

Lane Cove National Park

Bushcare volunteers: Taking stock, 10 years on

By Margaret Reidy, Winkie Chevalier and Tein McDonald

Lane Cove Valley's wildfires of 1994 triggered not only massive regeneration of natives and weeds but also a massive response from bush regeneration volunteers. Is the momentum still positive and what lessons can be learned?



Figure 1. The high intensity wildfire of January 1994 burnt the majority of the bushland in Lane Cove National Park, Sydney, Australia, and coincided with a community-driven program to rehabilitate the Park's bushland. The experience of the coordinating group, the Friends of Lane Cove National Park, provides important lessons that can be applied elsewhere. (Photo: T McDonald.)

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Introduction

Under extreme weather conditions, a bushfire swept through the Lane Cove Valley in the northern suburbs of Sydney, Australia, on 8 January 1994. No lives were lost but 13 homes were destroyed or damaged and the highly intense fire burnt 332 ha (83%) of the native bushland of the Lane Cove National Park (Fig. 1).

Soon after the next substantial rains, abundant germination of native sclerophyll species occurred throughout the burnt areas. Of itself, this regeneration would not be unexpected or surprising. What

was different about this fire was that it burnt a number of intensely weedy gullies and suburban boundary sites that had not been subjected to high intensity fire for many decades – and rather than only weed regeneration in these areas, native regeneration was also prolific. The wildfire was seen, therefore, as an unprecedented opportunity to achieve regeneration of degraded areas if weed could be controlled. This challenge galvanized bush regenerators already working in the Park to become involved in an effort to enlist the support of the broader community (Box 1, Fig. 2).

Box 1. Why was a concerted effort made after the fire?

Tipping the balance towards native resilience rather than weed resilience.

The rationale behind the call for community support for on-ground works was the observation that the bushfire had carried out 'primary treatment' across a very large area (see Box 2 for definition of terms). This primary treatment extended to moist gullies and highly fertile weed-dominated urban edges, many of which were unlikely to have been subjected to intense fire since the first period of urban construction that led to the development of weeds in these areas.

This fire was thought to have killed a proportion of the weeds in these areas while triggering much of the remaining rootstocks and weed seed banks to regenerate; 'flushing out' weed to a high degree. However, the wildfire also triggered

massive germination from long-buried seedbanks of fire-adapted native species (see Box 3).

The regeneration project was instigated for the following reasons. It was considered by regenerators that if the opportunity was not taken up to control weeds at this point, they would proliferate and smother natives before the natives could recharge their own seedbanks; potentially causing the sites to regress to even more degraded states than prior to the burn. In contrast, if weeds were controlled during the period required for the natives to dominate the sites, complete their life cycles, and reproduce; the sites could develop a native resilience higher than prior to the burn.



Figure 2. The intensity of the fire triggered germination of long-buried native seed, even on sites previously considered by regenerators to have no potential for native regeneration. Shown here is a wattle (*Acacia* sp.) germinating amongst Ink Weed (*Phytolacca octandra*) and Black Nightshade (*Solanum nigrum*). (Photo: T McDonald.)

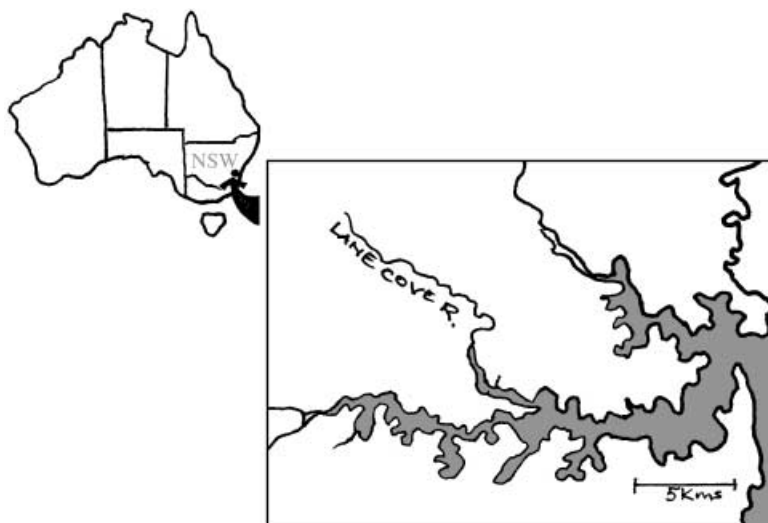


Figure 3. Lane Cove National Park, Sydney, Australia, stretches along the middle and upper reaches of the Lane Cove River, one of the main rivers draining into Sydney Harbour. The Park's narrow shape and topographic location makes it highly susceptible to nutrient elevation and weed invasion arising from the surrounding catchment. This location, however, also places it within the social catchment of the residential and working population of the valley, increasing its potential to attract volunteers.

This article reviews the genesis, scope, approaches and results of the community-based bushland restoration program that was given a major impetus by this fire (Also see brief review in White 1997; p. 211). The program, managed by Lane Cove National Park, is now referred to as the Lane Cove National Park Volunteer Bushcare Program.

The Park and its catchment context

Lane Cove National Park ('the Park') covers an area of 600 ha along the Lane Cove River in Sydney (Fig. 3). It attracts up to 1 million picnickers, bushwalkers, cyclists, joggers and birdwatchers per year, including interstate and overseas visitors. The Park is surrounded by residential suburbs, a large corporate estate, and a cemetery, and most of the Lane Cove River catchment has been developed for various urban and suburban purposes. Because of this development, the catchment generates increased volumes and velocity of urban run-off (ultimately running into the river that bisects the Park), its streams and floodplain soils are subject to elevated nutrient, and its bushland is subject to altered fire regimes and invasion by weed (NSW National Parks & Wildlife Service 1998).

