Tokewanna Fire Burn Injury
Factual Report

Accident Investigation Report
High Desert District – Bureau of Land Management
Rock Springs, Wyoming
July 29, 2016

Investigation Team:

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Executive Summary

At approximately 1545 hours on July 29, 2016, an accident occurred on the Tokewanna wildfire, a multi-jurisdictional wildfire southwest of Rock Springs, Wyoming. The fire started on private lands at approximately 1500 on July 28, 2016. County and Bureau of Land Management (BLM) resources initially responded along with a Type 3 Incident Commander (ICT3). All resources worked through the evening and a request for replacement overhead was ordered for the next operational period. The replacement overhead arrived at approximately 1300 on July 29, 2016. Shortly after the transfer of command, a firefighter sustained burns to his hands, calves, knees, elbows, cheeks, nose and ears while scouting fireline. The injured firefighter reported his injury utilizing the Medical Incident Report (9-line) protocols located in the *Incident Response Pocket Guide* and requested basic medical care and a ground ambulance. As the patient's condition deteriorated, the medical evacuation was escalated to an air ambulance. The patient was initially treated by the ground ambulance before being transported by air ambulance to the University of Utah Burn Center.

Narrative

On July 29, 2016 at approximately 1252, smokejumpers arrived on scene as replacement overhead on the Tokewanna Fire. The existing overhead structure worked through the previous night and was in a position that required them to meet two-to-one work rest guidelines. The time of transition was not optimal, but due to fatigue incurred by existing overhead, all parties interviewed agreed a transition should occur and was the best viable option for success.

At 1300, command of Division W (DIV W) was officially transferred to the firefighter who later received injury. All parties involved agreed the transition was adequate. At the time of transition, the identified priorities were: to establish resource accountability, the need to gather situational awareness (SA), and the need to establish an operational plan for incoming resources. The new Division Supervisor (DIVS) began scouting with the Type 2 IA Crew's Crew Boss to determine the current progression of the fire and the overall condition of DIV W. The DIVS and the Crew Boss (CRWB) decided to split up and scout line based on the state of fire activity, which was described as a smoldering, creeping black edge that was heavily reinforced with retardant.

At 1505, the incoming ICT3 and ICT3 (t) communicated to dispatch they assumed command of the incident. This message was relayed through one of only two radios that could communicate with dispatch on the incident, both of which were mounted in vehicles and utilized a truncated VHF system (WYO-Link). Resources were able to communicate internal to the incident through a mobile repeater, but the communication limitations added complexity later in the fire during the management of an incident-within-an-incident and medevac of the injured firefighter.

Between 15:30 and 15:45 the DIVS was scouting fireline and reached the highest point of where the fire had progressed on the ridge. At this location a flare up occurred downhill from the DIVS on the other side of a large stringer of lodgepole pine which had been heavily treated with retardant (*Reference Materials photos 2-5*). The DIVS stated, "I heard something I didn't like and determined I needed to leave." He retreated to his predetermined safety zone, which was the black and opted to continue downhill rapidly. While retreating he experienced an extreme pulse of radiant heat coming from the right accompanied by smoke and blowing ash. Because of the pulse of radiant heat, he used his helmet to shield the right side of his face. In recounting this he expressed "I wish I had my gloves on, but prior to the event I was away from the fire edge using a GPS and taking notes in my notepad." The radiant heat caused burns to the DIVS's hands, calves, knees, elbows, cheeks, nose and ears.

At approximately 1600, the injured DIVS arrived at the road and made contact with the Type 2 IA CRWB (t), the first person to see him post injury (*Reference Materials Photo 1).* The CRWB (t) stated he "did not see any visible signs of injury, but the individual was breathing heavily like he had been hiking hard." The CRWB (t) inquired as to whether or not they should burn the edge to clean it up, and the injured DIVS gave the direction to "not add any more fire and to continue to go direct." After discussing tactics with the CRWB (t) he progressed down the line towards the fish pond at which point he began to experience pain associated with his burn injuries. Upon arrival at the pond he stated "I had the urge to put my hands in cold water." At this point he realized he was injured and decided to proceed to Drop Point 10 (DP10) with the intent to transfer responsibility of DIV W back to the DIVS from the previous operational period.

