



Fire Risk Intelligence and Data Integration

June 1, 2026

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Fire Risk Problem

01

No existing measure of local fire risk, consistently nationwide.

Reflective of the unique differences in risks from structure fire, wildland-urban interface, and urban fire storms.



02

No consistent measure of direct **economic loss** from fires.

Forms the baseline understanding of the Nation's structure fire problem.



03

Lack of a fire **risk framework** with risk expressed as expected economic annual loss.

***Predictive basis** accounting for historical incidents, socio-economics, infrastructure, and resilience capacity.*



**POLICY DOESN'T
GET CREATED ON
WARNINGS.**



Warnings raise awareness,
but rarely drive action.



**IT ACTS ON
FRAMEWORKS.**



Frameworks provide clarity,
structure, and a path to action.



**GIVE RISK A
FINANCIAL VALUE,
AND SUDDENLY IT HAS
A SEAT IN THE ROOM.**



Vision and Approach



OUR VISION:

Our Nation's fire service and public leaders are equipped with **the fire risk intelligence** needed to make **science-based, data-driven** decisions in assessing, communicating, and **investing in risk reduction**.

OUR APPROACH:



1

Establishing consistent, baseline measures of fire risk that focus on the threat of fire to people, built infrastructure, and the economy are available and made accessible to all essential stakeholders.



2

Developing and providing a fire risk index solution set that is flexible, ensuring rapid adaptation as new, improved source data becomes available and as fire behavior science evolves and matures.



3

Resulting in Fire Risk Intelligence that is used by all stakeholders in successfully increasing community-wide risk understanding, and catalyzing public responsibility and action in preventing, mitigating and strengthening resilience for all types of fire.

Comprehensive, Systems Thinking Approach



Account for all modes of fire transmission and ignition:

- Radiative Heat Transfer
- Ember cast and dispersion
- Flame spread

Integrate core dimensions of risk:

- Socio-economic demographics and population deprivation
- Fire weather conditions
- Vegetation/landscape resistance and susceptibility
- Building resistance and susceptibility

Our Approach

1) **Developing a suite Fire Risk Indices** based on real historical incident occurrence data, fire dynamics in the landscape and built environment, socio-economic variables, infrastructure resilience, and measures of economic loss including:

Real Property Damage and Loss

Economic Loss from Injuries

Economic Loss from Human Fatalities



2) Researching and developing **novel methodologies for Fire Risk Indices** that account for the unique risk factors and fire dynamics across each fire type.

Structure Fire

Wildland-Urban Interface Fire

Urban Conflagration /
Structure-to-Structure Fire



3) Producing a **simple Fire Risk Intelligence solution for integration within NERIS and accessible by all target users:**

30,000 Local Fire Department
Leaders

50 State Fire Marshals and State
Foresters

Critical Infrastructure Owners and
Operators

U.S. Department of Homeland
Security and other Federal
Agencies

A SHARED UNDERSTANDING OF FIRE RISK

WHO BENEFITS AND HOW



1) U.S. DEPARTMENT OF HOMELAND SECURITY

Bolstering domestic security, prevention, and preparedness to all types of fire risks.



2) 30,000 LOCAL FIRE DEPARTMENTS

Equipping fire service leaders with the risk-based intelligence needed to inform mitigation, prevention, and preparedness to fire risks within their communities.



3) 50 STATE FIRE MARSHALS AND 50 STATE FORESTRY AGENCIES

Enabling state-level, shared understanding of local fire risks to inform state-level mitigation strategies, policies, and investments.



