biodiversity corridors plan

sustainable environment

BOROONDARA
City of Harmony

Meeting the needs of present and future generations

Prepared for
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City of Boroondara

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FOREWORD

"The City of Boroondara is committed to benefiting present and future generations through the practice of sustainability." City of Boroondara Environment Policy, 2001.

The City of Boroondara recognises its responsibilities as a custodian of the environment, as well as respectfully acknowledging the Wurundjeri people as the first owners of this country, and the custodians of the cultural heritage of this land.

Boroondara is home to numerous significant environments which Council has sought to maintain, enhance and protect by adopting the Biodiversity Strategy in 2003. The strategy aims to preserve all that is unique about our City and sets out the long term vision of protecting and enhancing native vegetation and fauna in the City. This Biodiversity Corridors Plan is a key action arising from the Biodiversity Strategy and is the main platform of delivery for achieving this vision.

The Biodiversity Corridors Plan sets out steps to establish a network of habitat links throughout the City that connect to adjoining municipalities, allowing indigenous fauna and flora to live, flourish and move through the landscape.

The major corridor is along the Yarra River. There are also creek corridors, such as Gardiners Creek, as well as linear and stepping stone reserves that protect more isolated habitats.

Habitat corridors will deliver an important social dividend by providing residents and visitors with opportunities to experience Boroondara's significant wildlife, as well as beautiful places where residents can relax.

Council is grateful for the suggestions and comments received from the community and interested parties in the development of this Plan, which received widespread support during the consultation process. Together our actions will ensure that the leafy-green native environments we have grown up with will be accessible by our children, and their children, into the future.

Council is delighted to present the community with Boroondara's Biodiversity Corridors Plan.

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SUMMARY

In adopting the Biodiversity Strategy in May 2003, Council set out its long term vision for protecting and enhancing native vegetation in the City. This Biodiversity Corridors Plan is a key action arising from the Biodiversity Strategy and is the key platform of delivery for achieving this vision.

This Plan sets out the steps to establish a habitat network across the City of Boroondara, as a means of conserving and restoring some of the indigenous (pre-1750) plants and animals of the area.

The focus of the Plan is on the waterways, especially the Yarra River, and associated open spaces. The biodiversity network will utilise a variety of land tenures and land uses, requiring collaboration between Council, government agencies, residents, business and other land owners. Establishment of a habitat network is a long-term vision that will take decades to achieve. Links must extend beyond Boroondara, ideally forming part of a metropolitan-scale network that will assist in conserving Melbourne's rich and complex natural heritage.

This document includes:

- a review of the current state of knowledge on the roles and values of landscape connectivity for nature conservation;
- an outline of factors influencing the design and effectiveness of links;
- a summary of relevant Victorian and catchment legislation, policies and strategies, including those of the City of Boroondara and other councils;
- identification of issues and opportunities;
- a goal and strategic objectives for a habitat network;
- a plan for the City with four types of links: major corridor (the Yarra River), creek corridor (Gardiners Creek), linear reserves and stepping stones;
- identification of target fauna species for each type of corridor, and the vegetation communities to be restored; and
- a detailed action plan for Council to establish the habitat network.

The action plan includes initiatives for each identified corridor or habitat link, Planning Scheme measures, recommendations for enhancing habitat links on Council and private land, collaborative projects with other organisations, proposals for community education and involvement, and recommendations for ongoing research and monitoring.

The intended outcomes of the Corridors Plan include:

- protection, restoration and management of a large proportion of Boroondara's remnant indigenous vegetation;
- protection and enhancement of the habitat connectivity of the Yarra River as Boroondara's and Melbourne's primary biodiversity corridor;
- establishment of a network of habitat links throughout Boroondara that connect into adjoining municipalities and enable indigenous fauna and flora to live in, and where possible, to move through the landscape; and
- a better understanding of the biodiversity benefits of corridors and enhanced connectivity in an urban environment.

INTRODUCTION

An urban mosaic

The City of Boroondara is an urban municipality with the vast majority of its indigenous[1] plant and animal communities replaced by a mosaic of buildings, roads and other hard surfaces. Its public and private gardens are largely planted with grass, trees, shrubs and flowers from overseas. A small number of foreign bird and mammal species dominate the fauna. However some remnants of the indigenous vegetation remain, and a number of adaptable native fauna species still live in, or visit Boroondara[2].

Local naturally occurring life forms and ecosystems are precious natural assets to an area. They are being increasingly appreciated for the range of tangible and intangible benefits they provide. If landscape connectivity can be enhanced, plants and animals should be better able to live within, and move through the urban mosaic. The establishment of a habitat network, with corridors of indigenous vegetation and other linkages, is a sustainable approach to retaining and restoring the native biodiversity of an area.

Aerial photographs and land use maps reveal the basis for a network of habitat linkages across the City of Boroondara: the waterways (including those creeks that now flow in underground drains), current and former rail reserves, and parks and open space reserves.

Boroondara's Biodiversity Corridors Plan

The preparation of this Biodiversity Corridors Plan was a key recommendation in the Boroondara Biodiversity Strategy. The Plan sets out steps to establish a habitat network across the municipality. It is a long-term vision, as it will take decades to establish the habitats and fill gaps in the links. The focus of the Plan is on the waterways, especially the Yarra River, and associated open spaces. The network will also utilise a variety of land tenures and land uses, and thus requires collaboration between Council, government agencies, residents, business and other land owners. Links must extend beyond the municipal boundaries, ideally forming part of a metropolitan-scale network that will assist in conserving Melbourne's rich and complex natural heritage.

[1] Indigenous biodiversity refers to the plants and animals that occurred in Boroondara before 1750. 'Indigenous' is used interchangeably with 'native' in this document.

[2] See the Boroondara *Biodiversity Strategy* vols. 1 and 2 for a list of remnant vegetation sites, and flora and fauna species recorded in Boroondara.

CORRIDORS AND CONNECTIVITY

Corridors and connectivity in developed landscapes

Throughout the world, human land-use has brought about major changes to the environments in which plants and animals live. In areas heavily dominated by people, such as cities and farmland, fragmentation of natural habitats has had a profound effect. Habitat fragmentation is an ongoing process with several important components. First, loss of native vegetation reduces the amount of habitat available to plants and animals. This limits the size of populations and the number of species that can occur. Second, the habitats that remain become progressively smaller and more isolated from each other. This means that populations of many species of plants and animals also become smaller, more localised, and increasingly isolated from other populations. Third, the remaining habitats are increasingly surrounded by less-favourable land uses, which have an impact on the natural areas. Invasion by pest plants and animals is a common example of disturbance from surrounding land uses.

Conservation actions, such as the protection of natural habitats, revegetation of new areas, and the restoration of disturbed vegetation to increase their habitat values, are examples of positive responses being taken by governments, organisations and individuals to address the loss of native vegetation. These actions assist in increasing the amount and quality of the habitats for nature conservation. However, the isolation of natural habitats by surrounding urban, industrial or agricultural land-uses poses a different kind of problem. To address this issue, there has been worldwide interest in the concept of 'corridors'. It has been widely proposed that the protection or restoration of corridors of native vegetation between otherwise isolated habitats will assist plants and animals to move, and thereby reduce the negative effects of isolation.

When the term 'corridor' or 'wildlife corridor' is used, most people think of a continuous strip of vegetation that provides a habitat through which animals can move between two larger areas. However, we need to think more broadly than this definition. A broader concept of 'connectivity' refers to the capacity of plants and animals to move within and through the landscape. Continuous corridors are one means of enhancing landscape connectivity, but they are not the only measure that can be used. Movements of some species may be assisted by 'stepping stone' habitats of various sizes and spacing, while other species may be able to move through a range of habitat types in the land mosaic. The level of connectivity in a particular landscape will vary for different species, depending on their mobility and the types of habitats they can use.

Connectivity can be enhanced at different scales. For example, a tunnel or bridge may assist some species to cross local barriers such as railway embankments, busy highways or streams. At a landscape scale, movements of some urban wildlife may be assisted by a continuous strip of riparian vegetation along a creek or river, while others may use a series of stepping-stone bushland reserves spaced throughout the suburban land. At a broader scale, major river systems or a mountain range could be a connecting habitat for movement.

Understanding the role and values of landscape connectivity for nature conservation is an active area of research, and it is beginning to be applied in land-use planning and land management. A number of books, conference proceedings, reviews and research papers

have been published to summarise the current state of knowledge on this topic[3]. These provide the basis for the following material.

What are the benefits for nature conservation?

Corridors and other linkages in developed landscapes provide some important functions (Bennett 1999):

1. They assist **the movements of individual animals** through modified landscapes, and thereby increase the likelihood that they will remain in, or recolonise an area. There are several types of movements:
   - daily or regular movements of wide-ranging species for feeding, shelter or nesting;
   - nomadic or migratory movements between seasonal resources, such as nectar, fruits or seeds;
   - movements of species that use different habitats at various stages of their life-cycle.
2. The ability of individuals to disperse from one location to another can **increase immigration to isolated habitats**, which can:
   - supplement small and declining populations, thereby reducing the chance of local extinction;
   - allow the recolonisation of a habitat where local extinction has occurred;
   - introduce new genetic variation and reduce the risk of loss of genetic variation or inbreeding depression.
3. They provide **additional habitat for plants and animals**. In heavily-cleared environments like urban areas, corridors may represent a large part of the remaining natural or semi-natural habitat for native flora and fauna. Stream systems in particular are rich habitats for wildlife, including those species that spend part of their life-cycle in water and part on land (e.g. frogs, some invertebrates).
4. They **contribute to ecological processes** in the landscape. Some processes, such as seed dispersal and pollination, depend on the movements of animals between habitats. Vegetated corridors influence wind flow and protect soils. In the case of streamside vegetation they can protect water quality for aquatic systems, reduce erosion of stream banks, and help buffer the run-off of excess nutrients and pollutants into streams.
5. The natural or semi-natural environments within corridors have an important **social benefit for people**. They are used for recreation and relaxation, appreciated as places of beauty, and provide a sense of location and identity to local residents. In urban environments they are important places where urban dwellers can experience -'nature' and wildlife.

The role of corridors and connectivity in conservation strategy

Increasing landscape connectivity makes a distinctive contribution to biodiversity conservation. It provides the opportunity for a series of small reserves or remnant blocks of

[3] Saunders and Hobbs 1991; Smith and Hellmund 1993; Ahern 1993; Forman 1995; Bennett 1999; and see References.

habitat to function as an interconnected network of habitats, rather than as isolated bits. This approach is now recognised as an important design principle in land-use planning[4].

The concept of habitat networks is being applied on a range of scales around the world, in:

- rural environments, where hedges, fencerows, streamside vegetation, roadside vegetation or small stepping stone blocks of forest or woodland can link the semi-natural and remnant habitats that are scattered amongst farmland;
- extensive forested landscapes in Australia and other countries, to incorporate the protection of stream corridors and other links to maintain networks of unlogged forest within timber production areas;
- national parks and other conservation reserves, to protect broad corridors of habitat between reserves. In Victoria, there are examples of such reserve networks in the Alpine region, the Central Highlands, and the Mallee region;
- conservation plans for the management of the habitats of threatened species, such as the Giant Panda (McKinnon and de Wulf 1994), or to maintain animal migration pathways in India and Africa (e.g. Mwalyosi 1991);
- urban environments, as documented for example by Little (1990) in 'Greenways for America', and in a number of Australian local government areas (see Appendix A).

Strategies to develop corridor networks in urban environments have some common features:

- the importance of rivers and streams as the main remaining natural linkages;
- the need to restore degraded habitats;
- multiple use of the network, especially for recreation as well as conservation;
- careful land-use planning to take into account existing land uses; and
- the need for a long-term approach.

Habitat networks require an integrated approach to nature conservation across a range of land tenures, rather than conservation depending primarily on dedicated reserves. For example, a habitat network could comprise of land managed by government agencies, local government, community organisations, companies and private individuals. This may include conservation reserves, stream and river reserves, easements, golf courses, local parks, and private lands and gardens.

[4] For example, see Ahern 1993; Forman 1995; Jongman 1995; Dramstad et al. 1996; Bennett 1999.

Factors influencing the design and effectiveness of links

Ecological requirements of species

The design requirements for habitat links will vary between species, according to their habitat needs and mobility. For mobile species such as many native birds or bats, a series of closely spaced 'stepping stone' habitats of the appropriate vegetation type and structure will be sufficient to enhance movement through the landscape. Other species that are well adapted to the urban environment (e.g. Red Wattlebird, Grey Butcherbird, Australian Magpie, White-plumed Honeyeater, Common Brushtail Possum) do not require specific linking habitats but readily move through the suburban mosaic of gardens and trees. In contrast, species with low mobility that depend on native vegetation require continuous connected habitats to facilitate their movement through urban landscapes. Examples include many invertebrates (beetles, spiders etc), small reptiles, frogs, and small mammals. The movement of plant species depends on the dispersal of their seeds, spores or pollen by wind, water or animals.

For habitat networks to be effective they need to be planned with the requirements of target species in mind.

To maintain connectivity for whole communities of plants and animals (especially less-mobile species), networks will be more effective if they comprise continuous strips or swathes of habitat.

Width of habitats

Maximising the width of links in urban environments, especially along waterways, is one of the most effective actions to increase their value for wildlife.

Width determines the total amount of habitat within the link. The number of different types of vegetation, wildlife species and the population sizes of species increase as width increases.

Wide strips of vegetation have greater capacity to buffer degradation processes than narrow strips that may be entirely disturbed by the degradation. For example, wide strips of vegetation along streams assist in reducing the influx of sediments and chemicals into the aquatic environment. They also provide habitat for wildlife and protect the aquatic environment.

From a biological perspective, there is no optimum width for a corridor or link. The width needs to be scaled to the type and role of the link.

The wider the link, the greater will be its value for wildlife conservation. Nevertheless, where wide corridors cannot be provided, narrow sections may still serve a useful purpose.

Quality of vegetation

The quality of the vegetation in a habitat network determines the amount and the type of resources available to wildlife, such as foraging sites, food resources, shelter, and breeding sites. It therefore influences the type of animal species that can occur and the size of their populations. Networks with high quality vegetation will generally support richer wildlife communities than those with poor quality or disturbed vegetation.

At least three main factors influence the quality of vegetation in urban environments:

- **Composition**. The native fauna formerly present in Boroondara are adapted to living in indigenous forest, woodland and wetland habitats. The quality of habitat networks will be closely related to their similarity to indigenous vegetation. Areas with largely-intact native vegetation can be expected to support a more diverse wildlife community than

those with few native plants or those dominated by exotic vegetation. This has been clearly demonstrated for bird communities. For example, streetscapes and reserves with indigenous trees support a greater diversity of native birds than do those dominated by exotic trees.

- **Structure**. The structural complexity of vegetation, such as the number of layers of vegetation, the range of tree sizes, and the variety of ground-layer habitats (logs, litter, stumps, shrub cover etc), influence the range of habitats available for animals. For example, structurally complex habitat will provide for birds that forage on the ground, among low shrubs, in tall shrubs and small trees, in the tree canopy and on the dead limbs and trunks of trees. In contrast, in a simplified habitat of trees and grass, many foraging sites will be missing.
- **Disturbance and degradation**. Invasion by weeds and other exotic species, occurrence of feral animals (e.g. Red Fox, Cat, Black Rat), and excessive disturbance by human activity all contribute to reducing the quality of habitats for wildlife.

The quality of vegetation for biodiversity conservation is therefore increased by having indigenous plant species, structurally complex habitats, and reducing degradation from disturbance.

Criticisms of the conservation value of corridors

The concept of 'corridors' as a conservation measure has received some criticism[5], centred on the following points:

- there is insufficient evidence to demonstrate the conservation benefits of corridors;
- corridors may have negative effects such as harbouring predators or pest species, or assisting the transmission of disease or disturbance; and
- there are more effective ways to spend scarce financial resources for conservation.

It is important that such concerns are considered. However, in this context it is essential to understand that this proposal emphasises a *habitat network* for Boroondara, rather than simply movement corridors (the focus of the above critiques). Even if the capacity for movement by flora and fauna in an urban environment proves to be limited, the habitat network is itself of great value in maintaining and expanding the area of semi-natural habitats for the conservation of biodiversity.

It should also be noted that while the provision of habitat links between reserves is a highly desirable aid to conservation, it does not replace the need for proactive management of flora and fauna species and their ecological communities within reserves.

[5] For example, see Simberloff and Cox 1987; Simberloff et al. 1992; and summary in Bennett 1999.

POLICY CONTEXT

[Note: no references to biodiversity corridors have been identified in National legislation, policies or programs.]

Victorian legislation, policies and programs

Victorian Biodiversity Strategy

Victoria's Biodiversity: Directions in Management (Dept of Natural Resources & Environment, 1997) includes as a key direction for urban and urban fringe areas:

> "Increase the provision of accessible strategic advice, such as the new format planning schemes being developed under the VPP[6], to local government planning processes to promote development in the least sensitive areas and to protect and promote corridor areas such as the Metropolitan green wedges." (p14)

Another volume of the Biodiversity Strategy, *Victoria's Biodiversity: Sustaining Our Living Wealth* emphasises the importance of links and corridors (pp12-13):

> "Fragmented ecosystems support less species and genetic diversity. Links between fragments can allow otherwise isolated populations of flora and fauna to remain connected to populations elsewhere.
>
> Links therefore maintain larger gene pools, contributing to evolutionary development and long-term viability. For some animals, the ability to move between different parts of their habitat is a critical requirement of their life cycle. In urban and rural areas, corridors of native vegetation along rivers and roads are literally lifelines for these animals."

State Planning Policy Framework

Three clauses in the State Planning Policy Framework (Victoria Planning Provisions) are relevant to corridors:

> **"15.1.2 Catchment Planning and Management...**
>
> Planning and responsible authorities should consider the impacts of catchment management on downstream water quality and freshwater, coastal and marine environments and, where possible should encourage:
>
> - the retention of natural drainage corridors with vegetated buffer zones at least 30m wide along waterways to maintain the natural drainage function, stream habitat and wildlife corridors and landscape values, to minimise erosion of stream banks and verges and to reduce polluted surface runoff from adjacent land uses;
> - measures to minimise the quantity and retard the flow of stormwater runoff from developed areas;
> - measures, including the preservation of floodplain or other land for wetlands and retention basins, to filter sediment and wastes from stormwater prior to its discharge into waterways."

[6] Victoria Planning Provisions.

"15.09 Conservation of native flora and fauna

15.09-2 General implementation

…Decision making by planning and responsible authorities should:
…

- assist the re-establishment of links between isolated habitat remnants."

"15.10 Open space

15.10-2 General implementation

Planning authorities should plan for regional open space networks to be used for recreation and conservation of natural and cultural environments.

Planning and responsible authorities should ensure that open space networks:
…

- incorporate, where possible, links between major parks and activity areas, along waterways and connecting places of natural and cultural interest….

Planning and responsible authorities should ensure that land use and development adjoining regional open space networks and national parks complements the open space in terms of visual and noise impacts, treatment of waste water to reduce turbidity or pollution and preservation of vegetation."

The *VPP Planning Practice Note on Biodiversity* (Dept of Infrastructure 2002) refers to the restoration of riparian and wildlife corridors as an example of a strategy to protect and enhance biodiversity. It states (p6) that the Environmental Significance Overlay can be applied to land identified for the establishment of vegetation corridors or revegetation.

Melbourne 2030

The metropolitan strategy, *Melbourne 2030: Planning for sustainable growth* (State of Victoria 2002) includes a policy (5.7) to "rectify gaps in the network of metropolitan open space by creating new parks and ensure major open space corridors are protected and enhanced".

Figure 39, a map of regional public open space, shows the Yarra River, Gardiners and Koonung Creeks, and the Outer Circle linear park as part of the existing open space network.

An initiative under policy 5.7 is relevant:

"5.7.4 Strengthen current policies and review the adequacy of planning controls relating to the Yarra and Maribyrnong Rivers to ensure the long-term protection of open space and conservation values - with the first priority being the Yarra River corridor between Punt Road and Burke Road." (p107)

Linking People and Spaces

Linking People and Spaces (2002) is a strategy for Melbourne's open space network, prepared by Parks Victoria. It "is primarily focused on planning for the regional open space network, which is complemented by and interconnected with the diverse local network." (p10) The document recognises habitat corridors along streams, including the Yarra River, that link larger parks (such as Yarra Bend Park and the Yarra Valley Parklands) and important habitats:

"Protecting and enhancing conservation values, including indigenous vegetation and habitats, is central to environmental sustainability. Expanding protected areas and

improving links between habitat corridors will be a part of the overall viability of conservation values." (p23)

One of the 0-3 year actions for the 'East region' of Melbourne is to:

"Implement a co-ordinated Yarra River Biolink program in order to connect, revegetate gaps and improve habitat condition in the strategic wildlife corridors of the Yarra River and its key tributaries." (p43). Local government is listed as one of the responsible agencies for this action.

This program has been operating over the past three years within Parks Victoria parks: Warrandyte State Park, Yarra Valley Parklands (Burke Road to Wonga Park) and Yarra Bend Park. Approximately 200,000 plants have been planted to date. Parks Victoria are proposing to involve local governments and other organisations to extend the program to other land in the near future, particularly between Yarra Bend Park and Warrandyte (Tony Varcoe, Parks Victoria, pers. comm. 24 March 2003).

Regional and catchment strategies

Regional Catchment Strategy

The Port Phillip and Western Port Catchment Management Authority is currently preparing a new Regional Catchment Strategy for the Port Phillip and Western Port catchment, due for completion in late 2003. This Strategy is the primary mechanism for integrated planning and management of natural resources in the region. It integrates the delivery of various State policies and programs at a regional level and establishes the framework for various action plans such as native vegetation.

A discussion paper contributing to the development of the new catchment strategy (Port Phillip & Western Port Catchment Management Authority 2002) notes that reversing the decline in native vegetation is a major task, and there is a further challenge to ensure that patches of remnant vegetation are not fragmented and isolated.

Port Phillip and Westernport Native Vegetation Plan

One of the five goals of the catchment *Native Vegetation Plan* (draft, Port Phillip & Westernport CALP Board 2000, p56) is "to enhance the connectivity of native vegetation across the region to maintain ecological processes". One of the components of Strategic Direction 6: Revegetation is 'creating wildlife corridors'. This section (p82 of the same document) notes that "corridors may exist as continuous connected strips to facilitate the movement of ground dwelling animals or a series of nearby patches and fragments directionally linked which together could be used by avifauna (flyers):- insects, birds, bats, flying foxes, gliders and the like…In the built up areas the rivers, creeks and streams provide the best opportunity to create continuous corridors." Map 27 on p84 shows proposed and existing regional corridors, including the Yarra River. A 500m buffer on both sides of major streams was applied in mapping the riparian corridors.

Local Government responsibilities and powers

Functions and powers

Local government in Victoria can protect and enhance native vegetation and biodiversity corridors through land use planning, development control, direct land management, management of environmental risks, management agreements, and education, support and encouragement of action by the community.

Legislation

The role of local government in biodiversity conservation is recognised in the *Local Government Act 1993* and the *Planning and Environment Act 1987*.

