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Prolonged disaster and the effects of uncertainty: The Montana wildfires of 2000

Ellen Mahoney Crouse

The University of Montana

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Prolonged Disaster and the Effects of Uncertainty:
The Montana Wildfires of 2000

by

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The majority of natural disaster studies to date have examined events that occurred over a relatively brief (e.g., hours to days) period of time. The present study examines the effects of a natural disaster with a protracted period of threat, namely, the wildfires that swept western Montana from late July through mid-September in the summer of 2000. The ongoing nature and unpredictable course of the fires meant that a large number of individuals were threatened with evacuation, property loss, and injury for weeks at a time. This led to a relatively unusual version of natural disaster: a prolonged rather than acute threat, with a lengthy period of uncertainty regarding the outcome. Data were collected from local residents ($n = 62$) divided into three groups: Group 1 consisted of individuals displaced by the fires, Group 2 was comprised of residents who lived in areas where others were evacuated but were not themselves displaced, and Group 3 came from areas distal to the fires. Results are examined in light of the effects of uncertainty as a critical variable in prolonged threat. As expected, uncertainty appears to be related to some aspects of posttraumatic symptomatology. Contrary to predictions, Group 2 reported the highest level of symptomatology. Results are discussed in light of current thinking regarding uncertainty, proximity, and post-disaster symptoms.
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Prolonged Disaster and the Effects of Uncertainty:

The Montana Wildfires

During most of the summer of 2000, wildfires plagued much of the United States. Three clusters of fires, the Blodgett Trailhead, the Valley Complex, and the Wilderness Complex, were in the Bitterroot National Forest, a mountain wilderness sprinkled with rural communities south of Missoula, Montana. On the 3rd of August, the three fire complexes covered over 12,000 acres with little to no containment by firefighters (National Interagency Coordination Center [NICC], 2000). At the time, few residents had a sense of what was to come.

Over the ensuing six weeks, fires in this one portion of southwestern Montana engulfed over 275,000 acres of the Bitterroot Valley, destroying hundreds of structures, devouring productive ranchland and logging operations, and driving residents from their homes for days to weeks at a time (NICC, 2000). In the end, the state lost almost a million acres of land to fire, leading President Clinton to declare Montana a major disaster area on the 30th of August (United States Fire Administration [USFA], 2000a). By mid-September, over 48 counties and 4 reservations in Montana were included in areas targeted for disaster relief by the Federal Emergency Management Administration (FEMA), leaving only 8 counties unaffected by drought and fire in the far northeast corner of the state (FEMA, 2000). Firefighters were flown in from throughout the United States, Canada, Mexico, New Zealand, and Australia, and at the peak of the fires, over 12,000 firefighters, almost half of the 30,000 actively working in the nation, were
fighting fires in Montana, a state with a total population of less than a million people (USFA, 2000a). Air quality throughout the Bitterroot valley also was affected, with respiratory hazard alerts issued frequently, children kept indoors on many days, local athletic teams practicing in areas outside the valley, and smoke from the fires so thick that at times, visibility in the Bitterroot Valley and Missoula was less than a few city blocks (Rider, 2000). Montanans watched the skies nervously that summer, praying for rain, but dreading the lightning that might accompany it.

According to the National Oceanic and Atmospheric Administration (NOAA), the year 2000 was the driest since the 1930's in western Montana (2000). According to the same source, “precipitation [in western Montana] during the June-August period ranked 2000 as the sixth driest summer for the period of record that begins in 1895,” compounding the months of drought preceding it and creating conditions that were ripe for unpredictable bursts of fire activity (NOAA, 2000). Following a meeting with the governors of six western states (Idaho, Montana, Oregon, Wyoming, South Dakota, and Utah) in September, the Secretary of the Interior described the summer as the worst fire season in the United States since 1910, a year in which three million acres of forest in Idaho and Montana were affected and over 85 people lost their lives (USFA, 2000a, 2000b).

Wildfire is a relatively frequent occurrence in western Montana. Missoula established one of the earliest training centers for smokejumpers during the
1930's and continues to be one of the top international sites for this type of training. Aside from the 1910 fires, many Montanans live with the memory of the Mann Gulch disaster, in which 13 smokejumpers lost their lives while fighting a 5,000 acre blaze in the blistering heat of the summer of 1949 (Maclean, 1992; USFA, 2000b; Weick, 1993). In 1988, the Yellowstone fires caused damage to over 1.5 million acres of mountain wilderness in Idaho and western Montana (USFA, 2000b). Many local residents recount stories of friends and loved ones who lost their lives as firefighters and smokejumpers.

In spite of the persistent threat, many Montanans cling to the beauty of their natural surroundings as an invaluable aspect of their lives. The Bitterroot Valley is home to some of the fastest-growing rural communities in the nation (Anez, 2000), and many residents express a fierce sense of “place attachment” to their homes and communities in the small towns that dot its forests. Although Missoula is the second largest city in Montana, at 58,460 residents (Anez, 2000), the towns spread throughout the Bitterroot to its south tend to be small communities that have evolved relatively stable social support systems over decades of cold winters and often dangerously dry summers. In spite of the social upheaval that has accompanied rapid population growth in the area in the 1990's, many residents of communities in the Bitterroot value the sense of community they find in the area. Several studies support the concept of “loss of place” as an important factor in psychological response to disasters and relocation (Erickson, 1976; Fried, 1982; Gerrity & Steinglass, 1994; Kobayashi,
Muira, & Maki, 1997; McFarlane & Raphael, 1984; Murphy, 1986). Closely intertwined with the concept of place attachment is the sense of community and social support, and several studies have pointed to the role of social support as a factor in the psychological outcome of disaster survivors (Gerrity & Steinglass, 1994; Smith & Freedy, 2000; Solomon & Smith, 1995).

During this fire disaster, residents of western Montana were faced with an overwhelming threat of loss of property and community, combined with a high degree of uncertainty about the outcome of the fires. By mid-September of 2000, many Bitterroot residents had experienced days to weeks of uncertainty regarding the effect of the fires on their homes and communities. The present study examines the relationship between prolonged uncertainty and the psychological health of disaster survivors. Before exploring these issues in depth, we will turn to past research on stress reactions and disaster.

Descriptions of Responses to Trauma: Historical Background

Although historical studies show evidence of symptoms similar to our current conceptualization of posttraumatic stress disorder (PTSD) in response to civilian natural disaster as long ago as the 18th century (Parry-Jones & Parry-Jones, 1994), for most of the twentieth century, trauma psychology focused primarily on combat-related events. Care-providers and families in the early 1920’s used names such as “shellshock,” “battle fatigue,” “effort syndrome,” and “compensation neurosis” to describe and attempt to explain the unusual changes in the behavior they observed in combat veterans (Kaplan & Sadock, 1998;
In 1941, Kardiner detailed his conceptualization of "traumatic neurosis," a condition based on Freud's descriptions of the repetitive cycling of defensive processes noted in veterans, elaborating on Freud's ideas with observations of changes in physiological reactivity (Brett, 1996). With the publication of the Diagnostic and Statistical Manual of Mental Disorders, first edition (DSM-I) in 1952, the effects of trauma were formally recognized under the term "gross stress reaction" (American Psychiatric Association [APA]). This diagnostic category disappeared, however, from the DSM-II in 1968 (APA), leaving clinicians with the single option of "adjustment reaction" to describe the symptoms they observed in veterans returning from combat. As increasing numbers of veterans returned from Vietnam in the 1970's, a new diagnostic category, "posttraumatic stress disorder" (PTSD), was developed and included for the first time in the DSM-III (APA, 1980). During the 1980's, clinicians noticed that many of the symptoms observed in war veterans were also evidenced in survivors of rape, automobile crashes, terrorist attacks, and other traumas (Brett, 1996; Herman, 1997; McFarlane & de Girolamo, 1996). Due in part to the recognition of PTSD in a wider variety of people, interest in the effects of trauma has burgeoned over the past two decades, and the definition of the disorder has evolved.

The current description of PTSD includes two criteria that must be met for the traumatic event and three categories of symptoms in response to the event. According to the DSM-IV's characterization of PTSD, the event must involve
“actual or threatened death or serious injury, or a threat to the physical integrity of self or others,” and it must evoke feelings of “intense fear, helplessness, or horror” (APA, 1994). However, current research calls into question the limiting effect of naming only these three emotional responses to disasters (Brewin, Andrews, & Rose, 2000). Other emotional reactions found to be commonly associated with PTSD symptomatology include delayed feelings of anger (at self or others) and shame (Brewin, et al., 2000; Sims & Sims, 1998; Wright, Binney, & Kunkler, 1994).

According to the DSM-IV, the three clusters of symptoms resulting from the event include reexperiencing, avoidance, and arousal (APA, 1994). For a diagnosis of PTSD, the survivor must evidence at least one Cluster B "reexperiencing" symptom, often exhibited in survivors as recurrent nightmares about the trauma or unexpected, intrusive, and disturbing memories or "flashbacks" to the time of the trauma. Additionally, survivors must exhibit three or more Cluster C "avoidance" behaviors, frequently seen in survivors' attempts to avoid places that might trigger memories of the event, feelings of detachment or being in some way different from those around them, or as an inability to visualize their lives in a positive light in the future. Finally, to meet criteria for a diagnosis of PTSD, survivors must have two or more Cluster D "arousal" symptoms, often seen in the form of sleep disturbances, poor concentration, and a tendency to be "on guard" or hypervigilant regarding potential threat (APA, 1994).
Although many of the symptoms noted above in the model of PTSD as a response to trauma may be present in disaster victims, many may not. Additionally, the phenomenological differences in the experience of acute versus protracted threat may also affect the types of symptoms seen in the current study. It is helpful, therefore, to review past research on a wide variety of disasters to better define common elements and responses, as well as any differences noted.

Research on Disaster

According to recent surveys, between 13% and 30% of the general population has been exposed to at least one natural disaster during their lifetime (Briere & Elliott, 2000; Green & Solomon, 1995). In response to an increased awareness of the prevalence of disasters, our conceptualization of stress disorders has evolved to recognize the significance of disaster-related trauma. Briere and Elliott (2000) define disasters as “large-scale, stressful environmental events that adversely affect a significant number of people.” Disaster-related traumas are qualitatively different than individual events, in that disasters disrupt community structure, unweaving the normal fabric of social support that frequently buffers trauma survivors (Erickson, 1976; Gerrity & Steinglass, 1994; McFarlane & Raphael, 1984; Ursano, Fullerton, & McCaughey, 1995). When communities are affected by disaster, uprooted residents cannot easily turn to neighbors, friends, and co-workers for emotional support, both because of the physical disruption of normal communication structures and because residents
frequently find that their social supports have been equally traumatized and cannot offer the same emotional resources that would be available in an individual trauma (Erickson, 1976; Green, Gleser, Lindy, Grace, & Leonard, 1996; McFarlane & Raphael, 1984). Frequently, disruption of work and provider roles in community disasters also intensifies the impact of financial losses directly attributable to the disaster (Solomon & Smith, 1994).

It is generally agreed that manmade and natural disasters generate different psychological responses (Freedy, Shaw, Jarrell, & Masters, 1992; Baum & Fleming, 1993). Past research has examined responses to manmade disasters such as air and rail crashes (Birmes, Arrieu, & Payen, 1999; Carlier & Gersons, 1997; Jenike, 1995; Selley, et al., 1997), sea disasters (Blomhoff, Rienvang, & Malt, 1998; Ursano, Fullerton, Vance, & Koa, 1999; Williams, Hodgkinson, Joseph, & Yule, 1995), commercial building fires (Green, Grace, Lindy, Titchener, & Lindy, 1983; Lindy, Green, Grace, & Titchener, 1983; Veltfort & Lee, 1943), crowd stampede/suffocation (Sims & Sims, 1998; Wright, et al., 1994), toxic waste threats (Breton, Valla, & Lambert, 1993; Solomon & Smith, 1994), nuclear plant accidents (Baum & Fleming, 1993), and explosions (Parson, 1995a, 1995b; Pfeifferbaum, et al., 1999; Sprang, 1999; Tucker, Pfeifferbaum, Nixon, & Foy, 1999). In the literature on natural disasters, several studies have examined the effects of hurricanes (Anthony, Lonigan, & Hecht, 1999; Burnett, et al., 1997; David, et al., 1996; Lonigan, Anthony, & Shannon, 1998; Sattler, et al., 1995; Vincent, 1997/1998; Wasserstein & LaGreca, 1998). Other types of naturally
occurring stressors, such as earthquakes (Azarian & Skriptchenko-Gregorian, 1998; McCaughey, Hoffman, & Llewellyn, 1995; Nolen-Hoeksema & Morrow, 1991; Pennebaker & Harber, 1993) and floods (Erickson, 1976; Gerrity & Steinglass, 1994; Green, Gleser, Lindy, Grace, & Leonard, 1996; Logue & Hansen, 1980; Smith & Freedy, 2000), have also been the focus of research. Commonly, these types of disasters are acute in nature; therefore, most studies define disasters as "sudden" and "unexpected" (Ursano, Fullerton, & McCaughey, 1995). Interestingly, overviews and analyses of disaster literature usually list many of the above categories of both manmade and natural disasters, but unless the reviewer has specifically focused on fire disasters previously (e.g., McFarlane, & de Girolamo, 1996), fire, whether occurring in urban areas or in the wild, is not often included in the list.

All of the above studies have observed elevated rates of symptoms in survivors, a finding supported by a retrospective disaster survey (n = 935) of the general population conducted by Briere and Elliott (2000). Researchers mailed 1,442 potential participants surveys containing the Traumatic Events Survey (TES; Elliott, 1992), a self-report measure of a variety of potential traumas ranging from interpersonal violence to disasters, and the Trauma Symptom Inventory (TSI; Briere, 1995), a self-report measure of a range of common symptoms following traumatic events (Briere & Elliott, 2000). Consistent with previous studies (Green & Solomon, 1995), 22% of the population surveyed reported exposure to earthquake, flood, hurricanes, tornados, or fires at some
time in their lives (Briere & Elliott, 2000). The mean period of time since last
disaster was 13 years. In a post hoc analysis of variance (ANOVA) of symptoms
reported on the TSI and their relationship to exposure to disaster and to
interpersonal violence, Briere and Elliott (2000) found that interpersonal violence
accounts for a much larger portion of the variance in TSI scores than did disaster.
However, disaster exposure was significantly related to increased scores on the
following subscales on the TSI in the ANOVA (F 10, 910): Anxious Arousal,
Intrusive Experiences, Defensive Avoidance (Briere & Elliott, 2000). Notably,
these three groups of symptoms align well with the current criteria for PTSD in
the DSM-IV.

In discussing the results of their study, Briere and Elliott (2000) observe
that the characteristics of the disaster, specifically, the experiencing of property
loss, physical injury to self or others, and fear of death at the time of the disaster,
influence survivors' psychological outcome more than the type of disaster
experienced (i.e., earthquake, tornado, flood, fire, hurricane). They note that the
number of negative characteristics experienced during a disaster positively
correlates with the number and severity of symptoms reported by survivors, and
that the presence of these negative characteristics accounts for a larger amount of
the variance in symptoms than does the type of disaster. Based on the results of
their survey, the authors propose that past research has focused too narrowly on
the differential effects of individual disasters, leading theorists to compare
outcomes by the category of disaster rather than by the qualitative nature of the
stressors involved (Briere & Elliott, 2000). This point is also made in earlier work by Green, Lindy, and Grace (1985), who proposed that three factors bear consideration in any examination of reactions to disaster: the characteristics and intensity of the stressor event, personal characteristics of the individual, and the nature of the recovery environment.

Bearing in mind these findings, it is important to examine the characteristics that have been found to be significant in general disaster research, as well as the types of responses and symptomatology most commonly observed in survivors of disasters. We will then turn to past research on other wildfires and studies of long-term disasters, to find qualitative parallels to the characteristics of the fires in the present study. Finally, an underlying construct that has been neglected in past disaster research, uncertainty, will be examined as a variable that may influence the psychological well-being of survivors of prolonged disasters. It is proposed that uncertainty may have played a large role in the psychological outcome of the survivors of the Montana fires. Examining the role of uncertainty should help us to create more effective preventative interventions for populations exposed to protracted disaster.

