USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Pacific Southwest Research Station

Los Angeles
Center for Urban Natural
Resources Sustainability
Rooted in Research

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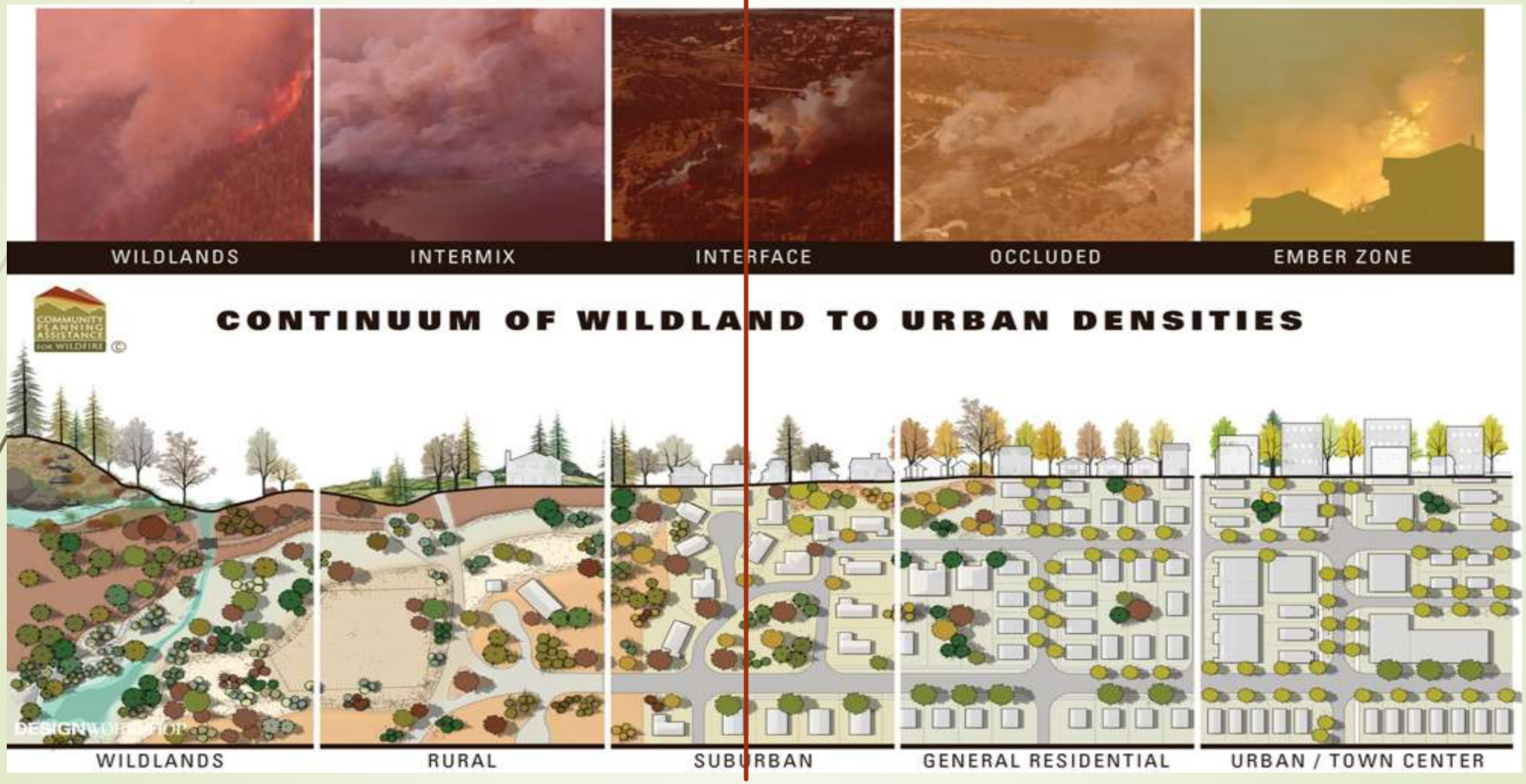
Urban forest – “native or introduced trees and related vegetation in the urban and near-urban areas, including, but not limited to, urban watersheds, soils and related habitats, street trees, park trees, residential trees, natural riparian habitats, and trees on other private and public properties” (California Urban Forestry Act of 1978).

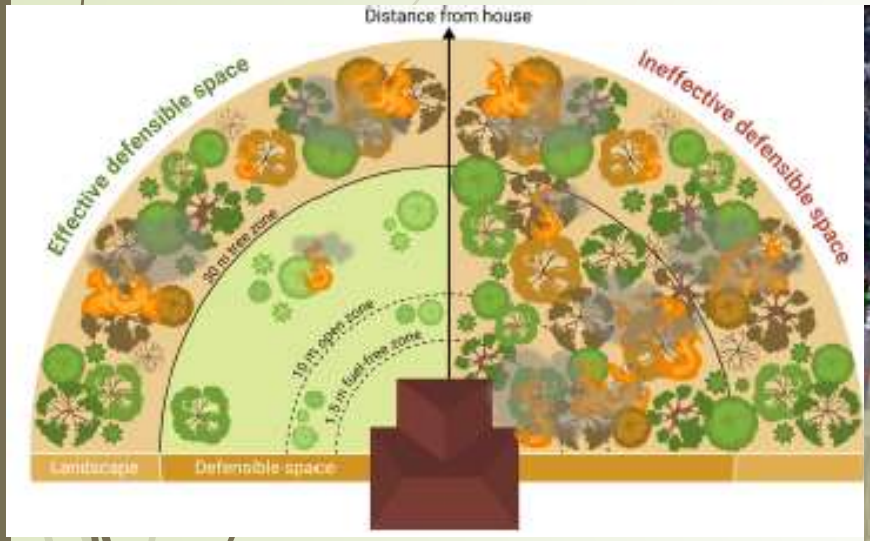
Jesse Goddard / LA Times: https://www.latimes.com/opinion/editorials/la-ed-tree-infrastructure-20190102-story.html

