

**FRAMING TECHNIQUES IN WILDLAND FIRE COMMUNICATION:
THE IMPACT OF GAIN AND LOSS FRAMES ON SUPPORT FOR
MANAGEMENT**

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ABSTRACT

The goal of this study was to add to our scientific knowledge about best practices for environmental risk communication, while producing applied materials for managers and stakeholders. I used a quasi-experimental pre-/post-test design to examine how two differently framed messages about wildfire projections for the northern Rocky Mountains influence attitudes about management actions. Current research has identified gain and loss frames as a needed area of study in climate change communication, as both frames have led to increases in perception of environmental problem severity, but it remains unclear how frames will influence attitudes, intentions and behavior (Spence & Pidgeon, 2010). Participants were randomly assigned to a treatment group and asked to review an on-line flyer presenting information about increasing wildland fire risk in the northern Rocky Mountains and risk reduction actions. One treatment flyer presented positive outcomes of taking action (gain frame), while the other presented negative outcomes of not taking action (loss frame). Participants completed on-line questionnaires assessing their attitudes and the thoughts they had when viewing the flyers. I hypothesized that loss framed messages would lead to deeper cognitive processing and therefore more positive attitudes.

This study contributes to our theoretical understanding of framing effects on attitudes by showing a significant effect of frame type on cognitive processing. Participants in this study engaged in deeper cognitive processing after reading the loss framed treatment flyer. However, my results did not indicate that either frame was effective at influencing attitudes about wildland fire management. Despite the impact of the loss frame on cognitive processing, other studies indicate that using a gain frame is more likely to influence attitudes. My results call into question whether effects of framing are likely to be substantial

in the context of wildland fire. Nevertheless, this study can contribute to our understanding of existing attitudes by providing data on current levels of support for a variety of management actions, which range from fuel reduction to community policies.

The summary report of this study (Appendix A) provides a description of participants' attitudes about management, a short description of the communication techniques used in the flyer, and recommendations gathered from the literature advocating the use of gain framed information. This summary and the gain flyer will be made available to managers and stakeholders.

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Chapter 1: INTRODUCTION

PROBLEM STATEMENT

The climate change communication field has grown substantially in recent years and now journal articles, research centers and books are devoted to the topic. However, articles recommending climate change communication best practices are more available than research testing the effectiveness of these practices. The lack of empirical evidence for these recommendations shows a general assumption that communication techniques have the same effect across various fields and topics (Spence & Pidgeon, 2010). This assumption could result in messages being ignored, or worse, rejected since the actual effect of a technique can vary given the topic and audience. With a topic as politicized as climate change, inappropriate messages could further the confusion and division surrounding the issue (Nisbet, 2009), and exposing the public to ineffective messages could be counterproductive.

Climate change is a challenging topic to communicate because of the global scale of the problem, its abstract or remote impacts, the politicized attributions of its cause, and the complexity and uncertainty of predictions (Moser, 2010; Nisbet, 2009). For example, readers of a message may argue that their personal actions could not affect a global problem, that climate change will have no direct personal impact, or that the issue of climate change is too complex and not well enough understood for them to take meaningful action. In addition to focusing on local and personal impacts of climate change, one way to address these communication challenges is to include information about the positive social consequences of collective actions, which could help prevent the reader from dismissing the effect he or she might have (Dunwoody, 2007). Furthermore, communication materials should be

appealing to the reader and easy to understand, which is often achieved by including narratives and supplementing scientific facts with examples and photos (Moser, 2010).

Some communication campaigns focus on the worst possible outcomes in the hopes that this will trigger a response from the reader to take action. However, Moser (2007) cautioned that fear appeals may change levels of concern, but if not designed carefully will not translate this concern into behavior change. For instance, people may not act if they believe that they cannot successfully take action, regardless of their level of concern about the problem. To address this problem, Markowitz and Shariff (2012) suggest focusing on costs imposed on future generations, highlighting positive social norms, and using positive emotional appeals to hope, pride, and gratitude. Moser (2007, p. 70) provides specific recommendations to help increase the persuasiveness of the message in generating persistent attitude change, arguing that readers should

- feel personally vulnerable to the risk;
- have useful and very specific information about possible precautionary actions;
- positively appraise their own ability (self-efficacy) to carry out the actions;
- feel the suggested actions will effectively solve the problem (response efficacy);
- believe the cost associated with taking precautionary action is low or acceptable;
- view the reward for not taking action as unappealing; and
- consciously and carefully process threat information (i.e., engage in central/systematic processing as opposed to peripheral/heuristic information processing)

These recommendations should be incorporated in treatment material design when testing specific communication practices. By incorporating techniques known to be

successful, we can test the effectiveness of new techniques in expanding our ability to create persuasive messages.

Although research on climate change is still relatively new, we can develop targeted environmental communication experiments by reviewing results of empirical studies from communication interventions about topics that share some similarities with climate change as a societal risk. One field to which climate change communicators have been looking for guidance is health communication, since both health and climate change contain aspects of risk and uncertainty. For example, studies by Morton, Rabinovich, Marshall, and Bretschneider (2011), Nerlich, Koteyo, and Brown (2010), and Spence and Pidgeon (2010) all were guided by health communication studies in designing experiments to test effective ways to present uncertain information, focusing on impacts of climate change. Some studies are applying these health communication techniques to climate change communication by focusing on how climate change will impact public health issues (Maibach, Nisbet, Baldwin, Akerlof, & Diao, 2010)

Focusing on certain aspects of a topic is a communication technique called framing. Framing is used to define problems, diagnose causes, make moral judgments, and suggest remedies (Entman, 1993). Nisbet (2009) argued that all information has been framed by communicators, either intentionally or intuitively, because the act of choosing what to say and how to say it is not necessarily a selective decision made by the communicator. In health communication, one frame type that is used intentionally for specific audiences is gain/loss framing (Rothman, Bartels, Wlaschin, & Salovey, 2006). A gain frame focuses on positive outcomes of taking an action, which may be positive results or avoidance of negative results.

In contrast, a loss frame focuses on the negative outcomes of not taking an action, which may be negative results that will happen or positive results that will not happen (Rothman et al., 2006). For example the statement, “If you carpool to work, you will lower your carbon footprint,” is a gain frame, while the corresponding statement, “If you don’t carpool to work, you won’t lower your carbon footprint,” is a loss frame. While there are many other types of frames, this study examined the effect of gain and loss frames because effects of this framing technique are not well understood and should be theoretically developed.

While recent climate change communication studies on framing have focused on general impacts of climate change (Morton et al., 2011), the topic of sea level rise (Spence & Pidgeon, 2010), health impacts (Maibach et al., 2010) or a combination of frames (Myers, Nisbet, Maibach, & Leiserowitz, 2012), this study focused on the impact of wildfire. Climate change impacts in the northern Rocky Mountains include changes in water availability and forest regeneration that would, when coupled with predictions for more frequent wildfire, increase the likelihood of larger, more intense fires and smoke (Westerling, Hidalgo, Cayan, & Swetnam, 2006).

PURPOSE OF STUDY

Due to the direct impact of climate change on lifestyles and communities, it is important to share scientific predictions with the people who will be affected by these hazards. As more information becomes available, residents and policy-makers should be considering policies to adapt to these changing conditions (Nisbet, 2009). Since most climate change impacts are described for large regions, it may be challenging for local areas to identify local-scale actions that can increase their preparedness. Vulnerability and

adaptive capacity assessments can help with this process, but as of spring 2012 these assessments had not been completed for the state of Idaho. When these assessments are completed, land managers can implement management actions that address climate change impacts at the local-scale.

This study contributes to the debate on how best to encourage individual and community preparedness planning by testing the effect of gain and loss communication strategies on public perceptions. Climate change communication is a new arena in which social science theories can be developed and tested. The results of this experiment expand our knowledge of this growing field by applying techniques from related areas of communication study. Specifically, this experiment tested existing predictions about the effect of gain and loss message framing on audiences' attitudes about wildfire adaptation and mitigation actions. The materials created for this study presented current projections for wildfire as influenced by climate change in the northern Rockies. The materials were designed to be used by either land managers or community leaders to raise awareness of actions that could reduce wildland fire risk. This regional information takes the next step from previous climate change communication research, which has tended to study how general environmental actions, such as recycling, are, or are not, prompted by climate change messages. Instead, this study's regional information focused on adaptation and mitigation actions that would be locally relevant, and if applied, would increase community preparedness, such as developing defensible space guidelines. In the future, this type of communication intervention could be targeted to communities identified in vulnerability assessments. Results from this study will help land managers tailor community-specific adaptation messages about anticipated forest-related projections in wildland fire risk.

This experiment tested the impact of treatments employing gain/loss framed information on attitudes about wildland fire management actions. The study provided participants with access to regional projections about climate change and related forest health conditions. Thus, in addition to contributing to climate change communication theory, materials created for this study can be used by managers or stakeholders to distribute results, start conversations with other managers, and raise public awareness of forest projections. By engaging residents in the Northern Rockies with this research, the treatment materials may contribute to the support and acceptance of adaptation strategies that increase community preparedness for wildfire. Results could aid managers in understanding how the public views adaptation strategies, and the materials developed using best practices for communication could be posted on the National Wildfire Coordinating Group website, used as materials for the developing Northern Rockies Fire Science Network library exchange program, or distributed by managers to their stakeholders.

THEORETICAL PERSPECTIVE

Framing

Frames are used as storylines to develop how an issue is understood, including what actions should be taken and who is responsible (Nisbet, 2009). Audiences use frames to make sense of and discuss information, while experts use frames to simplify technical details and journalists use frames to make a topic appealing and interesting (Nisbet, 2009). Frames do not always influence the reader in the way that a communicator intends because readers interact with the information and may selectively focus on frames that are more important to them due to preexisting values or perceptions (Entman, 1993; Maibach et al., 2010). Several types of frames have been used in climate change communication. For

example, climate change advocates may choose to use a social development frame, while climate change contrarians may choose to use a frame like “runaway science” (Nisbet, 2009).

Levin, Schneider, and Gaeth (1998) defined three types of framing that influence decision makers: attribute framing, goal framing, and risky choice framing. Attribute framing uses a single characteristic of an object or event to focus the evaluation of the information (Levin et al., 1998). The effect of this type of framing is measured by a comparison of the appeal of the item when the chosen attribute is presented with a negative versus a positive frame. Levin et al. (1998) used an example from a study on beef, where individuals rated beef labeled 75% lean as better tasting than beef labeled 25% fat. In climate change communication an example would be “Delayed first frost dates will make autumn seem longer” and “Delayed first frost dates will make winter seem shorter.”

Goal framing uses outcomes of behavior to change how actions are valued, rather than focusing on levels of risk, which occurs in risky choice framing, or a single characteristic, which occurs in attribute framing (Levin et al., 1998). In goal framing, the positive frame is a gain frame, in which there is a positive outcome of a behavior, and the negative frame is a loss frame, in which there is a negative outcome of a behavior. Following the example above, information persuading people to eat leaner beef could use the gain frame “If you eat lean beef you will reduce your fat intake” or the loss frame, “If you don’t eat lean beef, you won’t reduce your fat intake.” An example of goal framing in climate change communication is illustrated by frames in a study by Spence and Pidgeon (2010), where the authors used as the gain frame, “By mitigating climate change, we can

prevent further increases in winter floods to maritime regions and flash floods throughout Europe” and “Without mitigating climate change, we will see further increases in winter floods in maritime regions and flash floods throughout Europe” as the loss frame. Gain and loss frames are techniques used in both goal framing and risking choice framing.

Gain and loss frames were first studied in the development of prospect theory, which was created to explain how choices were made under uncertainty (Tversky & Kahneman, 1992). The main proposition of this theory is that, when given a set of choices that includes aspects of risk and uncertainty, the decision maker will assess values of potential outcomes and make a decision with the greatest potential for gains (Tversky & Kahneman, 1992). Gains are perceived as outcomes with a higher value, while losses are perceived as outcomes with a lower value. Tversky and Kahneman (1992) focused on how the presentation of outcomes that are factually equivalent, but have been framed deliberately by the communicator, can shift which outcome the decision maker prefers. A framing effect occurs when decision makers show a preference for one frame, despite the fact that both frames present equivalent outcomes (Tversky & Kahneman, 1992). Prospect theory predicts that high probability, or sure, choices will result in risk aversion for gains and risk seeking for losses, and low probability, or risky, choices will result in risk seeking for gains and risk aversion for losses. The Asian disease example (Kühberger & Tanner, 2010) supports this prediction. Participants are asked to choose between two programs to respond to a disease that, without action, is expected to kill 600 people.

In the positively framed version of the task the sure and risky options are described in terms of gains:

If Program A is adopted, 200 people will be saved.

If program B is adopted, there is a $1/3$ probability that 600 people will be saved, and a $2/3$ probability that no people will be saved.

In the negatively framed version the same options are described in terms of losses:

If Program C is adopted, 400 people will die.

If Program D is adopted, there is a $1/3$ probability that nobody will die, and a $2/3$ probability that 600 people will die.

It is important to recognize that Programs A and C are equivalent, while B and D are equivalent. However choices vary depending on the frame. Specifically, when asked to choose between Program A or Program B, decision makers tended to prefer choice A, but when asked to choose between Program C or Program D, decision makers tended to prefer choice D (Kühberger & Tanner, 2010). In other words, people are willing to take risks in order to avoid negative outcomes, but are cautious when seeking positive outcomes. Due to this component of risk, prospect theory is commonly used to examine the effects of risky choice frames.

An example of risky choice framing using gain and loss framing in climate change communication can be illustrated by frames used by Morton et al. (2011), where the authors used “It is 20% likely that global warming of 2°C will not cause abrupt and severe changes to regional weather patterns such as monsoons or the El Niño,” for the gain frame and “It is 80% likely that global warming of 2°C will cause abrupt and severe changes to regional weather patterns such as monsoons or the El Niño,” for the loss frame.

Based on prospect theory, loss frames should be more persuasive when individuals believe a behavior has a moderate risk of negative outcomes, while gain frames should be more persuasive when individuals believe a behavior has low risk of negative outcomes (Rothman et al., 2006). Using prevention and detection behaviors to explain impacts associated with gain and loss frames is called the Rothman et al. (2006) framework. This framework was developed because results in framing research are highly dependent on the type of behavior being studied. In health communication, gain frames should be more effective for messages about prevention behaviors and loss frames should be more effective for messages about detection behaviors. Prevention behaviors are considered cautious actions, since they remove risk. On the other hand, detection behaviors are considered risky actions, because a person can find out that s/he is sick.

These predictions are supported by a study on sunscreen use, a prevention behavior, which tested the effect of gain or loss framed information on attitudes, intention and behavior (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999). In this study, individuals who received a gain-framed brochure about skin cancer were more likely to seek out free sunscreen samples than individuals who had received a loss-framed brochure. Additionally, research on breast self-examinations, a detection behavior, showed that loss frames led to higher levels of behavioral intention after participants reviewed brochures and higher rates of self-reported breast self-exams four months later (Meyerowitz & Chaiken, 1987). This study also showed that the loss-framed brochure resulted in the highest measures of self-efficacy among participants. The authors proposed that the loss frame was more effective because it shifted participants' views from seeing themselves as healthy to recognizing that they might not be healthy.

While health communication focuses on prevention or detection behavior, I focused on adaptation and mitigation actions, which are considered equivalent to preventive behaviors (Spence & Pidgeon, 2010). An adaptation action is a change made in a human or natural system to moderate negative effects or exploit positive effects of a stimulus (IPCC, 2007). For example, an adaptation to higher average temperatures could be the increased use of air conditioners in homes. A mitigation action is a change made by humans to stop or reduce the stimuli contributing to the risk (IPCC, 2007). For example, a mitigation response to high green house gas emissions could be new emission regulations for vehicles. Few studies have tested the effectiveness of communicating climate change adaptation strategies, despite the clear need for this research (Moser, 2010; Pidgeon & Fischhoff, 2011). To address this need, a recent study by Spence and Pidgeon (2010) examined how gain/loss frames and local/global frames influenced knowledge about climate change impacts among British citizens. The authors considered both climate change adaptation and mitigation actions as comparable to preventative health behaviors, and their results supported the hypothesis that gain frames were more effective messages.

Issue Involvement and Message Processing

Some health communication studies have also considered how level of issue involvement and cognitive processing might influence framing effects. Issue involvement is defined as how relevant and important a topic is to an individual; high levels of involvement lead to elaborate processing of information about the topic (Kokkinaki & Lunt, 1997). For example, in the study on sunscreen use by Detweiler et al. (1999), the authors considered the entire sample to be highly involved because the study took place at a beach. While this did not allow for comparisons between high involvement and low involvement participants, the

authors hypothesized that the high level of involvement increased the salience of the topic and their messages were therefore carefully considered.

In the Elaboration Likelihood Model, or ELM, cognitive processing is divided into central processing, in which information is carefully considered, and peripheral processing, in which information is superficially considered and non-informational aspects play a major role in attitude change (Rucker & Petty, 2006). Central processing is dependent on a participant's motivation and ability to consider the information, and persuasive effects require focused, strong arguments. Peripheral processing relies more on cues, such as the source of the information or number of arguments. While central processing can lead to a long-term attitude change, peripheral processing can change attitudes in the short term, but such changes are not enduring.

Meyers-Levy and Maheswaran (2004) found evidence that individuals involved with an issue will process the message more centrally, and the authors suggest that loss frames will be more effective with these people. This prediction is based on the idea that negatively worded arguments are given greater weight during judgment formation and are thus always stronger than positively worded arguments (Rothman et al., 2006). Thus, while attitude change is unlikely for people with high issue involvement and strong prior attitudes, loss framing may have the greatest chance of success with this group.

However, other studies present seemingly contradictory results regarding which frame has a stronger influence with highly involved participants. Millar and Millar (2000) found that highly involved participants scored higher on cognitive thought listing exercises, indicating more central processing, and that these participants had higher behavioral

intention after exposure to gain framed messages. Conversely, Maheswaran and Meyers-Levy (1990) found that participants with high involvement, and high cognition scores, had higher levels of behavioral intention in a loss frame treatment. These apparently contradictory findings may be attributed to the different behaviors under study. Millar and Millar were studying safe driving behavior, which can be considered a cautious, or preventative, behavior. Maheswaran and Meyers-Levy, on the other hand, presented information on a blood test that would be considered a risky behavior in prospect theory. Therefore, despite the first study's support for use of gain frames and the second study's support for loss frames, both of these studies actually support the prospect theory hypothesis that gains will be more effective at promoting cautious actions, while losses will be more effective at promoting risky actions. Millar and Millar (2000) also proposed that lower levels of processing among low involvement participants could have minimized the framing effect. Thus, participants with high involvement should show a large increase in either a gain frame or loss frame, but which frame type is more effective will depend on whether the action is perceived as a risky or a cautious action. Since I focused on cautious actions, based on these predictions, the loss frame should have a greater effect on involved participants.

I assumed study participants were engaging in central processing when viewing the informational materials I supplied, because they were asked to carefully review the treatment materials, and people who were not interested likely never completed the survey. Nevertheless, I included questions measuring the depth of cognitive processing, since I believed one of the two samples in the study would have higher levels of involvement, as explained in the methods section. I assumed these highly involved participants would have stronger prior attitudes about management actions and therefore less attitudinal change than

less involved participants. By their very definition, strong attitudes are hard to change (Krosnick & Petty, 1995). One reason strong attitudes are resistant to change is that as a person becomes more knowledgeable s/he develops support for the pre-existing viewpoint. Furthermore, people find information that supports their prior attitudes to be more compelling and easier to remember. I designed my treatment materials carefully in order to present strong arguments that could counter pre-existing negative attitudes toward adaptation and mitigation actions.

HYPOTHESES

Elaboration Likelihood Model guided my predictions about how people would elaborate and evaluate messages. Although I hypothesized an overall main effect such that the loss frame would outperform the gain frame, ELM provided specific hypotheses for participants who exhibited high and low levels of cognitive processing of messages (elaboration), as measured with a thought listing exercise. Table 1.1 lists the nine hypotheses tested in this experiment and the following paragraphs explain how and why predictions varied with treatment exposure and the level of issue involvement.

Table 1.1: Hypotheses

H1: Both gain and loss framed treatment materials will increase participants' support for management actions to reduce fire risk when compared to the control group.
H2: Participants with high issue involvement scores and positive prior attitudes will have a higher level of support in the loss frame than the gain frame.
H3: Participants with low issue involvement scores will have a higher level of support in the gain frame than the loss frame.
H4: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher with increasing scores of issue involvement.
H5: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher with increasing scores of issue involvement.
H6: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher with increasing scores of issue involvement.
H7: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher in the loss frame.
H8: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher in the loss frame.
H9: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher in the loss frame.

Both the gain and loss frame were expected to generate increases in positive attitudes for management actions when compared to the control group (hypothesis 1). The information presentation in the treatment would be compelling enough to cause participants to engage in central processing, which should then lead to attitude change (Petty & Cacioppo, 1986).

Individuals who are highly involved with an issue or who have strong prior attitudes are less likely to be influenced by persuasive messages (Petty & Wegner, 1998). For highly involved participants whose prior attitudes were strongly positive, I expected a ceiling effect because there is little room for strong positive attitudes to become strengthened. Participants whose prior attitudes were strongly negative were expected to counter-argue the messages and therefore exhibit no change in support for management actions. Apart from these overall main effects of strong prior attitudes, Maheswaran and Meyers-Levy (1990) predicted that high involvement participants would be more persuaded by the loss frame, and low involvement participants would be more persuaded by the gain frame. As noted above, I hypothesized that this prediction would hold true for this study. Highly involved participants with positive prior attitudes were expected to exhibit a larger increase in support in the loss frame (hypothesis 2) because – although these participants already understand the positive and negative outcomes – focusing on the negative outcomes should lead them to want to avoid personal risk. Participants with low issue involvement, regardless of the valence of their prior attitude, were expected to exhibit the largest increase in support in the gain frame (hypothesis 3), because these participants would not have as much prior experience or knowledge with the topic and would focus on the positive messages of the gain frame. A visual representation of hypotheses 2 and 3 is shown in Figure 1.1.

	Hypothesis 2	Hypothesis 3
Prior attitude: Positive	High Involvement	Low Involvement
Gain Frame	↑	↑↑↑↑
Loss Frame	↑↑	↑↑
Control Group	No change	No change
Prior attitude: Negative	High Involvement	Low Involvement
Gain Frame	No change	↑↑↑
Loss Frame	No change	↑
Control Group	No change	No change

Figure 1.1: Visualization of hypotheses 2 and 3. I predicted that changes in attitudes are affected by frame type, level of involvement, and prior attitudes about wildland fire management. Arrows indicate increases in support.

The generation of message-related thoughts, as opposed to simple evaluative thoughts, is used to serve as an indicator of depth of cognitive processing (Chaiken, 1980). Participants with high issue involvement exhibit deeper processing of messages than low issue involvement participants (Maheswaran & Meyers-Levy, 1990). Participants who have high issue involvement are more likely to be knowledgeable about the pros and cons of suggested management actions. I believe that participants with high issue involvement are more likely to be critical of the management actions than participants with low issue involvement scores. Additionally, highly involved participants' familiarity with the topic makes it likely that they will make connections between the management actions the flyer suggests and participants' own lives. This leads to the hypotheses that higher scores on issue involvement would lead to higher scores on depth of cognitive processing (hypothesis 4), more negatively valenced thoughts elicited by the messages (hypothesis 5), and more personally relevant elaboration of the message topic (hypothesis 6).

Since previous studies have found that negatively worded arguments can lead to greater processing during decision making, I predicted that the loss frame would lead to more cognitive depth of elaborations (hypothesis 7) (Rothman et al., 2006). I hypothesized that the loss frame would lead to more thoughts that were negatively valenced (hypothesis 8) because the loss frame presented the negative outcomes of inaction. I predicted that participants in the loss treatment would express more negative thoughts, while participants in the gain treatment would express more positive thoughts. The negative focus of the loss frame may trigger participants to carefully consider how they might be negatively impacted. Thus I also predicted that the loss frame would result in more personally relevant elaboration (hypothesis 9).

KEY VARIABLES

The independent variables in this study were the gain or loss framed treatment materials about wildland fire risk, issue involvement, and prior attitudes about wildland fire management (Table 1.2). Gain framed materials focused on the positive outcomes of taking risk reduction management actions, while loss framed materials focused on the negative outcomes of not taking action. The dependent variables were post-test attitudes about wildland fire management, valence of thoughts about treatment materials, depth of cognition about treatment materials, and presence of thoughts indicating evidence of personally relevant elaboration about treatment materials.