Under the *Planning and Environment Act 1987,* local governments have the responsibility for the control of land use and planning within their municipalities. Local governments are responsible for developing and enforcing a planning scheme for their local area. The scheme sets out policies and requirements for the use, development and protection of land. The format must follow the structure of the Victoria Planning Provisions, which includes particular provisions in relation to the protection and conservation of native vegetation.

The State Planning Policy Framework includes an objective: “to assist the protection and conservation of biodiversity, including native vegetation retention and provision of habitats for native plants and animals and control of pest plants and animals.” Clause 15.09 of the State Planning Policy Framework establishes the requirement for planning authorities to have regard *to Victoria's Biodiversity Strategy* and other instruments made under the Flora and Fauna Guarantee Act, as well as approved regional vegetation plans when reviewing Municipal Strategic Statements and amending planning schemes. See 'Victorian legislation, policies and programs' above for more information about the State Planning Policy Framework in relation to corridors.

Biodiversity conservation can be furthered in various ways through the planning scheme:

- the *Municipal Strategic Statement* (which needs to justify why vegetation is being protected in the scheme).
- local policy - to explain and inform planning decisions;
- overlay provisions, e.g. the Vegetation Protection Overlay or the Environmental Significance Overlay. The schedule to a Design and Development Overlay may contain landscaping requirements;
- S.173 agreements under the Planning & Environment Act can be used to manage significant vegetation on development sites.

Under the *Domestic (Feral & Nuisance) Animals Act and Regulations 1994*, councils have powers to control dogs and cats. The purposes of the act are to promote animal welfare, responsible ownership of dogs and cats, and protection of the environment.

Relevant Council policies, strategies and plans in Boroondara

Council Plan 2003-2006

The *Council Plan* is Council's primary strategic planning document. One of the goals of the plan is "Protecting Our Environment: through strategic planning and appropriate development, we will protect and improve our built and natural environment and foster local economic activities."

Objectives under this goal include:

- work in partnership with our community, commerce, industry and other stakeholders to promote environmentally sustainable development and to preserve a quality environment for future generations;
- research the City's tree canopy and protect and preserve significant vegetation, landscapes and natural assets.

Completion of the Biodiversity Corridors Plan and commencing implementation of the Biodiversity Strategy are listed as commitments for 2003/2004 under Objective 2.2.

Municipal Strategic Statement

The City of Boroondara's *Municipal Strategic Statement* (1999) provides a vision for the development of the whole city, with long-term strategic directions.

The Statement recognises Council's role as custodian of a portion of the Yarra River and its environs, supporting all regional policies relating to the Yarra River. One of the City's key influence areas is developing 'strategies which encourage development which is compatible with the City's urban character and amenity which minimises environmental impact'. One of Council's values is sustainability.

In the Urban Character section of the Statement, vegetation is seen as valuable, as well as the watercourses that make up a significant stretch of Boroondara's borders, creating a strong and distinctive sense of character. Strategies include maintaining and promoting the City's treed and leafy environment, and conserving and enhancing distinctive landscapes within the City.

The Environment section notes the environmental significance of the Yarra and its immediate valley environs, and its value as a habitat corridor. The protection of the environmental qualities of the Yarra River and its environs, and other habitat corridors, is considered of primary importance in the protection of the municipality's natural resources. Implementation actions include the application of appropriate overlays and zones, a River Concept Plan for Gardiners Creek, and a Vegetation Policy which identifies strategies for conserving sites and corridors of flora and fauna and strategies for the control of noxious weeds and pest animals.

The Recreation and Leisure part of the Statement refers to the need to ensure that recreational activity nodes are located away from sensitive areas within sites of high natural environmental significance, or have access to these areas controlled.

Environment Policy

The City of Boroondara's *Environment Policy,* adopted in April 2001, commits to a number of environmental policy objectives. Objectives include the integration of triple bottom line objectives into all planning and policy making, regular communication with the community and awareness, promotion and compliance with this policy by all employees, contractors and subcontractors. The policy commits Council to preparing environment strategies to cover key areas subject to allocation of resources. One of the key areas is biodiversity, which includes vegetation management, habitat protection, indigenous animals and domestic animal control.

Biodiversity Strategy

The overall goal of the *Biodiversity Strategy 2003* is to protect and enhance local biodiversity across the City of Boroondara, and to support regional, state, national and international biodiversity conservation initiatives. One of the strategy's objectives is to "protect and enhance the ecological values of the Yarra River and its environs, and create and consolidate additional biodiversity corridors throughout Boroondara".

Preparation of this *Biodiversity Corridors Plan* is one of the key actions listed in the *Biodiversity Strategy*. Three of the Strategy's actions relate to the Yarra corridor, and one relates to the Outer Circle Linear Park.

Open Space Policy

The mission statement of the *Open Space Policy* (1998) is to preserve and enhance the amenity of Boroondara's high quality urban environment and facilitate appropriate development by strategies which will conserve and enhance landscape and natural settings.

One of the Policy's objectives is to provide a continuous and viable system of primary fauna corridors around and across the municipality. As part of this Council will enhance and extend fauna corridors along waterways (Yarra River, Gardiners Creek etc) and establish a cross-municipal fauna corridor along the line of the Outer Circle Path.

There needs to be a balance between indigenous and exotic vegetation. Other policy objectives include reinforcement of indigenous planting along waterways and corridors unless there is an established heritage character of exotic vegetation.

Greenhouse Strategy

Boroondara's *Greenhouse Strategy* (2001) refers to the effect climate change will have on natural ecosystems. Pressure for survival will increase for species, particularly those that are already struggling to cope with habitat fragmentation. Weed and pest problems are likely to increase as these species tend to be highly adaptable to change. One of the strategic objectives is to "conserve and enhance the carbon sink capacity of the municipality", which refers to the role of vegetation in absorbing carbon from the atmosphere.

Tree Development and Management Policy

This policy, adopted in 2003, deals with trees in Council parks, reserves and streets. It includes guidelines for tree removal and planting, including species selection and community consultation.

ISSUES AND OPPORTUNITIES FOR A HABITAT NETWORK IN BOROONDARA

Issues

A number of significant issues must be addressed in planning for biodiversity corridors in Boroondara:

- the extensive loss, degradation and fragmentation of indigenous vegetation and other habitat;
- the lack of large blocks of natural habitat to connect via corridors (with the exception of Yarra Bend Park and Wattle Park);
- the decline in indigenous species diversity; many remaining fauna species may be irregular visitors rather than residents, and resident fauna species (excluding mobile birds and bats) are likely to be occurring as small isolated populations;
- the limited knowledge of the flora and fauna of Boroondara, which affects the understanding of the function and value of habitat networks[7]. Little is known about the location, extent, size and viability of populations, the habitats they are using (or avoiding), or their changes in status over time. Even less is known about invertebrates;
- recreational use of linear reserves and disturbance from adjoining urban uses can conflict with nature conservation in the corridors;
- the 'disappearance' of minor creeks that now flow in underground drains;
- the barriers to movement of terrestrial species created by roads, fences, rail lines and built-up urban areas. These have greatest impact on the less mobile species (e.g. small reptiles, invertebrates);
- predators, particularly foxes, feral and domestic cats and dogs;
- width and contiguity of open space;
- invasive environmental weeds, including Wandering Trad, Desert Ash, Willows, Elms, and Blackberries.

Opportunities

The following opportunities have been identified to support the development of a habitat network in the City of Boroondara:

- the extensive areas of open space and significant habitat values of the Yarra River corridor;
- remaining sites and individual specimens of remnant indigenous vegetation, which provide nuclei for the habitat links and seed or cutting material for propagation for revegetation;
- existing patterns of open space across Boroondara, which includes many linear and linked reserves;
- the potential for revegetation of some of the extensive areas of mown grass including golf courses, grounds of institutions, and other large landholders;

[7] Note that studies of the indigenous flora and fauna are actions recommended in the Boroondara *Biodiversity Strategy* (2003).

- the large numbers of established Australian[8] and exotic trees and shrubs which provide habitat for some indigenous species;
- major redevelopment sites, including Kew Residential Services and the River Retreat area, which could incorporate indigenous planting in public and private areas;
- links with other municipal councils and agencies such as Parks Victoria which are likely to collaborate in partnership programs;
- social and educational opportunities, particularly for local schools, created with a habitat network.

[8] Australian vegetation refers to species native to locations anywhere in Australia.

STRATEGIC DIRECTIONS FOR A HABITAT NETWORK

Goal

The overall goal of this *Biodiversity Corridors Plan* is to conserve and enhance indigenous biodiversity through a habitat network across and beyond the municipality.

Strategic objectives

Council seeks to:

1. Identify, protect, restore and manage remnant indigenous vegetation within biodiversity corridors.
2. Protect and enhance the habitat connectivity of the Yarra River and environs as the primary biodiversity corridor in Boroondara.
3. Identify and establish a hierarchy of habitat links throughout Boroondara and connecting into adjoining municipalities, that enhances the capacity of indigenous fauna and flora to live in, and where possible, to move through the landscape.
4. Ensure that land owned by Boroondara Council within the habitat network is managed to protect and enhance habitat values.
5. Encourage non-Council landowners and managers within and adjoining habitat links to protect and establish habitat.
6. Empower the wider community to participate in the implementation of this Plan.

Types of links

A hierarchy of four types of habitat links is proposed for the City of Boroondara: major corridor, creek corridor, linear reserve and stepping stones. Detailed descriptions of each corridor are provided in Appendix B and their locations are shown on Map 1.

Major corridor

The Yarra River and its associated floodplains and open spaces are recognised as the primary biodiversity corridor at a metropolitan scale. It has highly significant vegetation remnants (certainly the highest within the City of Boroondara), large areas of habitat, and almost certainly the most diverse fauna. It has very high actual and potential connectivity, and its natural values contribute enormously to its recreation values.

Vegetated buffer zones should be at least 30m wide consistent with clause 15.1.2 of the State Planning Policy Framework.

The aim of this corridor is to provide linked habitat for all the animal groups discussed below, as well as to protect and restore the Riparian Woodland, Floodplain Riparian Woodland, Floodplain Wetland Complex, Plains Grassy Woodland, and Escarpment Shrubland vegetation classes (see Appendix F for descriptions of these ecological vegetation classes).

The Yarra corridor also acts as a spine to connect Boroondara's habitat network to those in the adjoining municipalities of Banyule, Manningham, Darebin, Yarra, Stonnington and Whitehorse.

Creek corridors

Other waterways which have not been barrel-drained, have the potential to provide a wide range of habitat values from aquatic through to riparian, floodplain and escarpment.

The only other waterway in Boroondara which still flows mostly above-ground is Gardiners Creek.

Parts of Back Creek and Glass Creek have not been barrel-drained, but the sections which have been reduce the values of these corridors.

Vegetated buffer zones should be at least 30m wide consistent with clause 15.1.2 of the State Planning Policy Framework.

The aim of this type of corridor is to provide habitat for aquatic invertebrates and mammals, fish, frogs, terrestrial invertebrates, reptiles, birds and bats, and to protect and restore some elements of the Floodplain Riparian Woodland vegetation class.

Gardiners Creek is also a potential link to habitats in the Cities of Stonnington, Whitehorse and Monash.

Linear reserves

Many waterways which are now barrel-drained still retain continuous or almost continuous open spaces along them which provide opportunities for woodland habitats. Rail, road and water easements can preserve open spaces suitable for linear corridors if the infrastructure use of the corridor is not excessive. A fairly continuous corridor of indigenous plantings is desirable in these linear reserves, with an effort made to minimise the gaps at road crossings. Both canopy and understorey connectivity should be maximised. A minimum desirable width of plantings of 10m has been adopted for this strategy.

This type of corridor is designed to provide habitat for bats, forest-dependent birds and generalist mobile birds, terrestrial invertebrates and reptiles, and to protect and restore some elements of the Valley Grassy Forest, Plains Grassy Woodland, Floodplain Riparian Woodland, Creekline Grassy Woodland and Creekline Herb-rich Woodland vegetation classes.

Stepping stones

A number of parks and reserves in Boroondara have habitat value for indigenous fauna, but are relatively isolated from other habitat areas. 'Stepping stones' are areas where habitat planting is to be encouraged, to link these reserves to others. For mobile species such as many native birds or bats, a series of closely spaced ‘stepping stone’ habitats of the appropriate vegetation type and structure will be sufficient to enhance movement through the landscape.

This type of corridor is designed to provide habitat for bats, forest-dependent birds, generalist mobile birds, terrestrial invertebrates and reptiles, and to protect and restore some very basic elements of the Plains Grassy Woodland, Creekline Grassy Woodland, Valley Grassy Forest, Floodplain Riparian Woodland, Swampy Riparian Complex, and Creekline Herb-rich Woodland vegetation classes.

Target species

Mammals

Large ground mammals

Large ground mammals, such as the Eastern Grey Kangaroo, Black Wallaby, Wombat and Short-beaked Echidna, have the potential to move into the area via the Major Corridor along

the Yarra River. Occurrences of such species, at least in the short term, are likely to be of dispersing individuals rather than resident animals. They are unlikely to be able to extend further downstream than Yarra Bend. The ability of such species to persist in habitats along the Yarra will depend on provision of indigenous habitat, especially refuge and shelter areas, and adequate control of domestic animals that may harass and can kill such species.

Arboreal mammals

Common Brushtail Possums and Common Ringtail Possums occur widely in well-vegetated urban areas and do not necessarily require corridors for habitat or movement in the urban area. The habitat network will contribute further to maintaining these native animals in the urban environment. Two additional arboreal mammals, the Sugar Glider and Koala, are not currently known from the area, but may potentially disperse downstream into the area along the Yarra River Major Corridor. Sugar Gliders will benefit from habitat management that maintains large trees, especially those with tree hollows that provide den sites, and the presence of a tall understorey layer of wattles such as Black Wattle or Silver Wattle.

Aquatic mammals

The Platypus and Water-rat have been recorded in the City of Boroondara and their continued occurrence will be associated with the suitability of habitat along the Yarra River Major Corridor. In the longer term, if major restoration and habitat improvement is carried out along Gardiners Creek, it may be possible for these species to further expand their distribution.

Bats

Small insectivorous bats are seldom seen by most people but are present in urban areas where suitable forested habitat is available for foraging and daytime roost sites. It is likely that at least 6 species are present in Boroondara (e.g. Lesser Long-eared Bat, Gould's Wattled Bat, Chocolate Wattled Bat, Little Forest Bat) although current records are sparse. A system of corridors is unlikely to be essential for movement of these species, but the restoration and enhancement of the habitat network will be of great value by increasing the area of forested vegetation in which bats can forage for invertebrates (flying beetles, moths, flies, mosquitoes etc.) around the canopy of eucalypt trees. Older trees, such as River Red Gums along the Yarra River Major Corridor, are particularly valuable when they provide hollows for roost sites. Dead trees and dead limbs on trees are often valuable roost sites. The larger Grey-headed Flying-foxes are not dependent on the habitat network as they favour fruiting or flowering trees in the suburban environment for foraging.

Birds

Wetland birds

The Yarra River Major Corridor and the creek corridors in the proposed habitat network are valuable for birds associated with wetland habitats. They offer the opportunity, with further restoration, to enhance the status of such species in the City. Creek corridors may be used by the more common species, such as Dusky Moorhen, Little Pied Cormorant, Little Black Cormorant, White-faced Heron and Pacific Black Duck. Other, less common urban birds, that are potentially able to occur along the Yarra River wetlands include Australasian Grebe, Darter, Rufous Night Heron, Australian Crake, Chestnut Teal, Grey Teal and Yellow-billed Spoonbill.

Forest-dependent birds

There are a large number of forest and woodland birds that are occasionally recorded in urban environments. They are more likely to regularly occur, and persist, if there are suitable areas of forest and woodland amongst the urban mosaic. The proposed habitat network will increase the total area of forest and woodland habitat and offer greater

opportunity to move through the urban environment within favourable habitat. Most bird species will have a reasonable capacity to cross 'gaps' in vegetated corridors such as those where roads occur. The linear reserves, stepping stones and creek corridors have the potential (as they are revegetated and restored) to support many of the more common 'bush birds' such as Grey Shrike-thrush, Brown Thornbill, Striated Thornbill, Golden Whistler, Rufous Whistler, White-browed Scrubwren, Superb Fairy-wren, Spotted Pardalote and Grey Fantail. The Major Corridor along the Yarra River will have the greatest potential (at present and in the future) to support these and a wider range of 'bush birds', such as Sacred Kingfisher, Brown Goshawk, Southern Boobook, Tawny Frogmouth, Crested Shrike-tit, Olive-backed Oriole and Dusky Woodswallow. In the longer term, the restoration of a connected network of indigenous habitat has the potential to greatly increase the number and conservation status of native birds within the urban environment.

Generalist and highly mobile species

There are a number of bird species that occur within the urban area that can be classed as 'generalists' or 'mobile species' that are likely to persist without the need for a specific habitat network. Examples include species that favour open grassy environments, such as Australian Magpie, Willie Wagtail, Magpie-lark, Welcome Swallow, and Little Raven, and also common garden birds such as Red Wattlebird, Little Wattlebird, White-plumed Honeyeater, Rainbow Lorikeet and Grey Butcherbird. It is worth noting that some other species that may occur in grassy reserves, such as Eastern Rosella and Red-rumped Parrot, require tree hollows for breeding.

Reptiles

The reptile fauna of the City of Boroondara is poorly known, and likewise little is known of the ability of reptiles to move through urban environments. Several species, such as Garden Skink, Marbled Gecko and Common Blue-tongued Lizard, may occur amongst houses and gardens where suitable cover and food sources are available. Most reptiles have relatively low mobility and depend on areas with suitable ground layer habitats to maintain local populations. The habitat network offers the potential to maintain and restore areas with semi-indigenous ground cover to support a greater number of localized populations of small reptiles, and provide a source for further dispersal. The larger areas of habitat along the Yarra River will be particularly important (e.g. Weasel Skink, Delicate Skink, Tiger Snake, Long-necked Tortoise).

Frogs

Wetland habitats associated with the Yarra River Major Corridor and Stream Corridors are the key parts of the habitat network for maintaining frog populations in the City, and for facilitating their dispersal. Common species such as Common Froglet and Southern Brown Tree Frog are likely to occur along stream corridors, such as Gardiners Creek, but the extent to which other species occur will depend on restoration and management of suitable aquatic environments and fringing vegetative cover. Little is known of the ability of frogs to disperse through urban environments, but it is most likely to occur along creek systems. There is considerable potential to create frog habitats as part of the restoration of the habitat network, and learn more about dispersal patterns.

Fish

The aquatic environment of the Yarra River Major Corridor is the primary habitat and movement corridor for native and exotic fish species in the area. In the longer term, restoration of creek corridors and their aquatic environment could also provide suitable habitat for some fish species.

Invertebrates

Aquatic invertebrates

The Yarra River Major Corridor is the key part of the habitat network for aquatic invertebrates, and important to its ecological function. The diversity of aquatic species in the creek corridor is likely to increase as restoration proceeds and will depend on the range of aquatic microhabitats and water quality.

Terrestrial invertebrates

There is an enormous diversity of terrestrial invertebrates (e.g. ants, beetles, centipedes, bugs, spiders, crustaceans, earthworms, flatworms, moths, flies, mantids and many more) but almost nothing is known of their occurrence and distribution in the City of Boroondara. All parts of the habitat network presently support a range of invertebrates, but the diversity of species (especially native species) will be related to the extent of indigenous vegetation and the complexity of the habitats that are restored.

Table 1. Potential use of components of the habitat network in Boroondara by different groups of animals

Type	Large ground mammals	Arboreal mammals (Sugar Glider, Koala)	Aquatic mammals	Bats	Wetland birds	Forest-dependent birds	Generalist mobile birds	Reptiles	Frogs	Fish	Aquatic invertebrates	Terrestrial invertebrates
Major corridor	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Creek corridor			✓	✓	✓	✓	✓	✓	✓	?	✓	✓
Linear reserve				✓		✓	✓	✓				✓
Stepping stones				✓		✓	✓	✓				✓

ACTION PLAN

The following actions cover a range of initiatives for Council to promote the establishment of a habitat network in the City of Boroondara. Their implementation will be subject to funding: either the allocation of resources through Council's annual budget process or through external funding. The 'priority' column indicates the sequence in which the actions should be undertaken, with the 'A' priorities recommended to be implemented earlier than 'B' or 'C' priorities. (Note that each corridor has been assigned a priority according to its significance in the network, and the higher priority corridors tend to have more 'A' priority actions. Nevertheless, an 'A' priority action in a lower priority corridor should have a similar timing as an 'A' priority action in a high priority corridor.)

Specific actions are recommended for: each identified corridor or habitat link; Planning Scheme measures; recommendations for enhancing habitat links on Council and private land; collaborative projects with other organisations; proposals for community education and involvement; and for ongoing research and monitoring of the habitat network. See pages 16-17 for an explanation of the proposed types of links in the network.