*Characteristics of the Disaster Experience that Influence Outcome*

Not everyone who is exposed to trauma or disaster develops PTSD or another disorder following the event. What is different in the personality or experience of disaster victims who exhibit symptomatology following disasters versus those who do not? With the exception of a study on depression by Nolen-
Hoeksema and Morrow (1991) which is detailed later, little research exists that examines prospectively the underlying personality characteristics of disaster survivors. Due to the unpredictable nature of disasters, this is not surprising. In contrast, prior research has uncovered a number of characteristics of the disaster environment that influence the degree of psychological distress exhibited by survivors. Before examining the common responses of disaster survivors in past research, it is important to look at factors in the environment and experience of disaster that have been found to influence the development of symptomatology. Past studies have considered the influence of the witnessing of injury or death, proximity to the disaster, social support, changes in the physical environment, perceived loss of control, and loss of property on the eventual development of symptomatology post-disaster.

**Effects of witnessing injury or death**

As indicated by current definitions of traumatic events associated with PTSD, witnessing the harm or death of others or fearing for one’s own safety appears to increase levels of distress following disasters. This finding makes intuitive sense. As humans, we are evolutionarily programmed to respond to threat with increased levels of hormones and neurotransmitters in order to escape or fight attack. When the threat subsides, we are left with the side effects of our biochemical response, including anxiety, fear, and anger. Witnessing injury to others provide a set of threat stimuli that imply similar threat to one’s self.
In Briere and Elliott's (2000) study cited above, property loss, fear of death, injury to self, and witnessing of injury to others were found to be the four characteristics with the strongest correlations with increased symptomatology. Another study followed 70 police officers involved in the Hillsboro Stadium disaster, in which 95 people were crushed to death in a crowd stampede (Sims & Sims, 1999). Results from this study support Briere and Elliott's findings. Officers who witnessed higher numbers of deaths, feared for their own safety, or were extensively involved in the handling of bodies, exhibited significantly higher levels of PTSD and depression than those who were not privy to these scenes and experiences (Sims & Sims, 1999). Effects of increased time of exposure were important in this group, as noted by Sims and Sims (1998): "There was no indication that psychological trauma occurred instantaneously, in fact exposure to horror was cumulative, and our informants described feeling worse the longer their aversive experiences."

Although in the Montana fires, there were no deaths and infrequent injuries directly attributable to the disaster and witnessed by others, these findings have important implications in regards to the experience of Montana residents, who were subjected to hours to weeks of witnessing damage to surrounding wildlife and the land they loved. Similarly, perceived threats to the health of one's self and family caused by man-made environmental hazards have also been shown to have a strong relationship with psychological distress and somatic complaints (Breton, Valla, & Lambert, 1993; Baum & Fleming, 1993;
Solomon & Smith, 1994). Results of these studies are detailed in a later section on extended technological disasters.

Effects of proximity to the disaster

Other researchers have examined the effects of proximity to the disaster as a characteristic that influences mental health outcomes. Closer proximity implies an increased probability of witnessing harm to others; therefore, this factor may work in tandem with the effects noted above. In an analysis of the survivors of the Oklahoma City bombing of the Alfred P. Murrah Federal Building, Tucker and colleagues (1999) conceptualize proximity effects on survivors as being based on relative degree of loss/bereavement and exposure to injury, a synthesis of the witnessing of harm effects noted earlier and physical proximity to the blast. Similarly, in a study of 472 subjects who were living in Oklahoma City at the time of the bombing, Sprang (1999) found significant effects on outcome measures of psychological functioning for proximity to the bombing. Sims and Sims showed similar effects for proximity in the Hillsboro Stadium disaster (1999). Proximity to the disaster site was also found to correlate significantly with increased emotional distress in a study of families forced to evacuate their homes due to toxic waste exposure which is explored later in this review (Breton, Valla, & Lambert, 1993).

Social support effects

Social support has also been identified as a factor that influences disaster outcomes, although the influence of social support appears to be complex. In a
study of 131 survivors of a major flood that occurred in the upper Mississippi valley in 1993, Smith and Freedy (2000) examined the effects of psychosocial resource loss. In the study, psychosocial resource loss was defined as a combination of the loss of personal resources, such as “feeling that I am accomplishing goals,” “a daily routine,” “a sense of optimism,” and “feeling independent,” and the loss of social resources, such as “feeling valuable to others,” “family stability,” “time with loved ones,” “intimacy with at least one friend,” and “companionship” (Smith & Freedy, 2000). Data were collected at 6 weeks and again at 6 months post-flood. A path analysis indicated that psychosocial resource loss acted as a mediator for the effects of flood exposure on psychological distress and somatic symptoms at 6 months post-flood (Smith & Freedy, 2000). The authors propose that greater attention to interventions that reduce psychosocial resource loss may help to decrease the long-term negative impact of disasters (Smith & Freedy, 2000). Given the fact that many Bitterroot residents were forced to put their lives “on hold” for extended periods of time in anticipation of the fires or were evacuated for days to weeks from their homes, many of the participants in the current sample may have experienced a chronic sense of instability regarding daily routine, the loss of feelings of independence, and the disruption of relationships with loved ones.

Other studies have noted an interaction between gender and social support in disasters survivors’ outcomes. Solomon and Smith (1994) studied 175 subjects who were exposed to flooding and/or dioxin threat following the Saint
Louis floods of 1982. Among other findings, the authors concluded that male participants experienced less psychological distress following the disaster with increasing amounts of social support, a relationship that was inverse and linear. In contrast, females responded well to moderate levels of support, but showed worse outcomes with high levels of social support, a curvilinear relationship (Solomon & Smith, 1994). The researchers theorize that because females traditionally bear the responsibility for maintaining relationships and are accustomed to reciprocating help given by others in the service of strengthening relational ties, they expressed a greater sense of stress when unable to fulfill these expectations (Solomon & Smith, 1994). Males in the study expressed no similar interpersonal stress in regards to social support, and apparently were able to accept high levels of assistance with relative ease (Solomon & Smith, 1994).

The effects of gender appear to be based on role expectations for males versus females. One common role expectation in disasters is that of the supportive person for a spouse who is involved in disaster relief. Fullerton and Ursano (1997) conducted a study of spouses and significant others (SSOs), almost exclusively female, of National Guard disaster workers following a 1989 DC-10 plane crash in Iowa. It was found that SSOs of disaster workers, exhibited significantly higher levels of psychological and somatic symptomatology than a comparison sample (n = 318) of SSOs of those who were not involved in the
disaster (Fullerton & Ursano, 1997). Results of this study support Solomon and Smith's earlier work regarding gender, social support, and disasters.

Overall, it appears that social support systems play a prominent, albeit complex, role in the psychological and physical health of disaster survivors, due to the fact that social support is interwoven into the maintenance of one's role and place within the community. The disruption of support systems causes strain on survivors' sense of personal efficacy and gender roles, as well as being intricately connected to survivors' sense of physical "place" within the community.

*Effects of changes in physical location and environment*

Physical location is closely related to one's connection to normal social supports and sense of community. The location of a home, within a particular community, set in a specific topography, and held within the larger social structure of a regional culture, directly influences the day-to-day lives, habits, and opportunities for communication and social interaction of its inhabitants. Three studies have examined the impact of changes in physical location from alternate perspectives, two examining the impact of relocation and the third examining the effects of disruption of activities during the rebuilding phase following an acute disaster.

In a qualitative study of the stress caused by relocation of survivors following the 1972 Buffalo Creek Dam collapse, Gerrity and Steinglass (1994) found that the disruption caused by relocation appears to interact with social
support losses (i.e., loss of long-term ties to neighbors), negatively affecting psychological health. The authors theorize that many of the negative effects of the flood were exacerbated by the fact that survivors were placed in shelters and new residences without regard to the normal, long-term structure of neighborhood and community. This point is echoed in a qualitative study of the effects of relocation following a volcanic eruption by Kobayashi and colleagues (1997):

Relocation is a life event that requires the individual involved to change his or her perspective about the relationship between person and environment....Relocations due to natural disaster may have even more profound effects than relocations related to other reasons because disaster often deprives people of one or all of the bases for settlement, namely, human relationships, homes and community, and occupation (pp. 209-210).

Another aspect to the disruption of one's location caused by disaster is the process of rebuilding. Burnett and colleagues (1997) investigated the effects of impediments to rebuilding of homes and property on a sample ($n = 96$) of survivors following Hurricane Andrew in 1992 at 9 and 12 months post disaster. The intensity and frequency of disruption to rebuilding uniquely accounted for 11% and 10% of the variance ($p < .01$ and $p < 0.5$, respectively) in psychological distress, as measured by the Global Severity Index of the SCL-90-R (Burnett, et al., 1997). These survivors reported increased levels of stress when they felt they were hindered from rebuilding their homes and communities. The overall picture presented by alterations in physical environment created by disasters is one that is interwoven into survivors' sense of being capable of solving their own
problems, perceived ability to protect themselves and their families, and feelings of connections to community and social ties.

Property loss effects

Another factor that has been found in several studies to have a marked impact on psychological outcome in disasters is the extent of property loss suffered by survivors. As with other factors, property loss appears to have a complex relationship to the well-being of survivors, in that it is likely to be intimately related to relocation stress, the breaking of community ties, and survivors' self-perceptions. Some disaster researchers hypothesize that property loss has an even stronger impact on survivors' psychological outcomes than intensity of exposure (McFarlane & De Girolamo, 1996). In a multiple regression analysis of the effects of different types of disasters on a sample \( n = 935 \) of the general population, property loss was the characteristic that most closely correlated with posttraumatic symptomatology \( (\beta = .20-.27, p < .05) \), with the highest correlation to increased depression (Briere & Elliott, 2000). These findings are supported in research on individual disasters. In their study of survivors of the Bijlmermeer plane crash, Carlier and Gersons (1997) found that PTSD was most strongly associated with material damage and loss. Similarly, David and colleagues (1996) found that having sustained "severe damage" from Hurricane Andrew was the risk factor most strongly correlated with PTSD, depression, and anxiety in survivors of the storm. Prior to that, research on Hurricane Hugo also revealed that resource loss more strongly predicted
psychological distress than did survivors’ personal characteristics or coping behavior (Freedy, Shaw, et al., 1992; Kaiser, et al., 1996). Other studies have noted property loss as an important factor in the development of hypertension and anxiety post-disaster (Logue & Hansen, 1980).

**Effects of perceived loss of control**

A final aspect of trauma is perceived loss of control. During traumatic events, people are often exposed to extreme lack of control over the environment and threats to their sense of safety, self-efficacy, and well-being. Several theorists have emphasized the role of this factor in post-disaster recovery. Feelings of lack of control may be related to the experience of helplessness during the traumatic event. In a study of survivors of a toxic waste threat, researchers found that children from all socioeconomic classes were equally affected by the threat (Breton, Valla, & Lambert, 1993). This finding was significant in that children from upper class homes have been shown in past disaster research to evidence less psychological stress than children from lower SES homes, presumably because high SES parents have access to greater financial and social resources that may “buffer” the impact of disasters for their children (Breton, Valla, & Lambert, 1993). Breton and colleagues (1993) posit that one of the reasons the children from higher SES homes may not have benefited from their families’ socioeconomic standing is that their parents were accustomed to a large amount of control over their external environment by virtue of their social class and,
thus, were affected particularly by the lack of control inherent in the mass relocation experienced during this disaster.

Baum and Fleming (1993) assert that man-made disasters may differ from natural disasters on the matter of loss of control, however. They propose that human-caused disasters reflect a loss of control over something that should be controllable, while natural disasters result from forces over which human beings expect to have no control; therefore, survivors of technological accidents versus natural disasters may differ in perceived loss of control (Baum & Fleming, 1993). Overall, the picture presented in disaster research to date indicates that feelings of helplessness and loss of control have a direct bearing on the psychological well-being of survivors.

In sum, each of the above environmental factors appears to play a part in emotional reactions to and psychological outcomes of disasters, depending on the nature of the event. As can be seen from the conceptual overlaps between each of these elements, the relationship of witnessing of harm to others, fear of harm to self, proximity to the disaster, levels of social support, changes in physical environment, property loss, and loss of control to each other and to eventual mental health outcomes are complex. Each has the potential to interact with the others and with survivors' inherent personality traits in a disaster.

Disorders Commonly Observed as Responses to Disaster

Psychological outcomes of disaster vary widely, and trauma survivors experience unique effects depending on the specific nature of the trauma (Briere
Elliott, 2000; Herman, 1997). Indeed, the crucial influence of the traumatic event in the development of PTSD is highlighted in the evolving definition of the disorder over the past two decades. With each new edition of the DSM, the event required has been more carefully defined to reflect those aspects of the traumatic experience that are most likely to contribute to the eventual development of a stress disorder. However, many studies have uncovered a number of divergent responses to trauma that do not fit the current PTSD diagnostic criteria neatly. Importantly, included within the symptom criteria for PTSD are many of the hallmark symptoms of depression (e.g., concentration difficulties and diminished interest in pleasurable activities) and of anxiety disorders other than PTSD (e.g., hypervigilance and irritability). Therefore, PTSD, depression, and anxiety all bear consideration as potential outcomes in any study of disaster survivors' responses.

PTSD as a response to disaster

Rates of PTSD have been extensively studied in prior disaster research, with strong evidence for marked elevations in the incidence of this disorder following exposure to disaster. In a longitudinal study of survivors of the 1972 Buffalo Creek Dam collapse, Grace, Green, Lindy, and Leonard (1993) found prevalence rates of 44% for PTSD among survivors at the time of the disaster, with rates remaining as high as 28% in subjects who participated in a 14-year follow-up. In another study, Vincent (1997/1998) followed hundreds of elementary aged children for nearly four years following Hurricane Andrew and
found that, among a group of 43 children who exhibited increased rates at 10 months after the storm, 40% still met criteria for full diagnosis of PTSD at 44 months after the storm.

Carlier and Gersons (1997) investigated the psychological outcome of 136 subjects who survived the 1992 crash of a Boeing 747 jet that slammed into a high-rise apartment building in Bijlmermeer, a suburb of Amsterdam. In the crash, 43 people died and 750 people were forced to be relocated. Based on the Structured Interview for PTSD, Carlier and Gersons (1997) found that 26% of subjects met criteria for PTSD at six months post-disaster, according to the DSM-III-R (APA, 1987). Three aspects of the disaster experience significantly predicted PTSD diagnosis in this population: "lost a loved one," "suffering material damage or lost home," and "was at home at the time of disaster" (Carlier & Gersons, 1997). In addition to the subjects who met full criteria for diagnosis of PTSD in this sample, 44% of the respondents reported subthreshold PTSD symptomatology.

The above statistics regarding post-disaster rates of PTSD can be contrasted to lifetime prevalence rates seen in the general population. Kessler and colleagues (1995) found that PTSD is relatively common, based on the results of the National Comorbidity Survey conducted between September, 1990, and February, 1992. Part II of the survey included diagnostic criteria for PTSD and was administered to a total of 5,877 noninstitutionalized civilians, aged 15-54. For this large adult American sample, the lifetime prevalence rate for PTSD was
7.8%, with rates for women (10.4%) twice those for men (5%). These statistics can be compared to the 51.2% of women and 60.7% of men in the study who reported at least one traumatic event in their lifetime. As has been noted in other population surveys (see Briere & Elliott, 2000), PTSD was found to persist for many individuals over a number of years (Kessler et al., 1995).

Subthreshold symptoms of PTSD cause a significant amount of distress for disaster survivors and are an important consideration in looking at the needs of this population. In a study of 61 survivors of Hurricane Andrew in 1992, David and colleagues (1996) screened out participants who had pre-existing psychiatric disorders, in an attempt to document incidence of symptomatology post-disaster. At the time of the study, 6-12 months post-hurricane, 22 subjects (36%) met criteria for PTSD, and another 16 participants (26%) exhibited subthreshold symptoms, meeting diagnostic criteria for two of the three symptom clusters. Other studies show similarly elevated rates of subthreshold PTSD (McFarlane, 1990; Miller & Kraus, 1994).

