Knox Revegetation Plan

Version 1.0, 20 November 2012

prepared by Dr Graeme Lorimer, Biosphere Pty Ltd

for Knox City Council

Contents

Acknowledgments

Thanks are extended to the following people who made substantial contributions to the investigations for this document:

Council staff and Councillors

- Nadine Gaskell, project manager for the project;
- Steve Rowlands, whose previous investigation into the opportunities for planting trees in Knox laid valuable groundwork for this document;
- The following staff who provided extensive information about their departments' roles in revegetation and planting: Peter Carlos, Dru Taylor and Ashley Tenson (Parks Services), Peter Kavan (Stamford Park); Marshall Kelaher (Open Space and Landscape Design), James Rose and John Erwin (Biodiversity);
- The following staff who provided planting data: Daniella Gerente, Ian Gleghorn, Flora Lau, Blair McCallum, Hans Pelgrim, Jennifer Prior;
- Councillors Van De Vreede and Cooper for providing useful feedback on the public draft, particularly in regard to the recent history of Council's policies and funding related to planting.

Other contributors

- Darren Wallace (Operation Revegetation Pty Ltd and the Knox Environment Society), who provided extensive information about the practicalities and obstacles to the supply and planting of indigenous plants, as well as various other aspects of this report;
- Members of the Environment Advisory Committee to Knox City Council, who contributed a number of suggestions and ideas to this project;
- The Knox Environment Society, whose members met with the author to discuss their experiences with revegetation, street trees and their indigenous nursery. The Society also provided feedback on the public draft;
- Greg Hollis of Baw Baw Shire Council and Joanna Lebbink of the Yarra Ranges Shire Council for information about their upcoming trial programs to sell vegetation 'offset credits';
- Lis Ashby (Department of Sustainability & Environment) and Cathy Willis (Manningham City Council) for additional information about sale of offset credits;
- Mark Williams and his group, the Friends of Koolunga Native Reserve, for positive feedback to the public draft.

Executive Summary

Context

Knox City Council plants approximately 150,000 plants each year for a wide range of purposes, such as street tree replacement, bushland habitat management, amenity gardening and stormwater management. This represents a substantial commitment of funds and staff time, commensurate with the substantial benefits that planting offers, such as:

- Beauty and amenity, including the green and leafy sense of place that is so appreciated in much of Knox;
- Local-scale moderation of weather – wind, heat, cold, sun;
- Sequestration of atmospheric carbon;
- Purification of air and water;
- Stabilisation of stream banks and flood mitigation downstream;
- Helping the survival of wild plants, animals and natural ecosystems;
- Improving the community's contact with nature.

This revegetation plan is aimed at maximising the coordination, efficiency and benefits of such plantings. It supports the 'Knox Council Plan 2009-2013', which includes the following key priority actions:

- Planting a minimum of 100,000 trees per year in public space, to enhance natural habitats, open space and bush boulevards by 2013;
- Continuing to contribute to a seamless tree canopy stretching from the Dandenong Valley to the tip of the Dandenongs;
- As a minimum, achieving no net loss in Council's street trees on an annual basis; and
- Where practicable, providing habitat linkages between sites of biological significance.

Additional motivation for this revegetation plan comes from Council's commitments to planting in a range of documents such as the *'Knox City Council Vision 2025'*, the *'Knox Urban Design Framework 2020'* and the *'Knox City Council Streetscape Policy'*.

In this plan, the term, 'revegetation' is widely circumscribed. It includes planting for amenity as well as environmental reasons. It spans the range of planting complexity from an individual specimen tree in a lawn to reconstruction of natural vegetation with its associated ecological functions.

Council's Existing Planting Activities

Chapter 2 contains an audit and assessment of all the planting done by Council, spanning the departments of Engineering, Parks Services, Biodiversity, and Open Space & Landscape Design. A summary of planting during the 2012 financial year is tabulated below.

Table 1. Summary of plantings by Council for different purposes in the 2011-12 financial year.

Purpose	Origin of Species			Total	% of grand total
	Indigenous	Australian native	Non-Australian		
street trees	309	777	266	1,352	1%
other roadside planting	14,250	4,307		18,557	11%
around buildings & shops	5,321	6,680		12,001	7%
bushland reserves	11,850			11,850	7%
other reserves	60,816	10,363	24	71,203	43%
stream corridors (ground covers)	15,615	1,200		16,815	10%
stormwater management	31,621	2,013		33,634	20%
Totals	139,782	25,340	290	**165,412**	100%

The high proportion of indigenous species in the table, for every type of plant, is a result of Council's policies related to biodiversity conservation and a leafy, natural landscape.

By far the biggest purpose for Council's plantings is to maintain and improve the amenity of parks, accounting for 43% of planting this past financial year. This is followed by planting in and around wetlands for the management or harvesting of stormwater, which accounts for 20% of planting this financial year (with an increasing trend). Street trees represent less than 1% of the total number of plants installed but a substantial fraction of Council's total expenditure on planting, commensurate with their large visual impact.

Less than 1% of all plants planted by Council are trees that grow at least 15 m tall – a little higher than an average power pole. Leaving aside seven bushland reserves, the statistic falls below one in 600. This tiny proportion of large trees is due to preference being given in most situations for tree species that are smaller and hence easier to maintain and fit in the spaces available.

There is consequently a steady decline in the abundance of larger trees along Knox's streets and on most of Council's land, as the planting of larger species fails to keep up with attrition. Large trees on private land are showing an even stronger decline due to urban development and the unsuitability of large trees in small gardens or lawns. The net decline across private and Council land appears to be having a significant adverse effect on landscape and the environment.

On nature strips, Council is planting substantially more street trees than the number reaching the end of their useful life. However, there is a similar (but unquantified) number of street trees that are being permanently lost due to urban development, e.g. due to nature strips being crossed by increasing numbers of driveways as properties are subdivided. Council uses its

planning controls to minimise such losses but the reduction in nature strip space inevitably means some reduction in street trees. On the other hand, larger land developments create new streets lined with new street trees.

On balance, it appears that the Council Plan's Key Priority Action for no net loss of street trees is being met. However the average size of mature street trees is declining as smaller tree species are being favoured.

Another Key Priority Action in the Council Plan is to plant at least 100,000 trees per year. Similar pledges such as the national 'One Billion Trees' program usually interpret 'trees' as anything that is planted, even a wildflower. If we were to employ that broad interpretation, Table 1 shows that Council is easily exceeding 100,000 per year.

However, if we were to adopt a more conventional interpretation of 'tree', Council is falling short of the target by a factor of thirteen. It is unrealistic to increase Council's tree planting by such a large factor, which would exhaust all the available space for tree planting after a year or so. Such a goal would also carry a substantial risk of being counterproductive because:

- The landscape and environment could suffer from an imbalance between trees and understorey plants, and more weed control would be needed;
- There would be pressure to plant trees more densely, causing the trees to have poorer growth rates, health and form, leading to less benefit and higher maintenance requirements;
- There are advantages in a lower, sustainable increase in the level of funding and staff required for revegetation.

It is recommended that the new Council, in its preparation of the upcoming Council Plan, replace the '100,000 trees' commitment in light of the new information provided in this report. Options include providing separate targets for trees and understorey, or just one target for all kinds of plants.

Table 1 includes only Council's own plantings. In addition, Council oversees or strongly influences the planting of large numbers of plants by others. The Stamford Park redevelopment is an example of a Council project that involves tens of thousands of plants being planted under contract. Many additional plants are being planted annually in private land developments (e.g. Harcrest) as a result of Council's powers over planning permits. Council also runs incentive programs that encourage residents and others to undertake planting.

The audit of Council's planting activities determined that improved coordination between staff, particularly across departments, offers opportunities for improving the efficiency and benefits of planting programs. This observation leads to detailed recommendations in Chapter 4.

Factors Underpinning Revegetation Planning

Chapter 3 contains a comprehensive review of all the factors that are ideally taken into account when deciding what revegetation to conduct and how, either at a strategic or site-specific level. Examples of the factors considered include bushfire hazard, habitat connectivity, selection of species and the burgeoning threat of Myrtle Rust disease. The

Contents pages provide a convenient summary of the issues discussed, too numerous to summarise here.

These factors have been analysed to devise the revegetation strategy and site-specific plans described in the subsequent two chapters.

Chapter 3's review of issues surrounding planting should be useful for guiding all of Council's other revegetation projects, as well as people outside Council.

Chapter 3 includes an investigation of whether Council could gain carbon credits for its revegetation (Section 3.8, p. 34), concluding in the negative. Nevertheless, the rate of carbon dioxide sequestered by revegetation can be readily estimated and it is instructive to think of it as an offset for emissions associated with Council's energy consumption. For example, it would take approximately 150 hectares of revegetation at peak growth rate to balance the emissions from Council's whole vehicle fleet. The number of existing hectares has not been estimated.

There are no grants currently available to augment Council's funding of revegetation and the only known upcoming grant programs have not yet specified eligibility criteria or what type of revegetation will be favoured. Nevertheless, the revegetation proposed below should stand in good stead when grants become available.

Chapter 3 also investigates the potential for Council's revegetation to be used as 'offsets' to compensate for vegetation removal under planning permits. Calculations indicate that revegetation is a very costly way of achieving offsets and there is little chance of attracting significant funds for revegetation by selling offset credits. Nevertheless, there are sound reasons in some cases for Council to fulfil some of its offset obligations through revegetation even though it is not the cheapest option. The Appendix therefore includes a proposal to revegetate part of Lakewood Nature Reserve in Knoxfield to serve as an offset.

Revegetation Strategy

Chapter 4 provides a strategic framework of recommended measures to improve the efficiency and benefits of future plantings. These recommendations are intended to complement Council's routine review of policies and procedures, which are continually evolving. A summary follows:

Coordination

It is proposed that a 'Planting Round Table' be formed to coordinate revegetation proposals between relevant staff through regular meetings and circulation of planting proposals. This function could potentially be integrated with Council's existing program of semi-annual Capital Works Synergy Meetings. The objectives are to:

- Share information, expertise and comradeship among the participants;
- Identify any possible overlaps or inconsistencies between proposed projects;
- Seek synergies between projects that may arise from combining funds or resources, synchronising timing or adjusting designs and species; and

- Ensure that the broad range of Council policies, procedures and plans that affect planting are applied uniformly and well across all planting projects.

It is intended that all of Council's planting projects and their species lists go through the Round Table process, with the possible exception of street tree planting. Rush jobs can go through retrospectively if necessary.

The Planting Round Table needs a Secretariat (perhaps a nominated officer) to fulfil the following functions:

- Organise meetings at least twice annually and prompt participants for contributions as necessary;
- From the information provided by participants, maintain and disseminate a site-by-site list of planned planting projects and, once available, the associated species and numbers of plants. This would mostly occur in association with the meetings;
- Compile annual inventories of plantings done by Council, to support annual reporting of how well Council is meeting its goals in relation to planting;
- Check that plantings in or near bushfire-prone areas are referred to the Municipal Fire Prevention Officer for approval; and
- Monitor and disseminate updates regarding expert guidance on dealing with Myrtle Rust or other diseases.

Each participant would have a duty to check that projects coming to the Round Table respond well to the policies, procedures and plans for which their department has primary responsibility. For example, the Biodiversity team would check species against the Genetic Integrity Policy and Engineering Services would consider Water Sensitive Urban Design.

The Planting Round Table would be an appropriate forum for a proposed review of the optimum plant species to use for different purposes in Knox.

Budgetary Reform

Staff are having significant, increasing difficulty obtaining the optimum plants for their needs because they cannot place orders early enough. Council's budgetary horizon is one year and the lead time required for some specialty plants that Council needs can be three years or more.

Revegetation is similar to built assets such as buildings in that they sometimes can't be supplied in the same financial year as they are ordered and it is not always possible to confidently predict which programs they will be used for when they are ready. Revegetation and built assets are also alike in their need for ongoing maintenance. It is therefore recommended that the current review of Council's budgetary process for capital items considers whether funding approaches for built assets can be adapted to plants with long lead times. 'Lifecycle' capital funding could be useful for maintenance of some planted vegetation.

Two options are proposed for extending the budgetary time line for some plants. One is to fund planting projects for more than one financial year. The other involves providing annual funding to cover predicted future financial years' needs for each type of plant that has a long lead time, without tying the funding allocation to individual programs. (This is analogous to predicting the need for new buildings of different kinds, even though the specific occupants of the building may be uncertain.)

In each of these two approaches, the longer time horizon would allow Council to enter into multi-year contracts for the supply of plants, providing greater security and planning ability for both Council and its suppliers.

Maintenance of Revegetation

The maintenance of amenity plantings is being assessed in a separate Council process and is not analysed here. Maintenance of non-amenity revegetation sometimes falls by the wayside over the years. It appears that responsibility for long-term maintenance falls through the crack between bushland management and management of parks and gardens.

This is a significant problem because the greatest potential benefits of revegetation accrue as the revegetation matures, but not if it is left in need of weed control, thinning or other maintenance.

It is recommended here that Council give greater attention and funding to long-term maintenance of revegetation areas and that the responsibility for it be clearly assigned.

It is recommended that the financial arrangements for planting should make provision for whole-of-life costs (including ongoing maintenance) in a similar way to built assets. Wherever possible, the maintenance needs of past plantings should be satisfied prior to funding new plantings.

Priority Revegetation Sites

Building on Council's document, *'Tree Planting Opportunities in Knox'*, nine large priority sites have been selected for individual revegetation concept plans. Revegetation areas within each site have been mapped using a Geographic Information System (GIS) and associated information has been compiled, such as recommended species, locations and methods.

The Appendix provides maps and tables containing the information about each revegetation area, of which there are usually many within a single site.

New Land Developments

New land developments sometimes contribute substantially to the total planting effort in Knox, so it is desirable to encourage developers and their landscape architects to make use of the guidance for planting that is in this revegetation plan. This can be done by revising Council's document, *'Landscape Guidelines for Urban Planning Applications'*, to incorporate the main points from this revegetation plan that are relevant to landscape design for major land developments. Statutory planners routinely provide that document to developers of projects with substantial landscaping components.

Community Relations

Council's 'Gardens for Wildlife', 'Kindergartens for Wildlife' and 'Bush Buddies' programs are providing financial and other incentives for the community to contribute to revegetation in Knox. They also help to foster community support and understanding for Council's own revegetation efforts. It is recommended that they continue.

To avoid any doubts that the Knox community may have about Council's revegetation activities, it is recommended that:

- This revegetation plan be placed on Council's website for the community to consult;
- Front-line staff become familiar with the relevant parts of this revegetation plan so that they can refer interested or concerned people to it;
- Newspaper articles be periodically sought to explain the unconventional and innovative practices that Council undertakes in line with this revegetation plan; and
- Temporary explanatory signs be erected next to areas where such practices are being undertaken, as appropriate.

Conclusion

The changes to existing Council planting practice recommended here are modest, spanning administrative, budgetary, planning and practical measures. If implemented, the changes should increase the efficiency, accountability and benefits of plantings conducted by Council.

Implementation will require contributions from the four Council departments involved in planting as well as the Municipal Fire Prevention Officer and the Finance department. Figure 6 on page 50 provides a schematic diagram of a proposed position for the Revegetation Plan within the web of Council's policies, plans and programs.

The site-specific concept plans in the Appendix should allow more rapid and strategic revegetation in Knox, as long as Council's budget provides funds to do so.

1. Introduction

1.1. Context

Knox City Council plants around 150,000 plants each year for purposes such as:

- Maintenance and replacement of street trees;
- Management of bushland parks, other parks and creek corridors;
- Creating or improving wildlife corridors;
- Increasing the populations of locally threatened plant species;
- Landscaping of public spaces in gardens, lawns and around car parks; and
- Planting in association with Council's engineering projects, such as creation of stormwater treatment wetlands.

The combined costs of the plants, planning, site preparation, planting and maintenance represent a significant contribution to Council's expenditure. Street tree replacement, on its own, is budgeted to cost $610,000 in the 2012 financial year.

This revegetation plan is aimed at maximising the coordination, efficiency and benefits of Council's plantings. It provides:

- A strategic framework for prioritising the areas to be planted and the types of planting to be done to achieve a variety of objectives (e.g. habitat linkage, amenity, stormwater treatment);
- Recommended policies, systems, procedures and budgetary reforms to maximise the efficiency and benefit of future plantings; and
- Concept plans for proposed revegetation at some priority sites.

Strong motivation for this plan comes from two of Knox City Council's most important strategic documents: the *'Knox City Council Vision 2025'* and the *'Knox Council Plan 2009-2013'*. Both were updated in 2010 and are available from Council's website. Their overarching vision statement is:

> *'Knox City Council and the community: a partnership in progress; creating a safe, healthy and connected community with high quality services, transport options, facilities and culturally rich experiences; committed to protecting our green, leafy neighbourhoods and natural environment, and enhancing economic sustainability for future generations.'*

The associated 'key priority actions' for 2009-2013 include the following:

- Planting a minimum of 100,000 trees per year in public space, to enhance natural habitats, open space and bush boulevards by 2013;
- Continuing to contribute to a seamless tree canopy stretching from the Dandenong Valley to the tip of the Dandenongs;
- As a minimum, achieving no net loss in Council's street trees on an annual basis; and
- Where practicable, providing habitat linkages between sites of biological significance.

These objectives and the vision statement are supported by various subordinate documents such as the *'Knox Urban Design Framework 2020'*, the *'Knox City Council: 2008/2018 Sustainable Environment Strategy'* and the *'Knox City Council Streetscape Policy'*.

1.2. Types of Revegetation

In Australia, the term, 'revegetation', usually refers to the planting of Australian native species and particularly species which are indigenous to the site of the planting. This revegetation plan also covers cases where species from overseas are more appropriate, such as within an existing landscape of non-Australian plants.

The types of planting included within this document include:

- Individual specimen trees, mainly on road verges, in park lawns and car parks;
- Amenity gardens in parks and around Council buildings, civic facilities and shopping centres;
- Massed plantings of indigenous species into mulched beds to simulate the site's pre-European vegetation;
- Scattered planting of indigenous species within naturally occurring (or 'remnant') native vegetation, to increase biodiversity, provide specialised fauna habitat, restore a more natural vegetation structure or boost the populations of locally threatened plants;
- Artificial creation of vegetated wetlands, particularly for management of stormwater.

'Revegetation' is usually applied to planting rather than fostering natural regeneration of plants, e.g. by ceasing to mow so that seedlings of shrubs and trees can grow. Both approaches are directed toward similar outcomes and sometimes they are combined to maximise the speed of vegetation development and the range of species. Therefore, this plan deals with natural regeneration as well as planting.

1.3. The Benefits of Planting

The following list summarises the main benefits of the various types of planting considered in this plan:

- Beauty and amenity, including the green and leafy sense of place that is so appreciated in much of Knox;
- Local-scale moderation of weather – wind, heat, cold, sun;
- Sequestration of atmospheric carbon;
- Purification of air through transpiration and capture of pollutants;
- Purification of water by filtration on land and aquatic processes in wetlands;
- Stabilisation of stream banks and flood mitigation downstream;
- Helping the survival of wild flora, fauna and natural ecosystems, for their own sake and for the benefit of nature lovers;
- Providing contact with nature for the community, partly through subtle cues such as growth, seasonal cycles, fragrances and the pleasures of birds and butterflies; and

- Delineation of routes for pedestrians or vehicles.

While revegetation can deliver these benefits, research shows that it falls well short of the environmental values of remnant native vegetation (Munro *et al*. 2007, Cunningham *et al*. 2008). Revegetation should never be seen as a substitute for retaining the small amount of remnant native vegetation left in Knox.

Knox is not prone to soil salinity and very little of it is subject to soil erosion, so these are not significant reasons for revegetation in Knox.

2. Council's Existing Planting Activities

This chapter contains an assessment of the revegetation or planting that is being done by Knox City Council or under Council's direction or guidance.

2.1. Audit of Council Planting

To determine the quantity and types of plants being planted by Council, data were sought from each relevant department of Council for a representative, recent, twelve-month period. Each department chose the 2011-12 financial year as a representative period, although the amount of planting can vary significantly from year to year depending on the timing of large projects. It is also possible that some planting projects have been overlooked.

A small proportion of the data were provided in the form of plant orders, delivery dockets or invoices, each with a date, prices, species and sizes. The remainder of the data was provided in summary form without dates, or sometimes with annotations that the purchases were yet to be made. No attempt was made to follow paper trails to check that the listed plants have been actually planted and that the planting was all within the specified twelve month period.

The data were all consolidated into a single Microsoft Excel workbook and analysed. Council's total plantings during financial year 2011-12 are summarised in Tables 2 and 3, categorised by purpose in Table 2 and by life form (shrub, creeper etc.) in Table 3. Table 2 shows that 43% of plantings were in parks and reserves other than bushland areas. Another 20% of plantings were for stormwater management, a figure that is expected to rise in future years.

Indigenous species dominate each category in Tables 2 and 3 except street trees. The general predominance of indigenous species is a result of Council's policies related to biodiversity conservation and a leafy, natural landscape. The exception for street trees is largely because the root systems and branch attachment of indigenous trees rarely suit nature strips.

Table 2. Summary of plantings by Council for different purposes in the 2011-12 financial year.

Purpose	Origin of Species			Total	% of grand total
	Indigenous	Australian native	Non-Australian		
street trees	309	777	266	1,352	1%
other roadside planting	14,250	4,307		18,557	11%
around buildings & shops	5,321	6,680		12,001	7%
bushland reserves	11,850			11,850	7%
other reserves	60,816	10,363	24	71,203	43%
stream corridors (ground covers)	15,615	1,200		16,815	10%
stormwater management	31,621	2,013		33,634	20%
Totals	139,782	25,340	290	**165,412**	100%

Table 3. As above, but categorised by the life form of the species planted.

Life Form of Plant	Origin of Species			Total	% of grand total
	Indigenous	Australian native	Non-Australian		
large tree, 15 m+	1,548	63	10	1,621	1.0%
medium tree, 10-14 m	3,262	205	160	3,627	2.2%
small tree	1,659	699	120	2,478	1.5%
shrub	17,664	2,865		20,529	12.4%
wetland plant	26,833	400		27,233	16.5%
creeper/climber	4,691	818		5,509	3.3%
other ground cover	84,285	20,130		104,415	63.1%
Totals	139,942	25,180	290	**165,412**	100%

The data for indigenous species do not distinguish whether or not the plants were of 'local provenance'; i.e. whether the parentage of the plants was local or from far away. This can be an important ecological factor, as discussed in Section 3.4.2. From field inspection and taking into account the nurseries which supplied the plants, it appears that most plantings of indigenous species are not of local provenance and are sometimes hybrids with non-local species. Such plantings do not conform to Council's Genetic Integrity policy introduced in June 2012.

Figure 1. Street trees, habitat revegetation and Water Sensitive Urban Design come together at Koolamara Waters in Ferntree Gully.

The breakdown of plantings according to different purposes is provided in the following tables. 'Large trees' are those expected to grow to at least 15 m tall at maturity and 'medium trees' grow 10-14 m tall.

Table 4. **Street Trees**: Summary table of Council plantings during FY 2011-12.

<table>
<tr><td>Council unit responsible</td><td>Parks Services - arboriculture</td></tr>
<tr><td>Associated policies & guidance documents</td><td>Streetscape Policy;
Council Plan – Key Priority Action for no net loss in street trees;
Urban Design Framework;
Knox Liveable Streets Plan;
VicRoads and Austroads guidelines;
Guidelines of utility service providers</td></tr>
<tr><td>Purpose(s) of plantings</td><td>1. Replace street trees that die or have to be removed;
2. Replace all the trees in whole streets to improve streetscape.</td></tr>
<tr><td>Number planted per year</td><td>
<table>
<tr><th>Size</th><th>Indigenous</th><th>Australian native</th><th>Non-Australian</th><th>Total</th></tr>
<tr><td>large tree</td><td>30</td><td>2</td><td>7</td><td>39</td></tr>
<tr><td>medium tree</td><td>160</td><td>205</td><td>139</td><td>504</td></tr>
<tr><td>small tree</td><td>119</td><td>570</td><td>120</td><td>809</td></tr>
<tr><td>Totals</td><td>309</td><td>777</td><td>266</td><td>1,352</td></tr>
</table>
</td></tr>
<tr><td>Types of species planted</td><td>Trees, mostly small species bought in 40 litre containers.</td></tr>
<tr><td>Comments</td><td>Street trees are planted in two programs: the 'Street Tree Management' program for replacement of individual street trees that have died or had to be removed; and the 'Bulk Tree Replacement' program for the replacement of all the trees along entire streets, creating new streetscapes.

A staff report to Council at its meeting of 23rd November 2010 stated that until the 2010-11 financial year, 'the number of trees removed on an annual basis was significantly higher than the number of trees replaced'. Council has since increased its annual funding for street tree planting to prevent further declines.

