

What Drives Wildfire Costs – Internal or External Pressure?

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Abstract

Over the past two decades, wildfires in the United States have become increasingly large, severe and costly to suppress. A century of successful wildfire suppression by the U.S. Forest Service and other land management agencies has fueled the growth of the wildland-urban interface, the area where human settlement intermingles with forest. Consequently, members of the public and political representatives, sources of external influence studied here, have grown to expect and demand suppression responses from fire managers. These external influences have been cited as a factor leading to higher wildfire suppression costs. This research was guided by the hypothesis that costlier fires are subject to more prevalent external influences. In an attempt to reduce wildfire suppression expenditures and to restore healthy forest ecosystems, federal wildfire policy has shifted away from focusing fire management on full suppression and now promotes a more flexible fire management approach. The transition to employing a more flexible fire management approach, which is intended to reduce wildfire suppression costs, faces challenges presented by internal factors studied in this research, the attitudes and beliefs of fire managers, as well as agency policies. This research project explores how internal and external influences affected wildfire cost and the application of more flexible fire management on wildfire events through two paired case studies of wildfires that occurred in the 2006-2007 fire seasons.

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Problem Reference

Since the late 1990s, the United States has experienced increasingly large, severe wildfires and rising wildfire costs (Dombeck et al. 2004). An accumulation of forest fuel loads resulting from decades of suppression, an increasing number of homes and structures situated in the wildland-urban interface (WUI), environmental factors such as drought, climate change and beetle killed forests, and the expansion of national fire suppression infrastructure have contributed to the increases in wildfire costs (Dombeck et al. 2004; Steelman and Burke 2007; USDA et al. 2009). The U.S. Forest Service (USFS) and other federal land management agencies have begun to shift away from fire management strategies focusing on full suppression that have been employed for the better part of a century to a strategy that allows a more flexible fire management approach in an attempt to reduce wildfire expenditures. Altering fire management strategy and policy to allow more flexible fire management faces challenges both internally within the USFS and other land management agencies, as well as externally from the public who is thought to expect aggressive suppression response. Communication and open dialogue between land managers and the public is an essential component of shifting wildfire management away from historic practices and toward new approaches to fire management (Fleeger 2008; Paveglio et al. 2009). The purpose of this research project is to determine what is really driving wildfire cost - internal or external pressure. This research project explores how internal and external influences affected wildfire cost and the application of more flexible fire management on wildfire events through two paired case studies of wildfires that occurred in the 2006-2007 fire seasons. My hypothesis is that costlier wildfires are subject to more prevalent external influences.

Literature Review

An exploration of the literature and history of United States' wildfire policy provides critical context in understanding the challenges land management agencies face as they attempt to move away from suppression dominant practices. Literature in the areas of risk perception, hazard communication, and wildfire education reveal many of the important social dynamics that complicate wildfire management. Overall, this literature review should provide helpful background on wildfire management in the United States and the complexity involved with altering fire management strategy and policy to incorporate more flexible fire management responses. It also helps contextualize the findings from the research.

Wildfire Policy

As Americans expanded westward in the late nineteenth century, destructive wildfires ravaged the West and Midwest leading to federal policy declaring all wildfire is bad (Dombeck et al. 2004). The year of the Great Fires, 1910, created the foundation for how federal agencies relate to wildfire as the government declared war on wildfire (Pyne 2001). By 1935, the 10 AM policy, which stipulated that all wildfires be put out by 10 AM the day after they started, had been formally adopted by federal land management agencies (Pyne 1982). By the 1940's, the United

States had developed the most sophisticated and technologically advanced fire suppression apparatus in the world (Dombeck et al. 2004). With the help of the Smokey Bear campaign, the perception that all wildfire is bad had become universal (Pyne 1982).

Following the deadly 1994 fire season, in which 34 firefighters perished, the 1995 Federal Wildland Fire Management Policy was established, emphasizing safety above all else (USDA et al. 1995). The 1995 policy directed federal agencies to allow naturally ignited fires to burn for “wildland fire use” (WFU) and to reintroduce fire to ecosystems through management ignited “prescribed fires.” All other fires were classified as wildfires, deemed unwanted, and were to be suppressed. The record setting 2000 wildfire season, in which 861 structures and 8 million acres were burned, and more than \$1.3 billion was spent on suppression costs alone, led federal policy makers to further reassess wildfire policy that for nearly a century had been almost exclusively devoted to suppression (Fleeger 2008). Furthermore, a prescribed fire escaped in 2000, threatening Los Alamos, New Mexico, creating additional incentive to revise the 1995 policy (USDA et al. 2001). The 2001 Federal Wildland Fire Management Policy directed federal agencies to manage wildfire as an ecosystem component, recognizing the natural role of fire in many landscapes and the need to reintroduce natural fire regimes. Fire management, as opposed to fire exclusion and suppression, requires more public cooperation, communication and trust than was necessary in the past (Paveglio et al. 2009) and therefore requires a more complex wildland fire management regime (Steelman and Burke 2007).

In an effort to address the root causes of high wildfire costs and to improve forest health overall, in 2000 President William J. Clinton enacted the National Fire Plan (NFP), a ten year, \$10 billion dollar package of plans, programs and appropriations to restore forest ecosystems and provide additional resources for community protection. To support the NFP, the Western Governor’s Association created a 10-Year Comprehensive Strategy to reduce wildfire risk and build collaboration among different levels of government. The 10-Year plan consisted of four goals: 1) improve fire prevention and suppression, 2) reduce hazardous fuels, 3) restore fire adapted ecosystems, and 4) promote community assistance (WGA 2001). The establishment of a comprehensive wildfire management strategy signified an important shift away from suppression focused policy of the 20th century (Nelson et al. 2005; Steelman and Burke 2007). Furthermore, a collaborative, community-based approach to wildfire management was seen as necessary to address the causes of the wildfire problem while building capacity at the local level to mitigate the wildfire threat to communities (Fleeger 2008).

President George W. Bush’s administration continued this trend by expediting hazardous fuel treatments and improving funding for community protection and collaborative wildfire management through passage of the Healthy Forests Initiative (HFI) and the Healthy Forest Restoration Act (HFRA) in 2002 and 2003, respectively. Although these policies have played an important role in shifting wildfire policy to focus on more long term goals, over the past decade fire budgets have continued to tap into funds meant for community assistance, hazardous fuel reductions, and restoration programs in order to pay for suppression costs (Reese 2002). A central component of the HFRA is the mandate for the development of Community Wildfire Protection Plans (CWPPs) in fire-prone communities within the WUI (Steelman and Burke 2007). Collaboration between local communities and fire management agencies has been promoted in wildland fire management as an important tool for increasing and improving

community fire preparedness (Grayzeck-Souter et al. 2009). While the NFP stipulates that treatments associated with a CWPP should be prioritized for funding, and HFRA allows the USFS and Bureau of Land Management (BLM) to expedite implementation of these treatments, only about half of the area treated in the WUI has been associated with a CWPP (Schoennagel et al. 2009). CWPPs are unlikely to be effective tools in mitigating the risk of wildfire unless they can successfully coordinate the activities of multiple levels of government and integrate the interests of relevant stakeholders (Fleeger 2008).

Within the past fifteen years, U.S. wildfire policy has shifted significantly to face mounting challenges presented by an increase in dangerously large fires, forests overburdened with excessive fuel loads, the growth of the WUI, and a reduction in resource availability. To address these challenges, wildfire policy has been updated several times since the 1995 Federal Wildland Fire Management Policy was first initiated. A 2003 Implementation Strategy for that policy was recently updated in 2008 with a document entitled *Guidance for Implementation of Federal Wildland Fire Management Policy*, released in February 2009 (NIFC 2009). This guidance document revised several directives present in the Wildland Fire Management Policy which had previously restricted land managers to manage fires for one and only one objective (Dalton 2009). For example, the 2001 policy restricted fire managers to one objective and strategy once selected, and prohibited shifting a full suppression strategy to any other strategy once suppression had begun (Dalton 2009). Overall, the new guidance document provided for much more policy driven flexibility in wildfire response, including use of more flexible fire management and consideration of situation instead of a single suppression mandate. The policy guidance document also directs the federal fire directors to work collaboratively with state, local and tribal fire managers and public and non-government organizations to communicate direction stated in the guidance document with internal and external audiences to foster understanding and support for the complexity of wildland fire management.

In 2006 and 2007, agencies began to re-emphasize Appropriate Management Response (AMR) as a way to encourage the use of a wider range of fire management strategies, despite the fact that AMR had been part of policy since 1995. AMR is defined as actions that are appropriate given the laws, policy, socio-political situation, and environmental conditions that are in effect at a given point of time (USDA 2006). This provides fire managers with a complete spectrum of tactical options, including: full perimeter control, point protection, large scale burnout, monitoring, fuel breaks, use of natural or artificial barriers, community hazardous fuel reduction treatments, slowing/delaying fire spread, and wildland fire use (USDA 2006). Starting in 2009, fire managers moved beyond AMR toward a risk management approach that incorporated the need to protect and enhance resource values while maintaining firefighter and public safety (USDA et al. 2009).

In 2009, the USFS also amended its classification system for wildfires to facilitate policy changes to allow for greater flexibility into management response. The distinction between wildfire and wildfire use (WFU), which had been used in the past to dictate response based on fire type, was replaced with the terms planned or unplanned ignitions (NIFC 2009). This change was meant to increase managers' ability to respond to changing incident conditions and allow for more flexible firefighting capability (USDA et al. 2009). "Planned ignitions" include prescribed burns and intentional backfires whereas "unplanned ignitions" are naturally occurring wildfires,

such as those caused by lightning strikes, and also arson. Prior to 2009, WFU fires required the development of Wildland Fire Implementation Plans (WFIP) to guide management strategy. Wildfire could never transition to a WFU fire, suppression was mandated by agency policy, and a Wildland Fire Situation Analysis (WFSA) was used to guide management decisions. The WFIP and WFSA documents, the decision support tools utilized by fire managers prior to 2009, have both since been replaced by the Wildland Fire Decision Support System, or WFDSS.

In June 2005, the National Fire and Aviation Executive Board chartered WFDSS to replace WFSA and WFIP by 2009 by slowly field testing and phasing in the new program while the old system was phased out. The WFDSS was conceived as a way of integrating the various applications used to manage incidents into a single computer based and data driven system that streamlines the analysis and reporting processes into a more intuitive and easy to use format. The former system had been around for 30 years with little change and had become cumbersome to use and was not scalable or flexible enough for today's complex fire management needs (WFDSS 2010). Advantages of the WFDSS over the system it replaced included the ability to layer spatial data, a reduction of input requirements, a reduction of text with more map displays, the process begins at the time of discovery, scalability for incident complexity, the ability to be used for single or multiple fire situations, and the ability to pre-load information from the Land and Resource Management Plan (LRMP), the Fire Management Plan (FMP) and other pre-planning activities (WFDSS 2010). Overall, the WFDSS tool should help line officers and fire managers better analyze and assess the various factors that influence fire behavior in order to inform strategies and decisions on tactics to be applied in fire management.

Over the past two decades, federal wildfire policy in the United States experienced dramatic changes in response to increasing suppression costs, diminishing forest health, growth of the WUI, and overriding considerations for firefighter and public safety. Fire policy has shifted away from mandating full suppression response and now provides fire managers with greater flexibility in determining fire management strategy and tactics. For example, the restriction placed on fire managers in the 2001 Federal Wildland Fire Management Policy that prohibited a change in fire management strategy once a full suppression strategy was selected was replaced in 2009. Current wildland fire policy, coupled with risk management considerations and decision support tools like WFDSS, provide fire managers with far greater policy driven flexibility to manage wildland fires. Whether this flexible policy framework translates into greater flexibility and less expensive wildfire costs is explored in this research.

Wildfire Communication

Up until recently, the general direction of communication about wildfire had been characterized by a unidirectional flow of information from experts to the public (Paveglio et al. 2009). The public seemed content with this arrangement, due to their limited interaction with wildfire and trust in professional land managers (McCaffrey 2004a). However, as residents began to move into the WUI in increasing numbers, the negative consequences of fire suppression became increasingly obvious and trust in public land managers suffered (Paveglio et al. 2009). As a result, citizen engagement and public education concerning wildfire risk and wildfire hazard mitigation became important roles of land managers. Shindler et al. (2009) found that agency personnel are filling a role very different from the past when citizen participation in fire

management was minimal. Land managers are now expected to have greater acceptance of input from community figures as well as the ability to address concerns and questions about forest and wildfire management (Shindler et al. 2009).

As the public has become increasingly involved with wildfire management, understanding the public perception of the wildfire hazard, public perception of fire management policies, and tactics, and effective communication strategies has become critical. Early studies on hazard perceptions found that residents typically underestimated wildfire hazards (Cortner et al. 1984; Gardner et al. 1987). In focus group sessions, McCaffrey et al. (2008) found that those living in fire-prone areas had lower risk perception than those living in less exposed areas. Years of fire suppression practices, which have limited the extent of most wildfire damage, have contributed to a sense of control and therefore reduced wildfire risk perception (McCaffrey 2004a). However, Winter and Fried (2000) found that individuals viewed fire as inherently uncontrollable, after a prescribed fire escaped control of land managers and threatened a community.

Several case studies have been conducted in various WUI areas of the country examining public perception of wildfire policies and issues, including perceptions of risk and the importance of communication. McCaffery et al. (2008) discussed the importance of sustained and continued communication between fire managers and the public throughout fire events, including specific explanations of wildfire risk and developing an understanding of fire management strategies among the public. Taylor et al. (2007) identified significant benefits in community-agency interactions resulting from establishing pre-fire communication and strategy. By investing in communication and outreach activities before a fire event, managers can help create more resilient relations among communities that will become even more important in the highly charged post-fire environment (Toman et al. 2008). Taylor et al. (2007) also described that during fire events, residents' search for real-time information was urgent and emotionally driven, and they were far less concerned about whether the information was officially sanctioned than if it was accurate and informative. By establishing a goal of "informing the network" fire information professionals can focus more on their responsibility as providers of up-to-date, accurate and real-time fire information. Special attention to communication efforts during evacuation, times of management transition, and reoccupation will be particularly important for the affected public (Taylor et al. 2007). Other researchers also documented the importance of pre-fire collaborative planning but could not clearly distinguish if community members expected or desired collaboration in the post fire period (Sturtevant and Jakes 2008). Ryan and Hamin (2008) discussed challenges and opportunities for improvement in areas of pre, during, and post fire communication. Overall, residents' desire for communication and participation indicates a shift towards collaborative management of fire. This appears to be a step toward support of fire inclusion strategies such as the use of prescribed burning to reduce catastrophic fire risk and more active participation of WUI residents in wildfire management (Paveglio et al. 2009).

