Colorado Wildfires 2002

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Introduction

More than 5,000 individuals were evacuated because of the catastrophic 2002 Colorado wildfires. Many of the individuals who were evacuated were kept from their homes for up to a month. Many homes were lost to the fire. This report addresses the actions people took and perceptions people had of the fire during the evacuation period. The questionnaire we used is provided at the end of this report.

The primary aims of this project were to determine:

1) The roles of new public and private sources of warning information for wildfire disasters in public response to warnings;

2) The importance of changing population demographic characteristics on types of warnings utilized and public responses enacted;

3) The utility of technological outlets for warnings and technological advances for spatial data use from Geographical Information Systems, (GIS);

4) The value of conventional wisdom for false alarms and warning lead-times on public perceptions of warnings; and

5) The predictive utility of social cognitive theory to help understand evacuation behavior and coping outcomes.

Methodology

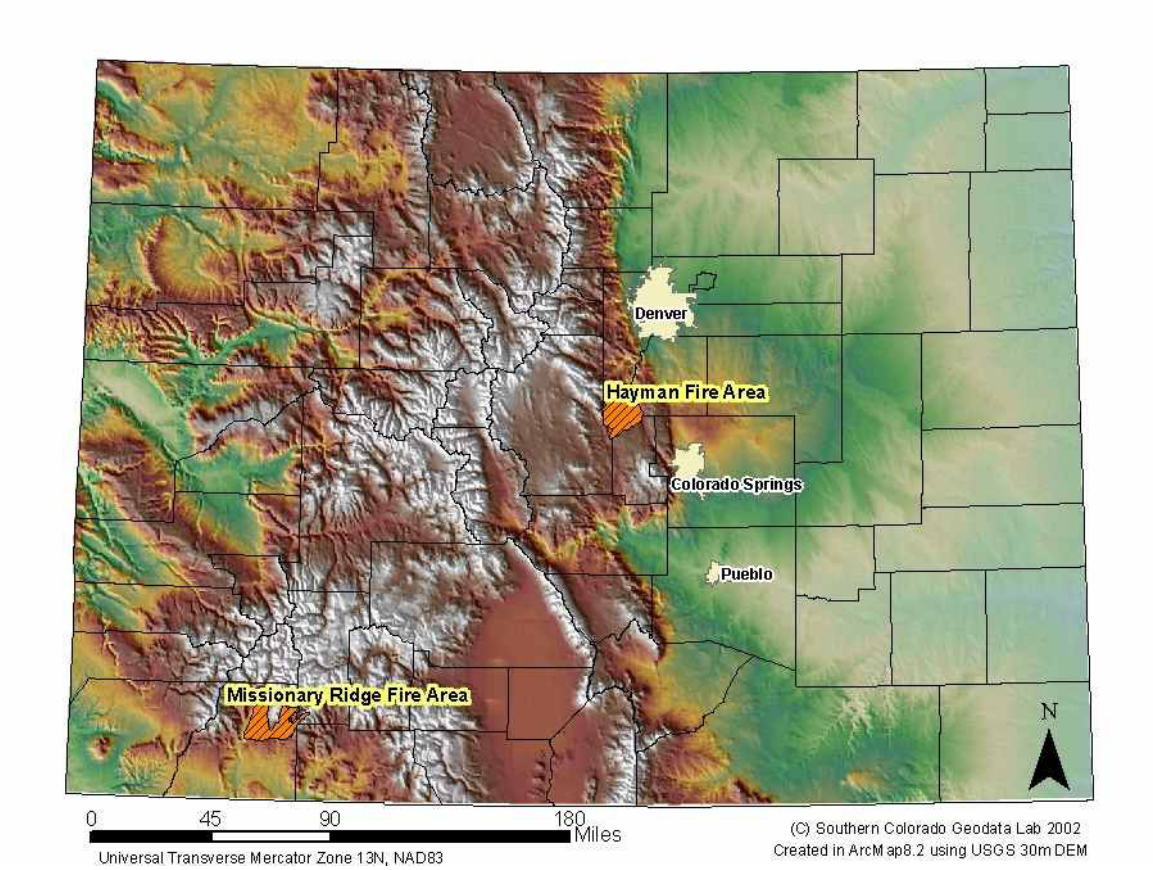
Study Area

The study area consisted of the regions affected by the two major Colorado wildfires of 2002, the "Hayman" fire and the "Missionary Ridge" fire, shown in Figure 1. The Hayman fire burned 138,577 acres thirty miles southwest of Denver; the Missionary Ridge fire burned 72,964 acres north and northeast of Durango, Colorado (USDA Forest Service, 2002). Most of the area of both these fires lies in National Forest.