The Park contains a variety of vegetation communities no longer well represented in the region, ranging from closed forests along creeklines (dominated by Water Gum, *Tristaniopsis laurina*) through tall open forests of Blackbutt/Sydney Blue Gum (*Eucalyptus pilularis*/*E. saligna*), to open woodland and heath on upper slopes and mangroves along the Lane Cove River. It provides habitat for three plant species listed as vulnerable under the NSW Threatened Species Conservation Act 1995 (TSC Act): *Darwinia biflora*, *Tetratheca glandulosa* and *Prostanthera marifolia*. In terms of fauna, a total of 156 species have been recorded within the park and its surrounds since 1950, including 19 threatened species. Threatened fauna found in the Park in recent years include the Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Red-crowned Toadlet (*Pseudophryne australis*), Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*), and Grey-headed Flying-fox (*Pteropus poliocephalus*; all these species are listed Vulnerable under the TSC Act.) The area

supports particularly high numbers of Powerful Owl and Red-crowned Toadlet, contributing significantly to the survival of these species within the region and plays an integral role in the survival of a number of native animals within the region (NSW National Parks & Wildlife Service 1998; Department of Environment & Conservation 2004; Plant nomenclature used in this article follows Harden (1990–1993).)

Early days of Program

The genesis of the Volunteer Bushcare Program can be traced back to March 1991, well before the wildfire, when over 40 interested locals turned up to a breakfast meeting at Carters Creek organized by well known conservationist Nancy Pallin (Fig. 4). Nancy appreciated that many people actively used the Park for recreation and saw an opportunity for park users to 'give something back' through active involvement in bush regeneration.

The breakfast was followed by a well-organized introductory bush regeneration training session (Fig. 4). A small team of trained bush regenerators acted as supervisors for small teams of newcomers, imparting basic skills through hands-on weeding of Lantana (*Lantana camara*) and other weeds in the designated work zone. This led to the formation of a permanent group who met monthly; an initiative that was soon followed by the formation of another group that met weekly.

These regular Bushcarers realized that the Park needed more helpers. Late in 1993 it was decided, with the blessing of Park management, to establish a working committee to recruit more volunteers and extend the works into other needy areas in the Park. So a group calling themselves 'The Friends of Lane Cove National Park' was formed.

Wildfire galvanizes action

Events then took a dramatic turn. Before any action could be taken to involve the community, the January 1994 fire burnt the majority of the bushland in the Park, closing the Park for a month. This fire event inspired the Friends to plan an ambitious regeneration program designed to tap into the groundswell of public concern about the Park's future.

The proposed regeneration program required a lot of organization and resources.

The Friends had the ideas but not the means of putting them into effect. So the Friends turned to two organizations; the Australian Association of Bush Regenerators (AABR; the industry body representing professional and volunteer regenerators) and the Foundation for National Parks & Wildlife (FNPW; previously National Parks and Wildlife Foundation; an independent organization supporting national parks). With AABR's encouragement, the Friends were able to draw upon the approach used at the first breakfast meeting at Carters Creek, that is, enlisting the support of 20 trained AABR bush regenerators to initially supervise and train small groups of unskilled volunteers. FNPW was able to attract donations from various sources totalling AUD\$330 000 (see Acknowledgements). This allowed the employment of two Bush Regeneration Coordinators (both experienced regenerators) for a 3-year period. These coordinators would provide the infrastructural and technical backup to the program during its development phase.

When the Park reopened to visitors, the Friends were at the entrances handing out information about their group and encouraging participation in the planned future bush regeneration program. Names were taken, and in the following weeks, letter-box drops and media publicity invited the community to a forthcoming meeting in the Park.

Much to everyone's surprise, 150 people turned up to the public meeting including locals, committed conservationists, and regular Park users. At the meeting, people joined the Friends and signed up to work on sites selected for regeneration. The volunteer Bushcare Program was born.

The project – the first 10 years

With the guidance of the two Bush Regeneration Coordinators and the bush regeneration supervisors from AABR (the latter subsequently later replaced by permanent volunteer coordinators for each site), the first volunteers started work on 19 priority sites in May 1994 (Fig. 5). The sites were all burnt, highly weed-infested sites, containing many small native seedlings and requiring the application of skilful weeding