As land managers and WUI residents come together to address the wildfire risk, strengthening the level of trust between these groups will be critical. Lachapelle et al. (2003) suggest a lack of trust is one of the primary barriers impeding natural resource decision making. Lijebld et al. (2009) state that by considering the public's level of trust in management, land managers can strengthen the relationship the public has with the land, which can in turn increase cooperation

between disagreeing parties and result in decreased opposition to management actions. Shindler and Toman (2003) found citizens had higher levels of support for prescribed fire when they felt they had been given credible information in prior relations with land management agencies. Reinhardt et al. (2008) have suggested that a primary objective of fuel reduction treatments is to make wildfire less severe and therefore more acceptable, instead of simply making it easier to suppress. Despite efforts to improve public trust of land managers, some citizens simply do not trust federal land management agencies and therefore do not support their decisions or how they are made (Shindler et al. 2002).

Educating the public about the wildfire hazard and fire management tools available to reduce risk, such as hazardous fuel reduction treatments and prescribed burning, has become important for land managers who are attempting to maintain public support and trust while moving away from full suppression strategies. Residents of the WUI find communication and education about wildfire hazards to be desirable (Zaksek and Arvai 2004). However, previous unidirectional information provision efforts have resulted in a public that is slow to seek information and remains unsure about how to contribute to wildfire management (Paveglio et al. 2009). Given the high levels of risk and uncertainty the public associates with prescribed fire and fuel management, effective message delivery is particularly important for outreach initiatives (Shindler et al. 2002). Adoption of one-size-fits-all communication programs is not recommended (Toman et al. 2005). Rather, messages should be targeted to specific, local contexts (Brunson and Shindler 2004). Indeed, McCaffrey (2004b) found the medium in which wildfire hazard information is presented to the public can substantially influence responses to hazards, and can often be as critical as the message. Toman et al. (2005) found that personal interactions between residents and land managers was more effective at developing understanding of the wildfire risk facing residents than unidirectional communications. Furthermore, research suggests that acceptance by citizens of new practices, like prescribed fire or fuel reduction treatments, can be increased if citizens are engaged in a dialogue about the merits of the practice, risks and potential outcomes (Shindler and Neburka 1997; Yaffe and Wondolleck 1997; Toman et al. 2005). For example, research by Toman et al. (2008) and McCaffrey et al. (2008) found benefits in community-agency interaction that resulted from fire managers guiding tours of burned areas during the sensitive post-fire period.

The past century of wildland fire management in the United States has been characterized by aggressive suppression. As a result, the public felt safe moving into the WUI as they have grown to expect suppression response by land managers. The diminished perception of wildfire risk has fueled the growth of the WUI, as more citizens continue to move into forested areas. In reality, the consequences of the past century of aggressive suppression are overstocked, unhealthy forests with dangerously heavy fuel loads. Land managers have begun to reintroduce fire as a natural ecosystem element through prescribed burns and WFU in an attempt to restore fire adapted ecosystems. Communication with, and education of, residents in the WUI has been cited as critical component for land managers to prepare communities for these changes in wildland fire management. Better understanding the effective techniques regarding fire management communication and education is important for land managers as they work to shift public expectations away from suppression towards recognition that, unlike Smokey Bear taught, not all forest fires are bad.

Internal and External Factors Influencing Wildfire Management

Considerable effort has been exerted in the past decade developing wildfire policy that moves beyond full suppression strategies. Engaging and educating the public about wildfire management has been, and continues to be, a critical feature in gaining public acceptance for changing fire management strategies and tactics. To better understand the factors influencing wildfire management, an assessment of the internal and external factors contributing to management decisions is necessary.

Internal factors influencing wildfire management are those over which the land management agency has control. Agencies must address a culture of suppression that has been promoted for the past century, as many firefighters have worked for years believing that suppression is the primary goal for wildfire management. Wildland fire managers have historically favored more aggressive strategies, such as suppression, instead of less aggressive strategies such as letting fire burn for WFU. Indeed, for a significant portion of the twentieth century, the USFS operated under the 10 AM policy, which directed fire managers to suppress all fires by 10 AM if possible. At the time the data were collected on which this research is based, wildfire policy restricted fire managers from using less aggressive, more flexible responses, such as WFU, because the “Red Book” explicitly stated that suppression of unplanned ignitions was required and the management strategy could not be changed. Beyond agency culture and policies, the agency managing a fire is also responsible for creating a Land and Resource Management Plan (LRMP) and a Fire Management Plan (FMP) to guide fire management decisions. The Agency Administrator (AA), the local federal land manager in charge of decision making on the fire, has control over the WFSA and the level of flexibility contained in the management strategy. The AA works in collaboration with an Incident Management Team (IMT) that is brought in to assist managing the fire to implement fire management strategy. The decision to manage a fire for WFU must be made at the onset of the incident, and if WFU is determined to be the chosen strategy, a WFIP must be written to help guide the long term management strategy.

External factors influencing wildfire management come from citizen, community and political pressure that are thought to demand suppression (NAPA 2004). Many land managers feel that they must suppress fires quickly and with overwhelming force because they fear public backlash associated with a perceived insufficient response. Furthermore, without public appreciation of other techniques to reduce the wildfire threat, such as WFU, prescribed burning or hazardous fuel reduction treatments, the public will continue to expect full suppression. For example, IMT members interviewed by Canton-Thompson et al. (2008) discussed “political smokes,” a phrase used by some team members to describe cases where external influences pressured them to use resources, strategies, or tactics they would not normally have used and, which in many cases, they knew would be ineffective. Canton-Thompson et al. (2008) also found that VIP visits by politicians increased wildfire costs. Additionally, Canton-Thompson et al. (2008) discussed the fact that many AAs who make decisions about fire management strategies are less likely to have specific fire management training or experience than in the past where fire management was an expected part of the job working for the USFS. Interviews of IMT members found that inexperience of AAs often increased wildfire costs because of unrealistic expectations about outcomes, and due to risk aversion, which resulted in the application of tactics insufficient to suppress a fire (Canton-Thompson et al. 2008). For more flexible approaches to fire

management to be adopted by AAs and fire managers, it is crucial that the concerns these groups have for external perspectives be validated or refuted.

To better understand what factors influence wildfire cost and wildfire management flexibility, the internal and external factors discussed above must be studied. The influence of internal factors, such as a culture of suppression and beliefs about public expectations, as well as guiding forest policy documents, need to be explored to assess their influence on management flexibility. External influences, such as political and community pressure, are thought to demand suppression responses. The question that remains is whether the internal or external factors drive the process toward greater cost in wildfire management.

Hypothesis and Guiding Research Question

This research is guided by the question: What is really driving wildfire cost – internal or external pressure? The main hypothesis guiding this research is: Costlier wildfires have more prevalent external influences.

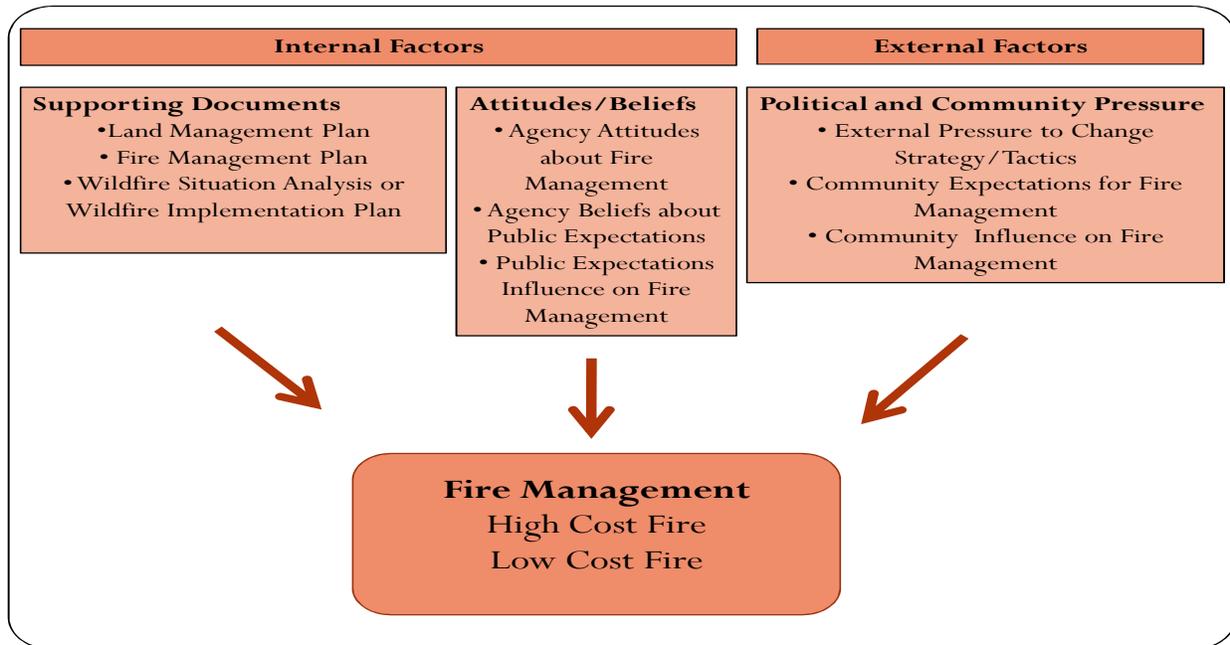
Methodology and Conceptual Framework

This research is designed to gain a greater understanding of how internal and external factors influence wildfire cost and builds on a research protocol established by Steelman and McCaffrey (in press). An interview protocol based on the conceptual framework in Figure 1 facilitated data collection that focused on internal and external factors (See Interview Guide in Appendix A) and their relative contributions to wildfire management decisions made in each of the case study fires. The conceptual framework divides analysis areas into three major categories: 1) internal supporting documents (LRMP, FMP, WFS/WFIP), 2) internal agency attitudes and beliefs, and 3) external community and political pressure. By dividing analysis into these three categories, individual components can be assessed and compared across the fires. Furthermore, the conceptual framework allows the effects of forest plans and policy on fire management to be separated from agency attitudes, agency beliefs about the fire management expectations of the public, and the influence public expectations have on agency fire management decisions.

To test the hypothesis, two paired case studies were conducted to examine four wildfires that occurred in the 2006 and 2007 seasons. To control for differences in budget allocations, administrative structures, environmental factors such as drought, fuel accumulation, and disease, and other factors, paired cases were selected that were in close geographic proximity. Set One is the comparison of the Potato Fire and the South Fork Complex that both burned areas of Idaho in the summer of 2006. Set Two is the comparison of the Ahorn Fire and the Wicked Hicks Complex that both burned areas of Montana in the summer of 2007. See Table 1 for an overview of fires studied. In each set, one fire is characterized by high costs while the other saw significantly lower expenditures, as measured by the Stratified Cost Index (SCI). The SCI is a set of regression equations developed by the USFS Rocky Mountain Research Station used to estimate suppression expenditures on individual large wildland fires greater than 300 acres. Inputs considered in SCI equations include fire size, fire environment (slope, aspect, energy release component, fuel model, etc), values at risk within 20 miles of the fire, resource availability, and geographic area. There are currently three SCI models, one for western U.S.

(USFS Regions 1-6), one for the eastern U.S. (USFS Regions 8-9) and one for the Department of Interior. For more on the SCI, see Gebert et al. 2007.

Figure 1: Conceptual Framework for Understanding Internal and External Factors on Fire Management



The Potato Fire on the Salmon-Challis National Forest burned 18,236 acres of sub-alpine fir and lodgepole pine in the Yankee Fork of the Salmon River Basin, seven miles north of Stanley, Idaho. A direct/indirect strategy was used to confine the fire within the fire perimeter set in a WFSa analysis. While one abandoned cabin was destroyed, several historic mining structures and residences were saved. The fire suppression cost just below \$15 million at a cost of \$787/acre. This fire was two standard deviations above the mean in its costliness, in terms of the SCI. The South Fork Complex consisted of 39 small and large fires burning over 52,000 acres of mixed spruce and fir on the Payette National Forest, between Cascade and McCall, Idaho. The South Fork Complex was made up of nine fires larger than 500 acres, two of which were managed for WFU. To protect the cabin community of Yellow Pine, 280 additional personnel were added to bolster the fire line and protect values at risk. The South Fork Complex also witnessed the tragic death of four firefighters whose helicopter crashed. Overall, the South Fork Complex cost about \$11.5 million at a cost of \$219/acre. This fire was two standard deviations below the mean in terms of its estimated costliness, according to the SCI.

The Ahorn Fire burned 52,205 acres of mixed spruce and fir in the Bob Marshall Wilderness of the Lewis and Clark National Forest, thirty miles west of Augusta, Montana. As the fire expanded, it charred timber, threatened structures, and led to evacuations. To contain the blaze, perimeter control and point protection within the perimeter line were the chosen suppression strategies. Although the WFSa estimated the fire would cost \$8.25 million at \$55/acre, the fire

actually cost just below \$17 million dollars at a cost of \$308/acre. This fire was two standard deviations above the mean in its costliness, in terms of the SCI. Consequently, it was a statistically significant in its costliness. The Wicked Hicks Complex was formed by the combination of the Wicked Creek and Hicks Park Fires. The Wicked Hicks Complex, fueled by heavily bug killed lodgepole pine, spruce and fir, burned about 29,000 acres of the Gallatin National Forest in Montana in areas near Livingston and Big Timber. A strategy of point protection and suppression was used to manage the Wicked Hicks Complex. The fire cost about \$5.5 million dollars at a cost of \$189/acre. This fire was two standard deviations below the mean in terms of its estimated costliness. In other words, it was a very cost effective fire. Prior to the fire, the Gallatin National Forest had been engaged with local residents and cooperating agencies to create CWPPs, promote hazardous fuel reductions and defensible space creation.

Table 1: Fires Studied

	Set 1: Idaho 2006	Set 2: Montana 2007
High Cost Fire	Potato Fire - \$787/ac	Ahorn Fire - \$308/ac
Low Cost Fire	South Fork Complex - \$219/ac	Wicked Hicks Complex - \$189/ac

Archival and Organizational Document Analysis.

Archival and organizational documents provide a foundation of knowledge about internal and external events during the fire. Four agency or community documents were important for this stage of the research: 1 & 2) the Land and Resource Management Plan (LRMP) and Fire Management Plan (FMP) for each forest where the fire occurred were procured and reviewed for its treatment of WFU; 3) the Wildfire Situation Analysis (WFSA) was obtained for each fire and reviewed to document the strategy and tactics used during the fire and especially for how WFU was or was not employed; and 4) Community Wildfire Protection Plans (CWPP) were identified where they existed and were evaluated for the role of WFU in case of a fire and the overall community goals in case of a wildfire.