In the past year, the Bulk Tree Replacement program has removed 296 trees and planted 924, more than a threefold increase. However, the gains made under this program are approximately matched by a steady, permanent loss of street trees to urban development. There are no statistics for the permanent losses, but Mr Dru Taylor (who supervises Council's street tree work) expects that they approximately balance the gains which his team makes. The net result is that the Council Plan's Key Priority Action for no net loss of street trees might not be met, other than for the planting of street trees in new estates.

Funding would have to be increased to reduce the past decade's backlog of locations where street trees have been removed without replacement, estimated as 11,350 trees in 2010.</td></tr>
</table>

Table 5. **Other Roadside Planting**: Summary table of Council plantings during FY 2011-12.

<table>
<tr><td>Council unit responsible</td><td>Parks Services - gardens;
Open Space and Landscape Design;
Biodiversity</td></tr>
<tr><td>Associated policies & guidance documents</td><td>Streetscape Policy;
Council Plan – Key Priority Action related to ‘bush boulevards’;
Urban Design Framework;
Knox Liveable Streets Plan;
Sites of Biological Significance in Knox;
Knox Genetic Integrity Policy;
VicRoads and Austroads guidelines;
Guidelines of utility service providers</td></tr>
<tr><td>Purpose(s) of plantings</td><td>1. Restore a more natural structure and composition to sites of biological significance on roadsides;
2. Create attractive ‘bush boulevard’ streetscapes.</td></tr>
<tr><td>Number planted per year</td><td>
<table>
<tr><th>Size</th><th>Indigenous</th><th>Australian native</th><th>Non-Aust.</th><th>Total</th></tr>
<tr><td>medium tree</td><td>3,000</td><td></td><td></td><td>3,000</td></tr>
<tr><td>small tree</td><td>700</td><td></td><td></td><td></td></tr>
<tr><td>shrub</td><td>4,050</td><td>420</td><td></td><td>4,470</td></tr>
<tr><td>creeper</td><td></td><td>818</td><td></td><td>818</td></tr>
<tr><td>other ground cover</td><td>6,500</td><td>3,069</td><td></td><td>9,569</td></tr>
<tr><td>Totals</td><td>14,250</td><td>4,307</td><td>0</td><td>18,557</td></tr>
</table>
</td></tr>
<tr><td>Types of species planted</td><td>Two categories: Indigenous understorey species for biologically significant roadsides and showy Australian natives for the ‘Bush Boulevards’ project.</td></tr>
<tr><td>Comments</td><td>Plantings on roadsides are strongly constrained by traffic considerations and the presence of cables, pipes, drains, batters, poor soil and other difficulties.</td></tr>
</table>

Table 6. **Gardens around Council Buildings and Shops**:
Summary table of Council plantings during 2011-12.

Council unit responsible	Parks Services
Associated policies & guidance documents	Urban Design Framework; Knox Liveable Streets Plan; Knox Genetic Integrity Policy; Knox Water Sensitive Urban Design Policy
Purpose(s) of plantings	Create and maintain attractive gardens in prominent public places.

<table>
<tr><td>Number planted per year</td><td>
<table>
<tr><th>Size</th><th>Indigenous</th><th>Australian native</th><th>Non-Aust.</th><th>Total</th></tr>
<tr><td>large tree</td><td>4</td><td>16</td><td></td><td>20</td></tr>
<tr><td>medium tree</td><td>7</td><td>0</td><td></td><td>7</td></tr>
<tr><td>small tree</td><td>12</td><td>49</td><td></td><td>61</td></tr>
<tr><td>shrub</td><td></td><td>938</td><td></td><td>938</td></tr>
<tr><td>wetland species</td><td>158</td><td></td><td></td><td>158</td></tr>
<tr><td>creeper</td><td>50</td><td></td><td></td><td>50</td></tr>
<tr><td>other ground cover</td><td>5,090</td><td>5,677</td><td></td><td>10,767</td></tr>
<tr><td>Totals</td><td>5,321</td><td>6,680</td><td>0</td><td>12,001</td></tr>
</table>
</td></tr>
<tr><td>Types of species planted</td><td>Mostly small Australian native species selected for their beauty, bought mainly in forestry tubes or pots of 14 cm diameter.</td></tr>
</table>

Table 7. **Bushland Reserves**: Summary table of Council's plantings during FY 2011-12.

<table>
<tr><td>Council unit responsible</td><td>Biodiversity</td></tr>
<tr><td>Associated policies & guidance documents</td><td>Sites of Biological Significance in Knox;
Knox Open Space Plan;
Bushland Management Plans for specific reserves;
Management Plan for Locally Threatened Species in Knox;
Knox Genetic Integrity Policy;
Knox Water Sensitive Urban Design Policy</td></tr>
<tr><td>Purpose(s) of plantings</td><td>Increasing the diversity of plant species;
Increasing populations of locally threatened plant species;
Restoring a more natural vertical structure to native vegetation;
Expanding bushland into adjacent areas.</td></tr>
<tr><td>Number planted per year</td><td>
<table>
<tr><th>Size</th><th>Number</th></tr>
<tr><td>large tree, 15 m+</td><td>1,350</td></tr>
<tr><td>small tree, below 10 m</td><td>150</td></tr>
<tr><td>shrub</td><td>1,475</td></tr>
<tr><td>wetland species</td><td>1,100</td></tr>
<tr><td>creeper/climber</td><td>200</td></tr>
<tr><td>other ground cover</td><td>7,575</td></tr>
<tr><td>Total</td><td>11,850</td></tr>
</table>
</td></tr>
<tr><td>Types of species planted</td><td>All indigenous species, mostly in forestry tubes</td></tr>
<tr><td>Comments</td><td>In addition to planting, new plants are encouraged to regenerate naturally from seeds in bushland reserves, particularly through cessation of mowing of indigenous species.</td></tr>
</table>

Table 8. **Council Parks** (excluding bushland): Summary table of plantings during 2011-12.

Council unit responsible	Parks Services; Open Space & Landscape Design
Associated policies & guidance documents	Open Space Plan; Knox Genetic Integrity Policy; Knox Water Sensitive Urban Design Policy
Purpose(s) of plantings	Maintain and improve the amenity of Council parks.
Number planted per year	

Size	Indigenous	Australian native	Non-Aust.	Total
large tree	118	45	3	166
medium tree	83		21	104
small tree	446	9		455
shrub	9,729	1,507		11,236
wetland species	724			724
creeper	3,453			3,453
other ground cover	46,263	8,802		55,065
Totals	60,816	10,363	24	**71,203**

Types of species planted	Mostly small Australian native species, bought in containers of various sizes.
Comments	This is by far the biggest category of plantings.

Table 9. **Stream Corridor Projects**: Summary table of Council's plantings during 2011-12.

Council unit responsible	Open Space & Landscape Design, with help from Parks Services
Associated policies & guidance documents	Open Space Plan; Sites of Biological Significance in Knox; The Council Plan's Key Priority Action of providing habitat linkages between sites of biological significance; Management Plan for Locally Threatened Species in Knox; Knox Genetic Integrity Policy; Knox Water Sensitive Urban Design Policy; Melbourne Water planting guidelines
Purpose(s) of plantings	Provide ecological linkages along streams; Amenity for people walking or cycling.
Number planted per year	

Size	Indigenous	Australian native	Non-Aust.	Total
large tree	10			10
medium tree	5			5
small tree	150			150
shrub	200			200
ground cover	15,250	1,200		16,450
Totals	15,615	1,200	0	**16,815**

Types of species planted	Overwhelmingly indigenous groundcover species in forestry tubes.
Comments	It has been normal for Council plantings to rotate from one creek to another annually. The past year's plantings were all along one reach of Blind Ck, and nearly all groundcover species (which has not been normal over the past decade). Melbourne Water does a considerable amount of additional revegetation along Knox's creeks.

Table 10. **Stormwater Management**: Summary table of Council plantings during 2011-12. This category of revegetation is particularly susceptible to large variations in scale from year to year.

Council unit responsible	Engineering, with assistance from Parks Services, Biodiversity and Open Space & Landscape Design
Associated policies & guidance documents	Water Sensitive Urban Design Guidelines for the City of Knox; Knox Water Sensitive Urban Design Policy; Knox City Council WSUD & Stormwater Mgmt Strategy 2010; Council Plan items related to stormwater; Knox Open Space Plan; Management Plan for Locally Threatened Species in Knox; Knox Genetic Integrity Policy; Melbourne Water planting guidelines
Purpose(s) of plantings	Purify stormwater; Even out peak flows entering streams by detention and groundwater recharge; Storage of stormwater for later re-use
Number planted per year	

Size	Indigenous	Australian native	Non-Aust.	Total
large tree	36			36
medium tree	7			7
small tree	82	71		153
shrub	2,210			2,210
wetland species	24,691	400		25,091
creeper	988			988
other ground cover	3,607	1,542		5,149
Totals	31,621	2,013	0	**33,634**

Types of species planted	Overwhelmingly indigenous species in forestry tubes.
Comments	The extent of planting for stormwater management and harvesting is likely to trend upward over coming years under Council's Water Sensitive Urban Design strategy. It provides an excellent opportunity to provide habitat for wetland wildlife and plants, which are more prone to drought than most flora and fauna.

Table 9 indicates that nearly all of the 16,815 plants that were planted along streams in the 2011-12 financial year were groundcover species. This represents a departure from Council's previous practice of extensive streamside plantings with many trees and shrubs as well as groundcovers, as typified in Figure 2. The advice from staff is that the change was not a conscious one but largely due to the departure from Council of the person who took charge of streamside revegetation.

Figure 2. Typical stream corridor revegetation along Ferny Ck in Ferntree Gully, thriving despite being planted in c. 2006 during the worst drought in history.

2.2. Additional Plantings under Council Control

This section discusses how Council oversees or strongly influences the planting of large numbers of plants in addition to what its own staff plant. The tables above only include planting projects done directly by Council staff, although sometimes with assistance of community volunteers.

2.2.1. The Stamford Park Development

The Stamford Park historical stud farm beside Corhanwarrabul Ck in Rowville is being redeveloped by Knox City Council with a seven-hectare residential estate, a two-hectare historic precinct and over thirty hectares of public open space.

A stormwater treatment wetland of approximately 6 hectares was excavated and planted in early 2011. It is one of several such wetlands constructed in Knox by Melbourne Water in recent years. Although its excavation, landscaping and planting were not done by Knox City

Council, the project came about largely as a result of Council's master plan for Stamford Park.

There are around twenty more hectares of public open space at Stamford Park that will be revegetated in the next few years (subject to funding), amounting to tens of thousands of plants. Many street trees and raingarden plants will also be planted for the new residential estate. Council has control over all of these plantings, which will be carried out under tender. The Biodiversity team and the Open Space & Landscape Design team are presently engaging with the project delivery team to establish parameters for the future plantings.

This project alone represents a substantial revegetation effort relative to the planting done by Council's own staff.

Melbourne Water plantings on Knox's floodplains make a significant further increment to the total revegetation effort within Knox. Council has varying levels of influence on planting by Melbourne Water, with the Stamford Park wetlands representing a strong Council influence.

Council also has a small level of influence on revegetation conducted by Parks Victoria in the Dandenong Valley Parklands.

2.2.2. Private Land Developments

Council has considerable control over private land developments through its powers under the Knox Planning Scheme. In a typical land development proposal, Council can influence the subdivision layout, the location and extent of public open space contributions and the landscape plan for the development – right down to the choice of species.

The Harcrest estate on the site of a former brickworks at Stud Rd, Wantirna South is the largest land development currently under construction in Knox. Thousands of plants are being progressively planted around the estate.

Many other developments are also undertaking planting that has been directed or strongly influenced by Council, although sometimes those developments are also removing mature vegetation whose role in the landscape cannot be replaced by revegetation, or only after decades.

No attempt has been made here to quantify how much planting is being done on private land developments under the direct or indirect guidance of Council.

Council is presently updating its document, *'Landscape Guidelines for Urban Planning Applications'*, whose purpose is to advise permit applicants about Council's wishes for landscaping and planting.

2.2.3. Planting Incentive Programs

Council provides technical support, encouragement and financial incentives for schools, kindergartens and residents to maintain, restore and augment native vegetation on their land. Council also provides arboricultural assistance to help landowners maintain trees and replace those which must be removed.

No attempt has been made here to quantify the revegetation that results from Council's incentive programs or arboricultural assistance, but its contribution to Council's objectives for a greener municipality should not be overlooked.

'Gardens for Wildlife' is a joint program of Knox City Council and the Knox Environment Society, operated like a club. It offers free technical information, personal advice, comradeship and small rewards for landholders to provide wildlife habitat in their gardens. A primary focus of the program is the planting of Australian native (and particularly locally indigenous) habitat plants.

Council's other relevant incentive program is 'Biodiversity Buddies', which provides qualifying members of 'Gardens for Wildlife' with grants of up to $1,000 for activities that may include revegetation.

Council has also created the 'Green*leaf*' outreach program, in which Council visits community groups, schools and businesses to encourage and facilitate environmental activities such as revegetation. This helps to maximise the public awareness and benefits of the 'Gardens for Wildlife' and 'Biodiversity Buddies' programs.

These programs not only encourage community participation in revegetation, they also help to foster community support and understanding for Council's own revegetation efforts.

2.2.4. Nature Strip Gardens

In general, plantings on nature strips may be subject to the constraints imposed by:

- Public safety;
- Council's Streetscape Policy;
- Council's Urban Design Framework;
- The Knox Liveable Streets Plan;
- VicRoads guidelines; and
- Guidelines and specifications of utility service providers (e.g. gas and electricity).

Because of the complexities of these matters, Council has not allowed landholders to take nature strip planting into their own hands.

Nevertheless, the right kind of nature strip plantings can make a substantially beneficial contribution to Council's landscape goals, such as the Council Plan's 'bush boulevards' concept and the oft-stated objective of maximising the green and leafy character of Knox. The recent median strip planting outside the Civic Centre in Wantirna South provides a good demonstration of how much positive impact a roadside garden can make.

For this reason, Council is considering whether residents should be permitted to plant their own nature strips, and if so, under what conditions. The vehicle for this is the 'Green Streets' policy, currently under development.

2.3. Interdepartmental Coordination

The tables of Section 2.1 reveal a wide range of purposes for planting, such as street tree replacement, bushland habitat management, amenity gardening and stormwater management. Therefore, it is inevitable that as many as four Council departments are involved: Parks Services, Sustainability, Engineering, and Open Space & Landscape Design. In some Council reserves, three departments may independently do planting in a single year, for different purposes.

Planting activities are further divided according to whether they are funded through Council's 'capital works' budget or its 'operating' budget, and also according to line items within each of those categories. This tends to inhibit a free exchange of funding, resources, information and expertise between staff, whose duties tend to be tied to particular budgetary items.

The physical separation of staff between the depot and the Civic Centre offices can also be an impediment to coordination of planting plans and activities, simply because of the importance of informal, face to face communication. Interdepartmental secondments and liaison meetings are two ways that Council deals with the physical separation.

Just as it is unavoidable that Council staff involved with planting are widely dispersed among buildings, departments and budgetary items, so is it important that the overall planting effort is coordinated. That is one of the primary motivations for the preparation of this revegetation plan. Good coordination offers the following benefits:

- The ability to consolidate reliable planting data (as done here in Section 2.1) and check whether Council is meeting its associated goals and commitments, such as the Council Plan's Key Priority Actions for planting 100,000 trees per year and achieving no net loss of street trees;
- Taking advantage of opportunities for synergies between environmental, engineering and amenity objectives, e.g. a 2011 stormwater management project at Wicks Reserve (under Engineering department) provided an opportunity to provide habitat for locally threatened plants and animals (with guidance from Sustainability department) as well as an aesthetically pleasing landscape (using the skills of Open Space & Landscape Design staff);
- Spreading the benefits of specialist skills held by particular staff, e.g. Biodiversity team staff can advise others about genetic integrity or avoidance of environmental weed species;
- Ensuring that the various staff involved with planting and landscape development at a particular site work to a common landscaping theme, in an optimal sequence and according to a consistent schedule;
- Achieving benefits of scale by pooling funds and resources, as opposed to piecemeal, small projects; and
- Sometimes reallocating funds to areas of greatest need or potential benefit.

Some of these advantages are being taken at present but others are being missed for want of greater coordination. For example, sometimes the staff involved in one planting project have been unaware of plans that other staff have had for the same site, running the risk of conflicting objectives, waste and disappointment.

To increase coordination between staff involved with the planning of planting, the revegetation strategy in Section 4.2 (page 42) includes recommendations for the formation of a 'Planting Round Table' that involves regular meetings and circulation of planting proposals.

3. Factors Underpinning Revegetation Planning

This chapter reviews the factors that are ideally taken into account when deciding what revegetation or planting to conduct and how, either at a strategic or site-specific level. These factors have been analysed to devise the revegetation strategy in Chapter 4 (p. 41) and the site-specific concept plans in the Appendix (p. 53). They should also be useful for guiding all of Council's other revegetation projects, as well as anyone else interested in revegetation.

3.1. Constraints

3.1.1. Bushfire Hazard

Knox contains some quite bushfire-prone areas and care must be taken to ensure that revegetation does not exacerbate the hazard.

Vegetation is only one factor that affects bushfire hazard, alongside others such as terrain, access for firefighting services and the type of landscape that lies upwind during the most fire-prone weather. Considerable expertise is required to assess the bushfire risk associated with vegetation and put it in context with the other risk factors. It is necessary to understand the effects of plants in combination (e.g. the 'ladder' effect of flames climbing through layers of vegetation) and the fire behaviour of individual species. Assessing the flammability of an individual plant must take into account multiple factors (Gill and Moore 1996), such as the tendency to accumulate dry, twiggy material, the capacity to shield radiation, the temperature at which the plant is likely to ignite, the radiant energy that is released during combustion and the amount of heat extracted from a fire through latent heat of evaporation of sap immediately prior to combustion.

Few people involved with planting or landscape design have the required skills to make such assessments. Municipal Fire Prevention Officers are in a better position to decide whether revegetation is acceptable at a particular site but they rarely know plant species well enough to make a detailed assessment from a planting schedule and a plan.

It is therefore desirable to have a system to trigger liaison between the Municipal Fire Prevention Officer and those planning revegetation, whenever bushfire hazard is an issue. A suitable trigger could be whenever revegetation is proposed within a Bushfire Management Overlay (or BMO) area or less than 100 metres from a BMO area. Maps of these areas are included in the Knox Planning Scheme and on Council's Geographic Information System.

Chapter 4 includes administrative mechanisms for implementing this suggestion.

In addition, even on land that is well removed from any Bushfire Management Overlay area, staff planning revegetation should be mindful of local bushfire risk factors. A typical example would be leaving a bare firebreak around a heavily vegetated reserve, wide enough for fire trucks.

3.1.2. Utility Services

A significant proportion of the grassy, open spaces of Knox are not available for revegetation due to the presence of easements, pipes and cables. The service providers generally have guidelines that can be followed, but in some cases (e.g. sewers and drains) they are so broad

that each planting proposal needs to be individually approved on the basis of site-specific factors.

The planting of street trees is particularly constrained by utility services, which are concentrated along roadsides.

Optus cables were erected in the 1990s at heights well below the cables already on the same poles. The reduced height led to massive disfigurement of street trees across Australia in order to keep the cables clear. It continues to require more lopping of street trees than would otherwise be needed. New plantings of street trees beneath Optus cables are restricted to the smallest sizes, which creates problems discussed in Section 3.4.1.

In May 2012, the Australian Competition and Consumer Commission published a draft decision to approve the decommissioning of all Optus cables as the National Broadband Network is rolled out. If this goes ahead, some of the problems and restrictions caused by the Optus cables will cease.

3.1.3. Floodways and Drainage

A significant proportion of revegetation in Knox has occurred along its waterways, all of which serve the important function of draining floodwaters. Most of the original creek courses have been filled in and replaced with straightened flood channels and underground low-flow pipes. Some stream corridors also carry sewers or water mains.

It is important that revegetation does not upset flood flows or damage pipes. The constraints that this places on what can be planted can be very site-specific. For example, vegetation can hold back floodwaters to some degree, which is undesirable if there are houses on the floodplain immediately upstream from the vegetation, but it could be beneficial if there is only parkland upstream and houses downstream.

Because of the site-specific nature of the effects of planting near a stream or drain, it is generally necessary to seek separate approval from Melbourne Water's departments of 'River Health', 'Flooding' and 'Civil Assets'.

Some of the matters to be taken into account are summarised in Melbourne Water's brochure titled *'Planting near Sewers, Drains and Water Mains Guide'*, which is available at www.melbournewater.com.au. Figure 3 provides some general guidance from the brochure.

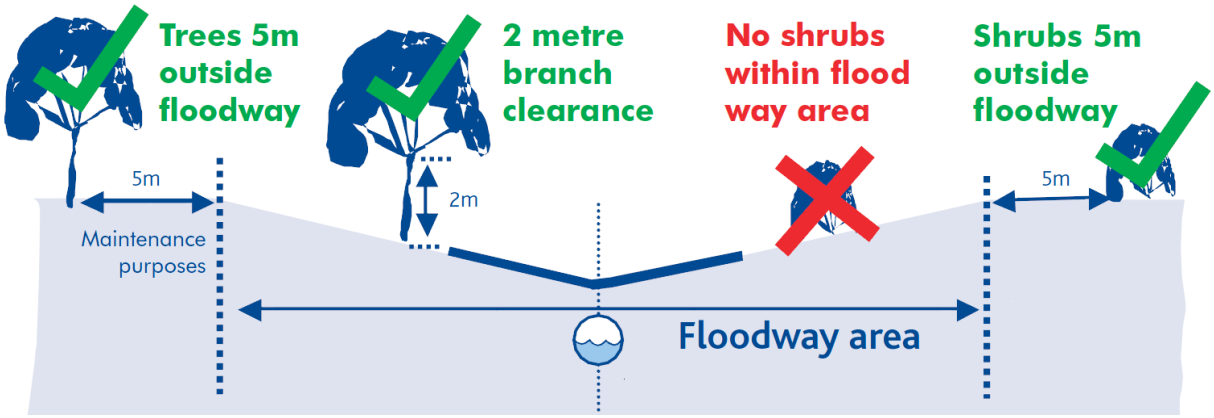


Figure 3. General guidance from Melbourne Water regarding planting within a floodway.

Other important factors to consider include the density of planting, the tendency of a species to bend over in floodwater and the smoothness of bark on trees.

3.1.4. Traffic Hazards

Plants can create traffic hazards beside roads or paths used by bicycles (e.g. the shared path network). They may obstruct visibility or represent dangerous objects for traffic to hit. Tree roots may also pose a risk of damage to pavement, particularly in the heavy clay soils that predominate in Knox.

Part 6 of the *'Austroads Guide to Road Design'* includes specifications for keeping roadside vegetation clear of traffic and sight lines. In Victoria, these guidelines are varied by application of a VicRoads Supplement.

These guidelines specify how to calculate the width of 'clear zones' beside roads. The VicRoads Supplement states:

> *'Clear zones are areas adjacent to traffic lanes which should be kept free from features that would be potentially hazardous to errant vehicles; such as trees, poles, culvert end walls and steep batters. The clear zone is a compromise between the recovery area for every errant vehicle, the cost of providing that area, and the probability of an errant vehicle encountering a hazard. The clear zone should be kept free of non-frangible* [=unbreakable] *hazards where economically and environmentally possible. …*
>
> *'For new tree planting on road reserves, refer to* A Guide to Tree Planting within Road Reserves, Technical Bulletin No. 36 *(RCA, 1987). In the case of established roadside trees, it may be environmentally unacceptable to provide the full clear zone width. Careful consideration shall be given as to the best treatment of hazards where conflicts occur between environmental requirements, safety, and economy'.*

Where the guidelines are not varied to balance competing objectives, the minimum clear zone width is 3 m from the edge of the nearest traffic lane, even where the speed limit is 25 km/h or 40 km/h on a straight, flat road. However, competing interests mean that smaller clear zone widths are found along most Australian residential streets. The guidelines specify an absolute minimum of 1 m clearance in low speed environments, which is often met.

The lower speeds of bicycles on shared paths means that lower clear zones may be acceptable, but the high vulnerability of cyclists is a compensating factor.

One way of reducing the hazards posed by roadside trees is to plant small species with slender, often multiple trunks that are more likely to break or bend on impact. The species, *Cercis canadensis* or Eastern Redbud, is one such species used by Knox City Council.

3.1.5. Other Hazards

Trees can occasionally present a hazard of limbs or whole trees falling. This is generally dealt with by managing the risk based on the likelihood and seriousness of damage or injury. Consequently, even species that are renowned for dropping limbs or falling over (e.g. the Swamp Gum, *Eucalyptus ovata*) can be planted within a patch of bushland without paths, whereas no trees, or only the safest species, are acceptable overhanging roads, footpaths or buildings.

