database. Another database is the Sub-Tropical Site Management database, a project begun by researchers at Southern Cross University in Lismore. CSIRO also has a tree performance database that is a subset of the original Treedat system. Some of the organizations maintaining these databases have struggled in the past to secure on-going funding to update and analyse the data. Yet the start has already been made.

13.17.4

Synthesis. Pp 21–25, Grant Wardell-Johnson[1], John Kanowski[2], Carla Catterall[2] and Peter Erskine[3]. ([1]School of Natural and Rural Systems Management, The University of Queensland, Gatton Qld; [2]Environmental Sciences, Griffith University, Nathan. Qld; [3]School of Life Sciences, The University of Queensland, St Lucia, Qld).

Key words: *harvest security, integrating ecosystems and production, landscape ecology, mixed-species plantations, monocultures, muliple use plantations*.

While many of the papers presented at this workshop pointed to the availability of useful scientific data being a long-term rather than short-term likelihood, this paper synthesised much of the thinking emerging from a cross-disciplinary reading of developments in the fields of landscape ecology, silviculture and environmental services. Interesting points made were that larger plots (i.e. > 200 ha) may have benefits for both farm forestry and ecological restoration and that while it may be appropriate to increase levels of timber production on cleared farmland in regions that already include an acceptable percent cover of native forest (e.g. 30%) in regions with less cover, it may be important to plan to include a substantial component of biodiversity in the plantation scheme. The synthesis also includes consideration of issues of harvest security and impacts of harvest on biodiversity. Many landholders feel threatened by the potential value of their plantations for biodiversity because they believe they may be prevented from harvesting biodiverse plantations. However, most governments have made provision for landholders to register plantations for future harvest. In general, harvest security is likely to increase with the amount of forest cover. Thus, it is more likely to be an issue where little forest cover remains. Whatever the value of plantations to biodiversity, there is obviously a loss of much of that biodiversity during the harvesting of plantations. It may be possible to use silvicultural solutions (e.g. selective or small-patch logging rather than large-scale clear felling) in dealing with aspects of these kinds of trade-off between biodiversity and productivity. These issues of potential conflict also raise questions that can be answered through a combination of new types of plantation trials, research and monitoring.

CULTURAL & SOCIOECONOMIC ISSUES & SOLUTIONS

14.26

Bush regeneration at Paddy Pallin Reserve: A comment on the importance of reliability and flexibility of funding to deliver ecological outcomes.

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[PEER REVIEWED].

Key words: *bush regeneration, corporate sponsorship, follow up, funding models, local government*.

It is often claimed that a bush regeneration approach (which focuses on reducing weed resilience and harnessing and building native vegetation resilience) can offer improved effectiveness and efficiencies compared to traditional methods of weed control (Bradley 1971; Buchanan 1990). This note discusses the results of work undertaken by skilled bush regeneration teams over the last 4 years in Paddy Pallin Reserve, where works were funded in a timely manner by corporate sponsorship, bypassing the problem of administrative delays common to many projects elsewhere. The note seeks to offer insights into the ecological effectiveness and cost-efficiency of a bush regeneration approach when continuity of follow up is secured.

The Reserve and its prior condition. Paddy Pallin Reserve, located between Provincial and Highfield Roads, Lindfield (in the northern suburbs of Sydney), was originally set aside as a drainage easement. The Reserve contains a small (0.15 ha) remnant of the endangered ecological community, Sydney Turpentine-Ironbark Forest. Part of Ku-ring-gai Council's public open space system, it was dedicated by Council in 1985, to honour a local citizen, Paddy Pallin, 'in recognition of his services to youth over many years and his encouragement to people of all ages to share his love of the great outdoors'.

The Sydney Turpentine-Ironbark Forest of this site is dominated by Turpentine (*Syncarpia glomulifera*), Blackbutt (*Eucalyptus pilularis*), Red Mahogany (*Eucalyptus resinifera*), and Sydney Red Gum (*Angophora costata*), with understorey shrubs including Sweet Pittosporum (*Pittosporum undulatum*), various acacias (*Acacia* spp.), Breynia (*Breynia oblongifolia*), Sandfly Zieria (*Zieria smithii*), and Maytenus (*Maytenus silvestris*). Native forbs include Cockspur Flowers (*Plectranthus parviflorus*), *Lomandra* spp., *Dianella* spp., Pastel Flower (*Pseuderanthemum variabile*), Nodding Greenhood Orchid (*Pterostylis nutans*); with grasses including Stout Bamboo Grass (*Stipa ramosissima*), Weeping Grass (*Microlaena stipoides*), Right-angle Grass (*Entolasia* sp.), Basket Grass (*Oplismenus imbecillis*), and Small-flowered Fingergrass (*Digitaria parviflora*). Twiners include Running Postman (*Kennedia rubicunda*), Glycine (*Glycine microphylla*) and Snake Vine (*Hibbertia dentata*). [Nomenclature follows Harden (1990–1993).]

