# EXPLORING WILDFIRE RISKS AND MANAGEMENT STRATEGIES IN THE WESTERN U.S.

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# STUDY #1

Landsc Ecol (2022) 37:1091–1112
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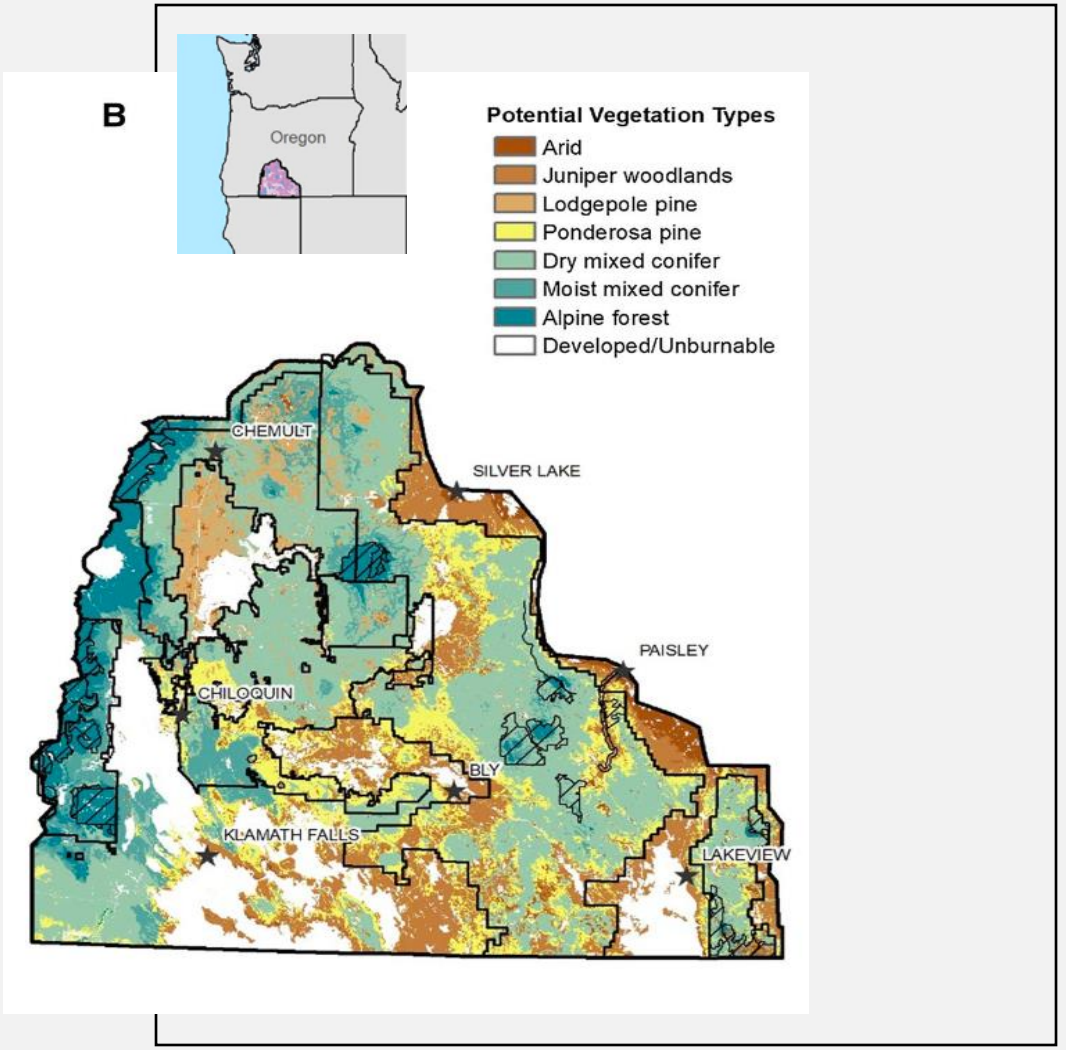
RESEARCH ARTICLE