Table 1.2: Variable definitions and uses

Variable and survey questions	Definition	How I used this information
Treatment Gain or loss framed flyers	Outcomes of wildfire risk reduction actions presented as either positives or negatives	To evaluate the influence of outcome focus in changes attitudes about wildland fire management
Independent Variable Issue involvement Q3, Q4, Q5	The level of issue involvement of the participant, determined by scores on knowledge, interest, and efforts to reduce wildland risk	To evaluate the influence of issue involvement on attitude change in relation to argument type
Independent Variable Wildland fire attitudes (pre-test) Q10 item 1-10	Participants' level of support toward wildland fire management actions prior to reading treatment materials	To assess the efficacy of the treatment on increasing positive attitudes about wildland fire management
Dependent Variable Wildland fire management attitudes (post-test) Q10 item 1-10	Participants' level of support toward wildland fire management actions after reading the treatment materials	To assess changes in attitudes from before and after the treatment
Dependent Variable Valence of thoughts (post-test) Q2 thought listing exercise	Participants' overall negative or positive thoughts after reading the treatment materials	To assess how positively or negatively the participant evaluated the treatment materials
Dependent Variable Depth of cognition (post-test) Q2 thought listing exercise	Participants' level of cognitive processing after reading the treatment materials	To assess how extensively the participant processed the treatment materials
Dependent Variable Personally relevant elaboration (post-test) Q2 thought listing exercise	Participants' thoughts about personal connections to the content in the treatment materials.	To assess how the participant elaborated on the treatment materials in ways that link to personal life or prior cognitive structures

Chapter 2: Methods

STUDY DESIGN

This study tested which treatment, gain-framed information or loss-framed information, was more effective at increasing support for management actions addressing the projected changes in wildland fire risks in the northern Rocky Mountains. I used a quasi-experimental quantitative approach with a pre-test/post-test survey design. Each treatment group was exposed to one of two versions of a flyer to assess if gain or loss frames were more effective at increasing support for fire adaptation and mitigation actions, and these were compared to control groups who did not receive either version of the flyer. The study sampled from two populations (as explained below), one of which was a panel, in which the same individuals completed pre-tests and post-tests (Sample 1); the other population was sampled in a cross-sectional design, with different individuals completing the pre-test and post-test (Sample 2). These design differences meant that different statistical analyses were used to test hypotheses for each sample. Specifically, I could only look at attitude change with Sample 1, because such analysis required matched pre- and post-test data.

PARTICIPANTS

The population for this study was U.S. residents living in northern Rocky Mountain states, represented by Idaho and Montana. The sample frame consisted of two different populations (Sample 1 and Sample 2) to test the effectiveness of the treatments on attitudes about wildfire management. Sample 1 participants had previously participated in a Joint Fire Science Program funded study, indicated they would be interested in participating in additional studies on wildfire, and had provided an email address (n=574). Sample 2

participants were members of the online panel Amazon Mechanical Turk; these participants had not expressed specific interest in wildfire research. This second sample was added to the research design to elicit responses from individuals with lower levels of issue involvement with the topic of wildland fire. Since the goal of this study was to understand how individuals are persuaded by different messages, the second sample permitted me to account for the effect of presumed higher issue involvement with the topic of wildfire among Sample 1.

The goal was to have a total sample size of 1,000 participants, with 500 participants from each sample population. Since the total population of Idaho and Montana is approximately 2,500,000 people I required 384 responses from both the high involvement and low involvement populations to achieve a 95% confidence interval with a margin of error of $\pm 5\%$ (Bartlett, Kotrlik, & Higgins, 2001). Since the high involvement population had indicated interest in wildfire research, I was anticipating a high response rate of 80%, or 400 responses. The low involvement participants (Sample 2) were selected using a quota sample, which was set at 200 for the gain frame, 200 for the loss frame, and 50 for the control group. I attempted to control for incomplete surveys by setting the quota ($n=500$) above the needed 384 responses (Table 2.1).

Table 2.1: Experimental design and sample sizes

Sample 1: Participants interested in wildfire research¹					
	Sample size		Time of administration		
	Requested	Completed	Oct. 9 – Nov. 4, 2012	Nov. 7 – 26, 2012	
Control pre-test and post-test	n= 100	n= 39	Survey		Survey
Pre-test, treatment 1, and post-test	n= 200	n= 56	Survey	Treatment 1	Survey
Pre-test, treatment 2, and post-test	n= 200	n= 60	Survey	Treatment 2	Survey
Sample 2: Amazon Mechanical Turk (Online panel)					
	Sample size		Time of administration		
	Requested	Completed	Oct. 9 – 24, 2012	Nov. 7 – Dec. 24, 2012	
Pre-test only	n=50	n= 48	Survey		
Treatment 1 and post-test	n= 200	n= 117		Treatment 1	Survey
Treatment 2 and post-test	n= 200	n= 114		Treatment 2	Survey
Control post-test only	n=50	n= 46			Survey

¹ The original sample size for participants in the Northern Rockies was a 6,000 with a response rate of 28%. This study allowed participants to complete a paper or online survey, 967 or 60% participants completed the survey online (Blades & Hall, 2012). Of these online participants, 574 indicated they would be willing to participate in additional wildland survey research.

Sample 1 participants were sent a personalized email cover letter (Appendix B) asking if they were willing to participate in the study, provided with a random unique identifier and given a link to the survey website. This sample of participants was entered to win one of three \$100 gift cards upon completion of the post-test survey.

For Sample 2 participants, a cover letter was posted on the Amazon Mechanical Turk website (www.mturk.com), along with a link to the online survey (Appendix C). Participants entered the code that appeared on the last page of the survey to receive a small payment (\$0.50) for their participation. These payments required approval to insure that the participant had actually completed the survey. The online panel allowed me to limit participant involvement to U.S. citizens, and additional instructions limited participation to residents of Idaho, Montana, Washington and Wyoming. I assumed that the pre-test (control) results would be representative of the population of participants on Amazon Mechanical Turk because, as noted above, a panel design using the same participants in a pre-test and post-test was not possible with the online population.

TREATMENT

Treatment materials addressed environmental risk communication needs identified by Moser (2010), including the need for audience-specific messages, effective use of visual information, and communication of adaptation strategies. Treatment materials were designed as a 8.5" X 11" letter-size flyer written for an audience of permanent homeowners living in the northern Rocky Mountains. The flyer was posted on a webpage in pdf format for participants to review. Flyer content focused on factors leading to increased wildfire risk and

adaptation and mitigation actions at the landscape, community and personal level that could reduce risk. Each point of information was accompanied by a photo to insure visual-verbal overlap. Flyers had approximately 330 total words, with sentences averaging 25 words each.

Information on the flyer was taken from recent white paper publications about wildland fire and forest changes in the northwestern United States and actions that can be taken to reduce risk from wildland fire. Information was also drawn from peer reviewed journal articles and government reports; a website at the bottom of the flyer directed participants to a list of these sources. This list of sources can be found in Appendix D.

Treatment materials highlighted three areas contributing to increasing wildfire risk: changes in precipitation patterns, increased fire fuels from beetle killed trees, and increased development in the wildland-urban interface. Land managers' actions focused on fuel reduction actions (e.g., controlled burns and mechanical thinning). Community actions suggested developing and maintain a Community Wildfire Protection Plan (CWPP) and developing ordinances for vegetation removal on private property. Finally, household actions focused on creating defensible space around homes and individual wildfire emergency plans.

Once layout and text were completed for the gain frame (positive outcomes; Appendix E) the actions section of the flyer was reworded to highlight the negative outcomes of not taking action (loss frame; Appendix F). This ensured that all other design elements remained constant for each flyer.

PROCEDURES

Survey Administration

Sample 1 participants received the initial cover letter email on October 9, 2012. Two weeks after the initial email, participants were sent a reminder email following the modified Tailored Design Method by Dillman, Smyth, and Christian (2009). On November 6, 2012, participants received an email requesting participation in the post-test, a reminder of their unique identifier number and a link to their post-test survey assignment. This link instructed the participants to carefully review the treatment materials provided before starting the survey questions. Participants were randomly assigned to either one of two treatment groups or to the control group. Two weeks after this initial email, participants were sent a reminder email.

Sample 2 participants were recruited starting on October 9, 2012, when the cover letter request appeared on the online panel website. This request was closed on October 24, 2012, when the pre-test control quota was filled. On November 6, 2012, three new tasks were posted, one for teach treatment and one for the post-test control group. Potential participants were only eligible to complete one of these tasks. This request was closed on December 24, 2012, due to the time that had lapsed since the task had been posted. These quotas were not completely filled, as shown in Table 3.

All participants completed the survey from the same survey website for their treatment group. After the initial screening question for state of residence, participants were instructed to carefully review the information on the flyer and consider how the information was relevant to them personally and their communities. Participants were told to click on a

photo of the flyer that would take them to a larger version in a new window (Appendix E or F). After reading the flyer, participants returned to their survey window to complete the survey questions.

Survey Measures

The independent variable in this study is the frame type. The gain frame emphasized the benefits of completing community and landscape level management actions. The loss frame emphasized the costs associated with not completing these actions. The survey assessed participant issue involvement with wildland fire by measuring perceived knowledge about wildland fire management, interest in management, and activity with efforts to reduce risk. A thought listing exercise was used to assess levels of cognitive processing including cognitive depth of thoughts, valence of thoughts, and personally relevant elaboration (Appendix G, questions 2-3).

The dependent variable is attitude about wildland fire management actions, which was measured as levels of support for various actions that could be taken at the landscape, community, and personal levels (Table 2.2). Other potentially confounding demographic variables were also measured, including age, gender, income, education and political affiliation (Appendix G, questions 11-21). Table 2.3 shows these variables, hypotheses and statistical tests used to test these hypotheses.

Table 2.2: Attitude items about wildland fire management (survey question #10).

Prescribed fire on public lands in my county.
Selective thinning on public lands in my county.
Community education programs about family wildfire plans.
Fire breaks around my community.
Livestock grazing on public lands to reduce fire fuels.
Mandatory review of my community's Wildfire Protection Plan (CWPP) every 3 years.
Defensible space guidelines in my community.
Mandatory defensible space ordinances in my community.
Fire-safety building guidelines in my community.
Mandatory fire-safety building ordinances in my community.

Note: 7-point Likert-type scale, where 1 = strongly support and 7 = strongly oppose

Table 2.3: Variable location in survey, data type, related hypothesis and use in statistical tests

Variable	Survey questions	Pre-test	Post-test	Data Type	Hypothesis	Statistical tests
Management Attitudes	Q10 – 10 items	X	X	Ordinal	H1, H2, H3	Kruskal-Wallis, Multiple linear regression
Issue involvement	Q3, Q4, Q5	X	X	Ordinal	H2, H3, H4, H5, H6	Kruskal-Wallis, Chi-squared, Multiple linear regression
Depth of cognition about messages	Q2		X	Ordinal	H4, H7	Chi-squared, Multiple linear regression
Valence of thoughts about messages	Q2		X	Ordinal	H5, H8	Chi-squared, Multiple linear regression
Personally relevant elaboration	Q2		X	Nominal	H6, H9	Chi-squared, Multiple linear regression

Data were collected using online survey software (Qualtrics) and then imported into SPSS for analysis. Databases for survey responses are maintained on University of Idaho servers. Identifying information was kept separate from survey responses, per conventions for the protection of human subjects. The methods for this research were approved for the duration of the project by the University of Idaho Institutional Review Board, protocol ID #12-232 (Appendix H).

DATA ANALYSIS

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 21.0. Items measuring issue involvement and wildland fire management attitudes were reduced to new variables using factor analyses, as described below in the results section.

The thought listing exercise was coded by two coders following the coding guide (Appendix I). The coding guide sets the rules for scoring each participant's responses for the valence of thoughts listed, presence or absence of personally relevant thoughts, and depth of cognition. Valence of thoughts was coded as the dominant type of thoughts listed. Valence was coded as negative if the participant was skeptical of the information presented in the flyer, argued against the flyers messages, or had a negative emotional reaction (e.g., "I'm terrified my family is at risk"). Personally relevant elaboration was coded as present when thoughts showed the participant had prior experience with wildland fire or had thought about the issues before reading the flyer (e.g., "I have worked to remove excess fuels from my property for the last five years"). Depth of cognition was coded as high if the participant included references to prior experiences, specific examples, or the personalization of the

message (e.g., “I haven’t seen evidence of there being less snow”). After receiving training on the codebook, each coder was given a set of thought listing responses to code. These results were then used to generate an inter-rater reliability score. Coding continued until the inter-rater reliability score of Cohen’s kappa reached 0.6 or higher. Once this was achieved, all thought listing responses were coded and added to the full dataset for analysis.

Kruskal-Wallis tests were run to assess the effectiveness of the treatments and the effect of issue involvement on support for management actions, because the management support variables were continuous, but not normally distributed. For Sample 1, the dependent variable was attitude change, but for Sample 2, the dependent variable was post-test attitude. If significant differences were found between the different groups, the appropriate pairwise comparison tests were completed. Associations between the cognition variables derived from the thought listing and treatment type and issue involvement type were tested using chi-squared test for independence with the Yates continuity correction, because both variables in these analyses were categorical. Multiple linear regression was used to explore the effect of treatment type, issue involvement, cognitive depth, valence of thoughts, and personally relevant elaboration of thoughts on post-test support for management actions.

Chapter 3: RESULTS

SURVEY SAMPLE SIZE

Data for this study were collected over nine weeks in fall of 2012. In Sample 1, a total of 574 survey requests were sent out, with an initial response rate of 35% for the pre-test. However, since participants were tracked using a unique identifier, I calculated a dropout rate of 22% from the pre-test to the post-test, resulting in a final response rate of 27% (Table 2.1). In Sample 2, a total of 332 individuals participated in either the pre- or post-test surveys (Table 2.1). Since this sample was recruited from an online panel without the ability to request the same participants in the post-test, the response rate cannot be calculated. The request for participation was left open until the quota was filled (pre-test) or 6 weeks had passed (post-test).

CHARACTERISTICS OF SAMPLES

Sample 1 participants lived in Idaho and Montana and had been previously involved with wildland fire survey research. Sample 1 demographic characteristics show an uneven representation of men (76%) and women (24%) participants (Table 3.1) with an average age of 61 years (Table 3.2). The average participant earned \$60,000 - \$80,000 per year (Table 3.3), had a Bachelors degree (Table 3.4), was politically neutral (Table 3.5), was a permanent resident of his/her community (Table 3.6), had lived there for more than five years (Table 3.7), and lived more than 1 mile from the nearest forest (Table 3.8). Participants reported that they were very interested in wildland fire management (Table 3.9), were moderately knowledge about wildland fire management (Table 3.10), and were slightly active in efforts to reduce wildland fire risk in their communities (Table 3.11). Typically these participants took more than five minutes to review the flyer (Table 3.12).

Sample 2 participants lived in Idaho, Montana, Washington or Wyoming. Their demographic characteristics show an approximately even representation of men (48%) and women (52%) (Table 3.1), with an average age of 33 years (Table 3.2). The typical participant earned \$40,000 - \$60,000 per year (Table 3.3), had an Associate's degree (Table 3.4), was politically liberal (Table 3.5), was a permanent resident of his/her community (Table 3.6), had lived there for one to five years (Table 3.7), and lived more than 3 miles from the nearest forest (Table 3.8). Participants reported that they were moderately interested in wildland fire management (Table 3.9), were slightly knowledgeable about wildland fire management (Table 3.10), and were slightly active in efforts to reduce wildland fire risk in their communities (Table 3.11). Typically these participants took one to five minutes to review the flyer (Table 3.12).

Table 3.1: Gender of participants in Sample 1 and Sample 2

Gender	Sample 1	Sample 2
Male	76.0%	47.2%
Female	24.0%	52.8%

Table 3.2: Age of participants in Sample 1 and Sample 2

Age in years	Sample 1	Sample 2
18-29	0.6%	55.6%
30-39	3.6%	23.2%
40-49	14.3%	12.6%
50-59	26.8%	5.6%
60-69	33.3%	2.6%
70-79	19.0%	0.3%
80-89	2.4%	0.0%

Table 3.3: Annual income of participants in Sample 1 and Sample 2

Annual income	Sample 1	Sample 2
Less than \$20,000	5.1%	22.7%
\$20,001 to \$40,000	11.5%	25.7%
\$40,001 to \$60,000	24.2%	24.3%
\$60,001 to \$80,000	15.3%	12.0%
\$80,001 to \$100,000	14.0%	8.7%
\$10,001 to \$120,000	16.6%	4.0%
more than \$120,000	13.4%	2.7%

Table 3.4: Highest level of education completed by participants in Sample 1 and Sample 2

Highest education completed	Sample 1	Sample 2
Some high school	0.6%	0.7%
High school degree	7.0%	15.8%
Some college	20.3%	29.3%
2-year degree	5.8%	11.8%
4-year degree	33.7%	29.9%
Advanced degree	32.6%	12.5%

Table 3.5: Political orientation of participants in Sample 1 and Sample 2

Political orientation	Sample 1	Sample 2
Very liberal	4.8%	13.5%
Liberal	15.2%	24.3%
Moderately liberal	15.2%	14.9%
Neither	15.8%	25.3%
Moderately conservative	15.8%	10.5%
Conservative	26.1%	6.8%
Very conservative	7.3%	4.7%

Table 3.6: Part-time or permanent residency of participants in Sample 1 and Sample 2

Type of residence	Sample 1	Sample 2
Part-time	2.9%	19.1%
Permanent	97.1%	80.9%

Table 3.7: Participant's years of residency in Sample 1 and Sample 2

Years of residence	Sample 1	Sample 2
Less than 1 year	0%	12.0%
1-5 years	8.8%	38.5%
More than 5 years	91.2%	49.5%

Table 3.8: Distance of nearest forest to participant's residence in Sample 1 and Sample 2

Forest distance from residence	Sample 1	Sample 2
On property	16.3%	11.2%
Less than 1/2 mile	17.4%	15.8%
Less than 1 mile	8.1%	12.2%
Between 1-3 miles	27.3%	20.8%
More than 3 miles	30.8%	40.0%

Table 3.9: Interest in wildland fire management

Interest in wildland fire management	Sample 1	Sample 2
Not at all interested	0.5%	3.4%
Slightly interested	5.7%	21.0%
Moderately interested	28.0%	39.3%
Very interested	49.7%	31.1%
Extremely interested	16.1%	5.2%

Table 3.10: Self-assessed knowledge about wildland fire management

Knowledge about wildland fire management	Sample 1	Sample 2
Not at all knowledgeable	4.7%	19.5%
Slightly knowledgeable	18.8%	38.4%
Moderately knowledgeable	60.2%	33.8%
Very knowledgeable	12.0%	7.9%
Extremely knowledgeable	4.2%	0.3%

Table 3.11: Self-assessed activity in wildland fire risk reduction efforts

Activity	Sample 1	Sample 2
Not at all active	22.4%	32.8%
Slightly active	32.3%	34.6%
Moderately active	31.3%	0.0%
Very active	11.5%	6.3%
Extremely active	2.6%	0.6%

Table 3.12: Self-reported amount of time taken to review treatment materials

Time	Sample 1	Sample 2
Less than 1 min	12.5%	1.3%
1-2 min	47.5%	39.0%
3-5 min	39.2%	46.9%
5-10 min	0.8%	11.4%
More than 10 min	12.5%	1.3%

SAMPLE CHARACTERISTICS SEEN IN THE THOUGHT LISTING EXERCISE

This study did not examine the thought listing exercise responses qualitatively, but a few general trends were seen between Sample 1 and Sample 2 (Appendix J). In general, Sample 1 participants were familiar with the management actions listed on the flyer, while Sample 2 participants were more likely to indicate they had learned something new from the flyer.

Comments from Sample 1 participants familiarity with the information included:

- “All common sense things to do.”
- “Most of this information I already knew.”

Comments from Sample 2 participants indicating less knowledge about wildland fire management included:

- “Does my community have a wildfire plan at all, or an updated wildfire plan?”
- “What is the likelihood that a wildfire could happen where I live?”
- “I was not aware that insects and diseases lead to increased risk.”
- “I didn’t know there had been that much less now for that many years. It makes sense why more wildfires have started.”

Both groups commented on different management actions, but Sample 1 seemed more likely to comment on the effectiveness of specific actions and suggested additional management options that could reduce risk from wildland fire. Several participants from Sample 1 commented that they thought logging was effective and should have been included on the flyer. When Sample 2 participants did mention management actions, they expressed support.

Comments from Sample 1 participants on management actions included:

- “Those who own homes in the woods should pay higher premiums for homeowners insurance if they do not reduce fuel around their homes.”
- “I notice there is no reference to an organized timber harvest program. This is important for forest health. Helps control bug infestations and reduce fuel loading on the ground. Controlled burning mostly does more damage than improvement.”
- “I think prescribed fire is not as beneficial as logging.”
- “Most people have an adverse opinion of any MANDATORY regulations of their personal property.”

Comments from Sample 2 participants on management actions included:

- “Prescribed burns work! We should do more of these.”
- “Education of homeowners is vital in containing and preventing mass destruction of structures.”

Participants from both samples also mentioned climate change. Participants from Sample 1 were more likely to express skepticism about climate change and the ability to predict future trends in weather patterns. Participants in Sample 2 seemed more likely to refer to climate change when talking about why the risk of wildland fire was increasing.

Comments from Sample 1 participants about climate change included:

- “It’s time to get real serious about climate change.”
- “Seems like a stretch to suggest that there will be less snow in the fall and more rain in the spring in the future; In the 1990’s we were going into a new ice age according to some.”
- “Generally a good flyer... perhaps more science-based info about fire increasing with climate change but perhaps without mentioning those words.”
- “Maybe global warming is real.”

- “I thought – OH NO – here we go again with someone blaming Global Warming.. and then I was pleasantly pleased that the flyer didn’t revolve around that subject.”

Comments from Sample 2 participants about climate change included:

- “Climate change is increasing the danger of fire.”
- “This makes me think that other natural disasters that will increase due to climate change and population increase.”
- “Climate change is a major factor in fire frequency and severity. Thus, addressing climate change is critical for addressing wildfires.”

Finally, Sample 1 participants listed more complex thoughts than participants in Sample 2. These thoughts included comments on the effectiveness of management, participant’s familiarity with the topic, and comments about personal experience. In contrast, participants in Sample 2 expressed surprise about the information on the flyer and frequently simply restated the information presentation on the flyer, rather than analyzing it.

The following is a good example of a complex thought listed from a participant in Sample 1:

“I agree that good forest management is critical to reducing future catastrophic wildfires. Reducing fuels is a large part of that. I think burning those fuels though prescribed burning is (potentially) the least expensive and most efficient way to do that. However, as a forest resident, the air pollution that is generated throughout the spring and fall from those burns, plus pollution from wildfires, all summer is killing me and making my life miserable. Plus it adds to climate change, so technically it’s probably killing us all slowly. Something worth considering is clean burning biomass with co-generation potential for the safe disposal of those fuels.”

DATA REDUCTION AND VARIABLE CONSTRUCTION

Factor analyses were conducted with a principal component analysis extraction method and an Oblimin rotation method with Kaiser normalization to determine if the attitude items from the survey (Table 3.13) measured one or multiple attitudes about support for wildland fire management. Separate factor analyses were performed on the Sample 1 and Sample 2 datasets. Items were considered part of a factor if their loadings were at least 0.40 on one and only one factor and made conceptual sense. The initial analysis showed larger alphas could be achieved if item 1, “Prescribed fire on public lands in my county,” and item 5, “Livestock grazing on public lands to reduce fire fuels,” were removed. Since prescribed fire is a common management technique, this attitude item was used as its own measure of management attitudes in hypothesis testing. It was concluded that the remaining attitude items measured two independent attitude dimensions (Table 3.14).

In Sample 1, both the pre- and post-test items loaded onto two factors. In Sample 2, all items loaded on to one factor. Because I planned to compare results between Sample 1 and Sample 2 for hypotheses testing, the same two factors were used in all analyses even though this division was not needed for Sample 2. Cronbach’s alpha for the first factor had high reliability, with all scores greater than 0.8; the alphas for the second factor were weak in Sample 1 pre-test at 0.45 and Sample 1 post-test at 0.63, though they were high for Sample 2 at 0.81.

Items that factored together were used to create new variables by taking the mean of the attitude scores for the items that loaded on each factor. Items 6, 7, 8, 9, and 10 were averaged and labeled “regulatory management attitude” (factor 1) because each of these

items was about a regulation for wildland fire management actions. Items 2, 3, and 4 were averaged and labeled as “miscellaneous management attitude” (factor 2), because these represented a mix of education and vegetation management actions.

Attitude change was calculated by subtracting the post-test attitude scores from the pre-test scores; this was only possible for Sample 1, which had matched data from individuals. Attitude change was used in Sample 1 Kruskal-Wallis tests of H1, H2, and H3. Typically Sample 1 participants moderately supported prescribed fire management action (Table 3.15), weakly supported regulatory management actions (Table 3.16), and moderately supported miscellaneous management actions (Table 3.17). Sample 2 participants weakly supported the prescribed fire management action (Table 3.15), supported regulatory management actions (Table 3.16), and supported the miscellaneous management actions (Table 3.17).

Table 3.13: Survey attitude items with means and standard deviations

Survey Item	Sample 1 pre-test attitudes		Sample 1 post-test attitudes		Sample 2 attitudes	
	Mean	SD	Mean	SD	Mean	SD
1. Prescribed fire on public lands in my county	2.37	1.62	2.31	1.75	3.11	1.63
2. Selective thinning on public lands in my county	1.49	0.79	1.40	0.85	2.68	1.57
3. Community education programs about family wildfire plans	1.81	0.96	1.84	1.01	2.25	1.38
4. Fire breaks around my community	2.27	1.33	2.17	1.27	2.70	1.48
5. Livestock grazing on public lands to reduce fire fuels.	2.36	1.56	2.39	1.56	2.61	1.53
6. Mandatory review of my community's Wildfire Protection Plan (CWPP) every 3 years	2.45	1.36	2.34	1.32	2.77	1.62
7. Defensible space guidelines in my community	2.12	1.22	2.08	1.16	2.79	1.34
8. Mandatory defensible space ordinances in my community	3.51	2.04	3.40	1.98	3.32	1.66
9. Fire-safety building guidelines in my community	2.39	1.59	2.19	1.44	2.63	1.56
10. Mandatory fire-safety building ordinances in my community	5.38	3.00	3.26	2.02	3.30	2.06

Note: 7-point Likert-type scale where 1= strongly agree and 7 = strongly disagree

Table 3.14: Factor loading for attitude items.

