

***WILDLIFE CORRIDORS AND LANDSCAPE
RESTORATION: PRINCIPLES AND STRATEGIES FOR
URBAN NATURE CONSERVATION***

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Canberra Urban Parks and Places

of the

ACT Department of Urban Services

by

Enviro Links Design Pty Ltd
P.O. Box 34, Yarralumla, ACT. 2601
Phone: 02 62604455 Fax: 02 6260 4311

in association with
Geoff Butler & Associates and Anne-Marie Wilson

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SUMMARY OF CONCLUSIONS & RECOMMENDATIONS

The conclusions of this report are that:

- there have been significant moves by the ACT government, its agencies and the community to address the needs of biodiversity conservation and a range of other environmental issues in recent years. The Government and community appear to be prepared to address environmental issues at the local and regional levels.
- Canberra, because of the stringent planning processes employed here, is internationally renowned for its environmental standards and has become a model for many new cities and for other urban areas subject to renewal programs. However, further significant opportunities still exist to increase the potential for wildlife habitation within the urban area.
- there is a reasonably comprehensive understanding of the means of increasing opportunities for wildlife within the urban area.
- there needs to be a more thorough integration of environmental programs and objectives within the planning processes of government agencies.
- While the requirements for sustainable development are generally well understood, a better understanding within the community of the need for biodiversity conservation is required.
- the financial and human resources available within government agencies to adequately manage environmental issues are rapidly diminishing, especially with regard to monitor and enforce compliance under existing environmental laws, strategies and policies. (e.g. the loss of adequate tree maintenance and replacement programs and the “brain drain” from agencies). There has also been an apparent lack of will to adequately monitor and if necessary enforce current policies and legislation related to environmental management issues.
- there is a need to take essential environmental components of the Canberra Landscape Guidelines into a sphere of enforceability as compliance is essential to meet the objectives of other government strategies and legislation for success to be achieved.

- the government needs to make a solid commitment to a comprehensive tree replacement program in the ACT's urban areas.
- an increased emphasis on "forward tree planting" programs is required, including the establishment of multiple stratas of vegetation.
- There is an apparently growing reliance on volunteer contributions to achieve environmental outcomes.

These conclusions, in addition to the perceived benefits of wildlife corridors as a possible landscape restoration strategy, formed the basis for our recommendations. It is considered essential that Canberra Urban Parks & Places (CUPP), in conjunction with other government agencies, should implement the following recommendations to cater for wider ecological parameters in their decision-making processes.

Recommendations

It is recommended that:

- a) the development and/or restoration of corridors or habitat areas be subject to a planning process as outlined in Figure 1 of this report
- b) an assessment be made of the potential benefits and costs associated with a corridor network compared to any other possible conservation strategies.
- c) a bushland assessment kit be developed for urban areas that will assist in the identification of priorities for refurbishment and management of wildlife values in urban park areas.
- d) CUPP begin a program for staff and the community to develop the skills and acquisition of knowledge required for biodiversity conservation within an urban environment.
- e) under present structural arrangements within government agencies that the capacity to effectively outsource important nature conservation tasks must be developed.

- f) more detailed information be gathered on how urban corridors and habitat are used and by what species of wildlife.
- g) a longer term monitoring program be established to examine the efficiency of corridors and habitat within the urban areas.
- h) CUPP continue supporting and cementing links with active community groups to ensure all parties are working to common objectives.
- i) any plantings by Landcare and similar “Care” groups and individuals with gardens that encroach onto public land should be integrated into the overall design for wildlife corridors.
- j) fire management options be incorporated in any corridor or habitat area design and development package that may be produced to provide guidance on suitable wildlife enhancement options.
- k) the ACT government recognise and support the value of urban corridor parklands within the spectrum of urban parkland areas.
- l) measures be taken to reduce the knowledge gap in staff and contractors if CUPP is to effectively implement urban wildlife conservation as proposed by the ACT Nature Conservation Strategy e.g. by use of in-service training workshops.
- m) CUPP and other government agencies should avoid the use of any species which have a tendency to spread or become invasive.
- n) an effective and comprehensive plant replacement program be implemented in the ACT with the utmost urgency
- o) a master plan (preferably GIS based) covering all the suitable corridor areas in the ACT urban zone needs to be prepared, and the draft Flora & Fauna Guidelines prepared in 1992 provide a useful starting point.
- p) the draft ACT Flora & Fauna Guidelines be used to assess significance of sites for corridors and habitat until a final version is produced.
- q) private sponsorship should be sought to assist the timely execution of a more comprehensive corridor network.

- r) interpretation of natural resources and assets be increased within the urban areas of the ACT to increase community and visitor awareness of the crucial importance of these resources and assets.
- s) there is a more concerted effort by both agencies and non-government organisations to promote the need for more funding to be directed towards environmental maintenance.
- t) add a wildlife suitability ranking into the Plant List incorporated within the Canberra Landscape Guidelines.
- u) prepare pilot wildlife corridor projects within urban areas that have been co-designed by landscape architects and ecologists. Select a range of sites e.g. ridgeline, waterway and mid-slope habitats.

SECTION 1

INTRODUCTION

“If we live as if it matters, and it doesn't matter, it doesn't matter. But if we live as if it doesn't matter and it matters, then it matters.”
(unknown source)

The Brief

In September 1997 Canberra Urban Parks & Places (CUPP's) offered a consultancy project by select tender that was awarded to Enviro Links Design Pty Ltd in association with Geoff Butler & Associates and Anne-Marie Wilson in December 1997.

The objectives of the project, as outlined in the consultancy brief were to:

- examine the appropriateness of past planting and current landscape refurbishment practices on wildlife fauna such as avian species, and consider aspects such as movement corridors and habitat
- develop a landscape planning framework which describes the step by step processes required to program landscape refurbishment works for the design outcome of retention or enhancement of ecological value.
- develop draft landscaping guidelines that retain or enhance the ecological value in landscape refurbishment. These are presented in Appendices A and B.

1.2) Background

It is now generally recognised that human activities are diminishing the Earth's capacity to support life, and that human induced activities are contributing to the warming climatic trends around the world. Future changes will wreak havoc on human populations, but also on all the Earth's biodiversity.

The effects of current degradation problems, combined with the best estimates of future challenges has resulted in a series of international agreements, the primary objective of which are to take actions internationally to meet the demands of ecologically sustainable development.

With the Federal Government's current commitment to these international agreements, many responsibilities of environmental management have fallen to State, Territory, (and more importantly) local government levels. For adequate conservation of many species of Australian wildlife, the ability to move freely across sometimes extensive areas is vital to their future. With others, the provision and /or retention of adequate habitat is critical. Urban areas have a considerably important role to play in this regard, despite the limitations involved.

Canberra is fortunate in being planned from the outset, and large areas of various forms of greenspace surround and permeate all urban areas. These urban parks and recreation areas were designed primarily to meet the social needs of the community. However, it is also realised they can contribute significantly to the economic and environmental dynamics of Canberra by conserving "natural" areas and significant man-made landscapes.

Any form of "natural" balance or retention of purely indigenous plant and animal communities within the intensity of pressure and usage by a large urban population is unachievable. However, significant opportunities are available within the urban areas of the ACT (both developed and yet to be developed) to cater for the essential needs of a variety of fauna as well as contributing to the well-being of the human community in social and economic senses.

This study was requested to identify initiatives and approaches that might extend the "best practice" benefit(s) of landscape planning and refurbishment projects for biodiversity found within urban areas of the ACT.

SECTION 2

WILDLIFE CONSERVATION CORRIDORS IN URBAN AREAS

“The integration of humans and wildlife within the same matrix needs to be further examined given the increased pressure of the landscape. If the idea of a conservation ethic is to succeed it will likely include the needs of humans to recreate in conjunction with the needs to encourage wildlife movement. Presently there is not enough information available to make informed design decisions regarding this integration.

As society attempts to heal the wounds on the landscape created by generations of human exploitation, landscape ecology is a discipline that has the potential to make a significant contribution. Patches of natural areas connected by appropriately designed corridors that provide habitat as well as conduit for movement will provide a framework for this healing.”

(Fleury and Brown 1997)

2.1) Wildlife Corridors

Wildlife corridors have an important role to play in off-reserve conservation in urban environments. These landscape elements, usually defined as linear strips of native vegetation, connect remnant vegetation and revegetation patches. The use and development of wildlife corridor networks is frequently recommended as a strategy to link otherwise isolated populations of plants and animals and to augment the availability of suitable habitat for wildlife. In rural settings throughout Australia, corridor networks are being implemented through the activities of many Landcare groups. This is also happening in some urban situations (Adams and Dove, 1989; Saunders et al., 1995; ACT ParkCare, 1997; Nature Conservation Council, 1998) and is likely to grow through the development of catchment and regional approaches to vegetation management (Biodiversity Group, 1996).

Despite the popularity of this approach, direct evidence for the use by fauna of these corridors for movement through the landscape is not yet available for more than a handful of species (Clinchy, 1998; Hobbs & Wilson, 1998). However corridors can also potentially provide important habitat opportunities for animals, particularly in a landscape with multiple land uses (Wilson & Lindenmayer, 1996). In addition, the basis of the precautionary approach to nature conservation (Saunders and Hobbs, 1991) implies some risk must be taken as the potential benefits of corridors potentially outweigh the possible risks. These costs and benefits are summarised in Tables 1 and 2.

Table 1: The potential benefits of corridors and corridor networks for wildlife populations.

- Provision of increased foraging area and extension of home range; i.e. provision of habitat;
- Providing cover for animals as they move between habitat patches;
- Reducing genetic isolation of plant and animal populations;
- Providing a mix of habitats and successional stages to those species that require them for different activities or stages in their life cycles;
- Providing refuge for plants and animals; e.g. if displaced by fire or loss of habitat elsewhere;
- Providing representative examples of native vegetation types (communities and species);
- Linking wildlife populations and helping to maintain immigration and recolonisation between otherwise isolated habitat patches, providing pathways for dispersal.

Table 2: The potential disadvantages of corridor networks for wildlife populations in urban and/or rural landscapes.

Corridor Function	Description of Process
Barrier or filter	Movement of some species may be impeded or prevented
Pathway for spread of pests, fire and deleterious genes	May promote the spread of unwanted species, weeds or other pests and enhance the spread of fire and undesirable genes
Population sink	Linkage of areas of unequal habitat suitability may cause a net loss of individuals from a local population; i.e. a source-sink effect
Increased contact between gene pools	Corridors may link previously isolated populations and lead to hybridisation between species that normally occur in separate areas
Spread of disease	Potential for increased disease transmission between animals may result from corridor establishment
Edge effects	Edge effects may significantly alter the quality and type of habitat available to animals and may not provide for species which require non-edge affected habitat for their long-term population persistence There may be an increased risk to an individual while moving through the corridor e.g. from predation
Cost	Cost of corridor establishment and maintenance may prevent the consideration of other, possibly more appropriate, conservation management options.

