

Factors Influencing Evacuation Decision-making During Fast-moving Wildfire Events:

A case study of two Colorado fires

William Cannon & Catrin Edgeley

School of Forestry, Northern Arizona University, Flagstaff, AZ, USA



Background

- Both environmental and social cues motivate action¹
- “Wait and see” behavior is widespread²
- Two core research questions:
 1. What cues influenced when and if people decide to evacuate?
 2. How do residents process multiple cues simultaneously?
- Two case studies:
 - **East Troublesome Fire (ETF):** 366 homes lost, up to 120,000 acres burned in one day (Oct. 21st, 2020)³
 - **Marshall Fire:** more than 1,000 homes lost, \$2 billion in damages in a day (Dec. 30th, 2021)⁴



Trees bent from wind driven fire from the East Troublesome Fire⁵

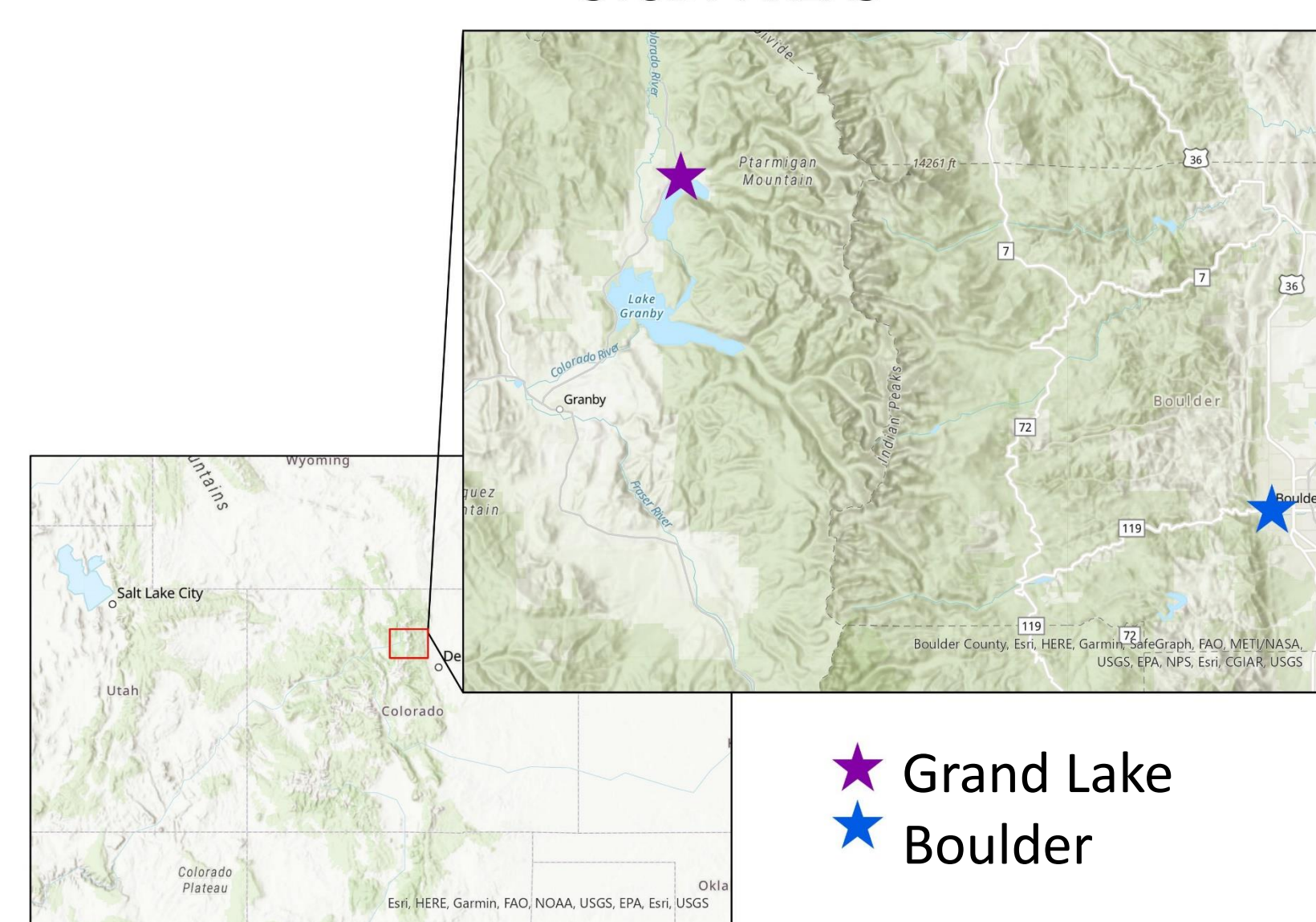


A neighborhood impacted by the Marshall Fire⁶

Methods

- We conducted 82 semi-structured interviews
 - ETF: 34
 - Marshall: 48
- Participants found through theoretical and snowball sampling
- Interview questions explored individual evacuation cues, post-fire recovery, and feedback on NCAR models of the fires
- Coding in qualitative analysis software NVivo

STUDY AREAS



★ Grand Lake
★ Boulder



Findings

- Interviewees emphasized the rapid spread of fire and its effect of condensing evacuation times

I honestly think nobody ever conceivably thought that was possible. That fire could move that fast.

- Consistent with existing literature, we found both social and environmental evacuation cues in both study areas
 - **Social evac cues:** official notices including in-person visits from officials, informal communication, and intuition
 - **Environmental evac cues:** changes in wind speed or direction, sound of the fire, smoke impacts on visibility, sound of the fire, and NOT visible flames

You could hear that freight train sound [of the fire]. And I've never heard it before, but it's that sucking up of oxygen, wind, creating its own weather system.

- Participants highlighted the importance of intuition in evacuation decision-making in condensed evacuation times

There were so many signs that I think empowering people to trust their intuition is a big part of it.

- Emotional responses to wildfire were crucial to decision-making
 - Emotional responses are important for agent-based evac modeling and assumptions of strictly rational decision-making
- Residents remain in a wait and see phase during evacuation where they seek to minimize personal impact based on a complex array of diverging priorities
 - Examples of priorities include safety, routine, concern for property, concern for others evac, and disbelief

People said, "I'm packing up both cars" and I said, "By you just taking two cars, you have just possibly cost somebody else their life."

Discussion

- Residents balance multiple competing priorities while in a ‘wait and see’ evac state
 - Future evac communication should build awareness of multiple cues and their impact on the intuition of different groups



ETF evacuation⁷

- View evac as an iterative decision-making process
 - Assumptions of immediate evacuation following an official notice are false
 - Promote intuition-based behavior through proactive messaging and planning
- This is one of the first studies incorporating understandings of fire behavior in evacuation
 - Public had a good understanding of fire behavior in our study areas
 - Now we need to know when people develop this understanding and how it can be leveraged in intuition messaging

Acknowledgements

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Contact Information

Email: Wc349@nau.edu