Survey Item	Sample 1 pre-test factors		Sample 1 post-test factors		Sample 2 single factor	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
2. Selective thinning on public lands in my county	-0.23	0.82	-0.20	0.88	0.70	
3. Community education programs about family wildfire plans	0.30	0.52	0.25	0.66	0.80	
4. Fire breaks around my community	0.18	0.56	0.06	0.65	0.74	
6. Mandatory review of my community's Wildfire Protection Plan (CWPP) every 3 years	0.59	0.33	0.49	0.41	0.80	
7. Defensible space guidelines in my community	0.56	0.38	0.53	0.40	0.79	
8. Mandatory defensible space ordinances in my community	0.90	-0.11	0.87	0.02	0.70	
9. Fire-safety building guidelines in my community	0.79	-0.12	0.83	-0.04	0.85	
10. Mandatory fire-safety building ordinances in my community	0.94	-0.20	0.95	-0.11	0.67	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
Factor Mean (SD)	2.74 (1.35)	1.85 (0.76)	2.66 (1.29)	1.82 (0.84)	2.94 (1.31)	2.54 (1.26)
Variance explained	46.3%	14.9%	49.7%	15.5%	57.4%	
Cronbach's Alpha	0.85	0.45	0.85	0.63	0.85	0.81

Shading indicates item included with the final factor. Items for Sample 2 not shaded since all items loaded onto one factor.

Table 3.15: Post-test support for prescribed fire management action

Prescribed fire	Sample 1	Sample 2
Strongly support (1)	43.3%	18.1%
Moderately support (2)	30.7%	25.7%
Weakly support (3)	6.3%	16.4%
Neutral (4)	5.5%	19.1%
Weakly oppose (5)	4.7%	11.8%
Moderately oppose (6)	3.9%	5.6%
Strongly oppose (7)	5.5%	3.3%
Mean (SD)	2.31 (1.75)	3.11 (1.63)

Table 3.16: Post-test support for regulatory management actions

Regulatory	Sample 1	Sample 2
Strongly support (1)	26.0%	17.7%
Moderately support (2)	22.8%	21.7%
Weakly support (3)	23.5%	24.7%
Neutral (4)	17.2%	21.7%
Weakly oppose (5)	9.5%	10.8%
Moderately oppose (6)	0.8%	3.3%
Strongly oppose (7)	0.0%	0.0%
Mean (SD)	2.66 (1.29)	2.97 (1.31)

Table 3.17: Post-test support for miscellaneous management actions

Miscellaneous	Sample 1	Sample 2
Strongly support (1)	42.5%	24.6%
Moderately support (2)	42.4%	30.3%
Weakly support (3)	10.2%	19.4%
Neutral (4)	3.2%	20.0%
Weakly oppose (5)	1.6%	3.9%
Moderately oppose (6)	0.0%	1.0%
Strongly oppose (7)	0.0%	0.6%
Mean (SD)	1.82 (0.84)	2.54 (1.26)

Factor analyses with a principal component analysis extraction method were conducted to determine if the three issue involvement items from the survey measured one or multiple facets of issue involvement. Separate factor analyses were performed on Sample 1 and Sample 2. The variables knowledge, interest and activity all loaded onto one factor for issue involvement in both samples (Table 3.18). Cronbach's alpha for these factors show high reliability, with the scores for each sample 0.60 or greater. Level of issue involvement was created by computing the mean of these five-point items. This index was converted into a new variable that categorized participants as low if their mean was below 3, moderate if the mean was 3, or high involvement if the mean was above 3. This was done to allow statistical tests to be run separately for each of these categories.

Table 3.18: Factor loading for issue involvement

Survey Item	Sample 1 pre-test	Sample 1 post-test	Sample 2
1. How interested are you in the topic of wildland fire management?	0.78	0.75	0.74
2. How knowledgeable are you about wildland fire management?	0.76	0.76	0.85
3. How active or inactive are you in any efforts to reduce wildland fire risk in your community or neighborhood?	0.73	0.72	0.75
Factor Mean (SD)	3.02 (0.67)	3.00 (0.64)	2.51 (0.76)
Variance explained	57.5%	55.0%	61.0%
Cronbach's Alpha	0.62	0.60	0.67

ASSESSING DATA FOR NORMALITY

To test for normality, Kolmogorov-Smirnov tests were run for all variables (Table 3.19), including the new indices computed based on the factor analyses, as explained above. Q-Q plots were used to double check for normal distribution of data, which is indicated when points cluster along a single straight line. Since the thought listing variables were scored as either presence or absence (personally relevant elaboration; cognitive depth) or high, medium, and low (valence of thoughts), normality tests were not run for these variables. A statistically significant value ($p \leq .05$) indicates that scores are significantly different from a normal distribution.

Table 3.19: Normality test results used to determine if nonparametric analysis was required

Sample 1 pre-test	Kolmogorov-Smirnov statistic	Sig	Skewness	Kurtosis
Issue involvement	D (193) = 0.10	$p < 0.001$	0.16 SE = 0.18	0.15 SE = 0.35
Fuel management attitudes	D (124) = 0.32	$p < 0.001$	1.73 SE = 0.22	2.421 SE = 0.43
Regulatory management attitudes	D (124) = 0.10	$p = 0.005$	0.59 SE = 0.22	-0.13 SE = 0.43
Miscellaneous management attitudes	D (124) = 0.15	$p < 0.001$	0.86 SE = 0.22	0.50 SE = 0.43
Sample 1 post-test	Kolmogorov-Smirnov statistic	Sig	Skewness	Kurtosis
Issue involvement	D(136) = 0.13	$p < 0.001$	0.15 SE = 0.201	-0.04 SE = 0.41
Fuel management attitudes	D (127) = 0.31	$p < 0.001$	1.49 SE = 0.22	1.180 SE = 0.43
Regulatory management attitudes	D (127) = 0.13	$p < 0.001$	0.42 SE = 0.22	-0.90 SE = 0.43
Miscellaneous management attitudes	D (127) = 0.17	$p < 0.001$	1.64 SE = 0.22	3.61 SE = 0.43
Sample 2	Kolmogorov-Smirnov statistic	Sig	Skewness	Kurtosis
Issue involvement	D (329) = 0.11	$p < 0.001$	0.29 SE = 0.13	-0.29 SE = 0.27
Fuel management attitudes	D (304) = 0.20	$p < 0.001$	0.504 SE = 0.14	-0.585 SE = 0.28
Regulatory management attitudes	D (304) = 0.08	$p < 0.001$	0.21 SE = 0.14	-0.83 SE = 0.28
Miscellaneous management attitudes	D (304) = 0.14	$p < 0.001$	0.66 SE = 0.14	-0.08 SE = 0.28

Hypothesis Testing

Since the variable distributions deviated from normal, nonparametric tests were used for hypothesis testing. Kruskal-Wallis tests were run to explore differences between test versions (gain, loss, and control) and to determine whether level of issue involvement were related to the dependent variables. If significant differences were found, the corresponding pairwise comparisons were run to identify which groups differed significantly from which other groups.

Chi-squared tests for independence were used to explore associations between treatment type or issue involvement and dependent variables depth of cognition, valence of thoughts, and personally relevant elaboration.

Multiple linear regression with forced entry was run with the following predictors of post-test attitudes: treatment, issue involvement, valence of thoughts, depth of cognition, and personally relevant elaboration of thoughts. Separate analyses were run for the outcome variables of prescribed fire management attitudes, regulatory management attitudes, and miscellaneous management attitudes. The corresponding correlation tables did not show multicollinearity levels that would threaten the validity of model estimates (Field, 2013).

Sample 1

This subsection will present results for each of the hypotheses for Sample 1. A summary of these results can be found at the end of this section. Some of these tests examine attitude change, while some analyses using the issue involvement and cognition variables use scores from the post-tests. The Kruskal-Wallis test uses medians, and in my

survey “1” indicated the highest level of support; therefore negative values for attitude change represent an increase in support.

Hypotheses 1 – 3: Treatment type and issue involvement impacts on attitudes

A Kruskal-Wallis test showed that there were no significant differences in amount of change in any of the three attitude variables across treatment versions (Table 3.20). These results do not support the hypothesis (H1) that exposure to either treatment would lead to higher levels of support than no treatment. Likewise, Kruskal-Wallis tests did not reveal a statistically significant difference in attitude change across levels of issue involvement (Table 3.21). These results provide support for rejecting hypotheses 2 and 3.

Table 3.20: Impact of treatment type on attitude change (Sample 1)

Kruskal-Wallis (χ^2)				Sig
Prescribed fire management attitude change				
Gp2, n= 43: gain Md = 0.0	Gp3, n= 43: loss Md = 0.0	Gp4, n= 30: control Md= 0.0	χ^2 (2, n=116) = 4.18	$p = 0.12$
Miscellaneous management attitude change				
Gp2, n= 43: gain Md= 0.0	Gp3, n= 43: loss Md= 0.0	Gp4, n= 30: control Md= 0.0	χ^2 (2, n=116) = 0.21	$p = 0.90$
Regulatory management attitude change				
Gp2, n= 43: gain Md= 0.0	Gp3, n= 43: loss Md= -0.2	Gp4, n= 30: control Md= 0.0	χ^2 (2, n=116) = 2.03	$p = 0.36$

Note: Gp2 = gain; Gp3 = loss; Gp4 = control. There is no Gp1 because Gp1 is notation for the pre-test. Since the pr-test has been used to calculate attitude change, it is not analyzed as a separate group in Sample 1.

Table 3.21: Impact of issue involvement on attitude change (Sample 1)

Kruskal-Wallis (χ^2)				Sig
Issue involvement and attitude change				
Prescribed fire management attitude change				
Gp1, n= 38: low Md = 0.0	Gp2, n= 25: moderate Md = 0.0	Gp3, n= 53: high Md = 0.0	χ^2 (2, n=116) = 1.07	$p = 0.59$
Miscellaneous management attitude change				
Gp1, n= 38: low Md = -0.2	Gp2, n= 25: moderate Md = 0.0	Gp3, n= 53: high Md = 0.0	χ^2 (2, n=116) = 3.92	$p = 0.14$
Regulatory management attitude change				
Gp1, n= 38: low Md = 0.0	Gp2, n= 25: moderate Md = 0.0	Gp3, n= 53: high Md = 0.0	χ^2 (2, n=116) = 0.99	$p = 0.61$

Note: Gp1 = low involvement; Gp2 = moderate involvement; Gp3 = high involvement.

Hypotheses 4-6: Issue involvement impact on cognitive processing of messages

A chi-squared test for independence with the Yates continuity correction did not reveal any significant associations between cognitive processes and issue involvement (Table 3.22). These results provide support for rejecting hypotheses 4, 5, and 6.

Table 3.22: Associations between issue involvement and cognitive processing (Sample 1)

Chi-Squared test	Test statistic	Significance	Association
Issue involvement level/type and depth of cognition	$\chi^2 (2, n = 83) = 2.96$	$p = 0.23$	phi = 0.20
Issue involvement level and valence of thoughts	$\chi^2 (2, n = 83) = 3.67$	$p = 0.45$	phi = 0.21
Issue involvement level and personally relevant elaboration	$\chi^2 (2, n = 89) = 1.10$	$p = 0.58$	phi = 0.11

Graphing the contents of the chi-squared contingency tables shows the proportions of cases for each cognitive measure across issue involvement levels (Figure 3.1).

Approximately 60% of moderately and highly involved participants processed the messages deeply, compared to only 40% of the low involvement participants. However, these differences were not statistically significant.

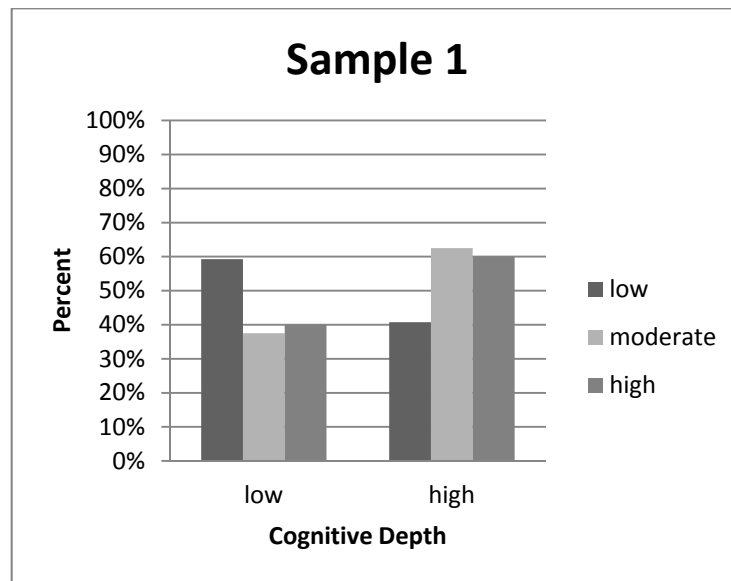


Figure 3.1: Depth of cognitive processing as a function of issue involvement (Sample 1)

Nearly 20% of participants with high scores on issue involvement listed negative thoughts, and less than 70% listed positive thoughts. More than 80% of those with low or moderate involvement listed positive thoughts (Fig. 3.2). Thus, the majority of participants, regardless of issue involvement, listed positive thoughts.

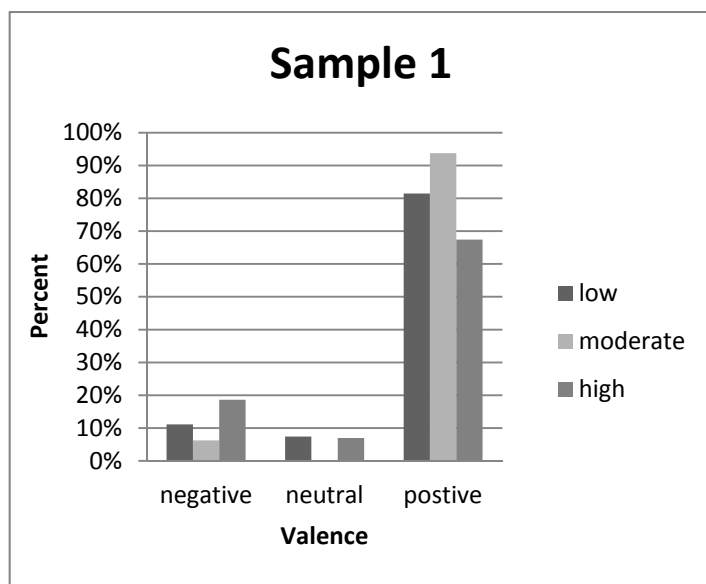


Figure 3.2: Valence of thoughts elicited by the messages as a function of issue involvement (Sample 1)

Approximately 10% more participants with high scores on issue involvement had personally relevant elaborations than participants with low and moderate involvement (Fig. 3.3). However the majority of participants in each issue involvement level did not list any personally relevant elaborations and, as noted above, the differences between groups were not statistically significant.

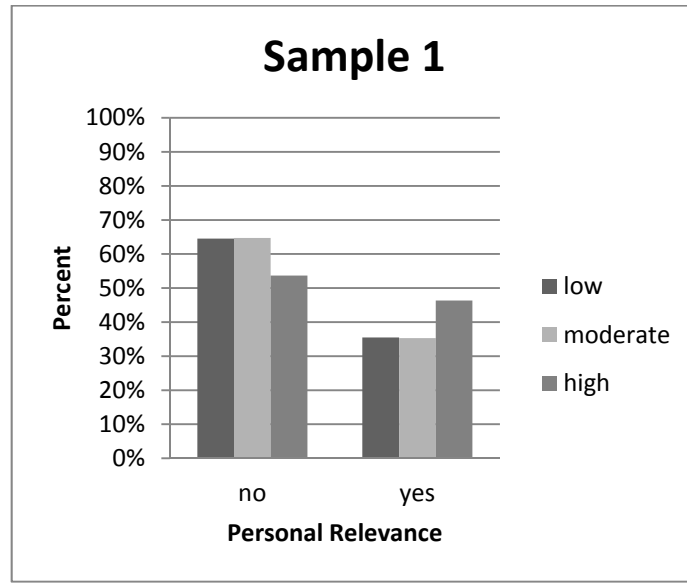


Figure 3.3: Personally relevant elaboration as a function of issue involvement (Sample 1)

Hypotheses 7- 9: Impact of treatments on cognitive processing of messages

A chi-squared test for independence with the Yates continuity correction did not reveal any significant associations between cognitive processes and treatment type expect for a small significant association between treatment type and depth of cognition (Table 3.23). This finding provides support for hypothesis 7 and support for rejecting hypotheses 8 and 9.

Table 3.23: Associations between treatment type and cognitive processing (Sample 1)

Chi-squared test	Test statistic	Significance	Association
Treatment type and depth of cognition	$\chi^2 (2, n = 84) = 4.79$	$p = 0.03$	phi = 0.26
Treatment type and valence of thoughts	$\chi^2 (2, n = 84) = 3.87$	$p = 0.15$	phi = 0.21
Treatment type and personally relevant elaboration	$\chi^2 (2, n = 90) = 1.67$	$p = 0.20$	phi = 0.14

Shaded areas indicate statistical significance at $\alpha = .05$.

Graphing the contents of the Chi-squared contingency tables shows the proportions of cases for each cognitive measure across treatment type. Nearly 70% of participants in the loss treatment had high cognitive processing, compared to only 40% in the gain treatment (Fig. 3.4).

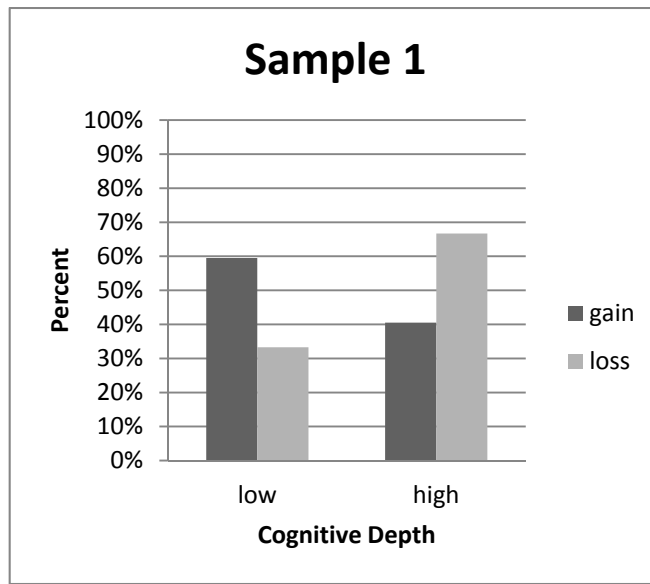


Figure 3.4: Depth of cognitive processing as a function of treatment version (Sample 1)

Nearly 20% of participants in the loss treatment listed negative thoughts, while only approximately 70% listed positive thoughts (Fig. 3.5). In contrast, nearly 90% of participants in the gain frame listed positive thoughts. However, these differences were not statistically significant, as noted above.

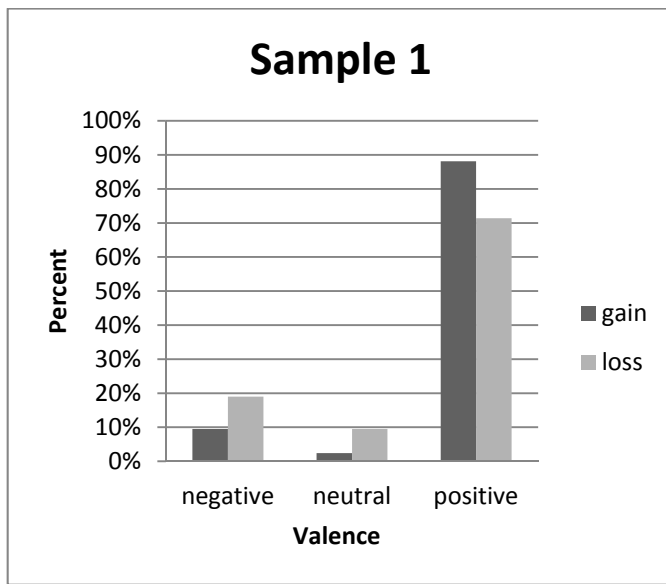


Figure 3.5: Valence of thoughts elicited by the messages as a function of treatment type

Nearly 60% of participants in the loss treatment provided personally relevant elaborations, compared to only 40% in the gain treatment (Fig. 3.6). However, as noted above, these differences were not statistically significant.

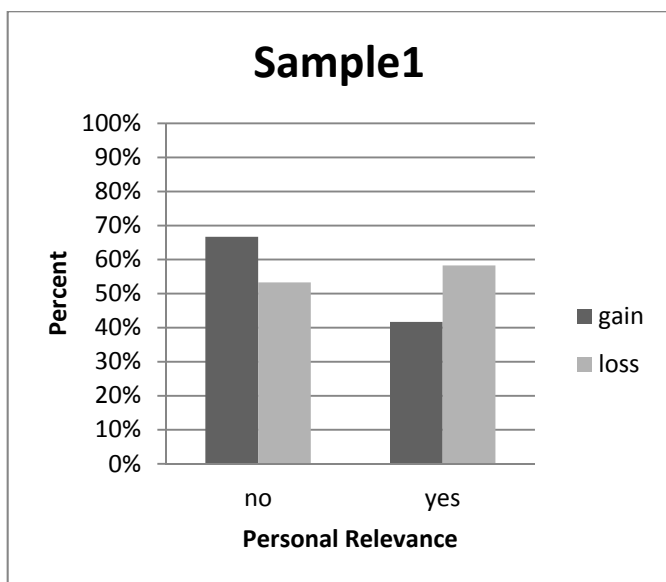


Figure 3.6: Personally relevant elaboration as a function of treatment type (Sample 1)

Combined contribution of treatment type, issue involvement, and cognition of messages on post-test attitudes

Multiple regression was used to assess which predictors significantly impacted post-test attitudes. Treatment type is indicated as ‘loss treatment’ since a dummy variable was used to analyze this categorical variable in the analysis. Given the bivariate findings presented above, these were not expected to yield many significant results. Indeed, only valence of thoughts was significant in any of the models (Table 3.24). Valence of thoughts significantly predicted attitudes about prescribed fire management, regulatory management, and miscellaneous management, such that people with positively valenced thoughts had lower (i.e., more positive) scores on attitudes. In all three models the beta values were similar, approximately -0.4, as was the variance explained by the model, approximately 20%. However, none of the other predictors were statistically significant.

Table 3.24: Summary of multiple regression analyses for variables predicting post-test attitude (Sample 1)

Prescribed fire management attitudes				
		β	t	sig
Constant			4.21	<0.0005
Involvement		-0.09	-0.81	0.42
Treatment (loss= 1)		-0.03	-0.28	0.78
Valence		-0.44	-4.13	<0.0005
Depth		-0.12	-1.08	0.28
Personally relevant elaboration		0.17	1.53	0.13
		df	R^2	F
Model		5	0.21	3.951
				sig
				0.003
Regulatory management attitudes				
		β	t	sig
Constant			5.12	< 0.0005
Involvement		-0.01	-0.13	0.90
Treatment (loss= 1)		-0.02	-0.20	0.84
Valence		-0.42	-3.85	< 0.0005
Depth		-0.17	-1.57	0.12
Personally relevant elaboration		0.14	1.25	0.22
		df	R^2	F
Model		5	0.20	3.68
				sig
				0.005
Miscellaneous management attitudes				
		β	t	sig
Constant			6.06	< 0.0005
Involvement		-0.17	-1.46	0.15
Treatment (loss= 1)		-0.03	-0.24	0.81
Valence		-0.40	-3.58	0.001
Depth		-0.11	-1.02	0.31
Personally relevant elaboration		-0.03	-0.24	0.82
		df	R^2	F
Model		5	0.17	3.07
				sig
				0.014

Shaded areas indicate statistical significance at $\alpha = .05$.

Overall, this series of statistical analyses for Sample 1 show that few hypotheses were supported (Table 3.25).

Table 3.25: Summary of hypothesis test results (Sample 1)

Hypothesis	Conclusion	Remarks
H1: Both gain and loss framed treatment materials will increase participants' support for management actions to reduce fire risk when compared to the control group.	Reject	No significant differences in support were found between the treatment groups and control. (Table 3.20)
H2: Participants with high issue involvement scores will have a higher level of support in the loss frame than the gain frame.	Reject	No significant differences in support were found between the treatment groups and the control (Table 3.21).
H3: Participants with low issue involvement scores will have a higher level of support in the gain frame than the loss frame.	Reject	No significant differences in support were found between the treatment groups and the control (Table 3.21).
H4: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher with increasing scores of issue involvement.	Reject	No significant association found in chi-squared analysis (Table 3.22).
H5: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher with increasing scores of issue involvement.	Reject	No significant association found in chi-squared analysis (Table 3.22).
H6: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher with increasing scores of	Reject	No significant association found in chi-squared analysis (Table 3.22).

issue involvement.		
H7: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher in the loss frame.	Fail to reject	Chi-square revealed small significant association (Table 3.23).
H8: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher in the loss frame.	Reject	No significant association found in chi-squared analysis (Table 3.23).
H9: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher in the loss frame.	Reject	No significant association found in chi-squared analysis (Table 3.23).

Sample 2

This subsection will present results for each set of hypotheses for Sample 2. A summary of these results can be found at the end of this section. These tests examine post-test attitudes, not attitude change.