Sample

The sample consisted of 109 individuals who were within an evacuation area during the fires. The average age of the people in the sample was 53; 59% were female. The median annual income was between $55,000 and $65,000. The majority of people surveyed were college graduates. As would be expected based on the demographics of rural Colorado, almost the entire sample was Caucasian (93%). Thus, virtually no information is available from this sample on minority populations. Sixty-two percent of the individuals in the sample reported being married. There was a wide range in the length of residency in a wildfire-prone area for people in the sample: from 3 months to 53 years. Time in present home ranged from less than 1 year to 45 years with a mean of 11 years. Of the sample, 82% reported owning their home. Only seven of the individuals who responded

Figure 1: Major Burn Areas in Colorado in 2002



indicated that their home had been destroyed by the fire. Thus, the majority of this sample experienced evacuation and were able to return to their homes. Approximately two thirds of the sample reported no damage to their home from the fire. In relation to proximity of the fire to the home, half of the sample indicated the fire was within one mile and the farthest distance reported was 8 miles. Only 6% of the sample indicated that they had received mental health counseling for problems related to the fire.

Evacuation experience

Individuals were asked about their pre-evacuation experience and the actual evacuation process. Thirty-seven percent were not put on evacuation standby at all, while the remainder of the sample was told to be ready to evacuate. Slightly over 20% of the sample was on evacuation standby for only 1 day before being evacuated. Just fewer than 30% of the individuals were on standby for 2 days and up to one week. Almost 4% were on standby for over 16 days. For the actual time evacuated the sample varied significantly. Table 1 depicts the evacuation time for the sample. Over half of the sample was evacuated for more than a week and a half, and almost 10% were still displaced at the time of the study.

Table 1: Evacuation Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Evacuated for 24 hours	3	2.8	2.9	2.9
Evacuated for 2-4 days	7	6.4	6.8	9.7
Evacuated for 5 days to 1 week	27	24.8	26.2	35.9
Evacuated for a week and a half	13	11.9	12.6	48.5
Evacuated for 2 weeks	24	22.0	23.3	71.8
Evacuated for 2.5 weeks	11	10.1	10.7	82.5
Evacuated for 3 weeks	4	3.7	3.9	86.4
Evacuated for 3.5 weeks	4	3.7	3.9	90.3
Still evacuated	10	9.2	9.7	100.0
Total	103	94.5	100.0	

Procedure

On June 28, 2002, the research director and six research assistants entered the field to disperse questionnaires to individuals who were evacuated. A table was set up at a local grocery store in Woodland Park, Colorado, from early morning to early evening. Ninety-eight questionnaires were distributed on the first day. A local coffee house was identified during this time as an informal briefing area for individuals who had lost their homes. Several questionnaires were left at this establishment and researchers attended two community briefings given by local law enforcement officials and the Forest Service where 68 more questionnaires were distributed. A table was staffed at the local grocery store for the remainder of this week, and 104 more questionnaires were handed out to individuals identified as evacuees. A research assistant also attended a Forest Service briefing in nearby Conifer, Colorado, and distributed forty questionnaires. Finally, the research director and a research assistant attended a Forest Service briefing on reclamation at the Deckers Community Center in Deckers, Colorado, where an additional forty questionnaires were distributed.

At the same time the Missionary Ridge Fire near Durango was increasing in severity and the sample expanded to include more geographic diversity. Fifty-five questionnaires were distributed in the Missionary Ridge area over a two-day period. Addresses for individuals who lost their homes in the Missionary Ridge Fire were published in the local paper in Durango; and were used to mail additional questionnaires. Unfortunately, most were returned as non-deliverable due to the destruction of the homes.

A total 453 questionnaires were handed out or mailed to evacuees from the Hayman and Missionary Ridge Fires. A total of 109 were completed representing a 24% response rate for the survey.