Many plants produce toxins in their leaves or fruit but no species used (or in contention for use) by Knox City Council are believed to present a significant health hazard.

3.1.6. Shade

Public open space ideally provides both shady spots for users in summer and sunny spots for winter. This can sometimes limit the amount of tree planting that should be done in a park.

Deciduous trees can be useful in this regard, although they often do not meet other criteria such as fitting in with a landscape theme.

In preparing the revegetation concept plans in the Appendix, an effort was made to locate the larger trees where they are least likely to create problems for neighbours.

3.1.7. Retention of Grassy Spaces for Recreation

Revegetation should only replace grassy, open areas where they are not needed for sport, casual physical activity or aesthetics. For example, at Bayswater Park, grassy expanses must remain around the barbecue shelters and near the playground for recreational activities such as picnicking, playing games or running around.

3.1.8. Landscape Values

Revegetation planning must take into account the principles of landscape architecture and landscape design, such as:

- Not obstructing important views or sight lines;
- Providing the right sort of transition between visually inconsistent landscape elements, e.g. between natural-looking indigenous revegetation and some formal, European styles of garden;
- Maintaining coherent streetscapes through choice of species, as per Council's Streetscape Policy and the Knox Liveable Streets Plan.

3.1.9. Passive Surveillance

It is often not possible to see from one side of a revegetation area right through to the other side. The benefits that this can provide include:

- Separating different open spaces or landscape elements, as in the case of alcoves that are created in botanic gardens;
- Screening, e.g. blocking off the sight of traffic along a main road to create a greater sense of serenity; and
- Benefitting wildlife, since most of Knox's wildlife species benefit from having habitat where they can forage, roost or nest out of the sight of humans and their predators, as discussed in Section 3.3.2.

However, concerns are sometimes raised that secluded places may harbour criminals or antisocial behaviour. It is important to recognise such concerns, particularly where vulnerable bystanders or children may be found alone or in small numbers (e.g. adjacent to a playground).

An appropriate response is to assess the level of risk associated with a proposed, visually dense planting and balance it against the benefits, in the same way that Council manages numerous other risks.

3.1.10. Growing Conditions

Some sites are unsuitable for revegetation, or only with certain species, because of harsh growing conditions. The most commonly encountered limiting conditions are:

- Soil compaction, particularly on nature strips and in car parks;
- Soil moisture availability, which may become limiting either due to wet conditions in the cooler months or dry conditions in the warmer months;
- Shade;
- Competition from other plants (desirable and otherwise), which relates to shade and availability of soil moisture and nutrients; and
- Soil type.

Site preparation such as cultivation can sometimes overcome some of these constraints.

In revegetation that is intended to restore nature to a site, it is not enough that conditions allow the plants to grow; The plants should be able to thrive, reproduce and eventually become self-sustaining.

3.2. Habitat Corridors

Consistent with a large body of scientific literature, the report, *Sites of Biological Significance in Knox* (Lorimer 2010a) identified that habitat corridors are important for wildlife conservation in Knox, particularly where the corridors are along streams.

The Knox Council Plan also recognises the importance of linking sites of biological significance by habitat corridors. So does the state government's Victoria Planning Provisions, in which Clause 14.02-1 includes the strategy:

> *'Retain natural drainage corridors with vegetated buffer zones at least 30 m wide along each side of a waterway 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'.

Revegetation also benefits from a position on a habitat corridor because of the presence of fauna that provide pest control, pollination and dispersal of seed. These benefits are particularly important where the objective is to restore nature and become self-sustaining.

There is therefore a wealth of impetus for giving a high priority to revegetation that will restore or improve habitat corridors, particularly along streams.

As noted in Section 2.1, Council has recently significantly reduced its revegetation of streams, a change which is recommended to be reversed.

3.3. Site Design and Planning

This section applies to revegetation that is conducted to restore nature using indigenous plants. It does not apply to street trees or amenity gardens.

3.3.1. Expanding Existing Habitat

Bushland and wetlands in Knox are always under pressure from 'edge effects', where adverse influences such as environmental weeds, insect pests and dumping of garden waste spread inward from the edges. By planting a buffer of revegetation around the perimeter, the edge effects can be pushed further from the core and have less effect on the natural vegetation. This is particularly effective where the revegetation smooths out irregularities in the shape of the native vegetation, thereby reducing the length of perimeter relative to the area of vegetation enclosed.

This strategy has other benefits such as:

- By increasing the population sizes of plant species, pollination and seed production increases and the species are less likely to die out;
- The larger the area of bushland or wetland, the more species of native fauna that will find enough habitat to meet their requirements; and
- The more species of native fauna, the greater capacity of the system to support ecological functions such as regulating the populations of insect pests.

In other words, revegetating around the edges of remnant patches of native vegetation can help reverse the problems of habitat fragmentation, which is recognised internationally as one of the greatest environmental problems facing the world (Lorimer 2010a).

Many sites that are candidates for revegetation contain patches of natural vegetation. The layout of revegetation at these sites should place a priority on putting revegetation along the edges of those patches, where that is feasible.

Even if revegetation is located close to remnant native vegetation rather than surrounding it, the proximity can yield some of the abovementioned benefits to wildlife and ecological functions. For example, if insects and birds can readily fly between the remnant patch and the revegetation, one would expect increased pollination, outbreeding and seed production. This conclusion is supported by the analysis of Munro *et al*. (2007), who found that the richness of

bird species found in Australian revegetation increased as the separation from remnant native vegetation decreased.

Mown fringes around patches of native vegetation are sometimes dominated by indigenous grasses, accompanied by a few species of small wildflowers. Council has identified some such areas and ceased mowing them to allow natural regeneration from seeds, tubers and runners. Sometimes this has been quite effective, but the strategy nearly always benefits from supplementary, scattered planting of tubestock to compensate for the selective loss of shrubs and certain wildflowers that results from decades of mowing. The natural regeneration is more efficient, and more likely to become self-sustaining, than revegetation that relies entirely on planting.

In any particular case, it can be difficult to predict whether natural regeneration or weeds will benefit more from cessation of mowing. The results can vary according to the weather over the subsequent few months or years. Cessation of mowing should therefore be monitored to see whether it is successful in any particular case.

3.3.2. Shape and Size of Revegetation Areas

As discussed above in the context of revegetation around the perimeter of remnant patches of native vegetation, natural ecological functions and resistance to edge effects benefit from maximising the size of the patches and minimising the irregularities in the perimeter shape.

The same applies to patches of revegetation. This conclusion is supported by the analysis of Munro *et al.* (2007), who found that the richness of bird species in Australian revegetation was greatest in revegetated areas that were large and broad.

It is a geometrical fact that narrow shapes have a larger ratio of perimeter length to area. (Consider the limiting case of a thin, long sliver, which may have very small area.) Consequently, revegetation in strips is more prone to edge effects than revegetation in shapes that are rounder. This is probably part of the reason for the findings of Munro *et al*.

Another probable reason is that most (but not all) bird species benefit from having habitat where they can forage, roost or nest out of the sight of humans and their predators. The narrower the revegetation, the more exposed a bird is to threats from outside the patch and the less likely they will persist there. This would also be true of many types of wildlife other than birds.

Unpublished research by David Lockwood in Melbourne's eastern suburbs confirmed wide-spread anecdotal indications that narrow strips of revegetation favour a small number of aggressive bird species at the expense of a large number of more ecologically beneficial species. This makes sense because the more aggressive bird species are less concerned about being exposed to other species. A typical observation in narrow revegetation strips is that aggressive Noisy Miners displace small insect-eaters such as wrens. This can result in an imbalance in insect populations and consequent decline in the health of the plants.

It follows that revegetation should ideally be in patches that are as large and rounded as feasible. The layout of a site usually limits the degree to which this ideal can be achieved.

The desirability of passive surveillance can also be counter to the ecological desirability of rounded areas of revegetation, as discussed in Section 3.1.9. Sometimes this conflict can be reconciled by leaving a gap between revegetation and paths.

3.3.3. Types of Revegetation

Revegetation to restore or simulate natural vegetation can be done in different ways to suit different situations. This section discusses the various options applicable in Knox.

Natural Regeneration

In the right situations, the following benefits can be gained by allowing wild indigenous plants to regenerate naturally (usually through cessation of mowing):

- Conserving local gene pools;
- Providing species that have been naturally selected for the site;
- Achieving denser coverage than planting, faster.

However, the species that regenerate are often not very diverse and may be those which survive best under mowing or grazing but are not abundant in natural stands. Shrubs, in particular, tend not to regenerate well after decades of mowing or grazing.

As demonstrated in the Dandenong Valley Parklands in Knox (Lorimer 2001), fire can partly overcome these shortcomings in cases where many indigenous seeds lie dormant in the soil (which is hard to tell). A more widely applicable and reliable alternative is supplementary, scattered planting of tubestock, as discussed in Section 3.3.1.

Replacement of Grassy Expanses

Revegetation in Knox is most commonly within mown expanses dominated by introduced grasses. Suitable approaches in these situations include the following, numbered to allow cross-referencing in the site-specific concept plans of the Appendix:

1. Planting into beds that have been laid bare, which is done either by scraping off topsoil or by applying herbicide and covering with mulch or a geotextile mat. This approach, using herbicide and hardwood mulch, is Council's most common method. Hardwood mulch made from old pallets or similar timber has proved preferable to mulch that is less durable or contains unwanted seeds (e.g. from tree maintenance). Spread of weeds via mulch was identified in public consultation as a significant concern;
2. Planting of trees, shrubs or big tussocks, each into its own, small circle prepared as above. This method is useful where there is no point in controlling the grass weeds, e.g. along a swale or gully subject to flooding and inaccessible for mowing;
3. Direct seeding, which involves sowing seed into or onto freshly cultivated and sprayed ground by various techniques such as seed blowers, hydroseeding or sowing into furrows created by tines; and
4. Artificial creation of wetlands, which involves excavation of depressions according to the design principles discussed in Section 3.3.4 and planting of wetland species to augment natural colonisation of plants by wind, waterbirds and (to a lesser degree) floodwaters.

Niche Planting

Council's Biodiversity team regularly undertakes scattered planting of tubestock within natural bushland and wetlands. Such plantings fall into the following categories:

5. Where there are gaps in the structure of the vegetation (e.g. a missing layer of small shrubs), the gaps are filled by a carefully chosen density of planting of species that grow to the required size and habit;
6. Where a patch of vegetation contains too few plant species or where one or more species has such small populations that their reproduction is failing, tubestock are planted to boost the numbers. As the objective is to establish populations that can successfully reproduce, each species must be planted in adequate numbers, and sometimes in clusters to maximise interchange of pollen.
7. As a variant of the previous category, locally threatened plant species are planted either to increase the size of existing populations or to start new populations that will add to the species' security. There is a program to do this under the *Management Plan for Locally Threatened Species in Knox – 2010* (Lorimer 2010b).

3.3.4. Wetland Design

A substantial proportion of Knox is occupied by floodplain and Knox City Council is increasingly creating artificial wetlands to manage or harvest stormwater. These wetlands are variously intended to:

- Purify urban runoff water;
- Smooth out peak flows by storing water from heavy rainfall and allowing it to slowly percolate into the soil and/or nearby streams;
- Provide wildlife habitat; and
- Be attractive.

In the near future, it is also planned to construct a wetland at Stamford Park to store water in an artificial aquifer for later irrigation of parkland.

Floods regularly cause new wetlands to be created in nature, e.g. when stream bends become disconnected from a new stream course. Consequently, wetland ecology is well adapted to establishing in new locations, and this applies even in artificial wetlands. Unlike bushland, it is possible to create artificial wetlands that function ecologically like wholly natural wetlands, within a few years.

However, this is unlikely to happen unless care is taken to observe a number of ecological design principles. The most common mistake is to create bank slopes that are too steep and bottoms that are too flat. Another important consideration – particularly in the light of climate change – is to make sure that the wetland does not dry out for too long during multi-year periods of extreme drought, as in the case of 2005-2009.

Planting of artificial wetlands is less critical than for other vegetation types because of the remarkable ability of wind and waterbirds to bring in seeds and fragments of many wetland plants. Another unusual aspect of wetland revegetation is that most plants have short lifetimes (an adaptation to floods and changing water levels), so it is unusually important to concentrate on establishing populations that will reproduce and become self-sustaining. The individual plants that are initially planted may not be there in two years, but they should have produced offspring that thrive in the parts of the wetland whose water level suits the species at that time.

Further details about wetland design and planting are provided by Romanowski (2009).

3.4. Species Selection

When an individual street tree has to be replaced, there is usually little if any choice of species because of the need for consistency with the streetscape created by the neighbouring street trees. In most other cases, there are many things to consider when choosing species to plant.

Here is a checklist of the main criteria for choosing species to be planted in a particular situation:

- Attractiveness;
- Shade;
- Bushfire hazard;
- Diversity (not applicable to street trees);
- Wildlife habitat;
- Whether the species is locally indigenous, and particularly if it is locally threatened;
- Drought tolerance;
- Tolerance of damage by humans, dogs or other animals, or discouragement of damage by prickly foliage or similar characteristics;
- Longevity, health, vigour;
- Ability to reproduce and eventually create a self-sustaining population (not applicable to street trees or amenity gardens);
- Suitability of the site's soil, drainage and exposure to sunlight;
- Competitiveness;
- Safety (e.g. toxicity or tendency to drop limbs);
- Visual density (e.g. to allow passive surveillance or provide seclusion);
- Contribution to the vertical structure of the vegetation (e.g. for habitat or as a windbreak);
- Availability, including the availability of local provenance plants for indigenous species.

Some of the main issues that surround the choice of species are discussed in the following sections.

3.4.1. Decline of the Larger Tree Species

Table 3 on page 5 shows that 1% of all plants planted by Council are trees that grow at least 15 m tall. Most of those trees were planted in seven bushland reserves, leaving only 271 (or less than one in 600 of all plantings) for the vast majority of Knox. This tiny proportion is due to preference being given in most situations to tree species that are smaller and hence easier to maintain and fit in the space available.

There is consequently a steady decline in the abundance of larger trees along Knox's streets and on most of Council's land, as the planting of larger species fails to keep up with attrition. The attrition rate is particularly high among large Red Ironbark street trees, which are significant for their habitat and landscape values.

Large trees on private land are showing an even stronger decline due to urban development and the unsuitability of large trees in small gardens or lawns.

The combined decline across private and Council land is probably having a significant effect on treetop species of birds and insects, such as Spotted Pardalotes and the leaf-eating insects they eat. This, in turn, may be causing an increase in insect damage to the remaining large trees.

There is also cause for concern about the impact of the decline of larger trees on Knox's landscape values and the leafy image that Council seeks to nurture and protect.

3.4.2. Use of Indigenous Species

In Victoria, revegetation began in the 1960s and 70s with Australian native trees and shrubs, particularly species from Western Australia. The 1980s saw a major shift toward species that grow naturally in the local area, usually called indigenous species. A preference for plants of local provenance (i.e. derived from local wild populations) also arose in the 1980s but has not been as widely accepted or adopted.

The movement toward indigenous species and local provenance has its roots in Knox, with the Knox Environment Society's nursery being one of the first indigenous plant nurseries in the whole world (dating from c. 1983).

The 'Knox Urban Design Framework 2020' makes many references to the desirability of planting more indigenous plants. For the 'Foothills backdrop' area, it has the goal, 'Retain and protect indigenous trees and require 80% of all new vegetation to be indigenous species'. On the basis of Table 2 on page 4, 85% of Council's total plantings during the current financial year were of indigenous species.

One of the objectives of revegetation is to restore nature to the landscape and people's lives. Indigenous species, and particularly plants of local provenance, have the greatest likelihood of restoring the complicated, natural web of interrelationships between Knox's flora and fauna. This is supported by ecological research on birds in eastern Melbourne suburbs (White *et al*. 2005) and insects in Perth (Bhullar and Majer 2000). Indigenous species also provide the best chance of retaining the landscape's local identity and heritage.

Nevertheless, indigenous species are not suitable for all applications. For example, there are very few local tree species of suitable size and safety to use as street trees, and it would be unreasonable to restrict all street tree planting to those few species. Also, the task of creating attractive, creative amenity gardens is made more challenging if the palette of species to choose from is restricted to just the local ones.

Where indigenous species are inadequate, the research of White *et al*. (2005) supports local observations that species from other parts of Australia can still fulfil some of the ecological roles of indigenous species, while non-Australian species are (on average) more likely to promote environmental problems than benefits. However, the environmental benefits or risks vary greatly among species within either category. For example, Sweet Pittosporum (*Pittosporum undulatum*) is an Australian native species that creates serious environmental problems in Knox, whereas some deciduous trees from overseas are useful for moderating climate and reducing greenhouse gas emissions with no known adverse impacts.

Figure 4. Local provenance plants at the Knox Environment Society community nursery.

Large-scale environmental changes are clouding the determination of which species are indigenous. The last two decades have seen many Victorian native species expand their ranges. Most people regard the spread of bird species such as Australian King Parrots into the suburbs as a positive change, but they may be less comfortable with the similar spread of some plant species. As an extreme example, the Wonga Vine (*Pandorea pandorana*) is an ecologically important indigenous species near the eastern edge of Knox but in recent years it has been spreading westwards and smothering other indigenous plants to death.

The question of how to respond to shifts in species' natural ranges is a philosophical one that is likely to be the subject of considerable debate over coming years.

The best source of definitive information about which species are indigenous to Knox is Appendix B in *'Sites of Biological Significance in Knox'* (Lorimer 2010a).

3.4.3. Local Provenance

When assessing the provenance (or lineage) of a plant, one should ideally take into account not only the general location of its wild origins, but also the growing conditions; e.g. on a floodplain or a dry ridge. The purest form of revegetation uses only plants whose provenance matches the planting site. This is extremely important for conserving locally threatened plant species (Lorimer 2010b), but it is less important in other cases and not often done.

Despite the advantages of using plants of local provenance, most plantings with indigenous species to date have used plants derived from distant (but poorly known) locations. That applies to plantings by Knox City Council and more widely. During fieldwork for this revegetation plan, it was found that some plants bought as indigenous species (particularly *Correa reflexa*) are actually wrongly identified or hybrids with non-local species.

The main reason for not using plants of local provenance is availability at short notice. Large wholesale nurseries cannot afford to keep stock of numerous different provenances, just in the hope that orders will come in for those provenances. Small local nurseries such as Operation Revegetation in Wantirna are more likely to hold stock of local provenance, but for any particular species there are obviously fewer plants of each provenance than would be available to a buyer who is prepared to accept any provenance. If large numbers of a species are required at short notice, they can rarely be supplied entirely with a provenance that matches the planting site.

In most cases, problems of availability can be overcome by ordering plants with enough lead time to allow seeds or cuttings to be propagated and grown on prior to the intended planting. However, this much lead time is often not available. Possible solutions to this obstacle are discussed in Section 4.5.1 (page 45).

Another reason for ignoring the provenance of indigenous species is that local provenance excludes artificially bred 'improved' genetic strains, or cultivars. For example, the local strain of Wattle Mat-rush, *Lomandra filiformis*, is hard to propagate in numbers large enough to meet the demand, whereas the more ornamental cultivars called *Lomandra filiformis* 'Filly Fine' and *Lomandra filiformis* 'Savanna Blue™' are routinely available in large numbers.

Gardeners and landscape designers sometimes opt for cultivars with the lure of achieving the dual benefits of an indigenous species *and* a more attractive or robust plant than the natural form. However, the lure is illusory. The cultivars do little to retain the local landscape

heritage, they may not achieve the ecological benefits of the local strain and they pose risks of genetic contamination and displacement of the local strain (Section 3.4.4).

If it is not possible to find a local form of an indigenous species to suit a particular use, it is better to use a non-indigenous species than a cultivar that bears the same species name as a local species but looks or grows differently.

3.4.4. Genetic Contamination

Planting non-local species near closely related indigenous species can lead to the creation of hybrids. This can upset the environment through two mechanisms:

- Hybrids are often more vigorous than either parent species. Sometimes a hybrid outcompetes and displaces the wild parent species or other indigenous plants from their habitat; and
- The original wild population can produce offspring which are predominantly hybrids. Over multiple generations, the original population of the indigenous parent species becomes progressively replaced by hybrids until it becomes locally extinct.

These problems can arise not only with closely related species, but also with non-local strains of indigenous species. Species of particular concern in this regard in Knox are *Lomandra filiformis* cultivars*, Lomandra longifolia* cultivars, *Correa reflexa* and *Dianella* species. For such species, it is particularly important to confine plantings to stock of local provenance.

The taxonomy of *Dianella* and the *Lomandra longifolia* group is poorly known to science, so labels of these plants in nurseries should be treated as potentially misleading.

Probably the best demonstration of the importance of this issue is provided by *Correas* at Bateman Street Bush in Wantirna. The site has a natural population of the local form of *Correa reflexa*, which is a locally Endangered species (Lorimer 2010a). However, it has been hybridising with horticultural forms of the same species as well as with *Correa glabra*, *Correa alba* and at least one other *Correa* species. The original wild population is rarely breeding true. In May 2012, approximately 100 hybrids forming a dense thicket were pulled out. The hybrids were mostly larger and more vigorous than the original *Correa reflexa* plants and had displaced many indigenous plants in the ground flora. The vegetation had been almost pristine prior to the emergence of the hybrids.

For this reason, it is recommended that no *Correa* species other than the local form of *Correa reflexa* be planted within 500 m of known stands of local form.

Because of the issues discussed in this section and the one before, Knox City Council has a Genetic Integrity Policy that excludes the use of non-local provenance stock whenever indigenous species are planted, except in the case of street trees.

3.4.5. Environmental Weeds

‘Environmental weed’ is a term used for plants that have a significant adverse effect on indigenous flora, fauna or ecological communities.

It is important to understand that every naturally occurring plant species is indigenous to somewhere and cannot be deemed an environmental weed in all contexts. For example, Agapanthus is not an environmental weed in its South African homeland or in an urbanised

environment without indigenous flora or fauna, but it becomes an environmental weed in parts of Knox where its progeny spread into bushland and displace indigenous flora and fauna. Species like the Wonga Vine discussed in Section 3.4.2 can be ecologically important in one part of Knox and environmental weeds in another.

Council's Biodiversity team have expertise in determining which species behave as environmental weeds in any given location.

Although a useful ornamental species like Agapanthus may only pose an environmental risk in a small part of the landscape, Councils often avoid planting them anywhere for fear of criticism or sending mixed messages to the community. Such decisions are matters of judgement about community perceptions but should be tempered by an objective assessment of each species' potential risks and benefits.

3.4.6. Specialised Propagation Methods

Some indigenous species that are ecologically important or would be particularly attractive in amenity plantings are not available because they are hard to propagate. The following species deserve particular mention:

- *Lepidosperma* species (sword-sedges and rapier-sedges) are particularly attractive and ecologically important but have defied propagation from seed until the past year. Andrea Kodym of the University of Melbourne has pioneered the use of tissue culture to propagate *Lepidosperma* species and some are now commercially available from a producer in Mansfield. To obtain local provenance, enough time should be allowed for seed to be collected and raised prior to planting.
- *Gahnia radula* (Thatch Saw-sedge) is often a dominant and ecologically critical species in the ground flora of local bushland. It hardly ever produces seed and had never been propagated until recent months. Andrea Kodym is working on tissue culture for this species, with the hope that commercial production might commence in a year or two.
- *Epacris impressa* (Common Heath) is important ecologically and because it is Victoria's floral emblem. It is also very attractive in amenity gardens, for its flowers and form. It can be reliably propagated with equipment available in large wholesale nurseries but the small nurseries that specialise in plants of local provenance struggle to produce many. It may be possible to increase the availability of local provenance stock by establishing partnerships between local indigenous nurseries and large wholesale nurseries.

Any improvement in the availability of these species should prompt a review of the plant species recommended in the site-specific concept plans in the Appendix.

3.5. Self-sustaining Revegetation

In the past, revegetation in Australia has been generally done without attention to the ability of the planted plants to reproduce and become self-sustaining over multiple generations.

In practice, as each species reaches the end of its life expectancy, it generally dies out without replacement. This leads to a steady reduction in numbers of species and a consequent increase in the sorts of environmental problems that arise in monocultures. Eventually, the revegetation will die out completely, although this has not often happened yet because very little revegetation has reached the age that eucalypts normally reach.

One could take the view that replanting is a simple remedy to this situation, but it is hardly consistent with the objective of restoring nature to the landscape.