Interview Protocols

Semi-structured, one-on-one interviews with 5-12 participants (e.g. Agency Administrator, Incident Management Team, Fire Management Officer, Information Officer, Community members) from each fire were conducted by the research team. The participants were selected based on the review of the fire and the archival document analysis. Specific questions about internal and external implementation factors were asked (See Appendix A). Specific questions were asked about internal factors and these include: 1) how much flexibility is provided for wildfire management in the LMRP; 2) how much flexibility is provided in the FMP; 3) what management tactics are permitted in the WFSA; and 4) attitudes toward suppression. Because respondents often have difficulty recollecting past experiences (Bernard et al. 1984), the interviews included a number of closed-ended questions that employed aided-recall techniques as a means for ensuring accurate responses on individual programs and implementation factors. These were followed with probing questions about interpretations and assessments made and about practices that were adopted or not. Triangulation can enhance the validity of qualitative data and compensate for individual biases (Yin 2003). Therefore, data were verified through complementary interviews and a review of organizational documents. Transcripts from the interviews were returned to the interviewees and verified.

Focus Groups.

Four small (nine people or less) focus groups were conducted to provide understanding about public perceptions among political and community elites (politicians, home owner association representatives, media, etc...) during the fire. Community and political elites for the focus groups were selected after a review of the fire and the archival documents. This review gave an idea about who were the opinion leaders external to the agency during the fire. Focus groups were used to gather information about public perceptions among the community and politicians to gain insight into internal and external factors that may influence acceptance of more flexible wildfire response strategies.

Categories of interview questions included: 1) perceptions about who has control over major decisions related to wildfire management, including the degree of control the Agency Administrator is perceived to have over the fire event versus others within the hierarchy of the Forest Service; 2) perceptions about the role of suppression and WFU as wildfire management strategies; 3) perceptions about how wildfires are fought and the role of more flexible management response. Focus groups contained five to twelve members from the community and were assembled according to standard protocols. Written transcripts from the sessions facilitated recall and coding of answers.

Agency and Community Participants

On each fire, agency representatives and community members were interviewed as indicated in Table 2. For the Ahorn Fire, six agency representatives and seven community members were interviewed. For the Wicked Hicks Complex, six agency representatives and twelve community members were interviewed. For the Potato Fire, eight agency representatives and five community members were interviewed. For the South Fork Complex, eight agency representatives and eight community members were interviewed. Individual interviews were used for agency representatives. Focus groups were used to gather perspectives of community members and facilitate discussions about their views concerning wildfire management. All interviews were digitally recorded, transcribed, then returned and verified by interviewees. Qualitative data were systematically coded and analyzed using *Atlas.ti*. *Atlas.ti* is a computer software program used to assist in qualitative data coding and analysis. The program allows the user to keep track of notes, annotations and codes to systematically analyze qualitative data.

Table 2: Agency and Community Participants by Fire

	Ahorn Fire	Wicked Hicks Complex	Potato Fire	South Fork Complex
Agency Participants (Internal)	6	6	8	8
Community Participants (External)	7	12	5	8
Total Participants	13	18	13	16

Qualitative Analysis and Verification.

To ensure accurate data collection and analysis, interviews and focus groups were recorded. All recorded materials have been transcribed. *Atlas.ti* was used to assist with qualitative analysis of the interview and focus group data. Content analysis of the interview and focus group data allowed me to identify core consistencies, meanings, patterns and themes (Patton 2002). To understand the interactive processes, analysis of the open-ended questions was carried out using open, axial, and selective coding techniques (see Corbin and Strauss 1998; Glaser and Strauss 1967). Using these and grounded theory coding procedures allowed me to trace patterns within each case and make comparisons across cases (see Yin 2003). Analytic induction provided a framework through which the conceptual framework (Figure 1) developed by Steelman and McCaffrey (2010) was applied to this research.

Based on the data analysis, a narrative of each case was written. A narrative is a rich description that orders factual, contextual, and cultural information in a way that illustrates patterns (Geertz 1973). Each narrative describes the internal and external factors, the types of interactions among participants, and the effects of the internal and external factors on wildfire management flexibility, costs and WFU. The narratives are important because they provide a means for verifying case details and illuminating validity of hypotheses.

Potato Fire Findings

Supporting Documents: LRMP, FMP, WFSA

Supporting documents for the Potato Fire reveal limited flexibility for fire management options besides suppression on the Salmon-Challis National Forest, except in the Frank Church-River of No Return Wilderness area and select fire management units of the forest where fire is allowed to play its ecological role where possible. However, discussions with forest fire managers revealed more flexibility than a simple reading of the documents would indicate. The Salmon and Challis National Forests were combined administratively in 1995 but still operate under their own aged LRMPs from the 1980s, pending the completion of a joint LRMP. These aged LRMPs focus primarily on suppression in non-wilderness areas, however amendments have been added since they were written to expand fire management flexibility and include a full suite of suppression tactics. The IMT Liaison Officer noted, “outside of the Frank Church you will have some difficulty in taking AMR because the LRMP will speak principally to suppression.” The Salmon-Challis Forest Fire Operations staff leader noted that “a suppression strategy can include all of these components from full perimeter control, partial perimeter control and point protection and still be a suppression strategy.” The Salmon-Challis Forest Supervisor stated, “We currently have three or four watersheds on the Challis end of the forest, outside of the wilderness, where fire use is allowed, but other than that we’re confined to just the wilderness.” The Salmon-Challis Forest Fire Operations staff leader felt that the LRMP did provide a flexible range of management responses. He claimed:

I think we have all the flexibility we need if we look at things with the lens of safety, values at risk and cost. I think that flexibility is built into both of those plans. What is not built in is the flexibility for fire use in some places in the forest.

In discussing the FMP, the Salmon-Challis Forest Fire Operations staff leader reasoned that the

overriding safety mandate created flexibility for fire managers in their fire management decision making.

Regardless of the Fire Management Plan, it says that safety will override everything. So I will use that to meet my safety objective and not fall back to a Fire Management Plan unless I can do it safely. In other words, just because we have a plan in place, we will not blindly follow it unless it can be done safely.

The Salmon-Challis Forest Supervisor stated that the forest was waiting until it had budget and staff available to completely revamp the LRMP, and in the meantime the forest reviews and approves its FMP on an annual basis. “Our FMP gives us all the flexibility we need,” Salmon-Challis Forest Fire Operations staff leader.

Due to considerations of terrain, safety, weather, probability of success, fire behavior, and resource availability, three WFSAs were written for the management of the Potato Fire because the fire surpassed WFA boundaries twice. The Type 1 IMT Incident Commander identified the initial WFA boundaries as a constraint because they set perimeter goals at the onset of the fire event. He noted, “That WFA boundary was right there, we were right up almost on that WFA boundary, but they don’t want us to pass that boundary. So what do you do? So there’s that other artificial constraint.” All three WFSAs identified full perimeter control and use of natural and artificial barriers as management strategies. The third and final “big” WFA also identified point protection as an additional strategy when it became clear full perimeter control would not be feasible and as the fire spread towards the communities of Bonanza and Custer. The Salmon-Challis Forest Fire Operations staff leader felt that WFA #3, “allowed for more flexibility than the first two.” Overall, supporting documents for the Potato Fire indicate limited flexibility for managing fire on the Salmon-Challis National Forest outside of wilderness areas. However, fire managers utilized their safety mandate to apply more flexible fire management strategies, such as point protection rather than perimeter control.

Agency Attitudes and Beliefs

When Salmon-Challis National Forest and IMT interviewees were asked about their attitude toward fire management, most respondents said that their attitude towards fire had not changed with time because they had always placed value on ecology and fire use, even in the past (1980’s) when full suppression was the dominant agency attitude. Three respondents noted a greater acceptance of letting some fires burn and a greater consciousness of ecology and safety when fighting fires now than there used to be. A Salmon-Challis Zone Fire Management Officer said, “I keep getting back to flexibility, but that seems to be the key - the range that we have now is more variable than it used to be.” He also noted that fires today are being managed for future benefits instead of short term suppression goals. Agency respondents indicated that there hasn’t only been a change in management perspectives on the potential benefits of fire use, but also among the public and their growing ability to accept that some fires should burn. A Salmon-Challis Zone Fire Management Officer credited this change in perspective to a better educated citizenry and forest workforce, as well as resources such as the internet where information about forest fire management procedures and fire ecology may be found. The Salmon-Challis Forest Fire Operations staff leader said his attitude towards fire management had changed over time, and his viewpoint now seemed to be in line with the others. He noted:

Once I got into working with fire use teams and understanding the different ways of managing fires and I'll call it the appropriate management response has challenged me to look closely at what is the right thing to do.

There was unanimous consent among the Salmon-Challis and IMT respondents that in general, the public expects full suppression of fires and that they are put out as quickly and with as much force as possible. The IMT Liaison Officer summed up this public expectation well.

I guess I think I can say this about the Potato Fire, and I believe it applies to pretty much all fires: There is a general expectation that we will put these fires out when they are small.

The Salmon-Challis Forest Public Affairs Specialist agreed with this assessment and stated, "There's always the expectation that the Forest Service should get in there with everything they've got and hit it as hard as they can." Two agency respondents cited resistance in communities from changing "the old way of doing things." The Type 1 IMT Incident Commander noted:

You've still got a real extractionist mentality with the ranchers, miners, timber folks, and the old way of doing things is the right way. You always have people come - and we did in one of our community meetings there - and say we should have been there fighting fires at night. "That's what we used to do. We always fought fire at night. Why aren't you doing it now? It's the best time to fight fire." Well, it is from a fire behavior standpoint, but it may well be quite unsafe because of falling snags and rolling rocks and the hills are very steep. "Well, you guys are a bunch of wimps." You've got to deal with that at these community meetings.

The Salmon-Challis Forest Fire Operations staff leader relayed a comment from a local ranch owner who said, "Fighting fires is like war, you have to expect some casualties," indicating that for some in the community, fire suppression was even more important than firefighter safety.

When asked if public expectations about fire management influenced the strategies chosen for the Potato Fire, Salmon-Challis and IMT interviewees were divided. Two Salmon-Challis forest staff members responsible for drafting the WFSA indicated the public expectation that private properties be protected influenced their thought process while developing the WFSA. A Salmon-Challis Zone Fire Management Officer noted that the public:

Expect the fire managers to be responsive to their needs, and in this case we had private property threatened. They expected us to step up and do something about it. So yeah, in that context of the question, they would expect it. I know that in the back of my mind if there are private structures out there, we're obviously not going to sit back and just allow it to burn.

The Salmon-Challis Forest Supervisor felt there "was a shared vision of protecting those values at risk." Two respondents said public expectations did not influence their management strategies

on the Potato Fire. The Type 1 IMT Incident Commander stated, “I don’t think there was that perception there that was forced on the forest. There were for some other reasons, but none that had anything to do with the strategies on the fire.” The Salmon-Challis Forest Fire Operations staff leader thought the WFSAs created and public desire were in line with one another, and because of this, public expectations had no influence. He indicated that “I think the expectation, or my belief about the expectation, was for full perimeter control. I don’t think that affected our last WFSAs and the strategy that we put into that WFSAs.”

When agency interviewees were asked if they received pressure from individuals external to the agency on fire strategy and tactics, respondents were again divided. The Salmon-Challis Forest Supervisor and the Forest Fire Operations staff leader both indicated they did not receive external pressure on the Potato Fire. The Type 1 IMT Incident Commander noted that he did not receive external pressure to change strategy on the Potato Fire, but acknowledged in general, the reaction of Agency Administrators to community pressure has implications for IMTs.

How the Agency Administrators react to that concern, then gets reflected in how we [the IMT] have to react. And there’s just a lot of concern about and responsiveness to permittees, recreation, that sort of thing that we have to deal with. And that’s just part of business... but what was really becoming an issue for all Incident Management Teams is protection of private property (Type 1 IMT Incident Commander).

There was one instance of external pressure attempting to influence fire management on the Potato Fire. However, this attempt did not result in an alteration of strategy. A Salmon-Challis Zone Fire Management Officer noted:

There were two individuals in the community that thought we should be using night operations and be more aggressive with the fire. We disagreed because of safety and exposure. We didn’t think it was the adequate thing to do. We used to fight fire a lot at night, but we’ve gotten away from that primarily because of safety reasons. So, I received the pressure, but it was really not considered seriously.

When Salmon-Challis and IMT respondents were asked whether internal or external factors most influenced management flexibility on the Potato Fire, respondents provided divided assessments. Three of the eight agency respondents identified external factors as influences, including the importance the community placed on protecting values at risk such as private land and structures, mines, timber resources, power lines, and historical sites. As the fire spread towards these values at risk, the Salmon-Challis Forest Supervisor exclaimed, “You don’t have any choice but to go after this one.” The Salmon-Challis Forest Public Affairs Specialist confirmed that concern about these values at risk in the community affected management decisions.

We did have a lot of folks down there that had a lot of money tied up in places up there. When you’re talking about economies, these small communities live or die by...I mean in both Custer and Lemhi Counties, the Forest Service manages 90% of the land base. A lot of the resources come from their sum. If you’ve got

something up there that's going to go up in smoke, you're going to be concerned about it, and you're going to be angry when it wasn't done just the way you think it should be done even if you're not a fire specialist.

In contrast, a Salmon-Challis Zone Fire Management Officer claimed that external pressure did not influence his decision making.

It's not like when I make a decision on these I'm thinking, "What are the commissioners going to think." It doesn't work that way. I mean, we're doing the job we're trained to do and keeping it professional and not letting those outside influences affect us.

Three of the eight respondents identified internal factors as most influential in determining the strategy and tactics for the Potato Fire. The Type 1 IMT Liaison Officer noted that "the Salmon-Challis has an antiquated LRMP," which "did not allow for wildland fire use management outside of the Frank Church Wilderness." A Salmon-Challis Zone Fire Management Officer identified public and firefighter safety as key internal factors. He noted that due to red flag conditions:

We didn't want to expose firefighters where we didn't need to, and the number one thing on our mind was where this thing was going to go, and providing the point protections and making sure there weren't any people in those homes.

The Salmon-Challis Forest Fire Operations staff leader identified a persistent agency culture of suppression as an internal factor. "I think there is probably the culture of full bore suppression affected our ability to communicate what we really wanted." However, he pointed out that although the "meat and potatoes" of Type 1 IMTs was full perimeter control, that the Type 1 IMT Incident Commander on the Potato Fire was "learning more of the ways of adapting."

The Type 1 IMT Incident Commander thought that neither internal nor external factors were more influential in determining fire management strategy and tactics. He noted, "In this particular case I'm not recalling anything that really played a lot bigger role than another one." In assessing the success of the management strategy chosen for the Potato Fire, the Salmon-Challis Forest Fire Operations staff leader stated, "I think we all could have done a little better on this. It was a success in the end, but a very costly success."

