Urban Bushland Council WA Inc

MANAGING OUR BUSHLAND

Proceedings of a conference about the protection and management of urban bushland

Cockburn Wetland Education Centre
16-17 October 1998

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Preface

Angela Carr
President, Urban Bushland Council WA Inc

This conference was organised by the Urban Bushland Council, with the assistance of grants from the Minister for the Environment and the Gordon Reid Foundation for Conservation. The grants enabled us to employ Vanessa Yeomans as conference organiser. Vanessa performed this task with quiet enthusiasm while also completing her studies at the University of WA. Vanessa worked with a conference steering group comprising Kirsten Tullis, Kevin McLean, Mary Gray and Angela Carr. We acknowledge the energy, knowledge and dedication of this group in bringing this conference to fruition.

We were fortunate to obtain an insight into how a council manages bushland as core business by inviting Mark Couston from Ku-ring-gai Municipal Council in NSW to be our guest speaker. We are very grateful that Mark, who is employed as Manager of Bushland Conservation, was able to attend the conference and be available for informal discussion.

To the Minister for the Environment and the Gordon Reid Foundation, a special thank you from the Urban Bushland Council and from delegates who benefited so much from the conference. Part of the funding produced these proceedings, which are being made available to local councils, community groups and government agencies.

We would like to thank the 160 people who attended all or part of the conference, among many of whom presented talks. The speakers gave interesting presentations on a wide range of topics. It was pleasing to see so many delegates. They came from State government agencies, local government and community groups, and included people from the country.

We would like to thank all those people who provided projectors and screens, who taped proceedings and looked after the microphone as well as directing the parking each morning. Many members of the Urban Bushland Council contributed to the conference by chairing proceedings, giving talks and asking questions and we thank them for their enthusiastic support. We would particularly like to mention the help of Denise Crosbie from the Cockburn Wetlands Education Centre who helped ensure the smooth running of the proceedings during the two days. Members of the Port Kennedy Land Conservation District Committee busily mowed the grass surrounding the Centre especially for the conference and we thank them.

We would especially like to thank Margo O'Byrne from the Ecoplan program run by the Department of Environmental Protection, for organising Ecoplan sponsorship of a number of community delegates. We also acknowledge those councils that sponsored community members' attendance.

There has always been tremendous community effort in Perth and other areas of the State to ensure protection of bushland. Recently there has been greater State and local government involvement in management of bushland in consultation with community members in such areas as regional parks and at Bold Park. There has been a long history of community groups encouraging government to save significant bushland as regional reserves. Perth Bushplan when fully implemented, hopefully soon, will be the culmination of enormous community effort over at least 26 years. We recognise the work government agencies have undertaken in its planning and preparation.

Bushland protection is seen as a quality of life issue that recognises the international significance of the biodiversity of bushland throughout Western Australia. There has also been considerable effort involved by communities to save locally significant bush and to prevent the sell off of government owned bushland. The conference illustrated the successes and failures to protect bushland and considered mechanisms that could be used in the future for better protection.

Hand in hand with securing bushland for protection is the need to manage the land for its long-term viability. When community groups show ownership of bushland areas then the community is more likely to respect that land. Community groups have worked tirelessly to manage bush with the erection of fences and signs, the construction of pathways and firebreaks, as well as weeding and regeneration work. Money has been available for community groups for such projects but increasingly it seems necessary for local and other government agencies to be involved in management. We are also aware that there are catchment management groups that have significant community involvement. We look forward to the day when all local governments take responsibility for all their bushland in consultation with community groups.

The conference was an opportunity to consider all the varied issues involved in the protection and management of bushland. For the plenary session delegates were invited to forward some recommendations, particularly for government. These and other ideas will be followed up by the Urban Bush-

land Council where possible. Partnerships between government and community groups are evolving and there is no doubt that there will always be a role for the community in bushland protection and management. The Urban Bushland Council will continue to nurture community groups as they struggle with the complex issues of bushland in the urban setting. We will continue energetically to lobby both State and local government to ensure that bushland is properly protected and managed. It is hoped that delegates have obtained new insights into issues that confront them as they continue to work for the public benefit of our unique natural asset that is bushland.

Official opening

Hon. Barbara Scott MLC,
Member for the South Metropolitan Region,
representing the Minister for the Environment.

I am delighted to be here to officially open the Managing our Bushland conference on behalf of Environment Minister Cheryl Edwardes.

Your conference theme — 'the protection and management of urban bushland' — is relevant to us all.

While we tend to focus on Perth, urban bushland is important to many communities north, in the south or in the wheatbelt region.

The majority of Western Australians love the bush, even those who do not necessarily love bushwalking or camping. Natural bushland is part of the Australian way of life — it epitomises the diversity and inherent social and environmental values that are very much part of our everyday life.

Setting aside natural bushland for nature conservation is essential, though sometimes difficult to do. Managing our bushland for the many and varied reasons it is used, is just as difficult. To find a balance between conservation, recreation, tourism and industry is a dynamic and constantly evolving job.

Therefore, the question I was asked to address in my speech today — 'would there be any urban bushland left in the year 2010?' — is totally baseless. Though it is difficult to manage, urban bushland is a vital part of our environment and community, and a top priority for the State Government. History has shown us the benefits of conservation.

We have magnificent national parks around Perth, such as Yanchep, John Forrest and Yalgorup; important nature reserves like Ellen Brook, Lake Joondalup and Thomson's Lake, and of course areas like Kings Park and Bold Park — all testaments to the foresight, persistence and dedication of people with the desire to conserve our bushland.

And this is the key to ensuring that as a State we do indeed have urban bushland, not only in the year 2010 but way beyond that.

Community involvement and support has been and will continue to be one of the driving forces for the preservation of bushland — the Urban Bushland Council of WA is a prime example of this.

You have dedicated members whose valuable contributions to bushland conservation means future generations have the opportunity to enjoy and experience our natural environment.

The conservation of our bushland, whether it is in urban areas such as Cockburn or in the much broader scale farming and pastoral areas, is an issue which is attracting increasing community interest.

Indeed, one only has to look through local newspapers to see that there is a host of individuals and organisations, which have taken on a particular piece of bushland and virtually 'adopted it'.

As a member of this community, I welcome this trend because it reflects that society is becoming much more aware of the local environment and the role that environment plays in our quality of life.

The list of activities undertaken by the Urban Bushland Council in the past few years certainly reflects that commitment.

Through organisations such as yours we can be sure that our diverse range of native plants can be preserved. WA truly fits into the 'mega-diversity' compared with other countries when it comes to numbers of flowering plant species.

Information from the Department of Conservation and Land Management suggests WA has around 9000 named species of flowering plants, 2000 unnamed species and a further 2000 that are thought to exist.

To put that in context, Western Australia has ten times the number of flowering plant species as Great Britain. Indeed, the Fitzgerald River National Park between Albany and Esperance has 1400 species alone.

One thing is clear: the task of conserving such a wide and diverse range of flora is beyond the scope of one organisation. It is a community responsibility.

The Urban Bushland Council is a good example of how one part of the community is prepared to pick up the challenge. The organisation of this conference to present this information to the wider community is very much an integral and important part.

I am sure that through this conference, people will not only become much more aware of the native bushland that surrounds them, but will become more involved in helping ensure it is conserved.

Conferences like this help us pool our knowledge and resources. In this way, we are much more likely to achieve our aims.

After all, one of the great lessons we can learn from our natural environment is that loners don't survive. All our native plants and animals have evolved

through forming partnerships with each other. We need to look at these partnerships and in so doing, apply the same principle to our endeavours.

In other words, today we are seeing a much more integrated approach to our Landcare problems because the government and the community are now working together in partnership.

As you may be aware, last year the State Government announced a new direction for the management of eight Regional Parks as part of the government's commitment to bolster the parks, bushland and Greenways network throughout the metropolitan area.

Management of the parks has been progressively transferred to CALM with the WA Planning Commission continuing to be responsible for acquiring lands for inclusion in the new parks.

In the first year, CALM assumed management responsibility for Yellagonga, Canning River, Beeliar and Herdsman Lake, all of which contain significant wetlands and bushland.

I am pleased to say that the State Government, through the WA Planning Commission, has earmarked five million dollars over the next five years for capital works for the parks and $500,000 for the preparation of management plans. CALM also will be provided with further funding for park management.

Work has also begun on Perth's Bushplan, which I understand will be detailed by a representative from the Ministry for Planning later in the conference.

I would like to emphasise that the government fully recognises the need for bushland in both the metropolitan area and country towns.

In the agricultural zone, remnant bushland covers 2.8 million hectares of the 20.8 million hectares of privately-owned land. In addition, a further 4.5 million hectares are in state forest, national parks, nature reserves and other public lands. This means that of the 25.3 million hectares of land in the agricultural area, 7.3 million hectares contain remnant vegetation — that is about 28%.

It is not practical, nor indeed wise, to merely fence off patches of bush to keep the sheep and cattle out and expect that somehow, if left to fend for themselves, these small blocks of native vegetation will somehow flourish. They won't.

As part of the salinity action plan, we have introduced a land for wildlife scheme. This is a voluntary program under which landowners will conserve remnant vegetation and wetlands and manage them for their conservation values.

Since the scheme was introduced in February 1997, 285 property owners have registered. Private landowners from Geraldton to Esperance have set aside more than 16,000 hectares for nature conservation.

I am confident that the enthusiasm with which farmers are grasping the scheme will rub off on their neighbours and we will see the area of remnant bushland on private land that is managed for wildlife habitat increase significantly over the next few years.

The government also has announced plans for a 50,000 hectare conservation reserve between Gnangara and the Moore River. Half of this area is already banksia woodlands along with stands of tuart, jarrah and marri. As the existing pines are progressively harvested over the next 20 years or so, the plantation land will be re-established as native bushland.

We are also committed to the concept of covenanting in relation to remnant vegetation on private land. We will be legislating to create a formal nature conservation covenanting scheme.

At the same time, moves are being made to assist landowners to lodge protective covenants or some other mechanism that will ensure remnant vegetation continues to be protected after land titles exchange hands.

Urban bushland is also clearly recognised as an important area for funding under the Natural Heritage Trust Bushcare program.

I appreciate that there are many other issues in relation to bushland conservation and while I see that some of the issues will be covered by formal talks, I am sure that many other issues will come up during your discussion here at the conference.

In closing, I once again would like to thank the Urban Bushland Council for the invitation to be here. On that note, I am delighted to officially open the Managing our Bushland conference.

Conserving Remnant Vegetation in an Urbanising Landscape: A View from Quinns Rocks

David Wake* and Renata Zelinova,
Quinns Rocks Environmental Group Inc

Quinns Rocks, on Perth's urban fringe, provides a useful case study of what's happening to bushland on the edge. We use the local situation to raise issues concerning urban development and bushland conservation and suggest some strategies for conserving remnant vegetation in an urbanising landscape.

Background

Quinns Rocks is located on the coast about 40 km north of Perth, in the north-west corridor. Once a small coastal community set in bushland, it is now surrounded by new suburbs on the northern margin of Perth's urban growth.

The loss of bushland is a matter of concern to the local community. Concern for the environment and the implications of proposed development led local residents to form the Quinns Rocks Environmental Group in 1985. The group has done many things to protect, study and raise awareness of bushland, including:

- making submissions on proposed rezonings for urban development in the area and strategic land use plans
- commenting on environmental assessments for development proposals including Mindarie Keys and Eglinton
- lobbying to protect significant areas including Burns Beach bushland and Neerabup National Park
- raising the values of, and threats to, bushland in the media
- holding workshops and publishing a book on urban bushland, its protection and management
- surveying flora and fauna in bushland remnants in Quinns Rocks.

Despite these efforts the loss of bushland has continued, though there have been some gains.

Remnant Vegetation Study

In 1995 the group put together a proposal and gained Landcare funding for the Quinns Rocks Remnant Vegetation Study. The study area covers about 8,000 hectares around Quinns Rocks, from Burns Beach Road to Pipidinny Road west of Wanneroo Road (Figure 1). This includes the localities of Burns, Kinross, Mindarie, Clarkson, Merriwa, Ridgewood, Quinns Rocks, Butler, Jindalee, Alkimos and Eglinton, and Neerabup National Park. The study aims to document remnant vegetation in the area and work out strategies to conserve it, given proposed urbanisation.

The area includes vegetation of the Quindalup and Spearwood Dune Systems. The Quindalup Dunes include mixed heathlands with *Melaleuca acerosa*, *Olearia axillaris*, *Scaevola* spp. and the herb *Lomandra maritima*. The Spearwood Dunes includes heathlands on limestone ridges (characterised by *Dryandra sessilis*, *Melaleuca cardiophylla*, *M. huegelii* and mallee eucalypts) as well as woodlands on deeper sands (dominated by banksia and mixed tuart, jarrah and marri over banksia). As part of the study a description of the vegetation and flora was prepared (Robinson 1997).

In a regional context the vegetation is important for a number of reasons:

- It includes large remnants in the Quindalup dune system and the western portion of the Spearwood system. The vegetation and landforms of these units are poorly conserved.
- It includes potential east-west and north-south transects of natural landscape which could be protected.
- It provides connections with other large remnants, including conservation reserves.
- It is a large area of natural habitat on the coastal plain.

The study seeks to convey something of the environmental history of the area. We have attempted to do this by looking at aerial photographs to see how vegetation cover and land use has changed over the last few decades.

In 1965 three-quarters of the area was native vegetation in good condition. Some land had been affected by grazing, particularly on the Cottesloe soils from Butler to Clarkson, and a former stock route ran along Wanneroo Road (Chambers 1991). There was some settlement at Quinns Rocks, which was becoming a holiday retreat, and some pockets of land along Wanneroo Road were being farmed.

Over the following twenty years Quinns Rocks grew and Burns Beach townsite was established, though most of the study area remained bushland. Some 68% of the area was native vegetation in good condition.

Between 1985 and 1995 the area covered with native vegetation declined from 89% to 72%. In late 1987 clearing for urban development started south and

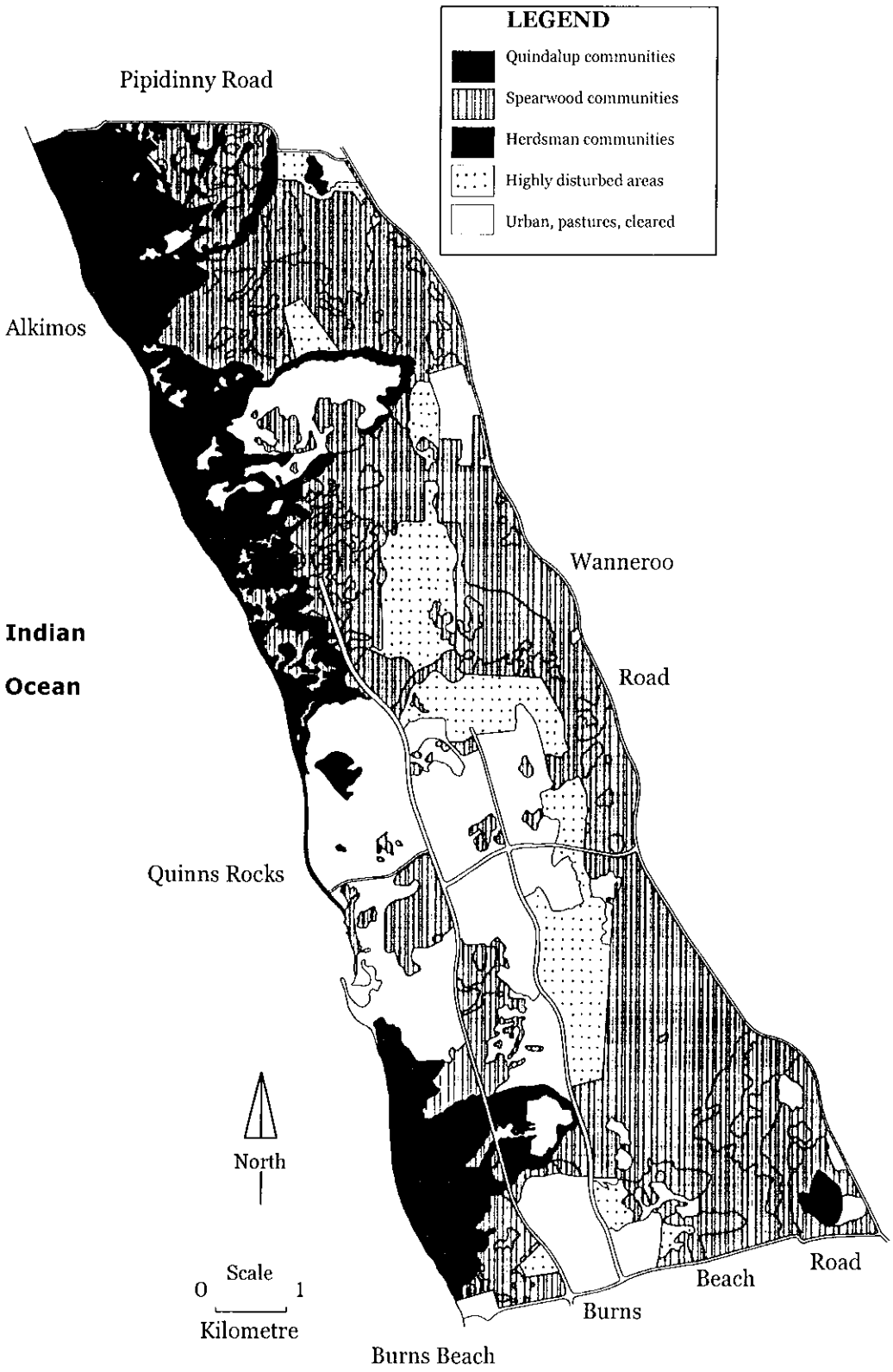

Figure 1: Remnant vegetation in the Quinns Rocks Area. Based on aerial photograph, January 1995. Source: Robinson 1997.

east of Quinns Rocks townsite. More extensive clearing followed as the suburbs of Clarkson, Merriwa and Kinross developed.

Changes in vegetation cover are summarised in Table 1, and a detailed assessment is provided by Zelinova (in prep).

Despite this history extensive areas of habitat remain, but these remnants are threatened by planned urban development. The most dramatic change in vegetation cover is yet to come. Extensive clearing and bulk earthworking are common practice in urban development around Quinns Rocks and elsewhere around Perth. Natural landform and the bushland it supports is quickly transformed into bare earth reshaped for standard stock housing. The rate of bushland loss in the local area is rapid and disheartening.

Change in remnant vegetation cover/land use, Quinns Rocks 1965-1995

	Coverage (as percentage)		
Vegetation cover/land use	**1965**	**1985**	**1995**
Remnant vegetation, little disturbance	75.7	68.1	62.6
Remnant vegetation, visible signs of disturbance	15.3	21.3	9.6
Cleared areas	7.9	8.8	18.3
Urban, built-up areas	1.1	1.7	8.9
Public open space, no remnant vegetation	0	0.1	0.6
Total	100.0	100.0	100.0

Quinns Rocks Remnant Vegetation Study, Quinns Rocks Environmental Group Inc September 1998

Strategies to conserve bushland

If this pattern of development continues there will be little bushland remaining in the area within ten to fifteen years. There will be little reminder of the former natural landscape and biodiversity in the area will be much depleted. Bushland will not feature much in the new neighbourhoods, with a lack of natural open space contributing to placelessness and alienation. This likely future shows up many of the flaws of the land use planning process, among other factors. The environment has not been a primary consideration and conservation has not been a priority in planning; that is why so much bushland has been lost.

This does not have to be the future. In June 1998 the Quinns Rocks Environmental Group brought together stakeholders, including developers, representatives of State and local government, and local residents, to discuss a green vision for the area and how it might be realised. We acknowledged that much of the area will be developed but found that there is still scope for positive action. Through more thoughtful planning and greater commitment more remnant bushland can be retained intact than would be the case if current practice continues.

Our vision is for a greener future, where there is protected and managed bushland which the community values. Under this vision bushland would be an integral element of the urbanising landscape. The study area would include:

- Well protected and managed regional conservation reserves including the coastal reserve, Burns Beach bushland and Neerabup National Park. These will link together and connect with other parts of the conservation estate. They will provide a green frame around existing and proposed urban neighbourhoods.
- Bushland remnants retained in local open space, school grounds and other public land, providing natural areas close to urban neighbourhoods where people can enjoy, connect with and look after nature.
- Major roads are landscaped with local plants to provide greenways across the urban area. These connect with bush remnants and, together with local plants in residential gardens, provide habitat for some native fauna.

Realising this vision will require efforts to secure bushland for conservation, innovation in planning and developing new neighbourhoods and informing and involving the local community and others with a stake in the future of the area. Key strategies we suggest for retaining bushland in an urbanising landscape are outlined below.

Secure key conservation areas in the reserve system

Large remnants of high conservation value should be in public ownership as part of the conservation estate. The System 6 recommendations (EPA 1983)

and strategic land use plans have identified some of these areas but in many cases little has been done to secure them, leaving them under threat as development pressure intensifies. Reservation should be a priority and these areas should be protected from incremental loss.

Locally, Burns Beach bushland and the link to Neerabup National Park should be reserved for conservation. These areas together with the coastal reserves and national park should be protected from inappropriate infrastructure proposals, including east-west roads that would fragment the bushland and impinge on the ecological functions of the reserve network.

Improve land use planning and development practices to retain bush

It is important to identify and set aside bushland in local open space and other public land. Clearing should be minimised. The natural landscape including remnant bushland should be an integral part of the emerging urban communities.

An appraisal of landform and remnant vegetation, and their conservation values, should inform land use zoning and structure planning. Remnant bush should be retained in relatively large, compact areas and, where possible, connected with other remnants. Design guidelines should be developed, covering issues such as delineation of areas for conservation and the interface between bushland and surrounding land uses. Local council planning schemes and engineering requirements should encourage retention of natural topography and remnant vegetation. There is certainly a need for change to this end in Wanneroo.

Manage all bushland remnants to enhance ecological integrity

Large conservation reserves and small urban remnants need to be looked after, though needs differ with scale and situation. Disturbance factors such as frequent fire, rubbish dumping and inappropriate access and use need to be addressed and regeneration of the bush encouraged. Local experience has shown that informed land managers, preparation of reserve management plans and use of ecologically appropriate management techniques are all important if the bushland is to retain its natural values.

Revegetate with local plants

Local flora can be used in landscaping of public land and residential gardens to provide habitat and create greenways linking with bushland remnants.

As urbanisation has occurred around Quinns Rocks, indigenous plants have been lost with clearing of the bushland. They are replaced with species from elsewhere, usually plants with higher water and nutrient needs and little value for wildlife. Encouraging the use of locally indigenous plants in gardens and along roadsides can contribute to biodiversity and water conservation and promote a sense of locality. Barriers to be overcome include aesthetic and horticultural preferences, ignorance of environmental realities, lack of awareness of local plants, and limited commercial propagation.

Raise community awareness

Bushland needs to be better understood and valued and more people need to be involved in looking after it if it is to remain intact. Bushwalks, talks to school students and community groups, leaflets on the importance of bushland, flora and fauna surveys, bush regeneration days and encouraging neighbouring residents to adopt the bush are some of the ways this could be done. So often threats to local bushland have come from a lack of appreciation of bushland; greater awareness and participation is important to retain bushland in the long term.

For bushland on private land which is not planned for urban development other strategies are needed. Some rural landholdings occur in the Quinns Rocks study area, including land along Wanneroo Road between Neerabup and Yanchep National Parks (some of which has been cleared). The proximity of existing and proposed development and the expectations of some landholders may require development controls as well as support for good land stewardship to retain and restore bushland along this potential conservation corridor.

Preparation of a local greening plan would be a useful process for bringing together stakeholders, identifying conservation issues and working out strategies to retain and manage remnant vegetation in urban and rural areas (a guide to preparing local greening plans is provided in Greening Australia 1995). This is something we are seeking for the Quinns Rocks area to translate ideas into action.

Conclusion

Realising a greener future for developing areas on Perth's urban margins depends on changes in the planning and development process. The Quinns Rocks example shows the effect of urbanisation and the need for a more thoughtful approach to urban development. Conserving bushland in urbanising areas would enhance the neighbourhoods that are being created.

The Quinns Rocks study suggests some ways we can improve the situation in areas earmarked for urbanisation, but we should also look critically at Perth's future urban development if we want to protect bushland throughout and beyond the metropolitan region. Local experience prompts us to question the way the city is developing. Continued low density urban expansion will be at the cost of bushland.

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Managing Urban Growth to Save Perth's Bushland

David Wake
Quinns Rocks Environmental Group Inc

Perth's outward growth is a major cause of bushland clearance on the Swan Coastal Plain.

Retaining bushland areas in a system of reserves is an important way to conserve biodiversity, but may by itself prove inadequate. The strategy of identifying a limited number of areas and putting them into the conservation estate or encouraging their protection in private hands (which is what Bushplan will do) does not address the ongoing loss of habitat due to urbanisation.

Can we maintain diversity by setting aside just 10% or 20% or 30% of habitat? Some biologists and ecologists doubt that this will be enough (Soulé 1995, Trudgen 1996). Setting a minimalist target for the conservation estate overlooks the imperative of managing entire landscapes to maintain biodiversity, including our urban landscapes. We should minimise clearing, maximise habitat retention and make biodiversity conservation a priority in land use decisions.

Perth's urban footprint continues to extend outward. In the process large areas of remnant vegetation are cleared. In the state's agricultural region a revolution in attitudes towards bushland is occurring; bushland is increasingly seen as valuable, indeed integral, to the livelihood of farming communities (Bradby 1998). The amount of vegetation clearing has declined. We are yet to see such a change in Perth; there is some concern at bushland loss but the loss goes on. It is reckoned that there may now be more clearing happening for urban development than there is for agriculture. Between 1994 and 1996 it is estimated that over 6,400ha of bushland in the metropolitan region was lost (data from Ministry for Planning's Perth Environment Project, Duggie 1996).

Maintaining biological diversity and ecological processes is fundamental to ecological sustainability, yet continuing erosion of natural habitat due to expansionist land use planning and our housing choices takes us further from this goal. Perth's urban sprawl not only threatens bushland it also affects water catchments and agricultural land and impacts on energy consumption, air quality, greenhouse gas emissions, economic efficiency and the very livability of our city (for discussion of metropolitan planning and ecological sustainability see Newman and Mouritz 1991, Yiftachel and Kenworthy 1992).

If we want a livable, sustainable city we should question the way Perth is headed.

Much of the discussion about urban sustainability acknowledges the importance of protecting natural capital and living within limits, including spatial limits. Writing about planning and sustainability, Timothy Beatley (1995, p. 384) noted that 'in the sustainable community, conservation and protection of natural and undeveloped land is a primary goal that is not easily overruled by proposals for housing or other land uses that could easily be accommodated within existing urban areas'. Containing growth and making cities compact is critical to making the places we live in more sustainable.

If Perth's population is to increase then how should it be accommodated? Population is a key issue for sustainability but no stabilisation of the region's population is in prospect. Instead of planning for more sprawl we could manage growth in a much more proactive way. This could include containing spatial growth through an urban growth boundary to define the long term limit for urban development (Figure 1). Development could be focussed to existing urban areas, to areas designated for new development and possibly to towns beyond. We could develop a more compact city, with a better mix of land uses and housing types and urban amenities with potential for a shift away from car-dependence to which sprawl contributes. The area outside the growth boundary could form a greenbelt where the priority is maintaining natural habitat and sustainable rural land uses.

As Perth grows some fragments of bush are retained but the sea of sprawl extends outwards. If we want to sustain biodiversity, to protect bushland, we could aiin for the reverse (Figure 2). We can apply ecological principles to urban design to fashion land use patterns which foster efficient use of urban space, promote livable cities and protect green space.

In this way we could develop a more compact, sustainable city and retain habitat in and around the urban area. Those concerned for Perth's bushland and the livability of the city should consider alternatives for Perth's future development.

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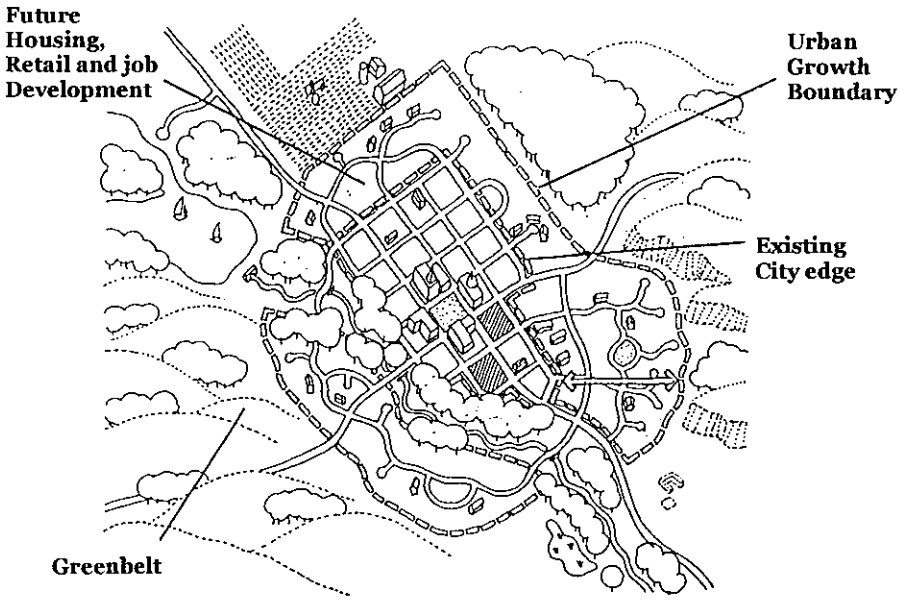


FIGURE 1: Urban growth boundary and greenbelt: land use tools to protect bushland and promote compact urban form
Source: Greenbelt Alliance 1995

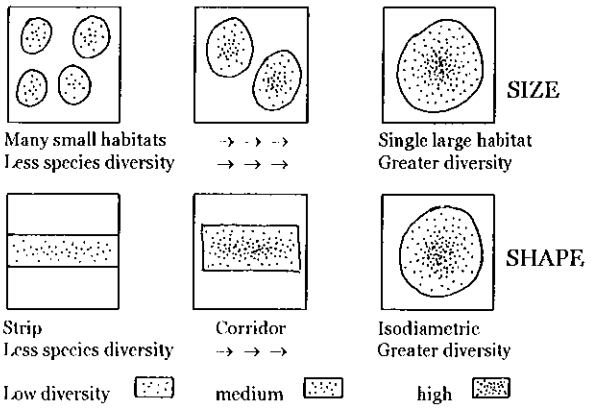
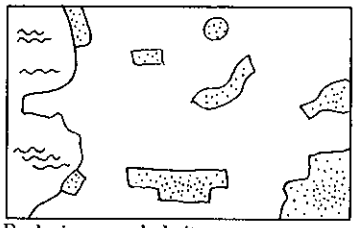


FIGURE 2: Ecological principles and urban planning
Principles of biogeography applied to design of wildlife habitat (left), and applied to ecocity design (right).

Source: Register 1987


Parks in sprawled city


Compact ecocities in nature (same location)

Urban Bushland and Planning: A Case for Further Reform

James Duggie
Save Our Bushland Campaign Coordinator, Wildflower Society of Western Australia (Inc.)

Introduction

In this paper I will argue that there is still an urgent need for major reforms in our State's planning processes to ensure that those processes are improved and urban bushland is more effectively protected.

Clearing urban bushland is an irreversible process. Revegetation and rehabilitation efforts are of course very important, but that does not change the fact that original bushland ecosystems, once completely cleared, cannot be recreated. Bushland is a part of our natural heritage, which we have a responsibility to preserve for future generations. But it is lost forever when we allow it to be cleared.

Some of you may wonder why I have bothered to state what may seem obvious here. I repeat it here exactly because it is *not* obvious to many people, including at least one Minister for Planning that I have spoken with. So we must not forget that there is still an enormous amount of education that needs to be done before society as a whole, and in some cases key decision-makers, fully understand the implications of clearing native vegetation.

Perth's growth is causing our bushland loss

Perth is growing in terms of both population and spatial extent at an enormous and alarming rate. This expansion is the most fundamental environmental pressure on urban bushland, as David Wake has discussed in the previous paper. Our current planning system is designed to facilitate this expansion process. The greater proportion of urban bushland clearing results from approved urban developments and related activities.

David Wake has described to us the experience of Perth's northern suburbs. But if you have been in Perth for long enough, I would like you to think for a moment. Can you remember what Perth was like 20 or more years ago? How long did it take to drive from the northern to the southern boundary of Perth? How much bushland did you grow up with in your neighbourhood? Perth's spatial extent increased by 50 per cent in the 20 years between 1971 and 1991, and we have lost an enormous amount of bushland from the city (Graetz, 1992). Perth now stretches approximately 90 km along the coast and 40 km inland (State of the Environment Reference Group, 1998:7). The nature of Perth has changed profoundly. But it is easy not to notice this as we go along in our lives focussing on the present as we all tend to do.

With this in mind we can look to the future. Can we imagine what Perth will look like if current trends continue? We will have an enormous, sprawling urban landscape with fewer and fewer remnants of bushland. Part of Perth's sense of place will be lost, and important part of the fabric of our local environments will have been squandered. As a result the quality of life for all of us living in Perth will be severely diminished.

Data on the rate of clearing of native vegetation is surprisingly scarce for the Perth Metropolitan Region (PMR). For example there are no published figures on the level of clearing in the last couple of years. This must change, as this type of information is crucial to well informed decision making. Hopefully the State Government's State of the Environment Reporting process will correct this gap in information gathering. We do know however, that within the PMR, in the ten year period between 1984 and 1993, a total of approximately 6700 ha of land was turned over to lots in Special Rural zones, and a further 9400 ha of land was turned over to residential lots in urban zones. (Western Australian Planning Commission (WAPC) & Agriculture WA, 1997:11) That is 16,100 ha in ten years, or 1600 ha per year. We don't know how much of this area was still native vegetation at the time of the lot creation, or how much of that area is now cleared, but the proportions in both cases are likely to be quite large.

It is estimated that by the mid-1990s over 6000 ha of bushland was lost in one two-year period. Nearly 1500 ha of this bushland was thought to have been regionally significant. (Ministry for Planning, 1996). The official estimates from the Western Australian Planning Commission (WAPC) suggest that, with current policies, to accommodate the expected increase in population from the current 1.7 million to 2.6 million in 2026, WA will require an additional 500,000 residential lots taking up another 55,000 ha of land (WAPC & AgWA, 1997:11). That is close to an average of 1900 ha per year for the next 29 years. Such figures are likely to be quite conservative when it comes to indicating the total area of bushland that will be lost if current trends continue. We can't afford to be complacent about our planning processes and the future of urban bushland.

Nothing is inevitable, there is a better way

If stronger measures are not introduced we will see an unacceptable expanse of priceless urban bushland lost in coming years. The current level of clearing of bushland is unacceptable. The clearing that is still to

occur will have a devastating impact. This clearing is not all inevitable. It doesn't have to occur. We as a society can choose to not let it happen. There are other, better ways of moving forward.

We need a complete shift in mindset, from the current one where all too often bushland is seen as 'vacant land' waiting to be developed, to a more sensible one where the values of bushland are fully recognised; to one where bushland conservation is seen as a legitimate land use; where every piece of bushland is treasured for what it is, and significant justification must be presented before any of it is allowed to be cleared. Only when we have such a shift through all sectors of the community will we really be able to achieve effective bushland conservation.

For those of you who doubt that this can occur, just think how big a mind shift has already occurred with respect to land clearing for agriculture in the last 16 years.

As is recognised by many, to achieve an effective shift we need a partnership between the State and local governments, the public and the business community, and community organisations. This conference is a good example of how urban bushland community groups are playing an important role.

Reforms and actions needed for bushland conservation

In the remainder of this paper I will discuss some of the key reforms to planning processes and other actions that the Wildflower Society of Western Australia and other groups, such as the Urban Bushland Council and the Conservation Council of Western Australia, have been calling for over many years. These reforms are ways in which the State government, State agencies, and local governments can improve their contributions to bushland conservation.

'Whole of government' approach to bushland conservation

Foremost is the need for the State government to develop a 'whole of government approach' to urban bushland conservation. There needs to be a designated lead agency or statutory authority which would be given overall responsibility for vegetation protection and management. This agency or authority would ensure coordination between the State agencies which have relevant responsibilities and powers. This organisation could also coordinate government support for landholders and community groups managing bushland. As part of this approach, all State agencies should be required to develop environmental policies for their activities, including policies which address any relevant bushland issues. These policies should include processes for resolving conflicts between agencies and for ensuring that polices and decisions are consistent with State Government bushland conservation policies and priorities – including Perth Bushplan. Such a whole of government approach must be extended beyond the four State agencies that have been involved with preparing the Perth Bushplan, to all government agencies and departments.

One area where such coordination between agencies is needed is in the area of the agencies identifying land vested in them which they consider surplus to their needs and subsequently proceed to sell. Such land should be assessed for bushland values, and referred to the bushland conservation lead agency for consideration before sales occur. This land is publicly owned. If it has significant bushland on it, this should not be lost due to the constraints of arbitrary accounting rules which separate the budgets and inventories of different Government agencies.

There are also problems with agencies which have large amounts of bushland vested in them which are earmarked for future purposes. These agencies should be required to meet their responsibilities to manage these areas appropriately prior to development. Future proposed uses of such vested bushland should be reviewed with regard to State bushland conservation priorities.

Environmental assessment process for all urban bushland clearing proposals

A process should be established to ensure that all urban bushland clearing proposals (on urban or other non-rural zoned land) receive adequate environmental assessments. Such a process is needed because not all bushland clearing that occurs through formally approved development proposals currently receive assessment or adequate consideration. The State Government should introduce immediately a publicly transparent process for application, assessment, public comment, dispute resolution and approval, or refusal, with respect to clearing of urban bushland. This could be administered by the bushland conservation statutory authority, and could perhaps borrow from the model established by the memorandum of understanding on rural land clearing established in 1997 (Commissioner for Soil and Land Conservation, 1997).

Environmental assessment of major amendments

It is essential that environmental assessments of major planning amendments incorporate consideration of the implications of amendments for any bushland that might be affected by the future consequences of the amendments. This should include, amongst other things, ensuring any bushland on land proposed to be rezoned is assessed for its heritage and conservation values. In addition, amendments which may lead to a detrimental impact on these values should be carefully considered and not approved where the loss of bushland values is considered unacceptable.

More generally, guidelines need to be developed to

assist planning agencies and decision-making authorities to identify bushland and assess its values and plan for its long-term use. There is also a need to train planners and decision makers in planning for bushland conservation. The State Government should also ensure that the WAPC has the power to impose and enforce appropriate binding conditions, such as fencing requirements and clearing restrictions on subdivisions, as part of the condition of subdivision approval. This is not currently the case. The planning processes need to be applied so that residential development and other incompatible land uses are controlled to ensure intended bushland conservation is effective. In some cases, historically inappropriate subdivisions may need to be consolidated in areas identified as being of high conservation value.

As recommended by the Western Australian State of the Environment Report, the State Government should develop an ecologically sustainable population and consumption strategy for Western Australia. This is an essential step towards becoming more ecologically sustainable as a society. In such a process, the issues relating to the continued growth of the State's, and Perth's, population and the associated expansion of urban development need to be addressed. The State Government should also adopt and enforce policies on the designation of urban growth boundaries for Perth and other population centres, and on the establishment of green belts.

Bushland conservation zoning and reserves

A 'Bushland Conservation' zone should be included in the Metropolitan Region Scheme and local government town planning schemes. This would be symbolic of the notion that bushland conservation is a legitimate land use, while also providing a tool for establishing clear guidance to planners and decision-makers with regard to the intent of protecting urban bushland. There is also a need to introduce 'Bushland Conservation' as a separate reservation category for public land to distinguish the reservation purpose of bushland conservation from the more general, more ambiguous, and therefore less secure, category of 'Parks and Recreation'.

Perth Bushplan

The Perth Bushplan will be discussed in more detail in other papers presented at this conference. It is, of course, an important State Government bushland conservation initiative. As the Perth Bushplan is now before the State Cabinet, our focus is on what the State Government's commitment will be to implementing the Bushplan's recommendations. It is vital that Bushplan recommendations are implemented in full, and in as short a time frame as possible.

One concern is the length of time it will take to fully implement the recommendations and the threat that regionally significant bushland will be under in the interim. Measures should be introduced to ensure the protection of these areas in the interim. A Statement of Planning Policy (SPP) could be used.

There is also a need to increase the level of funding for the implementation of the Perth Bushplan, particularly in respect to bushland acquisition. Land tax capitals should be increased on landholders to raise additional revenue for this purpose. At the same time, bushland retention could be encouraged by providing land tax relief. Land tax charges could be reduced by a certain proportion for landholders who retain bushland and enter into covenants and/or strictly implement approved bushland management plans.

Locally significant bushland and local governments

The Perth Bushplan only deals with bushland identified as 'regionally significant'. 'Locally significant' bushland issues are not yet being properly addressed. The State Government must recognise that it has an important role to play in conjunction with local governments when it comes to 'locally significant' bushland.

The Wildflower Society is very pleased that the Western Australian Municipal Association (WAMA) has recently been taking a leadership role in exploring a policy framework in which local governments can address bushland conservation and management issues and responsibilities (WAMA et. al., 1998). Many of the conclusions and recommendations of the recent WAMA discussion paper on bushland issues deserve support.

All local governments should be required to develop inventories of bushland within their areas. A precedent for such a requirement exists in the form of the requirement for local governments to develop inventories of places of heritage value within their areas. Local governments should also be required to develop and then implement local greening plans or vegetation management plans. These plans should have a clear forward planning vision indicating the desirable long-term land uses, including areas of bushland conservation. The plans should be based on a long-term vision for the locality and what the role of bushland will play in the local landscape. They should make clear where the lines on the ground are — where no further bushland clearing will be allowed. The plans should also set targets for how much of the remaining bushland in the locality should be retained. It will be important for the effectiveness of such plans that they are developed through a process of consultation with the community.

Town planning schemes and future planning decisions should be consistent with the local greening plan. To this end clauses could be introduced in town planning schemes which require the fencing and protection of bushland and, in appropriate cases, require the rehabilitation of remnant vegeta-

tion in designated areas and restrictions on land clearing.

The greening plans should allow for the establishment and implementation of bushland management plans for publicly-owned land. In addition they should allow for encouragement of, and provision of support for, management plans and their implementation on private lands. This support for privately owned bushland could come in the form of direct financial support, provision of advice or other forms of in kind support, or indirect support through differential rating for land which is being strictly managed according to approved management plans.

Local governments should be encouraged to use their powers to encourage bushland retention and appropriate management on private land by applying differential (in this case lower) rating charges to bushland conservation zones, and vary the rate in the dollar for landholders who do retain bushland and meet criteria of appropriate covenant agreements and/or implementation of approved management plans. If loss of revenue becomes too large an impediment to local governments to providing such rate relief, increased charges over the remainder of the rateable land could be introduced to overcome this problem. Introducing separate charges is allowed for under the *Town Planning and Development Act 1928* (WAPC & AGWA 1997, p. 89).

There is also a great need for State agency and State Government recognition of local government plans, polices and recommendations with respect to bushland conservation efforts. As the WAMA discussion paper states there is little point in local governments doing the right thing if their '... programs are not recognised or supported in the assessment and decision-making of other government agencies' (WAMA, 1998). The apparent willingness of a number of Ministers for Planning to uphold Ministerial appeals from proponents against local government decisions, and in some cases also against WAPC advice, is of particular concern. Ministerial appeals should be abolished and the appeals process which is established should be open to third parties — not just the proponents.

We need to monitor the pressure for land use change in local government areas and regions to ensure policies and controls are appropriate to contemporary circumstances and can effectively protect bushland to an appropriate level. Changes may be needed as circumstances change over time.

Conclusion

We need a greater level of appreciation and acknowledgement from all sectors of society that urban bushland is priceless and irreplaceable. It is an important part of our natural heritage, and it deserves a higher priority in all our decision making and planning.

There has not been time in this talk to acknowledge all the current State agency initiatives and planning mechanisms that are contributing, or may contribute, to bushland conservation. I would not wish to imply that there have not been sincere efforts to address the issues of bushland conservation. What must be said however is that we still have a long way to go before the planning mechanisms and policies of State agencies and the State planning processes can adequately protect our bushland heritage. Until the range of issues that I have briefly touched on here have been addressed therefore, it is vital that urban bushland is adequately protected by establishing a moratorium on land clearing.

Meeting the challenge of conserving our urban bushland heritage will require that all sectors of the community work together in partnership. We can not afford to be complacent, or we will witness a scale of bushland loss in future years which would be a tragedy that could have been avoided. In this paper I have identified many of the measures which can be taken now, or which require reforms that will assist us in this most important task.

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An Aboriginal Perspective

Robert Bropho
Swan Valley Nyungah Community

The reason I'm here today is that I've got a lot of concerns. I've listened to the few speakers that spoke before I come on up here. I'd like to start off by saying I come from a long way back down the track, something like 68 years. I've seen a lot of changes around the Perth area, but most of all what worries me is the beautifulness of what nature gave us is fast vanishing, it is losing its identity — but progress moves forward. And with the many people we've got here today, I think it is time that everybody combine together and start to do something about what nature has given us. The beautifulness of the land, the bush, the waterways.

The white people look at it in their kind of way. They feel hurt in their kind of way how they see the land being used in what shape or form. But what I would like to ask everybody here is to listen very carefully and have a clear understanding of what I am going to say now. Us, the Aboriginal people, we look at it in another different kind of way. We look at it in your kind of way, but we are part of the land, it is our life. Each thing that is on that land is in some way connected to our very existence. Mainly when we see the trees being knocked down and the beautifulness of all things that are within that land makes us feel very sad. We worry about it. What we are trying to say is the land itself is like us its got life, and so have we. Once you've destroyed that land you cannot replace it.

I've heard it said many times that 'Oh we can replace it. We can clear this and we can regrow anything that we've taken away.' Don't take that as a factual solution to replacing that land because nature's gift cannot be replaced, not by man or the latest technology of the white man and his ways. Because once it's gone, it's gone forever. It is like if anyone of us die, you cannot be reborn again; you cannot be replaced.

The important area I'd like to talk about now is on the corner of Patricia Road and Arthur Street in the Caversham area. It is south of Reid Highway and west of West Swan Road. I would like to bring it to the attention of this gathering here this morning. It is one of the rare strips of land left in the area, and like all other areas of concern to many of us it is under threat of progress. Now in this bit of land there is a lot of stinkweed, there is a lot of jarrah and sheoak, redgum and wattle. The whole of the top of the land is just covered with the thickness of nature with leaves and whatever falls on it. Now it is under threat. And I'd like to leave that challenge to each and every one of you here. I challenge you to go out and see it and take up some action in what kind of way that you can. The bell keeps on ringing so I'll leave it here and say thank you.

Perth's Bushplan

Paul Frewer
Director of Strategic Planning, Ministry for Planning

Status

Perth's Bushplan is currently undergoing final preparation in matters relating to remnant bushland mapping and boundary verification to improve the accuracy in identifying affected lots and to provide updated statistics on the areas identified in the plan. Once this has been completed, Bushplan will be released for a public comment and I am hopeful that this will occur very shortly. This process will provide a formal opportunity for members of the community to contribute toward the finalisation of the plan. I expect the consultation period will be three months.

What is Perth's Bushplan?

Perth's Bushplan will identify areas of regionally significant bushland and associated wetlands and it is proposed that these areas should be conserved and managed to provide a comprehensive representation of the original biological diversity of the Swan Coastal Plain portion of the Metropolitan area.

The draft Bushplan is a whole of government document and is an outcome of the Government's Urban Bushland Strategy (1995). It combines the results of several key research programs: the Perth Environment Project (Western Australian Planning Commission), the System Six Update (Environmental Protection Authority), Conservation and Land Management regional biological surveys, and wetland mapping and evaluation work by the Waters and Rivers Commission.

Securing the outcomes of Perth's Bushplan will provide a significant measure of achievement for the core objective of the National Strategy for the Conservation of Australia's Biological Diversity – that is, to achieve a comprehensive, adequate and representative reserve system. It will also provide early advice to landowners and developers on the issue of regional biodiversity conservation in the Perth Metropolitan Area.

Selection criteria for Bushplan sites

Key criteria for the selection of areas were developed in accordance with the Government's Urban Bushland Strategy through the Urban Bushland Advisory Group and the System Six update program. The Urban Bushland Advisory Group included a representation from the Urban Bushland Council to ensure an effective consideration of community concerns.

The principle criteria include: the protection of at least 10% of each of the original vegetation complexes represented within the Swan Coastal Plain, and protection of threatened ecological communities, floristic communities, and verified conservation category wetlands associated with bushland area. Other criteria such as size, vegetation condition, relationship to other areas and land use zoning constraints were also used in the selection process.

Where's the bush?

Perth has an enviable record of conservation compared to other cities in Australia and an extensive conservation reserve system. To a large degree the achievement of this reserve system can be attributed to the Metropolitan Region Improvement Fund which is administered by the Western Australian Planning Commission (WAPC). For many years the Commission has been quietly and successfully reserving and acquiring lands for conservation purposes through Parks and Recreation reservation in the Metropolitan Region Scheme. Once acquired, the Commission will manage the land for an interim period, establish Regional Parks where necessary, develop management plans and pass on the land to an appropriate end manager with funding thorough the Commission's Areas Assistance Scheme. In fact the very land this facility sits on was acquired by the WAPC and vested with the City of Cockburn at no cost to Council. Bibra Lake, North Lake and Yangebup Lakes and their surrounding areas have been and will continue to be purchased by the Commission as part of the Beeliar Regional Park.

Approximately 13% of the Metropolitan region is reserved for Parks and Recreation and this excludes areas of the CALM managed estate and local conservation reserves. This compares very favourably to around 17% zoned Urban or Urban Deferred in the Metropolitan Region Scheme. In the past seven years, approximately 32,000 hectares has been reserved at a cost of over $100M to the WAPC.

Bushplan takes full account of the existing conservation estate in its identification of regionally significant vegetation recommended for protection. For this reason, a number of Bushplan sites are currently afforded a level of protection through Parks and Recreation Reservation under the Metropolitan Region Scheme and/or reservation and vesting with the National Parks and Nature Conservation Authority.

It is estimated that of the 55,900 ha of regionally significant vegetation identified, some 40,000 ha are already protected in the existing conservation estate. Of the remainder, 9,000 ha is estimated to be zoned rural in the MRS and 1,000 ha zoned urban, with the

remainder zoned for public purposes and owned by the Government or the Commonwealth. These figures will be subject to review following the update of the vegetation mapping.

Implementation

Perth's Bushplan is designed to become the primary mechanism for implementing the Government's commitment to conserve regionally significant bushland in Perth and will replace the System 6 recommendations for this area.

It is clear from experience elsewhere in Australia that government acquisition alone will not meet the objectives of achieving a conservation system that is, as far as achievable, comprehensive, adequate and representative of the ecological communities and habitats of the region.

In recent years, additions to the metropolitan open space system have caused the liability of the WAPC to climb to exorbitant levels and the Commission can only commit itself to reserving and acquiring areas of high conservation value and lands which present the community with the best 'value for conservation dollar' in terms of land cost.

It is also essential that a range of 'off reserve' conservation initiatives are promoted as part of Bushplan. These initiatives are currently being developed through public and private conservation agencies and aim to retain land in private ownership with private conservation management agreements or legally binding nature conservation covenants. The fact is that in a number of cases there will be no need for government ownership and management, particularly where there are small pockets of bushland and where land access should be discouraged. In many cases, the existing owner provides the most effective form of land management, stewardship and policing. Conservation on private lands is likely to be an important component of any future protected area system.

The Government also has a legal obligation to honour existing planning and environmental approvals in recognition of the economic and social value of land as well as its conservation value and, for this reason, negotiated planning approaches which respect the rights of private landowners may need to be considered for lands zoned Urban in the MRS. This will achieve a balance between conservation and development with vegetation protection to be achieved at minimal cost to Government through the statutory planning process.

This will not be easy and will require patience and sensitive negotiations and will include: detailed structure planning, the establishment of bushland sensitive design principles, local conservation zonings or special control areas and their attendant performance criteria, and investigations into alternative forms of development — including more clustered types of development in appropriate locations. It is important that the development industry recognises its responsibility to preserve the best areas of vegetation through sensitive open space planning. This is a challenge which confronts us all from both sides of the spectrum.

One of the fundamental objectives of Bushplan should be to bring greater certainty to the process of land use planning through the early identification and classification of regionally significant bushland areas and through decision making systems which clearly identify the roles and responsibilities of each government agency. This process should be regulated through a Memorandum of Understanding between the key agencies and it is proposed that the Ministry for Planning will be the lead agency in the implementation of Bushplan since a majority of the statutory powers reside within planning legislation.

I believe the implementation of the plan will need to be approached with a degree of sensitivity and flexibility. A preparedness to negotiate and compromise to get the best outcomes will be necessary on a case by case basis. Although 10% is regarded by many as a minimum, the fact that we are seeking to achieve this target in a city with a history of agricultural clearing and with definite growth requirements, makes full achievement of this target unrealistic in all cases, particularly when better opportunities may exist outside the metropolitan area and at considerably less cost to the community.

Local bushland

Perth's Bushplan is explicitly concerned with regionally significant bushland. However, it does recognise the concerns of some communities regarding local bushland and proposes that State Government support will be developed through WAMA and relevant local authorities in areas relating to bushland identification, assessment and classification. This support will be through the development of guidelines and criteria for the assessment of local bushland, information support for bushland mapping and through assistance in the development of local bushland strategies.

In conclusion

Perth's Bushplan is a major conservation planning initiative by Government and represents four years of collaborative research by the four agencies involved with the conservation of the State's unique natural resources. It will recognise Perth as the biodiversity capital of Australia.

Bushplan also meets one of the key objectives of the recently released State Planning Strategy which aims to secure representative areas within each region to protect biodiversity and enhance the key natural assets of the State. I hope the community can get behind the plan and give the Bushplan its full support.

Bushland and the Environmental Protection Act

Dr Bryan Jenkins,
Chief Executive Officer, Department of Environmental Protection

Introduction

This paper covers two main areas regarding bushland and the Environmental Protection Act: proposed legislative changes, and policy and administrative changes.

In May 1998 the Minister for the Environment announced a comprehensive program of amendments to the Environment Protection Act 1986. These amendments aim to maintain its general strengths and principles, such as openness and accountability, and the independence of the EPA. In addition they are to improve the efficiency of the processes, while ensuring the environment is effectively protected.

Public submissions have been accepted and workshops held. As of November 1998 the drafting instructions, forwarded to the Parliamentary Counsel's Office, and the response to submissions are similarly open for public comment until 18 December 1998.

Proposed legislative changes

Introduction of environmental harm to the legislation

Under the Environmental Protection Act 'pollution' is defined broadly to include environmental degradation and was intended to include harm to the natural environment. This definition was tested in the well-known Palos Verdes case, where the clearance of vegetation occurred. The developer responsible was taken to court on the basis of 'pollution' being environmental degradation. However, the court decided that 'pollution' should be limited to the discharge of waste and the action was unsuccessful.

We are proposing that the new offence of 'environmental harm' will cover the gap in environmental protection created by that Court interpretation. Two types of environmental harm will be defined: material and serious.

1. *Material environmental harm:*

- Harm that is not trivial or negligible. Thus trimming your garden bushes is of no concern.
- Loss exceeding the threshold of $20,000.
- Prevention or rehabilitation costs which exceed the threshold. For example, where the costs of rehabilitating damaged bushland exceed $20,000.
- Environmental nuisance that is high or widespread. This relates more to pollution and nuisance issues that affect amenity.

2. *Serious environmental harm:*

- Intentional or criminally negligent.
- Irreversible, high impact or widespread.
- Harm to areas of high conservation value.
- Where there is substantial loss, or property damage is five times the threshold.
- Where costs of prevention and rehabilitation is five times the threshold.

Proposed powers in relation to environmental harm

The Environmental Protection Authority will have new powers under the Act regarding environmental harm.

1. *Environmental Protection Notice.*

This is an expansion of the existing Pollution Abatement Notice. The EPA will be able to require:

- Investigations of the cause of environmental harm.
- Remediation of harm.
- Monitoring of effectiveness of the remediation; ie in respect of the restoration of the environment following damage.

2. *Environmental offence.*

There are two levels:

- Tier 1: serious harm.
- Tier 2: material harm.

The new offences and penalties under the Act will provide for a fine of up to $500,000 for an individual and one million dollars for a company causing serious environmental harm.

3. *Defence if harm has been authorised.*

There is a provision for environmental harm to occur as long as it has been approved under applicable legislation such as:

- Soil and Land Conservation Act.
- Mining, Planning, Irrigation Acts.
- Environmental Protection Act.

Policy and administrative changes

Biodiversity in environmental assessments

The EPA now considers biodiversity as one of the key environmental factors in its assessments of proposals. In almost every case the issue of regional significance is part of the environmental impact assessment.

Biodiversity has been a pivotal factor in EPA advice on proposals, for instance the Burns Beach urban development, the Southern River subdivision at Harpenden Street and the Yarloop mineral sands proposal. In each proposal, biodiversity was the key determinant of the EPA's advice to limit the extent of the proposal or determine its environmental acceptability.

Vegetation retention in planning schemes

The assessment of planning schemes and planning scheme amendments is a new concept. Rather than assessing proposals we are now assessing zoning in advance of any proposal. Consideration of bushland retention is now beginning to feed into the overall process and at a much earlier stage in that process. Three examples of achieving vegetation retention have been:

- Bullsbrook rural/residential subdivision. Through the assessment process the concept was changed so that the building envelopes are restricted to cleared land.
- Point Grey, Shire of Murray. Here there has been a combination of remnant bushland retention and redesign of facilities during the assessment process.
- Byford Town Planning Scheme 2. The developer concerned has willingly accepted the adoption of buffer zones and a stream-line zone as part of the overall development.

Memorandum of Understanding on vegetation clearance

There is now a joint assessment of land clearing proposals. For land clearing proposals on rural land a Notice of Intent comes to the Soil and Land Commissioner. There is also a staged review by departments, and if the clearing results in impacts that are environmentally significant then the EPA begins a formal assessment. Two recent examples where the EPA provided advice were:

- At Branson Road near the Stirling Ranges National Park, where it was determined further vegetation clearance would increase salinisation.
- At a property at Dandaragan near Mt Lesueur National Park bushland was found to have enough conservation significance to warrant retention.

Beyond Perth Bushplan

Perth Bushplan is the first step in a review of the Systems recommendations of the 1980s.

We are in the process of updating the remainder of System 6 and part of System 1 on the Swan Coastal Plain. This is part of the Urban Bushland Strategy, which was released in 1995, and the overall State commitment to the National Biodiversity Strategy.

The initial tasks in the Update over the next year will be to define the objectives and roles, to investigate existing mapping and commence the supplementary fieldwork for the Coastal Plain.

Perth Bushplan represents an excellent model for getting statutory protection behind the System 6 process, and we shall be extending this to the rest of the Swan Coastal Plain.

Keynote Address
Urban Bushland in Sydney — SEPP No.19, Twelve Years On

Mark Couston
Manager of Bushland Conservation, Ku-ring-gai Municipal Council, NSW

After changing careers several times, Mark began his career as an Environmental Officer with a consulting firm, with three years spent on various projects which included pollution monitoring at Caltex Refining. He has been a site consultant and has prepared the environmental and occupational standards for the remediation of the Homebush Bay Olympic site. Following this he spent three years as Bush Regeneration Officer at Ku-ring-gai Municipal Council and six years ago was appointed as Manager of Bushland Conservation.

Mark spent four years studying Applied Science at Charles Sturt University and completed numerous short courses and certificates including Soil and Water Management at the University of Western Sydney, Rehabilitation of Mined Land at Sydney University, Bush Fire Management and Planning at the University of Technology Sydney, and went on to complete a Graduate Diploma at Charles Sturt University.

Introduction

When I flew across from Sydney I was again reminded just how far away Perth is. Perth may seem a remote destination, but it is subject to the same international treaties agreed to by Australian federal governments and it is subject to the same federal laws. The various States go about the their businesses differently, which is reflected in State legislation and State authorities. Local government, however, appears to operate in a similar manner throughout Australia, dealing with local issues, despite being subject to State legislation.

Perspectives at various scales

Internationally, Australia became a signatory to the Convention on Biological Diversity in 1993 — one outcome of the 1992 Earth Summit in Rio de Janeiro. Nationally, this convention stimulated the preparation of a National Strategy for the Conservation of Australia's Biological Diversity, which includes the statement, 'the goal is to protect biological diversity and maintain ecological processes and systems'. The individual States go about things differently. And so they should — they are allowed to. At the State level legislation and plans are fashioned to suit individual needs after giving some consideration to national strategies. At the local government level community issues are frequently raised and prioritised.

Now all this 'you beaut' stuff may seem far from reality as we see the continuing practice of land clearing in Queensland, mining of world heritage areas in the Northern Territory and forestry debates in New South Wales. But these intentions to conserve biodiversity do work — in many cases flowing on to conservation initiatives. Sometimes they take a while to filter into State laws and actions by State and local government. The rate of enactment of these conservation intentions is very much dependent upon the desires of the community.

Biodiversity conservation

Traditionally, lands set aside for conservation purposes were called national parks and managed by State government authorities. While these national parks are important, it is unlikely that they will be able to maintain larger scale ecosystems which are influenced by outside forces. Conservation must extend into and be integrated with other land uses outside national parks. One of the best ways to achieve this is at the local level.

Open space bushland planning and management in NSW

Taking a historical look at bushland conservation outside national parks in the Sydney region, reveals some significant steps in the processes of environmental planning, environmental assessment and natural area management.

1979: Land use planning — development or open space.

Planning schemes, or local environmental plans, designate various land uses — for example residential, commercial, industrial or open space. Controversy still exists between the need to conserve bushland and the need to develop land. However, the process in New South Wales has become more transparent, and decisions have been subject to scrutiny, since the introduction of the *Environmental Planning & Assessment Act, 1979.*

In NSW there are several separate steps in making a local environment plan. These plans may vary in scale from a single subdivision rezoning to an entire municipality. Two of the statutory steps in preparing a plan are undertaking an environmental study and public exhibition of the study and plan. When preparing such a plan a number of State and regional planning policies have to be

taken into account along with conservation legislation — such as the *Threatened Species Conservation Act 1995* and State Environmental Planning Policy No. 44 — Protection of Koala Habitat. In the end, however, it is the State minister who determines the plan.

1986: Open space planning — recreation or conservation.

