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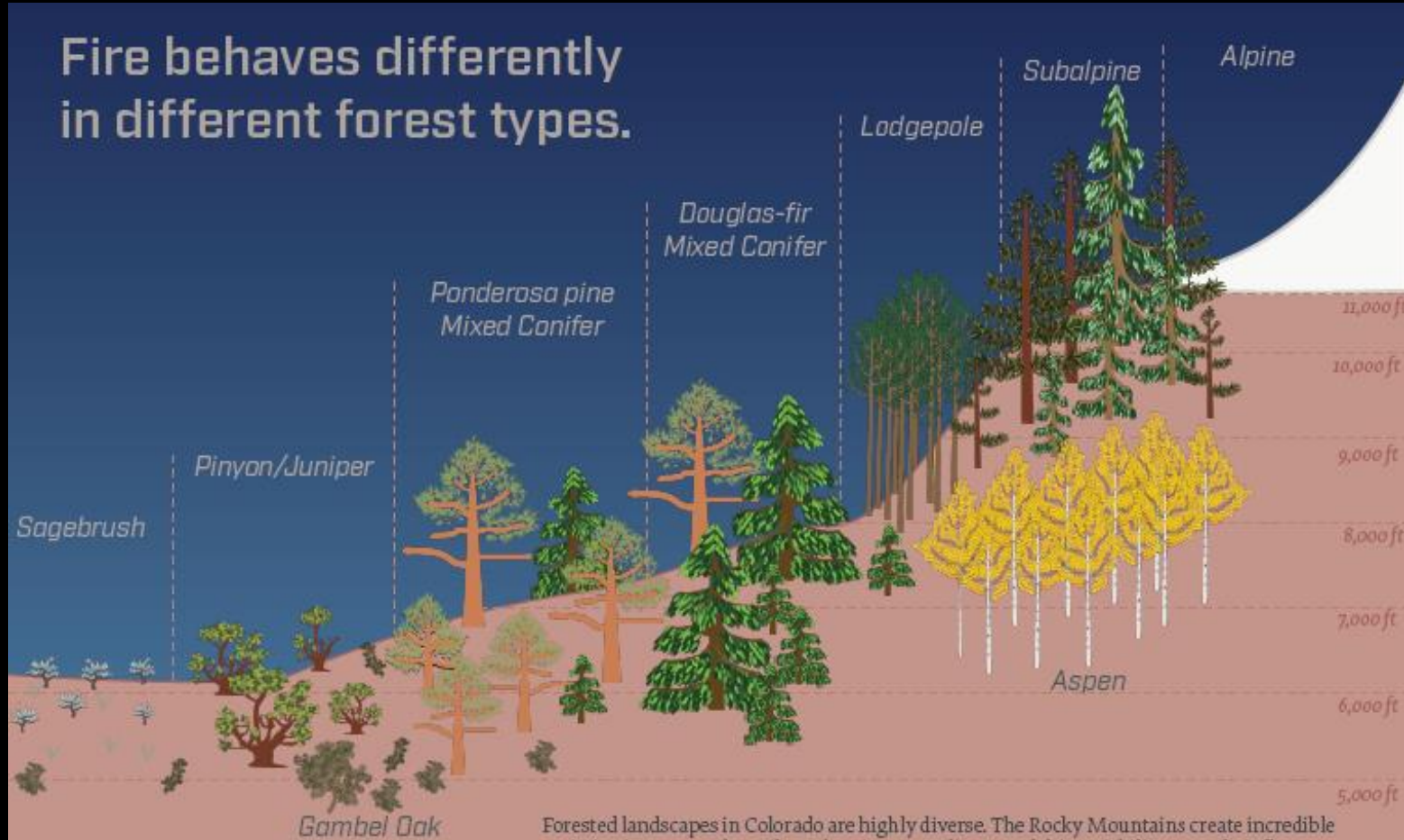


Fire Behavior  
Where is the risk  
Best available science  
What are we doing in Flagstaff  
Call to Action



# "Fire is Local"

Fire behaves differently  
in different forest types.



Forested landscapes in Colorado are highly diverse. The Rocky Mountains create incredible variation in topography, soils, and moisture gradients, and this variability strongly influences the enormous diversity of understory and forest vegetation that grows in different places. Even with all this diversity, Colorado's forests can be divided into several major forest types distributed across elevation gradients, as illustrated above. Fire is a necessary component of all these vegetation types and is an important force in shaping the forests we see today. Fire provides crucial ecosystem services to these forests, such as nutrient cycling, clearing out dead or diseased trees or accumulated fuel, and creating opportunities for new trees to grow. Each of these forest types responds differently to fire; read on for more details.



Photos taken at the same location





Table 1.—Composite fire intervals, Chimney Spring

| Period | Time span <sup>1</sup> | Number of years | Number of recorded fires | Interval<br>years |
|--------|------------------------|-----------------|--------------------------|-------------------|
| 1      | 1540-1876              | 336             | 68                       | 4.9               |
| 2      | 1754-1876              | 122             | 50                       | 2.4               |
| 3      | 1800-1876              | 76              | 37                       | 2.1               |
| 4      | 1820-1876              | 56              | 30                       | 1.9               |
| 5      | 1824-1869              | 45              | 26                       | 1.7               |
| 6      | 1850-1865              | 15              | 12                       | 1.25              |

<sup>1</sup>Dates between first and last fire scar. Includes all material.

