Fired Up: Scales of Safety and Federal Wildland Fire Management in the U.S.

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Abstract

The wildland fire environment in the U.S. is becoming increasingly complex due to a century of fire suppression policies, development in wildland-urban interface areas, and an expected increase in fire activity due to climate change. As more attention is focused on wildfire management, the role of U.S. federal wildland firefighters is quickly changing. Unlike most structure fire departments, federal wildland firefighters do not have a standardized "medic" position on crews and are provided very little medical training, leaving them particularly vulnerable to medical emergencies when responding to remote incidents. The history of firefighter safety policy creation is marked by reactions to visceral accidents, yet there are examples of more proactive approaches to safety policy creation within individual agencies. This research explores injury rates at various scales, particularly smaller incidents (Types 4-5), prescribed fires, and daily project work where planning for medical emergencies is more difficult. A detailed policy analysis using a "Science and Technology Studies" (STS) framework will attempt to uncover how firefighter safety knowledge is produced and operationalized, what size fires these policies apply to, and at which levels of organizational management these policies are implemented. As a former Forest Service firefighter, I intend to investigate major safety issues faced by federal firefighters with the goal of producing research that will increase the availability of medical training and resources to these individuals.

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Chapter 1: Introduction

"Hundreds evacuated as wildfire spreads." "Deadly fires rip across American West." "Record breaking fire season." These types of headlines are becoming increasingly frequent, and many physical geographers are predicting wildfire seasons of the future will burn hotter and consume more forest land (Tang, et al., 2014). Though wildfire is a natural part of ecological systems in the American West, several anthropogenic factors are exacerbating the effects wildfire has on both the landscape and on human populations in these regions. A century of federal fire suppression policies in the Western United States have led to the accumulation of hazardous fuels by excluding fire from environments where it would otherwise naturally occur (Pyne, 2015). As a result of these historical suppression policies, developers were allowed to expand housing subdivisions into the "Wildland-Urban Interface" (WUI), an area where human populations establish in rural areas that may be prone to wildfire (Bradshaw and Lueck, 2012). What's more, human-caused climate change is also exacerbating fire weather conditions which are conducive to large fire growth (Pyne, 2015). With the perfect alignment of social and ecological factors, the wildfire environment will become predictably unpredictable – and with that, it will present significantly more safety hazards to federal wildland firefighters working on the front lines.

Project Scope

My project focuses on wildland firefighters working for the federal government and the safety hazards they face on the fireline. The five federal land management agencies that are tasked with managing wildfire incidents work under the United States Department of Agriculture (USDA) or the Department of the Interior (DOI) and are: The U.S. Forest Service (USDA), the Bureau of Land Management (DOI), the Bureau of Indian Affairs (DOI), the National Park

Service (DOI), and the Fish and Wildlife Service (DOI). In order to protect their employees, these agencies have created a framework of safety policies over time that is designed to address situations firefighters may encounter in the field. Federal firefighter safety policies can focus on a range of hazards that can be related to the fire itself or medical emergencies that occur while engaged with a wildfire. One of the most significant shortcomings that exist within federal wildland fire management in regards to employee safety is the lack of emergency medical training. Unlike many structure firefighters working for municipal departments who receive extensive training to become qualified as Emergency Medical Providers, the standard of medical training provided to wildland firefighters working for the federal government is only a 16-hour First Aid/CPR class. Because wildland firefighters are often tasked with managing fires in remote areas far from medical support, they are particularly vulnerable if a medical emergency occurs, whether it be a minor injury such as a sprained ankle or painful big bite to more severe medical emergencies such as a chainsaw injury, broken bones, or serious life-threatening emergencies. With these issues in mind in mind, my investigation will consider how safety policy is applied to either large or small size wildfire incidents, and how various approaches to safety policy production occur at different levels of organizational management within the federal wildland fire service.

Research Context

Chapter 2 discusses relevant literature related to natural hazard mitigation, Science and Technology Studies (STS), and the social construction of scale. Because wildland fire management can be considered a policy domain prone to disaster, planning and policy implementation for natural disasters will be a salient theme throughout this project. Referring to natural hazards mitigation literature, I discuss two common approaches to policy production

within policy domains prone to disaster. Reactive approaches are characterized as being a form of "political learning" where an outside perturbation is needed to stimulate an organization to respond and proactive approaches are characterized as being a form of "social learning," where an organization proactively searches for weaknesses rather than waiting for them to occur before devising a response (Birkland, 2006). Though these are not the only possible ways of creating policies, these approaches are evident within the field of wildland fire management. These two approaches to policy production can be evaluated using one specific insight developed within the broader field of Science and Technology Studies that considers how scientific knowledge is produced, applied to specific policies, and circulated over space to address an issue (Goldman, 2013).

Once these policies are operationalized, they may be applied to wildfire incidents that range in size from small to large, and will be managed by different levels of organizational governance. Geographic literature on the social construction of scale will be useful in this context as scale is commonly used as a means of characterizing issues in reference to their size and geographic extent, or in reference to levels of organizational management. When characterizing scales of a natural hazard in reference to its size or geographic extent, it is possible for these socially constructed designations of scale to have material impacts on those operating at either large or small scales of incident management. Additionally, when considering scale as a reference to levels of organizational management, this project will consider how reactive and proactive approaches are being used at different scales of governance – where the reactive approach that has traditionally characterized the evolution of safety policy and has set the standard for how policy reforms occur for all firefighters working for the federal fire service, the proactive approaches are occurring within the federal fire service at the scale of individual

agencies or regions within agencies but is not applied to all firefighters working for the federal government. Considering which operational scales employ specific approaches to policy production can help to reveal how socially constructed levels of governance can have political consequences which impact those on the ground in specific spaces.

Background

After discussing the Research Context, I will cover background information on wildland fire management that will be useful to address my investigation of firefighter safety policy. First, I will discuss the way in which the five federal land management agencies define space and the levels of organization ranging from the fire service scale in which all agencies are involved to the individual agency scales, or regions within agencies. Next, I will discuss how these agencies administratively designate wildfire incidents as either “large” or “small” scale. Incident scales are an important political designation because it directly relates to the number of resources that will be present at the scene of a wildfire and the responses incident command staff can take to address increasing fire activity, medical emergencies, or other management concerns.

Following the discussion of how scale is operationalized in references to different size fires and different levels of organizational management, I will discuss how firefighter safety policy has evolved historically in the United States, showing that the most impactful events to transform safety policy were worst-case-scenario events that occurred on large scale fires. The first firefighter safety policies came about in response to fire related hazards, such as fires that blew out of control and killed firefighters. The last example discussed is in reference to a medical emergency that occurred on a fire that was not a result of a fire related injury. This incident led to the first major safety policy that addressed emergency medical response. While it may be a surprise that there is a lack of medical training in the federal wildland fire service, there

are many legal and jurisdictional factors that make this so. The last section of the Background Chapter will discuss the factors that inhibit medical training.

Methodology

My Methods chapter which is based on a policy analysis I use to answer my research question: How are reactive and proactive approaches to federal wildland firefighter safety policy creation produced, applied, and circulated to address safety issues related to emergency medical response on both large and small size wildfires and at different levels of organizational management? To address my research question, I will use the template provided by Bardach in his book *The Eight-Step Path of Policy Analysis* (1996) where he lays out a systematic approach to analyzing policy documents. The policy documents will be in reference to four historical events that reflected a reactive approach to policy production: The Fires of 1910, The Mann Gulch Fire of 1949, the South Canyon Fire of 1994, and the Eagle Fire of 2008.

Other policy documents will be used that demonstrate how policy production can be proactively approached, and include the examples of: The Forest Service Region 4 6725 Emergency Medical Services Guidelines 6725, and the Bureau of Indian Affairs Wildland Fire First Aid Project. The proactive and reactive approaches will be evaluated using criteria borrowed from Goldman's STS approach to analyzing policy (Goldman, 2011), which includes investigating how scientific knowledge was *produced* following an opportunity for organizational leaning, how this knowledge was *applied* to specific policies designed to address a problem, and how these policies were *circulated* over space to affected individuals. In short, the criteria of production, application, and circulation will be used to evaluate whether reactive or proactive approaches are better for creating safety policies that address hazards on both large

and small scale wildfire incidents, and at which levels of governance those approaches are being employed.

Results and Discussion

In Chapter 5, I begin by discussing how firefighter safety policy has been produced, applied, and circulated in a historical context. The first examples will be used to show how safety policy evolved reactively following tragic events, many of which were in response to fire related hazards where people were burned. The most recent historical example to evolve in this manner, the Eagle Fire, deviated from the previous examples because it was in relation to a medical emergency rather than a fire-related hazard. Because this event led to the creation of the first comprehensive medical policy via the reactive approach, it will serve as an analytical comparison to two more recent medical response policies that have occurred within individual fire management agencies which followed the proactive approach to policy production.

After comparing how reactive and proactive approaches are produced, applied, and circulated, I move on to discuss the implications these approaches have in relation to large and small incident scales, as well as organization scales of governance where safety policies are enacted. Wildfire incident scales, defined as large or small, are in reference to the size of the incident – and because the resources and management approaches for these scales are different, this designation can have substantive impacts on firefighters once a fire is designated as a certain size. Additionally, it is important to consider which levels of organizational management either reactive or proactive approaches to policy production are being applied to. After thoughtfully reflecting on these topics, I will discuss what I view as the best path to move forward for federal fire management agencies to address emergency medical response.

Telling the Story

Finally, the last chapter conclude the project and briefly tell the overall story of safety policy within federal fire management. By considering the history of policy production and alternative ways of moving forward, my hope is to produce a useful policy analysis that can help to inform federal fire management agencies about the very important topic of firefighter safety, and more particularly, emergency medical response. If our society has deemed it necessary that firefighters risk everything to protect our communities, it is our obligation to provide firefighters with the best possible support to help them do their jobs and come home at the end of the day.

Chapter 2: Research Context

To situate the research context of my project, I will discuss bodies of literature relevant to my research question that consider how natural disaster policy process occurs, how it is informed, and to which scales resulting policies are applicable. Section 2.1 reviews literature on the production of governmental policy with a particular focus on Birkland's *Lessons of Disaster: Policy Change after Catastrophic Events* (2006), which provides a contextual background of the policy process following disasters. Birkland's observations are useful when considering the evolution of firefighter safety policy and how "focusing events" often drive the safety policy process. But, a reactive approach can mean policy makers miss opportunities to proactively respond to a problem by investigating issues before they turn into a catastrophe. Section 2.2 reviews a slice of literature within the broader field of Science and Technology Studies (STS) that discusses policy change occurring at the "science-policy interface," which will show how empirical knowledge can be subjectively used to influence policy. Specifically, this section explains how political underpinnings can make certain scientific information "count" more than other pieces of information. Additionally, I will discuss how scientific knowledge is produced, applied to specific policies, and circulated over space to affected individuals to address a specific issue following a catastrophic focusing event, a process that will be particularly useful for evaluating the construction of firefighter safety policy and the scales where it is impactful. Though the field of STS encompasses much more than I will consider within the context of this project, the insights I will discuss are particularly relevant to my investigation of firefighter safety. Lastly, section 2.3 reviews literature on the geographic concept of scale as it applies to issues that are designated as either "large" or "small" scale. Though many geographic scholars recognize that these designations are socially constructed, concepts of scale nonetheless have

substantive impacts when applied to specific policies. If focusing events that influence policy tend to happen more frequently at certain scales, it may impact the scales where updated policies are effective – which is investigated specifically in respect to firefighter safety policy in this project.

Section 2.1 – The Policy Process, Natural Disasters, and Focusing Events

This section will introduce concepts related to the ways in which government policy is created. In Section 2.1 – A, I consider the theory of "bounded rationality" of organizations responsible for policy creation and how that factor shapes policy cycles. In Section 2.1 – B, I will more specifically consider how policies are created within natural hazards management to outline basic principles of disaster response. In Section 2.1 – C, I discuss "focusing events" that often serve as a catalyst for policy changes within "policy domains prone to disaster," and how responding to problems in this manner may be less effective than proactively addressing an issue before it turns catastrophic.

Section 2.1 – A – Bounded Rationality and Organizational Learning. To begin, it is important to consider the broader realm of policy production. In the United States, government organizations involved in the policy-making process all face similar challenges (Simon, 1957). Organizations are comprised of a diverse workforce completing tasks at different levels of management and must coordinate to produce acceptable governing outcomes over space (Simon, 1957). Underpinning governmental responses to a particular issue is what Simon identified as "bounded rationality." Bounded rationality impacts individual or organizational decision making because:

> the intended rationality of an actor requires him to construct a simplified model of the real situation in order to deal with it. He behaves rationally with respect to this model, and such behavior is not even approximately optimal with respect to the real world. To predict his behavior, we must understand the way in which this simplified model is

> constructed, and its construction will certainly be related to his psychological properties as a perceiving, thinking, and learning animal (Simon, 1957, p. 199)

The concept of bounded rationality has been used to describe organizational learning (Mileti, 2001; Birkland, 2006; Sabatier and Weible, 2014) and helps to demonstrate the limitations that both individuals and organizations have in respect to decision making. Both individuals and institutions attempt to create basic explanations regarding a particular issue in order to evaluate and understand that issue. As a result, both individuals and organizations are said to be bounded by their own rationality. Though they are capable of understanding parts of a whole, they are limited by the fact that there is no way to conceive all the pieces and "correctly" construct them into a whole. As a result, this process influences organizational decision making when characterizing problems and solutions to address a specific issue in a specific place.

Although there are many accounts that attempt to demonstrate how bounded rationality influences organizations, one particularly useful explanation is "punctuated equilibrium theory" (Baumgartner, Jones, and Mortenson, 2014). Borrowing from the concept of punctuated equilibrium in evolutionary biology, this concept attempts to explain how governing institutions behave during periods of "stasis or punctuation" (Baumgartner, Jones, and Mortensen, 2014). Though most governmental organizations attempt to maintain stasis and avoid major fluctuations, they are not immune to change, and when change comes in the form of a large and transformative event, there are often updated policy responses that attempt to bring an organization back to a state of stability.

The theory of punctuated equilibrium finds its roots within Herbert Simon's theory of bounded rationality. One way of identifying issues that need to be responded to is through recognizing large concerns that may inhibit an organization's ability to maintain stasis. In this way, punctuated equilibrium theory asserts that:

> Policymaking institutions seem to add friction to the process of translating inputs into policy outputs. This friction acts to delay action on issues until enough pressure develops to overcome this institutional resistance. Then there is a lurch or punctuation in policymaking. Friction, which leads to punctuated dynamics, rather than gridlock characterizes American national political institutions (Baumgartner, Jones, and Mortenson, 2014, p. 83).

In other words, the policy production process does not follow an incremental or logistic trajectory where changes accumulate evenly over time. Instead, tensions existing within the system force policymaking institutions to respond. If the scale of the issue is perceived as too small to garner attention, it may not receive the attention required to produce a change – but if a large scale issue attracts significant attention, policy makers may identify that issue as worthy of a political response.

This observation helps to describe how policy changes within governing institutions. Since organizations must receive stimulus to respond to issues, their response will not be evenly prescribed in all circumstances, but rather will reflect the urgency of those perceiving the issue. As a result:

> The general punctuation hypothesis suggests that information processing is disproportionate. That is, policymaking alternates between periods of underreaction and overreaction to the flow of information coming in from the environment. This reaction may stem from a vivid event that symbolizes everything that is wrong (Birkland, 1997) or from the accumulation of problems over longer periods (Baumgartner, Jones, and Mortenson, 2014, p. 83).

In other words, policy making institutions may be tasked with different objectives, but generally follow a path where outside perturbations prompt the organization to learn and adapt to new circumstances. Since organizations are bounded by their own rationality, they do not always produce an even response. While this is asserted to be true of all American political organizations, this is particularly true of those tasked with managing natural disasters or other disruptive events that can have a major impact on the normal functioning of that organization.

Section 2.1 – B – Disasters and the policy process. Government agencies that are responsible for managing disasters are constantly required to learn from and adapt to outside perturbations. The field of natural hazards management is constantly adapting to new circumstances, partly because natural hazards are becoming exacerbated by anthropogenic climate change (Godschalk et al., 1999; IPCC SREX, 2013) and partly because the underlying social circumstances are constantly changing. In his book *Disasters by Design: A Reassessment of Natural Hazards in the United States,* Mileti states "that natural hazards are the result of interacting natural and social forces and that hazards and their impacts can be reduced through individual and social adjustment" (Mileti, 1999, p. 19). This is why hazards scholars view natural disasters as socially constructed – though humans may not be directly responsible for a catastrophic weather event such as a hurricane, they are responsible for developments that may be built in areas that can be expected to be impacted, or for the pre-established social systems that may or may not alleviate pressures once a disturbance event occurs (Mileti, 1999). Since much of the impact created by a disturbance is related to underlying social systems, disasters can be made less severe by considering those factors.

Updated policies are the means by which governing agencies "adjust" in the face of known and expected natural hazards. Since many natural hazards are predictable in the sense that we understand a specific hazard has occurred in a particular area and likely will again in the future, the political responses to these events are also predictable. In the case of natural disasters, there are said to be four phases that occur before, during, and after catastrophes; mitigation, preparedness, response, and recovery (Godschalk, et al., 1999, Natural Hazard Mitigation p. 5). Mitigation occurs in advance of a natural hazard and is related to the ways people construct the environment in areas prone to disaster before they happen; preparedness occurs immediately

before a hazard and attempts to stave off the worst effects; response occurs immediately after the event has occurred and focuses on the most pressing issues; recovery occurs after the event has subsided and attempts to restore normal functioning of the community (Godschalk, et al., 1999, p. 5). This cycle is significant because it establishes the four key time elements that are incorporated into governing agencies' reactions to a disturbance either before, during, or after it occurs. Because disasters are socially constructed, considering how and when governing bodies respond to them can be critical when attempting to create a more effective response. If governmental agencies did more to mitigate and prepare for expected hazards, perhaps the response and recovery phases could be made less severe.

Section 2.1 – C – Focusing Events, Windows of Opportunity, and the Policy Process. The insights discussed above are demonstrated by Birkland in his book *Lessons of Disaster: Policy Change after Catastrophic Events* where he discusses how catastrophic events that garner significant public attention often spur policymakers to address whatever the perceived problem is. Birkland refers to these as "potential focusing events," which are defined as:

> events that are sudden, relatively rare, can be reasonably defined as harmful or revealing the possibility of potentially greater future harms, inflicts harm or suggests potential harms that are or could be concentrated on a definable geographic area or community of interest, and that is known to policy makers and the public almost simultaneously (Birkland, 1997, p. 22)

Focusing events are often used as a chance to make policy changes while people are aware of a specific problem, what Birkland refers to as "windows of opportunity" for policy reform (Birkland, 2006). He discusses how this concept applies to many different types of catastrophes with a focus on the different ways that governmental organizations learn from and react to major setbacks. He describes this reactive approach to policy production as "political learning," where a large perturbation is required to gain the attention of the organization. This is contrasted with a

proactive approach to organizational learning referred to as “social learning,” where organizations seek out and attempt to expose weaknesses before a problem arises.

While it comes as little surprise that major disturbance events can inspire political action, Birkland is careful to display how catastrophic events of different types and magnitudes influence policy differently. For the purposes of discussing policy change, he refers to three types of disturbances: crises, disasters, and catastrophes. A crisis is the smallest of the three types of disturbances and may be induced by human actions or a natural event such as the Exxon Valdez oil spill; disasters are larger and may include earthquakes or terrorist attacks like those that occurred on September 11, 2001; and catastrophes are considered the largest such as Hurricane Katrina (Birkland, 2006). When considering how an event is determined to be a crises, disaster, or catastrophe, Birkland states:

> Whether or how crises emerge depends upon the way in which they are interpreted by relevant actors, which determines whether these events become policy issues. (Birkland, 2006, p. 3)

In other words, there are no administrative cutoff points that define one event as a “catastrophe” and another as a “crisis.” Rather, these determinations are socially constructed in that the response (or lack of response) by policy makers may be heavily influenced the perceptions of the public or other relevant actors.

Similar to the discussion of “Punctuated Equilibrium Theory” where large punctuations attract the most attention, Birkland’s designations of disturbance events in relation to different scales are important points to highlight. Again, unsurprisingly, the largest catastrophes garner the most attention. Events such as Hurricane Katrina were undeniably significantto that region and to the country as a whole, leaving little room for policy makers to do anything other than attempt to respond to the incident as fast as possible. While smaller crisis events may sometimes expose a

weakness and lead to policy reform, they may not excite the gamut of policy makers in the same way that a major earthquake in Los Angeles might. In some cases, this may mean that smaller crises events might have to happen multiple times before there is enough recognition of the problem to create real change. These points will be raised later in reference to firefighter safety policy, which often evolves following the largest focusing events.

The size and perception of focusing events are an important consideration when investigating how knowledge is produced and used to inform policy changes. Birkland notes that it is rare for a major disturbance to reveal completely unknown shortcomings when he says: "new facts combine with old ideas in windows of opportunity for change" (Birkland, 2006, p. 60). In other words, the weaknesses of a system may have been known, but no action was taken to mitigate potential harm until something happened, at which point the usual policy avenues of investigations occur. With this in mind, it may be worthwhile to question this process. Though a catastrophic event may provide an opportune time to reform policy, is it not possible to address these issues before harm is caused? Rather than waiting for bad things to happen before investigating an issue, Birkland suggests a more proactive approach when he says:

> This is the situation we face today with much of the current policy on natural disasters, which emphasizes relief and recovery rather than mitigation. This emphasis actually encourages people to build in flood prone areas and otherwise behave in ways they wouldn't if government policies didn't distort their sense of self-interest by shifting the risk from individuals to society as a whole. (Birkland, 2006, p. 181)

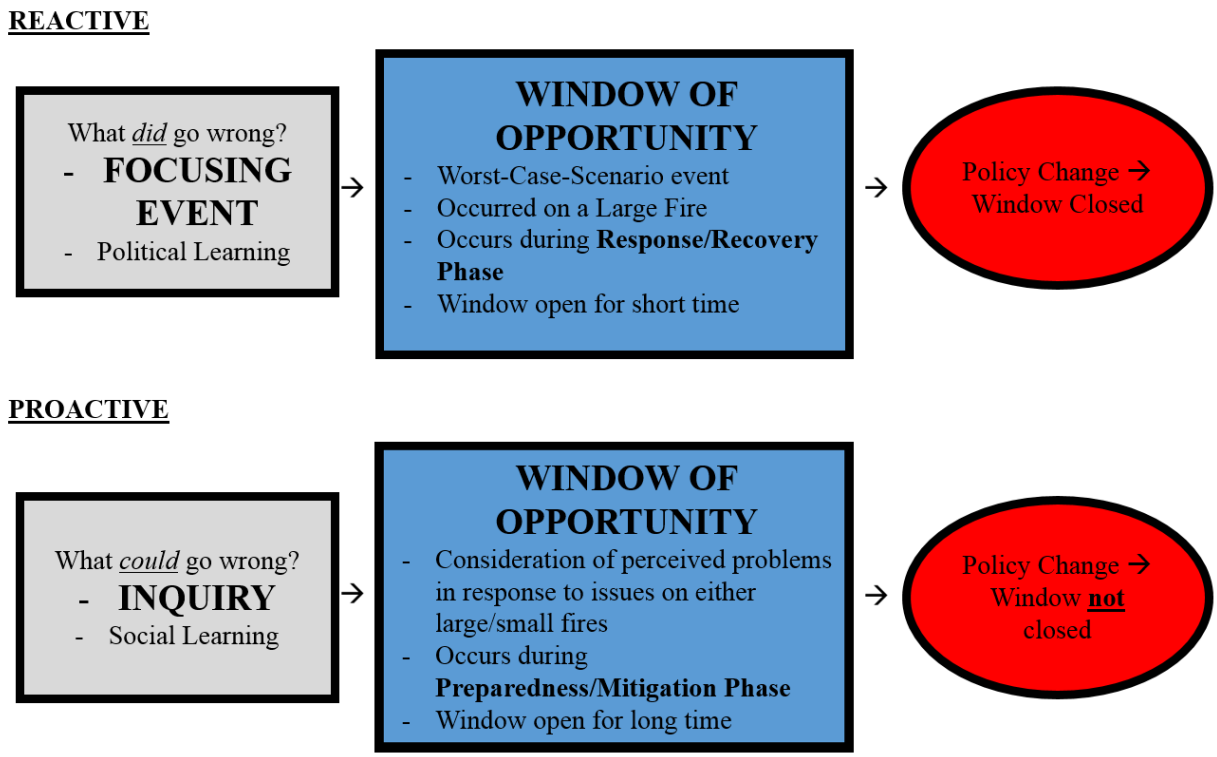
In other words, Birkland recognizes that there are multiple opportunities to address issues, and while it may be convenient politically to wait until something catastrophic has happened to produce change, it also may have many negative impacts that could be altogether avoided if there were more focus on preventing problems rather than a focus on responding to them once they have happened.

Birkland's book discusses how policy change occurs in "policy domains prone to disaster" such as aviation security or natural disaster response and recovery. These policy domains are prone to disaster because they are organizations that are tasked with managing incidents that can be expected to behave in unexpected ways (Birkland, 2006). Among the policy domains prone to disaster is the field of federal wildland fire management, and more specifically, safety management of those working for federal fire management agencies. Similar to Birkland's discussion of the policy process that often follows catastrophic events, the largest federal wildland firefighter safety policy changes have evolved reactively following focusing events which shine the light on a specific problem and can lead to policy changes. Other policies have recently been created which take a more proactive approach, as Birkland suggests, but they have not been significant changes that comprehensively changed federal safety policies.

This research project will apply insights from Birkland when considering the selection of historical cases that will be analyzed in future chapters. Just as Birkland identified common themes within different policy domains prone to disaster, I will identify common themes that have occurred among iconic examples of firefighter safety policy change that can be characterized as reactive because they occurred following a catastrophic event during the response and recovery phases. Along with considering the reactive policy process that typically characterizes the evolution of major safety policy changes, I will also discuss two recent examples that have occurred within individual agencies that take a proactive approach to providing safety to firefighters by conducting investigations during the preparedness and mitigation phases rather than waiting for an accident to happen. The reactive and proactive approaches suggested by Birkland will be used to analyze which approach is most applicable to safety hazards that occur on both large and small scale incidents.