At approximately 1615, the injured DIVS reached DP10 and tied in with the previous DIVS and stated he was hurt. Although the DIVS from the previous operational period offered his assistance with the injury report, the injured DIVS proceeded to call in his injuries to the IC using the Medical Incident Report (9-line) found in the *Incident Response Pocket Guide*. He categorized his injury as "green" (routine) and requested ground transport. Shortly after the injury report was relayed to the IC, a BLM Engine Boss with paramedic qualifications located at DP10 arrived to provide basic medical care to the injured firefighter. At 1627 a ground ambulance was confirmed en route from Ft. Bridger, WY to DP10 by Rawlins Interagency Dispatch Center.

The attending paramedic noted that the injured parties' condition began to deteriorate around 1630 and requested an air ambulance through Rawlins Interagency Dispatch Center to come out of Rock Springs, WY. The ground ambulance arrived on scene at approximately 1710 followed by the arrival of the air ambulance at 1715. At no time during the incident was the ground crew able to make contact with the air ambulance on the predesignated VMED 28 frequency. Despite a lack of air to ground communication, the patient was promptly loaded into the air ambulance

without delay. The air ambulance departed the incident with the injured firefighter en route to Salt Lake City, University of Utah Burn Center at 1743.

Investigation Process

In accordance with the *Interagency Standards for Fire and Fire Aviation Operations* a Wildfire Accident Investigation Team was assembled and delegated authority to investigate the accident. The investigation included analysis of human, material and environmental factors. The process consisted of interviews, verification of documentation, accident site visit, photographic and video documentation and establishment of the timeline of events for the day of the accident. The team consisted of the following individuals:

- Eric Walker, Team Lead, Assistant Fire Management Officer, New Mexico State Office BLM
- Will Briggs, Chief Investigator, Acting Risk Management Officer, Rocky Mountain Region, USFS
- Jim Wamsley, Team Member, Fire Chief, City of Rock Springs, Wyoming
- Amanda Burke, Writer/Editor, Team Rubicon, Region 3 Administrator

The Team Lead received the Delegation of Authority from the District Manager on July 29, 2016 at 1500. The team received a briefing at the Rock Springs District Office by the District Manager, State Assistant Fire Management Officer and Agency Administrators from the District on July 29, 2016 at 1500.

On August 1, 2016 the team traveled to Salt Lake City, Utah to interview the injured firefighter. The injured firefighter stated the following information and sequence of events:

- He was scouting fireline at the time of injury
- LCES was in place
- He described fire activity as smoldering and creeping in lodgepole with low intensity
- He was operating his GPS and taking notes prior to the injury occurred and was not wearing his gloves
- He didn't see flames at any time. Egress was difficult due to smoke and ash blowing. He stayed in the black and felt radiant heat from an "orange glow" off to his right (estimated 30 yards away)
- He communicated his injuries at DP10 approximately 20 minutes after they were sustained
- He called in his own Medical Incident Report (9-line) to the IC

On August 2, 2016 the team traveled to Rawlins, Wyoming to interview the ICT3, ICT3 (t) and the dispatchers that were involved the day the accident occurred. The interviewees stated the following information and sequence of events:

- ICT3 described overall fire activity as pulses of intensity in lodgepole, followed by low intensity spread in adjacent fuels with the fire never truly getting established
- Confirmed LCES was in place
- ICT3 received the Medical Incident Report (9-line) from injured firefighter and relayed "green – routine", non-emergency, and ground medevac was requested from dispatch
- Dispatch requested ground ambulance from Evanston Regional Medical Center
- Air ambulance was requested as the injured firefighter's condition began to deteriorate
- When it was ordered by the fire, dispatch requested an air ambulance and stated there was confusion over frequencies
- The dispatch center had practiced emergency scenarios during the spring and summer. Participation with district resources in these pre-season scenarios alleviated tension while coordinating this medical incident.

