DISSERTATION

ANALYZING RISK-RELATED INFORMATION SEEKING BEHAVIORAL INTENTION AND RISK PERCEPTION OF WILDFIRES: THE HIGH PARK FIRE BURN AREA

Submitted by

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In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer 2019

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ABSTRACT

ANALYZING RISK-RELATED INFORMATION SEEKING BEHAVIORAL INTENTION AND RISK PERCEPTION OF WILDFIRES: THE HIGH PARK FIRE BURN AREA

This study assessed risk-related information seeking behavioral intention and dual-process risk perception within the context of wildfires. Particularly, the study focused on utilizing a combined risk-related information seeking model with concepts originating from the planned risk information seeking model (PRISM), a framework of risk information seeking (FRIS), and the risk information seeking and processing model (RISP). The key concepts utilized included: past risk-related information seeking, self-efficacy, response efficacy, dual-process risk perception (affective and cognitive risk perception, perceived hazard knowledge, information needs, and behavioral intention. A survey (N=432; 60.8% response rate) was disseminated to the High Park Fire Burn Area, west of Fort Collins, Colorado which experienced a wildfire in 2012. The survey revealed the importance of including dual-process risk perception in risk-related information seeking models and highlighted its influence on past risk-related information seeking and risk-related information seeking behavioral intention. Response efficacy was correlated with self-efficacy, following suit to other risk-related information seeking studies. Cognitive risk perception was correlated with affective risk perception, suggesting a bi-directional relationship between the two concepts. Individuals were more likely to seek wildfire information in the past if they did not have enough knowledge about the hazard. Moreover, individuals are more likely to base their risk perception on their emotions, particularly when facing a wildfire. The results from the survey revealed that the exploratory path had a better model fit than the confirmatory path model, yet both provided important findings related to risk-related information seeking behavioral intention and dual-process risk perception. This study reaffirmed the need for theoretical improvement related to current information needs, particularly in relation with perceived hazard knowledge and risk-related information seeking behavioral intention. There were inconsistencies with current information needs throughout the study, following suit with the literature and calls for further refinement of the concept. Implications and future research efforts are also noted and discussed such as the importance of tailored messaging and a communication campaign.

ACKNOWLEDGEMENTS

I would like to acknowledge the contributions and guidance of my committee members, most notably Dr. Craig Trumbo, Dr. Jangyul Kim, Dr. Katie Abrams, Dr. Chad Hoffman, and Dr. Russ Schumacher. Their wisdom and support while at Colorado State University has been very helpful and greatly appreciated. I would like to thank William Mokry Jr., Ephraim Mokry, Marianne, and John Wygant, Keith, Mary, and William Mokry Sr. for their support. I would also like to thank Darci, Elden, and Shawn Milam, Matthew Claypool, Taryn Rosa, Brittany Peterson, Krisanda Kappus, and Susan Clotfelter for their support, assistance, and friendship over the years. Furthermore, I would like to Aaron Lumley, Josh Van Vlack, Anthony Schultz, and Bill Crapser for their continued support and encouragement while working at the Wyoming State Forestry Division. Lastly, I wish to acknowledge all of the firefighters, fire managers, researchers, public information officers, and decision makers in the wildfire realm.

DEDICATION

"You gain strength, courage, and confidence by every experience in which you stop to look fear in the face. You are able to say to yourself I have lived through this horror I can take the next thing that comes along. You must do the thing you think you cannot do."
– Eleanor Roosevelt

To all of the individuals who have lost their life or home to wildland fires.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

1.1 Overview of Central Concepts

The purpose of this study was to assess individuals' risk-related information seeking behavioral intention as it pertains to wildfires. The study was built on a path model utilizing and modifying existing risk-related information seeking theories. Specifically, this entailed testing the various relationships between the risk-related information seeking behavioral intention and the following concepts: dual process risk perception, perceived hazard knowledge, self-efficacy, response efficacy, past information seeking, current information need, and demographics through a cross-sectional mail-based survey. As such, this study provides a multi-disciplinary approach including literature from risk communication, social/cognitive psychology, natural hazards, and fire science. This work is critical and timely since it can influence educational outreach, risk messaging, and future risk communication for those that reside and work within the wildland-urban interface (WUI). Even though this study is focused on risk-related information seeking behavioral intention of wildfires, the framework can be extended to an array of other natural hazards.

Two closely-related conceptual areas are central to this project—risk perception and risk-related information seeking behavioral intention. These are briefly introduced here, and a more in-depth discussion of the contextual background for the study is provided later within the literature review.

Risk perception has been a core concept researched within the social sciences and more specifically communication studies throughout the years, providing valuable insight into an individual's judgment of risk and decision making (Wachinger et al., 2013). Oftentimes, risk perception is centered on perceiving environmental, natural hazards, or public health risks and an essential area of research since it provides insight into what may influence successful risk communication (Kellens et al., 2006; Kellens et al., 2011). An individual's perception of risk has the potential to vary based upon factors such as the specific risk, the risk-related situation, his/her character, and his/her social surroundings (Wachinger et al., 2013). Risk perception has been studied through a variety of different perspectives, each offering unique insight.

Over the years, scholars have addressed risk perception from three different paradigms—the cultural, sociological, and psychometric. The cultural paradigm suggests that risk perception is based upon an individual's socially constructed experiences, morals, and society's expectations; whereas the sociological paradigm highlights how institutions can influence risk. While both of these risk perception paradigms provide essential insight, they are not as prevalent for this study, nor as extensively researched or influential as the third paradigm—the psychometric.

The psychometric paradigm provides insight into an individual's feelings surrounding risk, focusing on affective and cognitive response to a given hazard (Trumbo et al., 2016) and it is oftentimes referenced as the "risk as feelings" paradigm or a dual process approach towards risk perception (Slovic et al., 2004; Trumbo et al., 2016). While this paradigm is rooted mostly in cognitive theory, scholars have suggested that affect is just as essential, noting dread as an important concept of an individual's risk perception (Fischhoff et al., 1978; Rundmo & Nordfjaern, 2016). The psychometric paradigm offers a multifaceted perspective and is based upon a set of specific scales and multivariate analysis, providing a quantitative approach towards risk perception (Slovic et al., 1982; Slovic & Weber, 2002). In an applied setting, individuals are frequently asked to evaluate and judge a set of risky situations and specify their preference on risk reduction (Slovic et al., 1982; Slovic & Weber, 2002). Likewise, this study utilized the psychometric approach to evaluate risk perception (known as dual process risk perception within the path model).

Similar to risk perception, information seeking behavior is commonly found within communication studies and fields such as psychology and public health. Specifically, within communication research, information seeking has been applied to "…interpersonal communication, organizational communication, health communication, mass communication, and political communication" (Lewis, 2017). There have been two different paradigms for information seeking behavior including a system-centered approach versus a person-centered approach. Specifically, a system-centered approach evaluates information seeking related to information channels and assesses where individuals obtain their information (Ter Huurne, 2008). Whereas, a person-centered approach focuses on self-efficacy, attitudes, and emotions (Ter Huurne, 2008). Moreover, within the information seeking behavior literature, there have been additional classifications identified such as active vs. passive information seeking, and ritual-based information seeking behavior where the information is unintentionally acquired (Ter Huurne, 2008). For this study, information seeking behavior will stem from the person-centered paradigm. As a result, information seeking is defined as the deliberate effort to seek information as a result of an individual's gap in their knowledge or the need for additional information, which is supported across the literature (Griffin et al.,1999), Kellens et al.,2012), Zeng et al.,2017).

While the initial information seeking literature did not include specific application and discussion of related theoretical frameworks, there are a variety of theoretical frameworks that have influenced communication studies over the years and more commonly found within the literature within the past few decades (Lewis, 2017). In particular, information seeking models focused on public health and environmental issues, have dominated this field of research. Examples of such information seeking models include the comprehensive model of information seeking, the theory of motivated information management, and the planned risk information seeking model (PRISM) (Lewis, 2017). Information seeking models are also prominent in the risk communication literature, including the risk perception attitude (RPA) framework and the risk information-seeking and processing (RISP) model (Lewis, 2017). Four other models provide insight into information seeking including the information search process (ISP) model, the Ellis model, the flow model of information seeking, avoiding, and processing, and the model of information behavior (Lewis, 2017). Due to the nature of this study, risk-related information seeking models are the most applicable. It is important to provide a little more detail on this specific type of information seeking to better understand the theoretical foundation found in the path model.

Risk-related information seeking frameworks and applied research have increased over the past two decades, filling a void in the risk communication literature (Griffin et al., 1999; Griffin et al., 2008; Kievik & Gutteling, 2011). Primarily, this type of research has been related to environmental science, public health, (Eastin et al., 2015; Hovick et al., 2014; Zeng et al., 2017) and climate change (Ho et al., 2014; Kahlor, 2007), drawing upon models such as the risk information seeking and processing model (RISP), the framework for risk information seeking (FRIS), and the planned risk information seeking model (PRISM) (Afifi & Weiner, 2006; Griffin et al., 1999; Griffin et al., 2008; Kahlor, 2010; Li et al., 2017, Ter Huurne, 2008; Zeng et al., 2017). While the literature is relatively plentiful, there is still a great need to further understand the risk-related information behavior of individuals for a variety of risks and geographic locations. It is also important to understand what concepts can provide key insight into seeking behavior. In some instances, the concepts in the risk-related information seeking frameworks overlap, and in other instances, they are vastly different (Ter Huurne, 2008). Potential concepts within the theoretical frameworks include information need, past hazard experience, efficacy beliefs, to name a few. Some of the theoretical frameworks focus just on risk-related information seeking (e.g., the planned risk information seeking model (PRISM)), and in other instances, they also include assessing factors such as information processing (e.g., the risk information-seeking and processing (RISP) model). While the majority of risk-related information seeking models focus on public health (Griffin et al., 1999; Griffin et al., 2012; Ter Huurne & Gutteling, 2008), the field has expanded the application of these models to areas such as natural hazards in recent years.

The application and utility of risk-related information seeking theoretical frameworks have begun to gain traction within the natural hazards arena over the past two decades. Coincidently, several types of natural hazards have increased in frequency and risk, requiring further effort to understand the application of risk-related information seeking. The lay public often relies on risk-related information to make informative decisions during natural hazard events. Decision makers and other personnel involved in the mitigation, preparedness, response, and recovery efforts for natural hazards must seek risk-related information to help with their job, communicate risk effectively and efficiently, and attempt to ensure the lay public is safe (Steelman et al., 2015). Without such critical information, decision makers cannot ensure successful mitigation of the natural hazard(s) and there is the risk that individuals will continue to be vulnerable (Steelman et al., 2015). Simply having risk-related information available does not ensure every individual seeks that information or that it results in improved decision-making (Rose et al., 2017). It does, however, provide an initial assessment of potential protective behavior and requires decision-makers and researchers to be more cognizant of specific concepts influencing risk-related information seeking, such as past hazard experience, information needs, and response-efficacy. All of these concepts stem from broader fields of research—risk communication, social psychology, and public health (Kellens et al., 2012; Zeng et al., 2017). This study aims to provide an applied approach, yet still relying on strong theoretical frameworks.

Given its multi-disciplinary nature, strong theoretical foundation in communication studies, and ease of applicability and application in an applied setting, risk-related information seeking, and risk perception research help fill a gap within the risk communication literature focused on natural hazards, and in particular, wildfires. This study utilized three previously well-known and established risk-related information seeking theoretical models—the PRISM, RISP, and FRIS. Further discussion about these models and the specific concepts can be found within the literature review. The next portion of this study encompasses a detailed discussion on the context of wildfires, noting increases in wildfire risk and how this particular natural hazard can benefit from further risk-related information seeking and risk perception research.

1.4 Context: Wildfires

Within the natural hazards literature, wildfires are classified as a biophysical hazard (Smith & Petley, 2009) and are the result of a "…chemical reaction molded by the physical characteristics of its environment" (Pyne, 2007, p. 271). Wildfires can occur because of anthropogenic factors and natural causes such as lightning (Dickinson et al., 2015; Pyne, 2015; Smith & Petley, 2009). Unfortunately, "the spread of human activities into areas of predominantly natural vegetation has increased the number of wildfires and the losses to life and property" (Smith & Petley, 2009, p. 223).

There are three main factors that determine the severity, intensity, and frequency of wildfires including weather, fuels, and ignition. Factors such as high temperatures, wind, and low relative humidity can greatly exacerbate wildfires or the potential for wildfires. Also, periods of consistent drought followed by vigorous growth in local vegetation can also prove to be problematic (Smith & Petley, 2009). Low-intensity wildfires commonly assist with recycling nutrients and reducing the risk for high-intensity fires (Busenberg, 2004; Dombeck et al., 2004). Climate change also significantly impacts wildfires due to variations in wet and dry cycles (Pyne, 2015). The type of vegetation and moisture content can greatly influence the intensity and the rate of spread of a given wildfire.

Overall, it is evident that research within the realm of fire science and fire ecology has attempted to reduce the biophysical risk and societal impacts of wildfire, primarily through tactic suppression strategies and public policy (McCaffrey, 2004; McCaffrey et al., 2011; Paveglio et al., 2015). However, even though there have been extensive efforts through these strategies to reduce wildfire risk, this natural hazard continues to increase in frequency, thus requiring additional approaches to reduce wildfire risk. Risk-related information seeking frameworks can be helpful in improving upon risk perception, risk communication, and educational outreach for an array of risk-related scenarios, ultimately complimenting other strategies to reduce risk. Thus, while this study does not attempt to reduce overall wildfire risk, it does offer the opportunity to better understand how individuals seek it.

CHAPTER II

LITERATURE REVIEW

2.1 Risk-Related Information Seeking Models

Over the years, there has been a large amount of literature dedicated to creating theoretical frameworks that assess risk-related information seeking behavior (Brashers et al., 2002; Griffin et al., 1999; Rees & Bath, 2000; Willoughby & Myrick, 2016). Some constructs complement one another, while others simply offer differing perspectives (Ter Huurne, 2008; Wilson, 1999). Not every framework describes the same variables or outcomes when assessing risk-related information seeking. Regardless, each model has attempted to aid researchers in assessing concepts that impact risk-related information seeking behavior (Kahlor, 2010). "The seeking of information has emerged as an important topic within risk communication over the past few years and can be described as a deliberate effort to acquire information in response to a need or gap in ones knowledge" (Griffin et al., 1999; Griffin et al., 2008; Kievik & Gutteling, 2011, p. 1477).

The application of risk-related information seeking models has been quite robust within the realm of public health (Afifi & Weiner, 2006; Griffin et al., 1999; Griffin et al., 2012; Li et al., 2017; Ter Huurne & Gutteling, 2008; Willoughby & Myrick, 2016). However, traction of these theoretical constructs has taken root within other fields of research, such as natural hazards more recently (Kellens et al., 2012; Kievik & Gutteling, 2011; Li et al., 2017; Ranganath et al., 2016; Rickard et al., 2017; Velez et al., 2017; Zeng et al., 2017).

Over time, there have been three distinct models that have assessed risk-related information-seeking behavior of individuals including the risk information seeking and processing (RISP) model, the planned risk information seeking (PRISM) model, and the framework for risk information seeking (FRIS) model. The RISP model has been most commonly referenced throughout the literature (Griffin et al. 1999; Li et al., 2017) in comparison to the PRISM and FRIS models (Li et al., 2017). However, portions of the PRISM and FRIS model stem from the RISP model and are just as important and useful. Detail of each risk-related information seeking model is addressed below, providing context to the varying concepts that can be assessed to evaluate an individual's risk-related information seeking behavior. It is critical to provide an overview of each theoretical concept to shed light on how risk-related information seeking models have progressed over the years. By reviewing each of the risk-related information seeking models, it provides insight into the various concepts that are assessed within this study. Also, the overview of each model provides context as to the importance and foundation of this particular study.

2.2 Risk Information Seeking and Processing Model (RISP)

The RISP model, originally created by Griffin et al. (1999), provides a dual-processing method to assess information seeking and processing (Griffin et al., 2012; Kahlor et al., 2003; Kahlor et al., 2006; Rickard et al., 2017; Zeng et al., 2017). The model stems from the field of social psychology and its application has been extended to risk communication research, mainly within the realm of public health (Griffin et al., 1999; Griffin et al., 2012). The RISP model "was designed to explain variance in information seeking and processing specifically within the context of risk" (Kahlor, 2010,

p. 347). It is linked to two different theoretical constructs including the Heuristic Systematic Model (HSM) and the Theory of Planned Behavior (TPB). HSM explains that an individual is likely to process information based upon motivation and capacity (Griffin et al. 2008), whereas the TPB helps researchers determine behavioral intentions, attitude, and knowledge (Azjen & Timko, 1986; Azjen, 1991, 1996, 2006; Griffin et al., 2012; Johnson, 2005; Zeng et al., 2017). The model also includes elements associated with dread risk "… but also goes one step further in mapping a causal relationship that separates worry/emotion from the other dread risk dimensions (e.g., fatal, catastrophic, controllable, etc.)" (Kahlor, 2010, p. 348).

The RISP model considers the complexities associated with risk and what motivates an individual to systematically process risk information (Griffin et al., 2012). Specifically, the RISP model suggests that three different attributes determine how much an individual will pursue risk-related information through common and uncommon channels (Griffin et al., 1999, Griffin et al., 2004; Zeng et al., 2017). The main objective of this model is to evaluate information sufficiency, "… which is the point where an individual makes a decision concerning information-seeking behavior" (Williams, 2012; Zeng et al., 2017, p. 740). As seen in Figure 1, the RISP model includes eleven different relationships including 1) relevant hazard experience; 2) political philosophy; 3) demographic/sociocultural; 4) perceived hazard characteristics; 5) affective response; 6) informational subjective norms; 7) information insufficiency; 8) channel beliefs; 9) perceived information gathering capacity; 10) seeking information; and 11) information processing (Griffin et al., 1999; Kahlor et al., 2003). There are eight different inputs for the RISP model and the relationships between the different concepts provides context as to what may influence an individual's perception of risk and determine risk-related information seeking and processing behavior for a given risk.

Demographics are an important part of the RISP model, focusing on an individual's personal experience with risky events, personal political opinion, and socioeconomic factors that may influence the entire risk-related information and seeking process (Kahlor et al., 2003). Socioeconomic factors such as educational attainment, ethnicity, race, age, gender, and median household income are also critical to evaluate and crucial to the RISP model. These attributes are a useful measurement of an individual's natural hazard comprehension (Gardner et al., 1987). Also, an individual's political opinion has the potential to be influential and be useful when assessing information processing, which could also provide an indication on how much government interference they do or do not prefer when it comes to mitigating natural hazards.

The RISP model also requires an individual's perception of a given risk (commonly referred to as perceived hazard characteristics). Specifically, this factor requires the evaluation of an individual's perception that they will be impacted by a given hazard (Kahlor et al., 2003). The perceived hazard characteristics can be broken down further into risk judgment, institutional trust, personal efficacy, and causal attributions. All of the perceived hazard characteristics can determine affective response of the lay public. Specifically, personal efficacy provides an indication of whether an individual has the capability to be resilient during a hazardous event. It also provides an evaluation of an individual's capability to help others and their surroundings. As mentioned by Griffin et al. (2008), another perceived hazard characteristic is institutional trust which compliments the other two inputs into the RISP model. Institutional trust focuses on assessing if individuals are likely to trust decision makers. This concept has the potential to be expanded further through theoretical reform.

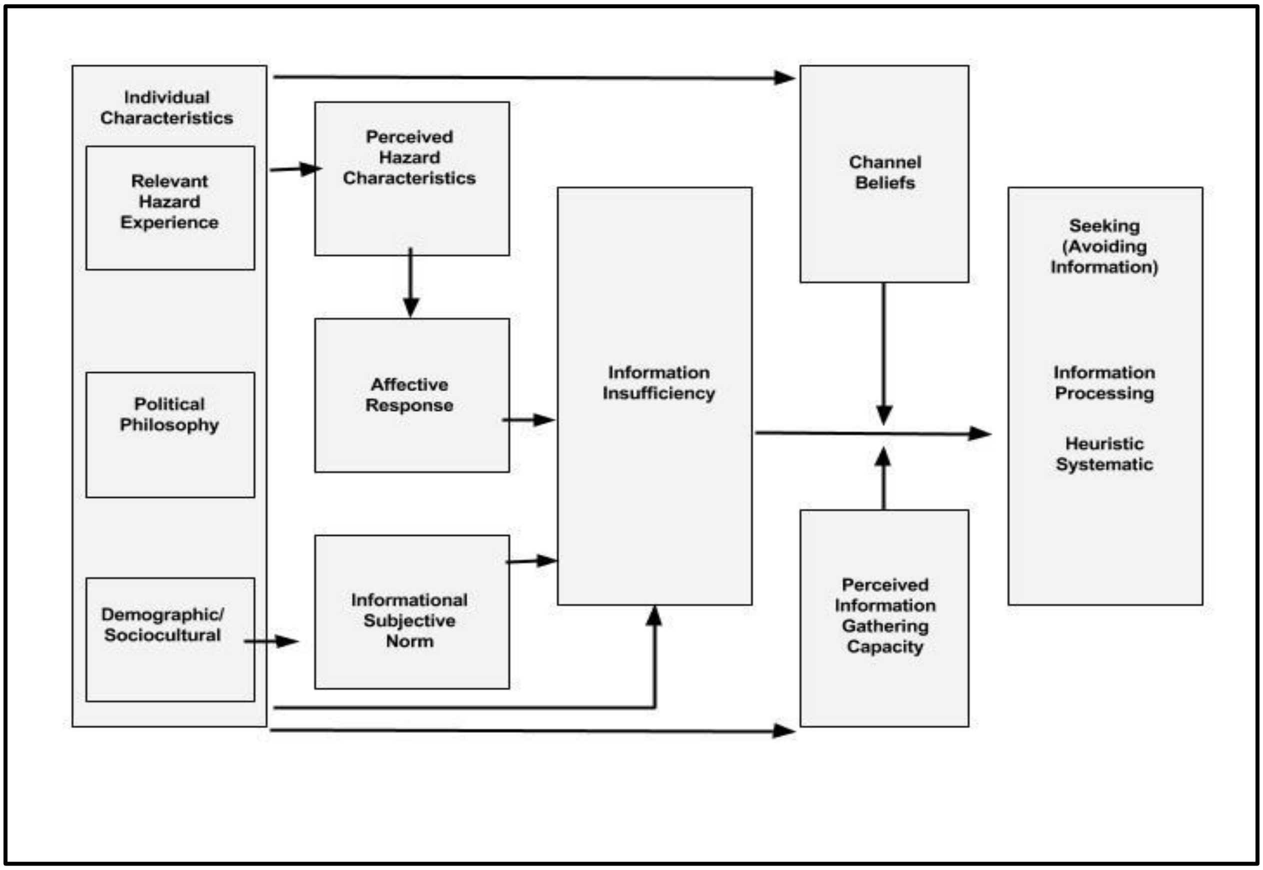

Figure 1. Risk information seeking and processing model.
Note. RISP model based on Griffin et al. (1999) and Griffin et al. (2006).

There are additional concepts included within the RISP model that are just as important as the other concepts discussed including perceived information gathering capacity, information seeking, and information processing strategies (Kahlor et al., 2003). Perceived information gathering capacity offers insight into an individual’s capability to seek risk-related information and process the information accordingly, especially when it may require the individual to cognitively process the information more intensely, and not routinely (Griffin et al., 2008). Together, all of the previously mentioned inputs provide insight into an individual's risk-related information seeking and processing. While it is essential to provide discussion on the different parts of the RISP model and the importance of the construct as a whole, it is just as important to provide further insight into the application of this model, providing specific examples of how the concepts have been applied, and discussion of overall patterns found between research studies.

In particular, the RISP model and additional refinements to the original model have been most commonly applied to public health risks and environmental risks. The RISP model has been applied to topics such as the risks associated with "… , the consumption risk of contaminated fish (Griffin et al., 2002; Griffin et al., 2004; Kahlor et al., 2006); municipal drinking water polluted by chemicals and organisms (Griffin et al., 2002; Griffin et al., 2004a; Griffin et al., 2004b; Kahlor et al., 2006); use of renewable energy sources and ecological security (Griffin et al., 2002, Griffin et al., 2005; Kahlor et al., 2006); hazardous industrial risk and hazard waster transportation (Ter Huurne & Gutteling, 2008; Ter Huurne et al., 2009); flood risks (Griffin et al., 2008, Kellens et al., 2012; Kievik & Gutteling, 2011); climate change (Krikelas, 1983); and global warming (Kahlor, 2007; Li et al., 2017, p. 268)" to name a few. Specifically, Table 1 provides insight into a few of the empirical studies that have utilized, tested, and adapted the RISP model to better understand risk-related information seeking. It is important to mention that each of the articles was discovered through incisive searching for key terms such as the risk information seeking and processing model, RISP, information seeking, and information processing, primarily through Google Scholar. The following provides a general overview of the particular concepts most commonly found throughout the literature and generalizations discovered amongst the variety of RISP related studies.

As seen in Table 1, there are quite a few examples of empirical studies applying the RISP model and some of the concepts are more widely utilized than others. Surprisingly, there is quite a lot of variability between the empirical studies, not only with which concepts were used, but also the overall conclusions found, and the vast array of risk-related topics researched. In some instances, there are specific concepts that actually have a positive relationship to risk-related information seeking, whereas in other instances some concepts do not have this relationship, and other times inconsistencies are found amongst the concepts within the model.

In terms of how extensively the concepts were included in risk-related information seeking studies, not a single study incorporated all of the RISP concepts from the model. Rather, it appears as though the researchers hand selected the concepts most applicable to their specific risk-related scenario and choose concepts that expanded the model or altered it slightly outside of the general RISP guidelines, attempting to improve the theoretical construct. Informational subjective norm was the most commonly analyzed concept amongst the RISP empirical studies, appearing in ten out of thirteen studies, followed by information insufficiency (included in nine of the studies), and relevant channel beliefs (eight of the studies). Both perceived information gathering capacity and affective response were analyzed in seven studies each, followed by perceived hazard characteristics and demographics (each included in six of the studies). Relevant hazard experience and perceived hazard knowledge were not as extensively included in the RISP risk-related information seeking empirical studies.

There is quite a variation in which concepts are used to assess risk-related information seeking. The following provides specific discussion about the relationship between the most widely applied concepts and risk-related information seeking including informational subjective norm, information insufficiency, relevant channel beliefs, perceived gathering capacity, and affective response.

Informational subjective norm was consistently found to have a positive direct relationship to risk-related information seeking (Calhoun, 2009; Griffin et al., 2005; Kahlor, 2007; Ter Huurne et al., 2009; Yang, 2012). This concept was relatively consistent in having a positive association with information insufficiency across the research studies reviewed (Griffin et al., 2008; Kahlor et al., 2006; Kahlor, 2007; Yang, 2012). However, Griffin et al. (2005) did not find that information subjective norms were positively correlated with information insufficiency in their research, which was not consistent with previous studies, especially those that were highlighted in this review of the literature. While this was the most widely applied concept from the RISP model, it is also important to highlight the generalizations found amongst the other concepts.

Information insufficiency was found to have a positive relationship with information seeking across an array of the studies (Griffin et al., 2004; Griffin et al., 2005; Griffin et al., 2008; Kahlor et al., 2006; Kahlor, 2007; Kahlor, 2010; Lu, 2015; Ter Huurne et al., 2009; Yang & Kahlor, 2013; Yang, 2012). This suggests that individuals who were aware of a gap in their current knowledge and additional knowledge required (information insufficiency) related to the given risk are more likely to seek and process information more consistently and vigorously (Griffin et al., 2008; Kahlor et al., 2006). But, Calhoun (2009) did not find a direct relationship between information insufficiency and information seeking and processing, suggesting that the participants in the study may have subdued the results. So, while it may be beneficial and quite common to include information insufficiency within RISP studies evaluating risk-related information seeking and processing, there is the potential for inconsistent results and no direct relationship at all.

The concept of relevant channel beliefs was also commonly found throughout risk-related information seeking studies, showing up in eight of the thirteen research studies reviewed. However, unlike other concepts analyzed across the empirical studies, very few of the studies that included relevant channel beliefs discussed the overall findings. Rather, generalizations were mentioned such as how this concept can provide further insight into an individual's media perception, which media platforms are most commonly applied when searching for risk-related information, and how the media can influence an individual's processing by giving cues (Calhoun, 2009; Griffin et al., 2004; Kahlor et al., 2006). Griffin et al. (2008) and Rose et al. (2017) found relevant channel beliefs to be an unpredictable and inconsistent concept of risk-related information seeking and processing. Yang (2012), however, did find a positive association between relevant channel beliefs and risk-related information, unlike the other empirical studies. Griffin et al. (2005) found that both perceived information gathering capacity and relevant channel beliefs could lead to more purposeful risk-related information seeking if an individual believes the various communication channels and media platforms are helpful. Overall, it appears as though this concept is not useful in application beyond the model, at least not yet. So, while it was widely attempted to be measured and analyzed, the results were often not conclusive and unreliable.

In terms of perceived information gathering capacity, which provides further explanation on about an individual’s access and comprehension about risk information (Yang & Kahlor, 2013), Griffin et al. (2008), Ter Huurne (2009), and Lu (2015) all found a positive relationship between current knowledge and perceived information gathering capacity. This suggests that individuals with greater capacity are more likely to have additional information possibilities and are more likely to be interested to seek new information (Lu, 2015). Griffin et al. (2005) found that perceived information gathering capacity paired with relevant channel beliefs resulted in more purposeful risk-related information seeking too. While Kahlor et al. (2006) included perceived information gathering capacity in their study, they did not include it in the formal analysis linked to the hypotheses. Rather, the concept was included to compare this study with previous ones. Whereas in comparison, Griffin et al. (2004) and Yang (2012) did not consistently find perceived information gathering capacity to have a positive relationship to risk-related information seeking. Also, Rose et al. (2017) found a negative association between risk-related information seeking and perceived information gathering capacity. Both sets of authors suggested the need for measurement refinement to help improve the validity and reliability of this concept (Griffin et al., 2004). Rose et al. (2017) noted: “one possible explanation of this difference could be due to the nature of the risk and the availability of information” (p. 19). Once again, it appears as though another important concept of the RISP model is not only inconsistently included across the studies, but it also does not produce reliable results linked to risk-related information seeking.

Affective response and informational subjective norms have been often known to have a direct impact and relationship with risk-related information seeking, as mentioned by Calhoun (2009), Kahlor (2007), Lu (2015), and Ter Huurne et al. (2009). Ter Huurne et al. (2009) found a link between affective response, risk perception, and institutional trust response. Rose et al. (2017) and Yang & Kahlor (2013) found a positive relationship between risk-related information seeking and affective response. This suggests that if an individual tends to be extra emotional about a given risk, it may result in the individual seeking out information about it (Ter Huurne et al., 2009).

Overall, it is evident that there are only a few select concepts from the actual RISP model that are consistently used across the empirical research studies as reviewed. More commonly, the empirical research studies include a unique and differing combination of RISP concepts and non-RISP concepts to evaluate risk-related information seeking behavior, often making it difficult to draw a lot of comparisons between the studies. This suggests that while the RISP model may be good in theory, the model as a whole is not as practical or fruitful in the application. Rather, researchers have selected key concepts most applicable to the specific risk they are evaluating and most consistently found to have a direct, positive relationship with risk-related information seeking.

In addition to discussing the most commonly applied concepts, it is also essential to provide a brief discussion on the overall generalizations found amongst the empirical studies reviewed. In particular, Griffin et al. (2008) summarized the overall importance and purpose of the RISP model and RISP risk-related information seeking studies very eloquently, noting that "…the RISP model is a work in progress. It invites researchers to propose, test, explore, and improve its various measures, concepts, and relationships" (Griffin et al., 2008, p. 307). Indeed, the RISP model serves as a foundation for risk communication researchers to test its utility, applicability, and consistently across a wide-array of risk-related contexts. Griffin et al. (2008) also discovered the need for risk communicators to ensure risk-related information is easily available, comprehensive for individuals with lower educational attainment, and for individuals who simply have very little if no knowledge about a given risk. Calhoun (2009) found that many of the RISP concepts could have indirect and direct effects on risk-related information seeking and processing. But yet again, this could vary depending upon the risk context and which combination of concepts are assessed. While it is helpful that the RISP model provides an individual foundation to assess risk-related information seeking behavior and insight into information processing for those interested, there is still the need for further refinement.

A majority of the RISP empirical studies reviewed called for additional research (Cahyanto et al., 2016; Calhoun, 2009; Griffin et al., 2004; Kahlor et al., 2006). The researchers noted the need for further refinement of the concepts (Cahyanto et al., 2016; Calhoun, 2009; Rose et al., 2017; Ter Huurne et al., 2009; Yang, 2012), reevaluation of the measurements (Calhoun, 2009), longitudinal studies (Griffin et al., 2004), and/or a different sample population (Calhoun, 2009; Ter Huurne et al., 2009), again suggesting that the model is a continual work in progress. Even though there were limitations found with each of the studies and there appears to be a perpetual need to further refine the model and concepts, overall the RISP model can still assist researchers and decision makers when evaluating risk and attempting to better understand risk communication and risk-related behavior. It is important though to provide further insight into the other risk-related information seeking models, critiquing their utility, exploring the different and similar concepts used, and provide further insight into how the field has expanded over the years. Thus, the next portion of this literature review provides a discussion specifically about the FRIS model.

Table 1.
Empirical Studies Utilizing the Risk Information Seeking and Processing Model.

Reference	Article Title	Topic	Theoretical Construct	Concept(s) Assessed	Result(s) Examined
Cahyanto et al. (2016)	Predicting Information Seeking Regarding Hurricane Evacuation in the Destination	Hurricane	HSM Information Processing and RISP	Risk belief, connectedness, perceived hazard knowledge, past hazard experience, active information seeking, passive information seeking	Information seeking and processing
Calhoun (2009)	Seeking Safety? Applying the Risk Information Seeking and Processing Model to Sexual Aggression on a College Campus	Sexual Aggression	RISP	Perceived importance, current knowledge, sufficiency threshold, systematic processing, heuristic processing, information seeking, avoidance, perceived informational gathering capacity, channel belief, likelihood of sexual aggression, seriousness of sexual aggression, perceived hazard characteristics, optimistic bias, perceived seriousness of experiencing the risk of sexual aggression, affective response, worry, anger, uncertainty, informational subjective norms, injunctive norms, descriptive norms, self-efficacy of preventing the risk of sexual aggression, level of trust in the university regarding risk of sexual aggression, relevant hazard experience, demographics: alcohol consumption, ethnicity, age	Active information seeking, avoidance, heuristic processing, systematic processing, information insufficiency
Griffin et al. (2004)	Testing the Robustness of a Risk Information Processing Model	Great Lakes Study & Watershed Study	RISP	Information sufficiency, perceived information gathering capacity, relevant channel beliefs, information processing, information seeking, demographics	Information seeking and processing

Reference (continued)	Article Title (continued)	Topic (continued)	Theoretical Construct (continued)	Concept(s) Assessed (continued)	Result(s) Examined (continued)
Griffin et al. (2005)	Applying an Information Seeking and Processing Model to a Study of Communication About Energy	Use of Energy in the Household	RISP	Heuristic and systematic processing, information insufficiency, informational subjective norms, perceived information gathering capacity, and relevant channel beliefs	Information seeking and processing
Griffin et al. (2008)	After the Flood- Anger, Attribution, and the Seeking of Information	Floods	RISP	Information seeking, information processing, information insufficiency, perceived information gathering capacity, channel beliefs, informational subjective norms, anger, efficacy, trust, concept, risk judgment: perceived likelihood & perceived severity, attributions	Information seeking and processing and resident response to flood damage
Kahlor et al. (2006)	Seeking and Processing Information About Impersonal Risk	Impersonal risk: environment	RISP	Informational subjective norms, information insufficiency, channel beliefs, perceived information gathering capacity, communities, demographics: gender, age, education, minority status, income, & political conservatism	Information seeking and processing
Kahlor (2007)	An Augmented Risk Information Seeking Model: The Case of Global Warming	Environment al risk information seeking: global warming	Augmented RISP	Attitude toward seeking behavior, perceived hazard characteristics, affective response, informational subjective norms, perceived behavioral control, information insufficiency, behavioral intent	Information seeking and processing

Reference (continued)	Article Title (continued)	Topic (continued)	Theoretical Construct (continued)	Concept(s) Assessed (continued)	Result(s) Examined (continued)
Lu (2015)	Burgers or Tofu? Eating Between Two Worlds: Risk Information Seeking and Processing During Dietary Acculturation	Health risks eating American-style food	RISP	Information seeking, information avoidance, systematic processing, heuristic processing, information insufficiency, perceived information gathering capacity, affective responses, informational subjective norms, self-efficacy, risk judgments	Information seeking and processing
Rose et al. (2017)	Public Use of Information about Smoke Emissions: Application of the Risk Information Seeking and Processing (RISP) Model	Smoke emissions	RISP	Perceived hazard characteristics, affective response, informational subjective norms, information sufficiency (sufficiency threshold & current knowledge), relevant channel beliefs, perceived information gathering capacity, and demographics	Information seeking and processing
Ter Huurne et al. (2009)	Risk Information Seeking Among U.S. and Dutch Residents: An Application of the Model of Risk Information Seeking and Processing	Hazardous industrial substances	RISP	Affective responses, informational subjective norms, current knowledge, sufficiency threshold, risk perception, institutional trust, self-efficacy	Information seeking and processing
Yang (2012)	Too Scared or Too Capable? Why Do College Students Stay Away from the H1N1 Vaccine?	H1N1 Influenza	RISP	Perceived hazard characteristics, affective responses, informational subjective norms, information insufficiency, relevant channel beliefs, perceived information gathering capacity, information seeking, attitudes, subjective norms, perceived behavioral control, behavioral intention	Information seeking and processing

Reference (continued)	Article Title (continued)	Topic (continued)	Theoretical Construct (continued)	Concept(s) Assessed (continued)	Result(s) Examined (continued)
Yang & Kahlor (2013)	What, Me Worry? The Role of Affect in Information Seeking and Avoidance	Climate Change	RISP	Information insufficiency, perceived hazard characteristics, negative affective responses, positive affective responses, informational subjective norms, perceived behavioral control, attitude toward seeking, age, gender, ethnicity, income	Information seeking and processing, and information avoidance

2.3 Framework for Risk Information Seeking Model (FRIS)

The FRIS model originated from the works of Ter Huurne & Gutteling (2008) and elements of this model stem from the RISP model (Kellens et al., 2012; Kievik & Gutteling, 2011; Li et al., 2017). This model detects social-psychological factors that entice individuals to seek risk-related information from different platforms or evade such information. Specifically, the theoretical framework focuses on a multifaceted audience-based approach. As seen in Figure 2, the FRIS model includes six different concepts of risk-related information seeking/avoiding behavior such as risk perception, self-efficacy, involvement, affective response, information sufficiency, and subjective norms (Ter Huurne, 2008). The model also focuses on determining what encourages individuals in a risky scenario to truly seek risk-related information and emphasizes which factors will be most helpful to encourage risk-related information seeking behavioral changes. According to the FRIS model, even though risk-related information seeking behavior often occurs because of a lack of information, there is also the potential it can occur without an individual being aware of a gap in knowledge, but rather prompted by feelings or a social setting (Ter Huurne, 2008). As mentioned by Ter Hurrne et al. (2009), the FRIS model also points out two concepts of risk-related information seeking—informational subjective norms and affective responses. FRIS also examines the connection between an individual's current knowledge and their perceived information gathering capacity (Ter Hurrne et al., 2009; Li et al., 2017).

The FRIS model specifically addresses risk-related information seeking behavior from a risk and safety perspective (Ter Hurrne, 2008; Kievik et al., 2009; Kievik & Gutteling, 2011). However, FRIS is different than the RISP and PRISM since it places "more emphasis on psychological characteristics, such as trust, self-efficacy, and engagement as concepts of information-seeking behavior" than the other models (Kellens et al., 2012, p. 1371; Li et al., 2017). More specifically, other risk-related information seeking models tend to focus on only suggesting what motivates individuals to seek information (Ellis et al., 2002; Kuhlthau, 1991; Wilson, 1981); whereas the FRIS, focuses on tangible risk factors and helpful application to better understand risk-related information seeking behavior (Ter Hurrne, 2008).

The FRIS model suggests three different steps are needed to fully understand risk-related information seeking including risk context factors, information utility perceptions, and information behavior decisions (Ter Huurne, 2008). First, the researcher(s) or decision-makers must understand what scenario is prompting the corresponding risk context and the potential need for additional information. "Responding to an issue by acting toward a resolution is triggered by awareness and salience evaluation of that particular topic. This process involves judging the characteristics and perceived relevance of the issue to the self" (Ter Huurne, 2008, p. 137). Ter Huurne & Gutteling (2008) discovered three distinct predictors that influence risk-related information seeking behavior including risk perception, information need, and current knowledge. Specifically, risk perception is essential to include within the model and it is contingent upon an individual's availability heuristics (Slovic et al., 1981; Ter Huurne, 2008), known as an individual's personal accounts and interpretation from a preceding series of events instead of the real event (Bohol, 1998; Ter Huurne, 2008). Heuristics clarify how individuals can have different perceptions from one another even when experiencing the same risk. It is widely known within the risk literature that there is a "… positive correlation between perceived risk and affective responses" (Finucane et al., 2000; Griffin et al., 2008; Kuttschreuter, 2006; Loewenstein et al., 2001; Ter Huurne, 2008, p. 138). This is important to keep in mind when assessing risk perception and during the application of the FRIS model.

The FRIS model also takes self-efficacy into consideration when assessing risk-related information seeking behavior, a factor that is not as prominent in the other information seeking theoretical constructs (Afifi & Weiner, 2006; Ter Huurne, 2008). Ter Huurne (2008) and Turner et al. (2006) discovered when establishing the FRIS model, that if an individual's risk perception is not very high, they tend to depend on efficacy beliefs to assess what behavior(s) are necessary during a risk related scenario. "With high-risk perceptions, efficacy beliefs take on added importance because the heightened levels of risk not only act as motivational factors but also tend to generate anxiety" (Ter Hurrne, 2008, p. 138). The more heightened an individual's anxiety becomes from a rise in risk perceptions, the more likely their behavior becomes contingent upon their perceived capability to control a given risk related situation (Ter Hurrne,2008; Witte, 1992).

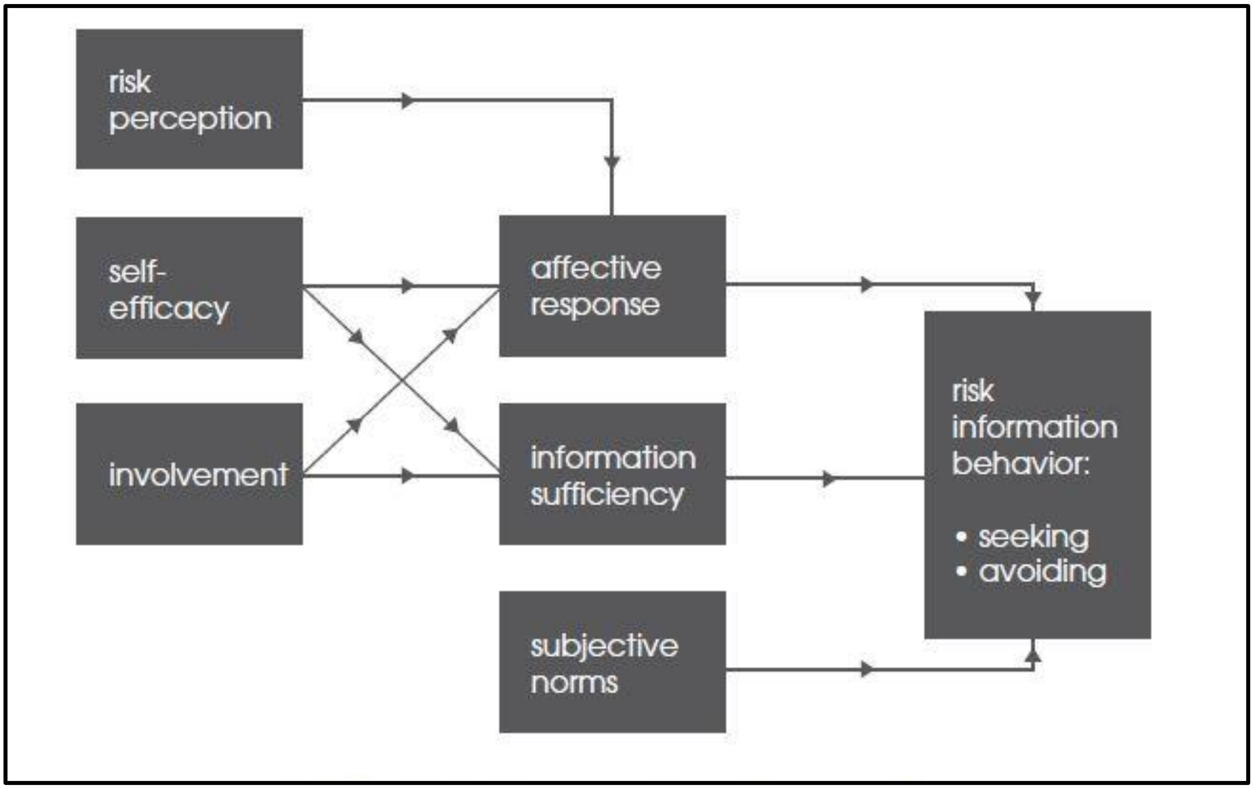

Figure 2. The framework for risk information seeking.
Note. FRIS model based on Ter Huurne (2008).

A third factor the FRIS model includes is an individual's perceived issue involvement (Ter Huurne, 2008). Issue involvement represents an individual's own or circumstantial involvement (Apsler & Sears, 1968; Ter Huurne, 2008) and a curiosity because of the notion that a given risk has the potential to substantially impact their life (Andrews et al., 1990; Cho & Boster, 2005; Ter Huurne, 2008). Also, "…involvement has a strong effect on risk-related information decisions and is significantly associated with risk perception, information needs, and affective responses" (Ter Huurne, 2008, p. 139). If an individual has a higher level of involvement, they are more likely to have higher affective responses and less information sufficiency; resulting in the potential for the individual to more likely seek additional information. This concept has not been as widely addressed as other concepts within the risk-related information seeking literature and more broadly within the risk communication and risk psychology literature (Ter Huurne, 2008). It is evident that the FRIS model is similar to the RISP model and PRISM in some instances, whereas in other instances it provides a slightly different perception of an individual's risk-related information seeking behavior, especially focusing more on the psychological attributes. Further discussion about the FRIS model in an applied setting is particularly useful, as discussed below.

In addition to providing insight into the creation of the FRIS model, it is also important to discuss the concepts most commonly found and generalizations from empirical studies that have applied the FRIS model to better understand risk-related information seeking. Unlike the RISP and PRISM models, there are very few studies that have applied only the FRIS model, yet it is still an important contribution to the risk-related information seeking models and literature. Rather, it is more common to see the FRIS model used in conjunction with the RISP and PRISM models. As seen in Table 2, there are two studies in particular that have used FRIS as a theoretical foundation. The only common concepts common between the works of Kievik et al. (2012) and Ter Huurne (2008) are risk perception and involvement. Otherwise, it appears as though each of the empirical studies focused on a different combination of concepts and main objectives to assess risk-related information seeking to utilize the FRIS model. The following provides a review of the two studies and generalizations found.

In terms of risk perception and involvement, Kievik et al. (2012) found in their first study found no effect between risk perception and involvement. However, they did notice that individuals were more likely to have greater amounts of perceived risk in situations when the given risk context was high. There was no significant effect found between risk perception and risk-related information seeking, and no effect with actual risk-related information seeking. Kievik et al. (2012) found that the lack of effect may be attributed to an imbalance between in power between risk perception and involvement. Thus, as a result, in their second study, they made two different changes. They focused on a different risk context, in this instance terrorism since it had the potential for greater risk perception. Also, they used fear appeals to manipulate risk perception (Kievik et al., 2012). In this instance, risk perception and involvement did have an impact on actual risk-related information seeking, which is supported in the original FRIS model.

Also, the FRIS model suggests that active risk-related information seeking results in a greater likelihood to implement risk-mitigating behavior (Kievik et al., 2012). Involvement was attributed to having an impact on actual risk-related information seeking, along with the intention to seek with both of their studies. Whereas, Ter Huurne (2008) focused on a slightly different combination of concepts, assessing the relationship between risk perception, involvement, and affective responses. Here, Ter Huurne found that both risk perception and involvement influence affective responses, noting that greater amounts of risk perception in combination with lesser self-efficacy, and greater involvement resulted in undesirable feelings about the given risk (Ter Huurne, 2008). Unlike Kievik et al. (2012), Ter Huurne (2008) do not provide much more discussion on the influences of risk perception in the study. Rather, the focus of this study was primarily on the influences of affective response, information sufficiency, and perceived information gathering capacity in relation to risk-related information seeking.

Overall, both studies appeared to provide a thorough assessment of risk-related information seeking. Ter Huurne (2008) focused on incorporating additional concepts to the FRIS model, including affective responses and informational subjective norms. Whereas, Kievik et al. (2012) appeared to focus on replicating the overall concepts of the FRIS model across two different studies and suggested the need for further FRIS research including concepts like affective response and informational subjective norms, as included in Ter Huurne (2008)'s study. Unfortunately, Kievik et al. (2012) did not get consistent results, suggesting that this was a result of the sample size. However, they were able to establish a set of dependable procedures and instruments. While, Ter Huurne (2008) did discover that the FRIS model was a good fit with the data, providing further insight into risk-related information seeking and risk-related information avoidance. However, both studies found that the FRIS model is easily applicable to a wide array of risk related contexts.

As discussed in the literature review, it is slightly more common to see the FRIS framework in conjunction with the RISP and PRISM when evaluating risk-related information seeking behavior. Further discussion and an overview are provided, noting the similarities and vast differences across the empirical studies. Furthermore, the following section provides insight into the third risk-related information seeking framework—PRISM, providing the opportunity to showcase the depth of this area of research, noting different concepts, and discussing the overall generalizations found between PRISM empirical studies.

Table 2.
Empirical Studies Utilizing the Framework of Risk Information Seeking.