Hypotheses 1 – 3: Treatment type and issue involvement impacts on attitudes

A Kruskal-Wallis test did not reveal any significant differences across test version for prescribed fire management attitudes or miscellaneous management attitudes (Table 3.26). These results do not support the hypothesis (H1) that exposure to either treatment would lead to higher levels of support than no treatment. In fact, opposite to H1, the pre-test control group (Gp1) had more positive regulatory attitudes than any of the three post-test groups (Table 3.27). Pairwise comparisons with adjusted *p*-values showed that there were statistically significant differences between the pre-test and the gain treatment and the pre-

test and the loss treatment. Support for hypothesis 1 would require significant differences between the gain treatment and loss treatment, or that the treatment groups would have more positive attitudes than the control. This support was not found, leading to the rejection of hypothesis 1.

Table 3.26: Impact of treatment type on attitudes (Sample 2)

Kruskal-Wallis (χ^2)					Sig
Prescribed Fire Management Attitudes					
Gp 1, n = 48 pretest Md= 3.0	Gp2, n= 106 gain Md = 3.0	Gp3, n= 110: loss Md = 2.5	Gp4, n= 40: control Md= 2.0	χ^2 (3, n=304) = 5.10	<i>p</i> = 0.70
Miscellaneous Management Attitudes					
Gp 1, n = 48 pretest Md= 2.8	Gp2, n= 106: gain Md = 2.3	Gp3, n= 110: loss Md = 2.0	Gp4, n= 40: control Md= 2.0	χ^2 (3, n=304) = 7.43	<i>p</i> = 0.06
Regulatory Management Attitudes					
Gp 1, n = 48 pretest Md= 4.0	Gp2, n= 106: gain Md = 2.8	Gp3, n= 110: loss Md = 2.7	Gp4, n= 40: control Md= 2.9	χ^2 (3, n= 304) = 12.31	<i>p</i> = 0.01

Note: Gp1 = pre-test; Gp2 = gain; Gp3 = loss; Gp4 = control. Shaded areas indicate statistical significance at $\alpha = .05$.

Table 3.27: Pairwise comparison between treatment type for regulatory management attitudes (Sample 2)

Regulatory Management Attitudes	Exact significance	Effect size
Pre-test (Md= 3.0) and gain (Md= 3.0)	$p = 0.01$	$r = 0.26$
Pre-test (Md= 3.0) and loss (Md= 2.5)	$p = 0.01$	$r = 0.25$
Pre-test (Md= 3.0) and control (Md= 2.0)	$p = 0.06$	$r = 0.27$
Gain (Md= 3.0) and loss (Md= 2.5)	$p = 1.00$	$r = -0.00$
Gain (Md= 3.0) and control (Md= 2.0)	$p = 1.00$	$r = -0.00$
Loss (Md= 2.5) and control (Md= 2.0)	$p = 1.00$	$r = 0.00$

Note: Kruskal-Wallis pairwise comparison tests. Shaded areas indicate statistical significance at $\alpha = .05$.

Kruskal-Wallis tests did not reveal a statistically significant difference in prescribed fire management attitudes across levels of issue involvement (Table 3.28). However, significant differences across levels of issue involvement were found for miscellaneous management attitudes and regulatory management attitudes, which led to further analysis via pairwise comparisons (Table 3.29). This analysis could be done with a series of Mann-Whitney tests, but this would inflate the familywise error rate and increase the chance of making at least one Type I error (Field, 2013). Pairwise comparison tests are used instead because they use an adjusted p -value that insures the Type 1 error rate remains at 5%. Pairwise comparisons with adjusted p -values showed that there were significant differences between the low and moderate issue involvement groups and between the moderate and high issue involvement groups for both miscellaneous management attitudes and regulatory management attitudes. However, no significant difference was found between the low and

high issue involvement groups. These results could have warranted further tests if the Kruskal-Wallis results for test versions had shown significant differences (Table 3.28). This significance was not achieved and therefore no further testing was done for hypotheses 2 and 3.

Table 3.28: Impact of issue involvement on attitudes (Sample 2)

Kruskal-Wallis (χ^2)				Sig
Issue involvement and attitudes				
Prescribed Fire Management Attitudes				
Gp1, n= 197: low Md = 3.0	Gp2, n= 51: moderate Md = 3.0	Gp3, n= 56: high Md = 2.0	χ^2 (2, n=304) = 2.18	$p = 0.34$
Miscellaneous Management Attitudes				
Gp1, n= 197: low Md =2.3	Gp2, n= 51: moderate Md = 3.0	Gp3, n= 56: high Md = 1.8	χ^2 (2, n=304) = 9.10	$p = 0.01$
Regulatory Management Attitudes				
Gp1, n= 197: low Md =2.8	Gp2, n= 51: moderate Md = 4.0	Gp3, n= 56: high Md = 2.7	χ^2 (2, n=304) = 9.97	$p = 0.01$

Note: Gp1 = low involvement; Gp2 = moderate involvement; Gp3 = high involvement.
Shaded areas indicate statistical significance at $\alpha = .05$.

Table 3.29: Pairwise comparisons between issue involvement level for miscellaneous and regulatory management attitudes (Sample 2)

Miscellaneous Management Attitudes	Exact significance	Effect size
Low (Md =2.3) vs. moderate (Md = 3.0)	$p = 0.04$	$r = -0.16$
Low (Md =2.3) and high (Md = 1.8)	$p = 0.83$	$r = 0.07$
Moderate (Md= 3.0) and high (Md = 1.8)	$p = 0.01$	$r = 0.28$
Regulatory Management Attitudes	Exact significance	Effect size
Low (Md =2.8) and moderate (Md = 4.0)	$p = 0.02$	$r = -0.18$
Low (Md =2.8) and high (Md = 2.7)	$p = 1.00$	$r = 0.05$
Moderate (Md = 4.0) and high (Md = 2.7)	$p = 0.01$	$r = 0.28$

Note: Kruskal-Wallis pairwise comparison tests. Shaded areas indicate statistical significance at $\alpha = .05$.

Hypotheses 4-6: Issue involvement impact on cognition of messages

A chi-squared test for independence with the Yates continuity correction did not reveal any significant associations between cognitive processing and issue involvement (Table 3.30). These results provide support for rejecting hypotheses 4, 5, and 6.

Table 3.30: Associations between issue involvement and cognitive processing (Sample 2)

Chi-squared test	Test statistic	Significance	Association
Issue involvement level/type and depth of cognition	χ^2 (2, n = 198) = 2.21	$p = 0.33$	phi = 0.11
Issue involvement level and valence of thoughts	χ^2 (2, n = 192) = 5.88	$p = 0.21$	phi = 0.18
Issue involvement level and personally relevant elaboration	χ^2 (2, n = 223) = 1.40	$p = 0.50$	phi = 0.08

Graphing the contents of the chi-squared contingency tables show the proportions of cases for each cognitive measure across issue involvement levels. More than 50% of participants with moderate scores on issue involvement processed messages with high cognitive depth, compared to less than 40% of the other two groups (Fig. 3.7). However, these differences were not statistically significant.

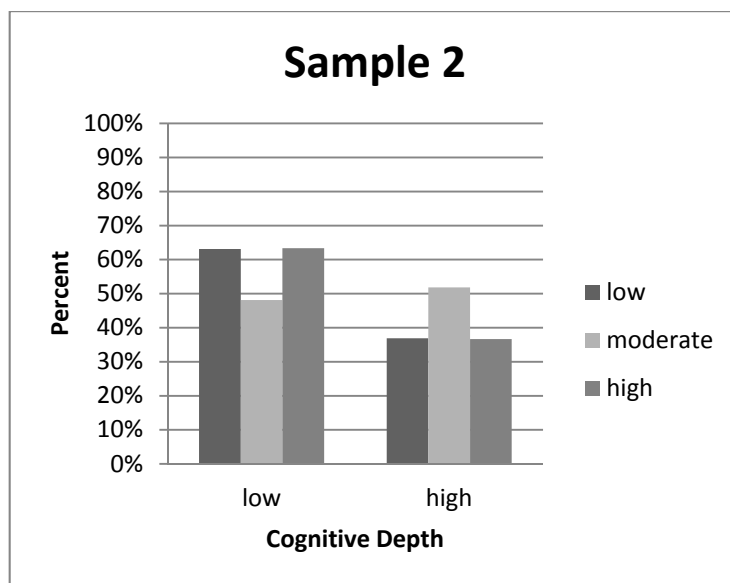


Figure 3.7: Depth of cognitive processing as a function of issue involvement (Sample 2)

Participants who scored high on issue involvement listed only positive thoughts about the messages and only participants who scored low on issue involvement listed negative, neutral and positive thoughts (Fig. 3.8). The majority of participants from each level of issue involvement were most likely to list positive thoughts.

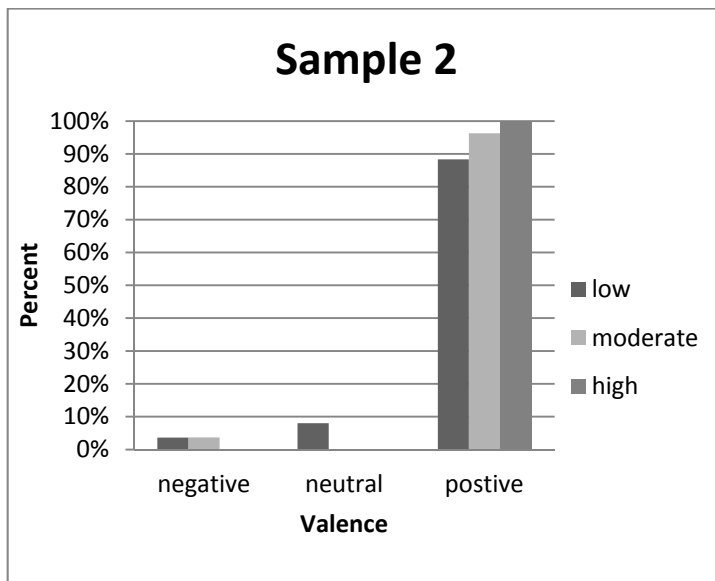


Figure 3.8: Valence of thoughts elicited by the message as a function of issue involvement (Sample 2)

Slightly more than 20% of highly involved participants listed personally relevant thoughts, compared to 10-15% of respondents with low or moderate levels of involvement (Fig. 3.9). However, the large majority of participants from each level of issue involvement did not list any personally relevant elaborations.

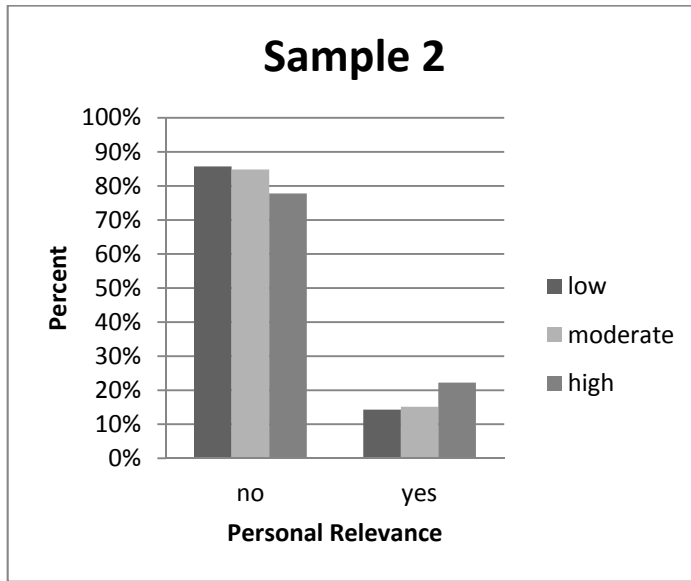


Figure 3.9: Personally relevant elaboration as a function of issue involvement (Sample 2)

Hypotheses 7- 9: Treatment type impact on cognition of messages

A chi-squared test for independence with the Yates continuity correction did not reveal any significant associations between cognitive processes and treatment type, except for a small significant association between treatment type and depth of cognition (Table 3.31). This finding provides support for hypothesis 7 and support for rejecting hypotheses 8 and 9.

Table 3.31: Associations between treatment type and cognitive processing (Sample 2)

	Test statistic	Significance	Association
Treatment Type and depth of cognition	$\chi^2 (1, n = 200) =$ 3.99	$p = 0.05$	phi = 0.15
Treatment type and valence of thoughts	$\chi^2 (2, n = 194) =$ 2.41	$p = 0.30$	phi = 0.11
Treatment type and personally relevant elaboration	$\chi^2 (2, n = 225) =$ 1.59	$p = 0.21$	phi = 0.21

Shaded areas indicate statistical significance at $\alpha = .05$.

Graphing the contents of the chi-squared contingency tables shows the proportions of cases for each cognitive measure across treatment type. Although lower cognitive processing was more likely than high cognitive processing in both the gain and loss treatments, the participants in the loss treatment had higher cognitive processing than the gain treatment (Fig. 3.10).

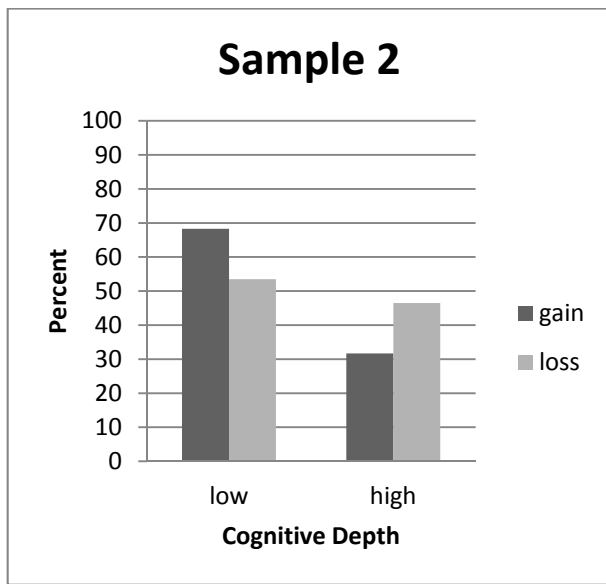


Figure 3.10: Depth of cognitive processing as a function of treatment type (Sample 2)

Participants in both the gain and loss treatments were equally likely to list positive thoughts (Fig. 3.11).

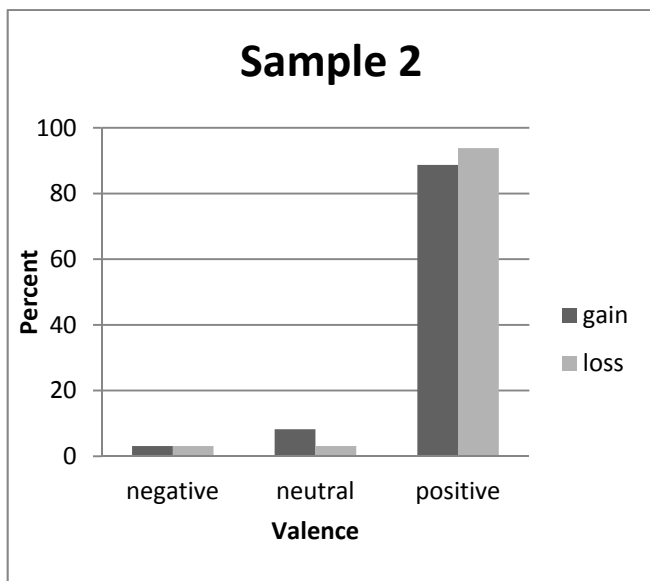


Figure 3.11: Valence of thoughts elicited by the messages as a function of treatment type (Sample 2)

Nearly 80% of participants in both treatments did not list personally relevant elaborations, and – as noted above – the differences were not statistically significant (Fig. 3.12).

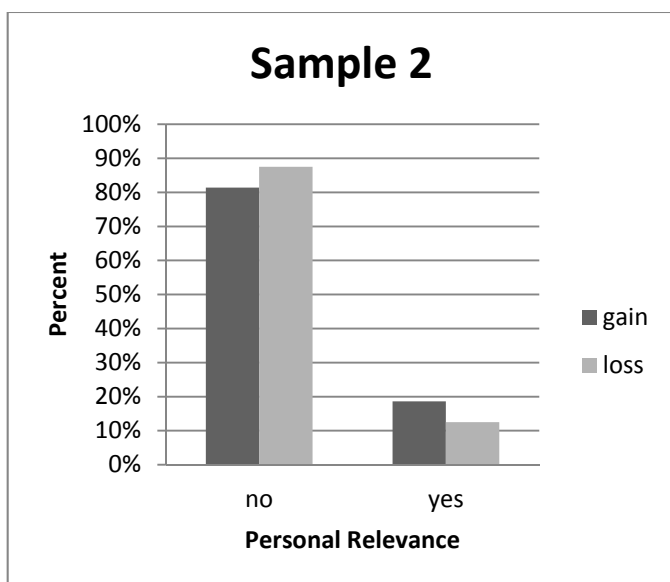


Figure 3.12: Personally relevant elaboration as a function of treatment type (Sample 2)

Contribution of treatment type, issue involvement, and cognition of messages to attitudes

Multiple regression was used to investigate the joint impact of cognitive processing, issue involvement, and treatment type on post-test attitudes. Treatment type is indicated as ‘loss treatment’ since a dummy variable was used to analysis this categorical variable in the analysis. None of the predictors was significant in the model for prescribed fire attitudes. However, valence of thoughts was a significant predictor of regulatory management attitudes. The beta value was negative and small, -0.19, and the variance explained by the

model is only 5% (Table 3.32). For miscellaneous attitudes, depth of processing was a significant predictor of attitudes, but the beta value was also negative, and the model explained only 3% of the variance.

Table 3.32: Summary of multiple linear regression analyses for variables predicting post-test attitudes (Sample 2)

Prescribed fire management attitudes				
		β	t	sig
Constant			6.21	<0.0005
Involvement		-0.12	-1.57	0.12
Treatment (loss= 1)		-0.04	-0.53	0.59
Valence		0.03	0.38	0.71
Depth		0.00	0.03	0.98
Personally relevant elaboration		-0.12	-1.52	0.13
		df	R^2	F
Model		5	0.00	1.12
Regulatory management attitudes				
		β	t	sig
Constant			8.85	< 0.0005
Involvement		-0.05	-0.70	0.48
Treatment (loss = 1)		0.07	0.96	0.34
Valence		-0.19	-2.67	0.01
Depth		-0.14	-1.84	0.07
Personally relevant elaboration		-0.08	-1.04	0.30
		df	R^2	F
Model		5	0.05	3.02
Miscellaneous management attitudes				
		β	t	sig
Constant			8.31	< 0.0005
Involvement		-0.13	-1.80	0.07
Treatment (loss = 1)		-0.03	-0.35	0.73
Valence		-0.01	-0.10	0.92
Depth		-0.16	-2.03	0.04
Personally relevant elaboration		-0.07	-0.86	0.39
		df	R^2	F
Model		5	0.03	2.01

Table 3.33 summarizes findings of hypothesis tests for Sample 2. While the pre-test control group differed from the post-test groups in attitudes, the post-test control did not differ from the two treatment groups at the post-test. Therefore, I conclude that there was overall no positive effect of the treatments on attitudes. Moreover, issue involvement was not significant in the models, and cognitive processing effects were minor.

Table 3.33: Summary of hypotheses test results (Sample 2)

Hypothesis	Conclusion	Remarks
H1: Both gain and loss framed treatment materials will increase participants' support for management actions to reduce fire risk when compared to the control group.	Reject	No significant differences in support were found between the treatment groups and control (Table3.26). The only differences observed were between the pre-test and the treatment groups (Table 3.27).
H2: Participants with high issue involvement scores will have a higher level of support in the loss frame than the gain frame.	Reject	No significant differences in support were found between the treatment groups and the control (Table3.26, 3.28, & 3.29).
H3: Participants with low issue involvement scores will have a higher level of support in the gain frame than the loss frame.	Reject	No significant differences in support were found between the treatment groups and the control (Table3.26, 3.28, & 3.29).
H4: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher with increasing scores of issue involvement.	Reject	No significant association found in chi-squared analysis (Table 3.30).
H5: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher with increasing scores of	Reject	No significant association found in chi-squared analysis (Table 3.30).

issue involvement.		
H6: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher with increasing scores of issue involvement.	Reject	No significant association found in chi-squared analysis (Table 3.30).
H7: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher in the loss frame.	Fail to reject	Chi-squared revealed small significant association (Table 3.31).
H8: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher in the loss frame.	Reject	No significant association found in chi-squared analysis (Table 3.31).
H9: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher in the loss frame.	Reject	No significant association found in chi-squared analysis (Table 3.31).

Chapter 4: DISCUSSION

In this section I briefly review the objectives of this study, review how the analyses performed sought to meet those objectives, and discuss findings and inconsistencies within the results. I then comment on how these results relate to the larger field of gain and loss framed communication studies and compare my results with results of recent meta-analyses on gain and loss framing. I conclude with implications for future research and applied communication materials.

The purpose of this study was to determine how gain or loss framed wildland fire information influenced support for various wildland fire management practices or policies. I also explored the possible contributing role of cognitive processes, including issue involvement, depth of cognition about the message, valence of thoughts elicited by the message, and personally relevant elaborations. These elements of cognitive processing, based on the ELM, should reveal mechanisms by which persuasive messages have positive, negative, or no effect on attitudes. The hypotheses proposed in this experiment combined ideas from ELM and Rothman et al.'s (2006) framework for prevention and detection behavior by drawing on results from communication studies on health and climate change. Since the influence of gain and loss framed information remains theoretically unclear, I sought to expand our knowledge of the topic and produce effective applied materials. The treatment flyers (Appendices E & F) and a summary report of this study (Appendix A) will be made available to land managers and wildland fire communicators.

SAMPLE CHARACTERISTICS

For Sample 1, I had expected a large response rate (80%) because participants were individuals from a previous fire-related study who had indicated a willingness to be involved in additional wildland fire research. The modest initial response rate of 35% could have been influenced by the online administration of my survey, for two reasons. First, most of the participants had completed a written survey in the previous study, suggesting a preference for that mode of delivery, which was not an option in my study. Second, the group as a whole was older and therefore presumably less comfortable with a web platform. The dropout rate of 22% between my pre-test and post-test was also unexpected and resulted in a 27% final response rate, which was well below the 80% response rate anticipated. This low response rate may have been due to the approaching holiday season, since the second survey was launched the second week of November.

Since Sample 2 participants were recruited from an online panel, response rates are unknown. Additionally, I was unable to fill the desired quota of post-test participants. Even after extending the sampling from Idaho and Montana to include Washington and Wyoming, the quota was not filled in the four-week time limit set for data collection. The time these surveys remained open was extended another two weeks and the quota was still not filled. One possible explanation is that there was a limited number of possible participants available from Amazon Mechanical Turk who met the study requirements of being residents in Idaho, Montana, Washington or Wyoming.

Demographic differences between Sample 1 and Sample 2 are not surprising because participants were recruited from different populations and in different ways. The average

age of participants in Sample 1 was almost twice that of Sample 2. Sample 1 participants also had residences closer to forests and had lived in those residences for longer. However, despite these differences, I expected that the nature of cognitive processes would be the same in both samples; that is, the type and direction of relationships between cognitive processing and attitude change would be the same. Indeed, many psychology experiments share this assumption and rely on student samples to study how information is processed. The main limitation to these studies is whether the topic is as relevant to students as to the general population, because relevance is theorized to influence processing and attitude change. I sought to overcome this potential limitation of topic relevance by recruiting participants who would have a use for the information presented to them, since the treatment materials were designed to include relevant regional information. By including samples recruited in different ways I hoped to extend the generalizability of the results to include individuals with a diversity of experiences with wildland fire and involvement levels. Compared to Sample 1, Sample 2 participants appear to be very removed from the risk, both physically, as almost 40% of participants lived more than 3 miles away from the nearest forest, and psychologically, as approximately 65% of participants were categorized as having low issue involvement.

HYPOTHESIS TESTING

In this subsection, I review each hypothesis and compare the findings from Sample 1 and Sample 2 for each statistical test (Table 4.1) and the figures showing cognition measures as a function of issue involvement or treatment type. I also compare the findings from the multiple regression models for Sample 1 and Sample 2.

Table 4.1: Summary of hypotheses test results for Sample 1 and Sample 2

Hypothesis	Sample 1	Sample 2
H1: Both gain and loss framed treatment materials will increase participants' support for management actions to reduce fire risk when compared to the control group.	Reject	Reject
H2: Participants with high issue involvement scores will have a higher level of support in the loss frame than the gain frame.	Reject	Reject
H3: Participants with low issue involvement scores will have a higher level of support in the gain frame than the loss frame.	Reject	Reject
H4: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher with increasing scores of issue involvement.	Reject	Reject
H5: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher with increasing scores of issue involvement.	Reject	Reject
H6: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher with increasing scores of issue involvement.	Reject	Reject
H7: The proportion of participants whose thoughts elicited by the messages show high cognitive depth will be higher in the loss frame.	Fail to reject	Fail to reject
H8: The proportion of participants whose thoughts elicited by the messages show negative valence will be higher in the loss frame.	Reject	Reject
H9: The proportion of participants whose thoughts elicited by the messages show personally relevant elaborations will be higher in the loss frame.	Reject	Reject

Hypotheses 1-3: Treatment type and issue involvement impacts on attitudes

The Kruskal-Wallis tests allows for medians to be compared across groups. No significant differences in attitude change about prescribed fire, regulatory, or miscellaneous

management actions between treatment versions or between issue involvement levels were found in Sample 1. This led to the rejection of hypotheses 1, 2 and 3 for Sample 1.

