The AIR U.S. Wildfire Model

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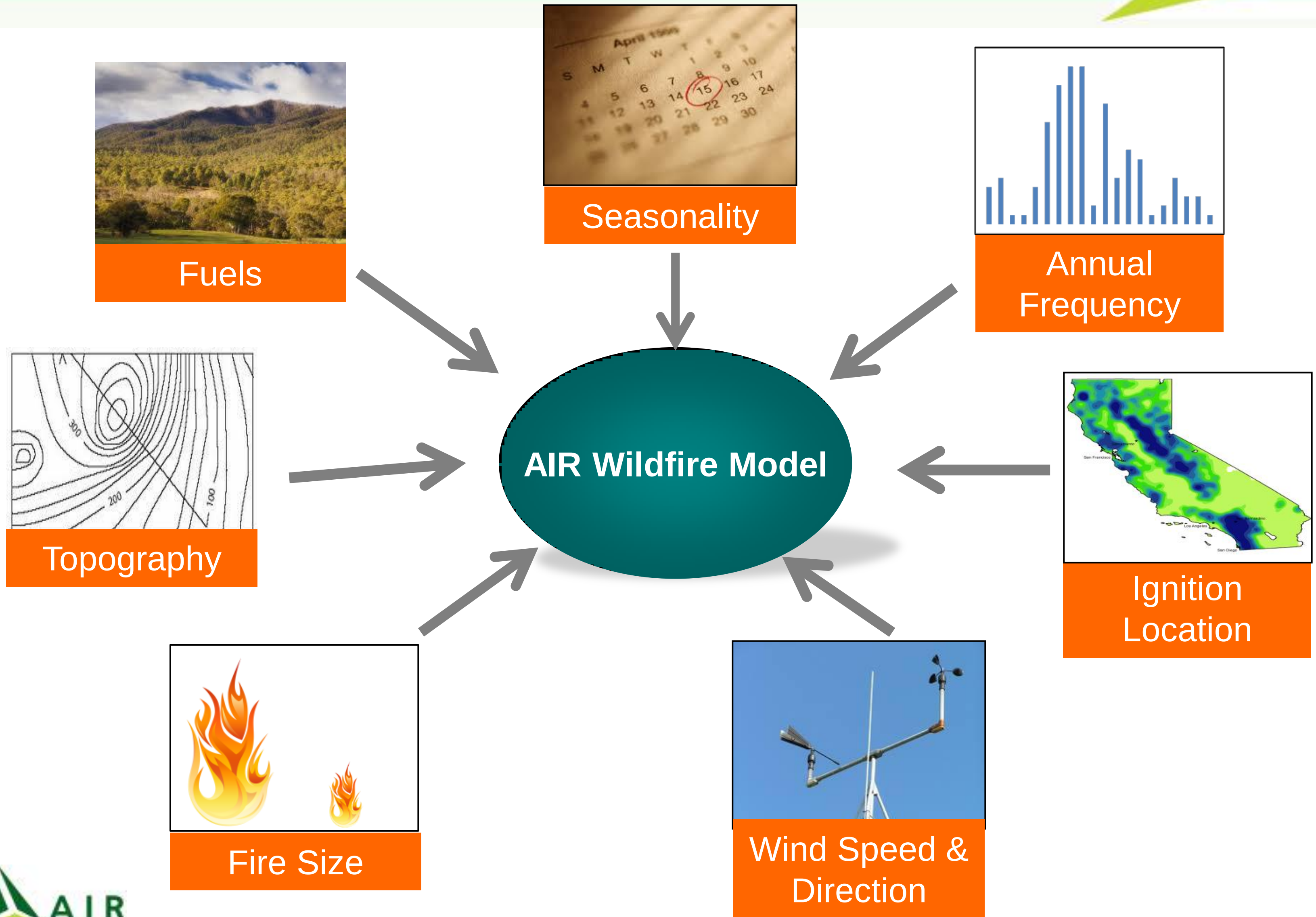
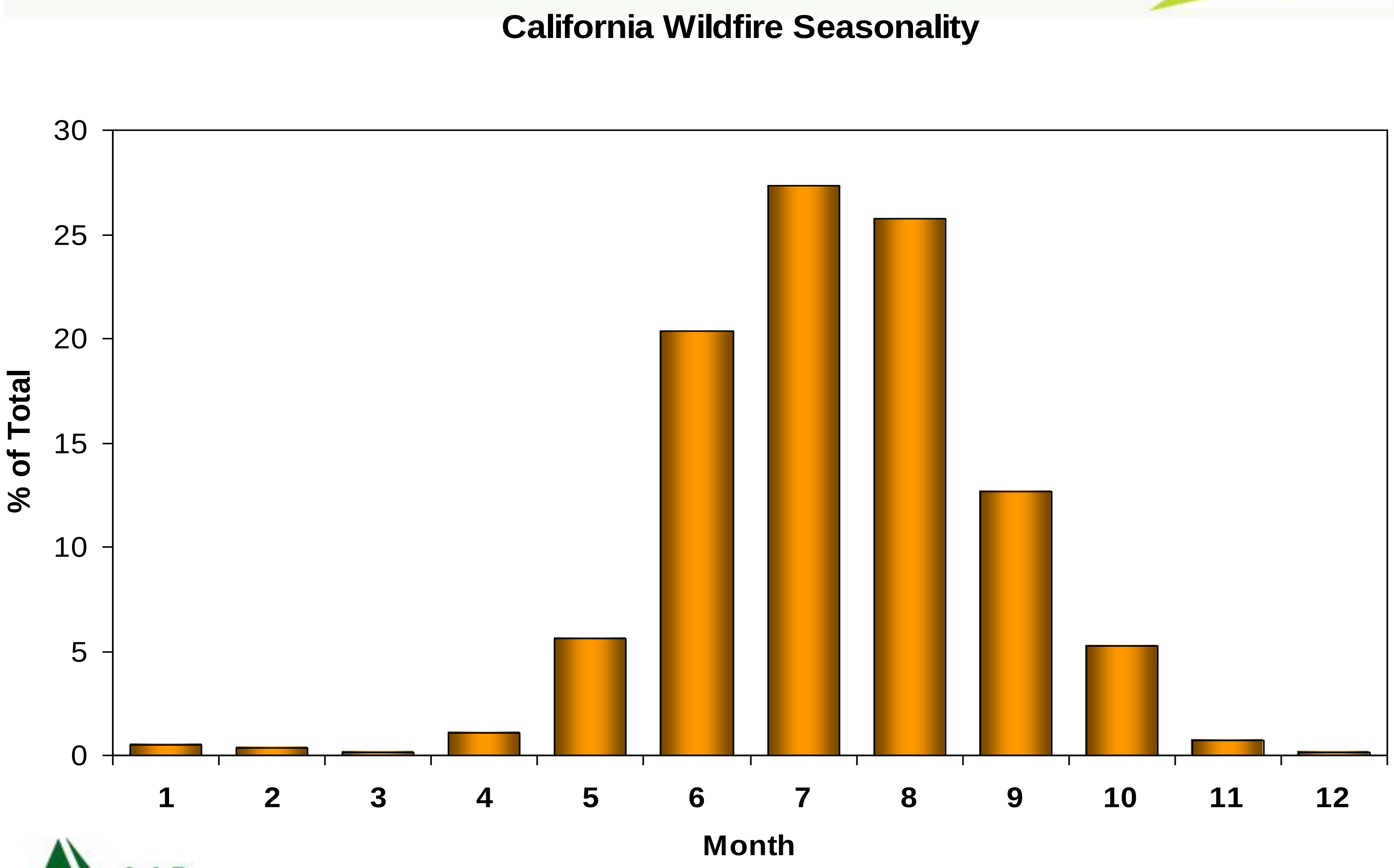
Agenda

- Overview of the AIR wildfire model
- Vulnerability of structures to fire
- Post-disaster surveys for recent fires
- Detailed claims data analyses
- Climate change and wildfire

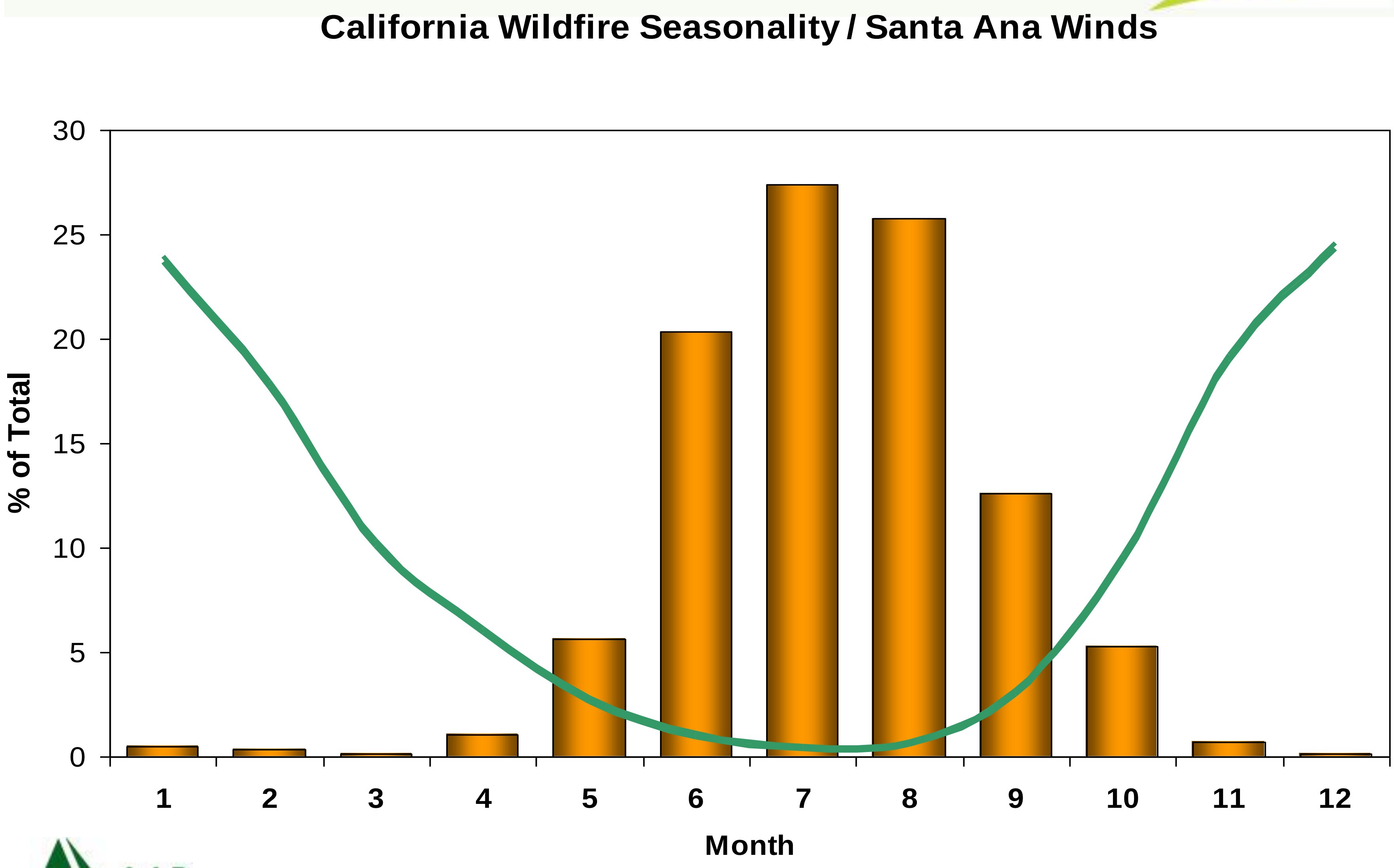
Probability Distributions Created for Key Variables That Define When and Where a Wildfire Occurs



