An Ethical Analysis of the Decision Making of the Granite Mountain Interagency Hotshot Crew's Leadership During the Yarnell Hill Fire

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Cutter Huston

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISOR

Benjamin J. Laugelli, PhD, Assistant Professor, Department of Engineering and Society

Introduction

On June 30th 2013, while operating at a large wildland fire in Arizona, 19 firefighters tragically died when their crew was overrun by the fire. Various agencies have thoroughly analyzed this incident and produced reports detailing the events of this tragedy. These reports focus heavily on compiling a complete timeline of events to understand why the Granite Mountain Interagency Hotshot Crew (GM IHC) was located where they were at the time of their emergency site deployment. However, no official report publicly available adequately analyzes the decision making of the GM IHC leadership to answer the simple question "should the GM IHC have been located where they were at the time of emergency site deployment?" By failing to publicly answer this question, the wildland firefighting service is missing out on the opportunity to educate their leadership on avoiding the mistakes that contributed to the only fire service incident in the last 30 years which killed more than nine firefighters other than 9/11 (National Fire Protection Association, 2022).

Using a virtue ethics framework which defines "good actions" as ones that embody virtuous character traits that are established in the '10 Standard Firefighting Orders' which were developed to assist with "making the right choice for action" on the fireline, I will argue that while making two critical decisions during operations at the Yarnell Hill Fire, the leadership of the GM IHC failed to possess four of the ten necessary virtues to be considered ethical and "good" wildland firefighting crew leaders. This analysis will primarily be based on the findings of two reports commissioned following the tragic deaths of the GM IHC: the '*Yarnell Hill Serious Accident Investigation Report*' and the '*GM IHC Entrapment and Burnover Investigation*.'

Literature Review

After Action Reports are post-incident analyses of major fire related incidents, usually involving a "close-call" event or a fatality, that attempt to piece together what actions were taken by actors on the fireground and produce actionable recommendations for the avoidance of similar outcomes in the future. Two such reports were generated following the Yarnell Hill Fire incident. These reports focus heavily on an analysis of why the GM IHC was located where they were at the time of their emergency site deployment and what other active components of the Yarnell Hill Fire response were doing throughout the incident. Likely because of the tragic nature of the deaths of the GM IHC, the heroic nature of their work, and the potential for legal action should blame be established in an official report, these works generally avoid publicly determining if crews violated fundamental fireline rules and ethical principles.

In the '*Yarnell Hill Fire Serious Accident Investigation Report'* sponsored by the Arizona State Forestry Division, the investigation team conducts a detailed analysis of the Yarnell Hill Fire incident. After reviewing the context and providing a complete timeline of suppression efforts at the incident from ignition to the end of the search and rescue effort, the investigation provides an analysis of the information available to the GM IHC's leaders at various critical decision points in the hour before their emergency shelter deployment. Following this analysis, the investigation concludes that "firefighters performed within their scope of duty, as defined by their respective organizations" and that "no indication of negligence, reckless actions, or violations of policy or protocol" were found (Dudley & Karels, 2013). While this report encourages "further analysis [of the] human factors of this event" it does not effectively analyze the GM IHC leadership's adherence to wildland firefighting industry standards. This omission is likely a result of the National Forest Service's directive to compile two separate reports for any

serious accident investigation: one report for public release that should list factual information about the fire and tragedy and another report for internal use only that should identify the causes of the accident (Interagency Serious Accident Investigation Guide, 2013)

The *'Granite Mountain IHC Entrapment and Burnover Investigation'* is an additional report on the Yarnell Hill Fire that was completed for the Arizona Division of Occupational Safety and Health (ADOSH), a state level agency that does not fall under the guidance of the National Forest Service. Like the Arizona State Forestry Division's report, it includes an event timeline and walkthrough, but progresses the analysis section to include a discussion about the Yarnell Hill Fire leadership's adherence to wildland firefighting industry standards. However, this report focuses most of its analysis on the actions of Incident Command at the fire and not the GM IHC leadership's decision making, only briefly mentioning some deviations from standard practices by the GM IHC.

While official investigators have examined the decision making of the GM IHC and agree that "all members acted within the scope of their professional duties and did not negligently endanger any other member of the crew" (Dudley & Karels, 2013), officials have not yet adequately considered the decision making of the GM IHC to answer the simple question "should the GM IHC have been located where they were at the time of emergency site deployment?" In the work that follows, I will address this gap in analysis through the lens of virtue ethics.

