MAPPING BUSHFIRE HAZARD AND IMPACT

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1. THE NEED

Little **accurate and timely spatial information** is currently available on **bushfire hazard and impacts**. This situation is rapidly evolving:

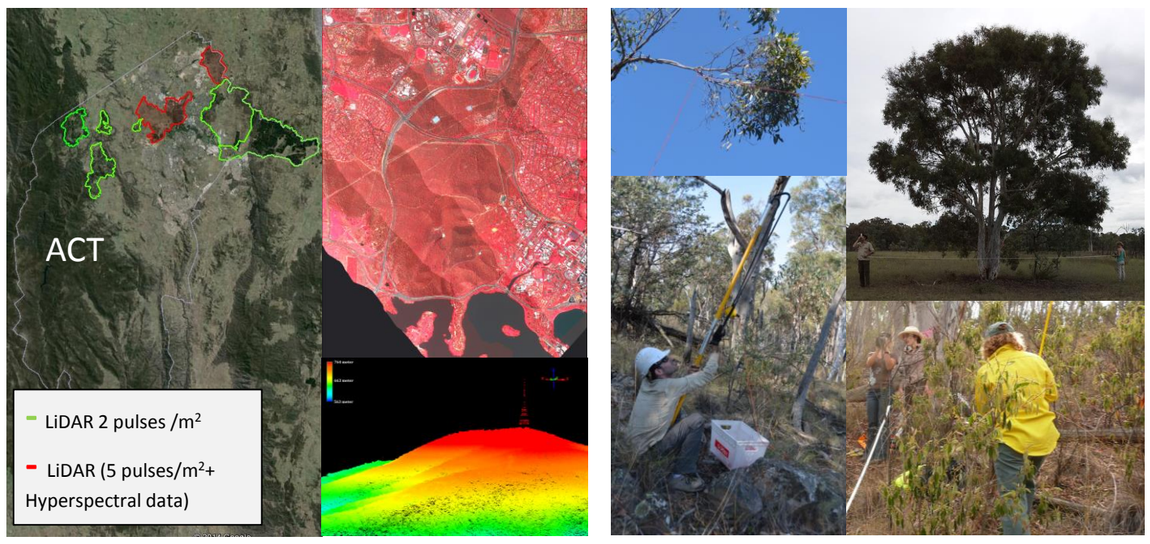
- New generation satellite, airborne and mapping derived products and models are now readily available;
- Applicability, value and adaptations of these products and models need to be assessed with reference to data required for fire risk calculations and fire modeling.

2. GOAL

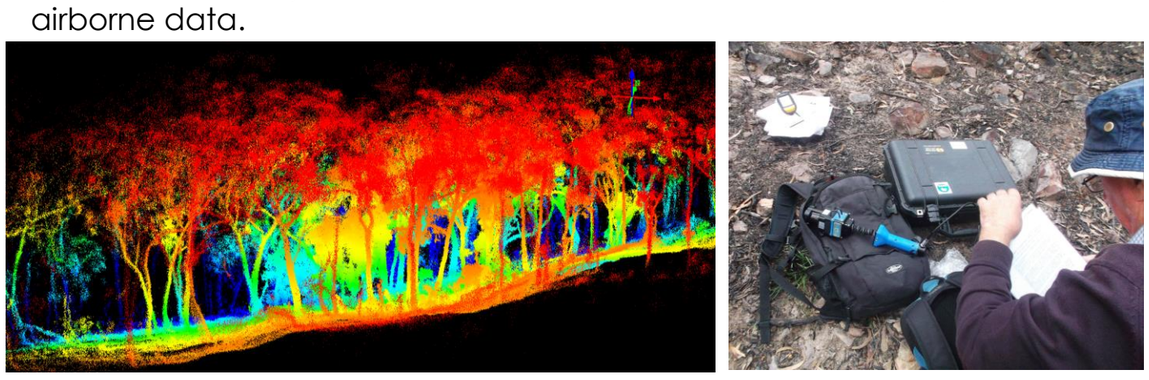
- Produce reliable and operationally useful **spatial information on critical aspects of bushfire hazard** (fuel load and fuel flammability);
- Determine the **impact of unplanned and prescribed burning** on fuel accumulation as well as landscape values (habitat, water resources and carbon storage) over time, in support of fire management.

3. METHODS

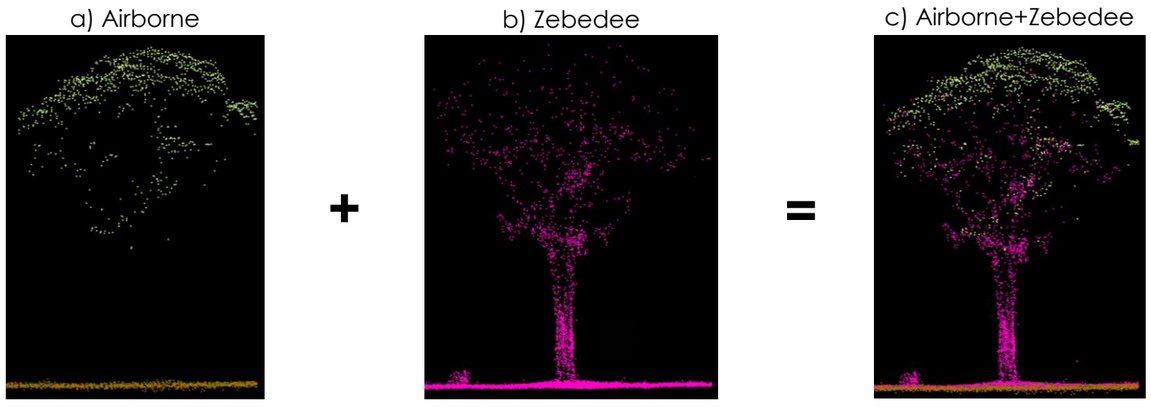
- **Airborne LiDAR** (Light detection and ranging) **and hyperspectral data** were successfully collected across several parts of the Australian Capital Territory (ACT).
- **Ground Truthing**: Fuel load, structural and moisture measurements were made at 40 plots.



