CRISIS DECISION MAKING: AN EXAMINATION OF EXECUTIVE LEADERSHIP IN A STATE FORESTRY SERVICE

A Thesis

by

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ABSTRACT

The Texas A&M Forest Service (TFS) led the firefighting efforts during the most catastrophic wildfire season in Texas history. The 2011 wildfire season caused massive losses statewide including four million acres burned and over 2,900 homes destroyed. TFS leaders who were responsible for managing and fighting these fires have valuable insights about how decisions were made during the 2011 wildfire season. These insights provided valuable information that can further the research paradigm of Naturalistic Decision Making and Macrocognition. Additionally, these insights provided reflective observations that TFS leaders can reference in order to continually improve in making effective decisions during crisis situations.

The purpose of this study was to understand how TFS leaders made decisions during the 2011 wildfire season. I used a qualitative approach to address the purpose of this study and understand factors that influenced how seven TFS leaders made decisions in 2011. Semi-structured interviews were conducted with the participants of this study. Additionally, several documents were obtained from the TFS to provide further information about how decisions were made in 2011. A number of factors were identified to have an influence on TFS leaders' decision making. It was found that TFS culture was a component that influenced decision making along with consideration of TFS's reputation and the safety of firefighters and people of Texas. Additionally, it was found that TFS leaders had to constantly account for the fire environment, manage the distribution of resources, and communicate effectively amongst themselves, interagency

firefighters, and the public of Texas. Lessons learned was the last component TFS leaders discussed as part of the decisions they made in 2011.

From the findings of this study, it was understood that the TFS leaders handled the 2011 wildfire season as effectively as possible considering the harsh implications of the wildfires they addressed. TFS leaders were responsible, conscientious, and caring to the people of Texas. I made several recommendations for future research in addition to some recommendations for changes TFS leaders may want to consider based on the findings from this study. This study was meant to provide a reference for TFS leaders to use so they could have a more complete understanding of factors, implications, strengths, and areas for improvement regarding decisions they made during the 2011 wildfire season.

DEDICATION

I would like to dedicate this thesis project to the Texas A&M Forest Service (TFS) and the TFS leaders who participated in this study. Their enthusiasm and willingness to provide information when needed were keys that allowed me to conduct this study accurately and in a timely manner. It was a blessing to work with such an upstanding and forthright group of individuals. I am very thankful for their time and desire to help me complete this project.

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First and foremost, I would like to thank my God and Savior, Jesus Christ. The sacrifice He made over 2,000 years ago is what gives me a hope for the future. I'm thankful for His death and resurrection, which, by His grace, will allow me to live eternally with Him. I'm also grateful for the grace He has given me to complete my graduate program. He has allowed me to learn many valuable and hard lessons during my time here at Texas A&M, and I am grateful for each one of them.

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CHAPTER I

INTRODUCTION

W. Goodrich Jones and several other conservation-minded leaders in Temple, Texas formed the Texas Forestry Association in 1914. At the time, the primary purpose of the Texas Forestry Association was to "form a state forestry agency and develop a statewide plan for forest conservation" (Texas A&M Forest Service, 2015a, para. 6). The Texas Forestry Association's purpose was accomplished in 1915 as the House Bill No. 9, "An Act to Promote Forest Interests in the State" provided the platform for the TFS to be created (Texas A&M Forest Service, 2015a, para. 7). When it was created by the Texas Legislature on March 31, 1915, it was originally called the Department of Forestry. In 1926, it was renamed the Texas Forest Service. In 2010 it was finally renamed the Texas A&M Forest Service (TFS) (Texas A&M Forest Service, 2015a).

The TFS responsibilities have grown over time. The 34th Texas Legislature delegated the responsibility to the TFS of creating a system to protect and preserve the Texas forests and also declare a state of emergency should one arise (Gammel, 1917, p. 220). Now the mission of the TFS can be boiled down to its three core values: Lead, Protect, and Conserve. These are reflected in the opening sentence of the TFS mission statement: "Texas A&M Forest Service provides statewide leadership to assure the state's trees, forests and related natural resources are protected and sustained for the benefit of all" (Texas A&M Forest Service, 2015b, para. 1). The TFS has been providing this service for 100 years, and it has protected Texans from the destruction of numerous wildfires. However, wildfires are a devastating force of nature that cannot always be

contained or controlled. In 2011, the wildfire conditions in Texas were, historically, the worst this state has ever experienced (Texas A&M Forest Service, 2015).

The exceptional wildfire conditions were due, in large part, to the drought beginning in October 2010, which lasted through September 2011 and was one of the driest yearlong periods in the history of Texas (Nielsen-Gammon, 2012). The drought was also considered the most costly drought in history as it cost a record of $7.62 billion (Fannin, 2012). However, the drought was not the only contributing factor that provoked the widespread devastation left in the wake of more than 31,000 wildfires that burned in Texas during 2011. In 2010, there were significant weather conditions that set the stage for massive fuel (grass and small brush) growth, which prompted the 2011 wildfires to burn with such ferocity. The fuel growth was caused by major rainfall from four tropical systems that led to rapid grass growth in the summer of 2010. In the winter of 2010, the grass and brush that grew earlier that summer dried out and froze. The freeze turned the brush into an excellent source of kindling (Jones, Saginor, & Smith, 2012). The infamous 2011 drought began in September 2010 when the last of the four storm systems, which brought a heavy amount of rainfall, left the state of Texas (Fannin, 2012). After this occurred, the drought conditions in Texas worsened and there were several record, high-temperature months along with a record, dry month (March, 2011) (Fannin, 2012).

In 2011, as the drought conditions worsened, the probability for highly-destructive wildfires became more likely. Not surprisingly, 2011 witnessed some of the most catastrophic wildfires in Texas history. According to the data Fannin (2012)

obtained from the TFS, the first out of the 20 largest (acres burned) fires in 2011 was the Matador West Fire that began on February 27 and burned 41,000 acres including two homes. Some of the other major fires that year included the Swenson Fire that burned 122,500 acres and two homes; the Possum Kingdom Complex that burned 126,734 acres and 168 homes, the Rockhouse Fire that burned 314,444 acres and 23 homes; and the most destructive wildfire in Texas history, the Bastrop County Complex, which resulted in 2 fatalities, 1,660 homes, 36 commercial buildings, and 34,068 acres burned (Fannin, 2012; Jones et al., 2012). As a whole, there were 31,453 fires that burned 2,947 homes and four million acres in 2011 (Jones et al., 2012).

Catastrophic events like the 2011 wildfire can teach valuable lessons about how to respond to similar situations in the future. This study explored how leaders of the TFS made decisions during the 2011 wildfire season. Consequently, the results of this study could be a valuable reference for TFS leaders when future wildfires occur, similar to the ones in 2011.

Problem Statement

The 2011 wildfire season was the most catastrophic fire season that Texas has on record. It required over 16,000 firefighters to come to Texas from all regions and territories of the United States. Previous studies have shown the causes of the 2011 wildfires, and how citizens can help mitigate or prevent fires from burning their homes and property in the future. However, I was not aware of any study that has been done to describe how TFS leaders, who were responsible for leading the firefighting efforts in 2011, made decisions.

Purpose of the Study

The purpose of this study was to describe how leaders of the TFS made decisions during the 2011 wildfire season. This study can be referenced as a resource for TFS leaders in the future who are faced with similar situations. This study addressed one research question: How did leaders of the Texas A&M Forest Service make decisions during the 2011 wildfire season?

Definition of Terms and Concepts

Wildfire – "An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out" (National Wildfire Coordinating Group, 2014, p. 185).

Scope – Operationally defined as the size and time risks associated with a fire. For example: high fire risk is present statewide for an extended period of time (SD3).

Operational Tempo – "The speed and intensity of actions relative to the speed and intensity of the unfolding events in the operational environment" (National Wildfire Coordinating Group, 2014, p. 130).

Complexity – Operationally defined as factors that increase the likelihood of a complex fire including: dry fuels, extended drought, fire weather (e.g. wind and no rain), and wildland urban interface (SD3).

Project Fire – Operationally defined as a fire that is out of control and usually massive in size requiring multiple types of resources to contain.

Incident Management Team (IMT) - "The purpose of an IMT is to organize and manage the response to an incident or to support a portion of the incident response." (SD4, p. 5).

Wildland Urban Interface – "Line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Describes an area within or adjacent to private and public property where mitigation actions can prevent damage or loss from wildfire" (National Wildfire Coordinating Group, 2014, p. 187).

Assumptions

There are several assumptions under which this study operated, including but not limited to the following:

1. The TFS leaders who were interviewed were honest in their answers to the questions that were asked of them.
2. The historical information provided by the TFS leaders regarding the 2011 wildfire season is accurate and true based on documentation and personal accounts.
3. The TFS leaders recounted their experiences from the 2011 wildfire season reasonably to the best of their ability.

Scope and Limitations of the Study

The scope of this study included seven high-level TFS leaders. I asked these TFS leaders to discuss specific, self-identified decisions they made during the 2011 wildfire season. A limitation of this study is that it only considered how decisions were made from the TFS leaders' perspectives who participated in this study. This study was not a holistic account of how decisions were made during the 2011 wildfire season. Additionally, because several years have passed since the 2011 wildfire season, several TFS leaders who were interviewed stated their memories were somewhat foggy about certain events that occurred.

Significance of the Study

This study sought to inform how TFS leaders made decisions during the most catastrophic wildfire season in the history of Texas. The TFS has a mission statement based on several core values "We have *a call to serve, a duty to protect, and a commitment to support; and we believe in the power of partnership*" (Texas A&M Forest Service, 2015, para. 1). In order for the TFS to continue to operate and achieve its mission, it is important TFS leaders understand how their decisions impact this mission. Consequently, the findings from this study can be used as a tool for TFS leaders to reference in the future when situations arise similar to the 2011 wildfire season.

CHAPTER II

REVIEW OF LITERATURE

This study sought to understand how TFS leaders made decisions during the 2011 wildfire season. The TFS is a public-service organization that operates much differently from a private sector company. They exist to serve the people of Texas (Texas A&M Forest Service, 2015). According to Coombs (2014), disasters are great in scale and they require multiple governmental units to address. In 2011, the wildfires created a disaster that cost Texas citizens' lives, property, and homes.

There are several concepts from previous literature that served as a framework to guide this study. The concepts included: Crisis Management, Communication, and Leadership; Learning Organizations; and High Reliability Organizations; and Macrocognition. Lastly, I discussed the Naturalistic Decision Making paradigm, as this was the context that primarily guided this study.

Crisis Management, Communication, and Leadership

A number of studies have been performed about managing crises in organizations (Boin & Hart, 2003; Coombs, 2014; Mitroff & Pearson, 1993; Pearson & Clair, 1998). Coombs (2007a) identified a crisis as "a significant threat to operations that can have negative consequences if not handled properly" (p. 1). Key threats a crisis imposes on an organization are (1) harm to the public, (2) loss of financial resources, and (3) damage to reputation (Coombs, 2007a). Several elements of dealing with crisis include: management of the actual events (crisis management) that occur during the crisis

(Pearson & Clair, 1998), communicating during a crisis (Hale, Dulek, & Hale, 2005), and leading during a crisis (James & Wooten, 2005).