Reference	Article Title	Topic	Theoretical Construct	Concept(s) Assessed	Result(s) Examined
Kievik et al. (2012)	The Action Suited to the Word? Use of the Framework of Risk Information Seeking to Understand Risk-Related Behaviors	Personal involvement and risk perception: terrorism scenario and building fire scenario	FRIS	Risk perception, involvement, intention to seek risk-information, actual risk information seeking behavior, response efficacy, intention to adopt risk-mitigating behavior	Information seeking, active information seeking, and the intention to adopt risk-mitigating actions
Ter Huurne (2008)	To Know or Not to Know? A Framework of Risk Information Seeking in the Sphere of Industrial Risks	Hazardous industrial substances	FRIS	Risk perception, affective responses, involvement, information sufficiency, perceived information gathering capacity, social norms, personal control	Information seeking and information avoidance

2.4 Planned Risk Information Seeking Model (PRISM)

In 2010, Kahlor expanded the risk-related information seeking models, adding the Planned Risk Information Seeking Model (PRISM). A majority of the PRISM model stems from a variety of other theoretical constructs, with a majority of the constructs originating from the public health and risk communication fields. Elements of PRISM stem from following theoretical constructs: the RISP model, the TPB, the augmented RISP, the theory of motivated information management (TMIM), the comprehensive model of information seeking (CMIS), the health information acquisition model (HIAM), and the extended parallel processing mode (EPPM) (Afifi & Weiner, 2004; Ajzen, 1991; Eastin et al., 2015; Griffin et al., 1999; Kahlor, 2010; Rosenthal, 2011; Wiloughby & Myrick, 2016; Witte, 1998; Witte, 1992). Specifically, Kahlor wanted to provide a theoretical framework that integrates “social psychology, health behavior, and communication theories to predict general information seeking” (Willoughby & Myrick, 2016, p. 696). It has most commonly been applied within the context of public health, but this does not mean it cannot be applied to other risk-related situations

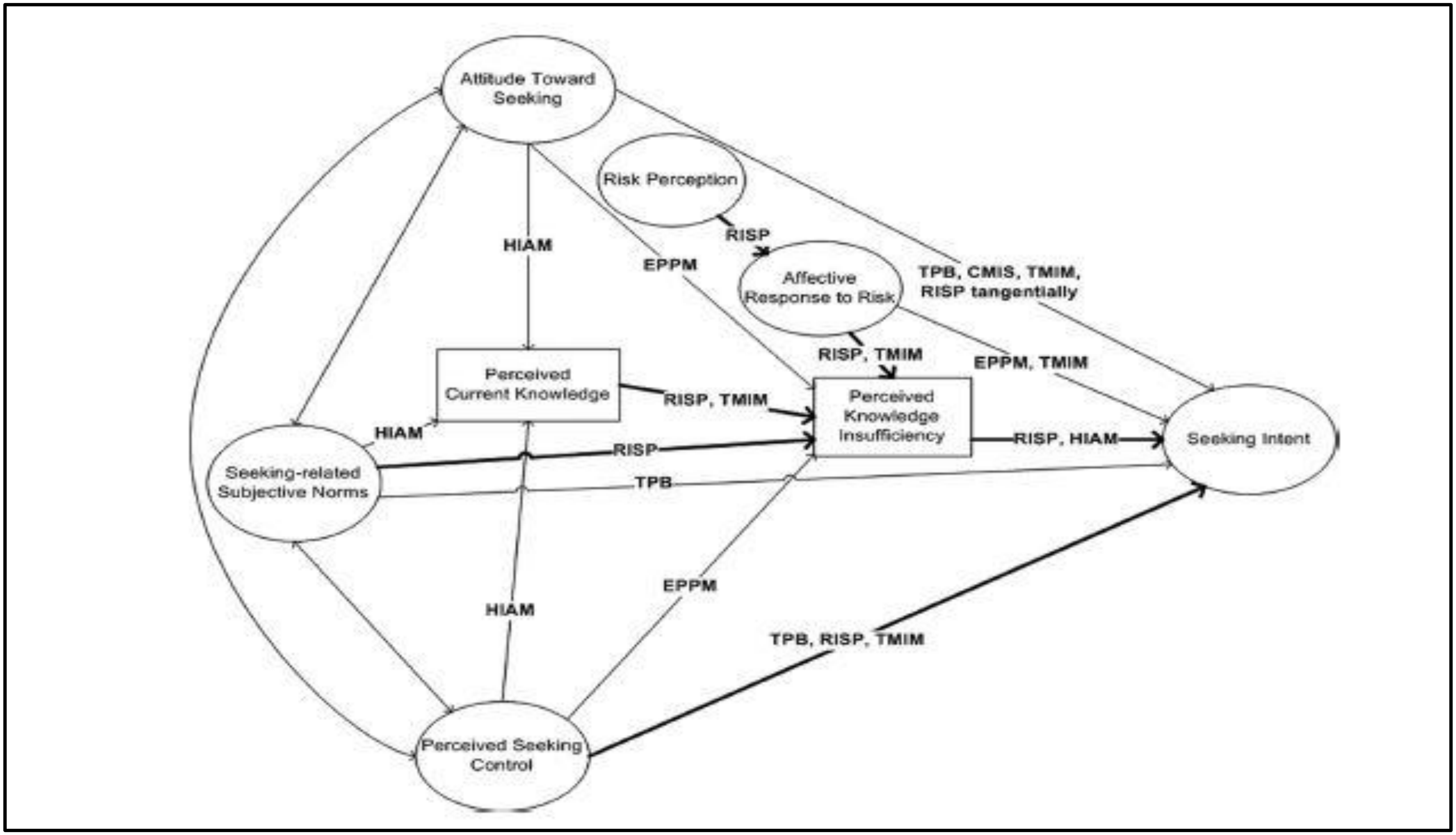

Figure 3. Planned risk information seeking model.
Note. PRISM model based on Kahlor (2010).

(Eastin et al., 2015; Hovick et al., 2014a; Hovick et al., 2014b; Kahlor, 2010). PRISM has gained traction within the academic arena over the years, yet its application is not as extensive as the RISP model (Ho et al., 2014; Kahlor, 2010; Willoughby & Myrick, 2016). Regardless, it is essential to provide further discussion on how this framework provides an understanding of risk-related information seeking behavior and compares to the other theoretical models.

The PRISM framework views risk-related information seeking behavior as a planned behavior and intentional, emphasizing individual-based concepts through a web of associations (Eastin et al., 2015; Kahlor, 2010). The following concepts compose the PRISM: attitude toward seeking, risk perception, affective risk response, perceived knowledge insufficiency, seeking-related subjective norms, perceived current knowledge, and perceived seeking control as seen in Figure 3, (Kahlor, 2010). Some of the concepts stem from multiple theoretical constructs, while others only from a singular framework. For example, in Figure 3, attitude toward seeking is set up as a direct concept of risk-related information seeking, stemming from TPB, CMIS, TMIM, and TISP. However, attitude toward seeking also is a direct concept of perceived current knowledge, originating from HIAM. Together, these concepts provide a robust perspective on risk-related information seeking behavior.

All of the TPB and RISP concepts are intertwined within PRISM and five additional relationships are also included. These additional relationships stem from the HIAM and the EPPM (Kahlor, 2010). One distinct difference between HIAM and the RISP model is HIAM suggests current knowledge is the most important and initial factor. Perceived efficacy is intertwined within the PRISM through the perceived seeking control and attitude toward seeking concepts (Kahlor, 2010). It is also worthy of mentioning that demographics are not included within the model and there is no intention of including it when applying this model to a scenario. Specifically, Kahlor choose to not include this concept "…based on the lack of consensus in the literature for what the role should be and the relatively small contribution such variables tend to make in predicting information seeking" (Eastin et al., 2015, p. 605).

It is important to provide further clarification on the relationships between the concepts and discuss the discrepancies. PRISM suggests that both perceived knowledge and perceived knowledge insufficiency are impacted by subjective norms, while perceived seeking control, and attitudes towards seeking are used simply as predictors of risk-related information seeking behavior (Kahlor, 2010; Willoughby & Myrick, 2016). There are also discrepancies within the empirical research discussing which concepts within PRISM influence risk-related information seeking behavior. For instance, Eastin et al. (2015) found that attitudes toward behavior, perceived behavioral control, subjective norms all have a direct impact on risk-related information seeking behavior; whereas, knowledge insufficiency and affective reaction have an indirect impact (Eastin et al., 2015). However, in contrast, Kahlor (2010) found that there is no link between knowledge insufficiency and risk-related information seeking behavior (Kellens et al., 2012). The PRISM does not include demographics as a contributing factor to risk-related information seeking since there is divergence within the literature "for what that role should be and the relatively small contribution such variables tend to make in predicting information seeking" (Eastin et al., 2015, p. 605). This is a distinct contrast to the RISP and FRIS models which include demographics as a concept that determines risk-related information seeking behavior. It could be argued that there is, in fact, considerable literature suggesting the influences of demographics such as age, gender, and ethnicity have on risk perception and risk-related information seeking. While the RISP model suggests information sufficiency is reliant on affective response, informational subjective norms, and demographics (Rosenthal, 2011), the PRISM "considers people's perceived knowledge and their perceived knowledge insufficiency to depend also on attitude toward seeking and perceived control over seeking" (Rosenthal, 2011, p. 43). The most distinct difference between RISP and PRISM is the fact that PRISM forecasts information seeking intentions; whereas RISP estimates an individual's real information seeking behavior (Rosenthal, 2011).

While it is essential to provide insight into the theoretical construct and the origin of the concepts, it is also useful to provide further discussion on the utility of this model, reviewing a variety of empirical studies and provide insight into which concepts are most utilized and the subsequent generalizations. As seen in Table 3, six different PRISM related studies have been conducted over the years. While this construct has not been applied to as many research studies over the years like the RISP model has, it still provides valuable insight. Also, while not every study utilizes the same concepts, there are still relevant generalizations and a few select concepts that are present across all of the empirical studies including affective response, attitude toward seeking behavior, informational subjective norm, and perceived seeking control. Risk perception is analyzed in five of the studies and perceived hazard knowledge was included in four of the empirical studies, while information (in)sufficiency and perceived knowledge insufficiency each in three of the studies. Other concepts included in each of the empirical studies were not as widely applied (Table 3). Similar to the RISP and FRIS studies, it appears as though researchers selected the concepts most applicable to the given risk context and based upon trends from past studies, rather than utilize the entire theoretical construct. Thus, it is important to better understand the most common concepts, noting how they may better provide insight into understanding risk-related information seeking.

In particular, Eastin et al. (2015) found that affective response influences risk-related information seeking. However, when evaluating the relationship between affective response and knowledge insufficiency, it resulted in a lower direct relationship than that of perceived seeking control and seeking intention, yet there was a relationship. This relationship follows suit if the original PRISM model. Ho et al. (2014) examined affective response in relation to media use, noting a positive relationship between risk perception and negative affective response. In this instance, Ho et al. added media use to the existing PRISM model and also found an indirect relationship between risk-related information seeking and media use. Hovick et al. (2014) also utilized negative affective response in their analysis, discovering a direct and significant effect between risk perception and affective response, which is similar to that of Ho et al. (2014) and Willoughby and Myrick (2016). Kahlor (2010) also noted a relationship between risk-related information seeking and affective response but provided very little discussion on this finding within the study. Rosenthal (2011) found that past risk-related information seeking foresees affective response but did not provide further discussion or analysis on active risk-related information seeking. Thus, some of the studies found similar findings, specifically in terms of affective response influencing risk-related information seeking; whereas, in other instances, the researchers focused on assessing the relationship of affective response with different concepts from study-to-study, making it difficult to draw a lot of comparisons.

Following suit with previous models, Ho et al. (2014), Hovick et al. (2014), Kahlor (2007), and Rosenthal (2011) discovered a direct relationship between risk-related information seeking intention, attitude towards seeking, perceived seeking control, and seeking-related subjective norms. While, Ho et al. (2014) found no relationship between sufficiency threshold and attitude toward seeking in conjunction with seeking-related subjective norms, and perceived seeking control. Kahlor (2010) found attitude toward seeking and perceived seeking control were substantial indicators of information insufficiency. In terms of attitude towards seeking and its relationship with perceived knowledge, there was found no significant relationship found by Ho et al. (2014) and Hovick et al. (2014). Eastin et al. (2015) found a variation in the impacts of attitude toward seeking related to perceived knowledge when assessing the three different study groups. In this instance, attitude toward seeking only had a direct and indirect impact on risk-related information seeking for those who had not previously made a decision or had not taken action when dealing with the given risk-related context. While Kahlor (2010) hints at the importance of perceived knowledge in relation to risk-related information seeking. As a result, it appears as though there is some consistency in the utility and positive effects of attitude toward seeking on other concepts found within the PRISM model and risk-related information seeking. But this is not across all of the studies or with all of the other varying concepts.

The third concept found across all of the empirical studies reviewed was informational subjective norms, commonly referred to as subjective norms. Subjective norms had an effect on risk-related information seeking intentions for Ho et al. (2014), and Hovick et al. (2014). In fact, Hovick et al. (2014) found that subjective norms were one of the most significant predictors of risk-related information seeking with attitude toward seeking, perceived knowledge insufficiency, and affective risk response in comparison to other concepts they analyzed. Kahlor (2010) also confirmed that subjective norms are one of the most influential concepts of risk-related information seeking. Rosenthal (2011) ascribed subjective norms as one of two concepts influencing affective response and subjective norms as a strong predictor of risk-related information seeking as well. Willoughby and Myrick (2016) also agreed that subjective norms, along with attitude toward seeking and affect all greatly influence risk-related information seeking. Furthermore, while Easten et al. (2015) did include subjective norms in their analysis, very little is discussed on the overall conclusions about this specific concept, especially in terms of risk-related information seeking. Rather, there is a casual discussion on the implications of subjective norms with other variables in relation to the Precaution Adoption Process Model (PAPM) and TPB rather than the PRISM model overall, suggesting it has external influences. Thus, overall it appears for the majority of the PRISM empirical studies that subjective norms are commonly utilized, analyzed, and a strong predictor or risk-related information seeking. While this is the last concept that is most widely applied, there are other concepts most commonly applied throughout the PRISM studies such as perceived seeking control and especially risk perception, given its importance in this study too.

Another variable, in particular, that has been an influential concept in PRISM empirical studies—perceived seeking control. This concept appeared in all of the six PRISM empirical studies reviewed. Eastin et al. (2015) discovered it as the most significant concepts of risk-related information seeking, for those who intended to take action during a risk-related situation. Ho et al. (2014) also found perceived seeking control as an influential concept within the PRISM model and more specifically, a predictor of risk-related information seeking, noting its generalizability to a plethora of risk-contexts. Ho et al. (2014) found that perceived seeking control, along with attitude toward seeking, and seeking-related subjective norms were not predictors of sufficiency threshold, as found in Kahlor's original PRISM study. Kahlor (2007) did not find a substantial relationship between perceived seeking control risk-related information seeking. Hovick et al. (2014) also did not find a distinct effect between perceived seeking control and risk-related information seeking when coupled with knowledge insufficiency seeking control. They did, however, find a link between perceived seeking control and perceived risk knowledge and mentioned how perceived seeking control is linked to past seeking behavior along with positive attitudes, perceived knowledge, and subjective norms. Thus, this proposes that the impact of perceived seeking control related to behavior intention is not directly linked but rather facilitated through other concepts (Hovick et al., 2014). Kahlor (2010) discovered that perceived seeking and attitude toward seeking influence information insufficiency. Kahlor (2010) mentioned how risk-related information seeking is accounted for through a variety of concepts, rather than just a single one, noting the following as the most essential: perceived seeking control, attitude toward seeking, and perceived knowledge. Rosenthal (2011) found perceived seeking control to be associated substantially with risk-related information seeking. However, when it was analyzed within the regression model, perceived seeking control was not a noteworthy predictor (Rosenthal, 2011). A majority of the analysis focused on understanding perceived seeking control was done as a post-hoc analysis by Rosenthal (2011), focusing mostly on the influence it has with demographics such as education and income. Overall, it is evident that there is some inconsistency related to the relationship between perceived seeking control and other concepts. It appears it is a direct predictor of risk-related information seeking, whereas in other instances it is not. Also, it appears as though this concept may be more influential in predicting other concepts than risk-related information seeking or in combination with others. As noted by Hovick et al. (2014), it is evident that there is a need for further research devoted specifically to perceived seeking control in terms of risk-related information seeking. Given the inconsistency in results, perhaps this is not the most relevant concept for risk-related information seeking. Thus, it is pertinent to provide further insight into other concepts most commonly applies across the PRISM studies, such as risk perception.

Risk perception is utilized as a concept in five of the six PRISM studies. Ho et al. (2014) found that risk perception serves a significant role in determining risk-related information seeking along with a thorough analysis of emotions. In particular, they found that the media serves as a powerful source for risk perceptions, especially in the case of climate change (Ho et al., 2014). Whereas, Eastin et al. (2015) discovered that individuals who choose to not take any action related to the risk context had lower levels of risk perception amongst other concepts such as affective response and attitude toward seeking. Hovick et al. (2014) focused on the role of risk perception in terms of affective response, mentioning it serves a significant role. Kahlor (2010) and Willoughby and Myrick (2016) also found risk perception to be a significant predictor for affective response. Affective response in both instances was found to be a direct predictor of risk-related information seeking. So, while none of the PRISM studies went into significant discussion about risk perception as per say its context in other risk-related information seeking studies, it nonetheless plays an important role in the process, especially in related to affective response.

The remaining three concepts found most frequently across the PRISM empirical studies include: perceived (risk) hazard knowledge (found in four of the six studies), information (in)sufficiency (analyzed in three of the six studies), and perceived knowledge insufficiency, also analyzed in three of the six studies. Other concepts were assessed for each of the six PRISM studies, but not discussed in further detail since they were not included across all of the studies. In addition to providing insight into the widely applied concepts and their relevance with risk-related information seeking and other concepts, it is also important to provide discussion on the overall generalizations found between the PRISM empirical studies reviewed, noting similarities, differences, and areas for further improvement and research.

In particular, Eastin et al. (2015) noticed the PRISM model did not consistently work the same across different sample populations (individuals willing to take action vs. individuals not willing to take action related to the risk context), noting that this may be a result of varying predictors and two concepts in particular—perceived knowledge and knowledge insufficiency. Whereas Ho et al. (2014) and Willoughby and Myrick (2016)'s results were in agreement with previous studies focused on risk-related information seeking such as the works of Griffin et al. (2008), Kahlor (2007), Kahlor (2010), and Yang et al. (2010), noting the PRISM model fit the data well. Ho et al. (2014) noted that risk-related information seeking is most greatly influenced by attitude toward seeking, seeking-related subjective norms, and perceived seeking control. Ho et al. (2014) overall thought that the PRISM model is a good theoretical construct when assessing behavioral intentions. They did find value in extending the PRISM model to include media use, noting its influence on risk perception, affective response, and risk-related information seeking. Overall their study proved that the PRISM model is not just as applicable to health risk contexts but others too such as climate change and also across other cultures (Ho et al., 2014). Ho et al. (2014) also mentioned the importance of deciphering risk-related information seeking for other individuals vs. oneself in future research. Overall, they found that subjective norms, attitude toward seeking, perceived knowledge insufficiency, and affective risk response were the most significant indicators of risk-related information seeking (Ho et al., 2014). Hovick et al. (2014) also extended the PRISM model but found that the original PRISM model was most relevant and fit the data well. Kahlor (2010) also found the PRISM model to be useful when assessing risk-related information seeking, finding that the model outdid both the TPB and RISP models in almost all of the relationships assessed. While, Rosenthal (2011) also found several similar concepts as predictors of risk-related information seeking including attitudes, subjective norms, perceived behavioral control, affective response, and information insufficiency. Rosenthal provided a unique yet different approach to assessing risk-related information seeking, specifically focusing on it in the past, which has yet to be done in other literature. Overall, Rosenthal discovered that past risk-related information seeking in combination with demographics helps decipher potential risk-related information seeking behavior. This is a different perspective than the other PRISM empirical studies.

All of the authors from the PRISM empirical studies reviewed called for further research and while there were some conclusive results between the studies, many of the researchers suggested there is not nearly enough research focused on risk-related information seeking and application of the PRISM model (Ho et al., 2014; Hovick et al., 2014; Kahlor, 2010; Willoughby and Myrick, 2016). While most are in agreement that there needs to be further research, there is quite the variability on what it should be. Specifically, Ho et al. (2014) suggested further research should be devoted to expanding the PRISM model and incorporating the importance of media use. While Hovick et al. (2014), suggested reevaluating the concepts utilized with the PRISM and risk-related information seeking research since there are so many different factors involved, stemming from a plethora of theoretical models. Kahlor (2010) and Willoughby and Myrick (2016), believe it is important to focus on the different relationships amongst the concepts. Thus, it appears as though overall there needs to be further research devoted to assessing risk-related information seeking with the PRISM model, but the specifics will vary based upon the risk-context and sample population. While the PRISM model proves to be a potentially useful model to assess risk—related information seeking, it is also important to discuss its role in combination with elements from FRIS and RISP, as mentioned below.

Table 3.
Empirical Studies Utilizing the Planned Risk Information Seeking Model.

Reference	Article Title	Topic	Theoretical Construct	Concept(s) Assessed	Result(s) Examined
Eastin et al., (2015)	Information Seeking as a Precaution Behavior: Exploring the Role of Decision-Making Stages	Hydraulic Fracturing	PRISM	Attitude toward seeking, risk perception, perceived knowledge, seeking-related subjective norms, perceived seeking control, affective risk response, perceived knowledge insufficiency	Information seeking & portions of the Precaution Adoption Process Model (PAPM)
Ho et al. (2014)	Seeking Information About Climate Change: Effects of Media Use in an Extended PRISM	Climate Change	PRISM and Extended PRISM	Attitude toward seeking, seeking-related subjective norms, perceived seeking control, affective response, perceived risk, media use, information insufficiency, information seeking intention	Information seeking behavior and media use
Hovick et al. (2014)	Personal Cancer Knowledge and Information Seeking Through PRISM: The Planned Risk Information Seeking Model	Cancer	PRISM vs. Expanded PRISM	Attitude toward seeking, subjective norms, perceived seeking control, risk perception, affective risk response, perceived risk knowledge, perceived knowledge insufficiency, seeking intention, past seeking, source beliefs	Information seeking
Kahlor (2010)	PRISM: A Planned Risk Information Seeking Model	Individual-based health risk information seeking	PRISM	Attitude toward seeking, seeking-related subjective norms, perceived seeking control, risk perception, affective risk response, perceived knowledge, knowledge insufficiency	Information seeking

Reference (continued)	Article Title (continued)	Topic (continued)	Theoretical Construct (continued)	Concept(s) Assessed (continued)	Result(s) Examined (continued)
Rosenthal (2011)	Personality and Motivation in an Augmented PRISM: Risk Information Seeking in the Context of the Indoor Environment	Radon and poor indoor air quality	Augmented PRISM	Behavioral seeking tensions, attitude toward seeking, seeking-related subjective norms, perceived control over seeking, information need, current knowledge, information sufficiency, affective response, information-seeking self-identity (self-efficacy), independent self-construal, motivation orientation, past seeking behavior, demographics	Information Seeking
Willoughby & Myrick (2016)	Does Context Matter? Examining PRISM as a Guiding Framework for Context-Specific Health Risk Information Seeking Among Young Adults	Health context: sexual health and cancer	PRISM	Attitude toward seeking, seeking-related subjective norms, perceived seeking control, perceived knowledge, knowledge insufficiency threshold, risk perception, affective risk response, seeking intent	Information seeking

2.5 Discussion and Applicability of Combined Risk-Related Information Seeking Research

The previous discussion focused on understanding the different risk-related information seeking models (FRIS, PRISM, and RISP), providing insight into how the field has progressed over the years, areas for improvement, and specific insight into the most commonly applied concepts. More recently, risk-related information seeking research has gravitated towards focusing on applying a combination of concepts from all three theoretical models. Specifically, three empirical studies, in particular, have showcased the theoretical and methodological application of all three risk-related information seeking theories (FRIS, PRISM, and RISP) including the works of Kellens et al. (2012), Li et al. (2017), and Zeng et al. (2017). The risk-contexts amongst all three studies are quite diverse. For example, as seen in Table 4, Kellens et al. (2012) assessed flood risks, Li et al. (2017) examined earthquakes, and Zeng et al. (2017) focused on nuclear risk. It is important to provide insight into all three of these combined studies since they seem to be the most applicable and relevant to this study. The three studies focused on applying portions of the FRIS, PRISM, and RISP are discussed together since they share similar theoretical foundations.

As seen in Table 4, there is quite the array of concepts utilized to assess risk-related information seeking in each empirical study. Only three concepts in particular were analyzed across all three of the studies including: information need, risk perception, and perceived hazard knowledge (referred to current risk knowledge for Li et al., 2017 and perceived knowledge for Zeng et al., 2017), all of which are also included in this current study. The following provides insight into the specific findings related to each of these concepts and discussion is also provided on the overall generalizations across the studies. This portion of the literature review is particularly important since it provides a foundation to better understand the roots important for this study.

Information need (also known as current information need) is a critical concept since it provides insight into an individual's current knowledge and the amount of knowledge needed for the individual to make critical decisions during a risk-related situation (Griffin et al., 2008; Kellens et al., 2012; Li et al., 2017). Li et al. (2017) and Zeng et al. (2017) found information needs to be a substantial predictor of risk-related information seeking. For Li et al. (2017), their research found that information need served as the mediator between informational subjective norms and risk-related information seeking. Also, there was a significant relationship found between perceived information gathering capacity and information need, and negative affective response and information need (Li et al., 2017). Similar to other research, Li et al. (2017) found a positive and significant relationship between risk perception and information need. However, this relationship was not as strong as others mentioned previously. Only one relationship proved to be non-substantial and non-significant which was the relationship between current risk knowledge and information need. This was also found to be true within other studies such as Ter Huurne et al. (2008) and Griffin et al. (2008) Kellens et al. (2012). Zeng et al. (2017) found information need somewhat intermediates the association between perceived knowledge, channel beliefs, and risk-related information seeking. While information needs completely facilitated the relationship between risk-related information seeking and perceived risk (Zeng et al., 2017). Zeng et al. (2017) found that channel beliefs were a substantial indicator for information needs. Overall, Li et al. (2017) and Zeng et al. (2017) found information needs to be a substantial and critical concept not only for risk-related information seeking but with other concepts important in the process. Whereas, Kellens et al. (2012) did not find a significant relationship between information need and risk-related information seeking. In their study, information need did not facilitate a relationship between knowledge and risk-related information seeking. However, this could potentially be attributed to a particular problem with their path model. Kellens et al. (2012) noted a "…suppression of the total indirect effect via risk perception and perceived knowledge. [They] found such suppression effects for the relationships between gender, permanent residence, and information need" (Kellens et al., 2012, p. 1379). Perhaps this is why the information need results were so different than that of Li et al. (2017) and Zeng et al. (2017) and did not predict risk-related information seeking. Thus, it appears though information need does have the potential to offer further insight into an individual's risk-related information seeking behavior. However, it is there could be some variability depending upon how the model is set up and influence of risk perception, perceived knowledge, and demographics. While information need is important, it is also essential to discuss other concepts commonly found across empirical studies such as risk perception to add further insight.

Perceived hazard knowledge also commonly referred to as current risk knowledge by Li et al. (2017) and perceived knowledge by (Zeng et al., 2017), also is an influential concept found across all three empirical research studies and critical to this study, since it provides insight into an individual's perspective of their hazard knowledge and vulnerability. Although Zeng et al. (2017) and Li et al. (2017) refer to perceived hazard knowledge by other names, in order to maintain clarity while discussing this portion of the literature review, the term perceived hazard knowledge will be applied across all studies. In particular, Zeng et al. (2017) discovered that perceived hazard knowledge is influential in determining information need in addition to risk-related information seeking. Zeng et al. (2017) also found that perceived hazard knowledge helps determine risk perception. In comparison, Li et al. (2017) found a negative relationship between perceived hazard knowledge and information need that was not significant, which is similar to the results in Ter Huurne et al. (2008)'s research and Griffin et al. (2008). They did, however, find that perceived hazard knowledge was predisposed by informational subjective norms and negative affective responses. Also, Li et al. (2017) found that perceived hazard knowledge had significant implications on perceived information gathering capacity. Unfortunately, Li et al. (2017) were unable to find perceived hazard knowledge as a direct predictor of risk-related information seeking. They did, however, attempt to improve the measurement of this concept and utilized it as its own variable as commonly applied across other studies (Kahlor, 2007; Kahlor, 2010; Kahlor et al., 2006; Kellens et al., 2012; Li et al., 2017; Ter Huurne & Gutteling, 2008; Ter Huurne et al., 2009). Kellens et al. (2012) also included perceived hazard knowledge in their study, focusing on its relationship primarily with demographics, information need, and risk perception. They found that perceived hazard knowledge was a mediator along with risk perception when assessing residency and gender. They did not find a substantial relationship between age, perceived hazard knowledge, and information need. However, "a closer examination of the intervening processes reveal[ed] that residing permanently [was] significantly associated with risk perception, perceived knowledge, and information need" (Kellens et al., 2012, p. 1377). Specifically, this referred to individuals who were residing permanently near the coastline and thus more susceptible to the flood risk in this instance. In general, it is apparent that there are some inconsistent findings related to perceived hazard knowledge amongst the three studies that combined all three theoretical constructs. However, it still is an important concept when assessing risk-related information seeking behavior and other concepts, often found across an array of studies. Given perceived hazard knowledge's influence on risk perception, and the importance of this variable for this study, it is also critical to provide discussion on this particular concept as well.

Risk perception (also referenced commonly as perceived risk), is known as an individual's evaluation of a risk-context, focusing on the severity and intensity that may influence the individual. In particular, Kellens et al. (2012) found that those who lived permanently closer to the coastline were more likely to have greater risk perception in comparison to individuals temporarily residing within their study area. Their study also revealed higher risk perception values in older individuals (part of the demographics concept), noting a significant relationship between these two concepts. Kellens et al. (2012) also discovered a substantial association between risk perception and risk-related information seeking. In particular, they found that as an individual's risk perception increased, so did their risk-related information seeking behavior. Whereas, Zeng et al. (2017) did not find a direct relationship between risk perception and risk-related information seeking. Rather, an indirect relationship was revealed with information needs. They noted that there may be further variances in risk-perception and risk-related information seeking, however they did not believe their sample size was big enough to determine any more conclusive and beneficial results. The authors overall recommended further research devoted to understanding individuals risk perception. Li et al. (2017) revealed a positive and significant association between risk perception and information need, and a positive association between negative affective responses and risk perception. However, Li et al. (2017) did not find a significant association between risk perception, and risk-related information seeking with perceived hazard knowledge, perceived information gathering capacity, and negative affective responses. Aside from analyzing the relationship between risk perception and risk-related information seeking behavior, it is difficult to compare the results of risk perception and other concepts it is compared or mediated since they vary considerably. Also, it is evident that there needs to be further research focused on understanding the methodology and theoretical importance of this concept to ensure consistency and fluidity specifically for risk-related information seeking studies. A plethora of research has been devoted to risk perception across an array of disciplines but its application in risk-information seeking studies is not as abundant. This is not to say that there is a lack of its incorporation, but rather a call for further research to refine its role, especially in relation to other concepts.

In addition to mentioning the overall application of information needs, perceived hazard knowledge, and risk perception within risk-related information seeking studies, it is just as important to discuss the overall conclusions found, noting other concepts critical to the results, considerable findings, and areas for further research. Zeng et al. (2017)'s overall conclusions mirror that of other risk-related studies such as the works of Ter Huurne & Gutteling, 2008 and the theoretical models (RISP, FRIS, and PRISM).

They did mention though that their study did not consider enough of the other factors prompting risk perception and information need. However, their study was strong in its theoretical application, focused on the psychometric approach towards risk and concepts that influence risk-related information seeking. Zeng et al. (2017)'s study also particularly focused on understanding the relationship between channel beliefs and information seeking. Zeng et al. (2017) mentioned that risk-related information seeking is important to continue to assess since it provides insight into an individual's risk protective behavior (Lindell and Perry, 2012). Li et al. (2017) also advocated for further research related to risk-related information seeking, noting the importance of assessing risk-related feelings including optimism. They also mentioned how their empirical study and results aligned well with past studies, especially related to negative affective response and risk-related information seeking. Their study was unique in comparison to Zeng et al. (2017) and Kellens et al. (2012) since Li et al. (2017) focused on refining the risk knowledge measurement. Here, they focused on assessing preparedness, response, and knowledge related specifically to earthquakes. Also, they expanded the path model, including perceived information gathering capacity, and information need. Overall, Li et al. (2017)'s study provided a foundation for future risk-related information seeking studies focused on other natural hazards. Kellens et al. (2012)'s study did not find any noteworthy impacts between an individual's past hazard experience and risk-related information seeking. They found that the model did prove to be slightly problematic due to "…suppression of the total indirect effect via risk perception and perceived knowledge" (Kellens et al., 2012, p. 1379). This influenced the relationships amongst concepts such as information need and demographics. As a result, information need did not have a significant effect on risk-related information seeking, as commonly found in RISP and FRIS studies (Kellen et al., 2012). However, their study did find that risk-related information seeking was influenced by risk perception and response efficacy, which is also supported by Kievik and Gutteling (2011). As a result, they proposed that future risk-related information seeking studies should include risk perception and response efficacy more consistently in the analysis and path model and assess their influence with persuasive messaging (Kellens et al., 2012). In general, their path model and analysis resulted in adequate conclusions, however, it appears as though the works of Zeng et al. (2017) and Li et al. (2017) are more influential and conclusive.

Similar to the individual PRISM, RISP, FRIS empirical studies previously mentioned, the research studies that focused on utilizing a combination of these theoretical models and concepts also appeared to vary based upon the specific risk-context. Concepts such as information need appear as though they have the potential to influence and predict risk-related information seeking behavior and given its long history of research, importance, and results, risk perception is also a critical concept to include in other studies, such as this one. Overall, all three groups of researchers called for further research refining the path model concepts, methodology, and continuing to utilize a combination of the theoretical foundation from PRISM, RISP, and FRIS. While this portion of the literature review was quite dense and focused specifically on the combined empirical studies, it is also essential to describe the most pertinent concepts for this study, many of which overlap with those previously mentioned and provide more of a historical context, particularly starting with risk perception.

Table 4.
Empirical Studies Utilizing the RISP, PRISM, and FRIS Models to Determine Risk-Related Information Seeking.

Reference	Article Title	Topic	Theoretical Construct	Concept(s) Assessed	Result(s) Examined
Kellens et al. (2012)	The Informed Society: An Analysis of the Public's Information-Seeking Behavior regarding Coastal Flood Risks	Floods	Combination: RISP, FRIS, and PRISM	Risk perception, perceived hazard knowledge, information need, response efficacy, and demographics	Information seeking behavior
Li et al. (2017)	Insight into the Earthquake Risk Information Seeking Behavior of the Victims: Evidence from Songyuan, China	Earthquakes	Combination: RISP, FRIS, and PRISM	Information need, current risk knowledge, perceived information gathering capacity, informational subjective norm, negative affective responses, risk perception	Information seeking behavior
Zeng et al. (2017)	Information-Seeking Intentions of Residents Regarding the Risks of Nuclear Power Plant: An Empirical Study in China	Nuclear Power Plant	Combination: RISP, FRIS, and PRISM	Perceived risk, perceived knowledge, channel beliefs, information need	Information seeking behavior

2.6 Risk Perception

Risk perception is a common concept to include when assessing risk-related information seeking behavior. It occurs when individuals make judgments about a given risk, assessing the severity and intensity of it (Dunwoody & Neuwirth, 1991; Kahlor, 2010; Li et al., 2017; Martin et al., 2009; Trumbo, 2013). An individual's risk perception can be accurate and true, whereas, in other instances, it might be imaginary or unrealistic (Dunwoody & Neuwirth, 1991; Li et al., 2017; Trumbo, 2013). The process of risk perception involves gathering, choosing, and inferring signals often about an unknown situation (Wachinger et al., 2013). A signal can either be directly or indirectly related to experience. For example, a direct experience could entail observing a wildfire. An indirect experience could entail reading or watching live accounts of a wildfire via social media platforms such as Twitter or Facebook. An individual's direct experience is an essential part of enhancing the field of risk communication (Li et al., 2017) and it is rooted in both scientific inquiry and cultural practices. There have been three distinct approaches towards risk perception over the years, attempting to address "…why risk is understood differently across social groups" (Schumann et al., 2017, p. 2) including the cultural, sociological, and psychometric paradigms (Kellens et al., 2013; Schumann et al., 2017; Trumbo 2013).

The cultural paradigm of risk perception originally stems from the works of Douglas (1982), Douglas and Wildasky (1982), Wildasky & Dake (1990), and Rundmo & Nordfjaern (2017). They discovered that an individual's perception of risk is constructed and controlled "…by such factors as the degree to which a culture is collective versus individualistic in its outlook, or strongly stratified socially versus more egalitarian" (Trumbo, 2013, p. 95). McCaffrey (2008) and Wachinger et al. (2013) further suggest that risk perception is based on personal morals, cultural norms, and societal expectations. It is important to point out that research focused on understanding risk perception from a cultural standpoint has significantly decreased over the years because of a lack of support and research (Rundmo & Nordfjaern, 2017). Rather, a majority of risk perception research has been dominated by the psychometric paradigm.

A sociological perspective takes into consideration the influence of institutions and future societal implications of risk (Giddens, 1998; Trumbo, 2013). The sociological paradigm focuses on how risk influences economics, industries, policies, social class, and human health. This perspective considers factors such as environmental racism related to natural hazards (Trumbo, 2013). Specifically, "regardless of its positive or negative connotations, risk can be seen as a condition of modern society (or modernity)" (Trumbo, 2013, p. 95). While the sociological paradigm is not as dominant as the cultural and psychometric paradigms of risk perception, it is still crucial to the overall field of risk perception research and further reducing the risk of populations most at risk due to their socioeconomic status and/or influence of a variety of institutions in charge.

Even though the cultural and sociological approaches of risk perception have been fruitful and provided essential insight, the psychometric paradigm of risk perception has been the most profound in contributing to risk communication research (Kellens et al., 2013; Rundmo & Nordfjaern, 2017; Trumbo, 2013). This paradigm originally stems from the works of Fischhoff et al. (1978) and Slovic (1987), when the main assessment of risk perception was based upon an individual's "feelings of dread" (Slovic et al., 2004, p. 314) and based upon probability of risk (Ter Huurne, 2008).

Since then, the psychometric paradigm has gravitated towards understanding “risk as feelings”, focusing on an individual’s affective response to a given risk related scenario, which the reaction can occur fast and drastically (Loewenstein et al., 2001; Rundmo & Nordfjaern, 2017; Slovic, 1992; Slovic, 2000; Slovic, 2004; Trumbo, 1996a; Trumbo, 1996b; Trumbo, 2013). If an individual’s feelings gravitate towards being favorable of the risk-related situation, then the individual is most likely encouraged to “… judg[e] the risks as low and benefits as high; if their feelings toward it are unfavorable, they tend to judge the opposite—high risk and low benefit” (Slovic et al., 2004, p. 315). Furthermore, “risk as feelings” often focuses on the expressive responses to risk including fear and anxiety and is tied to mental markers also known as mental shortcuts or cues (Slovic, 2010; Ter Huurne, 2008; Trumbo, 2013). The mental shortcuts lead individuals to compare the risk to past experiences and determine how probable it is to occur. The dual process theories provide further insight into risk perception (Slovic, 2010; Trumbo, 2013). It is essential to provide further clarification on the generalizations of risk perception and conclusions commonly found throughout the literature. Specific emphasis is placed on discussion of risk perception from a psychometric approach given the nature of this study, and wide acceptance within the risk communication arena. Further discussion on quantifying and analyzing risk perception from a psychometric approach is included too.

2.7 Summary of Literature on Risk Perception in Natural Hazards Research

This portion of the literature review specifically summarizes risk perception and risk-related information seeking literature specifically focused on natural hazards. It is particularly important to provide an overview of this literature since it offers insight into the different concepts that influence risk-related information seeking behavior and risk perception. It also provides insight into how robust the field is, gaps within the literature, and how this study fits within the literature.

The subsequent articles were located by searching for a mixture of terms in peer-reviewed articles including risk-related information seeking, risk perception, natural hazards, natural disasters, and the name of each type of natural hazard. Table 1 highlights these studies for each natural hazard, but it is not a complete list. There simply are too many studies to extensively highlight (especially related to risk perception) and such an elaborative discussion would take away the nature of this literature review and study. As seen in Table 1 and the succeeding paragraphs, a majority of the peer-review literature cited is heavily concentrated on risk perception for specific types of natural hazards and less frequently on a broader approach—assessing risk-related information seeking behavior of natural hazards. This is not to say there is no literature focused on risk-related information seeking of natural hazards, but rather the attention is more dominated on one side more than the other. It is evident that there is a great need for empirical research, such as in this study, to further expand the field and not focus solely on risk perception. Risk perception and risk-related information seeking behavior empirical research within the realm of natural hazards has expanded significantly over the years including research related to hurricanes, volcanoes, earthquakes, floods, wildfires, droughts, tsunamis, and multi-hazard studies, as seen in Table 1. This list of natural hazards is by no means entirely complete, but rather a reference of the common natural hazards and widely cited within the literature. Also, it is again important to stress that the literature cited above is predominantly centered on risk perception of natural hazards and the minority is focused on risk-related information seeking behavior. Other natural hazards that could use additional attention include landslides and avalanches, however, this is beyond the scope of this study.

Table 5.
List of Risk Perception and Risk-Related Information Seeking Empirical Studies with a Focus on Natural Hazards.

Type of Natural Hazard	Authors with Relevant Articles
Droughts	Duinen et al., 2014; Switzer & Vedlitz, 2017
Earthquakes	Armas, 2008; Li et al., 2017; Tekeli-Yesil et al., 2011
Floods	Armas & Avram 2009; Baan & Klijn, 2004; Biernacki et al., 2008; Botzen et al. 2009; Brilly & Polic, 2005; Felgentreff 2003; Griffin et al., 2008; Griffin & Reusswig, 2006; Heitz et al., 2009; Kellens et al., 2011; Kellens et al., 2012; Kellens et al., 2013; Kievik & Gutteling, 2011; Knocke & Kolivras, 2007; Krasovskaia, 2001; Lazo et al., 2015; Miceli et al., 2008; Morss et al., 2016a; Morss et al. 2016b; Ruin et al., 2007; Ryan et al., 2013; Siegrist & Gutscher, 2006; Slinger et al., 2007; Terpstra et al., 2009; Terpstra, 2011
Hurricanes	Cahyanto et al., 2016; Dash & Gladwin, 2007; Demuth et al., 2016; Peacock et al., 2005; Rickard et al., 2017
Multi- Natural Hazards	Lindell & Hwang, 2008; Plapp & Werner, 2006; Wachinger et al., 2012
Tornadoes	Ash et al., 2013; Schumann et al., 2017; Wallace et al., 2015
Tsunamis	Couling, 2014; Goeldner-Gianella et al., 2017; Kurita et al., 2007
Volcanoes	Barberi et al.,2008; Bird et al., 2010; Heijmans, 2001; Johannesdottir & Gisladottir, 2010
Wildfires	Brenkert-Smith et al., 2012; Brenkert-Smith et al., 2013; Champ et al., 2013; Crow et al., 2015; Dickinson et al., 2015; Gardner et al., 1987; Kumagai et al., 2006; Lindell & Perry, 2012; Martin et al., 2009; McCaffrey, 2004; McCaffrey, 2008; McCaffrey et al., 2013a; McCaffrey et al., 2013b; McCaffrey and Olsen, 2012; McCool et al., 2006; Paveglio et al., 2015; Steelman & McCaffrey, 2013; Steelman et al., 2015; Toman et al., 2013; Velez et al., 2017

Note that a majority of the publications list below are focused on risk perception. A smaller amount of the literature is specifically focused on risk-related information seeking behavior of natural hazards.

Origins of research focused on risk perception specifically related to natural hazards can be traced back to the 1940s when natural hazards geographer, Dr. Gilbert White first pioneered the field through his research on the floods within the United States. His initial study focused on the human ecology of floods (Bird, 2009; Brilly & Polic, 2005; Gaillard, 2008; Kellens et al., 2013; White, 1945). White discovered that the lay public's hazard experience related to floods had a direct impact on their behavioral intentions, especially if there was an imminent threat of flooding (Bird, 2009; Brilly & Polic, 2005; Kellens et al., 2013). It was not until the 1960s that risk perception became the center of political debate, focusing less on natural hazards and more on technological hazards—a time in which nuclear risk was most prominent (Kellens et al., 2013). However, within the past few decades, risk perception of natural hazards has once again gained traction and been pivotal towards understanding the lay public's behavior, understanding of risk, and essential to improving the field of risk communication. The following provides an overview of risk perception research related to the following natural hazards: hurricanes, tornadoes, floods, droughts, earthquakes, volcanoes, tsunamis, and wildfires, providing a general perspective on the field and how it can vary greatly between hazards.

As seen in Table 1, Demuth et al. (2016) focused on assessing risk perception and efficacy beliefs related to hurricanes, determining the relationships between cognitive and affective risk perception, past hazard experience, efficacy beliefs, hazard knowledge, hurricane evacuation intention, emotional impact, and demographics (gender, age, educational attainment, employment, race, primary language, length of residence, residence ownership, residence type, ethnicity, and world views). More specifically, this study highlighted the mediated connection between past hazard experience and hurricane evacuation intention. The authors found that almost half of the individuals in the study had already experienced evacuating for a hurricane and over half of them also had previous experience dealing with hurricane damage (Demuth et al., 2016). They also discovered that even individuals who do not have direct hazard experience from hurricane evacuation(s), financial burdens, and/or damage can still experience emotional repercussions from hurricanes. In relation to the mediating connections between the concepts, Demuth et al. (2016) discovered a robust association between cognitive and negative risk perception, self-efficacy, and response efficacy related to amplified hurricane evacuation intentions. “The mediation analysis with past evacuation experience indicates that it had a significant, positive influence on evacuation intention indirectly through all four mediating variables” (Demuth et al., 2016, p. 335). Female individuals of Hispanic descent who were older and spoke Spanish were found even more likely to have amplified hurricane evacuation intentions (Baker, 1991; Demuth et al., 2016; Huang et al., 2016; Lazo et al., 2015; Morss et al., 2016a).

The authors highlighted that cognitive and negative risk perception, along with efficacy beliefs (self-efficacy and response efficacy) were impacted by demographics. Most notably, age, individualist worldview, and length of residency were attributed to having the greatest impacts (Demuth et al., 2016). Past hazard experience also impacted efficacy beliefs, resulting in amplified efficacy beliefs related to evacuation capability and how successful evacuating is in lowering vulnerability. Demuth et al. (2016) revealed that individuals who had past hazard experience related to hurricanes and damage to their property subsequently resulted in lower response efficacy. As a result, those individuals are not as inclined to believe evacuating for a hurricane is the best option to reduce their risk and vulnerability. Overall, "the broad notion of one's past 'experience' with a hazard can encompass many different aspects, which can influence how one judges and responds to a future risk situation" (Demuth et al., 2016, p. 338). It is evident that Demuth et al. (2016) focused on the influence and importance in understanding past hazard experience related to precautionary actions and risk perception. Their findings suggest the need for further research devoted to understanding the importance of concepts such as past hazard experience and risk perception and improving upon risk communication interventions to promote positive behavioral responses (Demuth et al., 2016).

Wallace et al. (2015) also provide insight into risk perception, past hazard experience, and demographics, but in this instance, they focused on tornadoes (Table 1). Their research revealed that "actual experience had little impact on perceptions of future encounters with a tornado" (Wallace et al., 2015, p. 411) and that individuals believed it was probable that any future tornadic event would result in property damage or threat to their personal safety. Conversely, a substantial interrelationship was revealed for perceived risk. However, there was no substantial connection between an individual's location and their perceived risk. Also, no distinct relationship was found amongst perceived risk and an individual's actual experience (Wallace et al., 2015). The works of Wallace et al. (2015) reveal that indirect experience can indeed influence risk perception. This has the potential to provide key insight for decision makers, suggesting it is essential to further refine and enhance risk communication strategies along with preparedness and mitigation practices (Wallace et al., 2015).

As seen in Table 1, Barberi et al. (2008) provide an account of risk perception related to volcanoes. Here, the authors draw upon characteristics such as salience of the hazard, self-efficacy, hazard knowledge, hazard mitigation strategies, knowledge of risk reduction program, trust in officials, source of hazard information, hazard information channel, sense of community, and demographics (gender, age, and educational attainment) to assess the direct and indirect effects they have on risk perception (Table 1). Barberi et al. (2008)'s study stresses the need for decision makers and scientists to enhance risk-related information, messaging, and to improve upon educational outreach opportunities to help the public increase their self-efficacy (Barberi et al., 2008).

Gaillard (2008) also provides accounts of individual risk perception related to volcanos. However, emphasis is placed more on hazard experience, behavior response, protection knowledge, and confidence levels (Table 1). Gaillard stresses that "…volcanic risk perception may be a significant factor contributing to people's behavior in the face of volcanic hazards" (Gaillard, 2008, p. 325), which follows suite to other risk perception studies within the realm of natural hazard research. Here, Gaillard determined that high-risk perception alone does not prevent people from residing within hazardous landscapes, such as areas prone to volcanic eruptions. Rather, it is evident that factors such as cultural implications and political-economy are more influential (Gaillard, 2008).

As seen in Table 1, Tekeli-Yesil et al. (2011) focused on earthquake risk perception, examining both objective and subjective risk perception, awareness/hazard knowledge, past hazard experience, attitude toward action, source of information, participant general safety practice, and demographics (gender, age, presence of child at home, marital status, location of home, economic level, educational attainment, home ownership, and level of socioeconomic status (Table 1). Demographics such as educational attainment and socioeconomic status were significantly influential to enhancing risk knowledge along with geographic location. However, while demographics were greatly influential for risk knowledge, they did not account for high-risk perception. Rather, Tekeli-Yesil et al. (2011) suggest that "…individuals' characteristics or emotions and the way information relating to disasters is communicated (e.g., type of message, methods used to disseminate messages), might have a greater influence on risk perception" (Tekeli-Yesil et al., 2011, p. 445). Thus, it is critical to ensure decision makers and risk communicators take these factors into consideration when creating best management practices and working with the lay public (Tekeli-Yesil et al., 2011). This does not only hold true for earthquakes but across the natural hazard spectrum including wildfires, tsunamis, and droughts as also mentioned below.

A brief overview of risk perception related to wildfires is also provided. However, further discussion on wildfires and wildfire risk is discussed later on in the literature review. The purpose of providing this brief overview is to show how it contributes to the natural hazards literature overall.

Martin et al. (2009) provide one of many accounts of wildfire risk perception and focus on understanding risk reduction from the homeowner's perspective, specifically those within the WUI. The authors included the following concepts in their analysis: subjective hazard knowledge, locus of responsibility, residency status, self-efficacy, past hazard experience, and demographics (age, gender, education, length of residency, and income) (Table 1). Risk reduction behaviors are influenced by concepts such as hazard knowledge, efficacy, responsibility, and residency status (seasonal vs. fulltime resident) (Martin et al., 2009). However, past wildfire experience was not attributed to having an overall impact on risk perception nor an effect on risk reduction behaviors (MacKinnon et al., 2002; Martin et al., 2009; Sobel, 1982). "One possible 'residue' could be that no matter what you do to protect yourself from a hazard it will never be enough" (Martin et al., 2009, p. 495). There was no mediating connection discovered between risk perception and self-efficacy. Rather, self-efficacy was reported to have a direct effect on risk reduction behaviors (Martin et al., 2009). Also, reducing individual risk was more common in individuals with full-time residency in comparison to those with seasonal status. Subjective knowledge and locus of responsibility were also discovered to impact risk reduction behaviors. Martin et al. (2009)'s research discovered that higher risk perceptions resulted in individuals more likely taking risk reduction behaviors to reduce their risk and vulnerability, which follows the works of O'Connor et al. (1999) and Setbon et al. (2005). In general, Martin et al. (2009)'s research highlights the importance of enhancing education outreach and improvements in risk communication (Barberi et al., 2008; Demuth et al., 2016; Tekeli-Yesil et al., 2011; and Wallace et al., 2015).

In addition to research devoted to understanding risk perception of tornadoes, hurricanes, wildfires, and volcanoes, there has been some research devoted to understanding tsunami risk perception and related concepts (Table 1). However, literature focused on this natural hazard is not as frequent as the other natural hazards.

Specifically, Goeldner-Gianella et al. (2017) analyzed tsunami risk perception of tourists and provided discussion on tsunami evacuation too. Here, hazard knowledge was analyzed along with protective action; awareness of tsunami alerts; and demographics. When evaluating permanent residents in comparison to tourists in terms of risk, Goeldner-Gianella et al. (2017) found that permanent residents were more cognizant of tsunami risk than tourists. However, even though it appears as though individuals who are permeant residents are more perceptive of tsunamis, there are other areas where their knowledge of preparedness is lacking. It is evident that their evacuation preparedness is lacking, along with their understanding of warning systems. This is unfortunate especially since Goeldner-Gianella et al. (2017) mention how communication strategies about both had been improved within recent years. In terms of tourists, Goeldner-Gianella et al. (2017) suggest there is simply not enough information related to tsunami risk for tourists. Also, perhaps it can be inferred then that there is not enough information about tsunamis nor ideal communication strategies. It appears that while this study provides some insight, local changes are needed in terms of improvements in risk communication and preparedness strategies.

Kurita et al. (2007) also assessed risk perception of tsunamis, but in this instance analyzed and compared school children, school teachers, government officials, and the lay public in three different countries (Table 1). This provides a unique perspective on risk perception and related concepts. None of the other research studies discussed within this literature review related to risk perception provide the perspective of both decision makers and different sectors of the lay public. In this study, the emphasis was placed more on the concepts of risk perception, rather than just discussing risk perception in general. When assessing school children, Kurita et al. (2007) assessed interest in studying natural hazards, discussion of tsunamis with family members, and knowledge of what causes a tsunami. The school teacher analysis focused on evaluating curriculum within the classroom focused on natural hazards, teaching pedagogies, and how effective it is for risk perception. The government officials' portion of the study focused on evaluating past hazard experience, partnerships between the lay public and decision makers, disaster reduction communication strategies, interagency cooperation, and determining ideal evacuation locations. Assessment of the lay public directly focused on assessing hazard knowledge, effective media sources, and the best evacuation locations. Overall, Kurita et al. (2007) found a common lack of knowledge related to hazard risk amongst individuals residing within the hazardous landscape, opposite of what was discovered by Goeldner-Gianella et al. (2017). Some of the main conclusions drawn from this study are not as applicable to this current study and literature review. Thus, only the points applicable are mentioned. Past hazard knowledge did play a role in increased hazard awareness and reduction in tsunami related damage in the instance of residents residing on Simeulue Island (Kurita et al., 2007). This was attributed to the accounts of a 1907 tsunami being passed down from relatives. However, in other areas researched, the levels of past hazard knowledge were not as high. Again, there seems to be quite the variability in the influence of past hazard experience, requiring further research and potentially refinement. Kurita et al. (2007)'s research appears to be more focused on the concepts of risk perception than the exact evaluation and discussion of risk perception.

