Putting dieback on the map

by **Caris Bailey** and **Martin Rayner**

Dieback disease is one of the worst environmental threats facing Western Australia.

The first essential step in managing this threat has been to detect and map infected areas. That's been no small task, since the disease has been recorded over an area that stretches for millions of hectares, from Eneabba to east of Esperance.

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Main and inset Different views of a jarrah 'graveyard' showing the stark impact of dieback.

Left A recently-killed jarrah tree stands out from its healthy neighbour.
Photos – Jiri Lochman/CALM

The root rot disease commonly known as dieback is caused by several species of *Phytophthora*, water moulds named using two Greek words meaning 'plant destroyer'. The effects of the disease were recorded in Western Australia from the 1920s, and dieback was unwittingly spread across the south-west for decades before it was identified here in 1964. While it is now known to affect hundreds of native and exotic species growing in WA, its impact in the jarrah forest was most alarming at that time, and there were fears that the forest could be wiped out.

Initially, the priority for those managing the forest was to identify bare patches in the jarrah forest where stands of trees had been killed by dieback, so that the areas could be scheduled for timber harvesting before the trees degraded—a process that was then thought to be inevitable. As research revealed more about the disease, management focused on preventing the spread of dieback and protecting threatened species at greatest risk. This required mapping the distribution of the disease across the landscape.

Mapping challenge

Disease distribution was mapped from the mid-1960s using existing black and white aerial photographs that covered more than 2.5 million hectares of land. However, there were problems with accuracy, largely because of the small scale of the images (up to 1:50,000) and their variable quality due to age and the time that had elapsed (and hence vegetation change) since the photographs were taken.

In 1971, trials with colour aerial photographs taken under shadowless conditions began in the hope of finding a more accurate mapping technique, but the program was hindered by the lack of a reliable navigation system for aircraft until new equipment was introduced in 1977.

The challenge was to be able to navigate the planes along set flight paths so that the sea of trees below could be photographed systematically, and so that the location of the thousands of images collected could then be identified. At the time, field staff still relied on reference trees to find their way through a landscape with few roads. Adopted after the First World War, reference trees were specially marked trees on a surveyed grid one mile by one mile throughout the forest—the white-painted shields cut into selected trunks can still be seen if you look out for them.

The new navigation equipment meant forest officers had to work their way through the bush to set up transponders on vantage points to guide the planes. Though the technology has changed dramatically since the 1970s, working in difficult terrain, in the heat and in the rain, with March flies and ticks, remains part of the job of mapping dieback.

Interpreting dieback

Two generations of staff working for the then Forests Department and now for the Department of Conservation and Land Management (CALM) have worked in the field to detect and map dieback. These staff are called dieback

Towering achievement

There have been about 100 dieback interpreters since 1979, but Abe van der Sande's story illustrates their commitment particularly well.

Abe first worked for the Forests Department as a tower man in 1968 in the fire lookout tower at Mount Solus, east of Perth. He continued as a tower man over subsequent summers and in various roles outside the fire season, including starting the seed collection program that contributed to the rehabilitation of the areas around Jarrahdale mined for bauxite.

In 1980, he was selected as a dieback interpreter, a role in which he excelled. Recognising the enormous job to be done, Abe worked tirelessly, including many weekends. His wife Carol became a registered CALM volunteer, and often accompanied him. Abe's comprehensive knowledge of the vegetation patterns in the forests led to his discovery of a new species of dryandra in 1998, later named *Dryandra insulanemorecincta*. Further survey work identified five more populations in the area.

His work improved management practices for forests, coastal plains and wetlands, and he ultimately became responsible for CALM's interpretation program across more than three quarters of a million hectares of land in the northern region, including the training of new interpreters.

Last December, Abe and Carol were returning from another day's work in the bush when Abe died suddenly.

interpreters because they need to interpret a range of symptoms. As well, other diseases, insect attack, fire, waterlogging, drought, competition, salinity, frost, mechanical damage and herbicides can all produce similar symptoms to dieback.

Interpreters look for commonly found plant species within the particular vegetation type that are susceptible to dieback—known as indicator species—and assess the influence of their position in the landscape, local soils and drainage, all of which are factors in the spread of the disease. The absence of indicator species and dominance of dieback-resistant species can indicate long-term changes caused by dieback.