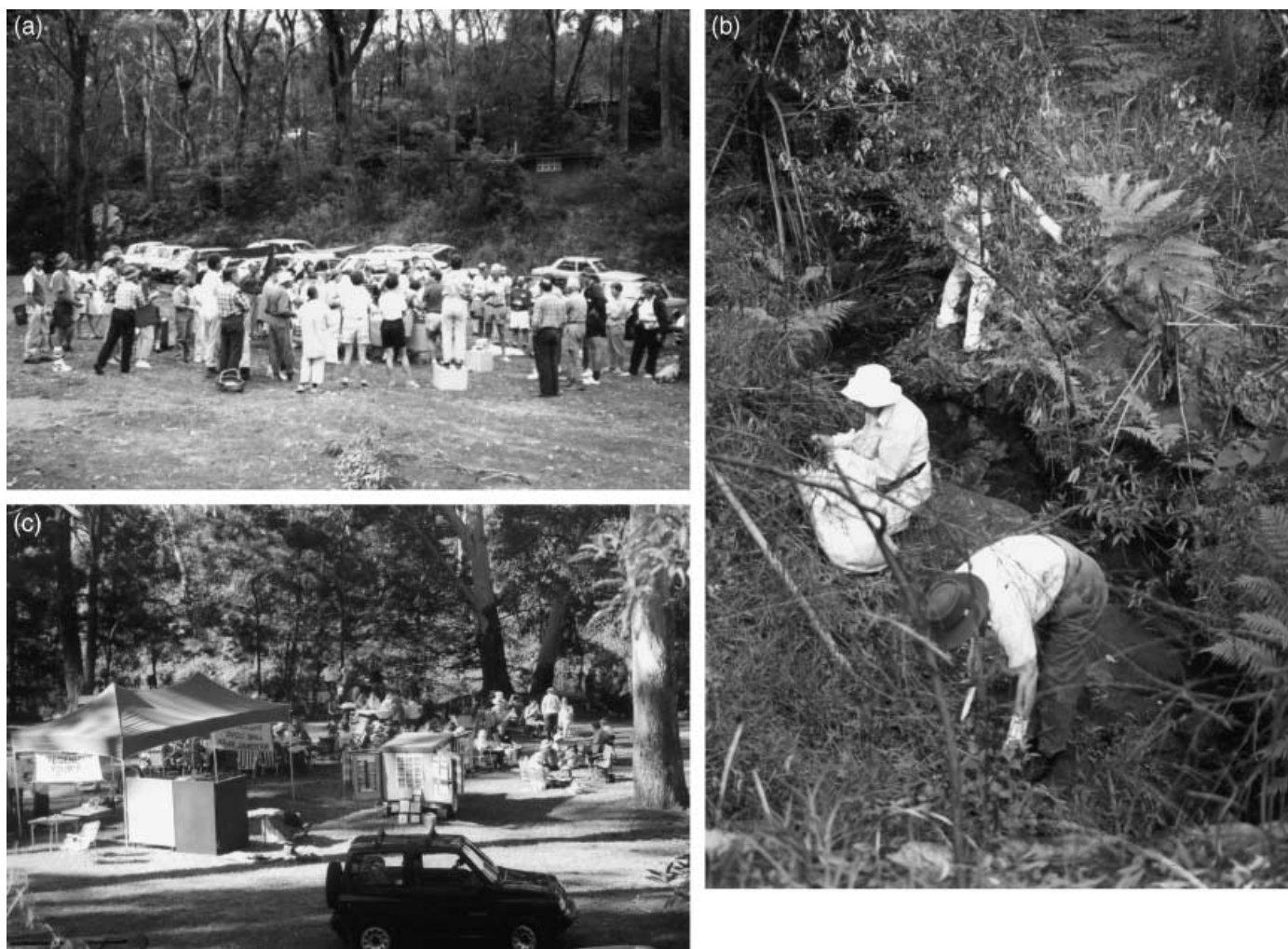


Figure 4. The Carters Creek ‘breakfast’ and community bush regeneration training day marked the commencement of the Friends of Lane Cove National Park a year before the fire. (a) Nancy Pallin, who initiated the project, inspires the volunteers to ‘give back’ something to the Park. (b) With the help of a team of experienced trainers available on the day, many volunteers gained sufficient satisfaction from clearing Lantana to entice them to join a permanent group. (c) The Friends meet at Carter’s Creek again in April 2004, to celebrate the Program’s 10 year anniversary. (Photos: Friends of Lane Cove National Park.)

Box 2. What are ‘primary’ and ‘secondary’ treatments?

In bush regeneration terms, ‘**primary treatment**’ is the first weeding treatment at a site – the one that removes the ‘parent’ generation of weed. As it creates new gaps for emergence of weed stored as seed in the soil, multiple ‘**secondary treatments**’ may be required to deplete weed sufficiently to allow the pre-existing native vegetation to fill the gaps (Buchanan 1990).

Limited resources for the work dictates that the area subjected to primary treatment by a regeneration team needs to be carefully limited to that area which the team can reliably re-treat multiple times (Bradley 1971; 1988; Buchanan 1990). This is because regenerators have found that taking on too large an area can lead to inability to follow up, which in turn can lead to much higher densities of weed and a more highly charged weed seedbank than prior to the primary treatment.

