Observations on the effects of mowing on native species in remnant bushland, western Sydney

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James, T.A. (National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, Australia 2000) 1994. Observations on the effects of mowing on native species in remnant bushland, western Sydney Cunninghamia *3(3): 515–519.* Native plant species were recorded in 1989 from Gum Tree Reserve, a small area of remnant Turpentine–Ironbark Forest in western Sydney, after many years of frequent mowing. A further list was compiled in 1993, one year after a change to a less frequent mowing regime. Within this time the number of native species recorded increased threefold. Future management options are discussed with regard to encouraging further regeneration of native species and re-establishing the soil seed bank.

Introduction

Small bushland remnants in western Sydney are subject to many pressures as a result of their size and proximity to suburban housing. With an increasing need to preserve biodiversity in the suburban context (Benson & McDougall 1991), it is now recognised that such areas are important conservation sites for their scientific, ecological, educational and heritage values and should be managed to retain their native species. The 'tidying' of areas by mowing is a widespread management practice which may reduce overall native species richness (Kirkpatrick 1986). A reduction or elimination of mowing could, therefore, allow native species to re-establish and help prevent further decline in species richness. An opportunity arose to test this hypothesis at Gum Tree Reserve in a residential area of Guildford, western Sydney. The site had been mowed frequently, approximately six times a year, probably for up to 20 years prior to July 1992 (Water Board pers. comm.). A checklist of the area was compiled by the author during this period, in August 1989. Since July 1992 Holroyd City Council have opted for a regime of less frequent mowing. The site was mowed in July 1992 and subsequently in December 1992 with no further mowing to date (Holroyd City Council pers. comm.). The opportunity was taken to record the native species present at the site in June/July 1993 to assess any change in species richness resulting from the altered mowing regime.

Study site

Gum Tree Reserve is a 0.75 ha block of land in Harris Street, a residential area of Guildford, western Sydney, about 4.5 km south-west of Parramatta (33° 51' 12" S, 150° 58' 28" E), situated on the Cumberland Plain. The underlying geology is the Liverpool subgroup of Wianamatta Shale. The average annual rainfall is approximately 940 mm (Bureau of Meterology 1979). The Reserve is a site of regrowth native woodland which, except for an adjacent Water Board pipeline corridor, is isolated by urban development. The nearest remnant bushland is at Duck Creek, Auburn, 3 km due east of the site, and at Prospect Creek, 2 km south-west of the site. The threat of development in the late 1980s motivated local residents to appeal to Holroyd City Council for conservation of the area as a local reserve.

The vegetation of the area is consistent with a drier form of Turpentine–Ironbark Forest once growing in districts west of Auburn (Benson & Howell 1990). The site is dominated by *Eucalyptus fibrosa* and *E. moluccana*, with occasional trees of *E. paniculata*, and one remaining tree each of *Syncarpia glomulifera* and *E. longifolia*. The understorey is poorly developed due to a history of clearing and regular mowing at the site. The few surviving small trees and shrubs include *Acacia parramattensis, Pittosporum undulatum, Bursaria spinosa, Rapanea variabilis* and *Maytenus silvestris*, most of which are located on the northern boundary of the reserve next to adjoining residences. Several exotic species (garden escapes) including *Tecoma capensis, Bryophyllum pinnatum* and *Bougainvillea* species have become established along this boundary. Holroyd City Council staff have recently planted several trees along the southern boundary (adjacent to pipeline corridor) including *Melaleuca linariifolia, M. styphelioides, Acacia floribunda* and *Eucalyptus* species. At least the first three species are native to the local area. Some trees of *Eucalyptus paniculata* may have been planted by the Water Board (D. Thomas pers. comm.).

Methods

Native plant species present in the reserve were recorded in August 1989, and subsequently during June–July 1993 by systematically walking the site. Observations on growth form, flowering/fruiting and means of regeneration were also made in June–July 1993.

Results

In 1989 when the site was regularly mowed, only 14 native species were recorded (Table 1). In contrast, in 1993 after a year of reduced frequency of mowing, a three-fold increase in the number of native species (14 to 45) was recorded. The regeneration of tree and shrub species was minimal, with only early stages of regrowth evident. However, there was significant regeneration of herbs, subshrubs and climbers, which accounted for 96% of the newly recorded species in 1993. Of the 45 species listed for Gum Tree Reserve, 68% are new records or have been recently recorded for the Holroyd Council area, and 13 species are considered vulnerable in western Sydney (Benson & McDougall 1991).

The dominant native grasses were perennial species including *Danthonia linkii, Digitaria parviflora, Paspalidium distans* and *Eragrostis leptostachya*, all of which were flowering or seeding at the time of the second survey. These species were well represented, particularly in areas away from the reserve boundaries, despite competition from exotic species including *Eragrostis curvula, Chloris gayana, Paspalum dilatatum, Sida rhombifolia* and *Plantago lanceolata*. Dominant species in the ground layer, other than grasses, were low-growing native shrubs, herbs and climbers with persistent rootstock and/or a stoloniferous habit including *Brunoniella australis, Einadia hastata, E. polygonoides, Dichondra repens* and *Glycine microphylla*.