Also included in Table 1 is the works of Duinen et al. (2014). Here, the authors focused on assessing risk perception related to droughts and examining the relationships between past hazard experience, perceived control, trust in water board officials, social influences, implications of the presence of water supply, percentage of total area suffering from salinization, presence of fruits of flower, farm revenue, and demographics such as age and educational attainment. Again, assessing risk perception with common concepts seen in other research studies but also including unique ones pertinent to this particular natural hazard. "The results show that the occurrence of salinization, the cultivation of drought- or salt-sensitive crops, farm revenue, drought risk experience, and perceived control are significant factors of farmers' drought risk perceptions" (Duinen et al., 2014, p. 13). Farmers perceive drought risk based upon both objective and subjective concepts, suggesting risk perceptions are not homogenous but rather there is heterogeneity. Also, in this instance, Duinen et al. (2014) found that objective and subjective concepts were more influential to risk perception than demographics such as age and educational attainment, following suit of Duinen et al. (2014), Gbetibouo (2009) Kellens et al. (2011), Kellens & Terpstra (2013), Maddison (2007) Mandleni & Anim (2011), Miceli et al. (2008), Safi et al. (2012), and Tang et al. (2013). Duinen et al. (2014) found a dual-process approach of risk based upon their research. Moreover, farmers depend on rational and experiential systems related to drought risk perception at the same time. This research provides a pivotal and critical evaluation of drought risk perception, especially since there is not a breadth of research focused on this perspective of natural hazards. It also sheds light on dual-processing theories, some of which can be interwoven through risk-related information seeking models, such as the RISP model previously discussed.

Lastly, Switzer & Vedlitz (2017) also focused on assessing risk perception of droughts, focusing on individual awareness, risk perception, and drought policy preference, so a slightly different approach than the works of Duinen et al. (2014). In this study, drought severity is the best indicator if an individual is cognizant of drought circumstances. Switzer & Vedlitz (2017) had variable results related to the influences of demographics and it appeared as though they were more influential on drought awareness than on drought risk perception. There were no significant effects reported for individuals who were female nor for those who identified as Hispanic descent, which was different than anticipated. Educational attainment did not have a significant impact on drought risk perception. However, income was found to be statistically significant in relation to drought risk perception. Individuals who identified as Black were not as aware of droughts as individuals who identified themselves as being Caucasian (Switzer & Vedlitz, 2017). The Willmott-Feddema moisture index was proven to have a significant effect on risk perception along with political ideology, religiosity, and information about water. While partisanship was reported to not have a significant effect on risk perception (Switzer & Vedlitz, 2017). Furthermore, "…drought awareness was an extremely strong predictor of risk perceptions and also had an impact on policy preferences" (Switzer & Vedlitz, 2017, p. 653). It is evident that Switzer & Vedlitz (2017)'s research provides a thorough analysis of not only risk perception but drought awareness and policy preferences. However, again there is a need for further emphasis on improving communication strategies. Switzer & Vedlitz (2017) call for further research devoted to assessing the geographic influences along with further refinement in hazard awareness.

Interestingly, the natural hazards research devoted to understanding risk perceptions seems to suggest there is a need for further research and practical application. A majority of the articles all hinted at the need for decision-makers to improve risk communication strategies, mitigation efforts, and preparedness actions. The discussion about risk perception seems quite variable, contingent upon the geographic location, type of hazard, and residency status, to name a few. So, while the above accounts of risk perception studies are important to the overall literature, there is still the need for refinement.

2.8 Summary of Literature on Risk-Related Information Seeking in Natural Hazards Research

While it is evident that the majority of the natural hazards literature is focused on risk perception and other factors not pertinent to this study, there is evidence of a few natural hazards studies devoted specifically on understanding risk-related information seeking. This provides a foundation and traces the roots pertinent to this study, showing the need for even more studies centered on risk-related information seeking. This realm of research has been prominent within the public health field and psychology since the mid-20th century, but its traction within natural hazards research is much more recent. Primarily, research dedicated towards understanding risk-related information seeking behavior related to natural hazards blossomed in the early 2000s, providing a wonderful opportunity for risk communicators and interdisciplinary scientists to further understand how the public seeks critical information before, during, and/or after a natural hazard. This specific area of risk-related information seeking research has been primarily concentrated on flood hazards. A small subset has also concentrated on hurricanes, tornadoes, earthquakes, and a wildfire. Below provides a general assessment of the findings and studies related to natural hazards and risk-related information seeking. Some of the research focuses more on a combination of theoretical and practical application, providing examples of models previously discussed.

Cahyanto et al. (2016) assessed risk-related information seeking behavior of tourists (a transient population) in Florida, primarily related to hurricane evacuations (Table 1). Variables such as risk-belief, perceived hazard knowledge were evaluated along with past hazard experience, and active versus passive information seeking. Specifically, Cahyanto et al. (2016) discovered a positive association between risk belief and information seeking (Maser and Weiermair, 1998; Vogt and Fesenmaier, 1998). They also found a negative association between knowledge, past experience, and information seeking behavior related to hurricane evacuations, noting this follows the utility maximization principle (Cahyanto et al., 2016; Letson et al., 2007). Several general conclusions were discovered by the researchers and applicable to other natural hazard contexts. For example, Cahyanto et al. (2016) mention how risk-related information is often sought after extensively by an individual in order to reduce ambiguity, especially if they have less hazard knowledge and no past hazard experience (Cahyanto et al., 2016). Cahyanto et al. (2016) did not find a substantial effect between connectedness and information seeking related to the hurricane, which is not common. Generally, "…past studies have consistently found a positive effect of connectedness on information seeking" (Cahyanto et al., 2016, p. 271). Also, Cahyanto et al. (2016) noted that hazard knowledge negatively influences information seeking related to hurricane evacuations, a common finding throughout the years (Alba & Hutchinson, 1987; Brucks, 1985; Cahyanto et al., 2016; Cahyanto & Pennington-Gray, 2015; Vogt & Fesenmaier, 1998). Again, this can be attributed to the fact that individuals who have a lower hazard knowledge will seek information more than individuals with a higher hazard knowledge. Individuals who have a higher hazard knowledge are less likely to rely on sources such as decision makers and more likely to trust their personal accounts (Cahyanto et al., 2016). Overall, Cahyanto and colleagues' (2016) study provides great insight into the implications of hazard knowledge, past hazard experience, and risk belief. Given its focus on evacuations, it may provide a helpful reference for this study since wildfires can also require evacuations. It is, however, important to provide further context to risk-related information seeking related to other natural hazards, proving an extensive and thorough review of the literature.

There is much less research devoted to understanding risk-related information seeking of tornadoes than other natural hazards. Thus, the research of Schumann et al. (2017) is timely and crucial to the research as a whole. Specifically, Schumann et al. (2017)'s research focuses on assessing risk perception and the risk-related information seeking behavior related to tornadoes. They also evaluated cognition and response tactics related too. More specifically, an emphasis was placed on evaluating a wide range of concepts in this study, zoning in on the implications of visual warning graphics, demographics, past hazard experience, attention to information warning cognition and tornado characteristics (loss, frequency, and morbidity), as seen in Table 1. The authors discovered that "…information seeking tendencies and the frequency of loss-causing tornadoes in one's reported hometown play consistent roles in affecting warning response" (Schumann et al., 2017, p. 17). Thus, suggesting a need to cater information seeking to specific locations and/or types of natural hazards, understand how it can influence other areas such as warnings, and the need to consider the cultural factors influencing individuals' risk-related information seeking behavior and risk perception (Schumann et al., 2017). When Schumann et al. (2017) assessed the implications of gender on risk-related information seeking behavior, they concluded it had a significant effect. Overall, the authors found that risk-related information seeking, especially customized to the individual's past hazard experience and cultural background, is crucial and paramount to improving the risk communication field and provides insight into protective action too (Schumann et al., 2017). The work of Schumann et al. (2017) provides a unique approach towards understanding risk-related information seeking, focusing more on the visual portions of communication and highlighting slightly different concepts. However, several of the concepts that were included do indeed parallel other natural hazards research studies. Overall, their study suggests that research devoted to risk-related information seeking can branch out and be applicable to an array of subtopics.

Li et al. (2017) provide a slightly different approach to understanding risk-related information seeking, providing a more theoretical application. Specifically, the authors utilize the RISP model (previously mentioned as one of three dominant paradigms of risk-related information seeking). Here, Li et al. (2017)'s research focuses specifically on earthquakes, assessing precisely information need, perceived hazard knowledge, perceived information gathering capacity, informational subjective norms, and negative affective responses (Table 1). Just information needs and informational subjective norms were discovered to influence earthquake risk-related information seeking behavior. Their research aligns with previous studies, noting that individuals are more likely to search for risk-related information if they have a significant yearning for that information (Griffin et al., 2008; Kahlor, 2007; Kahlor et al., 2006; Krikelas, 1983; Li et al., 2017; Ter Huurne, 2008; Yang et al., 2014). Li et al. (2017) found that individuals will be more likely to seek risk related information (in this instance related to earthquakes) if they felt that family members and/or friends rely on them to be the most knowledgeable. This research revealed that risk knowledge and risk perception did not have significant impacts on earthquake risk-related information seeking, which is contrary to other studies which have found direct relationships (Li et al., 2017). However, risk perception was found to have a direct effect on information need and subsequently, information need was linked to having a direct effect on risk-related information seeking about earthquakes (Li et al., 2017). Thus, it is evident that while risk perception does not have a direct effect on risk-related information seeking, it does have indirect effects. Li et al. (2017) mentioned that "to [their] knowledge, this is the first successful effort in verifying the mediating role of information need in a statistical and academic way" (Li et al., 2017, p. 13). Since there is variation and conflicting research in the role of information need throughout the literature, it will particularly be important to pay close attention to this concept in this study. It is evident that the works of Li et al. (2017) both aligned with previous research on risk-related information seeking concepts and their mediating roles, along with pushing the research further, suggesting new discoveries that could continue to come up.

The research of Kellens et al. (2012) focuses on flooding on the Belgian coast, assessing the mediating role of information need, perceived hazard knowledge, efficacy beliefs, and demographics (Table 1). In contrast to the works of Li et al. (2017), Kellens et al. (2012) did not find a direct effect between information need, risk perception, and risk-related information seeking. Kellens et al. (2012) found that information need is not a direct mediator amongst hazard knowledge and risk-related information seeking behavior. Also, there was a difference in risk perception, perceived hazard knowledge, and information need when evaluating permanent residents versus those considered as temporary ones. Individuals who were reported as permanent residents had a higher risk perception and higher levels of perceived hazard knowledge and information need in comparison to those who temporarily reside within the area. Further discussion on the research from Kellens et al. (2012) is discussed below, providing further insight into each of the concepts, relationships, and methodologies.

Kievik & Gutteling (2011), as seen in Table 1, also researched flood hazards specifically evaluating the effect that efficacy beliefs have on information seeking behavior, mitigation, and risk perception. The authors recognized the need to further understand the implications that risk perception and efficacy beliefs have on risk-related information seeking. They concluded that risk perception and efficacy beliefs only had a partial effect on risk-related information seeking (Kievik & Gutteling, 2011). The authors did mention that striving to improve risk-related information seeking may result in individuals taking preventative action. Thus, emphasis should be placed on further refining risk messaging and the concepts of risk-related information seeking in future studies, such as this one (Kievik & Gutteling, 2011).

To date, there are very few studies that focus just on evaluating risk-related information seeking of wildfires. The majority of research is focused on risk perception or mitigation of wildfires. However, one study is worth mentioning given its analysis of risk-related information seeking of wildfires, research conducted by Velez et al. (2017). Specifically, the authors assessed risk-related information seeking behavior of wildfires, focusing primarily determining what media platforms and sources individuals use, and readiness actions, hazard knowledge, past hazard experience, and the influence of gender (Table 1). This study seems to focus more on the media and media platforms than the other risk-related information seeking studies focused on natural hazards. Velez et al. (2017) discovered that most of the individuals assessed rely on only one source for their information related to wildfires, the local news. They also reported that individuals were more likely to utilize the same sources for wildfire risk information they have previously for any future instances (Velez et al., 2017). Wildfire knowledge had a positive association with the overall amount of information sources utilized to seek risk-related information about wildfires. Velez et al. (2017) also assessed the effect of gender on risk-related information seeking and found no significant effect. This study did affirm that there is a link between trust, risk perception, and information processing.

Overall, the work of Velez et al. (2017) provides a thorough foundation for assessing site-specific, risk-related information seeking behavior. The authors discovered that risk-related information seeking behavior has the potential to vary considerably based on the geographic location of the individual. Thus, it is crucial to provide further insight and continue to improve risk communication strategies. Furthermore, “during the fire season, it is important that officials ensure consistent messages between unidirectional and interactive information sources. During times of large fire growth potential, preparedness and evacuation messages should be concentrated with daily weather information sites and television and internet news sources" (Velez et al., 2017, p. 476).

It is evident that predominantly past hazard experience, perceived hazard knowledge, and demographics such as gender are most common concepts across the risk-related information seeking studies, as seen in Table 1 (Cahyanto et al., 2016; Kellens et al., 2012; Kievik & Gutteling, 2011; Li et al., 2017; Schumann et al., 2017; Velez et al., 2017). The remaining concepts included in each of the studies vary considerably and are more suitable to the specific natural hazard in the review. Also, it is evident that the risk-related information seeking studies of natural hazards were done only within the last seven years. Whereas, the risk perception research related to natural hazards has dominated the literature much longer. While it is wonderful to point out the progression in this area of research, it has not blossomed as much as risk perception studies. In fact, while analyzing empirical research for this study, only six research studies were found to specifically evaluate risk-related information seeking about a specific natural hazard and scenario at the caliber and thoroughness necessary to provide robust and helpful conclusions, as seen in Table 1. Thus, this current study is timely, innovative, and crucial to continue to enhance not only risk-related information seeking literature but also the natural hazards and risk communication literature too. Ultimately, research such as this can help reduce individuals' risk to natural hazards, even if on aminuscule scale. Information about risk and vulnerability of a natural hazard can help save lives.

Table 6.
Overview of Peer-Review Research on Risk Perception and Risk-Related Information Seeking Behavior Related to Natural Hazards.

Reference	Natural Hazard	Location	Concepts Assessed	Result Examined
Demuth et al. (2016)	Hurricane	Florida	Cognitive risk perception, affective risk perception, past hazard experience, efficacy beliefs, hazard knowledge, hurricane evacuation intention, emotional impact, gender, age, educational attainment, employment, race, primary language, length of residence, residence ownership, residence type, ethnicity, worldviews (belief in social structures and networks)	Risk perception and efficacy beliefs related to hurricanes
Cahyanto et al. (2016)	Hurricane	Florida	Risk-belief, connectedness, perceived hazard knowledge, past hazard experience, active information seeking, passive information seeking	Understanding information seeking behavior of tourists related to hurricane evacuation
Wallace et al. (2015)	Tornado	Alabama	Past hazard experience, age, gender, educational attainment, income, housing ownership	Perception of tornado risk
Schumann et al. (2017)	Tornado	South Carolina	Attention to information about tornadoes, past hazard experience, interest in weather, warning cognition (perceived fear and protective action intention), tornado losses, tornado frequency, tornado morbidity, gender, race/ethnicity, age, graphical effects (visual warning graphics)	Perception of risk, cognition, response tactics, and information seeking behavior related to tornadoes
Barberi et al. (2008)	Volcanic Eruption	Italy	Salience of the hazard, self-efficacy, prior hazard knowledge, hazard mitigation strategies, knowledge of risk reduction program, trust in officials, source of hazard information, hazard information channel, sense of community, gender, age, educational attainment	Risk perception of a volcanoes

Reference (continued)	Natural Hazard (continued)	Location (continued)	Concepts Assessed (continued)	Result Examined (continued)
Gaillard (2008)	Volcanic Eruption	Philippines	Hazard experience, behavioral response, protection knowledge, confidence level	Risk perception of a volcanoes
Li et al. (2017)	Earthquake	China	Information need, perceived hazard knowledge (referenced as current risk knowledge), perceived information gathering capacity, informational subjective norms, negative affective responses (affect)	Understanding information seeking behavior related to earthquakes
Tekeli-Yesil et al. (2011)	Earthquake	Turkey	Awareness/ hazard knowledge, past hazard experience, attitudes toward action, source of information, participant general safety practice, objective risk perception, subjective risk perception, gender, age, presence of a child at home, marital status, location of home, self-expressed economic level, educational attainment, home ownership, level of socioeconomic status	Risk perception of earthquakes
Kellens et al. (2012)	Flood	Belgian Coast	Information need, perceived hazard knowledge, efficacy beliefs, demographics	Perception of risk and information seeking behavior related to coastal floods based up on the mediating roles of the concepts
Kievik & Gutteling, (2011)	Flood	Netherlands	Actual information seeking, intention to seek information, intention to take precautionary measures, response efficacy, efficacy scale, flood risk, risk perception	Perceptions of flood risk and efficacy beliefs effect information seeking behavior and mitigation
Martin et al. (2009)	Wildfire	Colorado and Oregon	Subjective hazard knowledge, locus of responsibility, residency status, self-efficacy, past hazard experience, age, gender, education, length of residency, income	Risk reduction for homeowners residing within the WUI and risk perception of wildfires

Reference (continued)	Natural Hazard (continued)	Location (continued)	Concepts Assessed (continued)	Result Examined (continued)
Velez et al. (2017)	Wildfire	California	Media platforms, hazard knowledge, information seeking, past hazard experience, readiness actions, gender	Information seeking of wildfires
Goeldner-Gianella et al. (2017)	Tsunami	Norway	Hazard knowledge, protective action, awareness and opinion of tsunami alerts, residency status, age, gender, length of residence, nationality	Perception of tsunami risk and discussion on tsunami evacuation of tourists
Kurita et al. (2007)	Tsunami	Indonesia, Sri Lanka, and Maldives	School children: interest in studying natural hazards, discussion of tsunamis with family members, knowledge of what causes a tsunami School teachers: indication if natural hazard material is incorporated with lesson plans, effectiveness of natural hazard education, effective medium of natural hazard education Government officials: past hazard response, partnerships between the lay public and government officials, disaster reduction communication strategies, interagency cooperation, optimal evacuation locations Lay public: hazard knowledge, effective media sources, ideal tsunami evacuation locations	Determine regional differences in perception of tsunami risk of the following groups

Reference (continued)	Natural Hazard (continued)	Location (continued)	Concepts Assessed (continued)	Results Examined (continued)
Duinen et al. (2014)	Drought	Netherlands	Presence of water supply, percentage of total area suffering from salinization, presence of fruits of flower, farm revenue, past hazard experience, perceived control, trust in water board officials, social influence, age, educational attainment	Subjective and objective concepts influencing farmer's drought risk perception
Switzer & Vedlitz, 2017	Drought	United States	Concepts influencing individual awareness of drought, risk perception, and policy preference	Perception of drought risk

2.9 Previous Studies: Wildfire Risk, Risk-Related Information Seeking, and Risk Perception

Several factors contribute to increases in wildfire risk, creating further need to assess wildfire risk-related information seeking behavior and risk perception. Specifically, since the United States Forest Service's (USFS) main strategy to reduce wildfire risk has been fire suppression for over 50 years and there subsequently has been a buildup of fuels, there has been an increased risk for wildfires (Dickinson et al., 2015; Crow et al., 2015). As climate change continues to occur, it will alter fire regimes, resulting in more persistent droughts, and change the frequency, intensity, and severity of wildfires—most likely not in a good manner (Dickinson et al., 2015; Crow et al., 2015; Hessl, 2011). Also, there are more individuals residing within the Wildland Urban Interface (WUI) than ever before, exacerbating the wildfire risk that is already a result of fire suppression and climate change (Dickinson et al., 2015; Crow et al., 2015; Koebele et al., 2015). As more individuals migrate to the WUI in portions of the Intermountain West, it is imperative that these individuals understand their risk and vulnerability and seek information to help reduce the loss of life and property. Clearly, wildfire risk is not diminishing but rather increasing and will continue to do so if there are no significant changes done in fire management (Crow et al., 2015). It is crucial to understand risk-related information seeking behavior to help improve upon risk communication strategies, provide better messaging, mitigation strategies, and educational outreach (Crow et al., 2015; McCaffrey, 2008; Rickard et al., 2017).

It is evident that wildfires have been a common occurrence over the years despite the push from the lay public, policy advocates, and fire managers to suppress and eliminate this natural hazard from the ecological landscape (Crow et al., 2015;

Dickinson et al., 2015; Dombeck et al., 2004; Paveglio et al., 2015; Stephens & Ruth, 2005). The common occurrence, attachment to wildfires, and fires, in general, can be attributed to cultural ties, the progression of urbanization, and more recently the expansion of the WUI.

Culturally, individuals across the globe and more specifically the United States has heavily relied on wildfires for their daily life (Pyne, 2015). Uniquely, yet not surprisingly, changes in wildfire hazards and fire management have aligned with the progression of urbanization. Specifically, there are unique differences between the utility and impacts of wildfire before and after industrialization. Prior to industrialization, wildfires were wild, frequent, and abundant and utilized to transform landscapes. Individuals intentionally burned landscapes, altering fire regimes or recreating them (Pyne, 2015). Once industrialization took root, the manner, and perception of burning changed. The lay public ventured away from frequently carelessly lighting fires. Rather, fire was integrated into daily life through calculated and controlled methodologies. The internal combustion paved the way for future urbanization and fossil fuels became too dominant (Pyne, 2015). Individuals eventually did not light many fires, if any as they once had. Rather, fire suppression became the norm and widely accepted as a tactical strategy to combat wildfires. Thus, as the patterns of wildfire occurrence and management changed because of fire suppression, at the same time, the lay public started to encroach on forested landscapes, changing the boundary between areas habituated and uninhabited, commonly known as the WUI.

The WUI is the geographic buffer between urbanized populations and unscathed wilderness. Here lies the juxtaposition between nature and society and where wildfire goes from being considered a beneficial occurrence for ecosystems to a natural hazard. There is grave concern about the increase in the number of individuals residing within the WUI and the increase in the geographic size throughout the United States (Crow et al., 2015; Mell et al., 2010). Increases in the geographic scope and societal impacts of the WUI are resulting in increases in risk and vulnerability, strain on suppression tactics, extensive economic loss, and require vast changes in mitigation efforts (Brenkert-Smith et al., 2006; Brenkert-Smith et al., 2012; Brenkert-Smith et al., 2013; Crow et al., 2015; Dickinson et al., 2015; Martin et al., 2007; McCaffrey, 2004; McCaffrey et al., 2011; McCaffrey et al., 2013b; Mell et al., 2010; Paveglio et al., 2015; Radeloff et al., 2005;). Wildfires impact both private and public landscapes. Unfortunately, communities that are at risk for wildfires are not necessarily aware of the extent of their risk and commonly homeowners do little to help reduce fuels (Smith and Petley, 2009).

Expansion of the WUI can be attributed to increases in urbanization. Much of the population shift can be attributed to baby boomers, who commonly are choosing to relocate to warmer areas once they retire. In several instances, the locations they choose to reside just so happen to also include portions of the WUI and expansions to this geographic zone (Hammer et al., 2009). Also, other individuals are finding economic opportunities within these areas and drawn to the majestic mountain landscapes. It is evident that increases in the WUI are also a result of historic wildfire management tactics and policy, especially related to fire suppression.

Over time, fire suppression tactics have occurred across both populated and unpopulated regions. However, more commonly, this type of fire management has frequented populated landscapes. Thus, individuals have entrusted that wildfires can be mitigated and managed effectively and efficiently (Paveglio et al., 2015), resulting in a false sense of security and residual risk.

Within populated landscapes, wildfires are considered a natural hazard, resulting in a catastrophe (Gardner et al., 1987; Paveglio et al., 2015). Individuals are commonly drawn to landscapes that experience wildfires due to their natural beauty and opportunity for recreation. Yet, wildfires are not as prevalent throughout the natural hazards literature as are floods, tornadoes, and earthquakes (Brenkert et al., 2006; Gardner et al., 1987; McCaffrey, 2004; Martin et al., 2007; Martin et al., 2009). It has only been since the mid-2000s that the wildfire literature has slowly gravitated towards the realm of natural hazards. This has partially been a result of increases in the frequency and severity of wildland fires within the Intermountain West (Martin et al., 2007), yet there is a great need for additional progress.

Since the 20th century, wildfire management in the United States has been dominated by a singular paradigm—fire suppression. Within this overarching paradigm, there have been three sub-paradigms dominating the field during the following time periods: late 1800s, early 1900s, mid-1900s-early 2000s. From the late 1800s through the early 1900s, wildfires were used for land-use planning purposes throughout portions of the United States. Specifically, wildfires were set to help clear land to expand agricultural landscapes, improving production and quantity, whereas in other instances fire was used to clear vegetation and landscapes to expand railroads (Dombeck et al., 2004). However, slash and burn methodologies along with dry climate conditions commonly resulted in wildfires that were out of control and catastrophic. It was not until 1905-1911 when devastating and frequent wildfires throughout the United States occurred that the federal government became extensively involved in the fight against fires impacting the lay public (Busenberg, 2004; Dombeck et al., 2004; Pyne, 2001). During this time, the USFS attempted to respond to the devastating wildfires through more aggressive suppression tactics (Busenberg, 2004; Dombeck et al., 2004). Emphasis was placed on extensive efforts on firefighting, rather than widespread attempts at reducing fuel loads of the vegetation (Busenberg, 2004). Subsequently, there was a massive buildup of fuels throughout the various ecosystems in the United States (Paveglio et al., 2015). Thus, several scholars have attributed increases in wildfire risk to the buildup of fuels (Busenberg, 2004; Paveglio et al., 2015; Pyne, 2015). This mentality would continue throughout the 20th century, strengthening wildfire-fighting efforts and fire science research. In fact, since the 1940s, the USFS has been known to have the most extensive and efficient wildfire-fighting efforts in the entire world (Dombeck et al., 2004). While some individuals may find it archaic, practices of fire suppression that were created in the mid-1900s continue to be at the forefront of policy, research, and decision making as the 21st century progresses. The early 2000s gave way to slight policy changes and foreshadowed the need for a paradigm shift. Two policy creations were centered on this change including the National Fire Plan of 2000 and the Healthy Forest Restoration Act of 2003. Ideally, these were created to address wildfires from a different perspective, encouraging the lay public to become more actively involved in controlling wildfire risk on a personal level (McCaffrey et al., 2011). It also has resulted in the support for multidisciplinary research and more extensive thought on wildfire research from a risk perspective.

While, over the years, the majority of wildfire management in the United States has been centered on suppressing wildfires, there is new hope that further research can propel the field to focus on addressing risk perception in hopes of continuing to reduce the lay public's risk to wildfires. Even though there has been a slight paradigm shift, it is slow to be implemented, accepted, and not fully developed in some areas. Thus, there is a great need for further research centered on non-tactical approaches towards wildfire management and risk reduction. Assessing the lay public's perception of wildfire risk and integrating risk communication is timely and pivotal.

Within the realm of wildfire risk and social science literature, the majority of the research has been centered on evaluating wildfire risk through educational outreach, particularly from the homeowner's perspective (Brenkert-Smith et al., 2012; Crow et al., 2015; Hyde et al., 2013; McCaffrey et al., 2011; Miller & Ager, 2013; Paveglio et al., 2015; Syphard et al., 2014). There have only been a few studies focused on assessing risk-related information seeking and risk perception related to wildfires, and while there may only be a few, their implications are profound and contribute to the larger array of natural hazards and risk communication literature (Cohn et al., 2006; Kumagai et al., 2004; McCaffrey et al., 2013a; Taylor et al., 2007; Velez et al., 2017). It is essential to provide discussion on the breadth of wildfire risk and risk-related information seeking research to highlight areas of strength, how this study fits into the literature, and potential suggestions for future research beyond this current study

The wildfire literature avows that there is a link between risk perception, risk-related information seeking, and preparedness strategies related to wildfires (McCaffrey et al., 2013b; Velez, 2017). Scholars have found that "…local information seeking and public information dissemination influence both locally specific risk perception and wildfire preparedness actions" (Brenkert-Smith et al., 2013; McCaffrey, 2004; Velez et al., 2017, p. 469). The wildfire risk literature also indicates that there are several factors which influence the lay public's perception of wildfire risk and ultimately risk-related information seeking behavior including: an individual's understanding of the local topography, their interaction or lack thereof with other geographic regions, who they blame when a wildfire occurs, and any concurrent disputes with other individuals (Kumagai et al., 2006; McCaffrey and Olsen, 2012; Paveglio et al., 2015; Toman et al., 2013). The lay public's perception of wildfire risk and risk-related information seeking behavior is also influenced by the potential societal impacts, severity to property and infrastructure, and how much external aid is needed. When a wildfire occurs, it places the lay public on high-alert and in potentially risky scenarios. Thus, the lay public critically needs effective and efficient information during these situations (Lindell & Hwang, 2008; Lindell & Perry, 2012; Zeng et al., 2017).

Information before a wildfire is just as essential as during the hazardous event (McCool et al., 2006; Steelman & McCaffrey, 2013b; Velez, 2017). Specifically, disseminating information related to defensible space and potential evacuations routes helps the lay public be prepared prior to a wildfire. While, information related to the severity, intensity, and urgency of evacuation, and real-time information of a wildfire's progression and containment during a wildfire is crucial during the hazardous event (Velez, 2017). Individuals pursue risk-related information from a variety of platforms ranging from social media to traditional media sources such as television and the radio, and most commonly family and friends (Zeng et al., 2017).

The public's trust in the validity of the wildfire risk-related information is critical. Also, the lay public's trust in media and decision makers contributes to the information seeking process (Steelman et al., 2015; Velez, 2017; Winter & Cvetkovich, 2010). However, Steelman et al. (2015) discovered that during a wildfire event, the individuals are most likely to seek risk-related information through platforms they are most accustomed to irrespective if they can trust the source or if it is helpful (Velez, 2017).

Current literature on risk-related information seeking and risk perception related to wildfires has specifically found that there is a connection between information seeking, risk perception, and the geographic location (McCaffrey & Olsen, 2012; Velez, 2017). Specifically, Brenkert-Smith et al., (2013) discovered that there is likely an increase and distinct influence in an individual's risk perception based upon their geographic location and risk perception is linked to risk-related information seeking behavior (Velez, 2017). For example, those who reside within an urban landscape often will hear about a natural hazard such as wildfires from individuals face-to-face, television and/or digital platforms; whereas, individuals who reside within more rural location often will seek out information from specific decision makers from a local agency or the radio (American Red Cross, 2011; Cohen et al., 2007; Lachlan et al., 2008; Ryan, 2013; Velez, 2017). Velez (2017) discovered that risk-related information seeking behavior is influenced by an individual's perceived hazard knowledge and the specific situation surrounding the natural hazard. McCaffrey et al., (2013b) assessed risk-related information seeking behavior of individuals that choose to evacuate and those who choose to not evacuate during a 2010 wildfire event within Colorado and Arizona. Here, McCaffrey et al. (2013b) discovered that individuals who choose to evacuate sought out information related to the wildfire more than those who choose not to evacuate (Velez, 2017). Paveglio et al. (2015) discovered that there has been less literature devoted to understanding the public's perception of the impacts a wildfire has after the hazardous event.

Moving forward, it is essential that decision makers continue to try to maintain a positive relationship with the lay public, gain their trust, and continue to understand the lay public's perception of wildfire risk and risk-related information seeking behavior to further enhance risk messaging, improve upon policy measures, and further refine educational outreach.

CHAPTER III

STUDY DESIGN OVERVIEW

3.1 Definition of Concepts Employed

Within the past few decades, there has been research that has indicated individuals utilize a variety of resources to validate important risk-related information and more importantly, several concepts can greatly impact active risk-related information seeking behavior (Cahyanto et al., 2016). Understanding an individual's risk-related information seeking behavior is not a simple task. Individuals may not pursue pertinent risk information and in other instances, they may completely evade the information altogether (Kievik & Gutteling, 2011; Miller, 1987). Also, it is evident that within RISP, PRISM, and FRIS models that the various concepts assessed can vary, whereas in other instances they are similar. Oftentimes the concepts assessed with risk-related information seeking studies are selected due to their applicability to the given risk-context and consistent results across an array of studies. The purpose of this study is to assess individuals' information seeking behavioral intention, focusing on how the following concepts through a path analysis: dual process risk perception, self-efficacy, response efficacy, perceived hazard knowledge, current information need, as well as past information seeking. Demographics will also be evaluated, but external of the path analysis. Each of the concepts is discussed in the next portion of this study.

3.1.1 Information Seeking

Research devoted to information seeking has occurred for a long time and more recently that it has become a crucial topic within the risk communication literature (Kahlor, 2007). It is particularly an important concept within risk-related information seeking research studies, often known as the dependent variable analyzed and can offer insight into an individual's protective behavior. While there may be slightly varying definitions of information seeking (Li et al., 2017), the overall concept and importance are the same across an array of studies. In particular, information seeking is known as a deliberate approach to obtain information due to lack of information or the need for it (Griffin et al., 1999; Li et al., 2017; Zeng et al., 2017). Specifically, within the field of communication, it is oftentimes referred to as the "…level of seeking intensity" (Kahlor et al., 2006; Kahlor, 2007; p. 416; Lu, 2015). It is also important to provide further clarification of the different types of information seeking and discuss their relevance.

There are different types of information seeking referenced across the literature including active and passive information seeking, and past and future information seeking (Kahlor, 2007; Kahlor et al., 2006; Rosenthal, 2011). Discussion about future information seeking intentions is included within the risk-related information seeking behavioral intention section of this study. "Active [information] seeking describes a more goal-driven behavior, while passive [information] seeking describes a more ritual-based behavior" (Kahlor et al., 2006; p. 168). Several factors can influence the difference between an individual having active or passive information seeking. In particular, active information seeking requires an individual to go beyond their typical routine to gather information and influenced by the need for independence, reduce stress, and/or individualism, whereas passive seeking is focused on a repetitive behavior based upon factors such as "…identity building, identity reinforcement, and modeling" (Kahlor et al., 2006; p. 168). An example of active information seeking is utilizing a search engine such as Google, whereas an example of passive information seeking is watching the local news routinely every night (Kahlor et al., 2006). Both of these types of information seeking are more focused on information seeking related to media use and consumption. Not all of the empirical studies focused on assessing risk-related information seeking include both active and passive information seeking. Rather, a majority of the empirical studies reviewed only focused on active information seeking, often only referring to it as information seeking (Calhoun, 2009; Griffin et al. 2004; Griffin et al. 2005; Kahlor et al. 2006; Kahlor, 2010; Kellens et al. 2012; Li et al. 2017; Ter Huurne 2008; Ter Huurne & Gutteling 2008; Ter Huurne et al. 2008; Willoughby & Myrick, 2016; Yang, 2012; Yang et al., 2014; and Zeng et al. 2017). There are only a few select studies that focus on evaluating past information seeking (Hovick et al., 2014; Rosenthal, 2011).

Past information seeking is also an important type of information seeking, especially given its association with risk-related information seeking behavioral intention and future information seeking (Rosenthal, 2011). Hovick et al. (2014) found that past behavior can help clarify current behaviors. However, while it is an important type of information seeking, it is not as commonly assessed when evaluating risk-related information seeking intentions (Rosenthal, 2011). In fact, most studies look at the current, future, active, or passive information seeking rather than past information seeking. Thus, the incorporation of this particular concept is timely and crucial to better understand its implications on risk-related information seeking behavioral intention and to further expand the literature. Rosenthal (2011) mentioned that "although the TPB does not assert a relationship between past behavior and behavioral intention… the idea that past behavior would influence future behavior is highly logical. Ajzen (1991) contends that predicting future behavior with past behavior creates a ceiling effect since we can expect the two to correlate very highly for many behaviors" (p. 22). Also, past information seeking can lessen information need. Whereas in other situations, past information seeking may highlight a given risk further, magnifying information need (Rosenthal, 2011). Regardless though, Rosenthal (2011) found a relationship between past information seeking and information need. For this study, past information seeking will be evaluated with perceived hazard knowledge, current information need, and risk-related information seeking behavioral intention, as discussed further within the methodologies portion of this study. This will provide the opportunity to compare the results from this study with past studies.

Another important concept discussed alongside information seeking is information avoidance, which is when an individual refrains from seeking information simply because it causes psychological distress (Brasher et al., 2000; Lu, 2005; Ter Huurne, 2008). However, not all scholars believe this is conceptually a part of information seeking. Rather, Case et al. (2005) and Kahlor et al. (2006) find it to theoretically different from information seeking and not all communication scholars believe that individuals simply do not want to seek information (Case et al., 2005; Kahlor et al., 2006). As a result, only a select few studies within the risk communication assess information avoidance such as the works of Lu (2015) and Yang & Kahlor (2013). Even though information avoidance is not as commonly assessed across risk-related information seeking studies or other risk communication research, this does not mean it is not important to assess. Rather, it suggests that additional studies examine the importance of this concept and its relationship with other concepts. Thus, for this particular study, information avoidance will not be included amongst the concepts and within the survey disseminated.

3.1.2 Current Information Needs

Current Information need is the gap between an individual's present knowledge and the amount of knowledge that is adequate for the individual to make necessary judgments (Griffin et al., 2008; Kellens et al., 2012; Li et al., 2017). Factors such as the "source and level of information, media coverage, and involvement of experts in risk management" (Wachinger et al., 2013, p. 1051) are commonly known as indirect signals/experience. Individuals who have indirect experience commonly require additional information from external sources due to their lack of experience with a given risk or in this instance natural hazard (Wachinger et al., 2013). Information need is a critical part in risk communication and one of the most important factors when assessing risk-related information seeking behavior (Kellens et al., 2012; Li et al., 2017; Ter Huurne 2008). An extensive amount of literature has found that if an individual knows very little about a risk and is displeased with the amount they know, there is a greater likelihood that the individual requires additional risk-related information (Griffin et al., 2008; Kahlor et al., 2006; Kahlor, 2007; Kellens et al., 2012; Li et al., 2017; Ter Huurne & Gutteling, 2008; Ter Huurne et al., 2009; Yang et al., 2014). However, there is some research that does not support this notion (Kahlor, 2010; Kellens et al., 2012). There has been some support within the literature indicating that there is "…a positive relationship between risk perception and information needs, which in turn affect information seeking behavior" (Neuwirth et al., 2000; Strating et al., 2004; Ter Huurne, 2008, p. 39). Information need will be an important concept to include in this study, providing further clarification on how it is influenced by risk perception, perceived hazard knowledge, and demographics, ultimately defining an individual's risk-related information seeking behavior. Specifically, for this study, information need will stem from the overall concept of information insufficiency (Griffin et al.,1999, Griffin et al., 2004; Griffin et al., 2008). This approach towards information need stems from the heuristic-systematic model (HSM), providing an understanding of an individual's "…gap between current knowledge and sufficient knowledge" (Kellens et al, 2012, p. 1371). As discussed below within the measurements section, this concept will be evaluated in two parts— questions reflecting an individual's current knowledge and rating their sufficiency knowledge. Ideally, this approach should provide a well-balanced understanding and thorough investigation about individuals need for wildfire information, a helpful insight for future educational outreach.

3.1.3 Perceived Hazard Knowledge

Perceived hazard knowledge is also a critical concept to include when assessing an individual's risk-related information seeking behavior. It is an individual's perception of a given natural hazard's origin, their personal vulnerability to the hazard, and what they may determine to be essential behavior to evade or minimize their personal impact such as preparedness or mitigation techniques (Kellens et al., 2013; Lopez-Marrero, 2010; Tierney et al., 2001). It is an important concept to assess since it often provides insight into an individual's "need for risk-related information" (Kellens et al., 2012). This attribute is often included within models such as the RISP, however, it is often challenging to calculate, as noted by several scholars (Griffin et al., 1999; Griffin et al., 2008; Kellens et al., 2013). Thus, researchers often invoke perceived hazard knowledge "…by asking respondents to what extent they think or believe their knowledge reaches about risk-related topics" (Kellens et al., 2013, p. 22).

Generally, higher amounts of a perceived hazard knowledge will equate to a greater likelihood that the individual(s) will seek hazard modifications (Ge et al., 2011; Peacock, 2003; Peacock et al., 2005). Those who may have greater amounts of perceived hazard knowledge will most likely be reluctant to seek hazard modifications or no long seek risk-related information altogether (Ge et al., 2011; Kellens et al., 2012; Li et al., 2017; Lindell & Whitney, 2000; Peacock et al., 2005). Individuals who have less of a perceived hazard knowledge have a greater need to seek information related to their level of trust in decision makers (Kahlor et al., 2006; Kellens et al., 2012; Kellens et al., 2013; Li et al., 2017; Ter Huurne & Gutteling, 2008; Ter Huurne et al., 2009).

Studies show conflicting results regarding the correlation of perceived hazard knowledge with other attributes when evaluating risk-related information seeking behavior. From Griffin et al.'s (2008) perspective, perceived hazard knowledge is part of information insufficiency; whereas the majority of other scholars believe that perceived hazard knowledge is a singular attribute that impacts an individual's need for risk-related information (Kahlor, 2007; Kahlor, 2010; Kahlor et al., 2006; Kellens et al., 2012; Li et al., 2017; Ter Huurne & Gutteling, 2008). For the purpose of this study, perceived hazard knowledge will be included as a singular attribute, contributing to the overall assessment of risk-related information seeking behavior.

3.1.4 Risk Perception

Risk perception is also an important concept to include when assessing risk-related information seeking behavior. As previously mentioned in the literature review, risk perception is an individual's judgment of a given risk-related situation (Dunwoody & Neuwirth, 1991; Kahlor, 2010; Li et al., 2017; Martin et al., 2009; Trumbo, 2013). Individuals' risk perceptions can be accurate in some instances, while in others they can be unrealistic (Dunwoody & Neuwirth, 1991; Li et al., 2017; Trumbo, 2013). Risk perception stems from the process of assembling and interpreting signals about the unfamiliar hazardous situation (Wachinger et al., 2013). Three distinct paradigms have dominated the realm of risk perception research—the cultural, sociological, and psychometric paradigms, also previously mentioned in the literature review. Given the nature of this study, risk perception will be evaluated through a psychometric approach.

Quantifying and analyzing risk perception from a psychometric approach is commonly multidimensional, through a variety of scales, oftentimes through factor analysis (Fischhoff et al., 1978; Rundmo & Nordfjaern, 2017) and includes evaluating a variety of factors including: an individual's awareness of risk, how risk may impact other individuals, and how many individuals risk can impact at any given time (Griffin et al., 2012; Martin et al., 2009; Slovic, 1987, 1992, 2000). Rundmo & Nordfjaern (2017) further discusses how additional attributes are essential to distinguish and quantify when evaluating risk perception. Specifically, Rundmo & Nordfjaern (2017) mention the importance of assessing an individual's willingness to take on a given risk scenario, their knowledge of the science behind the risk, whether an individual perceives they can control the risky scenario or not, and the "immediacy of effect". Rundmo & Nordfjaern (2017) point out that it is also important to consider additional factors when determining an individual's risk perception such as: the level of "newness" of a given risk, whether it has the potential to be life-threatening, and how adaptable individuals may be to living with a given hazard, especially if temporally it occurs frequently (Rundmo & Nordfjaern, 2017). Also, additional influences of risk perception include the level of trust in decision-makers and other actors, and the level of confidence in protective actions (Wachinger et al., 2013).

An individual's reaction to risk can be evaluated through two different dimensions including dread risk and knowledge (Kahlor, 2010; Slovic, 1987; Slovic et al., 2001; Trumbo, 2013). Dread risk is commonly known as "an individual's assessments of whether a given hazard is controllable, catastrophic, fatal, reducible, increasing, voluntary, equitable, whether it evokes fear and worry (dread) and whether it poses a risk to future generations" (Kahlor, 2010, p. 348). Those who tend to have higher amounts of dread risk usually have an exaggerated viewpoint on the general risk (Kahlor, 2010; Slovic et al., 2001). "Risks that evoke dread, whether they are associated with common or rare hazards, motivate people strongly toward action" (Trumbo, 2013). Not all risk-related information seeking models consider "dread risk" factors, only a select few such as the RISP model include it (Griffin et al., 2004; Kahlor, 2010).

The second scope, knowledge, asseses if a given risk is understood by the individual and how attentive they are to the consequences of the given risk (Trumbo, 2013). It is also critical to point out a few of the generalizations and relationships discovered through peer-reviewed research on risk perception. Specifically, direct experience has a strong impact on risk perception related to natural hazards (Biernacki et al., 2008; Grothmann & Reusswig, 2006; Heitz et al., 2009; Miceli et al., 2008; Plapp & Werner, 2006; Siegrist & Gutscher, 2006; Terpstra, 2009; Terpstra, 2011). Also, when assessing risk perception, it is commonly based on not only the actual imminent threat but also based on the public's personal account, judgement of the risk, and the influence of decision-makers, the media, and peers (Mileti, 1994; McCaffrey, 2008; Wachinger el., 2013). Ter Huurne (2008) found that if an individual has a "higher risk perception, [it] is assumed to reflect higher uncertainty" (Ter Huurne, 2008, p. 39). Slovic et al. (1982) point out that risk perception can be quantified and often foreseeable. They also discovered that what one individual might perceive as a risk-related scenario or situation, another individual may not. Thus, it is evident that there is such a contrast in what individuals perceive an imminent threat to their wellbeing. This makes assessing risk perception a bit more complicated, yet not unachievable to gather. It is important to point out though, that even when individuals may disagree in relation to the level of risk with a given hazard, they oftentimes will agree on hazard characteristics (Slovic et al., 1982). Thus, it is evident that there can be several different factors to evaluate and quantify when determining risk perception. Risk perception truly provides a gateway towards understanding the public's risk-related information seeking behavior and helps focus on what truly encourages the lay public to be proactive in evading or adjusting risk (Rickard et al., 2017; Wachinger et al. 2013). This is especially true and important related to natural hazards such as wildfires and for this study. In this study, a dual-process risk perception approach will be included, as seen within the path model below.

3.1.5 Efficacy Beliefs

Efficacy beliefs are also important to assess when evaluating risk-related information seeking behavior, providing insight into how an individual will respond to a risk-related situation and protective behaviors (Demuth et al., 2016; Kievik & Gutteling, 2011). More specifically, "efficacy beliefs regulate human functioning and emotional well-being through a cognitive, motivational, affective, and selective process. When facing adverse events, those who retain the belief that they will be able to exert control over their thoughts are more likely to preserve in their efforts" (Turner et al., 2006, p. 132). The concept efficacy beliefs are multifaceted including concepts such as self-efficacy and response efficacy. As seen in the path model in Figure 4, both self-efficacy and response efficacy will be included as two dimensions of the higher order concept—efficacy beliefs in this study (Kellens et al., 2012; Kievik & Gutteling, 2011). Thus, further clarification about these concepts, and how efficacy beliefs are presented within each of the theoretical frameworks is vital to understand the background and applicability of this concept.

Over the years, there have been several definitions of self-efficacy. It is important to clarify that for this study, self-efficacy is known as an individual's belief they can accomplish a goal/task and it is an individual's belief they can deal with a given risk related scenario efficiently and effectively (Bandura, 2000; Griffin et al., 1999; Johnson, 2005; Kievik & Gutteling, 2011; Ter Huurne, 2008; Trumbo, 1999). Self-efficacy has the potential to influence an individual's capability to acclimate and be resilient during a hazardous scenario, influencing their ambitions and persistence to combat risk (Turner et al., 2006). Individuals "… who are self-efficacious are more likely to reject negative thoughts about themselves or their abilities than those with a sense of personal inefficacy" (Turner et al., 2006, p. 132). Greater self-efficacy is when an individual can articulate, examine, and critically analyze a risk-related situation with only partial amounts of information (Martin et al., 2009; Mitchell & Dacin, 1996). Within the last two decades, the risk communication and risk psychology arenas have begun to accept and utilize self-efficacy more extensively, and it has been known for its influence on risk-related information seeking behavior (Griffin et al., 2008; Kievik & Gutteling, 2011; Neuwirth et al., 2000; Rimal, 2001; Ter Huurne, 2008). While this is a critical concept to assess when evaluating risk-related information seeking behavior, it is also important to provide further discussion on response efficacy, which together both concepts represent the overall concept of efficacy beliefs.

Response efficacy is when an individual perceives that the action(s) they take will indeed lead to the desired outcome and is known as an "outcome expectation" of efficacy beliefs (Turner et al., 2006). More specifically, it "…denotes the perceived usefulness of information… to successfully cope with a threat" (Kellens et al., 2012, p. 1373). In this case, response efficacy might entail an individual thinking about the content they receive regarding how to deal with wildfires, which in result can help motivate the individual to maintain the risk and deliberately contemplate on how to diminish the risk (Kievik & Gutteling, 2011). Individuals with a higher amount of response efficacy are more likely to transfer the knowledge they gain into actions, persevere, and "…tend to derive greater confidence from behavioral accomplishments, rather than interpret success as the consequence of chance or good luck" (Bandura, 1986; Turner et al., 2006, p. 133). Kellens et al. (2012) and Kievik & Gutteling (2011) found it to be a strong predictor of risk-related information seeking behavior. It is is an important concept to include with the model and widely used in the three theoretical constructs previously mentioned (PRISM, RISP, and FRIS). However, efficacy beliefs are applied in different manners across the theoretical constructs, thus it is essential to provide a brief clarification on how it is presented.

Specifically, the RISP model includes self-efficacy within the perceived hazard characteristics concept to assess affective response, as previously mentioned in the literature review. Here, self-efficacy is combined with causal attributions, institutional trust, and risk judgment. Whereas the PRISM model subtly includes attributes of self-efficacy and perceived efficacy through the perceived seeking control and attitude toward seeking concepts. In comparison to RISP and PRISM, the FRIS model focuses more attention on psychological factors such as efficacy beliefs. Within the FRIS model, efficacy beliefs are categorized as one of two concepts of risk-related information seeking (alongside risk perception). The concept is also used in part with demographics, hazard characteristics, current knowledge, and risk perception to determine information need (Kellens et al., 2012). Also, the "…FRIS [model] states that, when risk and efficacy beliefs are made salient, risk perception and efficacy beliefs jointly affect subsequent action" (Kievik & Gutteling, 2011, p. 1477). As a result, the FRIS model affirms that both perceived risk and efficacy beliefs are essential concepts when assessing risk-related information seeking. (Kievik & Gutteling, 2011). As previously mentioned, both Ter Huurne (2008) and Turner et al. (2006) revealed that individuals are more likely to rely on their efficacy beliefs when determining the appropriate behavior for a risky situation if they have a low-risk perception. It is evident that there is quite the variation between the utility of efficacy beliefs between the three theoretical constructs. However, regardless, it is also apparent that it is a critical concept to include when assessing risk-related information seeking behavior and has proven to be a strong predictor across models and research studies. Again, it is important to mention that efficacy beliefs for this study will include both self-efficacy and response efficacy. For this study, both response efficacy and self-efficacy will be evaluated (Figure 4). Specific details on these concepts in terms of the measurement are highlighted within the methodologies portion of the study.

*3.1.6 R*isk-Related *Information Seeking Behavioral Intention*

Risk-related information seeking behavioral intention is also included in this study, an essential concept commonly found within the social psychology literature (Kahlor, 2007) and useful in risk communication. This concept provides insight into future intentions of an individual to conduct a certain behavior (Hoonhout, 2016). Overall, behavioral intention has traditionally been a part of the theory of planned behavior (TPB) research, which originated from the theory of reasoned actions (Azjen & Timko, 1986; Azjen, 1991, 1996, 2006; Hoonhout, 2016). In particular, the TPB helps clarify an individual's actions and behaviors, focused on behavioral beliefs, normative beliefs, and control beliefs. Behavioral beliefs result in attitude towards behavior, either favorably or unfavorably, contributing to the overall intention. Whereas, normative beliefs lead to subjective norms, commonly referenced as perceived social pressures, often contributing to overall behavioral intention. Control beliefs result in perceived behavioral control which leads to intention or directly to the intersection between intention and behavior (Azjen, 2006; Hoonhout, 2016). Thus, behavioral intention is a particularly important concept since it is a precursor to behavioral performance (Azjen, 1991; Kahlor, 2010; Griffin et al, 2012), and ultimately risk-related information seeking is a type of communication behavior (Eastin et al., 2015; Griffin et al., 1999; Griffin et al., 2008).

While the works of Griffin et al. (1999) are most commonly associated with the introduction of behavioral intent with risk-related information seeking, the works of Kahlor (2007) is just as notable and important for this study. Specifically, Kahlor (2007) utilized behavioral intentions in an augmented RISP study, attempting to improve upon the relationships between key concepts. Kahlor points out the theoretical association between the TPB and RISP framework and noted the importance in assessing risk-related information seeking behavioral intention (Hoonhout, 2016; Kahlor, 2007; Yang et al., 2010). It is a delicate balance between understanding how an individual handles risk information and an individual's behavior managing the risk (Hoonhout, 2016; Yang et al., 2010). In particular, the RISP model includes an important construct from the TPB—perceived behavioral control, also referenced as self-efficacy (Calhoun, 2009). Li et al. (2017) and Easten et al. (2015) found that the TPB also overlaps with the PRISM framework, again providing insight into risk-related information seeking behavioral intention through the three different TPB concepts along with knowledge insufficiency (which is referenced as current information needs for this study) and affective reaction indirectly (Easten et al., 2015). Thus, it is evident that behavioral intention is prevalent within other risk-related information seeking frameworks, although FRIS is not mentioned amongst them.