Conceptual Framework

The decisions and safety of an IHC operating on the fireline are the responsibility of the crew's leadership: the superintendent and assistant superintendent. As such, the decision-making analysis of this work will focus on the decisions of the two GM IHC leaders. My analysis of the ethicality of the actions of the GM IHC leaders draws on a virtue ethics framework, which allows for an analysis of their decision making based on their adherence to established wildland firefighting principles.

Virtue ethics is a theory developed by Aristotle which claims that "the final goal of human action is to strive for the highest good," defined as "the state of being a good person" (Royakkers & van de Poel, 2011). To achieve this state, one must possess moral virtues and the ability to apply practical wisdom, the intellectual virtue that enables one "to make the right choice for action," when making decisions (Royakkers & van de Poel, 2011). These virtues are qualities that can be learned through practice by individuals or organizations, and represent the ideal balance between an extreme excess and deficit of that quality (Royakkers & van de Poel, 2011). An example would be the virtue of courage, which exists as the ideal balance between recklessness and cowardice.

In the context of wildland firefighting, striving for the state of being a "good" firefighter requires the ability to apply practical wisdom and "make the right choice for action" on the fireline. To do so, the National Wildfire Coordinating Group (NWCG) developed a list of '10 Standard Firefighting Orders' in 1957 which are listed in order of importance. These orders are as follows:

Fire Behavior

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times
3. Base all actions on current and expected behavior of the fire.

Fireline Safety

4. Identify escape routes and safety zones and make them known.
5. Post lookouts when there is possible danger.
6. Be alert. Keep calm. Think clearly. Act decisively.

Organizational Control

7. Maintain prompt communication with your forces, your supervisor and adjoining forces.
8. Give clear instructions and ensure they are understood.
9. Maintain control of your forces at all times.

If you consider 1–9, then

10. Fight fire aggressively, having provided for safety first.

The 10 Standard Fire Orders are firm. WE DON'T BREAK THEM; WE DON'T BEND THEM. All firefighters have a Right to a Safe Assignment.

Figure 1: 10 Standard Firefighting Orders (NWCG, 2022)

I will use this set of orders as virtues, and with them, create a conceptual framework through which I will analyze the decisions and subsequent actions of the GM IHC's leadership at the Yarnell Hill fire. According to former United States Forest Service Fire and Air Director Jerry Williams, "compromise among one or more of [the orders] is always the common denominator of tragedy," and because "these orders mean little once [firefighters] are in trouble … [they] must routinely observe and rely on them before trouble confronts [them]" (Sholz, 2010). As such, the following section is an ethical analysis of two critical decisions made by the GM IHC's leadership where I will argue that they lacked four of the ten virtues that ethical wildland firefighters should possess.

Analysis

In the analysis that follows I will demonstrate that when making two different critical decisions in the 40 minutes before their crew's tragic deaths, the leadership of the GM IHC failed to possess four of ten virtues necessary for ethical and "good" wildland firefighting. In the decision-making process that resulted in the GM IHC's repositioning from the black and their descent from the two-track road into the box canyon, the GM IHC's leadership failed to know what their fire was doing at all times, failed to base all actions on current and expected behavior of the fire, failed to post lookouts when there was possible danger, and failed to maintain prompt communications with their supervisor and adjoining forces. I will argue that these omissions prevent the labeling of the GM IHC leadership as virtuous agents and as such, their actions, at times, must be considered morally irresponsible according to the principles of virtue ethics. However, I want to emphasize that this analysis will argue that these omissions *contributed* to the tragic deaths of the GM IHC and were not the lone cause. The purpose of this research is not to blame individuals for the tragic outcome at the Yarnell Hill Fire, but rather to ensure that lessons can be learned from the mistakes that contributed to this tragedy so that future leaders and crews can perform their lifesaving work, while keeping themselves safe too. The following sub-sections will take each of the four virtues individually and provide a detailed account, demonstrating why the decisions made by the GM IHC's leadership constituted a departure from these virtues. Prior to that analysis, however, it's necessary to provide additional information about the timeline of events and decisions of the GM IHC that will be referenced in each sub-section of analysis. This timeline is a selection of approximately two hours from a three-day incident that includes the critical decisions made by the GM IHC leadership that I will analyze. The timeline is as follows:

1526 – Updated weather report received from National Weather Service indicating an expected wind shift to the South with winds of 40-50 mph. The receipt of this report is confirmed by the GM IHC Superintendent and Lookout over the radio.