Instead, it is recommended here that Council's plantings for environmental purposes should aim to produce self-sustaining plant populations. This requires attention to the following matters:

- Including enough diversity of species and functional groups of species to promote ecological functions (essentially, mimicking the composition of natural vegetation);
- Including species that are particularly good at reproducing, e.g. *Solanum laciniatum*;
- Planting enough of each species within pollination range of each other to allow a good chance of pollination;
- Planting species that attract flying insects or birds that are believed to be important as pollinators;
- Favouring locations for revegetation that are near a natural stand of native vegetation (Section 3.3.1) and planting species that already exist in the natural stand;
- Not overplanting with trees (see below).

3.6. Structure and Density of Planting

Munro *et al*. (2007) found that structural complexity in revegetation benefits native birdlife; i.e. it is preferable for revegetation to contain plants of many sizes and forms. Different bird species tend to forage at different heights in forests or woodlands and they often follow each other in what amounts to cooperative feeding. If a layer of vegetation is missing or too sparse, its associated suite of bird species will be absent and the interrelationship between bird species will weaken. This may have flow-on effects such as reduced natural control of insect pests.

It is reasonable to expect that similar effects apply to groups of fauna other than birds, such as insects.

The ecological benefits of structurally complex revegetation conflict with some people's preference for an open, park-like appearance on the basis of aesthetics or concerns about personal security near denser vegetation. While there is a role for open park-like areas in some circumstances, this should be avoided where the main purpose of revegetation is to produce environmental benefits.

There are also other reasons to place a high importance on getting the right density of plants in each structural group (e.g. shrubs, trees, grasses):

- Over-dense planting of trees with few or no groundcover plants reduces plant vigour and often leads to proliferation of annual weeds;
- Under-dense planting may allow weeds to flourish in the gaps;
- Under-dense planting of an individual species may reduce the rate of pollination between the plants and jeopardise the species' ability to produce the next generation.

Figure 5 illustrates the first of these problems. The trees are planted so densely that they are spindly for their age and becoming unstable due to leaning. They take up all the moisture and

nutrients available in dry periods, preventing establishment of any other perennial species. In the wetter months, the ground becomes covered with plants that have an annual growth cycle and do not need to survive dry periods – nearly all of them weeds (e.g. grasses, Angled Onion and *Oxalis* species). Those plants die back in the dry months and may become a fire hazard. Rebalancing the structure requires cutting out some of the trees, and even then, any new perennial plantings will not grow as well as if they had been planted at the same time as the trees.

Figure 5. A typical case of overly dense planting of trees without groundcover leading to poor tree growth and intractable, dense winter growth of weeds.

This has been less prevalent in recent years as Council has learned to achieve a balance between trees that are sparse enough to grow well, shrubs that provide shade and habitat, and groundcover species such as creepers and tussocks to fill the spaces between the shrubs and trees (thereby suppressing weeds). This is reflected in the planting statistics in Table 1 (page vii), where it can be seen that 4½% of Council's indigenous plantings in 2011-12 were trees, 12½% were shrubs and 83% were smaller plants.

Research in Victorian revegetation by Vesk *et al*. (2008) highlights the problem that overly dense planting of trees causes slower growth rates and hence increasing delay until the trees reach full size and optimal habitat value for birds and mammals.

It is worth keeping in mind that Victorian forests have nearly all been logged at some stage, leaving mostly regrowth forest whose trees are smaller and denser than pre-settlement. Revegetation usually involves even higher densities of trees, which is even less natural and hence conflicts with one of the common objectives of revegetation.

Taking into account all the issues about structure and density, care should be taken in preparing planting lists and setting the plants out to achieve a suitably complex structure with the right densities of different life forms.

3.7. Climate Change and Variability

There is now compelling scientific evidence that the climate has begun to change and that we should expect an increasing frequency of extreme events such as droughts and floods. This has prompted questions about whether revegetation should change in response, and if so, how. In particular, in light of the recent record drought and water shortages, should revegetation leave out plant species that require more water to thrive?

In amenity plantings, the case for planting drought-tolerant species is compelling, but the case would apply even without climate change. As Victoria's population rapidly expands, water storages are coming under increasing pressure and the luxury of watering parks, gardens and street trees is becoming progressively harder to justify. The benefits of drought-tolerant plants for amenity purposes have as much (or more) to do with population pressures, infrastructure and irrigation as to expectations of changing climate.

The rise of 'Water Sensitive Urban Design' is providing some compensation for reduced availability of potable water. Street trees, parks, gardens and bushland plantings are all benefitting from the new paradigm of stormwater as a resource rather than a waste product. The proposed parklands and street trees at Stamford Park stand to benefit greatly, making it possible to use species and planting densities that would otherwise not be possible.

But in general, the considerations that apply to amenity plantings are different to revegetation that is intended to simulate natural vegetation.

The recent record drought provided an excellent insight into how revegetation without irrigation might cope with future droughts. Anecdotally, even in the driest period of the drought (around 2007-9), there was surprisingly little impact on indigenous plants in revegetation, other than species adapted to swampy ground. Very young plants, which one might have expected to be most vulnerable to drought, showed only a small increase in attrition. Many young eucalypts and other trees grew strongly, as exemplified in the photograph on page 11. In fact, weed species such as blackberries in revegetation tended to suffer more from the drought than the indigenous plants.

What then of the species adapted to swampy ground, which did suffer from the drought – species such as *Patersonia occidentalis* and *Goodenia humilis*? These species suffered at least as much in their natural habitat as they did in revegetation, so they feature prominently among Knox's most threatened plant species (Lorimer 2010a). For that reason, the *Management Plan for Locally Threatened Species in Knox* (Lorimer 2010b) is promoting *increased* planting of such species, not fewer.

If climate change causes increasing attrition of the more water-loving species in Knox, that would give even more reason to plant them. It would also heighten the importance of planting them in sites that are least prone to drying out, which is already a priority.

Planting such species in very dry years may lead to failure, but in other years they may thrive and set seed to allow regeneration following droughts. It is very hard to know what the

weather will be like a year or more ahead, so it is reasonable to keep planting regardless and accept the occasional failures.

On balance, it appears that the only response to climate change that is presently needed when planning revegetation is to avoid planting species in places that pose a high risk of plant death due to drought or a high bushfire risk during the expected periods of extreme bushfire danger. These matters should always have been taken into account anyway.

3.8. Carbon Credits

The Australian Government has established a carbon market to promote a transition to a future with lower net emissions of greenhouse gases to the atmosphere. In support of that market, the government allows qualifying revegetation projects to gain carbon credits through the Carbon Farming Initiative. To qualify, plantings must be specifically for the purpose of gaining the carbon credits and additional to what would have been planted otherwise. Amenity plantings are specifically excluded.

The Australian Government's 'Reforestation Modelling Tool' can be used to determine what carbon credits can be gained from any qualifying revegetation. A hypothetical example was chosen of a hectare of 'mixed species environmental planting' within open grass in Wantirna. The results from the Reforestation Modelling Tool indicate that carbon sequestration would accelerate from a very slow start in the first two years, then soon reach a fairly steady rate of sequestration of approximately two tonnes of carbon per hectare per year. This rate slowly declines after about fifteen years.

The peak rate of sequestration translates to approximately 7.6 tonnes of carbon dioxide per hectare per year. For one hectare, this is equivalent to the emissions of 1.8 average Australian cars. The valuation at the current fixed price of $23 per tonne of carbon dioxide is approximately $175 per hectare per year.

Deductions must be applied for any fuel used to maintain the revegetation and there is a standard 5% deduction to account for the risk of the revegetation failing. There would also be considerable overhead costs for accrediting, auditing, reporting and general administration of the revegetation. It is also predicted that the price of carbon will fall over the years. On balance, there appears to be little prospect that the Carbon Farming Initiative would be financially beneficial to Council.

There are also questions about whether Council's projects qualify (e.g. they must be deemed to be not 'Common Practice' for such an organisation, taken in context) and there are various non-financial costs (e.g. locking the land up indefinitely) and financial risks (e.g. if the revegetation is burnt by vandals or in a bushfire).

As an alternative to the Carbon Farming Initiative, there are various companies which offer carbon offsetting for activities such as air travel, car usage and electricity consumption. However, it seems unlikely that Council could obtain payment from such companies in return for its revegetation projects, or at least not to the extent that it would be financially attractive.

Perhaps it is better to treat the carbon dioxide taken up by revegetation as an offset against Council's greenhouse gas emissions, without relying on a market valuation. If a typical hectare of revegetation aged 4-20 years consumes 7.6 tonnes of carbon dioxide per year, then approximately 150 hectares would balance the emissions of Council's vehicle fleet (estimated

as 1,154 tonnes of CO_2-equivalent per year in 2010), or 500-550 hectares would balance the emissions associated with energy consumed by all of Council's buildings, or all the street lights in Knox. No estimate has been made of the existing amount of revegetation in Knox.

3.9. Grants

The availability of grants to municipal councils for revegetation has greatly diminished in recent years. There appears to be no such funding from the State government. The Federal government operates the 'Caring for our Country' and 'Biodiversity Fund' programs, but the shadow minister for agriculture, John Cobb, said in July 2012 that the Coalition may not continue the Biodiversity Fund if elected to office.

The Federal government has not released the eligibility criteria or funding priorities for the next rounds of the 'Caring for our Country' or 'Biodiversity Fund' programs. The associated websites indicate that future criteria and priorities could well change to respond to needs that remain unmet from previous funding allocations.

Although it is uncertain what revegetation projects (if any) will be favoured for future grants, the following features are likely to help:

- Use of a broad range of indigenous species;
- Located along streams;
- Involving threatened vegetation types;
- Of substantial scale; and
- Part of a coordinated strategy.

These features are routinely met by revegetation in Knox, except that revegetation along streams has declined in recent years and this revegetation plan represents the first coordinated strategy. The approach recommended in Chapter 4 takes these factors into account to maximise the likelihood of success with future grant opportunities.

3.10. Planting to Offset Clearing Elsewhere

The state government's Native Vegetation Framework requires that in most cases when Council issues a permit to remove native vegetation, there must be a compensating gain in the extent or condition of native vegetation elsewhere. The compensation is termed an 'offset' and depending on circumstances, some or all of an offset may involve revegetation.

Council's capacity to achieve genuine ecological gains through revegetation is well demonstrated by its offset project at R.D. Egan-Lee Reserve in Knoxfield. In the southeast of the reserve, a group of remnant eucalypts over mown grass has been converted in a few years to a larger, moderately rich mixture of indigenous plant species with a fairly natural vegetation structure and few weeds.

Council undertakes such projects because sometimes it needs offsets for vegetation that it has had to remove. Council also sometimes undertakes revegetation to meet the offset obligations of others (e.g. VicRoads or residents), which may involve payment. Offsets can therefore provide funding for revegetation that otherwise would not occur.

There is also a market for purchase and sale of offset credits which Council could potentially enter.

Many conditions must be met for revegetation to legally qualify as an offset, such as:

- There should be a ten-year 'offset management plan' that governs the revegetation itself, including when and how it is to be done, its composition, maintenance and (usually) fencing;
- The revegetation must be additional to Council's normal activities, or else it would not represent a genuine net gain in vegetation;
- The revegetated land must not be Crown Land (which is easy to satisfy in Knox);
- A monitoring regime must be in place to ensure compliance with the offset management plan; and
- There must be a robust and transparent process for keeping track of how much of the revegetation has been used up in fulfilment of offset obligations and establishing the nexus with the specific planning permits involved.

If Council seeks to sell offset credits associated with its revegetation:

- The proceeds must be set aside in an account separate from all other Council funds and not fully released to Council until it discharges all its obligations under the ten-year offset management plan;
- The account and its usage would have to be audited;
- The terms of the offset management plan and the monitoring of its execution would have to be at arm's length from Council (as a financial beneficiary), at Council's expense;
- There would also be costs for setting up and administering these processes and the associated financial transactions.

In cases of vegetation removal where the permit application must be referred to the Department of Sustainability & Environment, the department requires that:

- Council would have to sell offsets at a fixed price and register the sales in the department's 'Native Vegetation Credit Register' (for a fee);
- The offset management plan would have to be secured by an encumbrance on the land title under Section 69 of the *Conservation, Forests & Lands Act 1987*. (The department would also accept a covenant with the Trust for Nature but the Trust is unlikely to be interested.); and
- Council would have to report its activities to the department, including auditing and probity reports.

In combination, the practical, administrative and financial obligations above are quite substantial. Another burden is that there is a risk that the revegetation will be damaged during the ten-year duration of the offset management plan, e.g. by vandalism, fire, flood, storm or accident. Other risks include oversupply, underestimating costs, and the regulatory risk that future changes in planning law or policy will leave the scheme unviable or non-compliant.

These burdens are only justified if they are outweighed by the benefits, which depend on whether or not the offset credits are to be sold.

If the offset credits are not sold, the benefit is that Council may fulfil its own offset obligations while adding to the municipality's vegetation. The alternative would be to purchase offset credits in the market, probably from rural Victoria at a lower cost of around $100,000-$150,000 per 'habitat hectare'. In other words, if Council undertakes revegetation to meet its own offset obligations, it is not likely to be the cheapest option but it does mean there will be revegetation in Knox rather than in rural Victoria. It would also overcome the potential problem of limited availability of suitable offset credits in the market.

If Council sells offset credits, the upside is that the sale price might partly fund the revegetation (which, by necessity, would not have occurred without the funding). On the other hand, the administrative expenses of the scheme might exceed the proceeds. The price that Council could expect to receive for its revegetation would be roughly $20,000 per hectare. By comparison, the estimated ten-year cost of the offset at Egan-Lee Reserve is $100,000 for 0·4 hectares, i.e. $250,000 per hectare, without the administrative costs of a market-based scheme. Another comparison is provided by the offset credit sales scheme that Baw Baw Shire Council plans to commence in September or October 2012. To produce revegetation and sell the offset credits, Baw Baw Shire Council estimates its costs to be approximately $40 per plant, translating to roughly $150,000 per hectare. These figures are slightly higher than for some other councils whose schemes have been found not to meet all the applicable probity requirements (Costello 2010).

It therefore appears unlikely that Knox City Council could recoup much of the cost of its revegetation by selling associated offset credits.

The Baw Baw scheme is a trial. Its financial viability will become apparent in the months or year after it commences. Yarra Ranges Shire Council is planning to trial a similar scheme but decided that revegetation would be excluded except for some individual plants planted into existing patches of remnant vegetation. Baw Baw and Yarra Ranges each have larger areas available to revegetate than Knox and lower revegetation costs but it has still taken them years to get to the stage of a trial. Manningham City Council (whose landscape is more comparable to Knox) spent considerable effort to devise a workable scheme for revegetation on Council land and ultimately decided it would be unviable.

Given the doubts about the risks, administrative burden and financial viability of using revegetation to generate offset credits, it appears sensible for Knox City Council not to start a scheme involving sales of offset credits until the results of the Baw Baw Shire Council trial are known.

Nevertheless, it is reasonable for Council to continue to undertake revegetation to generate offset credits for its own needs even though that may not be the cheapest option. For these purposes, the revegetation concept plans in the Appendix include a proposal for revegetation at Lakewood Nature Reserve in Knoxfield to suit Council's likely needs for revegetation offsets. The proposal satisfies the usual 'like for like' criteria by involving the two predominant Ecological Vegetation Classes in Knox (Valley Heathy Forest and Swampy Woodland), both of which are listed as 'endangered'.

3.11. Myrtle Rust and other Pathogens

Myrtle Rust is a fungal disease that has recently been introduced to Australia and reached Knox in 2012. It affects many species in the Myrtle family (Myrtaceæ), which includes such

staple species in revegetation and horticulture as eucalypts, tea-trees, paperbarks, bottlebrushes, lilly-pillies and (of course) introduced myrtles.

Myrtle Rust principally attacks young growth, so seedlings and plant nurseries are particularly vulnerable. The susceptibility of Australian species is poorly known and likely to diminish as the disease spreads (rather like rabbit calicivirus). Lilly Pillies and *Agonis flexuosa* (W.A. Peppermint or Willow Myrtle) are particularly susceptible species that have been planted by Council in the past year. Blue Gums are also highly susceptible and have been used in Council's past plantings.

By one view, species in the Myrtle family should no longer be planted, at least in amenity plantings. However, such a response would cause massive change to Knox's landscape over time, even though it is not yet clear which (if any) species will suffer serious long-term damage.

In revegetation that is intended to restore nature to the landscape, the omission of species in the Myrtle family would completely negate that intention. This cannot be justified until and unless evidence emerges of which species are at serious long-term risk of dying out. As in the case of droughts, the more an indigenous plant species is threatened, the greater the motivation for trying to boost its numbers through planting (if that is a feasible option).

The response recommended here is to closely monitor the development of the epidemic and to put in place plant hygiene (or phytohygiene) measures to minimise the rate of spread.

The Myrtle Rust fungus can be killed by the application of chemical sprays. The Australian Pesticides and Veterinary Medicines Authority (APVMA) has issued permit PER12828 for application of the chemicals in gardens and permit PER12156 for most other situations. The *Australian Nursery Industry Myrtle Rust Management Plan*, prepared by Nursery & Garden Industry Queensland (2012), prescribes phytohygiene and monitoring procedures for Myrtle Rust in nurseries, including regular, preventative application of fungicide.

Myrtle Rust generally displays visible signs on young leaves within a week or two of infection. Therefore, if host plants in a nursery are checked each week and sprayed with a protective fungicide at prescribed intervals, infection can be prevented from developing. Inspection just prior to despatch further reduces the risk of spreading Myrtle Rust to a delivery destination or planting site.

The *Australian Nursery Industry Myrtle Rust Management Plan* includes a standard form for plant suppliers to declare that they have implemented all the preventative measures in the plan. Council has been requiring its suppliers to provide such declarations for recent consignments of species in the Myrtle family. This practice will have to remain for the foreseeable future.

Myrtle Rust is by far the greatest current concern about plant pathogens, but others may arise in future. The Council officers who are presently closely monitoring Myrtle Rust developments are in an excellent position to learn about any future epidemics and determine a suitable response by Council. This has been taken into account in the recommendations for the Planting Round Table, as discussed in Section 4.4.1 (page 43).

3.12. Lead Time for Procurement of Plants

85% of Council's total plantings during the current financial year were of indigenous species (see Table 2 on page 4). Procurement of indigenous plants often encounters the problem that the desired species are either not readily available or only in small numbers. The problem is greatly amplified when local provenance is specified, as discussed in Section 3.4.3 on page 28.

The solution to this problem is to order the plants with sufficient advance notice that the suppliers can then collect propagating material and raise the required plants before the desired planting season. However, Council's budgetary system operates on an annual cycle with little opportunity to commit funds as far ahead as required for propagating and raising plants.

The problem is most acute for 'advanced' and 'semi-advanced' trees, which are needed for street trees and many park projects. For example, the nationally rare Yarra Gum (*Eucalyptus yarraensis*) would be an excellent indigenous species to plant in certain parks and streets, and it would take at least two years for a nursery to raise them to the required size. Being a rare species with infrequent demand, nurseries cannot afford to grow them for over two years, just on spec.

Because of the conflict with Council's present budgetary time frame, it is common for the optimum species to be replaced by substitute species or stock that is not of local provenance.

Although this problem is greatest for indigenous species, it also arises sometimes with non-indigenous species.

This matter is about to come to a head as a result of Council's new (June 2012) Genetic Integrity Policy. The policy mandates an end to the use of non-local provenance stock whenever indigenous species are planted, except in the case of street trees. Tens of thousands of such plants were planted in the 2012 financial year, according to the data provided for Chapter 2.

Recommended options for solving this problem are included in the revegetation strategy, in Section 4.5.1.

3.13. Maintenance

In gardening, planting obviously needs to be followed by garden maintenance to nurture the plants, control weeds and maintain the garden's attractiveness and utility. Maintenance of street trees and trees in parks does not need to be as frequent as gardening but it is nevertheless very important.

As part of its pursuit of continuous improvement, Council is currently considering changes in how street trees and amenity plantings are maintained. The objective is to improve efficiency and achieve levels of service that meet community expectations. Rather than duplicate what Council is already doing, this report does not delve deeper into maintenance of amenity plantings.

Revegetation that is intended to simulate natural vegetation is usually given weed control until the plants are well established, but longer-term maintenance is typically scarce or absent. Consequently, the older stands of revegetation in Knox and elsewhere in Victoria often

contain uncontrolled weeds and poorly maintained trees. Dead plant material sometimes presents a fire hazard. A better approach would include ongoing:

- Control of weeds such as Blackberry and Sweet Pittosporum;
- Removal of dead plant material that is unsightly or represents a bushfire hazard;
- Tree maintenance;
- Infill planting; and
- Thinning of shrubs or trees to achieve improved plant vigour or a more natural vegetation structure.

Dealing with Myrtle Rust may soon become a large additional maintenance need.

In Knox, as in other Councils, maintenance of revegetation is apt to fall through the crack between bushland management (by the Biodiversity team) and management of parks and gardens (under Parks Services).

This is a greater problem than is generally realised. As revegetation matures, its value should increase for wildlife habitat, climate moderation and usually its landscape value. Failing to maintain revegetation into maturity is to jeopardise the greatest benefits that revegetation can offer. It also threatens the ability of revegetation to reproduce and become self-sustaining.

The focus on planting that led to the creation of this revegetation plan is laudable but it should not be at the expense of allowing older (and often more valuable) revegetation to deteriorate for lack of tree maintenance, infill planting or control of weeds or pathogens.

Wherever possible, the financial arrangements for planting should make provision for whole-of-life costs (including ongoing maintenance), as is common practice with built assets (e.g. under the International Infrastructure Management Manual 2006). Just as Council's Drainage Asset Management Plan states (on p. 151) that *'Provision of a sustainable drainage network requires a balanced allocation of capital and operating funds'*, it is important that Council keeps an eye on achieving balance between planting and ongoing maintenance. This appears to be done consistently for street trees and gardens but not for other plantings.

Council's asset management system is currently under review. Ideally, the system would be applied to revegetation.

Some Councils apply the same approach to the financing of built and natural assets. A model is the Sunshine Coast Council, whose Asset Management Policy of 2010[*] states that for capital works, *'Asset renewals and maintenance program requirements will be met prior to any new or additional assets being approved'*.

The revegetation strategy in Chapter 4 includes a recommendation for better maintaining revegetation into maturity (Section 4.6).

[*] Available at http://www.sunshinecoast.qld.gov.au/addfiles/documents/policies/asset_management.pdf

4. Revegetation Strategy

With the background of the previous chapters, this chapter proposes strategic measures for maximising the benefits and efficiency of Council's future plantings, and overcoming some looming threats.

4.1. 100,000 Trees per Year

There is a Key Priority Action in the *'Council Plan 2009-2013'* to plant at least 100,000 trees per year. It arose from the *'Knox City Council Vision 2025'* statement, prior to an investigation of the goal's feasibility. Whether it is being achieved depends on the definition of 'planting trees', which has not been specified.

Other comparable goals such as the Australian government's 'One Billion Tree' program of the 1990s and the 'Billion Tree' program of the United Nations Environment Program (2006-2011) have accepted any plant as a 'tree' for their purposes, regardless of size or type. Similarly, the 'National Tree Day' and 'Trees for Life' programs include all types of plant from groundcovers to tall trees. For all such programs that were investigated for this document, the term 'tree planting' has the same, broad interpretation.

On this basis, Table 3 on page 5 shows that Council is easily exceeding 100,000 per year.

However, it would be reasonable to argue that the term 'tree' should be restricted to woody plants more than several metres tall at maturity. The data in Table 3 demonstrate that in these terms, meeting the goal would require increasing Council's tree planting by a factor of thirteen. This raises questions about the feasibility and desirability of such a large increase in planting rate.

The question of feasibility was investigated in Council's May 2011 document, *'Tree Planting Opportunities in Knox'*. The report estimated that at that time, there may have been space for as many as 185,000 trees (in the narrow sense) in Knox. There was also a caveat that this may have been an overestimate due to unforeseen constraints of the kind discussed here in Section 3.1. Since then, some of the prospective planting areas have been planted (e.g. Peregrine Heights Reserve, where 10,000 plants were counted on) and a few have been found to be unsuitable for trees (e.g. south of the Knox Transfer Station, which is mostly wetland). The increased recognition of bushfire hazard recommended here further reduces the capacity to plant trees. Allowing for these changes, the capacity for planting of trees in Knox may now be closer to 100,000 trees, with an uncertainty of at least one third that amount.

Consequently, if Council were to set about planting 100,000 trees (in the narrow sense) per year, it would only be able to do so for about one year before running out of space.