As progressively shorter periods are selected for computing fire frequency, the interval becomes even shorter. For period 6, a 15-year period (1850-1865), fires were occurring on the Chimney Spring area at 1- to 2-year intervals (average 1.25 years).

Fire-scar data from specimens 2 and 3, only 20 feet (6 m) apart, show why a single tree does not necessarily reveal the true fire interval for a particular area. Whereas tree 2 had an average interval of 7.6 years for 18 fires, and tree 3 had an interval of 5.9 years for 16 fires, the CFI is 5.3 years based on 11 fires that were common to both trees and 12 fires that affected one specimen and not the other.

## Discussion

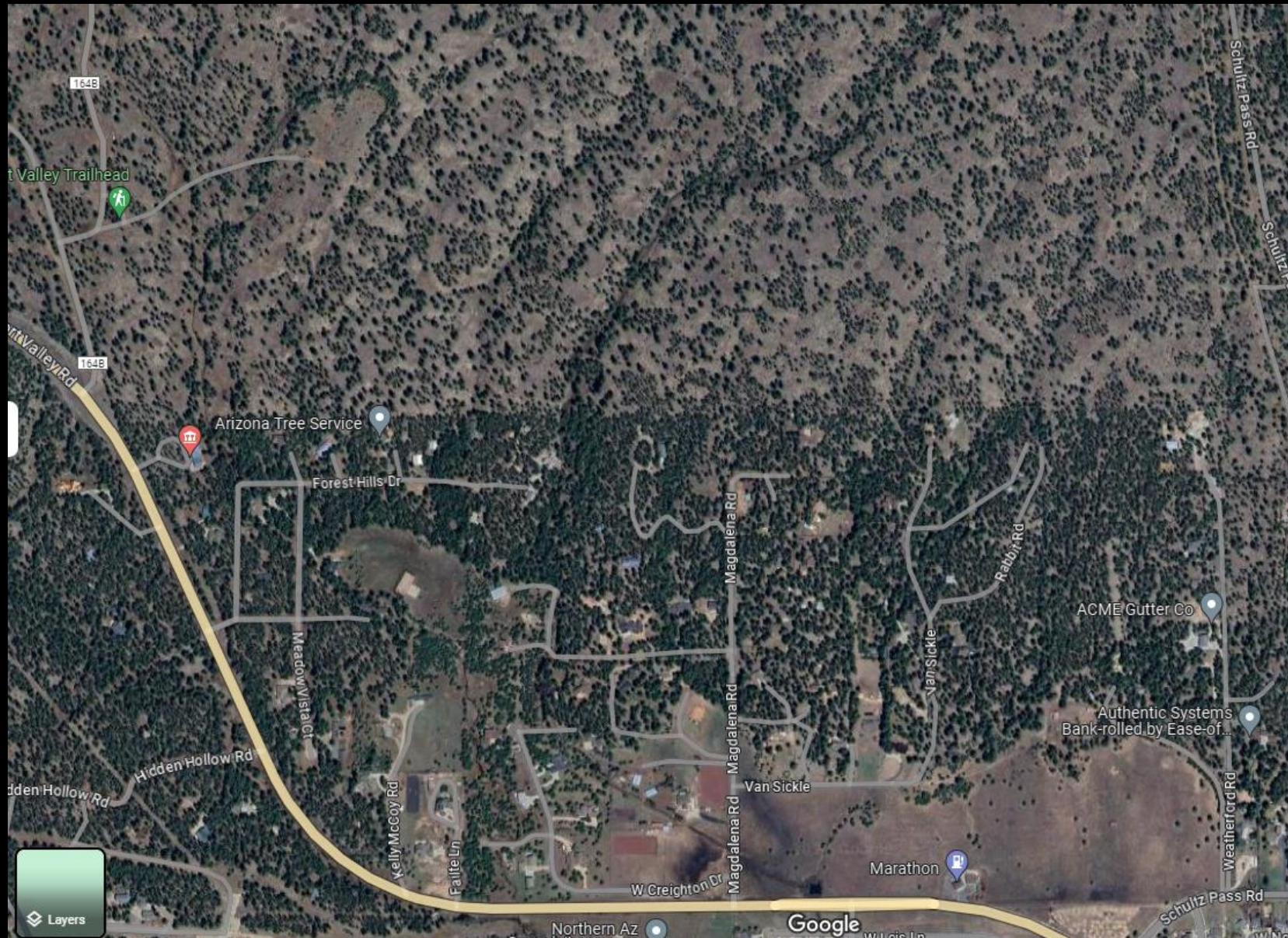
Two factors extremely significant to the site: (1) the presence of reliable ignition sources (lightning



# Where is the uncontrollable wildfire risk?



# Where is the uncontrollable wildfire risk?



# The key questions

Understanding the relationship between wildfire risk modeling, data, and insurer decisions



- Why is wildfire risk so hard to measure?
- Why is measuring the impact of mitigation even harder?
- What will it take to close the gap between  
*effective risk reduction actions by homeowners and communities*  
and  
*information visible to and useable by insurers for pricing and underwriting?*

