

Forest Health Bulletin

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Aerial Health Surveillance

by Robyn Doyle

Aerial surveys are an integral part of Forest health surveillance. Information generated during aerial surveillance is very useful for outlining gross health problems and giving an indication of their extent and severity. It takes just 10 days to survey the plantation estates of Forestry Tasmania, Rayonier and Norske Skog, mapping problems such as nutrient deficiency, poor performance and mortality onto 1:25 000 scale maps. Sketch-mapping, aerial photographs and GPS positioning are used to pinpoint anything unusual that will require a follow-up investigation from the ground. They are also used to assist in the placement of transects through compartments in which ground surveillance is required. This ensures adequate sampling in any regions with poor or variable performance.

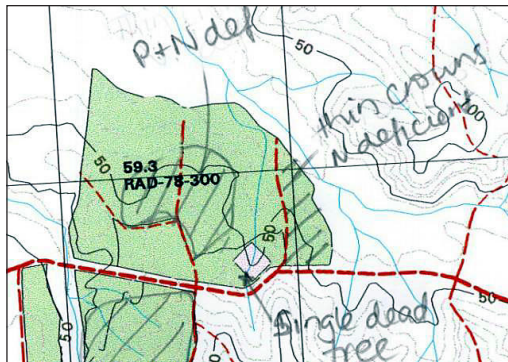


Fig 1: sketch map of a compartment showing nutrient deficiency and tree mortality

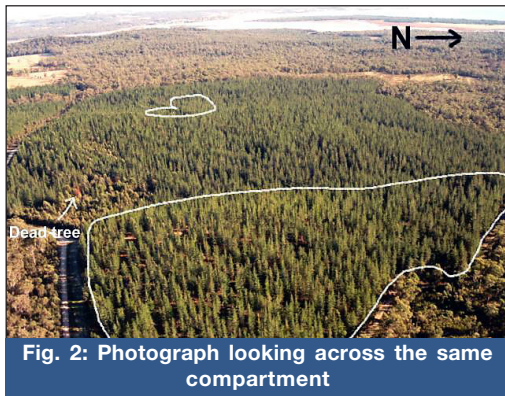


Fig. 2: Photograph looking across the same compartment

Aerial surveys may be carried out in a high-winged plane such as a Cessna 172, 182 or 206. When we first started conducting aerial surveys we used Cessna's, however due to the difficulty of finding and retaining a good pilot we decided that helicopters better suited our requirements. The two types of helicopters we use are Jet Rangers and a Robinson 44, and the sketchmapper and navigator sit on the same side so that they have a similar view. Helicopters allow a much clearer view of the plantations, and the ability to hover above a sick tree for accurate GPS fixing of problems that require follow-up assessment on the ground is extremely useful. This feature has also enabled us to hover close enough to pine trees to observe the bark stripped off by possums, which often ringbark the stems causing the tops to die.



Fig. 3: Ringbarked tops by browsing possums

The sketchmapper tracks the planes location on a hardcopy map and sketches the areas of forest that have been damaged by insects, disease or weather events (also mammals in Aust and NZ). From these hard copy maps, the sketched points, lines and polygons are digitised into a geographic information system.

An aerial sketchmapper must have a good sense of direction and be able to relate the paper map on their lap to the terrain below. The sketchmapper must also be trained to pick up anomalies in the forest plantations and be able to accurately sketch the area onto the paper map. A cast iron stomach is also a requirement as flights generally last 3-4 hours between breaks, and flights are often turbulent, especially around the mountains.

The optimum flying altitude for aerial sketchmap surveys is usually 1,000 to 2,500 feet above ground level (AGL). The surveys are flown as high as possible while still allowing the observer to accurately identify nutrient deficiency and pest-caused damage. This also improves efficiency and productivity since the area in view is greater at higher altitudes; hence more area can be covered in less time. Higher altitudes also improve the observer's ability to navigate and track his/her location as well as determine the relative location, extent, and severity of the pest damage. Survey flights are not usually conducted below 1000 feet AGL.