The financial viability of such a pursuit is dubious. In most cases, the planting of trees should be accompanied by a much larger number of understorey plants (Section 3.6, p. 31). That is why the planting statistics in Table 3 (page 5) show that 4½% of Council's indigenous plantings in 2011-12 were trees, 12½% were shrubs and 83% were smaller plants. To extrapolate, the planting of 100,000 trees would be accompanied by 273,000 shrubs and 1·8 million smaller plants. The cost of the plants, site preparation, planting and maintenance would be large. Many new staff would have to be hired, but only for a year or so until there is no more space available for planting. A second round of hiring would be needed a few years later when maintenance requirements become high.

To take this path would put pressure on staff to increase the density of trees and the ratio of trees to understorey plants, causing the ongoing adverse ecological and maintenance consequences described in Section 3.6.

All things considered, a better alternative would be to plant at a sustainable rate, with a focus on quality rather than quantity, and achieving a balance between planting and maintenance of established revegetation.

The 2009-2013 Council Plan's aspirational goal of planting 100,000 trees per year has provided a valuable motivation for maximising plantings, but the next Council Plan (due 30th June 2013) could adopt a more refined approach with the benefit of the information above.

Recommendation: That as part of its upcoming preparation of a new Council Plan, Council replace the '100,000 trees' commitment in light of the new information provided above. Options include providing separate targets for trees and understorey, or just one target for all kinds of plants.

4.2. No Net Loss of Street Trees

'Knox Council Plan 2009-2013' includes a key priority action to *'As a minimum, achieve no net loss in Council's street trees on an annual basis'*. Council has allocated increasing funding for planting of street trees in the past three years with the intention of reducing the past decade's backlog of locations where street trees have been removed without replacement, estimated as 11,350 trees in 2010.

However, as discussed in Table 4 (page 6), in the absence of clear statistics about the annual net change in numbers of street trees, it appears that losses and gains are approximately in balance.

It would be desirable to have data to determine the actual backlog size each year to assess how great the problem is and how effective the increased funding has been. Improved data are expected to be available soon as a result of Council implementing a new asset management system.

Recommendation: That Council's consideration of funding street tree planting in the 2013 budget take into account:

- The persistent backlog of street trees that have been removed and not replaced; and
- The option of putting more emphasis on clearing the backlog at the expense of the bulk tree replacement program.

4.3. Advocacy for Planting by Other Organisations

While Council faces limitations on the space available for planting (Section 4.1), a considerable amount of space could potentially be revegetated in the Dandenong Valley Parklands and other land owned or managed by Parks Victoria and Melbourne Water.

Recommendation: That Council advocates for further revegetation with Melbourne Water, Parks Victoria and local members of state parliament, particularly where the revegetation complements Council's own revegetation (existing or proposed).

4.4. Coordination

4.4.1. The Planting Round Table

Section 2.3 discussed the desirability of increased coordination between staff who are involved in the planning of plantings. The solution proposed here is the formation of a 'Planting Round Table', which is a forum for sharing revegetation proposals between relevant staff through meetings and circulation of planting proposals.

The objectives of the Planting Round Table are to:

- Share information and expertise;
- Promote comradeship among the diverse staff who contribute to Council's whole revegetation effort;
- Identify any possible overlaps or inconsistencies between proposed projects;
- Seek synergies between projects that may arise from combining funds or resources, synchronising timing or adjusting designs and species; and
- Ensure that the broad range of Council policies, procedures and plans that affect planting are applied uniformly and well across all planting projects.

At least twice each year, staff involved with planning of plantings would circulate to each other their planting proposals for the coming twelve months (or optionally beyond). This should be followed by a meeting to pursue the objectives in the bullet points above. The timing should be synchronised with major funding releases, being Council's budget and the announcement of external grants.

The Biodiversity team would have the special function of ensuring that the species lists passing through the Planting Round Table:

- Comply with Council's Genetic Integrity Policy;
- Do not contain environmental weeds; and
- Seize good opportunities to plant locally threatened plants or provide important wildlife habitat.

Similarly, other departments would have the role of ensuring that projects respond well to the policies, procedures and plans for which they have primary responsibility, e.g. Engineering Services for Water Sensitive Urban Design.

Council already has a program of semi-annual Capital Works Synergy Meetings that have a similar purpose to what is proposed for the Planting Round Table. It may ultimately prove best to integrate the Planting Round Table with the Capital Works Synergy Meetings but it is probably best for the Planting Round Table to meet separately to start with. This would allow the Planting Round Table's roles and procedures to become well established before trying to find their places within an expanded form of the Capital Works Synergy Meetings. In the interim, the Capital Works Synergy Meetings could consider whether to expand to accommodate the Planting Round Table and if so, how it can be best done.

It is intended that all of Council's planting projects and their species lists go through the Round Table process, with the possible exception of street tree planting. Even rush jobs that

arise between meetings should go through the process when it becomes feasible, even if retrospectively.

The Planting Round Table needs a Secretariat (perhaps a nominated officer) to fulfil the following functions:

- Organise meetings and agenda at least twice annually, keep minutes and prompt participants for contributions as necessary;
- From the information provided by participants, maintain and disseminate a site-by-site list of planned planting projects. This would mostly occur in association with the meetings, which would scrutinise the list to seek any possible overlaps, inconsistencies and synergies between proposals;
- Compile annual inventories of plantings done by Council, similarly to Tables 2-8. This requires tabulation of each project's details once the planting is confirmed, including the date, location, numbers of each species, whether of local provenance *etc.* (Council's asset management system, which is currently under review, may be useful for this purpose.);
- Monitor and report to the Round Table any issues of widespread relevance that have arisen (e.g. news about Myrtle Rust) and how Council is going relative to the Council Plan Key Priority Actions for planting 100,000 trees per year and achieving no net loss of street trees;
- Report annually on these Key Priority Actions as part of the annual review of the Council Plan, with a view to Council including the performance in its Annual Report; and
- Check that proposed plantings are referred to the Municipal Fire Prevention Officer for approval if they are located within a Bushfire Management Overlay (BMO) area under the planning scheme or within 100 metres of a BMO area.

The Planting Round Table would be an appropriate forum for a proposed review of the optimum plant species to use for different purposes in Knox.

Another function for the Planting Round Table would be devising a Council-wide list of plants that need to be organised more than a year in advance, as discussed in Section 4.5.1.

As seen earlier in this document, the issues surrounding planting of street trees tend to stand apart from the rest of Council's plantings. Consequently, it is not necessary for street trees to a routine subject for the Planting Round Table. However, there are likely to be occasions when the Round Table would benefit by calling on the street tree staff for their arboricultural knowledge.

If street trees are not a regular part of the Round Table processes, it would still be important for staff supervising street trees to contribute planting data at least annually to the Secretariat for inclusion in the consolidated statistics for the whole of Council. It would also be important that they still provide the Secretariat or higher management with an annual assessment regarding Council Plan's Key Priority Action to have no net loss of street trees.

The Round Table should maintain communication with Councillors because the Round Table will have the roles of ensuring compliance with Council policies (e.g. Genetic Integrity) and ensuring achievement of Council's commitments in the Council Plan. Communication could be done through reports from the Round Table to Council or by one or more Councillors attending relevant parts of some or all Round Table meetings. It is recommended that the

Round Table consider the best mechanism for communication with Councillors after its first or second meeting, once organisational details are settled.

4.4.2. Bushfire Hazard

As indicated above, it is recommended that the Municipal Fire Prevention Officer play a role in revegetation of bushfire prone areas. Staff involved with revegetation proposals in or near Bushfire Management Overlay areas are encouraged to discuss their proposals from the start, to determine whether revegetation is acceptable or under what restrictions.

Such detailed coordination between revegetation and fire prevention is innovative and the liaison process will probably develop over time. A CFA technical officer may be available to help initiate the process, e.g. by translating the interests and concerns of one side into language that is familiar to the other side.

4.5. Procurement

4.5.1. Lead Times and Budgeting

As discussed in Section 3.12, Council's recent adoption of a revised Genetic Integrity Policy will create a strong impetus for accommodating longer lead times in the procurement of indigenous plants. The main problem relates to the mismatch between Council's budgetary horizon of one year and the lead time of up to three years to produce some of the plant types that Council needs. It is not always possible to simply purchase a plant as soon as it is wanted for a particular purpose and then install it without further expense or attention.

In this sense, Council's revegetation has similarities to its built assets such as buildings. Council often contracts for the construction of a building that is not ready for use until a subsequent financial year, after which time the building may be used for purposes as yet unspecified. Plants have similar characteristics, including that some of them cannot be delivered in the same financial year that they are ordered and in a few cases it is hard to predict exactly which projects they will be used for. Both buildings and revegetation need ongoing maintenance.

Perhaps the funding approaches for built assets can be adapted to funding plants with long lead times. The current review of Council's budgetary process for capital items provides a good opportunity to consider alternative funding approaches.

Extending the budgetary time horizon for a planting project beyond one financial year would allow Council to enter into contracts for the supply of plants that are expected to be needed in a subsequent financial year. This would provide greater security and planning ability for both Council and its suppliers.

Another possible approach would be for Council's budget to include an item for general procurement of plants, rather than tying funds to the active projects of a single year. This would again allow longer-term supply contracts with nurseries, to the benefit of both Council and the suppliers. This approach would involve Council predicting the numbers of each plant species whose propagation should be initiated in the current financial year in order to have them ready for planting in future financial years. (This is analogous to predicting the need for new buildings of different kinds.) It would not be necessary to know what particular projects

the plants will be used in, as long as there is flexibility to distribute them as needed when they are ready for planting. The Planting Round Table provides a mechanism for reallocation of the plants.

In the event that the need for a particular species is over-predicted (e.g. because a planned large project does not get budgetary approval), it would often be possible to use the excess plants to augment activities such as enrichment planting in bushland. Sometimes, the excess plants could be grown on until a suitable project gains funding. In the worst case scenario, Council would seek places or organisations that would give the plants a good home.

In the event that demand for a species is under-predicted, the shortfall would generally be small and much more likely to be filled from suppliers' stocks than if no supply contract had been initiated.

There may be administrative obstacles to creating a single fund or line item to procure plants that may be used by several departments and for unspecified projects. However, the proposed consolidation of funds offers much greater benefits than segregation. Consolidation would also better reflect the reality that a single planting may be associated with the functions of multiple departments, as illustrated by the Wicks Reserve Bio-infiltration Wetland in 2011 (Section 2.3).

Similarly, there are benefits and efficiencies to be gained from consolidating funds for plants to be used variously in capital works programs or operational programs, as the need dictates. The budgetary distinction between capital works and operations is sometimes rather hollow in the case of planting. For example, if a few street trees along a street have reached the end of their useful life, the cost of replacement is attributed to operations, but if all the street trees in the street have reached the end of their useful life, their cost of replacement is attributed to capital works.

An additional measure to reduce the problem of long lead times is to plant younger stock. The Knox Environment Society advocates avoiding semi-advanced and advanced stock where possible and substituting cheaper, smaller stock. The greater vulnerability of small plants to damage is offset by the replacement being cheaper and easier to procure.

4.5.2. Phytohygiene

To counter the risk of spreading Myrtle Rust, Council should continue to require that plant suppliers follow the *Australian Nursery Industry Myrtle Rust Management Plan* and provide a signed and completed copy of the associated declaration form with every delivery.

As discussed in Section 4.4.1, the Planting Round Table provides an approach to monitoring and disseminating updates about management of plant diseases and related problems.

4.6. Maintenance of Revegetation

As discussed in Section 3.13 (p. 39), Council has an ongoing process that is considering changes to the way amenity plantings are maintained. Rather than duplicate Council's process, this section omits amenity plantings from its consideration of maintenance.

Section 3.13 (page 39) identified a problem that maintenance of a revegetation patch tends to fall by the wayside over the years. A major contributor to this problem appears to be that the

responsibility for long-term maintenance falls through the crack between bushland management and management of parks and gardens.

It is recommended here that Council give greater attention and funding to long-term maintenance of revegetation areas and that the responsibility for it be clearly assigned.

Within recognised sites of biological significance, the responsibility for maintenance of revegetation would typically be assigned to the Biodiversity team. In other cases, Parks Services would typically be assigned.

It is recommended that the financial arrangements for planting should make provision for whole-of-life costs (including ongoing maintenance) in a similar way to built assets. In particular, the 'lifecycle' component of Council's capital works program for built assets provides a suitable model for plant maintenance. The same sort of approach should be considered for plantings that are funded under Council's operations budget, since the needs for maintenance are essentially the same whether a plant is planted under the operations or capital works budgets.

Wherever possible, the maintenance needs of past plantings should be satisfied prior to funding new plantings, as in the case of the Sunshine Coast Council model discussed in Section 3.13.

Council's asset management system, which is currently under review, offers the promise of improved tracking of maintenance needs for revegetation.

4.7. Method for Prioritising Revegetation Areas

The prioritisation of street tree planting is a fairly straightforward and well-practiced process governed by the Knox Streetscape Policy.

In other cases, the order in which Council undertakes plantings is often dictated by the budgetary process and the timing of funds being allocated to projects. Many planting projects are ancillary to much larger budgetary items, in which case the priority for the planting is determined by the priority given to the larger components.

It is therefore impossible to provide a simple, definitive guide to the priorities that Council should place on individual prospective revegetation projects. Nevertheless, as long as it is understood that priorities will always be subject to change, it is possible to list the most important influences on the priority to be given to a prospective revegetation project:

- Cost and availability of funds for the project;
- Ease;
- Aesthetic appeal;
- Community support;
- Provision of wildlife habitat;
- Ecological linkages between presently isolated areas of habitat, particularly along streams;
- Expansion of existing habitat to mitigate the ecological problems of small patches of habitat;

- Synergies with other Council activities and objectives, such as integration with Water-Sensitive Urban Design and Council's obligations to provide 'native vegetation offsets' as compensation for unavoidable clearing;
- Likelihood that the plants will thrive and eventually reproduce;
- Likelihood of obtaining funding support from outside Council;
- Ability to serve as offsets for cleared vegetation (Section 3.10).

While these factors have generally guided Council's past revegetation efforts, Section 2.1 (page 4) pointed out that the high priority previously given to planting along streams did not persist when a key staff member left Council.

Recommendation: That Council restore the previous prominence given to revegetation along stream corridors.

Care needs to be taken in interpretation of the priority ratings given to individual revegetation areas. Just as no one plant may stand out in a beautiful garden, so may a single revegetation bed seem unimportant (aesthetically or ecologically) when considered in isolation from the surrounding vegetation and landscape. In the Appendix, the priority rating given to each prospective revegetation bed is based on what difference that bed makes, assuming that all the others are present. A site with many beds may be of high priority overall even if none of the individual beds has high priority.

4.8. Priority Revegetation Sites

Council's May 2011 document, *'Tree Planting Opportunities in Knox'*, identified the following groups of sites with potential for tree planting:

- 58 Council reserves;
- Numerous segments of the public land corridors along Dandenong Ck and Blind Ck;
- Several patches beside Ferny Ck and Corhanwarrabul Ck;
- Roadsides of nine main or secondary roads.

These areas served as a shortlist for preparation of concept plans for the revegetation of individual sites. The more promising sites were assessed according to the factors discussed in Chapter 3 and the list of priorities in Section 4.7. Nine of the sites that rated highest were then selected for preparation of individual concept plans, which appear in the Appendix to this report (Section 7, starting on page 54). A balance was sought between different types of revegetation, different parts of the municipality and different purposes (e.g. amenity, habitat and offsets). Some other high-ranking sites were passed over because their revegetation is so straightforward that a concept plan does not offer much benefit.

Some sites with concept plans contain many separate revegetation areas, each with its own priority ranking and recommendations for what sort of revegetation should occur there. The revegetation areas are mapped, each one labelled with a unique identifying number. Written details about each area are given following the site plan, including plant species, type of planting (e.g. niche planting or in mulched beds) and any other relevant matters.

The species in the planting lists have been chosen according to the factors discussed in

Section 3.4 (page 25). Where numbers of each species are specified, they take into account the questions of vegetation structure and plant density discussed in Section 3.6 (page 31).

The mapping of the revegetation areas has been done with a Geographic Information System (GIS). This allows GIS users within Council to readily obtain information such as, 'Where are the top-priority areas for niche planting within sites of biological significance?' or 'Where are the areas in Rowville recommended for natural regeneration by ceasing mowing?'.

The concept plans were prepared with the aid of relatively brief site inspections that included checking for the various factors discussed in Section 3, such as fire hazard, power lines and potential for flooding. Further checking of such matters was done with relevant documents such as the Knox Open Space Plan. Feedback was also sought from Council staff.

The plans are only at the concept stage and more detailed investigation may reveal that changes are desirable or required. In particular, the plans have not been exposed to the breadth of expertise and checking that the Planting Round Table is proposed to provide. Public consultation would also contribute to the refinement of the concept plans and perhaps reassessment of priorities. For these reasons, and because funding opportunities may arise for particular projects, it should be recognised that Council may have good reasons for changing the priorities of sites.

Revegetation at Lakewood Nature Reserve in Knoxfield is proposed to be done as an offset for future removal of native vegetation elsewhere (Section 3.13). It involves the two endangered Ecological Vegetation Classes that are useful for offsetting most clearing in Knox – Valley Heathy Forest and Swampy Woodland. To qualify as offsets, it is important that Council provide a convincing case that the revegetation in question would not have occurred anyway.

4.9. New Land Developments

Because new land developments sometimes contribute substantially to the total planting effort in Knox, it is desirable to encourage developers and their landscape designers to make use of the guidance for planting that is in this revegetation plan. This could be achieved in two steps:

- Select at least one staff member who assesses landscape plans in the statutory planning process to become familiar with this revegetation plan. They would then take on the duty of assisting the landscape architects of major land developments to maximise conformity with this revegetation plan; and
- Revise Council's document, *'Landscape Guidelines for Urban Planning Applications'*, to incorporate the main points from this revegetation plan that are relevant to landscape design for major land developments (e.g. species selection and site design). Statutory planners routinely provide that document to developers of projects with substantial landscaping components.

4.10. Planting Incentive Programs

Because of the importance of the community's contribution to revegetation in Knox (Section 2.2.3 on p. 12), it is recommended that Council continue to fund its incentive programs: Gardens for Wildlife, Kindergartens for Wildlife and Biodiversity Buddies.

4.11. Community Relations

People who live or work in Knox are sometimes puzzled or concerned by unconventional approaches to vegetation management such as leaving areas of parkland unmown to facilitate natural regeneration. Those people sometimes approach Council staff in parks or ring the Customer Service staff to ask or complain about what they see. It is important for Council to be able to explain what Council is doing and why.

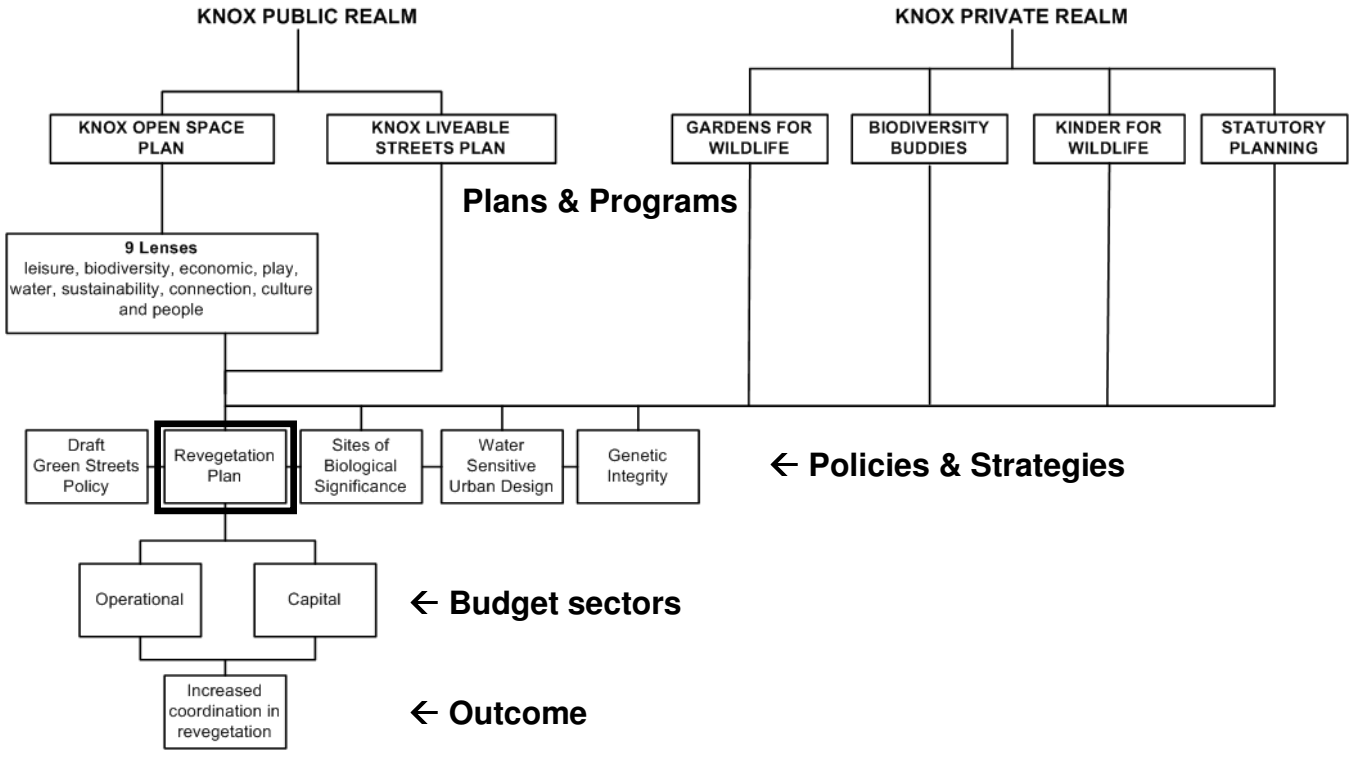
Therefore, it is recommended that:

- This revegetation plan be placed on Council's website for the community to consult;
- Staff who are likely to be approached become familiar with the relevant parts of this revegetation plan so that they can refer interested or concerned people to the document;
- Newspaper articles be periodically sought to explain the unconventional and innovative practices that Council undertakes in line with this revegetation plan; and
- Temporary explanatory signs be erected next to areas where such practices are being undertaken, as appropriate.

4.12. Positioning this Revegetation Plan

Implementation of this Revegetation Plan will require contributions from the four Council departments involved in planting as well as the Municipal Fire Prevention Officer and the Finance department. To aid appropriate allocation of responsibilities, Council staff have prepared Figure 6 as a schematic diagram of a proposed position for the Revegetation Plan within the web of Council's policies, plans and programs.

Figure 6. Schematic diagram of the proposed organisational context of this Revegetation Plan.



5. Conclusion

The changes to existing Council planting practice recommended here are modest, spanning:

- Increased coordination;
- Accountability and review;
- Budgetary changes;
- Resumption of revegetating stream corridors; and
- Practical measures.

If implemented, the changes should increase the efficiency, accountability and benefits of plantings conducted by Council.

The site-specific concept plans in the Appendix should allow more rapid and strategic revegetation in Knox, as long as Council's budget provides funds to do so.

It is hoped that the discussion of issues surrounding revegetation and planting in Chapter 3 will be a valuable resource for people inside and outside Knox City Council, being relevant to many kinds of planting in southeastern and southwestern Australia.

6. Bibliography

Austroads (2009). *'Austroads Guide to Road Design: Part 6'*. Austroads Ltd, Sydney.

Baw Baw Shire Council (2011). *'Baw Baw Shire Native Vegetation Bank Over-the-Counter BushBroker – Council Business Plan'*. Unpublished report, Baw Baw Shire Council, Warragul, Victoria.

Bhullar S. and Majer J. (2000). Arthropods on street trees: a food resource for wildlife. *Pacific Conservation Biology* **6**:171-173.

Costello R. (2010). *'Offset Policy and Options for the Yarra Ranges Council'*. Report to the Yarra Ranges Shire Council, Lilydale, Victoria. 101 pp.

Cunningham R.B., Lindenmayer D.B., Crane M., Michael D., MacGregor C., Montague-Drake R. & Fischer J. (2008). The combined effects of remnant vegetation and tree planting on farmland birds. *Conservation Biology* **22**(3):742-52.

Department of Sustainability & Environment (2006). *'Native Vegetation: Vegetation Gain Approach – Technical basis for calculating gains through improved native vegetation management and revegetation'*. Victorian Government, Dept of Sustainability and Environment, East Melbourne.

Department of Sustainability & Environment (2012). *'Guide to Assist Councils Develop Over-the-Counter Programs'*. This is presently an unpublished document but is planned to be published on the department's internet site in due course.

Gill A.M and Moore P.H.R. (1996). *'Ignitability of Leaves of Australian Plants'*. A contract report to the Australian Flora Foundation. CSIRO Plant Industry, Canberra. 34 pp.

Knox City Council (2003). '*Knox Urban Design Framework 2020'*.