Crisis Management and Communication

There are multiple types of crises that organizations deal with as Hutchins and Wang (2008) outlined in their study of organizational crisis management and human resource development. Types of crises, to name a few, include: corporate scandals, disease, explosions, and natural disaster (Hutchins & Wang, 2008; Mitroff & Alpaslan, 2003). No matter the type, "crisis management is a critical organizational function" (Coombs, 2007a, p. 1). Coombs (2007a) argued that a crisis must be dealt with based on the three threats previously mentioned. Public safety should always be the first priority in a crisis situation followed by reputational and financial concerns. Communication is a key element that affects public perception during a crisis situation (Coombs, 2007b). Communication can alter the public's view of the reputation of an organization positively or negatively during a crisis. "Crisis response strategies are the organization's answer" (Coombs, 2007b, p. 170). If an organization can effectively mitigate the damage a crisis causes to the public and itself, the organization is likely to emerge stronger than it was before the crisis (Coombs, 2007a).

Crisis Leadership

James and Wooten (2005) stated that dealing with a crisis involves more than just effective management and communication. They agreed that management and communication are two important elements of dealing with a crisis; however, they also identified another factor, leadership, which they believed was even more important than

management and communication. They argued that effective leadership is a key factor of moving an organization past a crisis situation. Dealing with a crisis is not a linear process; it is a dynamic and constantly changing process, which involves strong leadership that can analyze difficult situations and the associated consequences (Boin & Hart, 2003; James & Wooten, 2005; Walsh, 1995; Weick, 1988; Wooten & James, 2008). One of the most important attributes of crisis leadership is trustworthiness (James & Wooten, 2005). "Without trust, organizational decision-making and strategy implementation are doomed to fail…. To build trust, leaders need to communicate openly, honestly, and often" (James & Wooten, 2005, p. 146). Effective crisis leaders also rely on employees (or experts) with a specific knowledge base or experiences to glean information when making decisions. However, the leader, not the expert, must ultimately make the decisions, because the leader is often best positioned to do so as he/she has the "broadest perspective on the organization" (James & Wooten, 2005, p. 148). Another attribute of savvy leadership during a crisis is the recognition of the learning opportunity a crisis presents. However, in order to do this, the leaders, along with his/her organizations, must have a learning mentality (Hutchins & Wang, 2008; James & Wooten, 2005). Boin and Hart (2003) discussed (post-crisis) learning as "a matter of designing unheroic technological improvements and adapting bureaucratic routines. This requires patience, institutional memory, and a low-conflict atmosphere" (p. 548). Kotter (2012) posited that leaders should also practice reflecting on their experiences in order to learn from them. By reflecting on their experiences, leaders can

learn from their successes and mistakes in order to improve their performance in the future.

Learning Organizations

There is not a formal definition of a learning organization, because a learning organization could have different meanings to different people and organizations (Senge, 2014). Senge (2006) posited that a learning organization cannot even physically exist as it is more of a guiding ideology that organizations should continually strive to experience. Elements that have been associated with a learning organization include:

- People feel free to express their own opinions and biases.
- There is a sense of equality among people. A mutual respect among colleagues.
- People feel free to make mistakes, take risks, and assess results openly with others.
- People feel a deeper meaning to the work they do. There is a sense of purpose in the work they do.
- Employees are encouraged to learn the inner workings of their organization holistically so they are able to see how their actions affect it (Senge, 2014).

Organizations can only learn if the individuals that work within them are devoted to learning for themselves (Senge, 2006). Individual learning does not guarantee organizational learning, but organizational learning cannot occur without individual learning. Elements or "disciplines" that comprise a learning organization are systems

thinking, personal mastery, building a shared vision, team learning, and mental models (Senge, 2006). People with a high level of personal mastery contain several characteristics including "a special sense of purpose behind their visions and goals" and they "live in a continual learning mode" (Senge, 2006, p. 132). These characteristics allow individuals to inject their personal beliefs, values, and purpose into the work they do within their organization.

While personal mastery is a key to understanding vision, purpose, and continual learning, it is not the only component necessary within a learning organization. In addition to personal mastery, there are three other core disciplines of a learning organization: shared vision, team learning, and mental models (Senge, 2006). Shared vision is a core component, because it is the link for the personal visions of those in an organization. This is a vital component as it allows individuals to work together toward a common goal. Likewise, team learning is the link between individual learning and organizational learning. It brings together the personal visions and organizational shared vision, and focuses them into a collective effort to learn communally through the sharing of individual experiences. Lastly, mental models are the ingrained assumptions that individuals hold for how the world operates. The ability to reflect upon and test individual mental models and practices within an organization is another component vital to a learning organization. Senge (2006) recognized that individual mental models can be flawed. "Understanding these flaws can help to see where prevailing mental models will be weakest and where more than just 'surfacing' managers' mental models will be required for effective decisions" (Senge, 2006, p. 189). Mental models must be

challenged to determine their validity in making decisions and determining the strategy of an organization.

Senge (2006) further discussed how systems thinking could allow people to solve problems; "Often we are puzzled by the causes of our problems; when we merely need to look at our own solutions to other problems in the past" (p. 57). This example from Senge (2006) referred to how individuals and organizations learn by looking at their pasts; solutions are realized through individual learning and effective decision making. One type of organization that consistently learns and adapts is a high reliability organization (HRO) (Weick, Sutcliffe, & Obstfeld, 2008).

High Reliability Organizations

There may not be a formal definition for HROs, however, an acceptable description of them is that they are "adaptive organizational forms for an increasingly complex environment" (Weick, Sutcliffe, & Obstfeld, 2008, p. 31). HROs are characterized by five key factors: "Preoccupation with failure," a "reluctance to simplify interpretations," a "sensitivity to operations," a "commitment to resilience," and an "underspecification of structures" (Weick et. al., 2008, p. 31).

Preoccupation with Failure

A distinctive quality about HROs is their constant preoccupation with failure (Weick et. al., 2008). Sitkin (1992) outlined that learning in an organization occurs through failure. From that perspective, safe HROs would not be able to learn very effectively. Therefore, to be effective, HROs must learn in at least three ways including: analyzing near failures, concentrating on the liabilities of success, and treating any

failures they do experience as windows of opportunity to improve the strength of their systems (Weick et al., 2008).

Reluctance to Simplify Interpretations

Simplifying complex issues and problems is a welcome skill in most organizations, except for HROs. These simplifications or justifications allow members of the organization to ignore certain data and information if it is too complex or does not make sense (Weick et al., 2008). However, simplifications also allow uncertainty and misunderstanding to accumulate over time, which could lead to serious consequences for an HRO. HROs are different in that they train people not to simplify, but rather, pay attention to anomaly and notice bits of information that could lead to serious consequences if dealt with ineffectively or not at all (Roth, 1997; Weick et al., 2008; Xiao, Milgram, & Doyle, 1997).

Sensitivity to Operations

Sensitivity to operations has also been termed as "having the bubble," which is a term that has been borrowed from the U.S. Navy that basically means having an overall cognitive map that integrates meaning from a number of different inputs (Roberts & Rousseau, 1989, p. 132). Sensitivity to operations is an integrated view of the complexities in a given situation (Weick et al., 2008).

Commitment to Resilience

Not all HROs have a protocol that helps them handle problems effectively. There are many instances where members of HROs must deal with unexpected situations in quick and pressure-filled environments (Weick et al., 2008). Commitment to resilience

means that HROs must deal with fluctuating and uncertain environments in order to successfully prevent, mitigate, or cope with failure (Weick et al., 2008).

Underspecification of Structures

Effective HROs pay less attention to hierarchical structure and more attention to problems they must address. In other words, top leaders of an effective HRO are not always the ones to make decisions. Rather, decisions are allowed to be made by those who are closer to or have experience dealing with a specific problem at hand (Weick et al., 2008). "What is distinctive about effective HROs is that they loosen the designation of who is the 'important' decision maker in order to allow decision making to migrate along with problems" (Weick et al., 2008, p. 49).

HROs do not operate the same as typical corporations or organizations, because they are not focused primarily on efficiency or profitability. Rather, the issues they deal with are reliability of their operations (Weick, 1987; Weick et. el., 2008). Weick et al. (2008) stated, "for a system to remain reliable, it must somehow handle unforeseen situations in ways that forestall unintended consequences" (p. 35). HROs place more emphasis on not failing than they do on being successful. Additionally, effective HROs that experience failure infrequently must learn from the failures of other organizations, as they do not have the luxury to learn from their own mistakes (Weick et al., 2008). Two examples of HROs include: the Federal Aviation Administration's Air Traffic Control Centers, and the U.S. Navy (Roberts, 1990). A failure by either of these organizations will most likely produce catastrophic results that could easily include loss of multiple lives. For example, if a plane crashed into another plane (due to a poor

decision by the air traffic controller), or if a target was inadvertently destroyed by a navy ship (because of a poor decision made by a navy officer), many lives would be lost.

The people within HROs do not seek to simplify a situation for the sake of time. Their commitment to resilience allows them to work towards a solution that has been thoroughly analyzed. People within effective HROs challenge mental models as a necessary part of their existence. They cannot afford to think homogenously, because they have to recognize different threats and opportunities for failure. Weick (1987) summarized that teams in effective HROs have a diversity of individuals, which means they observe different things about a problem and can collectively see more than any one of them could see individually. On the other hand, homogenous teams do not have this diversity of thought, and are not able to handle problems effectively in the way that diverse teams can. The HROs' strength comes from their diversity of thought. This divergence of thought is exactly what HROs need because it "holds the key to detecting anomalies" (Weick et al., 2008, p. 42). However, HROs realize that error is inevitable, because humans are fallible, which means consequently, that the technology they create and use is also fallible (Vaughan, 1997; Weick et al., 2008). One source of error Quarantelli (1988) discussed was personnel burnout, where leaders work too long at one time and their decision making effectiveness is threatened due to fatigue. Additionally, if leaders are not able to make decisions effectively and efficiently, then the "capability of the organization can be seriously impaired" (Quarantelli, 1988, p. 380).

In light of this, HROs must make decisions that minimize and mitigate the potential for error. However, decisions that HROs make often have high risk of failure

with devastating consequences. This high risk of failure makes accuracy of decision making vital in order to avoid a catastrophe, and as expected, decision-makers in this context are held principally responsible for their decisions (Roberts, Stout, & Halpern, 1994). Because most HROs primarily exist as a public service (LaPorte & Consolini, 1991), safety is the most important concern that decision makers of HROs must address (Bourrier, 1996). This is because reliability, rather than efficiency, is the utmost priority of an HRO. Additionally, Bourrier (1996) found that "the most important characteristic is the formal delegation of power to craft personnel, supported by a nearly complete availability of top-management at all times. By being a very flexible and adaptive organization, any problem can rapidly receive the attention it requires …" (p. 109). This formal delegation is how HROs are able to make decisions based on experience rather than rank in the organization. As Bourrier (1996) posited, the delegation of decision making to people within the HRO that have specific expertise relating to the problem(s) at hand, allows those problems to be addressed by the most qualified (experientially) individuals. However, even with qualified people making decisions, errors still occur, and unfortunately, even failure.