On August 3, 2016, the team traveled to the accident site. Evidence collected at the location included GPS data, videos and photographs, which were used to understand the sequence of events. An interview was also conducted with the Type 2 IA CRWB (t) who was the first person to make contact with the injured firefighter after the injury occurred. The team then traveled back to the Rock Springs District Office where the BLM Engine Boss/paramedic who treated the injured firefighter on the day of the accident was interviewed. The interviewees stated the following information and sequence of events:

- CRWB (t) described the fire activity as sporadic intensity and unsettled
- CRWB (t) saw fire develop from a ground fire to a crown fire in the area the firefighter was injured and confirmed this was the event that would have generated the radiant heat
- CRWB (t) heard the CRWB advise the injured DIVS of the flare up on the tactical channel and the DIVS acknowledged the warning traffic by stating, "stand by" due to being on the move.
- CRWB (t) confirmed he spoke with injured DIVS after the injury occurred, but did not see any visible signs of injury
- Upon arrival the local BLM engine boss (ENGB)/paramedic noticed blistering on the hands of the injured party
- The paramedic did not notice any singed hair on the bearded face, head or neck of the DIVS and/or discoloration of Nomex but opted to remove the Nomex shirt thereby identifying burns to the elbows.
- When the injured party stated their knees were starting to hurt the paramedic inspected the Nomex pants finding no discoloration or burns. After removing the Nomex pants, burns were found on the knees, shins and calves.

On Aug 4, 2016, the team interviewed the DIVS assigned to the incident prior to the injured parties arrival, compiled and analyzed documentation and completed a draft report. The interviewee stated the following information and sequence of events:

- Communication between the ground ambulance and firefighters was never established on the radio
- A firefighter had to meet the ground ambulance along a main road and guide them to DP10
- Communication between firefighters on the ground and the air ambulance was never established

Key Team Findings, Discussions, and Recommendations

Finding: The DIVS's injuries were received by a radiant heat pulse from a rapidly moving fire front located on the other side of a green stringer of lodgepole that had been treated with retardant.

Discussion: DIVS stated he heard a change in the fire activity that prompted him to move to the pre-identified safety zone (the black) as a means to evacuate the area. The change in fire behavior that required the injured firefighter to retreat was confirmed by the Type 2 IA CRWB (t) who observed the location of the fire transitioning into the crowns. The radiant heat pulse caused burns to any exposed skin including the top of his hands and face as well as areas protected by PPE such as his calves, elbows, knees and shins. The firefighter stated he sustained a burn injury anywhere Nomex/PPE was in direct contact with his skin. Human skin receives 2nd degree blisters/burns at 130 F. Research conducted at Missoula Technology and Development Center (MTDC) has identified that dye sublimation on Aramid cloth occurs at 425 F, however no discoloration or charring was observed. Temperatures experienced during the radiant heat pulse are estimated to be between 130 F and 425 F.

Finding: Firefighter had gloves readily available but was not wearing them (*Reference Material Photo 3).*

Discussion: The need for dexterity to operate the GPS and take notes while scouting put the firefighter in a position where it was more efficient to remove his gloves. The fire conditions changed rapidly and the firefighter was unable to put his gloves on during his exodus.

Finding: The severity of the injuries was not initially recognized because there were no signs of visible injury from the radiant burn.

Discussion: The effects of a radiant burn injury may not immediately manifest themselves and can take up to 72 hours, which can potentially lead to denial or downplaying the severity of a radiant burn injury.

Finding: The injured firefighter initially assessed his own injury and submitted his own Medical Incident Report (9-line) to the incident commander.
Discussion: Self-assessment of an injury can result in denial and/or misidentification of the severity of the injury.

Finding: Communications were never established between the air ambulance and the firefighters on the ground, nor were any communications established with the ground ambulance dispatched to DP10.
Discussion: The incident attempted to utilize the VMED 28 frequency, which had been established preseason as a frequency to be utilized between incidents and air medevacs in the State of Wyoming. This frequency was given to the air ambulance service in the winter of 2015 as a result of the 2014 Rock Ridge burn injury, but the pilot was unable to locate VMED 28 in the helicopter's radio. The second frequency VFIRE 21 was given by Rawlins Interagency Dispatch Center to contact the air ambulance. Firefighters were unable to make contact with the air ambulance on this frequency. Air Attack was able to make contact with the air ambulance on the "Victor" frequency (UHF), the only contact made during the medevac. It is unknown if the ground ambulance attempted to make radio contact with firefighters on scene; however, the ground ambulance crew commented to ICT3 that "they should drive them (the injured firefighter) to meet the helicopter." The request to drive the injured party to the helicopter by ground ambulance was denied. The helicopter had a suitable place to land in close proximity to the injured party and was approximately five to ten minutes out from landing.