Results

Issue One

The role of new public and private sources of warning information for wildfire disasters in public response to warnings.

Supporting earlier findings from Dow and Cutter (1998), most respondents used a combination of sources for information on the fires from a variety of sources. Over 75% used more than one source for their information on the fire, primarily television, phone, newspaper, and the Internet. Over 50% used three or more sources of information and slightly over 35% used four or more sources for their information. Fifteen percent used five or more sources of information on the fire. Respondents used official and unofficial sources. For information specifically referring to the evacuation there was less variability in the sources utilized. Approximately 76% used only one source, with 50% of these using the telephone. Slightly more than 15% used the television for their evacuation information. Only 7% of the sample utilized cell phones for information. This could be due to the difficulty of good reception in rural mountainous locations.

Issue Two

The importance of changing population demographic characteristics on types of warnings utilized and public responses enacted.

Survey participants with a longer time of residency believed that their property would be safer (Mo = 2.43) than newer residents (Mn = 2.00) ($p = .014$). Gender played a role in responses to two questions in the survey. Males reported that it was significantly less difficult to leave their home because of their love for the forest (Mm = 2.43) compared to females (Mf = 2.85) ($p = .054$) (3 = pretty hard). Females also indicated significantly greater trust in governmental warnings/evacuations in relation to fire hazards (Mm = 2.67 vs. Mf = 3.06), ($p = .033$).

Issue Three

The utility of technological outlets for warnings and technological advances for spatial data use from Geographic Information Systems (GIS).

Of survey respondents who had access to *maps of the fire location*, the Internet was cited as the most common source of this information (over 41%). Other map sources cited included: bulletin boards posted around town, community meetings, evacuation centers, local officials, forest service, friends and neighbors, and the Red Cross Shelter. Almost half of the survey participants were not completely satisfied with their access to information. When survey participants were asked if they "had access to all the information about the fire that they required," 22% reported "not at all" and 24% specified "a little bit." When asked what other information would have been helpful, three major needs appeared consistently in the responses:

1) The need for more *accurate* and *consistent* reporting: Many respondents reported receiving conflicting information from television, newspaper, and local officials as to where the fire was and what actions they should take.

2) More *frequent* updates: Requests were made for hourly or several times daily updates on exact location of the fire, wind speed and direction and specific fire control reports for particular streets and neighborhoods. A radio station specifically for the fire reporting was also requested.
3) *Detailed maps* showing exact locations of fire in relation to people's homes: A commonly mentioned need was for detailed information about the location of the fire. Respondents wanted maps showing the fire boundary and its daily movement and requested maps that were detailed and accurate enough to show the fire in relation to specific streets and houses. Frequent responses included the desire for a map "showing my home and location of the fire in relation to it" and "maps on TV, newspapers and Internet are not detailed enough."

Mapping technologies such as real-time GIS (Geographic Information Systems), GPS (Global Positioning Systems) and satellite imagery are already being used extensively by government agencies charged with dealing with fires. Websites such as "GeoMac" (http://www.geomac.gov) exist to provide the public access to current and detailed interactive maps produced with these technologies. The Internet, being a visual, interactive, distributed, and easily updated medium is well suited for disseminating this type of information. Unfortunately, one of the difficulties noted in this study is that once evacuated, many residents lost their *connection* to this medium. However, wireless Internet is becoming increasingly prevalent, thus the Internet is becoming "portable." Therefore, the public's need for accurate, updated, and detailed maps will more easily be the met through the Internet, and the Internet's importance as a communication medium in short-fused events will likely increase.

Issue Four

The value of conventional wisdom about false alarms and warning lead-times on public perceptions of warnings.

In relation to false alarms, only 18% of the sample had been previously evacuated for a wildfire that did not end up directly affecting their home. Of those who indicated that they had previously experienced a "false alarm," 68% indicated that this experience had "not at all" influenced their decision to evacuate this time. Only 15% suggested that this previous "false alarm" experience influenced their decision this time either "pretty much or very much." The lessons learned by people who did not suffer major damage but who were evacuated appear to be helpful for future evacuations.

Issue Five

The predictive utility of social cognitive theory to help understand evacuation behavior and coping outcomes.