It was a result of a HRO failure in 1988 that led to the birth of a new field of research in decision making.

> The most advanced type of US Navy cruiser, the USS Vincennes, equipped with the state-of-the-art AEGIS tracking system, on a clear day, with hardly any other aircraft in the sky, mistakenly shot down an Iranian Airbus A300 airliner, killing all 290 passengers and crew members. The decision-makers on board the

> Vincennes had believed that the ship was being attacked by the Airbus, which they mistook for an F-14 despite clear evidence to the contrary. (Klein, 2015, p. 382)

Because of this incredible failure, a need arose to better understand how decisions were made under "time pressure and uncertainty" (Klein, 2015, p. 383). Klein (2015) noted that skilled decision makers can handle time pressure and uncertainty. However, there was not any research, outside of a laboratory setting, that indicated how decision makers made decisions, nor how their decision making could be practically improved (Klein, 2015). It was assumptions such as this that led to the discovery of the Naturalistic Decision Making (NDM) paradigm. However, first Macrocognition must be explained, as it is the broader framework in which NDM now resides.

Macrocognition

NDM research involves complex, "real world" studies, and it primarily draws upon real-life situations to inform it. "The mission of NDM – to understand how people make decisions under difficult conditions, and how to help them do a better job" (Schraagen, Militello, Ormerod, & Lipshitz, 2008, p. 6). Since NDM's inception, the paradigm has expanded its mission to include, "understanding how people handle difficult cognitive demands of their work, and trying to help them do a better job" (Schraagen et al., 2008, p. 6). It was further argued that solely focusing on decision making did not include the extent of the phenomena being studied (Schraagen et al., 2008). Klein et al., (2003) discussed Macrocognition as a more holistic approach to

understanding naturalistic decision making as part of overall cognition in a naturalistic context. Primary tenants of Macrocognition include:

- Decisions are typically complex, often involving data overload.
- Decisions are often made under time pressure and involve high stakes and high risk.
- Research participants are domain practitioners rather than college students.
- Goals are sometimes ill-defined, and multiple goals often conflict.
- Decisions must be made under conditions in which few things can be controlled or manipulated; indeed, many key variables and their interactions are not even fully understood. (Klein et al., 2003, p. 81)

Schraagen et al. (2008) defined Macrocognition as "the study of cognitive adaptations to complexity" (p. 9). They further explained Macrocognition as the "study of cognitive phenomena found in natural settings, especially (but not limited to) cognitive work conducted in complex sociotechnical contexts" (p.8).

The field of Macrocognition seeks to understand how people think in real-world settings. "By gaining a better understanding of macrocognitive functions we can provide an alternative to the conventional approaches to design and training and better support the needs of the practitioners – the people taking actions" (Schraagen et al., 2008, p. 15). Macrocognition retains primary tenants of NDM, but seeks to more holistically describe cognitive phenomena. Macrocognition involves a series of functions and processes that people perform in light of the eight features of NDM (Schraagen et al., 2008). Before these eight features are described, the origins of NDM must be understood.

Naturalistic Decision Making

In 1989 over 30 researchers met during a critical event to help understand "how people actually made decisions" following the USS Vincennes disaster (Klein, 2015, p. 383). The result of this meeting was a thorough explanation of NDM theory and its tenants (Klein, 1993). This was a collective effort of the professionals that met in 1989, and combined, they described the phenomenon now known as NDM.

"Naturalistic decision making is all about how experts make decisions in the real world" (Schraagen et al., 2008, p. xxv). There are eight characteristics of decision making that emerged to inform the NDM paradigm:

1. Ill-structured problems (not artificial, well-structured problems).
2. Uncertain, dynamic environments (not static, simulated situations).
3. Shifting, ill-defined, or competing goals (not clear and stable goals).
4. Action/feedback loops (not one-shot decisions).
5. Time stress (as opposed to ample time for tasks).
6. High stakes (not situations devoid of true consequences for the decision maker).
7. Multiple players (as opposed to individual decision making).
8. Organizational goals and norms (as opposed to decision making in a vacuum). (Zsambok & Klein, 1997, p. 5.)

From these key markers, a definition of NDM evolved:

> The study of NDM asks how experienced people, working as individuals or groups in dynamic, uncertain, and often fast-paced environments, identify and

> assess their situation, make decisions and take actions whose consequences are meaningful to them and to the larger organization in which they operate. (Zsambok & Klein, 1997, p. 5)

Rasmussen (1993) stated that practical or natural decision making involves making multiple decisions in a constantly changing environment rather than resolving a series of separate conflicts. Rasmussen (1993) looked at previously completed studies that illustrated this concept in actual work contexts including: The U.S Navy, medical doctors, and stock brokers. The main point was that experimental design studies about decision making do not adequately describe how decisions are made. "Experimental design suggests that decision makers are subject to an information input that they have to process. The task is isolated from its normal context, and, therefore, the 'tacit knowledge' of the subject has no opportunity to be 'synchronized'" (Rasmussen, 1993, p.161). Rasmussen (1993) further noted that subjects who have to make decisions in an actual work setting are forced to consider the context of where they are instead of isolating and addressing an individual task.

Schraagen et al. (2008) stated, "In gathering data, the field of NDM/Macrocognition is guided by curiosity about how experts are able to notice things that others cannot, and how experts are able to make decisions that would confound people with less experience" (p. 16). The primary goal of this study was to further inform the field of NDM/Macrocognition through a qualitative study of how TFS leaders made decisions during the 2011 wildfire season.

CHAPTER III

METHODS

The purpose of this study was to describe how TFS leaders made decisions during the 2011 wildfire season. I sought to understand how the phenomenon of the 2011 wildfire season held meaning for TFS leaders involved in making decisions. As this aligns with key characteristics of a basic qualitative approach, I chose to use this approach for this study. These key characteristics included: a desire to understand how people make meaning of their experiences, how people construct their environments in which they work and live, and how people make meaning of their experiences. (Merriam, 2009). Because this study addressed how the TFS leaders made decisions in 2011 it was "anchored in real-life situations," which was another reason why I selected a qualitative approach (Merriam, 2009, p. 51). Additionally, this study offered "insights" and it "illuminates meanings that expand its readers' experiences" that related to the 2011, Texas wildfire season (Merriam, 2009, p. 51). Affecting or improving practice is another reason for conducting a qualitative study (Merriam, 2009). This study sought to gain an understanding of how TFS leaders made decisions to hopefully affect and improve their ability to make decisions in the future. I gathered data through semi-structured interviews as well as document and archival record analysis (Lincoln & Guba, 1985).

This study relied upon multiple sources of evidence to address the previously stated research question: How did leaders of the Texas A&M Forest Service make decisions during the 2011 wildfire season? These multiple sources of evidence

developed “converging lines of inquiry,” which were necessary for the triangulation of the data (Yin, 2009, p. 115). Triangulation of data is a critical component of qualitative research. Effort was made to corroborate single sources of data against other sources, as “no single item of information should ever be given serious consideration unless it can be triangulated” (Lincoln & Guba, 1985, p. 283). Interviews were the primary source of data collected for this study as they were necessary to seek information about past events that cannot be replicated (Merriam, 2009).

Sample Selection

I selected a unique sample of individuals from the TFS. “A unique sample is based on unique, atypical, perhaps rare attributes or occurrences of the phenomenon of interest” (Merriam, 2009, p. 78). The population pool for this study included individuals who held department head (or higher) positions in the TFS [Name] branch. I chose participants for this study using criterion-based sampling. A key informant (gatekeeper), who was an executive leader in the TFS and a participant in this study, identified leaders who were responsible for decisions made during the 2011 wildfire season. Additionally, these participants were chosen, because they were primarily responsible for leading the emergency response efforts during the 2011 wildfire season. Each of the participants provided knowledge and understanding to the issues primarily important to the purpose of this study (Patton, 2002). I interviewed seven leaders in the TFS [Name] branch, which was the point when data saturation occurred (Lincoln & Guba, 1985; Merriam, 2009). Collectively, the participants had 168 years of experience working for the TFS

and 215 total years of firefighting and emergency management. Individual attributes of the TFS leaders were not disclosed to maintain the confidentiality of the participants.

Data Collection

Interviews

I conducted interviews for this study because "interviewing is necessary when we cannot observe behavior, feelings, or how people interpret the world around them. It is also necessary to interview when we are interested in past events that are impossible to replicate" (Merriam, 2009, p. 88). The interviews were semi-structured, and they loosely followed a set of interview questions derived from a protocol.

The interview questions were created based on the Critical Incident Technique (CIT). The CIT collects a record of specific evaluations and observations regarding a certain situation from those best qualified to do so (Flanagan, 1954). Using the CIT technique, I created an interview protocol, which was then peer reviewed by faculty experienced in qualitative research to enhance the likelihood of gathering relevant data to answer the research question previously mentioned. Using the protocol as a guide, I asked the participants to answer questions and make statements that served as a basis for the findings of this study.

I obtained permission to use dictation software prior to beginning this study for the purposes of gathering direct quotations from the participants. This software was supposed to collect the participants' words verbatim during the interviews and concurrently input their words into a document. However, the software malfunctioned repeatedly during the interviews and was not a reliable source of information. Therefore,

I took detailed field notes during the interviews to capture the data from participants. I chose not to audiotape the interviews so that the participants felt more comfortable openly sharing their experiences with me. Effort was taken to collect direct quotations from participants when something particularly perceived as interesting or important was said during the interviews (Patton, 2002). Steps were taken to ensure accuracy of the field notes, such as asking participants to restate their answers if I was not able to capture their answers fully the first time. I also asked follow-up questions when clarification or further information was needed. The interviews lasted approximately one hour with each participant, and ended when the interview was no longer productive (Lincoln & Guba, 1985). I determined the interview to no longer be productive when participants began repeating the same answers and information to me from earlier in the interview. At the end of each interview, interviewees were given the opportunity to add any final comments or information they believed was relevant to the study in addition to the questions they had already answered.

Confidentiality

Confidentiality of the participants was maintained through a coding process. No specific, demographic information was provided about the participants as it could have been used to link their responses to their identities. The names and data collected from the participants are referenced by a number (e.g. 1, 2, 3, 4, 5, 6, 7) throughout this study. Names of the participants were linked to their specific code and kept in a confidential key that only I accessed.

Document Analysis

Even though interviews were an excellent source of qualitative data, they needed to be considered in light of other interviews and sources of data (Merriam, 2009). I collected documents and records, which helped answer the research question this study addressed (Lincoln & Guba, 1985). Documents of all types can help uncover meaning, develop understanding, and discover insights relevant to the research question (Merriam, 2009). Therefore, this study also included data collected from two other sources: documentation and archival records. I collected archival wildfire data from 2011, TFS documents, and a personal document outlining a TFS leader's guiding principles. Personal documents gave me a glimpse of what the author believed was significant to making decisions (Merriam, 2009). Documents used in this study were coded as follows: SD1, SD2, SD3, and SD4. These documents and records were valuable to this study as they informed how TFS leaders made decisions during the 2011 wildfire season.