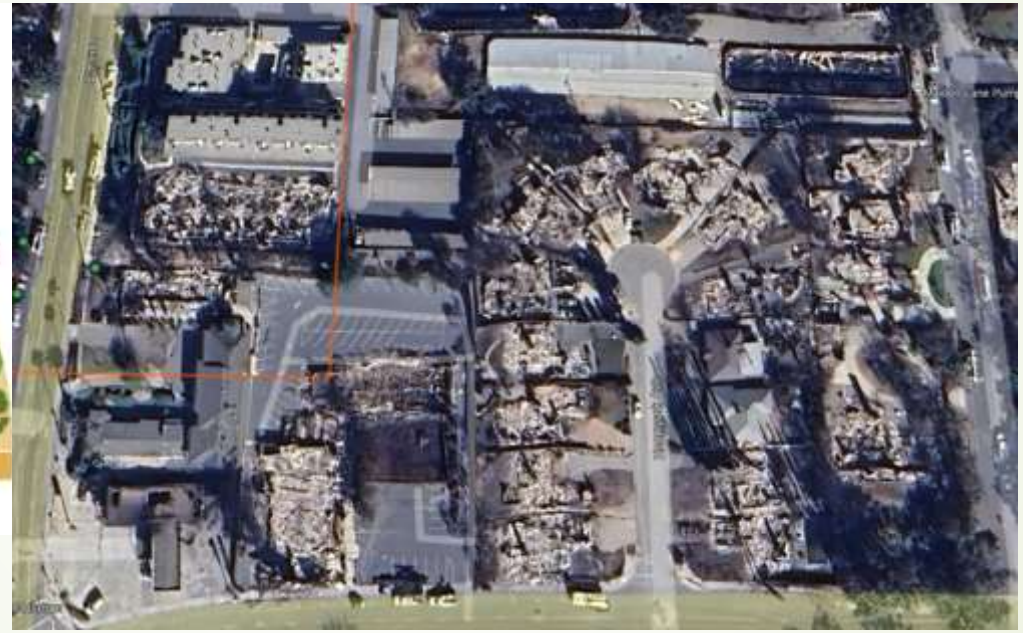
Shutterstock from https:/la.curbed.com

Two common approaches to WUI/urban forest management in fire-prone landscapes



Realties of [wild]fires in urban areas



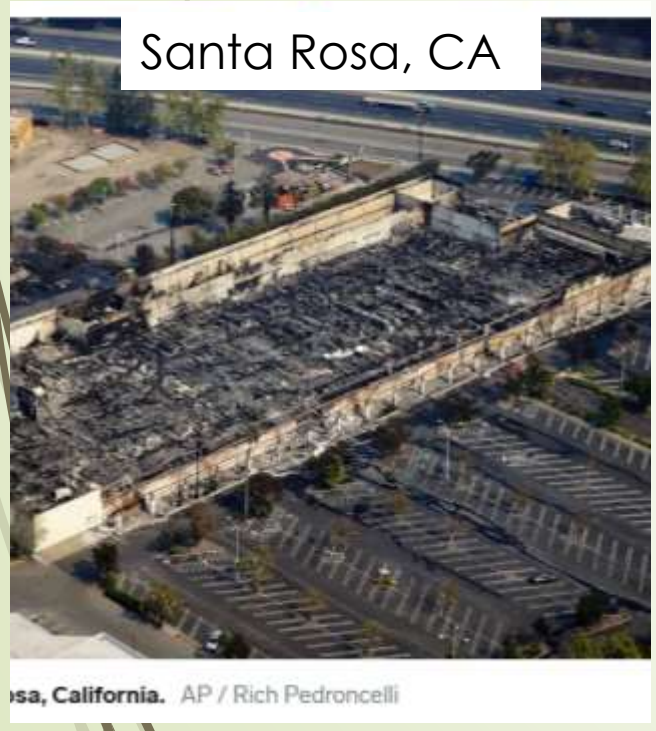


Two common approaches to urban forest management in fire-prone landscapes

<u>WUI Fire is an Ecosystem Disservice</u>
(ecological processes or costs that *negatively* affect human well-being)

Two common approaches to urban forest management in fire-prone landscapes

Urban forests provide Ecosystem Services
(ecological processes or benefits that *positively* affect human well-being)



Wildfires are increasingly affecting <u>urban</u> areas

"..disaster fires …have been …defined as an issue of wildfires that involved houses. In reality, they are ***<u>urban fires</u>*** *initiated by wildfires (Calkin et al, 2023)."*

