Street and Open Space Tree Design Guidelines

Renmark Paringa Council

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Introduction

Purpose of this Document

The Street and Open Space Tree Design Guidelines propose a methodology for making successful tree species selection that forms a coherent link between design considerations and implementation by setting out the optimum characteristics of street and open space trees, options for layout within streets, critical considerations in the selection process and best practice techniques for implementation.

Background

Trees in streets are essential for a high quality streetscape. Healthy, established urban trees provide a long term legacy for the community. Many of the most memorable streets and localities can attribute their noteworthy status to the presence of large healthy trees. At the regional scale street trees contribute to the overall percentage canopy cover which in turn delivers a variety of environmental benefits.

Experience has shown that simply the planting of street trees with all good intention is not sufficient to achieve a high quality streetscape. To achieve successful streetscapes critical factors such as selection of the most appropriate tree species, quality of the plant stock and planning for and providing adequate soil and water are essential. These guidelines address these matters.

How to use this Guideline

The information in the guidelines leads the reader sequentially through the process of planning, installing and establishing street and open space trees.

Part 1

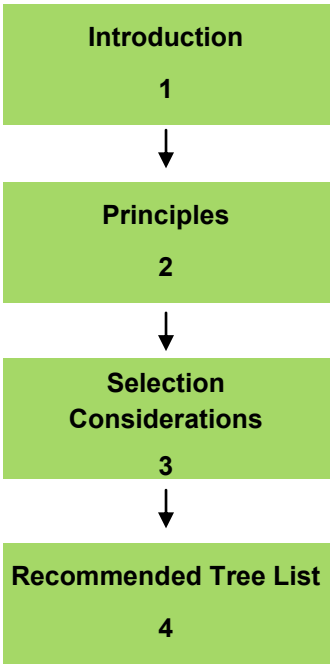
Highlights the Key Principles behind the document.

Part 2 Selection Considerations

Addresses consideration of the design intent for streetscapes; the function of the streets; underlying environmental conditions, and horticultural considerations.

Part 3 Recommended Tree List

Provides a guide for selection of species, along with the critical limiting factors pertinent to each species to ensure their successful use as street and open space trees.



Principles

There are six key principles that guide the landscape design of streetscapes.

- Street trees should contribute to the overall unity of the streetscape, through their layout, scale and character. Careful selection of the tree species will provide scale and visual cohesion to the street. Beyond this generic design intent for the street trees, trees can also form landmarks, contribute to both contextual character and the general amenity of open space.

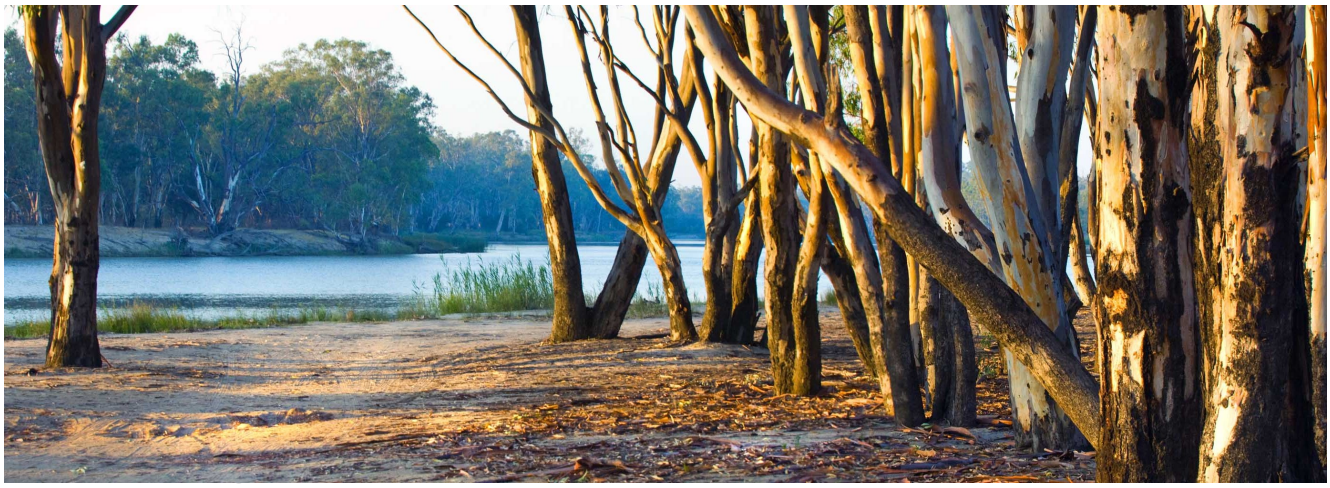
- Select the most appropriate tree species to satisfy the design intent and the physical conditions of the site both natural and man-made whilst responding to other functional requirements such as solar access and vehicle clearances.