- **Ground based LiDAR** (Zebedee) was collected to provide high resolution, reliable understory information useful to validate and/or complement airborne data.



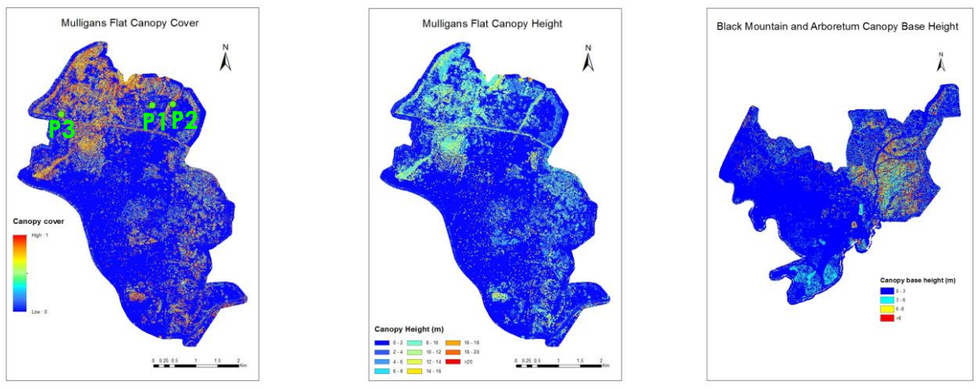
- **Airborne and ground LiDAR** (Zebedee) were matched.



Airborne and ground-based LiDAR dataset complement each other very well since Airborne LiDAR captures the canopy whereas ground LiDAR accurately measures the ground and elevated fuels.

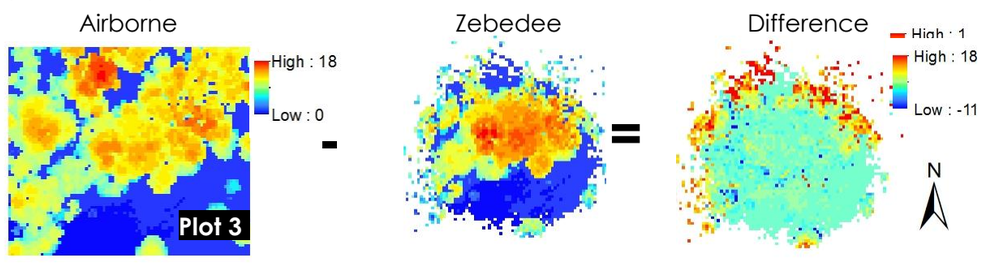
4. EARLY PROGRESS

- **Six maps** have been derived from airborne LiDAR: canopy height, base height and cover as well as understory height and cover and vegetation layering (examples below):



- **Comparison between the Zebedee and airborne** calculated (a)canopy heights and (b)canopy cover at Mulligans Flat Nature Reserve.

a) Canopy heights. Good agreement between both maps (zoom into plot 3 as an example bellow). The highest differences occur near the edges of the Zebedee point cloud where the point density is lower.

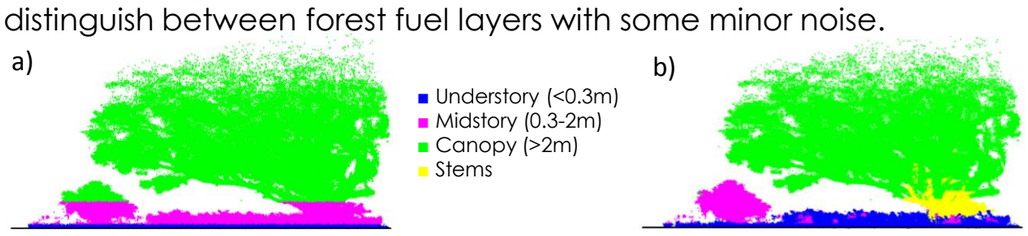


b) Canopy cover. Good agreement between maps (Table 1) what indicates that Zebedee data can also be used to successfully estimate canopy cover.

Plot nr.	R^2
Plot 1	0.851
Plot 2	0.557
Plot 3	0.649

Table 1. Correlation coefficient (R^2) between canopy cover calculations based on airborne and Zebedee LiDAR data for each plot (only cells with more than 20 Zebedee points are included in analyses).

- **Fuel classification with Zebedee**. a) Based on the presence of points classified within a specific height layer b) using an algorithm that re-classifies the previous output based on forest fuels rules. The later better distinguish between forest fuel layers with some minor noise.



5. CONCLUSIONS

- This project will develop methods to produce the **spatial information on fire hazard and impacts** needed by planners, land managers and emergency services. The added value represented by these new information sources will be compared to the practical feasibility and costs of its use.
- To date the use of **LiDAR data for forest fuel assessment** have been explored. The main findings are summarized below.

Dataset	Pro's	Con's
Airborne	- Covers large areas - Excellent to derive canopy height, base height and cover	- Little applicability for understory/midstory fuels
Zebedee	- Easy data collection - Accurately measures understory volume and dimensions	- Processing times - Algorithm availability - Small-scale

END USER STATEMENT

This research is valuable because it is bringing the industry closer to an operational broad-scale, spatially explicit fuel data collection system akin to Vesta or OFHA that can be used in existing fire behaviour models. The work will also help us to understand what information is easily and reliably collected from remote systems as a precursor to developing a new fire behaviour model based on the remote data.