	Action	***Priority***	***Resources required***	***Responsibility***
	The Yarra Corridor (major corridor - priority: very high)			
1.1	Continue to implement the Willsmere-Chandler Park Management Plan to preserve and enhance the natural indigenous qualities of the site and its role as a link in the flora and fauna corridor along the Yarra River. (This is Action 3.1 in the *Biodiversity Strategy*.)	A, ongoing	Separate recurrent funding	Strategic Planning Parks & Gardens
1.2	Participate in the Yarra Biolink Program co-ordinated by Parks Victoria, to connect, revegetate gaps and improve habitat condition in the strategic wildlife corridor of the Yarra River. (See also Action 3.2 in the *Biodiversity Strategy*.)	A, ongoing	To be assessed	Parks Victoria Strategic Planning Parks & Gardens
1.3	Continue to seek opportunities to work collaboratively with Parks Victoria to co-ordinate pest plant and animal control (including feral cats, foxes and rabbits) along the Yarra Corridor. (See also Action 6.4 in the *Biodiversity Strategy*.)	A, ongoing	Existing program	Parks & Gardens Parks Victoria
1.4	Continue works in conjunction with Melbourne Water to remove weeds in the riparian zone of the Yarra River and follow up establishment of indigenous vegetation, including the actions specified in the *Lower Yarra River Waterway Management Activity Plan*. Formulate an agreed plan with Melbourne Water to remove exotic species from the river corridor from the Freeway Golf Course to Chandler Highway bridge. (This is Action 3.3 in the *Biodiversity Strategy*.)	A, ongoing	Seek external funds	Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
1.5	Prepare and implement a site development plan with an indigenous planting theme for Council land between the Freeway Golf Course and Burke Road bridge.	B	$50-60,000	Parks & Gardens Strategic Planning
1.6	Organise a seminar and field day to discuss ecological restoration and management along both sides of the Middle Yarra Corridor, and possible mechanisms for ongoing co-ordination in planning and environmental management, as an initial step to further information exchange and collaboration between land managers in this area. Potential participants include municipal councils on both sides of the River, Melbourne Water, Parks Victoria, local community groups and major landholders such as golf clubs, and the Yarra Catchment Committee. (This is Action 3.4 in the *Biodiversity Strategy*.)	B	$3,000	Strategic Planning
1.7	Apply an indigenous planting theme to redevelopment sites adjoining the Yarra Corridor. Ensure that there is public land river frontage, at least 30m wide if possible, at these sites.	A	-	Strategic Planning Statutory Planning
1.8	Encourage private landowners downstream of Walmer Street to control exotic trees along their frontages and to plant indigenous trees, shrubs and groundcover, through education. Use planning controls to encourage retention of indigenous remnant vegetation.	B, ongoing	$2,000	Strategic Planning Statutory Planning Communications
1.9	Work with Scotch College and Strathcona Grammar School to set up programs whereby students are involved in restoring indigenous vegetation to the schools' river frontages.	B	-	Strategic Planning Parks & Gardens
1.10	In Freeway Golf Course (North Balwyn) and other parks managed by Council, design and plant a 30m wide buffer along the river frontage, incorporating existing remnant vegetation. Ensure that vegetation along the water's edge is suitable for Platypus and Water Rat shelter.	A	$15-20,000	Parks & Gardens
1.11	Work with Green Acres and Kew Golf Clubs to design and plant enhanced vegetation buffers along the River through their properties. Work with them to resolve how passage for large mammals including macropods (Kangaroos and Wallabies), Wombats and Echidnas might be provided without excessive threat to the golf courses.	A	-	Parks & Gardens Strategic Planning
1.12	Continue to implement the recommendations of the reports prepared by Kern et. al. (2000) for the City of Boroondara on the Yarra and Fairview Park.	A, ongoing	To be assessed	Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
1.13	Provide input to the State Government's forthcoming strategic review of planning controls along the Yarra River, to ensure that biodiversity issues are taken into consideration.	A	-	Strategic Planning
1.14	Encourage the establishment of a corridor link from the Yarra River at Bellbird Reserve, Kew, northeast across the Kew Residential Services site to the Outer Circle Linear Park at Princess Street.	A	-	Strategic Planning
	Gardiners Creek Corridor – (creek corridor - priority: high)			
2.1	Facilitate the setting up of an association or committee to bring together the councils abutting Gardiners Creek, other agencies including the Yarra Catchment Committee, Melbourne Water and VicRoads, other major landholders including Scotch College and Coles Myer, and community groups to work together to improve habitat and open space values along the Creek. Through this group, design and implement a belt of habitat plantings along the Creek, protect remnant vegetation, and replace environmental weeds along the Creek bank with indigenous species.	A	To be assessed	Strategic Planning Parks & Gardens
2.2	Provide support to Melbourne Water to assist their development of a Waterway Activity Plan for Gardiners Creek in conjunction with the Cities of Stonnington, Whitehorse and Monash, and the Yarra Catchment Committee. Propose investigation of the feasibility of the restoring the Creek as a more natural waterway, initially from Toorak Road to the Yarra River. (This Action supersedes Action 6.5 in the *Biodiversity Strategy*.)	B	-	Strategic Planning
2.3	Work with Scotch College to design and implement habitat improvements along its frontage of Gardiners Creek and establish a belt of indigenous plantings linking from the Yarra to H.A. Smith Reserve.	B	-	Parks & Gardens Strategic Planning
2.4	Increase the level of Council resourcing and implementation of habitat plantings along Gardiners Creek. Ensure protection of remnant vegetation from environmental weeds and disturbance, and establish buffers using indigenous plantings.	B, ongoing	$30-50,000/year	Parks & Gardens
2.5	Continue to foster the involvement of local community groups along the Creek.	A, ongoing	To be determined	Parks & Gardens Strategic Planning
2.6	Liaise with the City of Stonnington regarding possible habitat corridor development in Darling Park and the Malvern Valley Public Golf Course, where opportunities for this are limited on the Boroondara side of the Creek.	B	-	Strategic Planning

	Action	***Priority***	***Resources required***	***Responsibility***
2.7	Encourage the establishment of indigenous habitat plantings in a generous open space corridor along the Creek frontages of the former gasometer site on Toorak Road and the Coles Myer property at Tooronga.	B	-	Strategic Planning Statutory Planning
	Outer Circle Corridor (linear reserve - priority: high)			
3.1	Prepare a detailed Vegetation Management and Indigenous Revegetation Plan for public land along the Outer Circle linear reserve. This should include a mulched belt of plantings at least 10m wide along the corridor to cross or go around any mown grass spaces, with indigenous overstorey, mid and understorey species. Work with community groups to implement this plan. (See also Action 7.2 in the *Biodiversity Strategy*.)	C	$20 - 40,000 for plan	Strategic Planning Parks & Gardens
3.2	Review and implement the recommendations of Cowdell (1990) and Frood (1989) (see References) for the remnants in the vicinity of Welfare Parade.	A	$5,000	Parks & Gardens
3.3	Clarify ownership of public land in the corridor, and negotiate with the State Government over the terms of handover of management responsibility to Council, with associated resources.	A	To be assessed	Strategic Planning Property Services Parks & Gardens
3.4	Subject to Action 3.3, identify, protect and manage remnant vegetation along the corridor. Management requires control of environmental weed species along the corridor, and their replacement with indigenous species.	B, ongoing	$5,000/year	Parks & Gardens
3.5	Where adjacent reserves allow (such as Frog Hollow Reserve, Willison Park, Hartwell Station Reserve) supplement the vegetation along the rail line with a belt of indigenous planting.	A	-	Parks & Gardens
3.6	Consult residents and encourage the planting of indigenous street trees where there are opportunities, and use indigenous species when street trees require replacement in the sections of the following roads which are adjacent to the corridor: Laurel St, Ashburton Gv, Welfare Pde, (Ashburton) Prosper Pde, Trent St, Lithgow St, (Burwood), Fordham Ave, Georgina Pde, (Hartwell), George St, Westbourne Gve, Wandin Rd, Stanley Gve, (Canterbury), Campbell Rd, (Balwyn), Heather Gv, Maitland Ave, Valerie St, Asquith St and Earl St (East Kew). (See also Actions 4.3 and 5.2 in the *Biodiversity Strategy*.)	B, ongoing	-	Parks & Gardens
3.7	Encourage the gradual replacement of street trees on road crossings of the corridor with indigenous species.	ongoing	-	Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
3.8	Introduce indigenous species into plantings such as at the Harp Road Bus Station and at Ashburton Station.	ongoing	-	Parks & Gardens
3.9	Continue to encourage Deepdene Primary School and Camberwell Grammar to plant indigenous species along their boundaries with the corridor.	B	-	Strategic Planning Parks & Gardens
3.10	Liaise with the landowner of the Guide Dog training centre to encourage indigenous tree planting in their property, and undertake planting along the road frontage if possible.	A	-	Strategic Planning Parks & Gardens
3.11	Refer to action 1.14 regarding the establishment of a corridor link from Princess Street southwest across the Kew Residential Services site to join the Yarra River at Bellbird Reserve, Kew.	A	-	Strategic Planning
	Glass Creek Corridor (linear reserve - priority: medium)			
4.1	Encourage the managers of Kew Golf Club and Kilby Park Stud to establish belts of indigenous vegetation along Glass Creek, and to plant indigenous species throughout their properties to maximise wildlife corridor value.	B	-	Strategic Planning Parks & Gardens
4.2	Revegetate the banks of Glass Creek through Hays Paddock with species from the Floodplain Riparian Woodland EVC. Reinforce indigenous planting throughout Hays Paddock.	A ongoing	-	Parks & Gardens
4.3	Consult with residents to promote the gradual conversion of the exotic planting theme of Harrison Street Reserve to predominantly indigenous, while protecting memorial trees.	C	-	Strategic Planning Parks & Gardens
4.4	Design and establish a denser belt of vegetation around the ovals at Stradbroke Park linking the northern section of the corridor to the southwest and to the southeast and east.	B	-	Parks & Gardens
4.5	Consult residents to encourage the establishment of indigenous street trees along Lady Brasseys Drive to the Outer Circle Corridor (East Kew). Encourage indigenous planting on private properties along Harp Road between the southwestern corner of Stradborke Park and Lady Brasseys Drive.	B/C	-	Parks & Gardens Strategic & Statutory Planning
4.6	Encourage the planting of indigenous street trees where the corridor crosses Kilby Road, High Street, Burke Road, Belmore Road, Glass Street, Head Street, Birdwood Street and King Street when exotic trees require replacement. In Kilby Road consider long term plan to retain Pin Oaks, but replace Melaleucas/Brush Box as they decline with indigenous species, as part of Council's Street Tree Planting Program.	ongoing	-	Parks & Gardens

	Action	*Priority*	*Resources required*	*Responsibility*
4.7	Reinforce the existing vegetation in the King Street chain of parks with indigenous species including some areas with understorey.	C	-	Parks & Gardens
4.8	Investigate means of widening the corridor at its narrowest section.	C	To be assessed	Strategic Planning
	Hyde Park Corridor (linear reserve - priority: medium)			
5.1	Consult residents and encourage the establishment of indigenous street trees where the corridor crosses Kilby Road, Connor Street and Sutherland Avenue, replacing exotic species when necessary.	B/C	-	Parks & Gardens
5.2	Existing plantings should be reinforced with indigenous species to form a belt of vegetation along the corridor.	C	-	Parks & Gardens
	Ashburton Creek Corridor (linear reserve - priority: medium)			
6.1	Design and establish mulched belt indigenous plantings through the reserves of the corridor.	ongoing	-	Parks & Gardens
6.2	Consult with residents and gradually replace exotic street trees interrupting the corridor with indigenous species from the list in Appendix E.	ongoing	-	Parks & Gardens
6.3	Protect and retain remnant indigenous species.	ongoing	-	Parks & Gardens
	Willison Corridor (linear reserve - priority: low)			
7.1	Remove elms and plant with indigenous species along the Council-owned drainage line between Toorak Road and Camberwell Road.	C	-	Parks & Gardens
7.2	Design and plant a belt of indigenous species through Fairmont Avenue Reserve, Murdoch Street Reserve and Willison Park. Continue the canopy with specimen trees in Fordham Gardens.	C	-	Parks & Gardens
7.3	Encourage the replacement of exotic street trees (when necessary) along the corridor with indigenous ones, in consultation with residents.	ongoing	-	Parks & Gardens
7.4	Encourage residents along Gilbert Parade to plant indigenous plants in their properties.	C	-	Strategic Planning Parks & Gardens
	Koonung Creek Corridor (stepping stones - priority: medium)			
8.1	Design and establish a continuous belt of riparian and floodplain vegetation through the Freeway Golf course from the Yarra to Bulleen Road (North Balwyn). Include indigenous understorey in some areas.	B	$10,000	Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
8.2	Plant indigenous overstorey species as street trees in the vicinity of the Eastern Freeway/Bulleen Road/Thompsons Road intersection.	B	-	Parks & Gardens
8.3	Design and establish a continuous belt of vegetation through Koonung Creek Reserve, including indigenous understorey in patches.	C	-	Parks & Gardens
8.4	Encourage Bellevue Primary School to plant indigenous trees in its grounds.	B/C	-	Strategic Planning Parks & Gardens
8.5	Encourage VicRoads to enhance freeway plantings for corridor values.	B	-	Strategic Planning Parks & Gardens
8.6	Encourage residents between Highview Rd, Viewpoint Rd, Mountain View Rd and the Freeway, and between Doncaster Rd and Winfield Road Reserve to plant indigenous plants in their properties.	B/C	-	Strategic Planning Parks & Gardens
	Balwyn North Corridor (stepping stones – priority: medium)			
9.1	Encourage St Bridgets Primary School to plant indigenous trees in their schoolgrounds as part of the corridor.	B/C	Seek external funds	Strategic Planning Parks & Gardens
9.2	Encourage residents in the corridor areas to retain remnant and Australian trees, and to plant indigenous plants from the Plains Grassy Woodland community.	B/C	-	Strategic Planning Parks & Gardens
9.3	When street trees need to be replaced, recommend indigenous species from the Plains Grassy Woodland community.	ongoing	-	Parks & Gardens
9.4	Encourage residents along Alpha Street to retain mature Australian trees.	ongoing	-	Strategic Planning Parks & Gardens
9.5	Design and establish a substantial belt of indigenous plants from the Plains Grassy Woodland community through the parks in the corridor.	C	-	Parks & Gardens
	Back Creek Corridor (stepping stones – priority: medium)			
10.1	Continue to work with Friends of Back Creek, Friends of South Surrey Park and the Lions Club of Boroondara to assist and encourage them in their efforts to revegetate the open sections of the Creek.	ongoing	-	Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
10.2	Continue to work with Melbourne Water to encourage them to undertake more willow control and revegetation along the corridor and to work in partnership with the volunteer groups.	ongoing	-	Parks & Gardens
10.3	Design and implement mulched belt plantings (using plants from the Creekline Grassy Woodland, Valley Grassy Forest or Creekline Herb-rich Woodland EVC's) along the Back Creek Reserve, through Lynden Park, Cornell St Reserve and Quinton Road Reserve.	C	-	Parks & Gardens
10.4	Investigate the establishment of a linkage between Lynden Reserve and Back Creek Reserve in Hartwell through residential areas by encouraging residents to plant indigenous plants in their properties and through Council establishing indigenous street trees.	C	-	Strategic Planning Parks & Gardens
	Wattle Park Corridor (stepping stones - priority: medium)			
11.1	Design and establish mulched belt plantings (using plants from the Valley Grassy Forest EVC) through the reserves of the corridor.	C	-	Parks & Gardens
11.2	As opportunities arise gradually encourage the replacement of exotic street trees interrupting the corridor with indigenous species (see Appendix E).	ongoing	-	Parks & Gardens
11.3	Encourage residents in the gap to plant indigenous plants in their gardens.	C	-	Strategic Planning Parks & Gardens
	Canterbury Corridor (stepping stones - priority: low)			
12.1	Design and plant sizeable sections of the reserves along this corridor using indigenous species, excluding the John August Reserve and Canterbury Gardens.	C	-	Parks & Gardens
12.2	Encourage residents along this corridor to use indigenous species in their landscaping.	ongoing	-	Strategic Planning Parks & Gardens
12.3	As opportunities arise and after resident consultation, replace exotic street trees in the gaps between the reserves with indigenous trees.	ongoing	-	Parks & Gardens
	Glenferrie Corridor (stepping stones - priority: low)			
13.1	Design and plant sizeable sections of the reserves along this corridor using indigenous species.	C	-	Parks & Gardens
13.2	Work with West Hawthorn Primary School, Camberwell Anglican Girls Grammar School, and Swinburne University of Technology to encourage them to plant indigenous species in their grounds.	C	-	Strategic Planning Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
13.3	Encourage residents along this corridor to use indigenous species in their landscaping.	ongoing	-	Strategic Planning Parks & Gardens
13.4	As opportunities arise and after resident consultation, replace exotic street trees in the gaps between the reserves with indigenous trees.	ongoing	-	Parks & Gardens
	Kew Corridor (stepping stones - priority: low)			
14.1	Encourage the establishment of indigenous street trees where the corridor crosses Asquith Street, Hartington Street and High Street, replacing exotic species when opportunities arise and after resident consultation.	ongoing	-	Parks & Gardens
14.2	Existing plantings should be reinforced with indigenous species to form a belt of vegetation along the corridor. Weedy exotic species should be removed.	C	-	Parks & Gardens
14.3	Encourage adjacent landowners to plant indigenous species.	ongoing	-	Strategic Planning Parks & Gardens
	Glass Creek to Outer Circle link (stepping stones - priority: low)			
15.1	The existing Australian trees along the west side of Stradbroke Park should be reinforced with indigenous tree and ground storey planting.	C	-	Parks & Gardens
15.2	Landowners on either side of Lady Brasseys Drive should be encouraged to plant indigenous species in their gardens.	C	-	Strategic Planning Parks & Gardens
	Planning Scheme			
16.1	Investigate an extension of the existing Environmental Significance Overlay along the Yarra River frontage to cover all open space and the adjoining properties, and to include the proposed creek corridor along Gardiners Creek. Possible additions to the Schedule for the Overlay include a list of indigenous species recommended for planting in conjunction with new or re-development, and a list of environmental weeds to be avoided. Add this Corridors Plan to the list of Reference documents. (See also Action 6.7 in the *Biodiversity Strategy*.)	B	-	Strategic Planning
	Enhancing habitat links on Council land			

	Action	***Priority***	***Resources required***	***Responsibility***
17.1	Undertake plantings along the corridors using only indigenous species of local provenance (i.e. grown from seed or cutting material collected from as near as practicable to the collection site). Indigenous plantings should be designed to use species from the appropriate Ecological Vegetation Class (refer Map 1 to determine the appropriate EVC, and Appendix F for species occurring in the EVC) for the section of corridor to be planted, and reflect the microhabitat preferences of individual species, including middle storey vegetation.	ongoing	Separate recurrent funding	Parks & Gardens
17.2	Review and allocate resources and ensure that sufficient skilled personnel are available to implement the revegetation and habitat creation works recommended in this Plan, as part of Council's annual budget process.	ongoing		Parks & Gardens
17.3	Consider developing a Fire Management Strategy for specific bushland reserves.	C		Parks & Gardens
	See also specific recommendations under each corridor, above.			
	Encouraging habitat links on private land			
18.1	Publicise this Plan, its rationale, objectives and intended outcomes to residents within and adjoining the identified corridors, using the Council newsletter, displays, and a specially-prepared leaflet. The leaflet and other communications should encourage the retention of remnant indigenous vegetation, planting of local indigenous species, ponds for frogs, and responsible pet ownership.	A	$8,000	Strategic Planning Communications Local Laws
18.2	Ensure that residents and other property owners adjoining the identified corridors (including property-owners in the 'gaps' between stepping stones) are particular targets for the community awareness-raising and education actions in the *Biodiversity Strategy*. Promote the indigenous plant voucher scheme directly to these property owners.	ongoing	-	Strategic Planning Communications
18.3	Investigate measures to protect remnant indigenous trees in private properties adjoining the identified corridors.	A	Separate recurrent funding	Strategic Planning
	See also Planning Scheme, above.			
	Programs and partnerships with institutions, landholders and public agencies			
19.1	Approach educational institutions and businesses with large properties along the corridors to encourage indigenous plantings and other support for corridor enhancement.	ongoing	-	Strategic Planning Parks & Gardens

	Action	***Priority***	***Resources required***	***Responsibility***
19.2	Collaborate with Melbourne Water, agencies with responsibility for managing public land, and adjoining municipalities in habitat enhancement projects along corridors.	ongoing	-	Parks & Gardens Strategic Planning
19.3	Pursue partnerships with Boroondara based businesses for specific biodiversity projects in the identified corridors.	ongoing	External funding	Strategic Planning
	Community awareness, education and involvement			
20.1	Publicise this Plan using appropriate communications media, to the Boroondara community. Keep the community informed of progress in implementing the Plan.	A	-	Strategic Planning
20.2	Continue to conduct community planting days at revegetation sites in the identified corridors.	ongoing	-	Parks & Gardens
20.3	Co-operate with and continue to support Friends Of and other community groups in habitat enhancement projects in identified corridors. Encourage and support the establishment of Friends groups for corridors where none already exist. These groups will be encouraged to link up with local schools.	ongoing	To be determined	Parks & Gardens
	Land ownership			
	Identify land ownership along each corridor, in order of corridor priority.	A-C		Strategic Planning Property Services Information Technology
	Research and monitoring			
22.1	Conduct baseline flora and fauna surveys as recommended in the Biodiversity Strategy to identify indigenous species and communities currently present in the municipality.	A	See Biodiversity Strategy	Strategic Planning
22.2	Work with organisations such as the Australian Research Centre for Urban Ecology to develop protocols for the long-term monitoring of faunal usage of corridors, and the effectiveness of corridors as habitat and for fauna movement.	A	To be assessed	Strategic Planning
22.3	Encourage and support community involvement in the monitoring of biodiversity trends in the municipality (as recommended in the Biodiversity Strategy), with a particular focus on the identified corridors.	B ongoing	To be assessed	Strategic Planning

	Action	***Priority***	***Resources required***	***Responsibility***
22.4	Investigate the issue of barriers to wildlife movement created by roads with a view to measuring the effect of road barriers in Boroondara and finding ways to reduce their impact. Collaborate with organisations such as VicRoads and the Australian Research Centre for Urban Ecology.	C	To be assessed	Strategic Planning

MONITORING, REPORTING AND REVIEW

Progress in implementing this Plan will be reported annually.

The Action Plan will be reviewed annually and budget allocations made, as part of Council's corporate planning and budgetary processes. Implementation of Actions 22.1-22.3 will assist with quantifying progress.

The Plan will be subject to a comprehensive review, with community consultation, in five years' time (2008 / 09).

EVALUATION

Environmental criteria

This Plan aims to protect and enhance important and threatened natural assets - the indigenous flora and fauna of the municipality. Measures to conserve these assets will also improve air and water quality.

The Plan supports and applies locally a number of the strategic directions and priorities for biodiversity conservation that have been articulated at the state and regional scales.

The *Biodiversity Corridors Plan*, in conjunction with the *Biodiversity Strategy*, will reinforce Boroondara's position as a proactive local government within Victoria with respect to environmental issues. It will further Council's commitment to environmental responsibility and sustainability in both external services and internal systems.

Social criteria

Contact with nature has been shown to be a fundamental human need. Implementation of this Plan will benefit the current citizens of Boroondara as well as future communities, through:

- increased opportunities to see native wildlife and plants in their daily lives;
- greater awareness and appreciation of Boroondara's indigenous flora and fauna;
- more opportunities to become actively involved in community projects for environmental restoration and monitoring; and
- increased opportunities for healthy exercise in shaded parks and linear reserves.

Economic criteria

The biodiversity assets and life-support services that they provide are not easily translated into financial values. Nevertheless they are significant assets to the municipality, and worthy of investment in their maintenance and enhancement.

A community that takes pride in its full social, environmental and economic fabric will look forward with optimism and enthusiasm. In such a scenario Boroondara will only grow in its reputation as a place of choice for residents and business, providing economic stability and growth.

The document will assist in focussing and providing a rationale for external funding applications, and will increase the likelihood of attracting additional resources to Council. Several actions can be undertaken without any additional allocation of Council resources, or with very minor expenditure.

APPENDIX A: BIODIVERSITY CORRIDOR STRATEGIES AND PROGRAMS OF OTHER COUNCILS

Banyule City Council (Vic) – *Wildlife Corridor Program* (2000)

Major components of the program are campaigns to raise community awareness and involvement in the protection and re-establishment of wildlife corridors through the provision of incentives, indigenous plant giveaways, education activities and media promotions.

The wildlife corridors were grouped into two main categories:

- Major Wildlife Corridors – continuous reserves of substantial length, incorporating major natural feature such as a waterbody, and retaining significant habitat values; and
- Local Habitat Links – linkages between otherwise isolated natural habitat areas, relying on the inclusion of residential areas. Aim to link local areas with Major Wildlife Corridors.

Key factors for planning and design

Network of reserves and parkland along the major waterways (the Yarra River, Plenty River and Darebin Creek), allow for movement and dispersal due to their extent and continuity (especially beneficial for ground dwelling animals such as water rats and lizards).

Waterways and wetlands provide for movement of birds, platypus, native fish and frogs.

The remnant vegetation and natural habitats scattered throughout the residential areas are of equal importance as they allow for movement of birds and possums.

Key planning actions

Develop and implement planning controls where appropriate, to protect indigenous vegetation and habitat remnants. These include Vegetation Protection and Environmental Significance Overlays, conditions on planning permits, development of environmental plans, enforcement of planning permit conditions, monitoring of vegetation removal, increased publicity of penalties for illegal removal of vegetation, controls on the proportion of a site covered by development, set backs and site coverage control to provide buffers around reserves, and seeking the involvement of real estate agents in the education process.