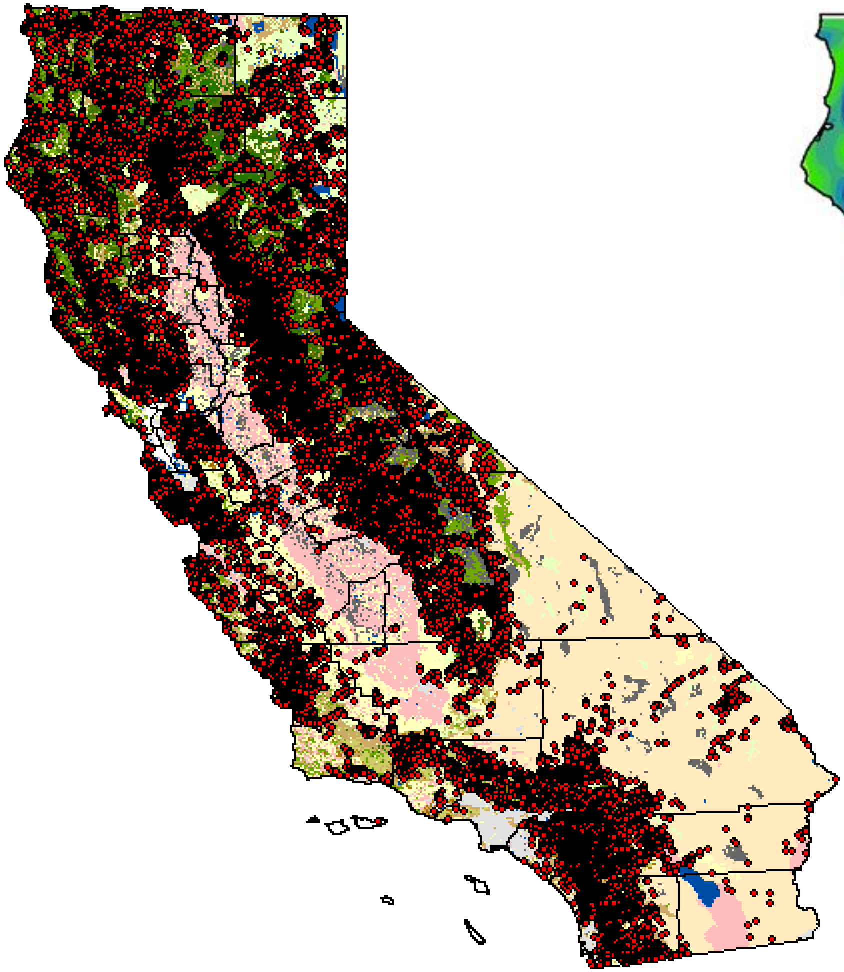
Late Summer and Early Autumn Are High Risk Seasons for Wildfires