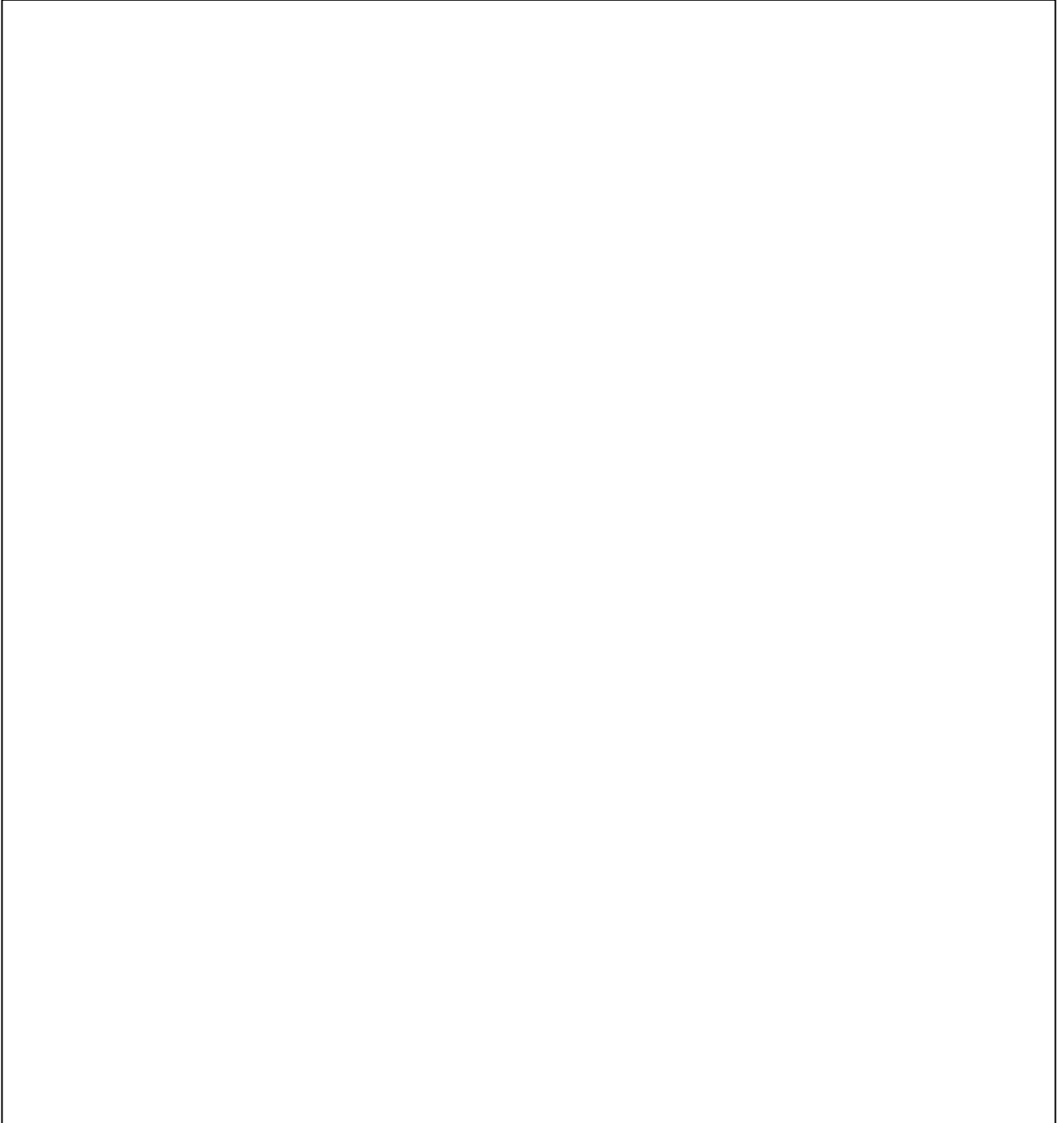
As with any landscape-based approach to the conservation of biodiversity, we must appreciate that animal species have unique needs with respect to habitat suitability and connectivity. Also, these individual needs can vary in response to landscape context, season and co-occurring species (Hobbs et al., 1993). It is possible that a single corridor may simultaneously benefit and disadvantage different species within an ecosystem. Wildlife corridors should not be viewed as a mechanism suitable for the conservation of all species of a particular ecological community or landscape.

With these points of caution in mind, the major benefits which may be achieved through the development and restoration of corridor networks in managed landscapes suggest that, on the basis of increasing the availability of suitable habitats, corridors are a suitable conservation strategy in urban environments. However, this approach may not necessarily address the conservation needs of declining species. These species of concern (e.g. Robinson & Traill, 1996) need to be the focus of targeted conservation measures.

2.2) Considerations for Planning and Managing Wildlife Corridors

Corridors and other habitat areas need to be developed and restored through an explicit corridor development or planning process similar to the process presented in Figure 1. **It is recommended that the development and/or restoration of corridors or habitat areas be subject to a planning process as outlined in Figure 1 of this report.**

**Figure 1: Elements of a Corridor and Habitat Development Process
(Wilson and Lindenmayer, 1996).**



The importance of clearly identified conservation priorities and objectives which corridors are intended to achieve cannot be over-emphasised. It is only when these goals have been clearly articulated that a corridor network can be designed. Some corridor planning has been initiated in the ACT (ACT Parks and Conservation Service, 1998). **It is recommended that an assessment be made of the potential benefits and costs associated with a corridor network compared to any other possible conservation strategies.** This will ensure that relative costs and benefits – ecological, social and financial – are assessed against the costs and benefits of other possible conservation strategies, if there are any suitable alternatives.

With respect to the design, management and maintenance of corridors and habitat areas, principles of landscape restoration can be used to ensure the long-term viability of these desired landscape elements.

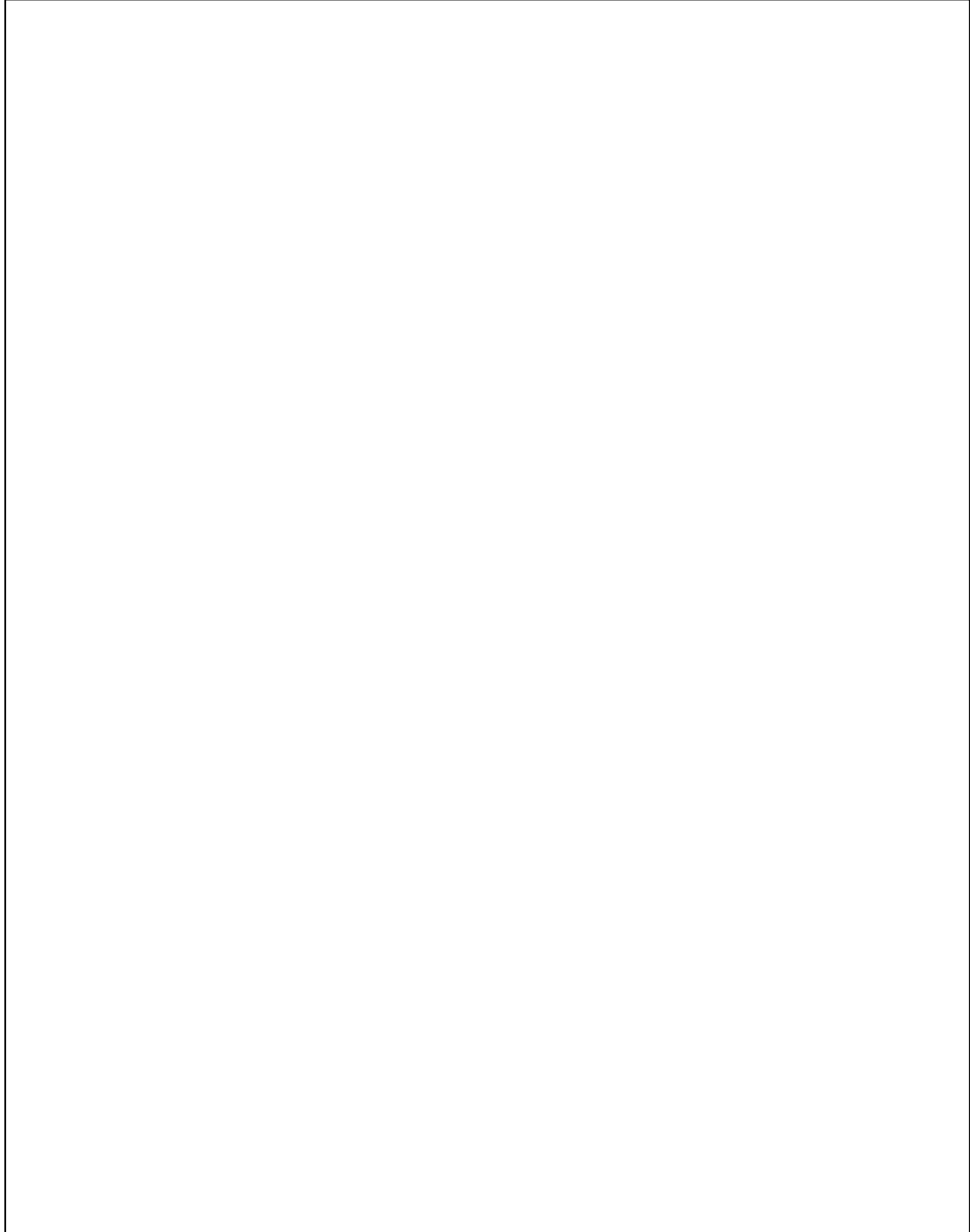
SECTION 3

**PRINCIPLES OF LANDSCAPE RESTORATION &
ESTABLISHMENT OF CORRIDORS OR HABITAT AREAS**

3.1) Elements of Corridor Design

To improve the contribution of vegetation corridors to the conservation of biodiversity, it is important that corridor design and management/refurbishment approaches incorporate factors that influence the connectivity function and habitat provision function for wildlife. These elements are summarised in Figure 2.

**Figure 2.: Main factors influencing animal use of wildlife corridors
(adapted from Wilson and Lindenmayer, 1996; Hobbs & Wilson, 1998).**



Other corridor design issues are captured in the following principles of corridor development (Table 3);

Table 3: Principles of Corridor Development (adapted from Wilson and Lindenmayer, 1996);

- 1- Applying the precautionary principle, assume that corridors do have potentially useful function, not only in providing habitat, but also in enhancing movements of wildlife;
- 2- The wider a corridor the better;
- 3- Corridors must be viewed as a sub-component of a broader regional conservation system; that is one of a number of options adopted to ensure the maintenance of wildlife populations in urban and rural landscapes;
- 4- Connectivity is not necessarily defined or determined by physical continuity of habitat; some populations are connected in patchy landscapes.
- 5- Ongoing protection, maintenance and monitoring are essential components of the corridor development process. This is essential to ensure habitat suitability over the long-term, to assess corridor function and effectiveness and to provide information to make further improvements to corridor design.
- 6- Need to design and plan for the specific landscape context, surrounding land use and integrated management goals.
- 7- To get the most from linear vegetation corridors, we must consider how to manage and mitigate the potential disadvantages of corridors. This could include efforts to minimise edge-effects and overcoming other negative values of corridors such as the dispersal of plant and animal pests. Human impact will also need to be considered.

Although these principles emerged from the consideration of newly established corridors, they can also guide attempts to optimise the corridor values of pre-existing vegetation corridors not primarily established or maintained for nature conservation. With sympathetic management, areas such as urban green spaces and parks can nonetheless make a significant contribution to the enhancement of local biodiversity values.

3.2) Restoring and Managing Suitable Habitat and Landscape Corridors

Three approaches to landscape restoration have been identified in recent literature (Lamb, 1994; Yates & Hobbs, 1998). These are;

- 1- *least-input approach*; involves the removal of disturbing agents and protection of the site from further disturbance;
- 2- *intermediate approach*; removal of disturbing agents and reintroduction selected native species to assist natural recolonisation;
- 3- *reparation/rehabilitation process*; site amelioration is undertaken in addition to the removal of disturbing agents and reintroduction of selected native species to assist natural recolonisation.

The approach taken depends on a combination of factors – the over-riding land management goal and the opportunities and desire to incorporate nature conservation objectives into this system. It is also important to direct efforts to address and improve the condition of vegetation corridors. Table 4 is a summary of the various parameters which can be used to assess the condition of a woodland habitat or corridor with respect to ecosystem function/health, symptoms to look for, possible explanations for the decline and particular actions to restore habitat condition. Similar principles but differing parameters would be used for other ecosystems such as wetlands and grasslands.