If an area is designated open space, then the use of such land is subject to a number of constraints, one of which is State Environmental Planning Policy No. 19 — Bushland in Urban Areas, 1986 (SEPP No. 19). This policy covers both public and private land zoned as open space. It also applies to land adjoining open space in terms of considering the potential impact of development proposals on the adjacent reserved bushland. The policy removed the competition between the land uses of developed open space (sports fields, golf courses, etc.) and bushland. It made reference to the preparation of plans of management for these bushland areas but, since it was only a policy there was no legal obligation to do so. It was at this point that bushland was recognised as a legitimate land use in the planning schemes of the Sydney region.

The general aim of SEPP No. 19 is to protect and preserve bushland for the following reasons:

- its value to the community as part of the natural heritage.
- its aesthetic value.
- its value as a recreational, educational and scientific resource.

It has these specific aims:

- to protect the remnants of plant communities which were once characteristic of the land now within an urban area.
- to retain bushland in parcels of a size and configuration which will ensure the long-term survival of existing plant and animal communities.
- to protect rare and endangered flora and fauna.
- to protect habitats for native flora and fauna.
- to protect wildlife corridors and vegetation links with other nearby bushland.
- to protect bushland as a natural stabiliser of the soil surface.
- to protect bushland for its scenic values, and to retain the unique visual identity of the landscape.
- to protect significant geological features.
- to protect existing landforms, such as natural drainage lines, watercourses and foreshores.
- to protect archaeological relics.
- to protect the recreational potential of bushland.
- to protect the educational potential of bushland.
- to maintain bushland in locations accessible to the community.
- to promote the management of bushland in a manner which protects and enhances the quality of the bushland and that facilitates public enjoyment of the bushland compatible with its conservation.

1993 — Public land management

In more recent times the *Local Government Act, 1993* clarified the responsibilities of local government in terms of public land management and made reference to the term 'community land'. The Act required councils to categorise community land as a park, general community use, a sports field or a natural area, and made it mandatory for councils to prepare plans of management for such land. These plans were required to have specific objectives and include the means by which the council's performance in managing such land was to be measured. In the category of 'natural area', the Act makes reference to sub-categories of bushland, foreshore, watercourse and escarpment.

1998: Natural area conservation objectives

Even as we speak, the NSW Government is considering amendments to the *Local Government Act, 1993, (NSW)* and in addition to these amendments a second hearing on the draft Local Government (Land Management) Regulations 1998 is being considered. These regulations include the criteria by which community land categories are to be categorised and specifies the core objectives to be included in plans of management:

- to conserve biodiversity and maintain ecosystem function in respect of the land, or the feature or habitat in respect of which the land is categorised as a natural area.
- to maintain the land, or that feature or habitat, in its natural state and setting.
- to provide for the restoration and regeneration of the land.
- to provide for community use of — and access to — the land in such a manner as will minimise and mitigate any disturbance caused by human intrusion.
- to assist in and facilitate the implementation of any provisions restricting the use and management of the land that are set out in a recovery plan or threat abatement plan prepared under the *Threatened Species Conservation Act 1995* or the *Fisheries Management.*

Further to this, the draft regulations include the objectives of the sub-categories of a natural area that should be included in plans of management:

Sub-category	Objectives
Bushland	to ensure the ongoing ecological viability of the land by protecting its ecological biodiversity and habitat values, the flora and fauna (including invertebrates, fungi and micro-organisms) and other ecological values. to protect the aesthetic, heritage, recreational, educational and scientific values of the land. to promote the management of the land in a manner that protects and enhances its values and quality and facilitates public enjoyment. to restore degraded bushland. to protect existing landforms such as natural drainage lines, watercourses and foreshores. to retain bushland in parcels of a size and configuration that will ensure the long-term survival of existing plant and animal communities. to protect bushland as a natural stabiliser of the soil surface.
Wetland	to protect the biodiversity and ecological values of wetlands, with particular reference to their hydrologic environment (including water quality and water flow), and to the flora, fauna and habitat values. to restore and regenerate degraded wetlands. to facilitate community education in relation to wetlands, and the community use of wetlands, without compromising the ecological values.
Escarpment	to protect any important geological, geomorphological or scenic features. to facilitate safe community use and enjoyment.
Watercourse	to protect the biodiversity and ecological values of the instream environment, particularly in relation to water quality and water flows. to protect the riparian environment, particularly in relation to riparian vegetation and habitats and bank stability. to restore degraded watercourses. to promote community education, and community access to and use of the watercourse, without compromising the other core objectives of the category.
Foreshore	to maintain the foreshore as a transition area between the aquatic and the terrestrial environment, and to protect and enhance all functions associated with the foreshore's role as a transition area. to facilitate the ecologically sustainable use of the foreshore, and to mitigate the impact of community use.

Conservation within developed land in Sydney NSW

1995: Conservation of threatened species

In 1995 the *Threatened Species Conservation Act* was introduced to conserve particular species, both flora and fauna, and ecological communities, and also to identify key threatening processes. This Act required planning and development processes to consider species listed in the Act's schedules and also required those activities which are not subject to the development consent processes to take into account threatened species.

In Ku-ring-gai many of the species and ecological communities listed in the Act's schedules are only there because they were restricted to a habitat which now has been largely developed. These species included *Darwinia biflora, Tetretheca glandulosa, Eucalyptus camfieldii, Pseudophryne australis* (red crowned toadlet), blue gum high forest and Sydney turpentine ironbark forest.

If we had been more aware of biodiversity conservation issues when the early planning schemes were developed then schedules in the *Threatened Species Conservation Act* would not be as extensive. It would also have avoided a lot of development conflicts and expensive court hearings.

1998: Environmentally sensitive residential land and limiting residential development.

As Sydney suburbs sprawled further outward across the landscape it became evident to the NSW State Government and the Department of Urban Affairs and Planning that infrastructure issues, such as transport, water and sewerage, were becoming a problem. Together with these infrastructure problems, other related issues such as air quality and motor vehicle use needed consideration.

The State Government adopted an urban consolidation approach, requiring councils throughout Sydney to prepare residential housing strategies to accommodate the needs of a growing metropolis. Basically this meant higher densities in the existing residential areas rather than continuing outward sprawl. This strategy did not mean changing existing open space zonings to residential. The State Government left the issue to be resolved at a local scale, allowing local communities to come up with their own strategy that was acceptable to the State. If local councils did not prepare an acceptable strategy then the State Environmental Planning Policy No. 53 — Metropolitan Residential Development would apply, making provisions for higher density developments right across the entire local government area.

Past planning schemes in Ku-ring-gai allowed large residential allotments averaging 1,200 square metres in size. With these large allotments Ku-ring-gai is dominated by an urban treed landscape and the im-

pact of uncontrolled higher density development would have a significant effect, and in many areas much of the urban native fauna and flora on private land would disappear.

Taking this planning opportunity, some areas of residential land were considered to be environmentally sensitive and these were identified in the proposed strategy. These areas included properties adjacent to bushland reserves and suburbs on ridgelines which extending into bushland reserves. In addition to these areas, residential land which was the most heavily treed and provided a link between bushland reserves was identified as a wildlife corridor. This corridor was intended to provide a suboptimal habitat for many birds and arboreal mammals to facilitate their movement between core bushland habitats.

After a great deal of debate and public consultation this approach to the residential housing strategy was adopted by the Council and given the consent of the State planning authority to proceed to a formal planning stage.

What has prompted these initiatives and changes?

The forces that initiate change can be either driven by the community or can come from good leadership. Changes are assisted by local communities voicing their values and having responsive politicians who listen. But even if this does occur it may not immediately provide for change if community values are discounted by the governing authority. And in referring to community values I do not mean the values of one loud-voiced individual.

Knowing what the community wants may seem a fundamental function of State and local government. If most successful business people take the time to know what the market is like, then why shouldn't politicians and government managers know what the community values are? Some politicians may rely on gut feelings or be interested in one or two main issues and some managers may have views that are clouded by a singular professional perspective.

Other impediments to change occur when local community members voice their values in a misguided manner, not being aware of the framework within which local or State government operates. Governments do operate with numerous bureaucratic rules, many of which are required under some form of legislation and many of these rules are there to ensure equitable and accountable processes.

Despite these impediments to change, bushland areas outside national parks, have been recognised as a legitimate land use in NSW planning instruments and the management of these bushland areas has been recognised as a function of local government. The level of protection and management afforded to bushland is often determined at the local level.

If a patch of urban bushland is not specifically recognised as having conservation significance from national or state perspective then its conservation worth is at a local level.

In March 1998, Ku-ring-gai Municipal Council commissioned a survey to assess the community attitudes towards the provision of services and facilities. Thirty-five issues were presented to participants, who were asked to rate what they saw as being important and to rate their level of satisfaction. Maintaining open space bushland rated as being the second most important issue below food shop cleanliness, equal to waste collection and disposal. These ranked higher than roads, library services, footpaths, aged facilities, sports fields, children's playgrounds, cultural facilities and another 25 issues.

The Future of Urban Bushland

In Gosford (NSW) and Ipswich (Qld) bushland has been purchased by the local council with the intent of conserving it. In Sydney, the planning mechanisms such as SEPP No. 19 have given recognition to urban bushland and current talks are considering a review making it stronger in conservation terms. The *Local Government Act, 1993* and draft regulations have made urban bushland conservation a core management function of local government on public land. Conservation values have also been recognised in other urban land uses in Sydney through legislation such as the *Threatened Species Conservation Act, 1995 (NSW)* and in regional strategies dealing with urban consolidation.

Based on these trends in New South Wales and in other parts of Australia, the recognition given to urban bushland will increase. The rate at which this happens is just a case of politicians listening to their constituents, government staff showing initiative, and the community in forums like this expressing their views.

Improving Legal Mechanisms for Protecting Urban Bushland: The Urban Bushland Strategy Recommendations and Beyond

Michael Bennett*
Solicitor, Environmental Defender's Office of Western Australia

In June 1995, the Western Australian Government issued the Urban Bushland Strategy, containing a number of specific law reform commitments. The purpose of this paper is to revisit those commitments, three years on, to see which have been implemented. Consideration will also be given to further law reform that could assist in protecting urban bushland.

Urban bushland laws: a thumbnail sketch

Before we look at the changes that were put forward in 1995, we need to consider in broad terms the legal mechanisms relating to protection of urban bushland in Western Australia.

Reserves

Perhaps the main source of protection for urban bushland is the reserve system.

The main statute relating to reserves is now the *Land Administration Act 1997*, which provides that the Minister for Lands may reserve Crown land for a specified purpose in the public interest, and may place management responsibility for that land in the hands of one or more persons.

Special legal obligations relating to nature reserves and national parks are dealt with in the *Conservation and Land Management Act 1984*. Under that Act, these areas are vested in the National Parks and Nature Conservation Authority, and are managed by the Department of Conservation and Land Management in accordance with management plans or, in the absence of such plans, in accordance with principles set out in the Act.

In the Perth metropolitan area, land can be reserved for a specific purpose, including parks and recreation, under the Metropolitan Region Scheme, and special permission is then required before a development can take place in that area. Similarly, local town planning schemes can record local reserves.

Town planning schemes

At a local level, applications for approval to develop land containing urban bushland are made under the town planning scheme of the local government in question.

Town planning schemes typically divide land within a council's district into zones and reserves and specify the type of development. The pattern of zones and reservations, and the constraints on the granting of development approval in those areas, will influence the extent to which urban bushland is cleared.

If a development proposal will have a significant environmental impact, the council is legally obliged to refer the proposal to the Environmental Protection Authority (EPA) before granting development approval under its scheme. The EPA will then decide whether the proposal should be subject to an environmental impact assessment. If the EPA does assess the proposal, the council cannot approve the development until the assessment process is complete.

Metropolitan Region Scheme

The Metropolitan Region Scheme (MRS) is similar to the town planning schemes administered by local councils, but instead of applying locally it applies to the whole of the Perth metropolitan area. The MRS is administered by the WA Planning Commission (WAPC).

In the Perth metropolitan area, development approval is required under both the local town planning scheme in question and the MRS. Although the WAPC has largely delegated its approval power to local councils, separate approval by the WAPC is still required in some circumstances, such as where the land in question adjoins a regional reserve. In such cases, the obligation to refer to the EPA proposals of environmental significance also applies.

Subdivision approval

Before land can be subdivided into separate lots, the approval of the WAPC must be obtained. Conditions can be placed on subdivision approval, including the retention of bushland. In legal terms, it has been decided that the environmental impacts of a subdivision proposal are proper town planning considerations, and subdivision can be refused on environmental grounds (JE Squarcini and Milano Pty Ltd v State Planning Commission, Unreported, WA Supreme Court, Scott J, 17 May 1995, lib no 960200).

Environmental impact assessment

The environmental impact assessment process es-

*My thanks to Andrew Roberts for his comments on a draft of this paper, and to Rebekah Dorman for her research assistance

tablished under the *Environmental Protection Act* is reserved in practice for only the most significant development proposals — it will not apply to every development that involves the clearing of bushland.

It should be noted that in addition to the obligation of government decision-makers, mentioned above, to refer to the EPA proposals that will have a significant impact on the environment, any member of the public may refer such a proposal to the EPA.

It should also be noted that, under changes to the law effective from August 1996, the EPA can now assess changes to town planning schemes and the MRS for their environmental impacts. However, if an environmental issue is assessed at that stage, it cannot be later referred to the EPA for assessment when it arises in the context of a specific development proposal.

Commitments in the Urban Bushland Strategy

With that brief background, we will now turn to look at the law reform commitments contained in the Urban Bushland Strategy.

Giving statutory recognition to regional parks

The Strategy proposed that statutory recognition be given to regional parks. This was to involve an expansion of the role of the National Parks and Nature Conservation Authority, and amendment to *the Conservation and Land Management Act 1984* to provide for a regional park category of land.

The CALM Act has not been amended in line with this recommendation, despite a number of other amendments being made to that Act since 1995.

Consideration of areas of environmental significance prior to land use changes

The Strategy stated that:

> Changes to planning and environmental legislation will ensure consideration and identification of areas of environmental significance, including remnant vegetation, prior to land use changes.

This was a reference to the changes to the environmental impact assessment system, mentioned above, which were implemented subsequent to the Urban Bushland Strategy. Under those changes, the EPA was empowered to assess (amongst other matters) changes to town planning schemes and the MRS.

Since those changes were introduced, the EPA has prepared guidelines which indicate what sorts of changes to town planning schemes and the MRS are likely to be formally assessed. Those guidelines indicate that any scheme that will impact on areas 'having the highest conservation value' is likely to be assessed. Such areas include:

- areas recommended for protection in the System 6 'Red Book' reports.
- land vested in the National Parks and Nature Conservation Authority for the purpose of conservation of flora or fauna, National Park or Conservation Park.
- lands reserved as 'Parks and Recreation' under the MRS.
- land containing declared rare flora and fauna and habitats of declared rare fauna.

It appears from the EPA's guidelines that once the Perth Bushplan has been completed, the areas of regional significance identified in that document will also fall into the 'highest conservation value' category.

Special development controls on bushland clearing

The Urban Bushland Strategy proposed a new assessment process for bushland clearing in urban areas. The strategy stated that:

> Clearing of bushland will be defined as development in the Town Planning and Development Act 1928 and any proposals to clear bushland over one hectare will require the approval of the Western Australian Planning Commission or its delegate.

This reform has not been implemented. This is unfortunate, for two reasons. First, the proposed reform recognised the importance of urban bushland by establishing a special process to assess applications to clear that bushland. Second, the reform would resolve doubt over whether development approval is required prior to clearing urban bushland.

To expand on this second point, I need to say something about the relevance and legal meaning of the word 'development'.

A town planning scheme will commonly require that 'a person shall not carry out development of or on any land zoned under the Scheme without first having applied for and obtained the approval of the Council.' 'Development' is then commonly defined in terms of the definition of that term in the Town Planning and Development Act. Unfortunately, while that definition makes clear that demolishing a building or carrying out excavation works amount to development, it does not explicitly state that clearing amounts to development. It needs to be put beyond doubt that clearing urban bushland does require development approval under town planning schemes and the MRS. Otherwise, a person who wishes to clear land could do so without having to apply for planning approval.

Review of Public Open Space Policy

The Urban Bushland Strategy also committed to review the WAPC's Public Open Space Policy, under which the Commission will require developers to set aside 10 per cent of new residential subdivisions for open space or parkland. The Strategy states that:

> a review of the Public Open Space Policy will be undertaken by the Western Australian Planning Commission with a view to encouraging the inclu-

sion of bushland as local open space when considering subdivisions at the local authority level.

Change to the Public Open Space Policy is not strictly law reform, but it is relevant in a legal sense because it guides the WAPC in the exercise of its legal power to grant subdivisions with conditions attached.

I understand from the Ministry for Planning that the Policy has been updated since 1995, but has not been reviewed with a view to encouraging the inclusion of bushland as local open space.

Beyond the Urban Bushland Strategy: other legal reforms

Putting aside the Urban Bushland Strategy commitments to law reform, what other changes could be made to the law to promote protection of urban bushland?

Bringing balance into the planning appeals system

One reform that is long overdue is to bring some balance into the planning appeals system, by allowing third party appeals.

At present, with the exception of the very few local governments that provide for third party appeal rights in their town planning schemes, there is no right of merits appeal for anyone other than applicants for development approval. This means that there will always be a potential appeal against a council that refuses an application to clear bushland, but there will be no appeal against the grant of approval to clear bushland. This is a systemic bias against preservation of urban bushland.

Unfortunately, there is little sign of third party appeal rights being introduced. A recent review of the planning appeals system did not even consider the possibility.

Bringing bushland conservation into urban planning

Under the MRS and most town planning schemes, the importance of bushland preservation and conservation is not explicitly recognised. There are a number of ways in which this situation could be changed to better promote bushland conservation.

One mechanism would be to have a specific category of 'bushland reserve' as opposed to the more traditional 'parks and recreation' reserve. In relation to the MRS, the Urban Bushland Strategy recognises that calls have been made in the past for a change along these lines. However, the Strategy says that it is too administratively difficult to implement separate bushland reserves because of 'the small size of some bushland areas and the integral links with parkland areas', and that in any case the Regional Bushland Strategy will provide this distinction. It needs to be asked why it is too administratively difficult to have a bushland reserve under the MRS that draws the line between recreation and conservation uses, and at the same time possible to make this distinction in the Regional Bushland Strategy.

At the local scheme level, there is nothing stopping local government from adopting a 'conservation zone' to operate alongside rural, residential or industrial zones. The Shire of Serpentine-Jarrahdale has adopted such a zone in its town planning scheme, and offers incentives to landowners within the zone to preserve remnant vegetation.

Another mechanism that can be used at the local scheme level is that of the 'special control area' within which additional development controls apply (e.g. public advertising requirements, or requirements to take into account specified matters in determining development proposals). The draft Model Scheme Text, issued in October 1997 for public comment, contains reference to the 'special control area' mechanism and provides examples of that mechanism applying to protect landscape values, vegetation or other identified environmental values.

Encouraging local government to 'think green'

Local governments cannot rely on the EPA to consider all development proposals having environmental impacts, and accordingly they should incorporate reference to environmental matters in their own decision-making, including decision-making on urban bushland issues.

One technique that can be used to move decision-makers, including local government, to take into account environmental considerations is to have a statutory requirement that this take place. In New South Wales, for example, it is a legal requirement for local government 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment' by reason of an activity it has been asked to approve (s.111, Environment Planning and Assessment Act 1979). A similar legal requirement should be considered for Western Australia. In the planning approval context, the draft Model Scheme Text goes some way towards this by requiring that one of the matters that a local government must consider when deciding on a application for planning approval are environmental considerations, and allowing for specified considerations to be taken into account in 'special control areas'.

Of course, a blunt requirement that environmental matters are to be taken into account is not of itself enough. Sufficient resources and expertise must be made available to local government so that environmental matters such as the value of local bushland can be properly considered.

Conclusion

Most of the law reform commitments made in the 1995 Urban Bushland Strategy have not been implemented, and it is hoped that this conference will

see explanations given as to why the promised changes have not occurred. Debate over law reform to better protect urban bushland should not be confined to the 1995 recommendations, however. A more balanced planning appeals system, a recognition of conservation values in town planning schemes, and statutory requirements that decision-makers take into account environmental matters are some of the reforms that should be considered in the continuing debate as to how the legal system can help preserve urban bushland.

Local Government Protection and Management Mechanisms Available for Urban Bushland

Clare Walsh
Western Australian Municipal Association

Introduction

This paper deals with the barriers faced by local government in its attempts to protect and manage locally significant bushland. WAMA, in conjunction with the Local Government Urban Bushland Advisory Group, has produced a discussion paper on this subject, developed as a response to the Perth Bushplan. I would like to focus on the regulatory barriers that have been identified, although it is well recognised that there are significant barriers to effective natural resource management resulting from, if you like, the culture of local government.

Locally significant bushland

As you will be aware, Perth's Bushplan has been developed by the Ministry for Planning, in conjunction with the Department of Environmental Protection's System 6 Update Program. An exhaustive assessment of remnant urban bushland within the Perth Metropolitan Region has been completed. The purpose is to identify regionally significant vegetation for protection.

The remaining bushland will be regarded as locally significant and will be the responsibility of local government and private landowners. While not having the same high conservation value as regional bushland, locally significant urban bushland provides important green corridors, habitat, landscape amenity, passive recreation, may contain declared rare flora, and maintains biodiversity.

There are a number of reasons why local government should be the primary driver of local bushland management, not the least being its legislative responsibility to 'provide for the good government of persons in its district' (*Local Government Act 1995*). The pressure on local government to improve its natural resource management performance is increasing from the Commonwealth and State governments and the community. However the commitment to good environmental management and the capability to undertake projects varies enormously between the 144 councils in Western Australia, as all community based environmental groups are well aware.

Town planning

These are the criteria used by the WA Urban Bushland Strategy to assess locally significant bushland:

- One of the better examples of a local vegetation type.
- Having biodiversity value, but may also include Declared Rare Flora, priority listed species or uncommon species. May include geographically significant species at the limit of their range.
- Vegetation may be in poor condition but capable of regeneration.
- Ideally greater than four hectares but smaller areas may be of significance depending on how much remains in the locality.
- Suitable for passive recreation by the local community.
- Use or potential for use by local schools.
- Having local heritage value.
- Shape not critical but remnant should be capable of ongoing management.
  (Government of Western Australia, 1995, *Urban Bushland Strategy*).

Statutory town and rural planning schemes are the most powerful tools available to local government to protect remnant vegetation and demonstrate intent in relation to long-term planning. Conservation aims can be provided for in the aims and objectives of the scheme and through relevant and appropriate zones or other policy mechanisms, but success is dependent on local government having the will and means to enforce scheme and policy provisions.

The planning, development and land use process in Western Australia generally follows a systematic progression and the overall process is often driven by the need to resolve many competing interests in land use, such as demand for urban and rural facilities and for natural resources, including the conservation of native flora and fauna in their natural habitat. However, although section 6 of the *Town Planning and Development Act 1928* outlines the purpose of making planning schemes with respect to any land, it does not provide specifically for conservation or other environmental considerations, except for the provision of reserves. A planning scheme, therefore, is not required to address environmental and conservation issues, although such issues can be included in a scheme (Western Australian Municipal Association 1998: *The Role of Local Government in the Management and Protection of Locally Significant Bushland*).

The Draft Model Scheme Text developed by the Ministry for Planning suggests a Rural Landscape and Conservation Zone, the objective of which is:

> To protect significant landscapes and environmental features and provide for development which is compatible with and will enhance the landscape and environmental qualities of the locality. (State of Western Australia, 1997: *Model Scheme Text: Explanatory Brochure*)

A similar Landscape and Conservation Zone may be appropriate for locally significant bushland and wetlands in urban areas.

Section 12 of the Act provides the possibility for a landowner to be compensated if, by the making of a town planning scheme, their land or property is injuriously affected. This may act as a disincentive for a council to zone land for conservation.

At present, a maximum of 10% of an urban development site is normally required to be set aside as public open space (POS), free of cost, to satisfy the recreational needs of a local community. Although a proportion of the 10% POS has sometimes been used to protect areas of native bushland or other environmental features, the opportunity to achieve significant environmental benefits by this means is limited. Implementation of rules is important, particularly to ensure that POS is not re-used for such things as drainage areas. The issue of resourcing for the management of any 'conservation' areas set aside through POS also remains. (Western Australian Municipal Association, 1998 *The Role of Local Government in the Management and Protection of Locally Significant Bushland*)

The use of POS for conservation purposes can be regarded as incongruous and as affording doubtful security to the environmental features so protected, in view of the legitimate need for local recreational space. This is emphasised in the draft Livable Neighbourhoods document which indicates that the WA Planning Commission will have to be satisfied that recreational needs will be adequately catered for in the event that any natural areas are included within the POS allocation. In addition, the draft Community Code proposes that the amount of POS required can be reduced from 10% of the gross subdivision area to 8% as an inducement to implement the provisions of the code (State of Western Australia, 1997: *Livable Neighbourhoods: Community Design Code*).

Particularly in Special Rural subdivisions, but also in rural areas not earmarked for urban use, local government does have some ability to secure areas of remnant vegetation through wise subdivision design and implementation. Areas of remnant vegetation can be secured within a minimum number of lots using a number of mechanisms. These include zoning provisions, special provisions, or special conditions applied to the area of conservation value. The blocks then become marketable as a 'rural retreat' or 'bush hideaway'.

However, because local government is not the consent authority on subdivision and can only make recommendations to the WA Planning Commission on subdivision applications, there are obvious limitations to this option in securing the conservation of significant bushland areas.

Providing incentives for conservation

One mechanism for Local Government to provide incentives for private landowners to protect and manage their remnant vegetation is through the rates system. Local government raises revenue through rates and charges as defined in the *Local Government Act 1995*. Revenue is raised mainly from land rates and services charges. In determining the valuation of land as a basis for rating, the Minister must take account of the general principle that 'where land is predominately used for rural purposes, the unimproved value of the land is to be used, and where the land is used predominately for non-rural purposes, the gross rental value of the land is to be used as the basis'.

For a council to offer incentives for private landowners to protect and manage their remnant vegetation, it would be useful to be able to determine rates based on the unimproved value of the land where a conservation agreement is in place. There are provisions that make this possible, but only where the land is subject to a government agreement which expressively makes provision to that effect (s6.30).

Aside from offering rate relief to land owners, the other alternative is for councils to acquire land.

> The Land Acquisition and Public Works Act 1902 clearly would allow a local government to take or purchase an area of high conservation value for the purpose of the protection and preservation of indigenous flora. However the cost of purchasing the land, or the compensation which may become due, limits the financial ability of a local government to exercise these options (CSIRO Wildlife and Ecology 1998 *Draft Final Report Opportunity Denied*).

In many instances, the costs of preparing programs for the identification, protection and management of locally significant bushland is a major barrier to local government. Therefore, the capacity for, and community support for, the raising of revenue for environmental purposes is important. Section 6.38 of the *Local Government Act 1995* allows for a council to impose a service charge on a landowner or occupier to meet the cost of providing a prescribed service for the land. The money raised in this way is only available to be used for the provision of that service. However, it is not possible to use this section to introduce an environmental levy or charge, as the definition of service is very prescriptive and does not include environmental services. Therefore, there is a need for the definition to be amended to include environmental services.

Conclusion

Whilst local government accepts its role as the man-

ager of locally significant bushland, there does need to be a more complementary relationship with the State Government. There seems little point in local government preparing programs for the identification, protection and management of locally significant bushland if those programs are not recognised or supported in the assessment and decision making of other Government agencies.

If the range of incentives available to local government were increased they would be in a better position, not only to lead by example with the management of their own land, but also to offer incentives for all landowners to make a contribution to the management and conservation of native vegetation. More encouragement and policy support, and possibly minor changes to legislation, would enable wider use of incentives.

The State Government must also recognise its responsibility to ensure that Local Government is adequately resourced to achieve the aim of best practice in bushland management. Local and regional communities are increasing the pressure on local government to better manage natural areas, taking into account issues such as water quality, conservation and heritage values, historical information, disabled accessibility and tourist customer satisfaction. Locally significant areas are not just catering to the local community, but extensively to the regional, state, national and international community.

It is also essential that Local Government is represented on all relevant committees or working parties to provide input when areas of either regional or local significance are being considered. Anything less than this will seriously undermine the ability for an integrated approach to be successfully achieved.

Local Government and Bushland Protection

Darren Walsh
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Introduction

Within the Perth Metropolitan Region, ongoing development is leading to the loss of substantial areas of urban bushland. Much of this loss is associated with urban development, although industrial development and quarrying also contribute.

While mechanisms for the protection of regionally significant bushland are improving, limited tools are available to local authorities to assist in the protection of locally significant bushland areas. Within the City of Cockburn, future urban areas contain substantial patches of locally significant bushland which will face considerable pressure from residential development. Other pockets of bushland within developed areas remain under pressure from infill development, quarrying and other land uses.

Over the last twelve months, several areas of locally significant bushland within the City have come under threat from residential development, leading to substantial community concerns being raised. This paper outlines the initiatives undertaken by the City of Cockburn in the protection of locally significant bushland and highlights some of the constraints faced by local government in achieving bushland protection.

City of Cockburn initiatives

The City has implemented a number of initiatives aimed at protecting locally significant bushland. What follows is a summary of the key measures undertaken.

Bushland Conservation Policy

A comprehensive Bushland Conservation Policy, adopted by Council in November 1997, forms the centrepiece of our approach. This Policy provides the framework for a range of strategies and actions and incorporates this statement of position:

> recognising the important environmental, social, cultural and educational values of bushland within the City, Council will make every reasonable effort to ensure the conservation, protection and management of local bushland within the City.

Strategies and actions supporting this position include:

- *Bushland inventory* — development of a detailed bushland inventory, incorporating bushland condition and conservation value, is to be undertaken in addition to existing mapping.
- *Protection of bushland through the planning and development process* — a range of actions are undertaken to maximise bushland protection. These include requiring flora surveys to be prepared at rezoning and structure planning stages to identify bushland values, retention of bushland on development sites through subdivision design and density trade-offs, and ensuring that good quality bushland is retained in public open space, with development of open space limited to the minimum required for active recreation.
- *Management of Council controlled bushland* — maintain and manage such areas to ensure that their values are not degraded and are enhanced where possible. Reserves containing good quality bushland have already been designated 'conservation reserves', ensuring their protection from future development.
- *Purchase of local bushland* — set aside funds for the purchase of locally significant bushland where appropriate.
- *Linkages and corridors* — aim to maintain corridors and linkages between bushland areas through structure plan design and revegetation projects.
- *Community education* — develop educational programs to highlight the values of local bushland to the community.
- *Protection of bandicoots* — given the high populations of bandicoots within the City, bandicoot management/relocation plans are required for situations where land which is to be rezoned for development contains bandicoots. For existing zoned land with bushland and bandicoots, the WAPC is requested to place conditions on subdivision approvals requiring bandicoot management and relocation.

Vegetation protection in special rural zones

Many of our special rural zones are located within areas containing significant bushland. In many situations, conditions are placed on special rural subdivisions limiting clearing and requiring the retention of native vegetation.

Fire management planning

Detailed fire management plans have been prepared for key bushland reserves within the City. These plans aim to reduce the incidence and severity of fires as well as improving response times and firefighting approaches by fire brigades. In addition to this, a Draft Rural Bushfire Management Strategy has recently been completed, dealing with areas of the City outside

of the Metropolitan Fire District. This Strategy includes the protection of bushland as a key fire management imperative alongside the protection of life and property, and includes a range of strategies and actions aimed at protecting bushland on Council controlled land and private property.

Rehabilitation of sand and limestone quarries

Extensive quarrying of sand and limestone occurs within the City. Unfortunately, many of these sites contain significant bushland, much of which is destroyed by mining. Rehabilitation efforts have generally been poor. In the face of these concerns Council has adopted a strict approach to rehabilitation on these sites, requiring an approach to revegetation which aims to restore 80% of pre-mining vegetation density and species richness. Detailed flora surveys which include DRF are also required for new sites and expansion of existing sites.

Greening Plan

A Greening Plan is to be developed over the next 12 months which will address in detail the revegetation of bushland areas and re-creation of linkages and bushland corridors.

Constraints

While all of these initiatives have the potential to assist in the protection of locally significant bushland, a number of constraints exist which can limit their effectiveness. The first of these relate to limitations associated with planning and development processes.

In particular, the maximum 10% public open space requirement for residential subdivisions is often insufficient to retain bushland while also providing for active recreational needs. In many situations, this severely limits the amount of bushland which can be retained within public open space and creates conflicts between bushland retention and community demand for active open space. In situations where bushland conservation is an issue, public open space contributions of more than 10% are often necessary to avoid these conflicts.

Support for the endeavours of local governments in protecting local bushland through planning and development processes is often lacking at the State government level. Contrary to popular belief, the State government has the final say on almost all rezoning, subdivision and development issues, with local government often forced into accepting decisions against its wishes. Many situations have occurred locally where extensive efforts to protect locally significant bushland through various means, including purchase, have been thwarted by a lack of support from the WAPC, or at ministerial level.

The attitudes of developers can also be a major constraint to protecting local bushland. Generally, the development industry is driven by the policy of maximising land yields, with subdivisions designed on this basis, rather than environmental considerations. While this is improving, bushland protection is still not a priority, and many examples occur where good bushland is cleared only to be relandscaped with exotics or even natives!

The marketability of a subdivision is also a prime determinant of subdivision design, with the maximisation of views, perceived security issues and even the fear of snakes often limiting bushland retention. Resistance to density bonuses as a means of increasing public open space in residential subdivisions is also common, with many developers considering that smaller lots and higher densities are not attractive to the current residential market. Approaches to earthworks on many subdivision and development sites can also severely limit bushland protection, with on-site cut and fill and mass earthworking common.

Finally, the purchase of locally significant bushland, while one of the few tangible strategies available to local government under the Urban Bushland Policy (Government of Western Australia 1995), is often financially prohibitive. This is particularly the case where councils are forced to buy bushland at inflated prices following rezoning for more intensive uses. Several recent examples of this have occurred at Cockburn where we have been willing to purchase bushland areas but have been restricted from doing so due to ridiculous asking prices.

Conclusion

While local governments are faced with a number of constraints in the protection of locally significant bushland, numerous opportunities do exist for councils to encourage bushland protection. To be successful, a strong commitment is required at council and senior administration level, and much persistence is necessary. A range of strategies can be used to protect local bushland, and the planning and development process, while at times frustrating, is often able to provide good opportunities.

Greater assistance and support from State government agencies for councils striving to protect locally significant bushland is considered essential to overcome many of the constraints currently faced.

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Achievements and Pitfalls in the Protection of Bushland by the Shire of Serpentine–Jarrahdale

Jan Star
Shire of Serpentine-Jarrahdale

I am going to structure this presentation as it happened, because that seems to tell the story best; but also, as time goes on, I'm one of the few left to tell the historical tale!

Four events underline our current achievements in bushland management.

1. Mainly because of the Peel–Harvey problems and the hassles with the Environmental Protection Authority as it started to exercise control over planning issues, the Shire of Serpentine–Jarrahdale obtained a Landcare grant to get an Environmental Officer (EO) — shared with Murray Shire and managed by a steering group that included Keith Bradby, from the Agriculture Department at the Pinjarra Community Catchment Centre. After the grant ended the Shire appointed the same person full-time because of his value.

2. Based on the work of Gerard Serio and Steven Davies (*Landmarc*), the EO led the Shire into finalising and implementing an innovative rural strategy, which was applauded by the vetting government agencies. This was based on land capability, so it used the five basic landforms: the Darling Plateau, Scarp, Ridgehill Shelf, Pinjarra Plain and Bassendean Sands. It drew attention to the dying landscape of the Plain, the need for revegetation and the need for corridors — basing them on the extensive waterways across the Plain. It used all available information, including Semeniuk's remnant vegetation mapping, the wetland work of the Water Authority, and Murray's Murdoch students. It also proposed a Conservation Zone for private land. It introduced the concept of 'environmental repair' to accompany development approvals, and revegetation conditions for rezonings.

3. There was an active Land Conservation District Committee (LCDC) which worked with the Shire and Agriculture Department to get the grant for the EO, helped with the strategy development and collected their own base information through a shared consultancy.

4. Led by councillors, community groups started forming. One was the Roadside Care Volunteers, who started by encouraging planting on verges and expanded to revegetating some verges themselves, helped by a grant for weed control equipment from the Gordon Reid Foundation.

Finally there was the Council itself which, apart from its role in the events described above, tried to broaden the vision of a small rural shire beyond roads, rates and rubbish. Before all the above took place, with encouragement from David Lamont and Penny Hussey, they had a vegetation classification of the road verges done and instituted measures to reduce the burning of verges — a common practice by the very able volunteer fire brigades (it provided good training!).

A strong foundation was laid with these events and partnerships. There was the policy component in the strategy, the mechanism for co-ordination and development of groups in the LCDC, the wherewithal in the Landcare, Alcoa and later National Heritage Trust grants and the Shire budget. Added to this was the knowledge, assistance, and encouragement of consultants, CALM, the Wildflower Society, the Roadside Conservation Committee and Greening WA, and the constant support of Agriculture WA (AgWa) at the Community Catchment Centre.

The situation now is that we have two properties in the formal process of being zoned conservation. One is Lowlands, which presumably everyone knows — the largest piece of privately owned remnant vegetation on the Swan Coastal Plain. The other is West Kingia, also on Bassendean Sands on Elliot Rd, Keysbrook. About 70 of its 128 hectares are in very good condition. It has not been burnt for over 30 years and has been assessed by the Department of Environmental Protection as being of regional significance. Fauna and flora surveys by DEP, Wildflower Society, the Keysbrook Environment Group with Winnox Wildlife Consultants, and the Shire Landcare Centre are under way. The zoning is only achieved when there is an acceptable management plan and the incentive is a 50% reduction in rates.

Through the rezoning processes, the Shire has instituted major replanting with subdivision. At one point the EO was challenging the Community Catchment Centre, claiming that he was getting more revegetation done this way than they were achieving through government policy and help. The mechanism for this has varied over time but is based on the Shire's Strategy, in particular the Guidelines for Drainage and Nutrient Management which have been accepted by the DEP and Ministry for Planning as the implementation of the Statement of Planning Policy No 2 — the Peel Harvey. An audit of this planting has not been done, but technically vegetation is supposed to cover 30% of each lot. Our most

sophisticated attempt has been near Mundijong Road, where members of the LCDC have used local seed and have been contracted to do the development's planting.

There is also now a tree protection clause for indigenous trees in the town planning scheme. This requires Council's permission for the removal of any native tree above a certain size. Council is currently prosecuting in a case of considerable damage done by horses despite many requests to remove them. It will be a further control on clearing.

We have stopped the routine burning of verges, and through our Roadside Care Volunteers (RCV) have formed partnerships with Men of the Trees (MOTT) and others, so that many of the thousands of plants given out to residents by the RCV now come from locally collected seed and all are local varieties. I think our work with MOTT at Rockingham helped them to get established too. The Shire pays for the plants. We have a much altered weed control regime for verges, including Fusilade in places, spot spraying on Flora Roads, free Roundup for people revegetating their verges, and attempts at non-chemical control. Permission to burn is based on the conservation status of the reserve. Another survey of roadside vegetation has been done; 252 kilometres, or 28.5% of the total, still has a high status, the same as the 1991 survey. However, only 15% is in the upper-medium category, versus 25% in the 1991 survey. This supports our hypothesis that areas of good vegetation will look after themselves and resist weed invasion as long as they are not disturbed. In contrast, once disturbance is started the area succumbs to weeds or invites burning or lack of care by utilities. This information is to form the basis for a new roadside management policy.

The Shire has also added Victorian tea tree and *Eucalyptus camaldulensis* to its list of pest plants, and has had a couple of eradication efforts on the former in a bushland reserve, once with a LEAP team, and once with Australian Trust for Conservation Volunteers.

The LCDC have become an umbrella group for ten community organisations including the RCV. The latter received a Landcare grant to study the Flora Roads around Mundijong which resulted in Bronwen Keighery's report *Flora Information for Roadside Bush Protection Plans in the Shire of Serpentine–Jarrahdale* and the declaration of two Flora Roads. The LCDC and Shire also received one of Greening WA's local herbaria (Native Plant Identification Kit) which has received a burst of life from Bronwen and one very active RCV member. It now has over 500 specimens. An inspirational talk by Greg Keighery on the diversity of the flora of the area at our Water Watchers' seminar was a major impetus for people here, including that particular RCV member.

A Landcare grant also funded a report on the Serpentine River, which has its own active group doing massive streamlining on the river and its tributaries and drains. The Serpentine Bushland Group is setting up a seed orchard in, and are helping the Shire with the management of, the equestrian reserve, which has some good remnant vegetation. There is also an area there that an early LEAP group fenced and revegetated. The Serpentine group has also been the main group assisting the EO revegetate Wright Road after the Water Corporation relaid a pipe. The opportunity was seized here to eradicate a lot of watsonia during the disturbance, with the Corporation contributing to the cost. A similar effort is being negotiated with Westrail after trains caused fires in thick lovegrass areas. The EO is negotiating with them to revegetate with local plants on the grounds of reduced fire danger, with the assistance of the local fire brigade. Other groups are fencing off and when necessary revegetating creeklines. The Medulla Creekdwellers also have produced a report on the state of the Medulla with the help of NHT and the Water and Rivers Commission. The Keysbrook Environmental Group are streamlining the Myara and working on a wandoo reserve along it, having won a big battle to keep a new fire station out of it. There is a major reconstruction of a drain into a wetland being done in the middle of Byford by the Byford Progress Association and the primary school. Most of these projects have had support from Alcoa's grants, now in their third year. In all, eight of the ten groups have management of remnant vegetation in their projects, three are planning seed orchards and many are collecting their own seed for revegetating under the aegis of the LCDC.

It was with this background that the Shire, with the LCDC, obtained a NHT grant which over three years will be over one million dollars, including Alcoa's contribution of around $25 000 per year. The project is called *Restoring Serpentine-Jarrahdale for Tomorrow* and through it a Landcare Co-ordinator, Cathy Lyons, a Bushland Manager, Jody Neiman, and a Bushland Trainee have been appointed and have been very active over the winter, organising planting, spraying, training and workshops. They now have a Green Corps to work with. This project is focussed on the management of five major bushland reserves in the Shire.

Near the Shire office is an early school building belonging to the Shire and set up as a meeting place for community groups. It is now also the Landcare Centre, home to the three new staff, the herbarium and the growing seed collection. As a focus of other groups' activities it is hopefully spreading other seeds. It is certainly abuzz with energy.

With so much happening it seems a shame to mention pitfalls, but we have had our share. Some years ago there was a Councillor turnover as developers felt the greening pressure. This lasted a couple of

years and set us back considerably. There is a continuing problem of inducing utilities and the road workers to recognise and care for vegetation. The number of new verge plants that have been sprayed, slashed or driven on, is sad. Timing is a problem, with keenness not always matched by knowledge, so some inappropriate planting has no doubt occurred, but hopefully in decreasing amounts. We have lost bush in developments — not much but some — where neither the Shire nor the State agencies picked up that there was something there, including one piece that is possibly in Bushplan. It is now being grazed. In one of our only bushland subdivisions, despite extensive negotiation to achieve strategic firebreaks only, individual breaks were put in. Remember here any disturbance means weeds, usually the dreaded lovegrass. One of the big problems is getting enough weed control — plants grow very well in our environment, but so do weeds which quickly smother natives. Monitoring has been negligible. With so much happening and so much enthusiasm we have neglected to keep count, so we don't know how much has been planted, we will have to measure crudely through changes in aerial photos. Perhaps the most unexpected pitfall was when someone in Byford expressed disappointment upon seeing that the new park was a wetland with sedges and natives, not roses and lawns.

In all, though, the change I have seen over fifteen years has been fantastic, especially for such a large shire with such a small population (only 10,000) and correspondingly small budget. I really want to thank all the people who have helped with their encouragement, knowledge and effort, making the dream of a network of corridors linking healthy bushland a possibility — if we can keep on top of the lovegrass and watsonia!

Strategic Planning for Bushland Protection: Shire of Mundaring's Environmental Advisory Committee

Alan Pilgrim*, Curtin University, and Robert Atkins, Swan River Trust

Introduction

In recent years the role of local government has broadened to include a range of responsibilities well beyond roads, drains and refuse collection. One such area of responsibility is that of environmental management, and while roads, drains and refuse collection are significant environmental issues in themselves, local government is playing an increasingly important role in the protection of remnant vegetation and waterways, revegetation programs, catchment management and a range of other related activities under the umbrella of Landcare.

One of the key elements in embracing responsibility for the environment is the incorporation of environmental management into the core business activities of the local authority. Linked to that process is the need for ongoing public consultation to empower the local community so that partnerships can be developed in the formulation of environmental policies in areas such as protection and management of local bushland reserves.

This paper examines the development of community participation in environmental management in the Shire of Mundaring. One of the outcomes is a formally constituted community based environmental advisory committee that makes recommendations to Council.

The physical setting

Located on the rural/urban fringe of the Perth Metropolitan Region, the Shire of Mundaring includes a mix of small urban villages surrounded by large bushland residential properties and rural holdings. The Shire boundaries extend from the footslopes of the Darling Scarp eastwards across the Darling Plateau to the townsite of Wooroloo. In the western part of the Shire the landscape is dissected by the incised valleys of the lower reaches of the Helena River and Jane Brook while to the east the landscape is typically of lower relief with more gently sloping valley forms. Virtually all of the Mundaring Shire lies within designated or proposed water supply catchments and in itself this has been a major control on the type and level of development within the Shire. Partly as a result of this constraint the area has retained a significant amount of remnant vegetation.

Early days — an environmental contact group

In the mid to late 1980s a range of development proposals met with growing opposition from local community based environmental groups concerned about impacts such as the loss of remnant bushland. In response to community pressure the Shire of Mundaring established an Environmental Contact Group in September 1989. Formation of the group was initiated by a councillor who saw the move as politically advantageous. Membership of the group was restricted to one representative from each of eight selected community groups ranging from established and well credentialled groups such as the Wildflower Society to small ad hoc pressure groups. It was intended that the group would meet three to four times a year.

The two key functions identified for the group were to prepare a discussion paper for Council on the proposed appointment of an environmental officer and for the group to serve as a focal point for Council to deal with community concerns of an environmental nature. This was seen as a way of removing the need for individual environmental groups to lobby Council on issues and could also be used to filter environmental concerns before they were considered by Council. The Council was 'seen to be actively addressing environmental issues'.

Formation of an environmental advisory committee

Although the Environmental Contact Group proved to be of value as a contact point for Councillors and environmental groups it did not sit within the formal committee structure of the Council. As already noted, membership of the group was restricted to a select number of community organisations. In addition, due to the infrequency of meetings, it was difficult for the committee to generate and maintain any real momentum. In order to improve community input into the decision making process Council moved, in late 1993, to initiate an Environmental Advisory Committee (EAC). Formed as an advisory committee to Council under the *Local Government Act* the committee now had more status and a formal role in the Council's decision making process.

While the direction of the committee's work remains fundamentally the same as that of the Contact Group, the EAC operates under a set of Rules and Terms of Reference. Membership of the EAC is open to all residents of the Shire with the committee expanded in number from eight to twelve — comprising ten community members elected by Council, a representative from the Shire's Bushfire Advisory Committee and a Councillor representative. Admin-

istrative support is provided by the Council. Nominations for membership are called for by advertisement in a local paper and nominees complete an application form detailing interests, expertise and experience in matters relating to the environment. Membership is for twelve months with retiring members eligible to re-nominate.

The EAC's function is defined as fourfold – to advise Council on community opinion and attitude on environmental issues within the Shire of Mundaring; to work within the community to encourage an environmental ethic; to consider and provide recommendations to Council on any matter referred to it by Council; and, subject to Council direction, to conduct functions and activities involving the community to create environmental awareness, canvas issues and/or gain community opinion or information it deems necessary. The EAC's role does not include undertaking environmental assessments on development proposals – that is to say the committee does not function as a subsidiary to Council's Planning Committee.

Choosing a focus – an environmental management strategy

Within the first two months of the formation of the EAC the committee decided to focus on long term outcomes that would be of strategic value to the community. The decision was taken to focus on the development of an Environmental Management Strategy. This was to involve the committee in a comprehensive review of earlier work initiated by the Environmental Contact Group and included a series of workshops over a twelve month period. In 1991 environmental consultants were engaged to complete an assessment of issues and make recommendations for management. The EAC used this report as the basis for preparing the EMS. Throughout this process the committee was ably assisted by an Environmental Officer contracted through the Eastern Metropolitan Regional Council (EMRC).

The *Environmental Management Strategy* (EMS) was endorsed by Council in February, 1996. The strategy identifies 16 implementation strategies each divided into a series of tasks with a timeline for each action. A total of approximately 100 tasks were identified under the EMS. The EMS was developed over a two-year period and represented a major undertaking, with the level of input from the committee ensuring that the process was 'community driven' rather than 'Council driven'.

Progressive implementation of the EMS has already resulted in a number of significant outcomes including the initiation of an Integrated Catchment Management (ICM) program across much of the Shires of Swan and Mundaring. A three-year project, the Swan–Mundaring Community Catchment Project commenced in early 1997. Funded through the Natural Heritage Trust (NHT) the project employs a Community Catchment Co-ordinator to undertake a range of community based activities including the formation of catchment groups, development of catchment management plans and a variety of environmental education activities. Additional funding through NHT for 1998 has enabled employment of a project officer to oversee a range of specific catchment based projects involving on-ground work by community groups.

Rather than play a direct role in the NHT Landcare project the EAC recommended the formation of a Landcare Working Party to co-ordinate the work of catchment groups in the Shire of Mundaring. The EAC has two representatives on the Working Party with the Working Party reporting to Council through the EAC.

Other outcomes from the EMS have included the development of environmental codes of practice, guidelines, policies and strategies addressing a range of issues including the protection and management of bushland.

Protection and management of bushland

Eight of the 16 strategies in the EMS relate to the protection and management of bushland. Outcomes from the EMS include an assessment of bushland reserves, a roadside vegetation conservation policy, development of a Friends Group Manual, protection of waterways and an ongoing community education program.

Historically, only a small number of the more than 200 bushland reserves within the Shire were vested in either the local authority or a State government agency for the purpose of conservation. In order to assess the conservation and social values of the bushland reserves, the Shire commissioned the *Reserves Study (Stage Two).* The work was undertaken by a consultancy with the EAC playing a key role as an informal steering committee. The committee was able to provide local expertise and knowledge, and identified a number of significant shortcomings in the research methodology. Without the advice provided through the EAC, the assessment of bushland reserves within the Shire is likely to have fallen well short of community expectations in not providing a sufficiently rigorous methodology for comparing the relative significance of different areas of bushland.

The *Code of Practice for Roadside Conservation in Road Construction and Road Maintenance (1997)* was also initiated by the EAC. Development of the policy was a collaborative effort between members of the EAC, the Shire's consultant environmental officer from the EMRC and Shire staff. The policy was recently adopted by the State Roadside Conservation Committee and is to be distributed to other local government authorities throughout Western Austra-

lia for their consideration and possible adoption.

In contrast to the relatively large number of bushland reserves within the Shire there are few areas where riparian vegetation is in good condition. A draft Creekline Protection Policy (1997) is aimed at both protecting remnant vegetation and the rehabilitation of degraded waterways. The policy includes a number of specific objectives including identification and removal of weed species and integration of creekline protection provisions into the Shire's Public Open Space Strategy (1996) and the ICM project.

A key function of the EAC is to encourage an environmental ethic within the community and raise the level of awareness. The committee has embraced this role through a range of activities funded by the Shire. Most of the activities involve additional voluntary commitments by committee members and include the preparation of a feature page on environmental issues for a local community newspaper (four issues per year), an annual full day environmental education seminar for teachers working in local schools, an environmental art competition for schools within the Shire and the presentation of environmental workshops, most recently the Fire and Weed Control Seminar (1997) for volunteer bush fire brigades.

Discussion

There is no doubt that the EAC has both shaped and driven the development of the Mundaring Shire Council's environmental program. At times this has placed the Council at the forefront of local government initiatives in environmental planning in Western Australia. The EAC's success story owes much to the excellent professional services provided by the environmental officer contracted by the Shire through the EMRC. In turn the EAC has added value to the work of the environmental officer by providing peer review and by sharing local knowledge and expertise.

The 1993 decision to establish the EAC resulted from the 'greening' of the Mundaring Shire Council in the early 1990s. The ability of the EAC to continue as a proactive voice for the community is dependent on the interplay of four components. First and foremost membership of the committee must remain enthusiastic, informed and focussed on achieving progressive implementation of the Environmental Management Strategy, in addition to fulfilling the role of 'community environmental watchdog'. To date the EAC has met that challenge with a membership blend of self-taught people with years of practical experience and university trained professionals covering disciplines such as environmental science, botany, engineering, soil science and geography. Each year the committee has included new members with a total of 24 local residents serving at least one year on the committee. The current committee includes several inaugural members and three former councillors.

Secondly, the EAC is very much reliant upon the continuing employment of an environmental officer. While the committee does contribute in a voluntary capacity outside of committee meetings, the preparation of environmental reports and the organisation and facilitation of many of the EAC's initiatives are in the main undertaken by the environmental officer.

The third component in the equation is the elected Councillors. Continued employment of an environmental officer and the implementation of many of the environmental initiatives are dependent upon budget allocations supported by Councillors who understand the often quite complex issues and responsibilities relating to environmental management or who are at least sympathetic to community expectations. Communities with a strong commitment to the environment are able to use the ballot box to influence the shade of green of their local Council. This was well illustrated in the early 1990s in the Shire of Mundaring.

Finally, continued success of the EAC involves not just a commitment from Councillors to fund environmental initiatives but equally a commitment from Shire staff to ensure successful implementation of many of the initiatives. Incorporating environmental management into the core business of local government inevitably involves a change in culture within the organisation. For some this is not an easy transition.

Over the period of the past five years the Shire of Mundaring's Environmental Advisory Committee has progressed from debating issues of environmental management to achieving progressive implementation of a comprehensive Environmental Management Strategy for the Shire. To date the EAC has proven to be an effective means of both empowering the local community and providing the Council with an impressive range of relevant expertise that resides in the community at considerably less cost than other options would provide. This is a model that may well be applied elsewhere in local government.

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Who's Looking After the Bush? Expectations of Community Involvement

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(The views expressed in this paper are those of the author and do not represent an official position of any agency)

History and setting of community involvement

In the urban areas of Perth, Mandurah and Bunbury we have a number of community conservation groups concerned with the retention and preservation of urban bushland. Some of these groups were formed in response to threats to their local bushland. Many were formed as lobby groups, to try and wade through the administrative and political processes necessary to secure the bushland. They also wanted to protect the habitat of local species and to awaken others community members to the special values of the bushland.

This has required tremendous energy, fortitude, and inner conviction as well as the mustering of resources, both political and personal, and sheer persistence. If these campaigns are won, group leaders and members develop a sense of 'ownership' of these areas. People feel personally that 'their' effort, often at great personal costs to individuals and their families, has ensured that the bushland remains today. It is not an intellectual exercise but an issue of the heart.

Many conservationists within agencies have also fought battles for particular areas. Many have contributed effort and hours over and above their paid work, sometimes risking their professional standing by putting their belief on the line. They too develop a strong sense of ownership.

If the tenure of land becomes more secure, the momentum of lobbying often turns to a practical effort towards management. Many community groups have contributed to developing management plans, revegetation plans, flora or fauna surveys, bush regeneration, tree planting and of course the constant weed removal. This has required training for individuals to gain the necessary skills to carry out these new tasks. All of this in turn has enhanced the sense of ownership of a particular piece of bushland.

If all efforts seem futile and the bushland is bulldozed to make way for development, a process of grieving for that loss ensues. Sometimes anger or sadness may be experienced, while at other times a love/hate relationship with an area may develop.

Management

Many areas of bushland, which are presently identified as priority conservation areas, do not have management plans. Urban bushland areas in Western Australia are continually threatened by a variety of disturbance factors that affect self-maintenance. These include partial clearing, fragmentation, selective removal of species by dieback, timber cutting, wildflower picking, repetitive burning, animal impact, soil movement, changes in water regimes, rubbish dumping, fertiliser drift, mining, grazing of stock, proliferation of tracks and use as service corridors (Keighery and Gray 1993). All these in turn lead to weed invasion, which again threatens the value of bushland.

Often the primary purpose of the area is not clearly identified. Apart from the town-planning scheme in the Shire of Serpentine–Jarrahdale, there is no provision for conservation zoning apart from A-class reserve. Some A-class reserves are in poor condition while nearby intact bushland is developed for housing. Surveillance of bushland for inappropriate activity such as off-road vehicle use, horse riding or rubbish dumping is often not carried out, mainly due to a lack of resources.

If areas have management plans, resources are not always allocated to carry them out. Staff assigned to deal with management are not always skilled in the task, and those with skills are too often overloaded with work commitments. Too often we have staff trained in traditional horticulture and lawn care, dealing with bushland management. If there are bush regeneration staff, the workplace culture allows little or no time for planning or monitoring. Professional development, if the officer can find the resources, is undertaken in their own time and at their own expense.

While some community groups have a very sophisticated understanding of conservation requirements and well thought out strategies for addressing these issues, the legislative and operational framework, both State and local, in which these changes can be implemented is limited.

In urban Western Australia, there appears to be a belief that the bush will take care of itself. Insufficient money is allocated to bushland management and indeed it was only in 1991 that a recommendation went to the Kings Park board to produce a man-

agement plan for the bushland of Kings Park. Government acquisition alone cannot hope to preserve bushland without the resources for effective on-ground management.

Pressures on bushland are increasing. As urban development increases the sheer number of people living around an area is greatly increased. The need to recreate, walk their dogs, build children's cubbies and ride mountain bikes brings increased weed invasion and together these contribute to the erosion of the conservation values of bushland. If we add to this the presence of rabbits and foxes, and too frequent fires, then we are in danger of developing a 'weedland' rather than a bushland. We need to decide together the purpose for a particular piece of bushland, and begin to focus our collective resources towards preserving some of the 'crown jewels'.

Many issues will need to be addressed in order for conservation values to be maintained.

Because of the lack of resources and the ability of community groups to attract funding when government agencies cannot, a sort of dysfunctional family management arrangement has come about. In a dysfunctional family, if the parents are unable or unwilling to carry out the parenting then the child, often the eldest will take on the role of the parent. In this case, if the local or State government agency is perceived by the community to be not effectively managing an important piece of bushland, then the community may step in and undertake this to the best of their ability. In the dysfunctional family, the child may do a satisfactory job of parenting in many situations, but fundamentally it cannot take on the parent role. For a start, the child does not have the resources which the parent can access, nor in fact the authority to instruct the other siblings in appropriate behaviour. Similarly the community are excellent bushland carers but need more resourcing, appropriate training and a greater share in decision making to become effective managers. The question remains, is **this** what the community wants to do?

If we take this analogy further, when the dysfunctional parent returns to take up the parenting role, the children who have been performing this job are somewhat put out at first and are often reluctant to fall back into the dependant role. When conservation areas are finally given the resources for effective management, it is important that agencies move into the new management role with a sensitivity to the community who have been caring for this bushland.

Why We Need the Community

> Agenda 21 clearly recognises that the energy, knowledge, skills and most importantly needs of local people and communities are the fundamental resources that need to be mobilised to bridge the gap between conservation and improving community welfare in an achievable pattern of sustainable development. (Furze et al 1996)

At present we do not have a system of allocating a portion of rates and taxes for bushland care such as happens in other parts of Australia. It is therefore vital that we form and nurture partnerships between agencies and community groups. Environmental officers working with local authorities have enormous workloads and are often caught between providing professional advice to council and facilitating on-ground bushland conservation. Resources need to be allocated within agencies to maintain and service effective linkages with the local community.

It is very difficult to establish and sustain community organisations unless there is a clear purpose. At the stage where the community perceives a threat to the local bushland, it is easier to muster support. As the negotiations for preservation are continued, especially if the process is long and drawn out, and necessitates attending endless committee meetings, then only the politically literate and process-interested members of the community will remain engaged.

Local people need to be involved in decision making about any issues that affect their way of life; and they can see that the nature conservation initiatives are beneficial, or at worst neutral, to them and their community (Sarkissian and Perlgut 1996).

Many people are willing to help if given a task — this means that, to continue to engage the interest of those with limited ecological knowledge, those with greater knowledge must be prepared to educate and direct. As well they need to be extremely organised so as to maintain and utilise this assistance. This usually requires an ability to listen, to think strategically and to be willing to give direction.

Some important differences are present when agency staff interact with community volunteers. These are outlined in the table below.

AGENCY STAFF	COMMUNITY VOLUNTEERS
Have easy access to facilities such as photocopying, photography, drafting, computers and GIS.	Often needs to make a special trip away from home to gain access to these services.
Expenses covered by agency.	Often carry the cost out of own pocket.
Trained in the scientific method to determine the nature of the task, evaluate alternatives, select a preferred solution, formulate and implement a plan, monitor during and after implementation.	Many volunteers are not trained in such problem analysis and solving.
Some agency staff believe that the national or state objectives of a particular program are the priority and that community group members will be willing to carry these out.	Some community members may have resentment for a particular agency developed over many years of frustration with perceived mismanagement.
Many agency staff dedicated to their work may become involved in a range of projects. They may be unwilling or unable to allocate time to successful operation of a network.	Many community members have extensive networks throughout their local community developed over many years.
Agency staff may be comfortable with a top-down approach to decision making.	Experience may suggest that a bottom up approach is more likely to succeed.
Staff may need to follow correct administrative procedures, with extensive paperwork and resulting cost and time delays.	Preference to 'go out and act' once everyone has agreed on a course of action.
Some agency staff and scientists may lack social skills or ability to communicate their ideas to community members.	Some community members may have outbursts of anger at the apparent unwillingness of agency staff to 'get on with the job'.

(Adapted from Masters 1995)

Who are the Community?

The 'community' is not a single entity. A 'Friends' group may have quite a number of members on their membership list, but the number doing the necessary work may be as low as four or five people. If we expect members of community groups to carry out extensive bush regeneration and environmental restoration tasks, perhaps we need to enquire about the state of health of their back and knees. Perhaps an offering of chiropractic appointments and yoga lessons may need to be part of our incentives to encourage people into bushcare!