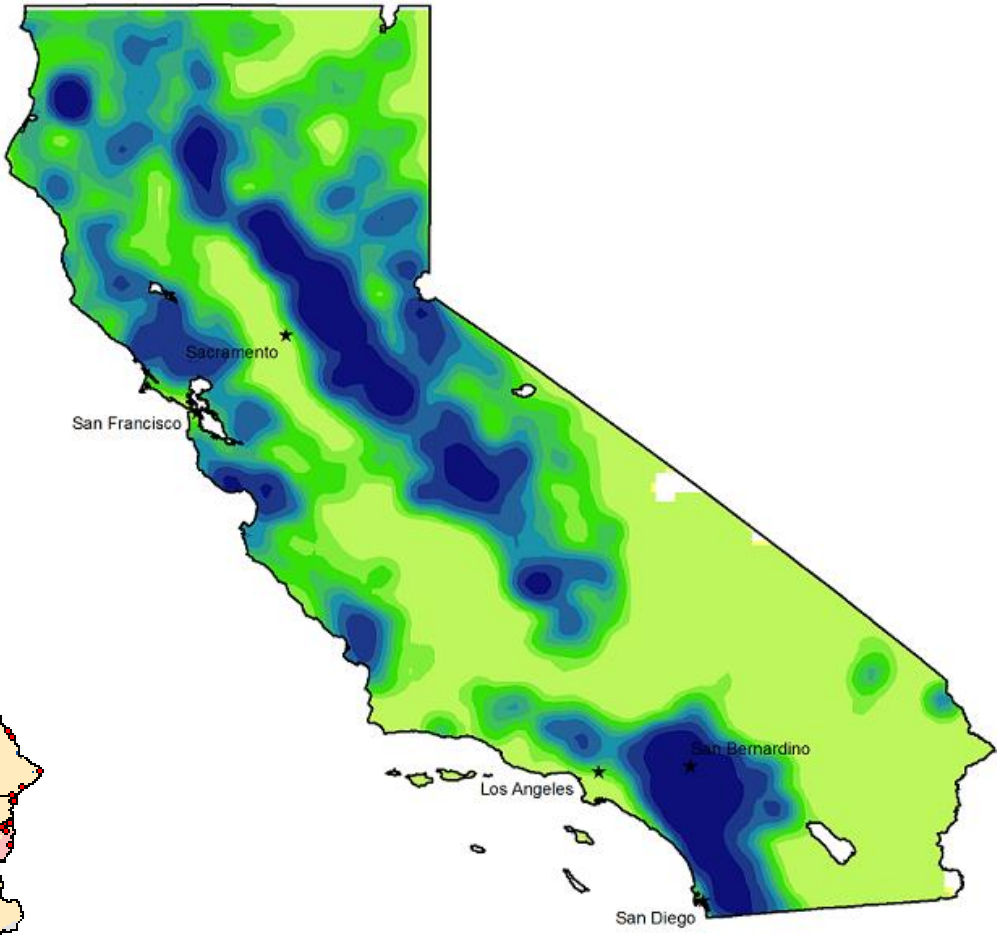


Seasonality Combines with Santa Ana Winds to Cause Catastrophic Fires

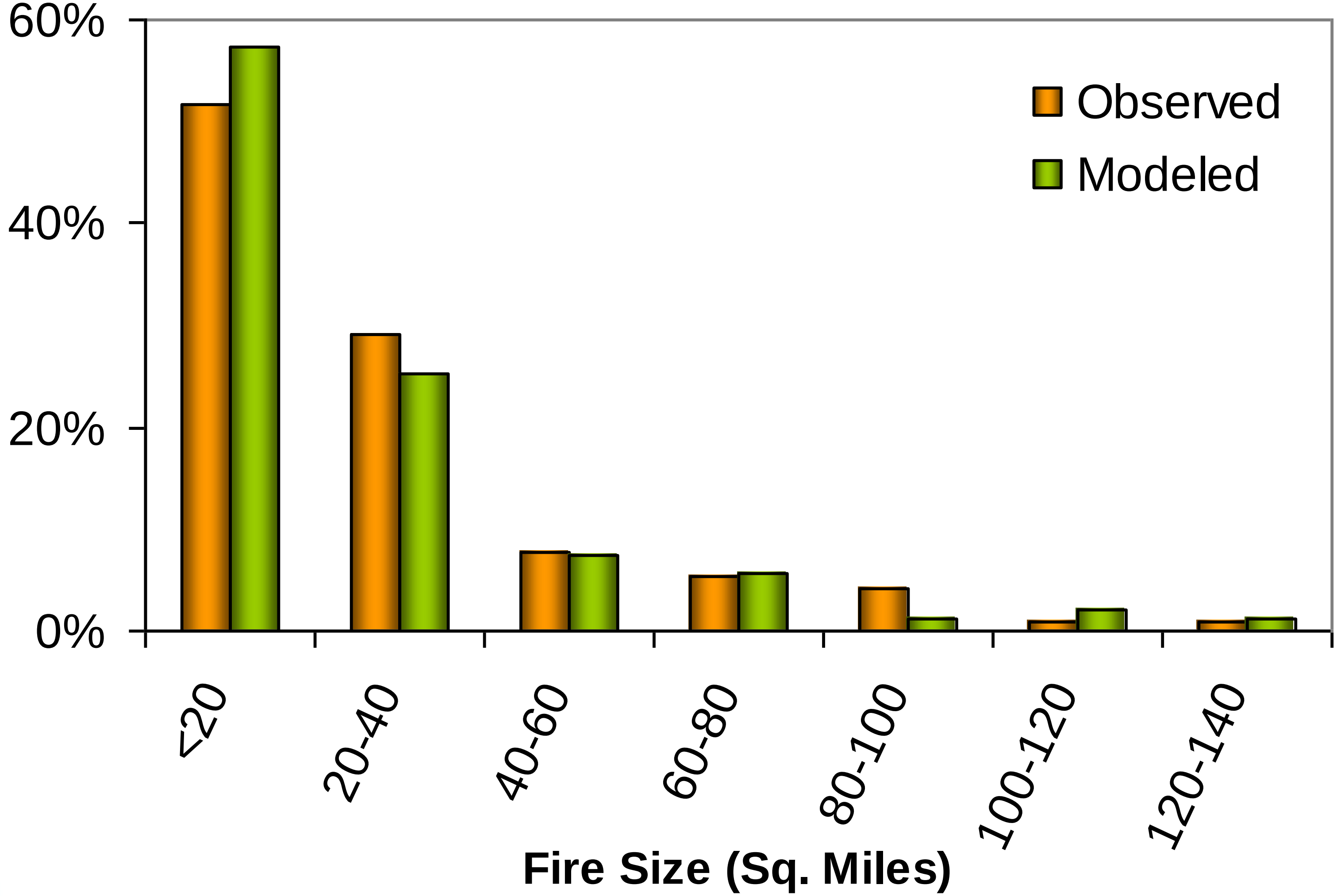


The Spatial Distribution of Wildfires Is Based on Historical Ignition Data

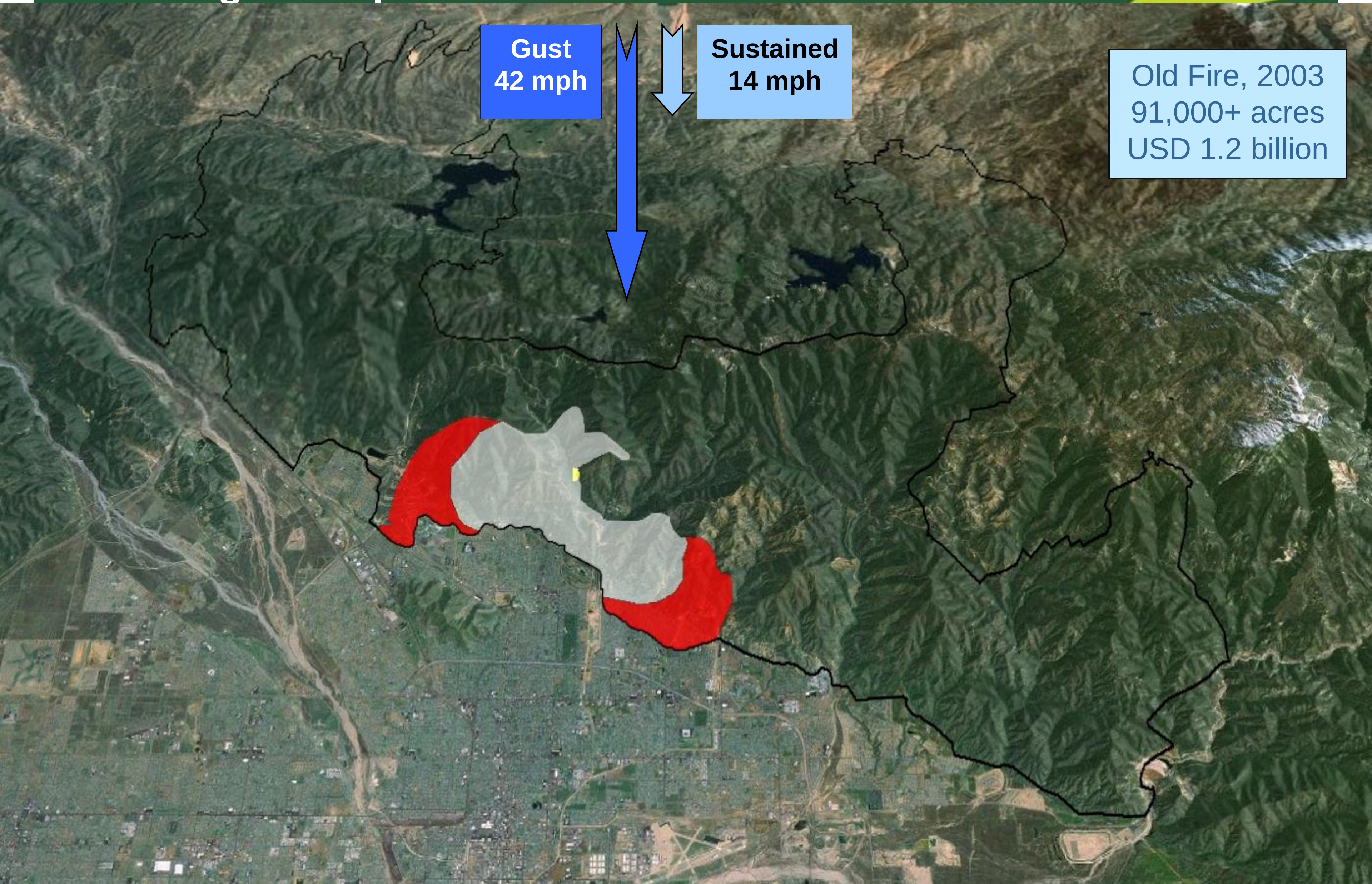




The Distribution of Modeled Fire Sizes Is Based on Historical Fires



Both Wind Speed and Direction Are Critical to Modeling Fire Spread



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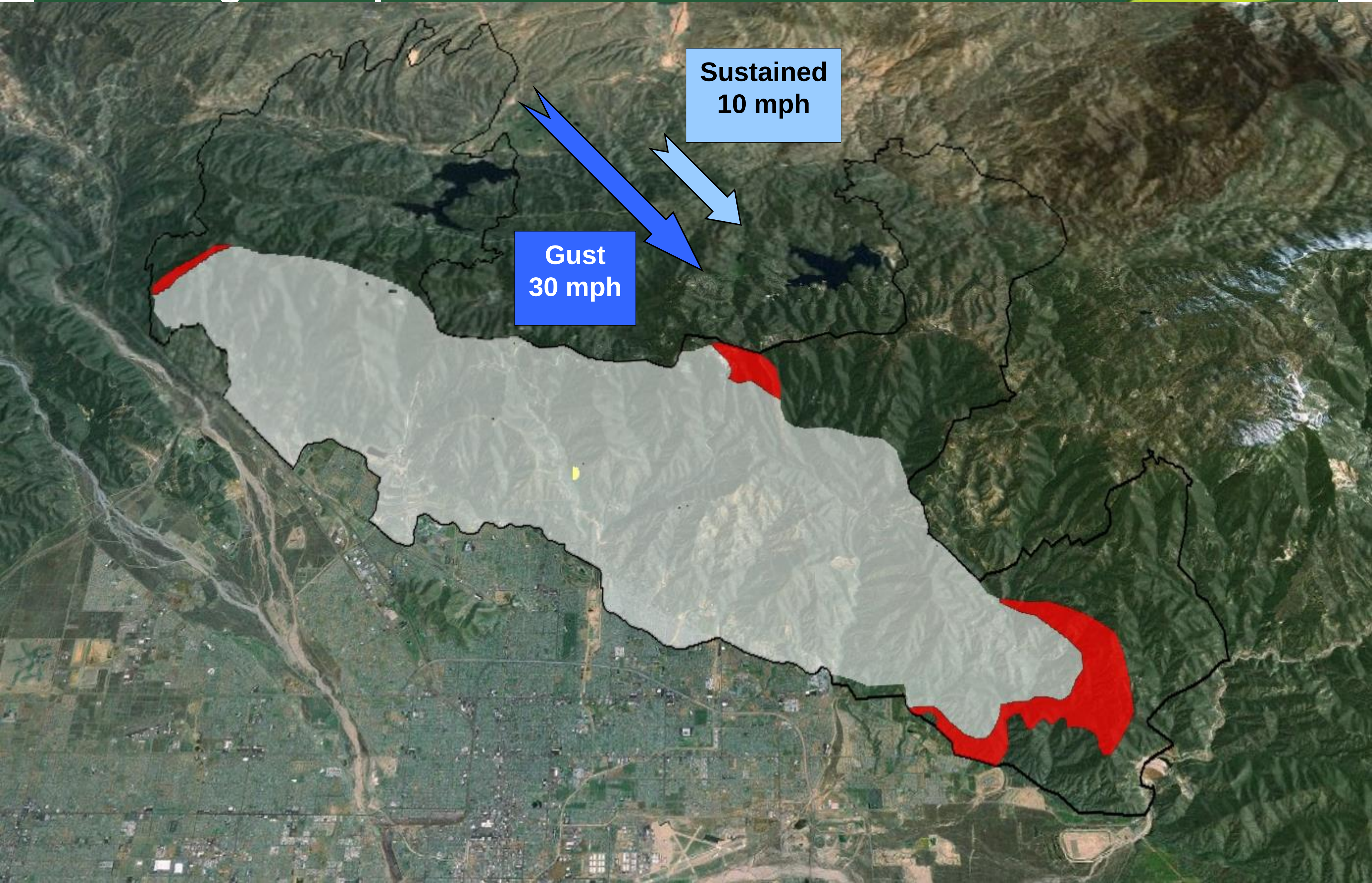

