Preliminary Data on Housing Heat Maps and Survivability

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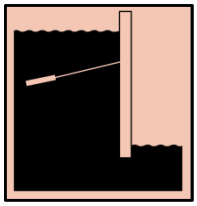
Oregon State University
University of Colorado Boulder
PURDUE UNIVERSITY

Overview of GEER mission

Characteristics of homes that influenced survivability



Performance of slopes and retaining structures

Behavior of lifelines and the role of utilities in response to the fire

Changes in policies immediately after the fire

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NSF

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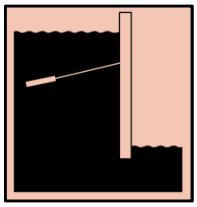

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In-field data collection January 23 – 30
Additional drone flights week of Februrary 14

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What characteristics of housing influenced survivability?

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Acknowledgements

Local municipalities

City of Louisville

Town of Superior

West Metro Fire

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Student support

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National Science Foundation support

NHERI Rapid Center, Jaqueline Zdebski

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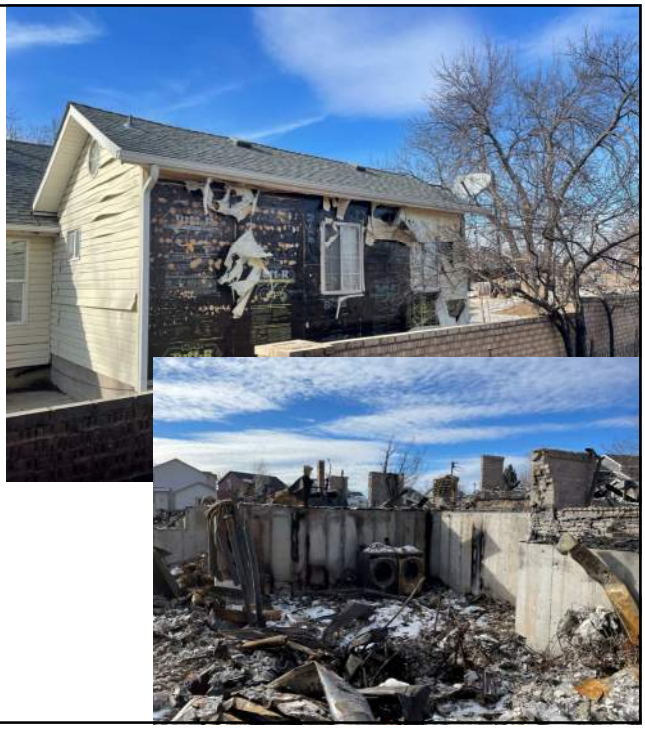
Overall damage

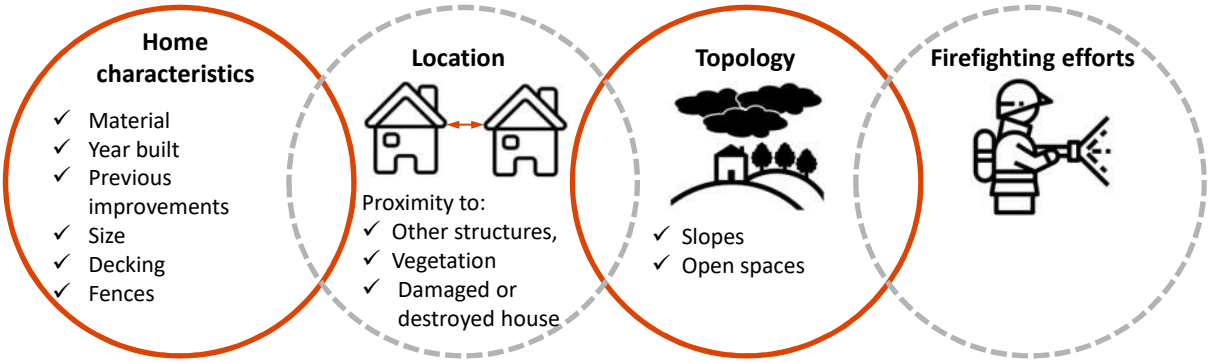
1,089 homes destroyed

149 homes damaged

- 3 jurisdictions
- Homes of different sizes with different lot sizes
- Varying topology (e.g. slopes)



What characteristics of housing influenced survivability in the 2021 Marshall Fire?