At the beginning of the project in 2000, well established weed populations were present in the bushland area, including a heavy infestation of the grass Ehrharta (*Ehrharta erecta*) over most of the site; a large area of Tradescantia (*Tradescantia fluminensis*); an area containing Fishbone Fern (*Nephrolepis cordifolia*), Agapanthus (*Agapanthus africanus*), and Morning Glory (*Ipomoea indica*); three separate infestations of Madeira Vine (*Anredera cordifolia*); as well as various Flatweeds (*Hypochoeris radicata.*, *Gnaphalium* spp.), *Oxalis* spp., Arum Lily (*Arum italicum*), Ochna (*Ochna serrulata*), False Breynia (*Phyllanthus hirtellus*), Onion Weed (*Nothoscordum borbonicum*), and some Balloon Vine (*Cardiospermum grandiflorum*).

Early treatments – and a conflict of approaches. Some bush regeneration treatments (consistent with Wright 1991) were carried out by a volunteer in the early 1990s. At that time, a severe infestation of Morning Glory was controlled and a patch of Tradescantia eliminated, with both areas subsequently recovering with naturally regenerating native vegetation. The volunteer stopped working, however, when Council staff and

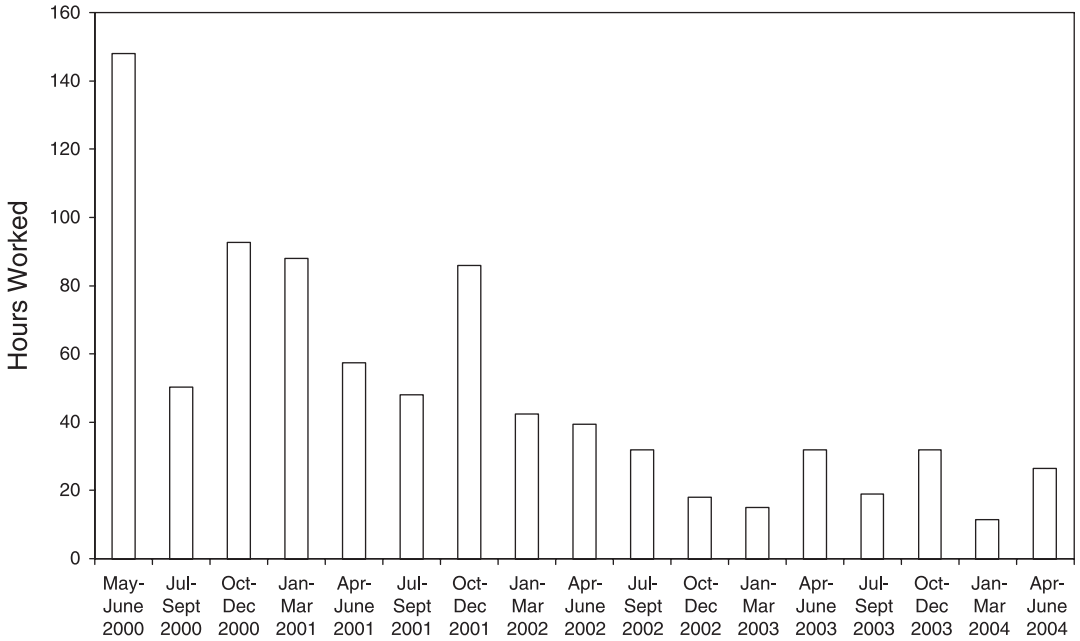

Figure 1. The lessening effort (over 4 years) required to treat weed infestations in urban bushland at Paddy Pallin Reserve, Lindfield, NSW.

contractors repeatedly applied herbicide to and mowed the work areas – an approach that complied with traditional 'park maintenance' approaches but damaged the regeneration occurring on the site. For a 5-year period (from early 1995 until 2000), Council contractors continued to apply herbicide alone for weed control, and the indigenous ground cover plants became badly affected by that regime, leaving depauperate vegetation, with Ehrharta the most visible plant for much of the area.

In 1996, Council's Bushland Advisory Committee expressed to Council their concern that the weed management of the Reserve was not effective. A reply to the Committee indicated that a maintenance team visited the Reserve every 3 weeks and that this team would care for the bushland area. Local conservationists, however, continued to be critical of the level of training and supervision of the maintenance staff and consistently advocated better care of the Reserve.

The inputs during the 5-year period comprised a Council Parks team of two, tending the Reserve once or twice a month for about half a day (D Wilks, Ku-ring-gai Municipal Council, pers. comm., 2005). Assuming that a quarter of the time was spent working in the bushland area, it is estimated that the time spent there would have been about 9 person-hours per quarter. Also, between 1998 and 2000, there were occasional visits by a Council bush regeneration team and the noxious weed team, but no figures for those efforts are available.

Recent Treatments. In May 2000, Council contracted a skilled bush regeneration team to work in Paddy Pallin Reserve. This funding was supplemented by a philanthropic donation from the firm of Paddy Pallin Pty. Ltd., which subsequently has been funding all of the bush regeneration work in the Reserve. While these funds were originally handled through Council, they are now made directly to the contractor to overcome the effect of administrative delays on the timing of urgent weed control. Council's role is now confined to approving the work plan and receiving the reports at the end of each contract; an arrangement that has been most successful and is expected to continue if the results satisfy all parties.

