How are residents' evacuation decision-making processes affected by changing wildfire behavior? Investigating the 2020 East Troublesome Fire in Colorado, USA

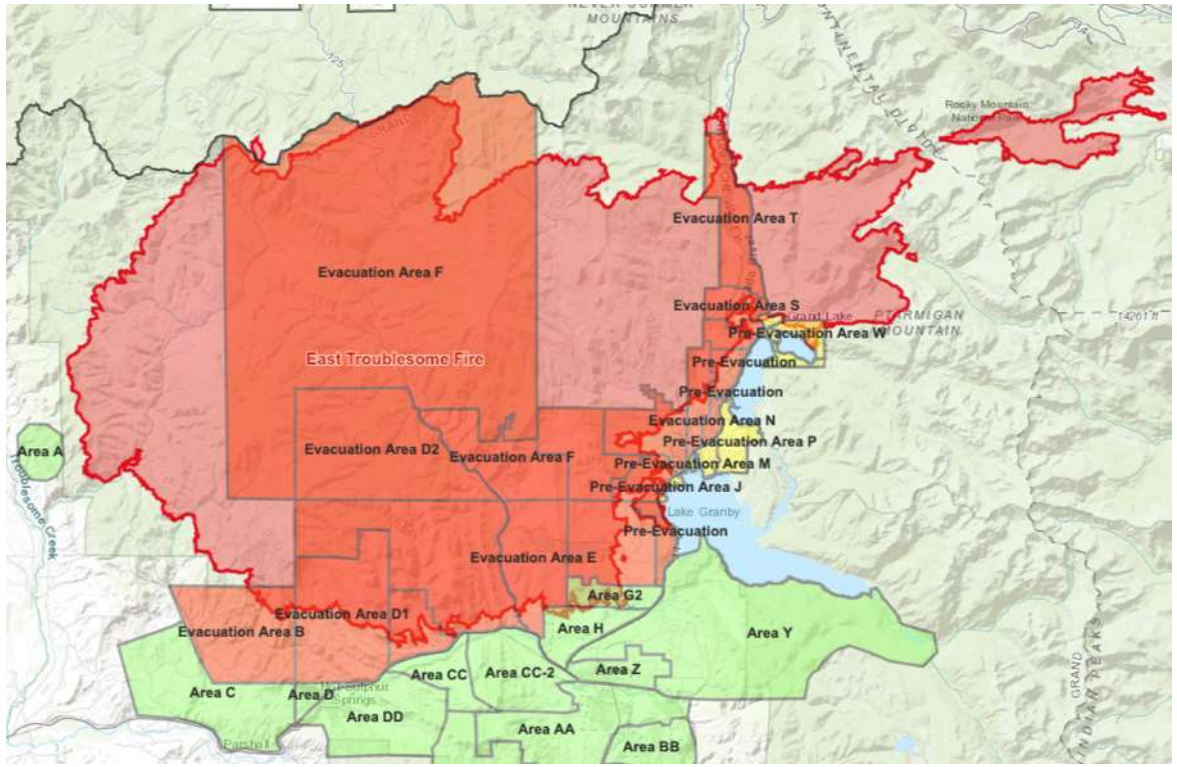
Catrin Edgeley[1], William Cannon[1], Scott Pearse[2], Branko Kosovic[2], Gabriele Pfister[2], Rajesh Kumar[2]
[1]*Northern Arizona University*
[2]*National Center for Atmospheric Research*

What do we know about wildfire evacuation?

- Conditions for wildfire evac are diversifying
- Intended actions are not always feasible
- “Wait and see” is widespread
- Both environmental and social cues motivate action
- **How do we empower rural residents to make proactive decisions independently?**

2020 East Troublesome Fire

- Grand County, CO
- October 14th ignition
- Complex fire behavior
- 80,000ac. burned in one day, evacuations that evening
- 193,812 acres total
- >366 homes destroyed