- Optimise soil conditions for trees and locate trees to maximise available soil volume. Ensure that there is a sufficient quantity and quality of soil within the anticipated root zone to support the intended mature tree and that adequate moisture is provided to that zone.

- Street trees need adequate water to flourish. Street tree location and design should optimise passive watering of all street trees.

- Minimise infrastructure and functional conflicts. Locate trees and utility services to minimise potential conflicts between street elements and functions, such as streetlights being blocked by the tree canopy or car doors being opened into tree trunks.

- Where appropriate integrate water sensitive urban design (WSUD) initiatives with the provision of street and open space trees.



Part 2

Selection considerations

The advantages of urban trees are extremely broad; from environmental to sociological benefits to quality of life and visual amenity improvements. This document accepts these benefits as a given and addresses the specifics of how to select longer living trees with appropriate characteristics for planting in streets.

2.1 Aesthetics

Selected species must have predictable growth habit and form to function as a successful street tree. A street tree should have a single straight trunk (to minimise conflicts with pedestrian and vehicular traffic) and stable branch structure (to minimise hazards created by inherent defects) with a clear trunk height (free of lateral branches) for not less than 3 metres from ground level.

The tree canopy (foliage and branches) should be broad domed or umbrageous in form (see Fig2). The traditional ideal of the avenue includes regularly spaced broad domed trees with canopies that interlock to provide a leafy ceiling to the street. In some situations strong vertical forms may be appropriate as a landmark (see Fig 3).

Ideally species selection should aim for consistency and visual uniformity providing streets with a recognisable character. This generally dictates the use of a single species within a street. Street plantings with a multiplicity of different species (with disparate forms) can add interest to the streetscape but often detract from the overall amenity of the street and the primary design character intent of giving the street unity.

Species with low branching habits, such as some conifers, trees with loose branching habits or those with multiple trunks and low horizontal branch development, are not generally suitable as street trees, but can be considered in open space.

Fig 2 Umbrageous or umbrella like form

Fig 3 Strong vertical forms

The selection of a street tree should also consider seasonal features that help the community experience their changing environment and add interest such as leaf colour variations (pink leaves in spring, autumnal leaf colour), flowers, or attractive bark that alters through the year. This creates an important dimension to the neighbourhood landscape.

In certain situations it may be beneficial to use more than one species in a street, where multiple species are used, however, they should be compatible (in form) and laid out so as to work together to achieve the overall unity of the streetscape. An additional benefit of the use of multiple species is the potential reduction of the impact of debilitating pests and diseases that have historically affected monocultures.

Pistachio Tree has an umbrageous form suited to the streetscape.

2.2 Climate

Renmark is surrounded by mallee scrub. Renmark is situated in a grassland location, above Goyder's Line, with hot dry summers and cool winters. Under Köppen climate classification, Renmark has a semi-arid climate with seasonal temperatures a few degrees above Adelaide's temperatures, although it has many more touches of frost in winter, also differing with Adelaide's sizeable winter precipitation. The average rainfall of Renmark is 243.7mm falling evenly throughout the year, as thunderstorms in summer, or with cold fronts in winter, and a combination of the two in spring and autumn. Record temperatures have ranged from 48.2 °C during February 2009 heatwave to -6.1 C during winter