Knox City Council (2008). *'Knox City Council: 2008/2018 Sustainable Environment Strategy'*. Available on Council's website. 111 pp.

Knox City Council (2010a). Council Plan 2009-13, 2010 update. Available on Council's website. 39 pp.

Knox City Council (2010b). '*Knox City Council WSUD & Stormwater Management Strategy 2010'*.

Lorimer G.S. (2001). *'Dandenong Valley Parklands -Flora Recovery after Ecological Burns and Other Treatments'*. Report to Parks Victoria. 29 pp.

Lorimer G.S. (2010a). *'Sites of Biological Significance in Knox'*. Knox City Council, Wantirna South. 2 volumes.

Lorimer G.S. (2010b). *'Management Plan for Locally Threatened Species in Knox – 2010'*. Report to Knox City Council. 17 pp.

MDG Landscape Architects and KLM Development Consultants (2010). *'Water Sensitive Urban Design Guidelines for the City of Knox'*. Report to Knox City Council. 51 pp.

Munro N.T., Lindenmayer D.B. & Fischer J. (2007). Faunal response to revegetation in agricultural areas of Australia: A review. *Ecological Management & Restoration*, **8**:199–207.

Nursery & Garden Industry Queensland (2012). *'Australian Nursery Industry Myrtle Rust Management Plan (Version 2) – 2012'*. Report to the Australian Nursery Industry. 26 pp.

Paget A.N. (1985). *'A Revegetation Design Method'*, comprising Volume 1, *'Revegetation of Knox'* and Volume 2, *'Appendices – Data for Revegetation of Knox'*. Bachelor of Applied Science (Landscape Architecture) thesis, Royal Melbourne Institute of Technology.

RCA (1987). *'A Guide to Tree Planting within Road Reserves'*. Technical Bulletin No. 36, Road Construction Authority, Kew, Victoria. 12 pp.

Romanowski N. (2009). *'Planting Wetlands and Dams: A Practical Guide to Wetland Design, Construction and Propagation'*, 2nd edition. Landlinks Press, Collingwood. 216 pp.

Rowlands S. (2010). *'Tree Planting Opportunities in Knox'*. An internal document of Knox City Council.

VicRoads (2010). *'VicRoads Supplement to the Austroads Guide to Road Design: Part 6 – Roadside Design, Safety and Barriers'*. Roads Corporation, Kew, Victoria. 26 pp.

Vesk P.A., Nolan R., Thomson J.R., Dorrough J.W. and McNally R. (2008). Time lags in provision of habitat resources through revegetation. *Biological Conservation* **141**:174-186.

White J.G., Antos M.J, Fitzsimons J.A. and Palmer G.C. (2005). Non-uniform bird assemblages in urban environments: the influence of streetscape vegetation. *Landscape and Urban Planning* **71**:123-135.

7. Appendix: Concept Plans for Priority Sites

Concept plans are presented below for the revegetation of nine priority sites in Knox. As discussed in Section 4.8, the priority given to these sites, and to other sites that do not appear below, are subject to change for a range of reasons.

Most sites contain many separate revegetation areas, each with its own priority ranking and recommendations for what sort of revegetation should occur there. The revegetation areas are mapped, each one labelled with a unique identifying number. Written details about each area are given following the site plan, including plant species, type of planting (e.g. niche planting or in mulched beds – see Section 3.3.3 on page 23) and any other relevant matters.

The concept plans were prepared with the aid of relatively brief site inspections that included checking for the various factors discussed in Section 3, such as fire hazard, power lines, passive surveillance and potential for flooding. Further checking of such matters was done with relevant documents such as the Knox Open Space Plan. Feedback was also sought from Council staff (but with too little time for deep consideration).

The plans are only at the concept stage and more detailed investigation may reveal that changes are desirable or required. It is intended that the plans would go through the Planting Round Table once they become candidates for upcoming funding.

Care needs to be taken in interpretation of the priority ratings given to individual revegetation areas, which can be far less than the strategic benefit of the areas in combination. The priority rating given to each area within a site is based on what difference its presence makes, assuming that all the others are present. A site may be of high priority overall even if none of the individual beds has high priority.

7.1. Bayswater Park, Mountain Hwy, Bayswater

Figure 7. Proposed revegetation areas at Bayswater Park.

Area 1 (in two parts). Bayswater Park, mown area in the northwest

Priority	Medium
Area	400 m²
Purpose	Provide wildlife habitat and ecological buffering of remnant Swampy Woodland at a major node on the Dandenong Ck habitat corridor.
Type of revegetation	Dense planting into a mulched bed to replace mown lawn.
Methods	Spray grass, spread mulch and plant all strata of Swampy Woodland.
Comments	The chosen area has been set back from the Dandenong Ck trail to retain visibility and passive surveillance along the trail. Keep the larger shrubs further from the trail except for some *Prostanthera lasianthos*, which are showy in summer.

Area 1 (in two parts). Bayswater Park, mown area in the northwest

Species

Canopy trees
Eucalyptus ovata
Eucalyptus cephalocarpa
Eucalyptus radiata

Smaller trees
Acacia melanoxylon

Shrubs
Acacia leprosa
Acacia verticillata
Banksia marginata
Bursaria spinosa
Coprosma quadrifida
Dillwynia cinerascens
Epacris impressa
Goodenia ovata
Gynatrix pulchella
Indigofera australis
Leptospermum lanigerum
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella admixta
Dianella tasmanica
Dichondra repens
Gahnia sieberiana
Lomandra longifolia
Patersonia occidentalis (near the sign)
Poa ensiformis

Twiners
Clematis aristata
Hardenbergia violacea

Area 2. Bayswater Park, western edge with mown understorey

Priority	Medium
Area	3,500 m²
Purpose	Provide wildlife habitat and a more bushy character to this part of the park.
Type of revegetation	Dense planting into a mulched bed to replace mown lawn, incorporating existing mature Australian native trees.
Methods	Spray grass and spread mulch (bypassing small patches of *Dichondra* and native grass), then plant with understorey tubestock.
Comments	This area could be done in stages from east to west. Take care not to spread mulch into the adjacent area with native grass, in which the listed rare species *Austrostipa rudis* subspecies *australis* is fairly abundant. The area has many fallen trees and limbs, which should be mostly removed. Only a small number are needed by lizards and frogs.

Area 2. Bayswater Park, western edge with mown understorey

Species

Understorey trees
3 *Acacia dealbata*
3 *Acacia melanoxylon*

Shrubs
Acacia verticillata
Banksia marginata
Coprosma quadrifida
Dillwynia cinerascens
Epacris impressa
Goodenia ovata
Hakea nodosa
Leptospermum lanigerum
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella admixta
Dianella tasmanica
Dichondra repens
Gahnia sieberiana
Lomandra longifolia
Poa ensiformis
Themeda triandra

Twiners
Billardiera mutabilis
Clematis aristata
Glycine clandestina
Hardenbergia violacea

Area 3. Bayswater Park, skeletal woodland in the northwest

Priority: Medium

Area: 1,000 m²

Purpose: Increase the structural and floristic diversity of skeletal Swampy Woodland for wildlife and for conservation of flora and the endangered community.

Type of revegetation: Niche planting of all vegetation strata within remnant vegetation

Methods: Plant tubestock without site preparation, taking care not to damage the listed rare species *Austrostipa rudis* subspecies *australis*, which is present there. Locate the trees in open areas.

Species

Canopy trees
3 *Eucalyptus ovata*
2 *Eucalyptus cephalocarpa*
1 *Eucalyptus radiata*

Understorey trees
2 *Acacia dealbata*
2 *Acacia mearnsii*
2 *Acacia melanoxylon*

Shrubs
Acacia verticillata
Banksia marginata
Coprosma quadrifida
Dillwynia cinerascens
Epacris impressa
Goodenia ovata
Hakea nodosa
Leptospermum continentale
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii

Ground flora
Dianella admixta
Patersonia occidentalis (in the north)
Poa ensiformis

Twiners
Billardiera mutabilis
Clematis aristata
Comesperma volubile
Glycine clandestina
Hardenbergia violacea

Area 4. Bayswater Park, drain

Priority	Medium
Area	1,000 m² (145 m × 7-8 m)
Purpose	Continue past revegetation to improve the vegetation's structural diversity.
Type of revegetation	Niche planting of understorey within native vegetation
Methods	Plant tubestock with weed mats or (in small patches) jute mat and a stake on the upstream side of each plant to catch flood debris. If using jute mat, spray weeds prior. When using weed mats, optionally spray niches prior. Do not plant the gully floor so densely as to be a problem with floodwater.
Comments	Low, herbaceous, introduced plants such as grasses, Creeping Buttercup and Angled Onion will persist indefinitely. Mulch is not useable due to floodwater and the steepness of the banks. Revegetation during the recent drought was only partly successful. Emphasis is placed here on establishing hardy species that can provide hardy competition for the introduced species.

Species	Shrubs	Ground flora
	50 *Coprosma quadrifida*	50 *Acaena novae-zelandiae*
	80 *Goodenia ovata*	50 *Carex appressa*
	30 *Leptospermum lanigerum*	20 *Gahnia sieberiana*
	30 *Leptospermum scoparium*	50 *Lomandra longifolia*
	50 *Ozothamnus ferrugineus*	100 *Persicaria decipiens*
	20 *Solanum laciniatum*	100 *Poa ensiformis*

Area 5. Bayswater Park, beside Dandenong Creek Trail

Priority	Medium
Area	1,700 m²
Purpose	Provide wildlife habitat and a more bushy character to this part of the park.
Type of revegetation	Dense planting into a mulched bed, incorporating existing mature Australian native trees.
Methods	Spray grass and spread mulch (bypassing small patches of *Dichondra* and native grass), then plant with understorey tubestock.
Comments	Take care not to spread mulch into the adjacent area with native grass, in which the listed rare species *Austrostipa rudis* subspecies *australis* is fairly abundant. The chosen area has been set back from the Dandenong Ck trail to retain visibility and passive surveillance along the trail. Keep the larger shrubs further from the trail except for some *Prostanthera lasianthos*, which are showy in summer.

Area 5. Bayswater Park, beside Dandenong Creek Trail

Species

Understorey trees
3 *Acacia dealbata*
3 *Acacia melanoxylon*

Shrubs
Acacia leprosa
Acacia verticillata
Banksia marginata
Bursaria spinosa
Coprosma quadrifida
Dillwynia cinerascens
Epacris impressa
Goodenia ovata
Leptospermum lanigerum
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella admixta
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Patersonia occidentalis (near the path)
Poa ensiformis
Themeda triandra

Twiners
Clematis aristata
Hardenbergia violacea

Area 6. Bayswater Park – the broadest expanse of Swampy Woodland

Priority: Medium

Area: 3,800 m²

Purpose: Increase the structural and floristic diversity of Swampy Woodland for wildlife and conservation of flora and the endangered Swampy Woodland community.

Type of revegetation: Niche planting of understorey within remnant vegetation

Methods: Plant tubestock without site preparation, taking care not to damage the listed rare species *Austrostipa rudis* subspecies *australis*, which is present there. The few eucalypts proposed for the planting are for the canopy gap in the northwestern corner.

Species

Canopy trees
4 *Eucalyptus ovata*

Understorey trees
2 *Acacia dealbata*
4 *Acacia mearnsii*
4 *Acacia melanoxylon*

Shrubs
Acacia leprosa
Acacia verticillata
Banksia marginata
Coprosma quadrifida
Dillwynia cinerascens
Epacris impressa
Goodenia ovata
Hakea nodosa
Leptospermum continentale
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii

Ground flora
Dianella admixta
Dianella tasmanica
Patersonia occidentalis
Wahlenbergia gracilis
Wahlenbergia stricta

Twiners
Billardiera mutabilis
Clematis aristata
Comesperma volubile
Glycine clandestina
Hardenbergia violacea

Area 7. Bayswater Park, 2 mown bays off the mown area around the barbecues

Priority: Medium

Area 7. Bayswater Park, 2 mown bays off the mown area around the barbecues

Area	220 m²
Purpose	Remove these weedy projections into the native vegetation to reduce edge effects, particularly spread of grass weeds into the bushland.
Type of revegetation	Dense planting into a mulched bed to replace mown grass.
Methods	Spray grass, spread mulch and plant tubestock.
Comments	

Species

Canopy trees
2 *Eucalyptus cephalocarpa*

Understorey trees
2 *Acacia dealbata*
1 *Acacia melanoxylon*

Shrubs
Acacia verticillata
Coprosma quadrifida
Goodenia ovata
Leptospermum scoparium
Olearia lirata
Prostanthera lasianthos
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella tasmanica
Lomandra longifolia
Poa ensiformis
Themeda triandra

Creeper/twiner
Hardenbergia violacea

Area 8. Bayswater Park, southwest of the picnic area

Priority	Low
Area	500 m²
Purpose	Provide wildlife habitat and strengthen the ecological linkage from Dandenong Ck to the playground.
Type of revegetation	Moderately dense planting into a mulched bed, incorporating existing mature Australian native trees.
Methods	Spray grass and spread mulch, then plant with tubestock. Retain a pathway between the picnic shelters and the mown area to the southwest. Do not plant shrubs densely enough to greatly obstruct vision from the picnic shelters toward the mown area southwest of the proposed revegetation. In the drainage channel, plant only species that are small or will bend over in floodwater.

Species

Understorey trees
2 *Allocasuarina littoralis*
2 *Acacia dealbata*

Shrubs
Acacia verticillata
Bursaria spinosa
Coprosma quadrifida
Goodenia ovata
Olearia lirata
Prostanthera lasianthos
Pultenaea gunnii
Solanum laciniatum

Ground flora
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Poa ensiformis
Themeda triandra

Area 9. Bayswater Park, westerly extension of wetland planting

Priority	Low
Area	165 m²
Purpose	Extend and buffer the existing revegetation area around the wetland.
Type of revegetation	Dense planting into a mulched bed to replace mown lawn.
Methods	Spray grass, spread mulch and plant tubestock.
Comments	Species have been chosen to allow greater visibility through the vegetation than in the existing revegetation patch around the wetland.

Species

Canopy trees
2 *Eucalyptus cephalocarpa*

Understorey trees
3 *Acacia dealbata*
3 *Melaleuca ericifolia*

Shrubs
Acacia leprosa
Acacia verticillata
Coprosma quadrifida
Goodenia ovata
Hakea nodosa
Leptospermum lanigerum
Ozothamnus ferrugineus
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella tasmanica
Gahnia sieberiana
Lomandra longifolia
Poa ensiformis

Twiners
Clematis aristata
Hardenbergia violacea

Area 10. Bayswater Park, drainage swale from wetland overflow

Priority	Medium
Area	100 m²
Purpose	Use plants to take up excess nutrients and water from a weedy drainage swale.
Type of revegetation	Dense planting into weedy grass, without mulch.
Methods	Spray grass (avoiding Australian Sweet-grass, *Glyceria australis*) and plant tubestock with weed mats. No mulch due to flooding.
Comments	Species have been chosen to compete with existing weeds. The *Persicarias* go in the wettest ground.

Species

Canopy trees
3 *Eucalyptus ovata*

Understorey trees
5 *Melaleuca ericifolia*

Shrubs
5 *Coprosma quadrifida*
5 *Goodenia ovata*
5 *Leptospermum lanigerum*
5 *Ozothamnus ferrugineus*

Ground flora
10 *Acaena novae-zelandiae*
10 *Carex appressa*
3 *Gahnia sieberiana*
3 *Lepidosperma elatius* (if available)
10 *Persicaria decipiens*

Area 11. Bayswater Park, northeast of the wetland

Priority	Medium
Area	570 m²
Purpose	Extend and buffer the existing revegetation area around the wetland.
Type of revegetation	Dense planting into a mulched bed to replace mown lawn, incorporating a few remnant trees.
Methods	Spray grass, spread mulch and plant tubestock.
Comments	

Species

Canopy trees
1 *Eucalyptus obliqua*
2 *Eucalyptus ovata*

Understorey trees
2 *Acacia dealbata*
2 *Acacia melanoxylon*

Shrubs
Acacia verticillata
Coprosma quadrifida
Goodenia ovata
Hakea nodosa
Leptospermum lanigerum
Ozothamnus ferrugineus
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella tasmanica
Gahnia sieberiana
Lepidosperma elatius (if available)
Lomandra longifolia
Patersonia occidentalis
Poa ensiformis

Twiners
Clematis aristata

Area 12. Bayswater Park, northwest of the cricket practice nets

Priority	Medium
Area	235 m²
Purpose	Improve the continuity of native vegetation beside the major drain and increase the bushy character of this part of the park.
Type of revegetation	Dense planting into a mulched bed to replace mown lawn, enveloping existing eucalypts.
Methods	Spray grass, spread mulch and plant tubestock.
Comments	

Species

Canopy tree
1 *Eucalyptus radiata*

Smaller trees
1 *Acacia dealbata*
1 *Acacia mearnsii*

Shrubs
Acacia verticillata
Banksia marginata
Bursaria spinosa
Coprosma quadrifida
Goodenia ovata
Indigofera australis
Leptospermum lanigerum
Olearia lirata
Prostanthera lasianthos
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella admixta
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Poa ensiformis

Twiners
1 *Clematis aristata*
2 *Hardenbergia violacea*

Area 13. Bayswater Park, northeast corner, patch with native understorey

Priority	Medium
Area	1,100 m2
Purpose	Increase the diversity of plants for wildlife and for conservation of flora and the endangered Swampy Woodland community.
Type of revegetation	Niche planting of all vegetation strata within remnant vegetation
Methods	Plant tubestock without site preparation, taking care not to damage the listed rare species *Austrostipa rudis* subspecies *australis*. Do not plant shrubs within 12 m of the fence around Bayswater Oval (i.e. east of the present slashed corridor) for passive surveillance.
Comments	If mowing is to be ceased in the abutting Area 14 (see below), some of the species listed below can be planted there, as well.
Species	Shrubs *Acacia verticillata* *Banksia marginata* *Coprosma quadrifida* *Dillwynia cinerascens* *Epacris impressa* *Hakea nodosa* *Leptospermum continentale* *Olearia lirata* *Ozothamnus ferrugineus* *Pultenaea gunnii* Ground flora *Dianella admixta* *Dianella longifolia* *Veronica gracilis* *Wahlenbergia gracilis* *Wahlenbergia stricta* Twiners *Billardiera mutabilis* *Clematis aristata* *Comesperma volubile* *Glycine clandestina* *Hardenbergia violacea*

Area 14. Bayswater Park, northeast corner, mown native ground flora

Priority	Medium
Area	85 m²
Purpose	Allow natural regeneration of native ground flora to expand the significant vegetation of Area 13.
Type of revegetation	Natural regeneration and minor enrichment planting
Methods	Cease mowing; Extend the planting of Area 13 into this area.
Comments	
Species	As for Area 13.

Area 15. Bayswater Park, south to west of the Bayswater Oval fence

Priority	High
Area	6,700 m²
Purpose	Provide ecological buffering for the significant patch of remnant bushland in Area 13; Fill in the gaps between existing revegetation patches to reduce edge effects; Provide wildlife habitat and a more bushy character to this part of the park.

Area 15. Bayswater Park, south to west of the Bayswater Oval fence

Type of revegetation	Dense planting into a mulched bed, incorporating some patches of remnant trees and mature planted trees.
Methods	Spray grass, spread mulch and plant tubestock.
Comments	Maintain a slashed strip adjacent to the Bayswater Oval fence. The existing revegetation patches are due for weed control.

Species

Canopy trees
Eucalyptus ovata
Eucalyptus cephalocarpa
Eucalyptus obliqua
Eucalyptus radiata

Understorey trees
Acacia dealbata
Acacia mearnsii
Acacia melanoxylon
Allocasuarina littoralis

Shrubs
Acacia verticillata
Coprosma quadrifida
Dillwynia cinerascens
Goodenia ovata
Hakea nodosa
Leptospermum continentale
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii

Ground flora
Acaena novae-zelandiae
Dianella admixta
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Poa ensiformis

Twiners
Billardiera mutabilis
Clematis aristata
Hardenbergia violacea

Area 16. Bayswater Park, southeastern corner beside footpath

Priority	Medium
Area	800 m²
Purpose	Contribute to Council's 'Bush Boulevards' theme; Showcase the park's pre-European flora; Provide a pleasant visual barrier between pedestrians and heavy traffic.
Type of revegetation	Dense planting into a mulched bed.
Methods	Spray grass, spread mulch and plant tubestock.
Comments	Leave slashed strips as shown to accommodate machinery access, construction of a path (Lilydale topping?) and drainage of floodwater across Mountain Hwy. Plant eucalypts at spacings of 10 m. Keep shrubs sparse enough to allow visibility across the width of the beds, for passive surveillance. Rely on a high density of groundcovers and small shrubs to suppress ingress of weeds.

Area 16. Bayswater Park, southeastern corner beside footpath

Species

Canopy trees
Eucalyptus yarraensis
Eucalyptus cephalocarpa
Eucalyptus obliqua
Eucalyptus radiata

Understorey trees
Acacia mearnsii
Allocasuarina littoralis

Shrubs
Acacia leprosa
Acacia myrtifolia
Acacia verticillata
Banksia marginata
Coprosma quadrifida
Dillwynia cinerascens
Epacris impressa
Goodenia ovata
Hakea ulicina
Hibbertia riparia
Indigofera australis
Kunzea ericoides
Leptospermum continentale
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Pultenaea gunnii
Spyridium parvifolium
Solanum laciniatum

Ground flora
Acaena novae-zelandiae (not near paths)
Dianella admixta
Dianella longifolia
Dianella tasmanica
Dichondra repens
Hovea heterophylla
Lepidosperma gunnii (if available)
Leptorhynchos tenuifolius
Lobelia anceps
Lomandra longifolia
Patersonia occidentalis
Poa ensiformis
Stylidium armeria/graminifolium
Themeda triandra
Veronica gracilis
Viola hederacea

Creepers and Twiners
Billardiera mutabilis
Clematis aristata
Glycine clandestina
Hardenbergia violacea
Platylobium formosum

7.2. Dandenong Ck, Dorset Rd to Bayswater Rd

The proposed revegetation of this site (like the other stream corridor sites) would have to be checked and approved by three departments of Melbourne Water. Space has been left for floodwater and management vehicles. Species planted within a few metres of the Dandenong Creek Trail should not provide a high visual density at eye level, for reasons of passive surveillance. Recent plantings along Burwood Hwy and Stud Rd in Wantirna South achieve this result. At greater distances from the trail, greater visual density is desirable to screen factories and for the benefit of wildlife. For the safety of cyclists and pedestrians on the Dandenong Creek Trail, good visibility has been retained at bends and junctions.

Taken one by one, the priority given to each revegetation area is moderate, but the collective benefit for wildlife and visual screening of factories is high.

Figure 8. Proposed revegetation areas along Dandenong Ck, Dorset Rd to Bayswater Rd. The right edge of the upper image slightly overlaps the bottom-left of the lower image.

Area 17 (in 17 parts). Between Dandenong Ck and adjacent factories

Area	5,200 m², in strip-like segments 3-8 m wide
Priority	Medium
Purpose	Eliminate fragmentation of the Dandenong Ck habitat corridor; Fill in spaces between existing small mulched beds to create larger patches that are more beneficial to wildlife and suffer less from edge effects (Section 3.3.2); Provide visual screening of factories from the Dandenong Ck Trail.
Type of revegetation	Dense planting into a mulched bed. Most of the area is presently covered solely with mown grass. The rest requires the revegetation to be installed beneath scattered, mature, planted 'Australian native' trees.
Methods	Spray grass and weeds, spread mulch and plant species of Swampy Woodland.
Comments	Eucalypts should be planted so that they, in combination with the pre-existing trees, are approximately 10 m apart on average.
Species	Canopy trees *Eucalyptus cephalocarpa* *Eucalyptus ovata* *Eucalyptus radiata* Smaller trees *Acacia mearnsii* *Acacia melanoxylon* *Acacia pycnantha* *Pomaderris aspera* Shrubs *Acacia leprosa* *Acacia paradoxa* *Acacia verticillata* *Bursaria spinosa* *Coprosma quadrifida* *Goodenia ovata* *Gynatrix pulchella* *Kunzea ericoides* *Leptospermum scoparium* *Olearia lirata* *Ozothamnus ferrugineus* *Prostanthera lasianthos* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Dianella admixta* *Dianella tasmanica* *Dichondra repens* *Gahnia sieberiana* *Lomandra longifolia* *Poa ensiformis* *Themeda triandra* Twiners (small numbers) *Clematis aristata* *Hardenbergia violacea*

Area 18(in four parts). Between the Dandenong Ck Trail and the creek

Area	380 m², in strip-like segments 3-5 m wide
Priority	Medium
Purpose	Replace uncontrolled weeds and dead trees with indigenous understorey.
Type of revegetation	Planting of scattered individual shrubs (and one or two small trees) between the trunks of scattered, mature or dead, planted 'Australian native' trees.
Methods	Remove dead or dying trees. Spray blackberries. Spray niches for individual plants prior to planting. Use individual weed mats when planting.