The corporate sponsorship enabled a professional bush regeneration team to be contracted to work in the Reserve. The team was selected on the basis of competitive tender. The first 2-month contract began on the site in May 2000, concentrating mainly on the Madeira Vine infestations, some areas of Tradescantia, and reducing the amount of Ehrharta. This was followed in September by a 3-month contract, and after that, contracts of 6–15 months were worked continuously until June 2004.

Across all contracts, areas considered to have the most potential for regeneration were given priority over those with less resilience. In these areas, repeated follow up was carried out prior to moving to new areas, and weed regrowth did not reach the seeding stage. In the first half of 2002, it was estimated that at least two-thirds of each work day was spent on follow up of previously weeded areas in order to stay ahead of seeding Ehrharta.

Results. With removal of the heavy infestations of Fish bone Fern, Agapanthus and Tradescantia, a gradual but steady increase occurred in the area of native vegetation cover. For example, after the first two of the contracts (totalling 291 hours worked), regeneration of native ground covers was already evident and 10 native plants were added to the list of species counted on the site. After the first of the 6-month contracts (a further 145.5 hours worked), the native species list was expanded by a further four

taxa – a trend that continued with each contract. Of the 67 species now present on the site (including eight forbs and twiners, three grasses, 11 trees and shrubs, eight ferns, five sedges, and three fungi), a total of 38 species have regenerated across the site, 11 of which were not previously observed on site. With constant attention, Ehrharta and Madeira Vine have become dramatically reduced and replaced by a prolific spread of natives including Weeping Grass, Basket Grass and Pastel Flower.

Importantly, the time needed for bush regeneration of the site has also lessened considerably over the 4 years (Figure 1). As is typical of bush regeneration sites, substantial inputs were initially required to achieve reduction of weed cover and regeneration of native species. While the site, because of its boundary length and relatively small area, will require constant attention in the future, it is now considered to be at a steady level of input, equating with a 'maintenance' regime.

Implications for management. If the trend shown in Figure 1 is relatively stable, we assess that 20 hours of skilled bush regeneration inputs per quarter will be sufficient to maintain the site in optimum condition. While this is twice the estimated figure of 9 h/quarter that the traditional approach of Council would have invested on an ongoing basis, we suggest that the bush regeneration approach represents a better long-term investment as it actually achieves substantial regeneration of a natural asset; and this condition can now be sustained at what would still be considered a relatively low cost.

While it is likely that the regeneration results were triggered by the regular attention by skilled regenerators (using consistent personnel, which enhanced predictability of the treatments needed), two other key factors have also been important: (i) the far greater *flexibility* and (ii) the far greater *reliability* of funding provided by a corporate sponsor.

Administrative flexibility allows a supervisor to extend a contract when dry weather slows plant growth so that money is available when weather conditions trigger a major regeneration event. This allows work to be done as seasonal conditions dictate and can mean the difference between having the resources or not to treat weed before it seeds.

Reliability of funding is also invaluable. Delays in funding contracts are very common in the bush regeneration field, creating a situation where decisions about the timing of work are made by financial administrators rather than by field supervisors. Yet short-term or interrupted funding for weed control cannot achieve reliable outcomes. Bush regeneration is, by nature, a responsive, iterative process. Each new foray into a previously untreated area creates an initial increase in weed – as it triggers germination or resprouting of soil-borne propagules of that weed (as well as of other species lying dormant) (Buchanan 1990). This means that delayed timing of treatments, as well as poor technique can cause a site to go backwards in the vulnerable recovery phase of a project. In extreme cases, funding gaps or inflexibility imposed by cumbersome administrative processes can even be enough to cause worsening of infestations of some weed species.

In summary, we suggest this case of philanthropic funding on a regular basis is an example of good corporate investment in the environment and a flexible response by Council. While the inertia of bureaucracies will continue to play a part in the letting of contracts, direct funding of contractors by the corporate sponsor (for work plans agreed to by the land manager) bypasses the very common problem of inflexibility and delays in funding. Given the importance of continuity of treatment to the results, greater efficiencies would be gained if funding (whether corporate or government) were at least 'pledged' for periods of 5 years or more.

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14.27

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14.27.1

Natural heritage values as a framework for assessing environmentally appropriate economic activity. Pp. 25–27, B. Mackey. (School of Resources, Environment and Society, Faculty of Science, The Australian National University, Canberra, Australia. Email: brendan.mackey@anu.edu.au)

Key words: *World Heritage, Cape York Peninsula, integrating ecosystems and production.*

One of the invited papers in this landmark workshop, this paper commences with the observation that economic activity is usually seen as development that pollutes the environment and mines what could be renewable natural resources, causing habitat loss, fragmentation and degradation leading to the loss of biodiversity. If Cape York Peninsula follows the same course of economic development as southern Australia, it is difficult to imagine how large-scale degradation of natural heritage values will be avoided. If potential exists for a different style of environmentally appropriate economic activity in northern Australia, however, we need to consider what it is about the environment that we value and seek