Finding: Communications between Rawlins Interagency Dispatch Center and the incident were limited to two vehicle mobile radios with WYO-Link truncated operability.
Discussion: A portable repeater was set up on the incident and provided adequate communication on the fire, although, communications with the incident and dispatch through mountain top repeaters were inadequate. This required the ICT3 to take command of the incident within the incident based on proximity to the injured party and available radio communications.

Finding: All firefighting personnel were fully qualified for positions performed on the incident per the *Interagency Standards for Fire and Fire Aviation Operations*, Chapter 11 Incident Management and Response.

Summary

Three key findings were brought out during this investigation:

- Timely recognition and reporting of burn injuries is critical
- The absence of PPE can contribute to the severity of injuries
- Firefighters were unable to contact the air ambulance utilizing pre-established radio frequencies

Lessons Learned from the Interviewees:

When asked if there were any lessons learned or best practices the interviewees would take away from the incident the following was captured:

- Recognize your own limitations and don't expect to have all of the answers or information on a rapidly emerging fire.
- Time of day and incident complexity were not optimal for transferring command, but in this case it was a better option than continuing to utilize fatigued resources.
- Sometimes you just need to safely engage to ensure you are not transferring risk to someone else later.
- Make the time to tie-in with your overhead to assure face-to-face interactions occur during transition.
- Participation with district resources in pre-season scenario based training alleviated tension while coordinating a real life medical incident at the dispatch center.
- Frequency sharing with local EMS will help facilitate efficient medevac procedures.
- Continue to encourage EMS certifications among line firefighters and/or identify ways to improve access to Advanced Life Support on emerging incidents.