Coping self-efficacy (perceived capability for taking appropriate actions) for evacuating and dealing with post-disaster recovery was investigated in relation to reported evacuation behaviors, environmental factors, and post-disaster psychological outcomes. Coping self-efficacy for evacuation during the fire was found to correlate negatively with the amount of time reported for evacuation (r = -.34, p = .001). Thus, those with greater perceived efficacy for evacuating had a shorter reported time to actually evacuate. Coping self-efficacy for evacuating was also found to be a significant predictor of post-

traumatic stress symptoms experienced after the fire even after controlling for amount of lost resources suffered in the fire and how close the fire came to their home. Greater self-efficacy for evacuating directly corresponded with lower psychological trauma response experienced after the fire.

One quarter of the respondents reported that their belongings slowed down their evacuation response time. Many respondents reported they had to evacuate on very short notice. Very few of the respondents reported taking fire-proofing measures before the evacuation such as thinning trees, disposing of trash and debris to create a defendable space, changing roof type, or clearing the gutters.

Problems Reported

1) The inter-jurisdictional problems presented by wildfires were illustrated in this study. Residents reported receiving conflicting information from different government agencies, such as firefighters, law enforcement, and Forest Service.
2) Maps on television and in the newspapers showed inaccurate or imprecise locations of subdivisions making it difficult to know where the fire was headed.
3) After the evacuations, many residents lost their access to television but more notably to the Internet. Thus, several respondents felt cut off from information after they left their homes. The information was still available but their access to the information was gone.

Respondent Suggestions

Comments made by respondents offered lessons for local officials and for other residents who live in fire prone zones. When asked what advice they would offer to others who might be told to evacuate their homes, practical suggestions included keeping a video of personal property, keeping important papers and photos together, and packing in advance. One resident filled the bathtub with water before evacuating and was able to water the plants on short visits to the house when there was no power or water. Another suggested that before evacuation, the refrigerator should be emptied to avoid a potential mess later. Many respondents repeated advice to keep valuables together and ready to go. Also noted was the usefulness of knowing how to reach neighbors to compare information and to help each other. A comment repeated several times was to be prepared in advance with important papers organized and ready to evacuate by car. Thinking in advance of "non-replaceable" items reduces stress. One respondent urged people to inform firefighters when evacuating a home so they do not unnecessarily spend valuable time searching for inhabitants.

Summary of Findings/Conclusion

1. Supporting earlier findings from Dow and Cutter (1998), most of our respondents (N=104) used a combination of information on the fires from a variety of sources. Over 75% used more than one source for their information on the fire.
2. Survey participants with a longer time of residency believed that their property would be safer than newer residents. Females reported that it was significantly

harder to leave their home because of love for the forest. Females also indicated significantly greater trust in governmental warnings and evacuations in relation to fire hazards.

3. Roughly half the respondents believed they had enough information and the other half reported there was not enough. The information that participants most needed was accurate, detailed, and up-to-date maps of the fire's exact location in relation to homes. The Internet was an important source for this kind of information, though some evacuees lost access to this medium upon leaving their homes.
4. Officials have often worried that false alarms reduce willingness to take protective action in later warnings. We asked if our respondents had previous experiences with false alarms. Most reported previous experience with false alarms had little effect on their decision whether or not to evacuate this time, and earlier lessons learned may have even helped them in the evacuation process.
5. Higher coping self-efficacy (CSE) for evacuating was correlated negatively with the amount of time reported for evacuation. CSE for evacuating was also found to be a significant predictor of posttraumatic stress symptoms experienced after the fire even after controlling for amount of lost resources suffered in the fire and how close the fire came to their home. Social cognitive theory may provide a useful framework for studying the warning process.

Future Studies

These preliminary studies provide support for a more comprehensive investigation of these areas across a variety of short-fused disasters. The detailed results are available for officials to review for their own planning purposes. The respondents affected by the 2002 Colorado wildfire are wealthier and more educated than the average Americans. The questionnaire can be used again to compare how different populations respond. It would be interesting to follow up in these subdivisions to see if there are a greater than average number of property sales following the fire. Another study might examine how the length of lead-time for evacuations affects perceptions and mental health.

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