Obviously, PTSD is an important consideration in the study of any trauma; however, the diagnostic criteria for PTSD are somewhat problematic. One aspect of the current DSM-IV approach to PTSD that has been called into question is the definition of the traumatic event (Roemer, Orsillo, Borkovec, & Litz, 1998). The first part of that definition, as noted earlier, requires that the event involve "actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (APA, 1994), a requirement that many
theorists believe to be too restrictive. For example, in the current study, many residents may feel an attachment to their land and habitat that is closely integrated into views of self and/or philosophical beliefs. The threat of destruction of their homes may be highly traumatic to these individuals, yet it does not technically meet the criteria for the event.

Other researchers take issue with the limited nature of possible reactions to the stressor (i.e., intense fear, helplessness, or horror) (Schuetzwohl & Maercker, 1999). Brewin and colleagues (2000), in a study of victims of violent crime (n=138), found that although a large percentage of subjects who were diagnosed with PTSD following the event retrospectively endorsed high levels of fear, helplessness, and horror at the time of the trauma, a subgroup rated each of these emotions at the time of the event as low. In spite of these ratings, many in this subgroup met the DSM-IV criteria for avoidance, reexperiencing, and arousal symptoms; these subjects also strongly endorsed feelings of "anger at others" and/or "shame" subsequent to the trauma, indicating that a different mechanism may be at work in the development of PTSD for this subgroup.

Importantly, if the current criteria for PTSD are strictly followed, a significant, albeit small, group of individuals who respond to trauma with delayed emotions such as anger and shame may be excluded from diagnosis and possibly overlooked for treatment.

These findings suggest that researchers need to persistently and sensitively explore all dimensions of human response to trauma, including

**Depression as a response to disaster**

Incidence of depression following disasters, both with and without a coexisting PTSD diagnosis, is generally high, ranging from 8.5% to 51%, depending on population studied, assessment method, and time since disaster (David, et al., 1996; Livingston, et al., 1994; McDermott & Palmer, 1999; McFarlane & Papay, 1992; Sims & Sims, 1998; Tucker, et al., 1999). McFarlane and Papay (1992), in their study of 147 firefighters from the Australian bushfires, found rates for current major depressive episode of 8.5% at 42 months post-disaster. In the 1989 Hillsboro Football Stadium disaster in Liverpool, England, Sims and Sims (1998) found elevated rates of depression in the 70 police officers studied. Interestingly, at least for this group of disaster survivors, the diagnostic criterion for the traumatic event were met, but subjects tended to manifest psychological impairment in the form of depressive symptoms, even when a concurrent diagnosis of PTSD was made. However, as noted earlier, one of the
problematic aspects of assessing rates of psychopathology post-disaster is the lack of prospective data and information on pre-existing symptomatology.

In this review of the literature, two prospective studies that focused on depression as a reaction to disaster were found. Davis and colleagues' study (1996) described above screened out individuals with indication of pre-existing symptoms in examining the incidence of disorders after Hurricane Andrew. In that study, 18 (30%) of the 61 subjects met criteria for current major depression, and 5 (8%) evidenced subthreshold symptoms at 6-12 months post-disaster (Davis, et al., 1996). A second study, conducted by Nolen-Hoeksema and Morrow (1991), took advantage of data on depression which coincidentally had been collected from college students (n=137) in the San Francisco Bay area just two weeks prior to the 1989 Loma Prieta earthquake. The results of this study indicate support for pre-existing depression as a contributor to higher post-event rates of depression in survivors of earthquakes. The researchers theorize that depression in response to disaster may reflect an underlying predisposition to react to stress with depression, rather than a response that is brought on by the event per se (Nolen-Hoeksema & Morrow, 1991). This hypothesis is supported by a study of survivors of the decade-long Lebanon wars (c., 1974-1984) conducted by Karam and colleagues (1997). Retrospective data was gathered from over 600 civilian survivors in 1989 and 1991. Results support the concept that when individuals who already exhibit depressive symptomatology are exposed to disaster, they are at a significantly increased risk for developing comorbid depression and PTSD.
Given the extensive overlap between depressive symptoms and many of PTSD's avoidant symptoms (e.g., diminished interest in significant activities, restricted range of affect) and arousal symptoms (e.g., sleep disturbances, difficulty concentrating), it is not surprising that the two disorders are highly comorbid. Findings from these studies highlight the importance of assessing for depression as a trauma response.

Anxiety as a response to disaster

Although rates of anxiety disorders (discrete from PTSD) are not usually as high as those of affective disorders following disasters, survivors often exhibit significantly elevated rates of generalized anxiety disorder, panic disorders, phobias, and to some extent, obsessive-compulsive disorder, when compared with the general population (Dixon, 1991; Livingston, et al., 1994; McFarlane & Papay, 1992; Tucker, et al., 1999). As with depression, symptoms of many of the anxiety disorders overlap significantly with those of PTSD, including the reexperiencing cluster (e.g., physiological reactivity), the avoidance cluster (e.g., avoiding thoughts, feelings or conversation that are associated with the trauma), and the arousal cluster (e.g., sleep disturbance, irritability). In the study of newly-developed symptoms in survivors of Hurricane Andrew cited earlier, 7 (11%) of the 61 participants met criteria for generalized anxiety disorder, 6 (10%) met criteria for panic disorder, and 5 (8%) met criteria for agoraphobia (David, et al., 1996). Likewise, in McFarlane and Papay's (1992) follow-up study of firefighters 42 months after the bushfires, 25 (6.4%) of the 147 participants met
criteria for generalized anxiety disorder, 15 (3.8%) met criteria for panic disorder, and 28 (7.2%) met criteria for phobic disorder. Another 0.7-3.5% of the participants exhibited subthreshold symptoms for these disorders. Although rates of anxiety disorders are lower than for PTSD and depression in studies of disaster survivors, rates generally appear to be higher than those seen in the general population and bear consideration in the current study.

Overall, it appears that PTSD, depression, and anxiety are relatively common responses to disaster. All three types of disorder have been shown by prior research to occur at higher rates among disaster survivors than in the general population. Each of these may be present in the sample in the current study.

**Research on Wildfires**

An extensive literature review revealed research on only two wildfire disasters, the East Bay Hills fires in northern California in 1991 and the Ash Wednesday bush fires in Australia in 1983. The East Bay Hills fire struck the Oakland-Berkeley area of northern California in October of 1991, rapidly consuming 3,135 residences and killing 24 people in the course of two days (Koopman, Claussen, & Spiegel, 1997). Two studies on this fire were found. The first, involving 154 survivors of the fire, examined dissociative symptoms within the first few days following the fire and the relationship of these symptoms to psychological and social functioning at a 7-month follow-up assessment (Koopman, Claussen, & Spiegel, 1997). High dissociators at the time of the fires
were found to have significant problems with major illness or injury, changes in eating and sleeping habits, decreased involvement in recreational, social, and religious activities, and fewer close friends at 7 months (Koopman, Claussen, & Spiegel, 1997). A second study of the East Hay Hills fires focused solely on the effects of a multiple stressor debriefing intervention with Red Cross workers (Armstrong, Lund, McWright, & Tichenor, 1995).

In contrast to the limited published research on the California fires, a number of studies of the effects of the Australian bushfires on both residents and firefighters have been conducted by McFarlane and colleagues. On the 16th of February, 1983, several overwhelming firestorms swept through and destroyed thousands of square miles of bush, forests, orchards, ranches, and national park land in southern Australia in the span of less than a day (McFarlane, 1990; McFarlane & Papay, 1992). Twenty-eight people died, hundreds were injured, more than a quarter of a million animals were killed, and hundreds of homes were destroyed (McFarlane, 1990; McFarlane & Papay, 1992). Several epidemiological studies were conducted, including a survey of 1,526 residents from affected areas and a series of four studies of hundreds of volunteer firefighters. Findings from the initial population survey conducted at 4 months post-disaster indicate that 42% of the respondents met criteria for mental disorder, a 50% increase over rates found in four epidemiological surveys of the general Australian population prior to the fires (McFarlane, 1990; McFarlane & Papay, 1992). In the other set of studies, a total of 469 firefighters were examined
at 4, 11, and 29 months after the disaster (McFarlane, Atchison, Rafalowicz, & Papay, 1994; McFarlane & Papay, 1992; Spurrell & McFarlane, 1993). A subgroup of 143 subjects were categorized as high-risk for PTSD according to their responses on a questionnaire about property loss, injuries sustained, and nature and extent of exposure to the fires, scores on the Impact of Events Scale (IES, Horowitz, Wilner, & Alvarez, 1979), and scores on the General Health Questionnaire (GHQ, Goldberg, 1972). This subgroup was then compared to a control subgroup at 42 months post-disaster, using the IES and GHQ (McFarlane, Atchison, Rafalowicz, & Papay, 1994). Of the 143 high-risk participants, 88 (61.1%) met criteria for a diagnosis of PTSD, another anxiety disorder, major depression, or a combination of these at 42 months (McFarlane & Papay, 1992). Major depressive disorder was present in 51% of the firefighters with PTSD; generalized anxiety disorder was present in 39% of those with PTSD (McFarlane & Papay, 1992). Another study of this same group concluded that the majority of those eventually diagnosed with PTSD first presented to general practitioners with physical ailments, leading the authors to speculate that, at least in this population, somatic symptoms provided a means of expressing distress when subjects were unable to recognize or appreciate emotional aspects of their reactions to trauma (McFarlane, Atchison, Rafalowicz, & Papay, 1994).

While these findings provide a backdrop for understanding the potential responses of participants in the present study, both of the wildfire disasters that have been examined to date had rapid onsets and lasted for relatively brief time
periods (i.e., a few hours to 2 days), very different than the chronic nature of the wildfires which plagued western Montana for several weeks in the late summer of 2000. No wildfire study to date has focused on the type of protracted threat of evacuation and potential property destruction that was experienced by rural Montana communities as they lived through a proclaimed disaster whose prolonged course stands in marked contrast to traditional definitions of disasters as “sudden” and “unexpected.”

Research on Prolonged Disasters

Although no research could be found on the effects of a chronic natural disaster, a few studies have examined the impact of extended technological disasters. In 1988, a fire was deliberately set at a PCB warehouse in a small town south of Montreal, releasing a thick, toxic smoke containing dioxins and furans, and subsequently causing the evacuation of 1,663 families in the surrounding community for almost three weeks (Breton, Valla, & Lambert, 1993). Residents were awakened in the middle of the night by the police and were given only minutes to leave their homes. During the year following the disaster, researchers administered structured questionnaires to, and monitored the progress of, 174 children and their parents, divided evenly between those who were and those who were not evacuated due to exposure threat (Breton, Valla, & Lambert, 1993). A significant positive correlation was found between mental health of parents and that of their offspring, and children in the exposed group continued to exhibit significantly higher rates of “internalizing symptoms” (i.e., depression,
anxiety, phobias) than non-exposed children as late as one year after the disaster (Breton, Valla, & Lambert, 1993).

Another study of prolonged technological threat focused on a complex of underground coal mine fires that afflicted Centralia, Pennsylvania, for almost a quarter of a century (Kroll-Smith & Couch, 1987). The fire was first discovered at an abandoned mining dump in 1962, and although local authorities tried to contain the blaze, it eventually ignited an outcropping of coal, spreading rapidly to the underground shafts beneath the ground (Kroll-Smith, & Couch, 1987). In spite of millions of federal dollars spent on control efforts, the fire continued for over two decades, eventually forcing the federal government to “buy out” the town in the 1980’s and destroying the community (Kroll-Smith, & Couch, 1987). The sociological study conducted with these residents focused on the effects of the fire on the community’s sense of religious meaning, lending compelling anecdotal evidence for the negative impact of the fires, but providing no standardized assessment of psychological outcome.

Solomon and Smith (1994) also conducted a study of a prolonged technological disaster. Their study of a sample of survivors (n = 494) of the 1982 floods in Saint Louis took advantage of prior data collected in the NIMH Epidemiological Catchment Area survey (see Eaton & Kessler, 1985) as a comparison for rates of disorders pre and post flood. That winter, Saint Louis residents were exposed to a series of traumatic events, including violent downpours, hail, several tornadoes, and subsequent flooding which caused five
deaths and the evacuation of approximately 25,000 people, many of whom were left homeless when the storms destroyed their property (Solomon & Smith, 1994). Compounding the devastation, the community of Times Beach and many surrounding areas were further affected when it was learned that the floods had greatly increased the risk of exposure to dioxin, a highly toxic waste product created at a nearby factory in the manufacturing of hexachlorophene, a disinfectant (Solomon & Smith, 1994). Before Christmas of 1982, the Environmental Protection Agency discovered that levels of dioxin in Times Beach were 300 times the level considered safe for human exposure, and the federal government bought out the residents, forcing them to quickly abandon their homes and relocate elsewhere (Solomon & Smith, 1994). Although the residents of Times Beach were afforded the ability to relocate, by the following spring, several communities surrounding Saint Louis were suspected to have similarly elevated dioxin levels. Residents faced conflicting and frequently changing reports regarding the safety of their surroundings, leaving them in a chronic state of uncertainty regarding their health and futures (Solomon & Smith, 1994). Researchers found themselves in a unique position in that they had a natural setting for comparing the effects of a natural versus a manmade disaster, with data regarding prior prevalence rates for mental illness for the local population. Residents participating in the survey were divided into three groups: those exposed to the floods alone ($n = 75$), those exposed to dioxin risk alone ($n = 28$), and those exposed to both threats ($n = 66$). Additionally, a
comparison sample (n = 325) of residents from nearby towns with no exposure served as a control group (Solomon & Smith, 1994). Researchers used a structured interview that had also been employed in the original catchment area survey, with some additional questions focusing on the disaster and its impact. Results of the survey showed that not only was there a distinct increase in symptomatology across the groups subsequent to the flood, disaster survivors in both exposed groups significantly exceeded the unexposed group on measures of depression, somatization, anxiety, PTSD, and alcohol abuse. The researchers next compared the proportion of participants in the sample reporting newly developed disorders to prevalence rates of each disorder in the greater Saint Louis area prior to the floods, in an attempt to estimate the degree to which flood exposure might account for the different rates of disorders (Solomon & Smith, 1994). When compared in this way, significant differences were found only for depression and PTSD (Solomon & Smith, 1994). While these results are compelling, no data were collected regarding residents' feeling of uncertainty regarding the disaster. Additionally, most of the technological disasters studied to date involve threats to health which are often not tangibly evident to survivors and which, therefore, may have a different effect on the surrounding population than the visual and sensory threat of fire experienced by the communities in the present study.

Other research, such as the investigations following the 1972 collapse of the Buffalo Creek Dam in West Virginia, has contributed significantly to our
understanding of the effects of major disasters on communities and individuals (Erikson, 1976; Gerrity & Steinglass, 1995; Green, Gleser, Lindy, Grace, & Leonard, 1996). However, as with most disasters, the Buffalo Creek tragedy was an event with a swift onset, followed by rapid destruction of property and loss of life, leaving survivors with years of clean-up and reconstruction but no further threat. This pattern contrasts with the chronic, unpredictable course of the fires in Montana, in which individuals stood watch for weeks on end, awaiting the potential destruction of their homes and livelihoods. These studies of technological disasters offer insight into the effects of chronic threat on a community's mental health; however, there remain no parallels in the research on natural disasters. Additionally, no psychological research to date has focused on the effects of fires on communities in the Northern Rockies, a population that lives with the threat of forest fires on a regular basis. In keeping with Briere and Elliott's (2000) findings on disaster characteristics, it is crucial to bear in mind that the extent of chronic threat and uncertainty experienced by participants at the time of the fires is likely to influence individual responses to the fires.

The Element of Uncertainty

What is Uncertainty?