Tests of hypotheses 1 to 3 for Sample 2 had some statistically significant, although perplexing, findings. Remember that in Sample 2 the pre-test, gain treatment, loss treatment and control were all separate groups of participants, and attitudes, not attitude change, were examined in this analysis. In this group, Kruskal-Wallis tests indicated there was some type of significant difference in attitudes toward regulatory management actions between test versions (Table 3.26). The pairwise comparisons of regulatory management attitudes revealed group differences between the pre-test and gain frame and between the pre-test and loss frame, but no significant difference was found between the gain and loss frame (Table 3.27). Furthermore, no significant differences were found between the gain frame and the control or between the loss frame and the control. Therefore, I cannot conclude that the treatments had an influence on attitudes, since there were no significant differences between any of the post-test attitude scores. This led to the rejection of hypotheses 1, 2 and 3 for Sample 2.

One possible explanation for the statistically significant differences between pre-test and post-test in Sample 2 is that a maturation effect may have been taking place. This is unlikely because there was no significant difference between the pre-test and post-test controls. For example, if stories about defensible space had become the focus of news coverage between my pre-test and post-tests, I would have expected support for defensible space to be significantly higher in my post-test control test than in my pre-test control. Perhaps the most likely explanation of differences between the two treatment groups and the

pre-test is that the post-tests included samples from additional states. The pre-test participants resided in Idaho and Montana. However, the sample was extended in all the post-tests to include Washington and Wyoming in an attempt to fulfill the requested survey quota. Thus, the baseline established in the pre-test may not be representative of the population surveyed in the post-test, despite all of these states being in the northern Rocky Mountain region. For example, participants in Washington could range from the northern Rocky Mountains to the Pacific Coast.

In Sample 2, Kruskal-Wallis tests for hypotheses 2 and 3 also indicated significant differences in attitudes toward regulatory management actions and miscellaneous management actions between levels of issue involvement (Table 3.28). The pairwise comparisons of regulatory management attitudes and miscellaneous management attitudes revealed group differences between the low involvement and moderate involvement groups and between the moderate involvement and high involvement groups (Table 3.29). However, no significant difference in attitude score was found between low involvement and high involvement participants. Since no significant differences were found between these post-test attitudes scores, additional analysis was not completed and I concluded that the effect of flyers did not vary with involvement levels.

Hypotheses 4-9: Issue involvement and treatment type impact on cognitive processing of messages

The following section will discuss if the trends seen in the frequency tables were the same as the trends that would be expected based on my hypotheses. Despite the all of the Sample 1 figures showing the hypothesized trend, only hypothesis 7 was supported by my

statistical tests. One possibility for this lack of significant findings is the small sample for each of the post-test groups, particularly in Sample 1.

Hypothesis 4

The shape of the frequency graphs for Sample 1 matched my predictions for hypothesis 4 (Fig. 3.1), though the differences were not statistically significant. In Sample 1, a larger percentage of the low involvement group was engaging in low cognitive depth (e.g., simple restatement of flyer messages), while participants who scored as moderately or highly involved were more likely to engage in high cognitive processing. In Sample 1 a larger percentage (60%) of high involvement participants were engaging in deeper cognitive processing, but in Sample 2 the majority of high involvement participants showed evidence of low cognitive depth (63%). In Sample 2 deep cognitive processing was most common among moderately involved participants (52%). The overall prevalence of low cognitive depth processing in Sample 2 may be an indicator that, despite self-reporting they were highly involved, these participants had lower levels of actual issue involvement than Sample 1.

Hypothesis 5

The shape of the frequency graph for Sample 1 matched my predictions for hypothesis 5 by showing the largest percentage of negative thoughts were listed by highly involved participants (19%) (Fig. 3.2), though the differences were not statistically significant. This trend was not seen in Sample 2, where negative thoughts were only listed by participants with low (4%) and moderate (4%) involvement scores. The majority of thoughts listed were positive for both Sample 1 (>67%) and Sample 2 (>88%). Although

more participants in Sample 1 listed negative or neutral thoughts, final measures of support were higher for this group than in Sample 2. This may indicate that managers should not assume that negative thoughts are an indicator for participant support for management.

Hypothesis 6

The shape of the frequency graphs for Sample 1 and Sample 2 matched my predictions for hypothesis 6, since the most personally relevant elaborations were listed by highly involved participants (Fig. 3.3), though the differences were not statistically significant. I expected to see higher levels of personal relevance from the high issue involvement group, since they would have more general experience with wildland fire. However, the overall percentage of participants listing personally relevant elaborations in Sample 2 was very small, ranging from 14% to 22%.

Hypothesis 7

Hypothesis 7, that the loss frame would promote deeper cognitive processing, was the only hypothesis supported by my statistical tests. Sample 1 and Sample 2 had larger percentages of participants processing messages with high cognitive depth in the loss frame than in the gain frame (Fig. 3.5). Results for Sample 1 show a moderate relationship between the treatment and depth of cognition (Table 3.23). Sample 2 results show a weak relationship (Table 3.31). This result is in agreement with other studies (Maheswaran & Meyers-Levy, 1990) that higher levels of cognition occur under the loss frame than in the gain frame.

Hypothesis 8

The shape of the frequency graph for Sample 1 matched my predictions for hypothesis 8 (Fig. 3.5), though the differences were not statistically significant. The Sample 1 frequency graph for valence of thoughts by treatment type shows a larger percentage of negative thoughts listed with the loss frame than with the gain frame. Furthermore, there were more neutral thoughts in the loss frame. Since a neutral score was achieved when participants listed both negative and positive thoughts, this graph depicts expected trends. The Sample 2 trend was not as expected, since there was a larger percentage of positive thoughts listed for the loss frame and more neutral thoughts listed in the gain frame.

Hypothesis 9

The shape of the frequency graph for Sample 1 matched my prediction for hypothesis 9 (Fig. 3.6), though the differences were not statistically significant. The Sample 1 graph shows a larger percentage of participants listing personally relevant thoughts in the loss frame. However, this trend was not seen in Sample 2, where a larger percentage of participants listed personally relevant thoughts in the gain frame. As expected, participants from Sample 2 listed few personally relevant thoughts (<20% in either treatment). This expectation was based on the assumption that Sample 2 participants were less likely to have personal experience with wildland fire. Given this distribution, detecting a relationship between treatment type and personally relevant elaboration would be less likely than in Sample 1.

Contribution of treatment type, issue involvement, and cognition of messages to attitudes

Multiple linear regression analysis tested the contributions of treatment type, issue involvement, valence of thoughts, depth of cognition, and personal relevance of thoughts to post- test attitudes about support for prescribed fire management actions, regulatory management actions, and miscellaneous management actions. In Sample 1 valence of thoughts was statistically significant in all three attitude types measured. The model for prescribed fire management attitudes explained 21% of the variance and each unit increase in valence corresponded to a 0.44 unit increase in attitude. The model for regulatory management attitudes explained 20% of the variance and each unit increase in valence corresponded to a 0.42 increase in attitude. The model for miscellaneous management attitudes explained 17% of the variance and each unit of valence corresponded to a 0.40 increase in attitude. In Sample 2 the models for prescribed fire management attitudes and miscellaneous management attitudes were not a significant fit for the data. The model for regulatory management attitudes explained 5% of the variance, and each unit increase in valence corresponded to a 0.19 increase in attitude.

Hence, the only statistically significant findings were that people who had more positive thoughts in reaction to reading the messages had more positive attitudes about management actions. These results are not surprising because ELM suggests that positive attitude changes occur when there is a preponderance of positive thoughts during message elaboration. Valence of thoughts was expected to be related to both treatment type and issue involvement. Specifically, I expected more favorable thoughts under the gain frame and among participants with lower levels of involvement, because participants without prior

experience with the topic of wildland fire would focus on the positive messages in the gain frame and focus on the negative messages in the loss frame. However, statistical tests did not support these relationships. This means that even an indirect effect of treatment type and issue involvement on attitudes was not supported.

Limitations

In this section I will review the main limitations of this project, including differences between sample populations, flyer and survey layout, and possible reasons for findings that are contrary to the larger literature.

Differences between Sample 1 and Sample 2 could contribute to the inconsistencies between results. Sample 2 did not have matched pre- and post-test participants, limiting my ability to examine attitude change. Differences in motivation to complete the survey could have had an influence, since Sample 1 participants had wished to be included in wildland fire research, while Sample 2 participants were recruited from an online panel and given a small incentive for participation. Participants from Sample 2 may have been less motivated to carefully review treatment materials and survey questions, and the faster completion times may indicate that this was occurring. However, given the younger average age of these participants and their recruitment from an online panel, this difference might also be attributed to participants being more comfortable with online surveys. Although I intentionally sought participants who varied in their levels of issue involvement, I had concerns that Sample 2 participants were attempting to finish the survey as quickly as possible without reading the questions. I tried to control for this by asking participants to carefully review treatment materials.

I was also concerned that Sample 2 participants were computer bots set up to take tests for the incentive, since this was a potential problem with using an online panel. I controlled for this by reviewing any survey whose completion time was less than seven minutes and by requiring the state entered at the beginning of the survey to match the state of the zipcode listed at the end. I did find evidence of these entries, typically indicated by all scores of three on Likert scale and a repetition of random letters in all text boxes. These surveys did not receive the incentive and were removed from analysis, along with incomplete surveys and surveys by participants who had completed another test version.

As mentioned above, one limitation with Sample 2 was the addition of participants from Washington and Wyoming in the post-tests, which could account for differences between the pre-test control (Idaho and Montana only) and post-test groups.

Although the treatment materials were developed following communication guidelines, a pilot test was not completed for the final flyers. These flyers were reviewed by colleagues in the Department of Conservation Social Sciences, but no formal feedback from students or community members was completed. Additionally, the flyer was presented to participants as a pdf through a weblink. Participants may have expected to engage with the information since it was delivered online.

The administration of the survey online may have posed its own drawbacks. The survey may have been difficult for some participants to complete because it included twenty questions, some of which had multiple items laid out in two columns. This may have been a greater limitation for participants in Sample 2 since my survey was more complex than other surveys posted on Amazon Mechanical Turk at the time of survey administration. Sample 1

participants, however, may not have found the survey layout challenges since it was similar to survey these participants had completed for the previous study by Blades and Hall (2012).

One of the main assumptions in this study was that issue involvement would influence attitude shifts (H2 and H3) and cognitive processing of messages (H4, H5, and H6) (Kokkinaki & Lunt, 1997). This assumption is based on the factors outlined in ELM that lead to central processing (Rucker & Petty, 2006). Issue involvement was hypothesized to lead to a higher depth of processing (H4), more personally relevant elaboration (H6), and more negative thoughts about the message (H5). The survey was distributed during the fall of 2012 after a particularly bad fire season. This may have resulted in more negative thoughts and associations about fire, or could have prompted some participants to have increased issue involvement after taking fire protection actions the previous summer. Additionally, the thought listing exercise did not afford me control of the actual depth of the cognitive processing.

I was surprised that no association was found between issue involvement and any of the three cognition measures. The finding that these constructs are independent of each other may be due to a problem with the operationalization of the constructs. ELM defines issue involvement as the extent to which the issue is considered personally important. I created my measure of issue involvement by asking participants about their knowledge of wildland fire management, interest in management, and activity in reducing wildland fire risk. I did not ask participants to indicate the how important wildland fire was to them personally, although the three variables seem to be reasonable indicators of involvement.

Perhaps a more likely problem was the way I operationalized the cognition measures. These items were generated through the content analysis of the thought listing exercise. The code book (Appendix I) used fairly simple methods to characterize each of the variables. Cognitive depth was categorized as low, which meant simple restatement of content in the flyer, or high, which included evidence of linking content to other ideas. Valence was categorized as negative, neutral, or positive based on the summation of the valence associated with each listed thought. Personal relevance of elaborations was coded as presence or absence. Not all participants engaged in the thought listing exercise and some chose to list fewer than the three thoughts requested.

My results may have been impacted by the smaller samples for these variables on top of already small group sizes for each post-test, especially in Sample 1. This may be why the percentages seen in the figures for hypotheses tests 4-9 generally matched my predictions, but statistical tests were not significant. Furthermore, cognitive measures were based solely on the thought listing exercise. Additional survey measures may have allowed for the use of more sophisticated analysis (e.g., knowledge questions).

Theoretical Implications

The hypotheses I created for this study were based on the results of seminal studies in health communication. However, only one of my hypotheses was supported. Thus, the empirical evidence I found suggests that the hypotheses may not be warranted in all situations. The perplexing results of this study, especially the general lack of influence of issue involvement, led me to return to the literature to seek explanations. I was unable to find a clear explanation for why issue involvement was not influencing results in my study.

However, I did discover several studies that also showed a statistically insignificant difference between gain and loss framed information and that these results were not considered uncommon. My findings mirror other studies that have shown inconclusive results regarding which frame has an influence on attitudes, although there are interesting implications for how frames may influence behavioral intention and actual behavior, apart from any impact on attitudes themselves. Below, I review these additional studies in the following order: studies with results about issue involvement, studies that measured attitude outcomes, studies that measured behavior and behavioral intention, and finally studies that question the utility of the Rothman et al. (2006) framework.

I had predicted that treatment type and depth of cognition would be associated, specifically that the loss frame would generate more cognitive processing (H7). My results provide support for this prediction, with both samples showing significantly higher levels of cognitive depth in the loss frame (Table 3.23 and 3.31). For example, in Sample 1, 67% of the loss group was categorized as high processing depth, compared to 41% in the gain frame. In Sample 2, 47% of the loss group was categorized as high processing depth, compared to 32% in the gain frame. This supports theoretical assumptions outlining why a loss frame should provoke more processing in O’Keefe and Jensen’s (2008) meta-analysis. The argument is that the loss frame should lead to more informational processing due to the fear-arousing appeals of the message and negativity bias, where sensitivity and heightened impact of the negative information result. However, in reviewing empirical tests of prevention behaviors, O’Keefe and Jensen found that gain frames led to more information processing and better memory recall. These results are surprising and the authors proposed that they might be limited to preventative behaviors, because those usually promise positive

outcomes. Perrin (2011) predicted less depth of cognition in the loss frame due to mediating effects of arousal-eliciting aspects of negative messages on processing. In other words, a strong emotional reaction to the message would override a reader's ability to think deeply about the message content. However, this hypothesis was not supported in Perrin's study, as there were no differences in emotional arousal between gain and loss framed information. My results are more consistent with a conclusion that loss framing leads to deeper cognitive processing, but clearly this issue deserves additional research attention.

Although the meta-analysis by O'Keefe and Jensen (2008) found that gain frames seemed to lead to more cognitive processing, other studies have not examined processing, but instead have focused on attitudes, behavioral intention, and actual behavior. O'Keefe and Jensen (2007) concluded that there was no significant effect of frames on attitudes and intentions. Gallagher and Updegraff (2012) also found that neither gain nor loss frames were more effective at influencing attitudes. However, they extended their meta-analysis to include actual behavior change and found that the gain frame was more persuasive with prevention behaviors. The authors argued that future studies should measure actual behavior, rather than merely attitudes, since it does not appear that gain and loss frames influence attitudes or intentions.

On the other hand, some studies have found an influence of frame type on attitudes. Nan (2007) found that both gain or loss frames can influence attitudes, but frames are more effective at influencing behavioral intention than attitude. The results of Nan's study support my hypotheses 2 and 3 by showing that the loss frame was more effective at influencing attitudes and intention with the high involvement participants (H2) and that the gain frame

was more effective with low involvement participants (H3). If I had seen these studies before developing my survey instrument, I would have included behavioral intention measures, such as intention to vote for or against proposed management actions.

The predictions in my study used the framework established by Rothman et al. (2006), showing that prevention and detection behaviors are influenced differently by frame type. Since Spence and Pidgeon (2010) argued that climate change mitigation actions were comparable to health preventative actions, I made the assumption that wildfire adaptation and mitigation actions could also be thought of as prevention behaviors. This makes intuitive sense because fuel management actions, such as selective thinning, or community management actions, such as new building guidelines, do not detect wildfire. However, the effects of frame type within detection or prevention actions are not well understood. Given that environmental risk communication is usually focused on mitigation behaviors, this framework may not be as useful in this realm of communication.

Gallagher and Updegraff (2012) identified that the impact of gain and loss framing may not be based on whether behaviors are seen as prevention or detection, but rather on an individual's construals of the risks associated with the behavior. This point has interesting implications for environmental risk communication. Whereas health risks pose direct personal impacts, and may therefore be highly salient, individuals may not have well developed ideas about the personal impacts posed by environmental risks. It is possible that gain and loss frames may be more useful than other message types in communicating only those climate change impacts that have well understood personal impacts. For example, impacts that are directly related to human health, like the increase in some vector born

diseases, may be impacted by gain or loss frames because they can be presented with specific risk information (i.e., numeric).

I did not use specific, numerical information in my materials for two reasons. First, this experiment was testing the impact of gain and loss frames on goal framed arguments, whereas specific numerical information is used in risky choice frames, as seen in the study by Morton et al. (2011). Second, uncertainty regarding climate change impacts, including wildland fire, makes it difficult to provide numerical information that is easily understood by the general public. Future assessments of how the general public understands risk posed by different climate change impacts could lead to communication materials that can overcome the challenges of low numeracy for many audiences.

Due to the history of wildfire management and suppression in the U.S., it is likely that this risk is perceived differently than other climate change impacts, such as sea level rise and extreme weather. For example, the perception that wildland fires can be controlled may contribute to confusion about the likelihood of any risk reduction outcome, and using a gain or loss frame to present this information may be less influential due to this confusion. Future research may show that my hypotheses about the potential impacts of gain or loss frames could hold true for other impacts with better understood risks and outcomes.

Gallagher and Updegraff (2012) suggested alternatives to Rothman et al.'s (2006) framework, and Nan (2007) argued the framework should be discarded altogether, because studies using these frameworks have had inconsistent results. Nan argued that the way that gain or loss frames are operationalized, as opposed to the actual manipulation of gain and loss, may provide a better explanation of their direct effect. She tested how the effectiveness

of gain or loss frames differed when focusing on desirable or undesirable end states. This study used gain and loss frames and desirable and undesirable outcomes to create four treatment types (Figure 4.1).

		Outcome type	
		Desirable	Undesirable
Frame type	Gain	If you do X, you will protect yourself.	If you do Y, you will be at greater risk.
	Loss	If you don't do Y, you will be at lower risk.	If you don't do X, you won't protect yourself.

Figure 4.1: Nan's suggested four-group experimental design

She found that, when end states focused on undesirable outcomes and participant issue involvement was low, the gain frame led to greater behavioral intentions. When end-states focused on undesirable outcomes and participant issue involvement was high, the loss frame led to greater behavioral intentions. However, no framing effects were found when end states were focused on desirable outcomes; my study focused on desirable outcomes, so this may account for the lack of framing effect. Although this research shows interesting implications for a new framework, the meta-analysis by O'Keefe and Jensen (2008) did not find that end-states focused on desirable or undesirable outcomes impacted the effectiveness of gain or loss frames. Further research is needed to explore the relationship between frame type, end state focus, and prevention or detection behaviors. My study only used two treatment materials framing the outcomes as gains or losses; future studies could adopt Nan's (2007) methods of four treatment materials with desirable and undesirable outcome presented in both gain and loss frames.

These recent studies and my results demonstrate the continued need for framing research in both health communication and environmental risk communication. The persuasive advantage of gain and loss framed messages in climate change communication has yet to be established. My results do not provide support for either frame in changing attitudes about climate change adaptation and mitigation actions, at least in the context of wildfire.

As mentioned above, Spence and Pidgeon (2010) called for communications to use the gain frame. Other advocates for using the gain frame, Morton et al. (2011), also found that the positive (gain) frame leads to decreases in perceived uncertainty and cautious responses to climate change information. Meanwhile, Gallagher and Updegraff (2012) called for the incorporation of concepts from other theories for a deeper understanding of the relationship between gain and loss framing, understanding of risks, self-efficacy, and threat appraisal. While recent studies such as Perrin (2011) have sought to fill the gap in our understanding of the relationship between emotional responses to messages and behavioral intentions, little research has been done to date. Thus, there is ample room to explore how framing impacts message processing and ultimately behavior.

Practical Implications

While the results of the various meta-analyses and studies discussed above show minor effects due to gain and loss framing, attitude change is difficult to achieve, persuasive messages are complex, and therefore any technique that could aid in success should be incorporated. While the theoretical function of gain and loss frames is not well understood, overall these studies suggest that the gain frame should be used when communicating

prevention behaviors (Gallagher & Updegraff, 2012; Morton et al., 2011; O'Keefe & Jensen, 2007, 2008; Spence & Pidgeon, 2010).

All materials should strive to provide clear and understandable explanations of the outcomes of the proposed action. Based on the studies listed above, it appears that the clearest explanations are presented in the gain frame. The loss frame often presents a double negative (e.g., the negative outcomes of not taking action), which can be confusing for readers. Therefore, the most direct method of communicating risk information is through the gain frame.

O'Keefe and Jensen (2007) found a strong gain frame advantage with one specific type of health behavior, dental hygiene behaviors. This effect may be a result of the perceived certainty of outcomes, since the outcomes of good dental hygiene are well understood. When possible, communicators should include information in their materials that focus on the certainty of outcomes.

Gallagher and Updegraff (2012) argue that the gain frame may be more persuasive because of other types of information that this frame communicates, such as self-efficacy, social norms, outcome expectations and positive emotions. In particular, self-efficacy may be key in prevention behaviors, but may play a smaller role in detection behaviors. The gain frame may be useful in setting social norms and increasing self-efficacy through the use of positive examples for taking recommended actions. Based on Nan's (2007) results, communicators should not only use the gain frame, but also focus on desirable outcomes of taking action.

Spence and Pidgeon (2010) applied gain and loss frames to climate change communication and found similar results supporting the "gain frame advantage." The

authors found that the gain frame suppressed fear responses and led to more positive attitudes about climate change mitigation than the loss frame, which produced higher levels of fear responses, increased perceptions of the severity of climate change impacts, and led to higher information recall.

Based on these studies, messages will be most effective when they address positive outcomes (gain frame), what others expect of participants (social norms), and empower individuals to take action (self-efficacy). Using the gain frame should allow communicators to present information that addresses risks without triggering an overwhelming fear response. Using the gain frame will provide readers with the clearest explanation of risks and desirable outcomes of the proposed actions.

Chapter 5: CONCLUSION

In this study, I tested nine hypotheses to assess how gain and loss frames and issue involvement affected cognitive processing and, in turn, attitudes toward climate change mitigation activities related to fire risk for people living in northern Rocky Mountain forests. Issue involvement in this study did not predict attitudes or cognitive processing of messages, which runs counter to the accepted role of issue involvement in the literature. Both Sample 1 and Sample 2 showed moderate levels of support for prescribed fire management, regulatory management and miscellaneous management in all post-tests. Additionally, there were no statistically significant differences in attitudes between treatment types or the control groups. These results also run counter to the literature, where it is assumed that exposure to any treatment should result in an effect. My results may be due to the timing of the survey after a particularly bad fire year, during which participants may have been exposed to many messages similar to those presented in the treatment materials. I did find that treatment type had an impact on the cognitive depth of message processing, but not the valence of thoughts or personally relevant elaborations. My results indicate that the loss frame leads to more message processing. Furthermore, my results do indicate that valence of thoughts is a small significant predictor of attitudes.

The inconclusive nature of these results is not surprising and has been demonstrated in several meta-analyses on the topic of gain and loss frames. Nevertheless, these meta-analyses and other studies may suggest a “gain frame advantage” in influencing attitudes, intentions and behavior. Thus, practitioners are recommended to use the gain frame, which may have additional positive impacts on self-efficacy and depth of cognitive processing.

Future studies are needed to understand the processes by which gain and loss frames have varied effects depending on the behavior being studied. Topic areas such as the role of certainty of outcomes, desirable end-states, and individuals' construal of risks are fertile areas for gain and loss frames to be explored.

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APPENDICES

APPENDIX A

SUMMARY REPORT FOR MANAGERS

Summary Report of Wildland fire Communication Research

The flyers designed for this experiment used the most current communication recommendations. The regional predictions make the information more personally relevant to the reader. The recommended risk reduction actions are specific and highlight that taking action is effective. Values, such as community and home, are appealed too in the message. Photos are used to supplement facts and provide examples. Sentences are kept short and use a seventh grade reading level. Readers are also given a web link directing them where to go to learn more about the information presented on the flyer.

This study tested the effect of message frames on attitudes for support for different wildland fire management actions. Gain frames focus on the positive outcomes of taking action, while loss frames focus on the negative outcomes of not taking action. This positive or negative wording was used to describe the results of the management actions suggested on the flyer.

The individuals who took part in the study had moderated levels of support for management actions such as community education programs about family wildfire plans, selective thinning on public lands in the county and fire breaks around the community. Defensible space guidelines were moderately supported, but mandatory defensible space ordinances for the community were weakly supported. Fire-safety building guidelines were moderately supported, but mandatory fire-safety building ordinances in the community were neither supported nor opposed. Study participants also indicated they weakly supported mandatory reviews of the community's CWPP every 3 years and prescribed fire on public lands in the county.

The results of my study did not show an advantage for either the gain or the loss frame. Attitudes did not differ between the gain group, the loss group, and the control group. I have to recommend using the gain frame and focusing messages on the positive outcomes of taking action.

Other studies have found that the gain frame:

- Is more persuasive with low involvement audiences (Nan, 2007)
- Is more persuasive at promoting an actual behavior change (Gallagher and Updegraff, 2012)
- Suppresses fear responses and leads to more positive attitudes about mitigation actions (Spence and Pidgeon, 2010).
- Leads to more information processing and better memory recall (O'Keefe & Jensen, 2008)
- Decreases perceived uncertainty and promotes cautious actions (Morton et al.)

