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## A Variable Sense of Place as Exemplified in an Iconic Urban Reserve in Western Australia

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### Introduction

Extensive open spaces containing predominantly natural vegetation are rarely represented within the inner areas of major cities. In Europe, from centuries to several millennia of human impacts has created a primarily human landscape. Some public open spaces can be traced back to commons and hunting estates (e.g. Phoenix Park, Dublin), while others were established during the 19<sup>th</sup> century to restore human health and well-being, as well as natural beauty, to overcrowded and polluted urban areas (Gilbert, 1989). In the New World, many cities which saw rapid population growth prior to the turn of the 20<sup>th</sup> century have similar open spaces, characterised by picturesque-style landscape gardens and recreational facilities. For example, Central Park in New York was established in 1853 on 700 acres (290 ha) of land previously occupied by the shanties and subsistence gardens of the poor.

Few major urban areas have extensive inner city open spaces dominated by natural vegetation. Among them are Kings Park in Perth (Australia) and Stanley Park in Vancouver (Canada), both boasting areas of around 1000 acres (400 ha) within 2 km of the city centre. Perth was first settled in 1829 and part of the area now occupied by Kings Park was set aside as parkland in 1831. Its reserve status was confirmed in 1872 and the area was enlarged to its current size in 1890 (Beard 1967). Subsequent development of a botanical garden has left a natural vegetation remnant of about 300 ha.

Many large city public open spaces have acquired iconic status, attracting strong public participation and support, and Kings Park enjoys such status in Western Australia. The park serves a variety of functions including as an important cultural link to nature for urban indigenous peoples, recreation, conservation of native vegetation and species, a demonstration site for plant species adapted to the local environment, and as one of the largest vegetation remnants in a network of reserves providing stepping stones for plant and animal species movement across the city.

The 'sense of place' that a city and its inhabitants come to identify themselves by can have profound impacts on the way that urban landscapes develop. In the case of Perth, its icons are the Swan River, The sandy beaches of the Indian Ocean coastline, and Kings Park. While the first two have defined the way that the city is laid out and has grown, the latter has fostered the development of an Australian garden and landscape approach to urban design, and a strong native species conservation ethic. Pickett and Cadenasso (2006) argue that urban ecology is increasingly being recognised as relevant to urban design and that ecologists need to engage more fully with urban planners, landscape architects and social scientists in planning the futures of our cities. They identify a number of integrative tools for the study of urban ecosystems, including watersheds, patch dynamics, comparative studies, simulation modelling and long term data. Long-term monitoring of public open spaces elsewhere has shown significant changes in the composition and structure of vegetation (Nygaard & Odgaard, 1999) with causes linked to management activities and user impacts. Pickett and Cadenasso argue that the combination of long-term vegetation monitoring, use of historical documents, and empirical/experimental

studies of plant species demography in the urban context can detect and determine the causes of vegetation and biodiversity change associated with management and human use, and contribute to better urban planning and management.

### Methods

In 1939 the vegetation in a 60 ha area of Kings Park was mapped by A.M. Baird of The University of Western Australia, and in 1965 the tree layer composition of another area of Kings Park (4.9 ha) was surveyed by Beard (1967). Resurvey of the area mapped by Baird was reported by Crosti *et al.* (2007) while re-examination of the Beard area was completed by us early in 2007. By reassessing these two areas we aim to determine any changes in the vegetation over the intervening 60 and 40 years, respectively, why they have occurred and what management responses are needed.

The Kings Park bushland is a mixed *Eucalyptus-Banksia-Casuarina* woodland located within the 400 ha Kings Park and Botanical Gardens, approximately 1.5 km from the Perth Central Business District. The park is isolated from other native vegetation by the Swan River to the south and east, and urban development in all directions. Almost a third of recorded plant species are exotics, with the South African grass, *Ehrharta calycina*, a major understorey invader since the 1940s.

In both studies the dominant species (the tall trees *Eucalyptus marginata* (jarrah), *E. gomphocephala* (tuart), *Corymbia calophylla* (marri), and small trees *Casuarina fraseriana*, *Banksia attenuata*, *B. menziesii*, *B. grandis* and *B. ilicifolia*) were mapped and the density of selected understorey species enumerated. The original plots were relocated as accurately as possible, the trees enumerated and eucalypts and banksias mapped. Saplings of all tree species (plants 30 cm to 2m tall and with a stem diameter less than 2.5 cm) were counted in each plot or, in the case of the prolific *Casuarina*, a subset of the plots. In this paper the results of the resurvey cover 12 of Beard's 24 plots.