Data Analysis

The data collected in this study were analyzed using the constant comparative method (Glaser & Strauss, 2009). Data were constantly compared to identify categories and themes that had similar meaning. Open and axial coding was used to categorize the data (Merriam, 2009). Open coding involved tagging relevant units of data. I used axial coding to organize related units of data into descriptive categories and themes. After these categories and themes were identified, they were named based on what I observed from the data (Merriam, 2009). The categories and themes were then referenced to draw conclusions and make recommendations.

Trustworthiness

There were several steps I took to ensure trustworthiness of the findings described in this study. I considered the credibility, dependability, transferability, and confirmability of data collected in this study.

Credibility

According to Lincoln and Guba (1985), credibility means that data were collected in such a way that there was high probability of the findings' truth value, and the findings of the study were approved by the members who sourced them. Triangulation of the data was one way this study established credibility. Triangulation occurs when data are cross-referenced using multiple sources of data (Denzin, 1973). Additionally, triangulation of data can occur by gathering multiple participant perspectives that complement one another (Merriam, 2009). I triangulated information gathered from participant interviews with other participant interviews along with historical documents and records concerning the 2011 wildfire season. I also ensured the data collected during the interviews were accurate by sending the interview transcripts to the participants in order for them to edit, add, or remove information as needed. By doing this, I allowed participants to correct my recording of the data if errors existed. This process is referred to as member checks or participant validation (Merriam, 2009). Additionally, I sought multiple peer examinations of the data collected and consequently the findings that were presented as a result of this study. The peers who examined my data and findings were faculty members who were experienced in conducting qualitative research. Peer examination or peer debriefing is the process of divulging details of the

study and data collected to a disinterested third party so that person(s) may explore and analyze the results of the study. This process helps me as the researcher stay honest when analyzing data and presenting the findings as the peer explores my biases and basis for data interpretation (Lincoln & Guba, 1985). In addition to establishing credibility, I ensured dependability of this study using similar methods.

Dependability & Confirmability

Dependability ensures the findings are consistent with how the data were collected during the study (Merriam, 2009). Likewise, confirmability ensures the findings are consistent with the actual data that were collected during the study (Lincoln & Guba, 1985). This study used triangulation and peer reviews of the data as two methods of ensuring dependability and confirmability. I also created an audit trail as another method to ensure dependability and confirmability. An audit trail is a record of how the data were collected, coded, and used throughout the study. (Lincoln & Guba, 1985). I utilized the audit trail to describe findings, which were then used to draw conclusions. The audit trail was audited by both interested and disinterested third party individuals to ensure dependability and confirmability. These third party individuals were faculty members who have experience conducting qualitative research. The audit trail (along with other methods) was used also to ensure transferability of the study.

Transferability

Transferability enhances the possibility of the results of a study to be transferred to a similar setting or situation (Merriam, 2009). I described the findings using rich, thick description, which included specific quotes from participants, documents, and

artifacts. I did this so the reader could understand the context of how decisions were made during the 2011 wildfire season.

Positionality of the Researcher

Because this was a qualitative study, I as the researcher, was the sole instrument for gathering and interpreting the data associated with this study (Patton, 2002). Therefore, it is important the readers have an understanding of the background, biases, and perspectives I held, and how they may have affected the findings of this study. I am a leadership studies graduate student who has a passion for service-oriented organizations, which the TFS could be considered. I recognized my positive bias of the TFS and, to the best of my ability, put this bias aside in order to perform this study. I underwent critical, self-reflection throughout this study to ensure an ethical approach to identifying and reporting the findings. This critical self-reflection helped to mitigate any biases, personal beliefs, and assumptions I held that may have affected the integrity of this study. Lastly, I had no personal relationship with any of the TFS participants prior to beginning this study.

CHAPTER IV

FINDINGS

This study sought to address the following research question: How did leaders of the Texas A&M Forest Service make decisions during the 2011 wildfire season? To answer this question, I asked the participants to discuss specific decisions they made and information they had to consider when making those decisions. The results revealed several factors that influenced how leaders made decisions in 2011. I referred to these factors as categories and themes according to the data analysis methods described in Chapter III. The categories identified, which influenced the decisions made by the TFS leaders during the 2011 wildfire season, were the following: Communication, Culture of the TFS, Reputation of the TFS, Safety, Accounting for Fire Environment, and Distribution of Resources. I also described a final category that emerged, which was labeled Lessons Learned, where the participants discussed changes they made and new systems they created during and after the 2011 wildfire season. Each of the categories was referenced in Table 1 along with their themes (and subthemes) if they existed within each category.

Table 1

Summary of Categories, Themes, and Subthemes Used to Describe Data

Categories	Themes	Subthemes
Communications	Interagency Distribution	
	Public Information Distribution	
Culture of the TFS	Behavior and Team Dynamics	
	Accountability	
	Staffing and Training	
	Policies and Standards	
Reputation of the TFS	Honesty and Integrity	
	Stakeholder Satisfaction	
Safety as a Priority	Human Safety	
	Minimizing Loss	
	Dealing with Casualties and Loss	
Accounting for Fire Environment		
Distribution of Resources	Human Capital	Interagency Support
	Equipment	
	Financial	
Lessons Learned	General Changes	Resources and Communication
	New Systems Created	Land Owner Liaison Team
		Sharing Public Information

Notes. Most categories include themes, which are listed directly to the right and down from each category. Some themes include subthemes, which are listed in the same order as themes are to categories.

Communication

Communication emerged as a category participants greatly discussed that informed how the leaders made decisions during the 2011 wildfire season (1, 2, 3, 4, 5, 6, 7). This category was the most discussed category, and contained the richest amount of data from the participant interviews, which was why it was listed as the first category of my findings. The TFS leaders communicated amongst themselves to determine the best course of action during specific wildfires based on the threat and growth potential of those wildfires. "I provided information regarding the threat…of the wildfire potential. I provided this information to the leadership team, which they used to make decisions. I supplied this information in daily briefing meetings and sometimes even multiple times per day" (3). TFS leaders also communicated within their specific teams during regular briefing meetings in 2011. Participant 6 stated that the aviation team had daily conference calls with safety experts to ensure they were maintaining safe practices throughout the 2011 wildfire season.

Additionally, TFS leaders shared multiple instances where information was communicated effectively among the TFS organization, interagency IMTs, and the public of Texas. They also shared several examples of miscommunication as well. Two themes emerged from this category: Interagency Information Distribution and Public Information Distribution.

Interagency Information Distribution

TFS leaders learned how to communicate with interagency IMTs as participant 2 reflected, "We learned how the agencies that made up the IMTs communicated both

formally and informally, which was an intangible asset" (2). Much of the communication, which occurred between the TFS and interagency IMTs, were in-briefs and after action reviews (AARs). An in-brief was described as a preparatory session prior to entering a specific incident to deal with a wildfire or crisis. In this briefing session, firefighters would discuss safety, risks, and critical concerns to "ensure accurate situation awareness" (National Wildfire Coordinating Group, 2007, p. 51). After an incident, firefighters ideally would perform an AAR, which is "a structured review or de-brief process of an event, focused on performance standards, that enables participants to discover for themselves what happened, why it happened, and how to sustain strengths and improve on weaknesses…" (National Wildfire Coordinating Group, 2014, p. 23).

> We recognized that having a good in-brief and de-brief… were keys to success for these teams. We did our best to in-brief the IMTs and inform them how to work with the local governments and private landowners before they moved into an area to start fighting fires. However, due to the severity and frequency of fires in 2011, we were not able to in-brief every resource. I would also try to follow-up and de-brief each resource after they were done. However, this was not always possible (7).

As participant 7 said, despite their best efforts to in-brief and debrief every interagency IMT, the extreme conditions in 2011 did not allow this to occur, which led to issues between these non-TFS firefighters and private landowners. "The non-TFS personnel did not communicate well with the private land owners and as a result the TFS got a bad

reputation" (1). Participant 7 suggested reasons why the non-TFS firefighters miscommunicated with Texas landowners and stakeholders. "IMTs and other out of state resources sometimes had difficulties with adapting to Texas culture and ideologies of local governments and private landowners. They did not always know how to communicate with these stakeholders effectively" (7).

Public Information Distribution

Another form of information distribution the TFS leaders mentioned was between the TFS and citizens of Texas. Participant 5 stated, "We need to keep folks informed and share a unified message." Other TFS leaders echoed this sentiment as participant 6 said, "The TFS is a very open agency when it comes to communication. We like to keep people aware of what we are doing at any given time" (6). Participant 4 had a responsibility as part of his team's role to convey a "unified message to the public" (4). "[My team] established an integrated plan to deal with all the media, elected officials, and general public. I trusted these people who proved themselves and led the TFS media response through the 2011 fire season" (4).

Likewise, participant 5 shared his experience of keeping the general public and elected officials informed in 2011:

> In September during the Bastrop fire, I was primarily stationed at TFS headquarters dealing with a tremendous amount of information requests …my role (one of them) was to keep the other factors (budgetary, legislative, media) taken care of to ensure that Operations kept running and addressing the wildfires.

> I helped answer questions that the legislature, media, and the general public had about our processes (5).

Participant 5 also dealt with the legislative "Sunset" process in 2011. "During this process we (the TFS) undergo a review and audit that determines if our existence is justified as an agency. I was responsible for responding to audit requests and questions that the legislators and staff had for the TFS" (5). Participant 5 was not the only TFS leader who personally dealt with elected officials in 2011, as participant 6 stated, "I provided some information to elected officials about fires in 2011. I learned that it is better to share information with elected officials proactively rather than waiting for them to ask you for information." Additionally, participant 2 shared, "I had a very powerful elected official call me to ensure that we were doing everything possible to keep his citizens safe... This was impressive and humbling to me that he would call" (2).

TFS leaders expressed the importance of communicating openly and honestly with the people of Texas during 2011. For instance, participant 6 described a particular online information distribution tool (dispatch tracker), which allowed misinformation to be seen by the public. The online tool was intended to distribute fire condition information to the TFS and other firefighting agencies. Any online user could access the dispatch tracker containing information called in by Texas citizens, who reported the fires as they observed them.

> Media, elected officials, and the public could access these records, which were not always accurate as they were based on information directly called in by the person who saw the incident. Events were exaggerated many times. People

> would say that multiple homes were on fire, when there may have only been one on fire. In 2011, people were on pins and needles because of the inaccurate information they could access. (6)

As a result, the TFS had to diffuse a number of situations that arose primarily with the media and legislative members who were fed incorrect or incomplete information from the dispatch tracker (6). Situations like these led to a series of lessons learned by the TFS leaders.

Culture of the TFS

Culture was another category participants discussed that informed how the leaders made decisions during the 2011 wildfire season (1, 2, 3, 4, 5, 6, 7). Within this category were several themes including: Behavior and Team Dynamics, Accountability, Training and Staffing, and Policies and Standards.