In the case of this study, behavioral intention is risk-related information seeking. While its application within the risk-related information seeking literature is very little, it has the potential to provide substantial opportunity to further understand risk-related information seeking (Kahlor, 2007; Rosenthal, 2011) and a very crucial concept in this particular study, serving as the dependent variable within the path model.

3.1.7 Demographics

The role of demographics on risk perception and/or subsequently on risk-related information seeking behavior is essential (Armas, 2008; Ash et al., 2013; Fishbein, 2008; Fothergill et al., 1999; Ge et al., 2011; Gotham et al., 2017; Kellens et al., 2011; Li et al., 2017; Lindell & Perry, 2012; Maloney et al., 2011; Schumann et al., 2017; Slovic, 2000; Velez, 2017). Variations in individual's risk perceptions and risk-related information seeking based upon demographics are socially constructed rather than biological differences (Schumann et al., 2017). Demographics such as gender, race, ethnicity, and age are commonly evaluated when determining risk perception and/or risk-related information seeking behavior (Kellens et al., 2012). Additional demographics may also be included such as: household income (Ge et al., 2001; Gotham et al., 2017), educational attainment (Ge et al., 2011; Gotham et al., 2017) permanent versus temporary residency, hazard experience (Kellens et al., 2012), length of residency (Gotham et al., 2017), housing type and house structure (Li et al., 2017).

Often, demographics are utilized in a-theoretical manners rather than an applied one. Thus, Griffin et al. (1999) and Griffin et al. (2004) found that demographics do not explain much of the variance for risk-related information seeking (Li et al., 2017). However, Ge et al. (2011) and Velez (2017) discovered that demographics do help illustrate the overall social vulnerability of a given population and do provide some essential insight into how individuals will perceive, gather, and react to risk-related information and risk perception in different manners. Kellens et al. (2012) point out that demographics are still pivotal to include since they can largely influence information need. Some of the demographics highlighted above have been more extensively applied than others, especially when evaluating risk perceptions and risk-related information seeking behavior. Thus, it is imperative to address the growing trends of some of these demographics.

A variety of empirical research studies have found that age and gender are linked to risk perception (Armas & Avram, 2009; Kellens et al., 2011; Kreibich et al., 2009; Lindell & Hwang, 2008; Schumann et al., 2017), along with previous hazard experience, which has been known to increase an individual's risk perception (Kellens et al., 2012; Keller et al., 2006; Knocke & Kolivras, 2007; Lara et al., 2010; Siegrist & Gutscher, 2006), and "the likelihood that people adopt hazard adjustments" (Grothmann & Reusswig, 2006; Kellens et al., 2012, p. 1372; Thieken et al., 2006). Women are more likely to perceive risk and seek risk-related information than their men counterparts, especially related to natural hazards (Armas & Avram, 2008; Cutter et al., 1992; Gotham et al., 2017; Gustafson, 1998; Ho et al., 2008; Lindell & Hwang, 2008; Schumann et al., 2017; Spence et al., 2007). Women are also more likely to display worried emotions and focused on the risks and vulnerability surrounding topics such as public health issues, environmental problems such as pollution and climate change (Brody et al., 2008; Gotham et al., 2017; Howe, 1990; Kraus et al., 1992; Kunreuther et al., 1988; McCright, 2010; Raudsepp, 2001; Schumann et al., 2017), it could also be argued for natural hazards as well. As referenced by Armas & Avram (2008) and Cutter et al. (1992), women are more likely than men to experience dread, have more uncertainty about the impending or potential risk (Goltz et al., 1992; Flynn et al., 1994;

MacGregor et al., 1994), and view “risk levels as unacceptable” (Kraus et al., 1992; Schumann et al., 2017, p. 2). It is important to point out though that there has been at least one study that found men having a higher risk perception than women, which evaluated risk perception after an earthquake near the New Madrid fault line. Here, Major (1999) discovered that women had lower risk perceptions than men “… ostensibly due to milling and confirmation behavior among female peers during the weeks between the prediction and the forecast date of the earthquake” (Schumann et al., 2017, p. 2).

It has also been widely supported that there is a distinct relationship between gender and race commonly referenced as the “white male effect”, which can impact risk perceptions (Finucane et al., 2000; Flynn et al., 1994; Marshall et al., 2006; McCright & Dunlap, 2013; Schumann et al., 2017) and risk-related information seeking behavior. Commonly, Caucasian males are often “…more hierarchical, more individualistic, less egalitarian, and more politically conservative worldviews” (Finucane et al., 2000; Schumann et al., 2017; p. 3) than their female counterparts. They often trust individuals who are professionals and do not trust decision makers as much, all of which could influence risk perception and risk-related information seeking behavior (Finucane et al., 2000; Schumann et al., 2017). Research dedicated to risk perception related to race and ethnicity has not been as extensively evaluated as gender (Schumann et al., 2017). However, there have been some overall conclusions.

Scholars have discovered a correlation between race and ethnicity related to risk perception for a variety of hazardous events (Macias, 2015; Gotham et al., 2017). More specifically, minorities based upon racial and ethnic characteristics are more likely to have a greater risk perception than individuals of Caucasian or Asian descent

(Fothergill et al., 1999; Goltz et al., 1992; Macias, 2016; Schumann et al., 2017). However, Ives & Furuseth (1983) discovered there were very little differences in risk perception between African Americans and Caucasians when evaluating floods. African Americans were more likely to perceive flooding as an uncontrollable hazardous event than their Caucasian counterparts (Schumann et al., 2017).

Educational attainment and household income can also greatly impact risk perception and risk-related information seeking behavior. Individuals who have a lower income and educational attainment often perceive risks higher than individuals who have higher educational attainment and income, regardless of the type of natural hazard (Ho et al., 2008; Gotham et al., 2017).

Related to age, Kellens et al. (2012) found a significant correlation between age and risk perception. However, they did not find the same significance between age, perceived hazard knowledge, and information need. Other authors also affirm that age can be associated with risk perception and important to include when conducting natural hazards research centered on risk communication and risk perception (Gotham et al., 2017; Grothmann & Reusswig, 2006; Lindell & Hwang, 2008; Schumann et al., 2017). Research related to floods (Botzen et al., 2009; Miceli et al., 2008) and hurricanes (Peacock et al., 2005) revealed that older individuals are more likely to have a lower risk perception than individuals who are younger. In terms of age and risk-related information seeking, especially related to extreme weather events, Knocke & Kolivras (2007) found that older individuals are more likely to take the risk seriously than their younger counterparts, particularly related to death and vital warnings of impending or imminent risk (Schumann et al., 2017).

More recently, the literature has focused on evaluating the implications of home ownership, type of housing, and length of residency (permanent vs. temporary—either seasonal or transient) has on risk perception and risk-related information seeking related to various natural hazards (Gotham et al., 2017; Kellens et al., 2012; Li et al., 2017). Burningham et al. (2008) discovered that individuals who own their properties have a higher risk perception than individuals renting their residency (Gotham et al., 2017). There has been extensive research surrounding flood risk perception and length of residency. While this natural hazard is different than wildfires in terms of the biophysical characteristics, the risk is just as grave as wildfires, as studied in this study. Specifically, researchers have found that an individual's length of residency can impact their risk perception, but it may be a minor implication in comparison to other concepts (Burningham et al., 2008; Gotham et al., 2017; Knocke & Kolivras, 2007; et al., 2008; Ruin et al., 2007).

For this study, a few demographics will be evaluated to better understand the population of the survey participants and assess if this concept, in fact, does influence risk-related information seeking related to wildfires. The following demographics will be included within the survey: age, gender, race, educational attainment, previous hazard experience, and housing ownership. Further discussion on specific measurements is noted within the methodologies section of this study.

3.2 Path Model and Research Hypotheses

This study assesses a variety of concepts of risk-related information seeking behavior and the subsequent relationships based upon the risk-related information seeking models discussed earlier (RISP, PRISM, FRIS; Figure 4). However, not every concept from the other models is assessed within this study. Rather, the psychometric/attitude measures are the most dominant, assessing risk-related information seeking based upon the following: risk perception, efficacy beliefs, perceived hazard knowledge, and information needs. Demographics are used only as a control. More specifically, this provides a path model of the predictors and controls of risk-based information seeking behavior listed below in the hypotheses.

The hypothesis outlined were assessed through a cross-sectional survey disseminated to individuals who reside within the High Park Fire Burn Area. Figure 4 provides a visual representation of the hypotheses listed and the subsequent relationships. More specifically, this provides a path model of the predictors (direct effects) of risk-related information seeking behavioral intention listed below in the hypotheses grounded on the theoretical expectations discussed within the literature. Indirect effects will only be addressed from a post-hoc exploratory approach and briefly mentioned in the final study discussion.

Based on the theory reviewed above and as demonstrated in the results by Ter Huurne & Gutteling (2008); Kahlor (2010); and Ter Huurne (2008).

H1: Dual-process risk perception will have a positive direct effect on past information seeking.

Based on the theory reviewed above and as demonstrated in the results by Kahlor et al. (2006); Li et al. (2017); Neuwirth et al. (2000); and Strating et al. (2004).

H2: Dual-process risk perception will have a positive direct effect on current information needs.

Based on the theory reviewed above and demonstrated in the results by Ter Huurne & Gutteling (2008).

> *H3: Dual-process risk perception will have a positive direct effect on risk related information seeking behavioral intention, not controlling for perceived hazard knowledge.*

Based on the theory reviewed above and demonstrated in the results by Hovick et al. (2014).

> *H4: Past information seeking will have a positive direct effect on perceived hazard knowledge.*

Based on the theory reviewed above and demonstrated in the results by Rosenthal (2011).

> *H5: Past information seeking will have a positive direct effect on current information need*

Based on the theory reviewed above and demonstrated in the results by Rosenthal (2011).

> *H6: Past information seeking will have a positive direct effect on risk related information seeking behavioral intention*

Based on the theory reviewed above and demonstrated in the results by Zeng et al. (2017).

> *H7: Perceived hazard knowledge will have a negative direct effect on current information need.*

Based on the theory reviewed above and demonstrated in the results by Ter Huurne & Gutteling (2008).

> *H8: Current information need will have a positive direct effect on risk related information seeking behavioral intention.*

Based on the theory reviewed above and demonstrated in the results by Kievik & Gutteling (2011).

> *H9: Response efficacy will have a positive direct effect on risk-related information seeking behavioral intention.*

Based on the theory reviewed above and demonstrated in the results by Kievik & Gutteling (2011)

> *H10: Self-efficacy will have a positive direct effect on risk-related information seeking behavioral intention.*

Based on the theory reviewed above and demonstrated in the results by Kievik & Gutteling (2011).

> *H11: Response efficacy and self-efficacy should be positively correlated with one another.*

Note: Demographics were assessed in a separate set of analyses prior to the model given there are little theoretical grounds. Indirect effects were not examined given it is unlikely they would have sufficient power.

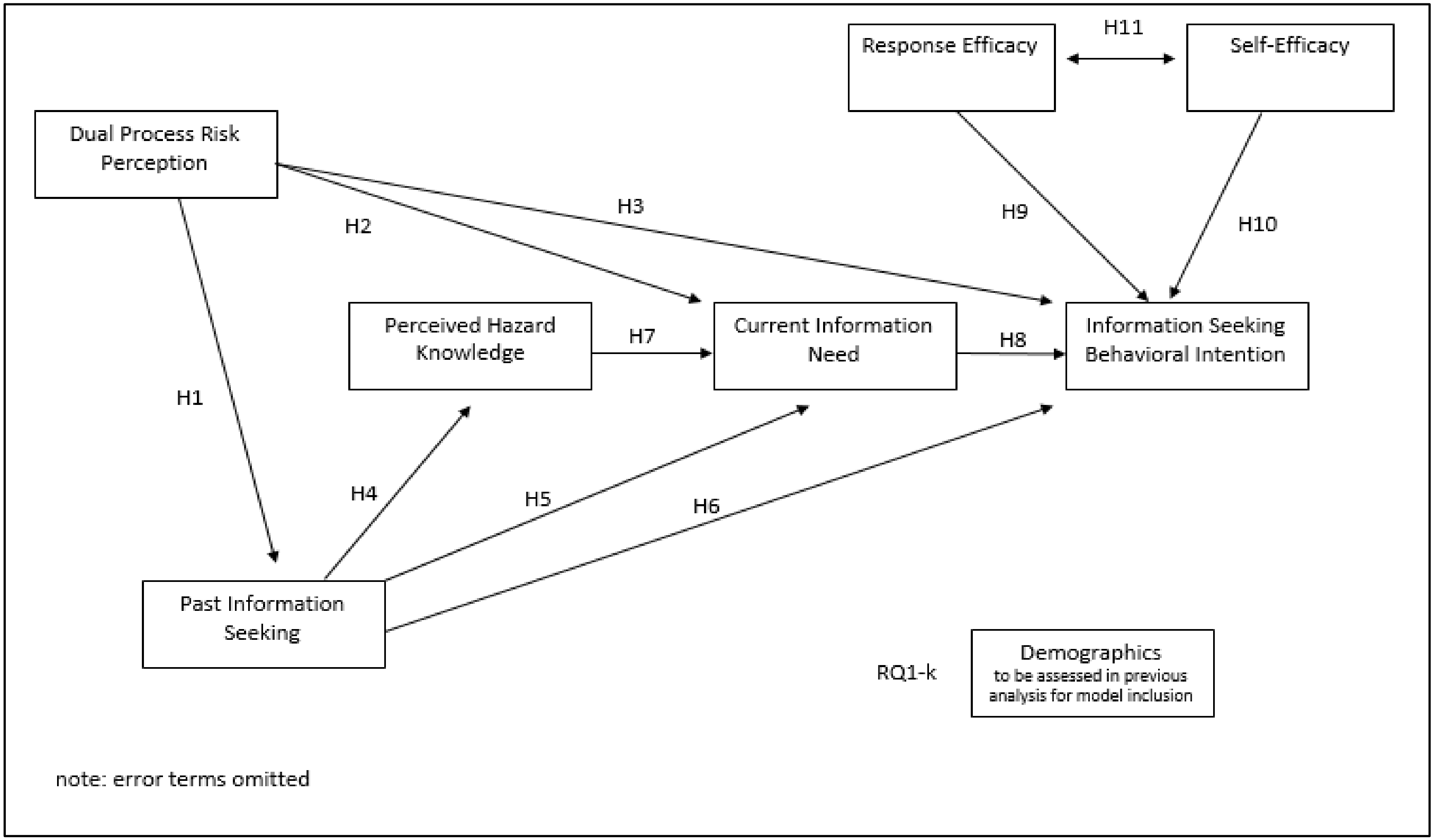

Figure 4. Path model of the hypothesized relationships between the concepts

CHAPTER IV

RESEARCH DESIGN

4.1 Design Overview

In order to quantify and determine risk-related information seeking behavioral intention, risk perception of individuals, and address the hypotheses above, a mail-based cross-sectional survey was created and disseminated to households located within the High Park Fire Burn Area. This portion of the study provides further insight into the different research steps, population sample, and study area that were curated prior to the survey dissemination. Further discussion about the survey methodology and measurements is provided later on within the measurements portion of this study, providing key insight into the creation, planned research, and dissemination of the survey.

As seen in Figure 5, the study was executed in three different steps. Together, these steps provided the opportunity to work towards the goal of determining risk-related information seeking behavior intention and the relationships between the concepts, providing a quantitative approach. Step 1 focused on preparing and disseminating the survey. This included approval from Colorado State University's Institutional Review Board (IRB) for the survey, finalizing the templates for the survey, and ensuring participants were notified of the survey opportunity. Once the surveys were disseminated and participants responded, Step 2 focused on analyzing the survey results utilizing Stata (StataCorp. 2017. Version 15) a statistical software. Step 3 required providing a final write-up for the dissertation research, final dissertation public defense, and final conclusions.

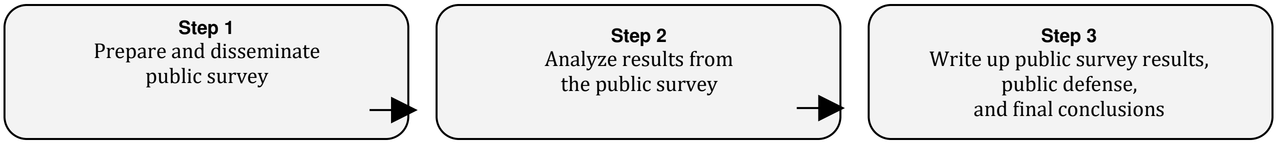

Figure 5. Overview of each research steps.

4.2 Study Area, Survey Population, and Sample

On June 7, 2012, a lightning strike ignited the High Park Fire, located just west of Fort Collins, Colorado by 30 km and approximately 4 km east-southeast of East White Pine Mountain (Coen et al., 2015). The initial report of the fire was not until the morning of June 9, 2012, when a unique fire behavior and weather conditions occurred within a very rugged terrain (W. Rutt, personal communication, October 8, 2017). Specifically, the wildfire ignited during a high point of a historic drought within the region, influencing the fuels. Extreme weather conditions further exacerbated the threat. There was an unseasonal downslope windstorm, which produced warm, consistent high wind speeds (Coen et al., 2015; B. Lebada, personal communication, September 25, 2017; W. Rutt, personal communication, October 8, 2017). Previous fire behavior models had not taken such extreme weather and climate conditions into account, since they would have proven to be almost impossible and outrageous for the season and location (B. Lebada, personal communication, September 25, 2017).

The High Park Fire burned 87,415 acres of the landscape (Coen et al., 2015; Miller et al., 2017), resulting in Colorado's second-largest wildfire in terms of acres burned to date. It burned portions of the Poudre River watershed along with the Rist Canyon and Buckhorn Creek drainages and significantly impacted the water quality of the Poudre River as well (Miller et al., 2017; W. Rutt, personal communication, October 8, 2017). It was evident that the soil loss from the High Park Fire was isolated. Fortunately, the soil loss was not as bad as it was initially thought to have been (B.

Lebada, personal communication, September 25, 2017). The societal impacts were just as significant, impacting a little over 1,000 households, burning 259 homes, and one fatality (Coen et al., 2015; Koebele et al., 2015; B. Lebada, personal communication, September 25, 2017; W. Rutt, personal communication, October 8, 2017). The economic impacts are also important to note, "…with insured losses totaling $113 million… and $38 million spent on suppression" (Miller et al., 2017, p. 1). The High Park Fire occurred in an area of mixed land-use and ownership, situated on the border of the WUI, and in close proximity to urbanized populations, as seen in Figures 6 and 7. The wildfire expanded so rapidly there simply was not enough suppression in some areas (W. Rutt, personal communication, October 8, 2017). Defensible space and structural accountability efforts prior to the High Park Fire proved to be beneficial in some instances, but in others, the preparedness actions did not help save homes (B. Lebada, personal communication, September 25, 2017; W. Rutt, personal communication, October 8, 2017). The mixed results of burned and unburned structures were ultimately greatly influenced by defensible space mitigation, the extreme weather conditions, and lack of suppression tactics (B. Lebada, personal communication, September 25, 2017; W. Rutt, personal communication, October 8, 2017). Individuals within the area who had evacuated did not know initially if their home had burned down or not, causing further stress, trauma, and tension (B. Lebada, personal communication, September 25, 2017; W. Rutt, personal communication, October 8, 2017).

It is evident that for many residing within the area, this wildfire proved to be a traumatic event, and it was too close for comfort for many other individuals residing just outside the wildfire's perimeter. Since the High Park Fire, in some areas of the burned area there has been a low and slow rebuild rate, whereas, in other areas within this geographic boundary, new residents have moved in that were not present during the wildfire event (B. Lebada, personal communication, September 25, 2017; Wes Rutt, personal communication, October 8, 2017).

Even though this area has already burned relatively recently, individuals within the burn area may be at risk for experiencing future wildfires in nearby locations and eventually relying upon critical risk-related information. Also, given their potential experience with the High Park Fire, their risk perception is important to assess. Thus, this catastrophic event prompted this study, specifically investigating wildfire risk perception and risk-related information seeking behavioral intention and aided in narrowing the sample population and geographic extent of the study area.

Geospatial data was utilized to refine the study area, define areas of the WUI, and determine the Decennial Census Blocks (2010) to aid in determining the sample population. Specifically, two different datasets and maps were used to further refine the sample population including the WUI database and the High Park Fire burn perimeter.

The WUI dataset provided a detailed description of the WUI throughout the entire U.S., but for the purpose of this study, it was refined to specifically highlight Larimer County, Colorado. This was done by simply utilizing the editor tool in ArcGIS 10.5, omitting all other United States counties and maintaining all of the Larimer County WUI information within the attribute table. The dataset was created by the United States Department of Agriculture—Forest Service by combining essential attributes from the following datasets: 2010 Decennial Census and the 2006 United States Geological Survey (USGS) National Land Cover.

It is interesting to point out that the geographic landscape that burned from the High Park Fire was previously defined as an area not within the WUI, as seen in green colors on the map in Figure 7. Rather, areas categorized as being an intermix or the wildland-urban interface were to the east of this burn area. The data for the particular map dates prior to the 2012 fire, dating back to 2010.

The High Park Fire Burn Area perimeter was obtained from the U.S. Department of Agriculture Forest Service's Geospatial National Database, known as the Monitoring Trends in Burn Severity (MTBS) Boundary from 1984-2015. Similar to the WUI data, the dataset was imported into ArcGIS 10.5 and the editor tool was selected, deleting the other fires within the dataset and keeping the High Park Fire in the attribute table. It was then displayed as a vector polygon. The WUI and High Park Fire Burn Area shapefiles were then combined by utilizing the join tool in ArcGIS. This then provided the opportunity to determine how many Decennial Census Blocks (2010) are within the High Park Fire Burn Area. In total, 57 Census blocks were identified for the 2010 population. The Census blocks cover the population inside the High Park Fire Burn Area and intersect it. The geographic extent of the Census blocks is extended slightly since Census blocks do not abide by the wildfire's burn area, but a portion may be slightly within it, while the remaining part of the Census block is outside the burn zone. Since the study focuses on risk-related information seeking behavior intention and risk perception of wildfires, the ideal survey population consists of individuals residing within the Decennial Census Blocks (2010) within or intersecting the High Park Fire Burn Area.

A list of the residences located within the High Park Fire Burn Area was obtained from Survey Sampling International (SSI). This data provided insight into how many residences were sampled and whether the individuals residing at each location consider it a permanent residence or temporary one. Also, the data provided by SSI included a variety of demographics such as the seasonal status of residency, gender, race, median income, age, and permanent residency status to name a few. These were used for assessment of response bias.

Overall, the data from SSI indicated that there are 1,060 residences within the study area. After reviewing the list of residences, the sample was narrowed down to 1,018 residences due to 42 duplicates. Kline (1998) provides a commonly used guidance on sample size for path analysis. A good sample size is held to be 20 times the number of parameters estimated. The model features 12 regression paths (including the seven demographic items), thus 260 would be ideal. Over the past two decades, there has been an increase in survey nonresponse rates, creating new challenges for researchers (Brick & Williams, 2013). Some attribute this increase to "…noncontact, refusals, and other reasons. The 'other reasons' category typically include[ing] language problems, being away during data collection, and poor health" (Brick & Williams, 2013, p. 37). It is crucial to ensure as many individuals as possible not only receive the survey but also enough respond. Thus, in order to ensure a N of at least 260 responses, the survey was disseminated to all 1,018 residences, located within or intersecting the High Park Fire Burn Area. The mailings asked that any adult member of the household may complete the survey and each mailing was addressed to the household rather than the individual.

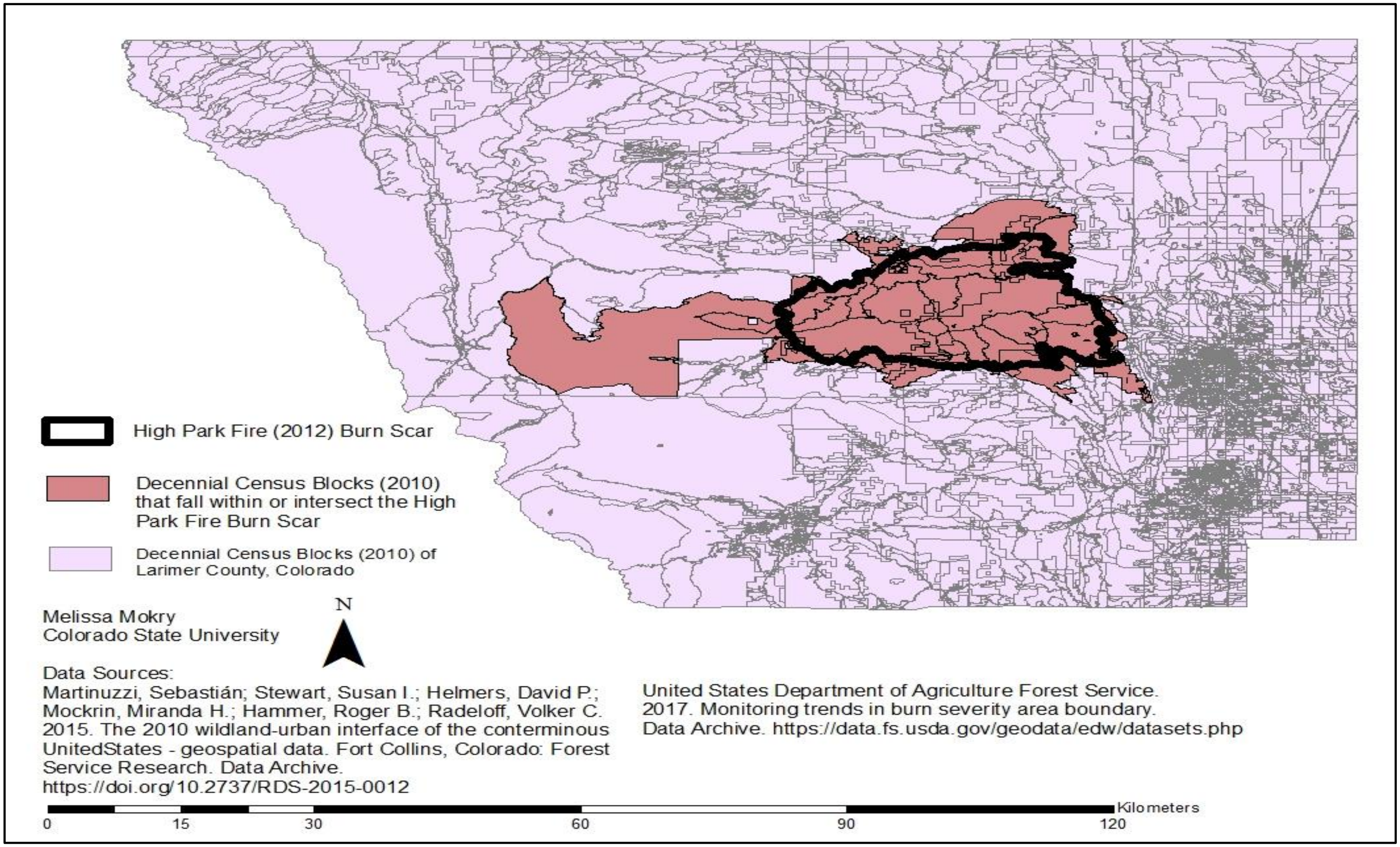

Figure 6. Study area.
Note. The map features the High Park Fire (2012) Burn Area, Decennial Census Blocks (2010) that fall within or intersect the High Park Fire Burn Area, and Decennial Census Blocks (2010) of Larimer County, Colorado.

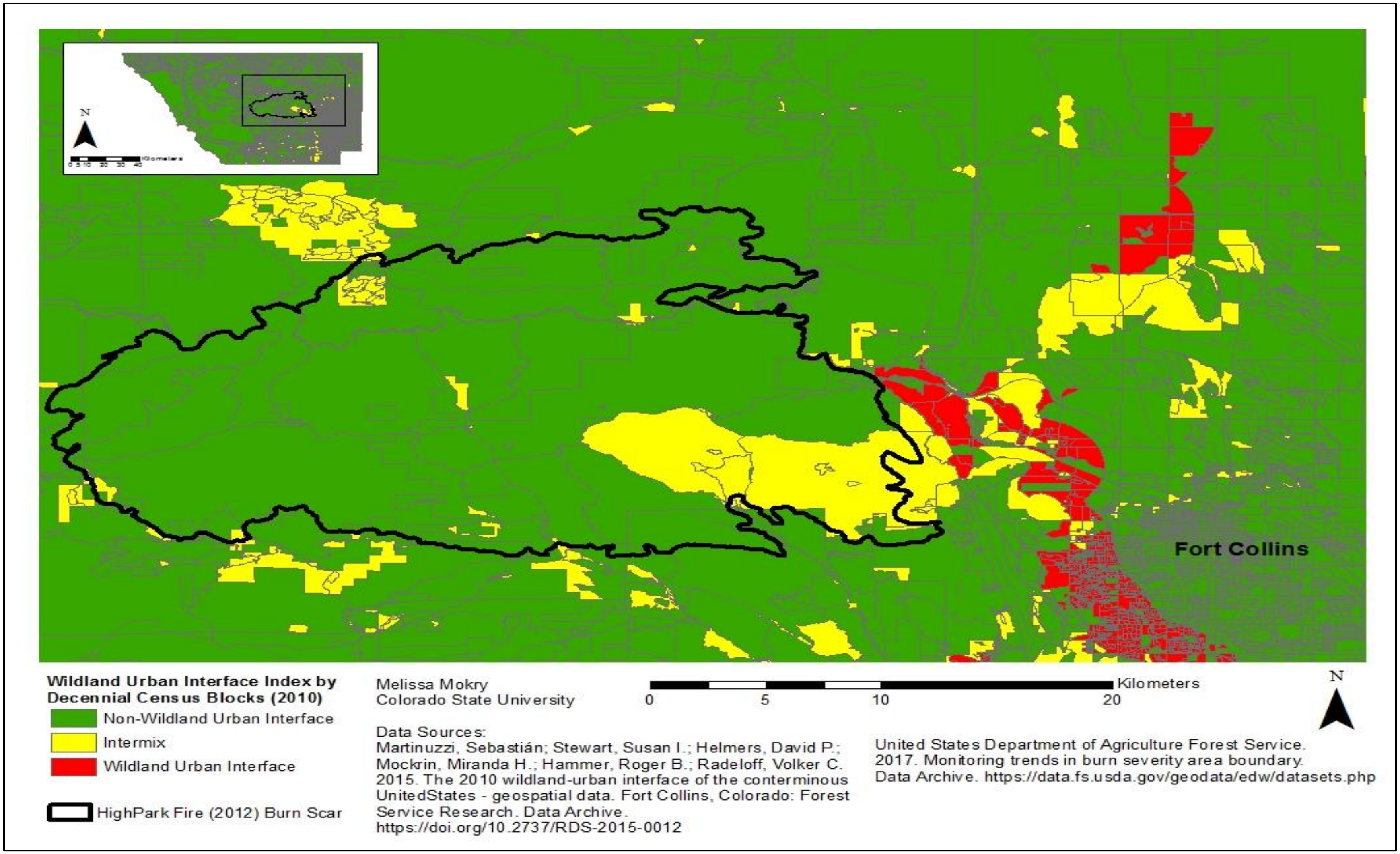

Figure 7. Wildland Urban Interface Index by 2010 Decennial Census Blocks.

Note. Areas designated as Non-Wildland Urban Interface are green, intermix are yellow, and wildland urban Interface locations are identified as red. The High Park Fire (2012) Burn Area is featured in a black outline, west of Fort Collins, Colorado.

4.3 Methods

This portion of the study provides further insight into the survey methods portion of the study. Specifically, discussion is provided about the importance of utilizing a cross-sectional survey as a methodology, discussion on other types of methodologies sometimes used for risk-related information seeking studies, dissemination of the survey materials, and discussion about the specific survey measures.

4.3.1 Discussion of Methodologies

There are a variety of methodologies used to gather risk-related information seeking such as surveys, experimental design, observational studies, face-to-face interviews, and focus groups. Some of these methodologies are more pertinent than others depending upon the purpose of the risk-related information seeking study, and how successful the methodology has held over time. Oftentimes some of the studies do not have enough ecological validity (Anker et al., 2011). It is important to provide some discussion on the different methodologies and particularly shed light on the importance of surveys given this study.

Over the years, a majority of the research studies focused on assessing risk-related information seeking, especially within the public health realm, have been cross-sectional survey studies (Anker et al., 2011). In fact, Anker et al. (2011) found that 72.9% of these studies from 1978 to 2010 were, in fact, cross-sectional studies and only 9.3% were observational data (Anker et al., 2011; So et al., 2016). Anker et al. (2011) also found that even fewer studies utilize experimental design (3.9%) to assess risk-related information seeking behavior. When reviewing the literature for this particular study, a majority of the studies utilized cross-sectional surveys to assess risk-related information seeking behavior such as: Cahyanto et al. (2016), Kellens et al. (2012), Li et al., (2017), and Ter Huurne (2008) to name a few and only a select few choose experimental design or other methodologies.

Cross-sectional studies are particularly important since they help "[draw] associations between predisposing factors" (Anker et al., 2011; p. 347) and risk-related information seeking. Also, there is greater ecological validity with this type of methodology than others. Cross-sectional surveys often provide further clarification on an individual's potential behavior given a risk-related situation and allow the researcher to make generalizations about the population simply through self-reporting (Anker et al., 2011). Emphasis is placed on the process of engagement with the information in cross-sectional surveys, rather than further analyzing "…outcomes associated with the search process" (Anker et al., 2011; p. 353). However, there are a few limitations to this type of methodology. In particular, cross-sectional surveys may leave the researcher with additional questions about risk-related information seeking behavior such as:(1) what may influence one population to seek information versus another population (perhaps based upon location, culture, or varying socioeconomic characteristics), and (2) if there is a constant risk for a given population, how might this influence the risk-related information seeking behavior (Anker et al., 2011). Overall, this type of methodology is the most applicable, widely used and accepted, and provides robust conclusions. It is important though to mention a few other types of methodologies (observational and experimental) applied to risk-related information seeking studies in order to understand why other researchers may use them.

Instead of a cross-sectional survey or another type of survey, an individual may choose to do an observational study to further assess the actual amount of time it takes for an individual to search for information and access it (Anker et al., 2011). However, this type of methodology is quite rare within risk-related information seeking studies and not as pertinent. It is also not robust and useful without other further analysis. Another type of methodology that is slightly more applicable and applied across a few select risk-related information seeking studies is experimental research. In particular, researchers such as Kievik & Gutteling (2011), Kievik et al. (2012), and So et al., (2016) all choose to assess risk-related information seeking through experiments, attempting to expand the field and further test this type of methodology for applicability. One advantage of this methodology is it provides an overall evaluation of the risk-related information seeking models in a generic perspective and allows for better generalizability and causal inference. Here, the purpose is centered more on understanding the utility and applicability of each theoretical model and perhaps even further improving upon the theory, rather than assessing the relationships between the concepts. Thus, it is evident that while this is a good methodology, is it simply not as applicable to this study. Also, it would be difficult to draw comparisons with other literature to draw generalizations since so very few actually use it. Thus, based on supporting evidence from previous studies, this study focused on providing a cross-sectional mail-based survey and path analysis to determine risk-related information seeking behavior within the High Park Fire Burn Area.

4.3.2 Dissemination of Survey Materials

The research design phase included disseminating a mail-based survey to all of the households within the High Park Fire Burn Area. The Dillman et al. (2014) tailored design method was applied in terms of how much content participants receive and follow-up. Specifically, all of the households received a pre-notice post-card, notifying them of the upcoming survey and discussing the importance of their responses. This was crucial since it was determined that publicizing the study may not be possible. A few days later, the survey package was mailed to each household. This included the following materials: a survey invitation, the printed survey, and a return envelope that was pre-stamped. In order to boost response rates, a cash incentive was provided for participants. Each participant received a $2 bill with the initial survey packet. Two weeks later, a prompt card was mailed to each of the households, reminding them to complete the survey. A second mailing was disseminated to households that did not respond to the initial survey. The strategy of this study and design was to optimize the strongest aspects drawn from previous studies relevant to this area of inquiry.

4.3.3 Measures

The measurements used to determine the concepts within the path model were based upon previous research (B. Lebeda, personal communication, September 25,2017; Easten et al., 2015; Griffin et al., 2004; Griffin et al., 2008; Hovick et al., 2014; Kahlor, 2007; Kellens et al., 2012; Kievik & Gutteling, 2011; Ter Huurne & Gutteling, 2008; Trumbo et al., 2016; U.S. Decennial Census; Yang et al., 2014), as seen in Table 8. Table 7 is a compilation of definitions for each of the concepts within the path model and analysis. The internal reliability (Cronbach's α) was tested for each of the measures. Since the measurements utilized for the survey were based upon previous research, the alpha scores from the literature are reported in Table 8. Insight into each of the survey questions is also provided below and in Table 9-16. For this study, seven different measures were evaluated including risk-related information seeking behavioral intention, self-efficacy, response efficacy, perceived hazard knowledge, dual process risk perception, current information needs, past information seeking, and demographics. All but one of the questions were closed-ended in the survey. The single open-ended question provided the opportunity for participants to describe how they were personally impacted by the High Park Fire. It is important to include this question since the High Park Fire was a traumatic event and this survey may stir up some emotions related to it. Together, all of these survey measurements provide a robust interpretation of the survey population and their risk-related information seeking behavioral intention within the High Park Fire Burn Area. The following provides insight into each of the measurements for the concepts including Likert-type scale, number of questions, and overall objective, as also since in Tables 9-16.

4.3.4 Dual-Process Risk Perception

Dual process risk perception was measured using eight questions—four specifically focused on affective risk perception and four on cognitive risk perception, based on the works of Trumbo et al. (2016) (Table 9). Participants were asked to use a 5-point Likert-type scale to evaluate their emotional responses to the threat of a wildfire with 1 (strongly disagree) to 5 (strongly agree).

4.3.5 Current Information Needs

Current information needs were specifically broken down into current knowledge and sufficiency threshold within the survey, measured with three questions. Two of the questions asked individuals to rate their knowledge about wildfire risk and estimate how much knowledge they need about wildfires, based upon the works of Griffin et al. (2004), Griffin et al. (2008), Li et al. (2017), and Zeng et al. (2017). Here, participants rated their knowledge from 0 (knowing nothing) to 100 (knowing everything they possibly could), as seen in Table 10. Also, the third question provided further insight into current knowledge by providing a single direct item, asking participants if they had felt they had enough information about wildfires, using a 5-point Likert-type scale: 1 (not at all) to 5 (completely).

4.3.6 Perceived Hazard Knowledge

Participants were also be asked how knowledgeable they feel they are about a variety of aspects of wildfires including evacuation procedures, causes of wildfires, and using defensible space (Table 11). There were eight questions for this particular concept and participants were given a 5-point Likert type scale rating their knowledge from 1 (very poorly) to 5 (very well). The measurement was based upon the works of Kahlor et al. (2003), Kellens et al. (2012), and Ter Huurne & Gutteling (2008).

4.3.7 Past Risk-Related Information Seeking

Past risk-related information seeking was measured with six questions, asking participants about their previous interaction with information concerning wildfires utilizing a 5-point Likert-type scale (1 (not at all) to 5 (completely)). As seen in Table 12, this construct was based upon the works of Griffin et al. (2008), Rosenthal (2011), and Ter Huurne (2008).

4.3.8 Risk-Related Information Seeking Behavioral Intention

To assess risk-related information seeking behavioral intention, participants were also be asked how likely they think of wildfire information and wildfires, in general with six questions. Here, the questions were based upon the works of Easten et al. (2015), Kahlor (2007), Rosenthal (2011), and Yang et al. (2014) (Table 13). A 5-point Likert-type scale was also used for this concept measurement ranging from 1 (strongly disagree) to 5 (strongly agree).

4.3.9 Response Efficacy

Response efficacy was measured with five questions, asking participants to what degree they feel certain actions would benefit them in the face of a wildfire such as searching for information, evacuating, and compiling an emergency preparedness kit. As seen in Table 14, the measurement was based upon the works of Kievik & Gutteling (2011), using a 5-point Likert-type scale ranging from 1 (not at all) to 5 (a great deal).

4.3.10 Self-Efficacy

Self-efficacy was measured with five questions asking participants to what degree they feel they are able to take actions that would benefit them in the event of a wildfire such as searching for information and evacuation (Table 15). This measurement was also be evaluated using the 5-point Likert type ranging from 1 (not at all) to 5 (a great deal) (Table 15). The measurement of this concept was based upon the works of Kievik & Gutteling (2011).

4.3.11 Demographics

To assess demographics, each participant was asked about their age, gender, educational attainment, place of residence, race, and personal impact of the 2012 High Park Fire. As seen in Table 16, the demographic questions were based upon the U.S. Decennial Census and personal communication from Boyd Lebada. Age was based upon the year born provided by participants, while gender was categorized as the following 0 (male), 1 (female), and 9 (prefer not to answer). Educational attainment ranged from 1 (some high school or less) to 8 (advanced degree). Place of residence ranged from 0 (own) to 1 (rent). Race was categorized as the following 1(American Indian or Alaskan Native), 2 (Asian), 3 (Black or African American), 4 (Native Hawaiian or other Pacific Islander), 5 (White), 6 (other). Participants were asked if they are of Hispanic, Latino, or Spanish origin, noting 0 (no) and 1 (yes). Lastly, two questions focused on evaluating the participant's experience and impact with the High Park Fire. As seen in Table 16, they were asked if they were impacted by the wildfire and if so, to answer the second question which asked the participant to share a few words about their experience.

Table 7.
Definitions of All the Concepts Included within the Path Model and Analysis for this Study.

Concept	Definition
Current Information Needs	The gap between what an individual knows about a risk-related situation (current knowledge) and what information is needed to better understand the risk-related situation (sufficiency knowledge) (Kahlor et al., 2006; Kellens et al., 2012).
Dual-Process Risk Perception	A cognitive and affective assessment of the likelihood of risk from a hazard (Trumbo et al., 2016).
Perceived Hazard Knowledge	An individual's perceived understanding of the causes of a hazard, how to prepare for it, and/or how to respond when impacted by the hazard (Li et al., 2017).
Self-Efficacy	Beliefs an individual has about accomplishing a set of actions that they could benefit from in the face of a hazard (Demuth et al., 2016; Kievik & Gutteling, 2011).
Response Efficacy	Beliefs held by an individual as to whether or not potential actions will help them avoid a hazard and reduce risk (Demuth et al., 2016).
Past Risk-Related Information Seeking	Indication of past behavior searching and gathering information about a hazard (Hovick et al., 2014).
Risk-Related Information Seeking Behavioral Intention	Future behavioral intentions to seek risk-related information about a hazard (Kahlor, 2007).
Demographics	Socially constructed characteristics describing a given population, often focused on factors such as age, gender, educational attainment, and median household income (Kellens et al., 2012; Schumann et al., 2017).

Table 8.
Sources utilized for the survey measurements and the subsequent reliability of these measurements.

Note. If applicable, reliability scores are reported based upon the Cronbach Alpha results.

Concept	Source Study/Studies	Reliability from Source
Current Information Need (Current Knowledge and Sufficiency Threshold)	Griffin et al. (2004); Griffin et al. (2008)	Griffin et al. (2004): no specific alpha stated but the authors do acknowledge that the "…results reinforce the construct validity of information sufficiency" (Griffin et al., 2004, p. 54), which is also known as information need; Griffin et al. (2008): no specific alpha stated for this concept
Dual Process Risk Perception (Affective and Cognitive Risk Perception)	Trumbo et al. (2016)	Cognitive Risk Perception: Trumbo et al. (2016): α=0.68 and α=0.67 Affective Risk Perception: Trumbo et al. (2016): α=0.85 and 0.84 Combined Scales: Trumbo et al. (2016): α=0.80 and α= 0.76)
Past Risk-Related Information Seeking	Hovick et al. (2014); Rosenthal (2011)	Hovick et al. (2014): α=0.96; Rosenthal (2011): α=0.86
Perceived Hazard Knowledge	Kellens et al. (2012); Ter Huurne & Gutteling (2008)	Kellens et al. (2012): α=0.94; Ter Huurne & Gutteling (2008): α=0.75
Risk-Related Information Seeking Behavioral Intention	Easten et al. (2015); Kahlor (2007); Yang et al. (2014); Rosenthal (2011)	Easten et al. (2015): α=0.93; Kahlor (2007): α=0.90; Rosenthal (2011): α=0.89; Yang et al. (2014): α=0.997
Self-Efficacy	Kievik & Gutteling (2011)	Kievik & Gutteling (2011): α=0.96
Response Efficacy	Kievik & Gutteling (2011)	Kievik & Gutteling (2011): α=0.95
Demographics	U.S. Decennial Census; B. Lebeda, personal communication, September 25, 2017	N/A

Table 9.

Dual Process Risk Perception Measurements.

Label	Item
Dual-Process Risk Perception: 1 (strongly disagree) to 5 (strongly agree)	
Affective	People have different *emotional responses* to the threat of a wildfire. The following questions ask about your perception of wildfire risk. In thinking about the possibility of your location experiencing a wildfire with the potential for widespread damage, how strongly would you disagree or agree with the following statements? *Thinking about the possibility of a major wildfire…*
Fear	makes me feel fearful
Worry	makes me feel worried
Dread	makes me feel dread
Depressed	makes me feel depressed
Cognitive	People *understand* wildfires in different ways. In thinking about the nature of wildfires generally, how strongly would you disagree or agree with the following? *Thinking about the nature of wildfires…*
Catastrophe	I think that wildfires may cause catastrophic destruction.
Widespread	I think that wildfires may cause widespread death.
Financial	I think wildfires pose great financial threat.
Generations	I think wildfires pose a threat to future generations

Note. Based upon the works of Trumbo et al. (2016).

Table 10.
Current Information Needs Measurements.

Label	Item
Current Knowledge (1 of 2 related to information needs): 0 (knowing nothing) to 100 (knowing everything you could possibly know about this topic) (Griffin et al., 2004; Griffin et al., 2008)	*Do you feel that you know all that you could about wildfires, or nothing at all?* • Please use a scale of zero to 100, where zero means knowing nothing and 100 means knowing everything possible.
Sufficiency Threshold (2 of 2 related to information needs): 0 (knowing nothing) to 100 (knowing everything you could possibly know about this topic) (Griffin et al., 2004; Griffin et al., 2008)	*We would like you to estimate how much knowledge you need about wildfires. Do you feel that you need to know as much information as possible or none?* • Please use a scale of zero to 100, where zero means needing to know nothing and 100 meaning needing to know everything possible
Current Knowledge (single direct item): 1 (I know little or nothing about wildfires) to 5 (Yes I have all the information I need) (Griffin et al., 2004; Griffin et al., 2008)	*First, we would like to ask about your knowledge of wildfire risk. Do you feel that you presently have enough information about wildfires in general?* • No, I know little or nothing about wildfires • Not really, I only have a modest understanding • I'm somewhat informed about wildfires • I feel pretty well informed about wildfires • Yes, I have all the information I need

Note. Based upon the works of Griffin et al. (2004), Griffin et al. (2008), Li et al. (2017), and Zeng et al. (2017)).

Table 11.
Perceived Hazard Knowledge Measurements.

Label	Item
Perceived Hazard Knowledge: 1 (understand very poorly) to 5 (understand very well) (Kahlor et al., 2003; Kellens et al., 2012; Ter Huurne & Gutteling, 2008)	*We would like to know more about your understanding about a variety of aspects of wildfires.* • *Note. Defensible space in this instance is defined as a 30-100 foot parameter around your place of residence that is clear of dead plants, grass, trees, or any other types of vegetation that may be fuel for a wildfire* *How well do you feel that you understand these aspects of wildfires?* • Creating defensible space • Using defensible space • Emergency safety kits • Sheltering-in-place • Evacuation procedures • Emergency warning system • Causes of wildfires • Wildland Urban Interface (WUI)

Note. Based upon the works of Kahlor et al. (2003), Kellens et al. (2012), and Ter Huurne & Gutteling (2008).

Table 12.
Past Risk-Related Information Seeking Measurements.

Label	Item
Past Risk-Related Information Seeking: 1 (not at all) to 5 (extremely) (Griffin et al., 2008; Ter Huurne, 2008)	*Here we would like to know how you have previously interacted with information concerning wildfires. How well do these statements describe your past orientation toward wildfire information?* • I have gone out of my way to get more information about wildfires. • When the topic of wildfires has come up, I have tried to learn more. • I have felt that seeking more information about wildfires would be a good use of my time. • When there has been a wildfire in the region, I paid close attention to the news. • I have sought information about wildfires from online sources. • In the past, I have spent a lot of time learning about wildfire risks.

Note. Based upon the works of Griffin et al. (2008), Rosenthal (2011), Ter Huurne (2008).

Table 13.
Risk-Related Information Seeking Behavioral Intention Measurements.

Label	Item
Risk-Related Information Seeking Behavioral Intention: 1 (strongly disagree) to 5 (strongly agree) (Easten et al., 2015; Kahlor 2007; Rosenthal, 2011; Yang et al., 2014).	*We now would like to know how you might interact with information concerning wildfires in the future. In the next three months, how strongly do you agree that you might do the following?* • I plan to seek more information about wildfires • I intend to find out more about wildfire risk • In the future, I will try to seek as much information as I can about wildfires. • I plan to seek more information about defensible space. • I intend to seek more information about evacuating during a wildfire. • I will look for information related to wildfires and emergency preparedness in the near future

Note. Based upon the works of Easten et al. (2015), Kahlor (2007), Rosenthal, (2011); Yang et al. (2014).

Table 14.
Response Efficacy Measurements.

Label	Item
Response Efficacy: 1 (not at all) to 5 (a great deal) (Kievik & Gutteling, 2011)	*To what degree do you feel that the following actions would benefit you in the face of a wildfire?* • Searching for information about wildfires. • Compiling a complete emergency preparedness plan. • Applying an emergency preparedness plan adequately. • Evacuating from a wildfire located nearby my residence. • Assisting others in the event of a wildfire.

Note. Based upon the works of Kievik & Gutteling (2011).

Table 15.
Self-Efficacy Measurements.

Label	Item
Self-Efficacy: 1 (not at all) to 5 (a great deal) (Kievik & Gutteling, 2011)	*To what degree do you feel that you are able to take these actions that might benefit you in the face of a wildfire?* • Searching for information about wildfires. • Compiling a complete emergency preparedness plan. • Applying an emergency preparedness plan adequately. • Evacuating from a wildfire located nearby my residence. • Assisting others in the event of a wildfire.

Note. Based on the works of Kievik & Gutteling (2011).

Table 16.
Demographic Measurements.

Label	Item
Age: responses will vary and be manually written in	What year were you born? • Blank space to write the year the participant was born
Gender: 0 (male), 1 (female), 2 (non-binary/third gender), 3 (prefer to self-describe) and 4 (prefer not to answer)	What is your gender? • Male • Female • Non-binary/third gender • Prefer to self-describe • Prefer not to answer
Educational Attainment: 1 (some high school or less) to 8 (advanced degree)	What is the highest level of education you have completed? • Some high school or less • High school diploma or the equivalent • Trade school such as beauty school or electrical school • Some college • Associate's degree or a 2-year college degree • Bachelor's degree or a 4-year college degree • Master's degree • Advanced degree such as a PhD, a Law degree, or a Medical degree
Place of Residency: 0 (own) and 1 (rent)	What best describes your permanent residency? • I rent • I own
Race (in general): 1 (American Indian or Alaskan Native), 2 (Asian), 3 (Black or African American), 4 (Native Hawaiian or other Pacific Islander, 5 (White), 6 (Other)	Which of the following best describes your race? Please check all that apply. • American Indian or Alaskan Native • Asian • Black or African American • Native Hawaiian or other Pacific Islander • White • Other: Please tell us:

Note. Based upon the U.S. Decennial Census and personal communication with Boyd Lebada.

Table 16 (continued).
Demographic Measurements.

Label	Item
Hispanic, Latino, or Spanish Origin: 0 (no), 1 (yes)	Are you Hispanic, Latino, or Spanish origin? • Yes • No
Household Income: 1 (Less than $20,000), 2 ($20,000 to $40,000), 3 ($40,001 to $60,000), 4 ($60,001 to $80,000), 5 ($80,001 to $100,000), 6 ($100,001 to $120,000), 7 ($120,001 to $140,000), 8 ($140,001 to $160,000), and 9 (Greater than $160,001)	What is your approximate total household income, before taxes and from all sources? • Less than $20,000 • $20,000 to $40,000 • $40,001 to $60,000 • $60,001 to $80,000 • $80,001 to $100,000 • $100,001 to $120,000 • $120,001 to $140,000 • $140,001 to $160,000 • Greater than $160,001
Personal Impact by the 2012 High Park Fire (closed-ended): 0 (no), 1 (yes)	Were you affected in any way by the 2012 High Park Fire? • Yes • No
Personal Impact by the 2012 High Park Fire: coded based upon themes found (open-ended)	If yes, please share a few words here on your experience.