APPENDIX B

SAMPLE 1 SURVEY COVER LETTERS

Pretest cover letter

The University of Idaho Institutional Review Board has approved this project.

Hello NAME,

My name is Melissa Clark. I am a graduate student at the University of Idaho researching wildfire risk communication. This study will help land managers address communication needs with residents.

You are invited to participate in a survey about Northern Rockies wildfire information. The first step of this study will be to fill out a survey, in a few weeks you will receive another request to review an online flyer and take another survey. The survey should take approximately 20 minutes. Upon completing the second survey you will be entered to win one of three \$100 gift cards.

You will benefit from this project by helping us understand which communication techniques are the best at presenting wildfire information. Northern Rockies communities will benefit because it will help natural resource managers communicate information about wildfire risks in the best possible way.

Your participation in this survey is voluntary and you can skip question or stop at any time. There are no risks associated with this project. All information you provide will be confidential and seen only by myself and my faculty advisor, Dr. Hall. Your name will not be connected to any of your responses throughout any portion of this study. If you decide to withdraw from the study or if you have any questions, please do not hesitate to contact me.

Go to the survey now: http://idaho.qualtrics.com/SE/?SID=SV_e4Zlw3V6PT7de3H

Unique ID: **NR####**

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Post-test cover letter

The University of Idaho Institutional Review Board has approved this project.

Hello NAME,

Thank you for taking the first survey in my study! This email includes the link for the second part of this study. Once you have completed this second survey, you will be entered to win one of three \$100 gift cards.

You have been randomly assigned to one of two versions of this second survey. In one version you will be asked to read a flyer about wildfires and complete the survey. In the other version you only have to complete the survey.

This second survey is very similar to the first survey. I have had several emails notifying me that the survey website is wider than some computer screens. Unfortunately, this setting width is out of my control and if you are experiencing this problem you will have to use the horizontal scroll bar at the bottom of your web browser window. I'm sorry for this inconvenience.

Please remember that you will benefit from this project by helping us understand which communication techniques are the best at presenting wildfire information. Northern Rockies communities will benefit because it will help natural resource managers communicate information about wildfire risks in the best possible way.

Your participation in this survey is voluntary and you can skip question or stop at any time. There are no risks associated with this project. All information you provide will be confidential and seen only by me and my faculty advisor, Dr. Hall. Your name will not be connected to any of your responses throughout any portion of this study. If you decide to withdraw from the study or if you have any questions, please do not hesitate to contact me.

Go to the survey now: http://idaho.qualtrics.com/SE/?SID=SV_e4Zlw3V6PT7de3H

Unique ID: **NR####**

Thank you again for your participation!

Kind regards,

Melissa

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APPENDIX C

SAMPLE 2 SURVEY COVER LETTER

Title: Wildfire Survey A

Description: Residents of ID, MT, WA, WY only – survey on fire preparedness. If you take this survey you are not eligible to take versions B or C.

Answer a survey about wildfire preparedness in the northern Rockies

The University of Idaho Institutional Review Board has approved this project.

My name is Melissa Clark. I am a graduate student at the University of Idaho researching wildfire risk communication. This study will help land managers address communication needs with residents.

Residents of Idaho, Montana, Washington and Wyoming are invited to participate in a survey about Northern Rockies wildfire information. Please note there are three versions of this study (A, B and C). You are eligible to complete one version only. This survey should take approximately 20 minutes.

You will benefit from this project by helping us understand which communication techniques are the best at presenting wildfire information. Northern Rockies communities will benefit because it will help natural resource managers communicate information about wildfire risks in the best possible way.

Your participation in this survey is voluntary and you can skip question or stop at any time. However, please note that surveys less than 75% complete will not be eligible for payment. There are no risks associated with this project. All information you provide will be confidential and seen only by me and my faculty advisor, Dr. Hall. Your name will not be connected to any of your responses throughout any portion of this study. If you decide to withdraw from the study or if you have any questions, please do not hesitate to contact me.

Survey link: [Survey A](#)

Provide the survey code here:

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APPENDIX D

FLYER REFERENCE LIST

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APPENDIX E

GAIN FRAME FLYER

At least 15 years, THE NORTHERN ROCKIES WILL SEE INCREASES IN WILDFIRE RISK.



STUDIES SHOW THAT BY 2030, THE NORTHERN ROCKIES WILL EXPERIENCE THE FOLLOWING CHANGES:

INCREASES IN INSECTS AND DISEASES

will lead to more dead trees throughout the region, creating more fuels for future fires. Mountain pine beetle has already affected 3,600,000 acres in the Rocky Mountains.



Province of British Columbia

LESS SNOW in the fall and more rain in the spring have led to longer fire seasons for the past 30 years. This trend is expected to continue, increasing the chance of more frequent fires.



George Wientner

INCREASED DEVELOPMENT

near public lands is expected to grow by 18%, putting additional homes and structures at risk from wildfires. 90% of homes near public lands are already at high risk for wildfire damage.



USFS



USFS



Firewise



Firewise

WHAT COULD BE DONE?

On public lands...

Managers can take action to reduce wildfire risk by reducing fire fuels. Selectively thinning trees not only removes fuel for fires, but also can slow down the spread of insect attacks. This protects live trees and healthy trees are more likely to survive wildfires. Using prescribed fire lowers the risk of catastrophic fires from lightning strikes.

In your community...

Communities that have developed a Community Wildfire Protection Plan (CWPP) are more prepared for wildfire. If your community has a CWPP that has been updated within the last 3 years, evacuations will be less difficult. Neighborhoods can reduce their risk from wildfires by adopting ordinances to limit the amount of flammable vegetation around homes.

On your property...

Clearing 100 feet of flammable vegetation around your home will help protect your personal safety, your home and the irreplaceable items inside. Families who have planned for wildfire are prepared for short notice evacuation and are equipped with the supplies they need if they cannot or decide not to evacuate.

*For more information about the statistics and suggestions described here, please go to www.cnr.uidaho.edu/wildfire/sources.htm

APPENDIX F

LOSS FRAME FLYER

IN 15 years, THE NORTHERN ROCKIES WILL SEE INCREASES IN WILDFIRE RISK.



STUDIES SHOW THAT BY 2030, THE NORTHERN ROCKIES WILL EXPERIENCE THE FOLLOWING CHANGES:

INCREASES IN INSECTS AND DISEASES

will lead to more dead trees throughout the region, creating more fuels for future fires. Mountain pine beetle has already affected 3,600,000 acres in the Rocky Mountains.



Province of British Columbia

LESS SNOW

in the fall and more rain in the spring have led to longer fire seasons for the past 30 years. This trend is expected to continue, increasing the chance of more frequent fires.



George Wierthner

INCREASED DEVELOPMENT

near public lands is expected to grow by 18%, putting additional homes and structures at risk from wildfires. 90% of homes near public lands are already at high risk for wildfire damage.



USFS



USFWS



Firewise



Firewise

WHAT COULD BE DONE?

On public lands...

If managers don't take action to reduce fire fuels, wildfire risk will not be reduced. Without selectively thinning trees, fuels for fires remain and diseases and insects can spread more quickly, killing more trees and increasing fuels for fire. Another way to reduce fuels is to remove underbrush through prescribed burning. Without prescribed fires the risk of catastrophic fires from lightning strikes will remain high.

In your community...

Communities without a Community Wildfire Protection Plan (CWPP) are less prepared for wildfires. If your community has a CWPP that has not been updated within the last 3 years, evacuations could be more difficult. Fuels in your neighborhood may not be reduced unless an ordinance is adopted to limit the amount of flammable material around homes.

On your property...

If you do not clear flammable vegetation within 100 feet of your home you will not reduce the risk of a wildfire to your personal safety, your home and the irreplaceable items inside. Families who have not planned for wildfire are less prepared for short notice evacuation and are not equipped with the supplies needed if they cannot or decide not to evacuate.

*For more information about the statistics and suggestions described here, please go to www.cnr.uidaho.edu/wildfire/sources.htm

APPENDIX G

SURVEY


Default Question Block

Opinions about Wildland Fire Management



This survey is designed to help wildland fire managers understand the public's views on wildland fire management. Thank you for participating. Your answers will be strictly confidential.

This study has been reviewed and approved by the University of Idaho Institutional Review Board.

Click the  button at the bottom right of the screen to advance

Please enter your unique ID number here:

In what state do you currently live?

I'm sorry but you do not meet the qualifications for this survey. Thank you for participating!

Before you begin the survey, carefully review the information on the flyer below. To view this flyer please go to the following webpage www.uoi.edu/wildfireflyer.htm and consider how this information is relevant to you and your community.



After reviewing the website, please complete the survey questions and add any comments in the space provided on the last page of the survey.

Here are definitions for some terms you will see in the survey:

Fire Fuels - Fire fuels are any materials, including living and dead vegetation, that can be ignited and burned.

Wildland Fire - Any nonstructural fire that occurs in forests, rangelands, grasslands, or other wildland setting (other than prescribed fire). When we refer to wildfires in this survey, we specifically mean fires in forests.

Prescribed Fire - Any fire ignited by land managers to meet specific forest resource management objectives.

Land Managers - Land managers are federal, state, or regional managers who to work to sustain the health, diversity and productivity of wildlands to meet ecological and public use objectives.

Click the button to continue after you have read the flyer.

Now that you have reviewed the flyer, please answer the following two questions about what you have just read. For the rest of the questions on this survey, please think about your involvement and experiences with wildfire preparation.

Q1) How many minutes did you take to read the flyer?

- less than 1 minute
- 1-2 minutes
- 3-5 minutes
- 5-10 minutes
- more than 10 minutes

Q2) Please describe any three thoughts that you had after reviewing the flyer about wildland fire risks and management ...

1)

2)

3)

For the rest of the questions on this survey, please think about your involvement and experiences with wildfire preparation.

Q3) How interested are you in the topics of wildland fire management?

Not at all interested Slightly interested Moderately interested Very interested Extremely interested

Q4) How knowledgeable are you about wildland fire management?

Not at all knowledgeable Slightly knowledgeable Moderately knowledgeable Very knowledgeable Extremely knowledgeable

Q5) How active or inactive are you in any efforts to reduce wildland fire risk in your community or neighborhood?

Extremely active Very active Somewhat active Seldom active Not at all active

Q6) Please consider risks that may be associated with a wildland fire near your community. For each item please indicate both how LIKELY and how SEVERE the impact would be. (Please answer both questions in each row.)

A wildland fire in or near my community would result in.....

	How LIKELY is this impact?			How SEVERE would this impact be?							
	Very Unlikely	Somewhat Unlikely	Neutral	Somewhat Likely	Very Likely	No Impact	Minimal	Slight	Moderate	Somewhat Severe	Very Severe
Loss of recreation and tourism opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative impact to my health from smoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Injury or death of wildlife in the area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Damage to my home or property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative impacts to scenery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q10) Please indicate your level of support for the following wildfire management actions:

	Strongly Support	Moderately Support	Weakly Support	Neutral	Weakly Oppose	Moderately Oppose	Strongly Oppose
Prescribed fire on public lands in my county.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Selective thinning on public lands in my county.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community education programs about family wildfire plans.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fire breaks around my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Livestock grazing on public lands to reduce fire fuels.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mandatory review of my community's Wildfire Protection Plan (CWPP) every 3 years.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Defensible space guidelines in my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mandatory defensible space ordinances in my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fire-safety building guidelines in my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mandatory fire-safety building ordinances in my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

To understand more about your community, we have a few questions about you.

Q11) What year were you born?

Click here to enter year (YYYY)

Q12) Please indicate the highest level of education that you have completed.

- Less than a high school degree
- High school degree or GED
- Some college or post high school training
- Two-year technical or associate degree
- Four-year college degree (BA/BS)
- Advanced degree (MS, JD, MD, Ph.D.)

Q13) Are you a permanent (year-round) or part-time resident in your community?

- Permanent (year-round)
- Part-time or seasonal

Q14) How many years have you lived in this community?

- Less than 1 year
- 1 - 5 years
- more than 5 years

Q15) How close is your property to the nearest forest?

- There is forest on my property
- Less than 1/2 mile
- Less than 1 mile
- Between 1-3 miles
- More than 3 miles

Q16) What is your zip code?

Q17) Is your employment or any source of income related to forests?

- Yes
- No

Q18) Please indicate the level of your current household income before taxes.

- Less than \$20,000 per year
- \$20,001 to \$40,000 per year
- \$40,001 to \$60,000 per year
- \$60,001 to \$80,000 per year
- \$80,001 to \$100,000 per year
- \$100,001 to \$120,000 per year
- more than \$120,000 per year

Q19) Are you male or female?

- Male
- Female

Q20) Please indicate your race/ethnicity below (you may select more than one).

- Black / African-American
- White / Caucasian
- Hispanic, Latino, or Spanish Origin
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Other Pacific Islander
- Other or Unknown

Q21) Please check the box that most accurately describes your political orientation on the following scale:

Very Liberal	Liberal	Moderately Liberal	Neither Liberal or Conservative	Moderately Conservative	Conservative	Very Conservative
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please use the space below to provide any additional concerns or comments regarding your options about wildland fire management, or comments related to any part of this survey

Did you find out about this survey through Amazon Mechanical Turk? If so, mark yes and enter the following code below into the HIT request field.

291623

- Yes
- No

APPENDIX H

IRB APPROVAL LETTER

University of Idaho**Office of Research Assurances****Institutional Review Board**PO Box 443010
Moscow ID 83844-3010

Phone: 208-885-6162

Fax: 208-885-5752

irb@uidaho.edu

August 14, 2012

To: Hall, Troy
Cc: Clark, MelissaFrom: Traci Craig, PhD
Chair, University of Idaho Institutional Review Board
University Research Office
Moscow, ID 83844-3010

Title: 'Effective Communication of Climate and Fire Projections'

Project: 12-232
Approved: 08/11/12
Expires: 08/10/13

On behalf of the Institutional Review Board at the University of Idaho, I am pleased to inform you that the protocol for the above-named research project is approved as offering no significant risk to human subjects.

This approval is valid for one year from the date of this memo. Should there be significant changes in the protocol for this project, it will be necessary for you to resubmit the protocol for review by the Committee.



Traci Craig

APPENDIX I

CODING GUIDE

Cognitive Depth and valence of thoughts

Code for the overall receptivity to the message (-2 to +2) by reading all three thoughts listed by each participant. The goal here is to determine if the participant was persuaded by the flyer. Did they accept the content of the flyer (+) or reject it (-)? When reading thoughts, consider if there is any indication they actually read the flyer. (This is particularly important for the Amazon Mechanical Turk sample because survey times were very short.)

A score of 0 indicates that the participant did not engage with the material or is ambivalent. A score of 1 indicates lower elaboration, while a code of 2 indicates higher elaboration. Use the code DK if there is not enough information to determine message receptivity.

Rule	Example
If all three thoughts are about the design and layout of the flyer, code DK.	1) Nice photos 2) long 3) The “15” looked weird NOTE: “good info”, “good stats, and “interesting” would be coded as positive thoughts because they are about content
If no thoughts suggest agreement or disagreement with the message, code DK. (This is usually listing topics)	1) Fire danger 2) bark beetles 3) development
If all thoughts are only a simple restatement of information, code +1.	1) Fire danger is increasing 2) Bark beetles are contributing to the problem 3) Increased development will put more people at risk
If thoughts are a combination of skepticism (-) and persuasion (+), the coder must weigh the thoughts to determine which code is appropriate. Thoughts with equal positive and negative reaction are offset and should be coded as 0. If two thoughts are negative and one thought is positive, then code -1.	1) It sounds like things are going to get a whole lot worse (+). 2) When I read things about ordinances I get a little nervous, simply because it sounds like something that can be done without as much care and thought as possible. I have had good experiences with ordinances... but also bad ones (-). 3) There really isn’t a whole lot (as in nothing) in here about fire ‘naturally’ – in terms of this being a component of ecosystems in general (-).
If the thought contains a strong emotional reaction, such as “I was shocked” or “I was amazed” or “I am terrified”, should be coded as either a -2 or +2. Determining the valence of the score will be indicated by the rest of the thought.	I was shocked to find out how many acres of forest had been affected by infestations. I am terrified my family is at risk.

<p>If the thoughts include the presence of related topics or personalization of the message, code as either – 2 or +2. These thoughts may also include references to prior experience and specific examples. If at least one thought must tie in with these larger ideas to be coded a -/+ 2.</p> <p>NOTE: If the thought includes comments about climate change or global warming code it a 2.</p>	<p>Example of motivation to act: This is really relevant to me and my home. I have to look into making sure my property is protected from these fires. (+2)</p> <p>Example of personal experience: I haven't seen evidence of there being less snow (-1 or -2)</p> <p>Examples of related topics: People need to be more careful in the woods to prevent as many forest fires as possible. (+2)</p> <p>I wonder how this will affect hunting and hiking opportunities and what local agencies will do. (+2)</p> <p>NOTE: Comments that are off topic are not coded as + or -.</p>
<p>If the thoughts contain questions, such as “Am I prepared?” and “What is a CWPP?”, this may indicate the code -1 or +1 is appropriate. This may also indicate a lack of previous experience or knowledge.</p>	<p>1) What is a CWPP? 2) Is my community prepared? 3) Am I prepared?</p>

Personally relevant elaborations

Code for the presence of personal experience or prior knowledge (y or n). This statement must show that the participant has thought about the issues before reading the flyer. This may be indicated the presence of specific terms not used in the flyer or comments about related issues, such as logging.

Examples:

- I have seen less snow in the last 5 years.
- I have worked...
- I have had good experiences and bad experiences...
- Why don't environmentalists want to allow harvesting of beetle killed trees?
- I knew this all already.
- We should use beetle kill trees.

APPENDIX J

THOUGHT LISTING RESPONSES

Sample 1 gain frame thought listing responses

Participant	THOU_1_TEXT	THOU_2_TEXT	THOU_3_TEXT
1	I was surprised to learn vegetation should be cleared 100 feet, we were always told 30 feet	interested in reading small snowpack in winter and heavy rains in spring made for more fires	agree with your management of the forests seems to make sense the thinner the area the less likely of fires
2	maybe limit the amount of building allowed, or have the cost of fire and fire suppression paid for by the people living in this area. most private property owners do not allow trespass		
3	It beats around the bush, rather than making a bold statement. Not everyone who reads the factors described will relate that to their home.	Why in 15 years? That dates the brochure.	One hundred feet! If I go 100' in any directions from my house I will be in someone else's lot. And one of those sides is a vacant field.
4	I believe that more than just selective cutting needs to be done. Clear cutting beetle infested areas should be done. Also, more heavy logging needs to be done in more prone fire areas.		
5	Possible climate changes	Population growth and its impact on wildfires	What the future holds or what the trends will be for my immediate future. What will my grand children face?
6	How will this affect my immediate future	What will be available for future generations	How much of this is based on scientific fact

7	important info	preparedness tips good	how will it be circulated
8	The information on the snow and rain forecasts.		
9	clear brush around home	managers can work to reduce risk of fires	
10	Increasing wildfires in the upcoming years is anticipated.	We can cope with the wildfires to come if we are better prepared and are allowed to do some preventative work.	Development, seasonal changes and insects are among the reasons for the prediction of increased wildfires.
11	My first thought was after seeing the picture of the beetle infested trees in British Columbia in the 1st column of the flyer, how similar it looked to a lot of the areas around my town of Salmon, Idaho.	My next thought was about a couple we met in June of 2012 who have a beautiful home on a beautiful tract of land on Hull Creek, a few miles north of North Fork, Idaho.	My third thought was about the rumors I heard about how the Mustang Complex fire grew to such a large size when it was (maybe not easily) but quite possible to have put it out the day after it started. Rumors were about fire managers letting it burn because it was in an area of beetle infestation and it would be a "good" thing for it to wipe out that area of infestation.
13	The design was attractive and bullet points were easy to quickly read and make sense of.	The expectations of future wildfire hit home and the approaches to reducing wildfire in and near communities are well presented.	Made me question whether the thinning and fuels reduction should occur primarily in a buffer zone around communities and critical watersheds. Large, stand-replacing burns are not all bad and beneficial to certain species of wildlife. The role of noxious weeds is not covered, but I realize this is a short bullet-point flyer.

12	I am glad you included tree thinning (Logging) The forest service seems to have forgotten logging, in their new "burn baby burn" philosophy. Fire has its place, but we don't have to have such catastrophic fires, if we thin the forests and utilize the resource before the beetles get it.	is there no spray that could be applied to stop or slow the beetles?	
14	Logging was not mentioned as a part of wildfire management. Loggers are invested in taking care of the forest rather than wasting it with fire.	Important information about protecting property (100 ft fuel free area) as major fire is considered a part of management.	Reactive management (CWPP) is greater than Pro-Active management. Evacuation and protection plans rather than forest management.
15	Agreed with insect and disease issue	Seemed like a stretch to suggest that there will be less snow in the fall and more rain in the spring in the future; In the 1990's we were going into a new ice age according to some.	Agreed that treatments may help, but I am worried that the scale of the treatments will not be nearly large enough to make more than a site specific difference.
16	Concise	major pts readily identified	easily understood
17	Bureaucratic language most likely reflective of bureaucratic mind-set.		
18	Increases in trees dying from bugs	changes in weather	need to control growth of building to close to the forest
19	Ok not to much material to absorb	How does this effect me and my property	
20	Obviously, the climate is changing	long fire seasons are here to stay	people need to avoid building in heavily forested areas adjacent to the national forests

21	Predictions about more wildland fires in the future is very likely.	Clearing a green space around the home is crucial.	Using thinning and prescribed burnings can directly reduce the hazard.
22	Why do we continue to let environmentalists limit attempts to maintain healthy forests through thinning, etc., which would dramatically reduce the risk of out-of-control fires?	Why can't environmentalists see the cause and affect of the policies that cause these extreme fires?	This is a well-designed, well-written flyer
23	REDUCE FLAMMABLE MATERIALS AROUND MY HOME	EVACUATIONS IN CASE OF FIRE	DOES MY COMMUNITY HAVE A PLAN
24	Very informative	Nothing on the causes of these expected future changes to wildfire behavior, frequency, or causes.	
25	Mostly common sense - The dead timber from insects and disease make excellent fodder for forest fires.	Housing developments stretching into timbered area increases the risk of forest fire causing housing loss and evacuation.	People need to learn to eliminate vegetation and trees at least 100 ft to prevent their houses from catching on fire.
26	Regulations should be proposed and enforced that would require new land purchases with intent to construct homes to adhere to the 100 ft clearance.	Prescribed burns should be increased.	Addition to question 1. Require sprinkler systems on forest side of property.
27	I was shocked to find out how many acres of forest had been affected by infestations and disease.	I was also shocked to find out that the weather patterns of lower snow fall and more rain had been going on for 30 years.	I realized that I didn't know if my town had a wild fire preparedness plan.
28	selective logging would be good for the forests	trust for those people trying to help the forests is low	Building homes in thickly forested areas is foolshand potentially

29	Important to thin trees and clear forest floors to prevent more fires and help eliminate insect infestation	Important to clear around homes in areas where there is a lot of forest. Also must clear roofs of needles etc.	costly to taxpayers. We have less snow that decreases moisture in forests - but no one can do anything about increasing snowfalls.
30	It made sense to me.	I agree with the suggestions	Local fire departments could distribute this and have it highlighted on local TV stations as a PSO
31	glad to see that the facts concerning weather changes acknowledged	also, facts regarding the benefits community preparedness are a step in the right direction	and reducing fuel on public lands close to homes, and around the homes themselves is a very important concept that needs to be adopted by those living close to the forest
32	I think those are good things to do.	I don't think it will help me much with the health problems it creates and increases for me.	all that can be done should be done because it is a serious problem.
33	The flyer is very attractive to look at.	The flyer is not directly cause and effect but problem solution. I like that!	Let's do something now.
34	fires are going to get worse	my friends that live in the woods better clear the trees out	Being a ham radio operator how can I help
35	Brochure s attractive	Mostly information I already knew	Wildfires are a nuisance
36	Most wildland fires are caused by nature and beyond our control	We can reduce the severity of these fires by severely restricting construction in the interface zones and by thinning.	All of these are beyond our control. However, there are some things we can do on our own to decrease our fire risk---primarily creating a zone around our homes that is free of potential fire materials.

37	Extremely high incidence of beetle killed trees is still increasing.	Encroachment into the interface area is stabilizing in our local area.	So-called fire fuel reductions are sadly coming up way short of any improvement here in the Bitterroot Valley.
38	nothing was said about the use of commercial logging as a tool for removing mature trees before beetle kill renders them useless		
39	The picture depicting "100 ft" clearance didn't look like it reflected the definition - which says "any" flammable or fuel that could burn - which would include those standing trees.	I questioned whether the global warming statement concerning fall snow and spring rains as "will" occur would be accepted by all populations.	I noted the website referral was to the Uof Idaho rather than a land management or state agency
40	Interesting	informative	concerned
41	There is much that can be done to ameliorate the devastating effects of wildfire.	I agree with selective thinning of dense forests but wonder how we can do it economically.	I do not know if Missoula has a CWPP. I have not seen or heard anything about it ib we do.
42	how do you assist your community in getting a firewise plan together?	Is it possible to get homeowners to give up their landscaping to be firewise?	How are we going to resolve the ongoing controversy about the value of "thinning" and the control of wildfires?
43	land managers and the general public are late addressing these issues	western forests need to be more actively manage	See above; management responsibilities must be returned to those trained in land management. There must also be more cooperative efforts between environmental groups and industries. The Montana Wilderness Assoc. and Sen. Jon Tester have shown the way.