1530 – A wind shift begins to push the fire East

1550 – GM IHC Lookout notes the fire has reached his predefined exfil "trigger" point and begins to reposition. He informs the GM IHC Superintendent of the fire's behavior and is subsequently picked up by another crew's leader in a 4x4 and reassigned to another task. Radio traffic occurs between the second crew's leader and the GM IHC Superintendent where GM IHC confirms they can see the fire, are located in the black, and understand their lookout has been reassigned.

1600 – Several bits of radio traffic occur. GM IHC Superintendent radios to the other crew leader that they are in the black and are making their way to their preplanned escape route to a ranch. The other crew leader attempts to confirm which route the GM IHC is taking and to which ranch they are traveling to by referencing "the road you saw me on earlier." GM IHC confirms that they are moving on "that road." While monitoring this radio channel, Aerial Command overhears this discussion and asks for clarification. GM IHC Superintendent does not respond, and Ground Command indicates that this is the GM IHC and that they are in a good place, likely referring to their 1550 radio traffic. Shortly after, the GM IHC Superintendent radios to Aerial Command that they are repositioning to a safety zone, but that everything was okay.

1604 – Members of the GM IHC text photos to family members that show them stopped in the black, watching the fire move East towards the town of Yarnell

No radio traffic occurs between the GM IHC and any other unit operating at the Yarnell Hill fire for the next 33 minutes. During this time, Ground Command and other crews were coordinating a rapid evacuation of the town of Yarnell, now in the direct path of the fire. The GM IHC was the only ground unit still located out "on the fireline" in the hills west of the town. Aerial Command, Ground Command, and the other crew's leadership all reported that they thought GM IHC was moving North through the black towards a ranch they must have established as their safety zone. Around 1630, the predicted Southerly wind shift materialized and began to rapidly push the fire to the South. Based on the eventual location of the GM IHC, it can be inferred that at some point after 1604 the GM IHC left the black and headed South along the elevated ridgeline on a two-track road towards a safe zone at Boulder Springs Ranch. At some point during this move, the GM IHC descended off of the ridgeline road into a box canyon, likely attempting to take the most direct route to Boulder Springs Ranch.

1637 – Seeing Aerial Command mark a drop path for another aerial unit to drop fire-retardant, the GM IHC Superintendent radios calmly that that is exactly where they want the drop to occur.

1639 – Over a broken, windy, and static filled transmission, the GM IHC Superintendent radios to Aerial Command that they are in the direct path of the fire. Aerial Command does not respond, and Ground Command attempts to radio the GM IHC Superintendent. The GM IHC Superintendent does not respond.

Seconds Later – The GM IHC radios for Aerial Command again. Chainsaws can be heard in the background. Aerial Command does not respond.

Less than a Minute Later – Yelling this time, the GM IHC Superintendent attempts to radio Aerial Command again. Aerial Command asks the GM IHC Superintendent to stop yelling. Ground Command radios Aerial Command that he believes the GM IHC is now in trouble and directs Aerial Command to attempt to contact them again.

Seconds Later – Calmly, the GM IHC Superintendent radios for Aerial Command. Aerial Command acknowledges this and lets GM IHC Superintendent know he is listening. Now sounding more urgent, the GM IHC Superintendent explains their escape route has been cut off and that they are preparing a site to deploy their emergency shelters. Aerial Command acknowledges this and asks if the GM IHC is on the South side of the fire. The GM IHC Superintendent yells, "Affirm!" Aerial Command acknowledges this and conveys that he will have fire retardant dropped on their exact location as soon as it is identified.

Over the next 4 minutes Aerial Command attempts seven times to contact any member of the GM IHC in order to determine their location for the fire-retardant drop. No further contact with the GM IHC was made and search and rescue efforts began. After intense searches, at 1810, their emergency deployment site was finally spotted in the box canyon and medics were helicoptered in. None of the GM IHC crew members at the emergency deployment site survived.