Local Agency and Community Member's Beliefs

To understand the dynamics between the agency and the community during the fire, community members were interviewed and some participated in a focus group. When asked about their expectations for fire management, community interviewees indicated that they expected aggressive action to suppress fire early, however some respondents acknowledged that safety concerns could impede such actions. Community Participant 1 expected early management of fires. He wanted fire managers to "go put the fire out!" rather than "stare it down". He exclaimed "we're spending millions and millions of dollars when it could have been put out for ten thousand dollars." Community Participants 2 and 3 agreed with this sentiment. Community Participant 2 felt "it just seems like we don't get on them quick enough when they're real small."

Community Participant 3 thought that “it’s best to get that fire as quick as you can before they become out of control and you spend millions of dollars on them.” Community Participant 3 indicated surprise at the efforts taken to protect his property by fire teams. “I didn’t really expect them to come up and put sprinklers around my house, and they foiled the garage and outbuildings. They did a lot of work that I was very appreciative of, that I really didn’t anticipate or expect.” Community Participant 4 expected fire managers to “manage it in the safest way possible with the first concern of public safety,” and to “make sure that our community is up to date and as informed as possible about the process.” Like Community Participant 4, Community Participants 1 and 2 also acknowledged the importance of and expectation for safety in managing wildfires. However, Community Participant 1 felt that sometimes safety is used by fire managers “as a tool to not go do their job.”

When asked if they had attempted to influence how the fire was managed, two of the five community interviewees indicated that they did not but three of the five indicated some efforts to influence fire management. Community Participant 1 stated that “you’re not going to influence them. You’re not going to change their ideas. They’re going to go do it.” Community members claimed that they had made phone calls on previous fires to obtain resources for the forest and IMT, but not on the Potato Fire.

We made phone calls that, of course that’s not the Potato Fire, but again because we didn’t have structures being threatened or we would have been on the phone with the congressional people and the governor and everybody else we have to call...but not really on the Potato Fire because there just weren’t that many structures that were being threatened (Community Participant 2).

Community Participant 5 explained that locals “assisted with the knowledge of the area, but they did not influence the IMT on how they would fight fire.” Community Participant 5 continued:

They took advisements, you know... Several of the public’s comments were taking into advisement such as local ranchers. They knew pockets of water, I do believe, if I can remember correctly, pockets of water that would be accessible to that helicopter for air dumps if needed.

Community members were not asked if they had exerted any pressure on how the Potato Fire was managed. I searched for indirect references to any instances of external pressure, but did not find any among the community participant data for the Potato Fire.

When looking at the data on how the internal and external factors influenced fire management on the Potato Fire, it is clear that both internal and external factors play a role, as detailed in Table 3. Despite flexibility to use other strategies on the Potato Fire, internal and external factors converged on a more suppression oriented response. The LRMP and FMP both dictated that any fire outside of wilderness areas be suppressed. Yet, in the eyes of the Salmon-Challis Forest Fire Operations staff leader, the safety mandate that he used to inform fire management strategy and tactics, coupled with the fact that suppression could include anything from full perimeter control to point protection, provided the forest with ample flexibility to manage fire. The initial two WFSAs for the Potato Fire did constrain fire managers to full perimeter control strategies,

however the third “big” WFSAs that was eventually used to manage the fire included point protection as well and provided more management flexibility. The attitudes of Potato Fire agency interviewees were open and flexible to employing different fire management strategies based on the situation. Agency interviewee believes that the public expected suppression and protection of private property did play a role in the strategy chosen on the fire, especially point protection efforts to defend values at risk. Community members confirmed their expectation that fire managers suppress fires quickly. However, community members did not influence fire management strategy or tactics on the Potato Fire.

Table 3: What Drives Fire Management on the Potato Fire?

Internal Factors –Supporting Docs	
LRMP	+ : LRMP dictates suppression in areas outside of the Frank Church Wilderness. Fire allowed to burn for resource benefit within wilderness areas and specific Fire Management Units (FMUs)
FMP	+/- : FMP is flexible to fire use for resource benefit in wilderness and specific FMUs but otherwise dictates full suppression tactics (full perimeter control, partial perimeter control, point protection)
WFSAs	- : Fire grew beyond WFSAs perimeter control boundaries twice. WFSAs #3 added point protection strategy which increased flexibility
Internal Factors– Attitudes/Beliefs	
Attitudes	- : Fire managers recognize ecological benefits of fire use and assess each fire in determining appropriate management strategy
Beliefs about Public Expectations	+ : Agency believes public wants suppression and private property protected
Public Expectations	+/- : Need to protect values at risk (private property, infrastructure, etc.) played a role in WFSAs strategy
External Factors	
External Pressure	n/a
Community Expectation	+ : Community expects quick suppression
Community Influence	- : Local knowledge of resources was used to assist firefighting but did not alter strategy

South Fork Complex Findings

Supporting Documents: LRMP, FMP, WFSAs

Supporting documents for the South Fork Complex indicate clear acceptance of fire as a natural element of the Payette National Forest landscape. The documents also promote fire use throughout nearly the entire forest in both wilderness and non-wilderness areas. Both the LRMP and the FMP provide for full, flexible ranges of wildfire management strategies and tactics and WFU is allowed on 89% of the forest. In 2003, the Payette National Forest, along with the Boise and Sawtooth National Forests, completed revisions of their LRMP, a process that began in 1996 and incorporated 3,500 public comments. The Payette Central Zone Fire Management Officer noted that the new LRMP “gives us the full range of suppression” and is much more flexible

than the 1988 plan it replaced. The Payette East Zone Fire Management Officer stated that the LRMP “worked pretty well to where when we moved out of just suppression, we were able to kind of make the right choice for each fire.” The Payette FMP is tied to the LRMP and allowed for a full range of fire management tactics. “It was wide open for us,” (Payette Central Zone Fire Management Officer). The Payette East Zone Fire Management Officer stated that:

The FMP probably didn’t give us enough direction on how to deal with that many fires and that large of fires in one spot...those FMP’s are being cleaned up and actually becoming things that you can use...guidance that you can use and places where you can seek how you should be handling or managing different things.

To keep up with rapidly changing conditions on the multiple fires being managed in the South Fork Complex, fire managers had to update and expand WFSAs several times. Eventually, four WFSAs were written for four South Fork Complex zones, a strategy that provided great flexibility to teams managing many fires with limited resources. The Area Command Team #1 Commander noted that his team “helped the forest implement a Zone WFA concept where WFA’s were prepared for smaller zones within the Complex and within parts of the forest rather than for specific fires.” By using Zone WFSAs, “we were able to go back to the forest and move things around, and we were flexible in what we could do with what we had,” (Type 2 IMT Incident Commander). The Payette East Zone Fire Management Officer agreed with this assessment. He stated:

The WFA’s for the team, for those, I think it gave them greater flexibility. They were able to come back and regroup if something got threatened and put people and equipment where it should be, and not park it there just because it may be needed later. There was a lot of movement of crews from fire to fire.

Overall, the supporting documents indicate very high levels of flexibility for managing wildfire on the Payette National Forest.

Agency Attitudes and Beliefs

When Payette, IMT and Area Command interviewees were asked about their attitude towards fire management, half of the eight respondents indicated that they already had flexible views concerning fire management, while the other half had become more tolerant of fire over time and were open to fire management flexibility. Those respondents who stated that their attitude about fire management had not changed over time viewed fire as a natural and necessary part of the ecosystem and understood that total suppression policies long dominant in the Forest Service were harming ecosystems more than helping them. The Payette Forest Fire Management Officer stated that fire “is a natural process and part of the landscape like wind or rain.” The Payette Forest Supervisor agreed with that assessment and claimed “I have been very frustrated in some cases over my whole career seeing all the dollars go to fire suppression in some places where I didn’t think it was appropriate.” The Area Command Team #1 Commander noted that the focus on suppression has been changing and said “I feel that we’ve been given an emerging and evolving policy over time that gives us more flexibility.” Interviewees who noted that their attitude towards fire management had changed over time discussed the priority of safety surpassing the priority of suppression. “Instead of just pushing a button and sending everything,

our attitude would change towards the safety,” (Payette East Zone Fire Management Officer). This shift has caused fire managers to rethink fire management strategies, which in turn has allowed them to see some of the potential benefits of fire use for the ecosystem when every fire is not fully suppressed. A lack of resources in the 2006 fire season, which made full suppression impossible, also contributed to this change in perspective. A statement from the Payette Central Zone Fire Management Officer did an excellent job in encapsulating this change in attitude toward fire management.

The South Fork Complex really changed my thinking as a fire manager. It really opened my eyes that in these fire adapted ecosystems, we’ve done a lot more harm by putting them out. That is a big reason why we’re getting these big mega fires, and in years like 2006, sure, for maybe a decade we’re going to have to eat some smoke, but it’s going to be such a reduction in fire behavior and smoke production into the future that we need to sell the public on that idea.

When asked what they felt the public expected in terms of fire management, Payette, IMT and Area Command interviewees agreed that generally the public expected suppression, but that this view was not uniform. Three of the eight interviewees noted that the some members of the public understood that every fire cannot be put out and that those most vocal about suppression represent a minority. The Payette Forest Fire Management Officer stated, “I am sure they expected us to go put it out.” The Type 2 Incident Commander thought that members of the public “always feel that the Forest Service isn’t jumping on the fire quick enough.” The Area Command Team #1 Commander agreed and felt the public “expect aggressive action and short durations.” The Payette Central Zone Fire Management Officer saw some members of the public expecting full suppression while others approved the strategy used to manage the South Fork Complex. He noted, “There’s select groups...that applauded us for what we did.” The Payette Public Affairs Specialist stated “some people whose expectation is for us to put the fire out...they’re a minority.” He continued, “I think most folks understand with fire season that we’re doing the best that we can. They see the air tankers flying over every day. They see the helicopters. They see the fire trucks in town.” The Payette East Zone Fire Management Officer agreed that a minority was vocal about their suppression expectations.

The minority always seem to be the one that’s in the headlines. Those are the ones that are always causing the stir, but our attitude is, “If those are the ones that are getting the headlines, before long, some of the other public is going to start thinking that’s exactly the truth, and those people are right.” So unless we counter it with better information, we may see some of that trend continue.

The Area Command Team #1 Commander noted the public, “expect professional fire management and professional actions, and they expect honesty and integrity in the agency’s dealings with them. They wanted to be communicated to. They want to know what’s going on.”

When asked if the public expectations about fire management influenced strategies chosen for the fire, Payette, IMT and Area Command interviewees all indicated that public expectations did not play a role in management of the South Fork Complex but acknowledged previous years when they did. “For this one I’d say no,” the Payette Forest Fire Management Officer noted.

The Area Command Team #1 Commander agreed and saw public expectations sometimes influencing fire management but not for the South Fork Complex. “Sometimes. Within the South Fork Complex, I don’t feel that it did,” he stated. The Type 2 IMT Incident Commander also did not feel public expectations influenced fire management on the South Fork Complex. He recalled:

No, I don’t think it altered as much as we tried to meet their needs by having the people visible and working around their town to make it fire safe as much as possible. That was not just because of what they said, it was because of the type of crew we had, kind of a combination of that.

The Type 2 IMT Incident Commander continued that the goal of his IMT was to “keep an open camp and open mind and open communication with the town.” The Payette Central Zone Fire Management Officer agreed that maintaining communication with the public was important in allowing fire managers to carry out their strategy for the South Fork Complex. He noted:

I mean, we listen to the public, but what we try to do is educate the public. We put out newspaper articles. I can’t tell you how many conversations with the public that I’ve had and that the rangers have had about the South Fork Complex to educate them. I guess, looking at the question...my beliefs...you know, the public expected us to put it out, and my beliefs told me that 2006 was a good time, especially in that South Fork drainage to let fire do its thing. So my beliefs didn’t match up with the public’s influence.

When agency interviewees were asked if they received pressure from individuals external to the managing agency on fire strategy and tactics, only one of the eight agency respondents indicated that they had. All other agency participants indicated that external pressure did not play a role in management of the South Fork Complex. The Payette Forest Fire Management Officer stated, “No, we really didn’t. The congressional staffers weren’t even really interested in this.” Both the Type 2 IMT Incident Commander and the Area Command Team #1 Commander stated that they did not receive external pressure on the South Fork Complex. The Payette East Zone Fire Management Officer noted that, “from the regional office to the Area Command...all those guys came in and I think they did an exceptional job of carrying out what the forest supervisor and the forest wanted for those fires. So nothing was altered or changed.” Only the Payette Central Zone Fire Management Officer recalled any external pressure to change fire management strategy. He recalled:

The Idaho Department of Environmental Quality, they didn’t appreciate that we were putting that much smoke into the air shed. I think they would have preferred that we put it out. They understood that we couldn’t and they couldn’t really do anything because it was a natural event, but later that fall, they didn’t give me clearance to do a large prescribed fire that I wanted to do.

When asked whether internal or external factors most influenced management flexibility on the South Fork Complex, agency respondents identified internal factors such as safety concerns and

lack of resource availability as primary drivers of management decisions made on the South Fork Complex. The Type 2 IMT Incident Commander explained:

The management at the South Fork Complex in general would have been different if there were more resources available. We could not do the normal things we do without the resources. If we had to do with what we had...and I can see the town thinking that that was not enough, or, "How come you can't have more people? How come you can't have more crews?" As far as the situation nationally, I think we did the best we could do and we were able to get the forest to help agree to do some things.

Due to agency resource unavailability, fire managers utilized less aggressive tactics because of safety concerns. "The main influence on anything that we do is the safety. We didn't have the correct people to put in those places, and we would not put people in a bad, unsafe situation," (Type 2 IMT Incident Commander). The Area Command Team #1 Commander also identified resource unavailability as an internal influence and stated, "Given the fire situation, the resource availability regionally and nationally became very low, so we had limitations on tactics we could choose and design because we didn't have enough resources to implement some of those." Additionally, The Area Command Team #1 Commander cited the decision to not manage many of the South Fork Complex fires for resource benefit as an internal constraint.

The internal factors would be the management decision to not manage any fires for resource benefits. So that took away a whole option we would have of managing those fires for resource benefits and monitoring some of those. So it put us into utilizing the full range of management responses and tactical responses for suppression activities.

Local Agency and Community Member's Beliefs

To understand the dynamics between the agency and the community during the fire, community members were gathered into a focus group and interviewed. When asked about their expectations for fire management, community members all agreed that they expected the fire to be suppressed quickly while it was still small. Community Participant 4 felt fire managers "should have put that fire out when it was a little fire.... if ten guys had a hit it, it would have been over with." Community Participant 8 agreed and thought fire managers should have extinguished a tree struck by lightning that started the fire. "I still think they should have put that tree out." Community Participant 8 continued:

I have a hard time when they throw out all these numbers, and millions and millions of dollars whining about it, when that could have been – I'll just say \$5,000 to put that fire out; that's a lot better than millions.