44		Too many build homes in areas prone to fire.	Protection of homes in fire-dangerous areas is too expensive.	People are hesitant to clear fuels around their homes.
45		The conditions described are prevalent in my area	Why does less snow and more rain increase fire conditions	I think we are doing many of the things suggested
46		Re: beetles my understanding is that beetle-killed trees don't necessarily increase the risk/chance of fire placement of this section first seems to give it precedence rather than the REAL issues of why fire is increasing...	i take issue with carte blanc "thinning of forests to reduce fire risk"	generally a good flyer....perhaps more science-based info about fire increase with climate change (and perhaps without mentioning those words)
47		Public land managers don't manager for insect and fire and what little they do is way too little.	Due to rural development fires have increased in size as agencies spend too much time trying to protect structures instead of on initial attack.	As long as the government will step in and underwrite fire loses as they did in California rural fire plans will lag behind.
48				
50		management involves a combination of efforts from government, community, and me personally.	The comments about increasing snow vs rainfall required me to accept a scientific premise.	The beetle kill of trees is something that i have personally witnessed with alarm over the past years.
51		Forest fires are likely to get worse in the near future	Prescribed burns are an effective tool in fire management	Advanced preparation is essential
52		Do not know if where I reside has a wildfire protection plan.	Two hundred foot clearance around my home does not exist. Must get busy and do something about that.	P

53		The extent of one of the bug kill problems	That selective thinning has multiple benefits, i.e., slowing wildfire spread, insect infestation spread	That increases in risk can be mitigated by pro-active steps
54		using beetle kill trees	changing weather patterns	clearing fuels from structures
55		Not sure if our community has a "plan"	Clearing of "burnable refuse" around structures and in the forest is a doable act and probably necessary to our long term survival in this vegetative area.	I live in the city and our property probably has a lower risk of wild fire/
56		I didn't know that thirty years of weather changes had caused the current fire danger situation.	I need to get more informed on what my community has in place to handle protection from wildfires and public safety.	I'm need to measure out 100' around our buildings and make sure I'm doing everything I can to protect my home.

Sample 1 loss frame thought listing responses

Participant	THOU_1_TEXT	THOU_2_TEXT	THOU_3_TEXT
1	Flyer was informative - explain the risks clearly and need for action	I didn't see any contact information or where to go if one is concerned about these issues. Should be contacts or website showing if a community has an CWPP plan and if it does, it should be viewed. If there is not one, then website should urging individuals to contact their city or county councils or the forest service. / / On property, should show where an property owner should go to receive assistance or further help. This would apply to the other two subsections as well	I believe it would helpful if the forest service would have a website showing the forest, boundaries interfaces with community and private property, fire risks, condition of the forest etc, what management steps Forest Service will be taking to address this risk in the 30 years. This would allow property owners and concerned citizen to view the areas of risk, what is being done and how where they can go if there is an issue or they need help address their property concerns.
2	I did not know the future risk factors	I did not realize the impact of insects and disease in our forests	I already knew about clearing around homes.
3	Good message on less snow more rain and effects without mentioning "global warming" and spooking folks.	I liked having need for "prescribed burning" tool put out there as important	
4	The risks of wildfires will increase in the Northwest and place human habitation at risk.	Fires will be far more dangerous due to environmental shifts and stresses on the forests unless the fuel for such fires is reduced by selective harvesting and removal of underbrush.	Preventive intervention must begin now.
5	I thought the flyer was very concise and well thought out. It	I liked the fact that this flyer was targeted to our specific region.	I also liked the fact that this flyer hit on the three facts that concern,

	<p>hit the main ideas of the risks to our wild land areas. It was specific in its content, but not extremely wordy. Some informational materials can be so long that they tend to lose the intended audience quickly. In my opinion this flyer had the right amount of information coupled with visuals to keep the readers engaged.</p>	<p>Many times I see ads that are to general in their scope. For me at least this drove home the fact the Northern Rockies, where I live, are seriously at risk currently today and have an increased risk for future problems.</p>	<p>or should concern, all of us. Regional (public), the town or specific are i live in (community) and me personally (property).</p>
6	<p>Those who have property that could potentially be damaged by fire should have a plan</p> <p>Worked at lumber/plywood mill in MT for 14 yrs. Aware of the dangers if no thinning, prescribed burns, and the beetle kill.</p>	<p>Properly managed forests provide less fuel and decreases the chances of severe fires.</p> <p>People love the beautiful nature and want to live in it also. That is where the fire danger explodes. It makes it more difficult for the fire teams to help for safety concerns. North of Boise is a good example. It's like a city up on the hills before Idaho City, there's too much housing for the fire team to help protect and focus on the fire too.</p>	<p>I would like to think that science can find a better way to slow the infestations of pine beetles</p>
7		<p>When I read things about ordinances I get a little nervous, simply because it sounds like something that can be done without as much care and thought as possible. I have had good experiences with ordinances...but also bad ones.</p>	<p>Prescribed burns and thinning is a very important part of managing the forests and even the private lands need to do the same.</p>
8	<p>It sounds like things are going to get a whole lot worse in the "Fires in the Future" department</p>		<p>There really isn't a whole lot (as in nothing) in here about fire "naturally"- in terms of this being a component of ecosystems in general.</p>

9	At last someone is dealing with the effects of climate change in a predictive manner.	The observation of less fall snow & more spring rain matches my observations. / /	The oblivious development of land within fire prone areas by people accustomed to city services is a major problem that requires continues education.
10	Increasing fire danger due to GLOBAL WARMING	Increased fuels due environmental factors influenced by above	Increased exposure of property due to stupidity in development
11	I'm in favor of prescribed burning.	I need to make a wildland fire plan with my family for our own home.	I am not sure our community has a wildland fire plan in place.
13	The things discussed don't really apply to my property in Custer County.	We don't know for sure if the three things on the left sidebar will happen for sure. They are likely to happen, but not certain.	I didn't have strong disagreement with any of it.
12	We better find a solution to the "pine beetle" problem!	I hope the predictions on weather patterns are wrong.	
14	Well done	Unfortunately, statistics don't always work. There is something about shock value which helps engrave stats into peoples minds. Maybe bolder images, etc would help drive home the importance of what is being said	
15	Current trends indicate increased threat to Western forests by wildfires and insects in the next 20 years.	Selective thinning and prescribed burning are both methods that may alleviate some of the threat of catastrophic fires and beetle kill.	Homeowners, especially those living near public lands, should make sure their communities have an updated plan in place to address fire issues. All homeowners should keep fuel away from their homes by creating a 100 foot fuel-free area around their homes.
16	How to get public to recognize potential dangers,	Can't change mother nature. It is NOT global warming. Natural cycle of the earth. / Why else do we find dinosaurs in the north	Need to keep educating the public and land managers about fire prevention.

			pole and Antarctica?	
17	The need for increased timber sales of dead trees and perhaps better timber management of healthy trees.	The need in residences located in high risk fire areas to be made aware brush cleansing!	A more regular annual or semi-annual meeting of residences that are located in high risk fire areas to remind them of being prepared for fire!	
18	FIRST I thought - OH NO - here we go again with someone blaming Global Warming... and then I was pleasantly pleased that the flyer didn't revolve around that subject. (I guess that was my first thought while reading the flyer)	Secondly I though THANK GOD someone is considering doing a better job managing the forest (by removing beetle kills, underbrush, and other "high heat" fuels	Third I thought I sure hope they use local resources (in the name of jobs) for our surrounding communities... if you let the people work to clear the fuels it is killing two birds with one stone.	
19	Thinning of forests is required	Prescribed burns reduces the amount of burnable vegetation helping to limit the spreading of wildfires	Keeping burnable materials at least 100 feet from structures greatly helps protect homes endangered by wildfires	
20	We are going to continue having wild fires	We need to thin the forests by logging, including old growth and by prescribed burning	We need to get people building in the forests to make their homes more defensible without the tax payer having to do it for them.	
21	We need to prepare our house for a potential wildfire. I'm glad we have a lake in our front yard.	People are idiots for not doing more about global climate change.	Humans may not survive after the havoc we have wrought on our environment.	
22	There is no doubt fuel loadings are increasing at alarming rates.	If predictions are right many communities will be lost in major wildfires throughout the west.	I do not hear the emphasis about wildfire dangers until a major fire is burning and out of control near a community.	
23	I already knew this stuff	The issues behind wildfire risk are climate change, fuel treatments and fire exclusion		
24	It's all stuff that I've heard before.	Increased risk is due to climate change, increased development and fire exclusion.		

25	This is all stuff I've heard before	Driving issues in Wildfire risk are climate change, fuel management and fire exclusion	Preventative measures need to be taken to prevent bad outcomes
26	The risk of increased fire starts, density and duration is real I need to check with the local RFD about the availability of a wildfire management plan.	The urban/rural interface is increasing I recognize the danger large Ponderosa Pine trees on my lot impose. Removing them would significantly change property value and aesthetics. Ground fires could be controlled but a crown fire would be disastrous.	Removing trees from one lot significantly increases the wind throw of trees on other lots. I have personal experience with this problem.
27			
28	This is quick and easy to understand. It explains risks and remedies simply and made sense to me.	On some of the flyers I have seen they show a birds eye view of the house this circles around the show proper distance for fire fuels away from the house. that would be a better image.	
29	How important it is to be prepared and have your property properly cleaned of debris is case of a forest fire.	Why don't the environmentalists want to allow harvesting of beetle killed trees?	
30	Great risk	Need more active management of the risk	Summers of smoke will decimate the Northern Rockies economy and make living where we do less enjoyable.
31	There are no footnotes or 'proofs' offered to back up the statements; I would like to know 'what studies' when that argument is used as a statement of facts. There is a single 'for more information', but that isn't specific enough for me.	How would this flyer be Used and Distributed? As a marketer, I would rewrite using more persuasive language.	There is no 'call to action'... what outcome do you expect; how will you gauge response?
32	Clear explanation of problems & the effective fixes	Graphics correlate with problems & fixes	I think a flyer is very cost effective to get messages to the public

33	beetles, weather and urban sprawl are causing greater fire risk	must have vegetation cleared 100 feet from home to be safe	prescribe fire helps reduce wildland fires
34	I feel that prescribed burning is not as beneficial as logging	How do we know that the weather trend will continue?	Why do we not remove more trees via logging of the forestlands?
35	clear your land	life is a cycle...live with it	fires need to be put out before they become campaign fires which is not doable / with today's' Forest service mentality of let it burn baby!
36			
37	Bettle kill	weather changes	
38	It's a good idea to do prescribed burns in the wildlands adjacent to housing developments to decrease fuel loading.	Folks who live in the woods need to reduce fuel around their homes	Those who own homes in the woods should pay higher premiums for home-owners insurance if they do not reduce fuel around their homes.
39	I notice there is no reference to an organized timber harvest program. This is important for forest health. Helps control bug infestations and reduces fuel loading on the ground. Controlled burning mostly does more damage than improvement.		
40	All common sense things to do.		
41	Information that needs to be seen by more people.		
42	The flyer was easy to read, hence the short reading time. However, I then returned and read it more carefully (largely because it was part of this survey). In general, the flyer is well laid out. But the design, the data and the text will make any careful reader question some of the information, and that	The prominent use of "15" (size and color) suggests a list of 15 points, rather than an interval of time. The critic will also note that in 15 years, it will be 2027, not 2030. / 90% of homes are now at some risk, and development is expected to increase by 18%. People will	The "What could be done" section is written almost entirely in a negative way. Why? It is much better to state things in a positive way. Examples: Instead of "What could be done," use "What can be done." Instead of saying "if you don't clear flammable vegetation..." say "clear flammable

	may cause him to de-value the information. Please see points below.	tend to think $90\% + 18\% = 108\%$, which is impossible, therefore the data must be wrong. An 18% increase from 90% is 91.6%. It is clearly not appropriate to use this number, since it does not convey the importance of the problem. Should this be reworked for clarity?	vegetation..." The need to update a CWPP every three years is important, but how do readers find out about how to start a CWPP in the first place if their community does not already have one. / PLEASE NOTE: These comments may seem to be nitpicking, but are all meant to be constructive, assuming that a flyer like this will be used. My observations come from a lot of experience with professional writing and editing (though I am neither a professional writer nor an editor, but a retired physician and professor).
43	underbrush and bug killed trees need to be removed.		
44	First two items are a nice way of saying "welcome to climate change"	Land managers rely on political direction as much as scientific	Urban land use controls are now natural resource tools as much as rules for social interactions
45	Go to the root of the problem, remove the dead trees! They will not grow again!	Forests are a renewable resource, treat it like a garden. Remove the dead and burned. Replant. Clear cut diseased areas and replant.	Bring back responsible logging, put people to work back in the forests. Prevent a lot of fires from becoming catastrophic.
46	Very easy to read and understand	Content is relevant and accurate	Photos help tell the story
47	Will thinning reduce insect infestations?	The photo of the house looked like the trees were too close.	Will thinning of forests increase the roads to roadless / wilderness areas?
48	Clearing trees from within 100 ft of a house is not feasible /	Dryer winters and wetter springs was new information - but it has	The information was easily understood and well written

			held true the last few years	
50	lack of logging		wasted wood	
51	Arguments by Environmentalists to keep Forests "natural"	thought about global warming and it's effect on our forests	More publicity to keep people aware of the hazard.	Follow-up to assure plans are acted on.
52			thought about how home development into forest areas is getting "out of control" in some places	I need to clear more trees from around my lake lot on Little Bitterroot Lake
53		good information to have	having a community plan is unlikely to happen and unrealistic to think most communities will do one much less use it	seems the problems you raise are not really dealt with in your answers. As in, the severity of what we face will not be handled adequately.
54	I do see that there are more bugs(Pine Beetles), Probably because the Forest Service is slow to eradicate affected stands		there has been less snowfall in the last 5 years	
55	I understand some of the warning signs of fire danger.		/ Prescribed burning/thinning are useful tools.	Most people have an adverse opinion of any MANDATORY regulations of their personal property.
56	It looks like there will have to be more logging permits issued.		I think its time to get real serious about climate control.	If people are going build next to a forest, then there going to have to except some of the responsibility.
57	Expecting weather trends to continue in a specific direction (wetter springs and dryer falls) put me off a bit, I'm not sure how you can make those assumptions. I don't necessarily buy into those assumptions. Smacks of propaganda, embellishing in order		I agree that good forest management is critical to reducing future catastrophic wildfires. Reducing fuels is a large part of that. I think burning those fuels through prescribed burning is (potentially) the least expensive and most efficient way	I worry that ordinances or laws would be to invasive of peoples civil liberties. Initially those laws would be moderate like forcing you to rake leaves and needles and remove dead vegetation on your property; but eventually someone with a little power and the

	to push your agenda.	to do that; however as a forest resident the air pollution that is generated throughout the spring and fall from those burns plus the pollution from wildfires all summer is killing me and making my life miserable plus it adds to climate change; so technically it's probably killing us all slowly. Something worth considering is clean burning biomass with co-generation potential for the safe disposal of those fuels.	selfishness to want to force their will on others would make us cut down all the tree around our houses. Ordinances and laws can get out of control in a hurry, because there are always plenty of people out there that want to tell everyone else how to live.
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Sample 2 gain frame thought listing responses

Participant	THOU_1_TEXT	THOU_2_TEXT	THOU_3_TEXT
1	Clearing 100 feet of land would be difficult in this area.	We often have wild fire risks.	It has seemed to have gotten worse over time.
2	It's so saddening to see that something so preventable can destroy something so naturally beautiful.	If everyone contributes to the same preventable measures, maybe we won't have to worry about this happening anymore.	I'm concerned for the future of my family.
3	Less snow might be a bad thing.	Maintaining my property	Knowing what to do in case of insect bites
4	Although I d	How much of the increasing fire hazard is human caused or natural?	Is there any way of reversing this increase in fire hazard?
5	Informative about the wildfire and risks.	simple and entertaining.	Doesn't concern me that much.
6	I had none.		
7	I didn't know it would be that soon.	I had no idea increases in insects and disease meant there would be a higher number of dried out, dead trees creating fire fuels.	That's really a shame since nature is so important to this community.
8	climate change is accepted as a given	we are trying to prevent the spread of insects	controlled burns are used to contain fires
9	it is very important that we	the government should help out	we should all prepare for the

	contain this situation	with the wildfire	situation
10	I need to protect my home from wildfire.	I need to alert my neighbors about the risks.	I need to speak with community leaders about wildfire management.
11	I didn't know less know and more rain can cause forest fires	Dead insects can affect forest fires	That diseases can cause fires also
12	Increase in insects and diseased in 2030.	Clearing 100 of vegetation to prevent fire around home.	Less snow in 2030.
13	I wasn't aware that insects and diseases can contribute that heavily to the number of dead trees within a forested area. That came as a surprise.	Another surprise was discovering that a suggested method of protecting yourself	I also began wondering how communities are informed about their local Community Wildfire Protection Plans. Granted, I don't live in a heavily forested area, but I assumed that people living in more forested lands have some kind of meeting for these things
14	the changes the Rockies could face	the risks that people could face	the action which people can take to prevent it
15	This is personal to me, our home was close to a wildfire.	Reading this brings out questions in my mind on how cautious I personally am.	Reading this will cause me to discuss this with others.
16	Wildfires must be becoming more frequent in my area.	We should work on controlling the beetle population that is killing wildlife.	I don't understand why longer rainfall in Spring creates more danger for fires.

17	That my home is not on a danger area.	Emergency planning is always a good idea.	The pine beetle is a terrible bug.
18	I wish there were some sources to back up claims.	I always wonder about controlled fires (prescribed fires) that could get out of control.	I wonder how this affects me if I live in a more urban area.
19	Never new fire was that destructible	Land manager-never heard of, interesting.	fire fuels is anything that is easily ignitable
20	Fires can have very serious results.	An increase in bugs, would mean many trees would die.	People should be more prepared for wildfires.
21	As a resident of Wyoming Pine Beetle kill is a problem we face every day, it is scary to know that it will continue to grow.	It made me think back to a bike ride I took earlier this fall where I surveyed the damage of the High Park fire just north of Fort Collins, Colorado and how fires ravaged the area earlier this year.	Confirmed what I already was thinking about the dangers of development in fire prone areas
22	Its only going to get worse.	I wish there was a way to get through to people that they need to keep their property cleared, but they just don't care.	It's going to be awful.
23	It is a greater risk to us because of the amount of homes, bugs, and less snow	I was wondering how I can help and what I can do from my home	I knew that we are more likely to have a forest first but didn't really know why.
24	If the flyer is correct there is an increasing risk of wildfires in	We need more snow to shorten fire	Clearing 100 feet of flammable brush will be difficult and expensive

	the Pacific Northwest.	seasons.	for some people.
25	Climate change must be at fault for increased wildfire risks in the future.	This is very worrying.	I wonder what will become of us.
26	Wildfires are necessary but scary	What are our evacuation plans?	I need to clear vegetation to protect my home
27	I recalled a story I heard last summer about a man who had cleared the land around his home before the fire in Colorado, and that had saved his home.	I wondered how many people work on things like prescribed fires.	I wondered who dictates where prescribed fires occur.
28	The trend concerning snowfall and rain is concerning not only in terms of wildfire, but also global warming in general.	I had not previously realized that mountain pine beetles were so hugely detrimental to our forests.	I was unaware that many neighborhoods had such groups; I will be checking with my neighbors soon
29			
30	unaware of insect threat	not surprised that people want to build here but am surprised the risk is so high - 90%	
31	It's sad to think that there are going to be more diseases and insects killing the wildlife.	I would like to do my part and remove vegetation from around my house in order to prevent wildfires.	It's a shame to think that there is going to be less water in the mountains leading to dry trees and making it easier for fires to start.

32	Scary!	Eww more bugs	that's a lot of homes in danger
33	wildlife is important	wildlife is at risk	fire is a great risk factor
34	We need to get off fossil fuels	I am at risk	This is a major issue in the future
35	We most get off fossil fuels	We need to stop developing in the Rockies	My property is at Risk
36	I wish there was more I could do about it.	I'm concerned about building up on that land.	Glad I live in an apartment building, which is just ecologically better anyway, so I don't have to clear flammable materials.
37	Interesting information.	Good wildfire preparedness.	Good statistics.
38	Feel it expresses the information well	Mixture of pictures and text is good	Could put some contact info in the flyer
39	90% of homes near public areas are at high risk of wildfire damage.	CWPP are more prepared for wildfires.	AN increase to diseases and insects lead to more dead trees
40	risk management practices by Forest Service employees and organizations of Forest Service employees.	Improve employee performance and safety through information transfer	Risk Management at all organizational levels
41	How does this benefit the wildlife?	How does this benefit People?	What will happen if we don't have controlled fires?

42	Fires have good and bad consequences	Fires may be helpful and/or harmful to the environment	In the next 15 years the N. Rockies will have an increase in wild fire risks.
43	More rain in the spring and less snow in the fall means longer fires	Clearing 100 ft of vegetation will make it safer.	Look for a CWPP in my city.
44	These seem like obvious steps to take	I wonder how many people will actually take these precautions	Will doing these things actually help prevent fires?
45	If we know the risk of fire will increase why are states allowing increased housing development in these areas?	The increasing threat of fire seem severe, but I don't feel confident in the solutions offered by the flyer.	Not sure that it will be possible
46	wildland fire risks will make more fuel	wildland fire risks and management will help your neighbor get more safety	The Community Wildfire Protection Plan is a great organization.
47	I wonder if it was really true about the ice melting and thought about Glaciers.	I did know how helpful it is to clear vegetation 100 feet away.	There really is not a lot of community awareness and there needs to be more.
48	Its depressing to hear that there is a huge increase in development and thus a decrease in wildlife.	It's sad to think that there are more diseases and insects around that are causing the forests and vegetation to die.	I would like to do my part to help protect the environment because I feel like even doing a small part could make a difference.
50	measures to be taken to reduce fire fuel by reducing vegetation	residents of risk area should be prepared for short notice	or should be ready with equipment if not ready to evacuate.

			evacuation.		
51	Information is condensed		Would like more information		Nothing new here
52	seems logical		fits along with other information I've been fed		it is a major concern
53	I had no idea these changes were happening.		I wasn't aware we should prepare for and increase in fires now.		
54	If they get rid of all the trees how are they going to have oxygen?		Why don't they build water towers close to where they know there's going to be fires?		Why don't they survey then land for fires before building on the land?
55	I seriously feel we should follow the guidelines as per flyer		It is sad that we are using natural resources without any give back		We must do anything to stop wildland fire risk
56	It's an ongoing issue		It's not new		Sometimes wildfire management is half-assed. For instance, some goofy specialist in the field did a control burn on a red flag day a couple three years ago. It got out of control and did damage.
57	Cant believe they will build houses in high risk fire zone		i could not live in a house like that if i knew there is a high risk that my house could catch on fire		i wonder if houses in high risk fire area are cheaper
58	Much more could be done to prevent wildfire.		Development near public land poses a huge wildfire risk.		Many homes in my area have brush closer than 100 feet.