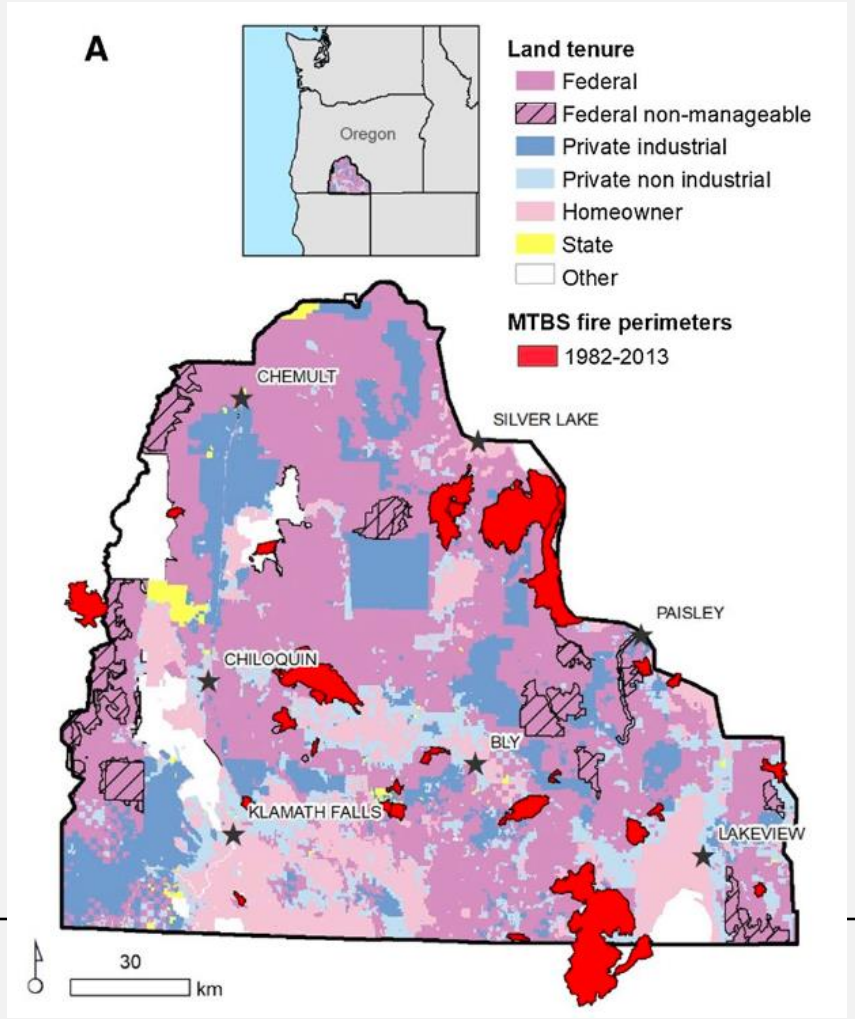
**Contrasting effects of future wildfire and forest management scenarios on a fire excluded western US landscape**

**Alan A. Ager · Ana M. G. Barros · Michelle A. Day**




## Study Area:

- 2 million ha landscape in southcentral Oregon
- Study area was dominated by overstocked conifer forests prone to high-severity fires




