

# Fact sheet 6: Mapping Victoria's forests with LiDAR

Comprehensive mapping of high conservation value forests provides the foundation for monitoring and management

## Key points

- The Victorian Government has commissioned comprehensive airborne LiDAR measurements of Victoria's forests.
- Mapping the location and density of high-conservation value forests, such as ecologically mature forests and rainforest, with the assistance of the LiDAR measurements provides the foundation for long-term monitoring programs and management strategies.

## What is LiDAR?

LiDAR (light detection and ranging) is an invaluable tool for mapping and monitoring forests. LiDAR is a surveying method that illuminates a target with a pulsed laser and measures the reflected pulses with a sensor.

Data acquisition involves an aircraft flying over the landscape, continuously making measurements. The technique yields a highly-detailed three-dimensional profile of vegetation structure. For a little over a dollar per hectare, the measurements provide extensive information about forest structure.

LiDAR surveys can be done at very high resolution (centimetre scale), creating profiles from the top of the forest canopy to the understorey. The data have been increasingly used for forest classification as the pulses penetrate the forest canopy and help reveal the structure of the lower strata.

Data derived from LiDAR measurements verified by on-the-ground surveys allow researchers to create models that can be used to produce detailed, accurate forest maps.

### Research project titles

Mapping high conservation value forest in Eastern Victoria

### Who is doing this work?

A number of LiDAR service providers

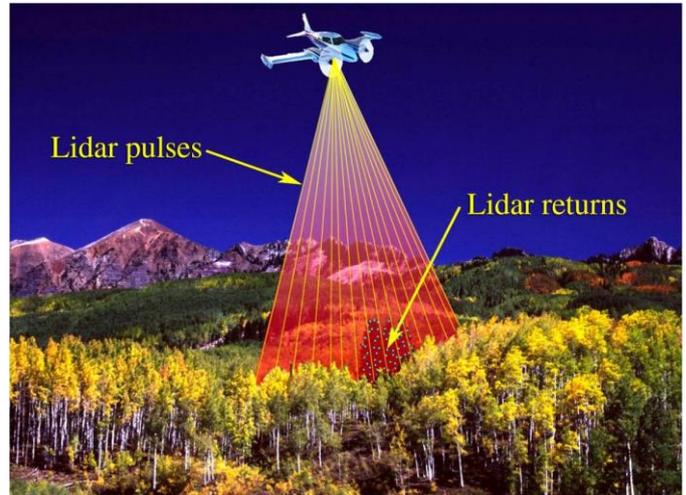


Image: Courtesy US Geological Survey

## A comprehensive new measurement program

The previous Regional Forest Agreements (RFA) assessments required the identification and precise description of all mature forests. This was done using aerial photographs and information about forest growth. However, mapping quality was variable.

In the past 20 years, there has been no comprehensive mapping of Victoria's mature forests. Major bushfires have occurred during this time, so it is important to assess the forests to determine how they have changed.

A wide-ranging airborne LiDAR measurement program was proposed by the RFA Program to survey all five RFA regions and non-RFA areas in western Victoria. This would allow researchers to model and map the State's forests consistently across the State. High priority areas for measurement are rainforest (including cool temperate mixed forest) and old-growth forests.

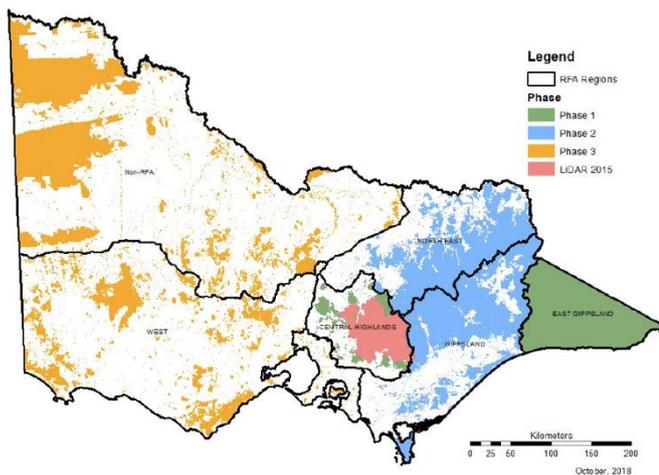
Data collection is proposed to happen in phases, with high interest areas first. Phase 1 will cover the East Gippsland and Central Highlands RFA regions and phase 2, the Gippsland and North East RFA regions. Phase 3 will cover the west RFA and non-RFA areas.