4) CRITICAL INFRASTRUCTURE OWNERS AND OPERATORS

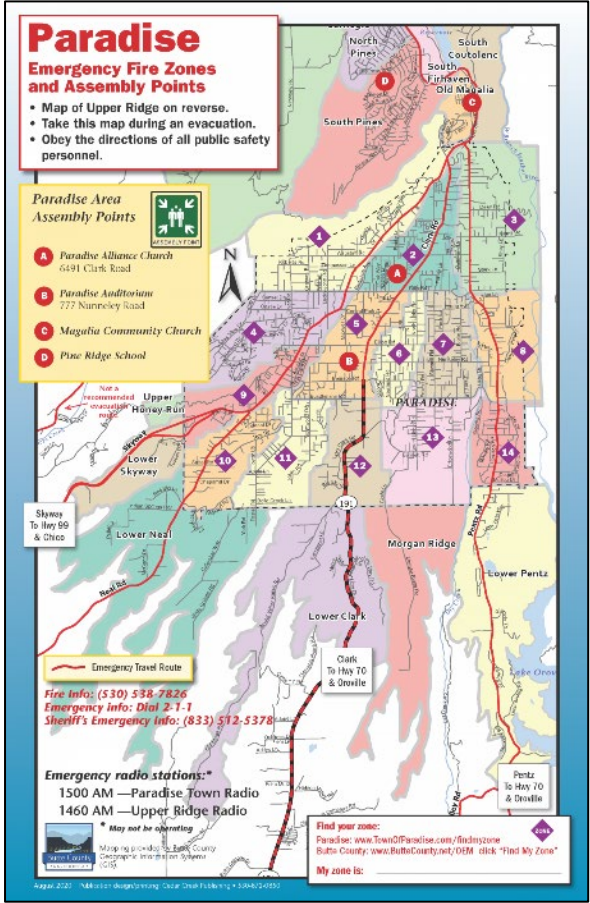
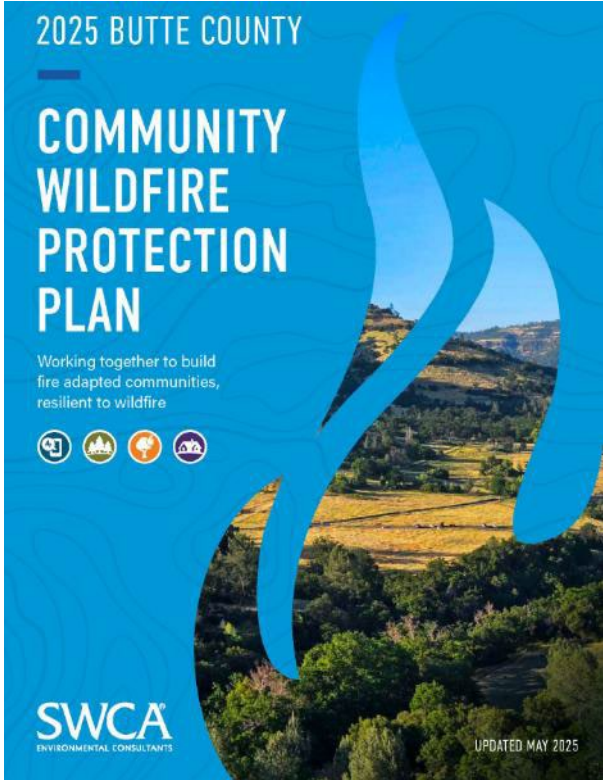
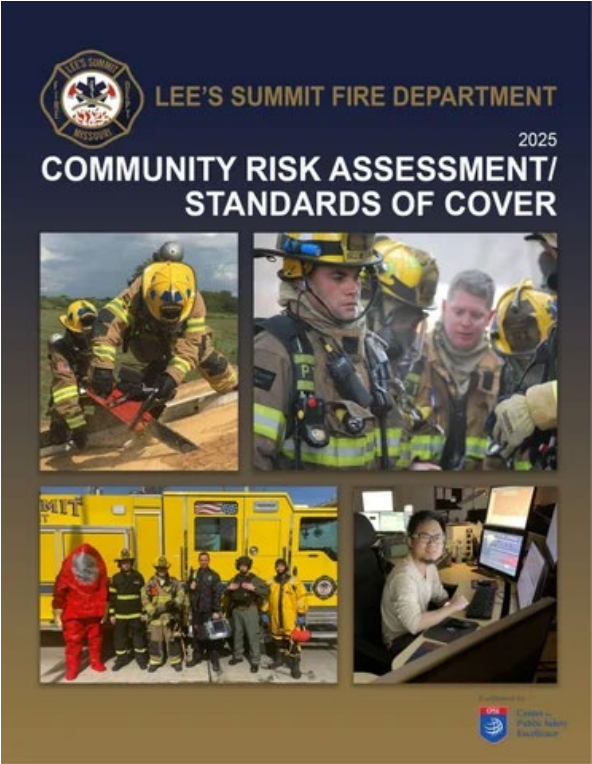
Providing shared fire risk intelligence to inform collaborative planning and investment in fire mitigation, prevention, and preparedness in partnership with local, state, and Federal agencies.