Note. Based upon the U.S. Decennial Census and personal communication with Boyd Lebada.

4.4 Data Analysis

For this study, the data analysis portion was directed by literature including: Costello and Osborn (2005) and Young and Pearce (2013) for the exploratory factor analysis (EFA); and Pedhazur (1997), and Stage et al. (2004) for the path analysis. Hayes (2005) was be used as a reference for the overall statistical analysis.

Specifically, an exploratory factor analysis (EFA) was the initial step in assessing the measures, focusing on each of the concepts assessed (dual-process risk perception, past information seeking, perceived hazard knowledge, current information need, response efficacy, self-efficacy, and risk-related information seeking behavioral intention). Each of the concepts was analyzed based upon the factor loadings and a scree plot. Eigenvalues larger than 1.0 were be retained (Costell & Osborne, 2005). Reliability of the multi-item measures was assessed using Cronbach's alpha. Additive scales were constructed using the EFA to determine dimensionality and iterative reduction to maximize alpha. EFA was ideal since helps "…reveal any latent variables that cause the manifest variables to covary" (Costell & Osborne, 2005, p. 2) and also aided in understanding the internal reliability. Also, it helps to determine how many and which factors impact the variables, providing key insight into which variables seem naturally cohesive (Young & Pearce, 2013). The second portion of the data analysis focused on assessing the path model using a multiple linear regression path analysis using Stata (StataCorp. 2017. Version 15). Path analysis was applicable to this study since it is a type of methodology that can assess the hypothesized concepts direct and indirect effects (Pedhazur, 1997). In this study, the path analysis helped in calculating correlations and standard deviation matrices found within the path model. Additionally, t-statistics were calculated for hypothesis tests on model paths. Overall model fit statistics were also be provided (particularly model R^2 values). Appropriate descriptive statistics were run with the survey results. Measures of central tendency and dispersion, association, and contrasts were also included in the data analysis. Thus, overall this study provided a robust quantitative analysis.

4.4.1 Validity and Reliability

Validity is an important part of the research design phase, which stems from a combination of empirical research studies and theoretical frameworks (Campbell & Stanley, 2015; Hayes, 2005). Validity focuses on determining potential errors (Hayes, 2005). There are a variety of types of validity and some more applicable to this study than others. Specifically, there are two different types of validity that are important to this study—content validity and construct validity. Content validity refers to the degree of which the measurement instrument reflects the spectrum of potential outcomes of a construct (Hayes, 2005). Thus, content validity is relevant to this study's objective of operationalizing risk-related information seeking behavioral intention as a construct. Construct validity is applicable in this study since it focuses on bridging the gap between measurements and theoretical frameworks. It requires sensibly selecting the appropriate concepts to test and determine the relationships between them and the main construct (Campbell & Stanley, 2015). Thus, for this study, Cronbach's alpha was calculated for each of the concepts within the path analysis, providing insight into the reliability. Each of the hypotheses and concepts included in the analysis stems from previous research and theoretical constructs.

While many empirical studies may benefit from conducting a pilot and/or pre-testing a survey to understand how participants may interpret survey questions, this study did not include a pilot survey or pre-testing. Specifically, a pilot survey nor pre-testing did not occur for this study because there was previous consultation with experts within the field through interviews and the dissertation committee reviews the survey questions prior to dissemination. Since the study focuses on a finite population (1,060 households within the High Park Fire Burn Area) and utilizes previous validated survey measures, this too affirms no need to include a pilot or pre-test.

CHAPTER V

RESULTS

5.1 Data Collection

The data collection portion of this study occurred from mid-June 2018 to the beginning of August 2018. Recall that 1,060 households were originally identified to be within the study area. However, after further evaluation of the household addresses, 42 were removed from the mailing list since they were duplicates and already recorded. As a result, 1,018 households received the initial post-card pre-notification of the survey. One week later, the same households received the initial survey packet (containing a cover letter, survey, self-addressed stamped envelope, and $2 incentive). For addresses that did not respond after the first survey packet was mailed, they received a second post-card (two weeks later) reminding them to participate in the survey. After that, if a household still did not respond, they received a second mailing of the survey, notifying them that there was still time to participate in the survey. This occurred a week after the second post-card notification was mailed.

The response rate was calculated utilizing the American Association for Public Opinion Research (APPOR, 2016, Version 9) outcome rate calculator for mail-based surveys of unnamed persons. This particular response rate calculator was downloaded from the AAPOR website (https://www.aapor.org/Education-Resources/For-Researchers/Poll-Survey-FAQ/Response-Rates-An-Overview.aspx) and then the responses were inputted into the Microsoft Excel spreadsheet that contained the outcome rate calculator. As noted in Table 18, the response rate is 60.8%. There were

710 valid addresses out of the original 1,060 (432 surveys returned and completed, and 278 survey materials successfully delivered but did not return anything).

Table 17.
Categories Utilized to Calculate the Mail-Based Survey Response Rate.

Category Used for Calculation and APPOR Code	Amount
Completed (all) Surveys (1.0)	432
Deceased (2.31)	1
Unknown Eligibility, Non-Interview: Other-No Response and No Return to Sender (3.90)	278
Not Eligible-Duplicate Listing (4.81)	42
Not Eligible: Other Undelivered and Returned to Sender (4.90)	307

Note. Calculations inputted into the APPOR outcome rate calculator.

After the data collection phase, the data was inputted into Microsoft Excel and assigned a number corresponding to the appropriate Likert-type scale for the construct or other type of numerical coding based on previous literature. Each construct was broken down by question and sub-question in preparation for analysis. For example, affective risk perception consisted of four sub-questions within the survey, thus there were four different columns worth of data for each respondent. A combined affective response column was also added to provide an overall value for this construct and in preparation for descriptive, exploratory, as well as path analysis phases in Stata (StataCorp. 2017. Version 15).

Missing data is oftentimes inevitable with surveys methods and requires careful consideration into how to deal with it. (Scheffer, 2002) and calculating the number of missing values was also crucial to determine since statistical software often drops the missing value case which eliminates them from the analysis altogether. There are several reasons for missing data, often referred to as missing mechanisms. These include: missing completely at random (MCAR), missing at random (MAR), and not missing at random (NMAR; Scheffer, 2002). MCAR, includes both missing values at random as well as those observed at random, which indicates the data was gathered randomly but does not depend on other concepts within the dataset. Whereas MAR is when the data may be missing but it is conditional to another concept. NMAR, also referred to as informatively missing, is when the missing value relies on the exact value of the missing data (Scheffer, 2002). This is oftentimes a difficult missing mechanism to account for.

There are several approaches towards handling missing data including traditional avenues such as case deletion, single imputation, as well as multiple imputation (Scheffer, 2002). Case deletion simply requires the missing data sections to be removed in order to have the remaining analysis conducted. However, oftentimes it is more complicated to simply delete the missing value placeholders than to use one of the other approaches. Single imputation can be conducted for the mean, median, or mode, often contingent on the type of data utilized. For example, mean imputation replaces the missing value with the mean for that concept. One of the benefits to utilizing single imputation is it oftentimes can reduce bias. However, it had the potential to influence the variance, oftentimes reducing it. Whereas, multiple imputation provides the opportunity to generate a variety of potential data sets and combines the results obtained from them (Sterne et al., 2009). One of the downfalls to utilizing multiple imputation is it quite computationally intensive and requires a lot of approximations (Sterne et al., 2009). As a result, the different algorithms oftentimes have to be applied and re-applied extensively in order to obtain accurate results. In the instance of this study, single imputation was included since it is often times easier to incorporate with the statistical software, simplistic approach since there was little missing data in this study, and it does allow for less bias.

The number of missing values for each variable and the percent missing were calculated in Stata (StataCorp. 2017. Version 15). Overall, the total missing values was 2.62%. It is important to ensure there are a limited number of missing values. The missing values are filled in based upon the type of variable. For continuous variables only, missing values were replaced by the mean, which is also known as mean imputation (Gelman & Hill, 2006). This is a common approach towards replacing missing values and one of the simplest forms to do so. However, recall that there is a downfall to this approach. Specifically, mean imputation can skew the variance and sometimes can underestimate the standard deviation (Gelman & Hill, 206). There is the potential this approach towards missing values can influence the model. However, this approach was still utilized for this study since it was only applied to one of the concepts and a very small amount of missing values were present. In the instance of this study, age was the only continuous variable. The mean was the year 1957 (61 years old). For categorical variables, the mode was used for any missing values. Once that was calculated, the mode was generated for each variable and coded to specifically replace each missing value, also known as mode imputation (Zhang, 2016). Similar to mean imputation, mode imputation is simply in practice yet can have downfalls when used widely across a dataset. Specifically, it has the potential to underrate the standard deviation and also it does not take into consideration its relationship with other concepts (Zhang, 2016). However, as previously noted, this approach towards missing values was still applied given the very small percentage of actual missing values from the overall dataset. Thus, the dataset used for the descriptive, exploratory, and path analysis had no missing values. Furthermore, it should be noted that for the analysis portion of this study, a 95% confidence interval was used for testing.

5.2 Descriptive Analysis

After the data collection and clean-up phase, the descriptive analysis portion of the study was conducted. This particularly entailed reviewing each scale concept by assessing the mean, standard deviation, range, kernel density plots, normal density plots, Shapiro-Wilk test, principal component analysis (PCA), as well as reviewing the reliabilities with Cronbach's alpha, when applicable. Additionally, the descriptive analysis portion also included reviewing the demographics, assessing central tendency and dispersion, histogram, as well as frequency tables. Specifically, the various results for each of the scale concepts can be viewed within the Appendix . The majority of tables and figures for the demographic descriptive analysis can be found in the appendix too. Moreover, Table 18 provides detail on overview of the mean, standard deviation, and range for each of the scale concepts. Table 19 provides the Shapiro-Wilk results for each of the measured concepts.

5.2.1 Risk-Related Information Seeking Behavioral Intention Descriptive Analysis

The dependent variable, risk-related information seeking behavioral intention, focused on assessing how participants might interact with information related to wildfires in the future. All of the variables for risk-related information seeking behavioral intention tend to be closer to the center range, with 1 indicating strongly disagreement to 5 which represents strong agreement. Table 44 in the appendix provides specific detail about the highest means for agreement and standard deviations. For example, it showcases that InfoSBI6 (I will look for information related to wildfires and emergency preparedness in the future) as the highest mean for agreement (*M*=3.42, *SD*=0.99). The values were then collapsed into a single value for risk-related information seeking behavioral intention (*M*=19.42, *SD*=5.32), as seen in Table 18. For risk-related information seeking behavioral intention, the normal probability plot and kernel density estimation plot revealed a moderate negative skew and a departure from normality, rejecting the null hypothesis *(w=0.98, p=0.00;* Table 19*)*, as seen in Figures 18 and 19. A correlation matrix for risk-related information seeking behavioral intention was also included. For this particular scale concept, there were six variables. The correlation matrix for risk-related information seeking behavioral intention reveals all of the correlations to be significant at the <0.001 level (Table 45). Dimensionality included only one factor with an Eigenvalue of >1 (Table 46) and the Cronbach alpha is strong, as seen in Table 21.

5.2.2 Past Risk-Related Information Seeking Descriptive Analysis

Participants were asked to think about their past risk-related information seeking, behavior ranging from 1 (not at all) to 5 (completely). Table 48 provides specific detail about the highest means for agreement and standard deviations. For example, the strongest means for agreement was PstInfoS4 (When there has been a wildfire in the region, I paid close attention to the new; *M*=4.40, *SD*=0.87). The values were then collapsed into a single value for past risk-related information seeking (*M*=20.98, *SD*=4.97), as seen in Table 18. The past risk-related information seeking normal probability plot and kernel density estimation plot reveal a departure from normality, rejecting the null hypothesis (*w=0.99, p=0.03*; Table 19), as seen in Figures 20 and 21.

The correlations were also significant at the <0.001 level and for dimensionality, only one factor had an Eigenvalue >1 (Table 49 and 50). For past risk-related information seeking, the Cronbach alpha was strong (Table 21).

5.2.3 Affective Risk Perception Descriptive Analysis

Participants were asked about their emotional response to the threat of a wildfire including whether they feel fearful, worried, dread, or depressed, focusing on the overall concept of affective risk perception (ranging from 1 (strongly disagree) to 5 (strongly agree). The highest means for agreement and standard deviation are broken down for affective risk perception in Table 52. For example, the highest means for agreement was AffRiskwo (Thinking about the possibility of a major wildfire makes me feel worried; *M*=3.60, *SD*=1.19). The values were then collapsed into a single value for affective risk perception (*M*=11.38, *SD*=4.08), as seen in Table 18. For affective risk perception, the data was normally distributed, as seen in Figures 22 and 23, accepting the null hypotheses ($w=1.00, p=0.19$; Table 19). All of the correlations were significant in the affective risk perception correlation matrix, with a significance level of <0.001 across the entire matrix (Table 53). Similar to other variables, when testing the dimensionality for affective risk perception, only one of the Eigenvalues was >1 (Table 54). Furthermore, the Cronbach alpha was strong for affective risk perception (Table 21).

5.2.4 Cognitive Risk Perception Descriptive Analysis

Cognitive risk perception questions focused on having participants think about the nature of wildfires from 1 (strongly disagree) to 5 (strongly agree). This particularly entailed assessing their cognitive risk perception of the financial threats, catastrophic destruction, and threat of wildfires for future generations. The highest means for agreement and standard deviation are broken down for cognitive risk perception in

Table 56. As referenced, the highest mean for agreement was CogRiskca (I think wildfires may cause catastrophic destruction; M=4.27, SD=0.96). The values were then collapsed into a single value for cognitive risk perception (M=14.58, SD=3.39; Table 18). The cognitive risk perception normal probability plot and kernel density estimation plot displayed a departure from normality, rejecting the null hypothesis, ($w=0.98$, $p=0.00$; Table 19), as seen in Figures 24 and 25. Moreover, the cognitive risk perception matrix included four variables and all of the Pearson correlations were significant at the level of <0.001 (Table 57). The dimensionality was just one factor with an Eigenvalue >1 (Table 58) and the Cronbach alpha was good (Table 21).

5.2.5 Response Efficacy Descriptive Analysis

The response efficacy question assessed whether participants felt certain actions would be benefit them in the event of a wildfire such as searching for information, evacuating, or assisting other individuals from 1 (not at all) to 5 (a great deal). The means of agreement and standard deviations for response efficacy can be seen in Table 60. As referenced, the highest means for agreement was RespEff3 (Applying an emergency preparedness plan adequately). The values were then collapsed into a single value for response efficacy and can be viewed in Table 18 (M=18.36, SD=4.00). The response efficacy kernel density estimation plot displayed a departure from a normal distribution, rejecting the null hypothesis ($w=0.97$, $p=0.00$; Table 19), as seen in Figures 26 and 27. Five variables were included within the correlation matrix for response efficacy. The correlations between the response efficacy variables were all significant at <0.001 (Table 61) and the dimensionality results indicate only one factor has an Eigenvalue >1 (Table 62). For response efficacy, the Cronbach's alpha was good as seen in Table 21.

5.2.6 Self-Efficacy Descriptive Analysis

Participants also were asked to what degree they feel they are able to take certain actions that would benefit them in the event of a wildfire, measuring self-efficacy from 1 (not at all) to 5 (a great deal). The specific means for agreement and standard deviations for self-efficacy can be viewed in the appendix in Table 64. For example, the highest means for agreement was SelfEff4 (evacuating from a wildfire located nearby my residence; M=4.17, SD=1.06). The values were then collapsed into a single value for self-efficacy (M=19.51, SD=3.84). The self-efficacy normal probability plot and kernel density estimation plot revealed a departure from a normal distribution, rejecting the null hypothesis *(w=0.94, p=0.00*; Table 19*),* as seen in Figures 28 and 29. Five variables were included within the self-efficacy correlation matrix and all of the variables are significant at the <0.001 level (Table 65). Dimensionality results for self-efficacy indicated only one factor with an Eigenvalue > 1 (Table 66) and Cronbach's alpha was strong (Table 21).

5.2.7 Perceived Hazard Knowledge Descriptive Analysis

Perceived hazard knowledge was also assessed to better understand what aspects related to wildfires participants understand the best and areas for improvement from 1 (very poorly) to 5 (very well). The means for agreement and standard deviation for perceived hazard knowledge are located in Table 68 of the appendix. For example, the highest mean for agreement was Phazk1 (creating defensible space; M=4.33, SD=0.80). The values were then collapsed into a single value for perceived hazard knowledge, as seen in Table 18 (*M*=30.71, *SD*=5.40). The normal probability plot and kernel density estimation plot revealed a departure from normality, rejecting the null hypothesis (*w=0.98, p=0.00*; Table 19), as seen in Figures 30 and 31. The perceived hazard knowledge correlation matrix included eight variables to assess this concept. All of the correlations were significant at the <0.001 level (Table 69). Additionally, the dimensionality testing reveals only one factor with an Eigenvalue >1 (Table 70) and Cronbach's alpha was strong as seen in Table 21.

5.2.8 Current Information Needs Descriptive Analysis

Current information needs were calculated by subtracting sufficiency threshold from current knowledge, based upon a range of -100 to 100. Positive values indicate that an individual believes they have enough knowledge about a given risk and no need for addition risk-related information seeking. Whereas, a negative value means the individual does not believe they have enough information about the risk and subsequently would feel the need to seek additional information. Current information needs were closer to the center range (*M*=2.12, *SD*=31.83). Moreover, the normal probability plot and kernel density estimation plot revealed a departure from normality, rejecting the null hypothesis (*w = 0.93, p=0.00*; Table 19).

Table 18.
Means, Standard Deviations, and Ranges for Each Scale Concept.

Concept	M	*SD*	Range
Risk-Related Information Seeking Behavioral Intention	19.42	5.32	6-30
Past Risk-Related Information Seeking	20.98	4.97	6-30
Affective Risk Perception	11.38	4.08	4-20
Cognitive Risk Perception	14.58	3.39	4-20
Response Efficacy	18.36	4.00	5-25
Self-Efficacy	19.51	3.84	5-25
Perceived Hazard Knowledge	30.71	5.40	11-40
Current Information Needs	2.12	31.83	-100-100

Table 19.
Shapiro-Wilk Results for Each Measured Concept.

Concept	W	Z	p
Risk-Related Information Seeking Behavioral Intention	0.98	3.98	0.00
Past Risk-Related Information Seeking	0.99	1.91	0.03
Affective Risk Perception	1.00	0.88	0.19
Cognitive Risk Perception	0.98	3.81	0.00
Response Efficacy	0.97	5.20	0.00
Self-Efficacy	0.94	6.66	0.00
Perceived Hazard Knowledge	0.98	4.41	0.00
Current Information Needs	0.93	7.32	0.00

5.3 Demographic Analysis and Census Comparison

The demographic data was included in the initial analysis of the data and compared with Census data to provide a better interpretation of the survey sample in comparison to the overall population for this geographic area. In the survey, participants were asked about the following demographics: place of residence, gender, race, Hispanic origin, educational attainment, household income, age, and whether they were impacted by the High Park Fire. The following were included within the demographic descriptive analysis including central tendency, dispersion, and frequency tables (Appendix). Additionally, the index of qualitative variation (IQV) was provided for categorical variables (Table 20). IQV examines the variability of a variable and ranges from 0 to 1. If the IQV is 0, then there is no diversity amongst the distribution. However, if the IQV is 1, there is maximum diversity within the distribution.

The majority of the survey participants own their place of residency, as seen in Figure 8. The survey response was biased towards male (62.5%), while just over a third of participants identified as female (Figure 9). Participants were asked to identify if they are of Hispanic, Latino, or Spanish origin. In this instance, just over 1% of the participants identified as Hispanic, Latino, or Spanish origin, while the remaining participants identified that they are not of Hispanic, Latino, or Spanish, as seen in Table 10. The survey underestimated the Hispanic. Latino, Spanish population. Participants were asked to identify their race overall including American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White, or Other. None of the survey participants identified as Black or African American or Native Hawaiian or Other Pacific Islander, while the majority identify as white, as seen in Figure 11. While a small portion of participants identified as either American Indian or

Alaskan Native, or Asian, and other, also seen in Figure 11. The IQV for race was very small, suggesting very little diversity amongst the distribution, which was similar to the ACS, as seen in Table 20.

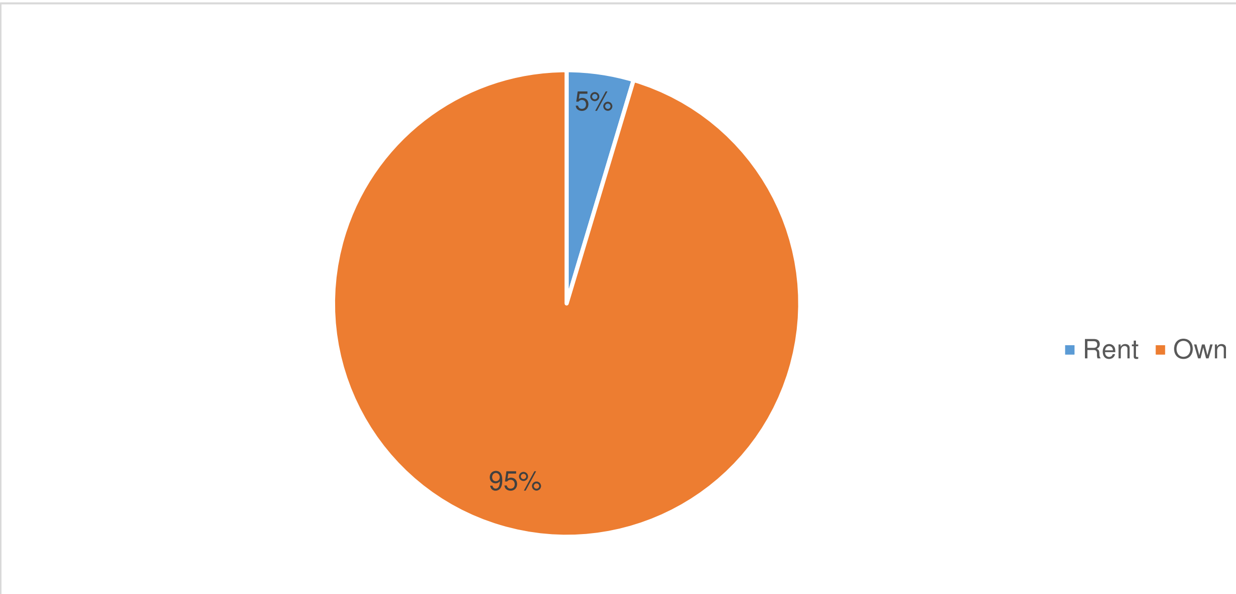

Figure 8. Place of residency for survey participants.

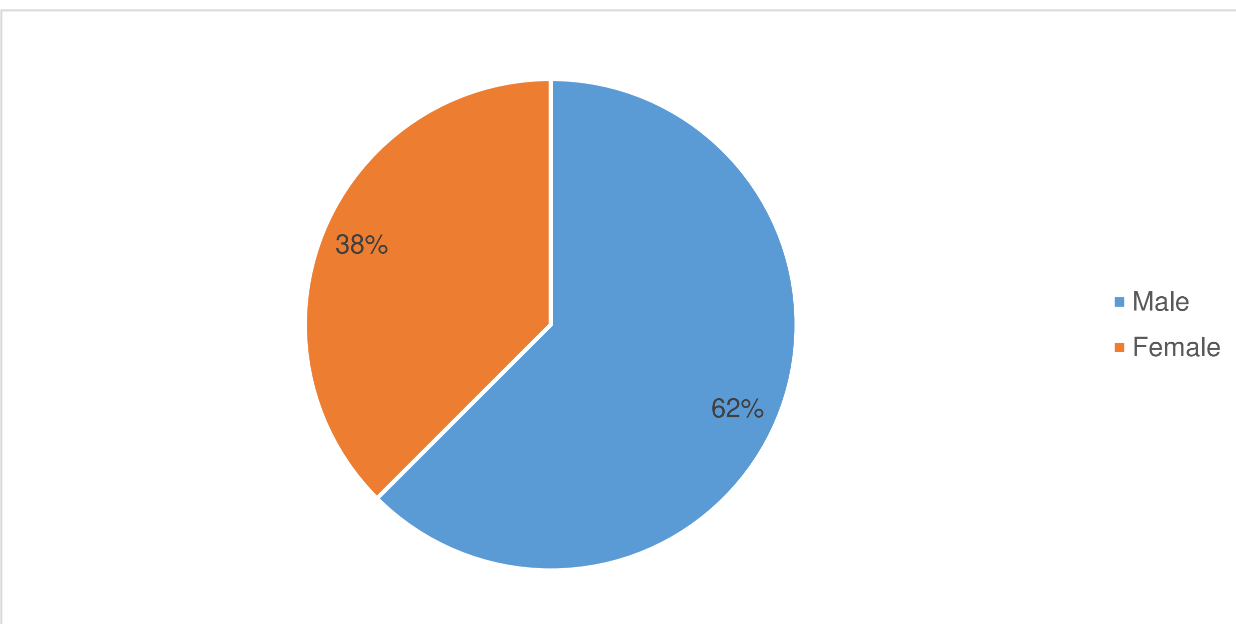

Figure 9. Gender of survey participants.

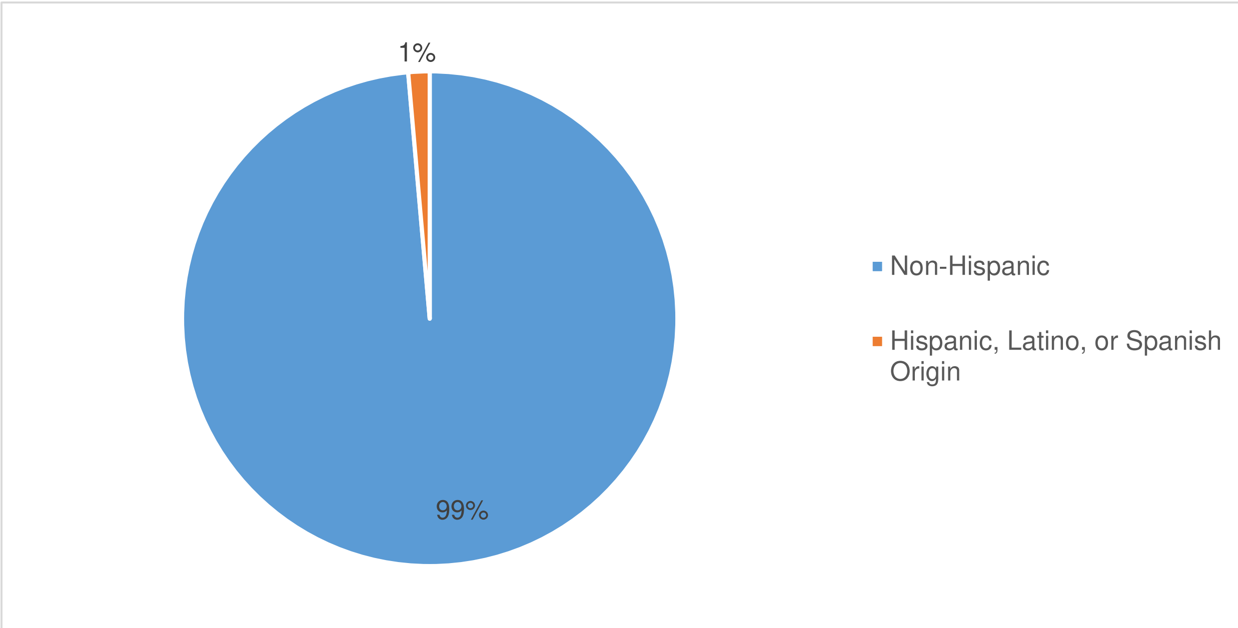

Figure 10. Hispanic origin of participants.

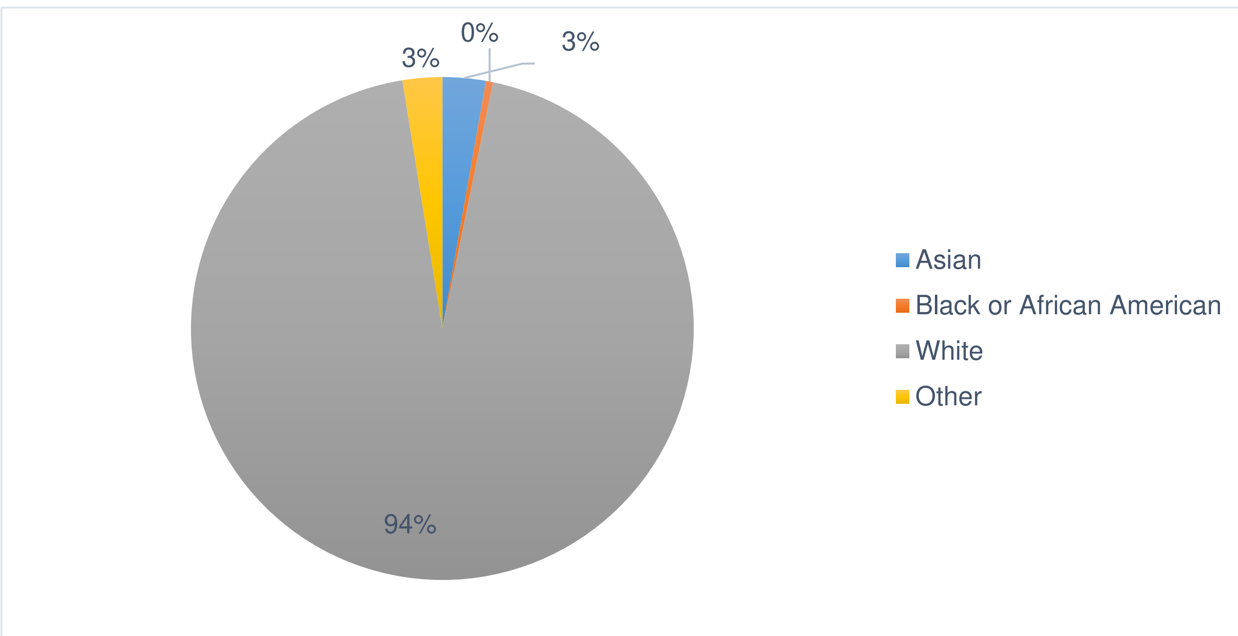

Figure 11. Race of participants.

Overall, just over a third of the participants indicated they completed a Bachelor's degree as their highest level of education, as seen in Figure 12. Meanwhile, the remaining number of participants seemed to have a diverse range of educational attainment, which was also affirmed from assessing the IQV. In fact, the IQV for educational attainment was high, noting substantial diversity amongst the distribution (Table 20). Total household income also had a high IQV indicating diversity within the distribution of data (Table 20). In particular, just over 27% of the participants noted a total household income in the mid-range (between $60,001 to $80,000), as seen in Figure 13. Whereas, the remaining total household income ranges had smaller amounts of participants representing them. Participants were also asked to indicate their birth year, helping determine their age. The average age of participants was 61 years old, based on a range of 18-93 years old (Table 39). The histogram for age affirms an older population of participants and a not normal distribution (*w=0.97, p=0.00*), as seen in the Table 17 in the Appendix.

Moreover, as seen in Table 20, the IQV for the race, educational attainment, and total household income from the survey were quite similar to those from the American Community Survey (ACS). Both indicated very little diversity amongst the distribution for race. Whereas both the survey and the ACS indicated diversity amongst the distribution for educational attainment and also total household income.

Table 20.
Index of Qualitative Variation (IQV) for Race, Educational Attainment, and Total Household Income from the Survey and the American Community Survey (ACS).

Demographic	Index of Qualitative Variation (IQV): Survey	Index of Qualitative Variation (IQV): ACS
Race	0.15	0.10
Educational Attainment	0.91	0.90
Total Household Income	0.96	0.97

Note. The index ranges from 0 to 1, 0 indicating no diversity. Amongst the distribution and 1 indicating maximum diversity.

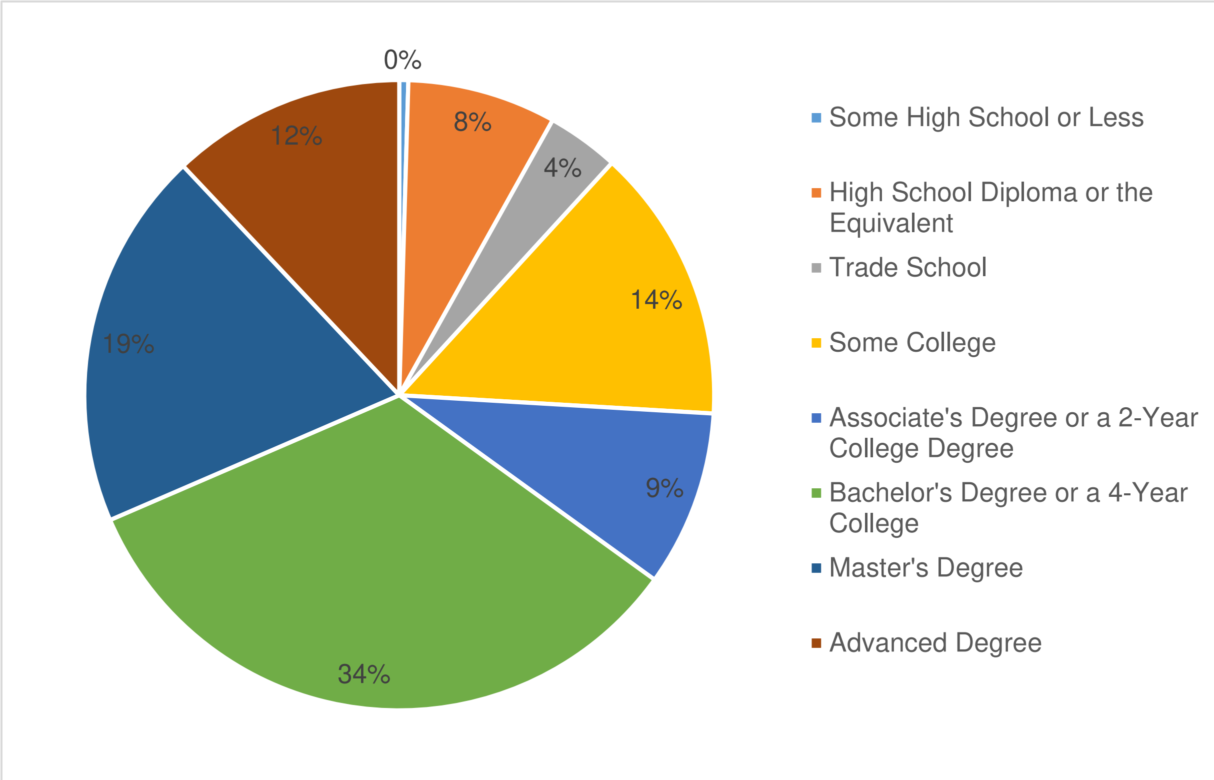

Figure 12. Educational attainment of participants.

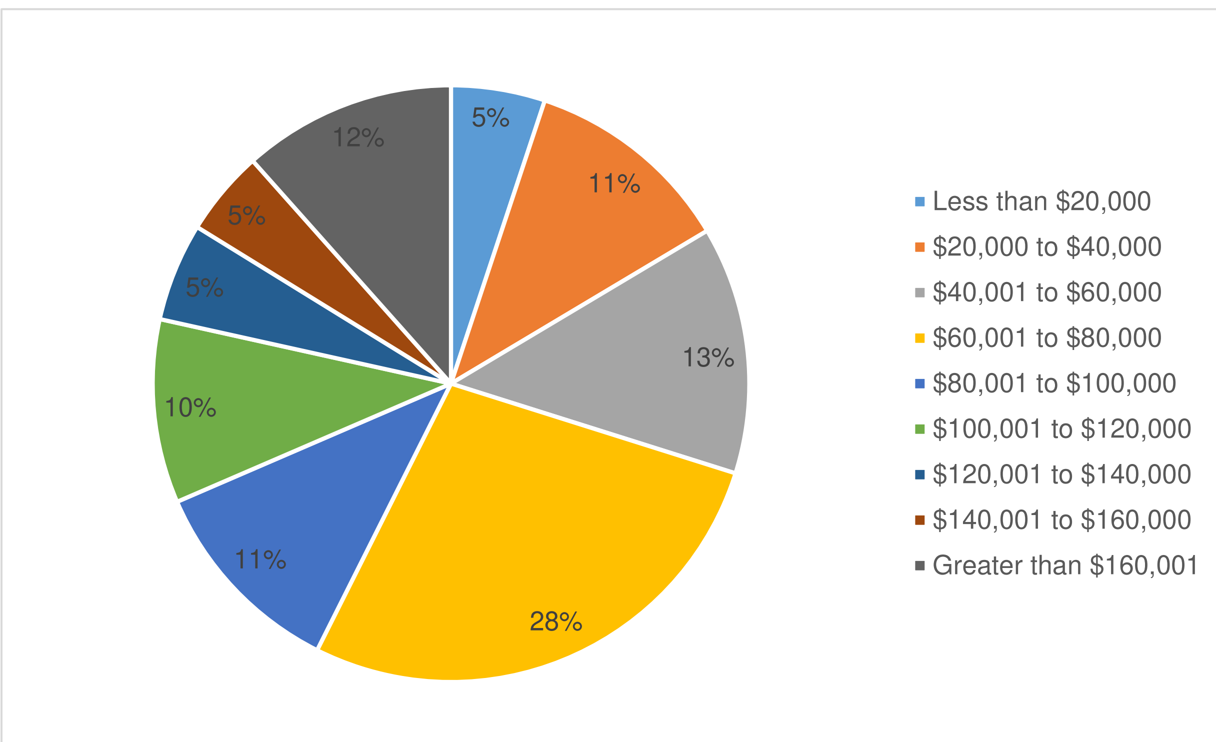

Figure 13. Total household income of participants.

In addition to assessing the common demographic characteristics, participants were also asked if they were personally affected by the 2012 High Park Fire. An overwhelming majority of participants indicates that they were personally impacted by this wildfire (86.34%), as seen in Figure 14. Further discussion on how the impact of the fire might influence risk-related information seeking behavioral intention and the other concepts is discussed in the follow-up exploratory analysis portion of this study.

While it is important to provide an overview of the participant demographics through central tendency and dispersion measurements, it is just as important to provide a brief analysis on how the overall survey sample fairs with the overall population for this area, based upon Census data. The American Community Survey (ACS) 2016 data was utilized for this comparison.

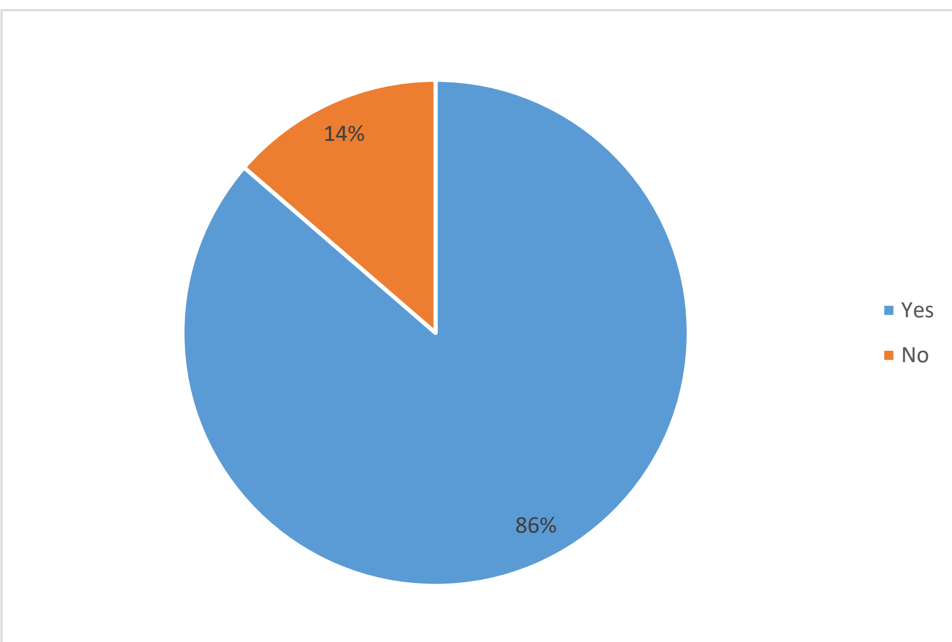

Figure 14. Percentage of residents impacted by the High Park Fire.

5.4 Exploratory Data Analysis

After the descriptive statistical analysis, exploratory data analysis (EDA) was included prior to the path analysis portion of this study. EDA provides the opportunity to examine the data set without pre-conceived assumptions, providing a more philosophical approach to data analysis (Martinez et al., 2017). In this particular context, the exploratory data analysis provided further insight into race, education and education specifically since each of these concepts was biased in this study. This specifically entailed testing means through independent t-tests, one-way ANOVA tests by race, education, and income, as well as constructing a correlation matrix of all the model variable.

5.4.1 Confirmatory Means Comparisons

Independent t-tests were run for two demographic variables—sex and Hispanic origin with each scale concept. When evaluating the t-tests by sex, only three of the nine scale concepts resulted in significant findings. Only those that are of the most importance and significant are noted here. There is a significant effect between affective risk perception and the sex of participants with $t(420)= -6.11, p=0.00$ and for cognitive risk perception and sex with $t(420)= - 2.59, p=0.01$. Additionally, to follow up with the individual t-tests that reported significant findings for the three these scale concepts, simple linear regression models are also included in the exploratory analysis.

Simple regression was used to assess the associations with the dichotomous variable sex, reporting standardized slope coefficients. Two findings are significant—affective risk regressed on sex $(\beta=0.28, p=0.00)$ and cognitive risk perception regressed on sex $(\beta=0.12, p=0.01)$. These findings are consistent with the literature, which shows that women tend to be more risk averse (e.g., Armas & Avram, 2009; Kellens et al., 2011; Kreibich et al., 2009; Lindell & Hwang, 2008; Schumann et al., 2017). This demographic variable was assessed in the path analysis.

Independent t-tests related to Hispanic origin and each of the scale concepts are also included in the exploratory analysis. In this instance, only one out of the nine t-tests has significant results—risk-related information seeking behavioral intention *(t(430)= -2.37, p=0.02)*. It is important to point out that one group only had n=6 and it is evident that the variances are not equal. Subsequently, the independent t-tests for Hispanic origin were then rerun to include unequal variances and reporting of the non-significant Welch test. In this instance, none of the scale concepts are significant.

5.4.2 Confirmatory One-Way ANOVA

The other portion of the exploratory analysis involves running one-way ANOVA with Bonferroni post-hoc analysis for race, educational attainment, and income. For the one-way ANOVA for race, there is only-one ANVOA that is significant—self-efficacy *(F(3, 428(-2.99, p=0.03)*. In instance case, none of the pair-wise post hoc comparisons are significant (alpha of 0.05 as the significant indicator). For the total household income one-way ANOVA, only one was significant— risk-related information seeking behavioral intention *(F(8,423)=2.36, p=0.02)* and in this case none of the pair-wise post hoc tests are significant. Also, for the one-way ANOVA for education, only one scale concepts have significant results—past risk-related information seeking. The one-way ANOVA results for past risk-related information seeking are *F(7,424)=2.88, p=0.01*.

5.4.3 Confirmatory Correlation Among Model Variables

Pearson's correlation coefficients were assessed for each of the scales. It is important to note that among the 36 coefficients, 8 are non-significant while 78% of the coefficients are significant. Most importantly, the dependent variable risk-related information seeking behavioral intention, has significant correlations with all of the scale items. Affective risk and risk-related information seeking behavioral intention had a positive, significant correlation of $r= 0.21, p<0.001$. The correlation between cognitive risk perception and risk-related information seeking behavioral intention was also positive and significant with $r= 0.25, p<0.001$. A positive correlation exists between response efficacy and risk-related information seeking behavioral intention, at $r=0.44, p<0.01$. Self-efficacy and risk-related information seeking behavioral intention also have a positive correlation with $r=0.25, p<0.001$. Additionally, there is a positive correlation between past risk information seeking and risk-related information seeking behavioral intention with $r=0.29, p<0.001$.

Table 21.
Cronbach's Alpha, Correlations, and Covariances of the Wildfire Information Study Scale Variables.

Concept	Cronbach's Alpha	Risk-Related Information Seeking Behavioral Intention	Affective Risk Perception	Response Efficacy	Cognitive Risk Perception	Current Info. Needs	Past Risk Related Info. Seeking	Self-Efficacy	Perceived Hazard Knowledge
Risk-Related Information Seeking Behavioral Intention	0.94	1	4.57	9.44	4.63	-60.71	7.73	5.17	-3.77
Affective Risk Perception	0.83	0.21***	1	3.37	4.08	-20.07	2.84	0.48	-2.62
Response Efficacy	0.77	0.44***	0.21***	1	3.26	-29.28	6.60	5.89	-0.62
Cognitive Risk Perception	0.79	0.25***	0.30***	0.24***	1	-9.86	2.31	1.79	-0.31
Current Info. Needs	N/A	-0.36***	-0.15***	-0.23***	-0.09	1	5.87	-7.37	49.35
Past Risk Related Info. Seeking	0.84	0.29***	0.14**	0.33***	0.14**	0.03	1	8.18	8.94
Self- Efficacy	0.81	0.25***	0.03	0.38***	0.14**	-0.06	0.43***	1	5.58
Perceived Hazard Knowledge	0.86	-0.13**	-0.12**	-0.03	-0.02	0.29***	0.33***	0.27***	1

Note. * represents <0.05, ** represents <0.01, and *** represents <0.001.

5.4.4 Confirmatory Path Analysis

In order to assess the hypotheses that stem from the theoretical concepts, as noted in section 3.2, a path analysis was run in Stata (StataCorp. 2017. Version 15). The results can be seen in Figure 15 and Table 22 provide a thorough summary of the tests of the hypotheses. Results are also presented below with the corresponding hypotheses. Standardized slope coefficients are reported, significance tests are directional. It should be noted that the use of one-tailed p-values did not alter the substantive findings versus two-tailed tests. A one-tailed test was used because there were directional hypotheses, and subsequently the p-value should be one-tailed. Stata (StataCorp, 2017. Version 15) originally gave me two-tailed values but I was unable to change this within the software. As a result, an accepted approach was utilized which requires the two-tailed value to be divided by two, as seen and recommended here: https://stats.idre.ucla.edu/other/mult-pkg/faq/pvalue-htm/. The following results were found when running the confirmatory path analysis:

H1: *Dual-process risk perception will have a positive direct effect on past information seeking.*

This hypothesis is supported for both affective *(β =0.11, Z = 2.2, $p < 0.05$)* and cognitive *(β =0 .11, Z = 2.1, $p < 0.05$)* components of risk perception.

H2: *Dual process risk perception will have a positive direct effect on current information needs.*

This hypothesis is not supported for affective risk perception (although significant, opposite valence) *(β = -0.10, Z=2.05, $p<0.05$)* nor for cognitive risk perception *(β = -0.51, Z=-1.08, p= n.s.)*. These results are controlling for past information seeking and perceived hazard knowledge.

H3: Dual-process risk perception will have a positive direct effect on risk-related information seeking behavioral intention, not controlling for perceived hazard knowledge.

This hypothesis is not supported for affective risk perception *(β =0.05, Z=1.19, p=n.s.)* but is supported for cognitive risk perception (β =0.13, Z=2.93, $p<0.01$). These results are controlling for response efficacy, self-efficacy, past information seeking, and information needs.

H4: Past information seeking will have a positive direct effect on perceived hazard knowledge.

This hypothesis is supported *(β =0.33, Z=7.82, $p<0.01$)*.

H5: Past information seeking will have a positive direct effect on current information needs.

This hypothesis is not supported *(β = -0.04, Z= -0.76, p=n.s.)*. This result is controlling for cognitive/affective risk perception and perceived hazard knowledge.

H6: Past information seeking will have a positive direct effect on risk-related information seeking behavioral intention.

This hypothesis is supported *(β =0.18, Z=3.82, $p<0.01$)*. This result is controlling for current information needs, self-efficacy, response efficacy, and cognitive/affective risk perception.

H7: Perceived hazard knowledge will have a negative direct effect on current information need.

This hypothesis is not supported *(β =0.29, Z=6.05, $p<0.01$)*. This result is controlling for cognitive/affective risk perception and past information seeking.

H8: Current information need will have a positive direct effect on risk-related information seeking behavioral intention.

This hypothesis is not supported *(β = -0.30, Z= -6.96, $p<0.01$)*. This result is controlling for past information seeking, response efficacy, self-efficacy, and cognitive/affective risk perception.

H9: Response efficacy will have a positive direct effect on risk-related information seeking behavioral intention.

This hypothesis is supported *(β =0.27, Z=5.79, p<0.01)*. This result is controlling for past information seeking, current information needs, self-efficacy, and cognitive/affective risk perception.

H10: Self-efficacy will have a positive direct effect on risk-related information seeking behavioral intention.

This hypothesis is not supported *(β =0.43, Z=0.92, p=n.s.)*. This result is controlling for past information seeking, current information needs, response efficacy, and cognitive/affective risk perception.

H11: Response efficacy and self-efficacy should be positively correlated with one another.

This hypothesis is supported *(β =0.38, Z=9.36, p<0.01).*

Also, there is a direct correlation between affective risk perception and cognitive risk perception *(β =0.30, Z=6.72, p<0.01).*

5.4.5 Confirmatory Path Model Fit

Overall, the model fit was not ideal ($\chi^2(9)$ =165.30 p < .01, RMSEA = .2, p-close < .01). Global model fit assessment can be problematic in a path model, as variables are measured without error. The model does produce good equation-level fit estimates, however: past information seeking ($R^2 = 0.03$, $F_{2, 429} = 6.6$, p < .01), risk-related information seeking behavioral intention (R^2 =0.27, $F_{6, 425} = 34$, p < .01), current information needs ($R^2 = 0.09$, $F_{4, 427} = 612$, p < .0), perceived hazard knowledge (R^2 =0.11, $F_{1, 430} = 54$, p < .01), and overall (R^2 =0.19, p< .01).

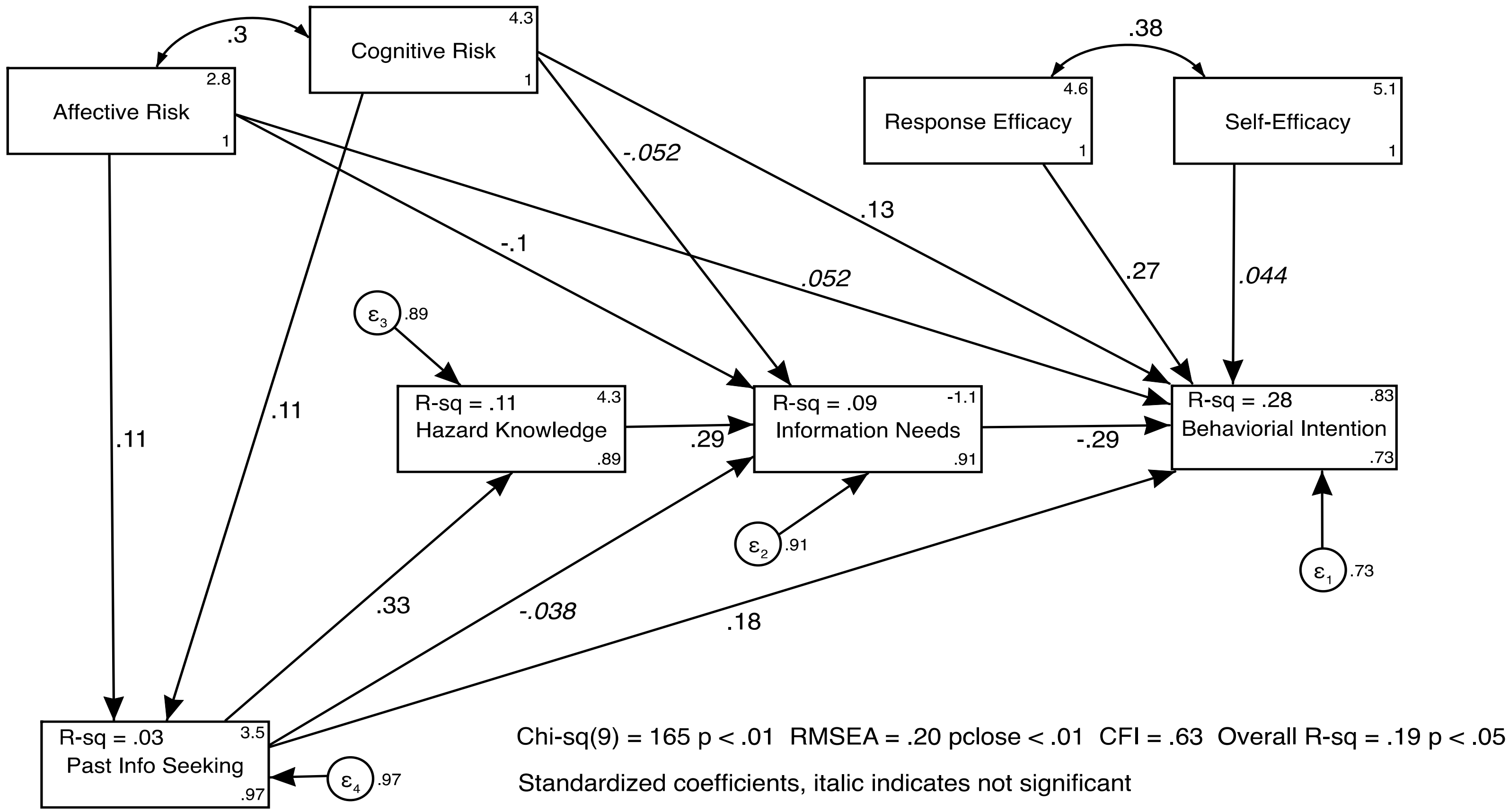

Figure 15. Results of the confirmatory path analysis.