Behavior and Team Dynamics

Elements of employee behavior and team dynamics among TFS leaders were referenced by all the participants in this study (1, 2, 3, 4, 5, 6, 7). Participant 1 stressed the importance of falling back on team decision making rather than individual decision making. Participant 2 echoed this sentiment. When describing the importance of a team he said, “It’s very difficult to describe the value of a close-knit team that’s motivated by shared goals and values. We all want to do the right thing. We have a level of cohesion that is invaluable” (2). He went on to say that each member of his team stands out individually, but they each watch out for each other and care about the greater good of the team (2). These statements were affirmed by a personal document containing a TFS

leader's guiding principles, "Help others be successful. Not only is this a good thing to do, you will also develop allies. This includes your subordinates, peers, and individuals that are in support and administrative jobs" (SD2).

Individual contributions within the team were also discussed, as participant 3 said, "We (the leadership team) worked together…My role was primarily to offer information and support to the leadership team to make decisions. I and my team were there to help define the scope, complexity, and operational tempo of the 2011 wildfires." Others agreed that having a team with a common direction was a valuable component of their success (1, 2, 5, 7). While the TFS [Department] leaders indicated they worked well as a team, one participant elaborated on an issue he had with one of his employees, which ultimately led to that person being demoted. However, this event turned out to be a positive move for his department as he said it "was a great opportunity to set the tone and bring the department together. It crumbled walls that were there previously…" (4). He said that after this event, morale was raised and other employees were empowered to do their jobs better (4).

Participant 1 recognized the importance of having time off to rest even during crisis situations. He believed that after three straight weeks of work, TFS employees should take four to five days to rest and recuperate before returning to the field (1). However, this was not always possible during the 2011 fire season. "I made a lot of personal sacrifices including lots of travelling and missing time with my family. I practically had a second home in Merkel [Texas] along with other TFS leaders" (4). TFS leaders were committed to their jobs until the fires were out. Participant 1 remembered

working 21 days straight before taking any time off along with many other TFS employees. He was committed to his job. It was difficult for him to take time off because he was so invested in the role he was filling (1). Likewise, participant 6 stated, “It is hard to take time off when situations (like 2011 [wildfire season]) are happening.”

Accountability

Participants shared stories that illustrated the importance of accountability among TFS employees as well as other firefighting agencies that assisted the TFS during the 2011 wildfire season (4, 5, 6). Participant 4 shared a story involving a TFS employee that did not follow orders and was held accountable for her actions.

> At one point during the 2011 wildfire season, one of my [Department] teams was assigned to go to a specific town in Texas to respond to fires in that area. The team leader did not follow orders and instead took the team to another location she thought was more important. I was in Merkel when I found out about this. I demoted the team leader and replaced her with a newer employee who had not worked extensively with the [Department] team before and was not accustomed to their old ways of operating. (4)

While this situation was not ideal for participant 4, he believed it was the right call to set the precedent that misconduct would not be tolerated and employees were accountable for their actions (4). Additionally, the TFS monitored outside firefighting agencies to ensure they were following procedures correctly. “I was involved in at least 3-4 decisions per day that needed to be made to keep critical operations moving forward… [which included] making sure that private (insurance-company) [non-TFS] firefighters

had access, but were also controlled and kept accountable" (5). The TFS organization was also held accountable for the federal resources they used to fight fires. Participant 6 chose to bring in federal safety experts to audit TFS use of aviation resources to ensure they were being safe and responsible with those resources. "I also wanted to keep open lines of communication with the federal agencies whose aviation resources we were using. We are an open book to them" (6).

Staffing and Training

Participant 4 previously mentioned staffing issues with one employee in particular who was demoted as a result of her actions, which turned out to be good for the TFS. This was because some employees were set in old ways of operating, and were not willing to follow new policies that the TFS had adopted. Participant 4 reflected, "By getting rid of the previous team leader….it sent a positive shockwave that allowed the [Department] to be accepted throughout the TFS" (4). TFS leaders also dealt with an influx of new employees, as close to fifty employees [including firefighters] were hired between 2009 and the 2011 wildfire season (7). "We trained the new employees and tried to bring them up to speed with what was happening in 2011. We had to adjust their amount of training time due to the needs we had to fight fires in the field. We had Just-in-Time training for the new employees" (7). Participant 7 went on to say that these employees were able to gain a lot of real world training and experience from the 2011 wildfire season.

Policies and Standards

A supporting document asserted a stance TFS leaders hold on indecision. "Indecision is a course of action; it is the decision to do nothing. You will be faced with situations that require a decision be made quickly. Make one. If it turns out not to be the best decision or just flat out wrong, observe, analyze, correct and move forward" (SD2).

Several TFS leaders discussed similarities they saw between their policies and standards and the military's policies and standards in response to crisis situations (2, 3, 7). "We strive to be a High Reliability Organization similar to the military. We follow many of the same procedures they do. Failure is not an option" (2). Participant 3 stated, "We followed military-like standards and protocols to manage the situations/wildfires that arose. These procedures work well for us just like they do for the military as we are faced with similar, stressful situations….It can't get more chaotic than a battlefield." Participant 7 explained their policies and standards in terms of leading an army of troops into war. "The troops have to be supported in order to fight a war. We treated our resources the same way" (7).

Reputation of the TFS

Reputation of the TFS was another category that emerged from the data (1, 2, 4, 5, 6, 7). Two themes, which described this category were the following: Honesty and Integrity as well as Stakeholder Satisfaction.

Honesty and Integrity

The TFS leaders who participated in this study stated honesty and integrity, or in other words, "the right thing to do" (1, 2, 6), was an integral component to making

decisions. Participant 2 said that their agency philosophy is to always tell the truth no matter what. He stated, "No matter how bad the situation is, tell the truth" (2). He also added, "…the TFS is considered trustworthy by other agencies" (2). This was supported by document SD2, which emphasized, "Always, always try to do the right thing. Not only is it the correct way to live your life but people sense that this is your motivation. It will become part of your reputation" (SD2). The TFS also fought to make sure the truth was told, and information was communicated accurately in 2011. Participant 4 shared this story:

> There was one event where we had to send PIOs (public information officers) to an airbase to cover media attention where they (the media) were trying to say that the TFS was shorthanded and were not getting the resources they needed. This was not true, and our PIOs did a good job of accurately portraying these facts to them. (4)

In addition to maintaining their honesty and integrity, the TFS leaders were also concerned with stakeholder satisfaction.

Stakeholder Satisfaction

One of the strongly held beliefs TFS leaders communicated during the interviews was that the TFS had not done their job right if stakeholders were not content when the wildfire was put out (1, 5, 7). "We have not done our job properly if we leave and someone is not happy with what we've done!" (1). Unfortunately, the TFS could not satisfy everyone in 2011.

> In 2011, a specific ranch manager, Joe, was especially not happy with the way his ranch and his neighbors were treated during one of the fires. He was not communicated with very well at all by the non-TFS firefighters that were on his land. Since that time, the TFS has made it a priority to communicate and serve the landowners regardless of the situation. (1)

Even though it was not TFS firefighters responsible for the treatment of Joe's ranch, the TFS was blamed because the it was the agency responsible for interagency coordination of non-TFS firefighters. Participant 5 shared a similar story that was told to him about a Texas landowner who was unhappy with how she was treated during the wildfires on her property:

> One lady said they fought the fire for 3 days trying to keep her house and grass (food for her cattle) alive. They were happy to see the firefighters (non-TFS) arrive, then instead of putting the fire out directly, they back off a significant distance, put in control lines and burnt out most of their pasture/grass. When asked they said it was safer and better for her pasture to do it that way, not recognizing that that grass was their cattle forage and livelihood. (5)

Even though the TFS was not directly responsible for the treatment of this lady, Joe, and others who were disappointed with the way they were treated during the 2011 wildfire season, the TFS made efforts to rectify these situations. "We have a responsibility to fight fires and to keep people informed. We need to make sure they know what we are doing and why, without them having to ask" (5). One way TFS rectified these situations was by sending high-level, TFS leaders to personally visit the stakeholders who were

treated poorly by non-TFS firefighters. “I was involved with following up with landowners and cattle raiser’s associations. I listened to their complaints about how they were treated during the wildfires on their property (mostly I listened as they voiced those complaints to our [Executive Leader])” (5). They did this because they did not believe their job was done until the citizens were satisfied. TFS leaders did what they could to ensure stakeholder satisfaction to the best of their ability. “Success in this case meant that the citizens wanted us to come back in the future after we had finished fighting the fire in their area” (7). Stakeholder satisfaction was a concern for the TFS as it impacted their reputation among Texas citizens.

Safety as a Priority

Safety was a fourth category that emerged from the data (1, 2, 4, 6). There were three themes that developed out of the data regarding safety: Human Safety, Minimizing Loss, and Dealing with Casualties and Loss.

Human Safety

Keeping firefighters safe was a responsibility that TFS leaders had during the 2011 wildfire season. Participant 1 explained a situation where he had to send firefighters to a remote location to fight a certain fire during 2011. Because the location was so remote, he had to allocate resources (firemen) that would be able to support themselves. He had to find lodging for those firemen near the location of the fire rather than allow them to travel home after a full day of fighting the fire. He did this for their safety, so they would not drive home when they were too physically tired to do so. It was the right thing to do for those firefighters in order to keep them safe (1). Participant 6

discussed aviation firefighter safety; “During 2011 we flew 17,000 hours on fires and dropped 39 million gallons of water and retardant. We put in a lot of effort to maintain aviation safety. I made the decision to have an aviation safety conference call every morning” (6). Participant 6 also said that the average flight time before an accident occurred is 3500 hours. However, the TFS did not experience a single, major aviation accident during 2011 (6). “I know that I can’t get complacent. It keeps me on my toes to maintain our safety record” (6). Participant 6 wanted to be proactive at maintaining the TFS aviation safety record. In addition to ensuring firefighter safety, the TFS leaders evaluated how they could minimize citizens’ loss in 2011.

Minimizing Loss

Participants discussed how they evaluated what they thought could be saved from fires and what could not (1, 2). “Our goal is to not allow any ‘project’ fires to occur and to put them out as quickly as possible to minimize exposure to losses and reduce the possibility of fires growing into project fires” (2). In 2011, participant 1 evaluated when a neighborhood or subdivision could still be saved, or when it was impossible to save. He had to make decisions to take resources out of areas in order to move them to areas where they could have a chance to save property and homes. Even if they were the right decisions, major losses were still incurred. An example he gave was about the Bastrop fire, “…most homes were lost in the 1st and 2nd days. They could not be saved due to the fuels, wind and overall fire environment” (1). Unfortunately, loss was a reality in 2011, and the TFS leaders had to deal with it in difficult ways.