5) OTHER FEDERAL AGENCIES (FEMA/USFA, DEPT. OF WAR, DEPT. OF INTERIOR, DEPT. OF ENERGY)

All Federal agencies responsible for protecting Federal lands and Federal installations benefit from a shared basis for measuring, understanding, and predicting risk of all types of fire pervasive across the US.

Applying Fire Risk Intelligence



Wildfire Risk Modeling Exercise

Advancing Wildfire Risk
Science and Modeling

Our Challenge

Increasing trend in wildfires destroying thousands of buildings, claiming lives, impacting health and ecosystems, and **resulting in negative economic impacts.**



We struggle to consistently measure, understand, and predict fire risk - the very foundation of effective mitigation.



Now more than ever, we need to understand **unique strengths** of wildfire risk models – to identify how to achieve the **most precise intelligence on fire risk.**



Exercise Planning & Conduct Team

Google.org



GORDON AND BETTY
MOORE
FOUNDATION



FireWERX

Who's Participating



47 Organizations registered and confirmed
20 teams formed and completed the exercise

Research / Academic Institutions
Private Sector – Technology and Insurance
National Labs / Government Agencies



20 Unique Modeling Approaches
~30 unique models tested throughout exercise conduct



Participants from across:
15+ US States
5 Countries

Goal and Objectives



GOAL: Advance wildfire risk modeling science through an interactive exercise and workshop, while fostering collaboration among leading research organizations.



OBJECTIVES

1



Identify the **unique strengths** of all existing wildfire risk models, and their most appropriate uses.

2



Determine how existing models can be **ensembled** to achieve the **greatest accuracy and precision**.

3



Identify **common data requirements** that, if available, would increase accuracy, reliability, and precision.

4



Determine the requirements to **scale** wildfire risk models, and any technical degradation in scaling.

5



Determine the feasibility of establishing a **common Wildfire Modeling Interconnected Project** as a shared framework for model standardization and interoperability.

6



Identify opportunities for **open science, code, and methodology frameworks** that can be shared for innovation.

7



Identify **priority gaps** in wildfire risk modeling science that can inform future scientific advancements and investments.

Exercise Process

COLLABORATIVE PLANNING



EXERCISE CONDUCT

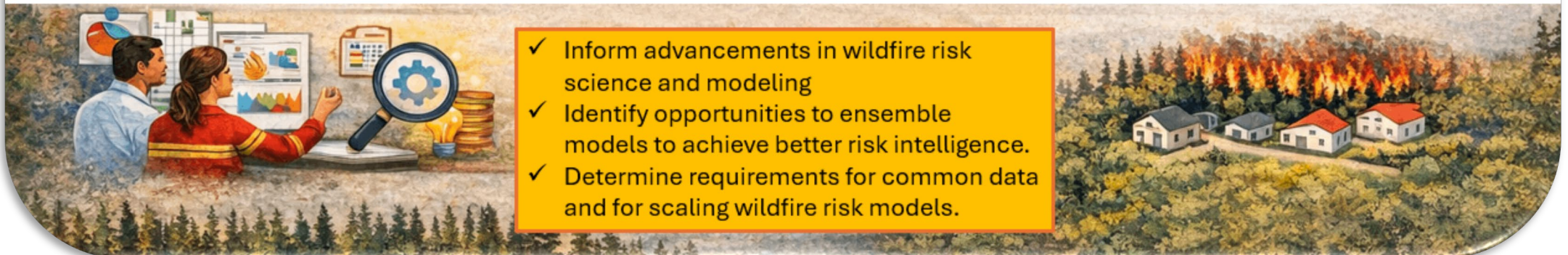


RESULTS



OUTCOMES

- ✓ Inform advancements in wildfire risk science and modeling
- ✓ Identify opportunities to ensemble models to achieve better risk intelligence.
- ✓ Determine requirements for common data and for scaling wildfire risk models.