# Best Available Science Guides Our Mitigation Efforts

## Flagstaff City Codes

Building, WUI, Resource Protection Standards, Landscaping

## Home Ignition Zone, Home and Business Hardening

National Fire Protection Association Firewise USA

Insurance Institute for Business and Home Safety

National Institute of Standards and Technology

## Natural & Built Environment Fire Pathways

## Structure Fire Spread & Vulnerability Model

**ON FIRE:** The Report of the  
Wildland Fire Mitigation and  
Management Commission



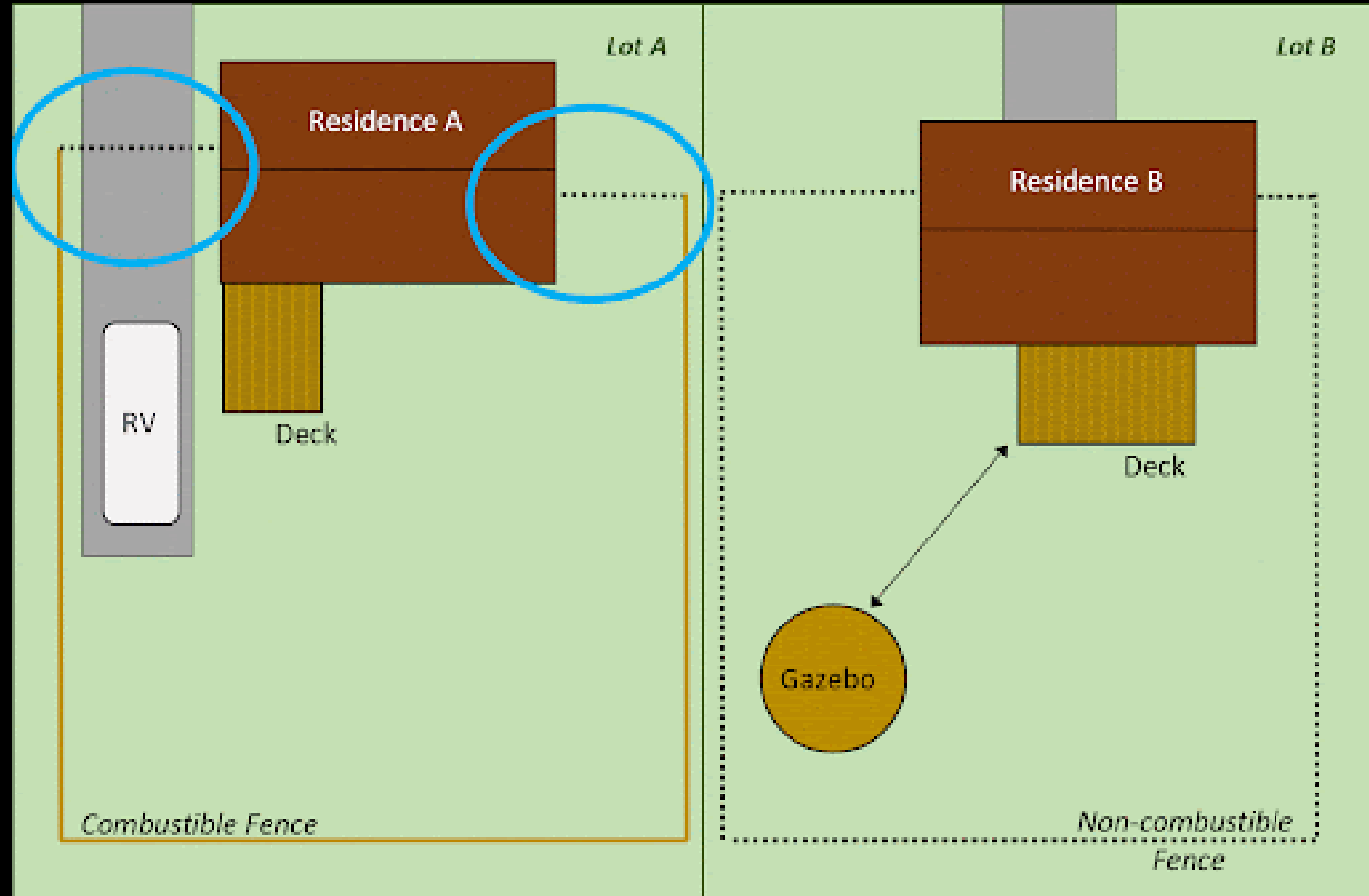
September 2023

## HAZARD MITIGATION METHODOLOGY (HMM)

- Exposures During WUI Fires
- HMM vs Traditional Hazard Mitigation
- WUI Definitions
- Structure Survivability in the WUI
- Community Survivability in the WUI
- Paths forward: Implementing HMM
- Communities already implementing HMM
- How Fire Spreads in the WUI
- Community-Wide Structure- and Parcel-Level Hardening Actions
- Hardening Actions: Construction
- Guidance