Considering the context of this research project, the aforementioned aspects of policy production within policy domains prone to disaster will be useful insights. As is demonstrated in Figure 2.1 under reactive approaches, firefighter safety policy created by the federal government is generally marked by punctuations where a focusing event occurred and forced fire management agencies to work within the bounds of their own rationality to update policies via political learning. Generally speaking, a tragic incident involving a firefighter creates a window of opportunity for policy change. Though this process has served as the primary means of creating firefighter safety policy, it is only occurring as a reaction to something that already happened, meaning organizational learning can only take place during the response and recovery phases when many other pressing issues are also occurring. In contrast, as demonstrated in Figure 2.1 under proactive approaches, there are other approaches within individual agencies that exemplify social learning within policy production because the knowledge used to inform policies is proactively attained during the preparedness and mitigation phases and does not favor large or small fires. This project focuses on whether the reactive or proactive process to safety policy production is best suited for addressing safety hazards at both large and small scales of incident management. Birkland's insights about natural disaster planning are relevant as they suggest that policy changes that occur during windows of opportunity may not be the best time to create policy. The following sections will build off of the concepts developed in this section, which are displayed below in Figures 2.1:

Figure 2.1:



Section 2.2 – Science and Technology Studies and the Policy Process

To understand a policy problem, it is important to understand the policy cycle that often follows catastrophic events. From here, it is useful to more specifically analyze the types of information used to inform policies that were updated as a result of some outside perturbation. The information that is used to inform policies can have direct impacts on how governmental policies play out over space, who they influence, and what the effects are at different scales of management. This is particularly the case with firefighter safety policy, where the "science" behind firefighter safety tends to focus on catastrophic worst-case-scenario accidents occurring on large fires at the expense of more common injuries occurring on smaller fires. Though the broader field of STS encompasses much more than I will discuss in relation to my research, the insights I will discuss are particularly relevant within the context of this research. In Section 2.2 – A, I review literature on the social creation of scientific policy. Next, Section 2.2 – B will

review STS literature relevant to organizational learning and expound off of ideas discussed by Birkland. Finally, Section 2.2 – C will review literature that considers what knowledge "counts" during policy production, and how that knowledge is produced, applied to policies, and circulated over space in order to lay a theoretical base for arguments that will be made about firefighter safety policy in future chapters.

Section 2.2 – A – STS and Socially Constructing Science. In contemporary times where much of our daily lives is dictated by scientific or technological advances, many people take science for granted, viewing it as an objective approach to understanding natural truths. In 1979, Latour and Woolgar made assertions about "the construction of a fact" and the ways by which science produces information that is perceived as truth (Latour and Woolgar, 1979). As some of the first to utilize the lens of sociology in respect to the production of science, their landmark book *Laboratory Life: The Social Construction of Scientific Facts* was one of the first major publications that led to the modern field of Science and Technology Studies. In it, they question the social underpinnings that designate some types of knowledge as "factual." In this case, they say that to leave science unquestioned as natural truth "entails the perception that a fact is something which is simply recorded in an article and that it has neither been socially constructed nor possesses its own history of construction" (Latour and Woolgar, 1979, p. 105). In other words, they are questioning the way science is viewed as given, not made. If science is being used to inform decision making, how might the assumption that it is "factual" rather than socially and politically constructed influence how decisions are made?

Latour and Woolgar helped to advance the field by displaying the social underpinnings of science, and since then, others have furthered those claims by questioning other aspects of the scientific process. As Sismondo explains in his book *An Introduction to Science and Technology*

Studies (2004), STS came about in response to the traditional ways science was approached, which were generally focused on empirically demonstrating a claim with scientifically tested and repeatable evidence. This form of conducting science is referred to as "logical positivism," with the notion that natural truths exist and that scientists just need to go out and find them. While there are other competing scientific philosophies, logical positivism is the primary method used by most scientists today. When discussing logical positivism, Sismondo says:

> standards or norms are the source of science's success and authority. For positivists, the key is that theories can be no more or no less than the logical representation of data….. Therefore, the view of science we have seen so far is not merely an abstraction from science, but is importantly a view of ideal science. (Sismondo, 2004, p. 8)

Sismondo reveals the underlying philosophies of logical positivism not only to demonstrate its limited scope, but to show that a more complete picture can be generated if one is consciously considering the positive and negative aspects of this philosophy. Within the context of STS, it is an important observation that the creation of "standards" is the means by which "ideal science" is created. Since standards are thought of as repeatable, they are also viewed as objective.

While the creation of standards is critical to the many advancements science has allowed humanity to achieve, we must not lose sight of the fact that the standards were not only created by humans, but later carried out and repeated by other humans. How were cutoff points established for specific standards, and by whom? Once standards were created, how did different people perceive those standards? In cases where cutoff points were within the margin of error, how might different scientists decide how to handle those cases differently? With this in mind, we can see that the standards upon which science is based are no less social than the humans carrying out the science.

In other words, the claims of objectivity that stem from standardized, repeatable scientific testing become questionable. To further this claim, Sismondo states that STS came about as a response to standardized scientific processes when he states:

> there is no such thing, at least in normal circumstances, as raw observation. Instead, observation comes interpreted: we do not see dots and lines in our visual fields, but instead see more or less recognizable objects and patterns. Thus observation is guided by concepts and ideas. This claim has become known as the theory-dependence of observation. The theory-dependence of observation is easily linked to Kuhn's historical picture, because during revolutions people stop seeing one way, and start seeing another way, guided by the new paradigm. (p. 16)

In other words, observations are socially contingent because not all people will observe phenomena in the same way. Because the standardization of observation serves as a cornerstone of modernist science, the recognition that observations are shaped by the eye of the beholder is particularly critical when questioning the "objectivity" of science.

When discussing the policy process, Birkland (2006) noted that catastrophes bring about new modes of thinking that are applied to previously established ways of knowing during windows of opportunity for policy reform. Additionally, the designation of the size of the catastrophe can impact the priority placed on response, which sometimes means that events perceived to be less serious may garner less attention for policy reform than events perceived to be more serious. If this mode of knowledge creation serves as the standard of understanding through which we conceptualize a problem, might that shape the types of responses individuals or organizations come up with? Do current approaches to organizational learning and policy production favor the "most serious" accidents to the point that "less serious accidents" are overlooked? This is but one avenue through which STS helps to reveal shortcomings in specific modes of knowledge production.

Section 2.2 – B – STS and Organizational Learning. While Sismondo attempts to situate STS more generally, other theorists have focused more explicitly on aspects that are ripe for deconstruction through the lens of STS. In their paper "*Organizations in the making: Learning and intervening at the science-policy interface*," Pallet and Chilvers discuss how varying scales of an organization learn and react to change with a particular focus on the "science-policy interface." As the name implies, the science-policy interface considers how scientific information is applied to policy responses.

Similar to sentiments discussed in Section 2.2, Pallet and Chilvers focus on a context of organizational learning. By looking at how different actors within an organization are related and considering what evidence they base decisions off of, the authors challenge common assumptions about how organizational learning takes place. Because organizations operating at the science-policy interface rely upon empirical evidence to support management decisions, their perspectives tend to follow the same logical positivist underpinnings upon which the empirical evidence is based. When discussing scientific knowledge within the context of organizational learning, the author's state:

> The consequence of opening up the black box of scientific knowledge was the implication that there could be other kinds of knowledge situated within different settings which might have something valuable to contribute to science-policy contexts. The idea of situated knowledge (e.g. Haraway, 1991) also resonated with geographical work, and both geographers and STS scholars have been concerned with engaging lay (i.e. non-expert) knowledges to provide alternative accounts and destabilize hidden power relationships. (Pallet and Chilvers, 2014, p. 7)

Here, Pallet and Chilvers show that not all forms of knowledge can be captured within the context of standard approaches to science.

This quote helps to show how things that cannot be tested are left out of the picture when considering science that is supposedly relevant to a problem. If there is some social aspect that is

not testable or clearly identifiable, it may be left out of scientific findings because it is not regarded as "objective." In essence, the authors are attempting to show how science and knowledge are a double edge sword when applied to politics, both informing about the unknown while simultaneously revealing the finiteness of our ways of knowing. As a result of the limitations of science as a way of knowing, the "facts" that are produced can be selectively used as objective evidence to inform political policies.

Section 2.2 – C – STS, what science counts, and how it is transformed into policy. In her book *Reframing Climate Change* (2016), O'Lear investigates how knowledge can be selectively used by governing institutions because it fits more conveniently into the current political context. Well established government agencies are limited by the structures that exist to support certain types of policies. In this way, it may be simpler for a government agency to favor certain types of science to inform policy decisions because of the predetermined missions of that respective agency. She highlights how science can be selectively used to inform political decisions when she states:

> "A widely held view of science is that it is distinct and separate from politics and can therefore provide objective guidance to policy. This view dates back to Vannevar Bush's report for President F.D. Roosevelt entitled *Science, the Endless Frontier* (Bush, 1945). In that report, Bush promoted a dualistic vision of basic, research-based science, on the one hand, and applied product development, on the other hand: the 'R' and 'D' of 'research and development' or the idea of pure, impartial science as necessarily distinct from political applications (see also Jasanoff and Wynne 1998). This binary view promotes science – rooted in certainty, fact, and truth – as playing an advisory role to values-driven policy (Price 1965) or rather, as 'speaking truth to power.'" (O'Lear, 2016, p. 100)

What impacts might the perception of science as impartial have when formulating policy? Is it fair to represent science as an objective tool for informing governmental decisions when in fact there are often social or political underpinnings? Much of O'Lear's insight stems from the fact that the scientific method, though useful for explicitly defining some natural "truth," can also

create many more questions than answers, or what is referred to as “scientific uncertainty.” When the limits of scientific methodology are reached, decisions that are inherently social in nature must be made. When considering how incomplete scientific knowledge is applied to policy, scientific uncertainty may pose “problems” because the pace of knowledge discovery is often far behind the pace of the policy process. When situations such as this arise, scientists must work within the confines of the information they have and make decisions based on the best evidence available. Though many often view decisions by policy makers to proceed with incomplete, but nonetheless “scientific” information as objective, the fact is that these decisions frequently inject social preferences into policy. This will be an important point within the context of the formulation of firefighter safety policy, where there is an abundance of information related to fatalities and serious accidents, but little information available to inform policies that attempt to mitigate minor injuries.

The processes by which scientific information becomes socialized are a few of many revelations that STS helps to bring about, though it is worth noting the field as a whole considers more beyond points related to the socialization of knowledge. One specific insight developed through the broader field of STS is related to how policies are created and operationalized. While the context of who is involved with decision making at the science-policy interface has been discussed, the means by which this process occurs can be effectively demonstrated when considering one specific insight within the broader field of STS, which comes from Goldman’s book *Knowing Nature: Conversations at the Intersection of Political Ecology and Science Studies*, where she discusses the relevance of STS to the creation of environmental policy. Particularly useful is her deconstruction of the policy process, which she has broken down into

the stages of production, application, and circulation. She underlines the relevance of this approach to policymaking when she says:

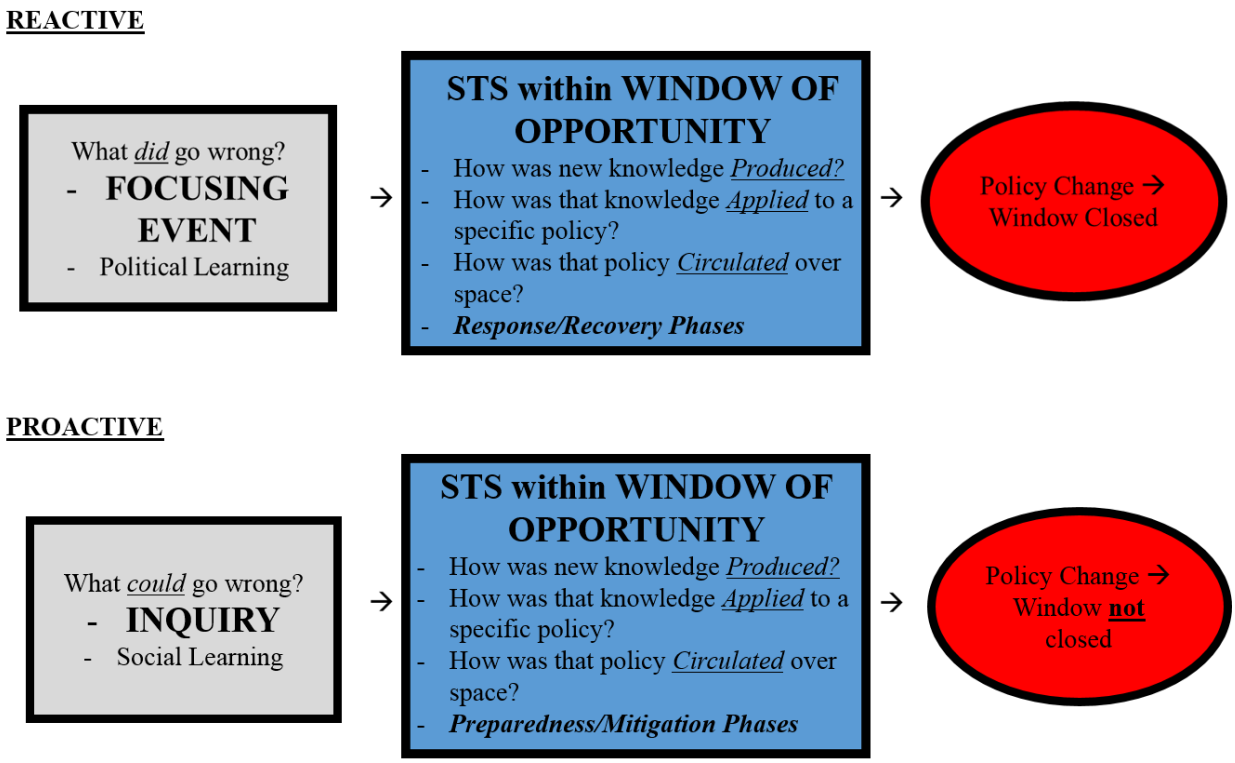
> "How applied research agendas are established, funded, pursued, and evaluated shapes the production of environmental knowledge. Management approaches (i.e., the "application" of environmental knowledge) are constructed from a mix of common understandings about human societies and the environment, scientific findings and technologies, standard (accepted) management approaches, political and economic prerogatives, and location specific understandings… The production of environmental scientific knowledge is shaped by management goals and directives as well as widely circulated ideas about society and environment. Clearly, the politics surrounding environmental management is not simply the playing out of material interests but is animated by competing knowledge claims about the environment. The outcome of these struggles shape the kind of "environments" that are produced and promoted, and whose purpose stretches of ground, water, and air serve." (Goldman, 2011, p. 2-3)

In other words, Goldman is critiquing the way in which scientific knowledge is actually translated into a specific policy, what impact that has, and who those decisions serve (or don't serve). By deconstructing the process by which scientific knowledge is produced, considering the ways in which that knowledge was applied to a specific policy, and investigating how that policy is circulated over space, it becomes possible to see what material affects a specific policy will have in relation to those impacted by the policy.

This process will be particularly critical within the context of this research project because Goldman's process of identifying the phases of production, application, and circulation offer a lens through which both reactive and proactive approaches to firefighter safety policy production can be analyzed and evaluated. This process dovetails nicely with Birkland's observations, as is demonstrated in Figure 2.2. Among federal fire management agencies, a focusing event can shed light on a problem and prompt an investigation which then produces new knowledge about that problem. This new information can then be applied to a specific policy that is designed to address the problem. Finally, the updated policy is then circulated to affected individuals during windows of opportunity for policy change. This process will be used

in my methodology section where the phases of production, application, and circulation will be used as criteria to evaluate the case studies under consideration for this project.

Figure 2.2



As has been shown, STS can be a useful perspective for analyzing government policy that is informed by scientific information. Once knowledge is applied to a specific policy reform, organizations that are impacted by that policy must find ways to operationalize the updates and disseminate them to affected individuals. The dissemination of policy is often achieved through the designation of scale within a given organization. How will policies play out at either local or national scales? How will policies be applied differently to larger or smaller scale issues? While these are important questions, it is necessary to deconstruct the underlying assumptions that allow these questions to be asked in the first place. The next section will consider how the social construction of scale may produce uneven material impacts when a given policy is applied to various scales of organizational management.

Section 2.3 – The Social Construction of Scale

Often underpinning natural disaster policies are hierarchical scales of governance among and within different organizations that are used to construct a vehicle for management. Section 2.3 – A will consider the ways in which geographic conceptions of scale are operationalized. Though the concept of scale may be easily taken for granted, there remains to be a fixed definition of what scale is precisely. According to Marston, Jones and Woodward (2005), "there is substantial confusion surrounding the meaning of scale as *size* –what is also called a horizontal measure of 'scope' or 'extensiveness' – and scale as *level* – a vertically imagined, 'nested hierarchical ordering of space (Howitt, 2002, 305)'." Because scale can be used to characterize processes of different sizes or that occur at different levels, human geographers have found this concept particularly useful, however it has been more recently contested as a social construction (Marston, 2000; Marston, Jones and Woodward, 2005). Section 2.3 – B will discuss how designations of scale can have substantive impacts when applied to policy. This discussion will be useful within the context of my project because while administrative designations of "large" and "small" wildfire incidents are in fact socially constructed, they nonetheless have material impacts on individuals operating within those scales.

Section 2.3 – A – The Concept of Scale – Size and Level. Beginning in the 1980s, a series of papers by human geographers was published that considered "The social construction of scale*"* (Marston, 2000), which advocated viewing hierarchical designations as socially produced rather than predetermined facts. Though designations of scale may be useful for describing certain phenomena, that usefulness changes depending upon the context, what Howitt refers to as: "the apparent paradox of scale – that it matters, but is almost meaningless as a stand-alone concept: it only matters in context – as a co-constituent of complex and dynamic geographic

totalities" (Agnew, Mitchell and Toal, 2003). While scale may be a useful in referring to various levels or sizes in relation to a specific issue, it is important to understand that the underlying assumptions about scale are not only socially created, but politically motivated. Were specific scales designated as such because it was politically convenient or fit neatly within a specific policy context? If so, what impacts might this have on those affected by the policy? Because scale is a socially constructed phenomenon, the designation of 'large or small,' or 'global or local' can have significant political or material impacts that may privilege some groups at the expense of marginalized groups (Agnew, Mitchell and Toal, 2003).

Marston (2000) refers to three different ways scale may be used in geography; cartographic scale is used in reference to mapping; geographic scale is used for describing how social or physical occurrences play out over space; and operational scale is used for describing how geographic processes intermingle at different scales of organizational management. Operational scale is a particularly relevant concept within geographic studies that investigate how "large" or "small" issues impact greater activities or responses within society. When considering the political implications of designating scale as either large or small, it is important to ask what actually constitutes "large" or "small," the distinctions between them, and who determines those cutoff points. To more aptly characterize these observations, Smith (1992) introduced the concept of "the politics of scale." The politics that underpin the social construction of scale should not be overlooked when investigating geographic issues, because "it is geographical scale that defines the boundaries and bounds the identities around which control is exerted and contested" (Marston, 2000).

Section 2.3 – B – The Material Impacts of Scalar Designations. Acknowledging the politics of scale is important for analyzing how scalar designations play out over space and how

scale may influence or characterize the way problems are perceived. Marston notes that "the particular ways in which scale is constructed – are tangible and have material consequences" (Marston, 2000). The ways in which designations of scale influence processes occurring at various scales has been referred to as "scale bending," where normalized social or political operations are assumed to specifically fit a particular scale without questioning why or how it fits (Marston, Jones, and Woodward, 2005). In this way, certain scales are privileged or assumed to be more important than other scales. For example, geographic problems that are characterized as "large scale" may warrant more political attention than problems that are characterized as "small scale." Again, Howitt lends a useful observation when he says "it has been easy to privilege one scale or another as the pre-eminent platform for political action" (Howitt, 2002, quoted by Agnew, Mitchell and Toal, 2003). If underlying assumptions about scale are unquestioningly applied to political actions, policies that are assumed to universally apply to a problem at all scales may actually fall short.

Those who have contested normalized conceptions of scale recognize that social relations influence how scalar designations effect politics over space (Bulkeley, 2005). Because of the inherent conflictions relating to the politics of scale, some have borrowed from Actor-Network Theory to reimagine "*Human Geography without Scale"* (Marston, Jones and Woodward, 2005). This approach is "premised on the understanding that shifting and contested scalar configurations are neither entirely local nor global but operate by way of networks that are always simultaneously 'deeply localized' as well as being extensive in their reach" (Marston, Jones and Woodward, 2005). As a result of this work, the idea of replacing scale with "flat ontologies" that recognize networks rather than socially constructed scalar designations has challenged conventional conceptions of scale.

Though scale can be problematic if it is used unquestioningly, it can still serve as a useful reference for analyzing political processes that use these designations. This observation is made by Jones when she says:

> once we accept that participants in political disputes deploy arguments about scale discursively, alternately representing their position as global or local to enhance their standing, we must also accept that scale itself is a representational trope, a way of framing political spatiality that in turn has material effects (Marston, Jones, Woodward 2005 quoting Jones, 1998).

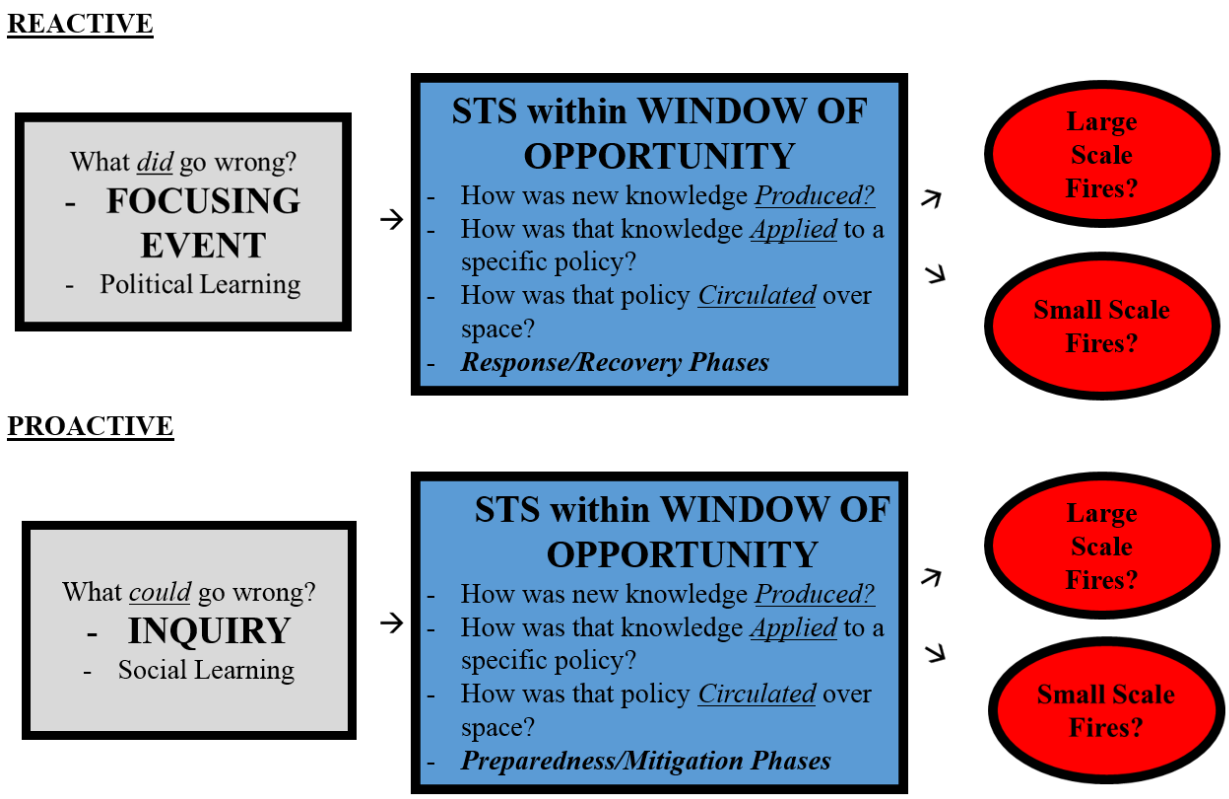
In other words, as long as scale is acknowledged as socially constructed and not naturally predetermined, it can serve as a useful analytical tool for demonstrating how designations of scale can have "material effects" on those who are (or are not) part of a specific set of scales. Moving forward, this project will critically consider how scale is administratively constructed and the material effects the construction of scale may have upon governed subjects.

Within the context of this project, geographic theory related to the social construction of scale will be used to show how scalar designations of wildfire incidents as either "large" or "small" can have material effects on firefighters operating within those scales of incident management. As Figure 2.5 shows, firefighter safety policy typically evolves following a tragic incident such as a firefighter fatality or serious injury. If the incident is perceived as serious enough, an accident investigation will follow that produces new information, applies the information to updated safety policies, and circulates those updates to affected individuals during windows of opportunity for policy change. Because political learning shapes the investigations and corresponding policy changes that selectively focus on worst-case-scenario accidents occurring on large scales during the response and recovery phases, the policies that are created may also selectively favor policies that only address worst-case-scenario hazards occurring at

large scales of wildfire management, thus not accounting for less severe hazards occurring on smaller scale wildfires.

Figure 2.3 offers a proactive alternative to the traditional process by instituting social learning during the preparedness and recovery phases. This approach does not selectively favor large scale issues, but rather inquires which scales are impacted by a given issue. These two approaches will be evaluated to determine whether a reactive or proactive approach to policy production best addresses safety hazards on both large and small scale wildfire incidents.

Figure 2.3:



Section 2.4 – Conclusion

This chapter has presented bodies of literature that are relevant within the context of this research project. Policy domains that are prone to disaster often reactively use focusing events as an opportunity to create policy change. While this is one possible way for organizational learning

to occur, the process of waiting for something bad to happen before a response is warranted may mean that catastrophes that could have proactively been prevented go undetected. After establishing the way policies change following focusing events, I introduced STS literature that specifically considers how knowledge is used to inform policy change. Though scientific knowledge is often privileged as being "objective" and therefore useful for informing policy, it is clear that social underpinnings frequently influence the way knowledge is used and characterized. The types of information that are selectively used to inform policy will influence the production, application, and circulation of corresponding policy changes. Finally, any changes that may occur as a result of policy updates do not apply universally to all levels of management – rather, organizations utilize administratively designated determinations of scale to apply policy updates to specific issues that may be either large or small. Though these designations are socially constructed, they still have material impacts on those who are included or excluded from specific designations of scale. If a reactive or proactive approach to policy production favors either large or small scale issues, the corresponding policies may not be as effective as they could be. Now that the research context has been established, I will move forward to provide a background of relevant information related to fire management and safety policy.

