The role of pathogens in the decline of tuart

Mike Stukely

Abstract

Plant pathogens can belong to any of a range of diverse and large groups – fungi, bacteria, nematodes, viruses, viroids, or phytoplasmas. There is a limited amount of information available on the pathology of tuart, and only fungi have received much attention. Fungi may directly attack either tree roots, stems, branches and twigs, foliage or reproductive organs.

Canker fungi are known to be present in tuart, and can significantly affect some trees. But cankers in trees are very common – these fungi are normally present in healthy forests and do not often cause great or lasting damage. Similarly, wood rot fungi are present in tuart, and these can significantly weaken some trees; these, too, are common in healthy forest. *Phytophthora cinnamomi* is not considered to be a problem, as tuart has a relatively high resistance to it; moreover, tuart grows on low-impact sites for *Phytophthora* (Spearwood sands and related systems). Some amenity plantings of tuart have shown damage from *Armillaria*, but tuart is generally more resistant to this pathogen than jarrah or wandoo. It is unlikely that some "new" pathogen alone is responsible for the decline – but the potential for the newly-described Mundulla Yellows disease to affect tuart needs to be examined further.

A large amount of time could be spent on well-meaning studies of populations of the countless species of micro-organisms that inhabit tuart trees, and examining the damage that they might cause under various conditions. But this in itself probably would not bring us much closer to solving the tuart decline problem.

Where trees are showing a Decline syndrome, as in the case of tuart, it is unlikely that a primary pathogen or pest is the sole cause (although one or more pathogens may be involved). In these situations generally, tree vigour is reduced over time by some external stress; trees' defences are consequently lowered and they become predisposed to attack by various opportunistic organisms that will quickly exploit any advantage. In some cases, the underlying problem may abate naturally, and trees can then recover without the need for management intervention. Cycles of decline and recovery may thus occur over time.

Complex interactions of environmental and biotic factors result in tree declines. The "Disease Triangle" illustrates this dynamic interdependence of factors. Perturbations in the balance of this triangle may lead to predisposition of trees to attack, and to increased disease. There is a need for investigation into the effects on tree vigour and health that result from interactions between frequently encountered pathogens and pests, environmental factors such as water availability and nutrition, and the application of different management treatments. It is necessary first to determine which factors are relevant and are contributing to decline, and which of these, if any, can be manipulated. If the underlying cause(s) of tree stress can be identified and addressed early enough, affected trees may be helped to recover and possibly others can avoid exposure to these factors following management treatments.

The need for this work is especially pressing in the case of tuart, as it is a relict species now surviving generally on marginal sites. With increasing urban development and land-use changes in its environment, tuart is likely to become increasingly vulnerable. Predicted climate changes in coming decades will superimpose additional stresses that may favour disease development. Furthermore, with regeneration from seed now often low or non-existent, the remaining tuart stands will become increasingly senescent, less able to adapt to imposed stresses, and more susceptible to attack by pathogens and pests.

Mike Stukely holds a Bachelor of Science (Agriculture) degree with Honours, from The University of Western Australia. He has worked in forest research since 1977 with the Forests Department of WA and then with the Department of Conservation and Land Management. Major pathology-related projects have included an investigation of mortalities of *Pinus radiata* (caused by *Phytophthora cinnamomi*); the demonstration of genetic resistance of *P.radiata* to *P.cinnamomi* and selection for this trait (with Mr T.Butcher, now of FPC); the demonstration of genetic resistance of jarrah to *P.cinnamomi*, and then a selection program, leading to the current establishment of seed orchards for the production of dieback-resistant jarrah for use in rehabilitation plantings.

Mike has been monitoring Mundulla Yellows disease in eucalypts in the south-west since 2000, and has been Manager of CALM's Vegetation Health Service at Kensington since July 2001.

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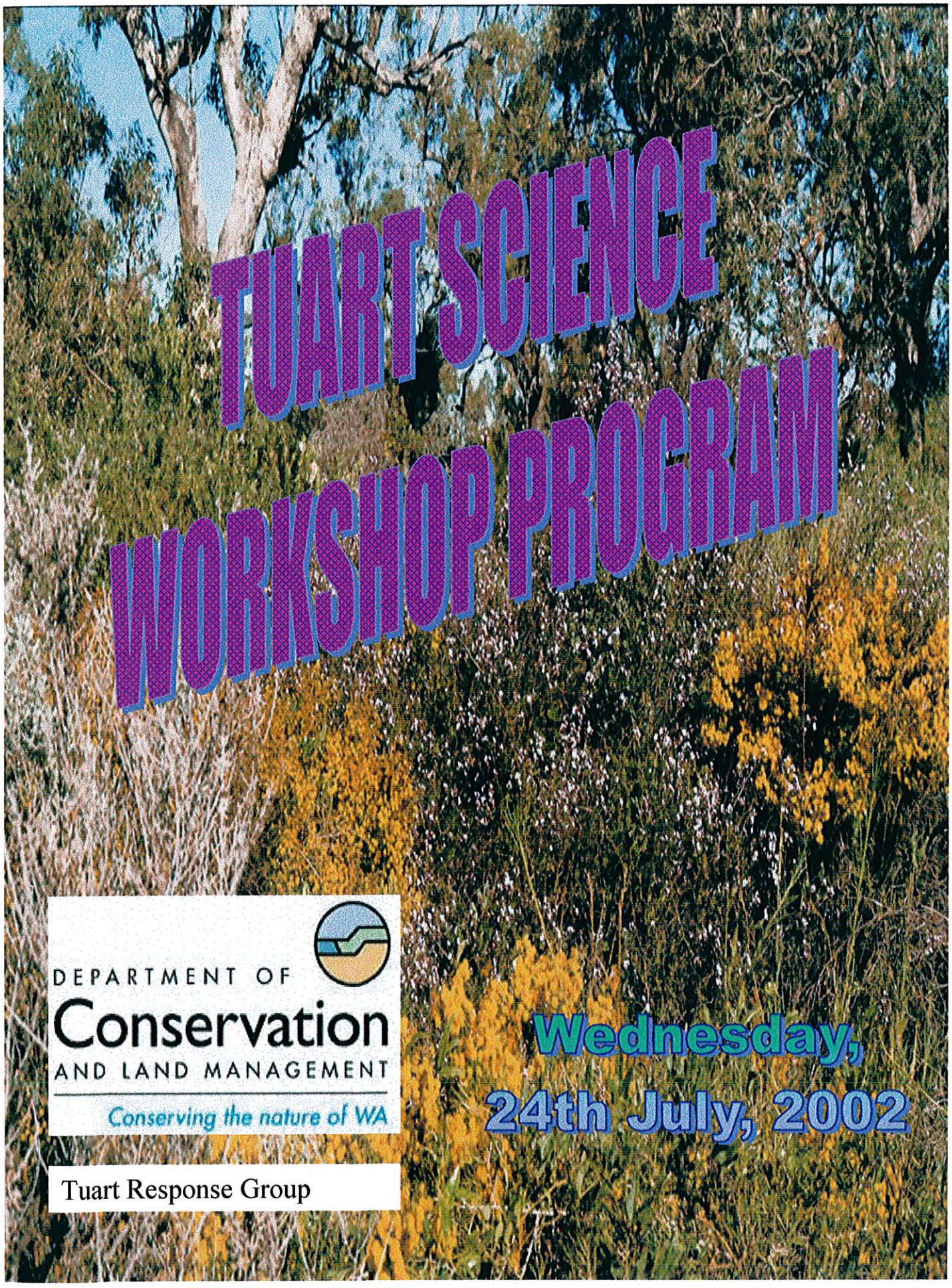

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