

Facing the Challenges of Using Fire in Urban Bushland Restoration

JUDY LAMBERT

North Head Sanctuary Foundation

Corresponding Author Email: judy@communitysolutions.com.au

Abstract

Many parts of the Australian landscape need fire to maintain their ecological health. The endangered Eastern Suburbs Banksia Scrub (ESBS) found at North Head in Manly and in other small areas of coastal Sydney is one such community. After several decades without fire, much of the North Head ESBS is becoming senescent and fears of species loss are growing.

However, the challenges faced in re-introducing fire into bushland surrounded by National Heritage listed buildings and densely settled residential areas are a strong deterrent to the use of fire as a management tool.

In 2011, planning for two small hazard reduction burns on North Head provided an ideal opportunity for the North Head Sanctuary Foundation and the Australian Wildlife Conservancy to work with the land managers (primarily the Sydney Harbour Federation Trust and the National Parks and Wildlife Service) to conduct comparative studies of a burn and selective thinning of species dominant in senescent ESBS, to determine the relative ecological merits of these management options.

Pre- and post-treatment assessment of vegetation species richness and diversity, invertebrate populations and use of the treated areas by the endangered population of long-nosed bandicoots are being conducted in burnt and thinned areas. The impacts of rabbits are also being assessed by the use of exclusion fences to establish protected quadrats in parts of each treatment area.

At the time of writing, the study sites had reached only six months post-treatment. Funded by the Foundation for National Parks and Wildlife for the initial 18 months, this study is intended to continue for three years post-treatment.

It is anticipated that the results will assist land managers in making sound decisions about the relative merits of fire and selective thinning, and of rabbit exclusion, in managing to restore areas of senescent coastal scrub in urban areas where fire management presents a challenge.

INTRODUCTION

Many parts of the Australian environment need fire to maintain their ecological health and diversity. Listed as an endangered ecological community both under the NSW *Threatened Species*

Conservation Act 1995 and nationally under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, Eastern Suburbs Banksia Scrub (ESBS) is one such community. Occurring only on nutrient-poor coastal sand dunes,

this community once covered an estimated 5 300 hectares in coastal areas of Sydney but has now been reduced to approximately 149 hectares (less than 3% of its original extent).

Both too frequent fire and long intervals between fires are unhealthy for many of the species in ESBS. Left undisturbed for more than about 15 years, remnants of ESBS will become dominated by one or two species, often coastal tea-tree, (*Leptospermum laevigatum*), that crowd out others and the scrub becomes senescent. Burnt too frequently, many species will not have time to set seed and regrow. The preferred fire interval to maintain robust ESBS in which a mix of coastal shrubland species survive and flourish is approximately 8-15 years.

As urban development has expanded, most of the remaining ESBS has been reduced to relatively small, scattered remnants. The largest and most intact remnants, almost half of the remaining ESBS, are those at North Head in Manly.

Like other bushland in urban areas, fire has been excluded from much of the ESBS in recent decades, putting at risk the survival of this unique combination of coastal species.

The challenges faced in re-introducing fire into bushland areas surrounded by National Heritage listed buildings and densely settled residential areas are strong deterrents to intentional use of fire as an ecological management tool. For pragmatic reasons other methods of disturbance, although less likely to stimulate restoration of the ecological

community, are increasingly being considered as an alternative to burning the bush.

IS THINNING A USEFUL ALTERNATIVE TO FIRE IN RESTORING COASTAL SCRUB?

In 2011, planning for two small hazard reduction burns on North Head provided an ideal opportunity for the North Head Sanctuary Foundation and the Australian Wildlife Conservancy to work with the public land managers (primarily the Sydney Harbour Federation Trust and the NSW National Parks and Wildlife Service) to conduct comparative studies of a burn and selective thinning of species dominant in senescent ESBS, to determine the relative ecological merits of these management options.

Pre- and post-treatment assessment of the richness and diversity of plant species present, and the use of the areas by the endangered population of long-nosed bandicoots at North Head are being conducted over a three-year period in both the burnt and thinned areas.

The impact of rabbits on newly emerging vegetation is also a concern. To address this issue, wire netting exclusion fences have been established across parts of the burnt and thinned areas and comparisons of vegetation are being made within and outside the 5 x 5m exclusion plots.



1a) senescent ESBS just prior to burning.



1b) fenced plot just after burning.



1c) the same plot six-months after burning.

Fig 1: ESBS study site at North Head, Manly.

Photopoint monitoring is being done at six-month intervals, with detailed botanical surveys of the fenced and matched unfenced plots being completed at six and 12 months post-treatment. A follow-up assessment is planned for three years post-treatment.

WHAT WE HAVE LEARNED TO DATE

Although the burn sites are quite small (1.3 hectares and 0.7 hectares) and the study plots are thus quite close together, data collected six months after burning or thinning shows considerable variation between plots, irrespective of how they were treated (see Fig. 1)

However, there were no significant differences between burnt and thinned plots six months after treatment. Burnt plots that were fenced contained on average 21.2 native species and 331 individual plants within the 5 x 5m plots, while thinned plots contained on average 19.8 different native species and 168 individual plants (see Fig. 2).