When asked if their expectations for fire management affected how the fire was managed, community participants unanimously agreed that they did not. Unlike the other fires, the community participants from the South Fork Complex felt that their expectations for fire management had been completely dismissed. Community Participant 7 stated, "Absolutely not." Community Participant 8 agreed with that assessment and noted, "we're not experts...I was told

to my face many times that, “You are not a fire expert.” I know that; I’m just asking a question.” Community Participant 4 echoed this sentiment. “We don’t know anything; I understand that. None of us sitting here know a thing.” Community Participant 7 summed up the community sentiment comparing public expectations to the actions of fire managers. “As far as what our expectations were, they certainly weren’t what happened.”

Community interviewees were also asked if they had attempted to influence the strategy or tactics used on the South Fork Complex. Community members did attempt to influence strategy on the South Fork Complex but were unsuccessful in their efforts. Community Participant 2 noted, “We tried, but were we successful? Zero.” Community participants disagreed with what they called for forest’s “let burn” policy, but were unable to change it. Community Participant 2 also recounted that “the local people and the local Sheriff and the local emergency people around here were trying to tell them that you need to do something now, not wait, and they had that all – And they let burn wilderness area.” Community members expressed frustration that they were unable to influence the forest’s WFU policy and program. Community Participant 4 stated:

This is the basic problem here. They can tell us all they want to about the let it burn policy...none of us agree with let it burn all the time policy.

Community Participant 7 agreed and saw “it might take some time but we could at least address the issue to say we don’t like this policy and start calling the people who could affect a change in the policy.”

Community members were not asked if they had exerted any pressure on how the South Fork Complex was managed. I searched for indirect references to any instances of external pressure, but did not find any among the community participant data for the South Fork Complex.

When looking at the data on how the internal and external factors influenced fire management on the South Fork Complex, neither played a particularly influential role, as detailed in Table 4. The LRMP and FMP of the Payette National Forest both are accepting of WFU on the forest and provide great flexibility for fire managers. The four zone WFSAs used to manage the various fires in the South Fork Complex allowed fire managers to tailor strategy to the situation on the ground and shift resources as necessary. Due to resource constraints, fire managers could not employ very aggressive tactics that would have put firefighters in dangerous situations. Having to make do with what resources were available allowed the forest to employ a strategy to let the fire work for resource benefit where possible, a strategy that was supported by the attitudes of agency respondents. Public expectations that fires be suppressed quickly did not alter the fire management strategy on the South Fork Complex, much to the disappointment of community members who do not approve of the forest’s fire use program. Overall, the principal factors that guided management decisions on the South Fork Complex were not any of the specific factors explored for this research. Rather, firefighting resource constraints and considerations of safety guided strategy and tactics most on the South Fork Complex.

Table 4: What Drives Fire Management on the South Fork Complex?

Internal Factors –Supporting Docs	
LRMP	– : Fire use approved on 89% of the forest and allows full range of strategies and tactics
FMP	– : Allows for full range of strategies and tactics. Only limiting factor of FMP – it doesn’t specifically address how to manage so many fires at once
WFSA/LTIP	– : Four zone WFSAs created to manage multiple fires in different areas of the forest. Strategy provided flexibility to easily shift resources as needed
Internal Factors– Attitudes/Beliefs	
Attitudes	– : Very flexible attitude about fire. Safety has overridden suppression as primary consideration
Beliefs about Public Expectations	+/- : Agency generally believes public wants suppression, but some public factions understand the value of fire
Public Expectations	– : Public expectations did not influence fire management decisions on the South Fork Complex
External Factors	
External Pressure	n/a
Community Expectation	– : Community expects fires to be quickly suppressed, but their expectations were not met
Community Influence	+/- : Community provided input but it did not alter the fire management strategy

Key Set One Findings

Comparing the internal and external factors that influenced wildfire management on the two Set One fires provides an opportunity to identify which factors may be most associated with a high cost fire, such as the Potato Fire. The supporting documents, the LRMP and FMP, agency beliefs about public expectations, two internal factors, and community expectations for fire management, an external factor, were found to be the most influential factors that restricted flexibility and contributed to high cost on the Potato Fire. On the Potato Fire, the LRMP and FMP limited fire management flexibility outside of wilderness areas. In contrast, WFU is allowed on 89% of the Payette National Forest where the South Fork Complex was burning. Fire manager’s attempts to meet the community expectation for protection of private property on the Potato Fire led to the inclusion of a point protection strategy that did add some flexibility but also increased suppression costs. The belief that the public expected suppression affected the strategy selected on the Potato Fire. The South Fork Complex saw more varied strategies that also included monitoring, use of fuel breaks, and slow/delay spread of fire. However it should be noted that the community from the South Fork Complex expressed disappointment that suppression was not the forest’s primary strategy and that citizens did not agree with the forest’s fire use program. The principal similarity found between the two fires was that agency attitudes on both fires were flexible and open to fire management flexibility.

Ahorn Fire Findings

Supporting Documents: LRMP, FMP, WFSA and LTIP

Supporting documents for the Ahorn Fire indicate acceptance of fire as a natural element on the lands of the Lewis and Clark National Forest and promote its use to enhance resources where possible, especially in wilderness areas. Both the LRMP and FMP allow unplanned ignitions to burn in specified zones of the forest, however control/confine suppression strategies are mandated in fire exclusion zones. Fire exclusion zones on the Lewis and Clark National Forest are situated near values at risk such as valuable timber areas, infrastructure and WUI communities. The Lewis and Clark Resource Advisor noted that the exclusion zone threatened by the Ahorn Fire was a “political designation [from] a number of years ago based on some fairly high profile private land near the wilderness boundary.” The Lewis and Clark Forest Fire Management Officer stated that the Ahorn Fire “could have been managed for resource benefit, but was not because of the proximity to the [wilderness] boundary [and edge of the fire exclusion zone], it was put into suppression status.” The Lewis and Clark Forest Fire Management Officer stated that the LRMP, although written in 1986, “allows us the full range of options for managing fire.” The FMP provided somewhat less flexibility than the LRMP because it included less precise language about WFU than the LRMP, and forest staff acknowledged the FMP needed to be updated. The Lewis and Clark Forest Fire Management Officer stated:

There’s other management areas within our LRMP that allow us to manage fires for resource benefit, but our FMP does not have that provision in there. It’s not because the plan is limiting, because the Fire Management Plan is simply an implementation tool for our Land Management Plan. It’s that we as land managers have not chosen to change our Fire Management Plan to allow more resource benefit objectives.

A Lewis and Clark District Ranger noted, “The interpretation of the FMP was that we put out all fires in non-wilderness, and that was the message that I carried, and it’s the one that I still carry today even though I would like to see a change.” The incongruence between the LRMP and the FMP as it related to fire exclusion zones was addressed in the forest’s updated 2009 Wildland Fire Response Guide (Lewis and Clark National Forest 2009).

The initial WFSA written for the Ahorn Fire dictated full suppression due to the proximity of the fire to the exclusion zone, but because of the inaccessibility of the area in which the fire was burning, rugged terrain, and fire behavior, the strategy was changed to confine and point protection. The Lewis and Clark Forest Fire Management Officer noted, “Once they lost it, our strategies and tactics had to change because we were no longer able to manage for full perimeter control.” A Lewis and Clark Resource Advisor stated that the WFSA “got totally ignored. By the time that...within a week of that WFSA being completed...the WFSA had no bearing on any sort of action at that point.” The WFSA was replaced with a Long Term Implementation Plan (LTIP) which utilized a strategy of “waiting for the right times to be aggressive.” The Lewis and Clark Forest Supervisor became “more comfortable once we got into the LTIP discussion and we were looking out quite a bit farther ahead,” because the LTIP “really helped us lay out actions and some places where we felt we needed to take action and places where we didn’t think any action was going to help.” Overall, the supporting documents indicate high levels of flexibility for managing wildfire on the Lewis and Clark National Forest.

Agency Attitudes and Beliefs

When Lewis and Clark National Forest interviewees were asked about their attitude toward fire management, most of the respondents noted that they had become more tolerant of fire over time and less likely to immediately use suppression as a management tactic. This shift in attitude was a result of experience and perspective gained by the respondents as they have advanced through their careers and managed fires in different circumstances. The Lewis and Clark Forest Supervisor noted, “I have always thought we were too aggressive on trying to put every fire out every time,” and “I started understanding how much money we were wasting on fire.” A Lewis and Clark District Ranger agreed with this statement and expressed, “I think we’re getting better at managing our dollar cost” and that the Forest Service would “like the public to get a better idea about us being more effective with their money.” A Lewis and Clark Resource Advisor felt that the Forest Service had done a much better job of incorporating flexibility and cost considerations into fire management when compared to state and federal partner organizations. He cautioned though, “I think there’s some very progressive folks out there, but I think there’s a large number of folks who are very suppression minded.” While the Lewis and Clark interviewees indicated that their own attitudes toward fire management were open and flexible, it was acknowledged that other fire management personnel, especially from partner and state organizations, remained suppression focused.

When asked what they believed the public expected in terms of fire management, most Lewis and Clark respondents noted that the public expected the fire to be put out as expeditiously as possible. The Lewis and Clark Forest Fire Management Officer stated that “they wanted it out, most importantly, they wanted it kept off private property.” A Lewis and Clark District Ranger discussed that the public expected information, they expected the forest to manage the fire in partnership with local agencies, and that private properties be protected. Two respondents said there were some members of the public who understood the resource benefit fire could provide, however, “As the fires grew, that’s when the nerves started to fray a little thinner.” The Lewis and Clark Interpretive Center Director noted that “some wanted it out, but not all wanted it out. There are factions in the communities along the front that understand the value of fire...and so some people understood what we were doing, and they did support it.” The Lewis and Clark Forest Supervisor stated, “The reality is they don’t want anything from a fire standpoint to change the way the forest looks, and they certainly don’t want any economic impact,” because of the negative impact on local businesses a fire may have. The Lewis and Clark Resource Advisor said, “The majority of the community, I think, still looks at a black acre as a destroyed acre, as opposed to fire playing its natural role.” “But there’s a growing number that understand we’re just powerless at times,” the Lewis and Clark Forest Fire Management Officer felt.

When asked if the public expectations about fire management strategy influenced the strategies chosen for the fire, all Lewis and Clark respondents noted that public expectations and influence did play a role on the Ahorn Fire. Many noted that they always took the public input and expectations into account and would take the time to speak with them, but that the public often had unrealistic desires about fire management. The Lewis and Clark Forest Supervisor confirmed this by stating, “We do listen to the public, but what they suggest has to be doable, and it has to be safe.” The Lewis and Clark Forest Fire Management Officer agreed and thought:

That's where we've gained credibility, I think, in the community, with that silent majority. We have spent the time to tell them--here's what you can expect, this is what we can do, this is what we can't do, and this is why we can't do it.

A Lewis and Clark District Ranger noted, "Their [the public's] comments are always considered when we're talking about fire in the long term or in terms of outside of the fire season when there's not something happening," but he did not appreciate distractions of fire crews by individuals trying to express their beliefs during a fire event. One respondent bemoaned public influence on forest fire policy and stated:

We're the ones that put the darn exclusion zones there in the Fire Management Plan for the Bob Marshall Wilderness Complex back in 1981. We succumbed to that and now we've had to live with it for however many years...²⁷ now I believe. So it has ended up putting undue pressure to suppress all fires related to that rather than manage them for potential benefit.

There were no specific instances of fire management changes on the Ahorn Fire in response to public expectations, however, the public expectation that private property and structures be protected did play a role in fire management strategy for the Ahorn Fire.

When agency interviewees were asked if they received pressure from individuals external to the managing agency on fire strategy and tactics, respondents were divided. Three of the six respondents acknowledged that they did experience pressure. This pressure came from private landowners, the public, local and state agencies or local fire departments, and local politicians. The Lewis and Clark Fire Management Officer noted:

From the day it escaped we were getting opinions as to what was the appropriate way to manage that fire from private individuals, from DNRC [Montana Department of Natural Resources and Conservation], from all of our interested participants. There was some political interest there. Our state representative, his ranch borders a national forest.

The IMT received input and criticism from local citizens and local fire management agencies about not putting the fire out fast enough. The Lewis and Clark Resource Advisor stated:

I know every day that, whether it was local state folks, fire department folks were trying to have some influence on the IC management on how that fire needed to be put out, but it just couldn't. It was a long term event and the only thing that was going to put this out was Mother Nature.

Other Lewis and Clark respondents discussed the positive input and negative pressure exerted by private landowners who owned land adjacent to the forest. One individual, a local politician who owned land next to the forest, came in to discuss fire management strategy options for his land. The Lewis and Clark Public Affairs Officer noted that:

I think they listened to him and that they thought about it. I don't know whether they took any of those actions that he recommended, but I do feel that he was respected and his ideas were respected a lot more than they would have been 20 years ago.

The Lewis and Clark Forest Fire Management Officer discussed a different local landowner who demanded a structure on his property be protected, an action which led to an estimated \$1,000,000 in fire management costs. He stated, "From an effectiveness standpoint, from a cost standpoint, we would have been better off to burn it out and be done. We would have saved hundreds of thousands of dollars."

Two of the six Lewis and Clark National Forest respondents stated that they did not receive external pressure during the Ahorn Fire. The District Ranger noted a difference in philosophy about fire between the IMT and the local county fire warden. He stated:

I can't say that he ever directly approached me or put any direct pressure on me. It was more behind the scenes. I can't say that it affected anything. We just continued to work closely with them, and knowing that perhaps he had different feelings about it.

When asked whether internal or external factors most influenced management flexibility on the Ahorn Fire, three of the six respondents identified internal factors as most influential while few identified external factors. Those respondents who thought internal factors were most influential identified considerations of firefighter safety, the effects of fire on resources, cost to some degree, and the arrival of a Type 1 IMT that didn't mesh well with the local unit as internal factors influencing fire management. Although these internal factors differed from those specifically explored for this research, the fact they were mentioned by multiple respondents supports their importance. A Lewis and Clark District Ranger stated:

I'd probably go with internal 70% and external 30% mainly because of the challenges from when the Type 1 teams [who wanted to aggressively suppress the fire] came in. A lot of teams aren't used to the local units being as assertive as we are, but we manage many of our Fire Use events on our own.

Pressure to change the management strategy was not exclusively from the external public, but also came from the IMT and their internal prevailing culture of how they fight fire.