Introduce a property registration scheme to recognise and encourage the involvement of private landholders, schools and other organisations participating in the program.

Provide incentives to private landholders adjoining key reserves and wildlife corridors for the protection and restoration of natural habitat on their properties. This could involve providing funding assistance on a dollar for dollar basis, a rate rebate scheme, grants, or as part of a cooperative land management agreement between Council and landholders.

Values of corridors

- allow for movement of animals between natural habitat areas;
- mechanism for the dispersal of plant seed and spores;
- maintain biodiversity of local area;
- assist in maintaining genetic diversity and viability of plant and animal populations;
- help to decrease the competitive impacts of introduced plants and animals;
- provide temporary feeding sites and shelter for nomadic and migratory animals; and
- enable return of plants and animals that may have become locally extinct.

Barriers

Physical barriers – such as buildings, roads. These present obvious restrictions to animals such as kangaroos and wombats.

The effectiveness of these approaches will largely depend on raising community awareness and involvement and the availability of resources to implement actions. Appropriate coordination and monitoring of outcomes are fundamental to the overall success and value of the program.

Progress in implementation

Since the program document was prepared, Banyule City Council, with funding from the National Heritage Trust, has employed a Wildlife Corridor Program Officer. The position primarily involves providing incentives to landholders on private land. This includes working with schools educating students on the types of habitat in their local area and providing schools with indigenous plants. Over the past three years, the program has given away 48,000 plants to private landholders and schools.

The City has a Bush Crew consisting of 10 people. The Bush Crew manages public bushland and areas along waterways within the municipality, including undertaking weed control.

The program has provided Council and the community with a number of positive outcomes including creating a point of contact and a way to become involved for the community, connecting people to other community groups such as rabbit action groups, and increasing the amount of indigenous flora within the municipality.

It is hoped from this program an Urban Landcare Group will be formed who are able to apply for their own funding.

(Lisa Pittle, pers comm., March 2003.)

Manningham City Council (Vic)

Manningham City Council currently employs a biologist who is mapping sites of significant remnant vegetation. Council is not specifically doing anything relating to biodiversity corridors but views the Yarra River and its environs as important for movement of flora and fauna. (P. Foreman, pers. comm., March 2003.)

Whitehorse City Council (Vic)

Informal exercises identifying habitat linkages have been undertaken, but as yet nothing has officially been prepared. Council has applied for funding on the basis that the works would strengthen habitat corridors. A major strategy, *Ecovision* (2002) provides a holistic approach to sustainability issues including the protection of biodiversity. An Open Space Strategy (to commence in 2004) will consider issues such as biodiversity corridors.

City of Yarra (Vic) *Yarra River Corridor Strategy* (1999) and *Natural Heritage Study* (1999, 2001)

The *Yarra River Corridor Strategy* (City of Yarra 1999) aims to protect and improve the environment in and along the Yarra River corridor. Its overarching goal is "to enhance and protect the Yarra River Corridor as an asset of local and metropolitan importance, especially with respect to landscape qualities, recreational opportunities natural environment, and the Aboriginal and post-settlement history." The plan sets out actions related to habitat, open space, water quality, heritage and landscape, and management and coordination. The City of Yarra has adopted a program of targeted Council actions, policies and related capital works to implement the Strategy.

The *Natural Heritage Study* (Stage 1, Biosis Research 1999; Stage 2, Biosis Research 2001) documented the indigenous flora and fauna of the municipality, assessed their conservation significance and current threats. The remnant vegetation is found scattered along the waterways (particularly the Yarra River) and railways of the City of Yarra.

The *Natural Heritage Study* notes the importance of the Yarra:

> "The most significant corridor within the City of Yarra is the Yarra River. The vegetation along the banks of the Yarra River has been identified as an area of moderate to high fauna habitat significance and as a habitat link within a regional network (Beardsell 1997)…The vegetation along the banks of the Yarra River provides a habitat link connecting parks within the City of Yarra with parks and reserves throughout the Yarra catchment across an area that has been highly modified and has had the majority of its native vegetation removed… The river itself can provide an important link for semi-aquatic fauna such as the Platypus and Water Rat." (Biosis Research 2001, p40.)
>
> "Numerous native waterbird and other vertebrate species of national, state and regional significance have been previously recorded along this section of the Yarra River….Many of these use the Yarra River as a stopping point during migrations or nomadic movements (e.g. Great Egret, Nankeen Night Heron, Swift Parrot). Other significant species may be resident (e.g. Common Bent-wing Bat, Platypus, Water Rat)." (Biosis Research 2001, p36.)

Subsequently, Council has adopted a new clause in the Municipal Strategic Statement relating to the Yarra River Corridor, a local planning policy for Protection of Biodiversity, and Environmental Significance Overlays (ESO) on remnant vegetation sites. The policy requires protection of remnant vegetation. Indigenous species should be used in landscaping within the ESO areas, and environmental weed species (as listed) should not be used. A home gardener's guide to *Gardening with Native Plants in Yarra* has been published, and residents receive a voucher for 10 indigenous plants from a local nursery. Ecological management guidelines have been prepared for Council-managed remnant vegetation sites.

Crow's Nest Shire Council (NSW) – *Remnant Vegetation Corridor Management Strategy* (2000)

Functions and benefits

Wildlife corridors that are of high significance must provide a link between relatively large patches of remnant vegetation and should accommodate a variety of species.

Wildlife corridors have been said to be a 'safe channel' for the movement of plant and animal species. They are also important for gene flow. Genetic variation within a species is highly desirable as it enables them to better respond to long term changes in the

environment, better respond to new pressures and diseases, and reduce the impact of genetic defects.

Vegetation corridors can also provide opportunities for recreation and the protection of scenic amenity. They can cater for nature appreciation, education, walking, cycling and passive recreation.

Corridors have value as habitat for species that are able to live within strips of habitat and provide recruits for other connected patches. They are also important in the prevention of land and water degradation.

Examples of barriers to movement are open unprotected areas such as cultivated land in rural areas, roads, large expanses of water and concrete, noise and light. Barriers can inhibit the movement of animals and therefore their ability to feed, reproduce, disperse and recolonise.

Corridors can improve a remnant's capacity for conservation by decreasing its isolation and facilitating colonisation. Several factors are largely responsible for determining the number of species found in remnant vegetation are:

- distance from the remnant to the nearest large area of habitat ie National Park, state forest, undeveloped area, etc;
- the quality of the intervening landscape;
- the size of the remnant habitat; and
- behavioural characteristics of particular wildlife.

The basic principles for conservation design are:

- wider is better;
- larger areas of remnant vegetation situated within a corridor support more flora and fauna species;
- smaller islands of bush are more vulnerable to disturbances;
- habitat corridors should connect remnant 'islands' and follow the natural contours of the landscape;
- rivers and creeks often form natural corridors of vegetation;
- retain, restore and extend existing corridors;
- narrow corridors may be sufficient to make connections at the local scale; and
- occasional bulges in width, especially along lengthy corridors, are highly desirable.

The vegetation was classified into three categories (good, fair and poor) and utilised when determining the corridors. The categories for the corridors were: critical corridor or linkage, important corridor or linkage, potential corridor or linkage.

Means of establishing corridors

Protection strategies:

- financial incentives including rate rebates, grants, management agreements
- voluntary conservation agreements and covenants
- revenue raising mechanisms including environmental contributions and levies
- non-financial motivational incentives including training for whole farm planning and a local award scheme

- regulatory measures including planning controls and local laws
- planning or development incentives such as tradeable or transferable development rights.

Management strategies:

- compatible adjacent land uses such as for recreational purposes
- fire management
- grazing management
- weed management
- feral and domestic animal control.

Gosford City Council (NSW) - *Biodiversity Management Policy* (2001)

One of the statements in Gosford City Council's *Biodiversity Management Policy* is to "promote and maintain wildlife corridors as a basis for maintaining biodiversity". The strategies for this policy statement include:

- surveying and identifying wildlife linkages throughout the city;
- identifying potential obstructions to wildlife movement and developing mechanisms to overcome the obstructions; and
- working with adjoining Councils to enhance and preserve wildlife corridors to and from the local government areas.

Bankstown City Council (NSW) - *Draft Biodiversity Strategy* (2002)

The Bankstown City Council's draft *Biodiversity Strategy* includes a Corridor Strategy for the City. The strategy involves:

- agreement in principle to the staged development of the nine identified biodiversity corridors;
- proceeding to implement the most significant of these corridors as a pilot corridor; and
- focusing future land acquisitions for recreational uses (as far as possible) within identified corridors.

Mountains to Mangroves Committee (Qld) - *Mountains to Mangroves Corridor Strategic Plan* (1998)

The *Mountains to Mangroves Corridor Strategy Plan* was commissioned by a number of local Councils and centres including the Brisbane City Council, Pine Rivers Shire Council, Bunyaville Environmental Education Centre and Downfall Creek Bushland Centre.

The Strategy has been developed around the following elements:

- an identification of the general values, management units and objectives for the Corridor;
- a description of each unit's values, attributes, management issues and priorities;
- an action plan for implementation which identifies priority, resourcing and responsibility; and
- actions to increase public awareness, appreciation and marketing.

NSW National Parks and Wildlife Service - *Fauna key habitats and habitat linkages of Eurobodalla Local Government Area* (2001)

Primary aims of the Fauna Key Habitats and Habitat Linkages project were to identify the key regional and local habitats of the Eurobodalla Shire and identify the important habitat linkages within and between these habitats, particularly on the rural lands of the Shire. During the process, biodiversity features were also identified.

Eurobodalla Shire contains large, continuous areas of habitat, therefore patterns of landscape habitat connectivity are strongly evident in the Shire. This is mainly because in its present state it supports a relatively high percentage of native vegetation cover.

Maclean Shire Council (Qld) - *Biodiversity Strategy* (2001)

Maclean Shire Council's *Biodiversity Strategy* recognises the role that corridors play in allowing native fauna to move and occupy greater areas, therefore having a better survival rate. Corridors need to be considered on a number of levels, Shire-wide, at the local level and links to habitat areas outside the Shire.

A Flora and Fauna Study undertaken in 1995 recognised several broad wildlife corridors in the Shire. At the time of the report there had been no further assessment of the corridors. It was suggested that Council tap into research and information that is being prepared by the State government to build a picture of the habitat areas and corridors in Maclean Shire. This includes information from the Department of Land and Water Conservation and the National Parks and Wildlife Service.

Upper Parramatta River Catchment Trust (NSW) - *Green Corridors Management Strategy for Upper Parramatta River Catchment*

The *Green Corridors Management Strategy* (1998) identifies a network of green corridors in the Upper Parramatta River catchment that are to be protected and managed for biodiversity conservation. It includes maps of remnant ecological communities, habitat types and vegetation management zones. The strategy assists local councils and the community in identifying areas of greatest need for the re-establishment of vegetation within a catchment context. It provides a regional planning framework to prioritise the allocation of resources, for individual plans of management, work plans and funding applications. It presents information on strategic and statutory planning mechanisms, and management and design guidelines for vegetation management and ecological restoration and revegetation work.

Macedon Ranges Shire Council (VIC) - Biolinks Wildlife Corridor Project

Macedon Ranges Shire has a Biolink Action Plan to link the Cobaw and Macedon Ranges forests. It is envisaged that this project will continue for the next 15-20 years.

The Shire's *Natural Environment Strategy* (2002) refers to the protection and re-establishment of wildlife corridors as a policy/strategic direction. One of its actions is to actively pursue Federal and State Government grants to achieve implementation of the Biolinks Program.

APPENDIX B: CORRIDOR DESCRIPTIONS FOR CITY OF BOROONDARA

1. Yarra River Corridor

Type:

Major corridor

Linkage:

This corridor links extensive parklands upstream managed by Parks Victoria and various councils, through golf courses and other parklands including Yarra Bend Park (Boroondara's major biodiversity asset) to the lower Yarra River. It forms the backbone to which a number of secondary corridors link, including the Merri, Darebin, Koonung and Gardiners Creek corridors, and within the municipality Glass Creek, Back Creek, Outer Circle Rail Line and Glenferrie corridors.

Priority:

Very high

An initiative under policy 5.7 of the Metropolitan Strategy is relevant:

> "5.7.4 Strengthen current policies and review the adequacy of planning controls relating to the Yarra and Maribyrnong Rivers to ensure the long-term protection of open space, conservation values - with the first priority being the Yarra River corridor between Punt Road and Burke Road." (p107)

Description:

The Yarra River between Warrandyte and its mouth at Williamstown has been identified as a site of national zoological significance, with some areas of lower significance. Of the 295 endemic non-vagrant fauna species in the SE Melbourne - Mornington Peninsula region, 77% have been recorded along or within 1km of the Yarra River (Brereton et al. 2001).

> "Apart from its inherent faunal value within the study area the Yarra River and adjacent riparian vegetation provides the most important habitat link into Melbourne and provides substantial habitat refuges, especially where the riparian vegetation connects with more extensive areas of native vegetation. This is demonstrated by the large faunal lists from areas of remnant bushland adjacent to the Yarra, such as Wilson Reserve and Studley Park. The high faunal value of the Yarra River is a direct result of the diversity of habitats that remain along its banks, such as wetlands, and their function as linking corridors to other habitat types. … These linking corridors formed by the Yarra River and its tributaries are major wildlife corridors, which serve more central parts of Melbourne and allow the rich diversity of fauna to persist in reasonable abundance in what is a highly urbanised environment." (Brereton et al. 2001, p12)

The City of Boroondara has only a section of this major wildlife corridor. Lands within Boroondara are complemented by lands on the opposite bank of the Yarra River, such as Latrobe Golf Club, Chelsworth Park, Ivanhoe Public Golf Course, and the Yarra Flats Park, the Merri and Darebin Creek parklands, Yarra Bend Park and Burnley Gardens.

From the north, the corridor links from the extensive habitat areas in the upper Yarra and Plenty valleys through Warrandyte State Park and in the City of Manningham to Yarra Valley Parklands and Bulleen Park just outside the municipality. It then passes through Freeway Golf course, Kew Golf Club and Green Acres Golf Club built on the floodplains of

the river. The corridor mainly follows the riverbank, where most remnant vegetation and cover exists. Willsmere Park leads to the narrow Yarra River Reserve wedged between the Eastern Freeway and the River itself. The corridor widens into Chandler Park, passes under the Chandler Highway to Yarra Bend Park, managed by Parks Victoria and the most important natural area in the City of Boroondara.

The Eastern Freeway is a barrier between the Yarra River Corridor along the northern edge of Boroondara and the rest of the municipality, and in particular it interrupts the connection with the Outer Circle Corridor. A corridor link is proposed from Bellbird Reserve on the Yarra, northeast across the Kew Residential Services site to the Outer Circle Linear Park near Princess Street. This link should incorporate and protect as many of the mature River Red Gums on the KRS site as possible, to be supplemented with indigenous planting.

South from Yarra Bend Park, the corridor is severely interrupted by residential areas extending right to the water's edge. Reserves between these residential areas include Rockingham Reserve, Harrison Crescent Reserve, Pridmore Park, Yarra Bank Reserve, Burwood Road Reserve, Hawthorn and Xavier Rowing Clubs, Yarra Street extension, Morang Road Reserve and the Wurundjeri Gardens, Wallen Road Reserve, Fairview Park, Scotsburn Street Reserve, to Scotch College at the confluence of Gardiners Creek with the Yarra River. From this point the River leaves the municipality, but continues downstream with limited and mostly formal open space on its banks, passing Herring Island and the Royal Botanic Gardens, Melbourne's CBD, and the docklands to the Bay.

Habitat Features:

Major habitat areas include Yarra Bend Park, which stretches from the Chandler Highway downstream to Walmer Street. This park includes the greatest area set aside for habitat in the municipality, and is a major biodiversity asset. Willsmere Park with its billabong provides another important habitat area. Outside of these parks, upstream of Chandler Highway the banks of the River are mostly lined with a band of remnant vegetation which varies in width between 5m and 30m, including large mature River Red-gums and a range of riparian woodland species. Ideally this corridor would be reinforced with indigenous planting so that it is no narrower than 30m anywhere along the whole length of the corridor.

Downstream of Walmer Street, occasional remnants occur in more formal parkland settings, sometimes with recent indigenous plantings.

The corridor has the most potential of all the corridors in Boroondara for movement of large mammals including macropods (in this case Eastern Grey Kangaroos and Black Wallabies), Echidnas and Wombats. The source of such animals would mainly be the Yarra upstream, although Black Wallabies are known to have moved along Merri Creek.

Although macropods are known to swim, this corridor will be most effective for larger mammals if swimming is not required for them to negotiate the corridor. For this reason the corridor is designed to use only the Boroondara bank of the River, although for aerial or aquatic species the habitat on the opposite bank will clearly add value to the corridor. Tall chainmesh fences reaching right to the water's edge make macropod movement difficult, and although required to restrict pedestrian and dog access to the golf courses, redesign to provide for macropod movement is required.

Whilst desirable for biodiversity purposes, Wombats and to a lesser extent Echidnas have the potential to do significant damage to golf course greens and fairways. Their entry into the golf courses along the River is unlikely to be welcome. Humans (of the non-golfer kind) also have the potential to damage golf courses, or to be injured by golf balls and are therefore excluded from the three golf courses along this corridor. At present, south of Yarra Bend Park there is insufficient contiguity of parkland and sheltering habitat for a satisfactory corridor for these species. Nonetheless this lower section of corridor can provide useful habitat for species able to fly or swim between nodes.

Platypus use the Yarra River as a movement corridor. According to the Australian Platypus Conservancy, a breeding population of Platypus is present at Heidelberg[9] which is not far upstream of Boroondara. Recent studies have shown that the presence of Platypus is positively related to the amount of indigenous vegetation growing along a waterway. Dense vegetation along the water's edge helps Platypus avoid predators like dogs, cats and foxes. According to the conservancy it is essential that a buffer strip of healthy vegetation be maintained wide enough to support a self-sustaining plant community, including native shrubs and low-growing vegetation as well as mature specimens of the tree species originally found in the habitat. Controlling dog access to the water's edge is also desirable. Water quality improvement would also encourage Platypus recolonisation. Because of the Platypus' ability to roam, the habitat corridor downstream of Walmer Street could be made more acceptable to Platypus by planting dense indigenous vegetation in areas of parkland or private land where there is that opportunity.

Less is known about the use of the Yarra River by the native Water Rat. Contrary to most people's assumptions, Water Rats are desirable in Melbourne's waterways. They are unlikely to cause disease, are attractive animals and form an important part of the web of life. Resident populations are present in Merri Creek and a number of other tributaries of the Yarra. It is presumed that habitat improvement designed for Platypus would also benefit Water Rats.

The river also provides an opportunity for movement of fish and other aquatic species. Whilst it is noted that having a good buffer of indigenous vegetation along the river's banks and improved water quality are important for these species they are not the principal focus of this study. The only major fish barrier in the Boroondara section of the Yarra used to be Dights Falls. This now has a fish ladder installed which according to Melbourne Water is working reasonably well.

Arboreal mammals likely to use the corridor include Brushtail and Ringtail Possums. More exciting is the potential of the corridor to provide for movement of the small gliding-possum the Sugar Glider. It is unlikely the corridor could provide for the Sugar Glider downstream of Walmer Street.

Many bird species already use the corridor. Maintaining or developing a healthy band of indigenous vegetation as described above is considered to be the most important strategy for bird species also. The whole of the corridor is considered potential for birds, because of their ability to cross the river and hop between areas of suitable habitat.

Gaps:

In respect of large ground mammals, between the northern boundary of the municipality and Yarra Bend Park, there are few gaps in the corridor. Bridges are generally well above the floodplain with plenty of space beneath for fauna passage. Open space is contiguous. However fence-lines do impede movement, particularly high chainmesh fences. The fence where the Yarra leaves Green Acres Golf Club is an example where the fence has been designed to prevent pedestrian entrance to the golf course from Willsmere Park, but the fence also stops movement of macropods, Wombats and Echidnas. Several properties at River Retreat have fences reaching down to the water's edge, and have exotic landscaping. These constitute barriers to the movement of large ground mammals. Downstream of Walmer Street the gaps in habitat are so extensive and fences so common that passage of these species is unlikely to ever be practical, and there is no destination downstream for them anyway.

There are no gaps in this corridor for Platypus and Water Rats. Dights Falls is considered passable and Melbourne Water have programmed works to improve the fish passage this

[9] The Australian Platypus Conservancy's official website is at http://www.totalretail.com/platypus.

year. Lack of native vegetation on the water's edge is one factor which may be preventing their colonisation of the lower Yarra.

For arboreal mammals a gap may comprise excessive distance between suitable patches of canopy. A detailed analysis of this has not been carried out as part of this project, however it is considered that upstream of Yarra Bend Park if there are any gaps these could be addressed through plantings. Downstream of Yarra Bend private ownership of significant parts of the frontage makes filling the gaps only possible with consultation, planning controls and/or education.

For bird species passage along the corridor would be enhanced by the planting of more indigenous plants downstream of Walmer Street, in both private and public land. Dense belts of indigenous plants along the River bank in Pridmore Park, Yarra Bank Reserve, Wallen Road Reserve and Fairview Park would provide nodes in the habitat for these species.

Land Ownership:

Yarra Bend Park, between Chandler Highway and Walmer Street, is owned by the Yarra Bend Park Trust and managed by Parks Victoria. Around River Retreat a few properties are privately owned to the water's edge, and Melbourne Water has transferred some land to the City of Boroondara where there was a pumping station.

Immediately upstream of Chandler Highway Council owns a section, but between that and the Green Acres Golf Club, and between the Kew Golf Club and Burke Road, the ownership needs clarification.

Downstream of Walmer Street the frontage is roughly 50-50 in public and private ownership. Notable areas where the frontage is in private ownership include at Young Street Kew, and at Coppin Grove, Strathcona Grammar School, Yarra Grove and at Scotch College in Hawthorn. Council owns almost contiguous frontage to the Yarra between Barkers Road and Burwood Road, and between Glenferrie Road and Scotch College.

Specific references:

Brereton, R. M. Schulz, I. Mansergh, K. Sandiford and S. Bennett (2001*) Sites of Zoological Significance of South-East Melbourne and the Mornington Peninsula* - a compendium of information collected between 1987 and 1991. Arthur Rylah Institute for Environmental Research Technical Report Series no. 92. Draft.

Kern, L. Gannon, P. and Muir, A. (2000) *Flora and Vegetation mapping on waterways in the City of Boroondara, Victoria: Yarra River*. Prepared for the City of Boroondara.

Kern, L. Gannon, P. and Muir, A. (2000) *Flora and Vegetation mapping on waterways in the City of Boroondara, Victoria: Fairview Park.*

Melbourne Water (2002) *Lower Yarra River Waterway Management Activity Plan*.

2. Outer Circle Corridor

Council's Open Space Policy commits Council to establishing a cross-municipal fauna corridor along the line of the Outer Circle Path.

Type:

Linear reserve

Linkage:

From the Yarra River Corridor to the Gardiners Creek Corridor, as well as the Eastern Freeway, Hyde Park, Kew, Glass Creek, Glenferrie, Canterbury, Back Creek, Delaney Creek and Ashburton Creek Corridors.