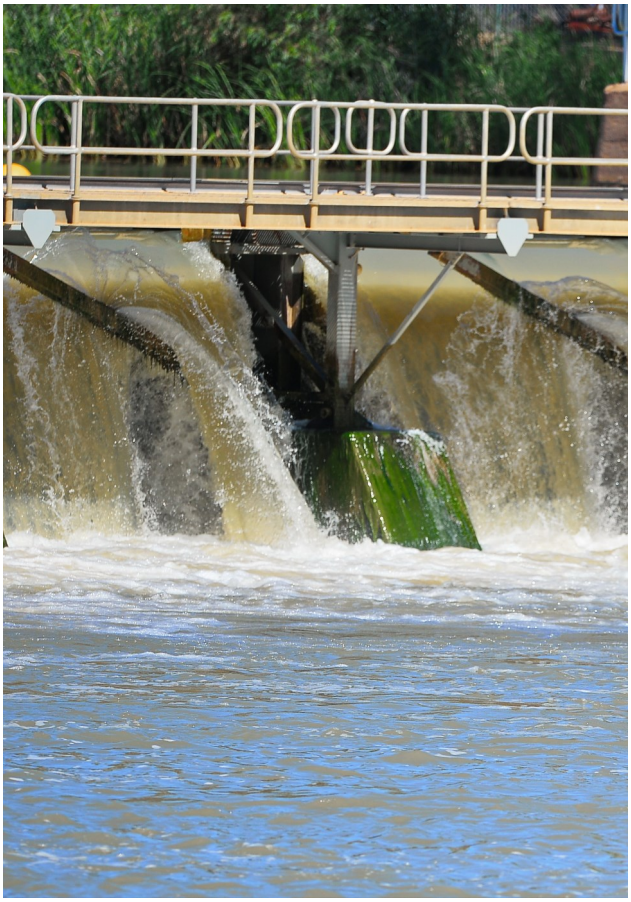
Only those species that have a proven performance record within the locality should be selected for use as street trees in the corresponding geographical area.

Different species have different microclimatic preferences and tolerances depending on the natural habitat. Some species are tolerant of full exposure to sunlight, whereas others prefer semi- shaded positions. Exposure to prevailing winds, salt laden winds, tolerance or sensitivity to frost and other environmental variables must be considered in both selection and placement within the site.

2.3 Water

Adequate soil moisture is essential for trees to flourish in the challenging urban environment.

There are a number of means by which street and open space trees may be watered including irrigation systems however these means can be costly. Alternative means of watering such as passive watering from ‘low flow’ stormwater should be considered within future designs.



2.4 Soils and Drainage

Soil conditions throughout the Council area are variable ranging from loam soils to sandy clay loam soils at a pH level of 6.0 to 6.5.

The selection of tree species must take into account the soil types both within the locality and the geographical region. Whilst some species are adaptable to a range of soil conditions, others prefer particular soil depth, fertility and moisture content to perform satisfactorily.

The site hydrology will also be a limiting factor in the selection of tree species. Low lying areas along drainage lines are typically poorly drained and may be suitable to species that will tolerate periodic inundation or waterlogged soils. Higher areas on side slopes or ridges are more typically well drained and species that prefer well drained soil conditions should be selected for these areas.

The root system provides the essential functions of anchorage (structural stability), absorption of water and nutrients and storage of vital food reserves. The mature size of a tree will be limited by the volume of soil suitable for root growth and development. Most tree roots are contained in the top metre or so of soil, but may extend 2 to 3 times beyond the extent of the drip-line (extent of the canopy projected to the ground plane). For trees to achieve their optimum mature dimensions, they must have adequate below ground space for the growth and development of the root system.

Soil conditions within an urban environment, particularly streetscapes, are far from natural. Soil profiles are often inverted, disturbed, paved, compacted and contain a variety of underground structures and utility services. Satisfactory growth and performance of trees relies heavily on an effective root system. Root growth is limited by available soil oxygen, soil strength, permeability and moisture holding capacity. Whilst some species will tolerate poor soil conditions, ideally improved soil conditions should be provided to ensure satisfactory root growth.

2.5 Biodiversity and Habitat

Where appropriate, consideration should be given to planting trees which provide a linkage between open space or other vegetated areas and natural stands of vegetation or bushland to assist in the movement of wildlife (fauna and birdlife) between those areas. These species should contain some benefits to wildlife including the physical benefits of protection, shelter, nesting sites and food sources.

Species that are locally indigenous to an area are likely to provide the most benefit to local wildlife, however these species are not always successful when planted in a highly urbanised situation. In some situations exotic species can provide similar attributes, such as habitat and linkages, for wildlife.

2.6 Services & Public Infrastructure

The size and position of underground utility services may limit effective root growth therefore limiting the optimum size, growth and performance of street trees. Likewise, tree roots may cause damage to underground services by direct pressure on conduits as roots grow and expand in diameter, or by entry to hydraulic services such as sewer and stormwater lines causing damage and blockage. Tree roots and underground services do not mix. Where possible tree planting areas and below ground service corridors should be separated.