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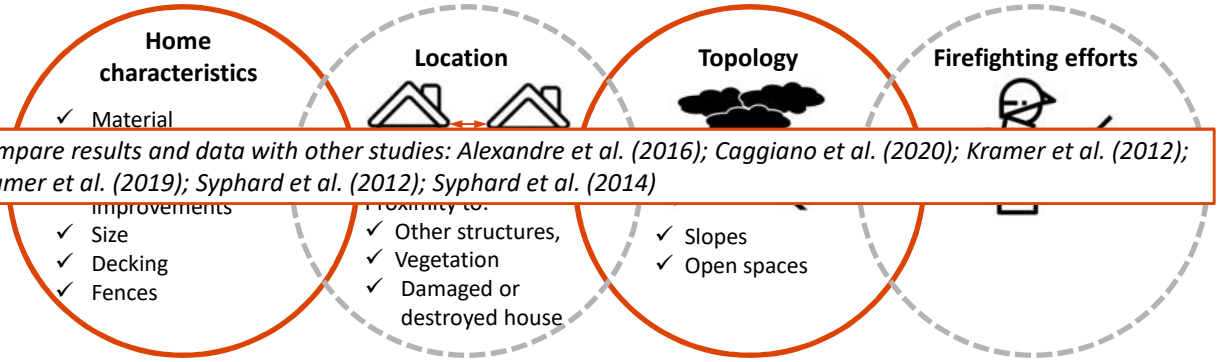

Compare results and data with other studies: Alexandre et al. (2016); Caggiano et al. (2020); Kramer et al. (2012); Kramer et al. (2019); Syphard et al. (2012); Syphard et al. (2014)

Data collection and analysis methodology

On-the-ground surveys

Data collection in the field using a survey developed by the team to collect dimensional and observational characteristics of homes (e.g. concrete foundation color)

Drones

Drone data collected over eight different neighborhoods with a mixture of damaged, destroyed, and standing homes.

Tax records, permit data, and Zillow

Tax records, permit data, and Zillow data contain information on building square footage, year built, previous improvements, and characterization of home.

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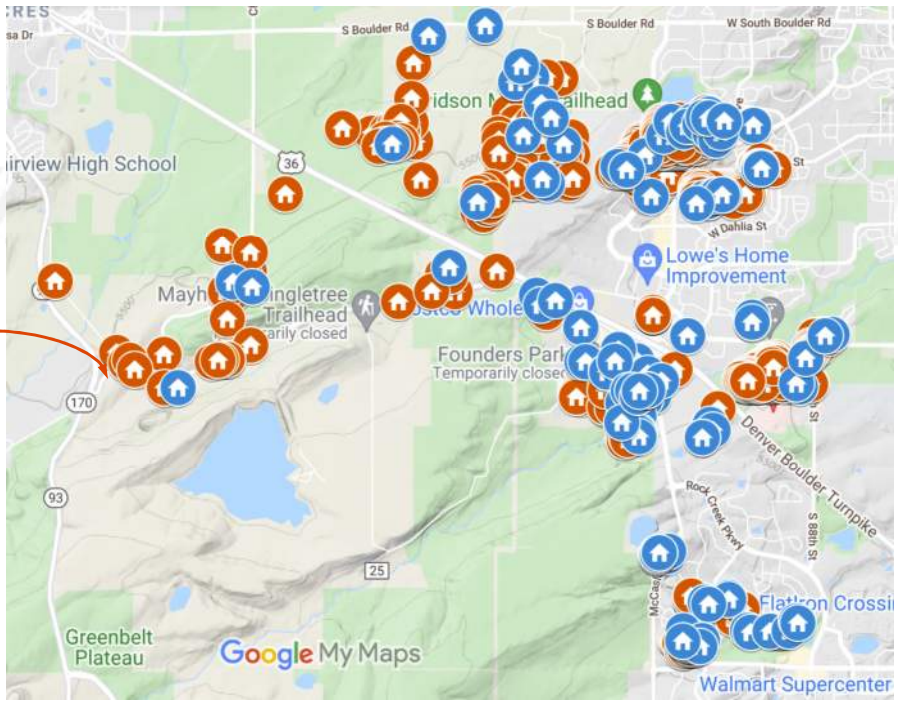
200+ homes