Priority:

High

Description:

This corridor follows the route of the old Outer Circle railway, constructed in the late 19th century (it was completed in 1891), and closed north of East Camberwell in 1943. It forms a spine through the otherwise strongly residential heart of the municipality, incorporating much remnant vegetation and forming many links to other corridors. It leaves the Yarra in the vicinity of the Chandler Highway crossing. Its first and major gap is the Eastern Freeway. The section from Princess Street to High Street is relatively broad (some 35 m) but threatened by future duplication of Earl Street. Between High Street and East Camberwell Station the corridor narrows down but is punctuated by wider parks often where there were stations on the old line. In some places in this section the reserve narrows to 15m. Between Whitehorse and Canterbury Roads the corridor is very poorly kept.

At East Camberwell Station the corridor follows the Alamein Railway Line. Despite sometimes steep cuttings, the rail embankments retain a surprising amount of remnant vegetation, and scope for improved biodiversity corridor value.

From Alamein Station the Outer Circle railway reserve continues to the south to meet the Gardiners Creek.

Habitat Features:

The corridor leaves the major remnant vegetation site of the Yarra at the eastern end of Yarra Bend Park. Unfortunately this good beginning is interrupted by the Eastern Freeway. A better linkage to the Yarra would be via the Kew Residential Services site to Bellbird Reserve (see Yarra Corridor, above).

From the Eastern Freeway to High Street the corridor comprises large areas of mown grass, and some significant mulched planting beds (in a belt between Princess St and Willsmere Road and in discrete beds elsewhere). These beds comprise a mixture of Australian and indigenous species, sometimes including exotics. Exotic specimen trees are scattered along this section. Between Cole Avenue and Belford Road the steep sides of the embankment retain mature River Red Gums and a range of indigenous ground-storey species. The width of the reserve in this section provides the opportunity for developing a continuous belt of planting using indigenous species to join up the existing plantings.

From High Street to Whitehorse Road, plantings take on a more indigenous character, especially at the site of the old East Kew railway station. Remnant trees are widely scattered along the reserve, with one cluster of River Red-gums at Lady Brasseys Drive (East Kew). Much reinforcement of the vegetation is required. In places where the reserve narrows adjacent residences could be encouraged to plant indigenous species, and strongly encouraged to retain remnant trees where these are present. Oaks and other exotic tree species are going wild in this section and squeezing out indigenous plantings. This balance needs to be reversed. Other sections are somewhat neglected (e.g. Second Avenue to Argyle Road, East Kew).

From Whitehorse Road the reserve follows a deep cutting, passing under streets until it re-emerges north of Canterbury Road at Shenley Ground. Between Campbell Road and Rubens Grove the vegetation along the corridor is weedy. Shenley Ground is open and grassy, and a belt of indigenous planting should be established around the western side of the oval.

South of Whitehorse Road, Boroondara Park is wide open and grassy, but the park to the west side of the path is largely unused and could be utilised for continuing the belt of indigenous vegetation, therefore reinforcing the avenue of Australian trees along the path. At East Camberwell Station the route of the corridor becomes rather unclear. In the fork of

the railway lines a recent medium density development provides little opportunity for indigenous landscaping. Two alternatives emerge, planting in the immediate vicinity of East Camberwell Station and following the railway, or following the path under the railway and along Myrtle Road Reserve and Matlock Street Reserve, through Camberwell High School and Riversdale Park to rejoin the railway at Riversdale Road. There are a number of remnant Blackwoods and River Red Gums adjacent to the railway line south of East Camberwell Station.

Between Riversdale Road and Toorak Road there are lots of remnant trees: River Red Gums, Yellow Box, and Black, Lightwood and Blackwood Wattles. Often the remnants are heavily outnumbered by weedy oaks, poplars and other exotic and Australian species. Around Toorak Road Elm suckering is particularly dense. These competitors should be controlled, and indigenous plantings undertaken on the easement and in a supplementary belt where possible (for example in Frog Hollow Reserve). Streets adjacent to the railway should have indigenous street trees.

Between Toorak Road and Alamein Station remnant indigenous species along the rail easement are quite noticeable. Cowdell[10] reported 92 species of indigenous plants between Burwood and Ashburton Stations in 1990 and made recommendations for management, many of which are still relevant. Other management recommendations were made in an earlier report by Frood[11].

Between Alamein Station and Gardiners Creek, the rail line is absent, but overhead infrastructure means that vegetation is still limited to the margins of the reserve. Common indigenous tree species are present although the understorey is dominated by weeds. Weed management in this section is pressing. Australian plantings around stations like Ashburton Station detract from the corridor, when indigenous species could have been used.

Gaps:

Road crossings of the railway create the most common gap along this corridor. The Eastern Freeway and Harp Junction are the most significant road crossings which require special investigation of how to minimise their impact. Many other roads cross the linear reserve. Replacing exotic street trees with indigenous trees at the crossing of the corridor, and increasing the density of indigenous trees would be helpful in minimising the impact of the crossing. At Harp Junction the wood yard increases the gap between available planting areas.

Open mown grassy areas are common along the corridor, particularly north of Whitehorse Road. Exotic plantings such as at the bus station at Harp Junction and Australian shrub plantings at Ashburton Railway Station also interrupt the corridor. Only indigenous species should be used where formal plantings are required.

The gap at East Camberwell Station requires special investigation of revegetation opportunities, which will depend on identifying fragments of land unused for rail or residential purposes.

The corridor's open space is generally around 30m wide, however narrower sections occur (for example around Burke Road).

Sections of the corridor where streets run parallel could be effectively widened by using complementary indigenous species in the street landscaping, on both sides of the street.

[10] Priorities for Conservation of Remnant Bushland in the Alamein Railway Reserve Burwood - Ashburton. Report by A. W. Cowdell (?1990).

[11] The Management of Remnant Vegetation at Welfare Parade, Hartwell. D. Frood. Report to Camberwell Council June 1989.

Streets where this would be appropriate include sections of Laurel Street, Ashburton Grove, Welfare Parade, (Ashburton), Prosper Parade, Trent Street, Lithgow Street, (Burwood), Fordham Ave, Georgina Parade, (Hartwell), George Street, Westbourne Grove, Wandin Road, Stanley Grove, (Canterbury), Campbell Road,)Balwyn), Heather Grove, Maitland Avenue, Valerie Street, Asquith Street and Earl Street. (East Kew).

Land Ownership:

Land ownership along this corridor is extremely complex, with thousands of parcels involved. Council owns some of the easement around Whitehorse Road, and a number of parks adjacent to the easement between Canterbury Road and Camberwell Road. Parts of the corridor are still in the ownership of the railways, particularly south of East Camberwell Station. Management of the easement in these areas requires a high level of collaboration with the relevant operator.

3. Gardiners Creek Valley Corridor

Type:

Creek corridor

Linkage:

This corridor links from the Yarra River Corridor to the upper Gardiners Creek east of the municipality.

Other corridors linking to this include the Back Creek Corridor and the Outer Circle Rail Corridor.

Priority:

High

Description:

Boroondara incorporates only the northern bank of Gardiners Creek, which forms the municipality's southern boundary.

Between the Yarra and Glenferrie Road Gardiners Creek flows in a concrete channel adjacent to Scotch College and below City Link in a formed channel. Upstream of Glenferrie Road City Link separates the Creek in its concrete channel from H.A. Smith Reserve. The Creek then passes under City Link in a quadruple culvert and flows adjacent to the Freeway through Patterson Reserve. In these sections the Creek banks are fairly bare, although there is some recent planting by Melbourne Water. The parkland is mostly mown grass with a few specimen trees, although there are some indigenous bed plantings close to Auburn Road. Towards Toorak Road, car parks are encroaching significantly on the parkland and the Creek.

South of Toorak Road the Creek channel becomes less regular, and indigenous plantings along the Creek bank are badly in need of maintenance and weed control as they are becoming overrun with exotic trees and sprawling plants. The Creek is squashed between the old gasometer site and the Freeway but the open space widens out towards Tooronga Road.

East of Tooronga Road the status of the corridor is unclear. The old Melbourne Brick Company quarry (now filled in) has not been redeveloped for any other purpose, and some of the land should be considered for acquisition for the corridor. The Creek banks have had indigenous plantings but these are becoming weedy and need maintenance. The shared pathway continues through this section. A wider belt of indigenous vegetation should be developed here, and Coles Myer nearby may be interested in helping with this work. To the west of Burke Road South Reserve the Creek passes into a long dark arched tunnel, to re-

emerge east of Burke Road, a distance of some 400m. Nonetheless parkland continues to Burke Road, with a mulched belt of indigenous planting following the north side of the freeway. At Burke Road the shared pathway passes through a subway under the embankment. This unfortunate combination of tunnel and subway provided instead of a bridge greatly detracts from the corridor value of Gardiners Creek .

East from Burke Road the Creek emerges from the tunnel and its bed rapidly becomes much more natural. The devastating effects of the Freeway construction become less evident. Here the corridor passes along the southern side of Howard Dawson Reserve to Nettleton Park where Back Creek meets the Creek. Various small reserves on the Boroondara side of the Creek are supplemented by significant reserves on the Stonnington side, including the Glen Iris Wetlands south of High Street. From Dorothy Laver Reserve the corridor follows the Creek through to Markham Avenue Reserve, although in the vicinity of Ashburn Grove there are significant numbers of private properties extending to the Creek, and the corridor here would rely on the Malvern Valley Public Golf Course opposite. From Markham Avenue Reserve the corridor passes under the Warrigal Road Bridge into the City of Monash and extensive parklands around Deakin University and Box Hill Golf Club. Linkage might also be established along the Glen Waverley Railway Line nearby.

Habitat Features:

Downstream of Nettleton Park (where the Back Creek Corridor joins this corridor), Gardiners Creek has been severely disturbed by freeway construction and little or no remnant vegetation remains. The main exception to this is at Scotch College where a strip of Red Gums survive along part of their Gardiners Creek frontage. Revegetation works in this section are almost exclusively associated with the freeway construction, but are in serious need of maintenance as they are being overwhelmed by environmental weeds. As these plantings mature they are certainly providing habitat, but need to be supplemented in their width and connectivity to form an effective corridor.

From Nettleton Park upstream the creek bed and banks have much more natural geomorphology, although the indigenous vegetation has been largely lost. Small but significant remnants of the original vegetation remain at the western end of Markham Avenue Reserve, and below the corner of Ryburne Avenue and Ashburn Grove, where a relatively high number of species remain and the understorey is generally intact. Other remnants are common in this stretch but are restricted to overstorey species - River Red Gums, Swamp Paperbark, Blackwood, Bursaria, Yellow Box. They occur at Nettleton Park, Brixton Rise Reserve, Muswell Hill Reserve, Eric Raven Reserve, Winton Road Reserve, Ryburne Avenue Reserve and at Markham Avenue Reserve.

A much higher level of community interest in the Creek is evident in this stretch by plantings by the Lions Club of Boroondara - Gardiners Creek, and the Friends of Gardiners Creek Valley in Glen Iris. Their plantings are much better maintained than the freeway ones albeit more recent. In Ashburton limited plantings by Melbourne Water are present along the Creek banks. Where plantings have not been carried out, environmental weeds along the Creek in this section are often mature and dense. The opportunities for habitat development are rich.

Gaps:

Scotch College, being at the junction of the Gardiners Creek and Yarra River is a critical gap in this corridor. Working with the College to improve the habitat along the Creek (as well as the River), and to establish a belt of indigenous vegetation including understorey linking from the Yarra to H.A. Smith Reserve will be critical to the success of this corridor.

As part of the construction of the South-Eastern Freeway (as it was then) the lower reaches of Gardiners Creek were straightened and channelised. Part of this section has been concreted and is a very poor habitat. Part of the straightened channel is rock-lined. In some sections efforts have been made to improve the straight channel by using loose rock

weirs to create pools and riffles. More could be done in this regard, and planting of indigenous plants as close as possible to the channel to provide shade and shelter and regular input of leaf-litter as food would help fish and other aquatic life somewhat. Ideally the channel would be reconstructed with naturalistic earthen banks which could be replanted right to the water's edge, and with a complex bed structure suitable for the full range of aquatic life, but this would be very expensive.

This corridor has a severe blockage at Burke Road. The Creek goes through a 400m long dark concrete tunnel, which although it can be walked through is unlikely to be used by large mammals, aquatic mammals or fish. The parkland is interrupted by the high embankment that Burke Road is on so mammal movement through the dryland is also difficult. A pedestrian subway is provided under Burke Road, but this is unlikely to be used by animals. Construction of a new creek channel to the north of the existing alignment and a bridge at Burke Road would be possible, but the massive cost of this makes it unlikely.

Given the lack of access for large mammals along the Yarra to the confluence with Gardiners Creek, and the blockage at Burke Road, this corridor is not considered likely to be ever suitable for large mammal movement. Given the channelised section and the tunnel at Burke Road, the suitability of the corridor for fish movement is likely to remain limited.

Land Ownership:

Council owns the majority of the Creek frontage to Gardiners Creek in the municipality. Between Council-owned land, and land owned by Stonnington City Council on the south side of the Creek and by Melbourne Water and VicRoads, most of the land along this corridor is in public ownership.

Exceptions include:

- Scotch College, where Council should work with the college to achieve corridor objectives;
- the Multinet gasometer site south of Toorak Road, where acquisition of additional land for the corridor would be highly desirable, given the limited land on the opposite bank of the Creek.
- the former Melbourne Brick Company land (now Coles Myer) where eventual acquisition of additional land would be desirable; and
- properties along Pitt Street and Ashburn Grove in Ashburton, which reach right to the Creek banks, obstructing pedestrian access along the Creek. However they do not preclude corridor development along the opposite bank providing this is compatible with the City of Stonnington's objectives for Darling Park and for the Malvern Valley Public Golf Course.

4. Glass Creek Corridor

Type:

Linear reserve

Linkage:

The Glass Creek Corridor links from the Yarra River Corridor along the old route of Glass Creek, now mostly barrel-drained, to Gordon St Balwyn, as well as to the North Balwyn Corridor.

Priority:

Medium

Description:

From the Yarra River Glass Creek passes through the Kew Golf Club, under the Eastern Freeway and through Kilby Park Stud and Hays Paddock. In this section the Creek is in its semi-natural channel, and passes through relatively wide parkland. Ideally the corridor would follow the Creek, however an alternative route would avoid the Stud by staying within Hays Paddock. Just to the north of Kilby Road, the parkland narrows down somewhat and the corridor passes through Harrison Reserve (North and South), Stradbroke Park (where the links to the Outer Circle Corridor and the North Balwyn Corridor meet), and through what is known as the King Street Chain of Parks south to Gordon Street Balwyn.

Habitat Features:

Where Glass Creek meets the Yarra, significant Floodplain Riparian Woodland vegetation is present. Passing through the Kew Golf Club, the Creek has been severely denuded of indigenous vegetation, except for a number of remnant River Red Gums. It passes under the Eastern Freeway through a culvert into the Kilby Park Stud, where it is inaccessible to the public. Through Hays Paddock, the channel of the Creek is still largely denuded of indigenous vegetation, although other parts of Hays Paddock have been significantly revegetated. Stradbroke Park together with the southern side of the Kew High School contain a large number of remnant indigenous River Red Gums, and has been extensively revegetated, especially between Kilby Road and Lawrence Street. A lot of bird life uses this park. South of Stradbroke Park, the corridor again narrows significantly. Some sections are heavily planted with Australian trees and would benefit from some understorey plantings, and gradual replacement of Australian trees with indigenous trees.

Gaps:

The major gap in the corridor is the Eastern Freeway. Other gaps occur at major roads: Kilby Road, High Street, Burke Road, and Belmore Road, and at minor roads Glass Street, Head Street, Birdwood Street and King Street. West of King Street a couple of completely developed house blocks interrupt the drainage easement.

Sections significantly lacking indigenous vegetation also include Kew Golf Club, Kilby Park Stud and Hays Paddock, which have widely scattered plantings of Australian species and some exotics, and Harrison Reserve North and South which have an exotic theme. The indigenous and Australian specimen trees around the ovals at Stradbroke Park provide some habitat, however a denser belt of vegetation should be designed through the park around the ovals to link to the southwest (via Harp Road and Lady Brassey's Drive to the Outer Circle Corridor) and to the southeast to the southern section of the corridor.

The road gaps should be addressed by replacing exotic street trees with indigenous trees where the corridor crosses the roads. This will improve links across the canopy over minor road gaps, but the corridor will still be significantly interrupted at ground level, making the link effective only for more mobile small ground animals and birds.

Land Ownership:

Kew Golf Club is privately owned, as is Kilby Park Stud. Apart from two house blocks just west of King Street, the corridor comprises parks and reserves owned by Council. The abutting Kew High School, with its forest of remnant River Red Gums is a significant adjunct to the corridor, presumably in Education Department ownership. Some acquisition of land to consolidate the corridor in the vicinity of King Street might be desirable.

5. Hyde Park Corridor

Type:

Linear reserve

Linkage:

This corridor links from the Yarra River Corridor past the Eastern Freeway Corridor to the Outer Circle Corridor

Priority:

Medium

Description:

This corridor follows the drainage reserves of an old creekline (name unknown) from the Yarra across the Eastern Freeway to Jack O'Tooles Reserve to Hyde Park, and then follows a pretty link along drainage reserves to the Outer Circle Corridor at Park Crescent.

Habitat Features:

Significant Floodplain Riparian Woodland vegetation is present where this corridor leaves the Yarra Corridor. At Jack O'Tooles Reserve is a large cluster of remnant River Red Gums. The rest of the corridor has scattered Australian plantings which should be consolidated to provide a relatively continuous belt of indigenous vegetation along the corridor.

Gaps:

The most significant gap in the corridor is the Eastern Freeway. Other roads interrupting the corridor include Kilby Road, Connor Street and Sutherland Avenue.

Land Ownership:

The whole of this link comprises land owned by Council.

6. Koonung Creek Corridor

Type:

From a map this corridor appears attractive as a linear reserve. However significant interruptions at the Freeway crossing, and Doncaster Road suggest that a stepping stone type link is more appropriate.

Linkage:

At its east end, this corridor links to the Yarra River just east of Burke Road, and upstream to the Koonung Creek in the City of Whitehorse.

Priority:

Medium

Description:

From the Yarra, the corridor passes through the Freeway Golf Course and to the south of the Carey Baptist Grammar Sports Centre (in the City of Manningham). It crosses Bulleen Road and includes the land around the Boroondara Tennis Centre, and the land below the Manningham Club and Conference Centre (in the City of Manningham) before crossing Thompsons Road and the Eastern Freeway to follow Koonung Creek Reserve, residential land between Doncaster Road and Leicester St, Winfield Road Reserve, and the Freeway Reserve on the south side of the freeway to the Koonung Creek which extends beyond the north-east corner of the municipality.

Habitat Features:

Where Koonung Creek meets the Yarra, there are significant areas of Floodplain Riparian Woodland. Between the Yarra and Thompson's Road, Koonung Creek follows a semi-

natural bed and is surrounded on both sides with open space but with no identified remnant vegetation.

Between Bulleen Road and Thompsons Road (North Balwyn) there are significant remnant eucalypts and wattles although elms and poplars are encroaching. Some recent indigenous plantings in this section are evident on the Manningham side of the Creek.

Upstream of the Freeway the Koonung Creek Reserve has significant recent indigenous overstorey and mid-storey plantings, but which do not at present form a continuous habitat belt through the reserve.

In the vicinity of Sweyn Street (North Balwyn) the corridor follows land along the reconstructed channel of the Koonung Creek, with indigenous under and overstorey plantings well away from the Creek, but no riparian plantings along the channel itself to soften the rock lining.

Winfield Road Reserve contains overstorey plantings of Australian species with indigenous closer to the freeway.

Freeway landscape plantings adjacent to this corridor use a range of indigenous species, including monocultures of groundcovers. Compared to the indigenous plantings in adjacent reserves these provide an abundance of ground shelter but probably not good habitat due to the lack of diversity of food sources, and the lack of connectivity with more diverse vegetation areas.

Gaps:

Lack of riparian indigenous vegetation in the Freeway Golf Course is a barrier to land animal and small bird movement. Establishment of riparian and floodplain vegetation along the Creek line is highly desirable.

Bulleen Road is a barrier for land animals although the triple culvert under the road alleviates this to some extent.

Thompsons Road/Eastern Freeway is an absolute barrier for land animals, being criss-crossed by roadways and fences, and the long dark barrel drain at this point is a complete barrier for large aquatic animals. Macroinvertebrates and fish may pass downstream through this barrel drain in higher flows. The large canopy interruption provided by the freeway may interrupt movement by smaller bird species. The residential area between Bulleen Road and Mountain View Road extends this gap. Little can be done to address this gap for ground animals, but additional planting of indigenous canopy species in and around the intersection and in Bellevue Primary School and residences between Bulleen Road and Mountain View Road would help address this barrier for small bird species.

Gaps in the corridor are also created by large mown grass areas in parks such as the Koonung Creek Reserve.

Doncaster Road and the residential area between Doncaster Road and Leicester St (North Balwyn) are a significant interruption to the corridor. A gap in the freeway plantings caused by a steep cutting and 8-10m high sound walls reinforce the gap. Planting of additional indigenous canopy species in this area is desirable.

Land Ownership:

Apart from land owned by the City of Boroondara, which forms the majority of the corridor, parts are owned by VicRoads (the Freeway), private residents (as noted above), and the Department of Education (Bellevue Primary School). Ownership of the reserve at the end of Sweyn St needs clarification.

7. Balwyn North Corridor

Type:

Stepping stone link

Linkage:

Koonung Creek Corridor to Glass Creek Corridor. Upstream Koonung Creek links to Elgar Park and Bushy Creek.

Priority:

Medium

Description:

From east to west, this corridor enters the municipality at Winfield Road where the Koonung Creek Trail link meets Winfield Road, then passes through a residential area, Greythorn Park, another residential area, Jacka Street Reserve, Gordon Barnard Reserve, Hislop Park, North Balwyn Tennis Club, Macleay Park and Myrtle Park, before crossing another residential area to Stradbroke Park on the Glass Creek Corridor.

Habitat Features:

Most of the parks this corridor passes through are primarily sporting in nature with the exception of Greythorn Park, which has recent indigenous plantings and along the south side a line of mature Australian trees, some of which may be indigenous. These trees extend through the residences to the east of the park along Alpha Street to Greythorn Road, and should be specifically protected as part of the corridor.

Within the other parks the ovals have spacious surrounds a few of which (e.g. Macleay Park) have indigenous plantings. A more or less continuous belt of indigenous plants from the Plains community should be established through these parks.

The residential areas through which this corridor passes are leafy and green, and Australian plantings are not uncommon, but remnant indigenous trees are rare. It would be desirable to increase the density of indigenous trees in these residential areas.

Gaps:

The primary gaps in this corridor are the residential areas described below.

The corridor is also interrupted by large mown areas and ovals and tennis courts in the Council reserves. A more or less continuous belt of indigenous vegetation through these reserves needs to be established.

The Koonung trail link east of Winfield Road in the City of Whitehorse is simply mown grass and whilst providing an opportunity for planting is currently a gap in the corridor. Further east Koonung Creek links to Elgar Park and Bushy Creek.