People's lives are not static. Members of community groups may form relationships when they were previously single, divorce when they were previously married, have babies or take on the care for elderly parents. All of these changes effect the ability of the group to function effectively. During these times of change, and depending on the distribution of responsibility within the group, the ability to respond to timelines set by planning and consultative processes may not be so effective. Where strong personal contact networks have been established and maintained, communication will be easier. If this has not occurred, then the previous gains made by the community group may be lost entirely.

To be effective in a community group members will need to:

- Be persistent.
- Keep long-term goals in view at all times.
- Resist the temptation to score points by exposing the shortcomings of the system.
- Be positive even in the face of difficulty.
- Be creative; groups have a lot more flexibility than government departments.
- Seek to understand complexity. Issues are complex, often involving many players and the delicate balance of interactions between players.
- Look towards sustainability. Sustainability of yourself, your group, and the environment.
- Seek allies.
- Use networking opportunities to present the group in a good light.
- Develop public relations skills, or find someone in the group who is good at this.
- Retain a sense of humour.
- Avoid burnout.
- Present a united front, and seek assistance to resolve conflicts within the group before they become major issues.
- Know how many people are in the group, how many are active, their age, physical health and family responsibilities, why they joined and what they spend their time doing.

- Be clever — know the rules and regulations. We wanted to put up a sign in our local bushland. The council was dragging their feet, going to this committee and that. I found out what dimensions would be approved by the planning department, had it made and erected.
- Have clear goals — planning is all.
- Use initiative — be on the scrounge all the time.
- Have loads of energy.
- Evaluate networks — if the person on the council has no clout, then it is a waste of time.
- Adopt engineer speak.
- Keep educating people all the time.
- Use diplomacy — don't offend the agency. Don't attack and don't criticise. If you meet a barrier, find a way to get around it.
- Give the people involved time to absorb new ideas. (O'Byrne 1997)

What Nurtures Partnerships?

In a paper presented at the Networks in Nature Conservation Conference in 1994 entitled 'The role of trust in social networks: formation, function and fragility' Sue Moore argues that:

- Past practices of the agency strongly influence whether people trust each other.
- Community group members will trust agency staff if they feel that the staff person is working together with the group for the common good of the public land.
- There is a need to build reliability — when somebody says they will do something, they do it and that in turn builds further trust.
- Interpersonal trust, faith in other group members, can be described by three attributes: honesty, benevolence and reciprocity. (Moore, 1995)

Organisational trust is an elusive thing, hard to win and easily lost. It is a trust in the fairness of the process, based on people being treated fairly, and having rules to ensure fair treatment.

There needs to be both genuine community participation and supporting policies and strategies from government agencies and politicians. Initiatives must have clear local benefits and must be financially viable in the marketplace as well as achieving conservation gains. Genuine attempts need to be made by all parties to achieve these linkages.

Partnerships are hindered when individuals stay within their self-interest to the perceived detriment of the common good. Unless efforts are made to break down the barriers and create situations of trust which allow for informal interaction, such as undertaking a field trip together, then people are more inclined to stay within their area of self-interest.

> When there is not a shared common goal towards which people are working then there is 'guarded trust.' (Moore 1995)

A workshop on community conservation at Airlie in 1993 put forward the idea of 'resource brokers' — external agents, experts in community development and conservation management. Social scientists with expertise in community structure, social impact assessment, participatory appraisal, can facilitate the linkages. (Furze et al 1996)

Some suggestions for agency staff working with members of community conservation groups are set out below:

- Listen.
- Link new community groups or individuals with existing conservation groups and leaders.
- Respond to the issues raised by those who are working actively in the community and feed back information.
- Assist groups to present their story of the reserve. This may mean help with information, maps, copies of background reports, etc.
- Recruit paid and volunteer staff who can relate to people. Workers in community support programs must have good people skills or undertake training in communication.
- Do not burn out your paid staff or your volunteers.
- Seek opportunities for formal and informal information sessions delivered in a common language. Have teachers address teachers, local government speak to other local government workers. This promotes an atmosphere of safe sharing of knowledge.
- Look for ways to publicly acknowledge volunteer contribution, such as nominating volunteers for awards.
- Work out of normal office hours, and develop a system within your agency, which supports community extension workers.
- Spend time feeding the information back to the relevant officers within your own departments. Seek opportunities to incorporate this information into the policy and strategies of relevant departments.
- Make sure that other staff members in your agency have a sense of ownership of the community program by circulating newsletters and good news stories of which they can feel proud.
- Gain political support for your project. Ensure there are good publicity opportunities for your minister, mayor or CEO. (O'Byrne 1997)

So who is looking after the bush?

When I look at the efforts to manage and care for urban bushland in Western Australia, I see ordinary folk struggling — struggling with understanding the complexity of the tasks facing them to effectively

manage bushland so as to retain its diversity and integrity.

Struggling with the red tape which seems complex and convoluted and appears to be unrelated to the time lines dictated by the natural processes. Struggling with the forces of destruction and fragmentation — vandals who deliberately light fires, people dumping unwanted rubbish in the bush, weeds invading from local gardens which quickly take over and require so much time and effort to control.

Struggling with decisions requiring technical expertise often not available at the community level — should we tackle one weed at a time, what is the effect of the compensating basin on the level of water in the wetland? Struggling with completing Natural Heritage Trust funding forms, and taking on more than the group has the expertise to carry out.

Struggling with maintaining the momentum of group members who have varying ideas about the direction the group should be taking. If the group is successful in obtaining funding and employing a project worker, then they may struggle with what is in effect, running a small business, which many groups do not have the skills or time to undertake.

People have often joined community groups because they love the bush, yet they are spending less and less time there and more and more time as administrators. Few opportunities exist to obtain funding for administration. The question remains — are we burning out our most valuable resource?

Vision

If we are to move forward in this important work of conserving our diverse and extraordinary natural heritage we need to nurture partnerships between government agencies and community groups. We need to develop a code of best practice for bushland maintenance, which has relevance to the diversity of soil and flora on the Swan Coastal Plain and the plateau.

There is a need for staff with more technical expertise to work alongside community conservation groups. The knowledge of bush regeneration principles is still in its formative stages in WA and government agencies need to seek ways to foster a greater understanding of these principles in their staff and work with the community to advance a collective understanding of these processes. We also need to fund advanced bush regeneration training and ensure accreditation for course participants. We need to develop a linking mechanism for the work of researchers and technicians to be passed on to local government grounds staff, contractors and community groups. We need to develop codes of practice for contractors, giving minimum standards for activities such as the spraying of veldt grass.

There is a need to become more strategic, for government agencies to work together so that we stop burning out community support by having a whole host of meetings for a small group of people to attend. We need to raise the status of umbrella organisations such as Australian Association of Bush Regenerators, Urban Bushland Council and Environmental Weeds Action Network so that they can make representation for issues affecting the whole community. We need to employ advocates/bridge builders with community development skills so as to break down the barriers between agencies and the community and finally we need to find ways to attract the broader community to bushland areas, so that they too can value these places as special.

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Community Perspectives — Rockingham Regional Park

Jeff Anderton
Port Kennedy Landcare District Committee

Given all the positive points coming out of this conference, in the case of Rockingham it is sad to say that since the formation of the park we have had no community input as we do not have a Community Advisory Committee. The land has had little management and we expend much effort lobbying CALM continually.

Obviously the community is composed of a wide cross section of interests, not just those of conservation, but I point out that conservation interests were primarily responsible, along with the planning authorities, for the creation of regional parks.

In the case of Rockingham it was the Conservation Council of WA in the early 1990s that first pushed the regional park concept. Local groups such as the Port Kennedy Landcare District Committee (PKLCDC) have spent many years working towards the regional park. Now we find ourselves arguing with CALM over their perceptions of what the park should be.

In 1990 the community formed the Port Kennedy LCDC, and in 1992 the Minister for Agriculture created the first Soil Conservation Reserve.

Between 1990 and December 1995 the PKLCDC raised and spent over $300,000 on the land. Unemployed youths were trained on rehabilitation projects as part of the Landcare and Environmental Action Program (LEAP).

Since CALM took over, feeble efforts to restore sand dunes have been initiated with hessian bags and frog matting. Feral fauna baiting has not been continued as the federal Australian Heritage Commission conditions required. Fencing has been allowed to deteriorate and last year no firebreaks were put in.

In 1995 the Ministry for Planning commissioned the Tingay Report, which was supposed to be the Management Plan for the park. This was part of the Department of Environmental Protection's environmental conditions placed upon it under the Metropolitan Region Scheme. It was downgraded to only a framework for a management plan, and we suggest the Ministry is in breach of the DEP conditions and could be prosecuted for not finalising this management plan.

Since then there has been little management, and recreation pursuits are dominating the park's land use. Land has been leased for cattle and horses, land yachts and model aero clubs, and there is much support for the horse beach. Yet conservation groups cannot lease land.

In summing up, though community perceptions are many and varied we say conservation needs to be the main priority. Conservation groups need to be encouraged to be involved, not evicted from compounds while trail bikes and horses are allowed to wander the land.

CALM needs to develop policies to work with the community, not just to talk down to it, or give lip service with advisory committees.

In order to ensure the appropriate long-term care of Rockingham Regional Park, we specifically call on CALM to:

- Form management committees with the community.
- Seek input from the communities and not tie them up with the bureaucratic process
- Consider vesting some areas with conservation-based community groups.
- Bring in interim guidelines to work to whilst the management plans are being developed.

Failing this happening, we call on the State government to establish a Land and Resource Authority, specifically to:

- Vest regional parks with that authority as A-class Reserves.
- Bring in full clearing laws to protect urban areas.
- Involve all the community in managing these important resources.
- Manage locally as well as regionally significant areas.
- Examine and expand the LCDC and Catchment Group models to help manage our natural areas.

We need to empower the community to help protect bushland – it is too much for the agencies alone to handle.

Community Perspectives — Yellagonga Regional Park

Laurie Boylan
Friends of Yellagonga Regional Park Inc.

Many of us have experienced something that makes us want to conserve the environment around us. It is essential we retain and conserve at least some natural heritage. We need to recognise and acknowledge the value of urban bushland.

The State government must fund conservation as part of the cost of development, and mustn't be allowed to take away everything in the interest of economic gain.

Our group, the Friends of Yellagonga Regional Park, doesn't always get what we want, but we are an effective community voice. We liaise with such authorities as the Department of Conservation and Land Management (CALM), the City of Wanneroo/Joondalup, the Fire and Emergency Service, the Water Corporation, Ministry of Justice, Ministry for Planning, the Department of Environmental Protection and politicians. We have learned to question rather than criticise. We are recognised as a stakeholder in Yellagonga Regional Park (YRP) and we have a voice, indirectly, through the Regional Park Community Advisory Committee. Government is approachable and does coordinate other groups through us, such as the Cancer Foundation and residents of Cherokee Caravan Park. Communications improve and new processes are implemented.There are more contacts through forms, letters, phonecalls, meetings, tours and visits.

Yellagonga Regional Park is variously bordered by urbanisation, bushland, industrial areas, and major roads. There are many impacts to consider in the management process.

We have good opportunities for input to the YRP management plan. We keep in mind the fact that CALM, Council, developers and the community all have their needs. The management plan is evolving, and to help the process there will be one manager in charge with whom everyone will liaise.

Is a Regional Park for the protection of the natural environment, or for people to use? We must all regularly re-examine the original intentions for the area and decide if we are meeting those objtectives.

Planners need to understand the bushland needs. One need is for appropriate management. Bush regeneration is a relatively new science, and there are always new ideas on best practice in fire management. Unfortunately the old culture often prevails, causing conflict. We have to contend with the imposition of traditional management practices, tied with what is cheapest and quickest.

We can't compete with government, as we are volunteers with limited resources. Therefore we have to use bush regeneration practices that make the best use of our limited resources.

Our experience with Council raises the question 'should Environmental Officers be contracted rather than employed, if they are reporting to an Engineering department?'

In the planning and works processes, our group always focus on the good things that authorities do, such as allocating funds for conservation work. In questioning rather than criticising, we seek to move them away from 'bad practices'.

Numerous 'public opinions' are sought. By far, the greatest interest is shown by those wanting to conserve rather than develop, but only developers seem to be heard. Developers use the very natural assets we seek to preserve to market their product. Then they carry out inappropriate development that destroys those assets. Financial incentives to promote conservation need to be implemented.

We must listen to local people. A hundred people may be living nearby, and although only 2 or 3 get involved, most live there because they are attracted to the natural environment.

We recognise the frustration of long-established community groups when a new governing body takes responsibility for their area. This means new rules are imposed, and work in conflict with community expectations and advice is carried out. With YRP, CALM are the 'new kids on the block' and we are working with them to manage the inevitable changes as best we can.

CALM Field Officers and Trainees are responsive and competent, and we feel some good things are being achieved. We are fortunate in having a good Minister for the Environment (our local member) who is community minded and approachable. We can and do approach the Minister to get things happening.

Government realises we (FOYRP) are now long established and here to stay. We have become part of the process, by helping to set the guidelines and by being included in the business of deciding what stays or goes. We learn from the government and the government from us.

This, however, doesn't necessarily mean all goes well — the way we want it to. We don't like the idea of 'user pays' as applied to National Parks — conservation areas are for all to use, experience and enjoy.

Community Perspectives – Canning River Regional Park

Julie Robert
Canning River Regional Park Advisory Committee and Bannister Creek Catchment Group

Introduction

My talk is about the community working with government agencies and vice versa. It has been eight years since Canning River Regional Park was envisioned. The Canning River Regional Park Advisory Committee has been in operation for about three years. I joined it relatively recently. The committee has functioned reasonably well, though this year, with CALM taking over in July, has been a difficult one for both the community and CALM. The working relationship with the City of Canning has been good.

Regional park protection

Some of the regional parks land is still not vested with CALM, and there is concern that it is in danger of being sold off. The land should be given conservation status to give the volunteers and agencies confidence that the work being done will not be lost to development or lack of care and management. We volunteer our time, expertise and energy because it comes from the heart, and it is vital that our work is protected.

Management plan is far too broad

The plan was done in a rush. There are no flora or fauna lists included. These plans are an important information base, and adequate time should be allowed so consultants can prepare them properly.

CALM staff

Continuity of staff on the ground is necessary. There was a lack of continuity of staff during the change over. The Ministry for Planning was managing the park, and when they pulled out there was no one organised to carry on. Subsequently there were 27 fires last season, and we've already had our first this season. There is a fire response plan in place, and we hope the situation will improve.

After gaining knowledge of one park, it is common for staff to be moved to another. In some cases they have too large an area to cope with.

Volunteers need to know the real constraints of the staff on the ground. Sometimes agency people have limited time and don't turn up to meetings, as they are not paid to do so. We have been very happy with the work and commitment of the park's two on-ground staff, Stuart and Greg, in the past six months. We would like more paid people assisting the volunteers. At present there are not enough qualified bush regeneration staff on the ground actually working as a team.

There is no CALM work base south of the river. Subsequently there is much time lost in travel for managers.

Volunteers

There is a need to respect the local volunteers' knowledge. Some people have worked in particular areas for 30 years or more. Unfortunately when an agency takes over they don't always make the most of this community knowledge and passion. This has occurred in our case.

Advisory committee nomination letters were not sent to the Community Catchment Groups that overlap with the park. Although the invitations were advertised in the *West Australian* busy coordinators do not have the time to check newspapers regularly.

The role of the community volunteers in the advisory groups is not clearly defined. The setting up of advisory groups appears to be an exercise in demonstrating that a community consultation process is active even though many decisions and documents are made and released before community consultation.

Partnerships

Another partnership that we'd like to build on is with children. One positive outcome of improved education and getting children involved in the environment by planning and implementing restoration of the parks would be a reduced occurrence of fire.

A good example where partnerships between community and government have worked is within the Bannister Creek Catchment Group, where I am coordinator. We have nine government agencies involved and once all were brought together positive things began to happen. Part of this success was having everyone join tours of the area to see it first hand. This too must be done for Canning River Regional Park. We plan a canoe trip and a bike ride.

NOTE: This is a personal viewpoint not discussed with the CRRP community group due to time constraints.

Perth Regional Parks Status Report, September 1998

Tim Bowra
Regional Parks, Department of Conservation and Land Management

Introduction

Through the combination of land acquisition under the auspices of the Metropolitan Region Scheme and the allocation of Crown land for 'conservation and recreation' purposes, Perth has one of the best open space systems of any city in Australia. This system has been developed to protect the conservation and recreation values of significant areas such as foreshores, ocean beaches, significant environmental areas including wetlands, and the Darling Scarp.

On 5 May 1997 Cabinet gave approval for the Department of Conservation and Land Management (CALM) to take responsibility for the management of regional parks. CALM, the Government's primary vehicle for conservation and recreation land management, was the most appropriate agency to provide a strong integrated framework of management for complex conservation and recreation areas.

The current holdings of land within defined regional park areas are complex. There are a number of different landowners of both Crown land and private land tenure. In general the Western Australian Planning Commission (WAPC) has proceeded to, and will continue to, acquire much of the land that is required to consolidate the parks.

Due to the nature of the land within regional parks local government will retain management of areas within regional parks. It is intended the WAPC will also transfer some land to local government, principally land that has a recreation focus. Final land vesting will be determined in the management plan.

Of primary importance will be the commitment of both CALM and local governments to form partnerships to jointly manage the regional parks.

The transfer of management responsibility is to occur over three years. The schedule is:

1997/98	Yellagonga
	Herdsman
	Beeliar
	Canning River
1998/99	Jandakot Botanic
	Rockingham Lakes
	Woodman Point (Ex-Ministry Sport and Recreation)
1999/2000	Darling Range

Funding requirements

Recurrent Budget

To secure the transfer of regional parks and complete the required maintenance tasks the following consolidated funding will be made available to CALM:

1997/98	$1 million
1998/99	$1.8 million
1999/2000	$2.35 million
2000 onward	$2.35 million

Management Plans

The WAPC will provide $500 000 for the preparation of management plans for the regional parks.

Capital Works

The WAPC will provide $5 million for CALM to complete capital works (where a management plan exists) or necessary works (where there is no management plan) requirements.

Additionally, under the Area Assistance Grant Scheme (AAGS) local governments can lodge submissions for grants of up to $100 000 per annum to complete works on land managed by Council.

CALM staffing and park management *(attachment 1)*

Among the regional park staff, CALM has employed specific operations staff to undertake management roles within individual parks. This has resulted in close on-ground communication with the community and immediate awareness of required management issues such as weed control and vandalism.

Maintenance works within the regional parks continue using a combination of external contractors, volunteers, State government initiatives and internal CALM fee-for-service providers.

All former Ministry for Planning contracts have been reviewed, rewritten and re-let.

A Memorandum of Understanding has been prepared for both the Perth District and the Marine and Coastal District for the provision of works within the Regional Parks. Assistance also continues from various specialist branches of CALM.

Specific works which have been initiated or completed in the last six months include:

- Intensive weed control works – Canning River

- Fencing and spraying for community rehabilitation works – Canning River
- Interpretive shelters (ongoing)– Yellagonga
- Completion of Boardwalk (ongoing) – Herdsman Lake
- Intensive Cleanup Brownman Swamp – Beeliar
- Culvert/crossing works – Beeliar.

These works were completed using the recurrent budget savings arising from the late setup of the Regional Parks Unit. The capital works budget of $5 million over five years from the Metropolitan Region Improvement Fund has therefore not been drawn on.

Community liaison

CALM will continue to involve the community in both a formal sense, through advisory committees, and an informal sense, through regular 'on-ground' contacts.

Four regional park advisory committees currently meet and are serviced by CALM — Canning River, Herdsman Lake, Yellagonga and Beeliar. Darling Range Regional Parks Advisory Committee is currently an interim group serviced by MfP.

Membership of the Herdsman Lake Regional Park Community Advisory Committee has been reviewed in consultation with the Chairman of the committee. The other three regional park advisory committees are functioning well.

Advertisements calling for nominations for membership of the Rockingham Lakes, Woodman Point, Jandakot and the revised Herdsman Lake Regional Park Advisory Committees will all be placed by September this year.

The senior staff from the Regional Parks Unit will share the CALM membership responsibilities on advisory committees.

Management plans

The Canning River Regional Park Management Plan was released in December 1997. The consultancies and associated planning teams for Yellagonga, Herdsman Lake and Beeliar Regional Parks are progressing.

Planning consultants for Jandakot Botanic, Rockingham Lakes and Woodman Point Regional Parks will be selected from the 'planning panel' currently in place. These plans will commence in September 1998.

At this stage it is planned to commence the Darling Range Regional Park Management Plan early in 1999.

Fire control

Most of the current regional parks fall within the Fire and Rescue Service Western Australia (FRSWA) gazettal.

Issues associated with fires in regional parks are being used to re-instigate the 'partnering agreement' between CALM and FRSWA. These issues include fire control responsibility, access, notification and fire control standards.

On 22 July 1998 CALM and FRSWA staff met at the first of the 'partnering' meetings. The primary agenda was fire control standards and requirements in regional parks. The meeting was a successful and fruitful information session for both agencies with a number of action items raised, including:

1. Joint CALM/FRSWA preparation of regional park fire response plans for each regional park. A designated officer from both CALM and FRSWA is currently preparing these plans. The community, including the Conservation Council, will be asked to comment on the documents while in draft form. It is planned to have the southern Regional Parks Fire Response Plans completed and in place by summer this year.
2. CALM will continue to assist and train FRSWA staff in urban bushland fire control techniques.
3. Adoption of a standard set of procedures by both agencies in the event of a fire, including:
   - Notification.
   - Water bomber use.
   - Mop up standards.
4. Ongoing communication to stakeholders including the community.
5. Ongoing review of processes.

Legislation

CALM is currently managing former MfP-managed areas of regional parks as per a Cabinet Minute dated 5 May 1997. The land is owned by WAPC and held as 'open space' to protect the conservation and recreation values of strategic areas. It was intended that these specific parcels of WAPC freehold land be transferred to the National Parks and Nature Conservation Authority (NPNCA) and managed by CALM as regional parks.

The Cabinet Minute outlined the need to amend the CALM Act 1984 to create a new category of land for regional parks. This direction is now not likely as following consultation with organisations such as the Conservation Council WA, CALM is seeking to have regional parks comprised of existing land categories under section 5 of the CALM Act i.e. to potentially include:

- National Parks
- State Forest
- Conservation Parks
- Nature Reserves
- other land reserved under the Land Act 1933.

The Crown Solicitors Office will draft a Section 16 Agreement under the CALM Act for management of the WAPC properties as regional parks until such time as they are vested in the managing authorities e.g. NPNCA. CALM and MfP have, however, already undertaken these arrangements through exchange of letters.

If necessary, regional parks managed by CALM can still eventually have their own category under the CALM Act. If and when this was appropriate the CALM Act could be altered to include a new land vesting.

This process will not result in a lack of protection for the regional parks, given CALM will be managing the land under the same conditions and legislative controls employed by the MfP.

The future

Specific tasks, other than those mentioned above, for the immediate future include:

- 'Information sessions' with all Councils and community groups including the Urban Bushland Council.
- Use of Ministry of Justice prisons crew for maintenance works.
- Development of a Regional Parks Aboriginal Landcare Training Initiative (in conjunction with WA Dept. of Training).
- Linking all required regional park maintenance works to a GIS package.

Attachment 1: Regional parks staff and contact details.

The following list is of CALM staff with designated responsibilities within regional parks. The list does not include the ongoing use of CALM specialist staff such as Planning Branch, Wildlife Branch, Research, Landscape Architects etc.

NAME	TITLE	ROLE	CONTACT
Tim Bowra	Regional Parks Co-ordinator	Manages the Regional Parks Unit	Ph. 9405 0740, 0417 957 002 (mob.) Address: CALM Regional Parks, 5 Dundebar Road, Wanneroo WA 6065
Greg Napier	Regional Parks Project Officer	Co-ordinates all on ground operations including contracts and CALM works	Ph. 9405 0744, 0417 973 480 (mob.) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Brendan Dooley	Regional Parks Senior Planner	Co-ordinates planning process.	Ph. 9405 0741, 0417 093 379 (Mob.) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Annabelle Vowels	Regional Parks Landscape Architect	Landscape Planning	Ph. 9405 0743, 0414 877 225 (mob.) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Jon Kaub	Regional Parks Planner	GIS Input. Co-ordinates land admin and tenure issues including impact assessments.	Ph. 9405 0745 (wk) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Jason Puls #	Operations Officer	Manages on-ground operations (CALM and contract) in Yellagonga, Herdsman and Jandakot Botanic	Ph. 9405 0779, 0417 930 259 (mob.) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Stuart Harrison #	Operations Officer	Manages on-ground operations (CALM and contract) in Canning River and Beeliar	Ph. 9405 0736, 0417 975 841 (mob.) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Debbie Wheeler	Regional Parks Administration Officer	Regional Parks administration and clerical duties	Ph. 9405 0742 Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Trainees (X4)	Short term contract positions.	Survey on-ground work requirements as land is transferred to CALM	Ph. 9405 0742 (wk) Address: CALM Regional Parks 5 Dundebar Road, Wanneroo WA 6065
Ian Gale*	Marine and Coastal District	Manages on-ground operations (CALM and contract) in Rockingham Lakes	Ph. 9432 5111, 0419 940 634 (mob.) Address: 47 Henry St Fremantle WA 6160
Tony Eddlestone*	Marine and Coastal District	Manages on-ground operations (CALM and contract) in: Woodman Point, Point Peron	Ph. 9432 5111 Address: 47 Henry St Fremantle WA 6160
Lyall Woods*	Marine and Coastal District	Manages on-ground operations (CALM and contract) in: Woodman Point Point Peron	Ph. 9432 5111 (wk) 47 Henry St Fremantle WA 6160

Perth District Staff. * Marine and Coastal District Staff. It must be noted these are current staff roles, and all are subject to change depending on work requirements and staff availability.

Local Bushland — Government Brick Wall

Dr Felicity McGeorge, BSc, BVMS.
Co-ordinator, Parkway Bush Preservation Group

Our group has been working for over four years to save eight hectares of banksia woodland on the eastern side of Bibra Lake. During this time we have encountered and re-encountered a multitude of government departments and agencies.

From the outset we believed we had an overwhelming case for the retention of this piece of bushland, at that time unvested Crown Land. The area has never been cleared (in contrast to land around nearby Bibra Lake, which is largely being regenerated from agricultural land), has been used as an educational resource for the adjacent primary school since the school's opening in 1987, and provides an obvious corridor from Bibra Lake to bushland east of the Kwinana Freeway. More recently the area has been used as a resource for the revegetation of the surrounds of Bibra Lake itself. The bush also acts as a physical barrier to the Western Power Southern Terminal, a bulk supply point for power to the south metropolitan area, with electricity of up to 330,000 volts moving through the transformers. Not an ideal neighbour for residential development.

The beginning of our campaign in March 1994 is a prime example of the difficulties we have faced. At that time the future of the bush came under discussion at the Bibra Lake Primary School Development Committee which then 'unanimously endorses any proposal that retains the bushland opposite the school in its natural state.' It was decided that the current status of the land should be ascertained. We received the following replies to our enquiries:

> *City of Cockburn, 30 May 1994*: As far as the City of Cockburn is concerned the land is still gazetted as a TAFE site.
>
> *Government Property Office, 9 August 1994*: Surplus to needs as a TAFE site but would need to go through Metropolitan Regional Scheme (MRS) and Town Planning before changes were made. There would be an opportunity for comment at that stage.
>
> *Department of Land Administration, Reserves Index Enquiry, 12 August 1994*: Unvested Crown land — 'I don't think it's going to be a Technical College. I'd look out for rezonings.'

Finally, questions asked in Parliament by our local member on 10 August 1994 yielded some surprising answers. The land was in fact at the tail end of the MRS amendment process, for which written submissions had officially closed.

So this was our first introduction to the wonders of government bureaucracy. It was truly stunning that such a simple enquiry could be so difficult to answer. Of course we now know we should have gone straight to the planning department. Back then, as novice bush savers, we hadn't quite grasped the intricacies of the various departments.

Since then this is what we have come to expect from government departments and agencies. Over the last five years we have dealt with seven State government departments, numerous agencies and at least four changes of ministers of these departments.

Our frustration with government authorities occurs in a variety of aspects of our dealings. The most insidious of these is the change in their stance over time, which is most apparent from our dealings with the Ministries for Planning and Housing. The following quotes from letters emanating from the Ministry for Planning illustrate this point.

> *Minister for Planning, Richard Lewis, 15 October 1994*: The Urban zone permits a wide range of uses and the use and development of the site remains to be determined. Issues relating to final land use will be required to be resolved through local structure planning and controlled by way of appropriate local town planning scheme zonings.
>
> *Minister for Planning, Richard Lewis, 30 November 1995*: Issues regarding locally significant bushland should be addressed by the local government authority ... The matter is now under consideration by the Western Australian Planning Commission ... You have also raised the issue of the proximity of the Western Power Southern Terminal to the site. This can be considered in the planning process when a development proposal is submitted by the owners of the land. The land is currently zoned Urban under the MRS and this must also be taken into account as the local authority and the landowner consider plans for the area. ... I do appreciate the value placed on the bushland in your local community and I accept its local significance. Your council must account for this in the context of the zoning of the land and the intentions of the landowner.
>
> *Minister for Planning, Richard Lewis, 21 July 1996*: ... agreement regarding the transfer of land is being finalised with Homeswest. At this stage, I suggest that you liaise with Homeswest regarding the bushland area.

From these letters it would appear that the matter was in the hands of the local authority. The town planning scheme amendment was initiated as required to bring it in line with the MRS zoning as Residential. As expected the local opposition to this

proposal was so overwhelming that the council resolved to modify the amendment to 'Local Reserve – Parks and Recreation', and duly submitted this to the Western Australian Planning Commission (WAPC). Looking good, you might think! But wait, the next letter from Department of Planning ...

> *Ministry for Planning, 30 July 1998*: ... the WAPC has ... resolved ... that the site should be zoned 'Residential' in the City of Cockburn's town planning scheme ... In respect of the rezoning, the Minister has resolved that the site be zoned 'Residential'.

The council was subsequently directed by the Minister to zone the land accordingly.

So over four years we had gone from dealing with an area of unvested Crown Land, through two planning processes and exhaustive communications and petition-writing by our group and the Cockburn Council, only to have a decision imposed on them by the Minister.

The saga of dealings with the Ministry for Housing was more of the same.

> *Minister for Housing, Dr Kim Hames, 14 August 1997*: It is my aim that the resolution of this matter will be satisfactory to all interested parties which of course includes the Parkway Bush Preservation Group. I will ensure that you are advised of the final decision in regards to the use of the land.'

> *Minister for Housing, Dr Kim Hames, 6 July 1998*: Homeswest intends to proceed with the subdivision of the land. ... Residents are assured that any development of the land will be treated with sensitivity and take into account its local value.

The idea of sensitive bulldozing is an amusing one although the Minister for Housing was obviously not amused in his recent reply to a letter from the UBC.

> *Minister for Housing, Kim Hames, 23 September 1998*: I am surprised at your statement that the Government and Homeswest have ignored the community's wishes on this matter.

Well I'm surprised he's surprised, after all we've spent hundreds of hours over four years to end up basically where we started, that is with the possibility of the 10% open space requirement remaining as bush.

Another rather disturbing aspect of the State government's handling of these matters has been their ability to blatantly ignore advice and reports, even from within their own organisation.

> *Memo – Minister for Housing Colin Barnett to Minister for Planning, 25 January 1996:* 'I do believe however that it would be very sensible to retain the existing bushland as a noise buffer to the Terminal Station. It's possible that additional transformer plant may be required to be installed at the site in the future to meet load growth. There would be obvious benefits to existing and future residents if the existing bush buffer was retained.
>
> For the proposed residential development any future expansion of transformer capacity at the Terminal Station would result in significant plant cost to incorporate noise reduction measures and, not withstanding these measures, in higher noise levels for the new residents.
>
> It may well be that if the proposed residential development proceeded Western Power may be forced to seek an alternative site to Southern Terminal to meet future load growth. This would be an expensive alternative and prove unpopular with the public as additional transmission lines would prove necessary.
>
> The existing bushland is of assistance to Western Power in keeping the cost of its facilities down and avoiding conflict with the public from possible noise complaints.

This memo was also sent to the Ministers for Lands and Housing. I don't think it was unreasonable to believe that this correspondence should have lead to a positive outcome for the bush. Instead, every mention of it we made subsequently was assiduously ignored.

A more recent letter may demonstrate the total lack of communication between departments, or more likely the unwillingness of the State government to inform involved parties of possible avenues to pursue.

> *Minister for Lands, Mr Doug Shave, 6 August 1998*: ... there are currently processes in place to allow local governments access to surplus crown land ... If a local authority is able to demonstrate that the land has significance to the local community and is prepared to accept a management order, then it could also be vested in the local authority for recreational purposes at no cost.'

Nice to know now, four years after the City of Cockburn requested that the land be vested in them and that they take responsibility for its management.

A few miscellaneous gems we've come by over the years:

> *Telephone discussion with Planning Department*: it's just bushland, ... no big trees. ... not much chance of saving it if it's not a wetland.

An interesting interpretation of a report:

> *Flora and Fauna Survey commissioned by City of Cockburn, 10 Nov 1995*: It is of high species richness compared to Banksia Woodland communities in general on the Swan Coastal plain, which average a species richness of 7 to 86 per 100m^2. (Gibson et al) [Parkway Bushland has a value of 83] ... This community type ... is considered poorly reserved on the Swan Coastal Plain and of vulnerable conservation status.
>
> *Minister for Housing, Kevin Prince, 27 Dec 1995 (Responding to the above report)*: I note that the survey found this bushland to be typical of characteristics evident throughout the Perth Coastal Plain

> ... The limited conservation value of this land has to be weighed against its' value to the wider community in providing an ongoing supply of suitable residential land.

Is living adjacent to transformers carrying 330,000 volts really suitable?

> *Light on facts — letter from Department of Planning*: The WAPC has concluded the land is not of Regional significance because a) the limited size of the piece of land and its isolation from other regionally significant bushland areas; and b) the condition of the bushland, and the fact that there are better examples of the relevant types of vegetation elsewhere.'

All sounds pretty logical, unless of course you have actually been to the area. Then you would know that as the tortoise crawls the bushland is in reality less than 250 metres from the eastern side of Beeliar Regional Park, that the condition of the bush has been independently rated as good to very good, not to mention the DEP report that considers it 'the best area of banksia woodland on the eastern side of Bibra Lake'.

This would all be quite funny if the fate of our bush didn't rest with these people.

Apart from our direct dealings with the Ministries we have had two petitions tabled and many questions asked in Parliament, several public meetings, numerous articles in local newspapers and the *West Australian* and recently a rally which appeared on nationwide news broadcasts, but still no progress!

Many of the hurdles we have encountered have been the result of the bush being arbitrarily identified as 'locally significant' under the Urban Bushland Strategy rather than 'regionally significant'. This allows the State to absolve itself of any responsibility, no matter how strong the case for preservation is. Unfortunately there is no system in place to balance this dereliction by the State government, putting local governments in the unenviable position of responsibility for preservation of these areas with minimal funding to fulfil these expectations.

One bright note in all this bureaucratic maze is the cooperation and support we have received from the City of Cockburn. From the outset the council has been attempting to secure the land for the community. This has included offers to manage the land as a reserve, to facilitate a land swap and to purchase it outright. At every attempt their efforts have been thwarted by the State government which appears to have gone out of its way to make everything as difficult as possible.

So here we are, over four years down the track, having sacrificed a few trees worth of paper in the name of conservation and having learned the hard way that common sense doesn't always prevail. The uncompromising nature of the government on this issue has led us to believe that the fate of so called 'locally significant bushland' is pretty dismal under the current arrangements, but while the bush is still there we'll keep fighting!

School Bushland Sell Off

James Duggie
Save Our Bushland Campaign Coordinator, Wildflower Society of Western Australia (Inc.)

Introduction

Urban bushland has many values and, as an important part of Western Australia's natural heritage, deserves to be given proper recognition and consideration in the development of Perth and other population centres (National Trust of Australia, 1993:7; Government of Western Australia, 1995:iv). Among the range of heritage values assigned to urban bushland is its role as an important educational resource. The Education Department has much land vested in it, some of which has remnant urban bushland of varying extent and condition. In the process of managing its land resources and other assets, the Education Department should take into consideration the educational and other heritage values of the bushland vested in it.

This paper discusses the Education Department's policies of the last two years, which have resulted in the identification of what the Department has considered excess land and subsequent efforts to sell that land. These policies have serious implications for bushland conservation. Unfortunately, to date the Department has not appeared to adequately recognise the importance of the urban bushland for which it is responsible in these policies. It is argued here that the Education Department has a responsibility to carry out an inventory of its bushland resource, and to ensure that the conservation and heritage values of bushland on Department vested land are given central consideration when land management decisions are being made. These decisions should be consistent with State government policies on urban bushland.

Urban bushland has important educational values

Urban bushland can be used as a teaching resource at all levels of the education system and in many aspects of the curriculum (Keighery & Gray, 1993), particularly the sciences, language and the arts. Bushland can be used for research and fieldwork from the primary school through to tertiary institutions. At primary school level various bushland activities can be used to provide a practical focus to assist students in learning problem solving, decision making, cooperative behaviour and other group skills (Fisher & Campbell, 1996). Such learning experiences can be very powerful and empowering for children. These activities can lift the self esteem of students, while developing in them an appreciation of the value of bushland (Fischer, 1996).

Keighery and Gray (1993:32) have argued that:

> The multiplicity of organisms and interactions in the bushland makes it the ideal place to develop observational skills, participate in the scientific process of discovery and develop an understanding of ecological processes ... Studies have shown that it is the repetitive exposure to natural areas that develops and internalises educational outcomes. Once only visits to 'the National Park' or 'the Zoo' do not achieve long term retention of skill and concepts.

Many schools have successfully incorporated bushland studies into their day-to-day curriculum. In some cases students are assisting in managing bushland remnants located near or on school properties. In other cases schools are establishing bush gardens or rehabilitating degraded areas of bushland (Keighery & Gray, 1993:33).

The Wildflower Society of Western Australia has recognised the importance of the educational values of bushland and the wide range of benefits of having bushland areas in close proximity to schools and residential areas by including the following in its Principles of Flora Conservation:

> Principle 9: The community has a right to know about and care about and enjoy our floral heritage. Community involvement and education are conducive to caring and enjoyment. Our children have the same rights. Furthermore, all children have the right to access to bushland within walking distance of home and school. (Wildflower Society of Western Australia, 1991)

Bushland on publicly-owned land vested in the Education Department is also an asset for the wider community. In many cases the wider community participates in bushland activities, either in cooperation with schools or separately, and otherwise enjoys the bushland. Participants in a well-known ongoing range of school bushland activities at City Beach Primary School note that the activities can create opportunities for linking the school to broader community involvement, and can help raise awareness of local native vegetation and environmental issues (Fisher & Campbell, 1996).

According to Beresford (1995a) environmental education is an important area for schools in Western Australia and the Education Department has had an environmental education policy since the 1970s. Environmental education is discussed in more detail in *Environmental Education in an Outcomes World* (Beresford, 1995b) produced as guidelines for this topic in Western Australia.

There can be no doubt that urban bushland, either on school properties or nearby, is an important educational resource and community asset. Once cleared such bushland communities can not be replaced. In some cases, the bushland on Education Department vested land may be the only remaining examples of local remnant vegetation, or perhaps the largest remnant, or the remnant in best condition. In most cases the bushland will be of local significance and plays an important part by contributing to the conservation of the local natural heritage.

Education Department land and bushland

As is the case for a number of State government departments, the Education Department has a substantial amount of land vested in it over a large number of locations throughout the State. Some of this land is currently being used for school sites, other land has been reserved for future use. Some of these publicly owned reserves have bushland on all or portions of them. Similarly, some schools have bushland remnants on part of their site.

To get a rough indication of the amount of land we are dealing with here for Perth, we can do a quick calculation. In the Perth Metropolitan Region (PMR) there are approximately 80 high schools, typically about 10 ha in size, although this size can vary significantly (Iacomella, 1998). There are over 550 primary schools in the PMR, typically about 4 ha in size, although again their size may vary. If we assume that these typical sizes are average sizes, then these schools represent roughly 3000 ha of land. This excludes vested land that is not yet being used.

Selling off school land

The Wildflower Society of Western Australia first became aware that the Education Department was intending to sell off some of the land vested in it in May 1996, when the opposition of local communities and politicians to a number of sell-off proposals hit the media. When we inquired further we discovered that the proposed sell-offs were a result of what was called the School Initiated Excision Policy. This policy '... permits schools to identify surplus grounds and buildings with a view to disposal. This policy allows return of funds to schools for school initiated building and ground improvements, and technology upgrades.' (Barnett, 1996)

The excision policy allowed for portions of school sites considered excess to the needs of the school to be excised from the school land title and sold. Sixty to seventy per cent of the funds raised would be returned to the school, the remainder would be put in a trust fund for capital works for other schools (Day, 1996; Rose, 1996). The Education Department had set site size criteria for schools. As a number of school sites were larger than the sizes set by the criteria, these schools could be considered in terms of selling off what is considered the excess land. This policy was part of the Department's efforts to meet its public responsibility to manage its assets most efficiently, and involved consultation with the schools affected (Griffiths, 1996). In fact, as the title of the policy (*School Initiated* Excision Policy) indicated, the Department attempted to give the impression that it was the schools which were initiating the process. The desire was that schools would identify excess land and propose to the Department that it be sold off. The Department would then decide whether it approved the proposal. However the Minister for Education, Mr Barnett, made it clear that the sharing of the revenue raised from sales with schools was designed to provide an incentive for schools to put forward such proposals. He was reported to have said: 'Unless the benefit is going to go back to local schools, I think there would be very little movement — no one is going to sell any land.' (Day, 1996c)

At this stage in 1996 the Department had no policy with respect to the bushland on Education Department vested land, and had no policy or procedure for assessing such bushland even in the case of the proposed sale of land with bushland on it (Griffiths, 1996). The Director of Facilities and Services explained that there was a trend for decision making to be decentralised so that decisions were being made more and more at the school level, with the Department setting frameworks and approving school decisions (Griffiths, 1996). This could potentially be a problem if particular schools under immediate financial pressure decide that the short-term benefits of additional revenue is more important than the long-term benefits of retaining bushland. Such decisions will be irreversible and would deny future generations of school children and the wider community members the benefits and values of the bushland experience.

In the initial wave of sell-off proposals, which went before the Minister for Education at the end of 1995, there were 15 sites proposed (Griffiths, 1996). For example Yokine, Belmay and Noranda Primary Schools all proposed to sell off bushland on their school sites (Anon., 1996; Day, 1996a; West Australian, 1996). Such proposals, along with proposals to sell sports ovals and buildings, caused a stir in the community. Significant opposition from local communities, politicians, the WA Council of State School Organisations and the State School Teachers' Union quickly emerged. The President of the latter organisation argued that it was outrageous that schools might sell off bushland as there was so little bush left near schools and it was an important resource (Day, 1996b). In a period of one month ten articles and one editorial focussing on such concerns appeared in the *West Australian*. One of the concerns that emerged was that the policy was not equitable because schools and students which happened to be located on school sites thought to have excess land would receive additional funds compared to other schools and students (West

Australian, 1996). It may have been this argument, and the public outcry which led the Minister for Education to announce a review of the policy in June of that year (Day, 1996c).

Local area education planning

In June 1997 the Department issued the assurance that 'No new excision projects had been approved this year and others are on hold. In future, excision proposals would not be assessed individually, but within the context of local area planning ...' (McCleary, 1997). In May 1997 the Education Department released a draft policy *Local Area Education Planning Framework* for public consultation (Education Department, 1997). This policy was to become a central part of the State Government's strategic approach to future planning of allocation of education resources, and education delivery. Unfortunately the policy did not seem to specifically consider the role of bushland or how school bushland should be considered in the decision making processes that were outlined. The final policy was launched in September 1997, at which time the Minister for Education announced that three districts would receive priority in terms of having the policy implemented (Iacomella, 1998). The policy announcement from the Minister in recent months this year with regard to *inter alia* school closures and mergers, are the results of this first wave of implementing the policy in the three districts identified. The policy will not be fully implemented across all districts until the end of 1999 (Iacomella, 1998).

There does not appear to be any inventory of bushland areas that might be affected by the recent announcements of school closures and mergers (Iacomella, 1998). At least one merger threatens remnant bushland at the new proposed site on the corner of Selby and Lemnos Street in Shenton Park. The Department contracts architects to manage the implementation of these policy measures in establishing new school sites etc (Iacomella, 1998). It is the responsibility of the contractors to identify and address any environmental and heritage issues that arise, but there is still no overall Education Department policy with respect to bushland sites and how consideration of them should be incorporated into the decision making processes of the Department (Iacomella, 1998).

The Wildflower Society has urged the Education Department, first in 1996, that it should develop a departmental policy on bushland. We believe this is an important measure which is urgently needed to ensure that bushland vested in the Department is managed appropriately and that its value is recognised and properly considered in decision making processes, especially with respect to land sell-offs and future planning. The policy should be consistent with State government urban bushland polices and priorities, such as Perth Bushplan. We have also urged that an inventory of all bushland in Education Department vested land should be carried out. The Department has balked at such a suggestion on the basis that the cost would be prohibitive (Griffiths, 1996). The thought of an inventory also appeared to concern the Department as it was perceived as a possible additional restraint on policy options. But this is essential information if the bushland asset vested with the Department is to be managed most appropriately for the whole community. Gaining this information is part of the Department's responsibility to ensure its resources are managed and used most effectively. To date we are not aware of any proposed bushland policy or bushland inventory.

To attempt to encourage the Department and school communities to value their bushland resource the Wildflower Society has initiated a proactive project. The Society has successfully applied for a grant from the National Heritage Urban Bushcare Program to carry out the Wildflower Society School Bushland Assessment Project: The Assessment of School bushland in three WA shires. The surveys will be performed by volunteer botanists and run along similar lines to the extremely successful Wildflower Society Bushland Plant Survey Program. The new project will commence in the near future.

Conclusion

The Education Department has a responsibility to recognise the value of bushland on Education Department vested land, in terms of educational values and a wide range of other heritage values. The Department should develop a policy on bushland, under which any areas of bushland which it may consider selling or impacting upon through other decisions should be assessed for their heritage values. It should be the Education Department's policy that no school bushland should be cleared or sold off. It is far too precious to be sold for short-term gain.

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Nature Conservation Covenants and the Nature Trust

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(This paper has been prepared for the Department of Conservation and Land Management)

Introduction

Western Australia's ancient landscape with its very rich and diverse flora and fauna is under threat. The system of conservation reserves can never represent and protect the full range of natural communities and species. Maintenance of this biodiversity requires recognition of and support for private landowners protecting the conservation values on their land.

The Department of Conservation Land Management (CALM) has developed Nature Conservation Covenants, a legally binding tool for permanently conserving natural heritage on private land. Nature Conservation Covenants are supported by Government, are recognised as an important tool in the Salinity Action Plan and are being implemented through a combination of the *Conservation and Land Management Act* and recent amendments to the *Transfer of Land Act*.

CALM is also developing an independent Nature Trust to protect nature conservation values by raising funds, acquiring land, funding scientific research, assisting private and government conservation of flora and fauna, and promoting and facilitating nature conservation covenants.

This paper discusses Nature Conservation Covenants and why we need them, the reasons people may place a covenant on their land, CALM's covenant program, the proposed Nature Trust, how to design a covenant for your land, and appropriate management plans.

What is a Nature Conservation Covenant?

Nature Conservation Covenants are voluntary. They seek to protect and enhance nature conservation values on private land. They are a legally binding agreement between a land owner and the Executive Director of CALM or the Minister for the Environment. Nature Conservation Covenants are statutory covenants, have the force of an Act of Parliament, and enable a body, such as CALM, to enforce them.

Nature Conservation Covenants are flexible. They are primarily designed to protect nature conservation values but can be individually designed to recognise human needs in living in harmony with nature. A conservation covenant can apply to all or part of a property. Nature Conservation Covenants are supported by practical management plans, developed by the landowner and CALM, to guide sound management of conservation land.

Covenants are registered on the title for the land and bind present and future owners to comply with their terms, though ownership and control of the property remains with the owner. Most covenants are designed to be permanent although they can, if desired, be specified for a particular period.

Whilst covenants are binding commitments on both parties, they rely to a large extent on the goodwill of the landowner to ensure management is sympathetic to conservation values. It is intended that Nature Conservation Covenants will encourage sympathetic management practices without causing undue economic hardship on the landowner.

In Western Australia there are a number of bodies such as the Heritage Commission, the National Trust and Agriculture Western Australia who have statutory powers to enter into statutory covenants with private landowners for heritage, nature conservation and soil conservation purposes.

Why do we need to protect nature conservation values on private land?

The agricultural development of the south-west of Western Australia has involved the clearing of some 17 million hectares of forest, woodland and shrubland since settlement. This development has brought the State economic benefit, but with considerable adverse impacts on land and water, including the significant loss of nature conservation values.

Many of the original ecosystems have disappeared or are very poorly represented in agricultural and urban areas. Those which remain are often fragmented, small and declining due to weed invasion, disease, predation by feral animals, changed fire regimes and local species extinctions. It is now widely recognised that these adverse impacts must be arrested and reversed.

Conservation reserves can never represent and protect the full range of natural communities and species. Nor are they adequate to provide other ecological services, such as the reduction of salinisation and erosion on adjacent farmlands. Many native animals and plants are now very rare and only occur, or have their most significant occurrences, on private land.

Partnerships between private land owners and Government, such as Nature Conservation Covenants, will be vital for long term protection of Western Australia's unique natural values.

Why place a Nature Conservation Covenant on your land?

People's reasons for placing covenants on their land to protect the nature conservation values vary but overwhelmingly they have developed a great love for their land, having worked hard to protect and manage it, and feel it would be threatened without legal protection. A covenant could:

- provide peace of mind that there is a capable steward taking an interest in the conservation values of their land in the long term.
- ensure that a subsequent purchaser is aware of the land's special values and status.
- hopefully attract a purchaser who is sympathetic to the land's conservation values.
- provide an interested third party as a source of management advice and long term stewardship.
- provide an advocate if the land is threatened by rezoning or works such as power lines, inappropriate fire prevention orders or mining.
- provide a sense of belonging to a club of like-minded people.
- provide satisfaction in having made a permanent contribution to nature conservation
- provide a reduction in rates, or financial assistance with fencing or management.

Most importantly, CALM accepts a permanent obligation as steward for the land, to monitor its condition and provide management advice, particularly when the land changes hands and to enforce covenant conditions when required.

Role of the Department of Conservation and Land Management (CALM)

CALM has a statutory responsibility under the *Conservation and Land Management Act 1984* to conserve native flora and fauna throughout the State. This role extends to private land and CALM is making a major contribution toward helping the community protect biodiversity, particularly through Land for Wildlife and Nature Conservation Covenants. These two programs are providing landowners with ways of making a practical contribution to conservation of the State's heritage.

Land for Wildlife is a simple, voluntary, flexible program designed to recognise and support landowners who wish to manage some or all of their land for nature conservation. The scheme involves an agreement between the landowner and CALM but the agreement is not binding on current or future owners.

The Nature Trust

The Department of Conservation and Land Management is supporting new legislation for the establishment of the Nature Trust, WA, Incorporated. The purpose of the Trust is to protect and enhance the natural environment by:

- seeking and encouraging the making of donations and testamentary gifts.
- the acquisition of land.
- holding land and facilitating transfer to appropriate long-term ownership and tenure.
- funding scientific research.
- assisting private landowners and public authorities to conserve flora and fauna.
- promoting and facilitating nature conservation covenants on private property.
- producing publications and merchandise for fund raising and education.
- facilitating broad public and corporate membership of the Trust.

The Nature Trust will be an independent body and not an agent of the government in any capacity. The Trust will be managed by an independent Board of five community members elected by the membership, three members appointed by the Minister for the Environment, and the Executive Director of the Department of Conservation and Land Management or his nominee.

The Nature Trust will have tax deductibility status for the purpose of attracting donations.

Does my land qualify for a Nature Conservation Covenant?

Land qualifies for a Nature Conservation Covenant if it has owners who wish to permanently protect the natural values, if the land has high nature conservation values and if the land is not seriously threatened by salinity, mining or government development proposals.

The land must have freehold title. Approval of all parties with an interest in the land to be covenanted, such as mortgagees, is required. Most importantly covenants are voluntary and require agreement from all owners.

The land must be of conservation significance. Factors taken into account include:

- the presence of ecosystems which have been extensively cleared.
- the presence of threatened plants, animals or ecological communities.
- corridors and stepping stones for wildlife movement.
- land which provides a buffer to a conservation reserve.
- examples of poorly reserved ecosystems of local significance.
- land which is valuable as an educational resource.
- relics of original ecosystems which are in poor condition but which may contain important con-

servation values.

The land should not be subject to threats which would seriously alter the natural values in the short or medium term. Salinity and dieback (Phytophthora) are of particular concern. Small and narrow areas are particularly threatened by weeds and edge effects and areas smaller than two hectares will only be covenanted in special circumstances.

Land will not be covenanted where there are conflicts with government development proposals but CALM will endeavour to resolve the issues to enable protection of important natural values.

Land protected by a Nature Conservation Covenant is subject to the requirements of the *Mines Act* and the *Bush Fires Act 1954* but CALM can play a useful role in assisting land owners resolve any conflicts which may arise.

Designing your covenant

Each covenant is designed primarily to protect nature conservation values with allowance made for dwellings and other activities to allow living in harmony with nature. Each covenant is individually designed to cater for the needs of the land and the land owner. The tables following this article show some of the more common types of covenant desired by land owners. They are examples, and a wide range of other options and combinations can be designed.

Management plans

Without active management the nature conservation values in agricultural and urban landscapes are unlikely to survive pressures of altered water and fire regimes, weed invasion and disturbance. Management plans are required as a guide in an environment of incomplete knowledge, where we are learning best practice. Management plans must be based on observations of ecological processes, be practical, and be adaptive to periodic events such as fire and to new knowledge.

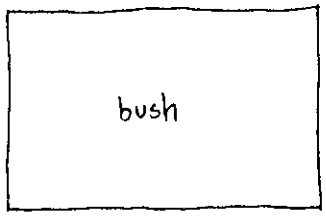
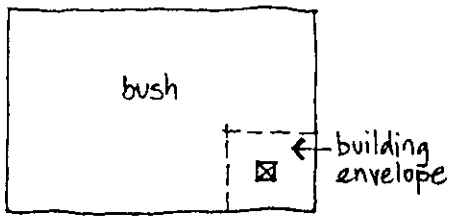
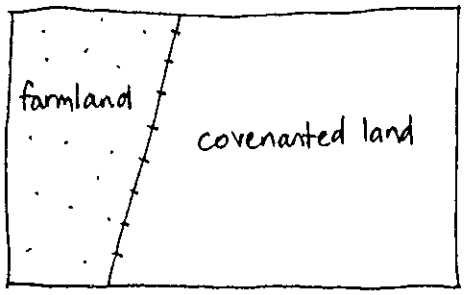
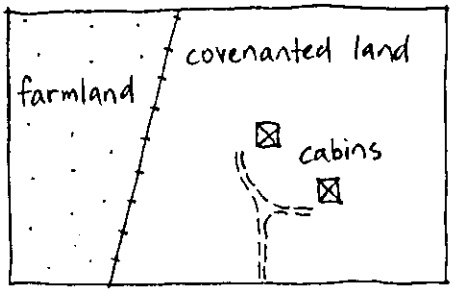
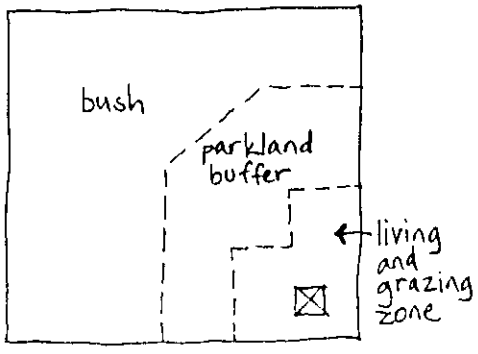
A plan of management is a document which sets out the desired management strategies, actions and performance indicators required for effective conservation. Plans of management are developed by the landowner and CALM and are included as a schedule to each conservation covenant, allowing for regular review and refinement of management practices.

The plan of management is an active document used to guide day-to-day management of the site and includes:

- Values — which identify the conservation values of the land.
- Management objectives — which state the objectives for protecting the conservation values of the land.
- Strategies — which identify threats to the conservation values and mechanisms through which the threats can be managed.
- Actions — which outline specific activities for managing threats.
- Monitoring — which identifies and measures performance indicators to evaluate the success of strategies and actions in meeting management objectives. Performance indicators should be practically orientated and encourage land owners to identify management problems as they arise in order to develop adaptive strategies.
- Review — where the results of the monitoring and new knowledge are taken into account in modifying the management plan if required.

Plans of management should be adaptable to changing circumstances. Plans should be reviewed at least every three years when the triennial stewardship inspection takes place but be adaptable to ongoing amendment if required.

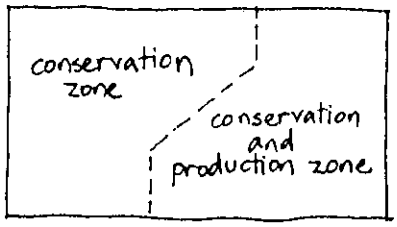
Examples of different designs for Nature Conservation Covenants

The bush block A landowner or group of owners have bought land with high nature conservation values and do not wish to see any development or use of the land save for the quiet enjoyment of its nature conservation values. The whole title is subject to a strict covenant.	
The bush block with a dwelling People have a house on the land but wish to see the complete protection of the bushland save for an envelope around the house for domestic activities and fire protection. In some cases up to two dogs may be permitted and some people wish to plant non invasive exotic plants within the building envelope. The whole title is subject to a covenant.	
Remnant natural areas within a larger allotment — no development Bushland or wetlands exist within a larger farming title. The purpose of the covenant is to protect the natural values from grazing and development. In some cases allowance is made for taking small amounts of natural produce such as firewood for use on the farming property. Only the bushland is protected by a covenant.	
Remnant natural areas within a larger allotment — modest development Bushland or wetlands exist within a larger farming title. The purpose of the covenant is to protect the natural values from grazing but modest development for ecotourism such as walking tracks and two cabins are permitted. Only the bushland is protected by a covenant.	
Tiered covenant allowing for a buffer and domestic/grazing area The purpose of the covenant is nature conservation with some human-oriented activities. Part of the land is completely protected, part is a buffer with seasonal grazing or removal of fuel loads and allowance is made for an area for horse grazing and a dwelling envelope. Up to two dogs are permitted within the dwelling envelope and grazing area. Fuel wood for use on the property can be taken. The whole title is protected by a tiered covenant.	

Tiered covenant allowing for timber production and/or seed collection and/or wildflower harvesting

The covenant has a zone which is completely protected and a zone used for commercial production of natural products such as timber, seed and wildflowers under a strict management plan.

The whole title is protected by a tiered covenant.

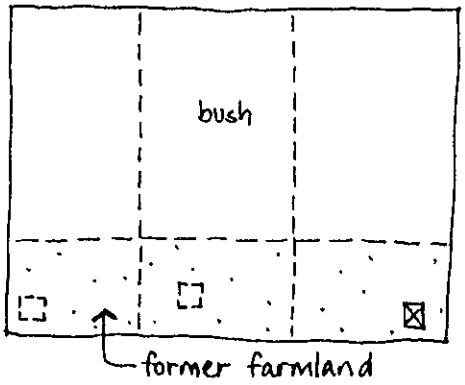


Covenant allowing for subdivision

In some cases land can be subdivided and the special nature conservation values retained. Three examples are provided:

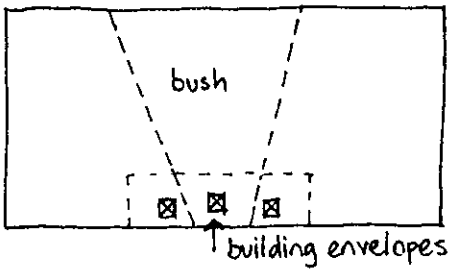
a) Bushland protected by a strict covenant, development on adjacent farmland and individual titles

Fence lines are marked but no fences or firebreaks are permitted in the bushland.
The whole title including the former farmland is protected by a tiered covenant. No cats or invasive plants are permitted in the farmland.



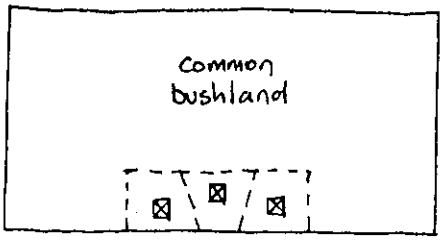
b) Land is divided into three titles with building envelopes clustered together, most of the bushland is protected by strict covenants

Fence lines are marked but no fences or firebreaks are permitted in the bushland.
The whole title is protected by a tiered covenant. No cats or invasive plants are permitted on the land.



c) Strata title subdivision with bushland retained as common land.

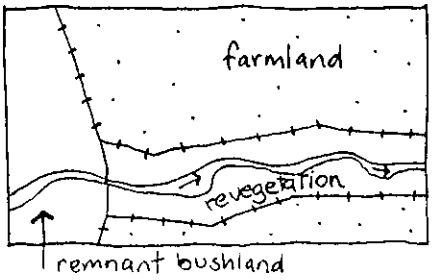
The whole title including the former farmland is protected by a tiered covenant. No cats or invasive plants are permitted on the land.



Revegetation covenant

An area which has been revegetated with a suite of native overstorey and understorey species is covenanted after it has met strict completion criteria such that it is considered able to regenerate itself in the future and therefore be sustainable in the long term.

Only the remnant bushland and the revegetated land are protected by the covenant.



The National Trust Of Australia (WA)'s Covenanting Program

Bridget Hyder-Griffiths
National Trust of Australia (WA) (Presented by Lesley Thomas)

This paper has been prepared after noting that Rod Safstrom's paper on behalf of CALM, 'Nature Conservation Covenants and the Nature Trust' follows later in the program. Rod will give you a much broader picture of what covenanting is about and I shall therefore focus on the National Trust of Australia (WA) (NTWA)'s involvement with the Covenanting Program, starting with a brief history of our efforts to initiate the program, moving then to describe where we are now, and then what we hope to achieve in the short and medium term.

I hope that this will avoid duplication of information and also give you an opportunity to direct any questions you may have either to Rod or to myself, after having listened to him.

Background

A covenant is a voluntary agreement between a landowner and a body capable of receiving the covenant, to protect certain defined conservation values on private land. Such a covenant usually stays with the land, so that a new purchaser is bound by the provisions of the covenant. In most cases, such a covenant can enhance the market value of the land.

