Seeing the buildings, forests, and trees: mapping WUI environments and losses after wildfire events

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About Us

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Work focus areas:

- WUI mapping and remote sensing
  - Radeloff et al 2018, USGS project using Microsoft buildings data
- Building loss and recovery after wildfires
  - Alexandre et al 2015, Mockrin et al 2016, 2018
- Understanding why and where buildings burn
  - Alexandre et al 2016, Kramer et al 2018, Kramer et al 2019
- Wildfire detection/post-fire vegetation mapping
  - Hawbaker et al. 2017, 2020

Title: Seeing the buildings, forests, and trees: mapping WUI environments and losses after wildfire events (national)

The Idea

Where are we losing buildings to wildfire, and why?

Currently: Forest Service and partners – spend billions on suppression, with 20,000 buildings lost in 2018. Yet, we largely rely on in situ post-fire surveys of building loss and fuels, or manual digitizing of buildings lost from high-resolution imagery.

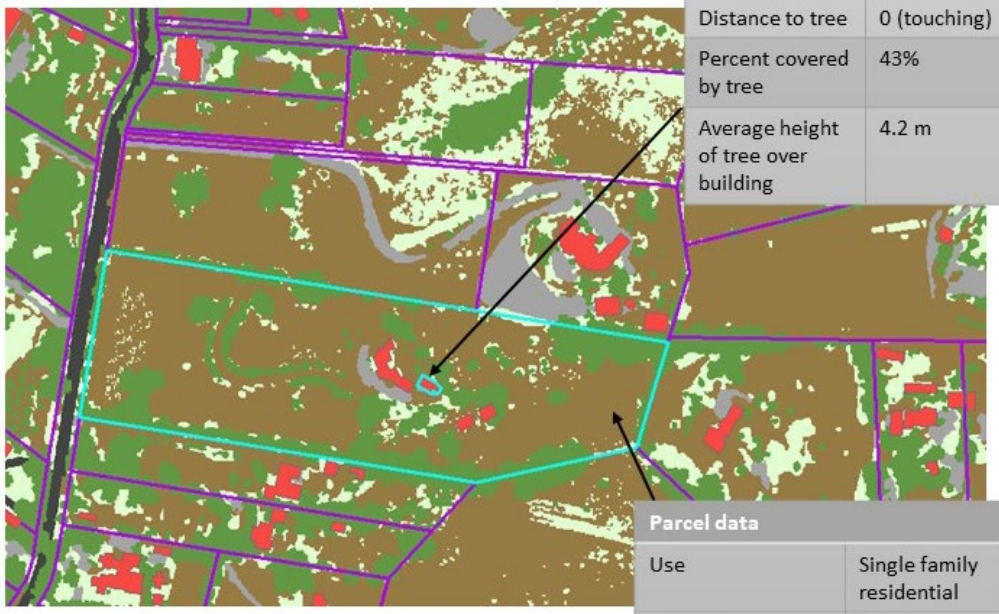

NIST Technical Note 1909

2011 Wildland Urban Interface Amarillo Fires Report #2 – Assessment of Fire Behavior and WUI Measurement Science

The Idea

Remote sensing offers new opportunities to map both buildings and vegetation, before and after fire:

- Object-based aerial image classification for building damage, destruction, rebuild/new
- Pre-fire vegetation density using object-based classification and existing LiDAR
- Develop predictive models of wildfire outcomes
  - Integrate with suppression, if possible



Building data	
Distance to shrub	1.4 m
Distance to tree	0 (touching)
Percent covered by tree	43%
Average height of tree over building	4.2 m

Parcel data	
Use	Single family residential
Year built	1949
Percent tree	28.2%
Percent shrub	1.8%
Percent building	1.5%
Percent road	0%
Other impervious	1.1%
Percent water	0%