Fig. 4: Patches of nitrogen deficiency

Surveillance of compartments over five years old involves the systematic coverage of large forest blocks. Depending on the terrain and the general shape of the block this entails a combination of strip passes or flight lines up and down ridgelines to provide a comprehensive coverage. Younger compartments require closer inspection, to allow for sketch mapping or photography. Individual compartments, as well as waypoints for navigating forest blocks, are targeted using a hand held Garmin GPS 12XL unit.

Aerial photography is used where phenomena such as patch death, severe defoliation or crown dieback are detected in older plantations. Photographs can also be used as an aid by the sketchmapper to assess the general health status of younger plantations and help detect and delineate any patches of differing performance within compartments.



Forestry Tasmania

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Fig.5: Young pine trees in various stages of mortality due to ringbarking



Fig 6: Mortality due to fire



Fig. 7: Aerial survey in the Rocky Mountains, Colorado

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and ensure that our systems are compatible with the rest of the world, I visited the US Forest Service in Colorado in September 2001, to see if I could pick up any tips to make our aerial surveillance more efficient. In the USA, aerial sketchmapping has been conducted since the 1940's. I joined an aerial survey of forests in the Rocky Mountains with Erik Johnson, who surveys 810 000 hectares annually. Although Erik's survey method was very similar to ours, there were several differences. They use a Cessna 206

rather than a helicopter, and there is only one person who both navigates and sketchmaps. The maps were at a scale of 1:100 000 whereas we sketch onto 1:25 000 scale maps (the smaller scale is better suited to our smaller forest blocks). Erik also has the same pilot for all his surveys and after many years the pilot is able to anticipate where to fly the aircraft for best visibility of the terrain below and he also helps with the navigation.

Some of the problems with manually sketching onto paper maps include numerous maps to manage in the cockpit, inaccuracy of sketched features and the office time required to digitise the sketched features. The US Forest Service is currently developing a digital aerial sketchmapping system. Potential advantages of the digital aerial sketchmapping system include cost savings due to reduced time spent in post-processing data and quicker delivery of data to the field. However, even though there are inefficiencies

and lack of accuracy, the manual system works. The hardware for the digital system is currently awkward and cumbersome, with many components and cables in the confined space of a small aircraft. Not only do they have a lap top computer, a GPS, a touch screen and pen all connected with a network of cables, they also have a transformer to convert the 28v of the aeroplane to 12 volts.

There have been a few success stories to justify aerial surveys in Tasmania. During this summer whilst conducting surveys in southern Tasmania, a couple of dead trees were observed in a eucalypt plantation of approximately 10 years of age. Waypoints were obtained for the dead trees and then a follow-up survey was conducted. It turned out that up to 50% of the trees were infected with the fungal disease *Endothia gyrosa*, which eventually kills the trees. This early detection will enable the timber to be salvaged before any more of the trees die.



Fig.8: Eucalypt mortality caused by Endothia gyrosa (northern Tas)

Another use for aerial surveillance has been to help map the distribution of *Sirex noctilio*, a wasp that was accidentally introduced into Tasmania in 1952. *Sirex* is controlled biologically with parasitic wasps and a nematode that causes the adults to become sterile. Radiata pine over 10 years old is most susceptible to the wasp and the affected trees are more easily spotted from the air than the ground, and the infestation can be monitored and controlled if necessary.

Forest Health Surveillance Update

by Karl Wotherspoon

Aerial surveys of the Rayonier estate were conducted in January. No major problems were observed.

Research being conducted on defoliation caused by *Mycosphaerella cryptica* in young *Eucalyptus globulus* plantations in northwest Tasmania required the development of simple but reliable defoliation assessment standards. These standards needed to be simple to use in the field and reliably reflect the volume of crown or leaf surface area that has been defoliated. Visual standards are generally the quickest and easiest to use. However, to be reliable they need to be developed on an accurately measured absolute crown volume or leaf surface area. Both the direction and the amount of defoliation are required to describe a defoliation event adequately. Although *Mycosphaerella* infection causes both severe leaf spotting and defoliation, both follow a similar pattern in the crown.

References

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