The NTWA, as an organisation capable of receiving covenants under its founding legislation, has been funded by the Lotteries Commission with up to $635,000 over a period of three years to extend its covenanting powers to protect natural and special conservation areas. This project, known as the Western Australian Conservation Covenanting Program, was approved as the result of the Commission's environment funding arm, the Gordon Reid Foundation for Conservation, recommending that a covenanting program was essential to complement existing government policy to protect national parks and reserves. Covenants will enable private landowners to ensure that natural and special cultural areas are conserved for future generations, and will complement similar covenanting programs inter-state and overseas.

An initial feasibility study, commissioned in 1993, established the viability of the program, but it was only in 1998 that the funding for the covenanting initiative was endorsed by the Minister for Racing and Gaming, with the full support of the Minister for the Environment and the Minister for Planning. The NTWA set up a Covenanting Management Committee, (CMC) chaired by a senior member of the Gordon Reid Foundation for Conservation, Dr Maurice Mulcahy. A project manager was appointed, Ms Bridget Hyder-Griffiths who will take up her appointment in November 1998, with a temporary appointment to the position until then.

A State Covenanting Advisory Board (CAB) has also been appointed, with terms of reference which include recommending policies and priorities to the Council of the NTWA. The CMC manages the Conservation Covenanting program, negotiating covenant contracts and providing advice to landowners.

Short-term priorities

Since the project is still at the formative stage, policies and procedures for both bodies are still to be endorsed, particularly for the CAB, which only held its inaugural meeting in early October. The Terms of Reference for both bodies, as approved by the NTWA's Council, were tabled at that meeting.

The CMC has been asked to prepare draft policies and procedures for the CAB and these will be considered at the next meeting of the CMC on 19 October. Also under consideration by the CMC are the Assessment and Management Plans for covenanted properties.

Our immediate intentions are for some five or six different covenants to be entered into within the next six months, to provide a model for future covenants and a firm basis for the future operation of the program.

Funding criteria, stewardship and a process of enlisting the cooperation of other organisations, public and private, will be developed over this period, following on which a State Heritage Conference in April 1999 will be convened of all interested individuals and organisations, to assess the achievements to date and to plan for future covenanting initiatives.

Other short- and medium-term priorities

Those are our intentions. I now wish to focus on the principal challenges in the short term, apart from those I have already outlined. They are:

1. the need to ensure that land put forward for covenanting should be identified as suitable for conservation purposes, and I shall explain what I mean by that, and
2. the need to introduce and manage an efficient stewardship program.

Both matters are inter-related.

So, firstly, what do we mean by 'land suitable for conservation'? I know that Rod Safstrom, in his pa-

per, goes into what this may mean. There are at least two schools of thought here. The first suggests that Trust policy, as a general principle, should be to attract landowners to place covenants as widely as possible, that is, to secure protection for all land that has some claim to be protected.

The second school of thought has it that, rather than 'casting a wide net', land suitable for covenanting must be identified as being demonstrably of special value, by virtue of, for instance, endangered flora and/or flora or possessing a habitat that, if not conserved, would be regretted by our successors.

The mission of the National Trust is to conserve Western Australia's heritage. The Trust could establish any covenant which conserves the heritage value of a place — aesthetic, social, educational or scientific. I suggest the majority of our covenants would be primarily based on scientific values, but there are already strong cases being presented for the other values. Take, for example, the ridgeline in the Leeuwin Naturaliste area. Aesthetic and social values are very important when considering development.

Trust policy is still to be determined, but it is likely that the process of identifying suitable land for covenanting will in itself point to the right track to be followed. The whole emphasis is not only on satisfying the CAB that a covenant is appropriate, but on ensuring that such a covenant, fully agreed to between the owner and the Trust, is not so ringed about with exclusions and restrictions as to exclude the landowner from enjoyment of the property, or make the covenant itself unworkable.

As I indicated earlier, it is the NTWA's intention to proceed cautiously and only accept up to six covenants in the first instance. These properties will be recommended to the NTWA after a process of:

- responding to the prospective covenantor in the first instance by arranging to meet to discuss a possible covenant and if, after the CMC agrees that the consultation should be continued,
- arranging for an environmental assessment of the property which is also considered by the CMC and put to the Advisory Board,
- recommending to the Advisory Board that a covenant be offered and for this to be accepted by the NTWA Council,
- agreeing on a management plan (including stewardship) for the property (and I shall refer shortly to what this may entail).

Part of the assessment process is to satisfy the CAB as to the landowner's motives in approaching the Trust for a covenant. There must be an intrinsic desire to protect the values of land, rather than the emphasis being on attracting financial incentives from the Trust — for example, fencing — which, while it may indeed isolate important land from the ravages of stock and similar, is not the principal purpose of the covenant: the desire by the landowner for the full protection of the land in its natural condition for the future. In some cases, covenants may be a condition of subdivision. That in itself could be a very valuable tool for urban bushland conservation, but there would be much work required for the owners' agreement to manage the land.

I now want to return to the management plan, the purpose of which is to put in place an agreement between the landowner and the Trust to ensure that the landowner receives advice and assistance on the land's protection under the covenant. Part of this agreement is a permanent commitment to monitor compliance with the covenant: 'to engender a positive relationship between the covenantor and the Trust [which] can be achieved by the Trust playing an educational and motivational role.' In other words, a stewardship program.

Stewardship requires periodic contact with the landowner, and when a property changes hands, or where there are management problems. Administrative and financial challenges are presented. Experience in the UK and in the USA and, closer to home in Victoria, has demonstrated that to accept covenants without an effective stewardship program can be deleterious to the further acceptance of the program itself and wasteful of scarce resources. How this is done effectively and efficiently has yet to be finalised.

As I said at the start of this paper, the National Trust's Covenanting program is in its infancy. Part of its efficacy will be to ensure that it complements efforts being made by other bodies and instrumentalities to conserve natural land and values for the future. Duplication of resources is not only wasteful, it lessens the impact on landowners who would understandably be cynical if they observed a mishmash of different initiatives being pursued in different areas by the NTWA and by the many government departments which are already have programs in place to protect the bush.

There are representatives of these bodies on the Covenanting Advisory Board: it is hoped that after full consultation with all concerned, an education and information program can be developed for the guidance of the public in choosing the appropriate course of action to secure permanent protection of their land.

Finally, I have not dwelt on our long-term priorities, being fully concerned with what has to be achieved with the next few months. The NTWA's Covenanting program will succeed if it continues on a sound administrative basis, and with the skilled and specialised advice so far available to the Trust. It will also require assured funding from both private and public sources.

So far, so good. These are early days.

Preserving Urban Bushland and Growing Local Plants to Protect Water Resources

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Water and Rivers Commission
and R. J. Powell

Introduction

Perth is Australia's only major city that lies over a major resource of fresh groundwater. Groundwater forms an important component of the city's water supply, providing 70% of all water used, and 40% of the municipal water supply for Perth. The groundwater occurs as an unconfined aquifer throughout the region, and in several confined aquifers. The shallow watertable and unconsolidated sand aquifer make groundwater easily available to most private properties. As a consequence, there are more than 120,000 privately-owned narrow-diameter bores, or dug wells with spear points, used to irrigate gardens in Perth. The ready availability of groundwater has greatly reduced the demand on public water supply schemes, and has contributed to the garden culture in the city. However, the generally shallow watertable and sandy soils in the region also make groundwater extremely vulnerable to contamination from the excessive use of fertilisers.

Perth is very much a garden city. Most people live in detached houses with gardens that consist mainly of lawn and exotic shrubs occupying a significant proportion of the landscape. It is estimated that 13,500 hectares of the Perth Metropolitan Region is covered by turf (del Marco 1990), of which about 67% is domestic lawns, and the rest public parks and golf courses. This area is expected to increase to about 16,000 ha by the year 2000. Fertiliser is currently applied on lawn areas at the rate of 100 kilograms per hectare (kg/ha) of nitrogen (N) and 30 kg/ha of phosphorus (P). If these rates continue, the annual load of nutrients applied to lawns in 2000 will be 1600 tonnes of N and 480 tonnes of P (Sharma et al 1996). As plants take up only 20-30% of the nutrients applied in fertiliser in Perth (Sharma et al 1996), a large amount of N and, to a lesser extent, P is available to be leached into the groundwater.

This paper discusses the current environmental effects of the use of fertilisers in Perth, and examines the implications of continued use on wetlands, the Swan and Canning estuaries, and the coastal marine environment. It highlights the role of urban bushland in ameliorating these effects and recommends the use of local plants. Local plants are those species that occur, or used to occur, naturally in the locality (Powell and Emberson, 1996), and can be determined fairly accurately by knowing the locality's soil-type. Their use can greatly reduce the need to use fertilisers and, moreover, increase the public's awareness of the need to protect bushland.

The effect of fertilisers on the quality of Perth's groundwater

The Perth Metropolitan Region is mostly underlain by sandy sediments forming an extensive shallow aquifer 20 to 80 metres thick. There are two major groundwater flow systems in this aquifer near Perth: the Gnangara Mound to the north of the Swan Estuary, and the Jandakot Mound to the south. Groundwater flows radially from elevated areas near the crests of the mounds towards the ocean, the Swan and Canning estuaries, and low-lying areas near the Darling Range. Large resources of groundwater occur also in deeper aquifers beneath Perth, but these have not been significantly affected by land-use, and are not considered further here, although they could become a significant part of Perth's future water supply.

Large areas near the crests of the Gnangara and Jandakot Mounds are covered by bush (generally banksia woodland) or pine plantations; the concentrations of nitrogen (mostly present in the chemical form of nitrate) in these areas are generally less than 1 milligram per litre of water (mg/L) (Davidson, 1995). As groundwater flows beneath urban areas, the nitrate concentrations generally exceed 1 mg/L-N, and often exceed 10 mg/L-N, the limit for acceptable drinking water, beneath areas where fertilisers are used intensively, such as golf courses, and heavily fertilised domestic gardens (Appleyard and Bawden 1987; Appleyard 1995). The concentrations of phosphorus in groundwater are generally low beneath urban areas, largely due to its adsorption in the soil profile. This process greatly reduces the rate at which phosphorus moves in soils, to the point that it may take decades to centuries, depending on the type of soil and the depth of the watertable, for P concentrations in groundwater to respond to current inputs of fertiliser (Sharma et al 1996).

The concentrations of nitrate in groundwater generally increase when native vegetation is cleared and urban development takes place, and there may be a time lag of several years before the concentrations reach equilibrium with inputs leached from the land surface. Often, nitrate concentrations measured in water-supply bores located in urban areas are the result of several changes in land-use that take place on the fringes of the metropolitan area. Typically in these

areas, newly cleared areas are used for intensive horticulture (market gardens), which then may be replaced by low-density unsewered urban development, which in turn may be replaced by higher density sewered urban development. This has taken place in Gwelup, where nitrate concentrations in some production bores have increased in response to a number of land-use changes, from 1 mg/L-N in the 1970s, to the current levels of about 10 mg/L-N (Barber et al., 1996). The rise in concentrations of nitrate in these bores may be a response to past land uses, but there is no evidence of concentrations decreasing, and the current use of fertiliser is sufficiently high to maintain, or even increase, concentrations (Gerritse et al., 1990; Sharma et al., 1996).

The effects of groundwater discharge of nutrients on the environment

One of the most severe environmental problems currently facing Western Australia is the degradation of estuaries and coastal waters caused by the excessive input of nitrogen and phosphorus from the adjacent land-use. Nitrogen is usually the critical nutrient in ocean water that can trigger blooms of algae or diatoms. Excessive nitrogen can cause the growth of epiphytic algae on seagrass that can lead to the loss of seagrass-beds and biodiversity in coastal waters. Nitrogen inputs may also have a large role in triggering algal blooms in the Swan and Canning rivers.

In the Perth Metropolitan Region, the discharge from groundwater is a significant source of nitrogen in the coastal environment (Hillman, 1981; Appleyard, 1990), and to the Swan and Canning estuaries (Appleyard, 1992).

It is estimated that the input of nitrogen from groundwater to the ocean in Perth suburbs to the north of the Swan Estuary ranges between 1 and 10 tonnes per kilometre of coastline each year (tonne/km/year). By contrast, discharge of nitrogen to the ocean from native bushland to the north of the metropolitan area is generally less than 1 tonne/km/year, and commonly about 0.1 tonne/km/year (Appleyard, 1990). There is currently little information available to indicate whether this increased input of nitrogen is affecting the marine environment in this area. However, groundwater is the most significant contributor of nitrogen to Cockburn Sound to the south of Perth, discharging a total of about 300 tonnes each year from mainly industrial sources (Appleyard and Haselgrove 1995). The input of nitrogen to Cockburn Sound has contributed to the loss of more than 80% of the seagrass beds and frequent diatom blooms.

Groundwater also discharges significant amounts of nutrients into the Swan and Canning estuaries. Currently, 160 tonnes of nitrogen and 5 tonnes of phosphorus is discharged to these estuaries from groundwater each year (Appleyard, 1992). Although this is a small fraction of the total inputs to the Swan and Canning estuaries of 500 and 60 tonnes of N and P respectively, groundwater continues to discharge nutrients during summer months when environmental conditions are most suitable for triggering algal blooms.

The discharge of nitrogen and phosphorus to wetlands within the metropolitan area has caused algal blooms and loss of biodiversity in these sensitive environments. Phosphorus is generally the critical nutrient causing environmental problems in wetlands, and is generally introduced into these areas by surface drainage. However, most wetlands on the coastal plain near Perth are surface expressions of the watertable, and they have groundwater catchment areas or 'capture zones' that may extend several kilometres from individual wetlands. It is likely that the discharge of groundwater with elevated nitrogen concentrations into wetlands is an additional environmental stress that makes them more susceptible to environmental degradation.

Role of urban bushland in reducing nutrients and their effects

The preservation of bushland areas under Crown control has an important role in protecting groundwater used for public water supply, particularly in so-called Priority 1 (P1) Underground Water Pollution Control Areas (UWPCAs). These are areas where little or no land development is allowed in order to avoid potential risks to the groundwater's quality. The largest P1 UWPCAs are located near the crest of the Gnangara Mound, an area covered by bushland and pine plantations that is also important for recharge to deeper aquifers. The importance of protecting these areas was reaffirmed in a parliamentary enquiry on 'Metropolitan Development and Groundwater Supplies' (Carew-Hopkins, 1996). The enquiry identified urban development as a significant risk to groundwater quality for public water supply, and concluded that the State government should strengthen legislation to protect groundwater resources. Protecting the quality of groundwater was seen as having primacy over other land planning issues in P1 groundwater protection areas.

Historically, the protection of groundwater quality has not been seen as an issue of high priority for urban areas of the metropolitan region. The groundwater in these areas is often considered a second-class water resource, only suitable for irrigating parks and gardens, and consequently requiring less stringent protection measures than groundwater used for public water supply. However, the fact that groundwater in Perth is a significant source of nutrients for waterways, wetlands and the ocean means that this view should be reassessed.

Areas of native vegetation could be used to protect sensitive surface-water environments from the groundwater discharge of nutrients in urban areas in much the same way that groundwater is protected

from contamination in UWPCAs. The role of the bushland in this context is to provide a buffer strip with low nutrient inputs to allow nitrate concentrations in groundwater to be reduced by dilution and chemical reactions within the aquifer before discharge. The size of the vegetated area needed to ameliorate the environmental effects will depend largely on nitrate concentrations in groundwater, the groundwater flow rate, and the extent to which chemical conditions in the groundwater support the removal of nitrate. This can be determined by detailed modelling, using procedures that have been developed for determining capture zones for wetlands on the Swan Coastal Plain (Townley et al., 1993). Such areas of native vegetation could be protected by planning measures to minimise the effect of new urban development on important wetlands, and along the coast. This approach would necessitate a fundamental shift in the practice of completely clearing areas to establish housing, and would require areas of native vegetation to be set aside to protect the environment.

The cultivation of local plants to reduce nitrogen loads and protect urban bushland

Ultimately, the use of vegetated buffers to protect sensitive water bodies will only work if less fertiliser is used in nearby urban areas. Dilution by groundwater flow alone will not ameliorate impacts in the long term if nitrate inputs remain high in areas adjacent to the bushland buffers. There is also some evidence that changes in the chemical environment in the groundwater following urban development make the chemical removal of nitrate from groundwater (the process of 'denitrification') less efficient (Appleyard, 1995)

There are a number of ways in which the use of fertilisers can be reduced. Reducing the area of lawn, either through urban consolidation or by encouraging an increase in paved areas in gardens, will greatly reduce fertiliser use, but can create other problems, such as increasing the volume of urban runoff that has to be managed and disposed of.

Another strategy is to change the plant species used in gardens to those that need little or no fertilising, especially by increasing the use of local plants. These plants have evolved in the region and so are well adapted to the local nutrient-poor soils and climate – as distinct from other 'Australian natives' which may come from climatic regions ranging from deserts to tropical rainforests. Local plants can grow into healthy specimens in unimproved soil without any use of fertilisers. Moreover, apart from some limited watering that may be needed to help them through their first summer in the garden, local plants do not need watering.

The widespread cultivation of local plants would have a number of benefits for preserving urban bushland. Perhaps most importantly, it would have an important role in educating an increasingly urban-dwelling population about the natural environment, including the interactions between plants, animals, landscape and climate (Powell and Lake, 1994). In this context, urban bushland remnants should be seen as a providing a genetic resource of plant species adapted to growing in specific areas. Conversely, the cultivation of local species in gardens may be a way of ensuring their preservation where their survival in natural habitats is threatened by weed invasion and frequent fires.

The integration of the preservation of urban bushland areas with the protection of water resources would also help create a more holistic approach to managing natural resources through an 'Integrated Catchment Management' (ICM) approach. The State and Commonwealth governments have been encouraging local communities to adopt ICM measures in rural parts of the State to deal with problems caused by the salinisation of land and the nutrient enrichment of waterways. The adoption of this approach in urban areas would be a natural extension of this process, and would acknowledge that environmental issues in Perth should be seen as part of a larger landscape, rather than being viewed in isolation. This process has already commenced in the metropolitan area, and over 12 catchment groups have formed in the last two or three years. However, further work is required for the entire urban area to be covered by ICM activities.

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Bushcare Support in Western Australia

Anna-Marie Penna
Greening WA

Greening Australia is a national community-based, non-government organisation. Our mission is to work with the community to achieve sustainable land and water resources, primarily through improving vegetation management practices.

Greening Western Australia is an independent incorporated organisation made up of members from all walks of life. We are a part of the Greening Australia federation, making us both a state and national organisation. We form partnerships with public and private bodies, but above all depend on strong community input and support. Our vision for the Western Australian landscape is one of diverse vegetation supporting natural systems and human activity, treasured by the whole community.

Bushcare

The Natural Heritage Trust (NHT) forms the basis for the Howard Government's environmental rescue initiative. It is funded through the partial sale of Telstra and represents a $1.25 billion investment over five years. The largest component of NHT is the Bushcare program. Other programs include the National Landcare Program, National Rivercare Initiative, National Wetlands Program, and Coastcare and Clean Seas Initiative.

Bushcare aims to reverse the long-term decline in the quality and extent of Australia's native vegetation in order to conserve biodiversity and contribute to the expansion of Australia's native vegetation. The Bushcare program objectives are:

- to conserve remnant native vegetation;
- to conserve our unique diversity;
- to revegetate to restore environmental values and productive capacity.

Bushcare support

Greening Australia has been contracted to deliver Bushcare support nationally. It is a project that will assist the on-ground implementation of the Bushcare program. Greening Australia has a network of Bushcare Support officers working across Australia to deliver Bushcare support.

The roles of the Bushcare Support Officers are to:

Work with the community to develop, implement and monitor Bushcare projects by:

- providing advice on best practices for native vegetation management including innovative and creative new approaches;
- assisting with technical aspects of NHT applications;
- assisting with aspects of project management;
- assisting with the monitoring and evaluation of Bushcare projects;
- assisting with information exchange between groups and all levels of government;
- assisting to create a more integrated approach, so that 'the left hand will know what the right hand is doing'.

Provide training opportunities for the community in aspects of sustainable native vegetation management through:

- organising and/or delivering structured workshops and field days on topics such as strategic planning, weed control measures, seed collection, revegetation techniques etc;
- setting up demonstration sites to provide practical examples of best practice in native vegetation management.

Develop education and awareness raising projects on sustainable native vegetation management:

- these projects will be designed to raise the awareness of the wider community about the need for, and advantages of sustainable native vegetation management. Target audiences for these activities will include schools and community organisations.

The Bushcare Support team in Western Australia comprises 10 regional officers and a manager (Nathan McQuoid) based at the Greening Western Australia State office in Fremantle.

The Bushcare Support Officers are here to assist and to provide support for the community organisations who are doing the invaluable work to protect remnant vegetation and re-establish native vegetation.

Working with the community to protect and improve native vegetation is the core of Bushcare Support.

The Bushcare Support team is a part of the Bushcare network. Others involved include the Bushcare Network Co-ordinator, Bushcare Coordinators (one for each state), Bushcare Regional Facilitators, Indigenous Land Management Facilitators, and the National Local Government Bushcare Facilitator. The wider network also encompasses Community Landcare Coordinators, Rivercare and Coastcare Coordinators.

We need to work together to ensure that this net-

work approaches our challenge in an integrated manner. Given the vast area we cover and the level of effort required to achieve our objectives, there is no reason for our roles/activities to overlap to the point of duplication.

The bigger picture of the network includes all the stakeholders associated with our bushland areas including:

- landholders
- community groups
- local government
- schools and youth
- state and federal governments
- indigenous peoples
- business and industry
- urban and urban-fringe groups
- regional organisations
- industry associations.

Due to the very nature of the different problems and issues facing urban and rural areas, the focus of the urban Bushcare support work will be quite different to that of the officers based outside the metropolitan area. In the urban context the focus will be:

- on bushland regeneration, incorporating best practice approaches such as the Bradley Method;
- on developing a more integrated approach with local governments and other authorities as the majority of the bushland is publicly owned;
- on issues associated with people management problems such as, rubbish dumpers, trail bike riders, path management, vandalism, etc;
- balancing what is 'good for the bush' with the public perception of what is desirable.

We all have a stake in the protection and management of our remaining bushland areas and we all need to work together to achieve the sustainable management of our native vegetation.

Bushcare support centres

Northern Agricultural Region

- *Three Springs*: Melissa Hudson — Telephone: 9954 1567, Fax: 99541183
- *Moora*: Anne Smith — Telephone: 9651 1424, Fax: 9651 1698

Urban Region

- *Perth*: Anna-Marie Penna — Telephone: 9221 3840, Fax: 9221 4960

Avon Region

- *Northam*: Mark Ochtman — Telephone: 9622 7600, Fax: 9622 7611
- *Southern Cross*: Clinton Rakich — Telephone: 9049 1001, Fax: 9049 1429

South-West Region

- *Wagin*: David Stapleton — Telephone: 9823 1661
- *Boyup Brook*: Neil Pemberton-Ovens — Telephone: 9765 1555, Fax: 9765 1455

South Coast Region

- *Cranbrook*: Wendy Bradshaw (part-time) — Telephone: 9825 3092
- *Jerramungup*: Matthew Inman — Telephone: 9835 1127, Fax: 9835 1329
- *Esperance*: Volker Mischker — Telephone: 9071 3733, Fax: 9071 3657.

Community Support Programs — Australian Trust for Conservation Volunteers

Ken Beasley
State Manager, Australian Trust for Conservation Volunteers

What is the Australian Trust for Conservation Volunteers (ATCV)?

ATCV is a national, non-profit, independent, non-political, community based organisation.

Mission Statement

To attract and manage a force of volunteers in practical conservation projects for the betterment of the Australian environment.

Objectives

- To link community volunteers, (including students) with practical conservation projects
- To provide a service to land managers (public and private) by providing labor support
- To assist in environmental education
- To be an effective community partner in practical conservation and environment projects
- To integrate with and contribute in a positive manner to the environmental network of Western Australia.

Funding sources

- Fee for service basis
- Corporate sponsorship
- Funding grants from Federal and State Government agencies e.g. Natural Heritage Trust. Other agencies e.g. World Wide Fund for Nature, Lotteries Commission.

Volunteers

- From all walks of life
- Local and international, students.

Project work

- Revegetation, planting and seed collection
- Endangered species protection, surveys
- Fencing remnant vegetation
- Bush regeneration, weed control
- Wetlands creation
- Walking track construction/maintenance.

Community links — examples

Bushland Care Days Program 1998

- Managed by Ecoplan, Department of Environmental Protection (DEP)
- ATCV volunteers assist and support other community groups to undertake on-ground works
- Alinta Gas provides funding for the program (Ecoplan, ATCV)
- Tasks included weed control, planting, rubbish removal, signage
- Planning for 1999 is on the drawing board
- Following table outlines participating groups.

Group	Worksite
Armadale Settlers Common	Armadale
Friends of Allen Park	Allen Park
WA Planning Commission	Cockburn Wetlands
Friends of Kadina Brook	Kadina Brook
Friends of Quenda Creek	Quenda Creek
Friends of Yellagonga	Yellagonga
Friends of Ellis Brook Valley	Ellis Brook Valley
Friends of Talbot Road	Talbot Road
Friends of Brixton St Wetlands	Brixton Wetlands
Friends of Bold Park	Bold Park
Friends of Blue Gum Reserve	Blue Gum Reserve
Friends of Shenton Bushland	Shenton Bushland
Friends of Hovea	Hovea

Urban Rural Links Program (Natural Heritage Trust funding)

- Not directly related to care of urban bushland, however provides opportunities for urban volunteers to work in rural communities. These activities influence bushland in urban regions as part of the bigger picture.

Green Corps, Young Australians for the Environment

- Commonwealth Government initiative administered by the Department of Employment, Education, Training and Youth Affairs (DEETYA) in association with the Department of Environment, Sport and Territories.
- Program is managed by the Australian Trust for Conservation Volunteers on a national basis.
- Objective is to give young Australians the opportunity to participate in high priority practical conservation projects, participate in positive

environmental outcomes and undertake accredited and on-the-job training.

How can community groups get involved?

- Apply for a core project of 14 weeks
- Apply for a minor project one day to two weeks duration
- Applications can be made in partnership with other agencies
- Projects must be in line with Regional Management Strategies e.g. Salinity Management Plan, Catchment Management Strategy
- Community group responsible for planning, materials, technical support, specialised tools and equipment and assistance with accommodation for remote projects
- Team consists of 10 trainees, suitably qualified and experienced Project Supervisor, transportation vehicle
- Joint participation between the community group and trainees is essential.

Local Government Authorities

ATCV undertakes a range of conservation and environment tasks throughout the metropolitan area, supported by various Council/Shires. Tasks include bush regeneration, weed control, planting and fencing. Examples include:

- City of Canning — Bannister Creek, Canning Regional Park.
- City of Stirling — Lake Gwelup, Trigg Beach.
- Shire of Serpentine–Jarrahdale — Mundijong Road Reserve, Bella Cummings Reserve, Soldiers Road Reserve.

The Swan Catchment Urban Landcare Program

- This program, under the management of the Swan Catchment Urban Landcare Program Steering Committee has been established through sponsorship provided by ALCOA of Australia Ltd.
- ATCV can provide 'on ground' labor support for Community Groups, by initially linking into the grant application process

Summary

- Volunteers play a critical role in the care of our urban bushland.
- There are opportunities for Community Groups to receive additional support, from other agencies.
- Be prepared to seek out networks, make full use of the resources available to you, and apply for funding opportunities.
- ATCV can provide labor support for 'on ground' works, and be part of your funding application.

For further information on ATCV programs

Contact: Ken Beasley State Manager ATCV.

- Phone: (08) 9336 6911 Fax: (08) 9336 6811
- Address: 216 Queen Victoria Street North Fremantle.
- Email: atcvwa@nettrek.com.au
- Website: http://www.netconnect.com.au/~atcv

Research and Management of Urban Bushland by Kings Park

R. T. Wills*, C. J. Yates, K. A. Meney, I. R. Dixon, K. W. Dixon, S. Forbes and S. D. Hopper
Kings Park and Botanic Garden, Perth Western Australia

Introduction

The bushland of Kings Park and Botanic Garden is a highly valued heritage asset uniquely placed on the doorstep of Perth's central business district. The bushland was effectively reserved for public purposes from the outset of the Swan River Colony. Half the present bushland was formally included in a reserve by Governor Weld in 1872, with the remaining half added in 1890 under John Forrest's administration. It was declared an A-class reserve in 1900.

Management of Kings Park bushland has varied according to the values and perceptions of the day. For example, logging of jarrah using convict labour was extensive in the 1860s, while major planting of the bushland with exotic species continued well into the present century. Removal of bushland for public recreation facilities reached its zenith in the 1960s.

Most recently, the Kings Park Board established a public review that led to the publication and adoption of the Kings Park Bushland Management Plan 1995-2005. In that document, the Bushland was defined as comprising 270 ha of natural forest and shrubland extending from the boundary and scarp on Mounts Bay Road to the gently undulating terrain abutting Thomas Street and Kings Park Road.

The Plan set management objectives concentrating on the conservation of biodiversity and landscape, and the achievement of goals for passive recreation and public education. The restoration and maintenance of the bushland offers Kings Park and Botanic Garden an opportunity to set standards and procedures for restoring and maintaining areas of remnant bushland which are often the nation's sole heritage of particular ecosystems in urban and agricultural areas.

Kings Park and Botanic Garden commenced implementation of the Bushland Management Plan in 1995. Ongoing commitments to effective fire control and public safety, weed management (mainly veld grass) and bushland restoration research were maintained, while new efforts were initiated to obtain substantial financial resources for bushland management and research through the agency's 10 year Business Plan put to government, as well as through significant sponsorships from WMC, Alcoa Australia, Western Power, Rocla Quarry Products and other companies.

The Board has recognised that implementation of the 207 recommendations of the Bushland Management Plan is a significant challenge and requires careful management to ensure outcomes are achieved. The process includes a strategic analysis of priorities and outcomes, identification of the projects and resources required, obtaining financial and other resources, and the delivery of best practice projects to achieve agreed outcomes.

As the resources to deliver on outcomes in the Bushland Management Plan became available, early in 1997 the Kings Park Board resolved to review and formalise an implementation policy and strategies in a Policy Paper and Implementation Plan. Work on developing these documents spanned a full year.

Costing for full implementation of the Bushland Management Plan over its life demanded a rigorous allocation of priorities to projects in developing the Implementation Plan.

The Kings Park Bushland Management Plan 1995-2005 and the Kings Park Bushland Policy Paper 1998 provide the framework for current and future bushland management and research, and has been assigned the following priorities.

- *Risk management:* Minimise impact, severity and extent of fire through a comprehensive fire control strategy; minimise impact, severity and extent of rockfalls and landslips on the Mount Eliza scarp through a comprehensive scarp management strategy; minimise danger from tree hazards, especially along paths consistent with conservation values; and improve public security.
- *Conservation:* Conserve existing species and communities of locally native plants, animals and microorganisms; manage towards agreed targets of relative abundance of species and communities (Subject to the adoption of agreed targets determined by benchmarking).
- *Interpretation:* Provide quality informative experiences by completing the signage program and delivering guided and self-guided tours.
- *Recreation:* Provide safe enjoyable access for all without compromising conservation objectives.
- *Environmental Weeds:* Eradication/control of veld grass, Agave, bridal creeper, freesia, gladiolus and woody weeds.
- *Feral Animals:* Eradication/control of foxes, feral cats, rats, feral honeybees and rabbits.
- *Rehabilitation:* Improve overall bushland condition by 10% and restore 10 hectares of alienated bushland including tipsites, tracks and escarpment.

- *Reintroduction:* Reintroduce splendid fairy wren, barking geckoes, quendas (southern brown bandicoots) and catspaws.
- *Tenure:* Ensure statutory protection through new legislation (the Botanic Gardens and Parks Authority Bill) of designated Kings Park bushland.
- *Fundraising:* To secure adequate funds to effectively implement the Kings Park Bushland Management Plan.

This Bushland Policy Paper thus provides key policy and strategic directions to ensure delivery of the following major outcome areas:

More people using the bushland through:

- high quality education and interpretation programs
- clearly defined access points
- improved systems and surfaces of trails and pathways
- a safe environment
- world class guided walks and self-guided tours
- development of specific bushland attractions
- access for people of all abilities.

Visibly improved natural heritage value through:

- substantial reduction of major environmental weeds
- control and elimination where feasible of feral animals
- reintroduction of animals and plants no longer present in the bushland
- restoration of degraded areas and rationalisation of tracks
- high quality research and its application to bushland ecology and system dynamics
- improved protection of the bushland through new legislation.

Enhanced public safety through:

- better containment and reduced risk of rock fall on the Mt Eliza scarp
- a reduced load of flammable weeds
- installation of improved water delivery systems
- improved fire control and management procedures
- expanded fire control assets
- management of tree hazards in defined areas of public access.

Sustainable funding for bushland maintenance through:

- enhanced public awareness of bushland values
- enhanced Government and community understanding of bushland values
- refined and efficient management skills and practices, including the establishment of a Division of Natural Heritage
- regular audits of progress of implementation and independent evaluation
- targeted fundraising.

Research

Kings Park and Botanic Garden undertakes scientific research in the fields of conservation biology, genetics, restoration ecology, germplasm conservation and propagation science. These five disciplines underpin the integrated approach used in providing focused and practical methods in bushland management and restoration, rare flora conservation and horticultural development of Western Australian plants.

The science group has developed a significant niche in conservation research with a unique melding of strategic and practical research, strengthened through its strong association with all universities in Western Australia, including the University of Western Australia where the laboratory has formal links through its Adjunct Department status. The raft of research capabilities developed by the Kings Park and Botanic Garden laboratory represents one of the only facilities of its type in botanical research in Australia.

The success of the laboratory is reflected in the growing number of research projects, climbing from 26 project areas in 1996/97 to 49 research initiatives in 1997/98. Government-funded positions remained at five full time staff, with externally funded staff amounting to 35. Training and development remains a major emphasis, with a trebling in the number of honours students to 17 with four new Ph.D. programs of research adding to the 10 pH programs already underway. Thirty students are associated with the laboratory, representing a wide variety of research areas including a number of new research initiatives.

Kings Park and Botanic Garden have a range of research projects operating to deliver information for the management of Kings Park & Botanic Garden bushland. This includes 7 co-ordinated projects:

WMC Centre for Urban Bushland Management — WMC Mount Eliza Scarp Restoration Project (K. Meney, project leader)

In 1996, WMC Resources Ltd commenced a long-term partnership with Kings Park and Botanic Garden which will assist the Park attain its goal of being a world-class manager of urban bushland. This started with the establishment of the WMC Centre for Urban Bushland Management, with its first project the WMC Mount Eliza Scarp Restoration Project.

The project includes Kings Park staff and volunteers, as well as work-experience and research students from various Western Australian universities. Tours have been provided for WMC environmental staff, the

Friends of Kings Park and various visitors to the Park.

The project has established a comprehensive inventory of fauna, vegetation, soils and hydrological attributes which characterise the escarpment across its length, to relate these attributes to disturbance and restoration potential. Studies are finding that, across much of the escarpment, natural regeneration potential is hampered by a limited persistent seed bank (strongly dominated by weed species), ongoing erosion processes which result in seed loss and seedling mortality, and weed competition.

These initial operational works will focus on priority weed removal, slope stabilisation and public safety works, and revegetation of key areas.

Another important result has been the discovery of two new spiders not previously recorded in the Park, with one species possibly new to science. The project has also resulted in the first record in the Park of a mosquito orchid (*Cyrtostylis reniformis*).

Alcoa Jarrah-Tuart Restoration Project (C. Yates, project leader)

It is generally thought that at the time of European settlement Kings Park was a eucalypt–banksia–sheoak forest variously dominated by tuart (*Eucalyptus gomphocephala*), jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*). Since settlement the Kings Park bushland has been subjected to a wide range of disturbances including selective logging of jarrah, repeated cool fires and controlled burning, frequent summer wildfires, livestock grazing, 'beautification', introductions of exotic species, and increasing fragmentation and isolation. There is anecdotal, historical and some scientific evidence to suggest that disturbance has led to a change in the composition and structure of the trees of the bushland, with jarrah and tuart declining, and sheoak and introduced eastern Australian species of sugar gum (*Eucalyptus cladocalyx*), bangalay (*E. botryoides*), lemon scented gum (*Corymbia citriodora*) and kurrajong (*Brachychiton populneus*) increasing in abundance.

This project has already mapped the current distribution of tuart and jarrah in Kings Park, and documented historical changes to their distribution. The project is also investigating the population processes underlying the decline of the trees, and the invasion of the introduced tree species. Thirdly, the project is developing techniques for increasing tuart and jarrah and reducing invasive species.

Studies describing the pattern and processes underlying the invasion of the Kings Park bushland by introduced sugar gum, bangalay, lemon-scented gum and kurrajong have been completed. The studies found that each species recruited large numbers of seedlings following the 1989 and 1996 fires and indicates that the process of invasion is facilitated by fire. This information will be used to inform management of the bushland.

This project has initiated the first scientific investigation of the pollination ecology of jarrah. The study found that jarrah was a mass flowering generalist in its pollination relationships attracting a diverse array of animals including insects and birds. Insects were overwhelmingly the most commonly observed floral visitor: 83 insect species from 65 genera in 39 families were observed visiting jarrah flowers. This diversity is higher than that reported in a limited number of studies for other species of eucalypt and was surprising given that Kings Park is an urban remnant in the centre of the metropolitan area, isolated since the turn of the century. The study supports the view that urban bushland remnants such as Kings Park are significant for biodiversity conservation despite their isolation and small size.

Tipsite restoration (C. Yates, project leader)

The first phase in a major urban bushland renewal project was completed. The project aims to restore a former rubbish tip site in Kings Park to the native ecosystem, a mixed eucalyptus–banksia woodland community. The project is a major initiative in the implementation of the Kings Park Bushland Management Plan. Kings Park and Botanic Garden staff, with generous support from Alcoa of Australia, Rocla and Western Power, have synthesised research and known restoration technologies. This work has included surveys of surrounding vegetation, collection of seed from Kings Park or from local provenance, genetic evaluation, smoke treatment of seed, tissue culture and inoculation with beneficial fungi to design a program for the return of a native ecosystem to the former rubbish tip. In the first phase over 50 plant species were returned to the former rubbish tip site as seedlings or by broadcasting seed. The return and planting of native species to the former rubbish tip was a co-operative effort and was undertaken by Kings Park staff, the Kings Park Friends, Rosalie Primary School and volunteers from the community to celebrate World Environment Day.

Assessing the impact of fire on ecosystems (R. Wills, project leader)

Fire results in 'biomass reduction' — the removal of both dead and living plants (and animals) from ecosystems, and clearly signals significant ecological changes. While Australian ecosystems can regenerate after fire, too-frequent fire is likely to impact on the health of ecosystems in Kings Park and Botanic Garden. A series of projects have been initiated in 1997/98 to investigate the effects of differing frequencies of fire on various environmental elements in Kings Park.

While there have been many studies on single fires in Australia, very few have looked at fire frequency, and none have considered a broad range of factors in a single case study. This study brings a team of re-

searchers to examine the effect of fire frequency on soils, plants, animals, and fungi. The information must be provided to allow managers to prevent the loss of species and to adequately manage the health of single trees and of whole ecosystems.

'Fuel reduction' burning programs rotating on a prescriptive standard do not take into account habitat variation. If the management is to reduce wildfire without taking into account ecosystem requirements, fine. But if conservation is an aim of management, fire regimes should be applied on an ecosystem by ecosystem basis, not on broad, general prescriptions. Furthermore, arguments for burning based on a 'natural rotation' or 'aboriginal burning practices' are also flawed – the ecosystems we manage today are different to those that were once exposed to 'natural' or 'aboriginal burning'. Expertise in current management techniques should not be confused with expertise in appropriate management!

Managing fungi in ecosystems (R. Wills, project leader)

Fungi have an important but little-studied role in the function of ecosystems, contributing to the health of the bushland ecosystem by capturing, storing, releasing and recycling essential nutrients. Some of the major roles of fungi include: (a) mutually beneficial relationships (mycorrhizas) with trees and other plants; (b) decomposition of organic matter and releasing mineral nutrients; (c) attacking living plants or producing wood rots.

Collaborative research by Dr Neale Bougher (CSIRO Forestry and Forest Products) and Kings Park and Botanic Garden on the biodiversity and ecology of fungi in Kings Park has identified many species of fungi not previously recorded in the Park. Indeed some have never been recorded before anywhere in Western Australia. Kings Park and Botanic Garden in Perth is an important bushland refuge for many fungi and over 100 species had been recorded in the Park. The diversity of fungi in Kings Park is significant because unique physiological attributes of each fungal species probably help perpetuate the woodland, as well as aid its recovery in the face of environmental perturbations. The biodiversity of fungi at Kings Park, their specific roles, and the potential uses of fungi in restoration of bushland plant communities have yet to be fully assessed.

Examples of bushland management research projects based in Kings Park & Botanic Garden: studies on Kings Park bushland

Ph.D. students

Joshua Smith	The biology, ecology and conservation of fauna in remnant bushland with special reference to the restoration of disturbed sites in a mediterranean-type environment in south-west Western Australia. (Zoology, UWA 1996 – present)
Katinka Ruthrof	The comparative population ecology of three tree species in an urban bushland remnant Kings Park. Processes underlying the decline of the locally native *Eucalyptus gomphocephala* (tuart) and *Eucalyptus marginata* (jarrah) and invasion of the introduced *Eucalyptus cladocalyx* (sugar gum). (Botany, UWA 1997 – present)

Honours students

Marcelle Buist	Ecology of the woody weed *Brachychiton populneus* (Schott et Endl.) R. Br. (kurrajong) in relation to the invasion of the Kings Park Bushland.
Kate Candy	The influence of fire frequency on plant communities in Kings Park, Perth, Western Australia. (Geography, UWA 1998)
Brad Cox	Birds and habitat of Kings Park. (Envtl Manag., ECU 1997)
Elisha Ladhams	The influence of fire regime on litter structure and associated invertebrates and in Kings Park, Perth, Western Australia. (Envtl Biol, Curtin 1998 – present [part-time])
Andrew May	The influence of frequent fire on soil characteristics in Kings Park, Perth, Western Australia. (Geography, UWA 1998)
Joeri Mak	Ecological impacts of rats on the Mt Eliza Scarp and potential management options. (Geography, UWA 1998)
Damien McAlinden	Seed morphology and post dispersal seed predation in mixed *Banksia-Eucalyptus* woodlands on the Swan Coastal Plain. (Biol Sci, Murdoch 1998)

Knowing and Understanding the Plants in our Bushland

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Introduction

Most people who become involved in managing bushland have a deep appreciation of bushland's intrinsic values. However, effective managers soon become aware of the need to have a knowledge and understanding of individual plants and the plant communities in their bushland. Western Australia has an amazingly diverse flora in a complex of plant communities, and few other urban areas have access to comparable levels of diversity within their boundaries. Collecting, assessing and collating information on flora and plant communities is vital. This information needs to be accessible to present and future managers. To interpret this necessarily complex information the ongoing support from individuals with an understanding of the information in both the local area and regional context is also vital.

The examples used in this paper are from bushland on the Swan Coastal Plain in the Perth Metropolitan Area. Many of the principles these examples illustrate are applicable in all urban situations.

What do we need to know about our bushland plants?

At the outset of bushland management we need to know the plants (flora) and patterns of distribution of all these bushland plants (plant communities). Such a record gives a snapshot of what we are aiming to preserve in each bushland patch.

Many bushland areas, especially those in the Perth Metropolitan Area, have been subject to some level of flora and vegetation survey. Collecting and collating the existing information before embarking on a survey program is fundamental. In using existing information it is important to understand the purpose of previous surveys. Previous surveys may have focussed on individual plants and communities, been done in restricted time frames or under very limited budgets (if there was a budget at all). Such factors influence both the information presented in the reports and the interpretation of the information.

Studies on specific areas generally range from limited survey, where the area has been visited once or twice and the principal vegetation units and some of the flora described (e.g. Keighery, B. J. 1995a) to detailed survey, involving multiple visits over one or several years, in which the entire area is traversed, the vegetation mapped and a comprehensive flora list prepared (e.g. Keighery, G. J. and Keighery 1993a).

Finding this information is not always easy. Sometimes you are able to find a person who has been down this track before and can point you in the correct direction immediately, but generally you should begin in the Alexander Library or specialist libraries such the Department of Conservation and Land Management's Wildlife Research Library at Woodvale or the Department of Environmental Protection's Library in Perth. A useful source of survey references is the 'Bibliography of location-based biological studies in Western Australia' (Lyons and Gibson 1994) that collates references to studies from 1960 to early 1993. In the Perth Metropolitan Area many of these areas have already been subject to some degree of survey and a number of these references (to mid–1998) will be found in Volume 2 of Perth's Bushplan (Government of Western Australia 1998). While your particular bushland area may not be referenced in these, there may well be a reference to it in a treatment of a nearby bushland area. Also, workshops and conferences are invaluable information sources. They give opportunities to compare and contrast experiences and introduce you to cur-

Table 1: *Flora and vegetation information for the Swan Coastal Plain in the Perth Metropolitan Area*

Area-specific Detail
Survey type: indicate the methods used in the survey and period over which the survey was done as well as any limitations placed on the survey work
Vegetation
Structural Units: mapped units with descriptions of these units and reference to regional representation of the units described.
Vegetation Condition: mapped units with descriptions of these units.
Flora
Total Flora: list of all taxa, weeds and native taxa, with reference to regional representation of taxa and expected degree of completion of the list.
Regional Information
Vegetation Complexes: after Heddle *et al.* 1980.
Floristic Community Types: after Gibson *et al* 1994, Department of Environmental Protection 1996.
Threatened Species and Communities: after Atkins 1998 and English and Blyth 1997.

rent studies. Often a chance comment at a meeting can save hours of searching, or introduce you to a person who can answer your question.

Once you have determined what survey is needed, consult a book such as Bushland Plant Survey (Keighery, B. J. 1994) which outlines standard survey practice suitable for use in the south west of Western Australia. Table 1 outlines the information on flora and vegetation that should be collected on the Swan Coastal Plain in the Perth Metropolitan Area. The remainder of this section looks at using rather than collecting survey information.

Area-specific information

This information needs to be collected with some rigour and recorded in a manner able to be communicated to others, especially managers. While information should be presented in a manner that is useful to the present managers, it is essential that the categories of information be well described and referenced so future users understand its context.

Vegetation

The core feature of this information is a vegetation map. Vegetation maps distinguish communities of plants at a variety of levels, ranging from the broad, effectively regional groups, to mapping of the local assemblages of plants. Each individual report's key needs to be consulted to understand the mapped units. Examples from Talbot Road Bushland (Keighery, G. J. and Keighery 1993a) and Shenton Bushland (Ecoscape 1994) illustrate these points (see Appendix 1 & 2).

In general care should be taken when comparing vegetation maps. They have a considerable subjective element and can often illustrate bias towards a particular type of plant community. Plant communities tend to be named for the most conspicuous and, to some extent, the most visually attractive plant. While this should not create any difficulties it may do when relative values are attached to plant communities. This is discussed in a following section.

In addition to maps of plant communities, maps of vegetation condition are often produced to present a picture of the degree of disturbance over the area. Again, there is a need to look carefully at the key to the condition classes. The difficulty with condition scales is that they compare what the bushland is like with how it should be were it not disturbed. To do this you need to be sufficiently familiar with the community type across its range to assess what an undisturbed community would be like. An example of a vegetation condition from Shenton Bushland (Ecoscape 1994) and the vegetation map from Talbot Road Bushland illustrate some of these points (see Appendix 1 & 3). Specific maps of the nature of the disturbance, such as maps of the frequency of occurrence of individual weed species are also very useful in management (Brown 1998, this publication).

Flora

Flora lists

While a flora list, by definition, would be expected to list all taxa (taxa are species, subspecies and varieties) present in the area, this is not necessarily the case. Lists might omit whole groups of inconspicuous plants such as sedges and rushes, plants that exist as seed, bulbs or tubers in summer, and weeds. Before comparing species diversity between two bushland areas look carefully at the time of the year and the period over which the information was collected. To be relatively complete flora lists need to be compiled over time, to account for changing seasons and environmental conditions such as post fire conditions and high rainfall years. However, no flora list is probably ever complete as rare events such as fire followed by a year of exceptionally high rainfall, or a cyclone can establish conditions for the growth of previously unrecorded species. Flora lists should indicate the expected level of completeness.

The arrangement and ordering of the species lists varies between reports. Most list species under family, either in order of the most closely related families or alphabetically. Species may be grouped in life forms (that is as trees, shrubs etc) or simply listed in alphabetical order. Once compiled, lists can be annotated with a variety of information categories such as the plant community in which it is located, flower colour, flowering time, taxonomic status (species, subspecies or variety) and/or presence of a local variant, life form etc. Information on local variants is particularly relevant on the Swan Coastal Plain as many widespread species have local variants that have not been recognised with formal names. Examples include Acacia pulchella, Hakea trifurcata and Eriostemon spicatus. Examples of flora lists from Talbot Road Bushland (Keighery, G. J. and Keighery 1993a) and Koondoola Open Space (Friends of Koondoola Open Space 1998) illustrate these points (see Appendix 4 & 5).

Biological information

Plant names can be used to access reports on how the plants live, that is, the biology of the individual plants. While reported information is very useful and can save time, information from your own observations is of great value. Some species, both weeds and natives, have quite different behaviour locally than is recorded in the literature. For example:

- the weed lovegrass (*Eragrostis curvula*) will grow and flower at different times on different soil types and water regimes. In some area there are several opportunities for control as lovegrass has two flowering seasons on some soils.
- different populations of species have different responses to dieback: *Calytrix sapphirina* (a purple starflower) in Bullsbrook Nature Reserve appears not to be killed by dieback but is severely affected in other areas (F. Podger pers. comm.).

Regional information

It is important that the specific area information be collected in a manner that can place your bushland area in a broader perspective enabling you to access information on your bushland type, its regional characteristics and information on similar areas (Table 1). In addition this regional information identifies the conservation status of the plants and communities. Restricted and uncommon taxa may be Declared Rare Flora (DRF) and Priority Flora (Atkins 1998), and restricted and uncommon plant communities may be deemed threatened ecological communities (English and Blyth 1997). While threatened ecological communities do not have the statutory protection afforded to Declared Rare Flora they are increasingly recognised as being in need of the similar levels of protection in planning.

Ongoing survey

It should also be kept in mind that plant communities (especially structural units) are dynamic, they change over time. Change can be natural, in response to changing environmental conditions (generally over long time spans). The maturation cycles of individual plant taxa, populations of taxa and plant communities varies (generally over shorter periods). Change can also be human-induced, where activities of humans alter the environmental conditions and the cycles of maturation.

Vegetation condition scales attempt to describe these changes. Both aspects of change will be affected by management activities that allow for augmented natural revegetation in response to weed control, closing of tracks, removal of rubbish etc and planting programs in degraded areas. Keeping records of the location of these activities and the change of plant communities in response to these activities is vital.

In addition regional values of vegetation and flora may change. Further survey and study of our poorly known flora may lead to a change in status of both communities and individual taxa.

How is this information relevant to management?

The flora and vegetation information identifies what you wish to maintain and identifies where change is needed to restore values that your bushland is losing. That is, changes that are leading to degradation can be identified and abated or minimised. These changes are termed 'threatening processes'. Also, in all bushland management there are limited resources and your information will be used to set priorities, that is to rank areas of vegetation for maximum protection and/or management effort.

However before considering selected issues in more detail it should be recognised that at times the local and regional conservation values of a bushland area are not apparent to some members of our community. In urban areas this value should be physically established as soon as the area is recognised with the conspicuous fencing and naming of the area, which establishes clearly that the area is valued. In addition fences remove the continued intrusions of unwanted activities in the bushland that so often lead to disturbance. This fencing and naming should be augmented by a series of awareness raising activities. Such activities are integral to retention of the area but these are not the focus of this paper.

Also observe the precautionary principle: if you are unsure of a management action, wait. Observations of many remnants on the Swan Coastal Plain indicate that benign neglect is less damaging than active mismanagement.

Area-specific values and management

A principal aim of urban bushland conservation is to keep, in each local area, representations of the communities and species typical of and associated with the local area. It is this typical bushland that contributes to each area's 'sense of locality' (Keighery, B. J. and Gray 1993). As a consequence it is this typical vegetation that has the most value at the local level. Areas can be ranked for management according to:

- disturbance — the least disturbed having greatest value
- community diversity — the most diverse having greatest value
- maturity of the community and individual species in the community — mature individuals or communities having greatest value.

Alongside this ranking should be the identification of threatening processes, which may be on such a scale that their alleviation is the primary concern. For example where dieback poses a threat to a significant portion of an area, removing this threat may be the most urgent action, regardless of any of the factors listed above.

There needs to be an awareness of these relative values and threats as in some cases flora/vegetation conservation values are not the focus of the management. The application of this approach is illustrated in a series of cases below.

Relative 'value' of different plant communities.

At times community types appear to be rated for management effort on a hierarchy related to the dominant life form in a community. A common hierarchy of ranking is: tall forest > low forest > tall woodland > low woodland > heaths > shrublands > herblands > sedgelands > grasslands. There is an additional aspect in wetland ranking, open water being more valued than vegetated wetlands. This approach is also very common in rating areas for retention. Comments referring to shrublands, herblands and sedgelands as lesser valued 'regrowth' are common in discussing relative vegetation values,

implying that if this vegetation had been allowed to follow its natural course it would become a higher valued woodland or forest. As a consequence there is a consistent tendency to locate tracks, notice boards, public facilities etc in the lower ranked communities, regardless of their condition, diversity or maturity. An awareness of this bias in the community should be sufficient to discount it.

The Brixton Street Wetlands well illustrates this ranking. These now well recognised wetlands of international significance contain over 300 native plant taxa in 20 hectares, growing mostly in shrublands, herblands and sedgelands, with small areas of marri (*Eucalyptus calophylla*) woodland and no open water areas (Keighery, G. J. and Keighery 1991; Keighery, B. J. and Keighery 1995). Most of the area is in excellent condition and a good representation of the typical plants and communities of the wet clay flats on the eastern side of the Swan Coastal Plain. However there is a continuing need for general awareness-raising programs as the area is often considered of low value since it contains very little woodland, no forests and no open water. Two examples of activities in the wetlands illustrate this allocation of values: a neighbour of the reserve planted 15 home grown *Eucalyptus camaldulensis* trees in the shrublands, and maintenance workers drove off the tracks through a herbland/sedgeland area to collect rubbish.

Restoration and revegetation

It is well recognised that management should focus on augmenting natural regeneration through limiting disturbance. Often the most needed activity is weeding, in a manner that allows for natural regeneration. Revegetation will be necessary in some areas. However the complexity of the communities in the south-west of WA is great and there is still little or no possibility that they can be re-created once destroyed. Revegetation work can only establish elements of these communities. However planting often becomes a focus of restoration related activities in managed urban bushland areas. While these planting activities may be well planned and, at times appropriate, they often create a series of insidious problems for the restoration effort, including:

- The implication that plant communities can be replaced by a relatively simple activity
- A focus on tree planting which reinforces the ranking of forests and woodlands as the most valuable communities
- Choice of species for planting being limited to what seed can be collected and grown
- Changing the structure and species of a natural plant community
- The introduction of
  - inappropriate species that become weeds in the community
  - non local forms of species that change the 'local' community (discussed further under the regional section below)
  - diseases and weeds in the soil
- Creation of disturbance in the planting activity
- Focusing management efforts and resources on revegetation projects rather than intact vegetation.

Two examples illustrate many of these points.

- The Brixton Street Wetlands contain over 300 native plant taxa in 20 hectares. Of these 300 taxa only about 20 have been suggested as being readily propagated and suitable for planting (see Table 2 below, from Keighery, B. J. 1995b). Nearly 50% of these have recognised local variants.
- South of Rockingham are a series of low Quindalup Dunes, naturally vegetated with a low shrubland with herb and grass layers (Keighery, G. J. and Keighery 1993b; Trudgen 1993). Many small patches of vegetation have been left in local parkland. These patches are being planted with tuart (*Eucalyptus gomphocephala*) trees that were not originally present in this bushland. If these trees grow they will be the focus of future management and water competition, and shade from the trees will lead to the loss of the natural shrublands.

Regional values and management

Only in very rare cases will your bushland area contain the only representation of a species or community or a rare species or community. However an understanding of the nature and variation of your bushland communities and species in the region is vital in developing community-specific management practises. A series of issues related to regional representation are outlined below.

Regionally significant populations of widespread species

Plants occur over a geographic area in a series of populations. Your bushland area may contain:

- distinctive local forms that have not yet been recognised taxonomically at the level of species, subspecies or variety
- populations that are outside the main geographic range, ie. disjunct populations
- populations at the extremity of the plant's geographic range
- populations that represent a significant number of the known individuals of the taxon in the region and/or a population in good condition (that is, a mixture of different-aged individuals — mature adults to seedlings).

These values need to be acknowledged in managing your area as plants that have these values contribute to the character of your bushland patch and need to be maintained.

Table 2: *Naturally occurring plant species at Brixton Street suitable for revegetation*

— Species with recognised local variants

Habitats: dry= 'uplands'; damp = waterlogged areas; wet = inundated areas

Family/species	Habitat	Propagation
Anthericaceae		
Sowerbaea laxiflora	dry	division/seed
Tricoryne humilis	dry	division/seed
Asteraceae		
Hyalosperma cotula	dry/damp/wet	seed
#Podolepis gracilis	damp/wet	seed
Haemodoraceae		
Anigozanthos manglesii	dry	seed
Mimosaceae		
#Acacia lasiocarpa	dry/damp	seed
#Acacia pulchella	dry	seed
#Acacia saligna	dry	seed
Myrtaceae		
#Astartea fascicularis	wet	seed
Baeckea camphorosmae	dry/damp	seed
Eucalyptus calophylla	dry	seed
Hypocalymma angustifolium	dry/damp	cuttings/seed
Hypocalymma robustum	dry	cuttings/seed
#Melaleuca rhaphiophylla	wet	seed
#Melaleuca viminea	wet	seed
Pericalymma ellipticum	damp/wet	seed
Papilionaceae		
Kennedia prostrata	dry/damp	seed
Viminaria juncea	damp/wet	seed
Proteaceae		
#Grevillea bipinnatifida	dry/damp	cuttings/seed
#Hakea trifurcata	dry/damp	seed
#Hakea prostrata	dry/damp	seed
#Hakea varia	damp/wet	seed

The recognition of local variants is of particular significance in management. All revegetation should be done using local seed and other propagating material collected from areas where natural regeneration will need to be augmented, NOT from the areas of intact vegetation. Also while propagation material of many of the species can be obtained from seed merchants these may well come from quite different forms of the species identified on the reserve. A large proportion of the species listed have readily distinguished local variants and others may have less obvious differences. To ensure that local variants are used for revegetation, propagation material must be collected in the local area. Local growers should be approached to collect and grow this material.

Plants for revegetation are suitable if they are important components of the local plant communities and able to be cultivated. Using the Brixton Street example again, there are many species that have been recorded for the area that are not listed in Table 2 as they are difficult to cultivate for a variety of reasons. This highlights the need for management of natural vegetation to focus on retention and restoration rather than revegetation.

Plants for revegetation should also be selected on a site by site basis (see sites, Appendix 1). That is they should be selected to match the soils, drainage and natural plant communities of the area where they are to be planted. Revegetation/planting should only occur in areas that are devoid of native vegetation or where it is required to maintain the integrity of surrounding bushland.

Examples of local variants and significant populations on the Swan Coastal Plain in the Perth Metropolitan area are given below.

- There are two varieties of this *Acacia lasiocarpa* recorded on the Swan Coastal Plain (Keighery, B. J. 1996; Keighery, B. J., Keighery and Gibson 1997). *Acacia lasiocarpa* var. *lasiocarpa* is found in near-coastal areas, generally on Tamala surfaces near the coast but also characteristic of the Beach Ridge Plain at Becher Point. The other variety, *Acacia lasiocarpa* var. *bracteolata* (long peduncle) is endemic to the Swan Coastal Plain, being found on the seasonally waterlogged and inundated heavy soils of the Pinjarra Plain.
- The small annual daisy *Gnephosis angianthoides* is found in significant numbers on the banks of the Serpentine River at Lowlands (Keighery, B. J., Keighery and Gibson 1995). *Gnephosis angianthoides* is not presently known in any other location on the Swan Coastal Plain. The only other record of this taxon on the Swan Coastal Plain is from Kings Park, where it is no longer found. It is considered that the habitat of this taxon, the sandy banks beside rivers, is now very rare on the Swan Coastal Plain and this is a very significant population of this species.

- While tuart (*Eucalyptus gomphocephala*) is confined to the Swan Coastal Plain it is relatively common on the Plain. However it is one of a series of typically coastal taxa that occur along the rivers of the Swan Coastal Plain (Keighery, G. J. and Keighery 1997). A small population of this tree is found at Lowlands (Keighery, B. J., Keighery and Gibson 1995). This is the most easterly occurrence of typical tuart. Previously a distinct variety of tuart (*E. gomphocephala* var *rhodoxylon*) was found at Guildford on the Swan River and is now probably restricted to a few individual trees (Keighery, G. J. 1998).
- Roadside populations of *Themeda triandra* (Kangaroo Grass) are found on the eastern side of the Swan Coastal Plain from Gingin to Dardanup (Keighery, B. J. 1996; Keighery, B. J., Keighery and Gibson 1997). Most commonly these populations are associated with wandoo woodlands but along Mundijong Road and Soldiers Road two populations are found associated with marri woodland. The occurrence of *Themeda* at the Duckpond Road turnoff along Mundijong Road is the most westerly occurrence of this species.
- Recent taxonomic work on the Rottnest Island cypress (*Callitris preissii*) found that 'true' *Callitris preissii* (K. Hill pers. comm.) is highly restricted in its distribution, all occurrences occurring within a twenty-kilometre radius of the centre of Fremantle (Keighery, B. J., Gibson and Keighery 1997). The distribution of *Callitris preissii* appears to have been centred in the Garden Island/Fremantle area but extends north to Mullaloo, south to Garden Island and inland to Kings Park. There is some uncertainty about the distribution of *Callitris preissii* as forms of *Callitris preissii* have been widely planted for many years. It is considered that the localities at the extremities of its range represent natural populations as they are growing in areas similar to those in which it is known to occur naturally elsewhere and these populations contain a mixture of glaucous and non-glaucous forms found in natural populations on the mainland but not found in cultivated populations. Recordings of *Callitris preissii* in the centre of Bunbury (Keighery, B. J., Gibson and Keighery 1997) and in Busselton area (Marchant *et al.* 1987) are considered to be plantings. That is *Callitris preissii* is a highly restricted species on a regional and national scale.