As expected, there was minimal regeneration of tree and shrub species due to their longer life cycles. Limited suckering around the base of the *Eucalyptus* species was observed. The most extensive and vigorous regrowth of the larger shrub species was of *Maytenus silvestris* and *Rapanea variabilis*. Regeneration was primarily from existing rootstock, often in close proximity to the mature trees. Regeneration was also evident in *Polyscias sambucifolia, Pittosporum revolutum* and *Clerodendrum tomentosum*. The only seedlings observed were of *Acacia parramattensis*. Soil surface conditions appeared to

Table 1. Native plant species recorded from Gum Tree Reserve, Guildford in August 1989 following regular mowing (on average every 2 months), and in June/July 1993 after a change to a less frequent mowing regime. Regular mowing ceased in July 1992 with a 6 month break before a final mowing in December 1992.

Family	Species	Growth form	Aug 1989	Jun/Jul 1993	Regeneration
Monocotyledons					
ANTHERICACEAE	*Arthropodium milleflorum*	Gr		* Fr	R
CYPERACEAE	*Cyperus gracilis*	Gr		* Fl	R
JUNCACEAE	*Juncus usitatus*	Gr		* Fl	R
LUZURIAGACEAE	*Eustrephus latifolius* **V**	Cl		*	R
POACEAE	*Aristida vagans*	Gr		* Fl/Fr	R
	Chloris truncata **V**	Gr		* Fr	R
	Danthonia linkii var. *linkii* **V**	Gr		* Fl	R
	D. racemosa **V**	Gr		* Fl	R
	Digitaria parviflora	Gr		* Fl	R
	Elymus scaber **V**	Gr		*	R
	Eragrostis leptostachya	Gr		* Fl	R
	E. sororia	Gr		* Fl	R
	Microlaena stipoides	Gr		* Fl	R
	Panicum simile	Gr		* Fl	R
	Paspalidium distans	Gr		* Fl/Fr	R
	Sporobolus creber **V**	Gr		* Fl	R
	Stipa rudis subsp. *nervosa* **V**	Gr		* Fr	R
Dicotyledons					
ACANTHACEAE	*Brunoniella australis*	Gr		*	R
ARALIACEAE	*Polyscias sambucifolia* **V**	Sh		*	R
ASCLEPIADACEAE	*Tylophora barbata* **V**	Cl		*	R
ASTERACEAE	*Vernonia cinerea* var. *cinerea*	Gr		* Fl	R, ?S
BIGNONIACEAE	*Pandorea pandorana* **V**	Cl	*	*	R
CAMPANULACEAE	*Wahlenbergia gracilis*	Gr		*	R, ?S
CELASTRACEAE	*Maytenus silvestris*	Sh	*	*	R
CHENOPODIACEAE	*Einadia hastata*	Gr	*	* Fl/Fr	R, S
	E. nutans	Gr		*	R
	E. polygonoides **V**	Gr		* Fl/Fr	R, S
CONVOLVULACEAE	*Dichondra repens*	Gr		*	R
EUPHORBIACEAE	*Breynia oblongifolia*	Sh	* Fl/Fr	* Fl/Fr	R, ?S
FABACEAE (Faboideae)	*Desmodium varians*	Gr		*	R
	Glycine microphylla **V**	Cl		*	R
FABACEAE (Mimosoideae)	*Acacia parramattensis*	Tr	*	*	S
LORANTHACEAE	*Amyema ?congener*	Aerial parasite	*	*	
MYRSINACEAE	*Rapanea variabilis*	Sh	* Fl	*	R
MYRTACEAE	*Eucalyptus fibrosa*	Tr	* buds, Fr	* buds, Fr (minimal suckering)	R
	E. longifolia **V**	Tr	*	* Fl,Fr (minimal suckering)	R
	E. moluccana	Tr	* buds, Fr	* buds, Fr (minimal suckering)	R
	E. paniculata	Tr	* buds, Fr	* buds, Fr (minimal suckering)	R
	Syncarpia glomulifera	Tr	*	*	R
PITTOSPORACEAE	*Bursaria spinosa*	Sh	* Fr	* Fr	R, ?S
	Pittosporum revolutum	Sh	*	R	
	P. undulatum	Sh	*	*	None
RANUNCULACEAE	*Clematis glycinoides*	Cl	*	R	
SCROPHULARIACEAE	*Veronica plebeia*	Gr	*	R	
VERBENACEAE	*Clerodendrum tomentosum* **V**	Sh	*	R	

Key

V = vulnerable in western Sydney. Growth form: Tr= Tree, Sh= Shrub, Cl= Climber, Gr= Ground (herbs or subshrubs with renewal buds at or near surface). Regeneration = means of regeneration recorded: R = rootstock, S = seed, * = species present: Fl = flowers present; Fr = fruit present. Nomenclature follows Harden (1990–93).

be suboptimal for germination and seedling growth, with large areas exposed with dry, hard soil and minimal accumulations of organic matter.