Figure 2: Selected Timeline of Critical GM IHC Related Events at the Yarnell Hill Fire (Dudley & Karels, 2013)

"Know What Your Fire is Doing at All Times"

In this section I will argue that certain actions of the GM IHC constituted a clear deviation from the principle "know what your fire is doing at all times," and as such, that they failed to possess a virtue that is necessary to label them as ethical wildland firefighting leaders at times.

On any wildfire incident, current and accurate information about fire behavior is critical to firefighter safety (NWCG, 2023). Having an accurate understanding of what the fire is doing, and what it will likely do in the future, allows crew leaders to ensure that their crew's suppression efforts will be effective and, more importantly, that they are not located in the current or future path of the fire. To maintain awareness of a fire's current location, fire crews use the lookout concept (NWCG, 2021). There are multiple options for this to occur. A crew can serve as its own lookout if it has a clear visual sightline to the fire and other dangers. When operating in an area with no visual sightline to the fire, a crew can designate one member to serve as their lookout by placing them in a location with a clear visual sightline to the fire, other possible dangers, and the rest of the crew, while remaining in consistent radio contact. When a crew is moving frequently and posting a member elsewhere as a lookout is not feasible, a crew can request help from other units operating nearby with direct sightline to them, the fire, and other possible dangers. When this version of a lookout is needed, aerial units are typically the most useful (NWCG, 2013).

For much of the day, the GM IHC leadership successfully followed this virtue, "knowing what their fire was doing at all times," by posting a lookout on a ridgeline that was in frequent radio contact and had direct sightlines to the GM IHC, the fire, and other potential dangers (Dudley & Karels, 2013). This lookout served his purpose by informing the GM IHC leaders at

1550 of the changing fire direction and confirming that they were in a safe location in the black (Dudley & Karels, 2013; Gleason, 1991). After his departure, the GM IHC leadership still adhered to this virtue by serving as their own lookout after electing to leave the safety of the black to travel along the ridge towards the Boulder Creek Ranch (Dudley & Karels, 2013). This is confirmed by photos sent from members of the GM IHC at 1604 showing them in a location with a direct sightline to the fire and other dangers (Dudley & Karels, 2013).

However, the GM IHC leadership demonstrated a critical error when electing to descend from the ridgeline to take a more direct path to the Boulder Springs Ranch through a box canyon. By descending from the ridgeline, the GM IHC lost visual sightline to the fire (ADOSH, 2013), and with that, their "knowledge of what the fire was doing at all times." At this point GM IHC leadership still had the option to ask aerial units to serve as their lookout while traveling through this canyon, but no request was ever made (ADOSH, 2013).

Sometime during their descent into and movement through the box canyon, the predicted Southernly wind shift materialized and pushed the fire directly towards the GM IHC at rapidly increasing speeds (Dudley & Karels, 2013). As a result of their location and lack of a lookout, the GM IHC was not able to identify this danger until 1639, when the fire was three minutes from their location (Dudley & Karels, 2013). This did not give them adequate time to reach their safe zone and the crew had to deploy their emergency shelters.

As a result of this clear deviation from the principle to "know what your fire is doing at all times," I claim that the GM IHC leadership failed to possess this necessary virtue to be considered ethical and "good" wildland fire crew leaders.

"Base All Actions on Current and Expected Behavior of the Fire"

In this section I will argue that certain actions of the GM IHC constituted a clear deviation from the principle "base all actions on current and expected behavior of the fire," and as such, that they failed to possess a virtue that is necessary to label them as ethical wildland firefighting leaders at times.

To successfully suppress a wildland fire and keep all crew members safe, crew leaders on the fireline must base their actions on what they, or their lookout, see the fire doing and what they predict it to do in the future. To maintain awareness of a fire's anticipated behavior, fire crews rely heavily on weather conditions and forecasts. There are three main ways for crews operating on the fireline to receive information and forecasts about weather conditions that will impact the behavior of the fire. They can utilize reports from the National Weather Service (NWS) for their specific geographical location that include current and anticipated moisture levels, temperatures, and wind speeds. They can utilize reports from mobile weather stations deployed in various locations across the fireline to receive real time weather information enabling their own prediction of fire behavior. Crews can also take basic weather measurements themselves to ensure correct understanding of the exact weather in their location.

