompted him to take an active mitigation role from the beginning. When he purchased the property in 2005, it was in extreme neglect: wooden shakes covered both his house and garage, and thick stands of lodgepole pine blanketed the entire property—encroaching on structures. Mr. Lanham was aware of the fire history within the area, including the Black Tiger Fire (1989), which at the time was the most destructive wildfire in terms of property loss and damage in Colorado history.[4] He also understood the unique wildland-urban interface challenges posed by his property and others' in the area. A history of mining claims contributed to a patchwork of large lots with irregular lot lines, sometimes presenting a challenge to coordinating large-scale mitigation efforts across property boundaries. In his own words, he "saw fire coming from the day we bought the place."

Over the course of ten years, Mr. Lanham transformed his house, garage, and forested property into a model for fire mitigation: He worked on weekends to clear lodgepole stands which had aggressively grown in following clear cuts for Tungsten mining during previous decades; he replaced the wooden shake siding and roofs with composite shingles and log siding; he created

[4] Boulder County Land Use Wildfire Mitigation website (The Black Tiger Fire). Retrieved on November 10, 2016. http://www.bouldercounty.org/property/forest/pages/blacktigerfire.aspx

open spaces on his property to encourage aspen and a mix of other trees, including limber pine, spruce and ponderosa, and; he significantly thinned trees to create a large treatment area between his property and thick stands of lodgepole on adjacent lots. Ultimately, Mr. Lanham's work translated into treating ten acres of his property, with thinning projects extending 150 ft. to the north, 250 ft. to south, 200 ft. to the east, and 500 ft. to the west of his house. Mr. Lanham estimates that he invested 1,000 hours of time on his property for fuel management while working on weekends over ten years. Official records show that he took 292 separate loads of material, an estimated 82 tons of biomass, to the Nederland Community Sort Yard from 2013-2016.

Wildfire Partners Assessment

Mr. Lanham received his assessment on June 8, 2014 and earned his certificate the following summer on October 17, 2015. His assessment focused primarily on two major mitigation areas: the condition of his log home and deck, and vegetation within Zone 1A. Specifically, the property had several vulnerabilities to ember intrusion: lumber stacked beneath the deck, collection of needles under the deck, wooden siding junction with the wooden deck, large cracks in several aged deck boards, fine fuels at the base of wooden deck steps, and a wooden fence connected to the deck.

Mitigation actions focused on: sealing deck board cracks, replacing base of wooden stairs with non-combustible materials, consistently installing flashing at the base of all siding walls, removing scrap lumber and needles from below the deck, removing and/or mowing grassy areas near the deck and porch stairs, ensuring a 5 ft. non-combustible zone extended around the house (including the deck), and covering areas with 1/8" metal meshing to protect against accumulating leaf and needle debris (see Figure 1 below for before/after examples). Mr. Lanham estimated that his home retrofits cost less than $400 in total.

It is worth noting that many property assessments within the Wildfire Partners program require more extensive mitigation work to the fuels within Zones 1 and 2. Due to Mr. Lanham's previous mitigation work, however, no further fuel management was required as part of the assessment actions.

Figure 1. *Before/After Mitigation Photos at 141 Sherwood Road (primary structure). Top left: condition of stairs and grass before mitigation (2014); top right: installation of a non-combustible border, repaired and sealed deck boards to eliminate any significant gaps or cracks (2016); bottom left: base of walls without flashing and vegetation (2014); bottom right: non-combustible metal flashing extending several inches from wall base, removal of all vegetation near structure (2016).*

Property Put to Test During Fire

When the Cold Springs Fire began, Mr. Lanham walked down to a neighbor's property with a firefighter from the Nederland Fire Department to point out the location of the fire. What began as a seemingly benign fire, however, had quickly turned into a fast-moving event. Mr. Lanham did not have time to return to his property and take any normal evacuation precautions. In fact, his girlfriend would soon later leave in a hurry and fail to close the garage door – an action that was later taken by a firefighter who came to the property before the fire front surrounded Mr. Lanham's house.

Fire Behavior

Topography and Vegetation

The Lanham property is located at the top of a Northwest aspect drainage and upwind/uphill of the Cold Springs fire point of ignition (Figure 2). The area immediately downslope of the main structures and extending downslope of the property is characterized by springs and surface water supporting a mixed vegetation type of conifer (lodgepole pine, ponderosa pine douglas fir and limber pine) and deciduous (mainly aspen). The majority of the conifer component between the main structures and to the property boundary has been removed by the land owner, leaving a dominating aspen stand.

Observed Burn Pattern

The mapped fire perimeter supported by witness accounts, ortho photo interpretation, and on site tree scorch and burn pattern assessment indicate the fire approached the property from the downhill/ down drainage and northwest direction. The above evidence also suggests that the fire split downhill of the property to flank the southwest and northeast slopes of the drainage, and subsequently the southwest and northeast sides of the property. The southwest finger of the fire appeared to burn predominantly cross slope on Hurricane Hill and in a southeasterly direction, exhibiting crown fire behavior for the majority of the distance. The primary burning activity that challenged the 141 Sherwood Drive property occurred in the first burning period on July 9, 2016. (Figure 2).