Phase 1 of the program has been co-funded with Local Infrastructure Group's Land Use Victoria. The Phase 1

survey commenced in March 2019, with final data products scheduled for delivery in December 2020.

The continuation of the program into Phases 2 and 3 are reliant upon securing additional funding.

If Phase 1-3 are undertaken, the acquisition will cover up to 7.6 million hectares with a focus on native forests. The scale and timelines will make this the largest such program ever conducted in Australia.



The proposed LiDAR measurement program

By identifying areas of forests that are likely to contain high conservation values, this work will provide important information for supporting decision-making during the RFA planning process. There will be insights into the effects of past disturbances, including a better understanding of the impacts of the bushfires on forest structure and composition.

The new work will identify areas with giant trees, multi-aged stands and areas with old-growth trees which have suffered recent disturbance and old-growth stands where the influence of past disturbances is now negligible.

The new LiDAR data will be available for analyses including assessments of timber volumes, stream flow, regrowth forest condition and extent, carbon, biomass, water, habitats and fire severity. It will also serve as a baseline for future monitoring of variations in forest structure and forest types, to estimate habitat for forest-dependant fauna and flora, and to determine carbon stocks, water yields, and wood supply for the forest industry.

The program will collect the data necessary for researchers to map high-value conservation forests, such as ecologically mature forests and rainforest with greater precision than has previously been done before for Victoria's forests.

The measurements will provide the foundation for management strategies and long-term monitoring programs.

### The applications of LiDAR measurements

University of Melbourne researchers used a 2007-08 LiDAR dataset that covered approximately 40 per cent of the Central Highlands RFA to distinguish between rainforest, eucalypt forest, and cool temperate mixed forest.

In 2015, DELWP commissioned the collection of new, higher-resolution LiDAR measurements over a 430,000-hectare region of the Central Highlands. The dataset provides an excellent resource for mapping forest features such as individual tree locations and sizes and for identifying potential areas of ecologically mature (old-growth) forest. The measurement program will also help the Victorian Government manage threatened and endangered species.

Researchers have established dozens of plots for detailed ground measurement. They are analysing LiDAR measurements over each plot to develop and refine forest classification models. The resulting models enable detailed classification of forest stand types from LiDAR measurements.