Table 4: Structural, compositional and functional for measuring ecosystem health, symptoms and known causes of decline and actions for restoring health in temperate eucalypt woodlands (modified from Yates and Hobbs, 1997).

Estimator of ecosystem health	Symptom of ecosystem decline	Known cause of decline	Actions to restore health (general)
Canopy cover, proportion of tree crown that is epicormic regrowth	Tree dieback	Nutrient enrichment Secondary salinity	Plant trees and other deep-rooted perennial native species Lower water tables
Tree species size class distribution	Lack of recruitment	Changed fire regimes Exotic species Fragmentation Grazing by introduced herbivores Decline in soil structure	Apply appropriate disturbance (fire etc.) Weed management Plant trees over time Remove livestock (if applicable) Soil works, deep rip
Tree species population size	Reduction in seed production and viability?	Fragmentation	Increase population size Encourage natural regeneration and revegetation
Understorey species richness and abundance	Decline in endemic species richness and cover	Changed fire regimes Exotic species Fragmentation Grazing by introduced herbivores Decline in soil structure Mowing regime	Apply appropriate disturbance Weed management Supplement regeneration Remove livestock Soil works, deep rip Alter frequency of mowing
Number of trees with hollows	Decline in hollow-dependent fauna	Loss of nesting and shelter resources through loss of older hollow-bearing trees	Retention of hollow-bearing trees Put up suitable nest-boxes

Table 4: cont'd

Estimator of ecosystem health	Symptom of ecosystem decline	Known cause of decline	Actions to restore health (general)
Number of fallen logs	Decline in ground-dwelling fauna	Loss of fallen branches and decaying logs	Avoid harvesting timber for firewood or 'tidying up' Mosaic burning (if used)
Exotic species richness and abundance	Increase in exotic species richness and cover	Grazing by introduced herbivores Nutrient enrichment Soil disturbance	Weed management Remove cause (livestock, runoff) Remove or modify cause
Canopy seed banks	Reduction of canopy seed stores	Fragmentation	Supplement regeneration (plant seedlings, direct seed)
Soil seed banks	Decline in endemic species richness and abundance	Grazing by introduced herbivores (e.g. Rabbits)	Supplement regeneration (plant seedlings, direct seed) Improve fire regimes
Litter cover	Decline in litter cover	Grazing by introduced herbivores	Remove livestock, Create barriers to trap litter
Cryptogam cover	Decline in cryptogam cover	Grazing by introduced herbivores	Remove livestock
Soil Parameters - generally requires reduction of soil compaction			
Soil microtopography	Loss of soil microtopography	Grazing by introduced herbivores	Remove livestock, soil works, reduce vehicular traffic
Soil bulk density	Increase in soil bulk density (soil compaction)	Grazing by introduced herbivores	Remove livestock and deep rip, reduce vehicular traffic
Soil penetration resistance	Increase in penetration resistance	Grazing by introduced herbivores	Remove livestock and deep rip, reduce vehicular traffic
Soil water infiltration	Reduction in soil moisture, increase in surface runoff	Grazing by introduced herbivores	Remove livestock and deep rip, reduce vehicular traffic
Soil organic carbon	Reduction in organic matter	Grazing by introduced herbivores	Remove livestock

With respect to urban park management, restoration/enhancement opportunities exist in the provision and retention of important wildlife resources such as those identified in Figure 2. Practically this includes practices such as retaining trees with hollows, increasing the amount of native habitat in an area, leaving fallen timber and rocks on the ground, ensuring that some areas have a mix of trees, shrubs and forbs that are valued for their habitat provision qualities. This will ensure that hollow-dependant species (which generally requiring large areas), mobile species (which utilise resources in different locations) and forest-dependent species (which forage and nest on the ground, or live in or on the ground) have greater access to important food and shelter resources throughout the urban landscape.

It is recommended that a bushland assessment kit be developed for urban areas that will assist in the identification of priorities for refurbishment and management of wildlife values in urban park areas. Full and complete ecological assessments would still require relevant professional services.

SECTION 4

CURRENT INITIATIVES IN THE ACT.

*“Biodiversity underpins all rural industries,
fisheries, tourism and even urban development.”*

(House of Representatives Standing Committee on
Environment, Recreation and the Arts, 1992)

The conservation of nature is a major environmental issue internationally. Since the advent of the Convention on Biological Diversity (signed by the Federal Government after the Earth Summit in Rio de Janeiro in 1992), many new environmental responsibilities have flowed on to State, Territory and local government agencies for action. Much environmental activity within the ACT can be attributed to the signing of international and intergovernmental agreements on the environment in the years since the Rio Convention, as can the considerable support for environmental protection measures within the ACT community.

A key factor in the decline of biodiversity can be attributed to continued land clearing, the subsequent fragmentation and decline of habitat and poor or otherwise unsympathetic landuse activities (Commonwealth of Australia, 1996). This includes the disturbances and fragmentation created by urban development. Ameliorating this situation within urban areas is not without its limitations and difficulties, but has resulted in many positive intentions to remedy the situation. With continued population growth and consequent pressures from urban development in the ACT, the need for continued diligence in the protection of the ACT’s natural assets within and adjacent to urban areas will increase. The ACT Nature Conservation Strategy recognises that the retention of existing habitat and the “off-reserve” reconstruction or rehabilitation of corridors of vegetation within urban areas can contribute in a positive (even if a somewhat limited) way to the conservation of biodiversity. More importantly, such actions will assist in raising the awareness of (and educating) urban populations in the importance of biodiversity, provide practical examples of ways to promote ecologically sustainable development, provide a visual and recreational amenity and

ensure an even closer contact with Australian nature that is often lacking in urban areas.

Recent initiatives in the ACT with regard to habitat and corridors have come from a number of sources.

4.1) Government/Agency) Initiatives

- Establishment of an integrated environment protection agency in 1997 as Environment ACT (EACT) and integrated legislation for use by that agency in 1998.
- Release of the ACT Nature Conservation Strategy (1998) which clearly indicates the necessity to establish and augment habitat links in landscape developments. The Strategy also clearly recognises the need for a conservation network which will be supported through a holistic approach to land use planning and development where biodiversity conservation requirements are integrated into planning and management of all land.
- The draft ACT & Subregion Planning Strategy (1995) refers to the adoption and strengthening of land use planning and development controls for the conservation of native vegetation and the implementation of wildlife and riverine corridors. The references to corridors and habitat retention are related to both the broader Capital Region and “local links” which include urban areas.
- The designation and protection of the Murrumbidgee and Lower Molonglo River corridors, including the production of management plans for these areas.
- Preparation and release of Action Plans for a number of endangered species and ecological communities.
- Management policies and roadside signage for the protection of high and moderate conservation quality roadside vegetation which provide valuable transit corridors and habitat for plants and animals as well as vehicles.

- Realisation of urban wildlife requirements associated with redevelopment activities e.g. the McKellar wetlands project.
- Support for a proposed Landcare based project for the creation of extensive linking wildlife corridors from Gungahlin to Hume, connecting a number of large units of Canberra Nature Park and other areas of remnant native vegetation on the urban fringes.
- Implementing (even though with some apparent difficulties) a rural policy planning scheme incorporating off-reserve conservation principles through Property Management Agreements with lessees.
- Continuing the excellent planning processes during urban and other development proposals which attempt to conserve existing native vegetation, especially with regard to areas or trees with high habitat values as outlined in the draft ACT Flora and Fauna Guidelines.
- A considerable degree of financial and other support for community groups and organisations working in conservation and Landcare related activities, some of the latter being urban corridors e.g. Ginninderra Creek.
- As the result of community concern, a Tree Protection Taskforce has recently been established to examine means by which trees can be adequately protected. The recommendations of this taskforce will have implications for habitat protection in particular.
- The government is currently preparing Fuel Management Plans for the ACT and land managed by CUPP is covered by this process. The Fire Control Officer has indicated that he has no objection to wildlife corridor proposals provided the necessary fire control measures are incorporated.
- Various projects have included the mapping of remnant vegetation and fauna habitats, both through ongoing work within the Wildlife Research and Monitoring Unit and various community projects. A good example is the mapping of roadside vegetation mentioned above.
- The continuing work on management plans for urban parkland regions and for a number of natural areas in the ACT. The plans of management

for urban parklands include areas of semi-natural open space and other areas with considerable nature conservation significance.

4.2) Community

The greater part of the ACT community has regularly shown itself to be concerned about environmental protection issues. This is reflected in:

- An awareness of environment reflected in various forms of survey. One notable example was the CUPP market study (1997) which indicated the importance of leisure and recreational opportunities within the larger urban park areas. Ninety four per cent (94%) of people surveyed indicated that they regularly used the larger parks in comparison to 71% using smaller suburban parks.
- The large number of people actively involved in environmental groups and organisations. Of special note are the 19 urban Landcare groups and Parkcare groups that have been established in recent years and the variety of environmental works to which they are contributing. Any proposal to establish corridors and conserve habitat will rely heavily on some level of continued commitment from the community.
- The willingness of many in the community to contribute to public consultation processes and various government/community committees related to environmental matters in the ACT.

4.3) Schools

School grounds provide significant areas of open space usually centrally located in urban areas. Many schools have become involved in Landcare related projects, some using their own grounds to provide plantings of native species for wildlife purposes. The management of school grounds has recently become the responsibility of the school (through their boards) and some concerns have arisen about the priority for future plantings and vegetation management on these important open spaces.

It is important to ensure that these school ground managers are included in any initiatives to promote and educate the community about the potential value to wildlife of sympathetically managed urban areas.

SECTION 5

LONG TERM MANAGEMENT ISSUES

Nearly all Australian landscapes are now managed or manipulated in some way in accord with the designated landuse of the area. Urban landscapes, for obvious reasons, are the most contrived and manipulated of any landscape. Any proposal to construct, refurbish or otherwise manage landscapes in the form of wildlife corridors or habitat suited to the needs of native wildlife must come within a management program. This, of necessity, will come with some associated costs. These costs would be of some substance in the short term, but longer term management and maintenance costs, although they will often be less, also need to be recognised.

As for any other type of urban park, objectives for any proposed wildlife corridor and habitat need to be stipulated and a management plan prepared to show how the objectives will be met.

The major issues involved in long term management are:

- User needs
- Development of skills and knowledge
- Education, awareness and interpretation
- Fire management
- Maintenance & costs
- Refurbishment and restoration

Discussion of each of these issues follows.

5.1) User Needs

The greatest attribute of the ACT is that it is a planned city. The planning process has ensured considerable areas of open space have been incorporated within the city limits. These open spaces have been provided to accommodate opportunities for various forms of recreation for the community. Their limited value to wildlife is incidental and not an explicit function of these areas. Economic imperatives now appear to threaten a proportion of these green spaces. It is important in creating a “sustainable” city that the needs of wildlife as well as the community's social and economic needs be considered and many more developments such as the McKellar wetlands need to be considered. This is especially so before these greenspaces are lost forever. It is also important to ensure that pressures on the environment emanating from urban areas be managed so that it is consistent with the maintenance of biodiversity. This does not preclude multi-use in nominated areas, but may mean the concerted management (or even prohibition) of any recreational activities that are not consistent with the objectives of any proposed wildlife corridor or habitat area (*after the ACT Nature Conservation Strategy 1998*).

There is no doubt that as human populations rise, further pressure is applied to the natural environment. As part of this unrelenting pressure, the ACT must ensure that a comprehensive user needs analysis is required which takes into account not only the community's long term needs, but also the needs of wildlife within the urban area. This is an urgent requirement so that important open space sites are not resumed for further urban development.