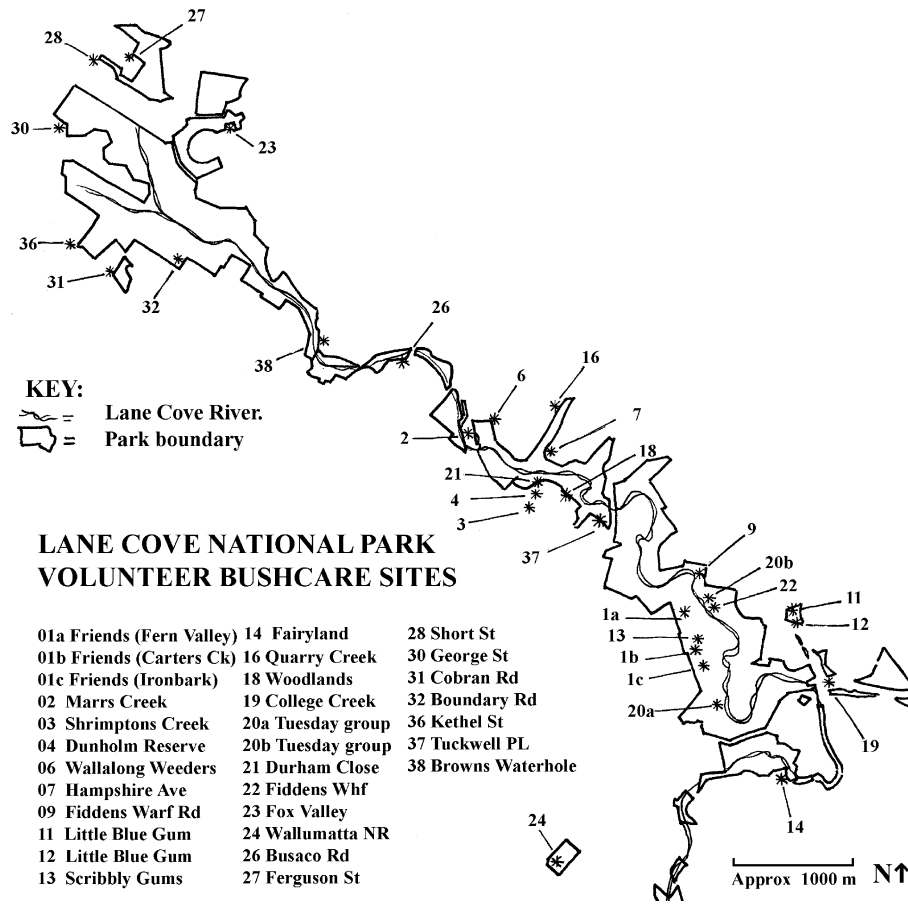


Figure 5. Location of the current 31 volunteer work sites. The first 19 numbered sites are those on which work commenced in 1994, while other sites have gradually been added as the program has expanded. (Sites worked by the same team have the same number.)

techniques (Box 3, Figs 5 and 6). Priorities were based on the: (i) predicted capacity of a site to securely recover if treated (i.e. relatively low level of impacts other than weed); (ii) size and shape in relation to adjacent area of undamaged bushland (reducing edge:area ratio of healthy bushland); (iii) weed species present (there were some priority weeds such as vines); and (iv) accessibility of the site to local volunteers.

Working in the priority sites for the first time was an exacting experience for the team leaders in charge of up to 10 volunteers. Fortunately, the sheer density of natives meant that there was sufficient redundancy to accommodate some degree of damage by over-enthusiastic volunteers, and, after a few sessions, participants were better able to discriminate weeds from natives and remove weeds in a non-destructive manner.

Months of regular removal of weeds prior to their seeding enabled sites to progressively stabilize with gradually coalescing native plant cover. In due course, the many sclerophyll shrub species (Table 1) flowered and fruited, rebuilding native seed banks; with the parent plants thinning out over time as the cover of longer-lived dominant trees such as *Eucalyptus* spp. increased. Work did not end there, however. After treatment of the priority sites,

Box 3. Natives and weeds emerging within the Lane Cove catchment after the fire

The germination response of native species to fire was assessed at 16 degraded sites and four adjacent burnt but otherwise healthy reference sites 6 months after the wildfire (Figs 6 and 7). The degraded sites were selected by bush regenerators as their 'best' examples of recovery on those sites which, prior to the fire, could be classed as having medium to very high weed domination. Data collected from 40 random (25 m²) quadrats in in these sites (eight per condition class) showed that the degraded sites typically contain resprouting privets (*Ligustrum lucidum* and *L. sinense*), and a dense suite of germinating annuals including Fleabane (*Conyza* spp.), Paddy's Lucerne (*Sida rhombifolia*), Ink Weed (*Phytolacca octandra*), Black Nightshade

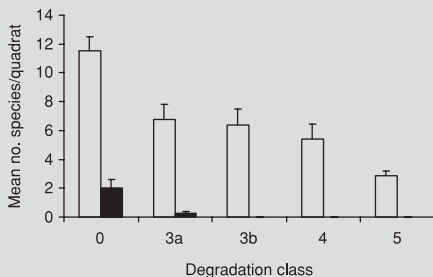


Figure 6. Regeneration of native sclerophyll shrub species, categorized by regeneration mechanism, in Lane Cove National Park, Sydney, Australia, 6 months after the 1994 wildfire. Number of species (mean ± standard error) determined from surveys of eight (25 m²) quadrats (from four subsites, in each of five condition classes (total of 40 quadrats)). Data from McDonald (1996). Open bars, obligate seeding species; closed bars, resprouters. Degradation categories: 0, healthy reference sites, burnt in 1994 bushfire; 3a, 50–75% exotic cover, some sclerophyll shrubs present; 3b, 50–75% exotic cover, sclerophyll shrubs not present; 4, 75–100% exotic cover, sclerophyll shrubs not present; 5, 100% exotic cover but soil profile intact.

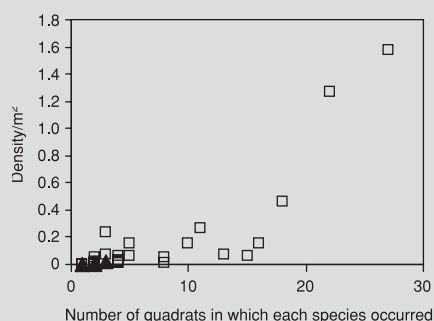


Figure 7. Relationship between frequency of occurrence and mean stem density for native sclerophyll species regenerating 6 months after the 1994 wildfire in degraded subsites in Lane Cove National Park, Sydney, Australia. Plants surveyed in eight (25 m²) quadrats (from four subsites) in each of five condition classes (total of 40 quadrats). Data from McDonald (1996). Open symbols, obligate seeding species; closed symbols, resprouters.

