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2 Environmental correlates and associations of tuart decline at Yalgorup

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Tuart (*Eucalyptus gomphocephala* DC.) is an ecologically and culturally important tree species that grows across a narrow 400 km coastal belt, from the Sabrina River south of Perth to Jurien Bay in the north. Unfortunately, tuart is also a species under considerable threat due to clearing, lack of recruitment and canopy decline.

Canopy decline is of particular concern, being increasingly reported throughout the tuart distribution. Despite this, previous studies of tuart have generally been limited to localised canopy decline events.

This two-phased study firstly involved an assessment of tuart canopy condition at 46 sites across the species distribution (Fig. 1). At each study site the canopy condition of at least 20 tuart trees was assessed using estimations of canopy completeness, measures of canopy size reduction and through the scoring of canopy condition indices. The second phase of the study involved collecting data on a wide selection of environmental factors considered to be important to canopy condition. These included factors of stand structure, understorey composition, landform (soil type, geology, topography, and geography), climate (gradients and change), hydrology (watertable depth, depth change, and chemistry), fire regimes, pollution and anthropogenic disturbance (fragmentation and site disturbance).

Assessment of canopy condition indicates that most of the tuart distribution has slight to moderate canopy decline, and is characterised by a mean canopy completeness of 70 per cent (Fig. 2).



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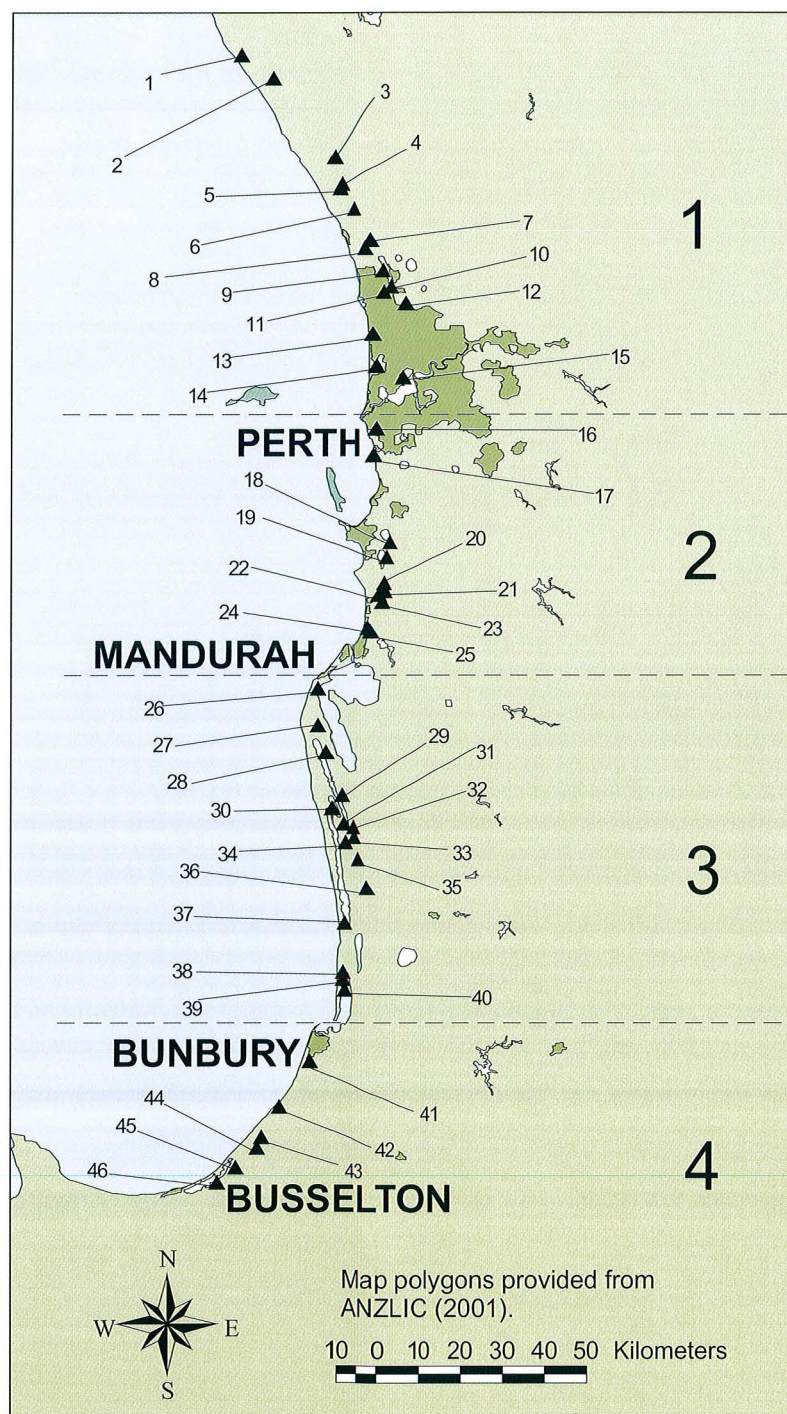


Figure 1: Distribution of the 46 sites established as part of this study.