Uncertainty can be defined in a number of ways. Dictionary definitions include "doubt," "hesitancy," "unpredictability," "indeterminacy," and "indefiniteness" (Webster's New Universal Unabridged Dictionary, 1996). In the case of the Montana fires, the latter three words probably best represent the
experience of uncertainty for the residents who felt at a loss to predict the duration, course, or eventual effects of the fires. Little research has closely examined the exact nature of uncertainty as a construct, however. Past studies have proposed to look at the relationship between uncertainty and major illness (Miles, Funk, & Kasper, 1992; Molleman, Pruyn, & Van Knippenberg, 1986; Viney & Westbrook, 1981; Walters & Charles, 1997), adaptation to foreign cultures (Gao & Gudykunst, 1990; Hammer & Martin, 1992; Witte, 1993), comfort with job interviews (Doster & Slaymaker, 1972), and the spreading of rumors (Rosnow, Yost, & Esposito, 1986), but few studies have tried to precisely define the mechanisms involved in uncertainty.

In an elegant series of experiment aimed at exploring the association between people’s cognitive appraisals of their environment and their emotional states, researchers distinguish between uncertainty as an appraisal of one’s current situation and unpredictability as an appraisal of likely outcome (Ellsworth & Smith, 1988; Smith & Ellsworth, 1985, 1987). These researchers found a moderate relationship between uncertainty and fear, such that as uncertainty rises, fear also increases, with little correlation between predictability and fear. Fear was also found to be related to perceived obstacles (Ellsworth and Smith, 1988). In their discussion of these findings, the researchers theorize that, because fear provides motivation to escape danger, the presence of obstacles blocks this adaptive response; therefore, uncertainty may increase fear because one may have difficulty judging the presence of obstacles in an uncertain
situation. The relationship between the appraisals of fear and predictability and the emotion of fear remains unclear, however (Ellsworth & Smith, 1998). While uncertainty remains the focus of the current study, given the lack of a clear differentiation between unpredictability and uncertainty, the two terms occasionally are used interchangeably in the discussion of past research and the results of the current study. However, to reduce confusing terminology, attention was given in the development of the questionnaire for this study to using only the term “uncertainty” when asking participants about this aspect of their experience.

Uncertainty and Disaster

The present study proposes that the element of uncertainty may be an underlying factor in the eventual development of stress symptoms in the Montana fire survivors. A large number of residents of the Bitterroot Valley spent days to weeks waiting for the fires that encroached on their land in the summer of 2000. Efforts at protecting structures through backburns, clearing surrounding underbrush, and wetting down roofs alternated with removing prized possessions, pets, and livestock from threatened areas. Entire communities were placed “on alert” for evacuation for weeks at a time, frequently finding that when the time to move finally arrived, they were taken by surprise, with only minutes to hours to escape. Many residents reported to distant jobs in surrounding towns morning after morning, not knowing if their homes would be standing when they returned from work. In addition to the
period spent awaiting the fires' approach, many residents were evacuated for
days to weeks at a time and spent extended periods in cramped conditions with
friends and family, or at evacuation centers. Although some were allowed to
"visit" their homes at specified times, depending on fire conditions, many people
did not learn the fate of their homes and property until they were able to return
to their land after the fires' final passing, weeks after their initial evacuation.

Miller and Krauss (1994) theorize that disasters that have a prolonged
anticipatory phase coupled with a sense of loss will be evidenced in survivors by
dysthymia and a decreased sense of self-efficacy secondary to a feeling of
hopelessness regarding the inevitability of the disaster. Freedy and colleagues
(1992) echo this point by stating that "in general, high levels of powerful impact
[and] threat...coupled with low levels of predictability and controllability have
been found to adversely affect community (e.g., basic services), social (e.g.,
availability of social and instrumental support), and individual functioning (e.g.,
psychological health)." Likewise, high levels of uncertainty have been shown to
have negative effects on physical health (Walters & Charles, 1997). Montana
residents survived an extended period of virtual helplessness against the
overwhelming power and unpredictability of the fires of 2000. Additionally,
many suffered extensive loss of property, and among those whose property was
not destroyed, a large number of individuals face a loss of their sense of "place."
Due in part to fire fighting policies focused on saving structures over vegetation,
when they were finally able to return to their homes, a number of residents were
greeted by a blackened wasteland surrounding their intact homes, where they had once been enveloped in lush green growth, leaving them with a recovery environment that is physically alien and that serves as a constant reminder of the random nature of the disaster. Many of these effects can be viewed as losses.

In 1988, Hobfoll proposed the theory of "conservation of resources" (COR) as a central feature in human responses to stress. COR theory posits that stress and decreased coping occur when humans are threatened with the loss of resources or potential resources. According to this theory, resources consist both of actual physical possessions and of intangible personal and social characteristics that can be used to achieve reinforcing, desirable states (Freedy, et al., 1992). The original COR model identifies four basic resource categories: object resources, which have functional or status value (e.g., cars, homes, household items), condition resources, which are basically social roles (e.g., employment, marriage), personal characteristic resources, or the individual's self and world views (e.g., a sense of optimism, independence, or meaning), and energy resources, or valuable tools for the acquisition of other resources (e.g., time, money, information) (Hobfoll, 1988, 1998). As noted earlier in this review, Smith and Freedy (2000) subsequently outlined the concept of psychosocial resource loss, the loss of a combination of social roles and personal characteristics, as a central factor in psychological distress following disasters.

The concept of potential resource loss may be closely connected to the degree of uncertainty experienced in this disaster. As they awaited the
approaching fires, residents of the Bitterroot and surrounding areas faced the specter of losses in terms of object resources (home and property destruction), condition resources (threat of job loss, especially in timber or ranching), personal characteristic resources (a sense of safety, "place," and optimism), and energy resources (time spent preparing for the fires and potential loss of income). Many residents describe days to weeks of being enveloped in a thick cloud of smoke, listening to the roar of the fires in the hills around their homes, uncertain of the proximity of the flames and dependent on fire agency reports for information regarding the need for evacuation. In this situation, uncertainty regarding resource loss comes to the fore as an important aspect of survivors' experience of disaster.

The connection between uncertainty and disaster has only recently begun to be explored (Gilbert, 1998). Since the late 1980's a few researchers have discussed a theoretical relationship between uncertainty and responses to disaster, proposing that a failure in communication between disaster agencies and affected residents may be at the heart of uncertainty in many community disasters (Gilbert, 1998; Rosenthal, 't Hart, Kouzmin, & Jarmin, 1989). In a review of the literature, however, no direct empirical testing of this proposed relationship was found. The present study directly examines the relationship between respondents' ratings of levels of uncertainty during the fires and psychological outcomes. As an exploration of the relationship between uncertainty and disaster, the study is designed to address a number of questions:
1) Do those participants living in the closest proximity to the fires (i.e., group 1 below) report greater levels of uncertainty and distress related to uncertainty than those more distal to the fires?

2) Does respondents' degree of uncertainty correlate positively with severity of PTSD symptoms, level of depression, and level of anxiety?

3) Finally, is there a relationship between participants' reports of the length of time of feeling uncertain and current symptomatology, paralleling earlier research on the concept of degree of exposure to disaster and outcome?

It is hoped that by examining uncertainty as a potential contributor to post-disaster symptomatology, more light will be shed on the possible mechanisms involved in the development of PTSD and other disorders following disasters. This information should be directly applicable to interventions for communities who face prolonged threat of disasters in the future, by emphasizing the importance of clear communication with residents and community agencies regarding the status and progress of threatened disasters.

Method

Participants

Participants in the study included adult (i.e., age 18 and older) residents of Missoula and Ravalli counties, as well as other areas in western Montana and northeastern Idaho that were affected by the fires of 2000. A total of 62 subjects participated in the study, distributed between three groups: 1) individuals who have been displaced by the fires (n = 28); 2) people who were not themselves...
displaced by the fires, but who live in communities in which others were
displaced by the fires \((n = 19)\); and 3) residents who did not live in communities
where anyone was displaced by the fires, but who were exposed to heavy smoke
and to extensive media coverage of the disaster \((n = 15)\). Participants were
recruited voluntarily with the assistance of community resources, through the
use of public service announcements and informational flyers regarding the
study. In an effort to avoid retraumatization of fire victims, random calling and
bulk mailings regarding the study were not used.

Of the 110 people who originally volunteered for the study, 62 (24 males
and 38 females) completed both the packet and the telephone portion and were
retained for analysis. Demographics for the sample are presented in Table 1.
When an analysis of variance (ANOVA) was run by group for all demographic
variables, only age differences between groups were significant \((F = 8.843, p <
.001)\). Independent samples \(t\) tests indicate that the distal group was significantly
younger on average than either of the other two groups, which did not show
significant differences for age. This difference in age may be due to the fact that
some of the public service announcements about the study were run on the
website for University of Montana, which is located in the distal area, thus
recruiting more college-age volunteers in this area.
### Table 1

**Demographics for Total Sample and by Group**

<table>
<thead>
<tr>
<th></th>
<th>Total sample</th>
<th>Evacuees</th>
<th>Near Evac.</th>
<th>Distal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.71% males</td>
<td>11 (39.29%)</td>
<td>6 (31.58%)</td>
<td>7 (46.67%)</td>
<td></td>
</tr>
<tr>
<td>61.29% females</td>
<td>17 (60.71%)</td>
<td>13 (46.43%)</td>
<td>8 (53.33%)</td>
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</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
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<tr>
<td>Mean: 46.81 years (SD = 14.79)</td>
<td>53.25</td>
<td>46.21</td>
<td>35.53</td>
<td></td>
</tr>
<tr>
<td>Range: 25-79 years</td>
<td>(15.85)</td>
<td>(10.40)</td>
<td>(10.45)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.7% High school</td>
<td>5 (17.86%)</td>
<td>2 (10.53%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>24.2% Some college</td>
<td>5 (17.86%)</td>
<td>7 (36.84%)</td>
<td>3 (20.00%)</td>
<td></td>
</tr>
<tr>
<td>8.1% 2-year degree</td>
<td>4 (14.29%)</td>
<td>1 (5.26%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>25.8% Bachelor's degree</td>
<td>5 (17.86%)</td>
<td>3 (15.79%)</td>
<td>8 (53.33%)</td>
<td></td>
</tr>
<tr>
<td>30.6% Advanced degree</td>
<td>9 (32.14%)</td>
<td>6 (31.58%)</td>
<td>4 (26.67%)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95.2% Caucasian</td>
<td>27 (96.43%)</td>
<td>18 (94.74%)</td>
<td>14 (93.33%)</td>
<td></td>
</tr>
<tr>
<td>3.2% Native American</td>
<td>0</td>
<td>0</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td>1.6% Hispanic</td>
<td>1 (3.57%)</td>
<td>1 (5.26%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Hometown</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.8% Rural/ranch</td>
<td>8 (28.57%)</td>
<td>6 (31.58%)</td>
<td>2 (13.33%)</td>
<td></td>
</tr>
<tr>
<td>12.9% Small town (&lt; 2K)</td>
<td>2 (7.14%)</td>
<td>4 (21.05%)</td>
<td>2 (13.33%)</td>
<td></td>
</tr>
<tr>
<td>12.9% Small city (40-100K)</td>
<td>3 (10.71%)</td>
<td>3 (15.79%)</td>
<td>2 (13.33%)</td>
<td></td>
</tr>
<tr>
<td>21.0% Metro (&gt; 100K)</td>
<td>7 (25.00%)</td>
<td>2 (10.53%)</td>
<td>4 (26.67%)</td>
<td></td>
</tr>
<tr>
<td><strong>Individual Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.9% 0-10K</td>
<td>5 (17.86%)</td>
<td>0</td>
<td>3 (20.00%)</td>
<td></td>
</tr>
<tr>
<td>22.6% 10-20K</td>
<td>5 (17.86%)</td>
<td>3 (15.79%)</td>
<td>6 (40.00%)</td>
<td></td>
</tr>
<tr>
<td>21.0% 20-30K</td>
<td>4 (14.29%)</td>
<td>7 (36.84%)</td>
<td>2 (13.33%)</td>
<td></td>
</tr>
<tr>
<td>12.9% 30-40K</td>
<td>3 (10.71%)</td>
<td>2 (10.53%)</td>
<td>3 (20.00%)</td>
<td></td>
</tr>
<tr>
<td>8.1% 40-50K</td>
<td>2 (7.14%)</td>
<td>3 (15.79%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>11.3% 50-60K</td>
<td>3 (10.71%)</td>
<td>3 (15.79%)</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td>1.6% 60-70K</td>
<td>0</td>
<td>1 (5.26%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>0.0% 70-80K</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3.2% &gt; 80K</td>
<td>2 (7.14%)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Household Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5% 0-10K</td>
<td>2 (7.14%)</td>
<td>0</td>
<td>2 (13.33%)</td>
<td></td>
</tr>
<tr>
<td>11.3% 10-20K</td>
<td>1 (3.57%)</td>
<td>3 (15.79%)</td>
<td>3 (20.00%)</td>
<td></td>
</tr>
<tr>
<td>14.5% 20-30K</td>
<td>5 (17.86%)</td>
<td>3 (15.79%)</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td>14.5% 30-40K</td>
<td>2 (7.14%)</td>
<td>3 (15.79%)</td>
<td>4 (26.67%)</td>
<td></td>
</tr>
<tr>
<td>4.8% 40-50K</td>
<td>1 (3.57%)</td>
<td>1 (5.26%)</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td>14.5% 50-60K</td>
<td>6 (21.43%)</td>
<td>2 (10.53%)</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td>11.3% 60-70K</td>
<td>3 (10.71%)</td>
<td>2 (10.53%)</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td>3.2% 70-80K</td>
<td>1 (3.57%)</td>
<td>1 (5.26%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>14.5% &gt; 80K</td>
<td>4 (14.29%)</td>
<td>4 (21.05%)</td>
<td>1 (6.67%)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70.9% married or co-habiting</td>
<td>24 (85.71%)</td>
<td>12 (63.16%)</td>
<td>8 (53.33%)</td>
<td></td>
</tr>
<tr>
<td>29.1% single, separated, or divorced</td>
<td>4 (14.29%)</td>
<td>7 (36.84%)</td>
<td>7 (46.67%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total # people living in house</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean: 2.44 (SD = 1.24)</td>
<td>2.43</td>
<td>2.42</td>
<td>2.47</td>
<td></td>
</tr>
<tr>
<td>Range: 1-8</td>
<td>(1.32)</td>
<td>(1.07)</td>
<td>(1.36)</td>
<td></td>
</tr>
</tbody>
</table>

* Significant group differences, \( F(2, 61) = 8.84, \ p < .0005. *
Materials

Participants completed a series of questionnaires at each of the two collection times during the study. Questionnaire packets included the instruments detailed below.

University of Montana Fire Consequences Questionnaire

The University of Montana Fire Consequences Questionnaire (UMFCQ, Appendix A) was developed for use in the current study. The questionnaire consists of six pages of questions regarding participants’ experiences surrounding the fires. When possible, Likert rating scales, ranging from 1 to 6, were included for rating intensity of reactions to various elements of the disaster.

A total of nine items (i.e., #5-12 and #17) on the form ask participants directly about levels of uncertainty regarding aspects of their experience. Internal consistency for the scale is outlined in the results section. Table 2 displays the nine areas about which uncertainty was assessed. Each of these items initially asks for a yes/no response, then prompts the participant to rate the degree to which their level of uncertainty on the item was “upsetting or unsettling” to them. The content of these items covers a wide range of concerns about which residents might experience uncertainty, including threat of evacuation, property damage, threats to the property and well-being of others, potential impact on the community and on natural resources, and the effects of the smoke on physical health. An additional question, although not inquiring about uncertainty directly, may also factor into the element of uncertainty.
Question 14 asks respondents, "If you left your home, how much notice did you have before leaving?" It is theorized that respondents who report little notice before evacuating their homes may also answer many of the "uncertainty" questions affirmatively, with associated high levels of distress regarding their uncertainty.