(*Solanum nigrum*), and exotic grasses. These species are typical of weed associations in higher fertility sites within the Sydney area (Adamson & Buchanan 1974; Adamson & Fox 1982; Buchanan 1990). Other sites contained Lantana (*Lantana camara*), while on floodplains, weed vines such as Balloon Vine (*Cardiospermum* sp.) and Turkey Rhubarb (*Acetosa sagittata*) occurred.

Natives regenerating. Abundant regeneration of natives were found within the quadrats at all sites in all classes of degradation. The vast majority of these were *obligate seeding* shrub species, particularly those from the Fabaceae family (Table 1). However, some obligate seeding species from the Epacridaceae and Proteaceae families that were represented on the healthy burnt sites were not found on degraded burnt sites. Obligate seeding species were presumably triggered to germinate from long-buried seed banks. *Resprouting* sclerophyll shrubs were largely absent from the degraded sites, although six resprouting shrub species were found on healthy burnt sites (including *Lambertia formosa* and *Personia levis* (represented as resprouts only) and *Micrantheum ericoides*, *Hakea laevipes* subsp. *laevipes*, *Lomatia silaifolia* and *Banksia spinulosa* (represented both as resprouts and as seedlings)).

Table 1. Native sclerophyll species germinating or resprouting within 6 months after wildfire in in the Lane Cove valley, Sydney, Australia. (Determined from surveys of eight (25 m²) quadrats (from four subsites) in each of five condition classes (total of 40 quadrats).) The species are listed from highest to lowest frequency of occurrence in a quadrat. (Data from McDonald (1996).)

Family	Species name (and occurrence in degradation classes)	Recovery mechanism	Degradation classes of quadrats in which the regeneration was recorded
FABACEAE	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	OS	1, 3a, 3b, 4, 5
SAPINDACEAE	<i>Dodonaea triquetra</i>	OS	1, 3a, 3b, 4, 5
FABACEAE	<i>Acacia decurrens</i> / <i>Acacia parramattensis</i>	OS	1, 3a, 3b, 4, 5
FABACEAE	<i>Acacia linifolia</i>	OS	1, 3a, 3b, 4, 5
MYRTACEAE	<i>Eucalyptus</i> spp. seedlings	(species not distinguished)	1, 3a, 3b, 4, 5
ASTERACEAE	<i>Ozothamnus diosmifolius</i>	OS	1, 3a, 3b, 4
CASUARINACEAE	<i>Allocasuarina littoralis</i>	OS	1, 3a, 3b, 4, 5
RUTACEAE	<i>Correa reflexa</i>	OS	3b, 4
PROTEACEAE	<i>Grevillea</i> sp.	OS	1, 3a, 3b, 4
PROTEACEAE	<i>Hakea sericea</i> ,	OS	1, 3a, 3b, 4, 5
RUTACEAE	<i>Zieria smithii</i>	OS	1, 3a, 3b
RUTACEAE	<i>Boronia ledifolia</i>	OS	1, 3a, 3b, 4
PROTEACEAE	<i>Grevillea linearifolia</i>	OS	1, 3a, 3b
FABACEAE	<i>Acacia suaveolens</i>	OS	1, 3a
FABACEAE	<i>Acacia terminalis</i>	OS	1, 3a, 4, 5
MYRTACEAE	<i>Kunzea ambigua</i>	OS	1, 3a, 5
APIACEAE	<i>Xanthosia</i> spp.	OS	1, 3a, 3b, 4
FABACEAE	<i>Acacia ulifolia</i>	OS	1, 3a, 3b, 4, 5
FABACEAE	<i>Pultenaea flexilis</i>	OS	1, 3a, 3b, 4
THYMELEACEAE	<i>Pimelia</i> sp.	R	3, 4
HALORAGACEAE	<i>Gonocarpus</i> spp.	OS	1, 3a, 3b
APIACEAE	<i>Platysace</i> sp.	OS	1, 3b, 4
FABACEAE	<i>Acacia implexa</i>	R	4, 5
PROTEACEAE	<i>Grevillea buxifolia</i>	OS	1, 3b
STERCULIACEAE	<i>Lasiopetalum ferrugineum</i>	OS	1, 3b
ERICACEAE	<i>Leucopogon juniperinus</i>	OS	3a
MYRTACEAE	<i>Angophora costata</i>	R	1, 3a, 3b, 4, 5
FABACEAE	<i>Dillwynia retorta</i>	OS	1, 4
PROTEACEAE	<i>Xylomelum pyriforme</i>	R	3b
PROTEACEAE	<i>Banksia serrata</i> seedlings,	R	1, 3a, 3b
PROTEACEAE	<i>Banksia ericifolia</i>	OS	1, 3a

OS, (obligate) seeding; R, resprouting.



Figure 8. Volunteers continue to work on bush regeneration in the Lane Cove National Park, Sydney, Australia, while others help with Bushcare program administration and work in the nursery. Many of the volunteers, particularly the volunteer coordinators, are the same ones who started with the program over 10 years ago, representing an invaluable reservoir of skill and experience. (Photo: M Reidy.)

the volunteer groups continued pushing into new areas that were next on the priority list – or undertook treatments in adjacent areas or areas within the same subcatchment that could increase the security of the sites already treated. Other sites were added as a result of the 2002 New Year's Day fires when nearby residents approached Park management for permission to work on the sites of particular interest to them. This self-selection of sites was then further refined by Park staff on the basis of the above priorities.