For the majority of the day, the GM IHC leadership successfully "based all actions on current and expected fire conditions" by adjusting tactics according to weather changes, taking weather measurements themselves, and ensuring the distribution of NWS updates (Dudley & Karels, 2013). After recognizing a wind shift and resulting change in fire direction around 1530, GM IHC leadership decided to halt the construction of a fireline that the new behavior rendered ineffective and to reposition to the safety of the black (Dudley & Karels, 2013). Also, throughout the afternoon, the GM IHC Lookout documented the collection of various weather

measurements and relayed them to the GM IHC leadership (Dudley & Karels, 2013). Similarly, when presented with an updated NWS report detailing an expected wind shift to the South at 40-50 mph, the GM IHC confirmed that he and the GM IHC Lookout understood the report (Dudley & Karels, 2013).

However, the GM IHC leadership demonstrated a critical error when electing to leave the safety of the black to reposition their crew further South. By doing so, the GM IHC Superintendent placed his crew in part of the green – an area of unburnt brush vulnerable to fire – that was in the expected path of future fire behavior (Dudley & Karels, 2013). It is not fully understood why this decision to move was made, but I argue that intent does not matter in this situation. The black is considered the safest area to be on the fireline (NWCG, 2021). If the GM IHC leadership felt that their position on the southern edge of the black was in danger because of the predicted wind shifts, they should have elected to move Northeast away from the expected fire location to one of multiple ranches available deeper into the black (ADOSH, 2013).

As a result of this clear deviation from the principal to "base all actions on current and expected behavior of the fire," I claim that the GM IHC leadership failed to possess this necessary virtue to be considered ethical and "good" wildland fire crew leaders.

"Post Lookouts When there is Possible Danger"

In this section I will argue that certain actions of the GM IHC constituted a clear deviation from the principle "post lookouts when there is possible danger," and as such, that they failed to possess a virtue that is necessary to label them as ethical wildland firefighting leaders at times.

I have already discussed the importance of crew leaders on the fireline establishing lookouts of any kind in a previous section regarding the virtue of "knowing what your fire is doing at all times." In that section, I elaborated on the close relationship between establishing a lookout and "knowing what a fire is doing at all times." I have also already detailed how the GM IHC leadership failed to establish any type of lookout when descending into the box canyon, and thus committed a clear deviation from the virtue.

In addition to establishing the need for wildland firefighters to "know what their fire is doing at all times," the '10 Standard Firefighting Orders' separately indicates that one of the necessary virtues of an ethical and "good" wildland firefighter is their "posting of lookouts whenever there is possible danger" (NWCG, 2022). As such, I wanted to ensure that this virtue received its own sub-section of analysis to highlight its importance and the significance of the GM IHC leadership's failure to employ it.

Some could argue that because of the Eastward movement of the fire that the GM IHC leaders had been tracking for the previous hour, it would be reasonable for them to assume that their location when descending into the box canyon did not constitute the "possible danger" mentioned in this virtue. I argue that logic is flawed for two reasons. First, regardless of perceived danger, descending into a box canyon with no visibility of the fire is in direct contradiction to the virtue "knowing what your fire is doing at all times," and is thus inherently dangerous. Second, based on the 1526 weather report detailing an expected Southernly wind shift at 40-50 mph, a virtuous wildland firefighter would recognize that the report alone, even if current fire behavior didn't match predictions, constituted a "possible threat" that warranted the establishment of a lookout.

As a result of this clear deviation from the principal to "post lookouts when there is possible danger," I claim that the GM IHC leadership failed to possess this necessary virtue to be considered an ethical and "good" wildland fire crew leader.

"Maintain Prompt Communications with Your Forces, Your Supervisor, and Adjoining Forces"

In this section I will argue that certain actions of the GM IHC constituted a clear deviation from the principle "maintain prompt communication with your forces, your supervisor, and adjoining forces," and as such, that they failed to possess a virtue that is necessary to label them as ethical wildland firefighting leaders at times.

To ensure successful and safe fire suppression at wildland fire incidents, consistent and clear communication between all units is critical (NWCG, 2023). Such communication is important so that units in command of an incident are kept aware of the fire's location and behavior, the actions and tactics of crews, and other factors they may not be able to track themselves at their command post. This is especially true on complicated incidents like the Yarnell Hill Fire where air- and ground-based units are working in tandem in a wildland-urban interface environment. To maintain consistent communication while crews are spread out over large distances, radios are utilized. To ensure the necessary communication on complex incidents occurs, wildland firefighters are tasked with five communication responsibilities on any incident. They are as follows:

1. Brief others as needed.
2. Debrief your actions.
3. Communicate hazards to others.
4. Acknowledge messages.
5. Ask if you don't know.