# NIST

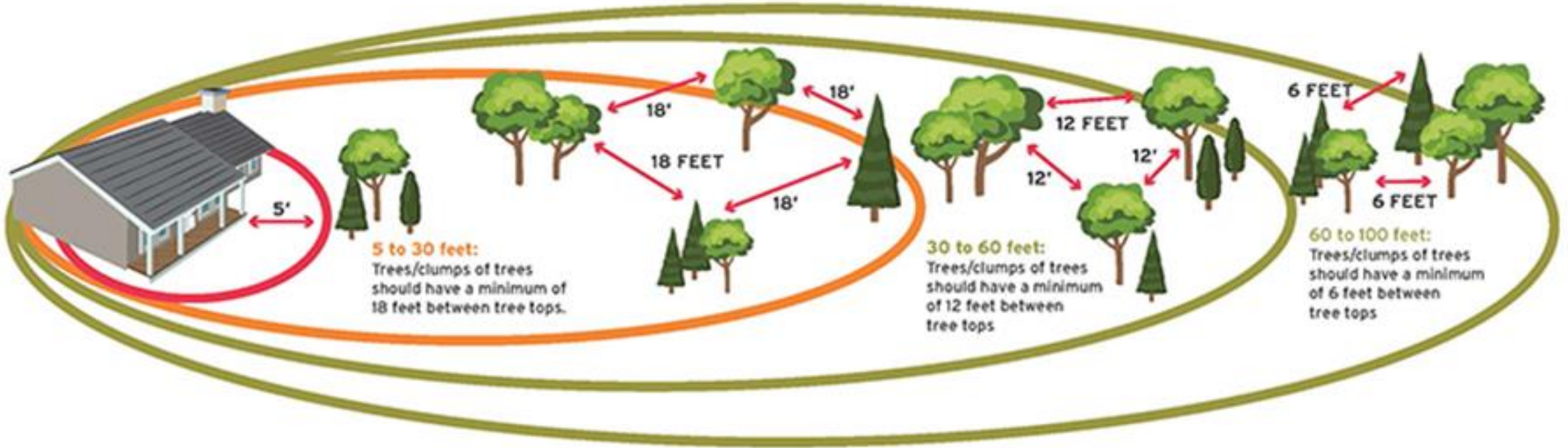
NATIONAL INSTITUTE OF  
STANDARDS AND TECHNOLOGY  
U.S. DEPARTMENT OF COMMERCE



# Built Environment Desired Conditions

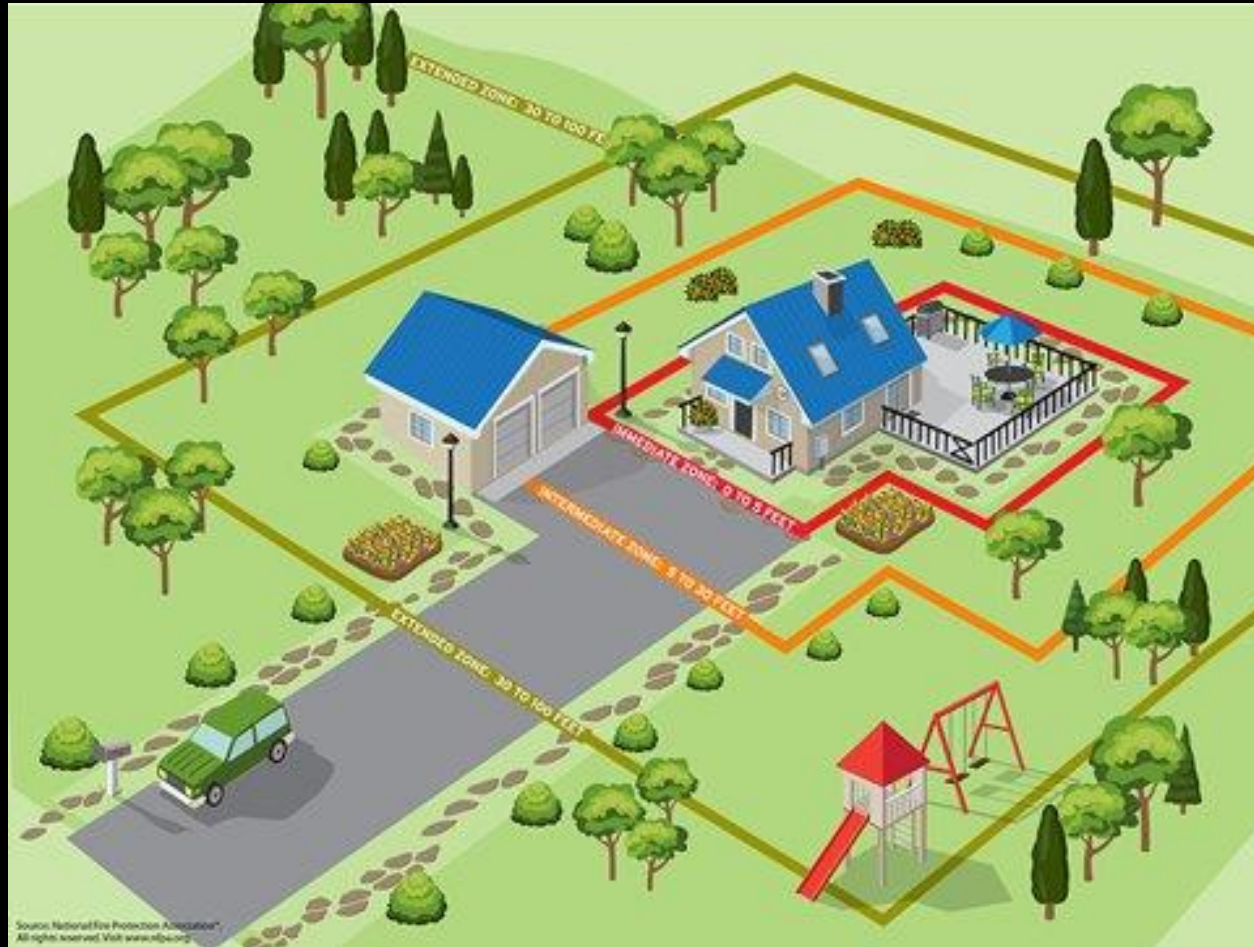
## National Fire Protection Association Firewise USA Standards