Plant community condition

When a community type has become very restricted over its range, the condition of the community is secondary in allocating values. This is especially relevant in stream lines on the Swan Coastal Plain as there are so few with any intact bushland that they have higher value than their condition would normally warrant. If these creeklines are associated with intact uplands their value is further increased. The riverine vegetation in Lowlands provides one of the few examples of essentially intact upriver riverine vegetation on the Harvey, Murray, Serpentine, Southern, Canning and Swan Rivers on the Swan Coastal Plain (Gibson et al. 1994, Keighery, B. J and Trudgen 1992, Keighery, G. J. and Keighery 1998, Gibson et al. 1994). Overall this area of fringing vegetation retains its structural and floristic integrity even though there is considerable weed invasion in some patches.

Other communities on the Plain where condition can indicate a significant degree of weed invasion but the community have high value occur in instance where there are few remnants in an area such as wandoo woodlands (for example, at Talbot Road, Apendix 1) and the restricted Quindalup Dune wetlands (Rockingham area).

Rarity — threatened species and communities

The presence of threatened species and communities in an area of bushland effectively establishes a series of management practices. Obviously DRF has special consideration as permission is required from the Minister for the Environment to destroy any part of DRF. The Department of Conservation and Land Management (CALM) is responsible for enforcing the *Wildlife Protection Act 1950* under which DRF is gazetted on a yearly basis.

Table 3: *Threatened Species and Communities on the Swan Coastal Plain in the Perth Metropolitan Area with Interim Recovery Plans (Western Australian Threatened Species and Communities Unit List 20/10/98)*

Communities

Floristic Community Types (after Gibson *et al* 1994)

Eucalyptus calophylla - Kingia australis woodlands on heavy soils (floristic community type 3a)

Eucalyptus calophylla - Xanthorrhoea preissii woodlands and shrublands (floristic community type 3c)

Sedgelands in Holocene dune swales (floristic community type 19)

Eastern shrublands and woodlands (floristic community type 20c)

Restricted floristic community type mosaics (after Keighery, G. J., and Keighery 1995)

Shrublands and woodlands on Muchea Limestones (intact examples possibly extinct in the Perth Metropolitan Area)

Freshwater plant and animal communities

Communities of Tumulus Springs (Jasinska and Knott 1994, Ahmat 1993)

Species

Calytrix breviseta subsp. *breviseta*

CALM notifies affected land managers (owners, vesting authorities) of known populations of DRF and their responsibilities under the Act. CALM also takes responsibility for management of threatened ecological communities, and where threatened communities are identified CALM will give advice in management.

Both threatened species and communities are expected to be managed according to the principles outlined in 'recovery plans' prepared for the entire range of the species or community. These plans essentially identify the threatening processes operating on the species or community and develops strategies to alleviate or minimise these threats. Table 3 lists the current recovery plans that are relevant.

In management there is a definite need to be aware of rarity. What at times appears to be an insignificant species or community may well be a very significant example of its type. In some areas it may be inappropriate to have public access. Access should be focused on areas where communities and species are not as threatened.

Determinations of rarity change. If the threatening processes identified in determining the rarity of the taxon or community are abated then they may no longer be classed as threatened. This is a measurement of effective management.

Again a series of examples can illustrate many of these points.

- *Eleocharis keigheryi* is an inconspicuous freshwater aquatic sedge (Cyperaceae) that is annually renewed from a rhizome when winter rains fill the claypans in which it grows. It then flowers in mid winter/early spring and dies off when the claypans dry out. One area in which it grows is the claypans surrounding the Pearce Airforce base runways (Keighery B. J. 1995a). The claypans are mown each year but not generally until after they have dried, hence the species persists. Awareness of the biology of this species and the significance of this management regime will enable conservation and protection of property to be effectively managed.
- All communities at Brixton Street are threatened ecological communities (English and Blyth 1997). Fencing of the wetlands has allowed most of the tracks to regenerate naturally. However, some of these tracks are required to have a fuel reduction treatment for them to function as fire access tracks. Mowing of these tracks once the claypans are dried and the last sequence of flowering has occurred will allow for continuation of the species and a necessary management activity.
- The *Callitris preissii* forest on Garden Island represents the largest extant area of this type of forest and the area in best condition (Keighery, B. J., Gibson and Keighery 1997). Other significant occurrences are at Peppermint Grove, Trigg Bushland, Rottnest Island and the Swanbourne Rifle Range. These forests and woodlands are a threatened ecological community. The recognition of the local, regional and national significance of communities dominated by *Callitris preissii* reinforces the need for the remaining areas to be managed for the survival of these communities. Studies on *Callitris preissii* since the early 1950s have identified a series of disturbances that have potential impact: clearing, frequent fire, erosion, grazing and weed competition. It is essential that these disturbances be managed.
- *Verticordia plumosa* var. *pleiobotrya* is only known from the Mundijong area (Atkins 1998; Keighery, B. J. 1997; Keighery, B. J., Keighery and Gibson 1997). The Mundijong Road populations are the largest known populations of the taxon. This variety is not known from any conservation reserve and is a rare taxon. A recent assessment of its conservation value changed its status from a Priority 1 taxon to Declared Rare Flora.

How should we collect information on our bushland plants?

Before considering the information on bushland plants (flora) and communities (vegetation) required in designing a management program one should understand the manner in which this information is collected. While it is often more convenient and quicker to pay a professional to record and document these values independently, involving the management group in this process of documentation allows for a better understanding of the area's values. This appreciation of the area's values can only result in better management. An understanding of the information also allows for its ongoing maintenance by the managing group.

In recognition of the need to share information on native plants and how they live in bushland the Wildflower Society of WA began a bushland area survey program in the early 1990s. The program began in response to a community need for detailed information to justify retention of a piece of bushland and for use in ongoing appreciation and management. Professional members of the Society were faced with many requests for survey work, well beyond their capacity to deliver. The techniques established in the 1988 community based regional survey work on the sandplain between Jurien and the Moore River (Griffin and Keighery 1989) laid the foundation for a program of individual bushland area surveys.

The program focussing on specific bushland areas, the Wildflower Society's Bushland Plant Survey, began in 1990 at the Talbot Road Bushland. From 1990 to 1995 the program focussed on the Swan Coastal Plain from Bullsbrook to Dunsborough. Over twenty bushland areas were surveyed in this period and reports prepared on more than half of these. As a part

of this program a guide to conducting community based surveys was developed outlining standard survey techniques and how these could be used by community groups (Keighery, B. J. 1994).

Since 1995 the area of the Wildflower Society's program expanded into the wider south-west and developed a greater focus on outcomes for management. Bushland surveys and workshops on the survey process have been held as far south as Denmark, east to Bodallin and north to Konnongorring.

This evolving program presents a series of opportunities for the interested public and bushland 'friends' groups to participate in vegetation and flora survey, receive training in various aspects of flora survey and develop management actions appropriate to the area's values. With this training a wider group in the community is able to understand the process of flora survey and be in a position to use this information within their local bushland areas.

Five features distinguish the Wildflower Society's bushland survey project:

(i) The emphasis is on rigorous plot (quadrats) based survey as the focus for collection of information on all plants in a bushland area and the communities they occur in.

(ii) Volunteer participation is designed to focus on groups supported by professional botanists. Botanical support comes from botanists employed by the Society, volunteers in the program and botanists with CALM and the Department of Environmental Protection (DEP).

(iii) Survey work is done in areas where the groups/individual responsible for managing the area are involved in the survey work alongside volunteers from the broader interested community.

(iv) Focus on cooperative projects facilitated by the Wildflower Society involving friends/Landcare groups, local government, CALM (Wildlife Research Survey Group) and the DEP (Ecoplan).

(v) Data collection is consistent with the CALM (Wildlife Research Survey Group) regional survey procedures which enables the incorporation of plot based information in regional datasets.

Outcomes of surveys include:

- participation of more than twenty friends or Landcare groups, over 100 trained volunteers (many of whom have been attending since the inception of the program in 1988) and numerous botanists
- presentation of data in more than twenty reports
- preparation of reference herbaria for individual areas
- use of plot based information in three regional surveys (Griffin and Keighery 1989, Gibson *et al.* 1994 and the Salinity Action Plan Biological Survey in process).

While the Wildflower Society's program is the longest running substantial program established to support community groups in identifying the values of individual areas, there are a series of programs both formal and informal to support the community in understanding bushland plants.

These programs range from occasional activities to structured programs organised by conservation/Friends/Landcare groups, and local and State government. Many programs are run cooperatively. Such partnerships are fundamental to good bushland management, combining the resources and knowledge of local and regional groups and government. Examples from each of these categories are outlined below and many more examples are found elsewhere in this publication.

Conservation/Friends/Landcare groups

Such groups operate programs of guided bushland walks, talks and specific workshops that are integrated with their ongoing management roles in particular bushland areas. Friends groups at Koondoola Open Space and Ellis Brook Valley conduct regular bushland based education activities and maintain flora lists for their bushland. Regular programs are also maintained at Bungendore Park, Brixton Street Wetlands, Bold Park, Yellagonga, Trigg Bushland, Quinns Rocks area and Star Swamp.

Local government

Employed environment officers and interested elected councillors are the core of successful local government participation in bushland management. Extensive programs such as that run at the Shire of Serpentine-Jarrahdale are beginning to develop.

State government

These include DEP's Ecoplan, CALM's Community Regional Herbaria Volunteer Program, Bushrangers, and Land for Wildlife

All of these programs, both structured and unstructured, depend on the dedication of volunteers and, generally, support of employed officers. However only Ecoplan and the recently established Bushrangers Program are supported by dedicated recurrent funds. All of the other programs depend on grants which run for no more than three years, after which they are expected to become self-funding. Successful programs must change their focus to that of the current 'guidelines' to gain further funding. While such changes can strengthen a program they have the potential to undermine it. They also focus programs on the success groups have in writing grant applications rather than on the success of the project.

In addition, with the complex, varied and poorly known flora of WA, it is essential that there is ongo-

ing involvement in bushland management of people with developed expertise. This cannot be based on the idiosyncratic nature of grants. Our flora and vegetation are too complex for people to accumulate and maintain knowledge without long-term support. Therefore resources need to be allocated from recurrent funds. Government employed officers with this expertise currently exist but they rarely have dedicated time allocated to supporting such programs. Participation by these people is additional to their normal programs in 'volunteer' time. If these successful programs are going to be established at a level required to manage bushland effectively it is essential that there be a commitment at state and local government level to employ ongoing technical experts to support bushland management. This is recognised elsewhere, for example in the bushland management program run by the Ku-ring-gai Municipal Council in Sydney (Couston 1998, this publication) where bushland management is integral to local government functions. A technical officer is employed to maintain the flora database and keep council aware of flora, vegetation and fauna values of the Municipality's bushland areas.

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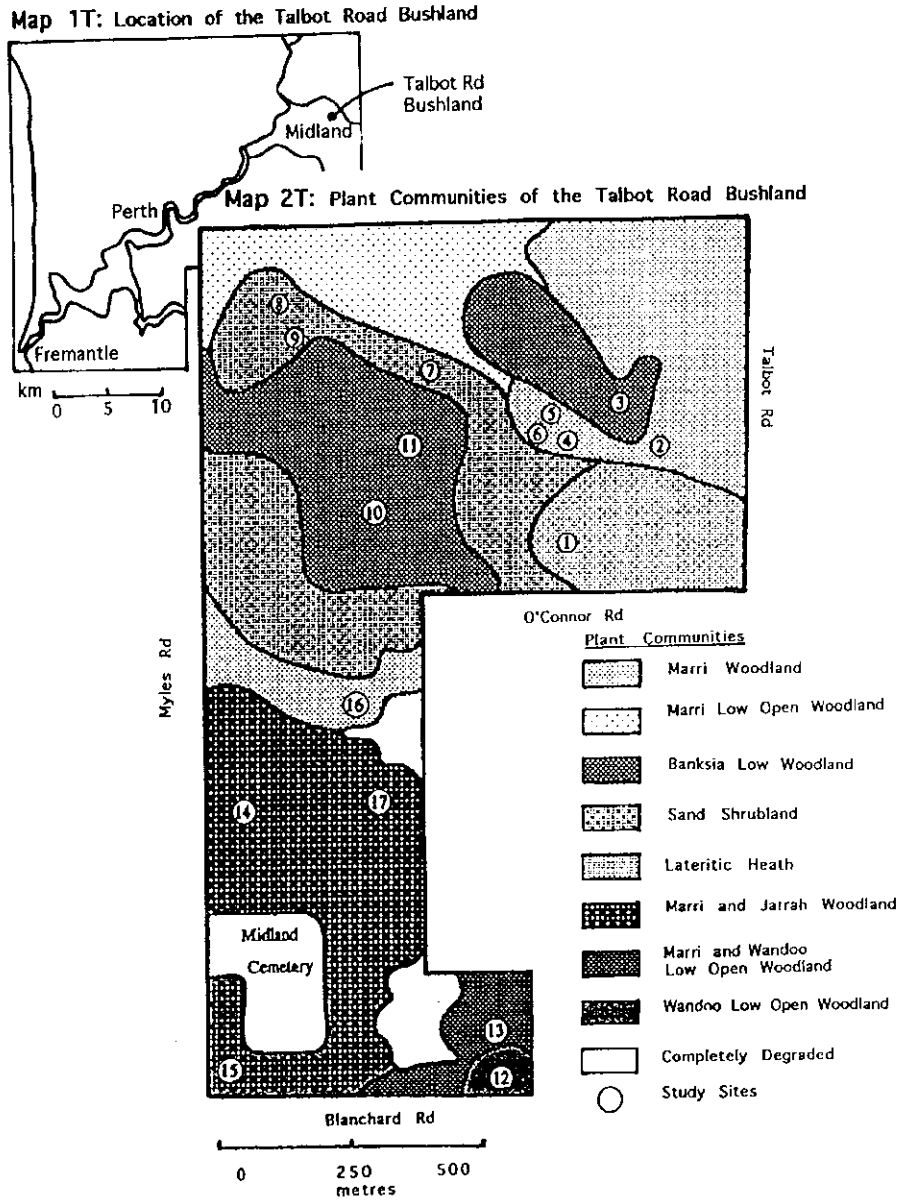
APPENDIX 1: Vegetation Map of Talbot Road Bushland (Keighery, GJ and Keighery 1993)



Reference to study sites gives detail of a specific area in a mapped unit. Site 12 is shown below. Site based condition ratings and general notes on the overall condition of the mapped area are given. Vegetation structure classes and condition scales are from Keighery, BJ (1994).

Site 12 — Wandoo Open Low Woodland. Plot TALB 12 from Gibson *et al.* 1994

Wandoo Open Low Woodland over *Acacia pulchella, Hakea lissocarpha, Hypocalymma angustifolium* and *Hakea erinacea* Low Shrubland over *Neurachne alopecuroidea* and *Stipa pycnostachya* Open Grassland; *Borya sphaerocephala, Trichocline spathulata* and *Xanthosia candida* Herbland and *Mesomelaena tetragona* Open Sedgeland.

Condition: Rating Very Good to Excellent

Comments: The overall area of Wandoo Open Woodland has been disturbed and there is an old gravel mine at the top of the rise. The southern slope is in good condition with small patches of weeds associated with tracks, rubbish dumping and soil disturbance. The boundary is fenced, which discourages the dumping of garden refuse.

Soil: red loam over quartzite, ?F6 (King and Wells, 1990)

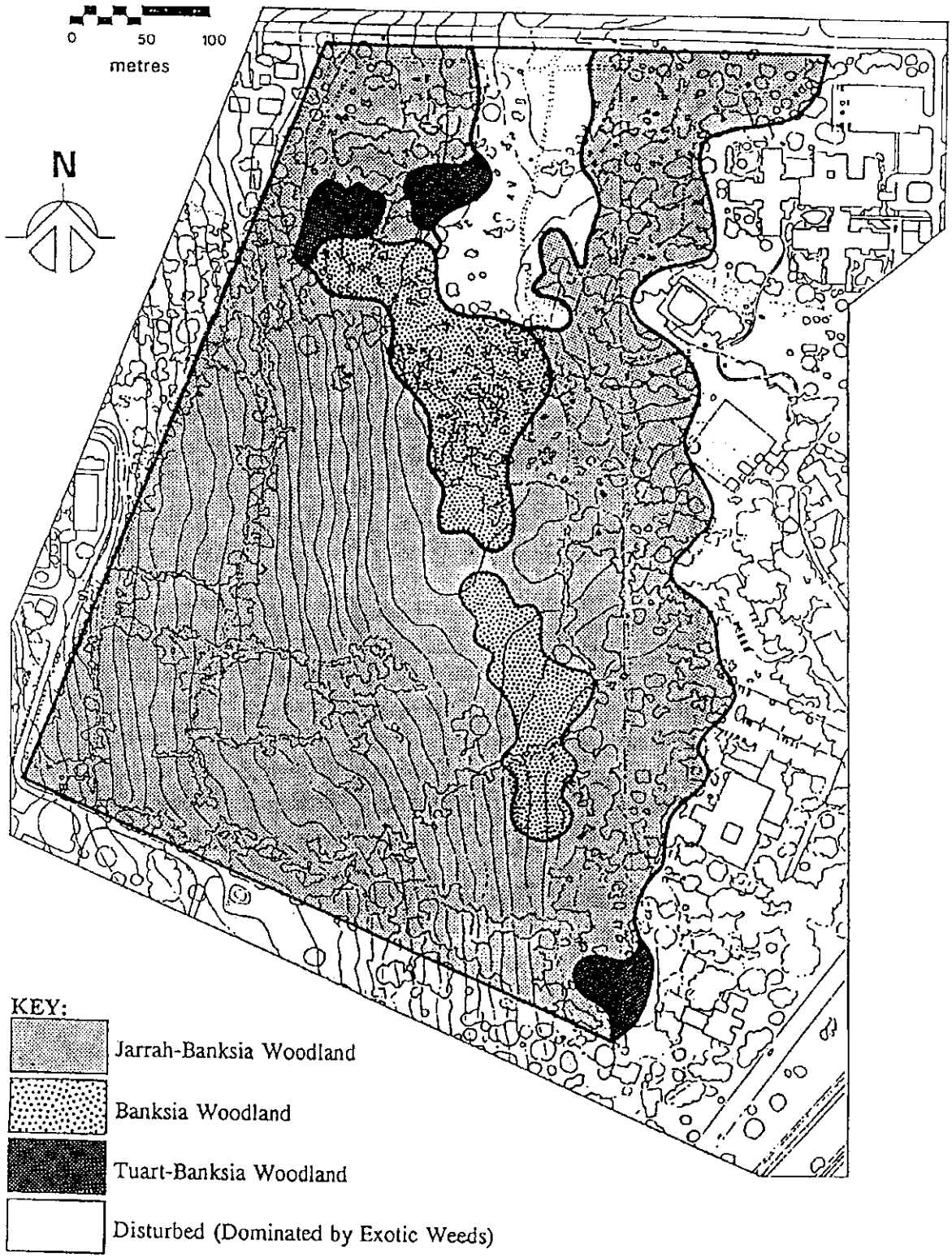
Litter: 50%

Bare ground: 20%

Drainage: moderate to poor

Aspect: gentle to steep slope, south

APPENDIX 2: Vegetation Map from Shenton Bushland (Ecoscape 1994)



APPENDIX 3: Vegetation Condition Map from Shenton Bushland (Ecoscape 1994)

Bushland Condition Scale

Very Good — Excellent

- 80–100% Native Flora composition
- Vegetation structure intact or nearly so
- Cover/abundance of weeds less than 5%
- Minor signs of disturbance (tracks, rubbish dumping)

Fair — Good

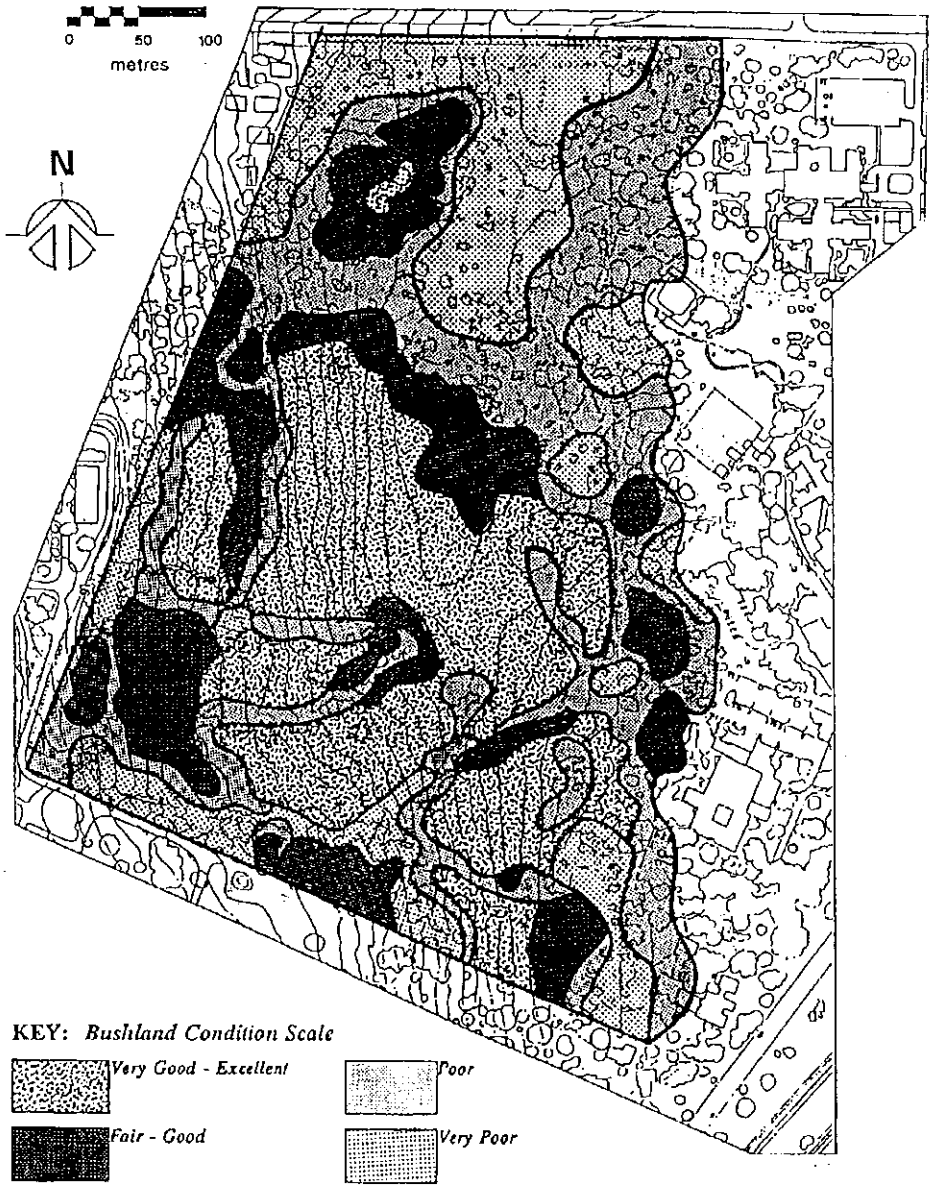
- 50–80% Native Flora composition
- Vegetation structure modified or nearly so
- Cover/abundance of weeds 20–60%, any number of individuals
- Disturbance incidence high

Poor

- 20–50% Native Flora composition
- Vegetation structure completely modified
- Cover/abundance of weeds 20–60%, any number of individuals
- Disturbance incidence high

Very Poor

- 0–20 % Native Flora composition
- Vegetation structure disappeared
- Cover/abundance of weeds 60–100% cover, any number of individuals
- Disturbance incidence very high



APPENDIX 4: Flora list from Talbot Road Bushland (Keighery, GJ and Keighery, B 1993)

Key

\# opportunistic record

• non-native taxa

Plant communities (see Map 2T, p 19)

wW Wandoo Low Open Woodland (Site 12)

wmW Marri & Wandoo Low Open Woodland (Site 13)

mjW Marri and Jarrah Woodland (Sites 14, 15 & 17)

mW Marri Woodland (Sites 2 & 4)

bW Banksia Low Woodland (Sites 3, 10 & 11)

sS Sand Shrubland (Sites 7, 8 & 9)

lH Lateritic Heath (Site 1)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Gymnosperms							
Zamiaceae							
#Macrozamia riedlei							
Angiosperms							
Aizoaceae							
#Macarthuria australis					+		
Amaranthaceae							
#Ptilotus declinatus			+				
#Ptilotus drummondii				+			
Ptilotus manglesii				+			
Ptilotus stirlingii		+		+			
Anthericaceae							
Arnocrinum preissii					+	+	
Arthropodium capillipes	+			+			
Arthropodium preissii	+	+					
Borya scirpoidea							+
Borya sphaerocephala	+	+		+		+	
Caesia micrantha	+	+		+			+
Chamaescilla corymbosa				+	+	+	+
Chamaescilla versicolor	+	+		+			+
Johnsonia pubescens				+	+	+	
Laxmannia grandiflora				+			+
Laxmannia ramosa	+			+	+	+	
Laxmannia sessiliflora			+	+	+	+	
Laxmannia squarrosa	+	+		+		+	
Sowerbaea laxiflora				+			
#Stypandra grandiflora				+			
Thysanotus arenarius				+			+
Thysanotus dichotomus				+			
Thysanotus glaucus					+		

APPENDIX 5: Flora list from the Friends of Koondoola Open Space database (8/9/98)

Symbols on list are as follows:

#	Also found on Yanchep list	**B**	Collected in Bud	F	Month of the year viewed in Koondoola in flower
!	Koondoola only	**Fl**	Collected in Flower	S	Month of the year viewed in Koondoola in seed
*	Non natives	**Fr**	Collected in Fruit	B	Month of the year viewed in Koondoola in bud

Family		Species	Common Name	B	Fl	Fr	J	F	M	A	M	J	J	A	S	O	N	D
Amaranthaceae	#	*Ptilotus manglesii*	Pom-poms, Rose tipped Mulla Mulla	X	X		FS					S				BF	BF	FS
	!	*Ptilotus polystachyus*	Prince of Wales Feather							BF								
Amarylidaceae	#*	*Narcissus tazetta*	Jonquil		X	X							F					
Anthericaceae	!	*Arnocrinum preissii*		X	X	X	F	F	S							BF	BF	F
	#	*Arthropodium capillipes*	Chocolate Lily											F	F	S		
	!	*Caesia occidentalis*																
	#	*Chamaescilla corymbosa*	Blue Squill	X	X	X								F	BF	S		
	#	*Corynotheca micrantha*	Sand Lily															
		Lomandra preissii	MALE	X	X						BF							
	!	*Lomandra preissii*	FEMALE								F	F	S					
	!	*Laxmannia ramosa*	Branching Lily	X	X					BF	BF							B
	!	*Laxmannia sessiliflora*		X	X						BF	F	F	S				
	!	*Laxmannia squarrosa*		X	X						B	B	F	F	F	BF		
	!	*Lomandra caespitosa*	MALE Close Tufted Matt Rush															
		Lomandra caespitosa	FEMALE Spread								B		F					
	!	*Lomandra hermaphrodita*	MALE	X	X						F							
		Lomandra hermaphrodita	FEMALE								F							
	!	*Lomandra suaveolens*	MALE pale purple form	X	X													
		Lomandra suaveolens	FEMALE															
	!	*Lomandra nigricans*	MALE	X	X	X						BF	FS	F	F	FS		
		Lomandra nigricans	FEMALE															
	#	*Sowerbaea laxiflora*	Purple Tassels											B	F			
	#	*Thysanotus multiflorus*	Many Flowered Fringe Lily															
	#	*Thysanotus patersonii*	Twining Fringe Lily	X	X										F	F		
	#	*Thysanotus sparteus*	Fringe Lily				F	F	F								F	
	#	*Thysanotus triandrus*												B	F	F		
	#	*Tricoryne elatior*	Yellow Autumn Lily															

An Environmental Weed Strategy for Western Australia

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David Kaesehagen, Ecoscape (Australia) Pty Ltd

The Department of Conservation and Land Management (CALM) is responsible for managing the impact of weeds on the biodiversity values associated with natural ecosystems in Western Australia. CALM manages conservation values on over 19 million hectares of terrestrial estate comprising National Parks, Conservation Parks, Nature Reserves, State Forests and Timber Reserves. In addition, CALM manages 1,145,940 hectares of marine estate consisting of Marine Parks and Marine Nature Reserves. CALM is also responsible for the conservation of flora and fauna on all lands throughout the State, ensuring that flora, fauna and special conservation values, such as threatened flora, fauna and ecological communities, are protected.

A major threatening process is the impact of weeds, in particular those known as environmental weeds. As for any landholder managing weeds it is vitally important to know what weeds are threatening these values and where they are located. It is also important to determine their relative importance in terms of environmental impact. This allows objective decisions to be made about the allocation of scarce resources to their control.

Given that the weed problem extends to all lands, not only those managed by CALM, the development of an environmental weed strategy that could encompass all land tenures and land managers would provide a framework to enable effective control operations to be undertaken whilst optimising the use of resources available to all the stakeholders (government, community and industry).

The Environmental Weed Strategy for Western Australia (EWSWA) is intended to be complementary to the National Weed Strategy and has a structure and content similar to other State Weed Strategies. However, the EWSWA is not a State Weed Strategy. Its emphasis is on environmental weeds only, not agricultural weeds. It is intended that this Environmental Weed Strategy will contribute to the preparation of a more comprehensive State Weed Strategy at some future time, which will include environmental and agricultural weeds.

CALM allocated $40,000 to the project which was supplemented by $35,000 of Natural Heritage Trust funds and resulted in the development of a draft Environmental Weed Strategy for Western Australia and an associated environmental weed database (CALMweed).

We believe the strategy and database that has been developed delivers the framework and information repository necessary to encourage all land managers to work cooperatively toward compatible objectives, ensuring best utilisation of all available resources.

The strategy was developed under the guidance of a steering committee consisting of representatives from the National Parks and Nature Conservation Authority, the Wildflower Society, Environmental Weed Action Network, CALM, Agriculture WA and the Water and Rivers Commission. A consultant, Ecoscape, was engaged to develop the strategy document and the database.

The consultant worked closely with the steering committee. A workshop of experts in the weed management field, from both government and community, was held to determine stakeholders' expectations. This information was used to model the final shape and content of the database and the strategy. Information on weeds from many sources was then collated and entered into the database.

The Strategy collated the large amount of data already held by CALM, other land management agencies and community interest groups on environmental weeds, the threats they pose to biodiversity and the most appropriate means of control. This information is presented as a strategy document supported by a database to be used by weed managers.

The Environmental Weed Strategy document addresses issues under a number of component headings:

- Coordination and Integration
- Roles and Responsibilities
- Introduction, Spread and Effects on Biodiversity
- Means of Control and Integrated Weed Management
- Rehabilitation, Monitoring and Evaluation
- Priorities and Planning
- Resources
- Public Awareness and Community Involvement

And is supported by a number of appendices:

- List of Environmental Weed Species of Actual & Potential Significance in WA.
- Criteria used for Ranking Significant Environmental Weeds of WA
- Database on Environmental Weeds of WA. Database includes; scientific name, common name, bioregion, CALM region, priority ranking, actually significant, potentially significant, etc

The database contains a large proportion of the in-

formation currently available for the environmental weeds identified in WA. The current version of the database will be distributed with the EWSWA as a CD-ROM. At some future time, when user protocols and database functionality have been finalised, it is expected to be available online to all interested users, including community and local government.

This will enable users to interrogate the database to determine what weeds are in their locality, and how important they are (priority for control). Users will also be encouraged to contribute information to the database to ensure it is complete and up to date.

WA is a very large State consisting of a range of climatic zones and number of bioregions. The EWSWA and the database emphasise bioregions, not State or administrative boundaries. The database is designed to allow extraction of information in reference to Bioregion, Shire and CALM Regional boundaries.

The information on the database for each weed consists of a picture, information on the name, origin, means of introduction, whether it is a weed elsewhere, its availability from commercial nurseries, life form and biology, a priority ranking, location information of known infestations and the effective methods of controlling the weed. The list of field names is itemised in the appendix.

Most importantly, dealing with the range of weed situations found in WA requires a means of consistently ranking and prioritising weeds for action. The EWSWA presents a consistent methodology for determining priorities at State, bioregional and local scales. The prioritisation process can be very demanding and require the assimilation of a large amount of information of varying quality, currency and complexity. It also requires a great deal of experience and knowledge. An experienced and expert weed manager carefully considered the information collated for each weed using the criteria defined by the EWSWA to determine the priority allocated in the database.

There are four broad priorities – Low, Mild, Moderate and High. These ratings are developed by applying three criteria to each environmental weed:

- **Invasiveness** – ability to invade bushland in good to excellent condition or ability to invade waterways.
- **Distribution** – wide current or potential distribution including consideration of known history of widespread distribution elsewhere in the world.
- **Environmental impacts** – ability to change the structure, composition and function of ecosystems. In particular, an ability to form a monoculture in a vegetation community.

The rating for each weed is then determined as:

- **High** – if a weed scores in the affirmative for all the criteria. Rating a weed species as high would indicate prioritising this weed for control and/or research.
- **Moderate** – if a weed scores in the affirmative for two of the three criteria. Rating a weed species as moderate would indicate that control or research effort should be directed to it if funds are available. It should be monitored closely if action is not possible.
- **Mild** – a weed species scoring in the affirmative for only one of the criteria. Rating a weed species as mild would indicate a requirement for monitoring and control where appropriate.
- **Low** – a weed species would score in the affirmative for none of the three criteria. Rating a weed species as low would indicate a low level of monitoring is required.

Having achieved a priority list, there is a requirement for integrated and coordinated action by all affected land managers. An integrated approach needs to accommodate the variety of objectives of land managers, the biology of the weed, the environment/s in which it exists, the feasibility of control strategies, the availability of resources and the research that needs to be undertaken to fill knowledge gaps.

Under the umbrella of the EWSWA it is possible to establish coordination groups to develop regional and local weed action plans. This cascade of plans from State to regional to local levels will allow consistency in approach to environmental weed management whilst allowing regional and local flexibility in funding, resourcing, executing and researching weed management issues.

It is hoped that the framework supplied by the EWSWA will enable all land managers and concerned community groups to develop local, catchment and regional weed action plans as a cooperative effort. Action plans will allow environmental weed control to be satisfied in the most effective and efficient manner possible with the skills and resources available to all the stakeholders involved.

Appendix – CALMweed database field names

Taxon Identification (derived from WA Census)

- Taxon Identification Number
- Genus Species
- Family
- Infraspecies
- Common names

Origin

Country of origin or, with Australian plants, State of origin.

Introduction

Method of introduction, e.g. horticultural purposes.

Weed Elsewhere

Other countries or Australian States where the plant is an environmental weed.

Availability

Availability from commercial nurseries.

Life Form

Annual, biennial, tree, vine etc.

Time to first fruit

Time in months to produce first fruit.

Fruiting time

Fruiting time in days.

Dispersal time

Time it takes in days before all fruit is dispersed.

Seed Dormancy

Period of seed dormancy (years, months).

Dispersal

Means of dispersal e.g. animal, wind etc.

Ranking

Ranking status (High, Medium, Mild, Low) or no record; Person who undertook ranking and date.

Observations

- Location
- Date
- Source
- Collector name, collector ID
- Recency
- Infestation
- Soil type
- Landform
- Vegetation type
- Latitude
- Longitude
- AMG co-ordinate
- Interim Biogeographical Region of Aust (IBRA)
- Shire
- CALM region
- User ID

Control

Means of control

- Mechanical
- Temperature
- Chemical
- Biological

Suggestions on control.

Notes.

Notes

General notes page on the weed, may include botanical description and any other points of interest.

Pictures

Pictures of the plant including close up of flowering inflorescence.

Integrated Environmental Weed Management

Rod Safstrom
Environs Consulting Pty Ltd

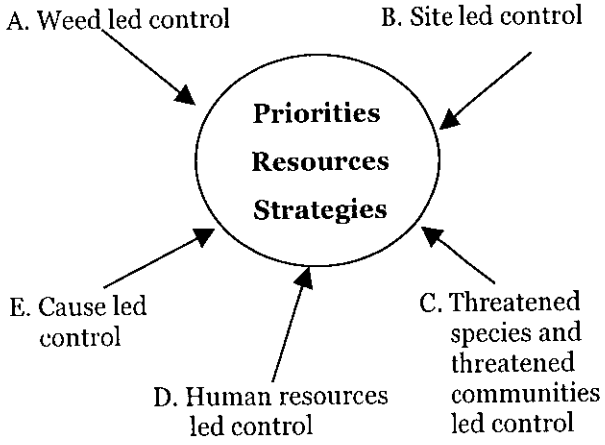
This paper is derived from the Draft Environmental Weed Strategy for Western Australia prepared for the Department of Conservation and Land Management by Ecoscape (Australia) Pty Ltd in association with Environs Consulting Pty Ltd, Ben Carr and Associates and Merriweb.

Introduction

There are limited resources for environmental weed control and it is important that these resources are applied most effectively to achieve strategic weed management. The purpose of this paper is to provide a pathway towards a successful integrated weed management program.

Integrated weed management is the combination of social, economic and technical approaches that leads to successful weed control. It involves the planned use of all control options, including weed led control, site led control, resources led control, threatened species and communities led control, and cause led control as shown in Figure 1.

Figure 1. Environmental Weed Management Approaches



The challenge for environmental weed management is to look at weed control from a number of angles, to fully consider the range of possible approaches and then to decide the combination of approaches which will maximise nature conservation outcomes and minimise adverse environmental impacts.

At a regional, local and patch scale it is rare that a single one of the approaches described in this paper would be used alone and normally a combination of approaches is employed. What is important is that each approach is fully explored so that a strategic approach which utilises the best elements of each pathway is considered. In the end the decision as to the best combination of approaches will be a judgement-based consideration of effectiveness of methods, urgency for control, the anticipated conservation outcomes and the resources available. The framework of control options developed in this paper provides the basis for a strategic approach to environmental weed management.

A flow chart for environmental weed management is provided in Figure 2.

Weed led control

Controlling potentially significant new species is essential if control is to be effective in the long term. Weed led control is a proactive strategy to prevent introduction, establishment, survival, reproduction and dispersal of an emerging environmental weed before it becomes a major problem at either patch, local, regional, state or national level. Prevention and eradication is a powerful tool for managers in their efforts to control the expanding number of weeds.

It is possible to eradicate localised populations of weeds at all scales in many circumstances. A small effort early in the invasion process can save considerable effort or loss of ability to control in the long run. For example early control of a small population of *Briza maxima* in an isolated wheatbelt reserve could prevent the weed overrunning the reserve. The key is good identification of the effort required, both in amount and duration, to ensure that control is possible, that the resources are applied and the effort sustained for sufficient time to achieve the goal. Eradication campaigns generally fail if one or more of the following criteria are not met:

- the population of the target species must be highly localised and the boundaries of the population assessed before hand;
- an effective control method needs to be available;
- the infested area must not be continuously reinfested from surrounding areas or from nearby cultivated specimens.

(S. Csurhes and R. Edwards, 'Potential Environmental Weeds in Australia', *Environment Australia* 1998)

A strategic approach to the removal of localised populations of individual weed species or small numbers of weed species is outlined in Figure 3.

Figure 2. Flow chart for integrated environmental weed management

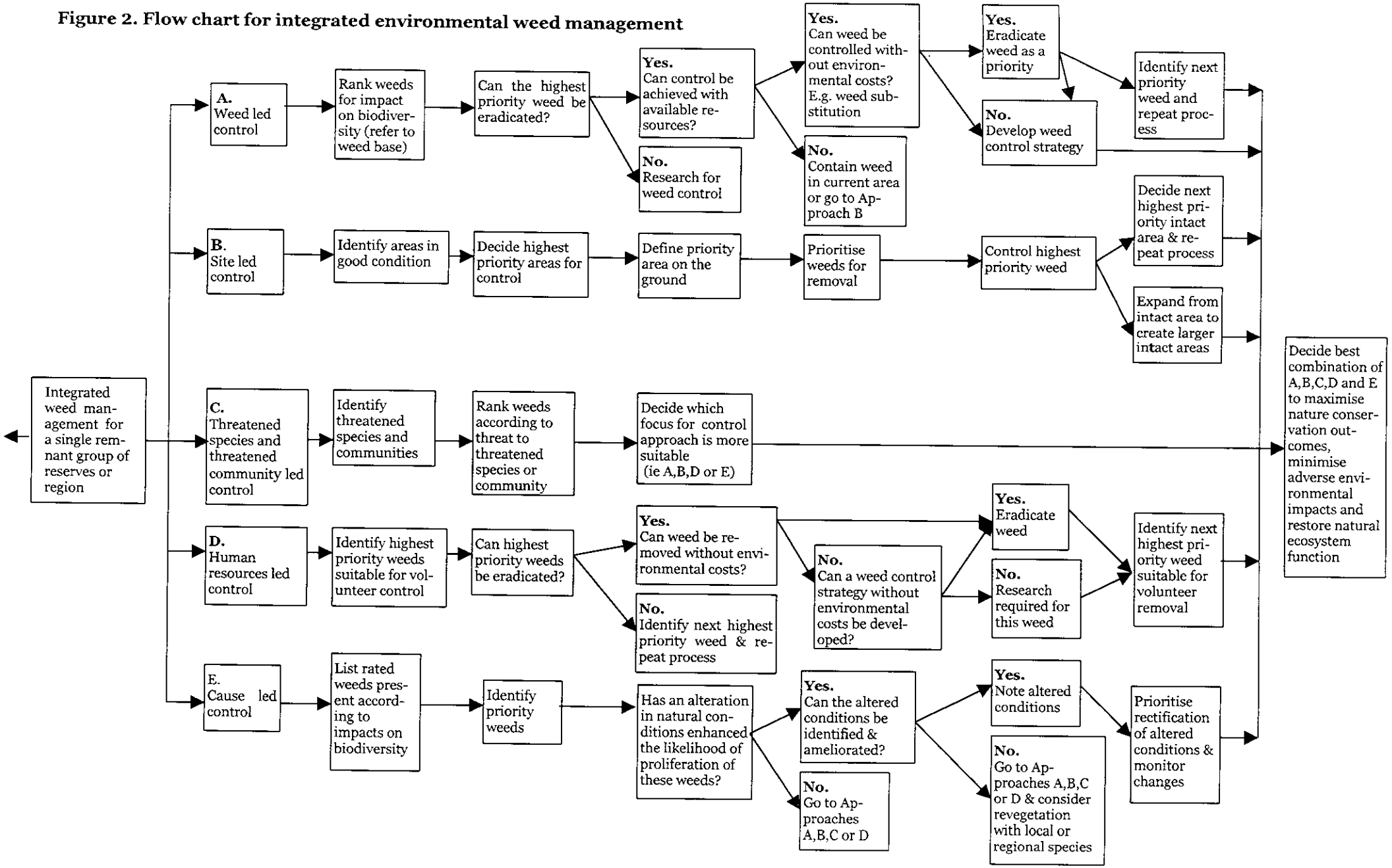
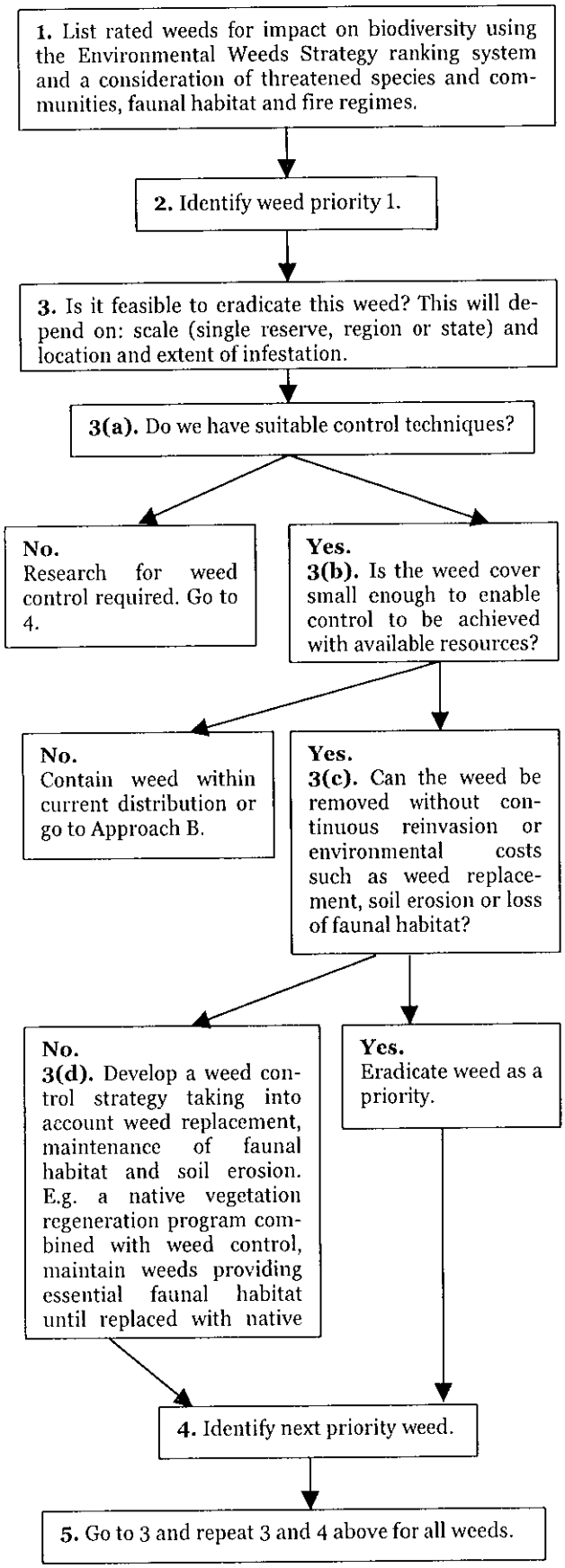


Figure 3. Weed led control — strategies for the removal of individual weed species or small number of weed species

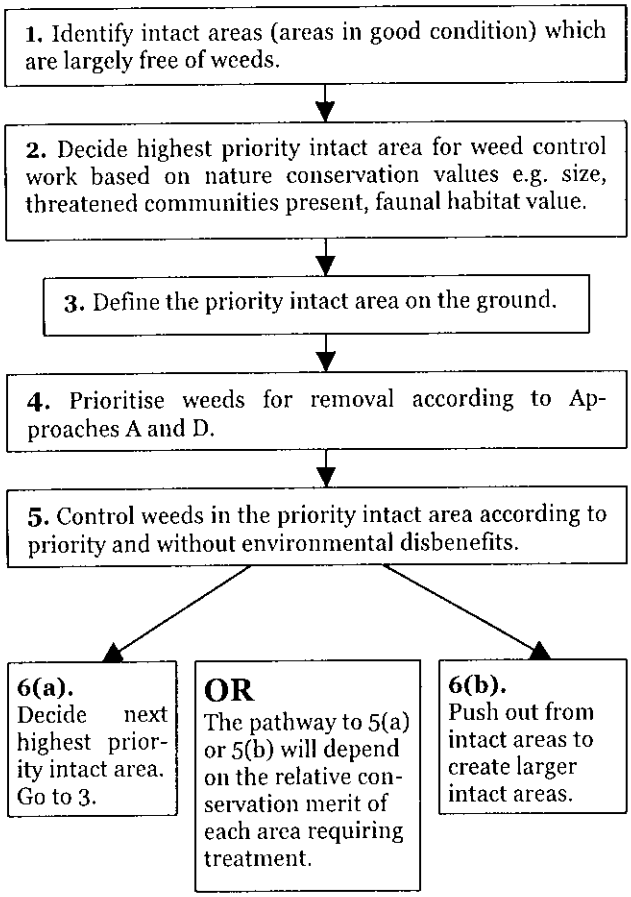


Site led control

Site led control focuses on identifying areas that require weed control to maintain their ecological values and sites which are currently in good condition and can maintain or improve that condition with planned effort. In some cases it is possible to expand control from areas in good condition to gain larger intact areas. The priority ranking of a proposed site led program is based on the biodiversity value of the core management unit and the urgency of control.

A strategic approach to identifying priorities for site led control is provided in Figure 4.

Figure 4. Site led control — strategies for protection of habitats currently largely free of weeds



Threatened species and threatened communities led control

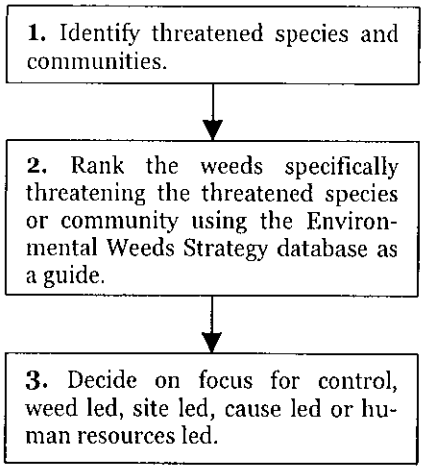
This approach places the protection of threatened species and threatened communities on public and private land as the highest priority for weed control. This is a subset of site led control where the site is identified by the presence of a threatened species or community.

While the protection of threatened species and communities is a very high priority to prevent extinctions, the disadvantage is that it focuses on points in the landscape and also needs to consider

the broader environment which may provide a continuing source of weeds.

A strategic approach for threatened species and threatened communities led control is provided in Figure 5.

Figure 5. Threatened species and threatened communities led control for protection of threatened species and communities as the highest priority.



Human resources led control

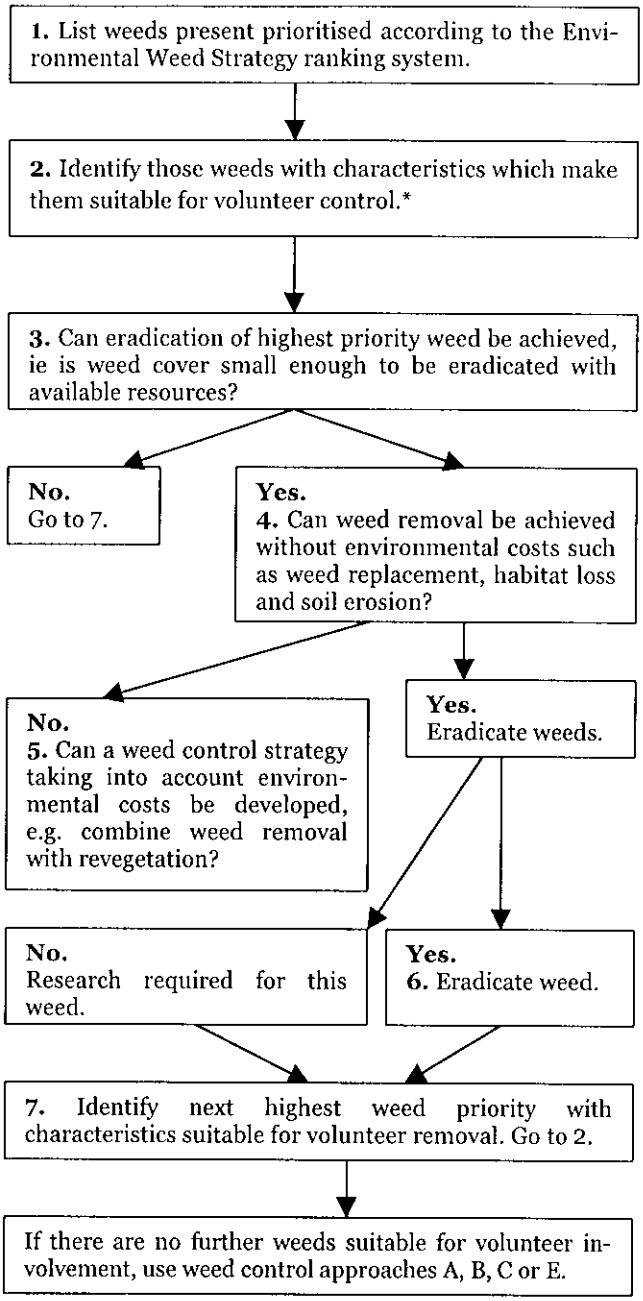
People and communities are becoming motivated to manage natural areas as evidenced by the steady growth of 'friends' groups and considerable effort by volunteers. Many of these groups are concentrating on bush regeneration and making significant contributions to weed control in natural areas. There is also an increase in professional contractors and some municipalities are employing staff with expertise in environmental weed control.

Establishing priorities for weed management can be difficult, and in some cases lack of understanding of ecological processes leads to weed replacement and continuous reinvasion. In these circumstances volunteers and professionals can lose motivation.

A human resources approach will identify which weeds and particular circumstances are best suited to volunteer control and those that are better managed by professionals. It may be better for volunteers to target small populations of highly visible weeds which can readily be removed by simple manual or chemical methods and which are suited for essential follow up and monitoring. Professionals may be best used where spraying or machinery or a concentrated effort is required.

A strategy for human resources led control – recognising control strategies for volunteers and professionals is provided in Figure 6.

Figure 6. Human resources led control – recognising different weed control strategies for volunteers and professionals



*Weeds suitable for volunteer control, e.g. highly visible weeds which can be readily removed by simple manual or chemical methods.

Cause led control

Many environmental weeds are proliferating because they are able to take advantage of disturbances such as:

- a change in soil conditions either by altered water regimes or increased nutrients;
- unnatural soil disturbances such as earthworks;
- changed fire regimes which alter ecosystem process and create niches;
- constant reinfestation from external sources.

This approach to weed control focusses on control-

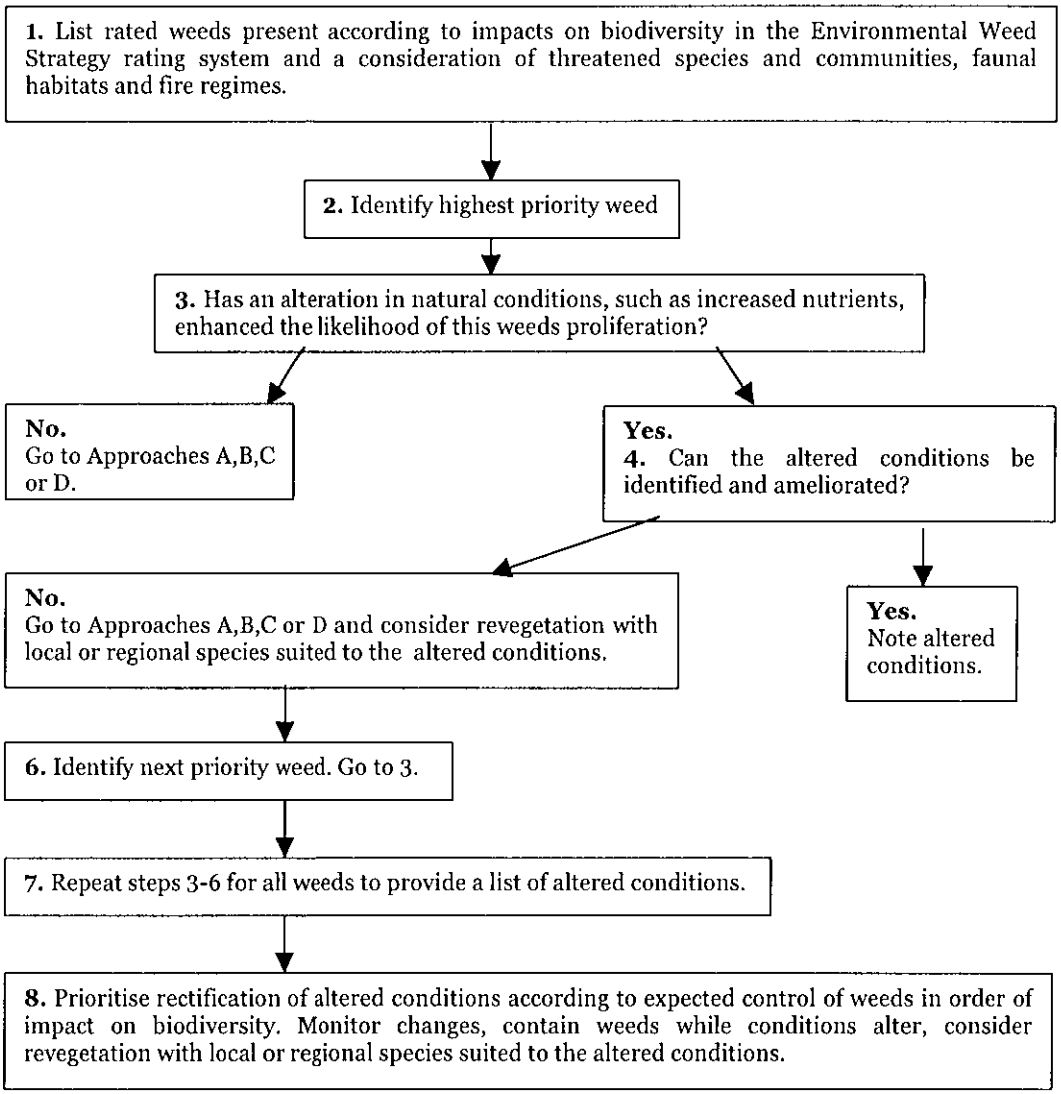
ling, reducing or eliminating disturbance factors that increase ecosystem vulnerability. Examples of this approach may include:

- control of access through bushland areas and rehabilitation of superfluous tracks;
- control of grazing in bushland areas and riparian vegetation through fencing of remnants;
- control and management of sources of nutrients entering water ways through planning controls and improved land management practices.

Cause led control can be seen as preventative in terms of ensuring that vegetation in good condition is protected from disturbances through planning controls and effective management strategies. Once environmental weeds are established, then control of disturbance factors is an important adjunct to other control methods in order to ensure effective control of environmental weeds and protection of environmental values.

A strategy for considering a cause led approach is provided in Figure 7.

Figure 7. Cause led control — recognising that the reasons for a weed's presence may be due to altered conditions which need to be addressed for the weed to be controlled.



Management & Resources

Mark Couston
Manager of Bushland Conservation, Ku-ring-gai Municipal Council, NSW

Introduction

The term 'management' implies making conscious decisions and the term 'resources' implies how much you have been given to work with.

Management

In most cases a manager is responsible for either a business or an asset. Businesses tend to deliver services such as garbage collection or video hire, or to supply goods. Assets include road networks and buildings, and tend to be constructed items of some value. In most cases the asset is either a place or infrastructure which is used to deliver services. For example a building (the asset) may provide a place from which a library operates (the service).

When we talk in terms of bushland, most people don't directly pay for the services bushland areas provide. Quite often they don't realise the services that bushland areas provide. Whether they do or don't doesn't matter in this paper, the important issue is to consider bushland as an asset.

Land management

Most land managers recognise their property and the improvements as an asset regardless of the land use. Farmers realise the importance of acreage and topsoil, road managers value the networks and road surfaces, and residents value their property and improvements. Land managers, like any asset manager, have to know the extent of the asset, the values attributed to the property and what condition it is in.

Now this may seem a waste of resources, finding out what exactly you are meant to be managing, but it is a fundamental principle.

If we put this into a bushland context, then you as the land manager need to know these principles. Even if you are a volunteer you need to establish the boundaries of the area, identify the values — even if they are just your values — and you need to assess the condition. In bushland terms this is called simply 'site assessment'. One trap land managers fall into is that they apply these management principles to a particular site or one part of the area they are responsible for with total disregard of the rest of the area. If this is the approach you take the land manager becomes the project manager and the question arises, who is the responsible land manager?

The business of resourcing

The manager should decide how resources should be spent after the board of directors decide how much should be spent, and any decisions made by the board of directors ultimately have to be justified to the shareholders. Excuse me here for not mentioning weeds or fauna or any other recognisable bushland issue but these form the business side of managing bushland. You may well ask where do the community, local or state government and the politicians fit in to this and what about the bushland itself? Well the bushland doesn't matter in this process. It is the same process whatever the corporate business is, it just happens that bushland is a corporate business of many governments, just like road management, waste collection and child care services.

Presenting a case for resourcing

It is important for managers to present a clearly understood picture of the extent of the asset, its values and its condition to those who make the decisions about the level of funding. In NSW local government the council makes the final decision as to the level of funding based upon community needs or their perception of community needs. In this situation, if a picture is clearly understood by the council then it is clearly understood by the community who can therefore voice their opinions.

In Ku-ring-gai (NSW) there are three main outcomes associated with the management of bushland: the condition of bushland vegetation, aquatic ecosystems and fauna populations. At present we are still putting together the fauna assessment methods with Macquarie University. These methods use rapid assessment techniques and provide an indication of condition. They are not full surveys. The benefit of this type of assessment is that it can provide a statistically correct indication which is based upon scientific research or principles. Basically you can get meaningful results with minimal efforts. How these are reported to Council is extremely important as many Councillors have to wade through voluminous amounts of information on a regular basis. The simpler and more graphical the better understood.

Once you get resources what do you do with them?

Again you may say the amount of resources going into monitoring could be better spent on actual work on the ground. To get an idea of how much should be spent on monitoring you may want to look at other industries. What level of expenditure in other industries is allocated to monitoring the market that they are in? How much money does a successful business spend on promotion to attract sales? How

much money is spent on monitoring production, and don't the shareholders (the community in this case) have a right to know what is being achieved?

To give you some perspective on the private sector, service industries can spend up to 50% of their gross turnover in management, marketing and promotion costs whereas manufacturing industries or industries producing goods may spend as little as 20% on management, marketing and promotion.

In Ku-ring-gai less than 12% of the total bushland expenditure is spent on management and this comprises approximately 9% on management administration and 3% on asset monitoring.

What are the management issues and what is the best way to go about dealing with the issues?

If bushland conservation is the land use then there are the typical issues of weeds, feral animals, bush fires, encroachments, water pollution, sedimentation/erosion etc. Most times we face these issues head on with action on the ground or by administering regulatory controls. Sometimes the cost of actions on the ground is subsidised by the goodwill of volunteers. However, in making the decision to tackle the issues directly we sometimes forget the other management approaches to deal with the issue. These other management approaches are through education and offering incentives.

Usually one approach won't effectively deal with the issue and the best mix of actions on the ground, regulatory controls, education and incentives, very much depends upon the issue.