5.2) Development of Skills and Knowledge

To ensure the success of any project aimed at biodiversity conservation and habitat values within the urban area there will need to be a considerable effort put into both the development of skills and acquisition of knowledge. **It is recommended that CUPP begin a program to develop the skills and acquisition of knowledge required for biodiversity conservation within an urban environment.** This will apply to the initial survey of a site and ongoing monitoring of it for nature conservation purposes. While this will apply primarily to departmental staff responsible for management of these areas, it will also apply to other government agencies, especially in the planning sphere. The same development of skills and knowledge is also important for those community organisations or individuals who become

involved with active management in their local areas, especially those individuals or groups that provide assistance to the government in natural resource management activities e.g. Landcare, Paddockcare, Waterwatch etc. However, it needs to be recognised that volunteer resources are a bonus to the regular land management responsibilities of government agencies, and should never be regarded as a replacement for a trained and paid labour force. Community volunteers may well reject having to be trained in the same way and for the same reasons that would apply to paid personnel. There a number of projects that have been developed that could be utilised in various training activities (e.g. ACT Parkcare Manual, 1997; Save the Bush Bushland Assessment Kit, 1997; Victorian Land for Wildlife Scheme)

- most importantly, is a need to better understand what biodiversity is and how it is important to future sustainability. Reams of information have been produced on this in recent years, and this awareness and education is a driving principle behind almost all conservation and sustainability programs in Australia. This factor is especially important in Landcare related activities. This will mean retraining and/or extending the thought processes of many staff members within agency(s) that are responsible for land within urban zones. It includes agencies other than CUPP. These processes have to be changed as the early years of Canberra being regarded as a “Garden City” have been subsumed by its well deserved international image as the “Bush Capital”. The conservation and protection of habitat and biodiversity within urban areas will require very different management techniques that will be difficult to accommodate in some peoples minds. The “tidy” mentality of urban horticulture will not necessarily preserve the values sought by the retention of habitat and construction of wildlife corridors.
- it is important that the high standard of staff and professional competencies are retained within the agencies. Recent developments related to economic constraints and greater efficiencies have not taken long term benefits into consideration. This has resulted in a “brain drain” from government agencies which the ACT can ill afford. If this process is to continue **it is recommended that the capacity to effectively outsource important nature conservation tasks must be developed.**
- more information is needed on how corridors and habitat areas are used and by what species of wildlife. Urban corridors can be quite efficient but this depends on restoration and management commitment. Artificial

habitats using unwanted natural materials from urban developments can increase the habitat values of corridors, even if confined to certain selected sites where they contribute maximum benefit. While urban corridors may only cater for certain more adaptable faunal species, these species alone will make a wonderful addition to the quality of life and natural experiences of the inner city zones. By the inclusion of certain Australian flora species, not necessarily locally indigenous, habitat can be made available for a wider number of faunal species even over the cooler months of the year. **It is recommended that more detailed information be gathered on how urban corridors and habitat are used and by what species of wildlife.**

- there is a need for long term monitoring programs. Longer term monitoring is essential to ensure the work put into development of the corridors and establishment of habitat is warranted and achieving what it set out to do. Some aspects of corridor development and management may be varied over time to improve their efficiency. **It is recommended that a longer term monitoring program be established to examine the efficiency of corridors and habitat within the urban areas.**

5.3) Education, Awareness & Interpretation

While a better understanding of biodiversity and sustainability is required for agency staff, it is also essential for the broader community. People must come to understand why certain projects have been undertaken and their relevance to them and future generations. The long term success of any proposal focussing on conservation and sustainability will rely heavily on a thorough understanding of the need for the project and a high level of self regulation and local management. There are a number of ways this can be achieved.

Community Groups (including Non-Government Organisations).

Community groups with a special interest in environmental issues can assist by practical involvement and “selling” the message and passing it on to new members and the community. These groups already have a strong, ongoing commitment that can be utilised to great advantage. They may also be able to assist by undertaking the wildlife movement and monitoring aspects referred to under 5.1, as it is often the longer term monitoring commitments that are neglected or otherwise impose excessive demands on agency

resources. It is also important to note that many community groups (e.g. Landcare and catchment management groups) and other community-based organisations (e.g. Conservation Council of the SE Region and Canberra, Greening Australia) have built working relationships with government and its agencies and are committed to working in cooperation and partnerships with government to achieve the necessary standards of environmental integrity essential for sustainability. This is their contribution to the education and awareness raising programs of the government and its agencies. **It is recommended that CUPP continue supporting and cementing links with active community groups.**

General Community

The ACT is very fortunate in having a large generally well-educated population which has shown it is aware of environmental matters. Well-educated communities are essential to achieve sustainability as it is only by thoughtful actions by every community member that sustainability will be achieved. Wildlife corridors within the urban areas offer a superb opportunity to increase the knowledge within the community of a raft of environmental matters.

Key features within the proposed corridors could be sign-posted indicating their importance within the overall ecosystem (e.g. hollow trees, types of ground or water habitat). As an example, while hollow trees in some urban locations may need to be removed due to safety and liability issues, they are crucial components of wildlife corridors and are therefore essential components within the urban landscape. This is an example of the type of message that could be very adequately relayed to the community through interpretive signage. Interpretation is extremely important. It is also more likely to receive support in the form of sponsorship contributions from local businesses.

Another important message would be to indicate the weed problem and how many of our favourite garden species have a detrimental effect on natural values through invasion. Special emphasis could be placed on the correct means of disposing of garden composts and wastes and the effects of pet predation. The contribution that the local community can provide towards improving water quality of urban run-off is another important environmental message.

5.4) Fire Management

One of the biggest factors that will deter public acceptance of any proposal for wildlife corridors will be the ability to manage fire. As the suburban population has grown, so have the frequency and number of ignitions occurring each year. While Canberra is internationally renowned for its environmental setting, it is this very thing that has increased suburban susceptibility to fire hazards, particularly on some sections of the urban/rural interface. Canberra has upwards of 1500 km of interface, with some of these regarded as being a high hazard rating. These high hazard interface areas will need to be taken into account with any proposal to develop or enhance urban wildlife corridors or habitat areas.

Wildlife corridor proposals will also meet resistance from fire authorities if these and other safety issues (e.g. ease of access) are not taken into account. Discussions with the ACT's Chief Fire Control Officer indicated that he was certainly not against wildlife corridor and habitat refurbishment proposals in principle. He indicated that planned and managed environments are far better than what is the current situation in many parts of the ACT urban interface areas, where "ad hoc" management or no management at all has accentuated the interface dangers (pers. comm). Peter Lucas-Smith, Bureau of Emergency Services). It is important that there is the ability to manage fuel loads wherever they occur on the interface. This can be achieved by adequate planning of the corridor design, and not just letting it happen. An example of this is the urban forest project within the suburb of Kambah, that has not generated any community concerns (pers. comm. Tony Bray, Community Liaison Officer, CUPP).

Fire safety is readily achieved by the modification and management of vegetation in the immediate vicinity of the interface. The community should be encouraged to participate with such vegetation management, especially where they have concerns. **It is recommended that any plantings by Landcare and similar "Care" groups and individuals with gardens that encroach onto public land should be integrated into the overall design for wildlife corridors.** New plantings should not be permitted to complicate fire management on immediate interface areas. A useful guide is to ensure low fire hazard plantings and fuel management within 20m of any "back fence" (ACT Bushfire Council Urban Interface Working Group, unpubl.).

Plantings will require some maintenance (e.g. the removal of excessive amounts of dead shrubs etc). Any island beds created within the proposed corridors could be mulched which would reduce the incidence of fire damage. Mulched beds will also assist in establishment and weed control, and may also assist in public acceptance of the proposals, at least in regard to fire control.

It is recommended that fire management options be incorporated in any corridor or habitat area design and development package that may be produced to provide guidance on suitable wildlife enhancement options.

5.5) Maintenance

It is important to note that maintenance requirements for natural vegetation communities and good quality remnant vegetation are low and concern factors such as fire and weed management. However, public attitudes to "debris" and ground habitat may remain difficult to change. It is therefore important to incorporate native areas into corridors wherever possible for the low maintenance required as well as their benefits to wildlife. The costs and labour deployment to rehabilitate and/or enhance natural ecosystems can accumulate rapidly (*ACT Nature Conservation Strategy 1998*), and therefore high quality areas should be high priorities for inclusion.

Maintenance of the proposed corridors will be a permanent management issue, and will bring some associated costs in both human resources and other financial terms. The greater percentage of the areas best suited to the establishment of wildlife corridors and habitat are the public lands associated with stormwater removal and floodplains. At the present time these areas have been designed as (or maintained as) low maintenance areas (pers. comm. CUP Area Managers 1998). This can be readily observed by the types of species used and the low degree of herbage (especially grass) maintenance that is undertaken within these areas. Useful comparative examples are the remnant native grasslands in the urban areas. Some years ago, these native grasslands were basically un-maintained areas, and since the value of these endangered plant communities has become recognised, they have been brought into a management regime geared especially for their requirements over the longer term. This management action was necessary, but did add a financial cost to the overall management of city landscapes (pers. comm. CUP Area Managers 1998). Any proposal for wildlife corridors within the urban areas will mean a certain degree of

establishment and ongoing maintenance costs. The urban Landcare movement is well developed in the ACT so there is probably little further scope to defray the establishment costs of corridors and habitat areas through the Natural Heritage Trust, sponsorship and through interested community groups and Non-Government Organisations. **It is recommended that the ACT government recognise and support the value of urban corridor parklands within the spectrum of urban parkland areas.**

Diversity in the species used in plantings will not only assist in catering for a larger number of wildlife species, but also has benefits in pest (insect and disease) management and aesthetic appeal. It is important where non-local native species are used that their weed potential be examined before establishment. Through the desirability for low-maintenance corridors, some natural recruitment may be an advantage, but invasive species should be avoided (e.g. *Acacia baileyana* and *A. paradoxa*).

Related to the weeds issue is a question about the wisdom of importing raw materials into the ACT. While this may not be immediately relevant to the establishment of wildlife corridors and provision of habitat, the ACT has suffered the consequences from the importation of raw materials, particularly with regard to soil and sands. A considerable quantity of these materials are accessed from the Bungendore and Monaro regions. Besides this practice being unsustainable, it depletes valuable soil from agricultural areas and has resulted in the importation of serious weeds into the ACT. Once established, these weeds have the attendant consequences of affecting other natural values and consuming valuable funding in weed management activities.

The use of mulch has been referred to previously under fire management. Mulch also has the benefit of facilitating quicker establishment, and may assist in public acceptance of establishing corridors due to "tidiness" and delineation of new beds..

5.6) Refurbishment and Restoration

Landscape refurbishment is without doubt one of the significant means of addressing the provision of wildlife needs within the urban area. The majority of urban landscape plantings within the ACT were not designed as wildlife habitat, even though some species do provide habitat values of various sorts for wildlife. It is interesting to note that a native species widely

used as a street tree within urban areas, *Eucalyptus mannifera*, has been noted to form hollows after some 60 years (pers. comm. CUPP Area Managers). A greater consideration of these urban plantings were aesthetics and design for low maintenance. In many cases urban landscapes are becoming older and there is a need to refurbish these areas. It is somewhat ironic that the hollow forming potential of *Eucalyptus mannifera*, while excellent for wildlife, will mean that in urban areas some are regarded as unsafe and require removal for public safety and other liability reasons. (See Gibbons and Lindenmayer, 1996 for more information about tree hollow formation in eucalypts).

When the planted vegetation in any urban area declines or otherwise becomes due for refurbishment, there is at present no official policy or consideration as to how the refurbishment may enhance or impact on wildlife (pers. comm. CUPP Area Managers). Any consideration of these issues apparently relies heavily on the asset manager taking them into account. Even when these issues are considered, there is a preponderance to consider the effect on bird species rather than the other species that may be affected by any removals.