Table 22.
Confirmatory Path Analysis Results of Standardized Coefficient, Z-Score, and the P-Value.

Structural	Standardized	Standardized Coefficient	Z-Score	P-Value
Risk-Related Information Seeking Behavioral Intention				
	Current Information Needs	-0.29	-6.96	0.00
	Past Risk-Related Information Seeking	0.18	3.82	0.00
	Self-Efficacy	0.04	0.92	0.36
	Response Efficacy	0.27	5.79	0.00
	Cognitive Risk Perception	0.13	2.93	0.00
	Affective Risk Perception	0.05	1.19	0.23
Current Information Needs	Perceived Hazard Knowledge	0.29	6.05	0.00
	Past Risk-Related Information Seeking	-0.04	-0.76	0.45
	Cognitive Risk Perception	-0.05	-1.08	0.28
	Affective Risk Perception	-0.10	-2.05	0.04
Perceived Hazard Knowledge	Past Risk-Related Information Seeking	0.33	7.82	0.00
Past Risk-Related Information Seeking	Cognitive Risk Perception	0.11	2.14	0.03
	Affective Risk Perception	0.11	2.21	0.03
Covariate	Self-Efficacy, Response Efficacy	0.38	9.36	0.00
	Cognitive Risk Perception, Affective Risk Perception	0.30	6.72	0.00

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Table 23.
Test of the Hypotheses for the Confirmatory Path Analysis.

Path	Proposed Direction	Path Coefficient	Z	P-Value (1-tailed)	Result Related to Hypothesis
H1: Dual process risk perception (cognitive) → past risk-related information seeking	+	0.11	2.1	0.02	Accepted
H1: Dual process risk perception (affective) → past risk-related information seeking	+	0.11	2.2	0.15	Accepted
H2: Dual process risk perception (cognitive) → current information needs	+	-0.51	-1.08	0.14	Rejected
H2: Dual process risk perception (affective)→ current information needs	+	-0.10	-2.05	0.02	Rejected
H3: Dual process risk perception (cognitive) →risk-related information seeking behavioral intention	+	0.13	2.93	0.00	Accepted
H3: Dual process risk perception (affective) → risk-related information seeking behavioral intention	+	0.05	1.19	0.16	Rejected
H4: Past risk-related information seeking → perceived hazard knowledge	+	0.33	7.82	0.00	Accepted
H5: Past risk-related information seeking →current information needs	+	-0.04	-0.76	0.23	Rejected
H6: Past risk-related information seeking →risk-related information seeking behavioral intention	+	0.18	3.82	0.00	Accepted
H7: Perceived hazard knowledge → current information needs	-	0.29	6.05	0.00	Rejected
H8: Current information needs →risk-related information seeking behavioral intention	+	-0.30	-6.96	0.00	Rejected
H9: Response efficacy → risk-related information seeking behavioral intention	+	0.27	5.79	0.00	Accepted

Table 23 (continued).
Test of the Hypotheses for the Confirmatory Path Analysis.

Path (continued)	Proposed Direction (continued)	Path Coefficient (continued)	Z (continued)	P-Value (1-Tailed; continued	Results Related to Hypothesis (continued)
H10: Self-Efficacy → risk-related information seeking behavioral intention	+	0.43	0.92	0.18	Rejected
H11: Response Efficacy → Self-Efficacy	+	0.38	9.36	0.00	Accepted

5.4.6 Exploratory Path Analysis

Since the confirmatory path analysis did not provide acceptable model fit, it is important to also do an exploratory path analysis to determine if there is a model that provides a better representation. An iterative approach was used in which non-significant paths were removed sequentially in ascending order of test statistic magnitude (re-running model between steps). With all non-significant paths eliminated Modification Indices were used to add new paths, in descending order to a floor value of 10, again re-running the model between steps. Theoretical and logical considerations were maintained concerning alternate path directions. The final exploratory model is presented in Figure 16 and Table 25. The exploratory results are described below with the corresponding hypotheses and descriptions of new findings that were not hypothesized. As this is an exploratory model, tests are two-tailed.

H1: Dual process risk perception will have a positive direct effect on past information seeking.

This hypothesis is supported for both *affective* ($\beta = 0.11, Z = 2.14, p < 0.05$) and cognitive ($\beta =0 .11, Z = 2.21, p < 0.01$) components of risk perception.

H2: *Dual-process risk perception will have a positive direct effect on current information needs.*

This hypothesis was not reproduced in the exploratory analysis.

H3: *Dual-process risk perception will have a positive direct effect on risk-related information seeking behavioral intention.*

This hypothesis is supported for cognitive risk perception *(β =0.13, Z=3.31, p<0.01)* but the effect of affective risk perception was not reproduced in the exploratory analysis.

H4: *Past information seeking will have a positive direct effect on perceived hazard knowledge.*

This hypothesis is supported *(β =0.36, Z=8.47, p<0.01)*.

H5: *Past information seeking will have a positive direct effect on current information needs.*

This hypothesis was not reproduced in the exploratory analysis.

H6: *Past information seeking will have a positive direct effect on risk-related information seeking behavioral intention.*

This hypothesis is supported *(β =0.24, Z=5.34, p<0.01)*.

H7: *Perceived hazard knowledge will have a negative direct effect on current information need.*

This hypothesis is not directionally *supported (β =0.28, Z=6.51, p<0.01)* but can be accepted as an exploratory finding counter to expectation.

H8: *Current information need will have a positive direct effect on risk-related information seeking behavioral intention.*

This hypothesis is not directionally *supported (β = 0.26, Z= -6.21, p<0.01)* but can be accepted as an exploratory finding counter to expectation.

H9: *Response efficacy will have a positive direct effect on risk-related information seeking behavioral intention.*

This hypothesis is supported *(β =0.27, Z=6.24, p<0.01)*.

H10: Self-efficacy will have a positive direct effect on risk-related information seeking behavioral intention.

This hypothesis was not reproduced in the exploratory analysis.

H11: Response efficacy and self-efficacy should be positively correlated with one another.

This hypothesis is supported *(β =0.31, Z=6.92, p<0.01).*

Additionally, there is a direct correlation between affective risk perception and cognitive risk perception, which was also present in the previous model *(β =0.30, Z=6.72, p<0.01)*.

There were nine additional findings that were not originally hypothesized. Affective risk perception has a negative direct path to perceived hazard knowledge *(β = -0.17, Z= -3.80, p<0.01)*. There is a positive direct path from affective risk perception to response efficacy *(β =0.11, Z=2.39, p<0.05)*. Additionally, there is a positive direct path from to cognitive risk perception to response efficacy *(β =0.13, Z=3.03, p<0.01)*. Past risk-related information seeking has a direct path to response efficacy *(β =0.22, Z=4.65, p<0.01)* and also a positive direct path to self-efficacy *(β =0.38, Z=8.94, p<0.01)*. Moreover, there is a negative direct path from perceived hazard knowledge to risk-related information seeking behavioral intention *(β = -0.13, Z= -2.86, p<0.01)* as well as from perceived hazard knowledge to response efficacy *(β = -0.17, Z= -3.85, p<0.01)*. There is a positive direct path from perceived hazard knowledge to self-efficacy *(β =0.14, Z=3.15, p<0.01)*. Lastly, there is a negative direct path from response efficacy to current information needs *(β= –0.22, Z= -5.06, p<0.01)*.

5.4.7 Exploratory Path Model Fit

Overall the model presents excellent fit ($\chi^2(9)$ =13.84, p = 0.13, RMSEA = 0.04, p-close = 0.72. The exploratory model produces good equation-level fit estimates: self-efficacy ($R^2 = 0.20$, $F_{2, 429} = 54.38$, $p < 0.01$), response efficacy ($R^2 = 0.25$, $F_{5, 426} = 28.86$, $p < 0.01$), risk-related information seeking behavioral intention ($R^2 = 0.33$, $F_{5,426} = 42.35$, $P < 0.01$), current information needs ($R^2 = 0.13$, $F_{2,429} = 32.58$, $p < 0.01$), perceived hazard knowledge ($R^2 = 0.14$, $F_{2, 429} = 34.82$, $p < 0.01$), past risk-related information seeking ($R^2 = 0.03$, $F_{2, 432} = 6.57$, $p < 0.01$), and overall ($R^2 = 0.13$, $p < 0.01$).

Table 24.
Test of Hypotheses for the Exploratory Path Analysis.

Path	Proposed Direction	Path Coefficient	Z	P-Value (1-tailed)	Result Related to Hypothesis
H1: Dual process risk perception (cognitive) → past risk-related information seeking	+	0.11	2.14	$p < 0.05$	Accepted
H1: Dual process risk perception (affective) → past risk-related information seeking	+	0.11	2.21	$p<0.01$	Accepted
H2: Dual-process risk perception (cognitive) → current information needs	+	N/A	N//A	N/A	N/A
H2: Dual-process risk perception (affective)→ current information needs	+	N/A	N/A	N/A	N/A
H3: Dual process risk perception (cognitive) → risk-related information seeking behavioral intention	+	0.13	3.31	$p<0.01$	Accepted
H3: Dual-process risk perception (affective) → risk-related information seeking behavioral intention	+	N/A	N/A	N/A	N/A
H4: Past risk-related information seeking → perceived hazard knowledge	+	0.36	8.47	$p<0.01$	Accepted
H5: Past risk-related information seeking →current information needs	+	N/A	N/A	N/A	N/A
H6: Past risk-related information seeking → risk-related information seeking behavioral intention	+	0.24	5.34	$p<0.01$	Accepted
H7: Perceived hazard knowledge → current information needs	-	0.28	6.51	$p<0.01$	Rejected

Note. Hypothesis two (H2), hypothesis three (H3; for affective risk perception, hypothesis five (H5), and hypothesis ten (H10) were not reproduced in the exploratory analysis.

Table 24. (continued)

Path (continued)	Proposed Direction (continued)	Path Coefficient (continued)	Z	P-Value (1-tailed)	Results Related to Hypothesis
H8: Current information needs → risk-related information seeking behavioral intention	+	-0.26	-6.21	P<0.01	Rejected
H9: Response efficacy → risk-related information seeking behavioral intention	+	0.27	6.24	P<0.01	Accepted
H10: Self-efficacy → risk-related information seeking behavioral intention	+	N/A	N/A	N/A	N/A
H11: Response efficacy→ self-efficacy	+	0.31	6.92	P<0.01	Accepted

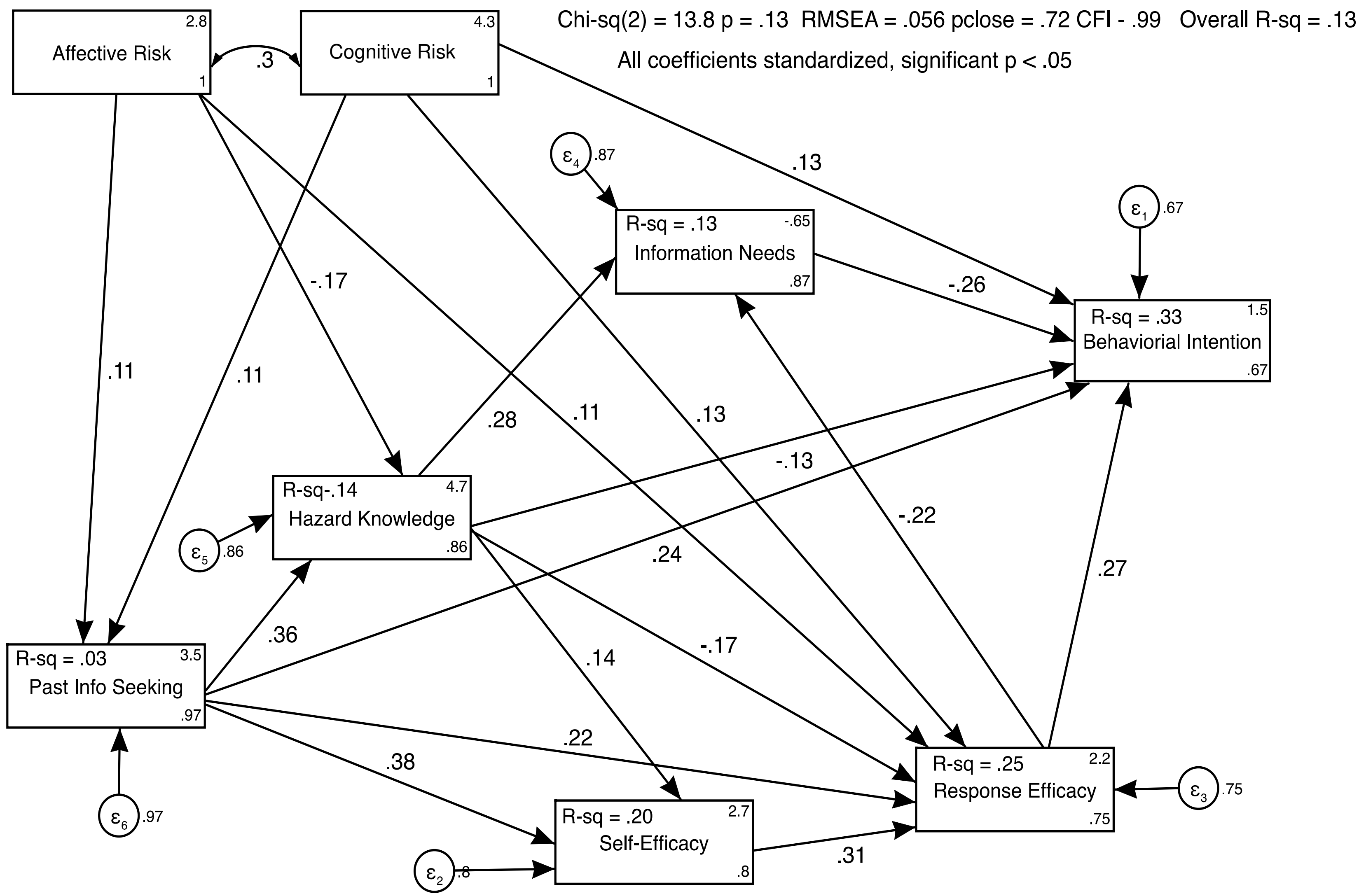

Figure 16. Results of the exploratory path analysis.

Table 25.
Exploratory Analysis Path Analysis Results of Standardized Coefficient, Z-Score, and the P-Value.

Structural	Standardized	Standardized Coefficient	Z-Score	P-Value
Self-Efficacy				
	Perceived Hazard Knowledge	0.14	3.15	0.00
Response Efficacy	Past Risk-Related Information Seeking	0.38	8.94	0.00
	Self-Efficacy	0.31	6.92	0.00
	Perceived Hazard Knowledge	-0.17	-3.85	0.00
Risk-Related Information Seeking Behavioral Intention	Past Risk-Related Information Seeking	0.22	4.65	0.00
	Cognitive Risk perception	0.13	3.03	0.00
	Affective Risk Perception	0.11	2.39	0.017
	Response Efficacy	0.27	6.24	0.00
	Current Information Needs	-0.26	-6.21	0.00
	Perceived Hazard Knowledge	-0.13	-2.86	0.00
Current Information Needs	Past Risk-Related Information Seeking	0.24	5.34	0.00
	Cognitive Risk Perception	0.13	3.31	0.00
	Response Efficacy	-0.22	-5.06	0.00
	Perceived Hazard Knowledge	0.28	6.51	0.00

Table 25.
Exploratory Analysis Path Analysis Results of Standardized Coefficient, Z-Score, and the P-Value.(continued).

Structural	Standardized	Standardized Coefficient	Z-Score	P-Value
Perceived Hazard Knowledge				
	Past Risk-Related Information Seeking	0.36	8.47	0.00
Past Risk-Related Information Seeking	Affective Risk Perception	-0.17	-3.80	0.00
	Cognitive Risk Perception	0.11	2.14	0.03
Covariate	Affective Risk Perception	0.11	2.21	0.03
	Cognitive Risk Perception, Affective Risk Perception	0.30	6.72	0.00

5.5 Follow-Up Exploratory Analysis

While the results from both the confirmatory and exploratory path analysis provided initial insight into risk-related information seeking behavioral intention and risk perception of residents within the High Park Fire burn area, it is also important to take that a step further and assess the results based on groups within the sample. Specifically, this entailed assessing the path model and conducting analysis based upon two groups—individuals who self-reported they were impacted by the High Park Fire and those who self-reported they were not personally impacted. There were 59 individuals who self-reported in the survey that they were not impacted by the High Park Fire, whereas there were 373 individuals who self-reported in the survey that they were impacted.

For this particular follow-up analysis, the exploratory path model was utilized since it provided the best model fit in the main analysis. Recall that the execution of this model in path analysis was a simple iterative reduction to best fit (within logical limits for association), a common approach in modeling. Moreover, it is important to highlight that the follow-up exploratory analysis is empirical rather than theoretical.

5.5.1 Path Model Results for Survey Participants Impacted by the High Park Fire

Specifically, the following results provide further insight into the various relationships amongst the concepts and model. The results for this particular follow-up exploratory analysis can be viewed in Table 26. Past risk-related information seeking had a positive direct relationship with cognitive risk perception *(β =0.14, Z=2.63, p<0.01).* Perceived hazard knowledge had a positive direct relationship with past risk-related information seeking *(β =0.34, Z=7.50, p<0.01).* Meanwhile, there was a negative direct relationship between perceived hazard knowledge and affective risk perception *(β = -0.18, Z= -3.79, p<0.01)*. There was a positive direct relationship between risk-related information seeking behavioral intention and past risk-related information seeking *(β =0.24, Z=5.10, p<0.01).* Risk-related information seeking behavioral intention and current information needs had a negative direct relationship *(β = -0.26, Z= -5.88, p<0.01).* The follow-up exploratory path analysis also revealed a positive direct relationship between risk-related information seeking behavioral intention and cognitive risk perception *(β =0.13, Z=2.95, p<0.01).* Self-efficacy had a positive direct relationship with past risk-related information seeking *(β =0.36, Z=7.82, p<0.01)* and also with perceived hazard knowledge *(β =0.19, Z=4.05, p<0.01).* Moreover, there was a direct positive relationship between current information needs and perceived hazard knowledge *(β =0.26, Z=5.51, p<0.01)*. Affective risk perception correlated with cognitive risk perception *(β =0.32, Z=6.77, p<0.01).*

Additionally, response efficacy had a positive direct relationship with past risk-related information seeking *(β =0.17, Z=3.31, p<0.01).* There was a significant positive relationship between response efficacy and cognitive risk perception *(β =0.17, Z=3.43, p<0.01).* Also, there was a negative direct relationship between response efficacy and perceived hazard knowledge *(β = -0.15, Z= -3.04, p<0.0).* Past risk-related information seeking and affective risk perception had a significant direct relationship *(β =0.09, Z=1.61, p=0.05).* Lastly, there was a negative but significant relationship between current information needs and response efficacy *(β = -0.22, Z= -4.58, p<0.01).*

5.5.2 Follow-Up Exploratory Analysis Path Model Fit—Impacted by the High Park Fire

Overall the model presents a good fit *($\chi^2(9) = 12.41$, prob $>\chi^2 = 0.19$.* The exploratory model does produce adequate equation-level fit estimates for the following: self-efficacy *($R^2 = 0.21$, $F_{2, 370} = 49.43$, $p < 0.01$)*, response efficacy *($R^2 = 0.22$, $F_{3, 369} = 11.87$, $p < 0.01$)*, risk-related information seeking behavioral intention *($R^2 = 0.33$, $F_{3,369} = 34.10$, $P < 0.01$)*, current information needs *($R^2 = 0.12$, $F_{2,370} = 89.51$, $p < 0.01$)*, perceived hazard knowledge *($R^2 = 0.13$, $F_{2, 370} = 28.78$, $p < 0.01$)*, past risk-related information seeking *($R^2 = 0.03$, $F_{2, 370} = 6.62$, $p < 0.01$)*, and overall *($R^2 = 0.17$, $p < 0.01$)*.

Table 26.
Follow-Up Exploratory Path Analysis Results Standardized Coefficient, Z-Score, and the P-Value for Residents Impacted by the High Park Fire and Residents Not Impacted by the Fire.

Structural	Standardized	Standardized Coefficient	Z-Score	P-Value (1-tailed)
Imp. HPF Past Risk-Related Information Seeking	Affective Risk Perception	0.09	1.61	P<0.01
No Imp. HPF Past Risk-Related Information Seeking	Affective Risk Perception	0.18	0.13	N.S.
Imp HPF Past Risk-Related Information Seeking	Cognitive Risk Perception	0.14	2.63	P<0.01
No Imp. HPF Past Risk-Related Information Seeking	Cognitive Risk Perception	-0.01	-0.05	N.S.
Imp. HPF Perceived Hazard Knowledge	Past Risk-Related Information Seeking	0.34	7.50	P<0.01
No Imp. HPF Perceived Hazard Knowledge	Past Risk-Related Information Seeking	0.19	1.49	N.S.
Imp. HPF Perceived Hazard Knowledge	Affective Risk Perception	-0.18	-3.79	P<0.01
No Imp. HPF Perceived Hazard Knowledge	Affective Risk Perception	-0.15	-1.17	N.S.
Imp. HPF Response Efficacy	Past Risk-Related Information Seeking	0.17	3.31	P<0.01
No Imp. HPF Response Efficacy	Past Risk-Related Information Seeking	0.47	4.56	P<0.01
Imp. HPF Response Efficacy	Perceived Hazard Knowledge	-0.15	-3.04	P<0.01
No Imp. HPF Response Efficacy	Perceived Hazard Knowledge	-0.15	-1.59	N.S.
Imp. HPF Response Efficacy	Affective Risk Perception	0.08	1.67	N.S.

Structural (continued)	Standardized (continued)	Standardized Coefficient (continued)	Z-Score (continued)	P-Value (1-Tailed) (continued)
No Imp. Response Efficacy	Affective Risk Perception	0.24	2.52	P=0.01
Imp. HPF Response Efficacy	Cognitive Risk Perception	0.17	3.43	P<0.01
No Imp. Response Efficacy	Cognitive Risk Perception	0.00	-0.04	N.S.
Imp. HPF Risk-Related Information Seeking Behavioral Intention	Past Risk-Related Information Seeking	0.24	5.10	P<0.01
No Imp. Risk-Related Information Seeking Behavioral Intention	Past Risk-Related Information Seeking	0.35	2.70	P=0.01
Imp. HPF Risk-Related Information Seeking Behavioral Intention	Current Information Needs	-0.26	-5.88	P<0.01
No Imp. Risk-Related Information Seeking Behavioral Intention	Current Information Needs	-0.22	-1.99	P=0.05
Imp. HPF Risk-Related Information Seeking Behavioral Intention	Cognitive Risk Perception	0.13	2.95	P<0.01
No Imp. HPF Risk-Related Information Seeking Behavioral Intention	Cognitive Risk Perception	0.11	1.10	N.S.
Imp. HPF Self-Efficacy	Past Risk-Related Information Seeking	0.36	7.82	P<0.01
No Imp. HPF Self-Efficacy	Past Risk-Related Information Seeking	0.46	4.36	P<0.01
Imp. HPF Self-Efficacy	Perceived Hazard Knowledge	0.19	4.05	P<0.01

Structural (continued)	Standardized (continued)	Standardized Coefficient (continued)	Z-Score (continued)	P-Value (1-Tailed) (continued)
No Imp. HPF Self-Efficacy	Perceived Hazard Knowledge	0.00	-0.02	N.S.
Imp. HPF Current Information Needs	Perceived Hazard Knowledge	0.26	5.51	P<0.01
No Imp. HPF Current Information Needs	Perceived Hazard Knowledge	0.27	2.27	P=0.02
Imp. HPF Current Information Needs	Response Efficacy	-0.22	-4.58	P<0.01
No Imp. HPF Current Information Needs	Response Efficacy	-0.26	-2.19	P=0.03
Imp. HPF Covariate	Affective Risk Perception, Cognitive Risk Perception	0.32	6.77	P<0.01
No Imp. HPF Covariate	Affective Risk Perception, Cognitive Risk Perception	0.15	1.19	N.S.

Note. Imp. HPF represents the group of individuals who self-reported they were impacted by the High Park Fire (373 individuals). No Imp. HPF represents the group of individuals who self-reported they were not impacted by the High Park Fire (59 individuals).

5.5.3 Path Model Results for Survey Participants Not Impacted by the High Park Fire

The following results highlight the relationships amongst the concepts and model for survey participants that self-reported they were not impacted by the High Park Fire. The results for this particular follow-up exploratory analysis can be viewed in Table 27.

Specifically, risk-related information seeking behavioral intention had a positive direct relationship with past risk-related information seeking *(β =0.35, Z=2.70, p<0.01)*. There was a negative yet significant relationship between risk-related information seeking behavioral intention and current information needs *(β = -0.22, Z= -1.99, p=0.05).* Self-efficacy had a positive direct relationship with past risk-related information seeking *(β =0.46, Z=4.36, p<0.01).* Response efficacy had a positive direct relationship with past risk-related information seeking *(β =0.47, Z=4.56, p<0.01).* Meanwhile, there was a positive direct relationship between current information needs and perceived hazard knowledge *(β =0.27, Z=2.27, p=0.02).* There was also a negative yet significant relationship between current information needs and response efficacy *(β = -0.26, Z= -2.19, p=0.03).* Additionally, there was a positive direct relationship between response efficacy and affective risk perception *(β =0.24, Z=2.52, p<0.01)* as well as a positive direct relationship between response efficacy and past risk-related information seeking *(β =0.47, Z=4.56, p<0.01).*

5.5.4 Follow-Up Exploratory Analysis Path Model Fit—Not Impacted by the High Park Fire

Overall the model presents a good fit *($\chi^2(9)$ =12.53, p = 0.01 prob >χ^2=0.18*. The exploratory model does produce good equation-level fit estimates: response efficacy *(R^2 = 0.49, $F_{3, 55}$ = 13.35, p < 0.01)*, self-efficacy *(R^2 = 0.21, $F_{2, 56}$ = 7.38, p <0.01)*, risk-related information seeking behavioral intention *(R^2 = 0.38, $F_{3,55}$ = 8.23, p <0.01)*, current information needs *(R^2= 0.15, $F_{2,56}$ = 4.88, p <0.01)*, and overall *(R^2 = 0.16, p <0.01)*.

5.5.5 T-Tests for Follow-Up Exploratory Analysis

Independent t-tests were run for all the variables in the follow-up exploratory analysis portion of this study. When evaluating the t-tests, there were only four scale concepts resulted in significant findings. Only those that are of the most importance and significant are noted here. There was significance between current information needs and participants impacted by the High Park Fire with *t(430)= -6.28, p=0.00* and for risk-related information seeking behavioral intention and participants impacted by the High Park Fire with *t(430)=2.31, p=0.02*. Moreover, there was a significance between perceived hazard knowledge and participants impacted by the High Park Fire *t(430)= -5.85, p=0.00* and also for past risk-related information seeking and participants impacted by the High Park Fire *t(430)= -4.49, p=0.00.*

CHAPTER VI
DISCUSSION

The purpose of this chapter is to connect the theoretical concepts discussed in the initial portion of the study with the statistical results noted later and to provide interpretation. Additionally, discussion is provided about the confirmatory path analysis and about the post-hoc exploratory path analysis which addressed the nuances that the confirmatory path analysis did not confirm. Moreover, there is discussion about the follow-up exploratory analysis too. This chapter provides insight into implications for practice and limitations of the study.

Recall that the main focus of this dissertation is on the theoretical implications. In particular, this study focused on examining individuals' risk-related information seeking behavioral intention in the context of wildfires, based upon risk-related information seeking theories that were modified. The theoretical foundation stemmed from two closely-related concepts—risk perception and risk-related information seeking. In this study, risk perception was addressed from a psychometric paradigm perspective, known as the dual-process approach (Altarawneh et al., 2018). This particular perspective of risk perception concentrates on individuals affective and cognitive response since both are likely activated when confronting a risk such as a wildfire. Risk-related information seeking was also a crucial concept in this study and provided insight into individuals' extensive efforts to obtain information as a result of a deficiency in their knowledge (Griffin et al., 1999; Griffin et al.,2008; Kievik & Gutteling, 2011, p. 1477). In particular, "risk [-related] information seeking is a novel form of behavior that involves distinct cognitive and affective processes" (Rosenthal, 2011), thus complimenting risk perception and was a novel concept to this study.

In recent years, risk-related information seeking research has begun to shift to applying theoretical concepts from all three models, further strengthening the utility of the model. Each risk-related information seeking model (PRISM, RISP, and FRIS), incorporates risk-related information seeking in a different manner (Kahlor, 2010) and has attempted in the past to better understand individual's behavioral intention (Kellens et al., 2012). While not all of the concepts were included from the PRISM, RISP, and FRIS models within the combined path models assessed in this research study (Zeng et al., 2017), the combined models did provide the opportunity to improve the relationships between concepts and risk-related information seeking behavioral intention in relation to wildfire risk. Most risk-related information seeking studies across the literature do not include all of the model concepts but rather select them based upon which are the most pertinent to the risk-related situation. This was also true for this research study. It is also important to note, that it is quite common to generate risk-related information seeking models based upon previous theoretical frameworks. Recall that the FRIS and PRISM were generated based upon the RISP model amongst other important risk communication frameworks (Li et al., 2017). Thus, it is not completely unheard of to provide a combined risk-related information seeking model overall, just more unique to include these particular ones together, which were particularly selected given the risk-related situation.

Each risk-related information seeking model provided a unique perspective, that combined make the path models more robust and provided a thorough assessment of risk-related information seeking behavioral intention for the residents within or near the High Park Fire Burn Area. This was particularly true given the exploratory path model and analysis. The combined risk-related information seeking models utilized in this research study together helped evaluate risk-related information seeking behavioral intention on an individual level, commonly attributed to the RISP model (Griffin et al., 2008) and included social-psychological concepts such as self-efficacy (Kellens et al. (2012), an important characteristic of the FRIS model (Li et al., 2017) and basis for assessing risk and risk-related information seeking behavioral intention. The combined risk-related information seeking model treated risk-related information seeking behavioral intention as a planned, deliberate behavior, as commonly seen in the PRISM model.

The concepts included within the path models in this study stemmed from strong reliabilities within the literature, as previously noted and discussed. Additionally, the concepts included in the study had acceptable reliability. Cronbach's alpha values that are 0.70 or higher are considered reliable, as seen in Table 26. The consistent unidimensionality of the factor analyses and the strong logical associations among measures are supportive of validity.

6.1 Confirmatory Path Analysis Implications for Theory

Research studies, such as this one help further ground concepts (such as risk-related information seeking behavioral intention) within risk communication and other concepts commonly found within risk-related information seeking models and in combined risk-related information seeking models (such as response efficacy or dual-process risk perception). The confirmatory path model and concepts utilized frameworks from the three-common risk-related information seeking models (FRIS, RISP, and PRISM) and studies by including common factors such as current information needs, risk-related information seeking behavioral intention, and perceived hazard knowledge. These models have oftentimes been tested using cross-sectional surveys like so in this study. Moreover, this study incorporated other factors less commonly found across the literature such as past risk-related information seeking and a dual-process approach to risk perception. Some of the findings are consistent with previous studies, whereas others are not. For example, as seen across risk-related information seeking studies and models, not one model provides the all-encompassing solution to assessing risk-related information seeking behavioral intention. However, distinct relationships amongst the variables were sometimes consistent such as a positive direct relationship between past risk-related information seeking and risk-related information seeking behavioral intention. The following provides further discussion on the similarities and differences found and their theoretical implications.

Overall, there were several relationships within the confirmatory path analysis that held true to previous studies and theory, such as past risk-related information seeking and risk-related information seeking behavioral intention. However, there were a few instances of new relationships and even null findings. It is important to note though that the measures included in this study and the sample were sound and may offer substantive value in terms of magnitude. Thus, the null findings may be a result of theory rather than the measurements or the study sample. The confirmatory path analysis results revealed the following relationships:

1. cognitive risk perception with past risk-related information seeking;

2. affective risk perception with past risk-related information seeking;
3. affective risk perception with cognitive risk perception;
4. cognitive risk perception and risk-related information seeking behavioral intention;
5. past risk-related information seeking with perceived hazard knowledge;
6. past risk-related information seeking with risk-related information seeking behavioral intention;
7. response efficacy with risk-related information seeking behavioral intention; and
8. response efficacy with self-efficacy.

Specific discussion about the implications this has for theory is discussed below, particularly noting the importance of these results and which previous studies found similar results.

6.1.1 Past Risk-Related Information Seeking

This study included the concept of past risk-related information seeking, which diverges from the main risk-related information seeking studies. Rather, this concept is more commonly found in theory of planned behavior studies. While it has not previously been included in many risk-related information seeking studies, it is still a critical concept since past behavior can often be an indicator of future behavior (Rosenthal, 2011). The confirmatory path analysis showed a positive direct effect of past risk-related information seeking and risk-related information seeking behavioral intention. This relationship was also confirmed by Rosenthal (2011). “In the context of information seeking, past behavior should exhibit a somewhat unique relationship with seeking intention, since people tend to seek risk information to fulfill an information need (Rosenthal, 2011, p. 3)." However, in this study, there was no relationship found between information need and risk-related information seeking, as noted below. Yet, there was a direct relationship between past risk information seeking and risk-related information seeking behavioral intention. Rosenthal (2011) suggests that past risk-related information seeking will increase an individual's knowledge about a risk and influence risk-related information seeking behavioral. Thus, in this study, oftentimes participants noted that they previously sought risk-related information and as a result, they feel confident about their knowledge of wildfire risk and in preparation for the next wildfire. One of the benefits of this finding is that it extends the literature that is focused on assessing the psychological factors that influence risk-related information seeking behavioral intention, similar to the works of Rosenthal (2011).

The relationship between past risk-related information and perceived hazard knowledge was also included in this study which is not oftentimes the case. Specifically, confirmatory path analysis showed a positive direct effect between perceived hazard knowledge and past risk-related information seeking. While Kellens et al. (2012) did not focus on past risk-related information seeking, the authors did find a similar relationship between information seeking in general, and perceived hazard knowledge and so did Li et al. (2017). This relationship suggests that individuals likely sought more wildfire information in the past if they felt they did not have adequate knowledge about wildfires and individuals who felt they already did have sufficient knowledge did not seek as much information in the past.

6.1.2 Dual-Process Risk Perception

This study included dual-process risk perception, accounting for both cognitive and affective risk perception within the path analysis. In this instance, the confirmatory path analysis showed a positive direct effect of affective risk perception and cognitive risk perception with past risk-related information seeking. Kievik & Gutteling (2011) suggests that risk perception can be helpful for motivating information seeking and encouraging self-protective behavior (Kievik & Gutteling, 2011). In this instance, dual-process risk perception greatly influenced individuals past wildfire information seeking. And, as noted later, past risk-related information seeking behavior has the potential to influence risk-related information seeking behavioral intention. Subsequently, one of the main focuses of risk communication should be on enhancing risk messaging, examining past messaging, and understanding how it has influenced individuals risk perception.

The confirmatory path analysis also indicated a positive direct relationship between cognitive risk perception and risk-related information seeking behavioral intention. Kievik & Gutteling (2011) found a slight variation of this relationship, noting that cognitive risk perception together with response efficacy can prompt and persuade an individual to further seek information about a given risk (Kievik & Gutteling, 2011). Li et al. (2017) also found that risk perception influences risk-related information seeking intention, particularly with perceived hazard knowledge and information need. Given the relationship between cognitive risk perception and risk-related information seeking behavioral intention related to wildfires, individuals may be more likely to gravitate towards wildfire risk communication if the messaging is enhanced. (Kievik & Gutteling, 2011; Kellens et al., 2012).

Moreover, affective risk perception was positively correlated with cognitive risk perception. This follows the literature of Altarawneh et al. (2018) and Van Der Linden (2014) which both assert that there is a bi-directional relationship between affective and cognitive risk perception and follows suit to how individuals perceive the risk they encounter. This suggests when an individual faced a wildfire or the potential for one, they likely based their risk perception on their emotions about the danger and cognitive information. Moreover, this also suggests that the two concepts can help with understanding how individuals form their risk perceptions and as a result, it could help with messaging and public outreach (Altarawneh et al., 2018). However, it is important to note that there are very few studies that include the dual-process approach towards risk perception within risk-related information seeking behavioral intention models. Thus, while there is a known bi-directional relationship between these two concepts, there should be more emphasis on incorporating them in risk-related information seeking behavioral intention studies to better understand not only the bi-directional influence but also the relationship with other concepts and different risk contexts.

6.1.3 Response Efficacy

Response efficacy was also a crucial concept included within the path model. In this instance, response efficacy had a positive direct effect on risk-related information seeking behavioral intention, which is similar to Kellens et al. (2012), Kievik & Gutteling (2011), and Li et al. (2017). Individuals with a higher response efficacy appear more likely to transfer their knowledge into action and persevere in risk-related situations. This suggests that risk-related information seeking behavior can be encouraged through specific messaging content and amplified if paired in conjunction with risk perception (Kellens et al., 2012; Kievik & Gutteling, 2011).

The confirmatory path analysis showed a positive direct correlation between response efficacy and self-efficacy. Kievik & Gutteling (2011) and Rosenthal (2011) also found a strong correlation between these two concepts when conducting their risk-related information seeking studies. When this occurs, individuals believe they are confident that they can follow through behaviors (Kievik & Gutteling, 2011; Rosenthal, 2011) such as information seeking, planning defensible space, evacuating, seeking shelter, etc., also known as self-protective behavior and alleviate wildfire risk. "…Under these conditions, people carefully think about the recommended responses advocated in the persuasive message and adopt those as a means to control the danger (Kievik & Gutteling, 2011, p. 1478). Overall, the correlation between these two concepts follows similar suit to other risk-related information seeking studies.

6.2 Confirmatory Analysis of Null Findings

In addition to the several direct positive relationships found within the confirmatory analysis, there were several null findings in this study that are worthy to note. Null findings are particularly important to discuss since they oftentimes can point to deficiencies within the theory and calls for refinement. This is particularly true in the instance of this study since the methods and sample are solid. Particularly, the following relationships had null results within the confirmatory path analysis including:

1. dual-process risk perception (cognitive and affective) with current information needs;
2. affective risk perception with risk-related information seeking behavioral intention;
3. past risk-related information seeking with current information needs;
4. perceived hazard knowledge with current information needs;
5. current information needs with risk-related information seeking behavioral intention; and
6. self-efficacy with risk-related information seeking behavioral intention.

As noted below in more detail, many of these relationships have actually been found within previous risk-related information seeking studies. Thus, these null findings are counter to what the theory suggests and may require further examination.

6.2.1 Current Information Needs and Other Related Concepts Resulting in Null Findings

Out of all the variables that had null findings within the confirmatory path analysis, current information needs was the most commonly reported. This concept also oftentimes referred to as information (in)sufficiency is commonly found within all three of the risk-related information seeking models given its important role in risk communication and influence for risk-related information seeking (Kellens et al., 2012; Zeng et al., 2017). If an individual is determined to increase their information in order to be self-assured to handle a risk-related situation, it encourages them to process that information in a systematic manner more than a heuristic one (Griffin et al., 2008). The motivation to fill one's gap in knowledge determines the amount of risk-related information seeking that occurs. It also has the potential to influence individuals to seek risk-related information beyond their traditional channels such as radio or television (Griffin et al., 2008). Current information needs are oftentimes placed within the middle portion of the path model, serving a role between other concepts and risk-related information seeking behavioral intention. Subsequently, current information need commonly is influenced by other concepts such as risk perception and perceived hazard knowledge (Kellens et al., 2012). However, in the instance of this study, there were null findings between dual-risk perception and current information needs, as well as perceived hazard knowledge and current information needs. Current information needs have not consistently had a direct, positive relationship with risk-related information seeking behavioral intention across the literature, regardless of the risk context. For example, Kellens et al. (2012) found a null finding between current information need and risk-related information seeking behavioral intention. However, Griffin et al. (2008), Ter Huurne & Gutteling (2008), and Zeng et al. (2017) contradict this finding, given they discovered a direct relationship between current information need and risk-related information seeking intention. It is important to note that just because there is the perception for information need related to wildfires, does not mean it will result in more risk-related information seeking behavioral intention from residents.

Dual-risk perception and current information needs also resulted in a null for the confirmatory path analysis. This too has been found within the literature. Specifically, Kellens et al. (2012) and Trumbo (2002) noted that the relationship with risk perception and current information need is often inadequately assessed and oftentimes does not produce a positive relationship.

The relationship between past risk-related information seeking and current information needs was also null in this study. This is contrary to what is found in the literature. Oftentimes, there is a causal link between past risk-related information seeking and current information needs, such as the works of Rosenthal (2011) However in this instance, the null finding suggests that perhaps individuals within the study area had undesirable experiences with past risk-related information seeking (such as they received too much information or it simply caused distress) and as a result perhaps they do not wish to further fulfill their current information needs.

The relationship between perceived hazard knowledge and current information needs was also null in this study. This particular relationship has had inconsistent results across the literature with other scholars reporting negative and positive findings as well as inverted relationships (Johnson & Russo; Kahlor, 2010; Kellens et al., 2012; Kerstetter and Cho, 2004; Ter Huurne & Gutteling, 2008; Zeng et al., 2017). Perhaps one reason for the disparity is simply because there are two different perspectives on perceived hazard knowledge's role and how it is measured. On one hand, Griffin et al (2008), suggest that perceived knowledge is a part of (in)sufficiency (also known as current information needs, whereas other scholars (Kahlor,2010; Ter Huurne & Gutteling, 2008) view perceived hazard knowledge as an individual concept that effects risk-related information seeking behavioral intentions through current information needs (Kellens et al., 2012).

The overall uncertainty with current information needs throughout its various roles in the path model and confirmatory path analysis proposes that the participants were uncertain about wildfire risk which led to uncertainty about their need for information. It is evident that this concept's role within the risk-related information seeking path models has yet to be fully explored extensively from a theoretical perspective and requires further evaluation and refinement. Rosenthal (2011) notes that this concept is "…statistically inadequate as a regressor in a structural model", suggesting there may be the opportunity for measurement refinement too with further research.

6.2.2 Risk-Related Information Seeking Behavioral Intention and Other Related Concepts Resulting in Null Findings

There were two confirmatory path model results that were null with risk-related information seeking behavioral intention including affective risk perception as well as self-efficacy. The null finding between affective risk perception and risk-related information seeking behavioral intention was similar to the works of Zeng et al. (2017). Whereas, studies such as Kellens et al. (2012), Li et al. (2017), and Ter Huurne & Gutteling (2008) found a significant association between the two concepts, particularly as risk perception increases. In the instance of Zeng et al. (2017), they suggested that "one explanation [for a null finding between these two concepts] is that…risk perception may, as the RISP and PRISM models actually suggest, better predict seeking through information need rather than as direct effects. Therefore, further research is needed to explore the relationship between perceived risk and information-seeking intentions" (Zeng et al., 2017, p. 751). Ter Huurne & Gutteling (2008) and Li et al. (2017) also note the importance of having information needs as the mediator between risk perception and risk-related information seeking behavioral intention. However, as previously mentioned, information needs and risk-related information seeking in this study resulted in a null finding for the confirmatory path analysis. It is evident then that there would also be a null finding between affective risk perception and risk-related information seeking behavioral intention given the common mediator did not produce positive, direct results even prior to testing this other relationship between concepts.

In addition, there was a null finding between self-efficacy and risk-related information seeking behavioral intention, quite contrary to what the literature has found over the years. In fact, more often than not there has been a positive direct effect between these two concepts including the works of Griffin et al., (2008); Ter Huurne & Gutteling, (2008); Kellens et al., (2012); and Kievik & Gutteling, (2011). Perhaps self-efficacy needs to be placed elsewhere within the path model to indicate the direct positive link to risk-related information seeking behavioral intention, liked suggested below in the exploratory path model. Here, self-efficacy is placed in the middle of the path model and influenced by past risk-related information seeking, and hazard knowledge prior to influencing risk-related information seeking behavioral intention. This would be more ideal given there are several previous experiences and current knowledge that influence an individual's self-efficacy and their behavioral intention.

Overall, the null findings suggest a need for further refinement from a theoretical standpoint and also within the path model layout. The measurements integrated within this study are strong given their previous success across the and the response rate was also impressive. Yet, while discussion of the null findings offers insight into how the results fit within the overall literature and offers suggestions for further refinement, it is also important to provide discussion on what it actually looks like to further refine the path model and exploratory analysis.

6.3 Exploratory Path Analysis Implications for Theory

While the confirmatory path model and analysis provided some substantial and intriguing results, the overall fit of the model was not quite ideal and there were several null findings. Thus, in order to attempt to find a better fit of the model an exploratory path model analysis was conducted post-hoc. In this instance, significant reconfiguration of the model occurred. Many of the relationships discovered with the exploratory path analysis follow similar suite to the literature. There were seventeen relationships that were significant for the exploratory path analysis including seven that were originally in the confirmatory path model and nine from the new one. The following relationships are found within the exploratory path model:

1. affective risk perception with perceived hazard knowledge;

2. affective risk perception with response efficacy;
3. affective risk perception with cognitive risk perception;
4. affective risk perception with past risk-related information seeking;
5. cognitive risk perception with past risk-related information seeking;
6. cognitive risk perception with response efficacy;
7. cognitive risk perception with risk-related information seeking behavioral intention;
8. past risk-related information seeking with perceived hazard knowledge;
9. past risk-related information seeking with risk-related information seeking behavioral intention;
10. past risk-related information seeking with response efficacy;
11. past risk-related information seeking with self-efficacy;
12. perceived hazard knowledge with risk-related information seeking behavioral intention;
13. perceived hazard knowledge with response efficacy;
14. perceived hazard knowledge with self-efficacy;
15. response efficacy with risk-related information seeking behavioral intention;
16. response efficacy with self-efficacy; and
17. response efficacy with current information needs.

Detailed dialog about the implications this has for theory are included below, predominantly remarking on the importance of these results and literature that has also found similar results, if applicable.

6.3.1 Dual-Process Risk Perception

Similar to the confirmatory path model and analysis, the exploratory path model and analysis also included the dual-process approach towards risk perception, a pivotal concept to include and one which is rarely included in natural hazard and risk-related information seeking studies (Altarawneh et al., 2018). Recall that both cognitive and affective risk perception are important to include and offer important insight since an individual is likely to trigger both. Overall, dual-process risk perception has a very important role within the exploratory path model and analysis, influencing a variety of concepts and binding the model together.

Both affective and cognitive risk perception had a positive direct relationship with past risk-related information seeking with the exploratory path analysis. Again, this was similar to the works of Kievik & Gutteling (2011). This suggests that risk perception likely influenced individuals past risk-related information seeking and individuals' future risk-related information seeking behavioral intention.

As noted by Altarawneh et al. (2018) and Kellens et al. (2012) dual-process risk perception not only influences behavioral intentions but also perceived hazard knowledge, as seen in the exploratory path analysis. However, in the instance of the exploratory analysis, there was a negative direct relationship between affective risk perception and perceived hazard knowledge. This result is contrary to the works of Zeng et al. (2017). Rather, this follows suit with earlier findings by He et al. (2013) Klerck & Sweeney (2007), and Wallquist et al. (2010). That is, when individuals have higher perceived hazard knowledge, they are likely to perceive less risk. In this instance, knowledge about wildfires decreased perceived risks. Thus, additional knowledge related to wildfires may help ease individuals fears about wildfire risks. Moreover, it would be beneficial for scholars to devote additional time on the relationship between affective risk perception and perceived hazard knowledge given there are inconsistencies within the literature and also the importance influence both have on risk-related information seeking behavioral intention.

Affective risk perception had a positive direct relationship with response efficacy. and cognitive risk perception also had a positive direct relationship in the exploratory path analysis. Since there is a positive relationship between these two concepts, this insinuates that increased amounts of risk perception in combination with efficacy beliefs can encourage individuals to seek self-protective actions, which is also noted by Kievik & Gutteling (2011). However, in contrast to this study, Kievik & Gutteling (2011) did not find this relationship when assessing flood risks. Perhaps it would be beneficial to further examine and analyze the role of these two concepts in further detail within other risk-related information seeking studies especially since this relationship is not found nor tested in detail across the literature.

The exploratory path analysis also revealed a positive direct relationship between cognitive risk perceptive and risk-related information seeking behavioral intention, similar to the confirmatory path analysis and literature. Studies such as Li et al. (2017) and Kievik & Gutteling (2011) also noted the important role risk perception has on risk-related information seeking behavioral intention, suggesting it can persuade an individual to further pursue information. As previously noted, it may be particularly useful to include risk messaging with a persuasive tone and fear appeals to further encourage risk-related information seeking behavioral intention (Kievik & Gutteling, 2011; Kellens et al., 2012).

Similar to the confirmatory path analysis, affective risk perception was positively correlated with cognitive risk perception within the exploratory path analysis. Again, this follows similar to the literature which notes a bi-directional relationship between affective and cognitive risk perception, as seen in Altarawneh et al. (2018) and Van Der Linden (2014). This relationship suggests that individuals are likely to form their risk perception based on both their emotions about the given risk as well as cognitive information. By having this relationship, it can help researchers better identify how risk perceptions are formed and help with risk-based messaging. However, since there are so few studies that incorporate the dual-processing approach within risk-related information seeking behavioral intention studies, it would be beneficial for additional studies to include this concept.

6.3.2 Past Risk-Related Information Seeking

As previously noted, the relationship between past risk-related information seeking with perceived hazard knowledge is not oftentimes found commonly in risk-related information seeking behavioral intention studies. Rather, other scholars have often focused on the relationship between perceived hazard knowledge and current information seeking instead of past information seeking (Kellens et al., 2012; Li et al., 2017). In the instance of the exploratory analysis, there was a positive direct relationship between past risk-related information seeking and perceived hazard knowledge, which is similar to that found within the confirmatory path analysis. This relationship proposes that individuals most likely pursued risk-related information related to wildfires in the past if they believed they did not have enough information. Whereas, perhaps individuals who personally felt they had acquired enough wildfire related information did not seek as much information in the past.

Additionally, there was also a direct positive relationship between past risk-related information seeking and risk-related information seeking behavioral intention in the exploratory path analysis. This was similar to the confirmatory path analysis and confirmed by the literature such as Rosenthal (2011). Particularly, this suggests that individuals past risk-related information seeking influences and encourages their knowledge about wildfire risk and influences their risk-related information seeking behavioral intention. This finding helps extend the scoop beyond psychological factors that impact risk-related information seeking behavioral intention.

In this instance, past risk-related information seeking had a positive direct relationship with response efficacy within the exploratory path analysis. Perhaps this suggests that if individuals previously sought risk-related information about wildfires, it boosted their confidence in being able to take action in the event of one. As previously mentioned, past risk-related information seeking is not commonly found throughout the risk-related information seeking models and literature but yet an important concept to include and evaluate with other concepts. As a result, there is very little literature to compare it to. However, it is important to provide some discussion about risk-related information seeking behavioral intention since it is the closest concept to past risk-related information seeking. Throughout the literature, there has been some discord in the relationship between risk-related information seeking behavioral intention and response efficacy. In some instances, there has been a positive relationship between risk-related information seeking behavioral intention and response efficacy, as seen in Kievik & Gutteling (2011) and Kellens et al. (2012). Whereas, Neuwirth et al. (2000) did not find a significant relationship between the concepts. Given the importance of including past risk-related information seeking behavior within the path model and very literature devoted to incorporating it, it would be beneficial if more risk-related information seeking studies included it.