Land Ownership:

Apart from the parks and reserves in this corridor which are all Council owned, there are four sections of private residential land which form part of this corridor:

- between Winfield Road and Greythorn Park (including St Bridgets Catholic Primary School);
- between Greythorn Park, Jacka Street Reserve and Gordon Barnard Reserve
- to the south of the North Balwyn Tennis Club and
- between Myrtle Park and the Glass Creek Corridor.

8. Back Creek Corridor

Type:

Linear reserve (large parts of the Creek are in a barrel-drain)

Linkage:

Back Creek Corridor links from Gardiners Creek at Glen Iris to the Outer Circle Corridor at Hartwell, and then to South Surrey Park near the eastern boundary of the municipality in Surrey Hills. It also links to the Ashburton Creek, Willison and Wattle Park Corridors.

Priority:

Medium

Description:

From Gardiners Creek the corridor leads along the route of Back Creek through Nettleton Park, Back Creek Reserve, Ferndale Park, Back Creek Reserve again to Hartwell, where it passes through a number of car parks, across the rail line and Toorak Rd, then through residential areas to Lynden Park, Cornell St Reserve, Quinton Road Reserve and South Surrey Park.

Habitat Features:

Moving upstream from the neglected banks of Gardiners Creek through Nettleton Park, Back Creek is exposed, but lined with dense willow and other exotic vegetation. The Reserve has a number of large remnant River Red Gums and Yellow Box as well as Swamp Paperbark and Black Wattles. A small beginning has been made on the restoration of this section of Creek with the Nettleton Park Peninsular Revegetation Project, run by the Lions Club of Boroondara.

From Nettleton Park to Glen Iris Road the corridor follows a pleasant but in some places narrow (10m) reserve (Back Creek Reserve) with mown grass and scattered mostly Australian trees and shrubs. Indigenous plants could be introduced into mulched beds along this reserve.

Ferndale Park has a large oval, some remnant River Red Gums, and scattered Australian and exotic specimen trees around the oval. There is one mulched bed of Australian trees to the south of the oval. There is potential to establish a belt of indigenous vegetation on the north side of the oval.

From Ferndale Park to Denman Street the Back Creek Reserve continues with mown grass and scattered Australian trees. There is good potential to introduce belts of indigenous planting through here.

North of Denman Street Back Creek re-emerges from the barrel drain briefly. Recent works by Melbourne Water to remove exotic vegetation has left this area fairly bare, however indigenous plantings have been carried out.

From here the Creek goes back underground and passes through the commercial heart of Hartwell and residential areas to Lynden Park, which has ovals and Australian and exotic specimen trees in the surrounds. There is scope for belt planting along the south side of the western oval and north side of the eastern oval. Scattered Australian trees are present on the narrower reserve which leaves Lynden Park northwards to Cornell St. Nazareth House nearby could be encouraged to plant indigenous species along its boundary with the reserve.

North of Cornell St the Creek again re-emerges. Remnant indigenous trees are present along the relatively narrow reserve (30m) and a considerable amount of revegetation work has been carried out by Friends of Back Creek. Nonetheless there is a lot of exotic

vegetation to be removed before the Creek is in a more or less natural condition. North from Riversdale Road the parkland widens out into South Surrey Park, where revegetation has begun in earnest. Some remnant vegetation is present, but much work is needed to replace the dense exotic vegetation lining the banks of the Creek with indigenous species.

East of Union Street the Creek passes underground again, under a very narrow drainage reserve between the houses in Rose and Varzin Avenues, and there is little opportunity to extend the corridor further beyond this, so effectively the corridor ends at South Surrey Park.

Gaps:

The major gap in this corridor is through commercial and residential Hartwell. The original drainage reserve is covered by bitumen car parks between Somerset Rd and Jickell Avenue, then the shops, railway and Toorak Road together block the corridor, followed by commercial and residential land north of Toorak Road. Houses appear to have been built on the drainage line between Toorak Road and Lynden Park, risking future flood damage. The best way of bridging this gap is not clear and requires further investigation. Planting indigenous trees in the carparks to the south of Hartwell Junction would improve the linkage to the outer circle rail line.

Land Ownership:

Between Gardiners Creek and Hartwell this corridor follows Council-owned reserves along the alignment of Back Creek. Private residential and commercial land intervenes in the Hartwell area, and a part of the corridor follows the Alamein railway line easement in the vicinity of Hartwell. Council reserves again form the basis of the corridor north-east of Hartwell.

9. Ashburton Creek Corridor

Type:

Linear reserve

Linkage:

This is a relatively uninterrupted corridor which links Back Creek Corridor to Outer Circle Corridor

Priority:

Medium

Description:

From the southern side of Ferndale Park this corridor follows the route of Ashburton Creek via Ferndale Road Reserve, Hill'n Dale Park, Summerhill Linear Park to Summerhill Park and the Outer Circle Corridor.

Habitat Features:

Ashburton Creek has been barrel-drained for the entire length of this corridor. Most of the reserves have scattered, mostly Australian trees with mown grass, although there are a few small mulched plantings with indigenous species including understorey. Some remnant trees are present at Hill'n Dale Park which provides a good opportunity for revegetation work.

Gaps:

There are no gaps in this corridor's open space with the exception of road crossings. Exotic street trees interrupt the native theme of the parks again and again. Replacing these with indigenous species would enhance the continuity of the corridor.

The wide areas of mown grass should be crossed with mulched belts of indigenous under, mid and overstorey plantings.

Land Ownership:

This corridor follows Council-owned reserves all the way.

10. Wattle Park Corridor

Type:

Stepping stone link

Linkage:

This corridor links the Back Creek Corridor at Lynden Park with Wattle Park just beyond the eastern boundary of the municipality.

Priority:

Medium

Description:

From Lynden Park a very narrow reserve leads east to Through Road. The corridor then comprises Through Road Reserve, recent residential development between Through Road and Morey Street, and a narrow drainage reserve to Cooper Reserve, which is opposite Wattle Park on Warrigal Road.

Habitat Features:

Most of the reserves feature scattered Australian and exotic trees in mown grass. There were no remnant indigenous species recorded. Nonetheless there is a good opportunity to establish belts and nodes of indigenous vegetation along this corridor to encourage bird movement from Wattle Park.

Gaps:

The most significant gap in this corridor is between Through Road and Morey Street where there is recent unit development on the drainage line. Encouraging residents to plant indigenous species in this section would reduce the impact of the gap.

Exotic street trees also interrupt this corridor. Replacement with indigenous species would reduce the gaps.

Land Ownership:

Apart from the residential gaps, this corridor follows Council-owned reserves.

11. Willison Corridor

Type:

Linear reserve

Linkage:

Links the Back Creek Corridor to the Outer Circle Corridor

Priority:

Low

Description:

From Back Creek in Hartwell the corridor follows the route of a creek (the name of which is unknown) north under Toorak Road, through a very narrow drainage easement to Camberwell Road, where it goes into a barrel-drain under Fordham Gardens, through a small residential area, Fairmont Avenue Reserve, Murdoch Street Reserve and Willison Park to the Outer Circle Corridor.

Habitat Features:

This corridor holds little habitat value currently. Between Toorak and Camberwell Roads the narrow channel of the Creek is full of elm suckers. Fordham Gardens is a neat formal garden with primarily exotic trees and flower beds. Surprisingly a couple of remnant eucalypts survive. Other reserves along the corridor have scattered Australian trees amongst mown grass.

Gaps:

The section from Toorak Road to Fairmont Avenue Reserve forms a relatively large gap in this corridor which could be dealt with by: acquiring land and widening the easement between Toorak and Camberwell Roads, removing the suckering elms and replanting with indigenous species, planting indigenous species in a belt through Fordham Gardens, encouraging residents along Gilbert Parade to plant indigenous plants in their properties, and Council planting indigenous street trees in these areas.

Land Ownership:

The section along Gilbert Parade is privately owned. The rest of this corridor follows Council-owned reserves.

12. Canterbury Corridor

Type:

Stepping stone link

Linkage:

This corridor links from the Outer Circle Rail Corridor east to Chatham and then north to Maranoa Gardens in Balwyn.

Priority:

Low

Description:

A corridor leading east from the Outer Circle Corridor along the Lilydale Railway line was investigated but rejected given the very limited open space available along the railway for planting. Instead a stepping stone corridor based on Council-owned parks was designated. This corridor leaves the Outer Circle Corridor at Boroondara Park, following the Myrtle Road Reserve south to Matlock Street Reserve, then north-east via Warburton Road Reserve, Warburton Road Land and Chaucer Crescent Reserve to Canterbury Gardens. From there the corridor steps to Shrublands Creek Reserve, John August Reserve, Evergreen Reserve, Balwyn Community Tennis Club and to Maranoa Gardens.

Habitat Features:

Habitat along this corridor is currently poor. Maranoa Gardens has significant remnant vegetation and much Australian planting. Shrublands Creek Reserve has Australian plantings and some remnant trees. Essentially however habitat would need to be developed throughout this corridor. Because it is a stepping stone corridor it would only ever be suitable for birds.

Gaps:

At this stage, none of the corridor has high habitat value. The reserves could have habitat plantings installed by Council, but Council should encourage landowners in the gaps between the reserves outlined below to use indigenous species in their landscaping.

Land Ownership:

The reserves along this corridor are by Council,. The gaps between the reserves are as follows:

- Canterbury Gardens to Shrublands Creek Reserve: private commercial and some residential land;
- Shrublands Creek Reserve to Evergreen Reserve: private residential;
- Evergreen Reserve to Balwyn Community Tennis Club: private residential; and Council community centre; and
- Balwyn Community Tennis Club to Maranoa Gardens: private residential.

13. Glenferrie Corridor

Type:

Stepping stone link

Linkage:

This corridor links from the Yarra River Corridor east through Glenferrie to meet the Outer Circle Corridor just south of Mont Albert Road.

Priority:

Low

Description:

A corridor following the Belgrave/Lilydale Rail Line was investigated but rejected because of the very limited space along the rail corridor, especially between Camberwell and Auburn Stations. Management of the land is beyond the control of Council and unsuitable for voluntary work. VicTrak, which is responsible for management, should be encouraged to manage the reserve for biodiversity where possible.

Instead a stepping stone link was designated, leaving the Yarra at Yarra Bank Reserve, passing through Creswick Reserve, St James Park, Grace Park, Glenferrie Oval, Central Gardens, Victoria Road Reserve, Sir William Angliss Reserve, Rathmines Reserve, and Norway Reserve to the Outer Circle Park south of Mont Albert Road. Between these reserves are gaps of up to 0.6km of residential, and sometimes commercial and educational land uses.

Habitat Features:

A number of reserves along the corridor have some mature remnant trees, such as at Yarra Bank Reserve, and at Rathmines Reserve. Large trees, particularly eucalypts, in the valley of Hawthorn Main Drain act as a corridor for birds. Development of this corridor would

require habitat plantings (over and understorey) of a significant size at each of the reserves along the corridor together with encouragement of residents and institutions in-between to plant suitable indigenous species. The corridor is likely to only be suitable for birds.

Gaps:

At this stage, none of the corridor has high habitat value. The reserves could have habitat plantings installed, but Council would need to encourage landowners in the gaps between the reserves outlined below to use indigenous species in their landscaping.

Land Ownership:

The reserves along this corridor are owned by Council. The gaps between the reserves are as follows;

- Creswick St Reserve and St James Park: Hawthorn West Primary School;
- St James Park to Grace Park: Primarily private residential, with some rail and some hospital grounds;
- Grace Park to Glenferrie Sports Ground: Council car parks could be planted with indigenous trees;
- Glenferrie Sports Ground to Central Gardens: private car park, commercial, rail and educational (Swinburne University of Technology);
- Central Gardens to Victoria Road Reserve: Primarily private residential with some commercial;
- Victoria Road Reserve to Sir William Angliss Reserve and Rathmines Reserve: private residential;
- Rathmines Reserve to Norway Reserve: Primarily private residential with some educational (Camberwell Anglican Girls Grammar School); and
- Norway Reserve to Outer Circle Park: private residential.

14. Kew Corridor

Type:

Stepping stone link

Linkage:

This corridor links the Outer Circle Corridor at Park Crescent to Victoria Park Kew.

Priority:

Low

Description:

The corridor follows a narrow drainage reserve between Childers and Churchill Streets to just north of High Street where it is interrupted by residential and commercial properties and High Street itself, before reaching Victoria Park Kew.

Habitat Features:

Whilst very narrow this link has quite a few remnant River Red Gums, and some scattered Australian and exotic plantings.

Gaps:

Apart from the road crossings at Asquith Street, Hartington Street and High Street, the major gap in this route is just north of High Street where some effort is needed to enhance the link.

Land Ownership:

This corridor follows a narrow drainage reserve. South of Hartington Street the reserve is owned by Council. Ownership of the reserve north of Hartington Street needs clarification, but is probably publicly owned. It would reinforce this link if adjoining private property owners were encouraged to plant indigenous species.

15. Glass Creek to Outer Circle Link

Type:

Stepping stone link

Linkage:

This corridor links the Glass Creek Corridor from Stradbroke Park to the Outer Circle Corridor

Priority:

Low

Description:

The corridor follows the western edge of Stradbroke Park then a short distance along Harp Road to Lady Brasseys Drive, which it follows to the Outer Circle Park.

Habitat Features:

Australian specimen trees are present on the western edge of the oval at Stradbroke Park which could be reinforced with indigenous planting. Some remnant River Red Gums and Blackwoods are present on the Outer Circle Park where this link would join.

Gaps:

From Harp Road to the Outer Circle Park is a gap which could be dealt with by planting indigenous street trees to replace the poorly developed maple plantings along Lady Brasseys Drive, and by encouraging nearby land owners to plant indigenous plants in their gardens.

Land Ownership:

Road reserves and private land between Harp Road and the Outer Circle Park.

APPENDIX C: ECOLOGICAL VEGETATION CLASSES FOR EACH CORRIDOR

EVC	Yarra River Corridor	Outer Circle Corridor	Gardiners Creek Valley Corridor	Glass Creek Corridor	Hyde Park Corridor	Koonung Creek Corridor	Balwyn North Corridor	Back Creek Corridor	Ashburton Creek Corridor	Wattle Park Corridor	Willison Corridor	Canterbury Corridor	Glenferrie Corridor	Kew Corridor	Glass Creek - Outer Circle link
47 Valley Grassy Forest								✓		✓					
53 Swamp Scrub*															
55 Plains Grassy Woodland	✓	✓✓		✓	✓	✓	✓					✓	✓	✓	✓
56 Floodplain Riparian Woodland	✓✓		✓✓	✓	✓	✓									
61 Box Ironbark Forest*															
68 Creekline Grassy Woodland				✓	✓		✓	✓	✓		✓	✓	✓	✓	
126 Swampy Riparian Complex						✓									
164 Creekline Herb-rich Woodland								✓		✓					
172 Floodplain Wetland Complex	✓														

EVC	Yarra River Corridor	Outer Circle Corridor	Gardiners Creek Valley Corridor	Glass Creek Corridor	Hyde Park Corridor	Koonung Creek Corridor	Balwyn North Corridor	Back Creek Corridor	Ashburton Creek Corridor	Wattle Park Corridor	Willison Corridor	Canterbury Corridor	Glenferrie Corridor	Kew Corridor	Glass Creek - Outer Circle link
175 Grassy Woodland		✓											✓		
641 Riparian Woodland	✓														
895 Escarpment Shrubland	✓														
937 Swampy Woodland*															

Corridors often cross through several Ecological Vegetation Classes. To identify which sections of corridors should be planted with which class, refer to the map of corridors and EVC's (below). For species occurring in each EVC, refer to the descriptions of each class in *Vegetation Mapping of the Port Phillip & Westernport Region* by Alison Oates & Maria Taranto, Arthur Rylah Institute, November 2001, extracts from which form Appendix F.

* Thirteen EVCs are listed as occurring in Boroondara pre-1750 (according to mapping provided to the City of Boroondara by the Department of Natural Resources and Environment which forms the basis of Map 2). All but three of these (53 Swamp Scrub, 61 Box Ironbark, and 937 Swampy Woodland) are included in one or more of the proposed corridors.

APPENDIX D: ENVIRONMENTAL WEEDS

Common name	Scientific name	Invasiveness in Boroondara	Priority for control in Boroondara's habitat corridors
Sycamore Maple	*Acer pseudoplatanus*	very high	Very high
Box-Elder Maple	*Acer negundo*	High	High
Madeira vine	*Anredera cordifolia*	Very high	Very high
White Bladder Flower/Kapok Vine	*Arauja sericifera*	Very high	Very high
Mirror Bush	*Coprosma repens*	High	High
Cotoneaster	*Cotoneaster spp*	High	High
Couch Grass	*Cynodon dactylon*	High	Low except in indigenous grassy understorey where high
Cape Ivy	*Delaira odorata*	High	High
Patterson's Curse	*Echium plantagineum*	Very high	Very high
Erica species	*Erica spp*	Very high	High
Desert Ash	*Fraxinus oxycarpa or F. Rotundifolia*	Very high	Very high
Flowering Ash	*Fraxinus ornus*	Potentially high	Moderate
Fennel	*Foeniculum vulgare*	High	High
Flax-leafed Broom	*Genista linifolia*	Very high	Very high
Montpellier Broom	*Genista monspessulana*	Very high	Very high
English Ivy	*Hedera helix*	High	High
Large-leafed Privet	*Ligustrum lucidum*	Very high	Very high
Japanese Honeysuckle	*Lonicera japonica*	High	Very high
Himalayan Honeysuckle	*Lycesteria formosa*	High	High
Serrated Tussock	*Nasella trichotoma*	Very high	Very high
Chilean Needle Grasses	*Nasella neesiana*	Very high	Very high
Prickly Pear	*Opuntia spp*	Moderate	High
Soursob	*Oxalis pes-caprae*	Very high	High where understorey plantings present or planned. Otherwise low.
Cape Wattle	*Paraserianthes lophantha*	High	High
Swamp Foxtail Grass	*Pennisetum alopecurioides*	Very high	High
Kikuyu	*Pennisetum clandestinum*	High	High

Common name	Scientific name	Invasiveness in Boroondara	Priority for control in Boroondara's habitat corridors
African Feather Grass	*Pennisetum macrourum*	Very high	High
Sweet Pittosporum	*Pittosporum undulatum*	High	High
Oak	*Quercus robur*	Moderate	Moderate
Black Locust	*Robinia pseudoacacia*	Moderate	Moderate
Blackberry	*Rosa rubiginosa*	Moderate	Moderate to High
Other Willow species	*Salix alba, fragilis, cinerea*	High along waterways	High along waterways
Weeping Willow	*Salix babylonica*	Moderate along waterways	Moderate along waterways
Tradescantia	*Tradescantia albiflora*	High along waterways	High
Gorse	*Ulex eruopaeus*	Moderate	Moderate
Dutch Elm	*Ulmus x hollandica*	High along waterways	High where indigenous plantings or remnants present
Bulbil Watsonia	*Watsonia meriana 'bulbilifera'*	High	High
Chrysanthemoides monilifera	*Boneseed*	Moderate	Moderate

APPENDIX E: INDIGENOUS SPECIES SUITABLE FOR USE AS STREET TREES

Common name	**Scientific name**
Lightwood	*Acacia implexa*
Blackwood	*Acacia melanoxylon*
Silver Banksia	*Banksia marginata*
Yellow Box	*Eucalyptus melliodora*
Swamp Gum	*Eucalyptus ovata*
Narrow-leaf Peppermint	*Eucalyptus radiata*
Yellow Gum	*Eucalyptus leucoxylon* ssp. *connata*

It should be noted that each of these species has their own requirements in terms of clearance from powerlines, soil conditions etc. and prior to selection of a species analysis must be undertaken to determine the appropriate species for any particular situation.

APPENDIX F: ECOLOGICAL VEGETATION CLASS DESCRIPTIONS

Extracts from *Vegetation Mapping of the Port Phillip and Westernport Region* by Alison Oates & Maria Taranto, Arthur Rylah Institute for Environmental Research Nov 2001.

EVC 47 Valley Grassy Forest

Occurs under moderate rainfall regimes of 700-800 mm per annum on fertile, well-drained, colluvial or alluvial soils, mostly on gently undulating lower slopes and valley floors. The tall, open overstorey consists of a variety of eucalypts, usually species that prefer moister or more fertile conditions, over a sparse shrub cover. In season, a rich array of herbs, lilies, grasses and sedges dominate the ground layer but at the drier end of the spectrum the ground layer may be sparse and slightly less diverse, but with the moisture-loving species still remaining. The range of floristic and environmental attributes for Valley Grassy Forest is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 40-300m.

Topography: Lower slopes and gully floors.

Geology: Mostly on Silurian sediments.

Soils: Relatively fertile loam to clay loams, sometimes sandy clays.

Present distribution: Scattered through Yan Yean, Hurstbridge, Eltham, Warrandyte, Kilsyth, Lysterfield and Beaconsfield areas.

Floristics: The overstorey is usually dominated by Candlebark *Eucalyptus rubida* and Yellow Box *Eucalyptus melliodora*, sometimes with Narrow-leaf Peppermint *Eucalyptus radiata* and Messmate *Eucalyptus obliqua* in moister sites (along gradient into Herb-rich Foothill Forest), or Red Stringybark *Eucalyptus macrorhyncha* and Bundy *Eucalyptus goniocalyx* in drier sites (along gradient into Grassy Dry Forest). Red Box *Eucalyptus polyanthemos* is usually absent except in narrow ecotonal sites within Grassy Dry Forest.

A range of *Acacia* species of dry forest/woodland habitats can be present including Black Wattle *Acacia mearnsii,* Golden Wattle *Acacia pycnantha,* Lightwood *Acacia implexa* and Hedge Wattle *Acacia paradoxa*. Blackwood *Acacia melanoxylon*, Cherry Ballart *Exocarpos cupressiformis* and *Cassinia* spp. may also occur.

The ground layer of relatively intact examples is diverse, grassy, and rich in herbs and geophytes. Dominant grass species include Kangaroo Grass *Themeda triandra*, Weeping Grass *Microlaena stipoides* var. *stipoides,* Veined Spear-grass *Austrostipa rudis,* Wallaby-grasses *Austrodanthonia* spp. and Grey Tussock-grass *Poa sieberiana*. Other species include Grass Lily *Caesia* spp., Sheep's Burr *Acaena echinata,* Milkmaids *Burchardia umbellata,* Chocolate Lily *Arthropodium strictum* s.l*.,* Kidney-weed *Dichondra repens,* Milkmaids *Burchardia umbellata*, Austral Bear's Ears *Cymbonotus preissianus*, Small-leaved Clematis *Clematis microphylla*, Pale Vanilla-lily *Arthropodium milleflorum*, Tall Sundew *Drosera peltata* subsp. *peltata,* Finger Rush *Juncus subsecundus* and Australian Buttercup *Ranunculus lappaceus.*

A range of species, presumed formerly widespread within this EVC are now rare components eg. Matted Flax-lily *Dianella amoena*, Showy Podolepis *Podolepis jaceoides*, Hound's Tongue *Cynoglossum suaveolens*, Yam Daisy *Microseris scapigera* spp. agg., Variable Billy Buttons *Craspedia variabilis*, Rough Burr-daisy *Calotis scabiosifolia*, Pink

Bindweed *Convolvulus erubescens*, Small-leaf Glycine *Glycine microphylla*, Clover Glycine *Glycine latrobeana* and Slender Tick-foil *Desmodium varians*.