# RESEARCH OBJECTIVES

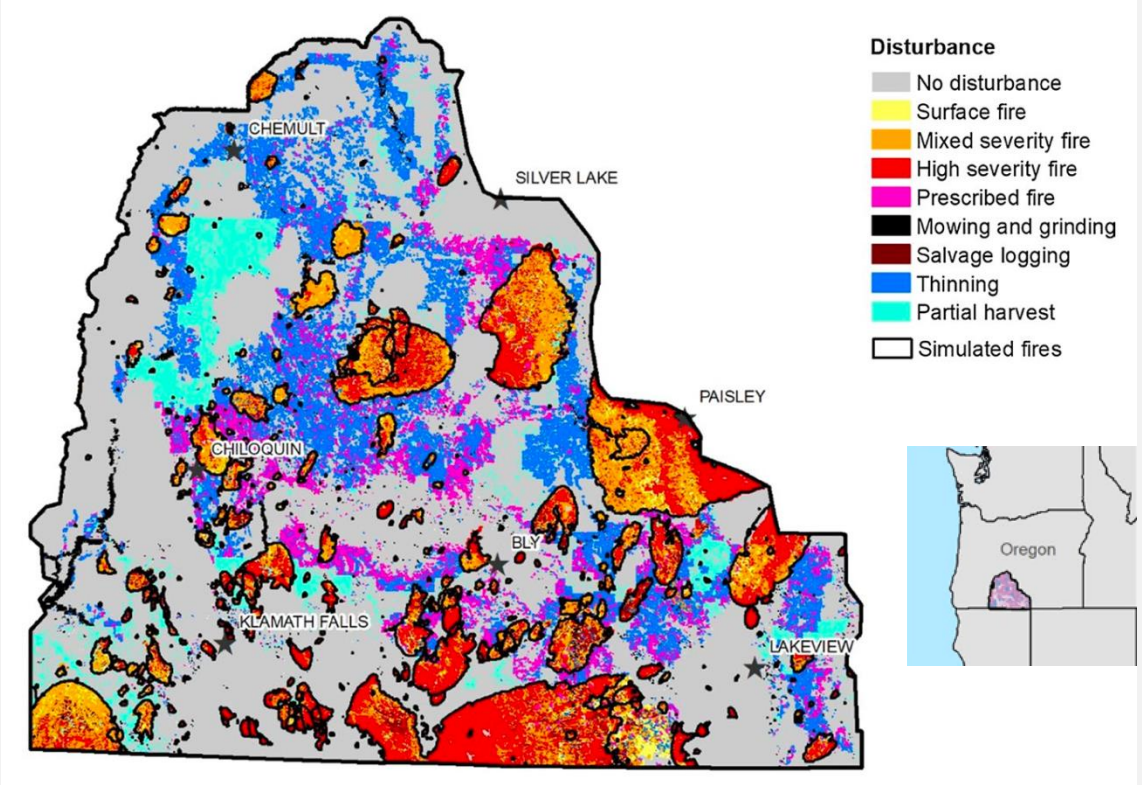
The effects of different intensities of wildfire and forest management over 50 years

The interactions between disturbances on federal (52%) and private lands

The relative efficiency of these disturbances in promoting fire resilience, carbon conservations, and forest restoration

# METHODOLOGY

- *Envision* model simulates forest growth, succession, wildfire, and management over a 50-year period
  - 12 scenarios with varying levels of wildfire intensity (1X, 3X, and 5X) and active management (e.g., thinning, prescribed fire, and harvesting)



# RESULTS: AREA BURNED & TREATED

## Wildfire & Management

- Wildfires **alone** were more efficient in reducing high-severity fire potential than active management

## Active Management

- Federal lands showed better outcomes in fire resilience by 15-35% under active management by reducing area
  - Created patches
- Private lands showed minor improvements, with harvesting practices often reducing resilience

## Management Efficiency

- Combined management and wildfire scenarios led to the greatest landscape change and forest resilience