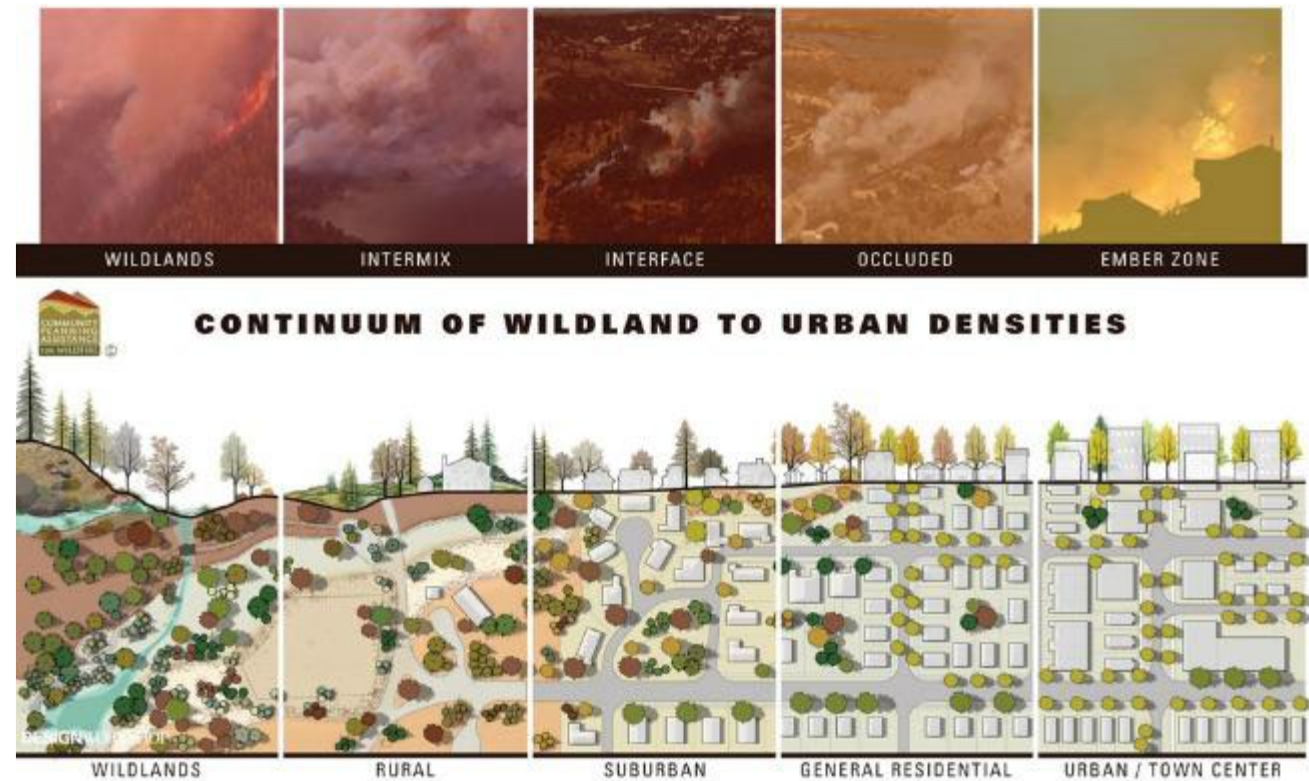
Synthetic Exercise Landscapes

Module A: *Town of Forests*

- Mountainous with variable elevation.
- High density of trees with varying species, heights, diameters, etc.
- Some residential sub-divisions are wildland-urban intermix.

Module B: *Town of Prairies*

- Mostly flat, with consistent elevation.
- Lower density of trees and tree characteristics.
- Some residential sub-divisions are wildland-urban interface.