### TREE SPACING



# Built Environment Desired Conditions

## National Fire Protection Association Firewise USA Standards



Source: National Fire Protection Association  
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# Insurance Institute for Business and Home Safety Wildfire Prepared Home and Neighborhood

NEED HELP?

LOGIN | CREATE ACCOUNT



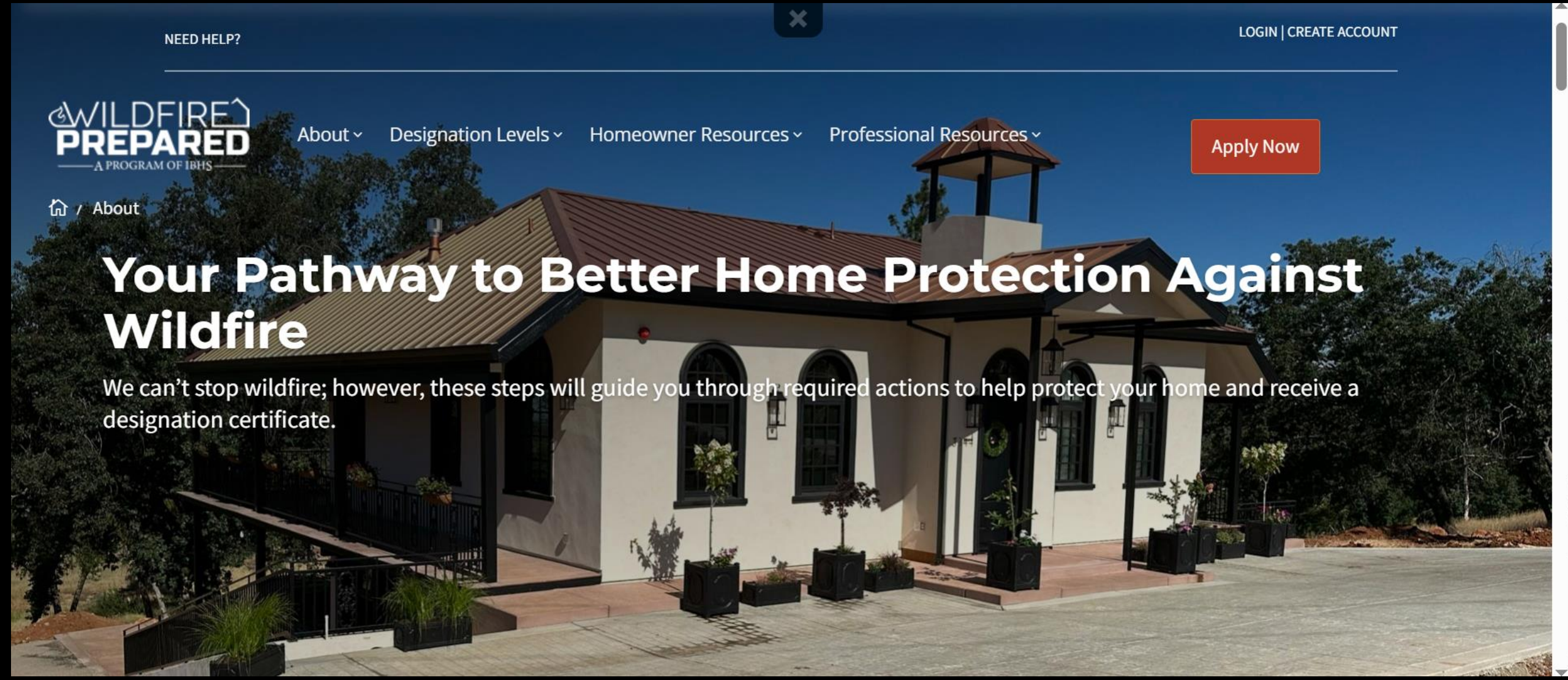
About ▾ Designation Levels ▾ Homeowner Resources ▾ Professional Resources ▾