Structure: Woodland (to open forest), with understorey variously with a component of shrubs and small trees, but primarily grassy and herbrich in relatively intact remnants.

References: Frood (in prep.).

Additional Comments: Valley Grassy Forest has a floristic composition intermediate between Herb-rich Foothill Forest on the damper sites and Grassy Dry Forest on the drier sites. It has a drier suite of species and a more open canopy than Herb-rich Foothill Forest and more species characteristic of fertile soils than are present in Grassy Dry Forest. Mesic shrubs in Valley Grassy Forest are absent except in atypical situations such as seepage gullies. It has affinities with Plains Grassy Woodland which is normally found on slightly more fertile soils and in less mesic situations.

EVC 53 Swamp Scrub

Closed scrub at low elevations on alluvial deposits along streams or on poorly drained sites with higher nutrient availability. The vegetation characteristically lacks a eucalypt overstorey and is dominated by Swamp Paperbark *Melaleuca ericifolia* (or sometimes Woolly Tea-tree *Leptospermum lanigerum*) which often forms a dense thicket, out-competing other species. Where light penetrates to ground level, a moss/lichen/liverwort or herbaceous ground cover is often present. Dry variants have a grassy/herbaceous ground layer.

The range of floristic and environmental attributes for Swamp Scrub is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 5-110m.

Topography: Flood plains, water courses and drainage basins.

Geology: Mainly on Quaternary and Tertiary deposits, rare on basalt.

Soils: Variable, ranging from peat on poorly drained sites and on lower slopes prone to periodic seepages, to organic loam on the margins of freshwater wetlands.

Present distribution: Found along and adjacent to creeks, drainage lines and water-bodies from just north of Whittlesea south to and including parts of the Mornington Peninsula, Bass Coast and west to Melbourne.

Floristics: The tallest stratum typically consists of a dense shrub layer of Swamp Paperbark *Melaleuca ericifolia* (or Woolly Tea-tree *Leptospermum lanigerum*, particularly on basalts). Occasionally there may be emergent Swamp Gum *Eucalyptus ovata*.

The extent of the development of the ground cover depends on the amount of light reaching the ground. Species at wetter sites include Swamp Club-sedge *Isolepis inundata*, Water Ribbons *Triglochin procerum*, Streaked Arrow-grass *Triglochin striatum*, Swamp Mazus *Mazus pumilo*, Austral Brooklime *Gratiola peruviana*, Centella *Centella cordifolia*, Soft Water-fern *Blechnum minus*, Swamp Goodenia *Goodenia humilis* and Rushes *Juncus* spp. Species at drier sites include Small-leaf Bramble *Rubus parvifolius*, Kidney-weed *Dichondra repens*, Bidgee-widgee *Acaena novae-zelandiae*, Common Tussock-grass *Poa labillardierei*, Slender Tussock-grass *Poa tenera*, Wetland Wallaby-grass *Notodanthonia semiannularis*, Shrubby Groundsel *Senecio minimus*, Austral Bracken *Pteridium esculentum* and Weeping Grass *Microlaena stipoides* var*. stipoides.*

Structure: A closed scrub variously with a moss/lichen/liverwort or herbaceous ground cover where light penetrates to ground level.

References: Davies *et. al.* (in prep.), Cheal *et al*. (unpubl.).

Additional Comments: Swamp Scrub originally occupied large wetlands in the regions such as the Carrum Swamp and Kooweerup Swamp. It had a scattered distribution in the eastern Melbourne area and extended eastward into West and South Gippsland. Today it is much more restricted due to the drainage of the swamps and clearing for agricluture.

EVC 55 Plains Grassy Woodland

An open, grassy eucalypt woodland in low (mostly <700mm per annum) rainfall areas occurring on fertile soils on flats and gently undulating plains at low elevations. The understorey consists of a few sparse shrubs over a diverse grassy, herb-rich ground layer. Widespread and extensive in the past but has now been largely cleared for agriculture, and more recently for urban development resulting in few relatively intact remnants remaining in the Port Phillip/Westernport area.

Plains Grassy Woodland is a very variable EVC and includes a range of communities. The original floristics of many are now conjectural. Within the study area there are at least three formally recognised floristic communities of Plains Grassy Woodland and undoubtedley others do exist. The range of floristic and environmental attributes for the formally recognised communities is tabulated below. Where information from published or unpublished reports is included the references are cited.

Floristic Community 55-03 Gippsland Plains Grassy Woodland

Altitude: 10-60m.

Topography: Undulating to flat plain.

Geology: Quaternary sediments.

Soils: Fertile, duplex consisting of sand and silt or loam over clay.

Present distribution: South-east of Melbourne in the Keysborough-Dandenong-Lyndhurst area. Also on the basalts of Phillip Island, French Island and the Corinella area.

Floristics: The overstorey is dominated by River Red Gum *Eucalyptus camaldulensis* with Black Wattle *Acacia mearnsii* and Blackwood *Acacia melanoxylon* often present. Other trees include Rough-barked Manna Gum *Eucalyptus viminalis* subsp. *pryoriana,* Drooping Sheoak *Allocasuarina verticillata* and Black Sheoak *Allocasuarina littoralis.* There may be scattered shrubs of Hedge Wattle *Acacia paradoxa,* with less common occurrences of Grey Parrot-pea *Dillwynia cinerascens* and Prickly Tea-tree *Leptospermum continentale.*

The ground layer is usually grassy and herbaceous with sedges and lilies also present. Frequent grasses are Weeping Grass *Microlaena stipoides* var*. stipoides*, Kangaroo Grass *Themeda triandra,* Stiped Wallaby-grass *Austrodanthonia racemosa,* Kneed Wallaby-grass *Austrodanthonia geniculata*, Purplish Wallaby-grass *Austrodanthonia tenuior*, Veined Spear-grass *Austrostipa rudis,* Common Tussock-grass *Poa labillardierei,* Common Love-grass *Eragrostis brownii* and Mat Grass *Hemarthria uncinata*. Other species include Common Bogsedge *Schoenus apogon*, Yellow Rush-lily *Tricoryne elatior*, Twining Fringe-lily *Thysanotus patersonii*, Vanilla-lilies *Arthropodium* spp., Sheep's Burr *Acaena agnipila*, Scaly Buttons *Leptorhynchos squamatus*, Narrow Plantain *Plantago gaudichaudii*, Slender Bottle Daisy *Lagenophora gracilis*, Yellow Pennywort *Hydrocotyle foveolata*, Kidney-weed *Dichondra repens*, Star Cudweed *Euchiton involucratus*, Small Poranthera *Poranthera microphylla* and Trailing Speedwell *Veronica plebeia.* Narrow Rock Fern *Cheilanthes sieberi* is also sometimes present.

Structure: Woodland to open woodland over a grassy and herbaceous ground layer.

References: Robinson (unpubl.), Cheal *et al* (unpubl.) and Cook (1993).

Additional Comments: Few intact remnants remain due to the pressures of agriculture, housing and industrial development and most sites are highly disturbed.

Floristic Community 55-04 Western Basalt Plains Grassy Woodland

Altitude: 10-260m.

Topography: Undulating to flat plain.

Geology: Quaternary basalt.

Soils: Fertile basalt-derived clays.

Present distribution: Restricted to an area just west of the Plenty River from Whittlesea to Craigieburn.

Floristics: The overstorey is dominated by River Red Gum *Eucalyptus camaldulensis* with a very open scattered shrub layer of various wattles. In relatively intact examples Kangaroo Grass *Themeda triandra* or Common Tussock-grass *Poa labillardierei* dominates the ground layer. Other grasses include Long-hair Plume-grass *Dichelachne crinita*, Wallaby-grasses *Austrodanthonia* spp., and Common Wheat-grass *Elymus scaber.* Kangaroo Grass tends to dominate the herbaceous ground layer in the absence of native grazing animals or frequent firing. Common forbs included Common Everlasting *Chrysocephalum apiculatum,* Yam Daisy *Microseris scapigera* spp. agg., Scaly Buttons *Leptorhynchos squamatus* and Blue-Devil *Eryngium ovinum.*

Structure: Woodland to open woodland over a grassy and herbaceous ground layer.

References: VicRFA(2000).

Additional Comments: This floristic community was widespread across the western basalt plains of Victoria but has been largely cleared for agriculture. The remnants within the study represent the eastern most extremity (and the drier end) of this community. It is a Flora and Fauna Guarantee listed community.

Floristic Community 55-06 Riverina Plains Grassy Woodland

Altitude: 60-120m.

Topography: Undulating to flat plain.

Geology: Quaternary basalt.

Soils: Fertile basalt derived clays.

Present distribution: Restricted to the driest areas of the plains just west of Melbourne, mainly in the Melton/Eynesbury area, also around Sunbury.

Floristics: The overstorey is dominated by Grey Box *Eucalyptus microcarpa* with scattered stands of Buloke *Allocasuarina luehmannii*. Most remnants have few if any shrubs but it is thought that this community may have been shrubby in character prior to European settlement. Shrubs recorded include Gold-dust Wattle *Acacia acinacea,* Golden Wattle *Acacia pycnantha*, Lightwood *Acacia implexa*, Sweet Bursaria *Bursaria spinosa* and Drooping Cassinia *Cassinia arcuata.* The grassy understorey is dominated by Wallaby-grasses and Speargrasses such as Common Wallaby-grass *Austrodanthonia caespitosa,* Bristly Wallaby-grass *Austrodanthonia setacea,* Stiped Wallaby-grass *Austrodanthonia racemosa,* Rough Spear-grass *Austrostipa scabra* subsp. *falcata* and Kneed Spear-grass *Austrostipa bigeniculata*. Other common species include Windmill Grass *Chloris truncata,* Common Wheat-grass *Elymus scaber,* Kidney-weed *Dichondra*

repens, Blackanther Flax-lily *Dianella revoluta* and Small-leaved Clematis *Clematis microphylla.* The presence of chenopods such as Nodding Saltbush *Einadia nutans,* Wingless Bluebush *Maireana enchylaenoides* and Ruby Saltbush *Enchylaena tomentosa* emphasise the dry nature of the community.

Structure: Woodland over a grassy and herbaceous ground layer.

References: VicRFA (2000).

Additional Comments: This floristic community was extensive across the Northern Plains of Victoria with isolated occurrences in dry rainshadow areas south of the Great Dividing Range. The few remnants within the study area represent the entire range of this community south of the Divide.

EVC 56 Floodplain Riparian Woodland

Open woodland -dominated over a medium to tall shrub layer with a ground layer consisting mainly of grasses, herbs and sedges. Occurs along the floodplains of the larger meandering rivers, characteristically in conjunction with one or more wetland communities. Elevation and rainfall are relatively low and the soil is a deep, fertile clay or loam/silt alluvium subject to periodic major flooding.

The range of floristic and environmental attributes for Floodplain Riparian Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 20-170m.

Topography: River and stream floodplains.

Geology: Quaternary basalt and Recent river alluvium.

Soils: Sands, silts and clays often high in organic matter and subject to seasonal inundation.

Present distribution: Restricted to the riparian areas of the mainly basalt plains west of Melbourne, and the Plenty and Yarra River floodplains.

Floristics: The overstorey is dominated by River Red Gum *Eucalyptus camaldulensis* in the drier areas, replaced by Manna Gum *Eucalyptus viminalis* and Swamp Gum *Eucalyptus ovata* at higher rainfalls (>700mm per annum).

The variable lower stratum usually has a diversity of small trees, mostly *Acacia* species such as Silver Wattle *Acacia dealbata*, Black Wattle *Acacia mearnsii* and Blackwood *Acacia melanoxylon*. Also present are the shrubs Sweet Bursaria *Bursaria spinosa*, River Bottlebrush *Callistemon sieberi*, Tree Violet *Hymenanthera dentata*, Woolly Tea-tree *Leptospermum lanigerum* and Swamp Paperbark *Melaleuca ericifolia.*

The groundlayer includes a mixture of perennial and annual herbs capable of withstanding periodic flooding. These variously include Common Blown-grass *Agrostis avenacea*, Water Plantain *Alisma plantago-aquatica*, Lesser Joyweed *Alternanthera denticulata*, Sea Celery *Apium prostratum,* Marsh Club-sedge *Bolboschoenus medianus*, Tall Sedge *Carex appressa*, Swamp Crassula *Crassula helmsii*, Kidney-weed *Dichondra repens*, Nodding Club-sedge *Isolepis cernua*, Loose-flower Rush *Juncus pauciflorus*, Broom Rush *Juncus sarophorus*, Angled Lobelia *Lobelia anceps*, Small Loosestrife *Lythrum hyssopifolia*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Common Reed *Phragmites australis*, Common Tussockgrass *Poa labillardierei,* Slender Knotweed *Persicaria decipiens,* River Club-sedge *Schoenoplectus validus*, Shiny Swamp-mat *Selliera radicans*, Water Ribbons *Triglochin procerum* and Large Bindweed *Calystegia sepium*.

Structure: Woodland, open woodland, shrubland, herbfield, sedgeland, reed bed.

References: Robinson (unpubl). VicRFA (1997).

Additional Comments: This vegetation includes very distinctive assemblages of plants. The zonation of the various components within it is dictated by the periods of inundation.

EVC 61 Box Ironbark Forest

Occurs in low rainfall areas on gently undulating rises, low hills and peneplains. Soils ranging from fertile clays to more infertile gravel deposits. An overstorey of Red Ironbark and Red Box is often present over a small tree or shrub mid storey with an open ground layer of herbs and grasses.

The range of floristic and environmental attributes for Box Ironbark Forest is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 120-300m.

Topography: Medium to strongly sloping exposed sites.

Geology: Tertiary fan deposits and Devonian, Silurian and Ordovician sediments.

Soils: Shallow, infertile, sodic, duplex.

Present distribution: Restricted to a few small occurrences along the upper slopes adjacent to the Plenty River, the Christmas Hills-Panton Hill-Diamond Creek area and the Pyrete State Forest/Toolern Vale area.

Floristics: The overstorey is variously dominated by Red Ironbark *Eucalyptus tricarpa* or with Red Box *Eucalyptus polyanthemos* subsp. *vestita,* Bundy *Eucalyptus goniocalyx*, Yellow Gum *Eucalyptus leucoxylon* subsp. *connata* and Red Stringybark *E. macrorhyncha*. Golden Wattle *Acacia pycnantha* often forms a dense to open small tree layer. Cherry Ballart *Exocarpos cupressiformis* is also frequently present.

The shrub layer consists of Shiny Cassinia *Cassinia longifolia,* Wedgeleaf Hop-bush *Dodonea viscosa* subsp. *cuneata*, Gold-dust Wattle *Acacia acinacea*, Cranberry Heath *Astroloma humifusum* and Grey Everlasting *Ozothamnus obcordatus*.

Herbs present in the ground layer include Saloop Saltbush *Einadia hastata*, Common Raspwort *Gonocarpus tetragynus,* Variable Stinkweed *Opercularia varia* and Trailing Speedwell *Veronica plebeia*. Grasses such as Common Blown-grass *Agrostis avenacea,* Soft Tussock-grass *Poa morrisii,* Silvertop Wallaby-grass *Joycea pallida,* Kneed Wallaby-grass *Austrodanthonia geniculata,* Stiped Wallaby-grass *Austrodanthonia racemosa,* Bristly Wallaby-grass *Austrodanthonia setacea* and Purplish Wallaby-grass *Austrodanthonia tenuior* are common. Thatch Saw-sedge *Gahnia radula* is abundant at some sites.

Structure: Open forest.

References: Robinson (unpubl), Muir *et al*. (1995).

Additional comments: Ironbark eucalypts occasionally extend into other EVCs such as Shrubby Dry Forest. At times within the study area floristic distinction between the Box Ironbark and Grassy Dry Forest EVCs was difficult. Consequently, in some cases there may be a degree of overlap between these two EVCs.

EVC 68 Creekline Grassy Woodland

Eucalypt-dominated woodland with occasional scattered shrub layer over a mostly grassy/sedgy to herbaceous ground layer. Occurs on low-gradient ephemeral to intermittent drainage lines, typically on fertile colluvial/alluvial soils, on a wide range of

suitably fertile geological substrates, within Plains Grassy Woodland in lower rainfall areas. These minor drainage lines can include a range of graminoid and herbaceous species tolerant of waterlogged soils, and are presumed to have sometimes resembled a linear wetland or system of interconnected small ponds.

Formerly widespread in narrow bands within suitable habitat, now almost entirely cleared or eroded as a consequence of altered hydrology.

The range of floristic and environmental attributes for Creekline Grassy Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 20-120m.

Topography: Ephemeral drainage lines of lower slopes of foothills and outlying hills to smaller intermittent creeks of the floodplain.

Geology: Minor alluvium within sedimentary or basalt soils.

Soils: Sands, silts and clays.

Present distribution: Restricted to isolated remnants on creeks and rivers on the plains just north-west of Melbourne such as tributaries of Moonee Ponds Creek, Deep Creek and the Maribyrnong River and also in the Mitcham area.

Floristics: The overstorey is dominated by River Red Gum *Eucalyptus camaldulensis.* A scattered shrub layer includes Black Wattle *Acacia mearnsii*, Blackwood *Acacia melanoxylon,* Sweet Bursaria *Bursaria spinosa* and sometimes Swamp Paperbark *Melaleuca ericifolia.*The ground layer is dense with grasses and sedges, most commonly Tall Sedge *Carex appressa,* Common Tussock-grass *Poa labillardierei*, Weeping Grass *Microleana stipoides* var*. stipoides*, Kangaroo Grass *Themeda triandra*, Common Wheat-grass *Elymus scabra*, Common Blown-grass *Agrostis avenacea* and Rushes *Juncus* spp.

Structure: Woodland to open woodland over a scattered medium to tall shrub layer and a dense layer of sedges and grasses. Creek banks lined with tall sedges and shrubs.

References: Muir *et al* (1995), VicRFA (1999).

Additional Comments: Few intact remnants survive in the study area due to industrial and urban development. This makes it very difficult to distinguish as a separate EVC to Plains Grassy Woodland and further sampling and analysis is required to clarify its status.

EVC 83 Swampy Riparian Woodland

Once a common vegetation type along broad drainage lines with slight gradients and on levees near streams, the EVC Swampy Riparian Woodland has been largely altered, particularly by drainage for agriculture. The range of floristic and environmental attributes for Swampy Riparian Woodland are tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 5-270m.

Topography: Riparian zone of low gradient streams, including levees and wetland systems associated with the verges of channels and ponds.

Geology: Quaternary alluviums.

Soils: Silt-rich river sands and gravels.

Present distribution: Low energy streams of the coastal plains and lower foothills inland from Port Phillip (Scotchmans Creek, Gardiners Creek and Ruffey Creek) to the south-east of Melbourne and Westernport Bays, Mornington Peninsula, Pakenham-Cardinia area, Kooweerup Swamp, and north-east of the study area.

Floristics: The overstorey is dominated by Swamp Gum *Eucalyptus ovata* or in higher elevations Mountain Swamp Gum *Eucalyptus camphora.* The lower strata are variously locally dominated by Swamp Paperbark *Melaleuca ericifolia,* Woolly Tea-tree *Leptospermum lanigerum* and Common Reed *Phragmites australis*. A range of shrub species occurs on the stream levees (eg. Hop Goodenia *Goodenia ovata*, Sweet Bursaria *Bursaria spinosa*, Victorian Christmas-bush *Prostanthera lasianthos*, Wattles *Acacia* spp. and Hemp Bush *Gynatrix pulchella*), in mixture with Spiny-headed Mat-rush *Lomandra longifolia* and Common Tussock-grass *Poa labillardierei*.

Structure: Woodland occurring on stream banks and including riparian elements such as reeds, sedges, rushes, tussock grasses and aquatic herbs.

References: Frood (pers. com.).

Additional Comments: This EVC is currently undersampled due to the lack of intact remnants. Swampy Riparian Woodland has some affinities with Riparian Forest but is found on lower gradient streams. The vegetation is almost a linear wetland bound by levees and lacks the tall Manna Gum *Eucalyptus viminalis* subsp. *viminalis* overstorey and broad-leaved shrub component of Riparian Forest. It is also closely related to Swampy Woodland that occurs on swampy flats, sometimes adjacent to Swampy Riparian Woodland. Most forms of Swampy Woodland are rarely inundated by flood waters, but can be subject to seasonal waterlogging and temporary inundation from surface runoff.

EVC 126 Swampy Riparian Complex

Swampy Riparian Complex occurs on poor drainage areas located in topographically protected high rainfall country. The complex consists of emergent eucalypts over a shrub layer with a ground layer primarily ferny to sedgy in character, including mixtures of wet forest and poor-drainage species. This complex has previously been used in other study areas as a default unit to encompass a number of floristic entities such as Creekline Herb-rich Woodland, Swampy Woodland, Gully Woodland, Shrubby Gully Forest and Swamp Forest. Overall, the composition and ecology of the vegetation types included in Swampy Riparian Complex are poorly defined due to a lack of intact extant examples. For this study, Gully Woodland, Swampy Woodland, Creekline Herb-rich Woodland and Shrubby Gully Forest have been separated out, where possible. Swamp Forest has not been recorded from the study area, but has been mapped (pre-1750) in the higher rainfall country in the Warragul area to the east.

EVC 164 Creekline Herb-rich Woodland

A woodland of low-gradient swampy gullies with a grassy/sedgy to rushy ground layer including a component of species associated with wetland habitats.

The range of floristic and environmental attributes for Creekline Herb-rich Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 20-180m.

Topography: Low-gradient swampy gullies within relatively open grassy vegetation (usually in association with Valley Grassy Forest).

Geology: Various.

Soils: Alluvial sands, silts and clays.

Present distribution: Isolated patches at Mt. Martha and in the foothills north-east of Melbourne (eg. Eltham-Hurstbridge area)

Floristics: The overstorey is dominated by Swamp Gum *Eucalyptus ovata* or Yarra Gum *Eucalyptus yarraensis*, with Candlebark *Eucalyptus rubida* also frequent in less boggy sites. A range of other eucalypt species such as Red Stringybark *Eucalyptus macrorhyncha*, Yellow Box *Eucalyptus melliodora*, Narrow-leaf Peppermint *Eucalyptus radiata* and Messmate *Eucalyptus obliqua* may also be present.

The understorey variously includes scattered shrubs such as Blackwood *Acacia melanoxylon*, Silver Wattle *Acacia dealbata*, Sweet Bursaria *Bursaria spinosa,* Prickly Tea-tree *Leptospermum continentale* and Burgan *Kunzea ericoides*.

Species of the ground layer include Common Tussock-grass *Poa labillardierei*, Soft Tussock-grass *Poa morrisii*, Slender Tussock-grass *Poa tenera*, Common Maidenhair *Adiantum aethiopicum*, Bidgeewidgee *Acaena novae-zelandiae,* Centella *Centella cordifolia*, Austral Brooklime *Gratiola peruviana,* Joint-leaf Rush *Juncus holoschoenus*, Angled Lobelia *Lobelia anceps,* Prickfoot *Eryngium vesiculosum* and Lanky Goodenia *Goodenia elongata*. Thatch Saw-sedge *Gahnia radula* and Austral Bracken *Pteridium esculentum* are present at some sites.