Figure 3: Communication Responsibilities of Wildland Firefighters (NWGC, 2022)

The radio communication from the GM IHC that was included in various reports about the Yarnell Hill Fire incident indicated that the GM IHC leadership generally followed these five responsibilities. However, during the two critical decision points that I am analyzing in this section, I argue that the GM IHC leadership failed to "brief others as needed" and "ask if you don't know," and as such failed to "maintain prompt communication with their supervisor and adjoining forces."

The task to "brief others as needed" is a very general order. How does one determine when a briefing is necessary? I argue that this determination is situation dependent, but should be based on a careful consideration of a unit's actions and needs compared to the command unit's understanding of those actions or needs. For example, the GM IHC leadership correctly identified that some sort of radio communication which indicated they were utilizing their escape route was warranted. They attempted to convey this at 1600 (Dudley & Karels, 2013). The need to move to an escape route is a serious event and not radioing this need to command would generate a significant knowledge gap for the command units. Furthermore, how does one determine what to include in a brief? Once a firefighter has determined that the command unit's gap in knowledge about their current situation warrants a brief, they should simply convey the actions that are taking and have taken, why, and what they will need and do in the future. This is the critical component that the GM IHC failed to accomplish. The GM IHC crew leaders failed to clearly convey what actions they were taking by speaking only in generalities: "we are in the black making our way on our escape route to the ranch" (ADOSH, 2013). This radio traffic also did not convey why they were repositioning or that they needed any further assistance. A more complete briefing might have sounded like "GM IHC is currently located at the Southern edge of the back and think our position could be compromised by future weather developments. Utilizing

our escape route of the two-track road on the ridge, we are making our way towards Boulder Springs Ranch. We are currently functioning as our own lookout and can see the fire front, but is there an aerial unit available to track our movement and advise potential danger?"

Additionally, when making the critical decision to descend off of the ridgeline road and into the box canyon, the GM IHC failed to provide any briefing, violating the responsibility to "brief others when needed." The decision to move to a location where they would be blind to changes in fire behavior is questionable in the first place, and certainly warrants the label of a "needed" briefing. Furthermore, now blind to changes in fire behavior, the GM IHC leadership could not have known where the fire was, something I have already established as fundamental to the actions of ethical wildland firefighting crew leaders. Once in the compromised position in the box canyon, the GM IHC leadership should have "asked since they didn't know" about the status of the fire. Instead, no radio traffic occurred until the GM IHC was in an emergency situation. The failure to adhere to the communication responsibilities of "briefing others as needed" and "asking if you do not know" represents a departure from the virtue of "Maintaining Prompt Communications with Your Forces, Your Supervisor, and Adjoining Forces." As such, I claim that the GM IHC leadership failed to possess this necessary virtue to be considered ethical and "good" wildland fire crew leaders.

Conclusion

I have argued that the GM IHC's leadership failed to possess four virtues necessary for the label of an ethical and "good" wildland firefighter according to the National Wildfire Coordinating Group, while making two critical decisions. The GM IHC failed to know what their fire was doing at all times, failed to base all actions on current and expected behavior of the fire, failed to post lookouts when there was possible danger, and failed to maintain prompt communications with their supervisor and adjoining forces. As a result, I am confident claiming that an ethical and "good" wildland firefighting crew leader would not have put their crew in the location that the GM IHC was at during their emergency deployment site without preemptively notifying somebody of their actions. Furthermore, given my analysis, I also think it is fair to claim that an ethical and "good" wildland firefighting crew leader would not have put their crew in the location that GM IHC was at during their emergency deployment at all.

These findings are significant in the context of the wildland firefighting service. Understanding that ethical and "good" wildland firefighting crew leadership requires the possession of all 10 of the Standard Firefighting Orders that are considered hallmarks of virtuous leadership, at all times, will help crew leaders conduct their suppression efforts more effectively and safely. It is my hope that this ethical analysis and others like it in the future, produce lessons that can prevent the occurrence of tragedies like the one that occurred during the Yarnell Hill Fire.

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