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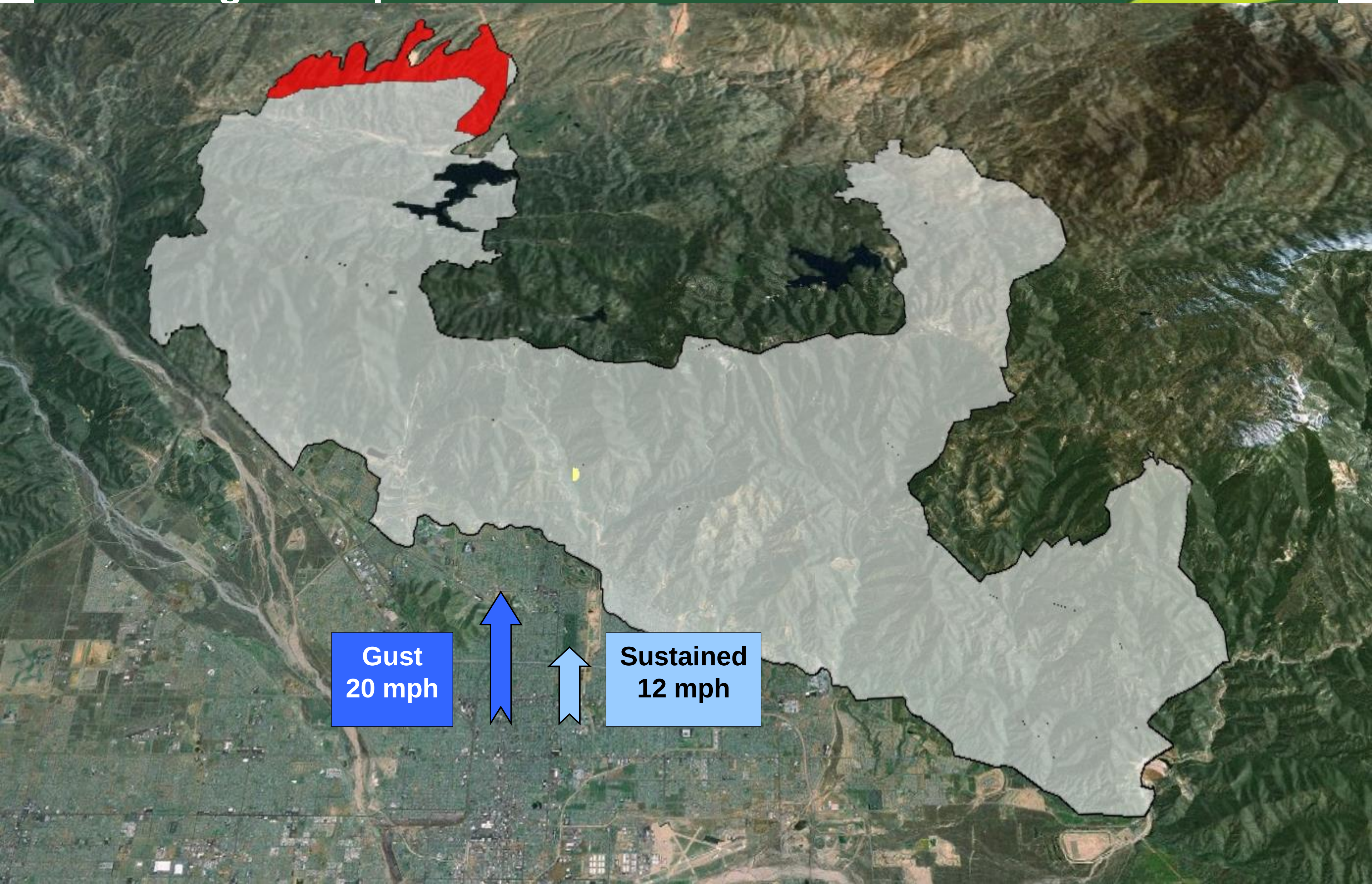
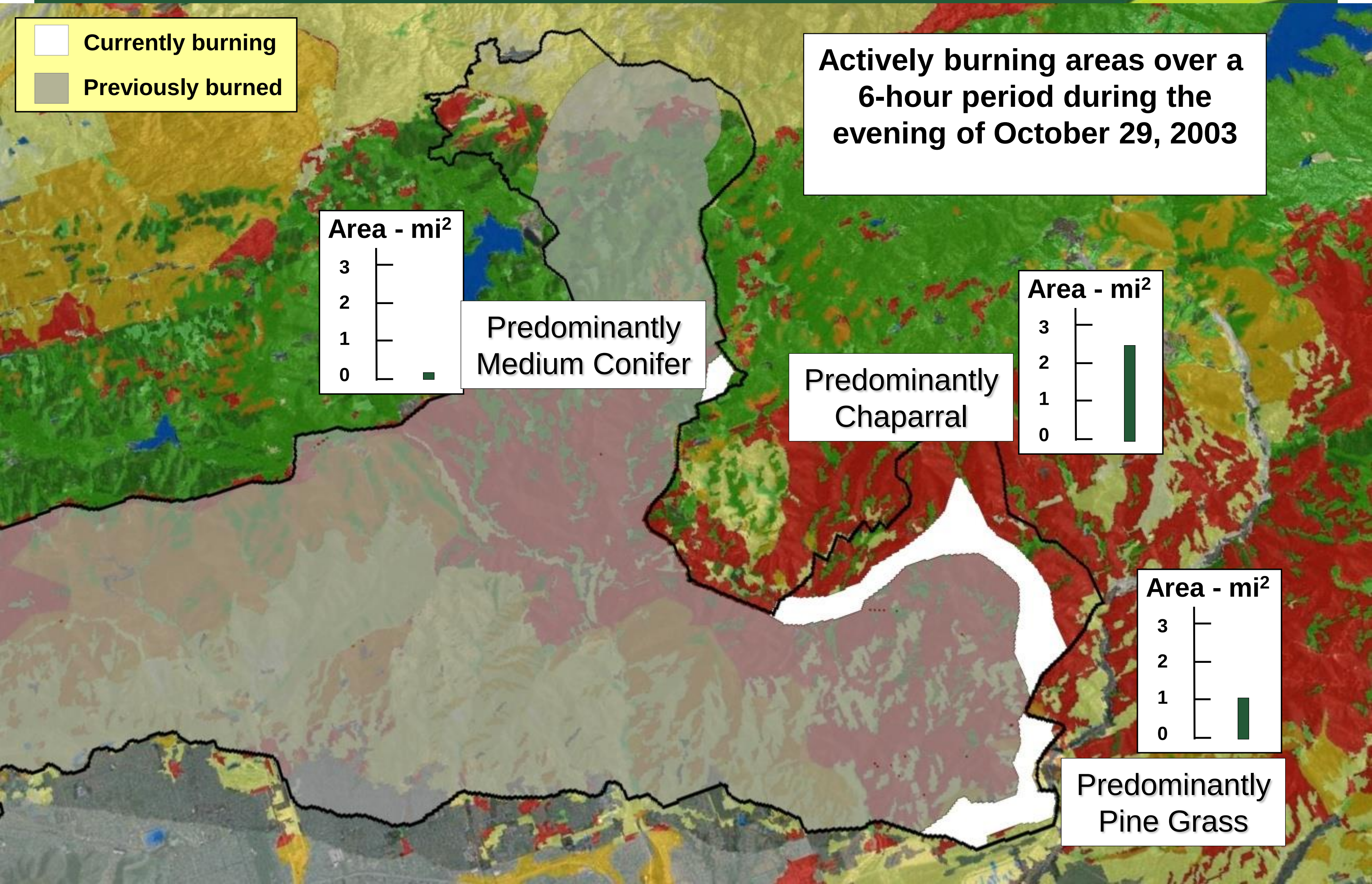
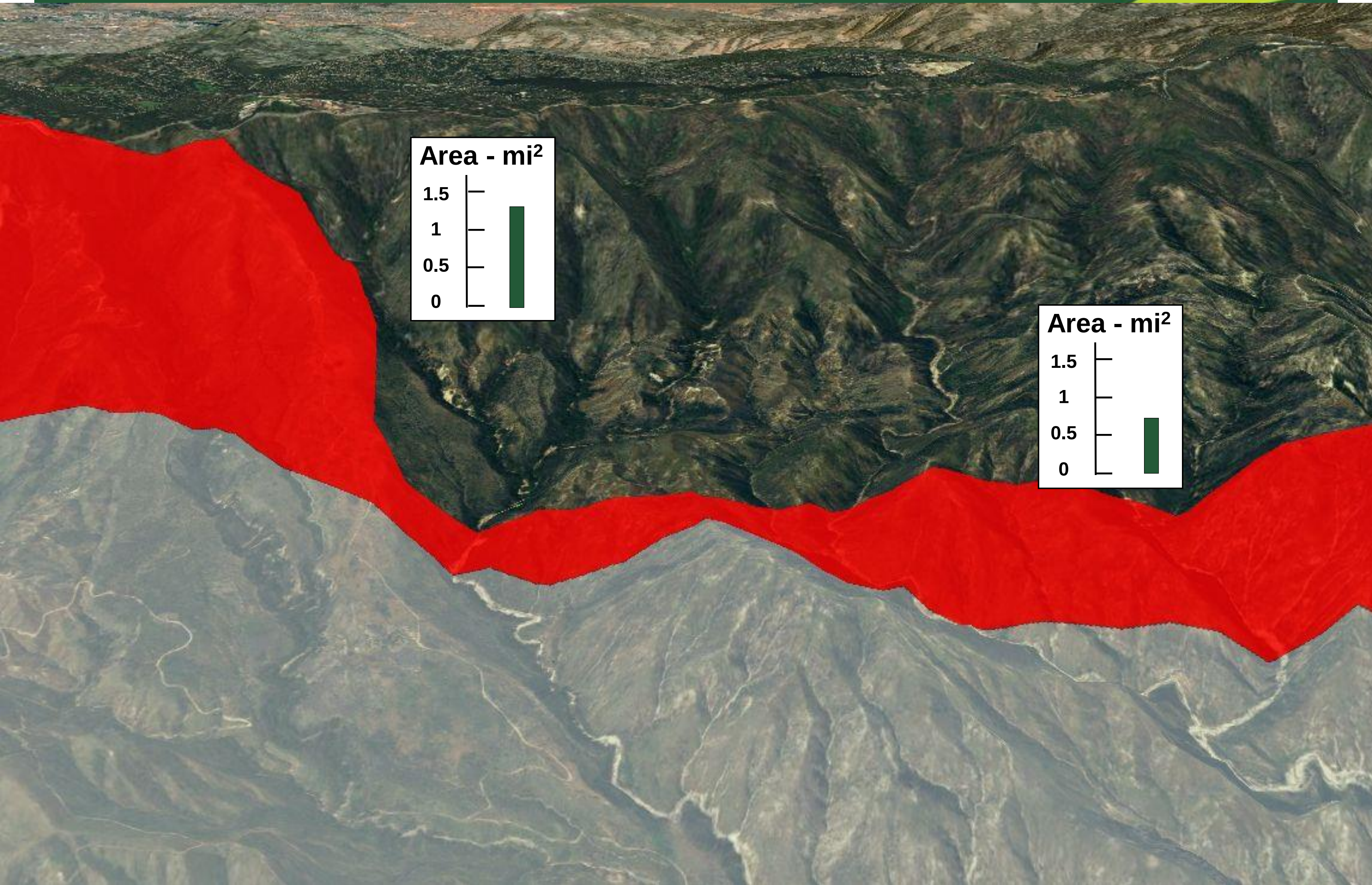