Fire and research on California/LA's Urban Forests

Wildfire-driven URBAN fires

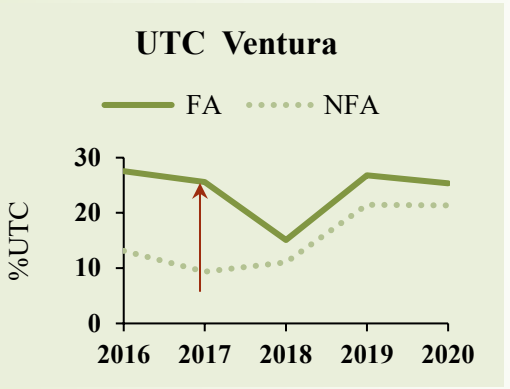
1. Existing research
2. How does urban vegetation type, and Defensible space Buffers influence building loss during urban fire events?
3. Observations from the Eaton and Palisades 2025 urban fires

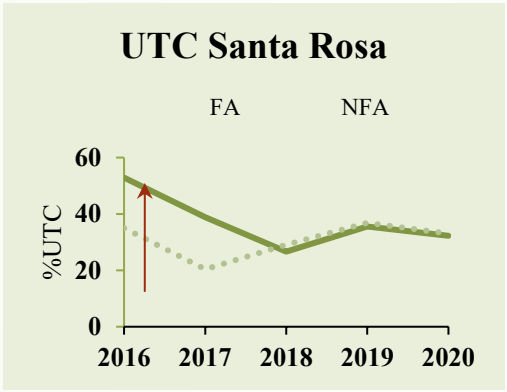
Ted Soqui, SIPA USA via Reuters

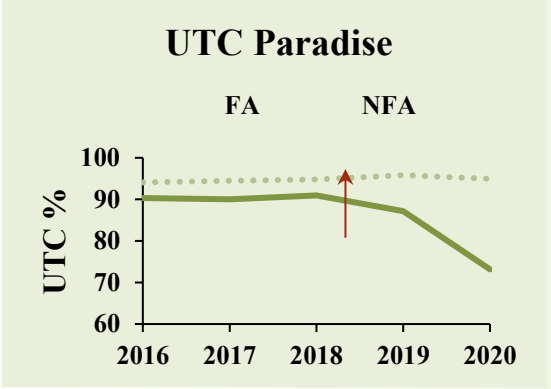
1. Neighborhood level Urban Tree Cover (UTC) change ~ 5 years

FA= Fire Affected
NFA= Non-fire Affected

Fire occurrence





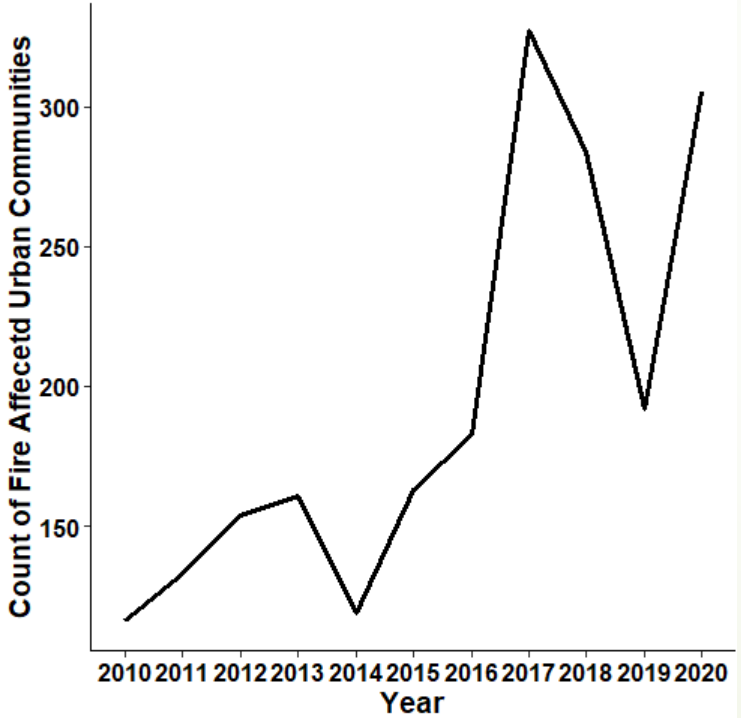


- Communities and urban forests respond differently
- 20-25% of fire affected areas outside the "WUI"
- UTC reflects surrounding land cover & ecosystems

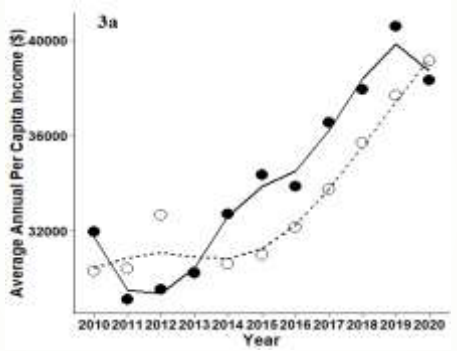
Escobedo, F.J., Yadav, K., Ossola, A., Klein, R. and Drury, S., 2024. Urban forest cover and ecosystem service response to fire varies across California communities. *Urban Forestry & Urban Greening*, *101*, p.128547.