59	I live in the middle of the woods, so this is relevant information.	I wonder if our town (being surrounded by forest) has a CWPPP?	There's a lot more vegetation than you think in that 100 feet around your house!
60	THAT IT GIVES GOOD ADVICE	IT POINTS OUT THAT SOMETIMES EVACUATION MAY *NOT* ALWAYS BE POSSIBLE WHICH IS HARD TO IMAGINE	DIRECTS CLEARING AROUND HOUSES WHICH MAY NOT APPLY TO THE SUBURBS
61	I think its sad how the Rockies will be experiencing more diseases, fires and less snow	Increased development= less forest, beauty and wild animals	It does seem odd to start fires (controlled) to prevent them
62	Risks are increasing.	Planning must be made in advance to ensure swift evacuation if the case / ensure supplies in case evacuation is not possible/wanted.	Certain measures may be taken in order to reduce risks as regards home safety (clear vegetation round the house).
63	The risks involved	The Rockies risk of fires	
64	This explains what we've seen in Washington state over the past few years - more fires and worse fires.	Not sure I like thinning forests, but probably a good idea.	Global warming is going to have major impacts.
65	I'm going to look into whether my community has a Community Wildfire Protection Plan.	I now have a strong dislike for the Mountain Pine beetle.	I'm going to talk to family members that live in wooded areas to make sure they're aware of the threats of wildfires and measures to prevent

				damage to their property.
66	It is good to raise awareness about wildfires.	I should make sure that my house has vegetation cleared away from it.	The Rockies will likely see more wildfires in the near future.	
67	Global warming also increases chances of wildfires	Clearing the area 100 feet around my home will increase safety	there are community organizations to help with fire maintenance	
68	Living in Montana I see the affect beetle kill has on our forests every single day so this hits close to home.	I love being out in nature and seeing the numbers on how fire danger could increase in the years to come if we don't do something is saddening.	I'm glad to see University of Idaho, my alma mater, is studying and researching this issue to see what fire management tactics are taking place around the region and what else we can do to protect the Northern Rockies.	
69	"Wow, I had no idea our 30 year forecast looked so grim"	"My state will burn."	"At least, we have people working the prob."	
70	The climate changing may be affecting the increase in fires	I wonder if my community have a wildfire protection plan	what steps are effective to take in my community and at my home	
71	Where I live forest fires are not common, so it is a rather stark reminder that they affect so many people every year	It is not surprising that fires will continue to become more common in the coming years, as climate change has already had dramatic effects on the dryness of other areas around the world	I have never heard of prescribed fires before	
72	Good work! It is difficult to	The pictures are very effective.	Over all, layout is clear and easy to	

	keep flyers interesting and informative, but you succeeded!		follow
73	Provides sound advice for prevention of fire damage to home and property	Show how very real threat wildfires are to our local ecology	Show how planning now can prevent disaster later
74	could be laid out better	more info, less big text	it's alright, doesn't grab me.
75	Long	Not enough information	Not detailed
76	clearing all dead vegetation and trees on my property at least 100 feet from home	preparing for emergency evacuation	worried about reduced snowfall and lightning strikes causing fires
77	The thought of clearing 100 feet of area around my home intrigued me. I would have never thought to do so.	Prescribed burning is familiar to me and thinking that the public and select homeowners should get behind the fire departments wanting to do so.	Thinking that there would be less snow in the mountains does not seem accurate to me. But with select studies I guess I can see it being true.
78	Is there any subsidy for clearing vegetation around your home? (i.e. hiring tree-cutters for dead trees)	What goes into a wildfire plan?	What do mountain pine beetles look like?
79	less winter snow and more spring rain increase fire risk	development of property creates risk to personal property	insect and disease lead to increased fire risk
80	i like this	i will do this	i also can try

81	Seems like a good idea.	Probably should find out if my area has a cwpp	Probably should clear out the excessive vegetation from around my house.
82	how close to live near the trees	how often do wildfires occur	what will make the wildfires increase
83	nothing really.	i don't know.	barely paid attention.
84	The changes are quite drastic	I don't want wildfires in Washington again this summer, the air quality was really bad	I like the section on what could be done.
85	informative	helpful	good to know information
86	They still haven't learned from Yellowstone. Stop putting out every natural fire that occurs from lightning and you won't have a catastrophic buildup of underbrush.	I looked out my window to see how much vegetation is in our yard.	I thought about our evacuation plans.
87	I'm worried about preserving the mountains I like to hike in.	The mountain pine beetle has destroyed a lot of trees on my moms property and I'm not worried that they are a fire hazard	
88	Fire Bad	Lots of houses and families in danger	More bugs and disease for trees will also add more bugs and disease to humans

89	Good ideas for what people can do.	Need more studies.	Need to show more problems of fire.
90	The trend of more rain in the Spring and less snow in Fall was surprising and enlightening. I learned something!	The flyer is VERY well designed.	The flyer relates it's message to its intended audience quickly.
91	scary	interesting	scary
92	I know people who lost their homes due to wildfire.	Would thinning really be effective against the pine beetle?	Wildfire must be a really serious problem
93	Most people don't know about clearing a hundred feet of fuel around their house	A lot of people I know don't like the thinning of trees	Prescribed fires have always caused a big argument among people I know
94	none	none	none
95	HOW TO ACT IN CASE OF A WILDFIRE AND THE SEVERITY OF LIVING IN A PLACE THAT IS PRONE TO WILDFIRE	WILDFIRE MANAGEMENT AND HOW TO ENACT IN CASE OF ONE.	THE DESTRUCTION A WILDFIRE CAUSES TO MAN AND NATURE
96	I thought about my own home. We live out in the country.	I thought about how the weather patterns are getting increasingly extreme.	I wondered if we had a CWPP in our area. I really don't know
97	many more mosquitoes to come	my community is not protected	I need to secure my home

		enough	
98	I don't have any land, so I can't clear it.	I don't smoke, so i can't start a fire.	Too bad about the no snow.
99	Scary that the fall snow fall is expected to remain scant.	Thinning trees is a good idea.	Setting up an evacuation plan prior to a fire is smart thinking.
100	Gave helpful information about how to help prevent spread of wildfire.	Interesting information about what officials are doing to prepare.	Nice to know what has increased risk of wildfires recently.
101	fire risks are increasing	it's unwise that people are building so close to wildlands	community agencies can help with planning to decrease fire damage
102	My mother occasionally helps fight forest fires as part of the National Guard Army.	I have not performed a fire eating dance routine in a while.	I miss playing with fire. :(
103	Fires are more dangerous than I had previously thought.	Fires are more common than I had thought.	Fires are preventable if people took more time to be safe.
104	The environment is changing	Man is destroying the land	The amount of snow will decrease.
105	This is terrible. Signs of global warming everywhere.	These precautions seem reasonable.	I don't know if my community has a CWPP.
106	This flyer served it's purpose in being informative.	This flyer had a couple of things on it that wouldn't really aid in reducing fires.	It didn't really have much that the individual could do as far as safety goes if a fire occurred.
107	I'm glad I live in the city.	How would thinning trees by	I don't think my central Great Falls

			lumbering be different than thinning trees with proscribed fire? Which is more effective? Which is more cost effective?	neighborhood has an evacuation plan. :-)
108	I was surprised that there is a prediction that wildfires will increase in the next 15 years	I thought that the flyer was well laid out	I felt that the information presented was just enough to get information across but also enough where I want to know more	
109	I don't know	very worry	this is very danger	
110	People should have more access to the flyer.	implementing a plan for forest fires is a good idea.	Basic knowledge of fire	
111	It was short and easy to read	Straightforward	Made me more aware of the dangers of fire	
112	90 % of houses already at risk is a lot	People that build their houses near the forest should have to pay the cost of fire fighting, not the federal government	The federal government must spend a lot of money on fire fighting	
113	These seem reasonable	This seems targeted at more rural residents	I wonder how recently my city has reviewed their plan of action	
114	hmmhmer, I live in Eastern WA...does "Northern Rockies" include my area. Aha, well, these are statements relevant anywhere	Actually, this looks like an excellent flyer.		

Participant	THOU_1_TEXT	THOU_2_TEXT	THOU_3_TEXT
1	What could be done section was good	statistics were for informational	enlarge pictures on left and make pictures on right smaller
2	Risk of wildfires is going to increase over the next 10 years.	You are more likely to be impacted by wildfires if you don't have a plan.	Communities need to have a wildfire protection plan.
3	I just read an article regarding the Mustang Complex Fire that brought into question the need and effectiveness of prescribed burning and thinning programs versus allowing wildfire to take it's natural course. This flyer seems to be in conflict with that assessment.	A coordinated effort to educate regarding clearances could be as effective as an ordinance.	I do not know whether my community has a current plan in place and I should find out.
4	Maybe global warming is real.	The West is going to be wiped out by forest fires.	Better move somewhere else.
5	The risk of wildfires is increasing.	The potential cost of wildfires is increasing as property is built in areas where wildfires can happen.	There is more that can be done to mitigate wildfire risks.
6	The risk of wildfires is increasing.	The cost of wildfires due to more houses being built near forests is increasing.	There is more that can be done to mitigate wildfire risk.

7	People need to be more careful in the woods to prevent as many forest fires as possible.	There are new increased risks due to climate changes like tree eating beetles that will cause more dry dead trees.	Burning brush when permitted is a good idea because lightning can strike your brush and cause a fire.
8	It's irrelevant if you live in a suburban setting.	I never thought a trend in dead trees would develop.	I wonder how this will affect hunting and hiking opportunities and what local agencies will do.
9	Will there be a fire near me?	Is my city prepared?	Am I prepared?
10	I have not seen a confirmation of diminished snowfall in the mountains.	I hate to think of the wildfires being worse in the future.	With the knowledge that wildfires will become worse in the future, I hope our state and federal government take the necessary steps to save the wilderness lands.
11	Thought the flyer was very informational	Some terminology needed further explanation for me.	The flyer perked my interest enough that I would read more and continue to the website for more information
12	There are a lot of properties that I have seen that do not take many of these precautions.	The changes that are described seem very drastic and may be exaggerated a little bit to prove their point.	This is very relevant to me and my home here in Montana and that I have to look into making sure that my property is protected from these fires.
13	The technology improves daily		
14	I'm not particularly fearful of wildfires because they are natural, and in the long run,	I appreciate these preventative measures, but I'm suspicious of their practical application	It's important to protect the housing

	healthy for the forest			
15	didn't like the wording on the parts about what can be done. Used negatives like don't and won't too frequently instead of emphasizing what should and can be done	Considered the impact to my community which is a rural area that could be impacted greatly by a fire.	Skeptical thoughts about whether we can really predict the next 15-20 years of weather.	
16	This will affect lots of people in the coming years.	Does the increase in insects cause the trees to die because the insects start to live and/or eat the tree?	What can I do to prevent fires?	
17	I am afraid of fire	people better be careful.	It is not funny.	
18	Wildland fire risks and management are closely tied to environmental changes.	Wildland fire management requires preparedness and actions on the part of individuals, communities, and governmental officials.	Risks for wildland fire can be reduced with appropriate actions from individuals and communities.	
19	Interesting that they had problems on one side and what needs to be done or should be done on the other.	I didn't know that there will be less snow.	Clearing flammable materials from around my house can be beneficial.	
20	Wildfires can cause so much damage to areas that have less snow fall and more rain fall.	People need to vacate flammable vegetation from there homes and the woods to decrease fires.	Fires are very common and are getting higher in ratings each year.	
21	concerns about land development near public lands	want to make sure we have a barrier around our house	photos go well with the description	

22	The retirement house my parents are building is definitely at risk from a fire.	Pullman is pretty safe from wild fires.	I didn't know you had to clear trees with in a 100 ft radius of the home.
23	In the right hand section last paragraph, it mentions people who choose not to evacuate. It makes me wonder why one would choose not to evacuate if needed?	Why are the weather patterns changing?	What exactly is a CWPP? What does it do? How does one abide by it?
24	The risks are higher than I imagined	Crazy to think insets will be increased	Good to have management so all the land isn't destroyed
25	Climate change is a major factor in fire frequency and severity. Thus, addressing climate change is critical for addressing wildfires.	A variety of individuals and groups must work together to reduce the risks of wildland fires- individuals, private and public organizations, government, etc.	Wildland fires threaten our local ecosystems and work hand-in-hand with other threats such as drought, pine beetle infestations, etc.
26	Limited applicability, given I live in a suburban area	I did not know about the increases in bugs & diseases, will think about.	Less snow is good.
27	My first thought was global warming..	I never realized how the bugs where destroying the forest.	I have to be more prepared about wild fires.
28	they may not effect the wild land in 15 years	They will effect the wildland within 15 years	increased development is not possible..due to pollution there may be decrease in development.
29	I am concerned about the damage of trees from pine beetles.	Increased fires may cause an imbalance in the forest environment.	I hope people choose to have fire insurance for their homes.

30	We have had lots of fires lately	The second page is poorly written	The flyer is so negative
31	my home is in the trees somewhat so my first thought is how much vegetation is around the house and how close is it to our log home.	I see prescribed fires all the time up here in glacier county and I agree with them.	Considering how much acreage we have up here that is still here from the red eagle fire which is great kindling for wildfires I am surprised we haven't had another fire yet.
32	insects killing trees and creating more fire fuel	What potential fire fuels do i have surrounding my own property.	the changes in the seasons is affecting the potential for fire danger.
33	Wildfires are only going to get worse in this area over the next 10 years.	I hadn't before realized there were methods to prevent as many wildfires.	There are things I can do at my own home to help reduce the risk.
34	This seems critical.	I have been through huge fires and think this is important.	"Fahrenheit 451" came to mind.
35	if managers do not take action to reduce fire fuels, wildfire risk will not be reduce.	Communities without a Community wildfire risk protections plan are less prepared for wildfires.	we need to do something before the fire can destroy all the mountains
36	At first I thought it was written by a logging company in an attempt to show how they help the environment.	Some of the wording seemed to be weird.	I thought about if it was true or not.
37	Thinning is a must.	Insects cause fire fuel by killing trees.	Clear vegetation at your home for protection from fires.
38	The dead trees and underbrush needs to be cleared out	People must clear out any flammable brush within 100 feet of	Communities must get together to lessen the damage caused by these

	throughout the woods	their property /	wildfires
39	I wanted to know if my city had a CW/PP and where to find this info out.	I thought about my house and getting the vegetation cleared	I was sad, it seems like the Rockies will be losing most of the trees within the next 30 years.
40	the problem is complex	we can do more to prevent them	by 2030 the situation will worsen considerably
41	high risk	more fire	more damage to life
42	The "What Could be Done" section should have been written in the positive instead of the negative. It would make more sense, be easier to read and understand would create more of a call to action.		
43	Things are getting worse	Why do people live so close to high danger areas?	I wonder what the chances are for this happening in my area?
44	how much does it cost to stop the average wild fire.	How much do they pay there employees	is it cheaper for emates to stop wild fires
45	The layout and presentation was clear,	The information was helpful.	The information was interesting.
46	Many people in the WA area have fire hazards around their homes with out probably being aware of it.	Because of how much it rains in Western Washington, people probably don't think about fire risks, or a future with less rain/snow.	The area keeps growing and more development keeps coming in, therefore fire hazardous areas are more likely to damage more and more property.

47	Well designed	Informative	I should prepare for a wildfire
48	Grass is easily flammable	The smoke must hurt alot of people and cause alot of health issues	They manage fires really good
49	I know it has to be done, but I hate the idea of cutting down trees	I think people living in fire zones should have to take more precautions	More education is needed on this subject
50	That I live in an apartment complex so I wouldn't know how to go about thinning brush in the surrounding area without getting into trouble.	That the information otherwise seemed helpful and informative.	I have slight worries about a prescribed fire getting accidentally out of control.
51	It depressed me that there is a threat to the forest	Is there any way to reduce the amount of beetles	What can I do about it
52	I was unaware that fire risk was gradually increasing	Didn't know that less snow in winter and more rain in Spring had the effect of increased wildfires	I'm not sure if our town has a CWPP
53	The Rockies are very vulnerable.	We can all help.	Wildfires are very important
54	this is more serious than i thought	i wonder if officials around me are concerned about it	i think there's flammable stuff within 100ft of my home
55	That man kind is going to be his own downfall.	Because of man made issues such as over utilization of land and water resources man is the cause of increased wild fires	it would be beneficial to people if they moved away from the wilderness and allowed the forests their own space to grow and thrive.

56	<p>fear that I'm going to one day go through a wild fire</p>	<p>after reading i felt a little more peace of mind that i knew more about wild fires and what we can do to reduce them</p>	<p>I did not know that some insects can lead to death of trees</p>
57	<p>I thought that the part about there being less snow in the fall is very true.</p>	<p>I felt like it made a good point about people needing to take action when it comes to wildfire prevention.</p>	<p>I thought that they are probably right about the risk of wildfires in the next 15 years, as there seems to be more and more wildfires every year.</p>
58	<p>A lot of homes are at risk for fire damage.</p>	<p>I need to think more carefully about where I live,</p>	<p>Managers need to be more carefully and aware.</p>
59	<p>kike it</p>	<p>found useful</p>	<p>short and sweet</p>
60	<p>Wow I don't want there to be less snow!!</p>	<p>I didn't know such small little bugs can have such a big effect!</p>	<p>I need to have an evacuation plan!!</p>
61	<p>I was reminded of wild fire facts I have known for years but don't often think about. Wildland fires are part of the natural cycle. The fires decrease insects and disease rates. Underbrush buildup is a result of fire suppression.</p>	<p>The longer wild fires are suppressed the greater the risk of a huge catastrophic fire.</p>	<p>People know that building homes in high risk areas is high risk behavior.</p>
62	<p>won't fires among home become increasingly common as we develop into forest land?</p>	<p>Are there any natural predators for the pine beetle?</p>	<p>What can I do?</p>
63	<p>Everyone is responsible to</p>	<p>Preparedness and education on the</p>	<p>It could be prevented or at least</p>

	prevent such a disaster.	issue is important.	contained.
64	I need to make sure that my land is cleared of fire fuels.	People keep moving closer and closer to the near public lands and increasing the amount of damage that can be caused to their homes.	I didn't know that the less snowfall had such a big impact on the fire season.
65	We must begin to prepare ourselves for evacuation, in case of a huge fire	the increase in dead foliage will create full for fires	due to our expansion we will be more prone to danger in the increase of fire risks
66	I thought I should make sure I have good fire insurance.	I was really interested in what I could do in the case of fire and wanted more information about that.	I wondered if my area had a Community Wildfire Protection Plan.
67	I thought about conversations that I've had with coworkers about insect invasions in forests around me, I hadn't made their connection to wildfires until I read this flyer.	I recalled smoke that we had around my city about a month ago from close wild fires	While I live inside the city, I have friends and coworkers who have land outside town and I thought about what steps they may have taken to protect their property
68	This seems a big long.	Is there a way to make it more understandable.	The information is good but way to complicated.
69	It was brief, but informative.	It was well organized visually for readability.	In the "In your community" section, it mentions the "Community Wildfire Protection Plan", motivating action locally. In the "On your property" section, it talks about preparations that are more individual and personal. Since I live

				in a neighborhood in a city, though close to wildfire areas, my property is not adjoining forested land. It does, however get me thinking about what other things I need to be prepared for.
70	Climate change is increasing the danger of fire.	The need to clear fire fuel away from the house is critical.	There are "land management" people concerned and working on the fire problem.	
71	I remembered how Boysen Reservoir dried up in my Mom's hometown of Riverton, Wyo.	I was thankful to be living in the Olympics instead of the Rockies.	I thought about how dangerous dust is to snow.	
72	The world is going down			
73	I feel like wildland fired will increase	I hope my community is updated on safety information	I am concerned about increase in disease	
74	The flier is organized and easy to read.	Fire safety is important.	How at risk of a fire is my area?	
75	I was not aware that insects and diseases lead to increased risk.	Residential development is increasing the risk.	I want to clear flammable vegetation near my home.	
76	What risks are associated with fire	Who will help control the fires	What chemicals are being used on the fires.	
77	I agree with all of them. I have lived in the Mountainous	Prescribed burns work! We should do more of these	If people do not protect their property they should not be covered	

		parts of Montana for the last 8 years and have seen this all firsthand.		by insurance.
78	More people should read this.	Although I feel more people should read this. I don't think this will benefit me in the future.	I wonder who I know, would find this interesting.	
79	what is a pine beetle?	how does spring rain affect wild fire	we should stop building near public lands	
80	Does my community have a wildfire plan at all or an updated wildfire plan?	Am I prepared?	What is the likely hood that a wildfire could happen where I live?	
81	I did not know that "less snow in the fall and more rain in the spring" means a longer fire season...this is a pattern of weather I have been noticing lately in Washington	The flyer made me a bit anxious about future wildfires	This makes me think of other natural disasters that will increase due to climate change and population increase	
82	I know people who live in areas of dense wilderness. It makes me think they should do more to prepare (clearing 100 feet around their homes).	I didn't know there had been that much less snow for that many years. It makes sense why more wild fires have started.	I did not know that insects were such a large problem in the fight against wild fires.	
83				
84	I'm glad I live in Seattle	Our world is falling apart.	Nature is more powerful than man.	

85	I wondered how Montana would be affected by the change in weather.	I don't like pine beetles destroying the forests.	It seems like common sense to keep high hazards away from homes.
86	My home isn't clear of flammable stuff within 100 ft	we don't see many serious wild fires around here	If an evacuation was order would we stay or go?
87	I see beetle kill every single day in the forests around where I live so that hit close to home for me.	I love spending time in the woods and to see what happens with wildfires and how they can start so easily if the proper procedures aren't taken is saddening.	It's great to see that U of Idaho, my alma mater, is researching this and how we can reduce danger with these wildfires
88	This is very informative	It is just descriptive enough to keep the reader interested and get them some basic facts.	We should make a much moreconcerted effort to try and avoid wildfires.
89	It was informative and did execute the seriousness of preparing for a wild fire.		
90	I like that there is information about the future that will be handy for fire prevention, like the increase in diseases and insects	It's attractive but there might be too much text to hold the reader's attention	The pictures on the future side are so small, they might not even be worth having
91	it sounds like hard work	i am a little scared	wonder how much taxes it costs
92	I did not know that the insect life could affect wildfires in such a negative way.	It's good to know that you should have a plan for evacuation if you live in a forested area and that a	The decreasing snow and rain negatively affects forest life and increases the season of wildfires in

			cleared radius of 100 feet can help increase the amount of time you have to prepare.	the areas affected by wildfires.
93	The Rockies are in for tough times.		People should do more to be aware of the conditions coming.	Properties being constructed should be built away from these risk zones.
94	Dry trees due to less water intake will increase wildfires.		There are already insects en masse that kill trees making them vulnerable to fire fuel.	Moving and clearing away vegetation that could be flammable 100 feet around a home could be the difference between keeping your home and letting it burn.
95	I had never heard of a CWPP before and I wonder if there is one in my community and if so how current it is.		I didn't realize how great the Pine Beetle concern was.	I will be keeping my property clear of any type of fire fuel.
96	I may need to rethink moving closer to state lands.		That explains all the burnt trees I have seen along the highways.	I need to come up with a wildfire plan.
97	The left side is good information about the 3 dangers facing the Northern Rockies		I am not a fan of brush clearing because it is not natural unless it is near a home	It is a good idea to have a community fire plan
98	I am concerned about the number of risks my area has for wild fire.		I thought it was more rainy and less snowy, I guess that's true.	I am concerned about friends and neighbors with underbrush lying all around their properties.
99	I am concerned. I had intended within the next year to move out of the suburbs into more		I was amazed how much insects have an effect on wild fires	I wasn't completely surprised about what I read

	rural parts. Now I have something to consider.			
100	My family is not prepared in the case of a wildfire.	The national forest land near my parents home is a prime area for a wildfire to start.	I have seen evidence of the changes mentioned.	
101	good information	This is kind of scary	I probably won't have to deal with this	
102	interesting	wildlife is very active	wildfires are prevalent in and out	
103	makes sense	nothing about climate change	lots of people won't comply	
104	The sideways "In" and yellow "15" in the title was distracting. If you want to get people's attention, put text in italics, to show motion (like Nascar numbers). Also, I think that "Within 15 years" would be more motivational, because it conveys more sense of urgency.	Really liked the property breakdown on the right into three areas: public, community and personal. I think that the words "clear these!" at the bottom of the log cabin picture with large arrows pointing to the trees near the log cabin would have more impact than a non-annotated picture.	Finally, I had to really scrutinize the top photo of the firefighter to determine whether or not HE was on fire, because it's an optical illusion, at least to me. The fire line of the field just happens to coincide with the physical outline of the left side of his body. A photo of a person facing the fire while starting the prescribed burn would be more clear.	
105	My first thought was why would disease and insect numbers increase?	I'm surprised that certain vegetation is considered flammable.	I would assume the decrease in snow fall would have to do with the current climate change that is associated with global warming.	

106	It revealed a lot of things I didn't know like how to make fire breaks.			
107	I find it interesting how the changes in the environment are a contributing factor	Individuals could really help lessen the threat of fires	Urban sprawl is another factor with fires	
108				
109	Why is it necessary to manage the natural fires.	Why is it significant you prescribe fires.		
110	I am thankful not to personally live an area of town that would be susceptible to wildfires or require management to prevent them.	Having seen some of the pine beetle impact, it makes much sense that curbing that in any way possible would be a priority.	I've witnessed the lengthening fire season and experienced the effects in town of an extended summer of wildfires in the region. I know people whose property in and near the mountains has been impacted by wildfires and believe strongly in requiring homeowners to clear vegetation from around their home.	
111	The beetle situation will get worse	Do we have a Community Plan?	We should thin the pines in our gully and clear underbrush	
112	Shit, less snow.	Diseases and insects are probably a bad thing	I don't think diseases and insects are related to fires.	
113	The focus on danger seemed light, used words that did not denote a timely and fast	I'm right handed, if it was on paper, when I picked it up, the reasons to why I should do the recommended	The title section on the top required me to read it a few times, seemed annoying. Would have stoped	

	response to the dangers.	things should be on the right side, not left. That way I read them first, so I see why I should do what you ask from your point of view, not the one I already have.	reading it due to the format of it, seemed all over the place, I had to figure out how to read it, while I was trying to figure out why I should do what ever you were going to tell me in it.
114	I'd better clear flammable vegetation within 100 feet of my home.	I'd better see if my community has updated is CWPP.	I wonder what other areas pine beetles have been especially active in.
115	we are developing so much and decreasing our wildlife areas	did not know you had to clear 100 feet to decrease you fire risk	Can't believe the fire season grows longer every year
116	fire risk can be lowered by managing it right way	is there anything we as a community can do to prevent wildfire?	need more infos
117	they need something to stop the fire in the forests .	this is a bad idea.	they should make houses away from the forests in case of fire.
118	Was shocked about increase of insects and diseases in the trees, as we already have a huge problem with the pine beetle.	I am not sure if our community or even if our own State legislature makes it mandatory to update the CWPP	Education of land and home owners is vital in containing and preventing mass destruction of structural damages
119	good idea	good idea	good idea
120	People should not build so close to wildlife areas with trends like this.	Climate change is likely related to the less snow in the fall and more rain in the spring. I did not know	It is our job to get out CWPP's up to date on these latest trends. It will save many lives and homes.

			that this was another effect of it. Just another reason to be environmentally conscious	
121	that something really needs to be done	worry about the safety of my home and family	worry about how safe my neighborhood and friends are	
122	They should talk more about how people can reduce fire fuels		It would be nice to see more info about how to plan in the event of wildfires	
123	It is a little unnerving thinking about the wild fires	I feel everyone needs to take part in reducing the risk	I am worried about my home	
124	Wildfires are dangerous and pose a real threat	I have trees that probably should be cleared around my property	Something must be done about wildfires	
125	Risk is growing	Development is encroaching on land, and making the fire hazard greater	Insects are destroying forests and elevating fire risk	
126	None	None	None	