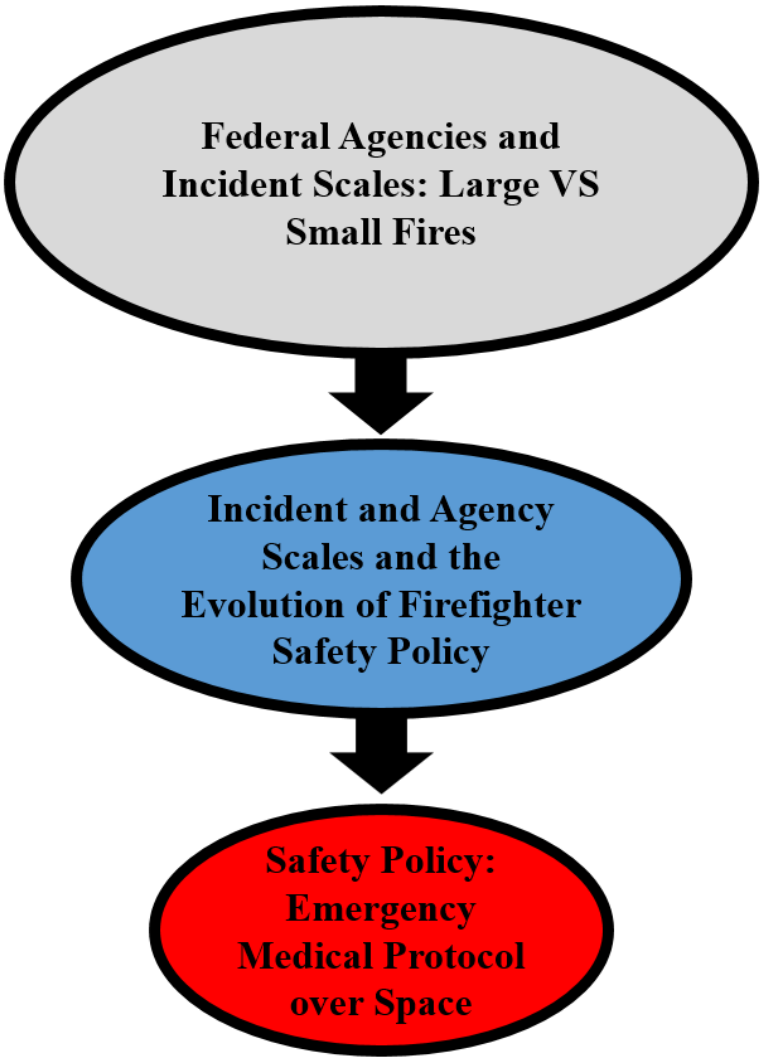
Chapter 3: A Background of Fire Management and Firefighter Safety Policy

This chapter is intended to provide a brief background of federal fire management and safety policy. In Section 3.1, I begin with a brief discussion about the five federal agencies tasked with managing wildfire. Because these agencies have different stated purposes in regards to land management yet still must cooperate during fire management operations, these agencies must standardize procedures with respect to fire management – with one such way being the designation of large and small scale wildfires. Section 3.2 will discuss how these agencies administratively designate both large and small scale wildfire incidents, as these designations play vital roles when investigating how effective safety management policies are at these respective scales.

In section 3.3, I will discuss historical events that have impacted fire policy within federal fire management, beginning in 1905 with the creation of the Forest Service extending to present day. The intention of this is to provide a brief prelude to the way that federal firefighter safety policy has generally evolved throughout U.S. history and show how the major policy changes generally followed the most visceral incidents occurring on large scale fires. The most recent example I will discuss, the Eagle Fire of 2008, is significant within the context of this project because it is the only example of a comprehensive change to emergency medical response policy in the history of federal wildland fire management.

In Section 3.4, I will briefly discuss the background to emergency medical response policy for federal wildland firefighters. Unlike many structure firefighters working for municipal departments, wildland firefighters working for the federal government do not have qualified and trained Emergency Medical Providers on crews. There are several legal and jurisdictional barriers that underpin these issues, yet this remains one of the most significant safety vulnerabilities federal firefighters' face. Section 3.5 will conclude the chapter. This chapter is summarized below in Figure 3.1:

Figure 3.1:



Section 3.1 – The Five Federal Land Management Agencies and Levels of Organization

There are five main federal fire agencies that fall under the United States Department of Agriculture (USDA) or the Department of the Interior (DOI) that have functions related to wildland fire management: The United States Forest Service (USFS), the National Park Service (NPS), the Bureau of Land Management (BLM), the Bureau of Indian Affairs (BIA), and the United States Fish and Wildlife Service (USFWS). Each of these agencies is tasked with different missions regarding land management, but all five of these agencies overlap when considering wildland fire management specifically.

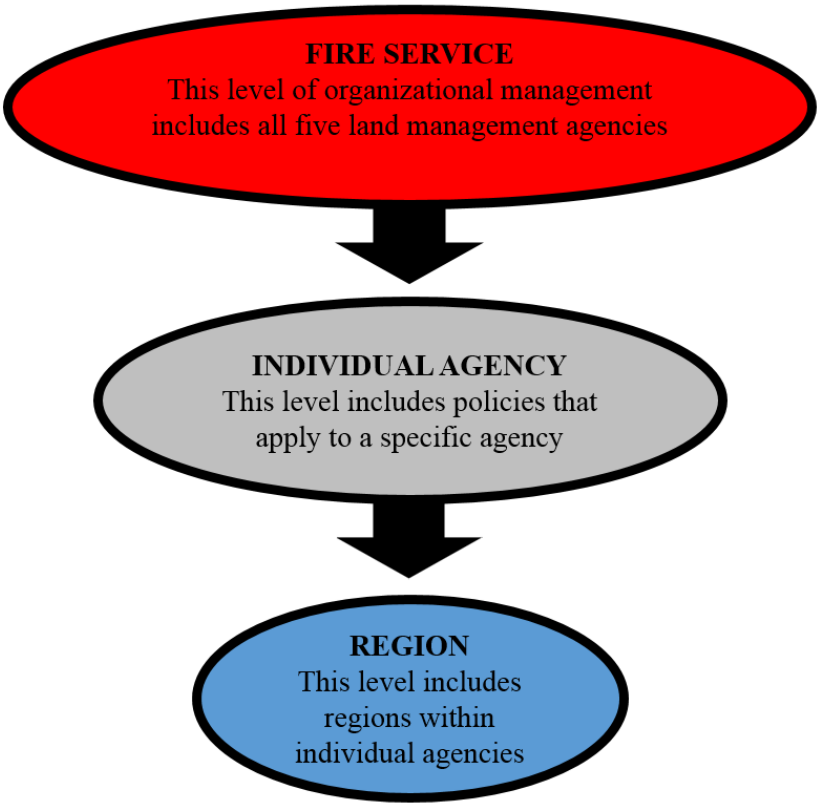
The Forest Service is responsible for managing some of the largest contiguous stretches of public land and has a stated intent of providing public lands for the use and enjoyment of patrons while also allowing for the use of resources for private industry (http://www.fs.fed.us/about-agency/what-we-believe, accessed 04/01/2016). The Bureau of Land Management has a similarly stated mission and the most land of any of the five agencies, but the majority is not contiguous. In addition, the land is less often used for recreation and more often used for resource extraction (http://www.blm.gov/wo/st/en/info/About_BLM.html, accessed 04/01/2016). On the other end of the spectrum, the National Park Service is responsible for preserving public lands at designated National Parks and that are used solely for recreation; however National Park Service holdings accounts for a small amount of federal public lands (https://www.nps.gov/aboutus/index.htm, accessed 04/01/2016). The United States Fish and Wildlife Service is somewhat similar to the National Park Service in that they are tasked with preserving National Wildlife Refuges in order to protect native wildlife species, and while they also do not possess as much land as the Forest Service or BLM, they are not as restrictive about resource use as the NPS (http://www.fws.gov/info/pocketguide/fundamentals.html, accessed

04/01/2016). Finally, the Bureau of Indian Affairs is responsible for managing lands that are associated with Indian Tribes and possesses the least amount of public lands of any of the five agencies (http://www.bia.gov/WhoWeAre/, Accessed 04/01/2016).

As was mentioned in Chapter 2, geography is often concerned with scale, with scale being a useful concept to characterize either the size or the level of a specific issue in reference to spatial processes. When considering scale in relation to level, these five land management agencies have several scales of organizational management. Each of the five land management agencies cooperate on many issues related to wildland fire management, but have many tasks they handle individually as agencies outside of fire management. When the five agencies are coordinating standardized procedures as a group while managing wildfires, this could be said to be at the scale of the fire service. When performing the disparate tasks associated with each agency, this could be considered as the individual agency scale. Still more refined is the regional scale within each agency, as each of the five federal land management agencies has specific regions within its respective organization. From here, scales could be more refined to include work stations, crews, or even the scale of the individual body – however this project will only consider scales spanning from the fire service to the regional scale, as is demonstrated in the diagram below:

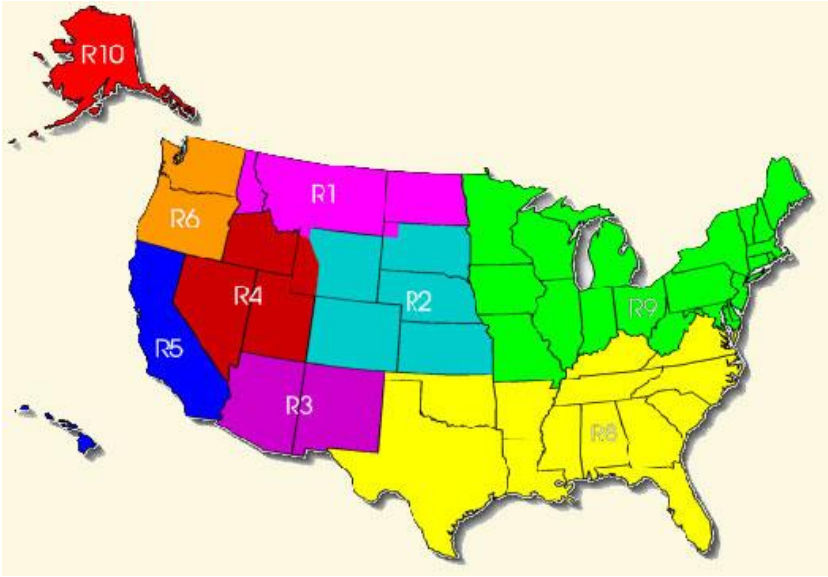
Figure 3.2:

ORGANIZATIONAL SCALES OF WILDFIRE MANAGEMENT

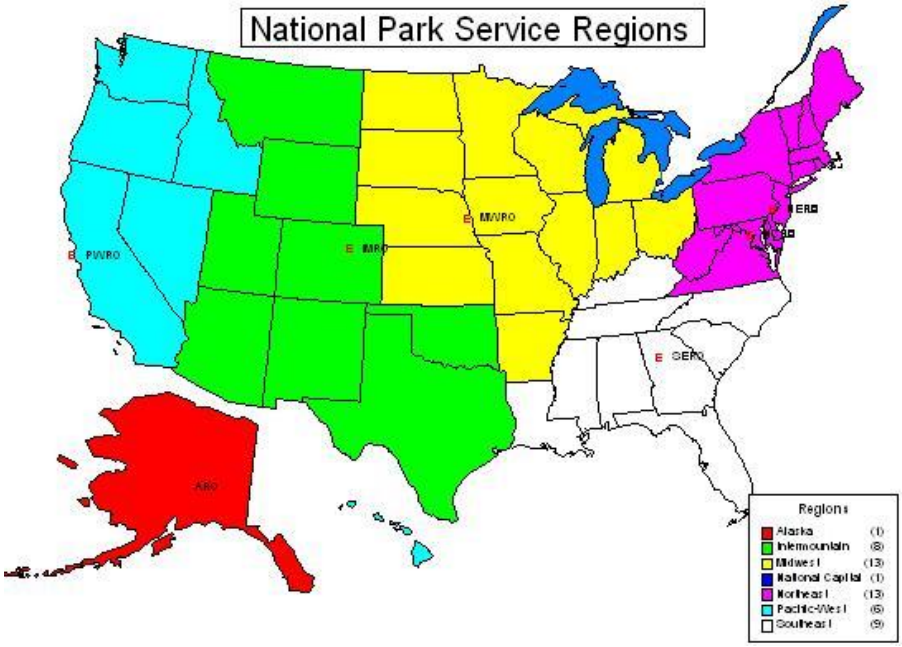


It is important to note, however, that these scales are not natural or predetermined, but are socially constructed. This is an imperative point to make because once an organizational scale has been defined, policies that are used for organizational management at these respective scales may change when moving up or down the hierarchy displayed above. Even more important, these policies must be enacted in specific places and may not be standardized among all five land management agencies, or even among regions within individual agencies. To visually demonstrate the incongruences that exist, I have shown the way each of these agencies defines space:

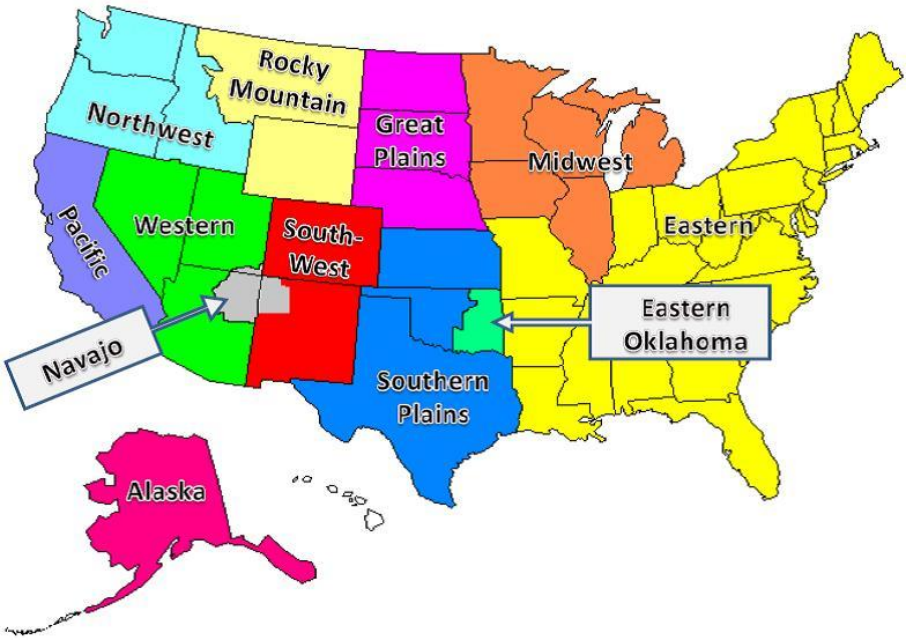
Map 3.1 – USDA Forest Service



Map 3.2 – DOI – National Park Service

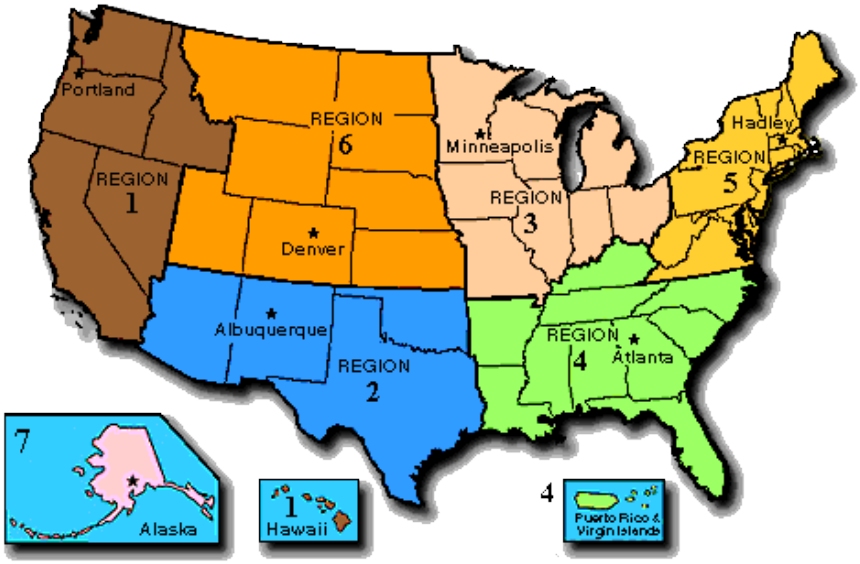


Map 3.3 – DOI – Bureau of Indian Affairs



Map 3.4 – DOI – Bureau of Land Management

Map 3.5 – DOI – Fish and Wildlife Service



U.S. Fish & Wildlife Service Regions

As can be seen, each of these agencies defines space in different ways. That means that the policies of individual agencies may not only differ from one another, but regions within individual agencies may even possess different policies that only apply within those geographic boundaries. In this situation, socially constructed scales of organizational management have created a situation where the policies corresponding with a specific scale may be incongruent among the agencies. Because each of these agencies have very different overall land management functions, it is no surprise they define scales and space differently. When considering that all of these agencies must coordinate in regards to fire management, however, the incongruence of certain policies that are not standardized can cause conflictions of policy among and within these agencies.

Due to the different missions of each agency, coordination can be difficult when there are high volumes of wildfire. In order to standardize fire related objectives and procedures, the

Department of the Interior and the Forest Service jointly created a single document that all five agencies are required to follow: *Guidance for the Implementation of Federal Wildland Fire Management Policy.* This document establishes a means of interagency cooperation when managing a multi-jurisdictional incident that impacts various governmental scales and the public and is intended to be "intergovernmental in scope" (p. 7). This agreement was first created in 1995 and was updated for clarification in 2001 and 2009. The original 1995 document covers five primary aspects of fire management, most of which still set the management precedent for federal fire agencies today: "Role of wildland fire in resource management, use of wildland fire, preparedness and suppression, wildland/urban interface protection, and coordinated program management." This document sets a precedent for how wildfire management policy is created.

Aside from this overarching policy document, fire agencies must standardize other features of wildfire management in order to cooperate efficiently with other agencies. While scale is a useful concept for understanding different levels of organization, it is also useful for designating different sizes. One of the most basic standard features of wildfire management is the designation of wildfires as either large scale or small scale. These designation come from the National Wildfire Coordinating Group (NWCG), an agency tasked with standardizing aspects of fire management so various jurisdictional actors within and outside of the federal government can coordinate fire related initiatives. By utilizing standard references to either "large" or "small" wildfire scales, agencies can implement standardized policies which apply to both of these scales. Section 3.2 discusses how scales are designated from an administrative standpoint.

Section 3.2 – Administrative Designations of Incident Size

To determine the scale of an incident as large or small, all wildfire incidents must be designated by "Type," which can range from a scale of 1-5, with Type 1 fires being the largest

and Type 5 fires being the smallest. Incident Types are dictated by the National Wildfire Coordinating Group (NWCG). Designations of scale are based on factors related to the number of resources required to address the incident and the duration of the incident – both factors that impact the geographic extent of the fire. This project will employ official terminology to distinguish between large and small scale incidents.

Section 3.2 – A – Small scale fires. The smallest incidents, designated as "Type 4-5" incidents, are also referred to as "Initial Attack" fires. These are generally smaller, more benign incidents that do not require more than a few operational shifts to contain and control. The NWCG defines an Initial Attack fire as:

> the action taken by resources that are first to arrive at an incident. All wildland fires that are controlled by suppression forces undergo initial attack. The kind and number of resources responding to initial attack varies depending upon fire danger, fuel type, values to be protected, and other factors. Generally, initial attack involves a small number of resources, and incident size is small. Regardless of fire type, location, or property/resource being threatened, firefighter safety will always be the #1 priority. NWCG *Fireline Handbook*, 2004, p.79

As can be seen, the designation of small fires is based on the number of resources required to address the incident and the amount of time it will take to control the incident – both factors that are related to the geographic extent of the fire. The number of resources assumed to be needed to address an incident are largely based off of how active the fire is and what is threatened if the fire grows larger. Along with the perceived number of resources, incident complexity is impacted by the perceived risk that firefighters would have to undertake in order to engage the fire. Even if a fire is small and not very active, an incident may progress in complexity if it presents great risks to firefighters who attempt to extinguish it. Conversely, a quick burning grass fire may impact dozens of acres only to be stopped suddenly by a road or lake where the fuels dissipate, thus not requiring many firefighting resources. With this in mind, the definition of

large and small fires is not explicitly based on geographic extent, but small fires generally impact a smaller geographic area than large fires – small scale fires do not last very long, so they do not have as much time to impact large geographic areas. Firefighters and the incident command staff on the scene of a wildfire will ultimately make the determination that the fire is manageable for the resources present, or decide that more resources are needed to address potential fire growth. Once a fire begins to exceed the perceived capacity of firefighting resources, the incident will transition from a small to a large fire.

Section 3.2 – B – Transitioning from small to large. When small fires get larger and cannot be contained, Incident command Staff must upgrade the fire type and call in more resources to deal with the incident. This phase is known as "Transfer of Command" and is considered to be a highly dangerous time for firefighters on the line because there is a short time period where the next person in charge, or "Incident Commander," must get briefed on what is happening and be brought up to speed all while the fire is still burning and firefighters are still engaged. The NWCG fireline handbook notes that:

> Many safety problems emerge as an incident becomes larger and/or more complex. Incident transfer of command historically has been one of the most dangerous phases of incident management. Incidents should transfer command at a specific time, preferably at the start of a new operational period. The operational effort should continue during transfer period with command and control of the incident firmly in place, and with clear, achievable and sound strategy and tactics communicating to and implemented by all firefighting resources. NWCG *Fireline Handbook*, 2004, p. 125

It is not so much the complexity of the incident itself that proves dangerous to firefighters so much as the difficulty of implementing a smooth transfer of command as the incident becomes more complex by becoming larger in size. Many of the same hazards exist at both large and small scales of incident management, but transfer of command is particularly dangerous because

there may not be clear operational intent directed to firefighters during the transition phase. As an incident becomes more complex, it transitions into a larger Type 1-3 fire.

Section 3.2 – C – Large scale fires. From an administrative standpoint, Type 1-3 fires are considered "Extended Attack Incidents" and must meet several stipulations to qualify as a large incident. The designation of a large incident has to do with the perception of the number of people required to manage the incident and the duration of the incident, as it is with small fires. According to the NWCG *Fireline Handbook*, the following list describes characteristics of large scale wildfire management:

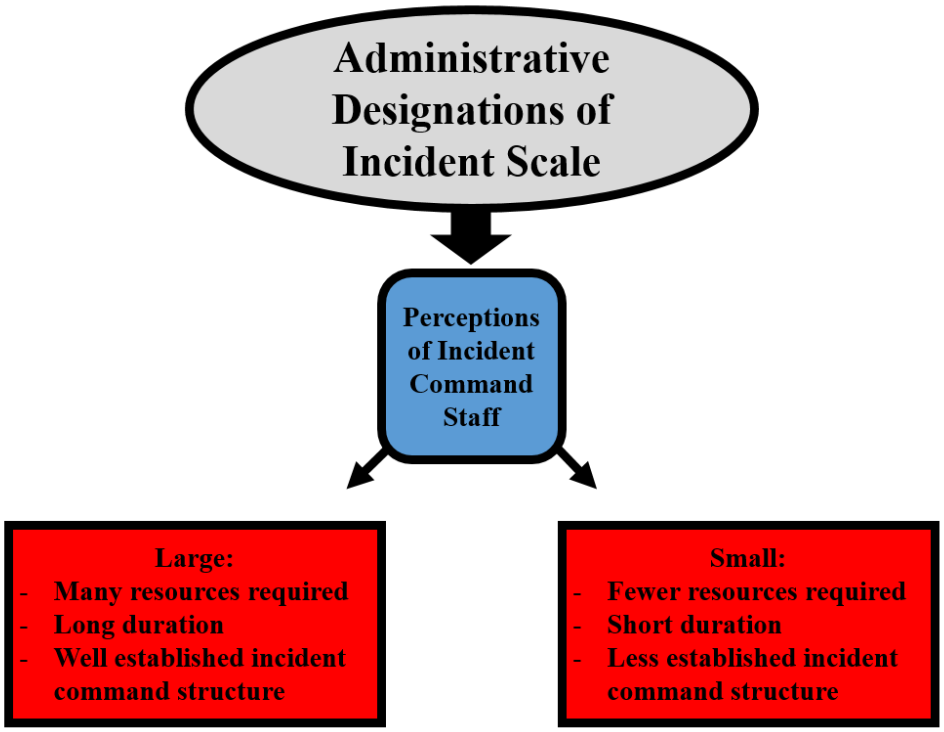
- Supervision for a large organization
- Multiple operational periods to contain fire
- Providing logistical support including the establishment and operation of a base and possibly camps
- Supervisors that are qualified to manage Type 1-3 fires
- Multiple divisions to manage different parts of a large fire, requiring multiple branches to be activated to address span-of-control needs
- Operations personnel often exceed 500 per operational period and total persons on the incident usually exceeds 1000
- Aviation operations often involve several types and numbers of aircraft (NWCG *Fireline Handbook*, 2004, p. 109, 119).

Fires are designated as large not just because they may involve many acres, but because the "values at risk" in that particular area, such as human developments or large populations of people, warrant the use of a large number of resources. Though the fire activity may be greater on large fires, there are more resources available to deal with those complexities. In this case, large fires require many firefighters (potentially thousands) over a time period of weeks or months. Though there is not a specific geographic criterion to designate a fire as large scale, large fires generally burn heavy fuels such as old growth trees over a long time period, and as a result also impact a substantial geographic region. The range in sizes of wildfires can be as small as a single flaming tree struck by lightning to many hundreds of square miles impacted by a fire

– because of this, it is difficult to put a specific number on the spatial area a fire must impact to be designated as a certain size, but the variation in size between what is considered small or large is nonetheless tied directly to the size of the geographic area that is impacted.

Section 3.2 – D – How scale is determined. Because much of what could be considered "complex" may be different for different firefighters, much of the construction of scale regarding the type of fire a specific incident is designated as is subjective to the individual firefighters on scene. The language regarding incident complexity has to do with number of resources perceived to be needed over the duration of the fire – both factors that are determined based off of the geographic extent of the fire. Large fires require many resources over a long period, and generally impact a large geographic area – small fires require few resources in a short period of time and generally do not have substantial geographic impacts. The designations of scale and the ways they are determined are shown in the diagram below:

Figure 3.3:



These designations are significant within the context of policy creation for reasons mentioned by Birkland (2006) and others. Because the most visceral focusing events tend to attract the most attention, it is common for the largest, worst-case scenario wildfire focusing events to garner the most attention during windows of opportunity. The next section will discuss historical events that attracted substantial attention and led to major fire management and firefighter safety policy changes.