Additionally, there was a positive direct relationship between past risk-related information seeking and self-efficacy which follows suit with Hovick et al. (2014). Individuals past risk-related information seeking behavior potentially influenced their reaction related to self-efficacy and then risk-related information seeking behavioral intention at a later time. However, it is important to point out that increased self-efficacy does not always result in instant risk-related information seeking. Rather, it can impact an individual's awareness of how knowledgeable they are and indirectly influence risk-related information seeking behavioral intention (Hovick et al., 2014). The relationship between these two variables is not as commonly studied across the risk-related information seeking models, thus there is the need for additional information about the impacts.

6.3.3 Perceived Hazard Knowledge

Recall, that throughout the literature, there have been contradictory results related to perceived hazard knowledge and its relationship with other concepts, particularly when assessing risk-related information seeking behavior. Part of the inconsistent rests on scholars' discord with whether to consider it a singular concept or in part with information insufficiency. This study focused on including perceived hazard knowledge as a singular concept.

There was a negative direct relationship between perceived hazard knowledge and risk-related information seeking behavioral intention within the exploratory path analysis, which is contrary to the majority of related literature. Kellens et al. (2012), Ter Huurne (2008), Zeng et al. (2017), all found a positive direct relationship between the two variables. Their results would suggest that individuals who have more knowledge would be more likely to seek additional risk-related information. However, in the instance of Li et al. (2017), they found a non-significant direct relationship between perceived hazard knowledge and risk-related information seeking behavioral intention. Whereas, the exploratory path analysis results for this study would suggest that just because an individual may be more knowledgeable about wildfires does not necessarily mean they will seek additional risk-related information. The inconsistencies across the literature and this study does raise questions about whether or not perceived hazard knowledge should continue to be a singular concept or perhaps it is more robust in conjunction with information insufficiency.

There was also a negative direct relationship in the exploratory path analysis between perceived hazard knowledge and response efficacy. Within the literature, there are very few studies that focus specifically on including both perceived hazard knowledge and response efficacy. Oftentimes, it is more common to see the results of perceived hazard knowledge with channels beliefs, which pairs self-efficacy with response efficacy. For example, Zeng et al. (2017) found that together, channel beliefs and perceived hazard knowledge help predict risk-related information seeking behavior but through the mediation of information needs. Kellens et al. (2012) did include both perceived hazard knowledge and response efficacy in their path model and analysis. However, they simply did not test the relationship between the two concepts. Rather, response efficacy was only tested with risk-related informational seeking behavioral intention. Whereas, perceived hazard knowledge was placed in the middle of Kellens et al. (2012)'s path model between individual characteristics and information as well as risk-related information seeking behavioral intention. So, while their study suggests that both perceived hazard knowledge and response efficacy are important concepts to identifying risk-related information seeking behavioral intention, it does not provide further context to the results of this study. However, there are some overall conclusions that may be drawn from the results of this study given the basic foundations of the two concepts. In this study, perceived hazard knowledge functions to decrease response efficacy. Moreover, just because an individual has a higher perceived hazard knowledge does not mean that they will have more of a belief that a specific action will help reduce their risk. It would be important if scholars devoted future research to further evaluate the relationship between these two concepts in risk-related information seeking situations.

Recall that self-efficacy notes whether or not an individual feels they can deal with risk. In the instance of the exploratory path analysis, there was a positive direct relationship between perceived hazard knowledge and self-efficacy. This relationship suggests that higher amounts of knowledge may improve an individual's perception that they can not only make sense out of the risk but also be able to deal with it. The literature also supports this relationship and is similar to the works of Griffin et al. (2006), Kahlor et al. (2006), and Ter Huurne (2008).

6.3.4 Response Efficacy

Response efficacy was also included within the exploratory path model and analysis. Particularly, there was a positive direct relationship between response efficacy and risk-related information seeking behavioral intention, which was also found within the confirmatory path analysis. This relationship has consistently been reviewed and affirmed throughout the literature as seen in Kellens et al. (2012), Kievik & Gutteling (2011), and Li et al. (2017). Drawing upon its theoretical foundation, this relationship suggests that individuals with greater response efficacy are more likely to carry their knowledge into behavioral actions.

In addition, there was also a positive direct correlation between response efficacy and self-efficacy within the exploratory path analysis. As previously noted, this too was discovered in the confirmatory analysis and confirmed by other risk-related information seeking studies such as the works of Kievik & Gutteling (2011) and Rosenthal (2011). This suggests individuals have the potential to be confident in their self-protective behavior and may attenuate their risk by cautiously contemplating the responses from persuasive messaging and in an attempt to control the impending risk accept the suggested responses (Kievik & Gutteling, 2011).

The exploratory path analysis revealed a negative direct relationship between response efficacy and current information needs. This suggests that there should be more emphasis on the practicality of information to effectively manage risk within risk communication. Perhaps the direction of the relationship found between response efficacy and current information needs is because individuals may believe they do not need additional information about wildfires. It is important to note that there are inconsistencies across the literature and unclear direction of current information needs role related to response efficacy and more broadly within risk-related information seeking models. Zeng et al. (2017) assessed channel beliefs and information need and also found a negative influence, which was contrary to some of the literature and what was hypothesized. More often than not, current information needs isoften paired with self-efficacy rather than response efficacy across the literature such as in Griffin et al. (2008) and Li et al. (2017). While Kellens et al. (2012) failed to assess the role of information needs in their study, whereas other risk-related information seeking studies suggested the importance of not only placing information needs within the middle of the model (Griffin et al, 1999; Ter Huurne & Gutteling, 2008; Zeng et al., 2017) but also its positive role. Perhaps the inconsistencies need to be further refined and parceled out. The definition alone of information needs can vary from author-to-author and as a result, their approaches towards including it within the path model and results will always vary.

Overall, the exploratory analysis provided a more in-depth analysis of the risk-related information seeking behavioral intentions. It also provided further insight into what relationships between concepts are better to not only get a better fit for the model but also to further understand risk-related information seeking behavioral intention. It is evident though that while the exploratory path analysis was beneficial, there is the need for additional research to be done, particularly related to the concepts and theory.

6.4 Exploratory Analysis of Null Findings

While it was important to provide discussion about the plethora of positive direct relationships found within the exploratory path analysis, it is just as important to discuss the two null findings. These null findings are essential to highlight potential deficiencies within the theory. Moreover, the following null findings were discovered when running assessing the exploratory path model including:

1. perceived hazard knowledge with current information needs; and

2. current information needs with risk-related information seeking behavioral intention.

Similar to the confirmatory path analysis, the exploratory path analysis null findings were both related to current information needs. This concept is oftentimes found within the three different risk-related information seeking models (Kellens et al., 2012; Zeng et al., 2017). As previously mentioned, perceived hazard knowledge and current information needs resulted in a null finding. This relationship is oftentimes unpredictable in the literature, with some scholars noting a negative relationship between the two concepts whereas others note a positive one (Johnson & Russo; Kahlor, 2010; Kellens et al., 2012; Kerstetter and Cho, 2004; Ter Huurne & Gutteling, 2008; Zeng et al., 2017). The disjointed findings can be attributed to the different measurements of this concept and also the different perspectives on its application within the path model. For example, Griffin et al (2008), view perceived knowledge as a part of (in)sufficiency whereas others (Kahlor,2010; Ter Huurne & Gutteling, 2008) view perceived hazard knowledge as an individual concept that effects risk-related information seeking behavioral intentions through current information needs (Kellens et al., 2012). For this study, perhaps the null finding suggests that individuals were ambiguous about wildfire risk and as a result, they may uncertain on their amount of information needed. The role of current information need should be further evaluated in risk-related information seeking studies, focusing on its role within the model and utilizing it as a single concept.

Current information needs and risk-related information seeking behavioral intention also resulted in a null finding with the exploratory path analysis. This was similar to the confirmatory path analysis. Moreover, the literature surrounding the relationship between these two concepts is inconsistent. In some instances, there has been a positive direct relationship between the two concepts such as the works of Griffin et al. (2008), Ter Huurne & Gutteling (2008), and Zeng et al. (2017). Whereas Kellens et al. (2012) also found a null finding between current information need and risk-related information seeking behavioral intention. Thus, just because an individual may need more information does not always result in risk-related information seeking behavioral intentions. Similar to other relationships, it would be beneficial if these concepts were further examined since there are such inconsistencies within the literature.

Moreover, the two null findings suggest the need for theoretical improvement for current information needs and its role with perceived hazard knowledge and risk-related information seeking behavioral intention. It is important to point out that even though these concepts together resulted in null findings, the measurements were based on previous studies that had strong reliabilities and theoretical foundations.

6.5 Theoretical Development with the Exploratory Revised Model

While the exploratory path analysis results were much more ideal than that of the confirmatory path analysis, simply just stating the results from the model and discussion on the implications from a concept-to-concept basis is only the initial discussion on the importance of this study and how it will contribute to theoretical development. This portion of the study highlights how this research study can serve as the basis for further research and how it can integrate with another existing theoretical framework.

Theoretical development and progress are oftentimes incremental, particularly in the context for risk-related information seeking models. When developing and refining a theoretical model it requires careful steps including not only selecting the theory in which it is based upon but also model construction, instrument construction, data collection, model testing, and interpretation. However, theoretical development and progress do not stop there, rather it is a continual loop going through the process over time and time again (Ter Huurne, 2008). Throughout the literature, scholars often have tested risk-related information seeking models for an array of natural hazards and often have to apply it to another theoretical framework to further extend the framework, progress the field, and discover new emerging findings (i.e. Hoick et al., 2014; Kahlor, 2010; Kellens et al., 2012; and Li et al., 2017). For example, the FRIS model is grounded on key concepts and theory from the RISP model and also incorporates social-psychological factors that were not otherwise included within these types of models. This research study included all six steps of model development and again now draw back to the theory phase, suggesting there is opportunity to connect the findings of this study and the overall framework to another closely related framework.

Looking at the big picture, this study was yet another incremental stepping stone to better attenuating risk-related information seeking models and also understanding risk-related information seeking behavioral intention in the context of wildfires. Moreover, this study provides the foundation to eventually create a new emergent framework and could do so by drawing upon pre-existing ones, such as the Protective Action Decision Model (PADM; Heath et al., 2018; Lindell & Perry, 2012; Terpstra & Lindell, 2013). This model focuses on the process of making protective actions decisions and has been applied across a spectrum of natural hazards (Perry & Lindell, 2008; Terpstra & Lindell, 2013). It also aligns very well with risk-related information seeking behavioral intention and risk perception.

Protective action decisions often start from environmental and social cues, along with warnings (Heath et al., 2018; Lindell & Perry, 2012). As a result, perceptions are made about the given risk and/or hazard. It is these perceptions that have the potential to influence protective action decision making and subsequently behavioral intentions. These stages are consecutive, similar to information seeking. Moreover, information seeking is part of the PADM and has the potential to occur anytime throughout the protective action decision progression. In terms of information seeking, the PADM includes an evaluation of information needs (similar to this research study), communication action, and implementation (Heath et al., 2018; Lindell & Perry, 2012).

One of the benefits of incorporating the information found in this research study into the PADM is it has practical implications. In fact, it has the potential to be applied to emergency response and long-term hazard mitigation (Lindell & Perry, 2012; Terpstra & Lindell, 2013). Specifically, this entails protective action decision making which focuses on the impending risk, information in relation to that risk, different options for protective action, as well as collaborate behavioral response. However, it is important to mention that there is a limitation to this area of research. Even though there has been extensive research focused on understanding protective action, there is not a strong indication on what truly encourages individuals to seek protective action. While risk perception is one of the main contributors to protective action, there are other factors that may be just as important (Lindell & Perry, 2012). Moreover, protective action can vary significantly from person-to-person or hazard-to-hazard, making it difficult for researchers to understand and make generalizable (Perry & Lindell, 2008). But, in spite of its limitations, this framework could be useful in terms of further progressing risk communication and incorporating the information discovered in this research study.

6.6 Examining Differences Between Models from a Concepts Perspective

This study provided the opportunity to examine two different risk-related information seeking models and analysis—the confirmatory and exploratory. Both offered intriguing insight into individual risk-related information seeking behavioral intentions and risk perception of residents within the High Park Fire Burn Area. In addition to discussing the theoretical implications of each of the relationships, it is also important to discuss the interesting differences between the models. In all, eight positive direct relationships in the confirmatory path model were also in the exploratory path model and including:

1. cognitive risk perception with past risk-related information seeking;
2. affective risk perception with past risk-related information seeking'
3. cognitive risk perception with risk-related information seeking behavioral intention;
4. past risk-related information seeking with perceived hazard knowledge;
5. past risk-related information seeking with risk-related information seeking behavioral intention;
6. response efficacy with risk-related information seeking behavioral intention;
7. response efficacy with self-efficacy; and
8. cognitive risk perception with affective risk perception.

This highlights the importance and consistency in including dual-process risk perception in risk-related information seeking models and suggests that it not only influences past risk-related information seeking but also risk-related information seeking behavioral intention. Also, both the confirmatory and exploratory path models and analyses indicated that the two dual-process risk perception concepts correlate with one another, displaying yet again a strong bond and importance in including within the models. Additionally, there was an obvious relationship between an individual's past risk-related information seeking and how that influences their risk-related information seeking behavioral intention. It also suggests that individuals perceived hazard knowledge, in this instance about wildfires, will vary depending upon an individual's past risk-related information seeking. Moreover, the two path models indicated the importance of maintaining response efficacy and how it can directly influence risk-related information seeking behavioral intention and also one's self-efficacy.

Overall, none of the hypotheses went from being rejected in the confirmatory path analysis to accepted and significant in the exploratory. Rather, the hypotheses that were rejected in the confirmatory path analysis either remained rejected or were not reproduced in the exploratory analysis, thus not applicable. Specifically, five of the hypotheses from the confirmatory path analysis were not reproduced in the exploratory path model and analysis. There were two null findings that were consistent between the confirmatory and exploratory path analyses. By not including these specific relationships, the exploratory path model fit improved greatly in comparison to the confirmatory. The following were not reproduced in the exploratory model and analysis including:

H2: dual process risk perception (cognitive and affective) with current information needs;

H3: dual-process risk perception (affective) with risk-related information seeking behavioral intention;

H5: past risk-related information seeking with current information needs; and

H10: self-efficacy with risk-related information seeking behavioral intention.

The following null findings were in both the confirmatory and exploratory path analysis:

H7: perceived hazard knowledge with current information needs; and

H8: current information needs with risk-related information seeking behavioral intention

Current information needs appears to be the concept that is the most consistent across the null and non-existent findings in both the confirmatory and exploratory path analyses. There is variation in the role of current information needs across the literature and often conflicting results. Thus, it is not surprising that this study had inconsistent results with this concept and often null findings. In this instance, current information needs stemmed from the overall notion of information insufficiency, based upon the HSM and assessed individual's current knowledge about wildfires and also their sufficiency knowledge. This approach was grounded in the literature by Griffin et al. (2004), Griffin et al. (2008), Li et al. (2017), and Zeng et al. (2017) and strong reliabilities. Perhaps there needs to be further theoretical refinement of this concept and its role within the path models.

Risk-related information seeking behavioral intention appeared to be the other concept most commonly found within the null and non-existent findings between the confirmatory and exploratory path analyses. Although overall the concept both had successful positive direct relationships with other concepts than not and also grounded in the literature by Easten et al. (2015), Kahlor (2007), Rosenthal (2011), and Yang et al. (2014). Perhaps this concept was more commonly found in the null and non-existent findings than other concepts since it is often difficult to predict with accuracy individuals' behavioral intentions.

Additionally, there were nine new additional relationships in the exploratory that were not in the confirmatory path analysis including:

1. affective risk perception with perceived hazard knowledge;
2. affective risk perception with response efficacy;
3. cognitive risk perception with response efficacy;
4. past risk-related information seeking with response efficacy;
5. past risk-related information seeking with self-efficacy;
6. perceived hazard knowledge with risk-related information seeking behavioral intention;
7. perceived hazard knowledge with response efficacy;
8. perceived hazard knowledge with self-efficacy; and
9. response efficacy with current information needs

It is evident that the exploratory path model and analysis was quite more robust and detailed than the confirmatory. The exploratory path analysis shed light on the importance of integrating response efficacy with more of the concepts, as seen in five out of nine relationships. This suggests that it would be beneficial to further focus on the beliefs that individuals hold about what actions may help them reduce their wildfire risk. Moreover, perceived hazard knowledge appeared quite frequently throughout the exploratory path model and analysis, suggesting the importance of its relationship in influencing individuals' self-efficacy, risk perception, current information needs, and risk-related information seeking behavioral intention. The other relationships suggest the need for better understanding of individuals risk perception and how their past risk-related information seeking can influence their efficacy beliefs. Overall, these additional relationships support the need to include more of a psychological approach towards risk-related information seeking.

The exploratory path analysis revealed that a more complicated path model is needed for risk-related information seeking studies. That way, it provides a more detailed description of individual risk-related information seeking behavioral intention and risk perception. While this does not discredit the results of the confirmatory path model and analysis, it does suggest further refinement. From a theoretical perspective,e 2some of the relationships found in the confirmatory and/or exploratory path analyses followed similar suit to the literature, whereas in other instances they did not. This study obviously affirmed there is no one specific path model that will provide the perfect outcome for risk-related information seeking, as also noted across the literature. However, they both do provide initial guidance and suggestions on how to better improve risk-based messaging and risk communication related to wildfires.

6.7 Overview of the Follow-Up Exploratory Analysis

Recall that follow-up exploratory analysis included in this study assessed the exploratory path model in two groups—individuals who self-reported that they were impacted by the High Park Fire and those who self-reported that they were not impacted by the fire in any capacity. This particular analysis was empirical rather than theoretical.

Overall, sixteen out of the seventeen relationships in the follow-up exploratory analysis for individuals impacted by the High Park Fire were significant, while one was not. For the follow-up exploratory path analysis for individuals not impacted by the High Park Fire, seven out of the sixteen relationships were significant whereas nine were not.

It is important to highlight instances where one of the groups had significant results whereas the other did not when examining individuals who self-reported they were impacted by the High Park Fire and those who were not.

In particular, there were ten instances where this was the case. There was a significant relationship between past risk-related information seeking and cognitive risk perception for those who were impacted by the High Park Fire, however there was no significance for the group not impacted by the fire. Perceived hazard knowledge and past risk-related information seeking were significant for the group of individuals impacted by the fire, but not those who reported they were not impacted. This was also the case for perceived hazard knowledge and affective risk perception. Response efficacy and perceived hazard knowledge was significant for those impacted by the fire, whereas it was not significant for those who did not. Response efficacy and cognitive risk perception were also significant for the group of individuals who were impacted by the fire but not for those who self-reported they were not impacted by it. Moreover, this was also the case between risk-related information seeking behavioral intention and cognitive risk perception, as well as the covariates affective risk perception and cognitive risk perception. The relationship between response efficacy and affective risk perception was actually significant for individuals who were not impacted by the High Park Fire but not significant for those who were impacted by the fire. Past risk-related information seeking and affective risk perception were significant for those impacted by the fire, whereas it was not significant for those who were not impacted by it. Lastly, self-efficacy and perceived hazard knowledge were significant for individuals impacted by the fire but not for those who were not, which is noted in Table 26.

After running the t-tests for the main concepts and High Park Fire impact concept, it was obvious that there were pronounced differences specially amongst the information-related measure which included the following: current information needs, risk-related information seeking behavioral intention, perceived hazard knowledge, as well as past risk-related information seeking.

It is important to note that there are markedly different Ns (59,373) in the follow-up exploratory analysis. Any subtle differences between the two groups are attributed to the sample size. The sample size was not designed to address this specific question. Most likely, in this instance this is response bias if individuals were not likely to respond to the survey if they were not affected. Moreover, this particular survey item is vague, suggesting there may be an interpretation challenge since it leaves “impacted in any way” open to an arrange of possibilities.

6.8 Implications for Practice and Future Research

In addition to the theoretical implications of this study, it is also crucial to note the applications for decision makers such as emergency managers. While this study focused on the High Park Fire Burn Area, the implications for practice can extend to other contexts. For example, the overall framework for this study has applicability and utility across the natural hazard’s spectrum including floods, tornadoes, and hurricanes, to name a few. The measurements incorporated, and theoretical framework are organized for other practitioners to adapt across the landscape and could prove beneficial to further craft risk-based messaging, as noted in further detail below.

The results from the study stressed the importance of the continued evaluation of risk-related information seeking behavioral intention along with dual-process risk perception to help refine risk communication. This is particularly true given natural hazards such as wildfires will continue to occur, and individuals will always need efficient and effective risk-based information and messaging to ensure not only are they informed but take the appropriate protective actions (Beggs, 2018; Sutton et al., 2018). This will also help ensure communities work towards being further disaster resilient (Steelman & McCaffrey, 2013) and assist emergency managers throughout the four phases: preparedness, mitigation, response, and recovery.

It should be noted though that the model results did not produce specific instructions on the implications for practice. Rather, the model and study as a whole serve as part of an incremental stepping stone to further progress risk-related information seeking and risk communication. The various relationships amongst the concepts suggest the need for tailored risk-based messaging and also denote the importance of evaluating socio-psychological parameters when trying to better understand risk-related information seeking behavioral intention and risk perception. It is common that risk-related information seeking literature oftentimes assesses risk from a removed, nonconcrete manner and in the instance where it does assess environmental risks, the decision-making process is often not dependent upon a specific timeframe (Sutton et al., 2018). Additionally, risk-related information seeking research in the context of natural hazards, often focuses on it before or after (as in the case of this study). As a result, it is not common to find many practical implications suggested after each analysis. Rather, the authors often just call for further theoretical refinement and mention the need to understand risk-based messaging. However, there are indeed next steps that affirm the importance of this study and applicability to decisions makers. What is most practical is to provide discussion on how the initial information from this study can be carried forward, attempting to further close the gap between theory and practice within the realm of natural hazards and risk communication.

Ideally, there are two stages to further progress this research study and apply it in a context that would be beneficial to a local emergency manager including tailored message testing and a communication campaign. Initially this would entail beginning with a study such as this one, helping understand the audience, overall risk perception, and initial risk-related information seeking behavioral intention (Paveglio et al., 2015) then utilize the knowledge gained to form a basis for a tailored messaging experiment.

Tailoring a message focuses on the individuals instead of a larger population which is often the root of targeted messaging (Stellefson et al., 2008). This is particularly applicable to this study area since it is relatively small, consists of both seasonal and permeant residents, who vary in educational attainment, and total household income, as previously noted. Individuals' risk varies significantly based upon their morals and principles. As a result, there has been a continued need to better understand and attenuate risk-based messaging and tailoring the communication tactics (Christanson et al., 2011).

The findings in this research study point to the following discussion, which can help craft tailored messaging that would be ideal for a quasi-experimental design: The quasi-experimental study could be conducted for the same study area and help refine risk-based messaging for this population, especially in the instance they experience another wildfire. This study revealed a positive association between dual-process risk perception and past risk-related information seeking, as well positive correlations between affective and cognitive risk perception. Subsequently, past risk-related information seeking, and risk perception have the potential to influence risk-related information seeking behavioral intention and encouraging protective action (Kievik & Gutteling, 2011). It would be ideal if some of the tailored messaging in the experiment focused on risk perception, crafting messages with an emphasis on risk as feelings. Moreover, individuals are more likely to focus on a risk-based messaging if it is heightened to increase their risk awareness (Kievik & Gutteling, 2011). Also, in this study, response efficacy had a positive association with risk-related information seeking behavioral intention, insinuating that participants with the higher response efficacy are more likely to transfer their knowledge into action. This is cautiously optimistic yet important for the tailored messaging experiment that would focus on protective actions such as evacuation and maintaining defensible space. Moreover, there was a positive correlation between response efficacy and self-efficacy, suggesting that participants are confident that they can follow through with behaviors such as maintaining defensible space, information seeking, evacuating, as well as seeking shelter, if applicable. This can be amplified if coordinated in conjunction with risk perception. While these are only some of the findings from this study, they do emphasize the importance of focusing on risk perception, efficacy beliefs, as well as risk-related information seeking behavioral intention when evaluating and creating tailored risk-based messaging for the lay public.

Assessing risk-based messaging related to risk-related information seeking behavioral intention and risk perception of wildfires helps to further identify not only what types of information decision makers should focus on but how to craft the message to encourage protective action. The next step would be to not only analyze the tailored messaging experiment but also develop a risk communication campaign focused on wildfires and conduct evaluative studies. A communication campaign would not only help implement tailored messaging but also raise community awareness and further improve preparedness and resiliency (Avvisati et al., 2019). This could be done prior to the next wildfire season or afterwards depending upon the timing of the tailored messaging analysis and wildfire status within the area and/or region.

Moreover, there are other options for further applying the results from this study to other areas of research and application. Another area of focus will be on evaluating the open-ended question from the original questionnaire, which asked participants to describe their experience with the High Park Fire, providing a qualitative approach towards risk perception and risk-related information seeking behavioral intention. It is also evident that there is a need for additional research focused on the theoretical constructs involved in risk-related information seeking studies such as PADM research that was previously discussed. Lastly, this study reaffirmed this need given there was a high response rate, the concepts had good reliabilities, and it was supported by well-known theoretical models, yet the outcomes of the confirmatory path model were still not ideal. Theory development is incremental yet very crucial for this area of research and as individuals continue to experience natural hazards such as wildfires, there will be the need to further refine risk-based messaging.

From a broader perspective, by focusing on tailored messaging, a communication campaign, as well as assessing the qualitative content from the original survey, all of these can help emergency managers and other decision makers better understand the lay public's risk perception, information seeking, and protective actions prior to the next natural hazard, particularly another wildfire. Ideally, this contributes to the preparedness and mitigation phase of emergency management and better articulates what specific information may need to be communicated and offered in training in order to ensure the individuals residing and working within the area are more disaster resilient and risk communication continues to improve.

6.9 Limitations

Several limitations of this study are important to note. First, the survey was cross-sectional. The data focused on past risk-related information seeking, and other important concepts often found in risk-related information seeking models and how they influence risk-related information seeking behavioral intention about wildfires. However, this should be approached with caution since no substantial conclusions were made regarding the causal effects and how this translates to future wildfires. Since the dependent variable in this study was risk-related information seeking behavioral intention, there were not specific results and conclusions focused on the actual behavior of residents, serving as a limitation. Thus, it would be important for future research be concentrated on evaluating if an individual's actual behavior aligns with their behavioral intention (Ter Huurne, 2008). Another limitation to note is this study may not be as generalizable to wildfire risk everywhere given the study was specifically only for the High Park Fire Burn Area. Here, the demographic tends to be older and the community is nestled within the WUI at the foothills of the Rocky Mountains. Not all individuals who experience a wildfire will be within this age demographic, topography, nor the same amount of risk-related information seeking. So, while there is valuable practical application of the results from this study, it may not provide massive generalizations to wildfires and risk-related information seeking behavioral intention across the United States or World. Another limitation of this study was that total household income had the highest missing rate. This is quite common since this demographic is often viewed by survey participants as a sensitive type of information that they do not want to reveal. Lastly, while there was an excellent return rate, there were still several hundreds of addresses that did not even receive a copy of the survey to participate simply because it was undeliverable to the address noted or the individuals had already moved away from this area. However, mailing lists such as the one used for this study and others are never completely up-to-date and the overall failed address rate from the SSI sample was typical.

CHAPTER VII

CONCLUSION

This study evaluated risk-related information seeking behavioral intention and dual-process risk perception within the context of wildfires. A survey was disseminated to residents within the High Park Fire Burn Area with a 60.8% response rate (N=432). In this instance, the study extended the application of a combined risk-related information seeking model (PRISM, FRIS, and RISP). Rooted in information seeking and risk perception theory and measurements, the concepts of risk-related information seeking behavioral intention path model and the relationships amongst the concepts were evaluated by a path analysis.

There were several novel findings in this study that extends the literature in substantial ways given their rarity in these types of research studies and impacts on risk-related information seeking behavioral intention. For example, both the confirmatory and exploratory path models tested the relationship between past risk-related information seeking and perceived hazard knowledge, which is not commonly applied. The study also revealed that dual-process risk perception can significantly influence individuals past risk-related information seeking about wildfires. The two path models analyses suggested that individuals were more likely to seek risk-related information about wildfires in the past if they did not feel they had a sufficient amount of knowledge already. And, if they then did seek the risk-related information, they were more likely to feel confident about wildfires and wildfire risk. Also, this study confirmed that past risk-related information seeking can influence risk-related information seeking behavioral intentions. Findings such as these examples suggest that combined risk-related information seeking models can provide initial insight into individuals risk-related information seeking behavioral intentions, particularly related to wildfires.

This study provides an initial evaluation of risk-related information seeking behavioral intentions, rather than their specific behavioral intentions and approaches this subject manner from a more theoretical approach. Similar to other studies, utilizing a combined risk-related information seeking model is always a work in progress, allowing researchers to suggest, evaluate, discover, and further improve upon the theoretical constructs and measurements. The findings of this study also suggest the need for continued improvement in the discrepancies between concepts and how no single path model provides the all-encompassing answer to risk-related information seeking behavioral intention and dual-process risk perception. This study provides a foundation to improve upon risk communication and gravitates practitioners and scholars to look beyond the basic messages of wildfire risk.

This study reiterates that it is important to comprehend how the lay public assesses risk-related information and dual-process risk perception to make decisions about wildfire risk. Moreover, this study provides a strong platform for additional combined risk-related information seeking studies, not only about wildfires but other natural hazards and the lay public.

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APPENDICES

Table 27.
Missing Values by Scale Variable Name, Total, and Percent Missing.

Variable	Missing	Total	Percent Missing
CurInffoN	0	432	0
AffRiskfe	11	432	2.5
AffRiskwo	6	432	1.4
AffRiskdr	15	432	3.5
AffRiskde	18	432	4.2
RespEff1	9	432	2.1
RespEff2	6	432	1.4
RespEff3	8	432	1.9
RespEff4	10	432	2.3
RespEff5	9	432	2.1
CogRiskca	3	432	0.7
CogRiswi	5	432	1.2
CogRiskfi	4	432	0.9
CogRisge	2	432	0.5
CurKnow	1	432	0.2
PstInfoS1	7	432	1.6
PstInfoS2	7	432	1.6
PstInfoS3	6	432	1.4
PstInfoS4	3	432	0.7
PstInfoS5	5	432	1.2
PstInfoS6	6	432	1.4
SelfEff1	11	432	2.6
SelfEff2	9	432	2.1
SelfEff3	12	432	2.8
SelfEff4	11	432	2.6
SelfEff5	10	432	2.3
Perhazkn1	2	432	0.5
Perhazkn2	11	432	2.6
Perhazkn3	11	432	2.6
Perhazkn4	14	432	3.2
Perhazkn5	10	432	2.3
Perhazkn6	11	432	2.6
Perhazkn7	11	432	2.6
Perhazkn8	17	432	3.9
SufThrs	9	432	2.1

Table 27.
Missing Values by Scale Variable Name, Total, and Percent Missing (Continued).

Variable	Missing	Total	Percent Missing
InsoSBI1	16	432	3.7
InfoSBI2	16	432	3.7
InfoSBI3	16	432	3.7
InfoSBI4	17	432	4.2
InfoSBI5	17	432	4
InfoSBI6	15	432	3.9
YoB	23	432	5.3
PoR	19	432	4.4
Sex	19	432	4.4
Race	17	432	3.9
HisO	27	432	6.3
EducAtt	8	432	1.9
HouInc	52	432	12
HPImp	3	432	0.7

Table 28.
Place of Residency Results.

Summary	Mean	Median	Mode	Range	SD
PoR	0.95	1	1	0-1	0.22

Note. Participants were asked to indicate their permanent place of residency, determining whether they rent (0) or own (1). Question: What best describes your permanent residency?

Table 29.
Frequency Table for Place of Residency.

Place of Residency (PoR)	Frequency	Percent	Cumulative
0	20	4.63	4.63
1	412	95.37	100.00
Total	432	100.00	

Note. 0 indicates participants rent and 1 indicates they own their place of residency.

Table 30.
Gender Results.

Summary	Mean	Median	Mode	Range	SD
Sex	0.38	0	0	0-1	0.48

Note. Participants were asked to indicate the gender that they identify with based on the following: male (0), female (1), non-binary/third gender (2), prefer to self-describe (3), and prefer not to say (4). The seven cases reporting values 3 or 4 were randomly recoded to 0/1. Question: What is your gender?

Table 31.
Frequency Table for Gender.

Gender (Sex)	Frequency	Percent	Cumulative
0	270	62.50	62.50
1	162	37.50	100.00
Total	432	100.00	

Note. 0 indicates male and 1 indicates female.

Table 32.
Race Results.

Summary	Mean	Median	Mode	Range	IQV
Race	4.90	5	5	1-6	0.15

Note. Participants were asked to indicate their race based on the following: American Indian or Alaskan Native (1), Asian (2), Black or African American (3), Native Hawaiian or other Pacific Islander (4), White (5), or other (6). Question: Which of the following best describes your race? Please check all that apply.

Table 33.
Frequency Table for Race.

Race	Frequency	Percent	Cumulative
1	12	2.78	2.78
2	2	0.46	3.24
5	407	94.21	97.45
6	11	2.55	100.00
Total	432	100.00	

Note. 1 represents American Indian or Alaskan Native, 2 represents Asian, 5 represents White, and 6 represents other races.

Table 34.
Hispanic Origin Results.

Summary	Mean	Median	Mode	Range	SD
HisO	0.01	0	0	0-1	0.01

Note. Participants were asked if they are of Hispanic, Latino, or Spanish origin with no (0) and yes (1) as choices for a response. Question: Are you of Hispanic, Latino, or Spanish origin?

Table 35.
Frequency Table for Hispanic Origin.

Hispanic Origin	Frequency	Percent	Cumulative
0	426	98.61	98.61
1	6	1.39	100.00
Total	432	100.00	

Note. 0 represents the individual is not of Hispanic, Latino, or Spanish origin and 1 represents that the individual is of Hispanic, Latino, or Spanish origin.

Table 36.
Educational Attainment Results.

Summary	Mean	Median	Mode	Range	SD
EducAtt	5.62	6	0	1-8	0.91

Note. Participants were asked to indicate their highest level of educational attainment with the following options: some high school or less (1), high school diploma or the equivalent (2), trade school (3), some college (4), Associate's degree or a 2-year college degree (5), Bachelor's degree or a 4-year college degree (6), Master's degree (7), and Advanced degree (8). Question: What is the highest level of education you have completed?

Table 37.
Frequency Table for Educational Attainment.

EducAtt	Frequency	Percent	Cumulative
1	2	0.46	0.46
2	33	7.64	8.10
3	16	3.70	11.81
4	61	14.12	25.93
5	39	9.03	34.95
6	145	33.56	68.52
7	84	19.44	87.96
8	52	12.04	100.00
Total	432	100.00	

Note. 1 represents some high school or less, 2 represents high school diploma or the equivalent, 3 represents trade school, 4 represents some college, 5 represents Associate's degree or a 2-year college degree, 6 represents Bachelor's degree or a 4-year college degree, 7 represents Master's degree, and 8 represents an Advanced degree. Question: What is the highest level of education you have completed?

Table 38.
Total Household Income Results.

Summary	Mean	Median	Mode	Range	SD
HouInc	4.72	4	4	1-9	0.96

Note. Participants were asked to approximate their total household income, before taxes and from all sources based on the following: less than $20,000 (1), $20,000 to $40,000 (2), $40,001 to $60,000 (3), $60,001 to $80,000 (4), $80,001 to $100,000 (5), $100,001 to $120,000 (6), $120,001 to $140,000 (7), $140,001 to $160,000 (8), and greater than $160,001 (9). Question: What is your approximate total household income, before taxes and from all sources?

Table 39.
Frequency Table for Total Household Income.

HouInc	Frequency	Percent	Cumulative
1	22	5.09	5.09
2	49	11.34	16.44
3	58	13.43	29.86
4	119	27.55	57.41
5	48	11.11	68.52
6	43	9.95	78.47
7	23	5.32	83.80
8	20	4.63	88.43
9	50	11.57	100.00
Total	432	100.00	

Note. The following: less than $20,000 (1), $20,000 to $40,000 (2), $40,001 to $60,000 (3), $60,001 to $80,000 (4), $80,001 to $100,000 (5), $100,001 to $120,000 (6), $120,001 to $140,000 (7), $140,001 to $160,000 (8), and greater than $160,001 (9). Question: What is your approximate total household income, before taxes and from all sources?

Table 40.
High Park Fire Impact Results.

Summary	Mean	Median	Mode	Range	SD
HPImp	0.86	1	1	0-1	0.34

Participants were asked if they were personally affected by the 2012 High Park Fire, indicating no (0) or yes (1).

Table 41.
Frequency Table for High Park Fire Impact.

HPImp	Frequency	Percent	Cumulative
0	12	2.78	2.78
1	2	0.46	3.24
Total	432	100.00	

Note. 0 represents the participant was not impacted by the High Park Fire and the 1 indicates the participant was personally impacted by the High Park Fire.

Table 42.
Age Results.

Summary	Mean	Median	Mode	Range	SD
Age	61.11	63	61	18-93	13.00

Note. Residents were asked what year they were born and then the ages were determined from the following: 2018-year of birth. Question: What year were you born?

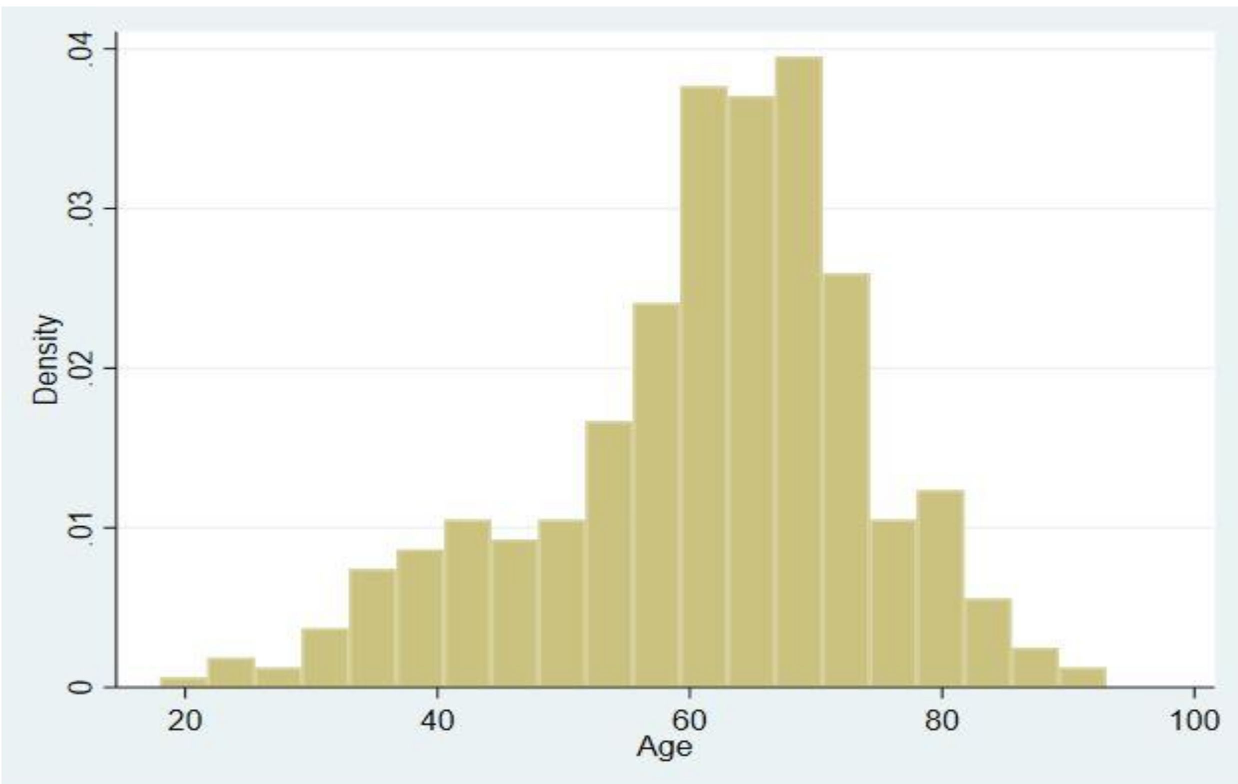

Figure 17. Graph of the age distribution of residents who participated in the survey.

Table 43.

Means and Standard Deviations on the Measure of Risk-Related Information Seeking Behavioral Intention.

Items	Statement	M	SD
InfoSBI1	I plan to seek more information about wildfires.	3.17	1.20
InfoSBI2	I intend to find out more about wildfire risk.	3.10	1.02
InfoSBI3	In the future, I will try to seek as much information as I can about wildfires.	3.27	0.98
InfoSBI4	I plan to seek more information about defensible space.	3.28	1.02
InfoSBI5	I intend to seek more information about evacuating during a wildfire.	3.19	1.08
InfoSBI6	I will look for information related to wildfires and emergency preparedness in the near future	3.42	0.99

Note. Participants were asked how likely they think about wildfire information and wildfires, in general, based on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Question: *We now would like to know how you might interact with information concerning wildfires in the future. In the next three months, how strongly do you agree that you might do the following?*

Table 44.

Correlations and Covariances on the Measure of Risk-Related Information Seeking Behavioral Intention.

	InfoSBI1	InfoSBI2	InfoSBI3	InfoSBI4	InfoSBI5	InfoSBI6
InfoSBI1	1	0.85	0.79	0.67	0.67	0.71
InfoSBI2	0.82***	1	0.79	0.76	0.77	0.72
InfoSBI3	0.79***	0.79***	1	0.67	0.71	0.70
InfoSBI4	0.65***	0.73***	0.67***	1	0.76	0.68
InfoSBI5	0.61***	0.70***	0.67***	0.69***	1	0.77
InfoSBI6	0.70***	0.71***	0.72***	0.67***	0.72***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001.*

Table 45.
Dimensionality (Principal Components) Risk-Related Information Seeking Behavioral Intention.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.55066	4.08692	0.7584	0.7584
Comp2	0.463732	0.118121	0.0773	0.8357
Comp3	0.345611	0.0788109	0.0576	0.8933
Comp4	0.2668	0.05273	0.0445	0.9378
Comp5	0.21407	0.0549401	0.0357	0.9735
Comp6	0.15913		0.0265	1.0000

Table 46.
Reliability (Cronbach's Alpha) Risk-Related Information Seeking Behavioral Intention.

Item	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
InfoSBI1	432	+	0.8751	0.8162	0.7070	0.9235	InfoSBI1
InfoSBI2	432	+	0.9086	0.8642	0.6895	0.9174	InfoSBI2
InfoSBI3	432	+	0.8891	0.8361	0.6997	0.9209	InfoSBI3
InfoSBI4	432	+	0.8440	0.7726	0.7232	0.9289	InfoSBI4
InfoSBI5	432	+	0.8409	0.7682	0.7249	0.9294	InfoSBI5
InfoSBI6	432	+	0.8654	0.8025	0.7121	0.9252	InfoSBI6
Test Scale					0.7094	0.9361	Mean (Standardized Items)

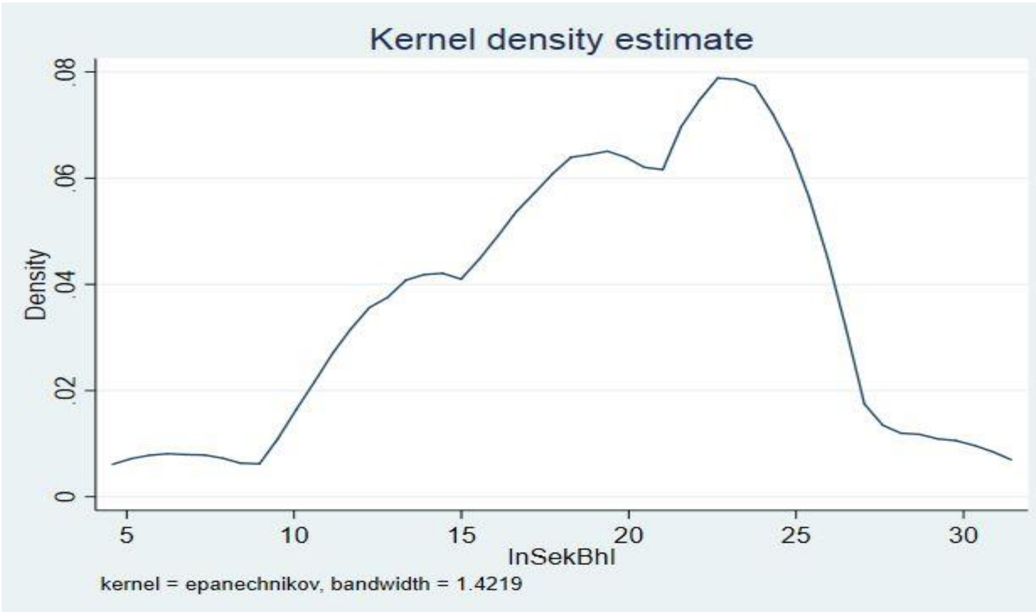

Figure 18. Kernel density estimation plot for risk-related information seeking behavioral intention.

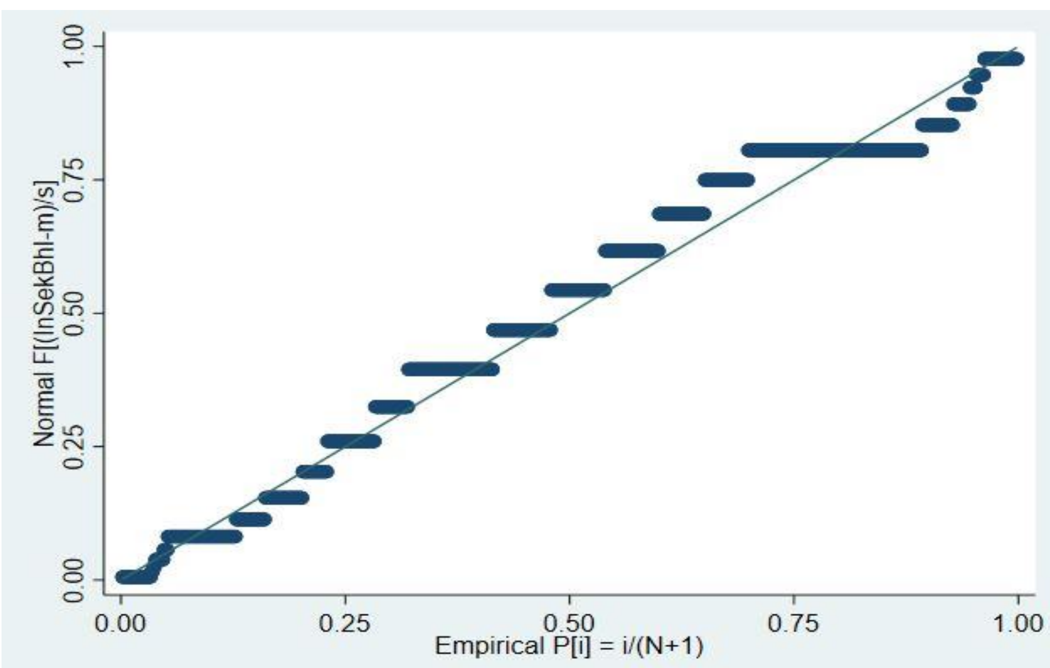

Figure 19. Normal probability plot for risk-related information seeking behavioral intention.

Table 47.
Means and Standard Deviations on the Measure of Past Risk-Related Information Seeking.

Items	Statement	M	SD
PstInfoS1	I have gone out of my way to get more info about wildfires.	3.16	1.12
PstInfoS2	When the topic of wildfires has come up, I have tried to learn more.	3.49	0.97
PstInfoS3	I have felt that seeking more information about wildfires would be a good use of my time.	3.32	1.09
PstInfoS4	When there has been a wildfire in the region, I paid close attention to the news.	4.40	0.87
PstInfoS5	I have sought information about wildfires from online sources.	3.44	1.34
PstInfoS6	In the past, I have spent a lot of time learning about wildfire risks.	3.16	1.21

Note. Participants were asked about their previous interaction with information concerning wildfires, based on a 5-point Likert-type scale ranging from 1 (not at all) to 5 (completely). Question: Here, we would like to know if you have previously interacted with information concerning wildfires. How well do these statements describe your past orientation toward wildfire information?

Table 48.
Correlations and Covariances on the Measure of Past Risk-Related Information Seeking.

	PstInfoS1	PstInfoS2	PstInfoS3	PstInfoS4	PstInfoS5	PstInfoS6
PstInfoS1	1	0.76	0.68	0.31	0.74	0.88
PstInfoS2	0.70***	1	0.69	0.28	0.59	0.69
PstInfoS3	0.56***	0.65***	1	0.36	0.61	0.59
PstInfoS4	0.32***	0.33***	0.38***	1	0.40	0.31
PstInfoS5	0.49***	0.45***	0.42***	0.34***	1	0.76
PsInfoS6	0.65***	0.29***	0.45***	0.30***	0.47***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001.*

Table 49.
Dimensionality (Principal Components) Past Risk-Related Information Seeking.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.41533	2.60841	0.5692	0.5692
Comp2	0.806922	0.167208	0.1345	0.7037
Comp3	0.639714	0.11574	0.1066	0.8103
Comp4	0.523974	0.186417	0.0873	0.8977
Comp5	0.337557	0.06106	0.0563	0.9539
Comp6	0.276507		0.0461	1.0000

Table 50.
Reliability (Cronbach's Alpha) Past Risk-Related Information Seeking.

Item	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
PastInfoS1	432	+	0.8275	0.7330	0.4376	0.7955	PstInfoS1
PastInfoS2	432	+	0.8279	0.7336	0.4374	0.7954	PstInfoS2
PastInfoS3	432	+	0.7685	0.6491	0.4641	0.8124	PstInfoS3
PastInfoS4	432	+	0.5945	0.4198	0.5423	0.8556	PstInfoS4
PastInfoS5	432	+	0.7066	0.5646	0.4920	0.8288	PstInfoS5
PastInfoS6	432	+	0.7681	0.6485	0.4643	0.8125	PstInfoS6
Test Scale					0.4730	0.8434	Mean (Standardized Items)

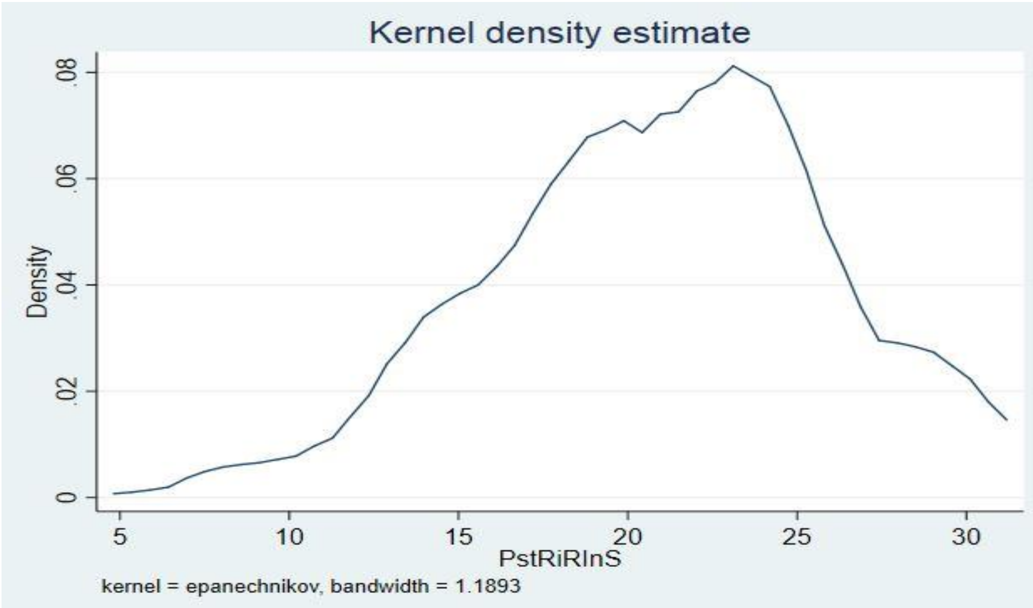

Figure 20. Kernel density estimation plot for past risk-related information seeking.