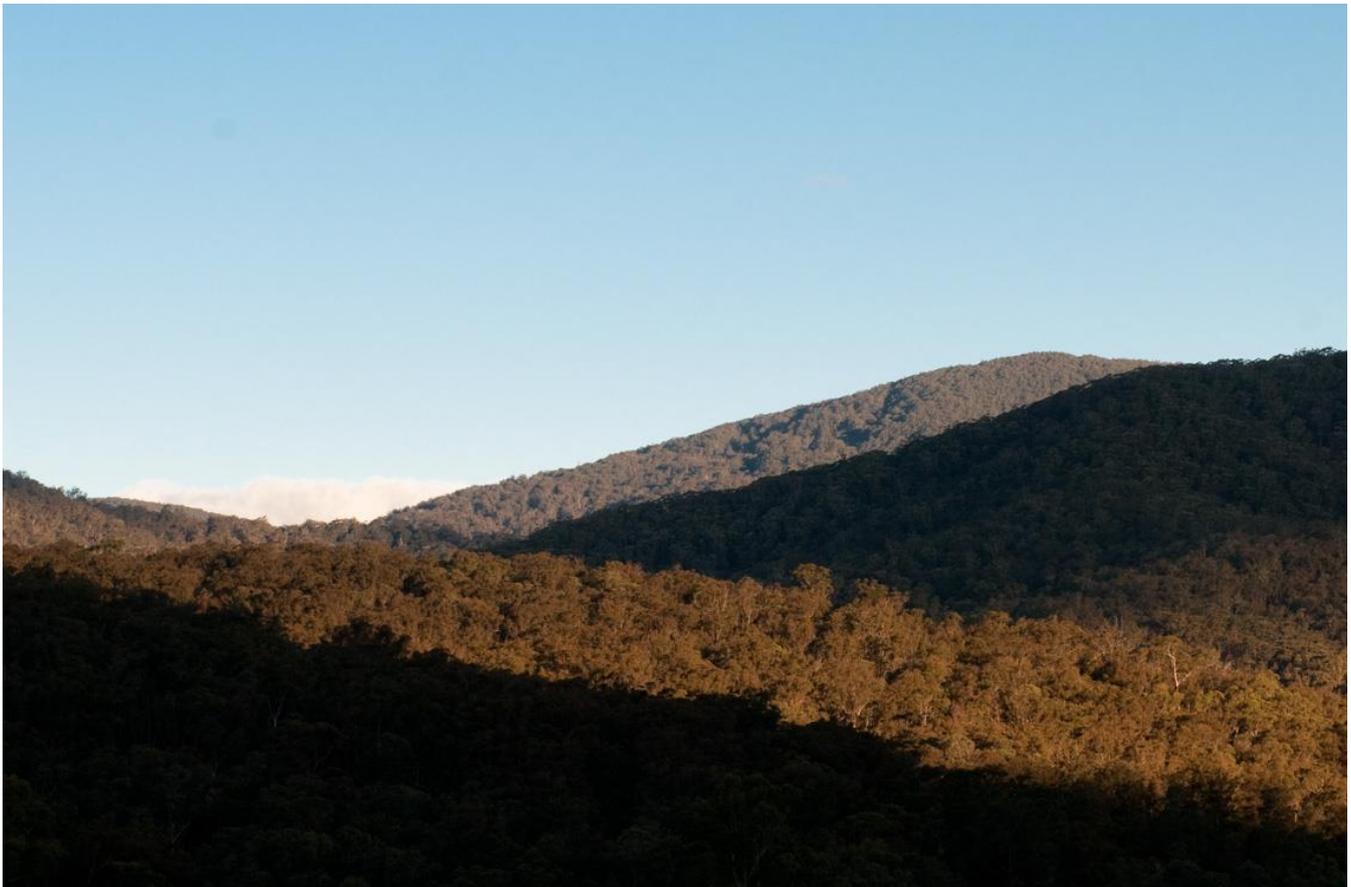
### Mapping high conservation forests

The Central Highlands region, approximately 100 kilometres north-east of Melbourne, includes rainforest stands dominated by trees 30–40 metres tall, an understorey reaching up to 20 metres, with tree ferns beneath. The rainforest stands occasionally include >60-metre high emergent *Eucalyptus regnans*. Eucalypt stands are dominated by towering *E. regnans* and occasionally *Acacia*-dominated understoreys reaching up to 40 metres.

Ecologically mature forests within these landscapes vary in structure and composition. They are often defined as having large trees and plants with a variety of ages. LiDAR can be used to identify mature forests in two ways. Crown size allows identification of individual large trees. Secondly, the measurements can generate landscape-wide information on factors such as canopy structure and the number of strata, which can be used in predictive models.

Airborne LiDAR mapping can also estimate the density of forest stands, and the height and diameter of individual trees within a stand. (A stand is a connected community of similar trees). These measurements can be used to predict both vertical and horizontal structural diversity, timber volume, the mass of above-ground carbon and the area of sapwood at a landscape-scale.

The detailed delineation of forest structure and forest types, specifically at the landscape scale, is an important step towards mapping the structural and spatial complexity of these ecosystems, which is important for the sustainable management and conservation of our forests.



## Comprehensive LiDAR surveys will help map East Gippsland old growth forest

Combined with Victoria's forest monitoring program, repeat LiDAR surveys can provide landscape-level estimates of changes to important forest metrics over time and space. The approach would provide a comprehensive assessment for Victoria's five-year State of the Forest reports. Such surveys would also identify areas where there are changes in forest structure caused by disturbances such as dieback due to drought and disease.

### More information

Future of our Forests

<https://www2.delwp.vic.gov.au/futureforests>

This series of fact sheets

<https://www2.delwp.vic.gov.au/futureforests/forest-values-assessment/forest-values-assessment-fact-sheets>

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