Section 3.3 – Historical Safety Policy Events

In order to understand how policy production occurs among federal land management agencies, it is important to have a historical background on how policies have evolved throughout the history of fire management. In the first century of American history, the federal government oversaw lands for the purpose of disposing of them to private individuals (Loomis, 2002). As the original 13 colonies grew and the newly founded nation began to press westward, the federal government did all they could to provide incentives to individuals to establish themselves in the Western States (Loomis, 2002). The most significant piece of legislation to promote westward expansion came under President Abraham Lincoln, who in 1862 signed the Homestead Act into law, which incentivized settlers to move west by offering 160 acres of land to any takers (Loomis, 2002). The objective of government to give land away set the tone for the first century of public lands management. It was not until the end of the 19th century that the federal government would begin to take a new approach.

Section 3.3 – A – The Beginning of Fire Management. While there are many significant events that could be pointed to when discussing the historical evolution of federal public lands in the United States, perhaps the most important example is the Forest Reserve Act of 1891 (Hudson, 2011). Created under President Harrison, this act established 13 million acres

as “forest reserves” that the government set aside for the public, and also allowed for future presidents to set aside similar reserves (Hudson, 2011). In 1905, the lands established under this act were transferred to the newly created Forest Service under President Theodore Roosevelt, where the majority of public lands were in the Western United States in places that had not been developed for communities or resource extraction (Egan, 2007). While this was a historic event within the history of federal land management, it did not go uncontested. From the beginning, private mining, logging, and railroad companies fought Roosevelt bitterly for the right to use and exploit the lands as they saw fit (Egan, 2007). Using western newspapers to circulate propaganda about individual rights and land ownership, these private sector interests nearly won out by convincing local residents that the government was only trying to take the land so it could intrude on individual liberties.

Wealthy private interests may have won had it not been for a tragic and societally altering event, the fires of 1910. Dubbed “the Big Burn.” These fires burned over 3 million acres in the Northwest United states and killed 79 firefighters (Egan, 2007). Because residents of western towns were worried forests would burn again and cause another devastating event, they saw the need for the newly formed Forest Service as an agency that would protect the public from fire. In the beginning, the Forest Service was created with a utilitarian mission in mind – “the greatest good for the greatest number” – and was intended to be used cooperatively between members of the public for recreation and homesteading or by the private sector for resource development (Hudson, 2011). This mission, created by Forest Service chief Gifford Pinchot, was intended to “conserve” resources while still allowing different groups of people to use the land as they saw fit. The only way to accomplish this mission, in the eyes of the newly formed Forest Service, was to exclude fire from Western landscapes. This was officially done in 1935 with the creation of

the “10 A.M.” wildfire suppression policy, which required all fires to be extinguished by 10 A.M. the morning after they were discovered. This policy was heavily influenced by the precedent set by the Forest Service following the fires of 1910. This event was significant because it set the stage for political learning that would dominate the way future fire management and firefighter safety policies would be created.

Section 3.3 – B – The middle period of fire management. The 10 A.M. suppression policy was partially designed with safety in mind so that firefighters could keep the public safe by eliminating large fires in areas where they might normally burn. As time went on, it became clear that not all fires could be contained and that some would inevitably grow into large fires. Following the creation of the 10 A.M. policy, several tragic events occurred that signaled to the Forest Service that it would not be possible to keep all fires small, and that when fires did get large, they posed a significant threat to the firefighters managing those fires. One of the most significant events to occur that signaled the need for the first firefighter safety policy came in 1949 as a result of the “Mann Gulch Fire” in Montana.

In this event, a crew of elite Smokejumpers – firefighters who travel by plane and parachute near fires – were sent to a fire outside of Helena, Montana, where they began suppressing a wildfire that was quickly spreading. As a result of topographic factors and weather conditions, the fire blew out of control. The firefighters attempted to escape the blazes, and while some made it out, 13 were overtaken by the fire and killed (Maclean, 1992). This event is perhaps the most iconic tragedy that contributed to the creation of the first comprehensive safety policy — the 10 Standard Fire Orders and the 18 Watchout Situations. Created in 1957, these were based on military standard orders and were created to help alert firefighters to common dangers on the fireline. The 10 Standard Fire Orders were protocols that would help firefighters

prevent accidents from happening, with orders that stated firefighters must “Stay informed on fire weather conditions and forecasts” and to “Post lookouts where there is possible danger,” among others (IRPG). The 18 Watchout Situations alerted firefighters to common dangers that could lead to a deadly situation, such as “Weather becoming hotter and drier,” or “Terrain and fuels which make escape to safety zones difficult” (IRPG). These updated protocols were significant because it was the first time federal fire management agencies recognized the need to maintain the safety of their employees in order to fulfil the overall agency objective of suppressing all fires. The creation of this policy essentially signaled that rather than rethink the overall strategy of aggressive fire suppression, they would instead find ways for firefighters to attack all fires, but in a supposedly safer way. Often referred to as the 10 & 18, these protocols are still standard training for all firefighters today.

The 10 Standard Fire Orders and 18 Watchout situations helped to set the precedent for how safety policies would be created. After the creation of this policy, other tragic events occurred that prompted federal fire agencies to respond to safety issues in a similar manner that allowed for the overall mission of suppressing wildfires to be maintained. The logic behind the 10 A.M. suppression policy was not questioned until the 1970’s when researchers on wildfire realized that suppressing fire meant that hazardous fuels would accumulate and eventually lead to much larger, more devastating fires (Bradshaw and Lueck, 2012). Though the 10 A.M. policy was officially replaced with less aggressive policies in 1978, the damage had been done (Bradshaw and Lueck, 2012). Not only did fire suppression lead to a buildup of fuels, it also allowed for developers to build homes and towns in areas that were prone to regular wildfire disturbance because fires were artificially removed (Bradshaw and Lueck). Even though there had been a recognition that the old policies were creating larger problems down the line, after

enough time had passed, fire management agencies had little choice but to continue suppressing most wildfires, even though the formal 10 A.M. suppression policy had been replaced because members of the public still needed protection. In this way, the 10 A.M. policy continued to influence firefighter safety well after it was established and repealed.

Section 3.3 – C – Contemporary fire management. These factors influenced the complexity of the bio-physical wildland fire environment, the ways federal fire agencies would approach fire management, and the safety hazards that firefighters faced. After the first formal safety policy had been created through the 10 Standard Fire Orders and 18 Watchout Situations, other firefighter tragedies would occur that similarly influenced updated safety policies and maintained the overall aggressive approach of fire management. Though many iconic events that influenced policy could be discussed, one of the most publicized events occurred in 1994 on the South Canyon Fire. In this event, 14 firefighters were killed on Storm King Mountain in Colorado on a fire that went from small and relatively benign to a massive conflagration in a single afternoon, which occurred in close proximity to populated areas near Glenwood Springs, Colorado.

Though many factors were cited leading up to the tragedy, two significant factors were identified; the most up to date fire weather reports were not disseminated to everyone who needed them; firefighters on the front lines had a lack of radios, and therefore an inability to communicate with the incident command staff in charge of the fire (MaClean, 1999). As a result, fire management agencies recognized that there needed to be more substantive materials provided to firefighters to help them control and manage fires in a safer way. This was accomplished by providing firefighters with more training on fire weather conditions and providing them with the most up to date weather information. Additionally, there was a greater

emphasis placed on providing communications devices to firefighters on the line. This event was significant because it signaled to fire agencies that more needed to be done to allow firefighters to protect themselves and the public. Because the management approach to controlling this particular fire was partly based on the fact that there was a nearby community, fire agencies realized they would need to provide their employees with better equipment to allow them to do their jobs and continue to exclude fires from places where it could impact members of the public.

Since this tragedy, more safety policies have been created to protect the firefighters who are protecting the public. Though today the 10 A.M. suppression policy is almost universally recognized as having been a failure, the impacts of fuel loading and allowing developments to occur in the Wildland-Urban Interface cannot be undone. As a result, fire management agencies are having to play catch-up with both management and firefighter safety policies. Though there is a recognition that all out suppression puts off the problem of wildfire for the future, it is incredibly difficult to allow natural fire disturbances to occur in populated areas. As a result, fire management agencies are forced to continue the aggressive approach to managing wildfire, especially if they grow large or if they threaten populated areas. In the present day, firefighter safety policy is in many ways continuing to evolve such that attempts to mitigate safety concerns still promote firefighters to aggressively engage fires.

One of the most significant safety concerns for federal firefighters comes not as a result of the fire itself, but as a result of medical emergencies that can occur on fires. Unlike many structure firefighters working for municipal departments who receive substantial training related to emergency medical response, wildland firefighters working for the federal government receive very little medical training. This leaves them particularly vulnerable if a medical emergency occurs in a remote area where rapid treatment and transport are difficult. A recent firefighter

tragedy that assisted in exposing these issues occurred in 2008 on the Eagle Fire in Northern California. On July 25, 2008, a crew of firefighters was assigned to a benign part of the fire to fell hazardous trees. During this assignment, one of the firefighters, 18 year old Andrew Palmer was struck by a tree. The tree broke his left femur, and because the crew was in a remote area, he had no one but his crewmembers to attend to his injuries until they could get him to an area that was accessible to emergency medical professionals. While there were many factors leading up to the accident, one of the most significant factors was a delayed response time – partly caused because his injury was identified and relayed as a broken leg, not a broken femur (Dutch Creek Accident Investigation, 2008). While a broken leg is no minor injury, a broken femur is potentially life-threatening because it can rupture the femoral artery and lead to death by internal bleeding in a short period of time. In this case, Palmer's injuries were not attended to fast enough and he passed away on the flight to the hospital (Dutch Creek Accident Investigation, 2008).

This incident was significant because it prompted federal fire agencies to consider the issue of emergency medical response for the first time and led to the production of the first comprehensive medical response policy for federal firefighters. The goal of updated policies was to find ways to either mitigate medical emergencies from happening in the first place, or to reduce response times to injured firefighters once something had happened, rather than bolster the amount of medical training provided to firefighters so they could begin to address medical issues themselves. While the provision of emergency medical training for firefighters may seem like an obvious way to better provide for firefighter safety, there are several important considerations that prevent this from happening. Before moving on, Table 3.1 below summarizes the main points from this section. The next section will discuss the legal and jurisdictional underpinnings to emergency medical training within the federal wildland fire service.

Table 3.1:

Time Period	Biophysical Fire Environment	Firefighter Safety
Beginning period	First formal management policies created – all out suppression	No formal safety policies of the time
Middle period	Suppression policies continued – led to the accumulation of hazardous fuels and expanding developments in WUI	First formal safety policies created
Contemporary period	All out suppression policies replaced, but suppression still needed because of a century of accumulating hazardous fuels and homes built in WUI	More safety policies created to address specific safety issues so firefighters can continue to suppress fires

Creation of safety policies over time has lagged behind complexities of fire environment of each time period

Section 3.4 – Emergency Medical Response in the Federal Wildland Fire Service

The Eagle fire and the *Dutch Creek Accident Investigation* were significant events within the context of federal firefighter safety policy because it was the first time a focusing event put a light on emergency medical response for federal wildland firefighters. One of the largest shortcomings within the realm of federal firefighter safety is a lack of medical training provided to firefighters. The only standardized training provided to all federal wildland firefighters is a 16 hour-long First Aid/CPR class. Because firefighters often respond to remote incidents where emergency medical providers would have a difficult time accessing, the lack of medical training provided to federal wildland firefighters is one of the single largest shortcomings related to

firefighter safety. This is not intentional on behalf of fire management agencies, but rather, several factors exist that have caused this situation to exist as such.

Section 3.4 – A – *Guidance for the Implementation of Federal Wildland Fire Management Policy.* As mentioned earlier, the *Guidance for the Implementation of Federal Wildland Fire Management Policy* is the main guiding doctrine regarding wildfire management policies. Because different agencies may have varying policies regarding natural resource management in general in regards to their land, it is necessary to standardize response to wildfire. This document, from a policy perspective, sets the precedent for all fire management activities at the federal level. In the executive summary, the first guiding principle for fire management policy states:

> Protection of human life as the first priority in wildland fire management. Property and natural/cultural resources jointly become the second priority, with protection decisions based on values to be protected and other considerations.

The 2009 updates include additional language:

> No natural or cultural resource, home, or item of property is worth a human life. All strategies and tactics should seek to mitigate the risk to firefighters and the public. Agency administrators will develop and establish process, procedures and objectives that ensure firefighter safety. Incident Commanders will develop and establish incident objectives, strategies and operational tactics that ensure firefighter and public safety.

The document reiterates points about "firefighter and public safety" multiple times throughout, seemingly setting a clear precedent for human health and well-being in regards to fire management. Though the term "safety" is repeated many times as a primary goal, there are ultimately no specifics about how safety will be accounted for. While the *Guidance for the Implementation of federal Wildland Fire Management Policy* standardizes many fire management activities among federal agencies, there is one critical piece related to safety that is

in no way addressed within this document: the role of medical training and emergency medical response for federal firefighters.

Section 3.4 – B – Legal underpinnings to emergency medical protocols among federal agencies. The reason this seemingly obvious safety concern is not addressed is because medical policy, unlike virtually every other aspect of federal wildland fire management, is not standardized among the five federal land management agencies in terms of what it covers, who it covers, or where it covers agency employees. Every agency approaches the subject of medical training and qualifications differently, meaning that some firefighters working for one agency may receive more or less medical training than firefighters working for a different agency. Though some agencies may provide more training than others, there is no federal fire agency that has federally endorsed and qualified emergency medical providers, such as paramedics. When considering the policies in place that govern these types of issues, there is scant direction provided to policy makers in regards to the amount of medical training employees are required to receive. Currently, there are only imprecise standards set for all federal employees, and for federal firefighters more specifically. The Occupational Safety and Health Administration (OSHA) states in the General Duty Clause, Section 5, which all federal agencies must follow, that:

> "Each employer:
> 1) Shall furnish to each of his employees employment and place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
> 2) Shall comply with occupational safety and health standards promulgated under this act" (OSHA, 1970).

Additionally, and specifically for federal firefighters, the *Wildland Fire and Aviation Handbook* states:

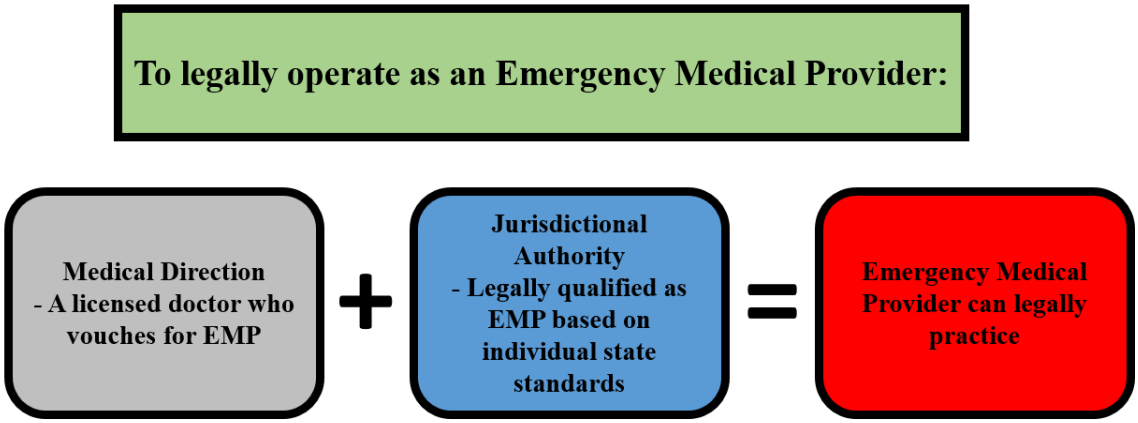
> "In the absence of an infirmary, clinic, or hospital in near proximity to the workplace which is used for the treatment of all injured employees, a person or persons shall be adequately trained to render first aid. Adequate first aid supplies shall be readily available." Medical Services and first Aid Regulation, 29 CFR 1910.151(b)

Beyond these two vague requirements, no guiding doctrine exists to address the subject of medical training for federal wildland firefighters. The only training that is provided as a standard among all five agencies is a 16 hour long First Aid/CPR class, and the only medical supplies made available as a standard are the "10 person First Aid kits," which simply contain small bandages and basic medical supplies (Wildland fire and aviation handbook). While many wildland firefighters may possess qualifications beyond First Aid/CPR, such as qualification as an Emergency Medical Technician, they would have had to acquire these on their own time and money, or have their local district provide it for them – in other words, it is not standardized among all federal fire agencies. Additionally, critical pieces of safety equipment such as stabilizing backboards or splints for fractures are not provided unless local duty stations prioritize their limited budgets to include these materials – again, something that must be done by individuals but is not standardized federally.

While this lack of guidance regarding a topic that is very obviously related to employee safety may seem negligent, there are many underlying legal, political and jurisdictional factors that make implementing standardized medical training beyond First Aid/CPR very difficult. Part of the reason that First Aid/CPR is used as training is because it is so general that it is not considered "advanced" from a legal perspective. More in-depth training would qualify one as an "Emergency Medical Provider" such as an Emergency Medical Technician or an Advanced Life Support Paramedic. These qualifications are considered advanced training and as a result require authority in specific jurisdictions in order to legally operate as an emergency medical provider, much like medical doctors who must receive specific state based authorizations to practice in a particular state. Typically, advanced training certification is issued and licensed at the state level, meaning that if one is qualified as an Emergency Medical Provider in one state, he or she can

only legally practice in that state and no other, unless ones goes on to acquire the same qualifications in multiple states. In order to legally operate once one receives these qualifications, they must work for an organization that provides "medical direction"—which means there is an on-call doctor who will vouch for an individual as competent and qualified to work on patients, and also provide off-site direction to the emergency medical provider should they need it (https://www.acep.org/Clinical---Practice-Management/Medical-Direction-of-Emergency-Medical-Services/, accessed 04/01/2016). Without jurisdictional authority or a medical director, one cannot legally operate as an emergency medical provider. These points are summarized in Figure 3.4 below:

Figure 3.4



It is well known by nearly all people involved in federal fire management that there is limited medical training to firefighters, but it is also understood that legal and political barriers exist externally of federal fire management agencies that spatially prevent firefighters from operating in multiple states with advanced training. This is not a problem for the majority of federal, state, or municipal agencies because there are few circumstances where first responders would need to practice emergency medicine in multiple states. Because the fire environment is

changing and becoming more complex, federal firefighters will be faced with more hazards and the issue of emergency medical response will become a more important factor when considering the safety of firefighters.

Section 3.5 – Conclusion

This chapter has discussed background aspects of fie management in the United States. The five federal land management agencies tasked with managing wildfire must find ways to coordinate to manage fire cooperatively. One such way of standardizing operations is through the designation of large and small wildfire incident scales. As will be shown in future chapters, the designation of either large or small wildfire incidents can directly enable or constrain firefighter responses to safety hazards when operating at these respective scales. This chapter also briefly discussed several major historical events that have shaped wildfire management over time. As was discussed by Birkland (2006), the largest focusing events tend to garner the most attention during windows of opportunity – a situation which is similarly reflected when discussing the history of federal wildland fire and safety management, where visceral worst-case-scenario events served as punctuations that were followed by policy change. One of the more recent tragedies to inspire policy change came out of the Eagle Fire, where fire management agencies took action to address the issue of emergency medical response for the first time. While it may come as a surprise that federal wildland firefighters receive very little standardized medical training, there are several legal and jurisdictional underpinnings which have influenced this situation. Now that a background of these issues has been discussed, I will move forward to demonstrate the methodological approach that will be taken to investigate my research question: How are reactive and proactive approaches to federal firefighter safety policy creation produced,

applied, and circulated to address safety issues related to emergency medical response on both large and small scale wildfires and at different levels of organizational management.

Chapter 4: Methodology – Policy Analysis

I approach my investigation of firefighter safety policy using a detailed policy analysis. In Section 4.1, the research design will be based on the comparison of proactive and reactive approaches to policy production to evaluate which approach works best for addressing safety hazards on both large and small scale wildfire incidents. A policy analysis will be useful in this context because it provides a systematic means of comparing two different approaches to policy production. In Section 4.2 I will discuss how I will conduct this analysis using Bardach's template in his 1996 book, *The Eight-Step Path of Policy Analysis,* because it is applicable for both academics and policy makers attempting to investigate real world issues. Following this eight-step path in Section 4.3, I will analyze reactive and proactive approaches to policy production – reactive approaches will be evaluated using four historical events that characterize how safety policy has been created over time for all federal fire agencies, and proactive approaches will be evaluated using two recent examples of policy change that occurred within individual agencies but not federally. Specifically, the recent examples under consideration apply to emergency medical response for firefighters. In Section 4.4, I will discuss my positionality as a researcher. As a former firefighter who has worked within the framework of many of the policies under consideration, my positionality must be made fully transparent. Finally, in section 4.5, I will discuss the limitations of this study.

Policy analysis is an appropriate methodological approach to address issues related to the production of policy, which in this case asks the question: How are reactive and proactive approaches to federal firefighter safety policy production produced, applied, and circulated to

address safety issues related to emergency medical response on both large and small scale wildfires? As was shown in the Research Context Chapter, this project will utilize literature relevant to Birkland's 2006 concept of focusing events, literature on Science and Technology Studies, and geographic literature related to the social construction of scale. Birkland's concept of focusing events helps to demonstrate how firefighter safety policy has reactively evolved over time, and his suggestions of proactive approaches to policy production reflect two recent policy changes that have occurred within federal agencies but not standardized for all federal fire management agencies. The STS literature discussed will inform the evaluative criteria used to analyze both reactive and proactive approaches to policy production by considering how safety information was produced, applied to specific policies, and circulated to firefighters over space. Finally, literature related to the social construction of scale sets up a theoretical point of comparison that considers the material effects of administrative designations of large vs. small scales and how those designations may either enable or constrain firefighter's responses to medical emergencies.

Section 4.1 -- Research Design – Case Studies of Reactive and Proactive Approaches to Policy Production

To expand from Birkland's insights about reactive policy production and demonstrate how windows of opportunity influence the creation of firefighter safety policy through political learning, I will discuss four major safety policy changes that have occurred throughout the history of wildfire management in the United States. Each event represents how policies have changed in response to focusing events during the beginning, middle, and contemporary periods of wildfire management. These periods correspond with the beginning of formal fire management with the creation of the Forest Service in 1905, the middle period extending into the

middle of the 20th century, and the contemporary period corresponding with the present day. While more or other events could have been selected to represent the evolution of firefighter safety policy, the following events were selected because they are some of the most well documented wildfire tragedies to occur throughout history. The events selected will include the Fires of 1910, the Mann Gulch Fire (1949), the South Canyon Fire (1994), and the Eagle Fire (2008). All four of these events are consistent with the concept of policy change following a focusing event, and in these cases, all occurred on large fires during worst-case-scenario events.

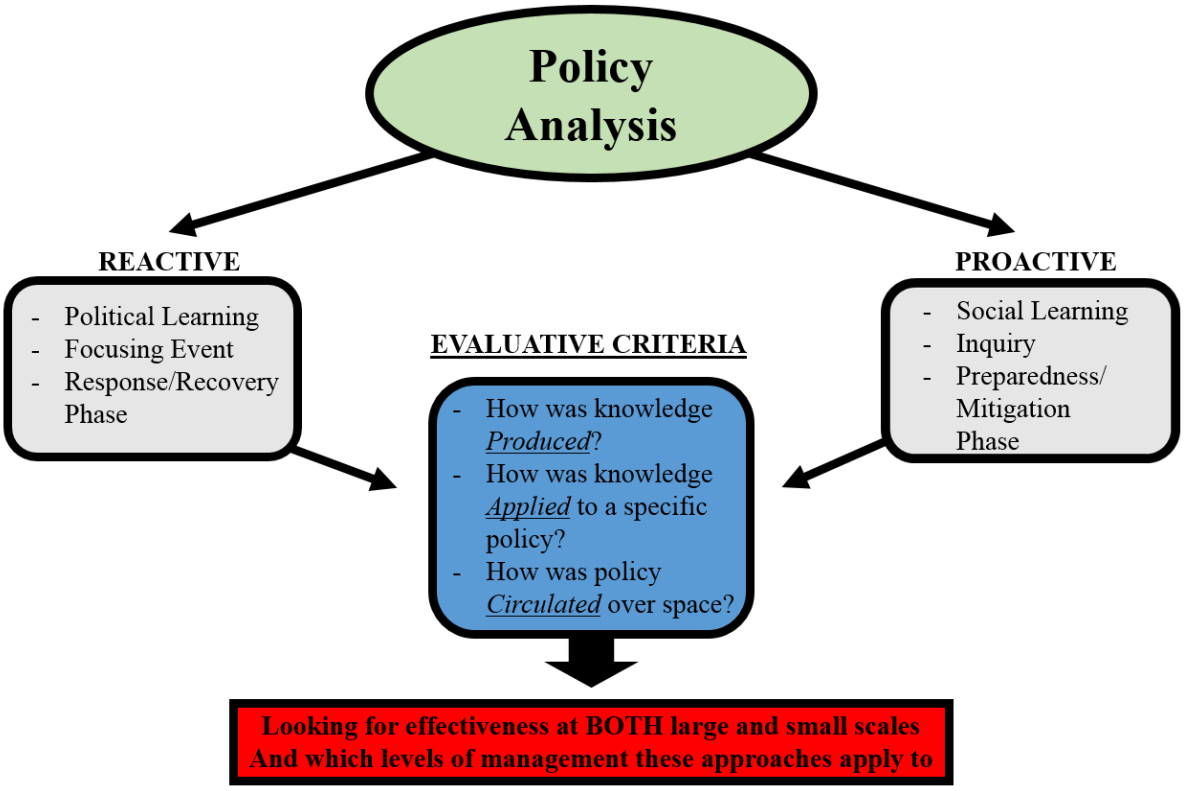
The reactive approach to policy production following political learning and has characterized the evolution of firefighter safety policy in the U.S. will be compared with the proactive approach to policy production that utilizes social learning that was described by Birkland in my Research Context Chapter. To do this, I will utilize two recent examples of policy changes that have occurred within individual agencies but have not been standardized for all federal fire management agencies. These examples will include the Forest Service Region 4 6725 Emergency Medical Services and the Bureau of Indian Affairs First Aid Project. While there may be other similar examples existing within federal fire management agencies that could have been used, these two are the most recent and adequately demonstrate an alternative to the traditional reactive process of policy production that remains to be the dominant form of comprehensive policy production that may not favor specific scales of wildfire management.

The methodological approach for this project will be a qualitative policy document analysis. I will discuss the criteria that were utilized in order to allow for repeatable testing. This project will operationalize insights from STS scholars who have analyzed the policy production process. Goldman's phases of policy production will be used as evaluative criteria upon which this policy analysis will be based, and consider:

- How was new safety knowledge ***produced*** following a tragic incident?
- How was that knowledge ***applied*** to a specific policy?
- How was that policy ***circulated*** over space to affected individuals?