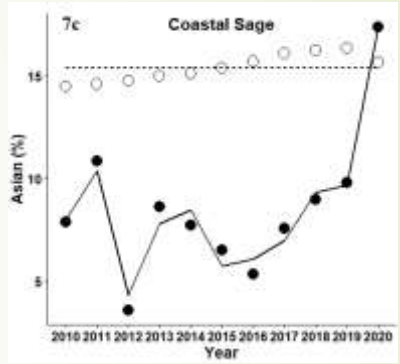
2. Increasing wildfires & changing sociodemographics in CA

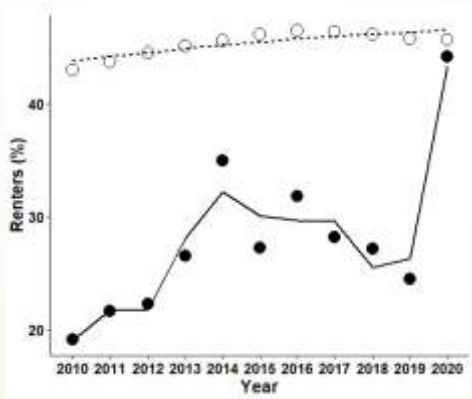
Statewide

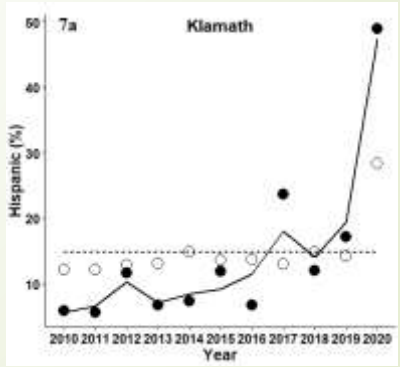


Regional





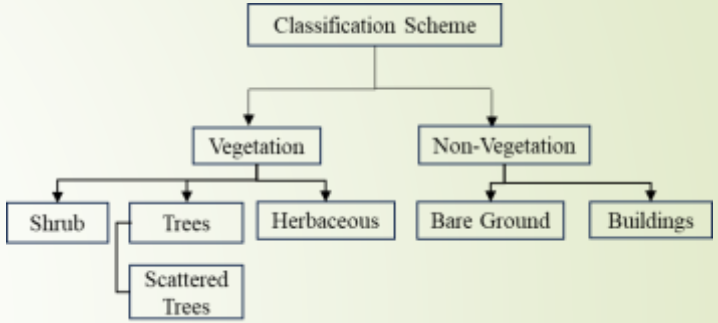


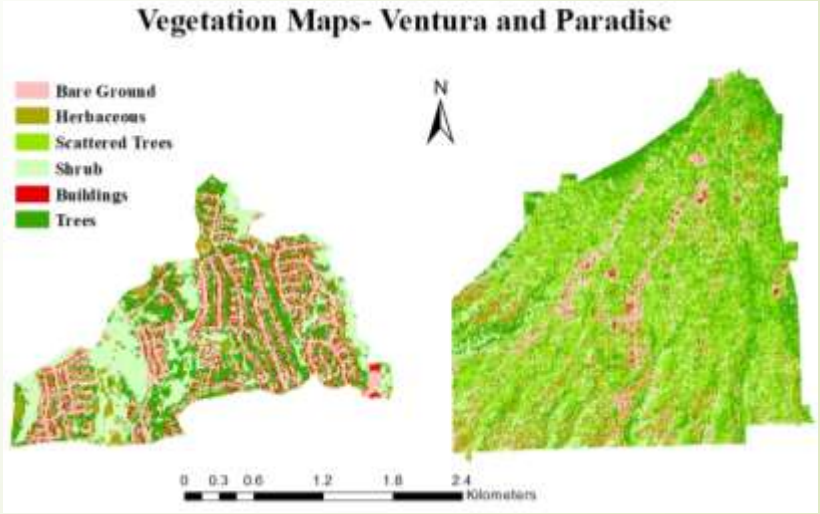


Yadav, K., Escobedo, F.J., Thomas, A.S. and Johnson, N.G., 2023. Increasing wildfires and changing sociodemographics in communities across California, USA. *International Journal of Disaster Risk Reduction*, p.104065.

3. Urban Vegetation, Defensible Buffer Zones and Home Loss in CA

- Previous wildfire research focused on building characteristics and "vegetation cover" @ resolutions of 30 m^2 (323 sq feet) pixels
- Our study
  - Satellite imagery from 1 day before/morning of fire
  - PlanetScope 3m^2 and e-cognition
  - Classified 5 vegetation types + buildings and non-vegetation types
  - Analyzed vegetation type/density, location, distance, moisture using regression models according to 3 distance buffers (CART & DT)