Table 2

<table>
<thead>
<tr>
<th>Uncertainty Items: Breakdown by Theorized Underlying Construct</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construct</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Personal Uncertainty</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Community Uncertainty</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Beck Depression Inventory, 2nd edition (BDI-II)

The BDI-II is a self-report measure of depressive symptomatology in adults and adolescents over age 13, developed by Beck, Steer, and Brown in 1996 to better reflect the diagnostic criteria for depression in the DSM-IV. The scale consists of 21 questions about a variety of depressive symptoms, with responses ranging in severity from 0 to 3, 3 being the most severe. The maximum total score for the scale is 63. Suggested cut scores for the scale are 0-13, minimal depressive symptoms, 14-19, mild, 20-28 moderate, and 29-63, severe (Beck, Steer, & Brown, 1996). The measure was normed on 500 outpatient participants, as well as a student sample of 120. For the norm group, the internal consistency is high, with a coefficient alpha of .92 for the outpatient sample and .93 for the college students (Beck, Steer, & Brown, 1996). In the norm group, test-retest reliability over a one week period was also strong, with an alpha of .93 (Beck, Steer, & Brown, 1996). When compared to other measures, the BDI-II shows adequate discriminant validity between depression and anxiety, with a correlation with the Revised Hamilton Psychiatric Rating Scale for Depression of .71 and with the Revised Hamilton Rating Scale for Anxiety of .47 (Beck, Steer, & Brown, 1996). In the current sample, the internal consistency is high, with an alpha of .87.

State-Trait Anxiety Scale (STAI)

The STAI (Form Y-1) was developed by Spielberger, Gorsuch, Lushene, Vagg, and Jacobs in 1983 to measure anxiety of two different types. State anxiety
refers to an unpleasant emotional condition of arousal and nonspecific fear in response to a stressor. In contrast, **trait anxiety** describes a relatively stable personality trait of anxiety-proneness. The two constructs are correlated, as described by the authors, in that “the stronger the anxiety trait, the more probable that the individual will experience more intense elevations in state anxiety in a threatening situation” (Spielberger, et al., 1983). Individuals who evidence a high level of trait anxiety tend to perceive a larger number of situations as threatening, although few differences exist in high and low trait anxiety individuals' responses to actual physical danger (Spielberger, et al., 1983). The instrument contains a total of 20 items for state and 20 for trait anxiety, and scores for each scale can vary from a minimum of 20 to a maximum of 80. The scale has been used extensively in research for the past two to three decades and has shown satisfactory concurrent validity with other, more lengthy measures of anxiety (Spielberger, et al., 1983). It also shows high levels of discriminant validity for differentiating between individuals with elevations in psychopathology (trait scale) and those without, and for differentiating between situational influences on anxiety levels (state scale) (Spielberger, et al., 1983). Internal consistency for the scale was very high for the current sample, with an alpha of .92 for the total scale, .95 for state anxiety, and .87 for trait anxiety.

**Posttraumatic Stress Diagnostic Scale (PDS)**

The Posttraumatic Stress Disorder Scale (PDS), designed by Foa and colleagues in 1995, is the second generation of a PTSD self-report form (Foa,
Cashman, Jaycox, & Perry, 1997). The first version of the instrument, the PTSD Symptom Scale - Self Report (PSS-SR; Foa, Riggs, Dancu, & Rothbaum, 1993) was a 17-item questionnaire based on the diagnostic criteria for PTSD in the DSM-III-R. Although the PSS-SR showed highly satisfactory psychometric properties, it failed to include information regarding the nature of the event (i.e., criterion A in the DSM-IV). When the authors revised the instrument to align with the DSM-IV, they included a section on the event and a section on the degree of impairment (i.e., criterion F in the DSM-IV). The resulting instrument, the PDS, parallels the diagnostic criteria for PTSD in the DSM-IV, dividing symptoms into clusters of "reexperiencing," "avoidance," and "arousal," and asking specific questions that correspond to each of the 17 symptoms listed in the DSM-IV. For each symptom, there is a four-point scale for severity, ranging from 0-3 (Foa, et al., 1997).

Reliability and validity of the instrument were tested on a group of 248 males (55%) and females (45%) who reported a variety of trauma, including accident, natural disaster, assault, and combat (Foa, et al., 1997). The instrument was tested for agreement with the Structured Clinical Interview for the DSM-IV (SCID-IV) for diagnosis of PTSD. Subjects were divided into two groups, based on a positive or negative PTSD diagnosis per the SCID-IV. Results support the PDS as a valid measure for PTSD diagnosis, with T values for comparison of these two groups' scores ranged from 12.11 to 16.18, p<.001. Effects sizes for mean differences ranged from 1.22 to 1.43. According to the authors, the internal
consistency of the instrument is strong, with an alpha of .92 for Total Symptom Severity, .78 for Reexperiencing, .84 for Avoidance, and .84 for Arousal (Foa, et al., 1997). In the original study, test-retest reliability (average of 16 days) for the diagnosis of PTSD was satisfactory, at a kappa of 87% (Foa, et al., 1997). Test-retest reliability for symptom severity was slightly lower, with reliability coefficients ranging from .77 (reexperiencing) to .85 (arousal) in the original study (Foa, et al., 1997). This change in symptom severity may reflect an actual reduction in symptomatology over time, however. The sensitivity of the PDS was .89, and specificity was .75, reflecting a slight tendency for the PDS to overdiagnose PTSD (Foa, et al., 1997). In the current sample, internal consistency is good, with an alpha of .87 for Total Symptom Severity. Subscale alphas for the current sample were moderate to strong: .67 for reexperiencing, .84 for avoidance, and .72 for arousal symptoms.

Demographics Questionnaire

A demographics questionnaire, developed for use in prior research at the University of Montana, requests information regarding participants' gender, age, ethnic identity, occupation, income, level of education, marital status, and household members.

Procedure

Information was gathered from participants between December 2000 to early April 2001, approximately 3 to 6 months after the end of the fires in late September 2000. Subjects who responded to flyers, word of mouth information,
and public service announcements were contacted by phone initially so that the study could be explained to them. If they expressed a desire to participate in the study, an appointment for a telephone interview will be made, and a packet of questionnaires was mailed to their address. Subjects were interviewed briefly by telephone using the PTSD portion of the SCID-IV. Researchers then asked subjects to complete the questionnaire packet that was been mailed to them and return it in an enclosed preaddressed, stamped envelope. All questionnaires and interviews were administered by graduate students in the clinical psychology program. Participants were informed that their statements and descriptions might be used in publications related to the study, but that their names will not be linked to any information reported in research. A code number was assigned to each subject for the purpose of protecting anonymity.

Results

Definition of Terms for the Three Groups

Several previous studies have cited proximity as an important factor in survivors' responses to disaster. Prior studies have grouped subjects not merely by physical location in relation to the disaster, but also by the consequences of the disaster on their day-to-day lives. For example, Tucker and colleagues (1999) grouped subjects according to their relationships to the victims of the Oklahoma City bombing and their involvement in the event (e.g., "next of kin," "service providers," "support providers") rather than by their geographic proximity to the explosion. Given the irregular distribution of the fires within the Bitterroot
valley, participants in the current study were categorized into three groups according to the following criteria: *Group 1* consisted of those individuals actually evacuated during the fires, *Group 2* was comprised of individuals who lived in areas where others were evacuated but who were not themselves displaced, and *Group 3* was made up of individuals living in areas more removed from the fires (i.e., those who were not living in communities where anyone was evacuated).

**Power**

Given the relatively small sample size in the study, a power analysis was conducted to determine whether sufficient power was present to detect group differences. When a moderate effect size \( (d = .50; \text{Cohen, 1988}) \) was assumed, 62 participants yielded a power of .97 \( (\alpha = .05, \text{two-tailed}) \) or .89 \( (\alpha = .01, \text{two-tailed}) \). For analyses that examined differences by group, an average of 20 participants per group was assumed, yielding a power of .61 \( (\alpha = .05, \text{two-tailed}) \) with a moderate effect size. The relatively low power may have hampered the ability to detect differences between groups and must be taken into account when interpreting the study results. Unfortunately, given the time-sensitive nature of data collection, it was not possible to increase the sample size.

**Development of the UMFCQ**

Because the UMFCQ was a new measure developed for this study, correlation matrices were generated for the uncertainty items to explore the relationships between them. Due to the limited number of participants for
whom uncertainty regarding the well-being of pets and livestock was relevant ($n = 3$), that item was dropped from all analyses, leaving eight items. Table 3 presents correlations between ratings of *degree of distress* for all eight uncertainty items. The majority of the distress items had mild to strong relationships with each other, with Pearson's correlations ranging from .33 to .88 for those that were significantly correlated. As seen in Table 3, all eight uncertainty items except one correlated significantly with six to seven others. The exception was distress regarding the possible effects of the fires on the health of self or others, which correlated significantly with only four others. The relationship between distress over the possibility of leaving home and the possibility of home damage was the strongest ($r = .88, p < .0005, n = 42$).

It was originally theorized that the uncertainty items reflected two broad categories, Personal Uncertainty and Community Uncertainty (refer to Table 2). Personal Uncertainty items included concerns about relocation, home damage, the effectiveness of fire protection efforts, and health effects of the fires. In contrast, Community Uncertainty items tapped into participants' societal concerns, such as the safety of others or others' property, the general impact on the community, and the effects of the fires on natural resources. As indicated by the correlation matrix (Table 3), the degree of distress variables generally did not support the two grouping of variables proposed prior to the analysis.
Table 3

Correlations Between Uncertainty Items: Degree of Distress

<table>
<thead>
<tr>
<th></th>
<th>Leave Home</th>
<th>Home Damage</th>
<th>Protection Efforts</th>
<th>Safety of Others</th>
<th>Others' Property</th>
<th>Comm. Effects</th>
<th>Natural Resource</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave Home</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home Damage</td>
<td></td>
<td>.88***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection Efforts</td>
<td></td>
<td>.83***</td>
<td>.81***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety of Others</td>
<td></td>
<td>.48**</td>
<td>.40*</td>
<td>.50**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others' Property</td>
<td></td>
<td>.49**</td>
<td>.48**</td>
<td>.49**</td>
<td>.70***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Effects</td>
<td></td>
<td>.41*</td>
<td>.39*</td>
<td>.53***</td>
<td>.50**</td>
<td>.64***</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Natural Resources</td>
<td></td>
<td>.39**</td>
<td>.37*</td>
<td>.60***</td>
<td>.47**</td>
<td>.48***</td>
<td>.69***</td>
<td>1.00</td>
</tr>
<tr>
<td>Health</td>
<td></td>
<td>.28</td>
<td>.24</td>
<td>.02</td>
<td>.36*</td>
<td>.59***</td>
<td>.43**</td>
<td>.33*</td>
</tr>
</tbody>
</table>

* p < 0.05 (two-tailed)
** p < 0.01 (two-tailed)
*** p < 0.001 (two-tailed)

The eight degree of distress uncertainty items then were examined for internal reliability. Due to the small number of participants in relationship to the number of uncertainty items, a factor analysis was not possible. Instead, a reliability analysis of the items, using alpha coefficients, was performed to explore the degree to which the uncertainty items correlated with each other, reflecting the two proposed underlying aspects of uncertainty. The alpha coefficient for the Personal Uncertainty group was .81, and the alpha coefficient for the Community Uncertainty group was .83. When a correlation was run, however, results showed that the two theorized variables were highly correlated ($r = .71, p < .0005$). A reliability analysis was conducted next on all eight of the
uncertainty items, and the resulting alpha coefficient was .84 (see Table 4 for
details on each proposed uncertainty variable). Based on these results, it
appeared not to make sense to separate the personal uncertainty and community
uncertainty subscales; therefore, an overall uncertainty score was created, based
on the average degree of distress regarding uncertainty reported by each
participant (i.e., sum of each participant's distress ratings divided by the number
of items answered). This variable, Global Uncertainty, was used in analyses of
the general influence of uncertainty on symptomatology.

Table 4

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td></td>
</tr>
<tr>
<td>Alpha Coefficient</td>
<td></td>
<td>(SD)</td>
<td>(SD)</td>
<td>(SD)</td>
<td></td>
</tr>
<tr>
<td>Personal Uncertainty</td>
<td>.81</td>
<td>3.35</td>
<td>3.60</td>
<td>3.24</td>
<td>2.99</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.14)</td>
<td>(1.11)</td>
<td>(1.18)</td>
<td>(1.11)</td>
</tr>
<tr>
<td></td>
<td>n = 61</td>
<td>n = 28</td>
<td>n = 19</td>
<td>n = 14</td>
<td></td>
</tr>
<tr>
<td>Community Uncertainty</td>
<td>.83</td>
<td>3.55</td>
<td>3.61**</td>
<td>3.95**</td>
<td>2.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.91)</td>
<td>(.83)</td>
<td>(.95)</td>
<td>(.69)</td>
</tr>
<tr>
<td></td>
<td>n = 62</td>
<td>n = 28</td>
<td>n = 19</td>
<td>n = 15</td>
<td></td>
</tr>
<tr>
<td>Global Uncertainty</td>
<td>.84</td>
<td>3.41</td>
<td>3.58*</td>
<td>3.63*</td>
<td>2.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.94)</td>
<td>(.92)</td>
<td>(1.01)</td>
<td>(.75)</td>
</tr>
<tr>
<td></td>
<td>n = 62</td>
<td>n = 28</td>
<td>n = 19</td>
<td>n = 15</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05 level (two-tailed)
**p < 0.01 level (two-tailed)

Two items on the UMFCQ, the possibility of evacuation and the potential
for home damage, asked participants to state the number of days that they had
experienced uncertainty. These two duration of uncertainty items showed a
moderate correlation of .36 (p < .01).
Table 5

Means and Standard Deviations: Symptoms of Depression, Anxiety, and PTSD

<table>
<thead>
<tr>
<th>Total Sample</th>
<th>By Group</th>
<th>Group Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>Group 1: Evacuees</td>
<td>Group 2: Near Evac.</td>
</tr>
<tr>
<td>BDI-II Total Score</td>
<td>n = 62</td>
<td>n = 28</td>
</tr>
<tr>
<td>(63 possible, range 0-23)</td>
<td>4.61 (5.59)</td>
<td>3.32* (4.73)</td>
</tr>
</tbody>
</table>

STAI: Total Scores
| n = 57 | n = 25 | n = 17 | n = 15 |
| State | (80 possible, range 20-65) | 34.68 (11.26) | 30.64** (10.59) | 39.29 (9.72) | 36.20 (12.22) | a |
| Trait | (80 possible range 26-57) | 39.40 (8.89) | 36.04** (8.85) | 44.05 (7.78) | 38.67 (8.17) | a |

PDS: # of Symptoms
| n = 58 | n = 24 | n = 19 | n = 15 |
| Reexperiencing | (5 possible, range 0-5) | .91 (1.26) | .67** (.92) | 1.63** (1.57) | .40 (.91) | a, b |
| Avoidance | (7 possible, range 0-6) | .69 (1.50) | .42* (.93) | 1.53* (2.20) | .07 (.26) | a, b |
| Arousal | (5 possible, range 0-5) | .97 (1.31) | 1.08 (1.26) | 1.26 (1.56) | .40 (.63) |

PDS: Severity of Symptoms
| n = 58 | n = 24 | n = 19 | n = 15 |
| Reexperiencing | (15 possible, range 0-7) | 1.07 (1.53) | .75** (1.03) | 1.95* (1.96) | .47 (1.13) | a, b |
| Avoidance | (21 possible, range 0-11) | .86 (2.09) | .54 (1.35) | 1.90* (3.11) | .07 (.26) | b |
| Arousal | (15 possible, range 0-12) | 1.43 (2.31) | 1.46 (2.00) | 1.95 (3.10) | .73 (1.39) |

* Group 1 significantly different from Group 2.
** Group 2 significantly different from Group 3.
* p < 0.05 level (two-tailed)
** p < 0.01 level (two-tailed)
Descriptive Statistics

Descriptive statistics for participants’ scores on the three measures of symptoms of depression, anxiety, and PTSD are displayed in Table 5. These data initially were compared to cut-off scores and/or normative data for each instrument to examine trends in the sample in light of guidelines for each measure. Later, group differences were explored by means ANOVA, followed by independent samples t tests for those ANOVA results that were significant.