As will be shown, this STS approach to policy analysis fits nicely within Bardach's 2006 process by identifying specific evaluative criteria upon which proactive and reactive approaches to policy production can be assessed. The approach to my policy analysis is characterized below in Figure 4.1.

Figure 4.1



Section 4.2 – Why policy analysis

Policy analysis is useful within the context of this research because it offers a methodological approach for addressing a particular policy problem; in this case, reactive and proactive approaches to the creation of safety policies that are intended to apply universally to large and small scale wildfires that may actually fall short. While my project will utilize

Bardach's process, there are other approaches to policy analysis. Weimer and Vining have written four editions of their 1996 book *Policy Analysis: Concepts and Practice,* where they detail the process of policy analysis for both students and practitioners. As some of the first to create a methodological approach to policy analysis, Weimer and Vining identified three major aspects that should be considered: a description of what policy analysis is and the contexts in which it is useful, a description of how to methodologically approach a policy analysis, and the ways policy analysis can be applied to specific problems (Weimer and Vining, 1999, p. vii). Nagel has also discussed approaches to policy analysis and helps to define differences between "policy analysis" and "policy evaluation" when he says "policy analysis is understood to be shot through with value conflicts, political decisions and priorities, but evaluation is typically seen as the application of relatively neutral, social scientific research techniques to policy issues" (Nagel, 1999, p. 2). With this in mind, my project will follow an analysis rather than an evaluation.

Though the approaches offered by these individuals are certainly worthy for conducting policy analysis, I will follow Bardach's process to methodologically approach my project. Bardach's Eight-Step Path consists of:

- Defining the problem
- Assembling evidence
- Constructing the alternatives
- Selecting criteria
- Projecting outcomes
- Confronting tradeoffs
- Deciding
- Telling a story

Bardach's process fits well with my investigation because it is a simple and straightforward process that is relevant to real world policy problems. The Eight-Step Path is flexible across the domains of geographic and planning literature and consists of a logical flow that could be

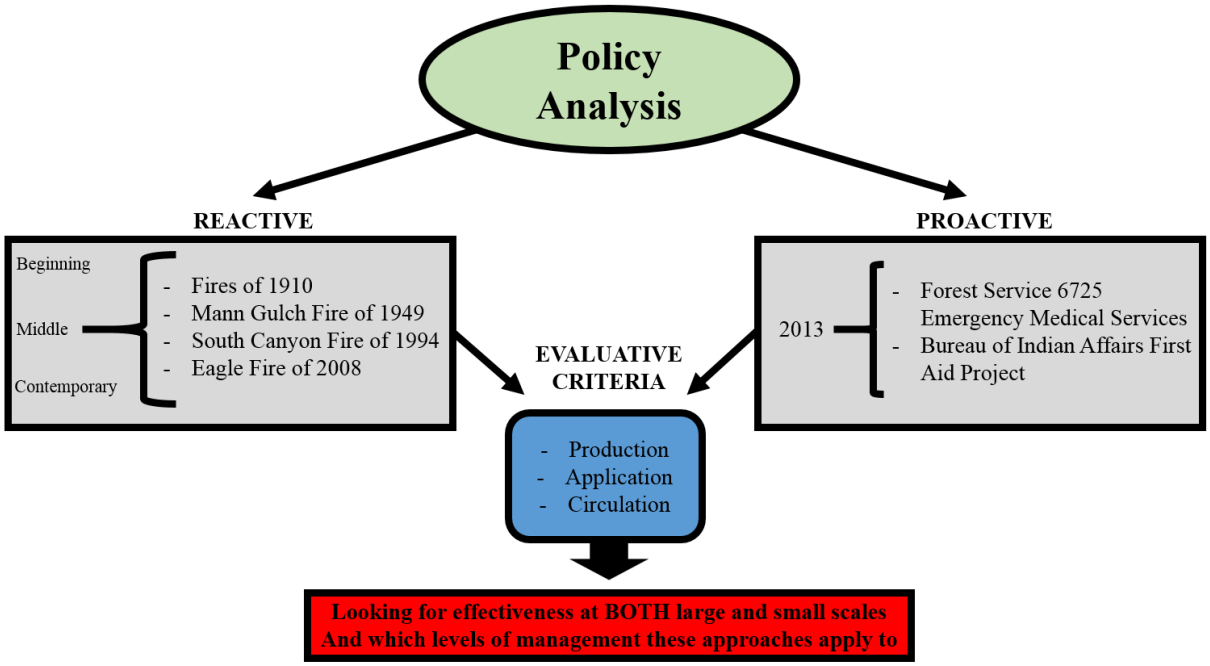
repeated by others attempting to replicate my study. Now that Bardach's process has been introduced, I will discuss how each step will be approached for my project.

Section 4.3 – Bardach's 8 Steps

Step 1: The first step in Bardach's policy analysis is to "Define the Problem." According to Bardach, this critical step frames the problem under consideration and provides a roadmap for how the policy will be analyzed with evidence. This project considers how anthropogenic factors that are exacerbating wildfire seasons will magnify shortcomings in the traditional policy making process that is focused on worst-case-scenario events occurring on large scale wildfire incidents. Under particular consideration is the current policy framework related to emergency medical response on wildfires.

Step 2: The second step is to "Assemble Evidence." According to Bardach, this part of the process requires critically thinking about and analyzing the problem. Why does the research question matter? What evidence is needed to address the research question? In this study, I will focus on reactive and proactive approaches to safety policy production. Reactive approaches that utilize political learning will be evaluated using the four historical cases, which will include: the Fires of 1910, the Mann Gulch Fire (1949), the South Canyon Fire (1994), and the Eagle Fire (2008). Proactive approaches that utilize social learning will be evaluated using two contemporary examples of policy changes that occurred within individual agencies but not federal wide, and will include the Forest Service 6725 Emergency Medical Services and the Bureau of Indian Affairs First Aid Project. My approach is visually displayed in Figure 4.2 below:

Figure 4.2



To evaluate reactive approaches based on the four historical examples, I will use factual information regarding these events that will come from federal agencies involved with wildland fire management. To inform the criteria of production, application, circulation, I will use formal accident investigations and safety statistics that will be collected from three of the largest and most influential groups responsible for compiling safety data for federal wildland firefighters; the National Wildfire Coordinating Group (NWCG), the National Interagency Fire Center (NIFC) and the Lessons Learned Center (LLC). The NWCG sets many of the standards among federal, state, and municipal agencies tasked with managing wildfire and collects safety statistics for all firefighters involved with wildfire management. They are also often involved in the process of investigating tragic incidents and possess databases for searching accident investigations. The NIFC is a group that coordinates among various federal agencies that are involved with fire management either directly or indirectly. It also possesses statistics on firefighter safety, including detailed historical data on federal firefighter fatalities over time. Finally, the Lessons Learned Center is tasked with compiling data from the NWCG and the NIFC in order to create

safety reports that can be made accessible to firefighters on the ground. The Lessons Learned Center has a substantial database on both accident investigations and firefighter safety statistics for federal firefighters and will serve as a primary source for information about federal firefighter safety for this project.

To evaluate proactive responses to policy production based on the two recent examples of agency policy that have been selected, I will utilize information coming directly from these respective agency websites. The Forest Service Region 4 6725 Emergency Medical Services policy can be accessed via the Forest Service Region 4 website (http://www.fs.usda.gov/detail/r4/fire-aviation?cid=stelprdb5375168). The Bureau of Indian Affairs First Aid Project policy can be accessed via the Bureau of Indian Affairs website (http://www.indianaffairs.gov/nifc/safety/firstresponder/index.htm).

Step 3: The third step is to "Construct the Alternatives." In this step, the specific plans that are intended to address the issue are considered. For this project, the alternative courses of action will be in reference to the way accident investigations are conducted. In this case, the traditional reactive approach that has characterized the evolution of safety policy and focuses on the response and recovery time periods of disaster management is being compared with a proactive approach which focuses on the preparedness and mitigation time periods. Though examples exist that display a proactive approach to policy production, they have not been standardized for all fire management agencies. Because the proactive approach has not been universally adopted, this will serve as the logical alternative to the reactive approach to policy production.

I will also consider alternatives to the scales focused on during traditional accident investigations. The focus on worst-case-scenario accidents occurring on large fires would be logically juxtaposed by considering minor injuries that occur on small fires – something that is

not presently tracked by federal fire management agencies. At present, there is no mandate by federal fire agencies to track minor injuries, and as a result, there is no data available to inform policies to mitigate minor injuries. The designations of large or small scale incidents will be based on administratively determined levels of scale as either large or small scale incidents. Finally, I will apply STS approaches that consider the involvement of federal agencies responsible for creating policies and what information they tend to look for specifically. The groups that are tasked with collecting and compiling safety information have administrative guidelines that require them to focus on life threatening or fatal accidents that have occurred. This requirement shapes the types of information these groups may produce following an accident investigation.

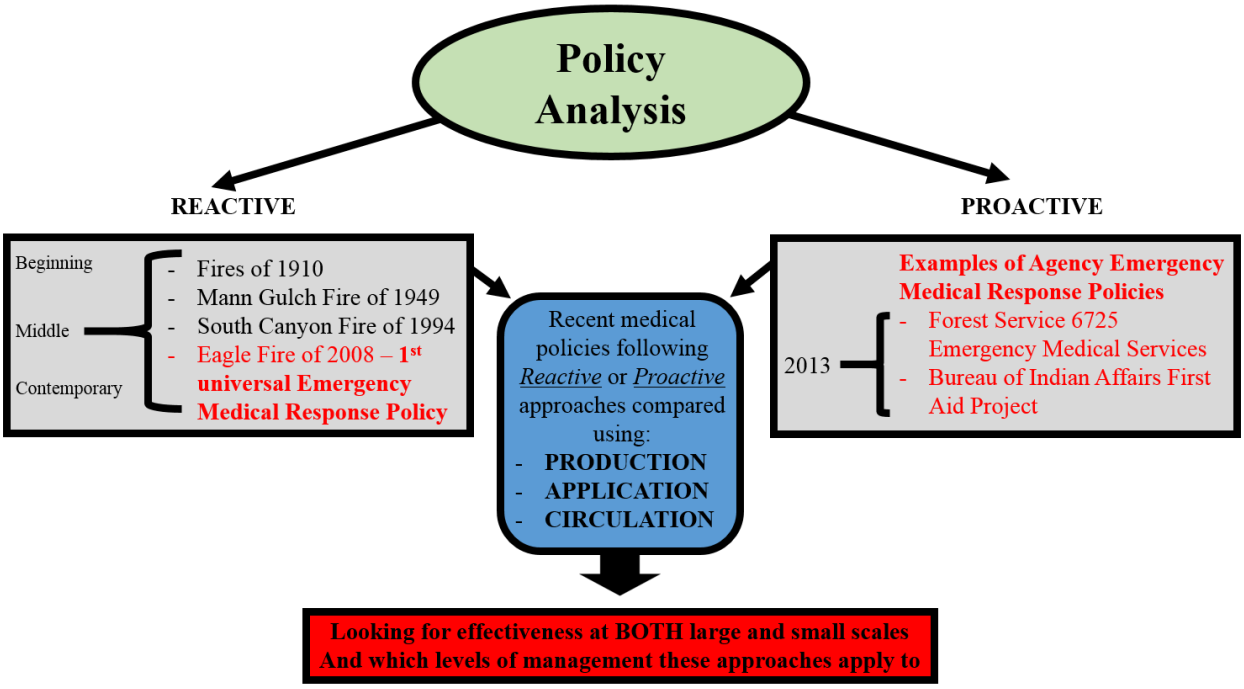
Step 4: The fourth step is to "Select the Criteria" that will be used to analyze the research question. Bardach states that criteria serve as "evaluative standards used to judge the goodness of the projected policy outcomes associated with each of the alternatives" (Bardach, 1996). The criteria will serve as the basis for measuring the alternatives that were discussed in Step 3.

The three criteria used to evaluate both reactive and proactive approaches to the creation of safety policy will be based on Goldman's three phases of policy production and will include; How was knowledge *produced* regarding an accident; How was that knowledge *applied* to specific policies; and how were those policies *circulated* over space to affected individuals? Considering these three phases will serve as starting points of analysis. The knowledge production phase is important to consider because it helps to reveal the time periods in which the knowledge was created – preparedness/mitigation that occurs well before an issue arises, or the response/recovery phases which occur after an issue has arisen. In this case, the reactive approach is marked by accident investigations which tend to focus on worst-case-scenario

accidents occurring on large scales.. The proactive approach is marked by an inquiry into a potential problem and may or may not focus on worst-case-scenario issues occurring at specific scales. The production of knowledge becomes more important once the updated information is applied to a specific policy. If the knowledge informing policy updates disproportionately considers visceral accidents over minor injuries, the application of knowledge to policy will selectively favor policies that address visceral accidents rather than minor injuries. Finally, once knowledge is produced and applied to a specific policy, the ways in which those updates were circulated to affected individuals over space can enable or constrain firefighter responses to emergencies occurring at either large or small scales..

The main case study under consideration will be the Eagle Fire, the most recent example of the four cases I have selected. Because this is the only example in existence of an accident that led to a major policy change to medical response protocol, this case will be the primary focus of this project. This policy, which was created under the traditional reactive approach to policy production, will be compared with other medical policies that have followed a proactive approach but are not standardized for all federal firefighters. Below is Figure 4.3 to demonstrate how I will use my criteria to perform a comparative analysis of reactive and proactive approaches to policy production and reveal which approach is most effective at addressing issues on both large and small scale wildfires. This is shown below in Figure 4.3:

Figure 4.3



Step 5: The fifth step is to "Project the Outcomes" based on the alternatives that were discussed and the criteria that are being used to evaluate those alternatives. In this step, the alternatives will be evaluated based on the potential impacts corresponding policies may have. Though reasonable expectations can be made about the outcomes of potential alternatives, there are also aspects that cannot be foreseen that may not be presented here. In the context of this project, I will evaluate reactive and proactive approaches to policy production based on the criteria I have selected to evaluate which approach is best for addressing safety issues on both large and small scale wildfire incidents. To project outcomes, I will consider questions such as: How would the alternative of a proactive approach be useful for addressing policies intended to comprehensively address safety issues on both large and small scale incidents? How would collecting more information on minor injuries occurring on small scale incidents help to inform proactive approaches to policy production?

Step 6: The sixth step, "Confronting the Tradeoffs," is used to "clarify tradeoffs between outcomes associated with different policy options for the sake of your audience" (Bardach, 1996, p. 49) and will be in reference to the possible actions that might be taken if shortcomings to policy are addressed compared with what is currently happening. In this investigation, it is suggested that safety policies related to emergency medical response and created in a reactive manner are not universally applicable to both large and small scale wildfire incidents, leaving firefighters particularly vulnerable to medical emergencies on small, remote fires. If these shortcomings were addressed in a proactive way, at least three responses could be reasonably expected; expand the number of privately contracted Emergency Medical Providers on smaller fires, begin training federal firefighters as Emergency Medical Providers, or increase the amount of first aid training to more accurately reflect issues firefighters may encounter in the field. Each of these options may result if the alternatives of policy production were to be implemented. These aspects will be covered in the results section with a cross-comparison of the tradeoffs between implementing one of these three possibilities versus leaving things the way they are.

Step's 7 & 8 – The last two steps, "Decide" and "Tell your story," will be covered in more detail in the Results and Discussion Chapters. In the step where I "Decide," I will consider what actions would most reasonably be taken based on the results of my analysis. Finally, in the step labeled "Tell your Story," Bardach says "after redefining your problem, reconceptualizing your alternatives, reconsidering your criteria, reassessing your projections, and reevaluating the tradeoffs – you are ready to tell your story" (Bardach, 1996, p. 57). For these steps, I will consider the entire process and present my findings and suggestions for alternative courses of action. These steps will be primarily addressed in the Results and Discussion Chapters.

Section 4.4 – Positionality and Reflexivity

Similar to other geographers conducting qualitative analysis, I will reflexively consider my relationship to the research and how my disposition may shape my perspectives (Johnson and Madge, 2016; Louis, 2016). According to Johnson and Madge, self-reflexivity involves confronting my own perspectives in relation to the project. My research has particular importance to me because I spent five years working as a Forest Service firefighter. During my service, I worked on the Black Hills National Forest for the Hell Canyon Ranger District, where I worked on nearly 100 wildfire incidents in eight different states. I was involved in multiple incidents in which medical emergencies occurred, making this a particularly personal topic for me. Because of my positionality, I willingly admit that my research is subjectively advocating for better emergency medical policy for federal wildland firefighters.

While traditional methodological approaches attempt to produce "objective" knowledge, the approach offered by Johnson and Madge recognizes that objectivity is impossible because all knowledge is socially constructed. Therefore, researchers should not privilege their own work by casting their results as objective when it may be used in subjective ways. Rather, we should admit our subjectivities and openly advocate for the improvement of conditions through our research, or as Louis says, "If research does not benefit the community by extending the quality of life for those in the community, it should not be done" (Louis, 2016, p. 131). By addressing subjectivities, reflexive methodological approaches attempt to bolster credibility through transparency while also recognizing that the same results likely could not be found quantitatively. Additionally, in order to avoid misleading results, it is critical that the researcher be transparent about underlying factors such as where research funding is coming from. In this case, my research project does not involve any outside funding. All research has been completed

independently at the University of Kansas through the Geography and Urban Planning Departments.

Through my research I am attempting to limit the marginalization of some federal firefighters that may not have the same access to needed safety resources as other federal firefighters. My hope is that this research project will empower federal wildland firefighters through better information that can be used to advocate for increased medical training. Louis states “the process of empowerment aims to undo or overcome oppression and increase opportunities, knowledge, skills, collective action, and choices for those groups routinely pushed to the margins of society. It can also disrupt further attempts to deny improvement to their opportunities” (Louis, 2016, p. 77). This approach is seen as a way to promote social justice for groups that are made institutionally vulnerable because of certain policies.

Though my positionality as a former firefighter may be seen as a potential bias in my research, this background provides some advantages that non-firefighters would not enjoy. As a former firefighter, I was able to gain access to people or documents that others may not have been able to gain access to as easily, which is referred to as “insider research” (Louis, 2016, p. 135). When doing qualitative research, being part of the community that is being researched can be beneficial because it helps to build trust between the researcher and the subjects. In the context of this research project, my professional background did help me to gain access to individuals involved with policymaking and helped me to gain insight and information about this topic that would not have been possible otherwise. Though my positionality as a former firefighter may influence my perceptions and representations, it will also help me to create bonds with the communities I am researching.

Section 4.5 – Limitations

There are several limitations regarding the approach of this project that must be discussed. Firstly, my project is limited in terms of the scope of the study. The topic of firefighter safety is rather broad, yet my project focuses specifically on emergency medical response. As a result, it may be possible to critique this study because it does not consider other aspects of firefighter safety. Additionally, the methodological approach of policy analysis is only one of many ways this study could have been conducted. Because this investigation did not utilize qualitative approaches such as interviews or surveys, there is no direct representation of the perspectives of affected individuals which may have bolstered the conclusions of this study. It also may have been possible to quantitatively approach this study by attempting to obtain missing statistics and create empirical findings, however this process would likely be unrealistic given the extreme disaggregation of certain types of safety statistics.

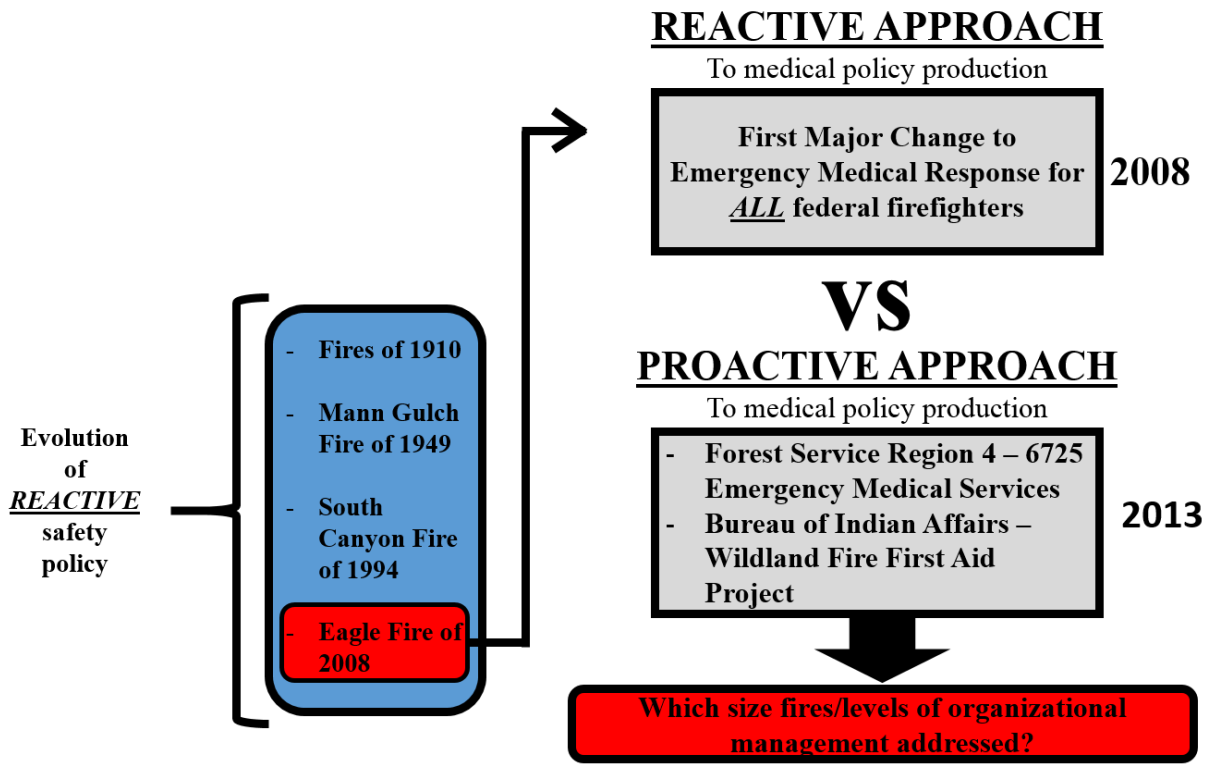
The sample size of case studies used might also be considered a limitation. I selected four primary historical case studies that are representative of beginning, middle, and contemporary periods of firefighter safety policy, but it would have been possible to select more or different cases. With that in mind, the cases selected were chosen because they are well documented iconic events that were undeniably influential. Because these cases are representative of different eras, I decided that the addition of more examples would only introduce more complexities without improving the methodological approach. Additionally, the study is limited in that it only considers cases that were worst-case-scenario tragedies occurring on large fires – however this was done because each example represents an iconic focusing event that led to major changes in safety policy. While this study has a focus on document analysis from statistics generated by the NWCG, the NIFC, and the LLC, there are other organizations that develop and maintain safety

information. With this in mind, the data sources I have selected are the largest organizations responsible for these tasks. Finally, though Bardach's approach is useful within this context, there are other approaches to policy analysis that could have been taken.

Chapter 5: Results and Discussion

This Chapter answers the research question: How are reactive and proactive approaches to federal wildland firefighter safety policy creation produced, applied, and circulated to address safety issues related to emergency medical response on both large and small scale wildfires and at different levels of organizational management? Using Bardach's template (1996), this chapter "Projects the Outcomes" of my research. I answer my research question through a comparison of both reactive and proactive approaches to policy change as were discussed in my Research Context and Methodology Chapters. I will analyze these two approaches using the three criteria I established based on Science and Technology Studies to investigate which incident scales these approaches are most applicable to, and which organizational scales utilize either reactive or proactive approaches to policy production. This comparison is summarized in Figure 5.1 below:

Figure 5.1



Section 5.1 will discuss the production, application, and circulation of reactive policy approaches over time that have traditionally characterized the way major safety policy changes have come about for all federal fire agencies. These events include the Fires of 1910, the Mann Gulch Fire of 1949, the South Canyon Fire of 1994, and the Eagle Fire of 2008. The first three examples help to show how safety policy has reactively evolved over time in response to fire related hazards. For the last example, the Eagle Fire, I will show how the traditional reactive approach to creating safety policy is less effective when considering emergency medical response for federal firefighters, which is different than the fire related hazards considered in the first three examples. After discussing this evolution, Section 5.2 will utilize insights from the STS section of Chapter 2 to show what types of knowledge about firefighter safety "count" when creating policies, and what types of knowledge are not considered but might be useful to know to inform more comprehensive policies.

In Section 5.3, the reactive approach will be juxtaposed with a proactive approach to safety policy creation where two recent policies to medical change at agency levels will be evaluated using the same criteria of production, application, and circulation. These policies will include Forest Service Region 4 6725 Emergency Medical Services and the Bureau of Indian Affairs Wildland Fire First Aid Project. These approaches will be compared and evaluated to reveal which approach to policy production is more effective on both large and small scale wildfire incidents. Once these policies have been discussed, Section 5.4 will continue with Bardach's 1996 process to "Confront the Tradeoffs" that were mentioned in Chapter 4 – expand contracted EMTs; expand EMT training to federal firefighters; provide federal firefighters more comprehensive first aid training – and then "Decide" which approach is best within the current framework of policies.

Finally, Section 5.5 will discuss how designations of scale, whether in reference to incident size or level of organizational management, can have substantive impacts on firefighters working at the ground level. When considering scale in relation to levels of governance ranging from the regional scale to the fire service scale, the reactive and proactive approaches discussed are applicable at different levels of organizational governance. Reactive approaches which have traditionally characterized the evolution of safety policy apply to all firefighters at the highest operational scale of the federal fire service. The proactive approaches that are discussed, however, happen at smaller organizational scales – the scale of the agency, or even a region within an individual agency. With this in mind, it is important to consider the organizational scales at which these policies are created, the spaces where they are enacted, and who is or is not covered by these respective policy approaches.

Section 5.1 – Projecting the Outcomes of Reactive Approaches -- Political Learning at the Federal Fire Service Scale

Birkland's discussion of the policy process that often follows catastrophic events is similar to how federal firefighter safety policy evolves following tragic events such as a fatality or serious accident in the policy domain of wildfire management. In this case, a tragic incident that exposes firefighters to a life threatening situation can potentially serve as a "focusing event" if the incident is severe enough to attract significant attention from the fire community or the public. Social or political events that are designated as large scale are often privileged and regarded as a natural starting point for addressing political issues that impact society, where smaller scale events are considered less ideal for exposing issues. If a focusing event is large enough, federal fire agencies will prompt an accident investigation to look for the underlying factors that led up to the event, and in so doing produce new knowledge about firefighter safety.