The Lewis and Clark Resource Advisor identified the arrival of a suppression oriented Type 1 IMT that wanted to fight fire and "claim victory" as an external influence because that team disagreed with the forest's LTIP strategy. A different IMT was subsequently brought in after a non-fatal helicopter crash that better understood the forest's LTIP strategy and "cut down their number of flight hours greatly compared to what their helicopters had been flying," (Lewis and Clark Resource Advisor). He stated, "Even though they, I think they understood it [the fire situation] or grasped it a lot better, it wasn't necessarily the cheaper of the two options." Differences in perspective about fire management between forests and IMTs were not examined in this research but deserve further consideration in future research.

The Lewis and Clark Forest Fire Management Officer noted that, “external factors are there. They have an influence. But we’re going to manage fires how we need to on the National Forest.” The Lewis and Clark Forest Supervisor thought neither internal nor external factors played a significant role and stated, “I think it was just the reality that we had a fire and we had to try and manage it.”

Local Agency and Community Members’ Beliefs

To understand the dynamics between the agency and the community during the fire, community members were gathered into a focus group and interviewed. This helped triangulate on the responses given by the agency representatives. When asked about their expectations for fire management, community members had varied responses. Community Participant E noted, “It’s completely different. You can’t open up your book, I don’t think, and look and say, this is how we’re going to do on this fire.” Community participants seemed to recognize that the difficulty of terrain made attacking the Ahorn Fire difficult. Community Participant B stated:

It was on some pretty bad terrain. They could have killed somebody there trying to put it out. So, in their defense, I think they did get on it right away, but I think they lost a lot of opportunities shortly thereafter where they could have got in there and done a little better job.

Many respondents discussed that they would like to see improved pre-fire communication from the Forest Service, including a clearer explanation of forest intentions on fire use. Many community members utilize forest lands to graze cattle, conduct timber operations, or for recreational activities. Therefore, being properly advised about the forest’s fire use plans is essential to the livelihood of community members. Community Participant C said, “it was clear to me they weren’t going to do anything to the fire ‘til it got way out here to the front. They ought to just tell us that upfront.” Community Participant F agreed with C and stated that the Forest Service should “be honest and upfront right from the get go so we don’t have all this chaos and people upset.” Community Participant D offered a theory why the forest did not explain its fire plans. “I think they kind of keep their head down because if their policy is let it burn, everybody’s going to get upset about that. So they don’t want to promote, communicate that a whole lot.” Overall, the data were unclear on public expectations for fire management. Community participants acknowledged that each fire requires unique management decisions, yet they also seemed disappointed that the fire was not suppressed early.

Community participants wanted the forest to simply be up front and state whether the fire would be suppressed or managed for resource benefit. Community Participant C stated:

What are their purposes for managing it? If they’re going to let it burn, they ought to tell people right upfront-you’re in trouble. And yes, they always have this suppress the fire, that’s one of their big things, but at some point, they need to be much more clear. They always hope hope hope. But as a manager, hope is not a business plan. They just can’t be doing that. They’ve got to be telling people-here’s what might could happen. They need to tell people upfront, who’ve been living here for years, this is what probably could happen. And these people could

take it. They might not like it, but at least they know. They don't hold out hope to people. And also they need to have an obligation to people, especially leasees and such. We know that fires occur, here's our back-up plan if something happens. Maybe those plans don't work, but we don't wait til after the fires and figure out whether we're going to move people around or leases or whatever. It's like, you're right, they're not managing fires, they're managing people.

When asked if they had attempted to influence how the fire was managed, many community participants indicated that they had. Community Participant B stated, "I was always putting my opinion out there, but it didn't really count for anything." Community Participant F agreed, "Yea, if you had a concern, you'd definitely approach them about it, depending on what kind of concern. But they don't ask you about your concerns necessarily." Community Participant C took a proactive approach in an attempt to influence how fire would be managed on his property.

We wrote that to them before they came to us because we had seen what happened to the neighbors and other people's fires. We were getting more aware. If we don't say anything-they're going to do what they want. That was my impression, if we don't say something, they will do something what they think is best. They don't care about your property or care about these things. They do certain things they think you wanted done. You need to tell them, don't do these things.

Community Participant F felt:

I think they respond to what the public wants. They tell you kinda what they think you want to hear, but they don't do what you wanted them to, or what people think. It's their way or no way really. They obviously have a procedure and a way to go about it.

Community members were asked if they exerted any pressure on how the fire was managed, and some indicated that they had. Community Participant F noted once the fire began, "Everybody pushes jump on it, jump on it." Community Participant C's property was threatened by the advancing fire, therefore "We wrote them a letter saying, here's what we expect of you. Once that fire comes out, here's some things you better not do." Community Participant E confirmed the instance discussed by the Lewis and Clark Forest Fire Management Officer of another structure being protected because the family "pushed on them a lot too."

Others brought up conflicts between the local Forest Service and the IMTs managing the Ahorn Fire. Community Participant B noted:

Well, there was a lot of conflict between him [District Ranger] and the different [IMT] team leaders because he was telling him, "We don't want you doing this," and they're saying, "We need to do this to stop the fire."

A trend that emerged through analysis of the Ahorn community interviews was one of distrust for non-local fire managers. Community Participant C recalled, "We said, this is how we prefer

to do it and we want the locals involved whatever we do because they have a different attitude.” In fact, one respondent noted that a District Ranger exclaimed he never wanted a Type 1 IMT back after the Ahorn Fire.

When looking at the data on how the internal and external factors influenced fire management on the Ahorn Fire, it is clear that both internal and external factors played a role, as detailed in Table 5. The LRMP, FMP, WFSA and LTIP provided fire managers with flexibility to manage the fire for resource benefit where appropriate. Due to the proximity of the fire to the exclusion zone and the probability that the fire would spread into it, a suppression strategy was employed even though the fire began in the wilderness where WFU was allowed. Lewis and Clark representatives indicated that their own attitudes about fire management were flexible, however the Type 1 IMT was more suppression oriented. Agency interviewees believed that most of the public expected suppression but noted that some community members understood the value of fire. Community members generally validated this view. Some community participants seemed open to accepting fire use if the Forest Service explained the circumstances of its application better. Agency respondents noted that they were open to receiving public input about fire management, but that they did not necessarily implement public suggestions. This sentiment was upheld by community members who acknowledged they provided input to fire managers, but knew that this information was not always used. Conflict between the some of the IMTs managing the fire and the local Forest Service unit provided the greatest levels of internal pressure on fire managers. Unfortunately, no IMT members agreed to be interviewed for the Ahorn Fire, restricting the possibility to better understand the differences between the IMT and the host agency on this issue. IMTs wanted to suppress the fire but were unable to apply an aggressive suppression strategy because of restrictions on fighting wildfire in wilderness areas enforced by the local District Ranger who took part in developing the fire strategy. The Lewis and Clark District Ranger noted:

We were still in wilderness. Often times, I’ve seen actions taken that had no way in hell of ever working, and then the scars are left, like dozer lines essentially, are worse than what the fire could have ever done. The fact that we were dealing with wilderness and wildland influenced that, and we also recognized that the fire had a pretty good steam. The forecast for the conditions throughout the remainder of July and August were looking pretty dire, and those things definitely influenced it in terms of us recognizing that the fire was going to get big, and that there was no need to put resources at risk anymore.

Table 5: What Drives Fire Management on the Ahorn Fire?

Internal Factors –Supporting Docs	
LRMP	+/- : LRMP encourages fire use throughout forest except in exclusion zones. Ahorn Fire started in the wilderness but near an exclusion zone boundary and therefore required a suppression strategy
FMP	+/- : FMP is flexible to fire use but contains less precise language about its use than LRMP
WFSA/LTIP	- : Fire burned past WFSA boundaries twice and instead a LTIP was implemented to manage fire as a long term, more flexible event
Internal Factors– Attitudes/Beliefs	
Attitudes	+ : Attitude of IMT was more suppression-minded than local host unit
Beliefs about Public Expectations	+/- : Agency generally believes public wants suppression, but some public factions understand the value of fire and that not every fire can be suppressed
Public Expectations	+/- : Public input accepted, but not always applied
External Factors	
External Pressure	+ : Private landowners provided input for how they wanted fire managed on their property
Community Expectation	+/- : Community expectations not uniform
Community Influence	+/- : Community provided input but recognized it was not always applied

Wicked Hicks Complex Findings

Supporting Documents: LRMP, FMP, WFSA, LTIP, CWPPs

Supporting documents for the Wicked Hicks Complex revealed clear restrictions regarding fire management flexibility in non-wilderness areas. According to the LRMP and the FMP, fires may be managed for resource benefit only if they are in either the Absaroka-Beartooth or the Lee Metcalf Wilderness areas. All other fires are considered wildfires requiring appropriate suppression. The Wicked Hicks Complex burned mostly in the Absaroka-Beartooth Wilderness, but also spread into non-wilderness areas, threatening communities. Concerning the LRMP, which was written in 1987, a Gallatin Natural Resource Staff Officer stated, “On a large landscape level it let us know what our overall objectives were and what’s permitted on that landscape.” In 2007, the Gallatin National Forest began a process to update its LRMP and FMP to develop broader fire use guides for areas outside the designated wilderness area which would provide more fire management flexibility across the forest. However, at the time of the Wicked Hicks Complex, WFU remained restricted to wilderness areas. Although the forest was in the process of updating the forest’s fire plans, the Gallatin Forest Fire Management Officer noted about the FMP:

We still have to follow it, and we do follow it, it’s just that we’re changing the fire language part with our [fire management] amendment. It’s not to say that it hampered us, but it’s not something we can just blow off just because it’s old.

In addition to forest plans, the Gallatin FMP also cited three CWPPs that had been developed by counties surrounding the forest, including the Gallatin County CWPP, the Park County CWPP, and the Sweet Grass County CWPP. These CWPPs all sought to identify values at risk throughout the counties through collaborative stakeholder and citizen engagement, with special focus on the WUI and fire management resources. Public education about defensible space and hazardous fuel reductions to mitigate wildfire risk were also important aspects of the CWPPs. Overall, the CWPPs served as guidance documents for the counties and communities involved rather than assertions of policy. Therefore, the CWPPs did not affect fire management flexibility. If anything, the CWPPs sought to improve firefighting coordination and cooperation for the future, in addition to public education about fire management, with the goal of developing more robust pre-fire planning structures.

The initial WFSAs for the Wicked Hicks Complex suggested a point protection, indirect, confine strategy. However, due to the growth in the fire size and the location it was burning in the Absaroka-Beartooth Wilderness area, the strategy shifted to accommodate management for a long duration event, and a LTIP was drafted using inputs from the WFSAs. The Gallatin East Zone Fire Management Officer stated, “The WFSAs were the actual decision documents and the Long Term Implementation Plan kind of laid out the long term strategy.” With national fire resources constrained because of the busy 2007 fire season, fire managers on the Wicked Hicks Complex drafted the WFSAs and subsequently the LTIP with broad, flexible parameters built in. The Gallatin Forest Fire Management Officer noted:

I think it’s really helped us look at some of these alternatives we used to apply to a fire with really small perimeters, and now you see these perimeters kind of backing off a lot and those teams actually get involved and pick the places that make the best sense to stop the fire.

A Gallatin District Ranger agreed that more flexibility and greater scope was being built into WFSAs, a result of the extreme 2006 fire season in which the area saw over 250,000 acres burned in the Derby Fire and the Jungle Fire.

The one thing the WFSAs did because of our experience in 2006, we did a much better job of thinking bigger and really outlining the values at risk, and if you look at that WFSAs, I think we had \$1.3 or 1.8 billion dollars worth of values at risk, and we’ve done a much better job than we’ve done in the past of really thinking about and being able to evaluate our values at risk. (Gallatin District Ranger)

Overall, the supporting documents do indicate flexibility for managing wildfire in wilderness areas but much less flexibility in non-wilderness areas of the Gallatin National Forest.

Agency Attitudes and Beliefs

When Gallatin National Forest and IMT interviewees were asked about their attitude toward fire management, all six respondents noted that it has changed over time and they have become more open minded towards fire management flexibility. Several respondents highlighted the shift in importance away from suppression and towards a focus on safety.

I think my attitude has shifted more toward really thinking about the important aspects of fire management, which is firefighter and public safety, and really weighing out the risks and benefits about managing those fires and the kind of situations that you're putting people in. (Gallatin Natural Resources Staff Officer)

The Type 1 IMT Incident Commander agreed. He claimed, "I feel fire management has changed. It's changed from fire control to fire management. The focus is on firefighter exposure." The Gallatin East Zone Fire Management Officer noted, "I realize the need for more fire on the land, and so I stay open to the ability to do that." A few respondents discussed how drastically fire management has changed since the 1970's and 80's when fires were handled by a single agency and suppressed quickly, whereas today large fires are typical and require collaboration among partners. "With the limited resources we're dealing with now, you just have to come up with new ways to manage these fires," the Gallatin Forest Fire Management Officer exclaimed. He went on:

Almost every fire we have has mutual aid response. So we've gotten to work with those folks and we've spent a lot of time explaining...first to them, and now they are explaining it to their customers why we're not putting full perimeter control on all these fires, and why we can't.

When asked about public expectations for managing the fire, all six agency respondents discussed the importance of providing information to the public and having an open dialogue with communities about fire management decisions, so the public could understand decisions and why they were made. The recurrence of this theme in interviews on the Wicked Hicks Complex stems from the apparent dissatisfaction of community members with fire management information they received during the Derby and Jungle Fires in 2006. The Gallatin Natural Resources Staff Officer noted that public "expectations were really about information and being able to get information and be engaged. They wanted to be able to talk to people and have access to people that could give them information." The Type 1 IMT Incident Commander reported, "I think initially the public expected us to do full perimeter control, build a line all the way around the fire." The Gallatin Forest Fire Management Officer confirmed this public expectation. He noted, "Their expectations are to keep it on the forest and not to burn private lands or structures." Fire managers held several public meetings when the fires broke out and explained to communities who wanted suppression that not every part of the fire could be or would be suppressed. The Gallatin East Zone Fire Management Officer discussed how lessons learned from the past of caving to pressure to change tactics had failed.

Several things we did and learned from in 2006 were kind of politically driven tactics that didn't work, and we just really didn't do any of those, and I think they [the community] appreciated that. I think that's really what they wanted. They wanted us to make sense (Gallatin East Zone Fire Management Officer).

Many respondents also discussed the expectation the public placed on safety of both firefighters and the community itself, including protection of private structures where possible. The Gallatin Public Affairs Officer summed up the public expectation for fire management. "Do what makes sense and protect our resources, but don't kill anyone in the process."