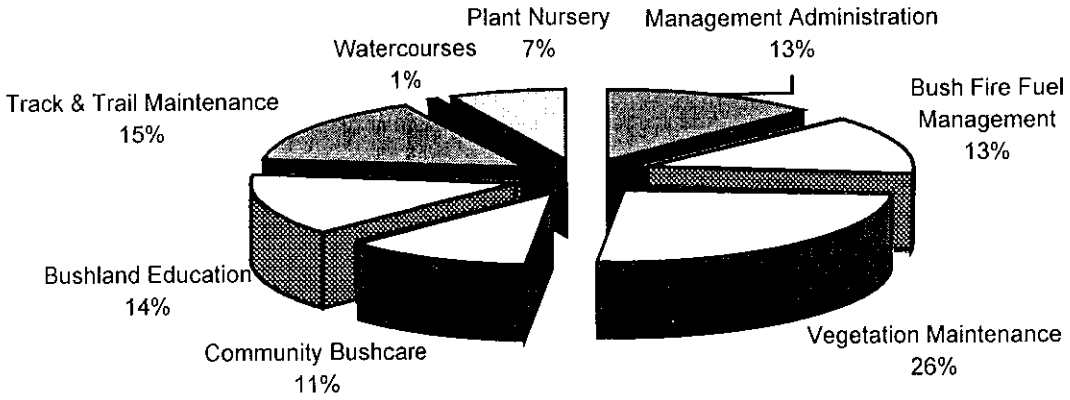
Management programs in bushland in Ku-ring-gai

Of the total budget of Ku-ring-gai Municipal Council just over 3.6% is spent directly on managing the 1,100 hectares of open space bushland, which occupies 13% of the local government area.

The percentage break-up for each program within bushland has evolved with adjustments made annually. The figure below represents the budget break up within bushland management. The total expenditure allocation in 1998/99 financial year is $2,000,000, and not included in the graph below is the $200,000 income expected from bushland.

To put this in perspective with other open space land management in Ku-ring-gai, Figure 2 below represents the expenditure in dollars per square metre excluding management and administration costs.

In 1998 Ku-ring-gai Municipal Council commissioned a survey to gauge the attitudes of the residents to the various services it provides. In the survey the community were asked what services were important to them and what was their level of satisfaction with each service. Figure 3 below highlights the results that are relevant to the Open Space management.



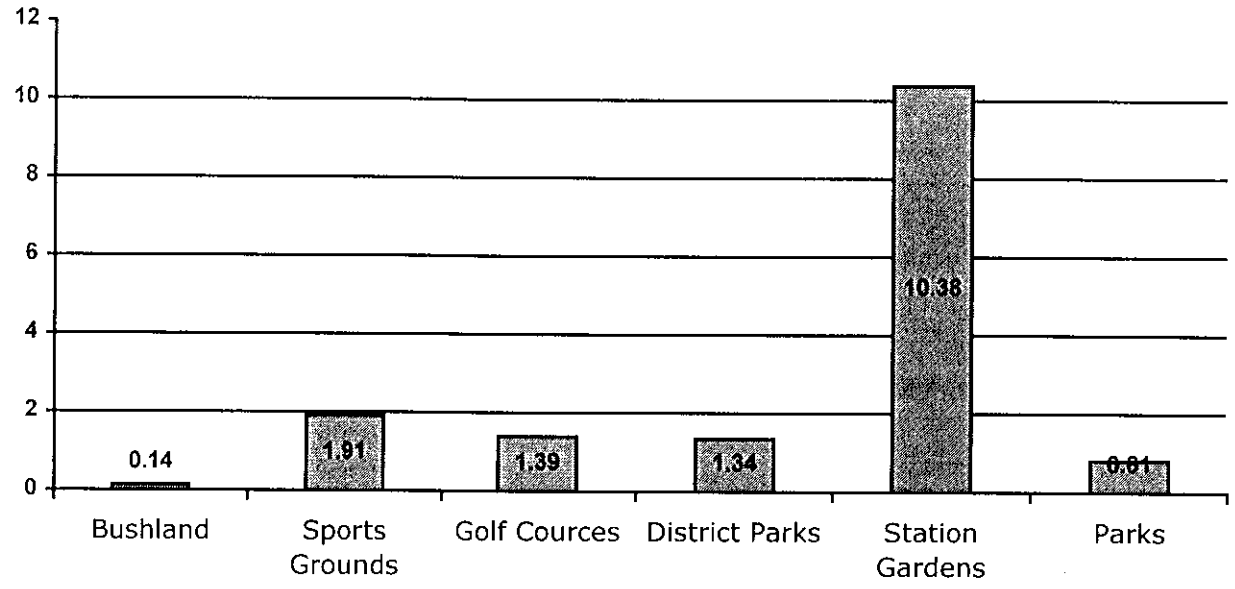


Figure 2: Expenditure of Various Open Space Land Uses (dollars/ sq m)

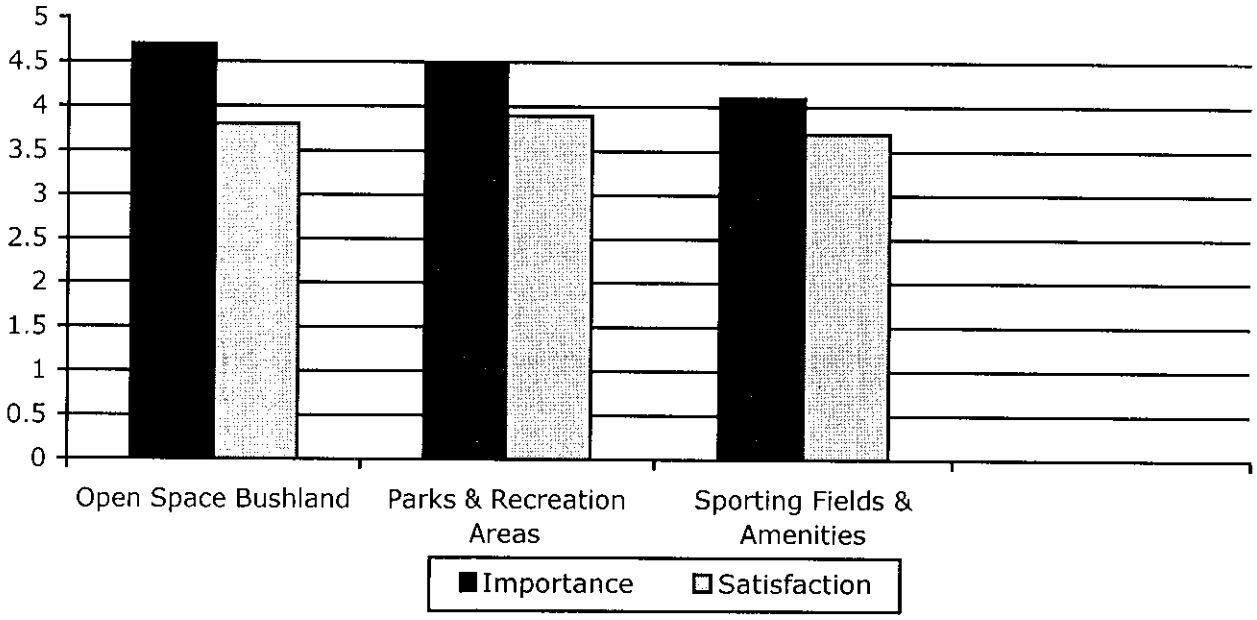


Figure 3: Community Importance and Satisfaction (ranked 1-5)

Summary

I have purposely not mentioned the various external sources of funding such as grants, sponsorship and State government subsidies. These tend to be offered on a dollar-for-dollar basis or require expenditure up front and should also be considered within the same management philosophy and approach to those resources allocated by local authorities.

The management of bushland in most Sydney councils some ten years ago was heavily focused on technical issues associated with biology and ecology. Whilst these still remain as significant considerations underpinning most management decisions, the focus of many Sydney councils has shifted, bringing bushland management in line with the corporate business approach. Whilst some opinions do differ from this view, saying that bushland should not be compared to a business, I believe that this approach does raise the profile of conservation, demonstrates a higher degree of professionalism in the way bushland is managed and brings it into line with other corporate objectives.

If bushland conservation has to compete for resources with other functions of government then sound asset and business management approaches will be of great importance.

Interim Management – 'The Quiet Achiever'

Matt Stafford
Ministry for Planning

When each of us (as speakers) are introduced to those of you listening here today, you may well be wondering as to our individual authority to speak on our chosen topics.

In my case, I am drawing on my experience as a Regional Field Management Officer for the various State planning agencies that have existed in Western Australia over the last fifteen years.

You may well ask, 'What does a planning agency have to do with bushland management?' And rightly so, because that is one of the points that I will be trying to make. By default under duty of care, by personal choice or in compliance with Department of Environmental Protection requirements, many of you here today are finding yourselves in that position.

That being the case, we must now examine exactly what 'interim management' can mean for us.

In the case of the Ministry for Planning, we had become one of the largest owners of urban bushland, and the brief of the section that I work for was to 'maintain and preserve the existing integrity of that land so as to allow an unbiased choice in regard to the eventual use and end manager of that land.'

Reading between the lines, not knowing that end purpose of each piece of land, made this type of goal a difficult task. Obviously, in order to preserve all choices, there had to be an assumption of an intent to preserve it from a biological viewpoint.

So, you may be thinking by now, 'what is interim management?'

Interim Management, according to my interpretation anyway, is a loose term applied to varying types of management carried out by persons or agencies looking after the best interests of large tracts of urban bushland with limited staff and monies to do so.

It is the nuts and bolts of land management: no frills, no time for bird studies, scientific research, creation of picnic areas or other recreational services. It is a case of purely giving nature the hand that it needs to look after itself in an otherwise modified environment. We say that the yardstick of success is the overall appearance of the quality of that land over a period of years (without having to know the precise details).

You may notice that I tend to emphasise fire management during this presentation and you may wonder what that may have to do with land management, rather than fire brigades.

This is because the very roots of our agencies' beginnings in 'interim management' started indirectly from the coronial inquiries following the 1982 Ash Wednesday bushfires in the eastern states, which determined, for the first time, some of the liabilities of landowners. All our original funding was only provided to satisfy duty of care for fire prevention but it soon became clear that the reserve well managed for fire, was also a reserve well managed for all other purposes.

Achieving our goal of interim management

Over the fifteen years of my experiences, I have found out, painfully at times, that much of this type of management was trial and error, in the absence of any previous cases to compare with or learn from.

However, luckily for others, a reasonably successful formula has emerged for those now alighting upon the same path.

Fire management will always be an inseparable component of bushland management plans, as one will not survive without the other (in fact you should never consider them as two separate plans).

Overall management of your bushland will show a drastic reduction in the amount of bushfire damage, both by a reduction in the frequency of fires, by having a better relationship with your fire brigade and more sustainable public use of the area.

The first component of having a piece of bushland being respected by nearby users of a 'non-greenie' nature is to psychologically declare it as 'something'.

In order to do this we have to define boundaries, usually by fencing or, in some instances, by firebreaking boundaries and signage or a combination of all of these. These tools make it visually 'something' to the uninitiated, which is the first step in creating a public conscience and a reason for parents to reprimand or educate their children in appropriate uses of such a 'reserve'. A deliberate play on words here — a 'tract' of urban bushland has now visually become a reserve, not only to the public, but you will also find an increased respect shown by other government agencies when working in such areas.

The second phase of our creation is to assist fire brigades in the event of a fire by dividing the area into fire compartments. These can be complemented by

the creation of maps (however simple) which can be discussed with your fire brigade. Prior to the fire season, and even off season, orienteering exercises could be carried out in preparation for an emergency. These maps can double up for recreational purposes such as information for bushwalkers or even as a working tool when directing workers to work on a particular problem in a particular section of your reserve. Another voluntary involvement activity could be to record the previous fire history, which could be extremely useful in the event of a bushfire.

If there are previously degraded areas within your reserve where 'improvements' still exist in a state of decay, or where large areas of land have been cleared and used for grazing purposes, a choice must be made between two possible courses of action. Either create 'low fuel zones' by annually slashing grassed areas, which might also give active recreational areas to users who may not be interested in bushland, or rehabilitate — usually too intense for interim management resources. In either case, it is usually prudent to demolish and remove all existing 'improvements' as these generally are a source of reserve abuse.

So, let us take a little time to review what we have just achieved within our reserve. We have fenced, firebreaked the perimeter, added informative signage, created fire compartments (walk trails for bushwalkers), maps for the fire brigade (maps for orienteering/bushwalking/work programs), cleared away improvements, and created low fuel zones (active recreational areas). Probably the only things left to do are to create things such as community firewatch, for early callout to fires and also to raise the awareness of danger and state of preparedness on the part of neighbours. And of course there should be follow-up maintenance patrols to assess and repair ongoing vandalism and to maintain that 'illusion' we have now called our 'reserve'. Volunteers could also be involved in tasks such as weed monitoring, planting out areas and public education.

As a postscript to this paper, you may well be thinking, 'But does it work? What does it achieve?' Well I can tell you. Over the last fifteen years, some of the most nondescript, degraded lands that came into the ownership of the (now) Western Australian Planning Commission have now been reassessed as environmentally and recreationally significant enough to create one of the most exciting park systems that Perth has ever had, Regional Parks.

What is Local Government Doing?

Mary Gray
Urban Bushland Council WA

One of the objectives of this conference is to focus on local government and its initiatives in statutory protection and management of urban bushland. In order for us to gain an overview of the magnitude of bushland areas and resources allocated by each council in the metropolitan area, a simple survey was conducted with a one-page questionnaire.

The questionnaires were sent by mail to all municipalities in the metropolitan region as well as a few in adjacent areas, such as Chittering and Mandurah. Councils were asked to fax back their responses. After some telephone and fax reminders, 25 Councils responded, out of a total of 33.

A copy of the questionnaire is shown in the appendix, and the responses are shown in the following tables. A summary of the responses is given below.

Population and area

The size and population of municipalities varies dramatically in the Perth Metropolitan Region. The smallest is the Shire of Peppermint Grove, with a population of just 1546 in an area of 150 ha. The City of Stirling is more than one hundred times larger, with 174,000 people in 10,940 ha.

There are nine relatively large councils with more than 50,000 people: Armadale, Canning, Cockburn, Joondalup, Wanneroo, Kalamunda, Melville, Stirling, and Swan. Small councils with populations of less than 10,000 include Chittering, Claremont, Cottesloe, Peppermint Grove, and Perth.

Area of bushland managed by Councils

Most councils have bushland reserves under their control. Some are unaware of the total area of bushland in their municipality.

The number of reserves controlled by each Council varies markedly from zero for Perth, Subiaco and Vincent, to 51 for Armadale, 55 for Stirling, to 400 for Mundaring. Only three or four Councils manage more than 1000ha of bushland. It should be remembered that there are large chunks of State Forest and Crown reserves which comprise bushland in the Darling Range portion of the metropolitan region.

Budget allocations to Bushland Management

Budget allocations to bushland management fluctuate wildly from zero for a council with about 500 ha of bushland under its control to Cockburn City's $446,474. Only a handful of councils spend over $100,000 per annum on managing bushland.

Staff

Thirteen out of 25, or half the councils, employ Environmental Officers.

Only four councils, however, employ Bushland Managers.

Seven councils employ Bush Regenerators, to a total of 13 staff. Six of these staff are employed at the City of Stirling where they comprise a bush regeneration team.

Not one Council employs a Bushland Education Officer.

Fire Prevention or Fire Control Officers, however, are more commonplace, with 12 Councils employing them. In some cases Rangers double as Fire Prevention Officers, although some councils focus on fire in buildings and have no bushland (Perth, Vincent).

Expertise

Councils were asked about the main source of expertise they use. Most use their own in-house expertise, consultants and contractors. Only three councils mentioned state government agencies (CALM, DEP, Agriculture WA) and one mentioned Kings Park.

Others mentioned individual experts such as Bronwen Keighery and Bob Dixon.

Town planning schemes

Four councils mentioned heritage inventories and heritage protection provisions (for bushland) in town planning schemes. Five councils include tree protection controls for large lot developments, while Melville includes vegetation protection for development.

Two councils — Serpentine-Jarrahdale and Stirling — have conservation zones in their town tlanning schemes. Melville has a conservation and recreation zone for Ken Hurst Park in its new Scheme No 5, which is not yet approved.

Appendix

MANAGING OUR BUSHLAND CONFERENCE

QUESTIONNAIRE TO LOCAL AUTHORITIES IN THE METROPOLITAN REGION

The Urban Bushland Council is holding a conference 'Managing our Bushland' on October 16-17, 1998. A focus of the conference will be the bushland protection and management activities carried out by local government in both WA and NSW. In order for us to gain an overview of the magnitude of bushland areas and resources allocated by each council in the metropolitan region, you are asked to respond to the following questionnaire as soon as possible but no later than 5th October.

A summary of responses will be presented at the conference.

PLEASE FAX BACK BY MONDAY 5TH OCTOBER to Swan Catchment Centre on 9221 4960

Local Authority _____

Contact person _____ Fax no _____

1. Population of municipality _____ Area _____ha
2. What is the total area of bushland in your municipality (on all lands)? _____ha
3. How many reserves (that you are responsible for) include bushland? _____
4. What total area of bushland is in these reserves? _____ha
5. What total Council budget allocation is made to bushland management $_____ /year
6. Does your council employ an Environmental Officer? Yes _____No _____
7. How many council staff are employed in bushland management?

   Bushland manager yes_____ no_____

   Bush regenerators yes_____ no_____ number_____

   Bushland education officer yes_____ no_____

   Fire prevention of fire control officer yes_____ no_____

   Other – please specify _____
8. What is the main source of bushland expertise used by your Council? _____
9. Is there a separate section in your Town Planning Scheme dealing with natural heritage or bushland conservation? Please give details.

   _____

Thank you for your time and thought

Please fax back to Swan Catchment Centre on 9221 4960

Council	Pop	Area ha	Bush area ha	No bush reserves	Area in reserves	Budget $ for bush	Environ officer	Bush manager	Bush regen	Educ officer	Fire officer	Other
Armadale	52,023	54,500	?	51	1192.51	74,845	no	no	no	no	yes	Manager pks & facilities + staff
Bassendean	13,230	1,100	?	10	?	nil	no	no	no	no	no	
Bayswater		32,800										
Belmont	27,500	4,000	~1000	4	30	100,000	no	no	yes	no	no	
Cambridge		2,200										
Canning	72,000	65,400	~100				no	no	Yes 1	no	no	Parks Env. officer 0.5FTE bushland
Chittering	~3400	117,500	27,000	20	~120	6000	no	no	no	no		1 Ranger – fire services
Claremont		490										
Cockburn	64,547	14,800		25		446,474	yes	Yes (=Env Officer)	no	no	yes	Env Tech Officer
Cottesloe	7500	400	6	2	6	nil	no	no	no	no	yes	
East Fremantle		320										
Fremantle	25,000	1,790	20	4	16		yes		yes - 1			Env project officer
Gosnells		12,700	(32%) 20% scarp	~15	~500	nil	yes	no	no	no	yes	
Joondalup }	148,047	9,660										
+Wanneroo}	69,987	68,750										
Kalamunda	50,000	37,000	23,500	240		147,000	yes	yes	no	no	yes	= 2FTE
Kwinana	22,000	12,000				15,000	yes	no	no	no	no	
Mandurah	42,000	17,900	(~35%)	160	?	~8,000	yes	no	no	no	no	Pks Tech Officer + Env Planner
Melville	95,000	5700	~350	~40	247	170,000	yes	no	2	no	no	Rangers +fire enforcement Officers
Mosman Park												
Mundaring	36,000	64,400	40,000	400	~25,000	150,000-200,000	yes				yes	Bushcare Co-ordinator soon

Council	Population	Area hectares	Bush area hectares	No bush reserves	Area in reserves	Budget $ for bush	Environ officer	Bush manager	Bush regen	Educ officer	Fire officer	Other
Murray	~10,000	180,000				nil	no	no	no	no	yes (2 rangers)	
Nedlands	21,000	2060	?	4	39.71	89,216 Inc capital S	no	no	no	no	no	
Peppermint Grove	1546	150	1.5	3	1.5	10,000	no	no	no	no	no	1 person
Perth	5,276	875	267	nil	nil	nil	yes	no	no	no	yes	
Rockingham		26,100										
Serpentine-Jarrahdale	10,000	90,000	41,400+	25	~150-200	55,000	yes		yes -1	no	yes	Landcare trainee
South Perth	35,394	19,900	~80		~80	~100,000	yes	yes	yes - 1	no	no	
Stirling	174,000	10,940	?	55	347	300,000	yes	yes - 1	yes - 6			~50% outsourced
Subiaco		710	nil	nil		-	no	no	no	no	yes	
Swan	69,112	102,900	~40,000	Very few	~400		yes (EMRC)	no	no	no	yes	Swan-Mundaring Community Catchment Co-ord
Victoria Park	26,720	1760	8	2 or 4?		12,500	no	no	no	no	no	
Vincent	25,500	1043	4	nil	nil	nil	no	no	no	no	yes -4	

Council	Expertise used	TPS: natural heritage or bushland conservation section	TPS: bushland protection or conservation zone
Armadale	Manager Parks &Facilities Community groups, Friends groups	no – under review in TPS	no
Bassendean	Bassendean Preservation Group	no	no
Bayswater			
Belmont	Contractors, environmental technicians	Tree preservation, Heritage provisions	no
Cambridge			
Canning	Internal staff: parks & streetscape services dept. Community & private consultants	no	no
Chittering	Landcare officer	Will be in new TPS being prepared at present	no
Claremont			
Cockburn	Env. Officer & Env. Technical Officer	no	no
Cottesloe		no	no
East Fremantle			
Fremantle	In house: Tony Baird, Shayne Boyle + network of consultants & other L.Govt	no	no
Gosnells	Contractors, consultants	Heritage inventory covers some natural heritage	no
Joondalup } +Wanneroo }			
Kalamunda	Specialist consultants/contractors, relevant govt agencies – DEP, CALM etc	Tree preservation zones in lots> 4000m2	no
Kwinana	Environ Officer, community, relevant experts, literature	No but there is a landscape protection policy	no
Mandurah	Parks technical officers and community knowledge	no	no
Melville	In house trained staff, external botanists, Kings Park & others	Not for bush conservation. Veg protection conditions in development approvals. Significant tree register in TPS	New conservation and recreation zone in Community Planning Scheme 5
Mosman Park			
Mundaring	Officers, govt agencies – CALM, local community	Tree preservation provisions for lots > 4000m2	no
Murray	Community catchment centre Pinjarra Agriculture WA, LCDC's	New TPS to include heritage provisions	no
Nedlands	Volunteers, ATCV	no	no
Peppermint Grove	Consultants & staff employed and trained in house	no	no
Perth	Not required	Natural heritage included in municipal inventory	no
Rockingham			
Serpentine-Jarrahdale	Local knowledge, Kings Park, experts such as Bronwen Keighery, Bob Dixon	Yes: a) Conservation zone b) Tree Preservation & Planting	
South Perth	Environ Officer, Bushland maintenance staff, community	no	no
Stirling	In house qualified and/or trained staff	Yes under TPS No2	yes
Subiaco		no	no
Swan	Isn't any	Bullsbrook Rural Strategy Gidgegannup Rural Strategy	no
Victoria Park	Parks staff, training courses	no	no
Vincent	nil	no	no

What are the Management Issues? — Community Perspectives

Kevin McLean
Friends of Signal Hill and Friends of Perth Airport Bushland

Over the past decade, community groups have fought very hard to save pockets and tracts of remnant bushland in and around Perth. Thankfully many blocks have received some measure of protection. But having worked to protect these areas community groups are now increasingly involved in the task of actually managing urban bushland remnants.

This paper will identify a range of key environmental management considerations and draw special attention to a number of associated issues which remain problematic from the perspective of community groups involved in bushland management.

To introduce the subject of community perceptions and experiences regarding bushland management issues, it is expedient to refer to a more or less conventionally accepted list of matters which may or may not require specific treatment in the drafting of environmental management plans, and in the carrying out of practical management tasks. The relevance and prioritization of these management considerations is likely to vary from site to site, and over time, with respect to any particular site.

It is not proposed to present a detailed discussion here but rather to briefly set out management issues of special concern to community groups. The issues will be described succinctly and rendered in point form under appropriate management tasks.

The production of management guidelines and management plans

A great many bushland remnants do not have management plans. It has been suggested, however, that the lack of management plans for reserved remnants, or remnants in planning limbo, can be partially overcome through the production of management guidelines. These documents can be relatively inexpensive to produce and useful for such purposes as identifying and addressing urgent management issues.

Many community groups have been unhappy with the lack of opportunity to participate in the production of management plans. Some agencies and local government authorities do not appear to welcome community input in the production of management plans but still expect strong community involvement in arduous on-ground works.

Community groups must try to make sure management plans are not written or edited in such a way as to minimise the management commitments and obligations of the landowner or manager. Bodies responsible for managing bushland may well prefer vague documents with ambiguous commitments and very loose time frames. Try to make sure appropriate terminologies are employed. Don't, for example, let dubious terms like 'weed prevention' be employed where the appropriate terminology and actual management requirement is 'weed control'. Management plans should, ideally, include action plans, budget estimates, and time frames for major management tasks.

Cooperation between community groups and landowners/managers

Many community groups report a reluctance on the part of landowners/managers to cooperate with community groups in carrying out bushland management. Local government authorities, in particular, can be very reluctant to allocate funds for bushland management. It is a relatively new field and many councilors and officers have not developed an awareness that local government has significant responsibilities with respect to protecting and managing urban bushland.

A number of community groups report unsatisfactory relationships with their local government, often due to the latter's dearth of interested and informed personnel with whom the group can communicate. Community groups expect councils with significant natural areas under their control to employ Environmental Officers and on-ground Bushland Managers. Community groups want to be involved in management but they cannot be expected to do all the work.

Grant funding opportunities for community groups

The red tape associated with grant funding deters groups from making applications. It is a frequent complaint that grant funding is difficult to obtain and that fulfilling bureaucratic requirements imposes an unreasonable burden on community volunteers. Funding bodies should have field staff who can check on-ground progress, give advice on bookkeeping requirements and grant permission for budget variations where necessary.

Fire

Many community groups are unhappy with sensationalising television news coverage of bushfires over the summer period. Most bushland arsonists appear to be either children, or adults suffering from some degree of mental disturbance. Having bushfires

shown so dramatically on television would seem likely to inspire such individuals to further acts of arson.

The media coverage of bushfires seldom refers to their serious ecological impacts or to the suffering of burned and displaced native animals.

There is a perception, yet to be proven in terms of on-ground results, that the Fire and Emergency Service approach to fires in urban bushland has improved dramatically. However, fires are sometimes not entirely extinguished, leaving areas prone to further 'flare-ups'. Community groups occasionally complain that fire vehicles do unnecessary damage to vegetation when putting out small fires. Some community groups have put the view that two light tankers rather than one should be sent to bushfires in the first instance, so that there can be a better opportunity to contain fires quickly. Concerns have been raised about the possible ecological impacts of the chemicals carried in the 'water bombing' planes.

There is on-going debate about prescribed burning. Nearly all community groups oppose the practice. Unfortunately most urban blocks are burned out so frequently by arsonists that the argument has become fairly academic.

Firebreaks can be a contentious issue. Many community groups have experienced the shock of finding large, new and often quite unnecessary firebreaks gouged through their bushland. Community groups should definitely be consulted about the positioning of firebreaks. Contractors must be told that they should disturb the bushland as little as possible. Too often they cut into bushland on the sides of firebreaks to create a dumping ground for weeds and other debris they have skimmed off the firebreaks.

Most community groups probably need to take a more systematic approach to assessing fire risks and planning ahead for fire incidents. Groups should meet with local Fire and Emergency Service representatives to make sure basic information like how bushland can be accessed does not have to be learned by trial and error after a fire has already taken hold.

Weeds

Given the scale of the problem, and the likelihood that it is going to get worse, the amount of research being carried out into controlling environmental weeds is quite inadequate.

There is presently a heavy reliance on herbicides in controlling environmental weeds. Many community volunteers are concerned that herbicides may be doing environmental damage that is not easily observed, or does not manifest itself in the short term. The general public tends to dislike herbicides being used in suburbia and volunteers carrying out herbicide spraying have been placed under some pressure by residents raising objections. Many volunteers would much prefer alternative methods to be available. Devices for burning weeds off with a jet of flame may be one option. Another might involve the use of steam.

Many environmental weeds are still sold in commercial nurseries. Most community groups are of the view that serious environmental weeds, or plants that are likely to become so, should be banned from sale in nurseries. There is also a case for banning some environmental weeds from cultivation in gardens.

Landscapers and local government authority staff occasionally plant species which are known to be environmental weeds in areas adjacent to bushland.

Earth, gravel, or limestone brought in for road construction, path establishment, or the installation of services, can be badly infested with weed seeds. Management Plans must be very strict regarding what can be brought on site if weed introductions are going to be minimized. Even mulch can introduce serious environmental weeds. Local Government Authorities and agencies often demonstrate a lack of understanding of these weed threats to bushland.

Horse riding in bushland can also result in the spread of some weeds.

Disease

Community groups often face difficulties in determining what is causing plant deaths or morbidity in their bushland. Pathology tests are expensive and some expertise may be required to collect appropriate tissue samples. A plant pathologist should be available to investigate apparent outbreaks of disease at least in bushland deemed to be of regional significance. A pathologist could also help with identifying such problems as vegetation being deleteriously affected by abnormal hydrological variations.

Many community groups are encouraged to use mulch in their regenerative planting and seeding activities. However, there are some fears that bringing in mulch may increase the risk of disease being brought into the bushland. The potential of mulch to be a disease source needs further investigation.

Dieback is a very serious threat to our bushland, but few precautions are really taken. Council vehicles, for example, regularly access bushland with no consideration given to the possibility that dieback could be introduced on tyres. Most urban bushland areas probably have inadequate hygiene protocols in place.

Access

It is generally desirable to fence urban bushland areas, which reduces such problems as the dumping of stolen cars, and the dumping of rubbish generally. Concern has been expressed about the use of wooden fencing materials, given their flammability. A large fire could prove very costly in this regard.

The use of vehicles of any kind in bushland must be

limited if the risk of introducing or spreading die-back is to be minimized, while fire vehicles must be able to get through gates easily in emergencies.

Interpretation and education

There is something of a consensus among community groups that local government authorities generally do not understand the need to protect and manage urban bushland. It has been suggested that a very worthwhile community initiative would be the establishment of a small group of representatives of various Friends groups to visit some of the more environmentally benighted councils with a view to boosting their knowledge and appreciation of urban bushland.

Community groups have had mixed results in trying to involve school children in bushland management tasks. The actual work of children can be frustratingly poor, but, in an overall sense, it is worth the effort as many children will have no other practical means of learning about the natural environment.

Research and monitoring

Monitoring is an area in which most groups fall down badly. The reason is almost invariably a lack of time. Photographs are not an ideal means of carrying out site monitoring but they are better than nothing at all. Community groups do have the opportunity to carry out their own modest practical research projects and should try to make time to do so. Groups need to carry out experiments and then share their acquired information with other groups to help prevent everybody else making the same mistakes.

Regenerative planting and seeding

There are differences of opinion as to whether regenerative planting and seeding should be avoided in favour of natural regeneration. In a relatively weed-free site, natural regeneration would usually be preferable. However, in badly weed-infested sites the replacement of the weed cover with indigenous plants is a more urgent matter if major weed control exercises are not to be a recurrent task. Furthermore, it seems to be the case that the natural recruitment of indigenous plants varies greatly from year to year depending upon the seasonal weather conditions. Planting and seeding, however, obviously introduce unnatural elements into the regeneration process. A planted or seeded area can hardly be said to constitute a natural floral community.

In planting an area with tube stock there is a slight risk of introducing disease and even weeds to the site. It is not clear whether all indigenous plant suppliers can guarantee their soil mixes are free of disease.

Seed collecting for regeneration is another contentious issue. It is not really clear how much genetic variation there is in most of our native species. Should seed be collected only from plants on the site? Can they be collected more than a kilometre away without altering the genetic character of the plants on the site? Should the immediate environment of the plants be taken into account? Should dampland areas, for example, only be planted with seeds that have come from plants growing in a dampland environment?

Councils have often carried out some planting of indigenous trees or shrubs in bushland without any regard to seed provenance. Should such trees and shrubs be removed?

When planting tube stock, should fertilizers be avoided? Should soil wetting agents and water absorbent soil additives be avoided?

When planting tube stock, should summer watering be limited to allow some drought-induced natural selection?

Mites, insects, and even snails, can wreak havoc with direct seeding exercises. Should insecticides be avoided at all costs? The use of insecticides in bushland could pose all kinds of ecological risks and most community groups would be strongly against their use.

Community groups are invariably advised to use large amounts of mulch in association with planting and seeding exercises. But the possible introduction of weeds and disease is not taken into account. Can mulch be guaranteed as being free of weed seeds and disease? Council mulch is hardly a known quantity in that regard.

Feral animals

The most destructive feral animal in our bushland would appear to be the fox. It is quite easy to see that it kills a variety of native animals and birds, and that it is fairly abundant. Fox tracks are readily spotted, and bird and animal remains lying around the entrances also tend to make their dens surprisingly conspicuous. However, the feral cat may be more devastating to fauna, particularly bush birds, lizards and other small vertebrates. Rabbits may be even more ecologically damaging through their impacts on flora. Poisoning is a difficult issue. 1080 is considered too dangerous for urban bushland and rabbit baits can be taken by native fauna. Furthermore, poisoned rabbits can cause poisoning when consumed by native fauna. Scientific experimentation into means of rendering foxes and rabbits sterile may provide the answer. Community groups should definitely lobby for the compulsory sterilization of domestic cats.

Horse riding

Horse riders and horse riding businesses can be difficult to deal with. They often have a poor understanding of the environmental risks posed by horse riding in bushland. Part of the problem is that many riders will have ridden through bushland regularly over a period of many years without causing any apparent ill-effects. The passage of horses through die-

back affected areas, however, clearly poses the risk of assisting the spread of the disease, with disease-laden earth adhering to the animals' legs and hooves.

Horse riders should not be permitted to ride through wetlands. If their passage is unavoidable, they should be restricted to a well-defined track. Horses should not be ridden through inundated areas. Wetlands tend to have soft earth, many small and fragile plant species, and vulnerable fauna species such as tortoises and frogs. Horses' hooves compact the wetland soils and destroy smaller wetland plants.

Bushland conservation community groups can face difficulties with horse riding businesses for obvious reasons but also with clubs and lobby groups. They tend to have a zeal for their hobby which can produce some quite undesirable conservation outcomes. No doubt horse riding is a very pleasurable outdoor recreational pursuit, but the particular enjoyment of a few does not bear comparison with the imperative of protecting our natural heritage in the longer term.

Manure from stables and horse pens should not be stored in the vicinity of drainage channels or wetlands. Manure will be a source of nutrients and weed seeds.

Off-road vehicles

In poorly-managed bushland areas off-road vehicles can be a persistent curse. Four-wheel-drives, trail bikes, all-terrain cycles, dune buggies and go-karts can all severely damage bushland. Apart from the risk of spreading disease, the physical impact of the vehicles alone can be quite devastating. Wetland areas have a particular appeal for many four-wheel-drive enthusiasts. Vehicles are churned through water, and muddy areas provide excellent opportunities for skidding about in circles. Needless to say, the impact on the wetlands is appalling. There are wetlands in Perth now interim listed on the Register of the National Estate which are regularly subjected to such treatment. Off-road vehicle legislation in Western Australia needs radical improvement.

Grazing

Livestock and bushland do not mix well. Livestock eat and ringbark various native plants, spread weeds, and compact the soil. Grazing animals are particularly damaging around the fringes of wetlands and waterways mainly through their trampling of soft, water-logged areas.

The fertilising of pastures adjacent to watercourses and wetlands often leads to algal blooms caused by nutrient-enriched run-off. Farmers must be persuaded to be very careful with fertilizer applications in such circumstances.

Physical disturbances

Bushland areas are often subjected to clumsy and unnecessarily destructive disturbances when services are installed or modified. Responsible agencies and their contractors, and local government authorities, should not be inflicting this kind of environmental damage on the natural environment. Agencies and LGAs should consult local community groups before carrying out works which are likely to cause disturbance to bushland areas.

Hydrology

The potential hydrological impacts of ground water extraction and surface drainage works in the vicinity of remnant bushland/wetland areas are often ignored, or estimated in a most unreliable fashion.

The hydrological features of a natural area can be impacted upon by activities occurring well off site. It is up to land managers and community groups to try to make themselves aware of developments occurring on site, or nearby, which might affect a bushland area's hydrology. Ground water extraction for the irrigation of crops, playing fields or golf courses, for example, may make plant communities much more susceptible to drought through lowering the summer watertable. Large scale tree deaths have been known to occur in the vicinity of bores extracting ground water for the metropolitan water supply. The installation of new drains to facilitate the construction of housing estates, and other civil engineering works, can have a similarly destructive effect on bushland and wetlands. Natural wetlands should not be used as sinks for artificial drainage systems.

Signage

Land owners and managers can be reluctant to install signage drawing attention to the environmental values of areas under their control particularly when they consider environmental issues to be an impediment to their development plans for those areas. But signage is important for conveying basic information about a bushland area's values, and for conveying basic management messages. Claims that signs will only be vandalized can be countered with demands that the environmental signage be placed in such prominent locations that vandals would be unlikely to strike for fear of being observed.

Rubbish dumping

The dumping of garden rubbish is one of the most vexing problems for community groups involved in bushland management. It is a very obvious cause of weed infestations and is potentially a source of disease as well. It would appear that very few perpetrators are subjected to significant penalties, even though they are occasionally identifiable through discarded mail items etc. found amongst the rubbish. Local government by-laws often contain quite strong penalties for rubbish dumping but the environmental harm caused by such actions is not fully appreciated. It should not be treated as a trivial offence as the long term management costs associated with introduced weeds can be very substantial.

Wood cutting

The cutting down of trees can be a serious problem in poorly managed bushland remnants. It would seem trees are usually removed for firewood but some may be cut down to obtain craft or woodworking materials. Any individual act of cutting down a tree may seem trivial, though it is bad enough in itself, but the real problem is in the gradual loss of trees from a remnant as they are removed one by one over an extended period. Of course opportunists hoping to sell firewood may do a lot of damage in a short time but generally trees are lost more sporadically. Perhaps the only way to prevent the loss of all the larger trees in a remnant, therefore, will be to encode and enforce significant penalties for the removal of any individual bushland tree by an unauthorised person.

Vandalism

Vandalism of gates, fences, signs, and facilities associated with bushland reserves is frequently reported by community groups. There are no easy solutions. Making structures as robust and generally vandal-proof as possible is one worthwhile strategy.

Some community groups report problems with juveniles tearing out plantings and breaking off saplings. Again, there are no easy solutions. It is probably as well to remember that if plantings are made as inconspicuous as possible, they are less likely to be recognised by vandals as being especially valued by anybody. For what ever reason, vandals are generally aiming to destroy something which somebody else values. If plantings are hardly recognisable as plantings, they may escape the vandals' unwanted attention.

Security concerns of residents

Bushland remnants in suburbia are sometimes utilized by petty thieves for the purpose of temporary concealment, and for the sorting and dumping of stolen items. This is an awkward problem and it can create some public relations difficulties. Local residents can become convinced that the bushland is actually causing crime. The reality is that burglaries and other crimes usually occur at similar rates in areas where there is no bushland at all. At worst, groups of residents may present petitions and memorials to the local government authority requesting that the bushland be cleared. The local friends group may then have to go through a wearing and time-consuming process of defending the bushland's worth to the community. Extra security patrols may deter antisocial or criminal activities in and around bushland areas.

Residences with back or side fences which form a border with laneways, municipal gardens, or other forms of open space accessible to the public, are probably more likely to have would-be burglars entering the property. Fences bordering bushland are no different. For residents so affected, it would seem sensible to make their fences more difficult to cross. Additional strands of barbed wire, for example, have been utilized successfully for such purposes in some areas of Perth. Bushland areas are sometimes used for dumping stolen cars. The real solution here is a full border fence made of strong materials.

On-ground Activity in the Shire of Mundaring: the Hovea Bush Regenerators

Jenny Johnson*, Hovea Bush Regenerators
Alan Pilgrim, Curtin University

Introduction

The Hovea Bush Regenerators provides one example of a successful community based group involved in the regeneration of degraded bushland. Evolving from a ratepayer organisation opposed to ad hoc subdivision and loss of bushland the group has grown from a handful of volunteers dedicated to the removal of watsonia to five formal Friends Groups involved in the regeneration of degraded bushland. The following discussion provides a brief history of the Hovea Bush Regenerators and addresses some of the challenges and solutions, ranging from the most basic to the more complex issues.

The Hovea landscape

Hovea is located immediately to the north of Great Eastern Highway, with John Forrest National Park and the locality of Parkerville forming the western and eastern boundaries respectively. The dominant landforms consist of areas of lateritic plateau and the incised valleys of Jane Brook and several tributary streams, including Glen Brook and Mahogany Creek. Exposures of the underlying granitic and gneissic bedrock occur in the valley floors and on the lower valley-side slopes.

One of the most distinctive features of Hovea is the lack of urban subdivision, with land holdings generally ranging upwards in size from one hectare. Most properties are two to four hectares and zoned rural landscape living. This zoning includes a provision that all buildings be located within designated building envelopes and on bushland blocks the remainder of the property is designated a tree preservation zone. A 20 metre tree preservation zone applies to the perimeter of all rural landscape living properties. There are no rural zoned properties in Hovea. The other distinctive feature of the area is the relatively large amount of natural bushland, a significant percentage of which is in reserves.

Hovea Residents and Ratepayer Association

The Hovea Residents and Ratepayers Association (HRRA) formed in the late 1980s out of concern about the increasing level of ad hoc subdivision. By the time HRRA gained incorporation in 1989, local residents were already seasoned campaigners, having spent the past four years opposing subdivision of part of the central plateau area of Hovea. This particular subdivision to create blocks of two hectares was followed a few years later by subdivision approval for the same blocks to one hectare. HRRA was also one of the local ratepayer groups that identified the need for change in the Mundaring Shire Council and worked for the 'greening' of the Council. The first 'green' Councillor was elected in 1989.

By 1990 the role of the HRRA was starting to change from that of a purely reactive group opposed to further subdivision to a more pro-active focus. Within a few years HRRA was actively involved in bushland regeneration; fuel hazard reduction (for example the removal of watsonia); the clean-up of roadside rubbish; identification and description of bush walks in Hovea; and lobbying for improved road safety and the provision of a local children's playground.

Hovea Bush Regenerators

In 1990 a small group of local residents began removing rubbish and weed species, notably watsonia, from the area of Falls Park adjacent to the Bridle Trail (the former railway reserve from Midland to Chidlow and beyond). By 1992 the HRRA was getting serious about watsonia control using herbicide supplied by the Shire of Mundaring. Peter Day from the Eastern Hills branch of the Wildflower Society and Keith Tressider from John Forrest National Park provided much needed advice on application techniques. Local field days were organised to highlight the impact of watsonia on local flora and fauna and the summer fire hazard generated by the mass of dead leaf material. A range of community groups were invited to the field days as it was obvious that the task of regeneration was going to need every available volunteer. HRRA formed a subcommittee, aptly named the Hovea Bush Regenerators (HBR), to co-ordinate the increasing amount of on-ground activity.

1993 was in many respects a pivotal year for the HBR with the group receiving the first of several grants, $5000 from the Gordon Reid Foundation for spray equipment and plants. In addition, a number of HBR members joined the Parkerville Volunteer Bushfire Brigade (PVBB) after a small trial burn of watsonia proved to be a lot less safe than anticipated. Finally, the progressive 'greening' of the Mundaring Shire Council brought the benefits of an Environmental Officer and the formation of an Environmental Advisory Committee within the formal committee structure of the Shire Council. Both of these developments were to the benefit of active

community groups such as the HBR.

Successful control of watsonia at Falls Park had involved a spring herbicide spraying over two years followed by a controlled burn in the third year. Based on the success at Falls Park, HBR commenced a watsonia control program at Brookside Park in Parkerville in 1994. Dominated by a disused gravel quarry, the site was quite degraded with a severe infestation of watsonia.

The potential for rehabilitation of Brookside Park was clearly demonstrated at Falls Park in 1995 with the germination of the seed bank that had lain dormant for years under the watsonia. Local species missing from Falls Park were identified with the assistance of members of the Eastern Hills Branch of the Wildflower Society. Community planting days then focussed on the replacement of these particular species with volunteer labour from Mundaring Lions, Parkerville Primary School, Australian Trust for Conservation Volunteers (ATCV) and members of HRRA.

A very hot wildfire in January 1996 burnt through part of the Bridle Trail and all of Brookside Park, disrupting the revegetation program and exposing the stream channel and floodplain of Jane Brook to erosion, siltation and weed infestation. Fortunately a successful grant application for $9000 from Greening WA/Alcoa provided 11,000 plants for the winter of 1996. Volunteer labour for the planting days included horticultural students from Midland TAFE, Mundaring Scouts, Guides and Rangers, students from Parkerville Primary School, ATCV and PVBB. Further grants of $8002 from Greening WA/Alcoa and $1500 from the Western Australian Government enabled a major planting program to be undertaken in 1997 along Jane Brook in Hovea and Parkerville.

Formal Friends Groups attached to particular reserves began to emerge in Hovea in 1994. The period 1996-97 saw a proliferation of Friends Groups across the Shire in response to the threatened sale of reserves by the Department of Land Administration (DOLA). Reserve groups formed in the belief that this would protect particular reserves from sale. While some of the new groups have failed to progress beyond a list of names, others are now well established and very active. DOLA's stated intention to sell particular reserves helped to boost interest in Friends Groups in Hovea even though none of the Hovea reserves were listed for sale. Formal Friends Groups were established for the Hovea Conservation Park and Callan Rd Reserve early in 1997, although herbicide spraying of watsonia had been undertaken in the Hovea Conservation Park since 1995.

Formation of the Hovea Conservation Park Friends Group has resulted in a concerted effort involving weed removal, revegetation and more recently erosion control. The work is concentrated in one small area of the Park, a small disused gravel quarry. Some 20 years ago the first rehabilitation work saw volunteers planting many of the weed species being removed by today's volunteers. Since 1997 the work has involved some 600 hours of labour, including a recent and very successful day with ATCV in September 1998. Elsewhere, at Falls Park and Brookside Park it has been business as usual in 1998 with planting days (stock supplied by the Shire of Mundaring and members of the Eastern Hills Branch of the Wildflower Society) and watsonia control on reserves and road verges in Hovea and Parkerville.

Challenges and Solutions

Every group involved in revegetation work encounters a familiar list of issues that usually includes the difficulty of finding volunteers, lack of resources, vandalism, non-survival of plants, weed identification, dieback control, the availability of a convenient water supply and, most importantly, the opportunity to spread the message to others. The following comments provide a brief overview of ways in which the Hovea Bush Regenerators have addressed each of these issues.

- (a) Finding enough volunteer labour is always a challenge. Across the Shire of Mundaring there are about 30 Friends Groups (not all of them active) with a total membership equivalent to a mere 1% of the Shire population. There is no shortage of labour — just a shortage of volunteer labour. The five Friends Groups now active in Hovea provide a reliable but relatively small core group of die-hard volunteers. As already noted, direct contact with local service organisations such as the Parkerville Volunteer Bushfire Brigade, Mundaring Lions, schools and clubs has proved successful on special planting days. In addition, work days are advertised in a range of publications including the local community newspaper, school newsletters and the Ecoplan newsletter. Mail box letter drops have also been used and roadside advertising is generally used for a few days preceding a work day.
- (b) Most of the equipment required for work days (such as spray equipment, gardening implements, trailers and even a portable toilet) is made available by local residents. Spray equipment, including a pump and 200-litre tank for herbicide was procured through the Gordon Reid Foundation due to the difficulty of borrowing spray equipment from the Shire. The Shire of Mundaring provides all the herbicide. HBR has enjoyed a high level of success with funding applications for equipment and plants. Careful planning is needed when seeking funds as success can place an extra burden on available volunteers, especially when planting times are limited.
- (c) Vandalism of new plantings has not been a problem. In part this may be due to the involvement of Parkerville Primary School in some of the revegetation projects, giving local children owner-

ship of the work.

- (d) Rabbits, dogs and horses have all posed a risk to the survival of new plantings. Rabbits were a major problem prior to the introduction of plant guards in 1995. Dogs urinating on plants remains a problem, especially in areas adjacent to walk trails and roads. This seems to be more of a problem when stakes are used. New plantings (and bushland in general) are also at risk from trampling by horses. Contact with local riding groups has sought to encourage all riders to keep to marked trails.
- (e) Controlled burns by the local bushfire brigade can also lead to the inadvertent destruction of recent plantings. The decision of several members of HBR to join the local brigade has resulted in better communication and co-operation between the two groups. This liaison has also proved to be very beneficial in the burning regime used for watsonia control.
- (f) Water erosion can also be a significant risk to new plantings. Water runoff is a problem especially in areas where the soil surface is disturbed such as the extensive areas of bare ground in the disused gravel quarry in the Hovea Conservation Park. Here and at other problem sites in Hovea logs are used to construct numerous small debris dams across rills and small gullies to slow the rate and reduce the volume of runoff. The trunks of weedy wattles growing in the reserve have provided an ideal source of logs. Water erosion in and adjacent to creeklines has always meant that available planting days are restricted to a short period of time when water levels are low enough to allow planting and the ground is still moist. HRRA have also had discussions with the Mundaring Shire regarding the use of water calming devices in roadside drains entering Jane Brook. It is anticipated that the Shire's recently completed Urban Drainage Strategy (1998) will lead to some long term benefits in this area.
- (g) Experience has also shown that new plantings need to be marked with stakes to enable follow-up watering and monitoring. Stakes are also needed for the plant guards. Bamboo provides an ideal source of plant stakes and makes good use of another local weed. Only dried canes or split green canes should be used as several years ago there was much wringing of hands in Hovea when a follow-up inspection of new plantings revealed that some of the bamboo stakes were growing!
- (h) In most situations there will not be a readily available water supply and hand carting cannot be avoided. Wherever possible HBR make use of the 200 litre herbicide tank (making sure it is flushed) to bring water as close as possible.
- (i) Not all of the Hovea volunteers have good plant identification skills. Educating volunteers and the general community to recognise even the more common weed species is a long-term effort. In Hovea 'weed displays' are organised at every opportunity. For example, when a community event is held at the Parkerville Hall the Hovea Bush Regenerators try to ensure that floral decorations comprise only local weeds. Equally important is the need for volunteers to be able to identify what is not a weed. Native grasses are present in a number of the reserves in Hovea and can easily be mistaken for weeds. It is an area that needs more attention.
- (j) A major problem for Friends Groups is the potential for groups to inadvertently assist the spread of diseases such as jarrah dieback. To date the efforts of the HBR have focussed on areas of severe disturbance where vegetation is either absent or largely replaced by weed species. There is a strong argument that areas of good condition bushland may benefit by the absence of a Friends Group. Dieback workshops, such as the one at Mundaring on 24 October organised through the Swan Mundaring Community Catchment Project, are a key component of educating the volunteer workforce. The HBR is not alone in having to give more thought to the long term implications of dieback and the need for dieback hygiene control measures for revegetation work on reserves.
- (k) Spreading the message about bush regeneration and learning from the experience of others is an important part of the work done by the HBR. This has included involvement with community workshops through the Shire of Mundaring, the Swan Community Catchment Project, Ecoplan, ATCV, WA Bush Regenerators, and local Friends Groups. There are also members of HBR active on the Shire's Environmental Advisory Committee, the Mundaring Landcare Working Party and the Jane Brook Catchment Group.

Concluding comments

Watsonia eradication was the starting point for the HBR. Encouraged by the commitment of one local resident the activities of the group gradually expanded both in nature and extent. Today with five Friends Groups in Hovea the HBR has a broader base of volunteers allowing for a more sustainable distribution of the workload. The success of the HBR can be attributed to strong leadership (leading by example); an emphasis on achieving outcomes on the ground (the evidence is there to see); a willingness to seek out funding opportunities; and an understanding of the importance of working co-operatively with other community based groups and the local Shire Council.

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Support for Weed Control and Bush Regeneration

Kate Brown
Environmental Weeds Action Network

Environmental Weeds Action Network (EWAN) has recently received funding through the National Heritage Trust Bushcare Program to employ a project officer to provide on-ground support for community groups involved in management of bushland on the Swan Coastal Plain. The aim of the project is to educate and assist community groups and local government to manage environmental weeds effectively. The project officer is based at the Swan Catchment Centre and will be providing technical advice and assistance with the planning, implementation and monitoring of weed management and bush regeneration work.

With limited resources available to community groups and local government in WA, weed control work in small reserves needs to be carefully targeted. This requires a detailed knowledge of bushland including the condition of the vegetation and of the distribution of the serious weeds present. Mapping of both vegetation condition and of individual weed species is therefore an important first step in setting priorities for weed control.

Monitoring the results of weed control techniques and the subsequent regeneration of the native flora is also an important part of understanding how to best deal with weeds in native bushland. The way different methods impact on the native plant communities is often poorly understood and this can be a major difficulty for groups undertaking weed control work.

The EWAN project officer will initially be working at three sites across the Swan Coastal Plain, Shenton Bushland, Blue Gum Lake and Brixton St Wetlands. Community groups and local government will be involved with development of weed control strategies for these reserves. This work will include mapping vegetation condition, mapping the distribution of individual weed species, trialing control techniques, implementing weed control and bush regeneration work, and setting up systems to monitor the results of this work.

Much of the work to date has focused on Shenton Bushland, a 25-hectare remnant of mainly jarrah/banksia woodland typical of the Karrakatta soil association. In a few places the jarrah is replaced by tuart and there are some patches of *Banksia attenuata* and *B. menziesii* dominated woodland along the ridges. Vegetation condition was mapped as part of a management plan developed for the bushland by Ecoscape environmental consultants in 1996. These maps indicate that around 35% of the bushland contains less than 5% weed cover (excellent condition), around 25% is in good to fair condition (5-20% weed cover) and the remaining bushland is in poor to very poor condition. Friends of Shenton Bushland have been managing the reserve on a voluntary basis since 1992.

The most serious weeds in Shenton Bushland include perennial veldt grass (*Ehrharta calycina*), freesia, *Lachenalia reflexa*, *L. allioides*, black flag (*Ferraria crispa*), and watsonia (*Watsonia meriana*). The veldt grass can be controlled with selective herbicides but the bulbous weeds are a more serious problem as they can be difficult to control with herbicides without damaging native plants. They can form dense mats, out-competing the native bulbous and herbaceous species for space, light, water and nutrients. Lachenalia reflexa in particular is moving quickly into areas of relatively undisturbed bushland.

Mapping of the most serious species has begun using aerial photographs and clear overlays. Overlaying the distribution maps of individual weeds on the bushland condition map provides the information required to carefully plan weed control work. The major considerations when planning will be identifying and removing sources of weed invasion, protecting areas of good to excellent bush from serious weeds, and working from the areas of good, relatively weed-free bush towards the more heavily infested areas, allowing regeneration of the native flora. The maps are also a useful tool for monitoring future changes in the distribution of particular weed species.

There is little information available on the most effective method of controlling some serious weeds where they occur growing among native plants. Herbicide treatments can cause damage to the native flora and hand removal can be time-consuming, with the soil disturbance it causes encouraging other weed species to move in. Some experimental plots in fairly good bush have been established to investigate different control methods for *Lachenalia reflexa*. As well as investigating the effectiveness of herbicide treatment and hand removal the study will also look at the species (exotic and indigenous) that move into the experimental plots when the *Lachenalia* is removed.

Work has also begun at Blue Gum Lake Reserve, part of a chain of freshwater lakes and swamps that lie at the interface of the Bassendean and Spearwood dune systems. The reserve covers only 8.25 hectares and less than half of this has a cover of remnant vegetation. Nevertheless the fringing wetland vegetation and surrounding banksia woodland have high aes-

thetic, educational and recreational value. In addition the reserve is an important refuge for native waterfowl and is listed on the register of the national estate. A management plan for the reserve was produced by the City of Melville in 1992 and a dedicated group of friends has been working in the reserve for several years.

EWAN is working closely with the City of Melville and the Friends of Blue Gum Lake Reserve to come up with a strategy for weed management and bush regeneration. Vegetation condition has been mapped, as has the distribution of the more serious weeds. Plots to monitor the effects of Fusilade spraying on the veldt grass and to look at the sort of plants that move in when the veldt grass has been eradicated have been established. A series of transects will also be established running from the edge of the lake through the *Eucalyptus rudis, Banksia littoralis, Melaleuca preissiana* woodland up into the banksia woodland to monitor the effects of weed control and bush regeneration work across the reserve.

The small area of remnant vegetation and the lack of serious bulbous weeds at Blue Gum Lake Reserve suggest that the management of the weeds and regeneration of the remnant banksia woodland is quite achievable in the longer term. Weed management in the *Eucalyptus rudis, Melaleuca preissiana, Banksia littoralis* woodland fringing the lake is also quite achievable in the longer term, however the badly degraded area around the edge of the lake offers more of a challenge.

The third site, Brixton St Wetlands, lies on a flat winter-wet plain between Yule and Bickley Brooks. The area is a small remnant (19 hectares) of seasonally waterlogged claypans overlying Guildford formation clays. The flora of Bixton St Wetlands is recognised as being exceedingly diverse and, with over 90% of these wetland types cleared, the area is of outstanding conservation value. The Friends of Brixton St Wetlands have been involved in the management of the reserve for several years. In 1995 the Perth branch of the Wildflower Society and the Friends of Brixton St Wetlands obtained a Community Conservation Grant and were able to prepare management guidelines for the wetlands and begin weed control work.

Fortunately, at present the major weed problems at Brixton St are largely restricted to the disturbed margins of the reserve. A group of dedicated volunteers has been effectively working on the watsonia and is slowly removing it from areas of good bushland. However a number of other cormous and bulbous weeds are starting to move into undisturbed areas of the wetland. In particular *Sparaxis bulbifera* is moving in from the disturbed margins of the reserve and requires immediate attention. A series of transects will be run from the disturbed margins into the good bushland that the *Sparaxis* is moving into to monitor the extension of the population, the effectiveness of control work on this species and the regeneration of native flora once this weed is removed. A major source of weed invasion along the northern end of the reserve is soil dumps and these will also need to be dealt with.

This project is initially funded for three years and will be working at a limited number of sites with success heavily dependent on the support of Friends groups and community volunteers. The implementation and monitoring of bush regeneration work at the sites will be a much longer term project. Environmental weeds are one of the major threats to the integrity of our remnant urban bushland. The regeneration of bushland suffering from the impacts of weed invasion is going to require support and commitment from state and local government for a long time into the future.

Bassendean Preservation Group Inc. — In for the Long Haul

Greg Peterson
Bassendean Preservation Group

The Bassendean Preservation Group was founded in 1985 in response to a proposal by the Town of Bassendean and the Department for Planning and Urban Development for a canal development at Ashfield Flats in Bassendean. The proposal was to turn a 50-hectare area of samphire and melaleuca wetland into canals joined to the Swan River, and create a more organised park than the current river flats area. Much of the area had been formerly a dairy farm but is now rich in wetland vegetation and birdlife.

Following defeat of that proposal, the Group has continued to flourish and has taken on a custodial role for other areas of wetland and remnant bushland in the Town of Bassendean.

Thirteen years after formation, the Group has approximately 80 members, is active in preserving and rehabilitating bushland outside Bassendean and persistently lobbies for bushland conservation in the north-east of the Perth metropolitan area.

In this long haul, we think that some lessons have been learned. The Bassendean Preservation Group makes no claim to have adhered to or executed all of these points well. In some cases, they are things that, in retrospect, we should have done, or at least could have done better.

Get the hearts and minds of the population

It is necessary to work at making people aware of local issues and increasing their consciousness of what is around them or on their doorsteps. This will involve pamphlet drops in letter boxes, displays at shopping centres, talks to school groups and generally getting voices heard in the community. If the community values its local bushland, then people will emerge to actively participate in protecting and enhancing it.

Social research suggests that the major difference between those who are active in bushland conservation and those who are not is that those who are active simply make the time to be involved. The general population believes that it is a good thing but get distracted by the many other things in their lives, or just do not know how to get involved.

Apathy is the biggest enemy and a significant part of a bushland group's efforts should be directed to overcoming that in the wider community.

Get publicity: get noticed

This goes hand-in-hand with the previous point. The state and local newspapers and even television and radio are keen to have interesting material in between their revenue-earning advertisements. Grab every chance to learn how to get this publicity and then take advantage of the opportunities that arise and even create your own opportunities.

Identify people within your group who are good at, or who could become good at this and let them loose. And always remember that (within reason) there is no such thing as bad publicity.

Get political

This incorporates the two preceding points but also involves cultivating contacts with people who can help within government and other large-body decision-making areas. This applies at both officer and politician level.

Let them know what the issues are and what is in it for them as well as the community.

Taking this a step further, there is a dearth of capable people on local government councils and a great need for councillors concerned for the future of our urban environment. One aspect of that environment is of course, urban bushland. Consider standing for local government elections or putting support behind candidates with a good track record in support of bushland. Action on bushland occurs at a local level and this is what local government is about.

Enlist help of local government — staff & councillors

Without taking a necessarily political approach, it pays handsome dividends to seek out the assistance of local government councillors and strategically placed staff. A councillor with good rapport with the right staff can get a lot of positive things done and can make sure that council staff avoid the range of destructive acts that they are prone to engage in, such as mowing down all of the seedlings that you planted out last week.

A helpful member of staff can get things happening without the bother and wait involved in getting approval from Council committees and full monthly meetings.

Get incorporated

There are two principal reasons for getting incorporated as an association under the relevant state leg-

islation. One reason is to provide a protection mechanism for individual members should the association come into conflict with persons such as commercial thugs, or where difficulties arise from damages or injuries. Where it is the incorporated body acting, the individuals will not be (successfully) the subject of legal action. Secondly, in most cases government and quasi-government grant conditions will require that the body receiving the grant be an incorporated not-for-profit body.

Have plans ready

Develop plans for your bushland. These do not have to be in great detail, but enough to show others that you have a vision for it and that the vision is achievable. Pictures are great for this. When grant programs arise — it's amazing what can happen just before elections — you will be ready to put in a submission in just a matter of days.

Your plans are the tools for getting buy-in and commitment from others — especially those who are in a position to help with money or significant labour and materials.

Get grants

It's almost certain that not everything you want to do can be done by volunteers or provided through the generosity of local individuals. So work out your strategy for getting assistance in the form of big dollars, or significant input in other forms.