Fuel Type Has a Large Impact on Fire Spread Rates and Burn Intensity

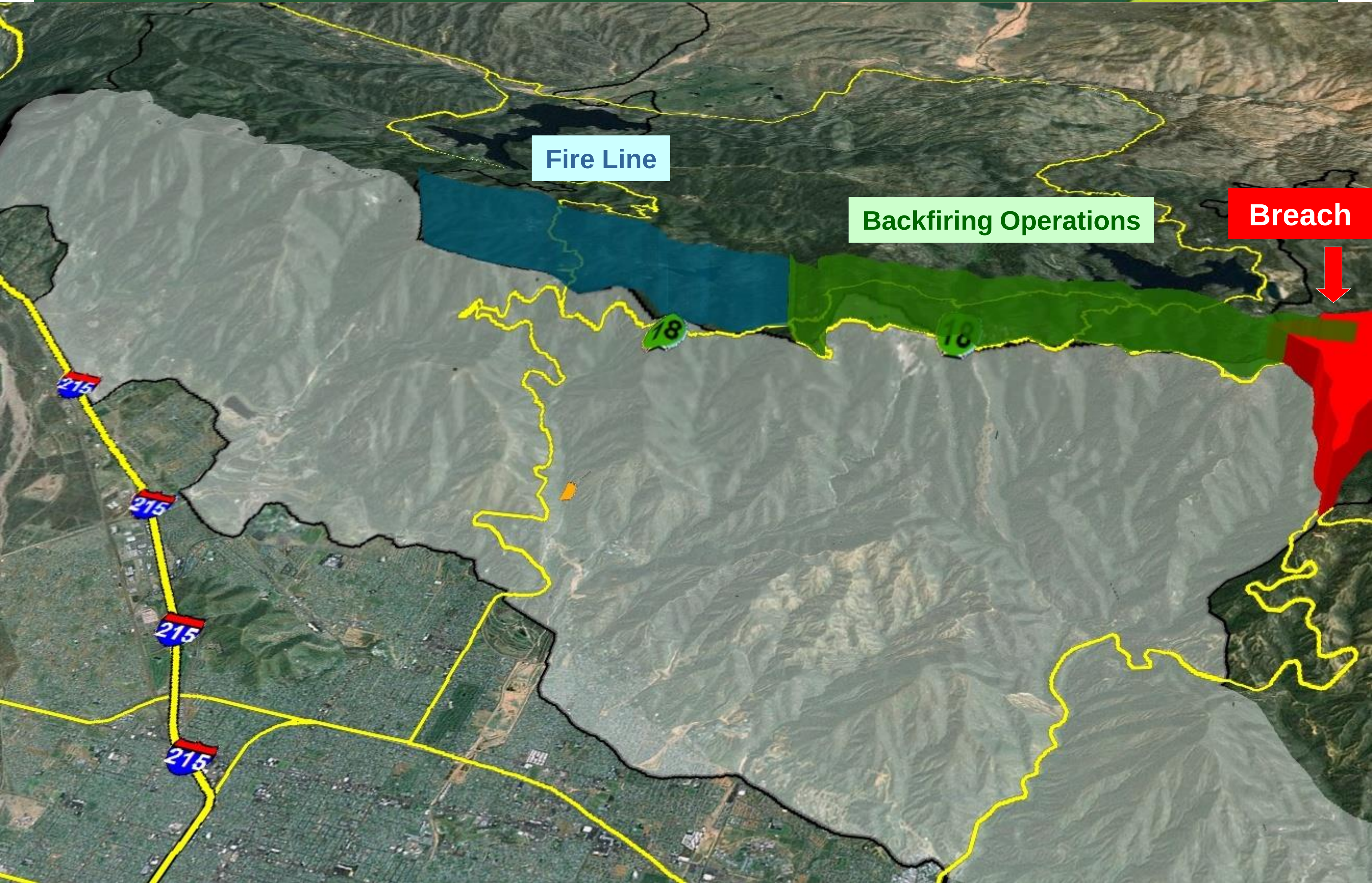
Vegetation Provides Fuel for the Fire



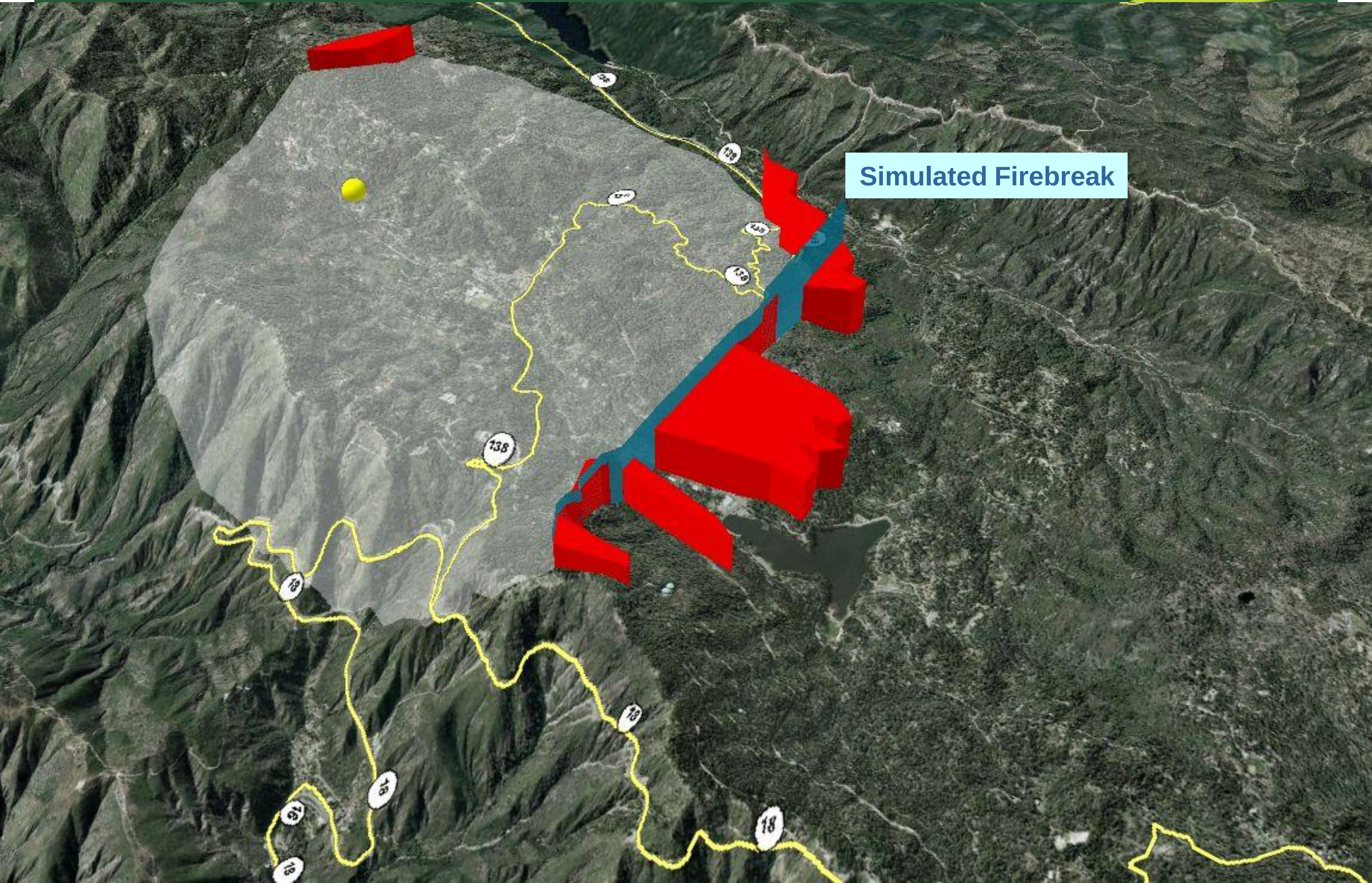
Fire Spread Rates Increase with Steep Terrain



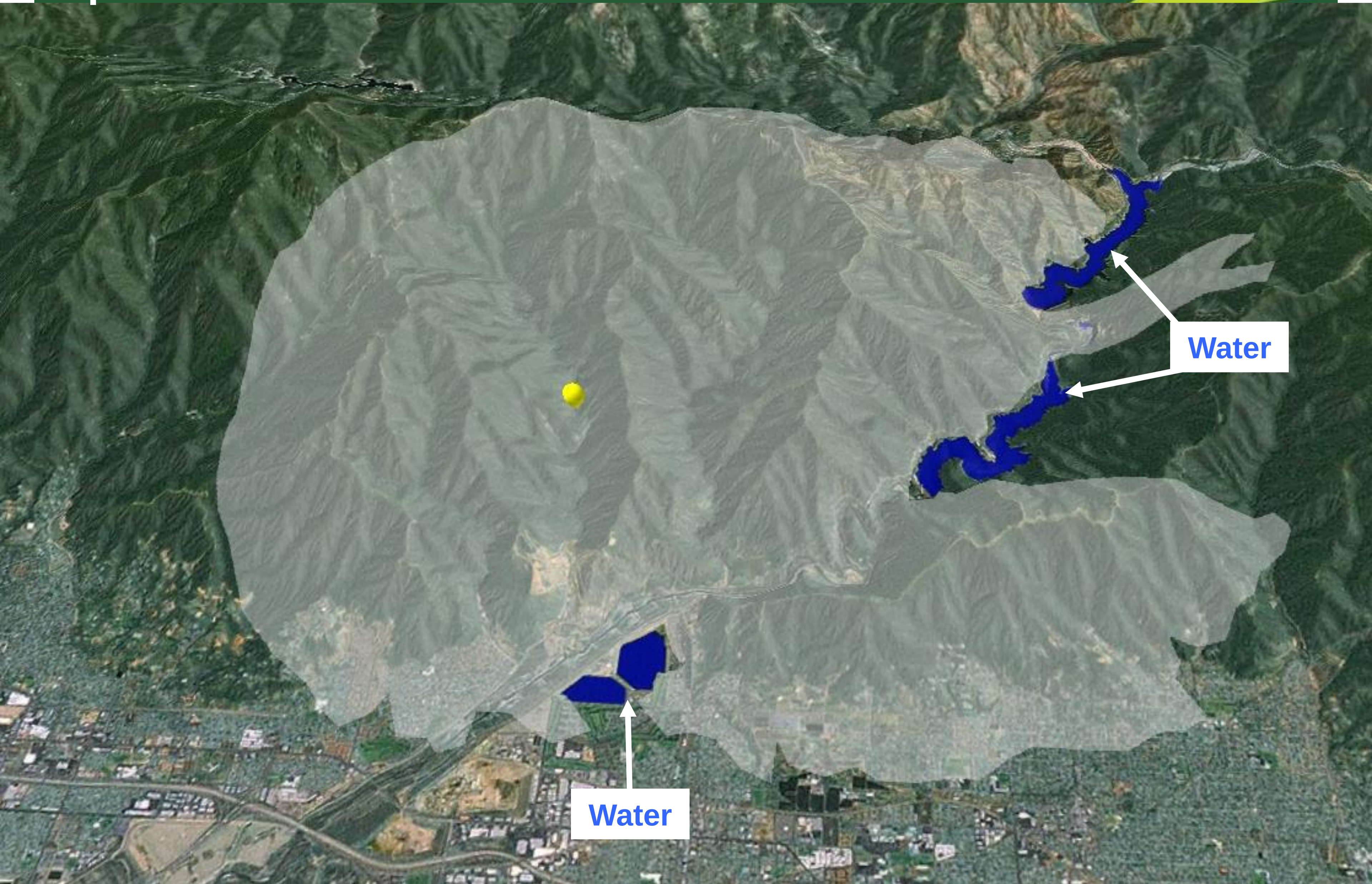
Suppression Efforts Influence the Ultimate Footprint of a Fire