14 different neighborhoods

All homes

Spatial distribution of damaged and destroyed homes

Fire started in Marshall, CO



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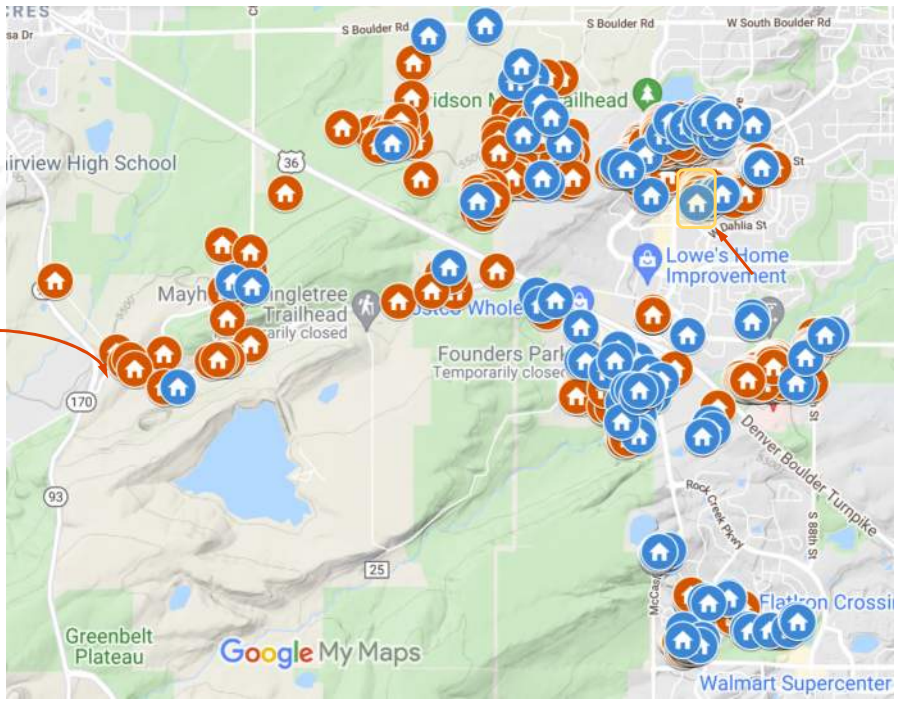


Spatial distribution of damaged and destroyed homes

- ✓ House characteristics
- ✓ Damage characteristics
- ✓ Location
- ✓ Topology
- ✓ Firefighting efforts

House characteristics

- All homes built in 1993
- Average sq. ft is 1975 ft^2 total
- 75% of homes are 2-3 stories
- 25% of homes are split-level
- None of the homes had siding renovations from 2016-2021
- Due to 2018 hail storm most homes have asphalt roof
- No significant slopes