Depressive symptoms, as measured by the BDI-II, were generally low. On the BDI-II, a score of 14 or higher is considered to be indicative of at least a mild level of depressive symptoms (Beck, Steer, & Brown, 1996). As seen in Table 5, the mean BDI-II score for the total sample in this study was 4.61 (SD = 5.59), well below the recommended cut-off score. In the current sample, 5 participants out of 62 (8.1%) scored at least a 14 on the BDI-II; Group 2 included 3 of the 5 participants with this level of depressive symptomatology.

Symptoms of anxiety were examined using participants’ responses to the STAI. The developers of the STAI do not specify a particular cut-off score for this instrument; however, normative data have been developed. According to Spielberger and colleagues (1983), for a sample of working adults (n = 1868), the average STAI-State (STAI-S) score is 35.59, with a standard deviation of 10.39; the average STAI-Trait (STAI-T) score is 34.86, with a standard deviation of 9.13. As noted in Table 5, in the present study, the average STAI-S score for the sample of participants who completed the STAI (n = 57) was 34.68, with a standard
deviation of 11.26. For trait anxiety, STAI-T scores for the entire sample averaged 39.40, with a standard deviation of 8.89. Scores from the current study were compared to the norms for working adults using a standardized z score, with the assumption that the means and standard deviations for working adults in the normative group could be viewed as representative population parameters for working adults as a whole. When the average of the scores for all participants was compared to the norm, no significant differences were found for the whole sample on state anxiety. However, the sample as a whole was significantly higher than the mean on trait anxiety, \( z = 3.76, p < .01 \). When the mean for each proximity group (see Table 5) was compared to the norm, Groups 1 and 2 varied from the normative data in opposite directions. Group 1 showed a significant difference from the norm group, evidencing lower state anxiety scores, \( z = 2.38, p < .05 \). Interestingly, the trait anxiety scores for this same group were not significantly different than the norm. In contrast to Group 1, Group 2 showed no significant difference from the norm for state anxiety; however, they did evidence significantly elevated trait anxiety scores when compared with the norm group, \( z = 4.29, p < .001 \). Group 3 did not differ significantly from the norm for either state or trait anxiety, although there was a trend for their trait anxiety scores to be slightly elevated, \( z = 1.62, p = .054 \).

Symptoms of PTSD were examined next. The PDS, reflecting the criteria for PTSD in the DSM-IV, requires that the event meet a minimal definition for a traumatic experience before the individual is diagnosed with PTSD. In addition,
the individual must endorse at least one reexperiencing symptom, three avoidance symptoms, and two arousal symptoms to meet criteria for diagnosis. The PDS also allows subjects to rate the severity level (0-3) of each symptom. Table 5 presents both the number of symptoms and the severity ratings by group for each type of symptom.

A total of 3 individuals (5.2% of the 58 participants who completed this form) met criteria for PTSD, based on their responses to the PDS. All three of these subjects were in Group 2, representing a 15.8% positive diagnosis rate within this subgroup of participants. The number of PTSD symptoms endorsed by subjects was examined next, in order to determine the number of individuals who met each symptom cluster's criteria for PTSD diagnosis. A total of 27 individuals (46.55% of respondents) endorsed at least one reexperiencing symptom; 10 subjects (37.04% of those who met this criteria) were in Group 1, 14 (51.85%) were in Group 2, and 3 (11.11%) were in Group 3, \( \chi^2 (2, n = 58) = 10.10, p < .01 \). At least three avoidance symptoms were reported by 6 participants (10.34% of respondents); of those who met the avoidance criteria, 1 (16.67%) was in Group 1 and 5 (83.33%) were in Group 2. A total of 16 subjects (27.59% of respondents) endorsed at least two arousal symptoms; of those meeting the criteria for arousal symptoms, 8 (50.00%) were in Group 1, 7 (43.75%) were in Group 2, and 1 (6.25%) was in Group 3.

The relationship between symptoms of depression, anxiety, and PTSD were examined last. As seen in Table 6, participants' scores on all three measures
tended to be highly correlated. These results support the close relationship between these symptoms noted in prior studies of post-disaster symptomatology.

Table 6

<table>
<thead>
<tr>
<th></th>
<th>BDI-II</th>
<th>STA I State</th>
<th>STA I Trait</th>
<th>PDS Reexper.</th>
<th>PDS Avoidance</th>
<th>PDS Arousal</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI-II</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STA I State</td>
<td>.50***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STA I Trait</td>
<td>.58***</td>
<td>.873***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>n = 54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDS Reexperiencing</td>
<td>.41**</td>
<td>.258</td>
<td>.317*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 58</td>
<td>n = 54</td>
<td>n = 54</td>
<td>n = 54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDS Avoidance</td>
<td>.61***</td>
<td>.341*</td>
<td>.43**</td>
<td>.53***</td>
<td>1.00</td>
<td></td>
</tr>
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<td>n = 54</td>
<td>n = 58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDS Arousal</td>
<td>.41**</td>
<td>.339*</td>
<td>.29*</td>
<td>.51***</td>
<td>.66***</td>
<td>1.00</td>
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<td>n = 58</td>
<td>n = 58</td>
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</tr>
</tbody>
</table>

1 Reported correlations with PDS scores are based on severity of symptoms.

* p < 0.05 level (two-tailed)
** p < 0.01 level (two-tailed)
*** p < 0.001 (two-tailed)

Group Differences

Scores on each measure were compared by group using analysis of variance (ANOVA), followed by independent samples t tests. Table 5 presents the means and standard deviations by group for symptoms on each measure, and Table 7 presents the findings of the ANOVA run for each instrument. For the BDI-II, significant group differences were noted. When follow-up t tests
were conducted, it was found that the only significant differences were between Groups 1 and 2, with Group 2 reporting the highest level of symptomatology, $t(45) = 2.29, p < .05$.

Table 7

<table>
<thead>
<tr>
<th></th>
<th>BDI-II</th>
<th>STAI-S</th>
<th>STAI-T</th>
<th>PDS-Reexp.</th>
<th>PDS-Avoid.</th>
<th>PDS-Arousal</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F$</td>
<td>3.08</td>
<td>3.45</td>
<td>4.89</td>
<td>5.58</td>
<td>4.09</td>
<td>1.17</td>
</tr>
<tr>
<td>$p$</td>
<td>.05</td>
<td>.04</td>
<td>.01</td>
<td>.01</td>
<td>.02</td>
<td>.31</td>
</tr>
<tr>
<td>$df$</td>
<td>2, 61</td>
<td>2, 56</td>
<td>2, 56</td>
<td>2, 57</td>
<td>2, 57</td>
<td>2, 57</td>
</tr>
</tbody>
</table>

1 Reported ANOVA results for PDS scores are based on severity of symptoms.

On the STAI, significant differences between groups were noted for both state and trait anxiety (see Table 7). Group 2 again evidenced the most severe symptomatology, but these differences were only significant when Group 2's scores were compared with those of Group 1, $t(40) = 2.69, p < .01$ for state anxiety, and $t(40) = 3.08, p < .01$ for trait anxiety. In light of the previous comparison of the group means to the normative data, showing opposing trends for each type of anxiety by group, these findings are not surprising. Potential implications of these different group averages are considered in the discussion section.

Group differences in PTSD symptoms were analyzed next. Table 5 presents the means and standard deviations by group for each symptom cluster, both by total number of symptoms reported and by severity of symptoms. For
number of PTSD symptoms endorsed, results of an ANOVA indicate significant
differences between groups for complaints related to reexperiencing, $F(2, 55) = 5.55, p < .01$, and avoidance, $F(2, 55) = 5.35, p < .01$. Specifically, for number of
reexperiencing symptoms, Group 2 was significantly higher in number of
symptoms than Group 1, $t(41) = 2.52, p < .05$, and Group 3, $t(32) = 2.69, p < .01$. For number of avoidance symptoms, the groups also showed significant
differences, $F(2, 55) = 5.35, p < .01$. For avoidance, Group 2 again reported
significantly more symptoms than Group 1, $t(41) = 2.24, p < .05$, or Group 3, $t(32) = 2.55, p < .05$.

For severity of symptoms on the PDS, which are distributed on a 0-3 scale
for each symptom, ANOVA results showed significant group differences for
symptoms of reexperiencing, $F(2, 55) = 5.56, p < .05$, and of avoidance, $F(2, 55) = 4.09, p < .05$ (see Table 7). In follow-up $t$ tests, significant differences were found
between Groups 1 and 2 for severity of reexperiencing symptoms, $t(41) = 2.58, p < .01$, with those in Group 2 evidencing the highest severity. Differences
between Groups 2 and 3 were significant for reexperiencing, $t(32) = 2.61, p < .01$, as well as for avoidance, $t(32) = 2.77, p < .05$; in this comparison, Group 2 again
showed the highest severity ratings. As evidenced by participants' responses to
all three standardized measures of symptomatology, Group 2 exhibited the
highest levels of symptoms across all instruments.
Research Question #1: Do participants living in the closest proximity to the fires report greater levels of distress related to uncertainty than those more distal to the fires?

The three groups representing different levels of proximity to the fires were compared for level of Global Uncertainty using an ANOVA. Results indicate that there was a trend, \( F (2, 59) = 2.92, p = .06 \), toward the highest rates of uncertainty being experienced by those individuals who were in Group 2, followed by participants in Group 1, then by those in Group 3 (see Table 8). Follow-up \( t \) tests (two-tailed) indicate that there was no significant difference between Groups 1 and 2, but the difference between Group 1 and Group 3 was significant, \( t (41) = 2.27, p < .05 \), with Group 1 reporting the higher level of uncertainty. Group 2 also evidenced significantly greater levels of uncertainty than Group 3, \( t (32) = 2.19, p < .05 \).

Table 8

<table>
<thead>
<tr>
<th></th>
<th>BDI-II</th>
<th>STAI State</th>
<th>STAI Trait</th>
<th>PDS Reexper.</th>
<th>PDS Avoidance</th>
<th>PDS Arousal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>.10</td>
<td>.02</td>
<td>-.05</td>
<td>.40**</td>
<td>.11</td>
<td>.27*</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>(.42)</td>
<td>(.90)</td>
<td>(.70)</td>
<td>(.002)</td>
<td>(.43)</td>
<td>(.04)</td>
</tr>
<tr>
<td></td>
<td>( n = 62 )</td>
<td>( n = 57 )</td>
<td>( n = 57 )</td>
<td>( n = 58 )</td>
<td>( n = 58 )</td>
<td>( n = 58 )</td>
</tr>
</tbody>
</table>

1 Reported correlations with PDS scores are based on severity of symptoms.
* \( p < 0.05 \) level (two-tailed)
** \( p < 0.01 \) level (two-tailed)

Because previous research has found that extent of property loss also is predictive of depression, anxiety, and trauma symptoms post-disaster, consideration was given to examining the relationship between property loss and participants’ responses on the BDI-II, the STAI, and the PDS. However, in
this sample only fourteen respondents claimed any property damage or loss, resulting in too little power to detect differences reliably.

Research Question #2: Does degree of uncertainty correlate positively with severity of PTSD symptoms, level of depression, and level of anxiety?

To examine the relationship between uncertainty and psychological symptomatology, correlations between participants' Global Uncertainty scores and their scores on the PDS, BDI-II, and STAI were analyzed (see Table 8). As noted in these results, severity of reexperiencing symptoms on the PDS had a moderately strong relationship to Global Uncertainty ($r = .40, p < .01$). Severity of arousal symptoms on the PDS also correlated significantly with Global Uncertainty scores ($r = .27, p < .05$). No significant correlations were noted for uncertainty and depressive symptoms (BDI-II), anxiety (STAI, state and trait), or for avoidance symptoms on the PDS.

Because past research has shown a correlation between trait anxiety and symptoms of psychological distress, the relationship between Global Uncertainty and participants' scores on the trait portion of the STAI were examined for a possible confound between trait anxiety and the above correlations. Given that a confounding variable can be defined as any variable that systematically varies with the level of the independent variable (Keppel, 1991, p. 11), and that in this sample (see Table 8), Global Uncertainty had no significant relationship with trait anxiety, it is unlikely that trait anxiety significantly influenced the relationship between Global Uncertainty and subjects' scores on other measures.
Research Question #3: Is there a relationship between duration of uncertainty and symptomatology, paralleling earlier research regarding degree of exposure to disaster and outcome?

Finally, the relationship between duration of uncertainty and symptomatology was examined. On the UMFCQ, two questions directly asked about duration of uncertainty: 1) For how many days were you uncertain if you would need to leave your home? and 2) For how many days were you uncertain if your home would be damaged or destroyed by the fires? Each of these questions allowed participants to respond in an open-ended, quantitative fashion, creating a natural continuous measure of duration of uncertainty regarding these two possible concerns.

Table 9

Duration of Uncertainty by Group (Mean and SD)

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration:</strong> Leave Home</td>
<td>9.85 (15.55)</td>
<td>14.42 (20.33)</td>
<td>8.22 (9.68)</td>
<td>3.79 (8.53)</td>
</tr>
<tr>
<td></td>
<td>n = 57</td>
<td>n = 25</td>
<td>n = 18</td>
<td>n = 14</td>
</tr>
<tr>
<td><strong>Duration:</strong> Home Damage</td>
<td>6.08 (8.24)</td>
<td>8.70** (8.68)</td>
<td>5.57 (8.43)</td>
<td>1.42 (4.32)</td>
</tr>
<tr>
<td></td>
<td>n = 56</td>
<td>n = 25</td>
<td>n = 19</td>
<td>n = 12</td>
</tr>
</tbody>
</table>

** Group 1 significantly different from Group 3 at the .01 level on independent samples t tests.

For the purpose of these analyses, subjects who responded that they did not feel any uncertainty were assigned a "number of days" rating of zero. Table 9 displays the means and standard deviations for number of days of uncertainty...
by group. The average number of days that subjects \( n = 57 \) reported feeling uncertain regarding the need to evacuate their homes was 9.85, with a standard deviation of 15.55 and a range of 0 to 60 days. The average number of days that participants \( n = 56 \) reported feeling uncertain regarding the possibility of damage to their homes was 6.08, with a standard deviation of 8.24 and a range of 0 to 30 days. As can be seen in Table 8, the general trend was for a gradual increase in duration of uncertainty with closer proximity. When an ANOVA was run to compare differences between groups, significant differences were noted only for duration of uncertainty regarding home damage, \( F (55) = 3.52, p < .05 \). Independent samples \( t \) tests revealed that the only significant difference between groups was that Group 1 reported a significantly higher number of days of uncertainty regarding the possibility of home damage when compared to Group 3, \( t (35) = 3.408, p < .01 \). Following group comparisons, correlations were run to examine the relationship between these two duration of uncertainty variables and participants' responses to the BDI-II, the STAI, and the PDS. Contrary to expectations, no significant correlations between duration of uncertainty and symptomatology were observed in this sample.

Discussion

Overall, the results of this exploratory study suggest that uncertainty may be an important factor to consider in disasters that include a protracted period of threat, particularly in regards to symptoms of PTSD. However, it appears that the associations between uncertainty, proximity, and symptomatology are
complex. Results of this study imply that geographic proximity may have less of an effect on the psychological outcome of survivors of prolonged disaster than that seen in more temporally contained events. Uncertainty appears to have played an critical role in this disaster, but its influence on survivors remains somewhat puzzling.

*Observed Symptomatology*

What symptoms were reported following the Montana fires and by whom? In this study, one group of subjects exhibited significantly more symptoms of depression and anxiety. PTSD symptoms, which include the three broad clusters of reexperiencing, avoidance, and arousal symptoms, were also noted to be different between groups. In contrast to past research, however, those most proximal to the disaster did *not* exhibit the highest rates of symptomatology on any of the measures included in this study. Counter intuitively, those individuals living close to the fires but not evacuated (i.e., Group 2) reported more symptoms of depression, anxiety, and PTSD than either those who were evacuated (i.e., Group 1) or those who were distant from the fires (i.e., Group 3). More specifically, Group 2 evidenced significantly more depression and anxiety than Group 1; Group 2 also reported significantly elevated levels of reexperiencing and avoidance symptoms when compared with Group 2 and Group 3. These unexpected results provoke a number of questions. What is different about Group 2? What qualities of Group 2's experiences
particularly trigger reexperiencing and avoidance symptoms? Why are there no
significant differences between groups for arousal symptoms?