Reference Materials

Photo 1 – Egress from ridgetop to Drop Point 10

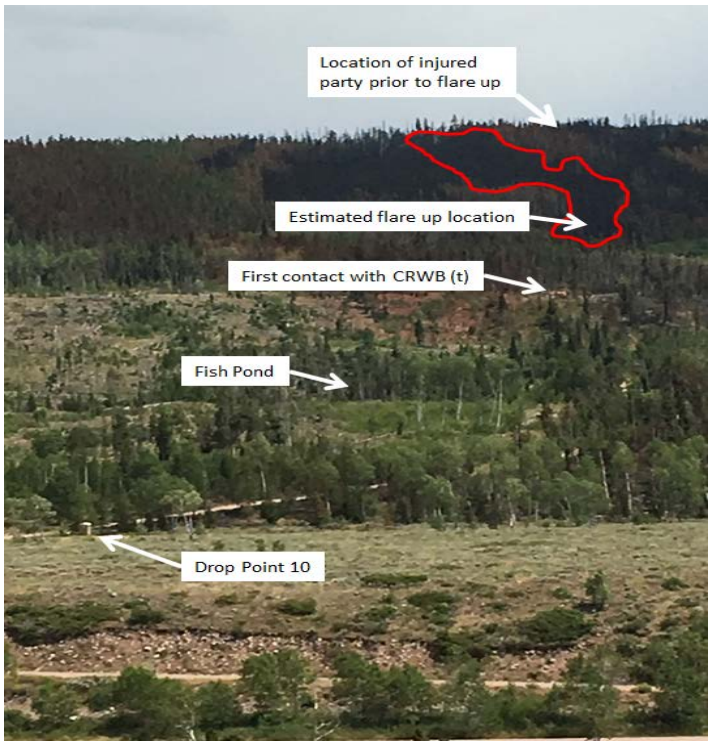

Photo 2 - Key locations and egress of injured firefighter

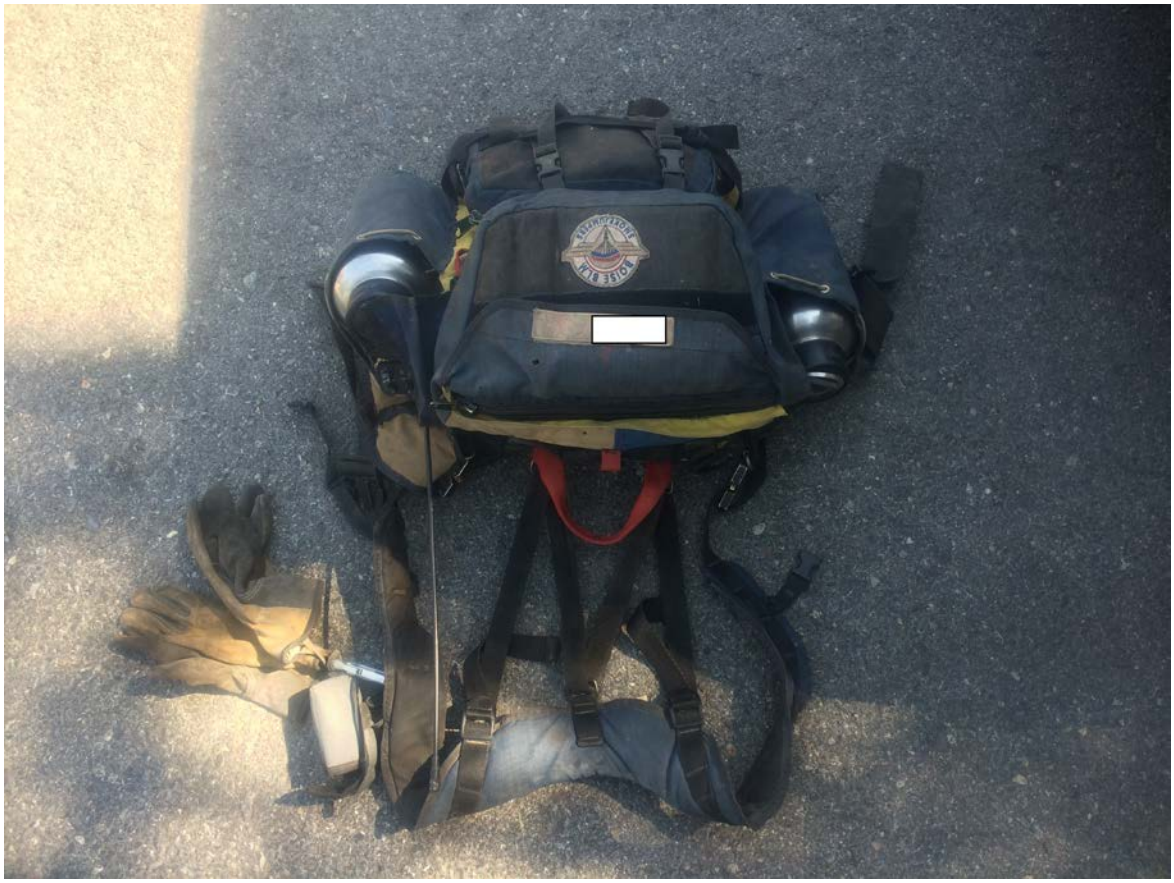

Photo 3 – Gloves clipped to chest strap

Photo 4 – Location on ridge top where injured firefighter marked lat/long as farthest fire progression