Dealing with Casualties and Loss

Many homes and several lives were lost in Texas from the 2011 wildfires. The TFS leaders had to handle both types of losses that year as a result (2, 4). Participant 4 reflected, "Every week, fire would take 2-3 homes. Branch directors would regularly call for PFA (post fire assessment) teams to assess homes lost across Texas" (4). Not only did they deal with homes lost to Texas citizens, TFS leaders also dealt with the loss of a non-TFS firefighter, who died from hyperthermia while fighting a fire near Mineral Wells, Texas (SD1). Participant 2 shared:

> The IM (incident management) team that was managing the fire where the fatality occurred took it very personally and were in a state of emotional shock. I made the decision to go to them immediately after he died and share in the experience with them. They appreciated my decision to come to them, however, they were still in shock when I arrived.

The fires were treacherous in 2011, and were unlike anything most of the TFS leadership had ever encountered (3). Participants discussed how the fire environment affected decisions they made during the wildfire season in 2011.

Accounting for Fire Environment

These were some questions that TFS considered on a daily basis during 2011: "Where was the fire burning? What was burning? What are the weather conditions like? What types of fuel (grass, timber, and houses) are being burned in a given area? Are there any natural breaks to slow the fires down?" (1). Each of these questions informed the overall span of control that the TFS had on any given wildfire that burned in 2011.

"Sometimes, the fires and weather are just too dangerous and there is nothing that can be done. In these situations fires can be a force of nature similar to a tornado or a hurricane" (2). Participant 1 reflected on the Bastrop fire and how it was impossible to fight at times because of strong winds:

> The wind element is a key consideration for aviation units. There was nothing that could be done to save Bastrop in those early days because of strong winds. Aircraft early on, would not [have] been effective, due to the severity of the fire and effects of the wind, even if they [aircraft] had been sitting and available in the immediate area, due to the wind being so high, they would not have even been able to fly (1).

Participant 2 likewise said, "We admitted when the fires were too strong and dangerous to fight. Some thought this may be similar to admitting weakness, but in reality we were setting realistic expectations for our capabilities" (2). There were a host of other factors that increased wildfire growth potential as participant 3 elaborated, "In 2011, fires occurred all over the state and the span of control was at its maximum. [It was] the most active and complex fire season I've ever experienced because of all three factors (scope, complexity, and operational tempo)." To manage these fires, TFS leaders had to manage resources efficiently and effectively.

Distribution of Resources

Allocation of resources was another category that emerged from the findings as a factor that influenced how decisions were made in 2011 (1, 2, 3, 4, 5, 6, 7). There were several different types of resources that participants discussed including human,

equipment, and financial. These types of resources were described in the following themes: Human Capital, Equipment, and Financial.

Human Capital

"People are your most valuable asset. You must do your best to understand your personnel; their needs and expectations, both personal and professionally. Communicate this in words and actions" (SD2). Additionally, this theme was discussed by all participants in this study (1, 2, 3, 4, 5, 6, 7). A subtheme that emerged from this theme was Interagency Support. In addition to using TFS employees, the TFS leaders brought in thousands of other firemen and women from outside agencies to fight fires in 2011 (2).

Interagency Support

In 2011, interagency support was needed to gain and maintain a span of control (3). Participant 2 further explained the process of requesting additional non-TFS resources:

> We used the National Wildfire Coordinating Group (NWCG) made up of state and federal agencies to bring in close to a dozen IMTs during the 2011 wildfire season. We mobilized over 16,000 people that year to fight the fires throughout Texas. This would not have worked unless the training across the NWCG agencies was homogenous. Even though firefighters were from across the nation, these individuals were all trained using the same curriculum, and they were able to immediately make an impact once they arrived at the fires in Texas (2).

TFS leaders knew they needed these interagency human resources to fight fires in 2011; they knew the TFS would not be able to handle them on their own (1, 3, 5). Participant 3 reflected, "In 2011, the scope was statewide. All TFS resources were exceeded and we had to go beyond our resources and ask for help from IMTs in order to maintain a span of control" (3). The month of April was mentioned as a particularly negative time during the 2011 season when multiple, major fires started (1, 2, 5, 6, 7). April 9th was identified as a historically "bad" day for fires (6, 7). "During that time [April] we had over 2000 firefighters active across the state most of whom were federal and from other states" (5). In addition to managing interagency personnel, the TFS leaders had to deal with exhaustion during 2011.

Equipment

Allocating and moving equipment was another resource factor that TFS leaders considered during 2011 (1, 2, 3, 6, 7). Participant 1 said he had to make daily decisions about where to move critical resources including helicopters, tankers, dozers, and hand crews. Much of participant 6's responsibility dealt with aviation resources that the TFS used during 2011. "A lot of my time was managing the aviation resources. All of them are on federal contracts except for the ones owned by the National Guard" (6). Respondent 7 likewise dealt with moving a number of resources during 2011. "We had to bring in additional people (hand crews), aircraft, fire apparatus and bulldozers to fight certain fires that season. I had to consider when to bring these resources in and how long to keep them in certain areas" (7). Like human resources, equipment resources cost

money to maintain and operate; fiscal responsibility was another factor TFS leaders had to consider in 2011.

Financial

TFS leaders discussed the importance of fiscal responsibility when ordering equipment and other resources during 2011 (2, 5, 7). However, they spent money as needed to effectively combat the wildfires. Participants illustrated this when he talked about a DC-10 aircraft the TFS used in 2011. Participants estimated that this aircraft could hold six to seven times the amount of fire retardant from other standard firefighting aircraft, however, it cost thousands of dollars per hour to operate. Participant 2 reflected, "We used this aircraft [DC-10] in 2011 even though it costs a very high amount of money to operate. We are a frugal organization, but it was the right thing to do to bring in that aircraft to fight the fires. So we did" (2). Participant 7 echoed this when he discussed managing resources in 2011. "Every resource we brought in cost something... We have a guiding principle, which I considered when making the decision to bring in additional resources. The principle is that we are 'providing good stewardship to the people of Texas'" (7). Even with responsible management of financial resources, the TFS did go over budget in 2011 due to the severity of conditions that year (5). Even so, TFS kept elected officials up-to-date as participant 5 explained, "I had to keep the state legislature informed of why we were going over budget and how we were using those financial resources" (5).

Lessons Learned

TFS leaders discussed lessons they learned during and as a result of the 2011 wildfire season (1, 3, 4, 5, 6, 7). When asked if he would change anything in future situations participant 3 said, "In the future, we (leadership team) would use the same strategies, but add our experience to improve the way we handle similar situations" (3). While overall strategies may remain the same, TFS leaders discussed several issues they would handle differently as a result of decisions they made and events that occurred during the 2011 wildfire season. Those issues were separated into two themes: General Changes and New Systems Created.

General Changes

TFS leaders reflected on what they would do differently or changes they would make as a result of events that occurred in 2011. Document SD2 supported the TFS leaders' notion of incorporating change, "Life is what happens when you're busy making plans. Change is constant; embrace it. Become an advocate for change that results in positive effects…" (SD2). A subtheme of change that emerged from the data was named Resources and Communication.

Resources and Communication

Some issues arose among TFS employees that did not understand why TFS leaders made certain decisions. Participant 4 explained a situation where this occurred in his department:

> I made the decision to create new PFA procedures that included more flexibility of the teams and new people operating on the teams who were willing to

> cooperate with the new procedures... I had to completely start over with a new system and insert new employees to perform PFAs. They were required to be: decisive yet flexible, and follow an autocratic process. (4)

This change had backlash that participant 4 would have rather avoided if it were possible. He further reflected on the situation:

> I would have taken a step back. It was a very sudden change. A rift was created between an employee and the agency. It even created a wedge between her county and our agency. I would have worked with this employee more and helped her try to understand why we had to change the PFA process rather than changing it abruptly with little input from that employee. (4)

Participant 1 divulged another situation where his employees did not fully understand a decision he made. Participant 1 had to send resources from one group of fires to other fires, where he believed those resources would have a more positive impact. Sometimes his subordinates did not understand these decisions. He said, in the future, he would better inform his subordinates of the reasoning behind his choices to send resources certain places so they could have a better understanding (1).

Participant 1 also said, in the future, he would want to know who the (non-TFS firefighter) resources are that are coming to aid in the firefighting efforts. This is so the TFS leaders can better communicate with the non-TFS firefighters about dealing with private landowners and other issues specific to fighting fires in Texas (1). Participant 5 said, “One of the conclusions is that we need to have had TFS leadership with the federal/non-TFS firefighters.” Participant 7 echoed, “I would also ensure that we have a

TFS representative with each IMT team in the future." Issues like this led to new processes and systems created to ensure similar situations like this do not happen again in the future.

New Systems Created

Land Owner Liaison Team

TFS leaders identified several areas that could be improved from what they experienced in 2011. One of those areas was improving communication between private landowners and firefighters (both TFS and non-TFS) (1, 5, 7). A team called the "Land Owner Liaison Team" (7) was created by a process described by participant 5.

> I lead the process to ensure we bring local landowners into the decisions on large fires, particularly when working with federal agencies and outside IMTs. This process included the Texas and Southwest Cattle Raisers Association, Texas Sheep and Goat Raisers Association and AgriLife representatives who we would communicate with during a wildfire. These organizations would then provide two-way communications to locals in the area who could potentially be affected. (5)

In addition to utilizing the Land Owner Liaison Team, participant 7 suggested an additional measure of accountability for the IMTs. "I would ensure that every IMT and every firefighter participates in a region-specific in-briefing prior to…fighting fires. I would also ensure that every IMT and firefighter participates in a de-briefing after the fires are out" (7).

Sharing Public Information

Other systems were created to address ways that the public and media received information. The dispatch tracker system was an issue during 2011 that participant 6 discussed.

> I decided that we needed to only show limited information to the public. As soon as the [2011] fire season ended we contracted a professional to build a new dispatch tracker display system. We wanted to be transparent, but only with accurate, truthful information… I wished we could have changed the dispatch tracker in the middle of the fire season, however, it was too important for the first responders and firefighting personnel to make any major changes during the wildfire season. (6).

Participant 6 further said after the TFS implemented the new dispatch tracker system, "it was the right thing to do by restricting access to the [old] dispatch tracker. We will continue to be transparent, but also truthful and accurate with the information we present" (6).

Participant 4 discussed a similar issue regarding public information distribution that led to the creation of a new system. "Our IMTs can handle basic interviews that address normal fires that occur, however, 2011 produced fires that were bigger and lasted longer than we have dealt with previously" (4). Because of this, he had to adapt during the fire season and create a new system to deal with the media. "My team had to come up with a staffing plan to communicate with the media…I brought in key members of my PI (public information) staff to help me create a new system to deal with all the

new media attention…" (4). Using this new system, the TFS was able to more effectively and efficiently communicate with the media during the 2011 wildfire system.

Summary of Findings

In addition to lessons that the TFS leaders learned, there were several other categories that emerged as a result of this study. Each category represented factors that TFS leaders considered as part of decisions they made during the 2011 wildfire season. These categories included: Communication, Culture of the TFS, Reputation of the TFS, Safety as a Priority, Accounting for Fire Environment, Distribution of Resources, and Lessons Learned. Specific stories and representative quotes from TFS leaders were used to describe each of these categories. Consequently, these categories helped to describe how TFS leaders made decisions during the 2011 wildfire season. In the next section, conclusions and recommendations are discussed based on the results of this study.