Witness accounts describe the south west flank of the fire turning downhill and spreading in an east northeast direction towards the property. The mapped burn perimeter, ortho photo interpretation, along with onsite tree scorch patterns and other onsite burn indicators support this account.

Ortho photo interpretation and onsite indicators suggest the northeast flank of the fire initially burned uphill and then transitions to a southeast spread direction, exhibiting intermittent crown fire behavior, destroying a neighboring structure and flanking the property on the northeast side.

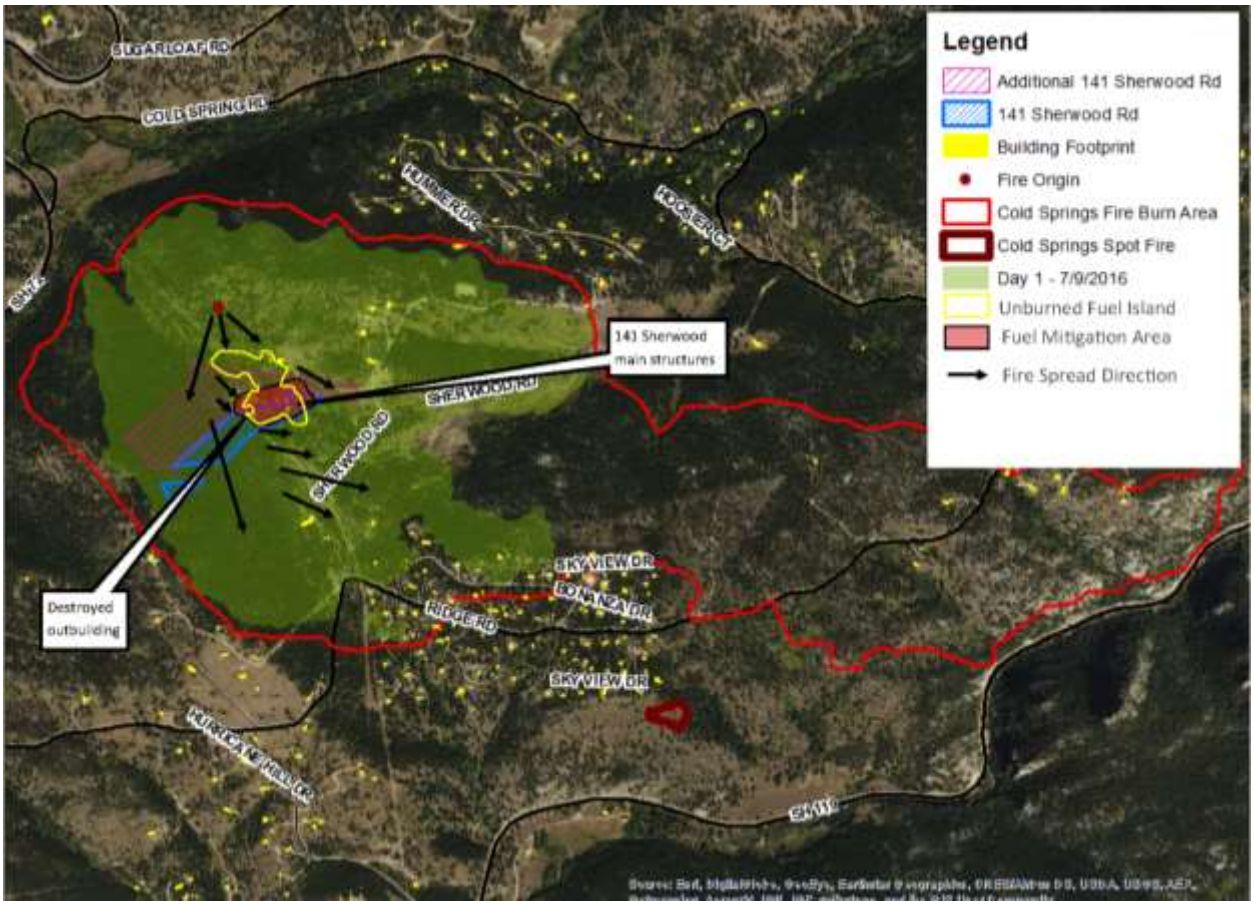

Figure 2. *Cold Springs Fire ortho photo with estimated burn perimeter (red polygon) and suggested fire spread direction in relation to the 141 Sherwood Rd main structures and surrounding unburned fuel island (yellow polygon). Estimation based on witness accounts, site visit observations and ortho photo interpretation and burn perimeter map supplied by Boulder County.*

Fire Impingement on 141 Sherwood

Crown fire activity through the southwestern portion of the property consumed the majority of the trees present on the northeast facing slope of Hurricane Hill. One outbuilding southeast to the main structures was destroyed in the fire. Onsite indicators suggest airborne embers to be the likely ignition source (Figure 3).