There is no doubt that birds are the most obvious urban wildlife, and therefore their habitat, particularly in the form of nesting sites, appears to be the main consideration. For this reason trees are not removed during the “nesting season” (pers. comm. CUP Area Managers). However, there are many wildlife species that rely on access to habitat all year round. Species that are immediately obvious are invertebrates, possums and bats. At present there is little consideration given with regard to the protection that urban vegetation provides from predators and how its removal may affect local food sources and food chains. There is a general lack of knowledge about these issues amongst staff (and contractors of various trades and professions) that are involved in planning and implementation of refurbishment works (pers. comm. CUPP Area Managers). **It is recommended that measures be taken to reduce the knowledge gap in staff and contractors if CUPP is to effectively implement urban wildlife conservation as proposed by the ACT Nature Conservation Strategy.**

The refurbishment of any plantings need to consider general landscape effects and the possible effects on wildlife. Planning for refurbishment/restoration should consider staged removal and replacement, the landscape objectives desired and how the replacement species will

benefit wildlife. Any refurbishment that has as an objective of either wildlife conservation, provision of habitat or wildlife corridors would have to rely on a high component of native species, including those indigenous to the ACT.

Another matter of great concern of recent years is the severe curtailment of planting replacement programs. The planting programs of the past, whether they were new plantings in developing urban zones or replacement plantings in areas being “redeveloped” has been one of the great strengths of the ACT. Past plantings programs have contributed significantly to the social, economic and environmental development of Canberra, and any moves to diminish or cease these programs will have detrimental long term consequences for the ACT community.

When selecting species under any refurbishment program, **it is recommended that CUPP avoid the use of any species which have a tendency to spread or become invasive.** This said, occasional seedling regeneration can be advantageous, but it is not desirable for “natural” regeneration to reach a point where other desirable species are excluded or otherwise affected e.g. the regenerative capacity of willows on watercourses. As mentioned earlier, a small number of Australian species have clearly shown the potential to become weeds in our region and species such as these should be avoided.

In some cases wildlife may be present in trees that are being removed. Relocation programs are desirable where feasible in these instances.

All the preceding management issues are essential when examining proposals for corridors and habitat

SECTION 6

FUTURE DIRECTIONS FOR CORRIDOR PLANNING AND MANAGEMENT

“The future is not just what lies ahead, it is something that we create.”

(Forman & Collinge, 1997.)

6.1) Priorities

There are a number of priorities for the future with regard to corridor planning and management.

6.1.1) Siting of corridors and linkages

While there is some degree of debate on the 'pros' and 'cons' of wildlife corridors, the more dominant contemporary opinion appears to favour their introduction and ongoing maintenance as one means of contributing to the conservation of biodiversity, as well as the socio-economic benefits that may flow from them. Wildlife corridors have the potential to permeate all landuse zones (whether urban, rural or industrial) and have various values for wildlife dependant on their positioning, size, and degree of quality.

Of prime importance (even for urban wildlife corridors) is a broad perspective which addresses regional linkages, thus permitting regional movement (*draft ACT Flora and Fauna Guidelines 1992; draft ACT & Subregion Planning Strategy 1995; ACT Nature Conservation Strategy 1998*). Regional movement corridors are crucially important for a raft of wildlife species that are unable to use or otherwise adapt to urban areas, as certain species cannot (or will not) move through anything but a continuous corridor of native vegetation.

There is a definite need to cross link any proposals for urban wildlife corridors with the major regional corridors. For example, a number of migratory bird species have routes through the ACT (e.g. various species of Honeyeaters). These routes cover localised but reasonably extensive areas and therefore large areas are required for these transit corridors. The larger the areas, the less subject they are to the effects of urban influences, (especially fragmentation). At the very least, with larger areas made available any migratory species can potentially find a number of routes through any area where fragmentation exists. The most important zones for this purpose within developed urban areas of Canberra are urban creek and flood corridors, semi-natural open space, arterial roads, power transmission corridors, golf courses, school and other playing grounds, large urban parks and units of CNP within and surrounding urban areas. While not all the preceding areas are public land units, they are the areas that offer the greatest potential for wildlife movement corridors and habitat retention.

A very high priority in deciding where to establish corridors must be to utilise areas that still contain remnant natural vegetation and vegetation communities. The second preference is those areas that have the potential to regenerate naturally or that can be assisted by enhancement plantings. Due to the considerable disturbance that has occurred in urban and near urban sites, the availability of areas containing remnant vegetation of high to moderate value is limited. In such cases corridor links may require considerable work to construct or rehabilitate corridors that meet the intended objective(s).

6.1.2) Community Acceptance

It has been repeatedly shown that there is strong community support for environmental management within the ACT. Community acceptance of any proposed wildlife corridors is critical to their long term success. To gain community acceptance, a series of issues will arise that have to be addressed to ensure community comfort with the concept of corridors, in particular for those who live immediately alongside the corridors. These issues are:

- while the heritage significance of our flora and fauna is recognised by the community, there is still a general uneasiness about “bush” in the minds of a minority, particularly when situated close to residences. Much of this uneasiness is brought about because of unfamiliarity, with many

residents preferring to have more familiar (usually exotic) plant species around them.

- concerns about the potential of fire to affect the urban interface zone. This issue is already well recognised by the ACT Bushfire Council. The ACT's Chief Fire Control Officer has clearly indicated that "managed" wildlife corridors are a far better proposition than the current situation of many unmanaged open spaces that currently permeate the urban areas (pers. comm. Peter Lucas-Smith 1998).
- the fear of snakes. While a legitimate concern the presence of wildlife corridors is not likely to increase the incidence of snakes to any significant degree from that already experienced. The presence of the occasional snake within urban areas is primarily due to many suburbs being in close proximity to broader rural landscapes and nature conservation areas in the ACT.
- safety and security. This is a matter of real concern, but if wildlife corridors are to be established the planning and management required to minimise the effects of fire on the interface can also be utilised to increase safety and security issues.

6.1.3) Political Considerations

There is no such thing as a completely ecologically sustainable city, and any city can continue to function without wildlife and access to natural areas. However, cities without access to nature are considered by many to be soulless environments. The conservation of biodiversity within urban areas benefits more than just the wildlife as there is a basic appreciation and need within most people for contact with the natural world. This was reflected in the results of the market study/survey undertaken by CUPP in 1997. For these reasons environmental issues, especially those related to the conservation of biodiversity, are likely to become an even larger part of political platforms in future years.

Various ACT governments have already indicated their commitment to environmental maintenance and the sustainable development of the Territory. Indeed they have committed the Territory to conforming to the principles of Ecologically Sustainable Development (ESD). Many positive environmental strategies have already been introduced by ACT

governments, and some actions have already been implemented with regard to the protection of environmental values. Wildlife corridors and the provision of quality habitat are two further ways urban areas can contribute to biodiversity conservation, albeit in a limited way.

The most powerful tools available to any government are its planning policies and guidelines. Regardless of past actions in environmental planning in the ACT, there appears to be a concerted effort to review the situation and to ensure policy and guideline documents are consistent with desired environmental outcomes. The enactment of the Environment Protection Act 1997 is an illustration of this.

6.1.4) Current Weaknesses

Some current weaknesses for priority attention are:

- i) the apparent reluctance to enforce any policies or other mandatory requirements already present in legislation.
- ii) the need for adequate protection for remnant vegetation and in particular, habitat trees that are retained (through the planning process) within urban boundaries but are removed by residents or developers.
- iii) the need for wildlife movement corridors already identified in urban areas to actually provide wildlife habitat consisting of native species e.g. while wildlife corridors were identified at an early stage of planning within Gungahlin, exotic species with poor habitat values have been widely used within these zones.
- iv) the need for greater use of native species, especially locally indigenous species, on public lands and other suitable open space leases (e.g. golf courses, playing grounds) that are of suitable dimensions for wildlife corridors. **It is recommended that greater use is made of native species in all areas that are of suitable dimensions for wildlife corridors.**
- v) the need to re-implement an effective and comprehensive plant replacement program within the ACT. **It is recommended that an effective and comprehensive plant replacement program be implemented in the ACT with the utmost urgency.**
- vi) the need for improved coordination between agencies and active reference to threatened species action plans, etc.

6.1.5) Current Strengths

Some current strengths that will facilitate the implementation of corridors and habitat retention are:

- i) community interest and support for environmental maintenance.

- ii) the availability of space suited to corridors and enhancing habitat values.
- iii) the culture of tree and shrub planting on both public and private lands that has dominated the city since its inception, and brought it international recognition.
- iv) the general goodwill of various governments reflected in the production of first class strategies and management plans focussed on environmental protection.
- v) public consultation processes when properly followed and used.

6.2) Corridor Development Process

The future landscapes of the ACT, whether urban or rural, will always be influenced by human activities. It is within the powers of the government and community to decide how these landscapes will be managed and how the landscapes of the ACT will look in the future.

Before implementation, it is important to identify the goals and objectives of any proposed corridor system as these may vary from site to site. In certain areas wildlife conservation may be the dominant principle, while in other areas there may be enormous potential to cater for other recreational, social or environmental needs e.g. multi-use trails, general amenity values or windbreaks.

It is important to recognise the limitations of wildlife corridors within urban areas. They are unlikely to replicate natural ecosystem conditions, and therefore the diversity of flora and fauna that are capable of living within or using them are limited. The more common, opportunistic and adaptable species of wildlife already present in urban areas will certainly find extra advantages within corridors, but more importantly many species that require either more continuous stretches of native vegetation or shelter will also be advantaged. This is why it is important to identify the goals and objectives of a corridor or corridor network prior to implementation.

While in an ideal world, wildlife corridors would reflect the original vegetation communities of the area, this is not realistic in practice. Vegetation communities and ecosystems cannot be reconstructed for a

variety of reasons. It is therefore important to incorporate any existing areas of natural vegetation or areas that have the capacity to regenerate or be enhanced wherever it is feasible to do so. This is also a much cheaper (cost effective) means of implementation. In many cases the reality is that any vegetation required to meet corridor objectives will have to be established. It must also be recognised that many of the natural corridor routes in the ACT (particularly those used by birds) traversed what was open grasslands to savannah woodlands (grassy woodlands). In many cases the tree ratio and habitat values therein may be all that is required to re-establish these corridors. Even so, greater benefits for a broader spectrum of wildlife may accrue even in these areas by providing some density of vegetation in a multi-layered structure.

All this is presented to indicate the crucial nature of adequate planning and design of the proposed corridors. There is a need to analyse what habitat (in the fullest sense) already exists and how or why this habitat is to be enhanced. **It is recommended that a master plan covering all the suitable corridor areas in the ACT urban zone needs to be prepared, and the draft Flora & Fauna Guidelines prepared in 1992 provide a useful starting point.**

Once these zones are established, individual corridors would need to proceed through a reasonably detailed design phase that incorporates all the contemporary knowledge on wildlife corridors. The design phase would examine such things as;

- the connectivity between significant landscape elements,
- minimisation of edge effects and road crossings,
- underpasses for obstructions (especially roads),
- possible effects of pest species (plant or animal),
- the costs of establishment,
- corridor size, widths, shape and boundaries,
- potential for disease spread,

- amount of continuous native canopy required and vegetation structure.

It would include incorporating any other attributes (e.g. remnant vegetation and heritage sites) that contribute to quality of the corridor and tailoring the corridor to meet species needs.

No matter how well planned, there will always be room for improvements and refinement over time. For this reason there should be a commitment to some form of monitoring and evaluation of any corridors. This is an area where nature based community groups may well be able to assist as their contribution to the success of corridors.