House characteristics

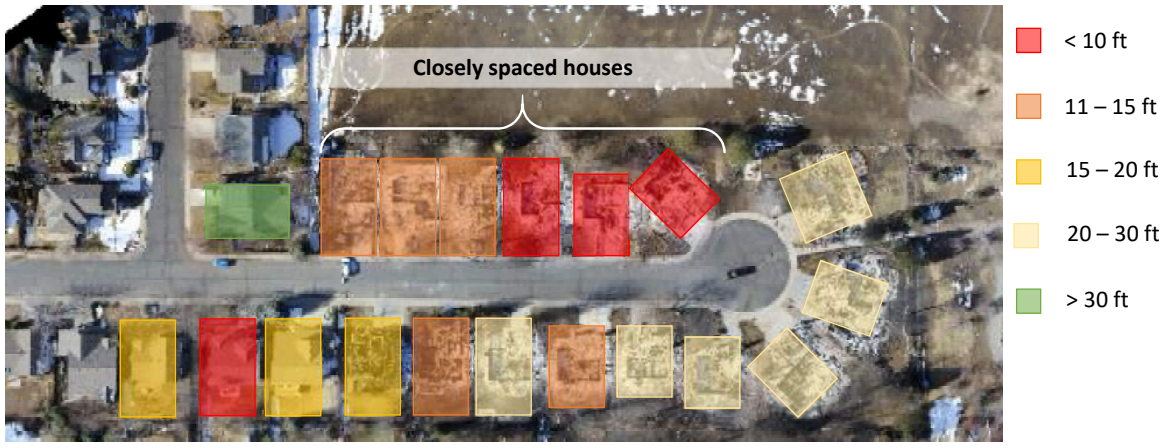
- All homes built in 1993
- 88% of homes have wooden fences
- 94% of homes with fences have fences touching the home
- 100% of homes have vegetation (shrubbery or trees) immediately next to the home

Location

Damage of homes

Location

Distance between homes



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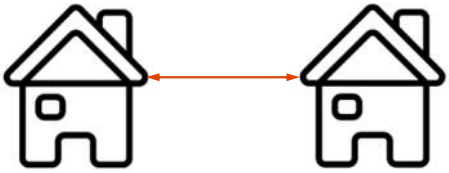

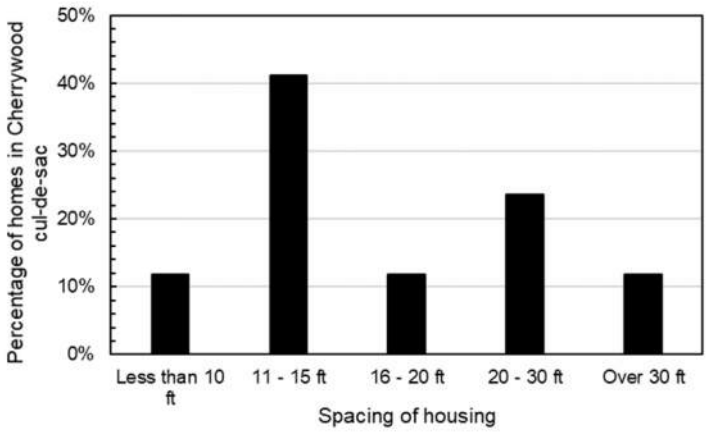

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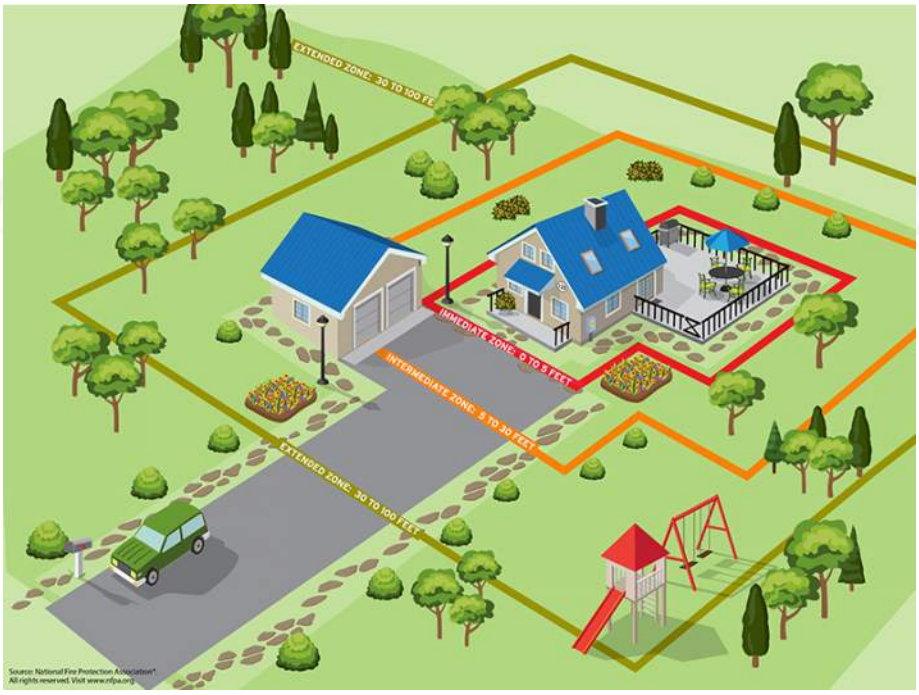