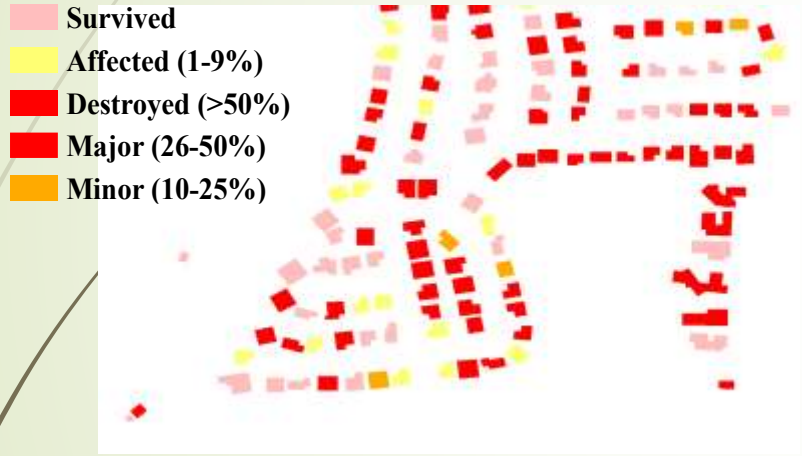


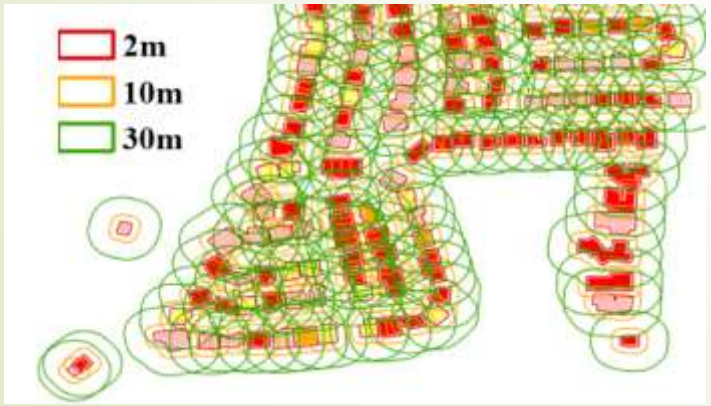


Escobedo, F.J., Yadav, K., Cappelluti, O. and Johnson, N., 2025. Exploring urban vegetation type and defensible space's role in building loss during wildfire-driven events in California. Landscape and Urban Planning, 262, p.105421.

3. Urban Vegetation-Fire-Building loss Relationships

DINS and Defensible Space Buffers



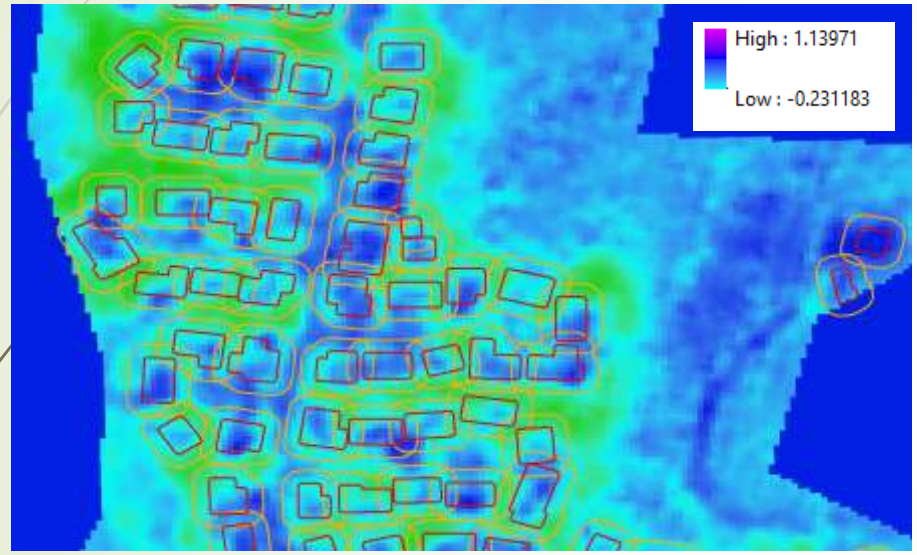


Variable type	Variables
Vegetation	Tree Cover (TreeP)
	Forest cover patch (ScatP)
	Shrub (ShrubP)
	Herbaceous (HerbP)
	Bare Ground (BareGP)
	Vegetation type moisture (Mo_Tree, Mo ScatP, Mo_Herb, Mo_Shrub, Mo_Bare,)
	Vegetation greenness (Gr_Tree, Gr_Herb, Gr_Shrub, Gr_Bare)
	Direction of Trees in buffer (Dir_Tree)
	Direction of Shrubs in buffer (Dir_Shrub)
	Direction of bare ground in buffer (Dir_Bare)
	Direction of Herbaceous in buffer (Dir_Herb)
	Building Occluding Tree Cover (OverScatP)
	Building Distance to: Trees/Forest cover patches/Shrub/Bare ground/Herbaceous (Dis_Shrub, Dis_Herb, Dis_Tree, Dis_Bare)

**Distance to Structures, Density of buildings in buffer, Building construction date, Building/roof construction material