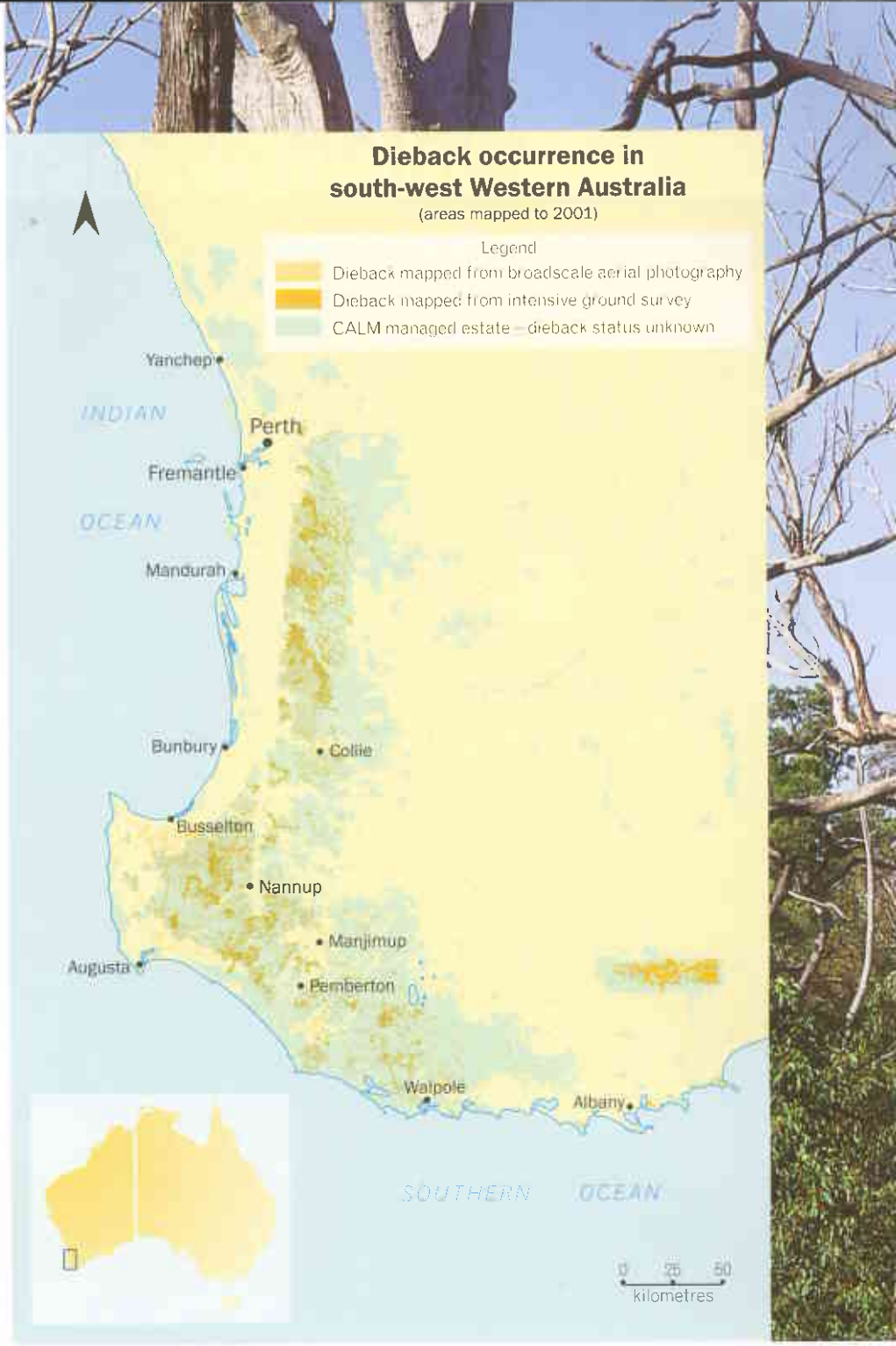
Dieback interpreters also take samples from recently-killed plants and the surrounding soil to analyse them for the presence of dieback. It is estimated that more than 22,000 samples have been tested in the Kensington laboratory of CALM's Vegetation Health Service since it was set up in 1979.

In the same year, an interpretation system using new aerial photographs—1:4500 colour images on 70-millimetre transparencies—was introduced by the Forests Department, a huge advance on the old, small-scale black and white images. With the creation of CALM in 1985, dieback mapping began to extend from the forest to national parks and nature reserves in the affected region. In 1986, the system was further improved with the introduction of 230-millimetre transparencies.

The next major advance came during the 1990s, when hand-held navigation devices operating on the satellite global positioning system (GPS) became affordable for field staff, making it possible to determine their location with far greater accuracy. Today, advances in computer technology enable staff to enter map information on palmtops in the bush and produce maps showing the expected spread of dieback decades into the future.

Despite enormous advances in technology and trial of satellite imagery and other remote sensed data, skilful interpretation and ground survey remain essential in mapping the extent and impact of dieback. It is estimated that dieback interpreters have walked assessment lines over 700,000 hectares, excluding areas mapped more than once, demarcating sites with around 85,000 rolls of tape and wearing through about 540 pairs of boots.

The information collected is used to manage access and operations in these landscapes, to project future spread and impact of the disease in the vegetation and wildlife it supports, and to contribute to a variety of research and educational projects. CALM is currently developing a dieback atlas, a project that will make the latest dieback mapping available to everyone in the community involved in managing dieback across the landscape.



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