Figure 3. *Foundation of an out building, located approximately 315 feet to the southwest of the main structures and 70 feet to the northeast of crown scorched trees, destroyed as a result of suspected ember ignition.*

All burn indicators suggest that the central portion of the property was initially largely exposed to a flanking and backing fire only and not the head fire (Figure 2). Secondarily, the fire turned to an easterly/south easterly direction, further exposing the property to a flanking and backing fire. Witness accounts describe airborne ember activity in the immediate vicinity of the main structures during this fire spread event; however, the closest evidence of successful ember ignition is at 36 feet southwest of the main structure in light matted grass and surface litter (needles and small twigs), where minimal spread occurred (maximum 1 foot in diameter) and self-extinguishment without firefighter intervention occurred (Figures 4 and 5). Ember ignition also occurred at a distance of 80 feet southwest of the structure, where remaining vegetation and juniper shrub were ignited and wooden fence posts were consumed as the resulting surface spread uphill (southeast) and away from the main structure (Figures 4 and 6). The wood post and rail fence did not sustain damage beyond the sections immediately adjacent to heavier vegetation (tall grass and juniper shrub) and self-extinguished without firefighter intervention did occur. An existing firewood pile (considered highly combustible) located at 30 feet to the northwest of the main home and detached garage, and approximately 200 feet from the closest crown fire activity did not show evidence of ember ignition (Figure 7).

Excluding the above ember impingement, the closest surface fire impingement into the property was a backing fire which burned within 55 feet to the northwest of the detached garage in light litter and cured/matted grass (Figures 4 and 8). This fire also self-extinguished without firefighter intervention.

Figure 4. *141 Sherwood main structures (house and detached garage) and surrounding unburned vegetation perimeter. Burned area includes out building destroyed as a suspected result of ember ignition. The structure directly to the north of the 141 Sherwood property was also lost in the fire.*

Figure 5*. The closest ember ignition evidence to the main structure was at 36 feet to the southwest.*

Figure 6. *Evidence of Southwest ember ignition (80 feet from the main structure) and resulting uphill fire spread (away from the structure to the southeast) in tall standing grass and juniper. Fence in the photo is the replacement fence.*

Figure 7. *Firewood pile located at 30 feet to the northwest of the main structure and detached garage and approximately 200 feet from crown fire activity did not show evidence of ember ignition*

Figure 8*. Evidence of the closest backing fire impingement from the northeast at 55 feet*

Mitigation Lessons and Conclusions

During the post-fire interview and site visit, Mr. Lanham observed that his "multiple lines of defense" that he had created had all been challenged by the Cold Springs Fire. In this conversation, Mr. Lanham referenced the combination of tree thinning and species conversion (to aspen), aggressive surface fuel reduction, diligence in grass trimming and finally the structure mitigations he undertook which were all challenged, and therefore necessary in preventing the loss of his home and garage.

Based on ortho photo interpretation and onsite evidence, the 141 Sherwood Road property appeared to be challenged by both ember intrusion and fire spread on two flanks. As mentioned earlier in the report, the property owner engaged in significant vegetation modification, including tree thinning, species conversion and surface vegetation reduction that show evidence of altering the impacts of the fire on the property. Specifically:

- Strong evidence links the homeowner's efforts of significantly reducing the conifer tree component through thinning and pruning, and promoting the deciduous tree component of the forest structure downhill and down drainage of the property, combined with the existing micro site moisture conditions, influenced conditions unfavorable for ignition and fire spread and significantly reduced the airborne ember risk to the property and main structures.
- Strong evidence links the homeowner's efforts in thinning and pruning of the conifer canopy and reducing the surface vegetation on the north and east sides of the main structures, combined with the slope and aspect, significantly reduced the airborne ember risk and fire behavior potential to a slow-moving surface fire that eventually self-extinguished.
- Strong evidence links the homeowner's efforts in removing the conifer tree component, reducing surface fuels and maintaining short grass were likely significant factors in minimizing the airborne ember risk and fire behavior potential to on the south side of the property.

It is important to note that no single mitigation measure was responsible for reducing the fire impacts on this property, but rather the combined mitigation efforts provided an effective multi-layered defense: 1) a ten-acre treatment area that included tree thinning, species conversions and ladder fuel removal, 2) aggressively maintaining vegetation within zone 1, such as juniper removal and mowing, and 3) reducing structure vulnerability through home retrofits.

About the authors: Kelly Johnston and Molly Mowery serve as Wildfire Mitigation Specialists for the Boulder County Wildfire Partners program. Kelly Johnston is a registered professional forester and fire behavior analyst. Molly Mowery is a certified planner and wildland-urban interface professional. Ms. Mowery conducted the original assessment on Robert Lanham's property.

All images in this case study were provided by ESRI, Boulder County and the authors.