3. Building loss, DSBs, Vegetation, NDWI data, etc statistically analyzed

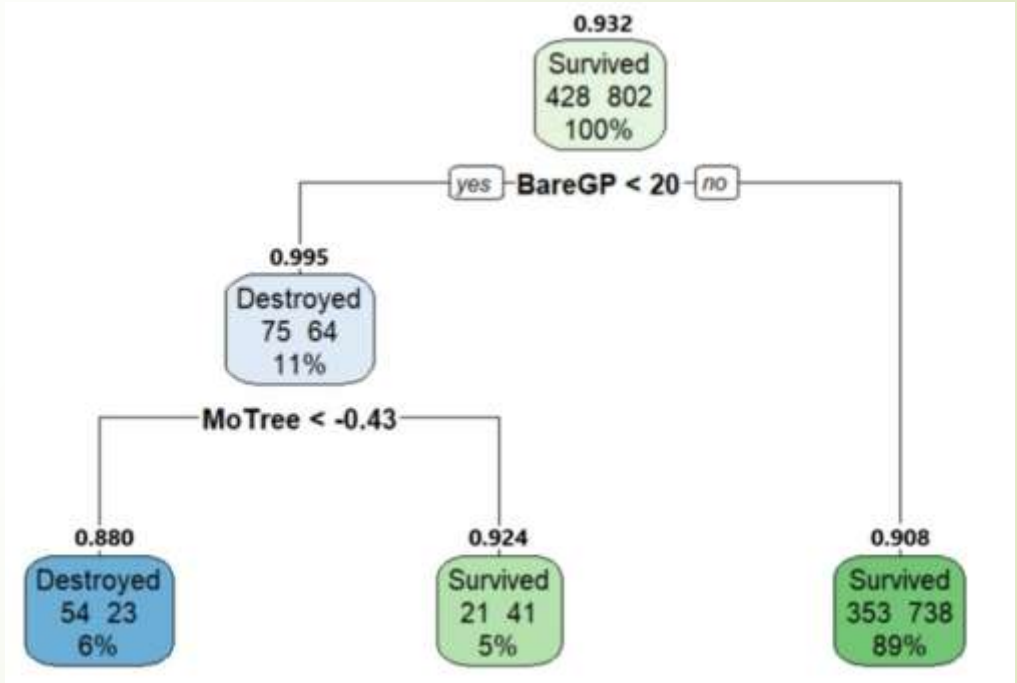
Vegetation moisture



NDWI	Description
0.2 1	High moisture-water
0.0 0.2	Green-humid
0.3 0.0	Moderate drought,
1 0.3	Droughty

*Normalized Difference Water Index (NDWI)

Classification and Regression Tree + Decision Tree Analyses



3. Results: Most influential predictors - listed in order of importance- of **building loss** in Ventura and Paradise, California

Ventura

Buffer 1 (0-2m "Zone 0")

- **Survivability => #1 high bare ground and #2 High Tree moisture**

Buffer 2 (2-10m)

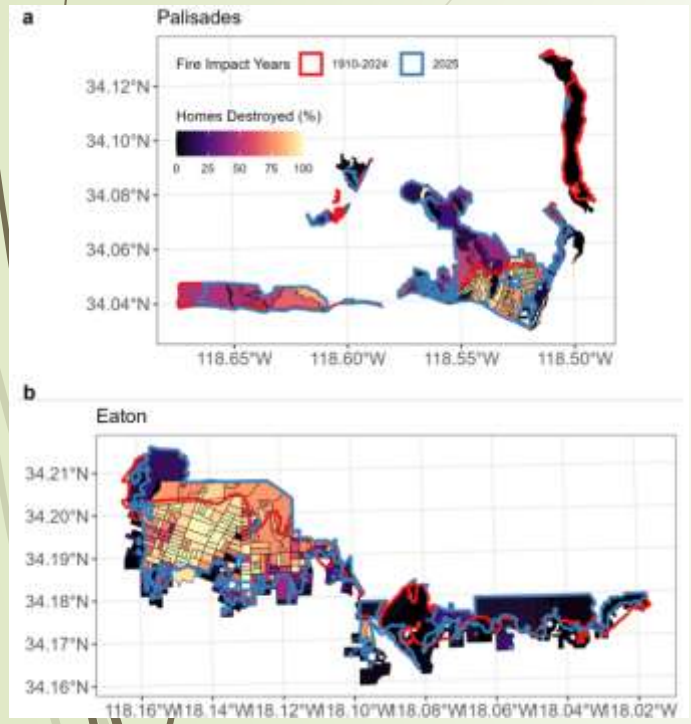
- **#1 Low Herbaceous moisture,**
  - **#2 Low Shrub moisture**, #3 Tree Distance

Buffer 3 (10-30m)

- **#1 Bare ground%,**
  - #2 Distance to herbaceous, **#3 Building density**, #4 Tree Distance

Paradise

4. 2025 LA Fires (Urban Neighborhood)



Eaton Fire

- Tree Cover 30%
- Replacement value $249,000*
- **19% AfrA, 26% Hispanic, 8% AA****
- Per Capita income $70,252
- 23% Renters; **24% Non-English****
- **On average 7 homes located within 100'**
  - **2 within 30', 17% had a structure within 5'**