Species that have large and vigorous root systems may result in significant damage to public infrastructure, including roads, kerbs, footpaths, paved areas and underground services. These types of trees should be avoided.

Where overhead power or communication lines occur, the size and/or types of trees suitable to be grown beneath are limited due to their branching habit and tolerance to severe pruning.

2.7 Native or Exotic

There is considerable divergence of opinion within the general community in regard to the use of native or exotic tree species in our urban environment. However, the origin of a tree is of lesser importance than it's ability to tolerate the modified urban environment and its appropriateness to the site conditions. Ultimately, it is critical that the species selected will be sustainable in the landscape, that is, it will grow to maturity and perform satisfactorily for an extended period in the street environment with a minimum of care and maintenance. A combination of tree types may best suit the specific site situation. There are broadly three different species options to consider:

Locally Native Species

These trees are generally best suited to the soils and climate of their particular area, they also promote biodiversity and habitat linkages, one such species is the Eucalyptus camaldulensis (River Red Gum). The constraints posed by the urban environment may not allow all locally native species to flourish causing them to be more susceptible to pests and disease when under environmental stress. Many of these species have not been extensively trialed in urban situations and their performance is not readily predictable.

Species Native to Australia

Native trees are widely used in the landscape industry having both the required form and ability to perform well in the urban environment. Many native species have been extensively used in amenity horticulture and their performance can be predicted under known environmental conditions.

Exotic Species

Some of our trees are exotic species and in some cases the species have been bred specifically for amenity horticultural purposes therefore being hardy and having a suitable form for use in the urban environment. Many of the exotic species commonly used are deciduous giving the benefit of affording solar access in winter. The option of using deciduous native trees species is extremely limited as there are very few true deciduous native species, most being semi-deciduous associated with their flowering cycle rather than in the winter period as is desirable in the urban environment.

2.8 Tree Size

Species should be selected such that the ultimate mature size is in scale with the relevant street or park, taking into consideration the site constraints, such as verge widths, overhead powerlines, building setbacks and vehicle clearances. The optimum size range should not be so small that it does not make a contribution to the amenity of the street, and not so large as to dominate and cause significant problems (damage & nuisance). In some instances the constraints imposed by the street environment will limit the ultimate size of street trees or even restrict tree planting altogether. It is recommended that the following sizes of trees be planted depending on specific design and physical conditions:

Small Trees

6-8m height with a 5m crown spread

Medium Trees

10-12m height with a 8m crown spread

Large Trees

16-20m height with a 16m crown spread

2.9 Tree Spacing, Life Span & Maintenance

Tree Spacing

A 1.2 metre minimum setback from the kerb generally ensures the tree does not impact the kerb. Furthermore it allows garbage trucks to operate along the street without causing too much damage to the trees. At minimum these trees would be spaced to give a consistent visual presentation, the optimum would be a size and spacing to achieve interlocking canopies both along and over the road reserve.

Street trees linear spacing should average 8.0 metres but will be dependent on the tree size to achieve the previously stated design intent but in detail will depend on the planting layout, mature size, road verge width and the location of existing infrastructure such as driveways and stobie poles.

Life Span & Maintenance

The procurement, planting and establishment maintenance of street trees is a significant investment of time and resources, therefore species selected should be long lived, not less than 20 years. While the majority of tree species are reputed to be long lived in their natural habitat often many species experience a reduced lifespan in the urban environment. Street trees typically do not receive the same level of care as those in residential gardens or parks and must be tolerant of drought, general neglect and atmospheric pollutants. Trees that are sensitive to disturbance or require high levels of maintenance such as regular removal of deadwood, pruning or pest and disease control should be avoided.

Tree species selected should require a minimum of maintenance following the establishment period. Species should also be adaptable to pruning and shaping where required to achieve clearances and appropriate form. To achieve the best outcome for environmental benefits and design intent the tree population should be managed through a life cycle management approach with a mix of tree age classes maintained in order to spread recurrent expenditure and management actions.

Once planted, trees should be inspected annually for up to three years then on a five year cycle to align with the block tree trimming program. At present the current service level is to aim to assess and trim approximately 1/5th of the urban areas of Renmark, Paringa and Lyrup each year.