# RESULTS: CARBON & FOREST STRUCTURE

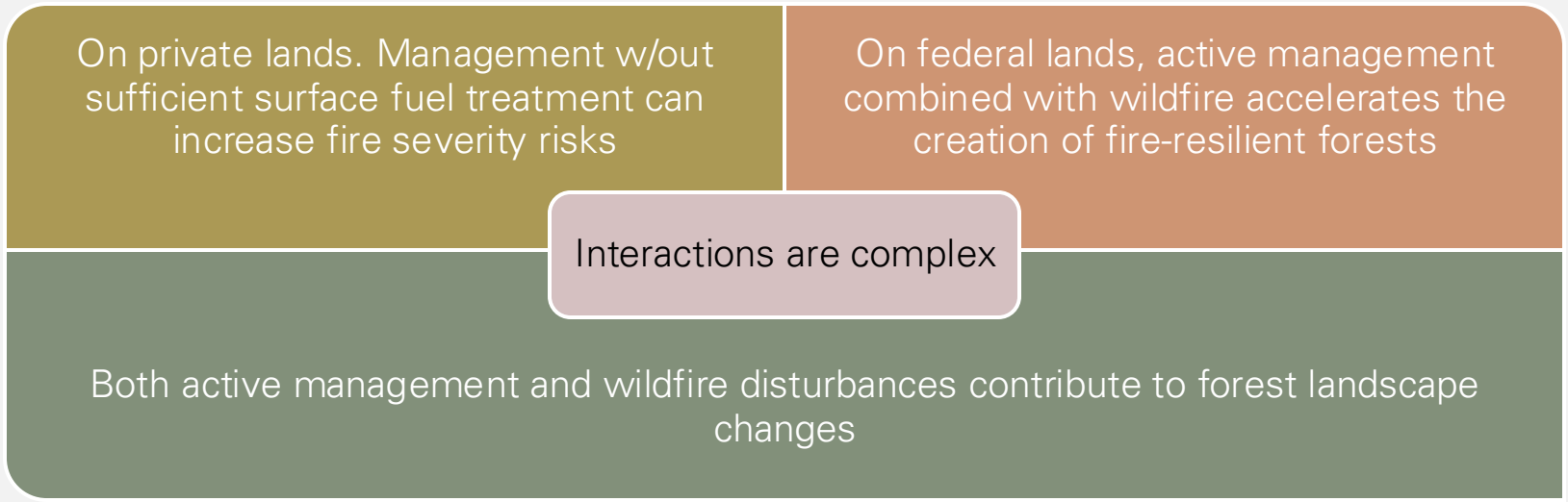
## Aboveground Carbon

- Most management and wildfire scenarios resulted in reduction in aboveground carbon stock
- Reduction of wildfire spread helped mitigate long-term carbon losses

## Forest structure

- Mature forests increased under active management
- Wildfire are crucial in shaping early-successional forests

# CONCLUSION & FUTURE RESEARCH




- Models should explore how changing fire regimes and climate dynamics influence long-term forest resilience and carbon storage
- Future studies need to address knowledge gaps on optimal fire and management practice (i.e., mixed-owner landscapes)

# STUDY #2

Landsc Ecol (2022) 37:2967–2976
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PERSPECTIVE

**Defensible-space treatment of < 114,000 ha 40 m from high-risk buildings near wildland vegetation could reduce loss in WUI wildfire disasters across Colorado's 27 million ha**

**William L. Baker**

Study Area:

- Colorado (27 million ha)

- Wildland urban interface (WUI): a zone of transition between unoccupied land and human development
- WUI wildfire disasters are wildfires that cause substantial building loss

Inset image: NBC News/ Cameron Peaks Fire in Colorado 2020

# RESEARCH GOALS

Assess the risk of building loss in WUI wildfire disasters.

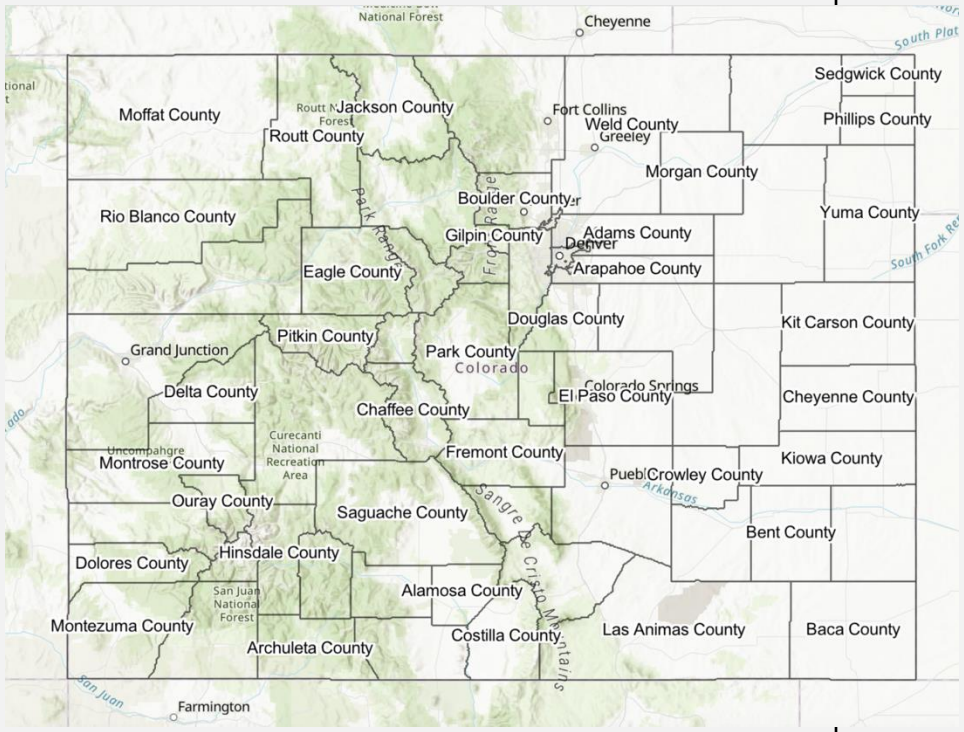
Map and quantify high-risk buildings across Colorado.

Determine the required scope of defensible-space treatments to mitigate risks.