CHAPTER V

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to describe how TFS leaders made decisions during the 2011 wildfire season. The research question that guided this study was the following: How did leaders of the Texas A&M Forest Service make decisions during the 2011 wildfire season? The findings from this study included rich, descriptive data regarding how TFS leaders made decisions during the 2011 wildfire season. While the findings are not generalizable, the descriptive nature of this study provided for the findings to be transferable to similar contexts or situations in the future.

Discussion of the Findings

The findings indicated several factors that influenced how TFS leaders made decisions during 2011. The factors identified in this study included: Communication, Culture, Reputation, Safety, Accounting for Fire Environment, and Distribution of Resources. Conclusions were made based on each of these factors. Additionally, an overarching category emerged: Lessons Learned. Conclusions were also made regarding the lessons learned that TFS leaders discussed.

Communication

The findings indicated that much of how TFS leaders made decisions during 2011 included some type of communication. Prior to the 2011 wildfire season, TFS leaders had not had as much experience dealing with interagency (non-TFS) IMTs, as they would have liked. This conclusion supports the seventh NDM characteristic as "multiple players" were involved in decision making during the 2011 wildfire season

(Zsambok & Klein, 1997, p. 5). The findings indicated several instances of miscommunication between the TFS and interagency IMTs along with instances of miscommunication between IMTs and Texas landowners. According to Coombs (2007b) miscommunication during a crisis can damage an organization's reputation.

TFS leaders recognized the reputation damage that occurred due to non-TFS IMTs' miscommunication with landowners. TFS leaders went to great lengths to rectify the miscommunication that occurred between non-TFS IMTs and Texas landowners. TFS leaders prioritized sharing unified and clear messages to the public regarding the status of wildfires throughout the 2011 wildfire season.

Culture

The culture of the TFS impacted how leaders made decisions. Cultural contributors included team decision making among TFS leaders, accountability among TFS employees and affiliates, training concerns, and military-like standards that the TFS follows. Of the eight NDM characteristics, this conclusion supports that decisions were made with consideration of feedback loops, multiple decision makers (i.e. multiple players), and organizational goals and norms (Zsambok & Klein, 1997). The findings suggested TFS leaders exemplified effective crisis leadership through their team decision making. The leaders displayed a level of trust in each other and their employees, which is required in effective crisis leadership (James & Wooten, 2005). Additionally, it can be concluded that TFS leaders displayed attributes found among those involved in a learning organization (Senge, 2006). The findings showed leaders were motivated by shared vision and goals during the 2011 wildfire season. Findings

also suggested that TFS leaders worked well individually (personal mastery) and as a team (Senge, 2006). If TFS leaders continue to work in the way they did during 2011, they should experience growth that allows them to operate more like a learning organization, which should enhance their leadership effectiveness during a crises in the future.

TFS leaders were open to employees making mistakes and, learning from those mistakes. However, TFS leaders were not afraid to demote or get rid of employees who did not follow orders or could not be held accountable. It can also be concluded that the crisis situation in 2011 altered the training schedule for new TFS employees, as they were needed immediately to fight wildfires after getting hired. Consequently, after going through an abbreviated training program, they gained on-the-job training. While it is impossible to give this same experience to current, incoming employees, TFS leaders described this type of on-the-job training as invaluable. Employees who were hired during the 2011 wildfire season could pass along the experience they gained in 2011 to new employees through mentoring relationships. While it is not the same experience, the employees hired in 2011 could communicate valuable lessons they learned to new employees through a mentor/mentee relationship, which could also aid in the new employees indoctrination into TFS culture.

It can be concluded from the findings that the TFS has similarities to an HRO. Diversity of thought is one of the greatest strengths of an HRO (Weick et al., 2008). TFS leaders shared a common bond in their goal to protect the people of Texas, however, they each had unique expertise and responsibilities that allowed them to work to

accomplish their goal. The findings suggested instances where TFS leaders dealt with multiple complex environments and were required to adapt accordingly, which is one of the tenants of an HRO. Additionally, TFS leaders saw their organization as one similar to a military organization and followed many of the same procedures the military follow. TFS leaders see similarities to the military in the way the TFS does not accept failure and it follows similar standards and protocols during crisis situations. Additionally, TFS leaders were able to make decisions based on their knowledge and expertise, which was another indicator of a HRO. These similarities between the TFS to a military organization and consequently a HRO, are positive attributes of the TFS. HROs must learn by investigating near failures, focusing on the dangers of success, and treating any failures they do experience as a learning opportunity. If the TFS learns like an HRO, they can more effectively mitigate and prevent wildfire destruction in the future.

Reputation

Reputation was another factor that influenced how TFS leaders made decisions. This conclusion supports the sixth characteristic of the NDM paradigm, because decisions were made in consideration of the high reputational threats (i.e. high stakes) that were involved with fighting fires during the 2011 wildfire season (Zsambok & Klein, 1997). Two elements of reputation displayed in the results were satisfaction of the Texas stakeholders along with honesty and integrity of TFS operations.

With regard to honesty and integrity of TFS operations, it can be concluded that TFS leaders perceive that other organizations view the TFS as a trusted organization. Additionally, TFS leaders have a deeply held desire to maintain Texas landowners trust

and satisfaction. It can be concluded that while the TFS was not perfect in maintaining landowners' trust or satisfaction, great effort was made to rectify situations where trust was broken during wildfire mitigation efforts in 2011.

Safety as a Priority

Coombs (2007a) posited that evaluation of safety should be the most important factor for consideration during a crisis situation. Additionally, a preoccupation with safety is supported by Bourrier (1996), which posited that safety is a top priority for decision makers in an HRO. It can be concluded that firefighter safety was of utmost importance to TFS leaders during the 2011 wildfire season. Great efforts were made to care for firefighters both on the ground and in the air. This conclusion supports the first and second characteristics of NDM as TFS leaders had to work in "uncertain, dynamic environments" with "ill-structured problems" in order to keep people safe (Zsambok & Klein, 1997, p. 5). It can also be concluded that TFS aviation safety procedures were well established, as the TFS did not experience a major aviation accident during the 2011 season, which was abnormal according to TFS leaders. TFS leaders performed well in this regard during the 2011 wildfire season, as they did not experience any TFS employee fatalities.

TFS leaders had to make difficult and sometimes unpopular decisions to evaluate whether or not properties could be saved during the 2011 wildfires. This conclusion aligned with the commitment to resilience of an HRO, as TFS leaders dealt with unexpected and pressure-filled situations (Weick et al., 2008). Additionally, this conclusion supports primary features of decision making according to the NDM

paradigm (Zsambok & Klein, 1997). TFS leaders had to deal with the uncertainty and ill-defined goals by choosing which houses or properties could be saved, and determining if there was even a possibility of saving those houses and properties. Deciding which homes and properties to save could be considered an ill-structured problem in a high stakes environment (people's livelihoods were at stake) that was influenced by time stress (wildfires do not wait for decisions to be made) and multiple players (homeowners, firefighters, and politicians). Based on these conclusions, it can be inferred that TFS leaders engaged in naturalistic decision making during times like this in the 2011 wildfire season.

Accounting for Fire Environment

The 2011 wildfire season was unlike any TFS leaders had ever seen, which presented challenges they had never faced. There were several instances during 2011 where the TFS leaders had no control over the circumstances in several of the wildfires that occurred. TFS leaders were forced to tell their firefighters to mitigate losses rather than put out fires that were uncontrollable, which aligned with the fifth NDM characteristic of "shifting, ill-defined, or competing goals" that TFS leaders managed when making those decisions (Zsambok & Klein, 1997, p. 5). Situations like this also aligned with tenants of Macrocognition, which assert that decisions must be made in conditions that are ill understood and cannot be controlled or manipulated (Klein et al., 2003). TFS leaders understood how to be realistic during crisis situations. They were able to make judgment calls about if particular wildfires were possible to fight or if the

conditions were too intense and needed time to wear down before they could be controlled.

Distribution of Resources

Resource distribution was another factor TFS leaders considered when making decisions during the 2011 wildfire season. With regards to human resources, interagency firefighters and IMTs were indispensable during the 2011 wildfire season. TFS resources were exceeded and the TFS leaders recognized the need to bring in outside aid. By recognizing this, it can be concluded from the findings that TFS leaders exemplified a preoccupation with failure, sensitivity to operations, and a commitment to resilience, which are all traits of an HRO (Weick et al., 2008). It can also be concluded that TFS leaders had a passion for their jobs that superseded the physical needs of rest and time off, and included personal sacrifices during the 2011 wildfire season. This sense of purpose the TFS leaders expressed is an element associated with learning organizations (Senge, 2006). This sense of purpose is admirable among TFS leaders as it likens them more to a learning organization, however, it could also be a detriment to the organization if fatigue negatively affects decisions that TFS leaders make during a crisis. Because of the high risk of failure in an HRO, it is imperative that decisions are made with accuracy to avoid costly mistakes (Roberts et al., 1994).

Consideration of equipment resources was another factor that influenced how TFS leaders made decisions in 2011. Equipment resources were not unlimited, and TFS leaders were required to make difficult decisions regarding where and how to use certain equipment such as bulldozers, tankers, and aircraft. They had to decide how long to keep

that equipment in an area before moving it elsewhere. Situations like this required TFS leaders to make complex, high stakes decisions while allocating equipment during 2011, which was consistent with primary tenants of Macrocognition (Klein et al., 2003). An example the findings illustrated, regarding the use of a DC-10 aircraft, was a high risk situation with a time pressure component where multiple goals conflicted and where conditions of the DC-10's use could not always be controlled or manipulated by TFS leaders. By seeking to further understand how difficult decisions like this were handled in 2011, TFS leaders can better perform their jobs in future situations where similar decisions must be made. After all, the Macrocognition /NDM paradigm exists to understand "how people handle difficult cognitive demands of their work, and trying to help them do a better job" (Schraagen et al., 2008, p. 6).

The findings indicated that TFS leaders showed a strong sense of respect for fiscal responsibility to the people of Texas and elected officials as they were expressly open about their fiscal decisions both to elected officials and the people of Texas. However, TFS leaders balanced this fiscal responsibility with their mandate to protect the people of Texas from wildfires. Even though the TFS went over their budget in 2011, they were justified in doing so, and they communicated willingly with the public of Texas.

The NDM paradigm posited eight characteristics that influence decision making. Perhaps a ninth characteristic should be allocation of limited resources. The findings from this study advocated that resource allocation was a constant factor that influenced decision making. While arguments could be made to place allocation of limited

resources into one of the other characteristics such as “high stakes” or “organizational goals and norms” (Zsambok & Klein, 1997, p. 5), this study revealed that resource allocation did not directly fit into either one of those categories. Therefore, based on the findings from this study, I suggest that a ninth characteristic, allocation of limited resources, be added to the NDM paradigm.