Discussion

The 'new' species recorded in the second survey were predominantly herbs, subshrubs and climbers capable of vegetative regeneration. This is consistent with previous studies that indicate mowing will promote a community dominated by plants with renewal buds near or below the ground surface and with short life cycles (Buchanan, 1989). These resprouters may have been present at the time of the initial survey but were not readily identifiable due to frequent defoliation by mowing. It is unlikely that recolonisation from the adjacent Water Board corridor or other remnant vegetation in the district could satisfactorily explain the documented increase in native species richness. Although c. 100 native species have been recorded from upper sections of the pipeline corridor (D. Thomas 1993), only 37% were also recorded at the study site.

The lack of seedlings could indicate that the soil seed bank has been severely depleted due to long-term mowing of the site, although some seed may be dormant awaiting favourable conditions for germination and establishment. The long-term viability of seed for different species is poorly documented, but estimates for *Acacia* species may be as high as 50 to 100 years (New 1984). The high percentage of grasses and herbs flowering or fruiting at the time of the second survey indicates a significant potential input to the soil seed bank within 12 months of the change of mowing regime. Further investigations including documentation of the size, composition and viability of the soil seed bank are needed.

To allow significant tree and shrub regeneration there should be no mowing for several years. In the longer term, a reduced mowing regime may need to be implemented to address concerns regarding both the appearance of the site and any potential fire hazard. Mowing could occur once every two or three years or when there is a high fire risk, at least along the northern boundary adjacent to local housing. A mosaic mowing regime may be feasible whereby selected areas are mowed at different frequencies and/or heights. This approach could reduce fire hazards where needed, provide some public access, protect regenerating trees and shrubs, and promote the growth of herbs and subshrubs. Mowing may also be useful in the control of some weedy species, but the timing, frequency and height of cutting must be closely related to the phenology of individual species. The use of control burning could also be considered, although there are limitations with the small size of the area and the close proximity of housing.

Conclusions

The present species composition of the woodland in Gum Tree Reserve suggests that the site was once part of a western outlier of Turpentine–Ironbark Forest. There are no other examples of this vegetation type existing in the local district today and consequently, despite its small size, it is of significant heritage and scientific value. The botanical significance of the site is highlighted by the large proportion of native species not previously recorded in the Holroyd Council area and 13 species considered vulnerable in western Sydney (Benson & McDougall 1991).

The long history of frequent mowing at the site is likely to have resulted in the loss of some native species. Conditions favour the persistence of species with protected renewal buds, persistent underground rootstock and short life cycles. An increase in species richness (14 to 45 species) was documented within 12 months of the change in mowing regime. This increase is probably chiefly due to regeneration of these persistent species which were not readily identifiable in the initial survey. The possibility of some degree of recolonisation from the adjacent pipeline corridor also exists. Regeneration was primarily by vegetative means. The soil seed bank may be severely depleted or a small store of dormant seeds may exist awaiting favourable conditions. A major limitation of the survey is the absence of a control area that has not been mowed for comparison. The effect of other environmental factors, therefore, cannot be eliminated.

To restore the original vegetation of the site, natural regeneration must be encouraged. This could be achieved by stopping all mowing at the site for an initial period of 1–2 years and then instituting an infrequent or mosaic mowing regime. Maximum protection should be given to regenerating trees and shrubs. Additional management practices including the propagation of vegetative or seed material collected from the site should be considered. Exotic species need to be controlled within the reserve, particularly along the northern boundary where garden escapes have become established.

Despite the limitations of the study, the results indicate that reduced frequency of mowing can have positive effects on native species richness. The apparent persistence of many native species despite long-term mowing is of interest. The implications of these results for the management of urban bushland areas by local councils warrants recognition. It is important that detailed documentation of such remnant bushland is undertaken and appropiate priorities and management practices adopted.

Acknowledgements

I would like to thank Doug Benson, Phillip Kodela and Dr Surrey Jacobs for valuable comments on the manuscript and David Thomas of the Water Board for useful information on the local area. Holroyd City Council provided details of recent mowing practices at the site.

References

Benson, D. & Howell, J. (1990) *Taken for granted: the bushland of Sydney and its suburbs* (Kangaroo Press: Kenthurst).

Benson, D. & McDougall, L. (1991) *Rare bushland plants of western Sydney* (Royal Botanic Gardens: Sydney).

Buchanan, R.A. (1989) *Bush regeneration: recovering Australian landscapes* (TAFE: New South Wales).

Bureau of Meterology (1979) *Climatic survey Sydney region 5: New South Wales* (AGPS: Canberra).

Harden, G.J. (ed.) (1990–93) *Flora of New South Wales* Vol. 1–4 (New South Wales University Press: Kensington).

Kirkpatrick, J.B. (1986) The viability of bush in cities — ten years of change in an urban grassy woodland. *Australian Journal of Botany* 34: 691–708.

New, T.R. (1984) *A biology of acacias* (Oxford University Press: Oxford).

Thomas, D. (1993) Lower canal vegetation survey. Water Board Report (Unpub.).

Manuscript received 3 August 1993
Manuscript accepted 15 December 1994