AIR's Model Simulates Man-Made Firebreaks and Their Effectiveness



AIR's Model Also Recognizes Natural Barriers to Fire Spread



Wildfires Damage Structures Through Direct Contact, Radiant Heat, or Firebrands and Embers

The Primary Drivers of Vulnerability Are Construction Material and Vegetation Setbacks

- The structural features of a building with greatest impact on susceptibility to wildfire burn are
  - Roofing type
  - Siding type
- The setback distance of the structure from surrounding vegetation also plays a critical role in determining the risk of damage
- Whenever feasible, AIR surveyors record these and other drivers of structural vulnerability
- The AIR wildfire model takes these mitigating factors into account when estimating losses

Fire-Resistant Roofing Protects Homes from Firebrands and Embers

Wood shingle roofs are *extremely* vulnerable

New asphalt shingles are excellent, but decompose with time

Clay barrel tiles may be the best possible roof material

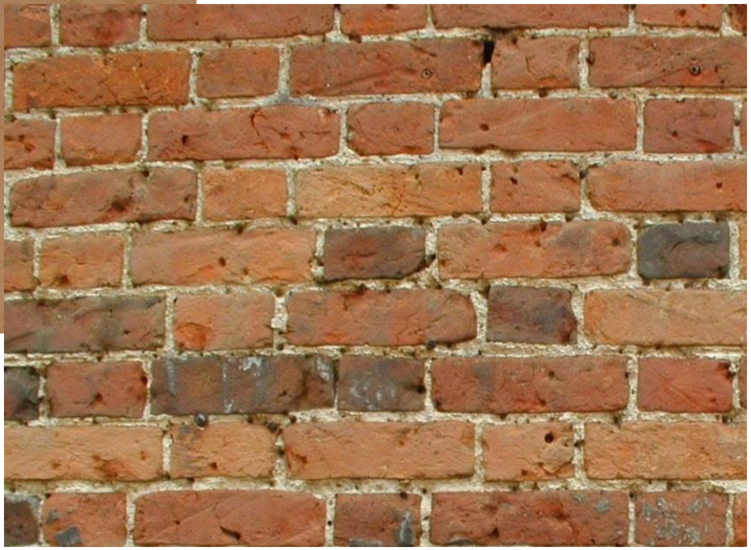
Stone-covered steel tiles are extremely fire-resistant

Siding Materials Respond Differently to Direct Contact with Flames and Radiant Heat Exposure

Wood offers the least protection

Stucco is more fire-resistant than wood

Brick is very fire-resistant



Vegetation Setbacks Vary Widely and Have a Large Impact on a Building's Susceptibility

Roof Installation Details and Building Maintenance Both Affect a Structure's Vulnerability

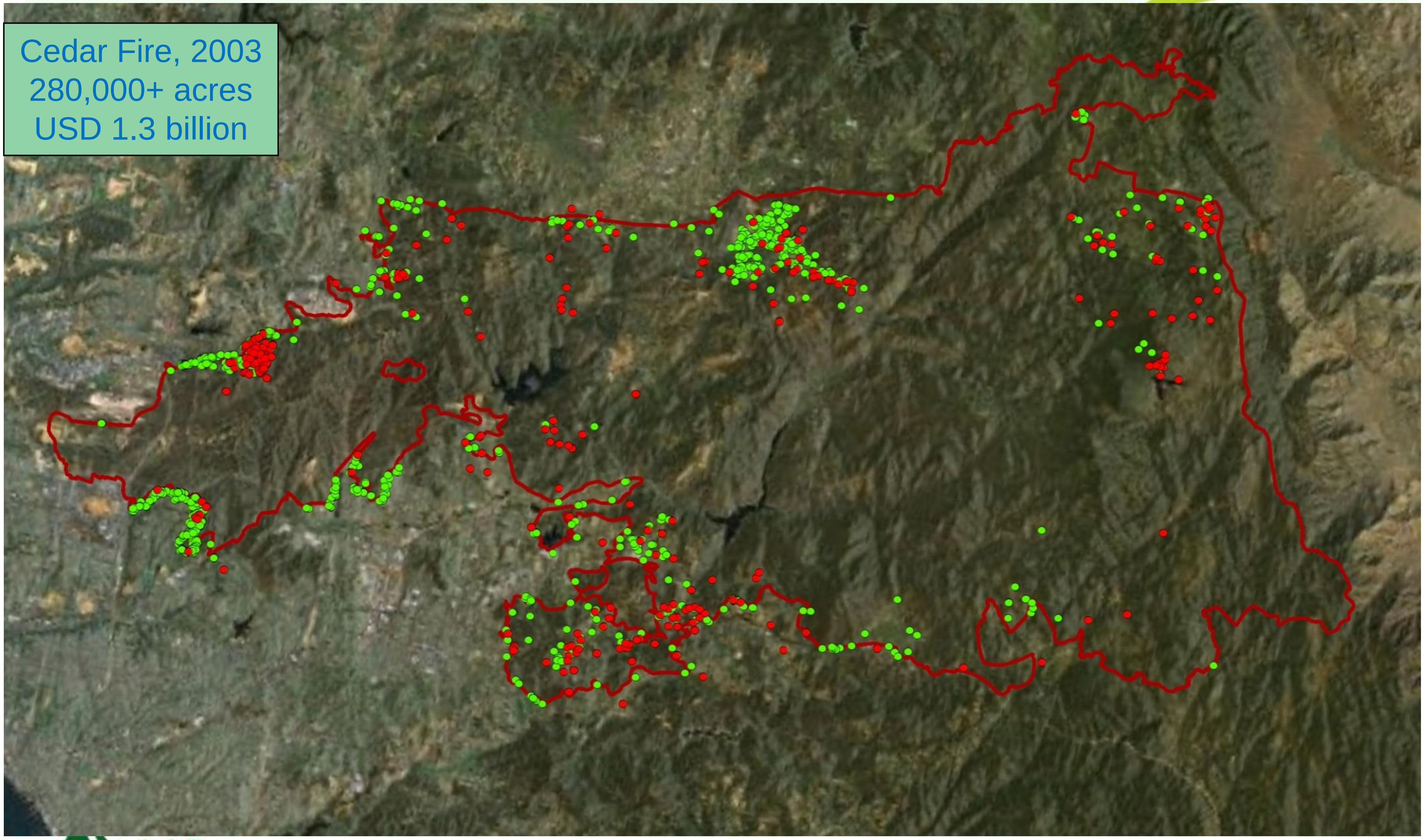
Source: University of California Regents

AIR Surveyed Damage from the 2007 and 2008 California Fires

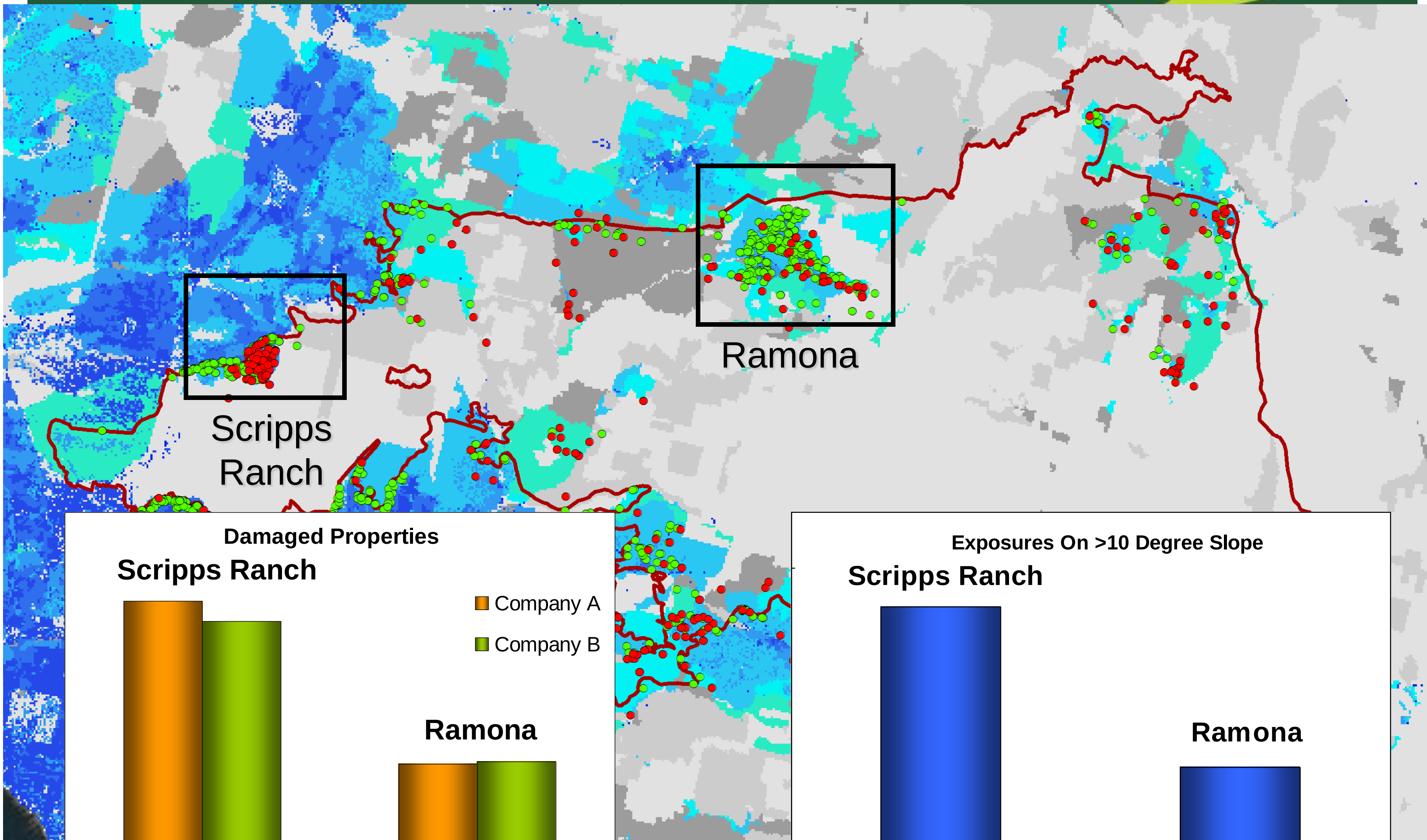
Surveys Confirmed that Wood Frame, Wood Siding, and Wood Roofing Are the Most Vulnerable