When agency respondents were asked if their beliefs about the public's expectations influenced fire management strategies and tactics, all six respondents agreed that conditions on the ground and safety considerations were most important in determining fire strategy. Many respondents noted that public expectations are often acknowledged and in the back of one's mind, but that the expectations would not necessarily alter management decisions. A Gallatin District Ranger said, "I believe the public has an expectation that we're going to manage these things professionally, but did we change our management based on public expectations? No." The Gallatin Natural Resources Staff Officer noted:

People's expectations certainly influenced some of the support decisions we made about the fire like how we communicated with them, how we implemented the evacuation and the end of the evacuation, the closure orders and the closures to recreation and camp fires...that's a real social decision.

The Gallatin Natural Resources Staff Officer clarified that ground conditions still dictate tactical and strategy decisions. The Gallatin Public Affairs Officer agreed with this assessment and stated, "From an information standpoint, we morphed our information approach a little bit by beefing up what we are doing on the Nye, Stillwater side, but not suppression tactics."

When agency respondents were asked if they received pressure from individuals external to the managing agency on fire strategy and tactics, most respondents said they did not receive external pressure to change fire management strategy. Some respondents discussed how public meetings were held in Stillwater County where the local public made their opinion that the fire should be put out as aggressively as possible well known to fire managers. The Type 1 IMT Incident Commander said these public meetings did not alter fire management strategy or tactics. He noted, "We had some discussions with the public so they would understand what we were doing and why we were doing it." The Gallatin Natural Resources Staff Officer stated:

I think we knew that they wanted the most aggressive tactics possible, but I don't know that I'd call that pressure. It certainly didn't turn into political pressure, it didn't turn into financial pressure, and we didn't change our strategy or tactics. We knew about people's desires, but it never turned into pressure.

The Gallatin Public Affairs Officer revealed that a trap-line location to distribute fire information was extended to the community of Nye based on public input. She stated, "We probably wouldn't have done that initially, but Nye was asking for that, so we provided that service." The Gallatin Forest Fire Management Officer explained that public input altered the public information strategy more than fire management strategy. He said:

I just felt that we needed to give them as much information as we could about the fire. I felt our tactics were very viable and appropriate to the type of fire we were dealing with, and so did all the folks who were immediately engaged in the fire.

The Gallatin Forest Fire Management Officer also noted, "We did fly their [Stillwater County] fire managers around just so they had an idea of what was ahead of that fire and why it really

posed no threat to the neighboring community in Stillwater County.”

When agency respondents were asked whether internal or external factors exerted the most influence on fire management for the Wicked Hicks Complex, respondents had varied responses. Many respondents noted that uncontrollable environmental factors such as terrain, geography and fire behavior often exert the greatest influence on fire management. “Those are the things that you can’t change and you sort of need to work with,” the Gallatin Natural Resources Staff Officer said. “Ultimately the terrain and fire behavior is what really drove us to some of the decisions we made,” the Gallatin Forest Fire Management Officer stated. Concern for safety in unpredictable terrain and windy conditions resulted in a more cautious approach to firefighting on the Wicked Hicks Complex. “We absolutely didn’t want to put resources where we didn’t have to, and that’s really become a strong message in the Northern Rockies Region,” the Gallatin Forest Fire Management Officer noted.

A few respondents noted that since the fire was managed for benefit to both the forest and community, that a balanced response was used and therefore resulted in neither internal nor external influences playing a more significant role in fire management decision-making. A Gallatin District Ranger stated, “We did what was the right thing on the land and the right thing for the people. I feel like if you’re making good decisions with good rationale, the agency should support you and the public should support you.” Other respondents discussed how internal and external factors did play a role. Internal procedures and documents describing appropriate responses in certain wilderness or habitat areas were cited as influences, while external pressure was described coming from private landowners like church camps and timber interests whose lands were threatened.

Local Agency and Community Member’s Beliefs

To better understand the dynamics between the agency and the community during the Wicked Hicks Complex, community members participated in a focus group interview. When asked about their expectations for fire management, community members had varied responses. Community Participant D stated, “That changes depending on where it is and the time of year and what is involved.” Community Participant E agreed with D and claimed, “I think every option should be open and on the table because, just as Community Participant D said, it changes so much depending on the year, the conditions, the topography, the accessibility.” Community Participant I noted, “People realize that they live in a very fire prone environment.” Despite this apparent flexibility in expectations among some, community members still expected an aggressive response on initial attack. The expectation was for fire managers “to react, rather than just sit back and watch it grow,” (Community Participant E). Community Participant J noticed that “the community’s been very aggressive since 1983. That was when we had the first big wildfire. And ever since 1983, there’ve been major fires almost every year.”

Community respondents also expressed distrust of fire managers from outside of the Northern Rockies Region and an expectation that those fire managers would not take their input seriously. Community Participant J noted, “we get these [out of region incident management] teams in and we try to tell them what’s happening, and they really don’t believe you.” Community Participant K echoed this sentiment.

I think, being ranch owners, part of our issue is a trust issue. We trust these [local] guys. We've heard too many things from ranchers through the Derby Fire when the other [out of region incident management] team came in and let things burn and whatever. We didn't want our buildings burning and we knew these [Northern Rockies IMT] guys wouldn't do that.

When community members were asked if they had attempted to influence how the fire was managed, none indicated that they had. Many community members discussed how the experience in 2006 with the Derby and Jungle Fires put the community on edge, a fact confirmed by Gallatin National Forest interviewees. "After the Derby and the Jungle fire, everybody was, another fire-you've got to get on it now and do something right away. I think everybody would be banging on their door if they hadn't acted right away," (Community Participant H). Community Participant E felt that the mood of the community following the 2006 fire season influenced the decision of the Gallatin National Forest to quickly bring in a Type 1 IMT to manage the fire. "I think that's how come we got a Type 1 team right away also. I don't think if it hadn't been for the year before, we probably could have got that team like we did." Community Participant D acknowledged that planning between the forest and the community before the fire meant that community influence during the fire was not necessary.

I think they fought it the way we would. You can only initial attack it one way. That's protect the houses and get people out of there. No matter how many times you go up there [in the Main Boulder Canyon] it's the same thing a hundred out of a hundred times in that particular time. So, yes, they listened to our tactics and did it the same way. We've had meetings about it.

Discussion among the community focus group participants revealed several instances of external pressure to change strategy or tactics on the Wicked Hicks Complex. Community Participant J recalled an instance of external pressure to change fire management tactics.

I called Community Participant I and I said "this is what could happen [with the wind], and probably is going to happen." And you agreed with me... You made about three phone calls and we got it changed. I was retired and I didn't have any business calling, but I did anyway.

Community Participant I, a local with fire experience, was able to utilize contacts with local Forest Service staff to convince the IMT operations chief that a "let it burn" strategy would result in a dangerous run of the fire because of unique wind conditions in the area. He told his local Forest Service contact, "It might be a good idea for you guys to get a hold of the [incident management] team and let them know they can't run that [Wicked] fire because it's going to tie in with the other [Hicks Park] fire." Community Participant D reported that a few people complained about the construction of fire line close to the wilderness area and "they wanted it shut down because of that." The District Ranger was able to alleviate those concerns; however management options in the wilderness area appeared to be constrained by internal policies.

I think there was an additional concern that wilderness designation was going to prevent us from doing what we knew management strategy said we had to do. And that's a frustration that we've had for a long time (Community Participant F).

Community Participant L recounted an incident where an IMT structure protection specialist, who was also in law enforcement, "was ready to arrest some people," because local community members were harassing IMT members about protecting structures in their residential area.

When looking at the data on how the internal and external factors influenced fire management on the Wicked Hicks Complex, it is clear that both internal and external factors played a role, as detailed in Table 6. The LRMP and FMP for the Gallatin National Forest dictated that appropriate suppression strategies must be employed outside of wilderness areas, serving as an internal constraint. Due to resource constraints which excluded the possibility to successfully establish full perimeter control, Wicked Hicks Complex managers developed WFSAs and a LTIP that employed flexible strategies and tactics. These tactics allowed fire managers to step back and select the appropriate times to be aggressive. CWPPs for the counties around the Gallatin National Forest served as a base of common ground between communities and fire managers and allowed them to establish known strategies for fire management. Agency representatives indicated that their own attitudes about fire management were flexible and that safety was their paramount concern, therefore this was not a constraining factor in the selection of a strategy. Agency interviewees believed that most of the public expected private property to be protected whenever possible. Community members confirmed this expectation, but understood that every fire is different and strategy and tactics must be decided on a case by case basis. Agency interviewees also stated that the public had an expectation that they be informed about fire management decisions. Agency interviewees asserted that their own beliefs about the public expectations did not affect fire management strategies and tactics, but that the public expectation to be informed did influence the public information decisions made for the Wicked Hicks Complex. Community members did report that they had exerted pressure to change strategy on the Wicked Hicks Complex, primarily as it related to a "let it burn" strategy chosen by the IMT which community members warned would be dangerous due to wind conditions in the area. Other community members provided input and influence about how they would prefer fire was managed on their property. This advice was considered but not always employed by fire managers.

Table 6: What Drives Fire Management on the Wicked Hicks Complex?

Internal Factors –Supporting Docs	
LRMP	+ : Appropriate suppression strategies must be employed outside of wilderness areas
FMP	+ : Appropriate suppression strategies must be employed outside of wilderness areas
WFSA/LTIP	– : WFSA and LTIP employed flexible strategies necessary due to constraints on resource availability
CWPPs	– : Served as community planning and guidance documents but were not binding. Provided fire managers and communities opportunity to lay out fire plans prior to an event
Internal Factors– Attitudes/Beliefs	
Attitudes	– : Safety is more important than suppression, leading to consideration of more flexible strategies and tactics
Beliefs about Public Expectations	– : Conditions on the ground and safety were most important in determining fire strategy
Public Expectations	+/- : Public wanted private structures and property protected but were most interested in being informed about fire management and understanding the strategies employed
External Factors	
External Pressure	+ : Community members put pressure on IMT to change strategy due to concerns about wind and effects of firefighting on the wilderness. Some harassed IMT to protect private structures in their community
Community Expectation	+/- : Community expectations not uniform
Community Influence	+/- : Nervous community mood following busy 2006 fire season contributed to forest decision to bring in Type 1 IMT. Agency-community planning before the fire made exerting influence during the fire unnecessary

Key Set Two Findings

Comparing the internal and external factors that influenced wildfire management on the two Set Two fires provides an opportunity to identify which factors may be most associated with a high cost fire, such as the Ahorn Fire. Agency attitudes about fire management and agency beliefs about public expectations, two internal factors, were the most influential factors on the costlier Ahorn Fire. On the Wicked Hicks Complex, agency attitudes were found to be more flexible and less suppression oriented than those for the Ahorn Fire. Wicked Hicks agency respondents noted that safety considerations principally drove their decision-making. Ahorn Fire managers believed that the public expected suppression and attempted to meet that expectation to protect private property and values at risk, whereas Wicked Hicks strategy was not influenced by agency beliefs about public expectations. The Wicked Hicks Complex also benefitted from the presence of CWPPs for the counties surrounding the forest. Agency and community perspectives seemed to be better aligned on the Wicked Hicks Complex and it is likely that the development of CWPPs contributed to that alignment. Aside from these key differences, many of the factors

explored on each fire were found to have equal influence. For example, both fires were subjected to LRMPs and FMPs that limited flexibility outside of the wilderness area, were managed as long term incidents, witnessed external pressure to change strategy and tactics, and saw that community expectations and influence on fire management were not uniform.

Results and Discussion

The results of this research, presented in Table 7, indicate that that fire management flexibility may be influenced by external, community and political sources, but also may be influenced by internal agency policies, attitudes and beliefs about public expectations, or by neither, indicating that other factors all together may be at play. Aside from the specific factors explored in this research, agency and community participants consistently identified safety considerations and resource constraints as two other important factors influencing wildland fire management decision-making. To better assess the influences of internal and external factors on the fires studied as they related to fire management flexibility and suppression costs, I compared factors between the two Set One fires (Potato and South Fork), between the two Set Two fires (Ahorn and Wicked Hicks), between the two high cost fires (Ahorn and Potato), and between the two low cost fires (Wicked Hicks and South Fork).

Table 7: What Drives Fire Management – Summary and Comparison

	Ahorn Fire (High Cost)	Wicked Hicks Complex (Low Cost)	Potato Fire (High Cost)	South Fork Complex (Low Cost)
Internal Factors- Supporting Docs				
LRMP	+/-	+	+	-
FMP	+/-	+	+/-	-
WFSA/LTIP	-	-	-	-
CWPPs	n/a	-	n/a	n/a
Internal Factors – Attitudes/Beliefs				
Attitudes	+	-	-	-
Beliefs about Public Expectations	+/-	-	+	+/-
Public Expectations	+/-	+/-	+/-	-
External Factors				
External Pressure	+	+	n/a	n/a
Community Expectation	+/-	+/-	+	-
Community Influence	+/-	+/-	-	+/-

Between the two Set One fires, the Potato Fire and the South Fork Complex, Potato represented the high cost fire according to the SCI and the South Fork was significantly less costly according to the SCI. The LRMP and FMP relevant to management of the South Fork Complex did not restrict fire management flexibility at all. In fact, WFU is allowed on 89% of the Payette National Forest. Fire managers on the South Fork Complex discussed that the FMP was not

structured to provide guidance for management of so many fires at once, but this was not considered a constraining factor. In contrast, the LRMP and FMP guiding management of the Potato Fire only provided limited flexibility for fire management outside of wilderness areas and otherwise spoke to suppression. The Salmon-Challis Forest Fire Operations staff leader responsible for local agency Potato Fire management decisions indicated that he interpreted the LRMP and FMP suppression mandates liberally and that based on safety considerations and the fact that suppression includes tactics from full perimeter control to point protection that these documents were not limiting. In either case, the forest documents for the South Fork contain substantially more flexibility. Fire managers on both the South Fork Complex and Potato Fire indicated that the WFSAs were not a factor that restricted management flexibility. In both cases, the fires burned past initially determined WFSAs boundaries and forced fire managers to adopt more flexible strategies. The final “big” WFSAs the Potato Fire was managed with added point protection in addition to perimeter control, which increased flexibility. Point protection of values at risk on the Potato Fire also contributed to higher fire costs. Management of the South Fork Complex was divided into four zone WFSAs and allowed fire managers to shift resources between Complex fires as needed while employing a combination tactics including full perimeter control, point protection, fuel breaks, monitoring, and slow/delay fire spread. Differences in agency beliefs about public expectations and the influence of public expectations also contributed to differences in management between the Potato Fire and the South Fork Complex. Potato agency participants indicated that they believed the public expected rapid suppression and that private property be protected. Community participants confirmed this expectation. The public expectation that property be protected was translated into the point protection tactic included in the third Potato WFSAs and contributed to the higher fire management costs. South Fork agency participants agreed that they believed that generally the public wants suppression; however they felt that those most vocal about their suppression expectations represented a minority and that some public factions understood the value of fire. As a result, public expectations did not influence fire management decisions on the South Fork Complex, much to the disappointment of community participants who indicated that they actually did expect suppression but that their expectations were not met. Agency attitudes of participants from both fires increased the opportunity for fire management flexibility, as fire managers from both the Potato and South Fork indicated they had flexible attitudes. Community influence on fire management did not appear to play much of a role on either fire. On the South Fork, community members provided input to fire managers but this did not necessarily alter fire management strategy. On the Potato Fire, local knowledge of resources was used to assist firefighting efforts but did not alter fire management strategy. Unfortunately, community participants from the Potato Fire and South Fork Complex were not asked about pressure they exerted to change fire management strategy and tactics. Overall, the confluence of internal documents that provided limited fire management flexibility, agency beliefs about public expectations, and community fire management expectations all contributed to less flexible fire management and higher costs on the Potato Fire.