Apply Now

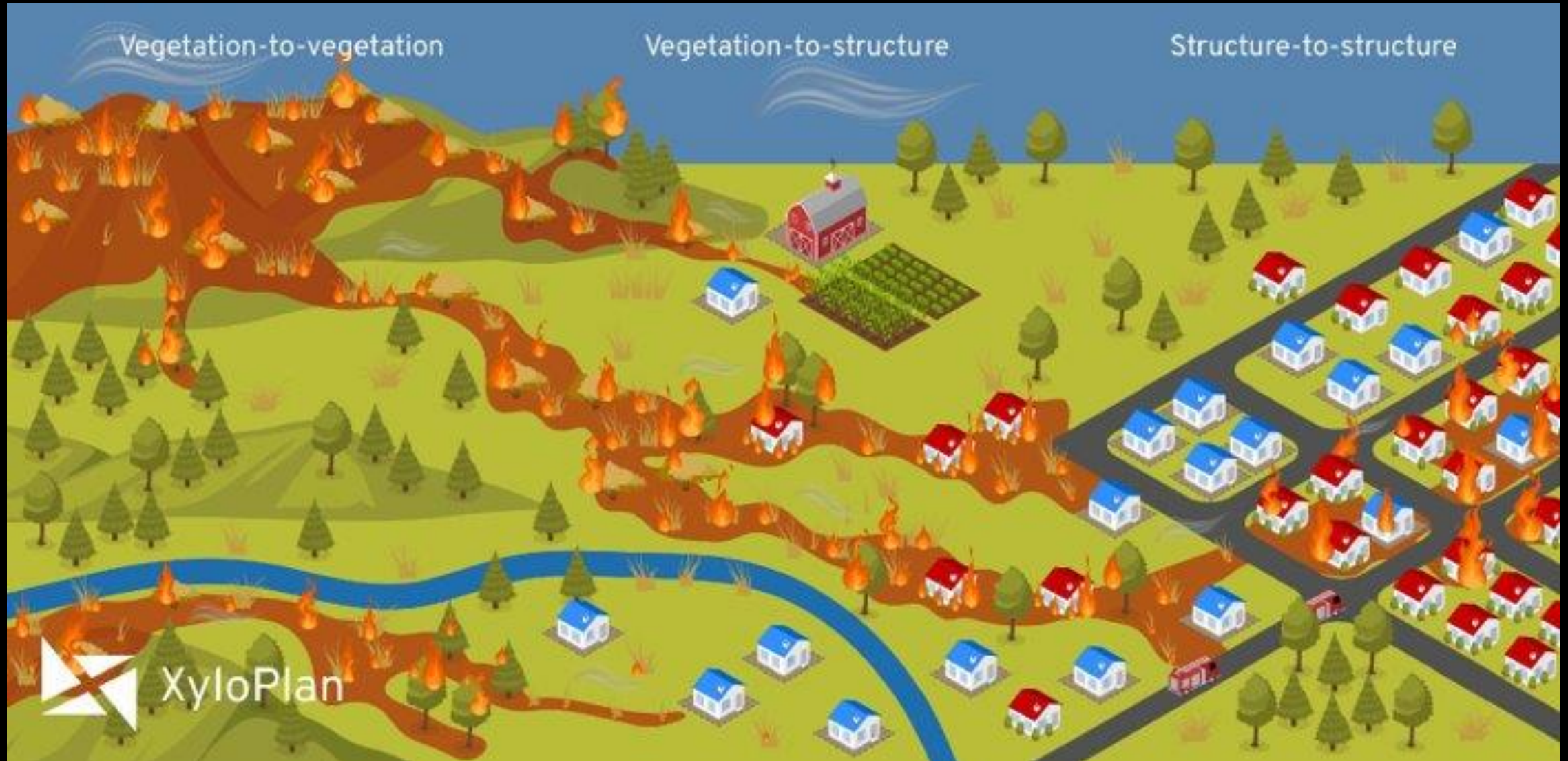
Home / About

## Your Pathway to Better Home Protection Against Wildfire

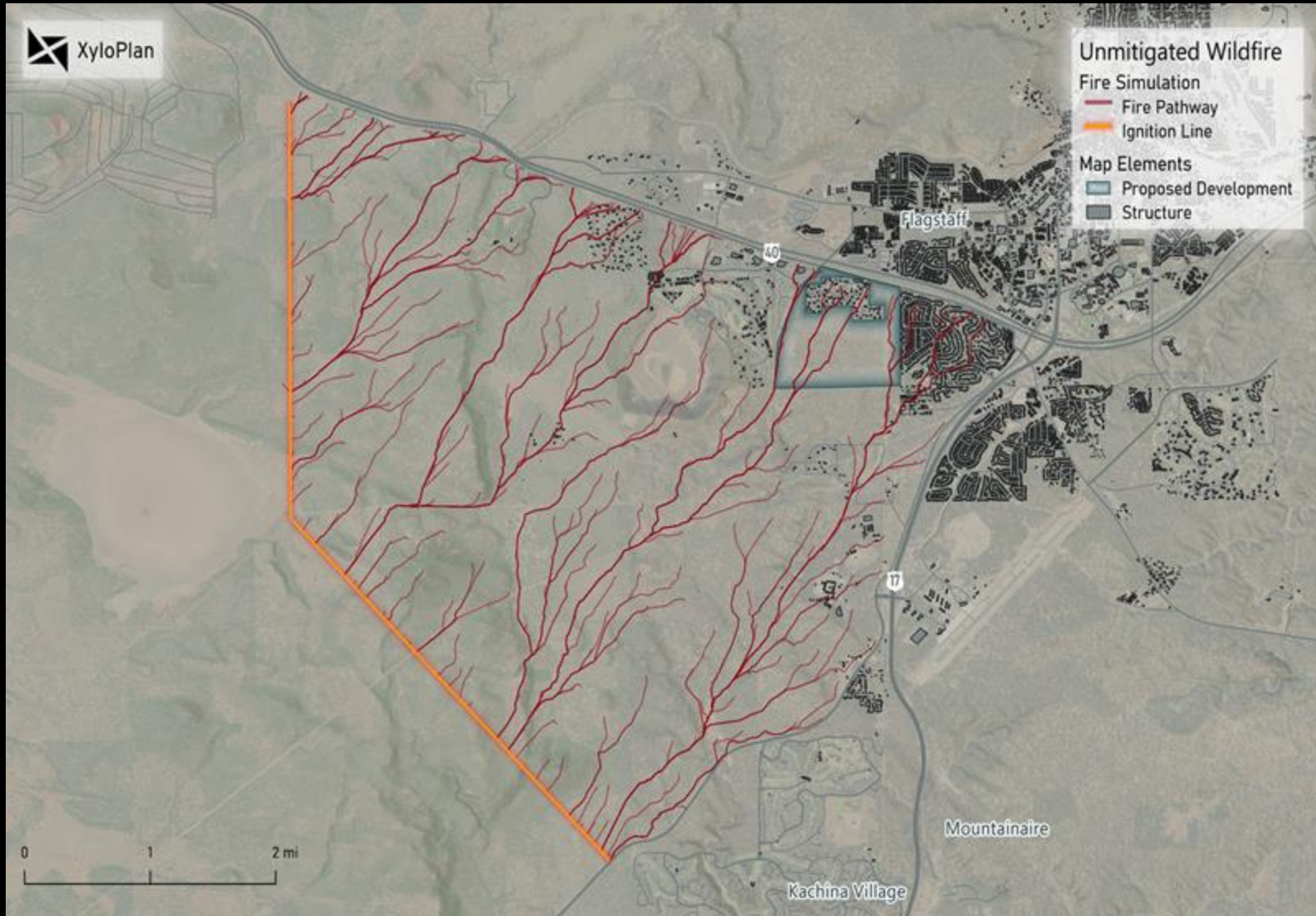
We can't stop wildfire; however, these steps will guide you through required actions to help protect your home and receive a designation certificate.