Outcomes

There are now 29 regular groups (numbering over 200 Bushcare volunteers) working on 31 sites in the Park (Fig. 5). Sites are distributed fairly evenly throughout the

valley, both at the problematic bushland/suburban interface as well as creekline locations well within the Park. (Information on current Bushcare groups and activities can be obtained from the website: <http://users.bigpond.net.au/folcnp/>.)

The nature conservation outcomes after 10 years appear substantial. Although five of the original 19 sites (and two of the newer sites) have been abandoned for a range of reasons; 31 sites are now under treatment. An assessment of the current condition of these sites has been made on the basis of two sources of information: (i) changes observed by regular assessment of the sites over the 6 years by the staff coordinator; combined with (ii) long-term observation (by volunteer coordinators) of trends in frequency and duration

and duration of treatments needed at each specific site (Fig. 8). (Note: this type of qualitative assessment is necessary because recent treatments can render direct measures of weed abundance unreliable.)

This assessment shows that most of the initial work areas on the 31 sites have been converted from a condition of medium to very high weed cover (with few natives) to a condition where natives dominate and very little weed is evident. A total of 15 of the 31 sites are on 'maintenance', which means that the restoration phase has been completed and weeding is minimal; directed at maintaining the restored state. At the remaining 18 sites, the initial treatment areas are on maintenance but treatments have been extended outwards into new problem areas (M Lane, Department of Environment and Conservation, pers. obs., 2005).

How sustainable is the investment?

Substantial investment has been made to the program, in terms of both human and financial resources. In terms of the human resources, the volunteer input has been estimated to have a value of about AUD\$2 million to date. The volunteers in the Park are mainly Friends and local residents who benefit in a range of ways from restoration of the Park including from improvements in the quality of their local environment. Some members of the local business community have contributed by allowing their staff a day off to work in the Park.

In terms of direct funding, almost AUD\$400 000 has been raised by the Friends group through membership fees, donations and grants for specific projects from the local Catchment Management Committee and State and Federal governments. An effort has also been made to direct donations and grants towards setting up more permanent systems that might be more economically self-sustaining in the longer term.

An early example of this transition to more self-sustaining systems was the temporary involvement of volunteer trainers and supervisors who, after the initial site assessment and instruction period, handed over their task of supervision and training to (i) the long-term volunteer coordinator

Box 4. From the Ridge to the River: Restoring Riparian Habitat in Lane Cove River Catchment

The 'Ridge to the River' project is a Natural Heritage Trust project within the overall Lane Cove National Park Bushcare program. Its aim is to deal with weed sources in the urban fringes and upper reaches of two small creek catchments (Fern Valley Creek, Carters Creek, and a hanging swamp between them) whose lower reaches were already subject to volunteer Bushcare and some contract bush regeneration work.

While funding was also used for community education and the construction of a sediment basin/wetland at the top of Carters Creek, the main focus was to employ contract bush regenerators. Contractors commenced primary work in Fern Valley in May 2000 by targeting an extensive area of Large-leaved Privet, Small-leaved Privet and Winter Senna (*Senna × pendula*). Medium specimens were cut and the stems painted with herbicide while mature trees were injected with herbicide and left standing to maintain habitat and creekline stability. Other weeds removed included Montpellier Broom (*Genista monspessulana*) and Blackberry (*Rubus* sp.) – with Mistflower (*Ageratina riparia*), Monbretia (*Crocasmia × Crocosmiiflora*), and Gladiolus (*Gladiolus* sp.) removed along the creek lines. In the hanging swamp, privets, Genista, Crofton Weed (*Ageratina adenophora*), Blue Paspalum (*Paspalum quadrifarium*), and *Cyperus eragrostis* were removed carefully and thoroughly, allowing the native Black Bog Rush (*Schoenus melanostachus*) to consolidate and dominate the habitat.

Follow up and maintenance of the sites is being undertaken by the volunteer groups, who are firmly dedicated to the task. The efficiency of the work is enhanced by the fact that the contract and volunteer teams are supervised by the same person, Lyn Hume, who also ensures (through the volunteer group or her own effort) that funding gaps do not result in lapses in essential follow-up work. TAFE students were involved in some monitoring and are continuing on-ground work targeting exotic species and undertaking secondary work in the area below the caravan park.

Lyn Hulme, summarizes the benefits of this collaborative approach:

The combination of contractors and volunteers is one of the reasons the sites have recovered so quickly – and is particularly important during the January and February period when annuals and species like Mistflower are developing and also there can be a funding gap between projects.

As a result, extensive areas on the two creeks and hanging swamp have now recovered to native vegetation, providing desired habitat for wildlife. Fern Valley creek and its waterfall have now been freed of Privet, Senna, Lantana, Mistflower and Blue and Giant Paspalum. The combined effort of both teams has now secured all the boundaries and escarpment above Carters Creek. No weeds are coming into the valley now from the edges except via urban run-off from the adjacent cemetery. We have further funding to work in a dense privet infestation remaining along the creek line at the top of the valley; and expect this will regenerate well over time as we have found that the sites are highly resilient. With regular checking and thorough follow up, most areas stabilize to a dense native cover within 3 years of the initial weed removal.