Structure: Woodland to open woodland with a variable shrub component, a grassy/sedgy (to rushy) ground layer with a component of species affiliated with wetland habitats.

References: Frood (in prep.).

Additional Comments: A range of the component herbaceous flora is now regionally very rare to threatened in this habitat (eg Lanky Goodenia *Goodenia elongata,* Prickfoot *Eryngium vesiculosum,* Pale Swamp Everlasting *Helichrysum* aff*. rutidolepis* (Lowland Swamps) and Billy-buttons (*Craspedia* spp.). Creekline Herb-rich Woodland has become very restricted within the study area. Most sites are very weedy and degraded and the above description is a collective interpretation based on chance survival of component species. Ecologically, Creekline Herb-rich Woodland is intermediate between Valley Grassy Forest and Riparian Forest/Swampy Riparian Woodland. Further sampling and analysis is required to clarify its status.

EVC 172 Floodplain Wetland Complex

This is a complex of a number of formally described and undescribed wetland EVCs including Billabong Wetland (which surrounds deep, often permanent water bodies, typically billabongs on the flood plain of major rivers) and shallow seasonal billabongs. All entities included in this complex are rare within the study area. Where biotic features still exist, the floristic composition has generally been radically altered, making detailed descriptions or onground distinctions between them impossible. The range of floristic and environmental attributes for Floodplain Wetland Complex is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitudinal range: 20-70m.

Topography: Low lying areas, depressions and billabongs on floodplains of major rivers.

Geology: Swamp and lagoonal deposits.

Soils: Silts, peats and clays.

Present distribution: Yarra River flats (eg. Yering, Bulleen).

Floristics: The overstorey typically consists of River Red Gum *Eucalyptus camaldulensis*. The shrub layer is sparse to non-existent. The understorey can be diverse or dominated by a few species such as Cumbungi *Typha orientalis*, Rush Sedge *Carex tereticaulis* or Pacific Azolla *Azolla filiculoides.* Other species possibly present include Clove-strip *Ludwigia peploides* subsp. *montevidensis*, Water-milfoil *Myriophyllum* spp, Creeping Knotweed *Persicaria prostrata,* River Buttercup *Ranunculus inundatus*, Thin Duckweed

Spirodela punctata, Tall Flat-sedge *Cyperus exaltatus,* Hollow Rush *Juncus amabilis,* Green Rush *Juncus gregiflorus,* Giant Rush *Juncus ingens,* Tall Rush *Juncus procerus,* Common Spike-sedge *Eleocharis acuta*, Spiny Mudgrass *Pseudoraphis spinescens*, Lesser Joyweed *Alternanthera denticulata*, Common Blown-grass *Agrostis avenacea* and Tall Spike- sedge *Eleocharis sphacelata.*

Structure: Woodland to open woodland over varied sedgeland-grassland and/or aquatic herbland.

Additional Comments Sometimes incorporated into the EVC 'Floodplain Riparian Woodland' of which it is a component and it can be difficult to resolve at smaller scales.

EVC 175 Grassy Woodland

A variable open eucalypt (or occasionally sheoak) woodland over a diverse ground layer of grasses and herbs. The shrub component is usually sparse. It occurs on sites with moderate fertility on plains or undulating hills on a range of geology. Previously widespread and locally extensive but now largely cleared for agriculture. Remnants are generally heavily grazed or altered by fire regimes.

The range of floristic and environmental attributes for Grassy Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 20-100m south and east of Melbourne, 200-400m north-east of Melbourne.

Topography: Undulating to flat plain.

Geology: Mainly Tertiary sediments but also Ordovician and Silurian sediments and granite/granodiorite.

Soils: Variable, ranging from duplex soils to humic gley soils to ferruginous sands and sandy clays.

Present distribution: The main area of distribution is the Mornington Peninsula and adjacent areas from about Seaford and Braeside southward but also north-west of Melbourne in the Sunbury and Toolern Vale areas, the coastal plain east of Westernport Bay between Lang Lang and Bass, north of Inverloch and Wonthaggi and Phillip Island. Examples of this EVC on the Mornington Peninsula are at Mount Martha Park, Woods Reserve, Moorooduc South and Lorikeet Reserve, Mount Eliza.

Floristics: The overstorey is variously dominated by Drooping Sheoak *Allocasuarina verticillata* and Black Sheoak *Allocasuarina littoralis* or eucalypt species eg. Narrow-leaf Peppermint *Eucalyptus radiata,* Coast Manna Gum *Eucalyptus viminalis* subsp. *pryoriana,* Snow Gum *Eucalyptus pauciflora,* Swamp Gum *Eucalyptus ovata.* Other eucalypts in more ecotonal habitats include Messmate *Eucalyptus obliqua,* Mealy Stringybark *Eucalyptus cephalocarpa*, Grey Box *Eucalyptus microcarpa* or Bundy *Eucalyptus goniocalyx.*

Other woody species variously include Black Wattle *Acacia mearnsii*, Blackwood *Acacia melanoxylon*, Hedge Wattle *Acacia paradoxa*, Cherry Ballart *Exocarpos cupressiformis*, Prickly Tea-tree *Leptospermum continentale*, Sweet Bursaria *Bursaria spinosa,* Black Sheoak *Allocasuarina littoralis*, Common Flat-pea *Platylobium obtusangulum* and Common Heath *Epacris impressa*.

The very diverse ground cover variously includes Weeping Grass *Microlaena stipoides* var. *stipoides*, Kangaroo Grass *Themeda triandra*, Soft Tussock-grass *Poa morrisii*, Grey Tussock Grass *Poa sieberiana*, Velvet Wallaby-grass *Austrodanthonia pilosa*, Bristly Wallaby-grass *Austrodanthonia setacea*, Wetland Wallaby-grass *Notodanthonia semiannularis*, Reed Bent-grass *Deyeuxia quadriseta*, Veined Spear-grass *Austrostipa*

rudis, Milkmaids *Burchardia umbellata,* Tall Sundew *Drosera peltata* subsp. *auriculata*, Ivy-leaf Violet *Viola hederacea* subsp. *hederacea*, Yellow Rush-lily *Tricoryne elatior*, Chocolate Lily *Arthropodium strictum*, Kidney-weed *Dichondra repens*, Shade Raspwort *Gonocarpus humilis*, Common Raspwort *Gonocarpus tetragynus*, Variable Stinkweed *Opercularia varia*, Common Rice-flower *Pimelea humilis*, Small Poranthera *Poranthera microphylla*, Common Apple-berry *Billardieri scandens*, Love Creeper *Comesperma volubile*, Common Bottle-daisy *Lagenophora stipitata*, Annual Fireweed *Senecio glomeratus*, Honeypots *Acrotriche serrulata*, Spiny-headed Mat-rush *Lomandra longifolia*, Wattle Mat-rush *Lomandra filiformis*, Black-anther Flax-lily *Dianella revoluta*, Small Grass-tree *Xanthorrhoea minor* subsp. *lutea,* Austral Bracken *Pteridium esculentum* and Thatch Saw-sedge *Gahnia radula.* Sweet Pittosporum *Pittosporum undulatum* is also often present, outside its natural range.

Structure: Woodland, open-woodland with grassy/herbaceous understorey.

References: Robinson (unpubl).

Additional Comments: Grassy Woodland has affinities with a number of EVCs including Herb-rich Foothill Forest, Valley Grassy Forest, Valley Heathy Forest, Grassy Forest and Plains Grassy Woodland. Compared to Herb-rich Foothill Forest, it is much drier and lower in stature with a more open overstorey and the floristic composition is that of a less mesic environment. Valley Grassy Forest mostly lacks sclerophyllous shrubs other than some *Acacia* species but a range of small sclerophyllous shrubs are typically present in Grassy Woodland (eg. Silky Guinea-flower *Hibbertia sericea* s.l. and Common Flat-pea *Platylobium obtusangulum*). Grassy Woodland occurs on more fertile soils and is more open and not as rich in ericoid species as Valley Heathy Forest. The Grassy Woodland flora is often dominated by Kangaroo Grass *Themeda triandra* and is indicative of more fertile sites compared to Grassy Forest. Grassy Woodland has been extensively cleared for agriculture and urban development and few intact remnants remain. It is likely that Grassy Woodland in the study area includes a number of floristic communities but disturbance and lack of large intact remnants have made these communities difficult to define. It appears that at least some of the (now) densely treed remnants in lower rainfall areas were very open (almost grasslands) prior to European settlement. These changes appear to be due to alterations to fire and grazing regimes. More floristic analysis of high quality Grassy Woodland remnants is required. The EVC label has been used to denote presumed prior vegetation on a range of moderately fertile soil types which supported some form of grassy woodland vegetation (but were not on soil types or habitats sufficiently fertile to support Plains Grassy Woodland). Consequently, it has developed as a default unit for sites that do not fit into the EVC Plains Grassy Woodland as well as being used for well-defined vegetation types on fertile Tertiary soils.

EVC 641 Riparian Woodland

Woodland dominated by River Red Gum *Eucalyptus camaldulensis* over a Common Tussock-grass *Poa labillardierei* dominated understorey. It occurs beside permanent streams, typically on narrow alluvial deposits.

The range of floristic and environmental attributes for Riparian Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 100-160m.

Topography: Adjacent to permanent streams.

Geology: Quaternary basalt and recent alluviums with restricted occurrences within sedimentary soils.

Soils: Moderately deep, fertile alluvial loams.

Present distribution: Restricted to a few occurrences along Deep Creek north-east of Sunbury, and sections of the Yarra River and its tributaries such as Ruffy Creek and the Plenty River.

Floristics: The overstorey is dominated by River Red Gum *Eucalyptus camaldulensis*, with occasional Manna Gum *Eucalyptus viminalis* subsp. *viminalis*.

Other major woody species include Black Wattle *Acacia mearnsii*, Swamp Paperbark *Melaleuca ericifolia*, Tree Violet *Hymenanthera dentata*, Sweet Bursaria *Bursaria spinosa*, River Bottlebrush *Callistemon sieberi*, Woolly Tea-tree *Leptospermum lanigerum* and Hemp Bush *Gynatrix pulchella*.

Ground layer species include Stiped Wallaby-grass *Austrodanthonia racemosa,* Kidney-weed *Dichondra repens*, Saloop Saltbush *Einadia hastata*, Common Tussock-grass *Poa labillardierei,* Slender Dock *Rumex brownii*, Shrubby Groundsel *Senecio minimus* and Trailing Speedwell *Veronica plebeia.*

Structure: Woodland.

References: Robinson (unpubl), VicRFA (2000).

Additional Comments: Riparian Woodland has affinities with Floodplain Riparian Woodland but the billabongs and former stream channels characteristic of Floodplain Riparian Woodland are absent. The latter EVC consists of an understorey of mixed shrubs but it lacks the clearly defined layer of small trees characteristic of Riparian Woodland, though Black Wattle *Acacia mearnsii* may form small stands. The ground layer of Riparian Woodland contains many species that are typical of riparian areas but also contains some species that are normally found in drier areas. This suggests that unlike the majority of the vegetation included in Floodplain Riparian Woodland, the soils are more freely draining and not as moist throughout the year. The vegetation on drier banks and levees within Floodplain Riparian Woodland is presumably a form of Riparian Woodland. While flooding may be common in this EVC, sites are rarely inundated for lengthy periods. High volume seasonal flows may be common. Formerly widespread along major creeks and rivers mostly on the basalt plains within the study area, now greatly reduced due to clearing for agriculture and housing and industrial development.

EVC 895 Escarpment Shrubland

An open shrubland generally associated with steep embankments beside major watercourses in low rainfall areas. The range of floristic and environmental attributes for Escarpment Shrubland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 140-200m.

Topography: Escarpments associated with the edges of basalt flows or where watercourses have cut deeply into the bedrock.

Geology: Mainly Quaternary basalt, with some Silurian sedimentary sites.

Soils: Fertile, skeletal.

Present distribution: Scattered along the escarpment of Deep Creek from Bulla north to Kongaderra, Merri Creek in Somerton area and small occurrences along the Yarra and Plenty Rivers.

Floristics: (on basalt) Apart from the occasional Drooping Sheoak *Allocasuarina verticillata* along the escarpment rim, the tallest stratum is the shrub layer. Common shrub species include Tree Violet *Hymenanthera dentata*, Black Wattle *Acacia mearnsii*, Lightwood *Acacia implexa*, Hedge Wattle *Acacia paradoxa*, Sweet Bursaria *Bursaria spinosa* and Sticky Hop-bush *Dodoanea viscosa*. Other species recorded include White

Cypress Pine *Callitris glaucophylla*, Cassia *Senna artemisioides*, Myoporum *Myoporum viscosum*, Rock Correa *Correa glabra* and Rosemary Grevillea *Grevillea rosmarinifolia*. Many of these species are now extremely rare in the study area. The ground layer consists of a few grasses and herbs such as Stiped Wallaby-grass *Austrodanthonia racemosa* var. *racemosa,* Weeping Grass *Microlaena stipoides* var. *stipoides*, Kidney-weed *Dichondra repens,* Kangaroo Grass *Themeda triandra* and Nodding Saltbush *Einadia nutans* subsp. *nutans.* In sheltered rocky sites the ferns Necklace Fern *Asplenium flabellatum*, Annual Fern *Anogramma leptophylla* and Sickle Fern *Pellaea falcata* may be found.

Floristics: There are often scattered eucalypts, variously River Red Gum *Eucalyptus camaldulensis*, Bundy *Eucalyptus goniocalyx*, Yellow Gum (on Silurian sediments) *Eucalyptus leucoxylon*, Red Stringybark *Eucalyptus macrorhyncha*, Yellow Box *Eucalyptus melliodora* or Manna Gum *Eucalyptus viminalis* subsp*. viminalis*. The shrub layer is dominant and includes Black Wattle *Acacia mearnsii*, Lightwood *Acacia implexa*, Hedge Wattle *Acacia paradoxa*, Golden Wattle *Acacia pycnantha,* Spreading Wattle *Acacia genistifolia*, Black Sheoak *Allocasuarina littoralis*, Cassinia spp., Tree Violet *Hymenanthera dentata*, Tree Everlasting *Ozothamnus ferrugineus*, Burgan *Kunzea ericoides* and Prunus Pomaderris *Pomaderris prunifolia*. Ground layer species in more intact remnants include Pink Bindweed *Convolvulus erubescens*, Shiny Everlasting *Bracteantha viscosa*, Prickly Starwort *Stellaria pungens*, Bedstraw *Galium* spp.,Variable Sword-sedge *Lepidosperma laterale*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Spiny-headed Mat-rush *Lomandra longifolia* subsp*. longifolia*, Saloop *Einadia hastata* and Nodding Saltbush *Einadia nutans* subsp*. nutans.*

Structure: Open-shrubland.

References: VicRFA (2000).

Additional Comments The floristics of Escarpment Shrubland vary according to whether they are occurring on sheltered or exposed aspects. Sheltered types may include ferns and sometimes broad-leaved shrubs. Previously localised and restricted habitat in the study area and now almost entirely cleared.

EVC 937 Swampy Woodland

Swampy Woodland occurs in low gradient habitat on seasonally waterlogged soils. This waterlogging is caused by seepage or surface run-off but not inundation from active floodplains. It has a large component of damp site species but overall lacks the obligate wetland flora. One floristic community, *Plains* Swampy Woodland, was formerly treated as a separate EVC, whereas other forms of Swampy Woodland were incorporated in Swampy Riparian Woodland or Swampy Riparian Complex. The range of floristic and environmental attributes for Swampy Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Altitude: 5-270m.

Topography: Wet flats, extending into valley floors in wet areas to the rear of stream levees.

Geology: Quaternary alluviums.

Soils: Silts to clays.

Present distribution: Stream and river flats inland from Port Phillip and Westernport Bays, Mornington Peninsula, Pakenham-Cardinia area, Lang Lang, and north-east of the study area.

Floristics: The overstorey is dominated by Swamp Gum *Eucalyptus ovata* (+/- relatively minor Messmate *Eucalyptus obliqua,* Narrow-leaf Peppermint *Eucalyptus radiata,* Yellow

Box *Eucalyptus melliodora* or Green Scentbark *Eucalyptus fulgens).* The understorey is generally open with small thickets of Swamp Paperbark *Melaleuca ericifolia* or Tea-trees *Leptospermum* spp. The ground layer is generally dense with Common Tussock-grass *Poa labillardierei,* Sedges *Carex* spp. and herbs shared with wetland habitats eg. Centella *Centella cordifolia*, Swamp Mazus *Mazus pumilo*, Austral Brooklime *Gratiola peruviana* and Joint-leaf Rush *Juncus holoschoenus.*

Structure: Woodland to open woodland which can include treeless areas (variously shrubland, reedbed or herbland). Lower strata variable, with patchy dominance by taller shrubs, reeds, sedges and tussock grasses, and on occasion wetland (to aquatic) herbs.

References Frood (pers. com).

Additional Comments Swampy Woodland has close affinities with Swamp Scrub which is usually a closed scrub of Swamp Paperbark *Melaleuca ericifolia* or Woolly Tea-tree *Leptospermum lanigerum.* It has a wider range of shrub and grass species and a reduced wetland component compared with Swamp Scrub. This EVC is currently undersampled due to the lack of intact remnants and may include several other floristic communities. The range of floristic and environmental attributes for the floristic community *Plains* Swampy Woodland is tabulated below. Where information from published or unpublished reports is included the references are cited.

Floristic Community 937-01 Plains Swampy Woodland

A eucalypt woodland with the ground layer dominated by tussock grasses and/or sedges and rich in herbs when relatively intact.

Altitude: 40-200m.

Topography: Seasonally waterlogged flats.

Geology: Primarily on paludal deposits on the volcanic plains with restricted occurences within Quaternary and Tertiary sediments.

Soils: Poorly drained, seasonally waterlogged heavy soils, normally black clay, sometimes with a silt overlay.

Present distribution: Reduced to small, degraded remnants only in Keysborough area southeast of Melbourne and the Whittlesea-Epping area north of Melbourne.

Floristics: The overstorey is dominated by Swamp Gum *Eucalyptus ovata* and occasionally River Red Gum *Eucalyptus camaldulensis*. An understorey tree layer of Blackwood *Acacia melanoxylon* is often present. Shrubs, if present, can include Tree Everlasting *Ozothamnus ferrugineus*, Prickly Tea-tree *Leptospermum continentale* and Scrub Sheoak *Allocasuarina paludosa*. Sedges are frequently conspicuous in the ground layer, most commonly *Carex* spp. but also including Coast Saw-sedge *Gahnia trifida*. Grasses (notably Common Tussock-grass *Poa labillardierei*) tolerant of waterlogging and a range of herbs occur in relatively intact sites.

Structure: Woodland, stunted in most waterlogged sites, with sedgy/grassy understorey.

References: VicRFA (1999).

Additional Comments: Plains Swampy Woodland occurs on highly fertile soils in areas that supported Plains Grassy Woodland on more free-draining soils before clearing of the vegetation. The description is limited due to the paucity and the extent of alteration of remnants.

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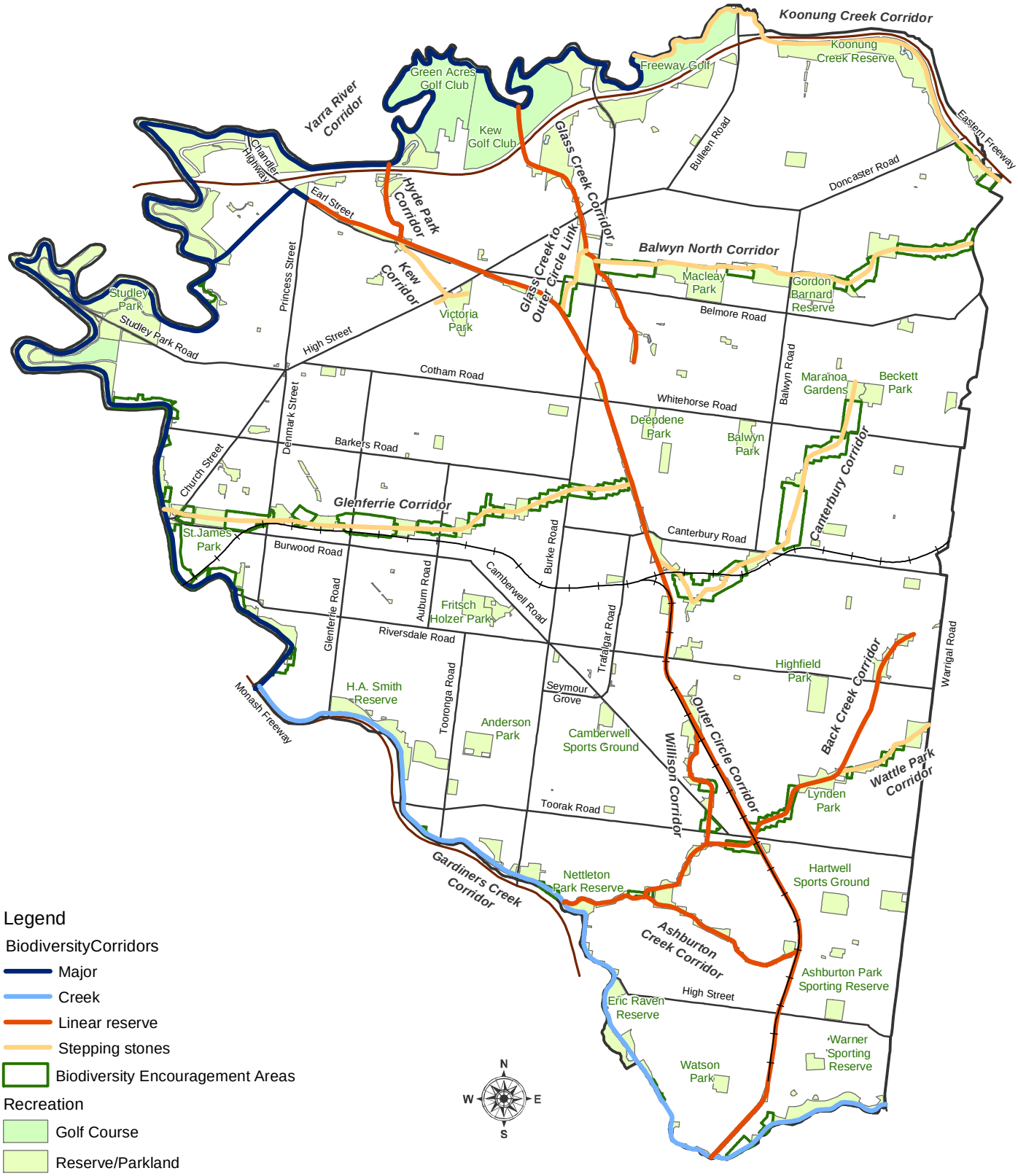
Map 1
Biodiversity Corridors
City of Boroondara



Legend

BiodiversityCorridors
- Major
- Creek
- Linear reserve
- Stepping stones

Biodiversity Encouragement Areas

Recreation
- Golf Course
- Reserve/Parkland
- Water Feature

Boroondara Boundary

Railway Line

Freeway

Primary Road

Metres

0 625 1,250 2,500

BOROONDARA
City of Harmony

Map 2
Ecological Vegetation Classes C.1750