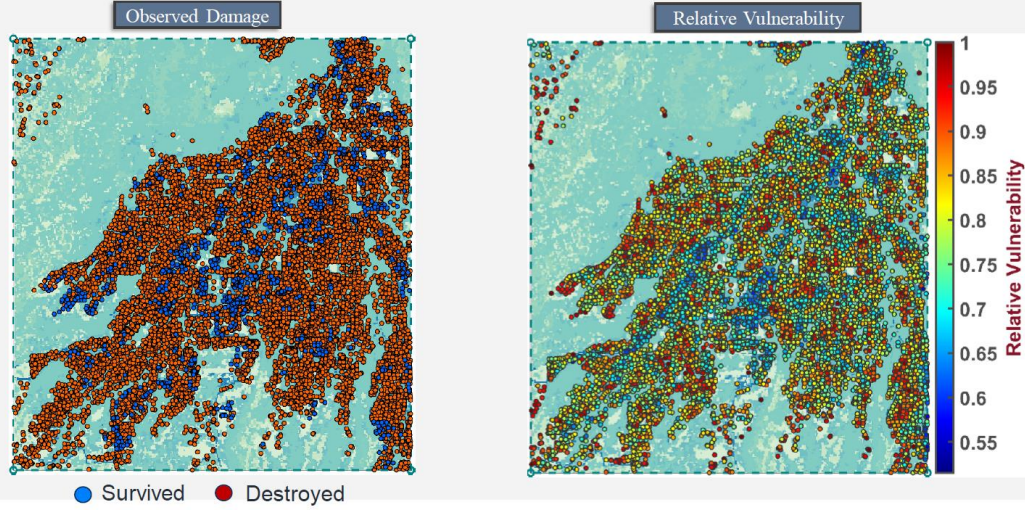


# Three types of Fire Spread Pathways



# Local Fire Spread Pathways



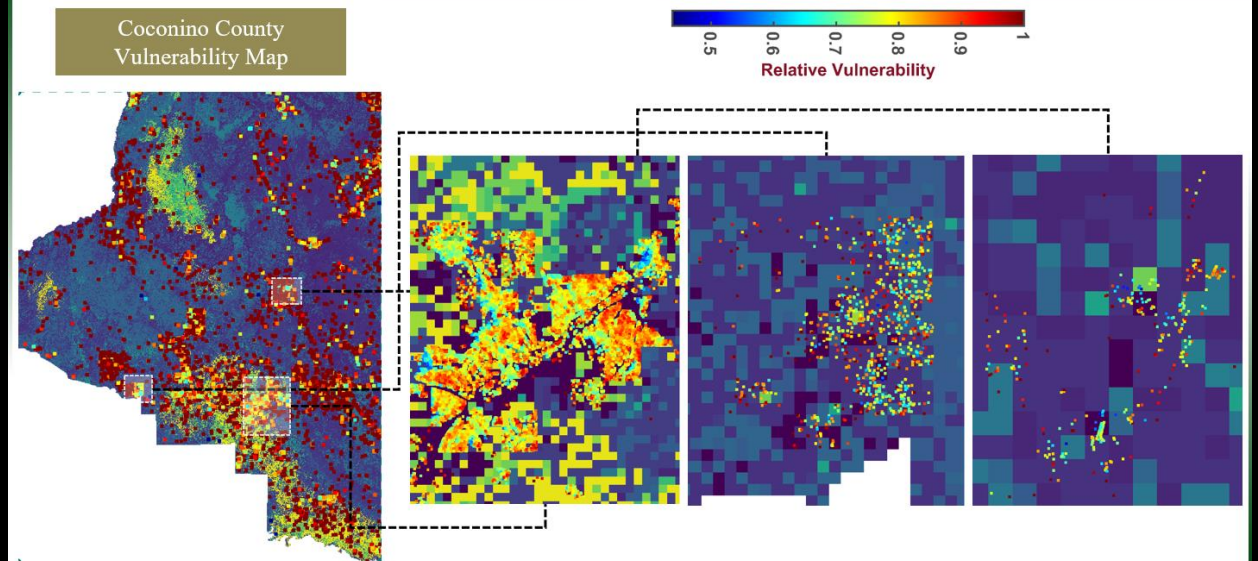


Chulahwat and Mahmoud et al. (2022) *Sci. Rep.*

# Structure Vulnerability Models

## Avoid Random Acts of Mitigation

### Relative Vulnerability Map





# FFD Current Efforts



Updates planned for:

- International Code Council Building Code (ICC)
- International Wildland Urban Interface Code (IWUIC)
- Resource Protection Standards
- Landscaping

Inspection Software: WUUII

AZ DIFI

Western Fire Chiefs

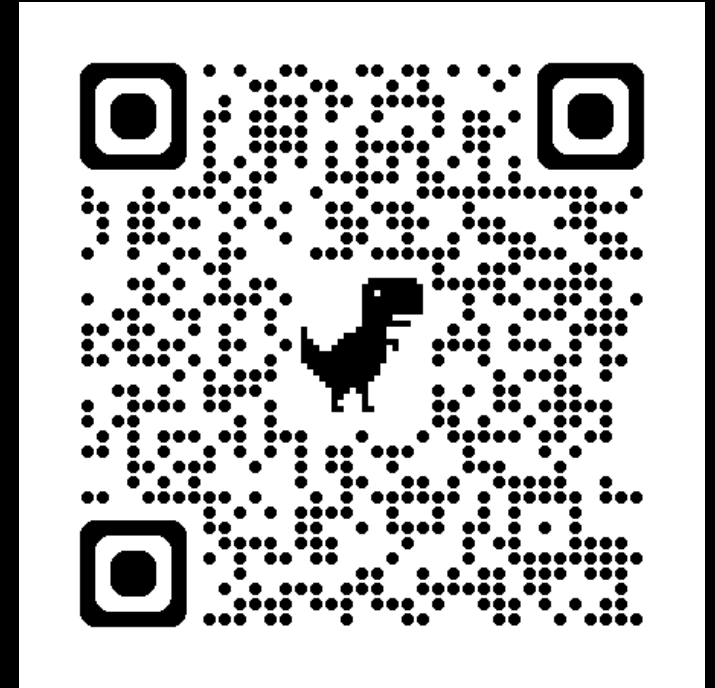
Local, State, and National Policy Collaboratives

# AZ Department of Insurance and Financial Institutions Resiliency and Mitigation Council

Investigate the availability and affordability of homeowners insurance in forested areas and wildland-urban interface areas of Arizona

Investigate the impact that natural disasters have on the availability and affordability of homeowners insurance in these areas

Investigate strategies that local communities in these areas may adopt to mitigate the risk of property loss due to natural disasters



# Western Fire Chiefs Association Multi-State WUI Mitigation Alignment Project with Arizona Fire Chiefs Association

## Five Enabling Tasks:

- Core set of “mitigations-that-matter”
- Structure to structure spread modeling with structures as a new and distinct fuel type