Broader community involvement has been sought through information posters in the Park's Display Centre and the mobile educational trailer to promote the project and seek Bushcare volunteers. A successful community Planting Day was held beside the hanging swamp to inform residents of the habitat issues and establish new habitat for the Swamp Marsh Frog known to occur in the site.

appointed at each site and (ii) the two staff Bush Regeneration Coordinators employed by grant monies. In turn, the staff coordinators worked hard to run workshops and write procedural manuals to increase the skills of the group themselves. In 1997, realizing the worth of the contribution made by volunteers to the Park's restored bushland, park management established a permanent Bushcare Coordinator position to

ensure the continuation of the program. In addition, all Field Officers employed in the Park are now required to have bush regeneration training and experience.

Combinations of contractors and volunteers

Other grants and donations have been directed towards a variety of objectives

including the acquisition of equipment, education of Park neighbours (e.g. a mobile educational trailer and an herbarium), and the control of problems at their source (e.g. signage, sediment basins and other drainage works). Other grants have been directed to contract bush regeneration works at specific sites. The most ambitious of these contracts was funded by the Federal government's Natural Heritage

Trust (NHT). This enabled the Friends to employ bush regeneration contractors for a 5-year period to undertake primary work in difficult and/or densely weed-infested areas.

Specifically, the NHT grant supported the project 'From the Ridge to the River', which involved the rehabilitation of riparian habitat on two creeks and a hanging swamp leading into Lane Cove River (Box 4). The qualifying 'in kind' contributions have been provided by volunteers, Park staff, and students from the Bush Regeneration course at the nearby Ryde TAFE.

The approach taken by 'From the Ridge to the River' project has been to marry the contract work into the overall volunteer program rather than see a complete reliance on either contractors or volunteers. Contractors (largely funded by outside sources rather than recurrent internal budgets) can carry out major primary and secondary works. Further follow up on the contract sites becomes the responsibility of the volunteers and Park staff. This approach has proven extremely successful in terms of the goals of (i) reinstating a diverse native vegetation on the sites and (ii) reduction in weed to a point where maintenance is minimal. The majority of donations to the Friends are now used in employing contractors to undertake small one-off projects on Bushcare sites.

Problems arising and lessons learnt

Personnel-related lessons

As usual with restoration projects, some failures have occurred within the project. The project suffered its share of loss of volunteer coordinators due to 'burnout', a not-infrequent occurrence among 'care' groups where some individuals take on (or are left to carry) a higher burden than others. Abandonment of sites have also occurred on seven sites over the 10-year period. In five of the seven cases, abandonment was due to the fact that the coordinator had left the area or met with sickness and had not been replaced; the other two were related to conflicting aims between volunteers and site managers.

Personnel problems could be better addressed in various ways. For example, more effort could be made to attract new volunteers to small groups and to replace coordinators that leave, particularly where the site is a roadside or drain site (which demand higher levels of input due to ongoing impacts from the urban zone). However, limits exist to active volunteers taking on further duties and more realistic budgets that could allow the Bushcare Coordinator to devote more attention to supporting volunteers could go a long way towards resolving this problem. Failures relating to conflicting aims between volunteers and site managers are not likely to be completely avoided, although some minor disagreements could be averted with improved public relations.

Technical lessons

In addition, there have been technical lessons learned. For example, it became clear that some of the sites at which volunteers were willing to work were on creeklines downstream of untreated sites (which meant the latter were repeatedly subject to invasion by weed propagules washing down from upstream). Even more problematic are riparian sites on the main river where levels of flooding remain unnaturally (and irreparably) high. While creekline sites have been able to be somewhat addressed by upstream work using contractors, river sites should be considered a lower priority or need more selective, gradual treatment to avoid them becoming a constant drain on resources needed elsewhere.

Another major lesson learnt is the necessity to think much more carefully in future about working in extremely weed-dominated sites using a one-off effort by contractors or a large group of volunteers. This approach was applied on a Privet/Balloon Vine-dominated road edge and floodplain near the Little Blue Gum Creek site (partly in response to public pressure and partly as the site was potentially affecting three successful bushcare sites). A grant was obtained, bush regenerators employed, the area cleared, mulched and planted out; with treatments repeated 2 years later. Maintenance on this site is very resource-demanding. Half the original area is main-

tained by a volunteer bush regeneration team with the other half (the responsibility of local council) now subject to serious weed reinvasion.

Lack of formal monitoring

Potential for gaining technical insights from the project is constrained by the degree to which the project is formally monitored. One major question, for example, is whether leaving weed untreated (particularly annual weed), would have had a detrimental effect on native recovery or not. Another, is whether the treated sites are now more resilient when future fires occur. While potential still exists to compare early post-fire data from 1994 with potential future data, the second question cannot be answered in any definitive way because of the lack of formal monitoring of the actual bush regeneration treatments. The perceived need to focus on operational challenges meant that resources were not directed to monitoring by the group or to attracting monitoring studies by local universities. As the volunteer coordinators have now become highly skilled in site assessment and plant recognition, they would like to find a way to assist park management to identify simple and practical measures for future monitoring of changes in the condition of treated and untreated sites over time.