Area 18(in four parts). Between the Dandenong Ck Trail and the creek

Comments	This area demonstrates the problem of past over-dense planting of canopy trees leading to unhealthy trees and a weedy understorey (in the absence of maintenance). Near the eastern end of this area, a single plant of the locally rare, weedy-looking shrublet, *Senecio bathurstianus* was found in 2012. Care should be taken not to destroy it. Identification requires someone with knowledge of the genus.
Species	Smaller trees *Acacia mearnsii* Shrubs *Acacia paradoxa* *Bursaria spinosa* *Goodenia ovata* *Kunzea ericoides* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Lomandra longifolia* *Themeda triandra*

Area 19. A wattle scrub remnant beside Dandenong Ck

Area	1,400 m²
Priority	Medium
Purpose	Increase the diversity of species and plant heights, for the benefit of wildlife and to compete with dense blackberries and other weeds.
Type of revegetation	Planting of scattered individual trees and shrubs among the existing blackwood trees.
Methods	Spray blackberries. Spray niches for individual plants prior to planting. Use individual weed mats when planting.
Comments	The objective is just to improve vegetation diversity and structure.
Species	Canopy trees *Eucalyptus cephalocarpa* *Eucalyptus ovata* Smaller trees *Melaleuca ericifolia* *Leptospermum scoparium*

Area 20(in three parts). Between Dandenong Ck and adjacent factories

Area	1 hectare
Priority	Medium
Purpose	Eliminate fragmentation of the Dandenong Ck habitat corridor; Provide vegetation broad enough to allow birds to roost, nest and seek refuge; Provide visual screening of factories from the Dandenong Ck Trail.
Type of revegetation	Dense planting into a mulched bed. Most of the area is presently covered solely with mown grass. The rest requires the revegetation to be installed beneath scattered remnant trees.
Methods	Spray grass and weeds, spread mulch and plant all strata of Swampy Woodland.

Area 20 (in three parts). Between Dandenong Ck and adjacent factories

Comments	Eucalypts should be planted so that they are approximately 10 m apart on average. If any die, they should be replaced. There is a remnant of indigenous ground flora in the notch that can be seen in the northern edge of the largest segment of this area. It contains *Carex ?gaudichaudiana*, *Lepidosperma elatius*, *Lomandra longifolia*, *Acaena novae-zelandiae* and probably other indigenous species that escaped detection in this investigation. Care should be taken not to harm these species and to remove the surrounding weeds, particularly Boneseed. This area is interrupted by a 1,000 m² rectangle of public land used commercially by 'Bondy's Barn' for outdoor entertainment.
Species	Canopy trees *Eucalyptus cephalocarpa* *Eucalyptus ovata* (dominant) *Eucalyptus obliqua* Smaller trees *Acacia mearnsii* *Acacia melanoxylon* *Melaleuca ericifolia* *Pomaderris aspera* Shrubs *Acacia leprosa* *Acacia paradoxa* *Acacia verticillata* *Bursaria spinosa* *Coprosma quadrifida* *Goodenia ovata* *Gynatrix pulchella* *Kunzea ericoides* *Leptospermum scoparium* *Olearia lirata* *Ozothamnus ferrugineus* *Prostanthera lasianthos* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Dianella admixta* *Dianella tasmanica* *Dichondra repens* *Gahnia sieberiana* *Lomandra longifolia* *Poa ensiformis* *Themeda triandra* Twiners (small numbers) *Clematis aristata* *Hardenbergia violacea*

Area 21 (in two parts). Beside Dandenong Ck, just downstream of Dorset Rd

Area	1,400 m²
Priority	High
Purpose	Remove a substantial interruption in the Dandenong Ck habitat corridor; Provide visual screening of factories from the Dandenong Ck Trail.
Type of revegetation	Dense planting into a mulched bed where there is presently dense Kikuyu.
Methods	Spray grass and weeds, spread mulch and plant all strata of Swampy Woodland.
Comments	The deep layer of weeds presents a challenge for site preparation but it is warranted by the high strategic value of vegetation at this location. Among the weeds are patches of the priority weed, St Peter's Wort.
Species	As for Area 20.

7.3. Colchester Reserve and adjacent Dandenong Ck, Boronia

This site includes a critical weak link in the Dandenong Creek habitat corridor. For the most part, the most effective corrective measure would be to revegetate the northern side of the creek (in Maroondah), where there are wide, flat, bare expanses. To do so would also significantly improve the experience of people walking or cycling along the adjacent Dandenong Creek Trail.

It is therefore recommended that Knox City Council seeks cooperation with Maroondah City Council to achieve a better, coordinated result.

The priorities assigned here to individual revegetation areas beside the creek may be too high in some cases if revegetation does occur on the Maroondah side. Taken one by one, the priority given to each revegetation area is less than if they are taken in combination.

The proposed revegetation of this site (like the other stream corridor sites) would have to be checked and approved by three departments of Melbourne Water. Space has been left for floodwater and management vehicles.

Figure 9. Proposed revegetation areas in and near Colchester Reserve, Boronia.

Area 22 (in 17 parts). Around the Colchester Reserve oval

Area	3,500 m²
Priority	Medium
Purpose	Fill in spaces between existing small mulched beds to create larger patches that are more beneficial to wildlife and suffer less from edge effects (Section 3.3.2); Make Colchester Reserve a node (or stopping-off place) for wildlife moving along the Dandenong Ck habitat corridor.
Type of revegetation	Dense planting into mulched beds where there is presently just mown grass or failed previous plantings.
Methods	Spray grass and weeds, spread mulch and plant species of Swampy Woodland.
Comments	Eucalypts should be planted so that they, in combination with the pre-existing trees, are approximately 10 m apart on average. Use *Eucalyptus cephalocarpa* where the crown will overhang paths, otherwise *Eucalyptus ovata*.
Species	Canopy trees *Eucalyptus cephalocarpa* *Eucalyptus ovata* Smaller trees *Acacia dealbata* *Acacia melanoxylon* *Pomaderris aspera* (beside creek) Shrubs *Acacia leprosa* *Acacia paradoxa* *Acacia verticillata* *Bursaria spinosa* *Coprosma quadrifida* *Goodenia ovata* *Gynatrix pulchella* *Kunzea ericoides* *Leptospermum scoparium* *Olearia lirata* *Ozothamnus ferrugineus* *Prostanthera lasianthos* *Solanum laciniatum* *Viminaria juncea* Ground flora *Acaena novae-zelandiae* (not near paths) *Dianella laevis/longifolia* *Dianella tasmanica* *Dichondra repens* *Gahnia sieberiana* *Lomandra longifolia* *Poa ensiformis* Twiners (small numbers) *Clematis aristata* *Hardenbergia violacea* *Pandorea pandorana*

Area 23. On a swale at the northwest perimeter of the Colchester Reserve oval

Area	800 m²
Priority	Medium
Purpose	Provide a vegetation cover for seasonally saturated ground that doesn't need mowing.
Type of revegetation	Dense planting into a bed with weed mat.
Methods	Spray grass, lay weed mat and plant
Comments	This area is very boggy in wet weather but dries out thoroughly in the drier months.

Area 23. On a swale at the northwest perimeter of the Colchester Reserve oval

Species

Shrubs
Coprosma quadrifida
Goodenia ovata
Leptospermum lanigerum
Ozothamnus ferrugineus
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Carex appressa
Gahnia sieberiana
Juncus gregiflorus
Juncus pauciflorus
Lomandra longifolia
Persicaria decipiens
Poa ensiformis

Area 24. Northeast of the Colchester Reserve oval

Area	600 m²
Priority	Medium
Purpose	Expand and improve the habitat provided by a group of eucalypts by planting understorey beneath them and linking them to an adjacent patch of trees.
Type of revegetation	Planting into a mulched bed beneath existing trees and on adjacent lawn.
Methods	Spray grass and weeds, spread mulch and plant species of Swampy Woodland.
Comments	Eucalypts should be planted so that they, in combination with the pre-existing trees, are approximately 10 m apart on average.

Species

Canopy trees
2 *Eucalyptus cephalocarpa*

Smaller trees
1 *Acacia dealbata*
1 *Acacia melanoxylon*

Shrubs
Acacia leprosa
Acacia paradoxa
Acacia verticillata
Bursaria spinosa
Coprosma quadrifida
Goodenia ovata
Kunzea ericoides
Leptospermum scoparium
Solanum laciniatum
Spyridium parvifolium

Ground flora under trees
Acaena novae-zelandiae
Dianella tasmanica
Dichondra repens

Ground flora in the open
Acaena novae-zelandiae (not near path)
Dianella tasmanica
Dichondra repens
Gahnia sieberiana
Hardenbergia violacea
Lomandra longifolia
Poa ensiformis
Themeda triandra

Twiner
Pandorea pandorana

Area 25. Beside Dandenong Ck, east of Colchester Reserve

Area	1,600 m² (280 m × 5½ m approximately)
Priority	High (or Medium if revegetation can be arranged on the Maroondah side of the creek, instead)
Purpose	Repair a significant gap in the Dandenong Ck habitat corridor, particularly in regard to the eucalypt canopy.
Type of revegetation	Planting into a mulched bed where there is presently grass (slashed regularly).
Methods	Spray grass and weeds, spread mulch and plant species of Swampy Woodland.

Area 25. Beside Dandenong Ck, east of Colchester Reserve

Comments	This bed is on a moderate slope facing south. Retain vehicle access. The eucalypts should be spaced approximately 10 m apart.
Species	Canopy trees 5 *Eucalyptus cephalocarpa* 25 *Eucalyptus ovata* Smaller trees *Acacia dealbata* *Acacia melanoxylon* *Pomaderris aspera* Shrubs *Acacia leprosa* *Acacia paradoxa* *Acacia verticillata* *Bursaria spinosa* *Cassinia aculeata* *Coprosma quadrifida* *Goodenia ovata* *Gynatrix pulchella* *Kunzea ericoides* *Leptospermum scoparium* *Olearia lirata* *Ozothamnus ferrugineus* *Prostanthera lasianthos* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Dianella laevis/longifolia* *Dianella tasmanica* *Dichondra repens* *Gahnia sieberiana* *Lomandra longifolia* *Poa ensiformis* Twiners *Calystegia marginata* *Clematis aristata* *Hardenbergia violacea* *Pandorea pandorana*

Area 26. Dandenong Ck bank, east of Colchester Reserve

Area	Linear, 550 m long (extending east-southeast of the map above)
Priority	High (or Medium if revegetation can be arranged on the Maroondah side of the creek, instead)
Purpose	Repair a significant gap in the eucalypt canopy of the Dandenong Ck habitat corridor.
Type of revegetation	Planting of individual eucalypts into weedy grass (slashed regularly).
Methods	Plant at intervals of approximately 15 m. Spray grass around each tree site prior to planting. Plant with weed mats and tree guards. Take care to minimise obstruction of slashers.
Comments	Swamp Gums at the specified spacing are not believed to materially impede floodwater.
Species	35-40 *Eucalyptus ovata*

7.4. Burwood Hwy Bush Boulevard, Wantirna South

Burwood Hwy is a major gateway to Knox and carries a substantial pedestrian traffic. Council has put a priority on creation of 'Bush Boulevards' in such locations to create a strong impression of Knox as a green and leafy municipality. In pursuit of this priority, some planting has been done along Burwood Hwy between Eastlink and Stud Rd recently.

The proposed plantings below seek to extend and strengthen the planting that has already been done. Much of the proposed planting involves individual trees planted into lawn, each with a nominated species. (It is not possible to display the names of the species at the scale of the map below but they are visible in the Geographic Information System.) There are also proposals to add to the mulched gardens beds. The placement of some proposed beds and the addition of small promontories to existing beds have been done in such a way as to fill visual gaps when viewed from the road or shared path.

Care has been taken to avoid planting too close to traffic or powerlines, which present a significant constraint on revegetation on the southern side of the highway. Species have been chosen with attention to their mature size in relation to the vertical and horizontal space available. Care has also been taken to avoid overshadowing neighbours' solar panels.

Figure 10. Proposed revegetation areas along Burwood Hwy west of Stud Rd.
The right edge of the upper image slightly overlaps the left edge of the lower image.

Area 27. Scattered trees to fill canopy gaps along Burwood Hwy

Area	Nearly all of this group are mapped as individual trees, so there is no well-defined area to measure.
Priority	Medium
Purpose	Fill in canopy gaps to further fulfil the intention of a 'bush boulevard'; Screen fences and buildings from the roads and paths; Encourage birdlife.
Type of revegetation	Planting of individual trees, not in beds.
Methods	Spray grass around each tree site prior to planting. Plant with weed mats and stakes. Tree guards may also be used with any tubestock that are planted.
Species	As recorded for each tree in the Geographic Information System – mainly *Eucalyptus melliodora, E. obliqua, E. cephalocarpa, E. macrorhyncha, Acacia melanoxylon* and *Acacia mearnsii*. There are also two small strips marked, each to be planted with a mixture of *E. cephalocarpa, E. radiata, A. implexa, A. mearnsii* and *A. melanoxylon*.

Area 28. A tiny patch of remnant bushland just east of Cathies Lane

Area	160 m² (approximately 30 m × 5 m)
Priority	High
Purpose	Restore a remnant that remarkably retains at least 18 indigenous flowering species and numerous indigenous moss species (as visible in July 2012).
Type of revegetation	Cessation of mowing; Enrichment planting.
Methods	Cease mowing and mark edges for mower operators; Spray veldt-grass and follow up with hand weeding & possibly spot spraying; Plant tubestock (taking care not to harm naturally occurring plants) to increase diversity and the populations of scarce species.
Comments	This is a specialty job for the Bushland team. Ideally, there would be a botanical survey in spring prior to planting. All species planted should be recorded so that it will be possible in future to know what is natural and what is the result of planting. The species marked with asterisks below are present naturally (along with many others).
Species	Shrubs *Acacia myrtifolia* *Pultenaea gunnii* Twiner *Hardenbergia violacea* Ground flora *Arthropodium strictum** *Dianella laevis/longifolia* *Dichondra repens* *Dillwynia cinerascens* *Helichrysum scorpioides* *Hovea heterophylla** *Poa morrisii* *Themeda triandra** *Tricoryne elatior** *Wahlenbergia gracilis*

Area 29 (in ten parts). Mulched beds beside Burwood Hwy

Area	2,400 m²
Priority	Medium
Purpose	Fill in understorey gaps to further fulfil the intention of a 'bush boulevard'; Screen fences and buildings from the roads and paths; Encourage birdlife.
Type of revegetation	Dense planting into mulched beds where there is presently just mown grass.
Methods	Spray grass and weeds, spread mulch and plant.
Comments	The intention is to build on recent plantings using similar species and structure, but without the *Correa* hybrids and with a few additional species.

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus macrorhyncha
Eucalyptus melliodora
Eucalyptus obliqua
Eucalyptus radiata

Smaller trees
Acacia implexa
Acacia mearnsii
Acacia melanoxylon

Shrubs
Acacia leprosa
Acacia myrtifolia
Banksia marginata
Bursaria spinosa
Dillwynia cinerascens
Goodenia ovata
Hibbertia riparia
Indigofera australis
Kunzea ericoides
Leptospermum continentale
Olearia lirata
Ozothamnus ferrugineus
Pultenaea gunnii
Solanum laciniatum
Spyridium parvifolium

Ground flora
Dianella admixta
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Helichrysum scorpioides
Lepidosperma gunnii (if available)
Leptorhynchos tenuifolius
Lomandra longifolia
Poa morrisii
Themeda triandra

Twiners
Clematis aristata
Hardenbergia violacea

7.5. Blind Creek Corridor, Wantirna South

This site is weak link in the Blind Creek habitat corridor. Planting opportunities are constrained by wetlands, floodwater and very narrow strips available beside the Blind Ck Trail. Land to the north formerly used for a tip would be valuable for revegetation when and if it becomes available for such a use.

In addition to filling gaps in the habitat corridor, the proposed planting below is intended to significantly improve the views from the Blind Creek Trail, which are presently dominated by the Knox Waste Transfer Station to the north and a Boral brickworks to the south.

The corridor includes a nationally rare Yarra Gum (in a tiny remnant just east of the transmission lines) and probably some regionally rare species in or around the wetlands. Care should be taken not to harm these plants.

The circles on the graphics below represent individual eucalypts. Each one is labelled in the Geographic Information System with the name of a chosen species but it is not possible to display them all at the scale used here.

The proposed revegetation of this site (like the other stream corridor sites) would have to be checked and approved by three departments of Melbourne Water.

Figure 11. Proposed revegetation areas along Blind Ck, Wantirna South.
The right edge of the upper image overlaps the left edge of the lower image.

Area 30. Scattered trees to fill canopy gaps beside the Blind Creek Trail

Area	This area comprises scattered trees, so there is no well-defined area to measure.
Priority	Medium
Purpose	Fill major gaps in the tree canopy along the Blind Ck corridor; Screen the waste transfer station and brickworks from the trail.
Type of revegetation	Planting of individual trees, not in beds.
Methods	Spray grass around each tree site prior to planting. Plant with weed mats. Use tree guards with tubestock on elevated ground. For each tree on the floodplain, put a strong stake on the upstream side to protect from debris in floods.
Comments	The spacing shown above is quite important. Yarra Gums and Silver-leafed Stringybarks are favoured over Swamp Gums next to the trail because the latter species is prone to fall over and drop limbs.
Species	*Eucalyptus cephalocarpa, Eucalyptus yarraensis* and a single *Eucalyptus ovata*.

Area 31. Narrow corridor southwest of the Knox Waste Transfer Station

Area	850 m² (190 m long in aggregate)
Priority	Medium
Purpose	Improve continuity of native vegetation along the Blind Ck corridor; Screen the former tip and transmission lines from the trail.
Type of revegetation	Planting into a mulched bed where there is presently grass (mown regularly).
Methods	Spray grass, spread mulch and plant species of Swampy Woodland.
Comments	The eucalypts should be spaced approximately 10 m apart.
Species	**Canopy trees** 10 *Eucalyptus cephalocarpa* 10 *Eucalyptus yarraensis* **Smaller trees** *Acacia pycnantha* *Acacia mearnsii* *Acacia melanoxylon* **Shrubs** *Acacia paradoxa* *Acacia verticillata* *Bursaria spinosa* *Coprosma quadrifida* *Goodenia ovata* *Kunzea ericoides* *Leptospermum scoparium* *Olearia lirata* *Ozothamnus ferrugineus* *Pomaderris racemosa* *Prostanthera lasianthos* *Solanum laciniatum* **Ground flora** *Acaena novae-zelandiae* *Dianella tasmanica* *Dichondra repens* *Lomandra longifolia* *Poa ensiformis* *Poa labillardierei*

Area 32. Batter overlooking Blind Ck and the brickworks

Area	540 m² (90 m × 6 m)
Priority	Medium
Purpose	Improve continuity of native vegetation along the Blind Ck corridor; Screen the brickworks from the trail.
Type of revegetation	Planting into a mulched bed where there is presently grass.
Methods	Spray grass, spread mulch and plant species of Swampy Woodland.
Comments	The eucalypts should be spaced approximately 10 m apart.
Species	Canopy trees *Eucalyptus cephalocarpa* *Eucalyptus yarraensis* Smaller trees *Acacia mearnsii* *Acacia melanoxylon* Shrubs *Acacia paradoxa* *Bursaria spinosa* *Goodenia ovata* *Kunzea ericoides* *Leptospermum scoparium* *Ozothamnus ferrugineus* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Dianella tasmanica* *Dichondra repens* *Lomandra longifolia* *Poa ensiformis*

Area 33. Floodplain of Blind Ck southwest of the Knox Waste Transfer Station

Area	1,700 m²
Priority	Medium
Purpose	Improve continuity of native vegetation along the Blind Ck corridor; Screen the brickworks from the trail.
Type of revegetation	Planting of scattered individual trees and rushes, not in beds.
Methods	Spray grass around each tree site prior to planting. Plant each tree with a weed mat and place a strong stake on the upstream side to protect from debris in floods. Rushes do not need stakes.
Comments	The floodplain is artificially narrowed here so planting is quite constrained by the need to avoid impeding floodwater. Do not plant too close to the creek channel, which is vulnerable to erosion.
Species	*Eucalyptus yarraensis*, *Eucalyptus ovata*, *Juncus amabilis, Juncus sarophorus, Juncus gregiflorus*.

Area 34. Floodplain of Blind Ck south of the Knox Waste Transfer Station entry

Area	2,700 m²
Priority	Medium
Purpose	Improve continuity of native vegetation along the Blind Ck corridor; Screen the brickworks from the trail.
Type of revegetation	Planting of scattered individual trees and rushes, not in beds.

Area 34. Floodplain of Blind Ck south of the Knox Waste Transfer Station entry

Methods	Spray grass around each tree site prior to planting. Plant each tree with a weed mat. For woody species, place a strong stake on the upstream side to protect from debris in floods.
Comments	Do not plant eucalypts or tall wattles beneath the powerlines. Do not plant too close to the creek channel, which is vulnerable to erosion.
Species	Canopy trees *Eucalyptus ovata* Smaller trees *Acacia mearnsii* *Acacia melanoxylon* Shrubs *Acacia verticillata* *Coprosma quadrifida* *Goodenia ovata* *Leptospermum lanigerum* *Melicytus dentatus* *Ozothamnus ferrugineus* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Carex appressa* *Juncus amabilis* *Juncus gregiflorus* *Juncus sarophorus* *Poa labillardierei*

Area 35. Southeast-facing batter beside the waste transfer station

Area	220 m²
Priority	Medium
Purpose	Improve continuity of native vegetation along the Blind Ck corridor; Screen the waste transfer station from the trail.
Type of revegetation	Planting into a mulched bed where there is presently grass.
Methods	Spray grass, spread mulch and plant.
Comments	Species were chosen that grow less than 8 m tall to avoid powerlines.
Species	Trees *Acacia mearnsii* *Acacia melanoxylon* Shrubs *Acacia paradoxa* *Acacia pycnantha* *Bursaria spinosa* *Cassinia aculeata* *Goodenia ovata* *Kunzea ericoides* *Leptospermum scoparium* *Ozothamnus ferrugineus* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Dianella tasmanica* *Lomandra longifolia* *Poa ensiformis*

Area 36. South of the gate to the waste transfer station

Area	200 m²
Priority	Medium
Purpose	Improve continuity of native vegetation along the Blind Ck corridor; Screen the waste transfer station from the trail.
Type of revegetation	Planting into a mulched bed where there is presently grass.
Methods	Spray grass, spread mulch and plant.
Comments	Do not plant the eucalypts where their branches will grow beneath powerlines.