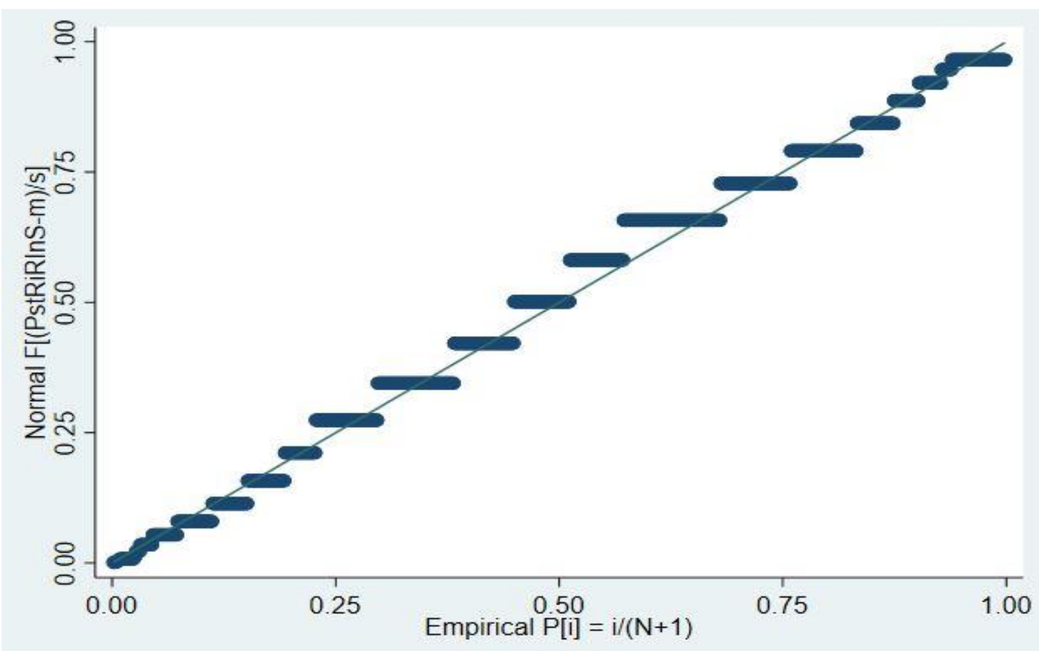

Figure 21. Normal probability plot of past risk-related information seeking.

Table 51.
Means and Standard Deviations on the Measure of Affective Risk Perception.

Items	Statement	M	SD
AffRiskfede	…makes me feel fearful	3.26	1.30
AffRiskwo	…makes me feel worried	3.60	1.19
Affriskdr	…makes me feel dread	2.50	1.31
Affrisk	…makes me feel depressed	2.03	1.18

Note. Participants were asked to use a 5-point Likert-type scale to evaluate their emotional responses to the threat of a wildfire (affective risk perception) from 1 (strongly disagree) to 5 (strongly agree). Question: People have different emotional responses to the threat of a wildfire. The following questions ask about your perception of wildfire risk. In thinking about the possibility of your location experiencing a wildfire with the potential for widespread damage, how strongly would you disagree or agree with the following statements? Thinking about the possibility of a major wildfire…makes me feel fearful, worried, dread, or depressed.

Table 52.
Correlations and Covariances on the Measure of Affective Risk Perception.

Items	PstInfoS1	PstInfoS2	PstInfoS3	PstInfoS4
AffRiskfe	1	1.08	1.06	0.69
AffRiskwo	0.70***	1	0.86	0.56
AffRiskdr	0.62***	0.55***	1	0.95
AffRiskde	0.45***	0.40***	0.62***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001*

Table 53.
Dimensionality (Principal Components) Affective Risk Perception.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.67666	1.99001	0.6692	0.6692
Comp2	0.686652	0.342429	0.1717	0.8408
Comp3	0.344223	0.0517596	0.0861	0.9269
Comp4	0.292463		0.0731	1.0000

Table 54.
Reliability (Cronbach's Alpha) Affective Risk Perception.

Item	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
AffRiskfe	432	+	0.8476	0.7143	0.5229	0.7668	AffRiskfe
AffRiskwo	432	+	0.8093	0.6506	0.5647	0.7956	AffRiskwo
AffRiskdr	432	+	0.8549	0.7267	0.5150	0.7611	AffRiskdr
AffRiskde	432	+	0.7557	0.5661	0.6230	0.8321	AffRiskde
Test Scale					0.5564	0.8338	Mean (standardized items)

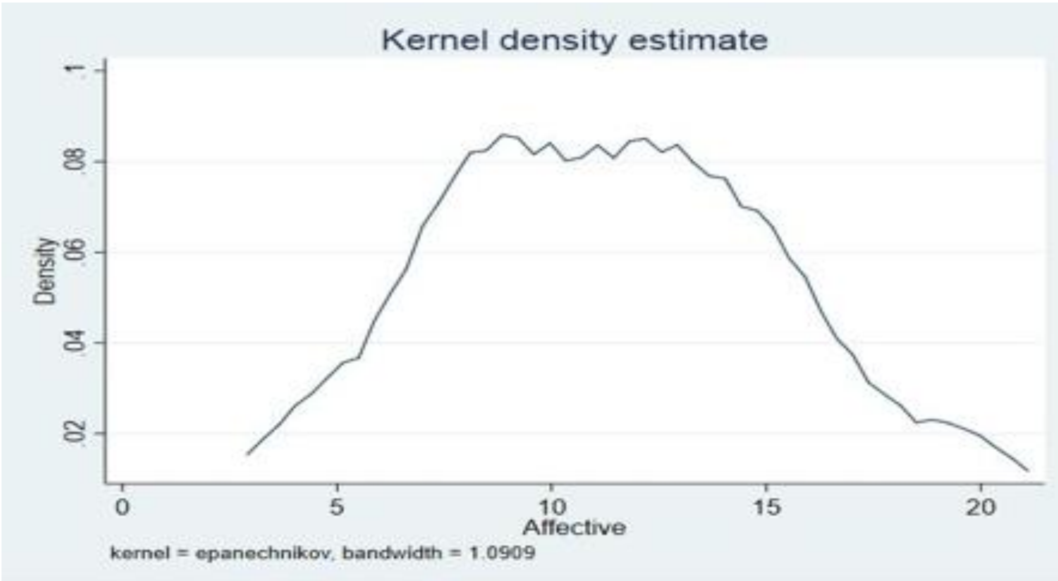

Figure 22. Kernel density estimation plot for affective risk perception.

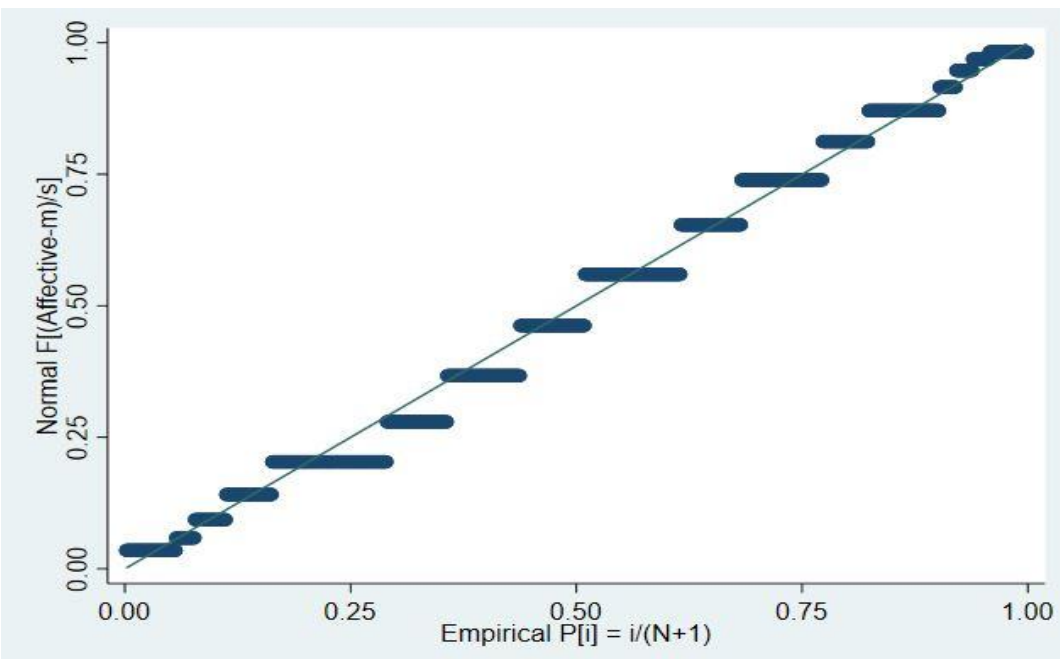

Figure 23. Normal probability plot for affective risk perception.

Table 55.
Means and Standard Deviations on the Measure of Cognitive Risk Perception.

Items	Statement	M	SD
CogRiskca	I think wildfires may cause catastrophic destruction	4.27	0.96
CogRiswi	I think that wildfires may cause widespread death	2.73	1.22
CogRiskfi	I think wildfires pose great financial threat	4.23	0.84
CogRisge	I think wildfires pose a threat to future generations	3.34	1.29

Note. Participants were asked to use a 5-point Likert-type scale to evaluate their emotional responses to the threat of a wildfire (cognitive risk perception) from 1 (strongly disagree) to 5 (strongly agree). Question: people understand wildfires in different ways. In thinking about the nature of wildfires generally, how strongly would you disagree or agree with the following? Thinking about the nature of wildfires… I think wildfires may cause catastrophic destruction, I think that wildfires may cause widespread death, I think wildfires pose great financial threat, and I think wildfires pose a threat to future generations.

Table 56.
Correlations and Covariances on the Measure of Cognitive Risk Perception.

Items	CogRiskca	CogRiswi	CogRiskfi	CogRisge
CogRiskca	1	0.52	0.45	0.59
CogRiswi	0.44***	1	0.45	0.75
CogRiskfi	0.57***	0.44***	1	0.59
CogRisge	0.48***	0.48***	0.55***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001*

Table 57
Dimensionality (Principal Components) Cognitive Risk Perception.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.47732	1.8756	0.6193	0.6193
Comp2	0.601727	0.086915	0.1504	0.7698
Comp3	0.514812	0.108675	0.1287	0.8985
Comp4	0.406137		0.1015	1.0000

Table 58.
Reliability (Cronbach's Alpha) Cognitive Risk Perception.

Item	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
CogRiskca	432	+	0.7901	0.6102	0.4878	0.7407	CogRiskca
CogRiswi	432	+	0.7484	0.5445	0.5315	0.7729	CogRiswi
CogRiskfi	432	+	0.8117	0.6457	0.4651	0.7229	CogRiskfi
CogRisge	432	+	0.7959	0.6197	0.4817	0.7360	CogRisge
Test Scale					0.4915	0.7945	Mean (standardized items)

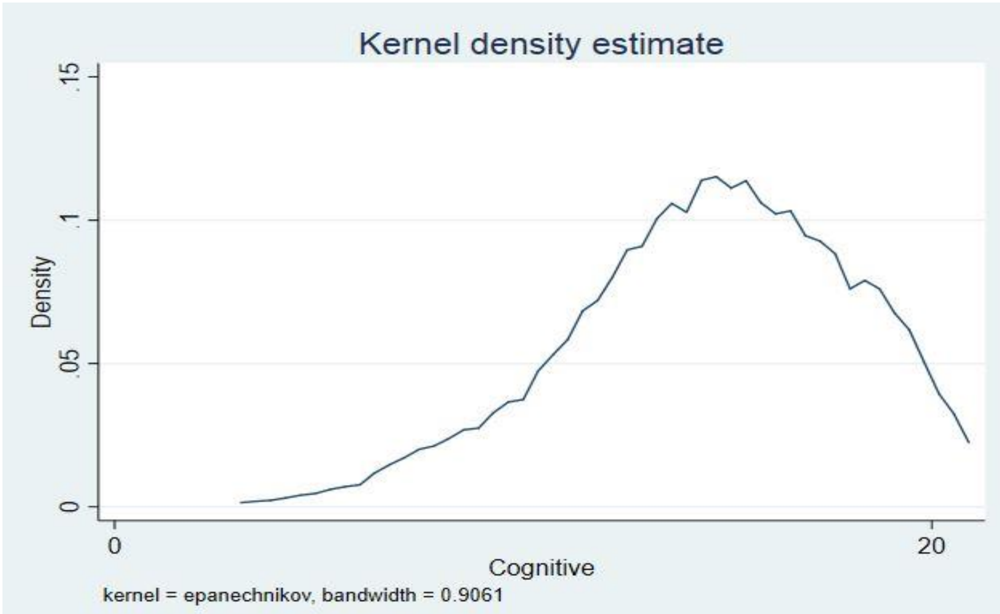

Figure 24. Kernel density estimation plot for cognitive risk perception.

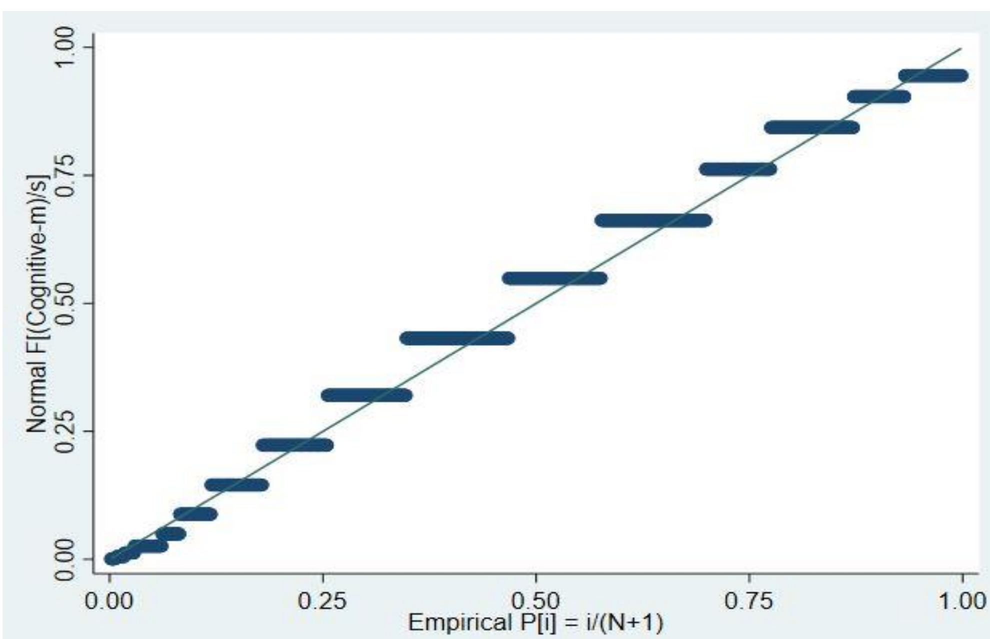

Figure 25. Normal probability plot for cognitive risk perception.

Table 59.

Means and Standard Deviations on the Measure of Response Efficacy.

Items	Statement	M	SD
RespEff1	Searching for information about wildfires	2.93	1.16
RespEff2	Compiling a complete emergency preparedness plan	3.82	1.07
RespEff3	Applying an emergency preparedness plan adequately	3.93	1.01
RespEff4	Evacuating from a wildfire located nearby my residence	3.82	1.31
RespEff5	Assisting others in the event of a wildfire	3.86	1.04

Note. Participants were asked to what degree they feel certain actions would benefit them in the face of a wildfire, based on a 5-point Likert-type scale ranging from 1 (not at all) to 5 (a great deal). Question: To what degree do you feel that the following actions would benefit you concerning wildfire? Searching for information about wildfires, compiling a complete emergency preparedness plan, applying an emergency preparedness plan adequately, evacuating from a wildfire located nearby my residence, and assisting others in the vent of a wildfire.

Table 60.

Correlations and Covariances on the Measure of Response Efficacy.

Items	RespEff1	RespEff2	RespEff3	RespEff4	RespEff5
RespEff1	1	0.46	0.40	0.40	0.31
RespEff2	0.37***	1	0.91	0.56	0.41
RespEff3	0.34***	0.84***	1	0.59	0.36
ResoEff4	0.26***	0.40***	0.44***	1	1.08
RespEff5	0.25***	0.37***	0.34***	0.34***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001*

Table 61.
Dimensionality (Principal Components) Response Efficacy.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.64464	1.86257	0.5289	0.5289
Comp2	0.782073	0.0146907	0.1564	0.6853
Comp3	0.767382	0.115383	0.1535	0.8388
Comp4	0.651999	0.498098	0.1304	0.9692
Comp5	0.153901		0.0308	1.0000

Table 62.
Reliability (Cronbach's Alpha) Response Efficacy.

Item	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
RespEff1	432	+	0.6186	0.3976	0.4565	0.7706	RespEff1
RespEff2	432	+	0.8312	0.7052	0.3291	0.6624	RespEff2
RespEff3	432	+	0.8256	0.6963	0.3324	0.6657	RespEff3
RespEff4	432	+	0.6786	0.4786	0.4205	0.7438	RespEff4
RespEff5	432	+	0.6412	0.4277	0.4429	0.7608	RespEff5
Test Scale					0.3963	0.7665	Mean (standardized items)

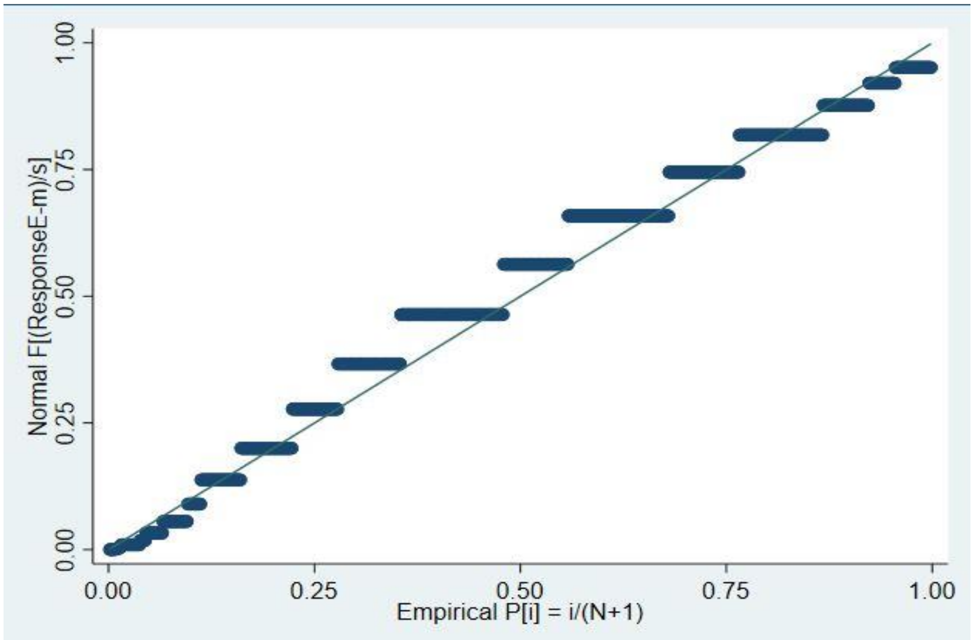

Figure 26. Kernel density estimation plot for response efficacy

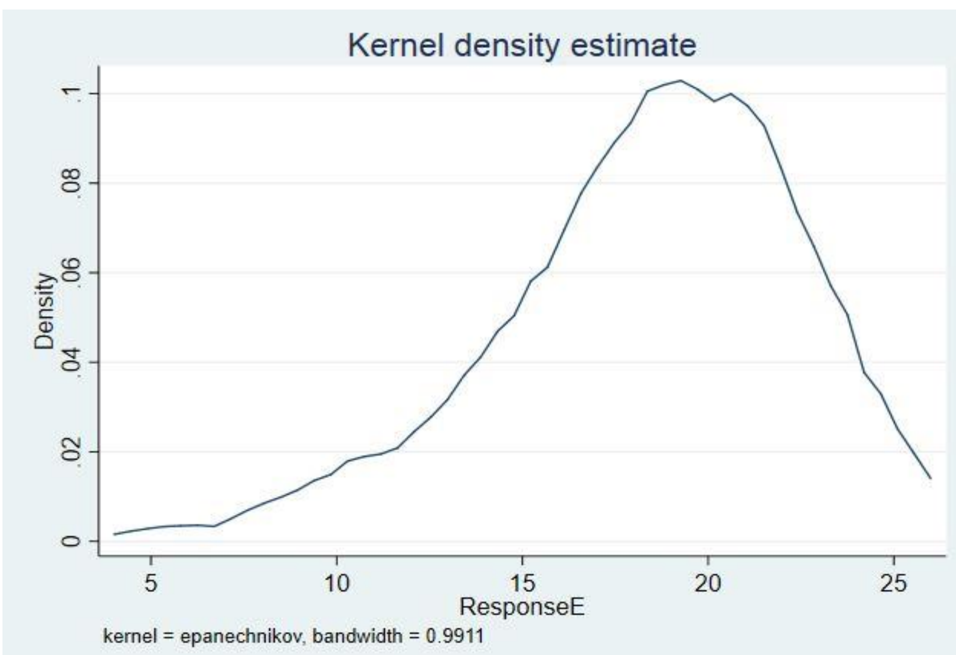

Figure 27. Normal probability plot for response efficacy.

Table 63.
Means and Standard Deviations on the Measure of Self-Efficacy.

Items	Statement	M	SD
SelfEff1	Searching for information about wildfires	3.83	1.01
SelfEff2	Compiling a complete emergency preparedness plan	3.84	1.01
SelfEff3	Applying an emergency preparedness plan adequately	3.85	0.97
SelfEf4	Evacuating from a wildfire located nearby my residence	4.17	1.06
SelfEff5	Assisting others in the event of a wildfire	3.83	1.04

Note. Participants were asked to what degree they feel they are able to take actions that would benefit them in the event of a wildfire, based on a 5-point Likert-type scale ranging from 1 (not at all) to 5 (a great deal). Question: To what degree do you feel that you are able to take these actions that might benefit you concerning wildfires? Searching for information about wildfires, compiling a complete emergency preparedness plan, applying an emergency preparedness plan adequately, evacuating form a wildfire located nearby my residence and assisting others during a wildfire.

Table 64.
Correlations and Covariances on the Measure of Self-Efficacy.

Items	SelfEff1	SelfEff2	SelfEff3	SelfEff4	SelfEff5
SelfEff1	1	0.45	0.36	0.37	0.32
SelfEff2	0.44***	1	0.83	0.46	0.50
SelfEff3	0.37***	0.85***	1	0.45	0.50
SelfEff4	0.35***	0.43***	0.44***	1	0.50
SelfEff5	0.31***	0.47***	0.50***	0.45***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001*

Table 65.
Dimensionality (Principal Components) Self-Efficacy.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.87493	2.14351	0.5750	0.5750
Comp2	0.731422	0.0218611	0.1463	0.7213
Comp3	0.709561	0.175319	0.1419	0.8632
Comp4	0.534242	0.384397	0.1068	0.9700
Comp5	0.149845		0.0300	1.0000

Table 66
Reliability (Cronbach's Alpha) Self-Efficacy.

Items	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
SelfEff1	432	+	0.6521	0.4543	0.5226	0.8141	SelfEff1
SelfEff2	432	+	0.8464	0.7370	0.4007	0.7278	SelfEff2
SelfEff3	432	+	0.8360	0.7206	0.4072	0.7332	SelfEff3
SelfEff4	432	+	0.7074	0.5300	0.4879	0.7921	SelfEff4
SelfEff5	432	+	0.7242	0.5538	0.4773	0.7851	SelfEff5
Test Scale					0.4591	0.8093	Mean (standardized items)

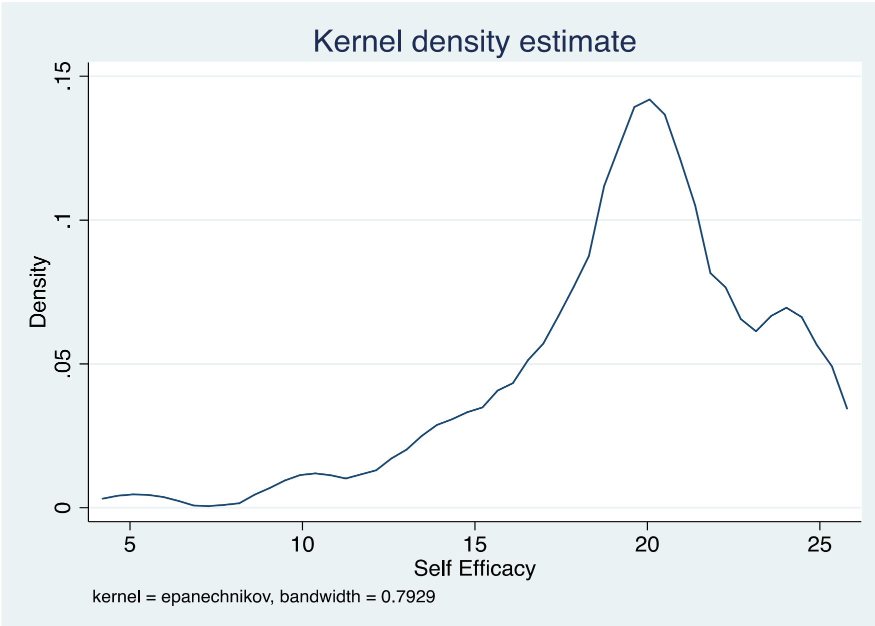

Figure 28. Kernel density estimation plot for self-efficacy.

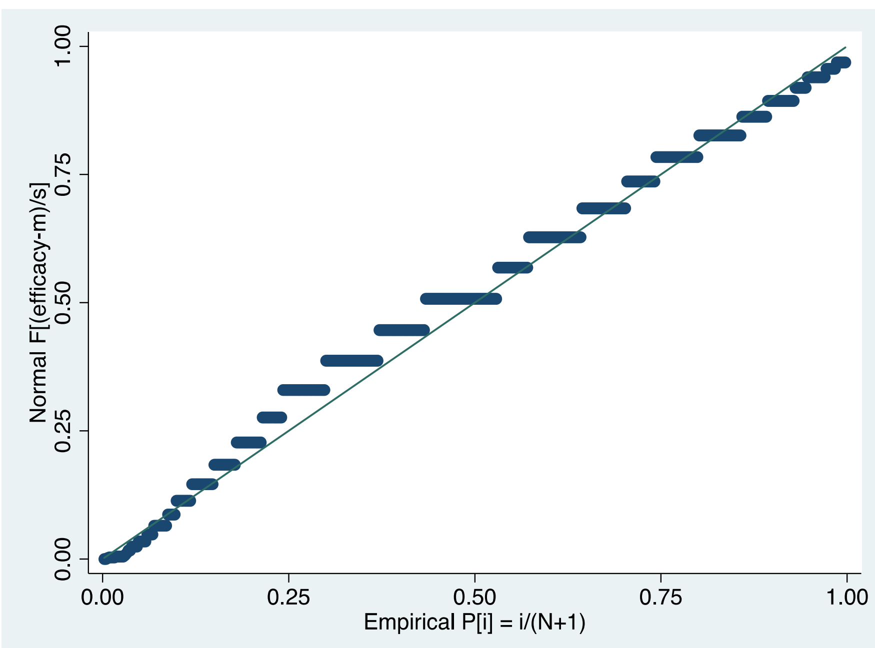

Figure 29. Normal probability plot for self-efficacy.

Table 67.
Means and Standard Deviations on the Measure of Perceived Hazard Knowledge.

Items	Statement	M	SD
Phazk1	Creating defensible space	4.33	0.80
Phazk2	Using defensible space	4.11	0.90
Phazk3	Emergency safety kits	3.68	0.99
Phazk4	Sheltering-in-place	3.31	1.13
Phazk5	Evacuation procedures	4.06	0.87
Phaszk6	Emergency warning system	3.88	0.92
Phasezk7	Causes of wildfires	4.32	0.64
Phasezk8	Wildland Urban Interface (WUI)	3.00	0.87

Note. Participants were asked how knowledgeable they feel they are about a variety of aspects related to wildfires based on a 5-point Likert-type scale ranging from 1 (very poorly) to 5 (very well). Question: we would like to know more about your understanding about a variety of aspects of wildfires. How well do you feel you understand these aspects of wildfires: creating defensible space, using defensible space, emergency safety kits, sheltering-in-place, evacuation procedures, emergency warning system, causes of wildfires and Wildland Urban Interface (WUI)?

Table 68.
Correlations and Covariances on the Measure of Perceived Hazard Knowledge.

	Phazk1	Phazk2	Phazk3	Phazk4	Phazk5	Phazk6	Phazk7	Phazk8
Phazk1	1	0.57	0.41	0.33	0.34	0.25	0.21	0.34
Phazk2	0.80***	1	0.48	0.47	0.41	0.30	0.26	0.44
Phazk3	0.52***	0.54***	1	0.60	0.45	0.43	0.27	0.52
Phazk4	0.36***	0.46***	0.53***	1	0.47	0.39	0.23	0.59
Phazk5	0.49***	0.47***	0.50***	0.45***	1			
Phaz6k	0.34***	0.37	0.47	0.37				
Phazk7	0.42***							
Phazk8	0.33***	0.37***	0.40***	0.41***	0.38***	0.32**	0.31***	1

*Note. * represents 0.05, ** represents <0.01, and *** represents <0.001*

Table 69.
Dimensionality (Principal Components) Perceived Hazard Knowledge.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.12432	3.23038	0.5155	0.5155
Comp2	0.893948	0.124625	0.1117	0.6273
Comp3	0.769323	0.107537	0.0962	0.7234
Comp4	0.661787	0.0752209	0.0827	0.8062
Comp5	0.586566	0.139878	0.0733	0.8795
Comp6	0.446688	0.124097	0.0558	0.9353
Comp7	0.322591	0.12782	0.0403	0.9757
Comp8	0.194771		0.0243	1.0000

Table 70.
Reliability (Cronbach's Alpha) Perceived Hazard Knowledge.

Item	Obs	Sign	Item-Test Corr.	Item-Rest Corr.	Interitem Corr.	Alpha	Label
Phazk1	432	+	0.7451	0.6499	0.4330	0.8424	Phazk1
Phazk2	432	+	0.7891	0.7070	0.4210	0.8358	Phazk2
Phazk3	432	+	0.7700	0.6821	0.4262	0.8387	Phazk3
Phazk4	432	+	0.6882	0.5776	0.4485	0.8506	Phazk4
Phazk5	432	+	0.7845	0.7010	0.4222	0.8365	Phazk5
Phazk6	432	+	0.6754	0.5616	0.4520	0.8523	Phazk6
Phazk7	432	+	0.6502	0.5304	0.4588	0.8558	Phazk7
Phazk8	432	+	0.6165	0.4892	0.4680	0.8603	Phazk8
Test Scale					0.4412	0.8633	Mean (standardized items)

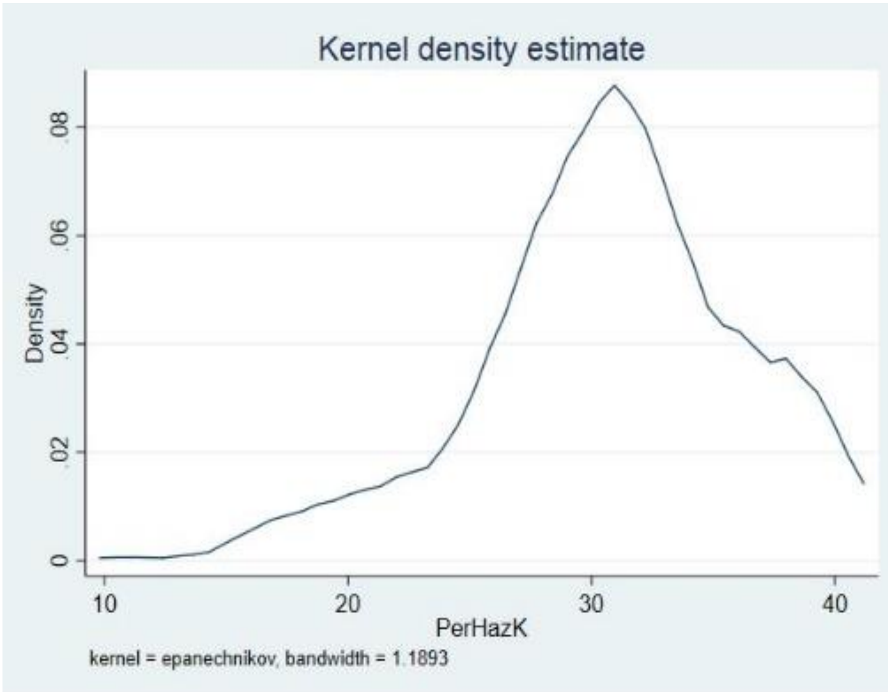

Figure 30. Kernel density estimation plot for perceived hazard knowledge.

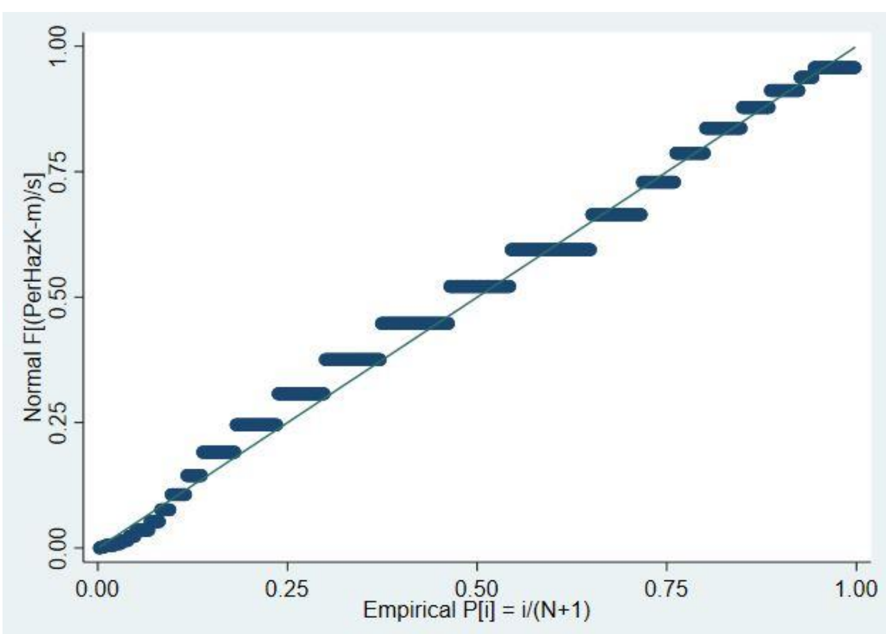

Figure 31. Normal probability plot for perceived hazard knowledge.

Table 71.
Sufficiency Threshold Results.

Summary	Mean	Median	Mode	Range	SD
SufThrs	75.06	82.5	100	0-100	26.56

Note. Participants were asked to approximate their overall knowledge needed about wildfires based on a scale of zero to 100, where zero indicated needing to know nothing and 100 needing to know everything possible. Question: We would like you to estimate how much knowledge you need about wildfires. Do you feel that you need to know as much information as possible or none? Please use a scale of zero to 100, where zero means needing to know nothing and 100 meaning needing to know everything possible.

Table 72.
Current Knowledge Results.

Summary	Mean	Median	Mode	Range	SD
CurKnowledge	72.95	75	80	0-100	17.25

Note. Participants were asked to self-rate their current knowledge about wildfires, ranging from zero (knowing nothing) to 100 (knowing everything possible). Question: Do you feel that you know all that you could about wildfires, or nothing at all? Please use a scale of zero to 100, where zero means knowing nothing and 100 means knowing everything possible.

Table 73.
Shapiro-Wilk Measured for Current Knowledge and Sufficiency Threshold.

Concept	W	Z	p
Sufficiency Threshold	0.93	7.10	0.00
Current knowledge	0.89	8.29	0.00

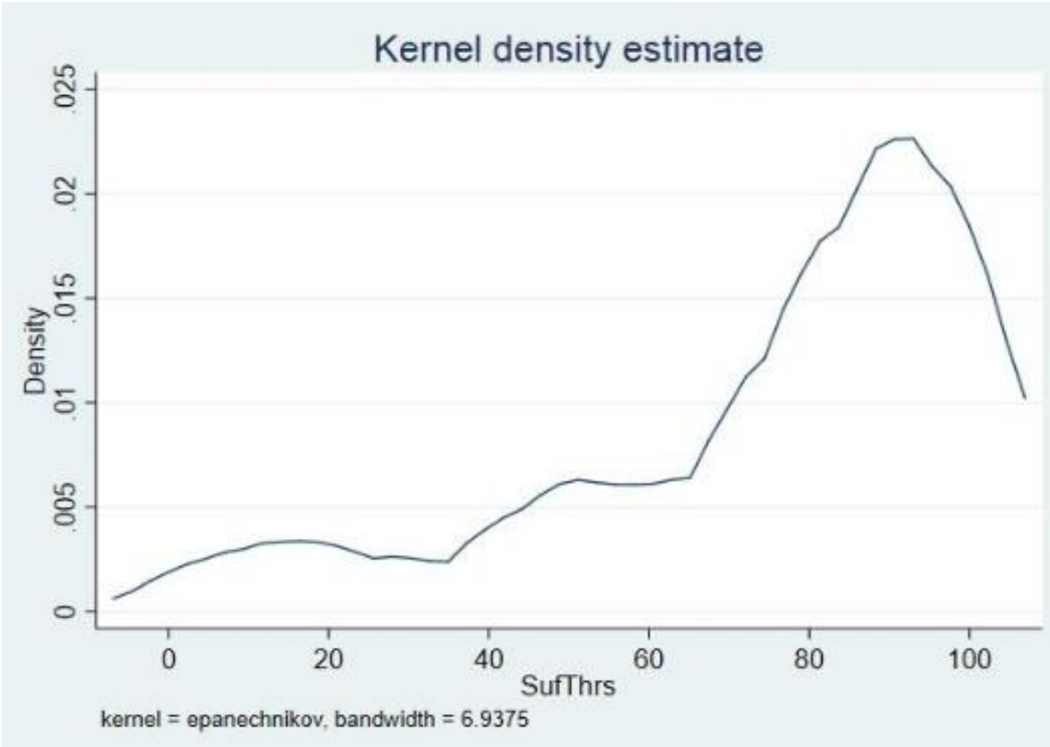

Figure 32. Kernel density estimate plot for sufficiency threshold.

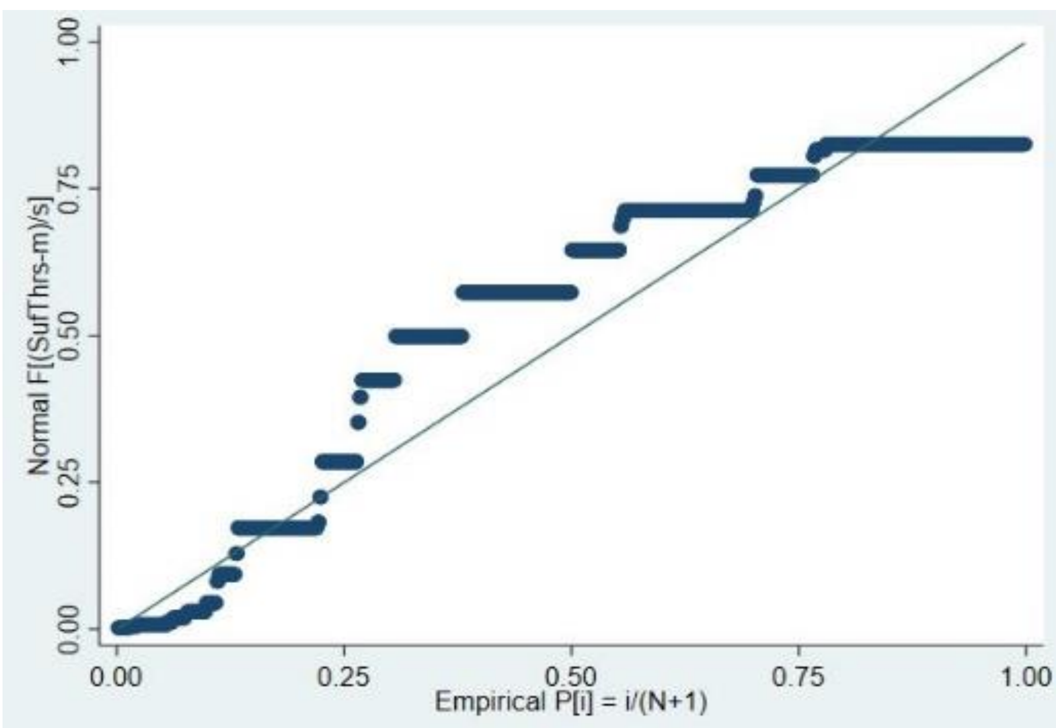

Figure 33. Normal probability plot for sufficiency threshold.

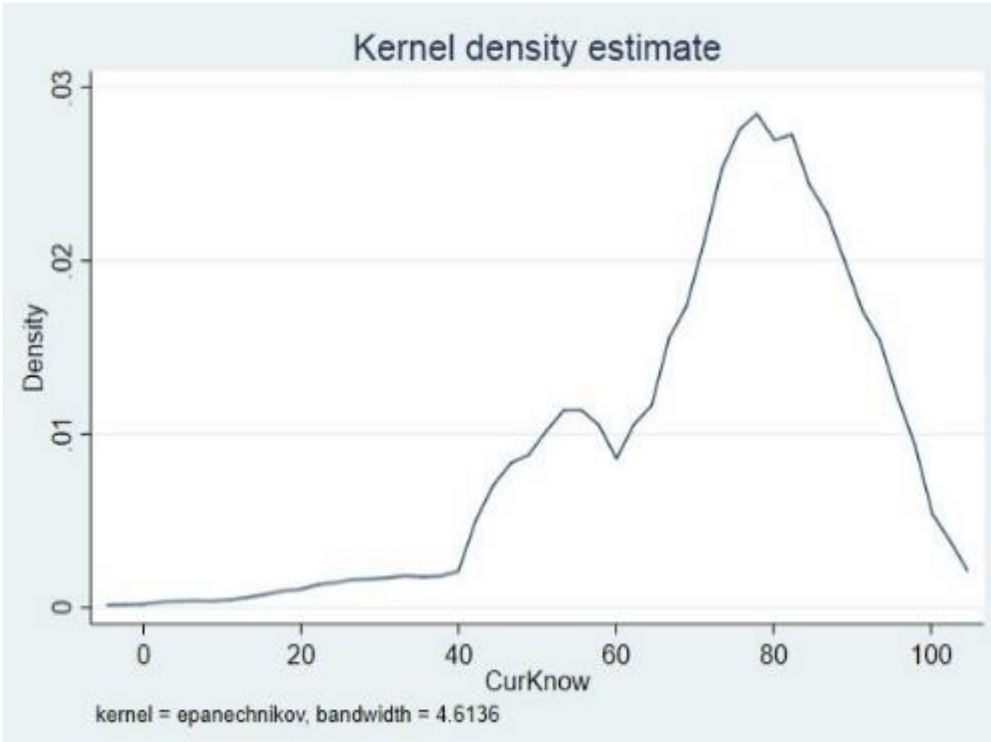

Figure 34. Kernel density estimate plot for current knowledge.

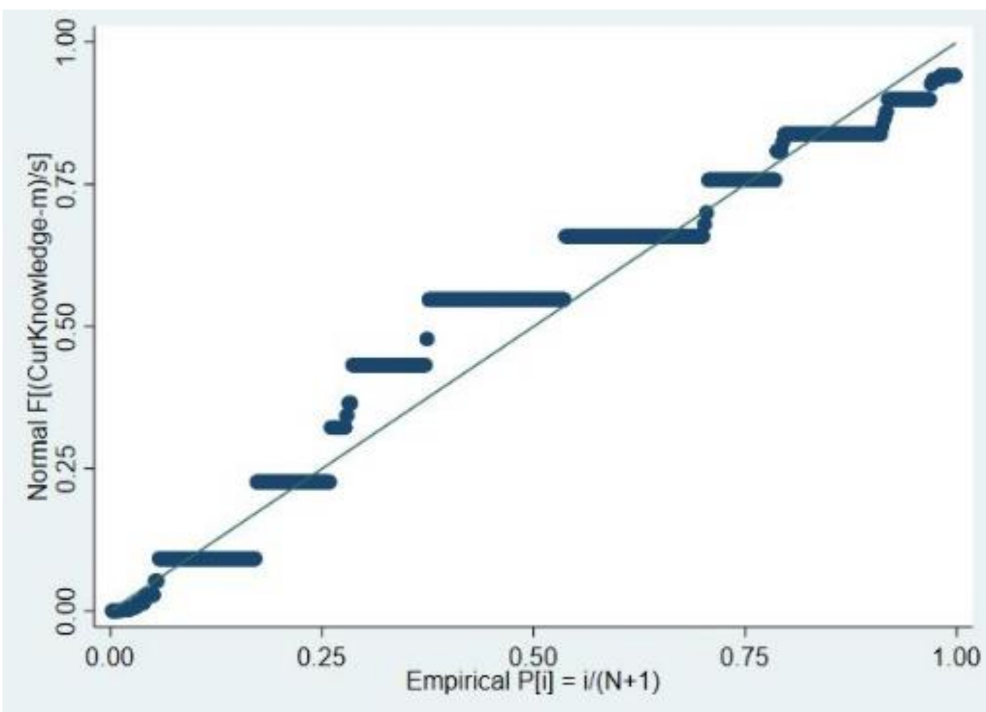

Figure 35. Normal probability plot for current knowledge.

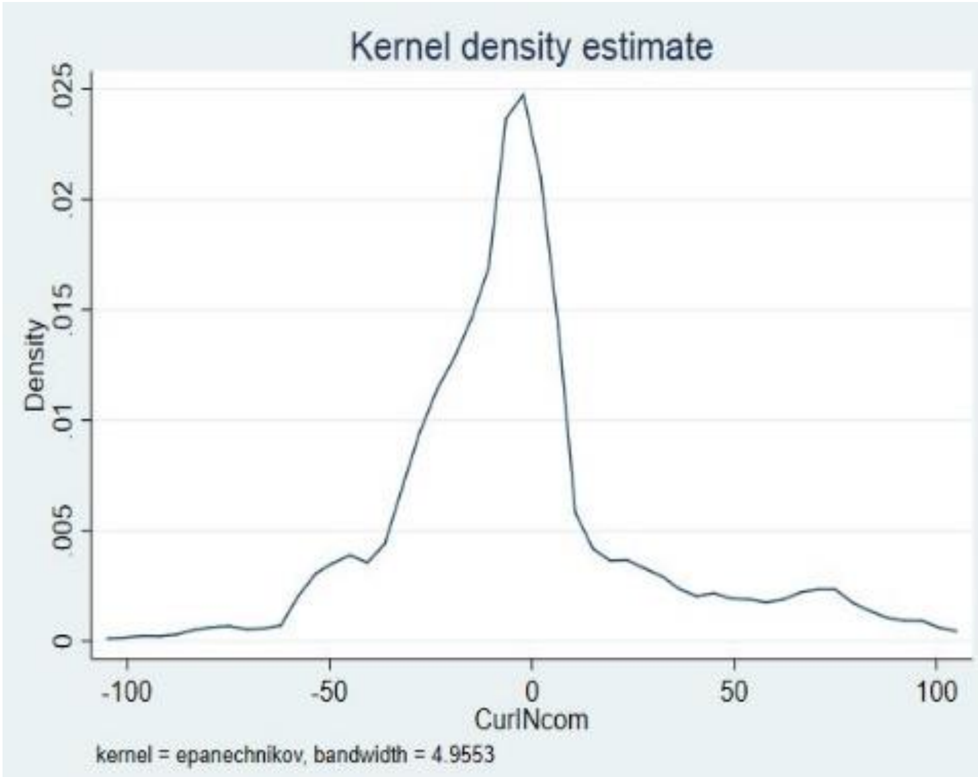

Figure 36. Kernel density estimation plot for current information needs.

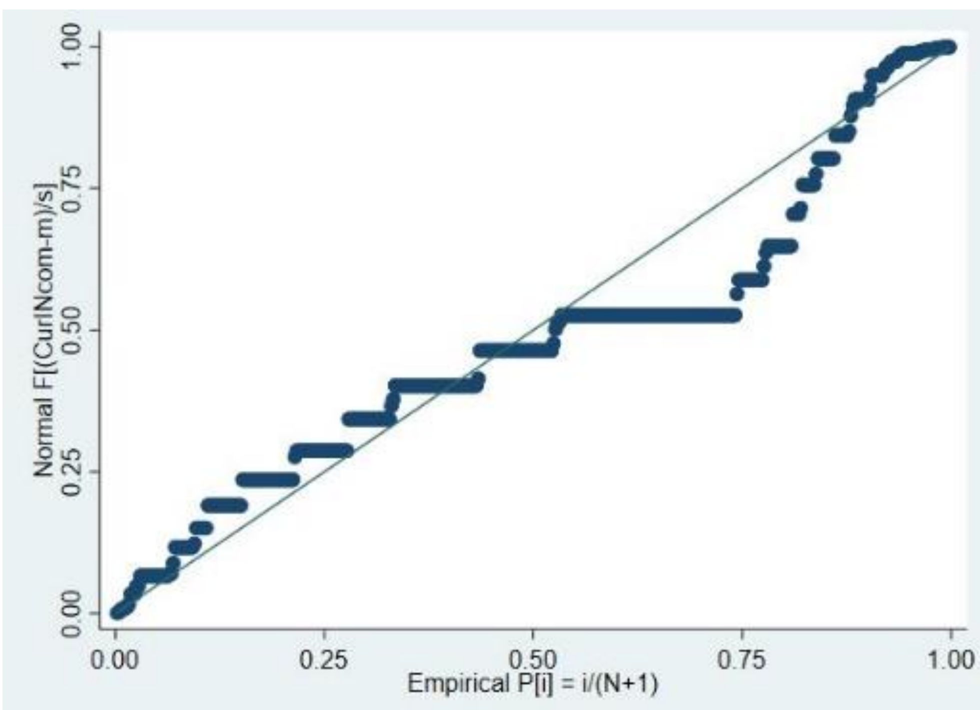

Figure 37. Normal probability plot for current information needs.

Table 74.
Age Results.

Zip Code	ACS Median Age	ACS Margin of Error	Median Age Estimate Based on the Average of the Two Zip Codes	ACS Margin of Error Based on the Average of the Two Zip Codes
80512	57	+/- 8	55	+/- 6.5
80536	53	+/- 5		(48.5, 61.5)

Note. The data displayed in the table is the demographic comparison of age with the 2016 American Community Survey (ACS) median age and margin of error for zip codes 80512 and 80536.

Table 75.
Wildfire Information Study Mean and Median Age and Confidence Interval

Mean Age	Median Age	Confidence Interval
61	63	61 +/- 1.2 (59.9, 62.3)

Table 76.
Confidence Interval Proportions for Gender.

Variable	Obs	Proportion	Standard Error	Binomial Exact (95% Confidence Interval)	
Sex	432	0.375	0.0232924	0.3291836	0.4225411

Table 77.
Gender Mean and 95% Confidence Interval Between the Research Study Survey and American Community Survey.

Concept	Mean	95% Confidence Interval	
Gender (Survey)	0.375	0.329	0.423
Gender (American Community Survey)	0.562	0.522	0.602

Table 78.
Confidence Interval for Mean Age.

Variable	Obs	Proportion	Standard Error	Binomial Exact (95% Confidence Interval)	
Age	432	61.11806	0.6252394	59.88916	62.34695

Table 79.
Age Mean and 95% Confidence Interval Between the Research Study Survey and American Community Survey.

Concept	Mean	95% Confidence Interval	
Age (Survey)	61.11	59.889	62.347
Age (American Community Survey)	55	48.5	61.5

Table 80.
Confidence Interval Proportions for Hispanic Origin.

Variable	Obs	Proportion	Standard Error	Binomial Exact (95% Confidence Interval)	
HisO	432	0.0138889	0.0056306	0.0051136	0.0299838

Table 81.
Hispanic Origin Mean and 95% Confidence Interval Between the Research Study Survey and American Community Survey.

Concept	Mean	95% Confidence Interval	
Hispanic Origin (Survey)	0.013	0.005	0.029
Hispanic Origin (American Community Survey)	0.06	0.035	0.085

Table 82.
Confidence Interval Proportions for Educational Attainment.

Variable	Obs	Proportion	Standard Error	Binomial Exact (95% Confidence Interval)	
EdAtt	432	0.650463	0.0229412	06034299	0695419

Table 83.
Educational Attainment Mode and Percent with a Bachelor's Degree or Higher for the Research Study Survey and the American Community Survey.

Concept	Bachelor's Degree or Higher (%)	95% Confidence Interval		Mode (%)
Educational Attainment (Survey)	65%	60%	69.5%	34%
Educational Attainment (American Community Survey)	43.4%	36.9	49.9%	31%

Table 84.
Confidence Interval Means Total Household Income.

Variable	Obs	Proportion	Standard Error	Binomial Exact (95% Confidence Interval)	
Income	432	84398.15	2186.377	80100.86	88695.44

Table 85.
Total Household Income Mean and 95% Confidence Interval between the Research Study Survey and American Community Survey.

Concept	Mean	95% Confidence Interval		Mode
Total Household Income (Survey)	$84,398	$80,100	$88,695	$70,000
Total Household Income (American Community Survey)	$86,444	$71,782	$101,056	$63,000

Table 86.
Race Mode for the Research Study Survey and American Community Survey.

Concept	Mean
Race (Survey)	White
Race (American Community Survey)	White