Useful wildlife corridors are dependant on the formation of habitat. This means various types and levels of vegetation structure and the formation of hollows and other habitats for nesting and refuge purposes. In other instances hollow trees (e.g. overhanging a street or pedestrian thoroughfare) are viewed as a danger and are removed. This is understandable due to public liability and duty of care issues. However, wildlife corridors are expected to provide habitat hollows and vegetation refuge sites, in no way dissimilar to the types of values found in natural bushland. Corridors will need to be managed to a large extent in the manner of nature conservation areas and the government (and community) needs to accept the same level of risk within corridor zones as is accepted in natural bush areas.

An excellent guide to the design of wildlife corridors is available in “*A framework for the design of wildlife conservation corridors*” by Fleury and Brown (1997), attached in Appendix E.

6.3) Habitat Assessment

Urban wildlife corridors will only be useful where they provide an adequate amount and quality of habitat for the species that are likely to use them or that are being encouraged to use them. The more diverse the habitat and vegetation structure provided, the more diverse will be the species with the potential to use them. Good quality and adequate habitat should provide plentiful quantities of food resources, home sites, secure roosting sites, various types of breeding/nesting sites and areas of general refuge. It is for

this reason that any remnant indigenous vegetation and landforms should always be incorporated within corridors wherever feasible.

A number of very adaptable species of wildlife have readily accepted the wide variety of plant material (both native and exotic) introduced and established in Canberra's urban areas. However, it is not these wildlife species (as common and familiar as many are to the community) that are the species of concern. It is of far more importance to provide suitable and secure habitat for the many more unfamiliar (and often migratory) bird and animal species. Many of these latter species are either in serious decline (or otherwise vulnerable in the longer term) due to the decimation of their habitats or because they avoid transit through urban areas because the habitat requirements are not complete, highly fragmented or disturbed. It is therefore considered most appropriate and important that the greater percentage of plant material used in such corridors are of Australian origin, and in some cases of local indigenous origin. Such plantings need to be well planned to create a structure that caters for the needs of the species that are to be encouraged to use the areas.

In some cases, it may be desirable to repair, create or extend habitat for certain species. Artificial habitats can be provided which include artificial nesting/shelter constructions and the use of "waste" materials (e.g. rocks and logs from urban development).

The 1992 draft ACT Flora and Fauna Guidelines offer a very useful series of questions to assess the significance of any particular site. **It is recommended that the draft ACT Flora & Fauna Guidelines be used to assess significance of sites for corridors and habitat until a final version is produced.** In accord with the Nature Conservation Strategy the Guidelines should be subjected to public scrutiny with the view to preparation of a final copy of the guidelines.

6.4) Role of the ACT Government & Legislative Assembly

The most powerful tools available to government are its planning responsibilities, its ability to intervene through zoning, subdivision requirements and heritage site designations and its powers of monitoring and enforcement. By the efficient use of the urban planning process, it is possible to ensure that suitable land areas are allocated for corridors as new urban developments are planned.

Government through its agencies can make a major contribution by providing an environmental educational service to the broader community. This is already done in a variety of ways and government agencies are encouraged to keep involved in this area, especially in relation to wildlife corridors and ESD.

6.5) Role of Community

It is now firmly recognised that the conservation of biodiversity (and all other natural assets) and reaching a position of sustainability in the future relies heavily (if not completely) on supportive and involved local communities (*ACT Nature Conservation Strategy 1998; Acting Globally, Brown 1994*). However, a better understanding of the importance of biodiversity is required by some community sectors. Education on biodiversity and sustainability is also crucial for many involved within the Landcare movement.

Local communities (or at least interested individuals from these communities) are often more aware of the problems of immediate concern in their local areas. Local communities can become involved in identification of concerns or problems at the local level, facilitate the dissemination of information in the community, provide local supervision and facilitation of projects, are often more flexible and innovative as a matter of necessity, can provide training to new recruits on safety and methodology, undertake monitoring and other on-ground works, lobby for resources for their projects or agencies working within their areas. The resources that are provided for conservation/biodiversity projects often reflect public support for an agencies program.

Landcare groups need to be realistic in what they take on. Some groups take on projects that are far beyond their capabilities, and on occasions have been bailed out by government assistance. On other occasions planting projects have been undertaken and no follow up occurs, resulting in large losses which effectively have wasted the grants monies provided for the project. This said, there is no doubt that community “ownership” of planning and management processes within their local area has great advantages (Fraser 1998).

6.6) Sponsorship Potential

The costs associated with the enhancement or construction of wildlife corridors may or may not be considerable, depending on the location and the objectives of the corridor. Regardless, some costs will be involved. There are opportunities to defray some of the costs through various forms of sponsorship, either by direct cash infusions or by donations in kind. Private business sponsorship, provision of community “in kind” labour and the Natural Heritage Trust are potential sources of funding for establishment of corridors. **It is recommended sponsorship should be sought to assist the timely execution of a more comprehensive corridor network.**

6.7) Community Awareness & Education

There are a number of important future directions for ACT community awareness and education. The ACT is fortunate in already having, for the most part, an environmentally aware community.

In many cases this awareness is at a rather crude level, with the recognition that environmental protection is important, but with less detailed knowledge as to why it is so and how it can be enhanced. There is always scope to improve community awareness on any issue, and it is the responsibility of both government agencies and non-government organisations to be involved in awareness raising exercises. Over recent years there has been a considerable amount of educational activity by these agencies and organisations. This momentum must be kept up and increased. The use of wildlife corridors and areas of comprehensive habitat types can be advantageous for increasing awareness and education, especially when interpretation (however subtle) is used as a community education tool. **It is recommended that interpretation of natural resources and assets be increased within the urban areas of the ACT to increase community and visitor awareness of the crucial importance of these resources and assets.**

As local, national and international communities move towards ecological sustainability, another important educational process is for the community to understand and accept that natural resource management costs money. If communities truly value the environment that supports and sustains them, the financial costs of environmental management need to be recognised and paid for. There has been a considerable amount of work done on the

financial costs of sustainability and the means of meeting these costs (e.g. *“Reimbursing the Future”*, *DEST Biodiversity Series Paper No 9 1996*). The responsibility for progressing this aspect of sustainability will rely heavily on government agencies and NGO’s, as the ideologies of political parties do not wish to be seen as imposing higher costs of living on the community, even though they fully understand the need to do so. **It is recommended that there is a more concerted effort by both agencies and NGO’s to promote the need for more funding to be directed towards environmental maintenance.**

It is also important for urban communities to understand and therefore begin to place more value on the visual nature of Australian landscapes. Official surveys conducted at various times with international tourists have clearly shown that 75-80% of international tourists chose Australia as a destination because of its different flora, fauna and landscapes. Even so, many tourists spend a proportion of their time in Australia within the major urban areas, including Canberra. The conservation and reconstruction of some semblance of “natural” landscapes within the urban areas will assist tourists (and residents) to receive exposure to these landscapes even within urban zones.

6.8) Other Opportunities

The introduction of wildlife corridors and establishment of habitat contributes more than to the immediate environmental effects. The natural environment as a whole provides for many of the spiritual, educational, aesthetic and recreational needs of our community (*ACT Nature Conservation Strategy 1998*).

Australia is internationally known as the Bush Capital and this factor allied with the outstanding design of the city attracts many visitors to the National Capital. As mentioned under 6.7, the establishment and conservation of natural assets as corridors preserves the Australian flavour of our landscapes and image as the Bush Capital and can only assist in attracting more visitors, particularly from international sources.

Corridors would assist in bringing the bush to the city, thus ensuring more contact by residents with the natural world. The corridors, especially where large enough, should function not only as environmental corridors, but as passive recreational areas and trails for residents, including passive horse

and mountain bike riding, walking, natural history studies, orienteering, jogging etc. Any activities conducted within the corridor areas must be of a passive nature otherwise noise and other disruption will exclude many fauna species from using the areas, and there is the possibility of damage to the land or vegetation from certain active recreational pursuits. The desire for more such areas and the principles of multi-use were confirmed by the recent CUPP market survey.

There are also financial benefits that may flow from this type of biodiversity proposal. As has been shown in nearby Yarrowlumla Shire, access to the Greenways network (an open space system based on unused crown road reserves) actually increases real estate values and is a real factor in selling properties.

SECTION 7

CONCLUSION

There have been significant moves by the ACT government, its agencies and the community to address the needs of biodiversity conservation and a range of other environmental issues in recent years. This is reflected in the number of government programs, management planning documents, action (implementation) plans and community based landcare and environment organisations whose underlying objectives are addressing environmental issues. Much of this activity is the result of the realisation of the environmental problems that confront communities throughout the world. Governments and communities are rising to meet the challenge of international conservation agreements that of necessity must be resolved at the local or regional level.

It is obvious that any urban conglomeration has severe and irreversible ecological effects. Canberra has been very fortunate that since its inception it has been subject to stringent planning controls. Because of these controls, Canberra is internationally renowned and has become a model for many new cities and for other urban areas subject to renewal programs. The planning process has incorporated many areas of “green space”, and the extensive planting programs have (often by default) also provided opportunities for wildlife within the city limits. Opportunities still exist to increase the potential for wildlife within the urban areas, even if in a limited way and for a limited number of species.

This study for CUPP examined the potential for improving “off -reserve” aspects related to wildlife corridors and habitat within the urban areas of the ACT. It has a specific emphasis on refinement of the ACT Landscape Guideline to incorporate, where necessary, improvements to the Guidelines that address these issues.

The study showed there is already a comprehensive understanding of increasing opportunities for wildlife. It also showed that various documents produced by the government in consultation with the community already

reflect this understanding. Most requirements for comprehensive environmental protection and management are already in place in various laws, policies and guideline documents. It would appear that the obstacles to achieving environmental ideals in a “sustainable city” are more related to:

- a more thorough integration of environmental programs and objectives within the planning processes of government agencies.
- a better understanding of the need for biodiversity conservation within the community.
- a shortage of resources (both human and financial) within government agencies.
- a heightened commitment by agencies to monitor and enforce compliance under existing environmental laws, strategies and policies.
- to take essential environmental components of the Canberra Landscape Guidelines into a sphere of enforceability as compliance is essential to meet the objectives of other government strategies and legislation and is also essential for success to be achieved.
- commitment to a comprehensive tree replacement program.
- increased emphasis on "forward vegetation" planting programs, including multiple strata of vegetation.

Investigation for this report indicates that the requirements for sustainable development are generally well understood. This is clearly and unambiguously referred to in many ACT planning and management documents, and in environmental strategies and legislation.

The factors that are most likely to effect any moves toward sustainability will be:

- the rapidly diminishing financial and human resources available to management agencies (e.g. the loss of adequate tree maintenance and replacement programs, “brain drain” from agencies).

- the apparent lack of will to adequately monitor and if necessary enforce current policies, guidelines and legislation related to environmental management issues.
- An apparently growing reliance on volunteer contributions

These issues, in addition to the perceived benefits of wildlife corridors as a possible landscape restoration strategy, form the basis of our recommendations.

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Appendix A

POINTS FOR THE ACT LANDSCAPE GUIDELINES

Introduction - include reference to ESD, nature conservation and wildlife corridors

The following points indicate potential improvements or a swing in emphasis of clauses within the Canberra Landscape Guidelines to reflect a more nature conservation oriented approach.

LG – 3 ACT Landscape Policy

- This section needs a detailed inclusion on the importance of wildlife corridors and habitat. It is suggested that the inclusion of a paragraph referring to biodiversity, corridors and habitat under the second paragraph under “1.0 Preamble” is the appropriate place.
- While the stated goal for landscaping (clause 2) includes reference to “sustainable living environments” it is still very anthropocentric. The importance of biodiversity conservation should have a more specific reference with the goal statement.
- Move dot point 6 under “3.0 Objectives for Landscaping in the ACT” to a more prominent position and incorporate words referring to wildlife corridors. Strengthen clause under “4.0 Explanation of Landscape Objectives” that provides an explanation of dot point 6.

