A LiDAR-derived Fuel Map for the ACT

Adam Leavesley, Albert Van Dijk and Marta Yebra
I’M GOING TO TALK ABOUT:

1. Value of LiDAR
2. ACT acquisition
3. Contractor processing
4. Experimental processing
5. Qualitative truthing
6. Next steps
Why invest in LiDAR for fuel mapping?

1. Inadequate knowledge of fuels and fuel condition was implicated in the Margaret River (Keelty, 2012) and Lancefield escapes (Carter et al. 2015).
Why invest in LiDAR for fuel mapping?

2. Spatially-explicit knowledge of the variation in the distribution of fuels may reduce some of the unpredictability of wildfire behaviour.
Why invest in LiDAR for fuel mapping?

3. LiDAR-derived vegetation models can be combined with DEMs to estimate solar radiation and flammability of surface fuels (Nyman et al. 2018).
What is LiDAR?

LiDAR: Light Detection and Ranging

LiDAR is a remote sensing method that uses light in the form of a pulsed laser to measure distances to the Earth.
What is LiDAR?
What is LiDAR?

(Marselis, 2014)
Acquisition in the ACT

Area: 3272km$^2$
Date: 18 May – 29 July 2015
Pulse density:
- Urban = 8ppm
- Rural = 4ppm
Average pulse density = 7.9ppm
Vertical accuracy = 0.20m
Cost = $250,000

(RFS Mapping, 2016)
Acquisition in the ACT

Area: 3272km$^2$
Date: 18 May – 29 July 2015
Pulse density:
  Urban = 8ppm
  Rural = 4ppm
Average pulse density = 7.9ppm
Vertical accuracy = 0.20m
Cost = $250,000
Contractor processing

Ground classification (ICSM Level 3)
Low vegetation (Level 1)
Medium vegetation (Level 1)
High vegetation (Level 1)
Buildings (Level 3)
Water (Level 1)

ICSM = Intergovernmental Committee on Surveying and Mapping
Contractor processing

ICSM = Intergovernmental Panel on Surveying and Mapping

Level 0 = Unclassified
Level 1 = Automated
Level 2 = Ground improved
Level 3 = Ground corrected
Level 4 = Detailed correction

Applied to Bushfire Attack Levels (Lhuede et al. 2017)
TERN-ANU Processing

AIMS:
1. Develop easily-derived experimental products for land managers.
2. Develop prototype processes and specifications.

OFHA and Project Vesta inputs
(Van Dijk, 2017; Hines et al. 2010; Gould et al. 2007)
TERN-ANU Processing

Bushfire layers

- Canopy: top and base height
- Elevated fuel – LCF
- Near-surface fuel – LCF
- Overstorey – LCF
- Understorey – LCF

LCF = leaf cover fraction

(Van Dijk, 2017; Hines et al. 2010; Gould et al. 2007)
Qualitative truthing

Fire severity analysis of the Cotter River Burn, April 2015

(Leavesley et al. 2015)
Qualitative truthing

Fire severity analysis of the Cotter River Burn, April 2015

(Leavesley et al. 2015)
Qualitative truthing

Fire severity analysis of the Cotter River Burn, April 2015

(Leavesley et al. 2015)
Qualitative truthing

Fire severity analysis, April 2015

LiDAR-derived Elevated Fuel, May-June 2015
Qualitative truthing

Fire severity analysis, April 2015

LiDAR-derived Elevated Fuel, May-June 2015
Qualitative truthing

Fire severity analysis, April 2015

LiDAR-derived Elevated Fuel, May-June 2015
Qualitative truthing

Fire severity analysis of the Cotter River Burn, April 2015

LiDAR-Derived fuel map, May-June 2015
Qualitative truthing

Fire severity analysis of the Cotter River Burn, April 2015

LiDAR-derived fuel map, May-June 2015
Qualitative truthing

Fire severity analysis of the Cotter River Burn, April 2015

LiDAR-derived fuel map, May-June 2015
Piccadilly burn, LiDAR-derived Elevated Fuel

dNBR Fire Seveirty Assessment, Piccadilly
Wrap up

1. Generally suitable for fuel mapping, but…
2. … issues with bark and litter.
3. Suitable for fuel, carbon and post-burn hydrology
4. Low frequency suitable for burn planning?
5. Move to “remote-sensing enabled systems”