If the investigation reveals any major deficiencies, investigation teams may apply this knowledge to a policy reform during a "window of opportunity" for policy change, and the updates circulate to all affected individuals at either large or small spatial scales of incident management. This description characterizes the reactive approach to safety policy production.

In this section, I will discuss four historical cases that exemplify how firefighter safety policy is typically created and how it has evolved over time. As was stated in the Methods section, I will be evaluating each time period (Beginning, Middle, and Contemporary) off of three main criteria:

- How was new safety knowledge ***produced*** following a tragic incident?
- How was that knowledge ***applied*** to a specific policy?
- How was that policy ***circulated*** over space to affected individuals?

Each of these factors will be considered in the four events I will be analyzing: The Fires of 1910; the Mann Gulch Fire of 1949; the South Canyon Fire of 1994; the Eagle Fire of 2008. These criteria will be used to show how the process of safety evolved over the course of federal public lands management in the U.S. Since this section is focused on reactive approaches to policy production, the reactive approach could be considered the "dependent variable." The "independent variable" for these four examples could be considered the type of accident that was addressed by the policy; was it addressing a hazard related to the fire itself, or was it addressing medical emergencies that occurred on a fire that were unrelated to the fire itself?

Section 5.1 – A – The Fires of 1910 –The Beginning

Production: The Forest Service was created in 1905 and narrowly survived the onslaught of attacks coming from private timber, mining, and railroad companies that were determined to stop the federal government from protecting public lands (Egan, 2009). After the Fires of 1910 burned nearly 3 million acres of land and killed 79 firefighters in the Northwestern United States,

the public desire for a governmental agency that would protect the forests was solidified. Following this event, H.S. Graves was appointed Chief Forester of the U.S. Forest Service and set a new precedent for fire management when he stated:

> The first measure necessary for the successful practice of forestry is protection from forest fires. As long as there is any considerable risk from fire, forest owners have little incentive to make provision for natural reproduction, to plant trees, to make improvement cuttings, or to do other work looking to continued forest production.-- *Protection of Forests from Fire,* 1910, H.S. Graves

The precedent set by H.S. Graves following the Fires of 1910 hugely influenced the relationship the Forest Service had with wildfire and would heavily shape future fire suppression policies. Along with several other large conflagrations and a series of heavy drought years in the early 1930s, the Forest Service used these examples to produce new knowledge about the dangers of wildfire (Bradshaw and Lueck, 2012).

Application: The Fires of 1910 did not produce a specific accident investigation; rather, during this time period, a series of catastrophic incidents were needed to accumulate before the infant agency would take comprehensive action to address the issue of fire protection. In this case, a history of catastrophic fires in the United States signaled the potential devastation large wildfires could unleash upon human settlements. The Peshtigo Fire of 1871 burned over a million acres in Wisconsin and killed an estimated 2000 civilians; The Fires of 1910 consumed several settler towns in the Bitterroot Mountains in Montana, Idaho and Washington; and in the early 1930s, a string of drought years led to catastrophic wildfire seasons (Bradshaw and Lueck, 2012). Though studies of wildfire behavior were in their infancy at the time (Egan, 2009), the collective historical knowledge about large fires was enough for fire managers of the time to know something needed to be done. Once historical knowledge about wildfire was produced, it was

applied to a specific policy. This was done with the "10 A.M. Policy." *The Suppression Policy of the U.S. Forest Service* states:

The approved protection policy on the National Forests calls for fast, energetic, and thorough suppression of all fires, in all locations, during possibly dangerous fire weather. When immediate control is not thus attained, the policy then calls for prompt calculating of the problems of the existing situation and probabilities of spread, and organizing to control every such fire within "the first work period." Failing in this effort, the attack on each succeeding day will be planned and executed with the aim, without reservation, of obtaining control before 10 o'clock on the next morning. – The Suppression Policy of the U.S. forest Service, *Fire control in the United States*, 1939

In the beginning of wildfire management, knowledge production regarding firefighting activities lagged behind safety issues of the time. Because the agency was relatively young and tasked with managing something the United States government had little experience managing before, organizational learning required multiple events to accumulate before any substantive changes would be made, exemplifying the beginning stages of political learning for this agency. In this case, a series of conflagrations occurred, beginning with the Fires of 1910, which impelled the public and Forest Service representatives to perceive fire as dangerous to human establishments (Bradshaw and Lueck, 2012). This fear prompted the creation of policies that aimed to eliminate fire from western landscapes altogether in a reactive manner that only followed multiple focusing events.

Circulation: In this situation, the policy change was circulated to all fire managers over space via "The Suppression Policy of the United States Forest Service." The policy change was specifically applied to small spatial scale fires, with the idea that smaller fires would be safer and easier to manage than larger fires. There is some merit to this claim as there is greater fire intensity on larger fires – however, many of the same safety concerns exist on both large and small fires such as falling trees or equipment accidents. With this in mind, the safety paradigm of the time emphasized that fire was a threat to humans and the only way to stop the threat was to

make sure fires did not burn. The 10 A.M. rule was not a formal safety policy, but because no formal safety policies of the time existed, the history involved with this policy directly led to several factors that would set a precedent for how safety policy would be created in the future. As time went on, focusing events such as the Fires of 1910 would similarly help to influence policy because they occurred on large fires with worst-case-scenario outcomes. It would take several decades of organizational learning before explicit safety policies were created.

Implications of the Fires of 1910 and the 10 A.M. Policy: In the beginning, the 10 A.M. policy was created following the most catastrophic fire season in U.S. history and as a result helped to usher in a policy that explicitly addressed small fires, with the idea that suppression would mitigate the possibility of large fires occurring. With the dependent variable being reactive approaches to policy production, this example has an independent variable of fire-related hazards. These management techniques came as a result of several catastrophic conflagrations that had occurred over a period of decades, with the first formal policy lagging well behind the perceived issues of the time. The 10 A.M. policy was so successful over time that increasing numbers of people were able to build their homes in wildland-urban interface areas prone to wildfire (Bradshaw and Lueck, 2012). As fuels accumulated and contributed to more volatile fire seasons, the federal government was forced to react and address issues occurring on larger scale incidents; namely, safety issues faced by those who were tasked with managing the conflagrations.

Section 5.1 – B – Mann Gulch Fire – Middle Time Period.

Production: In 1949, one of the most well-known firefighter tragedies occurred on the Mann Gulch Fire in Montana. On August 5, a crew of smokejumpers responded to a fire that was growing larger and began suppression efforts. A formal accident investigation followed this

particular event, which led to the production of knowledge regarding the factors that were believed to have caused this tragedy. As indicated in the "Mann Gulch Fire" report;

> This fire was one of about ten fires on the Canyon and Helena Ranger Districts started by the August 4 lightning storm. Two fires, the York and the Mann Gulch reached sufficient size to require support from outside the local organization. Predicted fire danger was "low," however, weather observations at the time of the accident indicate severe fire behavior potential…None of the firefighters were equipped with fire-resistant clothing nor fire shelters. Many of the smokejumpers had never been on a large fire. The foreman (initial attack incident commander) had not worked with most of the firefighters prior to this mission. Consequently, his abilities (although respected by his peers) was not known by the crew on this fire. (Mann Gulch Fire Report, 1949, p. 1)

In this case, a lack of standard protocols made coordination between firefighters and the foreman, most of whom did not know each other, much more difficult than it might have been otherwise. As a result of these human factors, organizing the crew in the face of other fire hazards such as fire weather conditions and topographic influences was sufficiently inhibited.

The Mann Gulch fire was one of several fires that influenced the creation of the first comprehensive safety policy. According to Forest Service historical archives, "The original ten Standard Firefighting Orders were developed in 1957 by a task force commissioned by the USDA-Forest Service Chief Richard E. McArdle. The task force reviewed the records of 16 tragedy fires that occurred from 1937 to 1956" (http://www.fs.fed.us/fire/safety/10_18/10_18.html, Accessed 04-01-2016). Similar to the way fire suppression policy was created following multiple catastrophic fires over time, the first major safety policy required multiple investigations to produce new knowledge which followed several visceral worst-case-scenario events that occurred on large fires. In this case, the Mann Gulch fire was the most publicized and well known of these tragedies. Though accident investigations of this time period were vastly different from how they are approached today, these investigations served to set the precedent for how they would be conducted in the future.

Application: The knowledge produced from 16 accident investigations, including the Mann Gulch fire investigation, was later applied to the "10 Standard Fire Orders & 18 Watchout Situations," and still remains one of the biggest pieces of safety protocol that firefighters follow in order to mitigate fire related hazards. The 10 Standard Fire Orders suggested firefighters "stay informed on fire weather conditions," (Standard Fire Order # 1) and to "know what the fire is doing at all times," (Standard Fire Order #2), both factors that were cited in the accident investigation as leading up to the tragedy. Additionally, the 18 Watchout situations warned about hazards such as having "unburned fuel between you and the fire" (Watchout Situation #11) or "building fireline downhill with fire below you" (Watchout Situation #8), situations that both contributed to the tragedy on the Mann Gulch fire.

The history of catastrophic fires to this point characterized wildfire as a danger to firefighters, though there would be no organizational attempt at mitigating safety hazards until multiple worst-case-scenario accidents happened on large fires. This is similar to Brikland's observation that "new facts combine with old ideas in windows of opportunity for policy change" (Birkland, 2006, p. 60). In other words, it didn't matter that the hazards were known because nothing would be done to effectively address the issues until they became major problems. Once they did become major problems, the spotlight was focused on those specific factors and the usual avenues of policy production were followed to mitigate similar accidents in the future. This event followed a similar response to the way the 10 A.M. policy was created where the Forest Service responded to several focusing events by producing updated knowledge and applying it to a policy change.

Circulation: In this case, the "10 & 18" were circulated via training exercises and official documents regarding the implementation of management strategies. Though fire agencies of the

time were well aware of the history of "threatening" conflagrations that posed a safety hazard to firefighters, it was necessary to establish common principles and make them known and available to all firefighters as a standard, rather than assume all employees have the same understanding of fire as a hazard. The 10 & 18 were also effective protocol updates that would apply to both large and small scale management because many of the same fire related hazards exist on both large and small scale fires. While this was an important update, part of its effectiveness comes as a result of being the very first, much needed formal safety policy, meaning that any address to safety concerns would be a welcome change.

Implications of the Mann Gulch Fire and the 10 & 18: The policy update of the 10 & 18 came as a result of a reactive approach to policy production where multiple focusing events where firefighters were killed as a result of fire related hazards. Because small fires can turn into large fires, addressing fire related safety issues is likely to be applicable to both large and small fires. In this case, the creation of the policy lagged well behind the hazards of the time, but once policies were created, they helped to fill in many gaps within safety policy that applied to both large and small scale incidents. Once this way of knowing and understanding safety issues was established, the ways in which federal fire agencies used political learning to become informed about safety issues were largely set, placing the focus on worst-case-scenario incidents, many of which occurred on larger fires – thus solidifying large scale tragedies as the pre-eminent platform for addressing safety concerns. Because the Mann Gulch fire was a particularly iconic event which involved a combination of topographic factors and weather conditions that exacerbated fire behavior and led to the tragedy, the focus on providing safety for firefighters was mostly about how to avoid getting burned while still managing to fight the fire, rather than questioning the way fires were fought in the first place. As a result of several such tragedies, it was deemed

necessary to create actual safety policies so that the mission of suppressing fires could be maintained. Though federal agencies had identified many of the most hazardous factors involved in fire management, substantive materials would be needed to more effectively mitigate risks associated with the fire itself.

Section 5.1 – C – South Canyon Fire – Contemporary Period.

Production: One of the most prominent recent examples of a firefighter tragedy occurred following the South Canyon Fire in 1994, where 14 firefighters were killed in Colorado. Several factors led up to the tragedy which prompted the production of knew knowledge via the *South Canyon Accident Investigation.* Firefighters on the fire did not all have direct communication with those in charge, which meant that not everyone was accounted for during suppression operations (South Canyon Report, 1994, p. 4). Additionally, fire weather conditions were so extreme that the National Weather Service issued a "red flag warning" indicating the potential for extreme fire behavior, however this information was not made widely available to all firefighters on scene and was therefore not taken into consideration when planning suppression tactics (South Canyon Report, p. 1). On July 2, 1994, the firefighters were killed by the fire (South Canyon Report, p. 1). Within three hours of the event, an investigation team was on scene attempting to figure out what led up to the tragedy and produced new knowledge upon which future policies would be based.

Different from the previous two examples, the policies that resulted following the South Canyon Fire came from this incident alone rather than requiring a number of incidents to occur before a window of opportunity for policy change opened. Contemporary safety policy follows a similar but more refined path than what had been established in previous eras in that new knowledge is produced from a single accident rather than multiple accidents, and the

investigation teams were basing their actions off of more established practices that had been developed over several decades of fire management, dating back to the creation of the Forest Service in 1905.

Application: The knowledge produced by the accident investigation was then applied to firefighter safety equipment updates to mitigate fire related hazards. Because a lack of communications with firefighters on scene was cited as one of the main factors causing the incident, this tragedy prompted federal fire agencies to provide more radios to firefighters to help ensure that they had a means of communicating with their supervisors. Additionally, had firefighters been made aware of the severity of the weather conditions that day, they may not have been as aggressive in attacking the fire. As a result, federal fire agencies bolstered their relationship with the National Weather Service, made it standard protocol to disseminate fire weather conditions to all employees, and also increased the amount of fire weather training that was provided to firefighters. This example serves as a good baseline to show how current policies are created in that a single accident was formally investigated by an official team which led to the production of new knowledge that was applied to specific policies.

Circulation: The equipment and weather reports firefighters needed to stay safe were circulated to firefighters in a more comprehensive manner that would address safety issues on both large and small scales. The scalar impacts of circulating necessary equipment to firefighters was similar to the 10 & 18 in that they were provided to help mitigate fire related safety hazards. As was the case with the 10 & 18, fire related hazards on both large and small fires may be appropriately addressed by this process of policy production because large fires started out as small fires and many of the same issues apply to both scales. While this event followed the same reactive approach as was used to create the 10 & 18, the South Canyon Fire effectively

streamlined the same process by using a single focusing event to spur a policy change, rather than multiple focusing events. Though these were welcome updates, they came well after problems had been established. Once again, the equipment updates to result from this tragedy reinforced the approach to policy creation of focusing on worst-case-scenario events that occurred on large fires, only this time a single incident was needed to justify reform.

Implications of the South Canyon Fire: A policy change that spurred the provision of needed safety resources came from the South Canyon fire in 1994, where the lack of up-to-date weather reports and unestablished communications resulted in a catastrophic incident. To this point, the reactive model of producing new knowledge after an accident, applying it to policy, and circulating those policies to all firefighters was arguably useful in exposing some of the largest safety concerns firefighters faced on both large and small incidents. Yet it is important to note that the hazards addressed in the examples discussed so far were hazards related to the fire itself.

Scalar issues are less important in relation to safety hazards that arise as a result of the fire itself because a fire that is small has the potential to turn into a fire that is large. If the policy production process uses worst-case-scenario events on large fires as a way to learn about and mitigate the most extreme fire related hazards, many of these mitigation procedures may be applicable to small fires as well. By providing the appropriate equipment and training to mitigate small issues that could become large issues, the reactive approach to policy production for fire related hazards was relatively effective. When considering safety hazards not related to the fire itself, namely medical emergencies, the reactive approach is not sensitive to scalar nuances which leave firefighters working on small scales of incident management particularly vulnerable. The next example will discuss the Eagle Fire, which led to an investigation that informed the

first comprehensive medical policy for firefighters, and was produced following the reactive approach to policy production.

Section 5.1 – D – The Eagle Fire – Contemporary Period

Production: One of the most significant recent changes to safety policy, and the only example of a major change to emergency medical response, came as a result of a tragic incident that occurred in California. Though following the same reactive approach as the previous examples discussed, this event was a result of a medical emergency that occurred on a fire, rather than a hazard caused by the fire itself. In 2008, 18 year old firefighter Andrew Palmer was starting his first fire season with the National Park Service and the Eagle Fire was the first incident he had ever been on. On July 25, one of Palmer's crewmembers cut a tree that was beyond their felling qualifications that struck Andrew and broke his left femur, at which point his crewmembers reported to dispatch: "Man down, man down. We need help. Medical Emergency. Dozer pad. Broken leg. Bleeding. Drop point 72 and dozer line. Call 911. We need help" (Dutch Creek Accident Investigation, 2008, p. 5). It is important to note that his injury was initially identified as a broken leg when it was in fact a broken femur. A broken femur will almost certainly rupture the femoral artery and can lead to death by internal bleeding in a matter of hours if not treated quickly. The miscommunication over the radio regarding the severity of the injury led to a slow response time, and Andrew passed away in a life flight helicopter on the way to the hospital less than 3 hours after the tree had struck him (Dutch Creek Accident Investigation, 2008, p. 5).

This tragedy was not taken lightly by the wildfire community. New knowledge was produced as a result of the *Dutch Creek Serious Accident Investigation* in 2008, which was the title of the formal investigation of the Eagle Fire. This investigation helps to further demonstrate how the evolution of safety policy has been refined over time, though still lagging behind many

of the major safety issues firefighters face. Similar to the South Canyon Fire, this accident investigation was based off of a single incident. The main difference between this and prior accident investigations is that it was based on a medical emergency, yet was still approached in the same way as previous investigations which considered fire related hazards. This is the only example of an accident investigation that led to policy changes regarding emergency medical response for firefighters. Though this was not the first time a firefighter had been severely injured or killed as a result of an injury sustained on a fire event, it took over 100 years since the founding of the Forest Service for fire management agencies to take any major action to address emergency medical response.

Application: The safety knowledge that was produced from the investigation was then applied to a series of recommendations that would attempt to address medical emergencies that occurred on fires, rather than hazards related to the fire itself. Among the policy changes was an addition to the "Incident Response Pocket Guide" that all firefighters are required to carry. A checklist was created and included in the IRPG to provide firefighters at the scene of an accident with a list of the most important factors to consider that would hasten professional medical response. This came in the form of a checklist known as the "Emergency Medical Care Guidelines" that was provided to all firefighters, pictured below in Image 1:

Image 5.1:

Medical Incident Report

Use items one through nine to communicate situation to communications/dispatch.

1. **CONTACT COMMUNICATIONS/DISPATCH**
   Ex: "Communications, Div. Alpha. Stand-by for Priority Medical Incident Report." (If life threatening request designated frequency be cleared for emergency traffic.)
2. **INCIDENT STATUS: Provide incident summary and command structure**

Nature of Injury/Illness		*Describe the injury (Ex: Broken leg with bleeding)*
Incident Name:		*Geographic Name + "Medical" (Ex: Trout Meadow Medical)*
Incident Commander:		*Name of IC*
Patient Care:		*Name of Care Provider (Ex: EMT Smith)*

3. **INITIAL PATIENT ASSESSMENT:** *Complete this section for each patient. This is only a brief, initial assessment. Provide additional patient info after completing this 9 Line Report. See page 100 for detailed Patient Assessment.*

Number of Patients:	Male/Female	Age:	Weight:
Conscious?	☐ YES	☐ **NO = *MEDEVAC*!**	
Breathing?	☐ YES	☐ **NO = *MEDEVAC*!**	
Mechanism of Injury: *What caused the injury?*			
Lat./Long. (Datum WGS84) Ex: N 40º 42.45'x W 123º 03.24'			

4. **SEVERITY OF EMERGENCY, TRANSPORT PRIORITY**

SEVERITY	TRANSPORT PRIORITY
☐ **URGENT-RED Life threatening injury or illness.** Ex: Unconscious, difficulty breathing, bleeding severely, 2º-3º burns more than 4 palm sizes, heat stroke, disoriented.	Ambulance or MEDEVAC helicopter. Evacuation need is **IMMEDIATE**.
☐ **PRIORITY-YELLOW Serious injury or illness.** Ex: Significant trauma, not able to walk, 2º-3º burns not more than 1-2 palm sizes	Ambulance or consider air transport if at remote location. Evacuation may be **DELAYED**.
☐ **ROUTINE-GREEN** Not a life threatening injury or illness. Ex: Sprains, strains, minor heat-related illness	Non-Emergency. Evacuation considered **Routine of Convenience**.

(*Incident Response Pocket Guide*, 2014)

The "Emergency Medical Care Guidelines" were provided to all firefighters so they would have standardized communications between firefighters on scene and dispatch in the event of a medical emergency.

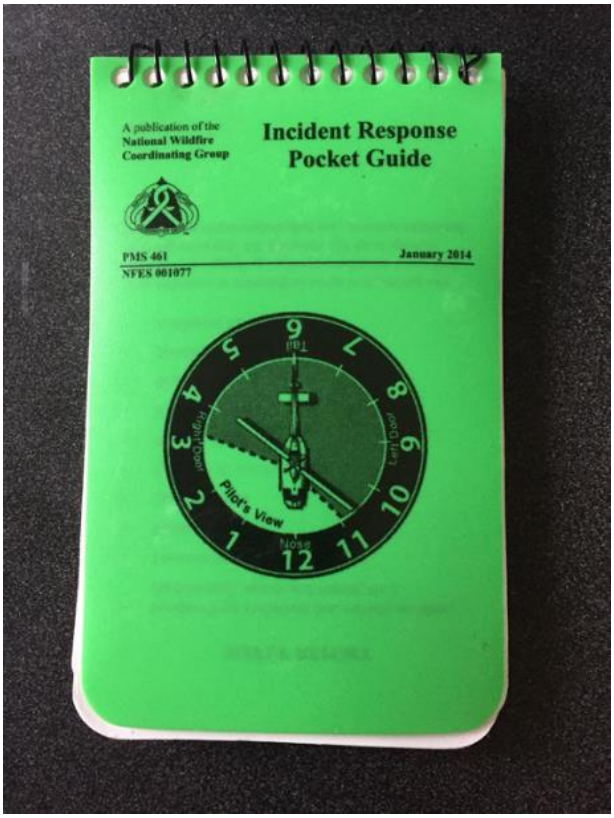
While this checklist is very useful for firefighters to expedite help for an injured firefighter, there are several requirements on this checklist that require the firefighter on scene to identify "Nature of Injury/Illness" and "Severity of Emergency/Transport Priority." With this in mind, it is important to consider the amount of standard medical training provided to firefighters – as mentioned earlier, there is only a 16 hour long First Aid/CPR class provided to all federal firefighters. This begs the question whether that really enough training for firefighters to be able to answer questions from this checklist such as "Nature of Injury/Illness," or "Severity of

Emergency/Transport Priority"? In the case of the Eagle Fire, which this checklist was based on, the amount of medical training Andrew's crewmembers possessed may not have prepared them to effectively utilize this checklist, had it been available to them at the time. As was mentioned, Andrew's injury was identified as a broken leg when in fact it was a broken femur. As a result, Andrew's transport priority was downgraded and response to his emergency was not as fast as it could have been. While this checklist certainly is useful in many circumstances, it is worth little if employees are not provided the necessary training they need to utilize it.

Though not a result of the *Dutch Creek Accident Investigation*, another change to emergency medical policy inspired by the Eagle Fire were the "New Minimum Standards for Medical Units" issued by the NWCG in 2013. Prior to this, contracted EMTs were not legally allowed to work on the fireline because no qualifications existed to allow them to work on wildfires. This update allowed for a much needed expansion of medical resources for firefighters. Where the recommendations from the *Dutch Creek Accident Investigation* provided protocols to mitigate accidents before they occurred, and the emergency medical care guidelines served as a way to hasten response once something occurred, the "New Minimum Standards" actually provided trained medical personnel to help firefighters injured on the fireline. While these updates were welcome changes, there are problems when analyzing how effective these updates are at either large or small scales of wildfire management.

Circulation: These guidelines were circulated via the *Incident Response Pocket Guide* (IRPG), something all firefighters are required to carry pictured below in Image 2:

Image 5.2:



(*Incident Response Pocket Guide,* 2014)

The IRPG has the ABC's of wildland fire management, covering topics from fire weather conditions to equipment operation. Because it is carried by all firefighters, it makes sense that the Emergency Medical Care Guidelines would be in this handbook. The updated protocols that came as a result of the *Dutch Creek Accident Investigation* produced new knowledge about firefighter safety that was applied to updated protocols and the Emergency Medical care Guidelines, and then circulated to all federal firefighters via the IRPG. In many ways, these updates were much needed and go a long way in protecting firefighters. In other ways, however, there are still shortcomings.

The dissemination of this document via the IRPG was effectively done in that it was provided to everyone who would need it. However, this was not the only medical policy change

to result from the Eagle fire. In addition to this, the NWCG created the New Minimum Standards for Medical Units in 2013 which expanded the availability of contracted EMT's to wildfire incidents. While this is a very useful and important change, it is more applicable to large scale wildfire incidents than small scale incidents, though technically applies to both. In the Background Chapter I discussed factors that are considered when designating a fire as large, such as:

- Supervision for a large organization
- Multiple operational periods to contain fire
- Providing logistical support including the establishment and operation of a base and possibly camps
- Supervisors that are qualified to manage Type 1-3 fires
- Multiple divisions to manage different parts of a large fire, requiring multiple branches to be activated to address span-of-control needs
- Operations personnel often exceed 500 per operational period and total persons on the incident usually exceeds 1000

(NWCG Fireline Handbook, p. 120-121)

Large incidents are less common and have a longer duration, they are more established than smaller incidents, and they require many more resources to engage the fire. When more resources are present and long range planning is more feasible, it is more likely for Emergency Medical Providers to be present. Smaller fires that happen much more frequently and cannot be planned for in advance have fewer firefighting resources, making it less likely for Emergency Medical Providers to be standing by. Though it is possible to request EMTs for small fires, it is less likely for them to be present because of logistical concerns, and because firefighters are likely to only have each other on small, remote fires, if a medical emergency occurs. As a result, this policy change is not universally applicable to both large and small scale wildfires, but rather selectively favors large fires. The example of the Eagle Fire demonstrates that policy responses to fire related hazards are not directly applicable to policy responses that address medical emergencies that occur on both large and small fires. Policy and equipment updates provided to

mitigate fire related hazards are applicable to both large and small scale fires because small fires can potentially become big fires, meaning many of the factors are the same at both scales – however, when considering medical emergencies, the designation of large or small scale may directly dictate the likelihood that contracted Emergency Medical Providers will be present.

Implications of the Eagle Fire: As was shown in the Background Chapter, large and small scale wildfires are administratively designated by the incident command staff who will dictate the number of resources needed for a particular fire, the estimated duration of the fire, and the geographic extent that is impacted. The determination of large or small scale leads to a determination of the number of resources needed to address the incident. As a result, the designation of large or small can directly enable or constrain firefighter responses to fire management scenarios – in this case, medical emergencies.