LG-A

- ◆ Consider incorporating key site planning and design issues for nature conservation in this section and cross-referencing to the urban Wildlife and Nature Conservation Design section of the Canberra Landscape Guidelines.

LG – A2.4 Design Around Existing Vegetation

- Needs some strengthening and reference to the importance of existing native vegetation, especially habitat trees, and the trouble that is taken to save vegetation during urban development planning processes.

LG – A3.3 Protection and Pruning of existing trees

- Tree protection has longer term implications than just during landscape construction phases and this should be made clear.
- Pruning techniques to conserve hollows in existing live or dead trees does not always conform to standard pruning practices. A further illustration on how to conserve usable tree hollows should be included.

LG – B.2 Procedures for Private Enterprise Development

- Under “1.2 Implementation Plan” reference needs to be made to corridor connections and habitat values under both “a) Site Analysis” and “b) Master Plan”.
- The “Landscape Procedures Checklist” should include a question relating to whether requirements related to corridor connections, tree protection etc have been met.

LG – B.5 Road Landscaping

- The crucial nature of wider arterials and other main roads as wildlife corridors needs to be emphasised (see clauses 2.2 h and 4.0). The emphasis should also make it quite clear that corridors depend heavily on the use of suitable native plant species. This section is particularly important as arterials identified as significant corridors during past planning processes have not always been planted with suitable plant material. There are good examples of this deficiency within designated corridors in the urban development of Gungahlin.

LG – B.6 Carparks

- Carparks have potential as wildlife habitat and as stopover points for wildlife (especially smaller bird species) if properly designed. Some

good examples are present in Canberra e.g. the carparks at the National Gallery of Australia and Commonwealth Gardens. The function of carparks for wildlife will be enhanced when native plant species are used. Emphasise this aspect as a sub-clause under “2.0 Design Aspects”.

LG – B.7 Urban Edge Zone

- Corridors and habitat need more emphasis under “Introduction” and “Planning and Design Objectives. This is one of the most important areas as urban edge zones are the entry points to the truly urban corridors and habitat areas. Fig 8 clearly illustrates what can be achieved by the construction of artificial habitat(s).

LG - B.12 Protection of Existing Trees

- The Introduction (1.0) should begin with a paragraph on the importance and value of existing trees, especially with reference to very old native trees that are retained through the urban development process. This should include the amount of trouble that is taken to save remnant native trees from the beginning of the design phase.
- The Introduction could also indicate the values inherent in large native trees that die, but have the potential (with correct lopping) to stand for many more years thus permitting wildlife to continue using any available hollows.
- Also refer to value of retaining young established native trees as long term elements of the landscape with the adaptability to respond to changes caused by development.
- Methods of pruning older trees, both dead and alive, should be illustrated somewhere. Slanting cuts on weaker branches can keep hollows protected from the elements. Accepted horticultural practices are not necessarily be the best way to conserve hollows in these trees.

LG – B.13 Laneways & Underpasses

- When designing laneways the width of laneways should be increased at early planning stages where they can provide suitable linkages between scattered vegetation remnants.

LG – B.15 Playgrounds

- This section could be expanded to ensure large playground areas are suitably planted with suitable shrub and tree species to provide “access to nature”. While child security is an issue, some larger play areas have the potential to be landscaped to encourage use by wildlife (see 1.1c and 2.2c).
- Large playgrounds offer potential for more “unstructured” play activities based on nature (see figure 17). These form of play activities fit well within “3.4 Challenge”.
- Emphasise that pedestrian spines linking playgrounds offer potential for planting as wildlife corridors (see Figure 10).

LG – B.16 Plant List

- This list contains a wide range of useful and hardy native species, some of which are rarely used. This is primarily because many designers and landscape firms do not know these species particularly well, if at all. The use of a wider range of species from this listing for habitat and corridor use should be encouraged. The addition of another column in the plants list indicating a wildlife ranking or features for wildlife is recommended.

LG – B.17 Housing Trust Projects

- Housing Trust estate landscaping or any similar private developments offer great potential to be developed as islands of native vegetation suited to wildlife (see 7.44). In particular, any public lands and general streetscapes within these estates can be developed using native species offering potential for coordinated landscape approaches over multiple blocks.

LG – B.18 School Grounds

- School grounds usually cover considerable areas which offer great scope for landscaping suited to wildlife. These plantings can also be multipurpose, offering protection and screening of school grounds as well as a very useful education and interpretive tool if well planned. The educative value of such plantings applies to students and the wider

community as well as school grounds are used by a wide cross section of the community for a variety of purposes. The fact that school ground landscape designs must be approved by ACT Planning and Land Management can be used to advantage in the planning and planting of these areas. Self-regulation may not be effective within school grounds.

- With the management of school grounds now being conducted through school boards, there is a need to communicate the importance of these areas to the boards, or personal preferences may cause great damage to existing useful features within the landscape. Perhaps an additional clause is required to reflect school board responsibilities in landscape management and refurbishment as related to wildlife now that boards manage these considerably important areas

LG – B.19 School Playgrounds

- The provision of “natural” adventure style playgrounds could be a useful asset to schools as well as contributing to wildlife conservation and provision of habitat.

LG – B.20 Signs

- The text of this section is applicable to interpretive signs referring to wildlife, corridors and habitat. The inclusion of an extra clause within this section that encourages interpretation of natural assets would be useful.

LG – B.21 Overhead Powerlines

- ♦ Power transmission corridors, especially wider 132LV corridors, offer the opportunity for extensive native shrub plantings, particularly for birdlife and small mammals.

LG – B.22 Soil Testing Procedures

- The importation of topsoil is unlikely to be proven a sustainable activity, even though it may be required in some instances. Weeds and pathogens can be imported with the product, then requiring other management activities. Soil importation also has ecological effects in the areas from which it is taken, one important consequence being a reduction of

viability of agricultural areas. Another disadvantage of topsoil introduction is that it is usually associated with irrigated areas which require extra water , fertilizer and maintenance inputs which can be avoided in many instances. An additional clause or words under “Introduction” in this section could reflect these issues. Enforcement of current standards may not be appropriate or possible. Weed management could well be addressed by longer consolidation periods where a weed seed threat is considered likely.

LG – B.23 Weeds

- Related to the above. Soil should not be imported from areas of known weed infestation e.g. African Love Grass and Serrated Tussock areas in the Bungendore/ Monaro areas. It is not restricted to the weed seed present in the soil, but the seed that is deposited along every transport route into the ACT e.g. Love Grass along the Monaro Highway.

APPENDIX B

**URBAN WILDLIFE AND NATURE CONSERVATION
DESIGN FOR INCORPORATION IN THE ACT
LANDSCAPE GUIDELINES**

B1.0 PURPOSE

Landscape restoration for nature conservation and wildlife corridors provide the opportunity to:

- establish and augment native conservation by linking protected areas, habitat corridors, private or public open space and remnant vegetation into a functional and legible ecological network.
- encourage the community, particularly children, to gain positive direct experience of their local environment
- lessen the environmental pressures emanating from urban development so as to maintain bio-diversity
- research the impact of urban life on wildlife patterns
- encourage and support community participation in native planting and maintenance programs such as Park Care.

**B2.0 THE POTENTIAL FOR WILDLIFE CORRIDORS IN
CANBERRA**

Urban development in Canberra has significantly destructed lowland and valley habitats and fragmented the connective linking vegetation between the hill and river reserves which are major habitat areas. Many of these reserves are incorporated into Canberra Nature Park. Suburbia extends mainly across native grassland and woodland which are the two most threatened lowland ecosystems.

The planning of Canberra creates the opportunity for successful corridors if planted with or retaining suitable native species

An ecological or wildlife corridor views wildlife movement as a priority whereas a social corridor is primarily concerned with the recreation needs of humans. How they are designed and managed often dictates whether the two uses can be successfully integrated.

Corridors occur in diverse habitats, sizes, urban settings and form. The corridors can be:

- linear – waterways, roads, floodways, service easements and the buffer zones between suburbs, or
- non-linear – schoolgrounds, sportsfields, golf courses, surrounds to major buildings, community parks (and even the consolidated private gardens of suburban areas).

B3.0 THE PRINCIPLES OF LANDSCAPE RESTORATION AND WILDLIFE CORRIDORS

To improve the contribution of vegetation corridors to the conservation of biodiversity, it is important that corridor design and management/refurbishment approaches incorporate factors that influence the connectivity function and habitat provision for wildlife.

Each site has its own specific requirements, project needs and opportunities (or constraints) to nature conservation and wildlife movement potential. Designs and techniques will therefore vary to suit each site. Designers should consider issues and ideas as listed below and integrate or adapt them as appropriate.

General principles of wildlife corridor management

These principles can optimise the corridor values of pre-existing vegetation corridors not primarily established or maintained for nature conservation. With sympathetic management, areas such as urban green spaces and parks can nonetheless make a significant contribution to the enhancement of local biodiversity values.

- Applying the precautionary principle, assume that corridors do have a potentially useful function, not only in providing habitat, but also in enhancing movements of wildlife;
- Smaller corridors or native conservation patches in urban areas must be viewed as a sub-component of a broader regional and major reserve conservation system e.g. National Parks and Canberra Nature Park reserves. The smaller urban areas support the main corridors by providing options for wildlife populations within the fragmented urban landscapes. This includes for migratory, transient or relatively fixed home range species.
- Connectivity is not necessarily defined or determined by physical continuity of habitat. Some populations are connected in patchy landscapes.
- Barriers lower the quality of a corridor by increasing the risk of death by either traffic or predators.
- Landscape design to restore sites for nature conservation to get the most from linear vegetation corridors, should aim to recreate and maintain as much natural strata species and spatial mix as possible. The ecosystems created should be diverse and self-sustaining that integrate both human impacts and environmental needs. Elements that affect the survival of native flora and fauna such as exotic weeds and pests need to be limited.
- Ongoing protection, maintenance and monitoring are essential components of the corridor development process. This is essential to ensure habitat suitability over the long-term, to assess corridor function and effectiveness and to provide information to make further improvements to corridor design.
- Maintain or enhance local genetic diversity and safeguard at risk species or communities
- Create significant improvement to bird habitat with heath like communities and a range of vegetation strata.
- Define explicit restoration and conservation goals considering the ecology of the target species; co-occurring species and competitors (especially predators); site context; species likely to be effected; could the proposal assist to spread pests, disease and gene pool contact; and habitat suitability.

- Consider if there is cover for movement; refuge; mix of habitats and successional stages; topographic variety; and the ability to increased the foraging area for a wide range of species or provide a source to recolonise surrounding environments when suitable habitats become available
- Corridor dimensions (width, length, continuity of retained vegetation and size of patches); presence of gaps and barriers; and the impact of the surrounding land matrix is critical. For instance, narrow corridors may be dominated by aggressive edge species.

Wildlife habitat and food chains

Improving the structural diversity of habitats is important.

Aging, dead and fallen trees with hollows provide nesting places for birds, and shelter for possums, gliders, bats, lizards, small mammals and many invertebrates.

If no hollows are available then nesting boxes can be installed. Fallen logs should be retained or added to provide refuges for small to medium ground dwelling animals, insects and soil fauna. Rocks also can be used as shelter for small animals such as frogs and lizards. Presence of ground litter or mulch can be critical for many small species.

Food chains are important to consider. For instance: spiders and insects provide food for many birds and animals. Immature meat ants are a favourite food of echidnas. Parent birds look for sap-sucking insects to feed their nestlings. Insects and birds help control pest insects on fruit, vegetables and other crops. Native plants need flies, wasps, bees and beetles for pollination so use garden spray sparingly, if at all. Mixed plantings are better able to withstand pest outbreaks.