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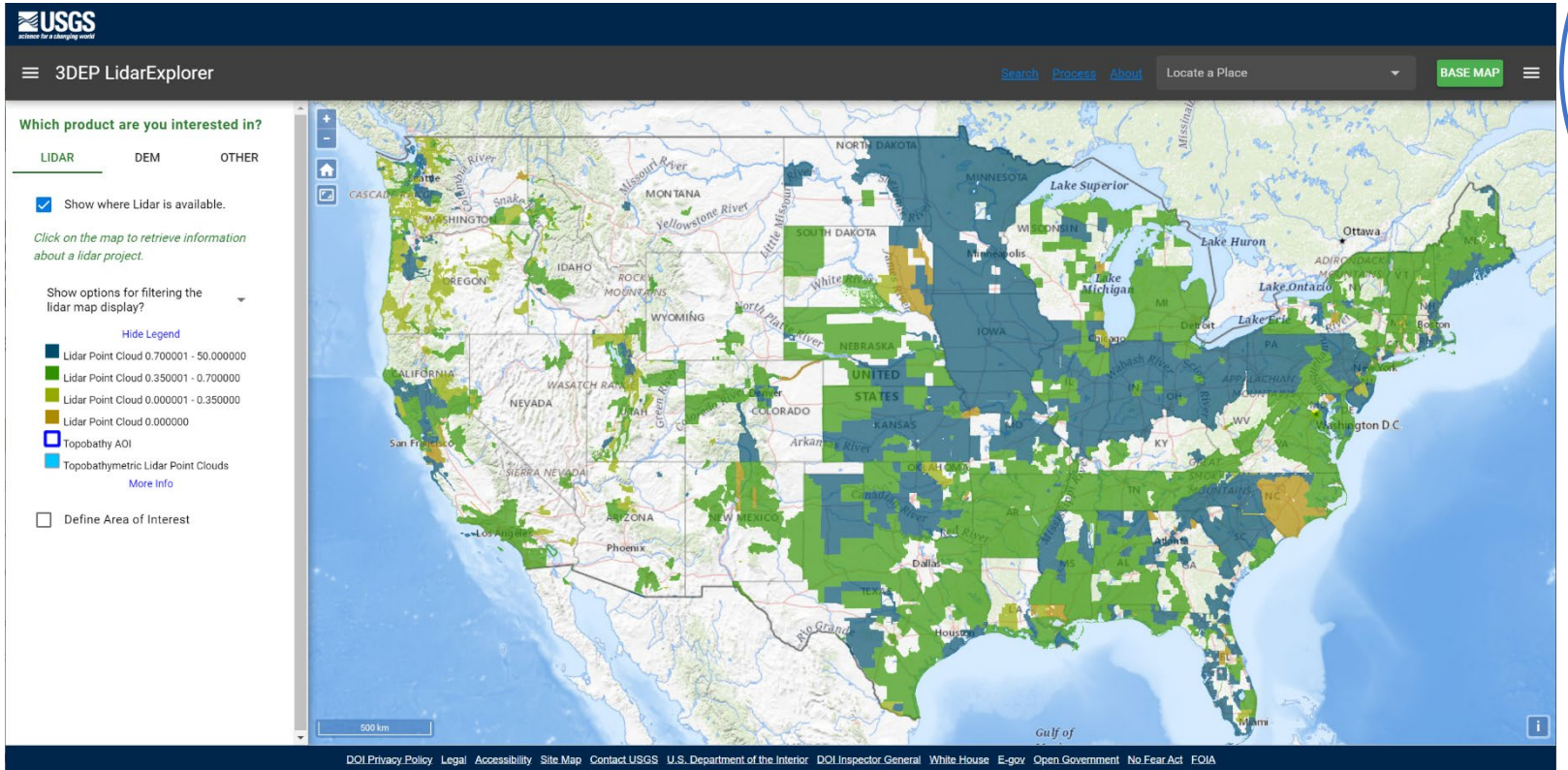
Object-based post-fire aerial image classification for building damage, destruction and defensive actions at the 2012 Colorado Waldo Canyon Fire

Derek McNamara[A,D], *William Mell*[B] *and Alexander Maranghides*[C]

What EO data does your idea utilize?