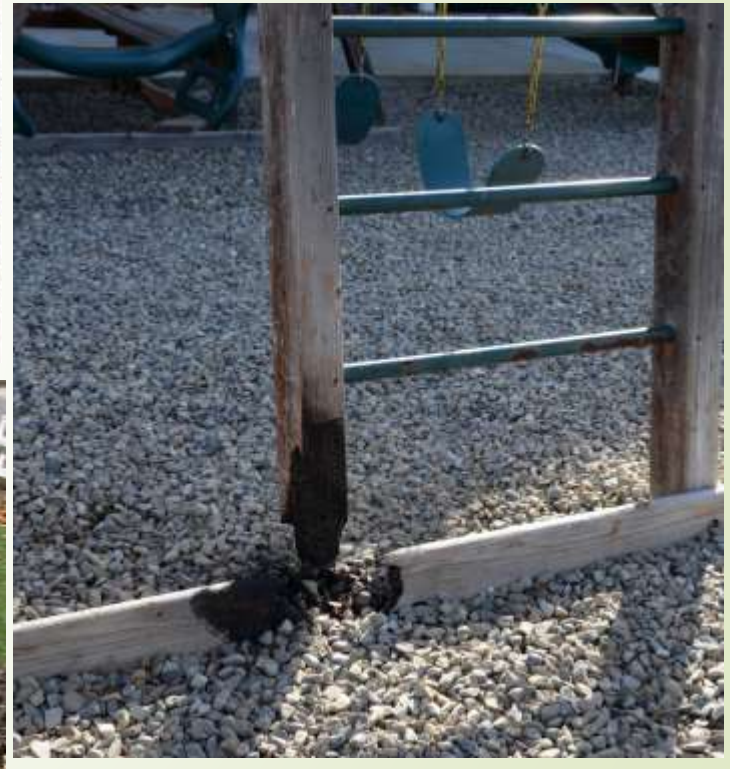
Palisades Fire

- Tree cover 24%
- Replacement value $349,000*
- **82% White****
- Per Capita income $140,932
- 21% Renters; **16% Non-English****
- **On average 6 homes located within 100'**
  - **2 within 30', 15% had a structure within 5'**

**US Army Corps of Engineers; **US Census Bureau*

Norlen, C, Sharma S, Escobedo F, In Review. Social-ecological impacts of the 2025 Los Angeles urban fires on communities, neighborhoods, and homes. Nature Communications

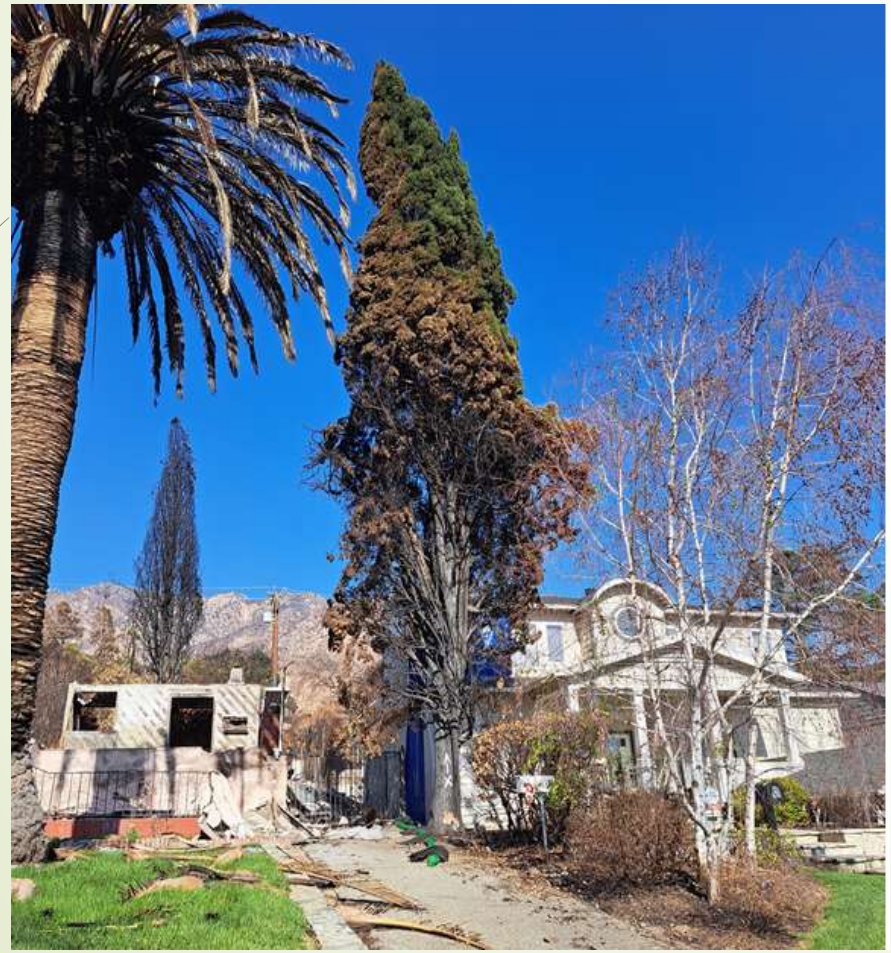
Wind-driven urban fire effects



15-17% had a home within 5’;
On average, 2 homes within 30’