Measure federal land area that contribute to WUI fire risk.

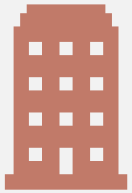
# METHODOLOGY

- GIS modeling to estimate risk of loss of buildings in WUI wild-fire disasters
- Combined 3 GIS calculations in buffers around each building to predict relative risk
  1. Building density
  2. Percent cover of wildland vegetation
  3. Distance to nearest large wildland vegetation patch
- Data sources included Microsoft building footprints and national land cover datasets




Inset image: Counties in Colorado

# RESULTS: FINDINGS OF HIGH-RISK ZONES



## Building Risk Profile

- **11%** (241,375) of 2 million are at high risk

(risk level 3-10)

- Concentrated in Colorado Front Range and southwestern Colorado

## Federal vs. Private

- **95%** of building on private lands were at risk
- **5.2%** of building on federal land was at risk
- Within 100 m of wildland vegetation

## Defensible-Space Treatment

- Treating just **0.2 – 0.4%** of Colorado's land (46,767 – 114,084) could protect most high-risk buildings

# RESULTS: FINDINGS OF HIGH-RISK ZONES

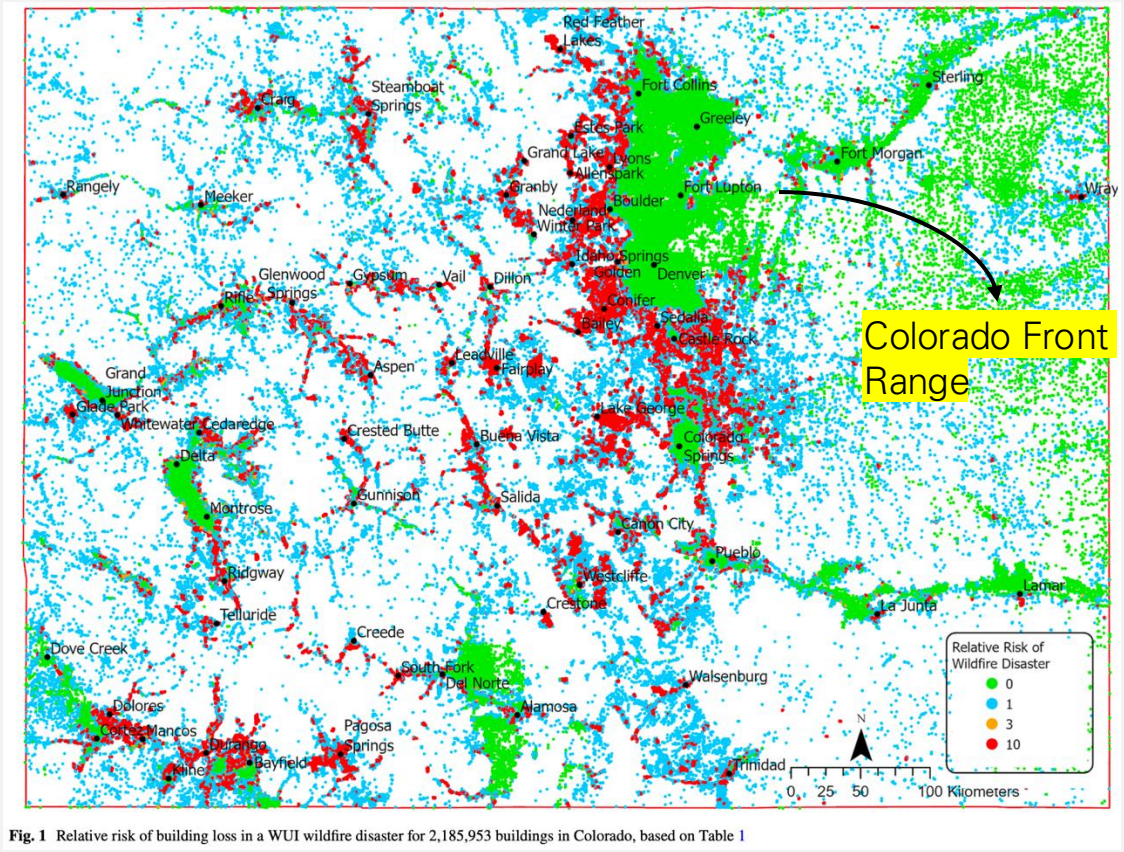
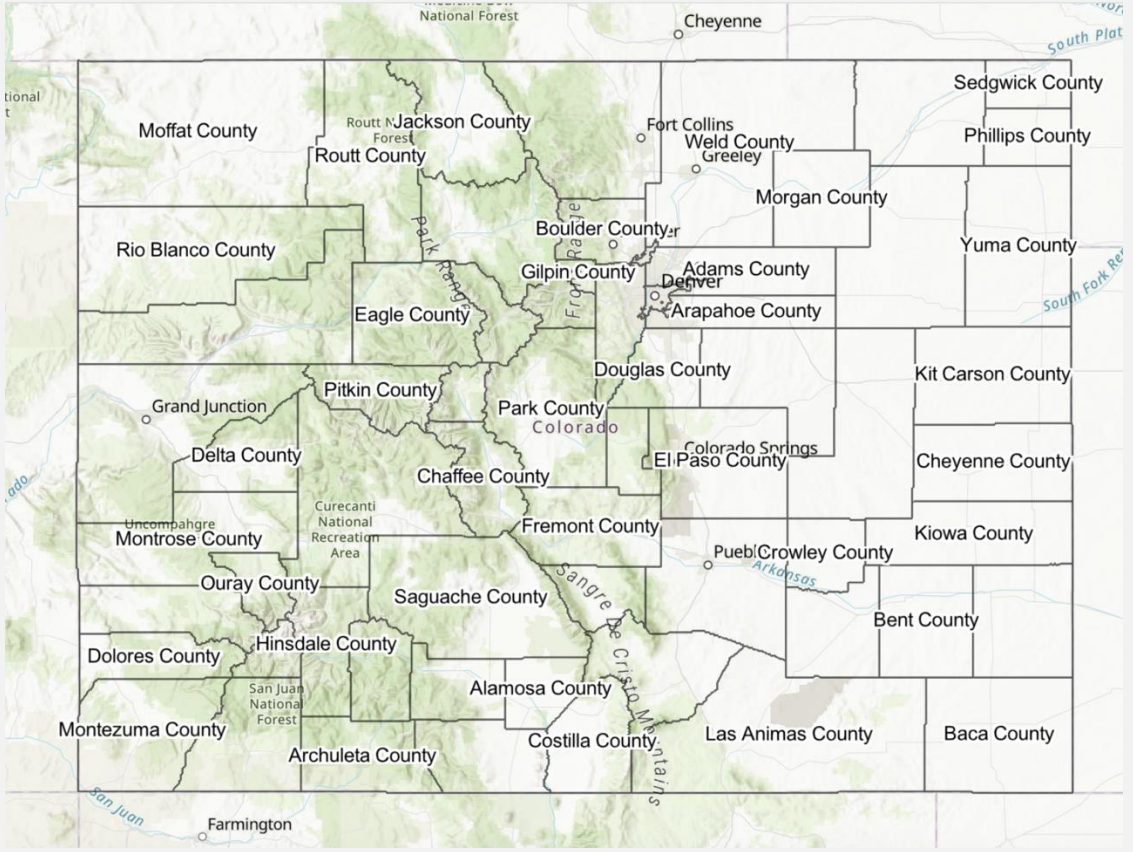



**Fig. 1** Relative risk of building loss in a WUI wildfire disaster for 2,185,953 buildings in Colorado, based on Table 1



# KEY RECOMMENDATIONS

Defensible-space treatments should prioritize reducing vegetation density and proximity within 100 m of buildings

Focused efforts on private lands can rapidly lower risks

Treating smaller, specific areas around high-risk building is more feasible than treating vast landscapes

Up to 850 m can enhance safety and limit fire spread

Need for collaboration between federal, state, and private entities

# CONCLUSION

- Focusing on high-risk buildings and applying empirical risk models, Colorado could efficiently reduce the likelihood of building losses during WUI wildfire disasters.
  - Balances protection of human infrastructure with the preservation of natural ecosystems
  - Enables safer maintenance of fire-adapted landscapes.

Inset image: Nakamoto Forestry (location unknown)

# REFERENCES


Ager, A.A., Barros, A.M.G. & Day, M.A. Contrasting effects of future wildfire and forest management scenarios on a fire excluded western US landscape. *Landscape Ecology.* 37, 1091–1112 (2022). https://doi.org/10.1007/s10980-022-01414-y

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