Most of this canopy decline is considered to be background (stand level) decline and likely to be a characteristic of the species. However, the lack of comparative studies using similar methodology makes the determination of the current state of tuart canopy condition difficult. Long-term monitoring of tuart canopy condition is recommended to determine temporal trends in canopy condition.

The main area of concern for tuart conservation was found to be the Yalgorup region where trees had typically less than 30 per cent canopy completeness (Sites 28-32: Fig. 2). Severe canopy decline in this region is similar to dieback reported in other eucalypt species across Australia – that is, gradually

receding canopy foliage leaving stag-headed trees and abundant epicormic foliage. Cases of canopy decline, similar in structure to that of the Yalgorup region, were found at Yellagonga (Site 9), Neerabup (Site 7) and Ludlow National Park (Site 45).

Investigations into environmental factors found severe canopy decline in the Yalgorup region is associated with higher rainfall, finer and shallower soil, higher groundwater alkalinity and salinity, and greater rates of groundwater salinity increase. Elsewhere tuart canopy decline was found to be associated with nutrient enrichment (high topsoil ammonium nitrogen) and high levels of fragmentation. Environmental factors other than those mentioned do not appear to

be causing tuart canopy decline across the distribution, for example understorey competition or altered fire regimes.

Future management of tuart canopy decline needs to focus on the severe canopy decline in the Yalgorup region and build upon the hypotheses proposed in this study to explain canopy decline. Low recruitment should also not be forgotten as a major cause of the species decline.

Key references:

Edwards, T. A. (2004). Environmental Correlates and Associations of Tuart (*Eucalyptus gomphocephala* D.C.) decline. MSc. Thesis. Edith Cowan University WA.

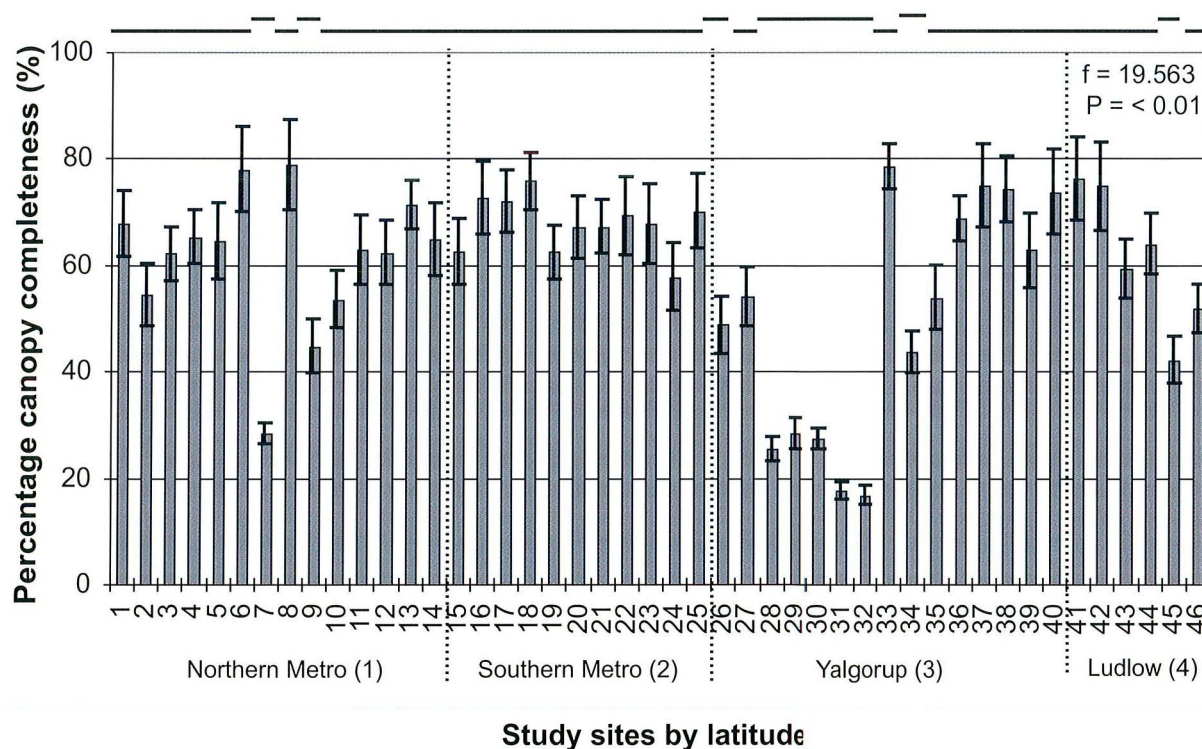


Figure 2: Mean canopy completeness (CC) per study site by latitude.