Location

Location

Number of neighboring destroyed or damaged home

Location

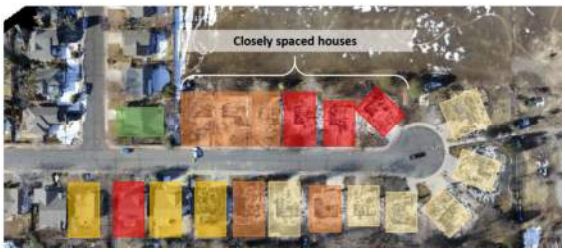
Proximity to open space

Neighboring open space

Location

Damage state of homes

Proximity of homes to other damaged homes



Proximity of homes to one another

Proximity of homes to open space

Firefighting

Damage characteristics

Approximate temperature of foundation (destroyed homes only)

Damage characteristics

Appoximate temperature of foundation (destroyed homes only)

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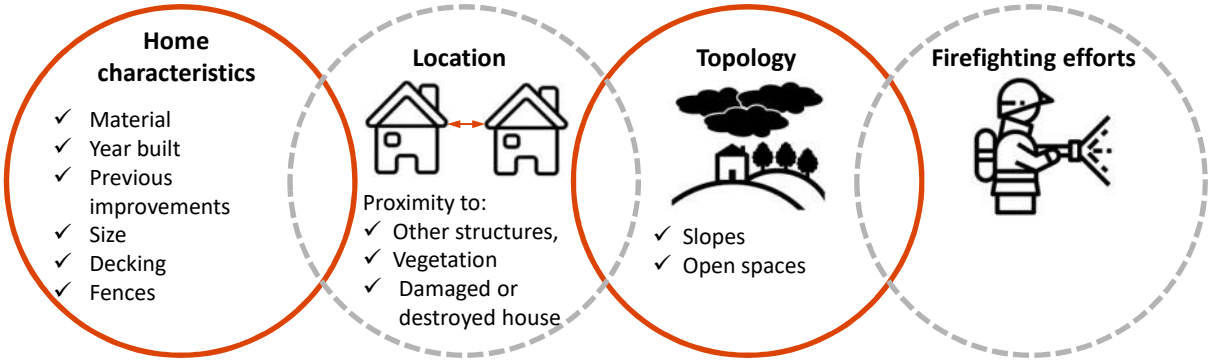


Preliminary Findings

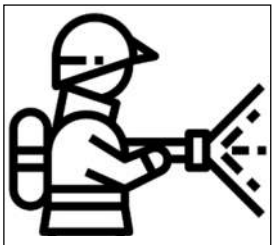
Closely spaced houses

High intensity of fire (high temperatures)

No protection on vents

Fences touching homes/Burnt fences

Proximity to open space



Firefighting strategies

Next Steps

- NSF Rapid Proposal
- Coordination with other teams (e.g. survey working group, drone flights)
- Analysis of data collected using drones and LiDAR
- Application of methodology to other neighborhoods impacted

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Questions?

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