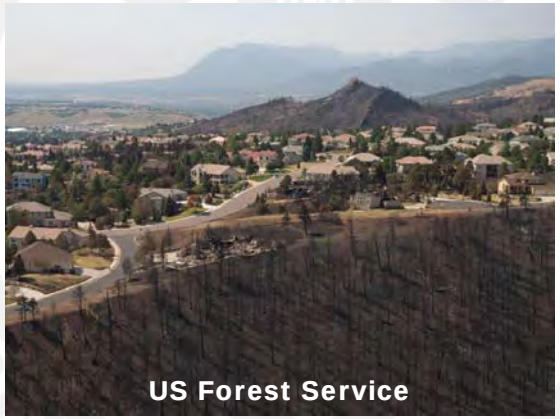
Study of Structure Vulnerability at the Wildland-Urban Interface

Albert Simeoni, FPE

Ali Rangwala, FPE

The Context

- Climate Change (including wet years)
- Urban Sprawl / population growth (exposure, ignitions)
- Structures and communities are extremely vulnerable to fire



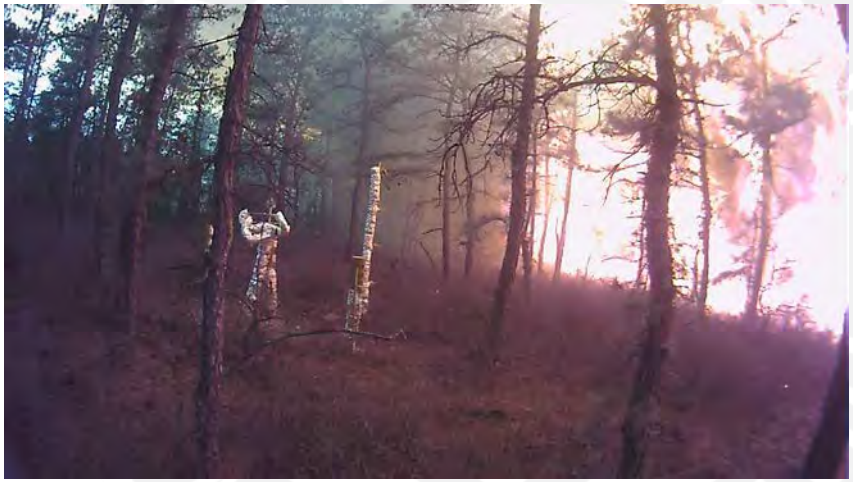
Different aspects to consider: the wildland fires, the spread mechanisms, the structures.

The Wildland Fires

- Multiple ignitions
- Extreme fire behavior
  - Elevated rate of spread
  - Higher heat fluxes
  - Ember showers
  - Merging fires
  - Fire whirls
- Smoke
- Influence on evacuation

The Spread Mechanisms

- Convective transfer / Flame contact
- Radiative transfer
- Firebrands
- Can be vegetation-to-structure or structure-to-structure
- Complex interaction between topography, wind, vegetation and structures
  - WUI and community geometry channeling wind, flames and firebrands
  - Spread corridors through communities



Study of Structure Vulnerability at the Wildland-Urban Interface

The Structures

- 38% of new home construction in Western US is in WUI areas
- Whole areas are wiped out
- Fires often transitions from wildland fires to urban / suburban fires
- Ornamental vegetation can be left almost untouched
- Community design:
  - Fire can spread from structure to structure resulting in a large domino effect
  - Sometimes, the interaction between fire, burning vegetation and burning structures can be very complex
  - Design can be assessed / improved at different scales


Thomas fire – abcnews.go.com


Skirball fire – ABC7 Los Angeles

Moving Forward

- Study of vulnerability at the WUI
  - Building and tree interaction with flow
  - WUI fire feedback studies in Canada
  - Merging fires
- Collaborations
  - NIST, USA
  - US Forest Service
  - NRC, Canada
  - State Key Laboratory of Fire Science, China