Participants in Group 2 share many of the same experiences as those in
Group 1: several weeks of heavy smoke and the roar of fires on nearby hills,
extended periods in which helicopters and emergency equipment intruded into
their daily lives, the disruption of normal community events and activities, the
barricading of familiar roads by local law enforcement, and the effects of
virtually continuous media coverage of the fires. Given the pervasiveness of
each of these effects of the fires, it would make sense for both groups to report
elevations in symptoms. What appears to differentiate Groups 1 and 2 is one act,
the evacuation of those in Group 1 to nearby shelters and homes. This
experience presents a number of possible reasons for the unexpected differences
in symptomatology between Groups 1 and 2.

It appears that in prolonged threat, proximity to the disaster is not as
clearly delineated as it may be in a more discretely defined event. The broad
reach of the effects noted above on residents near a disaster such as these fires
likely increases the potential for post-disaster symptomatology for both those
that are evacuated and those that are not. Importantly, though, those not
evacuated may experience a more sustained exposure to the effects of the fires
because they remain in the area. Many participants in the current study described
the eerie sensation of being able to hear the roar of the fires on nearby hills but
being unable to see the precise location of the fires. Other related that living in
the community "felt like a combat zone," complete with low flying helicopters buzzing through the smoke overhead and fiery debris falling from the sky when trees exploded in the intense heat. Although many of the shelters established by the Red Cross in this disaster were located in the communities affected by the fires, not all evacuees relocated to these shelters. Many in Group 1 reported staying with friends outside the most heavily affected communities, and these relocations may have spared a significant portion of Group 1 from the high rates of exposure endured by most of Group 2, who uniformly reported remaining at home.

For several weeks during the fires, heavy smoke frequently obscured the exact position of the blaze for those on the ground. This type of experience may have increased distress in those who remained in the area more than in those who evacuated, because those who left the area may have felt more confident about the location of the threat or at least about their own level of safety. Additionally, many in Group 2 related that they had to show identification to pass road barricades to get to their homes on a regular basis, whereas most of those in the evacuated group did not pass the barricades as often due to restrictions on returning to their homes and property. This combination of experiences endured by many in Group 2 may have exposed these individuals to more repetitive threat cues than those in Group 1, thus increasing the intensity of symptoms reported by those who remained in the area relative to those evacuated.
Coupled with the possibility of a decreased potential for repetitive exposure to threat cues, a clearly defined plan for dealing with the fires (i.e., evacuation) may help those who are evacuated in a prolonged disaster to cope with the crisis. Previous research indicates that individuals who feel that they have some way of altering their environment to prevent future danger frequently evidence lower rates of PTSD symptomatology than that experienced by those who feel little sense of agency in regards to the threat. This fits well with the different experiences of those who were and were not evacuated during these fires, lending some support to the findings of higher rates of symptomatology in Group 2. It may be that the combination of repetitive threat cues at the time of the fires, combined with a lack of clear alternatives for coping with the threat, increased Group 2's tendency to mentally repeat and relive their experiences, in hopes of "solving" the problem, thus increasing rates of reexperiencing symptoms in this group.

In addition to its potential effects on PTSD symptoms, the lack of a sense of agency about one's situation is also associated with depression. In the face of overwhelming and pervasive negative changes in the environment, individuals who remain in that environment may eventually give up hope that anything can be done to improve their situation. Air quality and visibility were diminished tremendously for weeks on end in the Montana fires. Aside from the option of wearing respirators to filter the air, an unpleasant alternative adopted by only a minority residents on a limited basis, few interventions for altering the effects of
the fires existed for those who lived and worked in the midst of the smoke on a daily basis. Given these conditions, it makes sense that depressive symptomatology would be elevated in Group 2 due to the sense of helplessness that many in this group may have experienced.

The blanket of smoke that covered the Bitterroot valley late in the summer of 2000 may have had an additional effect on depressive symptoms. Many participants in the current study reported that one of the most difficult aspects of their experience was the gray smoke obscuring the sky. Residents in the Missoula area regularly endure cloudy skies the majority of the time in the winter. Several subjects in the present study related that they usually make the most of the blue skies that summer brings by spending more time outdoors. Many made comments such as, “It felt like we missed summer completely this year.” Given the known relationship between seasonal lack of exposure to sunlight and depression, the increased rates of depressive symptomatology in the group of participants who remained in the areas most heavily affected by smoke are not surprising. Those individuals in Group 1 who had the opportunity to get out of the area also had a better chance of spending some time in the sunlight, and this experience may have served as a protective element for this group.

Following the fires, most of those in Group 1 returned to their homes and neighborhoods, primarily because simple economics demanded that they salvage what they could from the fires. On a daily basis, they were graphically
confronted with the devastation inflicted by the fires. In contrast, many in Group 2 stated that they did not want to see and actively avoided the areas that were destroyed by the fires for months after they were over, even if these were areas that they had previously visited with regularity. Many stated that they were afraid to see the effects of the fires. Given the fact that anxiety about an object or situation and avoidance of the same tend to each increase the other in a synergistic fashion, and that repetitive exposure to the same feared object or situation tends to decrease the need for avoidance, there is a certain logic to the paradoxically higher level of anxiety, avoidance, and reexperiencing symptoms noted in Group 2 versus those in Group 1.

A final aspect of the experience of those who were evacuated in this event bears consideration. In the majority of major disasters, those living closest to the center of damage often witness violent injury or death. Not surprisingly, greater proximity to the focal point of impact exposes survivors to a higher risk for post-disaster symptoms. In the Montana fires, the extended duration of the threat altered more than just the physical environment. Because the threat was prolonged, a different set of protective responses was set into motion than would occur with a short-term event such as a tornado or an earthquake. Communities had time to organize civil safety plans such as evacuation and shelters for those most immediately threatened by the fires. Fortunately, the fires progressed in a way that allowed those who might have suffered or witnessed injury or death to escape without serious physical harm. Individuals in Group 1 were spared
witnessing many of the traumatic images that often affect people at the center of
disaster. In light of this aspect of the fires, it makes sense that the symptoms
reported by Group 1 are less than might be expected on the basis of prior
research.

The Role of Uncertainty in Protracted Trauma

Some of the results of this study are congruent with our current
understanding of post-disaster symptomatology and the concept of uncertainty
while others are not. Consistent with expectations, uncertainty was positively
correlated with PTSD-related reexperiencing and arousal. This finding also
appears in some ways to support earlier findings by Ellsworth and Smith (1988)
that uncertainty is related to fear. In addition, individuals nearest to the fires
(i.e., Groups 1 & 2) expressed more distress regarding uncertainty, as well as
consistently longer duration of uncertainty with proximity. However, the
relationship between uncertainty and symptomatology is less straightforward
than these results might imply.

Counter to expectations, uncertainty was only related to reexperiencing
and arousal and showed no relationship to levels of depression, anxiety, or
avoidance symptoms. In addition, although the most proximal group was highly
uncertain, they were not generally more symptomatic than the distal group. In
fact, Group 2, whose uncertainty was similar to Group 1, was highest on all
measures of symptomatology. In particular, participants in Group 2 reported the
highest number and severity of reexperiencing symptoms of the three groups. It
is possible that Group 1's reexperiencing symptoms were lower because they were evacuated and had less exposure to the types of images that might trigger these symptoms, as discussed above. Within Group 1, however, there may have been a subgroup of individuals who were still having difficulty processing their disaster experiences at the time of the study, either because of a higher natural tendency toward anxiety or because their experience prior to evacuation was more severe and threatening than most of the other respondents in Group 1. In addition to looking at the significant differences between groups in this study it is also valuable to examine the general picture. For all PTSD-related symptoms, even though significant differences were not noted between Groups 1 and 3, Group 1 was consistently higher on symptomatology. Interestingly, this did not hold true for symptoms of depression and anxiety. It may be that differences between the groups exist but were not detected due to the relatively small sample and resulting low power.

When the characteristics of the reexperiencing symptoms of PTSD are considered more closely, their relationship with extended periods of uncertainty makes intuitive sense. If uncertainty produces anxiety and a lack of clarity regarding available options for decreasing threat, survivors of prolonged disaster could be expected to return their attention to the event frequently to try to find a solution that feels more dependable and concrete. While these findings on reexperiencing symptoms are logical and were predicted, they appear to be incongruent with the results regarding depressive symptomatology.
Uncertainty can be defined as the perception of obstacles and a lack of clear solutions to a problem. As such, it may have invoke a sense of a lack of agency in a protracted disaster and decrease a survivor's belief that anything can be done to clearly decrease threat. If uncertainty negatively affects one's sense of self-efficacy, therefore, it also should have some relationship to levels of depression, because of the sense of helplessness it might induce. In this study, it appears that uncertainty has little relationship to depression, in spite of uncertainty's high correlation with the reexperiencing symptoms of PTSD. This calls into question the ways in which uncertainty may have been experienced by survivors of the Montana wildfires, a point which will be addressed later in this discussion.

At first glance, the relationship between arousal and uncertainty also appears to make sense. It is likely that prolonged periods of uncertainty regarding the exact nature and location of the fires, along with the accompanying repetitive triggers of fire trucks, smoke, falling ash, and helicopters, increased the overall vigilance of those who remained in the area over and above the effects on those who evacuated and may have endured fewer of these stimuli. Thus, Group 2 as a whole might be expected to show the highest levels of both uncertainty and arousal symptoms. However, given that those who stayed and those who evacuated evidenced similar levels of uncertainty and that no significant differences in arousal symptoms by group were noted, this concept does not hold up well in the current study. Closer scrutiny of the means and
standard deviations for arousal symptoms by group reveals that the two closest groups have a greater amount of variance in levels of arousal, indicating that individuals within this group may have had more varied experiences with the fires and/or responded to their experiences more diversely than those more removed from the fires. As with reexperiencing symptoms, these results hint that survivors of long-term disaster may experience and react to uncertainty in their environment in very different ways. Although the current study does not allow complete exploration of this concept, it is worthwhile to consider the ways in which differences in personal experience during an extended disaster might influence psychological outcomes.

**Defining Uncertainty: Distress, Duration, Severity, and Probability**

Uncertainty was measured in the current study by asking participants to rate both the level of distress that they experienced in regards to uncertainty and the length of time that they experienced uncertainty. This approach was chosen primarily due to the abstract nature of uncertainty as a construct and the rather more concrete concepts of time and personal discomfort (i.e., people are generally more accustomed to their amount of pain or discomfort than their level of uncertainty). It was theorized that people might be able to quantify their level of distress regarding their uncertainty or the length of time that their uncertainty lasted more easily than their "uncertainty" itself. As is always the case with a construct that can be operationalized in numerous ways, there are pro's and con's to any particular approach. Participants' rich and varying descriptions of
their ordeals during the fires highlight the importance of examining several elements of uncertainty that may contribute to the experience of a prolonged disaster.

*Distress regarding uncertainty*

With the exception of intentional high-risk, "thrill-seeking" types of activities, most people probably prefer a state of greater rather than less certainty in their lives. We generally like to know where our next meal is coming from, for example, or how we will pay our bills at the end of the month. Threats to the overall stability of our lives are usually viewed as stressful, at least initially, and we tend to try to take action to reestablish our equilibrium when things like our economic resources or health or social structure are thrown off balance. From this perspective, measuring the amount of distress that people report in relation to uncertainty appears to be a salient aspect of the experience of disaster. When the disaster is prolonged, and the chances for eliminating uncertainty are reduced, it seems logical that distress regarding uncertainty would be higher.

Nonetheless, the absolute amount of uncertainty and distress about it are not necessarily correlated. It is possible to conceive of situations in which distress will not always increase with uncertainty. For instance, if the area of one's life that is affected most by uncertainty is less important than the areas in which one feels relatively "safe," uncertainty may be a reasonably tolerable state. In the present study, those faced the possibility of losing their summer vacation home may have experienced less distress regarding uncertainty relative to those
who feared destruction of their primary residence. Many in Group 1 may have rated their distress as relatively low because they did not feel that the property they were threatened with losing represented the most valued part of their lives. An appraisal such as this may account for the ratings of distress in Group 1 being similar to those seen in Group 2, even though Group 1 reported their duration of uncertainty to be much longer. Another possibility is that those individuals who endured longed duration of uncertainty eventually became acclimated to its presence in their lives and were able to tolerate higher levels of uncertainty without a commensurate increase in distress.

Distress regarding the presence of uncertainty in one's life may also be related to one's level of trait anxiety or neuroticism. In this study, given that Group 2 is highest in both types of anxiety as well as other symptomatology, and that Group 1 is generally lowest in both, anxiety should be considered as a possible factor that produces distress. Perhaps asking people to rate their distress about an item pulls for those who are naturally more anxious to rate that item as higher in intensity. It may be that anxiety is the factor that is driving up both uncertainty ratings and overall symptomatology in Group 2 and that Group 1's relatively low anxiety helps to dampen that group's symptom severity in kind. It is unclear why Group 1 is lowest of the three groups on both types of anxiety. If a larger number of individuals who evacuated and were doing well at the time volunteered for the study relative to evacuees who were having
difficulty with the effects of the fires on their lives, the level of anxiety evidenced in the evacuated population could have been misrepresented.

Is distress regarding uncertainty driven solely by anxiety levels? The relationship between uncertainty and anxiety is not clear in light of their relationship to other types of symptomatology. For example, when the relationship between uncertainty and PTSD symptoms were explored, significant correlations were seen for the reexperiencing and arousal symptoms of PTSD. However, when proximal groups’ levels of PTSD symptoms were examined using analysis of variance, significant group effects for reexperiencing and avoidance symptoms were observed, with Group 2 (i.e., those who were also highest in anxiety) being highest on both reexperiencing and avoidance. By group, no significant differences were noted for arousal. Given the known close relationship between anxiety, avoidance, and physiological arousal, it does not make sense for those Group 2 to be significantly higher on avoidance but not arousal if their increased anxiety alone is elevating their symptoms. Although these analyses do not delineate the influence of each variable, they do suggest that uncertainty may be related to post-disaster symptomatology in a way that is different from the influence of anxiety. Other aspects of the experience of uncertainty in this disaster may also be related to symptomatology.

*Duration of uncertainty as an aspect of survivors’ experiences*

In this study, uncertainty also was assessed in terms of the duration of its presence. Participants responded to questions about the duration of uncertainty
regarding the threat of evacuation and the threat of home damage (i.e., “For how many days did you experience uncertainty regarding [each variable]?”).

Although no clear relationship between duration of uncertainty and symptomatology was found in this study, given the limited number of items that inquired about duration, there may have been a problem with measurement. Thus, it is not possible to draw reliable conclusions about the relationship between duration and symptoms based on the results of this study.

Nonetheless, it may be fruitful to consider the ways in which duration of uncertainty may have affected psychological outcome in this situation. Imagine a family in Group 2 spending several days clearing brush from around their home, tracking the progress of the fires on the news whenever they can catch it, and spending weeks in limbo as they wait for rain. Now picture a family in Group 1 who knows about the fires for only two days before they are given orders to evacuate. Although the second family may endure a more intense and unexpected level of change in their lives, if they have a safe haven that works well for them as a family when they evacuate, they may adjust to the change more readily than those who wait for weeks for a threat that never materializes.

In many ways, duration seems to be at the very heart of uncertainty in a protracted threat situation, and it will be valuable in future studies to explore survivors’ reports regarding the duration of their uncertainty across more areas of their lives.
Severity of consequences and the experience of degree of uncertainty

Degree of uncertainty also can be conceptualized in terms of the severity of the potential negative event about which one is uncertain. Participants in the current study were not asked directly about their perceptions of the severity of the consequences of the fires on their lives. Although the analysis was not done as a part of this study, it might be informative to examine the relationship between the types of property that people lost in the fires and their levels of depression, anxiety, and posttraumatic symptoms. For instance, the threatened loss of a primary residence would likely have a much stronger impact than would the threatened loss of an outbuilding. It also is possible that the severity that one imagines as possible in a prolonged threat increases with duration of exposure. It would be helpful in future studies to ask participants to rate the relative salience of each uncertainty item to examine the relationship between potential severity and relevance to their lives of the event and their symptoms following the disaster. Concern about the potential severity of the outcome of disasters is closely related conceptually to an element that bears consideration, the likelihood that the event will actually occur.