Writing grant applications is not easy. It takes time, you need to learn the language and you need to do the lobbying that goes with putting in grant applications to government and large commercial bodies. There are many people around who do have the necessary experience, so seek their help.

Get others to get grants

Ideally, your vision should tie in with the visions of other people for complementary projects in the same or nearby bushland. Every grant that another body gets is an opportunity for you to leverage. If you get one grant, the relevant local government might be able to get a complementary grant for associated work.

Form linkages with other groups

Links with other like-minded groups are invaluable. You can share ideas, information, tools, plant material and even people. You can give moral and material support to each other. You can lobby on each other's behalf when it comes to things like rezoning or 'development' (i.e. destruction) proposals.

Don't forget the Urban Bushland Council of course, because that is the best place to find out about other groups.

Get lots of people involved

Take time to build up a reservoir of people willing to help in all sorts of ways. In the first instance you want many people, and from that group a range of useful talents will almost certainly emerge. At every opportunity, sign people up as part of the group. Find out when they can help and what things they consider that they can do. Later they will discover that they can do other things as well.

Get a diversity of skills involved

Bushland conservation, restoration and rehabilitation, and all the points discussed above require a range of skills — those who can write well, those who can draw, those who can take photographs, those who know their way around bureaucracies, those who can speak to groups of people, those who can wield a spray pack, those who can weld two pieces of metal together, those who have the patience to collect seed and raise seedlings and those who can observe flora and fauna, those with knowledge and those with time.

And perhaps most important of all are the skills of organising other people to achieve the group's goals.

Seek out the skills you need now and might need in the future. There are no super people who can do it all.

Build a knowledge base – specific and broad

You will need technical knowledge of a general nature — the botany and biology of the general region, the conditions in which melaleucas thrive, how to plant eucalypts, what the soil conditions are, etc. You will also need knowledge of the particular area you are dealing with — what plants are now growing there, what it looked like in 1925, what plans are now or have been before State and local government authorities for the area.

Develop systems for retaining that knowledge – filing cabinets and computer files and, most importantly:

Get expert help

You will need experts to help build up that general knowledge. There are dozens of dedicated people around and most of them are only too willing to give a little of themselves to help. Some of them are professional and others are very talented and dedicated amateurs. These are the botanists, biologists, plant pathologists, soil experts, planning experts, lawyers (yes even them!), ecologists, fire experts, journalists and many others that can help your group get its work done.

Don't trust governments

It can be a fatal mistake, for your bushland at least, to assume that the State or local government is actually going to do what it says it will do. We have seen town planning schemes and metropolitan region schemes changed to put roads through pristine

bushland, to fill in wetlands and to divide unified habitats. If a minister or a mayor is of a mind to create havoc it can be very difficult to influence the decision-making process to conserve or rehabilitate bushland. For that reason, we must assume that destruction will always be in someone's mind and constantly wage battle through the methods mentioned above.

Never assume that what the head of your local government's department of parks and gardens says will happen actually will happen. He (or possibly she) does not drive the tractor-mower nor decide the exact path taken be the 20-tonne truck delivering material for the children's playground or the cycleway.

As a famous person once said, just because you are paranoid it doesn't mean that they are not out to destroy your bushland! Just because the government has a bushland policy, it doesn't mean that it is a policy to do any good for bushland. Local governments are probably the least trustworthy.

Don't trust 'developers'

If you can't trust governments, that goes doubly for developers, who should in most cases be more correctly described as destroyers if they are anywhere near bushland.

Any verbal undertaking from the development fraternity is not worth the paper that it is written on! We must remember that they will always put their own financial interests and the financial interests of shareholders ahead of that of the public good.

Enlist the help of government departments and agencies

Despite what has been said before about government and quasi-governmental bodies, it is necessary to work with them, and when dealt with in the right way they can be extremely helpful. Build the personal contacts, have the telephone numbers handy, know when you can help them and vice versa.

As much as the irresponsible mower operator can destroy several weeks work by your group, the right person approached in the right way can supply materials and labour to get a job done and can make sure that the mowing is done at the right time so that your group's work doesn't go up in flames.

Build efficient communication networks within the group

Keep in touch with each other. This is important for many reasons – maintaining that sense of belonging to a group doing something important; for moving into action quickly when there is something that has to be dealt with quickly and to save time and effort in letting people know what is going on and what they should be doing.

We now have email, which means that sending a note to 100 people can be done as quickly as sending it to one person. If you are not already using email, I would urge you to get your group hooked up as soon as possible. Not only is it a tool for communicating within the group (and if your group has people younger than 40 there is a good chance that they will already have access, even if it is just through their work) but it is useful as a research tool and for keeping in touch with other groups.

Develop 'telephone trees' to relieve one person of the burden of telephoning dozens of people to tell them about things like working bees.

Plan for succession

Not everyone lasts forever. People get other jobs, their circumstances change and for a variety of reasons critically important people can become no longer available. But the work of bushland conservation will remain. Thus it is important that your organization can survive those changes.

Plan for the time when each person will no longer be available. Have understudies or people waiting in the wings who can pick up the reins when they are let go by the current holder.

Make it fun and social

Not only does your group have to do the work of bushland conservation but it also has to keep itself together and periodically refresh itself to maintain enthusiasm. For this reason it is important that your meetings and your working days be as much social occasions as they are working times.

In addition, the Christmas barbecue or the country excursion free of any labour can help the members of the group share their life experiences and their visions for the things that you might work on at other times. Make it all fun so that people want to join and want to come back time and again.

Conclusion

No doubt this is not an exhaustive list of the things that your bushland group can do to keep itself functioning. It does provide, however, a checklist of things that it would be wise to periodically refer to and see if you can further enhance your group and hence the work that it is doing.

Friends Group Manual in Mundaring

Mick McCarthy* and Herbert Titelius
Shire of Mundaring

Background

The Shire of Mundaring's 'Friends Group Manual' (the manual) was endorsed by the Mundaring Shire Council in July 1998 and represents a landmark document for volunteers working in bushland reserves throughout the Shire.

The manual is a key strategy of the Shire's Environmental Management Strategy and was developed over a 2-3 year period in consultation with the Shire's Environmental Advisory Committee (EAC) and local community groups involved in bushland management. During its development, there were a number of critical issues that the manual had to overcome in order to achieve its acceptability at both the corporate and community level. The purpose of this paper is to identify what those issues were, and how they were overcome to achieve mutually beneficial arrangements between the local government and the community in this important area of environmental management.

The key issues were identified as:

- The types and levels of bushcare activities
- Requests for Shire assistance
- Safety
- Insurance and public liability
- Resourcing Friends Groups.

The types and levels of bushcare activities

The types and levels of activities undertaken by volunteers involved in bushland management varied greatly throughout the Shire and was largely dependant upon the resources (and energy) available to a particular Friends Group.

Some groups were happy to periodically pick up rubbish from the perimeter of their reserves, whilst other groups were exceptionally well organised and followed a comprehensive schedule of activities which included weed control, active involvement in fire management, revegetation, education, applications for external funding and related tasks. Regardless of the types and level of activities undertaken by the groups, the people involved had a desire to improve their local environment and a commitment to contribute toward this goal.

In determining a framework to assist and support volunteers working at differing levels of activity, it was important that it had to be flexible, practical and proportional to the types of activities being undertaken. There is no benefit in asking a small, dedicated group of local volunteers to prepare a detailed management plan for a reserve if the group does not have the intention, energy or skills to undertake the type of management activities required to address threats to the bushland in question. Similarly, a well organised group of volunteers undertaking major bushland management activities (particularly those involving the use of machinery or large scale construction projects such as walk trails and shelters) should be operating under the guidance of a plan which is known to, and endorsed by, the local government or responsible agency (DOLA, CALM, WAPC etc) in control of the bushland reserve.

The Shire of Mundaring Friends Group Manual addressed this issue by allocating categories of bushland management activities which included basic, intermediate and advanced activities. Each level of activity requires a plan, identifies the types of activities, determines training requirements, outlines the level of Shire assistance and defines the responsibilities of the group in accordance with those activities (see Figure 1). This approach is aimed at ensuring the group can operate in a manner consistent with available resources and within accepted guidelines for bushland management.

Skills and competencies to undertake the types of activities can be gained by the group from available organisations, or alternatively sought from the local government. The Shire of Mundaring has set aside a training budget for Friends Groups which enables group members to attend training sessions relevant to their activities. A basic activity training weekend was organised last year through Ecoplan and this year it is intended to conduct training for intermediate bushcare activities.

The Friends Groups' responsibilities are aimed at ensuring participants involved in bushcare activities are properly recorded and that equipment being used by the group is correctly loaned and operated in accordance with manufacturers instructions.

The level of assistance provided by the Shire is based on the types of activities being undertaken and each group needs to apply for assistance annually.

Level of Shire Assistance

The Shire of Mundaring has set aside funds in the budget to assist Friends Groups undertaking bushland management activities on Shire vested reserves. Assistance from the Shire incorporates the following actions:

Figure 1:

SHIRE OF MUNDARING - FRIENDS GROUP STRATEGY

'Framework for Bushland Management Activities'

Level of Bushland Management Activity	Basic Bushcare Activities (Workplan Required)	Intermediate Bushcare Activities (Action Plan Required)	Advanced Bushcare Activities (Management Plan Required)
Actions and Types of Activities	• Rubbish collection • Weed control (physical) • Tree and shrub planting • Development of work plan	Basic bushcare activities plus • Seed collection • Weed control (herbicide) • Revegetation • Bushland regeneration	Intermediate bushcare activities plus • Slashing • Chainsaws • Dieback control (stem injection) • Construction works (trails, shelters)
Training and Competency for Friends Groups	• No training required (see responsibilities)	• Bushcare training required (APACE or equivalent) • Seed collection licence (CALM)	Intermediate bushcare training plus • Approved training and competency for chainsaw usage (CALM) and slashers
Shire Assistance	• Technical advice and site inspections • Rubbish removal • Provision of seedlings • Controlled burns	Basic bushcare assistance plus • Assistance with training • Provision of herbicide • Provision of available safety equipment	Intermediate bushcare assistance plus • Provision of available safety equipment
Friends Group Responsibilities Annual confirmation in writing of acceptance of Shire conditions for bushcare activities is required for each level of activity	• Submission of workplan • Keep diary of events • Register participants in bushcare events	Basic responsibilities plus • Submission and approval of action plan • Record herbicide collection and usage • Sign for loaned equipment	Intermediate responsibilities plus • Submission and approval of management plan • Gain written authorisation to use equipment • Sign for loaned equipment

- Technical advice and site inspections
- Rubbish removal
- Provision of seedlings for revegetation
- Undertaking controlled burns where appropriate
- Assistance with training
- Provision of herbicide and safety gear.

It is important that any requests to the Shire for assistance are submitted by registered Friends Groups with sufficient lead time to enable the assessment of the request by Shire staff and delivery of the assistance being sought. In general, the Shire requires such requests to be submitted by January or February of each year so that cost estimates can be prepared for Council consideration as part of the budget process.

Safety

Safety plays a crucial role for volunteers working in bushland reserves and the Shire has stipulated safety requirements related to the use of herbicides, chainsaws, mechanical equipment and the supervision of children. These specifications were determined by the Shire in liaison with the Eastern Metropolitan Regional Council Occupational Health and Safety Service and the Shire's insurers.

In general, the safety requirements reiterate manufacturers' safety standards for the equipment being used and includes the provision of competency certificates and the use of personal protective equipment by Friends Group members in cases where potentially dangerous equipment such as chainsaws and whipper snippers are being used. In addition, any weed spraying by the group using herbicides (Roundup Biactive) must be undertaken with appropriate signage in place to ensure the public is aware of spraying activities.

To ensure the safety of all concerned whilst undertaking bushcare activities, it is essential that children accompanying volunteers must be supervised at all times.

Insurance and public liability

Volunteers must be covered by the Shire's insurance for personal accident and public liability. To satisfy this condition, Friends Group volunteers are required to operate in accordance with the Friends Group responsibilities outlined in Figure 1 and undertake the following:

- Confirm in writing each year their acceptance of the Shire's conditions outlined in the manual
- Establish a volunteer register to record those attending bushcare events
- Designate a delegated co-ordinator to supervise the group.

Insurance cover is not available on reserves not vested in the Shire and Friends Groups need to be aware that the Shire cannot accept responsibility for activities undertaken on reserves under the control of other government agencies (e.g. DOLA, WAPC, CALM etc).

Resourcing Friends Groups

Friends Groups operate at the community level and therefore require support from local government to enable sufficient co-ordination and guidance. This support is best provided by an 'in-house' officer with designated responsibilities and skills to assist the groups in achieving mutually beneficial goals.

The Shire of Mundaring is in the process of employing a part-time Bushcare Co-ordinator to assist Friends Groups in undertaking bushland management.

The need for a co-ordinator has been recognised for some time, with support for the groups previously undertaken by a number of officers such as the Horticultural Officer, the Environmental Officer and the Catchment Landcare Officer.

The main activities undertaken by a designated bushcare officer are likely to include:

- Assistance with applications for external funding grants and Shire help
- Guidance on timetables for Friends Group activities
- Maintenance of Friends Group network (mail outs, newsletters)
- Assistance and support for 'on-ground' activities
- Co-ordination with Council activities and works programs
- Training.

Training is a particular area of interest for Friends Groups in the Shire of Mundaring, who are generally well organised and possess a wealth of local knowledge. Future training sessions will aim to utilise this local expertise to provide other groups with practical advice in dealing with bushland threats particular to the hills region.

Conclusion

The Shire of Mundaring's Friends Group Manual provides a Council-endorsed arrangement for supporting volunteers involved in bushland management on Shire vested reserves. The manual was developed as a collaborative effort between the Shire's Environmental Advisory Committee, Shire staff and the local community. The support provided by the local Government for Friends Groups will be enhanced with the imminent appointment of a Bushcare Co-ordinator. It is considered that the Shire of Mundaring's Friends Group Manual has widespread application to other local governments and State government agencies involved with volunteers undertaking bushland management activities.

The Role of the Soil Seed Bank in Bushland Management

Judy Fisher
University of Western Australia

Introduction

An important component of many ecosystems is disturbance, however variations in disturbance regime can effect ecosystem structure and functioning (Hobbs and Huenneke, 1992). Bushland remnants within the Perth metropolitan area have been subject to great variation from this regime as a result of frequent fires, disease, weed invasion, feral animals, grazing animals and conflicting land use patterns. One impact of these disturbance events is invasion by weed species, a symptom of a problem, not its cause. A weed, or alien plant, is growing in a situation where it has a detrimental effect on conservation areas, on humanity or its environment. That is, it is a plant out of place. The invasion of natural communities is a result of disturbance and the more prolonged, intense or repeated the disturbance, the greater the invasion may be (Fox and Fox, 1986).

As weeds dominate the understorey of remnant bushland they out-compete native plants for resources and space. As the abundance of native plants decreases a decline in native plant species richness occurs over time as weeds take over (Hobbs and Huenneke, 1992) with a subsequent decline in biodiversity.

Fire plays an important role in the regeneration of natural communities. Some common plant responses to fire include fire avoiders and fire tolerators. Fire avoiders have their current live tissues, in the form of rhizomes, tubers or bulbs, lying out of reach of fire below the soil surface. These rhizomes on stems either resprout following fire, or form clones by suckering. Fire tolerators, though extensively damaged following fire, normally survive and regenerate new leaves and shoots from buds in the bark (epicormic shoots).

A third major group of species is the seeders. These species are potentially long-lived. They reproduce by seed, with the majority producing their first flowers, and consequent seed, within four years of seed germination. They flower profusely for at least the following three years and in this time contribute significantly to their seed banks. These are the species most critically affected by disturbance, having their growth cycle prematurely terminated and leaving insufficient time for them to return sufficient offspring, in the form of seed, to the soil. These species rely solely on regeneration from seed for their persistence on a site. As disturbance events become more frequent native seeders tend to be replaced by introduced seeder species which germinate rapidly following the onset of rain and produce large quantities of seed from their first season of growth.

Soil seed banks

The soil seed bank comprises all viable seed present on or in the soil or associated litter (Figure 1). Seeds which germinate within a year of dispersal make up the transient seed bank (Thompson and Grime 1979), while those remaining in the soil for more than one year comprise the persistent seed bank (Bakker 1989). The persistent seed bank accumulates over time and contains a reserve of genetic material representing potential genetic diversity for the population. This source provides the ultimate genetic expression on which natural selection can act (Simpson et al. 1989). The seed rain determines the input to the seed bank, with the seed being dispersed initially on to the soil, and then displaced either horizontally or vertically. While locally dispersed seed dominates the seed rain, inputs from distant sources may make a major contribution to the vegetation. Wind, birds, animals, ants and fire may aid this dispersal. The soil seed bank of remnant vegetation is the future indicator of the vegetation's ability to maintain itself. For the next generation of native vegetation to establish, its offspring need to be waiting in the soil for the opportune moment to germinate.

Once dispersed most seeds undergo a period of dormancy, which is a delay in germination until conditions prove to be suitable for establishment (Fenner, 1985). Each species has its own characteristic set of germination cues, which are adaptations intended to maximise its survival. The south-western Western Australian flora has evolved a number of cues to break dormancy and stimulate germination at the most advantageous time for the species' survival. The timing of emergence enables the seedlings to cope with periodic drought, temperature extremes and fire (Bell, 1994). The cues are interrelated reflecting ecosystem conditions and plant life-history syndromes. Disturbed environments provide an unbalanced ecosystem that impact on the balance between these cues.

Study Site

In order to investigate the manner in which disturbance affects the soil seed bank, 12 sites of varying levels of disturbance were investigated in Bold Park. This is an area of significant urban remnant vegetation, located in the Perth Metropolitan area, made up of approximately 460 hectares of bushland. Eight major vegetation formations exist within the park, containing some 361 species, of which 63% are na-

tive and 37% are weed species. This research is based on soil seed bank studies in the banksia woodland formation, which is the main vegetation community in the park.

Methods

Sites were chosen subjectively based on vegetation cover and grouped according to their level of disturbance and the major invading weed species. Sites ranged from those in very good condition, medium condition, invaded by *Ehrharta calycina* and invaded by *Pelargonium capitatum*. *Ehrharta calycina* is a perennial grass native to South Africa and has a large viable seed set. *Pelargonium capitatum* is a perennial woody shrub providing a thick dense cover over the soil surface.

In assessing the impact of disturbance on the banksia woodland community, it is important to establish a complete description of the vegetation community. To do this the composition of weed and native species were determined for the above-ground vegetation and the soil seed bank. The floristic composition and percentage cover of the above-ground vegetation was assessed.

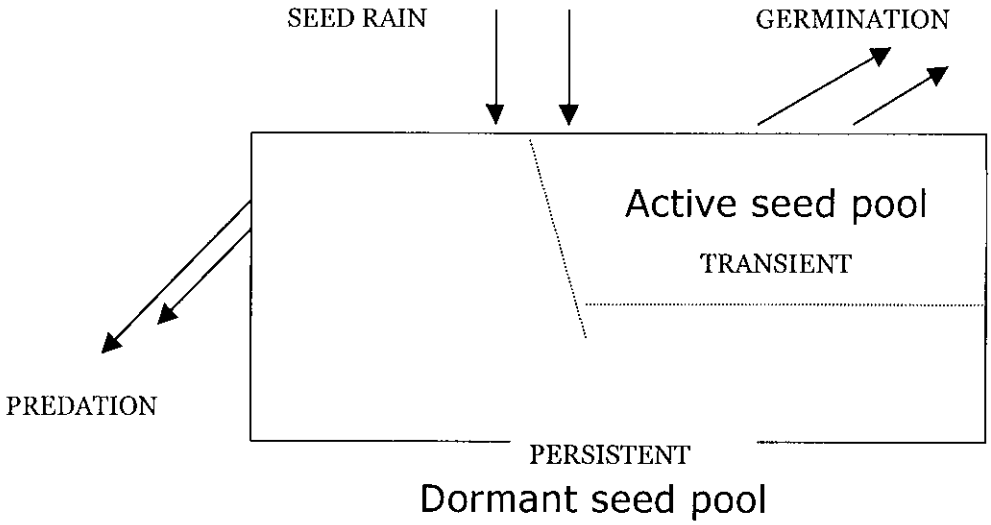

Figure 1: Model of a seed bank (Fenner, 1985)

To assess the soil seed bank, soil was collected at three depths, litter, 0-5cm and 5-10cm, from 26 locations at each site. Soil from each site was pooled by depth and germinated in trays in a greenhouse. The soil was subject to four conditions: smoke, heat, heat and smoke, and a control to ensure as many cues as possible were used to break dormancy. Each germinating seedling was identified and its date of germination recorded.

Results

A number of differences were found between weed and native species, above and below ground (Figure 2). The number of native species was greatest in the areas in best condition, declining as condition declined, with the least number of native species occurring in the most degraded areas. The number of weed species however did not behave the same way, with a consistent number of species occurring across all conditions. In the seed bank the number of weed species outnumbered native species in all conditions except the good condition. However a surprisingly large number of weed species still occurred in the seed bank of sites in good condition.

Investigation of the seed bank revealed the greatest number of native seeds in areas of good condition, declining with condition (Figure 3). The number of weed seeds was greatest in areas in poor condition, but areas invaded by *Pelargonium capitatum* did display differences to those invaded by *Ehrharta calycina*. The low numbers of seed, of both weed and native species, in the *Pelargonium capitatum* sites may be an indication of the dense cover provided by this species. Penetration of seed to the seed bank may be difficult or it may be that an alleleopathic response is preventing germination. The differences displayed by these species is an indication of the difficulties involved in repairing ecological environments, when responses occurring are different for each invasive species.

An important result is the number of weed seeds located in the soil seed bank in areas in good condition, where the seed load of weed species is almost as high as that of native species. This does not reflect the situation in the above-ground vegetation and highlights the precarious nature of this vegetation were a disturbance event to occur. The large stored seed load of weed species indicates their potential to dominate the vegetation should a fire, or other disturbance event, occur in the area.

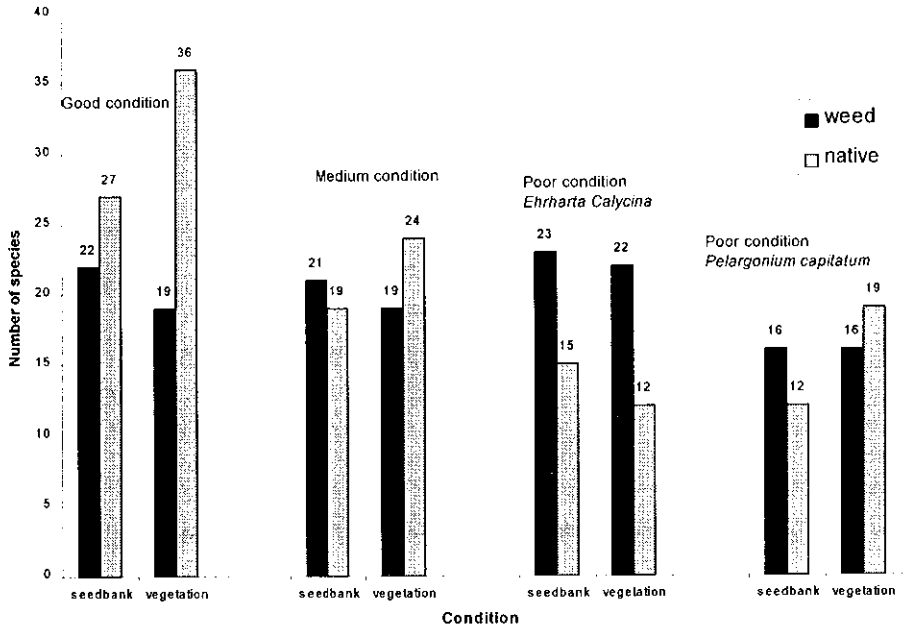

Figure 2: Average number of weed and native species in the seedbank and vegetation by condition

The large number of weed seeds in the soil in areas once degradation has begun (Figure 3) is an indication of a persistent seed bank rather than a transient one. Seed longevity, of both weed and native species, is an area about which very little is known. The large number of weed seeds in the degraded area is an indication of a long-term build-up of seed, suggesting much of this weed seed must remain viable for some time.

Weed and native seed also behave differently when considering their location within the soil profile (Figure 4). Weed seed is predominantly located in the upper 5 cm of vegetation, with very little weed seed below 5 cm. Weed seed also dominates the litter layer. On the other hand native seed is predominantly located at the 0-5cm depth, with more native seed at a depth of 5-10 cm than weed seed. The location of weed seed within the soil profile provides it with another competitive advantage. As the predominant germination cue for many weed species appears to be water, their location in the litter layer means they are the first species to access this resource when rain falls.

Weed species also demonstrate their competitive advantage over native species by their germination timing. The germination of weed and native species began within the first few days of the commencement of watering. This result was consistent for all sites and all conditions. By week two the germination of weed species had peaked while native germination was still increasing and did not peak until

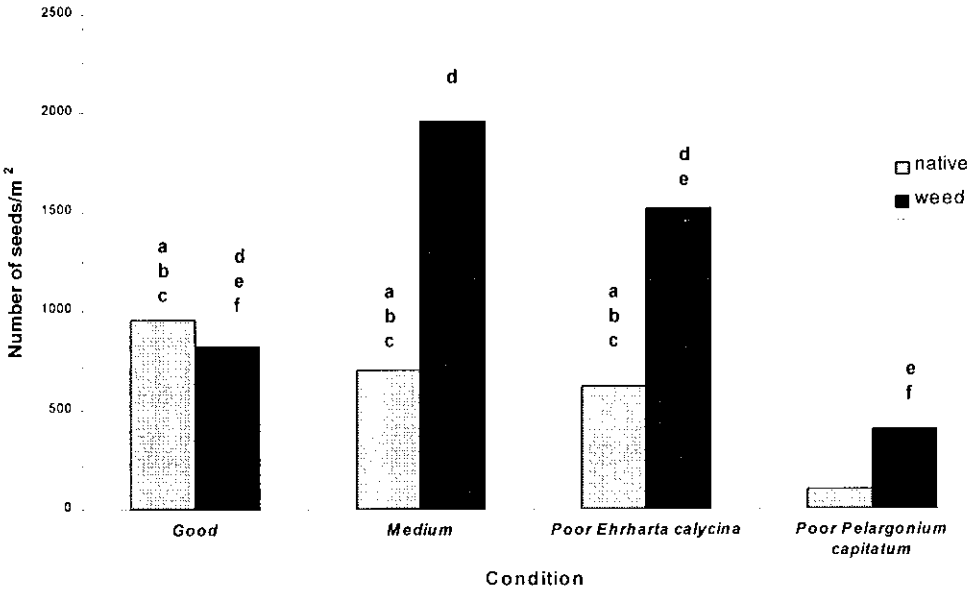

Figure 3: Mean number of weed and native seeds/m^2, showing significant differences by vegetation condition

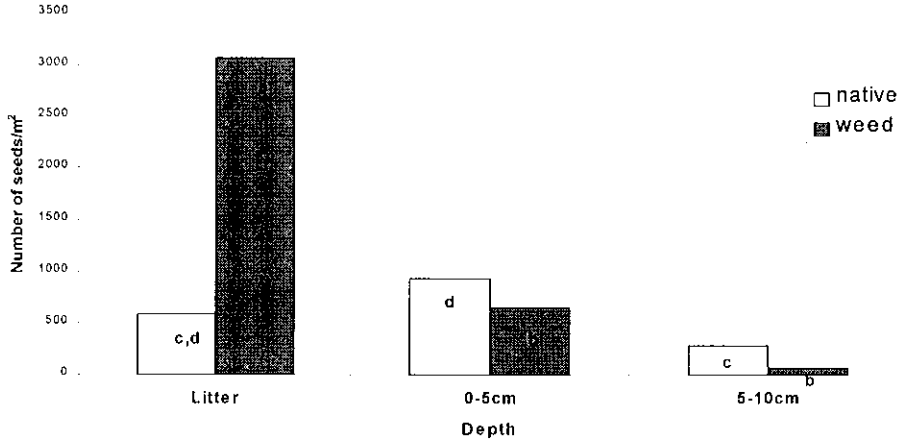

Figure 4: Mean number of weed and native seeds/m^2, showing significant differences by depth

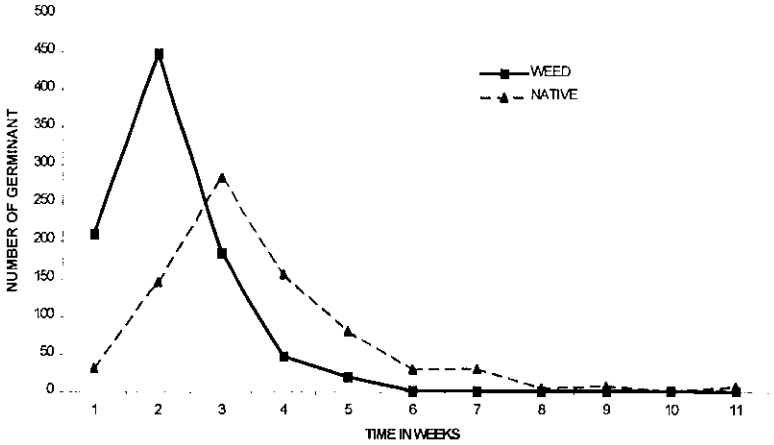

Figure 5: Germination timing of weed and native species in medium condition *Banksia* Woodland

week 3. By this time the germination of weed seeds was declining, with still a reasonable number of native seeds continuing to germinate into weeks 6 and 7. The major germination of weed seed had been completed by week 4. The early germination of weed seed provides weed species with great competitive advantages over native species.

Fire and seed banks

A demonstration of the manner in which fire can effect the seed bank is shown in Figure 6. Both sites are located within 200 metres of each other, with vegetation in medium condition. Soil was collected from two sites, one had not experienced a fire for more than 5 years (A), and the other (B) was burnt 4 months prior to soil collection. Site B has a small number of weed seeds in the litter layer, the result of incineration. The data indicates that there is a large native seed pool in the 0-5 cm layer of soil. Despite the large loss of weed seed from the litter layer, there is sufficient build up of weed seed in the 0-5cm layer of soil for weed seeds to establish. As is shown in site A, with increasing time since fire there is a large accumulation of weed seed in the litter layer and the passage of time has allowed the number of weed seeds to accumulate down to 5cm. But while the weed seed load has been establishing over time the native seed load has tended to remain static (Figure 6).

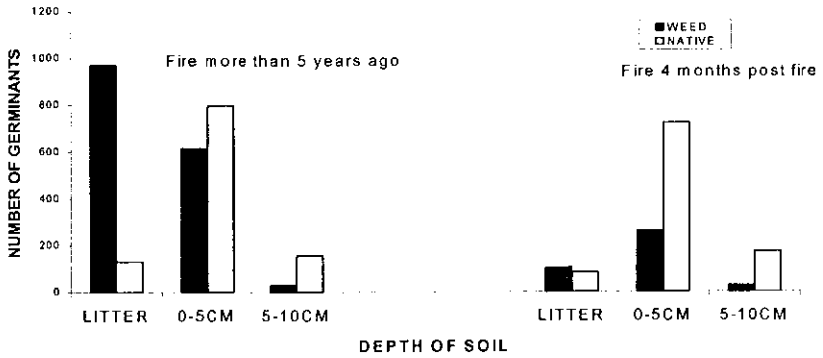

Figure 6: Weed and native germinants at sites with differing fire histories

Management Implications

The demonstrated difference in germination timing of weed and native species may possibly provide managers of remnant bushland with a window of opportunity in which to take action on weed seedlings before native seedlings have had time to germinate. Actions taken to combat weed species are often taken towards the end of winter when weed species have usurped many of nature's resources, out-competing native species. Taking advantage of this window of opportunity, early in the growing season, should require the use of fewer resources, economic, chemical and human, providing a more successful onslaught on alien species.

As the majority of weed seed is located in the top 5cms of soil, minimal soil disturbance should occur in the litter and upper soil layer. Disturbance will provide the opportunity for opportunistic weed seeds to germinate rapidly following the application of water. Once germinated, weed seedlings will utilise resources and rapidly out-compete native species.

Avoidance of frequent fire in our remnant vegetation seems to be very important. Following fire the number of weed seeds builds up constantly, while the native seed load tends to remain static. Despite the loss of weed seed during fire, the build up of weed seed below the surface provides a ready source of new invasive plants. The accumulation of weed seed within the soil seed bank of areas in good condition also demonstrates the importance of avoiding disturbance events such as fire.

In order to manage our remnant habitats it is vital that the native seed bank is maximised. Frequent disturbance is interfering with this process so an effective management tool would be to direct-seed our remnants with provenance seed. The development of provenance seed orchards, would greatly enhance the seed supply for direct-seeding. The common practice of seed collection in our remnants is further diminishing the seed rain and hence depleting the size of the native seed banks. This may be creating a further disturbance to our seed banks, assisting weed invasion.

Results from this study indicate weed seed in banksia woodland in Bold Park has established a large seed pool in all conditions of vegetation, placing these alien species in a prime position to make use of their competitive advantages following disturbance.

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The Importance of Topsoil in the Restoration of Banksia Woodland
Case Study: A Sand Quarry Following Sand Extraction

Deanna P. Rokich
Kings Park and Botanic Garden

Introduction

Banksia woodland is a widespread and common plant community on the Swan Coastal Plain. However, very little is known of the management needs and restoration biology of banksia woodland species. To begin to understand the restoration capacities of banksia woodlands, studies were undertaken at a sand extraction facility near Perth. A major component of the study was to evaluate the significance of the topsoil seed bank for use in rehabilitation. Studies for other plant communities have shown that the topsoil seed bank is an important source of seeds and propagules, and for some plants it may be the only reserve of propagules from which a species can be established in post-mined areas. Handled correctly, the topsoil seed bank can be used to successfully revegetate disturbed areas. Factors to consider when handling the topsoil are: the depth to which topsoil is stripped from the pre-mined woodland and spread in areas to be restored, the length of topsoil stockpiling, time of year for topsoil stripping and spreading operations and the use of germination-enhancing principles. The work presented here is likely to be applicable to many banksia woodland areas.

Depth of topsoil stripping from the woodland

To optimise the benefits of stripped topsoil as a rehabilitation tool, the depth of the soil seed bank is a key factor in ensuring maximum retrieval of seed. The germinable seed load in the upper 10 cm of banksia woodland topsoil is approximately 2621 seedlings/m² with 92 % of the seeds occurring in the upper 5 cm of this soil profile (Figure 1). As the seed bank is concentrated in a relatively shallow upper soil profile, it may be important for only the top 5 cm of topsoil to be stripped and used as a key source of soil stored seed in the rehabilitation of disturbed areas. A greater depth of topsoil removal may substantially dilute the seed bank, thereby reducing the efficiency of replaced topsoil (Figure 2). Operationally, methods for optimising the recovery of the top 5 cm from pre-mined vegetation may be difficult to implement on a broadacre basis. Removal of the top 10 cm is achievable using existing soil stripping methods and although some dilution of the 0-5 cm layer will occur, the germination outcomes are reasonable.

Figure 1: Soil seedbank seedling numbers

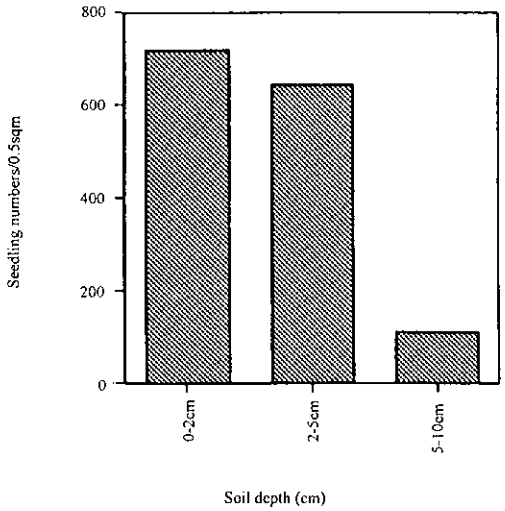
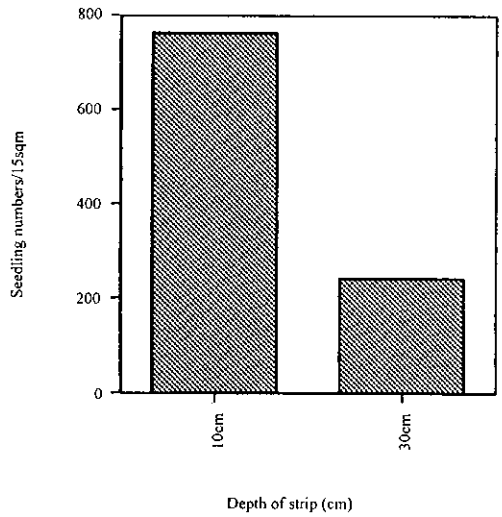


Figure 2: Effect of stripping depth on seedling numbers

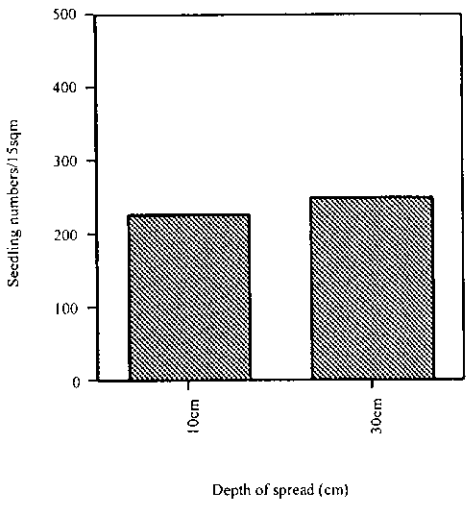


Depth of topsoil spreading in areas to be restored

Utilising the majority of the seed bank not only depends on the topsoil stripping depth in the woodland, but also on the replacement depth in areas to be restored. The replacement depth in turn, is driven by the capacity of seeds to emerge. Depth of burial of seed affects the ability of seedlings to emerge and establish. Most species cannot emerge from depths greater than 1 cm, let alone 10 cm. In our study, only the legumes were able to emerge from depths greater

than 5 cm. The greater depth of topsoil spread would not utilise those seeds that are buried deeply. Indeed, banksia woodland species have demonstrated no difference in seedling recruitment at either 10 cm or 30 cm depth of spread (Figure 3). Utilising the majority of the banksia woodland seed bank therefore involves spreading topsoil at the shallowest depth which is operationally possible (ie. 5 cm).

Figure 3: Effect of spread of depth on seedling numbers



Length of topsoil stockpiling effects

Ideally, the topsoil which contains much of the seed is used immediately after stripping to restore an area. However where stockpiling for extended periods occurs (1 year and 3 years), decreases of up to 35% and 11% respectively in seedling recruitment levels have been shown. Stockpiling, substantially decreases species diversity to 71% and 59% respectively. This may be attributed to decomposition of seed or triggered germination when seed is exposed to the elevated moisture and temperature conditions within the stockpile.

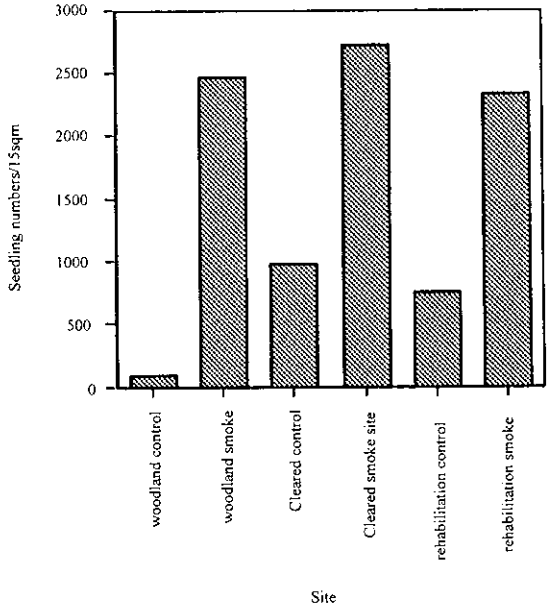
Season of topsoil stripping and spreading operations

Another factor in optimising the post-mining recovery of species is the impact of seasonal timing of topsoil stripping and spreading operations. Our work has demonstrated that seedling recruitment following an immediate spread of an autumn (dry) strip is 74 seedlings/5m2. Following an immediate spread of a winter (wet) strip there are only 4 seedlings/5m2. Stripping and spreading topsoil in the middle of winter may not provide seeds with sufficient time for germination and establishment. Also, stripping of topsoil in winter will terminate germination events which are already underway. Therefore, such operations should be undertaken in the dry months of the year.

Smoke as a germination tool

The recent development of aerosol smoke as a germination tool for many native species, has provided opportunities for increasing the total recruitment and the species biodiversity index in woodland restoration via smoke-stimulated germination. The application of aerosol smoke results in a 53-fold increase and three-and-a-half-fold increase in total seedling recruitment from the soil seed bank in woodland sites and newly rehabilitated sites respectively (Figure 4). Aerosol smoke application also contributes to increases in species diversity.

Figure 4: Effect of smoke in woodland and rehabilitation sites



Conclusions

Conclusions to be made from this work are that topsoil provides a useful source of seedlings for rehabilitation of banksia woodland communities in the southwest of Western Australia. Correct handling of the topsoil, stripped and replaced fresh and dry (direct return) and to the maximum depths of 10 cm can be used to successfully revegetate species rich banksia woodland communities. Seedling recruitment can be further enhanced by the application of smoke products.

Greening Western Australia Sustainable Seed Banks Project

J. A. Thygesen
Greening Western Australia (presented by Rod Safstrom)

Introduction

The wide scale destruction of native vegetation since settlement has resulted in significant disturbance to the Australian landscape. The Western Australian agricultural region, in particular, has been subjected to intense clearing. In some districts, less than 5% of the natural vegetation remains, much of it in poor condition. Subsequently remnants are affected by a wide range of degradation factors such as salinity, soil structure decline, erosion and soil acidification. This has resulted in loss of productivity, decline of rural infrastructure and loss of species of native flora and fauna (Scheltema 1992).

It is recognised that ongoing loss of habitat provides the greatest pressure to biodiversity (Government of Western Australia 1998). Only 2.8 million hectares of remnant vegetation remains on some 20.8 million hectares of privately-owned land (Government of Western Australia 1996).

To address this situation, wide scale revegetation with deep-rooted perennial species is required (Government of Western Australia 1996). The obstacle, however, is providing adequate seed of suitable species. Conservative estimates suggest that between 5% and 40%, or 900,000 to 7.2 million hectares, of cleared land needs to be revegetated. This would require 900 million to 7.2 billion seedlings at 1,000 stems per hectare (Greening Western Australia 1998). If direct seeding was also utilised, between 1,800 and 14,400 tonnes of native tree and shrub seed, at two kilograms per hectare, would be required. This amount of seed is currently not available from natural sources, even for seedling production. The challenge therefore is to provide an adequate source of seed for use in revegetation projects and to reduce collection pressures on remaining stands of remnant native vegetation.

The project

The Greening Western Australia Sustainable Seed Banks Project (SSBP), with funding from the Elsie Gadd Bequest, will establish a community-based network, the Sustainable Seed Banks Network (SSBN), of local native tree and understorey seed banks throughout regional Western Australia. Associated regional seed orchards using a portion of the seed collected will also be established. The project aims to establish 25 seed banks with a minimum of 10 associated seed orchards over the next three years. The primary objective of this project is to develop a supply of local provenance native plant seeds for use in local revegetation projects. This will provide seed from plants which are endemic (ie only occurring in that area) to the area where revegetation is to be undertaken.

Project implementation

The role of the seed banks is to store properly collected and recorded seed of local provenance (Greening Western Australia 1998). The initial seed stored in the bank will be collected from native remnant vegetation stands. Implicit to the collection of seed is the correct identification of flora, which is vital to document existing genetic resources and maintain biodiversity. To ensure these objectives are met, participants in the project will be trained to undertake vegetation surveys, identify species and collect, process and store seed. Specimens of parent plants will be vouchered with the Western Australian Herbarium ensuring that (i) species will be correctly identified by the collectors; (ii) that names of plants are kept current; and (iii) that the knowledge base maintained by the Western Australian Herbarium is augmented.

The following steps should be undertaken when establishing a seed bank:

- Collect seed, ensuring species name or description, location, soil type and other pertinent information are recorded.
- Clean seed using sieves to remove chaff.
- Ensure seed is dry, this reduces the chance of fungal attack.
- Store in an air tight container, this reduces the chance of insect attack.
- Add insecticide to the seed. Dichlorobenzene is the least hazardous insecticide and can also be beneficial in keeping seed dry.
- Keep the seed store in a cool place. This reduces the chance of seed becoming unviable.
- Ensure data collected is recorded on the container and in a database: ie, species, location, soil type and batch number.
- Ensure seed is checked on a regular basis.
- Ensure all movement of seed in and out of the seed bank is recorded. This is important to keep a record of how seed is used in revegetation, and the success of particular species. This can provide invaluable information on the success of individual species grown and revegetation in future years.

As in most cases seed is scarce, it will be disbursed in

a number of ways: (i) a portion of the seed collected will be vouchered away from the seed bank to ensure long term protection of the resource, (ii) some will be grown in a seed orchard to ensure future availability; and (iii) the major portion of seed will be distributed to the community for use in local revegetation projects. This will ensure its long term, sustainable use.

Inclusion of a wide range of locally endemic understorey species in revegetation programs is essential if nature conservation and biodiversity are to be maintained (Greening Western Australia 1998). Where possible, species that are widespread but locally rare will be incorporated into the seed orchard. A baseline ratio of ten understorey species to one tree species will be implemented to attain these objectives.

Seed orchards will be established using seedlings as well as direct seeding techniques as appropriate with adequate post-planting care being essential. Once the orchard is producing seed (two to five years in most cases), collection will be undertaken from the orchard, reducing the need to impact on remnant stands of native vegetation. This seed will be used to establish further orchards and to undertake wide scale revegetation and rehabilitation projects.

The following steps should be undertaken to establish a seed orchard (Seabrook 1994).

- Plan what species are to be grown and for what purpose.
- Establish how much seed is required.
- Ensure land is available to establish orchard.
- Establish what expenses may be incurred. For example machinery or fencing may be required.
- Establish who will be responsible for day-to-day management, for example, watching for weeds, pest attack, seed ripening or any other needs.
- Choose species which are suitable. For example species which germinate easily, are easy to harvest and are suitable for revegetation.
- Prepare the ground. For example, long term weed control may need to be undertaken to remove all weeds before sowing the orchard.
- Mark out rows to plant seed.
- Treat seeds which require treatment to break dormancy, for example legumes.
- Sow seed as soon as the season breaks to allow germination.
- Each species should be mixed with a bulking agent, for example sand and sawdust.
- Gently spread seed along rows.
- Ensure records are maintained, for example species sown, where, when and by what method. Photographic records can be extremely useful.
- After seeding, ensure the orchard is maintained. This may consist of weeding and thinning of plants which have germinated too quickly.
- Ensure orchard is protected with rabbit proof fencing.

While only a small amount of the total seed required for revegetation will be provided by the SSBN, it is anticipated the demand for such resource bases will increase. The SSBN will be an information source for interested parties and will continue to be dynamic. New members will be welcome.

Guidelines for seed banks and seed orchards under the SSBP include, but are not limited to, the following:

Seed Banks

- correct identification of parent plants ensured
- local provenances of local species collected
- no threat to the survival of parent plants or populations from collection activities
- CALM regulations in respect to collection maintained
- species matched to soil and habitat types
- seeds processed and stored to maximise germination
- majority of seeds to be used in local revegetation programs
- appropriate information systems developed

Seed Orchards

- seeds used to establish orchards have been taken from SSBP seed banks
- species planted into appropriate soil types and position in the landscape
- genetic integrity of planting ensured
- long term availability of land for seed production ensured
- community involvement in project
- one or many seed orchards affiliated with each seed bank
- seeds used in local revegetation projects
- appropriate information systems developed

Integration and enhancement of State, regional, catchment and action plans.

The Sustainable Seed Banks Project will enhance and support the objectives of state, regional, catchment and local revegetation plans. The project will be integrated with Florabank, a Commonwealth initiative aimed at facilitation of the sustainable and effective collection, treatment, storage and distribution of seed and plant material for revegetation and biodiversity conservation (Greening Western Australia 1998). All information collected from the project will be included on the Florabank database to enhance knowledge and information.

The supply of locally endemic seed for revegetation projects will support the WA Salinity Action plan to conserve and protect natural diversity. Additionally, this project will enhance the conservation of identified vegetation types and communities as required by the Commonwealth Government Initiative to establish a national representative conservation reserve system (Greening Western Australia 1998).

At a regional level, the project will raise community awareness of the importance of biodiversity and the need for understorey species in revegetation projects. These objectives will support the Swan-Avon Catchment Recovery Action Plan and the Western Australian Natural Heritage Trust regions by increasing community awareness, increasing skills and communication of Landcare issues through training. On a local scale, the project will be integrated into local conservation plans.

Project outcomes

The Sustainable Seed Banks Project will achieve a number of outcomes. It is envisaged the project will provide a perpetual source of local provenance seed, particularly understorey varieties, for use in revegetation projects. This will ensure a perpetual source of endemic tree and understorey seed while reducing collection pressures on remnant native vegetation. This in turn will increase the availability of local native understorey species for use in a wide range of revegetation projects.

The project will encourage greater understanding, involvement and ownership of natural resource management. This will be achieved by increasing awareness of biodiversity and conservation values at local, regional and state levels. This will include increasing the knowledge of stakeholders as to the importance of using local species, particularly understorey plants, to maintain a healthy, productive landscape. Our contribution will be on-going training and support.

Additionally, the project will (i) advance and increase the effectiveness of revegetation; (ii) conserve biodiversity; and (iii) improve long term protection of native vegetation and ecosystems.

In Conclusion

The establishment of a network of seed banks and seed orchards throughout regional Western Australia will provide a dynamic, perpetual supply of local native plant seed for revegetation programs. The Sustainable Seed Banks Project will provide resources and training to conserve and maintain biodiversity and implement local and regional revegetation objectives. Increasing awareness and resources to undertake successful revegetation projects will assist in enhancing and maintaining a healthy and productive landscape. Please join us.

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Community Involvement in Dieback Control

Dr Ian Colquhoun
Roleystone Dieback Action Group

The distribution of dieback disease (caused by the soil borne fungus *Phytophthora cinnamomi*) is widespread in bushland reserves in and around the metropolitan area. However, there are large areas which are free of the disease, and other areas where the pathogen is present but the impact is low. The challenge for the managers of these reserves is to maintain the dieback-free and low-impact status of these areas. I believe that community involvement in the dieback management of these reserves is vital if this challenge is to be successful.

Research by CALM, CSIRO and universities has determined how the pathogen spreads, how it kills and how to reduce the risk of it killing plants. This information can be used to manage the activities within these reserves to combat the risk of dieback. Dieback control procedures include: keeping new tracks out of dieback-free areas and closing old tracks, minimising vehicle use (especially vehicles with blades used to push firebreaks), schedule major activities to occur when the soil is dry, and minimise the flow of water into dieback-free and low-impact areas. Recently CALM scientists developed a treatment to increase the resistance of native plants to the dieback fungus. The chemical they use, phosphite, is inexpensive, environmentally friendly and of low toxicity to humans. CALM now spreads this fungicide by airplane to protect rare plants and communities in the south-west of the State. Community conservation groups can now use this chemical to protect their own local reserves. The Roleystone Dieback Action Group has been treating City of Armadale reserves with phosphite for the past four years. The incidence of death after treatment is very rare in the treated areas; trees and shrubs continue to die in neighbouring, untreated privately-owned bush blocks. The treatment is easy but hydraulic tree injectors are required to inject the fungicide into the tree stems. These injectors and backpack sprayers are available for loan from the Roleystone group.

The provision of a large Bushcare grant from the Natural Heritage Trust will give the opportunity for more community conservation groups to get involved with protecting their bushland from dieback. This project will involve seven local government authorities and three State government departments. The overall objective of the project is to develop dieback management strategies and procedures to minimise the risk of spreading dieback, and decreasing the impact of dieback within remnant native vegetation communities. This project will give land managers the knowledge and tools to better manage remnant bushland. The tools will include dieback maps of the areas, a dieback management Code of Practice and work instructions that will incorporate the dieback procedures in the Code of Practice. The major outcomes of the project will be :

- 10–15 reserves of high conservation status mapped for dieback
- dieback management plans for these areas
- a network of community group custodians for these areas
- dieback training packages
- routine work instructions for land management which include procedures to minimise the spread of dieback
- better understanding of dieback by local government authority operators and managers, contractors and the general public.

The project started in September 1998 and is at the early stage of selecting the 10–15 areas for the case studies. These sites will be remnant native bushland with high conservation status, which are at risk from dieback. There is an open invitation to other local government authorities to become involved in this project.

In conclusion, I believe that combating dieback is not a lost cause in the remnant bushland areas around Perth. Using our knowledge of the pathogen and the disease, dieback management plans can be developed to minimise the risk from dieback. The availability of an effective fungicide also provides a great opportunity to protect the plants in infected sites. The community can play an important role with on-ground treatments and in the development of dieback management plans.

Rabbit Control at Altone Road Wetland

Kirsten Tullis
Bayswater Greenwork

Introduction

This paper details a control program for some troublesome rabbits at Altone Road Wetland Reserve. The reserve is a small seasonal wetland surrounded by marri, jarrah and modong woodland and has been cared for by Bayswater Greenwork and other volunteers for over five years.

The group has continued in its bush regeneration work and in planting locally occurring species in the more degraded areas. Greenwork is also responsible for a narrow largely degraded strip adjacent to and beyond the fenced northern border. This land is owned by Optus Communications, with whom we have enjoyed a close association, and whose property totals about ten hectares of mostly degraded land. It was apparent that most of the rabbits lived on the Optus land, and they had benefited from the grassed areas and security due to few people and dogs. While doing little damage in the mostly intact reserve south of the fence, rabbits had each year eaten and dug up considerable numbers of seedlings planted on the Optus side. Optus were approached and they provided funding for our group to undertake a control program.

Poisoning could not proceed without the approval of Agriculture Western Australia (AgWA) as there are very strict guidelines, particularly in metropolitan areas. An officer met me on site to check the area and provide advice, and also set out the Pindone grain which was diluted in clean grain (horse oats are used). There is a charge of $90 per hour, or part thereof, for the initial visit and follow up visits to put out and remove grain. In order to substantially reduce costs we were able to make arrangements with AgWA to manage the program ourselves.

Before the introduction of poison grain AgWA advised that we were to set up feeding stations using clean grain and monitor the sites for rabbit and bird activity. This was done by simply checking the sand around the stations at dawn or dusk for footprints, then brushing it clean. Once rabbits started feeding the Pindone could be put out, but if bird prints were also found, precautions had to be taken.

The other approved poison used for rabbit control in WA is 1080. This is derived from native plants of the pea family known as 'Poison' (*Gastrolobium* sp). It is generally regarded as safe for native fauna as most species have evolved a resistance over thousands of years. 1080 kills non-resistant animals such as rabbits, cats, dogs and foxes, within hours. Although cats and dogs do not eat grain, they may eat dead rabbits. It is for this reason that 1080 is not approved for metropolitan areas.

Pindone is approved for metropolitan areas though extreme caution should be taken, particularly since some native animals are at risk. Bandicoots, kangaroos and wallabies will eat grain feed and so also may be poisoned. Our site has none of these and we felt confident about commencing the program. However I saw magpies feeding at bait stations during the clean grain stage, and footprints also revealed grain to be a favourite with these and other birds. To ensure such birds, which feed only during the day, were not open to poisoning, I undertook to ensure poison grain was only exposed during dark hours. Fortunately night-time is when rabbit activity is at its greatest. There is a risk that birds of prey may eat a succession of poisoned rabbits, however AgWA assured us that most rabbits die under cover — which appeared to be the case as only a small number were found. The risk to dogs and the public was minimal, due to the property being fenced off.

Pindone is a stronger version of Ratsak and works as an accumulative poison by thinning the blood and causing internal haemorrhage. This may take 4–5 days. While this is a drawback in some respects, there are at least two positives. One is that it gives time for the more meek rabbits to establish a feeding pattern by learning from the bolder ones. Secondly a cat or dog would have to eat dead rabbits over a number of successive days to be poisoned, and even if they did Vitamin K is a known antidote.

Method

The visits ran over six weeks from 19 April to 1 June, with the first two used to establish feeding patterns using horse oats with no poison. On the first day I set up nine bait stations using tables made simply from 900mm square boards with four wooden legs screwed on. Under the tables I put out clean grain in garden terracotta dishes or plastic takeaway food containers. Containers need to be wide and shallow enough for rabbits to feed from, and the plastic ones must be secured so they don't tip over. I made holes in the bottom and anchored the containers with straightened lengths of fencing wire, which were bent at the top. The tables are used to protect the grain from rain or sprinklers. Later on in the program I put out extra containers in the open. Any grain that became wet was dried and reused; though mixed with fresh poison grain in case too much Pindone was washed off.

Choosing places to put the stations was a case of trial and error, and over the weeks locations were changed around according to activity. I chose various locations including near burrows, near diggings and near what appeared to be runs through vegetation. According to AgWA, rabbits do not feed in the vicinity of burrows. By far the most successful places were on open grassed areas, and I found rabbits preferred not to feed from containers under tables. In many cases the best places were not determined until well into the poison stage. Visits by rabbits were obvious if there were footprints and grain was missing. To be sure, I flattened out the grain and made a note of how much I put out and how much was eaten. Any unused stations were moved to a new place. I used other foods to attract rabbits, such as carrot, apple and celery with mixed results. I'd heard rabbits love peanut paste, though it was rarely taken.

Due to not being able to visit every day initially, and waiting for a mutually convenient time to meet with the AgWA officer, it was nearly two weeks before the Pindone stage began. Generally, one week should be enough to establish feeding.

The poison grain needed to be put out every evening for just over four weeks, to make sure all the rabbits were killed. With time the number of bait stations was reduced to a few as localised populations disappeared. The program finished when no grain was taken from the last stations for two successive nights. There were two or more rabbits that were not killed. However, apart from some early evidence of diggings, by October no rabbits had eaten any of the seedlings we planted in winter. Monitoring of activity is continuing, and any more outbreaks will be swiftly controlled using the same methods. There is always the risk of new animals moving in as some of the boundary fences have gaps.

The timing was quite good, with the combination of late rains and less than usual new grass all over the site. Autumn with its longer dark hours was more favourable than trying to run a program in summer. Although the grain would be very attractive given there is less available feed in summer, it would mean having to wait longer for dusk and getting up much earlier for dawn.

The time taken to do the rounds varied from nearly an hour to 15 minutes, depending on the number of stations. Setting up initially took over three hours. I also did some walking around looking (and sniffing) for dead animals so they could be picked up and disposed of, including around the two burrows. I also smoothed the sand around one of the burrows to check for passing rabbits. The first dead rabbit of less than ten was found five days after the poisoning began. I and Optus security staff also noted how many live animals were about, and where they were. It was very pleasing to see the numbers fall.

Other methods of control are possible. Caged traps, shooting by firearm or crossbow, ferrets, sweeping a line of people to drive animals out and fumigation of burrows were not used here. Only two accessible burrows were found and I hoped rabbits would use them as a place to die. Inventive alternatives were explored. In the previous year we began dropping small portions of dog and snake droppings next to seedlings to deter rabbits digging up or eating them (we have three boa constrictors and three pythons where I work at the Western Australian Museum). Although not conclusive, it appeared that these seedlings were protected to some extent. Droppings were used again this year.

About 30 kg of Pindone grain mix was used. I estimate if each rabbit ate 100 grams each evening for five nights then around 60 died.

Note: I would like to acknowledge the assistance and advice of Darrell Stuart and Fred Ramsden from Agriculture WA in this project.

Best Management Practices for the Control of Perennial Veld Grass *Ehrharta calycina*

Bob Dixon
Extensions and Development Officer, Kings Park and Botanic Garden

Integrated management

The best approach to weed control is to keep the weeds out in the first place, by reducing disturbance such as dumping rubbish and vehicle access, and keeping out frequent fires. Good quality bushland will reduce the risk of weeds being able to establish themselves. Controlling veld grass is only a single tool in the overall management of bushland. Gaps created from removal or death of veld grass can create a problem far worse than what you started with. Grasses resistant to Fusilade, broadleaf or bulbous weeds can take over, and these cannot be selectively controlled. Therefore, always make sure you have an integrated approach so that the gaps can be filled with indigenous plants. Seed can be stimulated to grow using smoke water treatment of seed stored in the soil (if there is a seed bank), or use smoke treated seed sown in early to mid-autumn. Alternatively use green stock, planted as soon as the soil is moist enough. Timing of planting may be different in other areas, such as those prone to hard frost.

Notes on perennial veld grass *Ehrharta calycina* and its control

Veld grass is a long-lived perennial plant able to reproduce rapidly from seed stored in the soil. It usually benefits from fire (extra nutrients and lack of competition). It is considered to be one of our worst environmental weeds, smothering native plants and creating a major fire hazard.

Seek expert advice, when appropriate, e.g. Australian Association of Bush Regenerators, Environmental Weeds Action Network, Agriculture WA, Kings Park & Botanic Garden, CALM, Greening WA, local bushland groups (Friends).

Always record what you have done for future reference.

Target weeds on adjacent road verges/properties (with the authority/landowners permission) to stop them spreading into your bushland.

Use a spray rate of four litres Fusilade 212, in 300 to 400 litres of water, per hectare. For knapsack spraying use a mixture of one part Fusilade to 100 parts of water. Add a wetting agent such as Agral 600 at the recommended rate of 3.5 ml to each litre of water, and use a dye so you can see what has been sprayed. Lower rates of Fusilade can be used in bushland situations but the plants are hard to target and some years other factors such as earlier flowering, drought stress and rain can affect the results. Therefore it is more cost effective to go for the higher rates. Other similar herbicides such as Targa and Sertin have been used in Kings Park bushland with results equally as good as Fusilade. However, the only herbicide registered for control in bushland is Fusilade 212 in the liquid formulation. Though safer (no hydrocarbons, not as flammable or smelly, and easier to clean up spillage etc) Fusilade WG , a granular formulation, is not registered for bushland use.

Spray when the grass is actively growing (not under drought or frost stress), usually between early June and mid-August. When under drought stress, though the length of the new shoots may be ideal due to earlier good growing conditions, it usually takes about three weeks after heavy rain before plants are actively growing and ready for spraying.