Between the two Set Two fires, the Ahorn Fire and the Wicked Hicks Complex, Ahorn represented the high cost fire according to the SCI and the Wicked Hicks was significantly less costly according to the SCI. The LRMP and FMP relevant to the Wicked Hicks Complex clearly required a suppression strategy for fires not burning in wilderness areas, restricting fire management flexibility. However, because the Wicked Hicks Complex was burning partially in

the wilderness area, a point protection, indirect, and confine strategy was initially selected in the WFSAs. Eventually management of the Wicked Hicks Complex was altered to accommodate management of the Complex as a long duration event that utilized a LTIP. The LRMP and FMP guiding Ahorn Fire management allowed unplanned ignitions to burn in specified areas, but control/confine suppression strategies were mandated in fire exclusion zones. Although the Ahorn Fire began in a wilderness area that allowed WFU, the proximity to the fire exclusion zone and values at risk resulted in the initial WFSAs dictating full suppression. When the initial Ahorn WFSAs was surpassed, a strategy of confine and point protection was selected and a decision was made to also manage the Ahorn Fire with a LTIP. Despite the similarities in fire management strategy selected once the Ahorn Fire and Wicked Hicks Complex began to be managed under LTIPs, suppression costs on the Ahorn Fire were significantly higher. Exploring the internal agency attitudes and beliefs provides some insight into this deviation. The Type 1 IMT responsible for management of the Ahorn Fire was very suppression oriented and utilized aggressive suppression tactics. In contrast, Wicked Hicks Complex agency participants were more flexible in their attitudes about fire management and chose less aggressive strategies based on safety concerns. Ahorn agency participants believed that generally the public expected suppression while acknowledging this viewpoint was not uniform. This reduced fire management flexibility on the Ahorn Fire because fire strategy attempted to meet this expectation. Conversely, Wicked Hicks agency participants indicated that their beliefs about public expectations did not affect management flexibility and that conditions on the ground and safety were the most important factors in determining fire strategy. Agency participants from both the Ahorn and Wicked Hicks acknowledged public expectations that private land and property would be protected. On the Wicked Hicks Complex, agency participants also discussed that the public expected to be informed about fire management decisions. On both fires, community expectations for fire management were found to be not uniform, indicating some room for fire management flexibility because communities did not unequivocally demand suppression. The same is true for community influence on fire management. On the Ahorn Fire, community members acknowledged they provided input about fire management but that their input was not always applied. On the Wicked Hicks Complex, the presence of three CWPPs and collaborative agency-community planning before the fire made exerting influence during the fire unnecessary. However, the communities threatened by the Wicked Hicks Complex were still on edge following a busy 2006 fire season and this fact pushed fire managers to quickly bring in a Type 1 IMT. Finally, there is evidence that community members exerted pressure on fire managers to change strategies and tactics on both fires. On the Ahorn Fire, private landowners provided input to fire managers as to how they wanted fire managed on their property. On the Wicked Hicks Complex, some community members harassed the IMT to provide structure protection whereas others put pressure on the IMT to not allow the fire to burn unchecked because of concerns that the wind could shift and result in a dangerous and devastating run of the fire towards communities. Overall, it appears that the chief factors contributing to higher suppression costs on the Ahorn Fire were agency attitudes about fire management and agency beliefs about public expectations.

Comparing the two high cost fires presents an opportunity to identify whether any of the internal or external factors studied in this research are more prevalent on high cost events, therefore suggesting that those factors may be stronger indicators contributing to cost or limiting fire management flexibility. The guiding forest policy documents, the LRMP and FMP, for both the

Ahorn Fire and the Potato Fire did contain provisions to allow wildfires to burn in wilderness areas. However, suppression strategies were employed on each of these fires. In the case of the Ahorn, the proximity of the fire to the fire exclusion zone and the probability that the fire would spread into that area directly contributed to the decision to suppress the Ahorn Fire. In the case of the Potato, forest policy at the time of the fire dictated full suppression for any fire not in the wilderness or specific fire management units. Therefore, on both costly fires, forest policy documents limited the flexibility of fire managers by mandating suppression response. Agency attitudes about fire management played a role on the Ahorn Fire but not on the Potato Fire. A suppression oriented Type 1 IMT managing the Ahorn Fire employed more aggressive suppression tactics. Attitudes of Potato Fire agency representatives, including those from the Type 1 IMT, were more open to fire management flexibility. On both fires, agency participants indicated that they believed the public expected suppression, however Ahorn agency participants offered a caveat that some members of the public understand the value of fire and that not every fire can be suppressed. This agency belief contributed to the point protection tactic employed by fire managers on both the Potato and Ahorn to protect values at risk. Potato agency participants also cited public expectations as a factor that contributed to the inclusion of protecting values at risk, such as private property, into the WFSA. Community participants on both fires indicated that their expectation for fire management generally was for suppression. This community perspective was unanimous among Potato Fire participants however community expectations among Ahorn Fire community participants were not uniform. Community attempts to influence fire management did not have play much of a role in either fire. External pressure from community members was clearly present on the Ahorn Fire, however no data was collected on this variable for comparison from the Potato Fire. Overall, the forest policy documents – the LRMP and the FMP – as well as agency beliefs about public expectations and community expectations for fire management seem to be the strongest internal and external factors contributing to the high cost fires studied here.

Comparing the two low cost fires provides an opportunity to determine which factors provide flexibility that in turn contributes to lower wildfire costs. The fact that the two low cost fires studied were managed as complexes should not be overlooked in importance. By managing multiple fires as a complex, less aggressive tactics are often employed because teams lack sufficient overhead to successfully and safely carry out more aggressive tactics, such as full perimeter control. This was the case in both the Wicked Hicks Complex and the South Fork Complex. Resource constraints required fire managers to utilize the resources they did have as effectively and efficiently as possible. Attitudes of the Wicked Hicks and South Fork agency participants were also supportive of this strategy. Those agency respondents had indicated that they had flexible attitudes about fire management and that safety was their primary concern. Agency beliefs about public expectations and the influence of public expectations on fire managers did not play a significant role in fire management decision making on either the Wicked Hicks or South Fork. Conversely, when looking at Table 7, it appears that internal forest documents and external factors played a much greater role on the Wicked Hicks Complex than the South Fork Complex. Although the internal documents guiding Wicked Hicks management did dictate suppression outside of wilderness areas, part of the complex was in the wilderness. As a result, the management strategy shifted to facilitate management of the complex as a long duration event. Resource constraints contributed to the decision to switch to this strategy. Resource constraints also affected the ability of South Fork fire managers to respond

aggressively to the fires in that complex. Community participants from the South Fork expressed displeasure that fires were not being suppressed and their suppression expectations were not being met. In contrast, Wicked Hicks community participants did not have uniform fire management expectations. Some community members on the Wicked Hicks exerted pressure on fire managers to protect private structures and to change a strategy to let the fire burn down a canyon. Without community external pressure data from the South Fork Complex, the influence of this factor cannot be fully assessed. Overall, agency attitudes that were flexible and the fact that these fires were managed as complexes appeared to be the most influential factors on the low cost fires studied.

Based on the data, I am unable to support the hypothesis that costlier wildfires have more prevalent external factors. For Set One, the comparison of the Potato Fire and the South Fork Complex, I found internal factors, agency beliefs about public expectations and supporting forest documents that provided limited fire management flexibility, and external factors, community fire management expectations, as contributing to higher costs on the Potato Fire. For Set Two, the comparison of the Ahorn Fire and the Wicked Hicks Complex, I found that internal factors, agency attitudes about fire management and agency beliefs about public expectations, were most influential on the Ahorn Fire. A comparison between the two high cost fires revealed that the supporting forest documents and agency beliefs about public expectations were important internal factors, whereas community fire management expectations represented the most important external factor that contributed to higher costs. The comparative case study analysis of these three pairs does not seem to lead to any consistent or clear findings. Of the two low cost fires, internal factors, agency attitudes that are flexible and the decision to manage fires as a complex, contributed to lower costs. I believe that proximity to values at risk and resource availability, both cited as wildfire suppression cost factors in the SCI, were the most influential factors affecting cost and strategies on the fires studied. More likely however, is that given the very contextual nature of wildland fire management, it cannot be reduced to just a few factors.

A key conclusion seems to be the very contextual nature of fire management and that it cannot be reduced to just a few factors.

Conclusions and Implications

Federal fire management policy in recent years has shifted away from dictating suppression dominant strategies and tactics to those that provide greater flexibility (USDA 1995, 2001, 2006, 2009; WGA 2001; QFR 2009; NIFC 2009; Dalton 2009). Given the longstanding suppression history of fire management in the United States, challenges remain in achieving this goal. Conventional wisdom suggests that the public has grown to expect and demand suppression, and given the history of fire management in the United States (Dombeck et al. 2004), this is unsurprising. As more Americans move into the WUI, land managers must develop effective outreach and communication methods to discuss changing land management strategies and priorities. This research identifies a few key findings.

First, internal documents guiding forest fire management policy, the LRMP and the FMP, must allow flexible fire management responses. When an LRMP or FMP does not provide for flexibility and mandates suppression, fire managers have little choice but to adhere to these guiding documents. On the Ahorn Fire, fire managers had to employ suppression tactics even

though the fire began in a wilderness area that allowed fire use because of the proximity to a fire exclusion zone. The mandate to protect the exclusion zone increased wildfire suppression costs on the Ahorn Fire. On the Wicked Hicks Complex, the LRMP and FMP also dictated suppression in all non-wilderness areas. Fire managers on the Potato Fire also were required to employ a suppression strategy, however tactics included a range from full perimeter control to point protection, providing some flexibility. The documents guiding management of the South Fork Complex provided flexibility to use fire throughout nearly the entire forest. On all four fires, agency participants indicated that WFSAs and LTIPs, when used, did not themselves restrict their fire management flexibility but were influenced by the language present in the LRMP and FMP. Unless forest guiding documents are open to strategies less than full suppression, flexibility in responding to and deciding strategy and tactics for fire management is limited.

Second, agency attitudes about fire management are shifting to accept greater flexibility in managing wildfires. The overriding consideration of firefighter and public safety has allowed fire managers to step back from aggressively attempting to apply full suppression on every wildfire. Instead, this consideration of safety has guided fire managers to more flexible strategies where aggressive tactics can be employed when safe, but to step back and consider less aggressive tactics such as point protection when necessary. Agency attitudes and beliefs were found to play a greater role in fire management flexibility on the costlier fires, whereas they played a minimal role on the less expensive fires. Although many fire managers recognized much of the public still expects suppression, they saw that this viewpoint was not monolithic in the community. Interviews with community members confirmed this finding and indicate that there are members of the public who understand not every fire can or will be suppressed. The fact that those demanding suppression are often the most vocal skewed agency perceptions of community viewpoints about fire management. Through continued education, outreach, and collaborative planning, fire managers can reach out to communities in the WUI and discuss fire management prior to a fire.

Lastly, internal and external factors must be in alignment to bring the perspectives of fire managers and the public together in determining fire management strategies and policies. WUI areas and other values at risk should probably be protected with suppression, as was the case in the two costlier fires, the Ahorn and the Potato. In other areas of the forest, WFU may be appropriate, as used for several of the South Fork Complex fires. To align agency and community expectations for fire management, collaborative efforts to discuss fire management desires must take place before a fire breaks out. This will provide community members an opportunity to identify their expectations and desires, as well as allowing fire managers to discuss areas where they may employ more flexible fire management strategies. The Wicked Hicks Complex utilized inputs from three CWPPs to help inform fire management on the Gallatin National Forest. As seen in the South Fork Complex, forest policy allowed for WFU throughout much of the forest, but community members disagreed with this policy. Forest managers and the communities will need to address such differences in viewpoint in order to create better alignment.

In conclusion, fire management flexibility is influenced by factors both internal and external. The hypothesis that costlier wildfires have more prevalent external factors cannot be supported.

Rather, fire management flexibility and decision-making is based on a confluence of factors including those studied here in addition to others uncovered in this research. Safety considerations, resource constraints, conflicts between local forest units and IMTs and distrust of non-local fire managers also emerged as factors influencing wildfire management flexibility and suppression costs. Identification of these factors provide opportunities for future research.

National policy has shifted recently to allow for more flexible fire management, yet many forests still operate under outdated guiding policy documents. These documents must be updated for the 21st century and incorporate the possibility for fire managers to utilize more flexible management responses where possible. The safety mandate for fire management has shifted agency attitudes away from full suppression strategies towards those that are more flexible. Emphasis on collaboration and community outreach present in fire management guiding principles (WGA 2001; NIFC 2009) provide fire managers an opportunity to engage with the communities they serve and bring internal and external factors into congruence. As Americans continue to move into the WUI, their understanding of forest policy and the ecosystem role of fire will directly contribute to their perspectives about fire management.

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Appendix A: Interview Questions

Internal Factor Questions

Internal supporting documents

- Land Management Plan– How does the LMP address fire management and did it influence your decision in the management of this fire? (Agency)
- Fire Management Plan– How does the FMP factor into decision making on this fire? (Agency)
- Wildfire Situation Analysis/Wildfire Implementation Plan– Did the WFSA/WFIP influence your ability to manage the fire with greater or lesser flexibility? (Agency)

Attitudes about fire management

- Agency Attitudes--How would you characterize your own attitude toward fire management? Has your attitude changed over time? (Agency)
- What do you think the public expected from you in terms of managing this fire? (Agency)
- Do you think your beliefs about the public's expectations influenced the strategies and tactics you chose on this fire? (Agency)

External Factor Questions

• Political and community pressure

- Did you receive pressure from individuals external to the agency to change your strategy or tactics on the fire? (Agency)
- How did you expect this fire to be managed? (Community)
- Do you think public expectations for how the fire should be managed are influencing the management of this fire? (Community)