Area 36. South of the gate to the waste transfer station

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus ovata

Smaller trees
Acacia mearnsii
Acacia melanoxylon
Melaleuca ericifolia

Shrubs
Acacia paradoxa
Coprosma quadrifida
Goodenia ovata
Kunzea ericoides
Leptospermum scoparium
Ozothamnus ferrugineus
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Poa ensiformis
Poa labillardierei

7.6. Lakewood Nature Reserve Offset Site, Knoxfield

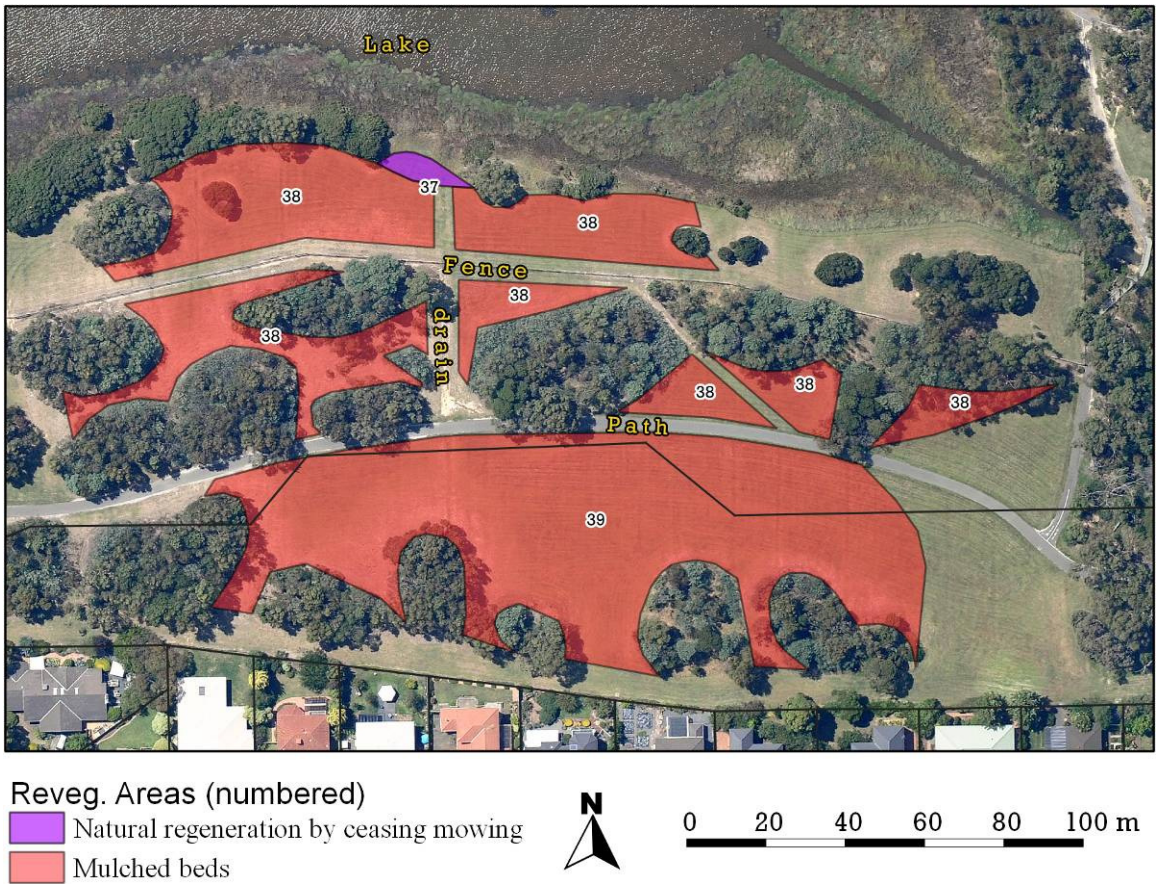
To the south of the eastern end of the lake at Lakewood Nature Reserve, there are lawn areas that once supported Swampy Woodland south of the path and Valley Heathy Forest north of the path (see Figure 12). There is a tiny remnant of Swampy Woodland ground flora abutting the lake and there are patches of mature revegetation interspersed with the lawn. Swampy Woodland and Valley Heathy Forest are both listed by the Department of Sustainability & Environment as endangered. They are by far the best types of vegetation in Knox for gaining offset credits in the way described in Section 3.10 (p. 35). Council therefore identified this area as a potential site to gain offset credits through revegetation.

Mowing of the tiny remnant of ground flora (Area 37) should cease immediately to allow recovery and natural regeneration.

The revegetation proposed below could be done piece by piece in accordance with the changing demands for offset credits in each of the two types of vegetation.

It is important that prior to revegetation, measures are in place to meet the many conditions that offsets must meet (Section 3.10). An additional complication is that all the land north of the path and a small fraction of the land south of the path belong to Melbourne Water (even though they are managed by Knox City Council). Melbourne Water would have to approve revegetation on their land. The Municipal Fire Prevention Officer should also be consulted.

Figure 12. Proposed revegetation areas at Lakewood Nature Reserve.



Area 37. Beside the lake

Area	100 m²
Priority	High, urgent
Purpose	Prevent further ecological deterioration of this tiny remnant of Swampy Woodland and allow it to recover and regenerate.
Type of revegetation	Natural regeneration through cessation of mowing.
Methods	Cease mowing.

Area 38 (in seven parts). Swampy Woodland area, north of the path

Area	4,100 m² in total
Priority	Medium
Purpose	Gain offset credits; Fill in spaces between existing mulched beds to create larger patches that are more beneficial to wildlife and suffer less from edge effects (Section 3.3.2).
Type of revegetation	Dense planting into mulched beds where there is presently just mown grass.
Methods	Spray grass and weeds, spread mulch and plant species of Swampy Woodland.
Comments	Eucalypts should be planted so that they, in combination with the pre-existing trees, are approximately 10 m apart on average. The existing revegetation has far too many eucalypts. Use *Eucalyptus cephalocarpa* where the crown will overhang paths, otherwise *Eucalyptus ovata*.

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus ovata

Smaller trees
Acacia mearnsii
Acacia melanoxylon
Melaleuca ericifolia

Shrubs
Acacia leprosa
Acacia paradoxa
Acacia verticillata
Cassinia aculeata
Coprosma quadrifida
Goodenia ovata
Kunzea ericoides
Leptospermum lanigerum
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Senecio minimus
Solanum laciniatum
Viminaria juncea

Ground flora
Acaena novae-zelandiae (not near paths)
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Gahnia sieberiana
Lomandra longifolia
Poa ensiformis

Twiner
Clematis aristata

Area 39. Valley Heathy Forest area, south of the path

Area	5,500 m² in total
Priority	Medium
Purpose	Gain offset credits; Fill in spaces between existing mulched beds to create larger patches that are more beneficial to wildlife and suffer less from edge effects (Section 3.3.2).
Type of revegetation	Dense planting into mulched beds where there is presently just mown grass.
Methods	Spray grass and weeds, spread mulch and plant species of Valley Heathy Forest.
Comments	Eucalypts should be planted so that they, in combination with the pre-existing trees, are approximately 10 m apart on average.

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus obliqua
Eucalyptus radiata

Smaller trees
Acacia mearnsii
Acacia melanoxylon

Shrubs
Acacia leprosa
Acacia myrtifolia
Acacia paradoxa
Acacia pycnantha
Bursaria spinosa
Cassinia aculeata
Coprosma quadrifida
Dillwynia cinerascens
Goodenia ovata
Hibbertia riparia
Indigofera australis
Kunzea ericoides
Leptospermum continentale
Olearia lirata
Ozothamnus ferrugineus
Platylobium obtusangulum
Pultenaea gunnii
Solanum laciniatum

Ground flora
Acaena novae-zelandiae (not near paths)
Austrostipa rudis subsp. *australis*
Dianella admixta
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Helichrysum scorpioides
Lepidosperma gunnii (if available)
Lomandra longifolia
Poa morrisii
Themeda triandra

Twiner
Billardiera mutabilis

7.7. Corhanwarrabul Creek Corridor, Knoxfield & Rowville

This site includes a weak link in the network of habitat corridors formed by Corhanwarrabul Ck, Ferny Ck and Monbulk Ck. The scenery for visitors or users of the shared path to the north of the creek is seriously marred by factories. Recently constructed water purification wetlands provide habitat for some waterbirds (although diminished by the steep sides that have been constructed). Planting trees near the wetlands may allow some waterbirds to nest or roost there and (in some locations) provide shade over the water, which is beneficial to water quality and some aquatic life.

Constraints to revegetation in this site include:

- Very little space between the shared path and the fences of adjacent factories, with powerlines above;
- Heavy machinery access to the water treatment wetlands, creek and drainage channels;
- The need to avoid impeding floodwater;
- Open space needed by the Knox Model Aircraft Club;
- Some of the public land is not in Council's jurisdiction; and
- Clay fill dumped along the southern perimeter during construction of adjacent factories.

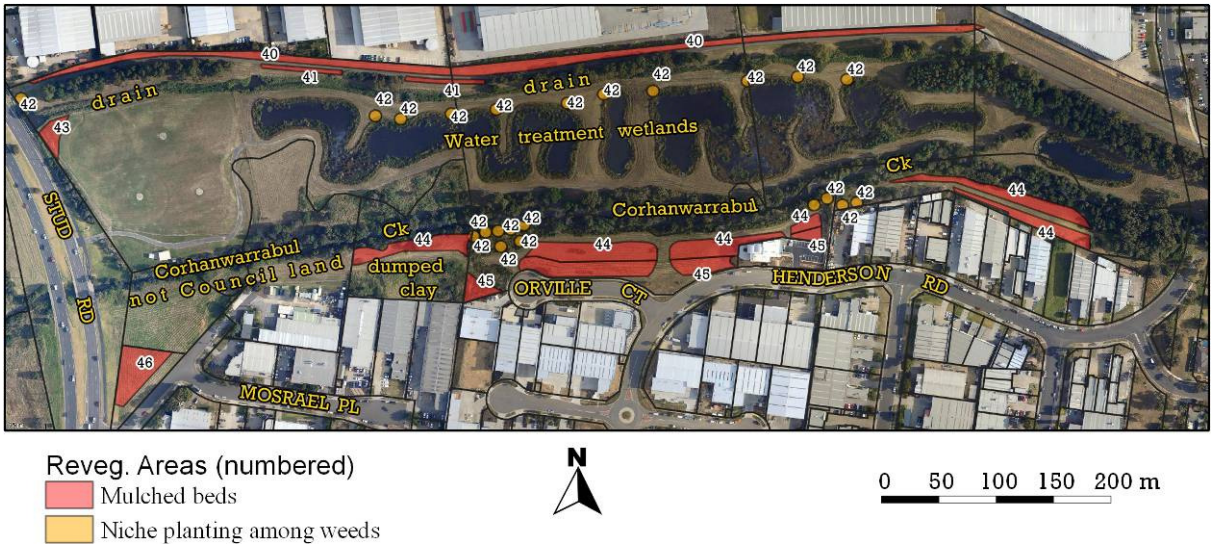
The narrowness of the strips available to revegetate presents a considerable constraint to the amount of visual screening and wildlife habitat that can be achieved.

Revegetation of a small triangle of public land beside Stud Rd opposite Mosrael Place may become important for channelling birds and insects to future treed habitat on the opposite side of Stud Rd, depending on the future of the Stamford Park redevelopment project.

The circles on the graphics below represent individual eucalypts. Each one is labelled in the Geographic Information System with the name of a chosen species but it is not possible to display them all at the scale used here.

The proposed revegetation of this site (like the other stream corridor sites) would have to be checked and approved by three departments of Melbourne Water.

Figure 13. Proposed revegetation areas along Corhanwarrabul Ck.



Area 40. Narrow strip between the shared path and factory fences

Area	5,200 m² (830 m long)
Priority	Medium
Purpose	Screen the view of factories from the shared path; Improve continuity of native vegetation along the corridor.
Type of revegetation	Planting into a mulched bed where there is presently grass (mown regularly).
Methods	Spray grass, spread mulch and plant species of Swampy Woodland.
Comments	In the 160 m closest to Stud Rd, there is a particularly low powerline above, requiring avoidance of species that grow taller than about 5 m. Further east, powerlines are higher and allow species growing to 8 m tall.

Species

Shrubs

Acacia paradoxa
Acacia pycnantha
Acacia verticillata
Bursaria spinosa
Coprosma quadrifida
Goodenia ovata
Kunzea ericoides
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Solanum laciniatum

Ground flora

Acaena novae-zelandiae (not near path)
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Hardenbergia violacea
Lomandra longifolia
Poa ensiformis

Area 41. Batter on the southern edge of the shared path

Area	540 m² (135 m × 4 m)
Priority	Medium
Purpose	Improve continuity of native vegetation along the corridor.
Type of revegetation	Planting into a mulched bed where there is presently grass.
Methods	Spray grass, spread mulch and plant.

Species

Canopy trees

Eucalyptus cephalocarpa
Eucalyptus yarraensis

Smaller trees

Acacia mearnsii
Acacia melanoxylon

Shrubs

Acacia paradoxa
Acacia pycnantha
Bursaria spinosa
Goodenia ovata
Kunzea ericoides
Leptospermum scoparium
Ozothamnus ferrugineus
Solanum laciniatum

Ground flora

Acaena novae-zelandiae
Dianella tasmanica
Lomandra longifolia
Poa ensiformis

Area 42. Scattered eucalypts

Area	This area comprises scattered trees, so there is no well-defined area to measure.
Priority	Medium
Purpose	Fill major gaps in the eucalypt canopy along the corridor; Provide shade and sites for waterbirds to nest and roost beside wetlands.
Type of revegetation	Planting of individual trees without creating beds, although some near the dead end of Orville Ct are to be planted within an existing bed with too few eucalypts.
Methods	Spray grass around each tree site prior to planting (except in the existing bed near Orville Ct). Plant with weed mats. Use tree guards or stakes to mark trees that could be overlooked by a slasher operator.
Species	*Eucalyptus cephalocarpa, Eucalyptus ovata* and a single *Eucalyptus yarraensis*.

Area 43. Unused, flood-prone corner of the model aircraft area

Area	425 m²
Priority	Medium
Purpose	Ameliorate a constriction in the habitat corridor.
Type of revegetation	Planting into a bed where there is presently grass.
Methods	Spray grass, spread weed mat and plant. (Not mulch due to flooding.)
Species	Canopy trees *Eucalyptus ovata* *Eucalyptus viminalis* Smaller trees *Acacia melanoxylon* *Pomaderris aspera* Shrubs *Coprosma quadrifida* *Goodenia ovata* *Leptospermum lanigerum* *Melicytus dentatus* *Ozothamnus ferrugineus* *Solanum laciniatum* Ground flora *Acaena novae-zelandiae* *Carex appressa* *Juncus amabilis* *Juncus gregiflorus* *Juncus sarophorus* *Poa labillardierei*

Area 44. Southern bank of Corhanwarrabul Ck

Area	6,600 m²
Priority	Medium
Purpose	Broaden the riparian vegetation along Corhanwarrabul Ck for wildlife and to shield factories from view along the shared path.
Type of revegetation	Planting into a bed where there is presently slashed grass.
Methods	Spray grass, spread mulch and plant.

Area 44. Southern bank of Corhanwarrabul Ck

Species

Canopy trees
Eucalyptus ovata
Eucalyptus cephalocarpa

Smaller trees
Acacia mearnsii
Acacia melanoxylon
Melaleuca ericifolia
Pomaderris aspera

Shrubs
Acacia verticillata
Coprosma quadrifida
Goodenia ovata
Kunzea ericoides
Leptospermum lanigerum
Leptospermum scoparium
Melicytus dentatus
Ozothamnus ferrugineus
Prostanthera lasianthos
Senecio minimus
Solanum laciniatum
Viminaria juncea

Ground flora
Acaena novae-zelandiae
Dianella tasmanica
Gahnia sieberiana
Juncus amabilis
Juncus gregiflorus
Juncus sarophorus
Lomandra longifolia
Poa ensiformis
Poa labillardierei

Twiner
Clematis aristata

Area 45. Batters abutting the floodplain of Corhanwarrabul Ck

Area	2,900 m²
Priority	Medium
Purpose	Broaden the Corhanwarrabul Ck habitat corridor.
Type of revegetation	Planting into a bed where there is presently slashed grass.
Methods	Spray grass, spread mulch and plant.

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus obliqua
Eucalyptus radiata

Smaller trees
Acacia mearnsii
Acacia melanoxylon

Shrubs
Acacia leprosa
Acacia myrtifolia
Acacia paradoxa
Acacia pycnantha
Bursaria spinosa
Cassinia aculeata
Coprosma quadrifida
Dillwynia cinerascens
Goodenia ovata
Kunzea ericoides
Olearia lirata
Ozothamnus ferrugineus
Pultenaea gunnii
Solanum laciniatum

Ground flora
Acaena novae-zelandiae (not near paths)
Austrostipa rudis subsp. *rudis*
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Poa morrisii
Themeda triandra

Twiner
Clematis aristata

Area 46. Triangle beside Stud Rd

Area	1,400 m²
Priority	Low until plans for the Stamford Park redevelopment crystallise. If there is to be increased treed habitat on the opposite side of Stud Rd from this triangle, the priority to revegetation will increase to Medium. If the land between the triangle and Corhanwarrabul Ck becomes available to Council for revegetation, the priority would rise to High.
Purpose	Ameliorate a significant gap in the Corhanwarrabul Ck habitat corridor.
Type of revegetation	Planting into a bed where there is presently slashed grass.
Methods	Spray grass, spread mulch and plant.
Species	As for Area 44.

7.8. Ferny Creek, Ferntree Gully

This concept plan concerns the Ferny Ck corridor in Ferntree Gully from Burwood Hwy to just downstream of Hancock Dr. This stretch has potential to serve as a significant wildlife corridor and contribute to Council's objective of creating green connections from the Dandenong Valley to the Dandenong Ranges. It is not living up to this potential because there are significant gaps in its vegetation, particularly in the eucalypt canopy. Wildlife further downstream would likely but richer if the gaps were filled.

The main objective here is to improve the continuity of vegetation with particular attention to planting indigenous eucalypts at optimal spacing. The site also provides a good opportunity to create a substantial (6,000 m²) patch of Valley Heathy Forest revegetation west of the Knox Regional Netball Centre (subject to open space master planning) see Area 49 below.

Figure 14. Proposed revegetation areas along Ferny Ck, Ferntree Gully. The right-hand edge of the top two panels overlap the left edge of the next panel down, but the north arrows show that the top panel is oriented differently.

One of the main reasons why this stretch of Ferny Ck has such patchy vegetation is that the artificial creek channel has been dug so wide as to leave limited space either side for trees.

The corridor was planted with trees from other parts of Australia more than a quarter-century ago, then augmented with some areas of indigenous revegetation more recently. It appears that bushfire hazard was not given a high priority, but that does not apply to the concept provided here. The proposals below should be referred to the Municipal Fire Prevention Officer for consideration.

Area 47. Scattered eucalypts to fill canopy gaps

Area	This area comprises scattered trees, so there is no well-defined area to measure.
Priority	High
Purpose	Fill gaps in the very fragmented eucalypt canopy along the Ferny Ck corridor; Provide a more natural ambience for users of the shared path.
Type of revegetation	Planting of individual trees, not in beds.
Methods	Spray grass around each tree site prior to planting. Plant with weed mats and tree guards or stakes.
Comments	The locations shown above are quite precise so alterations to locations or numbers should be avoided where possible. Each mapped tree has an associated species name in the Geographic Information System but the names cannot be displayed on the scale of the map above (Figure 14). Swamp Gums and Manna Gums have been avoided near the shared path because they are prone to drop limbs.
Species	*Eucalyptus melliodora, Eucalyptus cephalocarpa, Eucalyptus radiata, Eucalyptus viminalis* and *Eucalyptus ovata*.

Area 48. Grassy margins of Ferny Ck with little tree cover

Area	10,600 m²
Priority	High
Purpose	Broaden and fill in the vegetation of the Ferny Ck habitat corridor.
Type of revegetation	Planting into a bed where there is presently slashed grass.
Methods	Spray grass, spread mulch and plant.

Area 48. Grassy margins of Ferny Ck with little tree cover

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus melliodora
Eucalyptus obliqua
Eucalyptus ovata (not near paths)
Eucalyptus radiata

Smaller trees
Acacia dealbata
Acacia melanoxylon
Pomaderris aspera
Melaleuca ericifolia

Shrubs
Acacia leprosa
Acacia paradoxa
Acacia pycnantha
Bursaria spinosa
Cassinia aculeata
Coprosma quadrifida
Goodenia ovata
Indigofera australis
Kunzea ericoides
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Solanum laciniatum

Ground flora
Acaena novae-zelandiae
Austrostipa rudis subsp. *rudis*
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Lomandra longifolia
Poa ensiformis

Twiner
Clematis aristata

Area 49. Hillside west of the Knox Regional Netball Centre

Area	6,000 m²
Priority	Medium
Purpose	Increase the municipality's stocks of the endangered Valley Heathy Forest; Attract wildlife; Create a green and leafy outlook from the heavily used netball centre and the shared path.
Type of revegetation	Dense planting into mulched beds where there is presently just mown grass.
Methods	Such a large area deserves careful consideration by an open space planner, perhaps involving the creation of a master plan with a path and other facilities. Before planting, spray grass and spread mulch.
Comments	Eucalypts should be planted so that they are 8-10 m apart on average.
Species	As for Area 48, plus:

Shrubs
Acacia myrtifolia
Dillwynia cinerascens
Hibbertia riparia
Leptospermum continentale
Platylobium obtusangulum
Pultenaea gunnii

Twiner
Billardiera mutabilis

Ground flora
Austrostipa rudis subsp. *australis*
Dianella admixta
Helichrysum scorpioides
Lepidosperma gunnii (if available)
Poa morrisii
Themeda triandra

Area 50. Grassy margins of Ferny Ck with little tree cover

Area	1,700 m²
Priority	Medium
Purpose	Screen factories from view; Improve continuity of vegetation along the Ferny Ck habitat corridor.
Type of revegetation	Planting into a bed where there is presently slashed grass.
Methods	Spray grass, spread mulch and plant.
Species	As for Area 48.

7.9. Peregrine Reserve, Rowville

Most of Peregrine Reserve, Rowville, comprises open lawns with scattered trees (some of which are mature, remnant Swamp Gums). There are two playgrounds and a path system. At the centre of the reserve is a rectangular patch of remnant vegetation mixed with revegetation. There are also strips of revegetation, of which trees are the main component.

The reserve is less than one kilometre from the extensive semi-natural habitat of the Lysterfield Hills. If the habitat in the reserve is expanded, native birds and insects are expected to migrate there from the hills.

Figure 15. Proposed revegetation areas at Peregrine Reserve, with areas numbered as below.

In one sense, this site is the simplest that appears in this Appendix because so much of it is an blank canvas, with recreational facilities already in place and very few physical constraints. On the other hand, the large open expanses should not be taken up wholly by revegetation without carefully considering the alternative uses of the land.

The approach taken here is to map areas which would best suit revegetation and provide guidance on appropriate species, leaving Council's open space planners to decide which parts should be taken up, with input from the local community. Paths should be constructed through the areas chosen.

Because of the reserve's topography, it can be divided into three areas suited to different types of vegetation:

- The elevated land in the north and northeast (shaded red above) suits Valley Heathy Forest;
- A drain that flows westward toward the southeast corner has patches suited to seasonal wetland planting (if dug out slightly); and
- The remainder of the reserve is suited to Swampy Woodland.

Area 51. Valley Heathy Forest

Area	5,200 m²
Priority	Medium
Purpose	Increase the municipality's stocks of the endangered Valley Heathy Forest; Attract wildlife.
Type of revegetation	Planting into a mulched bed where there is presently grass (mown regularly).
Methods	Spray grass, spread mulch and plant species of Valley Heathy Forest.

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus melliodora
Eucalyptus obliqua
Eucalyptus radiata
Eucalyptus rubida

Smaller trees
Acacia implexa
Acacia mearnsii

Shrubs
Acacia leprosa
Acacia myrtifolia
Acacia paradoxa
Acacia pycnantha
Bursaria spinosa
Cassinia aculeata
Dillwynia cinerascens
Goodenia ovata
Hibbertia riparia
Indigofera australis
Kunzea ericoides
Leptospermum continentale
Olearia lirata Ozothamnus ferrugineus
Platylobium obtusangulum
Pultenaea gunnii
Solanum laciniatum

Ground flora
Acaena novae-zelandiae (not near paths)
Austrostipa rudis subsp. *rudis*
Dianella admixta
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Helichrysum scorpioides
Lepidosperma gunnii (if available)
Lomandra longifolia
Poa morrisii
Themeda triandra

Area 52. Swampy Woodland

Area	14,700 m²
Priority	Medium
Purpose	Increase the municipality's stocks of the endangered Swampy Woodland; Attract wildlife.
Type of revegetation	Planting into a mulched bed where there is presently grass (mown regularly).

Area 52. Swampy Woodland

Methods	Spray grass, spread mulch and plant species of Swampy Woodland.
Comments	*Eucalyptus cephalocarpa* is for near paths; use *E. ovata* instead elsewhere.

Species

Canopy trees
Eucalyptus cephalocarpa
Eucalyptus ovata

Smaller trees
Acacia mearnsii
Acacia melanoxylon
Melaleuca ericifolia

Shrubs
Acacia leprosa
Acacia paradoxa
Acacia verticillata
Cassinia aculeata
Coprosma quadrifida
Goodenia ovata
Kunzea ericoides
Leptospermum scoparium
Olearia lirata
Ozothamnus ferrugineus
Prostanthera lasianthos
Senecio minimus
Solanum laciniatum
Viminaria juncea

Ground flora
Acaena novae-zelandiae (not near paths)
Dianella laevis/longifolia
Dianella tasmanica
Dichondra repens
Gahnia sieberiana
Lomandra longifolia
Poa ensiformis

Twiner
Clematis aristata

Area 53. Seasonal wetland

Area	150-200 m²
Priority	Low
Purpose	Add a water feature to the reserve; Attract wildlife: invertebrates, frogs and birds.
Type of revegetation	Artificial wetland creation, including minor excavation to make the whole area hold water better.
Methods	Enlarge the existing depression by excavation; plant wetland species

Species

Alisma plantago-aquatica
Carex appressa
Carex fascicularis
Centella cordifolia
Crassula helmsii
Glyceria australis
Gratiola peruviana
Isolepis inundata
Juncus gregiflorus
Juncus pauciflorus
Leptospermum lanigerum (a few)
Lobelia anceps
Lomandra longifolia
Lycopus australis
Lythrum salicaria
Persicaria decipiens