Graphic Courtesy of American Planning Association

Synthetic Exercise Data



Building & Parcels

Building locations, footprints.
Building characteristics as attributes.
Property parcel geometries & attributes.
All synthetic.
GeoJSON



Trees

2M resolution.
Raster layer for vegetation with unique vegetation types identified that is capable of being voxelized.
All synthetic.
GeoJSON and txt



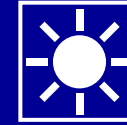
Road Networks

Standard, spatial road network.
Semi-synthetic, spatial geometry is real but partial network.
GeoJSON



Surface Fuels

Rasterized file for the surface with surface fuel data.
All synthetic.
GeoTIFF



Synoptic Weather

Specific date, time intervals for each location.
Wind speed, wind direction, relative humidity, temperature, etc.
CSV

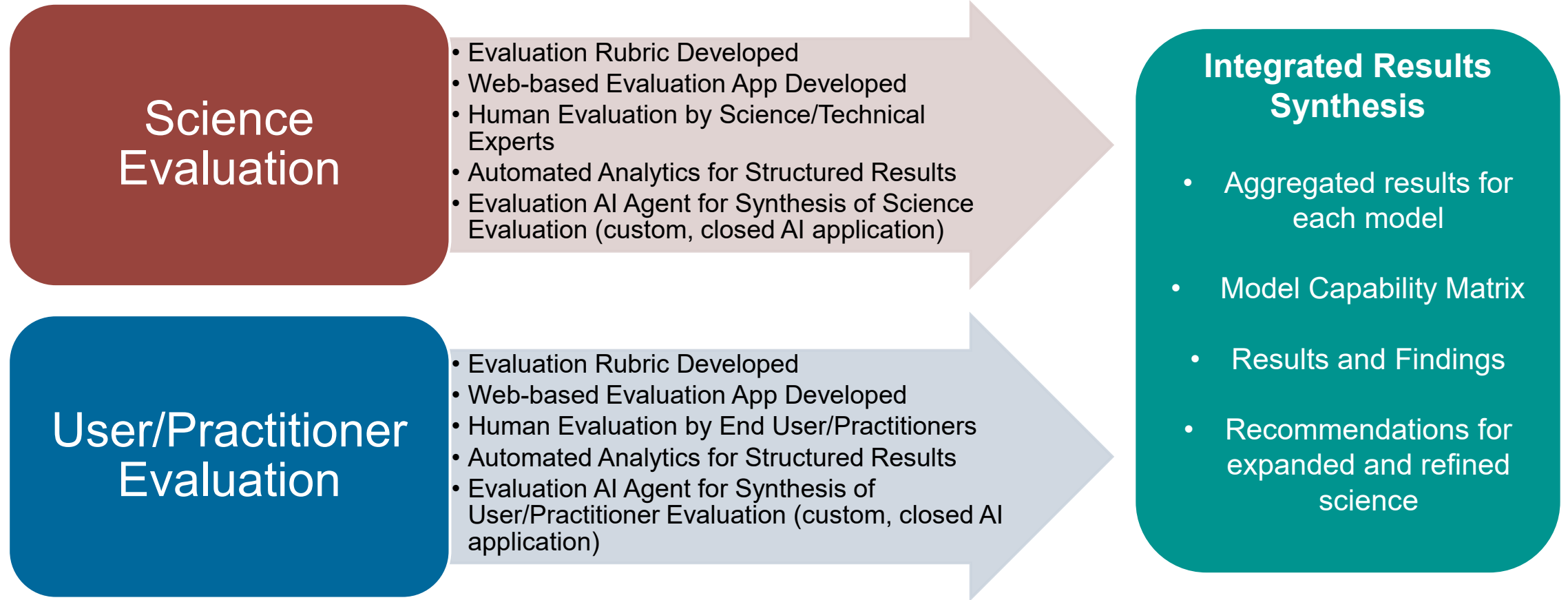


Fire Ignition Points

Single point ignition locations, lat/long.
Assumes fire in landscape for dynamic models.
All synthetic.
Lat/Long

All Synthetic Exercise Data is provided in .GeoJSON, .GeoTIFF, and .CSV

Evaluation Process



Exercise Milestones and Timeline

March

- March 18: Kick-Off with Participants
- March 24: Exercise START – Synthetic Exercise Data Released

April

- Exercise Conduct

May

- May 21: Submission Deadline
- May 22-June 1: Evaluators complete all evaluations

June

- June 8-9: In-Person Post-Exercise Workshop/Summit
- June 17: Virtual Exercise Hotwash

July

- Late July: After Action Review Report Released
- July and Beyond: Results and Recommendations Dissemination

Questions and More Information

Get In Touch

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*Learn More About Our
Fire Risk Research*