- **High spatial resolution R-G-B-NIR**
  - NAIP, GeoEye, Planet, QuickBird, WorldView

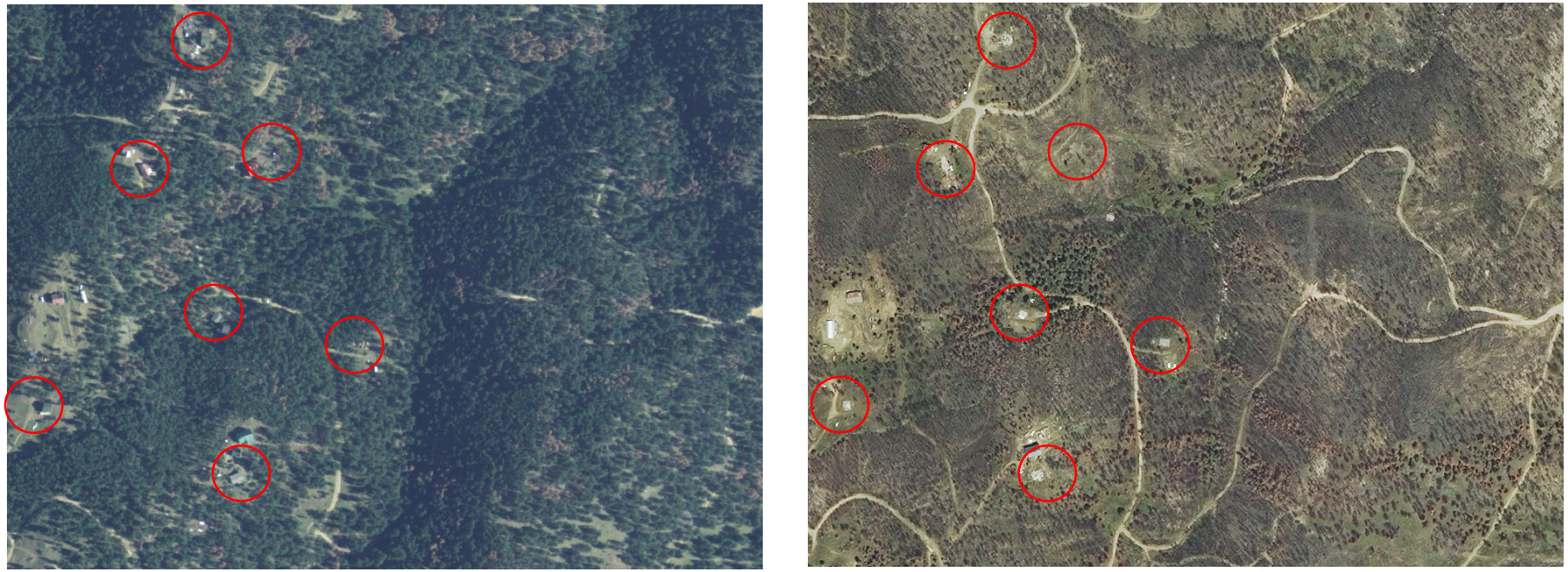
- **LiDAR, e.g. https://usgs.entwine.io/**



Earth Observation Tools

Issue(s) being addressed

- **Wildfire impacts**
- **Wildfire hazard**
- **Fuel loading**
- **Vegetation mapping**
- **Land-use/land-cover change**



2011 and 2013 NAIP imagery for part of the High Park Fire, CO (2012). Destroyed buildings circled in red.

Issues Addressed

The Idea – Outcomes / Societal Benefits

- How does this idea benefit the Forest Service and other land management agencies?
  - Help the Forest Service, other agencies, and communities strategically **allocate mitigation resources** to reduce future losses.
  - In a time when wildfire extent and losses continue to expand, such research is increasingly vital to **reduce wildfire risk across ownerships**.
  - Help communities enhance their **resilience when rebuilding** after wildfire
  - **Understand development patterns** near public lands
  - Contribute to **remote sensing for disaster** mapping broadly

remote sensing
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Remote Sensing for Post-disaster Phase: Damage Assessment, Reconstruction and Monitoring

Thank You!

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