### Results

In both areas there has been considerable change in the abundance of tree species. In the area mapped by Baird the mean density of woody plants increased substantially in the 60 years (Crosti *et al.* 2007). The relative abundance of species also changed, with increases in proportions of *Corymbia calophylla*, *Casuarina fraseriana*, *Acacia saligna* and the shrub, *Dryandra sessilis*. However there was a marked decrease in the density and relative frequencies of *Banksia* species. Similarly, in the area originally mapped by Beard, there has been a large increase in *Casuarina*, and a decrease in *Banksia* (Table 1). For *E. gomphocephala*, many large trees carry dead branches (as they did in 1965) but few have died, while there has been an increase in the density of both young trees and saplings. *Casuarina* saplings were not recorded by Beard (1967) but have a very high density. Some of the changes in the appearance of the vegetation can be illustrated in a profile diagram of a 90 X 15m plot that was drawn in 1965 (Beard, 1967) and re-examined in 2007 (Fig. 1). Many of the *Casuarina* trees have increased in height, while some *Banksia* and *Casuarina* and two of the large moribund *E. gomphocephala* have died.

**Table 1.** Tree layer vegetation change (mean  $\pm$  se tree density  $\text{ha}^{-1}$ ) from 1967 to 2007 in Kings Park, Perth based on remeasurement of trees in twelve contiguous 0.5 acre (0.21 ha) plots.

Species	Size-class	1965	2007
<i>Eucalyptus gomphocephala</i> (tuart)	tree	14 $\pm$ 3	52 $\pm$ 23
	sapling	2.5	26 $\pm$ 13
<i>E. marginata</i> (jarrah)	tree	6 $\pm$ 2.5	15 $\pm$ 7
	sapling	7.4	3.5 $\pm$ 2
<i>Banksia</i> species	tree	158 $\pm$ 14	55 $\pm$ 11
	sapling		60 $\pm$ 18
<i>Casuarina fraseriana</i>	tree	24 $\pm$ 3.4	419 $\pm$ 60
	sapling		1770 $\pm$ 480
<i>Corymbia calophylla</i> (marri)	tree		18 $\pm$ 6
	sapling		19 $\pm$ 6



**Figure 1:** Profile diagram of a 90m section of the Kings Park bushland; B = *Banksia attenuata*, C = *Casuarina*, M = *Corymbia calophylla*, J = *Eucalyptus marginata*, T = *Eucalyptus gomphocephala*; dark shading in (c) indicates dead limbs or trees. a. Inferred vegetation structure many years prior to 1965 from Beard (1967), b. Vegetation structure in 1965 from Beard (1967), c. Vegetation structure in 2007.

## Discussion

This study emphasises that the vegetation in urban reserves occupied by indigenous plants will change over time due to impacts inevitably associated with their urban setting, mostly in ways not desired by management authorities. In 1967 Beard was pessimistic about the future of the bushland, proposing that *E. gomphocephala* was declining while *Casuarina* and *Banksia* were increasing, transforming the area from an open eucalyptus woodland into a low, dense casuarina-banksia woodland. There is consistency between the two remeasurement areas reported here; Beard's projections of increased *Casuarina* have been proven correct, however, *Banksia* species have declined rather than increased. Further, Beard's concern for *E. gomphocephala* seems unsubstantiated, since few mature trees have died and there are many young individuals now present, albeit patchily distributed. The causes of shifts in dominance are most likely an increase in the occurrence of fire and weed invasion, both of which advantage casuarina seedling recruitment, and a syndrome that kills banksias in late summer/autumn (perhaps linked to increased heat and drought over the past 30 – 40 years; see Crosti et al. 2007).

Up until the 1960's plants not native to Western Australia were planted in Kings Park bushland (Buist et al. 2000). Some of these have become pests (e.g. *Brachychiton populneus*, *Eucalyptus cladocalyx*) and considerable efforts have been made in recent years to remove them. Planting of non-native species in urban bushland is no longer a management practice. Wildfires and weed invasion are problems for all reserves. However urban reserves are increasingly valued by local residents as areas to be protected. As ecological sustainability becomes a more common concern they are also considered part of an urban network to support biodiversity and sustainability. Despite rapid globalisation, the indigenous vegetation of Kings Park continues to provide a reference point for local residents for their own urban landscape design and for retention of their sense of place. This is likely to become more, rather than less, important as the city continues to grow and to be influenced in other ways by global factors. This in turn makes the sound management of natural vegetation fragments in urban areas an important focus in the context of sustainable cities.

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