Street cleaning to remove detritus such a leaves, flowers and fruit drop may need to be carried out, the magnitude and frequency of this activity will depend on the tree species selected.

Part 3

Recommended Tree List

Recommended Tree Lists

The recommended tree lists below have been created on the basis of previous experience regarding which trees have been successful in the Council district.

In addition the Botanical Gardens SA Plant Selector Tool is another resource to assist with the selection of appropriate street and open space trees.

The below lists have been assessed by Biosecurity SA to ensure no trees pose the risk for infestation by fruit fly.

Trees for Irrigated Streets

Botanical Name	Common Name	Origin	Deciduous (D) / Evergreen (E)	Soil Conditions	Drainage Requirements	Suitable under powerlines
Pistacia Chinesis	Chinese Pistache	Exotic	D	Clay, Loam, Sand	Well drained	No
Fraxinus Angustifolia	Claret Ash	Exotic	D	Clay, Loam, Sand	Well drained	Yes * dwarf only*
koelreuteria paniculata	Golden Rain Tree	Exotic	D	Alkaline and poor soils	Well drained	Yes
Ulmus glabra 'Lutescens'	Golden Elm	Exotic	D	Clay, Loam, Sand	Well drained	No
Ulmus Parviflora	Chinese Elm	Exotic	D	Clay, Loam, Sand	Well drained	No

Trees for Non - Irrigated Streets

Botanical Name	Common Name	Origin	Deciduous (D) / Evergreen (E)	Soil Conditions	Drainage Requirements	Suitable under powerlines
Geijera Parviflora	Wilga	Native	E	Loamy, Sandy loam, Clay loam, Poor soil	Dry Soil , Well drained	Yes
Acacia Pendula	Weeping Myall	Native	E	Sand, gravel, silt and clay	Well drained	No
Agonis Flexuosa	Willow Myrtle	Native	E	Sandy soil	Moist, Well drained soil.	No
Eucalyptus Salubris	Fluted Gum Tree (Gimlet)	Native	E	Sandy, Sandy loam, Clay loam	Well drained	No
Eucalyptus leucoxylon	SA Blue Gum & Euky Dwarf	Native	E	Loamy Soil	Well drained	Yes
Eucalyptus Spatulata	Swamp Mallet	Native	E	Sandy, Sandy loam, Clay loam	Poorly drained	No
Eucalyptus torquata	Coral Gum	Native	E	Sandy, Sandy loam, Clay loam	Well drained	No
Callistemon 'Kings Park Special'	Bottlebrush	Native	E	Sandy, Sandy loam, Clay loam	Dry, Well drained	No
Cupaniopsis anacardioides	Tuckeroo	Native	E	Sandy, Sandy loam, Clay loam	Well drained	No

Trees for Open Space

Botanical Name	Common Name	Origin	Deciduous (D) / Evergreen (E)	Soil Conditions	Drainage Requirements	Suitable under powerlines
Pistacia Chinesis	Chinese Pistache	Exotic	D	Clay, Loam, Sand	Well drained	No
Fraxinus Angustifolia	Claret Ash	Exotic	D	Clay, Loam, Sand	Well drained	Yes * dwarf only*
koelreuteria paniculata	Golden Rain Tree	Exotic	D	Alkaline and poor soils	Well drained	Yes
Ulmus glabra 'Lutescens'	Golden Elm	Exotic	D	Clay, Loam, Sand	Well drained	No
Ulmus Parviflora	Chinese Elm	Exotic	D	Clay, Loam, Sand	Well drained	No
Eucalyptus sideroxylon	Red Ironbark	Native	E	Clay or Sandy	Well drained	No
Quercus Robur	English Oak	Exotic	D	Clay, Loam, Sand	Well drained	No
Acer platanoides	Norway Maple	Exotic	D	Chalk, Clay, Sand, Loam	Well drained	No
Corymbia maculata	Spotted Gum	Native	E	Clay, Loam, Sand	Well drained	No
Corymbia citriodora	Lemon Scented Gum	Native	E	Loamy Soils	Well drained	No
Jacaranda mimosifolia	Jacaranda	Exotic	D	Slightly sandy soil	Well drained	No
Plantanus Acerifolia	London Plane	Exotic	D	Adaptable to all soils	Well drained	No
Brachychiton rupestris	Bottle Tree	Native	E	Medium to heavy clay, silt, sand	Well drained	No

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