New nature conservation areas often take time to evolve into worthwhile contributors to the wildlife corridor network. For instance it usually takes 5 - 10 years for understorey plants to grow to a size and stage where they provide resources for nectar-eating birds. Nature conservation areas in urban precincts or margins allow for environmental education and interpretation activities allied with increased bio-diversity of native flora and fauna.

Animal numbers can fluctuate depending on seasonal, migratory, weather and food source factors.

Sustainable design solutions will require evaluation of design alternatives; appropriate designer experience in nature conservation projects; maximising available habitat opportunities on a site both in terms of area, strata and shelter; retaining quality habitat areas where possible; and trying to incorporate natural features where feasible.

B4.0 SITE PLANNING AND ASSESSMENT FOR ENVIRONMENTAL BENEFITS

All projects and management plans should review the site survey and investigation and site analysis issues outlined in Section LGA 1.1 of the Guidelines.

In most instances projects need not have significant adverse impacts and the emphasis should be on sustainable and functional design solutions and proactive integration of suitable wildlife habitats into the urban framework.

To achieve this each site must be fully assessed relative to the habitat occurrence, significance and potential that the site offers. On critical sites, the Landscape Architect should be supported by specialists in flora, fauna, ecology, natural resource management, hydrology and archaeology as appropriate. The site planning should then balance and integrate the site opportunities and constraints and as many specialist recommendations as is feasible within project requirements.

If a rare or threatened species or community occurs on or near the site then the environmental context of the development becomes paramount. Information on the target species requirements, viability and specific management needs require thorough investigation and sufficient buffer protection. Consult the City Parks Management Guidelines for Specific Sites (1992) and relevant government agencies such as the Wildlife Research and Monitoring Unit.

A comprehensive site analysis and recognition of the existing habitat and its ecological potential is important in successful sustainable solutions. This assessment and analysis checklist should include:

HABITAT ASSESSMENT

Vegetation

Assessment Criteria	yes	no	n/a
What vegetation which occurs on the site is worthy of retention: - remnant trees? - shrubs and groundcover? - native grasslands? - wetland or periodic inundation zones?			
What other key habitat features are present? - nesting sites, roosts or breeding hollows; - fallen logs; - vegetation strata and/or other shelter; - rock outcrops/crevices; - heavy leaf litter.			
Are a range of vegetation layers or strata present?			
Does the site have diverse flora species?			
Are there any endangered, vulnerable or otherwise significant flora on site?			
Can wetlands be increased or have the potential to be created?			
Would a specialist vegetation survey be beneficial?			

Fauna

Assessment Criteria	Yes	no	n/a
Is the existing site likely to be regularly used by - Birdlife - Reptiles - Animals - Fish and amphibians			

Would a wildlife survey be beneficial?			
Is the site part of a recognised wildlife movement corridor?			
Are there any endangered, vulnerable or otherwise significant fauna species present on site?			

Site Disturbance

Assessment Criteria	Yes	no	n/a
Is the site stable based on slopes, soils and surface cover?			
Has the area been disturbed by: - erosion - fire - grazing - clearing			
Are siltation, erodability, surface flows, or ground water regimes an issue?			
Are degrading weeds present? - Is their impact significant? - Can they be readily managed and controlled?			
Are degrading feral animals present? - Is their impact significant? - Can they be readily managed and controlled?			
Is the site susceptible to potential weed infestation?			
Is the site susceptible to high fire hazards?			
Can effective fire management be incorporated into the design?			

Natural Regeneration Potential

Assessment Criteria	Yes	no	n/a
Is there potential for regeneration using: - seed or cuttings collected from site - topsoil stripping			

- vegetation mulching			
Would a prescription burn encourage indigenous seed regeneration for rehabilitation?			
Would a prescription burn encourage regrowth and produce a better age class and species diversity in the vegetation?			
Is there evidence of regeneration on site?			

Other Issues

Assessment Criteria	Yes	no	n/a
Will remnant vegetation or other nature conservation values on the site be impacted by: - existing movement patterns e.g. human desire lines, service easements and vehicle access? - potential movement patterns? - site construction management and environmental controls? - future maintenance?			
Are significant cultural or heritage features present?			

B5.0 DESIGNING FOR NATURE CONSERVATION

The Benefits of Designing for Diversity

Screen plantings can combine shelter and food plants for birds and insects and eventually provide roosting and nesting areas. Wattles provide food for seed-eating and insectivorous birds. Grevilleas attract honeyeaters. Prickly hakeas and other native plants make safe nesting sites. Low-growing ground-covers provide refuge for lizards, frogs and small mammals. A eucalypt closely surrounded by several wattles and a few large and small shrubs makes a satisfactory refuge and nesting site for small birds.

A piece of grassland consisting of some of the shorter native grasses such as Wallaby Grass and Kangaroo Grass, interspersed with low-growing daisies, peas, and other attractive grassland plants, can form a satisfactory and colourful fire break. Most grassland species will survive occasional

moderate mowing at 100mm height. This habitat provides food sources for birds that often shelter in nearby woodlands and denser vegetation.

A range of vegetation strata and species assists wildlife occupancy. Many forward tree planting programs in urban and rural fringe areas in the past have not been attractive to wildlife as they tend to be single strata eucalypts of the one age class in a continuous canopy. Greater contrast with openness and enclosure, sunshine and shade and informal transition edges create better habitats and opportunities for wildlife. Select shrubs to incorporate for their contribution to habitat, shelter and food source for native fauna.

Incorporate other herbs and forbs with native grasses where possible.

Design Principles

To be of greatest value for wildlife, wildlife corridors should:

Action	Reasons to support action
Use native plant species; have a diversity of plant species from local provenance	to provide resources that are adapted to the local environment; to recreate habitat suitable for a range of endemic species
Include a variety of flowering trees, shrubs and grasses appropriate to the site	to provide a diversity of resources for wildlife within a vegetated area and help restore the natural ecosystem
Contain all strata found in original, pre-existing vegetation of the area (i.e. before clearing by Europeans)	to ensure structural diversity to meet the different needs of species
Keep corridors as wide as possible	to reduce the potentially negative impact of edge effects
Limit access where appropriate	to prevent loss of habitat quality through damage of understorey and ground cover species and protect the remaining original vegetation
Ensure external factors do not contribute to corridor degradation e.g. fertilisers and changed water regimes	to protect native vegetation from damaging effects of such disturbances
Control weeds	to reduce competition with native vegetation
Encourage natural regeneration	can be cost effective, depending on the previous disturbance of the site
Control land degradation	to minimise the loss of soil and impact of rising groundwater
Utilise screening and buffers if appropriate	lessen disturbance to wildlife

Other issues to consider in the planning and design process:

Retain sustainable habitats

- If the site is to be significantly disturbed by the development what habitat or ecosystem would be of the most value to retain relatively protected and/or can best fit into the site usage and maintenance?

Access and human impacts

Effective nature conservation in urban areas usually requires:

- controlling unauthorised vehicle access
- minimising the impact of domestic and feral dogs, cats and other vertebrate pests.
- managing pedestrian movement and any associated wear and surface erosion
- controlling illegal dumping and domestic garden encroachment
- minimising site pollution by litter, chemicals and fertilisers directly, by runoff or ground water transfer
- implementing sediment control runoff management by filter ponds, swales and erosion management
- effective design and management of the interface between natural and development areas.
- removal of unsafe limbs in select access areas but the method of tree surgery should consider undercutting to allow wildlife continued access to hollows.

Economic Benefits

- Is the economic benefit of careful vegetation retention and protection appreciated due to potential saving in clearing, new landscaping, consolidation and ongoing maintenance demands?

Creative conservation and environmental education

Areas of quality natural habitat can in selective circumstances, be pro-actively designed to encourage access for education and enhancing community awareness of the nature ethos. Site selection must consider the susceptibility to damage and the potential to minimise this by good design and management.

Walking tracks and environmental trails should minimise disturbance to native grassland and other sensitive sites. Access management can include paths, boardwalks, signs, fencing or logs. Some can be well structured and capable of dealing with high user volumes, others are best in a low key natural character. Routing must discourage dispersal and short cutting. Trail construction must integrate measures to control erosion and minimise change to the hydrological regime. Path surfacing, width and what it leads to and how the environmental message is explained are all critical to a trails success.

Trails add the risk of vandalism, fire, and disturbance to habitats. When carefully designed they reward the community by providing a resource useful for environmental education and awareness raising.

EXAMPLE OF INTEGRATING A NATURE CONSERVATION
CORRIDOR INTO AN URBAN SETTING

[Adapted from Towards Ecologically Sound Australian Landscapes
(TESAL) 1992]

B6.0 DESIGN FOR MANAGEMENT SUCCESS

The ongoing management regime of a site is often as critical as the landscape design – particularly if a zone of remnant or relatively undisturbed natural vegetation is retained. The designer therefore needs to be aware of how the site may be managed and make design and management recommendations as appropriate to suit a successful nature conservation outcome over time. It would be beneficial for the designer to be engaged to develop specific plans of management and periodically review the site maintenance practices, planting success and use patterns.

Nature conservation and landscaping deals with a dynamic changing environment – the design and management of it must evolve and adapt with its successional change.

Weed and pest control

The level of control of pests and woody weeds and suckers may vary on projects depending on site significance, landscape intent and management resources. Early detection and control is usually the most cost effective management strategy. This should be integral in the design process.

Environmental weeds e.g. *Pyracantha*, *Cotoneaster*, *Crataegus*, Blackberry, Privet, *Cytisus*, Pampas Grass, Willow, Serrated Tussock, St John's Wort, Chilean Needle Grass, African Lovegrass and many others are capable of invading natural ecosystems. They suppress growth, survival and regeneration of indigenous flora, and therefore impact also on the indigenous fauna. Removal of these species should be a priority with specific programs of spraying, physical removal and monitoring in accordance with the ACT Weeds Strategy.

Some weeds or pests may not be able to be removed fully from a site but should be appropriately managed to limit their impact and further spread.

Ground layer management and fire

Each project needs to determine the areas subject to regular mowing/slashing; limited slashing; or no ground layer control as this will greatly affect the survival or natural regeneration of particular species. A regeneration strategy that raises slashing height; increases the interval between slashes or only undertakes it at the appropriate time can enhance the re-growth of native grasses and forbs.

Controlled burns of appropriate frequency, intensity and timing can assist particular species and can often be a more “natural” control than slashing. Obviously controlled burns need to be undertaken with specialist ecological advice and effective fire safety control in accordance with ACT legislation.

A pro-active fire fuel management strategy (e.g. slashing, controlled grazing and/or fuel reduction program) is essential for minimising the risks of uncontrolled fires impacting on flora and fauna. Community education on the benefits of this strategy, especially within urban areas, is essential for a positive community response. The recently completed ACT Bushfire Fuel Management Plan addresses these issues.

Ongoing management actions are needed to enhance habitat and wildlife viability, ecological succession and vegetation strata diversity for the benefit of both flora and fauna. In urban areas the human influence is so significant that it is essential to develop community understanding and co-operation of wildlife needs and the necessary management strategies needed to enhance sustainable habitats.

APPENDIX C

CONTACTS

Wildlife Research and Monitoring Unit, Environment ACT.	Heritage Unit, Environment ACT
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Department of Planning and Land Management (PaLM)	Urban Landcare Co-ordinator, Canberra Urban Parks & Places
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Conservation Council of the SE Region and Canberra	Canberra Urban Parks & Places
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National Parks Association

Society for Growing Australian Plants

Canberra Ornithologists Group

Nature & Society Forum

Field Naturalists Association

APPENDIX D

BIBLIOGRAPHY

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Appendix E

**FLEURY AND BROWN, 1997 URBAN PLANNING
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