When considering the policy changes to come from the Eagle Fire, the aforementioned points are important. Though the traditional reactive approach has been reasonably effective at addressing fire related hazards at both large and small scales, this approach does not transfer when applying it to medically related hazards. In this case, the updated "Emergency Medical Care Guidelines" were created to streamline communications between the firefighter on scene and the emergency dispatcher in order to hasten the appropriate medical response. While this was a useful change, it is important to consider the substance of the guidelines in relation to the amount of medical training provided to firefighters – is a 16 hour long First Aid/CPR class really enough to enable firefighters to address questions such as "Nature of Injury," or "Transport Priority?" In the case of the Eagle Fire, the misidentification of a broken femur directly led to a slowed response time.

Another change to medical policy that came several years after the Eagle Fire, but still inspired by the event, were the "New Minimum Standards for Medical Units," which greatly helped to increase the number of contracted Emergency Medical Providers on wildfires. While this was a welcome change, the presence of contracted Emergency Medical Providers is more likely on large, long duration incidents that can be planned for. Additionally, the "Emergency Medical Care Guidelines" are arguably less useful on small scale incidents where Emergency Medical Providers are less likely to be present because these guidelines do nothing as far as actual patient care is concerned. On large fires where medical professionals may be standing by, more efficient communications protocol will likely help get the proper care to the affected individual faster – but on small fires where firefighters are more likely to be on their own and far from patient care, the moments saved from efficient communication may not be good enough. In other words, the only way to address medical emergencies that occur on small fires is by providing more emergency medical training to fire crews so they can provide patient care if no one else is around. In effect, the designation of scale has substantive political implications for those on the ground.

Section 5.1 – E – Summary of Reactive Policy Production. This section has evaluated reactive approaches to safety policy production by considering how a focusing event produced new knowledge about firefighter safety which was applied to specific policies and circulated over space to affected individuals. Because knowledge production takes place during the response and recovery phases, there is limited time to learn from the focusing event, meaning policy updates may not be fully informed when using this knowledge. Additionally, because this approach requires worst-case-scenario accidents to occur, many of which happen on large scale fires, these scales are looked at and used as the preeminent platform for policy reform, thereby

missing issues on smaller scales that may not attract as much attention. When considering hazards related to the fire itself, this approach may be useful because many similar hazards exist on both large and small fires. When considering medical emergencies, however, these approaches do not address nuances between large and small scale fires. These insights have been summarized in the table below:

Table 5.1

EVOLUTOIN OF REACTIVE POLICY PRODUCTION

	Fire Name	Production	Application	Circulation
1910	Fires of 1910	Many large focusing events produced new knowledge	Knowledge applied to 10 AM Suppression Policy to mitigate fire related hazards	Circulated via "The Suppression Policy of the US Forest Service" – Intended for small fires
1949	Mann Gulch Fire	Many large focusing events produced new knowledge	Knowledge applied to 10 & 18 to mitigate fire related hazards	Circulated via the fireline handbook – applied to large and small scales
1994	South Canyon Fire	A single focusing event produced new knowledge	Knowledge applied by providing more/better safety equipment to mitigate fire related hazards	Circulated in the form of radios and weather training/information – applied to large and small scales
2008	Eagle Fire	A single focusing event produced new knowledge	Knowledge applied to "Emergency Medical Care Guidelines" and New Minimum Standards to mitigate medical related hazards	Circulated via IRPG – intended for both large and small scales, but did not follow same process as previous examples

Section 5.2 – Reactive Policy – What Knowledge Counts

Accident investigations serve as one of the primary means by which federal fire management agencies produce knowledge about the safety hazards faced by firefighters. If accident investigations tend to focus on worst-case-scenario accidents that have occurred on large fires, how may this influence the types of hazards fire agencies are able to address with the information they have available to them? How might focusing on the most visceral accidents cause fire agencies to miss less visceral safety hazards? This section will consider how

knowledge about death and serious injury tend to count more when applied to policy rather than other, less serious safety concerns.

Section 5.2 – A – Death and Serious Injury. As was mentioned in Chapter 4, the Lessons Learned Center (LLC) is an organization tasked with compiling safety data for firefighters. Because accident investigations tend to favor worst-case-scenario accidents occurring on large scales, the information generated by the LLC similarly reflects this focus. Many of the statistics the LLC generates come from the NWCG who are responsible for collecting and reporting "safety grams" that compile raw safety data for all five federal agencies. In order to determine what types of information they wish to collect, the NWCG created specific "reporting criteria" in order to establish the types of safety issues they intend to focus on. According to this criteria, "Safety gram data will include fatalities, entrapments, burnovers, and other potentially life threatening accidents and injuries" (NWCG Risk Management Committee, http://www.nwcg.gov/committees/risk-management-committee-rmc-safety-grams, accessed 04-04-2016).

In other words, the reporting criteria that dictate much of the information that is tracked by the NWCG selectively favors "potentially life threatening" safety hazards. These reporting criteria have helped to establish a precedent for creating knowledge about safety hazards that are only worst-case-scenario, many of which occur on large fires. In fact, there is virtually no statistical tracking of minor injuries at the federal level. Minor injuries such as slips, trips, falls, bug bites, sprained ankles, or mild heat disorders that may be uncomfortable but not life threatening are not presently tracked by federal agencies for the purpose of understanding these types of hazards. Though these types of issues may not excite policy makers in the way a visceral focusing event might, there types of medical issues are much more common and are the type of

thing that might be easily treated in the field by a firefighter with some amount of advanced medical training. With that in mind, there is a single study that investigates injury rates for firefighters, however it was not produced by federal land management agencies.

Section 5.2 – B –Minor Injuries. In 2010, Britton published *Risk Factors for Injury among Federal Wildland Firefighters in the U.S.* (Britton, 2010). As an epidemiologist, she attempted to investigate rates of minor injuries on wildfire incidents. In her study, injuries were defined as "slips, trips, and falls," and selectively looked for these types of incidents. Her study revealed that there are a substantial amount of injuries reported daily on large Type 1-3 wildfire incidents, with an average for 13.2 per 10,000 worker days reported – which was approximately 12-14 injures reported daily in the U.S. in the period of 2003-2007 (Britton, 2010). Even more interesting, Britton found that there were far fewer injuries reported on the largest Type 1 fires (3.61 per 10,000 worker days, ~3-4 injuries reported daily) as compared to Type 2 (11.69 per 10,000 worker days, ~11-13 injuries reported daily) and Type 3 incidents (15.15 per 10,000 worker days, ~15-16 injuries reported daily) (Britton, 2010). These results are noteworthy because they demonstrate not only that minor accidents occur much more frequently than worst-case-scenario accidents, but that there are more accidents on smaller Type 3 incidents as compared with larger Type 1 incidents. It is speculated by Britton that large fires produce fewer injuries because there is more planning and infrastructure in place to deal with any issues that arise, and because firefighters receive more informed briefings and may be provided with more equipment to deal with the larger, more established incidents (Britton, 2010).

While Britton's insights are extremely useful considering the dearth of statistical data on injury rates, her results are far from complete. With that in mind, the information she did provide helps to highlight where the largest shortcomings exist in terms of our knowledge about safety

hazards. For her study, she was limited to looking at injury rates on only large Type 1-3 wildfire incidents, and because there is no formal tracking of injury data, she had to utilize workman's compensation claims filed from 2003-2007 to establish a basis for injury rates at these scales (Britton, 2010). It is important to note that workman's compensation claims are filed to provide for treatment of an injured employee – they are not used by the federal government to track safety statistics. Furthermore, she had to acquire these statistics through the respective Department of the Interior and United States Department of Agriculture workman's compensation filing systems, which are different for the two agencies (Britton, 2010). The DOI uses the Safety Management and Information System (SMIS) to track workman's compensation claims, while the USDA uses the Safety and Health Information Portal System (SHIPS). As a result of this sampling mechanism, this study is only able to comment on the types of information found from available workman's compensation claims, thus limiting the breadth of information that could be gathered in this manner.

Finally, the process of acquiring these statistics also revealed that neither of these agencies require the tracking of workman's compensation claims for smaller Type 4-5 incidents. This is because large fires are managed through a central "Incident Command Post" where all paperwork, including workman's compensation claims, are filed when they occur on large incidents. Smaller Type 4-5 incidents, on the other hand, are usually handled locally by the duty station responsible for their own employees. As a result, there is virtually no way to use workman's compensation claims to track injuries on smaller Type 4-5 fires. If the criteria used by federal fire agencies to collect safety statistics selectively look for life threatening hazards, what types of knowledge about non-life threatening hazards might we be missing? How might an understanding of less serious (but likely more common) safety hazards such as minor injuries

change the way safety is viewed? Would more medical training for firefighters give them the knowledge to address these small issues before they turn into large issues? While efforts to account for safety at the federal level are highly skewed towards certain incident types, examples exist within agencies that are more proactive when attempting to address shortcomings in safety policy.

Section 5.3 – Projecting the Outcomes of Proactive Approaches – Social Learning at Agency and Regional Scales

The previous section discussed how a reactive approach to policy production has characterized the evolution of firefighter safety policy and how safety statistics that favor death and serious injury tend to "count" more when characterizing and addressing firefighter safety issues. In this Section I will use the same criteria of production, application, and circulation to assess the effectiveness of proactive approaches to policy production at both large and small scales of wildfire incident management. Though the *Dutch Creek Accident Investigation* was the first major medical policy change to occur for federal firefighters, there were still critical shortcomings – mainly related to the amount of standardized medical training provided to firefighters. The policy updates that came from the Eagle Fire were done comprehensively at the federal level and follow the traditional reactive approach to policy production, but other examples exist within individual agencies that take a proactive approach to policy production by instituting social learning. These two examples include the Forest Service Region 4 – Emergency Medical Services Guidelines, and the Bureau of Indian Affairs – Wildland Fire First Aid Project, and are discussed in the remainder of this chapter.

Section 5.3 – A – Forest Service Region 4 – 6725 Emergency Medical Services.

Production: In 2010, the Forest Service created a new risk management tool known as "Agency Safety Learning Journeys" which were intended to proactively seek the input of Forest Service employees through conversations about safety in the workplace (http://www.fs.fed.us/rm/human-factors/projects/learning-journeys/, Accessed 04/01/2016). As part of these safety journeys, Forest Service employees throughout the country were required to go to workshops and discuss safety concerns with other Forest Service employees. While these initiatives were required for the entire Forest Service, the outcomes of safety learning were applied differently within different regions of the Forest Service.

In this example, Forest Service Region 4, which includes Nevada, Utah, most of Idaho, and a portion of Western Wyoming, safety journeys were used as a risk management tool to address hazards faced by firefighters when attempting to provide care to a patient on the fireline (Forest Service Manual – Intermountain Region 4, p. 3). The safety journeys were useful in producing new knowledge in a proactive way in that the safety journeys helped to elicit authoritative knowledge about safety concerns among those involved with fire management. Rather than requiring a focusing event to justify the investigation of a safety concern, the approach of asking groups of affected individuals proved to be a useful means of producing new knowledge about emergency medical response for wildland firefighters. Though this policy update was not universal throughout the entire Forest Service, Region 4 was able to utilize this knowledge and apply it to updated policies.

Application: Each agency, though through different means, establishes that all field going employees must receive the 16 hour long First Aid/CPR class. The Forest Service does this through the *Forest Service Health and Safety Code Handbook, 6709.11*. While this is the standard that is set for the entire Forest Service, Region 4 has gone considerably farther by

including more comprehensive language that allows for the hiring of Emergency Medical Providers by applying knowledge from the safety journeys to Region 4 safety policy. They are clearly setting a much higher standard within the document when it is stated that the update:

> Removes language that requires units adhere to individual state policies or rules with regards to using employees that serve as Emergency Medical Providers. Assures employees that state rules regarding requirements for employees to be licensed or certified in their particular state do not apply to Forest Service employees in performance of Forest Service duties.

The document continues on by saying:

> The key component to all of these levels of "Emergency Medical Provider" is that the employee is designated as an EMP in the Unit's Emergency Medical Response Plan and that the employee is current with regards to certification (or licensure) at the listed level of qualification. All qualified Emergency Medical Providers will meet these two standards.

In other words, the jurisdictional issues related to emergency medical qualifications that are issued on a state by state basis have effectively been bypassed through this policy. As a result, this policy allows for Region 4 firefighters to hire and train fully qualified Emergency Medical Providers within the state of NV, UT, ID and WY.

Circulation: This regionally based effort is able to go farther than the federal government as a whole because Region 4 employees have independently laid the groundwork to form partnerships with state and local medical directors who are willing to sponsor their emergency medical personnel. Though other regions could potentially do this, it is uncharted territory that is not supported at the federal level through policy or through budgeting. The only way this is currently possible is to establish an individual medical director for each state – in other words, if they do not have a medical director specific to that state, they cannot legally operate as Emergency Medical Providers, but if a medical director has been established for multiple states,

this language allows for Forest Service Emergency Medical Providers to legally practice in multiple states as a result of 6725 Emergency Medical Services.

Though this appears to be a massive improvement to emergency medical policy from the outset, it is in its infancy and is far from representing the norm. Because this is a regionally led effort and not sponsored by the federal government, individuals within the region must make this initiative a priority over other things that also need attention. Just because this region has gone significantly further in providing costly medical training does not mean they will see a larger budget to account for these initiatives. As a result, they must work within a limited budget in order to make the most of what they can. While the language in 6725 Emergency Medical Services does legally allow Forest Service Region 4 to provide more medical training, they do not have the financial resources to expand the program. Additionally, Forest Service Region 4 employees that possess these advanced qualifications are only legally allowed to assist other Forest Service employees, but not other federal firefighters working for different agencies, even if they are on the same fire.

Section 5.3 – B – Bureau of Indian Affairs Wildland Fire First Aid Project.

Production: In this case, the production of new knowledge about firefighter safety was done proactively, though it differs from the approach that was used by Forest Service Region 4 through the use of "Safety Journeys." In this situation, experienced individuals within the agency realized that their firefighting staff required more medical training for their employees to successfully accomplish their jobs. As a result, a new program was initiated with a multi-year testing phase to assess the overall effectiveness of the policy. According to the BIA Wildland Fire First Aid Project initiative:

> During wildland fire incidents, there are two medical support needs Indian Country needs to provide to firefighters. The first is to have emergency medical systems (EMS) responders

> provide initial care, and if necessary, to safely transport patients to facilities where definitive care can be given. The second is to provide Indian Country employees adequate first aid training suitable for their wildland work environment.http://www.indianaffairs.gov/nifc/safety/firstresponder/index.htm(Accessed 04/01/2016)

When considering the reactive approach that has traditionally characterized the production of firefighter safety policy, new knowledge is produced following a focusing event and applied to a policy update. In this case, those steps were reversed – there was a basic understanding that BIA firefighters were not provided with substantial medical training which helped to inform the creation of the BIA "Wildland Fire First Aid Project." The goal is to assess the impacts of implementing this policy over a multi-year time period to evaluate the effects this policy will have. As a result, the production of new knowledge is coming after the policy was created which can later be used to tweak the policy, exemplifying characteristics of social learning.

Application: Instead of waiting for an event to spur the creation of updated safety knowledge which could then be applied to policy, the BIA created the policy first, which can then be updated as new knowledge regarding that policy is attained. This came in the form of the "Wildland Fire First Aid Project" which provides training to be certified as a "Wilderness First Responder." Where the current federal standard of First Aid/CPR training is only a 16 hour long class, the Wilderness First Responder is an 80 hour class that trains firefighters about situations they may reasonably encounter in the field. According to the initiative;

> The focus of this training is to provide wildland firefighters with the skills to help them manage complex logistical medical transports, respond to prolonged patient care, mitigate extreme environmental conditions, identify and use improvised equipment and how to interface with local EMS responders. http://www.indianaffairs.gov/nifc/safety/firstresponder/index.htm(Accessed 04/01/2016)

The regular First Responder class has several hours dedicated to infant CPR, something that may be useful to know but is unlikely for wildland firefighters to deal with out on the line.

Contrastingly, the Wilderness First Responder course trains people how to identify broken bones, how to give emergency care to an individual, and potentially how to transport them to a place where more medical help can be accessed. These training periodss often involve teaching individuals how to make use of the things around them in the event of an emergency, such as how to create an immobilizing splint from a hand tool or stick. This training covers many things that firefighters would actually encounter in the field.

Circulation: The Wilderness First Responder training is not considered advanced medical training which means that those possessing the Wilderness First Responder training cannot be held legally accountable like an advanced Emergency Medical Provider. In many ways, this is advantageous to federal fire agencies, which is part of the reason why the BIA has adopted this approach. The Wilderness First Responder training is legally viewed the same as the First Aid/CPR training – it is not advanced enough that it requires medical direction. According to the initiative;

> It does not replace State licensed EMS personnel who respond to Wildland fires; nor create a "responder" Wilderness Medical qualification, which is not recognized within the State EMS medical "responder" structure.http://www.indianaffairs.gov/nifc/safety/firstresponder/index.htm (Accessed 04/01/2016)

Because of this, it is possible for firefighters to receive training that is relevant to what they might encounter in the field, but they can get around many of the legal barriers that are currently a barrier to creating standardized medical training. Though this is not highly advanced training, it is considerably more than what is presently given and provides firefighters with more training to potentially help stabilize a patient while more advanced care is on the way. It is important to note that like the Forest Service Region 4 example, these updated policies only apply to firefighters working for that agency, meaning that firefighters could be working alongside other federal

firefighters on the same fire, but because of rules that are specific to individual agencies regarding medical policy, a medically qualified firefighter working for the BIA is not legally allowed to assist a firefighter working for the NPS.

Section 5.3 – C – Summary of Proactive Approaches to Policy Production. In these circumstances, the proactive approach to policy production is useful in that it does not require a visceral focusing event to spur organizational learning. Rather, by implementing social learning through a proactive pursuit of knowledge about firefighter safety during the preparedness and mitigation phases, this approach allows for a longer window of opportunity to create and adjust firefighter safety policies. The proactive approach to safety policy production has been summarized in the table below:

Table 5.2

PROACTIVE APPROACHES TO SAFETY POLICY PRODUCTION

	Policy	Production	Application	Circulation
2013	Forest Service Region 4 – 6725 Emergency Medical Service Guidelines	"Safety Journey" sessions that revealed a desire for more medical training	Information fro "Safety Journey's" applied to FS Region 4 – 6725 Emergency Medical Service Guidelines – applies to medical related hazards	Only applies to Forest Service employees in Region 4 (NV, UT, pats of WY and ID)
2013	Bureau of Indian Affairs – Wildland Fire First Aid Project	Authoritative knowledge applied to policy – designed for reevaluation following implementation	Knowledge applied to BIA Wildland Fire First Aid Project – updated after future evaluations – applies to medical related hazards	Only applies to BIA employees – not for all federal land management agencies

Section 5.4 – Confront the Tradeoffs and Decide

As was mentioned in the Research Context Chapter, "there is substantial confusion surrounding the meaning of scale as *size* –what is also called a horizontal measure of 'scope' or 'extensiveness' – and scale as *level* – a vertically imagined, 'nested hierarchical ordering of

space (Howitt, 2002, 305)'" (Marston, Jones, and Woodward, 2005). In this case, scales of large and small are in reference to the size of a fire. Though a specific geographic cutoff point is not required to determine a fire as large or small, large fires generally impact a much larger area for a longer time – and a result, warrant the use of more firefighting resources. To this point, I have compared both reactive and proactive approaches to safety policy production to evaluate which approach does a better job of addressing safety hazards at both large and small scales of incident management.

As has been stated, the reactive approach does a relatively good job at addressing hazards on large and small scales when applied specifically to fire related hazards, but falls short when applied to medical related hazards. When the reactive approach was applied to the Eagle Fire, the focus on worst-case-scenario accidents meant that the knowledge produced from the investigation could only inform issues on large fires. As a result, the corresponding policy updates tended to address medical response on large fires only. The proactive approach, on the other hand, did not focus on worst-case-scenario medical hazards occurring on large fires, so rather than try to think of ways to mitigate the worst accidents, the proactive approach did not selectively look for any specific types of accidents, which resulted in two policies that addressed actual patient care rather than just hastening response to a serious accident. The table below summarizes the scales at which these approaches are effective in regards to emergency medical policy creation:

Table 5.3

Medical Policy Production

Scale	REACTIVE	PROACTIVE
LARGE FIRES	Yes – more resources present, EMP's more likely to be present	Yes – more resources present, EMP's more likely to be present
SMALL FIRES	No – fewer resources, harder to preposition EMP's	Yes – fewer resources, but with enough medical training to stabilize patient until EMP's arrive

In Chapter 4, I discussed in Step 6 the ways to "Confront the Tradeoffs" and provided three possible alternatives that could be used to approach the expansion of emergency medical policy for federal firefighters. This included: 1) expanding the use of contracted non-federal Emergency Medical Providers for firefighters working on small fires; 2) providing federal firefighters with advanced medical training to become qualified Emergency Medical Providers; or 3) increasing first aid training with a more comprehensive course such as the Wilderness First Responder. All three of these options will be discussed in this section.

Section 5.4 – A – Expand Contracted Emergency Medical Providers. As has been discussed, the "New Minimum Standards for Medical Units" helped to expand the presence of contracted Emergency Medical Providers on wildfire events, but this expansion applies more to large wildfires where long range planning can occur. Because small fires are much more frequent and cannot be predicted, it would likely not be practical to attempt to expand the provision of contracted Emergency Medical Providers to account for every small fire. In order to do so, agreements with individual contractors would have to be made, and more contractors would have to be hired to stand by on incidents where something may or may not happen at the expense of responding to other non-wildfire related medical calls. While the expansion of contracted

Emergency Medical Providers is a practical approach to addressing medical issues on large fires, it does much less to help firefighters working on small scale incidents.

Section 5.4 – B – Create Agency Based Emergency Medical Providers. Of the examples presented, Forest Service Region 4 – 6725 Emergency Medical Services is the best example to reveal issues that can arise as a result of attempting to implement fully qualified Emergency Medical Providers. This approach would help to address the issue of emergency medical response on small wildfires because it provides the same advanced Emergency Medical Provider qualifications for firefighters as the contracted providers have, meaning firefighters would possess the knowledge and training to address serious medical issues, should they arise. Despite this seemingly massive change, this approach is not without problems. Firstly, qualified Emergency Medical Providers in this region must possess the correct qualifications, and more importantly, must be supported by Medical Directors in each state they wish to operate in. Because this is not a nationally based effort, creating and maintaining agreements with Medical Directors in various states will only continue if Region 4 employees foster those connections on their own.

Additionally, it could be argued that providing firefighters with the same qualifications as full time contracted Emergency Medical Providers could change the firefighters "scope of duty" – because wildland firefighters are tasked with the specific mission of mitigating wildfires, and because the use of Emergency Medical Providers on fire crews is intended for other crewmembers and not the public at large, would providing these advanced qualifications cause conflictions of duty if a fire crew was responding to a wildfire at the same time an unrelated medical emergency occurs in the same area with a member of the public? If possessing advanced medical qualifications detracts from the primary mission of managing wildfire, this may not be

an optimal approach within the current framework of policies – though few firefighters would likely argue with the standard provision of fully qualified Emergency Medical Providers.

At present, this policy it is in its infancy and is not supported at the federal level, meaning there is no guarantee the policy will remain in place. Just because this region has gone significantly further in providing costly medical training does not mean they will see a larger budget to account for these initiatives. As a result, they must work within a limited budget to make the most of what they can with what they have. While this relatively new program may not have all the support it needs to succeed on a wider level, this example represents social learning occurring within an individual agency by recognizing the need for more advanced medical training despite the fact that the federal government still has not caught up yet.

Section 5.4 – C – Increase First Aid Training Requirements. Finally, the initiative led by the Bureau of Indian Affairs known as the Wilderness First Aid project demonstrates what may be the most practical option for implementing more medical training. This is because this particular qualification is not considered as advanced as the training required to become a legal Emergency Medical Provider and therefore does not require specific state based qualifications or a medical director, meaning this approach bypasses many of the legal and jurisdictional issues tied to providing fully qualified Emergency Medical Providers. As a result, the training is not advanced enough to significantly change firefighter "scope of duty."

Though this is still considered "First Aid" training, the Wilderness First Responder goes significantly beyond the 16 hour class that is currently provided. Where the current class briefly covers a wide range of potential medical issues, including a substantial portion that trains firefighters on infant CPR (which is highly irrelevant to the types of hazards they may face), the Wilderness First Responder class is an 80 hour long intensive course that familiarizes firefighters

with issues they may encounter in the field, such as how to identify common injuries/illness related to overexertion or environmental factors, as well as how to stabilize and transport patients when in inaccessible areas. While the addition of this training would unquestionably cost more than what is currently offered, it would not be nearly as costly as it would be to provide fully qualified Emergency Medical Providers on fire crews. Though the qualifications are not as advanced, they are likely enough to help firefighters effectively utilize the Emergency Medical Care Guidelines and to stabilize and transport a patient, either on large or small fires.

Section 5.4 – D – Decide. In confronting the tradeoffs between the three approaches to addressing emergency medical response for federal firefighters, I argue here that the most practical approach to addressing medical emergencies for firefighters on both large and small scales within the current framework of firefighter safety policy would be to follow the lead the BIA has taken with the "Wildland Fire First Aid Project." While this alternative represents a proactive approach to addressing the very real issue of medical training for federal firefighters, there are other things federal fire agencies could do to help inform future policies; namely, by considering the safety statistics that are tracked (or not tracked), and which scales those statistics tend to favor. These insights are summarized in Table below:

Table 5.4

	REACTIVE Contracted EMP's	PROACTIVE Federal EMP's	PROACTIVE Advanced First Aid
Legal or Jurisdiction Issues to Overcome?	NO	YES	NO
Only Practical for Large Wildfires?	YES	NO	NO
Possible change to Scope of Duty?	NO	YES	NO
Required Medical Director?	NO	YES	NO
Substantial Time/Cost Commitment?	YES	YES	NO (As compared with the other options)

These are important points to consider within the context of the social construction of scale. The designation of wildfire incidents as large or small are determined on an individual basis by the incident command staff on the scene of a particular fire. The designation of large or small has a direct impact on the number of resources that will be available to engage an incident, which means the designation of scale may enable or constrain the actions incident command staff are able to take, based on the number of resources present. When considering the case of emergency medical response, policies exist that make it more likely for Emergency Medical Providers to be present on large fires, but this policy does much less to account for medical emergencies that can occur on small fires, because they are much more difficult to plan ahead for.