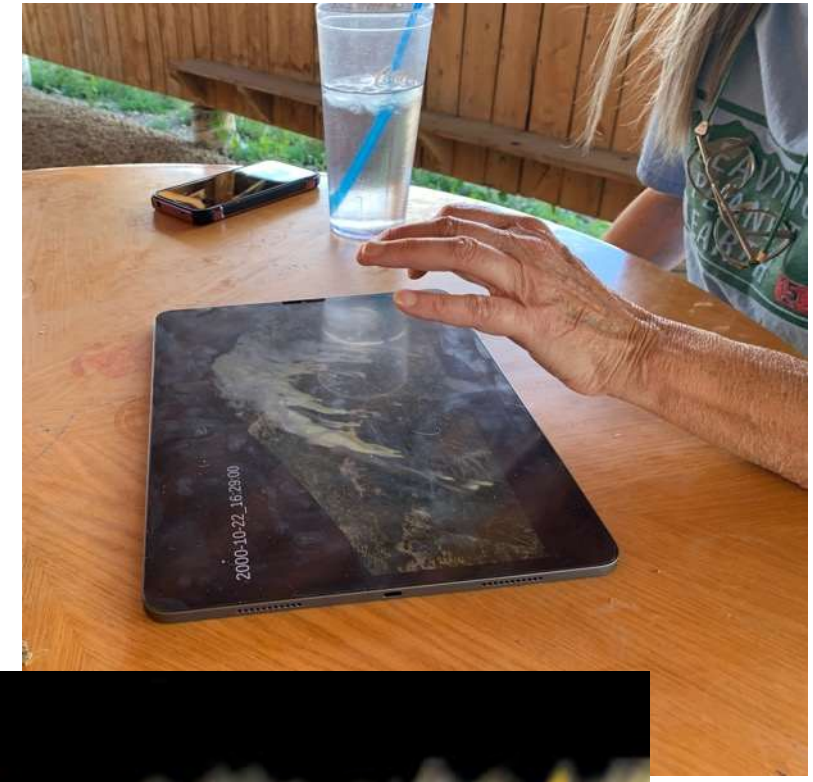


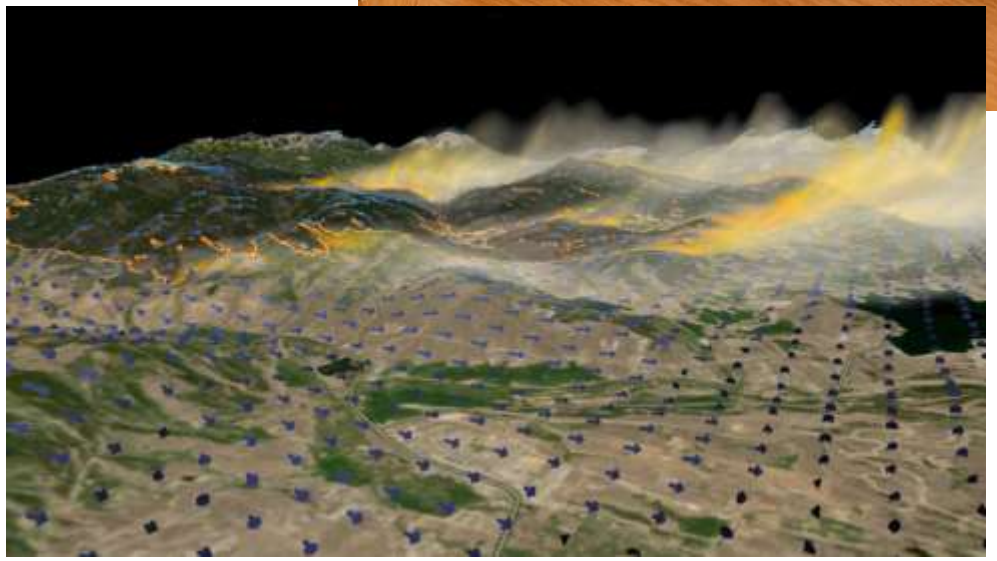
Data collection and analysis

- 36 semi-structured interviews with 51 participants
  - 47 participants = residents and local professionals
  - 4 participants = fire experts
- Participants identified through snowball and theoretical sampling
- Coding, mental models

Use of model outputs

- **Are visualizations useful?**
- **If so, how and when?**
- Our NCAR visualizations
  - Fire spread/progression
  - Wind speed and direction





Results: Evacuation experiences

- Lack of general fire experience in the area
- Most had 15 minutes between pre evac and evac notice
- No one was certain about fire location
- Information from IMT reassured residents there was no threat to Grand Lake

Results: Evacuation drivers

Environmental

- Wind
  - Speed
  - Direction
- Fire rate of spread
- **Air quality**
  - Smoke color, density,
  - Lighting, color of sky
- *NOT* visible flames!

Social

- **Code red text alerts**
- **In-person visits**
- **Intuition**
- Concern over road closures
- Evac. route proximity to fire

Results: Understanding fire behavior

- Pre-existing conditions
  - Drought, climate change, beetle kill
- Diverse theories about fire behavior
  - E.g., wind speed
    - Plume collapse
    - Drought conditions
    - Cameron Peak microclimate
- Uncertainty about the reach of fire weather

Visualizations as a recall tool

- Public
  - Helpful for diving into minutiae of timing with decisions
  - less of a recall tool, more of an “a-ha!” moment?
- Professionals
  - Jogged memories of fire behavior and suppression tactics
  - Valuable for explaining tactical decision making

Visualization uses: After fire

User group	Application
Fire professionals	Rebuilding trust with communities Tabletop/training exercises
Mental health professionals	A tool for processing, discussing traumatic events
Residents	To understand the fire’s behavior as a whole, rather than just their location
Sheriff/EM	Justifying evacuation decisions and challenges

Takeaways

- Rural understandings of fire behavior to inform evacuation are higher than expected
  - Now to help them act on it
- Visualizations: a useful tool in post fire environments for a variety of applications
  - More detail needed

Thank you!

Catrin.Edgeley@nau.edu

Funded by the NSF-NCAR Early Career Faculty Innovators program

NAU NORTHERN ARIZONA UNIVERSITY School of Forestry

NCAR