Tree moisture and Height seem to be more influential than species or nativity

Home igniting trees – not trees igniting homes

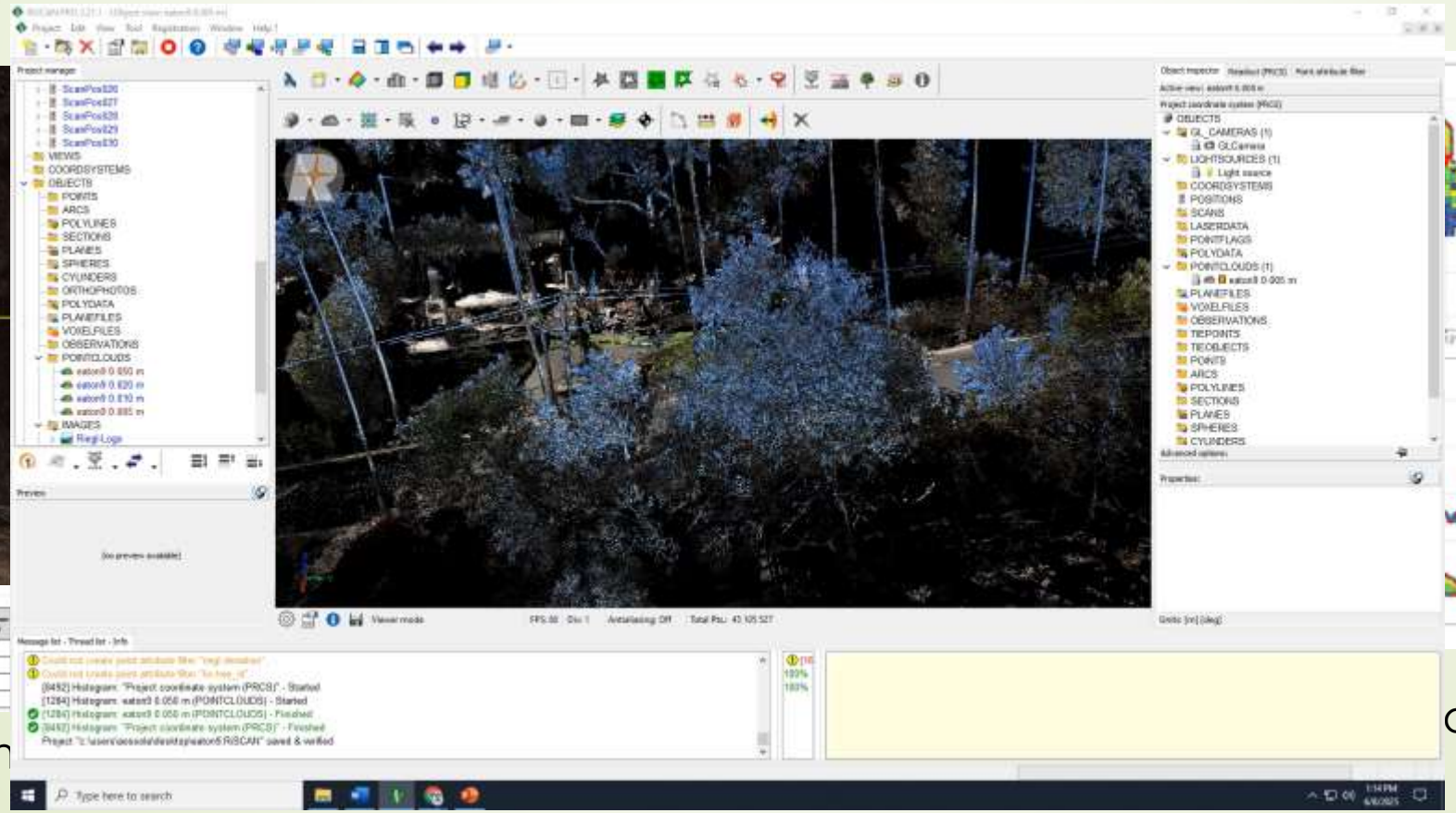


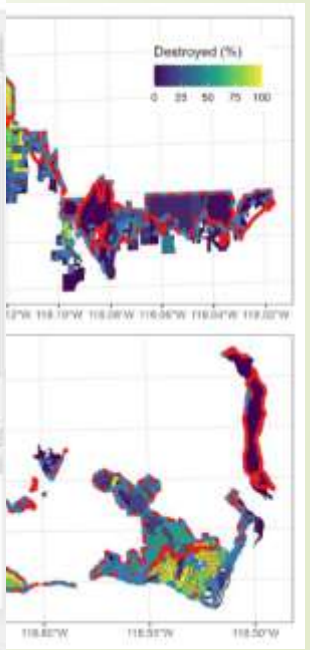
Post-fire data collection- Eaton and Palisades

Tree-level fire effects

LiDAR

Geospatial Analysis





UC Extension

orlen USGS

Lessons/ Take Away

- All communities are different and respond differently in terms of fire-vegetation cover maintenance
- ~20% of homes in Altadena and Pacific Palisades had another home withing 5’
- The demographics of homeowners in these areas is changing, we need to change the way we message them
- In terms of fuels “A tree is not a tree”; well maintained, properly placed, well pruned, well irrigated tree is very different than a droughty, non-maintained tree

Thank you

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