- WUI Response rating
- WUI data commons
- Barriers to social support for implementation and maintenance of parcel level mitigations

# What Action is Needed?

- **National Policy**

- Unprecedented investments in the Built Environment

- WFMCC Recommendation #1: Fire Environment Center (FOFA)
- WFMCC Recommendation #56: US Fire Administration Expansion

- **Support Beneficial Wildfire across Federal Lands**

- 700K acres across 4FRI since 2010
- AZ: 74% of all wildfire 2010 – 2020 = Good Fire (Balch, Jennifer & McIntosh, Tyler & Ilangakoon, Nayani & Cummins, Karen & Varner, J. & Hansen, Winslow & Marquis, Kate & Raymond, Crystal & Harvey, Brian & Platt, Rutherford. (2024). Good fire: quantifying the beneficial ecosystem work of western U.S. wildfires (2010-2020). 10.1101/2024.12.06.627082.)

# What Action is Needed?

- **State Policy – ENABLE RISK REDUCTION**

- Mitigations that Matter
- Avoid policy that disrupts insurance markets

- **Local action – BE PROACTIVE!!**

- CWPP's that Matter
- Codes – WUI, Development, Vegetation, HVAC
- LOTS more beneficial fire
- LOTS more smoke mitigation investments (hepa filters for all!)
- Create opportunities to test "Alternative Risk Transfer Approaches"

**Resilient Landscapes  
Fire Adapted Communities  
Safe & Effective Wildfire Response**

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