Lessons Learned

It can be concluded from the findings that TFS leaders learned valuable lessons from decisions they made during the 2011 wildfire season. Learning lessons that result from crises is a trait of effective crisis leadership (James & Wooten, 2005). TFS leaders have a learning mentality, which is a key component for their organization to learn (James & Wooten, 2005; Hutchins & Wang, 2008). From these lessons learned, TFS leaders made changes and created new systems to operate more effectively. The creation of these new systems based on lessons learned aligns with Senge’s (2006) suggestion of how systems thinking operates among individuals and organizations. TFS leaders perceived these lessons learned as windows of opportunity to improve the strength of their decision making in the future, which is similar to how an HRO learns from failures or near failures (Weick et al., 2008).

One of the lessons learned TFS leaders discussed was that they would communicate differently with interagency IMTs in the future, and ensure each IMT participates in an in-brief and de-brief. This lesson learned is supported by Boin and Hart’s (2003) suggestion of post-crisis learning in an organization as the TFS leaders made “technological improvements” and adapted their “bureaucratic routines” (p. 548).

By participating in proper in-briefs and de-briefs prior to dealing with a wildfire, interagency IMTs learn how to interact with the stakeholders and landowners whose property is affected by a wildfire. These in-briefs and de-briefs for interagency IMTs can help prevent miscommunication between the stakeholders and interagency IMTs who report to the TFS. By reducing instances of miscommunication in a crisis, the TFS can reduce the reputational damage it experiences during a crisis due to miscommunication (Coombs, 2007b).

It can be concluded from the findings that TFS leaders were involved in creating new systems and networks that allowed for more effective communication among the TFS, firefighters (TFS and non-TFS), and the public in Texas (media, landowners, and elected officials) during a wildfire. These new systems provided a better response strategy for the TFS to communicate with the public during a crisis. According to Coombs (2007b), effectively communicating with the public is a key element during a crisis situation.

TFS leaders also learned how to better communicate with their employees during a crisis situation. The findings showed that some TFS leaders felt they should have communicated more frequently and openly with their subordinates about decisions they were making. This conclusion supports the trust factor outlined by James and Wooten (2005) of effective crisis leadership.

Recommendations for Practice

I have several recommendations for TFS leaders to consider based on the conclusions of this study. Additionally, these recommendations were also considered in light of previous research that related to the findings from this study.

As discussed in the conclusions, consideration of safety was a priority TFS leaders discussed as a factor that influenced decisions they made in 2011. The literature agreed that safety should be a high priority for an organization dealing with a crisis situation (Bourrier, 1996; Coombs, 2007a). Therefore, it is recommended that TFS leaders should continue to prioritize and strive to improve their safe practices and procedures within the TFS during crisis situations in order to maintain their exemplary safety standards.

One way TFS leaders could do this is by allowing independent auditors (similar to the federal aviation experts participant 6 discussed) to regularly inspect their operations during future wildfire or crisis situations. By allowing these auditors to regularly inspect their operations, TFS leaders can ensure they continually update and maintain safe practices when dealing with a crisis.

Kotter (2012) posited that leaders who are involved in learning organizations engage in lifelong learning. A key component of lifelong learning is taking risks and learning from the consequences associated with them, which TFS leaders did during the 2011 wildfire season. Kotter (2012) suggested that leaders should reflect on their experiences in order to learn from them and improve their performance in the future. TFS leaders engaged in naturalistic decision making during the 2011 wildfire season

using their prior knowledge and experience. It is recommended that TFS leaders regularly reflect on decisions they make when dealing with wildfire and crises, so they can learn how to become even more effective when making decisions in future crisis situations. A suggestion for TFS leaders to reflect would be to honestly assess successful and unsuccessful (especially these) decisions they made during a crisis and factors that led them to those decisions. During future crisis situations, TFS leaders should allot time at the end of their day (or week depending on how long the crisis lasts) to think about and write down their thoughts about decisions they made. They should ask themselves questions such as: What decision(s) did I make that had a positive impact on the crisis situation? What decision(s) did I make that I would go back and alter or change completely? Did I allow other qualified individuals to question my decision(s) to ensure I was making the best possible one? After asking themselves these questions, TFS leaders should write down their answers and discuss their answers with their peers. This will not only allow leaders to assess themselves on the decisions they made, but it will also result in another form of accountability for them.

TFS leaders referenced having a deep sense of purpose for their roles during the 2011 wildfire season. This sense of purpose led to TFS leaders making personal sacrifices and coping with exhaustion in order to perform their duties during critical times in the 2011 wildfire season. Quarantelli (1988) described situations like this as personnel burnout where “key officials in positions of authority continue working too long” (p. 380). While I understand that the 2011 wildfire season had unprecedented and previously unknown complications TFS leaders had to deal with, it is recommended that

TFS leaders consider taking time off to rest periodically during future wildfire or crisis situations to prevent personnel burnout. A recommendation for time off would be for every 21 days TFS leaders work, they should take four days off to rest. This would allow them enough time to rest, reflect, and reset before entering back into the crisis situation. Quarantelli (1988) further described possible implications of burnout including inefficient decision making. TFS leaders could provide a greater benefit to the organization and the public whom they serve by resting in order to make more effective decisions rather than making critical decisions when they are fatigued. By taking time off, TFS leaders have the opportunity to make more effective and efficient decisions for a longer period of time rather than if they work until they are burned out from exhaustion.

With regards to communication, I recommend that TFS leaders continue to learn and adapt new ways to best share information with the public during a crisis to avoid miscommunication. The TFS should continue to develop or encourage the development of networks that allow the TFS to efficiently disseminate information to the public during a wildfire or crisis. As the findings indicated, miscommunication negatively influenced the perceptions of Texas landowners towards the TFS according to the participants of this study. Similar to the Land Owner Liaison Team, TFS leaders could establish more communication networks between the TFS and organizations like the Texas Farm Bureau, Texas Cotton Association, the Texas Wheat Producers Association, the Texas Pecan Growers Association, the Texas Wildlife Association, and the Lumbermen's Association of Texas and Louisiana, who are connected to landowners

and stakeholders in Texas. These networks could aid in a crisis by effectively disseminating information to Texas landowners and stakeholders. Additionally, more networks like the Land Owner Liaison Team could lessen instances of miscommunication between wildfire/crisis respondents (both TFS and non-TFS) and Texas stakeholders and landowners.

Recommendations for Further Research

Through this study, I identified several opportunities for future research. The scope of this study was narrow as it focused solely on seven TFS leaders' perspectives of how they made decisions. While meaningful, there is still much to be learned about how decisions were made during the 2011 wildfire season.

A possibility for future research could focus on how decisions were made on the ground level by the firemen and women who fought the 2011 wildfires. A study like this could shed light on the factors that influenced decisions at the individual firefighter level, and how those factors are consistent or inconsistent with the decision making factors found in this study of TFS leaders. A ground-level study could also be considered through the NDM/Macrocognition paradigm, and further inform that line of inquiry. These firemen and women could be considered experts, which is a primary tenant for research using the NDM/Macrocognition paradigm (Schraagen, et al., 2008). There are several approaches one could take when conducting a future study of ground-level firefighters. One approach could be to perform a case study about how individuals in a specific non-TFS IMT made decisions when fighting wildfires in 2011. Data could include interviews with members of the IMT, photographs of the IMT members fighting

fires in 2011, along with data mined from videos they recorded while fighting the wildfires. Another approach one could take would be a qualitative comparative evaluation about how men and women firefighters made decisions. This type of study could address the question (among others): What values did men and women firefighters consider when making decisions of what homes and properties to save while fighting fires in 2011?

The findings from this study showed how the TFS leaders operated like members of an HRO as they displayed characteristics of a HRO during the 2011 wildfire season. Specifically, they displayed a preoccupation with failure through their aviation safety protocols. They were not willing to allow even one accident to occur, and they focused on ways to mitigate the chances of an accident occurring. TFS leaders also showed sensitivity to operations during the wildfire season, as they had to integrate information from a number of different sources (including firefighters, private landowners, elected officials, and media) and follow a cognitive map of that information, which allowed them to make decisions. Additionally TFS leaders displayed a commitment to resilience, as they had to address a number of unexpected, time-sensitive situations such as determining how many and what kind of resources were needed to fight fires before they grew too big to fight. The TFS displayed an underspecification of structures when TFS leaders delegated decision making responsibilities to lower-level employees and firefighters, who had a better grasp of what was happening on the ground where the fires were burning. They did not micromanage the firefighters; rather, they gave the actual firefighting responsibilities to the IMTs. One characteristic of an HRO that the findings

from this study did not adequately support was a reluctance to simplify interpretations. A ground-level, qualitative study could address how TFS firefighters did or did not simplify complex information in order to make quick decisions when fighting fires. A future study like this could gather data by directly observing firefighters as they fight fire in addition to conducting interviews with them after the wildfire to understand how they dealt with uncertainty and processed information when dealing with the fire.

Further research should also be conducted about how Texas landowners perceive the new communication network TFS leaders initiated to improve communication between the TFS (and other firefighting agencies) and Texas landowners during a crisis. Additionally, a future study could address any concerns that Texas landowners have with the new communication network, and provide insight into how Texas landowners feel the new system could be improved or altered.

Further research should also be conducted regarding the leadership styles of the TFS leaders. Specifically, the research should consider how the leaders' individual styles influence the role they fill on the leadership team and as leaders of their own teams respectively. A study like this could be a valuable source of information to TFS leaders and the TFS organization as a whole. The information may provide valuable insight for the continuity of the TFS organization, as they would have a reference for the type of leadership styles that work well within their organization. This should lead to more effective crisis management, as multiple studies have found that strong leadership (i.e. leaders who are willing to learn and who view crises as opportunities rather than problems) is vital to dealing with crises because of their dynamic and constantly

changing environments (Boin & Hart, 2003; James & Wooten, 2005; Walsh, 1995; Weick, 1988; Wooten & James, 2008).

Conclusions

The purpose of this study was to describe how TFS leaders made decisions during the 2011 wildfire season. From the collection of participant experiences through interviews, documents, and artifacts, I was able to describe factors that influenced how TFS leaders made decisions. Based on the results, I drew conclusions and offered recommendations for future research and improvement to the TFS organization. I made a recommendation, based on the findings of this study, to add a ninth characteristic to the NDM paradigm, which should further explain how decisions are made during crisis situations. I hope that the findings, conclusions, and recommendations drawn from this study are informative to TFS leaders and to anyone who wants to better understand how leaders make decisions during a crisis.

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APPENDIX

Interview Protocol:

Context

1. Recall the 2011 wildfire season. Describe your role and responsibilities in this particular time.

Incidents (decisions)

2. Describe 3-5 separate incidents/decisions you either had to make or were involved in that dealt with specific incidents from the wildfires that year.

3. What factors did you consider when each of those decisions were made?

4. After each of those decisions were made, what actions were taken?

Consequences

5. What were the outcomes of each of those decisions?

6. Why do you think each of those decisions were effective or ineffective?

7. If you were faced with a similar situation(s) in the future, what decisions or actions would you do differently?