Probability as an aspect of degree of uncertainty

A final aspect of the intensity of uncertainty is the strength of belief that an individual holds regarding the possibility that the event actually may occur. In the current study, beliefs about probability of harm may have played a large role in the differences observed between groups regarding overall uncertainty.
The two groups defined as most proximal to the fires rated their uncertainty as significantly higher than those in the distal group. It is interesting that in this study both proximal groups' increased levels of uncertainty appear to have focused more on community-oriented rather than personal concerns. When considered in light of probability, however, this result makes sense. Given the somewhat mercurial nature of the course of most wildfires, it may be more difficult to believe than one will be affected personally than that someone one knows may be harmed. In other words, in the current study, the probability that the fires would have a negative impact on others in the community may have seemed much more likely to many of those in Groups 1 and 2 than that their own house would burn. It would be helpful in future research on prolonged threat to have some assessment of how likely each participant thought it was that the negative event would occur. However, retrospectively rating one's belief in the likelihood of a particular outcome occurring with accuracy is virtually impossible after one already knows the real outcome, pointing to the need for data collection as prolonged disasters unfold.

Although each of the elements that may contribute to uncertainty may have influenced outcomes in the current study, one final variable deserves consideration. Past disaster research has shown that proximity is a factor in that is highly correlated with survivors' symptomatology. In the current study, proximity's influence remains somewhat elusive.
The Role of Proximity in Prolonged Disaster

The results of the current study do not appear to replicate earlier research, in which closer proximity to a disaster is related to higher levels of symptomatology. The evacuated group, presumably the most proximal, had fewer symptoms than the next most proximal group. A number of factors concerning the definition of proximity, the duration of the event, and the possibility of subject selection bias present possible explanations for the unexpected results.

Defining proximity to the fires was a challenge in the design of this study. Large wildfires frequently are scattered across numerous mountains and ranges and tend to jump somewhat unpredictably with the wind from one area to another. Reliably measuring an individual's location in relation to a wildfire in traditional units such as miles presents a daunting task. This problem is compounded when the wildfire lasts for several weeks and has more opportunity to travel within a region. As noted earlier, the presence of these factors in the Montana wildfires prompted the definition of proximity in this study by groups, according to the effects of the fires on participants' daily lives. Given the results of this study, it may be that separating Groups 1 and 2 into two separate categories based on evacuation is a means of categorization that does not validly reflect proximity but rather some other facet of participants' experiences during the fires. If geographic proximity to a fire complex could be quantified precisely for each participant, results regarding proximity effects
might well have supported prior research. As noted above, geographic proximity to a threat should influence one's judgment regarding the potential severity of the threat as well as the probability that one will be harmed. In this way, actual geographic proximity, which was not measured in this study, may have been an underlying variable that was related to both uncertainty and symptomatology, creating mixed results by group.

In addition to problems with determining geographic proximity, in a prolonged disaster, assessment of proximity to a disaster may be confounded with length of exposure to the threat. In the Montana wildfires, for example, those whose homes were geographically closer to the epicenter were evacuated, and those who remained in the area actually may have endured more exposure to the fires over time. If duration of exposure to the fires is conceptualized as temporal proximity, the results of the current study again appear to contradict prior findings, because those in Group 2 reported the highest symptomatology. Interestingly, participants in Group 1 rated the duration of their uncertainty as longer than did those in Group 2, who in turn reported longer duration of uncertainty than those in Group 3.

A final consideration regarding the proximity effects in the current study is selection bias. After the fires, many of those evacuated did not return to their homes immediately; several participants reported going to stay with relatives in another location and not returning to the Bitterroot Valley for a few months. Most of those who participated in the study who evacuated did not lose their
homes. It may be that those people in Group 1 whose lives had stabilized and who were functioning fairly well after evacuation disproportionately volunteered for this project, producing less severe findings in Group 1 that are not reflective of the evacuated population at large.

Significance for Information Management and Evacuation Policies in Long-Term Disaster

This study has important implications for evacuation policy and information management during long-term disasters. Government officials and those managing information disbursal to those affected by chronic disaster need to be aware of the negative effects of uncertainty on the well-being of individuals and communities. Although the degree of uncertainty in more acute disasters may be elusive, the current study suggests that it is an important consideration in planning policy for long-term threats with an unpredictable course, such as extended wildfire.

In this sample, many of those evacuated described going to shelters, where they were able to meet and gain support from others who were displaced from their homes; many other evacuees stayed with friends or family who provided emotional support. Those who were not evacuated may have felt more isolated from others due to the lack of "official" reasons for being concerned or for going to shelters or others' homes for support. It seems likely that at least some of those who were not evacuated felt a lack of validation for their concerns, thus increasing both their uncertainty and their symptoms.
Obviously, the expense of evacuation and of obtaining appropriate shelter for large groups of people is a vital part of the equation in an event such as this and bears consideration. In contrast to the long-term mental health costs of protracted threat, however, providing the option of shelters at the time of the event to all who are affected may be a small sacrifice in terms of resources and manpower. In long-term disaster, government and relief agencies may better serve the needs of affected communities by encouraging or at least clearly offering the option of moving to shelters for any residents who are concerned by the threat, even if no imminent reason for evacuation is apparent to the agencies involved. It may be that simply knowing that one has the opportunity to evacuate, even without actually acting on it, is a factor that will help to decrease symptomatology by increasing survivors' sense of personal efficacy in the face of an overwhelming threat.

In addition to policies surrounding evacuation decisions, those agencies that are responsible for notifying community members about the presence and extent of threat in a disaster such as these fires may benefit by understanding the impact of uncertainty on those they serve. It appears that accuracy and consistency in reporting information about extended disaster may go a long way toward decreasing uncertainty and post-disaster symptomatology.

Considerations for Clinicians

Clinicians serving the needs of populations affected by long-term disaster may improve interventions by attending to the apparent effects of uncertainty
and proximity on symptomatology. Based on the results of this study, the potential for elevated depressive, anxiety, and PTSD symptoms should be considered in both assessment and treatment planning. Survivors of extended disaster should be interviewed in depth regarding their personal experience during the event, with special focus on the presence and degree of uncertainty, perceived distance from and duration of the threat, evacuation and how evacuation was handled, as well as being assessed for depression, anxiety, and PTSD symptomatology. In planning treatment for long-term disaster survivors, it may be important to differentiate between the effects of the event versus the effects of uncertainty. For example, with those clients who report a being near the event but not being evacuated, exposure therapy aimed at reducing avoidance symptoms may be more relevant in planning treatment, but for those who report high levels of uncertainty at the time of the event, decreasing overall anxiety and hypervigilance may carry more weight.

Limitations

Limitations of the study include the fact that participants were self-selected volunteers, which may have influenced the type and intensity of symptoms observed. For example, as noted previously, if those in Group 1 consisted primarily of individuals with enough personal and psychological resources to feel secure about volunteering for the study, symptoms in this group would appear less marked. Additionally, all measures analyzed in this survey were self-report and, therefore, subject to witting or unwitting distortion. For
example, those who volunteered for the study may also have been those individuals who were more inclined to reframe the event in a more positive light, thus decreasing observed symptoms. It is also possible that the new and unproven measure of uncertainty used in the study minimized or exaggerated the levels of this variable that participants actually experienced, for example. As noted above, inquiring about "distress regarding uncertainty," rather than having participants rate the level of uncertainty itself may have encouraged those who are generally more emotionally reactive to any sort of disturbance falsely elevate their ratings of uncertainty. Additionally, the number of duration items was extremely limited, thus reducing the reliability of this aspect of the measure. In addition, the time period of data collection, at 3-6 months post-disaster, may not accurately reflect those trauma-related symptoms that peaked at a point either earlier or later following the fires. Finally, the relatively small sample size may have minimized the ability to sensitively analyze symptoms.

Suggestions for Future Research

Given that the current study lends partial support to the premise that uncertainty is related to symptomatology following a long-term disaster, future research should focus on more clearly defining the exact nature of the relationship and the mechanisms involved. A larger sample size would allow researchers to more sensitively analyze the effects of uncertainty, and it would be informative to collect data over time, both during and for months to years following similar events, to observe for longitudinal changes in symptomatology.
Because duration of uncertainty appears to be related to proximity, it would be helpful in future research to examine the influence of duration of uncertainty with the inclusion of a larger number of predictor variables. Supplementing the fire consequences questionnaire with duration questions on each uncertainty variable would help to clarify the influence of this aspect of survivors’ experiences and the influence of uncertainty. Consideration also should be given to asking participants to quantify their level of uncertainty directly rather than through questions regarding distress about uncertainty, in order to tease out the effects of anxiety versus those of uncertainty. Finally, asking participants to rate the relative importance and probability of occurrence of each uncertainty item would help to clarify the role of uncertainty in future disasters.
References


Appendix A

University of Montana
Fire Consequences Questionnaire

Following are questions that relate to experiences you may have had with the fires. Please consider each question carefully and respond to the best of your ability. At the end of the questionnaire, you will have the opportunity to add any information that you feel is important regarding your experiences with the fires.

I. General Effects of the Fires

1) Did you ever feel that the fires were a threat to your personal safety?
   Not at All A Little Somewhat Quite a Bit Very Much Extremely
   1 2 3 4 5 6

2) Have the fires negatively affected your physical health?
   Not at All A Little Somewhat Quite a Bit Very Much Extremely
   1 2 3 4 5 6

3) Have the fires caused you financial hardship?
   Not at All A Little Somewhat Quite a Bit Very Much Extremely
   1 2 3 4 5 6

II. Effects at the Time of the Fires

4) Did anyone else come to live with you as a result of the fires?
   No Yes
   For how many days? _____________ How many people? ________________

5) Was there a period of time when you were uncertain if you would need to leave your home because of the fires?
   No Yes For how many days? _____________
   If there was a period of uncertainty, how upsetting or unsettling was this for you?
   Not at All A Little Somewhat Quite a Bit Very Much Extremely
   1 2 3 4 5 6

6) Was there a period of time when you were uncertain if your home would be damaged or destroyed by the fires?
   No Yes For how many days? _____________
   If "Yes," how upsetting or unsettling was this for you?
   Not at All A Little Somewhat Quite a Bit Very Much Extremely
   1 2 3 4 5 6
7) Did you experience uncertainty about whether or not fire protection efforts would successfully contain the fires?
   No  Yes
   If "Yes," how upsetting or unsettling was this for you?
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   1  2  3  4  5  6

8) Was there a period of time when you were uncertain about the safety of other people?
   No  Yes  Who? ___________________________
   If "Yes," how upsetting or unsettling was this for you?
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   1  2  3  4  5  6

9) Was there a period when you were uncertain about the safety of other people’s homes and property?
   No  Yes  Who? ___________________________
   If "Yes," how upsetting or unsettling was this for you?
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   1  2  3  4  5  6

10) Was there a period when you were uncertain about the impact of the fires on your community?
    No  Yes
    If "Yes," how upsetting or unsettling was this for you?
    Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
    1  2  3  4  5  6

11) Was there a period when you were uncertain about the impact of the fires on the natural resources in your area?
    No  Yes
    If "Yes," how upsetting or unsettling was this for you?
    Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
    1  2  3  4  5  6

12) Did you experience uncertainty about the effects of the smoke from the fires on yours or another’s health?
    No  Yes
    If "Yes," how upsetting or unsettling was this for you?
    Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
    1  2  3  4  5  6

13) Did you evacuate your home as a result of the fire?
    No  Yes  For how many days? ____________

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14) If you left your home, how much notice did you have before leaving?

Did not leave
1-24 hours
24-48 hours
Less than one hour
More than 48 hours

15) If you left your home, where did you stay? (Circle any that apply.)

Relatives
Friends
A shelter
Motel/hotel
Other property/home
Other:

16) Did you evacuate livestock or animals because of the fires?

No
Yes
If “Yes,” for how many days? _______

Please describe # and type of animals: ______________________________________

17) If you moved animals or livestock, did you experience uncertainty regarding the safety or quality of care that they were receiving in their new location?

No
Yes

If “Yes,” how upsetting or unsettling was this for you?

Not at All
A Little
Somewhat
Quite a Bit
Very Much
Extremely

1  2  3  4  5  6

18) Circle the number that best describes the strength of each of the following emotions at the time when you were most affected by the fires:

Fear:
Not at All
A Little
Somewhat
Quite a Bit
Very Much
Extremely

1  2  3  4  5  6

Helplessness:
Not at All
A Little
Somewhat
Quite a Bit
Very Much
Extremely

1  2  3  4  5  6

Horror:
Not at All
A Little
Somewhat
Quite a Bit
Very Much
Extremely

1  2  3  4  5  6

Another Emotion (Please explain): ______________________________________

1  2  3  4  5  6

19) Which of the following, if any, provided emotional support for you? (Circle any that apply.)

Relatives
Coworkers
Physician

Friends
Service organization
Pets

Church
Counselor/Therapist
Other: ______________________
20) Did you have property that was damaged or destroyed as a result of the fires?
   No  Yes
   If "Yes," please circle on the list below any items that were damaged or destroyed by the fires:
   Primary home  Vacation Home  Landscaping
   Livestock  Car/truck(s)  Domestic pet(s)
   Personal momentos  Other: _______________________________________

If your home was destroyed, do you plan to rebuild in the same location?
   No  Yes

III. Current Effects of the Fires

21) How do you feel at this point in time about how the fire-fighting agencies involved handled the fire suppression efforts?

<table>
<thead>
<tr>
<th>Extremely Negative</th>
<th>Quite Negative</th>
<th>Somewhat Negative</th>
<th>Somewhat Positive</th>
<th>Quite Positive</th>
<th>Extremely Positive</th>
</tr>
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<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>

22) How do you feel at this point in time about the support provided by relief agencies (for example, the Red Cross)?

<table>
<thead>
<tr>
<th>Extremely Negative</th>
<th>Quite Negative</th>
<th>Somewhat Negative</th>
<th>Somewhat Positive</th>
<th>Quite Positive</th>
<th>Extremely Positive</th>
</tr>
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<td>2</td>
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</tr>
</tbody>
</table>

23) How do you feel at this point in time in regard to the fires and their impact on your life?

   Sad:
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   | 1 | 2 | 3 | 4 | 5 | 6 |

   Relieved:
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   | 1 | 2 | 3 | 4 | 5 | 6 |

   Confused:
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   | 1 | 2 | 3 | 4 | 5 | 6 |

   Worried:
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
   | 1 | 2 | 3 | 4 | 5 | 6 |

   Thankful:
   Not at All  A Little  Somewhat  Quite a Bit  Very Much  Extremely
<p>| 1 | 2 | 3 | 4 | 5 | 6 |</p>
<table>
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<th>Feeling</th>
<th>Not at All</th>
<th>A Little</th>
<th>Somewhat</th>
<th>Quite a Bit</th>
<th>Very Much</th>
<th>Extremely</th>
</tr>
</thead>
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<td>6</td>
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<td>6</td>
</tr>
<tr>
<td>Angry at Yourself</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Angry at Someone Else (Please Specify)</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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</tbody>
</table>
24) Do you have insurance to help cover your damages or losses?
   No          Yes

Do you feel that your insurance coverage is adequate?
   No          Yes

IV. Other Factors:

25) Have you ever been affected by a natural disaster (tornado, earthquake, flood, hurricane, fire, etc.) before the recent fires?
   No          Yes

   If “Yes,” please explain briefly: ___________________________________________
                                                                   ___________________________________________
                                                                   ___________________________________________
                                                                   ___________________________________________

26) If you would like to add any comments or observations about your experience with the recent fires, please do so:
                                                                   ___________________________________________
                                                                   ___________________________________________
                                                                   ___________________________________________
                                                                   ___________________________________________
                                                                   ___________________________________________
                                                                   ___________________________________________