Masonry Structures Are the Most Fire-Resistant

AIR Has Obtained and Analyzed Detailed Claims Data for the Cedar and Old Fires from Two Major U.S. Insurers

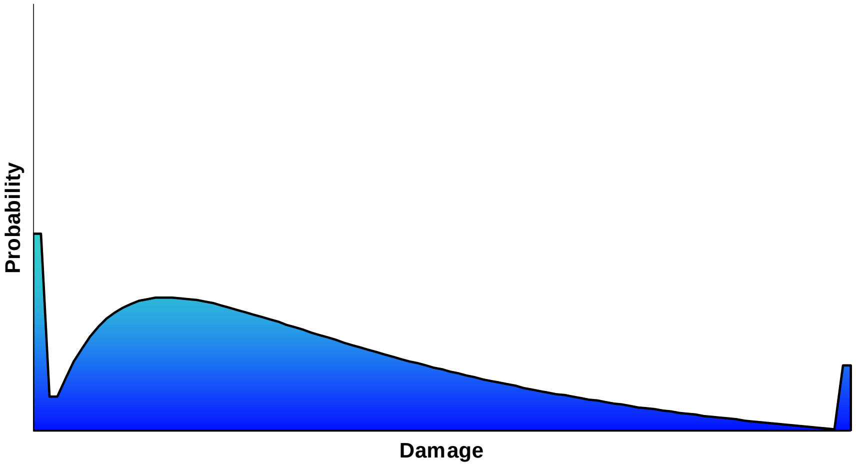


AIR Analysis Revealed that Claims Density Was Higher in Areas of Steeper Slope

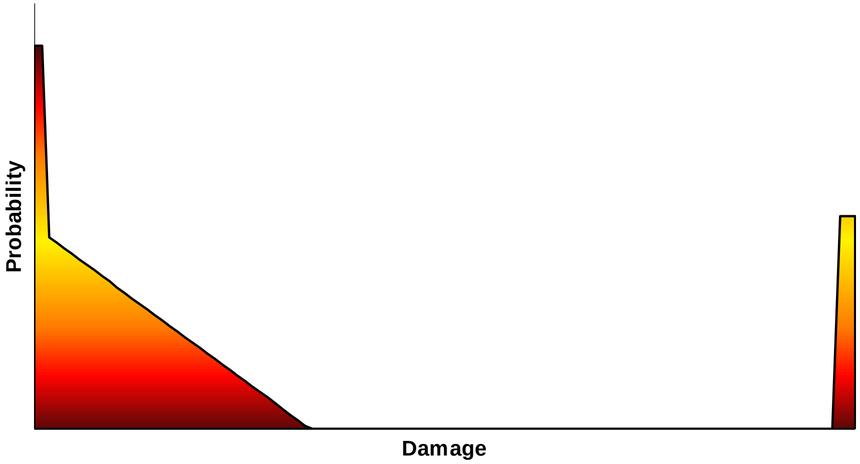


Wood Sidings and Roofs Also Contributed to Higher Claims Density in Scripps Ranch

Wildfire Damage Distribution Has More Weight at the Extremes Than Distributions for Other Perils