Despite the lack of quantitative data, however, reflection on the successional behaviour of privet and other mesomorphic weeds suggests that, without intervention, the sites that were previously dominated by these species (and which showed evidence of resprouting) would have again become dominated by such weed. Insights can also be gained from sites that have been treated but later abandoned. Of the seven sites abandoned, some drier parts of the sites remain free of weed, but the core areas on all sites (despite at least 3 years of work on five of them) have regressed to weed dominance. Weeds included both Small- and Large-leaved Privets, Winter Senna (*Senna pendula* var. *glabrata*), Morning Glory (*Ipomoea indica*), Turkey Rhubarb, Asparagus (*Asparagus* spp.), Tradescantia, Crofton weed (*Ageratina adenophora*), Mist Flower (*Ageratina riparia*), Montpellier

Box 5. Community education

One of the aims of the Friends is to disseminate information to the public on conservation issues. This is undertaken in a variety of ways.

- The Friends website – designed and maintained by one of the committee volunteers, the site attracts enquiries about Bushcare, conservation and volunteering from local and overseas searchers (<http://users.bigpond.net.au/folcnp/>)
- Regular newsletter called *Regenavitis* combining input from the Park and Friends
- Mobile Education Trailer including displays of weeds and educational material on establishing bush-friendly gardens
- Interpretive display in the Park's Display Centre
- Brochures, posters, signage on habitat for wildlife, water quality and Bushcare
- Friends attending workshops and special events (e.g. Weedbusters Week, Biodiversity month)
- Community work days (e.g. Planet Ark tree planting day)
- Media releases on special issues in local newspapers

Broom (*Genista monspessulana*), Camphor Laurel (*Cinnamomum camphora*), Honeysuckle (*Lonicera japonica*), and a range of persistent herbaceous species (M Reidy & M Lane, pers. obs., 2005).

Management-related lessons

During the 1990s, Park management's recognition of the economic advantages of the project was indicated by creating a permanent coordinator position and recurrent budget to support the program. However, senior management has more recently overlooked support for the bush regeneration volunteer project, as it has received no budget allocation in the past 2 years. This, coupled with the reduction of the regional budget for pest species control which contributes to training, has resulted in a lack of material and technical support for the volunteers; with new groups not gaining the support that would bring them up to the skill and productivity levels of the established groups. While some of the more experienced volunteer coordinators have recently offered to contribute yet more time to assist with training new volunteers, this is likely to run the risk of volunteer burnout. If we are to learn from lessons experienced in the past in this regard, reinstatement of adequate funding should be the goal of management rather than placing increasing burdens on volunteers.

Directions for the future?

The Park has grown over the years – with additional land and reserves being added along with additional Bushcare groups (Chevalier 2004). Bushfires have also prompted new groups to form to take care of burnt areas. There are approximately 100 members of the Friends, which has an energetic committee of 12. The vast majority of sites have progressed well, with many transformed back to what appears to be healthy bushland. Other sites, however, will always require maintenance due to the dispersal of seed propagules when creeks flood at times of heavy rain.

There has also been a trend of encroaching development around the Park; a proposed road widening, construction of a railway, and other developments. For this reason, the Friends are becoming increasingly involved in community education (Box 5) and encouraging reduction of problems at their source – as well as campaigning on issues where the natural environment is likely to be adversely affected.

The faithful volunteers, many still there from 1994 or even earlier, are getting older. There is always the need to keep recruiting to maintain the status quo and increase numbers. Most of the new volunteers seem to be drawn from recent retirees looking for a new lifestyle. They quickly become committed and are amongst the program's

most enthusiastic members. The Bushcare Program will continue as long as there are dedicated volunteers and as long as those volunteers are properly supported by Park management in the form of operational costs and adequate guidance. People come and go but overall the enthusiasm has not flagged.

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References

- Adamson D. and Buchanan R. (1974) Exotic plants in urban bushland in the Sydney region. *Proceedings of the Weed Society of NSW* **VI**, 24–27.
- Adamson D. A. and Fox M. D. (1982) Changes in Australasian vegetation since European settlement. In: *A History of Australasian Vegetation* (ed. J. M. B. Smith), pp. 109–146. McGraw-Hill, Sydney.
- Bradley J. (1971) *Bush Regeneration*. Mosman Parklands and Ashton Park Association, Sydney.
- Bradley J. (1988) *Bringing Back the Bush*. Lansdown Press, Sydney.
- Buchanan R. M. (1990) *Bush Regeneration: Recovering Australian Landscapes*. T.A.F.E. Learning Publications, Sydney.
- Chevalier W. (2004) *Why do We Care: A Brief History of 13 Years of Bushcare in Lane Cove National Park*. Friends of Lane Cove National Park Inc, Sydney.
- Department of Environment and Conservation (NSW). (2004) *Systematic Survey of Vertebrate Fauna in Lane Cove National Park*. Unpublished report funded by Sydney North, Central Directorate Parks and Wildlife Division of Department of Environment and Conservation Conservation Assessment and Data Unit, Conservation Programs and Planning Branch, Environment Protection and Regulation Division. [Cited 4 April 2005]. Available from URL: http://www.nationalparks.nsw.gov.au/npws.nsf/Content/LaneCoveNP_vertrebrate_fauna.
- Harden G. J. (ed.) (1990–1993) *Flora of New South Wales*, Vol. 1–4. New South Wales University Press, Kensington.
- McDonald M. C. (1996) *Ecosystem resilience and the restoration of damaged plant communities: A discussion focusing on Australian case studies*. PhD Dissertation, University of Western Sydney.
- NSW National Parks and Wildlife Service (NPWS). (1998) *Lane Cove National Park Plan of Management*. NPWS, Sydney.
- White M. E. (1997) *Listen . . . Our Land is Crying*. Kangaroo Press, Kenthurst.