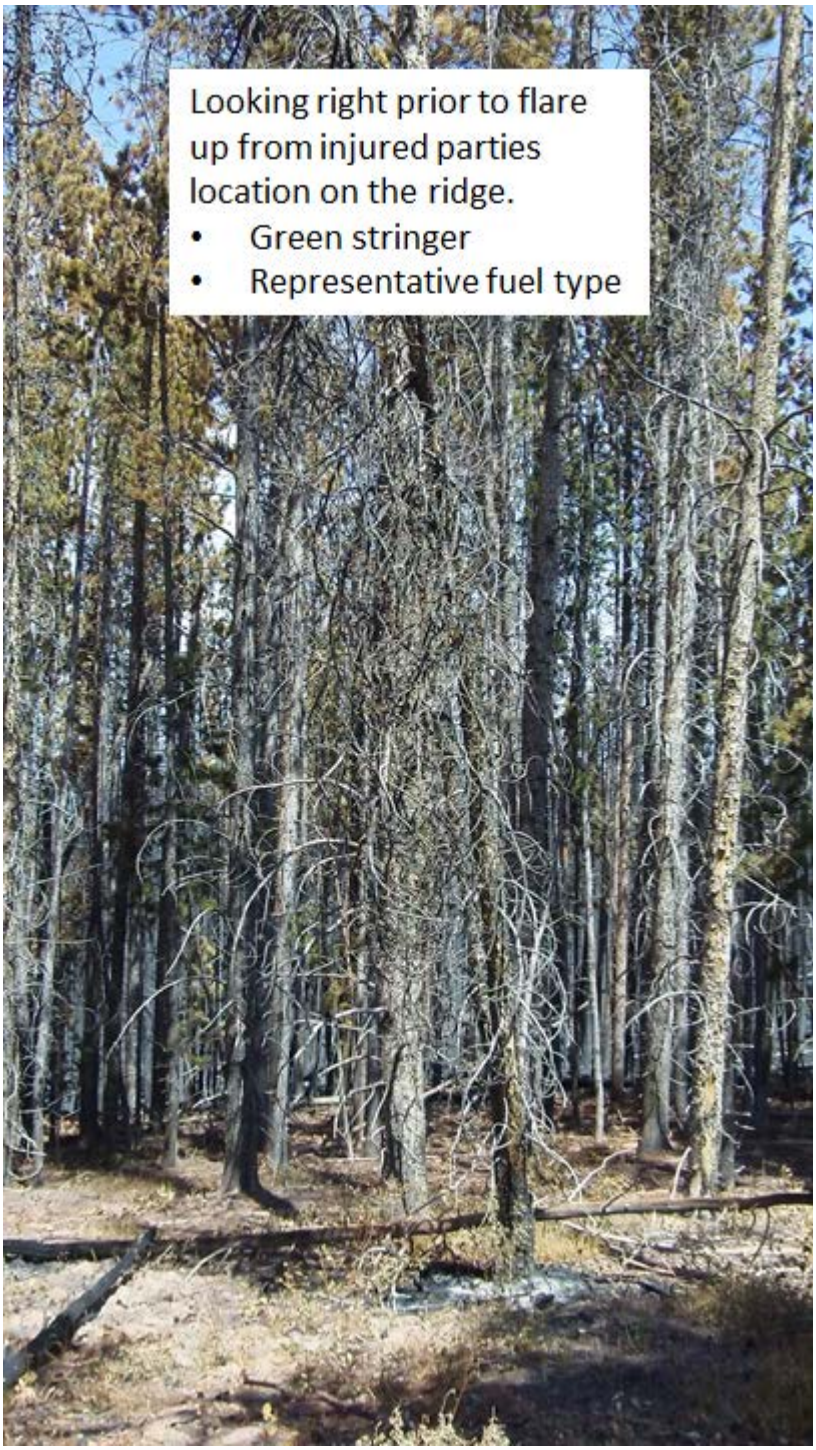

Photo 5 – Representative fuel type looking north (right) towards flare up from highest point on ridgetop where injured party marked lat/long.