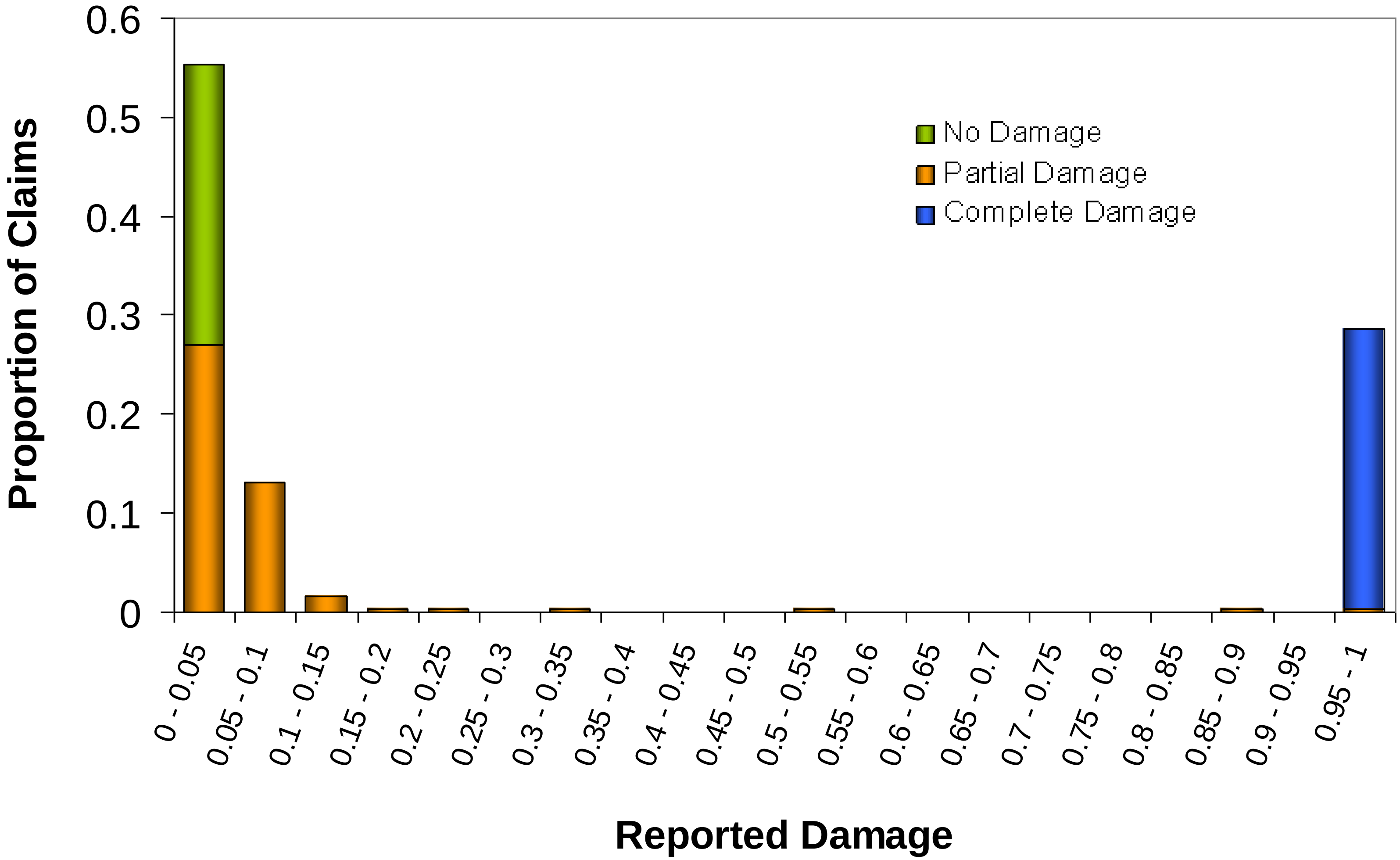


More Conventional Damage Probability Function for Other Perils

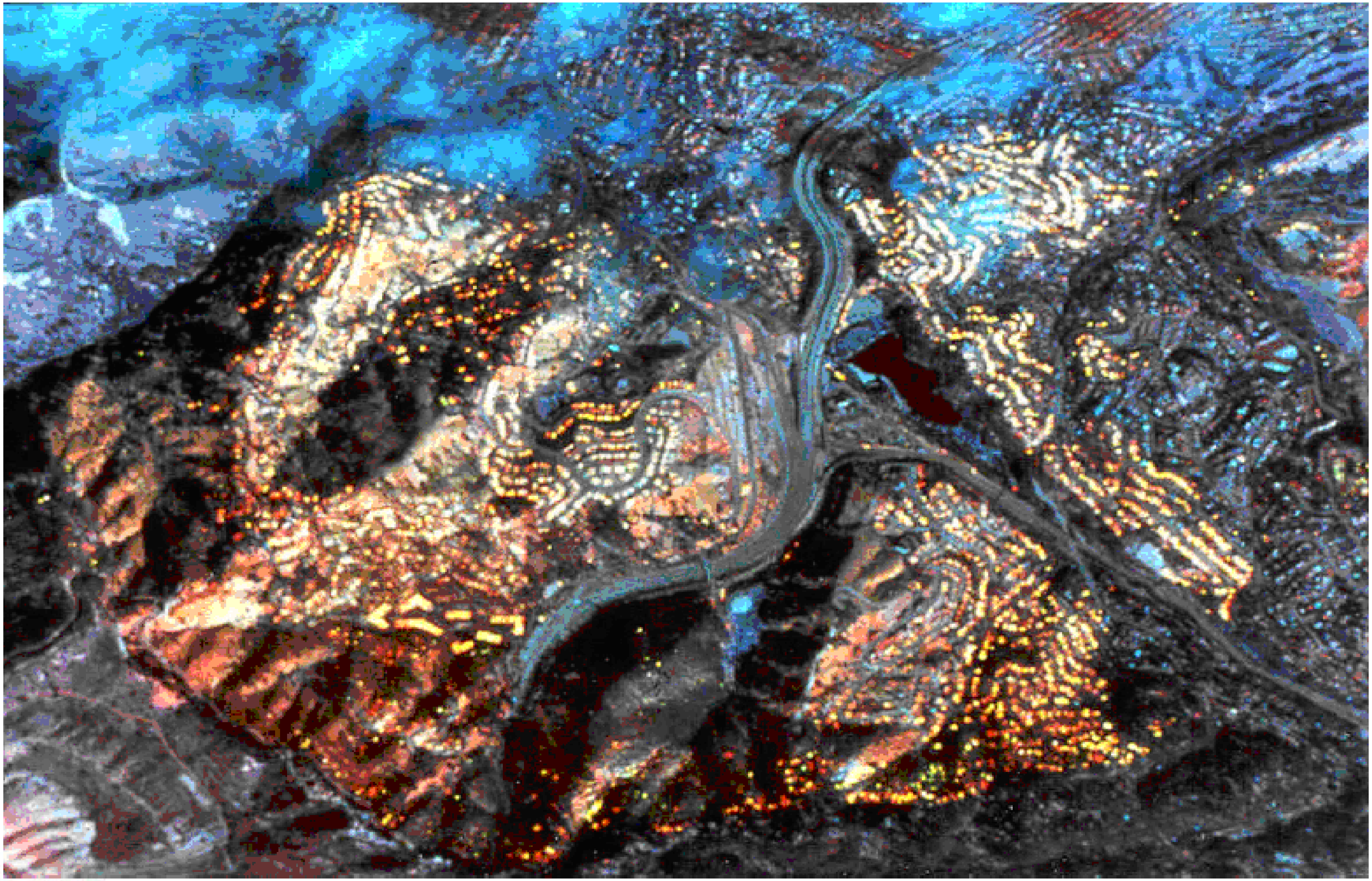


Wildfire Damage Probability

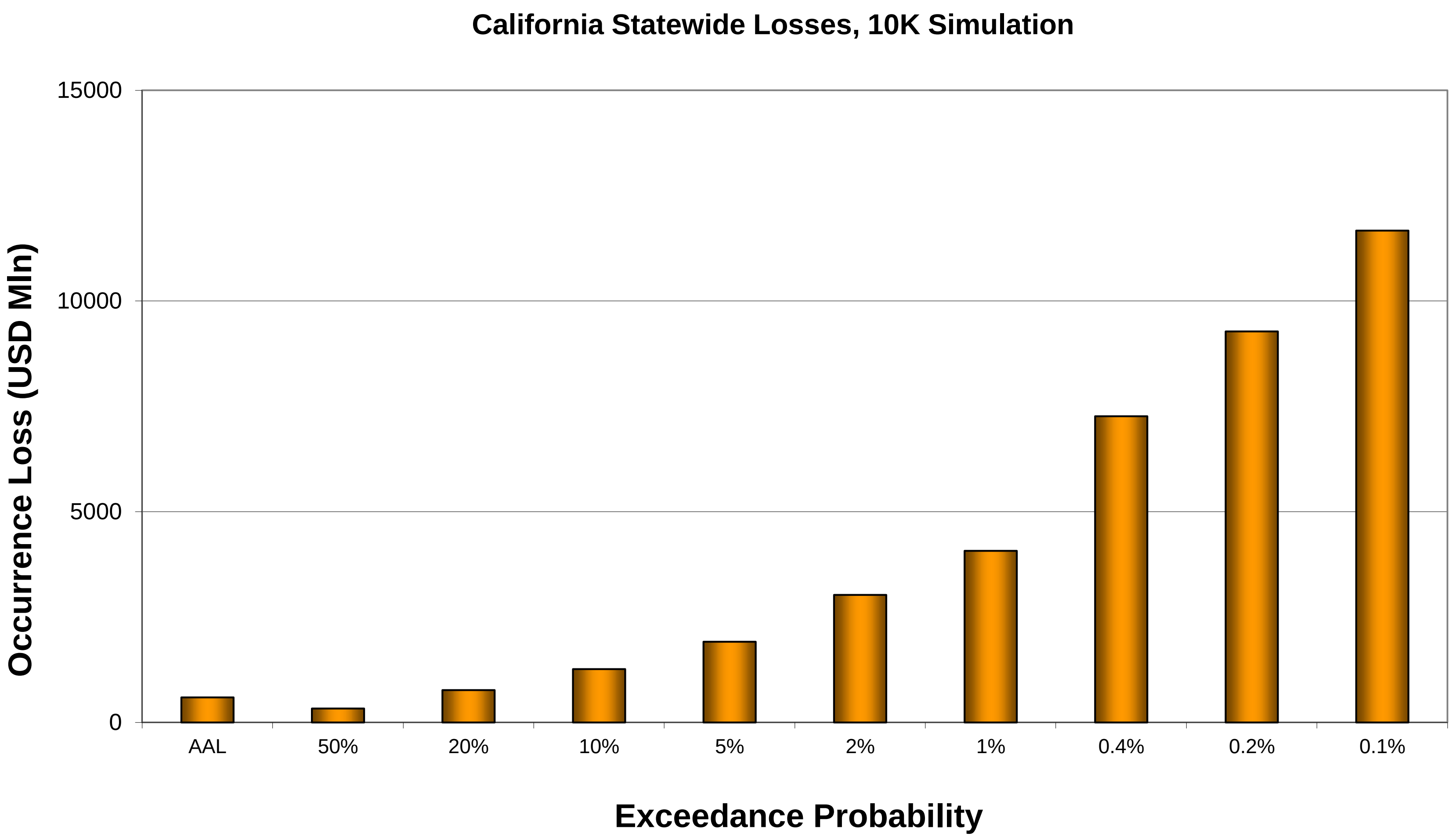
Claims Data for the Cedar and Old Fires Confirm the Form of AIR’s Damage Functions



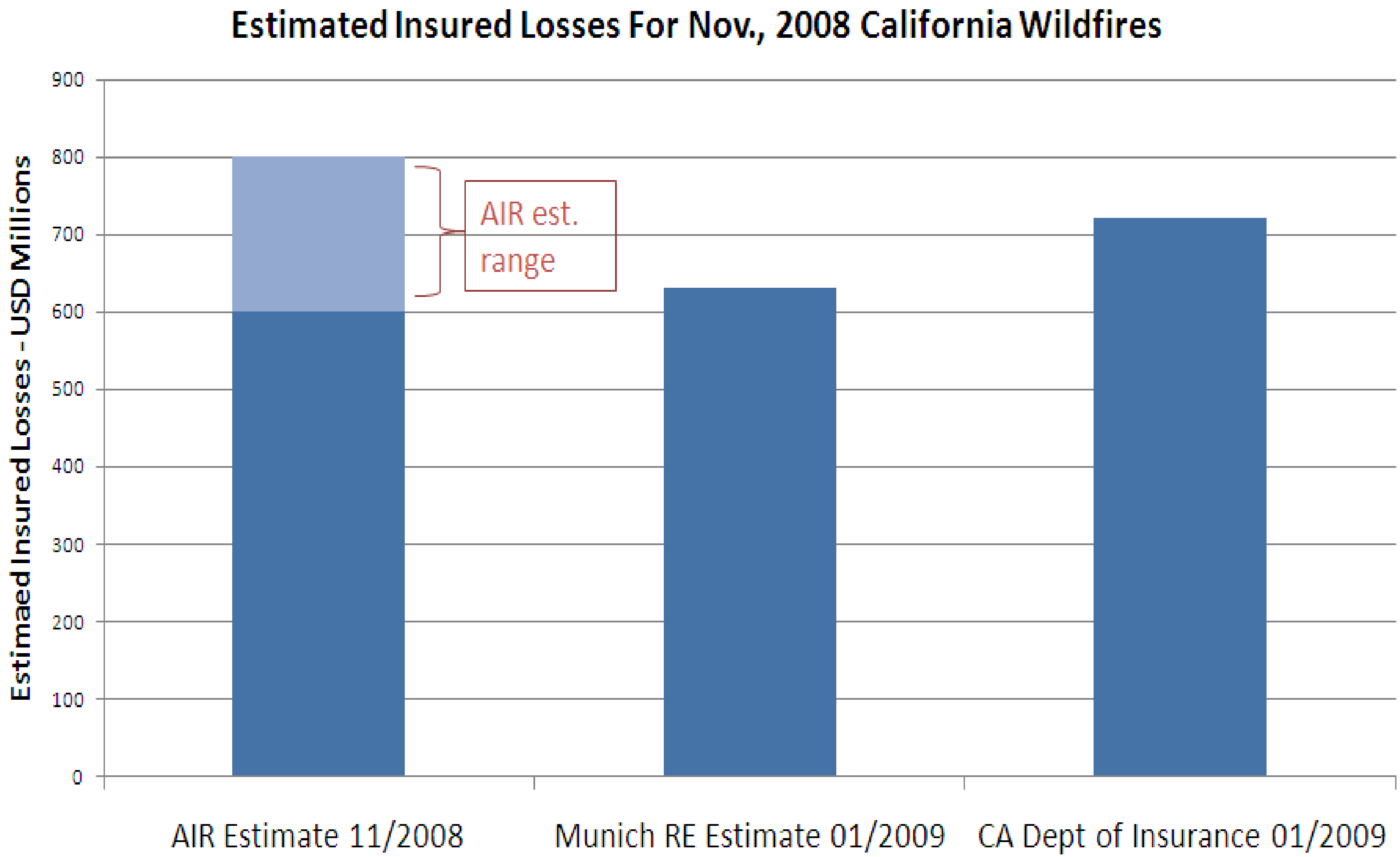
Some “Wildfires” Are Urban Conflagrations



Statewide Exceedance Probability Curve



AIR Provides Event Sets for Significant Wildfires via AIR Loss Estimates in Real-Time (ALERT)



Fire Hazard Has Not Changed Much over Time, Yet the Number of Properties at Risk Has Increased

It Is Widely Believed That	Historical Data Show That
Damaging fires are occurring more frequently	Occurrence rate of fires, including damaging ones, is fairly constant
Catastrophic fires are occurring more frequently	Frequency of catastrophic fires is more or less constant
Average risk to homes in the wildland-urban interface is increasing	Probability of an individual home being damaged by fire is fairly constant
Primary cause of increasing losses is climate change	Primary cause of increasing losses is increasing exposure in WUI

AIR Models Bushfires in Australia, and Is Considering Wildfire Models for Additional U.S. States

Summary

- Vegetation, topography, and meteorological conditions influence the direction and spread of wildfire events
- Primary drivers of vulnerability are construction material and vegetation setback
- In 2007 and 2008, AIR engineers performed detailed surveys of the damage from fires in California
- AIR damage functions have been validated using detailed claims data for the Cedar and Old Fires
- AIR has developed a model for Australia and is considering a wildfire model for other U.S. states

AIR