The preference of fire agencies to focus on the most visceral accidents, many of which happen on large scales, may have the effect of shaping the types of policies that are created. Though there are specific criteria an incident must meet to be considered as "large," there is

nothing natural or predetermined to make this designation a fact, because both large and small scales are socially constructed on an individual basis. However, once these socially constructed designations are made, there are substantive material impacts that affect those working within these scales of incident management.

Section 5.5 – Spaces of Vulnerability

While it is clear that a proactive approach to policy production is more sensitive to scalar nuances than reactive approaches, it is nonetheless important to consider the geographical underpinnings of the two examples of proactive medical response policies. As was mentioned in the Background Chapter, each of the five land management agencies have differing functions and as a result define space differently in that the "regions" for each agency are not the same for all. Though the missions of each respective agency differ from one another, they all overlap in regards to wildland fire management. To confront this issue these agencies have standardized policies through the *Guidance for the Implementation of Wildland Fire Management Policy* document, which standardizes all policy creation – with the exception of medical training policy, which is handled by each agency. Because agencies define space differently from one another, the corresponding medical policies intended to apply within those spaces will only apply to those respective employees.

In the case of the Forest Service Region 4 updates, these policies only apply within Region 4 – and what is more, they only apply to other Forest Service employees. That means that if NPS and Forest Service Region 4 firefighters respond to a fire within Region 4 and a medical emergency occurs with a NPS employee, the Forest Service Region 4 Emergency Medical Providers would not be legally allowed to assist the NPS employee. Another possible circumstance would occur with a Forest Service Region 4 employee working on a fire outside of

Region 4 – in which case, any of the policy updates to come from 6725 Emergency Medical Service Guidelines no longer apply. In the case of the BIA Wildland Fire First Aid Project, these updates similarly apply only to other BIA employees. There is no regional distinction here because this project was not specific to an individual BIA region, however the situation of not being able to assist non-BIA employees is the same.

With this in mind, it may be possible for federal firefighters from different agencies to be working alongside each other on the same fire, but because of the respective policies of their agencies, along with how those policies are implemented over defined spatial regions, that some firefighters may have more medical protection in place than other federal firefighters. In this way, the incongruence of medical policy among and within land management agencies creates spaces of vulnerability on wildfires where some firefighters are more vulnerable in the event of a medical emergency than others. Because these are all firefighters working for the federal government, and because medical response is a high priority safety issue, this circumstance creates a situation that is not equitable for all federal firefighters.

The discussion regarding the social construction of scale once again becomes useful for understanding this situation to address scale in reference to level, rather than size. As was discussed in Chapter 2, "operational scale" can refer to different levels within an organization – in this case, federal fire management agencies organize themselves as a cohesive group that must all coordinate on many fire management issues as directed in the *Guidance for the Implementation of Federal Wildland Fire Management Policy*, which could be said to characterize the largest scale of the federal fire service, where all five agencies coordinate on standardized procedures. Within the hierarchy, however, there are things that are not standardized – such as medical training and response protocol – which is generally handled at the

individual agency scale. The BIA Wildland Fire First Aid project is a good example of an agency level policy that applies to them and no other fire management agency. Within the agency, there is a regional scale, where still more policies maybe created that only apply within this nested hierarchy, such as Forest Service Region 4 6725 Emergency Medical Service Guidelines exemplifies. From here, scales could continue to be broken down to represent specific duty stations, crews, or even the scale of the body of individual firefighters, though this project does not consider scales smaller than the regional scale. While these scales are useful references for understanding how medical policies play out over space, it is important to remember that these scales are not natural or predetermined – rather, they are socially constructed, and because certain policies may only apply at certain levels of governance, the construction of organizational levels over space can have direct material impacts regarding where certain policies apply (or to whom they apply).

Furthermore, operational scale is an important consideration in the context of reactive and proactive policy because these approaches are not being utilized at the same operational scales. In the case of the medical policies that followed the Eagle Fire, a formal accident investigation produced recommendations that were applied to policies which were intended for all federal firefighters at the scale of the fire service. The proactive policies, however, are happening at agency or regional scales and only apply to firefighters represented by those agencies or regions. As has been shown, I have determined that proactive approaches to policy production are more sensitive to safety hazards that occur on both large and small scale wildfire incidents – yet these policies do not apply to all federal firefighters. This recognition harkens back to the concept of "scale bending" in Chapter 2. Scale bending helps us to understand how "entrenched assumptions about what types of social activities fit properly at which scales are

being systematically challenged and upset" (Marston, Jones and Woodward, 2005). In this case, smaller scales of fire management governance at regional or agency scales are challenging the approach used to traditionally create safety policy by taking policy actions into their own hands.

Why is it that changes are being made at smaller scales of governance that do not impact all firefighters? Is this because the traditional reactive approach is not working well enough, thus forcing smaller scales of governance to account for safety on their own? Is it that these scales of governance are able to operate differently in regards to safety policy creation and have advantages that the fire service as a whole does not? What is it that has prompted individual agencies to address medical response issues at this time, as opposed to other times throughout history? While answers to these questions can be speculated, the example of a new approach to policy production that is more sensitive to issues that occur on either large or small scales are important points to note. Though no proactive policies have been created that address the largest levels of the entire fire service, these examples may help to show both a need for, and a path forward to, a better way of creating safety policy that addresses more safety issues faced by firefighters.

Chapter 6: Conclusion

This project has investigated my central research question: How are reactive and proactive approaches to federal wildland firefighter safety policy creation produced, applied, and circulated to address safety issues related to emergency medical response on both large and small scale wildfires and at different levels of organizational management? While the history of safety policy creation has been marked by catastrophic punctuations that led to organizational learning, I suggest in this project that a reactive approach to safety policy production is not ideal for creating the most comprehensive safety policies possible. Many of the largest safety policy changes to occur throughout the history of the federal fire service in the United States led to improved working conditions for firefighters, but these changes only came after visceral, worst-case-scenario accidents occurred on large fires. Following this model, focusing events were used to spur an accident investigation where new knowledge was produced during the response and recovery phases of disaster management, then applied to specific policies, and circulated over space.

Section 6.1 – Reactive Policy Production and Incident Size

In the first several decades of fire management, multiple punctuations were needed to trigger policy changes, but over time, fire agencies responded more acutely to individual focusing events. This approach to policy creation was relatively effective in the earlier periods of federal fire management, but most of these safety polices were created to mitigate hazards related to the fire itself. Since small fires can turn into large fires, many of the same safety concerns could plausibly exist on both incident types – so by accounting for the worst outcomes, protocols that were developed from knowledge about a tragic incident were relatively effective at addressing safety concerns on both large and small fires. It is important to note, however, that

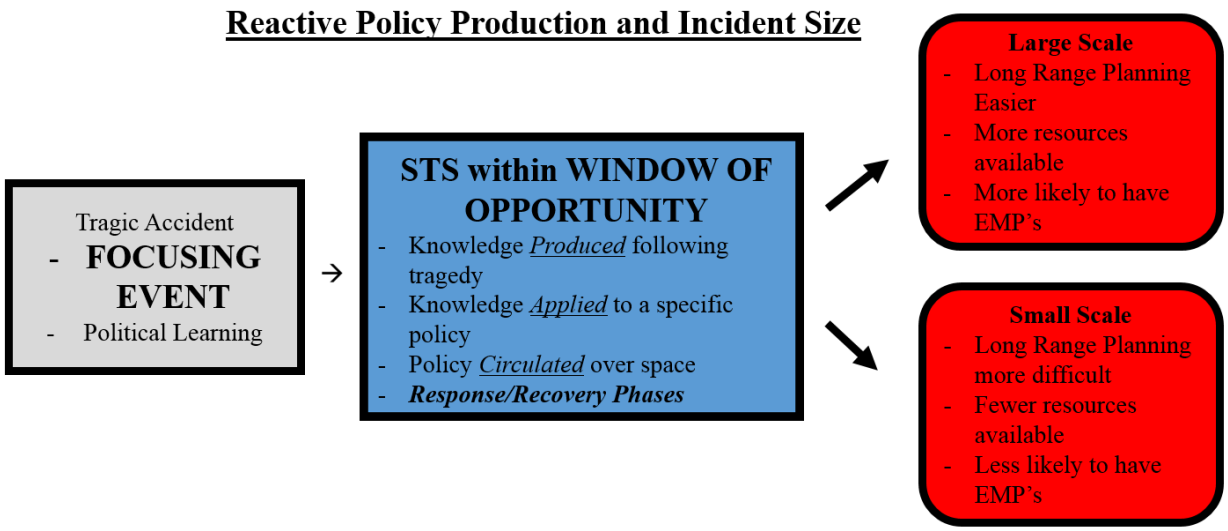
because reactive investigations occur during the response and recovery phases of disaster management, the window of opportunity for policy change is only open as long as long as policy makers are focused on that specific issue.

When the reactive approach was applied to a different type of accident, such as the medical emergency that occurred on the Eagle Fire, this approach was less useful. In this case, an accident investigation occurred shortly after the tragedy. Since this investigation was focused explicitly on a worst-case-scenario medical hazard that occurred on a large fire, the resulting knowledge was only useful for informing policy makers about other worst-case-scenario medical emergencies that occurred on large fires. In this case, some of the policy changes to come from this event focused on streamlining communications protocol during medical emergencies and creating qualifications to expand the use of contracted Emergency Medical Providers. Though these were useful and welcome policy changes that comprehensively addressed emergency medical response for federal firefighters for the first time, the impacts of this policy are incongruent when applied to either large or small scales.

On small scale fires, the updated Emergency Medical Care Guidelines may indeed be useful for hastening the proper medical response, but if the injured firefighter is in a remote location far from help, the moments saved may make little difference. Additionally, small fires are much harder to predict than large fires which means planning ahead and prepositioning contracted Emergency Medical Providers is logistically infeasible. As a result, the policy updates that came following the Eagle Fire were useful on large scale incidents, but less useful on small scale incidents. Without providing actual patient care, these policy updates do not go nearly as far as they could, and because emergency medical protocols favor large scale incident management, the designation of incident size can directly enable or constrain the responses

incident command staff have available to them when confronting a medical emergency. The relationship between the reactive policy approach and incident size is shown in Figure 6.1 below:

Figure 6.1

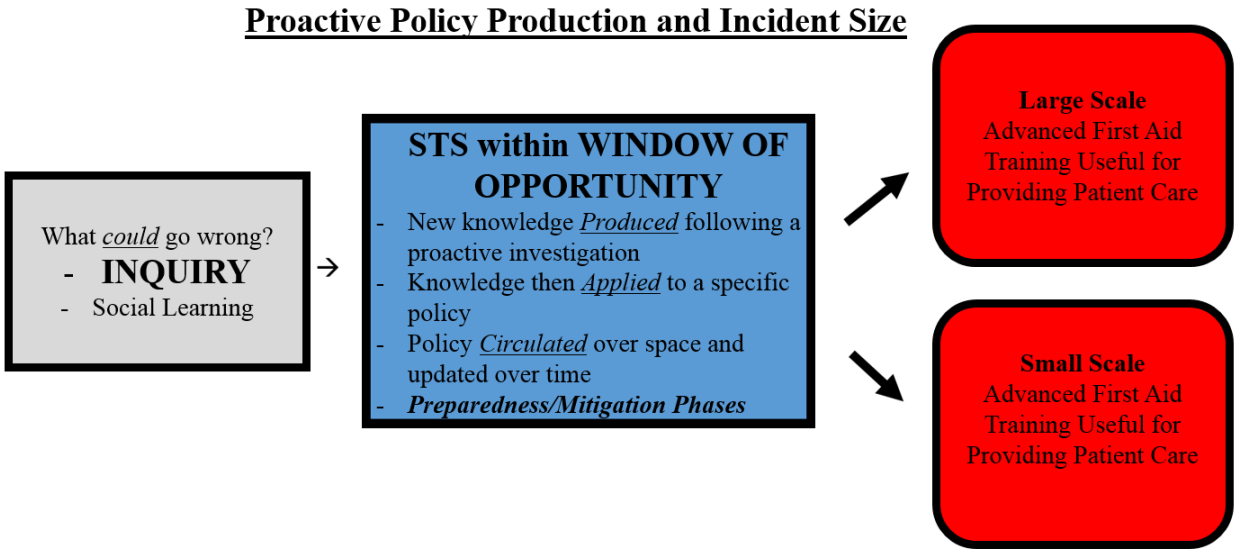


Section 6.2 – Proactive Policy Production and Incident Size

Rather than waiting for a specific accident to occur to warrant the investigation of a safety issue, smaller scales of wildfire organizational management have proactively searched for ways to address the issue of emergency medical response for firefighters within their agencies, or regions within agencies. In this case, a specific focusing event was not needed to trigger an investigation – instead, the production of knowledge was done proactively during the preparedness and mitigation phases of disaster management, applied to policies that could be flexibly changed and updated over time, and circulated within the individual agencies or regions where they were created. Since the proactive approach triggers investigations during the preparedness and mitigation phases of disaster management, the window of opportunity for policy change is open longer because it is not dependent upon a specific, visceral focusing event. While I argue here that the proactive approach to policy production is much more effective at

addressing emergency medical response at smaller scales of incident management because they account for training related to patient care, it is important to note that the proactive approach to policy production is not occurring for all firefighters, but instead is occurring at smaller scales of organizational management. The relationship between proactive approaches and incident size is shown in Figure 6.2 below:

Figure 6.2



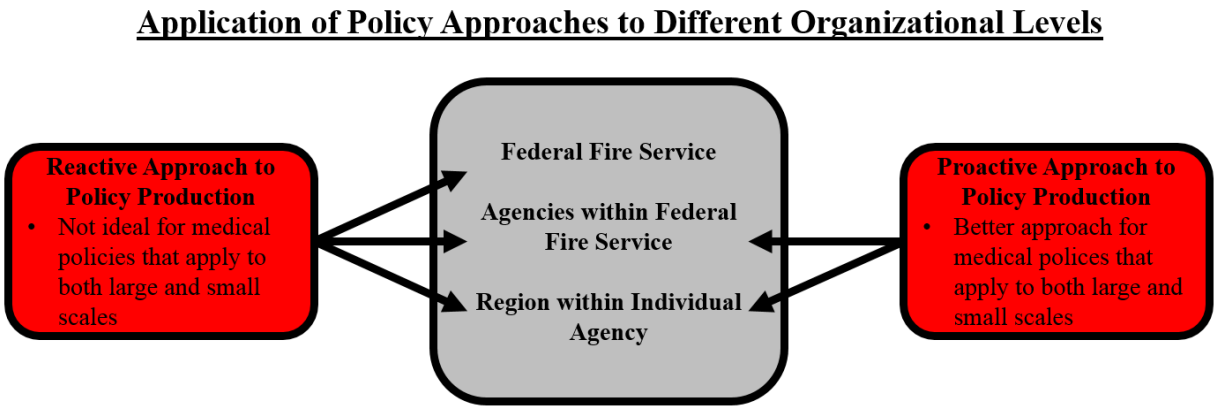
Section 6.3 – The Proactive Approach and Organizational Levels

Because the standards for medical training among the five fire agencies are incongruent, where some agencies or regions within agencies have gone further than others in terms of providing for more comprehensive medical training policies, it is possible to have firefighters working for the federal government on the same fire, but represented under different safety policies. As a result, the patchwork of approaches to addressing medical training and response may create spaces of vulnerabilities where some firefighters are represented by better safety policies than other firefighters on the same fire. This situation clearly demonstrates that not all

firefighters are equitably represented by the federal government when considering one of the most important safety factors for firefighters – emergency medical response.

Though the proactive approaches to policy production only apply at certain scales of organizational management, these examples can serve as a template for creating more equitable safety policies that could be applied at the scale of the fire service. Here, I argue that "scale bending" (Marston, Jones and Woodward, 2005) could be a useful consideration when creating comprehensive safety policies that would occur for all federal levels. Smaller scales of organizational management are not often privileged as ideal for policy reform, however recognizing the attempts of policy production at these levels may lead to a more proactive approach at the scale of the fire service. Though agency or regional level policies may deviate from the traditional reactive approach that has been followed at the fire service scale, it is important to remember that these scales are socially constructed, rather than natural or predetermined. Political factors may privilege the highest level organizational scales as the preeminent platform for policy production, but to provide the best possible safety policies for firefighters, these assumptions must be questioned – particularly in the face of proactive examples that are already occurring and would serve as a positive guide to more equitable safety policies. The relationship between policy approaches and organizational level is shown in Figure 6.3 below:

Figure 6.3



Section 6.4 – Broader Implications of this Investigation

While this project is specifically in reference to the creation of safety policy for federal wildland firefighters, the implications of this study have broader impacts that may be useful for urban planners or geographers interested in employee safety policy creation within other policy domains prone to disaster. With global atmospheric changes occurring as a result of human activity, response to natural disasters may become a more common occurrence for governing organizations and communities' alike throughout the United States. As Birkland showed, governmental policies that are created following disasters generally tend to reactively respond to a visceral focusing event and use these punctuations as opportunities to reform and improve policies and responses to similar issues in the future. My investigation is a useful extension of his work by applying these concepts to federal wildland firefighter safety policy, which frequently follows a reactive approach to safety policy production. Though outside the scope of this study, it may be that other fields involved with disaster response may have similar issues in regards to the safety of the individuals involved with managing these types of incidents, such as agencies or institutions that respond to hurricanes, earthquakes, or other natural disasters. As natural and human induced disasters occur, individuals responding to disaster events will be confronted with

more safety concerns. In this way, these insights may be useful for policy makers considering how to address the safety of employees working in fields related to disaster management.

Aside from the usefulness of this project in reference to disaster management, this investigation also employs social theory concepts within the field of Science and Technology Studies to a practical problem in a way that may be useful for policy makers and practitioners. The process of considering how scientific knowledge was *produced*, then *applied* to a specific policy, and *circulated* over space to affected individuals helps to reveal underlying relationships among different actors in different places that influence the policy process. These criteria could be usefully applied to the deconstruction of policy issues that range well beyond firefighter safety policy by practicing planners or others involved in the policy making process. Additionally, STS can be feasibly applied to real life policy problems by helping practitioners to consider what knowledge is used to inform a specific policy, and conversely what knowledge is nonexistent. Oftentimes, policy problems are normalized and appear to have pre-established and direct routes to reform when in reality the characterization of an issue may be constrained if only considering the knowledge available to inform a policy. By considering how a characterization of a problem foregrounds some knowledge while simultaneously backgrounding others, it becomes possible to understand how knowledge creation is politicized and can influence the creation of policy, all insights that may be usefully employed by practicing planners or policy makers well outside the realm of wildland fire management.

Finally, this project may be useful for geographers interested in investigating the politics of scale in reference to other policy domains prone to disaster. In this project, I considered how two representations of scale – size and level – are employed by governing agencies tasked with managing natural disasters. Though governing agencies may require designations of scale to

produce a cohesive management structure, it is important to consider that these designations are in fact socially constructed, rather than natural. By understanding how an agency tasked with managing any type of disaster employs characterizations of scale in reference to either size or level, it becomes possible to think beyond the limited responses to policy creation that are constrained by the belief that organizational scales are set in stone. Geographers researching disaster management or the safety of government employees could employ these considerations in a similar manner.

Section 6.5 – Conclusion

As a former Forest Service firefighter who has worked within this framework of policies, I am particularly passionate about the issue of emergency medical training for federal wildland firefighters. During my five years of service, I was fortunate enough to have excellent leadership that went out of their way to account for factors related to emergency medical response, but was aware that many other fire crews were constrained by budgets or other factors which inhibited the ability of their supervisors to go beyond the minimum requirements for medical training and response. I argue here that the proactive examples of policy production demonstrate that the most effective policies to address emergency medical response are not coming from the highest echelons of management, but within – it is the Fire Management Officers, the Engine Captains, the Hotshot Foreman's and the Smokejumpers that are taking the lead on creating policies that help to protect their people. Rather than waiting for more accidents to happen to warrant a major change to the way emergency medical response is handled for federal firefighters, I believe that we should instead listen to those who are impacted by these policies. We have deemed wildland fire management as a societally important task for over 100 years. It is time we treat the safety of firefighters as an equally important mission.

References

Agnew, J. A., Mitchell, K., & Toal, G. (2003). *A companion to political geography*. Malden, MA: Blackwell.

Bardach, E. (1996). *The eight-step path of policy analysis: A handbook for practice*. Berkeley: Berkeley Academic Press.

Baumgartner, Jones & Mortenson. (2007). Punctuated Equilibrium Theory: Explaining Stability and Change in Public Policymaking. In Jones (Ed.), *Theories of the Policy Process* (2nd ed., pp. 155-188). Boulder, CO: Westview Press.

Birkland, T. A. (2006). Lessons of disaster: Policy change after catastrophic events. Washington, D.C.: Georgetown University Press.

Birkland, T. A. (1997). *After disaster: Agenda setting, public policy, and focusing events*. Washington, DC: Georgetown University Press.

Bradshaw, K., & Lueck, D. (2012). *Wildfire policy: Law and economics perspectives*. New York: RFF Press.

Britton, Carla Lea. "Risk factors for injury among federal wildland firefighters in the United States." PhD (Doctor of Philosophy) thesis, University of Iowa, 2010.

Bulkeley, H. (2005). Reconfiguring environmental governance: Towards a politics of scales and networks. *Political Geography, 24*(8), 875-902. doi:10.1016/j.polgeo.2005.07.002

Egan, T. (2009). *The big burn: Teddy Roosevelt and the fire that saved America*. Boston: Houghton Mifflin Harcourt.

Godschalk, D. R. (1999). *Natural hazard mitigation: Recasting disaster policy and planning*. Washington, D.C.: Island Press.

Goldman, M., Nadasdy, P., & Turner, M. (2011). *Knowing Nature: Conversations at the Intersection of political ecology and science studies*. Chicago: University of Chicago Press.

Howitt, R. (2002). Scale and the other: Levinas and geography. *Geoforum, 33*(3), 299-313. doi:10.1016/s0016-7185(02)00006-4

Hudson, M. (2011). *Fire management in the American West: Forest politics and the rise of megafires*. Boulder, CO: University Press of Colorado.

Johnson, J. T. (n.d.). Empowering Methodologies: Feminist and Indigenous Approaches. In C. Madge (Ed.), *Qualitative Research Methods in Human Geography* (3rd ed., pp. 76-94). New York: Oxford University Press.

Latour, B., & Woolgar, S. (1979). *Laboratory life: The social construction of scientific facts*. Beverly Hills: Sage Publications.

Loomis, J. B. (2002). *Integrated public lands management: Principles and applications to national forests, parks, wildlife refuges, and BLM lands*. New York: Columbia University Press.

Louis, R. P. (2007). Can You Hear us Now? Voices from the Margin: Using Indigenous Methodologies in Geographic Research. *Geographical Research, 45*(2), 130-139. doi:10.1111/j.1745-5871.2007.00443.x

Maclean, N. (1992). *Young men & fire*. Chicago: University of Chicago Press.

Maclean, J. N. (1999). *Fire on the mountain: The true story of the South Canyon fire*. New York: William Morrow.

Marston, S. (2000). The social construction of scale. *Prog Hum Geogr Progress in Human Geography, 24*(2), 219-242. doi:10.1191/030913200674086272

Marston, S. A., Jones, J. P., & Woodward, K. (2005). Human geography without scale. *Trans Inst Br Geog Transactions of the Institute of British Geographers, 30*(4), 416-432. doi:10.1111/j.1475-5661.2005.00180.x

Mileti, D. S. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Washington, D.C.: Joseph Henry Press.

Nagel, S. S. (1999). *Policy analysis methods*. Commack, NY: Nova Science.

O'Lear, S., & Dalby, S. (n.d.). *Reframing climate change: Constructing ecological geopolitics*. London and New York, 2016: Routledge -- Taylor and Francis Group.

Pallett, H., & Chilvers, J. (2014). Organizations in the making: Learning and intervening at the science-policy interface. *Progress in Human Geography, 39*(2), 146-166. doi:10.1177/0309132513518831

Pyne, S. J. (n.d.). *Between two fires: A fire history of contemporary America*. The University of Arizona Press.

Sabatier, P. A., & Weible, C. M. (2014). *Theories of the policy process*. Boulder, CO: Westview Press.

Simon, H. A. (1957). *Models of man: Social and rational; mathematical essays on rational human behavior in society setting*. New York: Wiley.

Sismondo, S. (2004). *An introduction to science and technology studies*. Malden, MA: Blackwell Pub.

Smith, N. (1996). Spaces of Vulnerability: The space of flows and the politics of scale. *Critique of Anthropology, 16*(1), 63-77. doi:10.1177/0308275x9601600107

Tang, Y., Zhong, S., Luo, L., Bian, X., Heilman, W. E., & Winkler, J. (2014). The Potential Impact of Regional Climate Change on Fire Weather in the United States. *Annals of the Association of American Geographers, 105*(1), 1-21. doi:10.1080/00045608.2014.968892

Weimer, D. L., & Vining, A. R. (1999). *Policy analysis: Concepts and practice*. Upper Saddle River, NJ: Prentice Hall.

Official Documents

"Dutch Creek Accident Report," National Wildfire Coordinating Group – 2009

Forest Service Manual – Intermountain Region 4 – 6725 Emergency Medical Services

Forest Service Health and Safety Code Handbook – 6709.11

Guidance for the Implementation of Federal Wildland Fire Management Policy, 2009 – United Stated Department of Agriculture and Department of Interior

"Mann Gulch Fire Report,"1949 – United States Forest Service

National Wildfire Coordinating Group – Fireline Handbook – 2004

National Wildfire Coordinating Group – Incident Response Pocket Guide – 2014

National Wildfire Coordinating Group – Wildland Fire and Aviation Handbook – Medical Services and First Aid Regulation

Occupational Safety and Health Administration – General Duty Clause

"Protection of Forests from Fire," H.S. Graves, 1910

"The Suppression Policy of the United States Forest Service – Fire Control in the United States," 1939

"South Canyon Accident Investigation," National Wildfire Coordinating Group, 1994

"10 Standard Fire Orders and 18 Watchout Situations" – Incident Response Pocket Guide

Websites

USDA Forest Service
http://www.fs.fed.us/about-agency/what-we-believe, accessed 04/01/2016

Bureau of Land Management
http://www.blm.gov/wo/st/en/info/About_BLM.html, accessed 04/01/2016

National Park Service
https://www.nps.gov/aboutus/index.htm, accessed 04/01/2016

Fish and Wildlife Service
http://www.fws.gov/info/pocketguide/fundamentals.html, accessed 04/01/2016

Bureau of Indian Affairs
http://www.bia.gov/WhoWeAre/, Accessed 04/01/2016

American College of Emergency Physicians -- Medical Direction
https://www.acep.org/Clinical---Practice-Management/Medical-Direction-of-Emergency-Medical-Services/, accessed 04/01/2016