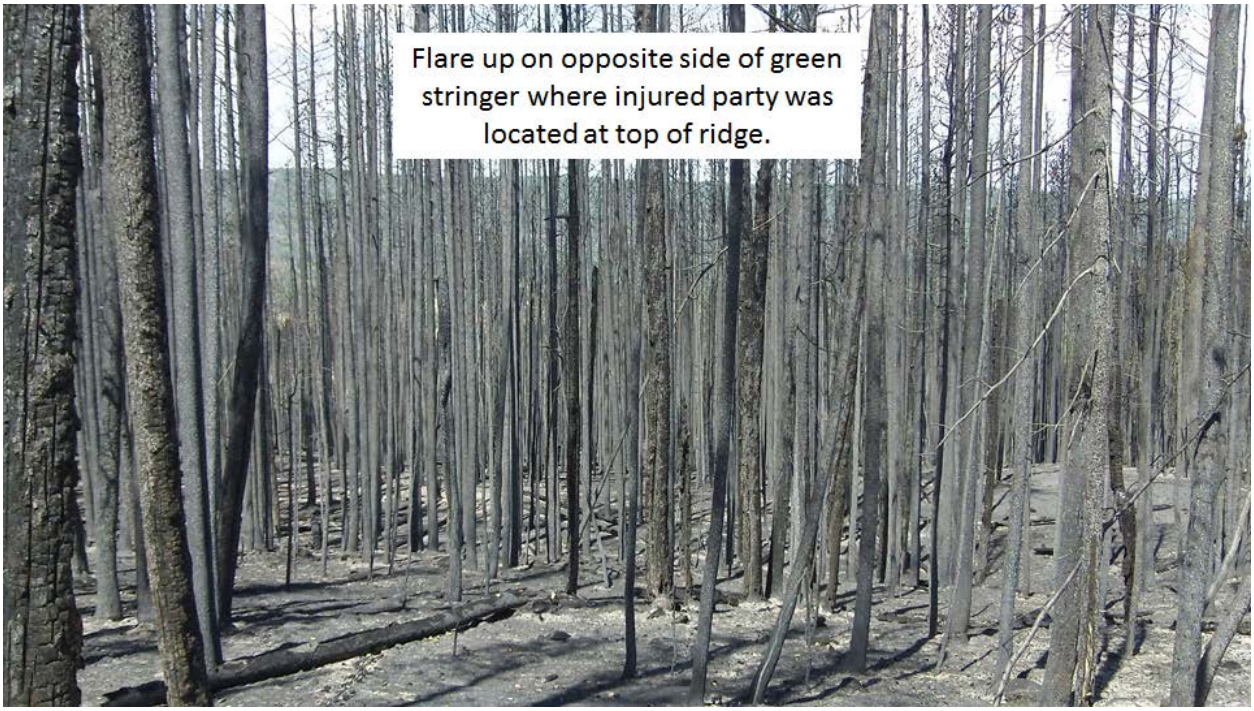

Photo 6 – Approximately 3 chains north (right) of injury parties lat/long marked in GPS to show fire progression

Photo 7 – Approximately 3 chains north looking back through the green stringer at the location where the injured firefighter started their retreat

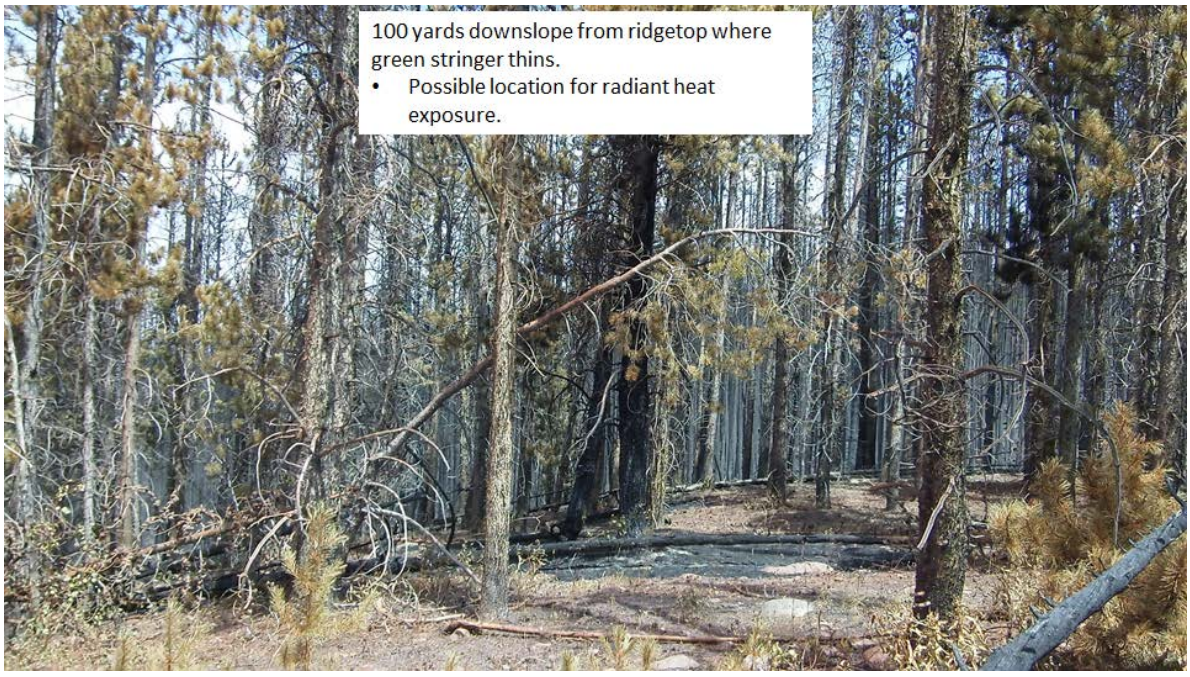

Photo 8 – Fuel structure showing thinning of vegetation between injured firefighter and flare up

Photo 9 – Fire flare up July 29, 2016 at approximately 1545.