Ideally, new growth should be at least 15cm high, which gives enough surface area for the herbicide to be absorbed into the plant and translocated to the dormant buds at the base of the plant.

Always make sure it is not raining when spraying as it takes one hour for most of the spray to be absorbed into the plant. In Perth we tend to have a lot more wet days in August, therefore it is more difficult spraying at this time.

Always try to get the spraying done early in the season. However, late spraying is more likely to control germinating seedlings. Usually two lots of germinants appear during winter but last year there were three lots due to the extended wet weather.

Though blanket spraying by hand lance with a long flexible hose is the usual method of application, side-mounted spraying units or misters can also be used while driving along tracks, spraying the herbicide several metres into the bush. Coverage depends on the direction and strength of the wind. Small infestations are also sprayed using back pack sprayers.

In the Perth metropolitan area do not spray after mid-August as the plants are then sending up their flowering stems. Spraying at this stage causes the death of the top of the plant but will not kill the dormant buds at the base. This leads to new growth from the dormant buds, often taking 3 months for new growth to appear. By next autumn the plant will be as strong as ever again.

Symptoms of the herbicide working will vary depending on the weather. In hot weather the plant

foliage turns red within a few days, while in cold conditions there may only be a light tinge of red which takes a long time to appear. The best method of testing at early stages is to pull out a shoot and look at the base node or joint. If the herbicide is working it will start to turn light yellow then brown.

A hot wildfire will occasionally kill the parent plants and seed stored in the litter layer and top of the soil, but the seed can germinate at 5 cm below ground level. We have no idea how the seeds get that deep, or how long they remain viable. After fire is a good time to spray as it is easy to target plants. Therefore be flexible enough to alter your spraying program.

Careful hand removal during the plants' growing season is difficult due to soil disturbance. Use a knife to cut the roots to reduce disturbance. Remove these plants as they may re-root if left on top of the soil during winter. Alternatively in summer the plants root system is easily broken by twisting the plant which can then be left on the ground as a mulch.

Calendar of Events

Month/year	Comments
Feb/Mar/April 1998	Arrange your budget for the next financial year.
June/July –Dec	Arrange a seed collecting program if necessary.
July–Jan	Collect seed — timing depends on species. Clean, treat and store as necessary.
Sept–Nov	Write up a standard contract for your contractor. Once done it is amended each year it is used.
Sept–Oct–Nov	Survey bushland to record areas of veld grass to be sprayed, its easier to see when it is flowering or seeding.
Sept–April	Fire season. Be flexible, if there is a fire and the area is known to contain veld grass if possible change your program to spray this area.
Dec–Jan	Arrange at least three quotes for spraying Fusilade. Ask around who are the best operators. You have to justify when you don't choose the cheapest quote. Always keep records of past work done. This can assist in justifying your decision. Make sure you arrange the timing you require (early or late). Get quotes for supply of materials as well, contractors normally supply it cheaper than you can purchase. If buying yourself purchase early(Jan–Feb) as supplies often run out.
Dec–Jan	Make sure you have organised the growing of green stock if required. When it is propagated (time) depends on the species and if you are using seed or vegetative material.
Feb–March 1999	Check up on how the green stock is progressing.
March–April	Was there a fire, do you need to change the area to be sprayed?
March–April	Touch base with your spraying contractor. See where you fit into his schedule and get an approximate date of spraying.
March–April	Apply smoke water if necessary to stimulate germination at the onset of winter rains. In badly degraded areas full of veld grass it may be better to sow seed the following year as correct site preparation is the most crucial factor in successfully restoring bushland.
April–May	Sow treated seed if necessary.
May–June	Inform staff and local residents (where appropriate) a spraying program has been arranged. Give approximate timing of spraying operations.
June–July	Check the stage of growth of the veld grass to see if it is ready for spraying.
June–mid Aug	Spraying in progress. Make sure its being done correctly including safety regulations etc.
June–mid Aug	Put in quadrats for monitoring death rates.
June–July	Plant green stock if necessary.
July–Sept	Check to see if the spray is working.
Nov–Dec	Monitor quadrats.
Nov–Dec	What was the kill rate? Do you need to negotiate with the contractor to respray any areas next year?
Nov–Dec	Do you need to repeat last year's steps?
Nov–Dec	Arrange for secondary weeding e.g. spot spraying or hand weeding in 2000.
Jan–Mar 2000	Hand weeding just twisting out the plants.
2001 and beyond	Check for any further germinants, treat as necessary.

Calendar of events expanded

Make sure you have a contract, especially for large areas, and that the contractors abide by the conditions in the contract, for example, use of dye when spraying so that you can see where the contractor has sprayed, kill rates required, safety regulations, any special areas (around playgrounds, memorials etc) that need to be avoided during ceremonies or school holidays, cessation of spraying operations during rain etc.

Provide a map for the contractor with the areas to be sprayed highlighted. You could use different colours for sensitive areas, e.g. around playgrounds to be sprayed during specific time periods (early morning, late afternoon).

Monitor spraying operations, make sure areas being sprayed are cordoned off with tape if necessary and signs are in place warning staff and visitors spraying is in progress.

It is a good idea to notify staff, also nearby residents if appropriate, prior to spraying taking place. However, although the grass may be ready for spraying starting dates and times are totally dependent on the weather.

Put out quadrats straight after spraying to count live plants, doing this prior to spraying indicates to the contractor where the quadrats are. About 4 months later check again to see what the kill rate is. It is no good spraying if you are not killing the plants. Human error is possible, you may remember to put the dye in the tank and forget the herbicide or wetter. In Kings Park we also monitor on a larger scale, 100 x 100 m grid system, where we employ contractors to estimate the density of veld grass on a scale of 1 to 5 — 5 indicates the heaviest infestation, whilst 0 indicates it is absent (Mattiski, Walton and Kullmann). We can then return in later years for precise locations and find out if the control program is working.

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Weeds in Wetlands

Linda Taman
Native Environmental Systems and Bennett Brook Catchment Group

Introduction

Almost all wetlands on the Swan Coastal Plain have suffered from some form of degradation. In many wetlands, the indigenous vegetation has been invaded by exotic species, and in some cases it has disappeared altogether.

Wetlands are extremely productive places, as plant growth is not generally limited by lack of water over the summer. The weeds which grow in wetlands are correspondingly quick growing and prolific. Before natural regeneration or revegetation can occur in a wetland site, it is necessary to control the weeds.

What problems do wetland weeds cause?

In general, weeds cause the same degradation in wetlands as they do in dryland sites, with a few additional problems:

- Loss of indigenous vegetation
- Loss of habitat for fauna
- Prevention of natural regeneration
- Increase in fire hazard
- Decrease in water quality, caused by soft leafed species which rot quickly
- Blocking of the natural water flow
- Increase in bank erosion

What is the best method of control?

The method used depends largely on the weeds you wish to control, and the level of control selected. The aim of the weed control may not always be eradication. If eradication is beyond the resources of the group, a decision may be made to control the spread of the weed, by removing seedheads or preventing further rhizome spread.

Low impact methods of control include the use of overstorey to shade out understorey weeds and the removal of seed heads. Weeds can also be smothered using jute matting or weed mat. Slashing or burning can be useful where dense stands of weeds prevent access, however follow-up spraying will be needed for most species. A few weed species can be successfully pulled up or dug out.

The worst of the wetland weeds will need to be sprayed at least once to obtain control. Although Roundup Biactive and Fusilade are recommended as safe for use near waterways, there are no guarantees that they will not cause some damage. At least these products are of low toxicity to humans, and break down fairly quickly into harmless products.

What are the most common weeds on the coastal plain?

Grasses, which include kikuyu, couch and buffalo, are amongst the worst of the wetland weeds, as they are very difficult to control. Low impact methods include steam treatment and the use of clear plastic to heat the ground beneath to high temperatures in summer. The alternative to these is the use of herbicide. If no native vegetation is present, Roundup Biactive is the cheaper solution, but if the grass is growing through indigenous vegetation, Fusilade will kill only the grasses. Spraying should be done over the spring and summer when the grass is actively growing, and at least two applications will be needed.

Bulrush (*Typha orientalis*) is also an extremely common weed of wetlands. There is a native species of bulrush (*Typha domingensis),* which is uncommon in the metropolitan area, as it readily interbreeds with the exotic species. Bulrush is an extremely productive plant, with one plant able to cover tens of square metres, with approximately 30,000 seeds per head. The seeds will blow or wash for kilometres, and there will be a constant danger of new outbreaks. It is important to control bulrush, however, as it greatly increases the risk of fire. It is possible to drown bulrush if the stems are cut as water is rising, and they remain under water for some time. Alternatively, large stands with no native vegetation may be removed with a backhoe (Stirling Council has used this method successfully). The stems may also be brushcut or burnt, and the regrowth sprayed or wiped with Roundup Biactive. If the infestation is very large, control rather than eradication should be aimed for. Shading with dense canopy species such as paperbark will weaken the stand, as will continual slashing. If all else fails, place firebreaks between bulrush stands and native vegetation.

Arum lily can form dense stands in wetlands and streams. It is extremely difficult to eradicate, and Roundup seems fairly ineffective. Glean and Garlon have been used with some success, but regrowth still occurs, and these herbicides have unknown effects on wetland organisms. The plants are very difficult to dig out, though continual slashing will eventually weaken the plants.

Watsonia is also difficult to control. Seedheads may be removed, and small infestations may be dug by hand. Large areas will require spraying or wiping

with Roundup Biactive.

Blackberry forms impenetrable thickets, which make removal difficult. With great persistence, the plants can be dug out, though small sections left behind will continue to reshoot. The plants may be sprayed with Roundup, which is not generally very effective. Brushoff is the recommended chemical, again with unknown effects within the wetland.

Juncus microcephalus is a common sedge in wetlands, and a very prolific seeder. Small infestations may be dug out, or Roundup Biactive may be used to spray. If no other control is attempted, the seed heads should be removed.

Pampas grass should be controlled where possible by digging the plant out, as it has fairly shallow roots. Alternatively, the plant may be brushcut, and the regrowth sprayed with Roundup.

Pepper Trees should be either cut down and the stumps painted with Roundup, or the trunk should be stem injected with Roundup.

What criteria should be used to prioritise weed control?

When faced with large numbers of weeds, it is often difficult to know where to begin. The following checklist provides some criteria by which to prioritise weed control

- Aggressiveness: is the weed actively increasing its coverage, and moving into native vegetation?
- Extent of threat to existing native vegetation: which weeds are currently reducing the existing biodiversity of the remnant vegetation?
- Fire risk: does a weed greatly increase the risk of fire, e.g. bulrush?
- Prevention of natural regeneration: are certain weeds preventing the regeneration of seedlings?
- Negative impacts: removal of some weeds may cause habitat loss for fauna, or may increase erosion problems.
- Maintainability: many weeds will require repeated efforts to eradicate. Can you maintain the weed control you are proposing over a number of years?

What resources are available to control weeds?

A successful weed control program will require either labour resources or money, and probably both. The land manager, which is often local or State government, can often provide all these for you. If you need to access your own resources, labour is available through many different organisations. The Australian Trust for Conservation Volunteers provides up to 10 people a day with a supervisor for $300. Larger projects may wish to make use of the Work for the Dole Scheme, or to have their project included in work done by the scheme. The community offender program also provides a labour force with a supervisor.

Although spot spraying with Roundup and Fusilade is often carried out by community groups, it is better to have large spraying programs carried out by professionals who have a spray operator's certificate. If spray work is to be carried out by the community, ensure the landowner/manager is aware of the activity, and ensure that you carry public liability insurance.

Money is available from a number of grant programs. Funds through the Natural Heritage Trust have been notoriously difficult to obtain for weed control, however the Alcoa Landcare Funds and the Gordon Reid Foundation of the Lotteries Commission do provide funds for this work.

Conclusion

The hardest task in a rehabilitation program is usually effective weed control, and in wetlands this is especially difficult. Without good weed control, most revegetation work is doomed to failure. It is worth spending a lot of time and effort on this aspect of the project, to give it the best chance of success.

It is also important to be realistic about what you can achieve, and what you are able to maintain in the long term. No aspect of rehabilitation causes more burnout within a group than weed control!

Burning Issues

Howard Fiedler
Fire and Emergency Services Authority of Western Australia

Ladies and gentlemen, my name is Howard Fiedler and I am the Manager for Wildfire and Special Risks in the Prevention and Risk Management Directorate at the Fire and Emergency Services Authority.

Today I hope to give you an overview of the Fire and Emergency Services Authority and its activities with regards to what we term our Urban Bushland Plans.

First of all, some of you may be unaware of the significant changes which have occurred within the State's fire services: one of those being implied in my reference to the Fire and Emergency Services Authority rather than simply the Fire and Rescue Service. It is timely to give a very brief overview of what has been happening.

In the last 12 months the Fire and Rescue Service, Bush Fire Service, State Emergency Service and Emergency Management Unit have been combining under an umbrella authority known as the Fire and Emergency Services Authority (FESA). FESA handles the Human Resource, Accounting, Financial and Prevention/Risk Management functions for the three Services, and the Emergency Management Unit.

This amalgamation was brought about on the recommendations of the 1977 Emergency Services Taskforce which reported to the Minister for Police and Emergency Services.

FESA is not yet a legislated entity. The FESA bill is presently scheduled to have its second reading in the upper house during this month. Notwithstanding this the amalgamation process is surging ahead at some pace. This has meant many changes within all the Services.

For example, all senior and middle management positions in the Fire and Rescue Service have been thrown open. The same process is happening right now for Bush Fire Service personnel and will probably happen in the future for State Emergency Service and Emergency Management Unit personnel.

The actual structure of FESA and the component Services has also changed a number of times since the commencement of the amalgamation process.

Currently the state has been divided up into five regions with the director for each region being responsible for all Fire and Rescue Service and Bush Fire Service personnel. The direct effect in the Metropolitan area is that now instead of the previous three regions only two now exist, North and South.

Who is in charge of the new Authority and what does it look like? Chief Executive Officer of FESA is Bob Mitchell, Executive Director of Fire Services is Bill Forbes and Director Operations (Fire Services) is Owen Kinsella. Headquarters for FESA is 480 Hay Street, Perth now called FESA House.

The whole process is very dynamic and one thing which is constant is that changes will continue to happen at a rapid rate.

So that is a brief overview of the new FESA organisation and the people who are leading it into the future.

Now to business, the Urban Bushland Plans developed by FESA. The idea for the plans came out of the Burning our Bushland Conference held in 1995 and subsequent discussions between the UBC and the then CEO of the FRS, Chester Burton. Initially, District Officer Richard Robertsen headed the push for the plans and then Director South Lindsay Cuneo was tasked to develop the idea. I took over the project, which was well advanced, from Lindsay on my appointment in November last year.

The basic objective of the plans is to minimise the potential for and impact of incidents in urban bushland areas arising from fire, hazards and other emergency situations.

To achieve this meant that we had to identify the areas, groups and local governments involved with those areas and, through a consultative process, agree on what was needed and develop the plans from that base.

It has been an enormous amount of work by many people. Presently we have over 250 urban bushland plans. Briefly I will work through one of our plans to show you the form which they have taken and how areas were categorised into high, moderate and low areas. One of the challenges with developing these plans was devising a system which would rate, to all parties' satisfaction, the relative importance and risk of an area.

The plans themselves are a standard four-page document with maps of the area attached. They are held on all Fire Stations, Regional Offices and the Operations Centre at Perth. They are available to any interested people. These plans are considered by FESA as a reasonable starting point. The plans are not set in stone and in fact we want them to change, improve and evolve with time.

In our recent work with CALM on the Regional Parks, Ross Mead and FESA have developed Fire

Management and Suppression Response Plans which owe much to our Urban Bushland Plans and also indicate the form and content to which our plans may be upgraded in the near future. CALM in particular have excellent mapping capabilities which we will be 'stealing' for our Urban Bushland Plans.

That shows the basic content of the plans. In the past year we have recognised some 'mobilising problems' and are now putting in a significant effort to overcome these problems. The problem identified was that as long as the Fire Station which developed the Urban Bushland Plan was called to a fire in that area the plan worked very well. That crew knew what was in the plan and the appropriate response. However, in the case where another truck and crew from a station removed from the area, for example a Claremont/Daglish crew standing by at Armadale station, became involved, and this happens frequently during busy summer months, we had a problem.

It is impractical for every truck to carry around the entire set of 250 plus plans so we decided that the vital information on the plans needed to be summarised so it could be relayed to our people via our radio communications network.

On the face of it, this seems like a relatively simple plan but as with anything worth doing a number of small challenges presented themselves.

- First we had to agree on a format and then physically go through each plan and pull out the relevant details.
- The Planning and Evaluation section digitised plan areas/maps and associated attributes into Arcview Urban Bushland images.
- The Manager of our operations centre then used these Arcview images to create a new turnout for the area.
- The manager then matched the summarised plans and renamed the files to correspond to the new turnouts created.
- The whole package was then given to FESA Information Technology group for propagation into the Operations Centre console computer.

The end result is that summarised plans are being progressively loaded onto the Brigades Operational Mobilising System so that whenever a fire is reported on or near an urban bushland area the operations centre have built into their computer terminals a 'drop down box' summarising the plan for that area. This is an automatic response and is based on recognition of street names contained in the digitised plan area.

The Communication Systems Officers then convey the information to the fire crew en route so they know before they arrive at a fire the importance of the area and relevant information on how to commence fire suppression. This process has greatly increased recognition across the service of the plans and increased many times their effectiveness as a useful tool in our prevention and suppression activities.

The other bonus of this system is that fire crews now know that if they produce first rate plans, inspect the areas prior to the burning season and liaise closely with the stakeholders on prevention and fuel reduction activities they will avoid many problems come summer and have good quality information that they have collected supplied to them en route to an incident.

- In conclusion, the plans have now been completed for over 250 urban bushland areas.
- The plans are progressively being loaded on to the radio network for instant conveyance to crews in the field.
- The plans will be progressively updated once work is finalised on the Regional Park Fire Management Plans which incorporate a good number of the urban bushland areas.
- The FESA organisation and its people are committed to the environment. We have made many changes in the last few years and learnt many lessons from dedicated and highly knowledgeable groups represented by the Urban Bushland Council.

We still have a lot to learn and improve on and its our intention to do exactly that!

The Juvenile and Family Fire Awareness (JAFFA) Program

Dr Peta Odgers
Senior Research Officer, Fire & Emergency Services Authority of Western Australia

Introduction

Each year juveniles between 4 and 16 years of age who are involved in firelighting cost the Western Australian community millions of dollars in property and bushland loss. In 1997 alone, juveniles caused more than $15 million worth of damage. No records, however, were kept of the associated costs involved in responding to these incidents, let alone the environmental costs incurred, the injuries sustained or the lives that were lost. The 'real' cost of juvenile firelighting to the Western Australian community is therefore far greater than simply the monetary value purported.

Juvenile firelighting is acknowledged worldwide as an increasing problem and Western Australia is no different. The Fire & Emergency Services Authority of Western Australia has responded to juvenile firelighting through the development of the Juvenile and Family Fire Awareness (JAFFA) program, an extension of the earlier Juvenile Firelighter Program begun in May 1989. This initial program operated on an informal basis, seeing approximately 50 juveniles per year. The JAFFA program has a more formalised approach than its predecessor and is aimed at minimising loss of life and injury, and property and environmental damage caused by juveniles engaged in once-off or repetitive firelighting behaviours.

JAFFA is designed as an educational program for children between 4 and 16 years of age. It is not a program which incorporates punishment, nor does it promote a physical reward system for abstinence. Instead, the JAFFA program endeavours to help children understand the elements of fire, the speed at which it travels, the dangers, the potential consequences of fire, the types of burns which can be suffered, the types of treatments and long term effects of being burnt as well as the legal implications of firelighting and issues relating to criminal responsibility. Through these different learning experiences juveniles are encouraged to decide for themselves not to light fires and to talk to their friends about being fire-safe. The intrinsic rewards and motivations inherent to the JAFFA program help to promote ownership, responsibility and decision making within the young people who attend the program. Without the attainment of these qualities juveniles will not stick to a rule of 'Thou shall not light fires'.

The approach adopted by the JAFFA program is unique. It combines psycho-educational and socio-educational approaches to ensure that the underlying causes of the firelighting behaviour are addressed as well as the superficial act of lighting fires. The way in which these issues are dealt with varies from individual to individual and family to family. The JAFFA program also aims to educate the parents in relation to fire safety. In many instances juvenile firelighting activities can be averted through better supervision, better planning and a greater understanding of the dangers associated with the unsanctioned use of fire by juveniles. It is therefore important to at least attempt to make adult members of the family more aware of the different strategies that they can employ to reduce the likelihood of any further firelighting incidents. In some instances the outcomes of our involvement may even involve the juvenile and/or family being referred to a clinic for long term assessment and intervention.

What is juvenile firelighting?

Juvenile firelighting is the unsanctioned use of fire by children and adolescents between the ages of 4 and 16 years. Included in this broad definition are such diverse behaviours as the inadvertent starting of fire by a child playing with matches or lighters, to the deliberate and repeated setting of fires in order to cause damage or injury. Juvenile firelighters are generally males with an average age of 9 years. They tend to come from mixed socio-economic backgrounds, from both single and dual parent families, have overactive, impulsive and mischievous natures, and are prone to temper outbursts.

The vast majority of juveniles involved in the unsanctioned use of fire are <u>not</u> fully aware of the potential dangers and possible consequences of fire. Research associated with the JAFFA program has revealed that the majority of fires lit by juveniles have been started with matches or lighters found in the home, although, sadly, there is also an increasing number of juveniles reporting that they are purchasing these items from the local shop. Juveniles participating in the JAFFA program have predominantly been found to be setting fire to paper, candles, bush and schools. They have also been found to be involved in the making of sparkler bombs, petrol bombs, aerosol flamethrowers and so on.

Motives for juvenile firelighting

There are a number of reasons why juveniles light fires, ranging from simple curiosity to malicious intent. For the most part, however, juveniles appear to start fires of their own accord and to 'just to see what happens'. Image and reputation, however, have been found to play a large role in the lighting of fires

among adolescents. Their need for acceptance by their peers and affiliation with a group often overrides an adolescent's ability to appropriately choose between right and wrong, and in many instances precludes the adolescent from clearly rationalising the possible consequences of their actions. Some of the most common reasons, however, include: curiosity, fascination, attention seeking, peer pressure, reputation and image, boredom, anger, revenge, crime concealment, mimicking of adult role models, malicious intent and so on. In many instances the juveniles involved in the unsanctioned use of fire are not only unaware of the possible consequences of their actions, but also generally have no intent to damage property, the environment, other individuals, themselves or bushland areas. It must be said though that in some instances the juveniles involved will have at least some awareness and understanding of the ramifications of their actions.

One of the most popular attractions for juveniles in relation to firelighting is bushland. Bushland provides a perceived area of safety — 'out of the sight of passers-by'; a perceived area conducive to experimentation — 'we're only lighting a couple of leaves'; a perceived area which can't be damaged — 'nobody owns it'; and a perceived area in which a fire can be lit and controlled. The JAFFA program, in conjunction with the schools fire safety education program, is trying to address each of these issues through education and increased awareness with an aim to reducing the number of fires which occur in bushland areas each summer.

The results of the JAFFA program so far have been more than encouraging with a recidivism rate less than 5%. It is also interesting that the vast majority of individuals re-engaging in firelighting behaviours are reported to do so between the JAFFA program's first and second visit and very rarely after the educational aspects of the program have been completed. We are particularly proud of this record given the high proportion of referrals we receive from the police, courts and juvenile justice teams. A program such as the JAFFA program, however, does not simply achieve success without effort and there are a number of barriers to dealing with juvenile firelighting which have had to be overcome.

Barriers to juvenile firelighting

The majority of barriers that the JAFFA program has been faced with in the last 12 months have been related to a 'lack of something'. A lack of public awareness; a lack of trained personnel; a lack of parental involvement; a lack of program integration; a lack of resources; a lack of interagency co-operation and communication; and a lack of understanding within the fire service. All of these, and others, are continuing to be addressed within the context of the JAFFA program. For example, one of the areas which sets the JAFFA program apart from other similar programs is the strong interagency co-operation and communication which has been developed.

Interagency co-operation is important in our efforts to prevent the maintenance of firelighting behaviours in juveniles. Strong links have been developed between the JAFFA program and the WA Police Service, Family & Children's Services, Ministry of Justice, Princess Margaret Hospital, the Education Department, tertiary institutions and mental health agencies. Each of these agencies, along with the Fire Services of WA, were represented on a steering committee that was responsible for providing feedback and guidance at each of the different developmental stages of the JAFFA program. Membership of this committee was important for a number of reasons but most of all to ensure that agencies where potential referrals were to be received from or made to were not only aware of the JAFFA program but also had some ownership and investment in it. The support from these agencies within the context of the steering committee was tremendous and certainly contributed to the ongoing development and growth of the program as well as the establishment of very sound interagency links. The interagency model established with the development of the JAFFA program is now being picked up by Fire Services in other States who are starting to develop much sounder links with agencies in their States which may be able to assist them in combating juvenile firelighting.

Referrals

Referrals to the JAFFA program are received from many different sources including the Police, Juvenile Justice Teams, the Courts, Family and Children's Services, Princess Margaret Hospital, the Education Department, fire fighters, relatives and parents. The current lack of resourcing, however, has necessitated that the publicity of the JAFFA program is minimised and controlled as much as possible. Strategies are being discussed to rectify this problem though and it is hoped that by mid-January 1999 the JAFFA program will be highly publicised throughout the Education System, the Medical System, the Police Service, the Courts and the Ministry of Justice. It is also envisaged that further efforts will be made to better inform the general public about the JAFFA program. All of this, however, is very much dependant upon our abilities to rectify our resourcing problems and our efforts will incorporate the active pursuit of corporate sponsorship.

Conclusion

The JAFFA program is a very valuable tool in the fight against juvenile firelighting in Western Australia. It is a program that is already demonstrating that it has the potential to substantially reduce the ongoing costs of juvenile firelighting to the Western Australian community. In particular, it is thought that the JAFFA program will be able to reduce the number of recurrent bushland, school and accidental

fires. The success of the program over the last 12 months has already demonstrated its ability to achieve this not only by directly influencing the juveniles which attend the program, but also indirectly by influencing the curriculum content of the school-based fire safety education program.

The implications of the JAFFA program are great. In the short term the program is aiming to achieve a reduction in recidivist firelighting activities, preventing serious burns and injuries, reducing the amount of property and environmental damage which an individual juvenile can cause and increasing the general fire safety and awareness levels of parents, families and friends. In the long term, the JAFFA program is aiming to be influential in reducing the level of adult arson in our community along with the total cost of fire incurred by the community each year. While these aims provide a substantial challenge for a relatively new program, the outcomes which have been achieved so far are encouraging and provide substantial evidence supporting the JAFFA program's ability to meet these goals.

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Bushfire Risk Management Planning

Lesley Thomas
Ecoscape (Australia) Pty Ltd

Introduction

Managing fire and the risk of fire at the urban/rural interface is a huge challenge in an area where there is often a high concentration of actual and perceived conservation values. The rapid growth of new subdivisions mean that this interface is subject to rapid changes, with an influx of new residents, many new to semi-rural living. The values systems of neighbouring residents may differ widely and there may be considerable conflict between the perceptions of what is required for the protection of bushland and the protection of property from the risk of fire.

Bushfires in remnant bushland in urban and rural landscapes threaten not only lives and property; they also present one of the most severe threats to the ongoing retention and integrity of remnant bushland. The interrelationship between fire frequency and increased fire risk due to invasive grassy weed growth creates a vicious cycle which is difficult to break once established. Effective fire management encompasses objectives to protect lives, property and environmental values, to identify high risk areas and scenarios, and to putt in place strategies to minimise the destructive potential of frequent, uncontrolled, bushfires. To maximise their benefit, strategies must be clear, simple, resource effective, adaptable and achievable.

Yet currently there is no program, strategy or policy to manage bushfire risk in the semi-rural and rural areas in any part of Western Australia, much less the metropolitan area. This is a serious shortfall, and one that should be addressed before a serious fire on the scarp or the coastal plain highlights the absence of risk management planning through loss of life, property and environmental assets.

In late 1997, the City of Cockburn commissioned Ecoscape to prepare a bushfire risk management strategy for the Cockburn Bushfire District. This is the first major step forward, and provides a starting point from which regional bushfire risk management can progress.

The City of Cockburn contains extensive areas of bushland that ranges in significance from local to international. Apart from those areas within the secure conservation estate, much of the remnant bushland is on private land or in reserves for purposes other than conservation, such as road reserves.

Residents in rural and semi-rural areas are concerned about the potential bushfire risk, particularly from vegetation in road reserves. Through this report, the City is addressing residents' concerns while ensuring that the value and integrity of remnant bushland areas are not compromised. The strategy focuses on land under Council control, though it also addresses bushfire risk and management on private land within the City.

The City of Cockburn Bushfire Management Strategy has the following objectives:

- To minimise the risk from bushfire damage to life and property both within and adjacent to natural bushland areas
- To minimise the impact of inappropriate fire regimes on the environmental values of the Cockburn Bushfire District
- To ensure appropriate development in areas prone to bushfires
- To educate the community about bushfire risk, and about Council strategies and programs for bushfire risk management.

This presentation will focus on the City of Cockburn's strategy as an example of what factors should be addressed. However, one thing I want to stress above all else is that Bushfire Risk Management Planning needs a common regional model. The Strategy prepared by Ecoscape for the City of Cockburn is a starting point for discussion.

Essential components of a bushfire risk management strategy

Bushfire Risk Management Planning needs to address a number of issues:

- Sub-division planning and design
- Residential fire planning and property management
- Bushland management to protect assets and reduce hazards
- Regional mapping and identification of risks and hazards
- Operational fire control strategies and tactics
- Co-ordination of all facets in a single plan.

The last point is the most important as implementation of the strategy will involve planners, fire control agencies, environmental managers and the community. Effective communication and co-ordination is the key to successful implementation.

Risk and hazard assessment

In order to address this issue, an understanding is needed of the relevant components of the region that

affect both bushfire risk and management of that risk. CALM has already developed an interactive GIS based program called Wildfire Threat Analysis or WTA (Muller & Vodopier, 1994). The focus of WTA is on large tracts of vegetation, with few nodes of human habitation, where the fire control authority is the major land manager and where fires are large and may take days to control. This is not something that applies to the semi-rural urban fringe. However, the mapping hierarchy is a useful way of approaching risk and hazard analysis.

Sirofire is a fire spread simulator developed by CSIRO (CSIRO, 1998). Like WTA, it is designed as a predictive tool for use in large wildfires and uses many of the same components as the Wildfire Threat Analysis. The Sirofire mapping system includes land use categories more comparable to those found within Cockburn and is based on finer scale mapping which gives a more realistic picture of on-ground conditions.

Ecoscape developed the following series of GIS overlays to identify areas at high risk.

BUSHFIRE THREAT

- Values at risk
- Risk of Ignition
- Fire History
- Factors Affecting Headfire Behaviour
  - Fuel Type
  - Fuel Condition/Quantity
  - Slope/Terrain

Aspects addressed by WTA and Sirofire, but not used in detail in the Cockburn Bushfire Risk Management Strategy are climate, detection time and response time. The area covered is small enough that the climate is consistent. Detection and response time may vary, though not sufficiently to require consideration in the formulation of risk management strategies.

For the City of Cockburn fuel loads and fuel types for all areas of the Bushfire District were mapped. For ease of mapping, the fuel loads on the tables used in the McArthur Grassland Fire Behaviour Meter tables were reduced into three basic categories: low, medium and high. We also defined bushland fuel loads into low, medium and high categories.

Bushland risk management

Fire management planning for urban bushland areas is currently operating without a solid basis. It should be noted that where the protection of environmental assets from fire is mentioned, this should be taken to mean the protection of environmental assets from inappropriate fire regimes. As yet, there is no reliable data on upper and lower fire interval thresholds for key species or plant communities on the Swan Coastal Plain, though some work on banksia communities has been developed by Burrows & McCaw (1990). Frequent fires are linked with structural changes in the vegetation (Bradstock, 1998) and localised extinction of plant species (Gill & Bradstock, 1995). Until further research is carried out which examines fire ecology both in both pristine and modified bushland, including fire interval threshold, seasonality and intensity, bushfire risk management planning is severely hampered. In NSW, this type of research is largely driven by the requirements of the Threatened Species Conservation Act. Therefore, we have taken a precautionary approach and have recommended minimisation of fires where possible, as an interim measure in areas of good bushland condition.

Management of bushfire risk in bushland areas requires management of fuel loads and, if possible, types of fuel, as well as minimisation of the risk of ignition and effective fire control once fires are away. The City of Cockburn's Chief Fire Control Officer has recorded and mapped all ignitions since 1991. The records show that 74% of all unplanned fires began in or close to road reserves. Thus it was determined that fuel management should focus on a 30 m fuel management zone along all major boundaries for reserves, and on management of verge fuel loads. Other areas with a history of frequent ignitions are also targetted.

Fuel management methodologies are addressed in the report, with a matrix to assist in determining the most appropriate methodology for a given set of conditions. The strategy tried not to be too prescriptive and left room for personal judgement. Frequent control burns of bushland areas was discouraged.

In addition, a questionnaire was developed which could be applied by council officers or local residents to assess the risks posed by fuel loads and types, together with other hazards, on both the property and the verge.

Subdivision planning and design

This topic was also addressed in the volume *Planning with Fire* (Shire of Swan *et al*, 1995). However, some important aspects of planning and subdivision design were not addressed in *Planning with Fire*, primarily relating to the role of subdivision design in minimising fire hazards. For example, in the City of Cockburn, several special rural subdivisions were noted where the homes were clustered around a cul-de-sac, and where fuel loads were high around the only entry/exit point into the street. In addition, many houses had high fuel loads right up to the house. It is important that the planning procedure, as well as ensuring that there are adequate water supplies, should also address the need for through access and fuel management zones.

The risk and hazard assessment methodology provided in *Planning with Fire* also needs some refining before it can be usefully applied. For example, the scale of risk associated with the type of vegetation should include common coastal plain vegetation types such as banksia woodland and melaleuca forest, and the degree of fuel curing, which varies seasonally, is irrelevant and should be deleted.

Residential fire planning and property management

In the Ash Wednesday fires, 31 civilians in Victoria died. In almost all cases, the deaths were preventable. In the event of a major fire in any of the major rural residential areas around Perth, people are likely to make the same mistakes. We are basically a fire-ignorant community. We know very little about how to make our homes bushfire safe, how or when to evacuate, or appropriate survival strategies.

The Community Fireguard Program, established and run by Warren McCarthy, addresses this very problem. But it is under-resourced and not widely known. Yet programs such as this are absolutely essential if Western Australia is not to repeat the tragedy of the Ash Wednesday fires.

In terms of residential fire risk for already established areas, the main controls outside of firebreak control and reduction of grassy fuels, are education and encouragement. Issues that the City of Cockburn Strategy focusses on are:

- extending the Community Fireguard program to the City of Cockburn
- appropriate fuel management on private property
- low fuel zones around infrastructure
- use of landscaping for fire shields
- fire 'literacy' and preparedness of communities in high fire risk areas
- use of roof sprinkler systems independent of mains water and electricity
- appropriate house construction standards and placement of building envelopes. (Australian Standard 3959, Construction of Houses to Prevent Ember and Radiation Attack).

The implementation of the Cockburn Bushfire Risk Management Strategy will require considerable input from both the fire control and environmental management sections, so that the goal of lower fuel loads is achieved without compromising the conservation of bushland on private property. This is particularly relevant in the Jandakot Botanic Park area.

Operational fire control strategies and tactics

This is a topic worthy of a report in itself and was only touched on briefly within the City of Cockburn Bushfire Strategy. Aspects addressed included:

- Fire management plans for reserves
- Water bombers
- Earth-moving equipment
- Use of maps — fire history, fuel loads, environmental assets
- Post fire management.

It was recognised that the development of joint training programs through the Fire & Emergency Services Authority will provide opportunities for reviewing fire control strategies and tactics in order to improve environmental outcomes.

Action plan

The implementation of the various components of the strategy are brought together in an action plan that defines the task to be undertaken, nominates the person responsible and provides a timeline and an indication of priority. The action plan is based on the strategies documented in the report.

It is to be hoped that if a regional model for bushfire risk management planning is developed, the individual plans can be more streamlined than the Strategy prepared by Ecoscape for the City of Cockburn.

Regional bushfire risk management planning

To be fully effective, bushfire risk management planning needs to involve:

- the local government authority, whose boundaries can effectively form the bushfire risk management plan boundaries
- all major government land and resource managers such as CALM, Ministry for Planning and Water & Rivers Commission
- conservation over-groups, such as Urban Bushland Council
- community and local conservation groups, Landcare and catchment management groups, local residents associations
- relevant fire control authorities.

And it needs, more than anything else, a statutory basis and a common model. This is the basis for bushfire risk management planning in NSW where it evolved as a response to a series of tragic fires in the 1980s. The concept of regional bushfire risk management planning is covered in the Rural Fires Act (1997), which also integrates the principles of ecologically sustainable development into the operations of the Rural Fire Service. With this basis, protection of environmental assets from fire is not at the whim of a Minister or the local fire authority, it is ensconced in legislation.

Western Australia cannot afford to wait until lives are lost before deciding to act.

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Closing Remarks

Angela Carr
President, Urban Bushland Council

The community realises what a magnificent asset we have in bushland. I think people would like all government departments responsible for bushland to actively manage them in accordance with sound practice. If bushland areas are to be saved at a later date, the chances are they won't be as degraded if they are well looked after. What a wonderful role model we would have if all relevant State authorities had environmental officers and bush managers looking after their own patches of bushland. They could also supervise contractors and make sure any development minimises loss of bushland.

The Urban Bushland Council would like to see a whole-of-government policy on bushland, including locally significant bushland. This could include items such as a SEPP 19 that applies to local councils and State government agencies in NSW. Resources need to be made available so that local councils can undertake management plans and implement them. Legislation should also suggest that locally significant bushland be managed by council in partnership with community groups. Perhaps we should also require that a public consultant be employed by local council for any proposed development. This would enable the community and the developers and council to work through all the issues, including matters relating to bushland. Also we would like to see bushland protection and management become part of the core business of councils. Perhaps friends groups can push for an environmental officer by requesting that management plans be drawn up for each area of bushland.

The UBC believes there needs to be a central agency that can provide information on urban bushland management. This agency could train and provide support for bushland managers, provide in-service training on weed control and provide research results on bush regeneration techniques. There may be a number of government agencies that would like to perform this role.

The UBC would like to see the community involved in a serious dialogue with other bodies on the legal identity and a management framework for regional parks.

We look forward to the amendments of the EPA Act, as we hope that there will be serious consequences for illegal clearing in environmental harm legislation.

The Urban Bushland Strategy has failed to address clearing of urban bushland. This matter still needs a legal approval process such as now exists in the SEPP 19 legislation in NSW.

We advocate a separate zoning under the Metropolitan Region Scheme — a bushland conservation zone. Perhaps we need to work with developers and planners to be more creative with housing developments near bushland. The scorched earth policy is unacceptable.

The government must address these issues now. The community needs to be involved in decision-making, as it is with regional parks. Members of the community are doing very good work in bushland management but they can't continue indefinitely without support and recognition. Most of this work is voluntary, but there must also be a greater input by paid full time or contract bushland managers with up to date training. Volunteers, if not already trained, should be offered training and payment from time to time.

To all speakers and participants, we thank you for coming and for your contribution to the conference. Bushland protection and management is a quality of life issue that generates a high level of community interest. We hope that there will soon be a legislative framework for bushland that will optimise its potential for protection and management. The Urban Bushland Council will continue to lobby for change, though we need to be backed by strong community support.

Keep up the good work all of you and thanks for being here today. I would like to thank Mark Couston for his telling of the story of bushland management at Ku-ring-gai Municipal Council. We are very glad to have had his input. Once again, a special thank you to all those people who made this conference happen.

Recommendations from the Conference

Recommendations 1-17 were read out to the audience.

1 The State Government establish a policy requiring all urban bushland clearing proposals be subject to adequate environmental assessments. The policy should be binding on all state agencies. The agency administering the policy should be empowered to coordinate State agencies to allow for prohibition of clearing, requiring binding conditions on approved proposals and facilitating negotiated outcomes where necessary.

James Duggie
Wildflower Society of WA

2 That unvested crown land which contains remnant bushland be offered to the local authority for management as a conservation reserve prior to any revesting or rezoning processes being initiated.

Felicity McGeorge
Parkway Bush Preservation Group

3 That this conference calls upon the government to introduce a new Bushland Conservation Zone in the Metropolitan region for all Bushplan areas. Also that a Bushland Conservation Zone be introduced to the Model Scheme Text for Town Planning Schemes.

Mary Gray
UBC, Wildflower Society of WA

4 That at least one community person attending this conference from each local government nominates for council elections in May 1999.

Robert Atkins
Mundaring

5 That the Appeals process be reformed so that government departments and/or the Minister cannot overrule environmental issues in favour of development when the public and council are unanimously united against such development.

Josephine Te Puni
Coast Care Advisory Committee

6 To endorse Urban Bushland Council action to call upon the State government to establish an environmental weed control research unit with ample budget and resources.

Kevin McLean
Friends of Signal Hill
Friends of Perth Airport Bushland

7 The Education Department establish as part of its Environmental Policy a requirement that all Education Department land which is to be sold, transferred to other State agencies or developed should have any bushland assessed for heritage values. These values together with its values as an educational resource should be considered in decision making.

James Duggie
Wildflower Society of WA

8 This conference calls upon the State government to introduce a statutory planning policy (SPP) equivalent to SEPP 19 'bushland in urban areas' from NSW.

Mary Gray
UBC, Wildflower Society of WA

9 We urge State and local government to work together with the community to develop Greening Plans in order to protect and manage remnant bushland especially in urbanising areas on the fringes of Perth and other urban centres.

David Wake
Quinns Rock Environmental Group

10 To endorse Urban Bushland Council action to call upon the State government to ban the sale of plant species which are known to be serious environmental weeds and to discourage their cultivation.

Kevin McLean
Friends of Signal Hill
Friends of Perth Airport Bushland

11 That the State government place a ban on all scorched earth clearing.

Kirsten Tullis
UBC, Bayswater Greenwork, Men of the Trees

12 That all local councils employ environmental officers with a particular focus on bushland management.

Kirsten Tullis
UBC, Bayswater Greenwork, Men of the Trees

13 That in the light of the mishandling by the State government of the case of the Parkway Bush, the case be referred to the Ombudsman by the Urban Bushland Council.

Felicity McGeorge
Parkway Bushland Preservation Group

14 To call upon the State government to develop sustainable population targets for the Perth region, taking into account all relevant biodiversity and heritage issues.

Kevin McLean
Friends of Signal Hill
Friends of Perth Airport Bushland

15 Recognising Perth's urban sprawl as a major threat to remnant bushland and to the sustainability of the city we call upon the State government to look at innovative growth management, including urban growth boundaries and greenbelts, in planning the future of the Perth Metropolitan Region and beyond.

David Wake
Quinns Rock Environment Group

16 To call upon the State government to pass legislation further restricting the unauthorised use of off-road vehicles in remnant bushland.

Kevin McLean
Friends of Signal Hill
Friends of Perth Airport Bushland

17 That Fusilade WG be made legally acceptable for use in bushland.

Warwick Boardman
Manning Primary School bushland and COSPEA
[There was strong opposition to this resolution from one person at the forum because of the perceived long term effects on the ecology and rivers.]

18 Each council should aim to eradicate five noxious weeds such as caltrop, geraldton carnation weed etc, within five years.

Andrew Thomson
UBC, CREEPA, COSPEA

19 There is a need to regulate fertiliser use and to encourage the planting of local natives to protect water resources.

Steve Appleyard
Waters and Rivers Commission

20 To encourage the planting of local natives to protect the ground water resources. To have hobby gardening programs and horticulturists/nurseries to promote local plants for Perth gardens with information on ongoing maintenance.

Jan King
Mt Henry Peninsula Preservation Group

21 The Urban Bushland Council to ask the WA Municipal Association to encourage local government authorities to conserve and manage their remnant bushland with appropriately trained staff.

Kevin McLean
Friends of Signal Hill
Friends of Perth Airport Bushland

22 That when managing bushland councils and community groups make sure the management schedule integrity is maintained. There are enough natural variables to contend with in bushland regeneration so it should not be at the mercy of factors such as the failure of the contractor to work to a schedule or to use appropriate practices.

Dorothy Perret
Wildflower Society

23 That UBC and the conference attendees support the concept of regional bushfire risk management planning. This planning requires a statutory basis, a common model and methodology, and a good Geographical Information System (GIS) basis.

Lesley Thomas
National Trust, Ecoscape

24 To increase fines for dumping rubbish from $50 to a maximum of $5000.

Andrew Thomson
UBC, CREEPA, COSPEA

25 That WA legislation be brought into line with NSW legislation to include environmental management as a service provided by local government authorities, to include conservation zones in Town Planning Schemes and the Metropolitan Region Scheme, to increase public open space to 25% and to allow local government authorities to issue tree/vegetation preservation orders.

Beatrice Franke
Upper Canning/Southern
Wungong Catchment Team

26 To protect biodiversity and the environment in general this conference urges the State and Federal governments to adopt a population policy which restricts immigration levels to replacement rates and encourage families to have fewer children.

Andrew Thomson
UBC, CREEPA, COSPEA

27 That Environmental Science studies be made available as an evening course to allow people who are working to become further educated as external courses are too inadequate and too impersonal for a working person.

Tim Rodgers
City of Canning

28 That bushland appreciation and study be included in the school curriculum from first grade to late secondary school.

Kirsten Tullis
UBC, Bayswater Greenwork, Men of the Trees

Conference Program

(*Denotes speaker, where there are multiple authors)

Day One: Protection

8.30 am *Registrations*
9.00 am *Welcome*

Angela Carr, President, Urban Bushland Council

9.05 am *Official Opening*

Hon. Barbara Scott MLC

9.10 am *Community Visions*

Chaired by Angela Carr, Urban Bushland Council

Conserving Remnant Vegetation in an Urbanising Landscape (15 minutes)
David Wake* and Renata Zelinova, Quinns Rocks Environmental Group

Bushland Protection and Planning: A case for further reform (10 minutes)
James Duggie, Wildflower Society of WA

Robert Bropho — Swan Valley Nyungah Community (5 minutes)

9.40 am *State Government Initiatives*

Perth's Bushplan (20 minutes)
Paul Frewer, Director of Strategic Planning, Ministry for Planning

10-minute question time

Environmental Protection Act (10 minutes)

Dr Bryan Jenkins, Department of Environmental Protection

5-minute question time

10.25 am *Morning Tea*
10.40 am *Legal Mechanisms*

Chaired by Mary Gray, Urban Bushland Council

Key note speaker:

SEPP-19 – 12 Years On (30 minutes)
Mark Couston, Ku-ring-gai Municipal Council, NSW
15-minute question time

Legal Mechanisms for the Protection of Bushland (15 minutes)
Michael Bennett, Environmental Defender's Office

5-minute question time

Local Government Protection and Management Mechanisms Available for Urban Bushland (10 minutes)
Clare Walsh, Western Australian Municipal Association

5-minute question time

11.55 am *Local Government Initiatives*

Local Government and Bushland Protection (10 minute)
Darren Walsh, City of Cockburn

Achievements and Pitfalls in the Protection of Bushland in the Shire of Serpentine–Jarrahdale (10 minutes)
Jan Star, Shire of Serpentine–Jarrahdale

A Positive Experience — Mundaring's Environmental Advisory Committee (10 minutes)
Dr Alan Pilgrim*, Curtin University, and Robert Atkins, Swan River Trust.

10-minute question time

12.35 pm *Lunch*
1.35 pm *Community and Government Partnerships*

Chaired by Jan King, Mt Henry Peninsula Preservation Group

Who's Looking After the Bush? Expectations of Community Involvement (20 minutes)
Margo O'Byrne, Department of Environmental Protection

5-minute question time

Community Perspectives (20 minutes)
Jeff Anderton, Rockingham Regional Park
Laurie Boylan, Yellagonga Regional Park
Julie Roberts, Canning River Regional Park

Conservation and Land Management (20 minutes)
Tim Bowra – Regional Parks, CALM

10-minute question time

2.50 pm *Afternoon Tea*
3.05 pm *Walks and Talks*

Concurrent sessions — please choose one

Local Bushland — Government Brick Wall and Tour

Chaired by Diana Corbyn, Wildflower Society of WA

Bibra Lake Case Study
Felicity McGeorge, Parkway Bush Preservation Group

School Bush Selloff,
James Duggie, Wildflower Society

DOLA Selloff in Mundaring
Janet Atkins, Mundaring Community Member

2. Bushland Protection

Chaired by Jeff Anderton, Urban Bushland Council

Nature Conservation Covenants and the Nature Trust
Rod Safstrom, Environs Consulting

Covenanting
Bridget Hyder-Griffiths, National Trust
Presented by Lesley Thomas, Ecoscape Australia

Preserving Urban Bushland and Growing Local Natives Plants to Protect Groundwater Resources
Steve Appleyard*, Water and Rivers Commission and R.J. Powell

3. Community Support Programs

Chaired by Kim Sarti, Wildflower Society of WA

Greening WA Bushcare Program
Anna-Marie Penna, Greening WA

Management — partnerships between community groups and government agencies
Ken Beasley, Australian Trust for Conservation Volunteers

4. Walk

A Look at Bibra Lake Regeneration Work
Denise Crosbie, Friends of the Cockburn Wetlands Education Centre

Day Two: Management

9.30 am *Welcome*
9.35 am *Knowledge Base*

Chaired by Kirsten Tullis, Urban Bushland Council

Research and Management of Urban Bushland by Kings Park (20 minutes)
R. T. Wills*, C. J. Yates, K. A. Meney, I. R. Dixon, K. W. Dixon and S. D. Hopper, Kings Park and Botanic Garden

5-minute question time

Knowing and Understanding the Plants in Your Bushland (15 minutes)
Bronwen Keighery*, (Department of Environmental Protection) Greg Keighery, (CALM) Neil Gibson (CALM) and Ann Gunness (Wildflower Society of WA).

5-minute question time

10.20 am *Weeds*

Environmental Weed Strategy for WA (10 minutes)
F. Batini, J. Asher, R. Armstrong* (CALM), D. Kaesehagen (Ecoscape), D. Pigott (MerriWeb)

Integrated Environmental Weed Management (10 minutes)
Rod Safstrom, Environs Consulting

5-minute question time

10.45 am *Management Resources*

Management Resources (10 minutes)
Mark Couston, Ku-ring-gai Municipal Council, NSW

5-minute question time

Interim Management — The Quiet Achiever (10 minutes)
Matt Stafford, Ministry for Planning

5-minute question time

What is Local Government Doing? (5 minutes)
Mary Gray, Urban Bushland Council

11.20 am *Morning Tea*
11.35 am *On the ground*

Chaired by Janice Marshall, Friends of Shenton Bushland

What are the Management Issues? — Community Perspectives (20 minutes)
Kevin McLean, Friends of Signal Hill/Friends of Perth Airport Bushland.

Regeneration after Watsonia Occupation (10 minutes)
Dr Alan Pilgrim* (Curtin University) and Jenny Johnson (Hovea Bush Regenerators)

5-minute question time

Support for Weed Control and Bush Regeneration (10 minutes)
Kate Brown, Environmental Weed Action Network

5-minute question time

In for the Long Haul — the Bassendean Preservation Group in its Second Decade (10 minutes)
Greg Peterson, Bassendean Preservation Group

5-minute question time

The Friends Group Manual in Mundaring (10 minutes)
Mick McCarthy* and Herbert Titelius, Shire of Mundaring

5-minute question time

1.00 pm *Lunch*
2.00 pm *Walks and Talks*

Concurrent sessions — please choose one

1. The Seed Bank

Chaired by Kevin McLean, Friends of Signal Hill/Friends of Perth Airport Bushland.

The Role of the Seed Bank in Bushland Management
Judy Fisher, University of Western Australia

The Importance of Topsoil in the Restoration of Banksia Woodland. Case Study: A Sand Quarry Following Sand Extraction
Deanna Rokich, Kings Park and Botanic Garden

Greening WA Sustainable Seed Banks Project
Rod Safstrom* (Environs Consulting) and Julie Thygesen (Greening WA)

2. Pests and Diseases

Chaired by Jeff Anderton, Urban Bushland Council

Community Involvement in Dieback Control
Ian Colquhoun, Roleystone Dieback Action Group

Rabbit Control at Altone Road Wetland
Kirsten Tullis, Bayswater Greenwork

Best Management Practices for the Control of Perennial Veld
Bob Dixon, Kings Park and Botanic Garden

Weeds in Wetlands
Linda Taman, Native Environmental Systems, Bennett Brook Catchment Group

3. Fire Management

Chaired by: James Duggie, Wildflower Society of WA

Burning Issues
Howard Fiedler, Fire and Emergency Service of WA

The Juvenile and Family Awareness Program
Dr Peter Odgers, Fire and Emergency Service of WA

Bushfire Risk Management Planning
Lesley Thomas, Ecoscape Australia

4. Walk

A Look at Bibra Lake Regeneration Work
Denise Crosbie, Friends of the Cockburn Wetlands Education Centre

3.15 pm *Afternoon Tea*

3.30 pm *A Final Plenary Session*

Conference Delegates

(s) denotes speaker

Jeff Anderton (s)	Port Kennedy LCDC/UBC Vice President
Steve Appleyard (s)	Water and Rivers Commission
Roger Armstrong (s)	CALM, Bunbury
Janet Atkins (s)	Wildflower Society of WA
Robert Atkins	Community Member
Margaret Bailey	Curlewis Reserve
Yvonne Baldock	Curlewis Reserve
Louisa Barnacle	Swan River Trust
Bevan Barron	City of Mandurah
Kerryn Barton	
Loretta Bean	Eastern Metropolitan Regional Council
Keiron Beardmore	Ministry for Planning
Ken Beasley (s)	Australian Trust for Conservation Volunteers
Kim Bell-Compton	
Michael Bennett (s)	Environmental Defenders Office
Bernhard Bischoff	South West Environment Centre Bunbury
John Blyth	CALM Wildlife Research Centre
Joan Boardman	Manning Primary Bush Group
Warwick Boardman	Manning Primary Bush Group
Heather Bowler	Friends of Ellis Brook Valley
Tim Bowra (s)	CALM, Regional Parks
Laurie Boylan (s)	Friends of Yellagonga Regional Park
Robert Bropho (s)	Swan Valley Nyungah Community
Kate Brown (s)	Environmental Weeds Action Network
Bryce Bunny	City of Mandurah
Geoff Burrel	City of Mandurah
Norma Calcutt	Friends of Bold Park Bushland
Claudia Calderon	City of Joondalup
Louie Cameron	Town of Kwinana
Maureen Campbell	Peel Preservation Group
Angela Carr (s)	City of South Perth Environmental Association/UBC President
Alanna Chant	
Richard Cleverley	Guilderton Community Association
Ian Colquhoun (s)	Roleystone Dieback Action Group
Sarah Comer	Toby Inlet Catchment Group
Richard Cooke	Murdoch University, Environmental Technology Centre
Diana Corbyn	Murdoch TAFE (South Metropolitan College)
Mark Couston (s - keynote)	Ku-ring-gai Municipal Council, NSW
Denise Crosbie (s)	Cockburn Wetlands Education Centre
Harry De Jong	Wetlands Conservation Society
Allison Dixon	Mandurah Environmental Advisory Committee
Bob Dixon (s)	Kings Park and Botanic Gardens
Cathy Drake	Department of Environmental Protection, Ecoplan; Media
Trevor Drummond	Friends of Brixton Street Wetlands/UBC Treasurer
James Duggie (s)	Wildflower Society of WA
Judy Edwards, MLA	Shadow Minister for the Environment
Val English	Consultant to CALM
Ray Erington	City of Mandurah
Sandi Evans	Eastern Metropolitan Regional Council
Howard Fiedler (s)	Fire and Emergency Services Authority of WA
Judy Fisher (s)	University of WA, Centre for Ecological Education
Beatrice Franke	Upper Canning Southern-Wungong Catchment Team/Centre for Ecosystem Management, Edith Cowan University
Brett Fraser	Bennett Brook Catchment Group

Sharon Fraser	City of Rockingham
Paul Frewer (s)	Ministry for Planning
John Garside	City of Mandurah
Gerry Gauntlett	Neerabup Resident Group
Judith Gauntlett	Nerrabup Resident Group
Elizabeth George	Friends of Koondoola Regional Bushland
Neil Gibson	CALM
Rosemary Glass	Bayswater Integrated Catchment Management
Ron Glasson	Mandurah Coast Care Coordinating Committee
Kaye Godwin	
Cheryl Gole	Friends of Railway Reserve, Nature Reserves Preservation Group
Michael Grasby	Swan Mundaring Community Catchment Project
Mary Gray (s)	Wildflower Society of WA/UBC Executive
Sally Grebe	Mt Henry Peninsula Preservation Group
Janet Gunn	Mandurah Environmental Advisory Committee
Claire Hall	Bassendean Preservation Group
John Harris	City of Mandurah
Jacqueline Harvey	Friends of Yellagonga Regional Park
Diane Harwood	Denmark Bush Care
Susan Hill	Leschenault Community Nursery
Sjann Hoetmer	City of South Perth Environmental Association
Bob Huston	CALM Land for Wildlife/Wooroloo Brook Landcare
Jeanette Huston	Revegetation for the Future Working Group/Wooroloo Brook Landcare
David James	Friends of Forrestdale
Patricia Janssen	Murdoch University
Margaret Jeffery	Swan Valley Nyungah Community
Christine Jekabsons	Men of the Trees
Bryan Jenkins (s)	Department of Environmental Protection
Jenny Johnson (s)	Hovea Bush Regenerators
Nick Jones	Town of Kwinana
David Kaesehagen	Ecoscape
Colma Keating	Dinkum Results
Jacqueline Keelan	Quinns Rocks Environmental Group
Bronwen Keighery (s)	Department of Environmental Protection
Sharon Kilgour	Shire of Kalamunda
Jan King	Mt Henry Peninsula Preservation Group
Cliff Lloyd	Ministry for Planning
Sandra Maciejewski	CALM Wildlife Branch
Jenny Mackintosh	Wildflower Society of WA, Eastern Hills Branch
Mike Mackintosh	Rocky Gully Catchment Group
Sally Madden	Conservation Council of WA
Jodi Mansell	Kings Park and Botanic Gardens
Janice Marshall	Friends of Shenton Bushland
Mick McCarthy (s)	Eastern Metropolitan Regional Council
Cath McChesney	Kings Park and Botanic Gardens
Robin McElroy	City of Joondalup
Felicity McGeorge (s)	Parkway Bush Preservation Group
Russell McKenzie	City of Mandurah
Jock McLean	Mandurah Environmental Advisory Committee
Kevin McLean (s)	Friends of Signal Hill/Friends of Perth Airport Bushland/UBC Executive
Rod Mifflin	WA Gould League
Peter Mooney	Kings Park and Botanic Gardens
Alan Morgan	City of Mandurah
Brian Moyle	Wildflower Society of WA
Rosalynd Murray	Town of Kwinana
Peter Nash	Swan Catchment Centre
Denyse Needham	Serpentine – Jarrahdale LCDC
Jody Neiman	Serpentine – Jarrahdale LCDC
Jackie Nichol	Kings Park and Botanic Gardens
John Nicholson	Eastern Metropolitan Regional Council
Margo O'Byrne (s)	Department of Environmental Protection, Ecoplan
Peta Odgers (s)	Fire and Emergency Services Authority of WA

Joan Payne	Water Bird Conservation Group
Wendy Payne	Community Member
Anna Marie Penna (s)	Greening WA, Urban Bushcare
Dorothy Perret	Wildflower Society of WA
Susan Petersen	Curlewis Reserve
Greg Peterson (s)	Bassendean Preservation Group
Alan Pilgrim (s)	Curtin University of Technology
Lee Prideaux	City of Joondalup
Geoff Rawley	Apace Aid
Julie Robert (s)	Canning River Regional Park
Bill Robinson	Fire and Emergency Services Authority of WA, Fire Prevention and Risk Management
James Robinson	City of Armadale
Deania Rokich (s)	Kings Park and Botanic Gardens
Timothy Rodgers	City of Canning
Tom Rose	Swan River Trust
Katinka Ruthrof	Kings Park and Botanic Gardens
Rodney Safstrom (s)	Environs Consulting
Lucy Sands	Water and Rivers Commission
Kim Sarti	Wildflower Society of WA
Barbara Scott, MLC (s)	Liberal Member for South Metropolitan Region
Lesley Shaw	Friends of Allen Park
Matt Stafford (s)	Ministry for Planning
Jan Star (s)	Shire of Serpentine – Jarrahdale
Damien Staude	Mt Henry Peninsula Preservation Group
Paddy Strano	City of Cockburn
Linda Taman (s)	Native Environmental Systems
Josephine Te Puni	Mandurah Coast Care Coordinating Committee
Sylvia Tetlow	Waterbird Conservation Group
Lesley Thomas (s)	Ecoscape
Andrew Thomson	City of South Perth Environmental Association/UBC Executive
Natalie Thorning	Department of Environmental Protection
Herbert Titelius	Hovea Bush Regenerators
Kirsten Tullis (s)	Bayswater Greenwork/Men of the Trees/UBC Secretary
Ben Wading	Curtin University of Technology
David Wake (s)	Quinns Rocks Environmental Group
Stacey Wallace	Friends of Bob Blackburn Flora Reserve
Clare Walsh (s)	WA Municipal Association
Darren Walsh (s)	City of Cockburn
Brian Warren	Shire of Esperance
Fiona Webster	
Arthur Weston	
Ray Wills (s)	Kings Park and Botanic Gardens
Sarah Winter	Bennett Brook Catchment Group
John Wroth	Shire of Busselton
Vanessa Yeomans	Conference Organiser
Marilyn Zakrevsky	City of Joondalup
Renata Zelinova	Quinns Rocks Environmental Group

The following people were not delegates, but are authors or co-authors of papers:

J. Asher	CALM
F. Batini	CALM
Kingsley Dixon	Kings Park and Botanic Gardens
Ann Gunness	Wildflower Society of WA
Stephen Hopper	Kings Park and Botanic Gardens
Bridget Hyder Griffiths	National Trust of WA
Greg Keighery	CALM
Kathy Meney	Kings Park and Botanic Gardens
David Pigott	MerriWeb
Robert Powell	CALM
Julie Thygesen	Greening WA
C. J. Yates	Kings Park and Botanic Gardens