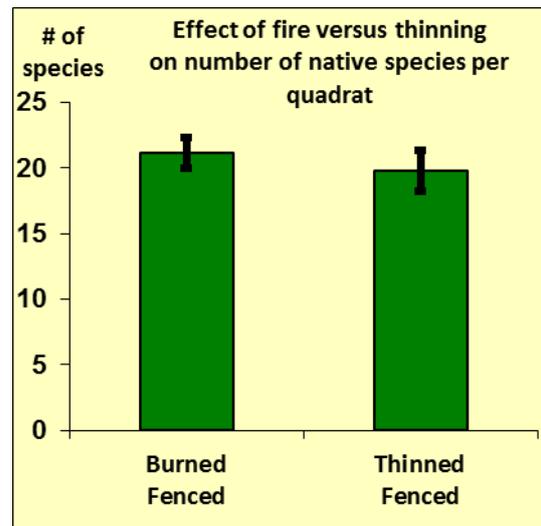


Fig 2: Number of native species in fenced plots six-months after either burning or selective thinning.

However, there were measurable differences observed in the mix of species present in burned and thinned plots. Many species found in burned plots were not found in the thinned plots and many in thinned plots were not found in burned plots.

The only other measurable differences between different treatment plots were those between those with predator exclusion fences and those without. Whereas burnt plots that were fenced contained on average 21.2 native species and 331 individual plants, unfenced plots (matched as closely as possible to the fenced plots) contained on average 17.2 native species and 180 individual plants (see Fig. 3).

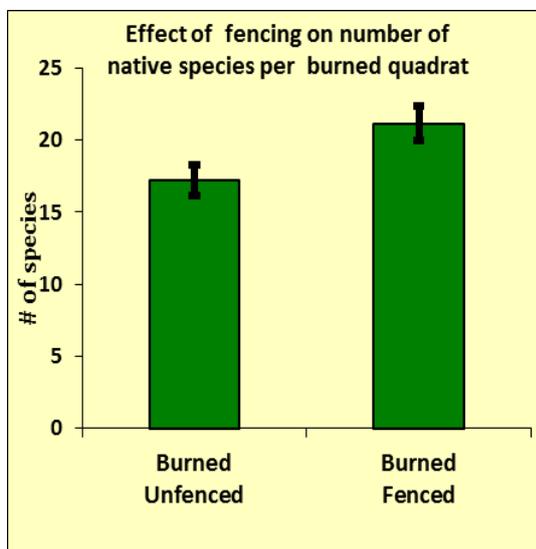


Fig. 3: Number of native species in fenced and unfenced plots 6-months after burning.

Weeds occurred in all plots both after burning and after thinning. On average the burned plots contained 2.3 weed species and 2.9 individual plants, while the thinned plots contained on average, 7.2 weed species and 34.4 individual plants. Consistent with sound bush regeneration practice, weeds were manually removed from each plot after completion of the botanical surveys and before any seeds could disperse.

DISCUSSION

The question of whether selective thinning by removing the dominant tree species present is an alternative to burning for the restoration of senescent coastal scrub in places where the re-introduction of fire in urban areas is of some considerable significance to many land managers.

Although the sites used in the current study were relatively small (1.3 hectares and 0.7 hectares), the data collected six months after burning or thinning shows considerable variation among the individual 5 x 5m plots used. A number of factors may contribute to this variability, including differences in slope, aspect, soil characteristics, micro-climates, past uses and the mix of species that are resprouters after fire, as compared with those that are obligate seeders.

After six months the overall regeneration in these sites was modest. However, the plots studied generally contained a greater diversity of species than had been apparent in dense, senescent ESBS present prior to either burning or thinning. At that time, two or three species dominated. Most notably, coastal tea-tree (*Leptospermum laevigatum*), tree broom-heath (*Monotoca elliptica*) and a small number of grass species.

At the time of this initial post-treatment assessment no significant differences were found between the effects of burning or thinning. As suggested by studies of fire impacts in other ecological communities (see, for instance Pickup et al., 2013) a longer time may be required

to enable seed germination and recovery of some species.

The most obvious difference across the project area at this time is the extent to which rabbits have removed a majority of the regrowth of small green shoots across the unfenced parts of the site, highlighting the need to control rabbit numbers prior to regeneration burning or thinning.

It is intended that photopoint monitoring will continue at six-monthly intervals for up to three years after the burning or thinning and that further botanical surveys will be completed one year and three years after treatment.

Currently, the 12-month post-treatment assessments were completed in October 2013. Burnt plots had significantly more plants, a greater number of ESBS species, greater vegetation cover and fewer weeds than thinned plots. However, unless the plots were fenced, a majority of emergent seedlings were lost to rabbit predation. A more detailed research paper is planned later in the follow-up.

REFERENCE

Pickup, M., Wilson, S., Freudenberger, D., Nicholls, N., Gould, L., Hnatiuk, S & Delandre J. (2013). Post-fire recovery of vegetated woodland communities in south-eastern Australia. *Austral Ecology*, 38, 300-312.

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BIOGRAPHY

Dr Judy Lambert was the President of the North Head Sanctuary Foundation and continues to serve as a committee member. Judy brings to her voluntary work the experience gained through several decades of work as a research scientist, a community sector environmental advocate and as the principal of a small consulting business that brings together the diversity of people needed to get sustainable outcomes in natural resource management. Her consultancies have included work with the Hotspots Fire Project and she currently serves as the NCC representative on the Manly, Mosman, North Sydney Bush Fire Management Committee.